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NISSAN TRUCK & **PATHFINDER**

MODEL D21 SERIES

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HEATER & AIR CONDITIONER

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FOREWORD

This manual contains maintenance and repair procedures for the 1994 Nissan TRUCK and PATHFINDER.

In order to assure your safety and the efficient functioning of the vehicle, this manual should be read thoroughly. It is especially important that the PRECAUTIONS in the GI section be completely understood before starting any repair task.

All information in this manual is based on the latest product information at the time of publication. The right is reserved to make changes in specifications and methods at any time without notice.

IMPORTANT SAFETY NOTICE

The proper performance of service is essential for both the safety of the technician and the efficient functioning of the vehicle.

The service methods in this Service Manual are described in such a manner that the service may be performed safely and accurately. Service varies with the procedures used, the skills of the technician and the tools and parts available. Accordingly, anyone using service procedures, tools or parts which are not specifically recommended by NISSAN must first completely satisfy himself that neither his safety nor the vehicle's safety will be jeopardized by the service method selected.



Tokyo, Japan

INCH TO METRIC CONVERSION TABLE (Rounded-off for automotive use)

(Kounded-off	for automotiv	e use)		
inches	mm	inches	mm	
.100	2.54	.610	15.49	
.110	2.79	.620	15.75	
.120	3.05	.630	16.00	
.130	3.30	.640	16.26	
.140	3.56	.650	16.51	
.150	3.81	.660	16.76	
.160	4.06	.670	17.02	
.170	4.32	.680	17.27	
.180	4.57	.690	17.53	
.190	4.83	.700	17.78	
.200	5.08	.710	18.03	
.210	5.33	.720	18.29	
.220	5.59	.730	18.54	
.230	5.84	.740	18.80	
.240	6.10	.750	19.05	
.250	6.35	.760	19.30	
.260	6.60	.770	19.56	
.270	6.86	.780	19.81	
.280	7.11	.790	20.07	
.290	7.37	.800	20.32	
.300	7.62	.810	20.57	
.310	7.87	.820	20.83	
.320	8.13	.830	21.08	
.330	8.38	.840	21.34	
.340	8.64	.850	21.59	
.350	8.89	.860	21.84	
.360	9.14	.870	22.10	
.370	9.40	.880	22.10	
.380	9.65	.890	22.61	
.390	9.91	.900	22.86	
.400	10.16	.910	23.11	
.410	10.41	.920	23.37	
.420	10.67	.930	23.62	
.430	10.92	.940	23.88	
.440	11.18	.950	24.11	
.450	11.43	.960	24.38	
.460	11.68	.970	24.64	
.470	11.94	.980	24.89	
.480	12.19	.990	25.15	
.490	12.45	1.000	25.40	
.500	12.70	2.000	50.80	
.510	12.95	3.000	76.20	
.520	13.21	4.000	101.60	
.530	13.46	5.000	127.00	
.540	13.72	6.000	152.40	
.550	13.97	7.000	177.80	
.560	14.22	8.000	203.20	
.570	14.48	9.000	228.60	
.580	14.73	10.000	254.00	
.590	14.99	20.000	508.00	
.600	15.24			

METRIC TO INCH CONVERSION TABLE (Rounded-off for automotive use)

mm 1	inches	 51	inches
2	.0394		2.008
		52 52	2.047
3	.118	- 53	2.087
4	.157	54	2.126
5	.197	55	2.165
6	.236	56	2.205
7	.276	<u>57</u>	2.244
8	.315	58	2.283
9	.354	59	2.323
10	.394	60	2.362
11	.433	61	2.402
12	.472	62	2.441
13	.512	63	2.480
14	.551	64	2.520
15_	.591	65	2.559
16	.630	66	2.598
17	.669	67	2.638
18	.709	68	2.677
19	.748	69	2.717
20	.787	70	2.756
21	.827	71	2.795
22	.866	72	2.835
23	.906	73	2.874
24	.945	74	2.913
25	.984	75	2.953
26	1.024	76	2.992
27	1.063	77	3.031
28	1.102	78	3.071
29	1.142	79	3.110
30	1.181	80	3.150
31	1.220	81	3.189
32	1.260	82	3.228
33	1.299	83	3.268
34	1.339	84	3.307
35	1.378	85	3.346
36	1.417	86	3.386
37	1.457	87	3.425
38	1.496	88	3.465
39	1.535	89	3.504
40	1.575	90	3.543
41	1.614	91	3.583
42	1.654	92	3.622
43	1.693	93	3.661
44	1.732	94	3.701
45	1.772	95	3.740
46	1.811	96	3.780
47	1.850	97	3.819
48	1.890	98	3.858
49	1.929	99	3.898
50 50	1.929	100	3.937
30	1,707	100	3.731

QUICK REFERENCE CHART: TRUCK&PATHFINDER 1994

ENGINE TUNE-UP DATA VG30E 750<u>-</u>50 klie speed rpm A/T (in "N" position) 750±50 Ignition timing 15" -2" (B.T.D.C. at idle speed) Spark plug (Standard type) **BKR6EY** Used belt Drive belt deflection (Cold) mm (in) New belt Limit After adjustment 12 (0.47) (0.24 0.31) (0.20 - 0.28)9 - 11 Air conditioner compressor 16 (0.63) $(0.35 \cdot 0.43)$ $(0.28 \cdot 0.35)$ 11 - 13 9 - 11Power steering oil pump 17 (0.67) (0.43 - 0.51) $(0.35 \cdot 0.43)$ Applied pushing force N (kg, lb) 98 (10, 22)

ENGINE TUNE	-UP D	ATA K	A24E
M/T		800=50	
Idle speed rpm A/T (in "N" position)		800±50	
Ignition timing (B.T.D.C. at idle speed)		10°±2°	
Spark plug (Standard type)		ZFR5E-11	
D: 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2	Us	New belt	
Drive belt deflection (Cold) mm (in) =	Limit	After adjustment	Mew DEIL
Alternator	17 (0.67)	10 · 12 (0.39 · 0.47)	8 - 10 (0.31 - 0.39)
Air conditioner compressor	16 (0.63)	10 · 12 (0.39 · 0.47)	8 · 10 (0,31 · 0.39)
Power steering oil pump	15 (0.59)	9 · 11 (0.35 - 0.43)	7 - 9 (0.28 - 0.35)
Applied pushing force N (kg. lb)		98 (10, 22)	

WHEEL ALIGNMENT (Unladen*1)

		ALLOWAE	BLE LIMIT	ADJUSTING RANGE			
Applied model		2WD Truck	Except 2WD Truck	2WD Truck	Except 2WD Truck		
Camber	degree	-0°20' to 1°10'	-0"05' to 1"25'	-0'05' to 0"55'	0°10′ - 1°10′		
Caster	degree	-0°23′ to 1°07′	0°33' - 2°03'	-0 08' to 0 52'	0°48′ 1°48′		
Kingpin inclination	degree	8°20' - 9°50'	7 21' - 8 51'	8 35' 9 35'	7 36 8 36		
Toe-in Radial tire					,		
А В	mm (in)	1 - 5 (0.04 - 0.20)	2 · 6 (0.08 · 0.24)	2 · 4 (0.08 · 0.16)	3 - 5 (0.12 - 0.20)		
Total angle 20	degree	5' - 25'	9' - 29'	10' - 20'	14' - 24'		

^{*1:} Fuel radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

CLUTCH PEDAL Unit: mm (in) VG30E: 227 - 237 (8.94 - 9.33) Height KA24E: 236 - 246 (9.29 - 9.69) 1.0 - 1.5 (0.039 - 0.059) Free play **BRAKE** Unit: mm (in) Pad minimum thickness 2.0 (0.079) Rotor repair limit 0.07 (0.0028) or less Runout 20.0 (0.787), CL28VA 24.0 (0.945), CL28VD Minimum thickness 16.0 (0.630), AD14VB Drum brake Lining minimum thickness 1.5 (0.059) Drum repair limit 261.5 (10.30), LT26B 296.5 (11.67), LT30A Maximum inner diameter 191.0 (7.52), D\$19HB M/T model 209 - 219 (8.23 - 8.62)

212 - 222 (8.35 · 8.74) 120 (4.72) or more

A/T model

FRONT WHEEL BEARING

	Model							
Item		2WD Truck	Except 2WD Truck					
Tightening torque N-m (kg-m, ft-lb)	34 - 39 ((3.5 - 4.0, 25 - 29)	_					
Return angle degree		45° - 60°						
	New seaf	9.8 - 28.4 (1.0 - 2.9, 2.2 - 6.4)	Wheel bearing lock nut Tightening torque N·m (kg·m, ft-lb) Retightening torque after loosening wheel bearing lock nut N·m (kg·m, ft-lb)	78 - 98 (8 - 10, 58 - 72) 0.5 - 1.5 (0.05 - 0.15 0.4 - 1.1)				
Preload (At hub bolt) N (kg, (b)			Axial end play mm (in) Starting force at wheel hub bolt N (kg, lb)	0 (0) 				
	Used scal	9.8 - 23.5 (1.0 - 2.4, 2.2 - 5.3)	Turning angle degree Starting force at wheel hub bolt N (kg, lb)	15° - 30°				
			Wheel bearing preload at wheel hub bolt B - A N (kg. lb)	7.06 - 20 9 (0.72 - 2.14 1.59 - 4.72				



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^{1:} Under force of 490 N (50 kg, 110 lb) with engine running

AUTOMATIC TRANSMISSION

SECTION A

GI

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When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit. When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

PREPARATION AND PRECAUTIONS

Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description		
ST2505S001	· · · · · · · · · · · · · · · · · · ·	Measuring line pressure	- G
(J25695-A) Oil pressure gauge set ① ST25051001 (—)		-3	M
Oil pressure gauge ② ST25052000 (—)		- (4)	
Hose ③ \$T25053000 (—)		-5	
Joint pipe ③ ST25054000 (—)			Ē
Adapter (5) ST25055000 (—)	NT097		FI C
Adapter ST07870000	NIOS	Disassembling and assembling A/T	-
(J37068) Transmission case stand		Disassembling and assembling A/1	M
	NT094		ΑT
KV31102100 (J37065) Torque converter one-way clutch check tool		Checking one-way clutch in torque converter	T
ciuten check tooi	NT098		[]
ST25850000 (J25721-A)		Removing oil pump assembly	_
Sliding hammer			F.
KV31102400	NT095	Removing and installing clutch return	- R
(J34285 and J34285-87) Clutch spring compressor		springs	8
			S
ST33200000 (J26082) Orift	NT096	Installing oil pump housing oil seal Installing rear oil seal	
ווונע	a b NT091	a: 60 mm (2.36 in) dia. b: 44.5 mm (1.752 in) dia.	H
	1		

PREPARATION AND PRECAUTIONS

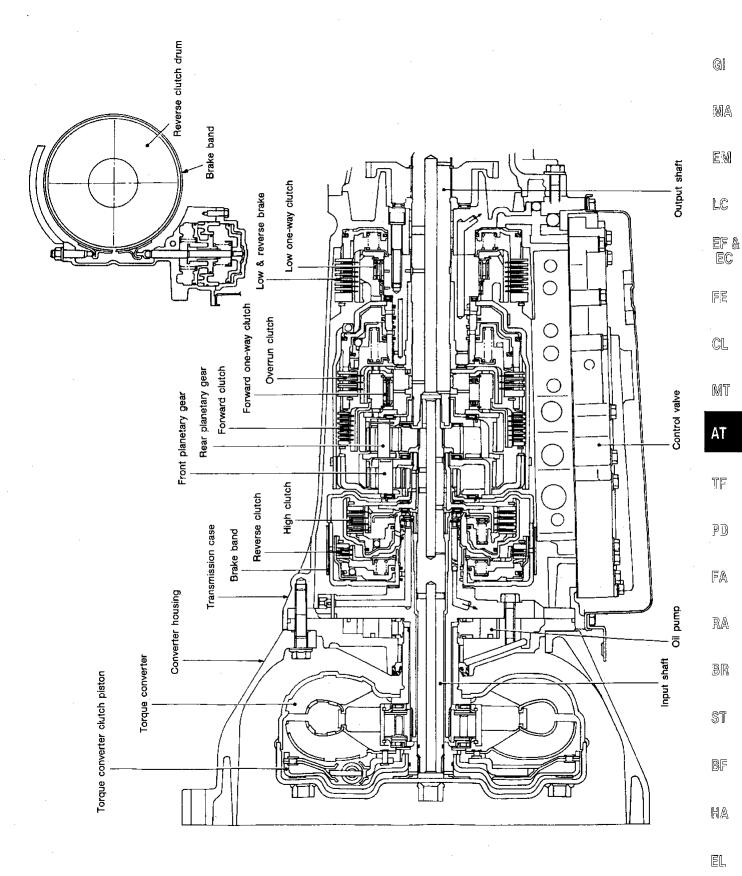
	Special Se	ervice Tools (Cont'd)
Tool number (Kent-Moore No.) Tool name	Description	
ST30720000 (J34331) Drift	a b	Installing rear oil seal a: 77 mm (3.03 in) dia. b: 55.5 mm (2.185 in) dia.
(J34291) Shim setting gauge set	NT115	Selecting oil pump cover bearing race and oil pump thrust washer

Service Notice

- Before proceeding with disassembly, thoroughly clean the outside of the transmission.
 It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use line-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transmission.
- When disassembling parts, place them in order in a parts rack so that they can be put back into the unit in their proper positions.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals and O-rings should be replaced any time the transmission is disassembled.
- It is very important to perform functional tests whenever they are indicated.
- The valve body contains precision parts and requires extreme care when parts are removed and serviced. Place removed parts in order on a parts rack so they can be put back in the valve body in the same positions and sequences. Care will also prevent springs and small parts from becoming scattered or lost.

- Properly installed valves, sleeves, plugs, etc.
 will slide along their bores in the valve body under their own weight.
- Before assembly, apply a coat of recommended ATF to all parts. Petroleum jelly may be applied to O-rings and seals and used to hold small bearings and washers in place during reassembly. Do not use grease.
- Extreme care should be taken to avoid damage to O-rings, seals and gaskets when assembling.
- During overhaul, if excessive foreign material is found in the oil pan or clogging the strainer, flush or replace ATF cooler as required.
 Refer to TROUBLE DIAGNOSES Remarks. AT-19
- After overhaul, refill the transmission with new ATF.
- Even when the drain plug is removed, the old A/T fluid will remain in the torque converter and the A/T fluid cooling system.
 Always follow the procedures under "Changing A/T Fluid" in the MA section when changing A/T fluid.

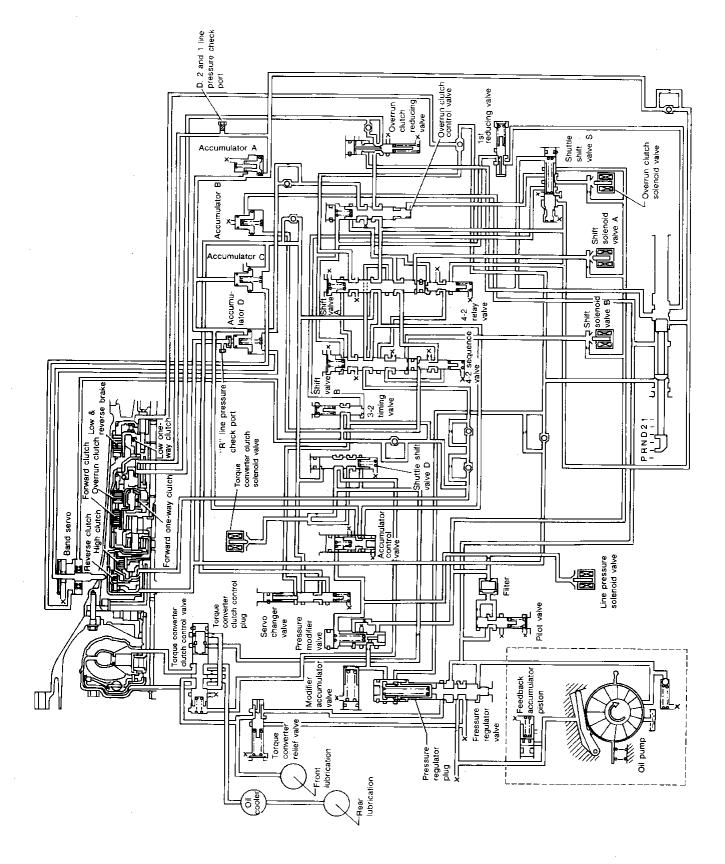
Cross-Sectional View



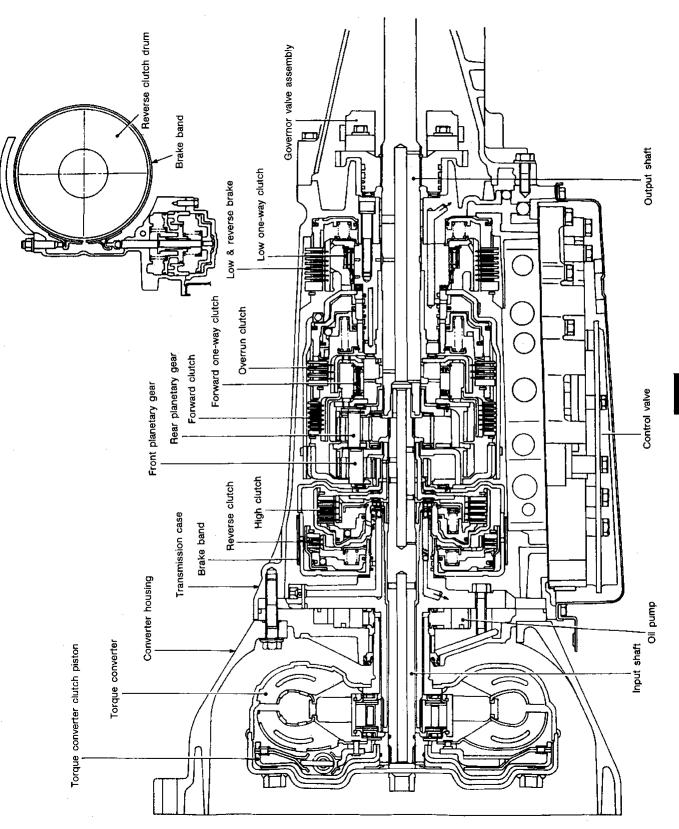
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Hydraulic Control Circuits



Cross-Sectional View



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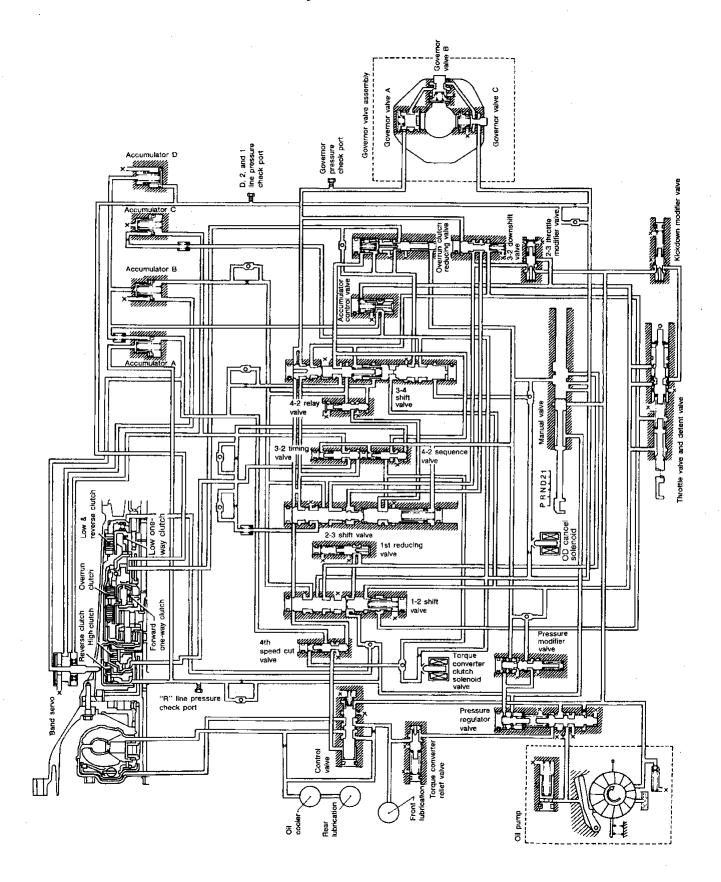
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Hydraulic Control Circuits



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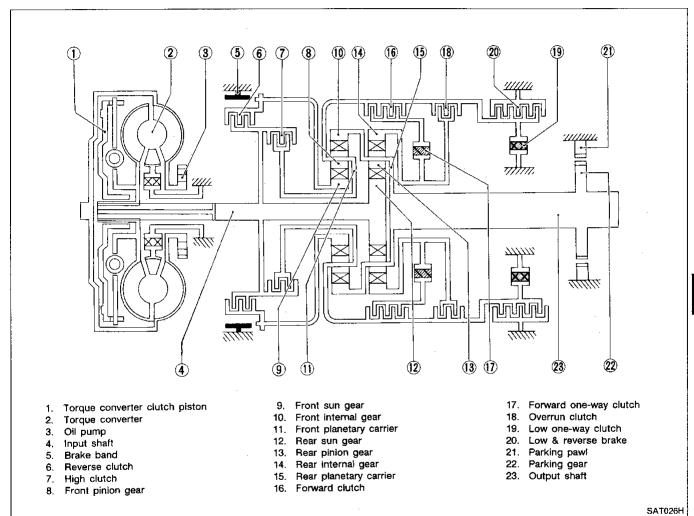
Shift Mechanism

The RL4R01A and RE4R01A automatic transmissions use compact, dual planetary gear systems to improve power-transmission efficiency, simplify construction and reduce weight.

They also employ an optimum shift control and superwide gear ratios to improve starting performance and acceleration during medium and high-speed operation.

Two one-way clutches are also employed: one is used for the forward clutch and the other for the low clutch. These one-way clutches, combined with four accumulators, reduce shifting shock to a minimum.

CONSTRUCTION



DESCRIPTION

Shift Mechanism (Cont'd)

FUNCTION OF CLUTCH AND BRAKE

Control members	Abbr.	Function			
Reverse clutch	R/C	To transmit input power to front sun gear			
High clutch H/C		To transmit input power to front planetary carrier			
Forward clutch F/C		To connect front planetary carrier with forward one-way clutch			
Overrun clutch O/C		To connect front planetary carrier with rear internal gear			
Brake band	B/B	To lock front sun gear			
Forward one-way clutch	F/O.C	When forward clutch is engaged, to stop rear internal gear from rotating in opposite direction.			
Low one-way clutch	L/O.C	At D ₁ position, to prevent rear internal gear from rotating in opposite direction.			
Low & reverse brake	L&R/B	To lock rear internal gear (2, 1 ₂ and 1 ₁), to lock front planetary carrier (R position)			

OPERATION OF CLUTCH AND BRAKE

	01:11					1	Band servo)	Forward	Low	Low &		
Shift position		Reverse clutch	High clutch	Forward clutch	Overrun clutch	2nd apply	3rd release	4th apply	one-way clutch	one-way clutch	reverse brake	Lock-up	Remarks
	P									_			PARK POSITION
	R	0									0		REVERSE POSITION
	N												NEUTRAL POSITION
	1st			0	®				•	•			
D	2nd			0	·1{©	0			•				Automatic shift
*4	3rd		0	0		+2⊗	\otimes		•				1 ↔ 2 ↔ 3 ↔ 4
	4th		0	\otimes		*3⊗	\otimes	0				0	
	1st			0	®				•	•			Automatic shift
2	2nd			0	0	0			•				1 ↔ 2
	1st			0	0				•		0		Locks (held
1	2nd			0	0	0			•				stationary) in 1st speed 1 ← 2

^{*1 :} Operates when overdrive switch is set in "OFF" position.

[:] Oil pressure is applied to both 2nd "apply" side and 3rd "release" side of band servo piston. However, because oil pressure area on the "release" side is greater than that on the "apply" side, brake band does not contract.

[:] Oil pressure is applied to 4th "apply" side in condition *2 above, and brake band contracts. : A/T will not shift to 4th when overdrive switch is set to "OFF" position.

[:] Operates

O: Operates when throttle opening is less than 1/16. Engine brake activates.

[:] Operates during "progressive" acceleration.

⁽X): Operates but does not affect power transmission.

^{(3):} Operates when throttle opening is less than 1/16 but does not affect engine brake.

Control System

OUTLINE

The RE4R01A automatic transmission senses vehicle operating conditions through various sensors. It always controls the optimum shift position and reduces shifting and lock-up shocks.

MA

EM

LC

SENSORS

Inhibitor switch Throttle position sensor Closed throttle position switch Wide open throttle position switch Engine speed signal Fluid temperature sensor Revolution sensor Vehicle speed sensor Kickdown switch

A/T CONTROL UNIT

ACTUATORS

Shift control Line pressure control Lock-up control Overrun clutch control Timing control Fail-safe control Self-diagnosis

Shift solenoid valve A Shift solenoid valve B Overrun clutch solenoid valve Torque converter clutch solenoid valve Line pressure solenoid valve

Power shift indicator lamp

EF & EC

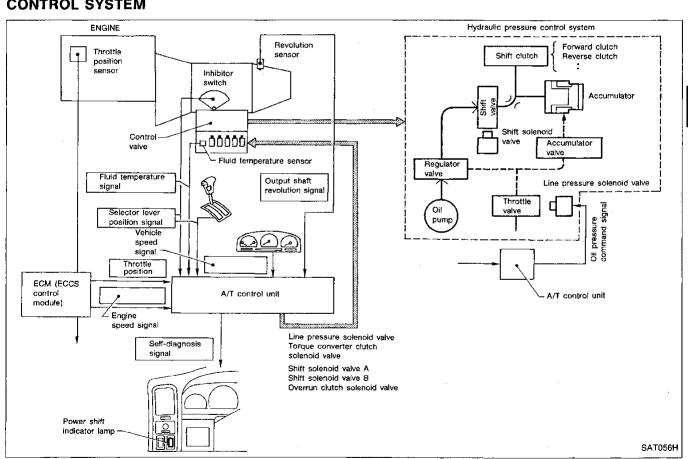
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CONTROL SYSTEM



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DESCRIPTION

Control System (Cont'd)

A/T CONTROL UNIT FUNCTION

The A/T control unit receives signals sent from various switches and sensors, determines required line pressure, shifting point, lock-up operation, engine brake operation, and sends required signals to the respective solenoids.

INPUT/OUTPUT SIGNAL OF A/T CONTROL UNIT

	Sensors and solenoid valves	Function		
_	Inhibitor switch	Detects select lever position and sends a signal to A/T control unit.		
	Throttle position sensor	Detects throttle valve position and sends a signal to A/T control unit.		
	Closed throttle position switch	Detects throttle valve's fully-closed position and sends a signal to A/T control unit.		
	Wide open throttle position switch	Detects a throttle valve position of greater than 1/2 of full throttle should throttle sensor malfunction and sends a signal to A/T control unit.		
	Engine speed signal	From ECM (ECCS control module).		
Input	Fluid temperature sensor	Detects transmission fluid temperature and sends a signal to A/T control unit.		
	Revolution sensor	Detects output shaft rpm and sends a signal to A/T control unit.		
	Vehicle speed sensor	Used as an auxiliary vehicle speed sensor. Sends a signal when revolution sensor (installed on transmission) malfunction.		
	Kickdown switch	Detects full throttle position (accelerator pedal fully depressed). Sends a signal to A/T control unit when throttle position sensor malfunctions.		
	Shift solenoid valve A/B	Selects shifting point suited to driving conditions in relation to a signal sent from A/T control unit.		
	Line pressure solenoid valve	Regulates (or decreases) line pressure suited to driving conditions in relation to a signal sent from A/T control unit.		
Output	Torque converter clutch solenoid valve	Regulates (or decreases) lock-up pressure suited to driving conditions in relation to a signal sent from A/T control unit.		
	Overrun clutch solenoid valve	Controls an "engine brake" effect suited to driving conditions in relation to a signal sent from A/T control unit.		
	Diagnostic information display	Shows A/T control unit faults, when A/T control components malfunction.		

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(SYMPTOM: OD OFF indicator lamp does not come on when setting	ı	
overdrive switch to "OFF" position.)	ΔT-54	
Diagnostic Procedure 3	/\\\ \\	TF
-		
(SYMPTOM: Engine cannot be started with selector lever in "P" or "N" position or engine can be started with selector lever in "D", "2", "1" or "R" position.)	AT 51	
	A 1-54	PU
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with selector lever in "P" position.)	A I -54	u v u
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(SYMPTOM: Vehicle moves forward or backward when setting "N" position.)	AT-55	RA
Diagnostic Procedure 6		
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Diagnostic Procedure 7		BR
(SYMPTOM: Vehicle does not creep backward when selecting "R" position.)	AT-57	
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(SYMPTOM: Vehicle does not creep forward when selecting "D", "2" and "1" position.)	ΔT_58	\$7
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Diagnostic Procedure 10		
(SYMPTOM: A/T does not shift from D ₁ to D ₂ at the specified speed.		HA
A/T does not shift from D ₄ to D ₂ when depressing accelerator pedal fully at		. 100 3)
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		FIEN A

TROUBLE DIAGNOSES

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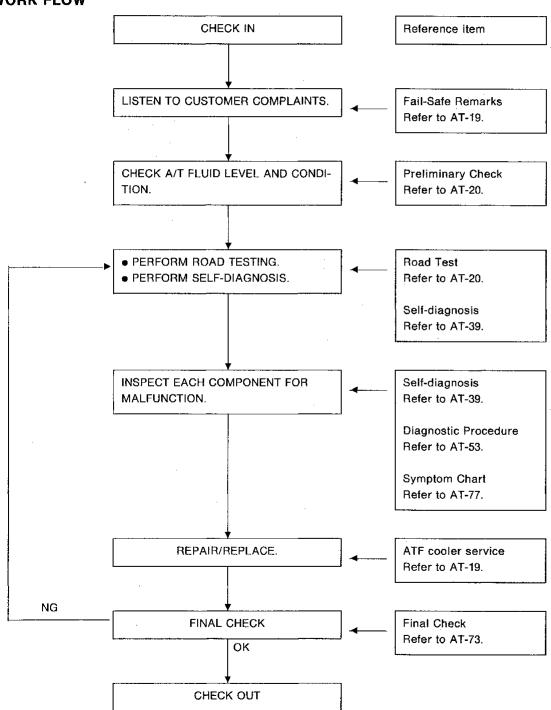
How to Perform Trouble Diagnoses for Quick and Accurate Repair

A good understanding of the malfunctioning conditions can make troubleshooting faster and more accurate.

In general, the feeling about a problem depends on each customer. It is important to fully understand the symptoms or under what conditions a customer complains.

Make good use of the two sheets provided, "Information from customer" and "Diagnostic worksheet", in order to perform the best troubleshooting possible.

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TROUBLE DIAGNOSES

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

INFORMATION FROM CUSTOMER

KEY POINTS

WHAT Vehicle & A/T model WHEN Date, Frequencies WHERE Road conditions

HOW Operating conditions, Symptoms

Customer name MR/MS	Model & Year VIN					
Trans. model RE4R01A	Engine VG30E	Mileage				
Incident Date	Manuf. Date	In Service Date				
Frequency	☐ Continuous ☐ Intermittent	(times a day)				
Symptoms	☐ Vehicle does not move. (☐	☐ Any position ☐ Particular position)				
	\square No up-shift (\square 1st \rightarrow 2nd	\square 2nd \rightarrow 3rd \square 3rd \rightarrow O/D)				
	\square No down-shift (\square O/D \rightarrow 3	$3rd \Box \ 3rd \rightarrow 2nd \Box \ 2nd \rightarrow 1st)$				
	□ Lockup malfunction					
	☐ Shift point too high or too low.					
	☐ Shift shock or slip (☐ N → D ☐ Lockup ☐ Any drive position)					
	☐ Noise or vibration					
	□ No kickdown					
	☐ No pattern select					
	□ Others					
	(
Power shift indicator lamp	The indicator lamp blinks for a	bout 8 seconds.				
	☐ Come on	☐ Come off				

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

DIAGNOSTIC WORKSHEET

1.	☐ Read the Fail-safe Remarks and listen to customer complaints.	AT-19
2.	☐ CHECK A/T FLUID	AT-20
	☐ Leakage (Follow specified procedure)☐ Fluid condition☐ Fluid level	
3.	☐ Perform all ROAD TESTING and mark required procedures.	AT-20
	3-1 Check before engine is started.	AT-21
	 □ Diagnostic Procedure 1 (Power shift indicator lamp comes on for 2 seconds.) □ SELF-DIAGNOSTIC PROCEDURE — Mark detected items. 	
	 □ 1. Revolution sensor □ 2. Vehicle speed sensor □ 3. Throttle position sensor □ 4. Shift-solenoid valve A □ 5. Shift-solenoid valve B □ 6. Overrun clutch solenoid valve □ 7. Torque converter clutch solenoid valve □ 10. Line pressure solenoid valve □ 11. Battery □ 12. Others □ 12. Others 	
•	☐ Diagnostic Procedure 2 (OD OFF indicator lamp comes on.)	
	3-2. Check at idle	AT-22
	 □ Diagnostic Procedure 3 (Engine starts only in P and N position) □ Diagnostic Procedure 4 (In P position, vehicle does not move when pushed) □ Diagnostic Procedure 5 (In N position, vehicle moves) □ Diagnostic Procedure 6 (Select shock. N → R position) 	
	 □ Diagnostic Procedure 7 (Vehicle creeps backward in R position) □ Diagnostic Procedure 8 (Vehicle creeps forward in D, 2 or 1 position) 	
	3-3. Cruise test	AT-23
	Part-1 ☐ Diagnostic Procedure 9 (Vehicle starts from D₁) ☐ Diagnostic Procedure 10	
	 □ Diagnostic Procedure 11 □ Diagnostic Procedure 12 □ Diagnostic Procedure 13 (Shift schedule: Lock-up) 	
	 □ Diagnostic Procedure 14 (Lock-up condition more than 30 seconds) □ Diagnostic Procedure 15 (Lock-up released) □ Diagnostic Procedure 16 (Engine speed return to idle. Light braking D₄ → D₃) 	

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How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

	Part-2 □ Diagnostic Procedure 17 (Vehicle starts from D ₁) □ Diagnostic Procedure 10 (Kickdown: D ₄ → D ₂) □ Diagnostic Procedure 11 (Shift schedule: D ₂ → D ₃) □ Diagnostic Procedure 12 (Shift schedule: D ₃ → D ₄ and engine brake)	AT-25
	Part-3 □ Diagnostic Procedure 18 (D ₄ → D ₃ when OD switch ON → OFF) □ Diagnostic Procedure 16 (Engine brake in D ₃) □ Diagnostic Procedure 19 (D ₃ → 2 ₂ when selector lever D → 2 position) □ Diagnostic Procedure 16 (Engine brake in 2 ₂) □ Diagnostic Procedure 20 (2 ₂ → 1 ₁ , when selector lever 2 → 1 position) □ Diagnostic Procedure 21 (Engine brake in 1 ₁) □ SELF-DIAGNOSTIC PROCEDURE — Mark detected items.	AT-26
	 □ 1. Revolution sensor □ 2. Vehicle speed sensor □ 3. Throttle position sensor □ 4. Shift solenoid valve A □ 5. Shift solenoid valve B □ 6. Overrun clutch solenoid valve □ 7. Torque converter clutch solenoid valve □ 10. Line pressure solenoid valve □ 11. Battery □ 12. Others □ 12. Others □ 13. Others □ 14. Shift solenoid valve □ 15. Others □ 16. Overrun clutch solenoid valve □ 17. Torque converter clutch solenoid valve 	
4.	Perform the Diagnostic Procedures marked in ROAD TESTING. Refer to the Symptom Chart when you perform the procedures. (The chart also shows some other possible symptoms and the components inspection orders.)	AT-77
5.	Perform FINAL CHECK. If NG, go back to "CHECK A/T FLUID".	AT-73
	☐ Stall test — Mark possible damaged components/others.	
	☐ Torque converter one-way clutch ☐ Reverse clutch ☐ Forward clutch ☐ Overrun clutch ☐ Forward one-way clutch ☐ Line pressure is low ☐ Clutches and brakes except high ☐ Forward one-way clutch ☐ Low & reverse brake	
	☐ Pressure test — Suspected parts:	*

Remarks

FAIL-SAFE

The A/T control unit has an electronic Fail-Safe (limp home mode) to allow the vehicle to be driven even in the event of damage of a major electrical input or output device circuit.

In this condition, the vehicle runs in third gear in positions 1, 2 or D and will not upshift. Customer may say "Sluggish, poor acceleration".

When Fail-safe operation occurs the next time the key is turned to the ON position, the power shift indicator lamp will blink for about 8 seconds. (For diagnosis, refer to AT-21.)

If the vehicle is driven under extreme conditions such as excessive wheel spinning and emergency braking suddenly after, Fail-Safe may be activated even if all electrical circuits are undamaged. In this case, normal shift pattern can be returned by turning key OFF for 3 seconds and then back ON. The blinking of the OD OFF indicator lamp for about 8 seconds will appear only once and be cleared. The customer may resume normal driving conditions by chance.

Always follow the "WORK FLOW" (Refer to AT-15.)

The SELF-DIAGNOSIS results will be as follows:

The first SELF-DIAGNOSIS will indicate the damage of the vehicle speed sensor or the revolution sensor.

During the next SELF-DIAGNOSIS performed after checking the sensor, no damages will be indicated.

ATF COOLER SERVICE

If the oil pan contains foreign matter in large quantities or if the strainer is excessively clogged during A/T overhaul, service the ATF cooler as follows:

- RE4R01A with VG30E engine Fin type
 Replace the radiator lower tank (which includes ATF cooler) with a new one, then flush the cooler
 line using cleaning solvent and compressed air.
- 2) RL4R01A with KA24 engine Tube type Flush the ATF cooler and cooler line using cleaning solvent and compressed air.

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Preliminary Check

A/T FLUID CHECK

Fluid leakage check

- 1. Clean area suspected of leaking, for example, mating surface of converter housing and transmission case.
- 2. Start engine, apply foot brake, place selector lever in "D" position and wait a few minutes.
- 3. Stop engine.
- 4. Check for fresh leakage.

Fluid condition check

Fluid color	Suspected problem
Dark or black with burned odor	Wear of frictional material
Milky pink	Water contamination — Road water entering through filler tube or breather
Varnished fluid, light to dark brown and tacky	Oxidation — Over or under filling, Overheating

Fluid level check — Refer to section MA.

ROAD TEST PROCEDURE 1. Check before engine is started. 2. Check at idle. 3. Cruise test.



ROAD TESTING

Description

- The purpose of this road test is to determine overall performance of automatic transmission and analyze causes of problems.
- The road test consists of the following three parts:
- 1. Check before engine is started
- 2. Check at idle
- 3. Cruise test
- Before road test, familiarize yourself with all test procedures and items to check.
- Conduct tests on all items. Troubleshoot items which check out No Good after road test. Refer to "Self-diagnosis" and "Diagnostic Procedure" (AT-39).

Go to Diagnostic Proce-

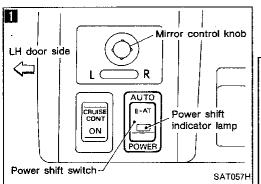
Go to Diagnostic proce-

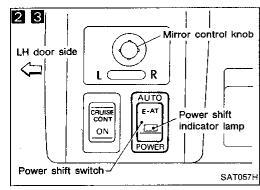
dure 2 (AT-54).

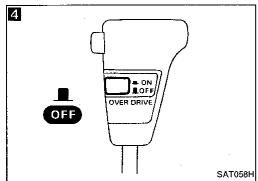
dure 1 (AT-53).

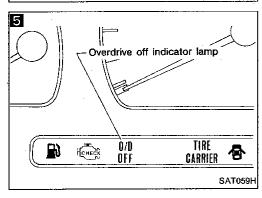


1. Check before engine is started







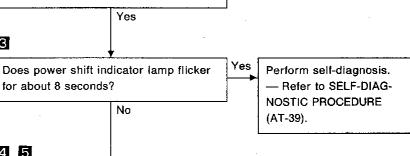


- 1. Park position vehicle on flat surface.
- 2. Turn ignition switch to "OFF" position.
- 3. Set power shift switch to "AUTO" position.
- 4. Move selector lever to "P" position.
- 5. Turn ignition switch to "ON" position.

(Do not start engine.)

3

2 Does power shift indicator lamp come on for about 2 seconds?



No

No

4 5 1. Set overdrive switch to "OFF" posi-

2. Does OD OFF indicator lamp come on?

1. Turn ignition switch to "OFF" posi-

Yes

- 2. Perform self-diagnosis. - Refer to SELF-DIAGNOSTIC PRO-CEDURE (AT-39) and note NG items.
- 3. Go to "ROAD TESTING 2. Check at idle" (AT-22).

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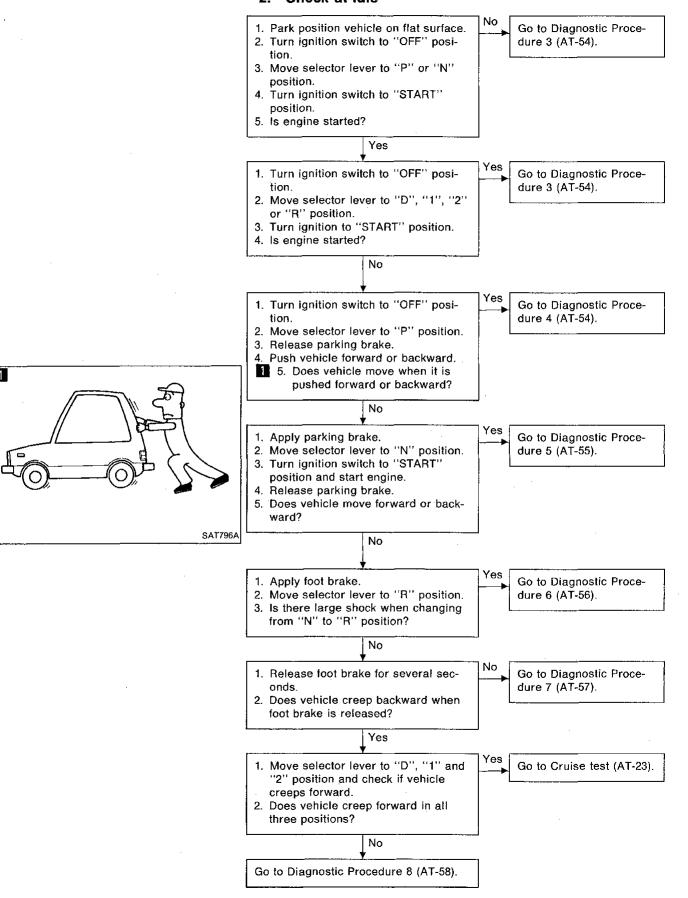
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2. Check at idle



At half throttle open OCONNECTOR C/UNIT At full throttle open At idle SAT455E

Cruise test

- Check all items listed in Parts 1 through 3.
- Throttle position can be controlled by voltage across terminals (f) and (f) of A/T control unit.

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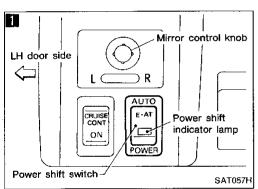
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Cruise test — Part 1

Warm up engine until engine oil and ATF reach operating temperature after vehicle has been driven approx. 10 minutes.

ATF operating temperature: 50 - 80°C (122 - 176°F)



1. Park position vehicle on flat surface.

1 2. Set power shift switch in "AUTO" position.

3. Set overdrive switch in "ON" posi-

4. Move selector lever to "P" position.

5. Turn ignition switch to "ON" position and start engine.

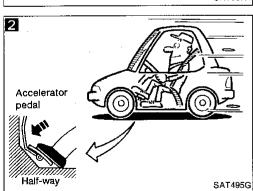
6. Move selector lever to "D" position.

2 7. Accelerate vehicle by constantly depressing accelerator pedal half-way.

Yes

Yes

8. Does vehicle start from D₁?

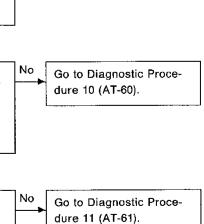


3

Does A/T shift from D, to Do at the specified speed?

Specified speed when shifting from D_1 to D_2 :

Refer to Shift schedule (AT-28).



Go to Diagnostic Proce-

dure 9 (AT-59).

4

Does A/T shift from D2 to D3 at the specified speed? Specified speed when shifting

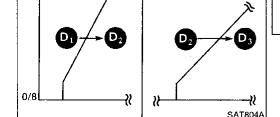
from D₂ to D₃: Refer to Shift schedule (AT-28).

Yes **(A**)

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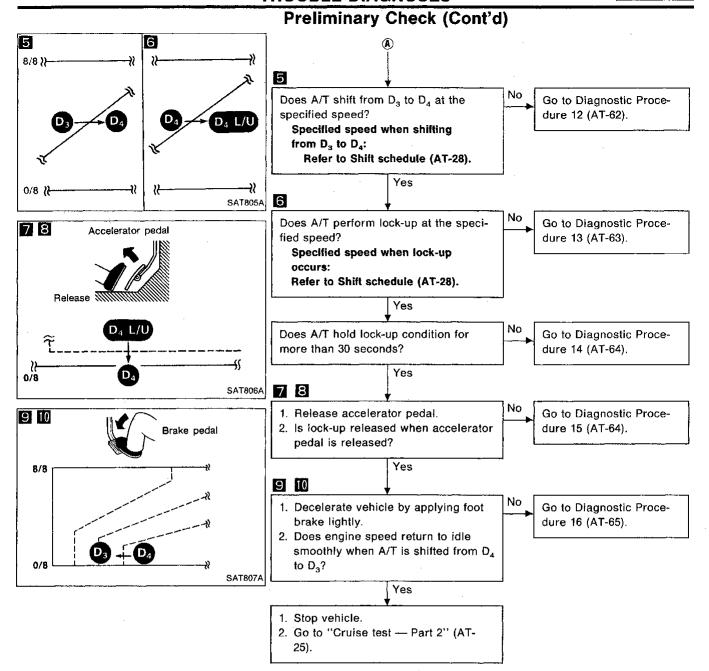


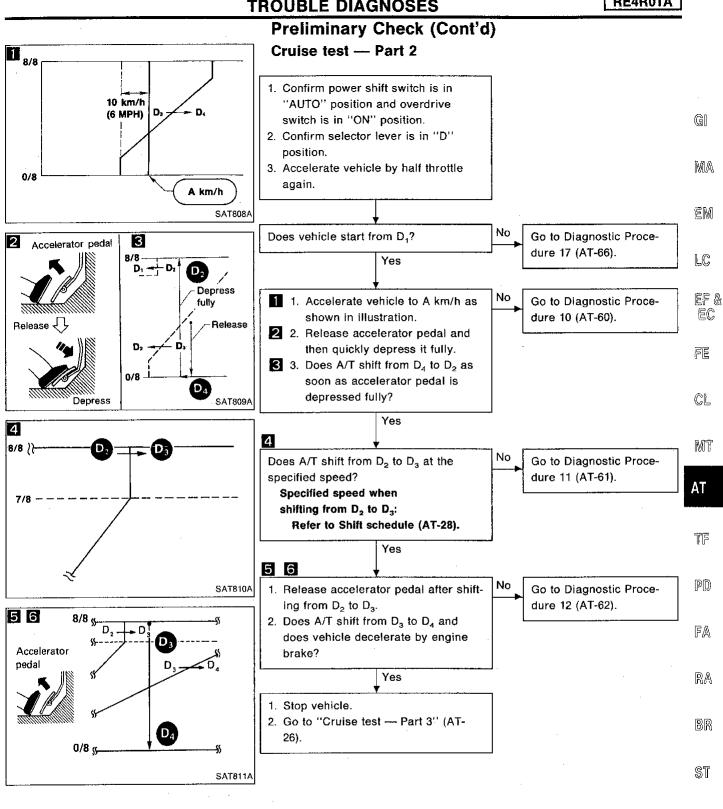
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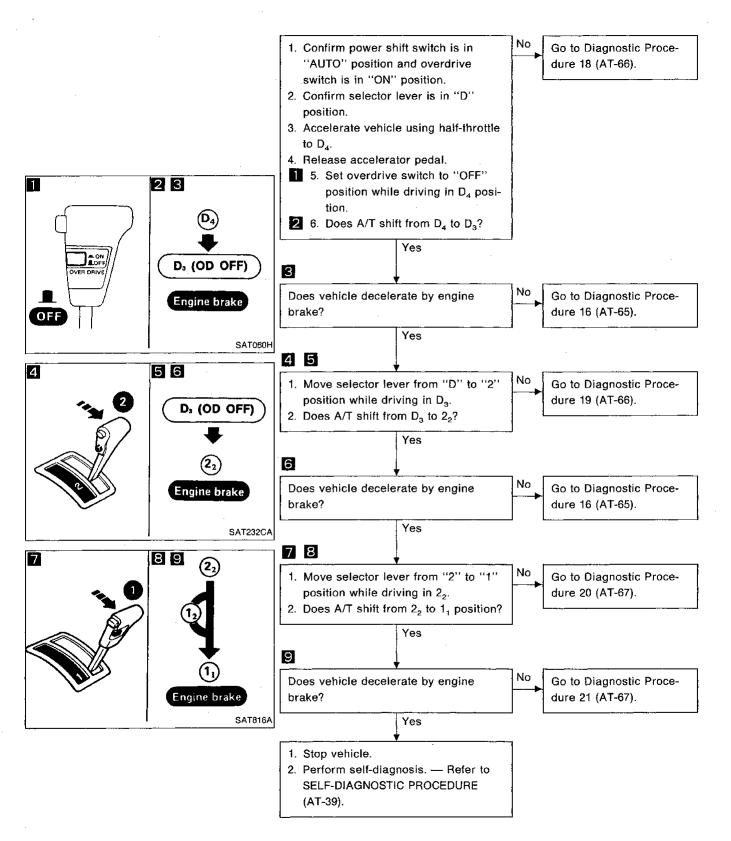
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Preliminary Check (Cont'd) Cruise test — Part 3



Vehicle speed when shifting gears

VG30E engine 4WD (Final gear ratio: 4.375)

Throttle	Vehicle speed km/h (MPH)						
position	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	1 ₂ → 1 ₁
Full throttle	50 - 54	97 - 105	162 - 172	157 - 167	92 - 100	38 - 42	38 - 42
	(31 - 34)	(60 - 65)	(101 - 107)	(98 - 104)	(57 - 6 2)	(24 - 26)	(24 - 26)
Half throttle	32 - 36	64 - 70	111 - 119	65 - 75	29 - 35	10 - 14	38 - 42
	(20 - 22)	(40 - 43)	(69 - 74)	(40 - 45)	(18 - 22)	(6 - 9)	(24 - 26)

VG30E engine 4WD (Final gear ratio: 4.625)

Throttle	Vehicle speed km/h (MPH)						
position	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	1 ₂ → 1 ₁
Full throttle	46 - 50	90 - 98	150 - 160	145 - 155	86 - 94	38 - 42	38 - 42
	(29 - 31)	(56 - 61)	(93 - 99)	(90 - 96)	(53 - 58)	(24 - 26)	(24 - 26)
Half throttle	30 - 34	60 - 66	103 - 111	60 - 68	28 - 34	10 - 14	38 - 42
	(19 - 22)	(37 - 41)	(64 - 69)	(37 - 42)	(17 - 21)	(6 - 9)	(24 - 26)

VG30E engine 2WD

Throttle	Vehicle speed km/h (MPH)							
position	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	1 ₂ → 1 ₁	
Full throttle	52 - 56	99 - 107	159 - 169	154 - 164	91 - 99	44 - 48	38 - 42	
	(32 - 35)	(62 - 66)	(99 - 105)	(96 - 102)	(57 - 62)	(27 - 30)	(24 - 26)	
Half throttle	32 - 36	66 - 72	105 - 113	69 - 77	29 - 35	10 - 14	38 - 42	
	(20 - 22)	(41 - 45)	(65 - 70)	(43 - 48)	(18 - 22)	(6 - 9)	(24 - 26)	

Vehicle speed when performing and releasing lock-up

VG30E engine 4WD (Final gear ratio: 4.375)

7 3 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4							
There was	OB auditab	Vehicle speed km/h (MPH)					
Throttle position	OD switch [Shift position]	Lock-up ''ON''	Lock-up "OFF"				
	ON [D ₄]	163 - 171 (101 - 106)	158 - 168 (98 - 104)				
Full throttle	OFF [D ₃]	97 - 105 (60 - 65)	92 - 108 (57 - 67)				
Half throttle	O N [D₄]	110 - 118 (68 - 73)	82 - 90 (51 - 56)				
	OFF [D ₃]	76 - 84 (47 - 52)	71 - 79 (44 - 49)				

VG30E engine 2WD

Throttle	OD ausitah	Vehicle speed km/h (MPH)		
Throttle position	OD switch [Shift position]	Lock-up ''ON''	Lock-up "OFF"	
	ON [D₄]	160 - 168 (99 - 104)	155 - 163 (96 - 101)	
Full throttle	OFF [D ₃]	99 - 107 (62 - 66)	91 - 99 (57 - 62)	
Half throtile	ON [D₄]	101 - 109 (63 - 68)	82 - 90 (51 - 56)	
	OFF [D ₃]	76 - 84 (47 - 52)	71 - 79 (44 - 49)	

VG30E engine 4WD (Final gear ratio: 4.625)

Throttle position	OD switch [Shift position]	Vehicle speed km/h (MPH)	
		Lock-up ''ON''	Lock-up "OFF"
Full throttle	ON [D ₄]	151 - 159 (94 - 99)	146 - 154 (91 - 96)
	OFF [D ₃]	90 - 98 (56 - 61)	86 - 94 (53 - 58)
Half throttle	ON [D ₄]	103 - 111 (64 - 69)	83 - 91 (52 - 57)
	OFF [D ₃]	76 - 84 (47 - 52)	71 - 79 (44 - 49)

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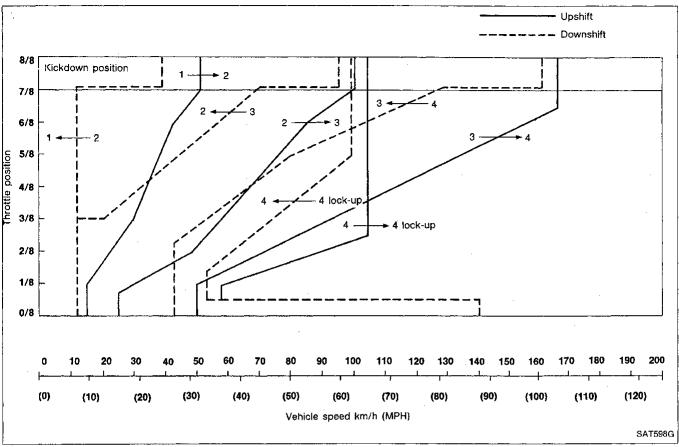
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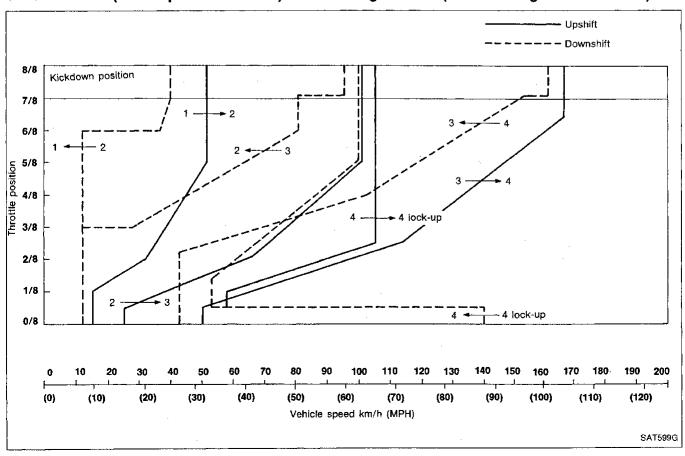
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Shift schedule (Standard pattern: OD ON) / VG30E engine 4WD (Final drive gear ratio: 4.375)



Shift schedule (Power pattern: OD ON) / VG30E engine 4WD (Final drive gear ratio: 4.375)



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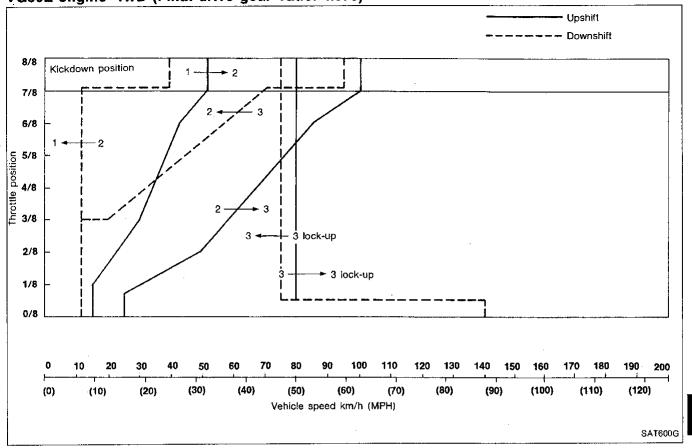
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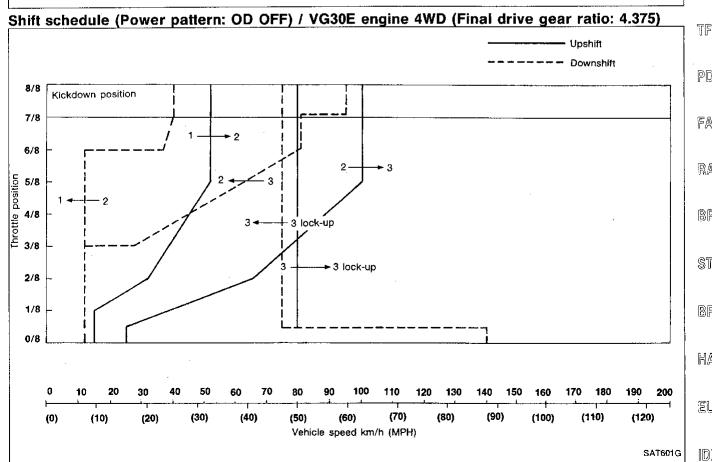
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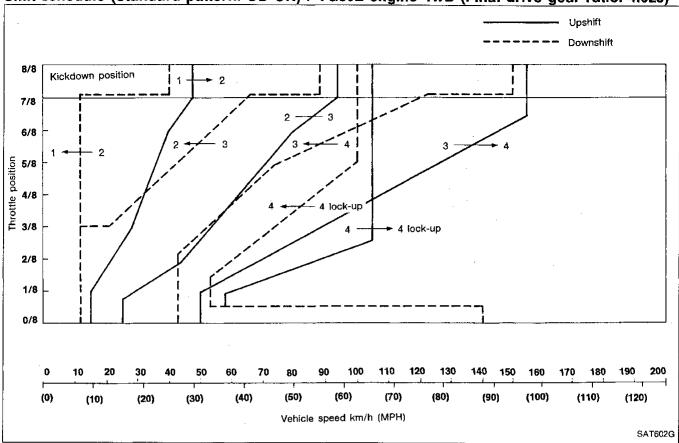
Shift schedule (Standard pattern: OD OFF)

VG30E engine 4WD (Final drive gear ratio: 4.375)

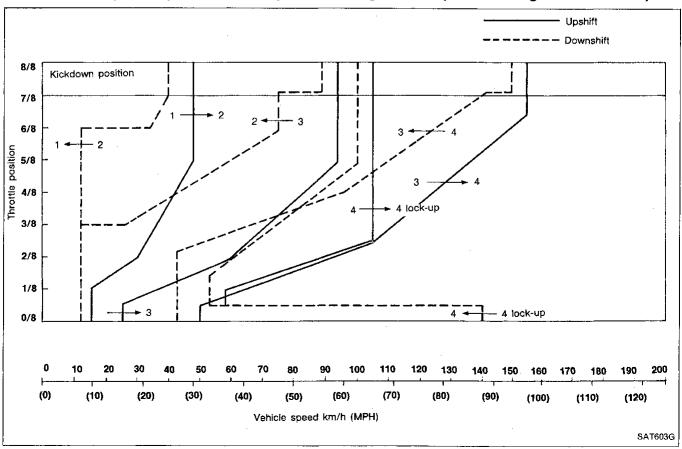




Shift schedule (Standard pattern: OD ON) / VG30E engine 4WD (Final drive gear ratio: 4.625)

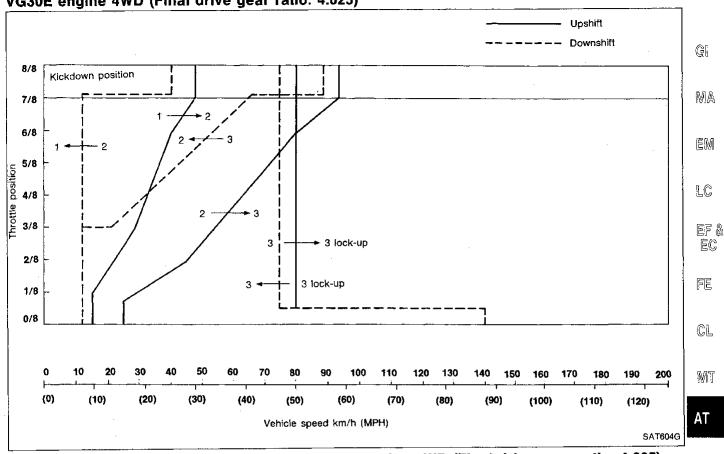


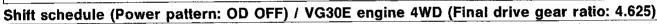
Shift schedule (Power pattern: OD ON) / VG30E engine 4WD (Final drive gear ratio: 4.625)

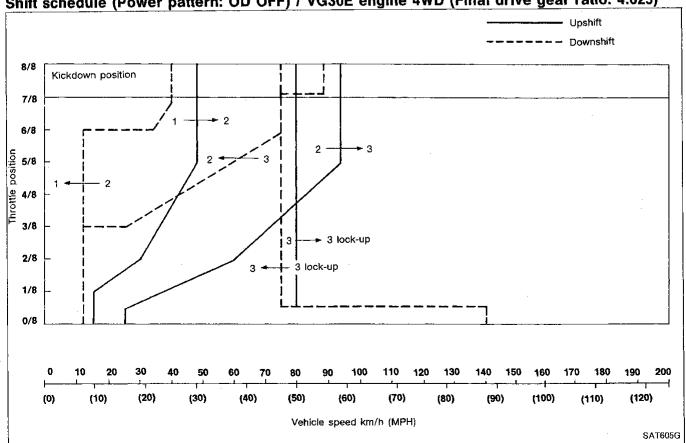


Shift schedule (Standard pattern: OD OFF)

VG30E engine 4WD (Final drive gear ratio: 4.625)







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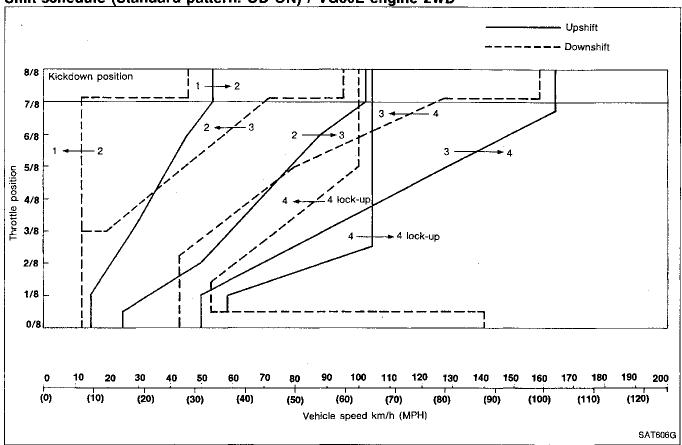
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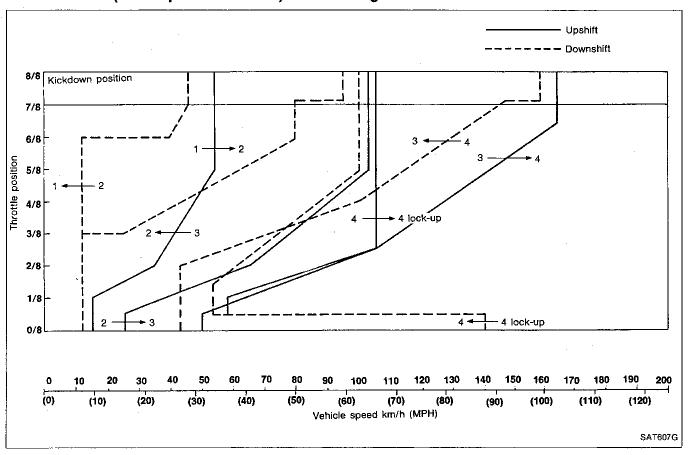
EL

NDX





Shift schedule (Power pattern: OD ON) / VG30E engine 2WD



G

MA

EM

LC

& **7**3

EC

FE

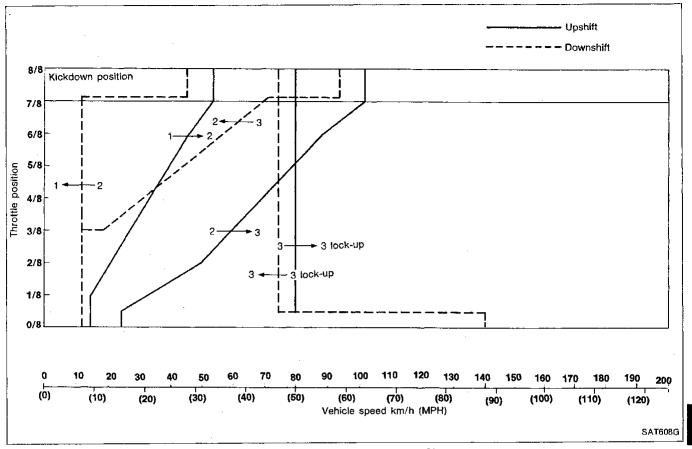
CL

MT

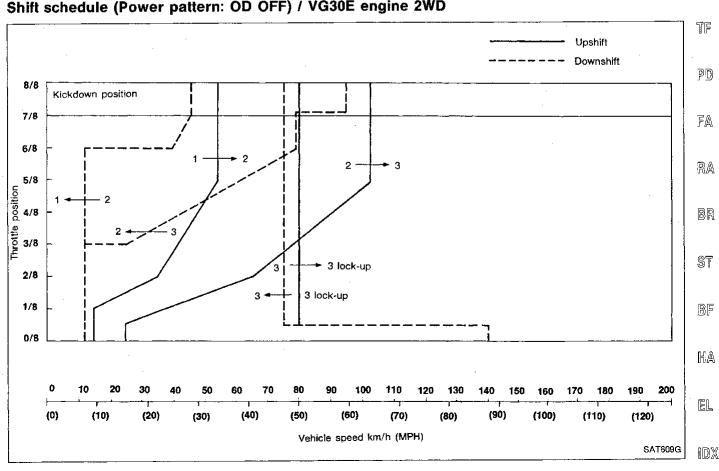
ΑT

Preliminary Check (Cont'd)

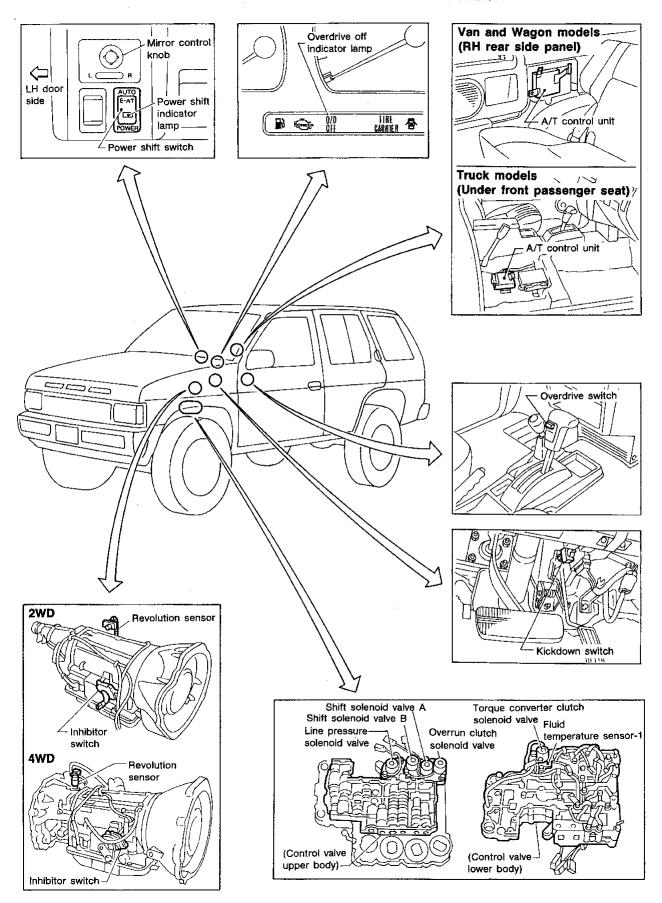
Shift schedule (Standard pattern: OD OFF) / VG30E engine 2WD



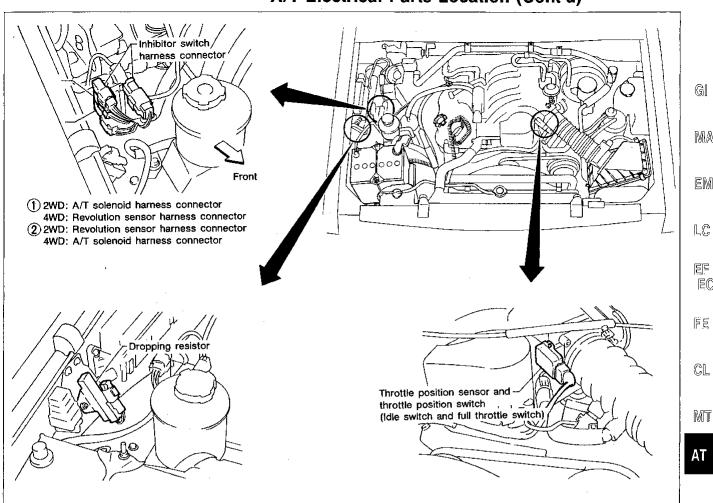
Shift schedule (Power pattern: OD OFF) / VG30E engine 2WD



A/T Electrical Parts Location



A/T Electrical Parts Location (Cont'd)



G

MA

EM

LC

EF & EC

FE

CL

ΑT

FA

SAT721C

RA

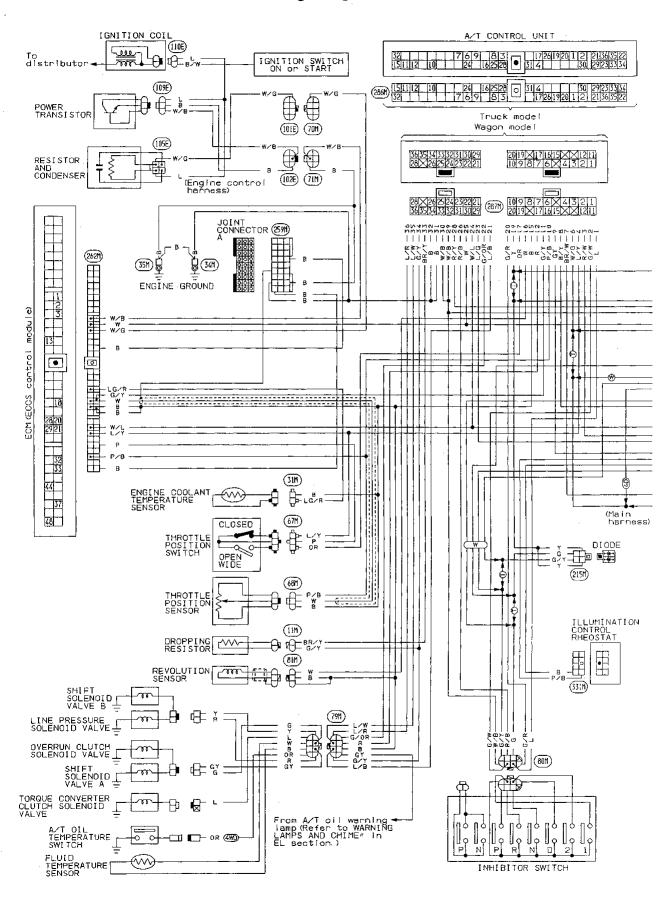
BR

BF

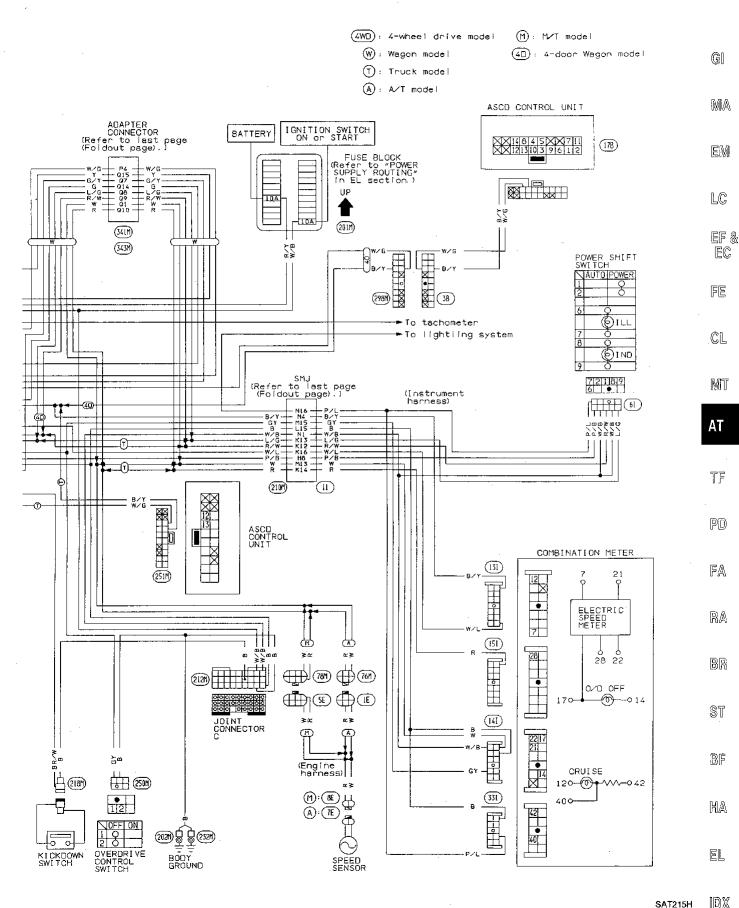
KA

EL

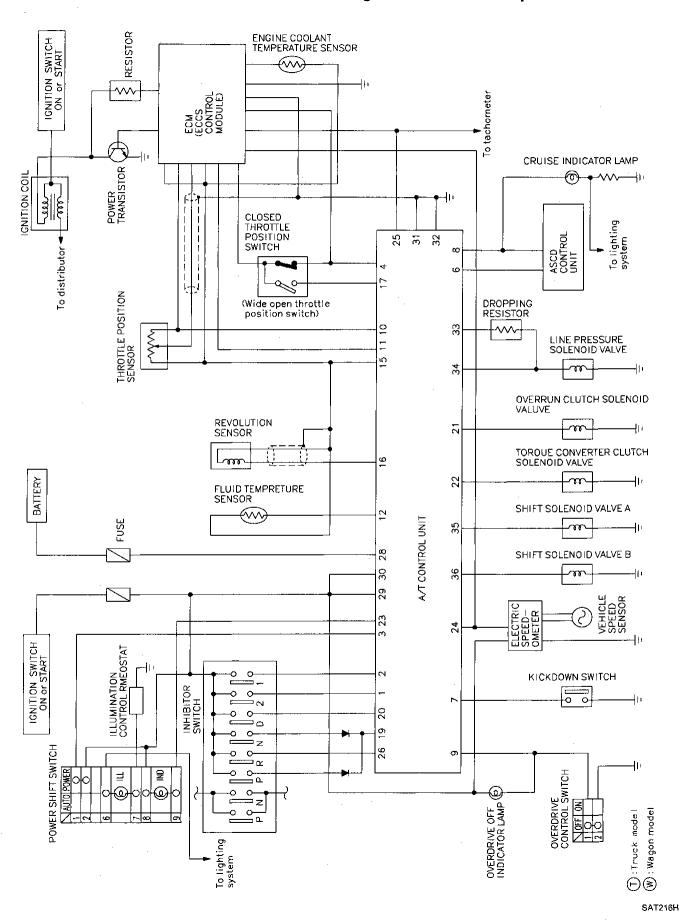
Wiring Diagram



Wiring Diagram (Cont'd)



Circuit Diagram for Quick Pinpoint Check

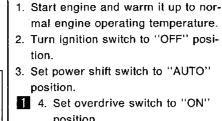


Go to Diagnostic Proce-

dure 1 (AT-53).

DIAGNOSIS START

Self-diagnosis SELF-DIAGNOSTIC PROCEDURE



position.

2 5. Move selector lever to "P" posi-

6. Turn ignition switch to "ON" position. (Do not start engine.)

7. Does power shift indicator lamp come on for about 2 seconds?

Yes

1. Turn ignition switch to "ACC" position.
2. Move selector lever to "D" position.
3. Set overdrive switch to "OFF" position.
4. Turn ignition switch to "ON" posi-

tion. (Do not start engine.)

• Wait for more than 2 seconds after

ignition switch "ON".

5. Move selector lever to "2" position.

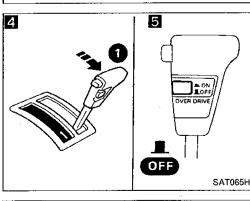
Set overdrive switch to "ON" position.

4 7. Move selector lever to "1" position.

8. Set overdrive switch to "OFF" position.

6 9. Depress accelerator pedal fully and release it.

 Check power shift indicator lamp.
 Refer to JUDGEMENT OF SELF-DI-AGNOSIS CODE on next page.



AUTO

E-AT

POWER

CRUISE

ON

2

SAT064H

SAT057H

Mirror control knob

Power shift indicator lamp

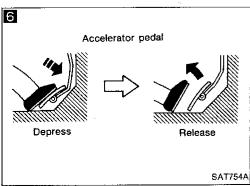
1

ON

LH door side

Power shift switch

3



DIAGNOSIS END

EM

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MA

LC

EF & EC

FE

CL

MT

AT

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TF

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ST

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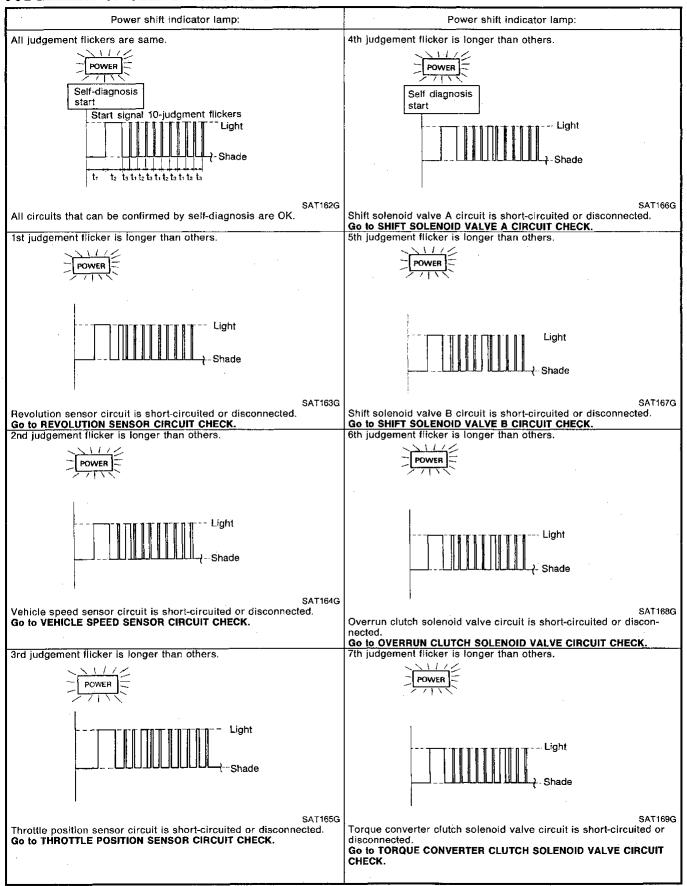
HA

EL

IDX

Self-diagnosis (Cont'd)

JUDGEMENT OF SELF-DIAGNOSIS CODE



MA

EM

WI

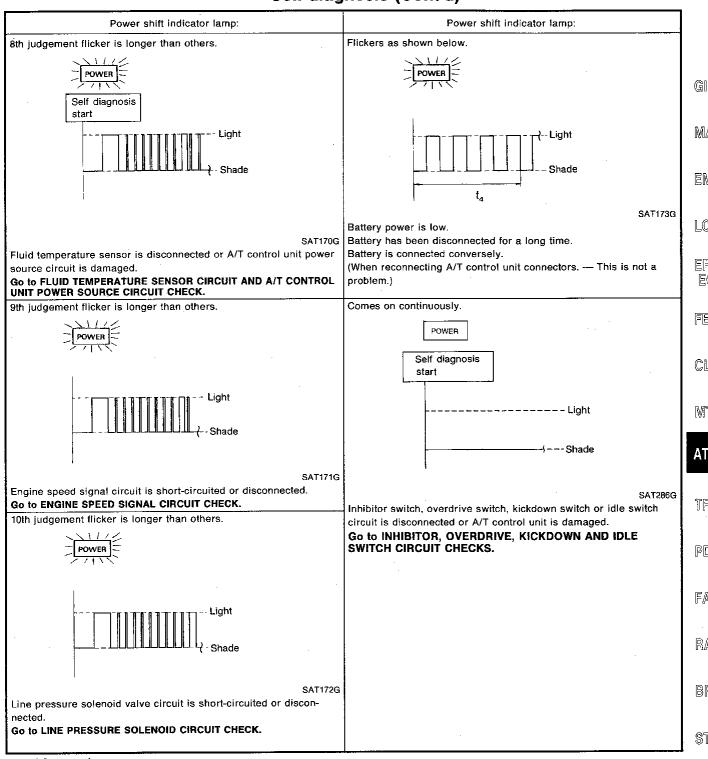
TF

PD

RA

BR

Self-diagnosis (Cont'd)



^{= 1.0} second

图字

HA

EL

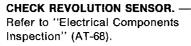
Revolution sensor 16 15 A/T control unit SAT140B

Α

Self-diagnosis (Cont'd)

REVOLUTION SENSOR CIRCUIT CHECK

OK



Repair or replace revolution sensor.

CHECK INPUT SIGNAL.

- Turn ignition switch to "START" position and start engine.
- Check voltage between A/T control unit terminal (6) and ground while driving.

(Measure with AC range.)

Voltage:

At 0 km/h (0 MPH): 0V At 30 km/h (19 MPH):

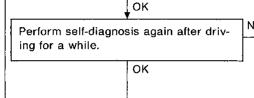
1V or more

(Voltage rises gradually in response to vehicle speed)

Check the following items.

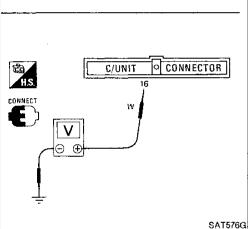
NG

- Harness continuity between A/T control unit and revolution sensor (Main harness)
- Harness continuity between revolution sensor and ECM (Main harness)
- Ground circuit for ECM
 Refer to section EF
 & EC.

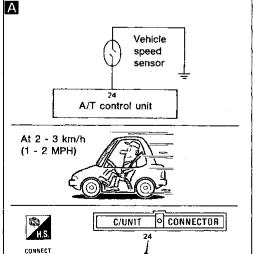


INSPECTION END

- Perform A/T control unit input/output signal inspection.
- If NG, recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.



VEHICLE SPEED SENSOR CIRCUIT CHECK



CHECK INPUT SIGNAL.

Α

SAT577GA

- Turn ignition switch to "START" position and start engine.
- Check voltage between A/T control unit terminal and ground while driving at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.

Voltage: Varies from 0V to 5V

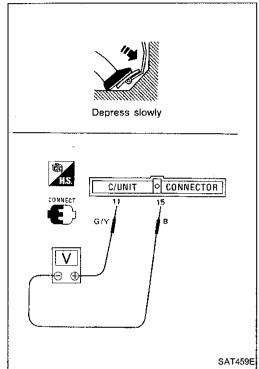
Perform self-diagnosis again after driving for a while.

OK

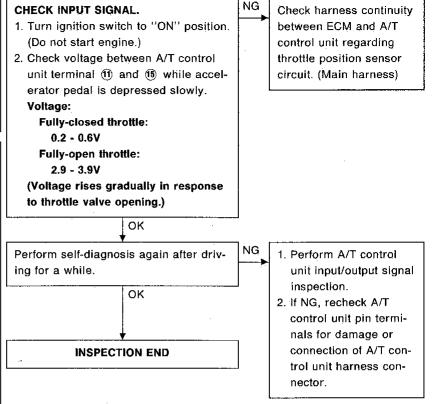
INSPECTION END

- Check the following items.
- Vehicle speed sensor and ground circuit for vehicle speed sensor
 Refer to section EL.
- Harness continuity between A/T control unit and vehicle speed sensor (Main harness)
- Perform A/T control unit input/output signal inspection.
- If NG, recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

Throttle position sensor ECM IS II 10 A/T control unit SAT015GA



Self-diagnosis (Cont'd) THROTTLE POSITION SENSOR CIRCUIT CHECK



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MA

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ef & ec

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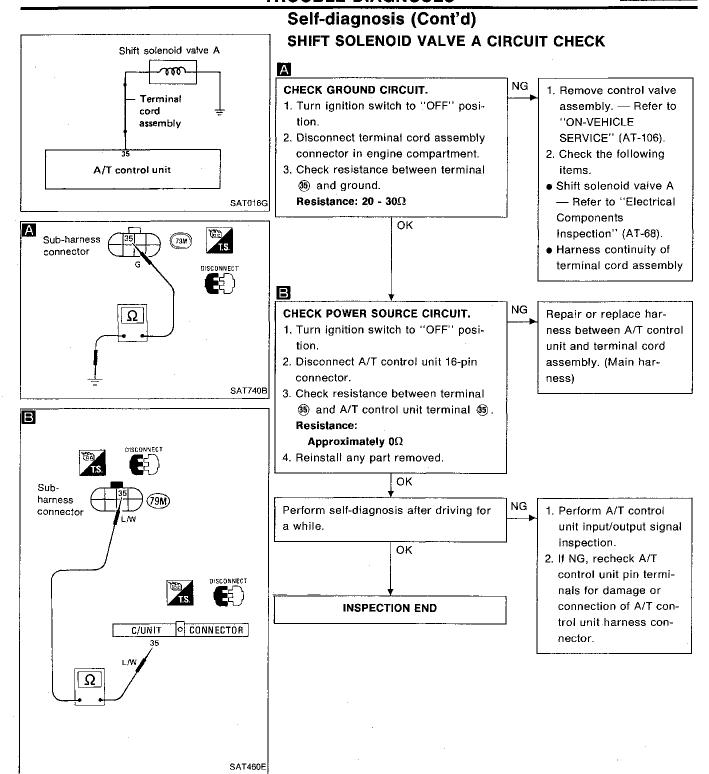
图图

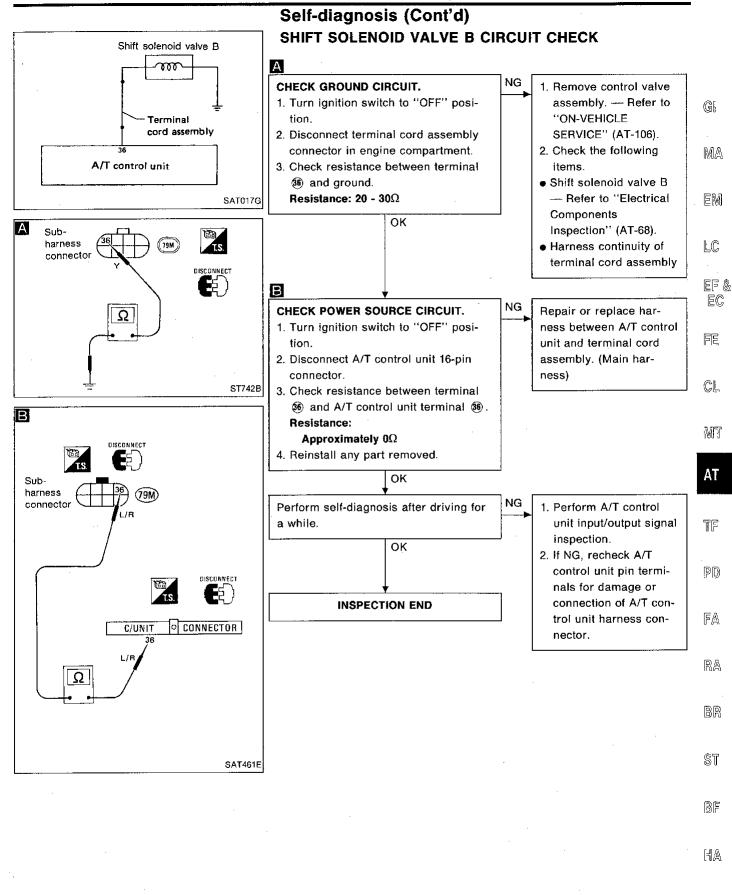
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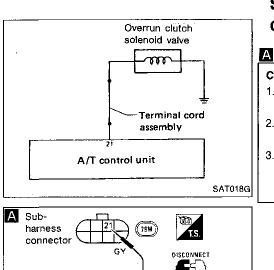
HA

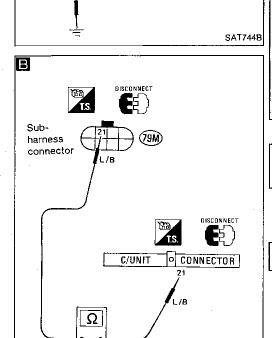
DX





EL





Self-diagnosis (Cont'd)

OVERRUN CLUTCH SOLENOID VALVE CIRCUIT CHECK

NG

NG

CHECK GROUND CIRCUIT.

- 1. Turn ignition switch to "OFF" position.
- Disconnect terminal cord assembly connector in engine compartment.
- Check resistance between terminal and ground.

Resistance: 20 - 30 Ω

B

SAT462E

- Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE" (AT-106).
- 2. Check the following items.
- Overrun clutch solenoid valve. — Refer to "Electrical Components Inspection" (AT-68).
- Harness continuity of terminal cord assembly

Repair or replace har-

assembly. (Main har-

ness)

ness between A/T control unit and terminal cord

CHECK POWER SOURCE CIRCUIT.

- 1. Turn ignition switch to "OFF" position.
- 2. Disconnect A/T control unit 16-pin connector.
- 3. Check resistance between terminal ② and A/T control unit terminal ③.

 Resistance:

Approximately 0 Ω

4. Reinstall any part removed.

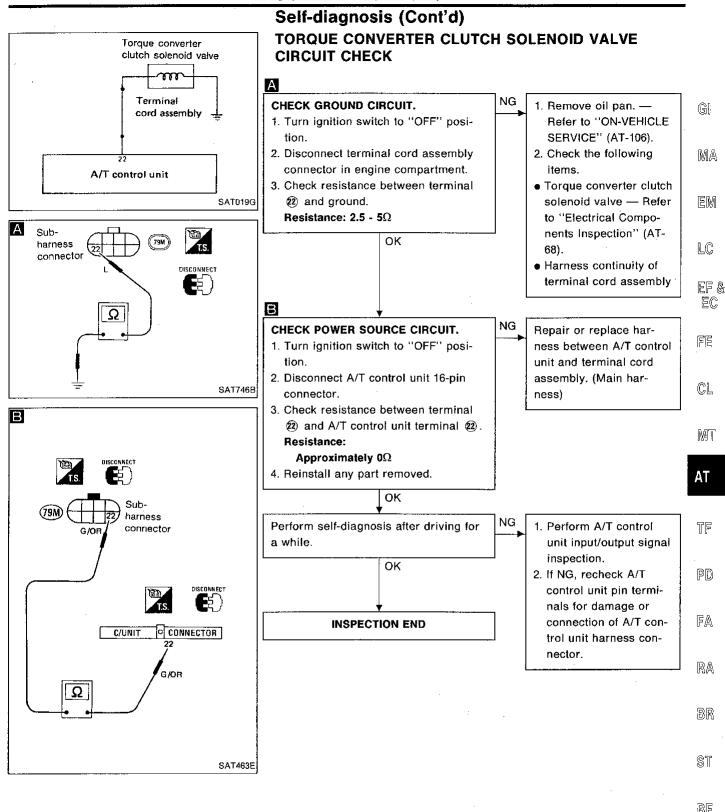
Perform self-diagnosis after driving for a while.

OK

OK

INSPECTION END

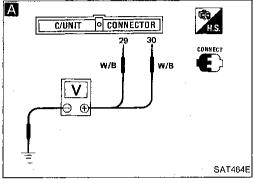
- Perform A/T control unit input/output signal inspection.
- If NG, recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

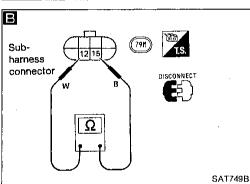


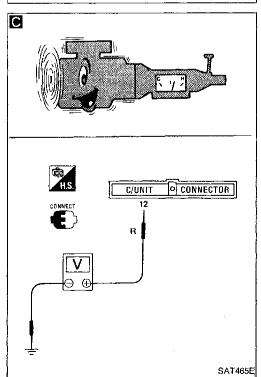
HA

EL

Ignition Fluid temperature switch sensor Terminal cord Fuse assembly A/T control unit SAT143B







Self-diagnosis (Cont'd)

FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECKS

NG

А **CHECK A/T CONTROL UNIT POWER** SOURCE.

- 1. Turn ignition switch to "ON" position. (Do not start engine.)
- 2. Check voltage between A/T control unit terminals 29, 39 and ground. Battery voltage should exist.

Check the following items.

- Harness continuity between ignition switch and A/T control unit (Main harness)
- Ignition switch and fuse Refer to section EL.

CHECK FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY.

oκ

- 1. Turn ignition switch to "OFF" posi-
- 2. Disconnect terminal cord assembly connector in engine compartment.
- 3. Check resistance between terminals (12) and (15) when A/T is cold.

Resistance:

В

C

Cold [20°C (68°F)] Approximately 2.5 k Ω

4. Reinstall any part removed.

- 1. Remove oil pan.
- 2. Check the following items.
- Fluid temperature sensor — Refer to "Electrical Components Inspection" (AT-68).
- · Harness continuity of terminal cord assembly

CHECK INPUT SIGNAL OF FLUID TEM-PERATURE SENSOR.

OK

- 1. Turn ignition switch to "ON" position and start engine.
- 2. Check voltage between A/T control unit terminal (12) and ground while warming up A/T.

Voltage:

Cold [20°C (68°F)] → Hot [80°C (176°F)]:

 $1.56V \,\rightarrow\, 0.45V$

Check the following items.

NG

NG

 Harness continuity between A/T control unit and terminal cord assembly (Main harness)

Perform self-diagnosis after driving for a while.

ΟK

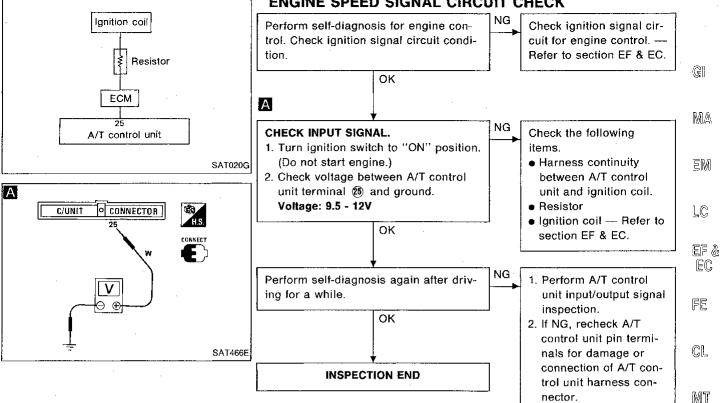
OK

INSPECTION END

- 1. Perform A/T control unit input/output signal inspection.
- 2. If NG, recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

Self-diagnosis (Cont'd)

ENGINE SPEED SIGNAL CIRCUIT CHECK



TF

PD

FA

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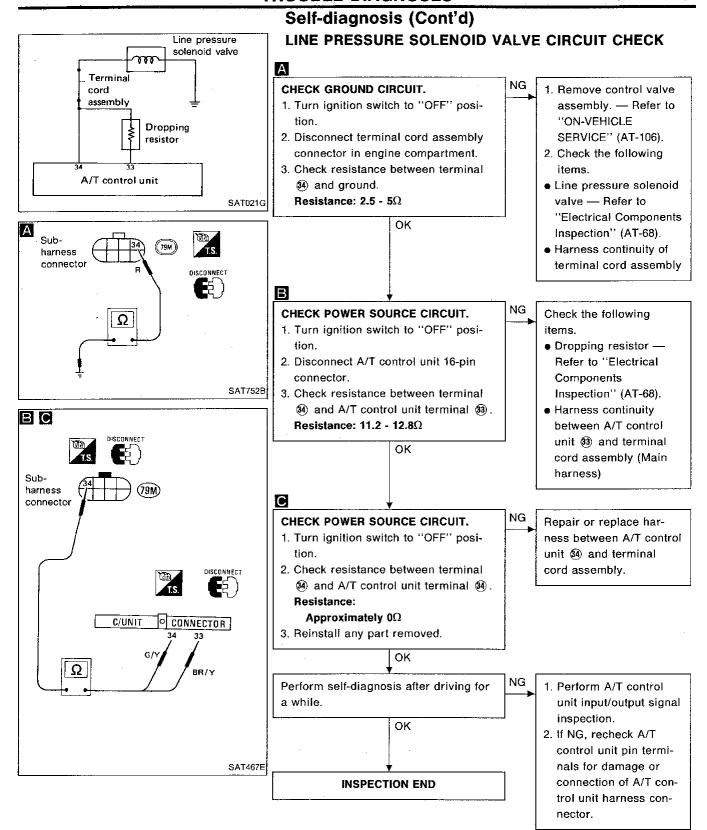
BR

BF

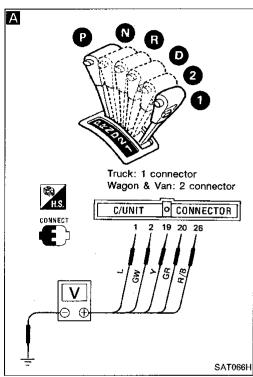
HA

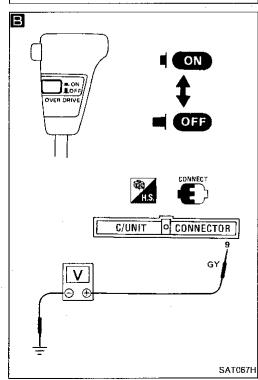
EL

IDX



Ignition switch Fuse Pastion Fuse Pastion Fuse F





Self-diagnosis (Cont'd)

INHIBITOR, OVERDRIVE, KICKDOWN AND CLOSED THROTTLE POSITION SWITCH CIRCUIT CHECKS

Α

CHECK INHIBITOR SWITCH CIRCUIT.

- Turn ignition switch to "ON" position.
 (Do not start engine.)
- 2. Check voltage between A/T control unit terminals ①, ②, ⑩, ⑩, ⑥ and ground while moving selector lever through each position.

Voltage:

B: Battery voltage

0: 0V

Lever	-	Tern	ninal No.			
position	19	26	2 0	1	2	
P, N	B	0	0	0	0	
R	0	В	0	0	0	
D	0	0	В	0	0	
2	0	0	0	В	0	
1	0	0	0	0	B	

Check the following items.

- Inhibitor switch —
 Refer to "Electrical
 Components
 Inspection" (AT-68).
- Harness continuity between ignition switch and inhibitor switch (Main harness)
- Harness continuity between inhibitor switch and A/T control unit (Main harness)

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MIT

CHECK OVERDRIVE SWITCH CIRCUIT.

OK

- Turn ignition switch to "ON" position.
 (Do not start engine.)
- Check voltage between A/T control unit terminals (9) and ground when overdrive switch is in "ON" position and in "OFF" position.

Switch position	n Voltage	
ON	Battery voltage	
OFF	1V or less	

OK

Check the following items.

- Overdrive switch Refer to "Electrical Components Inspection" (AT-68).
- Harness continuity between A/T control unit and overdrive switch (Main harness)
- Harness continuity of ground circuit for overdrive switch (Main harness)

TF

ΑT

PD

FA

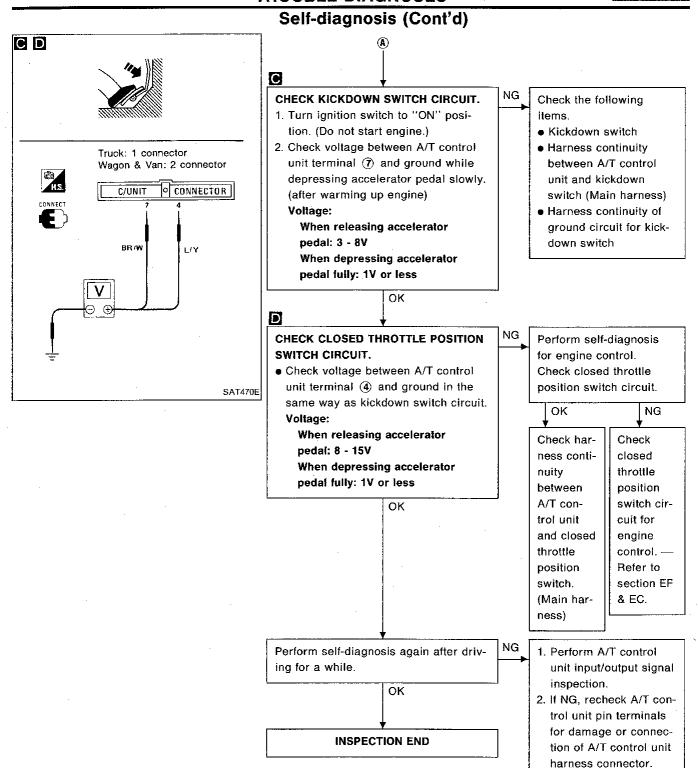
RA

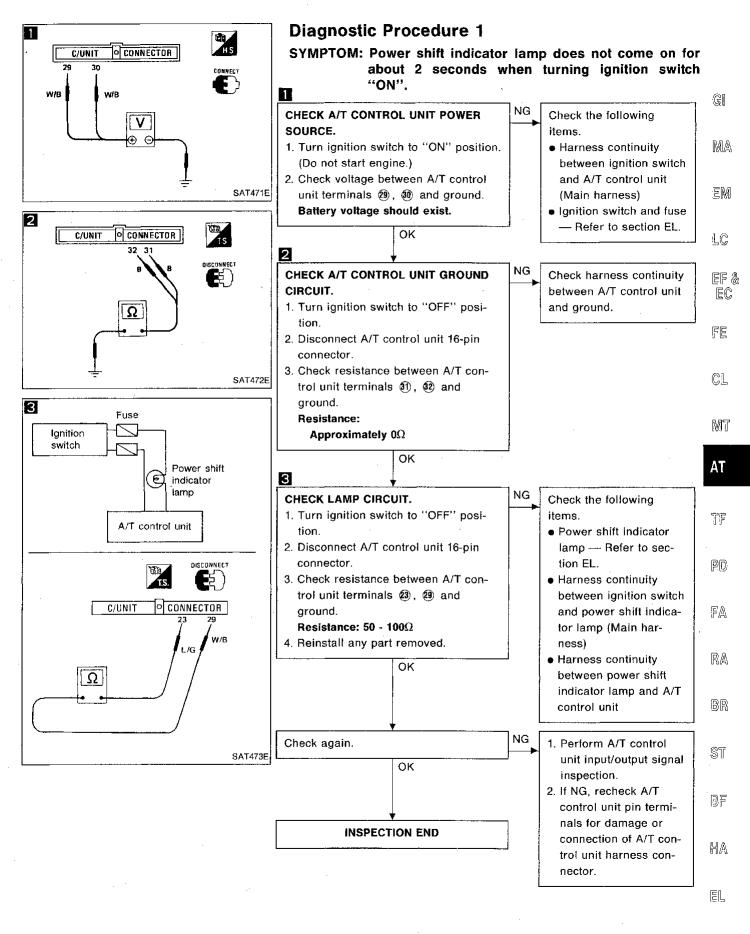
BR

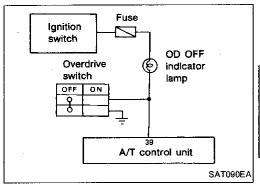
ST

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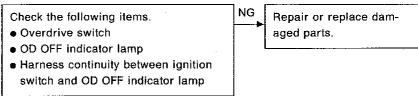






Diagnostic Procedure 2

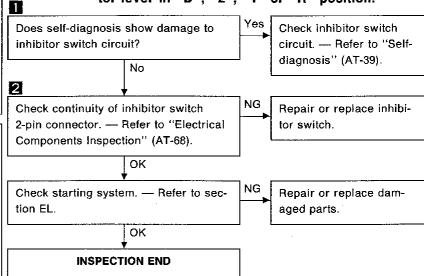
SYMPTOM: OD OFF indicator lamp does not come on when setting overdrive switch to "OFF" position.

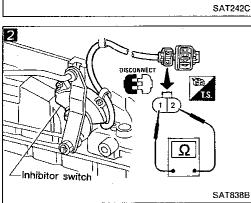


Self-diagnosis start Light Shade



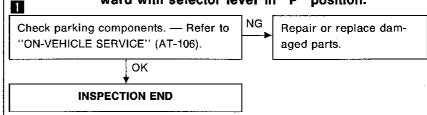
SYMPTOM: Engine cannot be started with selector lever in "P" or "N" position or engine can be started with selector lever in "D", "2", "1" or "R" position.

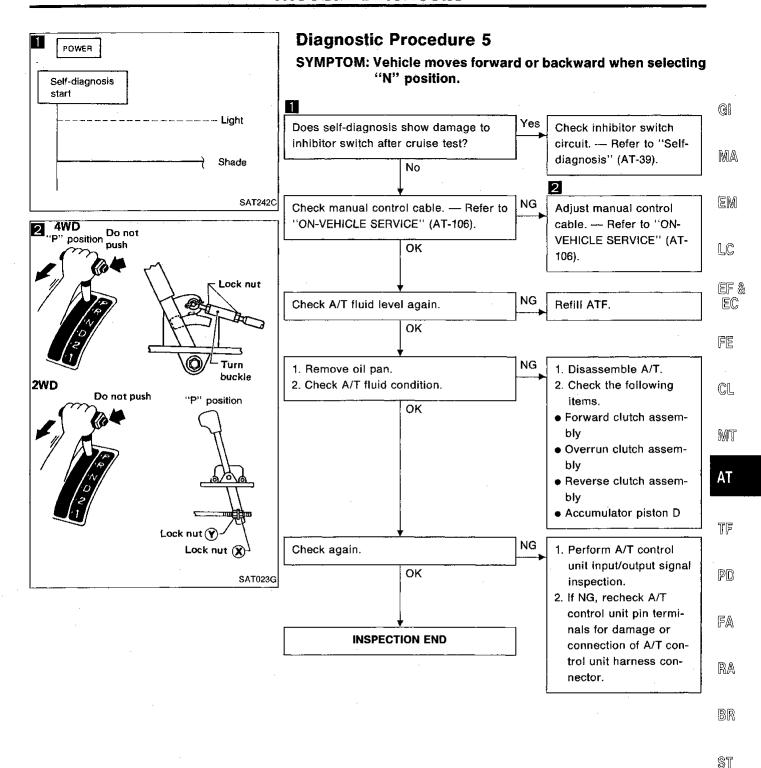




Diagnostic Procedure 4

SYMPTOM: Vehicle moves when it is pushed forward or backward with selector lever in "P" position.





AT-55

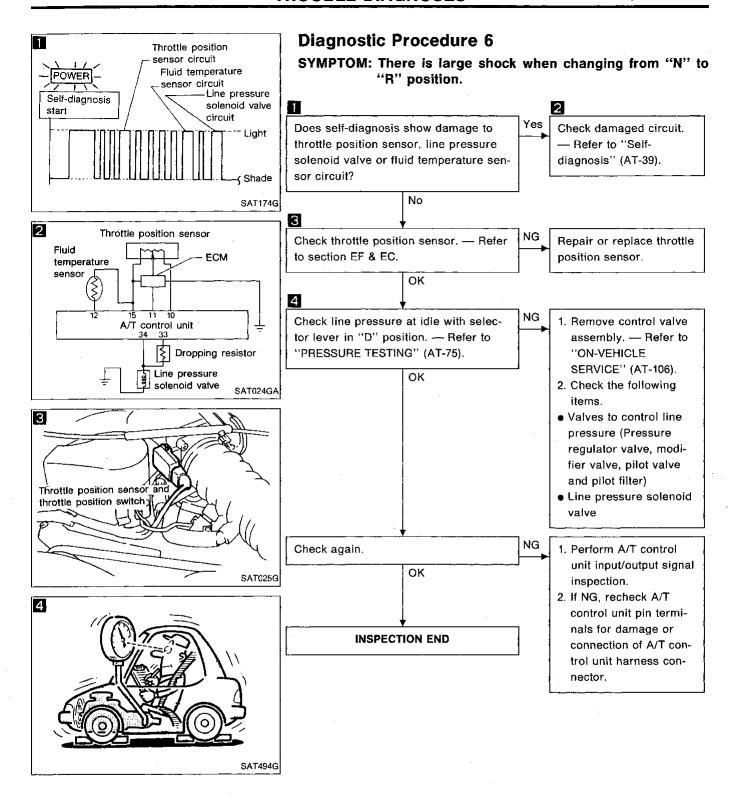
603

HA

BF

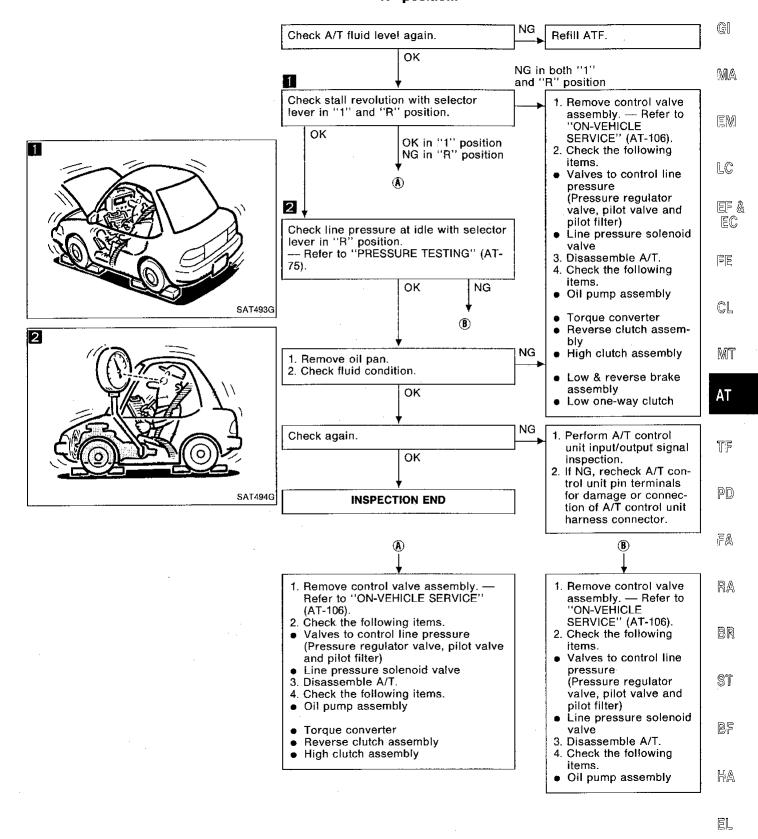
EL

IDX



Diagnostic Procedure 7

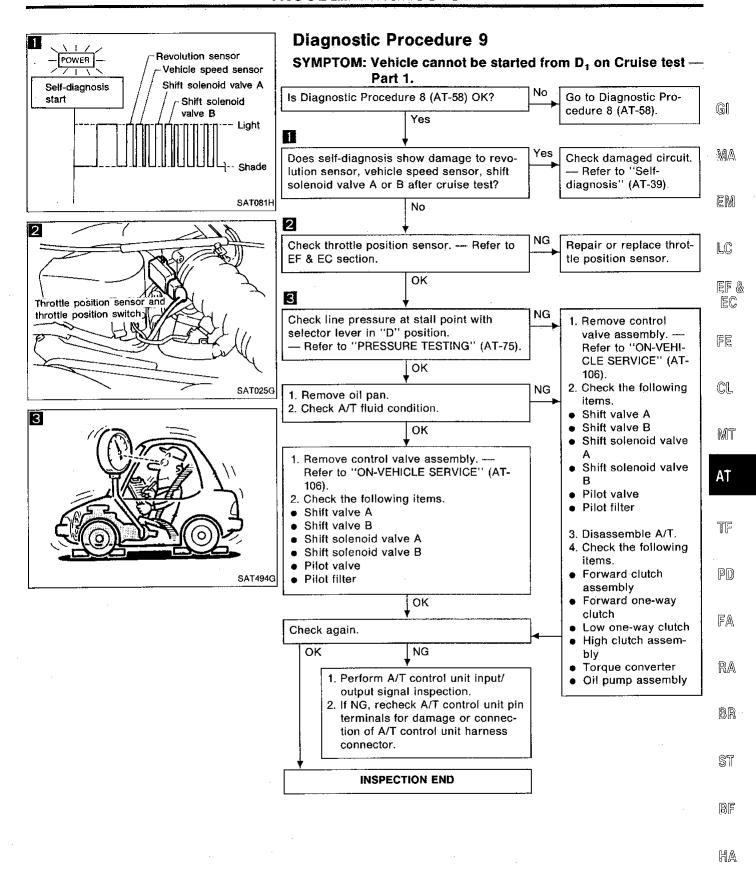
SYMPTOM: Vehicle does not creep backward when selecting "R" position.



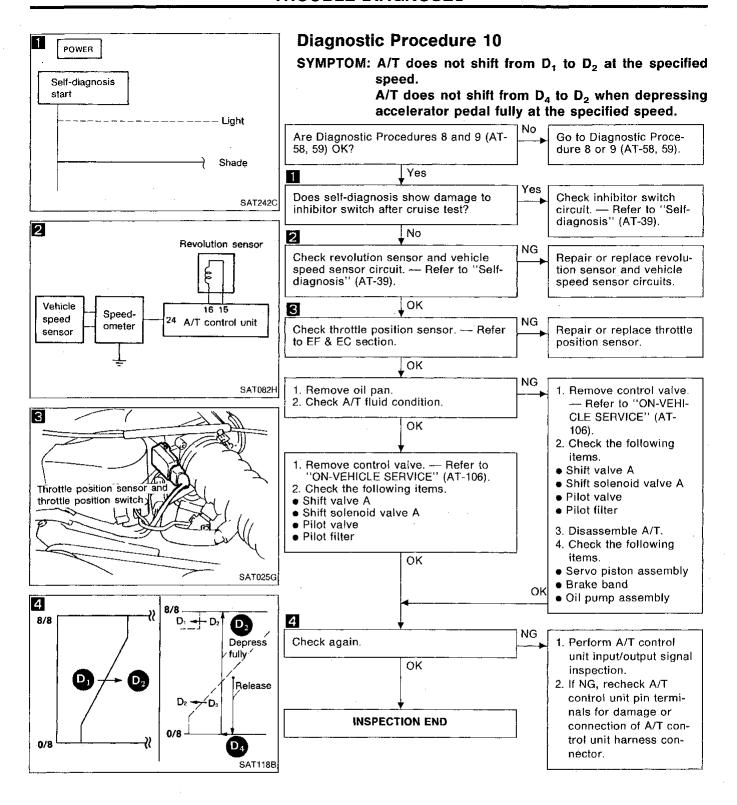
Diagnostic Procedure 8

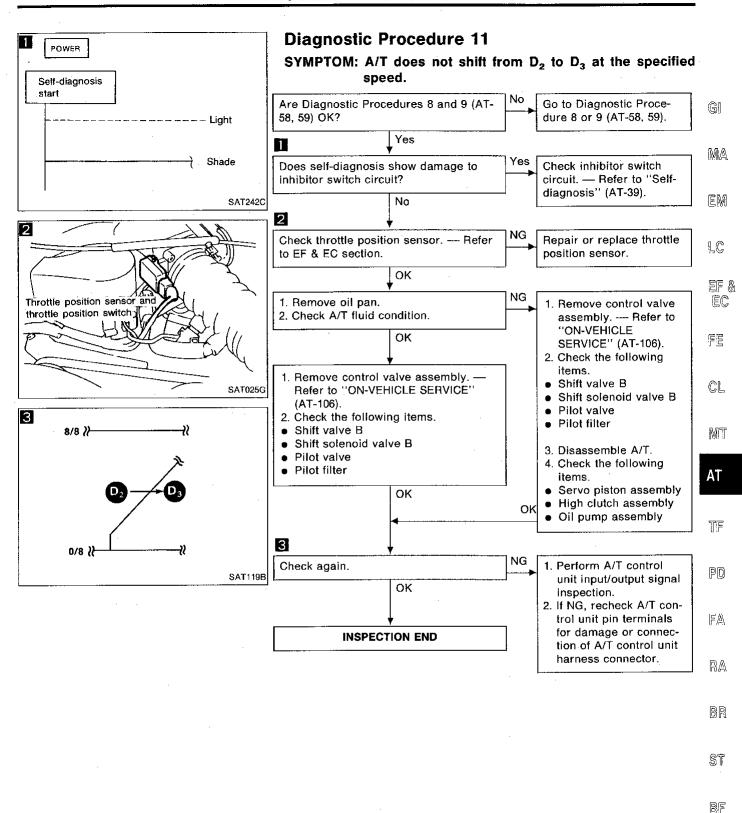
SYMPTOM: Vehicle does not creep forward when selecting "D", "2" or "1" position. NG Refill ATF. Check A/T fluid level again. П NG Check stall revolution with selector lever in 1. Remove control "D" position. - Refer to "STALL valve assembly. -TESTING" (AT-73). Refer to "ON-VEHI-CLE SERVICE" (AT-OK 1 106). 2 2. Check the following items. Check line pressure at idle with selector Valves to control lever in "D" position. line pressure - Refer to "PRESSURE TESTING" (AT-75). (Pressure regulator OK NG valve, modifier valve, pilot valve 1. Remove control valve assembly. and pilot filter) - Refer to "ON-VEHICLE · Line pressure sole-SERVICE" (AT-106). SAT493G noid valve 2. Check the following items. 3. Disassemble A/T. 2 · Valves to control line pressure 4. Check the following (Pressure regulator valve, modiitems. fier valve, pilot valve and pilot Oil pump assembly filter) · Line pressure solenoid valve Forward clutch 3. Disassemble A/T. assembly 4. Check the following items. Forward one-way Oil pump assembly clutch Low one-way clutch NG Low & reverse 1. Remove oil pan. SAT494G brake assembly 2. Check A/T fluid condition. Torque converter OK NG Check again. 1. Perform A/T control unit input/output sig-ΟK nal inspection. 2. If NG, recheck A/T control unit pin terminals for damage INSPECTION END or connection of A/T control unit harness

connector.



ЮX



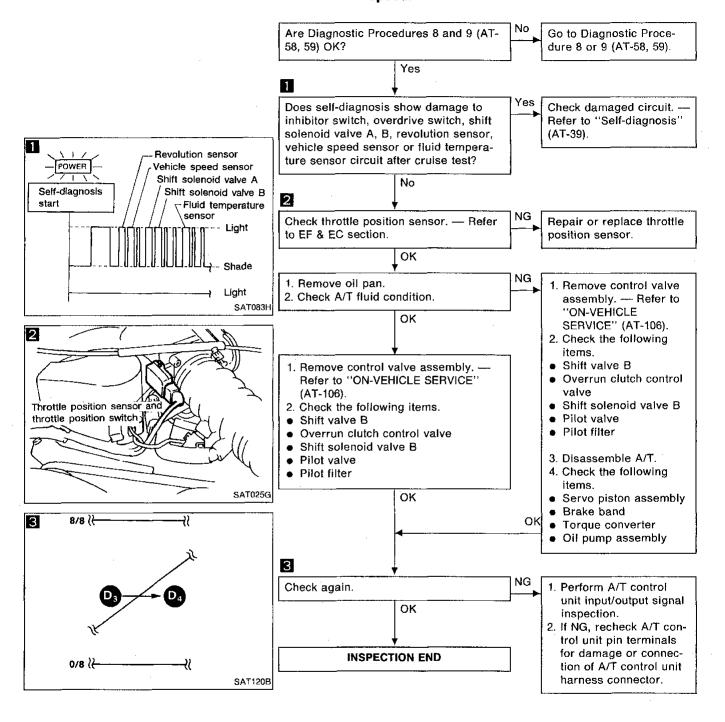


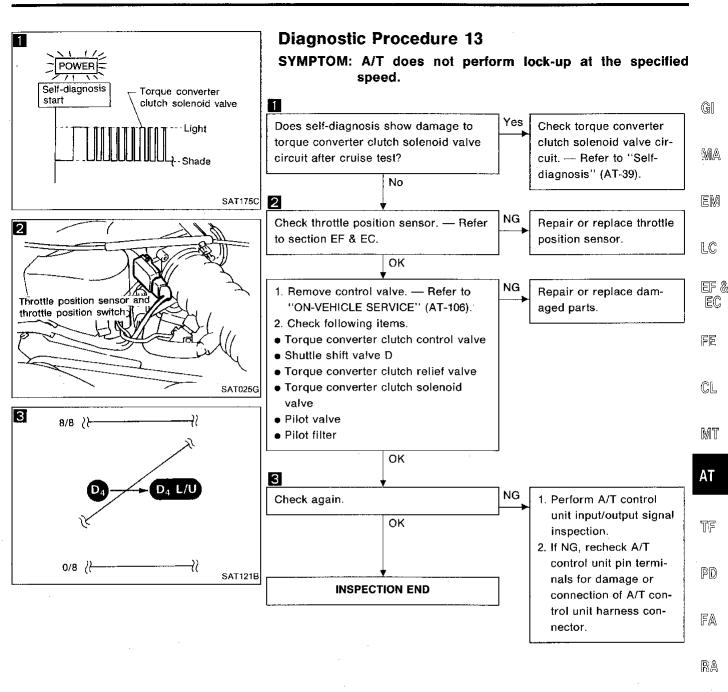
EL

HA

Diagnostic Procedure 12

SYMPTOM: A/T does not shift from D_3 to D_4 at the specified speed.





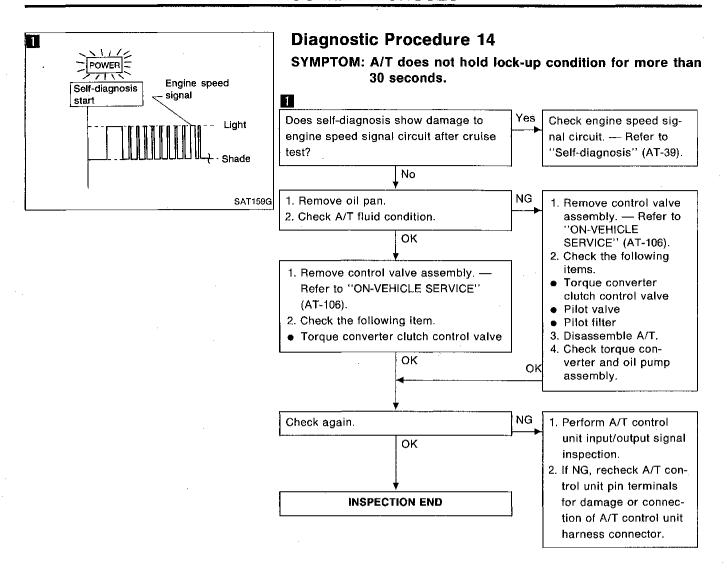
BR

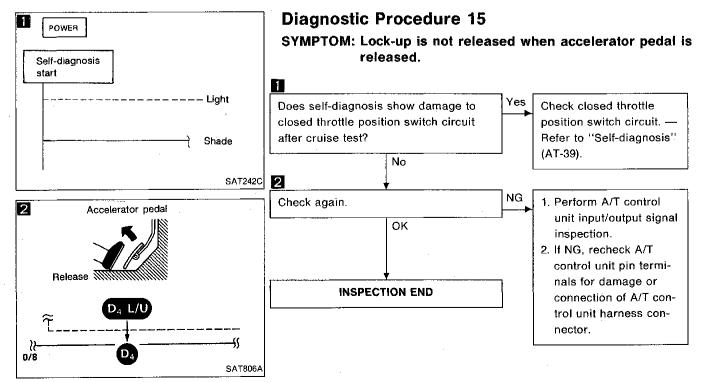
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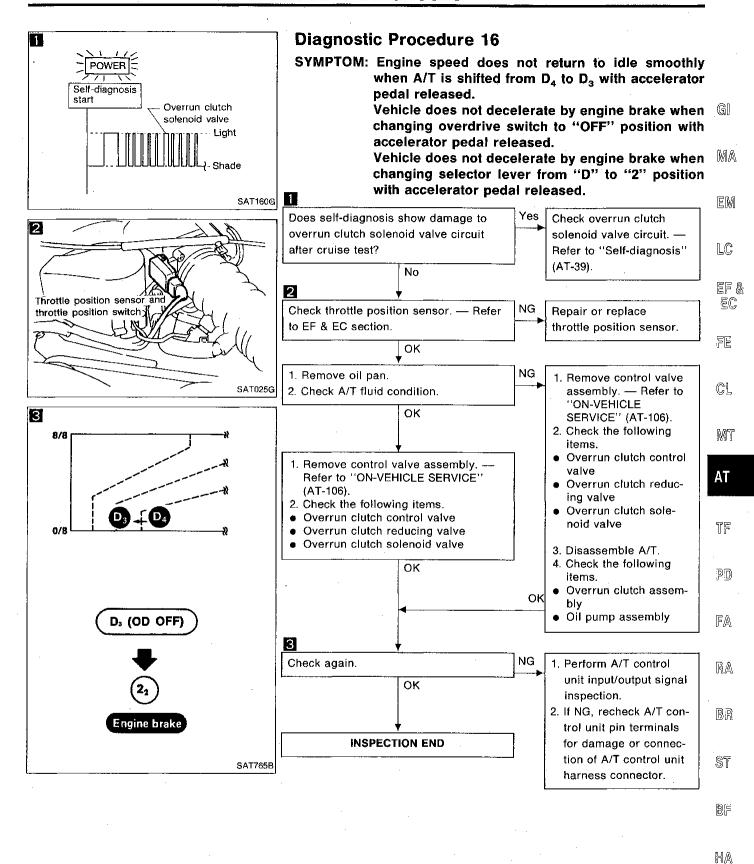
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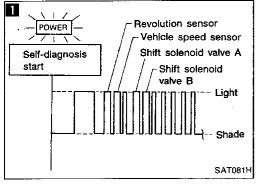






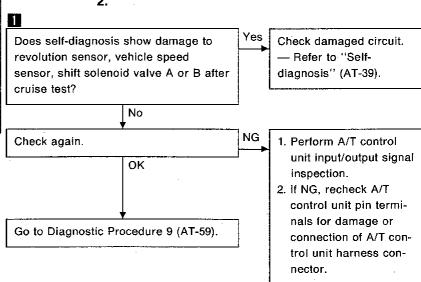
EL

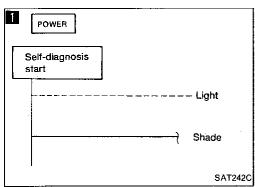
IDX



Diagnostic Procedure 17

SYMPTOM: Vehicle does not start from D₁ on Cruise test — Part 2.





Diagnostic Procedure 18

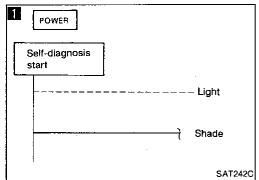
SYMPTOM: A/T does not shift from D_4 to D_2 when changing overdrive switch to "OFF" position.

Overdrive switch to "OFF" position.

Does self-diagnosis show damage to overdrive switch circuit after cruise test?

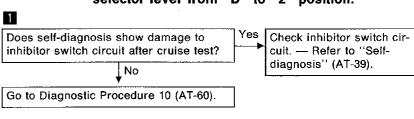
No

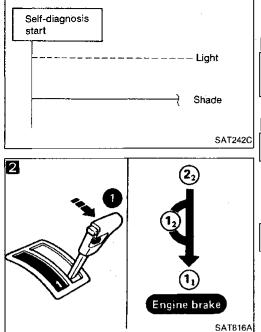
Go to Diagnostic Procedure 11 (AT-61).



Diagnostic Procedure 19

SYMPTOM: A/T does not shift from ${\bf D}_3$ to ${\bf 2}_2$ when changing selector lever from "D" to "2" position.

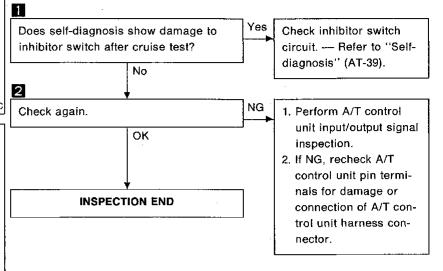




POWER

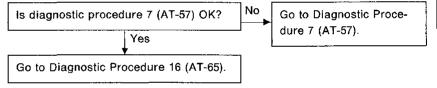
Diagnostic Procedure 20

SYMPTOM: A/T does not shift from 2₂ to 1₁ when changing selector lever from "2" to "1" position.



Diagnostic Procedure 21

SYMPTOM: Vehicle does not decelerate by engine brake when shifting from 2_2 (1_2) to 1_1 .



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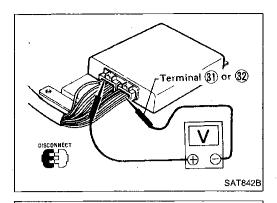
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Electrical Components Inspection INSPECTION OF A/T CONTROL UNIT

Measure voltage between each terminal and terminal for by following "A/T CONTROL UNIT INSPECTION TABLE".

Pin connector terminal layout.

A/T CONTROL UNIT INSPECTION TABLE (Data are reference values.)

Ter- minal No.	Item	Condition		Judgement standard	
	1-1-1-11-11-11-11-11-11-11-11-11-11-11-		When selector lever is set to "2" position.	Battery voltage	
1	Inhibitor "2" position switch		When selector lever is set to other positions.	1V or less	
	Inhihitau (1477 nagitian		When selector lever is set to "1" position.	Battery voltage	
2	Inhibitor ''1'' position switch	(Con)	When selector lever is set to other positions.	1V or less	
3 Power shift switch		When power shift switch is set to "POWER" position.	Battery voltage		
	<u></u>	When power shift switch is set to "AUTO" position.	1V or less		
Closed throttle position switch (in throttle position switch)	X (0)	When accelerator pedat is released after warming up engine.	8 - 15V		
		When accelerator pedal is depressed after warming up engine.	1V or less		
5			<u> </u>		
6 I	ASCD and OD cut signal		When "ACCEL" set switch is released on ASCD cruise.	5 - 8V	
			When "ACCEL" set switch is applied on ASCD cruise.	1V or less	
7 .	Kickdown switch	Con	When accelerator pedal is released after warming up engine.	3 - 8V	
			When accelerator pedal is depressed fully after warming up engine.	1V or less	

TROUBLE DIAGNOSES

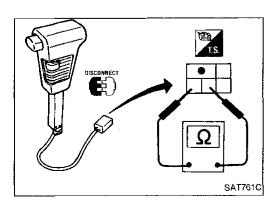
Electrical Components Inspection (Cont'd)

			***************************************	<u>, , , , , , , , , , , , , , , , , , , </u>	-
Ter- minal No.	Item		Condition	Judgement standard	
	ACCD and a pignal		When ASCD cruise is being performed. ("CRUISE" light comes on.)	Battery voltage	- G1
8	ASCD cruise signal	EOPHO!	When ASCD cruise is not being performed. ("CRUISE" light does not come on.)	1V or less	_
9	Overdrive control		When overdrive switch is set to "ON" position.	Battery voltage	- M -
	switch		When overdrive switch is set to "OFF" position.	1V or less	<u>.</u>
10	Throttle position sensor (Power source)	((Con))		4.5 - 5.5V	
11	Throttle position sen-		When accelerator pedal is depressed slowly after warming up engine. Voltage rises gradually in response	Fully-closed throttle: 0.2 - 0.6V Fully-open throttle:	L(
		85 ² 1	to throttle opening angle.	2.9 - 3.9V	E
10	Fluid temperature		When ATF temperature is 20°C (68°F).	1.56V	
12	sensor		When ATF temperature is 80°C (176°F).	0.45V	_
13					_ F
14					_
15	Throttle position sen- sor (Ground)		<u> </u>		- ©
16	Revolution sensor (Measure in AC posi- tion)	602A03	When vehicle is cruising at 30 km/h (19 MPH).	1V or more Voltage rises gradu- ally in response to vehicle speed.	. M
	,		When vehicle is parked.	0V	_
17	Wide open throttle		When accelerator pedal is depressed more than half-way after warming up engine.	8 - 15V	A
	position switch		When accelerator pedal is released after warming up engine.	1V or less	_
18		(Con)		<u> </u>	_ T
19	Inhibitor "N" and "P"	<u></u>	When selector lever is set to "N" or "P" position.	Battery voltage	
	position switch	X CO	When selector lever is set to other positions.	1V or less	P -
	Inhibitor "D" position		When selector lever is set to "D" position.	Battery voltage	
20	switch		When selector lever is set to other positions.	1V or less	_ _
21	Overrun clutch sole-		When overrun clutch solenoid valve is operating.	Battery voltage	
	noid valve		When overrun clutch solenoid valve is not operating.	1V or less	R -
22	Torque converter	F. (1) F. (1) F.	When A/T is performing lock-up.	8 - 15V	_
	clutch solenoid valve		When A/T is not performing lock-up.	1V or less	_ B
	Power shift indicator	(CON)	When power shift switch is set to "POWER" position.	Battery voltage	- \$
23	lamp		When power shift switch is set to "AUTO" position.	1V or less	Ð
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Electrical Components Inspection (Cont'd)

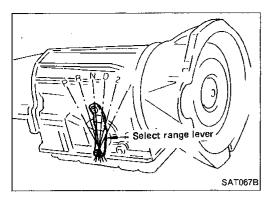
			and components mepochen	(
Ter- minal No.	Item		Condition	Judgement standard
24	Vehicle speed sensor		When vehicle is moving at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.	Vary from 0 to 5V
25	Engine speed signal		When engine is running at idle speed.	9.5 - 12V
20	Engine speed signal		When engine is running at 2,500 rpm.	Approximately 10V
	Inhibitor "D" position	Cal	When selector lever is set to "R" position.	Battery voltage
26	Inhibitor "R" position switch		When selector lever is set to other positions.	1V or less
27		N.		· —
28	Power source	(Pa)	When ignition switch is turned to "OFF".	Battery voltage
	(Back-up)	or	When ignition switch is turned to "ON".	Battery voltage
29	Power source		When ignition switch is turned to "ON".	Battery voltage
30			When ignition switch is turned to "OFF".	1V or less
31 32	Ground			
	Line pressure sole- noid valve		When accelerator pedal is refeased after warming up engine.	5 - 14V
33	(with dropping resis- tor)	(Co)	When accelerator pedal is depressed fully after warming up engine.	0.5V or less
	Line pressure sole-	8 22	When accelerator pedal is released after warming up engine.	1.5 - 2.5V
34	noid valve	/\	When accelerator pedal is depressed fully after warming up engine.	0.5V or less
			When shift solenoid valve A is operating. (When driving in "D ₁ " or "D ₄ ".)	Battery voltage
35	Shift solenoid valve A	7-7-	When shift solenoid valve A is not operating. (When driving in "D ₂ " or "D ₃ ".)	1V or less
 			When shift solenoid valve B is operating. (When driving in " D_1 " or " D_2 ".)	Battery voltage
36	Shift solenoid valve B		When shift solenoid valve B is not operating. (When driving in "D ₃ " or "D ₄ ".)	1V or less

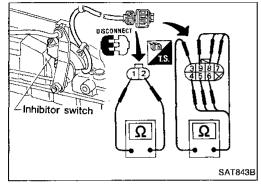


OVERDRIVE SWITCH

Check continuity between two terminals.

OD switch position	Continuity
ON	No
OFF	Yes







1. Check continuity between terminals ① and ② and between terminals ③ and ④, ⑤, ⑥, ⑦, ⑧, ⑨ while moving selector lever through each position.

Lever position				Ter	minal	No.			
Level position	1	2	3	4	(5)	(6)	7	8	9
Р	0-	-	0-	_					
R			0-		-0				
N	0-		<u> </u>			-			
D			0-						
2			0-					0	
1			0-						$\overline{}$



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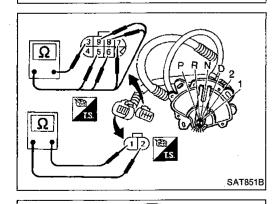
If NG, check again with manual control cable disconnected from manual shaft of A/T assembly. — Refer to step 1.
 If OK on step 2, adjust manual control cable — Refer to



"ON-VEHICLE SERVICE" (AT-106).



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- 4. If NG on step 2, remove inhibitor switch from A/T and check continuity of inhibitor switch terminal. Refer to step 1.
- 5. If OK on step 4, adjust inhibitor switch. Refer to "ON-VEHICLE SERVICE" (AT-106).
- 6. If NG on step 4, replace inhibitor switch.



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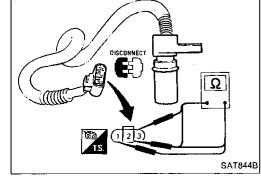
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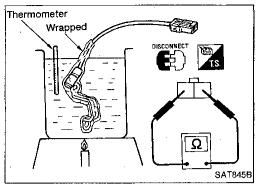
- For removal and installation, refer to "ON-VEHICLE SERVICE" (AT-106).
- Check resistance between terminals (1), (2) and (3).

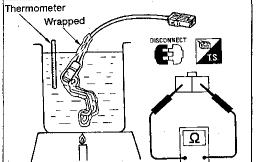
Termir	nal No.	Resistance
1	2	500 - 650Ω
2	3	No continuity
(1)	3	No continuity



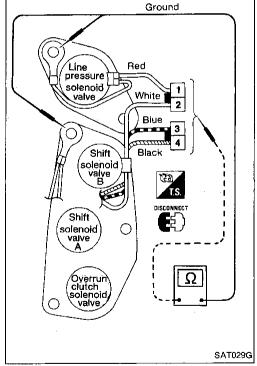
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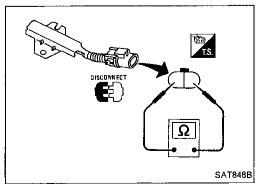
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Electrical Components Inspection (Cont'd) FLUID TEMPERATURE SENSOR

- For removal and installation, refer to "ON-VEHICLE SERVICE" (AT-106).
- Check resistance between two terminals while changing temperature as shown at left.

Temperature °C (°F)	Resistance
20 (68)	Approximately 2.5 kΩ
80 (176)	Approximately 0.3 kΩ

TORQUE CONVERTER CLUTCH SOLENOID VALVE

- For removal and installation, refer to "ON-VEHICLE SERVICE" (AT-106).
- Check resistance between two terminals.

Resistance: 10 - 16 Ω

3-UNIT SOLENOID VALVE ASSEMBLY (Shift solenoid valves A, B and overrun clutch solenoid

AND LINE PRESSURE SOLENOID VALVE

- For removal and installation, refer to "ON-VEHICLE SERVICE" (AT-106).
- Check resistance between terminals of each solenoid.

Solenoid	Terr	ninal No.	Resistance					
Shift solenoid valve A	3							
Shift solenoid valve B	2	Consumed to service at	20 - 30Ω					
Overrun clutch solenoid valve	4	Ground terminal						
Line pressure solenoid valve	1		2.5 - 5Ω					

DROPPING RESISTOR

Check resistance between two terminals.

Resistance: 11.2 - 12.8 Ω

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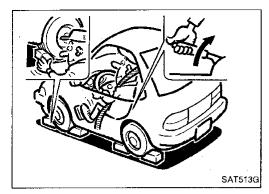
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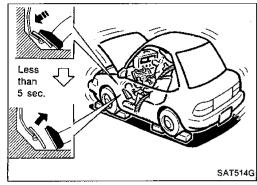
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Final Check

STALL TESTING

Stall test procedure

- Check A/T and engine fluid levels. If necessary, add.
- Warm up engine until engine oil and ATF reach operating temperature after vehicle has been driven approx. 10 minutes.

ATF operating temperature:

50 - 80°C (122 - 176°F)

- Set parking brake and block wheels.
- Install a tachometer where it can be seen by driver during test.
- It is good practice to put a mark on point of specified engine speed on indicator.
- Start engine, apply foot brake, and place selector lever in "D" position.
- Accelerate to wide-open throttle gradually while applying foot brake.
- Quickly note the engine stall revolution and immediately release throttle.
- During test, never hold throttle wide-open for more than 5 seconds.

Stall revolution:

2,260 - 2,510 rpm

- Shift selector lever to "N".
- 9. Cool off ATF
- Run engine at idle for at least one minute.
- 10. Perform stall tests in the same manner as in steps 5 through 9 with selector lever in "2", "1" and "R", respectively.

JUDGEMENT OF STALL TEST

The test result and possible damaged components relating to each result are shown in the illustration. In order to pinpoint the possible damaged components, follow the WORK FLOW shown in AT-15.

Stall revolution is too high in "D" or "2" position:

- Slippage occurs in 1st gear but not in 2nd and 3rd gears. Low one-way clutch slippage
- Slippage occurs in 1st through 3rd gears in "D" position and engine brake functions with power shift switch set to "POWER", or slippage occurs in 1st and 2nd gears in "2" position and engine brake functions with accelerator pedal completely released (fully closed throttle). Forward clutch or forward one-way clutch slippage

Stall revolution is too high in "R" position:

- Engine brake does not function in "1" position. Low & reverse brake slippage
- Engine brake functions in "1" position. Reverse clutch slippage

Stall revolution within specifications:

Vehicle does not achieve speed of more than 80 km/h. One-way clutch seizure in torque converter housing

CAUTION:

Be careful since automatic fluid temperature increases abnormally.

- Slippage occurs in 3rd and 4th gears in "D" position. High clutch slippage
- Slippage occurs in 2nd and 4th gear in "D" position. Brake band slippage

Stall revolution less than specifications:

Poor acceleration during starts. One-way clutch seizure in torque converter

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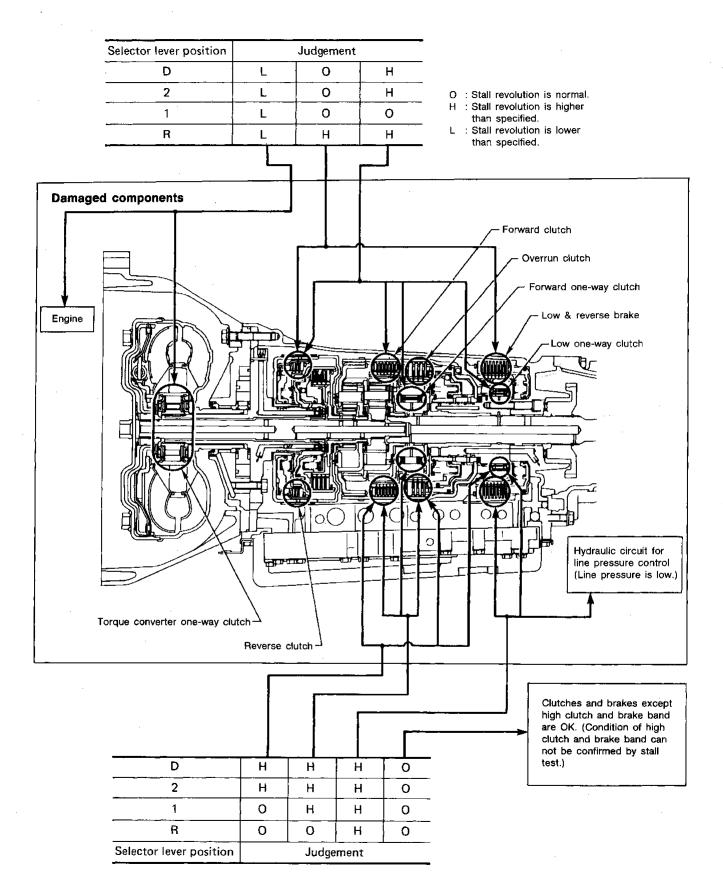
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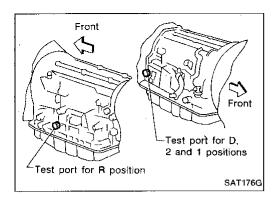
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Final Check (Cont'd)

Judgement of stall test





Final Check (Cont'd) PRESSURE TESTING

- Location of line pressure test port
- Line pressure plugs are hexagon headed bolts.
- Always replace line pressure plugs as they are self-sealing bolts.



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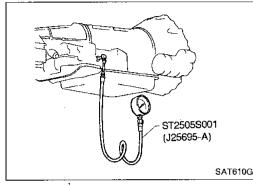
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Line pressure test procedure

- Check A/T and engine fluid levels. If necessary, add.
- Warm up engine until engine oil and ATF reach operating temperature after vehicle has been driven approx. 10 minutes.

ATF operating temperature: 50 - 80°C (122 - 176°F)

- 3. Install pressure gauge to line pressure port.
- D, 2 and 1 positions —





- Set parking brake and block wheels.
- Continue to depress brake pedal fully while line pressure test at stall speed is performed.

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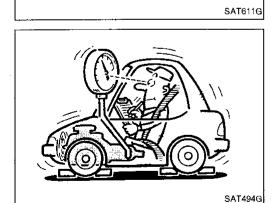
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- Start engine and measure line pressure at idle and stall
- When measuring line pressure at stall speed, follow the stall test procedure.



Engine speed	Line pressure k	Pa (kg/cm², psi)
rpm	D, 2 and 1 positions	R position
ldle	442 - 461 (4.3 - 4.7, 61 - 67)	667 - 706 (6.8 - 7.2, 97 - 102)
Stall	1,020 - 1,098 (10.4 - 11.2, 148 - 159)	1,422 - 1,500 (14.5 - 15.3, 206 - 218)



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Final Check (Cont'd)

JUDGEMENT OF LINE PRESSURE TEST

	Judgement	Suspected parts
	Line pressure is low in all positions.	 Oil pump wear Control piston damage Pressure regulator valve or plug sticking Spring for pressure regulator valve damaged Fluid pressure leakage between oil strainer and pressure regulator valve
At idle	Line pressure is low in particular position.	 Fluid pressure leakage between manual valve and particular clutch. For example: If line pressure is low in "R" and "1" positions but is normal in "D" and "2" positions, fluid leakage exists at or around low & reverse brake circuit.
	Line pressure is high.	 Mal-adjustment of throttle position sensor Fluid temperature sensor damaged Line pressure solenoid valve sticking Short circuit of line pressure solenoid valve circuit Pressure modifier valve sticking Pressure regulator valve or plug sticking
At stall speed	Line pressure is low.	Mal-adjustment of throttle position sensor Control piston damaged Line pressure solenoid valve sticking Short circuit of line pressure solenoid valve circuit Pressure regulator valve or plug sticking Pressure modifier valve sticking Pilot valve sticking

Symptom Chart

	B (^-	Τ.	<u>, </u>	7.1	Τ	_		ehiçle	_	1	1,	. Т	400	F	^^	1	· 	-	FF \	····		1			1
	Reference page (AT-·)	20, 110		1	71	75	1	140, 72	72	72	72, 106	100	1	106	1	22, 36		67, 71	ſ	73, 83	ı	73, 81	1	77	190	
Reference page (AT-)	Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transmission must be removed from the vehicle.	Fluid level		ensor (Adjustment)	Revolution sensor and vehicle speed sensor Engine speed signal	Engine idling speed	Line pressure	assembly valve A	Shift solenoid valve B Line pressuré solenoid valve	ue converter clutch	J.C.	Accumulator 1-2	Accumulator 2-3	ا ق	Torque converter		Reverse clutch		400	ty clutch		Low one-way clutch	Low & reverse brake	plant Dario	Parking components	
54	Engine does not start in "N", "P" positions.	. :	+			1.							\top	. 1	<u> </u>			-	T.	_	Ī.					
54	Engine starts in position other than "N" and "P".		1 2			1.						ļ.	1		Ι.	٠,	· .	<u> </u>			†			.		1
	Transmission noise in "P" and "N" positions.	1		3	4 5	1.	2			Ī			.	. ,	0	6					<u>†</u> −	<u> </u>				1
54	Vehicle moves when changing into "P" position or parking gear does not disengage when shifted out of "P" position.												-				•			,				,	2	F
55	Vehicle runs în "N" position.	Ŀ	<u> </u>			Ŀ	_				<u> . </u>	Ŀ	4	4 .	Ŀ		3		2		(3)		·		<u> . </u>	1 6
57	Vehicle will not run in "R" position (but runs in "D", "2" and "1" positions). Clutch slips. Very poor acceleration.		1	٠			2	4 .	. 3								(5)	6	Ø	-	(8)		9	•		
	Vehicle braked when shifting into "R" position.	1 :	<u> </u>	·	<u></u>	ļ.,	3	5 .	. 4	<u></u>			.			<u> </u>	<u>.</u>	6	(8)		9			7		1 3
_	Sharp shock in shifting from "N" to "D" position.		<u> </u>	2	. 5	1	3	7.	. 6		4 8		<u>. </u>		Ŀ	<u> </u>	<u>.</u>		9	<u>.</u>	<u>.</u>		·-			
_	Vehicle will not run in "D" and "2" positions (but runs in "1" and "R" position).		1	-		-			· ·			·			Ŀ	•			·	•		2	·	•		Α
58	Vehicle will not run in "D", "1", "2" positions (but runs in "R" position). Clutch slips. Very poor acceleration.	1	. .	-			2	4 .	. 3		. 5		-			•	6	7	8	9		10				
	Clutches or brakes slip somewhat in starting.	1 :	<u> </u>	3		1.	4	6.	. 5		. 7		. 8	3.	(3)	(12)	1		9			<u>.</u>	1	_ <u>:</u> _	·]
_	Excessive creep.	٠	<u> </u>			1					ļ	٠.	4		Ŀ	<u>.</u>	<u>.</u>			-	<u> </u>	·				
57, 58	No creep at aĦ.	1	1	·		ŀ		3 .	. ,				1	· ·	©	(5)		•	4	•					•	
	Failure to change gear from "D ₁ " to "D ₂ ".		-		5 .	+	4	4 3	<u> </u>			٠	+		<u>l</u> .	<u> </u>	Ŀ			•	Ŀ	•		<u>6</u>	<u></u>	ľ
	Failure to change gear from "D ₂ " to "D ₃ ".	. 2	-	\cdot	5 .	ŀ	-	4 .	3 .	ļ			+	· ·	ŀ∸		ŀ	6		•	-	·.	· ·	<u> </u>	· · · ·	ł
	Failure to change gear from "D ₃ " to "D ₄ ".	. :	2 1	1	4 .	+	4	. 3	4 .	· ·	5 .		+	· ·	⊢		ŀ	•	Ŀ	•	ŀ	•	<u> </u>	<u>6</u>	<u> </u>	
	Too high a gear change point from " D_1 " to " D_2 ", from " D_2 " to " D_3 ", from " D_3 " to " D_4 ".			'	2 .		·	. 3	4 .				<u> </u>		Ĺ				, 	•	·	•	'	•	•	
_	Gear change directly from "D ₁ " to "D ₃ " occurs.	1	<u> </u>				•				-	2	4		Ŀ		·				٠.			3		-
	Engine stops when shifting lever into "R", "D", "2" and "1".	·				1	4	3 .		2 .			. .		4	•			٠.	•	·	•	· 			
_	Too sharp a shock in change from "D ₁ " to "D ₂ "		+	1		+-	\rightarrow	4 .		<u> · </u>	5 .	3	+		Ŀ	·	·		·	•	·	•		<u>6</u>	٠.	
_	Too sharp a shock in change from "D ₂ " to "D ₃ " Too sharp a shock in change from "D ₃ " to "D ₄ "		+:-	1			2	4 .	· ,	 ` 	 ` `	' '	3 .		-	<u></u>	١.	(5)	_	•	<u></u>		<u> </u>	<u>(6)</u>	<u> </u>	· "
_	Almost no shock or clutches slipping in change from " D_1 " to " D_2 ".	1 .	: <u>:</u>	2		_	3					4				•	٠	•		•	<u>6</u>	•		⑤		
	Almost no shock or slipping in change from " D_2 " to " D_3 ".	1 .		2		ļ.	3	5 .				. 4	1 .					6	 	•				•		
_	Almost no shock or slipping in change from " D_3 " to " D_4 ".	1 .		2			3	5 .					. 4	1 .	٠.			6				•		•		
_	Vehicle braked by gear change from "D ₁ " to "D ₂ ".	1 .	-	•		-							.				2	4		•		⑤	3	,		
	Vehicle braked by gear change from " D_2 " to " D_3 ".	1 .	ŀ			ŀ								-	Ŀ			·						2	·	[
_	Vehicle braked by gear change from " D_3 " to " D_4 ".	1		·		-	•						. [.		Ŀ		(4)			3	2		·			
	Maximum speed not attained. Acceleration poor.	1	2	. [1.		5 3	4 .	ļ:	ļ	<u> </u>	ــــــــــــــــــــــــــــــــــــــ		1	(11)	(6)	7	.		<u> </u>		9	8		
	Failure to change gear from "D ₄ " to "D ₃ ".	1 .	<u> </u> .	2		1.	_	6 4		. 3	1	<u> . </u>	<u>. .</u>		Ŀ		<u> </u>		<u> </u>		8	-	<u>O</u>		<u> </u>	
	Failure to change gear from "D ₃ " to "D ₂ " or from "D ₄ " to "D ₂ ".	1 .	-	2				5 3	4 .				. .		·			6	•			•	•	(7)	,	

TROUBLE DIAGNOSES

Symptom Chart (Cont'd)

							1	ON v	ehic	le	_					-				0	FF v	ehic	:le			-
	Reference page (AT-)	20,	7	1	71	7	5	140,	72	:	72	72,	106	T	106		22,		§7,		73,	1	73,	1	177	190
	Numbers are arranged in order of probability.	110			sor	-	-	72		1		106		+		13	36	1	71	1:	83	1:	81		·•· ··· · · · · · · · · · · · · · · · ·	\vdash
	Perform inspections starting with number one and work up. Circled numbers indicate that the transmission must be removed from the vehicle.				vehicle speed sensor					4. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	noid valve e	i														
Reference page (AT-)		Fluid level Control linkage	Inhibitor switch		Revolution sensor and vehic	Engine idling speed	Line pressure	Control valve assembly Shift solenoid valve A	Shift solenoid valve B	Line pressure solenoid valve	lorque converter clutch solenoid valve Overrun clutch solenoid valve	Fluid temperature sensor Accumulator N-D	Accumulator 1-2		Ignition switch and starter	Torque converter	di ind	Reverse clutch	nign cluten	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low & reverse brake	Brake band	Parking components
	Failure to change gear from "D ₂ " to "D ₁ " or from "D ₃ " to "D ₁ ".	1 .		2	•		_	5 3	4					1					7	٠	· —	· 	(6)	ļ.	(8)	ļ. —
	Gear change shock felt during deceleration by releasing accelerator pedal.	<u> </u>	 -	1		1	2	4 .		1	. 3			1		Ŀ	_		•	·	·	Ŀ	· —	ļ.		Ļ.
	Too high a change point from " D_4 " to " D_3 ", from " D_3 " to " D_2 ", from " D_2 " to " D_1 ".				2 .	· ·				-				1		Ŀ	·		•	·	•	·	· —	<u> </u>		ļ.
	Kickdown does not operate when depressing pedal in "D ₄ " within kickdown vehicle speed.				2 .		_	. 3		•			· ·	1		Ĺ	•		•	·	· —		<u> </u>	<u> </u>		<u> </u>
	Kickdown operates or engine overruns when depressing pedal in "D ₄ " beyond kickdown vehi- cle speed limit.			2	1 .			. 3	4	•							•						•	·		Ĺ
_	Races extremely fast or slips in changing from "D ₄ " to "D ₃ " when depressing pedal.	1 .	·	2		· ·	3	5 .	ŀ	4						·	•		(5)	7					•	
_	Races extremely fast or slips in changing from "D ₄ " to "D ₂ " when depressing pedal.	1 .	ŀ	2			3	6 5	·	4				ŀ		Ŀ	•	٠		(8)	•		·	·	•	ŀ
_	Races extremely fast or slips in changing from "D ₃ " to "D ₂ " when depressing pedal.	1 .	ŀ	2		Ŀ	3	5 .	ŀ	4		8 .	. 10	0 .			•	·	9	•		·		Ŀ	•	Ŀ
-	Races extremely fast or slips in changing from "D ₄ " or "D ₃ " to "D ₁ " when depressing pedal.	1 .		2			3	5 .		4				1		Ŀ			٠	6	•	·	B	Ŀ	•	
	Vehicle will not run in any position.	1 2				<u>.</u>	3		<u> </u>	4				1		9	(5)	Ŀ	(5)				•	(8)	O	•
_	Transmission noise in "D", "2", "1" and "R" positions.	1 .					·		٠	·				1		2	·	٠				·		·	·	ŀ
	Failure to change from " D_3 " to " 2_2 " when changing lever into "2" position.	. 7	1	2				6 5	4		. 3						•		٠			9		·	8	·
	Gear change from "22" to "23" in "2" position.	<u></u>	1			<u>. </u>	_		<u> </u>	-	'		١	1		<u>.</u>	<u>.</u>	<u> </u>		·		Ŀ		Ŀ	<u>.</u>	Ŀ
	Engine brake does not operate in "1" position.	. 2	1	3	4 .	4-		6 5	<u> </u>	1	. 7		ļ	4	·	<u>.</u>		Ŀ		Ŀ	:-	<u></u>		9		
_	Gear change from "1 ₁ " to "1 ₂ " in "1" position. Does not change from "1 ₂ " to "1 ₁ " in "1" posi-	. 2	1		2 .	. .		4 3	· ·	-	. 5			+			·	· -	•	· ·	•	· •		<u>.</u>	•	<u> </u>
_	tion. Large shock changing from "1 ₂ " to "1 ₁ " in "1" position.				• • •	+	-	1 .	-	-			-	+						-	. •	 		(2)	<u> </u>	\vdash
	Transmission overheats.	1 .	1.	3		2	4	6 .	Ţ.	5				1.		14	7	8	(9)	11		12		13	18	T.
_	ATF shoots out during operation. White smoke emitted from exhaust pipe during operation.	1 .					•			\neg				1			,		3			<u>(6)</u>			4	
	Offensive smell at fluid changing pipe.	1 .											. ,	1.		2	3	4	(5)	7	_	8		9	6	T .
	Torque converter is not locked up.	<u>.</u> .	3	1	2 4		6	8 .	Ŀ		7,	5 .	<u> </u>	.] .		9						Ŀ		Ŀ		
	Lock-up piston slip	1 .		2			3	6 .	Γ	5	4	<u>. </u>	<u> </u>			(7)	_			Ŀ		Ŀ		Ŀ		<u> </u>
63	Lock-up point is extremely high or low.			1	2 .			4 .			3.					Ŀ						Ŀ		Ŀ		
	A/T does not shift to " D_4 " when driving with overdrive switch "ON".		2	1	3 .		8	6 4	·	•	. 5	7 .				·					•	10		·	9	
	Engine is stopped at "R", "D", "2" and "1" positions.	1 .	-	,			· [5 4	3	.]	2 .	,								<u> </u>						

Preliminary Check (Prior to Road Testing)

FLUID LEAKAGE CHECK

- 1. Clean area suspected of leaking, for example, mating surface of converter housing and transmission case.
- Start engine, apply foot brake, place selector lever in "D" position and wait a few minutes.
- 3. Stop engine.
- 4. Check for fresh leakage.

FLUID CONDITION CHECK

Fluid color	Suspected problem
Dark or black with burned odor	Wear of frictional material
Milky pink	Water contamination — Road water entering through filler tube or breather
Varnished fluid, light to dark brown and tacky	Oxidation Over or under filling Overheating

FLUID LEVEL CHECK — Refer to section MA.

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Road Testing

Perform road tests using "Symptom" chart. Refer to page (AT-77).

"P" POSITION

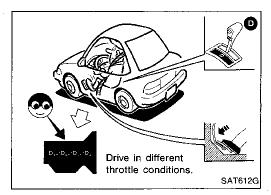
- 1. Place selector lever in "P" position and start the engine. Stop the engine and repeat the procedure in all positions, including neutral position.
- 2. Stop vehicle on a slight upgrade and place selector lever in "P" position. Release parking brake to make sure vehicle remains locked.

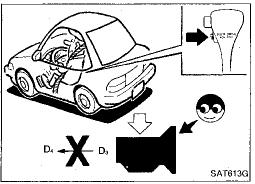
"R" POSITION

- 1. Manually move selector lever from "P" or "R", and note shift quality.
- 2. Drive vehicle in reverse long enough to detect slippage or other abnormalities.

"N" POSITION

- 1. Manually move selector lever from "R" and "D" to "N" and note quality.
- 2. Release parking brake with selector lever in "N" position. Lightly depress accelerator pedal to make sure vehicle does not move. (When vehicle is new or soon after clutches have been replaced, vehicle may move slightly. This is not a problem.)





"D" POSITION

- 1. Manually shift selector lever from "N" to "D" position, and note shift quality.
- 2. Using the shift schedule as a reference, drive vehicle in "D" position. Record, on symptom chart, respective vehicle speeds, at which up-shifting and down-shifting occur. These speeds are to be read at three different throttle positions (light, half and full), respectively. Also determine the timing at which shocks are encountered during shifting and which clutches are engages.
- Determine, by observing lock-up pressure, whether lock-up properly occurs while driving vehicle in proper gear position.
- Check to determine if shifting to overdrive gear cannot be made while OD control switch is "OFF".
- 5. When vehicle is being driven in the 65 to 80 km/h (40 to 50 MPH) position in "D₃" position at half to light throttle position, fully depress accelerator pedal to make sure it downshifts from 3rd to 2nd gear.
- 6. When vehicle is being driven in the 35 to 45 km/h (22 to 28 MPH) ("D₂" position) at half to light throttle position, fully depress accelerator pedal to make sure it downshifts from 2nd to 1st gear.

"2" POSITION

- 1. Shift to "2" position and make sure vehicle begins to move in 1st gear.
- 2. Increase vehicle speed to make sure it upshifts from 1st to 2nd gear.
- 3. Further increase vehicle speed. Make sure it does not upshift to 3rd gear.
- 4. While driving vehicle at the 35 to 45 km/h (22 to 28 MPH) with throttle at half to light position ("22" position), fully depress accelerator pedal to make sure it downshifts from 2nd to 1st gear.
- 5. Allow vehicle to run idle while in "2" position to make sure that it downshifts to 1st gear.
- 6. Move selector lever to "D" position and allow vehicle to operate at 40 to 50 km/h (25 to 31 MPH). Then, shift to "2" position to make sure it downshifts to 2nd gear.

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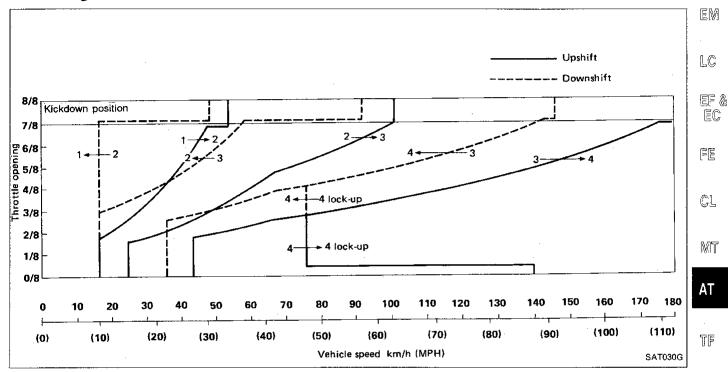
Road Testing (Cont'd)

"1" POSITION

- 1. Place selector lever in "1" position and accelerate vehicle. Make sure it does not shift from 1st to 2nd gear although vehicle speed increases.
- 2. While vehicle is being driven in "1" position, release accelerator pedal to make sure that engine compression acts as a brake.
- 3. Place selector lever in "D" or "2" position and allow vehicle to run at 20 to 30 km/h (12 to 19 MPH). Then move selector lever to "1" position to make sure it downshifts to 1st gear.

SHIFT SCHEDULE

KA24E engine model



VEHICLE SPEED WHEN SHIFTING GEARS

KA24E engine

Throttle		Vehicle speed km/h (MPH)														
position	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	1 ₂ → 1 ₁									
Full throttle	53 - 57 (33 - 35)	100 - 108 (62 - 67)		147 - 157 (91 - 98)	91 - 99 (57 - 62)	47 - 51 (29 - 32)	41 - 45 (25 - 28)									
Half throttle	32 - 36 (20 - 22)	57 - 65 (35 - 40)	114 - 124 (71 - 77)	65 - 75 (40 - 47)	28 - 36 (17 - 22)	12 - 16 (7 - 10)	41 - 45 (25 - 28)									

VEHICLE SPEED WHEN PERFORMING AND **RELEASING LOCK-UP**

KA24E engine

	D ₄ Vehicle speed km/h (MPH)										
Throttle position											
	Lock-up "ON"	Lock-up "OFF"									
Full throttle	<u> </u>	_									
Half throttle	71 - 79 (44 - 49)	71 - 79 (44 - 49)									

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Road Testing

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	of probability.			ing						Ð					valve		ve	Ğ
the vehicle. Valve expected to be m	alfunctioning	oil quality	0	h and wir		peeds			valve	lator valv	ifier valve				control val	valve	difier valve	M
		Oil level and oil	Control linkage	Inhibitor switch and wiring	Throttle wire	Engine idling speed	Line pressure	Control valve	4th speed cut valve	Pressure regulator valve	Pressure modifier	1-2 shift valve	2-3 shift valve	3-4 shift valve	Accumulator	3-2 downshift	2-3 throttle modifier	Ei L(
Sharp shocks in shifting from "I	N" to "D" position	1	2		5	3	4	8						Ħ				
	When shifting from 1st to 2nd or 2nd to 3rd	1	2		4		3	7										
	When shifting from 3rd to 4th	1	2		4		3	6				_						
Shift shocks	When shifting from D to 2 and 1 position. When OD switch is set from "ON" to "OFF"	1	2		4		3	5										FI Ci
	When shifting from 2nd to 1st in "1" position	1	2		4		3	5										n.a
	When shifting from 1st to 2nd	1	2	,	4		3	6				L	L					
Shift slippage when upshifting	When shifting from 2nd to 3rd	1	2		4		3	6				ļ	ļ					
	When shifting from 3rd to 4th	1	2	·	4		3	6					<u> </u>	_				A٦
	When shifting from 4th to 2nd	1	2	•	5		3	7				_						
Shift slippage with accelerator pedal depressed	When shifting from 4th to 3rd When shifting from 4th to 1st and shifting from 3rd to 1st	1	2	•	5	·	3	7										Ţ
	When vehicle starts	1	2		5		3	10					<u> </u>	ļ <u></u>				 P
Poor power/acceleration	When upshifting	1	2		4		3	8			komen	-	 					
	When shifting from "D" to "2" and "1" position	1	2	·	4		3	6										Fl
No engine braking	When OD switch is set from "ON" to "OFF"	1	2		4		3	8										R
	When shifting from 2nd to 1st in "1" position	1	2	-	4		3	6										
	Too low a gear change point from 2nd to 3rd and from 3rd to 2nd.	1		•	4		2	5										B
Shift quality	Too high a gear change point from 2nd to 3rd and from 3rd to 2nd.	1	-		4		2	5			3 833-33							S
	Too low a gear change point from 2nd to 1st in "1" position.	1	-	-	4	•	2	5										IGN
	Too high a gear change point from 2nd to 1st in "1" position.	1			4		2	5										B

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Road Testing (Cont'd)

→		ON VEHICLE ON VEHICLE													- ▶	→			(OFF	VEH	IICLE	<u> </u>										
4-2 relay valve	Torque converter clutch control valve	Throttle valve & detent valve	Manual valve	Kickdown modifier valve	1st reducing valve	Overrun clutch reducing valve	3-2 timing valve	Torque converter relief valve	4-2 sequence valve	Governor pressure	Governor valve	Primary governor valve	Secondary governor valve ①	Secondary governor valve ②	OD cancel solenoid	Torque converter clutch solenoid valve	Accumulator N-D	Accumulator 1-2	Accumulator 2-3	Accumulator 3-4 (N-R)	Ignition switch and starter motor	OD control switch and wiring	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-wy clutch	Overrun clutch	Low one-way clutch	Low & reverse clutch	Brake band	Parking components
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TROUBLE DIAGNOSES

Road Testing (Cont'd)

		-						OI	V VE	HICI	_E						-	1
Numbers are arranged in order Perform inspections starting with Circled numbers indicate that it the vehicle. : Valve expected to be made to the made	th number one and work up. he transmission must be removed from	Oil level and oil quality	Control linkage	Inhibitor switch and wiring	Throttle wire	Engine idling speed	Line pressúre	Control valve	4th speed cut valve	Pressure regulator valve	Pressure modifier valve	1-2 shift valve	2-3 shift valve	3-4 shift valve	Accumulator control valve	3-2 downshift valve	2-3 throttle modifier valve	GI MA EM
	Failure to change gear from 4th to 2nd with accelerator pedal depressed.	1			4		2	5										
	Failure to change gear from 3rd to 2nd with accelerator pedal depressed.	1			4		2	5										EC
	Failure to change gear from 1st to 2nd in "D" and "2" position.	1			4		2	5										FE
	Vehicle does not start from "1st" in "D" and "2" position.	7			4		2	5										@n
Shift quality	Failure to change gear to 3rd to 4th in "D" position.	1			4		2	7										CL
	Changes gear to 1st directly when selector lever is set from "D" to "1" position.	1			4		2	5										"לואוו "דרואוו
	Changes gear to 2nd in "1" position.	1			4		2	5										ΑT
	Too high or low a change point when lock-up operates.	1			4		2	5										
	Lock-up point is extremely high or low.	1			4		2	5										TF
Lock-up quality	Torque converter does not lock-up.	1			4		2	5										
	Lock-up is not released when accelerator pedal is released.	1						-										PD
Engine does not start in "P" an	d "N" positions.		2	3														_
Engine starts in positions other	gine starts in positions other than ''P'' and ''N'' positions.							,										FA

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TROUBLE DIAGNOSES

Road Testing (Cont'd)

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4-2 relay valve	Torque converter clutch control valve	Throttle valve & detent valve	Manual valve	Kickdown modifier valve	1st reducing valve	Overrun clutch reducing valve	3-2 timing valve	Torque converter relief valve	4-2 sequence valve	Governor pressure	Governor valve	Primary governor valve	Secondary governor valve ①	Secondary governor valve ②	OD cancel solenoid	Torque converter clutch solenoid valve	Accumulator N-D	Accumulator 1-2	Accumulator 2-3	Accumulator 3-4 (N-R)	Ignition switch and starter motor	OD control switch and wiring	Torque converter	dmnd HO	Reverse clutch	High clutch	Forward clutch	Forward one-wy clutch	Overrun clutch	Low one-way clutch	Low & reverse clutch	Brake band	Parking components
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Stall Testing

STALL TEST PROCEDURE

- Check A/T and engine fluid levels. If necessary, add.
- Warm up engine until engine oil and ATF reach operating G temperature after vehicle has been driven approx. 10 minutes.

ATF operating temperature: 50 - 80°C (122 - 176°F)

- Set parking brake and block wheels.
- Install a tachometer where it can be seen by driver during

It is good practice to put a mark on point of specified engine speed on indicator.

- Start engine, apply foot brake, and place selector lever in "D" position.
- Accelerate to wide-open throttle gradually while applying foot brake.
- Quickly note the engine stall revolution and immediately release throttle.

During test, never hold throttle wide-open for more than 5 sec-

Stall revolution: 2,100 - 2,300 rpm

- Cool off ATF.

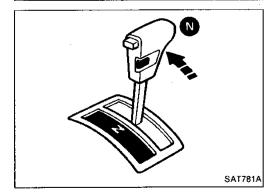
SAT513G

SAT514G

Run engine at idle for at least one minute.

10. Perform stall tests in the same manner as in steps 5 through 9 with selector lever in "2", "1" and "R", respectively.

Shift selector lever to "N".



than 5 sec.





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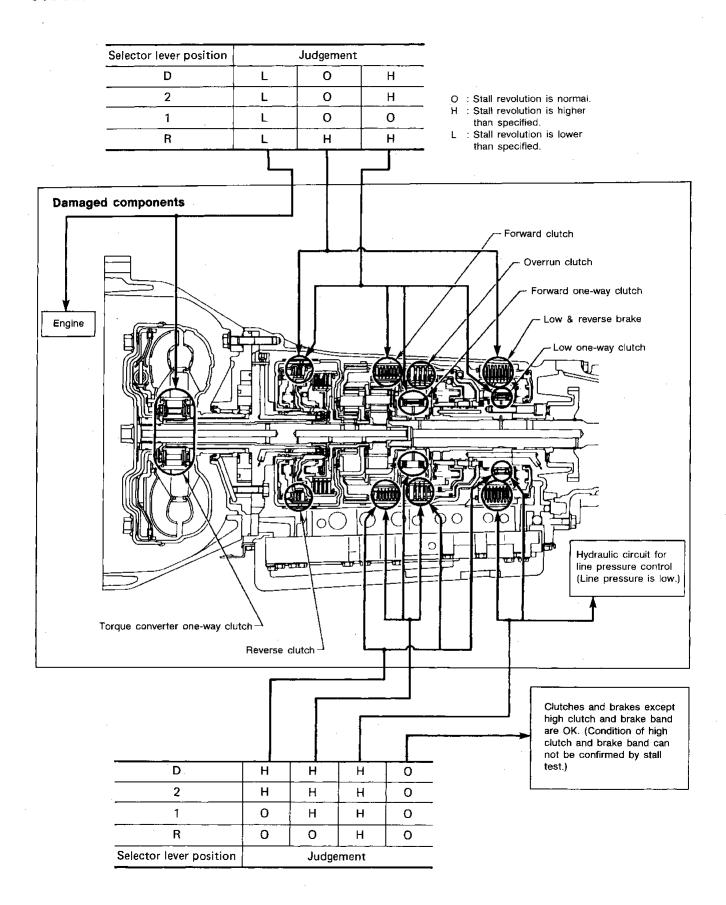
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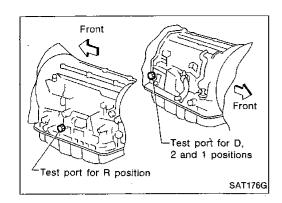
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Stall Testing (Cont'd)

JUDGEMENT OF STALL TEST





\$T2505\$001 (J25695-A)

ST2505S001 (J25695-A) SAT180BA

SAT611G

Pressure Testing

- Location of line pressure test port
- Line pressure plugs are hexagon headed bolts.
- Always replace line pressure plugs as they are self-sealing bolts.

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LINE PRESSURE TEST PROCEDURE

- Check A/T and engine fluid levels. If necessary, add.
- Warm up engine until engine oil and ATF reach operating temperature after vehicle has been driven approx. 10 minutes.

ATF operating temperature: 50 - 80°C (122 - 176°F)



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3. Install pressure gauge to line pressure port.

— D, 2 and 1 positions —

- R position -



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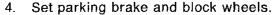
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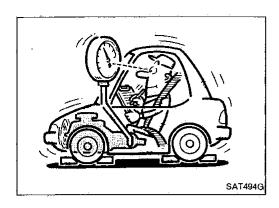


 Continue to depress brake pedal fully while line pressure test at stall speed is performed. 3F

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AT-89



Pressure Testing (Cont'd)

- 5. Start engine and measure line pressure at idle and stall speed.
- When measuring line pressure at stall speed, follow the stall test procedure.

Line pressure:

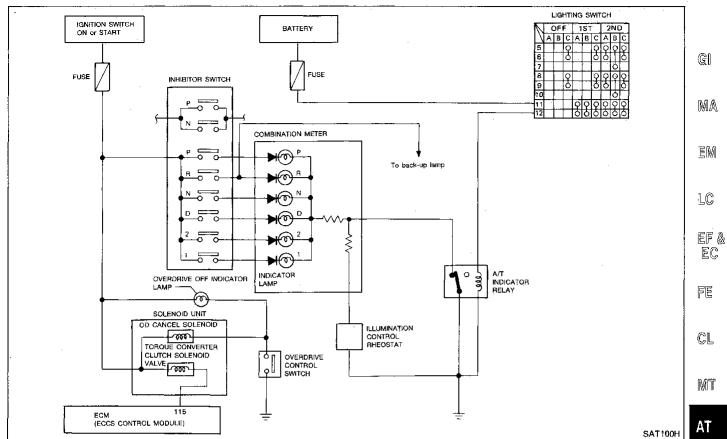
Engine speed	Line pressure k	Pa (kg/cm², psi)
rpm	D, 2 and 1 positions	R position
Idle	422 - 461 (4.3 - 4.7, 61 - 67)	667 - 706 (6.8 - 7.2, 97 - 102)
Stall	883 - 961 (9.0 - 9.8, 128 - 139)	1,393 - 1,471 (14.2 - 15.0, 202 - 213)

JUDGEMENT OF LINE PRESSURE TEST

	Judgement	Suspected parts
	Line pressure is low in all positions.	 Oil pump wear Control piston damage Pressure regulator valve or plug sticking Spring for pressure regulator valve damaged Fluid pressure leakage between oil strainer and pressure regulator valve
At idle	Line pressure is low in particular position.	 Fluid pressure leakage between manual valve and particular clutch. For example: If line pressure is low in "R" and "1" positions but is normal in "D" and "2" position, fluid leakage exists at or around low & reverse brake circuit.
	Line pressure is high.	 Mal-adjustment of throttle position sensor Fluid temperature sensor damaged Line pressure solenoid valve sticking Short circuit of line pressure solenoid valve circuit Pressure modifier valve sticking Pressure regulator valve or plug sticking
At stall speed	Line pressure is low.	 Mal-adjustment of throttle position sensor Control piston damaged Line pressure solenoid valve sticking Short circuit of line pressure solenoid valve circuit Pressure regulator valve or plug sticking Pressure modifier valve sticking Pilot valve sticking

AT-90 638

Circuit Diagram



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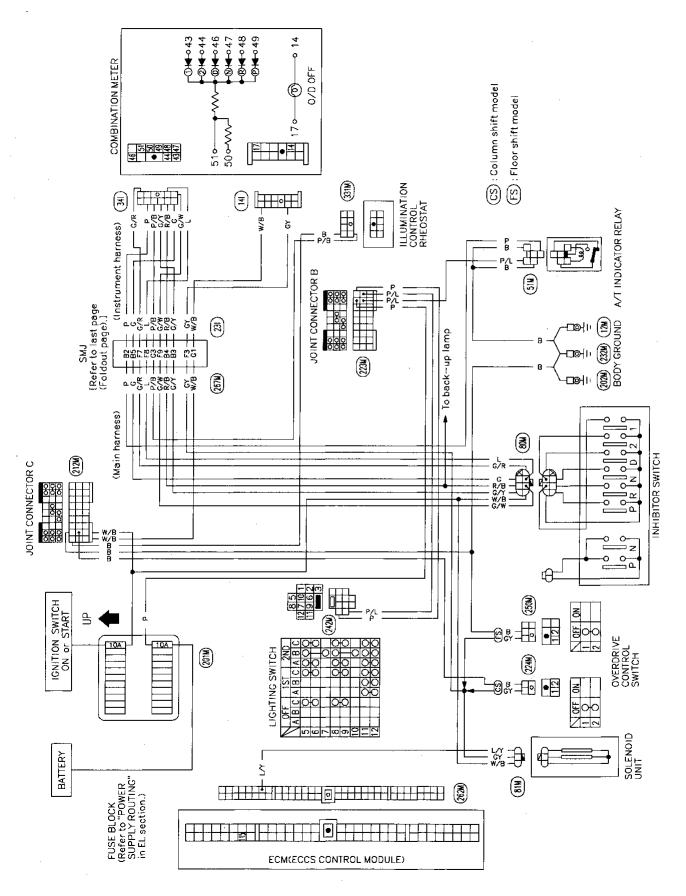
BF

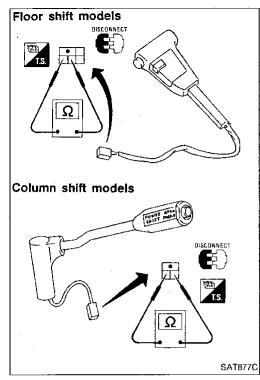
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Wiring Diagram





Electrical Components Inspection OVERDRIVE SWITCH

Check continuity between two terminals.

OD switch position	Continuity
ON	No
OFF	Yes

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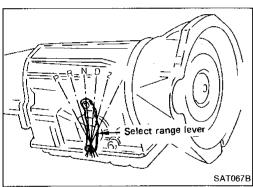
EM

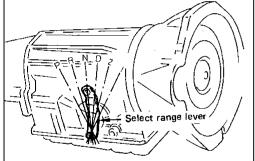
LC

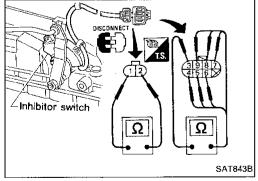
EF & EC

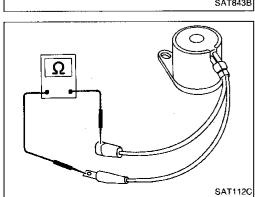
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INHIBITOR SWITCH

1. Check continuity between terminals (1) and (2) and between terminals 3 and 4, 5, 6, 7, 8, 9 while moving selector lever through each position.

Lover position	Terminal No.														
Lever position	1	2	3	4	(5)	6	7	8	9						
Р	0-	-0	0	-0											
R			0-		-										
N	0-	$\vdash \circ$	0-		ļ <u>.</u>	$\overline{}$									
Ð			0				 0								
2			0-				+	- 0							
1			0-			-			$\overline{\vdash}$						

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OD CANCEL SOLENOID AND TORQUE CONVERTER CLUTCH SOLENOID VALVE

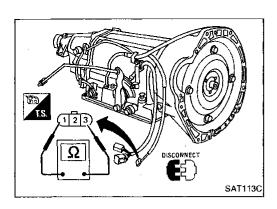
Check resistance between terminals of each solenoid. Resistance: 20 - 30Ω

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Electrical Components Inspection (Cont'd)



Solenoid	Terminal No.	Resistance
OD cancel solenoid	1 - 2	
Torque converter clutch solenoid valve	① - ③	20 - 30Ω

TROUBLE DIAGNOSES — A/T Shift Lock System

Contents

Shift Lock System Electrical Parts Location	AT-	96	
Circuit Diagram for Quick Pinpoint Check	AT-	97	
Wiring Diagram	AT-	98	@I
Diagnostic Procedure	AT-	99	911
SYMPTOM 1: Selector lever cannot be moved from "P" position when applying brake pedal or can be moved when releasing brake pedal. Selector lever can be moved from "P" position when key is removed from key cylinder. SYMPTOM 2: Ignition key cannot be removed when selector lever is set to "P" position or can be removed when selector lever is set to any position except "P".			MA EM
Key Interlock Cable			LC
Shift Lock Control Unit Inspection Table			
Component Check			EF & EC

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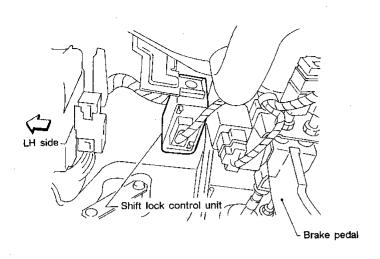
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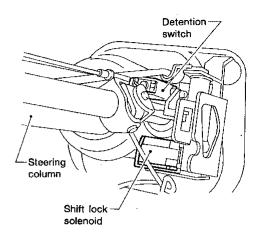
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Shift Lock System Electrical Parts Location

COLUMN SHIFT

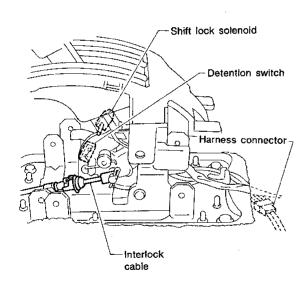


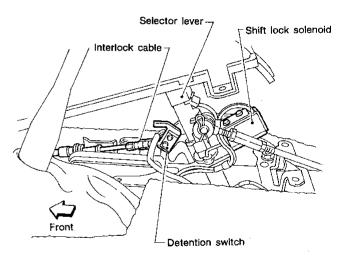


FLOOR SHIFT

2WD

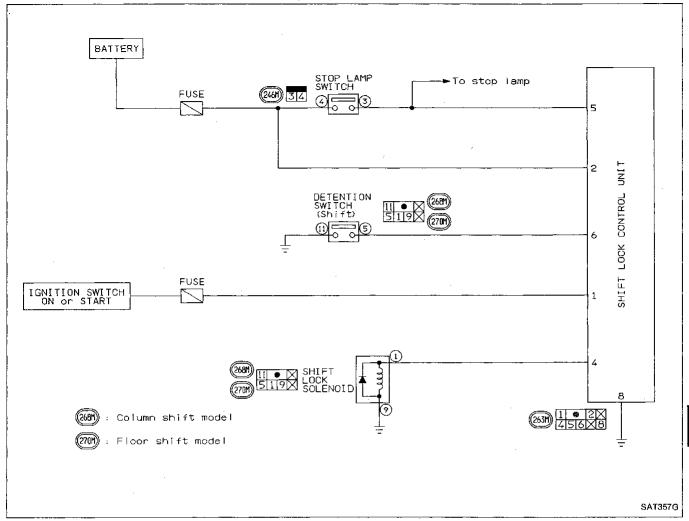






TROUBLE DIAGNOSES — A/T Shift Lock System

Circuit Diagram for Quick Pinpoint Check



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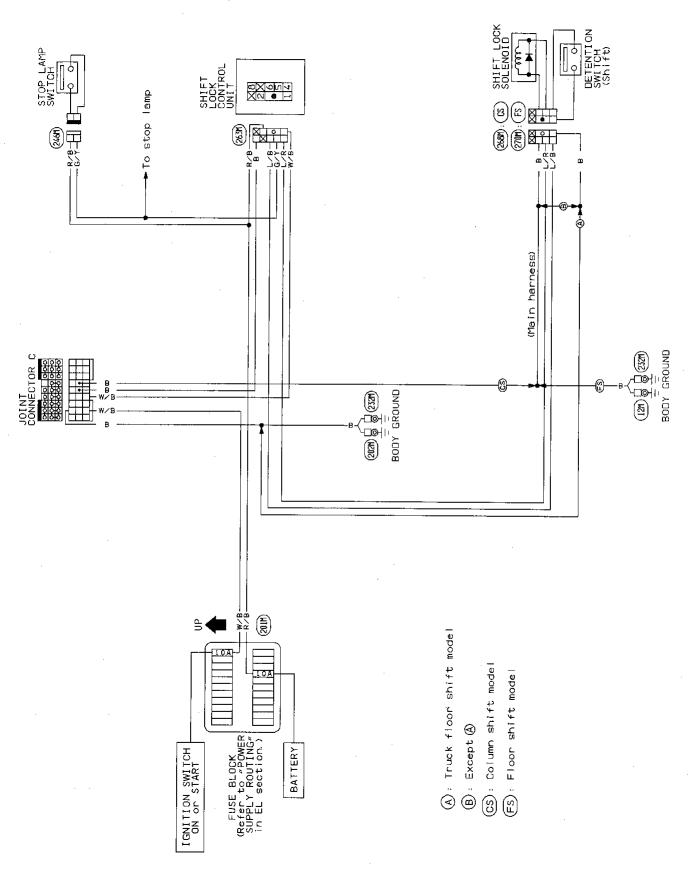
ST

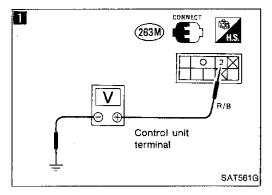
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Wiring Diagram





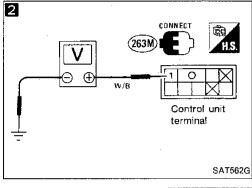
Diagnostic Procedure SYMPTOM 1:

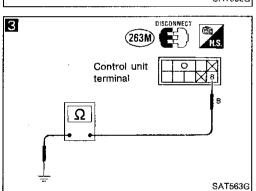
With key in "ON" position, selector lever cannot be moved from "P" position when applying brake pedal or can be moved when releasing brake pedal.

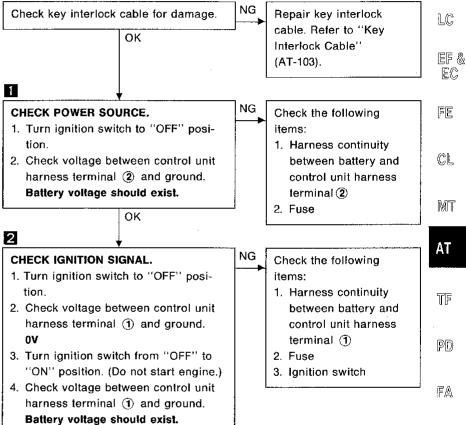
Selector lever can be moved from "P" position when key is removed from key cylinder.

SYMPTOM 2:

Ignition key cannot be removed when selector lever is set to "P" position or can be removed when selector lever is set to any position except "P".







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Repair harness or con-

nector.

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Continuity should exist.

OK

CHECK GROUND CIRCUIT FOR CON-

1. Turn ignition switch from "ON" to

2. Disconnect control unit harness con-

3. Check continuity between control unit harness terminal (8) and ground.

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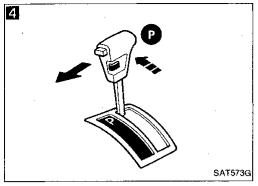
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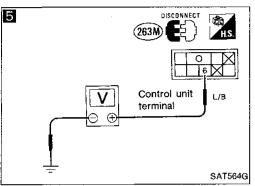
TROL UNIT.

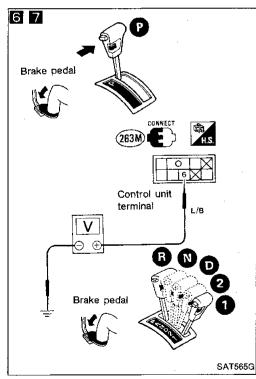
nector.

"OFF" position.

Diagnostic Procedure (Cont'd)







CHECK INPUT SIGNAL (DETENTION SWITCH).

- Reconnect control unit harness connector.
- 2. Turn ignition switch from "OFF" to "ON" position. (Do not start engine.)3. Set selector lever in "P" posi-
- tion and release selector lever button.

 When selector lever cannot be moved from "P" position with brake pedal depressed, set ignition key to "ACC" position and
- 5 4. Disconnect control unit harness connector.

key to "ON" position.

 Check continuity between control unit harness terminal (6) and ground.

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move lever. Then set ignition

Continuity should not exist.

—shift.

Refer to "COMPONENT CHECK" (AT-105).

Check detention switch-

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CHECK INPUT SIGNAL (DETENTION SWITCH).

- Turn ignition switch to "ON" position. (Do not start engine.)
- 2. Check continuity between control unit harness terminal (6) and ground with brake pedal depressed and selector lever button pushed.

Continuity should exist.

7 3. Check continuity between control unit harness terminal 6 and ground with selector lever set in any position except "P".

Battery voltage should exist.

OK

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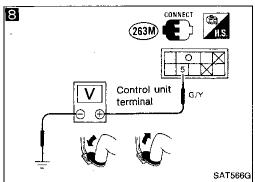
Check the following items:

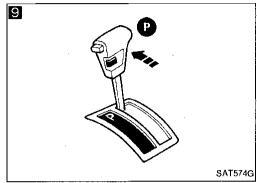
- Harness continuity between control unit harness terminal (6) and detention switch harness terminal (6)
- Harness continuity
 between detention
 switch harness terminal
 and ground
- 3. Detention switch
 Refer to "COMPONENT
 CHECK" (AT-105).

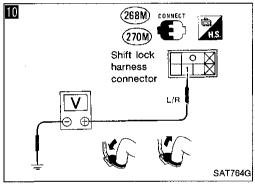
AT-100

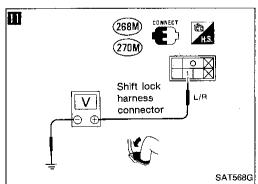
TROUBLE DIAGNOSES — A/T Shift Lock System

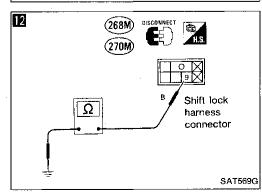
Diagnostic Procedure (Cont'd)

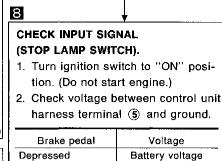












Released

Check the following items:

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1. Harness continuity between control unit harness terminal (5) and stop lamp switch harness terminal 2

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- 2. Harness continuity between stop lamp switch harness terminal (2) and fuse
- 3. Stop lamp switch Refer to "COMPONENT CHECK" (AT-105).

1. Set selector lever in "P" position. **CHECK OUTPUT SIGNAL** (SHIFT LOCK SOLENOID). 2. Turn ignition switch to "ON" posi-

tion. (Do not start engine.)

3. Check voltage between shift lock harness connector terminal (1) and body ground.

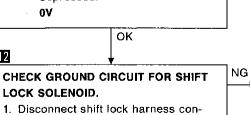
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Brake pedal	Voltage	
Depressed	Battery voltage	
Released	0	

- 4. Turn ignition switch from "ON" to "OFF" position.
- 5. Check voltage between shift lock harness connector terminal (1) and ground with brake pedal depressed.

0V

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1. Disconnect shift lock harness connector.

2. Check continuity between shift lock harness terminal (9) and ground. Continuity should exist.

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Check harness continuity between control unit harness terminal (1) and shift lock solenoid harness terminal (9) .

Repair harness or con-

nector.

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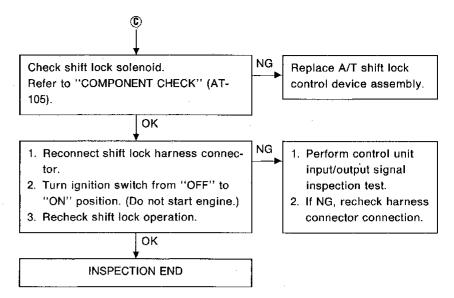
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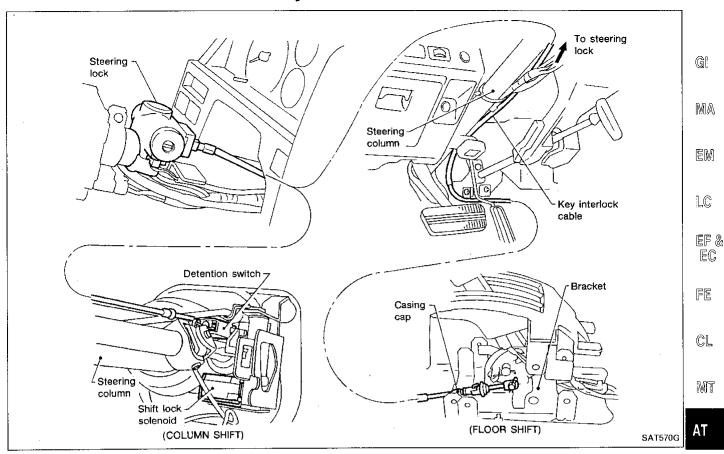
AT-101

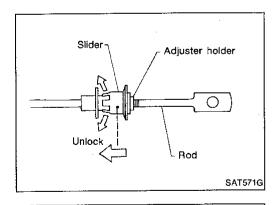
TROUBLE DIAGNOSES — A/T Shift Lock System

Diagnostic Procedure (Cont'd)



Key Interlock Cable





Key interlock

SAT988F

cable

Lock plate

Steering

lock

REMOVAL

- Remove snap pin temporarily and remove key interlock cable from vehicle.
- 2. Unlock slider from adjuster holder and remove rod from
- Install rod to control device with snap pin. 3.
- Remove self-shear type screws. (Tilt type)

INSTALLATION

- Set key interlock cable to steering lock assembly and install lock plate.
- Install steering lock with self-shear type screws and then cut off the screw heads. (Tilt type)
- Clamp cable to steering column and fix to control cable with 3.
- Set control lever to P position.
- Insert rod into adjuster holder. 5.
- Install casing cap to bracket. 6.
- 7. Move slider in order to fix adjuster holder to rod.

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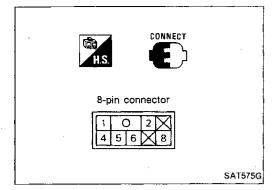
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TROUBLE DIAGNOSES — A/T Shift Lock System



Shift Lock Control Unit Inspection

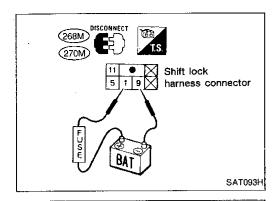
- Measure voltage between each terminal and terminal 8 by following "Shift Lock Control Unit Inspection Table".
- Pin connector terminal layout.

Shift Lock Control Unit Inspection Table

(Data are reference values.)

Terminal No.		ltom	Candikian	
⊕	Θ	- Item	Condition	Judgment standard
4		Shift lock signal	When selector lever is set in "P" position and brake pedal is depressed.	Battery voltage
			Except above	0V
2]	Power source	Any condition	Battery voltage
5	is set in "P" position with selector lever button pushed	Stop lamp switch	When brake pedal is depressed.	Battery voltage
			When brake pedal is released.	0V
6		Detention switch	 When key is inserted into key cylinder and selector lever is set in "P" position with selector lever button pushed. When selector lever is set in any position except "P". 	Battery voltage
		0V		
1		Ignition signal	Con	Battery voltage
			Except above	0V
8	_	Ground	_	<u>.</u>

TROUBLE DIAGNOSES — A/T Shift Lock System



Component Check

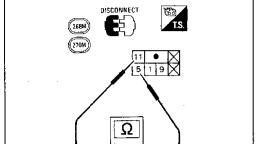
SHIFT LOCK SOLENOID

Check operation by applying battery voltage to shift lock harness connector.



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DETENTION SWITCH

Check continuity between terminals (5) and (1) of shift lock LC harness connector.



Condition	Continuity	
When selector lever is set in "P" position and selector lever button is released	No	
Except above	Yes	

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SAT579G

SAT150H

Stop lamp switch

harness connector

Check continuity between terminals 3 and 4 of stop MT lamp switch harness connector.



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Condition	Continuity
When brake pedal is depressed	Yes
When brake pedal is released	No

TF

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Check stop lamp switch after adjusting brake pedal — refer to section BR.

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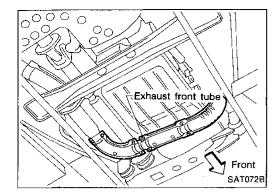
HA

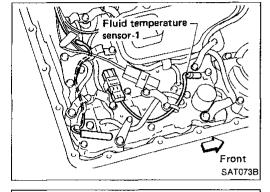
EL

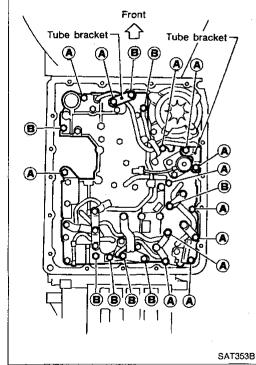
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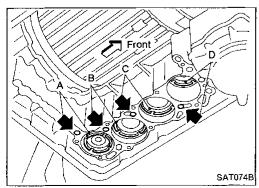
AT-105

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Control Valve Assembly and Accumulators Inspection

— RE4R01A —

- 1. Remove exhaust front tube.
- 2. Remove oil pan and gasket and drain ATF.
- 3. Remove fluid temperature sensor-1 if necessary.
- 4. Remove oil strainer.

Remove control valve assembly by removing-fixing bolts and disconnecting harness connector.

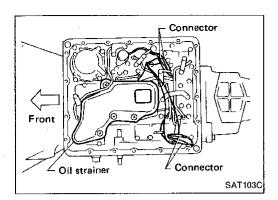
Bolt length and location

Bolt symbol	ℓ mm (in)
<u>(A)</u>	33 (1.30)
. 8	45 (1.77)

- Remove solenoids and valves from valve body if necessary.
- 7. Remove terminal cord assembly if necessary.

- 8. Remove accumulator A, B, C and D by applying compressed air if necessary.
- Hold each piston with rag.
- 9. Reinstall any part removed.
- Always use new sealing parts.

AT-106 654



Front

Control Valve Assembly and Accumulators Inspection (Cont'd)

— RL4R01A —

- Remove oil pan and gasket and drain ATF.
- Remove oil strainer.

Disconnect harness connector.

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Remove control valve assembly by removing fixing bolts.

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Bolt length and location

Bolt symbol	ℓ mm (in)
(A)	33 (1.30)
®	45 (1.77)

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Be careful not to drop manual valve out of valve body.

- Remove solenoids and valves from valve body if necessary.
- Remove terminal cord assembly if necessary.

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7. Remove accumulator A, B, C and D by applying compressed air if necessary.

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Hold each piston with rag.

8. Reinstall any part removed. Always use new sealing parts.

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– 4WD model –

- Remove rear engine mounting member from side member while supporting A/T with transfer case with jack.
- 2. Lower A/T with transfer case as much as possible.
- Remove revolution sensor from A/T. 3.
- Reinstall any part removed.
- Always use new sealing parts.

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(B)

B

SAT714C

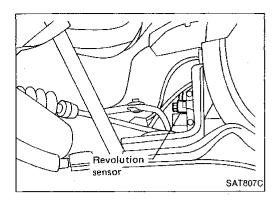
SAT074B

SAT094H

(DX

AT-107

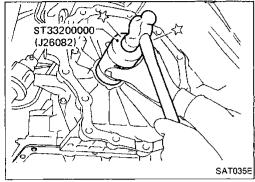
655



Revolution Sensor Replacement — RE4R01A (Cont'd)

- 2WD model -

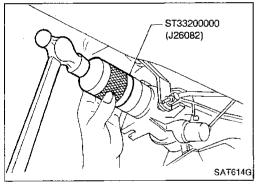
- Remove revolution sensor from A/T.
- · Always use new sealing parts.



Rear Oil Seal Replacement

- 4WD model -

- 1. Remove transfer case from vehicle. Refer to section TF.
- 2. Remove rear oil seal.
- Install rear oil seal.
- Apply ATF before installing.
- 4. Reinstall any part removed.

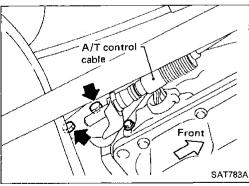


- 2WD model -

- Remove propeller shaft from vehicle. Refer to section PD
- 2. Remove rear oil seal.
- 3. Install rear oil seal.

Apply ATF before installing.

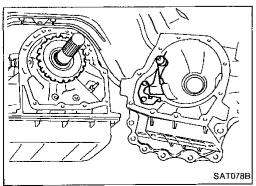
4. Reinstall any part removed.



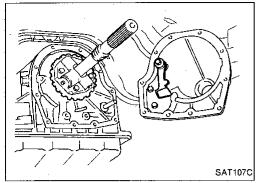
Parking Components Inspection

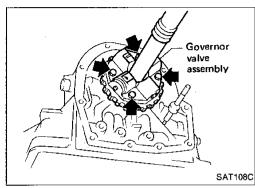
— 4WD model —

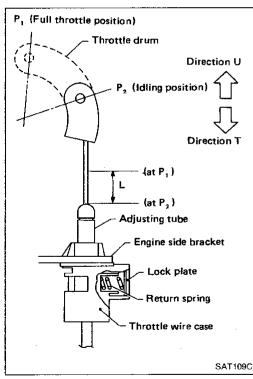
- Remove propeller shaft. Refer to section PD.
- 2. Remove transfer case from vehicle. Refer to section TF.
- 3. Remove manual control linkage bracket from adapter case.

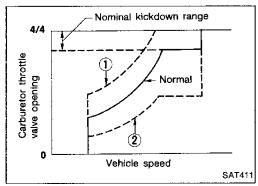


- 4. Support A/T assembly with a jack.
- 5. Remove adapter case from transmission case.
- 6. Replace parking components if necessary.
- 7. Reinstall any part removed.
- Always use new sealing parts.









Parking Components Inspection (Cont'd)

— 2WD model —

- Remove propeller shaft from vehicle. Refer to section
- 2. Support A/T assembly with a jack.
- 3. Remove rear engine mounting member.
- Remove rear extension from transmission case.
- Replace parking components if necessary.
- Reinstall any part removed.
- Always use new sealing parts.

Governor Valve — RL4R01A

- Remove propeller shaft from vehicle. Refer to section LC
- 2. Support A/T assembly with a jack.
- Remove rear engine mounting member from A/T assembly.
- 4. Remove rear extension from transmission case.
- 5. Remove governor valve assembly.
- Inspect and repair governor valve assembly. Refer to "REPAIR FOR COMPONENT PARTS" (AT-165).

Throttle Wire Adjustment — RL4R01A

- While pressing lock plate, move adjusting tube in direction MT "T".
- 2. Return lock plate.
- Move throttle drum from "P2" to "P1" quickly.
- Ensure that throttle wire stroke "L" is within specified position between full throttle and idle.

Throttle wire stroke "L": 38 - 42 mm (1.50 - 1.65 in)

- Adjust throttle wire stroke when throttle wire/accelerator wire is installed or after carburetor has been adjusted.
- Put marks on throttle wire to facilitate measuring wire stroke.

In throttle wire stroke is improperly adjusted, the following problems may arise.

- When full-open position "P1" of throttle drum is closer to direction "T", shift schedule will be as shown by 2 in figure at left, and kickdown range will greatly increase.
- When full-open position "P1" of throttle drum is closer to direction "U", shift schedule will be as shown by (1) in figure at left, and kickdown range will not occur.
- After properly adjusting throttle wire, ensure the parting line is as straight as possible.

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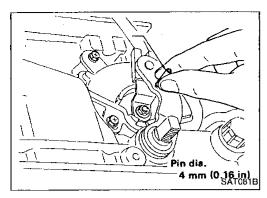
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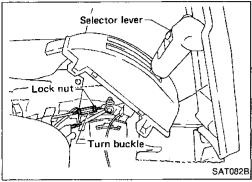
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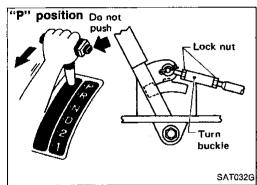
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MOX

AT-109







Inhibitor Switch Adjustment

- Remove manual control linkage from manual shaft of A/T assembly.
- 2. Set manual shaft of A/T assembly in "N" position.
- 3. Loosen inhibitor switch fixing bolts.
- Insert pin into adjustment holes in both inhibitor switch and manual shaft of A/T assembly as near vertical as possible.
- 5. Reinstall any part removed.
- Check continuity of inhibitor switch. Refer to "Electrical System" (AT-71).

Manual Control Linkage Adjustment

FLOOR SHIFT MODEL - 4WD

Move selector lever from "P" position to "1" position. You should be able to feel the detents in each position.

If the detents cannot be felt or the pointer indicating the position is improperly aligned, the linkage needs adjustment.

- 1. Place selector lever in "P" position.
- 2. Loosen lock nuts.
- Tighten turn buckle until aligns with inner cable, pulling selector lever toward "R" position side without pushing button.
- Back off turn buckle 1 turn and tighten lock nuts to the specified torque.

O: Lock nut 4.4 - 5.9 N·m

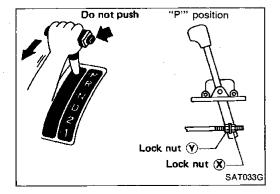
(0.45 - 0.60 kg-m, 3.3 - 4.3 ft-lb)

Move selector lever from "P" position to "1" position. Make sure that selector lever can move smoothly.

FLOOR SHIFT MODEL -- 2WD

Move the selector lever from the "P" position to "1" position. You should be able to feel the detents in each position. If the detents cannot be felt or the pointer indicating the position is improperly aligned, the linkage needs adjustment.

- 1. Place selector lever in "P" position.
- Loosen lock nuts.



- 3. Tighten lock nut ③ until it touches trunnion, pulling selector lever toward "R" position side without pushing button.
- 4. Back off lock nut **(X)** 1 turn and tighten lock nut **(Y)** to the specified torque.

(I): Lock nut 11 - 15 N·m

(1.1 - 1.5 kg-m, 8 - 11 ft-lb)

Move selector lever from "P" position to "1" position.

Make sure that selector lever can move smoothly.

AT-110 658

Manual Control Linkage Adjustment (Cont'd) **COLUMN SHIFT MODEL**

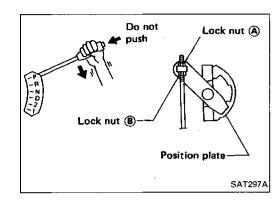
Move the selector lever from the "P" position to "1" position. You should be able to feel the detents in each position. If the detents cannot be felt or the pointer indicating the position is improperly aligned, the linkage needs adjustment.



Loosen lock nuts.



Gl



Kickdown switch

Lock nut

□8 - 12 N·m

Stopper

rubber

Accelerator

pedal

Tighten lock nut (A) until it touches trunnion, pulling selector lever toward "R" position side without pushing button.

EM

Back off lock nut (A) two turn and tighten lock nut (B) to the specified torque.

EF & ÆC

(C): Lock nut 11 - 15 N·m (1.1 - 1.5 kg-m, 8 - 11 ft-lb)

FE

CL.

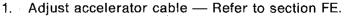
Move selector lever from "P" position to "1" position. Make sure that selector lever can move smoothly.

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Kickdown Switch Adjustment



EA

Adjust clearance "C" between stopper rubber and end of kickdown switch thread while depressing accelerator pedal

RA

Clearance "C": 0.3 - 1.0 mm (0.012 - 0.039 in)

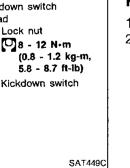
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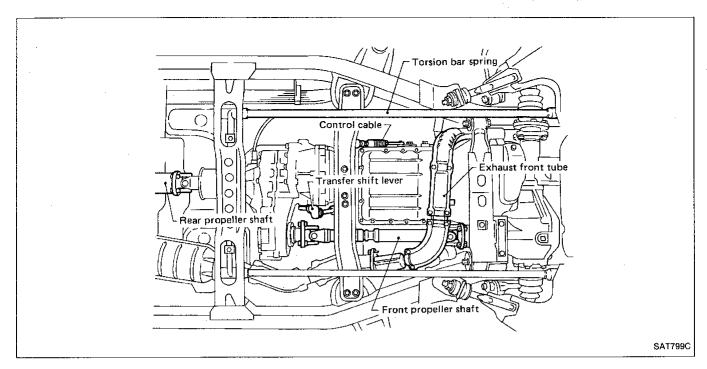
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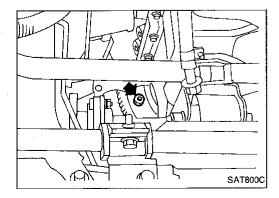




Removal

— 4WD and 2WD model —

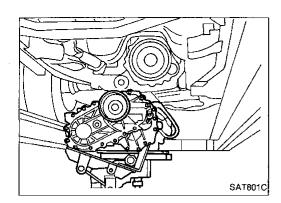
- Remove exhaust front tube. (VG30E engine model)
- Remove fluid charging pipe from A/T assembly.
- Remove oil cooler pipe from A/T assembly.
- Plug up openings such as the fluid charging pipe hole, etc.
- Remove propeller shaft.
 Refer to section PD.
- Remove transfer control linkage from transfer.
- Insert plug into rear oil seal after removing rear propeller shaft.
- Be careful not to damage spline, sleeve yoke and rear oil seal.
- Remove torsion bar springs. Refer to section FA. Then remove second crossmember. (4WD model)
- Remove speedometer cable from transfer assembly or A/T assembly.
- Remove A/T control cable from A/T assembly. (4WD model)
- Remove A/T control linkage from selector lever. (2WD model)
- Disconnect A/T harness connectors.



- Remove starter motor.
- Remove gusset securing engine to A/T assembly. (VG30E engine model)
- Remove bolts securing torque converter to drive plate.
 Remove the bolts by turning crankshaft.

AT-112

REMOVAL AND INSTALLATION



Removal (Cont'd)

- 4WD model -

- Support A/T and transfer assembly with a jack.
- Remove rear mounting bracket from body and A/T assem-
- Remove bolts securing A/T assembly to engine.
- Lower A/T assembly with transfer.



MA

EM

LC



– 2WD model —

- Support A/T assembly with a jack.
- Remove rear mounting bracket from body and A/T assem-
- Remove bolts securing A/T assembly to engine.
- Pull A/T assembly backwards.
- Secure torque converter to prevent it from dropping.
- Secure A/T assembly to a jack.

Slant and lower A/T assembly.

EF & EC

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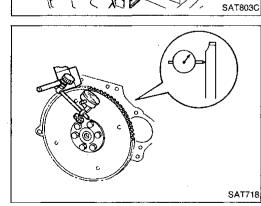
CL

MT

ΑT

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FA



Installation

SAT802C

- Drive plate runout
 - Maximum allowable runout:

0.5 mm (0.020 in)

If this runout is out of specification, replace drive plate with ring gear.

BR

ST

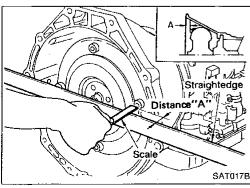
When connecting torque converter to transmission, measure distance "A" to be certain that they are correctly

Distance "A": 26.0 mm (1.024 in) or more

KA

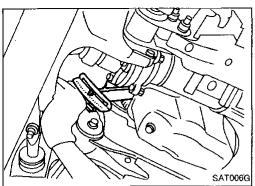
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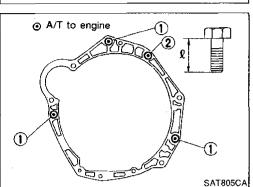
assembled.

REMOVAL AND INSTALLATION



Installation (Cont'd)

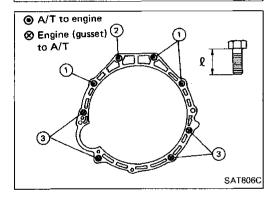
- Install converter to drive plate.
- After converter is installed to drive plate, rotate crankshaft several turns and check to be sure that transmission rotates freely without binding.



Tighten bolts securing transmission.

- KA24E engine model -

Tightening torque N·m (kg-m, ft-lb)	Bolt length ''ℓ'' mm (in)
① 39 - 49 (4.0 - 5.0, 29 - 36)	45 (1.77)
2 39 - 49 (4.0 - 5.0, 29 - 36)	40 (1.57)



--- VG30E engine model ---

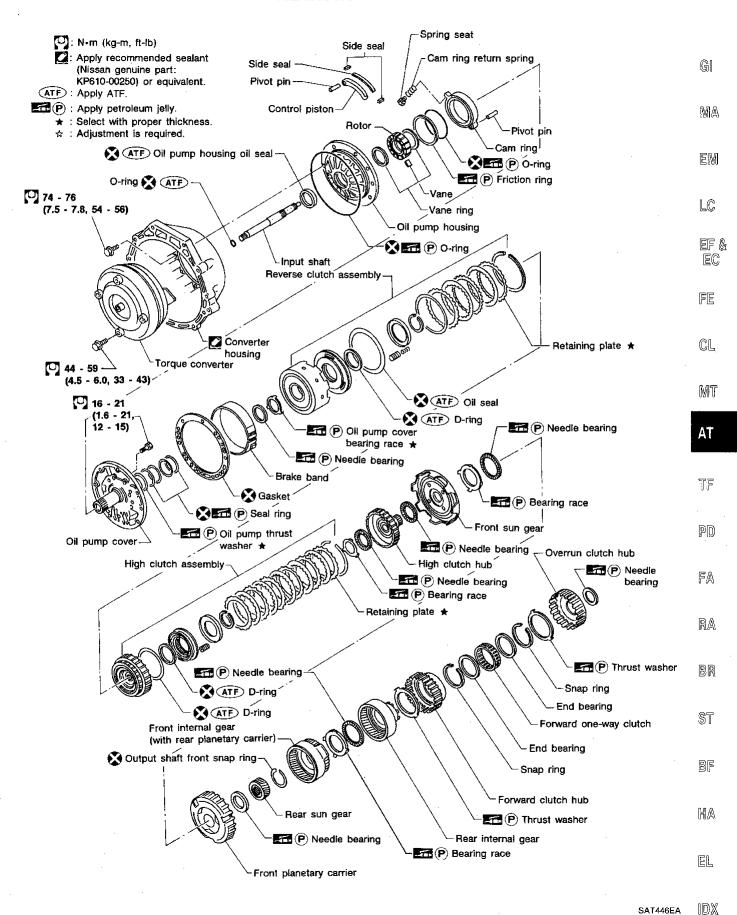
Bolt No.	Tightening torque N·m (kg-m, ft-lb)	Bolt length "\vert^" mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	45 (1.77)
2	39 - 49 (4.0 - 5.0, 29 - 36)	50 (1.97)
3	29 - 39 (3.0 - 4.0, 22 - 29)	25 (0.98)
Gusset to engine	29 - 39 (3.0 - 4.0, 22 - 29)	20 (0.79)

- Reinstall any part removed.
- Check fluid level in transmission.
- Move selector lever through all position to be sure that transmission operates correctly.

With parking brake applied, rotate engine at idling. Move selector lever through "N" to "D", to "2", to "1" and to "R". A slight shock should be felt by hand gripping selector each time transmission is shifted.

Perform road test. — Refer to "ROAD TESTING" (AT-20).

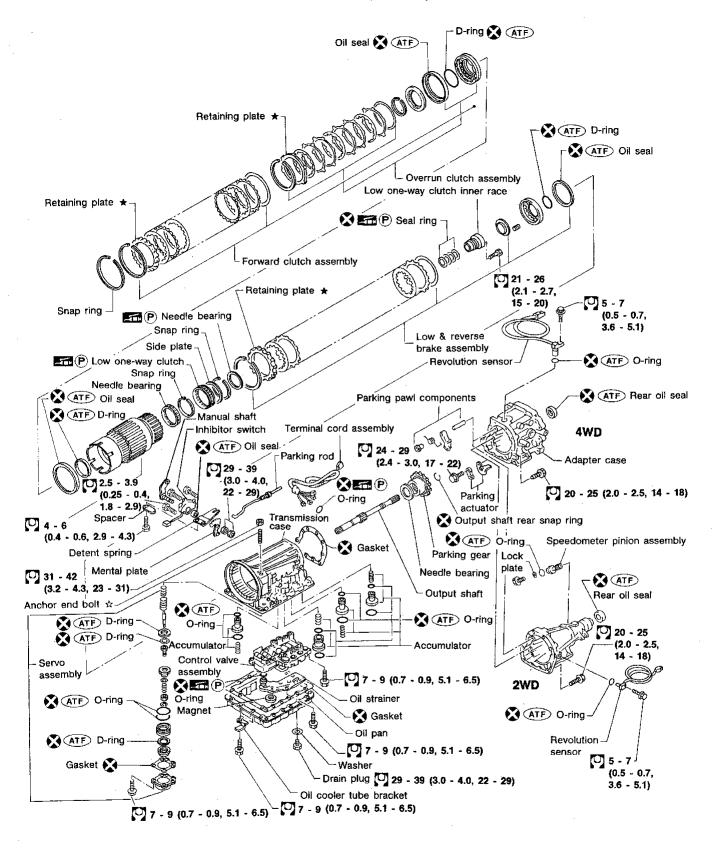
RE4R01A



SAT446EA

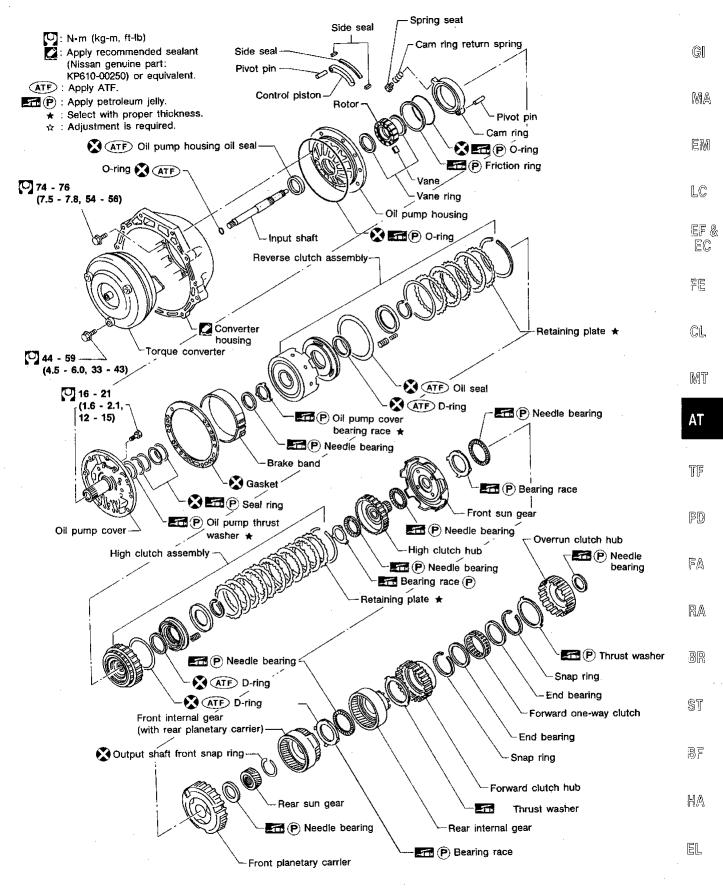
MAJOR OVERHAUL

RE4R01A (Cont'd)



(N-m (kg-m, ft-lb)

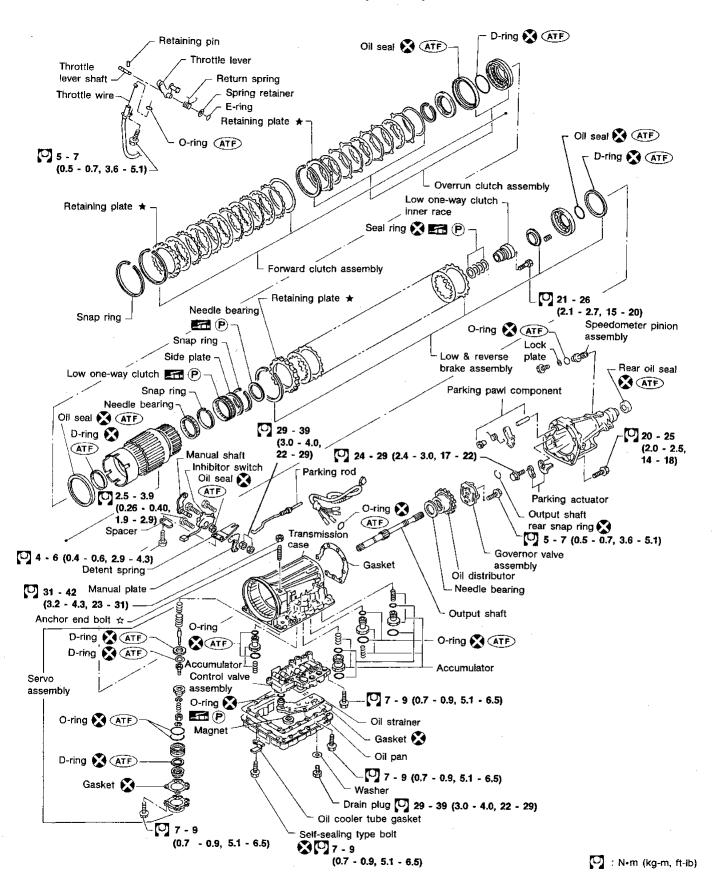
RL4R01A



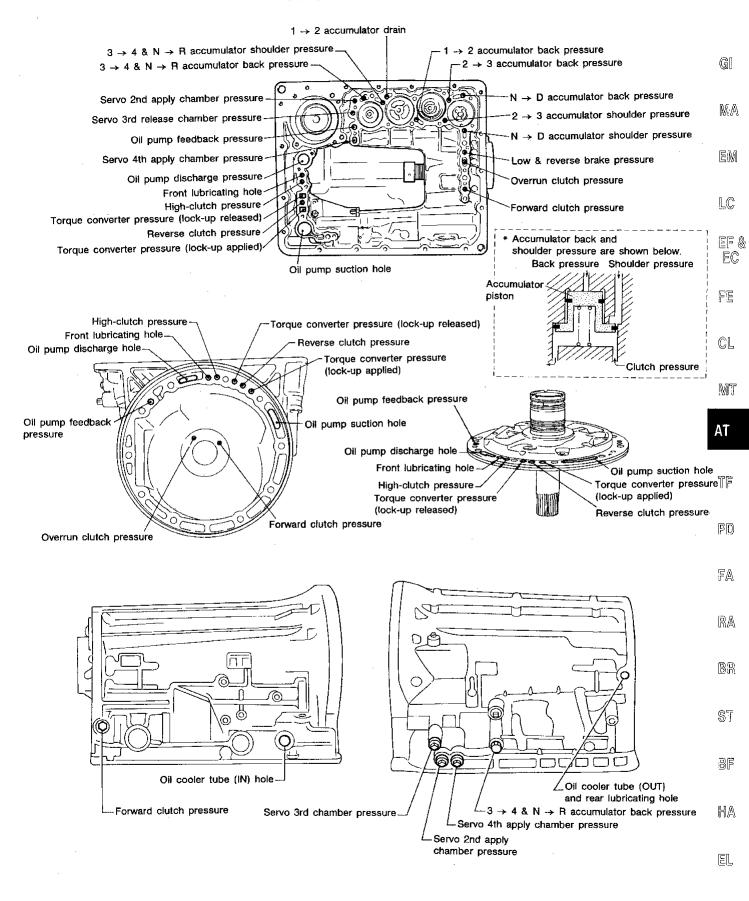
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MAJOR OVERHAUL

RL4R01A (Cont'd)



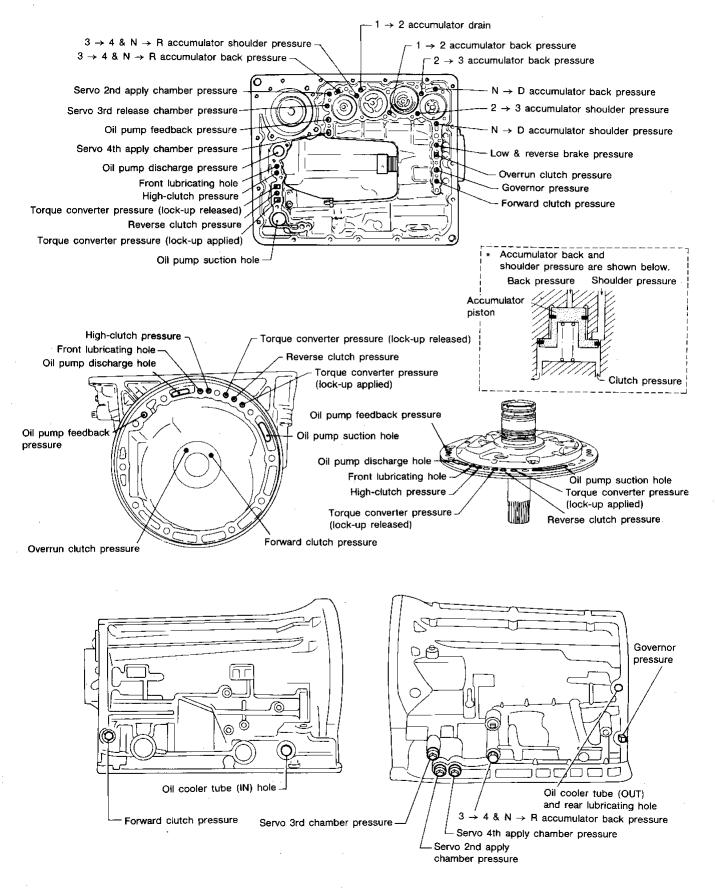
Oil Channel — RE4R01A



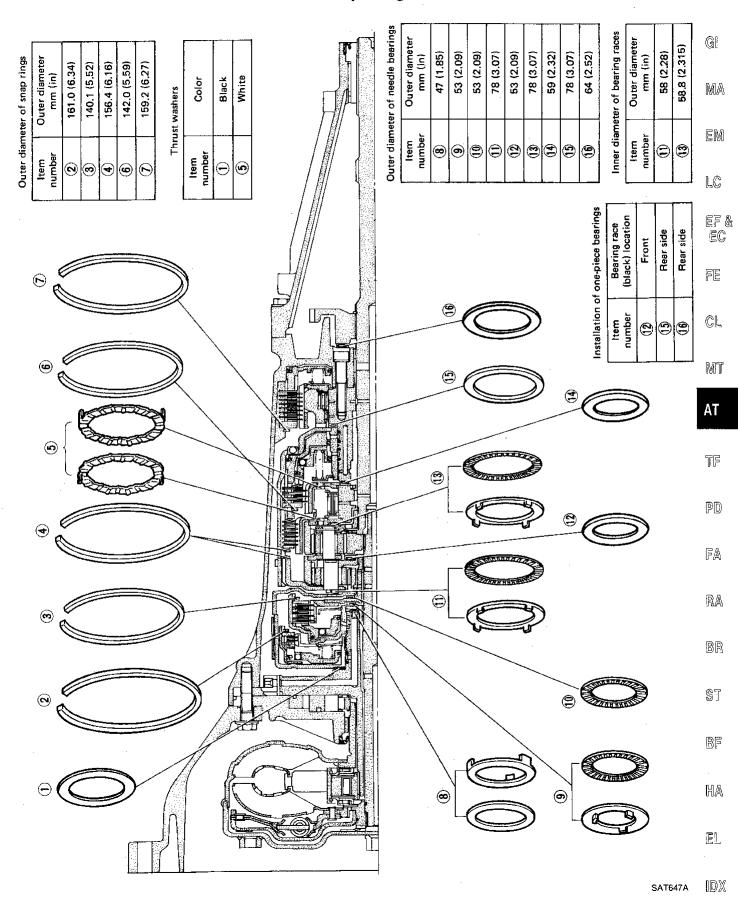
SAT185B

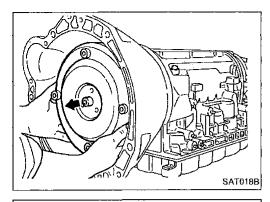
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Oil Channel — RL4R01A



Locations of Needle Bearings, Thrust Washers and Snap Rings

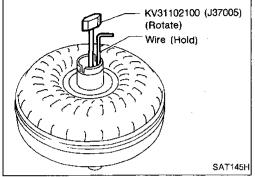




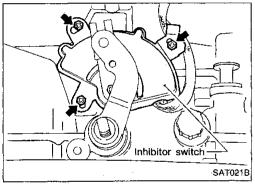
Disassembly

- RE4R01A and RL4R01A -

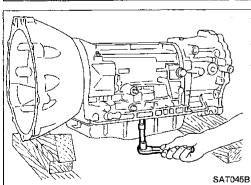
 Removing torque converter by holding it firmly and turning while pulling straight out.



- 2. Check torque converter one-way clutch.
- a. Insert Tool into spline of one-way clutch inner race.
- b. Hook bearing support unitized with one-way clutch outer race with suitable wire.
- c. Check that one-way clutch inner race rotates only clockwise with Tool while holding bearing support with wire.

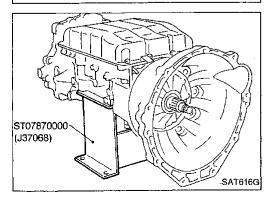


3. Remove inhibitor switch from transmission case.



- 4. Remove oil pan.
- a. Drain ATF from drain plug.
- Raise oil pan by placing wooden blocks under converter housing and adapter case.
- c. Separate the oil pan and transmission case.
- Always place oil pan straight down so that foreign particles inside will not move.
- 5. Place transmission into Tool with the control valve facing up.
- Check oil pan and oil strainer for accumulation of foreign particles.
- If materials of clutch facing are found, clutch plates may be worn.
- If metal filings are found, clutch plates, brake bands, etc. may be worn.
- If aluminum filings are found, bushings or aluminum cast parts may be worn.

In above cases, replace torque converter and check unit for cause of particle accumulation.



Disassembly (Cont'd)

7.

— RE4R01A —

 Remove torque converter clutch solenoid valve and fluid temperature sensor-1 and 2 connectors.

Be careful not to damage connector.

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Remove torque converter clutch solenoid valve and OD LC cancel solenoid connectors.

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8. Remove oil strainer.

Remove oil strainer from control valve assembly.
 Then remove O-ring from oil strainer.

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b. Check oil strainer screen for damage.

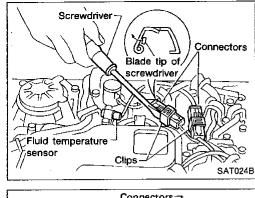
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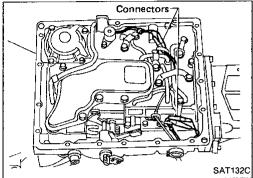
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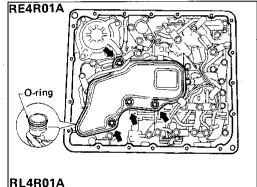
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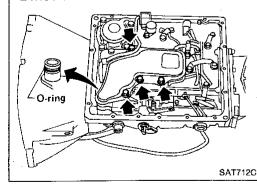
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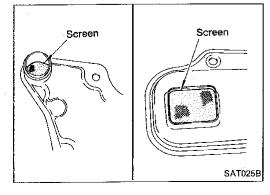






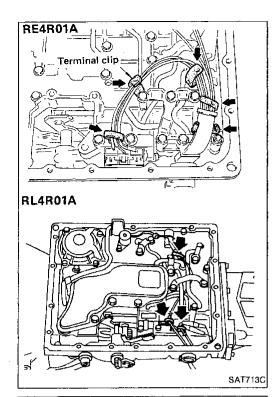


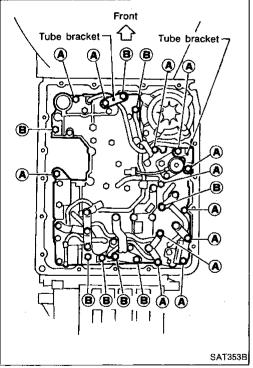




Disassembly (Cont'd)

- 9. Remove control valve assembly.
- a. Straighten terminal clips to free terminal cords then remove terminal clips.

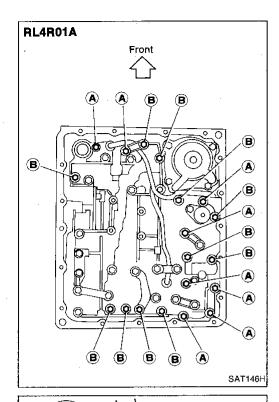




b. Remove bolts (A) and (B), and remove control valve assembly from transmission.

Bolt	ℓ mm (in)
(A)	33 (1.30)
8	45 (1.77)

Disassembly (Cont'd)



Bolt	ℓmm (in)
(A)	33 (1.30)
(B)	45 (1.77)

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— RE4R01A ----

SAT026B

SAT127B

Remove solenoid connector.

- RE4R01A and RL4R01A -

MT

Be careful not to damage connector.

d. Remove manual valve from control valve assembly.

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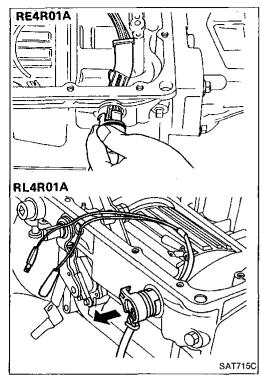
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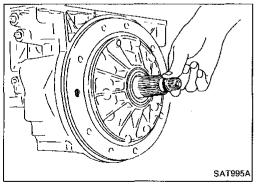
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Disassembly (Cont'd)

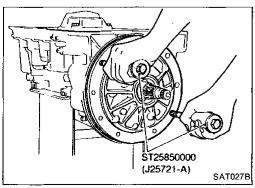
- 10. Remove terminal cord assembly from transmission case while pushing on stopper.
- Be careful not to damage cord.
- Do not remove terminal cord assembly unless it is damaged.



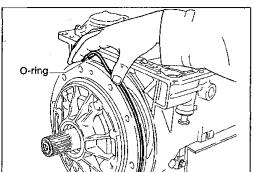
- SAT999A
- 11. Remove converter housing.
- a. Remove converter housing from transmission case.
- b. Remove traces of sealant.
- Be careful not to scratch converter housing.



12. Remove O-ring from input shaft.

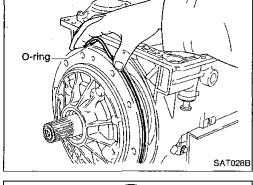


- 13. Remove oil pump assembly.
- a. Attach Tool to oil pump assembly and extract it evenly from transmission case.



Disassembly (Cont'd)

- Remove O-ring from oil pump assembly.
- Remove traces of sealant from oil pump housing.
- Be careful not to scratch pump housing.



washer

d. Remove needle bearing and thrust washer from oil pump assembly.

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EF & EC

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14. Remove input shaft and oil pump gasket.

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- 15. Remove brake band and band strut.
- a. Loosen lock nut and remove band servo anchor end pin from transmission case.

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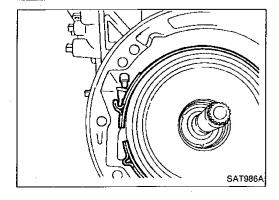
b. Remove brake band and band strut from transmission case.

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BF

EL

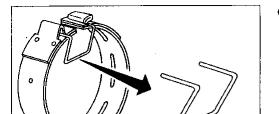
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SAT988A

SAT029B

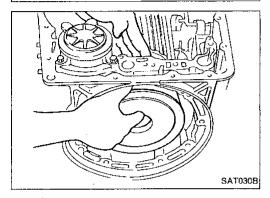


Clip

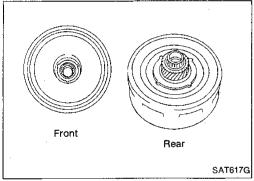
SAT655

Disassembly (Cont'd)

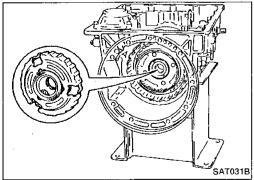
c. Hold brake band in a circular shape with clip. Check brake band facing for damage, cracks, wear or burns.



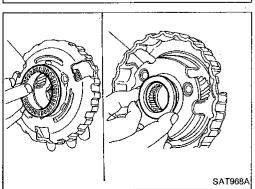
- 16. Remove front side clutch and gear components.
- a. Remove clutch pack (reverse clutch, high clutch and front sun gear) from transmission case.



- b. Remove front bearing race from clutch pack.
- c. Remove rear bearing race from clutch pack.

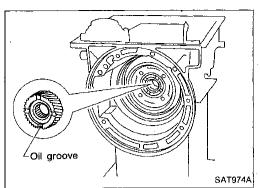


d. Remove front planetary carrier from transmission case.

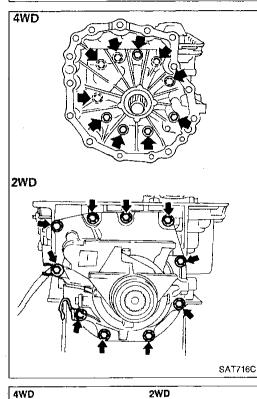


- e. Remove front needle bearing from front planetary carrier.
- f. Remove rear bearing from front planetary carrier.

Disassembly (Cont'd)



g. Remove rear sun gear from transmission case.



17. Remove rear extension or adapter case.

Remove rear extension or adapter case from transmission case.

b. Remove rear extension or adapter case gasket from transmission case.

ef & ec

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TF

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c. Remove oil seal from rear extension or adapter case.

Do not remove oil seal unless it is to be replaced.

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SAT146G

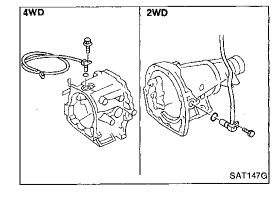
d. Remove revolution sensor from rear extension or adapter BF case.

e. Remove O-ring from revolution sensor.

HA

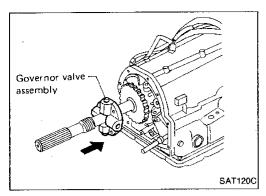
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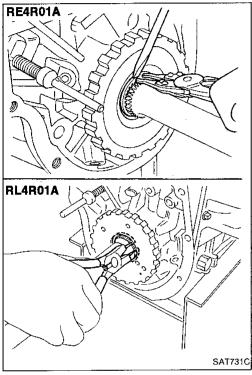
Disassembly (Cont'd)

- RE4R01A and RL4R01A -
- 18. Remove output shaft and parking gear.
- RL4R01A —
- a. Remove governor valve assembly.

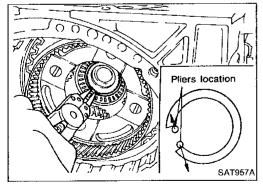


--- RE4R01A and RL4R01A ---

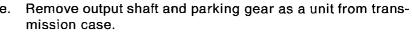
b. Remove rear snap ring from output shaft.



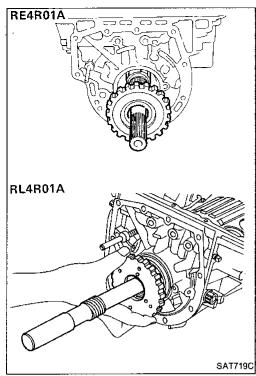
- c. Slowly push output shaft all the way forward.
- Do not use excessive force.
- d. Remove snap ring from output shaft.



Disassembly (Cont'd)



f. Remove parking gear from output shaft.



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Remove needle bearing from transmission case.

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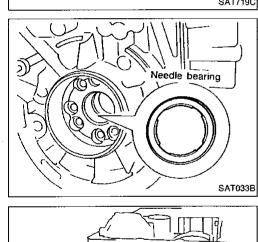
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SAT954A

SAT110B

Hole for pawl

19. Remove rear side clutch and gear components.

a. Remove front internal gear.

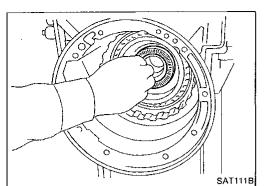
b. Remove bearing race from front internal gear.

BF

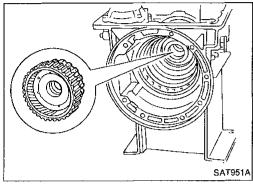
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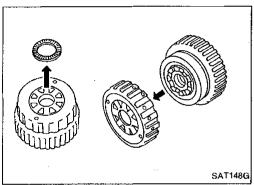
Disassembly (Cont'd)



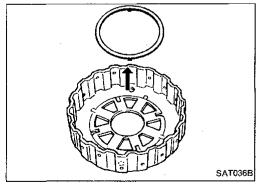
c. Remove needle bearing from gear internal gear.



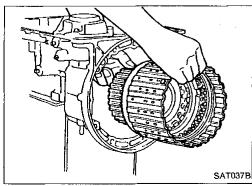
d. Remove rear internal gear, forward clutch hub and overrun clutch hub as a set from transmission case.



- e. Remove needle bearing from overrun clutch hub.
- f. Remove overrun clutch hub from rear internal gear and forward clutch hub.

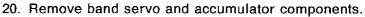


g. Remove thrust washer from overrun clutch hub.

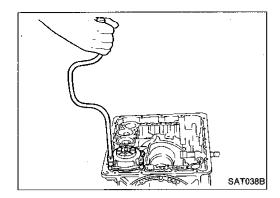


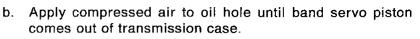
h. Remove forward clutch assembly from transmission case.

Disassembly (Cont'd)



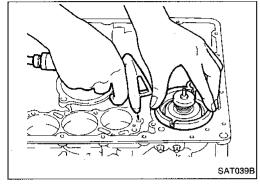
Remove band servo retainer from transmission case.





Hold piston with a rag and gradually direct air to oil hole.

Remove return springs.

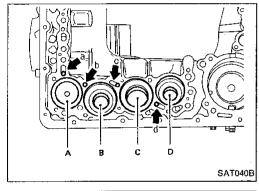


Remove springs from accumulator pistons B, C and D.

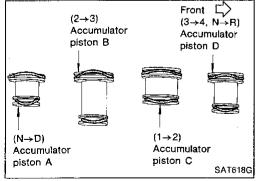
e. Apply compressed air to each oil hole until piston comes

Hold piston with a rag and gradually direct air to oil hole.

Identification of accumulator pistons	Α	В	С	D
Identification of oil holes	а	b	С	d



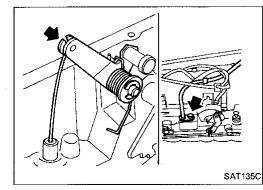
Remove O-ring from each piston.



– RL4R01A —

21. Remove throttle wire components if necessary.

Remove throttle wire from A/T assembly.



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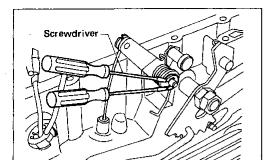
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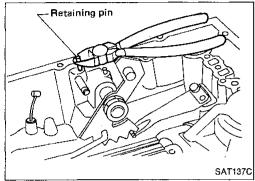
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Disassembly (Cont'd)

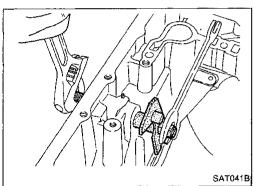


SAT136C

- b. Remove throttle lever shaft E-ring.
- c. Remove return spring.
- d. Remove throttle lever.

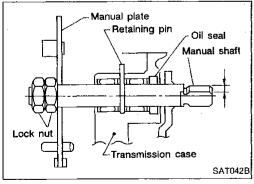


 Remove throttle lever shaft retaining pin and throttle lever shaft.

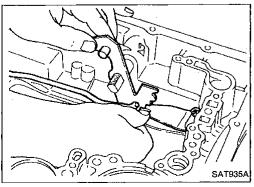


- RE4R01A and RL4R01A -

- 22. Remove manual shaft components, if necessary.
- a. Hold width across flats of manual shaft (outside the transmission case) and remove lock nut from shaft.

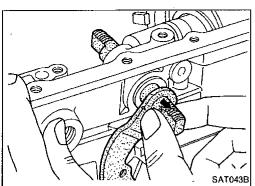


b. Remove retaining pin from transmission case.

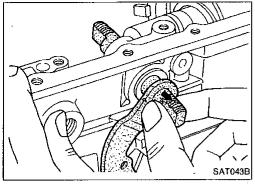


While pushing detent spring down, remove manual plate and parking rod from transmission case.

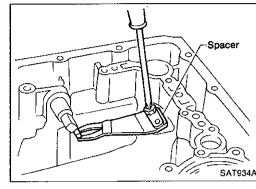
Disassembly (Cont'd)



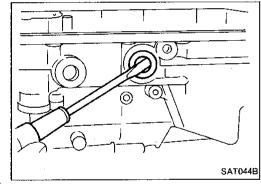
d. Remove manual shaft from transmission case.



e. Remove spacer and detent spring from transmission case.



Remove oil seal from transmission case.



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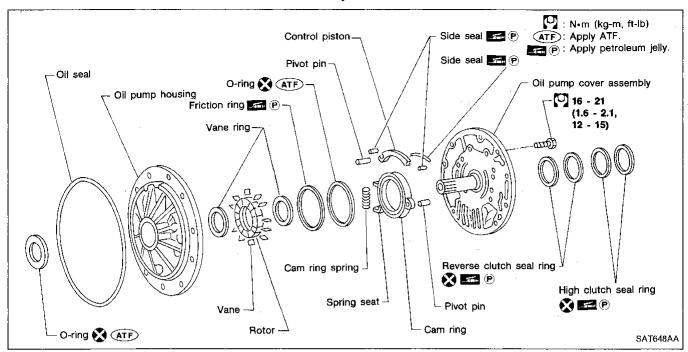
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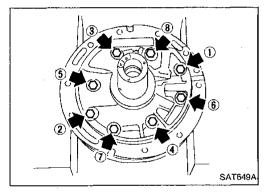
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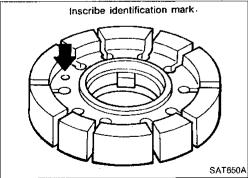
Oil Pump — RE4R01A and RL4R01A



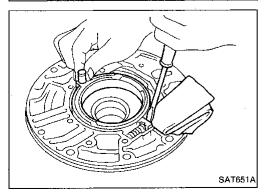


DISASSEMBLY

 Loosen bolts in numerical order and remove oil pump cover.

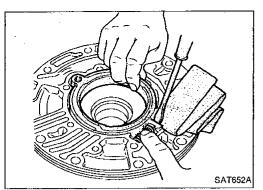


- 2. Remove rotor, vane rings and vanes.
- Inscribe a mark on back of rotor for identification of foreaft direction when reassembling rotor. Then remove rotor.



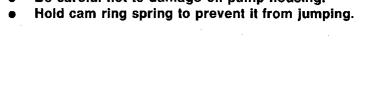
- 3. While pushing on cam ring remove pivot pin.
- Be careful not to scratch oil pump housing.

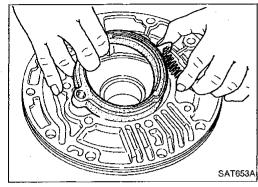
REPAIR FOR COMPONENT PARTS



Oil Pump — RE4R01A and RL4R01A (Cont'd)

- While holding cam ring and spring lift out cam ring spring.
- Be careful not to damage oil pump housing.





Remove cam ring and cam ring spring from oil pump housing.



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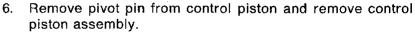
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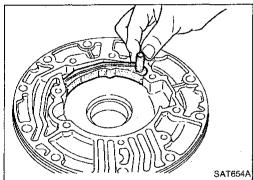
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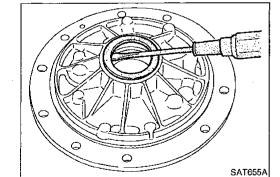




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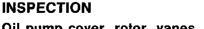


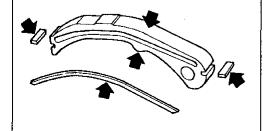
- Remove oil seal from oil pump housing.
- Be careful not to scratch oil pump housing.

RA

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Oil pump cover, rotor, vanes, control piston, side seals, cam ring and friction ring

Check for wear or damage.

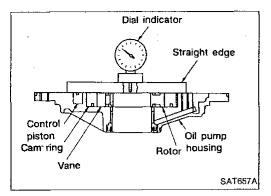
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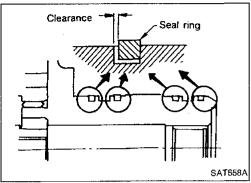
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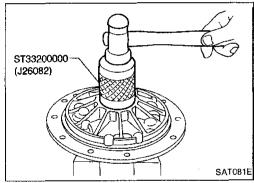
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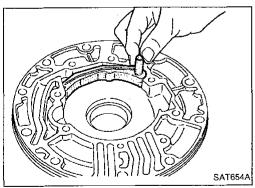
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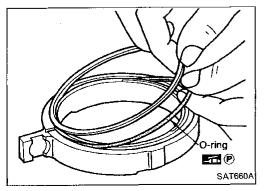
REPAIR FOR COMPONENT PARTS











Oil Pump — RE4R01A and RL4R01A (Cont'd)

Side clearances

- Measure side clearances between end of oil pump housing and cam ring, rotor, vanes and control piston in at least four places along their circumferences. Maximum measured values should be within specified ranges.
- Before measuring side clearance, check that friction rings,
 O-ring, control piston side seals and cam ring spring are removed.

Standard clearance (Cam ring, rotor, vanes and control piston):

Refer to SDS (AT-217).

If not within standard clearance, replace oil pump assembly except oil pump cover assembly.

Seal ring clearance

Measure clearance between seal ring and ring groove.

Standard clearance:

0.10 - 0.25 mm (0.0039 - 0.0098 in)

Wear limit:

0.25 mm (0.0098 in)

• If not within wear limit, replace oil pump cover assembly.

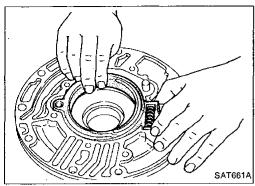
ASSEMBLY

- 1. Drive oil seal into oil pump housing.
- Apply ATF to outer periphery and lip surface.

- 2. Install cam ring in oil pump housing by the following steps.
- a. Install side seal on control piston.
- Pay attention to its direction Black surface goes toward control piston.
- Apply petroleum jelly to side seal.
- b. Install control piston on oil pump.
- c. Install O-ring and friction ring on cam ring.
- Apply petroleum jelly to O-ring.



REPAIR FOR COMPONENT PARTS



Oil Pump — RE4R01A and RL4R01A (Cont'd)

d. Assemble cam ring, cam ring spring and spring seat. Install spring by pushing it against pump housing.



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e. While pushing on cam ring install pivot pin.

Install rotor, vanes and vane rings. Pay attention to direction of rotor.



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Install oil pump housing and oil pump cover. Wrap masking tape around splines of oil pump cover



assembly to protect seal. Position oil pump cover assembly in oil pump housing assembly, then remove masking

tape.

RA

Tighten bolts in a criss-cross pattern.

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Install seal rings carefully after packing ring grooves with petroleum jelly. Press rings down into jelly to a close fit.

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Seal rings come in two different diameters. Check fit carefully in each groove.

Small dia. seal ring:

No mark

Large dia. seal ring:

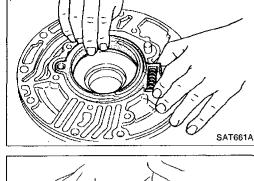
Yellow mark in area shown by arrow

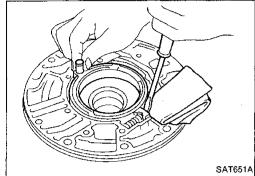
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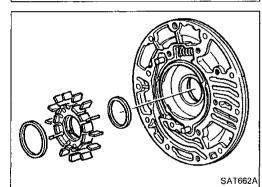
Do not spread gap of seal ring excessively while installing. It may deform ring.

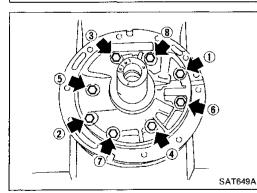
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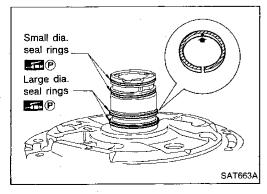
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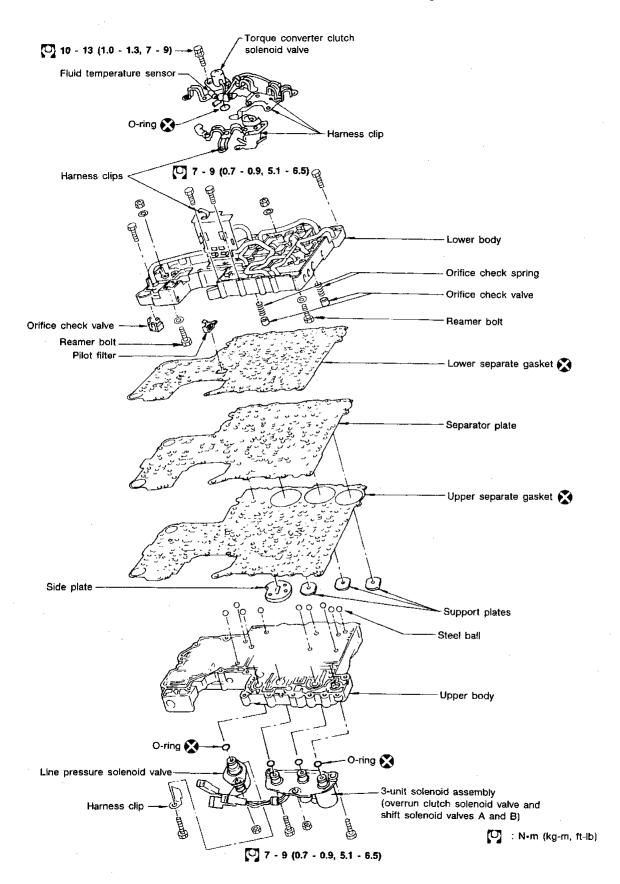


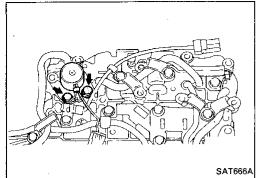






Control Valve Assembly — RE4R01A





Control Valve Assembly — RE4R01A (Cont'd) **DISASSEMBLY**

- Remove solenoid valves.
- Remove torque converter clutch solenoid valve and side plate from lower body.
- Remove O-ring from solenoid valve.



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- Remove line pressure solenoid valve from upper body.
- Remove O-ring from solenoid valve.



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- Remove 3-unit solenoid valve assembly from upper body.
- Remove O-rings from solenoid valves.

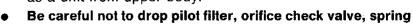
Disassemble upper and lower bodies.



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PD)

- Place upper body facedown, and remove bolts, reamer FA bolts and support plates.
- Remove lower body, separator plate and separate gasket as a unit from upper body.





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and steel balls.



- Place lower body facedown, and remove separator gasket and separator plate.
- Remove pilot filter, orifice check valve and orifice check spring.

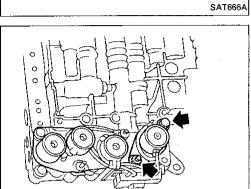


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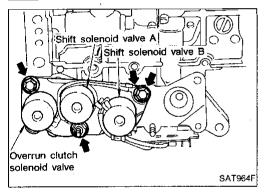
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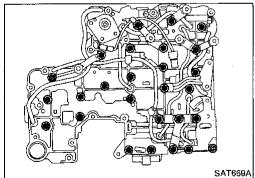
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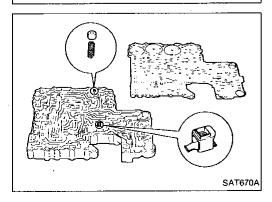
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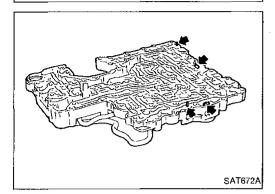




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Control Valve Assembly — RE4R01A (Cont'd)

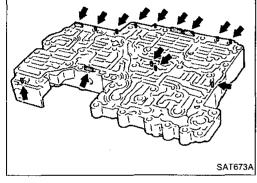
e. Check to see that steel balls are properly positioned in upper body and then remove them from upper body.



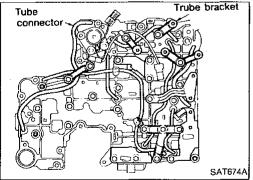
INSPECTION

Lower and upper bodies

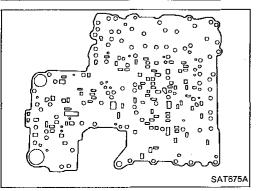
 Check to see that there are pins and retainer plates in lower body.



- Check to see that there are pins and retainer plates in upper body.
- Be careful not to lose these parts.

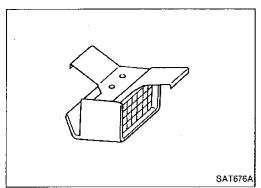


- Check to make sure that oil circuits are clean and free from damage.
- Check tube brackets and tube connectors for damage.



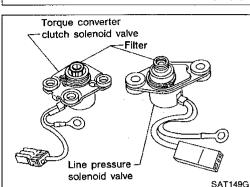
Separator plates

 Check to make sure that separator plate is free of damage and not deformed and oil holes are clean.



Control Valve Assembly — RE4R01A (Cont'd) Pilot filter

Check to make sure that filter is not clogged or damaged.



Torque converter clutch solenoid valve

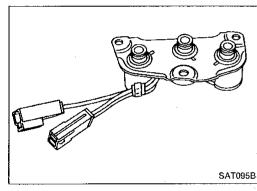
Check that filter is not clogged or damaged.

Measure resistance. - Refer to "Electrical Components Inspection" (AT-72).

Line pressure solenoid valve

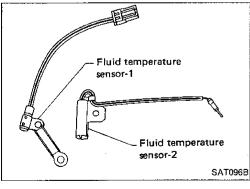
Check that filter is not clogged or damaged.

Measure resistance. — Refer to "Electrical Components Inspection" (AT-72).



3-unit solenoid valve assembly (Overrun clutch solenoid valve and shift solenoid valves A and B)

Measure resistance of each solenoid valve. — Refer to. "Electrical Components Inspection" (AT-72).



Fluid temperature sensor-1 and -2

Measure resistance. — Refer to "Electrical Components Inspection" (AT-72).

ASSEMBLY

1. Install upper and lower bodies.

Place oil circuit of upper body face up. Install steel balls in their proper positions.

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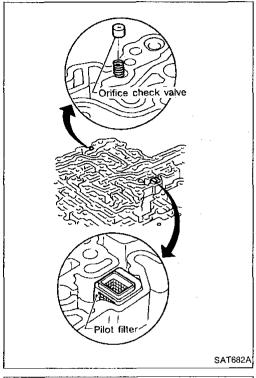
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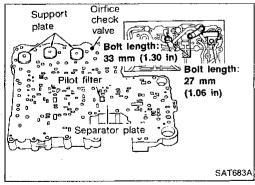
Reamer bolt (long) Reamer bolt (short)

Control Valve Assembly — RE4R01A (Cont'd)

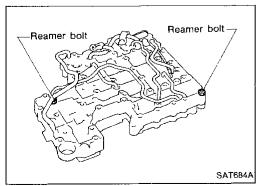
b. Install reamer bolts from bottom of upper body and install separate gaskets.



c. Place oil circuit of lower body face up. Install orifice check spring, orifice check valve and pilot filter.



- Install lower separate gaskets and separator plates on lower body.
- e. Install and temporarily tighten support plates, fluid temperature sensor-2 and tube brackets.



- Temporarily assemble lower and upper bodies, using reamer bolt as a guide.
- Be careful not to dislocate or drop steel balls, orifice check spring, orifice check valve and pilot filter.

SAT685A

Side plate

Control Valve Assembly — RE4R01A (Cont'd)

g. Install and temporarily tighten bolts and tube brackets in their proper locations.

Bolt length and location

Bolt symbol		а	b	С	ď
Bolt length	mm (in)	70 (2.76)	50 (1.97)	33 (1.30)	27 (1.06)



MA

EM

- Install solenoid valves.
- Attach O-ring and install torque converter clutch solenoid valve and side plates onto lower body.



LC

EC

FE

CL

- Attach O-rings and install 3-unit solenoid valve assembly onto upper body.
- Attach O-ring and install line pressure solenoid valve onto upper body.
- Tighten all bolts.



AT

TF

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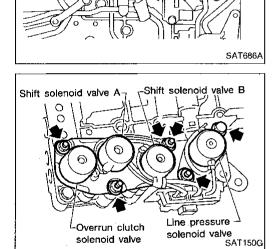
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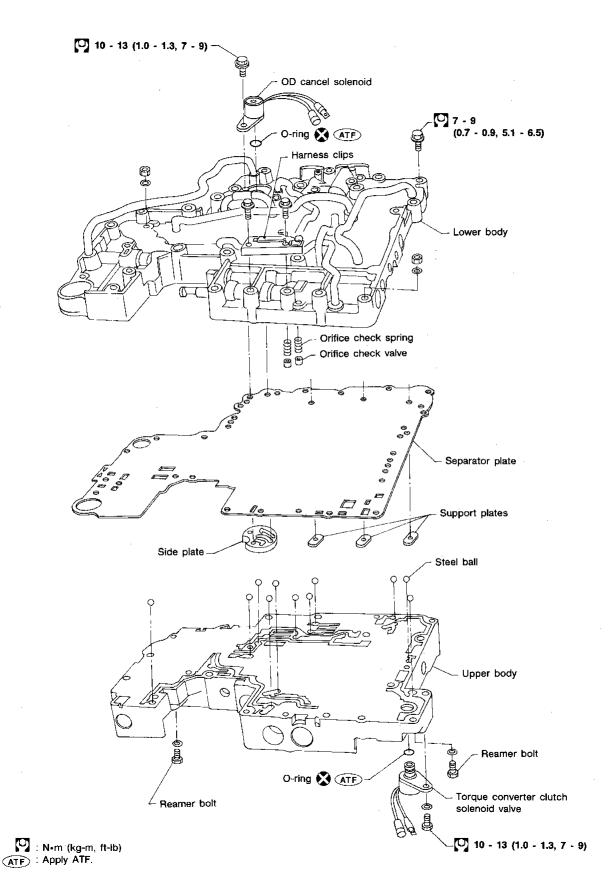
EL

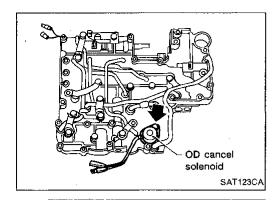
(ID)X(



solenoid valve

Control Valve Assembly — RL4R01A





Torque converter clutch solenoid valve

Control Valve Assembly — RL4R01A (Cont'd) DISASSEMBLY

- Remove solenoids.
- Remove OD cancel solenoid and side plate from lower
- Remove O-ring from solenoid.

GI

MA

ΕM

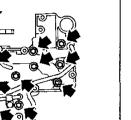
Remove torque converter clutch solenoid valve from upper body.

LC

EF & EC

FE

CL



SAT144G

Disassemble upper and lower bodies.

Remove O-ring from solenoid valve.

Place upper body facedown, and remove bolts, reamer bolts and support plates.

- Remove lower body, separator plate and separate gasket as a unit from upper body.
- Be careful not to drop orifice check valve, spring and steel balls.

TF

ΑT

PD

- Place lower body facedown, and remove separator plate.
- Remove orifice check valve and orifice check spring.

RA

FA

BR

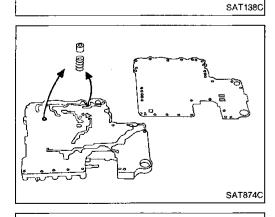
ST

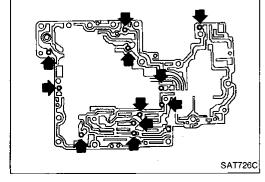
BF

HA

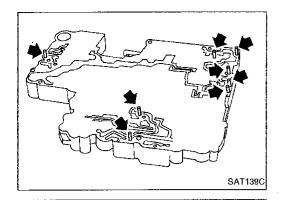
EL

ID)X





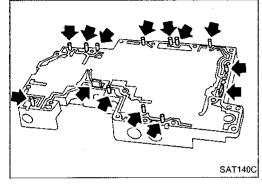
Check to see that steel balls are properly positioned in upper body and then remove them from upper body.



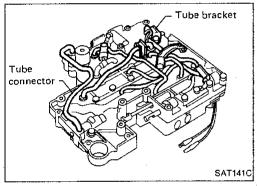
Control Valve Assembly — RL4R01A (Cont'd) INSPECTION

Lower and upper bodies

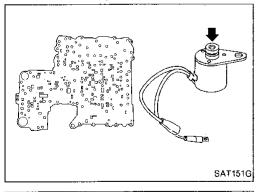
 Check to see that there are pins and retainer plates in lower body.



- Check to see that there are pins and retainer plates in upper body.
- . Be careful not to lose these parts.



- Check to make sure that oil circuits are clean and free from damage.
- Check tube brackets and tube connectors for damage.

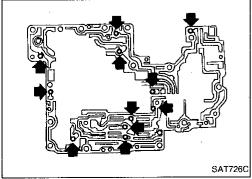


Separator plates

 Check to make sure that separator plate is free of damage and not deformed and oil holes are clean.

OD cancel solenoid and torque converter clutch solenoid valve

- Check that filter is not clogged or damaged.
- Measure resistance. Refer to "Electrical Components Inspection" (AT-72).



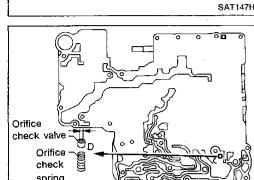
ASSEMBLY

- 1. Install upper and lower bodies.
- Place oil circuit of upper body face up. Install steel balls in their proper positions.

Reamer bolt Reamer (Long) bolt (Short) SAT147H

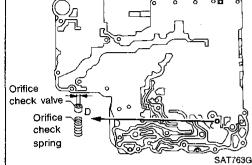
Control Valve Assembly — RL4R01A (Cont'd)

b. Install reamer bolts from bottom of upper body and install separate gaskets.



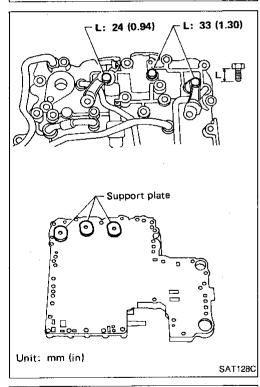
Place oil circuit of lower body face up. Install orifice check spring, orifice check valve.

D: mm (in) 2.0 (0.079)



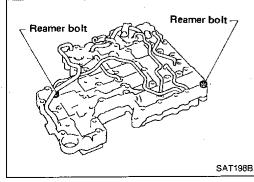
Install separator plates on lower body.

Install and temporarily tighten support plates and tube brackets.



Temporarily assemble lower and upper bodies, using reamer bolt as a guide.

Be careful not to dislocate or drop steel balls, orifice check spring and orifice check valve.



[DX

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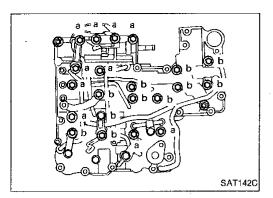
ST

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697

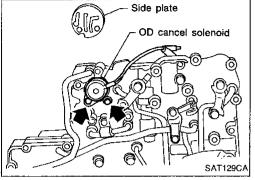


Control Valve Assembly — RL4R01A (Cont'd)

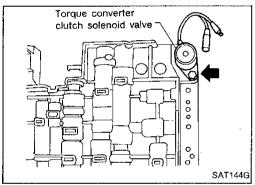
g. Install and temporarily tighten bolts and tube brackets in their proper locations.

Bolt length and location:

[tem		Bolt symbol	
	а	b	
Bolt length	mm (in)	45 (1.77)	33 (1.30)

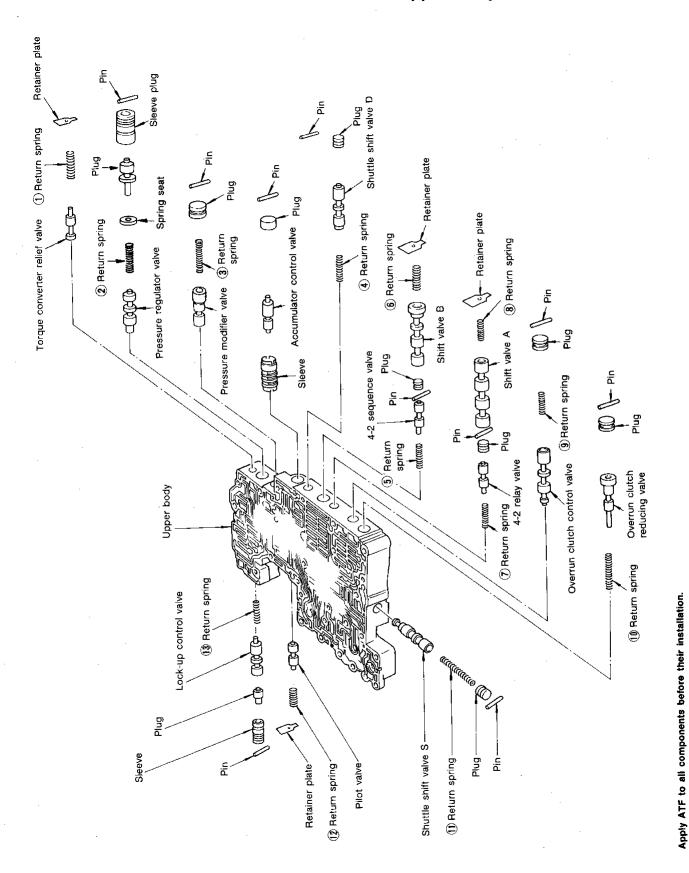


- 2. Install solenoids.
- a. Attach O-ring and install OD cancel solenoid and side plates onto lower body.



- b. Attach O-ring and install torque converter clutch solenoid valve onto upper body.
- 3. Tighten bolt.

Control Valve Upper Body — RE4R01A



Numbers preceding valve springs correspond with those shown in Spring Chart on page AT-154.

SAT745GA IDX

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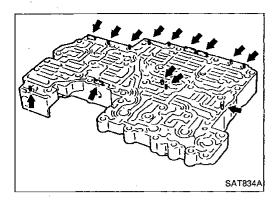
BR

ST

BF

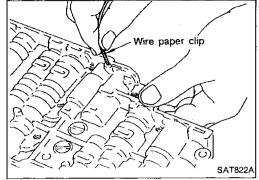
HA

EL

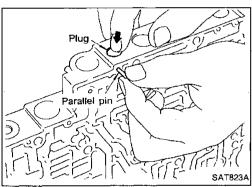


Control Valve Upper Body — RE4R01A (Cont'd) DISASSEMBLY

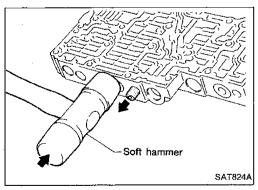
- Remove valves at parallel pins.
- Do not use a magnetic hand.



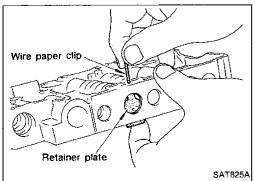
a. Use a wire paper clip to push out parallel pins.



- b. Remove parallel pins while pressing their corresponding plugs and sleeves.
- Remove plug slowly to prevent internal parts from jumping out.



- c. Place mating surface of valve facedown, and remove internal parts.
- If a valve is hard to remove, place valve body facedown and lightly tap it with a soft hammer.
- Be careful not to drop or damage valves and sleeves.

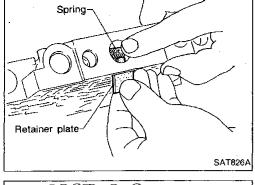


- 2. Remove valves at retainer plates.
- a. Pry out retainer plate with wire paper clip.

Control Valve Upper Body — RE4R01A (Cont'd)

Spring Retainer plate

Remove retainer plates while holding spring.



Place mating surface of valve facedown, and remove internal parts.

LC

G!

MA

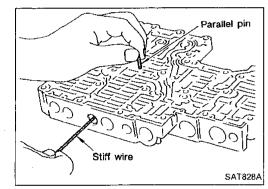
EM

If a valve is hard to remove, lightly tap valve body with a soft hammer.

EF & EC

Be careful not to drop or damage valves, sleeves, etc.

FE



2: Free length

diamet

D: Outer

Soft hammer

SAT827A

SAT829A

4-2 sequence valve and relay valve are located far back in upper body. If they are hard to remove, carefully push them out using stiff wire.

MT

CL

Be careful not to scratch sliding surface of valve with wire.

ΑT

TF

PD

INSPECTION



FA

Measure free length and outer diameter of each valve spring. Also check for damage or deformation.

 $\mathbb{R}\mathbb{A}$

Numbers of each valve spring listed in table below are the same as those in the figure in AT-151.

BR

ST

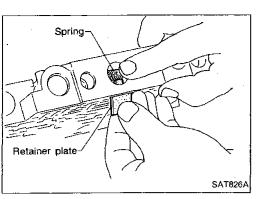
BF

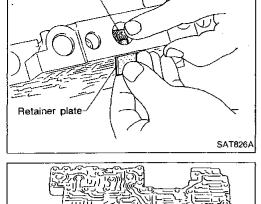
HA

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AT-153

701





Control Valve Upper Body — RE4R01A (Cont'd)

Inspection standard

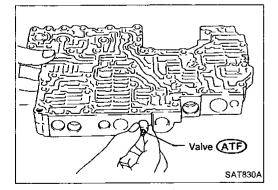
Unit: mm (in)

			Item	
	Parts —	Part No.	€ .	D
1	Torque converter relief valve spring	31742-41X23	38.0 (1.496)	9.0 (0.354)
2	Pressure regulator valve spring	31742-41X24	44.02 (1.7331)	14.0 (0.551)
3	Pressure modifier valve spring	31742-41X19	31.95 (1.2579)	6.8 (0.268)
4	Shuttle shift valve D spring	31762-41X00	26.5 (1.043)	6.0 (0.236)
(5)	4-2 sequence valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
6	Shift valve B spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
7	4-2 relay valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
8	Shift valve A spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
9	Overrun clutch control valve spring	31762-41X03	23.6 (0.929)	7.0 (0.276)
10	Overrun clutch reducing valve spring	31742-41X20	32.5 (1.280)	7.0 (0.276)
1	Shuttle shift valve S spring	31762-41X04	51.0 (2.008)	5.65 (0.2224)
12	Pilot valve spring	31742-41X13	25.7 (1.012)	9.1 (0.358)
(13)	Lock-up control valve spring	31742-41X22	18.5 (0.728)	13.0 (0.512)

Replace valve springs if deformed or fatigued.

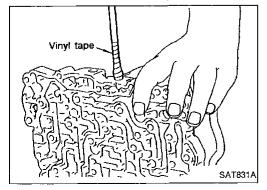
Control valves

Check sliding surfaces of valves, sleeves and plugs.



ASSEMBLY

- Lubricate the control valve body and all valves with ATF Install control valves by sliding them carefully into their bores.
- Be careful not to scratch or damage valve body.



Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.

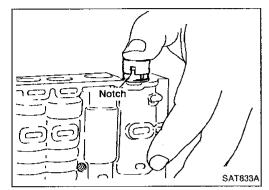
Sleeve Lightly push sleeve in while turning it. Center plug in spool bore Screwdriver Vinyl tape SAT832A

Control Valve Upper Body — RE4R01A (Cont'd) Pressure regulator valve

- If pressure regulator plug is not centered properly, sleeve cannot be inserted into bore in upper body.
 If this happens, use vinyl tape wrapped screwdriver to center sleeve until it can be inserted.
- Turn sleeve slightly while installing.







SAT834A

Accumulator control plug

- Align protrusion of accumulator control sleeve with notch in plug.
- Align parallel pin groove in plug with parallel pin, and install accumulator control valve.



install accumulator control valve.

CL

2. Install parallel pins and retainer plates.

MT

AT

TF

PD

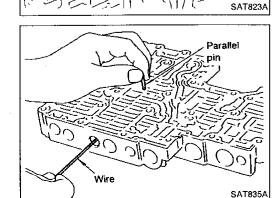


FA

RA

BR

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Parallel pin

4-2 sequence valve and relay valve

 Push 4-2 sequence valve and relay valve with wire wrapped in vinyl tape to prevent scratching valve body. Install parallel pins.

HA

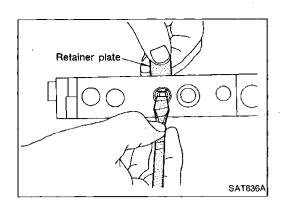
EL

IDX

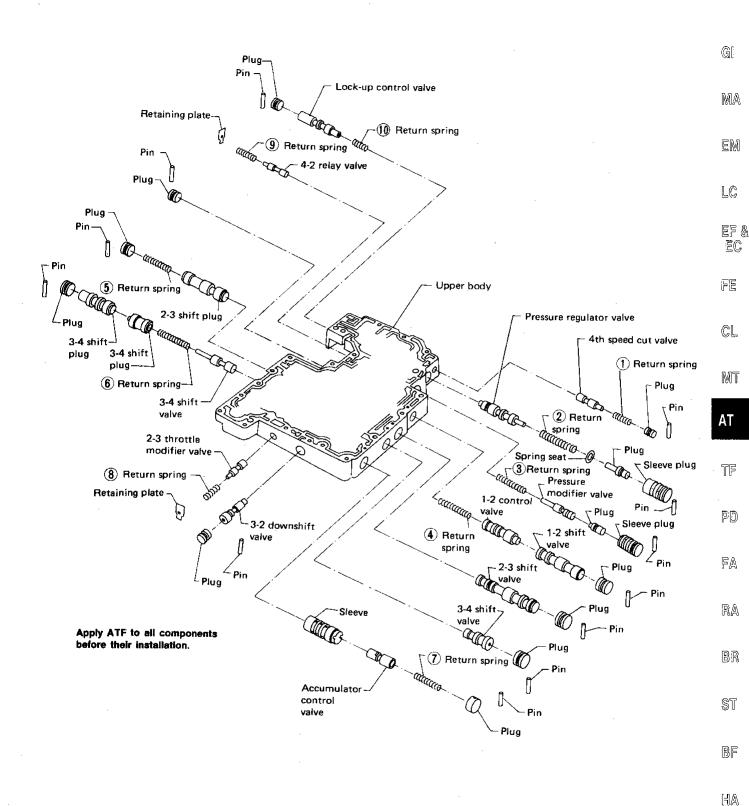
AT-155

Control Valve Upper Body — RE4R01A (Cont'd)

Insert retainer plate while pushing spring.

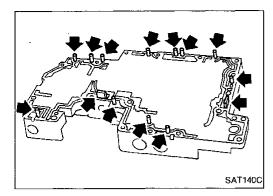


Control Valve Upper Body — RL4R01A



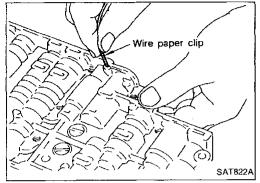
Numbers preceding valve springs correspond with those shown in Spring Chart on page AT-159.

SAT746GA □X

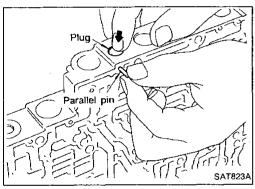


Control Valve Upper Body — RL4R01A (Cont'd) DISASSEMBLY

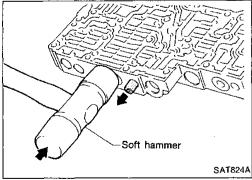
- 1. Remove valves at parallel pins.
- Do not use a magnetic hand.



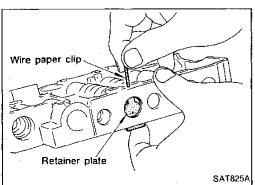
a. Use a wire paper clip to push out parallel pins.



- Remove parallel pins while pressing their corresponding plugs and sleeves.
- Remove plug slowly to prevent internal parts from jumping out.



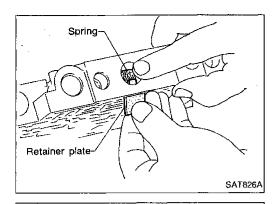
- c. Place mating surface of valve facedown, and remove inter-
- If a valve is hard to remove, place valve body facedown and lightly tap it with a soft hammer.
- Be careful not to drop or damage valves and sleeves.

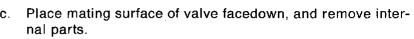


- 2. Remove valves at retainer plates.
- a. Pry out retainer plate with wire paper clip.

Control Valve Upper Body — RL4R01A (Cont'd)

b. Remove retainer plates while holding spring.





If a valve is hard to remove, lightly tap valve body with a soft hammer.

Be careful not to drop or damage valves, sleeves, etc.

EF &

LC

GI

AM

EM

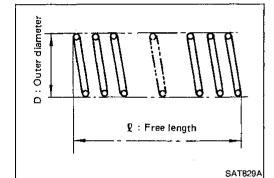
EC

FE

CL.

MT

ΑT



Soft hammer

SAT827A

INSPECTION

Valve springs

Measure free length and outer diameter of each valve spring. Also check for damage or deformation.

Numbers of each valve spring listed in table below are the same as those in the figure in AT-157.

TF

RA

BR

ST

85

HA

PD

Inspection standard

Unit: mm (in)

FA

Darta			Item				
	Parts	Part No.	l	D			
1	4th speed cut valve spring	31756-48X09	23.5 (0.925)	7.0 (0.276)	_		
2	Pressure regulator valve spring	31742-48X16	48.5 (1.909)	12.1 (0.476)			
3	Pressure modifier valve spring	31742-48X13	40.83 (1.6075)	8.0 (0.315)	_		
4	1-2 shift valve spring	31762-48X00	43.4 (1.709)	6.0 (0.236)	_		
<u>(5)</u>	2-3 shift valve spring	31762-48X01	42.7 (1.681)	9.0 (0.354)	_		
6	3-4 shift valve spring	31762-48X06	44.03 (1.7335)	8.0 (0.315)			
7	Accumulator control valve spring	31742-48X02	29.3 (1.154)	8.0 (0.315)			
8	2-3 throttle modifier valve spring	31742-41X21	33.0 (1.299)	6.5 (0.256)	_		
9	4-2 relay valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)	_		
10	Lock-up control valve spring	31742-48X07	20.0 (0.787)	5.45 (0.2146)			

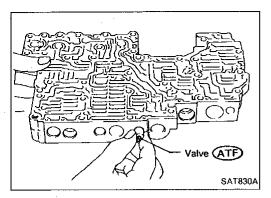
if deformed Replace valve springs or fatigued.

Control valves

Check sliding surfaces of valves, sleeves and plugs.

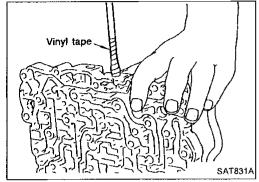
MX

EL

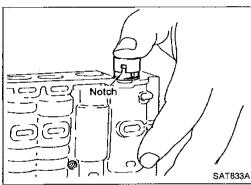


Control Valve Upper Body — RL4R01A (Cont'd) ASSEMBLY

- Lubricate the control valve body and all valves with ATF Install control valves by sliding them carefully into their bores.
- Be careful not to scratch or damage valve body.

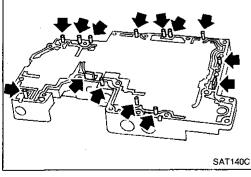


 Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.

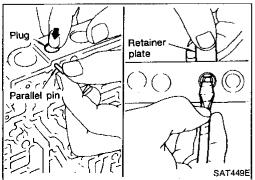


Accumulator control plug

- Align protrusion of accumulator control sleeve with notch in plug.
- Align parallel pin groove in plug with parallel pin, and install accumulator control valve.



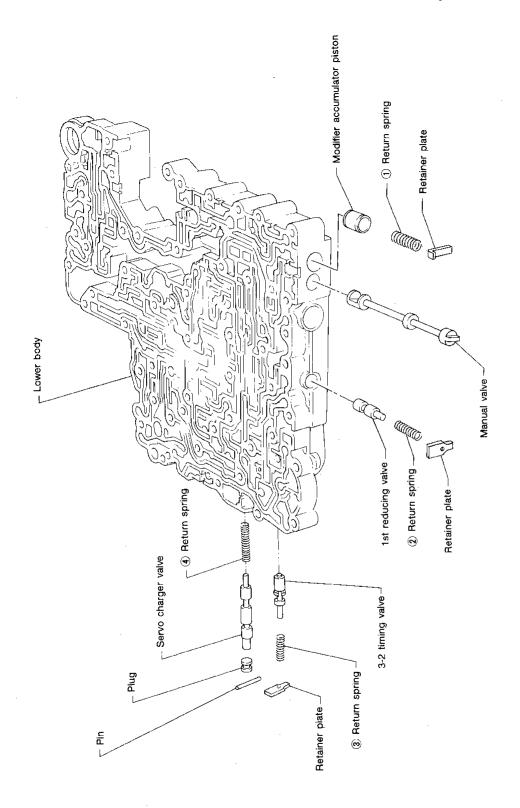
2. Install parallel pins and retainer plates.



- While pushing plug, install parallel pin.
- Insert retainer plate while pushing spring.

AT-160 708

Control Valve Lower Body — RE4R01A



Apply ATF to all components before their installation.

Numbers preceding valve springs correspond with those shown in Spring Chart on page AT-162.

SAT997GA

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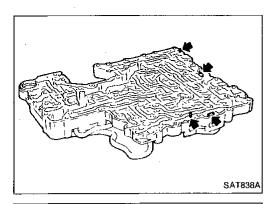
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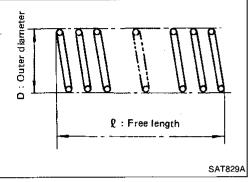
EL

IDX



Control Valve Lower Body — RE4R01A (Cont'd) DISASSEMBLY

- 1. Remove valves at parallel pins.
- Remove valves at retainer plates.
 For removal procedures, refer to "DISASSEMBLY" of Control Valve Upper Body (AT-152).



INSPECTION

Valve springs

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.
- Numbers of each valve spring listed in table below are the same as those in the figure in AT-161.

Inspection standard

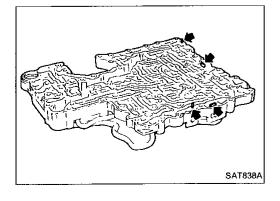
Unit: mm (in)

Parts			Item		
		Part No.	e	D	
①	Modifier accumulator valve spring	31742-27X70	31.4 (1.236)	9.8 (0.386)	
2	1st reducing valve spring	31756-41X05	25.4 (1.000)	6.75 (0.2657)	
3	3-2 timing valve spring	31742-41X08	20.55 (0.8091)	6.75 (0.2657)	
4	Servo charger valve spring	31742-41X06	23.0 (0.906)	6.7 (0.264)	

Replace valve springs if deformed or fatigued.

Control valves

 Check sliding surfaces of control valves, sleeves and plugs for damage.

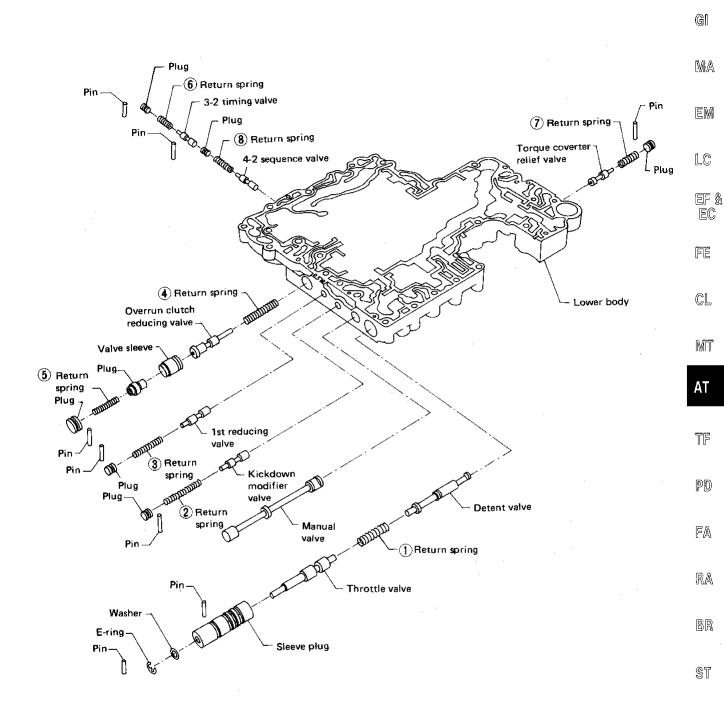


ASSEMBLY

Install control valves.
 For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body (AT-154).

AT-162 710

Control Valve Lower Body — RL4R01A



Apply ATF to all components before their installation,

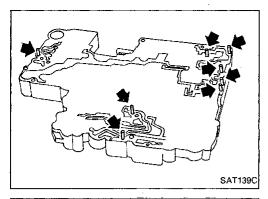
Numbers preceding valve springs correspond with those shown in Spring Chart on page AT-164.

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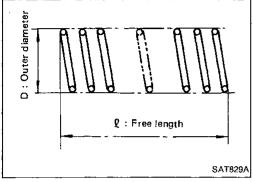
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Control Valve Lower Body — RL4R01A (Cont'd) DISASSEMBLY

- 1. Remove valves at parallel pins.
- Remove valves at retainer plates.
 For removal procedures, refer to "DISASSEMBLY" of Control Valve Upper Body (AT-157).



INSPECTION

Valve springs

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.
- Numbers of each valve spring listed in table below are the same as those in the figure in AT-163.

Inspection standard

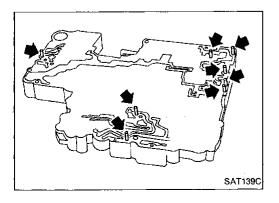
Unit: mm (in)

Parts		Item			
		Part No.		D	
①	Throttle valve & detent valve spring	31802-48X02	34.23 (1.3476)	11.0 (0.433)	
2	Kickdown modifier valve spring	31756-48X01	45.3 (1.783)	7.0 (0.276)	
3	1st reducing valve spring	31756-48X08	29.7 (1.169)	7.2 (0.283)	
4	Overrun clutch reducing valve spring	31742-48X04	45.0 (1.772)	7.45 (0.2933)	
<u> </u>	Overrun clutch reducing valve spring	31742-48X05	31.0 (1.220)	5.2 (0.205)	
6	3-2 timing valve spring	31742-48X15	23.0 (0.906)	7.0 (0.276)	
7	Torque converter relief valve spring	31742-41X23	38.0 (1.496)	9.0 (0.354)	
8	4-2 sequence valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)	

• Replace valve springs if deformed or fatigued.

Control valves

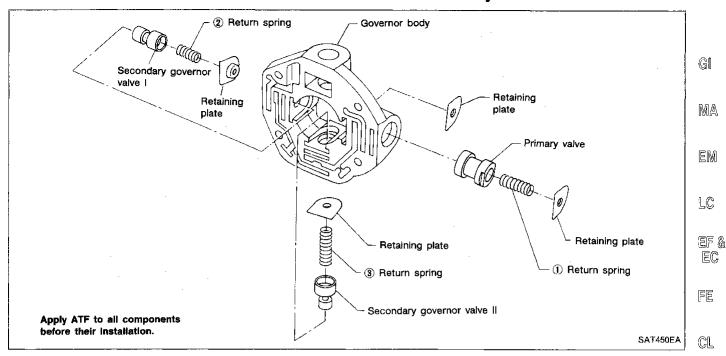
 Check sliding surfaces of control valves, sleeves and plugs for damage.



ASSEMBLY

Install control valves.
 For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body (AT-160).

Governor Valve Assembly — RL4R01A



INSPECTION

Governor valves and valve body

Check governor valves and valve body for indication of burning or scratches.

Outer diameter 2 : Free length SAT829A

Valve springs

Measure free length and outer diameter of each valve FA Also check for damage or deformation.

Inspection standard

			Unit: mm (in)	. Br
Donto		Item		
Paris	Part No.	e	· D	HA
or valve spring	31742-48X11	19.1 (0.752)	9.05 (0.3563)	
or valve spring I	31742-48X09	30.58 (1.2039)	9.2 (0.362)	El
or valve spring II	31742-48X10	16.79 (0.6610)	9.0 (0.354)	الخ الح
	or valve spring I	Part No. or valve spring 31742-48X11 or valve spring I 31742-48X09	Parts Part No. € or valve spring 31742-48X11 19.1 (0.752) or valve spring I 31742-48X09 30.58 (1.2039)	Parts Part No. ℓ D or valve spring 31742-48X11 19.1 (0.752) 9.05 (0.3563) or valve spring I 31742-48X09 30.58 (1.2039) 9.2 (0.362)

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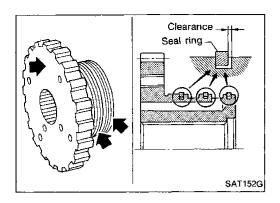
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Oil Distributor

INSPECTION

- Check contacting surface of oil distributor and ring groove areas for wear.
- Measure clearance between seal ring and ring groove.

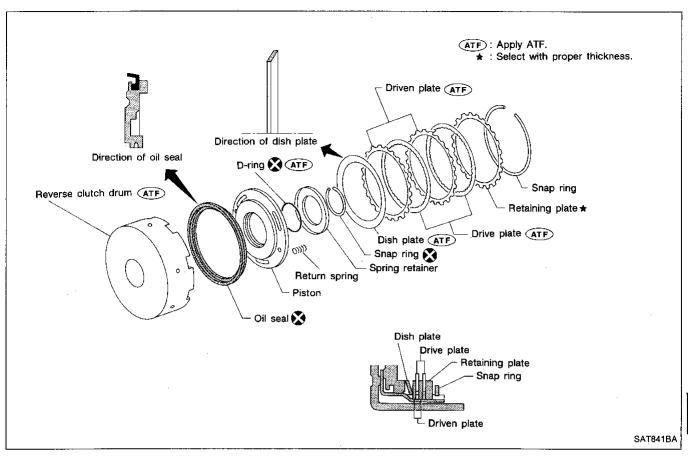
Standard clearance:

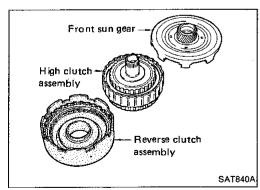
0.15 - 0.40 mm (0.0059 - 0.0157 in)

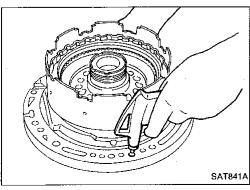
Wear limit:

0.40 mm (0.0157 in)

Reverse Clutch — RE4R01A and RL4R01A







DISASSEMBLY

Remove reverse clutch assembly from clutch pack.

Check operation of reverse clutch.

- Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
- Check to see that retaining plate moves to snap ring.
- If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.

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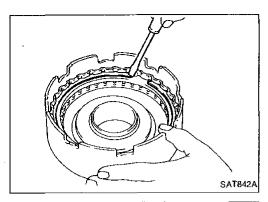
BR

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BF

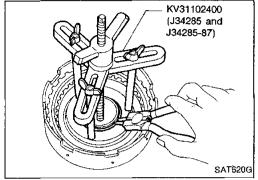
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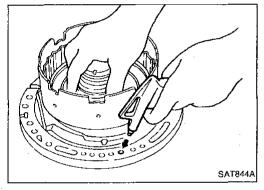


Reverse Clutch — RE4R01A and RL4R01A (Cont'd)

3. Remove drive plates, driven plates, retaining plate, dish plate and snap ring.



- 4. Remove snap ring from clutch drum while compressing clutch springs.
- Do not expand snap ring excessively.
- Remove spring retainer and return spring.

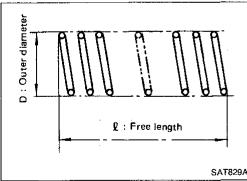


- Install seal ring onto oil pump cover and install reverse clutch drum. While holding piston, gradually apply compressed air to oil hole until piston is removed.
- Do not apply compressed air abruptly.
- 7. Remove D-ring and oil seal from piston.

INSPECTION

Reverse clutch snap ring and spring retainer

Check for deformation, fatigue or damage.



Reverse clutch return springs

 Check for deformation or damage. Also measure free length and outside diameter.

Inspection standard

	<u></u>	Unit: mm (in)
Part No.	E	D
31505-41X02	19.69 (0.7752)	11.6 (0.457)



- Check facing for burns, cracks or damage.
- Measure thickness of facing.

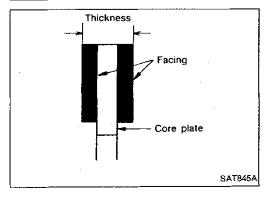
Thickness of drive plate:

Standard value 1.90 - 2.05 mm (0.0748 - 0.0807 in) Wear limit 1.80 mm (0.0709 in)

If not within wear limit, replace.

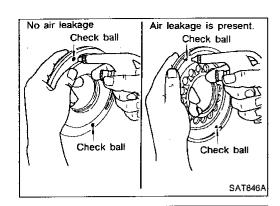
Reverse clutch dish plate

Check for deformation or damage.



AT-168

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Reverse Clutch — RE4R01A and RL4R01A (Cont'd)

Reverse clutch piston

- Shake piston to assure that balls are not seized.
- Apply compressed air to check ball oil hole opposite the return spring to assure that there is no air leakage.
 - Also apply compressed air to oil hole on return spring side to assure that air leaks past ball.

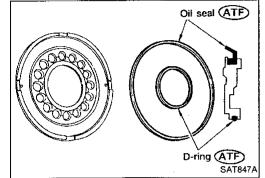


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ASSEMBLY

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- Install D-ring and oil seal on piston.
- Apply ATF to both parts.



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- Install piston assembly by turning it slowly and evenly.
- Apply ATF to inner surface of drum.



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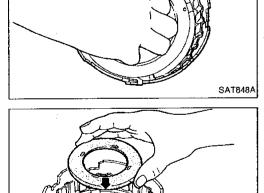
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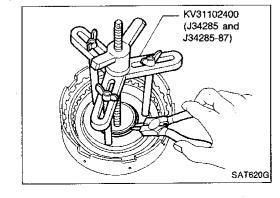
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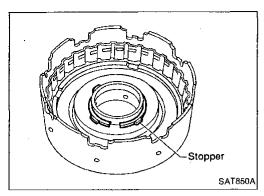
EL





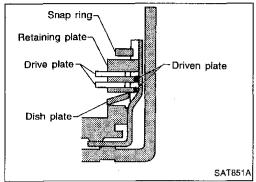


Install snap ring while compressing clutch springs.

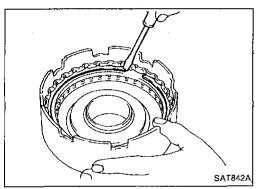


Reverse Clutch — RE4R01A and RL4R01A (Cont'd)

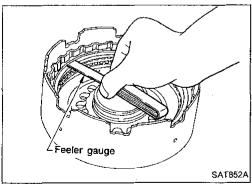
• Do not align snap ring gap with spring retainer stopper.



5. Install drive plates, driven plates, retaining plate and dish plate.



6. Install snap ring.



Measure clearance between retaining plate and snap ring.
 If not within allowable limit, select proper retaining plate.

Specified clearance:

Standard

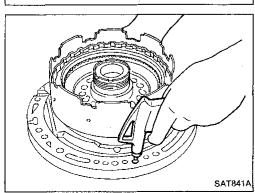
0.5 - 0.8 mm (0.020 - 0.031 in)

Allowable limit

1.2 mm (0.047 in)

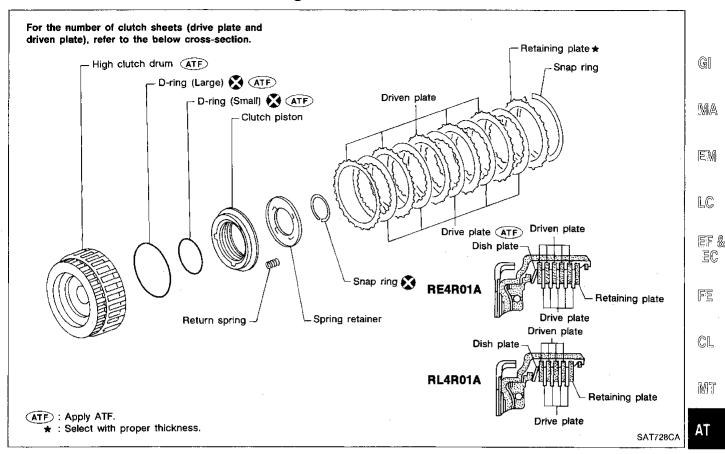
Retaining plate:

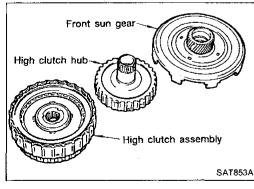
Refer to SDS (AT-215).

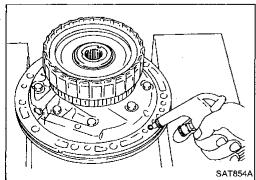


Check operation of reverse clutch.
 Refer to "DISASSEMBLY" of Reverse Clutch (AT-167).

High Clutch — RE4R01A and RL4R01A







Service procedures for high clutch are essentially the same as those for reverse clutch, with the following exception:

Check of high clutch operation

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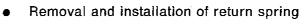
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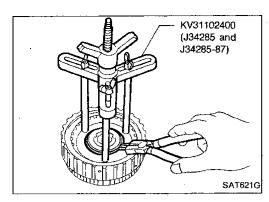
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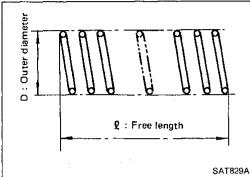
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AT-171

High Clutch — RE4R01A and RL4R01A (Cont'd)

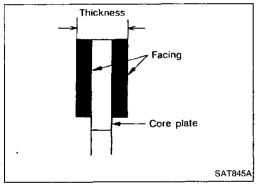


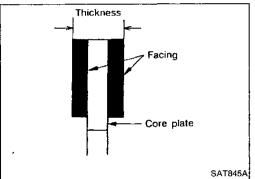


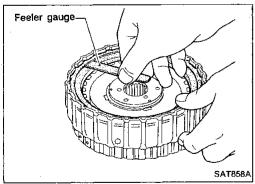


•	Inspection	of high	clutch	return	springs
Insp	pection star	ıdard			

		Unit: mm (in)
Part No.	e	. D
31505-21X03	22.06 (0.8685)	11.6 (0.457)







Inspection of high clutch drive plate Thickness of drive plate: Standard 1.52 - 1.67 mm (0.0598 - 0.0657 in) Wear limit 1.40 mm (0.0551 in)

Measurement of clearance between retaining plate and snap ring

Specified clearance:

Standard

1.8 - 2.2 mm (0.071 - 0.087 in)

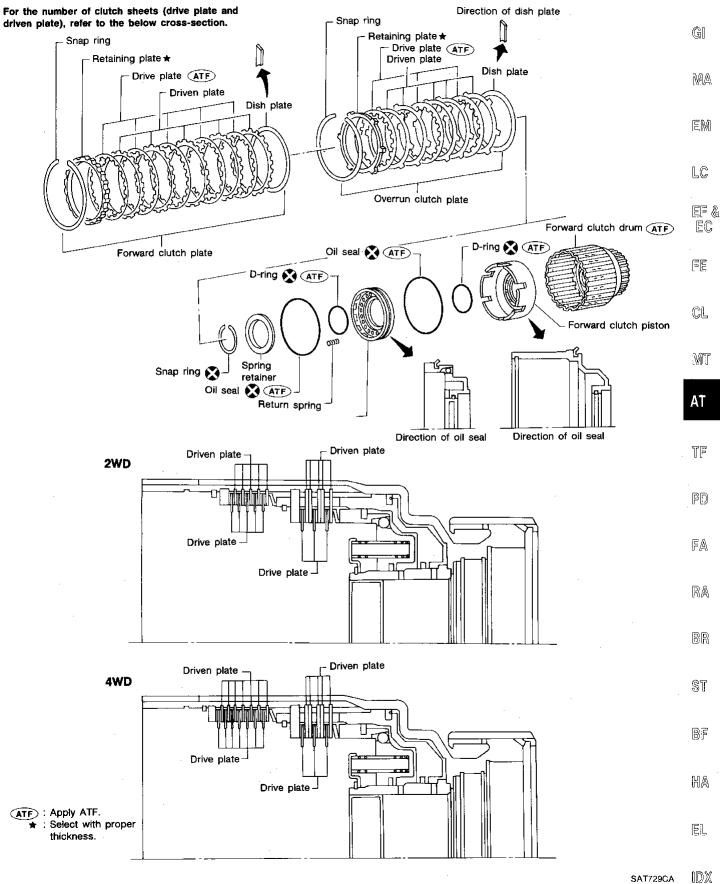
Allowable limit

2.8 mm (0.110 in)

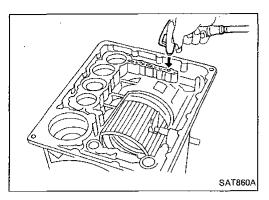
Retaining plate:

Refer to SDS (AT-215).

Forward and Overrun Clutches — RE4R01A and RL4R01A



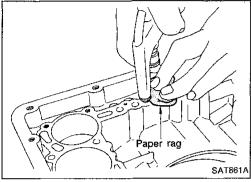
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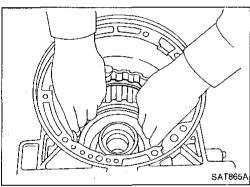
Forward and Overrun Clutches — RE4R01A and RL4R01A (Cont'd)

Service procedures for forward and overrun clutches are essentially the same as those for reverse clutch, with the following exception:

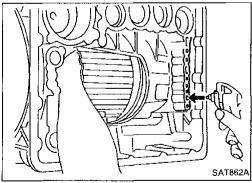
· Check of forward clutch operation.



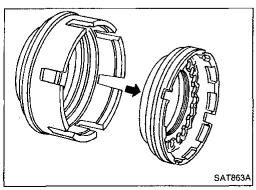
· Check of overrun clutch operation.



 Removal of forward clutch drum
 Remove forward clutch drum from transmission case by holding snap ring.

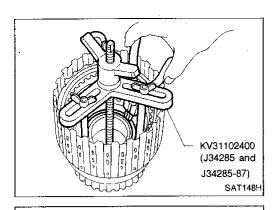


Removal of forward clutch and overrun clutch pistons
While holding overrun clutch piston, gradually apply compressed air to oil hole.



2. Remove overrun clutch from forward clutch.

AT-174 722



2: Free length

Facing

Core plate

Facing

Core plate

Thickness

Thickness

SAT829A

SAT845A

Outer diameter

Forward and Overrun Clutches — RE4R01A and RL4R01A (Cont'd)

Removal and installation of return springs

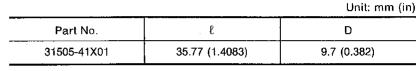


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Inspection of forward clutch and overrun clutch return springs

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Inspection standard



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Inspection of forward clutch drive plates Thickness of drive plate:

Standard

1.90 - 2.05 mm (0.0748 - 0.0807 in)

Wear limit

1.80 mm (0.0709 in)

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Inspection of overrun clutch drive plates

Thickness of drive plate: **Standard**

1.90 - 2.05 mm (0.0748 - 0.0807 in)

Wear limit

1.80 mm (0.0709 in)

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Installation of forward clutch piston and overrun clutch pis-

Install forward clutch piston by turning it slowly and evenly.

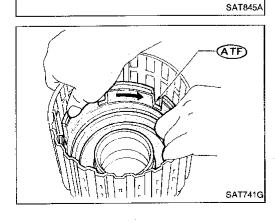
Apply ATF to inner surface of clutch drum.

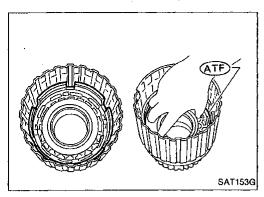
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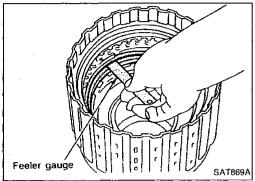
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Forward and Overrun Clutches — RE4R01A and RL4R01A (Cont'd)

- Align notch in forward clutch piston with groove in forward clutch drum.
- 2. Install overrun clutch by turning it slowly and evenly.
- Apply ATF to inner surface of forward clutch piston.



 Measurement of clearance between retaining plate and snap ring of overrun clutch

Specified clearance:

Standard

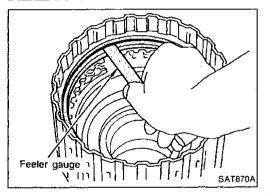
1.0 - 1.4 mm (0.039 - 0.055 in)

Allowable limit

2.0 mm (0.079 in)

Retaining plate:

Refer to SDS (AT-216).



 Measurement of clearance between retaining plate and snap ring of forward clutch

Specified clearance:

Standard

0.45 - 0.85 mm (0.0177 - 0.0335 in)

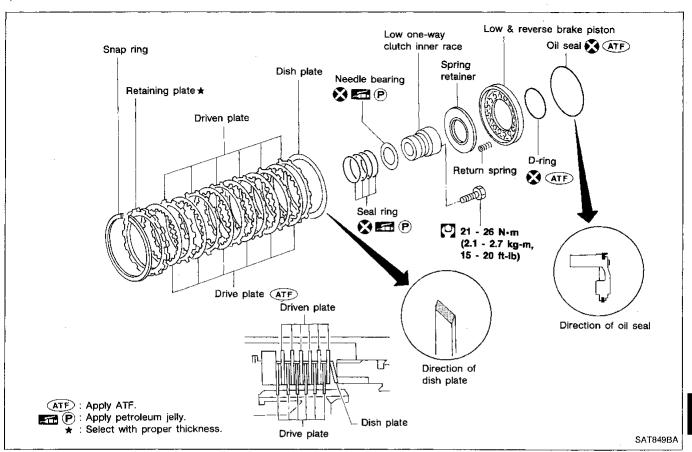
Allowable limit

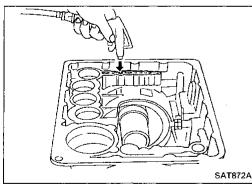
Refer to SDS (AT-215).

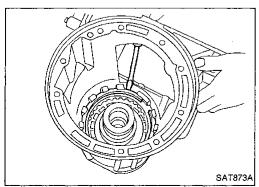
Retaining plate:

Refer to SDS (AT-215).

Low & Reverse Brake — RE4R01A and RL4R01A







DISASSEMBLY

1. Check operation of low & reverse brake.

Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.

b. Check to see that retaining plate moves to snap ring.

c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.

Remove snap ring, low & reverse brake drive plates, driven plates and dish plate.

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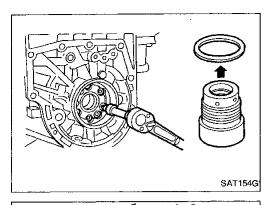
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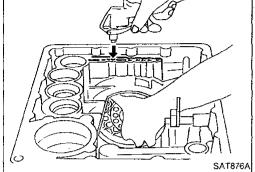
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Low & Reverse Brake — RE4R01A and RL4R01A (Cont'd)

- 3. Remove low one-way clutch inner race, spring retainer and return spring from transmission case.
- 4. Remove seal rings from low one-way clutch inner race.
- Remove needle bearing from low one-way clutch inner race.

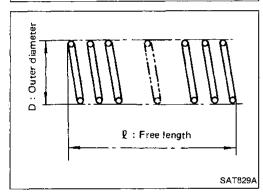


- 6. Remove low & reverse brake piston using compressed air.
- 7. Remove oil seal and D-ring from piston.

INSPECTION

Low & reverse brake snap ring and spring retainer

Check for deformation, or damage.

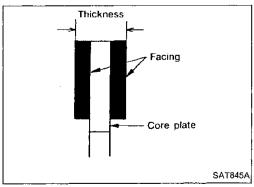


Low & reverse brake return springs

 Check for deformation or damage. Also measure free length and outside diameter.

Inspection standard

		Unit: mm (i
Part No.	l	D
31521-21X00	23.7 (0.933)	11.6 (0.457)



Low & reverse brake drive plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate:

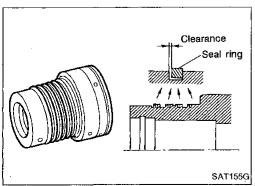
Standard value

1.90 - 2.05 mm (0.0748 - 0.0807 in)

Wear limit

1.8 mm (0.071 in)

If not within wear limit, replace.



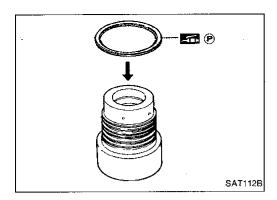
Low one-way clutch inner race

- Check frictional surface of inner race for wear or damage.
- Install a new seal rings onto low one-way clutch inner race.
- Be careful not to expand seal ring gap excessively.
- Measure seal ring-to-groove clearance.

Inspection standard:

Standard value 0.10 - 0.25 mm (0.0039 - 0.0098 in) Allowable limit 0.25 mm (0.0098 in)

 If not within allowable limit, replace low one-way clutch inner race.

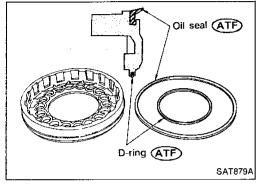


Low & Reverse Brake — RE4R01A and RL4R01A (Cont'd)

ASSEMBLY

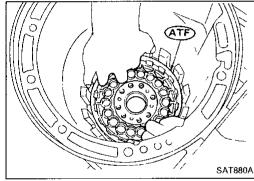
- Install bearing onto one-way clutch inner race.
- Pay attention to its direction --- Black surface goes to rear





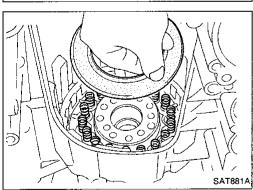
Install oil seal and D-ring onto piston.

Apply ATF to oil seal and D-ring.



Install piston by rotating it slowly and evenly.

Apply ATF to inner surface of transmission case.



Driven plate

Drive plate

Dish plate

SAT850B

Install return springs, spring retainer and low one-way clutch inner race onto transmission case.

Install dish plate low & reverse brake drive plates, driven

plates and retaining plate.

Install snap ring on transmission case.

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AT-179



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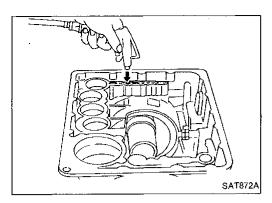






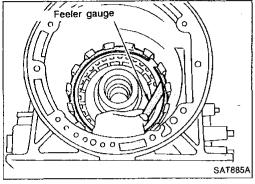
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Low & Reverse Brake — RE4R01A and RL4R01A (Cont'd)

7. Check operation of low & reverse brake clutch piston. Refer to "DISASSEMBLY" (AT-177).



Measure clearance between retaining plate and snap ring.
 If not within allowable limit, select proper retaining plate.
 Specified clearance:

Standard

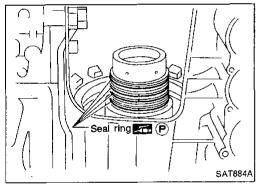
1.1 - 1.5 mm (0.043 - 0.059 in)

Allowable limit

2.3 mm (0.091 in)

Retaining plate:

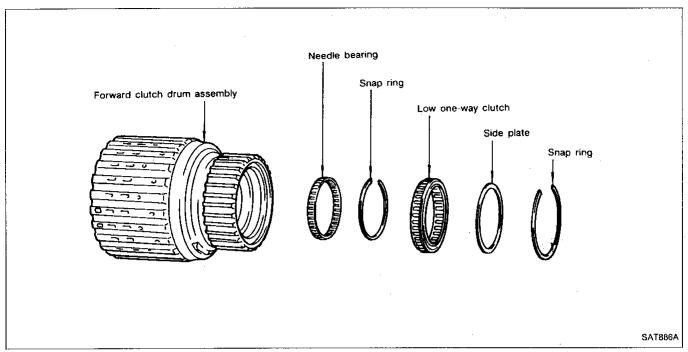
Refer to SDS (AT-216).

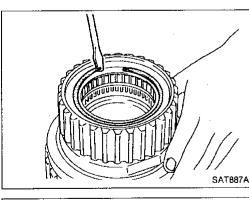


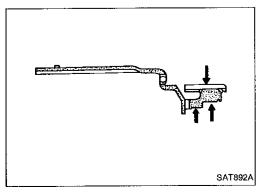
- 9. Install low one-way clutch inner race seal ring.
- Apply petroleum jelly to seal ring.
- Make sure seal rings are pressed firmly into place and held by petroleum jelly.

728

Forward Clutch Drum Assembly — RE4R01A and RL4R01A







DISASSEMBLY

- Remove snap ring from forward clutch drum.
- Remove side plate from forward clutch drum.
- Remove low one-way clutch from forward clutch drum.
- Remove snap ring from forward clutch drum.
- Remove needle bearing from forward clutch drum.

INSPECTION

Forward clutch drum

- Check spline portion for wear or damage.
- Check frictional surfaces of low one-way clutch and needle bearing for wear or damage.

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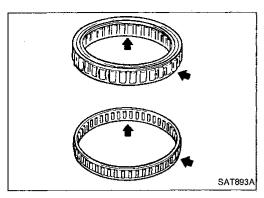
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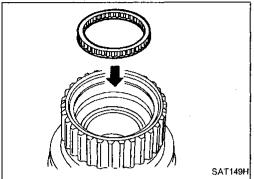
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Forward Clutch Drum Assembly — RE4R01A and RL4R01A (Cont'd)

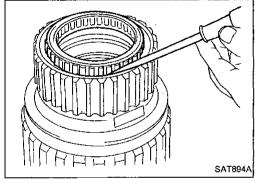
Needle bearing and low one-way clutch

Check frictional surface for wear or damage.

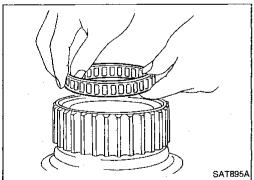


ASSEMBLY

- 1. Install needle bearing in forward clutch drum.
- 2. Install snap ring onto forward clutch drum.

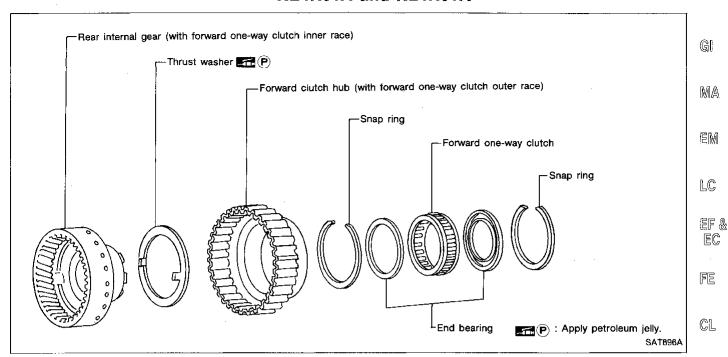


3. Install low one-way clutch onto forward clutch drum by pushing the roller in evenly.



- Install low one-way clutch with flange facing rearward.
- 4. Install side plate onto forward clutch drum.
- 5. Install snap ring onto forward clutch drum.

Rear Internal Gear and Forward Clutch Hub -RE4R01A and RL4R01A



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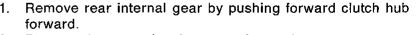
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DISASSEMBLY

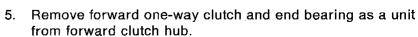


- Remove thrust washer from rear internal gear.
- Remove snap ring from forward clutch hub.

RA

Remove end bearing

BR



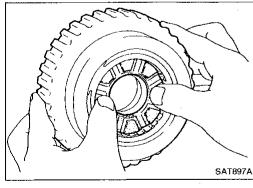
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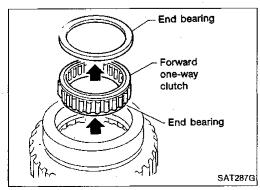
Remove snap ring from forward clutch hub.

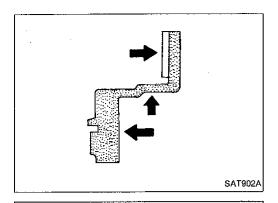
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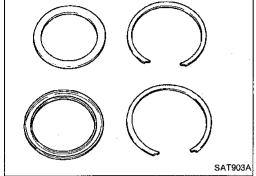




Rear Internal Gear and Forward Clutch Hub — RE4R01A and RL4R01A (Cont'd) INSPECTION

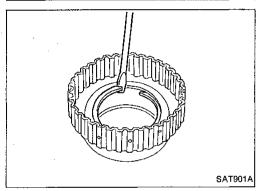
Rear internal gear and forward clutch hub

- Check gear for excessive wear, chips or cracks.
- Check frictional surfaces of forward one-way clutch and thrust washer for wear or damage.
- Check spline for wear or damage.



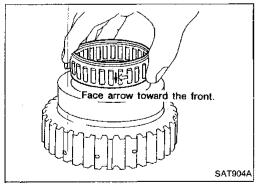
Snap ring and end bearing

Check for deformation or damage.

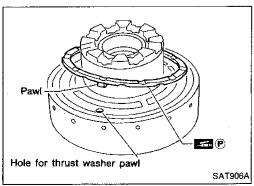


ASSEMBLY

- 1. Install snap ring onto forward clutch hub.
- 2. Install end bearing.

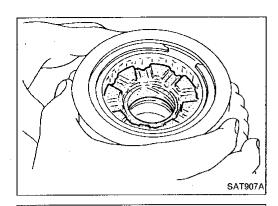


- 3. Install forward one-way clutch onto clutch hub.
- Install forward one-way clutch with flange facing rearward.
- 4. Install end bearing.
- 5. Install snap ring onto forward clutch hub.



- 6. Install thrust washer onto rear internal gear.
- · Apply petroleum jelly to thrust washer.
- Securely insert pawls of thrust washer into holes in rear internal gear.

AT-184 732



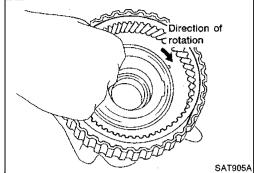
Rear Internal Gear and Forward Clutch Hub — RE4R01A and RL4R01A (Cont'd)

7. Position forward clutch hub in rear internal gear.



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8. After installing, check to assure that forward clutch hub rotates clockwise.



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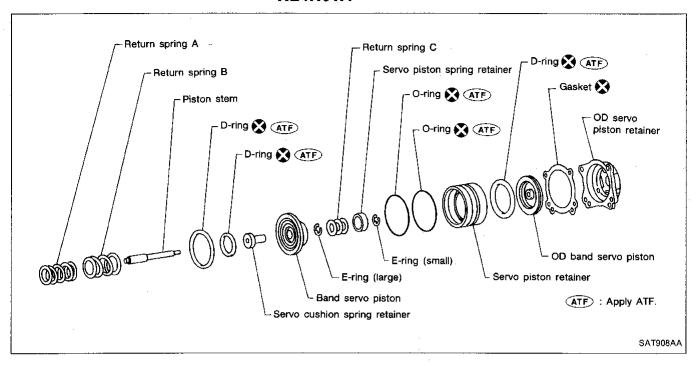
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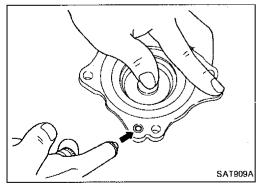
IDX

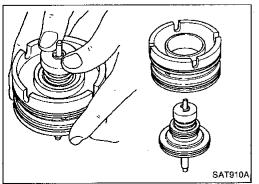
AT-185

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Band Servo Piston Assembly — RE4R01A and RL4R01A





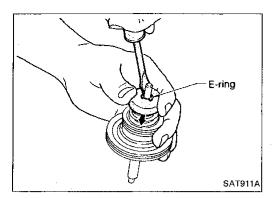


DISASSEMBLY

- Block one oil hole in OD servo piston retainer and the center hole in OD band servo piston.
- Apply compressed air to the other oil hole in piston retainer to remove OD band servo piston from retainer.
- 3. Remove D-ring from OD band servo piston.

4. Remove band servo piston assembly from servo piston retainer by pushing it forward.

AT-186 734



Band Servo Piston Assembly — RE4R01A and RL4R01A (Cont'd)

5. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.

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6. Remove servo piston spring retainer, return spring C and piston stem from band servo piston.

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Remove E-ring from band servo piston.

Remove servo cushion spring retainer from band servo

9. Remove D-rings from band servo piston.

10. Remove O-rings from servo piston retainer.

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Servo cushion spring retainer

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Spring B

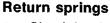
SAT914A

Check frictional surfaces for abnormal wear or damage.

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Check for deformation or damage. Measure free length and SF outer diameter.

Inspection standard

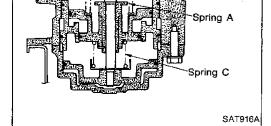
Unit: mm (in)

HA

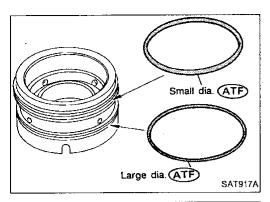
EL

Parts	Free length	Outer diameter
Spring A	45.6 (1.795)	34.3 (1.350)
Spring B	53.8 (2.118)	40.3 (1.587)
Spring C	29.7 (1.169)	27.6 (1.087)

(in)X



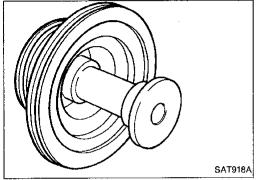
AT-187



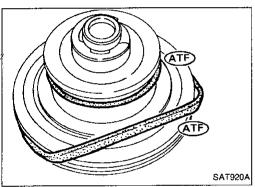
Band Servo Piston Assembly — RE4R01A and RL4R01A (Cont'd)

ASSEMBLY

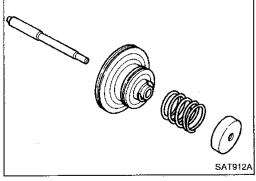
- 1. Install O-rings onto servo piston retainer
- Apply ATF to O-rings.
- Pay attention to position of each O-ring.



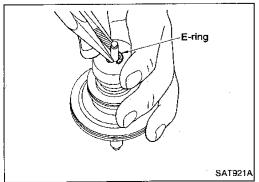
Install servo cushion spring retainer onto band servo piston.



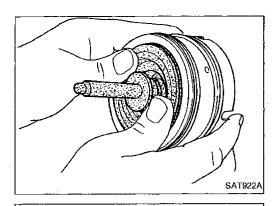
- 3. Install E-ring onto servo cushion spring retainer.
- 4. Install D-rings onto band servo piston.
- Apply ATF to D-rings.



5. Install servo piston spring retainer, return spring C and piston stem onto band servo piston.



Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.



Band Servo Piston Assembly — RE4R01A and RL4R01A (Cont'd)

7. Install band servo piston assembly onto servo piston retainer by pushing it inward.

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. Install D-ring on OD band servo piston.

• Apply ATF to D-ring.

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SAT924A

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Install OD band servo piston onto servo piston retainer by pushing it inward.

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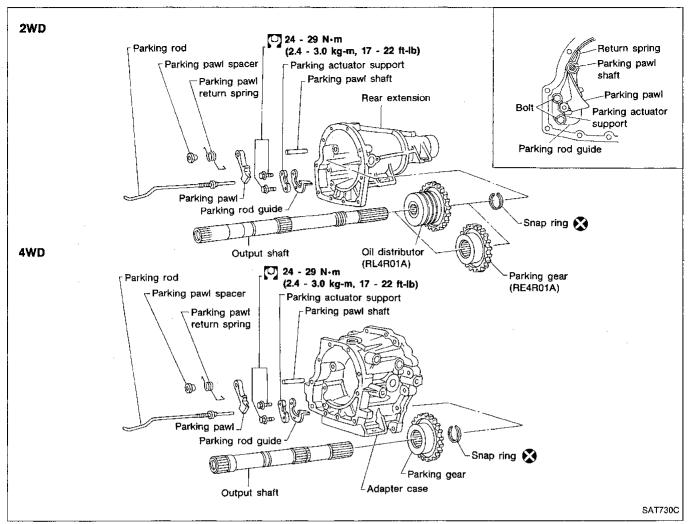
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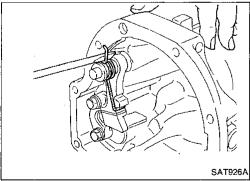
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AT-189

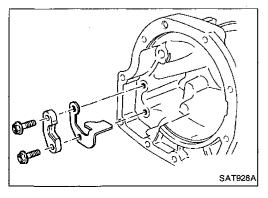
Parking Pawl Components — RE4R01A and RL4R01A



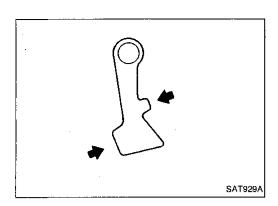




- 1. Slide return spring to the front of rear extension case flange or adapter case flange.
- Remove return spring, pawl spacer and parking pawl from rear extension or adapter case.
- Remove parking pawl shaft from rear extension or adapter case.



 Remove parking actuator support and rod guide from rear extension or adapter case.



Parking Pawl Components — RE4R01A and RL4R01A (Cont'd)

INSPECTION

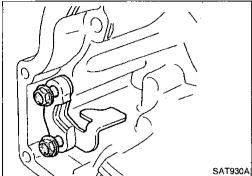
Parking pawl and parking actuator support

Check contact surface of parking rod for wear.



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ASSEMBLY

Install rod guide and parking actuator support onto rear LC extension or adapter case.

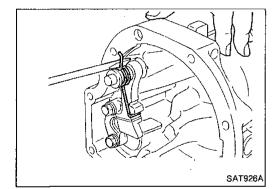
Insert parking pawl shaft into rear extension or adapter case.

EF & EC

Install return spring, pawl spacer and parking pawl onto parking pawl shaft.

FE





Bend return spring upward and install it onto rear extension or adapter case.

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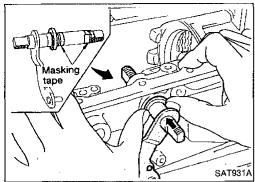
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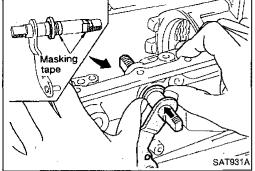
EL

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AT-191

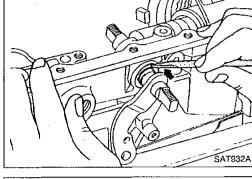
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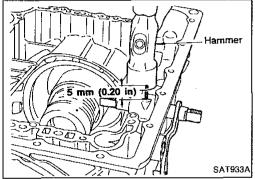


Assembly (1)

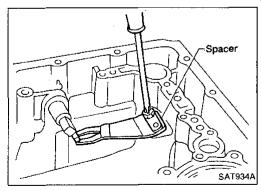
- RE4R01A and RL4R01A —
- 1. Install manual shaft components.
- Install oil seal onto manual shaft.
- Apply ATF to oil seal.
- Wrap threads of manual shaft with masking tape.
- Insert manual shaft and oil seal as a unit into transmission
- C. Remove masking tape.
- d. Push oil seal evenly and install it onto transmission case.



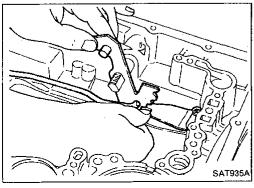
Align groove in shaft with drive pin hole, then drive pin into position as shown in figure at left.



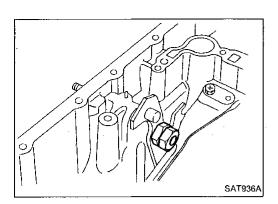
Install detent spring and spacer.



While pushing detent spring down, install manual plate onto manual shaft.



AT-192



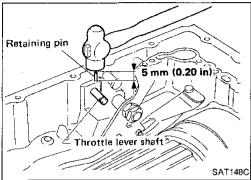
h. Install lock nuts onto manual shaft.



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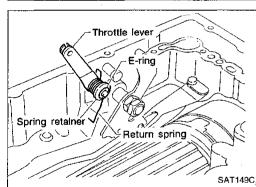
— RL4R01A —

- 2. Install throttle lever components.
- a. Install throttle lever shaft.
- b. Align groove in shaft with drive pin hole, then drive pin into position as shown in figure at left.



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c. Install throttle lever, return spring, spring retainer and E-ring.



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d. Install throttle wire.

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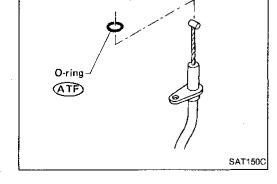
SAT135C

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AT-193

Front -

piston D

Accumulator piston C

Accumulator

SAT937A

SAT938A

Accumulator

piston B

piston A

Assembly (1) (Cont'd)

--- RE4R01A and RL4R01A ---

- 3. Install accumulator piston.
- a. Install O-rings onto accumulator piston.
- Apply ATF to O-rings.

Accumulator piston O-rings

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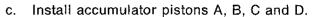
Accumulator	Α	В	С	D
Small diameter end	29 (1.14)	32 (1.26)	45 (1.77)	29 (1.14)
Large diameter end	45 (1.77)	50 (1.97)	50 (1.97)	45 (1.77)

b. Install return spring for accumulator A onto transmission case.

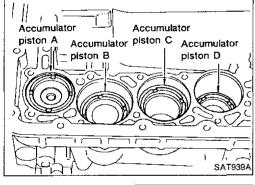
Free length of return spring

	mm	

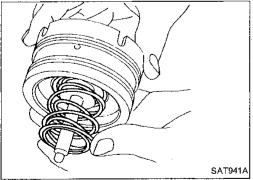
Accumulator	A
Free length	43 (1.69)



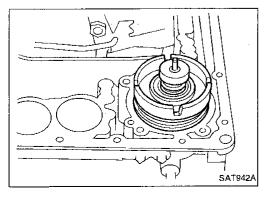
Apply ATF to transmission case.

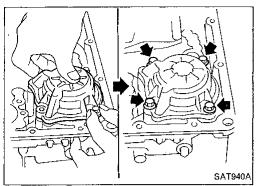


- 4. Install band servo piston.
- a. Install return springs onto servo piston.

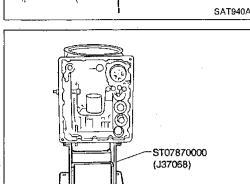


- b. Install band servo piston onto transmission case.
- Apply ATF to O-ring of band servo piston and transmission case.
- c. Install gasket for band servo onto transmission case.

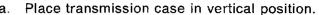


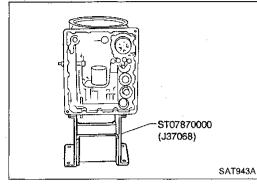


d. Install band servo retainer onto transmission case.

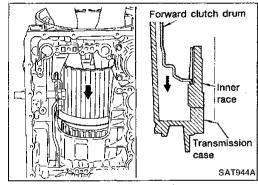


Install rear side clutch and gear components.

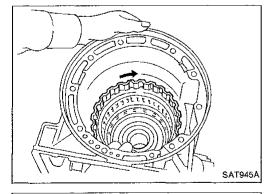




Slightly lift forward clutch drum assembly and slowly rotate it clockwise until its hub passes fully over the clutch inner race inside transmission case.

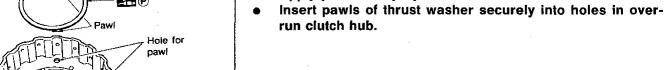


Check to be sure that rotation direction of forward clutch assembly is correct.



Install thrust washer onto front of overrun clutch hub.

Apply petroleum jelly to the thrust washer.



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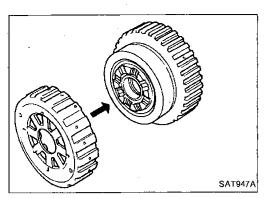




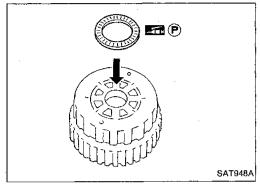




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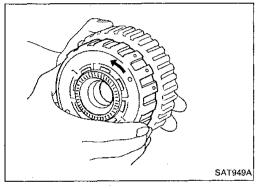


e. Install overrun clutch hub onto rear internal gear assembly.

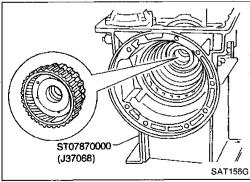


f. Install needle bearing onto rear of overrun clutch hub.

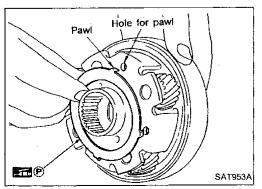




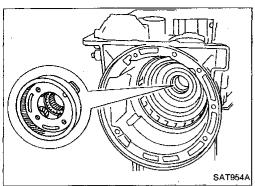
g. Check that overrun clutch hub rotates as shown while holding forward clutch hub.



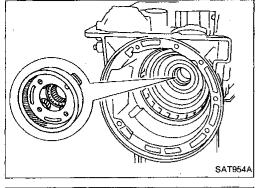
- h. Place transmission case into horizontal position.
- i. Install rear internal gear, forward clutch hub and overrun clutch hub as a unit onto transmission case.



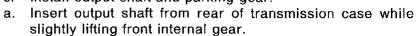
- j. Install needle bearing onto rear internal gear.
- Apply petroleum jelly to needle bearing.
- k. Install bearing race onto rear of front internal gear.
- Apply petroleum jelly to bearing race.
- Securely engage pawls of bearing race with holes in front internal gear.



Install front internal gear on transmission case.



Install output shaft and parking gear.



Do not force output shaft against front of transmission case.



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Carefully push output shaft against front of transmission case. Install snap ring on front of output shaft.

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Check to be sure output shaft cannot be removed in rear direction.



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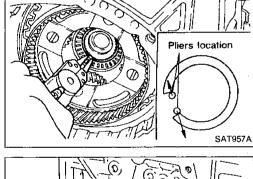
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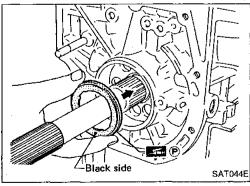
Install needle bearing on transmission case.

Pay attention to its direction — Black side goes to rear.

Apply petroleum jelly to needle bearing.



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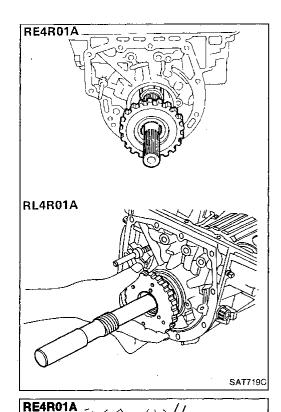
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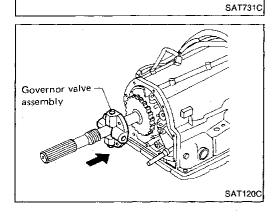
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d. Install parking gear on transmission case.



- RL4R01A
- e. Install snap ring on rear of output shaft.
- Check to be sure output shaft cannot be removed in forward direction.



--- RL4R01A ----

. Install governor valve assembly on oil distributor.

2WD

2WD

4WD

4WD

(J26082)

Assembly (1) (Cont'd)



- 7. Install rear extension or adapter case.
- Install oil seal on rear extension or adapter case.
- Apply ATF to oil seal.

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SAT147G

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- Install O-ring on revolution sensor. Apply ATF to O-ring.
- Install revolution sensor on rear extension or adapter case.

Install adapter case gasket or rear extension case gasket

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on transmission case.

Install parking rod on transmission case.

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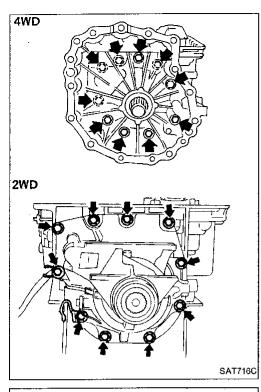
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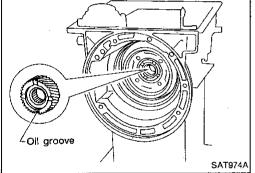


Assembly (1) (Cont'd)

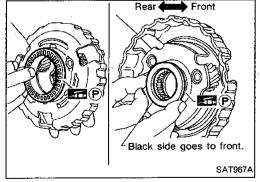
f. Install rear extension or adapter case on transmission case.



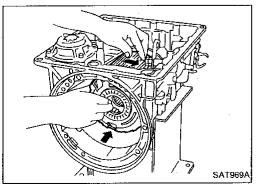
- 8. Install front side clutch and gear components.
- a. Install rear sun gear on transmission case.
- Pay attention to its direction.



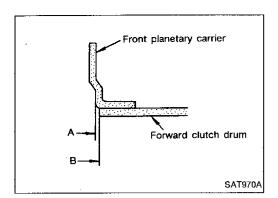
- b. Install needle bearing on front of front planetary carrier.
- Apply petroleum jelly to needle bearing.
- c. Install needle bearing on rear of front planetary carrier.
- Apply petroleum jelly to needle bearing.
- Pay attention to its direction Black side goes to front.



d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.



AT-200 748



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Assembly (1) (Cont'd)

 Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly.

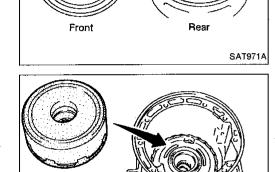


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- e. Install bearing races on front and rear of clutch pack.
- Apply petroleum jelly to bearing races.
- Securely engage pawls of bearing races with holes in clutch pack.
- f. Place transmission case in vertical position.



g. Install clutch pack into transmission case.



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Adjustment

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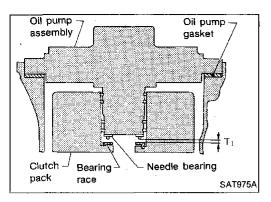
When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

	Item		
Part name	Total end play	Reverse clutch end play	
Transmission case	•	•	
Low one-way clutch inner race	•	•	
Overrun clutch hub	•	•	
Rear internal gear	•	•	
Rear planetary carrier	•	•	
Rear sun gear	•	•	
Front planetary carrier	•	•	
Front sun gear	•	•	
High clutch hub	•	•	
High clutch drum	•	•	
Oil pump cover	•	•	
Reverse clutch drum		•	

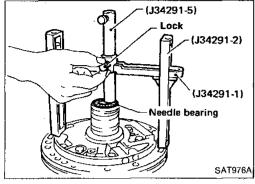
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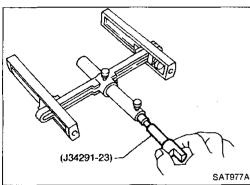
Adjustment (Cont'd)



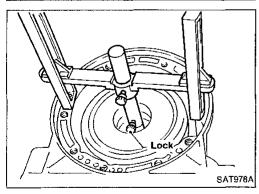
Adjust total end play.
 Total end play "T₁":
 0.25 - 0.55 mm (0.0098 - 0.0217 in)



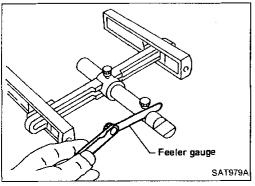
a. With needle bearing installed, place J34291-1 (bridge), J34291-2 (legs) and the J34291-5 (gauging cylinder) onto oil pump. The long ends of legs should be placed firmly on machined surface of oil pump assembly and gauging cylinder should rest on top of the needle bearing. Lock gauging cylinder in place with set screw.



b. Install J34291-23 (gauging plunger) into gauging cylinder.



c. With original bearing race installed inside reverse clutch drum, place shim selecting gauge with its legs on machined surface of transmission case (no gasket) and allow gauging plunger to rest on bearing race. Lock gauging plunger in place with set screw.



d. Remove Tool and use feeler gauge to measure gap between gauging cylinder and gauging plunger. This measurement should give exact total end play.

Total end play "T₁":

0.25 - 0.55 mm (0.0098 - 0.0217 in)

 If end play is out of specification, decrease or increase thickness of oil pump cover bearing race as necessary.

Available oil pump cover bearing race: Refer to SDS (AT-217).

Thrust Oil pump Oil pump washer assembly gasket Clutch pack SAT636G

Adjustment (Cont'd)

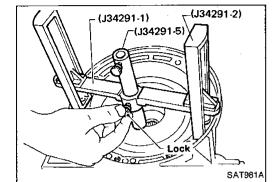
Adjust reverse clutch drum end play. Reverse clutch drum end play "T2": 0.55 - 0.90 mm (0.0217 - 0.0354 in)



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Place J34291-1 (bridge), J34291-2 (legs) and J34291-5 (gauging cylinder) on machined surface of transmission case (no gasket) and allow gauging cylinder to rest on front thrust surface of reverse clutch drum. Lock cylinder in place with set screw.



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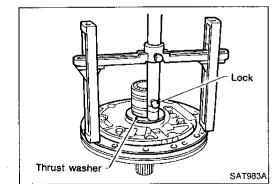
Install J34291-23 (gauging plunger) into gauging cylinder.



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Feeler gauge

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SAT982A

With original thrust washer installed on oil pump, place shim setting gauge legs onto machined surface of oil pump assembly and allow gauging plunger to rest on thrust washer. Lock plunger in place with set screw.



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 d. Use feeler gauge to measure gap between gauging plunger and gauging cylinder. This measurement should give you exact reverse clutch drum and play.



Reverse clutch drum end play "T2": 0.55 - 0.90 mm (0.0217 - 0.0354 in)



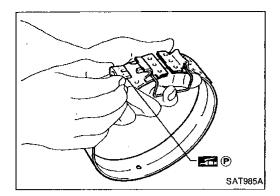
If end play is out of specification, decrease or increase thickness of oil pump thrust washer as necessary.

Available oil pump thrust washer: Refer to SDS (AT-217).



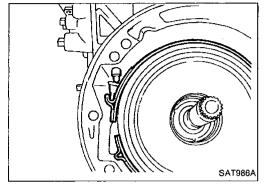
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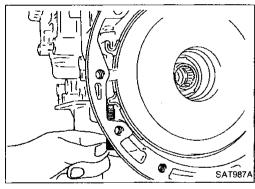


Assembly (2)

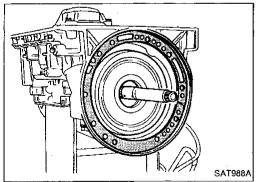
- 1. Place transmission case into horizontal position.
- 2. Install brake band and band strut.
- a. Install band strut on brake band.
- Apply petroleum jelly to band strut.



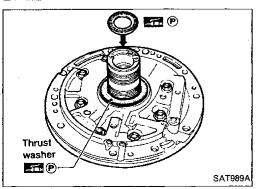
b. Place brake band on periphery of reverse clutch drum, and insert band strut into end of band servo piston stem.



c. Install anchor end bolt on transmission case. Then, tighten anchor end bolt just enough so that reverse clutch drum (clutch pack) will not tilt forward.



- 3. Install input shaft on transmission case.
- Pay attention to its direction O-ring groove side is front.
- Install gasket on transmission case.



- 5. Install oil pump assembly.
- a. Install needle bearing on oil pump assembly.
- Apply petroleum jelly to the needle bearing.
- b. Install selected thrust washer on oil pump assembly.
- Apply petroleum jelly to thrust washer.

Seal ring **75.** (P)

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SAT991A

SAT992A

O-ring 🚾 🕑

Assembly (2) (Cont'd)

Carefully install seal rings into grooves and press them into the petroleum jelly so that they are a tight fit.

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- Install O-ring on oil pump assembly.
- Apply petroleum jelly to O-ring.



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Apply petroleum jelly to mating surface of transmission case and oil pump assembly.



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- Install oil pump assembly. Install two converter housing securing bolts in bolt holes in
- oil pump assembly as guides.



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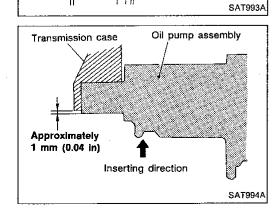
Insert oil pump assembly to the specified position in transmission, as shown at left.

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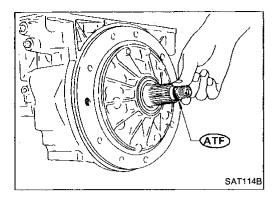






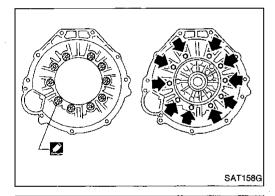
Assembly (2) (Cont'd)

- 6. Install O-ring on input shaft.
- Apply ATF to O-rings.

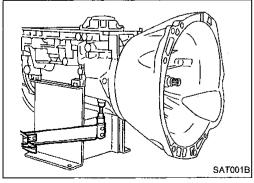


SAT397C

- 7. Install converter housing.
- Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to outer periphery of bolt holes in converter housing.
- Do not apply too much sealant.



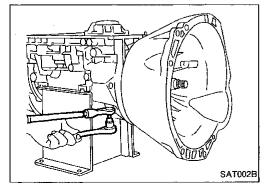
- Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to seating surfaces of bolts that secure front of converter housing.
- c. Install converter housing on transmission case.



- 8. Adjust brake band.
- a. Tighten anchor end bolt to specified torque.
 - (C): Anchor end bolt 4 - 6 N·m

(0.4 - 0.6 kg-m, 2.9 - 4.3 ft-lb)

b. Back off anchor end bolt two and a half turns.



c. While holding anchor end pin, tighten lock nut.

AT-206 754

Assembly (2) (Cont'd)

- Install terminal cord assembly.
- a. Install O-ring on terminal cord assembly.
- Apply petroleum jelly to O-ring. •
- b. Compress terminal cord assembly stopper and install terminal cord assembly on transmission case.



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- 10. Install control valve assembly.
- a. Install accumulator piston return springs B, C and D.

Free length of return springs

			Unit: mm (in		
Item	Accumulator				
	В	С	D		
Free length	66 (2.60)	45 (1.77)	58.4 (2.299)		

PD

- Install manual valve on control valve.
- Apply ATF to manual valve.

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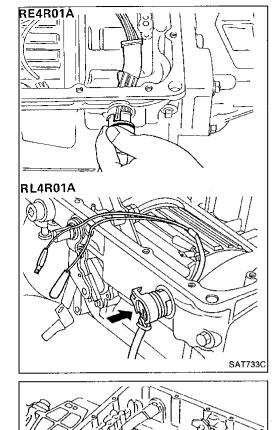
- c. Place control valve assembly on transmission case. Connect solenoid connector for upper body.
- 图图

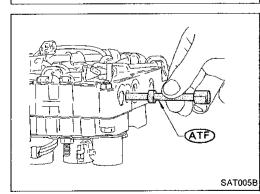
- RE4R01A —
- d. Install connector clip.



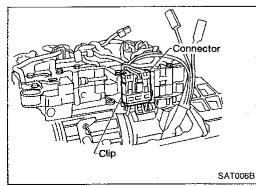
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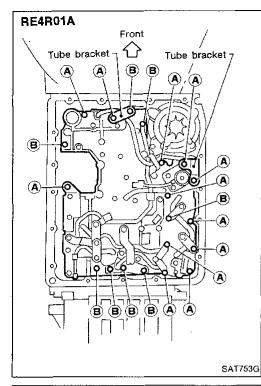


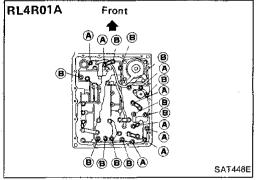
Assembly (2) (Cont'd)

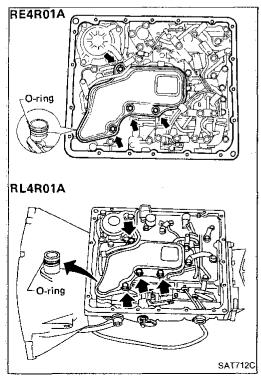
- RE4R01A and RL4R01A -

- e. Install control valve assembly on transmission case.
- f. Install connector tube brackets and tighten bolts (A) and (B).
- Check that terminal assembly harness does not catch.

Bolt	ℓ mm (in)
(A)	33 (1.30)
8	45 (1.77)

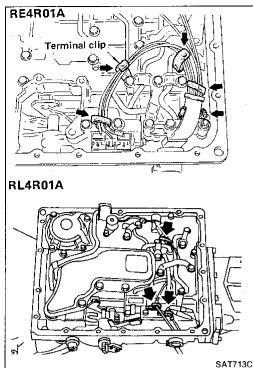


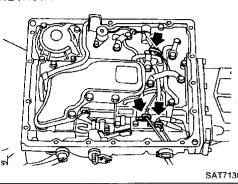




- g. Install O-ring on oil strainer.
- Apply petroleum jelly to O-ring.
- h. Install oil strainer on control valve.

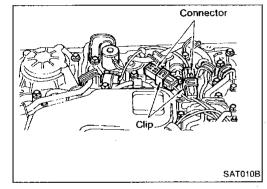
Securely fasten terminal harness with clips.





- RE4R01A ---

Install torque converter clutch solenoid valve and fluid temperature sensor 1 and 2 connectors.



11. Install oil pan.

a. Attach a magnet to oil pan.

Magnet SAT011B

Drain plug

Install new oil pan gasket on transmission case.

Install oil pan and bracket on transmission case. C.

Always replace oil pan bolts as they are self-sealing bolts.

- Before installing bolts, remove traces of sealant and oil from mating surface and thread holes.
- Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.
- Tighten drain plug.

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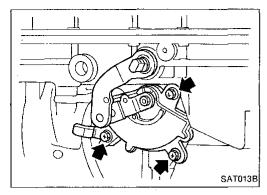
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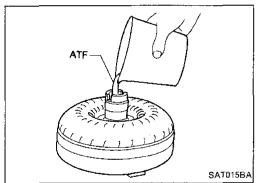


Assembly (2) (Cont'd)

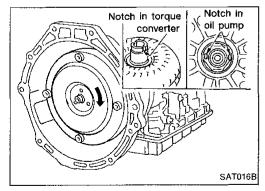
- 12. Install inhibitor switch.
- a. Check that manual shaft is in "1" position.
- b. Temporarily install inhibitor switch on manual shaft.
- c. Move manual shaft to "N".



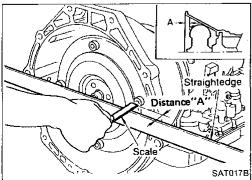
- SAT014B
- d. Tighten bolts while inserting 4.0 mm (0.157 in) dia. pin vertically into locating holes in inhibitor switch and manual shaft.



- 13. Install torque converter.
- a. Pour ATF into torque converter.
- Approximately 2 liters (2-1/8 US qt, 1-3/4 Imp qt) of fluid are required for a new torque converter.
- When reusing old torque converter, add the same amount of fluid as was drained.



b. Install torque converter while aligning notches and oil pump.



 Measure distance A to check that torque converter is in proper position.

Distance "A": 26.0 mm (1.024 in) or more

AT-210 758

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

	KA24E	KA24E engine		engine	
Applied model	Floor shift	Column shift	2WD	4WD	
Automatic transmission model	RL4	R01A	RE4	IR01A	
Transmission model code number	49X02	49X03	45X60	45X72	
Stall torque ratio		2.0 : 1			
Transmission gear ratio				· .	
1st			3.027		
2nd	1.545			1.619	
Тор	1.000			1.000	
OD	0.694			0.694	
Reverse		2.272			
Recommended oil	Genuine Nissan ATF or equivalent type DEXRON™ II				
Oil capacity ℓ (US qt, Imp qt)		7.9 (8-3/8, 7)		8.5 (9, 7-1/2)	

Specifications and Adjustment

VEHICLE SPEED WHEN SHIFTING GEARS

1) KA24E engine

Throttle position			Vehic	cle speed km/h (МРН)		
Throttle position	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	1 ₂ → 1 ₁
Full throttle	53 - 57 (33 - 35)	100 - 108 (62 - 67)	_	147 - 157 (91 - 98)	91 - 99 (57 - 6 2)	47 - 51 (29 - 32)	41 - 45 (25 - 28)
Half throttle	32 - 36 (20 - 22)	57 - 65 (35 - 40)	114 - 124 (71 - 77)	65 - 75 (40 - 47)	28 - 36 (17 - 22)	12 - 16 (7 - 10)	41 - 45 (25 - 28)

2) VG30E engine 2WD

Throttle position			Vehic	le speed km/h (МРН)		
Throttle position	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	1 ₂ → 1,
Full throttle	52 - 56	99 - 107	159 - 169	154 - 164	91 - 99	44 - 48	38 - 42
	(32 - 35)	(62 - 66)	(99 - 105)	(96 - 102)	(57 - 62)	(27 - 30)	(24 - 26)
Half throttle	32 - 36	66 - 72	105 - 113	69 - 77	29 - 35	10 - 14	38 - 42
	(20 - 22)	(41 - 45)	(65 - 70)	(43 - 48)	(18 - 22)	(6 - 9)	(24 - 26)

3) VG30E engine 4WD (Final gear ratio: 4.375)

Thurst 1 it i		Vehicle speed km/h (MPH)					•	
Throttle position	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	1 ₂ → 1 ₁	- Br
Full throttle	50 - 54 (31 - 34)	97 - 105 (60 - 65)	162 - 172 (101 - 107)	157 - 167 (98 - 104)	92 - 100 (57 - 62)	38 - 42 (24 - 26)	38 - 42 (24 - 26)	-
Half throttle	32 - 36 (20 - 22)	64 - 70 (40 - 43)	111 - 119 (69 - 74)	65 - 73 (40 - 45)	29 - 35 (18 - 22)	10 - 14 (6 - 9)	38 - 42 (24 - 26)	- ST

4) VG30E engine 4WD (Final gear ratio: 4.625)

*	Vehicle speed km/h (MPH)					_		
Throttle position	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	1 ₂ → 1 ₁	- _ [][]
Full throttle	46 - 50 (29 - 31)	90 - 98 (56 - 61)	150 - 160 (93 - 99)	145 - 155 (90 - 96)	86 - 94 (53 - 58)	38 - 42 (24 - 26)	38 - 42 (24 - 26)	
Half throttle	30 - 34 (19 - 21)	60 - 66 (37 - 41)	103 - 111 (64 - 69)	60 - 68 (37 - 42)	28 - 34 (17 - 21)	10 - 14 (6 - 9)	38 - 42 (24 - 26)	

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SERVICE DATA AND SPECIFICATIONS (SDS)

Specifications and Adjustment (Cont'd)

VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP

1) KA24 engine

	D_4				
Throttle position	Vehicle speed km/h (MPH)				
	Lock-up "ON"	Lock-up ''OFF''			
Full throttle					
Half throttie	71 - 79 (44 - 49)	71 - 79 (44 - 49)			

2) VG30E engine 2WD

Thurstella	OD multiple	Vehicle speed km/h (MPH)		
Throttle position	OD switch [Shift position]	Lock-up "ON"	Lock-up "OFF"	
Full throttle	ON [D ₄]	160 - 168 (99 - 104)	155 - 163 (96 - 101)	
	OFF [D ₃]	99 - 107 (62 - 66)	91 - 99 (57 - 62)	
Half throttle	ON [D ₄]	101 - 109, (63 - 68)	82 - 90 (51 - 56)	
	OFF [D ₃]	76 - 84 (47 - 52)	71 - 79 (44 - 49)	

3) VG30E engine 4WD (Final gear ratio: 4.375)

Throttle position	OD avvitata	Vehicle speed km/h (MPH)		
	OD switch ([Shift position]	Lock-up ''ON''	Lock-up ''OFF''	
Full throttle	ON [D ₄]	163 - 171 (101 - 106)	158 - 168 (98 - 104)	
	OFF [D ₃]	97 - 105 (60 - 65)	92 - 108 (57 - 67)	
Half throttle	ON [D ₄]	110 - 118 (68 - 73)	82 ~ 90 (51 - 56)	
	OFF [D ₃]	76 - 84 (47 - 52)	71 - 79 (44 - 49)	

4) VG30E engine 4WD (Final gear ratio: 4.625)

The section	OD switch	Vehicle speed km/h (MPH)		
Throttle position	[Shift position]	Lock-up "ON"	Lock-up ''OFF''	
Full throttle	ON [D ₄]	151 - 159 (94 - 99)	146 - 154 (91 - 96)	
	OFF [D ₃]	90 - 98 (56 - 61)	86 - 94 (53 - 58)	
Half throttle	ON [D ₄]	103 - 111 (64 - 69)	83 - 91 (52 - 57)	
	OFF [D ₃]	76 - 84 (47 - 52)	71 - 79 (44 - 49)	

STALL REVOLUTION

Engine		Stall revolution rpm
	KA24E	2,100 - 2,300
Ī	VG30E	2,260 - 2,510

LINE PRESSURE

1) VG30E engine

Engine speed	Line pressure kPa (kg/cm², psi)		
rpm	D, 2 and 1 positions	R position	
ldle	422 - 461 (4.3 - 4.7, 61 - 67)	667 - 706 (6.8 - 7.2, 97 - 102)	
Stall	1,020 - 1,098 (10.4 - 11.2, 148 - 159)	1,422 - 1,500 (14.5 - 15.3, 206 - 218)	

2) KA24E engine

Engine speed	Line pressure kPa (kg/cm², psi)		
rpm	D, 2 and 1 positions	R position	
ldle	422 - 461 (4.3 - 4.7, 61 - 67)	667 - 706 (6.8 - 7.2, 97 - 102)	
Stall	883 - 961 (9.0 - 9.8, 128 - 139)	1,393 - 1,471 (14.2 - 15.0, 202 - 213)	

SERVICE DATA AND SPECIFICATIONS (SDS)

Specifications and Adjustment (Cont'd)

RETURN SPRINGS

1) KA24E engine

					Unit: mm (in)	
Dorto			ltem			- - (G
Parts			Part No.	Free length	Outer diameter	- (3
	4th speed cut valve spring		31756-48X09	23.5 (0.925)	7.0 (0.276)	-
	Pressure regulator valve spring		31742-48X16	48.5 (1.909)	12.1 (0.476)	- IM
	Pressure modifier valve spring		31742-48X13	40.83 (1.6075)	8.0 (0.315)	-
	1-2 shift valve spring		31762-48X00	43.4 (1.709)	6.0 (0.236)	- [5]
	2-3 shift valve spring		31762-48X01	42.7 (1.681)	9.0 (0.354)	-
	3-4 shift valve spring		31762-48X06	44.03 (1.7335)	8.0 (0.315)	- - L
	Accumulator control valve sprin	g	31742-48X02	29.3 (1.154)	8.0 (0.315)	- Ŀ
	3-2 downshift valve spring		_	-	_	- - E
	2-3 throttle modifier valve sprin	9	31742-41X21	33.0 (1.299)	6.5 (0.256)	- <u>-</u> [
Control valve	4-2 relay valve spring		31756-41X00	29.1 (1.146)	6.95 (0.2736)	-
	Lock-up control valve spring		31742-48X07	20.0 (0.787)	5.45 (0.2146)	- [-
	Throttle valve & detent valve sp	oring	31802-48X02	34.23 (1.3476)	11.0 (0.433)	-
	Kickdown modifier valve spring		31756-48X01	45.3 (1.783)	7.0 (0.276)	- - (
	1st reducing valve spring		31756-48X08	29.7 (1.169)	7.2 (0.283)	- 6
	Overrun clutch reducing valve spring		31742-48X04	45.0 (1.772)	7.45 (0.2933)	-
			31742-48X05	31.0 (1.220)	5.2 (0.205)	9
	3-2 timing valve spring		31742-48X15	23.0 (0.906)	7.0 (0.276)	
	Torque converter relief valve spring		31742-41X23	38.0 (1.496)	9.0 (0.354)	
	4-2 sequence valve spring		31756-41X00	29.1 (1.146)	6.95 (0.2736)	
		Primary	31742-48X11	19.1 (0.752)	9.05 (0.3563)	 Ti
Governor valve	Governor valve spring	Secondary ①	31742-48X09	30.58 (1.2039)	9.2 (0.362)	
		Secondary 2	31742-48X10	16.79 (0.6610)	9.0 (0.354)	-
Reverse clutch		16 pcs	31505-41X02	19.69 (0.7752)	11.6 (0.457)	- (F
High clutch		16 pcs	31505-21X03	22.06 (0.8685)	11.6 (0.457)	•
Forward clutch (Overrun clutch)		20 pcs	31505-41X01	35.77 (1.4083)	9.7 (0.382)	- -
_ow & reverse orake	18 pcs		31521-21X00	23.7 (0.933)	11.6 (0.457)	- [
····	Spring A		31605-41X05	45.6 (1.795)	34.3 (1.350)	
Band servo	Spring B		31605-41X00	53.8 (2.118)	40.3 (1.587)	- - [
	Spring C		31605-41X01	29.7 (1.169)	27.6 (1.087)	- p
	Accumulator A		31605-41X02	43.0 (1.693)		_
S	Accumulator B		31605-41X10	66.0 (2.598)	-	- 6
Accumulator	Accumulator C	}	31605-41X09	45.0 (1.772)	_	_
	Accumulator D		31605-41X06	58.4 (2.299)		- _ [

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Unit: mm (in)

EL

SERVICE DATA AND SPECIFICATIONS (SDS) Specifications and Adjustment (Cont'd)

2) VG30E engine

Unit: mm (in)

Parts -		Doub	Item			
		Parts —	Part No.	Free length	Outer diameter	
		Torque converter relief valve spring	31742-41X23	38.0 (1.496)	9.0 (0.354)	
		Pressure regulator valve spring	31742-41X24	44.02 (1.7331)	14.0 (0.551)	
		Pressure modifier valve spring	31742-41X19	31.95 (1.2579)	6.8 (0.268)	
		Accumulator control valve spring	_	_	<u>-</u> -	
		Shuttle shift valve D spring	31762-41X00	26.5 (1.043)	6.0 (0.236)	
],,	4-2 sequence valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)	
	Upper body	Shift valve B spring	31762-41X01	25.0 (0.984)	7.0 (0.276)	
		4-2 relay valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)	
Control		Shift valve A spring	31762-41X01	25.0 (0.984)	7.0 (0.276)	
alve		Overrun clutch control valve spring	31762-41X03	23.6 (0.929)	7.0 (0.276)	
		Overrun clutch reducing valve spring	31742-41X20	32.5 (1.280)	7.0 (0.276)	
	•	Shuttle shift valve S spring	31762-41X04	51.0 (2.008)	5.65 (0.2224)	
		Pilot valve spring	31742-41X13	25.7 (1.012)	9.1 (0.358)	
		Lock-up control valve spring	31742-41X22	18.5 (0.728)	13.0 (0.512)	
		Modifier accumulator valve spring	31742-27X70	31.4 (1.236)	9.8 (0.386)	
	Lower	1st reducing valve spring	31756-41X05	25.4 (1.000)	6.75 (0.2657)	
	body	3-2 timing valve spring	31742-41X08	20.55 (0.8091)	6.75 (0.2657)	
		Servo charger valve spring	31742-41X06	23.0 (0.906)	6.7 (0.264)	
Reverse	clutch	16 pcs	31505-41X02	19.69 (0.7752)	11.6 (0.457)	
ligh clu	tch	16 pcs	31505-21X03	22.06 (0.8685)	11.6 (0.457)	
orward Overrur	clutch clutch)	20 pcs	31505-41X01	35.77 (1.4083)	9.7 (0.382)	
_ow & re	everse	18 pcs	31521-21X00	23.7 (0.933)	11.6 (0.457)	
Band servo		Spring A	31605-41X05	45.6 (1.795)	34.3 (1.350)	
		Spring B	31605-41X00	53.8 (2.118)	40.3 (1.587)	
		Spring C	31605-41X01	29.7 (1.169)	27.6 (1.087)	
		Accumulator A	31605-41X02	43.0 (1.693)	_	
\	latar	Accumulator B	31605-41X10	66.0 (2.598)		
Accumu	iator	Accumulator C	31605-41X09	45.0 (1.772)		
		Accumulator D	31605-41X06	58.4 (2.299)	_	

ACCUMULATOR O-RING

Accumulator	Diameter mm (in)					
Accumulator	А	В	С	D		
Small diameter end	29 (1.14)	32 (1.26)	45 (1.77)	29 (1.14)		
Large diameter end	45 (1.77)	50 (1.97)	50 (1.97)	45 (1.77)		

SERVICE DATA AND SPECIFICATIONS (SDS) Specifications and Adjustment (Cont'd)

CLUTCHES AND BRAKES

de number		49X02	49X03	45X60	45X72	
. Reverse clutch]					
Number of drive	plates			2		
Number of drive	n plates		2	2		
Thickness of Standard			1.90 - 2.05 (0.	0748 - 0.0807)		
drive plate mm (in)	Wear limit		1.80 (0	0.0709)		
Clearance Standard			0.5 - 0.8 (0.	020 - 0.031)		
mm (in)	Allowable limit		1.2 (0	0.047)		
in'		Thickness	s mm (in)	Part nui	mber	
Thickness of reta	aining plate	4.6 (0 4.8 (0 5.0 (0 5.2 (0 5.4 (0 5.6 (0 5.8 (0	0.189) 0.197) 0.205) 0.213) 0.220)	31537-4 31537-4 31537-4 31537-4 31537-4 31537-4	2X02 2X03 2X04 2X05 2X06	
. High clutch			****			
Number of drive	plates	•	4	5		
Number of drive	n plates		4	5		
Thickness of	Standard		1.52 - 1.67 (0.	0598 - 0.0657)		
drive plate mm (in)	Wear limit		1.40 (0	0.0551)		
Clearance	Standard	1.8 - 2.2 (0.071 - 0.087)				
mm (in)	Allowable limit	2.8 (0.110)				
		Thickness mm (in) Part number		Thickness mm (in)	Part number	
Thickness of ret	aining plate	3.6 (0.142) 3.8 (0.150) 4.0 (0.157) 4.2 (0.165) 4.4 (0.173) 4.6 (0.181) 4.8 (0.189) 5.0 (0.197)	31537-41X61 31537-41X62 31537-41X63 31537-41X64 31537-41X65 31537-41X66 31537-41X67 31537-41X68	3.4 (0.134) 3.6 (0.142) 3.8 (0.150) 4.0 (0.157) 4.2 (0.165) 4.4 (0.173) 4.6 (0.181) 4.8 (0.189)	31537-41X71 31537-41X61 31537-41X62 31537-41X63 31537-41X64 31537-41X65 31537-41X66 31537-41X67	
de number		49X02 493	X03 45X60	45X7	⁷ 2	
. Forward clutch						
Number of drive	plates	5		7		
Number of driven plates		5 7				
Thickness of	Standard		1.90 - 2.05 (0.	.0748 - 0.0807)	· 	
drive plate mm (in)	Wear limit		1.80 (0	0.0709)		
Clearance	Standard		0.45 - 0.85 (0.	.0177 - 0.0335)		
mm (in)	Allowable limit	1.85 (0.0728)	2.25 (0.	0886)	
Thickness of retaining plate		Thickness mm (in)	Part number	Thickness mm (in)	Part number	
		8.0 (0.315) 8.2 (0.323) 8.4 (0.331) 8.6 (0.339) 8.8 (0.346)	31537-41X00 31537-41X01 31537-41X02 31537-41X03 31537-41X04	4.0 (0.157) 4.2 (0.165) 4.4 (0.173) 4.6 (0.181) 4.8 (0.189)	31537-41X07 31537-41X08 31537-41X09 31537-41X10 31537-41X11	
	!	9.0 (0.354) 9.2 (0.362)	31537-41X05 31537-41X06	5.0 (0.197) 5.2 (0.205)	31537-41X12 31537-41X13	
		3.2 (0.002)	01007-41700	U.E (U.EUU)	01001-41010	

SERVICE DATA AND SPECIFICATIONS (SDS)

		Speci	ificati	ons and a	Adjustmen	t (Cont'	d)
ode number		49X02 49X	03	45X60		45X72	, , , , , , , , , , , , , , , , , , ,
4. Overrun clutch							
Number of drive	plates			;	3		
Number of drive	n plates				5		
Thickness of	Standard			1.90 - 2.05 (0.	.0748 - 0.0807)		· · · ·
drive plate mm (in)	Wear limit			1.80 (0.0709)		
Clearance	Standard			1.0 - 1.4 (0.	.039 - 0.055)		
mm (in)	Allowable limit			2.0 (6	0.079)		
		Thickness	mm (in)			Part numbe	er
		4.0 (0.	.157)	•		31537-41X7	' 9
		4.2 (0.				31537-41X8	80
Thickness of reta	aining plate	4.4 (0.	•			31537-41X8	
	j	4.6 (0.				31537-41X8	
		4.8 (0. 5.0 (0.			31537-41X83		
	Į	5.0 (0.197) 5.2 (0.205)		31537-41X84 31537-41X20			
Code number		45X72		45X60	49X02	49X03	
5. Low & reverse brake							
Number of drive	plates				6		
Number of drive	n plates		•		6		
Thickness of	Standard	1.90 - 2.05 (0.0748 - 0.0807)					
drive plate mm (in)	Wear limit	1.80 (0.0709)					
Clearance	Standard			0.7 - 1.1 (0	0.028 - 0.043)		
mm (in)	Allowable limit	<u></u>		2.3 (0.091)		
		Thickness mm (in)	Pa	rt number	Thickness mn	n (in)	Part number
ĺ		8.6 (0.339)	31	667-41X03	9.0 (0.354)	31667-41X05
		8.8 (0.346)	31	667-41X04	9.2 (0.362)	31667-41X06
Thickness of retaining plate		9.0 (0.354)	31	667-41X05	9.4 (0.370)	31667-41X09
		9.2 (0.362)		667-41X06	9.6 (0.378	′ I	31667-41X10
		9.4 (0.370)		667-41X09	9.8 (0.386	· I	31667-41X18
		9.6 (0.378)	31	667-41X10	10.0 (0.394	+)	31667-41X19
6. Brake band							
Anchor end bolt	tightening						
torque				4 ~ 6 (0.4 ~)	0.6, 2.9 - 4.3)		
	N·m (kg-m, ft-lb)						
Number of retur	· .				2.5		
TOT ATTORIOR ETIG L	,o.r.						

SERVICE DATA AND SPECIFICATIONS (SDS)

Specifications and Adjustment (Cont'd)

OIL PUMP AND LOW ONE-WAY CLUTCH

Oil pump clearance mm (in)	<u></u>
Cam ring — oil pump housing	
Standard	0.01 - 0.024 (0.0004 - 0.0009)
Rotor, vanes and control piston — oil pump housing	
Standard	0.03 - 0.044 (0.0012 - 0.0017)
Seal ring clearance mm (in)	
Standard	0.10 - 0.25 (0.0039 - 0.0098)
Alfowable limit	0.25 (0.0098)

REVERSE CLUTCH DRUM END PLAY

Reverse clutch drum end play "T2"	0.55 - 0.90 mm (0.0217 - 0.0354 in)		
	Thickness mm (in)	Part number	
Ī	0.7 (0.028)	31528-21X00	
Thickness of oil	0.9 (0.035)	31528-21X01	
pump thrust washer	1.1 (0.043)	31528-21X02	
pump unust washer	1.3 (0.051)	31528-21X03	
	1.5 (0.059)	31528-21X04	
	1.7 (0.067)	31528-21X05	
	1.9 (0.075)	31528-21X06	

TOTAL END PLAY

Total end play "T₁"	0.25 - 0.55 mm (0.0098 - 0.0217 in)		
	Thickness mm (in)	Part number	
	0.8 (0.031)	31429-21X00	
Thickness of oil	1.0 (0.039)	31429-21X01	
pump cover bearing	1.2 (0.047)	31429-21X02	
race	1.4 (0.055)	31429-21X03	
Ì	1.6 (0.063)	31429-21X04	
j	1.8 (0.071)	31429-21X05	
	2.0 (0.079)	31429-21X06	

REMOVAL AND INSTALLATION

Manual control linkage	
Number of returning revolu- tions for lock nut	
Column shift	2
Floor shift	1
Lock nut tightening torque N·m (kg-m, ft-lb)	
2WD	29 - 39 (3.0 - 4.0, 22 - 29)
4WD	29 - 39 (3.0 - 4.0, 22 - 29)
Distance between end of clutch housing and torque converter mm (in)	
2WD	23.5 (0.925)
4WD	26.0 (1.024) or more
Drive plate runout limit mm (in)	0.5 (0.020)

OIL DISTRIBUTOR (KA24E engine)

Standard 0.15 - 0.40 (0.0059 - 0.0157) Allowable limit 0.40 (0.0157)	Seal ring — ring groove mm (in)	İ
Allowable limit 0.40 (0.0157)	Standard	0.15 - 0.40 (0.0059 - 0.0157)
	Allowable limit	0.40 (0.0157)

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When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

★ For seat belt, refer to MA section.

ST

BF

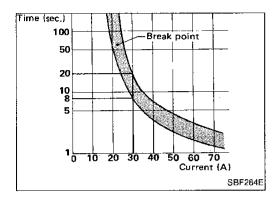
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Precautions

- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removing or installation. Be careful
 not to soil or damage them.
- Apply sealing compound where necessary when installing parts.
- When applying sealing compound, be careful that sealing compound does not protrude from parts.
- When replacing any metal parts (for example body outer panel, members, etc.), be sure to take rust prevention measures.



Circuit Breaker Inspection

For example, when current is 30A, the circuit is broken within 8 to 20 seconds.

Circuit breakers are used in the following systems.

- Power window & power door lock
- Back door window opener

Clip and Fastener

- The following numbers and symbols correspond to clips and fasteners in BF section.
- Replace any clips and/or fasteners which are damaged during removal or installation.

Symbol No.	Shapes	Removal & Installation
(£101)		Removal: Remove by bending up with flat-bladed screwdrivers.
	SBF256G	SBF367B
(C102)	MBF176B	Removal: Pull up by rotating. SBF115B

GENERAL SERVICING

Clip and Fastener (Cont'd)

Symbol No.	Shapes	Removal & Installation
(33)		Removal: Remove with a flat-bladed screwdriver or pliers. MA
	SBF257G	Push center pin to
(C203)		catching position. Push (Do not remove center pin by hitting it.)
		FE
<i>₹</i> ₩	SBF258G	Installation: SBF708E
		Removal:
Œ103)		AT
		TF
	SBF104B	PD SBF147B
		Removal: Remove by bending up with flat-bladed screwdrivers.
		Radiator grille
(G104)		Body panel
	SBF351C	SBF352C ST
L		BF

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GENERAL SERVICING

Clip and Fastener (Cont'd)

Symbol No.	Shapes	Removal & Installation
ŒE114)	SBF353	
	Clip-A Seal Clip-B (Grommet)	Flat-bladed screwdriver Body panel Clip-A SBF652B
(E) (m-9)	Seal rubber Clip-B	Removal: Clip-A Finisher Weatherstrip Clip-B Rubber seal Flat-bladed screwdriver SBF6498
(F114)	SBF317	Panel Removal: Remove using flat-bladed screwdrivers or pliers. Panel Flat-bladed - Clip
(A103)	SBF768	Removal: Holder portion of clip must be spread out to remove rod. SBF770B

GENERAL SERVICING

Clip and Fastener (Cont'd)

No.	Shapes	Removal & Installation	
© 6101)		Removal: Rotate 45° to remove. Removal:	SBF085B
(30) (10) (10) (10) (10) (10) (10) (10) (1		Removal: 1. Screw out with a Phillips screwdriver. 2. Remove female portion with flat-bladed screwdriver.	

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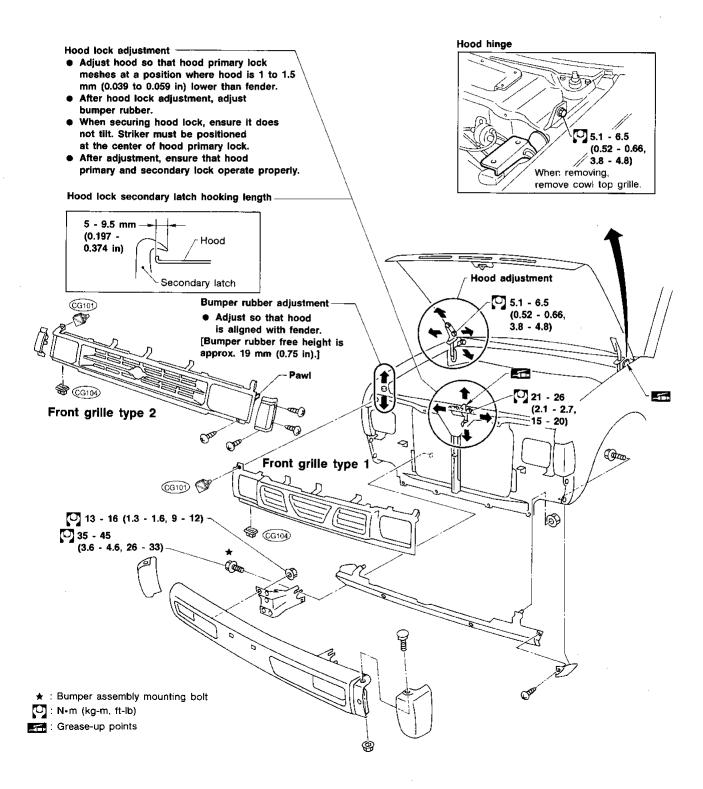
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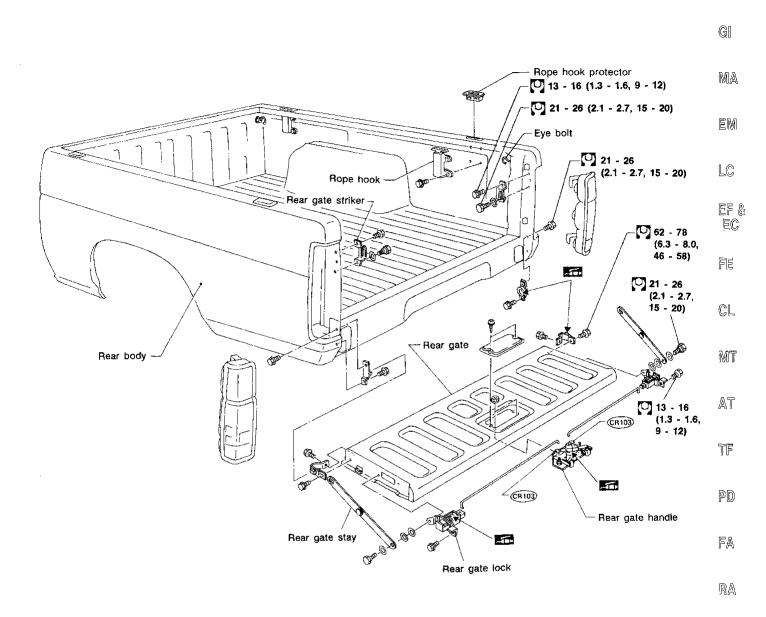
Front End

- Hood adjustment: Adjust at hinge portion.
- Hood lock adjustment: After adjusting, check hood lock control operation. Apply a coat of grease to hood locks engaging mechanism.
- Hood opener: Do not attempt to bend cable forcibly. Doing so increase effort required to unlock hood.
- Bumper finisher: It is made of plastic, so do not use excessive force and take care to keep oil away from it



MBF299B

Rear End — TRUCK



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: N•m (kg-m, ft-lb) : Grease-up points

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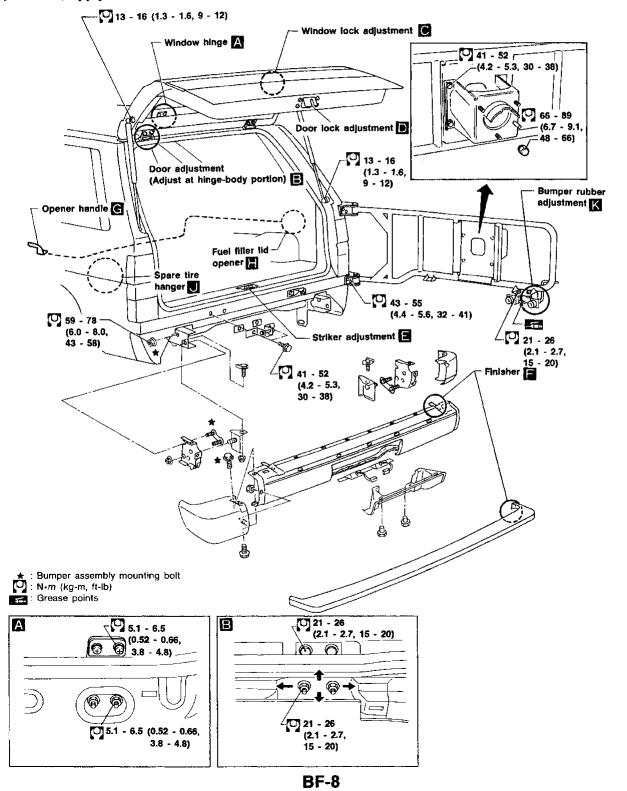
SBF344GA

Body Rear End — WAGON

- Back door lock system adjustment: Adjust lock & striker so that they are in the center.
 After adjustment, check back door lock operation.
- Back door hatch lock system adjustment: Adjust lock & striker so that they are in the center.
 After adjustment, check back door hatch lock operation.

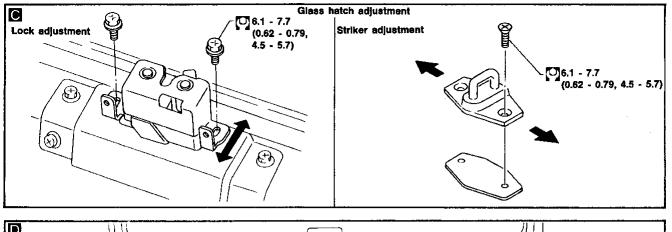
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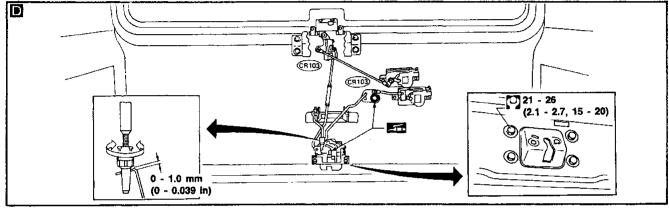
- a. Be careful not to scratch back door stay and/or back door hatch stay when installing back door and/or back door hatch. A scratched stay may cause gas leakage.
- b. The contents of the back door stay and back door hatch stay are under pressure. Do not take apart, puncture, apply heat or allow fire near them.

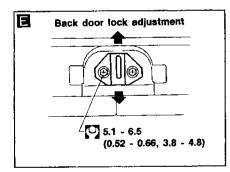


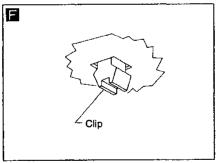
BODY END

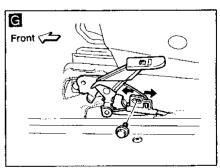
Body Rear End — WAGON (Cont'd)

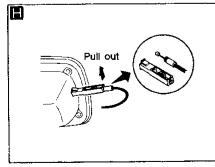


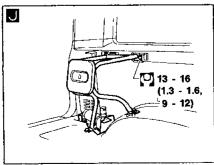


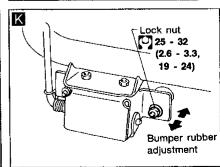












: N·m (kg-m, ft-lb)

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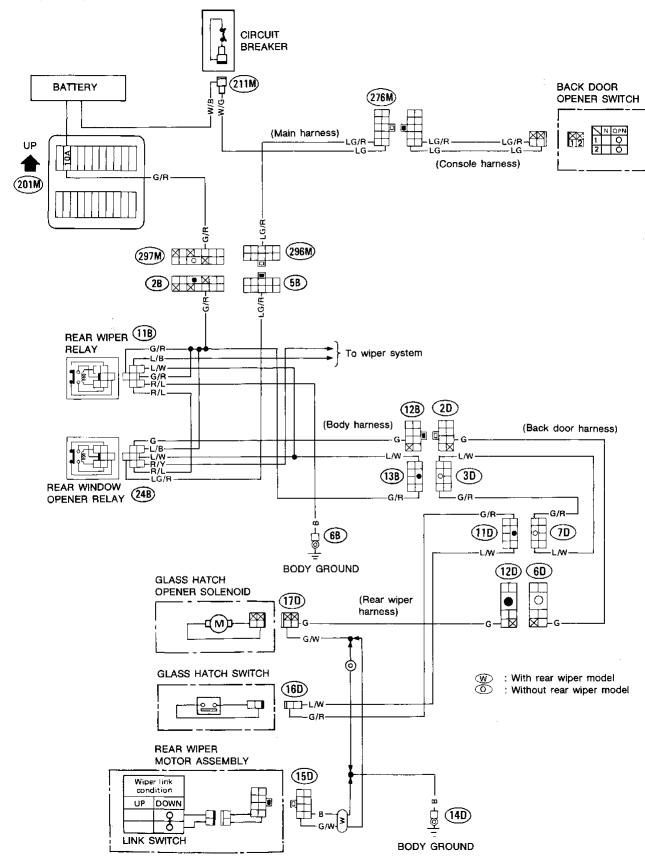
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Back Door Window Opener — WAGON

WIRING DIAGRAM



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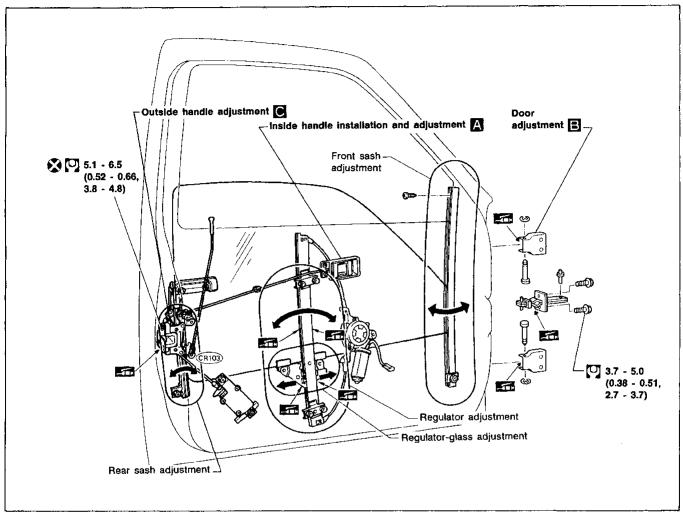
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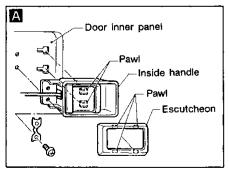
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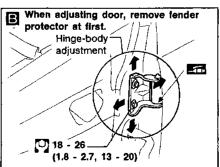
IDX

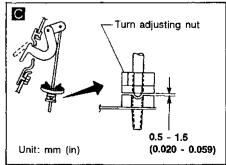
Front Door

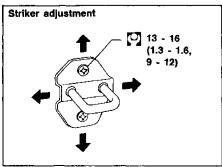
- For removal of door trim, refer to "INTERIOR AND EXTERIOR", (BF-29 or 32).
- After adjusting door lock, make sure door locks properly.









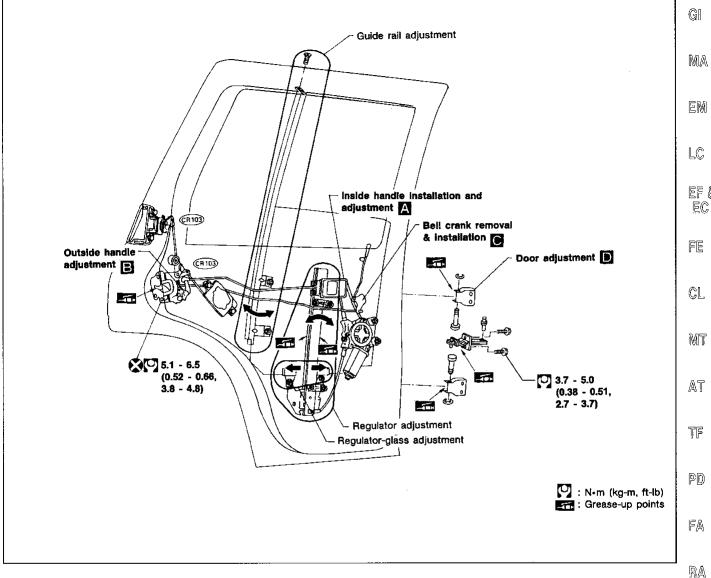


: N·m (kg-m, ft-lb)

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Rear Door — WAGON

- For removal of door trim, refer to "INTERIOR AND EXTERIOR", (BF-32).
- After adjusting door or door lock, make sure door locks properly.



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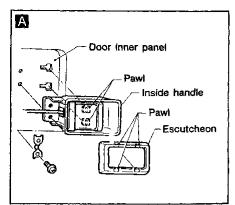
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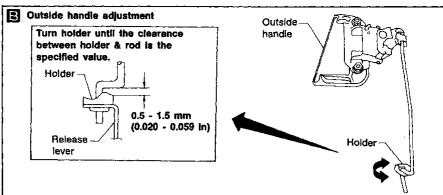
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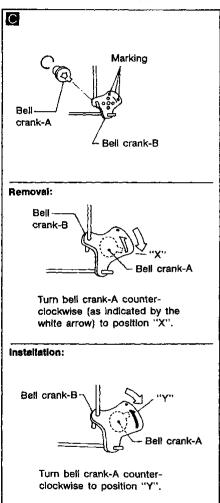
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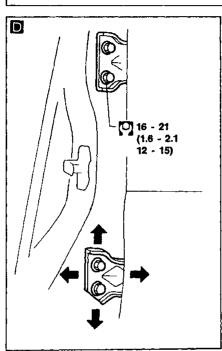
DOOR

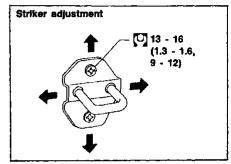
Rear Door --- WAGON (Cont'd)











N•m (kg-m, ft-lb)

Power Door Lock — TRUCK

DOOR LOCK TIMER INSPECTION

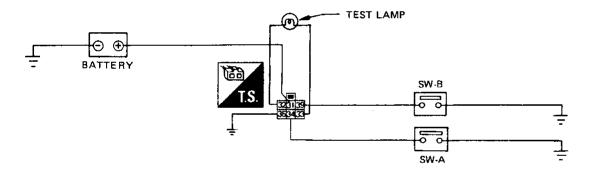
TESTING OPERATION

signal	SW-A operation	OFF	Turns ON	ON	Turns OFF	OFF	OFF	OFF	Turns ON	Turns OFF
Input si	SW-B operation	OFF	OFF	OFF	OFF	Turns ON	ON	Turns OFF	After SW-A operation, immediately turns ON	Turns OFF
Output signal	Test lamp operation	OFF	ON (Approx, 1.0 sec.) → OFF	OFF	OFF	ON (Approx. 1.0 sec.) → OFF	OFF	OFF	ON → OFF → ON → OFF	OFF

- Carry out the complete inspection in this chart from left to right.
- Do not carry out any switch operations that are not described in the above chart so as to avoid breaking the door lock timer,

Lighting period of test lamp differs according to SW-B operation. Moreover, test lamp may come on once or it may not come on at all. If this occurs, do not judge it faulty solely from this step, but use other steps to make final judgement.

INSPECTION CIRCUIT (This test circuit must be wired by the technician.)



DOOR LOCK TIMER

	CIRCUIT CONNECTIONS
31	Power source (BAT)
32	To/From actuators (Lock power source & Unlock ground)
33	To/From actuators (Lock ground & Unlock power source)
34	To lock-unlock switches (Input signal for lock)
35	Ground
39	To lock-unlock switches (Input signal for unlock)

CIRCUIT BREAKER

The circuit breaker is the same as the one for Power Window system. So refer to "Power Window".

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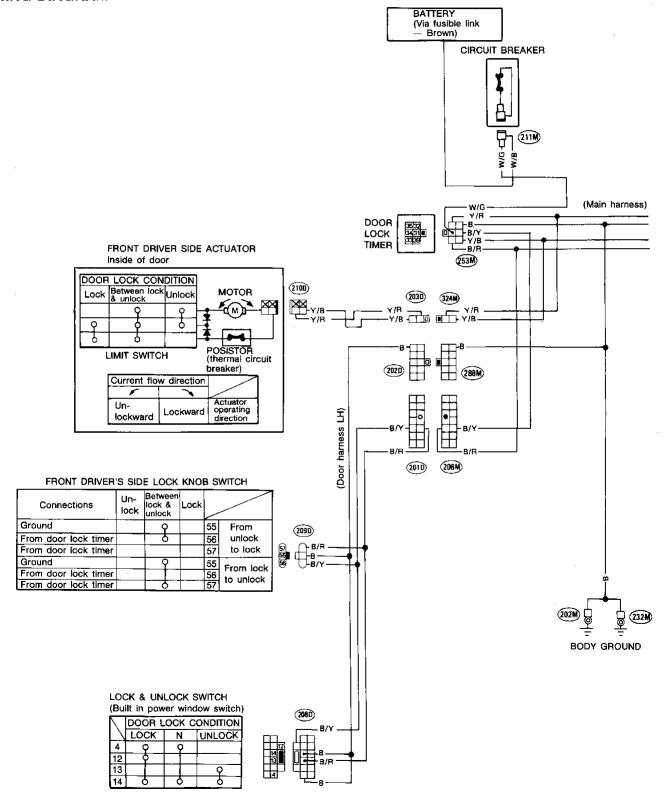
HD)X

Power Door Lock — TRUCK (Cont'd)

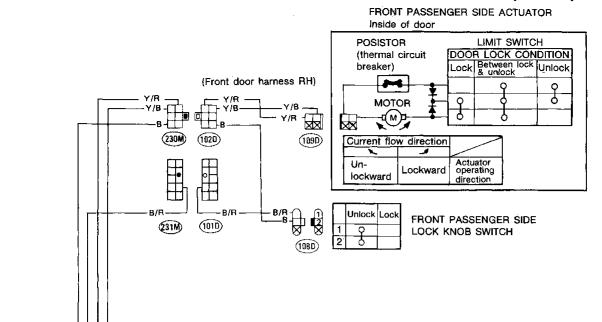
 When Lock-Unlock (Unlock-Lock) is repeated more than two or three times rapidly using the door lock-&-unlock switch connected to driver side door lock knob, the door may either be locked or unlocked by itself, or the actuator may not be activated. This depends on the Lock-Unlock operation period and other conditions.

Avoid this type of operation as a system malfunction may occur.

WIRING DIAGRAM



Power Door Lock — TRUCK (Cont'd)



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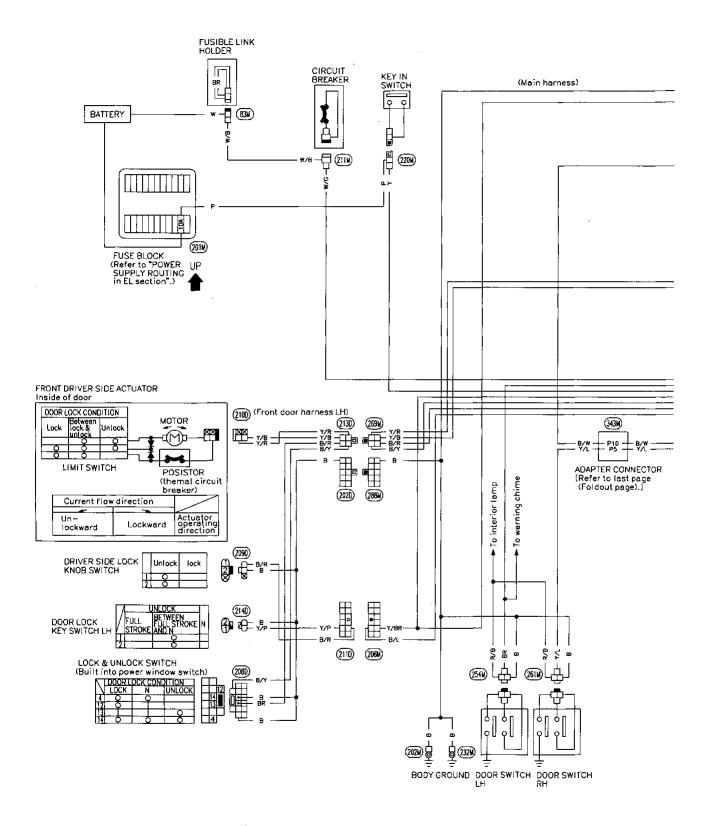
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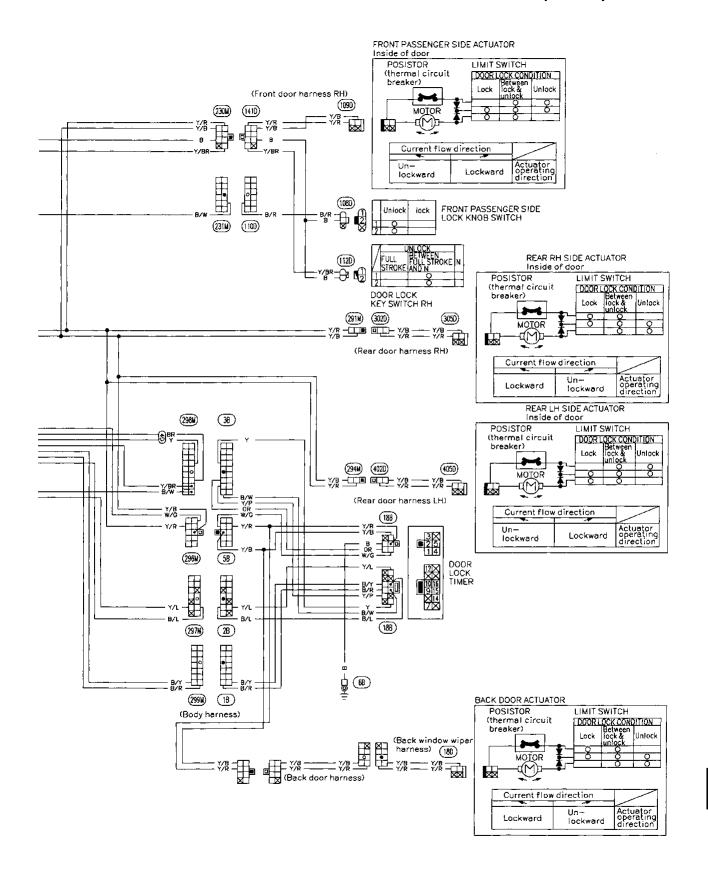
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Power Door Lock — WAGON

WIRING DIAGRAM



Power Door Lock — WAGON (Cont'd)



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DOOR

Power Door Lock — WAGON (Cont'd)

DOOR LOCK TIMER INSPECTION

- Carry out the following inspections:
- (1) Check power source and ground.
- (2) Check input signals.

INSPECTION.

If the input signal is NG, go to ELECTRICAL COMPONENTS INSPECTION.

(3) Check output signals.
If the input signal is OK and the output signal is NG, replace the door lock timer.
If the input signal and output signal are OK, check door lock actuator in ELECTRICAL COMPONENTS

Lock & unlock operation by lock knob or main switch

(The voltages are approximate values.)

•				Opera	ations	
		Connections	Lock knob switch LH	Lock knob switch RH	Lock & unl	ock switch
			Unlock → Lock	Unlock → Lock	N → Unlock	N → Lock
1	Power	source	12V	12V	12V	12V
5	Ground	<u></u>	Ground	Ground	Ground	Ground
7		Key switch				
4		Door switch LH		Either key switch or a (Key is not in the ignition		
12		Door switch RH			· · · · · · · · · · · · · · · · · · ·	
10	nal	Lock knob switch LH	ON → OFF (Ground) (Open)	_	_	_
9	Input signal	Lock knob switch RH	_	ON → OFF (Ground) (Open)	_	_
14	_ =	Door lock key switch		_	_	
16		Lock & unlock switch lock	_	_		OFF → ON (Open) (Ground)
15		Lock & unlock switch unlock		_	OFF → ON (Open) (Ground)	
2	signal	Door lock actuator (Lock power source)	0V → 12V → 0V (Approx. 1.0 sec.)	0V → 12V → 0V (Approx. 1.0 sec.)	0V	0V → 12V → 0V (Approx. 1.0 sec.)
3	Output	Door lock actuator (Unlock power source)	٥٧	0V	0V → 12V → 0V (Approx. 1.0 sec.)	0V

Power Door Lock — WAGON (Cont'd)

Unlock operation by door lock key switch

(The voltages are approximate values.)

				Operations		
		Connections	Door lock key switch LH			_
			N → Unlock -	→ N → Unlock	Unlock → Lock	_
1	Power	source	12V	12V	12V	-
5	Groun	d	Ground	Ground	Ground	_
7		Key switch				-
4	1	Door switch LH	Either key switch or door switches are off. (Key is not in the ignition or all doors are closed.)			
12		Door switch RH	(Noy is a	or in the ignition of an abord a	. u 510500.7	
10	signal	Lock knob switch LH	_	-	ON (Ground) → OFF (Open)	-
9	ut si	Lock knob switch RH	_		_	-
14	Input	Door lock key switch	OFF → ON → OF (Open) (Ground) (Ope	· · · · · · · · · · · · · · · · · · ·	OFF (Open)	
16		Lock & unlock switch lock	_	_	_	-
15]	Lock & unlock switch unlock	_		_	-
2	signal	Door lock actuator (Lock power source)	ov	ov	0V → 12V → 0V (Approx. 1.0 sec.)	-
3	Output	Door lock actuator (Unlock power source)	0V	0V → 12V → 0V (Approx. 1.0 sec.)	ov	-

- The second unlock signal of door lock key switch is counted when it is within approximately 4 seconds of the first signal.
- Lock operation by key is mechanically transmitted to the lock knob switch.
- Operation of door lock key switch RH is the same as LH.

Key reminder operation

(The voltages are approximate values.)

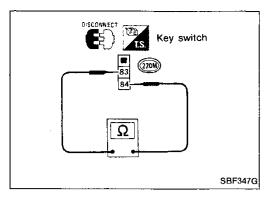
			Operations		
		Connections	Lock knob switch LH	Lock & unlock switch	— — TF
			Unlock → Lock → Automatically unlocked	N → Lock → Automatically unlocked	 јГ
1	Power	source	12V	12V	
5	Groun	d	ov	OV	- PD
7		Key switch	ON (12V) — Key i	s in the ignition.	
4		Door switch LH	ON (O		 Fa
12		Door switch RH	ON (Ground) Either door is open.		
10	signal	Lock knob switch LH	ON → OFF → ON (Ground) (Open) (Ground)	_	ra Ra
9	Lt Si	Lock knob switch RH		<u> </u>	
14	Input	Door lock key switch	_	_	BR
16		Lock & unlock switch lock	_	OFF \rightarrow ON \rightarrow OFF (Open) (Ground) (Open)	_
15		Lock & unlock switch unlock			st
2	signal	Door lock actuator (Lock power source)	0V → 12V → 0V (Approx. 0.3 sec.)	0V → 12V → 0V (Approx. 0.3 sec.)	BF
3	Output	Door lock actuator (Unlock power source)	0V → 12V → 0V (Approx. 1.4 sec.)	0V → 12V → 0V (Approx. 1.4 sec.)	 HA

[•] Operation of lock knob switch RH is the same as LH.

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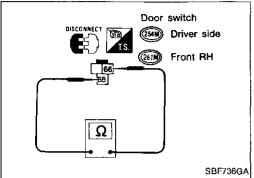
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Power Door Lock — WAGON (Cont'd) ELECTRICAL COMPONENTS INSPECTION

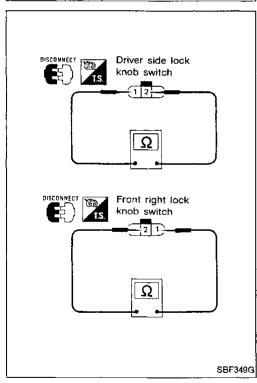
Key switch

Terminals	Condition	Continuity
	Key is in the ignition.	Yes
83 - 84	Key is not in the ignition.	No



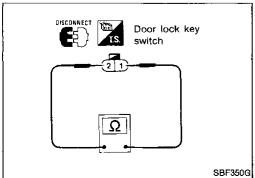
Door switch

Terminals	Condition	Continuity
65) - 66)	Door is closed.	No
160) - 160)	Door is open.	Yes



Lock knob switch (Built-in front door lock actuator)

Terminals	Condition	Continuity
	Lock	No
① - ②	Unlock	Yes

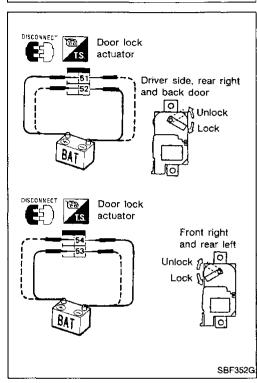


Door unlock key switch

Terminals	Operation	Continuity
4 8	Key is turned toward unlock.	Yes
① - ②	Except above	No

DOOR

Lock & unlock switch Ω SBF351G



Power Door Lock — WAGON (Cont'd)

Main switch

Terminals	Operation	Continuity
	Lock	Yes
② - ④	Neutral and unlock	No
A A	Unlock	Yes
(13) - (14)	Neutral and unlock	No

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Door lock actuator

	Terminals		Operation	LC
	0	θ	Operation	
Driver side, rear right and back door	6	52	Lock	EF
	52	1	Unlock	- EC
Front right and rear left	63	64)	Lock	- - FE
	54	63	Unlock	

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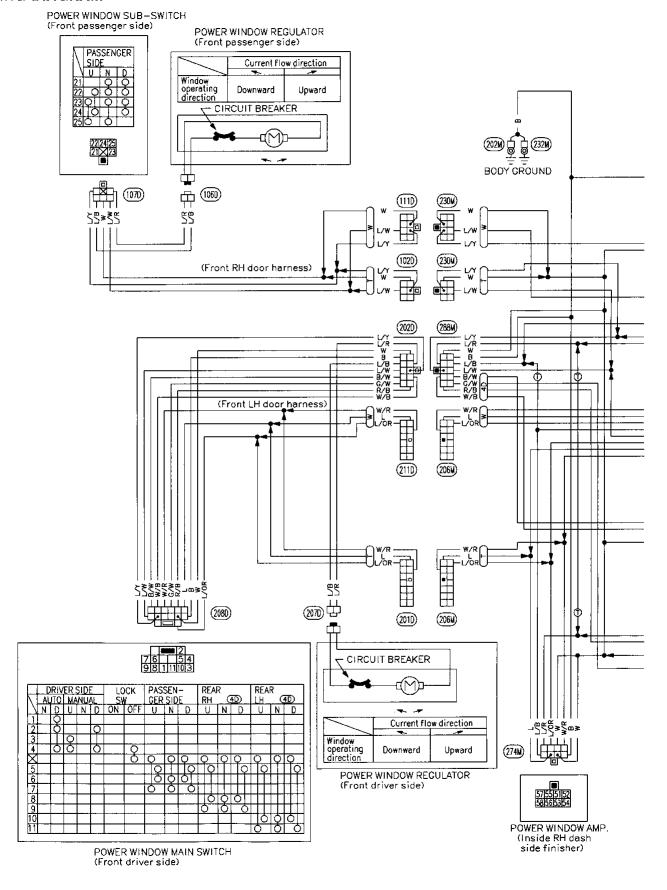
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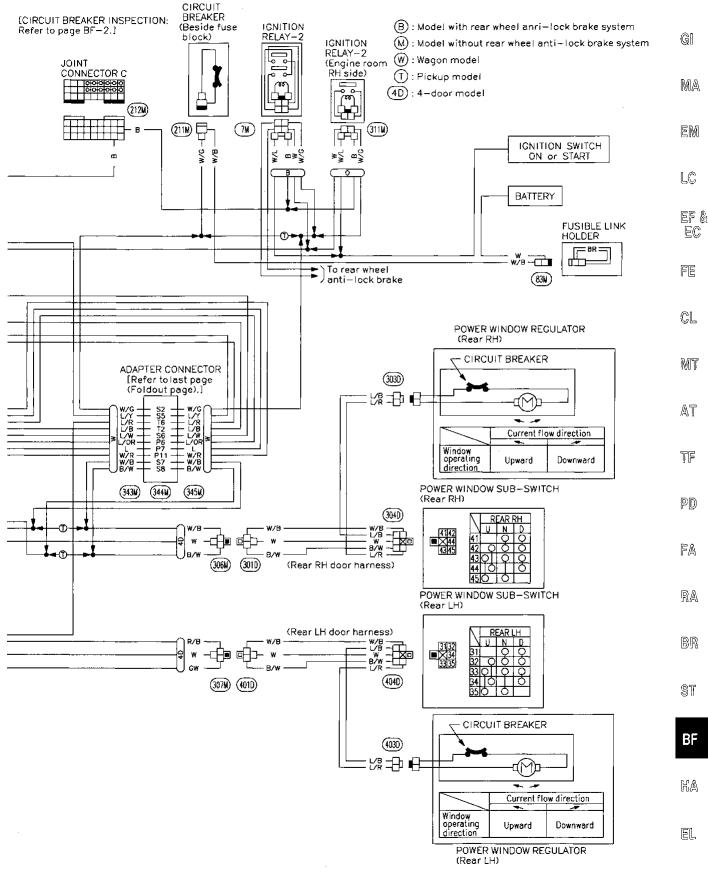
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Power Window

WIRING DIAGRAM



Power Window (Cont'd)



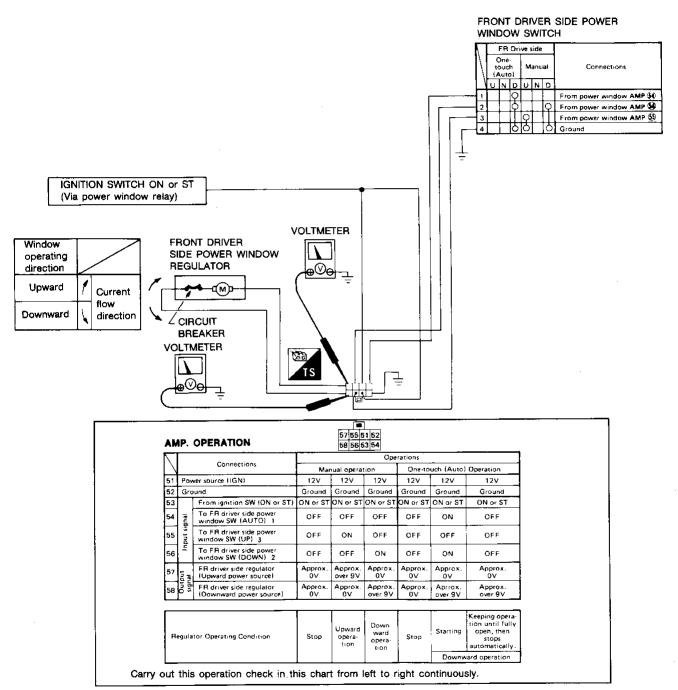
SBF193H [□)\/

Power Window (Cont'd)

ONE-TOUCH (Auto) OPERATION

Power window system is designed to fully close the driver's window automatically by one-touch (Auto) operation of driver's door window switch. Stopping the window at the fully open or closed position is done by power window amp. operation.

Power window amp. inspection



POWER WINDOW AMP. - Inside of RH side dash side finisher

SBF789CA

CAUTION:

- Disconnect ground terminal from battery in advance.
- Be careful not to scratch pad and other parts.

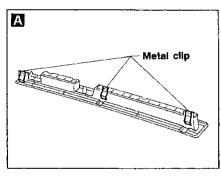
REMOVAL — Instrument panel assembly

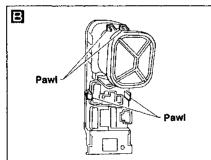
Pay attention so as not to scratch the parts (plastic). During installation, fit the ducting parts precisely.

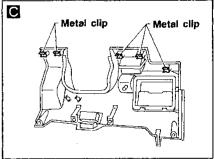
- 1 Remove steering wheel.
- Remove steering column cover.
- 3 Remove lower instrument panel on driver's side.
- 4 Remove glove box assembly.
- (5) Remove lower instrument panel on passenger's side.
- 6 Remove cluster lid C.
- ⑦ Remove console box.
- 8 Remove instrument stay cover.
- Remove A/C or heater control unit.
- 10 Remove audio and deck pocket.
- n Remove lower instrument panel center.
- 12 Remove cluster lid A.
- (3) Remove combination meter.
- 4 Remove ventilator grille on driver's side.
- (5) Remove front defroster grille. A
- 6 Remove left and right front pillar garnishes. Refer to "INTERIOR AND EXTERIOR", (BF-29 or 32).
- The Remove instrument panel and pads.

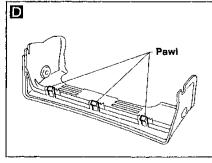
INSTALLATION

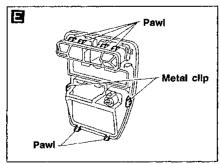
Reverse the procedures described above.

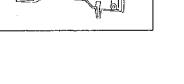












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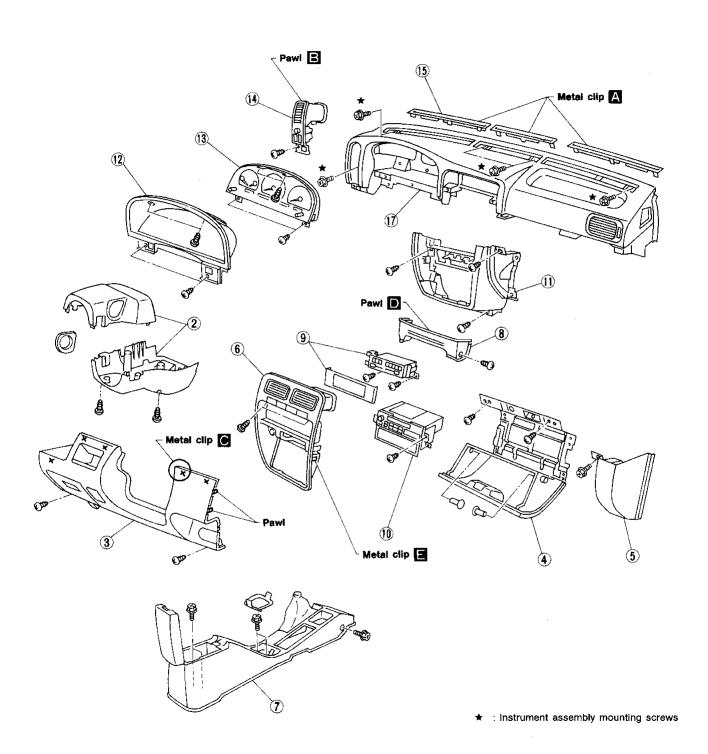
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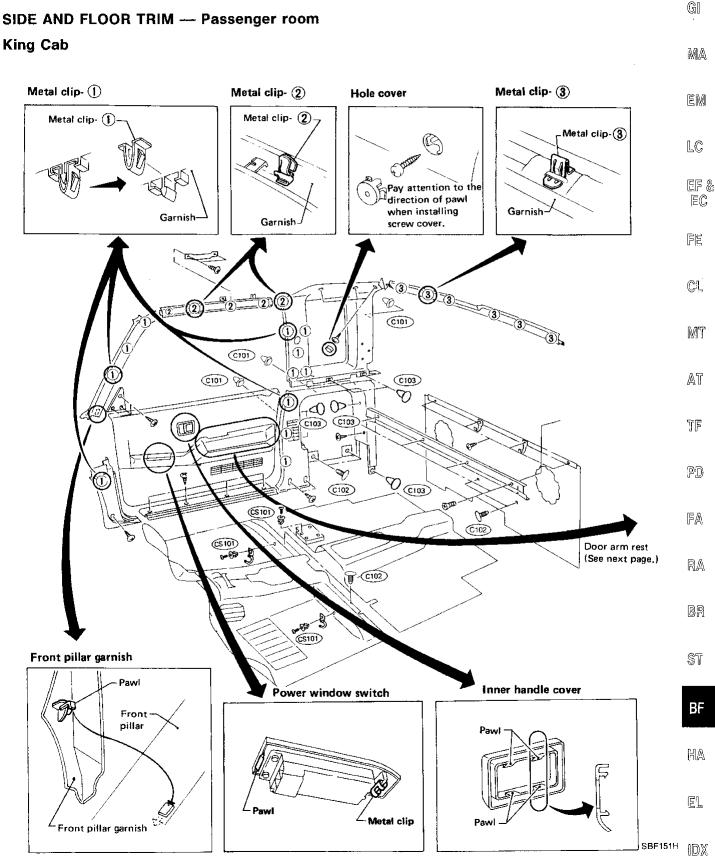
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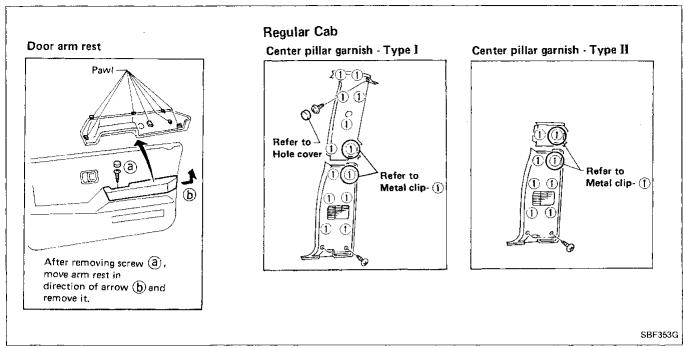
Interior — TRUCK

- Apply sealing compound where necessary while installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.

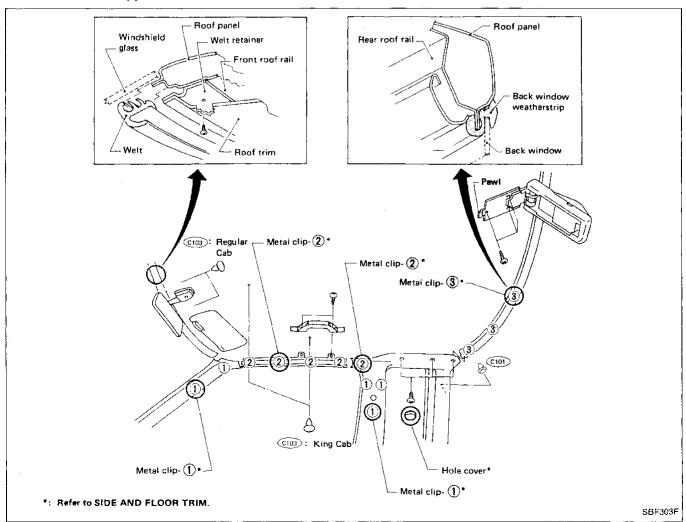


Interior — TRUCK (Cont'd)

SIDE AND FLOOR TRIM (Cont'd)



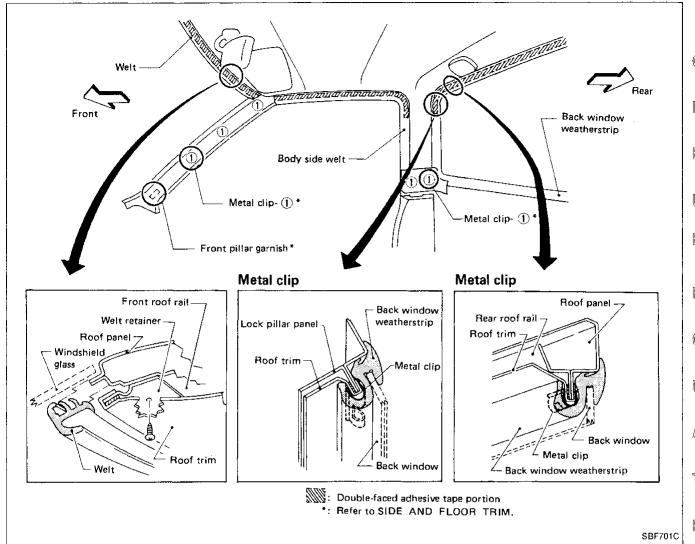
ROOF TRIM — Type I



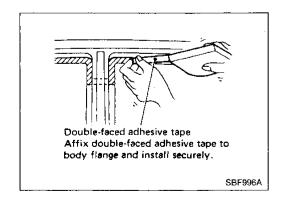
INTERIOR AND EXTERIOR

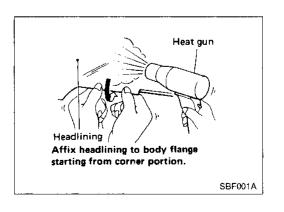
Interior — TRUCK (Cont'd)

ROOF TRIM — Type II



Roof trim installation





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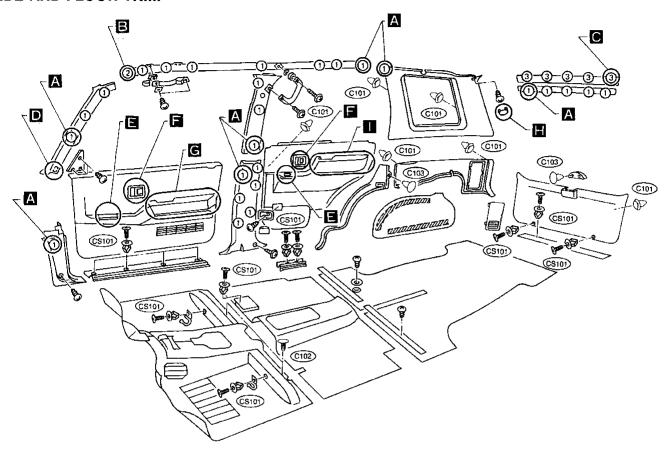
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Interior — WAGON

- Apply sealing compound where necessary while installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.

SIDE AND FLOOR TRIM

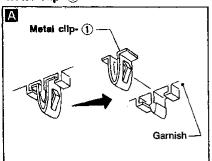


: Double-faced adhesive tape

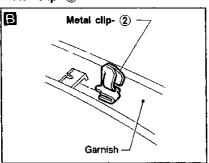
INTERIOR AND EXTERIOR

Interior — WAGON (Cont'd)

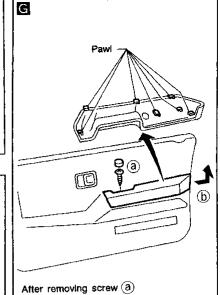
Metal clip- 1



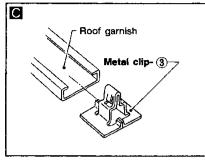
Metal clip- ②



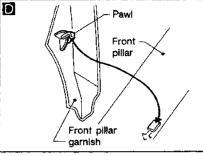
Door arm rest (Front)



Metal clip- 3

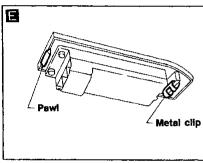


Front pillar garnish

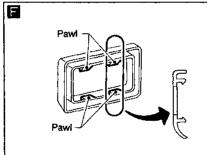


move arm rest in direction of arrow (b) and remove it.

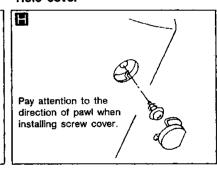
Power window switch



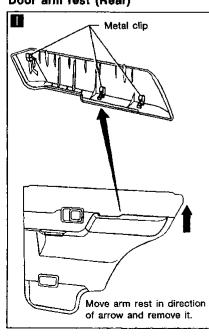
Inner handle cover



Hole cover



Door arm rest (Rear)



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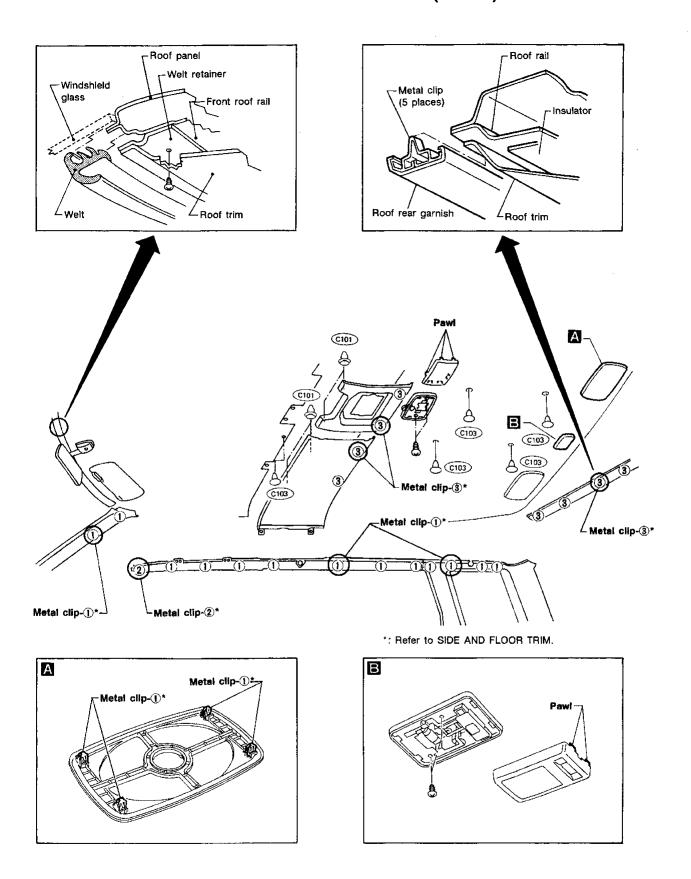
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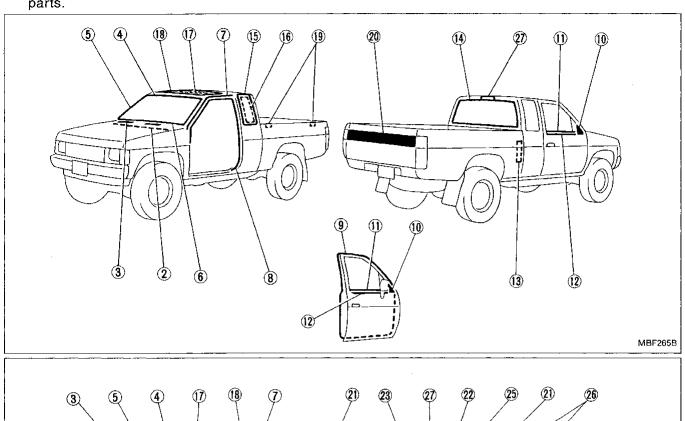
INTERIOR AND EXTERIOR

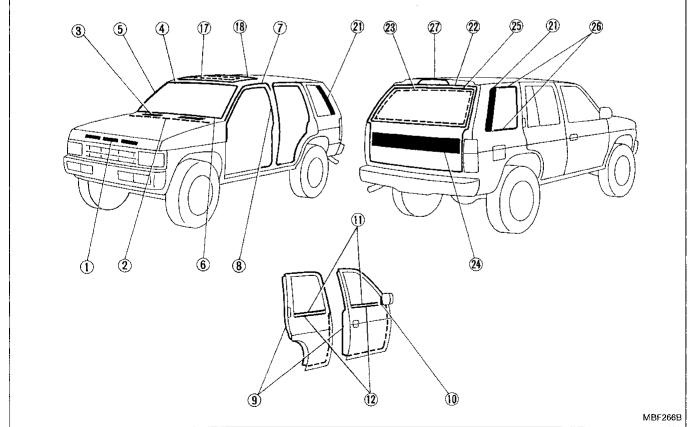
Interior — WAGON (Cont'd)



Exterior

- Apply sealing compound where necessary while installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.





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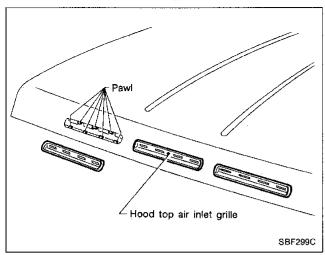
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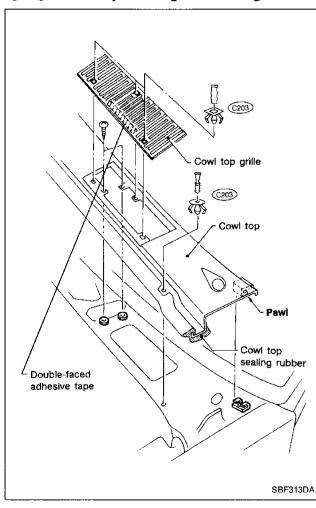
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Exterior (Cont'd)

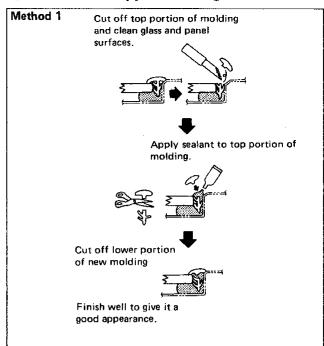
Hood top air inlet grille



2 3 Cowl top sealing rubber & grille

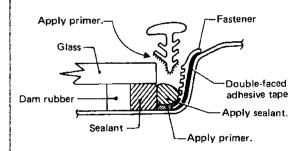


4 Windshield upper molding



Method 2

- 1. Cut off sealant at glass end.
- 2. Clean the side on which panel was mounted.
- Set molding fastener and apply sealant & primer to body panel, and apply primer to molding.



4. Install molding by aligning the molding mark located on center with vehicle center.

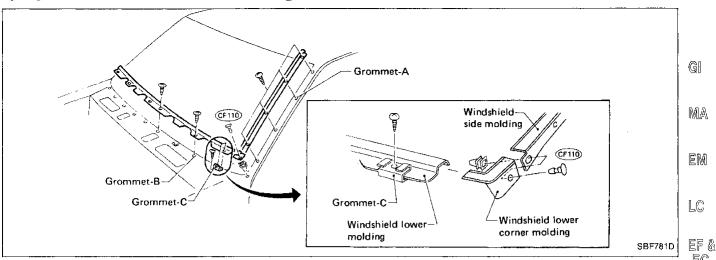
Be sure to install tightly so that there is no gap around the corner.

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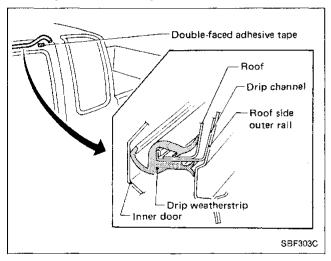
INTERIOR AND EXTERIOR

Exterior (Cont'd)

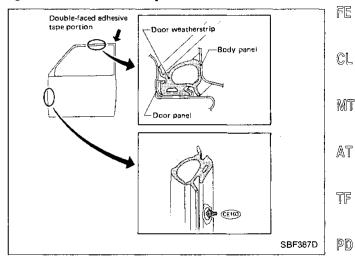
5 6 Windshield side & lower molding



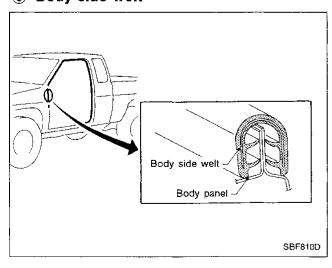
⑦ Drip weatherstrip



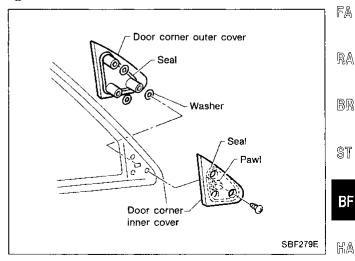
9 Door weatherstrip



8 Body side welt



10 Door corner cover



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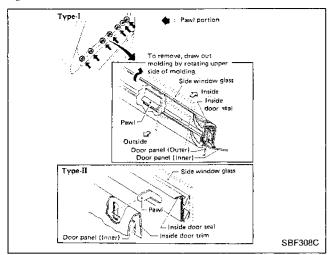
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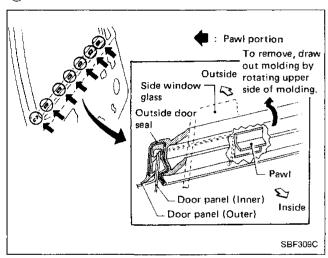
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Exterior (Cont'd)

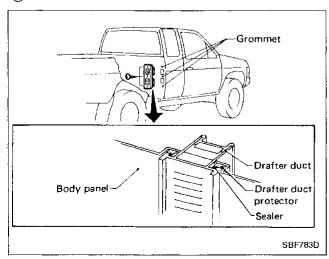
1 Door waist inner seal



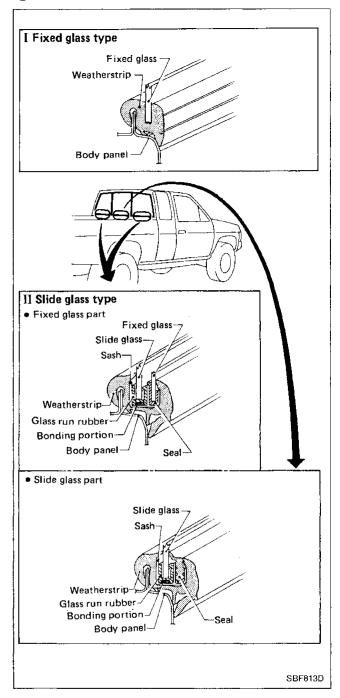
12 Door waist outer seal



13 Drafter duct



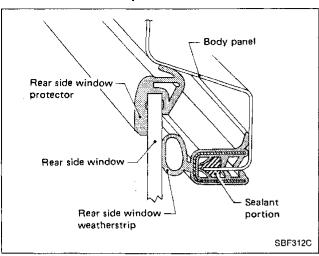
(4) Back window



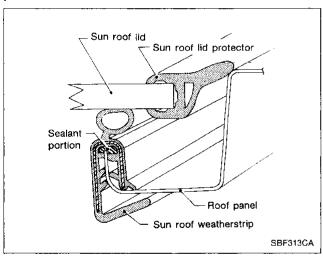
INTERIOR AND EXTERIOR

Exterior (Cont'd)

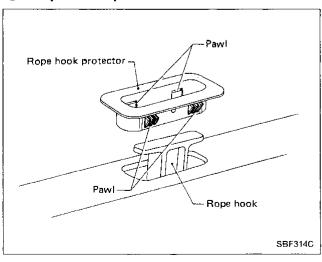
(15) (16) Rear side window weatherstrip and rear side window protector



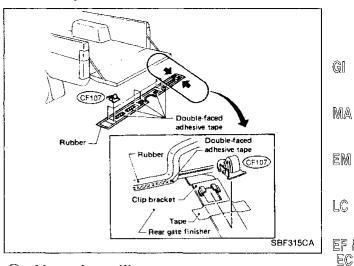
17 18 Sun roof weatherstrip and lid protector



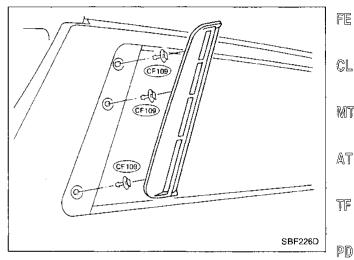
19 Rope hook protector



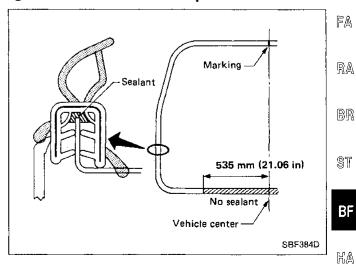
20 Rear gate finisher



21 Air outlet grille



22 Back door weatherstrip

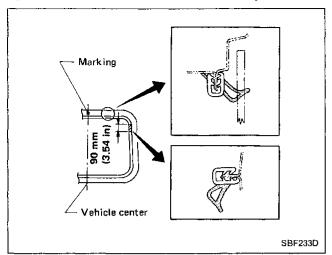


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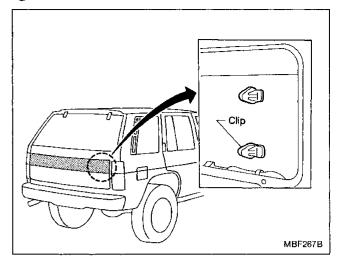
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Exterior (Cont'd)

23 Back door window weatherstrip



24 Back door finisher



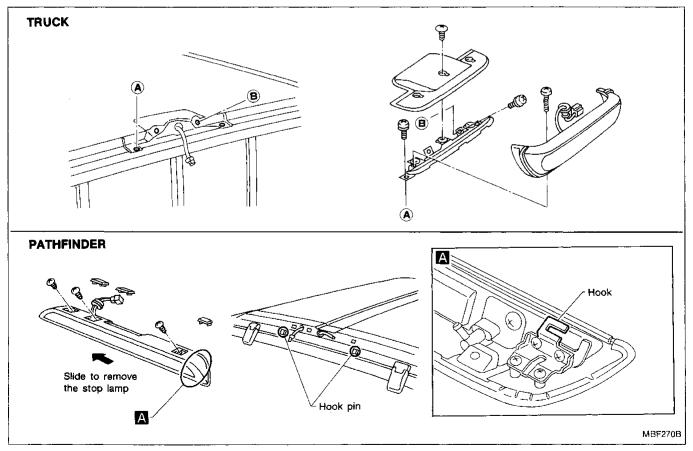
25 Back door window molding

Basically the same as 4 windshield upper molding.

26 2nd side window molding

Refer to the applicable sections on the preceding pages.

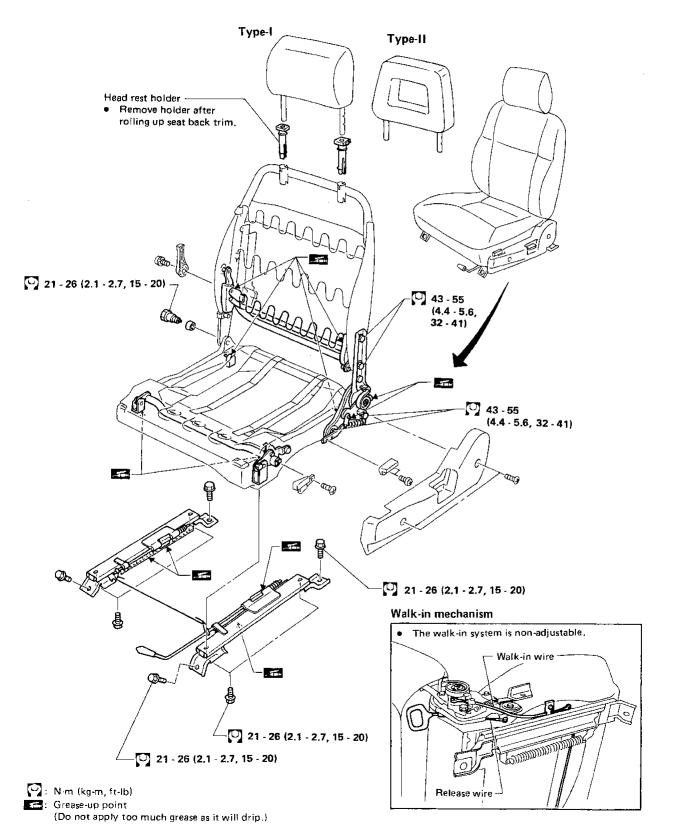
7 High-mounted stop lamp



When removing or installing the seat trim, carefully handle it to keep dirt out and avoid damage.

Front Seat

SEPARATE SEAT



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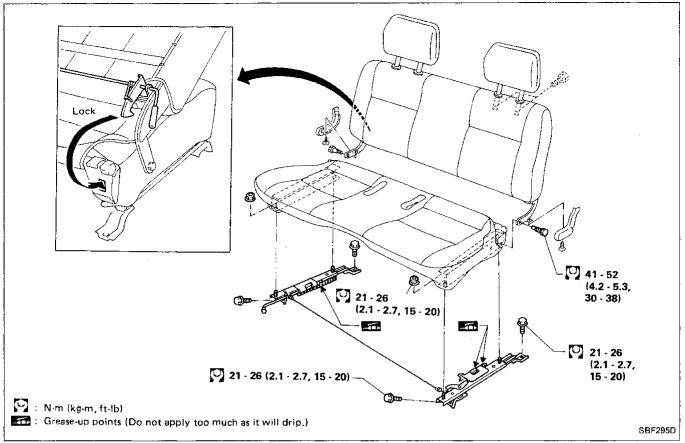
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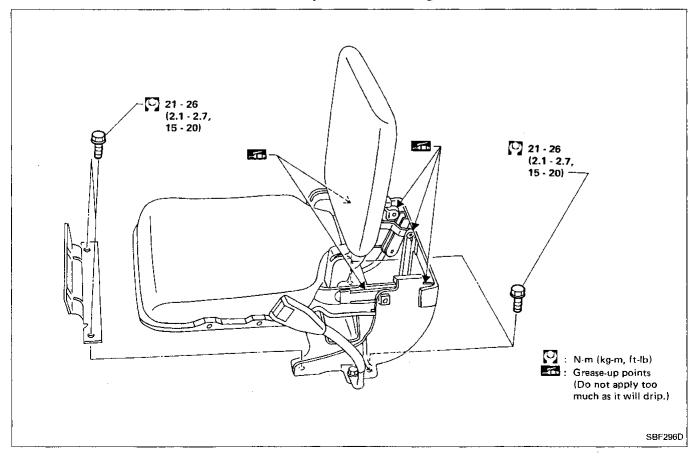
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BENCH SET — TRUCK

Front Seat (Cont'd)

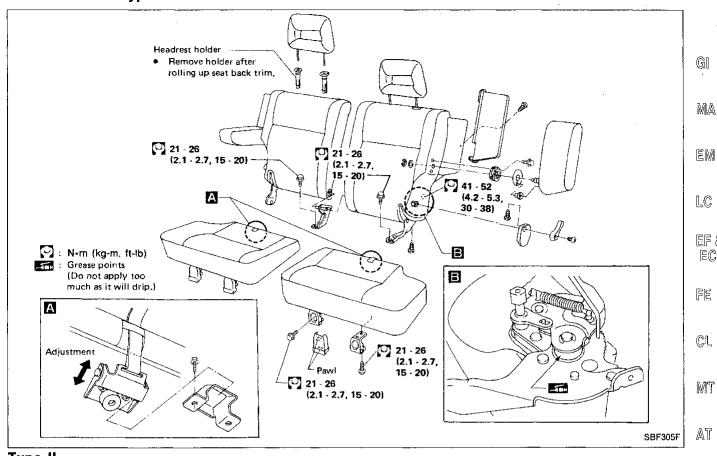


Jump Seat — King Cab Model



REAR SEAT --- Type I

Rear Seat — WAGON



Type II Α Adjustment Α 21 - 26 (2.1 - 2.7, 15 - 20) 21 - 26 (2.1 - 2.7, 15 - 20) ∠<mark>- []</mark> 21 - 26 (2.1 - 2.7, 15 - 20) : N·m (kg-m, ft-lb) : Grease-up points (Do not apply too much as it will drip.) SBF281E

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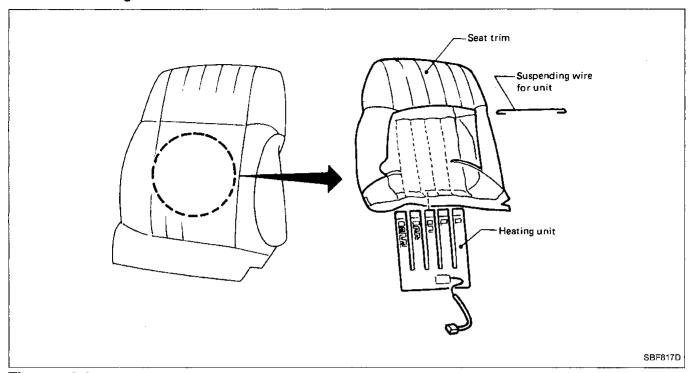
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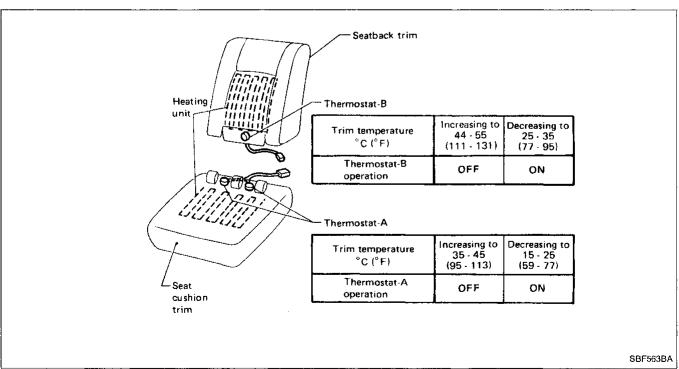
Heated Seat

- When handling seat, be extremely careful not to scratch heating unit.
- To replace heating unit, seat trim and pad should be separated.
- Do not use any organic solvent, such as thinner, benzene, alcohol, gasoline, etc. to clean trims.

Seatback heating unit removal & installation

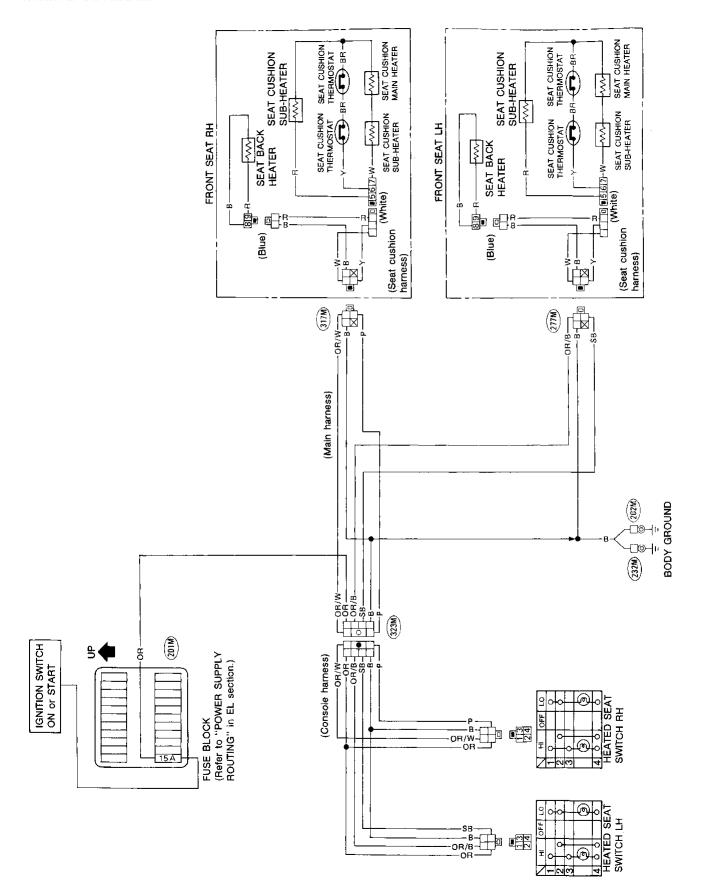


Thermostat



Heated Seat (Cont'd)

WIRING DIAGRAM



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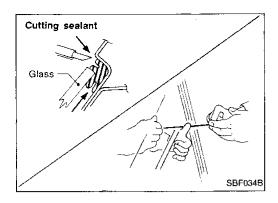
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REMOVAL

After removing moldings, remove glass.

CAUTION:

Be careful not to scratch glass when removing.

INSTALLATION

- Use genuine Nissan Sealant kit or equivalent. Follow instructions furnished with it.
- After installing the glass, the vehicle should remain stationary until the sealant hardens.

WARNING:

Keep heat and open flames away as primers are flammable.

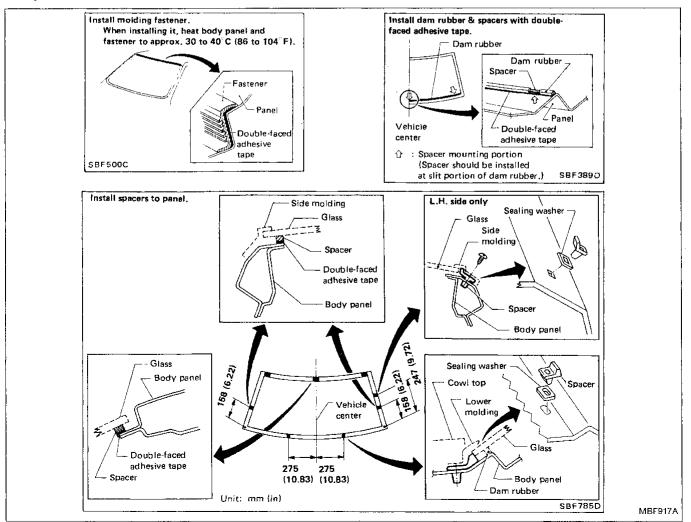
CAUTION:

Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.

- Do not use sealant which is past its usable term.
- Do not leave cartridge unattended with its cap open.
- Keep primers and sealant in a cool, dry place. Ideally, they should be stored in a refrigerator.
- Molding must be installed securely so that it is in position and leaves no gap.

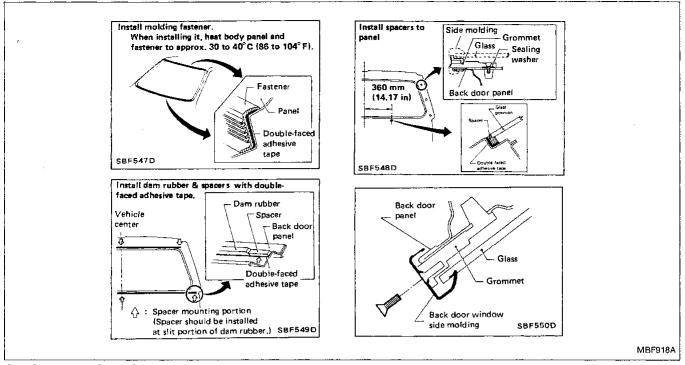
Windshield and Back Door Window

Body side of windshield

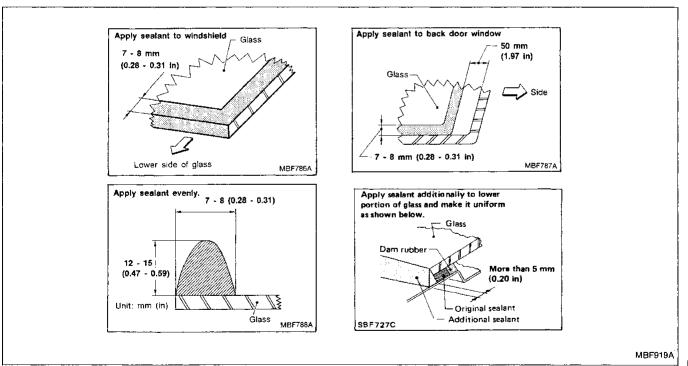


Windshield and Back Door Window (Cont'd)

Body side of back door window



Apply area of sealant



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Windshield and Back Door Window (Cont'd)

REPAIRING WATER LEAKS FOR WINDSHIELD

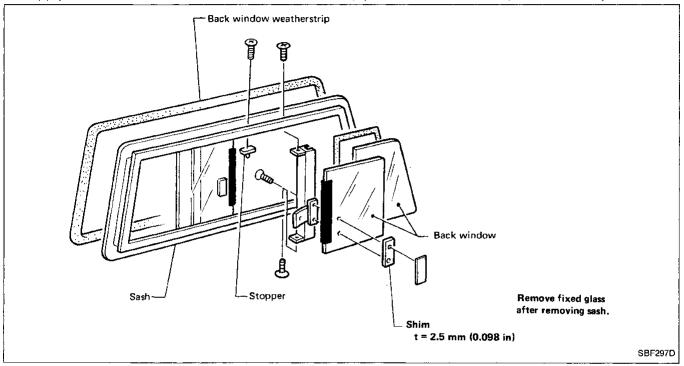
Leaks can be repaired without removing and reinstalling glass.

If water is leaking between caulking material and body or between glass and caulking material, determine the extent of the leak by applying water while pushing glass outward.

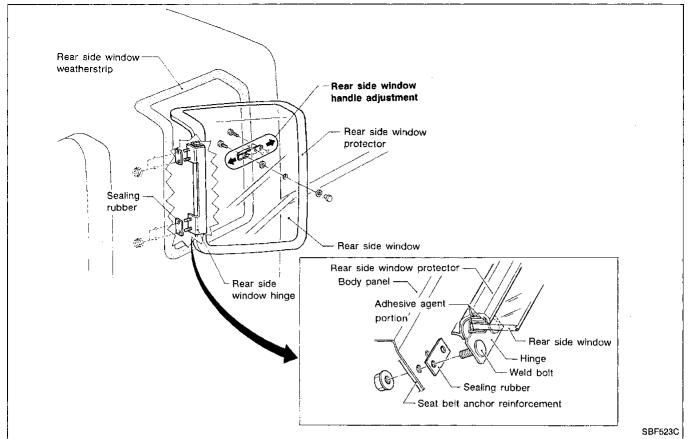
To stop the leak, apply primer (if necessary) and then sealant to the leak point.

Back Window — TRUCK

- Window glass is held in place by weatherstripping. For details regarding weatherstrip, refer to "Exterior".
- Apply sealant to clearances between vehicle body panel and weatherstrip as necessary.



Rear Side Window — TRUCK



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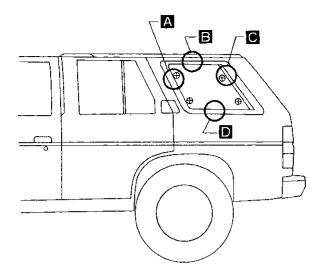
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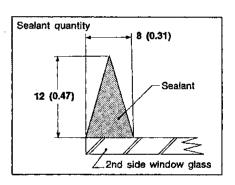
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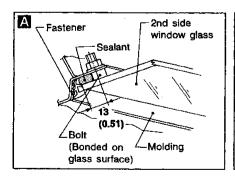
Rear Side Window (2nd) — WAGON

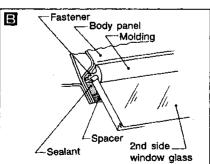
The drying period for sealant is the same as that of windshield and back door window.

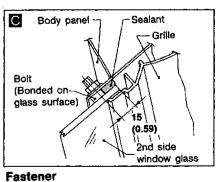


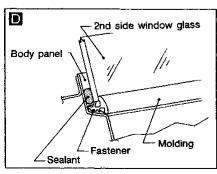
⊕ : BOLT
Unit: mm (in)

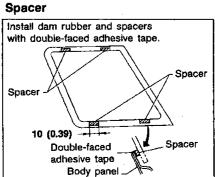


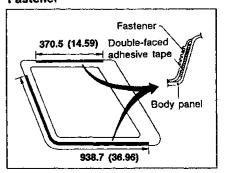






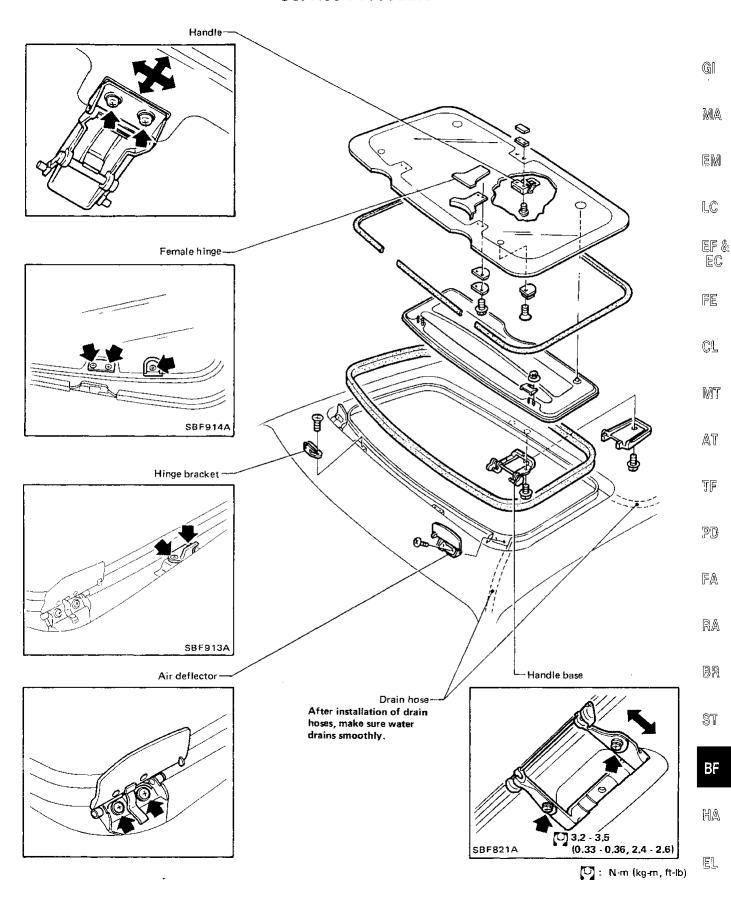






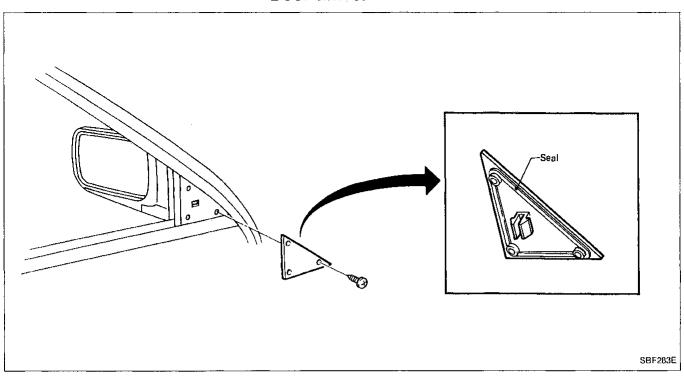
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Service Procedure



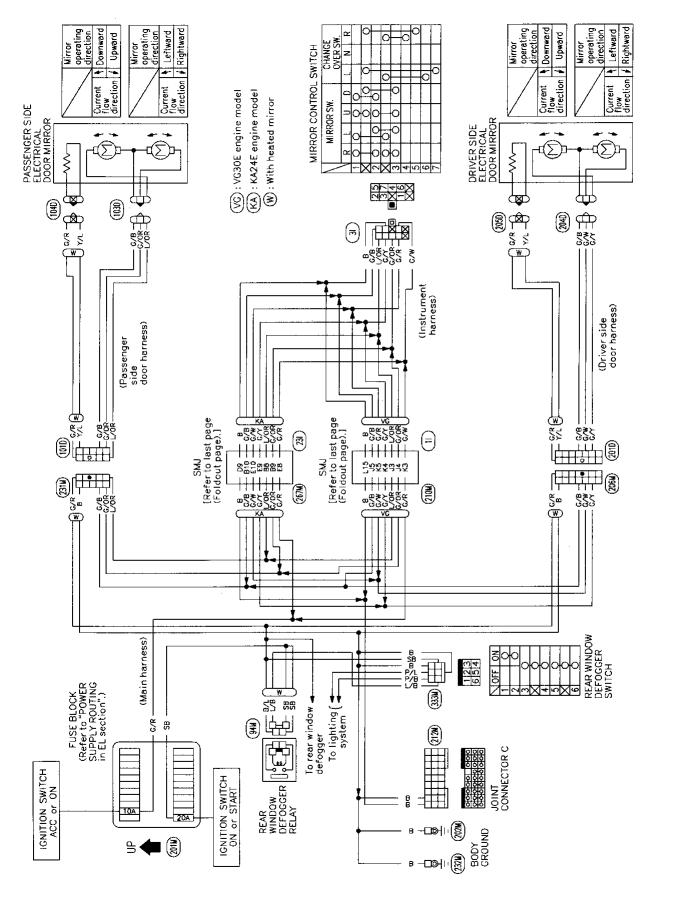
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Door Mirror



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Door Mirror (Cont'd)



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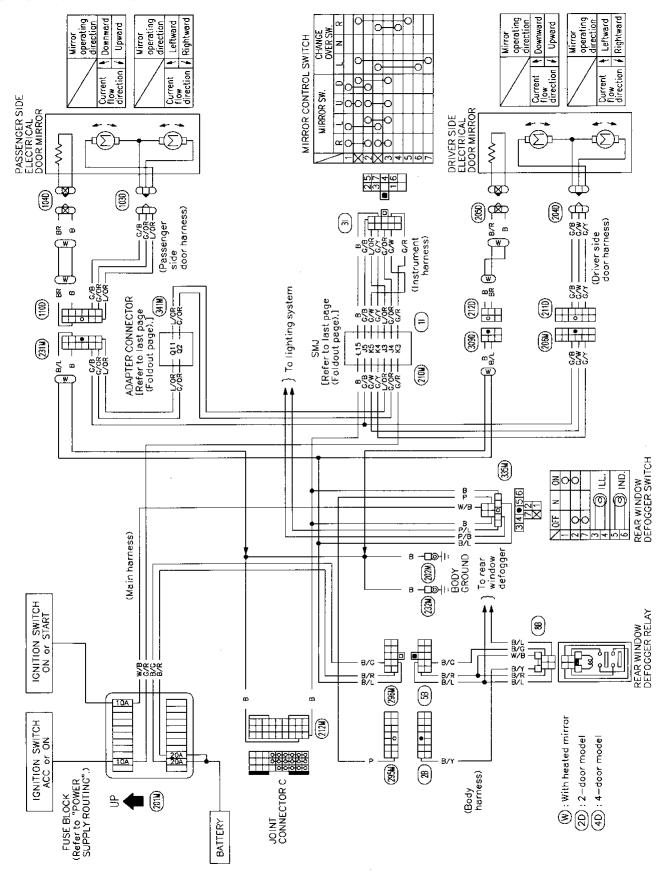
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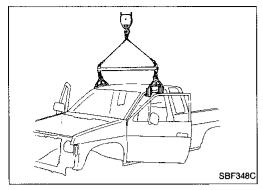
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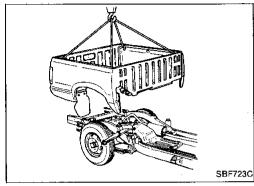
Door Mirror (Cont'd)

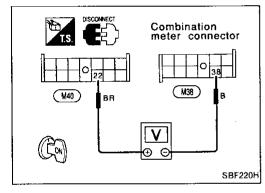
ELECTRICAL REMOTE CONTROL DOOR MIRROR WIRING DIAGRAM



CAB AND REAR BODY







Cab Body — TRUCK

- Remove following parts in engine room at least.
- (1) Main harness and other wiring harness
- Disconnect brake and clutch line in engine compartment.
- Remove following parts under body at least.
- (1) Transmission and transfer control levers
- (2) Hand brake control lever and cable
- (3) Main harness and other wiring harness

Rear Body — TRUCK

- Remove following parts at least.
- (1) Rear combination lamp and license plate lamp harness
- (2) Fuel filler tube fixing screws

Cab Body — WAGON

- Remove following parts in engine room at least.
- (1) Main harness and other wiring harness
- Disconnect brake and clutch line in engine compartment.
- Remove following parts under body at least.
- (1) Transmission and transfer control levers
- (2) Hand brake control lever and cable
- (3) Main harness and other wiring harness
- Remove seat belt anchor bolt.

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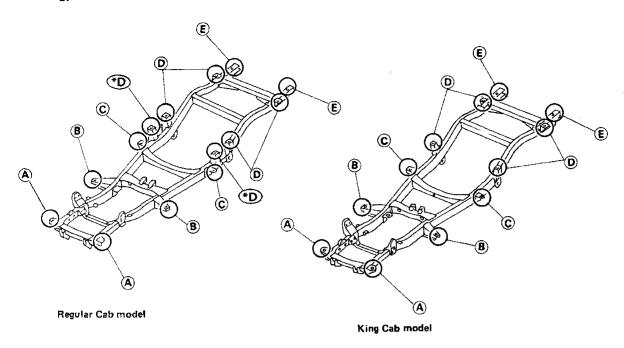
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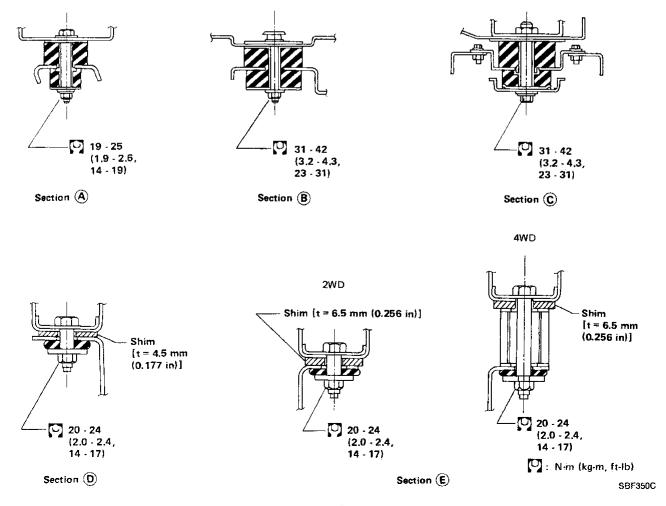
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Body Mounting — TRUCK

When removing, be sure to replace bolts and nuts (sealant applied bolts or self-lock nuts are used for all mounting).

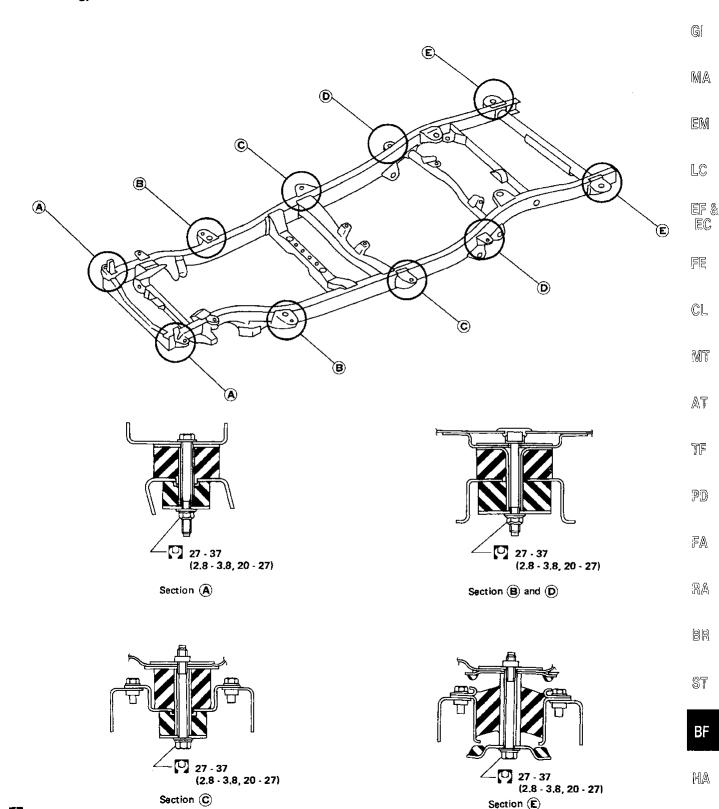


*D: Except for short wheelbase model (This bracket is not used for body mounting.)



Body Mounting — WAGON

When removing, be sure to replace bolts and nuts (sealant applied bolts or self-lock nuts are used for all mounting).



: N·m (kg·m, ft-lb)

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BODY ALIGNMENT

- All dimensions indicated in figures are actual ones.
- When a tram tracking gauge is used, adjust both pointers to equal length and check the pointers and gauge itself to make sure there is no free play.
- When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
- Measurements should be taken at the center of the mounting holes.
- An asterisk (*) following the value at the measuring point indicates that the measuring point on the other side is symmetrically the same value.
- Measurement points

The coordinates of the measurement points are the distances measured from the respective dimension lines in the directions of "x", "y" and "z".

Dimension lines: "x" line — Center line of vehicle

"y" line — Center line of front axle (Any measurement point in front of the dimension line refers to a minus "—" value.)

"z" line — Datum line (Any measurement point under the dimension line refers to a minus "—" value.)

2W.SB

2W.LB

4W.SB

4W.LB

: Short wheelbase (2WD)

: Long wheelbase (2WD)

: Short wheelbase (4WD)

: Long wheelbase (4WD)

2W : 2WD

4W : 4WD

SB

: Short wheelbase

LB : Long wheelbase

R : Regular Cab

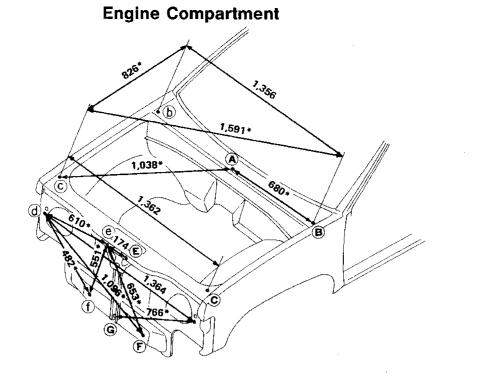
K : King Cab

RL : Regular Cab (Long wheelbase)

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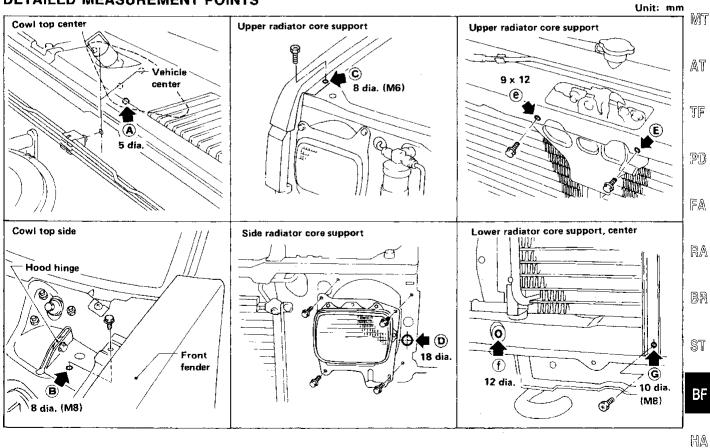
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MEASUREMENT



Unit: mm

DETAILED MEASUREMENT POINTS



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EF & EC

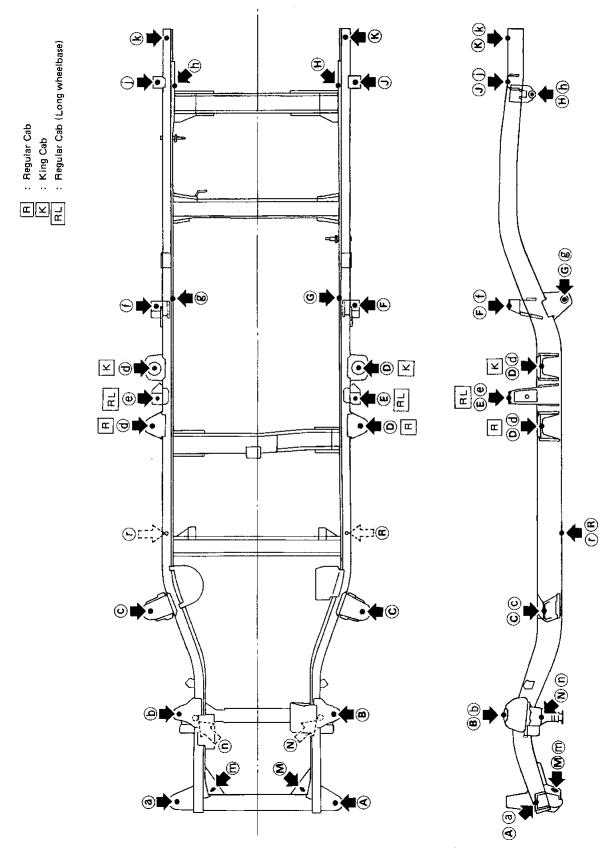
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Underbody — TRUCK

MEASUREMENT POINTS

2WD models

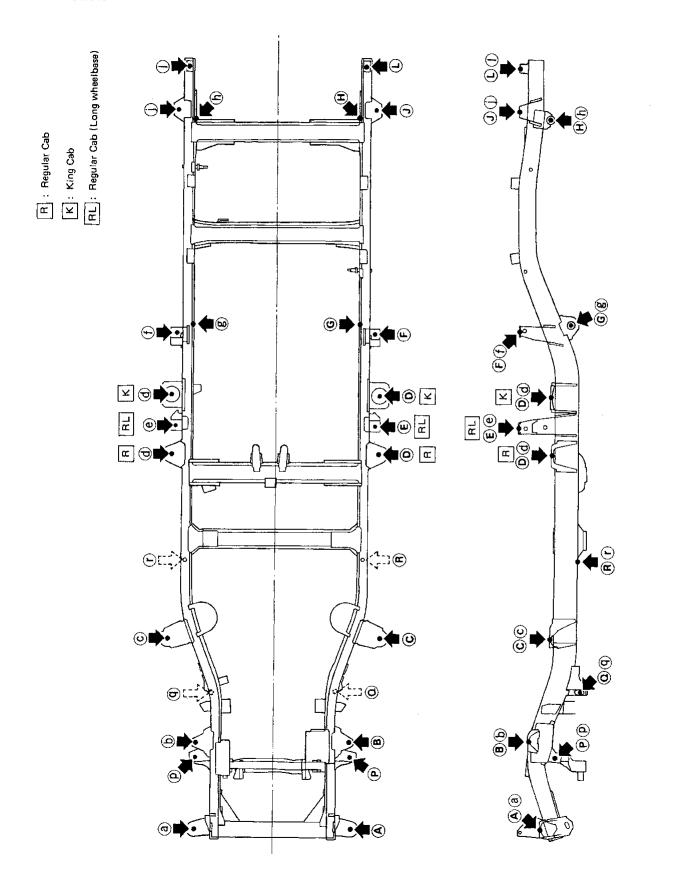


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Underbody — TRUCK (Cont'd)

MEASUREMENT POINTS

4WD models



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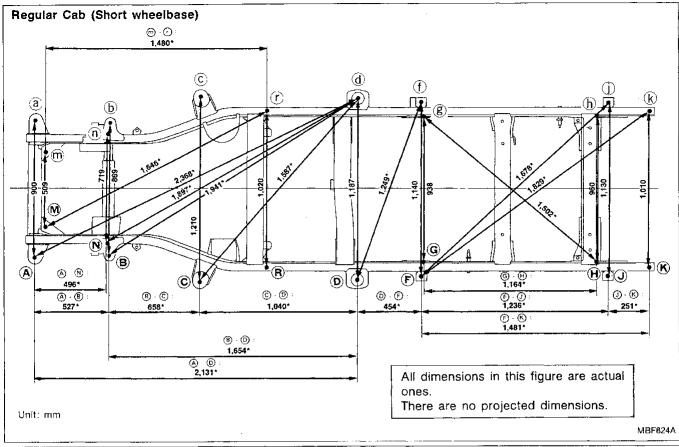
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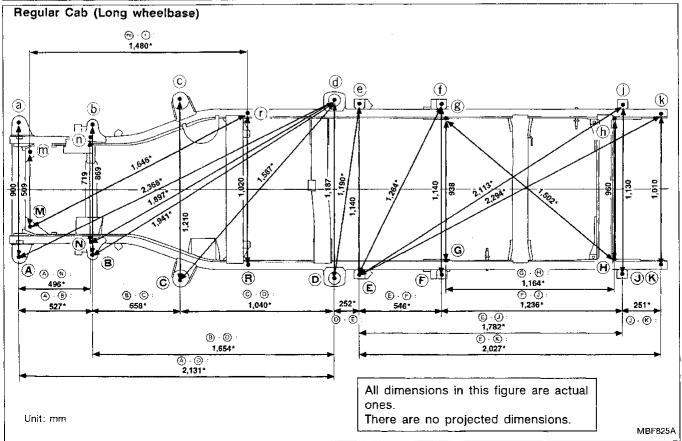
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Underbody — TRUCK (Cont'd)

MEASUREMENT

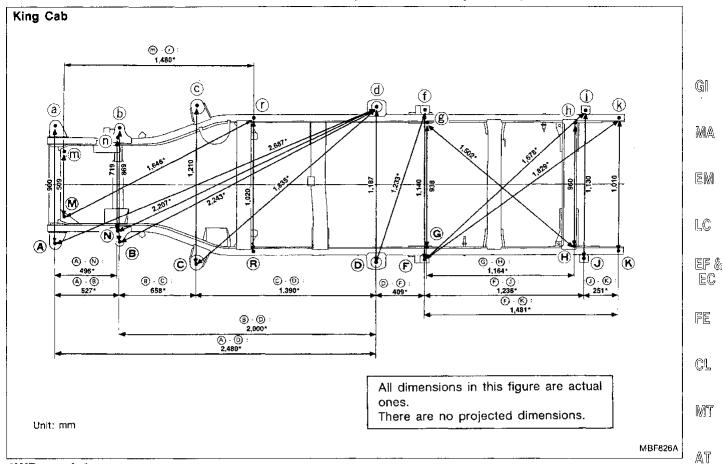
2WD models



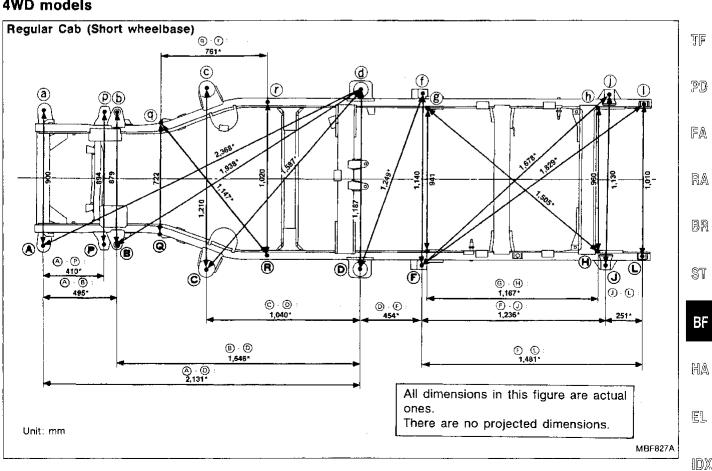


BODY ALIGNMENT

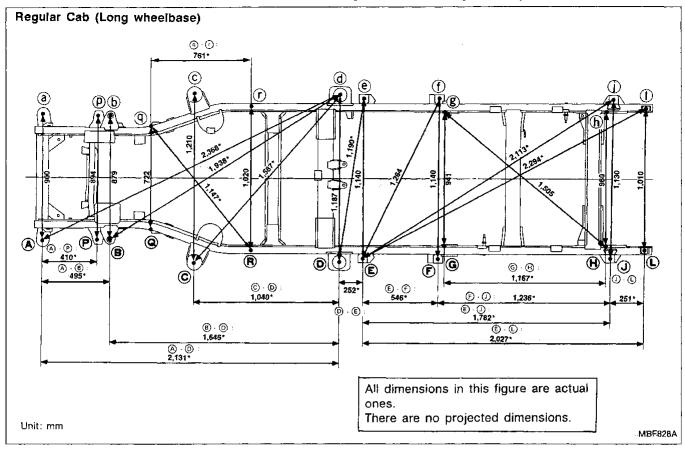
Underbody — TRUCK (Cont'd)

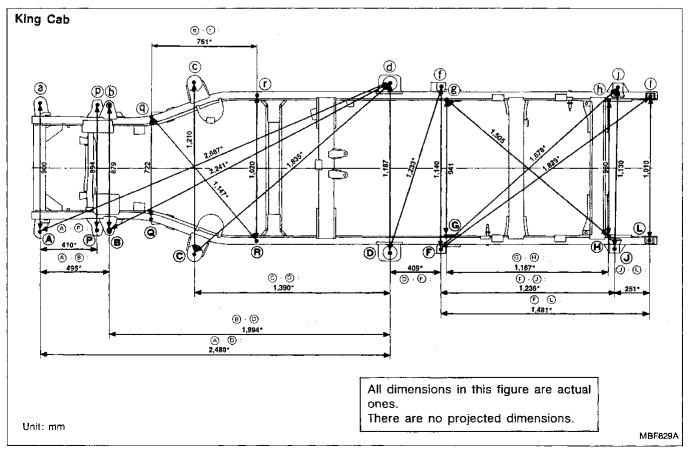


4WD models



Underbody — TRUCK (Cont'd)





BODY ALIGNMENT

Underbody — TRUCK (Cont'd)

DETAILED MEASUREMENT POINTS

Points	Hole dia. Detailed points			Coordinates mm			
roms	mm	Detailed points			''y''	"z"	
(A) (a)	24	Center of hole on top of bracket SBF274B		450.0	-488.5	2W : 21.2 4W : 71.2	G[
© ©	28		Cab body or	605.0	597.5	2W 28.2 4W 21.8	MA
(D)	85		rear body mounting insulator mounting hole	593.5	R: 1,637.0 K: 1,987.0	2W : -15.0 4W : 35.0	em LC
(E) (e)	18			RL : 570.0	RL: 1,804.0	2W : 171.8 4W : 221.8	EF & EC
(F) (1)	18			570.0	SB: 2,050.0 LB: 2,350.0	2W 171.8 4W 221.8	FE Cl
① ①	18		Cab body or rear body mounting	565.0	SB: 3,286.0 LB: 3,586.0	2W 171.8 4W 221.8	MT
() ()	22		insulator mounting hole	505.0	SB: 3,530.0 LB: 3,830.0	220.0	AT
8 b	2W : 15 4W : 15.3	2WD B 4WD B SBF668C	Hole for front shock absorber mounting at the bracket	2W : 434.7 4W : 439.7	5.6 4W 1.4	2W : 203.2 4W : 142.0	TF PD FA RA
() ()	12	Front mounting bracket Inner side SBF795G	Hole for rear spring front mounting at the bracket	2W : 469.0 4W : 470.5	2W.SB: 2,059.0 2W.LB: 2,359.0 4W.SB: 2,080.0 4W.LB: 2,380.0	2W : -152.0 4W : -86.0	BR ST BF

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BODY ALIGNMENT Underbody — TRUCK (Cont'd)

	Hole dia.				oordinates m	m
Points	mm	Detailed points	''x''	''y''	"z"	
(H) (T)	33	Rear mounting bracket Inner side SBF796G	Hole for rear spring rear mounting at the bracket	480.0	2W.SB 3,209.0 2W.LB 3,509.0 4W.SB 3,240.0 4W.LB 3,540.0	2W : 30.0 4W : 43.0
® ®	22	Side member outer	Hole for body mounting at rear of side member outer	505.0	SB : 3,530.0 LB : 3,830.0	170.0
(M) (m)	27	Front Tension rod bracket M (m)	Hole for tension rod mounting at the bracket	254.6	-417.1	-92.3
(N) (n)	9	Bumper rubber SBF799G	Hole for locating at bound bumper bracket	359.5	-3.2	23.5

BODY ALIGNMENT Underbody — TRUCK (Cont'd)

Points	Hole dia.	Hole dia. Detailed points		Coordinates mm			
	mm			''x''	''y''	''z''	
P P	10.5	SBF800G	Hole for rebound bumper mounting at lower link bracket	447.0	88.0	-14.9	GI MA EM
()	27	Compression rod bracket		361.1	294.5	-158.9	ef & ec
			Hole for com- pression rod mounting at the bracket				
							CL
		SBF801G					MT
	13	Side member outer	Hole for wax- ing at lower side of side member outer	510.0	1,040.0	-135.0	
® •							AT
							TF
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		▼® (r) SBF802G					FA

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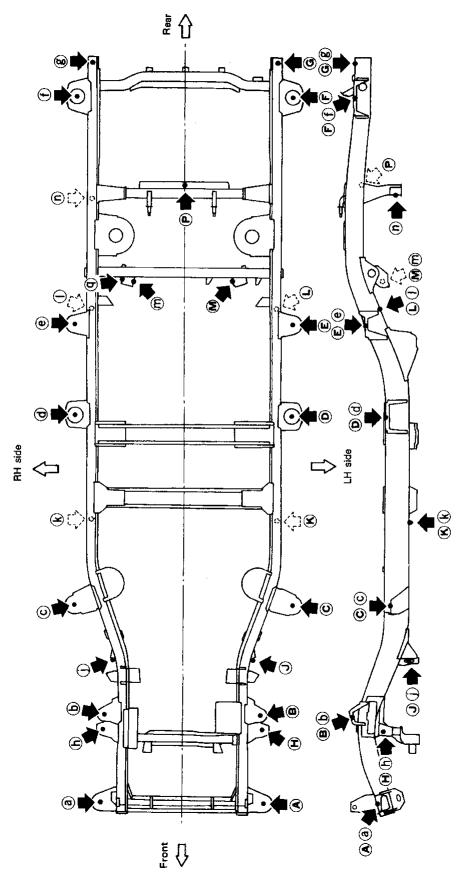
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Underbody — WAGON

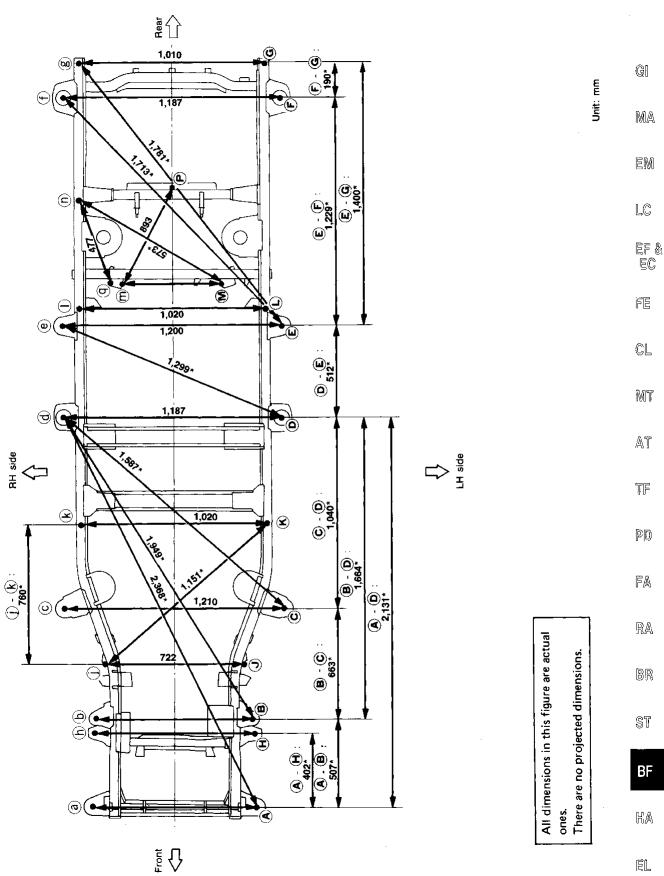
MEASUREMENT POINTS



SBF234DA

Underbody — WAGON (Cont'd)

MEASUREMENT



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BODY ALIGNMENT Underbody — WAGON (Cont'd)

DETAILED MEASUREMENT POINTS

Points	Hole dia.	Detailed points			Coordinates mm		
	mm			"x"	"y"	"z"	
(A) (a)	24	Center of hole on top of bracket		450.0	-488.5	21.2	
© ©	28	Center of fice on top of practice	Hole for body	605.0	597.5	-28.2	
(D) (d)	85		mounting insulator	593.5	1,637.0	_15 	
(E) (9)	28		mounting	600.0	2,135.0	104.7	
F (f)	85	SBF274B		593.5	3,362.0	170	
® ⓑ	13	SBF381D	Hole for front shock absorber mounting at the bracket	434.0	7.7	181.9	
© 9	25	© ® Side member outer	Hole for body mounting at rear of side member outer	505.0	3,530.0	170.0	
(f) (h)	10.5	SBF804G	Hole for rebound bumper mounting at lower link bracket	447.0	-88.0	-14.9	

BODY ALIGNMENT Underbody — WAGON (Cont'd)

Points	Hole dia. mm	Detailed points		Co	Coordinates mm		
① ①	27	Front SBF805G	Hole for com- pression rod mounting at the bracket	361.1	y 294.5	-158.9	GI MA EM
(K) (k)	13	Side member outer	Hole for wax- ing at lower side of side member outer	510.0	1,040.0	-135.0	EF E(
() ()	13	SBF806G	Hole at lower side of side member outer	510.0	2,210.0	17.2	CL Mi
(M) (m)	14	Left side	Hole for upper link	268.0	2,381.6	5.0	– at
(9)	14		mounting at the bracket	332.0	2,396.4	5.0	– _ TF
n	14	Front	Hole for pan- hard rod mounting at front portion of the bracket	496	2,840.5	-55	- 7. PO - FA
P	11	Right side SBF385D	Hole for fuel tank mount- ing at vehicle center	0.0	2,878.0	106.0	- 17# R#

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BRAKE SYSTEM

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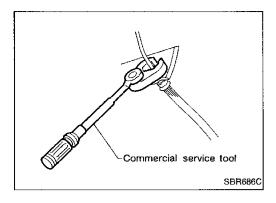
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PRECAUTIONS AND PREPARATION



Precautions

- CL28VD type front disc brake uses plastic pistons. Handle them carefully comparing with the former steel pistons.
- Recommended fluid is brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- To clean or wash all parts of master cylinder, disc brake caliper and wheel cylinder, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of the hydraulic system.
- Use flare nut wrench when removing and installing brake tube.
- Always torque brake lines when installing.

WARNING:

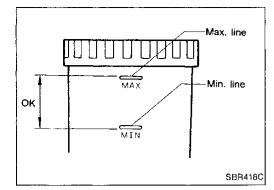
 Clean brake pads and shoes with a waste cloth, then wipe with a dust collector.

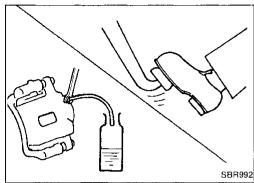
Special Service Tools

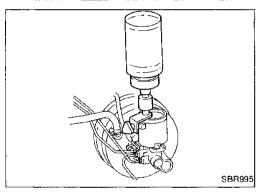
Tool number (Kent-Moore No.) Tool name	Description	
KV991V0010 (—) Brake fluid pressure gauge	NT151	Measuring brake fluid pressure

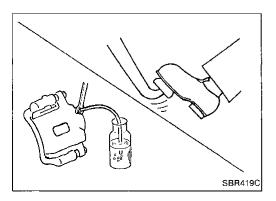
Commercial Service Tools

Tool name	Description
 Flare nut crows foot Torque wrench 	
	NT223









Checking Brake Fluid Level

- Check fluid level in reservoir tank. It should be between Max, and Min, lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.

Checking Brake System

 Check brake lines (tubes and hoses) for evidence of cracks, deterioration or other damage. Replace any damaged parts.

If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

 Be sure to check for oil leakage by fully depressing brake pedal.

Changing Brake Fluid

- 1. Drain brake fluid in each air bleeder valve.
- 2. Refill until new brake fluid comes out of each air bleeder valve.

Use same procedure as in bleeding hydraulic system to refill brake fluid.

Refer to Bleeding Procedure below.

- Refill with recommended brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.

Bleeding Brake System

CAUTION:

- Carefully monitor brake fluid level at master cylinder during bleeding operation.
- If master cylinder is suspected to have air inside, bleed air from master cylinder first. Refer to "Installation" in "MAS-TER CYLINDER" (BR-9).
- Fill reservoir with new brake fluid "DOT 3". Make sure it is full at all times while bleeding air out of system.
- Place a container under master cylinder to avoid spillage PD of brake fluid.
- Models equipped with Rear Wheel Anti-Lock Brake system:
 Before bleeding air, be sure to turn OFF ignition switch,
 and disconnect battery ground cable and actuator connector.
- Bleed air in the following order.
 - 1. LSV air bleeder (Models equipped with LSV)
 - 2. Left rear brake
 - 3. Right rear brake
 - 4. Left front brake
 - 5. Right front brake
 - 6. R-ABS actuator (Models equipped with R-ABS)
- 1. Connect a transparent vinvl tube to air bleeder valve.
- 2. Fully depress brake pedal several times.
- With brake pedal depressed, open air bleeder valve to release air.
- 4. Close air bleeder valve.
- 5. Release brake pedal slowly.
- Repeat steps 2. through 5. until clear brake fluid comes out of air bleeder valve.
- 7. Tighten air bleeder to the specified torque.

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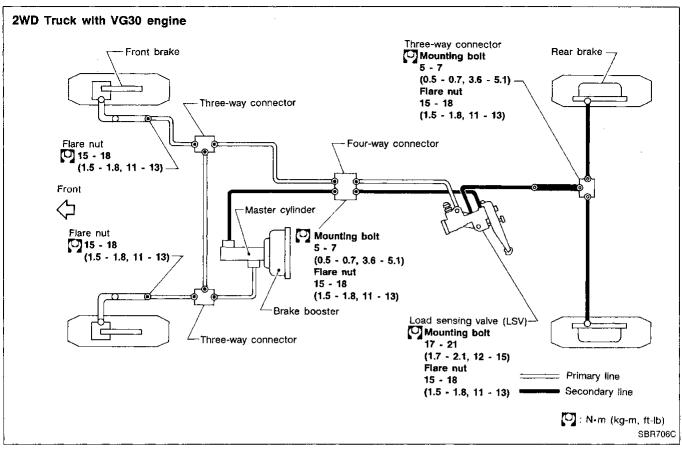
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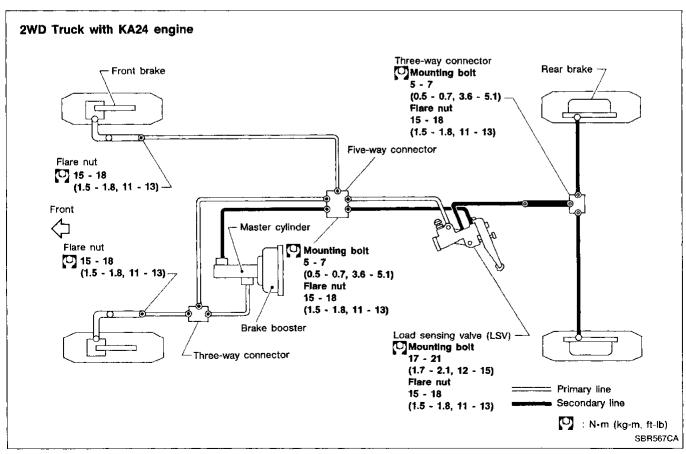
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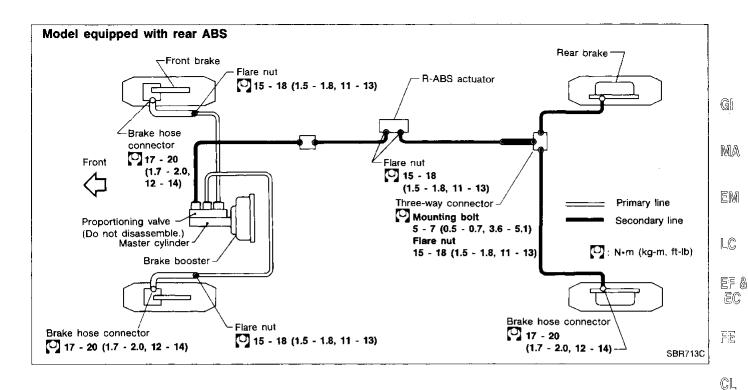
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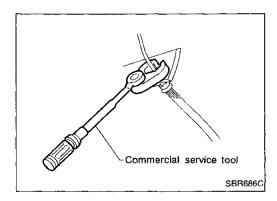
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Removal and Installation

CAUTION:

- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
- All hoses must be free from excessive bending, twisting and pulling.
- Refill with new brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Use Tool when removing and installing brake tube.
- Cover openings to prevent entrance of dirt whenever disconnecting hydraulic line.
- To remove brake hose, first remove flare nut securing brake tube to hose, then withdraw lock spring. Next disconnect the other side.
- All hoses must be free from excessive bending, twisting and pulling.
- After installing brake lines, be sure to check for oil leakage by fully depressing brake pedal.

Inspection

Check brake lines (tubes and hoses) for evidence of cracks, deterioration or other damage. Replace any damaged parts. If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

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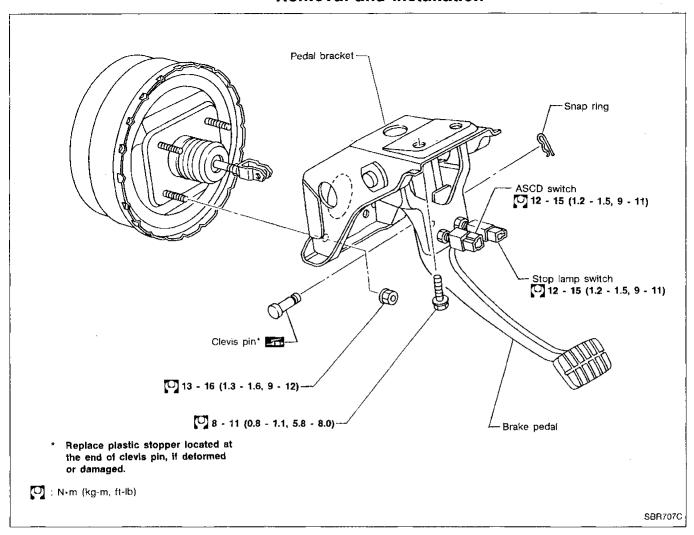
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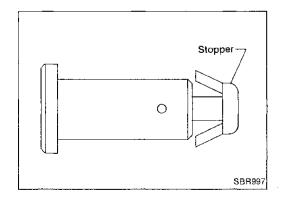
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Removal and Installation

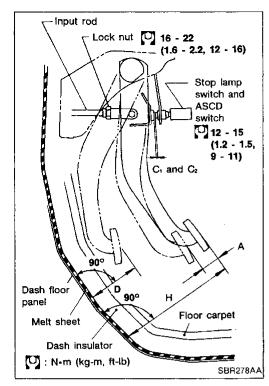


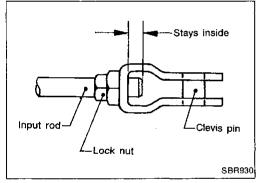


Inspection

Check brake pedal for following items:

- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion
- Crack or deformation of clevis pin stopper





Adjustment

Check brake pedal free height from melt sheet. Adjust if necessary.

H: Free height Refer to SDS.

D: Depressed height

Refer to SDS.

Under force of 490 N (50 kg, 110 lb) with engine running

 $\mathbf{C_1}$: Clearance between pedal stopper and threaded end of stop lamp switch

0.3 - 1.0 mm (0.012 - 0.039 in)
Clearance between pedal stopper

C₂: Clearance between pedal stopper and threaded end of ASCD switch

0.3 - 1.0 mm (0.012 - 0.039 in)

A: Pedal free play

1 - 3 mm (0.04 - 0.12 in)

 Adjust pedal free height with brake booster input rod. Then tighten lock nut.

Make sure that the tip of input rod stays inside.

 Adjust clearance "C₁" and "C₂" with stop lamp switch and ASCD switch respectively. Then tighten lock nuts.

Check pedal free play.

Make sure that stop lamp is off when pedal is released.

4. Check brake pedal depressed height with engine running. If depressed height is below the specified value, check brake system for leaks, accumulation of air or any damage components such as master cylinder, wheel cylinder, etc. Make the necessary repairs, if necessary.

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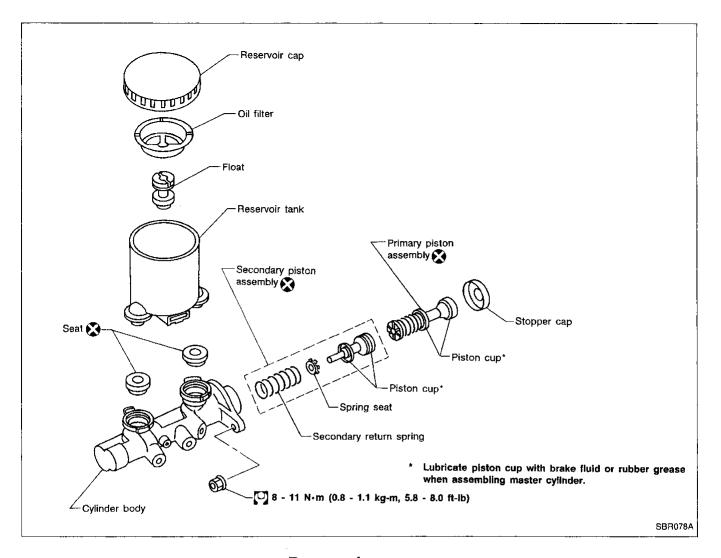
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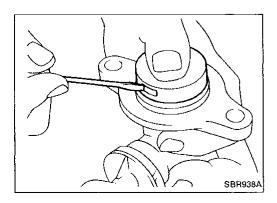
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Removal

CAUTION:

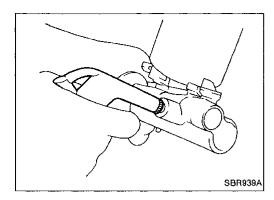
- Be careful not to splash brake fluid on painted areas; it may cause of paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
- 1. Connect a vinyl tube to air bleeder valve.
- 2. Drain brake fluid from each air bleeder valve, depressing brake pedal to empty fluid from master cylinder.
- 3. Remove brake pipe flare nuts.
- Remove master cylinder mounting nuts.



Disassembly

- Remove valve stopper while pushing valve into cylinder lightly.
- 2. Bend claws of stopper cap outward.

MASTER CYLINDER



Disassembly (Cont'd)

Remove piston assemblies.

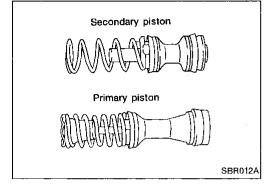
If it is difficult to remove secondary piston assembly, gradually apply compressed air through fluid outlet.

Draw out reservoir tank.



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Inspection

Check for the following items.

LC

Replace any part if damaged. Master cylinder:

Pin holes or scratches on inner wall.

EF & EC

Piston:

Deformation of or scratches on piston cups.

FE

Assembly

Pay attention to direction of piston cups in figure at left. Also, insert pistons squarely to avoid scratches on cylinder bore.

CL

Bend claws inward.

2. Install stopper cap.

3. Install reservoir tank oil seals.

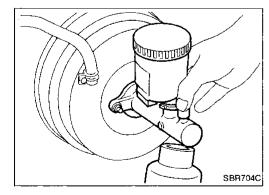
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4. Push reservoir tank into master cylinder.

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Installation

CAUTION:

SBR940A

FA

Refill with new brake fluid "DOT 3".

Never reuse drained brake fluid.

Place master cylinder onto brake booster and secure mounting nuts lightly.

2. Torque mounting nuts.

8 - 11 N·m (0.8 - 1.1 kg-m, 5.8 - 8.0 ft-lb)

BR

Fill up reservoir tank with new brake fluid.

Plug all ports on master cylinder with fingers in order not to have air sucked while releasing brake pedal.

5. Have driver depress brake pedal slowly several times until

no air comes out of master cylinder.

Fit brake lines to master cylinder.

Tighten flare nuts.

(I): 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)

8. Bleed air from brake system. Refer to "Bleeding Brake System" (BR-3).

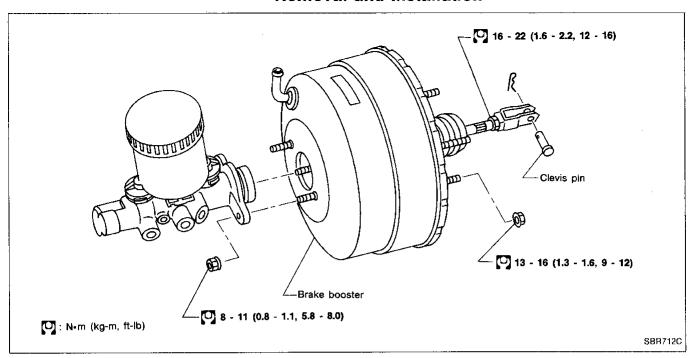
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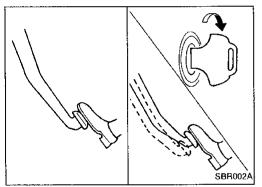
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BR-9

Removal and Installation





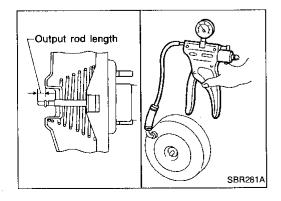
On-vehicle Service

OPERATING CHECK

- Depress brake pedal several times with engine off, then check that there is no change in pedal stroke.
- Depress brake pedal, then start engine. If pedal goes down slightly, operation is normal.

AIRTIGHT CHECK

- Start engine, then stop it in one or two minutes. Depress brake pedal several times slowly. If pedal goes further down the first time and gradually rises after second or third time, the booster is airtight.
- Depress brake pedal while engine is running, then stop engine with pedal depressed. If there is no change in pedal stroke after holding pedal down 30 seconds, brake booster is airtight.



Inspection

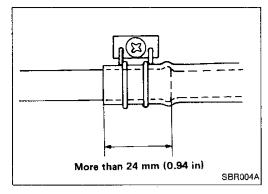
OUTPUT ROD LENGTH CHECK

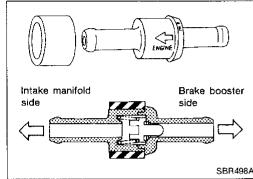
- 1. Supply brake booster with vacuum of -66.7 kPa (-500 mmHg, -19.69 inHg) using a handy vacuum pump.
- 2. Check output rod length.

Specified length:

10.275 - 10.525 mm (0.4045 - 0.4144 in)

VACUUM PIPING





Engine side

SBR943A

Booster side

Removal and Installation

CAUTION:

Do not apply any oil or lubricants to vacuum hose and check

Insert vacuum tube into vacuum hose more than 24 mm (0.94 in).

> MA EM

Install check valve properly paying attention to its direction.

LC

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Inspection

HOSES AND CONNECTORS

MT

- Check condition of vacuum hoses and connectors.
- Check vacuum hoses for air tightness.

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Check vacuum with a vacuum pump.

Connect to Vacuum should exist. booster side Connect to Vacuum should not exist. engine side

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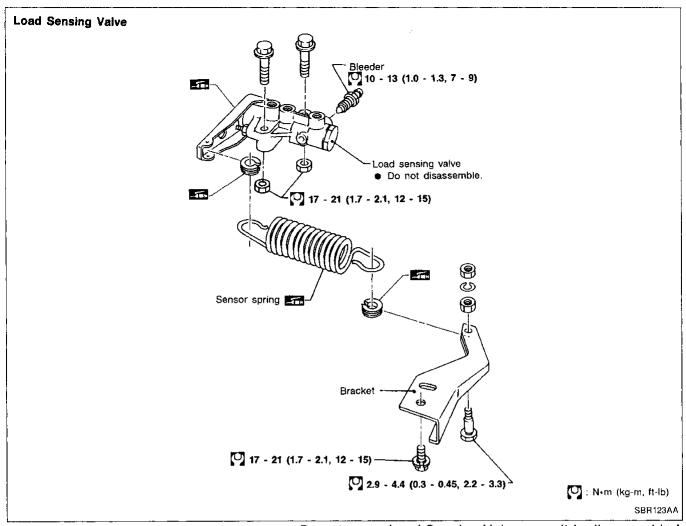
MM

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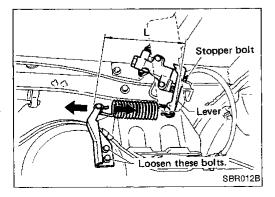
DX

BR-11

LOAD SENSING VALVE



- Do not reuse Load Sensing Valve once it is disassembled.
- Replace damaged Load Sensing Valve as an assembly.
- When disassembling, apply multi-purpose grease to all rubbing areas.



Inspection (LSV)

- 1. Ensure vehicle is unladen condition*.
 - Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
- Have a driver sit in the driver's seat and one person sit on the rear end. Then have the person on the rear end slowly get off the vehicle. This is necessary to stabilize suspension deflection.
- 3. Attach a lever to the stopper bolt, and adjust length "L" as follows:

Length "L":

Approx. 189 mm (7.44 in)

BR-12

LOAD SENSING VALVE

Inspection (LSV) (Cont'd)

Install pressure gauge to front and rear brake.

Tool number: KV991V0010 (—)

Raise front brake pressure to 9,807 kPa (100 kg/cm², 1,422 psi) and check rear brake pressure.

Rear brake pressure:

Refer to table below.

If rear brake pressure is not within specification, adjust bracket.

(Refer to step 3.)

SBR013B

SBR014B

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Set weight slowly on axle center.

Weight: 100 kg (221 lb)

7. Raise front brake pressure to 9,807 kPa (100 kg/cm², 1,422 psi) and check rear brake pressure.

Rear brake pressure.

Refer to table below.

If rear brake pressure is not within specification, adjust bracket

as follows:

CL

Adjust bracket to direction of L when rear brake pressure is above specification.

Adjust bracket to direction of R when rear brake pressure is below specification.

Repeat step 7. until rear brake pressure is within specification.

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Unit: kPa (kg/cm², psi)

		U.S.A.		Canada		
	KA24E	VG30E		VA045	VG30E	
		Except HD *	HD *	KA24E	Except HD *	HD *
Without weight	2,942 - 3,727 (30 - 38, 427 - 540)	3,040 - 3,825 (31 - 39, 441 - 555)	3,040 - 3,825 (31 - 39, 441 - 555)	2,942 - 3,727 (30 - 38, 427 - 540)	3,040 - 3,825 (31 - 39, 441 - 555)	3,040 - 3,825 (31 - 39, 441 - 555)
With weight	3,432 - 4,805 (35 - 49, 498 - 697)	4,119 - 5,492 (42 - 56, 597 - 796)	3,923 - 5,296 (40 - 54, 569 - 768)	3,334 - 4,707 (34 - 48, 483 - 683)	4,119 - 5,492 (42 - 56, 597 - 796)	3,923 - 5,296 (40 - 54, 569 - 768)

^{*}HD: Heavy duty models.

HA

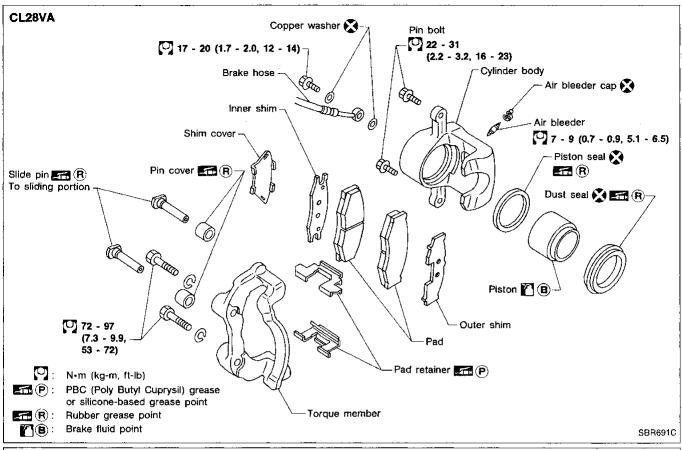
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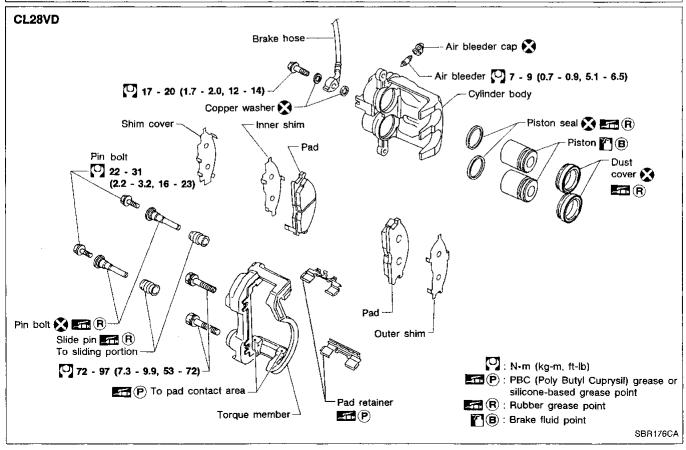
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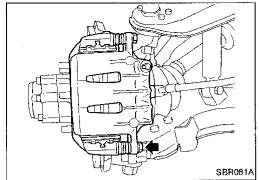
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BR-13

CL28VA and CL28VD

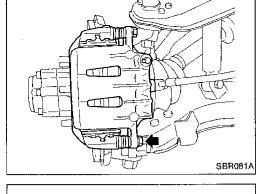






Pad Replacement

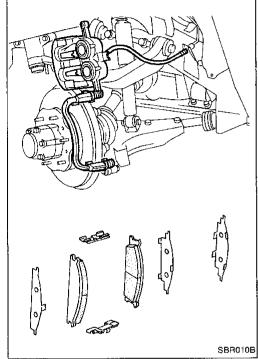
1. Remove pin bolt.



2. Swing cylinder body upward. Then remove pad retainers, and inner and outer shims.

When cylinder body is swung up, do not depress brake pedal because piston will pop out.

Be careful not to damage dust cover or get oil on rotor. Always replace shims when replacing pads.

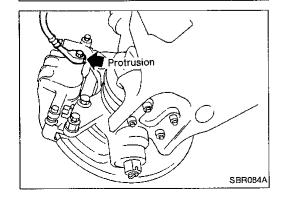


Removal and Installation

Remove torque member fixing bolts and union bolt.

SBR083A

Install brake hose to caliper securely.



993

BR-15

BR ST BF $\mathbb{H}\mathbb{A}$ EL IDX

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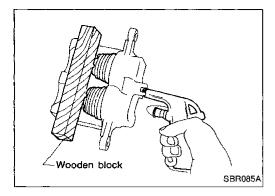
TF

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FRONT DISC BRAKE

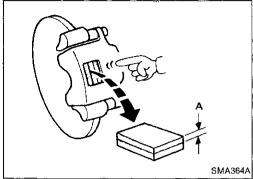


Disassembly

Push out piston with dust cover with compressed air. For CL28VD (2-piston type), use a wooden block so that the 2 pistons come out evenly.

CAUTION:

CL28VD type front disc brake uses plastic pistons. Handle them carefully comparing with the former steel pistons.

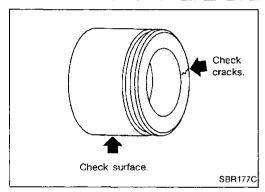


Inspection

DISC PAD

Check disc pad for wear or damage.

Pad wear limit (A): 2.0 mm (0.079 in)



PISTON

— for steel piston (CL28VA only) —

Check piston for score, rust, wear, damage or presence of foreign materials. Replace if any of the above conditions are observed.

CAUTION:

Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

— for plastic piston (CL28VD) —

Check piston for uneven surface, small chips or cracks. Replace if any of the above conditions are observed.

CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign objects. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign objects may be eliminated by polishing the surface with a fine emery paper.
 Replace cylinder body if necessary.

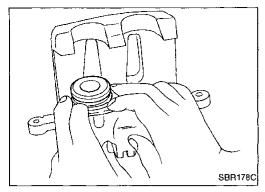
CAUTION:

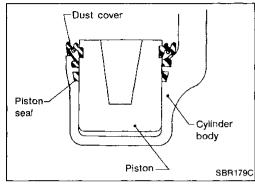
Use brake fluid to clean. Never use mineral oil.

PIN, PIN BOLT AND PIN BOOT

Check for wear, cracks or other damage. Replace if any of the above conditions are observed.

FRONT DISC BRAKE





Assembly

- Insert piston seal into groove on cylinder body.
- With dust seal fitted to piston, install piston into cylinder body.

CAUTION:

- Secure dust seal properly.
- Lubricate with brake fluid before installing plastic piston (CL28VD) into cylinder body.

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Rotor Inspection

RUBBING SURFACE

Check rotor roughness, cracks or chips.

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RUNOUT Make sure that axial end play is within the specifications before

measuring. Refer to "Front Wheel Bearing" in FA section.

Rotor repair limit:

Maximum runout

(Total indicator reading at center of rotor pad con-

tact surface)

0.07 mm (0.0028 in)

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THICKNESS

SBR089A

Rotor repair limit:

Minimum thickness

CL28VA 20.0 mm (0.787 in)

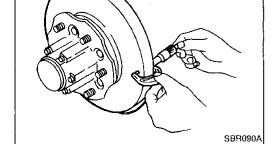
CL28VD 24.0 mm (0.945 in)

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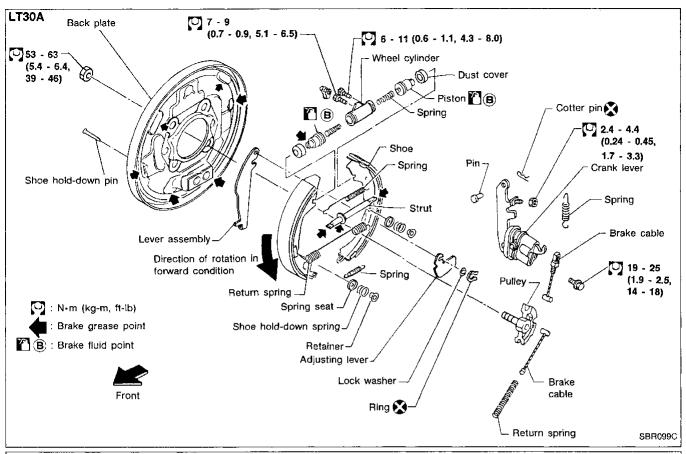
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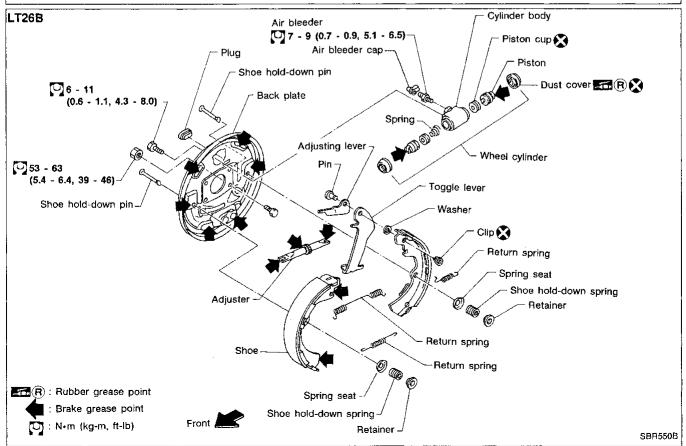
995

BR-17

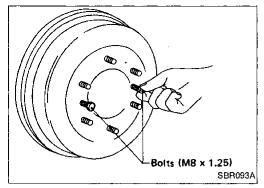


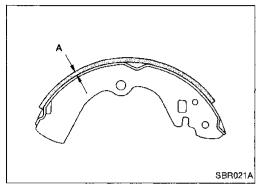
LT30A and LT26B





REAR DRUM BRAKE





Inner diameter-

SBR095A

Brake Drum Removal

- Release parking brake control lever fully.
- Tighten two bolts gradually if brake drum is hard to remove.

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Shoe Replacement

Measure lining thickness.

LC

Lining wear limit (A):

1.5 mm (0.059 in)

Before installing new shoes, rotate nut until adjuster rod is at its shortest point.

After installation is completed, adjust shoe-to-drum clearance. EE

CL

Wheel Cylinder Inspection

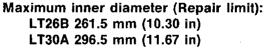
Check parts for score, wear or damage. Replace if any of the MT above conditions are observed.

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Contact surface should be finefinished with No. 120 to 150 RA emery paper.

Using a drum racer, lathe brake drum if it shows score marks, partial wear or stepped wear.

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After brake drum has been completely reconditioned or replaced, check drum and shoes for proper contact pattern.

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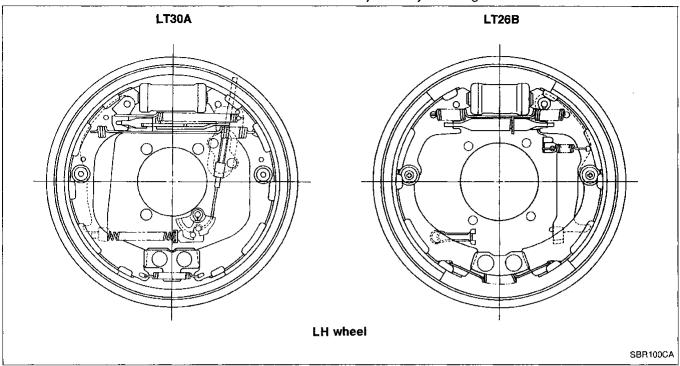
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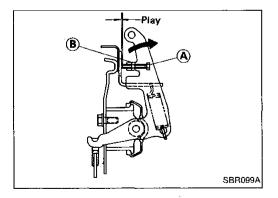
||D)X

BR-19

Shoe Installation

- Install all the parts by referring to the figure below.
- Shorten adjuster by rotating it.



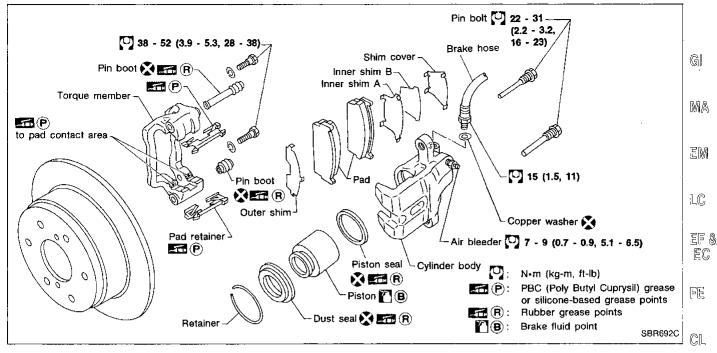


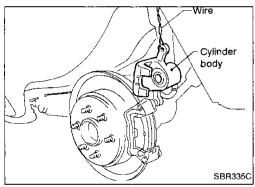
LT30A model

After installing crank lever on back plate, make sure that there is no play between crank lever and back plate. If play exists, adjust bolt (A) and lock nut (B).

BR-20

AD14VB





Pad Replacement

1. Remove guide pin.

 Swing cylinder body upward. Then remove pad retainer and inner and outer shims.

CAUTION:

 When cylinder body is swung up, do not depress brake pedal because piston will pop out.

Be careful not to damage dust seal or get oil on rotor.
 Always replace shims when replacing pads.

Removal and Installation

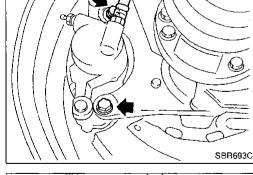
Remove flare nut securing brake tube and brake hose. FA
 Then remove brake hose from caliper.

Remove torque member fixing bolts.

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CAUTION:

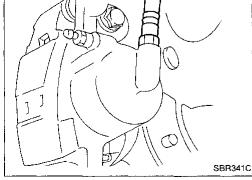
● When installing brake hose to caliper, disconnect brake

BF

hose from brake tube.

 $\mathbb{H}\mathbb{A}$

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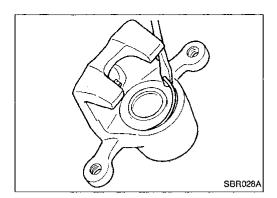


BR-21

REAR DISC BRAKE

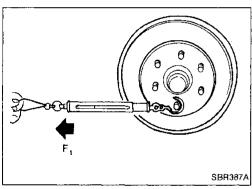
Removal and Installation (Cont'd)

Remove retainer with a screwdriver.



SBR772

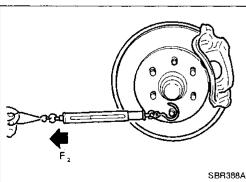
Push out piston with dust seal with compressed air.



Inspection

Inspection of brake drag force

- (1) Swing cylinder body upward.
- (2) Make sure that wheel bearing is adjusted properly. Refer to "Rear Wheel Bearing" in RA section.
- (3) Measure rotating force (F₁).



- (4) Install caliper with pads to the original position.
- (5) Depress brake pedal for 5 seconds.
- (6) Release brake pedal, rotate disc rotor 10 revolutions.
- (7) Measure rotating force (F₂).
- (8) Calculate brake drag force by subtracting F_1 from F_2 .

Maximum brake drag force $(F_2 - F_1)$: 103.0 N (10.5 kg, 23.2 lb)

Pin

Pin cover

SBR041A

If it is not within specification, check pins and pin boots in caliper.

- Make sure that wheel bearing is adjusted properly.
- Disc pads and disc rotor must be dried.

Disc pad

Check disc pad for wear or damage.

Pad wear limit (A): 2.0 mm (0.079 in)

REAR DISC BRAKE

Inspection (Cont'd)

Cylinder body

- Check inside surface of cylinder body for score, rust, wear, damage or presence of foreign objects. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign objects may be eliminated by polishing surface with a fine emery paper. Replace cylinder body if necessary.

CAUTION:

Use brake fluid to clean. Never use mineral oil.

Piston

Check piston for score, rust, wear, damage or presence of foreign materials. Replace if any of the above conditions are observed.

CAUTION:

Piston sliding surface is plate. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

Pin, pin bolt, retainer, piston seal, dust seal and pin boot

Check for wear, cracks or other damage. Replace if any of the above conditions are observed.

Assembly

- With dust seal fitted to piston, insert dust seal into groove MT on cylinder body and install piston.
- Properly secure dust seal.

Rotor Inspection

Rubbing surface

Check rotor for roughness, cracks or chips. Repair or replace if necessary.

Runout

Make sure that axial end play is within the specifications before measuring. Refer to "Rear Wheel Bearing" in RA section. Then check maximum runout with a dial gauge.

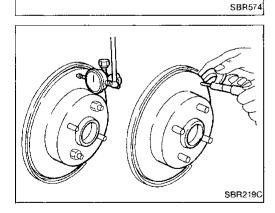
Rotor repair limit: 0.07 mm (0.0028 in) (Total indicator reading at center of rotor pad contact surface)

Thickness

Rotor repair limit: 16.0 mm (0.630 in)

Minimum thickness





Cylinder body



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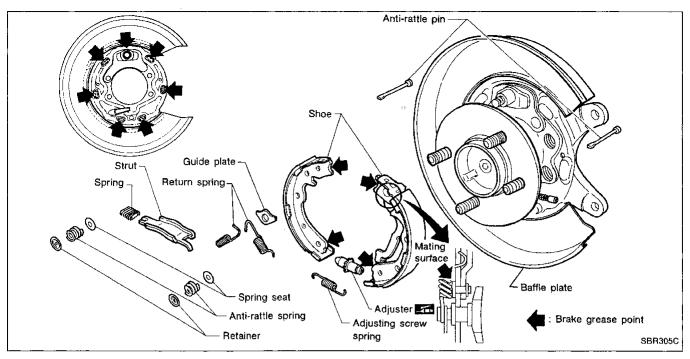
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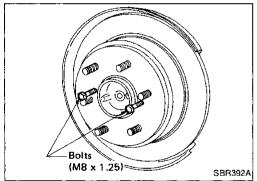
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DS19HB — AD14VB Model

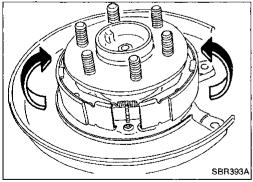




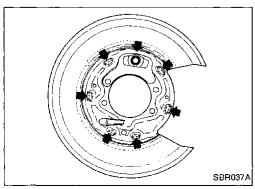
Shoe Replacement

it.

Remove disc rotor (With parking brake drum).
 Tighten two bolts gradually if disc rotor is hard to remove.

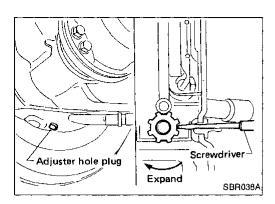


After removing retainer, remove spring.
 Be careful not to damage parking brake cable when separating



Apply brake grease to the contact areas shown at left.

PARKING DRUM BRAKE



Shoe Replacement (Cont'd) SHOE CLEARANCE ADJUSTMENT

 Remove adjuster hole plug, and turn down adjuster wheel with a screwdriver until shoe touches brake drum.

Make sure that parking control lever is released completely.

- Return adjuster wheel 7 to 8 latches.
- Install adjuster hole plug, and make sure that there is no drag between shoes and brake drum when rotating disc rotor.

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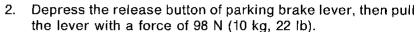
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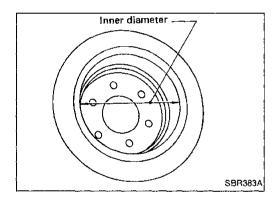
EC

BREAKING IN DRUM AND LINING

 Set transfer lever in the "2H" position. Using either low or 2nd transmission speed, drive the unloaded vehicle at approximately 30 km/h (19 MPH) on a safe, level and dry road.



- 3. While holding the lever back, continue to drive the vehicle FE 100 m (328 ft).
- 4. Repeat steps 1 through 3 two or three times.



Drum Inspection

Maximum inner diameter (Repair limit): 191.0 mm (7.52 in)



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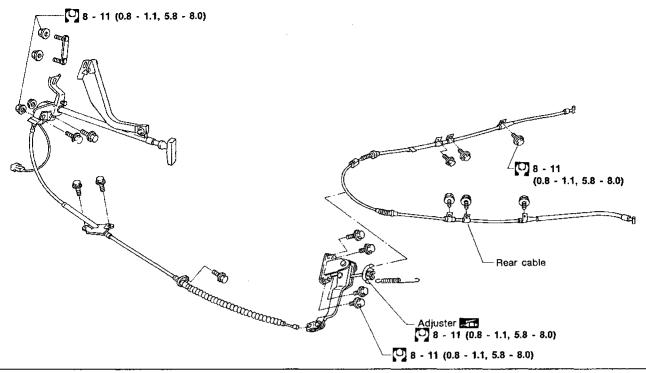
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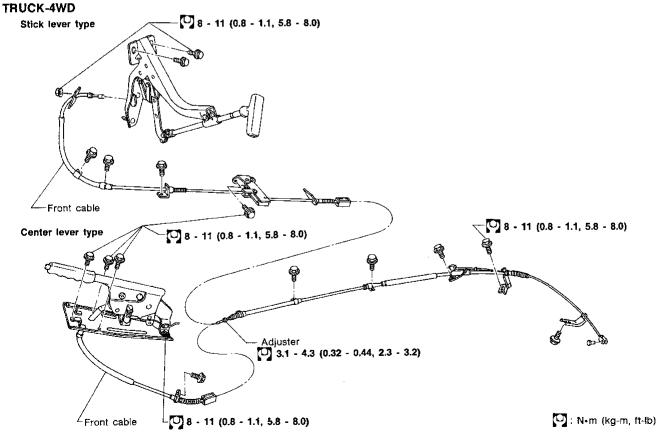
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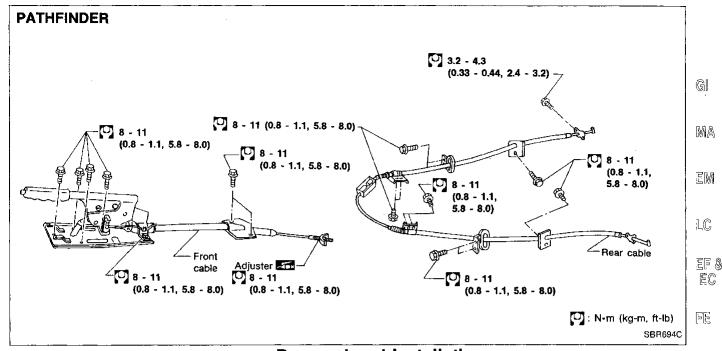
11D)X

BR-25

TRUCK-2WD







Removal and Installation

Be careful not to damage cable.

Make sure there is no free play after installation.

Inspection

MT

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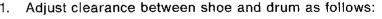
BR

EC

CL

- Check control lever for wear or other damage. Replace if necessary.
- Check wires for discontinuity or deterioration. Replace if necessary.
- Check warning lamp and switch. Correct if necessary.
- Check part at each connecting portion and, if found deformed or damaged, replace.

Adjustment



- LT26B ---

Pull parking brake lever several times until clicking sound does not occur from rear brake.



- Release parking brake lever and loosen adjusting nut. a.
- Depress brake pedal fully at least 10 times. b.
- 2. Loosen lock nut (A), rotate adjuster (B).

3. Tighten lock nut (A).

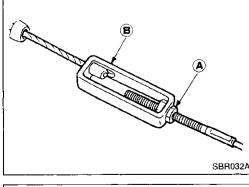
Pull control lever with specified amount of force. Check 4. lever stroke and ensure smooth operation.

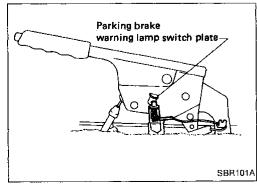
Number of notches: Refer to SDS (BR-48).

Bend parking brake warning lamp switch plate so that brake warning light comes on when ratchet at parking brake lever is pulled "A" notches and goes out when fully MA released.

Number of notches "A": Center lever type 1

Stick lever type

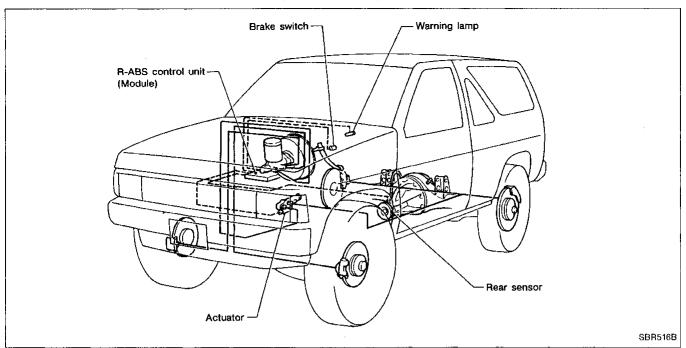




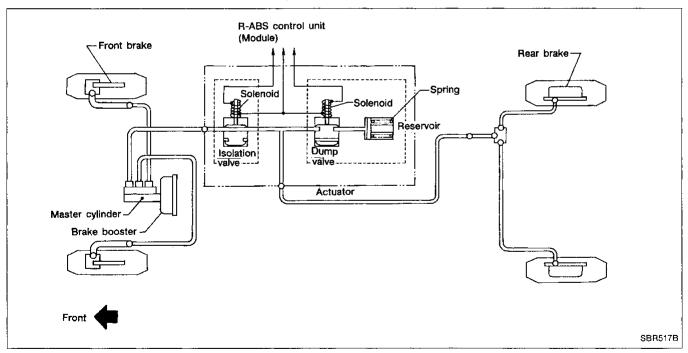
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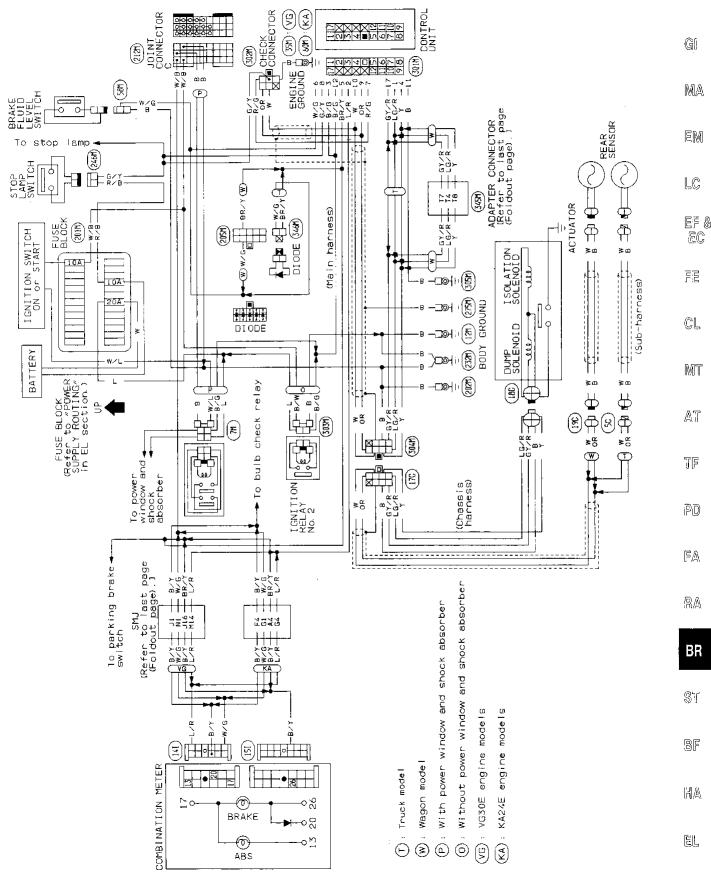
System Components



Hydraulic Circuit



Wiring Diagram



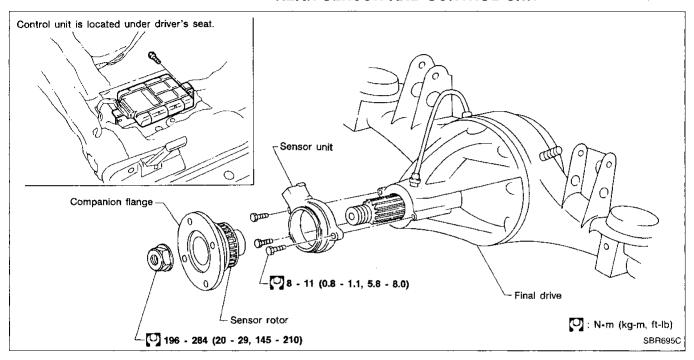
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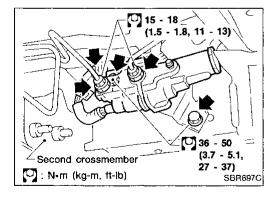
Removal and Installation

CAUTION:

Be careful not to damage sensor edge and sensor rotor teeth. In case the final drive assembly needs to be removed, disconnect the ABS sensor from the assembly and move it away. Failure to do so may result in damage to the sensor wires making the sensor inoperative.

REAR SENSOR AND CONTROL UNIT





ACTUATOR

Removal

- 1. Disconnect battery cable.
- Drain brake fluid.
 Refer to "Changing Brake Fluid" in "CHECK AND ADJUSTMENT" (BR-3).
- Disconnect connectors, brake pipes and remove fixing nuts.

Installation

CAUTION:

After installation, refill brake fluid. Then bleed air. Refer to "Bleeding Brake System" (BR-3).

- 1. Connect brake pipes temporarily.
- 2. Secure fixing nuts.
- 3. Torque brake pipes.
- Connect connectors and battery cable.

TROUBLE DIAGNOSES

Contents

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(Warning lamp flashing number 9 or 10)		⊘n
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Diagnostic Procedure 12 — CONTROL UNIT (Warning lamp flashing number 13, 14 or 15)		
Diagnostic Procedure 13 — Other (Warning lamp flashing number 5)		IA AIST
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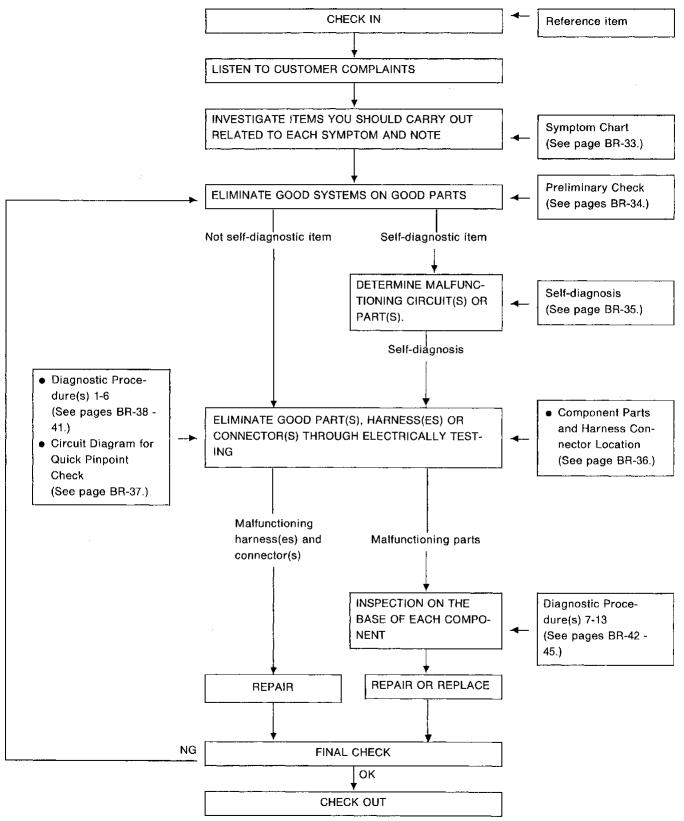
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How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



Symptom Chart

PROCEDURE	Prelir Ch	Pretiminary Check		Dia	gnostic	Diagnostic Procedure	ıre		(Se	elect ins	Diagnostic Procedure spection with LED flas	tic Proc with LE	Diagnostic Procedure (Select inspection with LED flashing No.)	ing No.)		Electrical Compo- nents Inspection
REFERENCE PAGE	BR-34	BR-34	BR-38	BR-38	BR-38	BR-39	BR-40	BR-41	BR-42	BR-42	BR-43	BR-44	BR-44	BR-44	BR-45	BR-46
SYMPTOM	Preliminary Check 1	Preliminary Check 2	Diagnostic Procedure 1	Diagnostic Procedure 2	Diagnostic Procedure 3	Diagnostic Procedure 4	Diagnostic Procedure 5	Diagnostic Procedure 6	Warning flashing 2 or 7	Warning flashing 4	Warning flashing 3 or 8	Warning flashing 9 or 10	Warning flashing 6	Warning flashing 13,14 or 15	Warning flashing 5	Sensor Unit and Actuator
Pedal vibration & noise			0						0	0	0	0	0	0	0	
Long stopping distance		-		0					0	0	0	0	0	0	0	
Brake pedal stroke					0				0	0	0	0	0	0	0	
R-ABS doesn't work	0	0			·	0			0	0	0	0	0 !	0	0	0
R-ABS works frequently								0							0	

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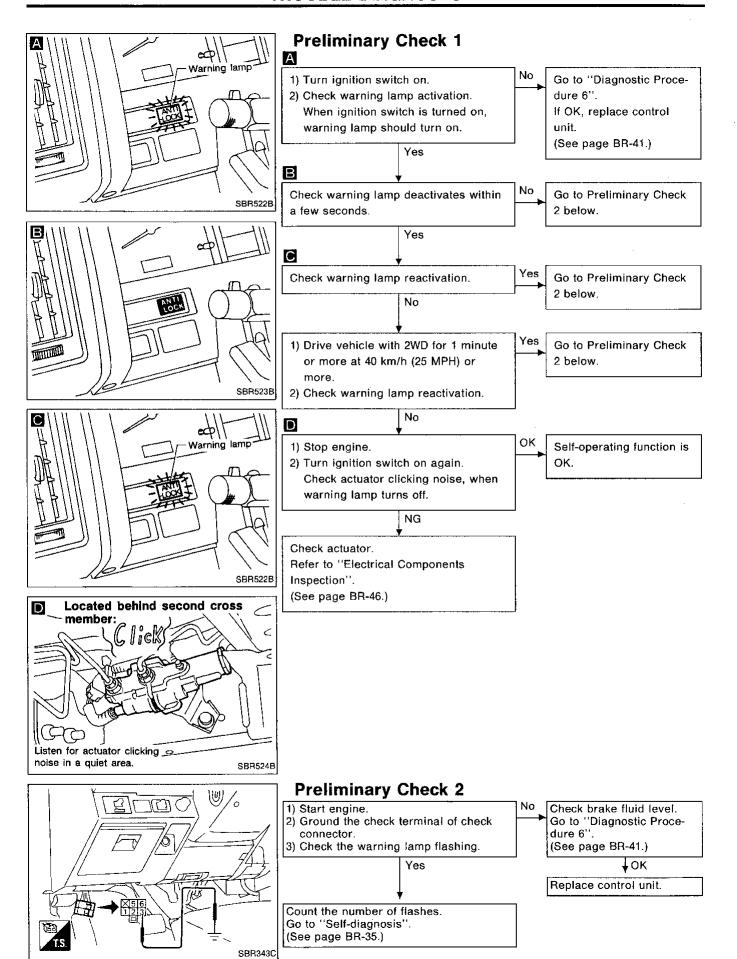
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Self-diagnosis

CHECKING THE NUMBER OF WARNING LAMP FLASHES

When a problem occurs in the R-ABS, the warning lamp on the instrument panel comes on. As shown in the table, the control unit performs self-diagnosis.

To obtain satisfactory self-diagnosing results, the vehicle must be driven in 2WD above 40 km/h (25 MPH) for at least one minute before the self-diagnosis is performed. After the vehicle has been stopped, the number of warning flashes is counted by grounding the check terminal, with the engine running, there be identifying a malfunctioning part or unit by the number of flashes.

If more than two parts or units malfunction at the same time, the warning lamp will flash to indicate one of the malfunctioning parts or units. After the part or unit has been repaired, the warning lamp will then flash to indicate that the other part or unit is malfunctioning.

No. of warning flashes	Detected items	Malfunctioning	cause or part	Diagnostic Procedure],
2			Open	Diagnostic Procedure 7	
7		ISO solenoid	Shorted	Diagnostic Procedure 7	
4	Actuator		Blocked	Diagnostic Procedure 8	1
3		DUMP astancial	Open	Diagnostic Procedure 9	1
8		DUMP solenoid	Short circuit	Diagnostic Procedure 9] [
9		Ót	pen	Diagnostic Procedure 10	
10	Sensor	Short	circuit	Diagnostic Procedure 10	
6		Err	atic	Diagnostic Procedure 11	
13, 14 or 15	Control Unit	-	-	Diagnostic Procedure 12	
5	_	Other		Diagnostic Procedure	

CAUTION:

When driving in 4WD, the rear anti-lock brake system is not effective in most cases. The rear wheels will lock if the front wheels lock as the transfer mechanically couples the front and rear axles together. If this happens, the rear anti-lock brake system may not function but the ordinary brakes will operate normally. The "ANTI-LOCK" brake warning light will then come on. The above condition is not a malfunction and the rear anti-lock brake system can be re-activated by starting the engine again. The "Anti-Lock" brake warning light will then go off.

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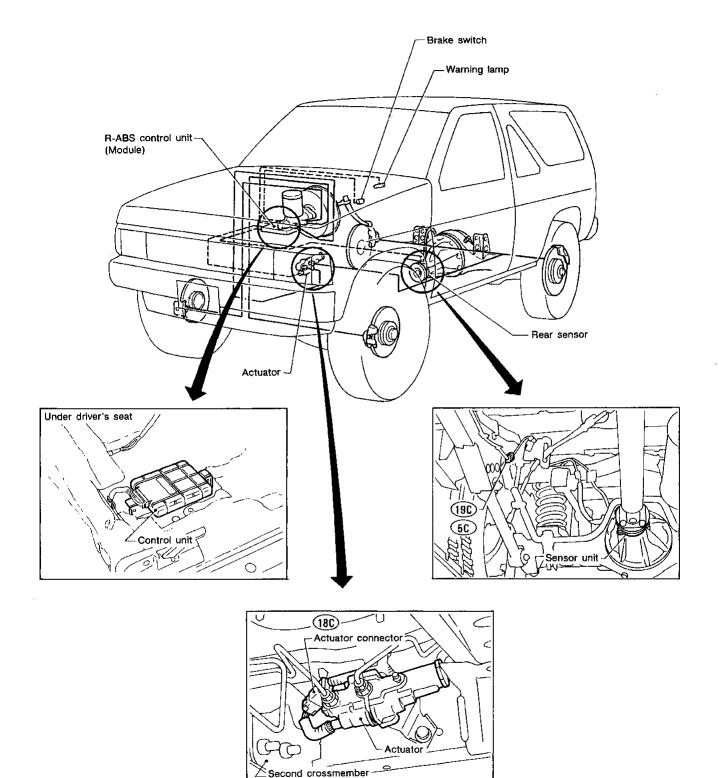
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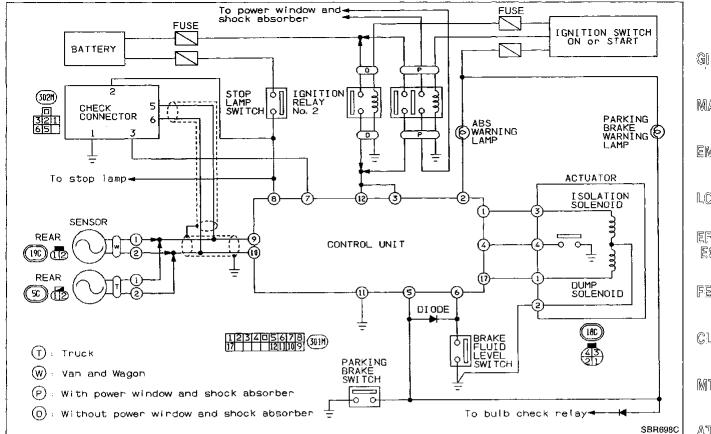
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Component Parts and Harness Connector Location



Circuit Diagram for Quick Pinpoint Check



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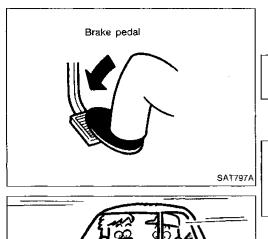
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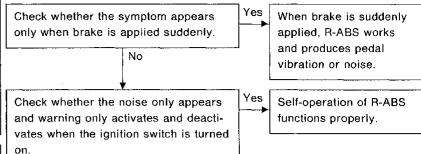
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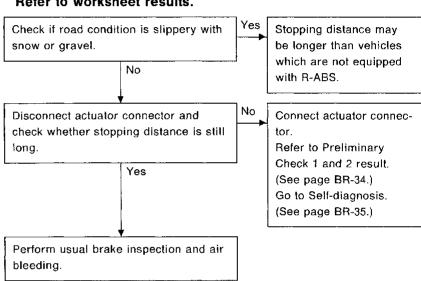


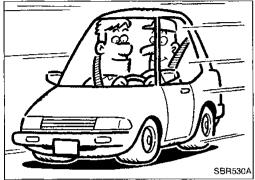
Diagnostic Procedure 1 SYMPTOM: Pedal vibration or noise

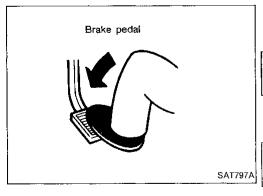


Diagnostic Procedure 2

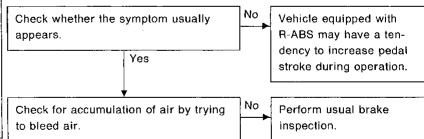
SYMPTOM: Long stopping distance Refer to worksheet results.







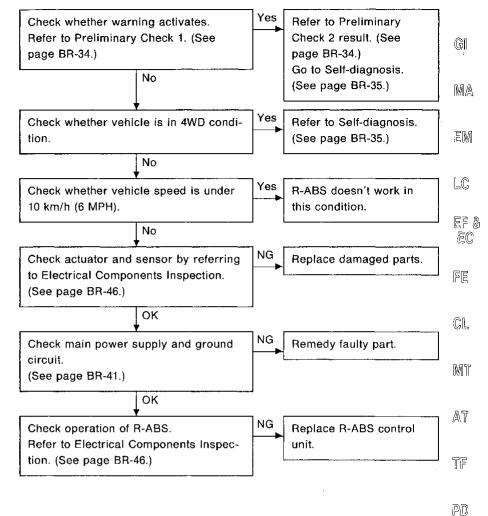
Diagnostic Procedure 3 SYMPTOM: Brake pedal stroke is large.



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Diagnostic Procedure 4

SYMPTOM: R-ABS doesn't work.



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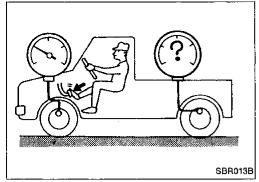
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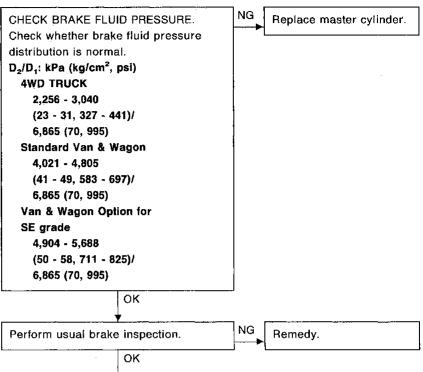


Bear brake fluid bressure P1 = P2 P2 KBa (kg/cm², psi) Front brake fluid pressure SBR543A

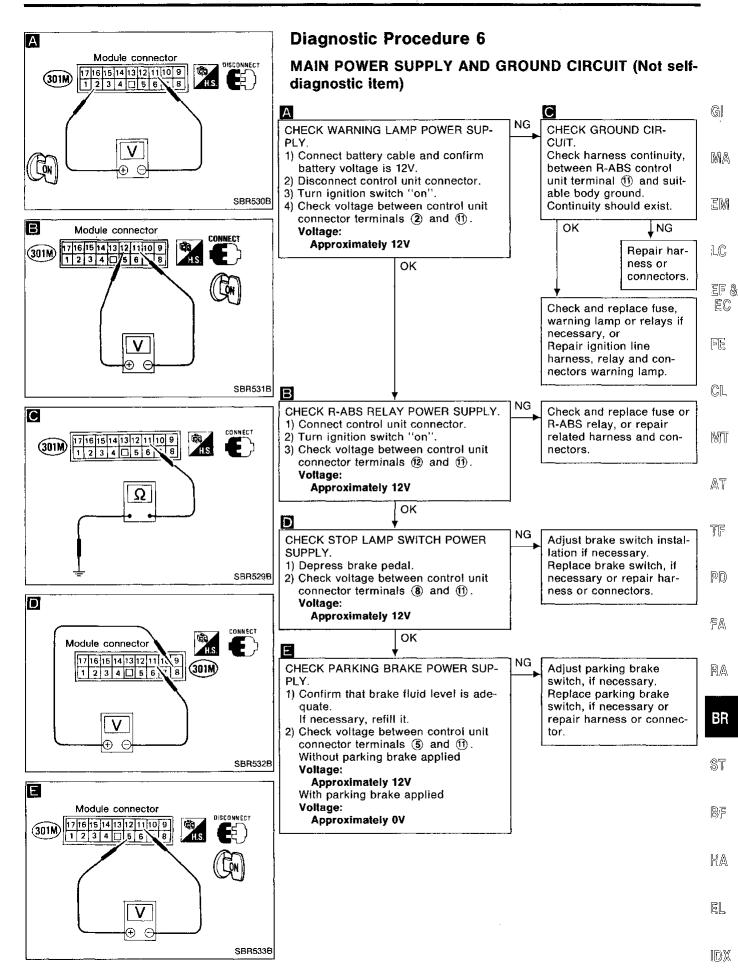
Diagnostic Procedure 5

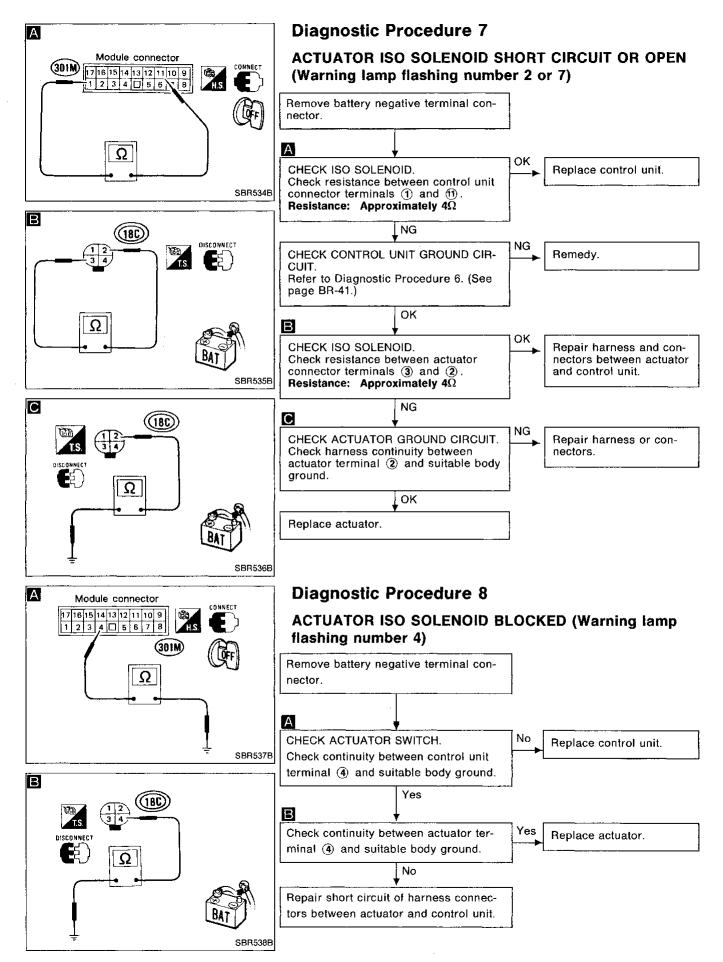
SYMPTOM: R-ABS works frequently.

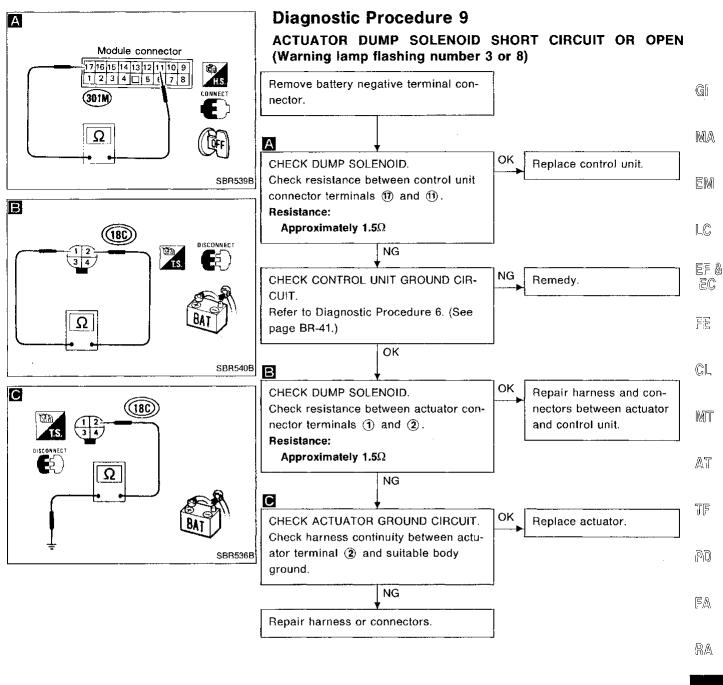
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When wheel lock occurs frequently due to hard braking operation, the R-ABS operates at each occurrence of wheel lock. Accordingly, frequent R-ABS operation is normal under severe braking conditions where wheel lock would occur frequently due to braking.







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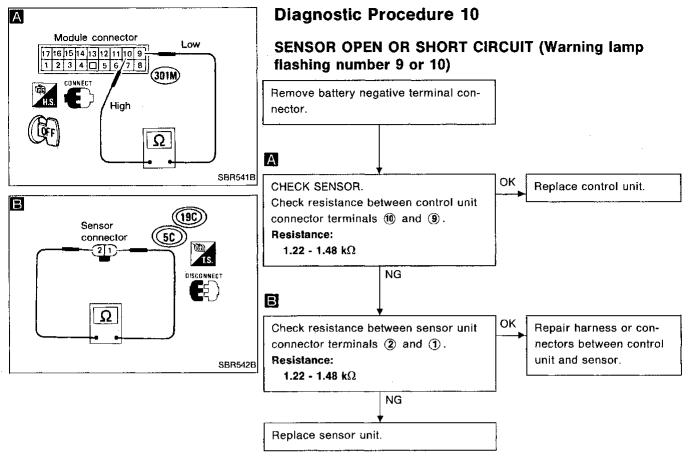
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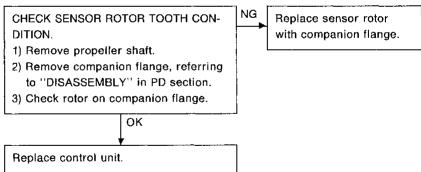
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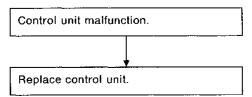
Diagnostic Procedure 11

SENSOR SIGNAL ERRATIC (Warning lamp flashing number 6)



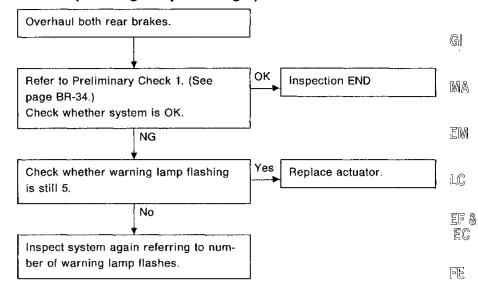
Diagnostic Procedure 12

CONTROL UNIT (Warning lamp flashing 13, 14 or 15)



Diagnostic Procedure 13

Other (Warning lamp flashing 5)



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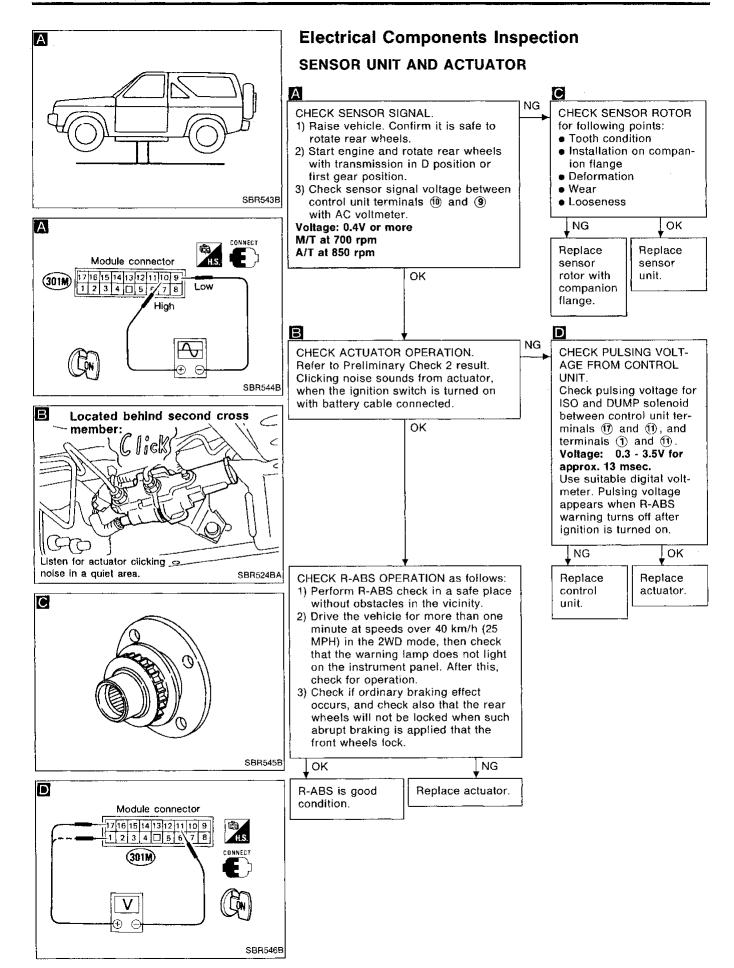
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SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

	Without rea			VVICIO	rear ABS	
Applied model		Truc	T		Pat	hfinder
	2WD KA24E	VG30E	4W Standard	Long	Standard	Option for SE grade
Front brake						
Brake model	CL28VA			CL28VD		,
Cylinder bore diameter x number of pistons mm (in)	60.6 (2.386) x 1			42.8 (1.685) x	2	
Pad length x width x thickness mm (in)	IN: 126.5 x 43 x 11 (4.98 x 1.69 x 0.43) OUT: 129 x 43 x 11 (5.08 x 1.69 x 0.43)		146.6 x 4	48.5 x 10 (5.77 x ⁻	1.909 x 0.39)	
Rotor outer diameter x thickness mm (in)	250 x 22 (9.84 x 0.87)	260 x 26 (10.24 x 1.02)		277 x 26	(10.91 × 1.02)	
Rear brake						
Brake model	LT26	В	LTS	30A	LT26B	AD14VB
Cylinder bore diameter x number of pistons mm (in)	22.22 (7	7/8)		20.64 (13/16)		42.83 (1.6862)
Lining or pad length x width x thickness mm (in)	249.6 x 50. (9.83 x 1.99		296 x 5 (11.) 1.97 x		249.6 x 50 x 5.5 (9.83 x 1.97 x 0.217)	99.8 x 33.5 x 10.0 (3.929 x 1.319 x 0.394)
Drum inner diameter or rotor outer diameter x thickness mm (in)	260.0 (10.24) 295.0 260.0 (10.24) (10.24)		286 x 18 (11.26 x 0.71)			
Parking brake						
Brake model						DS19HB
Lining length x width x thickness mm (in)				182.3 x 30 x 3 (7.18 x 1.18 x 0.12)		
Drum inner diameter mm (in)			_			190.0 (7.48)
Master cylinder Bore diameter mm (in)	25.40 (1)					
Control valve	Linkage tyr sensing		Pr	oportioning valve	e within master cy	linder
Valve model	<u> </u>		2 450 (55 555)	0.040 (00. 40=)	0.450 (05.055)	0.000 (40.500)
Split point [kPa (kg/cm², psi)] x reducing ratio	(Variat x 0.2		2,452 (25, 356) x 0.2	2,942 (30, 427) x 0.2	2,452 (25, 356) x 0.2	3,923 (40, 569) x 0.4
Brake booster						
Booster model	M195T			M215T		
Diaphragm diameter mm (in)	Pri.: 205 (8.07) Sec.: 180 (7.09)			Pri.: 230 (9.06 Sec.: 205 (8.0	•	
Recommended brake fluid		<u> </u>	DO		·	

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SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment

DISC BRAKE

Unit: mm (in) Brake model CL28VA CL28VD AD14VB Pad wear limit Minimum thickness 2.0 (0.079) Rotor repair limit 24.0 16.0 20.0 Minimum thickness (0.630)(0.787)(0.945)

DRUM BRAKE

·		Unit: mm (in)
Brake model	LT26B	LT30A
Lining wear limit		
Minimum thickness	1.5 (0	0.059)
Drum repair limit		
Maximum inner diameter	261.5 (10.30)	296.5 (11.67)
Out-of-round limit	0.03 (0).0012)

PARKING DRUM BRAKE

	Unit: mm (in)
Brake model	DS19HB
Lining wear limit	
Minimum thickness	1.5 (0.059)
Drum repair limit	
Maximum inner diameter	191.0 (7.52)
Brake shoe adjustment	
Returning notches	7 - 8

BRAKE PEDAL

	Unit: mm (in)
Free height "H"	
. M/T	209 - 219 (8.23 - 8.62)
A/T	212 - 222 (8.35 - 8.74)
Depressed height "D" [under force of 490 N (50 kg, 110 lb) with engine running]	120.0 (4.72)
Clearance "C" between pedal stopper and threaded end of stop lamp switch or ASCD switch	0.3 - 1.0 (0.012 - 0.039)
Pedal free play	
At clevis	1.0 - 3.0 (0.039 - 0.118)
At pedal pad	4 - 12 (0.16 - 0.47)

PARKING BRAKE CONTROL

Control type	Center lever	Stick lever
Lever stroke [under force of 196 N (20 kg, 44 lb)]	9 - 11*1 7 - 9*2	10 - 12*1
Lever stroke when warning switch comes on	1	1

^{*1:} Truck models.

^{*2:} Van and Wagon models.

CLUTCH

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Special Service Tools	2
Commercial Service Tools	
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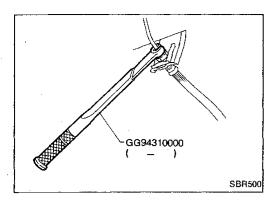
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PRECAUTIONS AND PREPARATION



Precautions

- Recommended fluid is brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- When removing and installing clutch piping, use Tool.
- To clean or wash all parts of master cylinder, operating cylinder and clutch damper, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene.
 They will ruin the rubber parts of the hydraulic system.

WARNING:

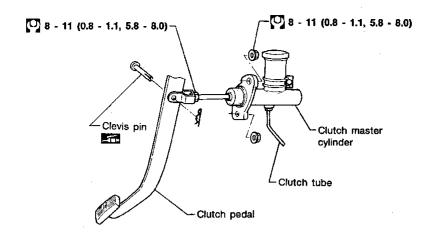
Remove all dust from clutch disc with a dust collector after cleaning with waste cloth.

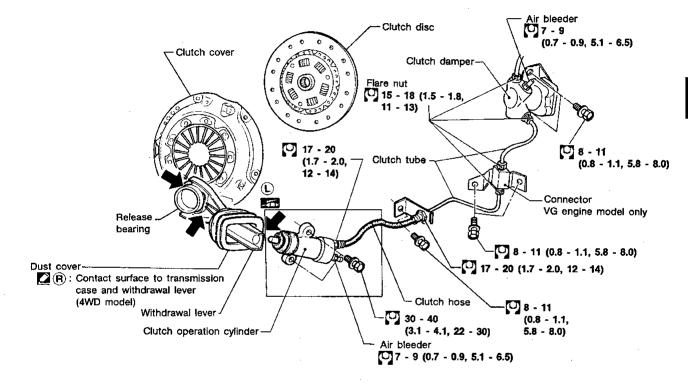
Special Service Tools

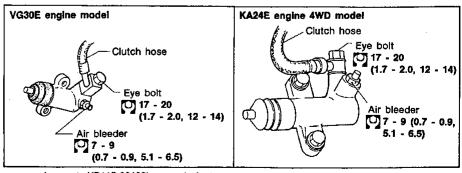
Tool number (Kent-Moore No.) Tool name	Description	
ST20050010 (—) Base plate ST20050100 (—) Distance piece	NT058	Inspecting diaphragm spring of clutch cover
GG94310000 (—) Flare nut torque wrench	NT064	Removing and installing each clutch piping
ST20600000 (J26366) Clutch aligning bar	NT062	Installing clutch cover and clutch disc
ST20050240 (—) Diaphragm spring adjusting wrench		Adjusting unevenness of diaphragm spring of clutch cover
	NT060	

Commercial Service Tools

Tool name	Description	
Bearing puller	NT077	Removing release bearing
Bearing drift	NT063	Installing release bearing a = 50 mm (1.97 in) dia.







R: Apply recommended sealant (Nissan genuine part: KP115-00100) or equivalent.

(L): Apply lithium-based grease including molybdenum disulphide.

O: N·m (kg-m, ft-lb)

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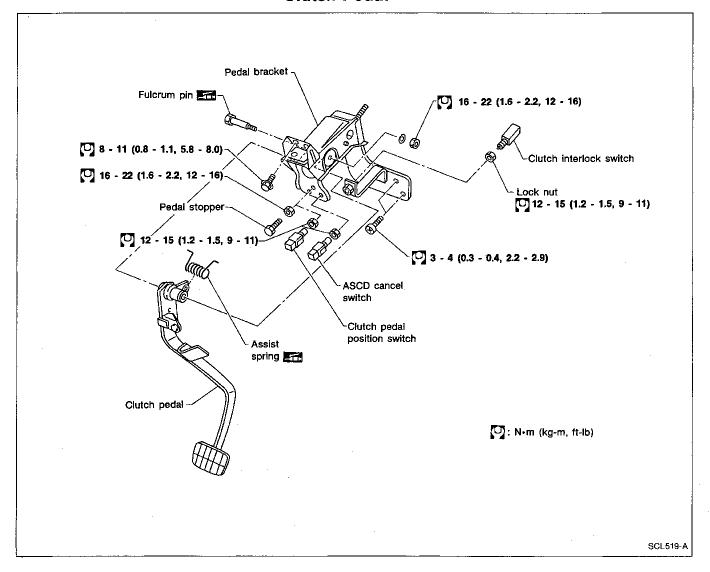
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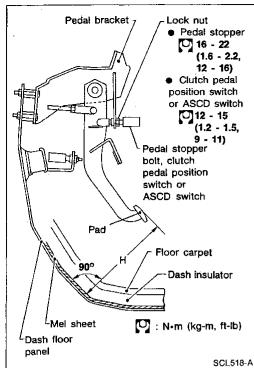
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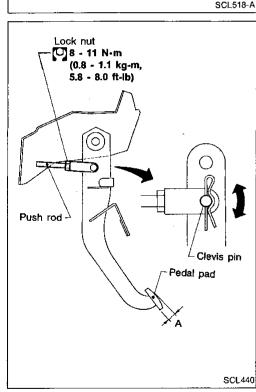
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Clutch Pedal







Adjusting Clutch Pedal

1. Adjust pedal height with pedal stopper or clutch pedal position switch.

Pedal height "H":

KA24E engine 236 - 246 mm (9.29 - 9.69 in) VG30E engine 227 - 237 mm (8.94 - 9.33 in) G

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Adjust pedal free play with master cylinder push rod. Then tighten lock nut.

Pedal free play "A":

1.0 - 1.5 mm (0.039 - 0.059 in)

Pedal free play means the following total measured at position of pedal pad:

Play due to clevis pin and clevis pin hole in clutch pedal.

Make sure that clevis pin can rotate smoothly.
 If not, readjust pedal free play with master cylinder push rod.

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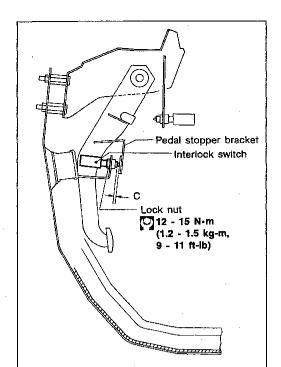
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INSPECTION AND ADJUSTMENT

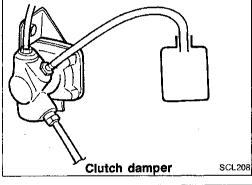


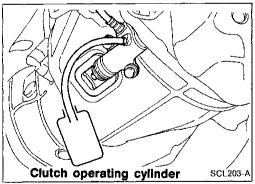
Adjusting Clutch Pedal (Cont'd)

4. Adjust clearance "C" between pedal stopper bracket and threaded end of clutch interlock switch while depressing clutch pedal fully.

Clearance "C":

0.3 - 1.0 mm (0.012 - 0.039 in)



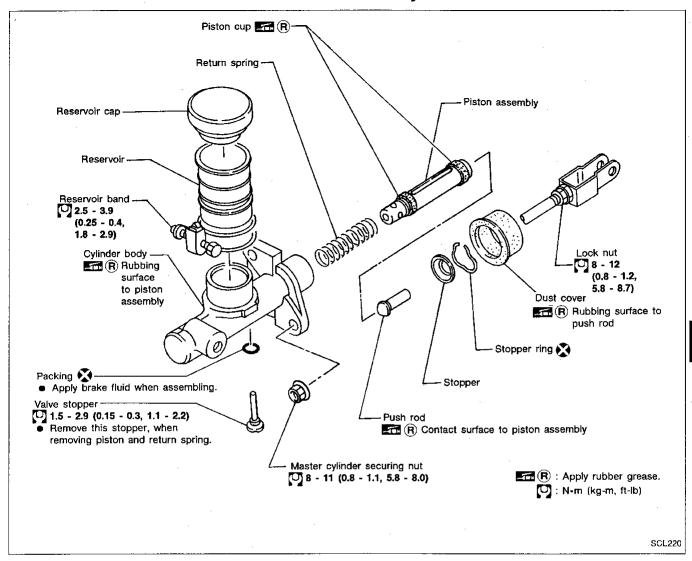


Bleeding Procedure

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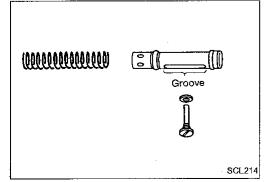
- 1. Bleed air from clutch operating cylinder according to the following procedure.
- Carefully monitor fluid level at master cylinder during bleeding operation.
- a. Top up reservoir with recommended brake fluid.
- b. Connect a transparent vinyl tube to air bleeder valve.
- c. Fully depress clutch pedal several times.
- d. With clutch pedal depressed, open bleeder valve to release air.
- e. Close bleeder valve.
- f. Repeat steps c through e above until brake fluid flows from air bleeder valve without air bubbles.
- Bleed air from clutch damper according to the above procedure.
- Repeat the above bleeding procedure 1 and 2 several times.

Clutch Master Cylinder



DISASSEMBLY AND ASSEMBLY

Push piston in cylinder body with screwdriver when removing and installing valve stopper.



- Align groove of piston assembly and valve stopper portion when installing valve stopper.
- Check direction of piston caps.

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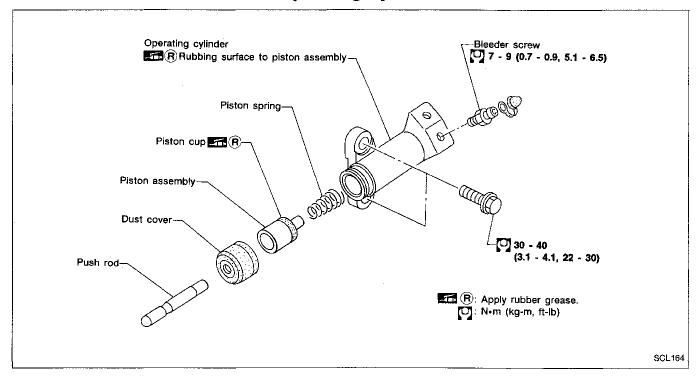
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HYDRAULIC CLUTCH CONTROL

Clutch Master Cylinder (Cont'd)

- Check cylinder and piston rubbing surface for uneven wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check return spring for wear or damage. Replace if necessary.
- Check reservoir for deformation or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.

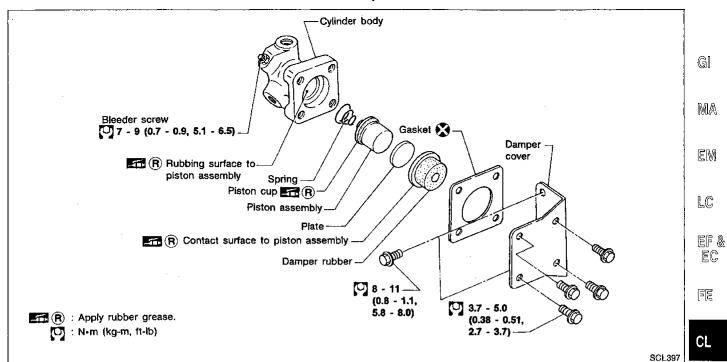
Operating Cylinder



INSPECTION

- Check rubbing surface of cylinder for wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check piston spring for wear or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.

Clutch Damper



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INSPECTION

- Check cylinder and piston rubbing surface for uneven wear, rust or damage. Replace if necessary.
- Check damper rubber and piston cup for cracks, deformation or damage. Replace if necessary.

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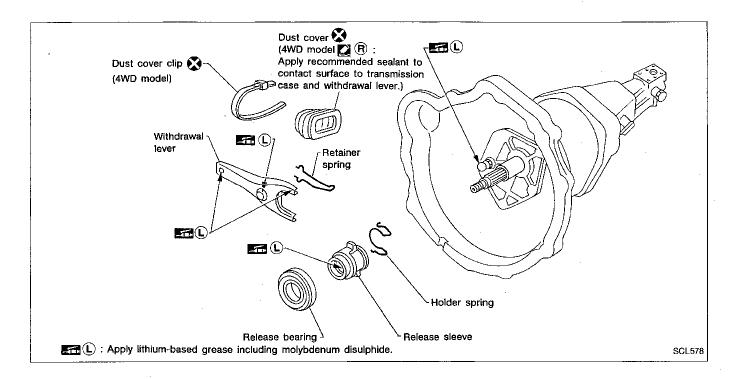
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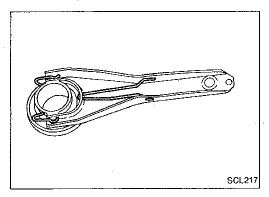
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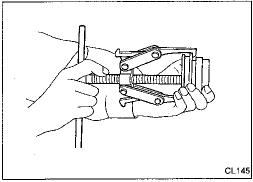
CLUTCH RELEASE MECHANISM



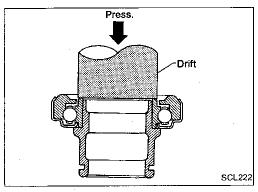


REMOVAL AND INSTALLATION

Install retainer spring and holder spring.



Remove release bearing.



Install release bearing with suitable drift.

INSPECTION

- Check release bearing to see that it rolls freely and is free from noise, crack, pitting or wear. Replace if necessary.
- Check release sleeve and withdrawal lever rubbing surface for wear, rust or damage. Replace if necessary.



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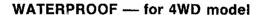
LUBRICATION

- Apply recommended grease to contact surface and rubbing LC surface.
- Too much lubricant might damage clutch disc facing damage.



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Apply recommended sealant to contact surface of dust MT cover to transmission case and withdrawal lever and then install dust cover clip.

Recommended sealant: Nissan genuine part (KP115-00100) or equivalent.

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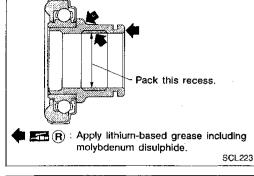
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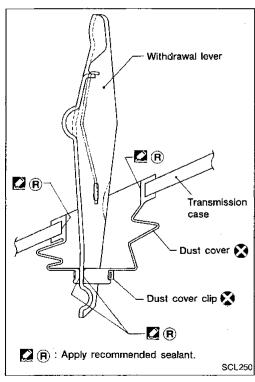
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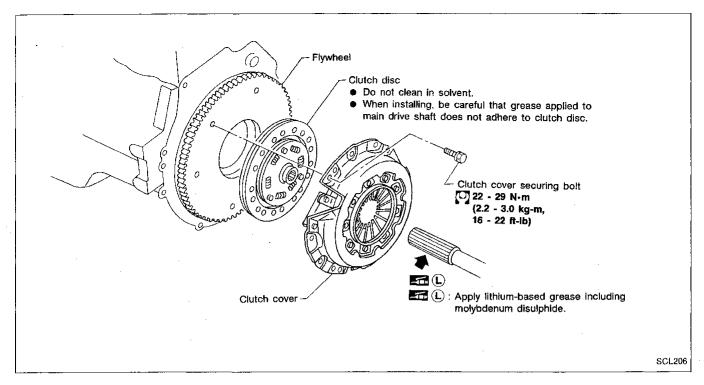
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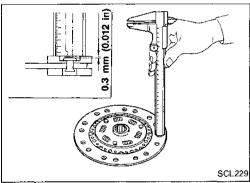
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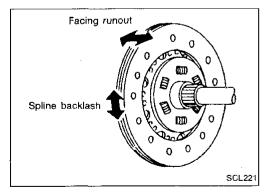




INSPECTION

Check clutch disc for wear of facing.

Wear limit of facing surface to rivet head: 0.3 mm (0.012 in)



Check clutch disc for backlash of spline and runout of facing.

Maximum backlash of spline (at outer edge of disc):

1.0 mm (0.039 in)

Runout limit:

1.0 mm (0.039 in)

Distance of runout check point (from hub center):

Model 240 115 mm (4.53 in)

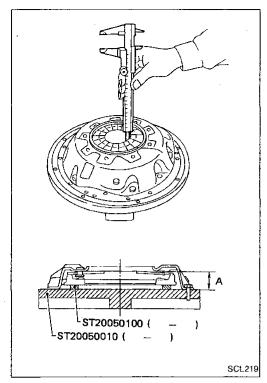
Model 250 120 mm (4.72 in)

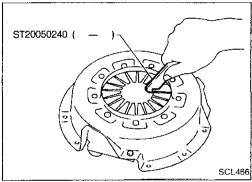
 Check clutch disc for burns, discoloration or oil or grease leakage. Replace if necessary.

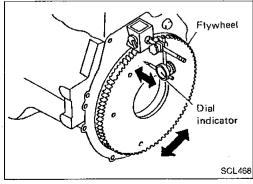
INSTALLATION

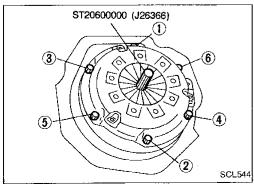
 Apply recommended grease to contact surface of spline portion.

Too much lubricant might cause clutch disc facing damage.









Clutch Cover and Flywheel

INSPECTION AND ADJUSTMENT

- Set Tool and check height and unevenness of diaphragm spring.
- Set 0.2 mm (0.008 in) feeler gauges on distance pieces (ST20050100) when checking model 240 or 250.

Diaphragm spring height "A":

Model 240 37.0 - 39.0 mm (1.457 - 1.535 in)

Model 250 36.5 - 38.5 mm (1.437 - 1.516 in)
Check thrust rings for wear or damage by shaking cover

- assembly and listening for a chattering noise, or by lightly hammering on rivets and listening for a cracking noise. Replace clutch cover assembly if necessary.
- Check pressure plate and clutch disc contact surface for slight burns or discoloration. Repair pressure plate with emery paper.
- Check pressure plate and clutch disc contact surface for deformation or damage. Replace if necessary.

Adjust unevenness of diaphragm spring with Tool.

Uneven limit:

Model 240 0.5 mm (0.020 in)

Model 250 0.5 mm (0.020 in)

FLYWHEEL INSPECTION

- Check contact surface of flywheel for slight burns or discoloration. Repair flywheel with emery paper.
- Check flywheel runout.

Runout (Total indicator reading):

Flywheel

Refer to EM section. (Inspection — CYLINDER BLOCK)

INSTALLATION

- Insert Tool into clutch disc hub when installing clutch cover and disc.
- Tighten clutch cover fixing bolts in numerical order by 2 steps.

Tightening torque:

First step 20 N·m (2.0 kg-m, 14 ft-lb)

Final step 22 - 29 N·m (2.2 - 3.0 kg-m, 16 - 22 ft-lb)

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SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

CLUTCH MASTER CYLINDER

Inner diameter	mm (in)	15.87 (5/8)		
CLUTCH OPERATING CYLINDER				

Inner diameter	mm (in)	17.46 (11/16)	

CLUTCH DAMPER

Inner diameter	mm (in)	19.05 (3/4)
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CLUTCH DISC

Model	240	250
Engine	KA24E	VG30E
Facing size (Outer dia. x inner dia. x thickness) mm (in)	240 x 150 x 3.5 (9.45 x 5.91 x 0.138)	250 x 160 x 3.5 (9.84 x 6.30 x 0.138)
Thickness of disc assembly With load mm (in)	7.8 - 8.2 (0.307 - 0.323) with 4,904 N (500 kg, 1,103 lb)	7.9 - 8.3 (0.311 - 0.327) with 5,884 N (600 kg, 1,323 lb)

CLUTCH COVER

Model		240	250
Engine		KA24E	VG30E
Full-load	N (kg, lb)	4,413 (450, 992)	4,904 (500, 1,103)

Inspection and Adjustment CLUTCH DISC

CLUTCH PEDAL

	Unit: mm (in)
Pedal height*	
KA24E engine model	236 - 246 (9.29 - 9.69)
VG30E engine model	227 - 237 (8.94 - 9.33)
Pedal free play	1.0 - 1.5 (0.039 - 0.059)
Clearance between pedal stopper bracket and threaded end of clutch interlock switch (when depressing clutch pedal fully.)	0.3 - 1.0 (0.012 - 0.039)

^{*:} Measured from surface of melt sheet to pedal pad.

Unit: mm (in)

Model	240	250
Wear limit of facing surface to rivet head	0.3 (0	0.012)
Runout limit of facing	1.0 (0.039)	
Distance of runout check point (from hub center)	115 (4.53)	120 (4.72)
Maximum backlash of spline (at outer edge of disc)	1.0 (0.039)	

CLUTCH COVER

Unit: mm (in)

Model	240	250
Diaphragm spring height	37.0 - 39.0 (1.457 - 1.535)	36.5 - 38.5 (1.437 - 1.516)
Uneven limit of diaphragm spring toe height	0.5 (0.020)	0.5 (0.020)

ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

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When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit. When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

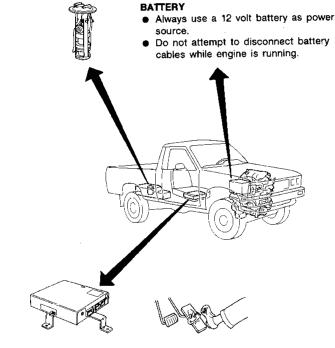
Special Service Tool

Tool number (Kent-Moore No.) Tool name	Description			Engine application	
				VG30E	KA24E
EG11160000 (—) Adapter harness	NT056		Measuring engine speed	Х	x .

Precautions

FUEL PUMP

- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.



ECM

- Do not disassemble ECCS control module (ECM).
- Do not turn diagnosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ECM value.

The ECCS will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.

WHEN STARTING

- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

WIRELESS EQUIPMENT

- When installing CB ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.
- Keep the antenna as far as possible away from the electronic control units.
- Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls.
 Do not let them run parallel for a long distance.
- Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
- Be sure to ground the radio to vehicle body.



INJECTOR

- Do not disconnect injector harness connectors with engine running.
- Do not apply battery power directly to injectors.

ECCS PARTS HANDLING

- Handle mass air flow sensor carefully to avoid damage.
- Do not disassemble mass air flow sensor.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble IACV-AAC valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the camshaft position sensor.

ECCS HARNESS HANDLING

- Securely connect ECCS harness connectors.
 - A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep ECCS harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an ECCS system malfunction due to receiving external noise,

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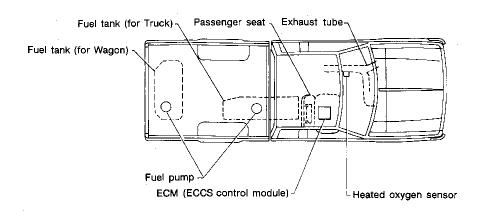
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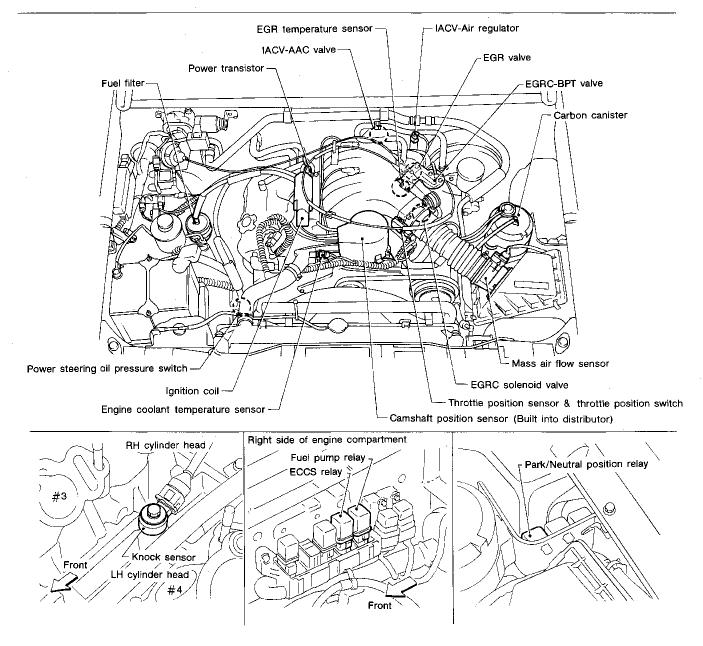
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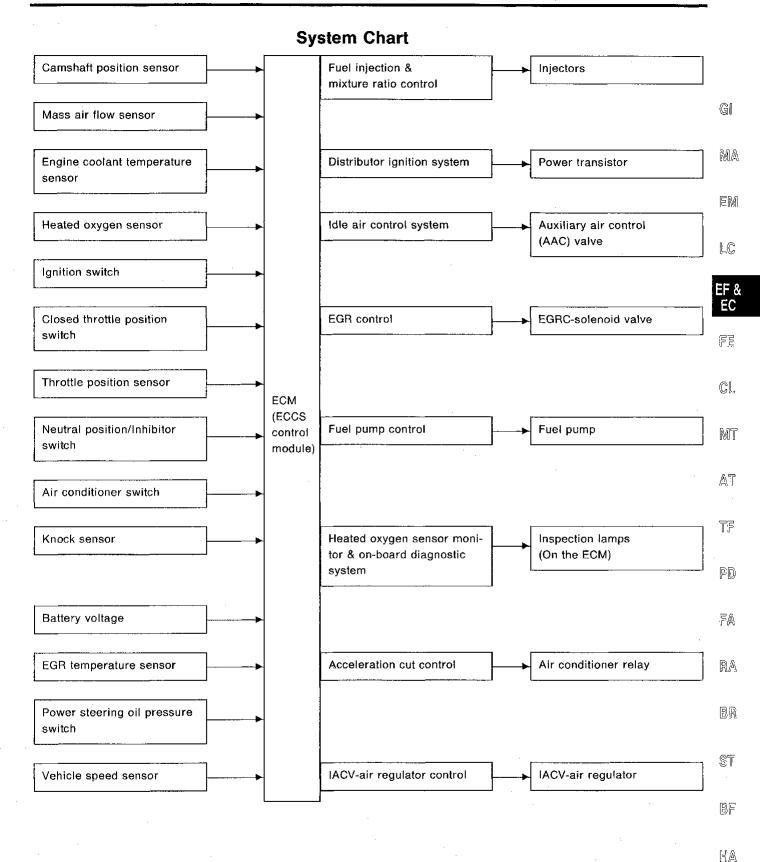
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ECCS Component Parts Location



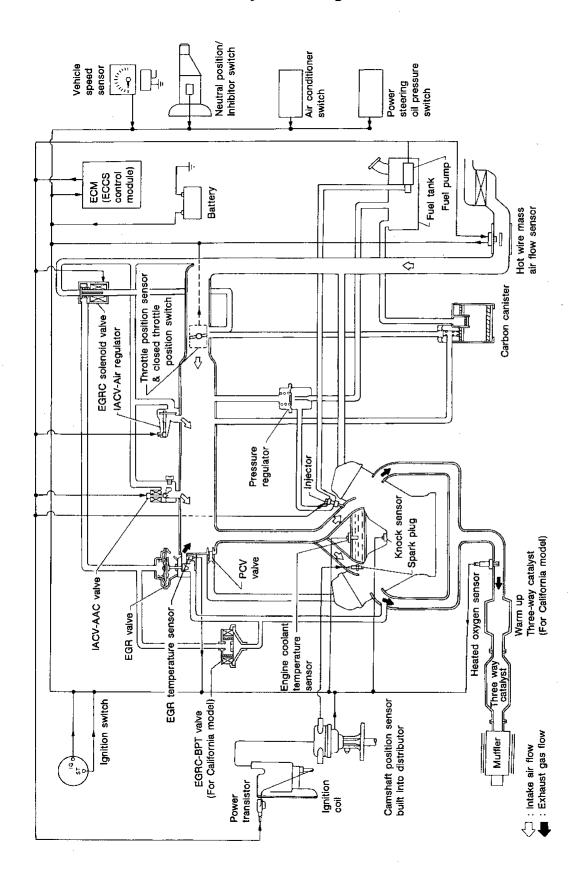




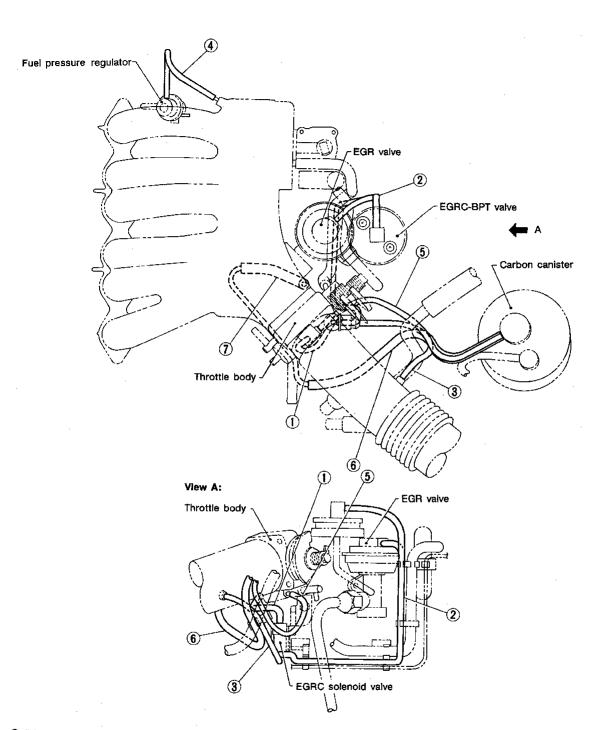
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System Diagram



Vacuum Hose Drawing



- ① EGRC solenoid valve to Throttle body
- ② EGRC solenoid valve to EGR valve
- 3 EGRC solenoid valve to Air duct
- Fuel pressure regulator to Intake manifold collector

- (5) Carbon canister vacuum port to Throttle body
- Carbon canister purge port to Vapor purge tube
- Vapor purge tube to Throttle body

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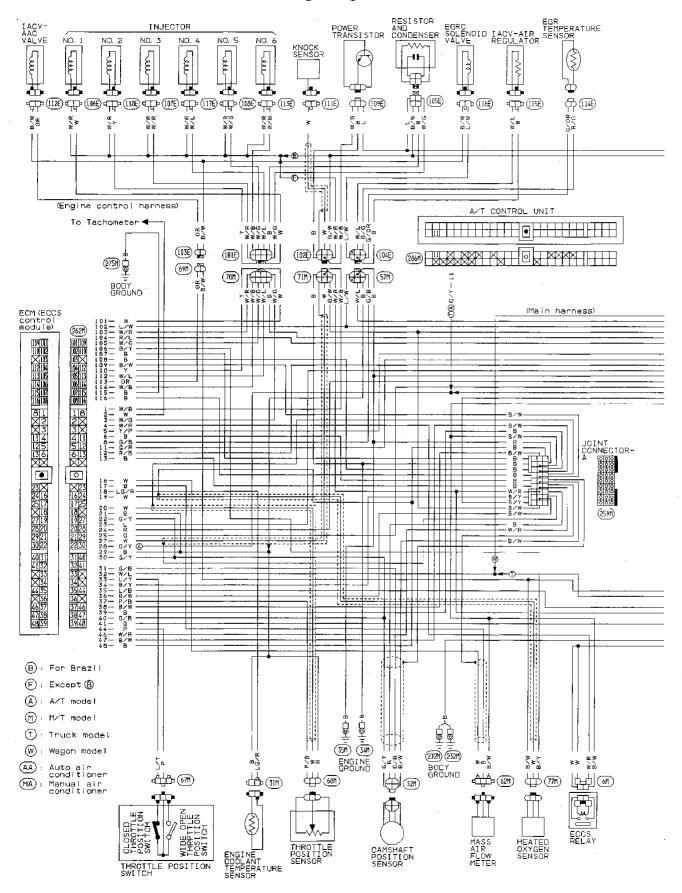
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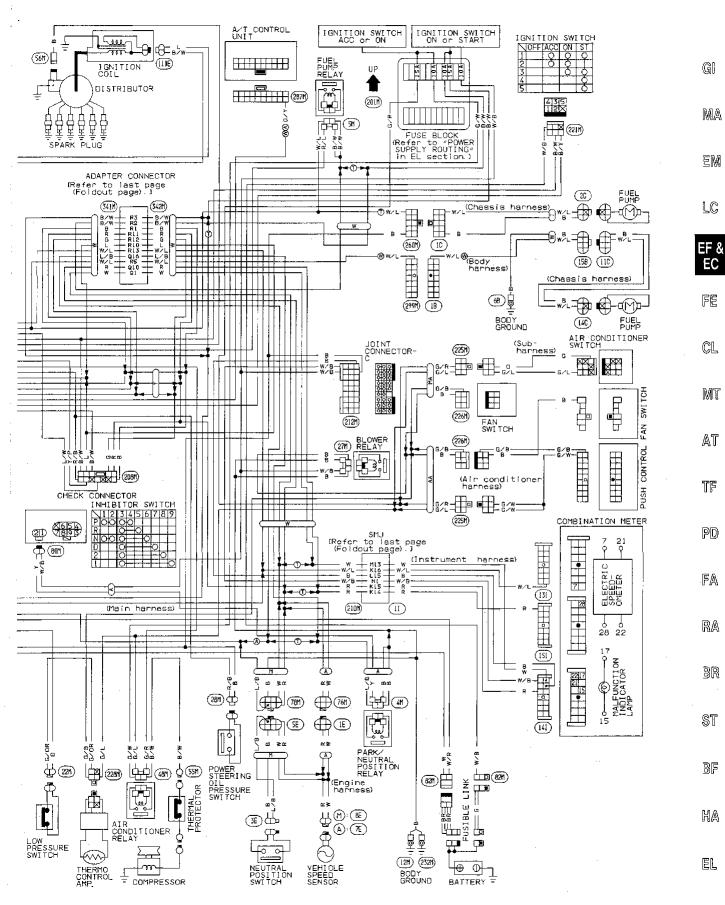
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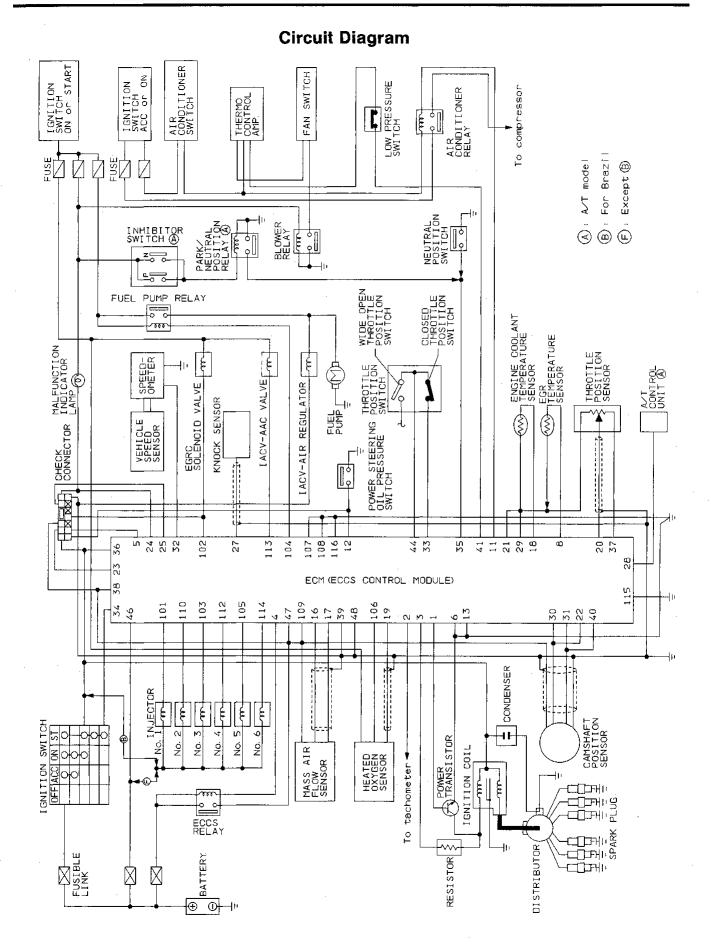
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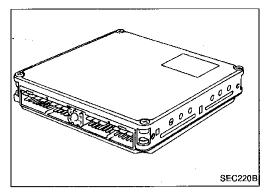
Wiring Diagram

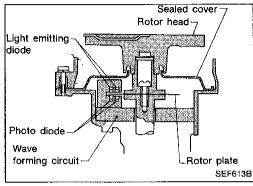


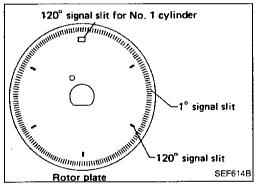
Wiring Diagram (Cont'd)

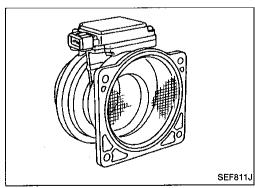












Engine Control Module (ECM)-ECCS Control Module

The ECM consists of a microcomputer, inspection lamps, a diagnostic test mode selector, and connectors for signal input and output and for power supply. The unit controls the engine.

Camshaft Position Sensor (CMPS)

The camshaft position sensor is a basic component of the entire ECCS. It monitors engine speed and piston position, and sends signals to the ECM to control fuel injection, ignition timing and EF & other functions.

The camshaft position sensor has a rotor plate and a waveforming circuit. The rotor plate has 360 slits for 1° signal and 6 slits for 120° signal. Light Emitting Diodes (LED) and photo diodes are built in the wave-forming circuit.

When the rotor plate passes between the LED and the photo diode, the slits in the rotor plate continually cut the light being transmitted to the photo diode from the LED. This generates rough-shaped pulses which are converted into on-off pulses by the wave-forming circuit, which are sent to the ECM.

Mass Air Flow Sensor (MAFS)

The mass air flow sensor measures the intake air flow rate by taking a part of the entire flow. Measurements are made in such a manner that the ECM receives electrical output signals varied by the amount of heat emitting from the hot wire placed in the stream of the intake air.

When intake air flows into the intake manifold through a route around the hot wire, the heat generated from the hot wire is taken away by the air. The amount of heat depends on the air flow. On the other hand, the temperature of the hot wire is automatically controlled to a certain number of degrees.

Therefore, it is necessary to supply the hot wire with more electric current in order to maintain the temperature of the hot wire. The ECM knows the air flow by means of the electric change.

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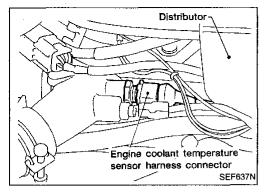
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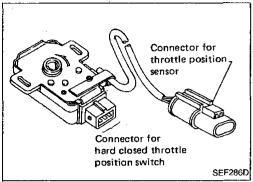
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Engine Coolant Temperature Sensor (ECTS)

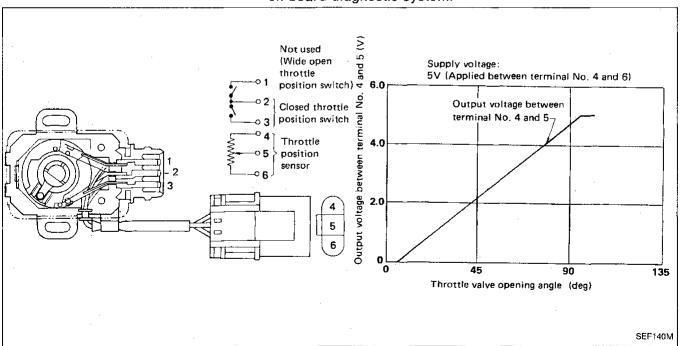
The engine coolant temperature sensor, located on the water outlet housing, detects engine coolant temperature and transmits a signal to the ECM.

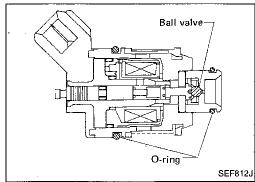
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

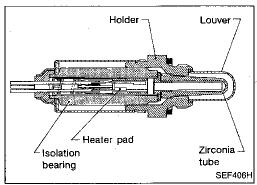
Throttle Position Sensor (TPS) & Soft/Hard Closed Throttle Position (CTP) Switch

The throttle position sensor responds to the accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle position into output voltage, and emits the voltage signal to the ECM. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds the voltage signal to the ECM.

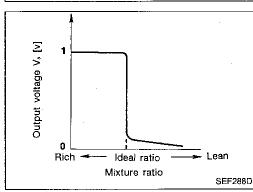
Idle position of the throttle valve is determined by the ECM receiving the signal from the throttle position sensor. This system is called "soft closed throttle position switch". This one controls engine operation such as fuel cut. On the other hand, "hard closed throttle position switch", which is built in the throttle position sensor unit, is used not for engine control but for on-board diagnostic system.

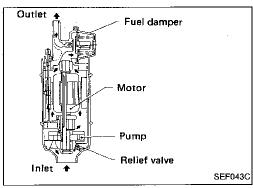






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Fuel Injector

The fuel injector is a small, elaborate solenoid valve. As the ECM sends injection signals to the injector, the coil in the injector pulls the ball valve back and fuel is released into the intake manifold through the nozzle. The injected fuel is controlled by the ECM in terms of injection pulse duration.

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Pressure Regulator

The pressure regulator maintains the fuel pressure at approximately 294 kPa (3.0 kg/cm², 43 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.

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Heated Oxygen Sensor (HO2S)

The heated oxygen sensor, which is placed into the exhaust MT outlet, monitors the amount of oxygen in the exhaust gas. The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and AT the inner surface to atmosphere. The zirconia of the tube compares the oxygen density of exhaust gas with that of atmosphere, and generates electricity. In order to improve generating power of the zirconia, its tube is coated with platinum. The voltage is approximately 1V in a richer condition of the mixture ratio than the ideal air-fuel ratio, while approximately OV in leaner conditions. The radical change from 1V to 0V occurs at around the ideal mixture ratio. In this way, the heated oxygen sensor detects the amount of oxygen in the exhaust gas and sends the signal of approximately 1V or 0V to the ECM. A heater is used to activate the sensor.

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Fuel Pump

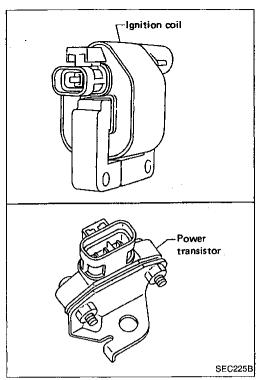
The fuel pump with a fuel damper is an in-tank type, that is the pump and damper are located in the fuel tank.

The vane rollers are directly coupled to a motor which is cooled by the fuel.



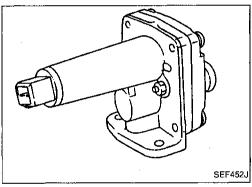
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Power Transistor & Ignition Coil

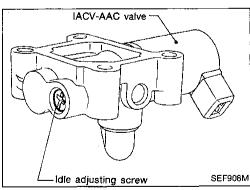
The ignition signal from the ECM is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, molded type.



Idle Air Control Valve (IACV)-Air Regulator

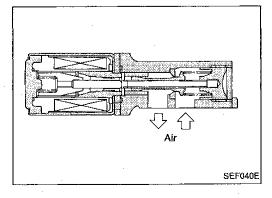
The IACV-air regulator provides an air by-pass when the engine is cold for a fast idle during warm-up.

A bimetal, heater and rotary shutter are built into the IACV-air regulator. When the bimetal temperature is low, the air by-pass port opens. As the engine starts and electric current flows through a heater, the bimetal begins to turn the shutter to close the by-pass port. The air passage remains closed until the engine stops and the bimetal temperature drops.



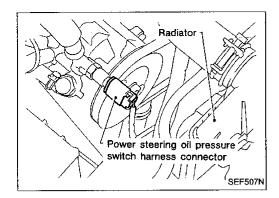
Idle Air Adjusting (IAA) Unit

The IAA unit is made up of the IACV-AAC valve and idle adjusting screw. It receives the signal from the ECM and controls the idle speed at the preset value.



Idle Air Control Valve (IACV)-Auxiliary Air Control (AAC) Valve

The ECM actuates the IACV-AAC valve by an ON/OFF pulse. The longer that ON duty is left on, the larger the amount of air that will flow through the IACV-AAC valve.



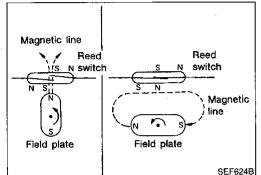
Power Steering Oil Pressure Switch

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects the power steering load, sending the load signal to the ECM. The ECM then sends the idle-up signal to the IACV-AAC valve.



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Vehicle Speed Sensor (VSS)

The vehicle speed sensor provides a vehicle speed signal to the ECM.

The speed sensor consists of a reed switch, which is installed in the speedometer unit and transforms vehicle speed into a pulse signal.

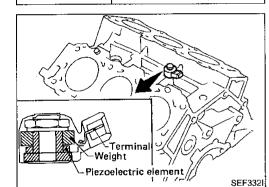


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Knock Sensor (KS)

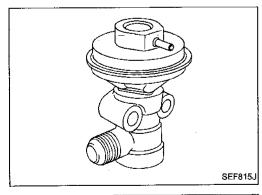
The knock sensor is attached to the cylinder block and senses engine knocking conditions.

A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This vibrational pressure is then converted into a voltage signal which is sent to the ECM.

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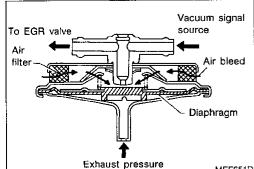
Exhaust Gas Recirculation (EGR) Valve

The EGR valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve.

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EGR Control (EGRC)-BPT Valve

The EGRC-BPT valve monitors exhaust pressure to activate the diaphragm, controlling throttle body vacuum applied to the EGR valve. In other words, recirculated exhaust gas is controlled in response to positioning of the EGR valve or to engine operation.

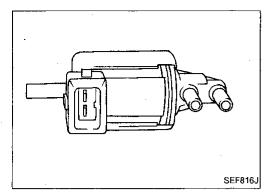
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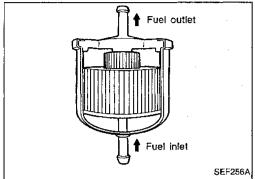
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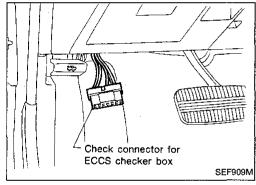
EGR Control (EGRC)-Solenoid Valve

The EGR system is controlled only by the ECM. At both low- and high-speed revolutions of engine, the solenoid valve turns on and accordingly the EGR valve cuts the exhaust gas leading to the intake manifold.



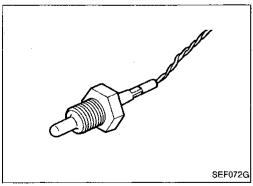
Fuel Filter

The specially designed fuel filter has a metal case in order to withstand high fuel pressure.



Check Connector for ECCS Checker Box

The check connector for ECCS checker box is located in the instrument panel to the rear of the hood opener.

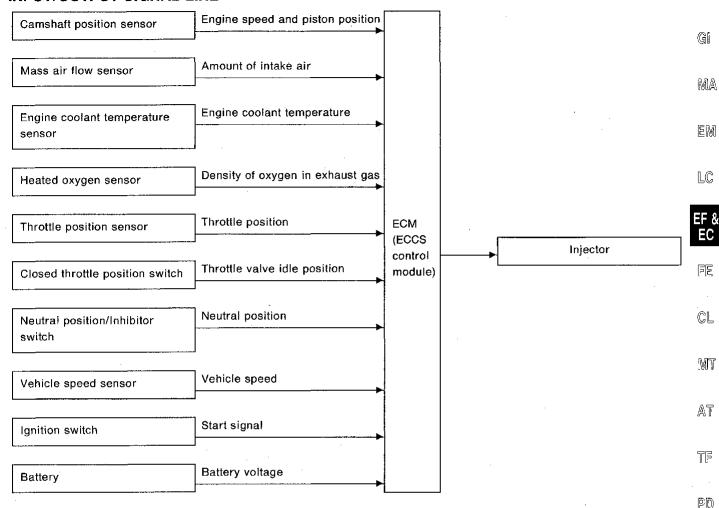


EGR Temperature Sensor

The EGR temperature sensor monitors in exhaust gas temperature and transmits a signal to the ECM. The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electric resistance of the thermistor decreases in response to the temperature rise.

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



BASIC MULTIPORT FUEL INJECTION **SYSTEM**

The amount of fuel injected from the fuel injector, or the length of time the valve remains open, is determined by the ECM. The basic amount of fuel injected is a program value mapped in the ECM memory. In other words, the program value is preset by engine operating conditions determined by input signals (for engine speed and air intake) from both the camshaft position sensor and the mass air flow sensor.

INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injection is compensated for to improve engine performance under various operating conditions as listed below.

<Fuel increase>

- 1) During warm-up
- 2) When starting the engine
- 3) During acceleration
- 4) Hot-engine operation
- <Fuel decrease>
- 1) During deceleration

VARIOUS FUEL INJECTION

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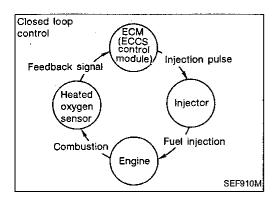
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Multiport Fuel Injection (MFI) System (Cont'd) MIXTURE RATIO FEEDBACK CONTROL

Mixture ratio feedback system is designed to precisely control the mixture ratio to the stoichiometric point so that the three-way three way catalyst can reduce CO, HC and NOx emissions. This system uses an heated oxygen sensor in the exhaust manifold to check the air-fuel ratio. The ECM adjusts the injection pulse width according to the sensor voltage so the mixture ratio will be within the range of the stoichiometric air-fuel ratio.

This stage refers to the closed loop control condition. The open-loop control condition refers to that under which the ECM detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion.

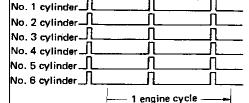
- Deceleration
- 2) High-load, high-speed operation
- 3) Engine idling
- 4) Malfunction of heated oxygen sensor or its circuit
- Insufficient activation of heated oxygen sensor at low engine coolant temperature
- 6) Engine starting

MIXTURE RATIO SELF-LEARNING CONTROL

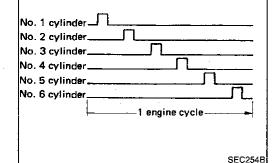
The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the heated oxygen sensor. This feedback signal is then sent to the ECM to control the amount of fuel injection to provide a basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. This is due to manufacturing errors (e.g., mass air flow sensor hot wire) and changes during operation (injector clogging, etc.) of ECCS parts which directly affect the mixture ratio.

Accordingly, a difference between the basic and theoretical mixture ratios is quantitatively monitored in this system. It is then computed in terms of "fuel injection duration" to automatically compensate for the difference between the two ratios.

Simultaneous maltiport fuel injection



Sequential multiport fuel injection



FUEL INJECTION TIMING

Two types of fuel injection systems are used — simultaneous multiport fuel injection system and sequential multiport fuel injection system. In the former, fuel is injected into all six cylinders simultaneously twice each engine cycle.

In other words, pulse signals of the same width are simultaneously transmitted from the ECM to the six injectors two times for each engine cycle.

In the sequential multiport fuel injection system system, fuel is injected into each cylinder during each engine cycle according to the firing order.

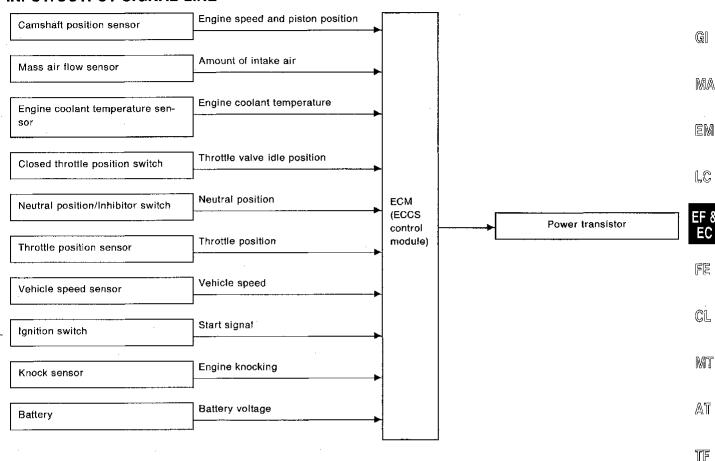
When engine is starting, fuel is injected into all six cylinders simultaneously twice a cycle.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or highspeed operation.

Distributor Ignition (DI) System

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM in order to maintain the best air-fuel ratio in response to every running condition of the engine.

The ignition timing data is stored in the ECM located in the ECM, in the form of the map shown below.

The ECM detects information such as the injection pulse width and camshaft position sensor signal which varies every moment. Then

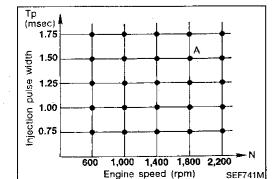
responding to this information, ignition signals are transmitted to the power transistor.

g. N: 1,800 rpm, Tp: 1.50 msec A °BTDC

In addition to this,

- 1) At starting
- 2) During warm-up
- 3) At idle
- 4) At low battery voltage

the ignition timing is revised by the ECM according to the other data stored in the ECM.



The retard system by knock sensor is designed only for emergencies. The basic ignition timing is pre-programmed within the anti-knocking zone, even if recommended fuel is used under dry conditions. Consequently, the retard system does not operate under normal driving conditions.

However, if engine knocking occurs, the knock sensor monitors the condition and the signal is transmitted to the ECM (ECCS control module). After receiving it, the ECM retards the ignition timing to avoid the knocking condition.

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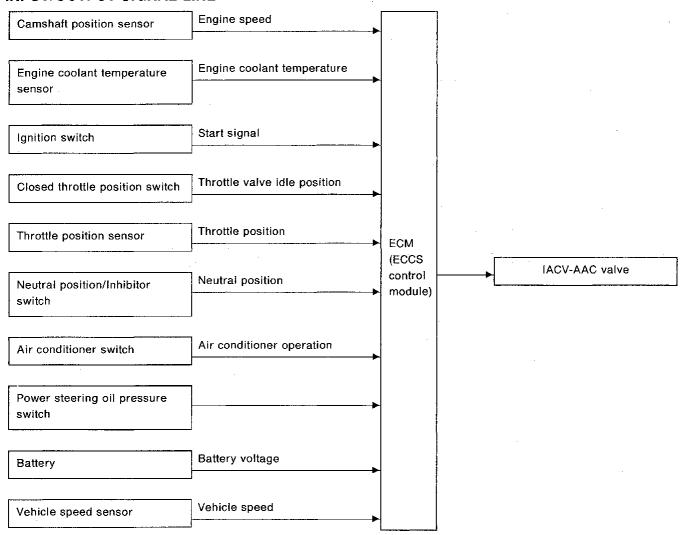
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Idle Air Control (IAC) System

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via IACV-AAC valve. The IACV-AAC valve changes the opening of the air by-pass passage to control the amount of auxiliary air. The opening of the valve is varied to allow for optimum control of the engine idling speed. The camshaft position sensor detects the actual engine speed and sends a signal to the ECM. The ECM then controls the ON/OFF time of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as warming up and during deceleration, fuel consumption, and engine load (air conditioner, electrical load).

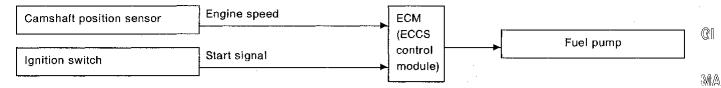
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Fuel Pump Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

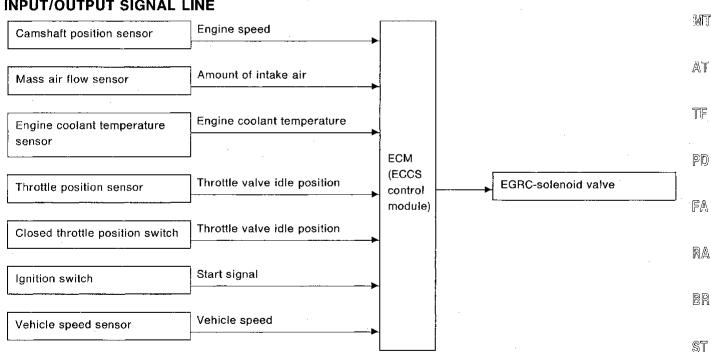
To reduce power consumption, fuel pump relay ON-OFF operation controls the fuel pump as follows:

Fuel pump ON-OFF control

Ignition switch position	Engine condition	Fuel pump relay	Fuel pump operation
ON	Stopped	ON → OFF	Operates for a few seconds after ignition switch turns to "ON"
ON -	Starting	ON	Operates
	Running	ON	Operates

Exhaust Gas Recirculation (EGR) System

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

In addition, a system is provided which precisely cuts and controls port vacuum applied to the EGR valve to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM. When the ECM detects any of the following conditions, current flows through the solenoid valve in the EGR control vacuum line.

This causes the port vacuum to be discharged into the atmosphere so that the EGR valve remains closed.

- 1) Low engine coolant temperature
- 2) Engine starting
- 3) High-speed engine operation
- 4) Engine idling
- 5) Excessively high engine coolant temperature
- 6) CPU malfunction of ECM and camshaft position sensor malfunction

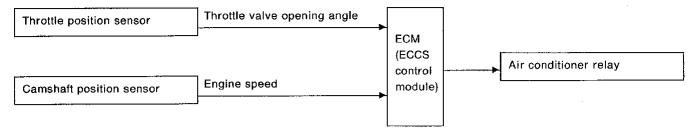
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Acceleration Cut Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

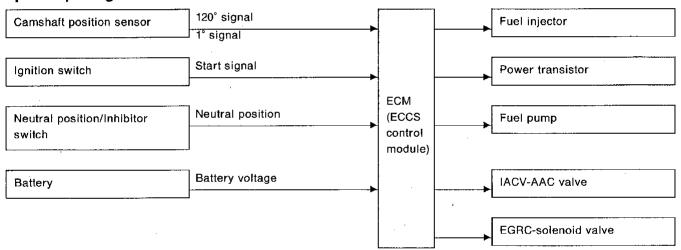
Air conditioner is turned off for a few seconds during accelerating condition.

This system improves acceleration when air conditioner is used.

Fail-safe System

CPU MALFUNCTION OF ECM AND CAMSHAFT POSITION SENSOR MALFUNCTION

Input/output signal line



Outline

The fail-safe system makes engine starting possible if there is something malfunctioning in the ECM's CPU circuit, or if there is a disconnection or short/open circuit in the camshaft position sensor circuit.

In former models, engine starting was difficult under the conditions mentioned above. But with the provisions provided in this fail-safe system, it is possible to start the engine.

Fail-safe system activating condition when camshaft position sensor is malfunctioning

The fail-safe mode operation starts immediately after all of the following conditions have been satisfied for several seconds.

- (1) No pulse of 120° signal (reference signal) detected for several seconds, or 1° signal (position signal) is equivalent to 0 rpm.
- (2) Ignition switch in START

- (3) Battery voltage is greater than 10 volts with ignition switch ON.
- (4) The neutral position switch is ON, or the inhibitor switch is in the "P" or "N" position.
- (5) When ignition switch is in START, battery voltage is at least 1 volt lower than when ignition switch is ON.

Fail-safe system activating condition when ECM is malfunctioning

The computing function of the ECM was judged to be malfunctioning.

When the fail-safe system activates, i.e. if the ECM detects a malfunction condition in the CPU of ECM or camshaft position sensor circuit, the MALFUNCTION INDICATOR LAMP on the instrument panel lights to warn the driver.

Fail-safe System (Cont'd)

Engine control, with fail-safe system, operates when ECM or camshaft position sensor is malfunctioning

When the fail-safe system is operating, fuel injection, ignition timing, fuel pump operation, engine idle speed, and EGR operation, are controlled under certain limitations.

Cancellation of fail-safe system when ECM or camshaft position sensor is malfunctioning

Activation of the fail-safe system is canceled each time the ignition switch is turned OFF. The system is reactivated if all of the above-mentioned activating conditions are satisfied after turning the ignition switch from OFF to ON.

MASS AIR FLOW SENSOR MALFUNCTION

If the mass air flow sensor output voltage is above or below the specified value, the ECM senses an mass air flow sensor malfunction. In case of a malfunction, the throttle position sensor @ substitutes for the mass air flow sensor.

Though mass air flow sensor is malfunctioning, it is possible to drive the vehicle and start the engine. But engine speed will not rise more than 3,000 rpm in order to inform the driver of fail-safe system operation while driving.

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Operation

Engine condition	Starter switch	Fail-safe system	Fail-safe functioning
Stopped	ANY	Does not operate	
Cranking	ON	Operates	Engine will be started by a pre- determined injection pulse on ECM
Running	OFF		Engine speed will not rise above 3,000 rpm

ENGINE COOLANT TEMPERATURE SENSOR MALFUNCTION

When engine coolant temperature sensor output voltage is below or above the specified value, water temperature is fixed at the preset value as follows:

Operation

Condition	Engine coolant temperature decided		
Just as ignition switch is turned ON or Start	20°C (68°F)		
More than 6 minutes after ignition ON or Start	80°C (176°F)		
Except as shown above	20 - 80°C (68 - 176°F) (Depends on the time)		

KNOCK SENSOR MALFUNCTION

When the output signal of the knock sensor is abnormal, the ECM judges it to be malfunctioning. When knock sensor is malfunctioning, ignition timing will retard according to operating conditions.

THROTTLE POSITION SENSOR **MALFUNCTION**

When throttle position sensor output voltage is below or above the specified value, throttle position sensor output is fixed at the preset value.

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PREPARATION

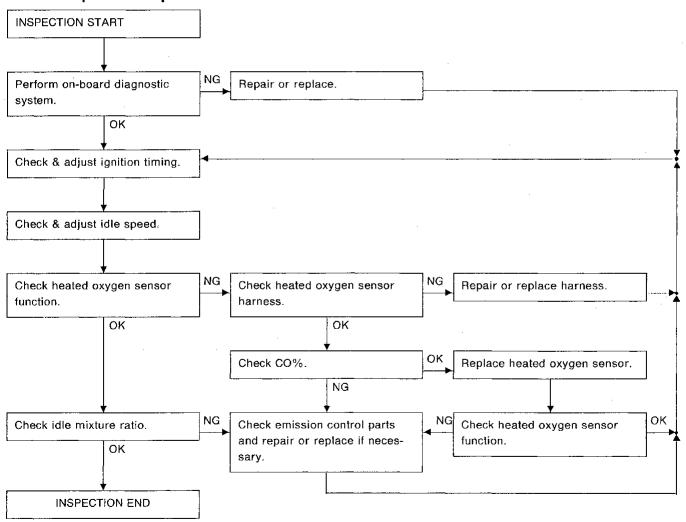
- 1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- ECM SMJ harness connector
- Vacuum hoses
- Air intake system
 (Oil filler cap, oil level gauge, etc.)
- Fuel pressure
- Engine compression
- EGR valve operation
- Throttle valve

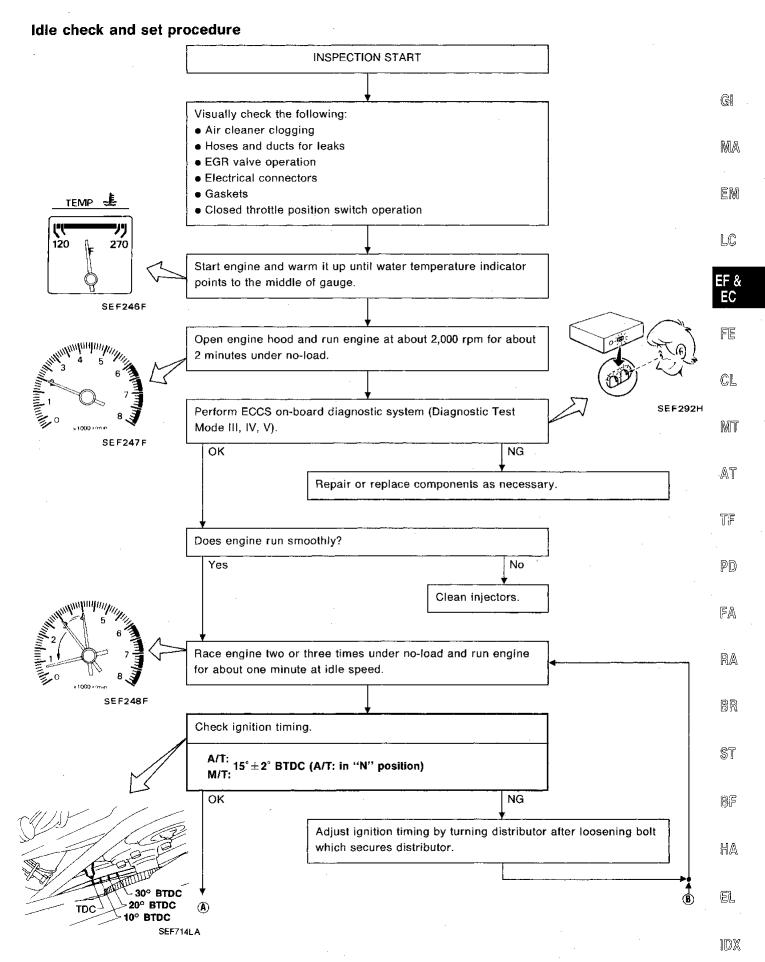
- 2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
- On automatic transmission equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.
- 4. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
- 5. Turn off headlamps, heater blower, rear defogger.
- 6. Keep front wheels pointed straight ahead.
- 7. Make the check after the cooling fan has stopped.

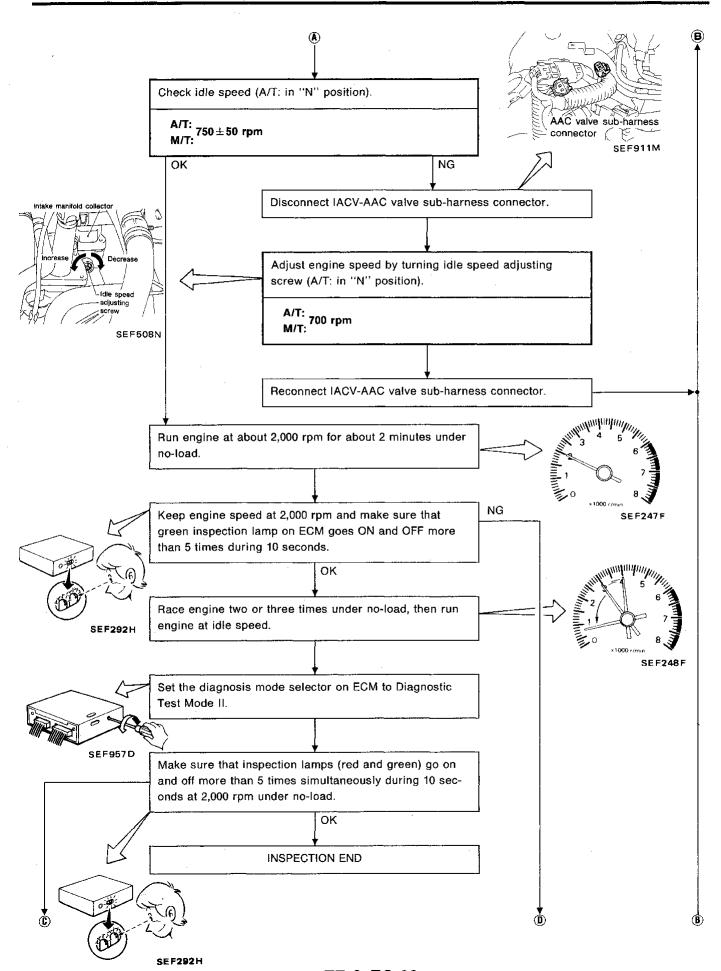
WARNING:

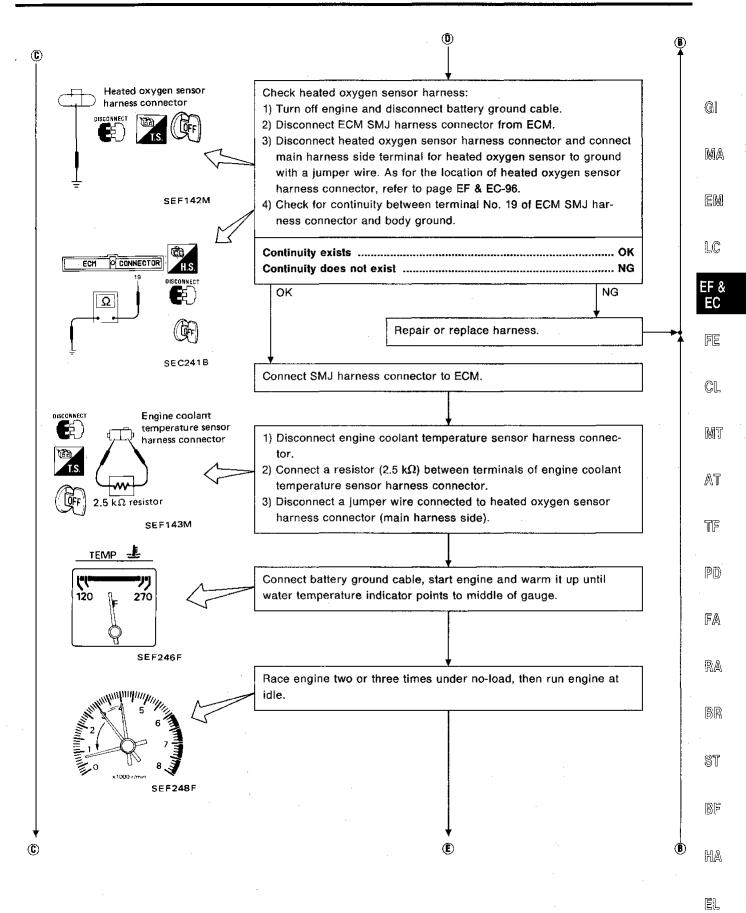
Apply parking brake and block both front and rear wheels with chocks.

Overall inspection sequence

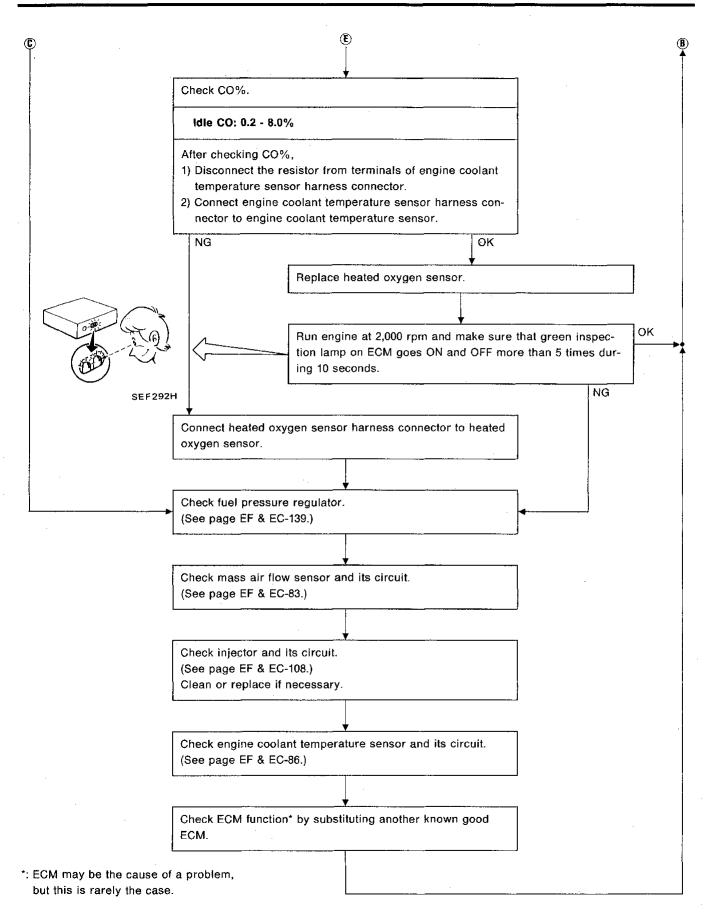








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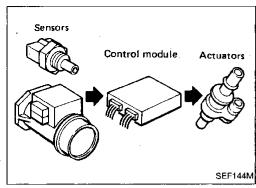
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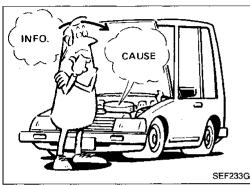
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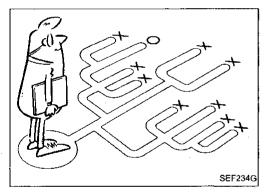
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How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. At the same time, it is important that there are no conventional problems such as vacuum leaks, fouled spark plugs, or other problems with the engine.

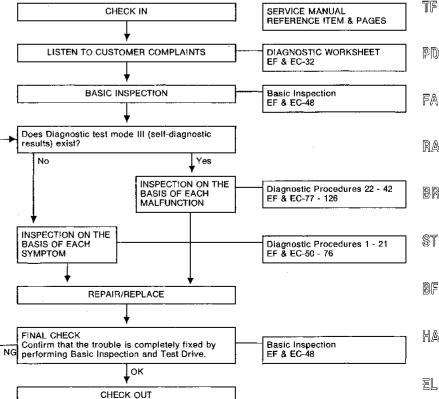
It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.

A visual check only may not find the cause of the problems, so a road test with a circuit tester connected to a suspected circuit should be performed.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a driveability complaint. The customer is a very good supplier of information on such problems, especially intermittent ones. Through interaction with the customer, find out what symptoms are present and under what conditions they occur.

Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot driveability problems on an electronically controlled engine vehicle.

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KEY POINTS

WHAT Vehicle & engine model
WHEN Date, Frequencies
WHERE..... Road conditions
HOW Operating conditions,
Weather conditions,
Symptoms

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How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

DIAGNOSTIC WORKSHEET

There are many kinds of operating conditions that lead to malfunctions on engine components.

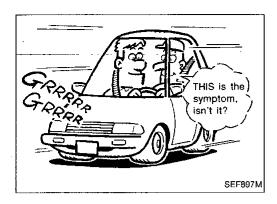
A good grasp of such conditions can make trouble-shooting faster and more accurate.

In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms or under what conditions a customer complains.

Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for troubleshooting.

Worksheet sample

Customer name	MR/MS		Model & Year	VIN			
Engine #			Trans.	Mileage			
Incident Date		_	Manuf. Date	In Service Date			
	□ Startability	□ P	ossible to start No combustion artial combustion affected by throttle partial combustion NOT affected by through the but hard to start Others [1		
Symptoms	□ Idfing	☐ No fa	ast idle 🗀 Unstable 🗀 High idl rs [e			
Symptoms	☐ Driveability	□ Sturr □ Intak □ Othe	e backfire	_ack of power			
	☐ Engine stall	☐ While	e time of start	iting			
Incident occurrence			after delivery □ Recently e morning □ At night □ In the	daytime			
Frequency		□ All ti	☐ All the time ☐ Under certain conditions ☐ Sometimes				
Weather condition	ns	□ Not a	affected				
	Weather	☐ Fine	☐ Raining ☐ Snowing ☐	Others [1		
	Temperature	☐ Hot	□ Warm □ Cool □ Cold	☐ Humid	°F		
		□ Cold Engine	speed	arm-up -,000 6,000	8,000 rpm		
Road conditions		□ In to	wn 🗆 In suburbs 🗆 Highway	☐ Off road (up/down)			
Driving conditions		☐ At st	e accelerating	·			
Malfunction indic	ator lamp	☐ Turn	ed on Not turned on				



How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd) INTERMITTENT PROBLEM SIMULATION

In order to duplicate an intermittent problem, it is effective to create similar conditions for component parts, under which the problem might occur.

Perform the activity listed under Service procedure and note the result.

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į	Variable factor	Influential part	Target condition	Service procedure
1	Mixture ratio	Pressure regulator	Made lean	Remove vacuum hose and apply vacuum.
'	Mixture ratio	rressure regulator	Made rich	Remove vacuum hose and apply pressure.
2	lanition timina	Camshaft position	Advanced	Rotate distributor counterclockwise.
	Ignition timing	sensor	Retarded	Rotate distributor clockwise.
3	Mixture ratio feedback	Heated oxygen sensor	Suspended	Disconnect heated oxygen sensor harness connector.
3	control	ECM	Operation check	Perform on-board diagnostic system (Diagnostic Test Mode I/II) at 2,000 rpm.
	ldle seed	IACV-AAC valve	Raised	Turn idle adjusting screw counterclockwise.
4	Idle speed	IACV-AAC Valve	Lowered	Turn idle adjusting screw clockwise.
			Poor electrical con- nection or improper wiring	Tap or wiggle.
5	Electrical connection (Electric continuity)	Harness connectors and wires		Race engine rapidly. See if the torque reaction of the engine unit causes electric breaks.
			Cooled	Cool with an icing spray or similar device.
6	Temperature	ECM	Warmed	Heat with a hair drier. [WARNING: Do not overheat the unit.]
7	Moisture	Electric parts	Damp	Wet. [WARNING: Do not directly pour water on components. Use a mist sprayer.]
8	Electric loads	Load switches	Loaded	Turn on head lights, air conditioner, rear defogger, etc.
9	Closed throttle posi- tion switch condition	ECM	ON-OFF switching	Rotate throttle position sensor body.
10	Ignition spark position	Timing light	Spark power check	Try to flash timing light for each cylinder using ignition coil adapter (SST).

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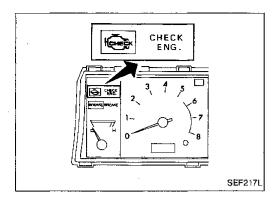
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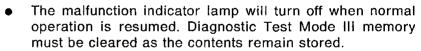
On-board Diagnostic System MALFUNCTION INDICATOR LAMP

A malfunction indicator lamp has been adopted. This light blinks under the following conditions:

California model	Non-California model
-	Light illuminates when any one of conditions 1), 2) and 4) is satisfied.

- 1) When ignition switch is turned "ON" (for bulb check).
- 2) When systems related to emission performance malfunction in Diagnostic Test Mode I (with engine running).
- This malfunction indicator lamp always illuminates and is synchronous with red LED.
- 3) When a malfunction is detected regarding the following self-diagnostic items.

Malfunction	On-board diagnostic system diagnostic trouble code No.	Malfunction	On-board diagnostic system diagnostic trouble code No.	
·		Heated oxygen sensor cir-		
Engine coolant temperature	13	cuit		
sensor circuit		EGR temperature sensor circuit	35	
Vehicle speed sensor cir- cuit	14	Throttle position sensor cir-	43	
ECM (ECCS control mod-	31	cuit		
ule)		Injector leak	45	
EGR function	32	Injector circuit	51	



4) When camshaft position sensor or CPU of ECM malfunctions and fail-safe system operates during engine rotation.



In the ECM, the Green and Red LED's have been adopted to monitor the self-diagnostic functions.



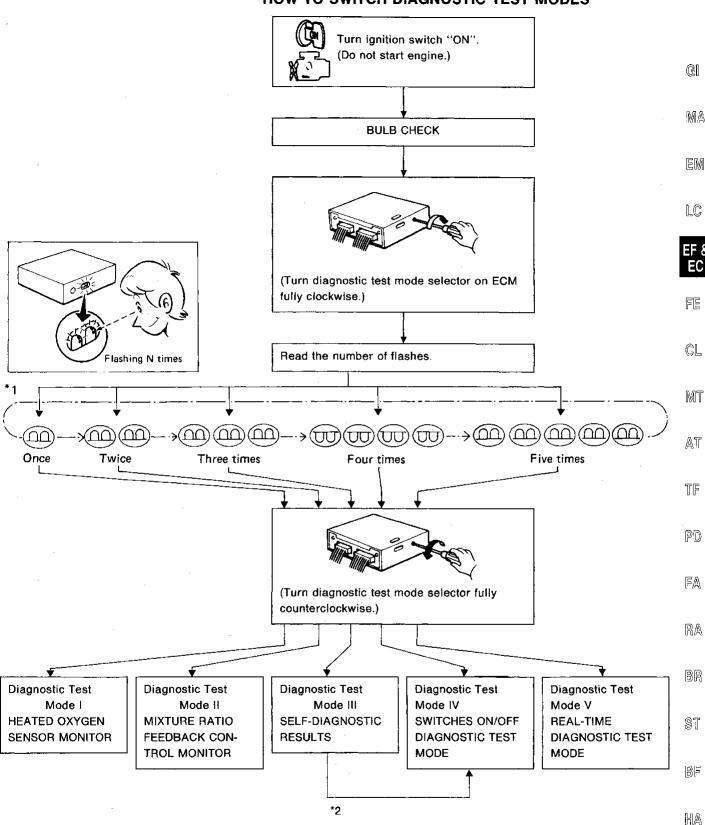
SEF287M

LED
Diagnostic test mode selector

SELF-DIAGNOSTIC FUNCTION

Diagnostic Test Mode	Function	
Diagnostic Test Mode I	HEATED OXYGEN SENSOR MONITOR	
Diagnostic Test Mode II	MIXTURE RATIO FEEDBACK CONTROL MONITOR	
Diagnostic Test Mode III	SELF-DIAGNOSTIC RESULTS	
Diagnostic Test Mode IV	SWITCHES ON/OFF DIAGNOSTIC TEST MODE	
Diagnostic Test Mode V	REAL-TIME DIAGNOSTIC TEST MODE	

On-board Diagnostic System (Cont'd) HOW TO SWITCH DIAGNOSTIC TEST MODES



- *1 While the diagnostic test mode selector is kept turned fully clockwise, it will continue to change in the order of Diagnostic Test Mode I \rightarrow II \rightarrow III \rightarrow IV \rightarrow V \rightarrow I ...
- *2 The diagnostic trouble code is erased from the backup memory of the ECM.
- Return the diagnostic test mode selector to the original position so as not to disturb the idle speed.

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On-board Diagnostic System — Diagnostic Test Mode I

Heated oxygen sensor monitor

This mode checks the heated oxygen sensor for proper functioning. The operation of the ECM LED in this mode differs with mixture ratio control conditions as follows:

Diagnostic Engine stoppe		Engine stopped	Engine running		
Test Mode	Test Mode (Ignition switch "ON")		Open loop condition	Closed loop condition	
	Green	ON	*Remains ON or OFF	Blinks	
Diagnostic Test Mode I	Red	ON	ON: a. when the MALFUI ITEMS are stored model only) b. when fail-safe sy: OFF: except for the above	in the ECM (California . stem is operating	

^{*:} Maintains conditions just before switching to open loop

HEATED OXYGEN SENSOR FUNCTION CHECK

If the number of LED blinks is less than that specified, replace the heated oxygen sensor.

If the LED does not blink, check heated oxygen sensor circuit.

HEATED OXYGEN SENSOR CIRCUIT CHECK

See page EF & EC-96.

On-board Diagnostic System — Diagnostic Test Mode II

Mixture ratio feedback control monitor

This mode checks, through the ECM LED, optimum control of the mixture ratio. The operation of the LED, as shown below, differs with the control conditions of the mixture ratio (for example, richer or leaner mixture ratios, etc., which are controlled by the ECM).

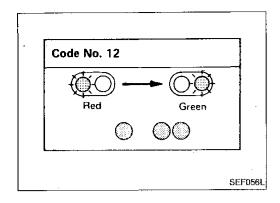
Diagnostic Tool		Engine stopped	Engine running			
Diagnostic Test Mode	LED	(Ignition switch ''ON'')	Open loop condition	Closed loop condition		
	Green	ON	*Remains ON or OFF	Blinks		
	Red OFF		*Remains ON or OFF	Compensating mixture ratio		
Diagnostic Test Mode II		OFF		More than 5% rich	Between 5% lean and 5% rich	More
				OFF	Synchronized with green LED	Remains ON

^{*:} Maintains conditions just before switching to open loop

If the red LED remains ON or OFF during the closed loop operation, the mixture ratio may not be controlled properly. Using the following procedures, check the related components or adjust the mixture ratio.

COMPONENT CHECK OR MIXTURE RATIO ADJUSTMENT

See page EF & EC-24.



On-board Diagnostic System — Diagnostic Test Mode III Self-diagnostic Results

The ECM constantly monitors the function of these sensors and actuators, regardless of ignition key position. If a malfunction occurs, the information is stored in the ECM and can be retrieved from the memory by turning on the diagnostic test MA mode selector, located on the side of the ECM. When activated, the malfunction is indicated by flashing a red and a green LED (Light Emitting Diode), also located on the ECM. Since all the self-diagnostic results are stored in the ECM's memory even intermittent malfunctions can be diagnosed.

A malfunction is indicated by the number of both red and green 👢 🖺 flashing LEDs. First, the red LED flashes and the green flashes follow. The red LED corresponds to units of ten and the green LED corresponds to units of one. For example, when the red LED flashes once and the green LED flashes twice, this signifies the number "12", showing that the mass air flow sensor signal is malfunctioning. All problems are classified by diagnostic trouble code numbers in this way.

- When the engine fails to start, crank it two or more seconds before beginning on-board diagnostic system.
- Read out self-diagnostic results first and then erase the malfunction records which are stored in ECM memory. If it is erased, the on-board diagnostic system function for intermittent malfunctions will be lost.

DISPLAY DIAGNOSTIC TROUBLE CODE TABLE

Diagnostic trou- ble code No.	Detected items	
11	Camshaft position sensor circuit	Х
12	Mass air flow sensor circuit	Х
13	Engine coolant temperature sensor circuit	Х
14	Vehicle speed sensor circuit	Х
21	Ignition signal missing in primary coil	Х
31	Engine control module (ECM)	X
32	EGR function	Х
33	Heated oxygen sensor circuit	X
34	Knock sensor circuit	Х
35	EGR temperature sensor circuit	Х
43	Throttle position sensor circuit	Х
45	Injector leak	X
51	Injector circuit	Х
55	No malfunction in the above circuit	X

X: Available

HOW TO ERASE SELF-DIAGNOSTIC RESULTS

The diagnostic trouble code is erased from the backup memory of the ECM by the following:

- When the battery terminal is disconnected, the diagnostic trouble code will be lost from the backup memory within 24 hours.
- When Diagnostic Test Mode IV is selected after selecting Diagnostic Test Mode III.

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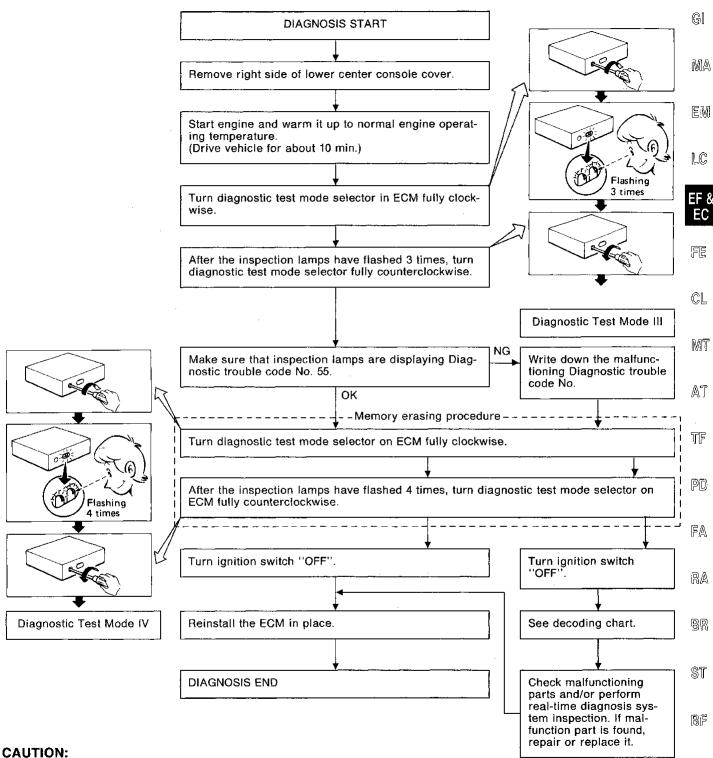
TROUBLE DIAGNOSES

On-board Diagnostic System — Diagnostic Test Mode III Self-diagnostic Results (Cont'd)

•		— — — — — — — — — — — — — — — — — — —	· · · · · · · · · · · · · · · · · · ·
Diagnostic trouble code No.	Detected items	Malfunction is detected when	Check item (remedy)
*11	Camshaft position sensor circuit	 Either 1° or 120° signal is not entered for the first few seconds during engine cranking. Either 1° or 120° signal is not input often enough while the engine speed is higher than the specified rpm. 	Harness and connector (If harness and connector are normal, replace camshaft position sensor.)
12	Mass air flow sensor circuit	 The mass air flow sensor circuit is open or shorted. (An abnormally high or low voltage is entered.) 	Harness and connector (If harness and connector are normal, replace mass air flow sensor.)
13	Engine coolant temperature sensor circuit	The engine coolant temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	Harness and connector Engine coolant temperature sensor
14	Vehicle speed sensor cir- cuit	The vehicle speed sensor circuit is open or shorted.	Harness and connectorVehicle speed sensor (reed switch)
*21	Ignition signal circuit	 The ignition signal in the primary cir- cuit is not entered during engine cranking or running. 	Harness and connector Power transistor unit
31	ECM	ECM calculation function is malfunctioning.	[Replace ECM (ECCS control module).]
32	EGR function	EGR valve does not operate. (EGR valve spring does not lift.)	EGR valve EGRC-solenoid valve
33	Heated oxygen sensor cir- cuit	The heated oxygen sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	 Harness and connector Heated oxygen sensor Fuel pressure Injectors Intake air leaks
34	Knock sensor circuit	 The knock sensor circuit is open or shorted. (An abnormally high or low voltage is entered.) 	Harness and connector Knock sensor
35	EGR temperature sensor circuit	The EGR temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	Harness and connector EGR temperature sensor
43	Throttle position sensor circuit	The throttle position sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	Harness and connector Throttle position sensor
45	Injector leak	Fuel leaks from injector.	• Injector
51	Injector circuit	The injector circuit is open.	Harness and connector Injector
1,000		·	

^{*:} Check items causing a malfunction of camshaft position sensor circuit first, if both diagnostic trouble code No. 11 and 21 are displayed at the same time.

On-board Diagnostic System — Diagnostic Test Self-diagnostic Results (Cont'd) **PROCEDURE**



During display of a Diagnostic trouble code No. in on-board diagnostic system mode (Diagnostic Test Mode III), if another diagnostic test mode is to be performed, be sure to note the malfunction Diagnostic trouble code No. before turning diagnostic test mode selector on ECM fully clockwise. When selecting an alternative, select the diagnosis mode after turning switch "OFF". Otherwise, on-board diagnostic system information in the ECM memory will be lost.

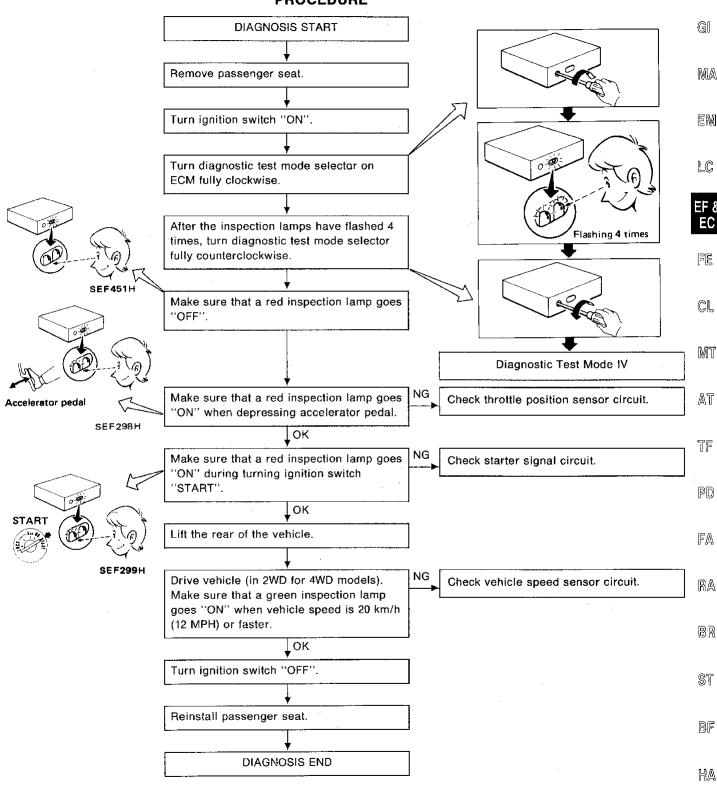
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On-board Diagnostic System — Diagnostic Test Mode IV Switches ON/OFF diagnostic test mode

In switches ON/OFF diagnostic system, ON/OFF operation of the following switches can be detected continuously.

- Soft closed throttle position switch
- Starter switch
- Vehicle speed sensor
- (1) Closed throttle position switch & Starter switch The switches ON/OFF status in Diagnostic Test Mode IV is stored in ECM memory. When either switch is turned from "ON" to "OFF" or "OFF" to "ON", the red LED on ECM alternately comes on and goes off each time switching is performed.
- (2) Vehicle speed sensor The switches ON/OFF status in Diagnostic Test Mode IV is selected is stored in ECM memory. The green LED on ECM remains off when vehicle speed is 20 km/h (12 MPH) or below, and comes ON at higher speeds.

On-board Diagnostic System — Diagnostic Test Mode IV Switches ON/OFF diagnostic test mode (Cont'd) PROCEDURE



CAUTION:

• For safety, do not drive rear wheels at higher speed than required.

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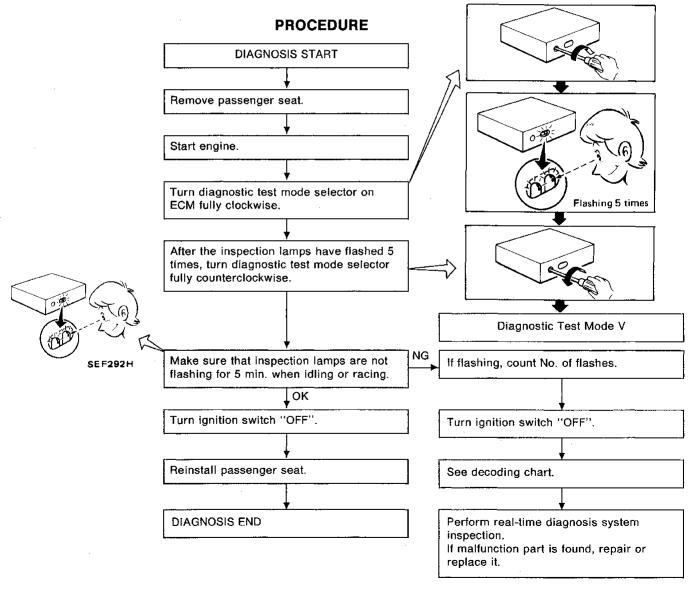
On-board Diagnostic System — Diagnostic Test Mode V

Real-time diagnostic test mode

In real-time diagnosis, if the following items are judged to be working incorrectly, a malfunction will be indicated immediately.

- Camshaft position sensor (120° signal & 1° signal) output signal
- Ignition signal
- Mass air flow sensor output signal

Consequently, this diagnosis very effectively determines whether the above systems cause the malfunction, during driving test. Compared with on-board diagnostic system, real-time diagnosis is very sensitive and can detect malfunctions instantly. However, items regarded as malfunctions in this diagnosis are not stored in ECM memory.

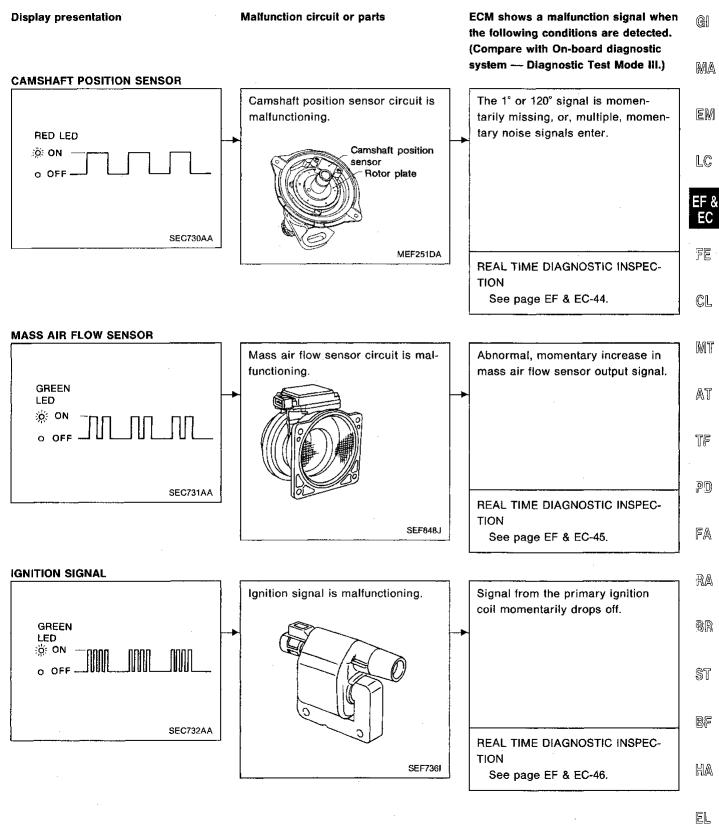


CAUTION:

In real-time diagnosis, pay attention to inspection lamp flashing. ECM displays the diagnostic trouble code only once and does not memorize the inspection.

On-board Diagnostic System — Diagnostic Test Mode V Real-time diagnostic test mode (Cont'd)

DECODING CHART



On-board Diagnostic System — Diagnostic Test Mode V Real-time diagnostic test mode (Cont'd)

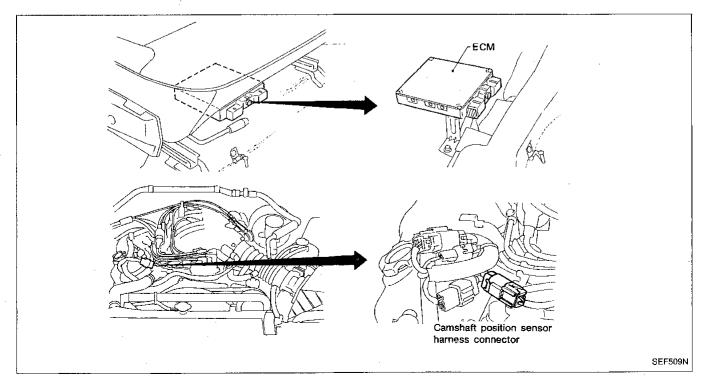
REAL-TIME DIAGNOSTIC INSPECTION

Camshaft Position Sensor

X : Available

—: Not available

Check sequence	Check items	Check conditions		Check parts		If malfunction, perform the following items.
			Camshaft position sensor harness connector	Sensor & actuator	ECM SMJ harness connector	
1	Tap and wiggle harness con- nector or component during real-time diagnosis.	During real-time diagnosis	x	х	x .	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	х	-	_	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	x	_	×	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	_	_	. X	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	х	_	_	Replace terminal.
6	Tap and wiggle harness con- nector or component during real-time diagnosis.	During real-time diagnosis	X	х	х	If diagnostic trouble codes are displayed during real-time diagnosis, replace terminal.



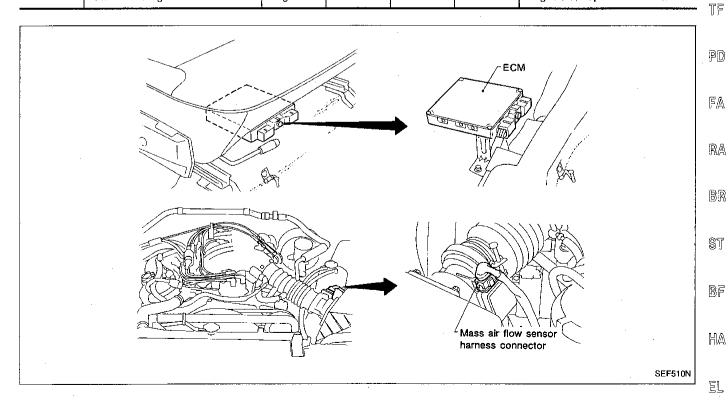
On-board Diagnostic System — Diagnostic Test Mode V Real-time diagnostic test mode (Cont'd)

Mass Air Flow Sensor

X: Available —: Not available

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	Check items	Check conditions		Check parts		If malfunction, perform the following items.	
Check sequence			Mass air flow sen- sor harness connector	Sensor & actuator	ECM SMJ harness connector		MA EM
1	Tap and wiggle harness con- nector or component during real-time diagnosis.	During real-time diagnosis	×	x	x	Go to check item 2.	LC EF &
2	Check harness continuity at connector.	Engine stopped	х	_	_	Go to check item 3.	EC
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	х	_	x	Clean terminal surface.	FE
4	Check pin terminal bend.	Engine stopped		_	×	Take out bend.	" CL
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	x	_		Replace terminal.	MT
6	Tap and wiggle harness con- nector or component during real-time diagnosis.	During real-time diagnosis	×	×	x	If diagnostic trouble codes are displayed during real-time diagnosis, replace terminal.	AT • TS



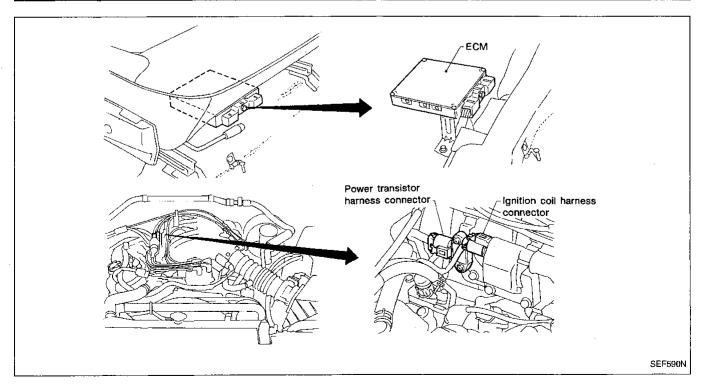
On-board Diagnostic System — Diagnostic Test Mode V Real-time diagnostic test mode (Cont'd)

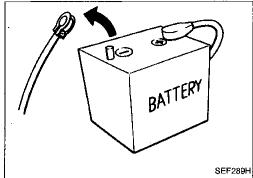
Ignition Signal

X: Available

--: Not available

Check sequence	Check items	Check conditions		Check parts		If malfunction, perform the following items.
			Ignition signal harness connector	Sensor & actuator	ECM SMJ harness connector	
1	Tap and wiggle harness con- nector or component during real-time diagnosis.	During real-time diagnosis	х	х	х	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	x	_		Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	Х		x	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped		_	х	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	х	· _	_	Replace terminal.
6	Tap and wiggle harness con- nector or component during real-time diagnosis.	During real-time diagnosis	х	x	x	If diagnostic trouble codes are displayed during real-time diagnosis, replace terminal.





Red projection

Protector

SEF725H

SEF291H

SEF149M

Diagnostic Procedure

CAUTION:

break).

1. Before connecting or disconnecting the ECM harness connector to or from any ECM, be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage ECM as battery voltage is applied to ECM even if ignition switch is turned off. Failure to do so may damage the ECM.



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When connecting ECM harness connector, tighten securing bolt until red projection is in line with connector face.

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When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or

MT

Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.

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Before replacing ECM, perform ECM input/output signal inspection and make sure whether ECM functions properly or not. (See page EF & EC-127.)

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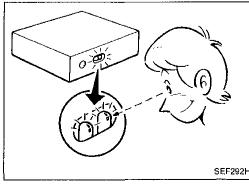
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After performing this "Diagnostic Procedure", perform ECCS on-board diagnostic system and driving test.

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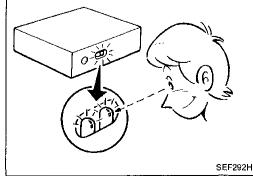


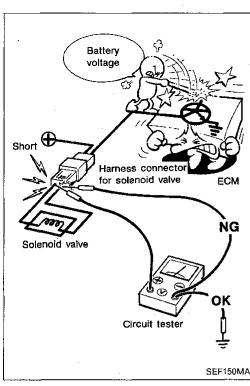
Perform ECM in-

put/output signal

inspection before replacement.

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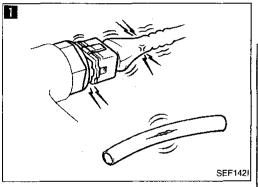


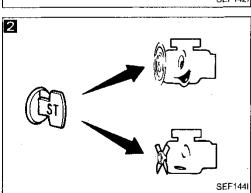


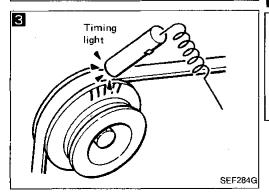
Diagnostic Procedure (Cont'd)

7. When measuring ECM controlled components supply voltage with a circuit tester, separate one tester probe from the other.

If the two tester probes accidentally make contact with each other during measurement, the circuit will be shorted, resulting in damage to the ECM power transistor.



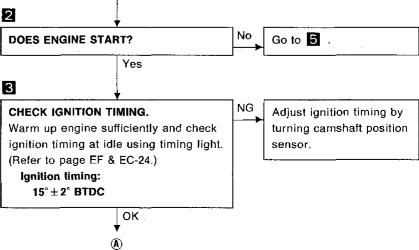




Basic Inspection

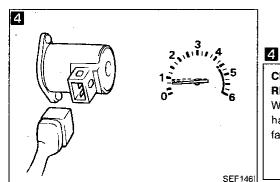
BEFORE STARTING

- Check service records for any recent repairs that may indicate a related problem, or the current need for scheduled maintenance.
- Open engine hood and check the following:
- Harness connectors for proper connections
- Vacuum hoses for splits, kinks, and proper connections
- Wiring for proper connections, pinches, and cuts



EF & EC-48

Basic Inspection (Cont'd)



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CHECK IDLE ADJ. SCREW INITIAL SET RPM.

When disconnecting IACV-AAC valve harness connector, does engine speed fall to;

 $700 \pm 50 \text{ rpm}$ [in "N" position]?

Adjust engine speed by turning idle adjusting screw.

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CHECK THROTTLE POSITION SENSOR IDLE POSITION.

Yes

Measure output voltage of throttle position sensor using voltmeter, and check that it is approximately 0.5V. (Throttle valve fully closed.)

OK

 Adjust output voltage by rotating throttle position sensor body.

NG

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 Disconnect throttle position sensor harness connector for a few seconds and then reconnect it.

3. Confirm that "IDLE POSITION" stays "ON".

EF & EC

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CHECK SWITCH INPUT SIGNAL.

Remove ECM and check the switches' ON-OFF operation using voltmeter at each ECM terminal.

Switch	Condition	Voltage (V)		
Start signal	IGN _ IGN ON START	0 → Battery voltage		
Throttle posi- tion switch	Idle position	Battery voltage		
A/C signal	A/C A/C OFF ON (Engine run- ning)	Battery voltage → 0.5 - 0.7		
Neutral (Park- ing) position switch	Selector lever is "N" or "P" position → Except "N" and "P"	0 → 8.0 - 9.0		

Repair or replace the malfunctioning switch or its circuit.

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Yes

READ SELF-DIAGNOSTIC RESULTS.

1. Set "Self-diagnostic function" in
Diagnostic Test Mode III. (Refer to
page EF & EC-37.)

Count the number of LED flashes and read out the diagnostic trouble codes.

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3. Are the diagnostic trouble codes being output?

No

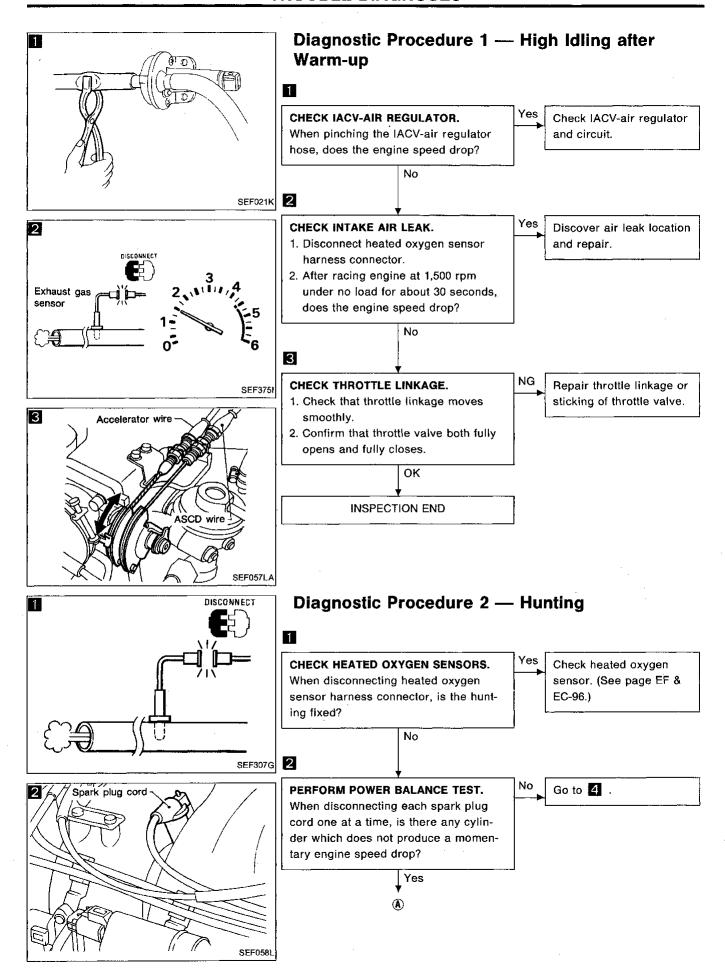
INSPECTION END

Go to the relevant inspection procedure.

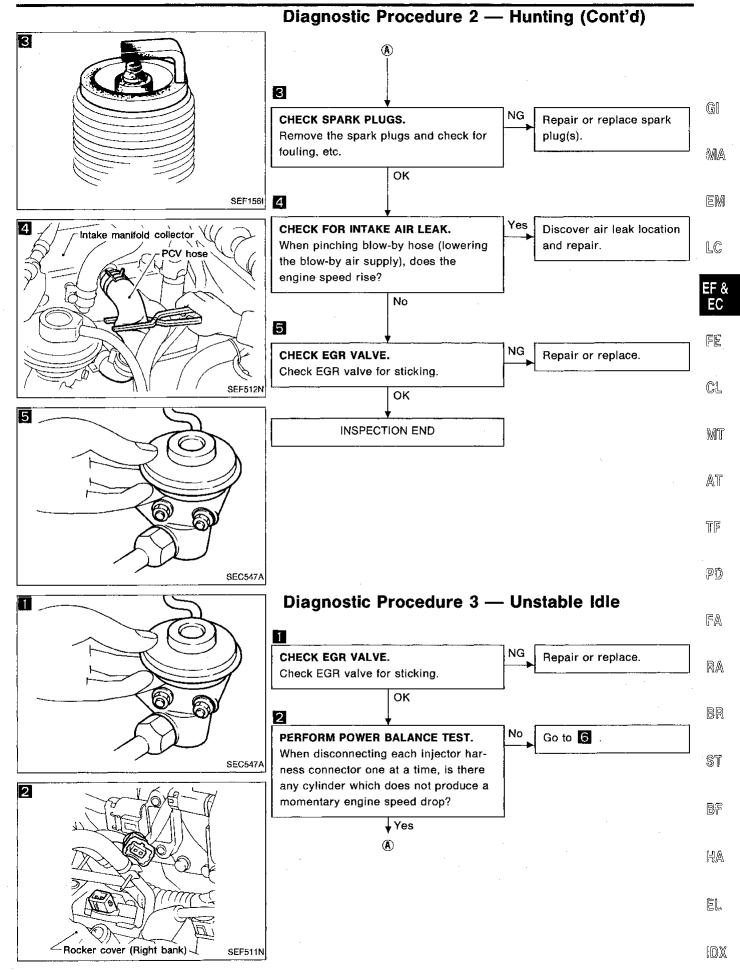
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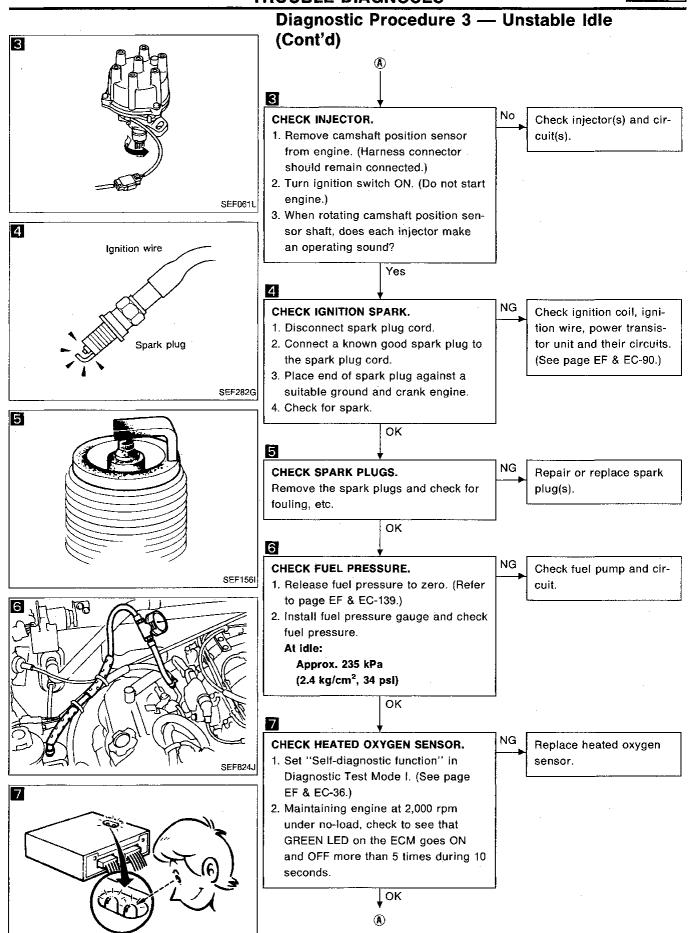
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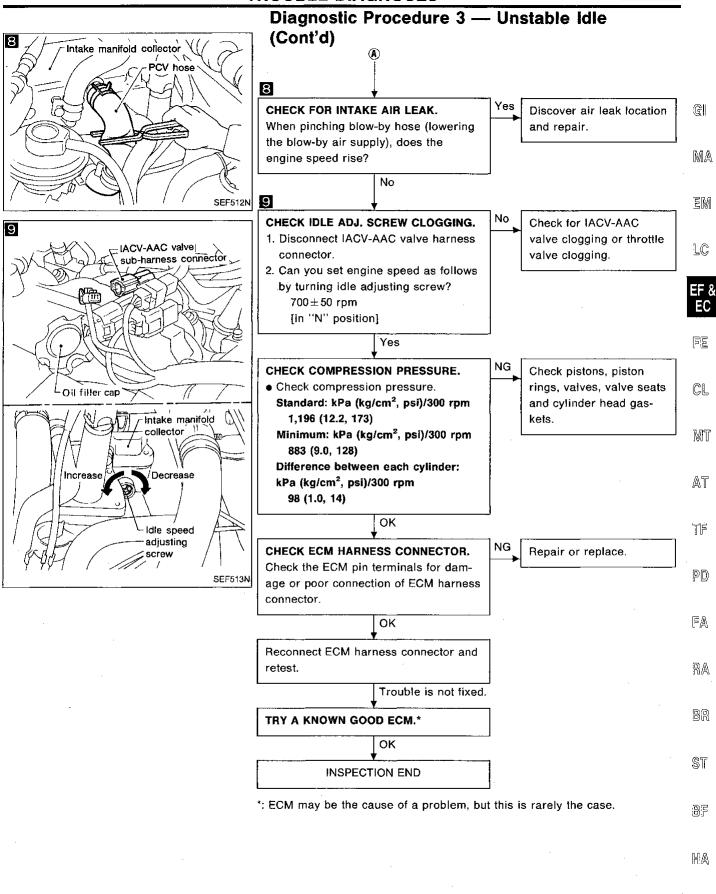


EF & EC-50



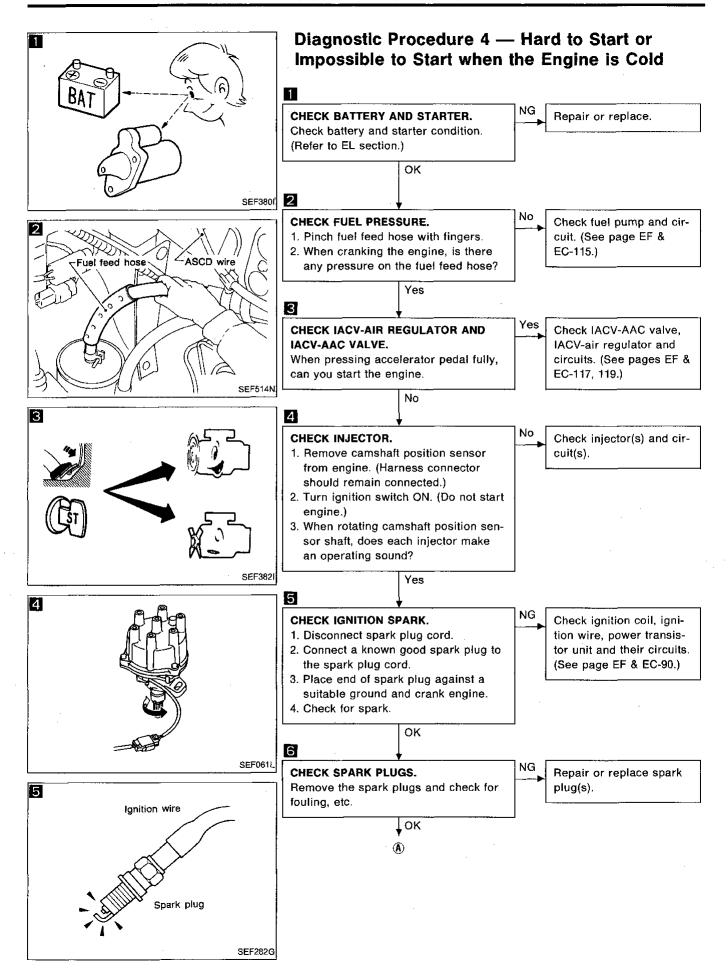


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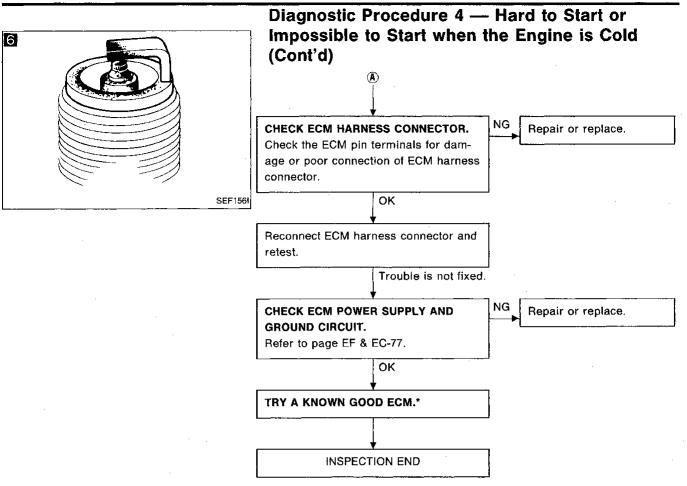
BR

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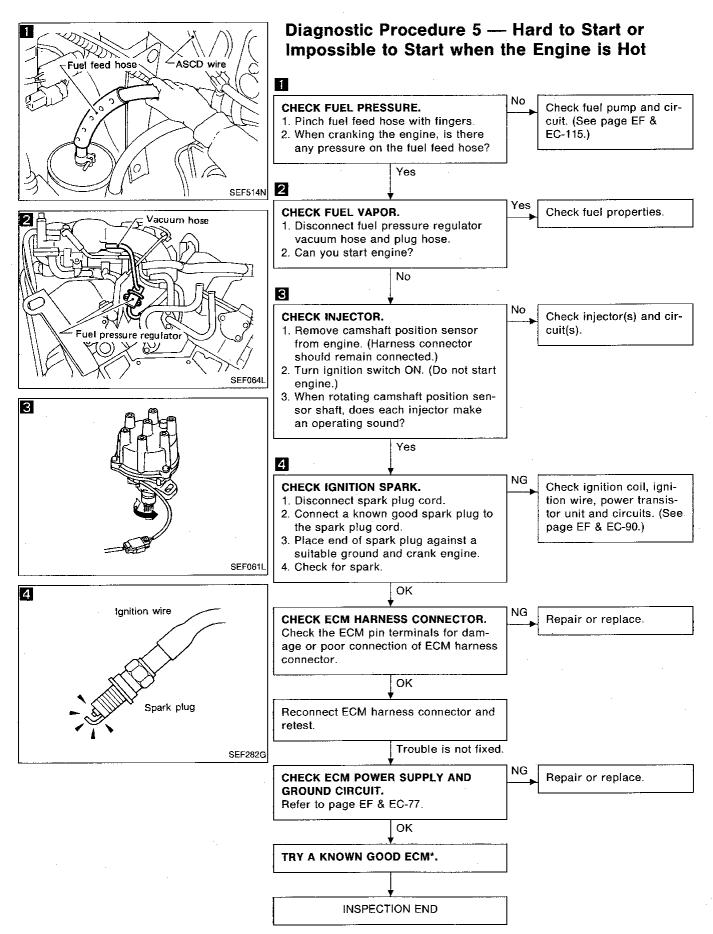
HA

EL

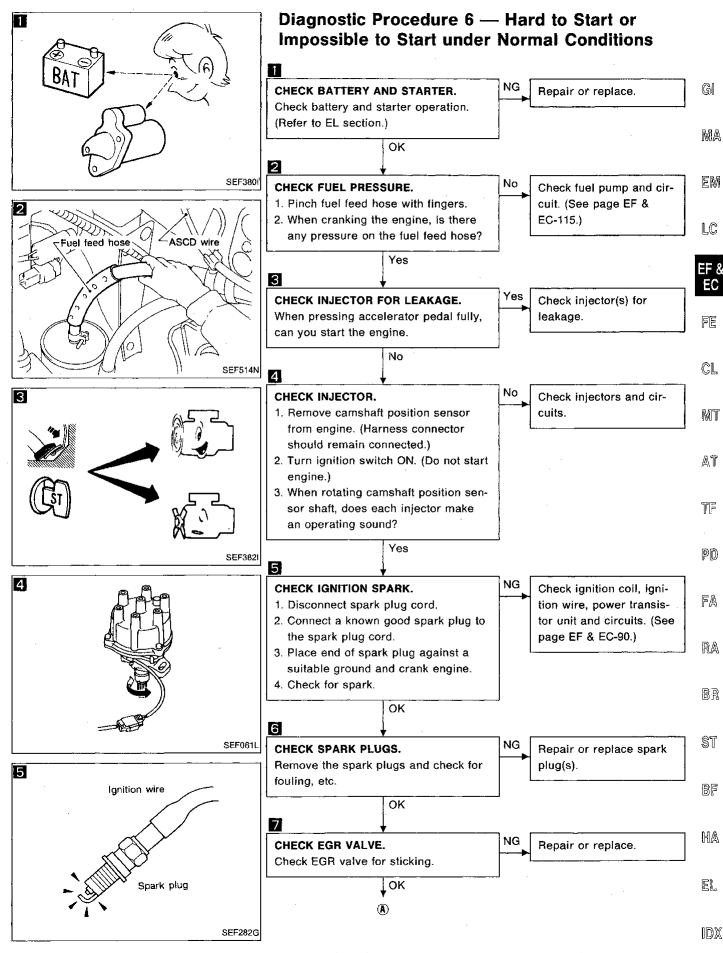


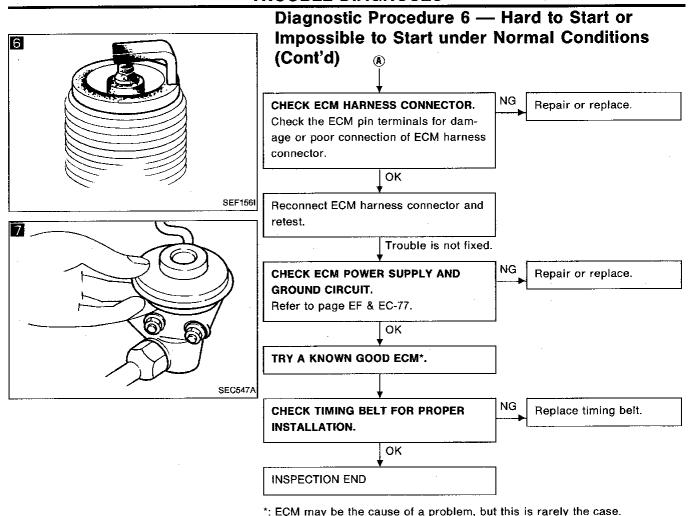
*: ECM may be the cause of a problem, but this is rarely the case.

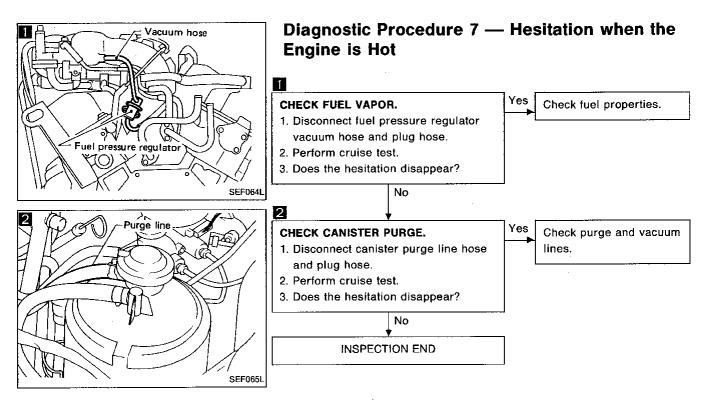
IDX

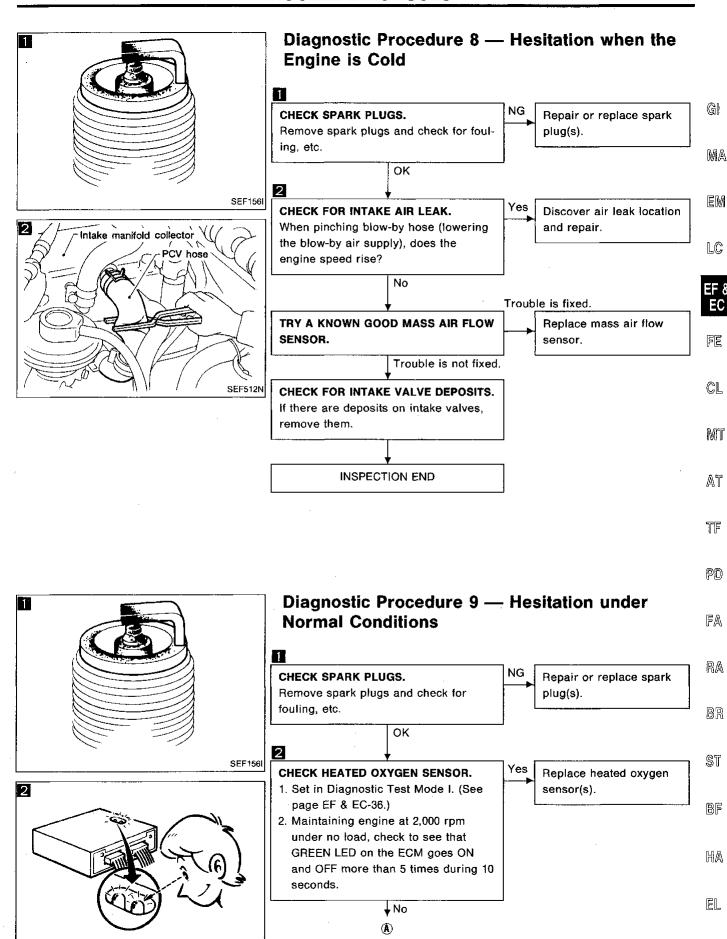


^{*:} ECM may be the cause of a problem, but this is rarely the case.







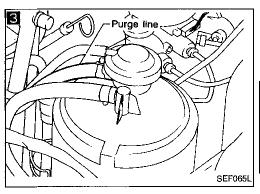


SEF332D

(ID)X

Check purge and vacuum

lines.

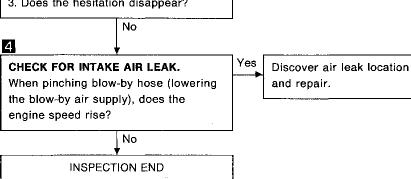


intake manifold collector

Diagnostic Procedure 9 — Hesitation under **Normal Conditions (Cont'd)**



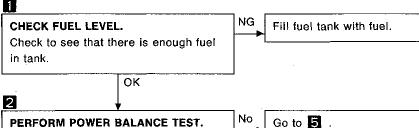
- 1. Disconnect canister purge line hose and plug hose.
- 2. Perform cruise test.
- 3. Does the hesitation disappear?



SEF386I

SEF512N

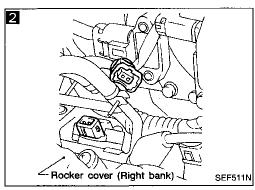
Diagnostic Procedure 10 — Engine Stalls when **Turning**

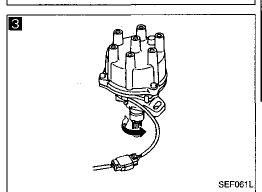


No

cuit(s).

Check injector(s) and cir-



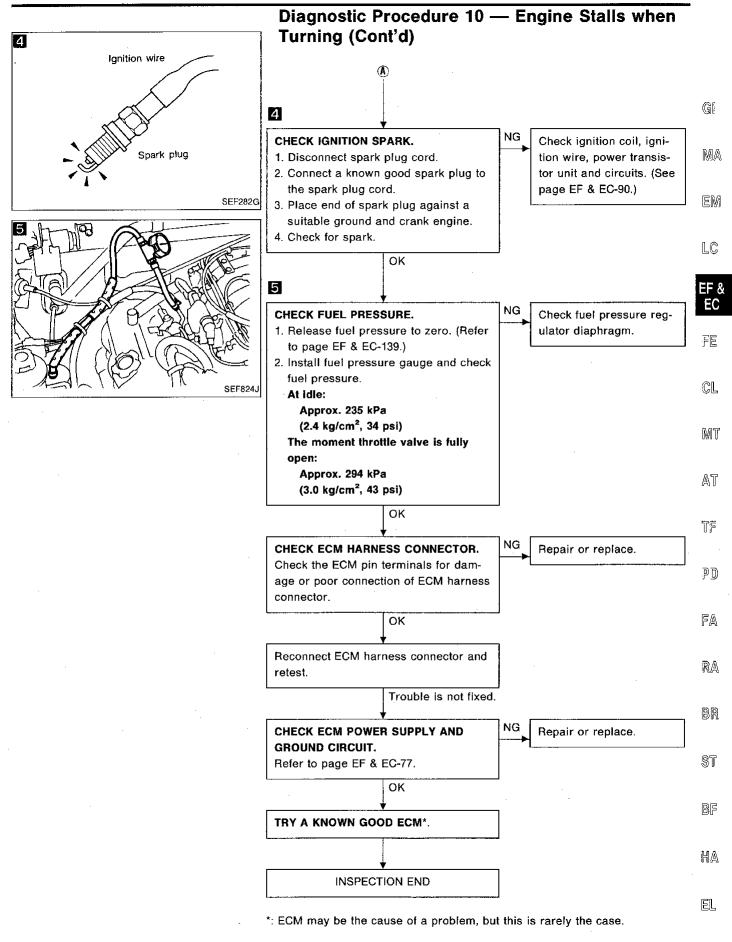


When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

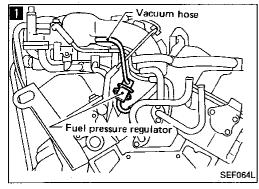
Yes

CHECK INJECTOR. 1. Remove camshaft position sensor from engine. (Harness connector

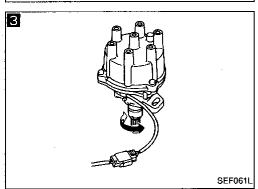
- should remain connected.) 2. Turn ignition switch ON. (Do not start
- engine.) 3. When rotating camshaft position sen-
- sor shaft, does each injector make an operating sound?

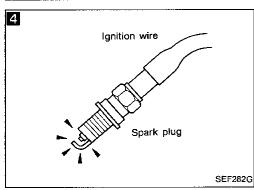


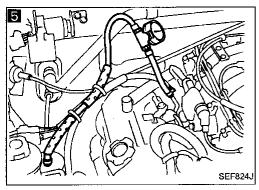
 $\mathbb{D}X$



Rocker cover (Right bank) SEF511N







Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot

1

CHECK FUEL VAPOR.

- Disconnect fuel pressure regulator vacuum hose and plug hose.
- 2. Perform cruise test.
- 3. Does the engine stall disappear?

No

Yes

PERFORM POWER BALANCE TEST.

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop? Go to 5.

3

2

CHECK INJECTOR.

- Remove camshaft position sensor from engine. (Harness connector should remain connected.)
- 2. Turn ignition switch ON. (Do not start engine.)
- 3. When rotating camshaft position sensor shaft, does each injector make an operating sound?

Yes

Check injector(s) and circuit(s).

Check fuel properties.

4

CHECK IGNITION SPARK.

- 1. Disconnect spark plug cord.
- 2. Connect a known good spark plug to the spark plug cord.
- Place end of spark plug against a suitable ground and crank engine.
- 4. Check for spark.

Check ignition coil, ignition wire, power transistor unit and their circuits. (See page EF & EC-90.)

Check fuel pressure reg-

ulator diaphragm.

NG

NG

5

CHECK FUEL PRESSURE.

 Release fuel pressure to zero. (Refer to page EF & EC-139.)

OK

Install fuel pressure gauge and check fuel pressure.

At idle:

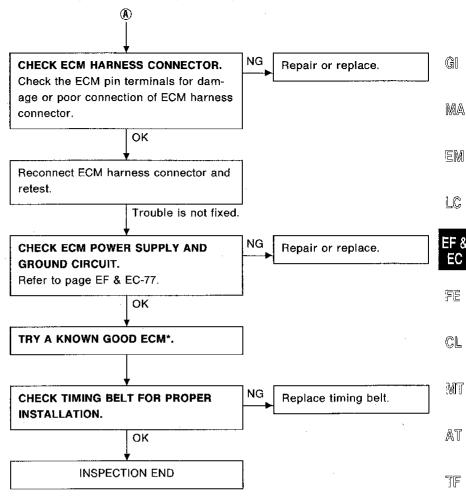
Approx. 235 kPa (2.4 kg/cm², 34 psi)

The moment throttle valve is fully open:

Approx. 294 kPa (3.0 kg/cm², 43 psi)

> ↓ok (A)

Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot (Cont'd)



*: ECM may be the cause of a problem, but this is rarely the case.

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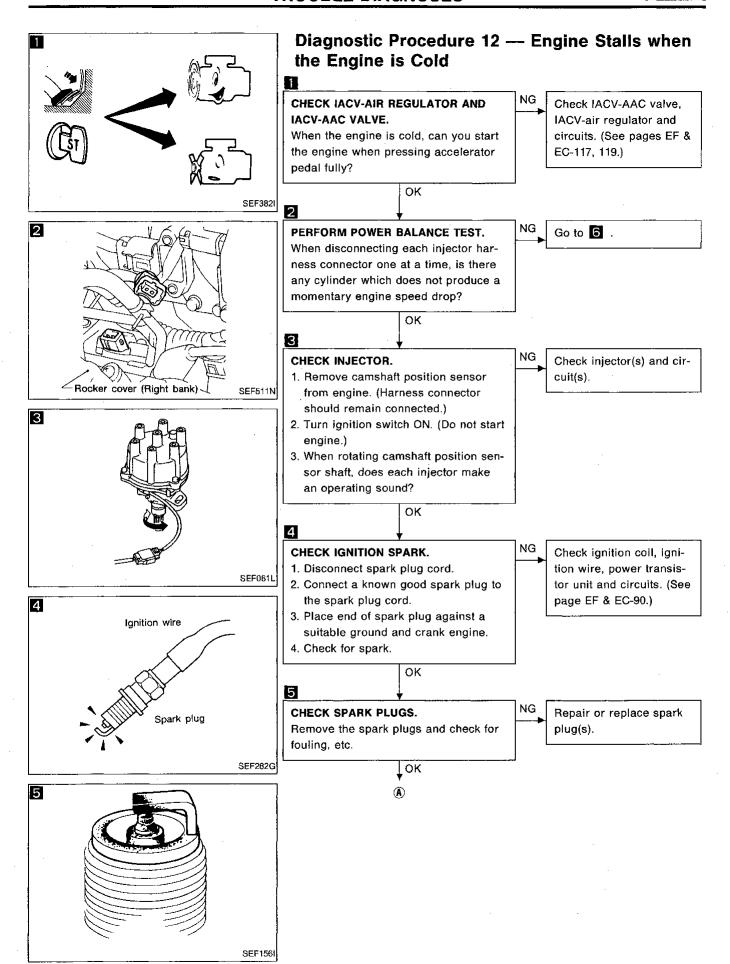
BF

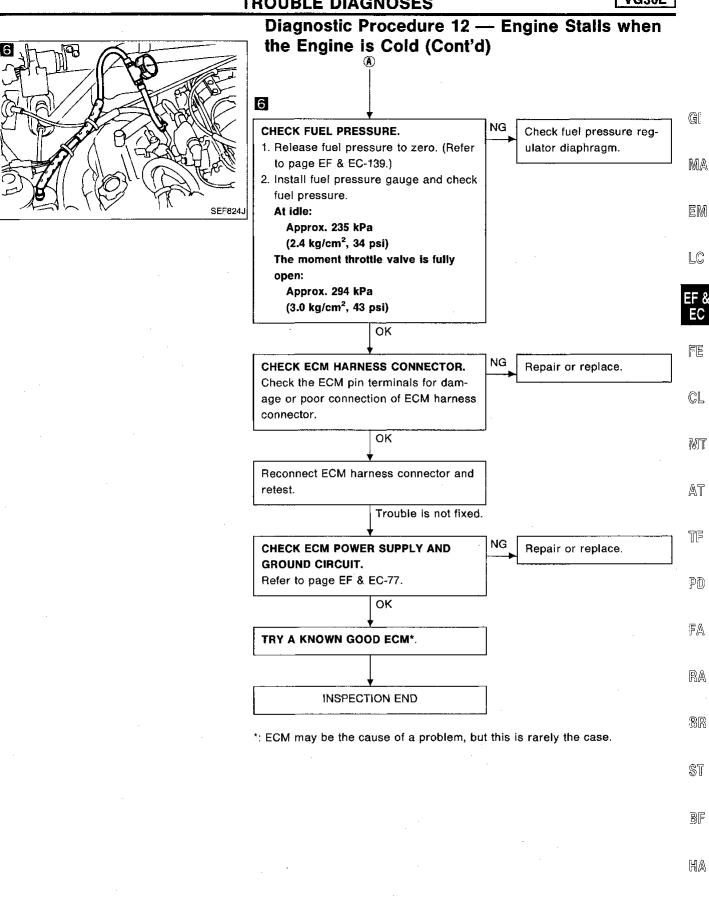
.

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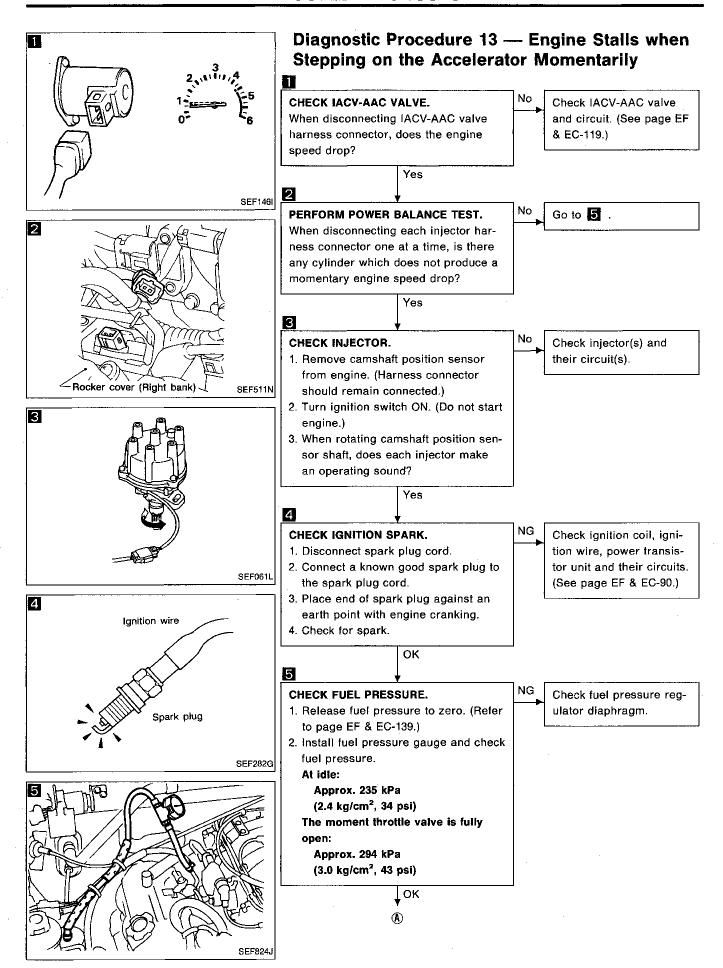
 $\mathbb{I}\mathbb{D}\mathbb{X}$

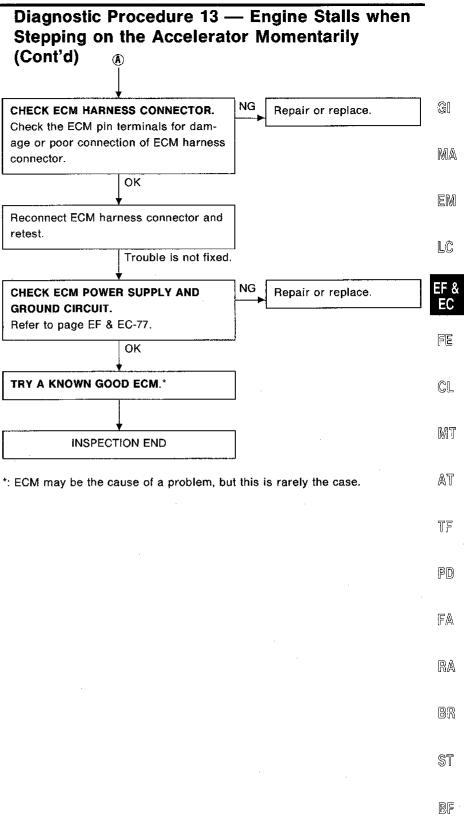




FDX

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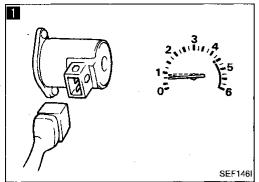


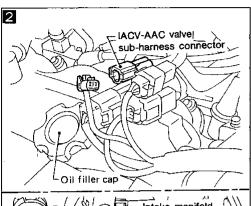


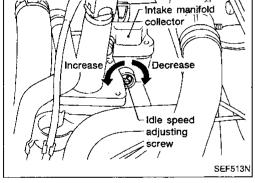
 $\mathbb{D}\mathbb{X}$

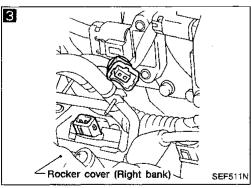
HA

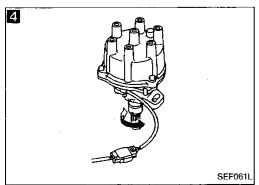
EL











Diagnostic Procedure 14 — Engine Stalls after **Decelerating**

No CHECK IACV-AAC VALVE. Check IACV-AAC valve and circuit. (See page EF When disconnecting IACV-AAC valve harness connector, does the engine & EC-119.) speed drop? Yes 2 No CHECK IDLE ADJ. SCREW CLOGGING. Check for IACV-AAC 1. Disconnect IACV-AAC valve harness valve clogging or throttle connector. body clogging. 2. Can you set engine speed as follows by turning idle adjusting screw? $700 \pm 50 \text{ rpm}$ [in "N" position] Yes PERFORM POWER BALANCE TEST. Go to 6 . When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop? Yes 4 No CHECK INJECTOR. Check injector(s) and cir-1. Remove camshaft position sensor cuit(s). from engine. (Harness connector

- should remain connected.) 2. Turn ignition switch ON. (Do not start
- engine.)
- 3. When rotating camshaft position sensor shaft, does each injector make an operating sound?

Yes

5 CHECK IGNITION SPARK.

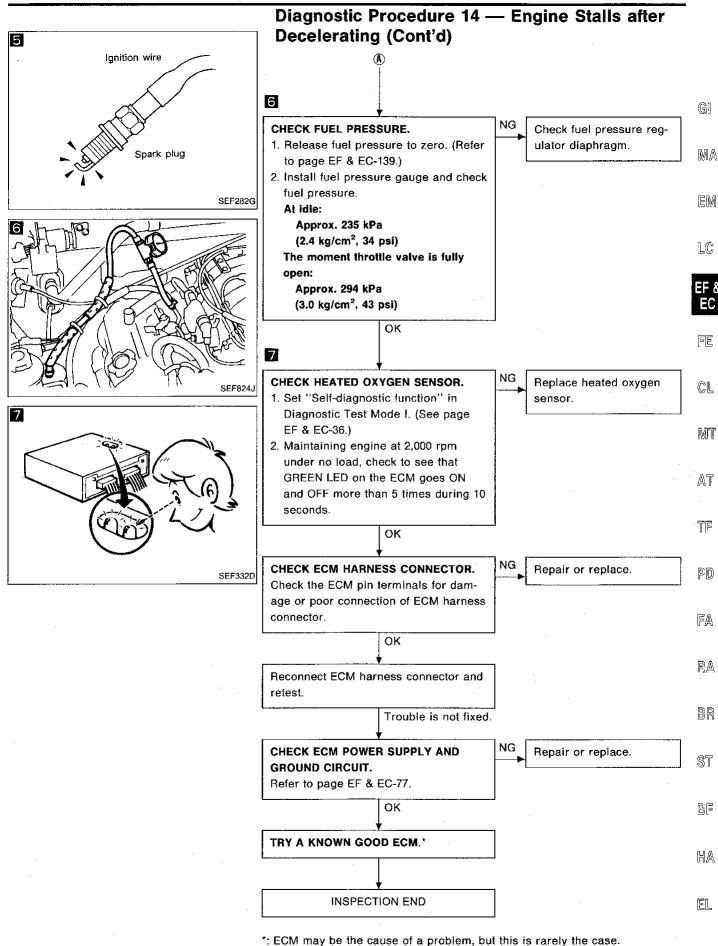
- 1. Disconnect spark plug cord. 2. Connect a known good spark plug to the spark plug cord.
- 3. Place end of spark plug against a suitable ground and crank engine.

4. Check for spark.

↓õĸ

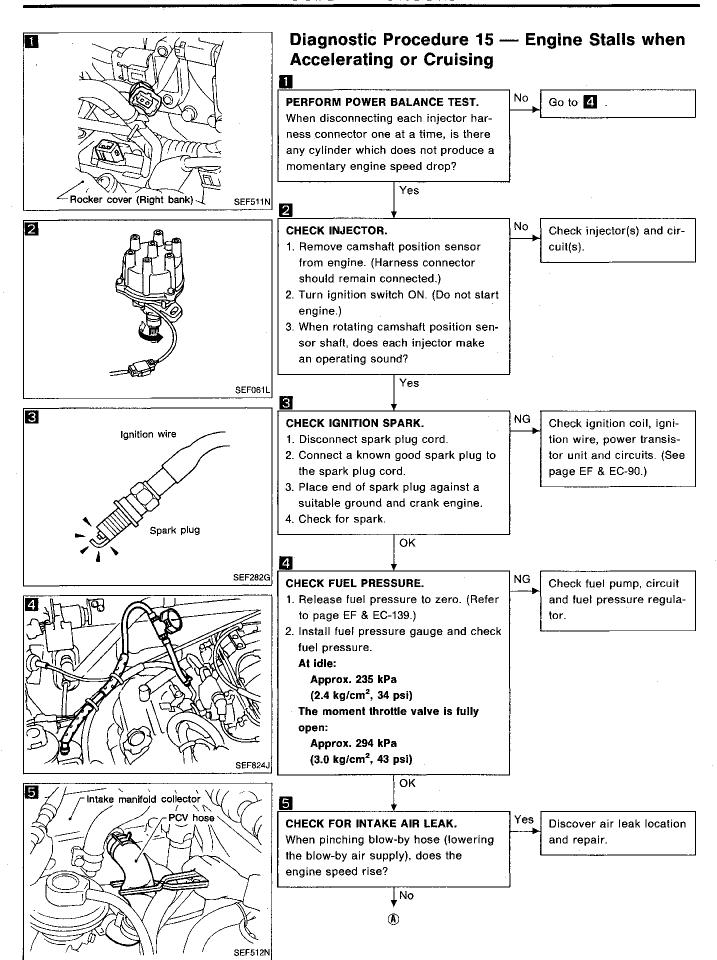
Check ignition coil, ignition wire, power transistor unit and circuits. (See page EF & EC-90.)

NG



EF & EC-69

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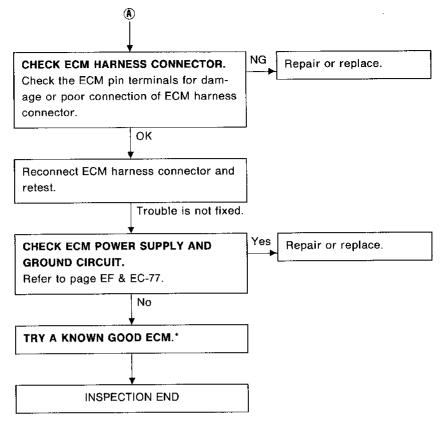
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Diagnostic Procedure 15 — Engine Stalls when Accelerating or Cruising (Cont'd)



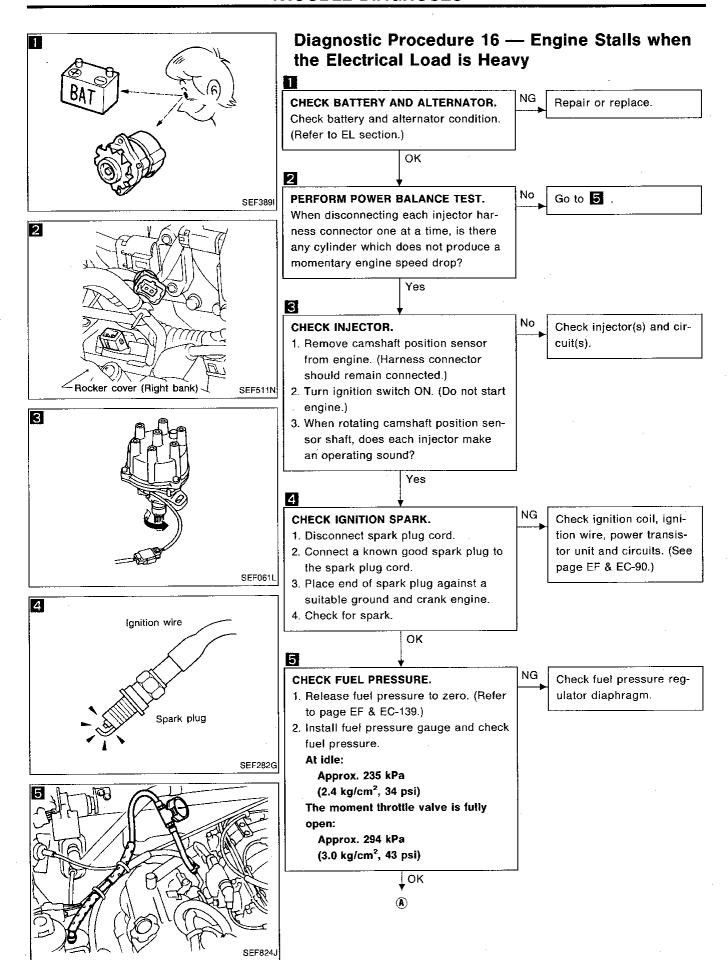
^{*:} ECM may be the cause of a problem, but this is rarely the case.

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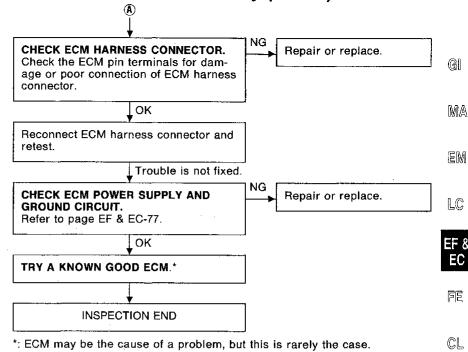
BF

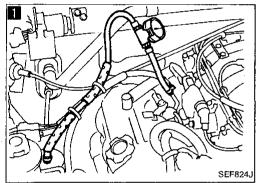
HA

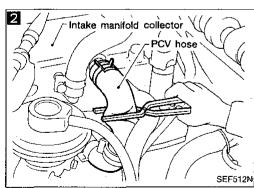
IDX



Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy (Cont'd)

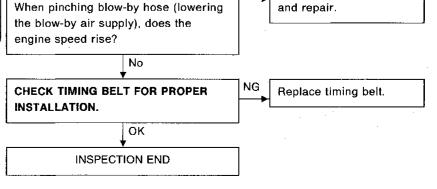






Diagnostic Procedure 17 — Lack of Power and Stumble

CHECK FUEL PRESSURE. Check fuel pressure regulator diaphragm. 1. Release fuel pressure to zero. (Refer to page EF & EC-139.) Install fuel pressure gauge and check fuel pressure. At idle: Approx. 235 kPa (2.4 kg/cm², 34 psi) The moment throttle valve is fully open: Approx. 294 kPa (3.0 kg/cm², 43 psi) OK



Yes

Discover air leak location

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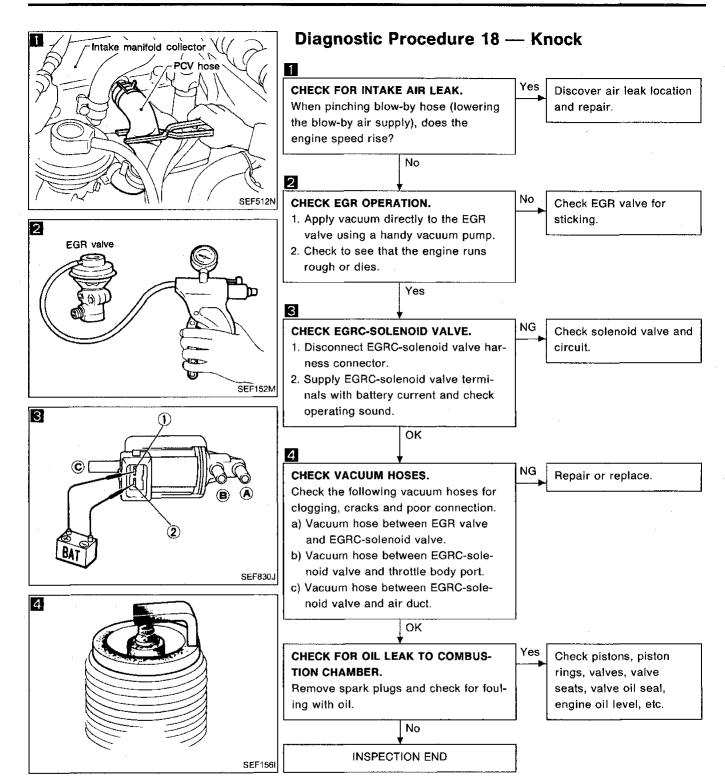
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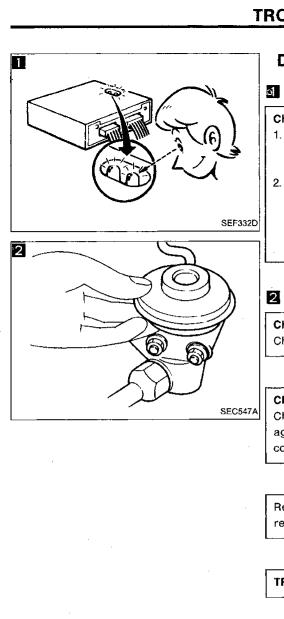
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CHECK FOR INTAKE AIR LEAK.

2





Diagnostic Procedure 19 — Surge

CHECK HEATED OXYGEN SENSOR.

- 1. Set "On-board diagnostic system function" in Diagnostic Test Mode I. (See page EF & EC-36.)
- 2. Maintaining engine at 2,000 rpm under no load, check to see that GREEN LED on the ECM goes ON and OFF more than 5 times during 10 seconds.

NG Replace heated oxygen sensor.

Repair or replace.

MA

EM

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CHECK EGR VALVE.

Check EGR valve for sticking.

OK

οк

CHECK ECM HARNESS CONNECTOR.

Check the ECM pin terminals for damage or poor connection of ECM harness connector.

OK

Reconnect ECM harness connector and retest.

Trouble is not fixed.

INSPECTION END

TRY A KNOWN GOOD ECM.*

ΟK

*: ECM may be the cause of a problem, but this is rarely the case.

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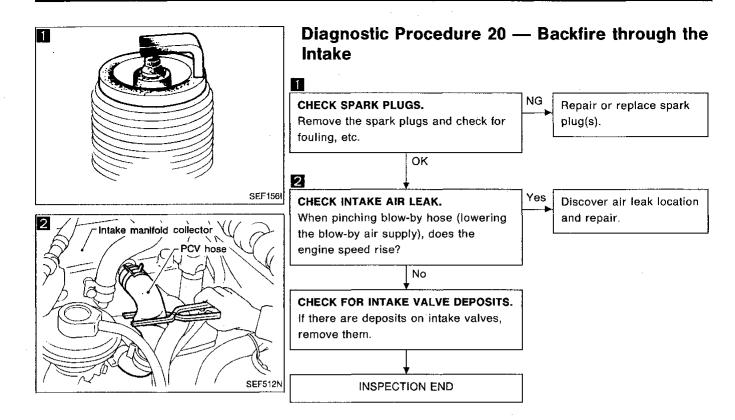
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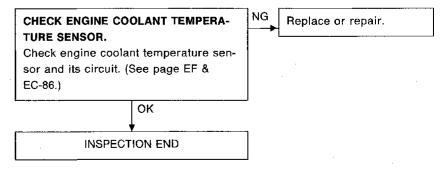
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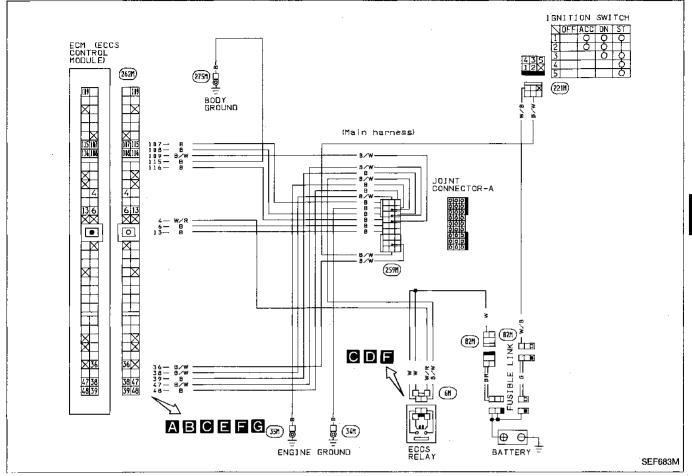


Diagnostic Procedure 21 — Backfire through the Exhaust

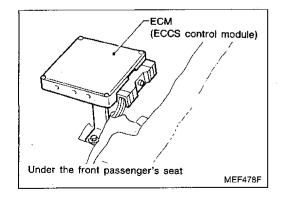


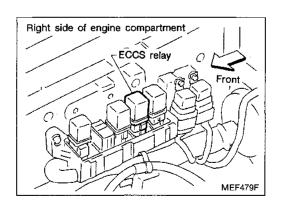
Diagnostic Procedure 22

MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)



Harness layout





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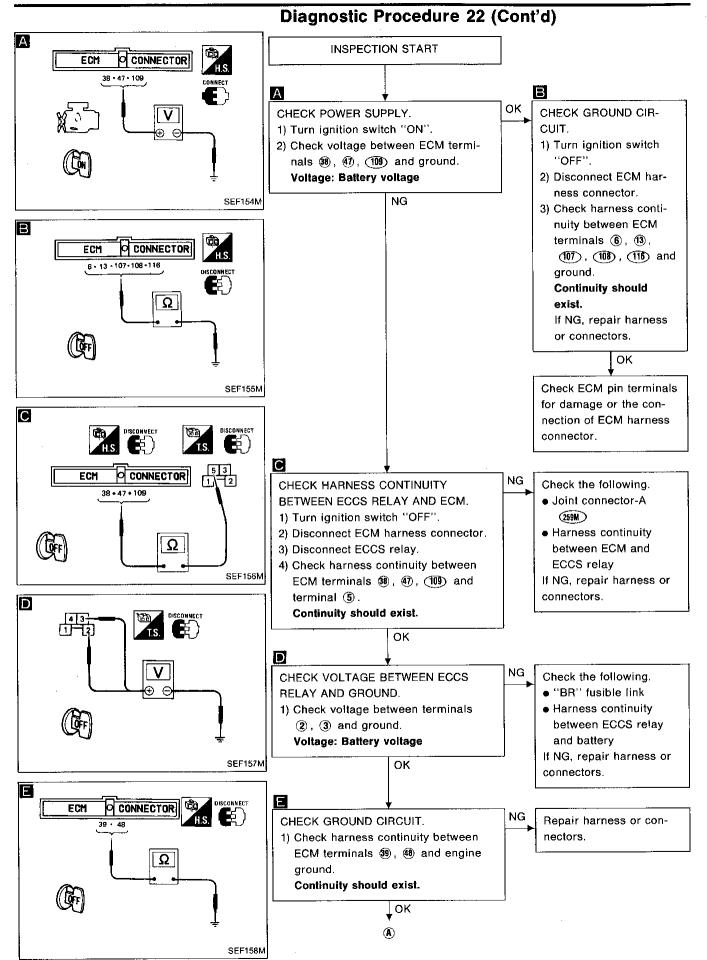
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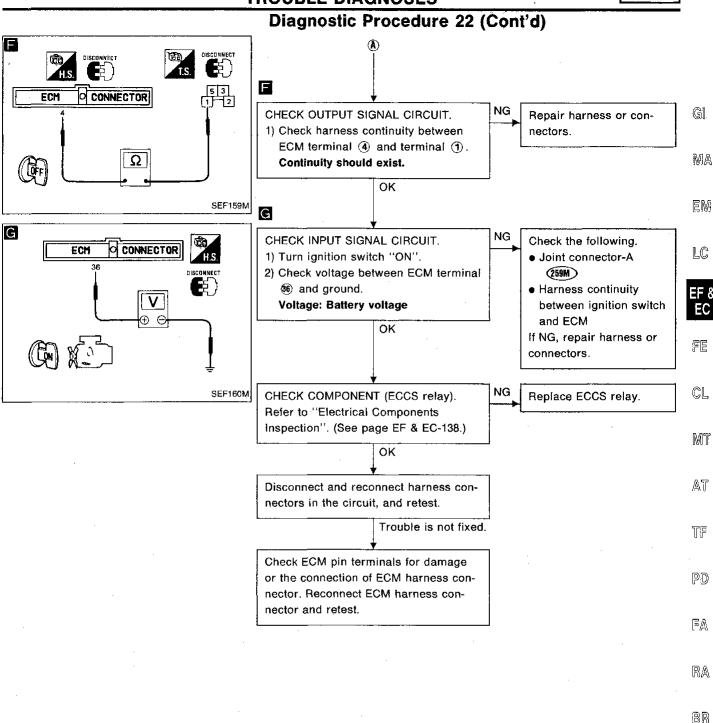
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IDX



EF & EC-78



EF & EC-79

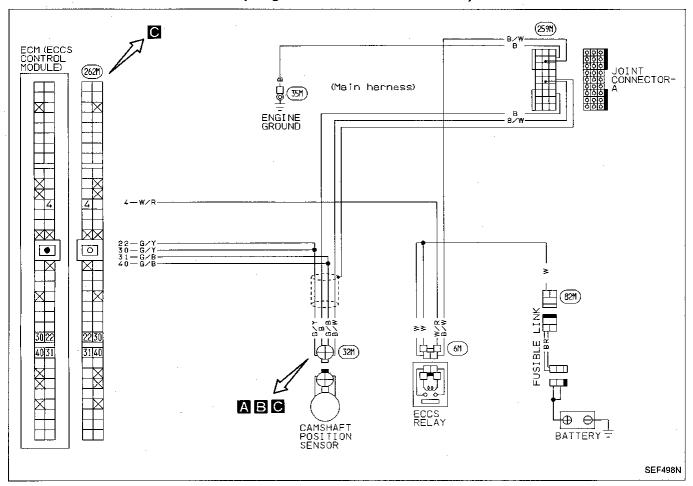
BF

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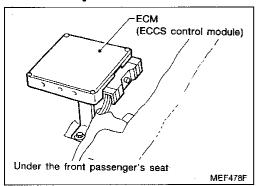
EL

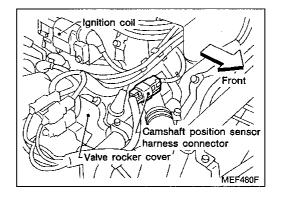
MX

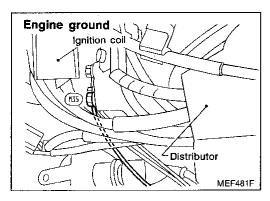
CAMSHAFT POSITION SENSOR (Diagnostic trouble code No. 11)

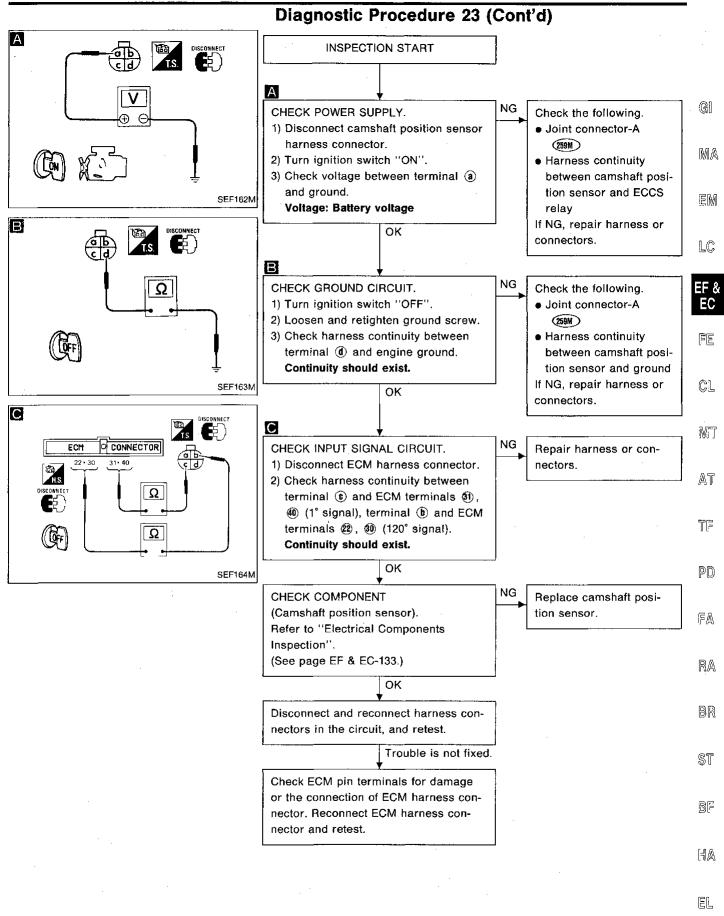


Harness layout



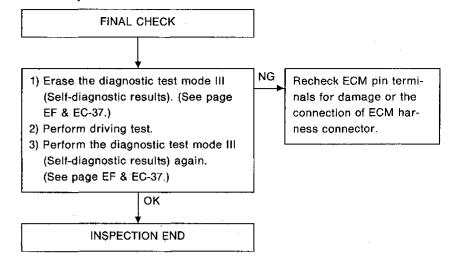




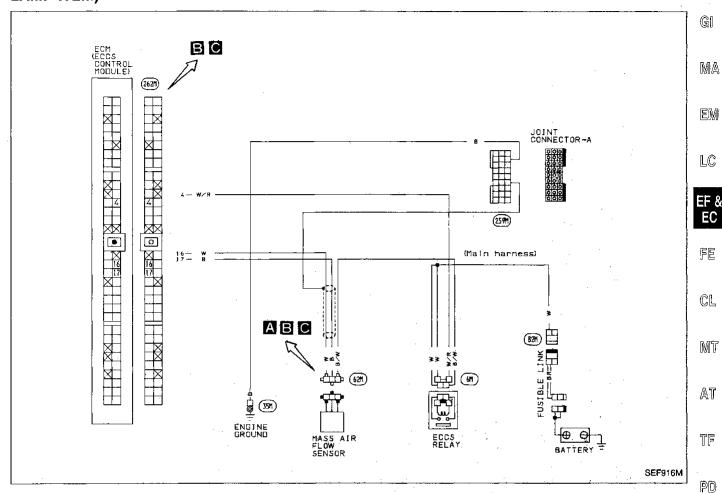


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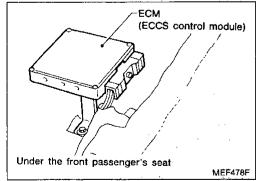
Diagnostic Procedure 23 (Cont'd)

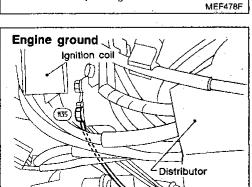


MASS AIR FLOW SENSOR (Diagnostic trouble code No. 12) (CHECK (MALFUNCTION INDICATOR LAMP ITEM)

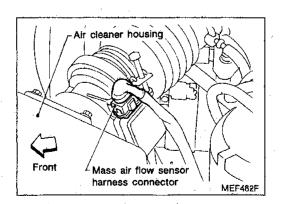


Harness layout





MEF481F



EF & EC-83

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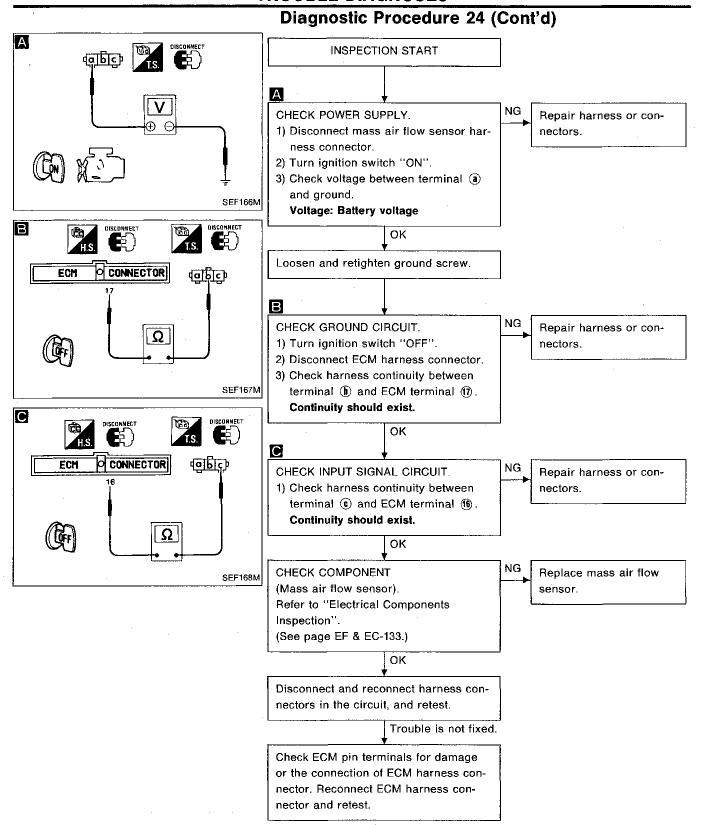
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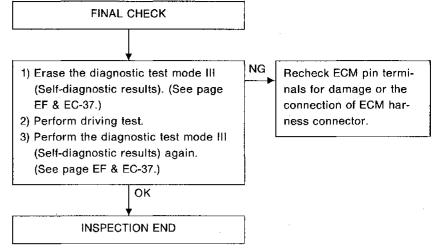
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Diagnostic Procedure 24 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.



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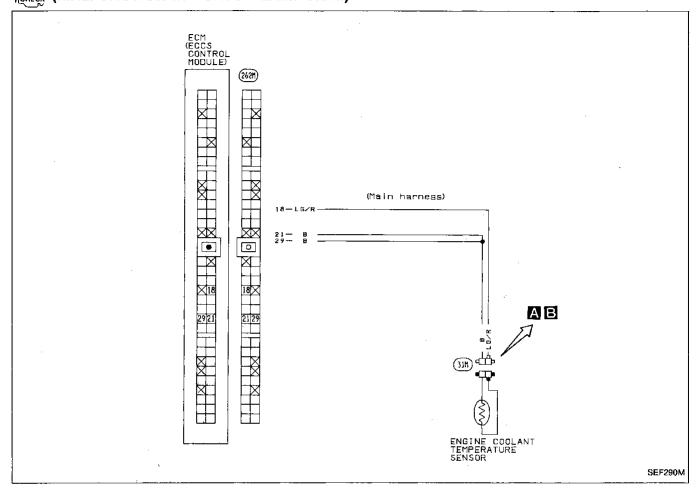
ST

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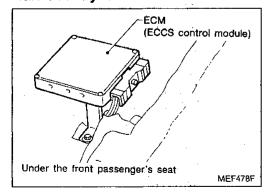
HA

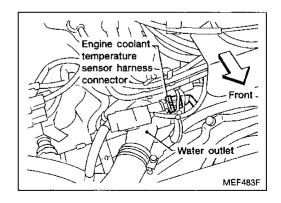
EL

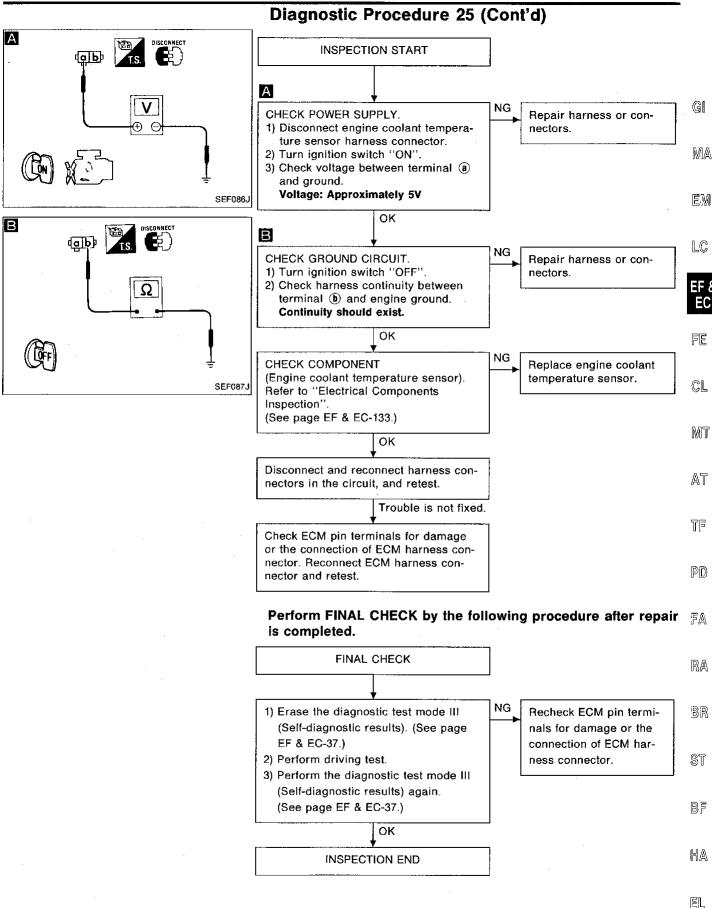
ENGINE COOLANT TEMPERATURE SENSOR (Diagnostic trouble code No. 13)



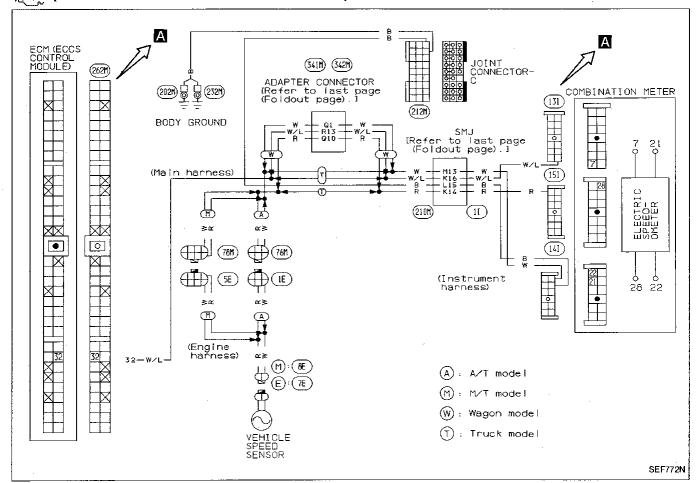
Harness layout



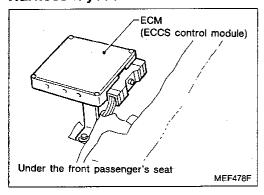




VEHICLE SPEED SENSOR (Diagnostic trouble code No. 14) (Switch ON/OFF diagnostic item)



Harness layout



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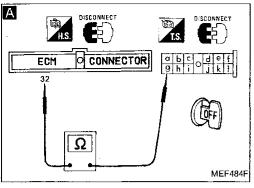
FE

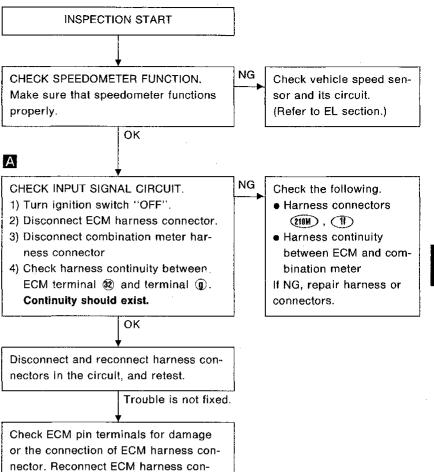
MT

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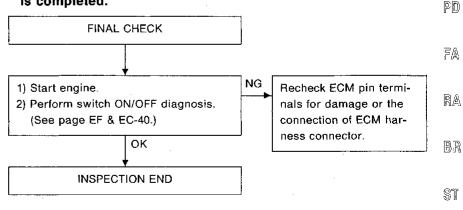
TF

Diagnostic Procedure 26 (Cont'd)





Perform FINAL CHECK by the following procedure after repair is completed.



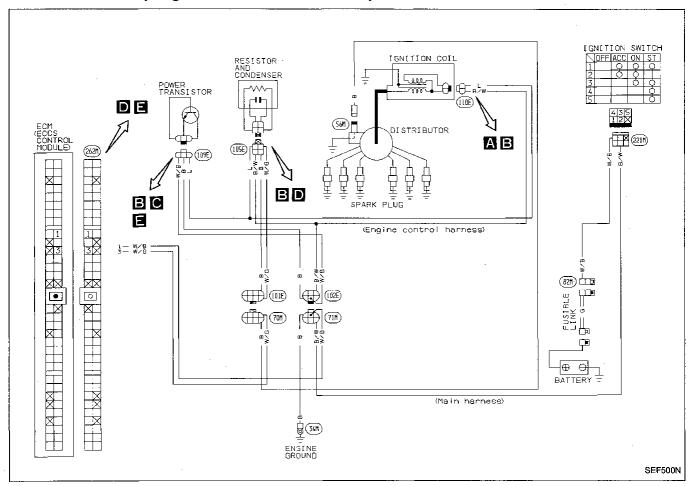
HA

EL

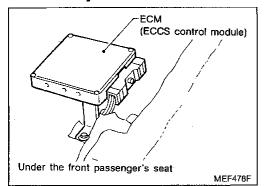
BF

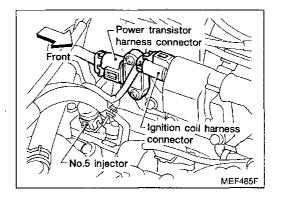
nector and retest.

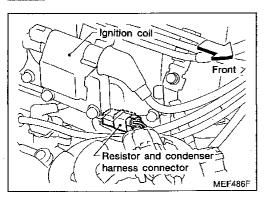
IGNITION SIGNAL (Diagnostic trouble code No. 21)

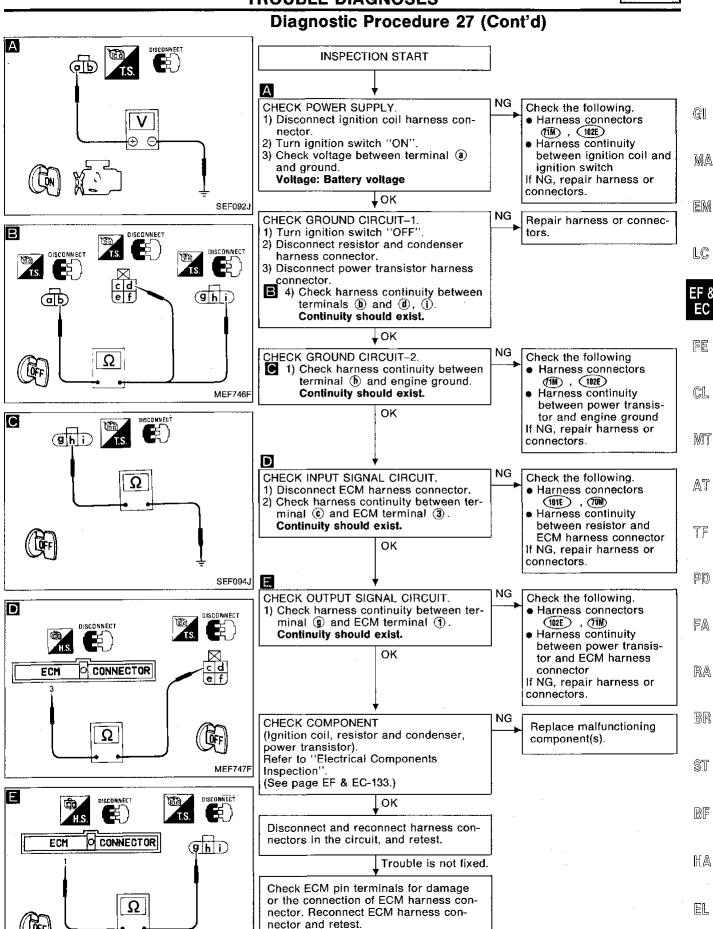


Harness layout





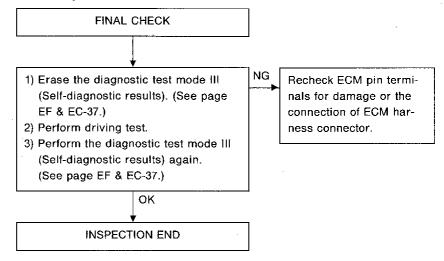




SEF172M

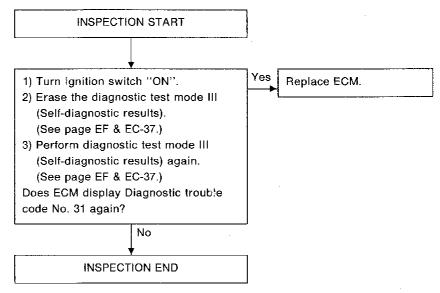
Diagnostic Procedure 27 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.

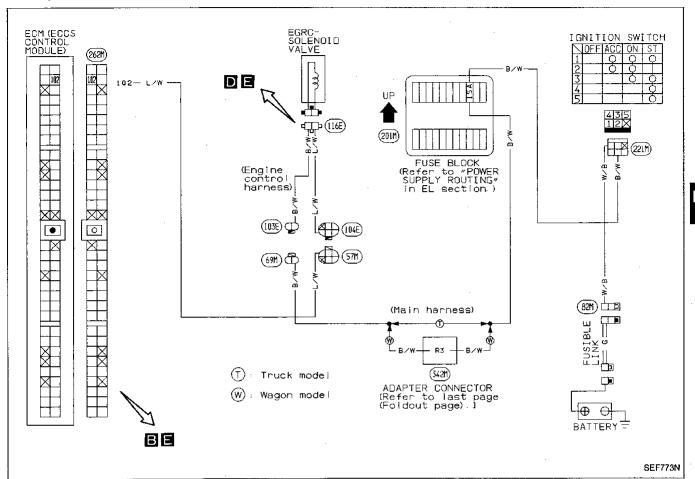


Diagnostic Procedure 28

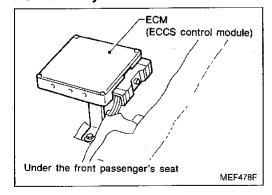
ENGINE CONTROL MODULE (ECM) (Diagnostic trouble code No. 31) (MALFUNCTION INDICATOR LAMP ITEM)

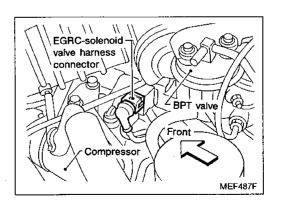


EGR FUNCTION (Diagnostic trouble code No. 32) (MALFUNCTION INDICATOR LAMP ITEM)



Harness layout





Gl

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EM

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EF & EC

FE

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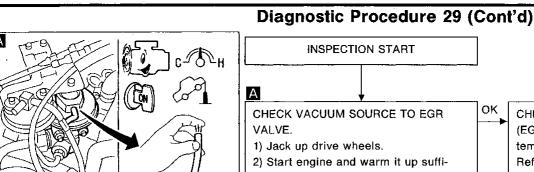
BR

ST

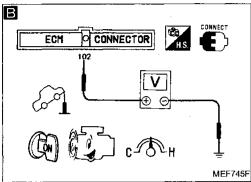
BF

HA

EL

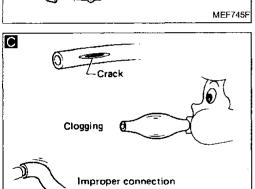


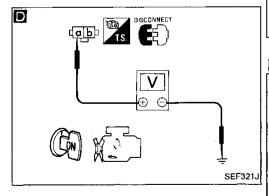
MEF488F



Vacuum hose connected

to EGR valve





- ciently.
- 3) Perform diagnostic test mode III (Self-diagnostic results). Make sure that diagnostic trouble code No. 12 is not displayed. Make sure that both camshaft position sensor and ECM's CPU are not in "fail-safe" state.
- 4) Set shift lever to 1st position.
- 5) Keep engine speed at about 2,000
- 6) Disconnect vacuum hose to EGR valve.
- 7) Make sure that vacuum exists.

Vacuum should exist.

CHECK COMPONENTS (EGR valve and EGR temperature sensor). Refer to "Electrical Components Inspection". (See page EF & EC-135.)

NG

Replace malfunctioning component(s).

В CHECK CONTROL FUNCTION.

1) Check voltage between ECM terminal (102) and ground under the following conditions.

NG

Voltage:

SEF816F

At idle

Approximately 0V Engine speed is about 2,000 rpm

Battery voltage

CHECK POWER SUPPLY.

- 1) Stop engine.
- 2) Disconnect EGRC-solenoid valve harness connector.

NG

- 3) Turn ignition switch "ON".
- 4) Check voltage between terminal (a) and ground.

ОК

Voltage: Battery voltage

С CHECK VACUUM HOSE.

OK

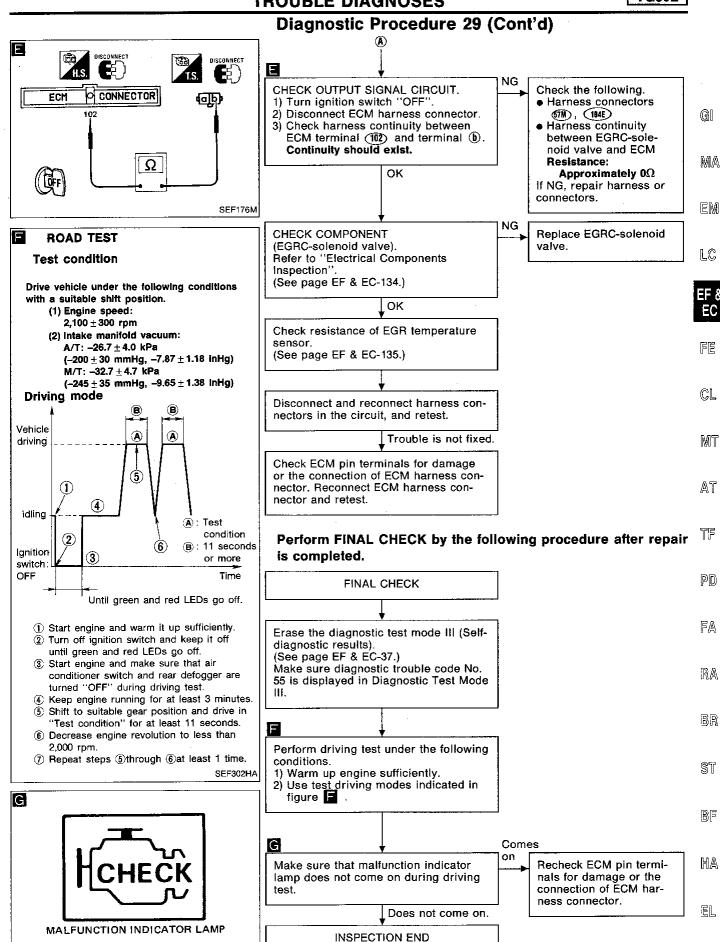
NG

1) Check vacuum hose for clogging, cracks and proper connection.

Check the following.

- Harness connectors €9M , 103E
- "15A" fuse
- Harness continuity between EGRC-solenoid valve and ignition switch

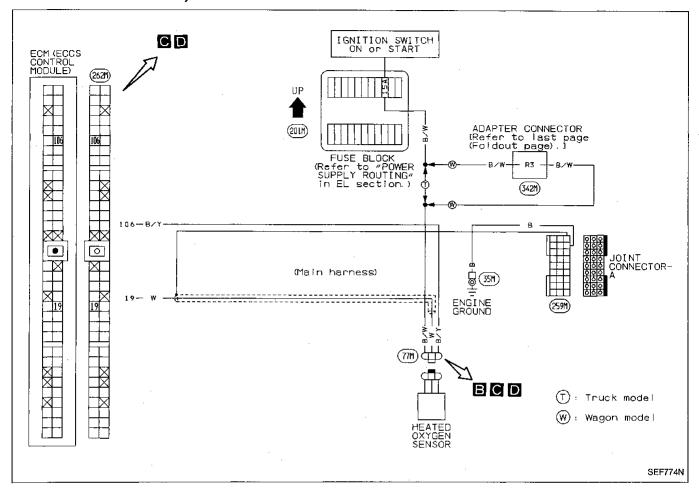
If NG, repair harness or connectors.



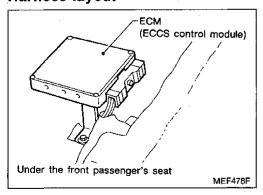
SEF177M

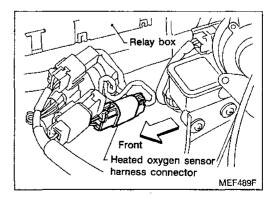
HDX

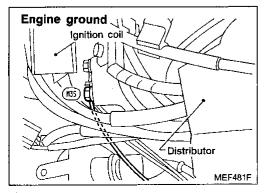
HEATED OXYGEN SENSOR (Diagnostic trouble code No. 33) HELEK (MALFUNCTION INDICATOR LAMP ITEM)

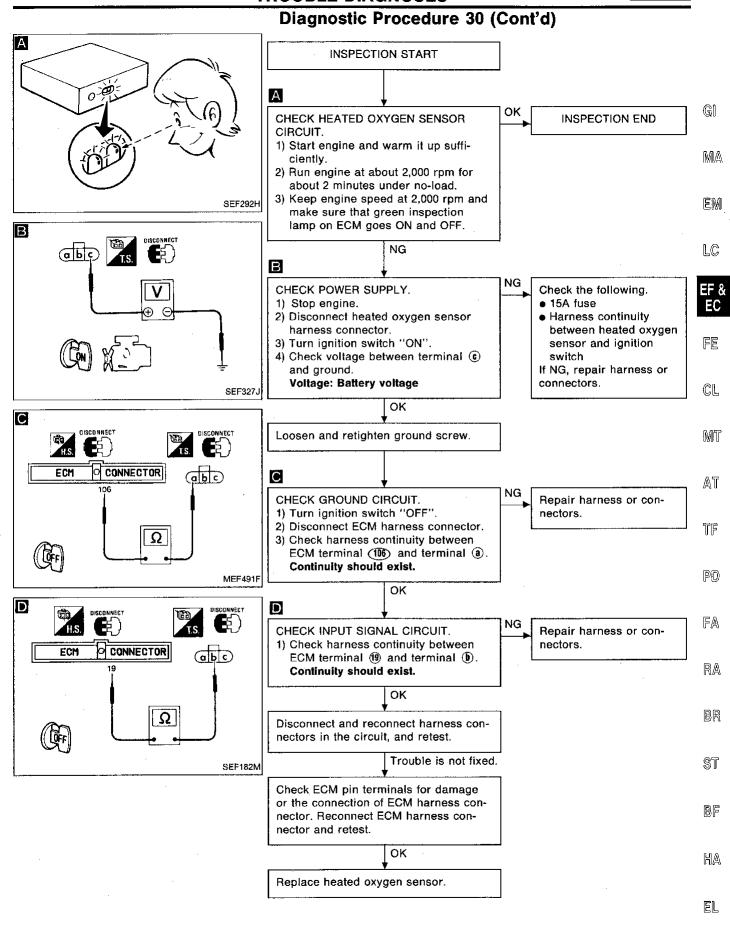


Harness layout

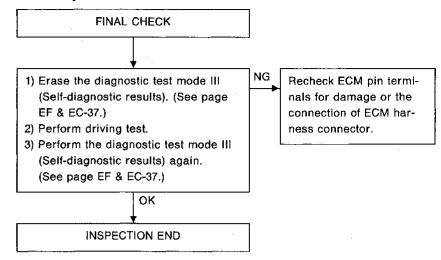








Diagnostic Procedure 30 (Cont'd)



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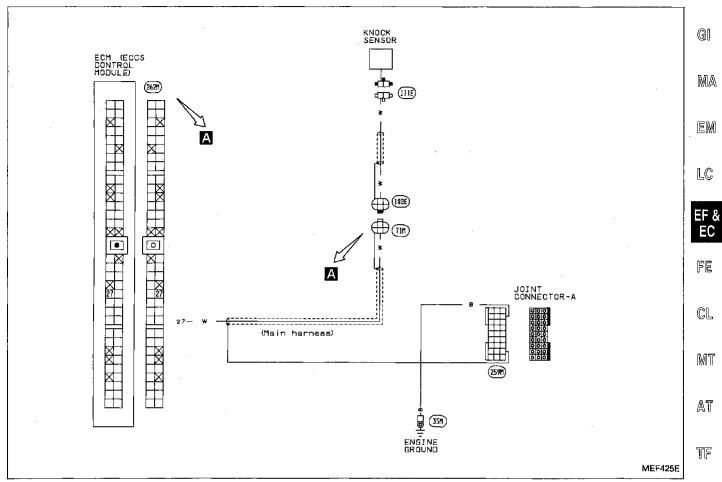
MIT

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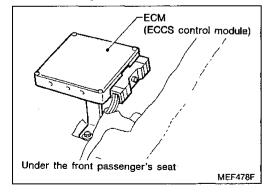
TF

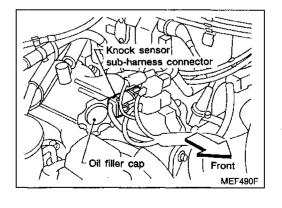
Diagnostic Procedure 31

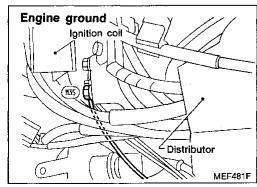
KNOCK SENSOR (Diagnostic trouble code No. 34)



Harness layout







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EF & EC-99

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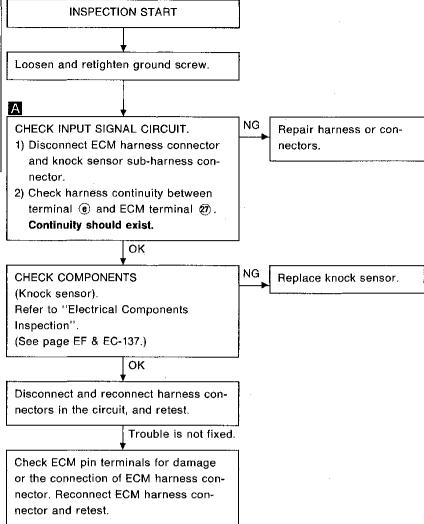
BR

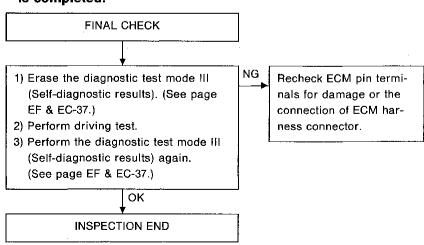
ST

BF

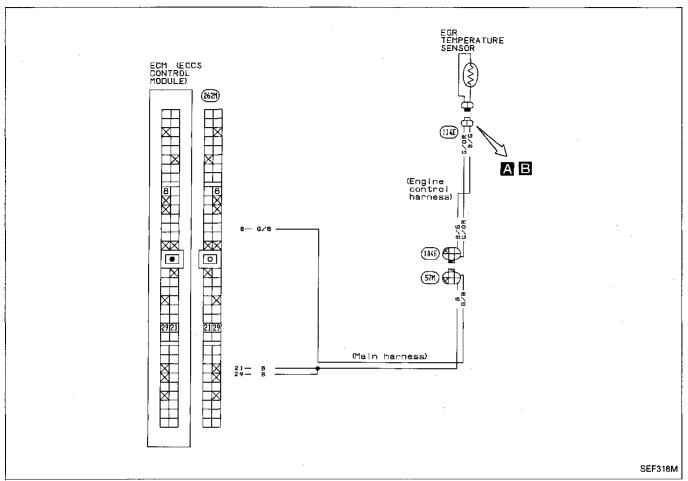
ECM CONNECTOR G b c 27 SEF184M

Diagnostic Procedure 31 (Cont'd)

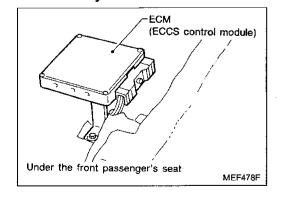


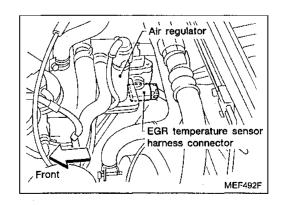


EGR TEMPERATURE SENSOR (Diagnostic trouble code No. 35) (MALFUNCTION INDICATOR LAMP ITEM)



Harness layout





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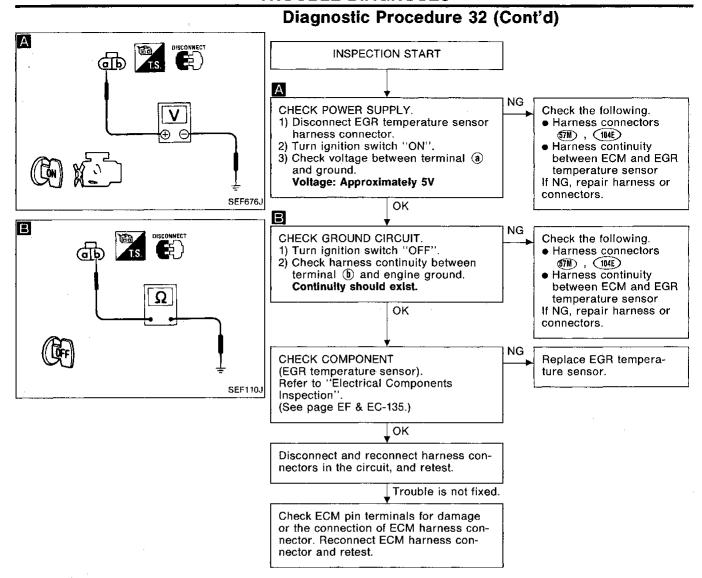
BF

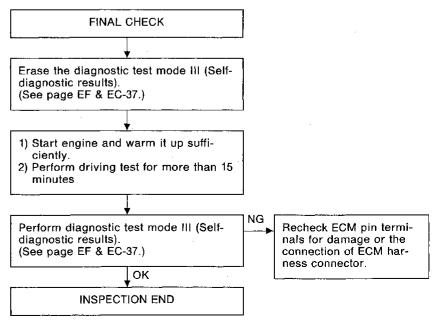
HA

EL

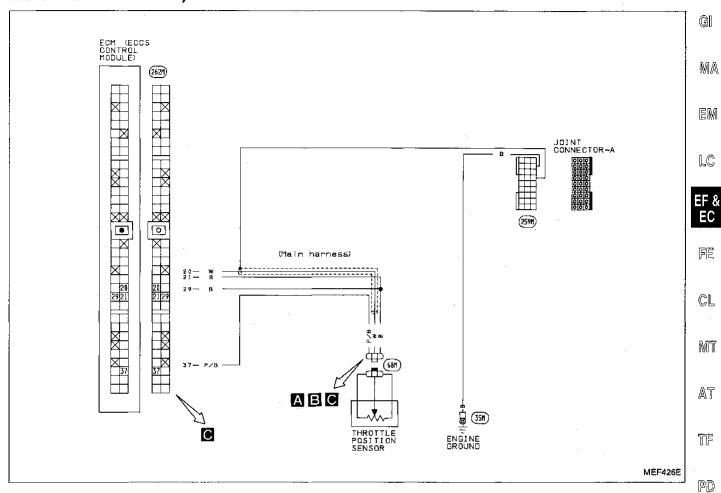
n => 1\v7

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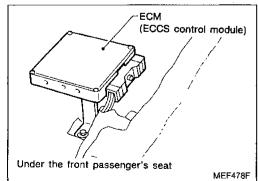


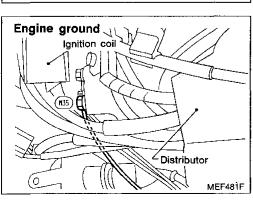


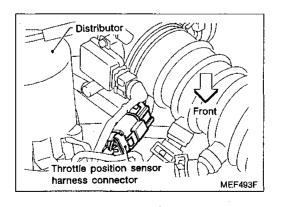
THROTTLE POSITION SENSOR (Diagnostic trouble code No. 43) (MALFUNCTION INDICATOR LAMP ITEM)



Harness layout







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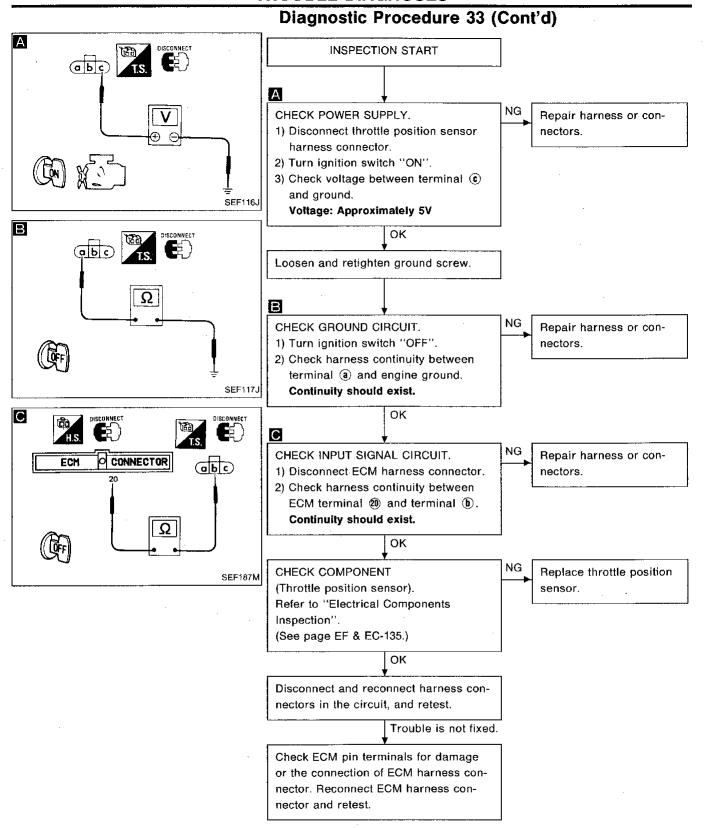
RA

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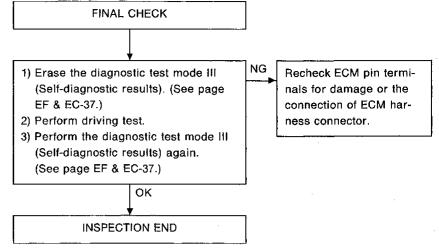
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Diagnostic Procedure 33 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.



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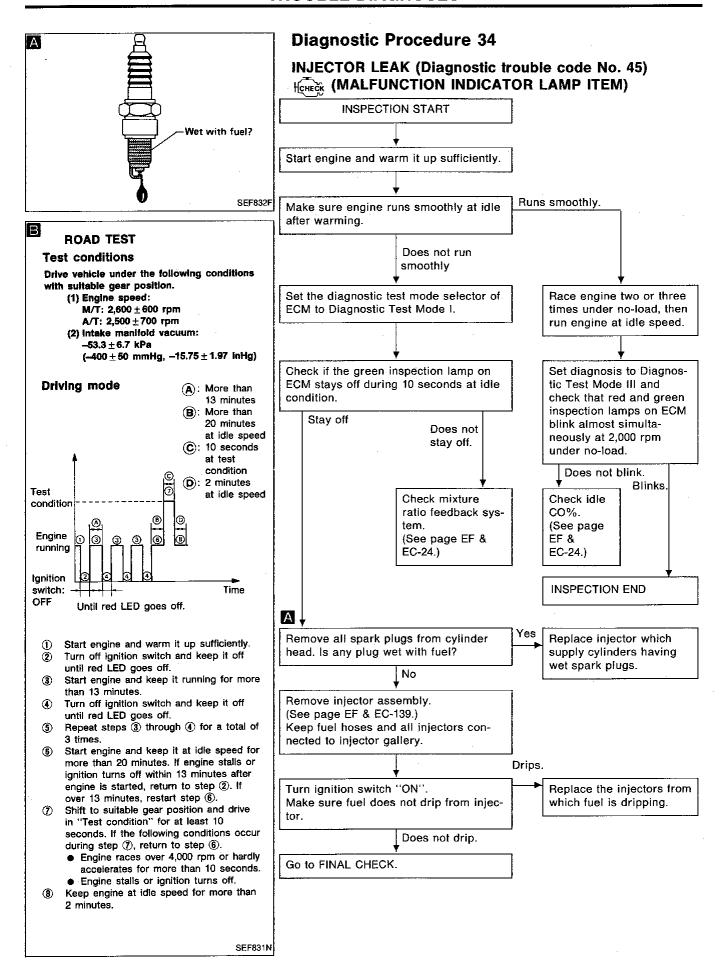
BR

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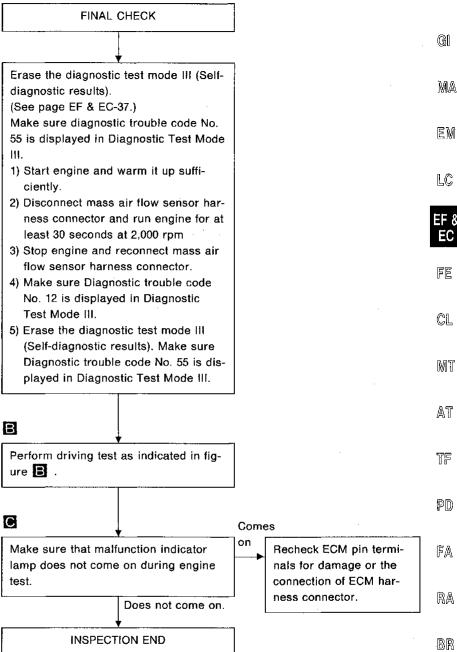
EL



С MALFUNCTION INDICATOR LAMP SEF177M

Diagnostic Procedure 34 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.



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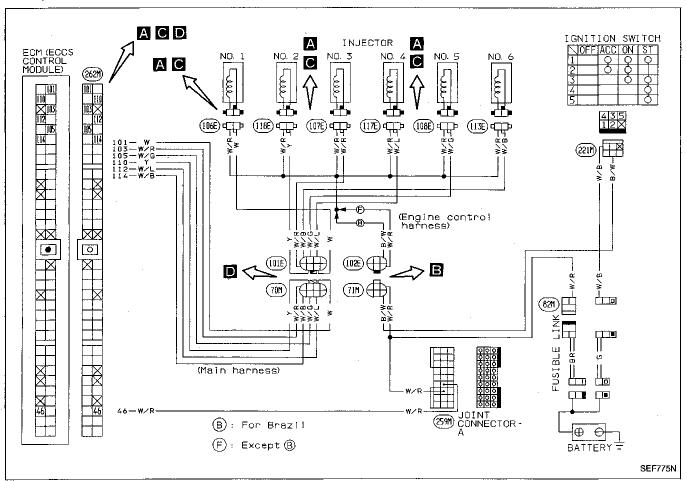
BF

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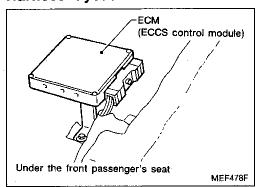
EL

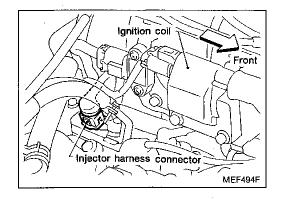
MX

INJECTOR CIRCUIT (Diagnostic trouble code No. 51) (MALFUNCTION INDICATOR LAMP ITEM)



Harness layout





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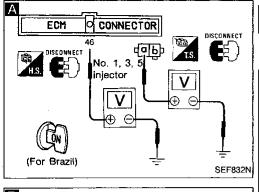
ST

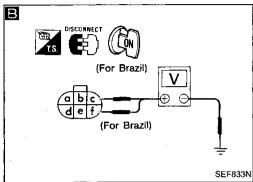
BF

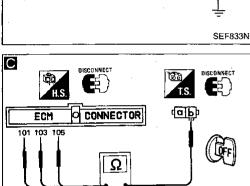
HA

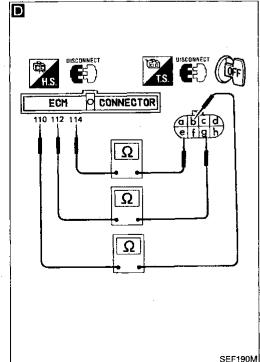
Diagnostic Procedure 35 (Cont'd)

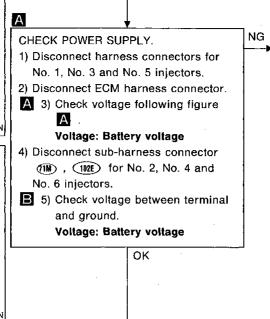
INSPECTION START











CHECK OUTPUT SIGNAL CIRCUIT.

and No. 5 injectors.

No. 6 injectors.

SEF189M

ing figure D

Continuity should exist.

2) Disconnect sub-harness connectors

(10M), (181E) for No. 2, No. 4 and

3) Check harness continuity follow-

Continuity should exist.

1) Check harness continuity follow-

ing figure (F) for No. 1, No. 3

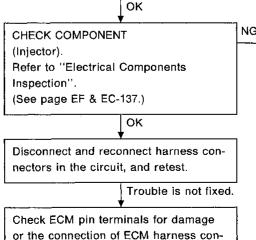
Check the following. Joint connector-A (259M) Harness connectors (1M) , (102E) • "BR" fusible link Harness continuity between battery and injector Harness continuity between battery and **ECM** Harness continuity between ignition switch and injector (For Brazil) If NG, repair harness or connectors. NG

Check the following.

Harness connectors

Harness continuity
between injector and
ECM
If NG, repair harness or connectors.

Replace injector.



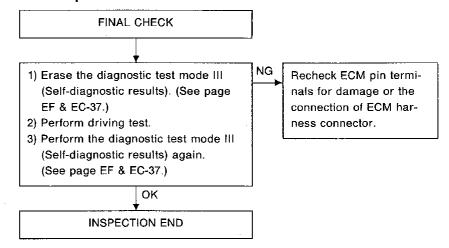
nector. Reconnect ECM harness con-

EL

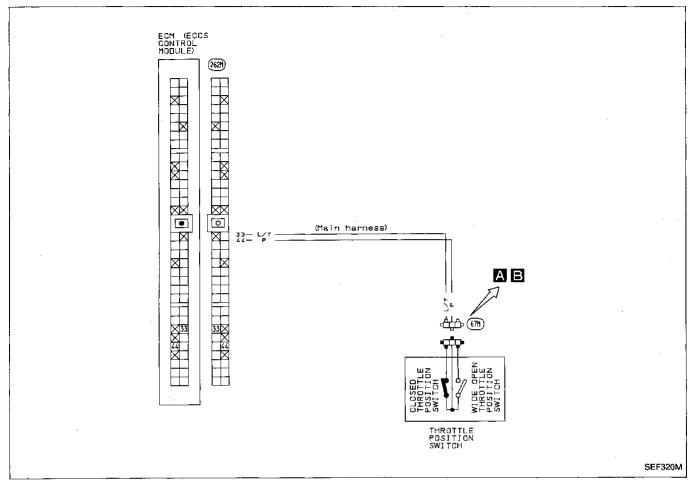
ĮDX

nector and retest.

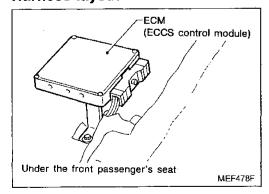
Diagnostic Procedure 35 (Cont'd)

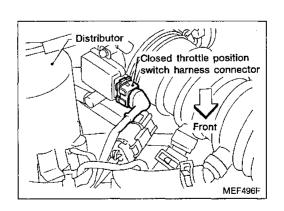


CLOSED THROTTLE POSITION SWITCH (Switch ON/OFF diagnostic item)



Harness layout





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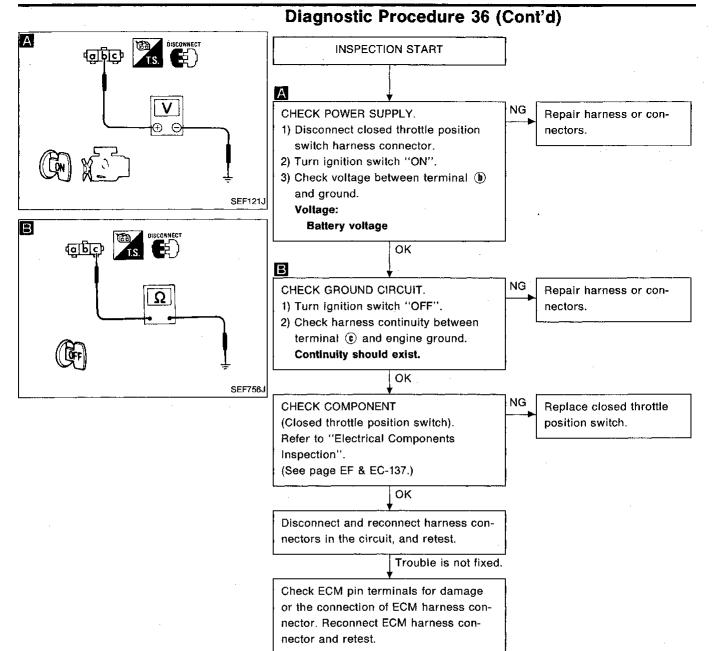
BR

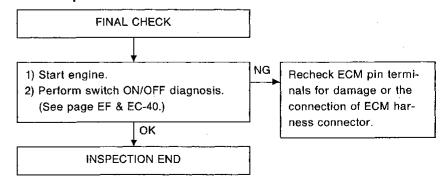
ST

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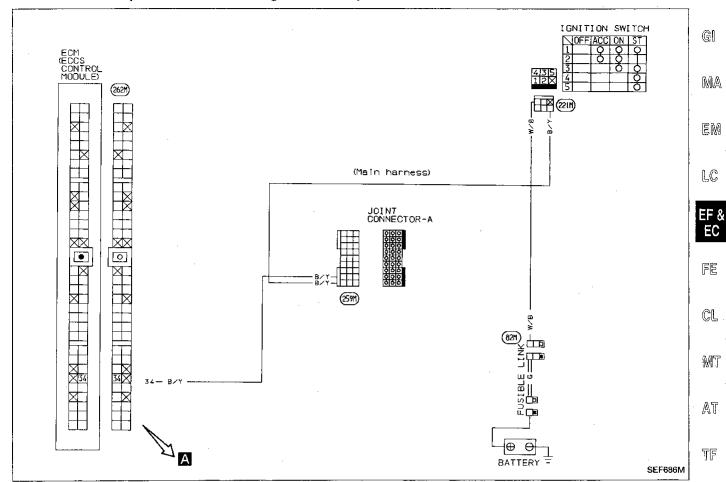
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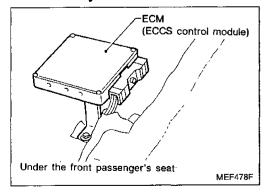




START SIGNAL (Switch ON/OFF diagnostic item)



Harness layout



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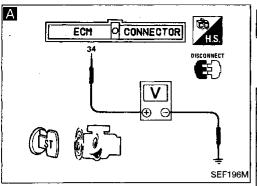
BF

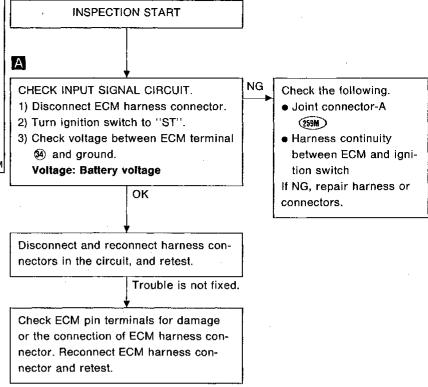
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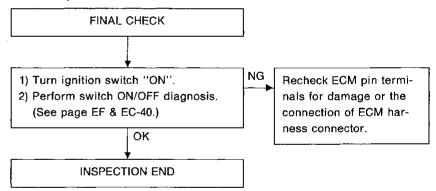
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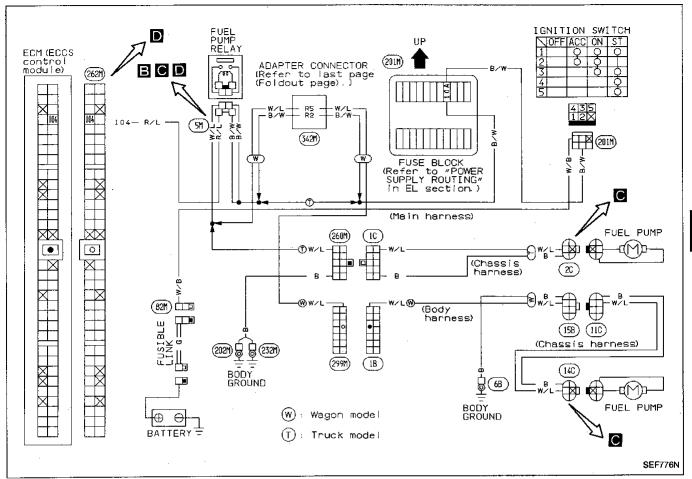
Diagnostic Procedure 37 (Cont'd)



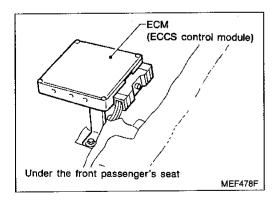


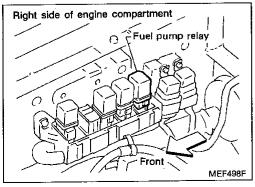


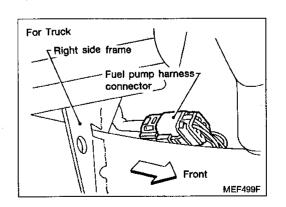
FUEL PUMP (Not self-diagnostic item)

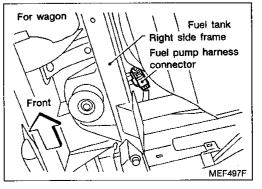


Harness layout









EF & EC-115

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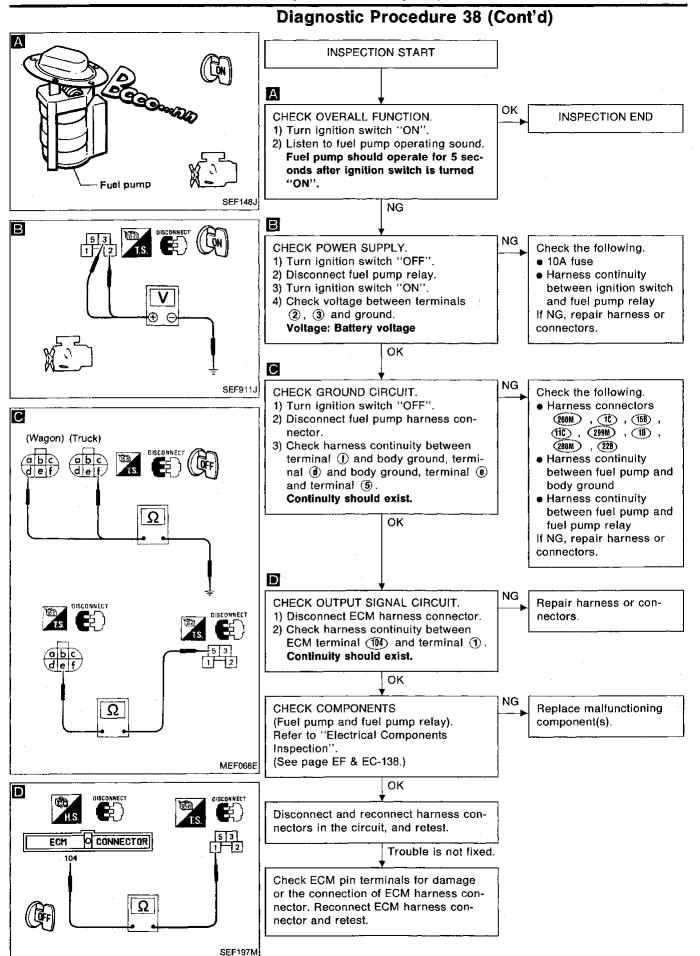
BR

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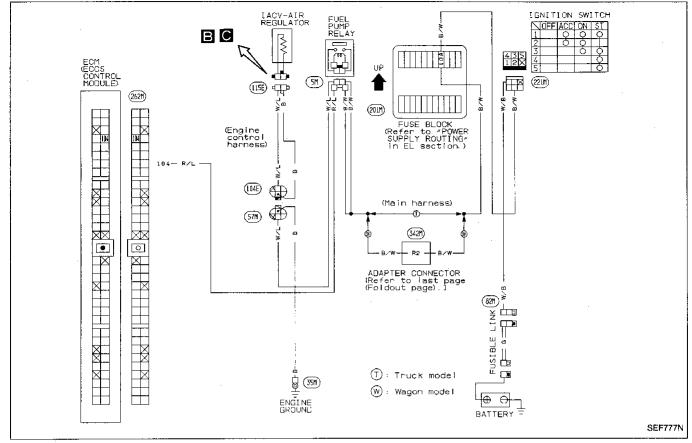
BF

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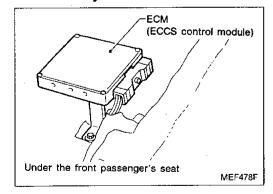
EL

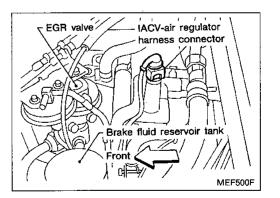


IACV-AIR REGULATOR (Not self-diagnostic item)



Harness layout





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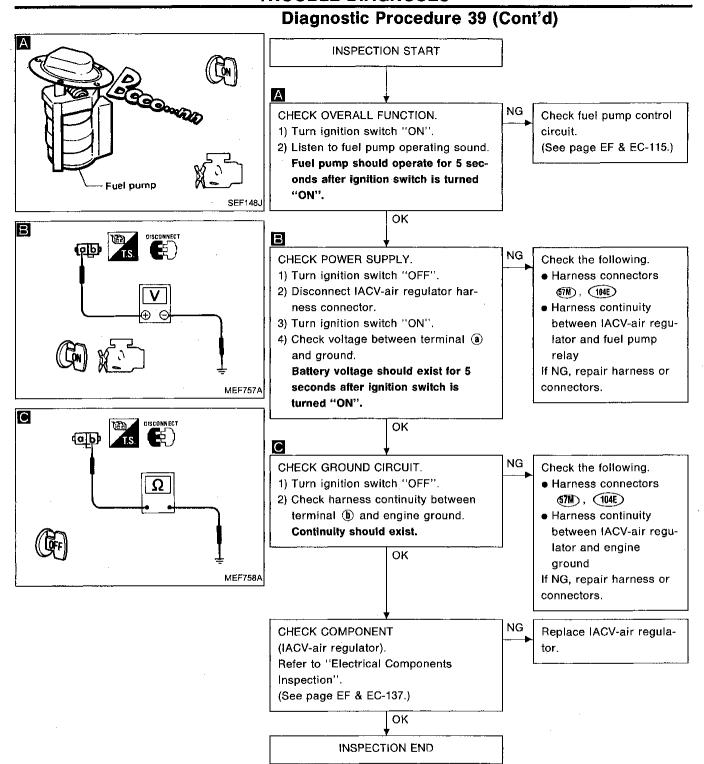
BR

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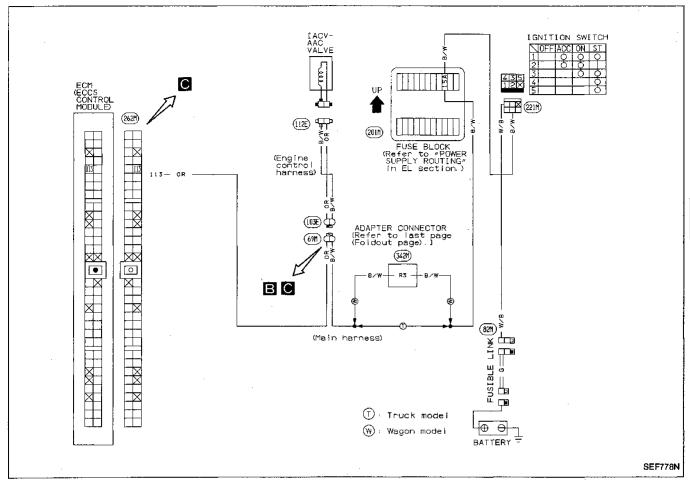
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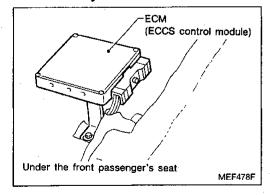
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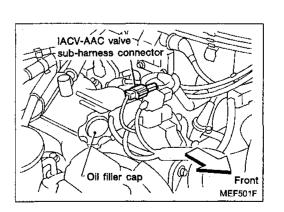


IACV-AAC VALVE (Not self-diagnostic item)



Harness layout





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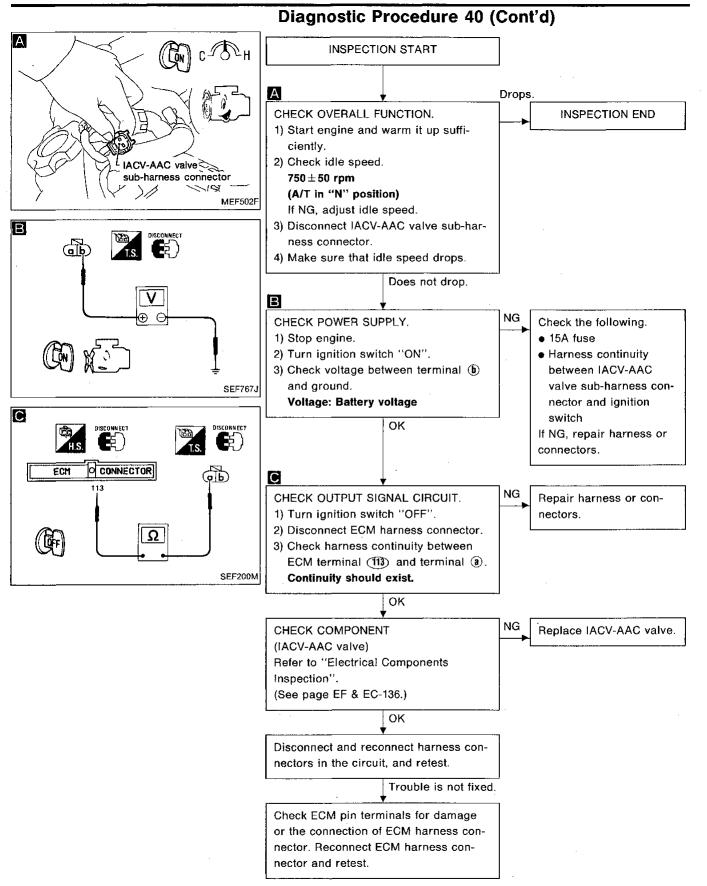
BR

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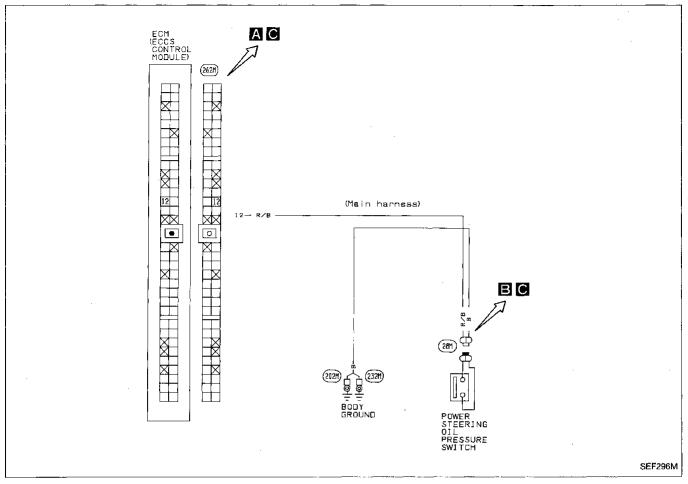
BF

HA

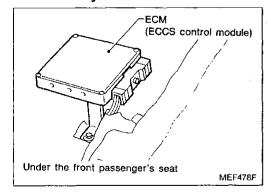
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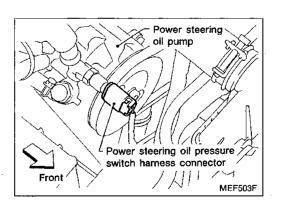


POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)



Harness layout





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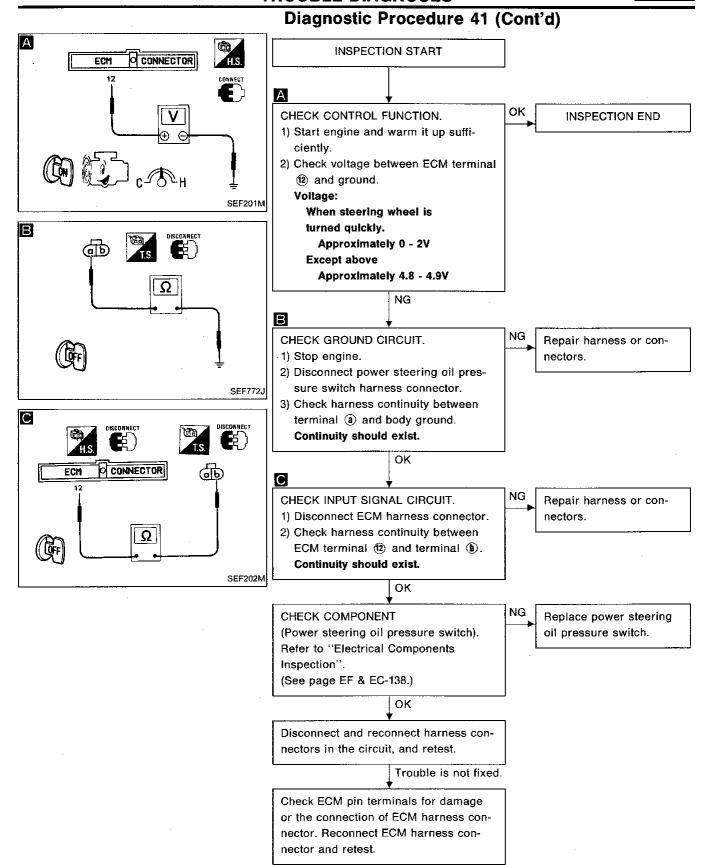
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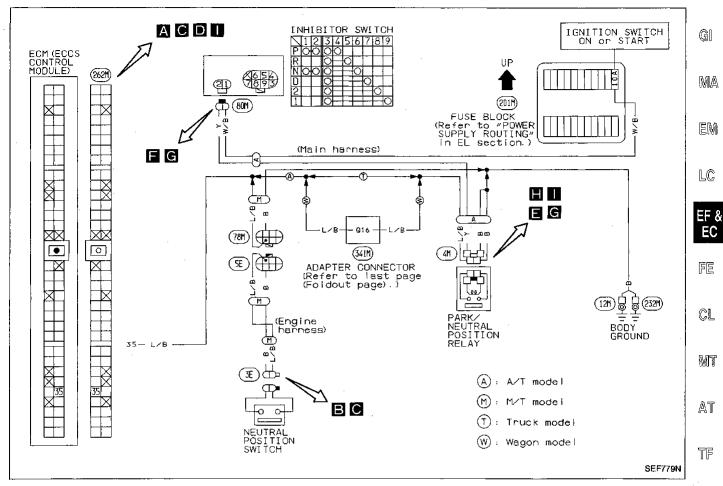
HA

EL

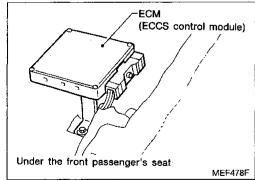
1DX

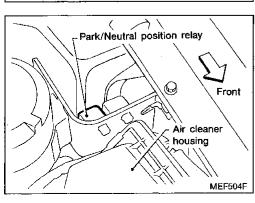
Diagnostic Procedure 42

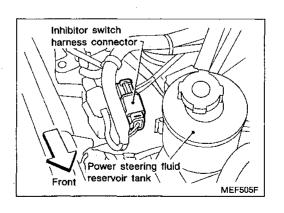
NEUTRAL POSITION/INHIBITOR SWITCH (Not self-diagnostic item)



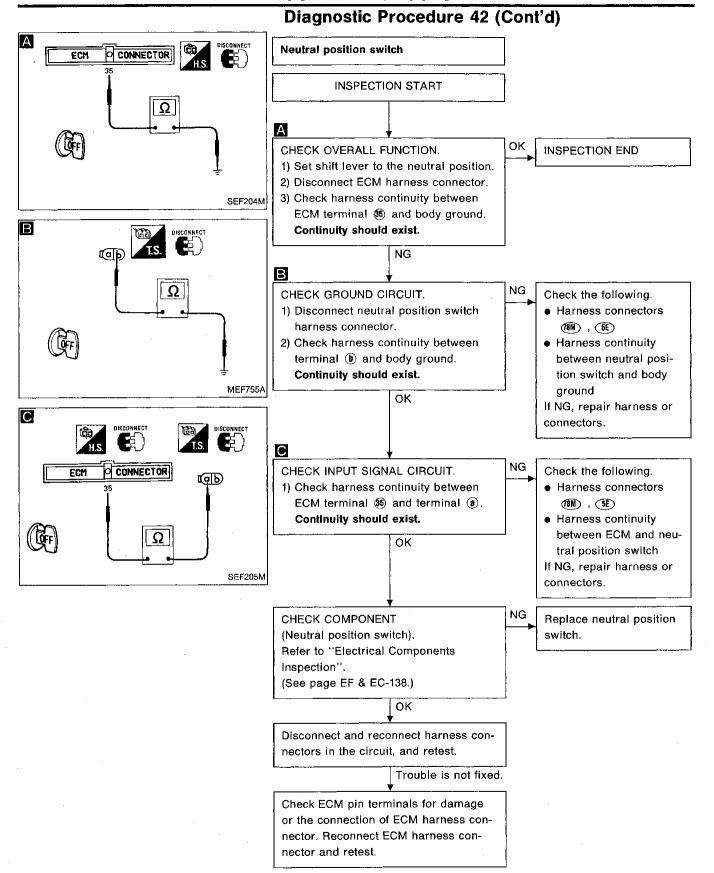
Harness layout





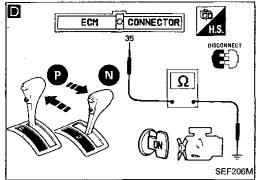


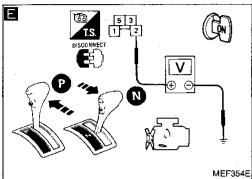
EF & EC-123

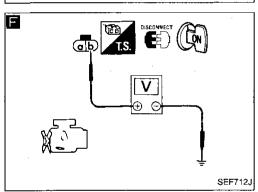


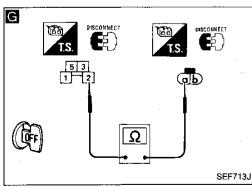
Inhibitor switch

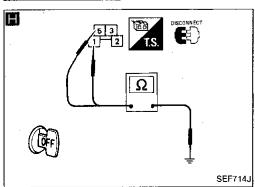
Diagnostic Procedure 42 (Cont'd)

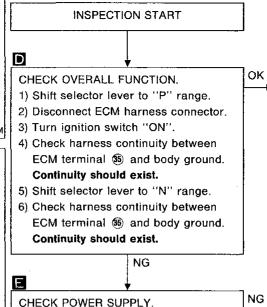












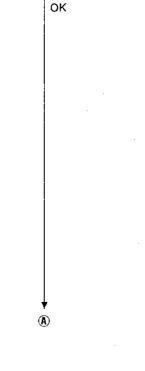
CHECK POWER SUPPLY.

- 1) Turn ignition switch "OFF".
- 2) Disconnect Park/Neutral position
- 3) Make sure that selector lever is in "N" range.
- 4) Turn ignition switch "ON".
- 5) Check voltage between terminal (2) and ground.

Voltage: Battery voltage

- 6) Shift selector lever into "P" range.
- 7) Check voltage between terminal (2) and ground.

Voltage: Battery voltage



INSPECTION END

Check the following. E CHECK HARNESS CONTINUITY BETWEEN INHIBITOR SWITCH AND BATTERY.

1) Turn ignition switch "OFF".

- 2) Disconnect inhibitor switch harness connector.
- 3) Turn ignition switch "ON".
- 4) Check voltage between terminal (b) and ground.

Voltage: Battery volt-

If NG, check the following.

- 10A fuse
- Harness continuity between fuse and inhibitor switch

If NG, repair harness or connectors.

- G CHECK HARNESS CONTINUITY BETWEEN INHIBITOR SWITCH AND PARK/NEUTRAL POSI-TION RELAY.
- 1) Turn ignition switch "OFF".
- 2) Check harness continuity between terminal (a) and terminal (2). Continuity should exist.

If NG, repair harness or connectors. CHECK COMPONENT (Inhibitor switch). Refer to "Electrical Com-

ponents Inspection". (See page EF & EC-138.) MA

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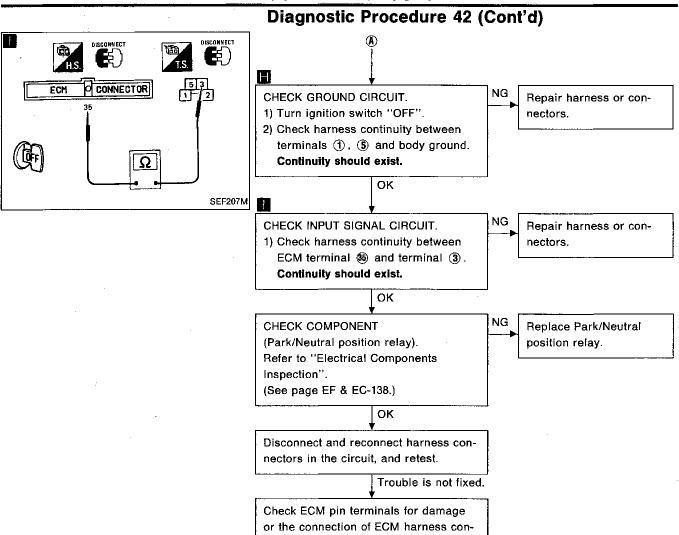
BR

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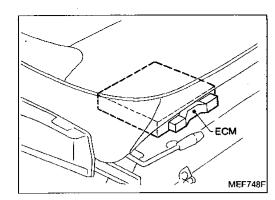
HA

EL



nector. Reconnect ECM harness con-

nector and retest.



Electrical Components Inspection ECM INPUT/OUTPUT SIGNAL INSPECTION

ECM is located under the passenger seat. For this inspection, remove passenger seat.

GI

MA

EM

2. Remove ECM harness protector.

LC

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CL

Perform all voltage measurements with the connectors connected.

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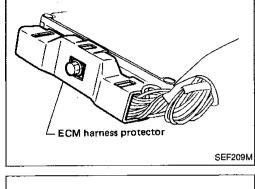
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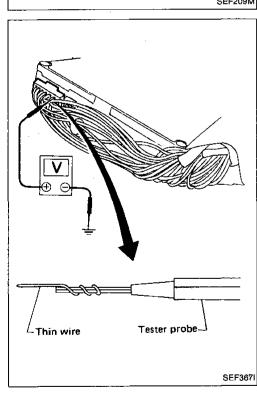
BF

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IDX





Improve tester probe as shown to perform tests easily.

Electrical Components Inspection (Cont'd)

ECM Inspection table

*Data are reference values.

			Data are reference values.
TERMI- NAL NO.	ITEM	CONDITION	*DATA
1	lanition signal	Engine is running. Idle speed	0.5 - 0.6V
1	Ignition signal	Engine is running. Engine speed is 2,000 rpm.	1.2 - 1.3V
		Engine is running. Idle speed	Approximately 1.0V
2	Tachometer	Engine is running. Engine speed is 2,000 rpm.	2.7 - 2.9V
3	Ignition check	Engine is running. Luldle speed	9 - 12V
		Engine is running. Lidle speed	0 - 1V
4	ECM power source (Self-shutoff)	Engine is not running. For a few seconds after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
		Engine is running. Idle speed	1.0 - 2.0V
8	EGR temperature sensor	Engine is running. (Racing) After warming up	0 - 1.0V
11	Air conditioner relay	Engine is running. Both A/C switch and blower switch are "ON".	0 - 1.0V
	·	Engine is running. A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
	Power steering oil pressure	Engine is running. Steering wheel is being turned.	0 - 2.0V
12	switch	Engine is running. Steering wheel is not being turned.	4.8 - 4.9V

Electrical Components Inspection (Cont'd)

*Data are reference values.

			"Data are reference values.
TERMI- NAL NO.	ITEM	CONDITION	*DATA
16	Mass air flow sensor	Engine is running.	1.0 - 3.0V Output voltage varies with engine speed.
18	Engine coolant temperature sensor	Engine is running.	1.0 - 3.0V Output voltage varies with engine water temperature.
19	Heated oxygen sensor	Engine is running. After warming up sufficiently.	0 - Approximately 1.0V
20	Throttle position sensor	Ignition switch "ON"	0.4 - Approximately 4V Output voltage varies with the throttle valve opening angle.
22 30	Camshaft position sensor (Reference signal)	Engine is running. Do not run engine at high speed under no-load.	0.2 - 0.5V
27	Knock sensor	Engine is running. Idle speed	Approximately 2.5V
28	Throttle opening signal	Ignition switch "ON"	0.3 - Approximately 3V
31 40	Camshaft position sensor (Position signal)	Engine is running. Do not run engine at high speed under no-load.	2.0 - 3.0V
<u> </u>	Closed throttle position switch	Ignition switch "ON" Throttle valve: Idle position	Approximately 8 - 10V
33	(⊝ side)	Ignition switch "ON" Throttle valve: Any position except idle position	ov
34	Start signal	Cranking	8 - 12V
35	Neutral position switch & Inhib-	Ignition switch "ON" Neutral position/Parking	ov
	itor switch	Ignition switch "ON" Except the above gear position	6 - 7V

EL

 $\mathbb{D}\mathbb{X}$

Electrical Components Inspection (Cont'd)

'Data are reference values

			*Data are reference values.
TERMI- NAL NO.	ITEM	CONDITION	*DATA
36	Ignition switch	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
37	Throttle position sensor power supply	Ignition switch "ON"	Approximately 5V
38 47	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE
41	Air conditioner switch	Engine is running. Both air conditioner switch and blower switch are "ON".	0V
		Engine is running. Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
		Ignition switch "ON" Throttle valve: Idle position	Approximately 9 - 10V
44	Closed throttle position switch (⊕ side)	Ignition switch "ON" Throttle valve: Except idle position	BATTERY VOLTAGE (11 - 14V)
46	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
101	Injector No. 1		
103	Injector No. 3		·
105	Injector No. 5	Engine is rupping	BATTERY VOLTAGE
110	Injector No. 2	Engine is running.	(11 - 14V)
112	Injector No. 4		
114	Injector No. 6		

Electrical Components Inspection (Cont'd)

*Data are reference values.

			Data are reference values.	
, TERMI- NAL NO.	ITEM	CONDITION	*DATA	
		Engine is running. (Warm-up condition) Idle speed (Jack up drive wheels and set shift lever to 1st position.)	0.7 - 0.9V	GI MA
102	EGRC-solenoid valve	Engine is running. (Warm-up condition) Engine speed is 2,000 rpm. (Jack up drive wheels and set shift lever to 1st position.)	BATTERY VOLTAGE (11 - 14V)	em LC
		Engine is running. (Warm-up condition) Engine speed is above 3,100 rpm. (A/T model) Engine speed is above 2,600 rpm. (M/T model) (Jack up drive wheels and set shift lever to 1st position.)	0.8 - 0.9V	EF & EC
104	Fuel pump relay	Ignition switch "ON" For 5 seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V	MT AT
		Ignition switch "ON" Within 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)	TF
		Engine is running. Engine speed is below 4,200 rpm.	Approximately 0V	PD
106	Heated oxygen sensor heater	Engine is running. Engine speed is above 4,200 rpm.	BATTERY VOLTAGE (11 - 14V)	FA RA
		Engine is running. Idle speed	7 - 10V	ria Br
113	IACV-AAC valve	Engine is running. Steering wheel is being turned. Air conditioner is operating. Rear defogger is "ON". Headlamps are in high position.	4 - 7V	ST BF

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Electrical Components Inspection (Cont'd)

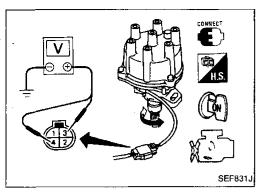
ECM HARNESS CONNECTOR TERMINAL LAYOUT

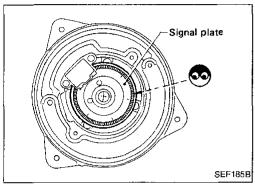
| 101|102|103|104|105|106|107|108 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 6 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 109|110|111|12|13|14 | 18 | 9 | 10 | 11 | 12 | 13 | 14 | 25 | 26 | 27 | 28 | 29 | 30 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |

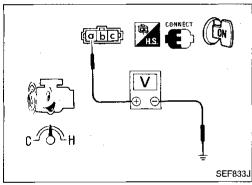


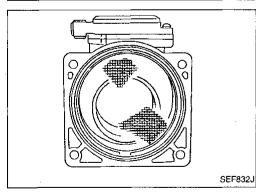


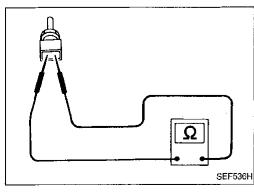
SEF419H











Electrical Components Inspection (Cont'd) CAMSHAFT POSITION SENSOR

- 1. Remove distributor from engine. (Camshaft position sensor harness connector should remain connected.)
- 2. Turn ignition switch "ON".
- 3. Rotate distributor shaft slowly by hand and check voltage letween terminals (3), (4) and ground.

Terminal	Voltage
③ (120° signal)	Tester's pointer fluctuates between 5V and 0V.
4 (1° signal)	

If NG, replace distributor assembly with camshaft position sensor.

Visually check signal plate for damage or dust.

EF & EC

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MASS AIR FLOW SENSOR

- 1. Peel mass air flow sensor harness connector rubber as shown in the figure if the harness connector is connected.
- 2. Turn ignition switch "ON".
- Start engine and warm it up sufficiently.
- 4. Check voltage between terminal a and ground.

Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Less than 1.0
Idle (Engine is warm-up sufficiently.)	Approximately 1.5 - 2.0

5. If NG, remove mass air flow sensor from air duct. Check hot wire for damage or dust.



FA

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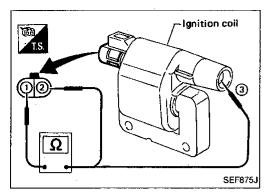
EL

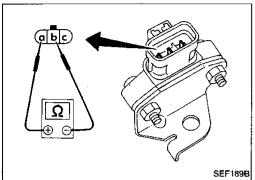
ENGINE COOLANT TEMPERATURE SENSOR

- Disconnect engine coolant temperature sensor harness connector.
- 2. Check resistance as shown in the figure.

Temperature °C (°F)	Resistance k Ω
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.0
80 (176)	0.30 - 0.33

If NG, replace engine coolant temperature sensor.





Electrical Components Inspection (Cont'd) IGNITION COIL

- 1. Disconnect ignition coil harness connector.
- Check resistance as shown in the figure.

Terminal	Resistance
① - ②	Approximately 1.0Ω
① - ③	Approximately 10 kΩ

If NG, replace ignition coil.

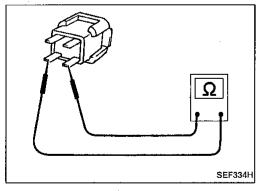
POWER TRANSISTOR

- Disconnect power transistor harness connector.
- Check continuity between power transistor terminals with a digital meter.

Set tester in lower range.

Terminal No.	Tester polarity	Continuity
(8)	0	No
(b)	⊖	No
a	Θ	Vas
(b)	0	Yes
a	•	
©	Θ	No
a	⊖	Yes
©	•	

If NG, replace power transistor.



RESISTOR

- Disconnect resistor harness connector.
- 2. Check resistance between terminals.

Resistance: Approximately 2.2 Ω

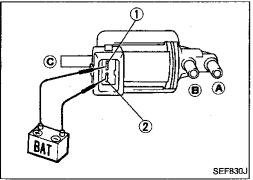
If NG, replace resistor.

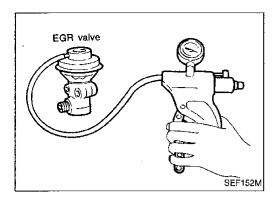


- 1. Disconnect EGRC-solenoid valve harness connector.
- 2. Check solenoid valve, following the table as shown below:

port (A) and (B)	port ® and ©
Yes	No
No	Yes
	Yes

If NG, replace EGRC-solenoid valve.





Electrical Components Inspection (Cont'd) EGR VALVE

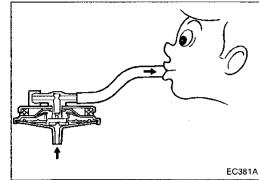
Apply vacuum to EGR vacuum port with a hand vacuum pump. EGR valve spring should lift.

If NG, replace EGR valve.



MA

EM



EGRC-BPT VALVE

Plug one of two ports of EGRC-BPT valve. Apply a pressure above 0.490 kPa (50 mmH₂O, 1.97 inH₂O) to check for leakage. If a leak is noted, replace valve.



LC

HEATED OXYGEN SENSOR

Refer to "Diagnostic Procedure 30". (See page EF & EC-96.)



FE

CL

EGR TEMPERATURE SENSOR

Check resistance change and resistance value at 100°C (212°F).

Resistance should decrease in response to temperature increase.

AT

Resistance: 100°C (212°F) **85.3** \pm **8.53 k**Ω

If NG, replace EGR temperature sensor.

TF

PD)

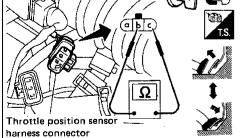
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SEF830F

SEF210M



THROTTLE POSITION SENSOR

Disconnect throttle position sensor harness connector.

Make sure that resistance between terminals (b) and (c)

changes when opening throttle valve manually.

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 1
Partially released	1 - 9
Completely depressed	Approximately 9

If NG, replace throttle position sensor.

ST

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Adjustment

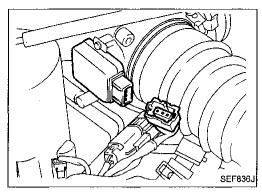
If throttle position sensor, closed throttle position switch and/or wide open throttle position switch is replaced or removed, it is necessary to install in proper position, by following the procedure as shown below:

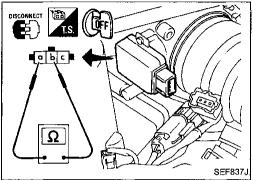
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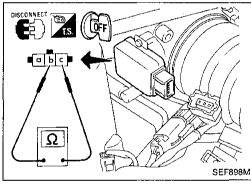
MA

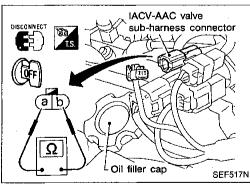
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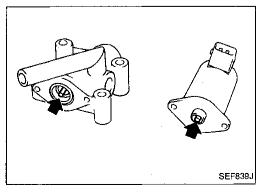
NDX











Electrical Components Inspection (Cont'd)

- 1. Install throttle position sensor body in throttle body. Do not tighten bolts. Leave bolts loose.
- 2. Connect throttle position sensor and closed throttle position switch harness connector.
- 3. Start engine and warm it up sufficiently.
- 4. Disconnect IACV-AAC valve sub-harness connector.
- Disconnect closed throttle position switch harness connector.
- Check closed throttle position switch OFF → ON speed with circuit tester, closing throttle valve manually.

M/T: Idle speed \pm 250 \pm 150 rpm

A/T: Engine speed (at idle in "N" position) \pm 250 \pm 150 rpm

- 7. If NG, set closed throttle position switch OFF → ON speed to the specified value by turning throttle position sensor body. Connect circuit tester with terminals (a) and (b) on closed throttle position switch side and find out OFF → ON point.
- 8. Tighten throttle position sensor installing bolts carefully after setting so that throttle position sensor does not move.

WIDE OPEN THROTTLE POSITION SWITCH

- 1. Disconnect throttle position switch harness connector.
- 2. Check continuity between terminals (c) and (b).

Accelerator pedal condition	Continuity
Released	No
Depressed	Yes

If NG, replace throttle position switch.

IACV-AAC VALVE

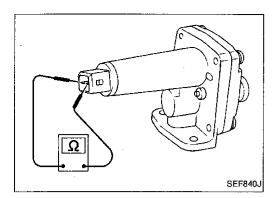
Resistance check

- 1. Disconnect IACV-AAC valve sub-harness connector.
- 2. Check resistance between terminals (a) and (b).

Resistance:

Approximately 10 Ω

- Check plunger for seizing or sticking.
- 4. Check for broken spring.



Oil filler cap

Electrical Components Inspection (Cont'd) IACV-AIR REGULATOR

- Disconnect IACV-air regulator harness connector.
- Check resistance between terminals (a) and (b).
 - Resistance: Approximately 70 80 Ω

Check IACV-air regulator for clogging.

G

MA

EM

KNOCK SENSOR

- Disconnect knock sensor sub-harness connector.
- Check continuity between terminals (e) and ground. Continuity should exist.

EC

LC

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INJECTOR

SEF518N

SEF842J

No. 1, No. 3 and No. 5 cylinders

No. 2, No. 4 and No. 6 cylinders

- Disconnect injector harness connector.
- Check resistance between terminals as shown in the figure. Resistance: 10 - 14 Ω

If NG, replace injector.

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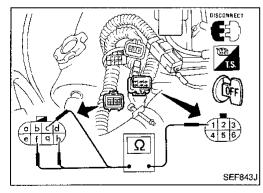
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- Disconnect middle harness connectors for injectors. Check resistance between terminals, following the table as
- shown below:

Cylinder	Terminal No.	Resistance
No. 2	① - ©	
No. 4	① - ①	10 - 14Ω
No. 6	① · ①	

If NG, replace injector.



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CLOSED THROTTLE POSITION SWITCH

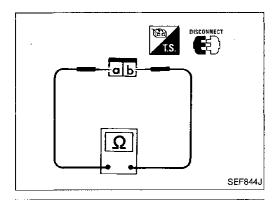
- Disconnect throttle position switch harness connector.
- Check continuity between terminals (a) and (b).

Accelerator pedal condition	Continuity
Released	Yes
Depressed	No

If NG, replace throttle position switch.

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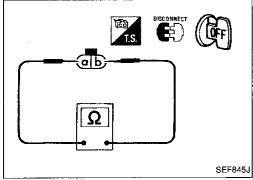


Electrical Components Inspection (Cont'd) NEUTRAL POSITION SWITCH

Check continuity between terminals (a) and (b).

Conditions	Continuity
Shift to Neutral position	Yes
Shift to other position	No

If NG, replace neutral position switch.

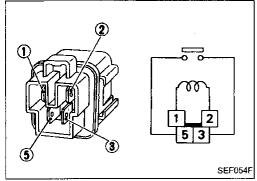


INHIBITOR SWITCH

Check continuity between terminals (a) and (b).

Conditions	Continuity
Shift to "P" position	Yes
Shift to "N" position	Yes
Shift to positions other than "P" and "N"	No

If NG, replace inhibitor switch.

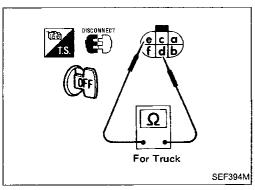


ECCS RELAY, FUEL PUMP RELAY, AIR CONDITIONER RELAY AND PARK/NEUTRAL POSITION RELAY

Check continuity between terminals 3 and 5.

Conditions	Continuity
12V current supply between terminals ① and ②	Yes
No current supply	No

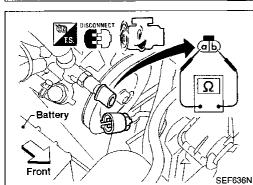
If NG, replace relay.



FUEL PUMP

- 1. Disconnect fuel pump harness connector.
- 2. Check resistance between terminals (0) and (e). Resistance: Approximately 1.5 Ω

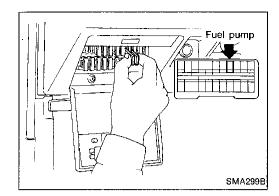
If NG, replace fuel pump.



POWER STEERING OIL PRESSURE SWITCH

- 1. Disconnect power steering oil pressure switch harness connector.
- 2. Start engine:
- 3. Check continuity between terminals (a) and (b).

Conditions	Continuity
Steering wheel is being turned	Yes
Steering wheel is not being turned	No



Releasing Fuel Pressure

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

- 1. Remove fuse for fuel pump.
- 2. Start engine.
- After engine stalls, crank it two or three times to release all fuel pressure.
- Turn ignition switch off and reconnect fuel pump fuse.

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Fuel Pressure Check

- When reconnecting fuel line, always use new clamps.
- Make sure that clamp screw does not contact adjacent parts.
- Use a torque driver to tighten clamps. C.
- d. Do not perform fuel pressure check while fuel pressure regulator control system is operating; otherwise, fuel pressure gauge might indicate incorrect readings.
- 1. Release fuel pressure to zero.
- Disconnect fuel hose between fuel filter and fuel tube (engine side). Then install pressure gauge.
- 3. Start engine and check for fuel leakage.

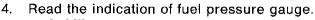


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At idling:

When fuel pressure valve	Approximately 235 kPa
vacuum hose is connected.	(2.4 kg/cm², 34 psi)
When fuel pressure valve	Approximately 294 kPa
vacuum is disconnected.	(3.0 kg/cm², 43 psi)

- Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
- 6. Plug intake manifold with a rubber cap.
- 7. Connect variable vacuum source to fuel pressure regulator.
- Start engine and read indication of fuel pressure gauge as vacuum is changed.

Fuel pressure should decrease as vacuum increases. If results



are unsatisfactory, replace fuel pressure regulator.

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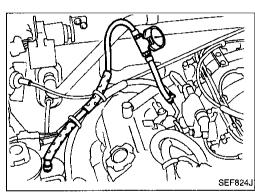


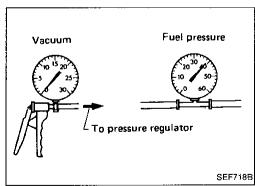
- Release fuel pressure to zero.
- Drain coolant by removing drain plugs from both sides of cylinder block.

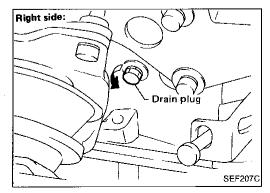
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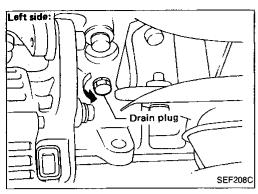


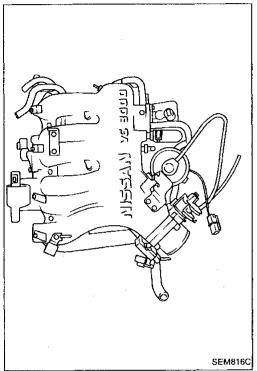


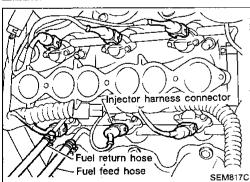


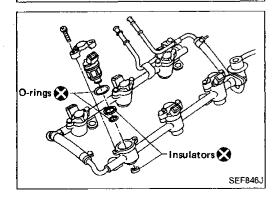


Injector Removal (Cont'd)









- Separate ASCD and accelerator control wire from intake manifold collector.
- Remove intake manifold collector from engine. The following parts should be disconnected to remove intake manifold collector.
 - a. Harness connectors for
 - IACV-AAC valve
 - Throttle position sensor and closed throttle position switch
- Ignition coil
- Power transistor
- EGRC-solenoid valve
- IACV-air regulator
- EGR temperature sensor
- b. Water hoses from collector and heater hoses
- c. PCV hose from RH rocker cover
- d. Vacuum hoses for
- Canister
- Brake master cylinder
- Pressure regulator
- e. Purge hose from canister
- f. EGR tube
- g. Ground harnesses
- h. Air duct hose
- Remove fuel feed and return hose from injector fuel tube assembly.
- 6. Disconnect all injector harness connectors.
- 7. Remove injector fuel tube assembly.

- 8. Remove any malfunctioning injector from injector fuel tube.
- 9. Replace or clean injector as necessary.

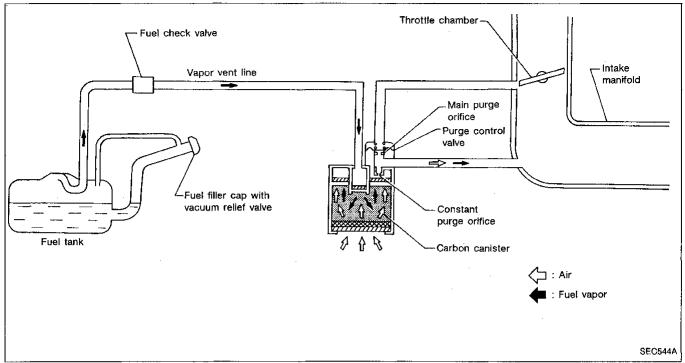
Always replace O-rings and insulators with new ones.

- 10. Connect injector to injector fuel tube.
- 11. Reinstall any part removed in reverse order of removal.

CAUTION

After properly connecting fuel hose to injector and fuel tube, check connection for fuel leakage.

Description

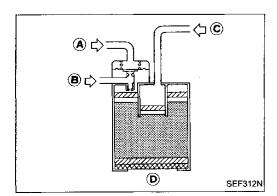


The evaporative emission system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

The fuel vapor from the sealed fuel tank is led into the canister which contains activated carbon and the vapor is stored there when the engine is not running.

The canister retains the fuel vapor until the canister is purged by the air drawn through the bottom of the canister to the intake manifold when the engine is running. When the engine runs at idle, the purge control valve is closed.

Only a small amount of stored vapor flows into the intake manifold through the constant purge orifice. As the engine speed increases, and the throttle vacuum rises higher, the purge control valve opens and the vapor is sucked into the intake manifold through both the main purge orifice and the constant purge orifice.



Inspection

ACTIVATED CARBON CANISTER

Check carbon canister as follows:

- Blow air in port (A) and ensure that there is no leakage.
- Apply vacuum to port (A).
- Cover port (1) with hand.
 - Blow air in port **©** and ensure free flow out of port **B**.

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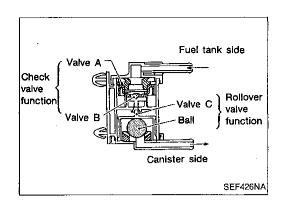
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Inspection (Cont'd)

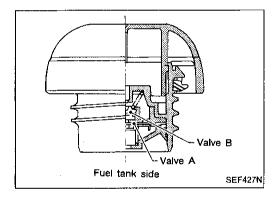
FUEL CHECK VALVE (With rollover valve)

Check valve operation

- Blow air through connector on fuel tank side.
 A considerable resistance should be felt and a portion of air flow should be directed toward the canister side.
 - Blow air through connector on canister side.
 Air flow should be smoothly directed toward fuel tank side.
- If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.

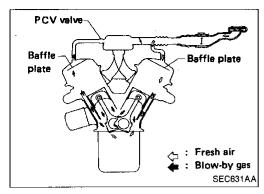
Rollover valve operation

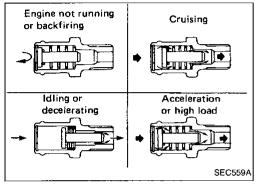
Ensure that continuity of air passage does not exist when the installed rollover valve is tilted to 90° or 180°.

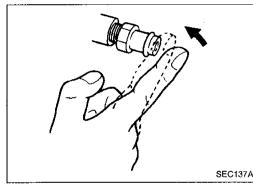


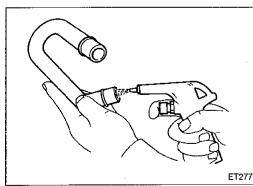
FUEL TANK VACUUM RELIEF VALVE

- 1. Wipe clean valve housing.
- 2. Suck air through the cap. A slight resistance accompanied by valve clicks indicates that valve A is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
- Blow air on fuel tank side and ensure that continuity of air passage exists through valve B.
- 4. If valve is clogged or if no resistance is felt, replace cap as an assembly.









Description

This system returns blow-by gas to both the intake manifold and air cleaner.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.

During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is then drawn from the air cleaner, through the hose connecting air cleaner to rocker cover, into the crankcase.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air cleaner under all conditions.

Inspection

PCV (Positive Crankcase Ventilation)

With engine running at idle, remove ventilation hose from PCV valve; if valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.

VENTILATION HOSE

- Check hoses and hose connections for leaks.
- 2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

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General Specifications

PRESSURE REGULATOR	
Regulated pressure kPa (kg/cm², psi)	Approx. 294 (3.0, 43)

Inspection and Adjustment

Idle speed*1	rpm	
No-load*2		
M/T		750 50 (700)*0
A/T (in "N" position)	,	750±50 (700)*3
Air conditioner: ON		
M/T		000 (50
A/T (in "N" position)		800±50
Ignition timing	degree	15° ± 2° BTDC
Closed throttle position sw	itch	
touch speed	rpm	
M/T		Idle speed + 250 ± 150*3
A/T (in "N" position)		I love speed + 250 ± 150 5

^{*1:} Feedback controlled and needs no adjustments

- Air conditioner switch: OFF
- Steering wheel: Kept straight
- Electric load: OFF (Lights, heater, fan & rear defogger)
- *3: (): Disconnect IACV-AAC valve sub-harness connector.

IGNITION COIL

Primary voltage	٧	12
Primary resistance [at 20°C (68°F)]	Ω	Approximately 1.0
Secondary resistance [at 20°C (68°F)]	kΩ	Approximately 10

MASS AIR FLOW SENSOR

Supply voltage	٧	Battery voltage (11 - 14)
Output voltage	٧	Approximately 1.5 - 2.0*

^{*:} Engine is warmed up sufficiently and idling under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

Resistance k Ω	
2.1 - 2.9	
0.68 - 1.00	
0.30 - 0.33	

FUEL PUMP

Resistance	Ω	Approximately 1.5
GR TEMPERA	TURE SE	NSOR
Resistance at 100°C (212°F)]	kΩ	85.3 ± 8.53

ACV-AAC VAL		Approximately 10 C
ACV-AAC VAL Resistance	VE	Approximately 10.0

THROTTLE POSITION SENSOR

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 1
Partially released	1 - 9
Completely depressed	Approximately 9

kΩ

Approximately 2.2

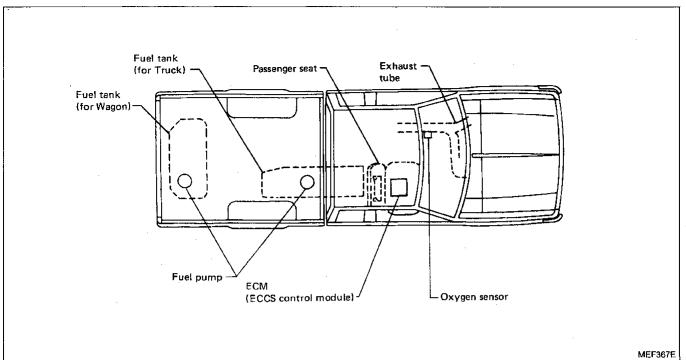
IGNITION WIRE

Resistance

		
Resistance	$k\Omega/m$ ($k\Omega/ft$)	Less than 30 (9.1)

^{*2:} Under the following conditions:

ECCS Component Parts Location



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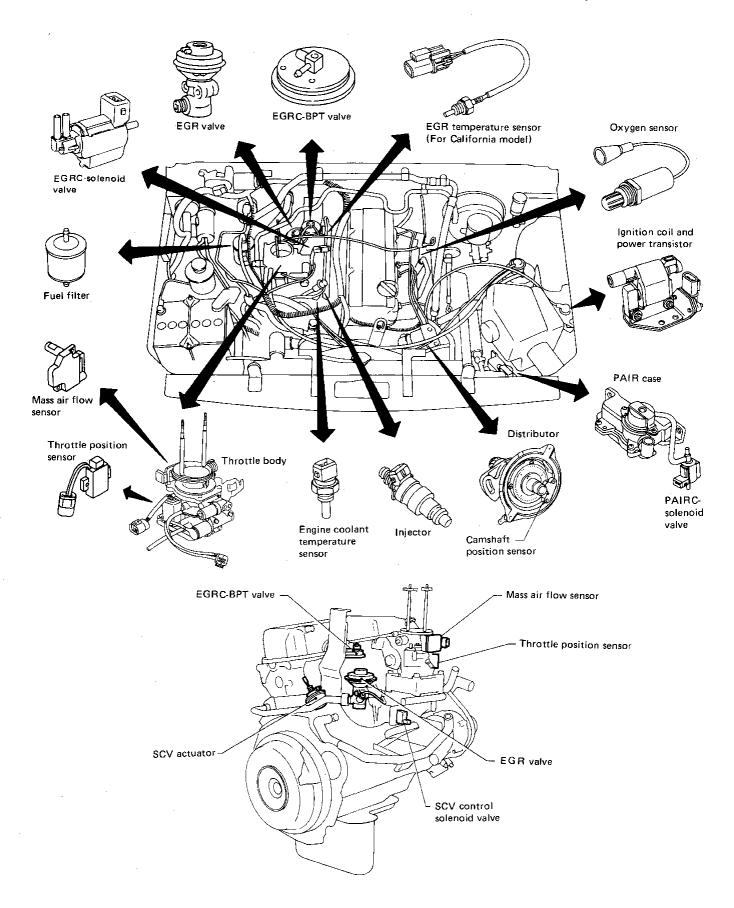
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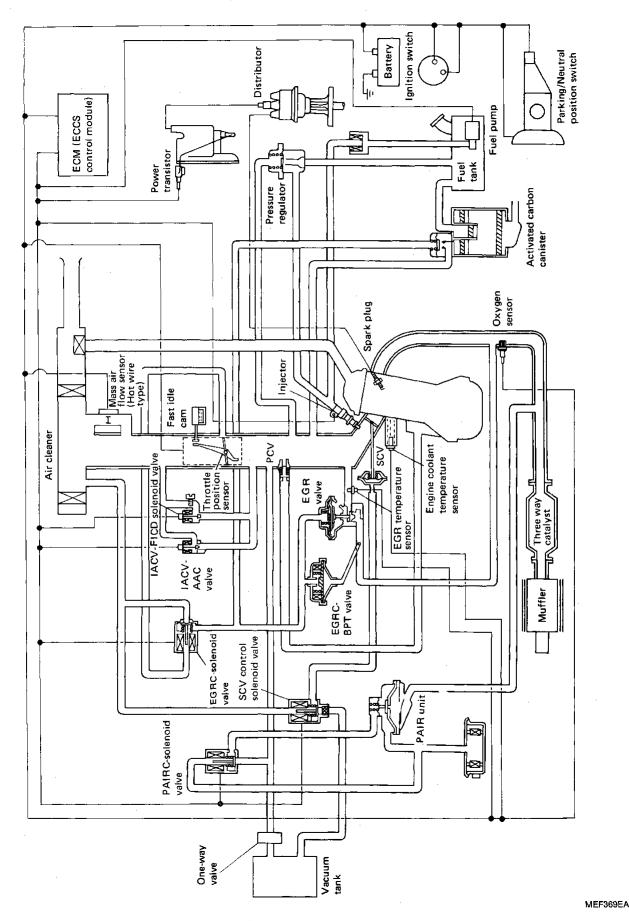
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ECCS Component Parts Location (Cont'd)



System Diagram



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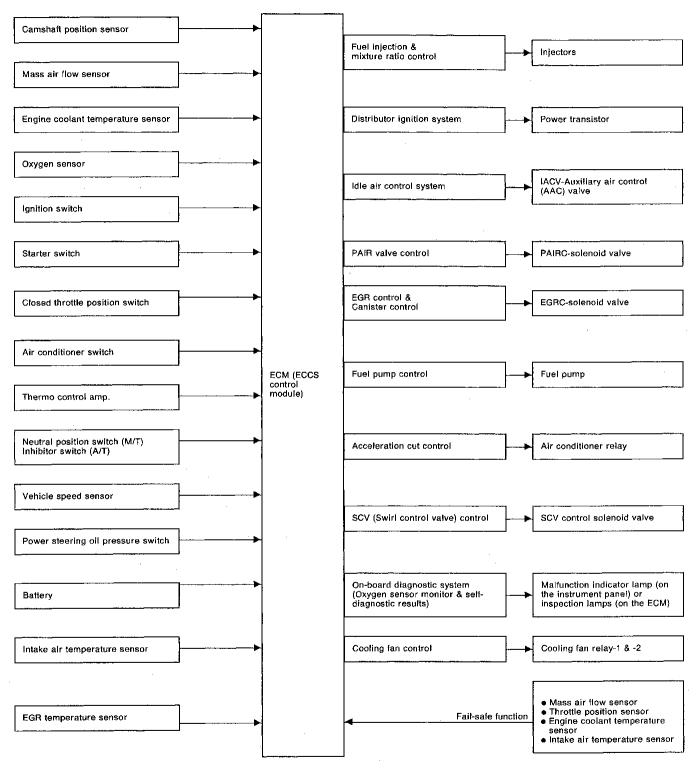
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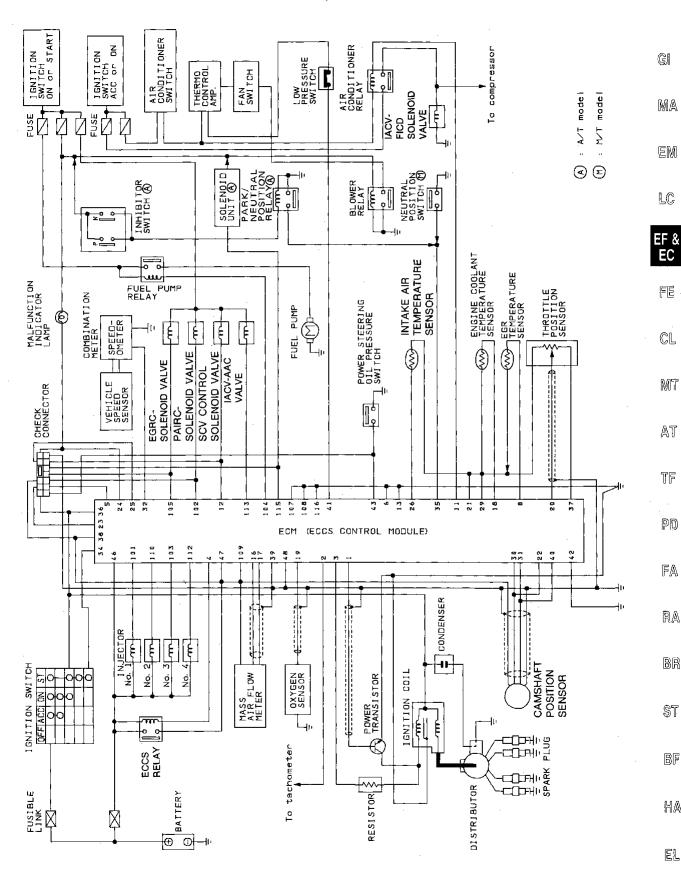
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System Chart

ECCS CONTROL SYSTEM



Circuit Diagram



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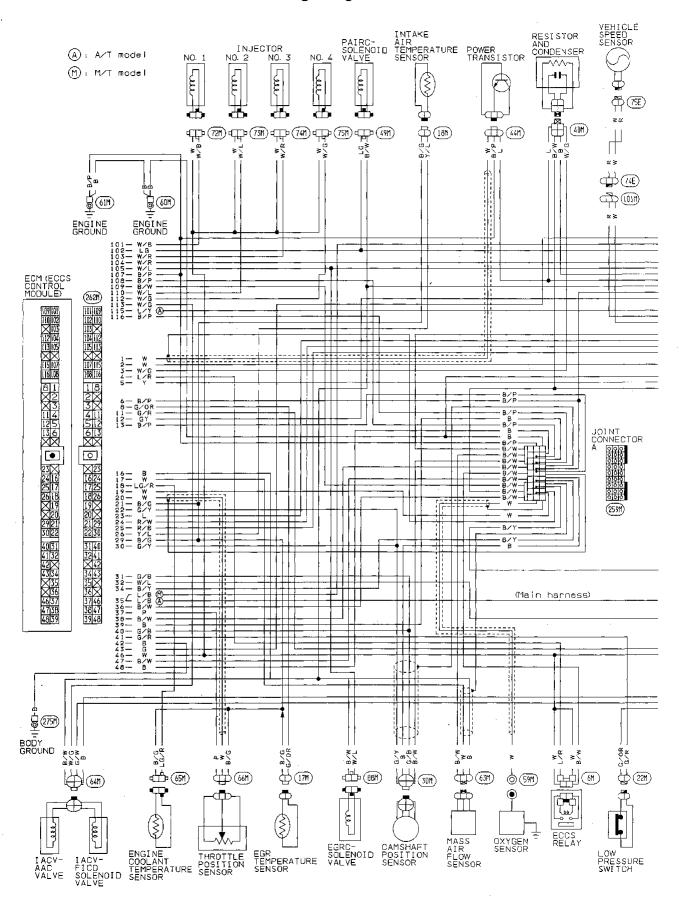
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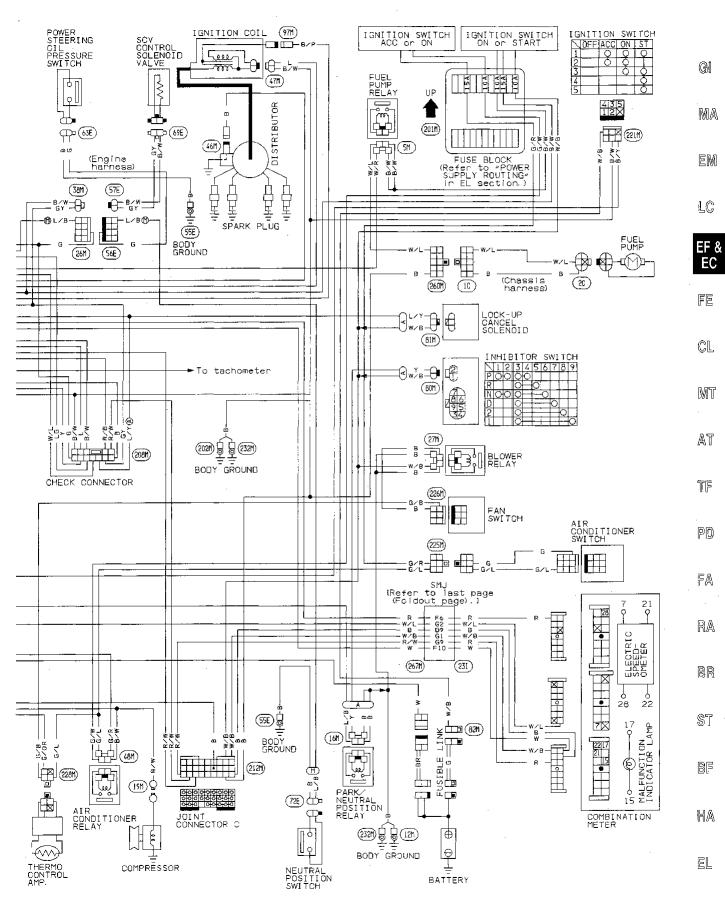
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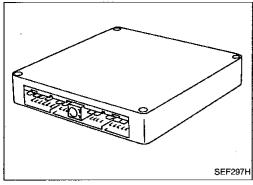
Wiring Diagram



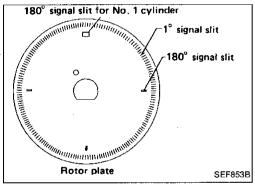
Wiring Diagram (Cont'd)

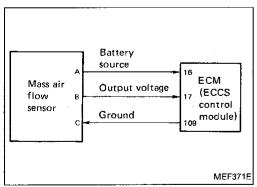


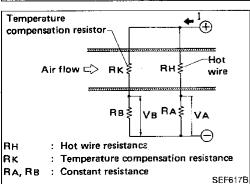
SEF780N IDX



Sealed cover Rotor head Light emitting diode Photo diode Wave forming circuit Rotor plate SEF813B







Engine Control Module (ECM)-ECCS Control Module

The ECM consists of a microcomputer, inspection lamps, a diagnostic test mode selector, and connectors for signal input and output and for power supply. The unit controls the engine.

Camshaft Position Sensor (CMPS)

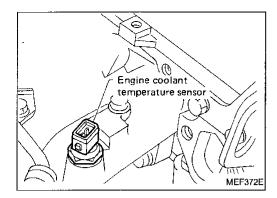
The camshaft position sensor is a basic component of the entire ECCS. It monitors engine speed and piston position, and sends signals to the ECM to control fuel injection, ignition timing and other functions.

The camshaft position sensor has a rotor plate and a waveforming circuit. The rotor plate has 360 slits for 1° signal and 4 slits for 180° signal. Light Emitting Diodes (LED) and photo diodes are built in the wave-forming circuit.

When the rotor plate passes between the LED and the photo diode, the slits in the rotor plate continually cut the light being transmitted to the photo diode from the LED. This generates rough-shaped pulses which are converted into on-off signals by the wave-forming circuit, which are then sent to the ECM.

Mass Air Flow Sensor (MAFS)

The mass air flow sensor measures the mass flow rate of intake air. Measurements are made so that the control circuit will emit an electrical output signal corresponding to the amount of heat dissipated from a hot wire placed in the stream of intake air. The airflow past the hot wire removes the heat from the hot wire. The temperature of the hot wire is very sensitive to the mass flow rate. The higher the temperature of the hot wire, the greater its resistance value. This temperature change (resistance) is determined by the mass air flow rate. The control circuit accurately regulates current (I) in relation to the varying resistance value (R_H) so that V_A always equals V_B . The mass air flow sensor transmits a voltage value V_A to the ECM where the output is converted into an intake air signal.



Engine Coolant Temperature Sensor (ECTS)

The engine coolant temperature sensor detects the engine coolant temperature and transmits a signal to the ECM. The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

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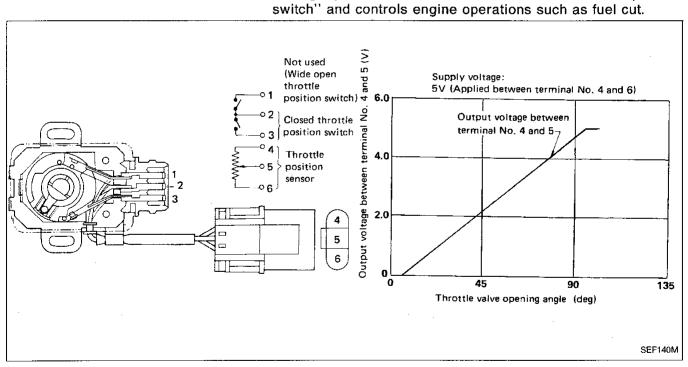
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Throttle Position Sensor (TPS) & Soft Closed Throttle Position (CTP) Switch

The throttle position sensor responds to the throttle position which, in turn, is determined by accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle position into an output voltage, and transmits it to the ECM. The sensor also detects the opening and closing speed of the throttle valve and feeds this information as a voltage signal to the ECM too.

Closed throttle position is determined by the ECM. This positioning system is called the "soft closed throttle position switch" and controls engine operations such as fuel cut.



Non-California model Terminal Nozzle Needle valve Coil SEF359HA

Fuel Injector

The fuel injector is a small, elaborate solenoid valve. As the ECM sends injection signals to the injector, the coil in the injector pulls the needle valve back and fuel is released into the intake manifold through the nozzle. The injected fuel is controlled by the ECM in terms of injection pulse duration.

Brass wire is used in the injector coil and thus the resistance is higher than a conventional injector.

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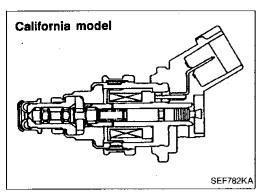
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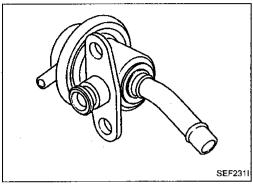
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Fuel Injector (Cont'd)

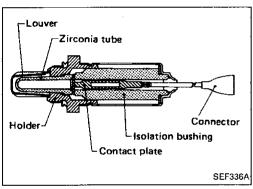


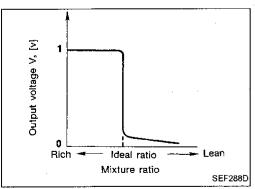


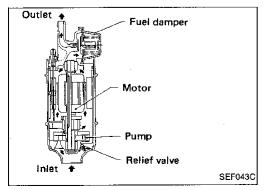
The pressure regulator maintains the fuel pressure at 299.1 kPa (3.05 kg/cm², 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pres-

Pressure Regulator

sure at the above value.





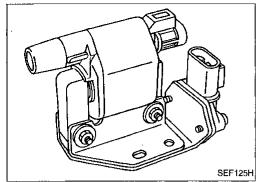


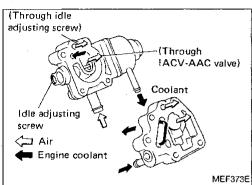
Oxygen Sensor (O2S)

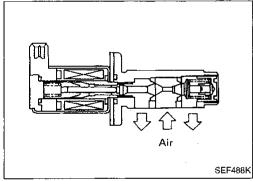
The oxygen sensor, which is placed into the exhaust manifold, monitors the amount of oxygen in the exhaust gas. The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares the oxygen density of exhaust gas with that of atmosphere, and generates electricity. In order to improve the generating power of the zirconia, its tube is coated with platinum. The voltage is approximately 1V in a richer condition of the mixture ratio than the ideal air-fuel ratio, while approximately 0V in leaner conditions. The radical change from 1V to 0V occurs at around the ideal mixture ratio. In this way, the oxygen sensor detects the amount of oxygen in the exhaust gas and sends the signal of approximately 1V or 0V to the ECM.

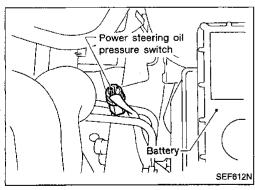
Fuel Pump

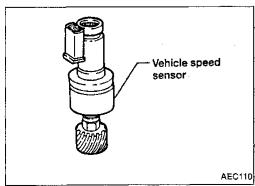
The fuel pump with a fuel damper is a submergible type, and are located in the fuel tank.











Power Transistor

The ignition signal from the ECM is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, molded type.

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Idle Air Adjusting (IAA) Unit

The IAA unit is made up of the IACV-AAC valve and air cut valve. It receives the signal from the ECM and controls the idle speed at the preset value under various conditions.

The air cut valve prevents an abnormal rise of idle rpm when IACV-AAC valve operates abnormally.

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Idle Air Control Valve (IACV)-Auxiliary Air Control (AAC) Valve

The IACV-AAC valve is attached to the throttle body.

The ECM actuates the IACV-AAC valve by an ON/OFF pulse. The longer that ON pulse is received, the larger the amount of air that will flow through the IACV-AAC valve.

The IACV-AAC valve adjusts idle speed to the specified value.

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Power Steering Oil Pressure Switch

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects the power steering load, sending the load signal to the ECM. The ECM then sends the idle-up signal to the IACV-AAC valve.

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Vehicle Speed Sensor (VSS)

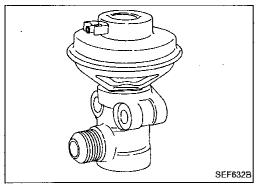
The vehicle speed sensor provides a vehicle speed signal to the ECM.

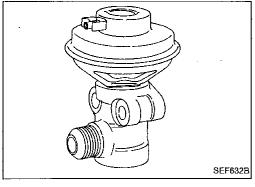
The speed sensor consists of a reed switch, which is installed on the transmission unit and transforms vehicle speed into a pulse signal.

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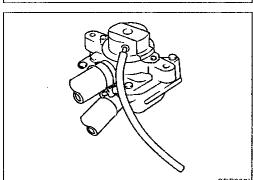
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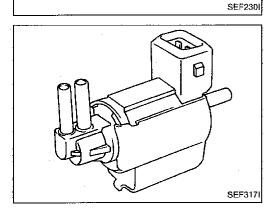
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Vacuum signal source To EGR valve filter Diaphragm Exhaust pressure MEF374E





Exhaust Gas Recirculation (EGR) Valve

The EGR valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve.

EGR Control (EGRC)-BPT Valve

The EGRC-BPT valve monitors exhaust pressure to activate the diaphragm, controlling throttle body vacuum applied to the EGR valve. In other words, recirculated exhaust gas is controlled in response to positioning of the EGR valve or to engine operation.

Pulsed Secondary Air Injection (PAIR) Valve (PAIR valve)

The PAIR valve sends secondary air to the exhaust manifold, using a vacuum created by exhaust pulsation in the exhaust manifold. When the exhaust pressure is below atmospheric pressure (negative pressure), secondary air is sent to the exhaust manifold. When the exhaust pressure is above atmospheric pressure, the reed valves prevent secondary air from being sent back to the air cleaner.

Pulsed Secondary Air Injection (PAIRC) Solenoid Valve

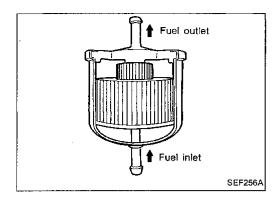
The PAIRC-solenoid valve cuts the intake manifold vacuum signal for PAIR valve control. It responses to the ON/OFF signal from the ECM. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the ECM sends an ON signal, the coil pulls the plunger downward and feeds the vacuum signal to the PAIR valve control valve.

EGR Control (EGRC)-Solenoid Valve

The EGR system is controlled only by the ECM. At both low- and high-speed engine speeds, the solenoid valve turns on and accordingly the EGR valve cuts the exhaust gas leading to the intake manifold.

SCV Control Solenoid Valve

The SCV control solenoid valve cuts the intake manifold vacuum signal for swirl control valve. It responds to the ON/OFF signal from the ECM. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the ECM sends an ON signal the coil pulls the plunger and feeds the vacuum signal to the swirl control valve actuator.



Fuel Filter

The specially designed fuel filter has a metal case in order to withstand high fuel pressure.

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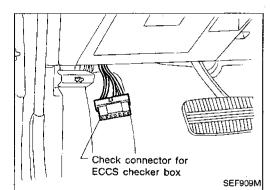
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Carbon Canister

The carbon canister is filled with active charcoal to absorb evaporative gases produced in the fuel tank. These absorbed gases are then delivered to the intake manifold by manifold EF & vacuum for combustion purposes.

The vacuum in the intake passage upstream of the throttle valve increases in response to the amount of the intake air.

EC



Check Connector for ECCS Checker Box

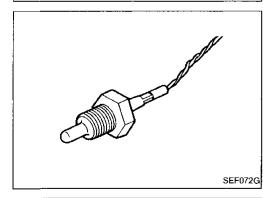
The check connector for ECCS checker box is beside the fuse box.

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EGR Temperature Sensor

The EGR temperature sensor monitors in exhaust gas temperature and transmits a signal to the ECM. The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electric resistance of the thermistor decreases in response to the temperature rise.

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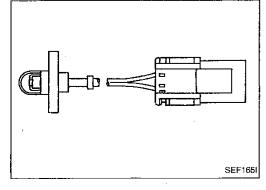
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The intake air temperature sensor controls ignition timing when the intake air temperature is extremely high, in order not to cause knocking.

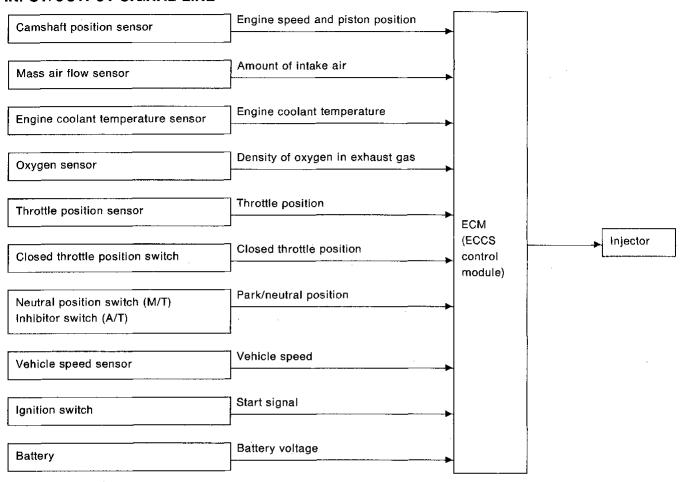
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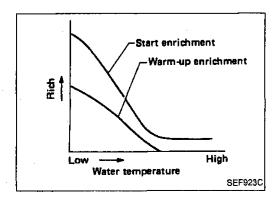
Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



BASIC MULTIPORT FUEL INJECTION SYSTEM

The amount of fuel injected from the fuel injector, or the length of time the valve remains open, is determined by the ECM. The basic amount of fuel injected is a programmable value mapped in the ECM memory. In other words, the programmable value is preset by engine operating conditions determined by input signals (for engine speed and air intake) from both the camshaft position sensor and the mass air flow sensor.



VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injection is compensated for to improve engine performance under various operating conditions as listed below:

<Fuel increase>

<Fuel decrease>

- 1) During warm-up
- 1) During deceleration
- 2) When starting the engine
- 3) During acceleration
- Hot-engine operation

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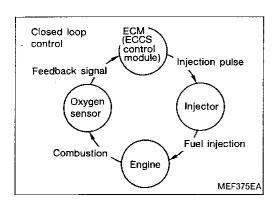
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Multiport Fuel Injection (MFI) System (Cont'd) MIXTURE RATIO FEEDBACK CONTROL

Mixture ratio feedback system is designed to precisely control the mixture ratio to the stoichiometric point so that the three way catalyst can reduce CO, HC and NOx emissions. This system uses an oxygen sensor in the exhaust manifold to check the air-fuel ratio. The ECM adjusts the injection pulse width according to the sensor voltage so the mixture ratio will be within the range of the stoichiometric air-fuel ratio.

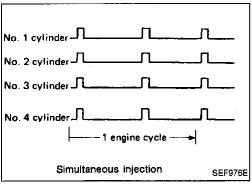
This stage refers to the closed loop control condition. The open loop control condition refers to that under which the ECM detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion.

- 1) Deceleration
- 2) High-load, high-speed operation
- 3) Engine idling
- 4) Malfunctioning of oxygen sensor or its circuit
- Insufficient activation of oxygen sensor at low engine coolant temperature
- 6) Engine starting

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the oxygen sensor. This feedback signal is then sent to the ECM to control the amount of fuel injection to provide a basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. This is due to manufacturing errors (e.g., mass air flow sensor hot wire) and changes during operation (injector clogging, etc.) of ECCS parts which directly affect the mixture ratio.

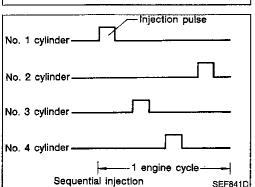
Accordingly, a difference between the basic and theoretical mixture ratios is quantitatively monitored in this system. It is then computed in terms of "fuel injection duration" to automatically compensate for the difference between the two ratios.



FUEL INJECTION TIMING

Fuel is injected once a cycle for each cylinder in the firing order.

When engine starts, fuel is injected into all four cylinders simultaneously twice a cycle.



FUEL SHUT-OFF

Fuel to all cylinders is cut off during deceleration or high-speed operation.

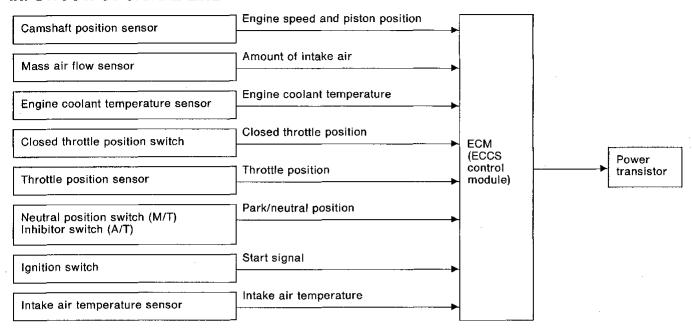
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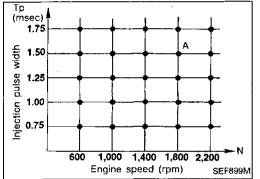
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Distributor Ignition (DI) System

INPUT/OUTPUT SIGNAL LINE





SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM in order to maintain the best air-fuel ratio in response to every running condition of the engine.

The ignition timing data is stored in the ECM located in the ECM, in the form of the map shown below.

The ECM detects information such as the injection pulse width and camshaft position sensor signal which varies every moment. Then responding to this information, ignition signals are transmitted to the power transistor.

e.g. N: 1,800 rpm, Tp: 1.50 msec A °BTDC

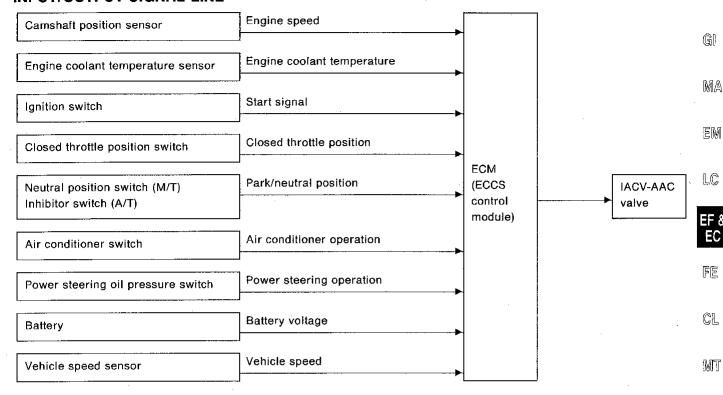
In addition to this,

- 1 At starting
- 2 During warm-up
- 3 At idle
- 4 At low battery voltage
- 5 During swirl control valve operates
- 6 During hot engine operation
- 7 At acceleration
- 8 When intake air temperature is extremely high

the ignition timing is revised by the ECM according to the other data stored in the ECM.

Idle Air Control (IAC) System

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via IACV-AAC valve. The IACV-AAC valve repeats ON/OFF operation according to the signal sent from the ECM. The camshaft position sensor detects the actual engine speed and sends a signal to the ECM. The ECM then controls the ON/OFF time of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM.

The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as noise and vibration transmitted to the compartment, fuel consumption, and engine load.

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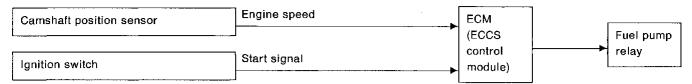
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Fuel Pump Control

INPUT/OUTPUT SIGNAL LINE



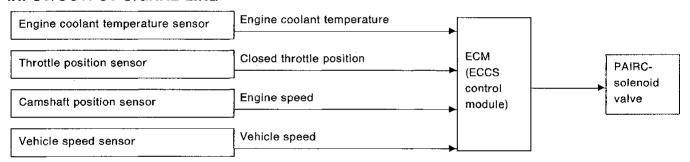
SYSTEM DESCRIPTION

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 1° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to perform. If the 1° signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation	
Ignition switch is turned to ON.	Operates for 5 seconds	
Engine running and cranking	Operates	
When engine is stopped	Stops in 1 second	
Except as shown above	Stops	

Pulsed Secondary Air Injection (PAIR) System

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The PAIR system is designed to send secondary air to the exhaust manifold, utilizing the vacuum caused by exhaust pulsation in the exhaust manifold.

The exhaust pressure in the exhaust manifold usually pulsates in response to the opening and closing of the exhaust valve and decreases below atmospheric pressure periodically.

If a secondary air intake pipe is opened to the atmosphere under vacuum conditions, secondary

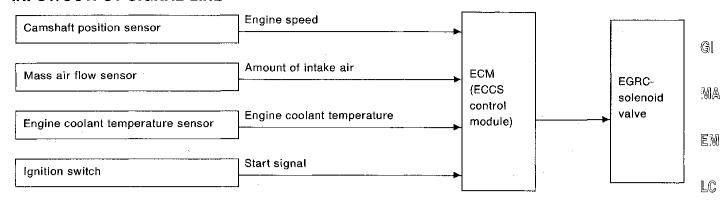
air can be drawn into the exhaust manifold in proportion to the vacuum.

The PAIR valve is controlled by the ECM (ECCS control module), corresponding to the engine coolant temperature. When the engine is cold, the PAIR system operates to reduce HC and CO. In extremely cold conditions, PAIR system does not operate to reduce after-burning. This system also operates during deceleration for the purpose of blowing off water around the PAIR valve.

Engine condition	Engine coolant temperature °C (°F)	PAIRC-solenoid valve	PAIR valve system	
Idle or deceleration	Between 28 (82) and 115 (239)	ON	Operates	

Exhaust Gas Recirculation (EGR) System

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

In addition, a system is provided which precisely cuts and controls port vacuum applied to the EGR valve to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM. When the ECM detects any of the following conditions, current flows through the solenoid valve in the EGR control vacuum line. This causes the port vacuum to be discharged into the atmosphere so that the EGR valve remains closed.

- 1) Low engine coolant temperature
- 2) Engine starting
- 3) High-speed engine operation
- 4) Engine idling

EGRC-solenoid valve operation

	Condition		EGRC-solenoid valve	— TF
When starting		· · · · · · · · · · · · · · · · · · ·		
Pm	°C (°E)	Below 60 (140)	ON.	PD
Engine coolant temperature	°C (°F)	Above 115 (239)	ON	
Idle & heavy load conditions				FA
Other conditions			OFF	

EGR system operation

EGR system operates under only the following conditions

Engine coolant temperature °C (°F)	EGRC-B	C-BPT valve				
	Exhaust gas pressure	Operation	Throttle position	EGRC-solenoid valve	EGR system	
Between 60 (140) and 115 (239)	High	Closed	Partially open	OFF	Operates	

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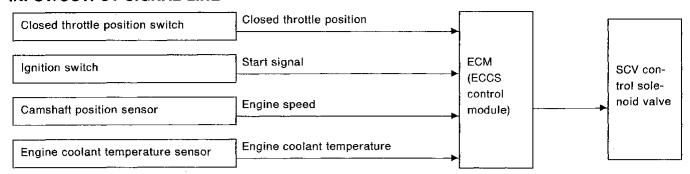
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Swirl Control Valve (SCV) Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

This system has a swirl control valve (SCV) in the intake passage of each cylinder.

While idling and during low engine speed operation, the SCV closes. Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion chamber.

Because of this operation, this system tends to increase the burning speed of the gas mixture, improve fuel consumption, and increase the stability in running conditions.

Also, except when idling and during low engine speed operation, this system opens the SCV. In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance, intake flow.

The solenoid valve controls SCV's shut/open condition. This solenoid valve is operated by the ECM.

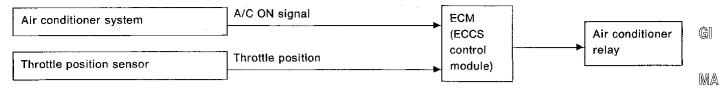
SCV system operation (Engine is running)

Closed throt- tle position switch	Engine speed	Solenoid valve	SCV
ON	Below 4,000 rpm	ON	Closed
OFF	Less than 2,800 rpm	ON	Closed
<u> </u>	More than 4,000 rpm	OFF	Ореп

When engine coolant temperature is below 0°C (32°F) SCV is kept open.

Acceleration Cut Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

When accelerator pedal is fully depressed, air conditioner is turned off for a few seconds. This system improves acceleration when air conditioner is used.

Fail-safe System

MASS AIR FLOW SENSOR MALFUNCTION

If the mass air flow sensor output voltage is above or below the specified value, the ECM senses an mass air flow sensor malfunction. In case of a malfunction, the throttle position sensor substitutes for the mass air flow sensor.

Though mass air flow sensor is malfunctioning, it is possible to drive the vehicle and start the engine. But engine speed will not rise more than 2,400 rpm in order to inform the driver of fail-safe system operation while driving.

Operation

System	Fixed condition		
EGR control system	OFF		
Idle air control system	A duty ratio is fixed at the preprogrammed value.		
Multiport fuel injection system	Fuel is shut off above 2,400 rpm. (Engine speed does not exceed 2,400 rpm.)		

ENGINE COOLANT TEMPERATURE SENSOR MALFUNCTION

When engine coolant temperature sensor output voltage is below or above the specified value, water temperature is fixed at the preset value as follows:

Operation

Condition	Engine coolant temperature decided	
Just as ignition switch is turned ON or Start	20°C (68°F)	
More than 6 minutes after ignition ON or Start	80°C (176°F)	
Except as shown above	20 - 80°C (68 - 176°F) (Depends on the time)	

THROTTLE POSITION SENSOR MALFUNCTION

When throttle position sensor output voltage is below or above the specified value, throttle position sensor output is fixed at the preset value.

INTAKE AIR TEMPERATURE SENSOR MALFUNCTION

When intake air temperature sensor is below or above the specified value, intake air temperature value is fixed at the preset value [20°C (68°F)].

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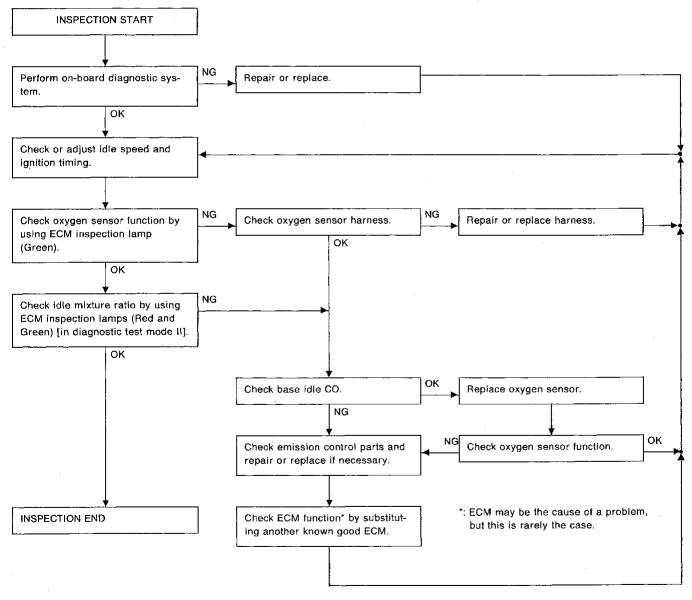
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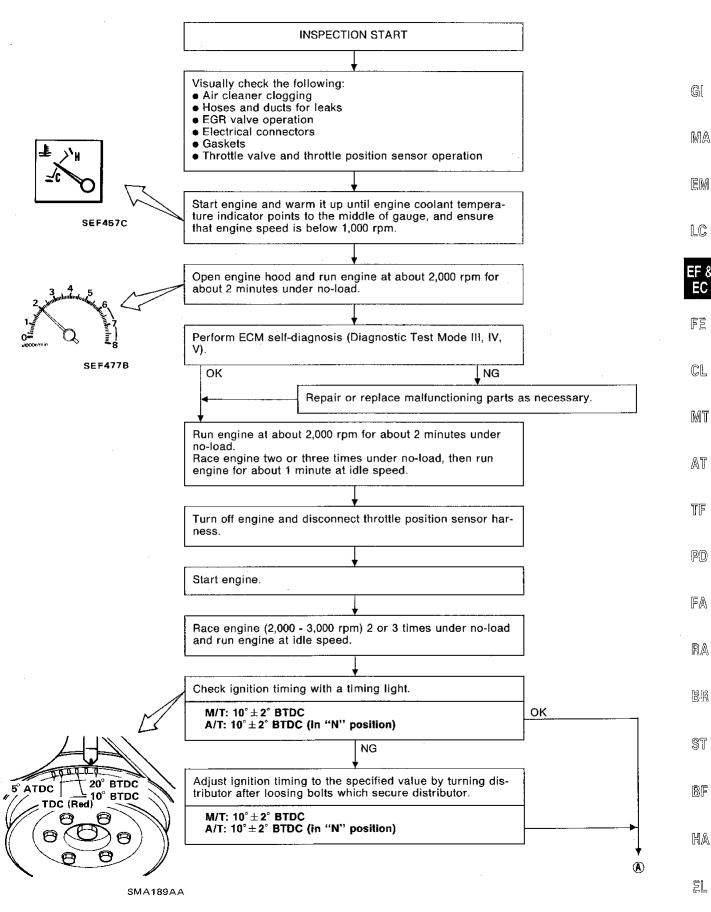
PREPARATION

- 1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- ECM harness connector
- Vacuum hoses
- Air intake system
 (Oil filler cap, oil level gauge, etc.)
- Fuel pressure
- PAIR valve hose
- Engine compression
- EGR valve operation

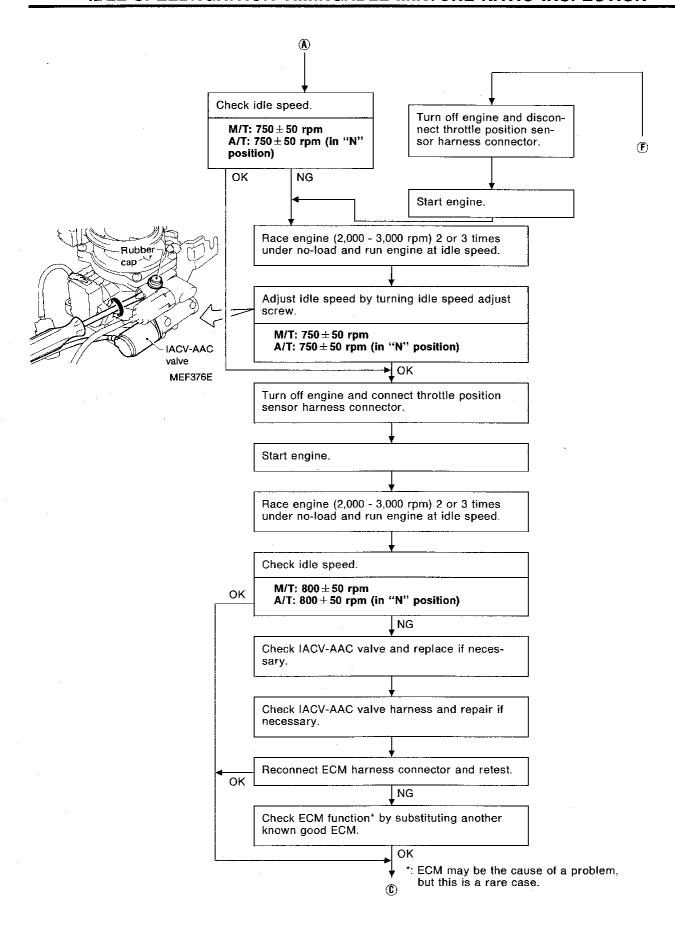
- Throttle valve and closed throttle position switch
- 2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
- On automatic transaxle equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.
- 4. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
- 5. Turn off headlamps, heater blower, rear defogger.
- 6. Keep front wheels pointed straight ahead.

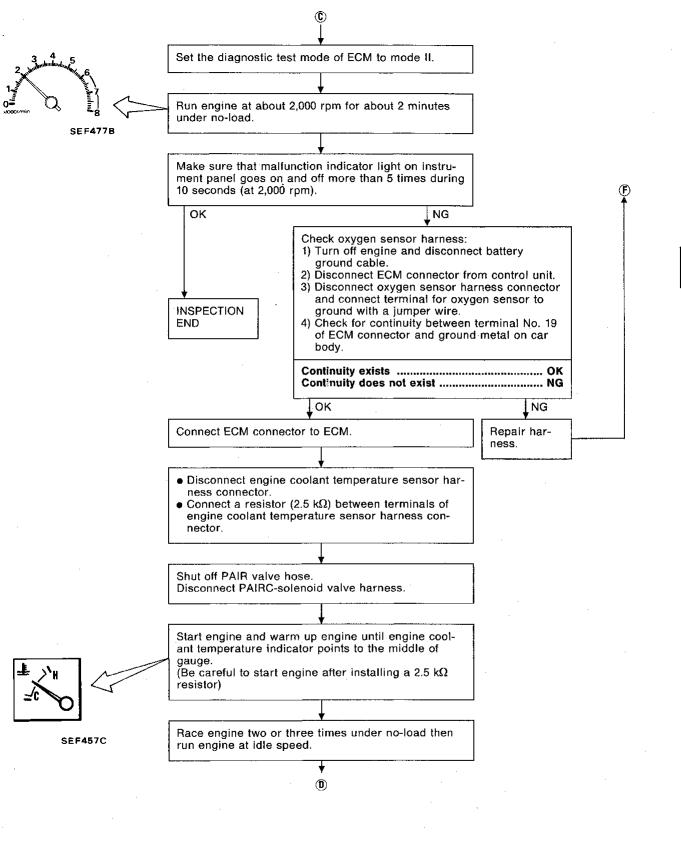
Overall inspection sequence





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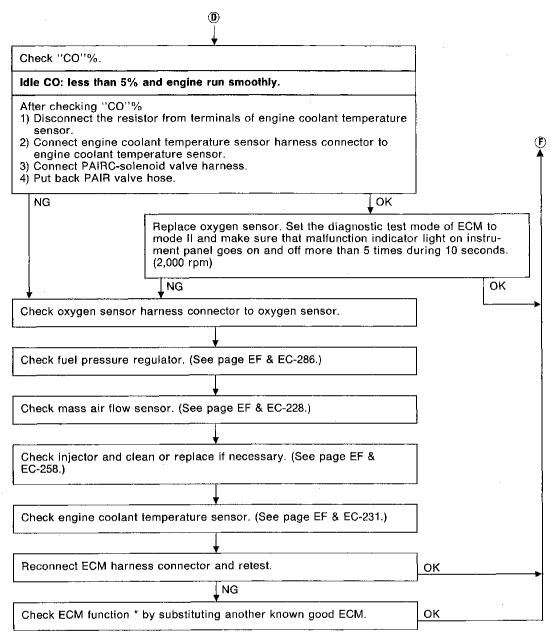
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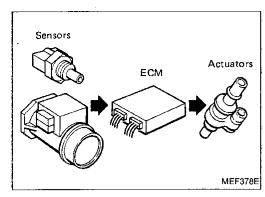
*: ECM may be the cause of a problem, but this is a rare case.

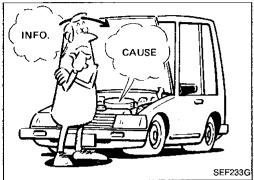
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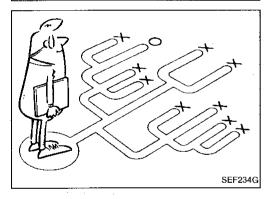
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Diagnostic Procedure 2 — Hunting				LC
Diagnostic Procedure 3 — Unstable Idle				
Diagnostic Procedure 3 — Chistable Idle Diagnostic Procedure 4 — Hard to Start or Impossible to	L., '	α <u>.</u>		EE 0
Start when the Engine is Cold	EE.	8. EC	`_201	EF &
Diagnostic Procedure 5 — Hard to Start or Impossible to	L \	u _ c	/-201	EC
Start when the Engine is Hot	==	8 EC	2.202	
Diagnostic Procedure 6 — Hard to Start or Impossible to	I! (X L.C)- <u>2</u> 02	FE
Start under Normal Conditions	C C	8 EC	204	
Diagnostic Procedure 7 — Hesitation when the Engine is Hot				
Diagnostic Procedure 8 — Hesitation when the Engine is Cold				CL
Diagnostic Procedure 9 — Hesitation under Normal Conditions				
Diagnostic Procedure 10 — Engine Stalls when turning				
Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot				MT
Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold				
Diagnostic Procedure 13 — Engine Stalls when Stepping on the	_' '	u	7-210	200
Accelerator Momentarily	FF :	& FC	-212	ĀT
Diagnostic Procedure 14 — Engine Stalls after Decelerating				
Diagnostic Procedure 15 — Engine Stalls when Accelerating or when	`	×	, <u>L</u> 1-1	566
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Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy				
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Diagnostic Procedure 18 — Knock				U LE
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Diagnostic Procedure 23				
CAMSHAFT POSITION SENSOR	FF	& FC	-225	
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ENGINE COOLANT TEMPERATURE SENSOR	EF &	& EC	-231	
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HCHECK VEHICLE SPEED SENSOR	EF	& EC	-233	BF
Diamentia Brandura 27				
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HEHEER EGR FUNCTION	Ere	α EU	,-∠ 39	

TROUBLE DIAGNOSES

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How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. At the same time, it is important that there are no conventional problems such as vacuum leaks, fouled spark plugs, or other problems with the engine.

It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or faulty wiring. In this case, careful checking of suspicious circuits may help prevent the replacement of good parts.

A visual check only may not find the cause of the problems. A road test with a circuit tester connected to a suspected circuit should be performed.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a driveability complaint. The customer is a very good supplier of information on such problems, especially intermittent ones. Through the talks with the customer, find out what symptoms are present and under what conditions they occur.

Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot driveability problems on an electronically controlled engine vehicle.

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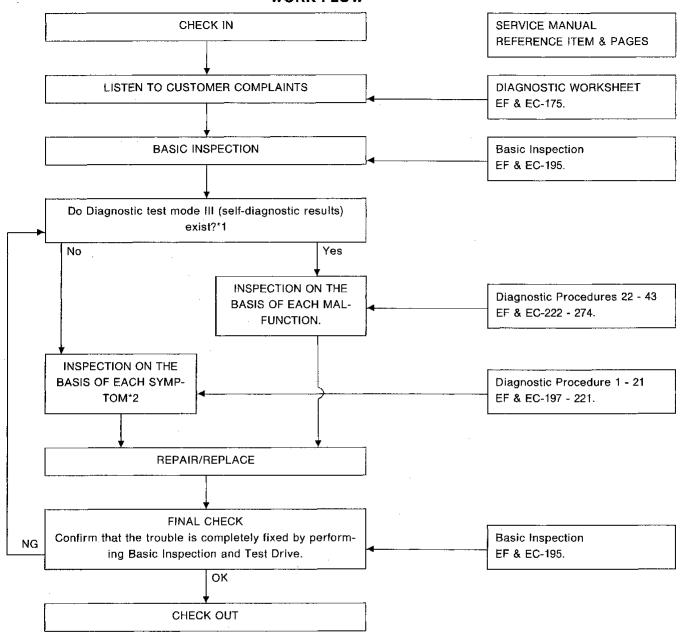
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How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd) WORK FLOW



^{*1:} If the on-board diagnostic system cannot be performed, check main power supply and ground circuit. (See Diagnostic Procedure 22.)

^{*2:} If the trouble is not duplicated, see INTERMITTENT PROBLEM SIMULATION (EF & EC-176).

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KEY POINTS

WHAT Vehicle & engine model
WHEN Date, Frequencies
WHERE..... Road conditions
HOW Operating conditions,
Weather conditions,
Symptoms

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How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

DIAGNOSTIC WORKSHEET

There are many kinds of operating conditions that lead to malfunctions on engine components.

A good grasp of such conditions can make trouble-shooting faster and more accurate.

In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms or under what conditions a customer complains.

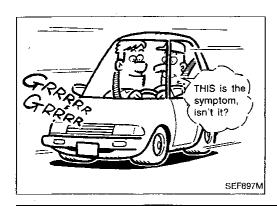
Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for troubleshooting.

Worksheet sample

			Worksheet sample	5		L(
Customer name MR/MS			Model & Year		VIN	·
Engine #		Trans.		Mileage	EF E	
Incident Date			Manuf. Date		In Service Date	
	☐ Startability	□ P	artial combustion affected artial combustion NOT affe			on FE
Committee	□ Idling	☐ No fa	ast idle	☐ High idle	□ Low idle	
Symptoms	☐ Driveability	□ Sturr □ Intak □ Othe	ce backfire		ack of power	A
	☐ Engine stall	□ While	e accelerating	e idling e decelerating e loading	3	
Incident occurrence			after delivery	ntly	daytime	
Frequency		□ All ti	he time 🔲 Under certa	in conditions	□ Sometimes	P
Weather condi	tions	□ Not a	affected			
	Weather	☐ Fine	□ Raining □ Sno	wing 🗆 C	thers [j F/
	Temperature	□ Hot	☐ Warm ☐ Cool	☐ Cold	☐ Humid	°F
Engine conditions		☐ Cold Engine	3 1-	□ After wa 4,000	·	8,000 rpm
Road conditions		□ In to	wn 🗆 ln suburbs 🛭	☐ Highway	☐ Off road (up-dow	n)
Driving conditions		□ At st	e accelerating	☐ At racing cruising (RH		S1 B1
Malfunction in	dicator lamp	☐ Turn	ed on 🗀 Not turne	ed on		

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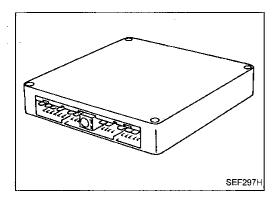
How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

INTERMITTENT PROBLEM SIMULATION

In order to duplicate an intermittent problem, it is effective to create similar conditions for component parts, under which the problem might occur.

Perform the activity listed under Service procedure and note the result.

	Variable factor	Influential part	Target condition	Service procedure
1	Mixture ratio	Pressure regulator	Made lean	Remove vacuum hose and apply vacuum.
I	Mixiure ratio	Pressure regulator	Made rich	Remove vacuum hose and apply pressure.
2	Innition timing	Distributor	Advanced	Rotate distributor clockwise.
2	Ignition timing	Distributor	Retarded	Rotate distributor counterclockwise.
	Mistory and a food	Oxygen sensor	Suspended	Disconnect oxygen sensor harness connector.
3	Mixture ratio feed- back control	ECM	Operation check	Perform on-board diagnostic system (Diagnostic Test Mode I/II) at 2,000 rpm.
	141	IAA unit	Raised	Turn idle adjusting screw counterclockwise.
4	Idle speed	IAA unn	Lowered	Turn idle adjusting screw clockwise.
	Electric connection	Harness connectors and wires	Poor electric con- nection or faulty wiring	Tap or wiggle.
5	(Electric continu- ity)			Race engine rapidly. See if the torque reaction of the engine unit causes electric breaks.
·			Cooled	Cool with an icing spray or similar device.
6	Intake air temper- ature		Warmed	Heat with a hair drier. [WARNING: Do not overheat the unit.]
7	Moisture	Electric parts	Damp	Wet. [WARNING: Do not directly pour water on components. Use a mist sprayer.]
8	Electric loads	Load switches	Loaded	Turn on head lights, air conditioner, rear defogger, etc.
9	Closed throttle position switch condition	ECM	ON-OFF switching	Perform on-board diagnostic system (Diagnostic Test Mode IV).
10	Ignition spark position	Timing light	Spark power check	Try to flash timing light for each cylinder.



On-board Diagnostic System — Description

The on-board diagnostic system is useful to diagnose malfunctions in major sensors and actuators of the ECCS system. There are 5 modes in the on-board diagnostic system.

- Diagnostic Test Mode I (Oxygen sensor monitor)
- During closed loop operation: The green inspection lamp turns ON when a lean condition is detected and goes OFF under rich condition.
- During open loop operation condition: The green inspection lamp remains OFF or ON.
- Diagnostic Test Mode II (Mixture ratio feedback control monitor)

The green inspection lamp function is the same as Diagnostic Test Mode I.

- During closed loop operation: The red inspection lamp turns ON and OFF simultaneously EF & with the green inspection lamp when the mixture ratio is controlled within the specified value.
- During open loop operation: The red inspection lamp remains ON or OFF.
- Diagnostic Test Mode III (Self-diagnostic results) In this mode the number of both green and red LED's flashing indicates the group to which the malfunctioning part belongs.
- Diagnostic Test Mode IV (Switches ON/OFF diagnostic system)

During this mode, the inspection lamps monitor the switch AT ON-OFF condition.

- Soft closed throttle position switch
- Starter switch
- Vehicle speed sensor
- Diagnostic Test Mode V (Real-time diagnostic system)

The moment the malfunction is detected, the display will be presented immediately. That is, the condition at which the malfunction occurs can be found by observing the inspection lamps during driving test.

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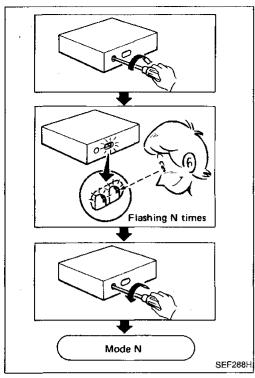
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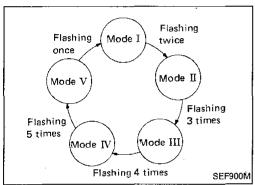
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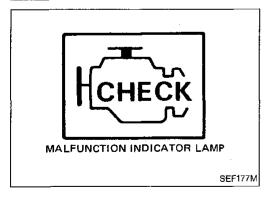
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On-board Diagnostic System — Description (Cont'd)

HOW TO SWITCH THE DIAGNOSTIC MODES

- Turn ignition switch "ON".
- 2. Turn diagnostic test mode selector to ECM (fully clockwise) and wait for inspection lamps to flash.
- Count the number of flashes, and after the inspection lamps have flashed the number of the required mode, immediately turn diagnostic test mode selector fully counterclockwise.
- When the ignition switch is turned off during diagnosis in any mode and then turned on again (after power to the ECM has dropped completely), the diagnosis will automatically return to Diagnostic Test Mode 1.

The stored memory will be lost if:

- 1. Battery terminal is disconnected.
- After selecting Diagnostic Test Mode III, Diagnostic Test Mode IV is selected.

However, if the diagnostic test mode selector is kept turned fully clockwise, it will continue to change in the order of Diagnostic Test Mode I \rightarrow II \rightarrow III \rightarrow IV \rightarrow V \rightarrow I ... etc., and in this state the stored memory will not be erased.

This unit serves as an idle speed feedback control. When the diagnostic test mode selector is turned within the "diagnostic test mode OFF" range, a target engine speed can be selected. Mark the original position of the selector before conducting on-board diagnostic system. Upon completion of on-board diagnostic system, return the selector to the previous position. Otherwise, engine speed may change before and after conducting on-board diagnostic system.

MALFUNCTION INDICATOR LAMP (CHECK

This vehicle has a malfunction indicator lamp on the instrument panel. This light comes ON under the following conditions:

- 1) When ignition switch is turned "ON" (for bulb check).
- When systems related to emission performance malfunction in Diagnostic Test Mode I (with engine running).
- This malfunction indicator lamp always illuminates and is synchronous with red LED.
- Malfunction systems related to emission performance can be detected by on-board diagnostic system, and they are clarified as diagnostic trouble codes in Diagnostic Test Mode III.
- Malfunction indicator lamp will come "ON" only when malfunction is sensed.

The malfunction indicator lamp will turn off when normal operation is resumed. Diagnostic Test Mode III memory must be cleared as the contents remain stored.

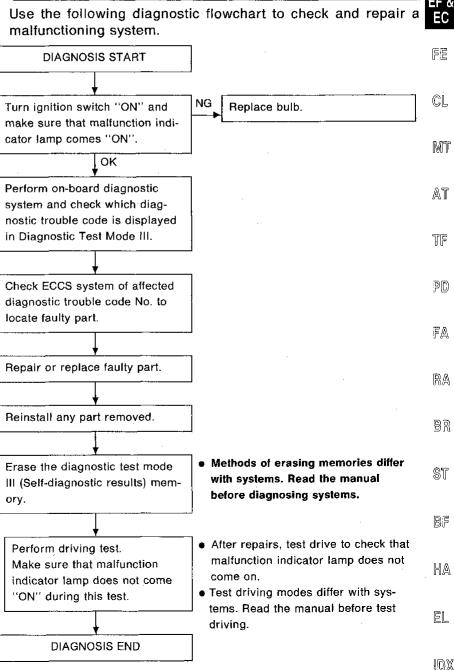
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On-board Diagnostic System — Description (Cont'd)

Diagnostic trouble code No.	Malfunction	
12	Mass air flow sensor circuit	
13	Engine coolant temperature sensor circuit	
14	Vehicle speed sensor circuit	
31	ECM (ECCS control module)	
32	EGR function	
33	Oxygen sensor circuit	
35	EGR temperature sensor circuit	
43	Throttle position sensor circuit	
45	Injector leak	



On-board Diagnostic System — Diagnostic Test Mode I (Oxygen sensor monitor)

This mode checks the oxygen sensor for proper functioning. The operation of the ECM LED in this mode differs with mixture ratio control conditions as follows:

Diagnostic Test Mode	LED	Engine stopped	Engine running	
		(Ignition switch "ON")	Closed loop condition	
Diagnostic Test Mode I (Monitor A)	Green	ON	Blinks	
	Red	ON	ON: when the MALFUNCTION INDICATOR LAMP ITEMS are stored in the ECM OFF: except for the above conditions	

OXYGEN SENSOR FUNCTION CHECK

If the number of LED blinks is less than that specified, replace the oxygen sensor.

If the LED does not blink, check oxygen sensor circuit.

OXYGEN SENSOR CIRCUIT CHECK

See page EF & EC-242.

On-board Diagnostic System — Diagnostic Test Mode II (Mixture ratio feedback control monitor)

This mode checks, through the ECM LED, optimum control of the mixture ratio. The operation of the LED, as shown below, differs with the control conditions of the mixture ratio (for example, richer or leaner mixture ratios, etc., which are controlled by the ECM).

Diagnostic Test LEE	LED	Engine stopped (Ignition switch	Engine running			
		"ON")	Closed loop condition			
	Green	ON	E	Blinks		
Diagnostic Test Mode II (Monitor B)			Compensating mixture ratio			
	Red	OFF	More than 5% rich	Between 5% lean and 5% rich	More	
			OFF	Synchronized with green LED	Remains ON	

If the red LED remains on or off during the closed loop operation, the mixture ratio may not be controlled properly. Using the following procedures, check the related components or adjust the mixture ratio.

COMPONENT CHECK OR MIXTURE RATIO ADJUSTMENT

See page EF & EC-166.

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On-board Diagnostic System — Diagnostic Test Mode III (Self-diagnostic Results)

The ECM constantly monitors the function of these sensors and actuators, regardless of ignition key position. If a malfunction occurs, the information is stored in the ECM and can be retrieved from the memory by turning on the diagnostic test mode selector, located on the side of the ECM. When activated, the malfunction is indicated by flashing a red and a green LED (Light Emitting Diode), also located on the ECM. Since all the self-diagnostic results are stored in the ECM's memory even intermittent malfunctions can be diagnosed.

A malfunction is indicated by the number of both red and green flashing LEDs. First, the red LED flashes and the green flashes follow. The red LED corresponds to units of ten and the green LED corresponds to units of one. For example, when the red LED flashes once and the green LED flashes twice, this signifies the number "12", showing that the mass air flow sensor signal is malfunctioning. All problems are classified by diagnostic trouble code numbers in this way.

- When the engine fails to start, crank it two or more seconds before beginning on-board diagnostic system.
- Read out self-diagnostic results first and then erase the malfunction records which are stored in the ECM memory. If it is erased, the on-board diagnostic system function for intermittent malfunctions will be lost.

DISPLAY DIAGNOSTIC TROUBLE CODE TABLE

Diagnostic trou- ble code No.	Detected items	Availability
11	Camshaft position sensor circuit	Х
12	Mass air flow sensor circuit	X
13	Engine coolant temperature sensor circuit	х
14	Vehicle speed sensor circuit	X
21	Ignition signal missing in primary coil	Χ
31	Engine control module (ECM)	Х
32	EGR function	X
33	Oxygen sensor circuit	X
35	EGR temperature sensor circuit	Х
41	Intake air temperature sensor cir- cuit	X
43	Throttle position sensor circuit	Х
45	Injector leak	X
55	No malfunction in the above circuit	X

X: Available

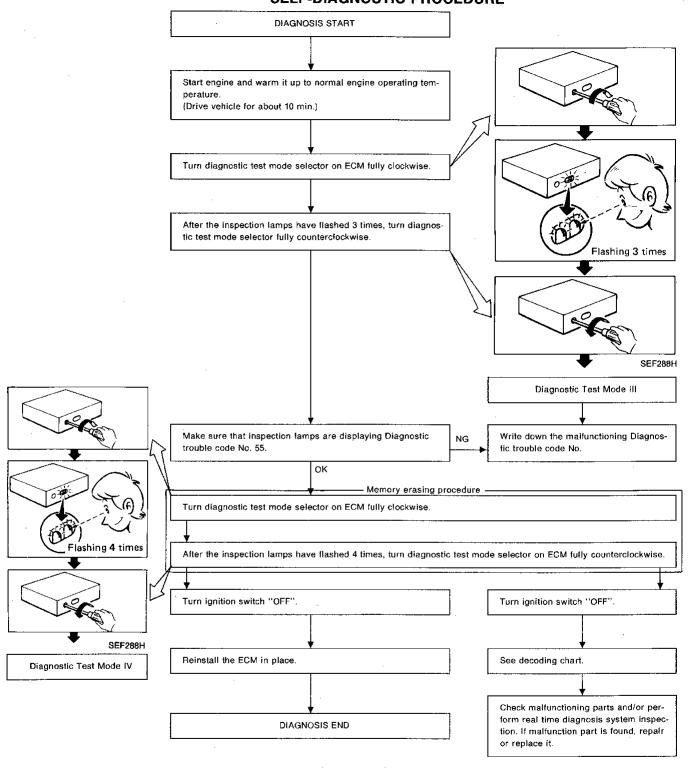
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On-board Diagnostic System — Diagnostic Test Mode III (Self-diagnostic Results) (Cont'd) SELF-DIAGNOSTIC PROCEDURE



CAUTION:

During display of a diagnostic trouble code number in on-board diagnostic system mode (Diagnostic Test Mode III), if another diagnostic test mode is to be performed, be sure to note the malfunction diagnostic trouble code number before turning diagnostic test mode selector on ECM fully clockwise. When selecting an alternative, select the diagnosis mode after turning switch "OFF". Otherwise, on-board diagnostic system information in the ECM memory will be lost.
 Return the DIAGNOSTIC TEST MODE selector to the previous position.

On-board Diagnostic System — Diagnostic Test Mode III (Self-diagnostic Results) (Cont'd) DECODING CHART

DISPLAY DIAGNOSTIC TROUBLE CODE

MALFUNCTIONING CIRCUIT OR PARTS

ECM SHOWS A
MALFUNCTION SIGNAL WHEN
THE FOLLOWING CONDITIONS
ARE DETECTED.

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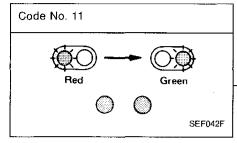
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CAMSHAFT POSITION SENSOR



Camshaft position sensor circuit

Mass air flow sensor circuit

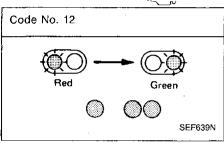
 Either 1° or 180° signal is not entered for the first few seconds during engine cranking.

 Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm.

SYSTEM INSPECTION

See page EF & EC-225.

MASS AIR FLOW SENSOR (CHECK

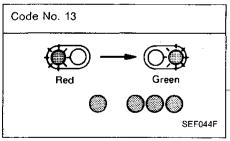


 The mass air flow sensor circuit is open or shorted.
 (An abnormally high or low voltage is entered.)

SYSTEM INSPECTION

See page EF & EC-228.

ENGINE COOLANT TEMPERATURE HERECK SENSOR



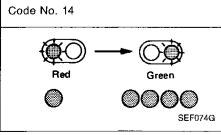
Engine coolant temperature sensor circuit

 The engine coolant temperature sensor circuit is open or shorted.
 (An abnormally high or low output voltage is entered.)

SYSTEM INSPECTION

See page EF & EC-231.

VEHICLE SPEED SENSOR HEHEEK



Vehicle speed sensor circuit

Signal circuit is open.

SYSTEM INSPECTION

See page EF & EC-233.

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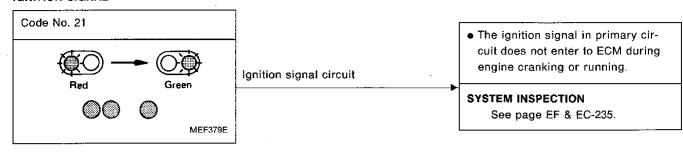
On-board Diagnostic System — Diagnostic Test Mode III (Self-diagnostic Results) (Cont'd)

DISPLAY DIAGNOSTIC TROUBLE CODE

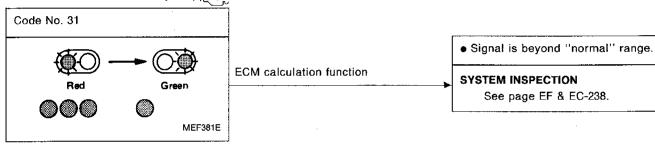
MALFUNCTIONING CIRCUIT OR PARTS

ECM SHOWS A
MALFUNCTION SIGNAL WHEN
THE FOLLOWING CONDITIONS
ARE DETECTED.

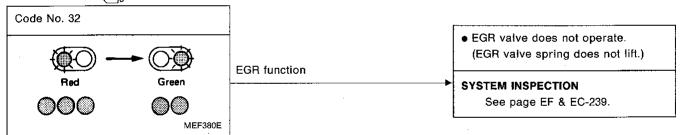
IGNITION SIGNAL



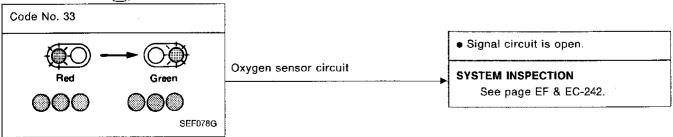
ENGINE CONTROL MODULE (ECM) HOHECK



EGR FUNCTION CHECK



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On-board Diagnostic System — Diagnostic Test Mode III (Self-diagnostic Results) (Cont'd)

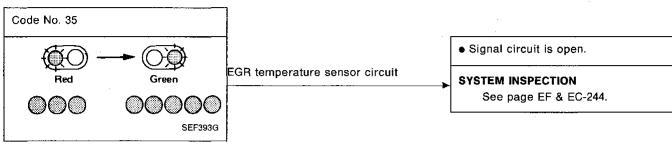
DISPLAY DIAGNOSTIC TROUBLE CODE

MALFUNCTIONING CIRCUIT OR PARTS

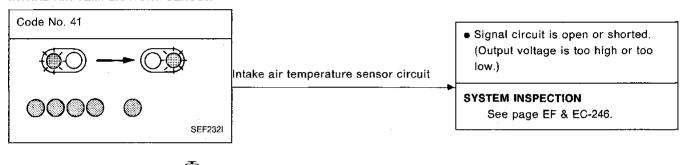
ECM SHOWS A MALFUNCTION SIGNAL WHEN THE FOLLOWING CONDITIONS

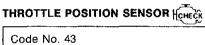
ARE DETECTED.

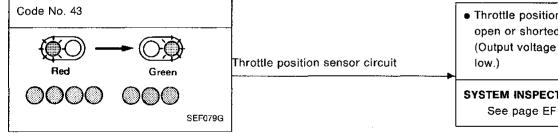




INTAKE AIR TEMPERATURE SENSOR







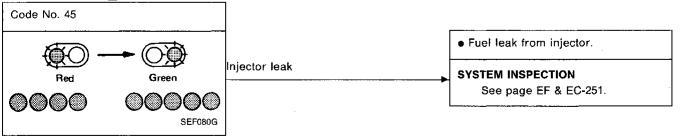
Throttle position sensor circuit is open or shorted.

(Output voltage is too high or too

SYSTEM INSPECTION

See page EF & EC-248.





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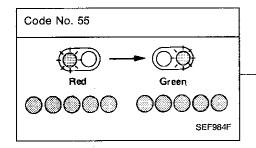
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On-board Diagnostic System — Diagnostic Test Mode III (Self-diagnostic Results) (Cont'd)

DISPLAY DIAGNOSTIC TROUBLE CODE

MALFUNCTIONING CIRCUIT OR PARTS

ECM SHOWS A
MALFUNCTION SIGNAL WHEN
THE FOLLOWING CONDITIONS
ARE DETECTED.



Normal operation.

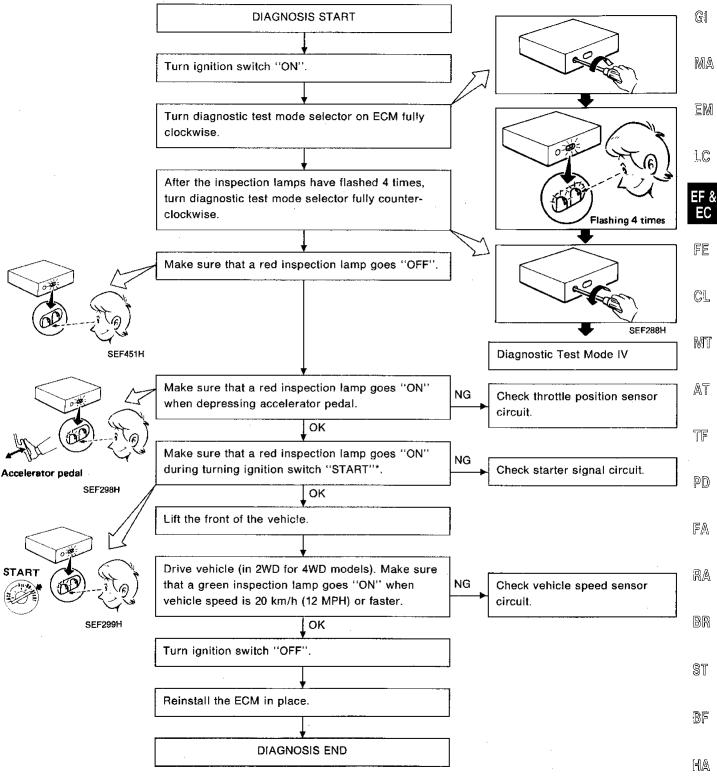
On-board Diagnostic System — Diagnostic Test Mode IV (Switches ON/OFF diagnostic system)

In switches ON/OFF diagnosis system, ON/OFF operation of the following switches can be detected continuously.

- Soft closed throttle position switch
- Starter switch
- Vehicle speed sensor
- (1) Soft closed throttle position switch & Starter switch The switches ON/OFF status in mode IV is stored in ECM memory. When either switch is turned from "ON" to "OFF" or "OFF" to "ON", the red LED on ECM alternately comes on and goes off each time switching is performed.
- (2) Vehicle Speed Sensor
 The switches ON/OFF status in mode IV is selected is stored in ECM memory. The green LED on ECM remains off when vehicle speed is 20 km/h (12 MPH) or below, and comes ON at higher speeds.

On-board Diagnostic System — Diagnostic Test Mode IV (Switches ON/OFF diagnostic system) (Cont'd)

SELF-DIAGNOSTIC PROCEDURE



CAUTION:

• For safety, do not drive rear wheels at higher speed than required.

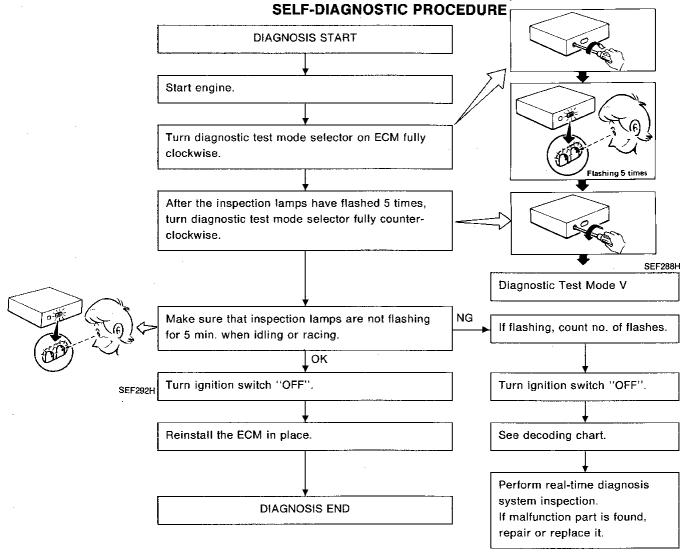
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On-board Diagnostic System — Diagnostic Test Mode V (Real-time diagnostic system)

In real-time diagnosis, if the following items are judged to be working incorrectly, a malfunction will be indicated immediately.

- Camshaft position sensor (180° signal & 1° signal) output signal
- Ignition signal
- Mass air flow sensor output signal

Consequently, this diagnosis very effectively determines whether the above systems cause the malfunction, during driving test. Compared with on-board diagnostic system, real-time diagnosis is very sensitive and can detect malfunctions instantly. However, items regarded as malfunctions in this diagnosis are not stored in ECM memory.



CAUTION:

In real-time diagnosis, pay attention to inspection lamp flashing. ECM displays the diagnostic trouble code only once and does not memorize the inspection.

On-board Diagnostic System — Diagnostic Test Mode V (Real-time diagnostic system) (Cont'd)

DISPLAY DIAGNOSTIC TROUBLE CODE

MALFUNCTIONING CIRCUIT OR PARTS

ECM SHOWS A

MALFUNCTION SIGNAL WHEN THE FOLLOWING CONDITIONS

ARE DETECTED.

(Compare with On-board diag-

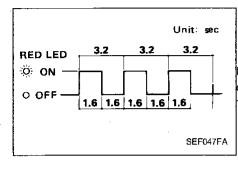
nostic system

- Diagnostic Test Mode III.)

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CAMSHAFT POSITION SENSOR



Malfunction of camshaft position sensor circuit

 The 1° or 180° signal is momentarily missing, or, multiple, momentary noise signals enter.

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REAL-TIME DIAGNOSTIC INSPECTION

See page EF & EC-190.

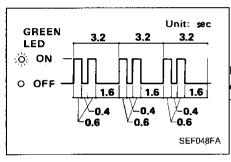
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MASS AIR FLOW SENSOR



Malfunction of mass air flow sensor circuit Abnormal, momentary increase in mass air flow sensor output signal

REAL-TIME DIAGNOSTIC INSPECTION

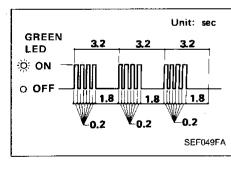
See page EF & EC-191.

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IGNITION SIGNAL



Malfunction of ignition signal

 Signal from the primary ignition coil momentarily drops off.

REAL-TIME DIAGNOSTIC INSPECTION

See page EF & EC-192.

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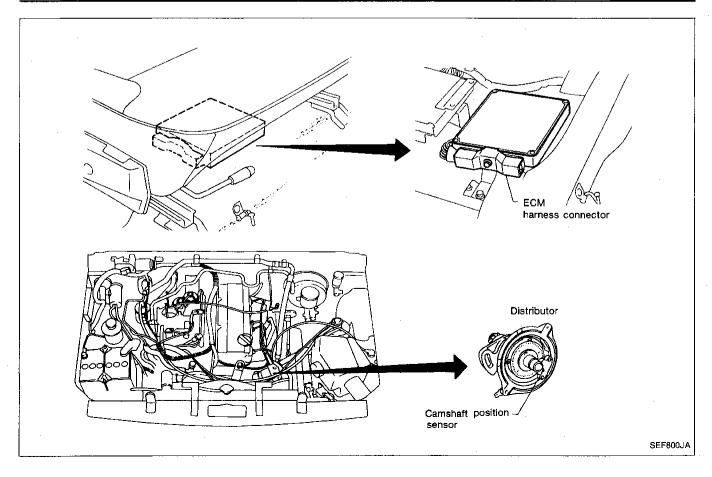
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On-board Diagnostic System — Diagnostic Test Mode V (Real-time diagnostic system) (Cont'd) REAL-TIME DIAGNOSTIC INSPECTION

Camshaft Position Sensor

X: Available
---: Not available

Check sequence	Check items	Check conditions		Check parts		
			Middle connectors	Sensor & actuator	ECM harness connector	If malfunction, perform the following items.
1	Tap harness connector or component during real-time diagnosis.	During real- time diagno- sis	х	Х	x	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	x		<u>—</u> :	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	x	_	×	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped			Х	Take out bend.
5	Reconnect harness con- nector and then recheck harness continuity at con- nector.	Engine stopped	×		_	Replace terminal.
6	Tap harness connector or component during real-time diagnosis.	During real- time diagno- sis	X	X	×	If diagnostic trouble codes are displayed during real-time diagnosis, replace terminal.

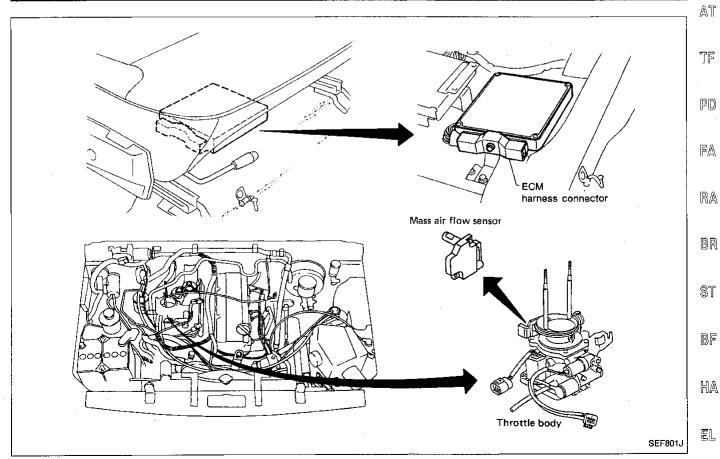


On-board Diagnostic System — Diagnostic Test Mode V (Real-time diagnostic system) (Cont'd)

Mass Air Flow Sensor

X: Available —: Not available

				Check parts		GI	
Check sequence	Check items	Check conditions	Middle connectors	Sensor & actuator	ECM harness connector	If malfunction, perform the following items.	_ MA
1	Tap harness connector or component during real-time diagnosis.	During real- time diagno- sis	x	x	х	Go to check item 2.	em
2	Check harness continuity at connector.	Engine stopped	×	_		Go to check item 3.	•
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	x	_	x	Clean terminal surface.	EF &
4	Check pin terminal bend.	Engine stopped	_		х	Take out bend.	
5	Reconnect harness con- nector and then recheck harness continuity at con- nector.	Engine stopped	х		_	Replace terminal.	FE CL
6	Tap harness connector or component during real-time diagnosis.	During real- time diagno- sis	X	x	x	If diagnostic trouble codes are displayed during real-time diagnosis, replace terminal.	MT



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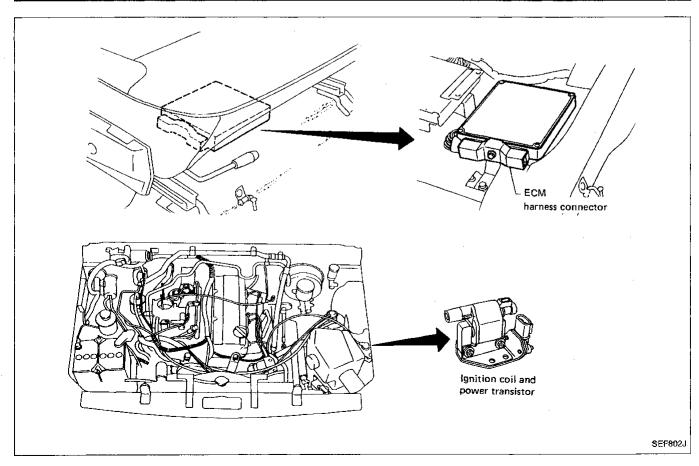
On-board Diagnostic System — Diagnostic Test Mode V (Real-time diagnostic system) (Cont'd)

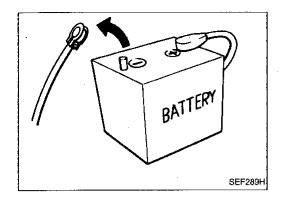
Ignition Signal

X: Available

—: Not available

Check sequence	Check items	Check conditions		Check parts		
			Middle connectors	Sensor & actuator	ECM harness connector	If malfunction, perform the following items.
1	Tap harness connector or component during real-	During real- time diagno-	X	х	х	Go to check item 2.
	time diagnosis.	sis				
2	Check harness continuity at connector.	Engine stopped	х	-	_	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	х		х	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	_		х	Take out bend.
5	Reconnect harness con- nector and then recheck harness continuity at con- nector.	Engine stopped	Х	_		Replace terminal.
6	Tap harness connector or component during real-time diagnosis.	During real- time diagno- sis	x	x	×	If diagnostic trouble codes are displayed during real-time diagnosis, replace terminal.





Protector

OLD ONE

SEF290H

SEF291H

Diagnostic Procedure

CAUTION:

Before connecting or disconnecting the ECM harness connector to or from any ECM, be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage ECM as battery voltage is applied to ECM even if ignition switch is turned off. Failure to do so may damage the ECM.

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When performing ECM input/output signal inspection, remove connector protector to insert tester probe into connector.

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When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals.

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Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.

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Before replacing ECM, perform ECM input/output signal inspection and make sure whether the ECM unit functions properly or not. (See page EF & EC-275.)

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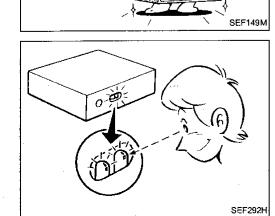
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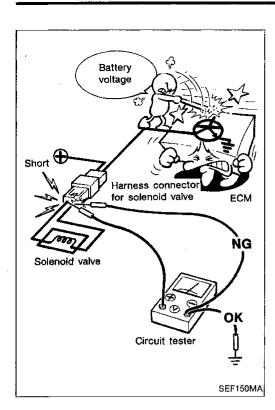
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Perform ECM input/output signal

inspection before replacement.

> After performing this "Diagnostic Procedure", perform ECCS on-board diagnostic system and driving test.



Diagnostic Procedure (Cont'd)

7. When measuring ECM controlled components supply voltage with a circuit tester, separate one tester probe from the other.

If the two tester probes accidentally make contact with each other during measurement, the circuit will be shorted, resulting in damage to the ECM power transistor.

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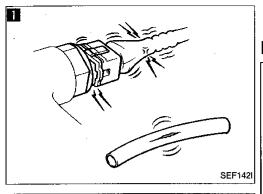
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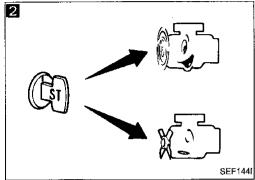
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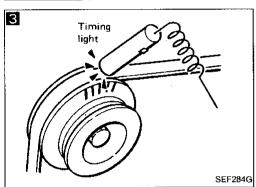
HA

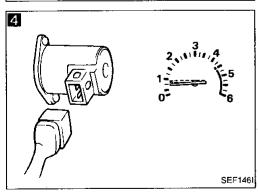
訌

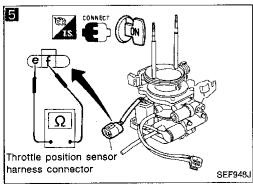
1DX







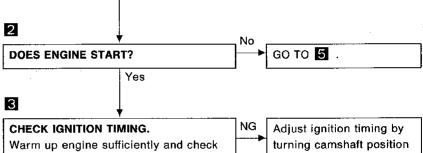




Basic Inspection

BEFORE STARTING

- 1. Check service records for any recent repairs that may indicate a related problem, or the current need for scheduled maintenance.
- 2. Open engine hood and check the following:
- · Harness connectors for proper connections
- Vacuum hoses for splits, kinks, and proper connections
- Wiring for proper connections, pinches, and cuts



4 CHECK IDLE ADJ. SCREW INITIAL SET

ignition timing at idle using timing light.

OK

OK

(Refer to page EF & EC-166.) Ignition timing: $10^{\circ} \pm 2^{\circ}$ BTDC

When disconnecting IACV-AAC valve harness connector, does engine speed fall to 650 ± 50 rpm (A/T in "N" position)?

Adjust engine speed by turning idle adjusting screw.

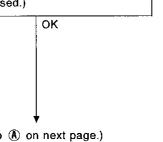
sensor.

NG

CHECK THROTTLE POSITION SENSOR IDLE POSITION.

5

Measure output voltage of throttle position sensor using voltmeter, and check that it is approx. 0.4 to 0.6V. (Throttle valve fully closed.)

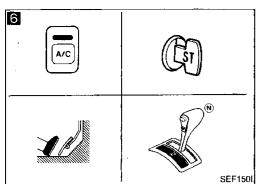


- 1. Adjust output voltage by rotating throttle sensor body.
- 2. Disconnect throttle position sensor harness connector for a few seconds and then reconnect it.
- 3. Confirm that "Closed throttle position" stays "ON". Refer to page EF & EC-282.

(Go to (A) on next page.)

EF & EC-195

Basic Inspection (Cont'd)





CHECK SWITCH INPUT SIGNAL.

6

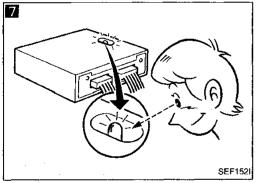
Remove ECM from front floor panel and check the above switches' ON-OFF operation using voltmeter at each ECM terminal.

Switch	Condition	Voltage (V)		
Start signal	IGN ON →	0 → 9 - 12V		
Start Signal	IGN START			
	Engine			
	warmed up	Battery volt-		
Closed throt-	sufficiently			
tle position	Idle position			
tie position	→ Depress	age → 0V		
	the accelera-			
	tor pedal.			
	A/C OFF →			
A/C signal	A/C ON	Battery volt-		
A/O signai	(Engine run-	age → 0V		
	ning)			
	Shift lever is			
Neutral	"N" or "P"			
(Parking)	position →	0 → 6 - 7		
position	Except "N"			
switch	and "P"			
	positions			

Repair or replace the malfunctioning switch or its circuit.

NG

Yes

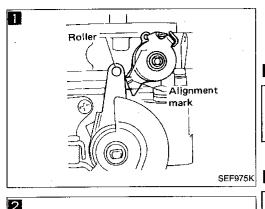


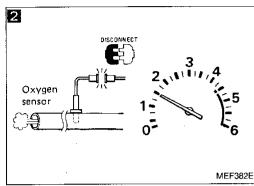
READ SELF-DIAGNOSTIC RESULTS.

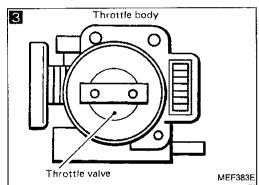
- Set Diagnostic Test Mode III (self-diagnostic results). (Refer to page EF & EC-181.)
- Count the number of RED and GREEN LED flashes and read out the diagnostic trouble codes.
- 3. Are the diagnostic trouble codes being output?

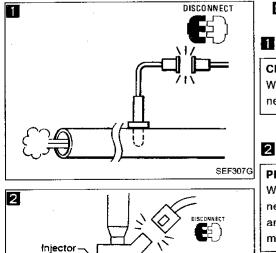
INSPECTION END

Go to the relevant inspection procedure.

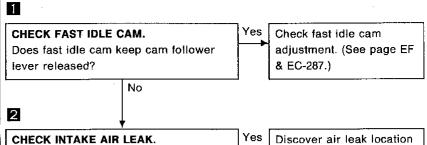






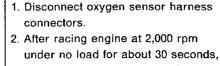


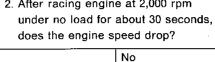
Diagnostic Procedure 1 — High Idling after Warm-up

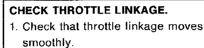


NG

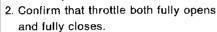
Yes







3



OK INSPECTION END Discover air leak location and repair.

Repair throttle linkage or

sticking of throttle valve.

FE

LC

GI

MA

EM

MT

AT

TF

PD

FA

RA

Diagnostic Procedure 2 — Hunting

CHECK OXYGEN SENSORS.

When disconnecting oxygen sensor harness connectors, is the hunting fixed?

2

PERFORM POWER BALANCE TEST.

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

(Go to (A) on next page.)

Yes

Check oxygen sensor.

Go to 4 .

(See page EF & EC-242.)

BR

ST

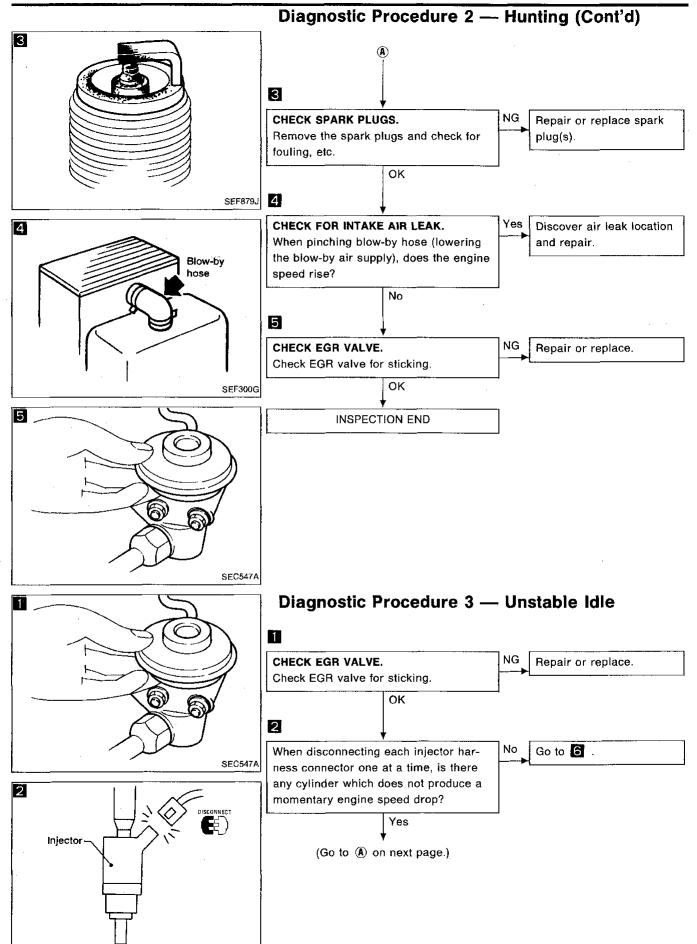
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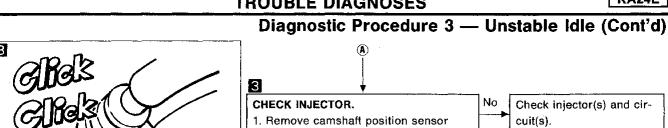
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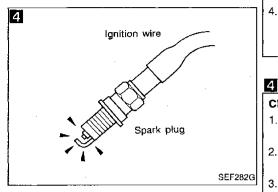
PD

停風

RA

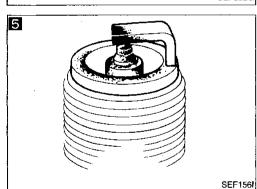
BR

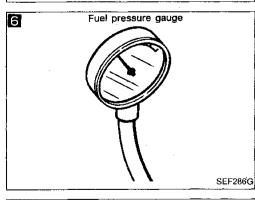


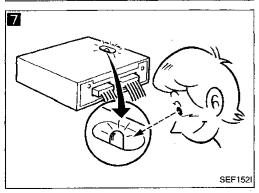


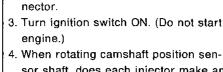
Injector

SEF280G









2. Disconnect ignition coil harness con-

with distributor from engine. (Harness connector should remain connected.)

sor shaft, does each injector make an operating sound? Yes

CHECK IGNITION SPARK.

- 1. Disconnect ignition wire from rocker
- 2. Connect a known good spark plug to the ignition wire.
- 3. Place end of spark plug against a suitable ground and crank engine.
- 4. Check for spark.

5

6

OK NG Repair or replace spark

NG

Check ignition coil, power

transistor unit and their

circuits. (See page EF &

EC-235.)

plug(s).

cuit.

CHECK SPARK PLUGS. Remove the spark plugs and check for fouling, etc. OK

CHECK FUEL PRESSURE.

- 1. Release fuel pressure to zero. (Refer to page EF & EC-286.)
- 2. Install fuel pressure gauge and check fuel pressure.

At idle:

Approx. 226 kPa (2.3 kg/cm², 33 psi) OK

1. Set Diagnostic Test Mode I (oxygen sensor monitor). (See page EF & EC-180.)

2. Maintaining engine at 2,000 rpm under no-load, check to make sure that RED LED on the ECM goes ON and OFF more than 5 times during 10 seconds.

(Go to B) on next page.)

Loĸ

Replace oxygen sensor(s).

Check fuel pump and cir-

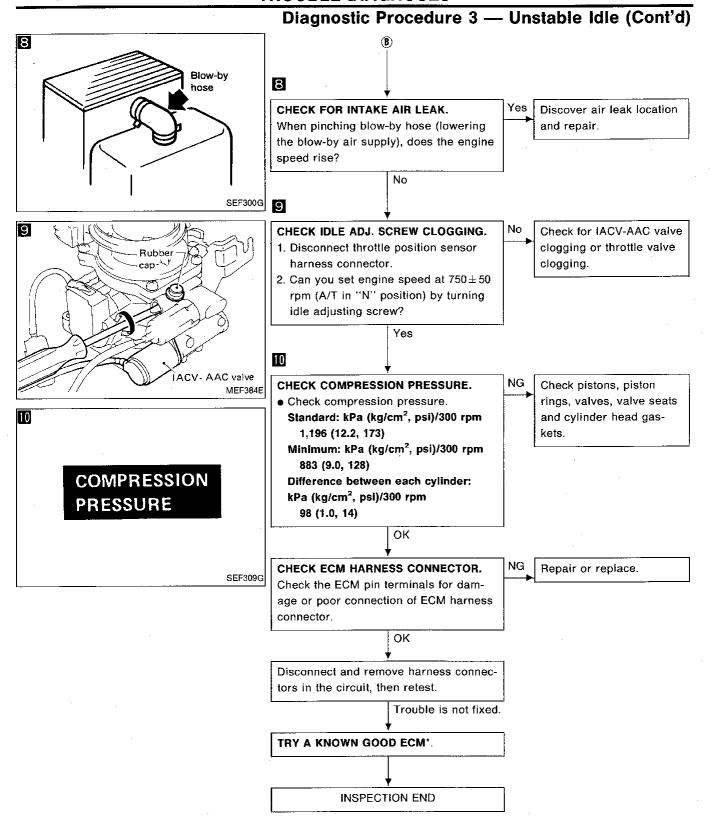
ST

85

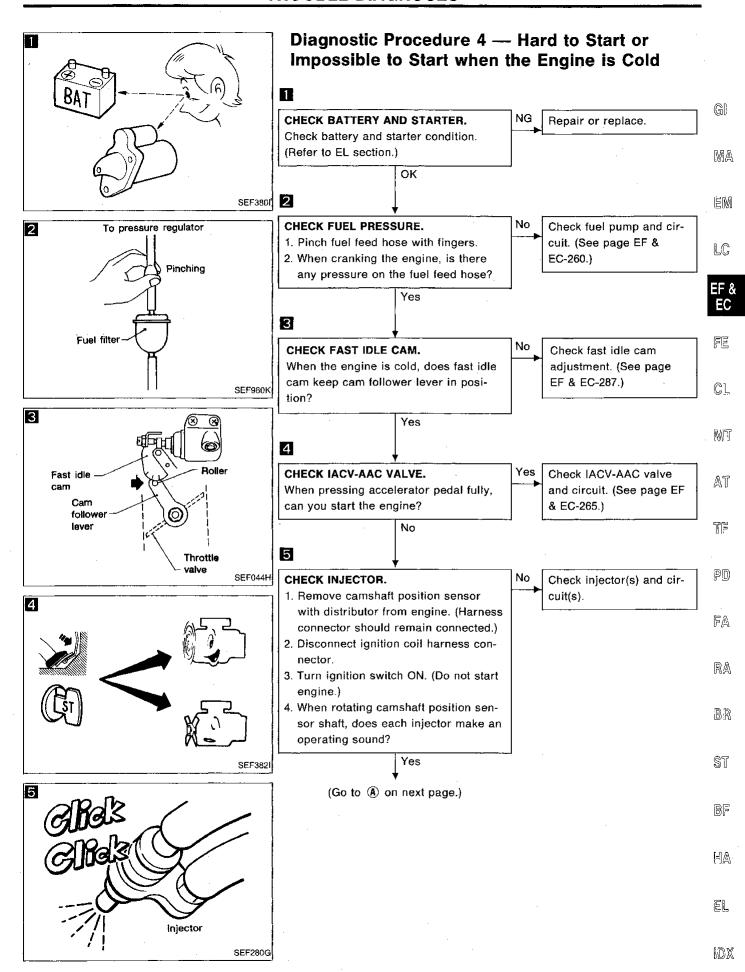
HA

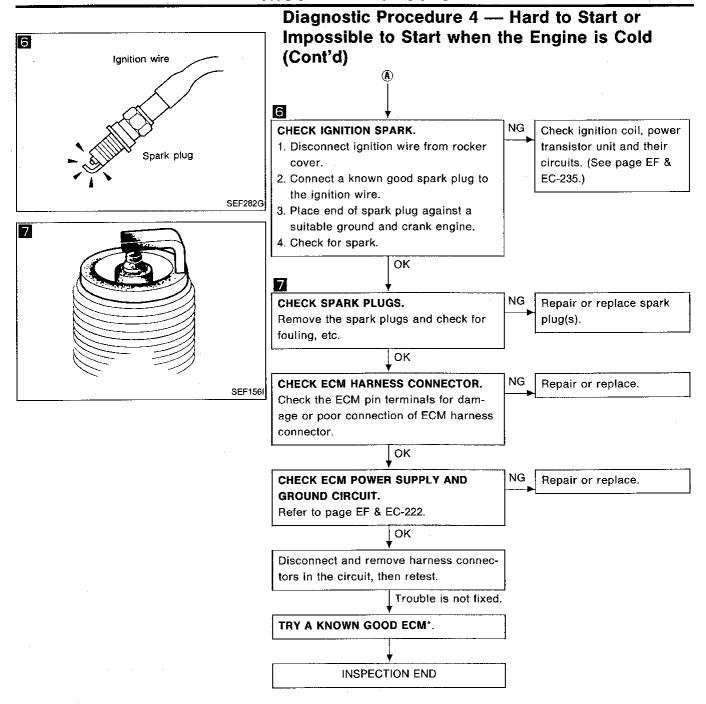
EL

IDX

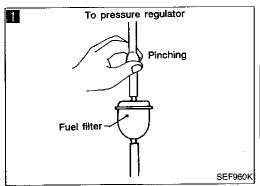


^{*:} ECM may be the cause of a problem, but this is rarely the case.



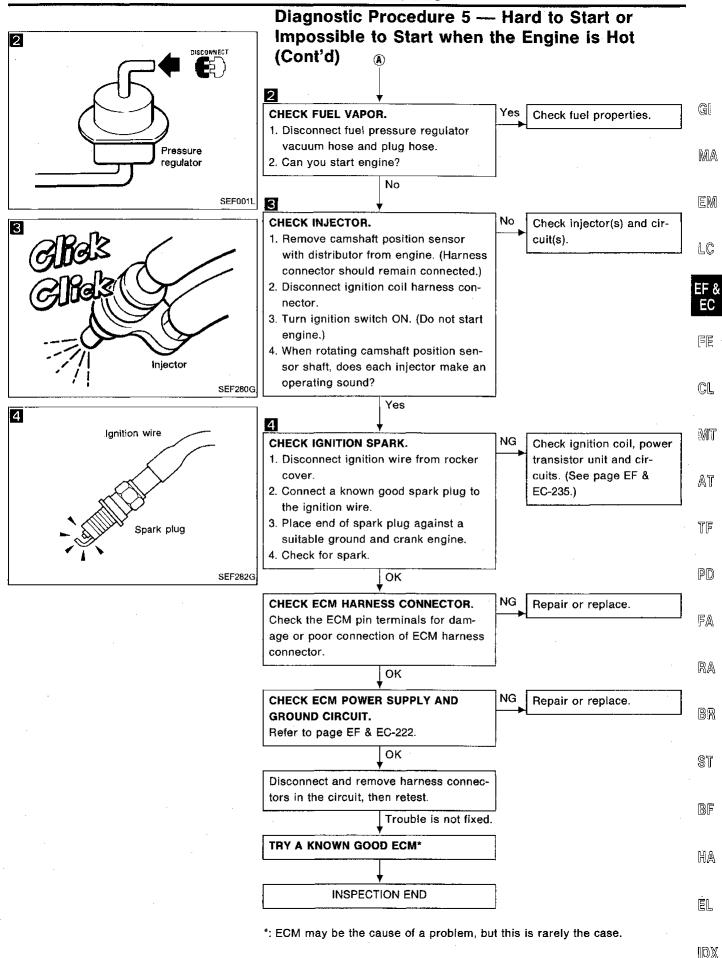


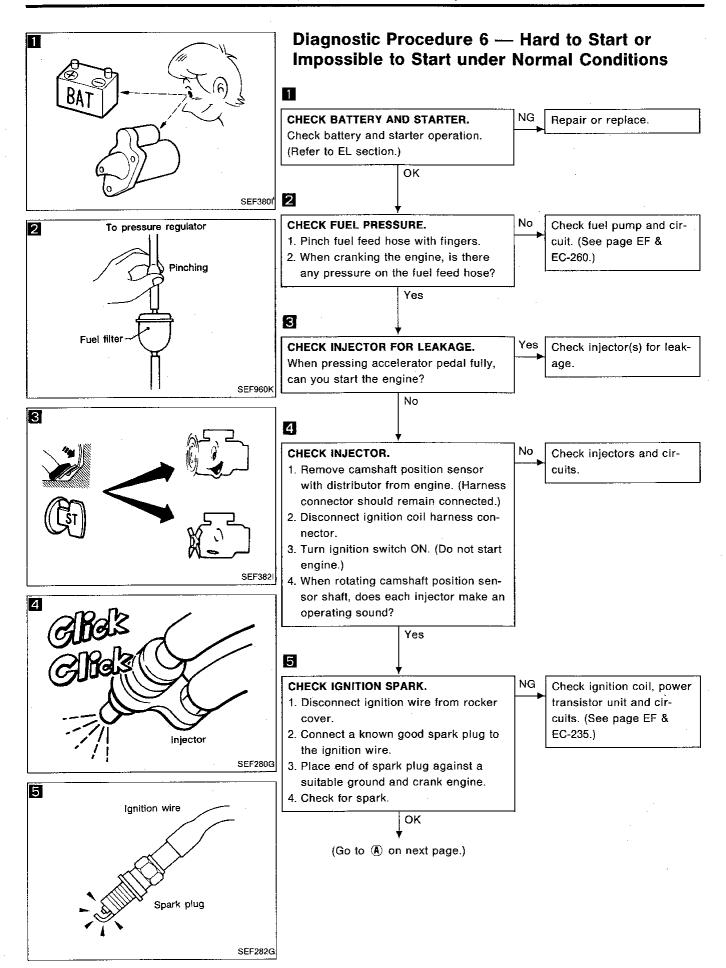
*: ECM may be the cause of a problem, but this is rarely the case.

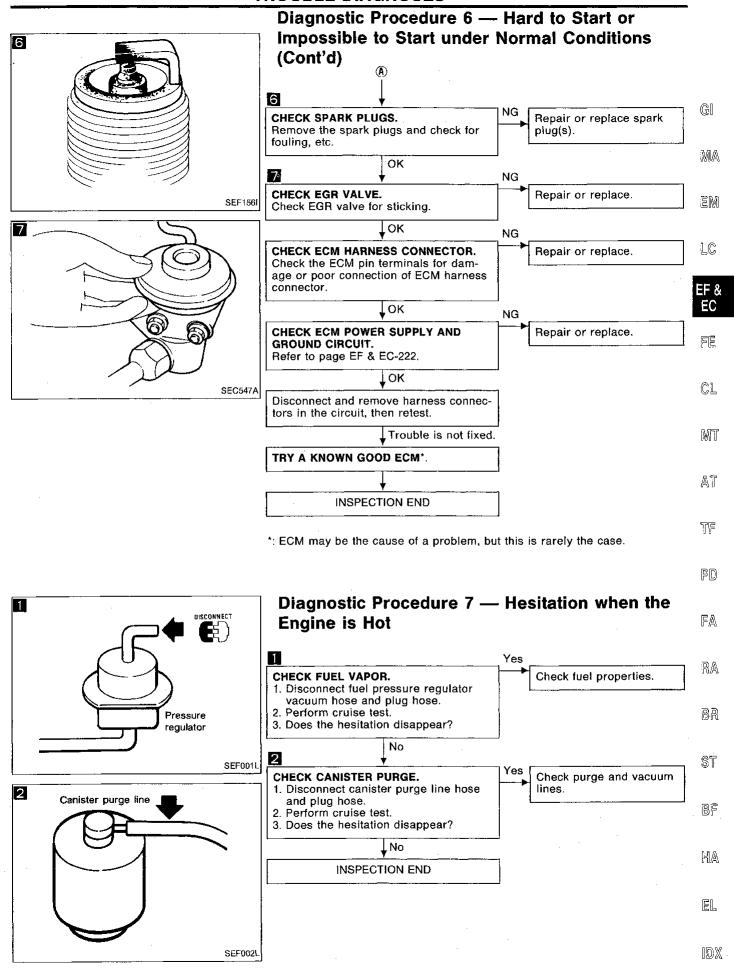


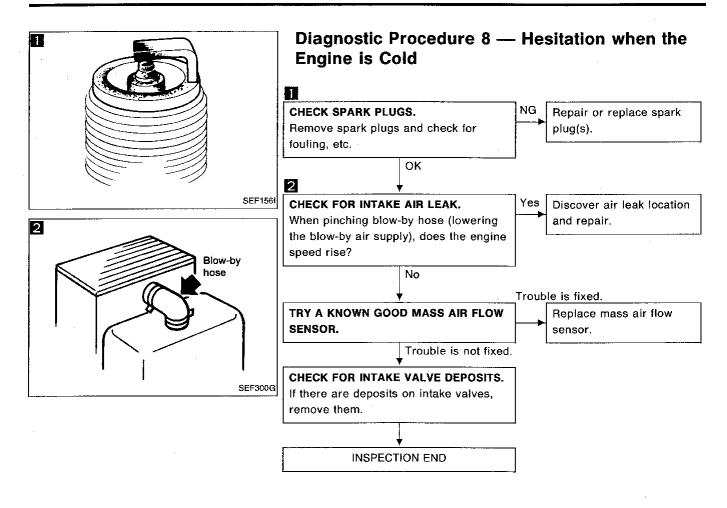
Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot

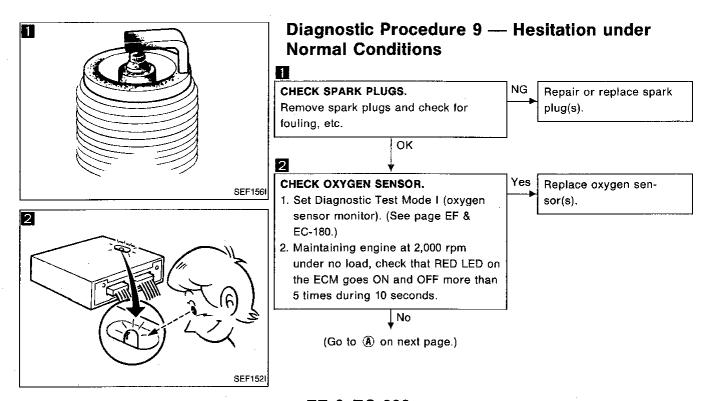
CHECK FUEL PRESSURE. 1. Pinch fuel feed hose with fingers. 2. When cranking the engine, is there any pressure on the fuel feed hose? Yes (Go to (A) on next page.)

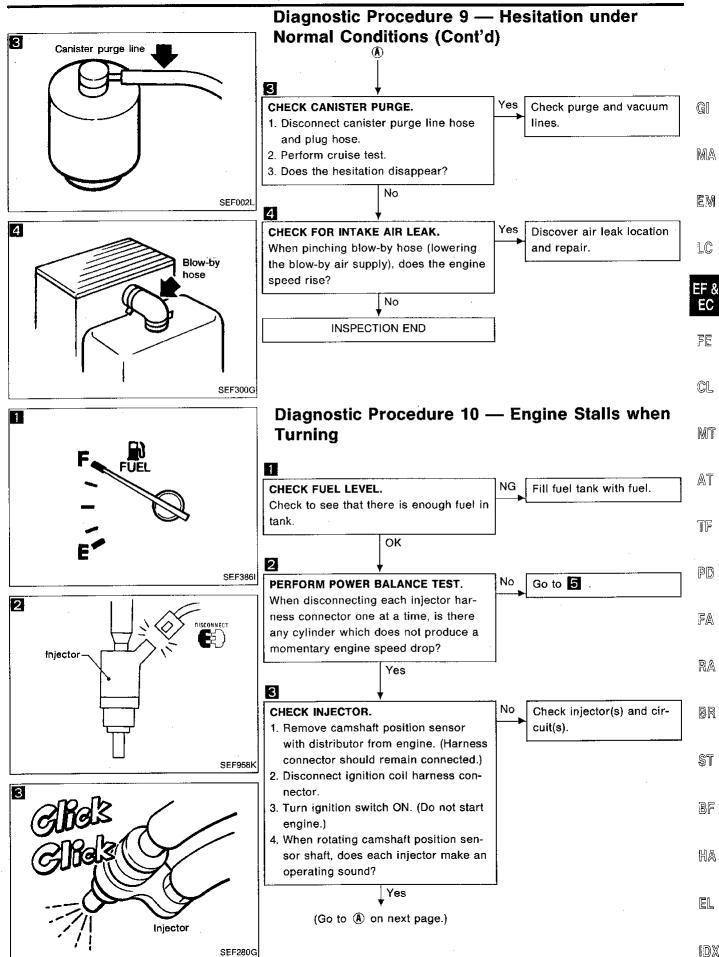


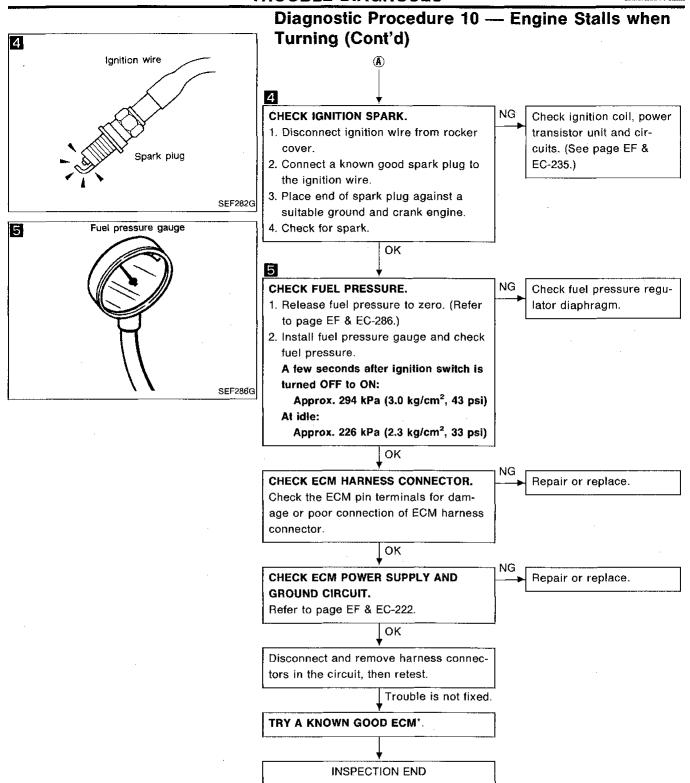




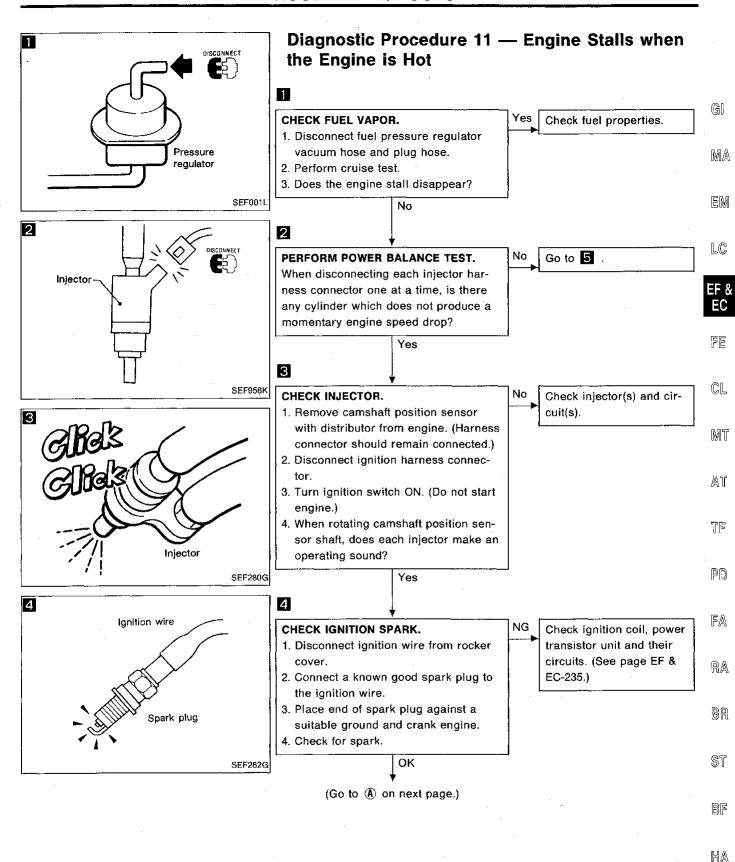






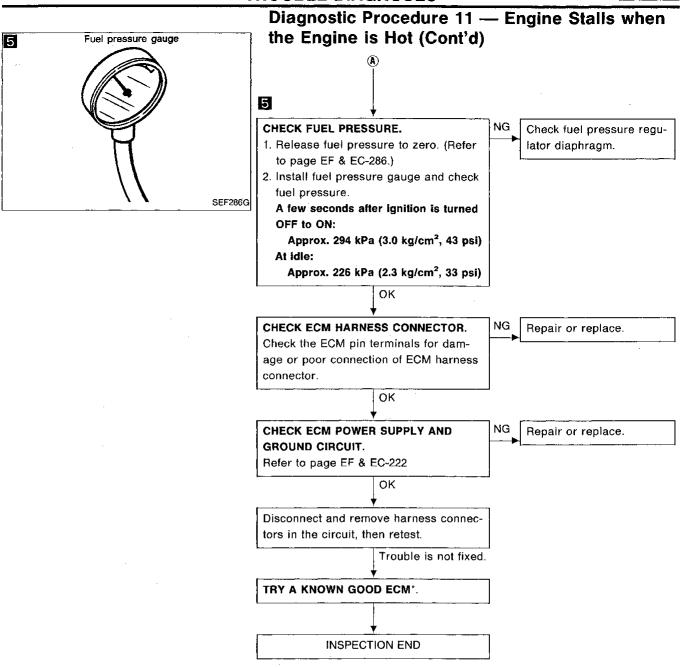


^{*:} ECM may be the cause of a problem, but this is rarely the case.

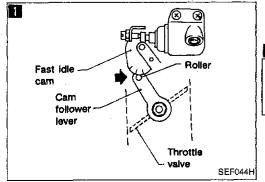


IDX

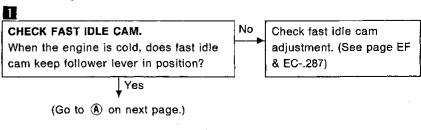
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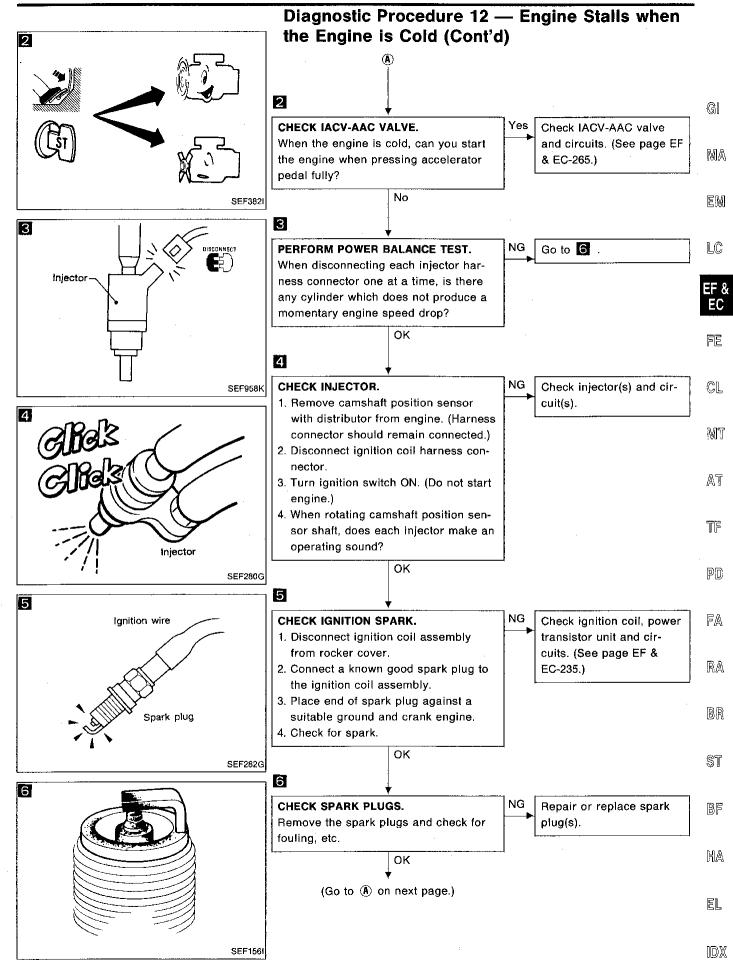


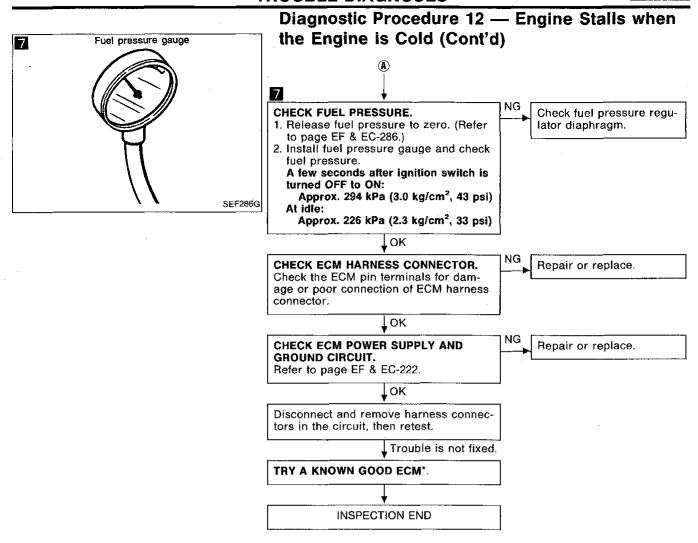
*: ECM may be the cause of a problem, but this is rarely the case.



Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold

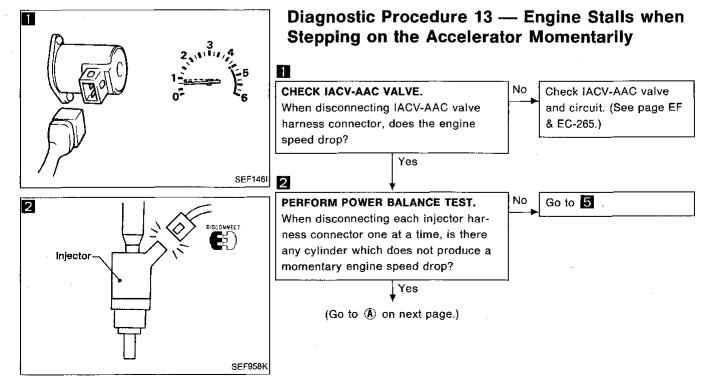


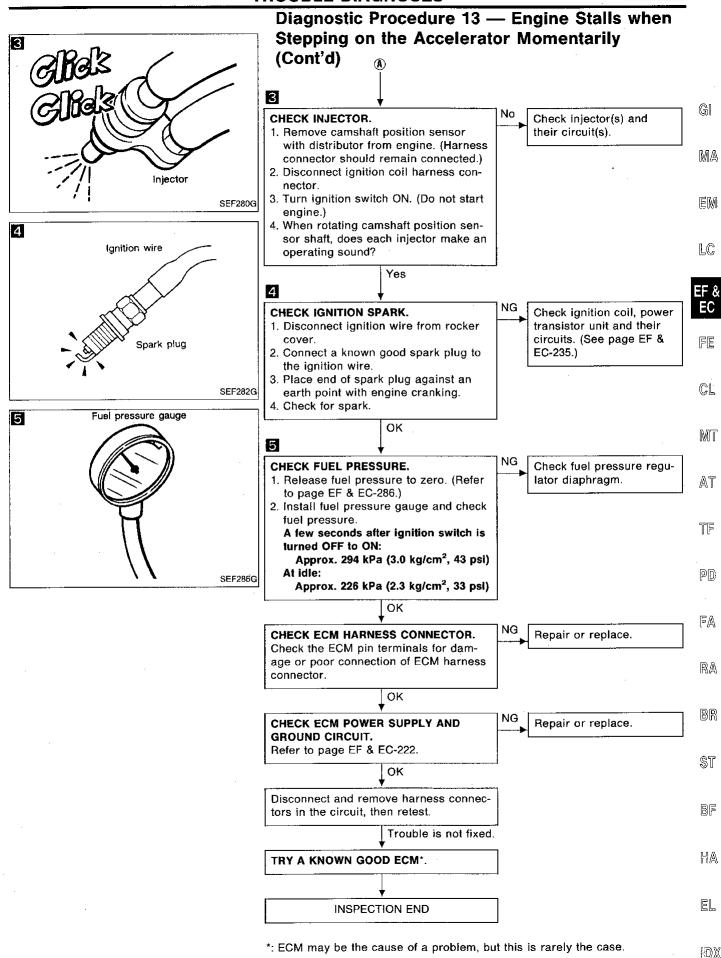


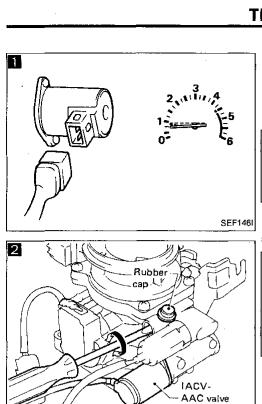


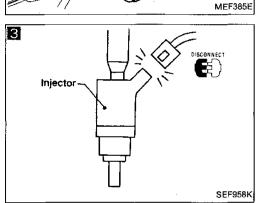


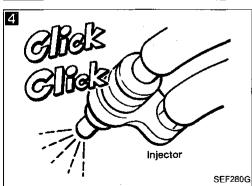
*: ECM may be the cause of a problem, but this is rarely the case.

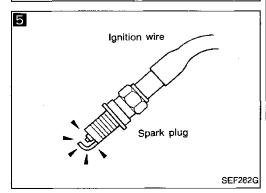












Diagnostic Procedure 14 — Engine Stalls after Decelerating

No

1

CHECK IACV-AAC VALVE.

When disconnecting IACV-AAC valve harness connector, does the engine speed drop?

Check IACV-AAC valve and circuit. (See page EF & EC-265.)

2

CHECK IDLE ADJ. SCREW CLOGGING.

Yes

- Disconnect IACV-AAC valve harness connector.
- Can you set engine speed at 650±50 rpm (A/T in "N" position) by turning idle adjusting screw?

Check for IACV-AAC valve clogging or throttle body clogging.

Go to 6 .

cuit(s).

NG

3

4

PERFORM POWER BALANCE TEST.

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes

Yes

CHECK INJECTOR.

- Remove camshaft position sensor with distributor from engine. (Harness connector should remain connected.)
- Disconnect ignition coil harness connector.
- Turn ignition switch ON. (Do not start engine.)
- 4. When rotating camshaft position sensor shaft, does each injector make an operating sound?

Yes

5

CHECK IGNITION SPARK.

- Disconnect ignition wire from rocker cover.
- Connect a known good spark plug to the ignition wire.
- Place end of spark plug against a suitable ground and crank engine.

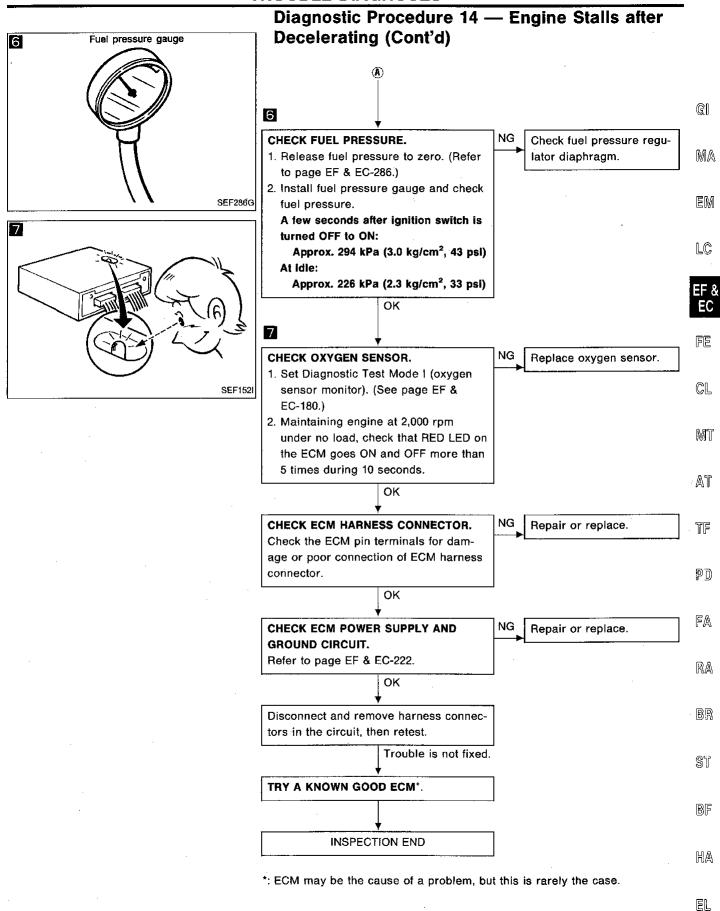
4. Check for spark.

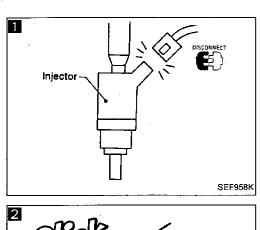
OK

(Go to (A) on next page.)

Check ignition coil, power transistor unit and circuits. (See page EF & EC-235.)

Check injector(s) and cir-





Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed

PERFORM POWER BALANCE TEST.

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Go to 4.



CHECK INJECTOR.

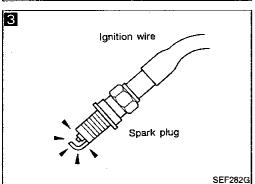
1. Remove camshaft position sensor with distributor from engine. (Harness connector should remain connected.)

Yes

- 2. Disconnect ignition coil harness con-
- 3. Turn ignition switch ON. (Do not start engine.)
- 4. When rotating camshaft position sensor shaft, does each injector make an operating sound?

Yes

Check injector(s) and circuit(s).



Injector

SEF280G

CHECK IGNITION SPARK.

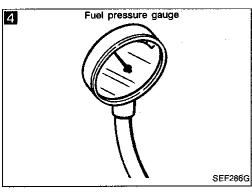
- 1. Disconnect ignition wire from rocker cover.
- 2. Connect a known good spark plug to the ignition wire.
- 3. Place end of spark plug against a suitable ground and crank engine.
- 4. Check for spark.

Check ignition coil, power transistor unit and circuits. (See page EF & EC-235.)

NG

NG

Yes



4

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-286.)

OK

2. Install fuel pressure gauge and check fuel pressure.

A few seconds after ignition switch is turned OFF to ON:

Approx. 294 kPa (3.0 kg/cm², 43 psi)

Approx. 235 kPa (2.4 kg/cm², 34 psi)

OK

Check fuel pump, circuit and fuel pressure regulator.

Discover air leak location

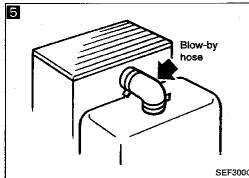
and repair.



CHECK FOR INTAKE AIR LEAK.

When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

(Go to (A) on next page.)



EF & EC-216

MA

EM

LC

CL

MT

AT

TF

PD

FA

RA

BR

ST

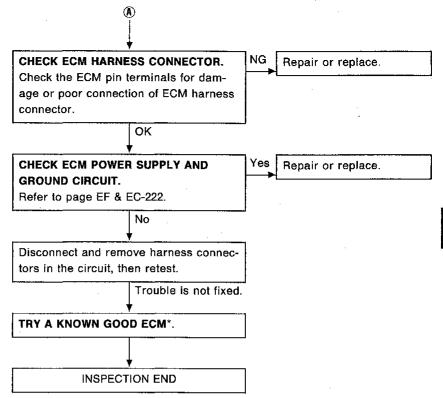
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HA

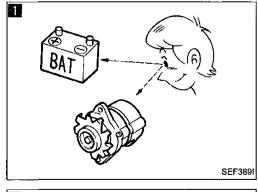
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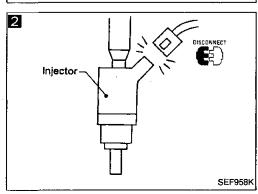
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Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed (Cont'd)

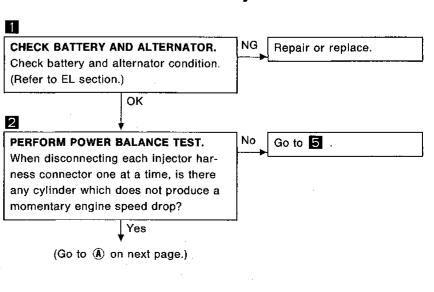


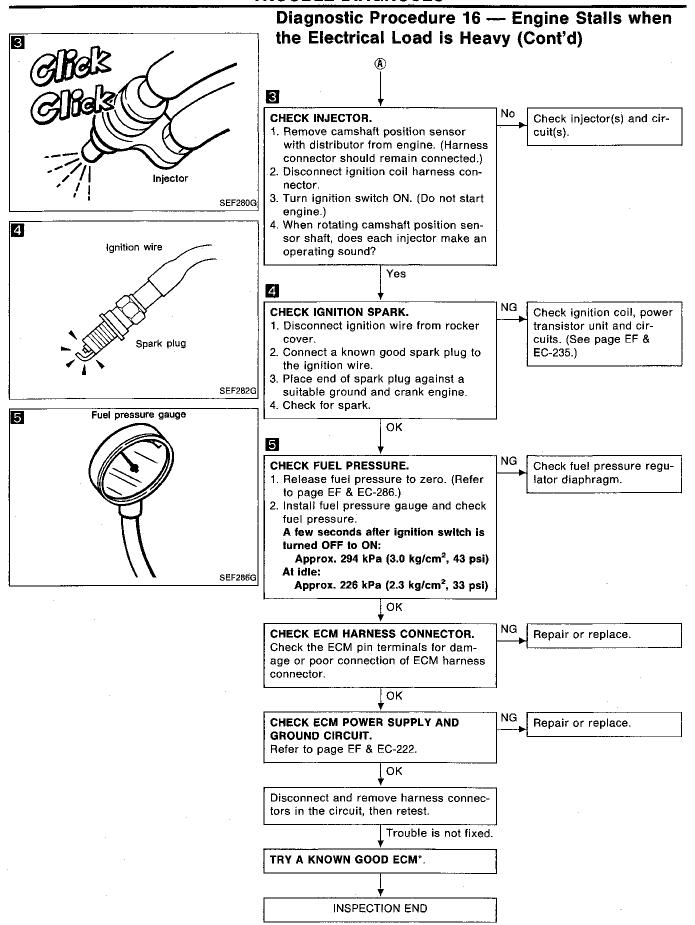
*: ECM may be the cause of a problem, but this is rarely the case.





Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy





^{*:} ECM may be the cause of a problem, but this is rarely the case.

AM

EM

LC

EC

FE

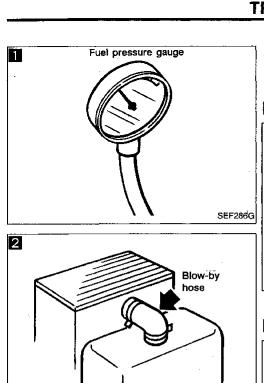
CL

MT

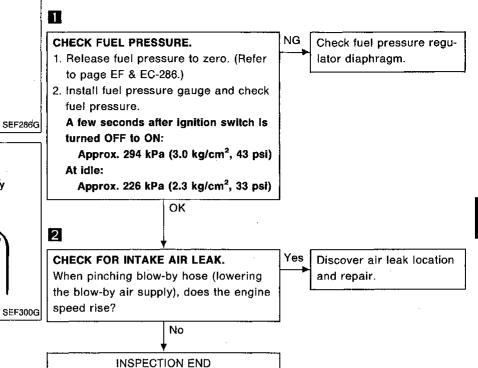
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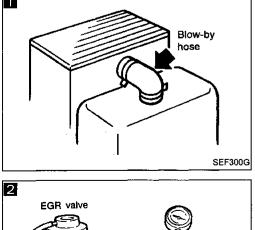
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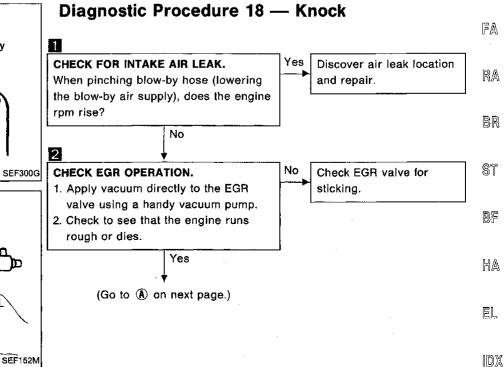
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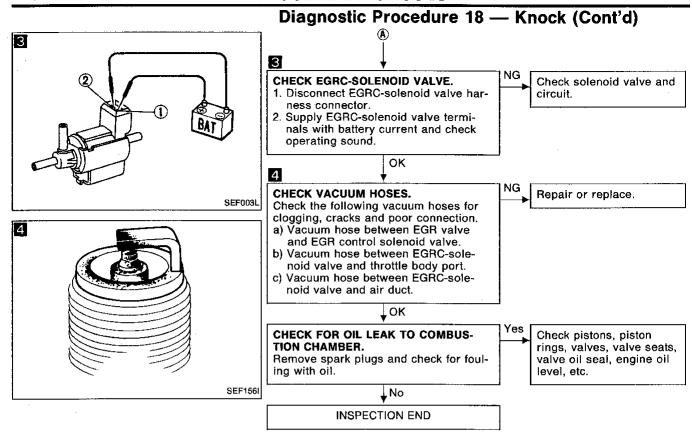


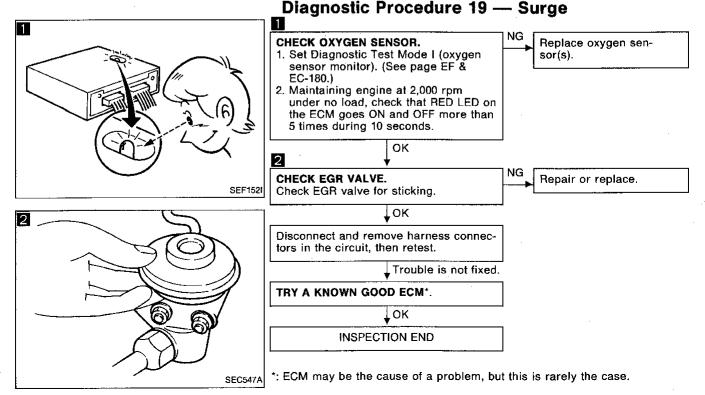
Diagnostic Procedure 17 — Lack of Power and Stumble

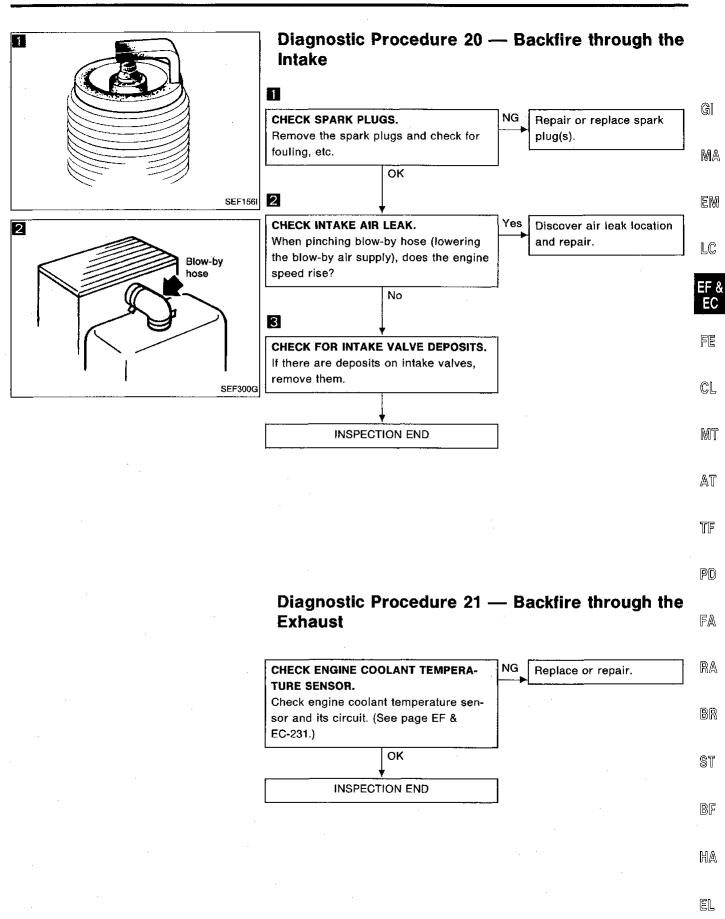






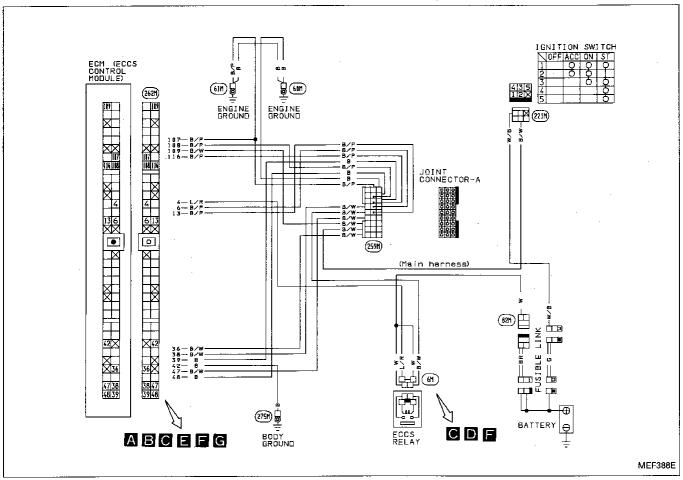




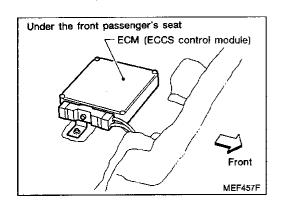


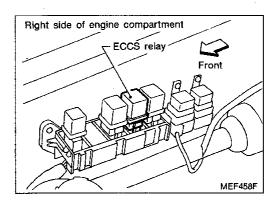
Diagnostic Procedure 22

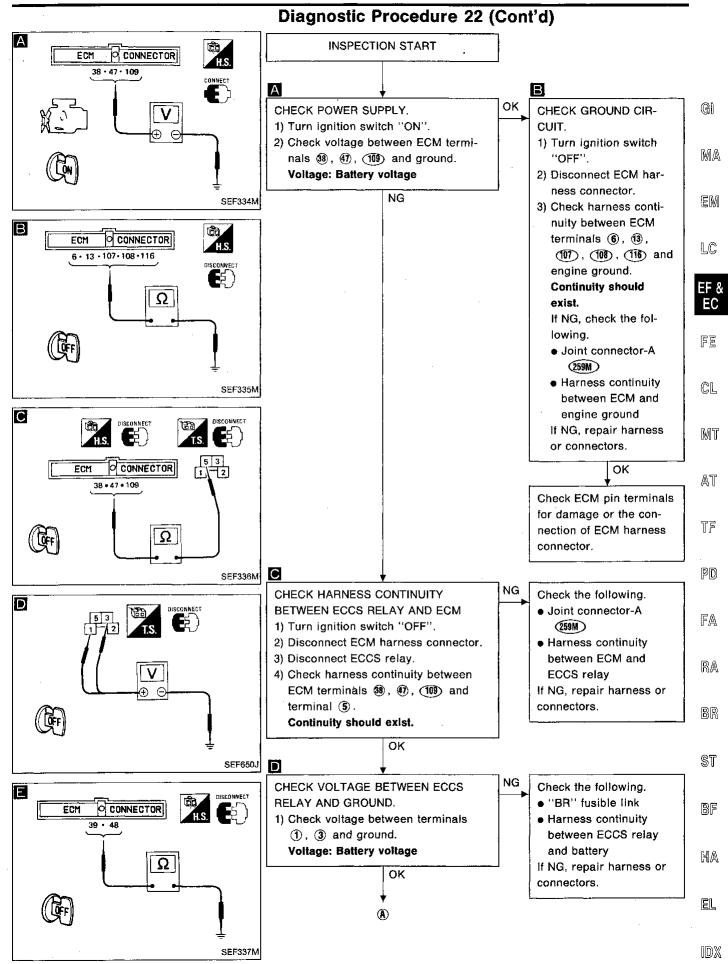
MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)

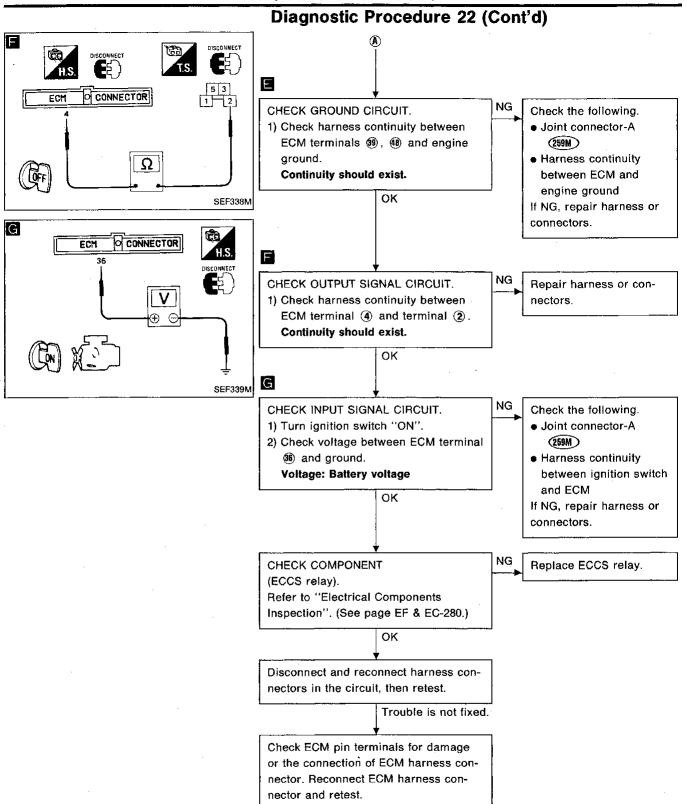


Harness layout

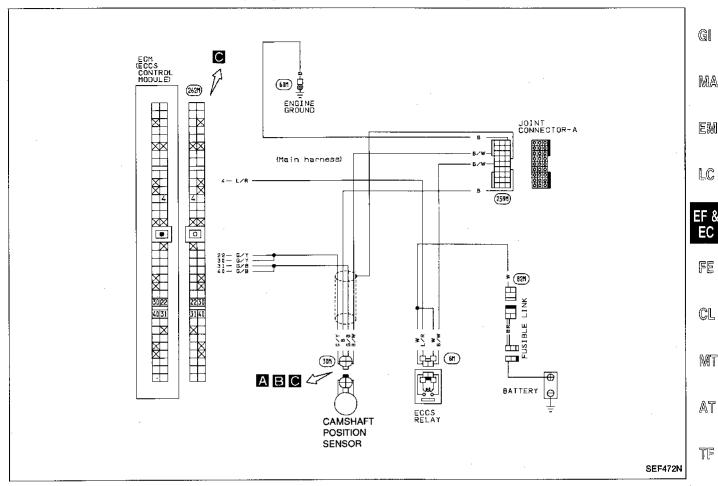




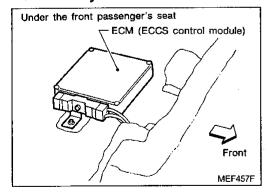


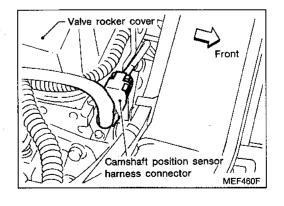


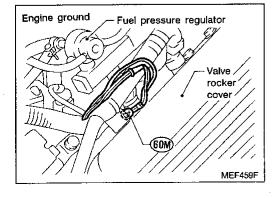
CAMSHAFT POSITION SENSOR (Diagnostic trouble code No. 11)



Harness layout







BF HA

EL

IDX

CL

MI

AT

TF

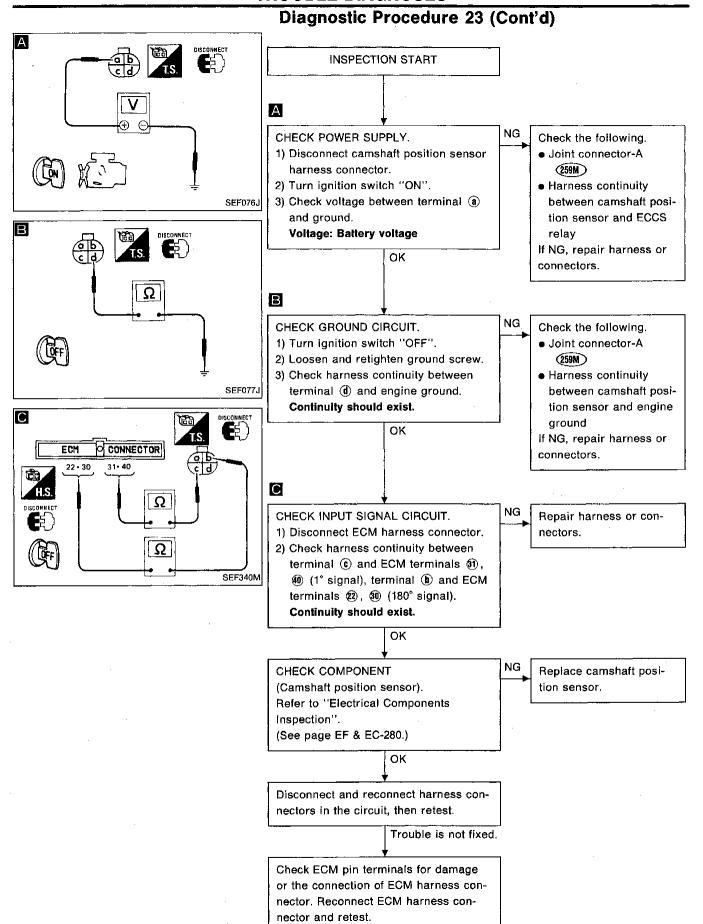
PD

FA

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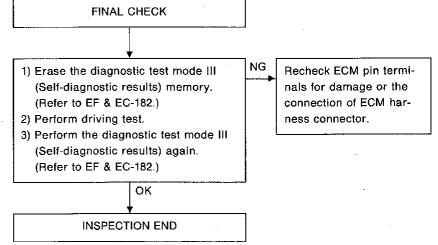
BR

ST



Diagnostic Procedure 23 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.



GI

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LC

EF & EC

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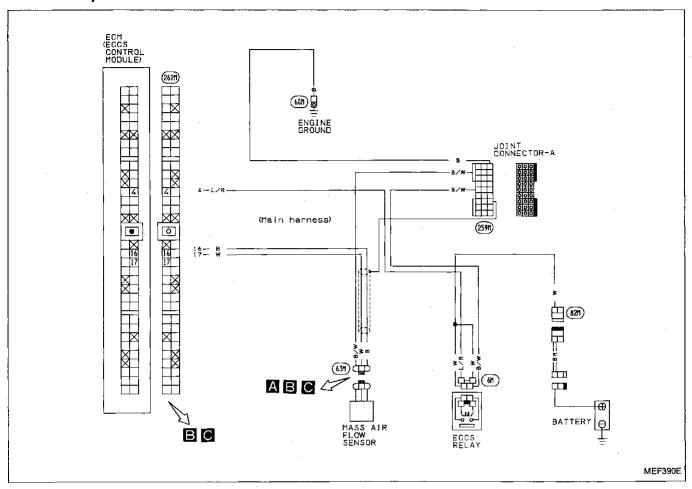
ST

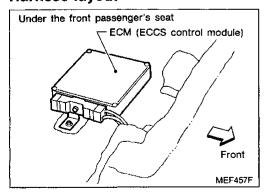
BF

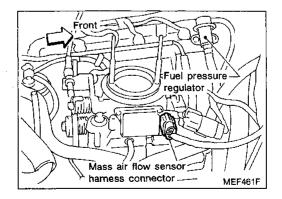
HA

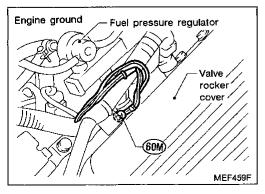
EL

MASS AIR FLOW SENSOR (Diagnostic trouble code No. 12) (CHECK (MALFUNCTION INDICATOR LAMP ITEM)

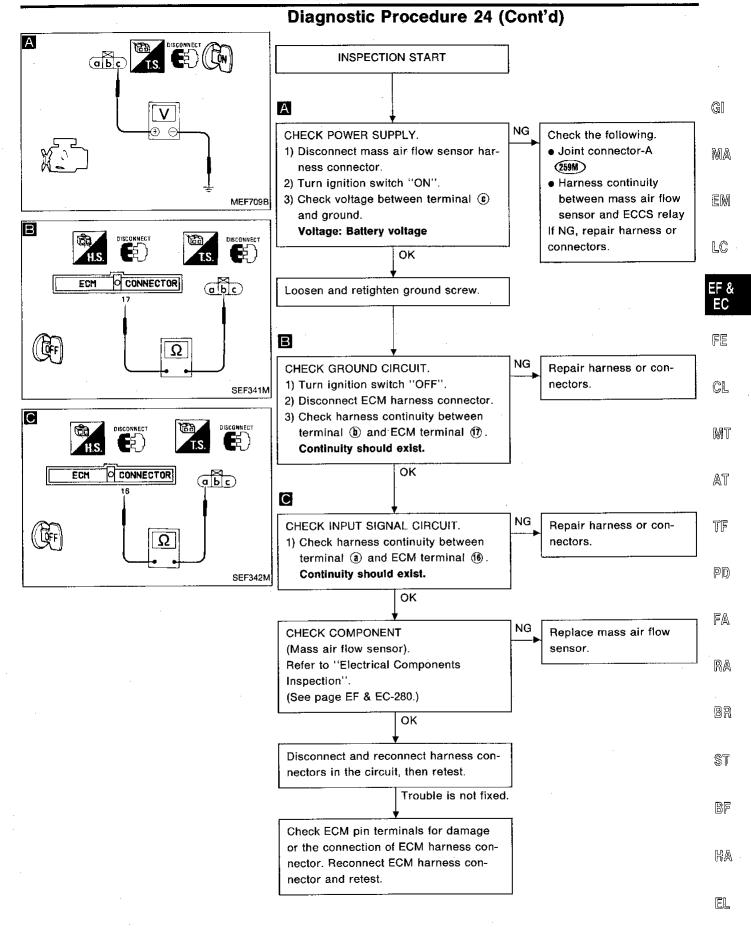






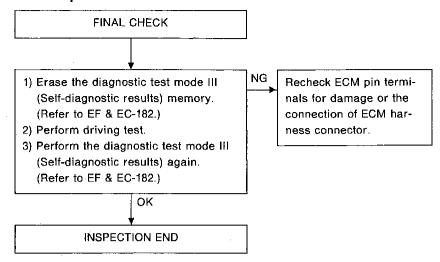


EF & EC-228

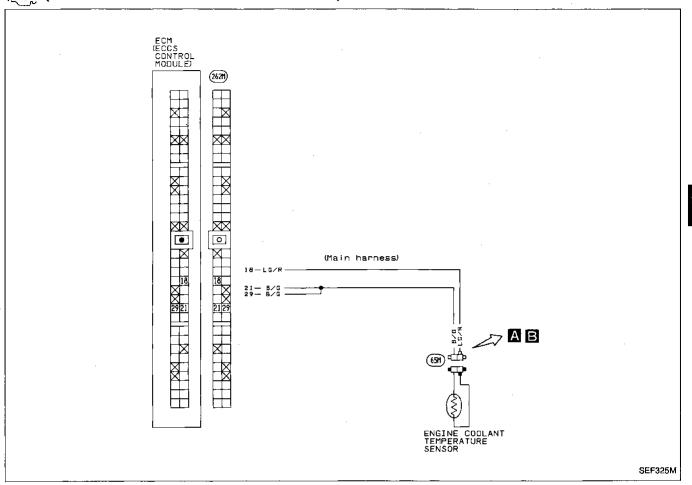


Diagnostic Procedure 24 (Cont'd)

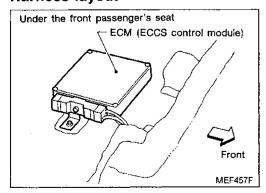
Perform FINAL CHECK by the following procedure after repair is completed.

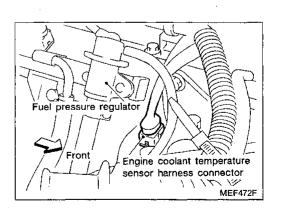


ENGINE COOLANT TEMPERATURE SENSOR (Diagnostic trouble code No. 13)



Harness layout





GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

TF

PD

FA

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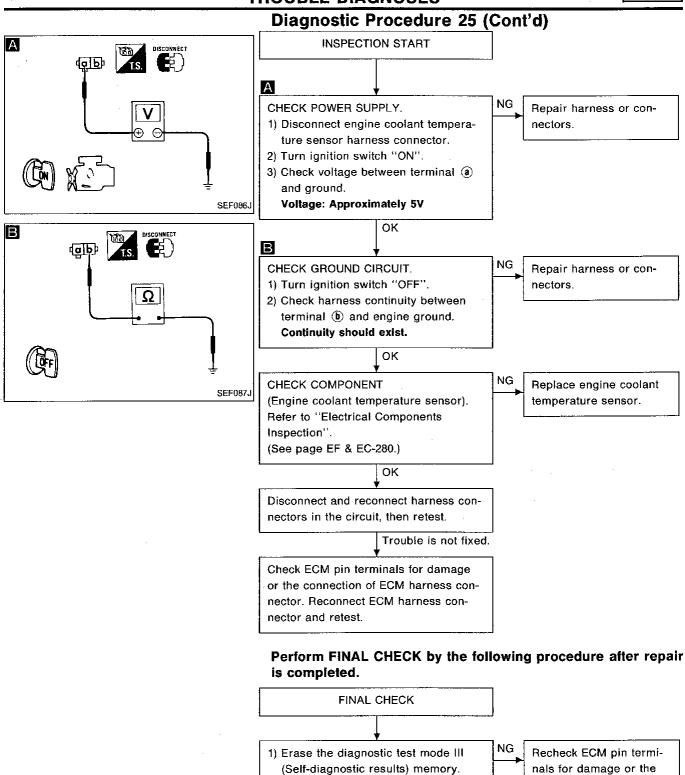
BF

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EL

IDX

EF & EC-231



(Refer to EF & EC-182.)

 Perform the diagnostic test mode III (Self-diagnostic results) again. (Refer to EF & EC-182.)

OK

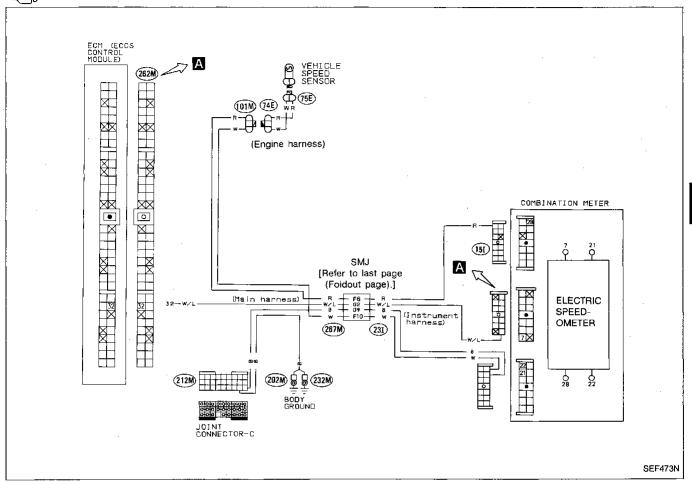
INSPECTION END

2) Perform driving test.

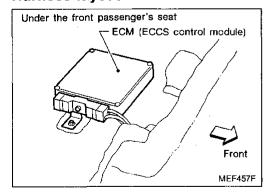
connection of ECM har-

ness connector.

VEHICLE SPEED SENSOR (Diagnostic trouble code No. 14) (Switch ON/OFF diagnostic item) (MALFUNCTION INDICATOR LAMP ITEM)



Harness layout



GI

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EF & EC

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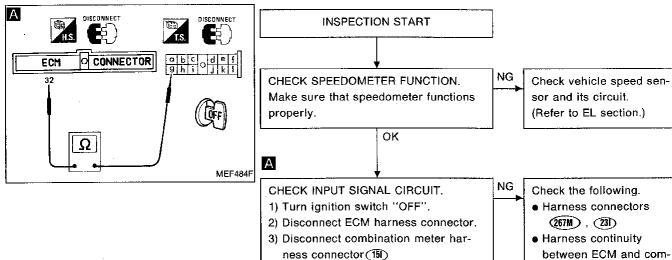
EL

bination meter

connectors.

If NG, repair harness or

Diagnostic Procedure 26 (Cont'd)



Disconnect and reconnect harness connectors in the circuit, then retest.

4) Check harness continuity between

Continuity should exist.

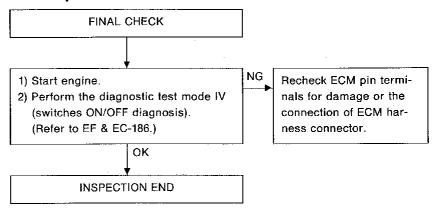
ECM terminal 32 and terminal 3.

OK

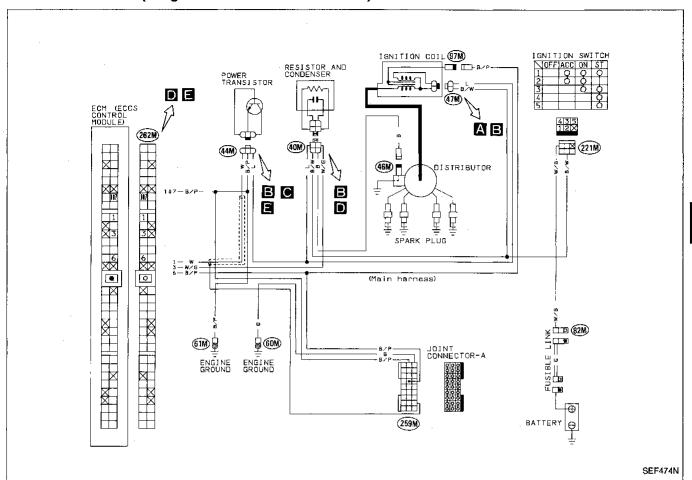
Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

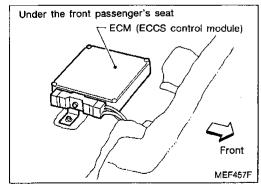
Perform FINAL CHECK by the following procedure after repair is completed.

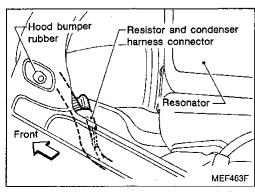


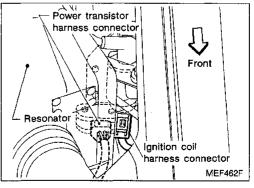
IGNITION SIGNAL (Diagnostic trouble code No. 21)

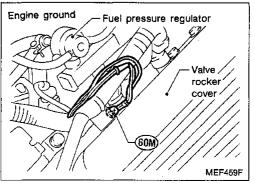


Harness layout









EF & EC-235

GI

MA

EM

LC

EF & EC

CL

MT

AT

TF

PD FA

RA

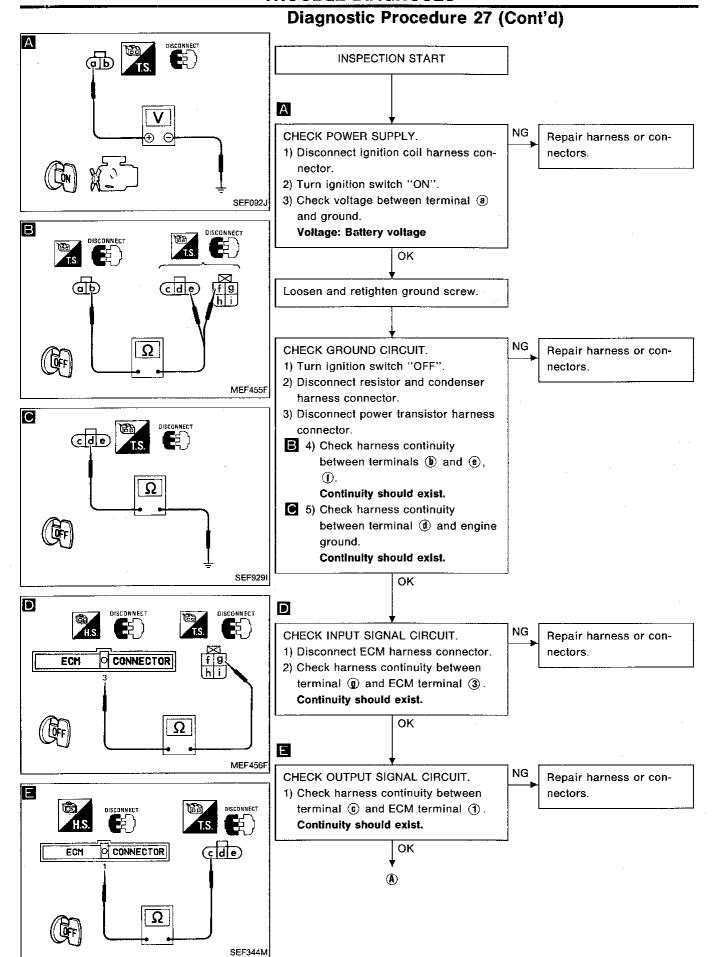
BR

ST

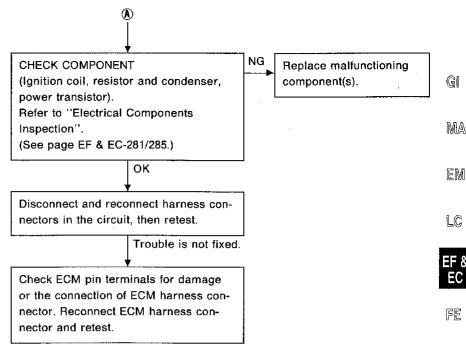
BF

HA

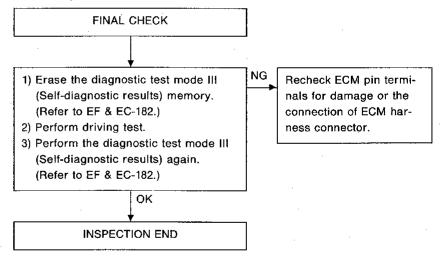
EL



Diagnostic Procedure 27 (Cont'd)



Perform FINAL CHECK by the following procedure after repair is completed.



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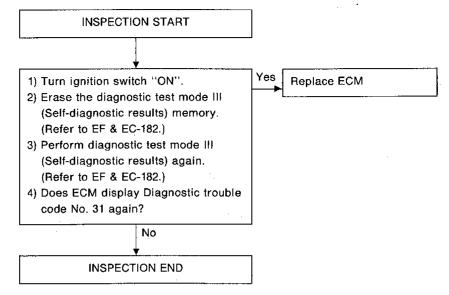
FA

RA

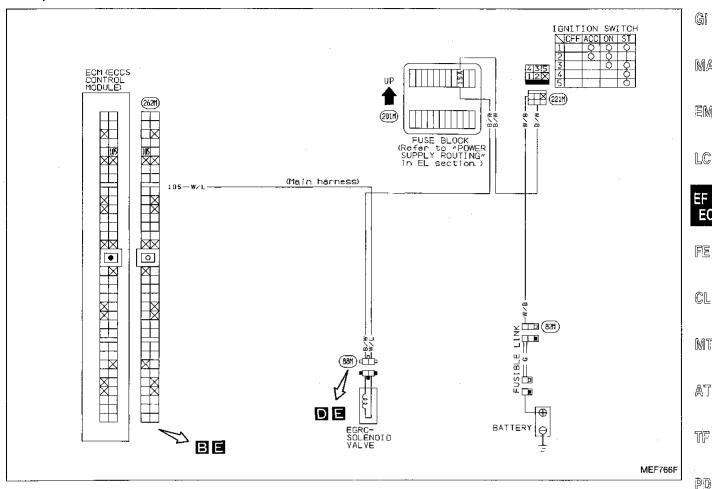
BR

\$T

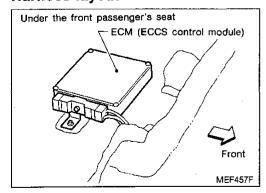
ENGINE CONTROL MODULE (ECM) (Diagnostic trouble code No. 31) (MALFUNCTION INDICATOR LAMP ITEM)

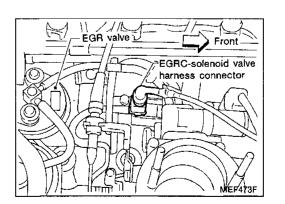


EGR FUNCTION (Diagnostic trouble code No. 32) (MALFUNCTION INDICATOR LAMP ITEM)



Harness layout





Gi

MA

EM

LC

EC

FE

CL

MT

TF

FA

RA

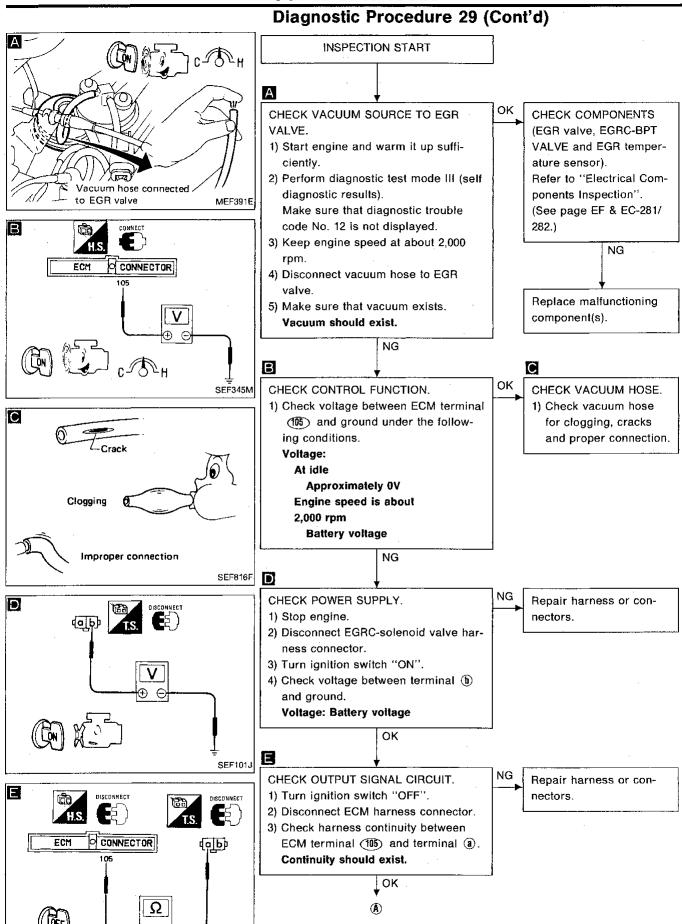
BR

ST

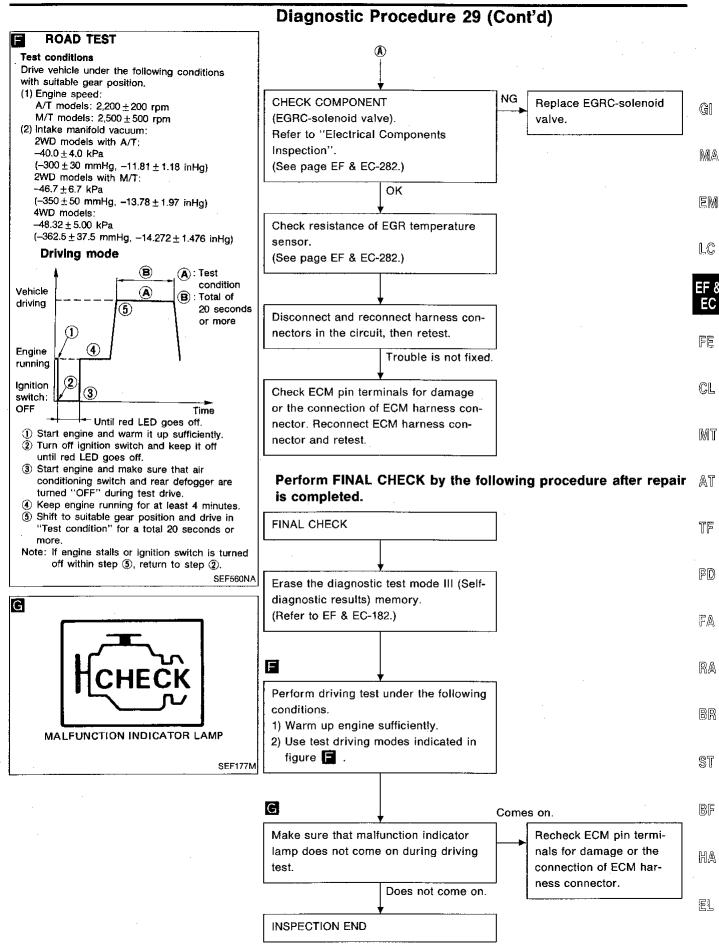
BF

HA

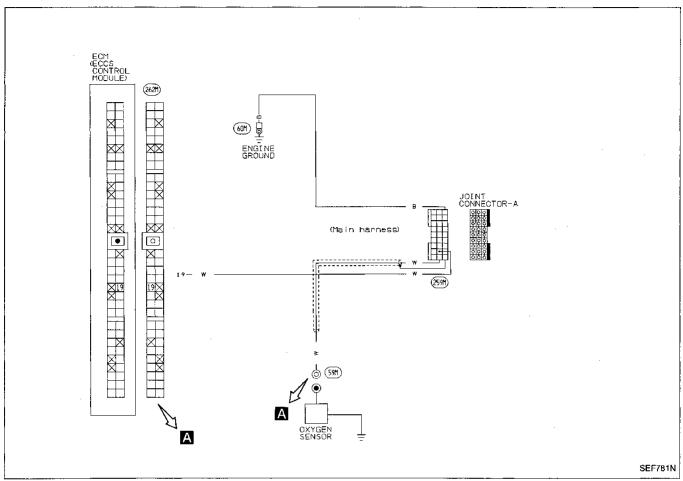
EL

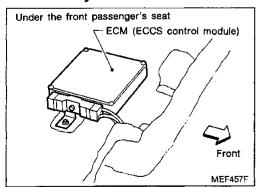


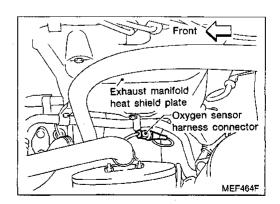
SEF346M

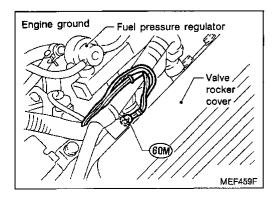


OXYGEN SENSOR (Diagnostic trouble code No. 33) (CHECK (MALFUNCTION INDICATOR LAMP ITEM)

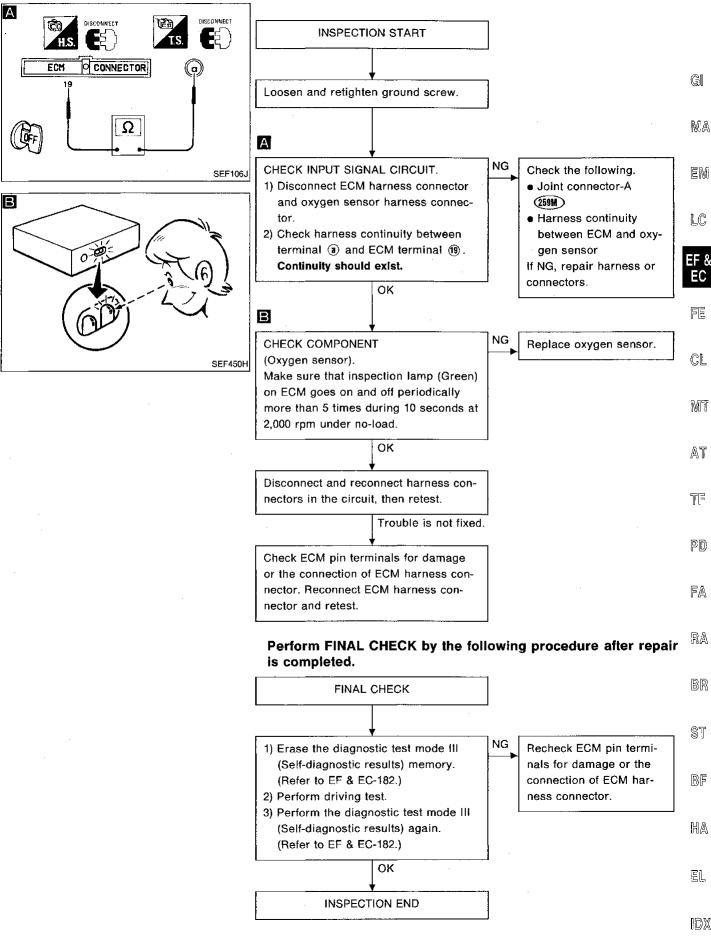




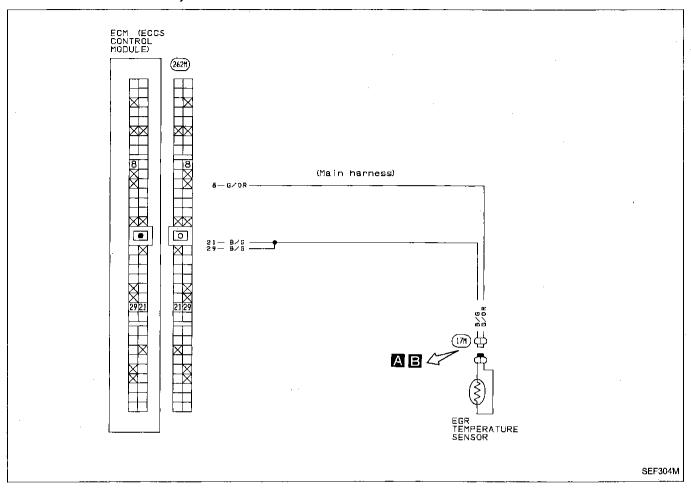


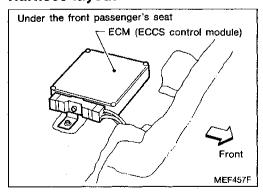


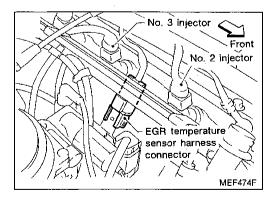


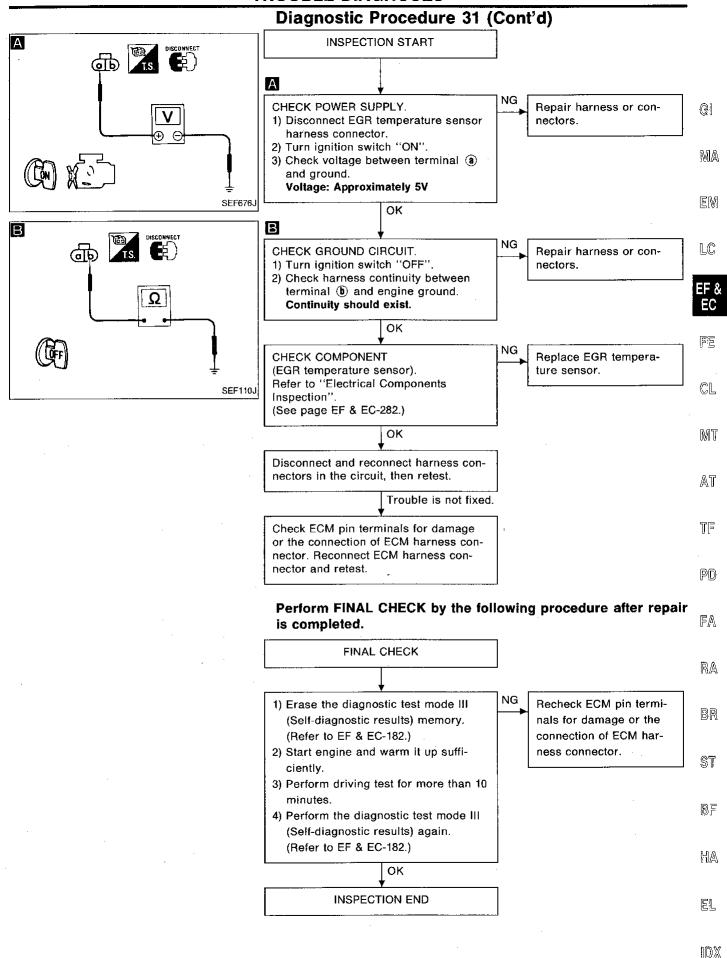


EGR TEMPERATURE SENSOR (Diagnostic trouble code No. 35) HELEK (MALFUNCTION INDICATOR LAMP ITEM)

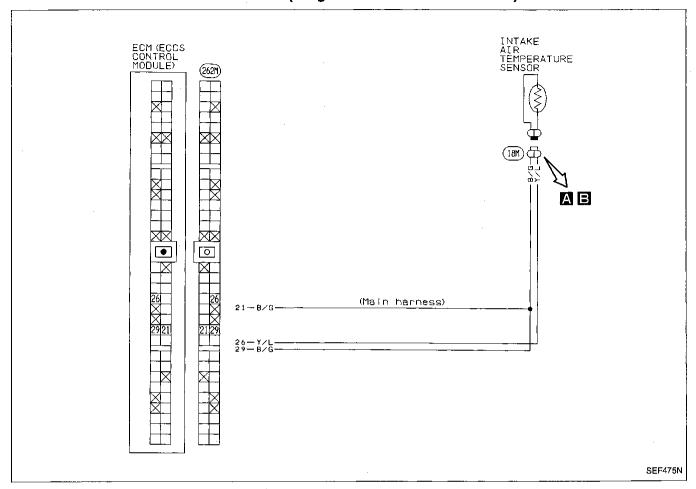


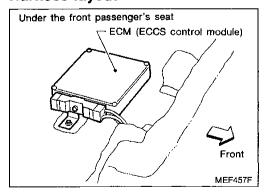


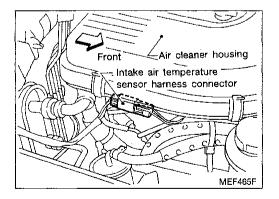


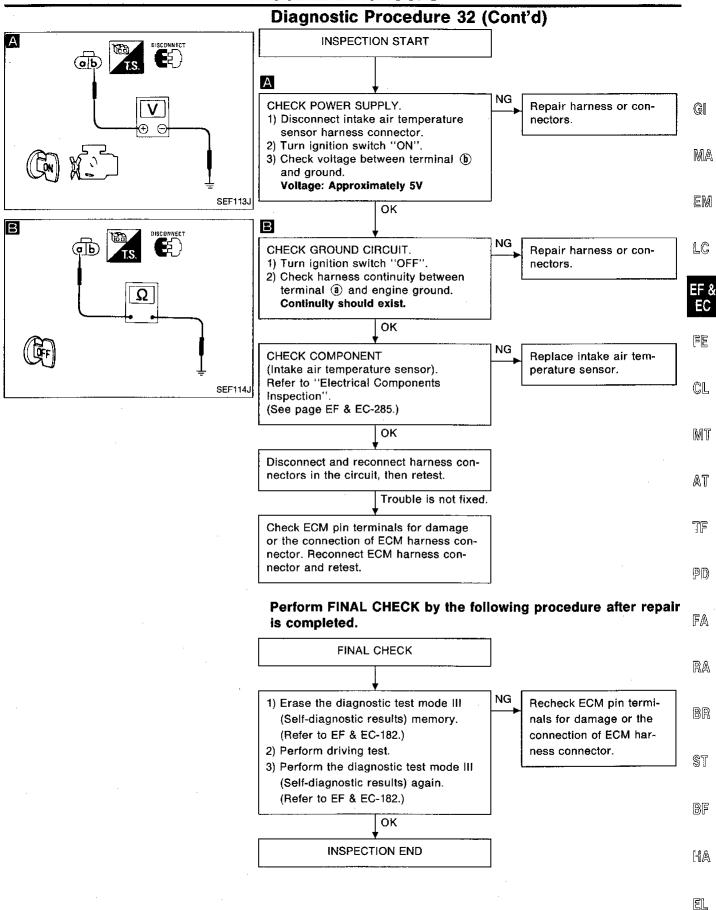


INTAKE AIR TEMPERATURE SENSOR (Diagnostic trouble code No. 41)

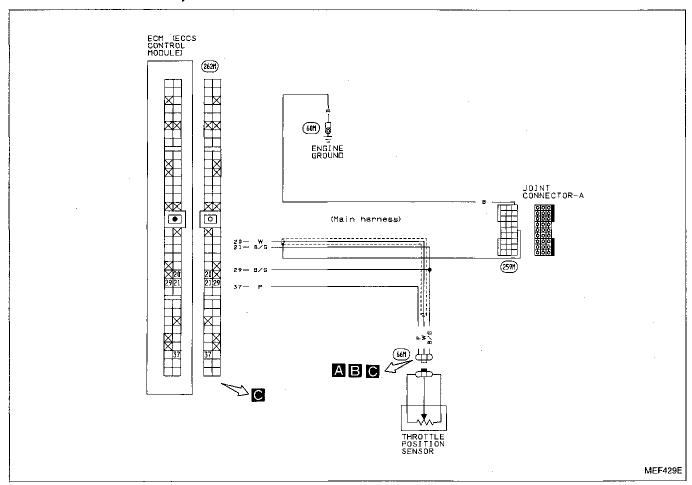


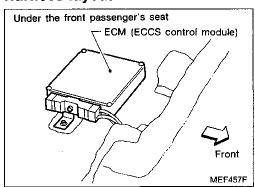


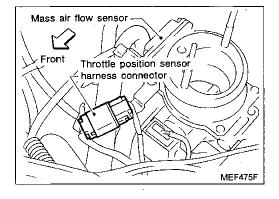


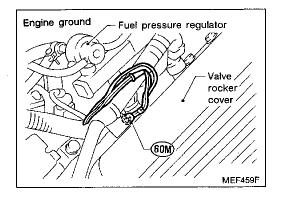


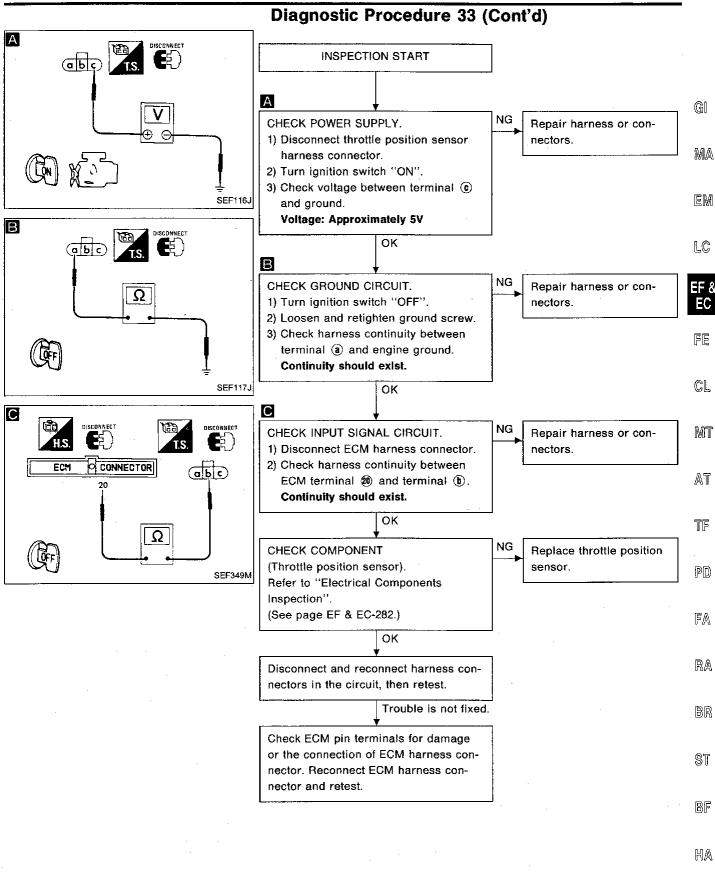
THROTTLE POSITION SENSOR (Diagnostic trouble code No. 43) (MALFUNCTION INDICATOR LAMP ITEM)







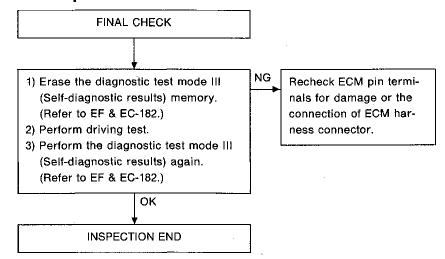


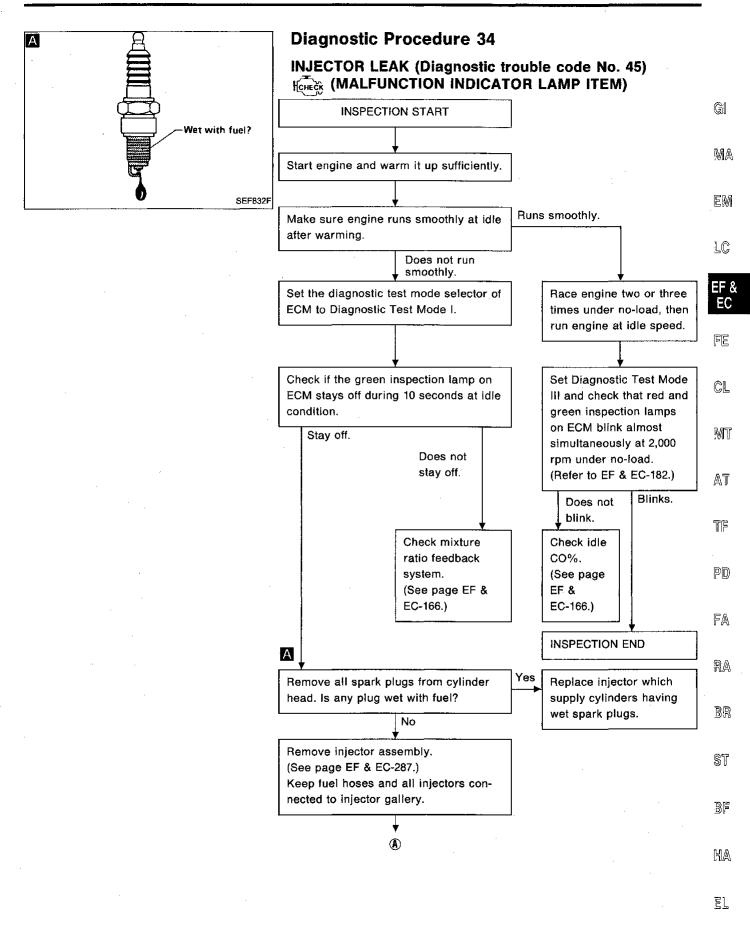


EL

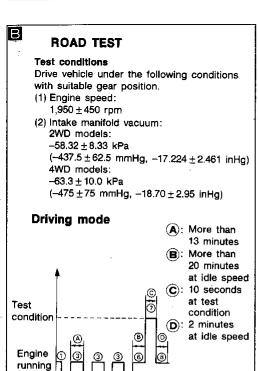
Diagnostic Procedure 33 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.









Start engine and warm it up sufficiently.
 Turn off ignition switch and keep it off until red LED goes off.

Until red LED goes off.

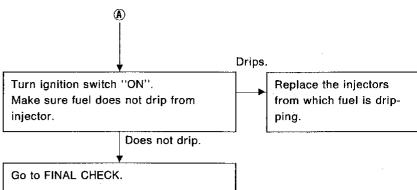
Time

Ignition

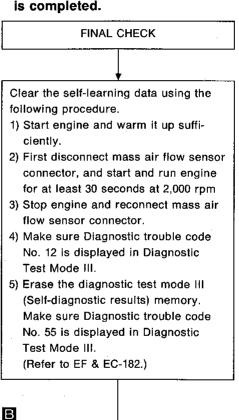
switch:

OFF

- Start engine and keep it running for more than 13 minutes.
- Turn off ignition switch and keep it off until red LED goes off.
- S Repeat steps 3 through 4 for a total of 3 times.
- Start engine and keep it at idle for more than 20 minutes. If engine stalls or ignition turns off within 13 minutes after engine is started, return to step ②. If over 13 minutes, restart step ⑤.
- Shift to suitable gear position and drive in "Test condition" for at least 10 seconds. If the following conditions occur during step ①, return to step ⑥.
 - Engine races over 4,000 rpm or hardly accelerates for more than 10 seconds.
 Engine stalls or ignition turns off.
- Keep engine at idle speed for more than 2 minutes.

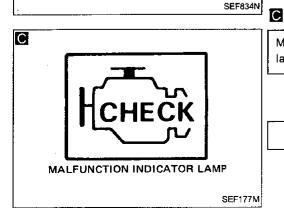


Perform FINAL CHECK by the following procedure after repair is completed.



Perform test drive as indicated in figure

В.



Make sure that malfunction indicator lamp does not come on during test.

Does not come on.

Does not come on.

INSPECTION END

G

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EC

33

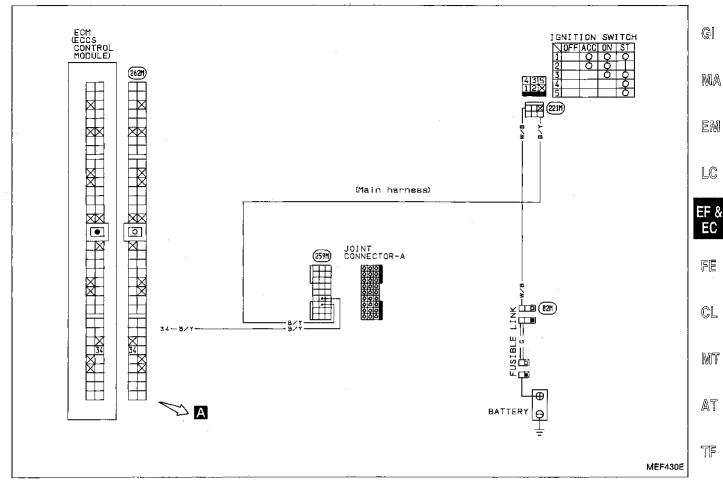
CL

MT

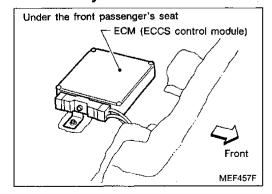
AT

Diagnostic Procedure 35

START SIGNAL (Switch ON/OFF diagnostic item)



Harness layout



PD

TF

FA

 $\mathbb{R}\mathbb{A}$

BR

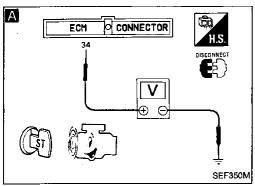
ST

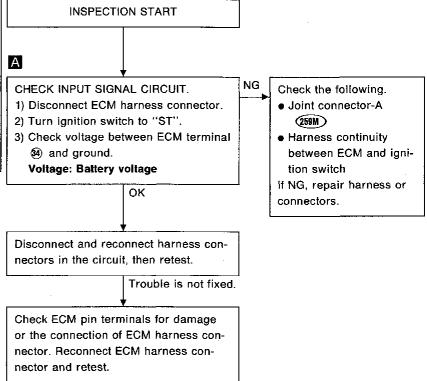
BF

HA

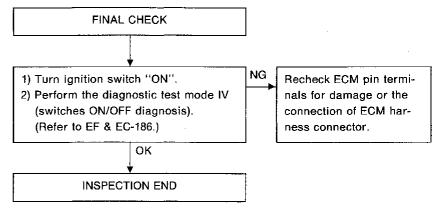
EL

Diagnostic Procedure 35 (Cont'd)

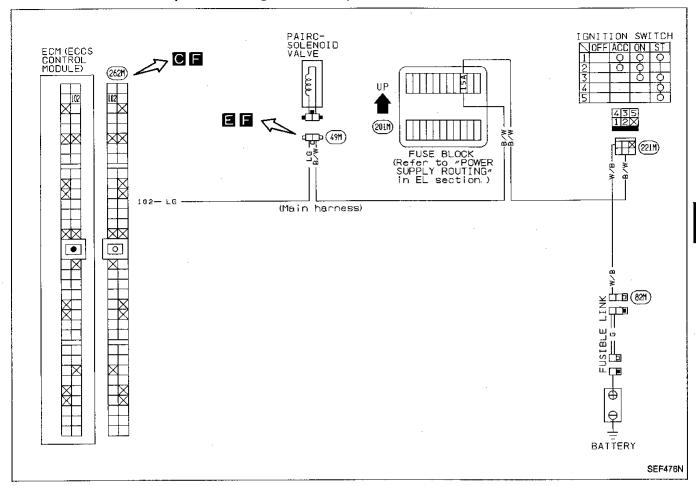




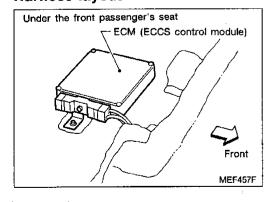
Perform FINAL CHECK by the following procedure after repair is completed.

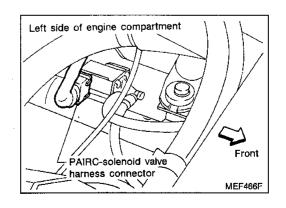


PAIR VALVE SYSTEM (Not self-diagnostic item)



Harness layout





G

MA

EM

LC

EF & EC

FE

MT

CL

AT

TF

PD

FA

RA

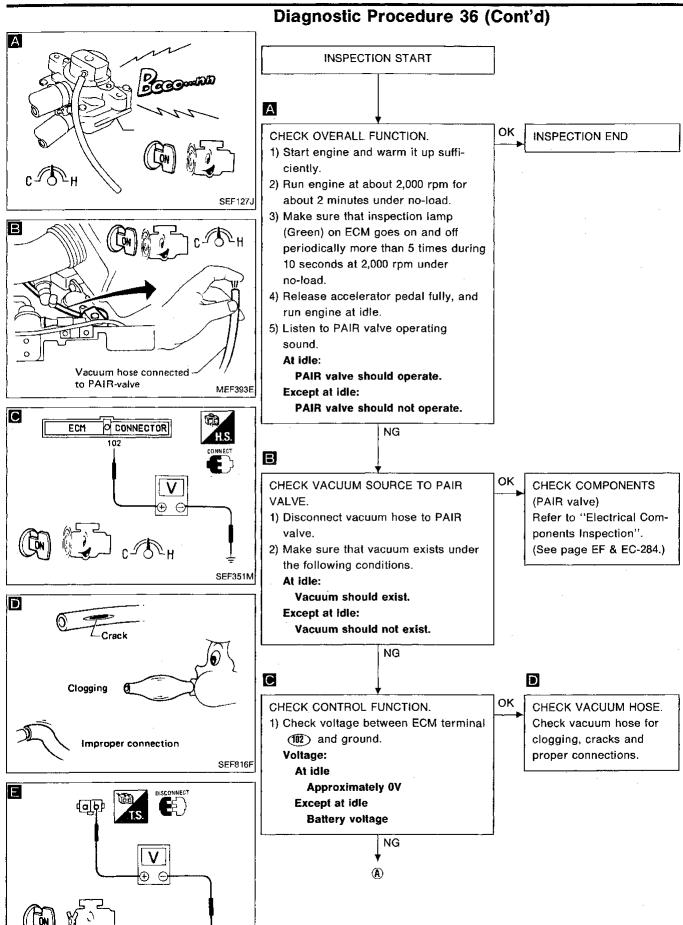
BR

ST

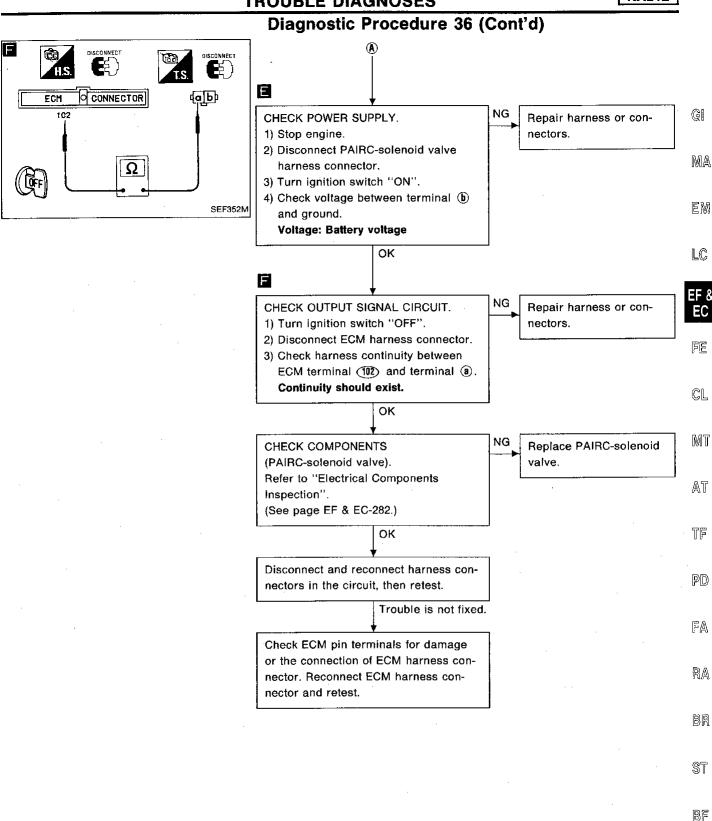
BF

HA

EL



SEF131J

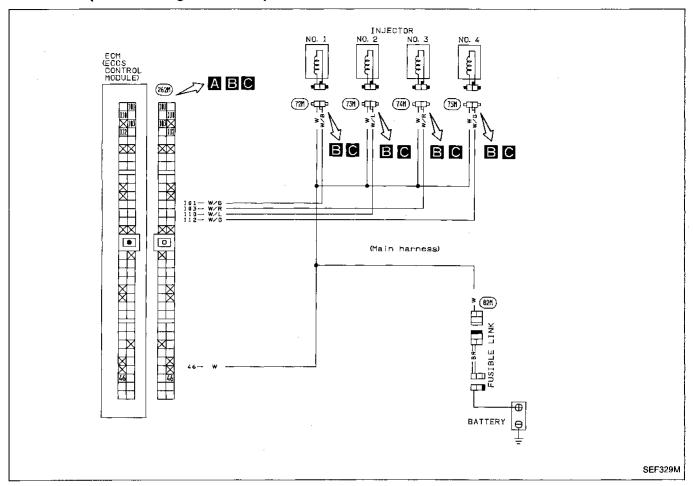


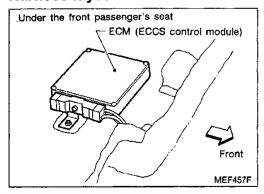
IDX

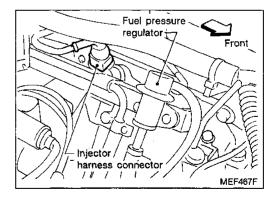
EL

HA

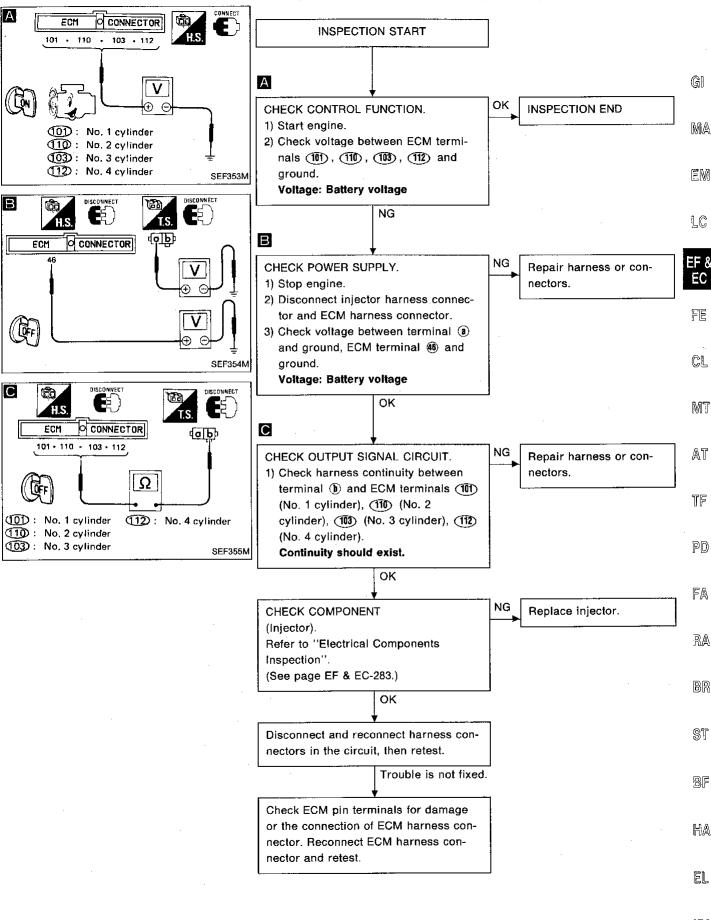
INJECTOR (Not self-diagnostic item)





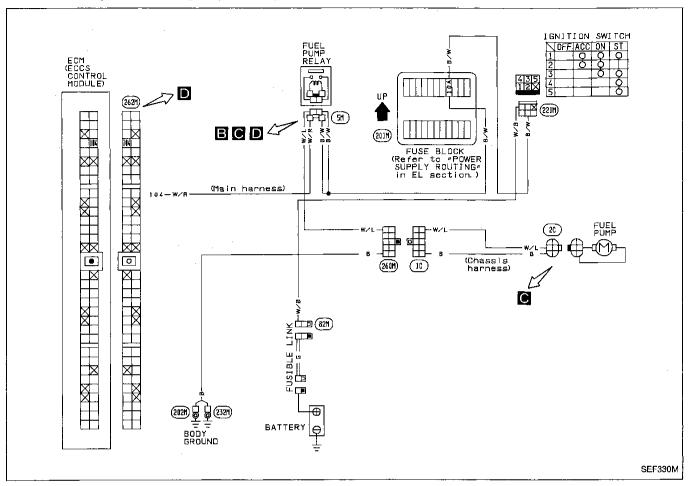


Diagnostic Procedure 37 (Cont'd)

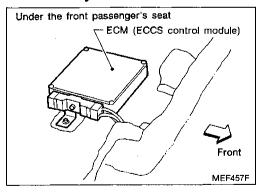


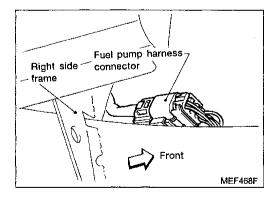
Diagnostic Procedure 38

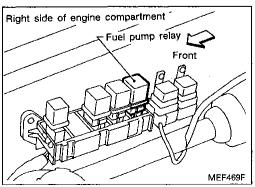
FUEL PUMP (Not self-diagnostic item)

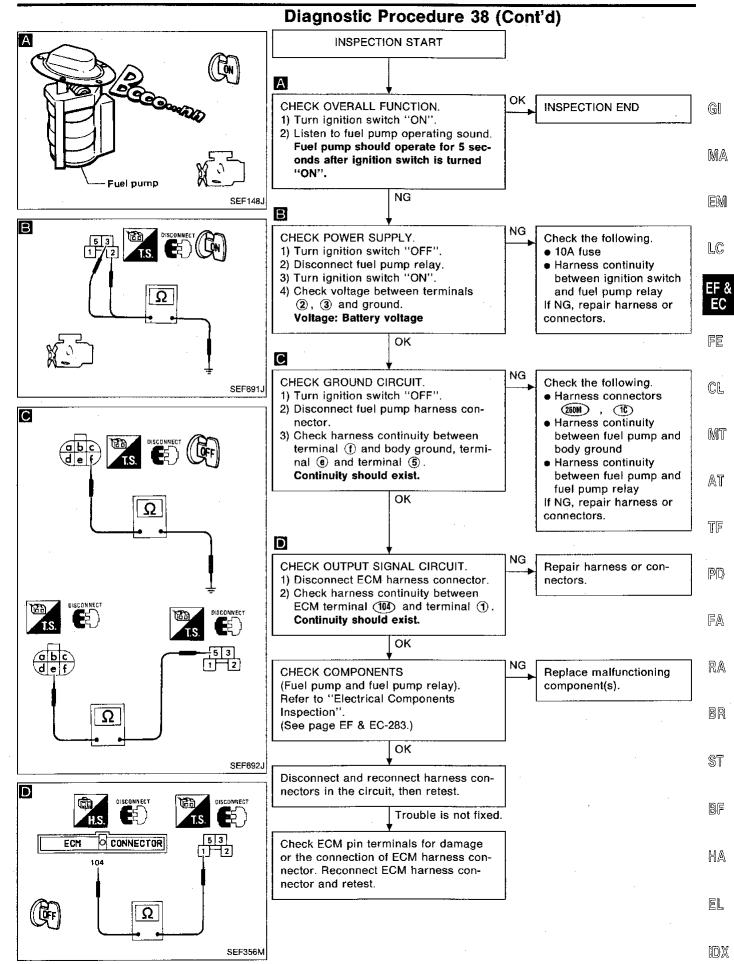


Harness layout



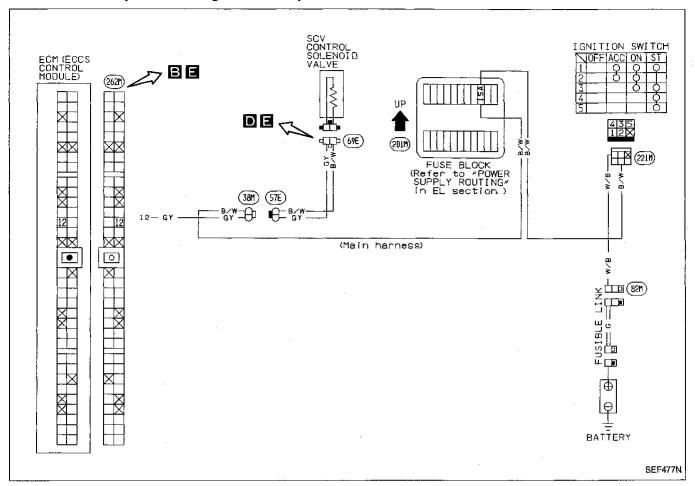




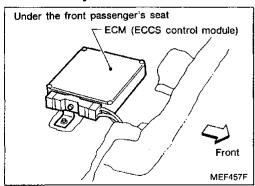


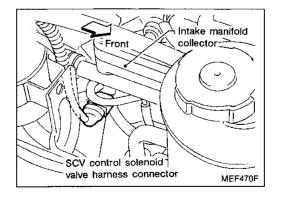
Diagnostic Procedure 39

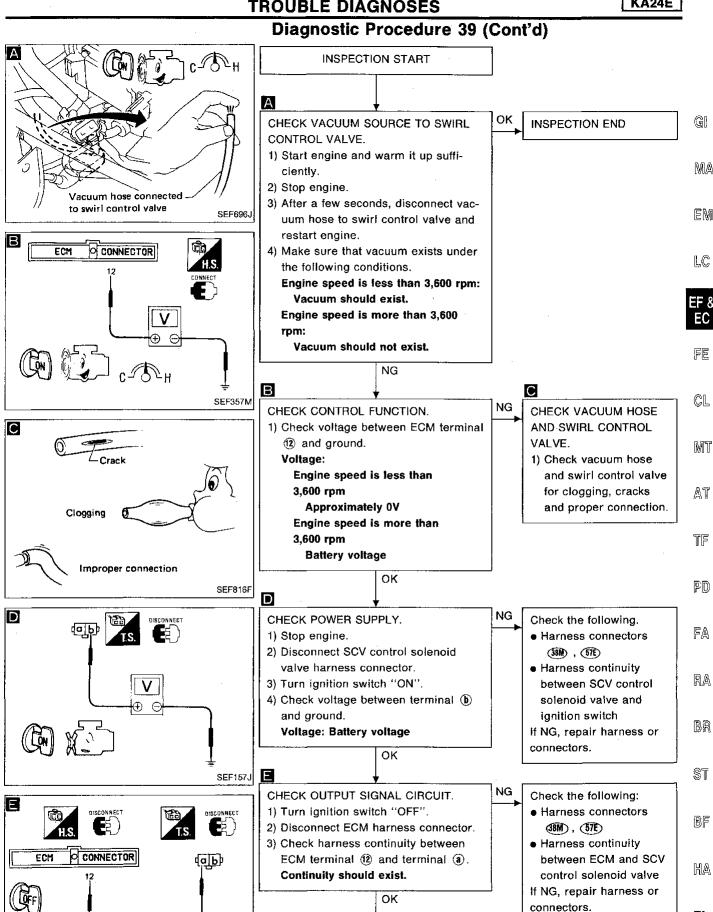
SCV CONTROL (Not self-diagnostic item)



Harness layout

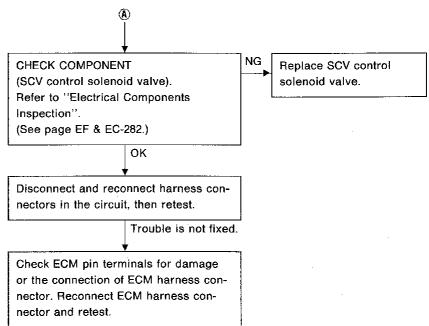






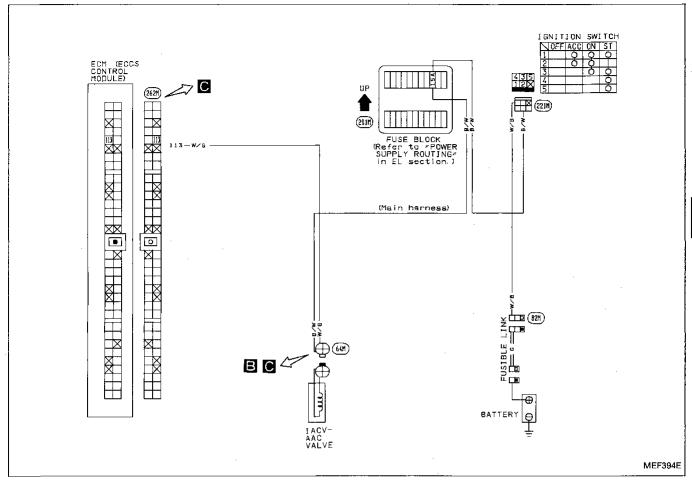
SEF358M

Diagnostic Procedure 39 (Cont'd)

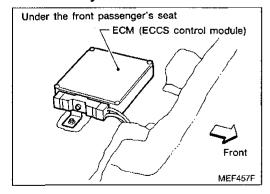


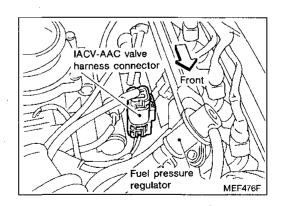
Diagnostic Procedure 40

IACV-AAC VALVE (Not self-diagnostic item)



Harness layout





GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

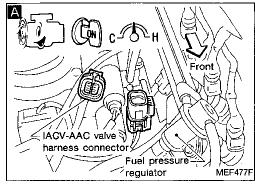
ST

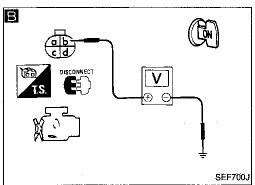
BF

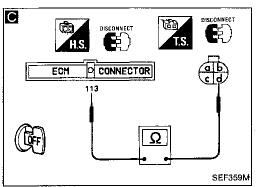
HA

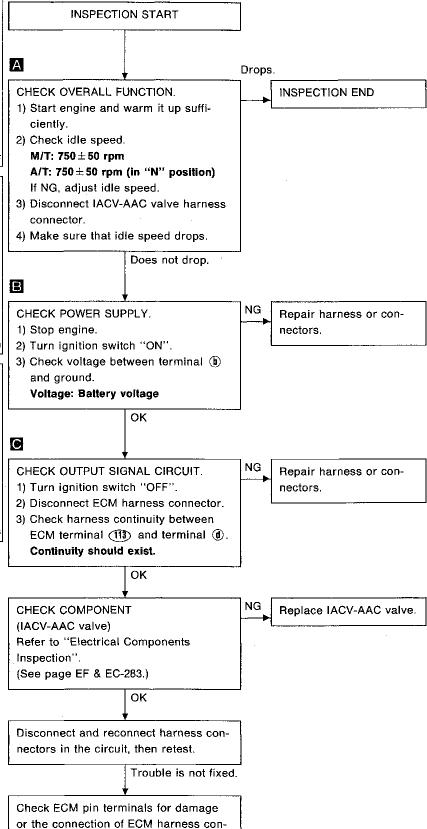
EL

Diagnostic Procedure 40 (Cont'd)







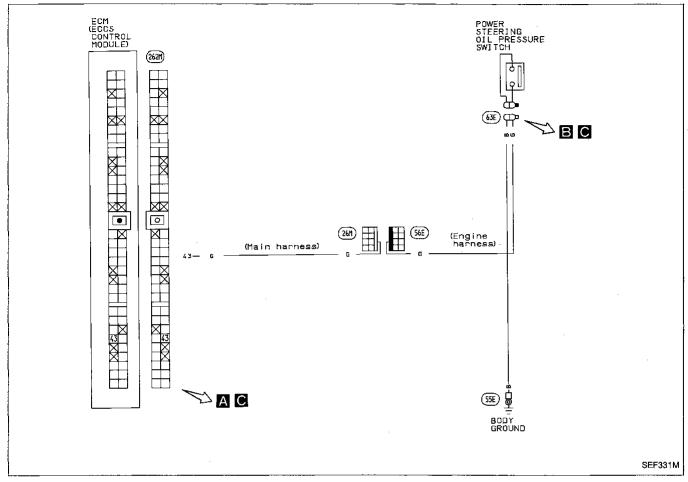


nector and retest.

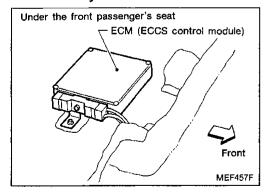
nector. Reconnect ECM harness con-

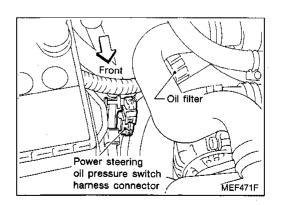
Diagnostic Procedure 41

POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)



Harness layout





G

MA

ΞM

LC

EF & EC

CL

MT

AT

ŢŖ

PD

FA

RA

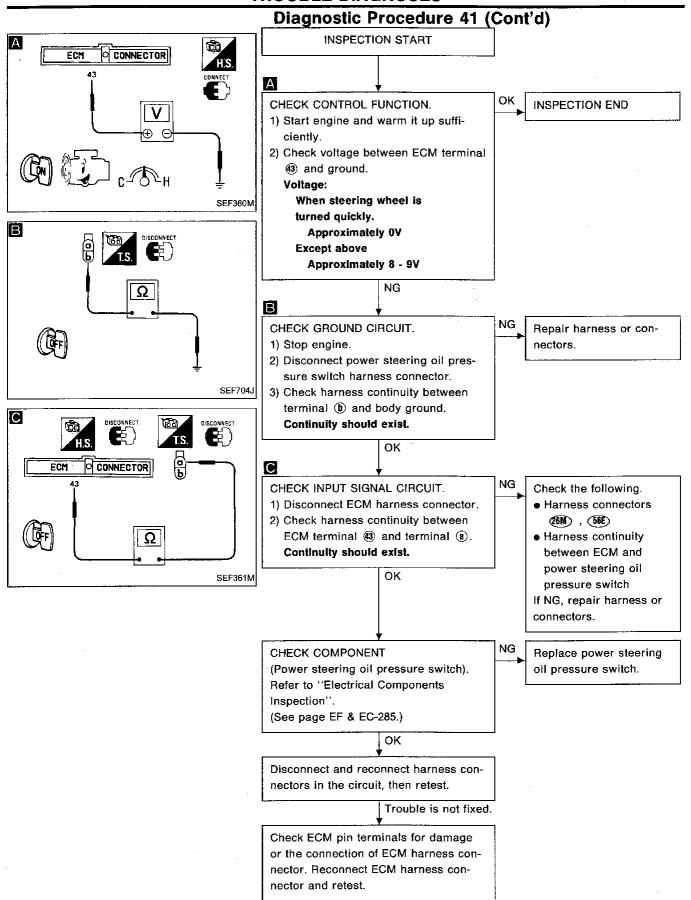
BR

ST

BF

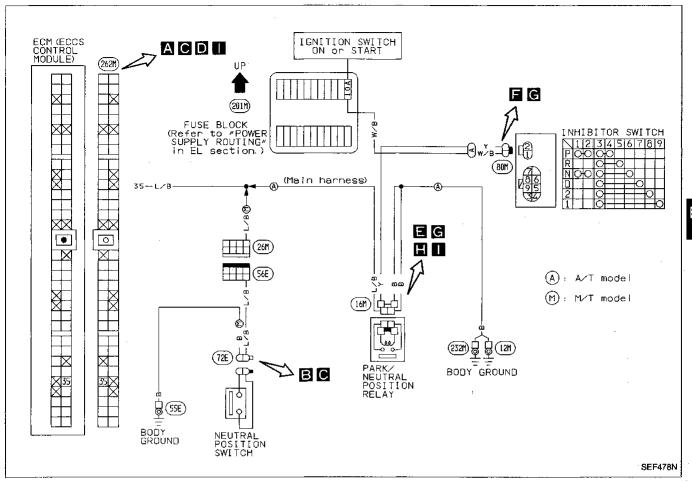
HA

EL

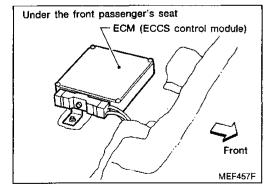


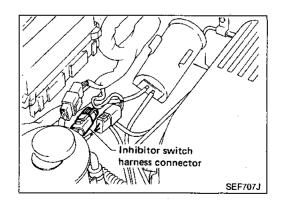
Diagnostic Procedure 42

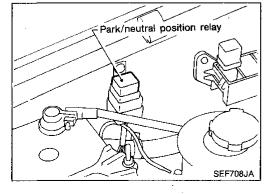
NEUTRAL POSITION/INHIBITOR SWITCH (Not self-diagnostic item)



Harness layout







EF & EC-269

G[

MA

EM

LC

EF & EC

FE

CL

MT

AT

TF

PD FA

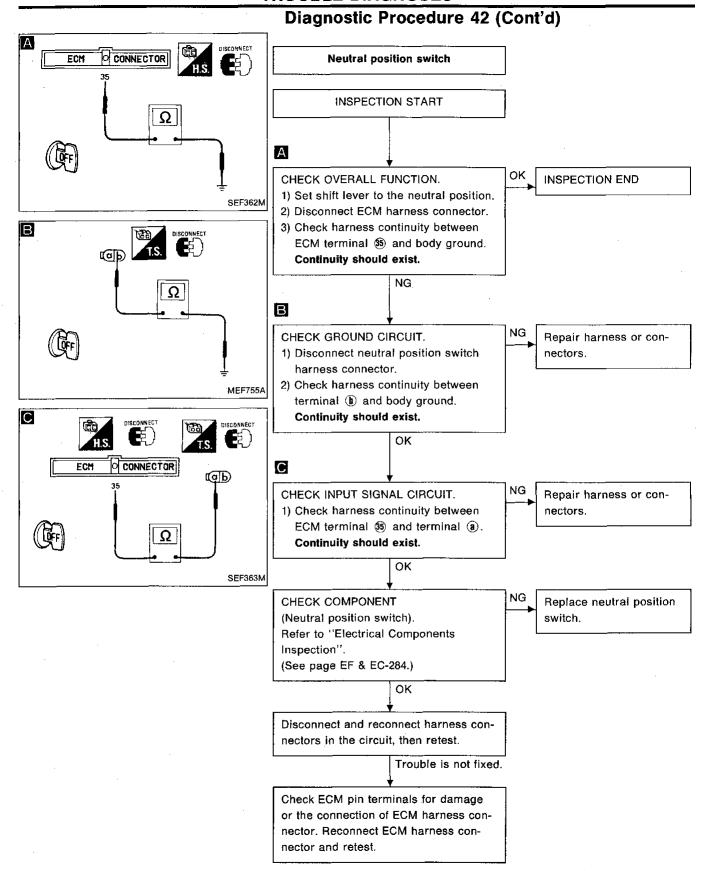
RA

BR

ST

BF

HA



G[

MA

EM

CL

MT

AT

TF

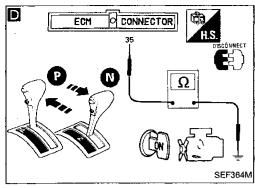
FA

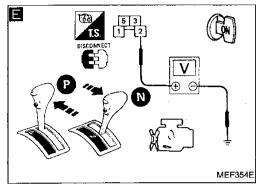
RA

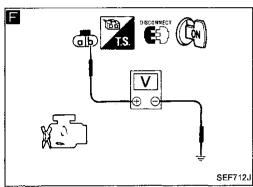
BR

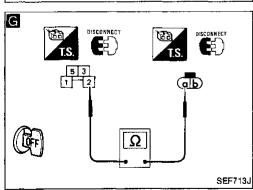
ST

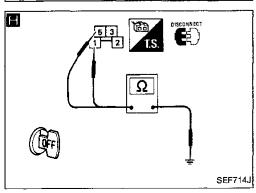
BF

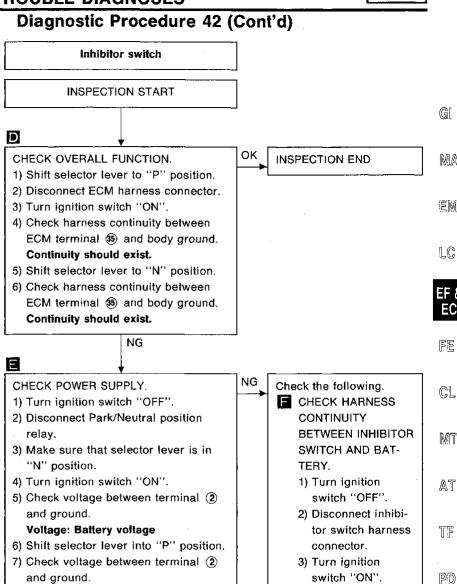












and ground. Voltage: Battery voltage OK

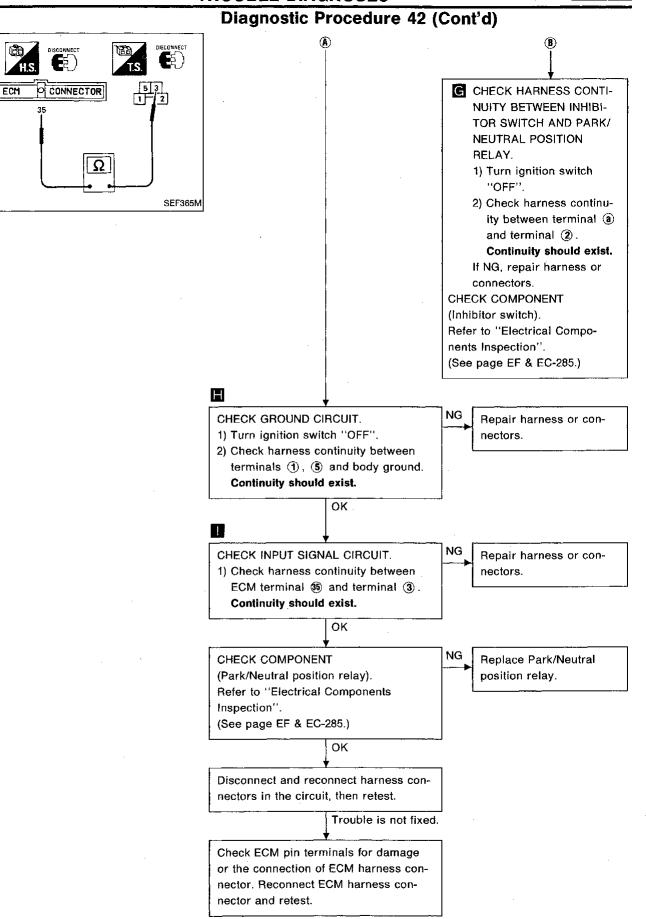
(b) and ground. Voltage: **Battery voltage** If NG, check the following. • 10A fuse Harness continuity between fuse and inhibitor switch If NG, repair harness or connectors. **B**

4) Check voltage

between terminal

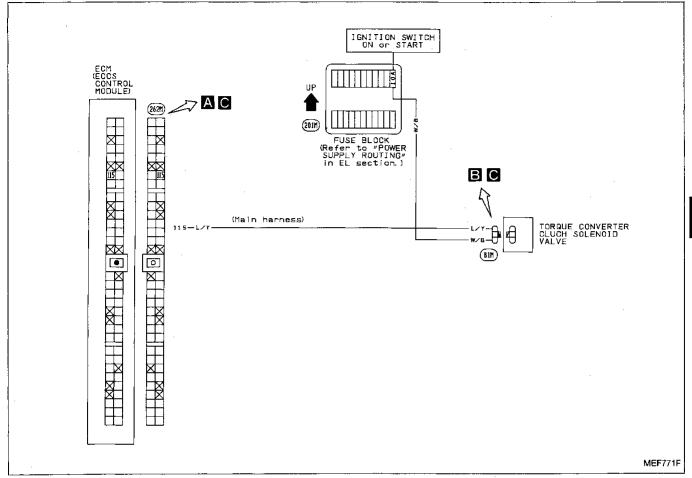
EL

HA

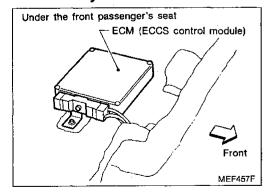


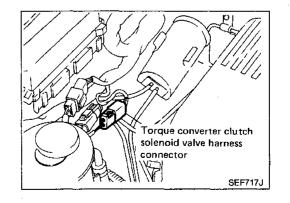
Diagnostic Procedure 43

TORQUE CONVERTER CLUTCH SOLENOID VALVE (Not self-diagnostic item)



Harness layout





G

MA

ΞM

LC

EF & EC

FE

CL

MT

AT

l TF

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FA

RA

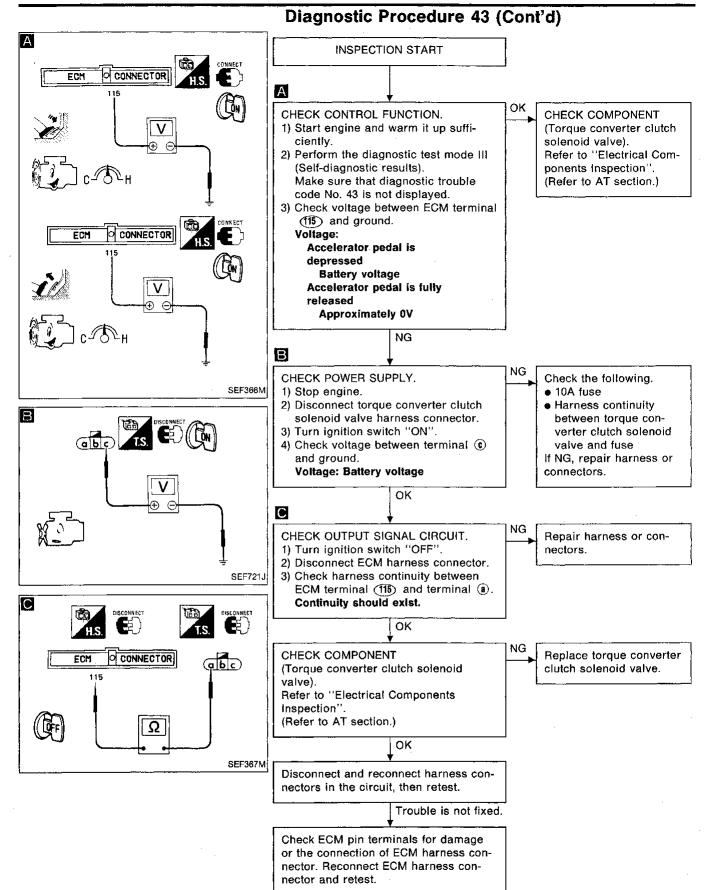
BR

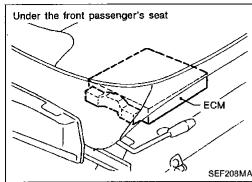
ST

BF

HA

EĻ





Electrical Components Inspection ECM INPUT/OUTPUT SIGNAL INSPECTION

ECM is located under the front passenger seat. For this inspection, remove passenger seat.

Gl

MA

EM

Remove ECM harness protector.

LC

FE

CL

Perform all voltage measurements with the connectors con-

MT

AT

TF

PD

FA

RA

BR

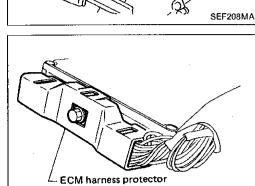
ST

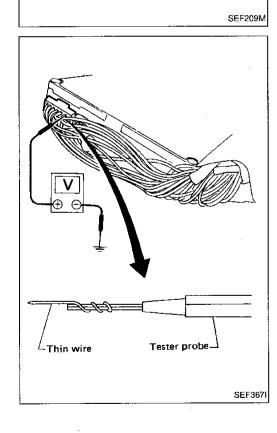
BF

HA

EL

DX





nected. Improve tester probe as shown to perform tests easily.

Electrical Components Inspection (Cont'd)

ECM inspection table

*Data are reference values.

TERMI- NAL NO.	ITEM	CONDITION	*DATA
1	Ignition signal	Engine is running. L Idle speed	0.3 - 0.6V
_		Engine is running. Engine speed is 2,000 rpm.	1.2 - 1.5V
2	Tachometer	Engine is running. Idle speed	Approximately 1.0V
		Engine is running. Engine speed is 2,000 rpm.	Approximately 2.7V
3	Ignition check	Engine is running. Idle speed	9 - 12V
4	ECCS relay (Main relay)	Engine is running. Ignition switch "OFF" Within approximately 1 second after turning ignition switch "OFF"	0 - 1V
		Ignition switch "OFF" For approximately 1 second after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
8	EGR temperature sensor	Engine is running. Idle speed	3.0 - 4.0V
		Engine is running. (Racing) After warming up	0 - 3.0V
11	Air conditioner relay	Engine is running. Both A/C switch and blower switch are "ON".	0 - 1.0V
		Engine is running. A/C switch is "OFF".	ov

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

*Data are reference values.

TERMI- NAL NO.	ITEM	CONDITION	*DATA	_
12	SCV control solenoid valve	Engine is running. Idle speed Engine is running.	0 - 1.0V BATTERY VOLTAGE	G N
		Engine speed is 3,600 rpm.	(11 - 14V)	
16	Mass air flow sensor	Engine is running.	1.0 - 3.0V Output voltage varies with engine speed.	
18	Engine coolant temperature sensor	Engine is running.	1.0 - 3.0V Output voltage varies with engine water temperature.	
19	Oxygen sensor	Engine is running. After warming up sufficiently.	0 - Approximately 1.0V	
20	Throttle position sensor	Ignition switch "ON" After warming up sufficiently.	0.5 - Approximately 4V Output voltage varies with the throt- tle valve opening angle.	. (
22 30	Camshaft position sensor (Reference signal)	Engine is running. Do not run engine at high speed under no-load.	0.3 - 0.4V	-
00		Ignition switch "ON" Intake air temperature is 20°C (68°F).	Approximately 2.4V	- . โ
26	Intake air temperature sensor	Ignition switch "ON" Intake air temperature is 80°C (176°F).	Approximately 0.3V	
31 40	Camshaft position sensor (Position signal)	Engine is running. Do not run engine at high speed under no-load.	2.0 - 3.0V	
34	Start signal	Cranking	8 - 12V	- [
35	Neutral position switch &	Ignition switch "ON" Neutral position/Parking	ov	- [-
	Inhibitor switch	Ignition switch "ON" Except the above gear position	6 - 7V	000

BF

HA

EL

Electrical Components Inspection (Cont'd)

*Data are reference values.

			Data die lelelelice values.
TERMI- NAL NO.	ITEM	CONDITION	*DATA
36	Ignition switch	Ignition switch "OFF"	0V BATTERY VOLTAGE (11 - 14V)
37	Throttle position sensor power supply	Ignition switch "ON"	Approximately 5V
38 47	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
41	Air conditioner switch	Both air conditioner switch and blower switch are "ON".	ov
		Engine is running. Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
40		Engine is running. Steering wheel is being turned.	0.1 - 0.3V
43 F	Power steering oil pressure switch	Engine is running. Steering wheel is not being turned.	Approximately 5V
46	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
101	Injector No. 1		
103	Injector No. 3		BATTERY VOLTAGE
110	Injector No. 2	Engine is running.	(11 - 14V)
112	Injector No. 4		
		Engine is running. Engine is cold. Engine coolant temperature is below 60°C (140°F).	0.7 - 0.9V
105	EGRC-solenoid valve	Engine is running. (Racing) After warming up Engine coolant temperature is between 60°C (140°F) and 105°C (221°F).	BATTERY VOLTAGE (11 - 14V)
		Engine is running.	Approximately 0V
102	PAIRC-solenoid valve	Engine is running. Except at idle Do not run engine at high speed under no-load.	BATTERY VOLTAGE (11 - 14V)

Electrical Components Inspection (Cont'd)

*Data are reference values.

	 			
RMI- NAL NO.	ITEM	CONDITION	*DATA	
•••		Ignition switch "ON" For 5 seconds after turning ignition switch "ON"	0.7 - 0.9V	. [
104	Fuel pump relay	Engine is running. Ignition switch "ON" Within 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)	[
		Engine is running. Idle speed	7 - 10V	1
113	IACV-AAC valve	Engine is running. — Steering wheel is being turned. — Air conditioner is operating. — Rear defogger is "ON". — Headlamps are in high position.	4 - 7V	(
	T	Engine is running. Idle speed Engine coolant temperature is below 40°C (104°F).	Approximately 0V	į
valve	Torque converter clutch solenoid valve	Engine is running. — After warming up Engine coolant temperature is above 40°C (104°F). — Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)	

ECM HARNESS CONNECTOR TERMINAL LAYOUT





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BF

HA

FA

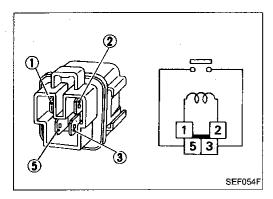
RA

BR

ST

EL,

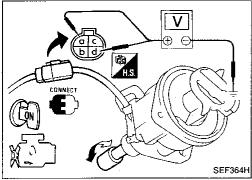
 $\mathbb{ID}\mathbb{X}$



Electrical Components Inspection (Cont'd) ECCS RELAY

Check continuity between terminals 3 and 5.

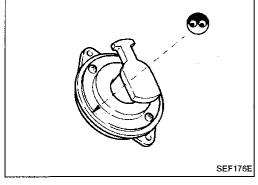
Condition	Continuity
12V direct current supply between terminals ① and ②	Yes
No supply	No



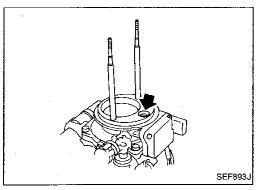
CAMSHAFT POSITION SENSOR

- 1. Remove distributor from engine. (camshaft position sensor harness connector is connected.)
- Turn ignition switch "ON".
- 3. Rotate camshaft position sensor shaft slowly and check voltage between terminals (a), (b) and ground.

Voltage fluctuates between 5V and 0V.

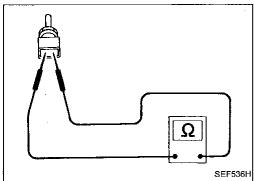


4. Visually check rotor plate for damage or dust.



MASS AIR FLOW SENSOR

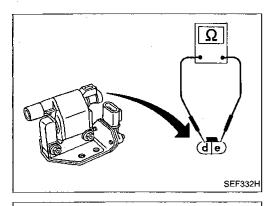
Visually check hot wire air passage for dust.



ENGINE COOLANT TEMPERATURE SENSOR

Check engine coolant temperature sensor resistance.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.30 - 0.33



Ω

a b c

SEF333H

Θ

Electrical Components Inspection (Cont'd) IGNITION COIL

Check ignition coil resistance.

Terminal	Resistance
d - e	Approximately 0.7Ω

MA

EM

MT

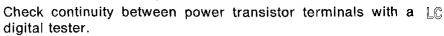
AT

TE

PD

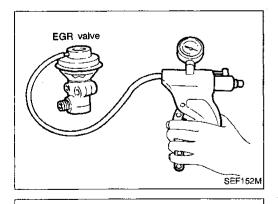
GI

POWER TRANSISTOR



EF & EC	Continuity	Tester polarity	Terminal No.
EC	N-	•	a
FF	No	Θ	(b)
[5 <u>E</u>	V	Θ	a
	Yes	•	(b)
CL	Ma	⊕	a
	No	Θ	©
			<u> </u>

Yes **(c)** \oplus



EGR VALVE

Apply vacuum to EGR vacuum port with a hand vacuum pump. FA EGR valve spring should lift.

RA

BR

ST

BF

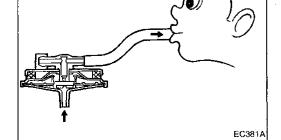
EGRC-BPT VALVE

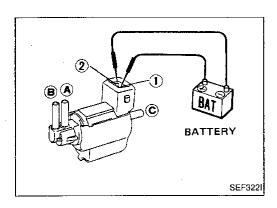
Plug one of two ports of EGRC-BPT valve. Apply a pressure above 0.490 kPa (50 mmH₂O, 1.97 inH₂O) to check for leakage. If a leak is noted, replace valve.

MA

EL

M

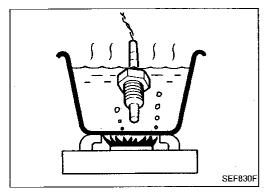




Electrical Components Inspection (Cont'd) EGRC-SOLENOID VALVE, PAIRC-SOLENOID VALVE AND SCV CONTROL SOLENOID VALVE

Check air passages continuity.

Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals (1) and (2)	Yes	No
No supply	No	Yes

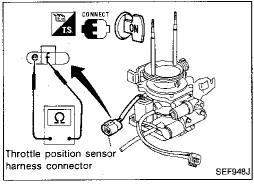


EGR TEMPERATURE SENSOR

Check resistance change and resistance value at 100°C (212°F).

Resistance should decrease in response to temperature increase.

Resistance: 100°C (212°F) 85.3 \pm 8.53 k Ω



THROTTLE POSITION SENSOR

Make sure that resistance between terminals (a) and (1) changes when opening throttle valve manually.

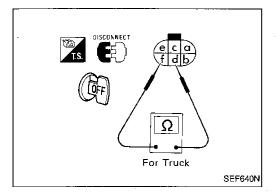
Resistance should change.

If NG, replace throttle position sensor.

Adjustment

If throttle position sensor is replaced or removed, it is necessary to install it in the proper position, by following the procedure as shown below:

- Install throttle position sensor body in throttle body. Do not tighten bolts.
- 2. Connect throttle position sensor harness connector.
- 3. Start engine and warm it up sufficiently.
- 4. Measure output voltage of throttle position sensor using voltmeter.
- 5. Adjust by rotating throttle position sensor body so that output voltage is 0.4 to 0.6V.
- Tighten mounting bolts.
- 7. Disconnect throttle position sensor harness connector for a few seconds and then reconnect it.



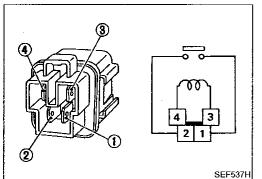
Electrical Components Inspection (Cont'd) FUEL PUMP

Check continuity between terminals (1) and (1). Continuity should exist.

G[

MA

EM



FUEL PUMP RELAY

Check continuity between terminals (1) and (2).

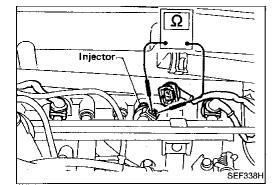
LC.

Condition	Continuity	
12V direct current supply between terminals ③ and ④	Yes	
No supply	No	

FE

CL

MT



INJECTORS

Check injector resistance.

Resistance:

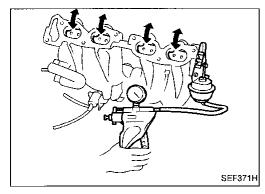
Approximately 10 - 15 Ω

Remove injector and check nozzle for clogging.

TF

AT

PD)



SWIRL CONTROL VALVE

Supply vacuum to actuator and check swirl control valve operation.

RA

Close
Open

ST

BR



Check IACV-AAC valve resistance.

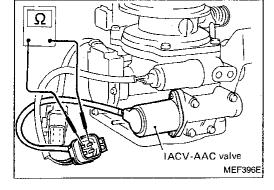
BF

Resistance:

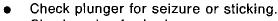
Approximately 10 Ω

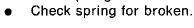
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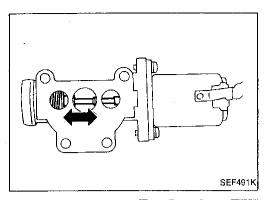
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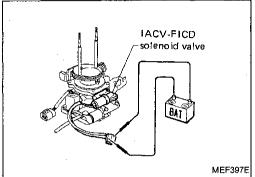


Electrical Components Inspection (Cont'd)



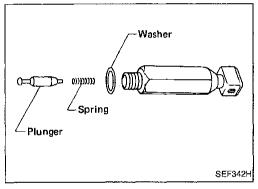




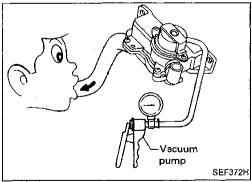


IACV-FICD SOLENOID VALVE

 Check that clicking sound is heard when applying 12V direct current to terminals.

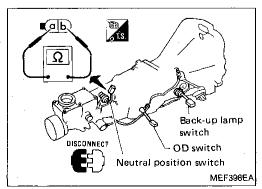


- Check plunger for seizure or sticking.
- Check for broken spring.



PAIR VALVE

Apply vacuum to vacuum motor, suck or blow hose to make sure that air flows only towards the air induction side.



NEUTRAL POSITION SWITCH (M/T model)

• Check continuity between terminals (a) and (b).

Conditions	Continuity
Shift to Neutral position	Yes
Shift to other position	No

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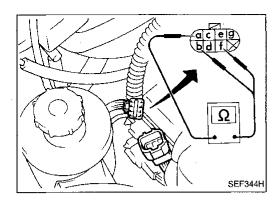
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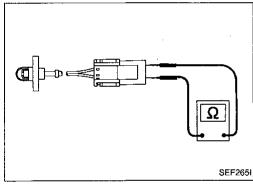
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For A/T model without ASCD Battery SEF345HA



Electrical Components Inspection (Cont'd) INHIBITOR SWITCH (A/T model)

Check continuity between terminals (a) and (b), (f).

Conditions	Continuity between terminals (a) and (b)	Continuity between terminals (a) and (f)
Shift to "P" position	Yes	No
Shift to "N" position	No	Yes
Shift to positions other than "P" and "N"	No	No

PARK/NEUTRAL POSITION RELAY (A/T model)

• Check continuity between terminals (h) and (j) .

Condition	Continuity between terminals (i) and (i)	
12V direct current supply between terminals (i) and (ii)		
No supply	No	

INTAKE AIR TEMPERATURE SENSOR

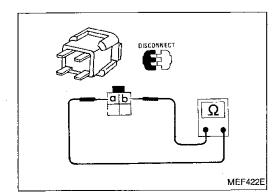
Check intake air temperature sensor resistance.

Temperature °C (°F)	Resistance $k\Omega$
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38

POWER STEERING OIL PRESSURE SWITCH

- 1. Disconnect power steering oil pressure switch harness connector.
- 2. Check continuity between terminals.

Conditions	Continuity
Steering wheel is being turned.	Yes
Steering wheel is not being turned.	No

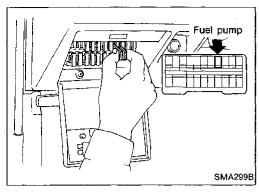


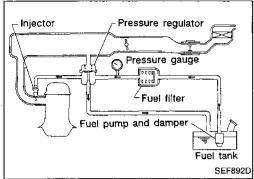
RESISTOR

- 1. Disconnect resistor harness connector.
- Check resistance between terminals (a) and (b).
 Resistance: Approximately 2.2kΩ
 If NG, replace resistor.

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Releasing Fuel Pressure

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

- 1. Remove fuel pump fuse.
- 2. Start engine.
- After engine stalls, crank it two or three times to release all fuel pressure.
- 4. Turn ignition switch off and reconnect fuel pump fuse.

Fuel Pressure Check

- a. When reconnecting fuel line, always use new clamps.
- b. Make sure that clamp screw does not contact adjacent parts.
- c. Use a torque driver to tighten clamps.
- d. Use Pressure Gauge to check fuel pressure.
- Do not perform fuel pressure check while fuel pressure regulator control system is operating; otherwise, fuel pressure gauge might indicate incorrect readings.
- 1. Release fuel pressure to zero.
- Disconnect fuel hose between fuel filter and fuel tube (engine side).
- 3. Install pressure gauge between fuel filter and fuel tube.
- 4. Start engine and check for fuel leakage.
- 5. Read the fuel pressure gauge indication.

At idling:

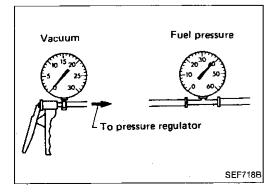
When fuel pressure regulator valve vacuum hose is connected.

More than 226 kPa (2.3 kg/cm², 33 psi)

When fuel pressure regulator valve vacuum hose is disconnected.

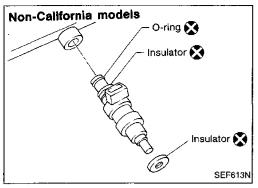
Approximately 294 kPa (3.0 kg/cm², 43 psi)

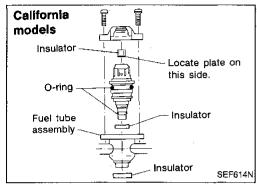
- 6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
- 7. Plug intake manifold with a rubber cap.
- 8. Connect variable vacuum source to fuel pressure regulator.



9. Start engine and read fuel pressure gauge indication as vacuum changes.

Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.





Roller

Alignment mark

SEF975K

SEF553K

Injector Removal and Installation

- Release fuel pressure to zero.
- Remove or disconnect the following: 2.
- EGRC-BPT valve
- Fuel tube securing bolts
- Remove injectors with fuel tube assembly.
- Remove injector from fuel tube.

For California model, push out injector from fuel tube assembly. Do not extract injector by pinching electric connector.

Install injector to fuel tube after cleaning exterior of injector.

Use new O-rings and insulators.

Lubricate O-rings with a smear of silicone oil.

After properly connecting injectors to fuel tube, check connection for fuel leakage.

Assemble injectors with fuel pipe to intake manifold.

Fast Idle Inspection and Adjustment

- Start engine and warm it up until water temperature indicator points to the normal operating temperature.
- Stop engine and remove air cleaner assembly.

- 3. Be sure to set the mark to point to the roller center as shown in the figure.
- On throttle bodies, an alignment mark is impressed on the FIC so that the top of the cam may be faced in the correct direction.

If necessary, adjust the adjusting screw (A) until the top of

the cam faces the center of the lever roller.

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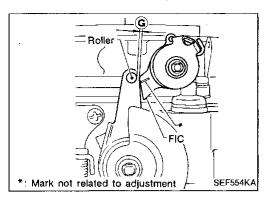


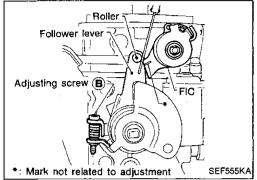












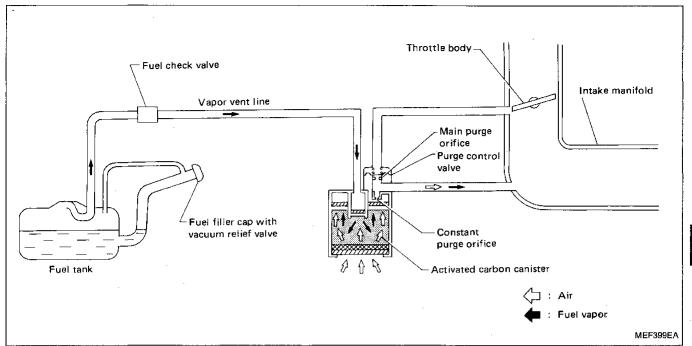
Fast Idle Inspection and Adjustment (Cont'd)

4. Measure clearance **(G)** between the roller and the top of the FIC using a feeler gauge. (See figure.)

Clearance **(§)**:
 M/T model
 2.0 - 2.6 mm (0.079 - 0.102 in)
 A/T model
 1.8 - 2.4 mm (0.071 - 0.094 in)

If clearance (i) is out of specification, adjust clearance (i) using adjusting screw (ii) to 2.3 mm (0.091 in) (M/T) or 2.1 mm (0.083 in) (A/T).

Description

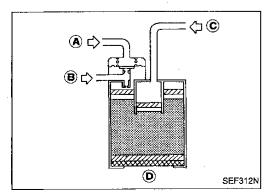


The evaporative emission system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

The fuel vapor from the sealed fuel tank is led into the canister which contains activated carbon and the vapor is stored there when the engine is not running.

The canister retains the fuel vapor until the canister is purged by the air drawn through the bottom of the canister to the intake manifold when the engine is running. When the engine runs at idle, the purge control valve is closed.

Only a small amount of stored vapor flows into the intake manifold through the constant purge orifice. As the engine speed increases, and the throttle vacuum increases, the purge control valve opens and the vapor is sucked into the intake manifold through both the main purge orifice and the constant purge orifice.



Inspection

ACTIVATED CARBON CANISTER

Check carbon canister as follows:

- Blow air in port (a) and ensure that there is no leakage.
- Apply vacuum to port (A).
- Cover port (1) with hand.
 - Blow air in port © and ensure free flow out of port ®.

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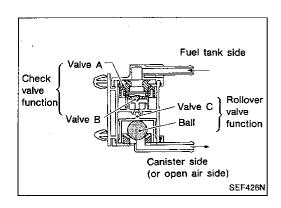
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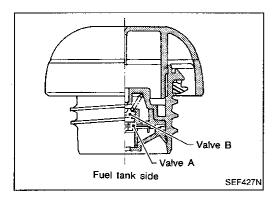
Inspection (Cont'd) FUEL CHECK VALVE (With rollover valve)

Check valve operation

- Blow air through connector on fuel tank side.
 A considerable resistance should be felt and a portion of air flow should be directed toward the canister side.
- Blow air through connector on canister side.Air flow should be smoothly directed toward fuel tank side.
- If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.

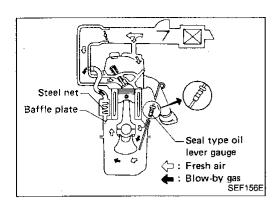
Rollover valve operation

Ensure that continuity of air passage does not exist when the installed rollover valve is tilted to 90° or 180°.



FUEL TANK VACUUM RELIEF VALVE

- 1. Wipe clean valve housing.
- Suck air through the cap. A slight resistance accompanied by valve clicks indicates that valve A is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
- Blow air on fuel tank side and ensure that continuity of air passage exists through valve B.
- 4. If valve is clogged or if no resistance is felt, replace cap as an assembly.



Description

This system returns blow-by gas to both the intake manifold and air cleaner.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.

During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is then drawn from the air cleaner, through the hose connecting the air cleaner to rocker cover, into the crankcase.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air cleaner under all conditions.



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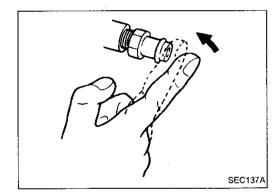
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Inspection

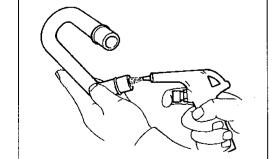
PCV (Positive Crankcase Ventilation)

With engine running at idle, remove ventilation hose from PCV valve; if valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.





FA



VENTILATION HOSE

- Check hoses and hose connections for leaks.
- Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.





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General Specifications

IGNITION TIMING	BTDC	10° ± 2°
IDLE SPEED	rpm	M/T 800 ± 50 A/T 800 ± 50 (in "N" position)

Inspection and Adjustment

ENGINE COOLANT TEMPERATE SENSOR	URE		
They later registered	kΩ	20°C (68°F)	80°C (176°F)
Thermistor resistance	K32 [2.1 - 2.9	0.30 - 0.33
FUEL PRESSURE at idling			
(Measuring point: between fu filter and fuel pipe)	ıel		
Vacuum hose is connected kPa (kg/cm²			imately .3, 33)
Vacuum hose is disconned kPa (kg/cm²			imately .0, 43)
FUEL INJECTOR			
Coil resistance	Ω	Approxima	tely 10 - 15
EGR TEMPERATURE SENSOR			
The mariates we sintense	1.0	100°C	(212°F)
Thermistor resistance	kΩ	85.3	± 8.53

ELECTRICAL SYSTEM



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When you read wiring diagrams:

● Read GI section, "HOW TO READ WIRING DIAGRAMS".

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A/T CONTROL SYSTEM		AT SECTION	
		BR SECTION	
		FA SECTION	
		BF SECTION	
		BF SECTION	
		BF SECTION	
DOOR MIRROR		BF SECTION	
REALER AND AIR COMMISSIONER		HA SECTION	

Description

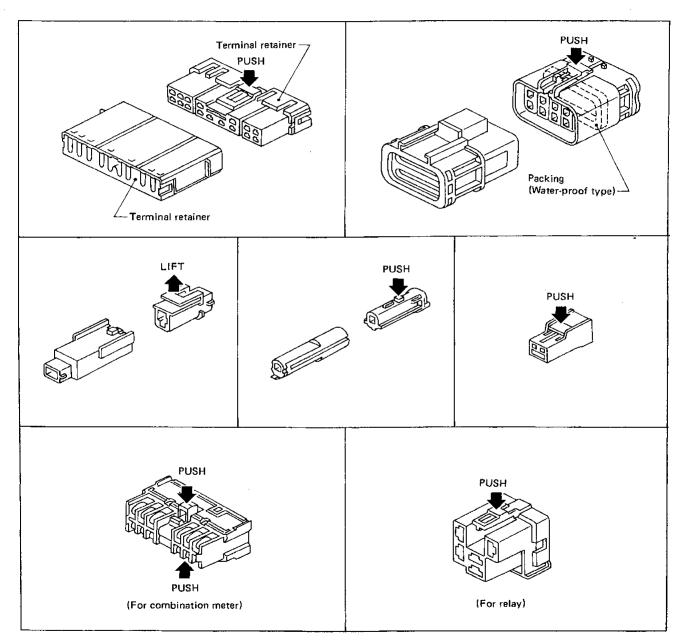
HARNESS CONNECTOR

- All harness connectors prevent accidental looseness or disconnection.
- The connector can be disconnected by pushing or lifting the locking section.

CAUTION:

Do not pull the harness when disconnecting the connector.

[Example]



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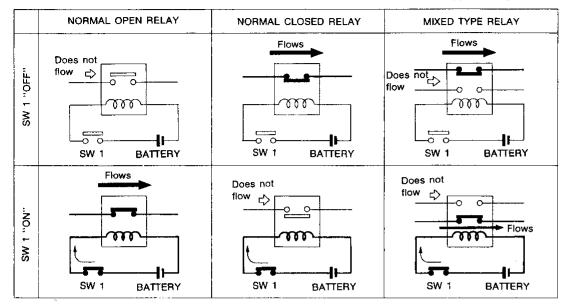
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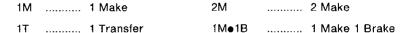
Normal Open, Normal Closed and Mixed Type Relays

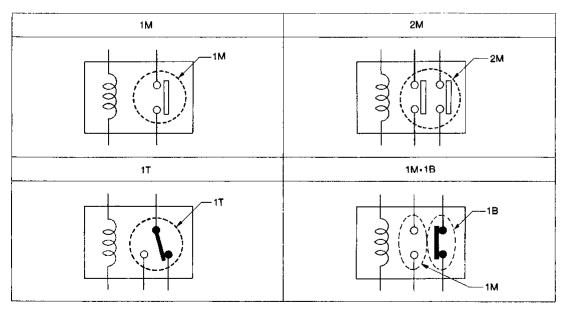
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



SEL881H

Type of Standardized Relays





SEL882H

STANDARDIZED RELAY

Туре	Outer view	Circuit	Connector symbol and connection	Case color
1T		① ⑤ ④ ① ② ③	2 1 5 3	BLACK
1M	5	3 0 0 5	00 1 2 5 3	BLUE or GREEN
2M		(a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c	00 2 1 7 5 6 3	BROWN
1M•1B		1 6 3 000 0	2 1 6 7 3 4	GRAY

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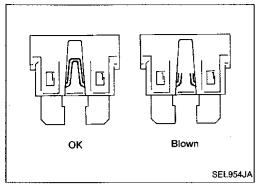
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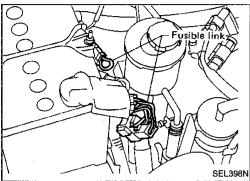
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POWER SUPPLY ROUTING





Fuse

- a. If fuse is blown, be sure to eliminate cause of problem before installing new fuse.
- b. Use fuse of specified rating. Never use fuse of more than specified rating.
- Do not partially install fuse; always insert it into fuse holder properly.
- d. Remove fuse for clock if vehicle is not used for a long period of time.

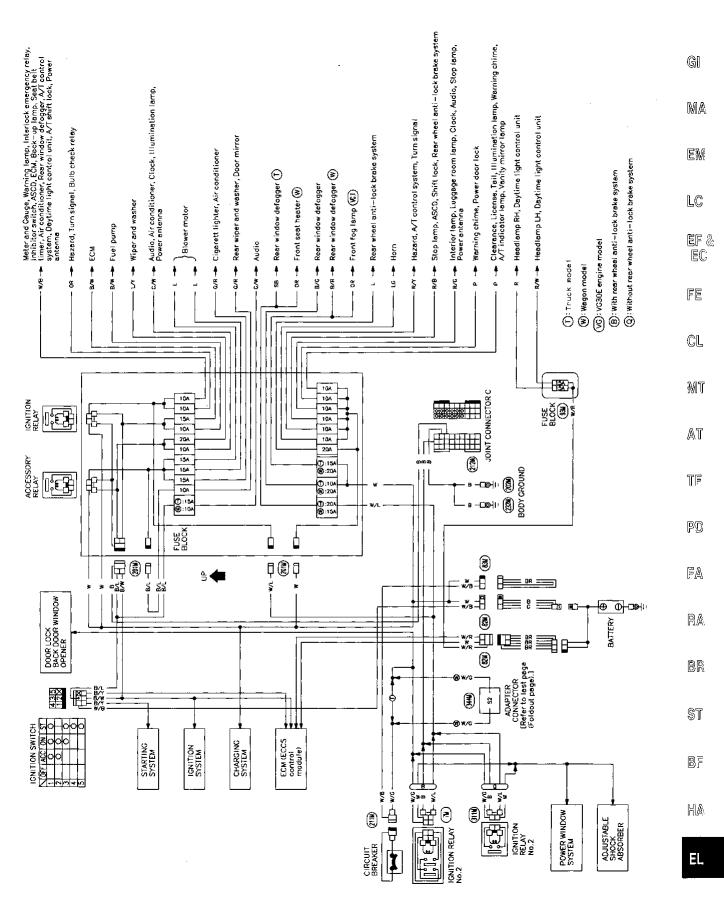
Fusible Link

A melted fusible link can be detected either by visual inspection or by feeling with finger tip. If its condition is questionable, use circuit tester or test lamp.

CAUTION:

- a. If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.
- b. Never wrap outside of fusible link with vinyl tape. Extreme care should be taken with this link to ensure that it does not come into contact with any other wiring harness or vinyl or rubber parts.

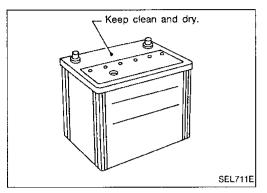
Wiring Diagram



SEL889S

CAUTION:

- a. If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
- b. After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.
- Never add distilled water through the hole used to check specified gravity.

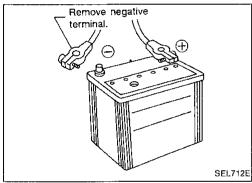


How to Handle Battery

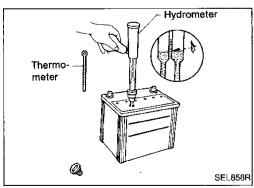
METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level.



 When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal. (If the vehicle has an extended storage switch, turn it off.)



Check the charge condition of the battery.
 Periodically check the specific gravity of the electrolyte.
 Keep a close check on charge condition to prevent over-discharge.

BATTERY

How to Handle Battery (Cont'd) CHECKING ELECTROLYTE LEVEL

WARNING:

Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If the acid contacts the eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.



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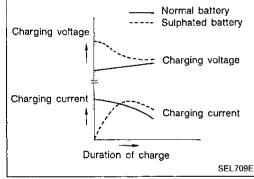
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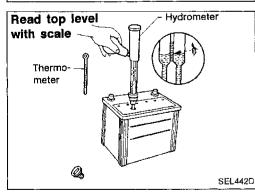
10)X



- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



Cell plug-



SULPHATION

When a battery has been left unattended for a long period of time and has a specific gravity of less than 1.100, it will be completely discharged, resulting in sulphation on the cell plates.

Compared with a battery discharged under normal conditions, the current flow in a "sulphated" battery is not as smooth although its voltage is high during the initial stage of charging, as shown in the figure at the left.

SPECIFIC GRAVITY CHECK

Read hydrometer and thermometer indications at eye level.

How to Handle Battery (Cont'd)

 Use the chart below to correct your hydrometer reading according to electrolyte temperature.

Hydrometer temperature correction

Battery electrolyte temperature °C (°F)	Add to specific gravity reading
71 (160)	0.032
66 (150)	0.028
60 (140)	0.024
54 (129)	0.020
49 (120)	0.016
43 (110)	0.012
38 (100)	0.008
32 (90)	0.004
27 (80)	. 0
21 (70)	-0.004
16 (60)	-0.008
10 (50)	-0.012
4 (39)	0.016
-1 (30)	-0.020
-7 (20)	-0.024
-12 (10)	-0.028
-18 (0)	-0.032

Corrected specific gravity	Approximate charge condition
1.260 - 1.280	Fully charged
1.230 - 1.250	3/4 charged
1.200 - 1.220	1/2 charged
1.170 - 1.190	1/4 charged
1.140 - 1.160	Almost discharged
1.110- 1.130	Completely discharged

CHARGING THE BATTERY

CAUTION:

- a. Do not "quick charge" a fully discharged battery.
- Keep the battery away from open flame while it is being charged.
- c. When connecting the charger, connect the leads first, then turn on the charger. Do not turn on the charger first, as this may cause a spark.
- d. If battery electrolyte temperature rises above 60°C (140°F), stop charging. Always charge battery at a temperature below 60°C (140°F).

Charging rates:

Amps	Time
50	1 hour
25	2 hours
10	5 hours
5	10 hours

BATTERY

How to Handle Battery (Cont'd)

Do not charge at more than 50 ampere rate.

Note: The ammeter reading on your battery charger will automatically decrease as the battery charges. This indicates that the voltage of the battery is increasing normally as the state of charge improves. The charging amps indicated above refer to initial charge rate.

If, after charging, the specific gravity of any two cells varies more than .050, the battery should be replaced.

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Service Data and Specifications (SDS)

Applied area		U.S.A.	Canada			
Engine		All	KA24E	VG30E		
Туре		55D23R	65D26R	75D31R		
Capacity	V-AH	12-60	12-65	12-70		
Cold cranking current (For reference value)	Α	356	413	447		

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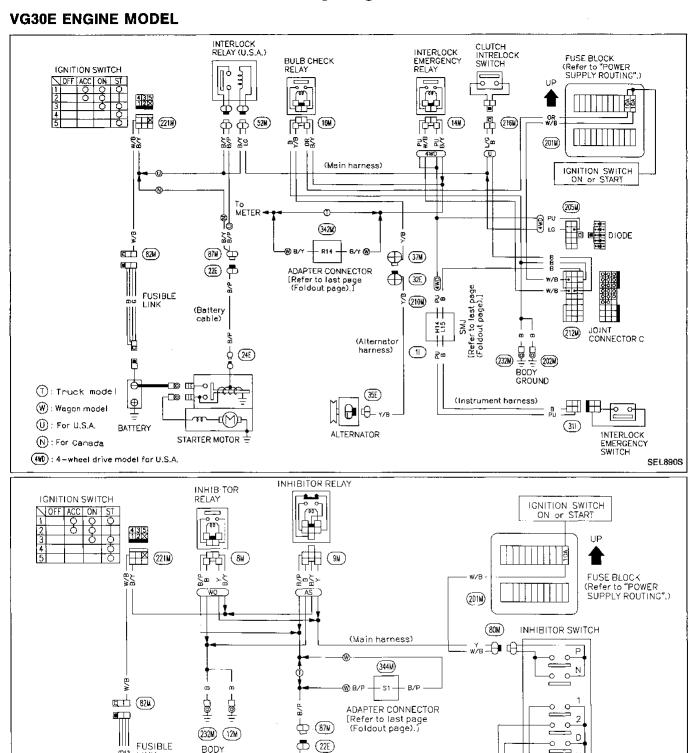
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Wiring Diagram



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(AS): With ASCD (WO): Without ASCD

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STARTER MOTOR

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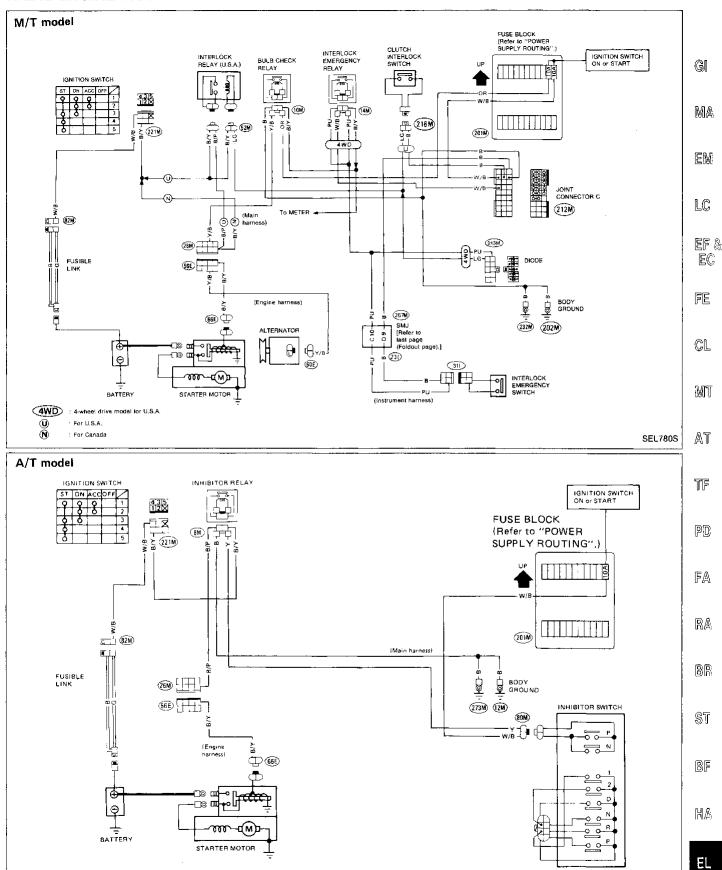
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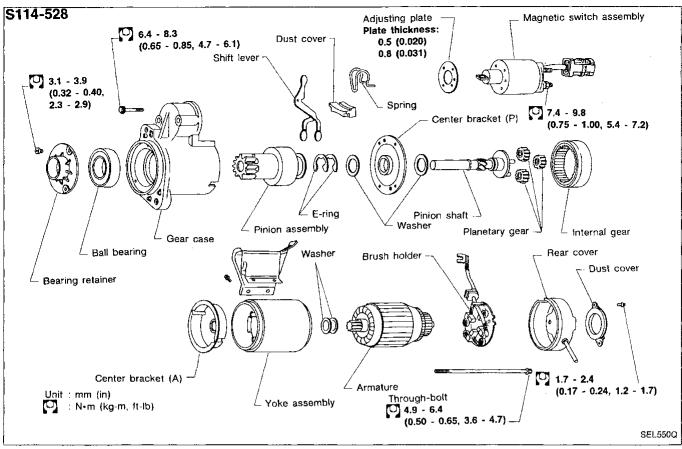
Wiring Diagram (Cont'd)

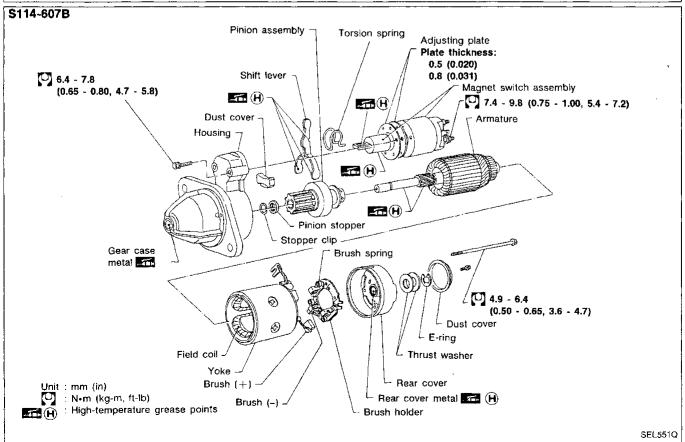
KA24E ENGINE MODEL



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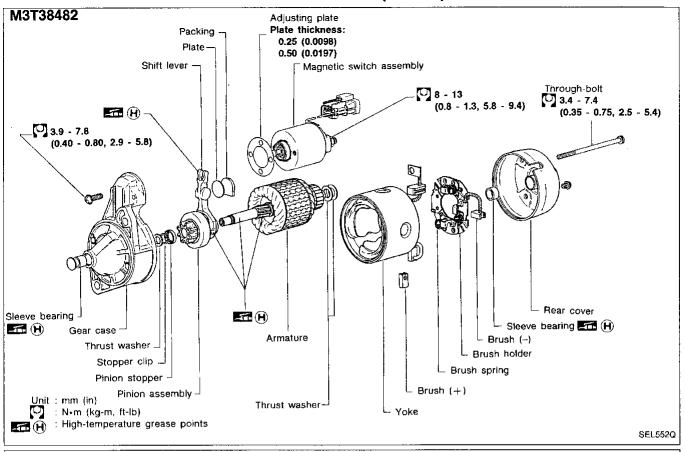
Construction

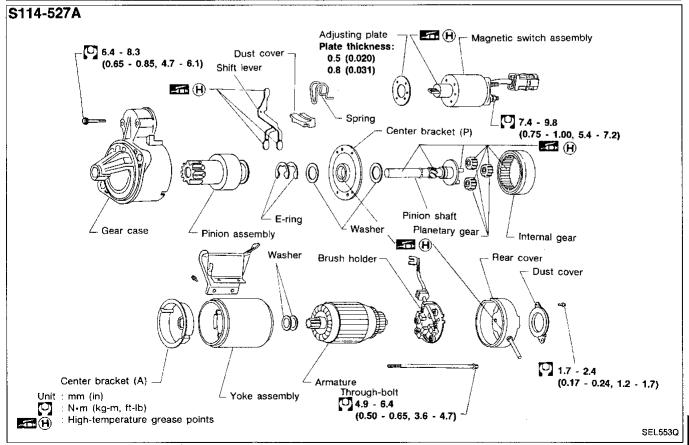




STARTING SYSTEM

Construction (Cont'd)





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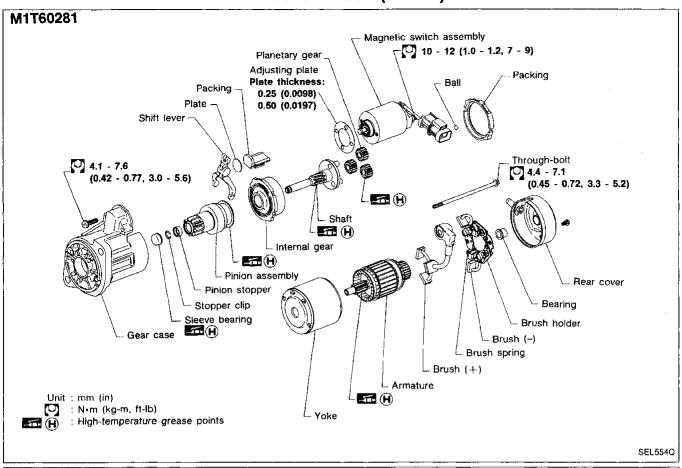
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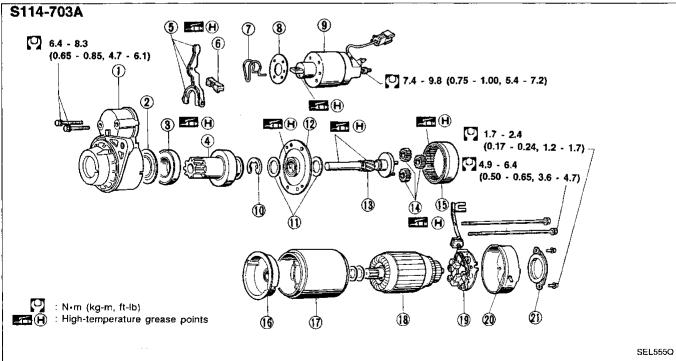
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STARTING SYSTEM

Construction (Cont'd)





- 1 Gear case
- Bearing cover
- (3) Ball bearing
- 4 Pinion assembly
- 5 Shift lever
- 6 Dust cover
- 7 Torsion spring

- 8 Adjusting plate
- Magnetic switch assembly
- 10 E-ring
- (f) Thrust washer
- (2) Center bracket
- (3) Pinion shaft
- (4) Planetary gear

- (5) Internal gear
- 16 Center bracket
- Yoke assembly
- ® Armature
- 19 Brush holder assembly
- 20) Rear cover
- 21) Dust cover

STARTING SYSTEM

Service Data and Specifications (SDS)

STARTER

	S114-528	S114-607B	M3T38482	S114-527A	M1T60281	S114-703A	
Туре	нітл	ACHI	MITSUBISHI	HITACHI	MITSUBISHI	HITACHI	
	Reduction	Non-re	duction	Reduction			
				KA24E			
Applied model	VG30E		U.S.	A. 2WD		All 4WD and	
		M/T A/T		/ T	CANADA		
System voltage V				12			
No-load							
Terminal voltage V	11.0	11	1,5		11.0		
Current A	Less than 90	Less than 60	Less than 60	Less than 90	50 - 75	Less than 90	
Revolution rpm More than		More than 7,000	More than 6,500	More than 2,950	3,000 - 4,000	More than 2,950	
Minimum diameter of com- mutator mm (in)	More than 32 (1.26)	More than 39 (1.54)	More than 31.4 (1.236)	More than 32 (1.26)	More than 28.8 (1.134)	More than 32 (1.26)	
Minimum length of brush mm (in)	, ,	0.43)	11.5 (0.453)	11 (0.43)	12 (0.47)	11 (0.43)	
Brush spring tension 17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)		13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)		
Movement in height of pinion assembly mm (in)		_			0.5 - 2.0 (0.020 - 0.079)	_	
Clearance of bearing metal and armature shaft mm (in)	0.03 - 0.3 (0.0012 - 0.0118)	Less than 0.2 (0.008)		0.2 (0.008)	_	0.03 - 0.3 (0.0012 - 0.0118)	
Clearance between pinion front edge and pinion stopper mm (in)	0.05 - 1.5 (0.0020 - 0.0591)	0.3 - 2.5 (0.012 - 0.098)	0.5 - 2.0 (0.020 - 0.079)	0.3 - 1.5 (0.012 - 0.059)		0.05 - 1.5 (0.0020 - 0.0591)	

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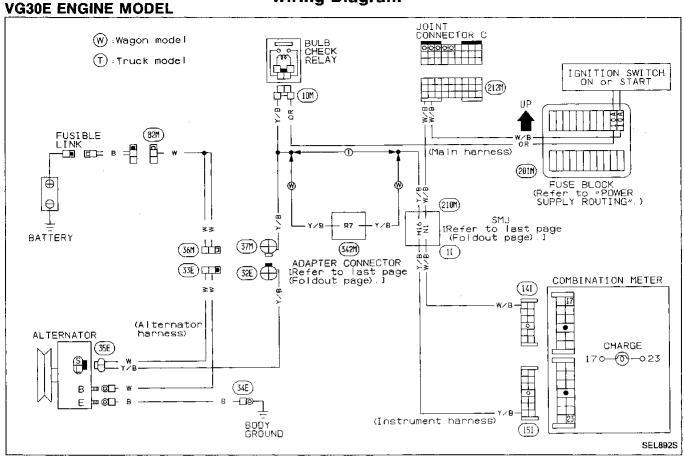
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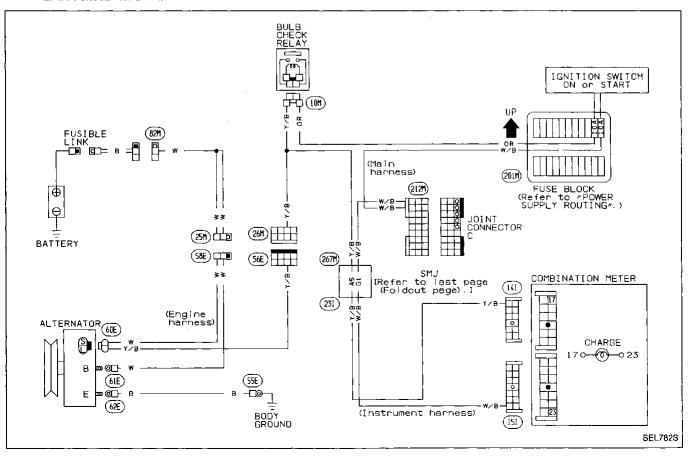
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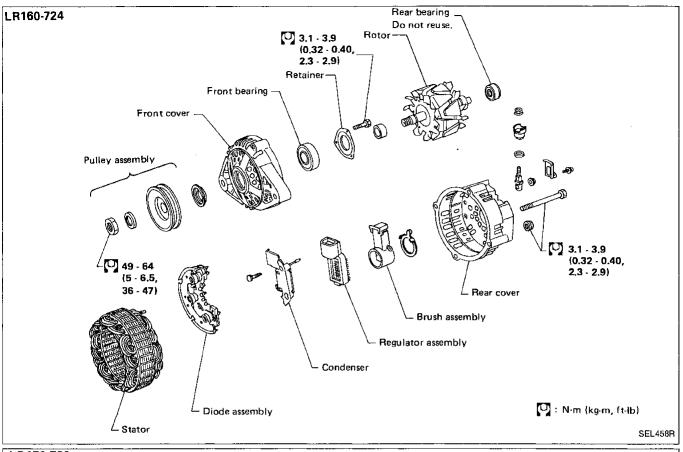
Wiring Diagram

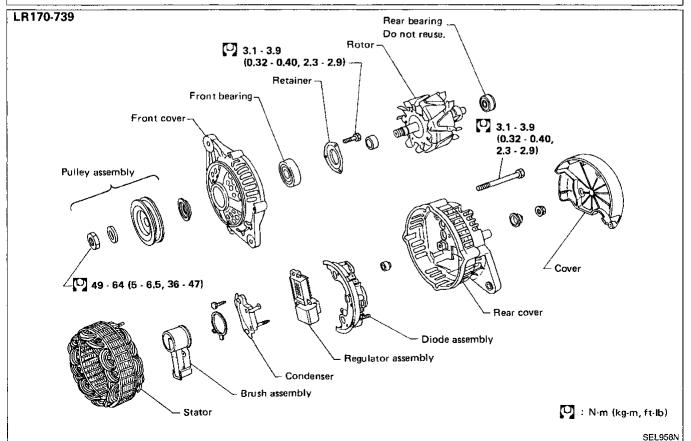


KA24E ENGINE MODEL



Construction





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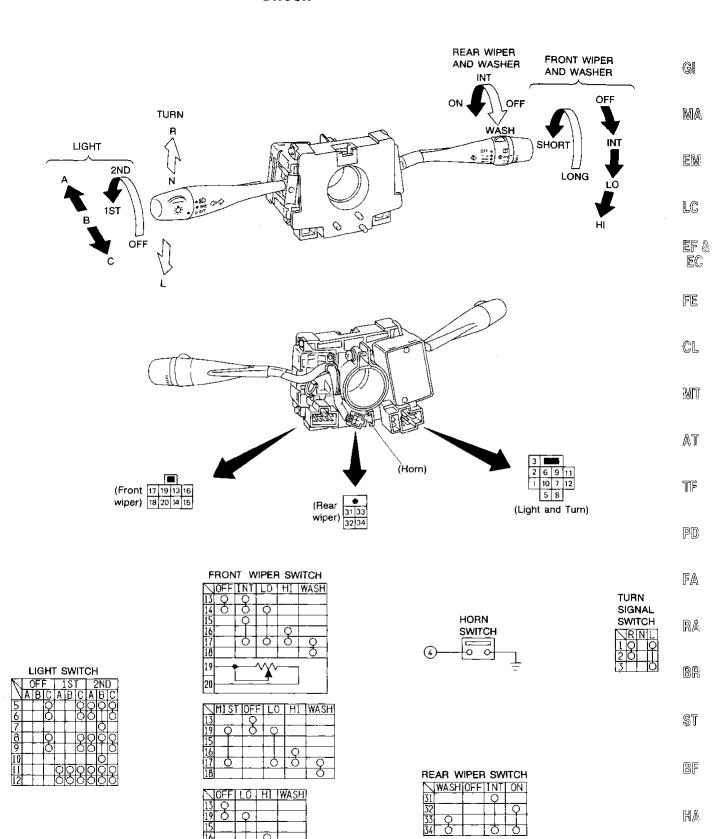
HA

Service Data and Specifications (SDS)

ALTERNATOR

Applied model		VG30E	KA24E
Туре		LR170-739	LR160-724
Nominal rating	Nominal rating V-A		12-60
Ground polarity		Neg	ative
Minimum revolution under no- (When 13.5 volts is applied)	load rpm	Less than 950	Less than 1,000
Hot output current (When 13.5 volts is applied)	A/rpm	More than 22/1,300 More than 50/2,500 More than 67/5,000	More than 17/1,300 More than 48/2,500 More than 57/5,000
Regulated output voltage	V	14.1	- 14.7
Minimum length of brush	mm (in)	6 (0	0.24)
Slip ring minimum outer diame	eter mm (in)	More than	26.0 (1.024)
Rotor (Field coil resistance)	Ω		2.58

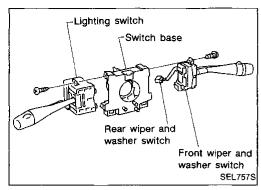
Check



SEL756S

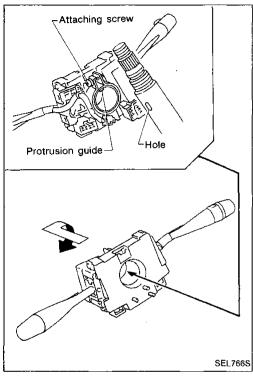
EL

COMBINATION SWITCH



Replacement

• Lighting switch, wiper & washer switch and can be replaced without removing combination switch base.



To remove combination switch base, remove base attaching screw and turn after pushing on it.

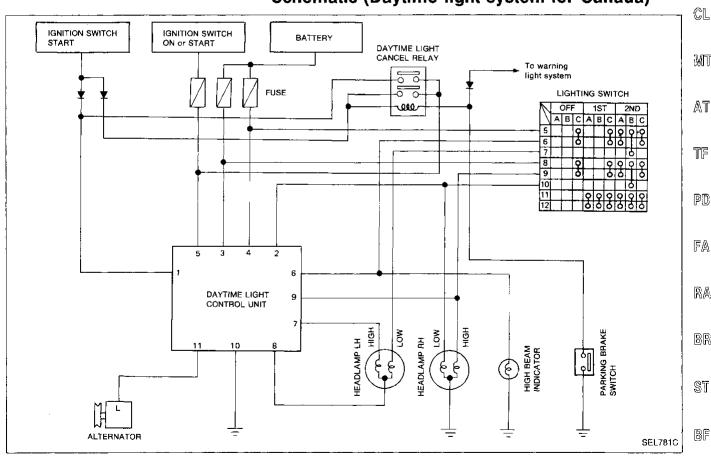
Operation (Daytime light system for Canada)

After starting the engine with the lighting switch in the "OFF" position or "1ST" position, the headlamp high beam automatically turns on. Lighting switch operations other than the above are the same as conventional light systems.

Engine		With engine stopped						٧	With engine running										
Lighting switch			OFF			1ST			2ND			OFF			1ST			2ND	
		Α	В	С	Α	8	С	Α	В	С	Α	В	C	Α	В	С	Α	В	. с
Head- lamp	High beam	Х	Х	0	Х	х	0	Q	Х	0	Δ,	Δ٠	.0	Δ	Δ	0	0	Х	0
	Low beam	Х	Х	Х	х	х	х	Х	0	х	Х	Х	Х	Х	Х	Х	Х	0	Х
Clearance and tail lamp		X	Х	Х	0	0	0	0	0	0	х	Х	Х	0	0	0	0	0	0
License and lamp	instrument illumination	x	х	х	0	0	0	0	0	0	х	х	×	0	0	0	0	0	0

O: Lamp "ON"

Schematic (Daytime light system for Canada)



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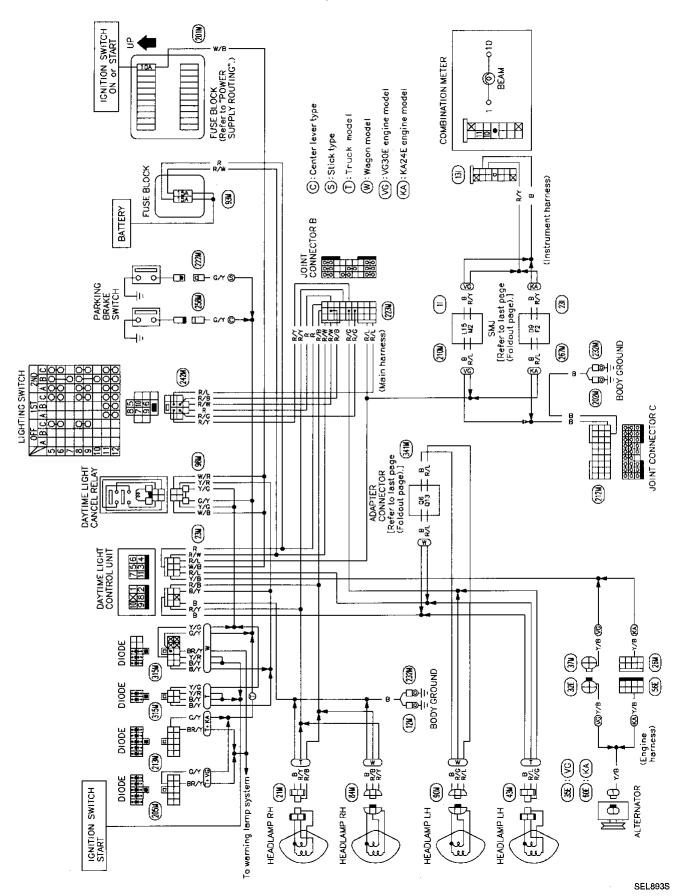
X: Lamp "OFF"

 $[\]triangle$: Lamp dims.

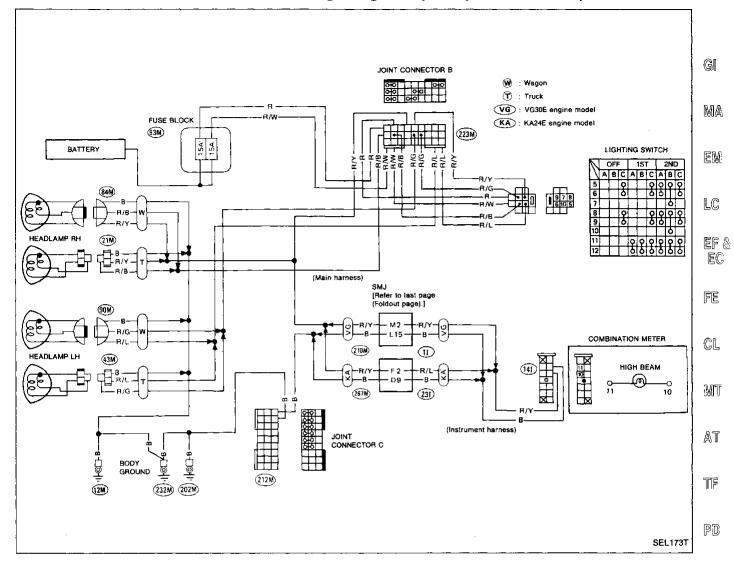
^{☐:} Added functions

^{*:} When starting the engine with the parking brake released, the daytime light will come ON. When starting the engine with the parking brake pulled, the daytime light won't come ON.

Wiring Diagram (Daytime light system for Canada)



Wiring Diagram (Except for Canada)



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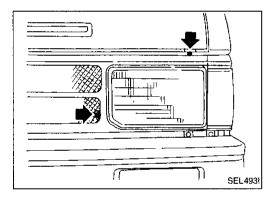
Aiming Adjustment

When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. For operating instructions of any aimer, it should be in good repair, calibrated and used according to respective operation manuals supplied with the unit.

If any aimer is not available, aiming adjustment can be done as follows:

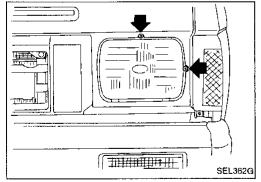
For details, refer to the regulations in your own country. CAUTION:

- a. Keep all tires inflated to correct pressures.
- b. Place vehicle and tester on one and same flat surface.
- c. See that there is no load in vehicle (coolant, engine oil filled up to correct level and full fuel tank) other than the driver (or equivalent weight placed in driver's position).



LOW BEAM

- 1. Turn headlamp low beam on.
- 2. Use adjusting screws to perform aiming adjustment.



- Before adjusting headlamps, remove covers.
- First tighten the adjust screw all the way and then make adjustment by loosening the screw.

HEADLAMP

$W_L = 1,067 (42.01)$ 7,620 (300.00) "H": Horizontal center line of headlamps Vertical center line Upper edge of ahead of headlamps high intensity zone Height of lamp centers 100 100 (4) (4) 100 100 (4) (4) 100 100 100 100 (4) (4) (4) Left edge of high intensity zone = ACCEPTABLE RANGE Unit: mm (in) SEL914D

Aiming Adjustment (Cont'd)

- Adjust headlamps so that upper edge and left edge of high intensity zone are within the acceptable range as shown at left.
- Dotted lines in illustration show center of headlamp.

"H": Horizontal center line of headlamps.

" W_L ": Distance between each headlamp center

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When using a mechanical aimer, adjust adapter legs to the data marked on the headlamps.

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Example:

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4H 2V Vertical side: 2 Horizontal side: 4

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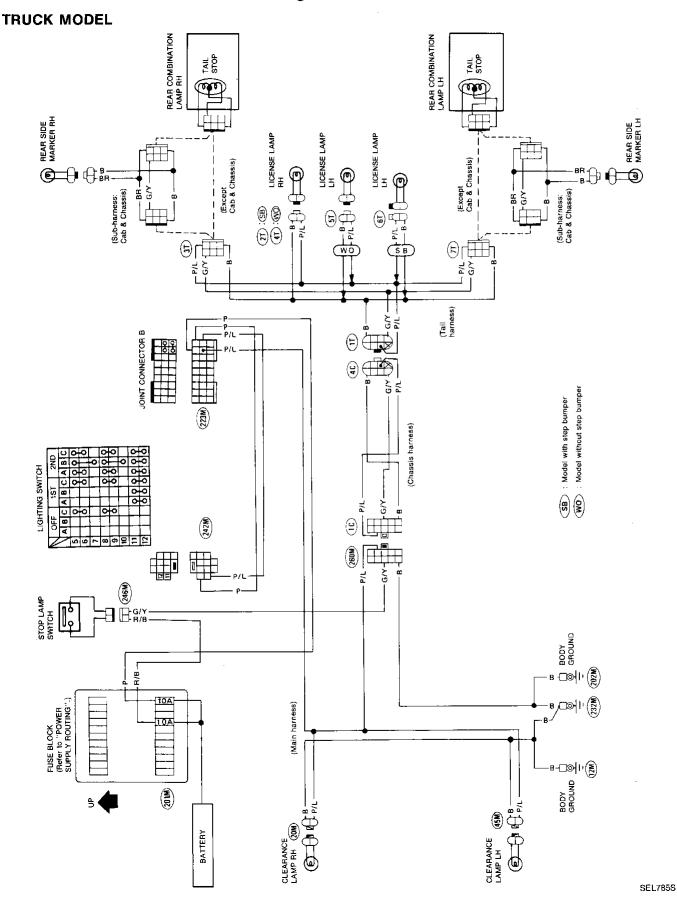
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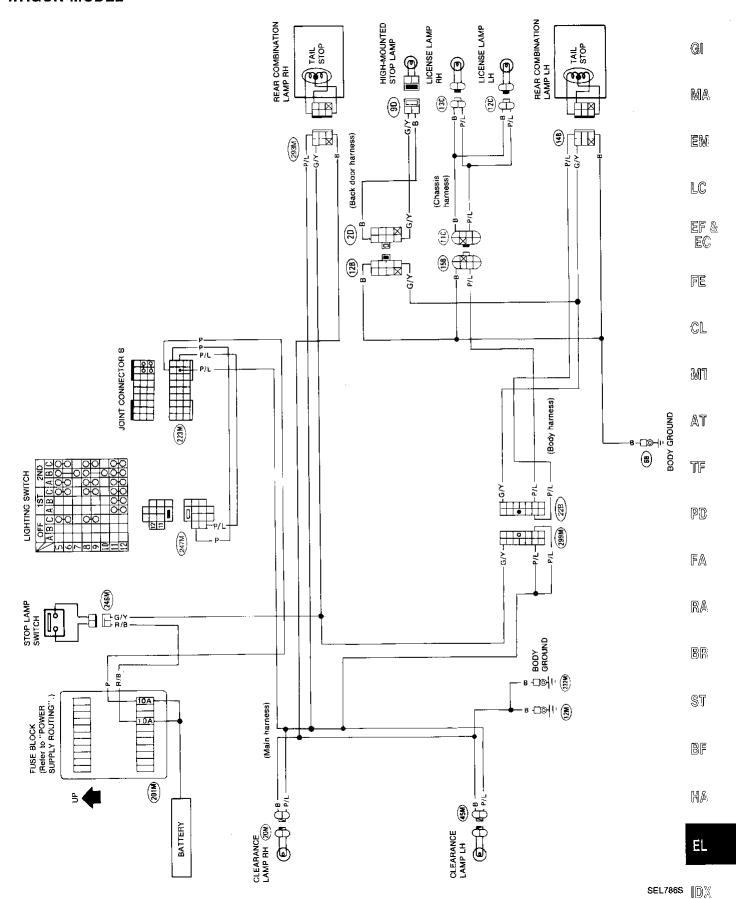
EL-27

Clearance, License, Tail and Stop Lamps/Wiring Diagram



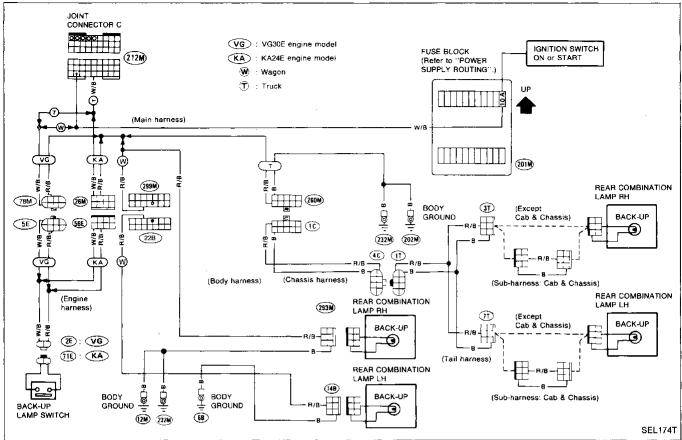
Clearance, License, Tail and Stop Lamps/Wiring Diagram (Cont'd)

WAGON MODEL

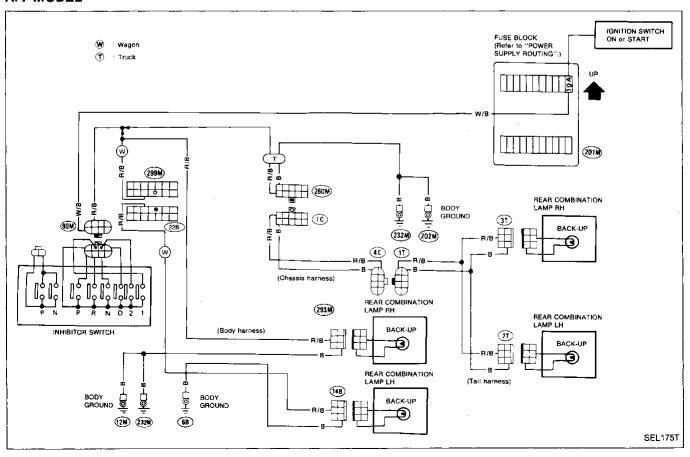


M/T MODEL

Back-up Lamp/Wiring Diagram



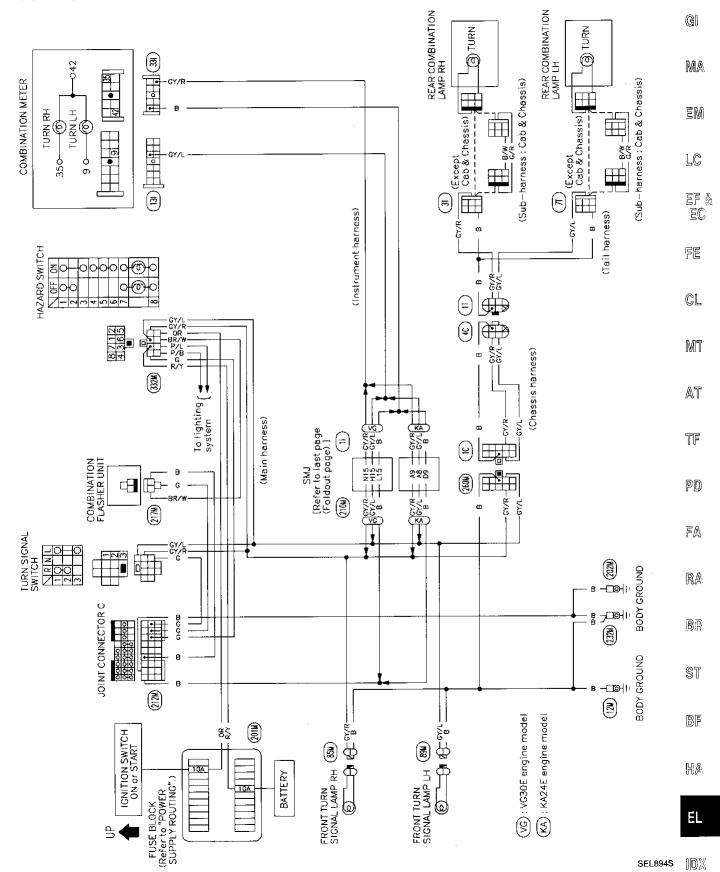
A/T MODEL



EL-30

Turn Signal and Hazard Warning Lamps/Wiring **Diagram**

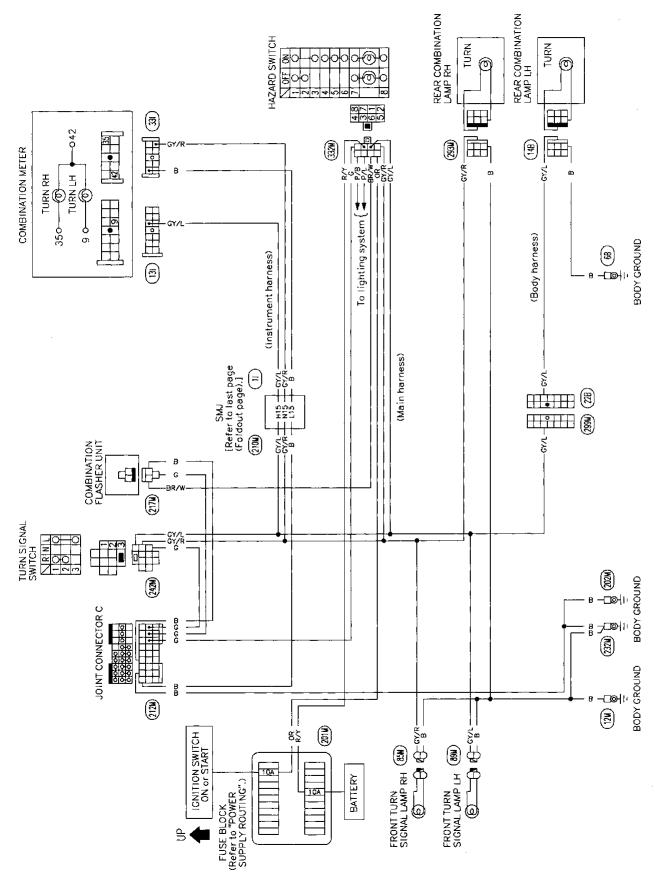
TRUCK MODEL



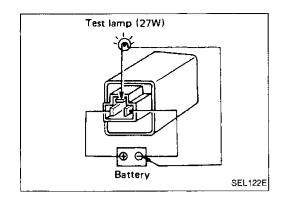
SEL894S

Turn Signal and Hazard Warning Lamps/Wiring Diagram (Cont'd)

WAGON MODEL



EXTERIOR LAMP



Combination Flasher Unit Check

- Before checking, ensure that bulbs meet specifications.
- Connect a battery and test lamp to the combination flasher unit, as shown. Combination flasher unit is properly functioning if it blinks when power is supplied to the circuit.

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Bulb Specifications

HEADLAMPS

LC

	Wattage (W)	Bulb No.
Conventional bulb	65/55	H6052
Halogen bulb	65/35	H6054

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OTHER LAMPS

,	Wattage (W)	Bulb No.	Cl
Front turn signal lamp	27	1156	. 66
Front clearance lamp	3.8	194	5/ 05-5
Rear combination lamp			MT
Turn signal	27	1156	
Stop/Tail	27/8	1157	AT
Back-up	27	1156	
Rear side marker lamp	3.4	158	TF
License plate lamp	3.8 or 5	194 (For 3.8W lamp)	
Interior lamp	10	_	PD

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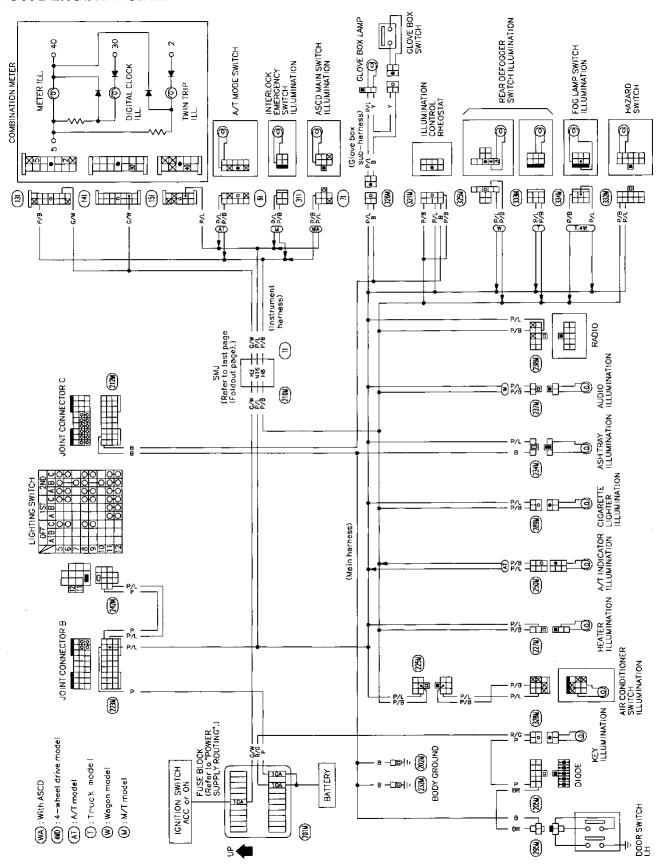
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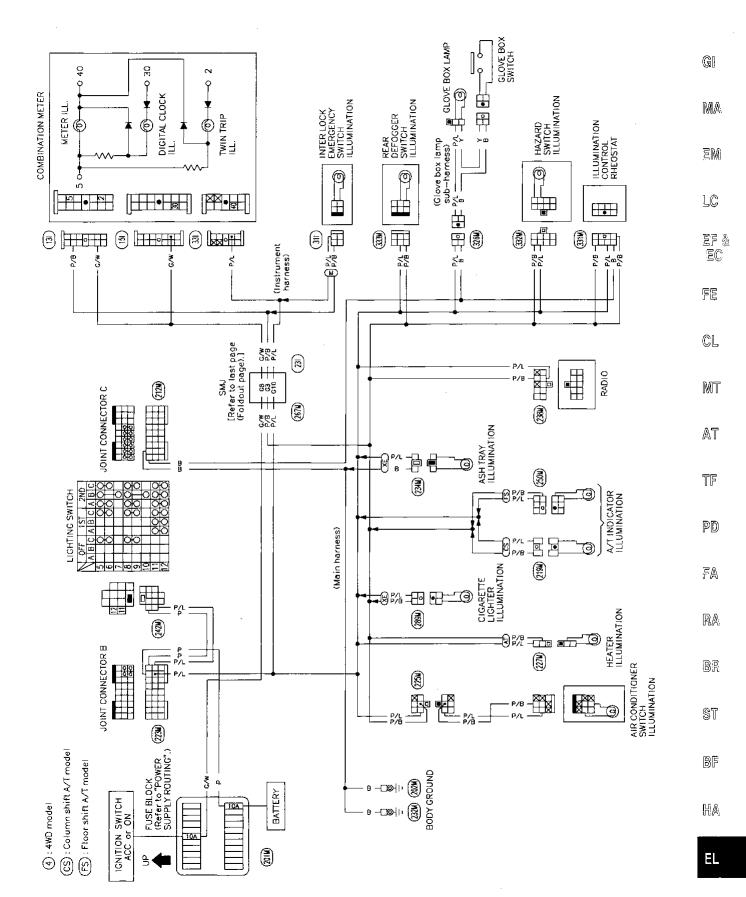
Illumination/Wiring Diagram

VG30E ENGINE MODEL



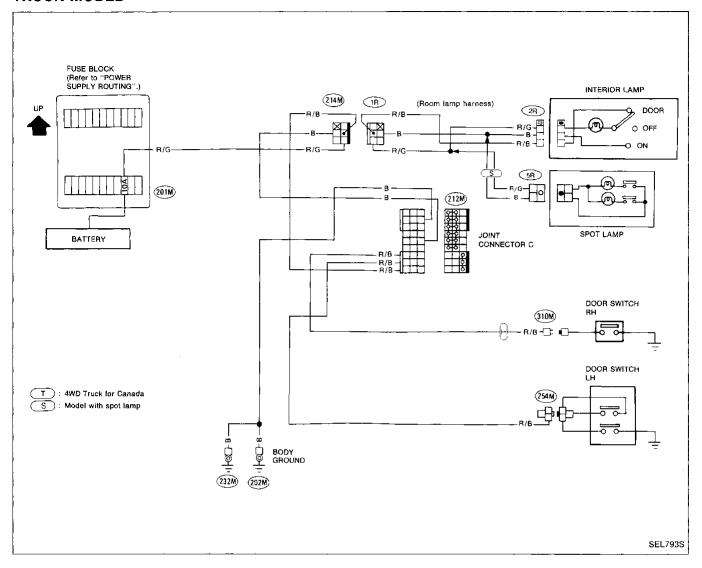
Illumination/Wiring Diagram (Cont'd)

KA24E ENGINE MODEL



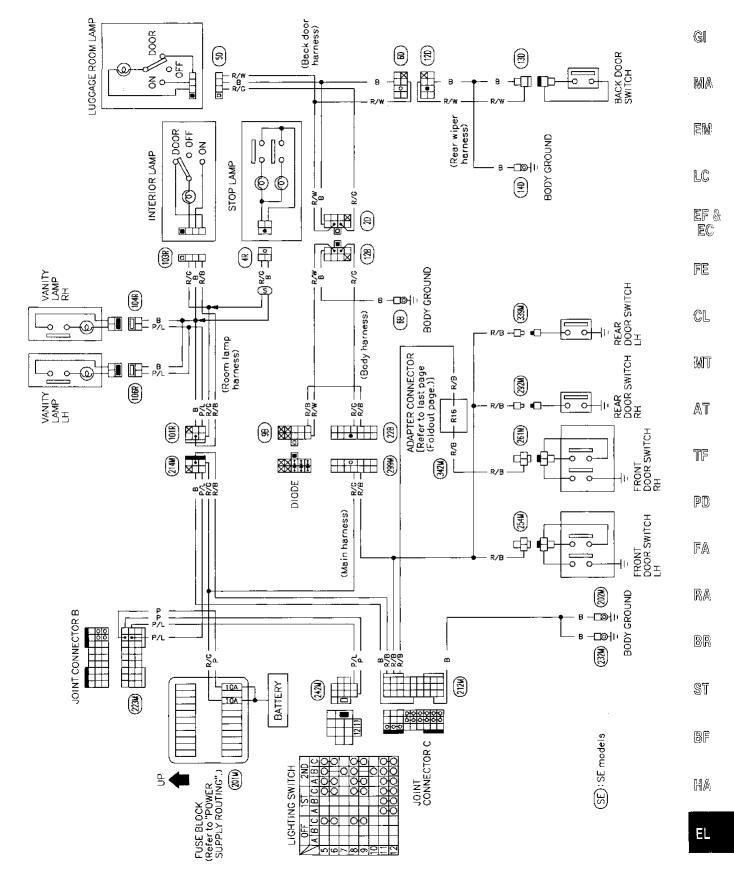
Interior Lamp/Wiring Diagram

TRUCK MODEL

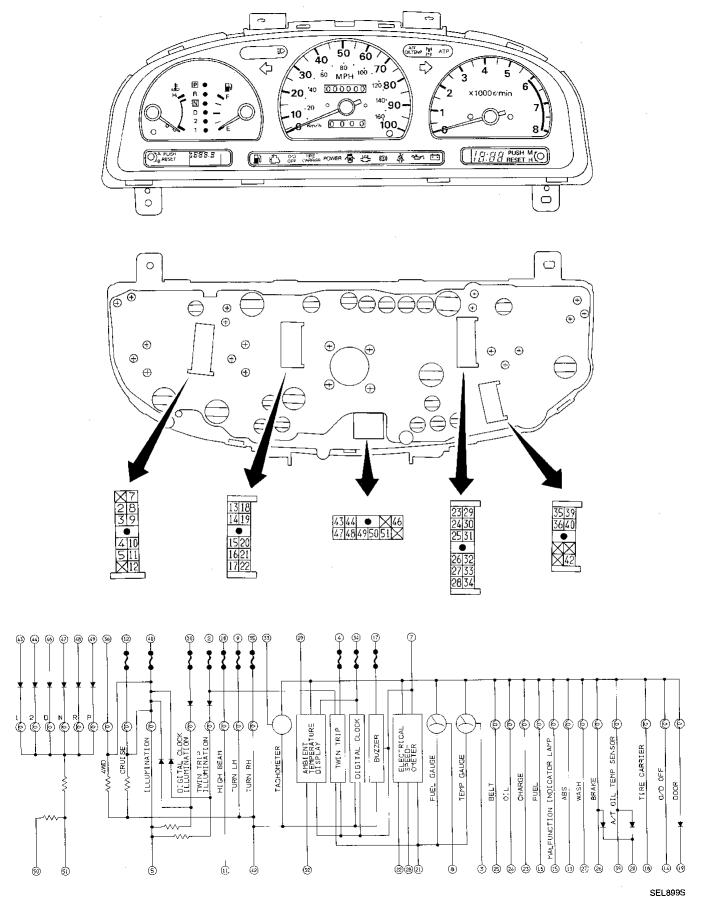


Interior Lamp/Wiring Diagram (Cont'd)

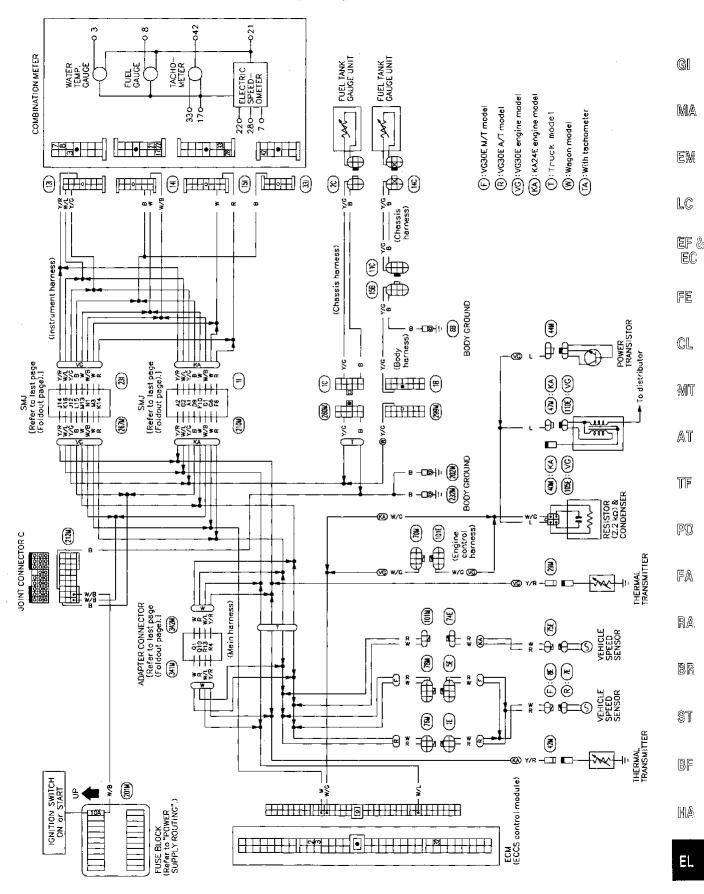
WAGON MODEL



Combination Meter

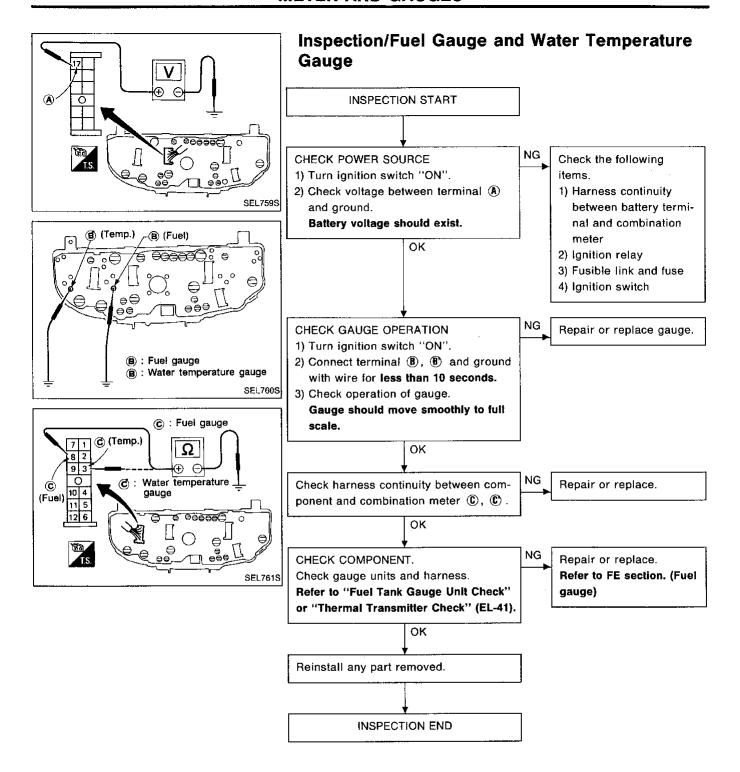


Wiring Diagram

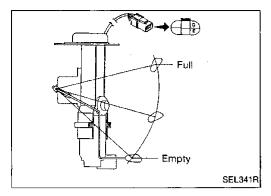


SEL900S

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METER AND GAUGES



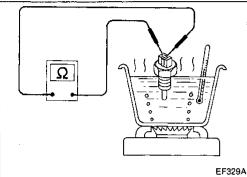
Fuel Tank Gauge Unit Check

-	Ohmr	meter	Model	Clast position	Desistance value		
	(+)	()	Model	Float position	Resistance value		
_	(G)	Æ.	Truck	Full	Approx. 3.8 - 8.5Ω		
	•	(E)		Empty	Approx. 83.6 - 93.6Ω		

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Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

Water temperature	Resistance
60°C (140°F)	Approx. 70 - 90Ω
100°C (212°F)	Approx. 21 - 24Ω

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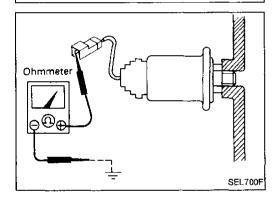
TF

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Oil Pressure Switch Check

Check the continuity between the terminals of oil pressure switch and body ground.

Oil pressure kPa (kg/cm², psi)	Continuity
More than 10 - 20 (0.1 - 0.2, 1 - 3)	NO
Less than 10 - 20 (0.1 - 0.2, 1 - 3)	YES



Vehicle speed

Approx. 0.5 V

[Alternating current (AC)]

Voltmeter

SEL768S

sensor

Vehicle Speed Sensor Signal Check

Remove vehicle speed sensor from transmission.

 Turn vehicle speed sensor pinion quickly and measure voltage across a and b.

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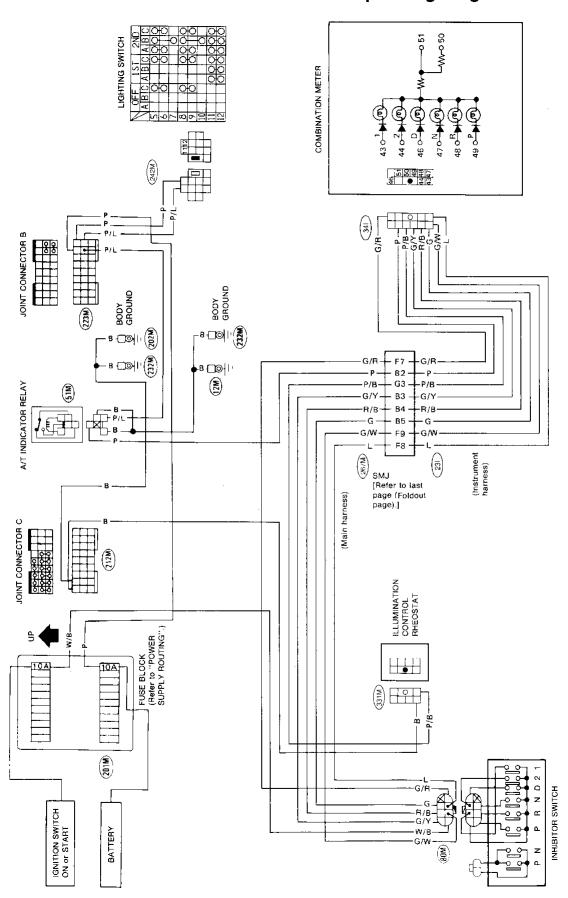
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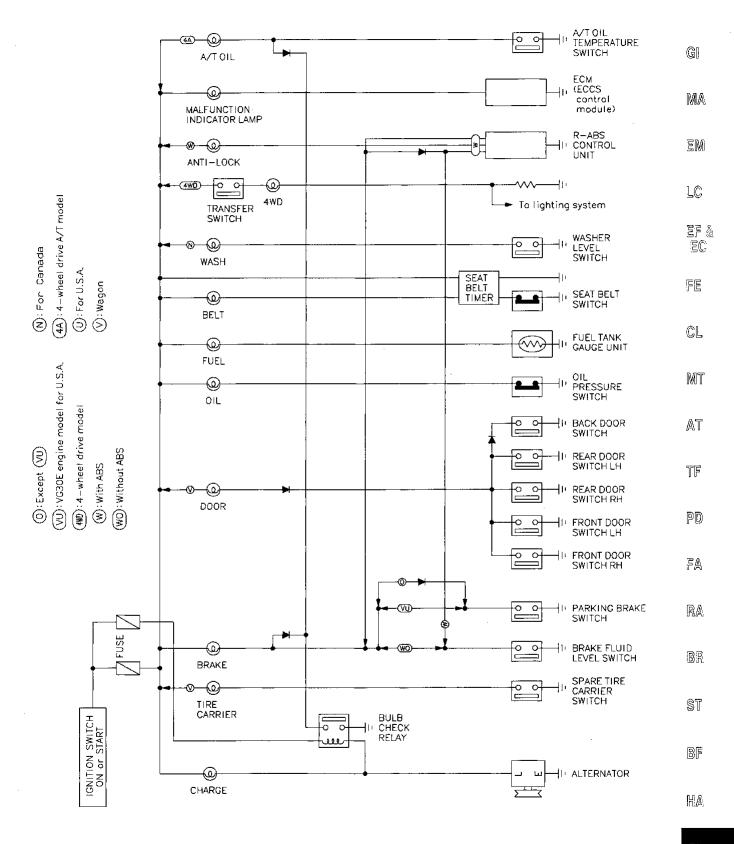
EL-41

A/T Indicator Lamp/Wiring Diagram



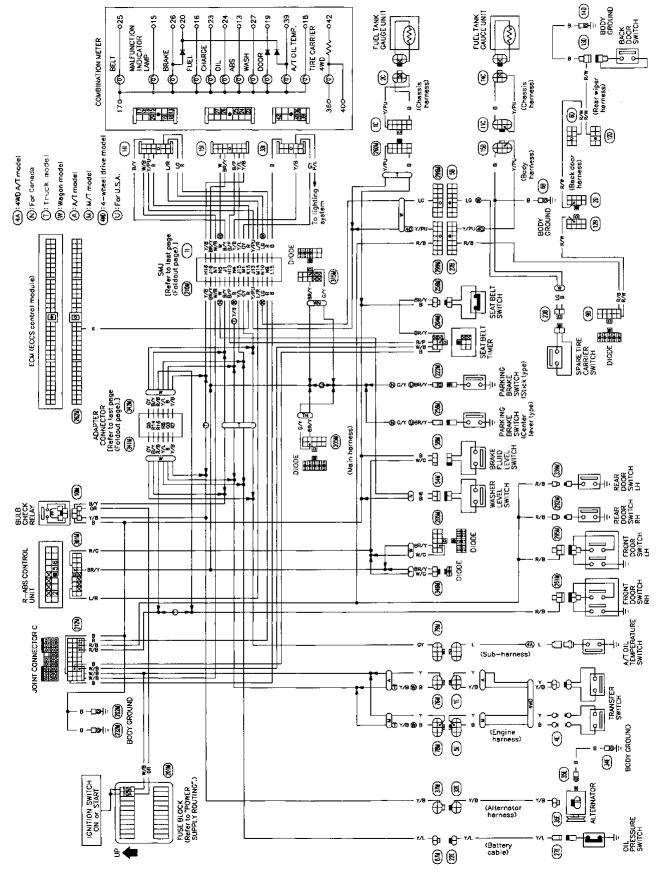
SEL796S

Warning Lamps/Schematic



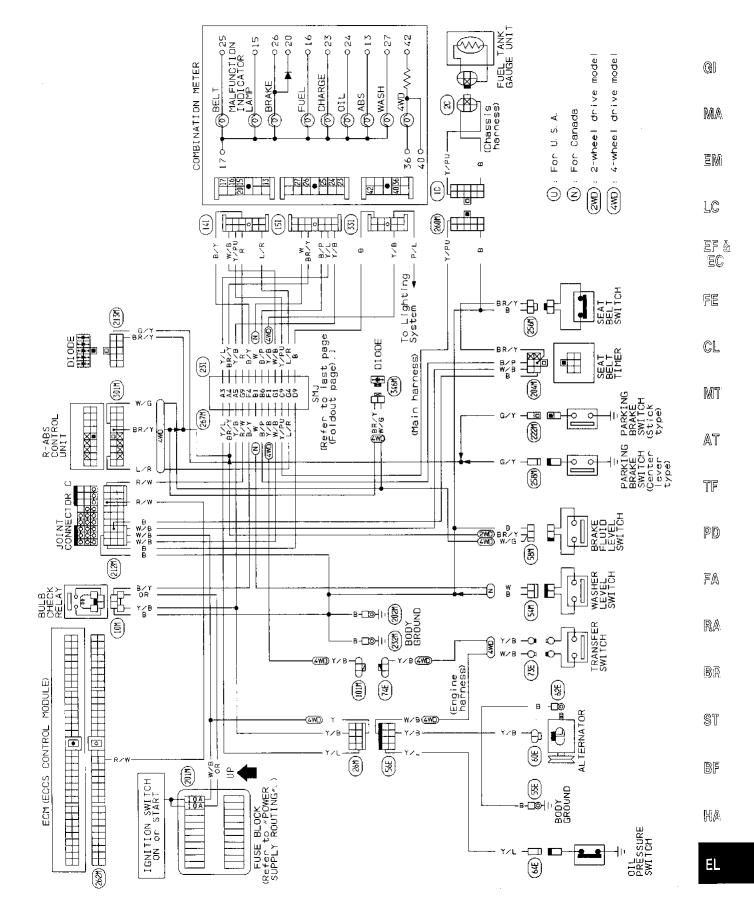
Warning Lamps/Wiring Diagram

VG30E ENGINE MODEL

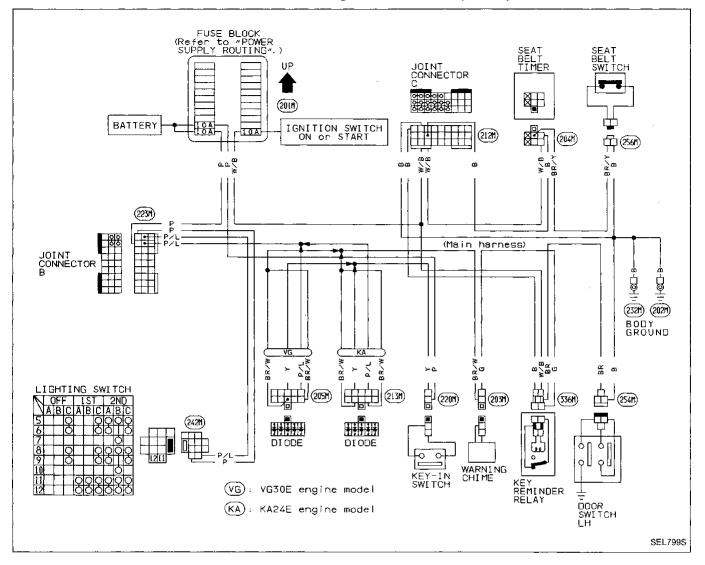


Warning Lamps/Wiring Diagram (Cont'd)

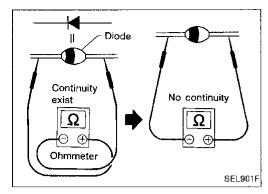
KA24E ENGINE MODEL

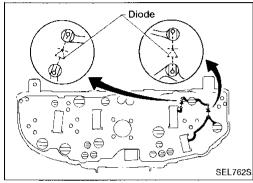


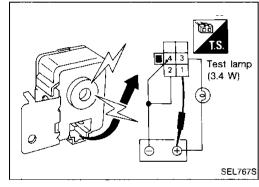
Warning Chime/Wiring Diagram

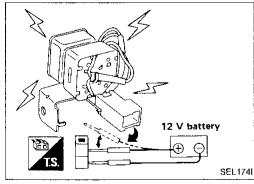


WARNING LAMPS AND CHIME









Diode Check

- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure on the left.

NOTE: Specifications may vary depending on the type of tester.
Before performing this inspection, be sure to refer to the instruction manual of your tester.

EM

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 Diodes for clock illumination lamp are built into the combination meter printed circuit.

27 & EC

LC

FE

CL

MΥ

Seat Belt Timer Check

Connect as shown in the figure to the left.

If chime and test lamp come on for 4-8 seconds when connecting terminal (1) to battery \oplus terminal, seat belt timer is normal.

ΑT

TF

PD

Warning Chime Check

FA

 $\mathbb{R}\mathbb{A}$

BR

ST

BF

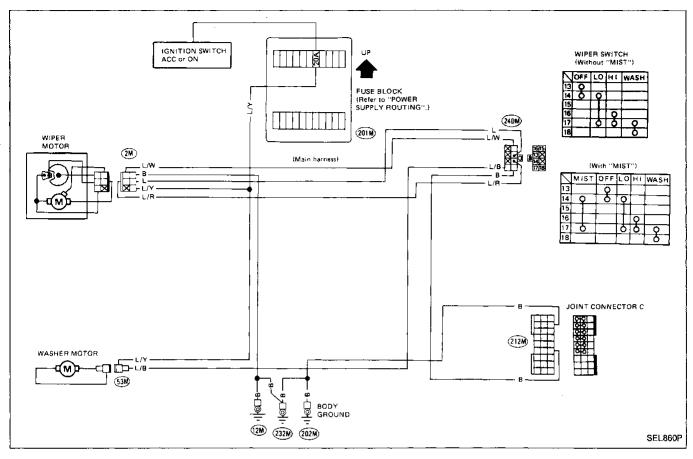
HA

EL

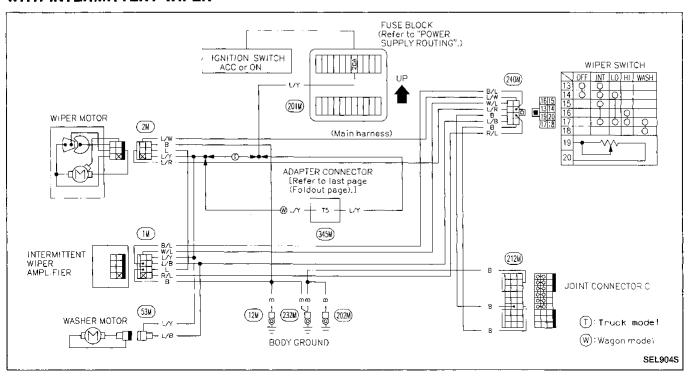
10%

Front Wiper and Washer/Wiring Diagram

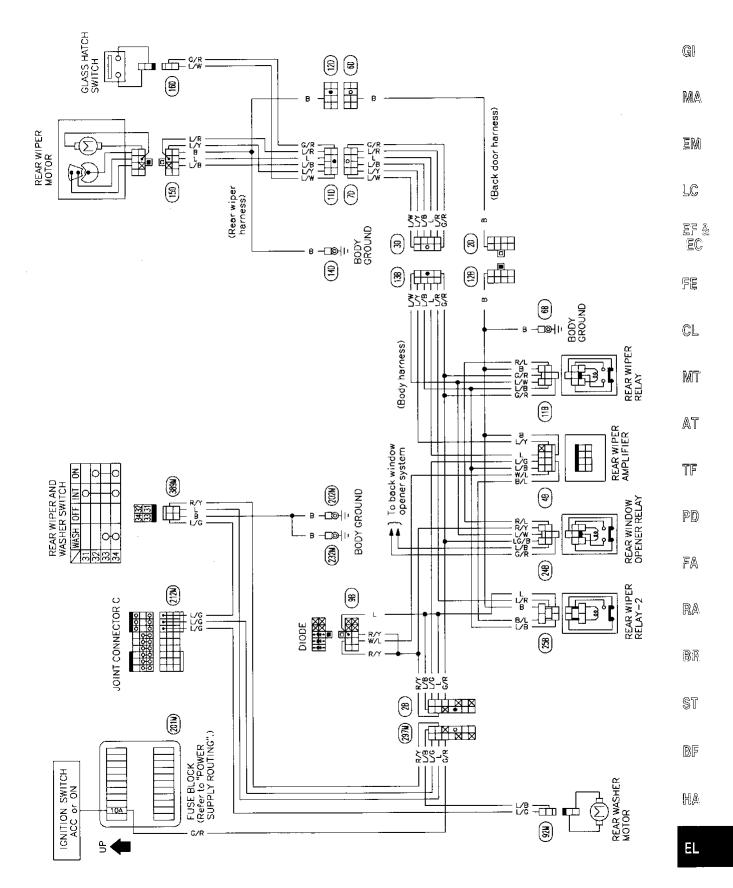
WITHOUT INTERMITTENT WIPER



WITH INTERMITTENT WIPER



Rear Wiper and Washer/Wiring Diagram



Windshield Wiper Installation

Adjustment

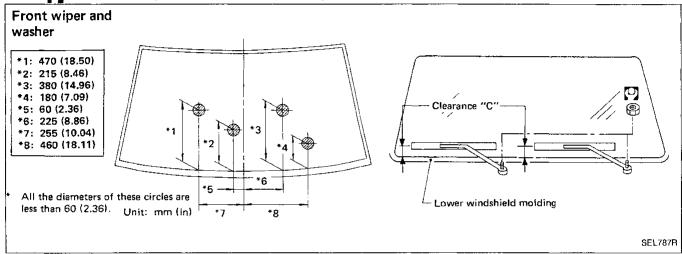
- 1. Prior to wiper arm installation, turn on wiper switch to operate wiper motor and then turn it "OFF" (Auto Stop).
- 2. Lift the blade up and then set it down onto glass surface to set the blade center to clearance "C" immediately before tightening nut.
- 3. Eject washer fluid. Turn on wiper switch to operate wiper motor and then turn it "OFF".
- 4. Ensure that wiper blades stop within clearance "C".

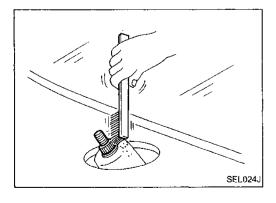
Clearance "C": 20 - 30 mm (0.79 - 1.18 in)

Installation

• Tighten windshield wiper arm nuts to specified torque.

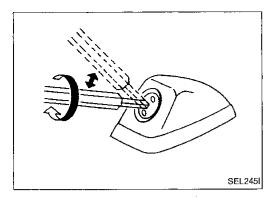
(1.3 - 1.8 kg-m, 9 - 13 ft-lb)

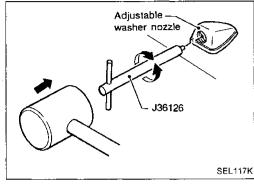


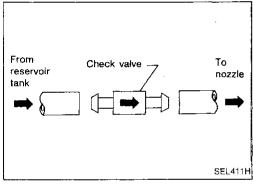


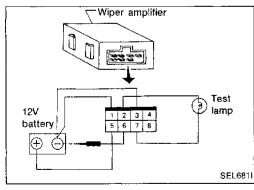
 Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.

WIPER AND WASHER









Washer Nozzle Adjustment

Using Tool J36126, adjust windshield washer nozzle to correct its spray pattern.

Before attempting to turn the nozzle, gently tap the end of the tool to free the nozzle.

This will prevent "rounding out" the small female square in the center of the nozzle.

Special service tool Tool number: J36126

Tool name: Washer nozzle adjusting tool

Check Valve

A check valve is provided in the washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.

Wiper Amplifier Check

Connect as shown in the figure to the left.

2. If test lamp comes on when connected to terminal **6** and battery ground, wiper amplifier is normal.

GI

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EM

LC

EF &

FE

CL

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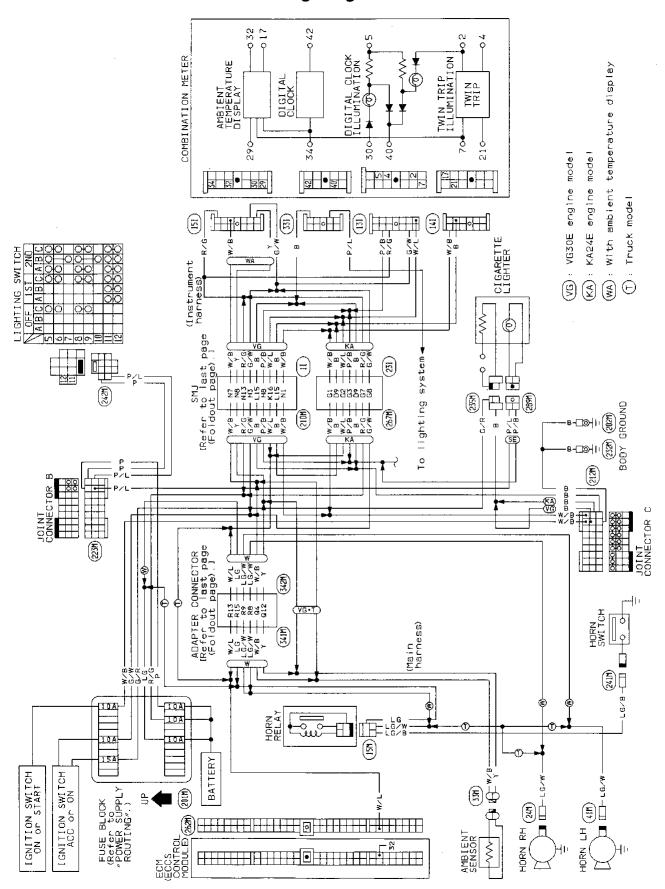
BF

HA

EL

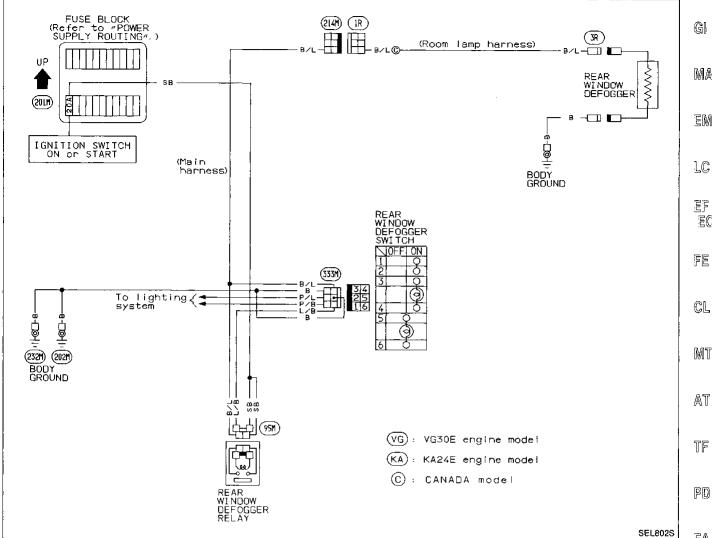
.

Wiring Diagram



Wiring Diagram

TRUCK MODEL



GI

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EM

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ST

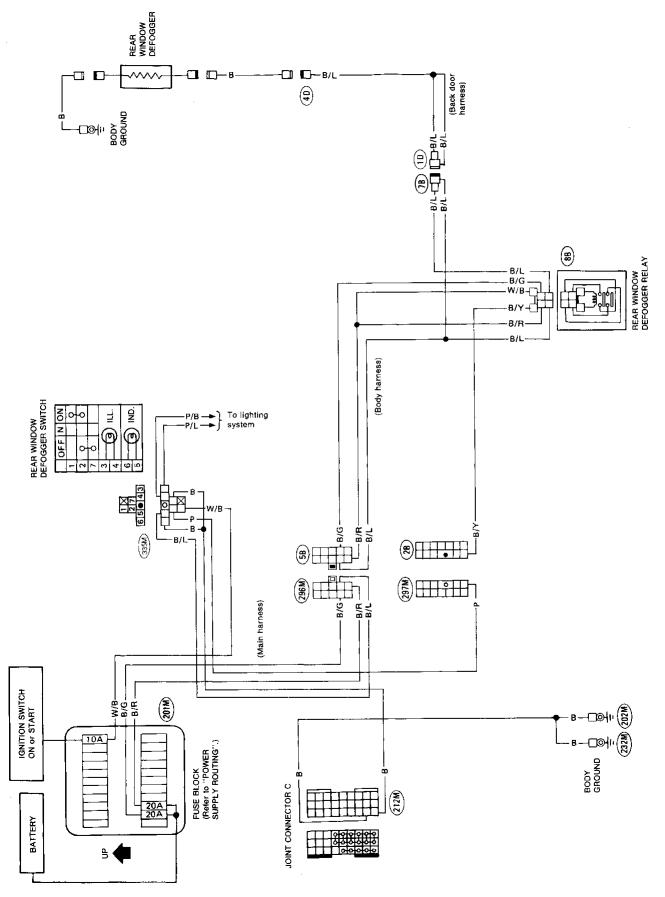
BF

HA

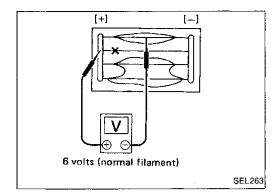
EL,

Wiring Diagram (Cont'd)

WAGON MODEL



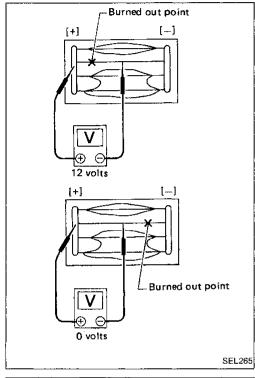
SEL803S



Filament Check

1. Attach probe circuit tester (in volt range) to middle portion of each filament.





[-]

SEL266

[+]

Heat wire

2. If a filament is burned out, circuit tester registers 0 or 12 volts.

CL

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ef & ec

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PD

To locate burned out point, move probe to left and right along filament to determine point where tester needle

RA

BR

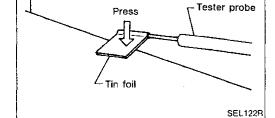
ST

 When measuring voltage, wind a piece of tin foil around the top of the negative probe and press the foil against the wire with your finger as shown.

BF

HA

IDX

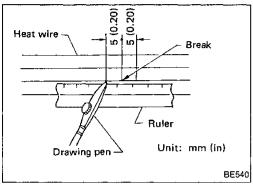


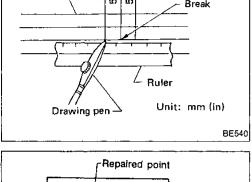
swings abruptly.

Filament Repair

REPAIR EQUIPMENT

- Conductive silver composition (Dupont No. 4817 or equivalent)
- 2. Ruler 30 cm (11.8 in) long
- 3 Drawing pen
- 4. Heat gun
- 5. Alcohol
- 6. Cloth





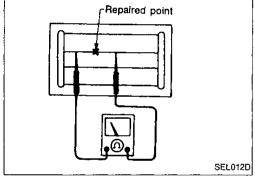
REPAIRING PROCEDURE

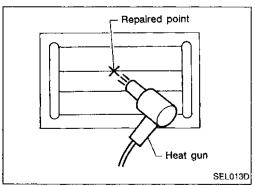
- 1. Wipe broken heat wire and its surrounding area clean with a cloth dampened in alcohol.
- Apply a small amount of conductive silver composition to tip of drawing pen.

Shake silver composition container before use.

- 3. Place ruler on glass along broken line. Deposit conductive silver composition on break with drawing pen. Slightly overlap existing heat wire on both sides [preferably 5 mm (0.20 in)] of the break.
- 4. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

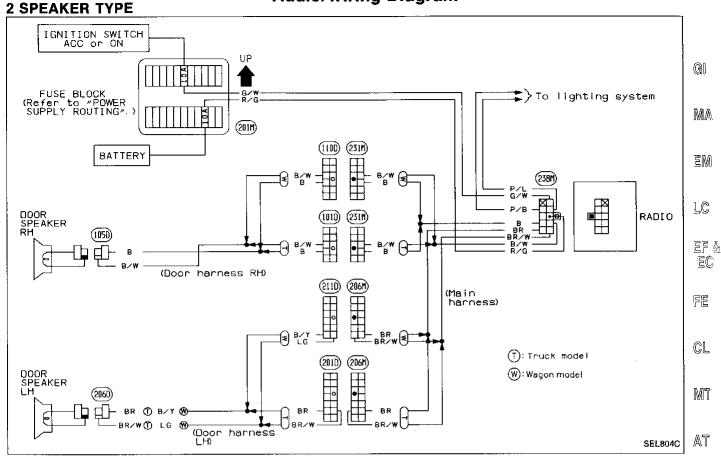
Do not touch repaired area while test is being conducted.



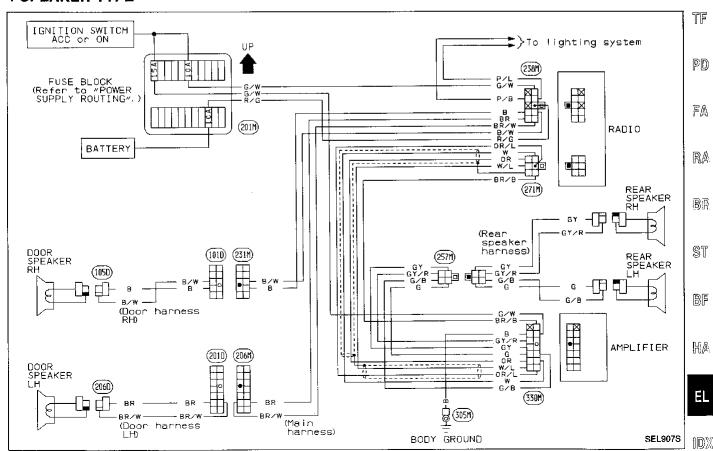


Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

Audio/Wiring Diagram

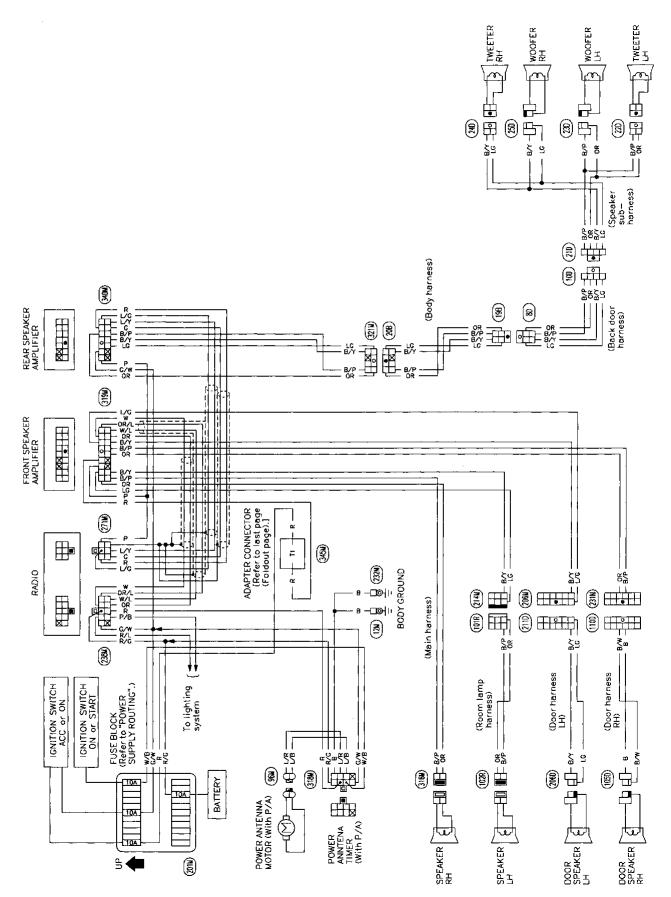


4 SPEAKER TYPE

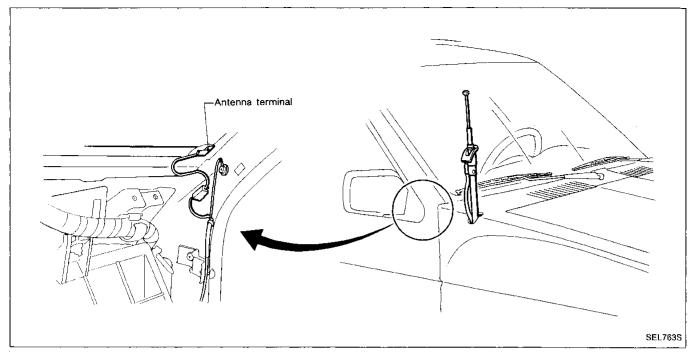


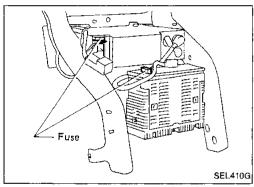
Audio/Wiring Diagram (Cont'd)

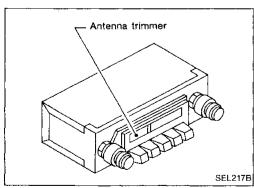
6 OR 8 SPEAKER TYPE



Location of Antenna







Radio Fuse Check

Antenna Trimmer Adjustment

The antenna trimmer should be adjusted in the following cases:

- Fading and weak MW (AM) reception.
- After installation of new antenna, feeder cable or radio receiver.

Before adjusting, be sure to check harness and antenna feeder cable connectors for proper connection.

- 1. Extend antenna completely.
- 2. Turn radio on, and turn volume control to increase speaker volume.
- 3. Tune in the weakest station (barely audible) on dial at the range around 14 (1,400 kHz).
- 4. Turn antenna trimmer to left or right slowly, and set it in the position where reception is strongest.

CAUTION:

Do not turn antenna trimmer more than one-half turn.

EL

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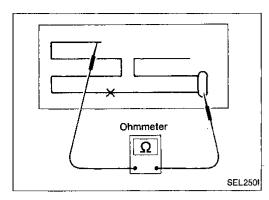
FA

RA

BR

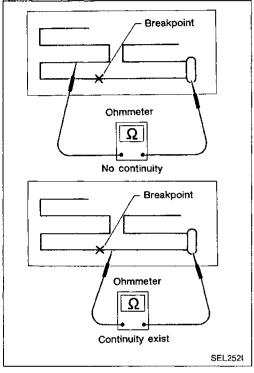
림음

HA

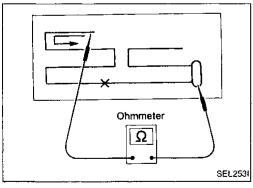


Element Check

1. Attach probe circuit tester (in ohm range) to antenna terminal on each side.



2. If an element is broken, no continuity will exist.

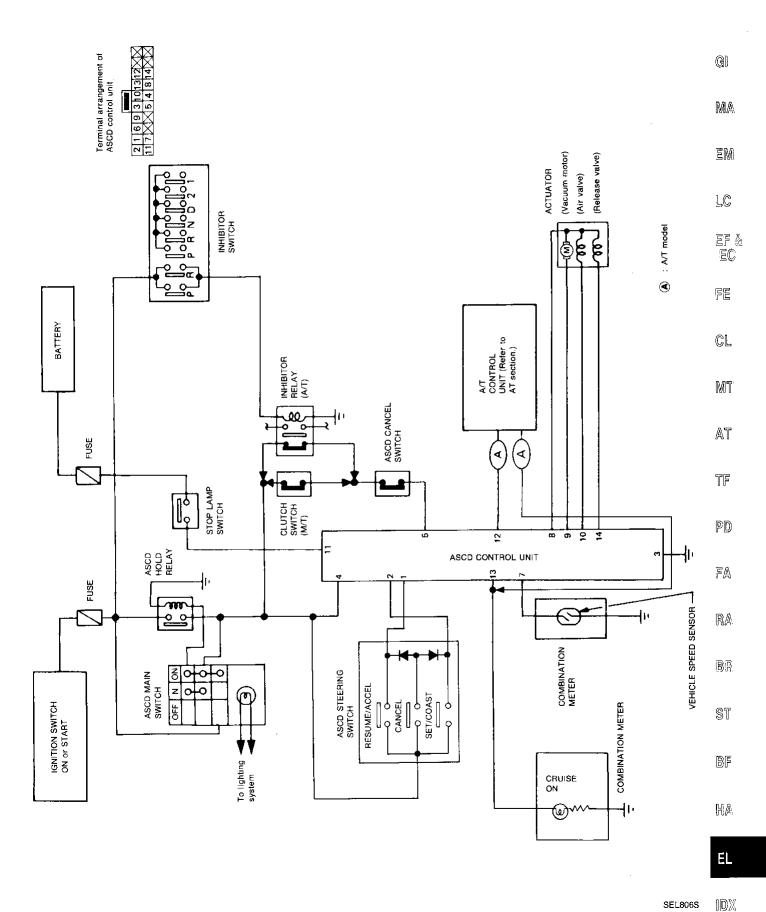


3. To locate broken point, move probe to left and right along element to determine point where tester needle swings abruptly.

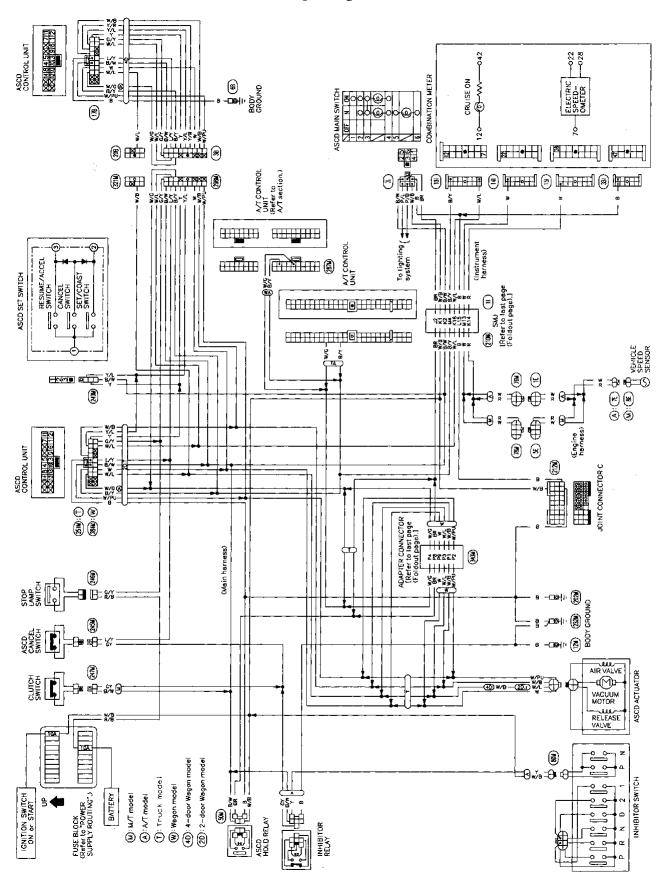
Element Repair

Refer to REAR WINDOW DEFOGGER "Filament Repair" (EL-56).

Schematic



Wiring Diagram



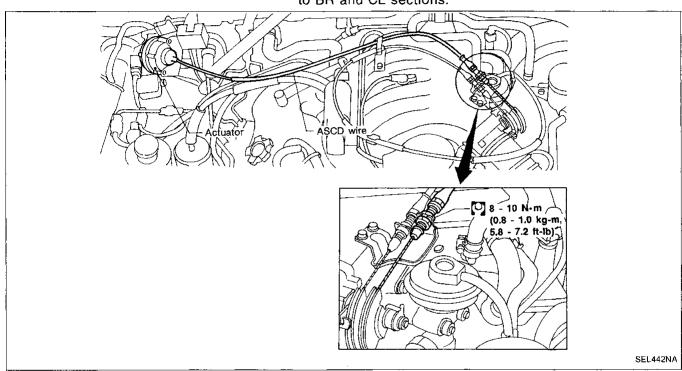
ASCD Wire Adjustment

CAUTION:

- Be careful not to twist ASCD wire when removing it.
- Do not tense ASCD wire excessively during adjustment.

After confirming that accelerator wire is properly adjusted, adjust the tension of ASCD wire in the following manner:

- (1) After adjusting the length of the accel wire, turn a securing nut by 1/2 to 1 turn from throttle open starting position to the wire loosening direction to fix. (Must be securing carried out to prevent response delay of operation of the ASCD.)
- (2) Securely tighten lock nut to hold adjusting nut in place.
- For ASCD stop switch and clutch switch adjustment, refer to BR and CL sections.



GI

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ef & ec

FE

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TF

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FA

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BR

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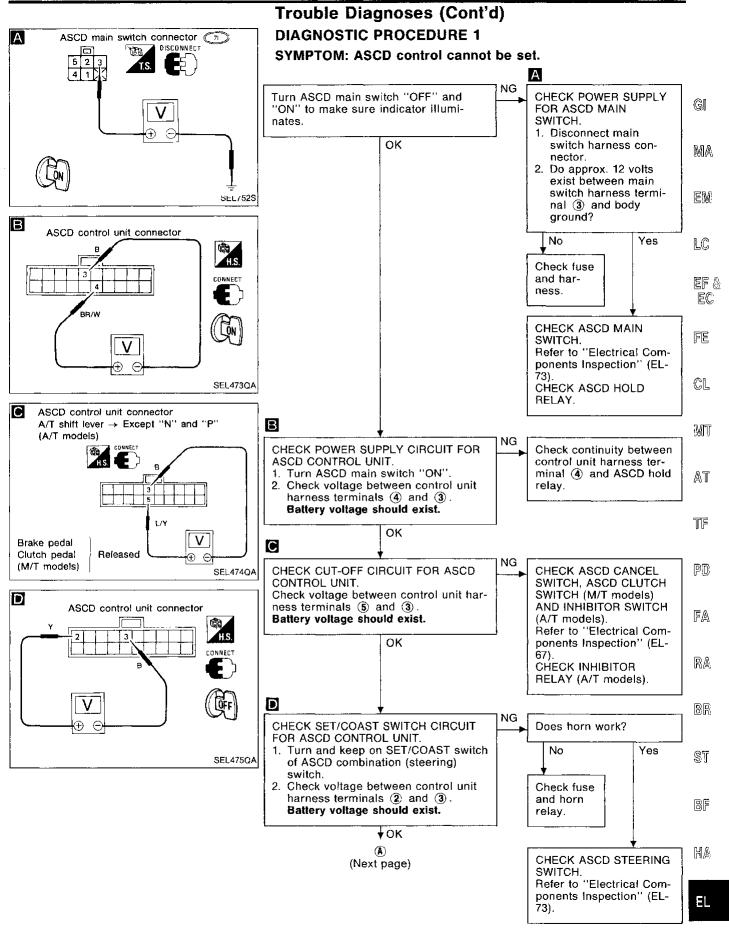
HA

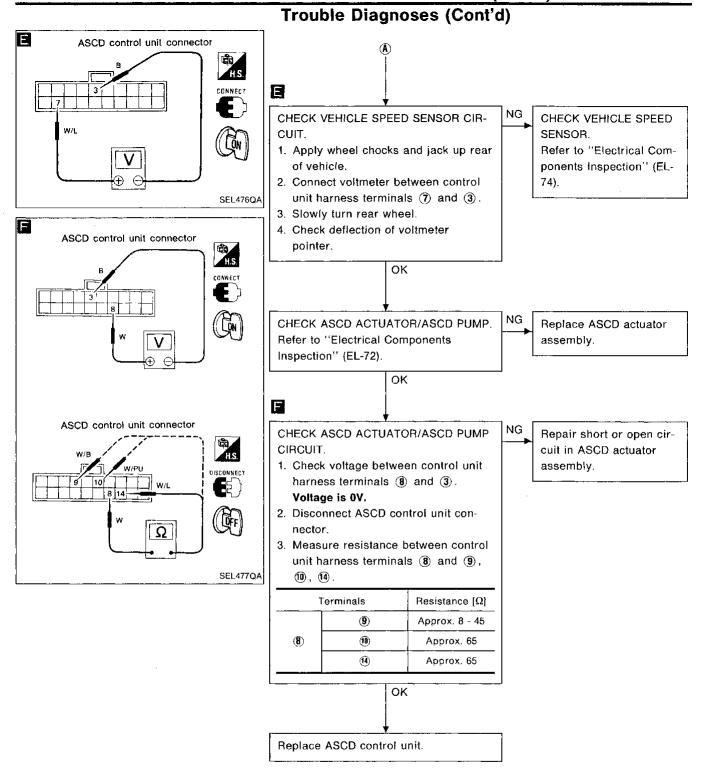
EL

Trouble Diagnoses

SYMPTOM CHART

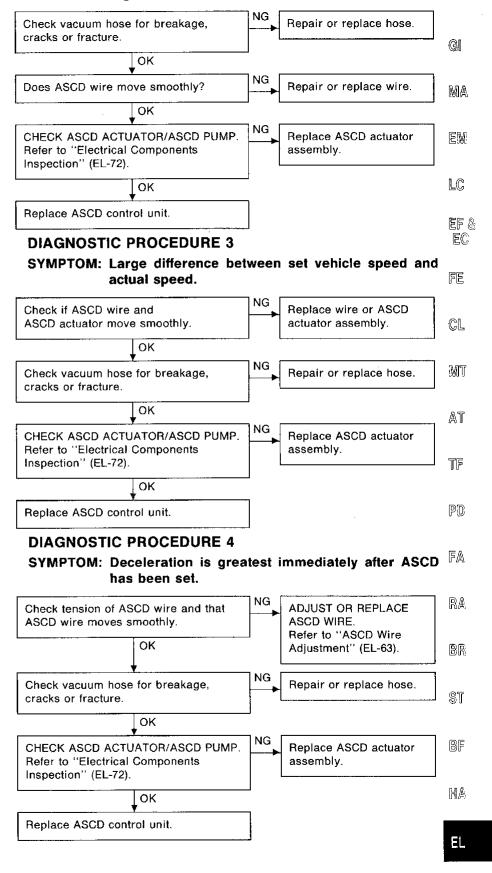
PROCEDURE			Diag	nostic	Proce	dure			El	lectric	al Con	npone	nts In:	spection	on
REFERENCE PAGE	EL-65	EL-67	EL-67	EL-67	EL-68	EL-69	EL-70	EL-71	EL-72	EL-73	EL-73	EL-73	EL-73	EL-73	EL-74
SYMPTOM	Diagnostic Procedure 1	Diagnostic Procedure 2	Diagnostic Procedure 3	Diagnostic Procedure 4	Diagnostic Procedure 5	Diagnostic Procedure 6	Diagnostic Procedure 7	Diagnostic Procedure 8	ASCD actuator/ASCD pump	ASCD main switch	ASCD steering switch	ASCD cancel switch and stop lamp switch	ASCD clutch switch (For M/T models)	Inhibitor switch (For A/T models)	Vehicle speed sensor
ASCD control unit cannot be set properly.	0								0	0	0	0	0	0	0
Engine hunts		0							0						
Large difference between set speed and actual vehicle speed.			0						0						
Deceleration is greatest immediately after ASCD has been set.				0					0						
ACCEL switch will not operate.	0				0						0				
RESUME switch will not operate.	0					0					0	0	0		
Set speed cannot be cancelled.							0		0			0	0		
"CRUISE" indicator lamp blinks.								0	O		0	0	}		

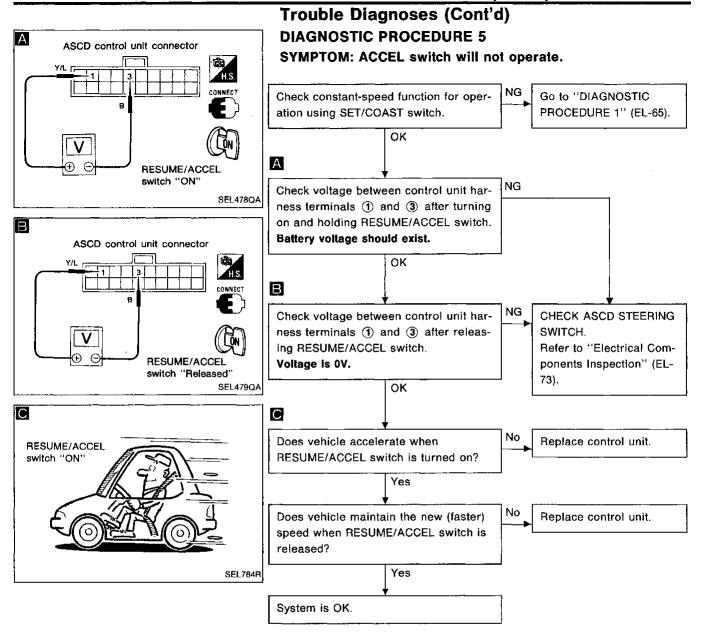


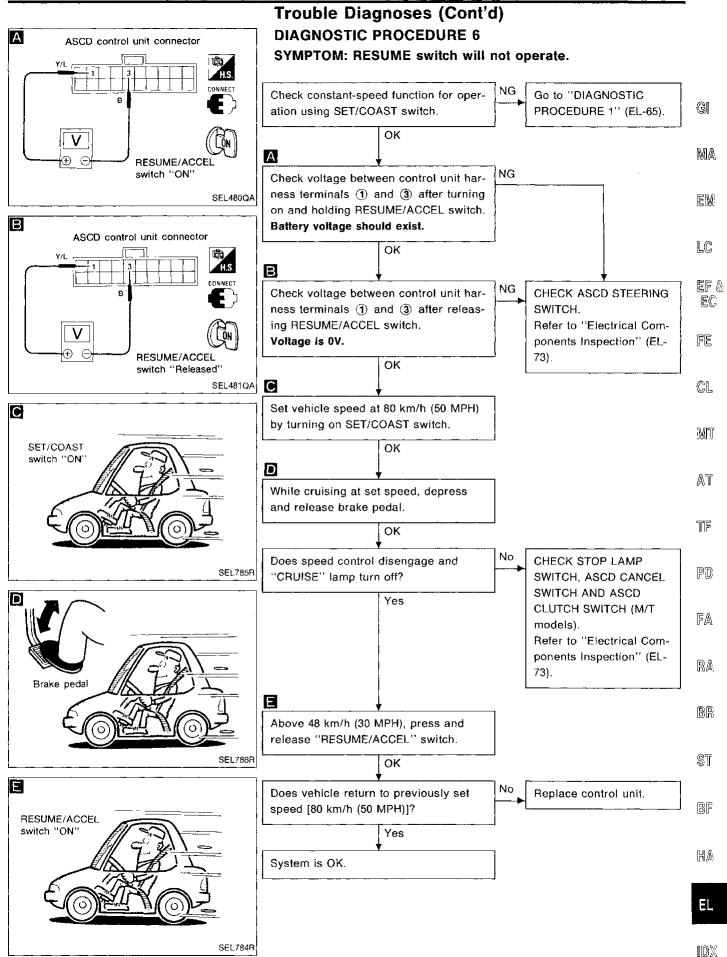


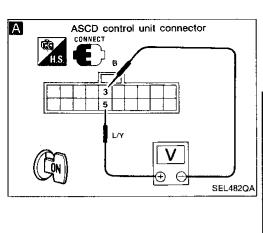
Trouble Diagnoses (Cont'd) DIAGNOSTIC PROCEDURE 2

SYMPTOM: Engine hunts.









Trouble Diagnoses (Cont'd) DIAGNOSTIC PROCEDURE 7

SYMPTOM: Set speed cannot be cancelled.

Α

CHECK ASCD CANCEL, CLUTCH, INHIBITOR SWITCH CIRCUIT.

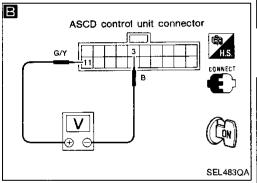
- 1. Turn ASCD main switch on.
- 2. Check voltage between control unit harness terminals (5) and (3).

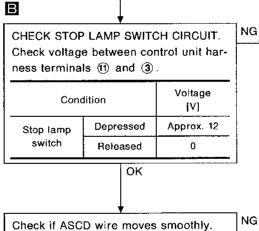
	Voltage [V]		
	ASCD	Depressed	0
M/T	cancel switch	Released	Approx. 12
	ASCD	Depressed	0
	clutch switch	Released	Approx. 12
A/T	A/T shift tion is at excep	Approx.	
	A/T shift tion is	0	

CHECK ASCD CANCEL, CLUTCH, and INHIBITOR SWITCH.

NG

Refer to "Electrical Components Inspection" (EL-73).





OK

OK

CHECK STOP LAMP SWITCH.

Replace ASCD wire.

Refer to "Electrical Components Inspection (EL-73).

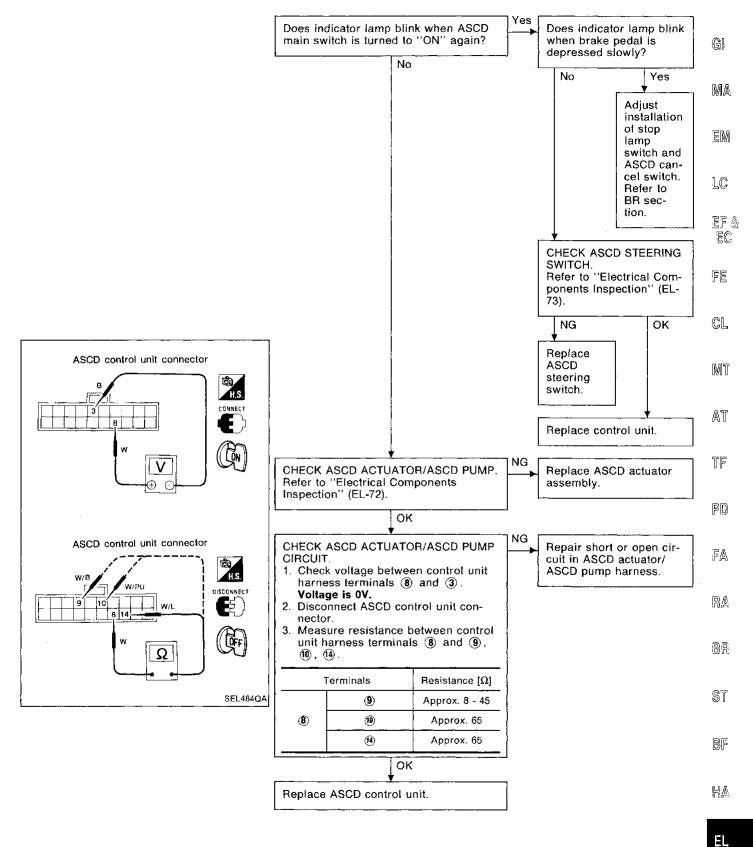
CHECK ASCD ACTUATOR/ASCD PUMP.
Refer to "Electrical Components
Inspection" (EL-72).

OK

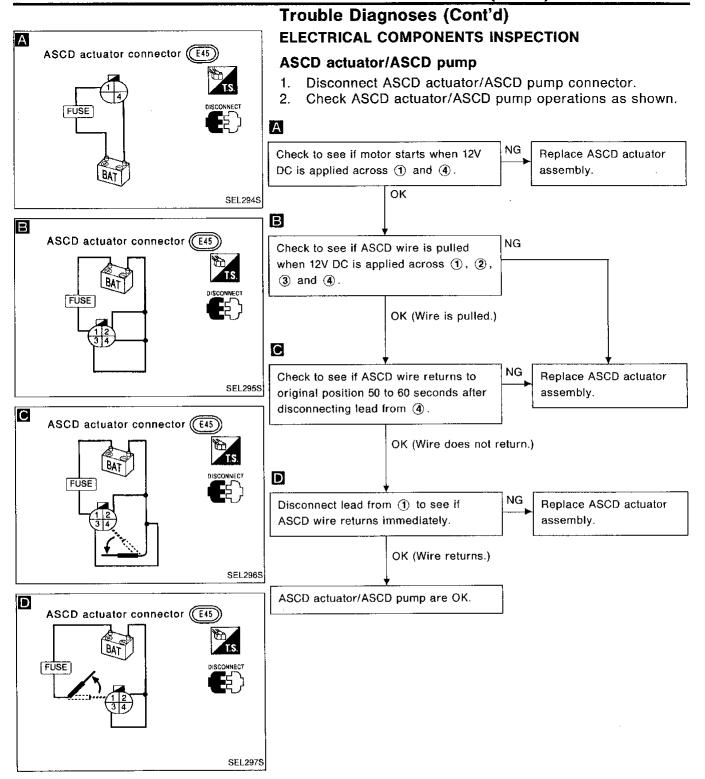
Replace ASCD actuator assembly.

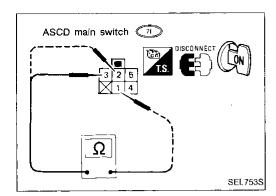
Trouble Diagnoses (Cont'd) DIAGNOSTIC PROCEDURE 8

SYMPTOM: "CRUISE" indicator lamp blinks.



11D)X





Trouble Diagnoses (Cont'd)

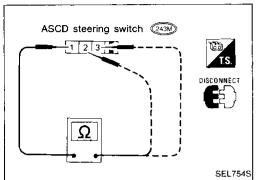
ASCD main switch

Check continuity between terminals by pushing switch to each position.



MA

EM



ASCD cancel switch

Clutch switch (247M)

 Ω

(245M)

Stop lamp switch

 Ω

SEL487QA

DISCONNECT

(246M)

EÉ)

ASCD steering switch

Check continuity between terminals by pushing each button.

	Terminal	1	2	3
Button		'	}	
SET/COAST		<u> </u>		
RESUME/ACCEL		<u> </u>		
0411051		0) -0	
CANCEL.		0		

ef & _ ec

LC

FE

CL

MT

AT

ASCD cancel switch and stop lamp switch

	Continuity				
Condition	ASCD cancel switch	Stop lamp switch			
When brake pedal is depressed	No	Yes			
When brake pedal is released	Yes	No			

Check each switch after adjusting brake pedal — refer to BR section.



FA

RA

Clutch switch (For M/T models)

Condition	Continuity
When clutch pedal is depressed	No
When clutch pedal is released	Yes

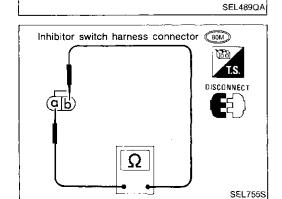
Check switch after adjusting clutch pedal — refer to CL section.

8R

ST

BF

HA



Inhibitor switch (For A/T models)

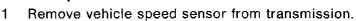
Shift lever position	Terminal	а	b
"P"		<u> </u>	
Except "N" or "P"			

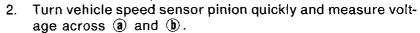
ΕL

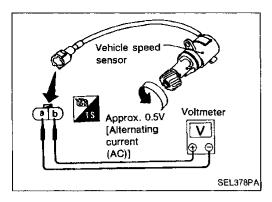
IDX

Trouble Diagnoses (Cont'd)

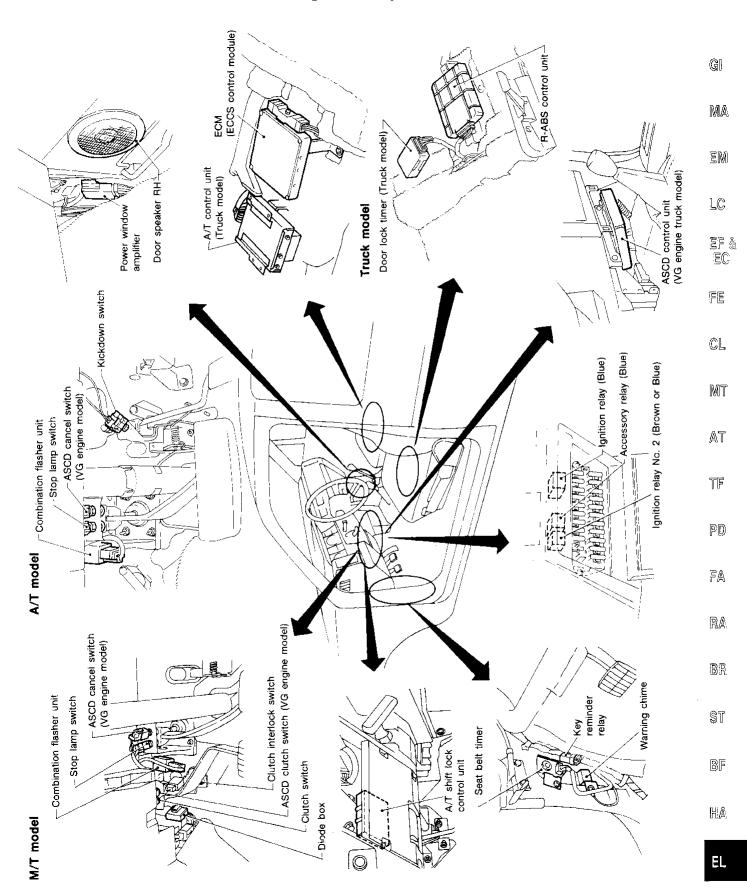
Vehicle speed sensor





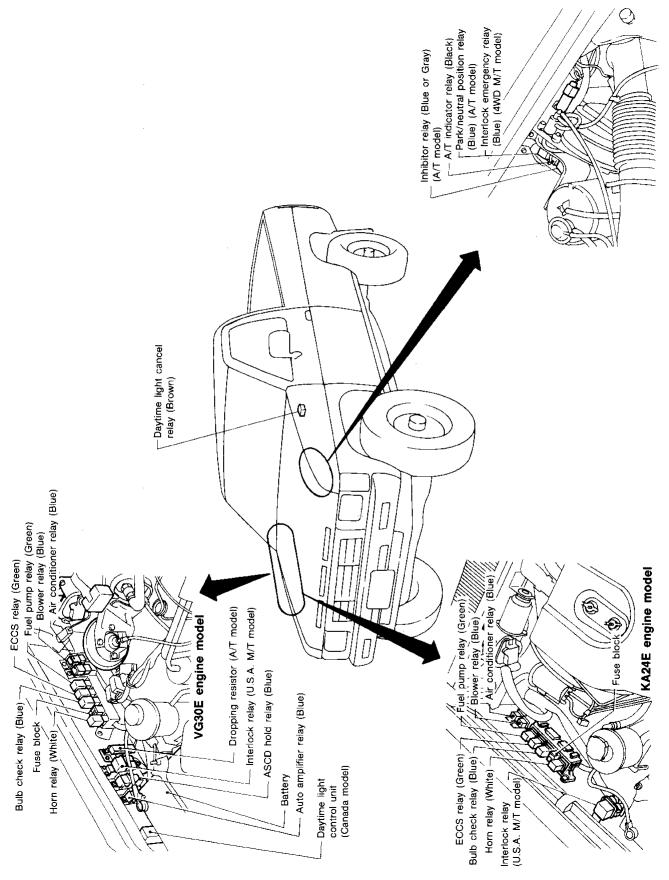


Engine Compartment



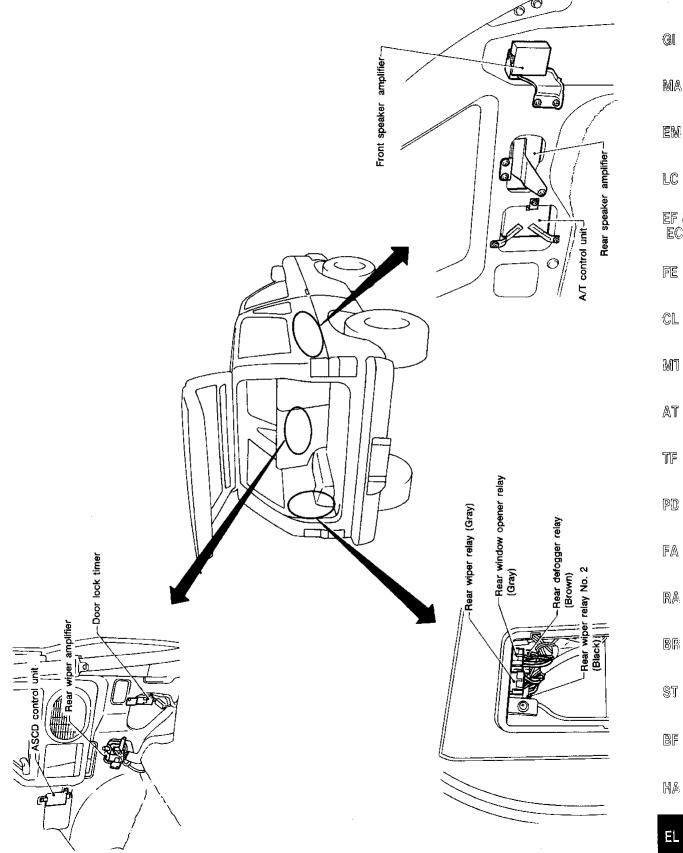
IDX

Passenger Compartment



Passenger Compartment (Cont'd)

WAGON MODEL



ΞM

ef & ec

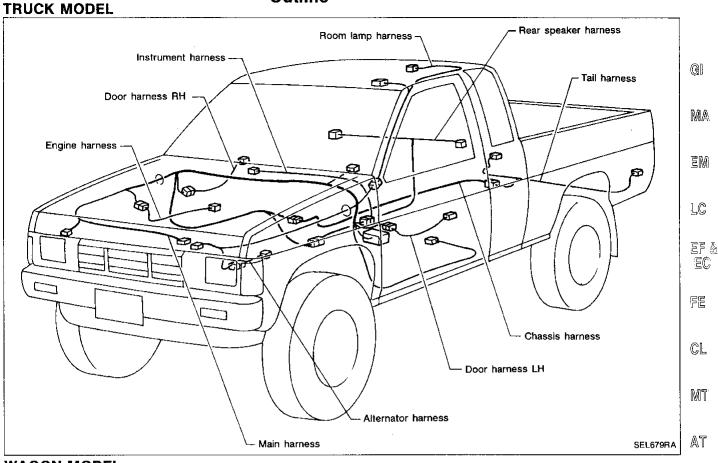
SEL765S IDX

LOCATION OF ELECTRICAL UNITS

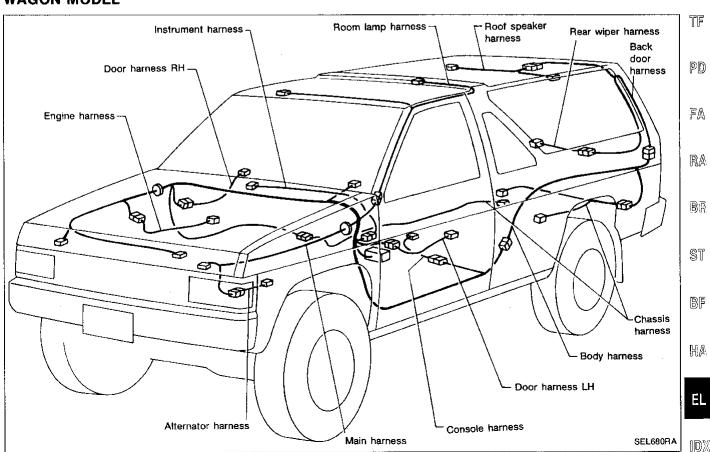
NOTE

EL-78

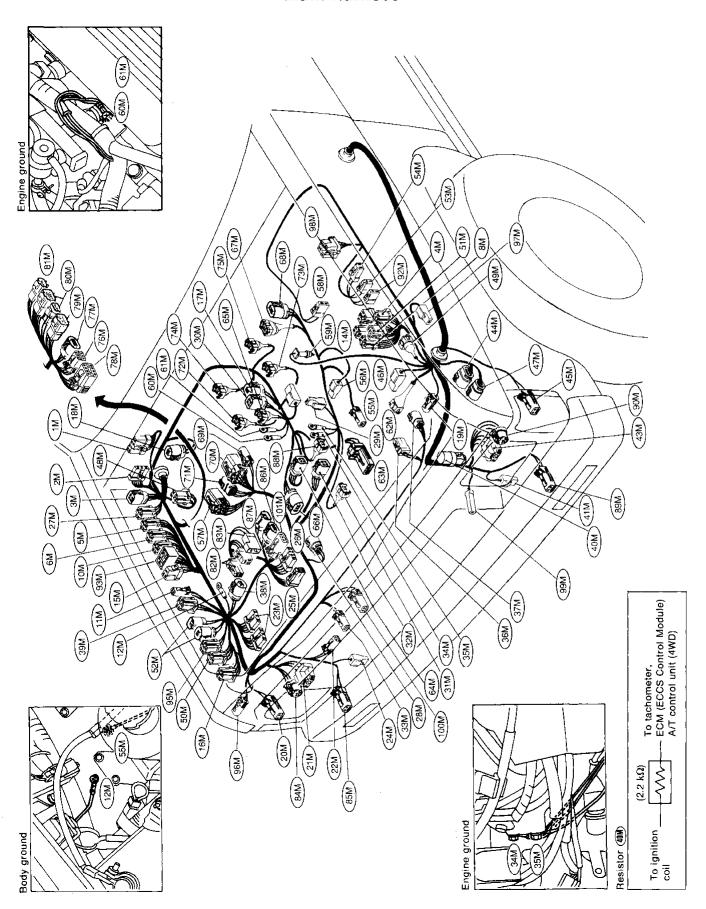
Outline



WAGON MODEL



Main Harness



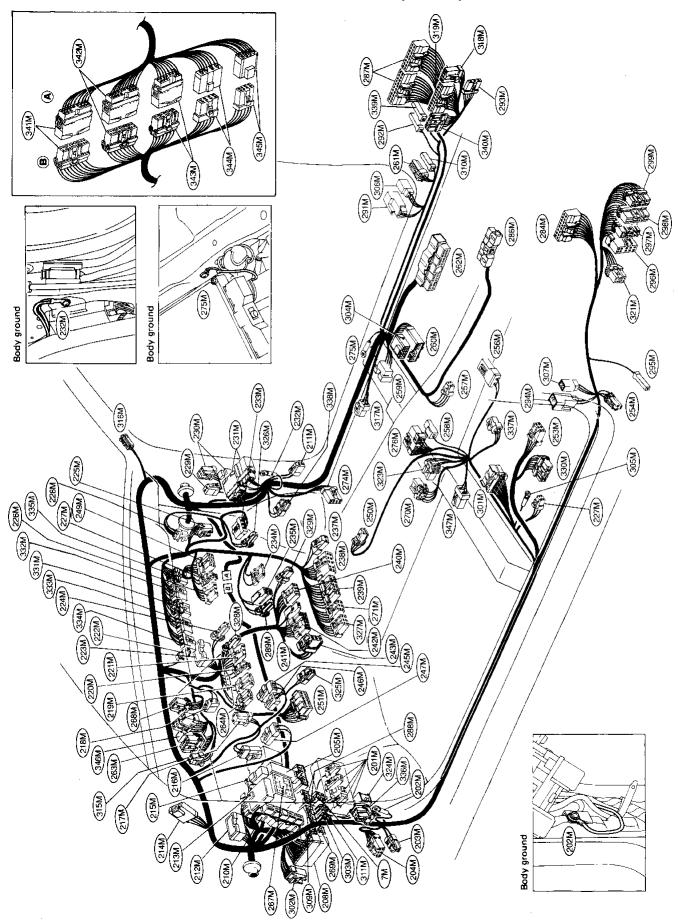
HARNESS LAYOUT

Main Harness (Cont'd)

(
k model) model) door model	GI
ruck) (Wagon) gine mod slay (For (gine Truc E engine I Fruck 2-	MA
Fuse block Rear defogger relay (Truck) Power antenna motor (Wagon) Ignition coil (KA24E engine model) Daytime light cancel relay (For Canada) To fog lamp (VG30E engine Truck model) To (AE) (KA24E engine Truck 2-door model)	EM
Fuse block Rear defogg Power anten Ignition coil Daytime ligh To fog lamp Ambient sen To (14) (KA	LC
	EF & EC
model) model) model) el) el) model) el) el) el) model) nodel) model) model)	FE
lignition coil (KA24E engine model) Air conditioner relay Asic bold relay (VG30E engine model) AAT indicator relay (VG30E engine model) AAT indicator relay (Inuck AIT model) Masher motor Washer level switch Compressor (VG30E engine model) Distributor (VG30E engine model) To (100E) (VG30E engine model) Engine ground (KA24E engine model) Engine ground (KA24E engine model) ACV-AAC, FICD valve (KA24E engine model) Throttle position sensor (KA24E engine model) To (100E) (VG30E engine M/T model) To (100E) (VG30E engine model)	CL
II (KA24E engine model oner relay anoid valve (KA24E engine relay vog30E engine roor relay (VG30E engine model) or relay (IVG30E engine model) vog30E engine vog30E engine model) vog30E engine MAZ4E engine relenoid (KA24E engine MAZ4E engine MAZ4E engine model) vog30E engi	MT
ier relay oid valve elay (KA24E er relay oid valve elay (VG33E elay (M7T m br. I switch (VG30E elay Santon ind (KA24E en sensor ind (KA24E en indid (KA24E en indid (KA24E en indid (KA230E))	e AT
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Main Harness (Cont'd)



Main Harness (Cont'd)

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HARNESS LAYOUT

Main Harness (Cont'd)

Door switch RH (Truck 4WD model for Canada) Ignition relay No.2 (Truck 2WD model) (Wagon) To (2128)

To (3010) (Wagon)

Body ground

(Wagon)

Diode (2058) (VG30E engine model)

To interlock emergency To door switch LH To warning chime To brake fluid level switch To interlock relay To lighting switch (For U.S.A.) To key-in switch ABS control unit To key illumination

Front fog lamp switch (VG30E engine Truck 4WD model)

Rear defogger switch (Truck)

Rear defogger switch (Wagon)

Key reminder relay

Audio amplifier (VG30E engine Truck model)

Illumination control rheostat

Hazard switch

Key illumination (4WD model)

Audio amplifier (Wagon)

Glove box lamp

Rear wiper switch (Wagon)

To (2030) (VG30E engine Truck model)

Foot lamp LH (Wagon)

To console harness (Wagon)

To console harness (VG30E engine Truck model)

Rear speaker amplifier (Wagon)

Adapter connector-2 Adapter connector-3

Adapter connector-1

Rear door switch RH (Wagon)

Foot lamp RH (Wagon)

Diode (Truck model with ABS)

Fog lamp relay

Adapter connector-5

Ignition relay No.2 (With powerwindow)

Speaker RH (Wagon with 6-speaker or 8-speaker) Diode (For Canada)

Front speaker amplifier (Wagon) Power antenna timer (Wagon) Seat heater (Wagon)

Diode (21311) (KA24E engine model)

To (208) (Wagon)

To interlock emergency switch To warning chime To door switch LH To brake fluid level switch To key-in switch To interlock relay To key illumination To lighting switch To ABS control unit (For U.S.A.)

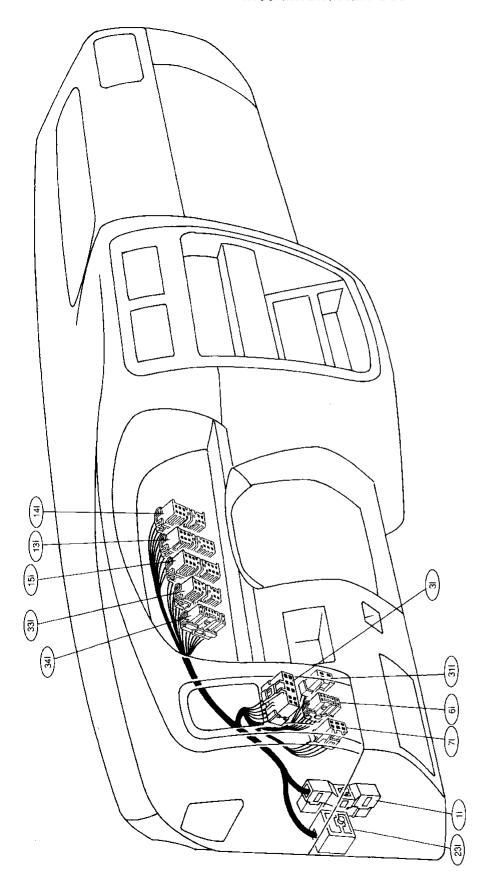
(VG30E engine model) 215H Diode

To A/T control unit To inhibitor switch

(For A/T control system)

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Instrument Harness



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To (267N) (SMJ) (KA24E engine model) Interlock switch (Wagon M/T model)

ASCD switch (Wagon and VG30E engine Truck SE model) A/T mode switch (VG30E engine A/T model)

Combination meter

To (21014) (SMJ) (VG30E engine model)

Remote control mirror switch

Combination meter Combination meter

Combination meter Combination meter

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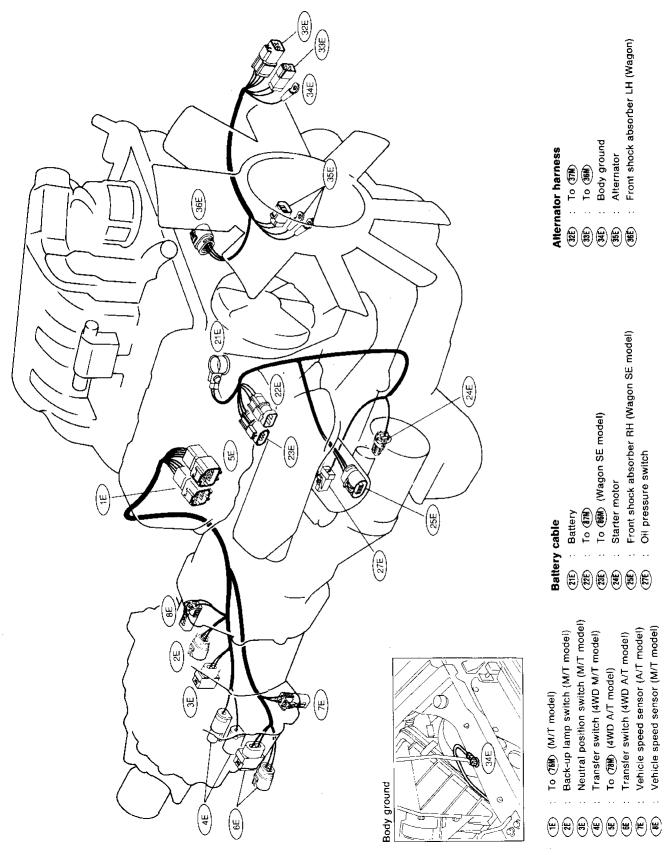
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Engine Harness

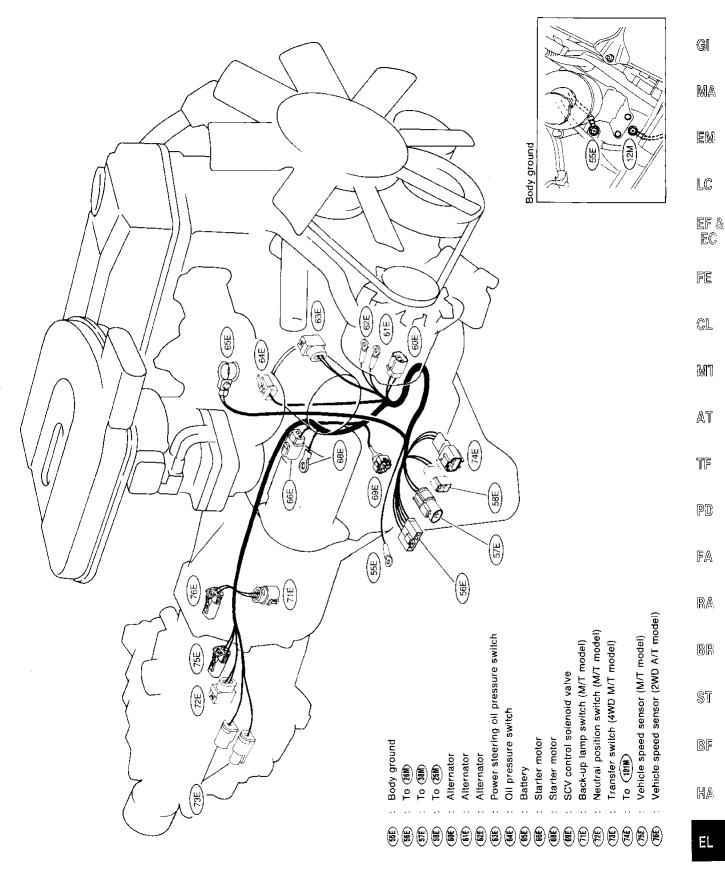
VG30E ENGINE



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Engine Harness (Cont'd)

KA24E ENGINE

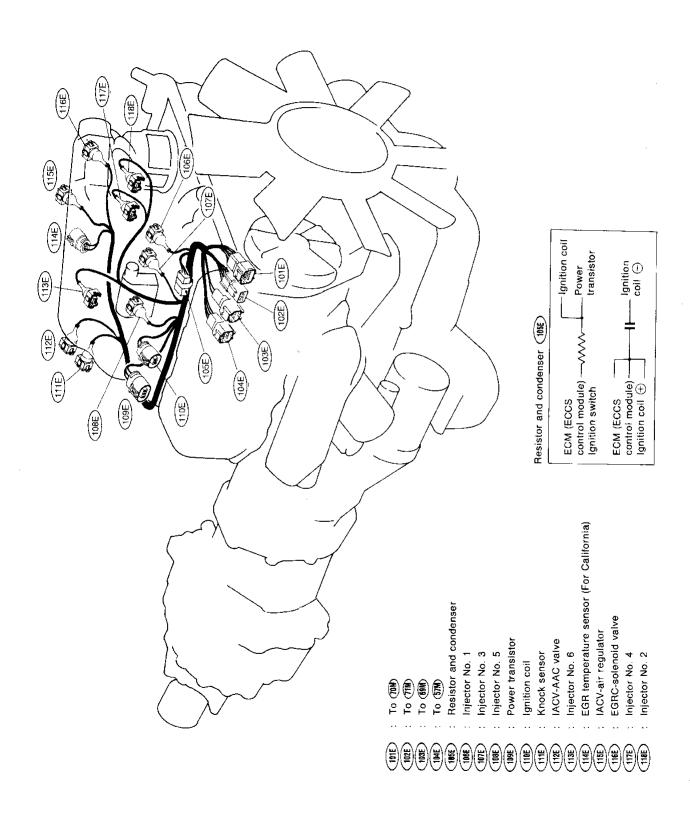


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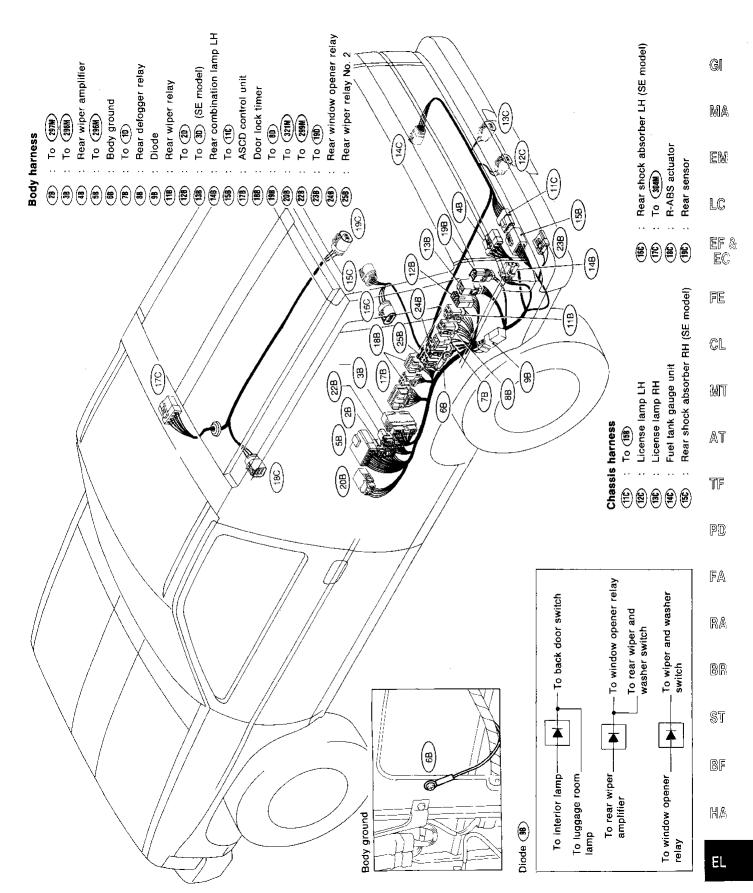
Engine Control Harness

VG30E ENGINE



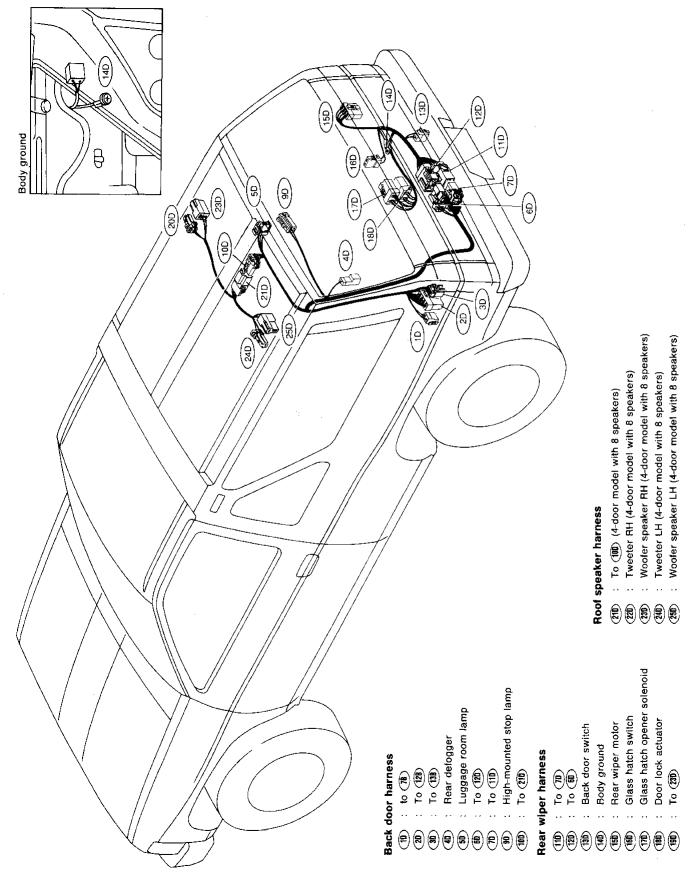
Engine Control Harness (Cont'd)

WAGON MODEL



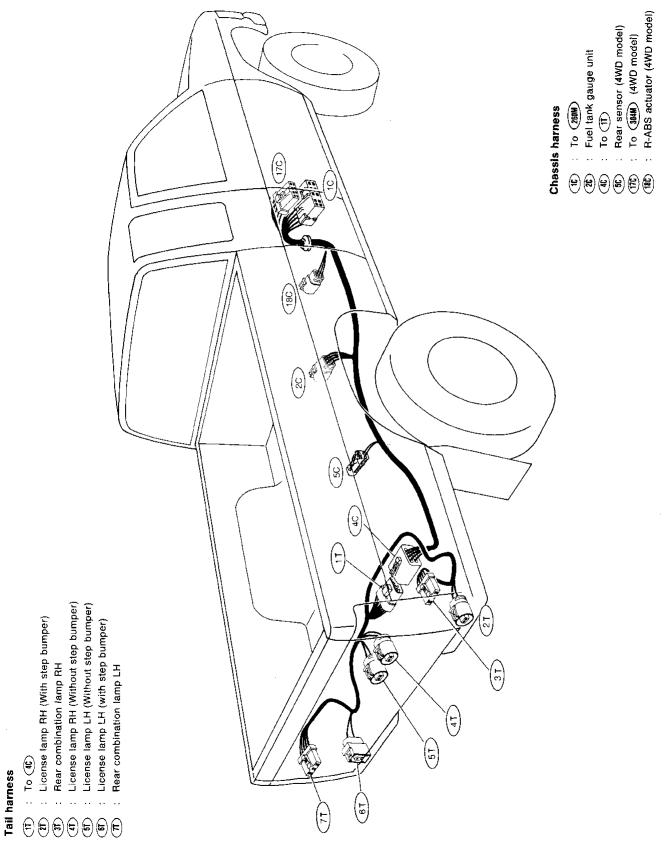
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Back Door and Rear Wiper Harness



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Chassis and Tail Harness



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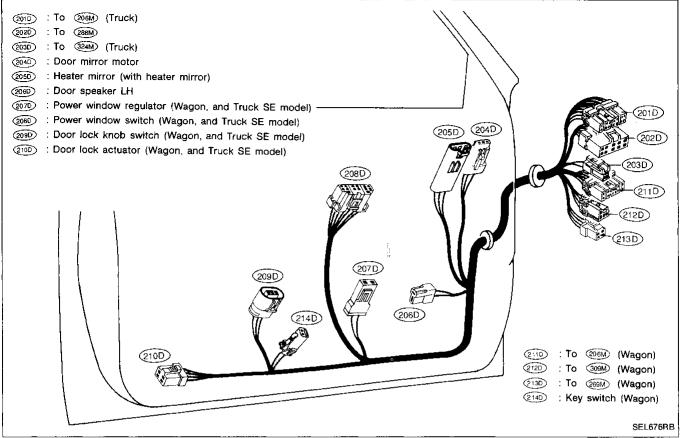
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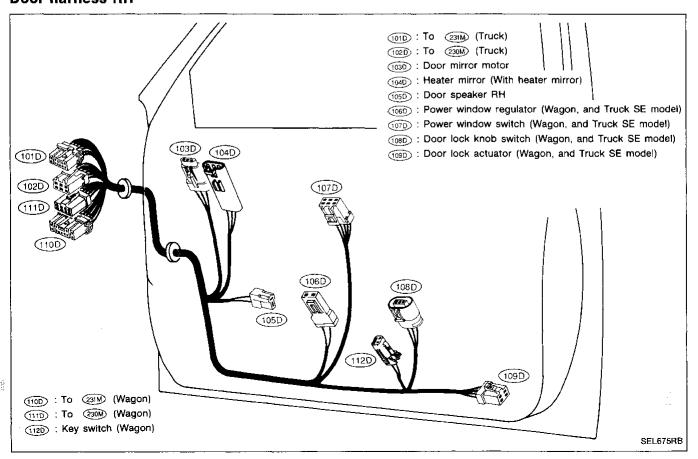
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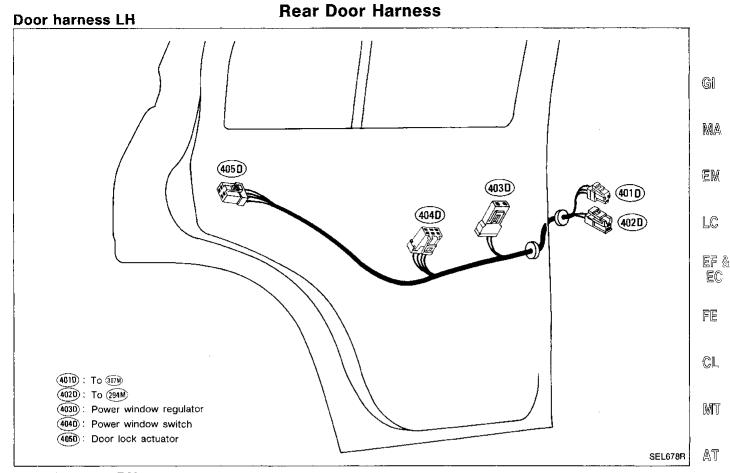
Door harness LH

Front Door Harness

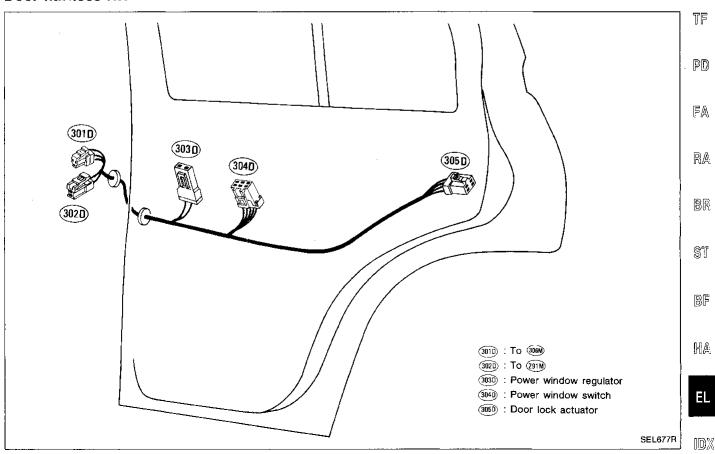


Door harness RH



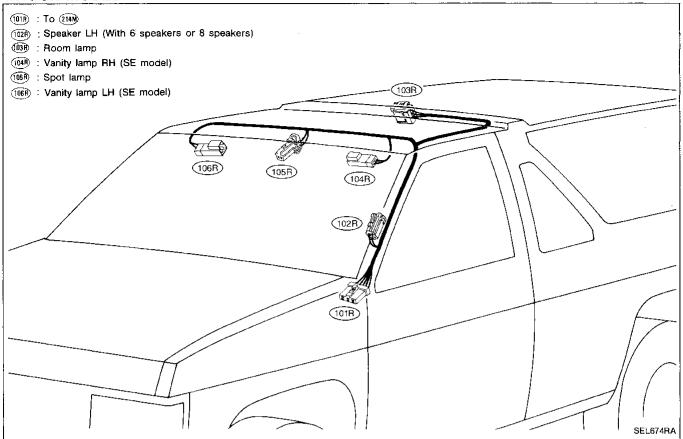


Door harness RH

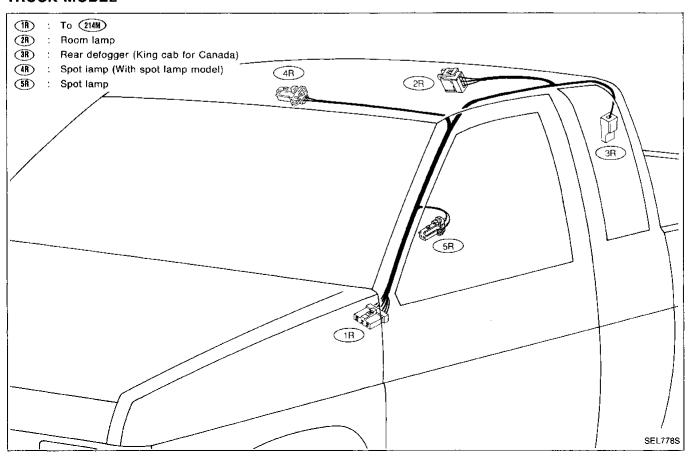


WAGON MODEL

Room Lamp Harness



TRUCK MODEL



ENGINE MECHANICAL

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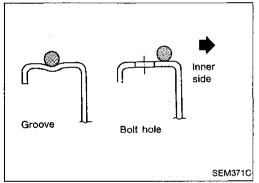
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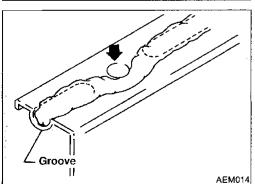
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Parts Requiring Angular Tightening

- Some important engine parts are tightened using an angular-tightening method rather than a torque setting method.
- If these parts are tightened using a torque setting method, dispersal of the tightening force (axial bolt force) will be two or three times that of the dispersal produced by using the correct angular-tightening method.
- Although the torque setting values (described in this manual) are equivalent to those used when bolts and nuts are tightened with an angular-tightening method, they should be used for reference only.
- To assure the satisfactory maintenance of the engine, bolts and nuts must be tightened using an angular-tightening method.
- Before tightening the bolts and nuts, ensure that the thread and seating surfaces are clean and coated with engine oil.
- The bolts and nuts which require the angular-tightening method are as follows:
 - (1) Cylinder head bolts
 - (2) Connecting rod cap nuts





Liquid Gasket Application Procedure

- a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves, and then completely clean any oil stains from these portions.
- Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
 - Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide (for oil pan).
 - Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).
- Apply liquid gasket to inner surface around hole perimeter area.
 - (Assembly should be done within 5 minutes after coating.)
- d Wait at least 30 minutes before refilling engine oil and engine coolant.

PREPARATION

Special Service Tools

Tool number		Engine a	pplication	
(Kent-Moore No.) Tool name	Description	VG30E	KA24E	_
ST0501S000 (—) Engine stand assembly ① ST05011000 (—) Engine stand ② ST05012000 (—) Base	Disassembling and assembling NT042	×	X	- ([
KV10106500 (—) Engine stand shaft	NT028	x	_	<u> </u>
KV10105001 (—) Engine attachment	NT031	_	х	- (0
KV10110001 (—) Engine sub-attachment	NT032	x		- - - 1
ST10120000 (J24239-01) Cylinder head bolt wrench	Loosening and tightening cylinder head bolt	х	_	- !
KV10110600 (J33986) Valve spring compressor	Disassembling and assembling valve components	x	_	 [=
KV101092S0 (—) Valve spring compressor ① KV10109210 (—) Compressor ② KV10109220 (—) Adapter	Disassembling and assembling valve components	_	X	
KV10107501 (—) Valve oil seal drift	Installing valve oil seal	х		- [=

PREPARATION

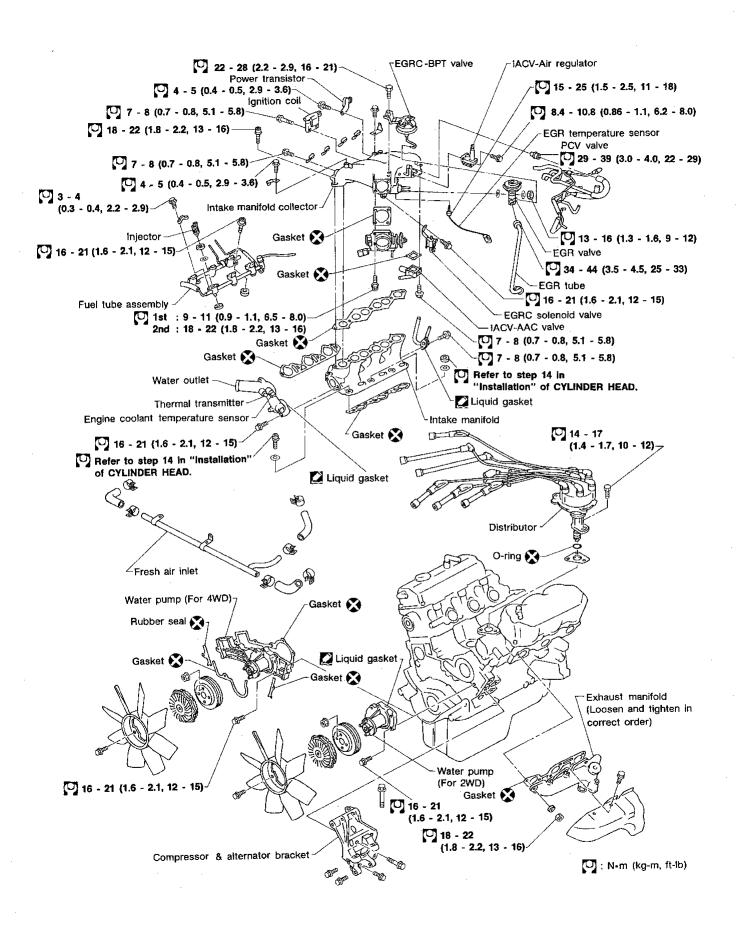
	Special Service To	ols (Cont'd)		
Tool number			Engine a	pplication
(Kent-Moore No.) Tool name	Description		VG30E	KA24E
KV109B0010 (—) Valve oil seal drift	NT027	Installing valve oil seal.	<u>·</u>	X
KV10110300 (—) Piston pin press stand assembly ① KV10110310 (—) Cap ② KV10110330 (—) Spacer ③ ST13030020 (—) Press stand ④ ST13030030 (—) Spring	(a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c	Disassembling and assembling piston with connecting rod	X	×
Spring (5) KV10110340 (—) Drift (6) KV10110320 (—) Center shaft	NT036			
EM03470000 (J8037) Piston ring compressor	NT044	Installing piston assembly into cyl- inder bore	x	х
(J36467) Valve oil seal remover	NT034	Displacement valve oil seal	_	х
ST16610001 (J23907) Pilot bushing puller	NT045	Removing crank- shaft pilot bushing	х	х
KV10111100 (J37228) Seal cutter	NT046	Removing oil pan	×	X
WS39930000 (—) Tube presser		Pressing the tube of liquid gasket	х	х

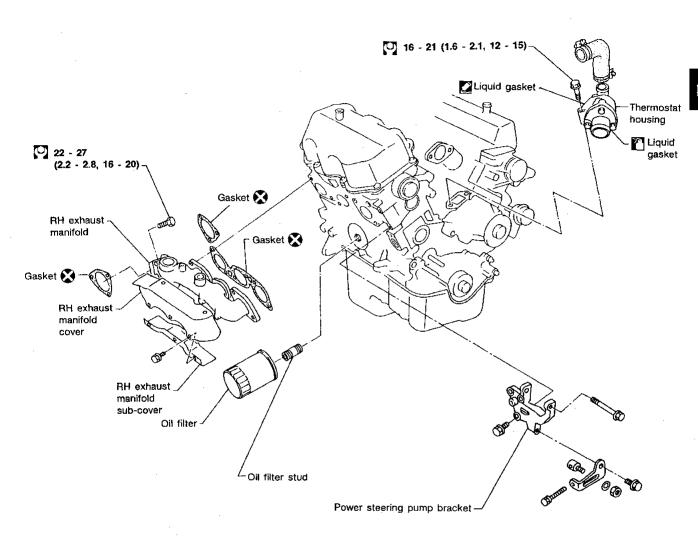
PREPARATION

		Special Service	e Tools (Cont'd)			
Tool number (Kent-Moore No.)	Description			Engine a	pplication	
Tool name	Description			VG30E	KA24E	
KV10105800 (J25660-C) Chain stopper			Holding the timing chain		x	
•	NT010					_

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,	Comme	rcial Service Tools			EM
T			Engine a	pplication	
Tool name	Description		VG30E	KA24E	- LC
Spark plug wrench	16 mm (0.63 in) NT047	Removing and installing spark plug	х	x	- EF EC FE
Pulley holder	NT035	Holding camshaft pulley while tightening or loosening camshaft bolt	x	х	- Cl MT
Valve seat cutter set	NT048	Finishing valve seat dimensions	x	X	- AT - T(5
Piston ring expander	NT030	Removing and installing piston ring	х	x	- 11(r PD
Valve guide drift	NT015	Removing and installing valve guide Diameter mm (in)	x	x	FA RA BR ST
Valve guide reamer	NT016	Reaming valve guide ① or hole for oversize valve guide ② Intake: $d_1 = 7.0 \text{ mm } (0.276 \text{ in) dia.}$ $d_2 = 11.2 \text{ mm } (0.441 \text{ in) dia.}$ Exhaust: $d_1 = 8.0 \text{ mm } (0.315 \text{ in) dia.}$ $d_2 = 12.2 \text{ mm } (0.480 \text{ in) dia.}$	X	x	- BF HA





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: N·m (kg-m, ft-lb)

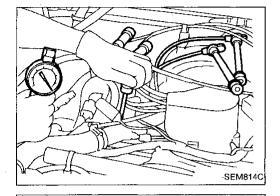
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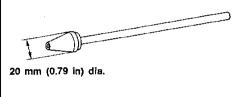
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Measurement of Compression Pressure

- 1. Warm up engine.
- 2. Turn ignition switch off.
- Release fuel pressure.Refer to "Releasing Fuel Pressure" in EF & EC section.
- 4. Remove all spark plugs.
- 5. Disconnect distributor center cable.





Use compressor tester whose end (rubber portion) is less than 20 mm (0.79 in) dia. Otherwise, it may be caught by cylinder head during removal.

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- 6. Attach a compression tester to No. 1 cylinder.
- Depress accelerator pedal fully to keep throttle valve wide open.
- 8. Crank engine and record highest gauge indication.
- Repeat the measurement on each cylinder as shown above.
- Always use a fully-charged battery to obtain specified engine speed.

Compression pressure: kPa (kg/cm², psi)/300 rpm Standard 1,196 (12.2, 173) Minimum 883 (9.0, 128)

Difference limit between cylinders 98 (1.0, 14)

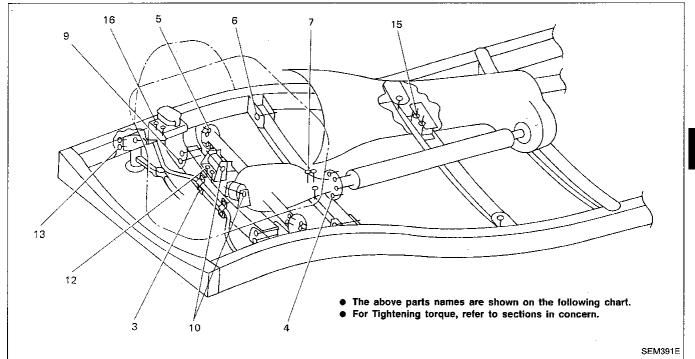
pour a small amount of engine oil into cylinders through spark plug holes and retest compression.

• If adding oil improves cylinder compression, piston rings

10. If cylinder compression in one or more cylinders is low,

- If adding oil improves cylinder compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston.
- If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seat. (Refer to SDS) If valve or valve seat is damaged excessively, replace them.
- If compression in any two adjacent cylinders is low and if adding oil does not improve compression, there is leakage past the gasket surface. If so, replace cylinder head gasket.

Removal



Decreed and and and		Applied	d model
F	Removal order and points	2WD	4WD
1	Remove undercover.	0	0
2	Drain engine oil.	. 0	0
3	Remove stabilizer bracket bolts (RH & LH).	0	
4	Remove front propeller shaft from front differential carrier.		0
5	Remove front drive shaft fixing bolts (RH & LH).	_	0
6	Remove front differential carrier member bolt (RH & LH).		0
7	Remove front differential carrier fixing bolts and support it.	_	0
8	Remove front differential carrier bleeder hose.	_	0
9	Remove front suspension crossmember.	0	

Removal order and points		Applied	l model
		2WD	4WD
10	Remove differential front mounting bolts (RH & LH).	_	0
11	Remove front differential carrier.	_	0
12	Remove front differential carrier mounting bracket.	_	Ó.
13	Remove idler arm.	0	0
14	Remove starter motor.	0	0
15	Remove transmission to rear engine mounting bracket nuts (RH & LH).		0
16	Remove engine mounting bofts or nuts (RH & LH).	_	. 0
17	Remove engine gussets.	0	0
18	Lift up engine. If necessary, disconnect exhaust tube.		0
19	Remove oil pan.	*	*

* Refer to next page.

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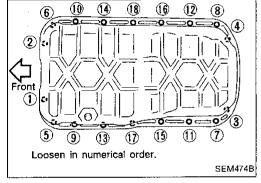
Removal (Cont'd)

WARNING:

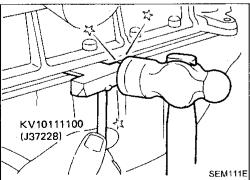
- a. Place vehicle on a flat and solid surface.
- b. Place chocks at front and rear of rear wheels.
- c. You should not remove oil pan until exhaust system and cooling system have completely cooled off. Otherwise, you may burn yourself and/or fire may break out in the fuel line.
- d. When remove front and/or rear engine mounting bolts or nuts, lift up slightly engine for safety work.

CAUTION:

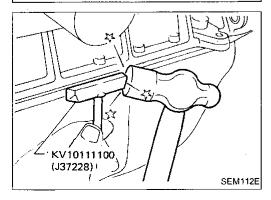
- In lifting engine, be careful not to hit against adjacent parts, especially against accelerator wire casing end, brake tube and brake master cylinder.
- b. For tightening torque, refer to AT, MT and PD sections.



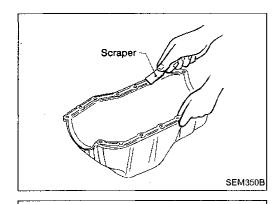
1. Remove oil pan bolts.



- 2. Remove oil pan.
- (1) Insert Tool between cylinder block and oil pan.
- Do not drive seal cutter into oil pump or rear oil seal retainer portion, or aluminum mating face will be damaged.
- Do not insert screwdriver, or oil pan flange will be deformed.



(2) Slide Tool by tapping its side with a hammer, and remove oil pan.

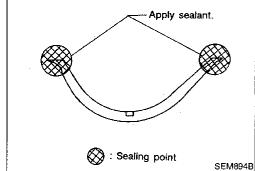


Installation

- Before installing oil pan, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.

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Apply sealant to oil pump gasket and rear oil seal retainer gasket.

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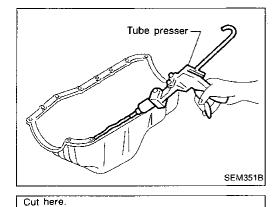
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- Apply a continuous bead of liquid gasket to mating surface of oil pan.
- Use Genuine Liquid Gasket or equivalent.



Liquid gasket

Groove

7 mm (0.28 in)

Bolt hole

Inner

side

Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in)

FA

PD

Apply liquid gasket to inner sealing surface as shown in figure.

RA

- Attaching should be done within 5 minutes after coating.
- Install oil pan.
- Install bolts/nuts in their reverse order of removal.
- Wait at least 30 minutes before refilling engine oil.

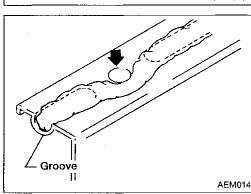
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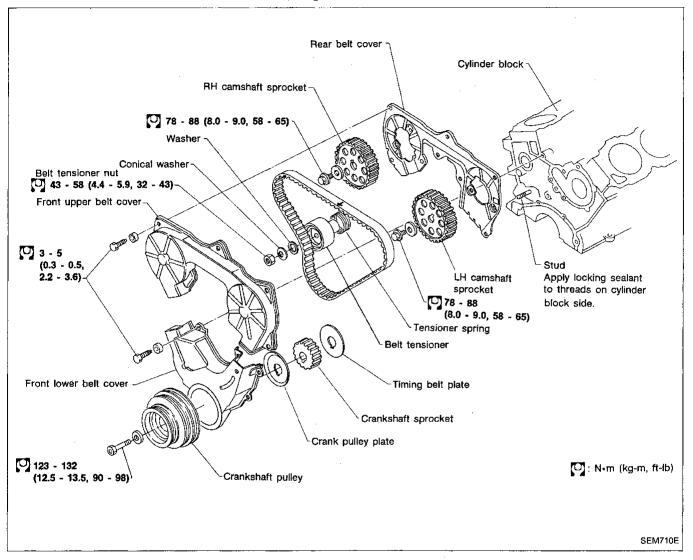
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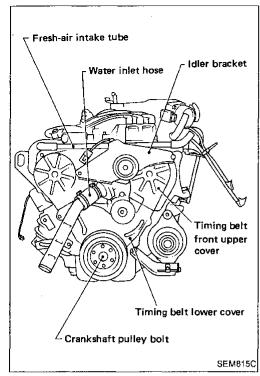
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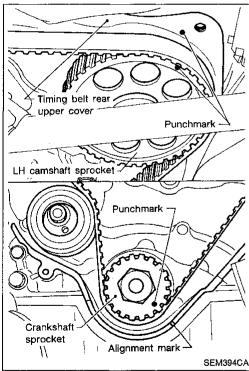


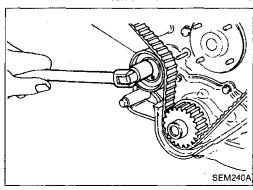
CAUTION:

- a. Do not bend or twist timing belt.
- After removing timing belt, do not turn crankshaft and camshaft separately because valves will strike piston heads.
- c. Make sure that timing belt, camshaft sprocket, crankshaft sprocket and belt tensioner are clean and free from oil and water.
- d. Installation should be carried out when engine is cold.









Removal

- 1. Remove engine under cover.
- Drain engine coolant from radiator.

Be careful not to spill coolant on drive belts.

- 3. Remove radiator. (Refer to LC section.)
- 4. Remove engine cooling fan and water pump pulley.
- 5. Remove the following belts.
- Power steering pump drive belt
- Compressor drive belt
- Alternator drive belt
- 6. Remove all spark plugs.
- 7. Remove distributor protector.
- 8. Remove compressor drive belt idler bracket.
- Remove fresh-air intake tube for rocker cover.
- 10. Remove water hose for thermostat housing.
- 11. Remove crankshaft pulley bolt.
- 12. Remove crankshaft pulley with a suitable puller.
- 13. Remove front upper and lower belt covers.
- 14. Set No. 1 piston at TDC on its compression stroke by rotating crankshaft.
- Align punchmark on LH camshaft sprocket with punchmark on timing belt upper rear cover.
- Align punchmark on crankshaft sprocket with notch on oil pump housing.
- Temporarily install crank pulley bolt on crankshaft so that crankshaft can be rotated.

15. Loosen timing belt tensioner nut, turn tensioner, then remove timing belt.

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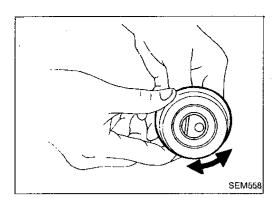
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Inspection

Visually check the condition of timing belt. Replace if any abnormality is found.

Item to check	Problem	Cause
Tooth is broken/tooth root is cracked.		Camshaft jamming Distributor jamming Damaged camshaft/crankshaft oil seal
	SEM394A	
Back surface is cracked/worn.		Tensioner jamming Overheated engine Interference with belt cover
	SEM395A	
Side surface is worn.	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Improper installation of belt Malfunctioning crankshaft pulley plate/timing belt plate
	Belt corners are worn and round. Wicks are frayed and coming out. SEM396A	
Teeth are worn.	Rotating direction	 Poor belt cover sealing Coolant leakage at water pump Camshaft not functioning properly Distributor not functioning properly Excessive belt tension
	 Canvas on tooth face is worn down. Canvas on tooth is fluffy, rubber layer is worn down and faded white, or weft is worn down and invisible. 	
Oil/Coolant or water is stuck to belt.		Poor oil sealing of each oil seal Coolant leakage at water pump Poor belt cover sealing



Inspection (Cont'd)

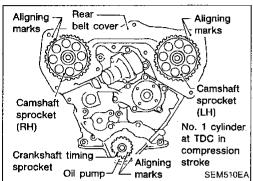
BELT TENSIONER AND TENSIONER SPRING

- Check belt tensioner for smooth turning.
- 2. Check condition of tensioner spring.

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Stud

Hook tensioner spring.

Arrow A

SEM243A

SEM829A

Installation

. Confirm that No. 1 piston is set at TDC on its compression stroke.

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2. Install tensioner and tensioner spring.

If stud is once removed, apply locking sealant to threads of stud on cylinder block side before installing.

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3. Turn tensioner fully outward with hexagon wrench, and temporarily tighten lock nut.

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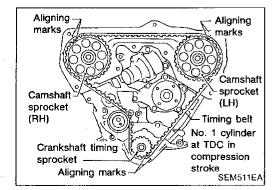


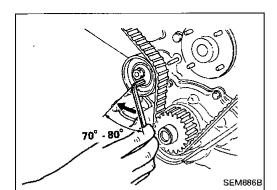
- (1) Align white lines on timing belt with punchmarks on camshaft sprockets and crankshaft sprocket.
- (2) Point arrow on timing belt toward front belt cover.

Number of teeth (reference):

Number of timing belt teeth 133

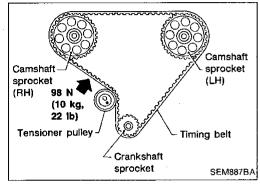
Number of teeth between timing marks Between LH camshaft sprocket and crankshaft timing sprocket 43



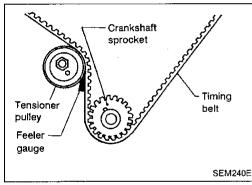


Installation (Cont'd)

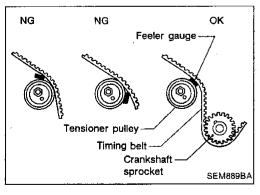
- 5. Loosen tensioner lock nut, keeping tensioner steady with hexagon wrench.
- 6. Turn tensioner 70 to 80 degrees clockwise with hexagon wrench, and temporarily tighten lock nut.
- 7. Turn crankshaft clockwise at least 2 times, then slowly set No. 1 piston at TDC on its compression stroke.



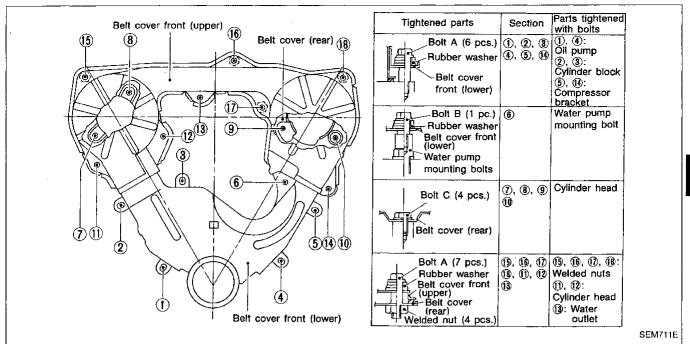
- 8. Push middle of timing belt between RH camshaft sprocket and tensioner pulley with force of 98 N (10 kg, 22 lb).
- 9. Loosen tensioner lock nut, keeping tensioner steady with hexagon wrench.

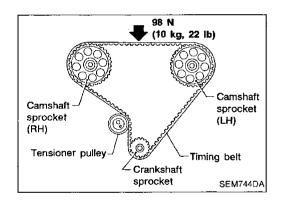


10. Set feeler gauge as shown in figure which is 0.35 mm (0.0138 in) thick and 12.7 mm (0.500 in) wide.



- 11. Turn crankshaft clockwise until feeler gauge is positioned as shown in figure.
- Timing belt will move about 2.5 teeth.
- 12. Tighten tensioner lock nut, keeping tensioner steady with hexagon wrench.
- 13. Turn crankshaft clockwise or counterclockwise, and remove feeler gauge.
- 14. Turn crankshaft clockwise at least 2 times, then slowly set No. 1 piston at TDC on its compression stroke.
- 15. Install lower and upper belt covers.





BELT TENSION CHECK

1. Set No. 1 piston at TDC on its compression stroke.

 Measure deflection of timing belt midway between camshaft pulleys while pushing with 98 N (10 kg, 22 lb) force.
 Belt deflection (Reference value):

13 - 15 mm (0.51 - 0.59 in)/98 N (10 kg, 22 lb)

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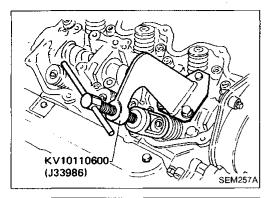
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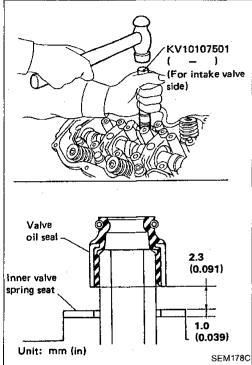
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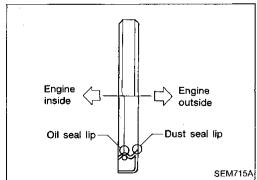
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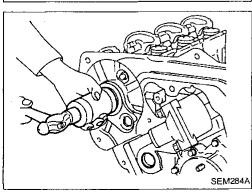
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VALVE OIL SEAL

- 1. Remove rocker cover.
- 2. Remove rocker shaft assembly and valve lifters with valve lifter guide.
- 3. Remove valve springs and valve oil seal.
- Piston concerned should be set at TDC to prevent valve from falling.
- When removing intake side valve oil seal, use Tool or suitable tool.
- When removing exhaust side valve oil seal, pull it out with suitable tool.
- 4. Apply engine oil to new valve oil seal and install it.
- Before installing valve oil seal, install inner valve spring seat.
- When installing intake side valve oil seal, use Tool.
- When installing exhaust side valve oil seal, set it by hand.

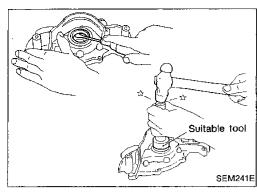
OIL SEAL INSTALLING DIRECTION

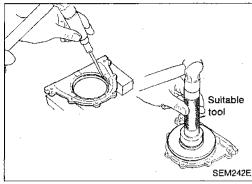
CAMSHAFT OIL SEAL

- 1. Remove timing belt.
- 2. Remove camshaft sprocket.
- 3. Remove camshaft.
- 4. Remove camshaft oil seal.

Be careful not to scratch camshaft.

5. Apply engine oil to new camshaft oil seal.





FRONT OIL SEAL

- 1. Remove timing belt and crankshaft sprocket.
- Remove oil pump assembly.
- 3. Remove front oil seal from oil pump body.
- Apply engine oil to new oil seal and install it using suitable (4. tool.



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REAR OIL SEAL

- Remove flywheel or drive plate.
- Remove rear oil seal retainer.
- 3. Remove rear oil seal from retainer.
- Apply engine oil to new oil seal and install it using suitable
- 5. Install rear oil seal retainer with a new gasket to cylinder block.



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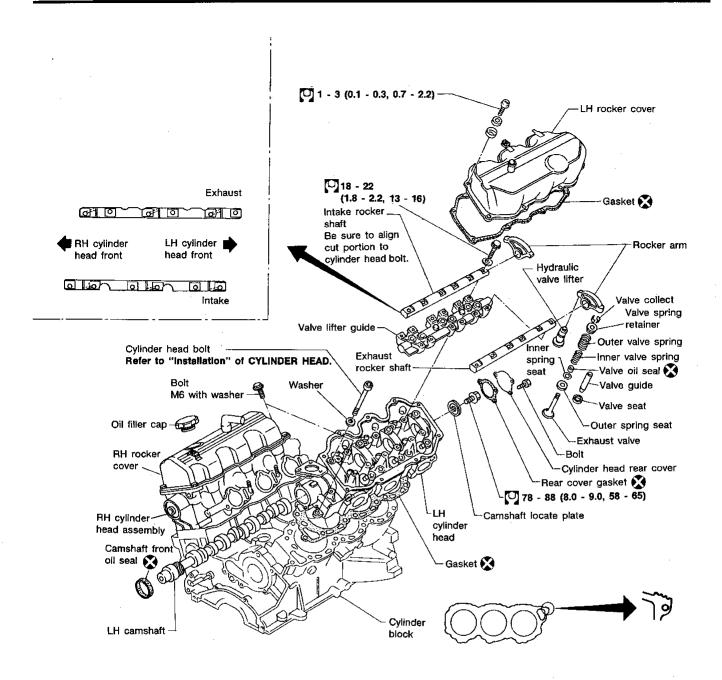
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EM-19



: N-m (kg-m, ft-lb)

CAUTION:

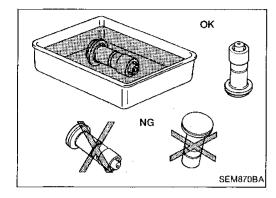
- When installing sliding parts such as rocker arms, camshaft and oil seal, be sure to apply new engine oil on their sliding surfaces.
- When tightening cylinder head bolts and rocker shaft bolts, apply new engine oil to thread portions and seat surfaces of bolts.

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- If hydraulic valve lifter is kept on its side, there is a risk of air entering it. After removal, always set hydraulic valve lifter straight up, or when laying it on its side, have it soak in new engine oil.
- Do not disassemble hydraulic valve lifter.
- Attach tags to valve lifters so as not to mix them up.

ef & EC

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Removal

- Release fuel pressure.
 Refer to "Releasing Fuel Pressure" in EF & EC section.
- Remove timing belt.
 Refer to "TIMING BELT Removal" (EM-13).

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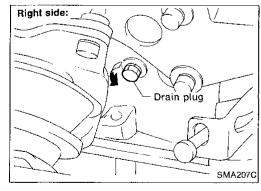
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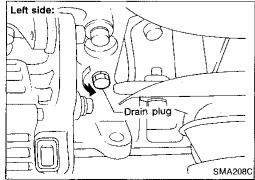
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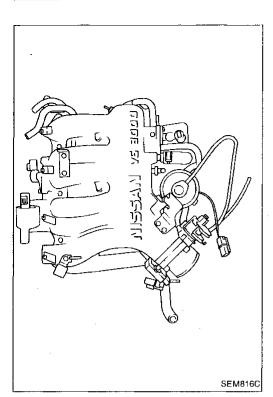
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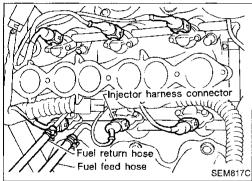


Drain coolant by removing drain plugs from both sides of cylinder block.

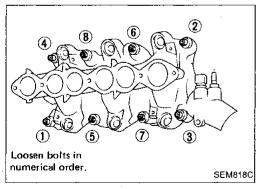


Removal (Cont'd)

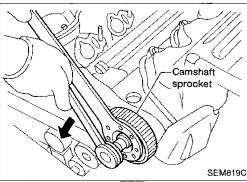
- 4. Separate ASCD and accelerator control wire from intake manifold collector.
- 5. Remove intake manifold collector from engine. The following parts should be disconnected to remove intake manifold collector.
- a. Harness connectors for: IACV-AAC valve, Throttle position sensor, Throttle position switch, Ignition coil, Power transistor, EGRC-solenoid valve, IACV-air regulator and EGR temperature sensor.
- b. Water hoses from collector
- c. Heater hoses
- d. PCV hose from RH rocker cover
- e. Vacuum hoses for: Canister, Master brake cylinder and Pressure regulator.
- f. Purge hose from canister
- g. EGR tube
- h. Earth harnesses
- i. Air duct hose



- 6. Remove fuel feed and fuel return hoses from injector fuel tube assembly.
- 7. Disconnect all injector harness connectors.
- Remove injector fuel tube assembly.



- Remove intake manifold from engine.
 The following parts should be disconnected to remove intake manifold.
- a. Engine coolant temperature switch harness connector
- b. Thermal transmitter harness connector
- Water hose from thermostat housing



- 10. Remove both camshaft sprockets.
- 11. Remove rear timing belt cover.
- 12. Remove distributor and ignition wires.

After pulling out distributor from cylinder head, do not rotate distributor rotor.

- 13. Remove harness clamp from RH rocker cover.
- 14. Remove front exhaust tube from exhaust manifold.

Removal (Cont'd)

SEM821C

SEM403C

SEM926AA

Front

 \Rightarrow

For RH cylinder head

No. 5

For LH cylinder head

Engine front

RH exhaust manifold

LH exhaust manifold

Front

 \Diamond

Loosen in numerical order.

(5)

- 15. Remove compressor from its bracket.
- 16. Remove alternator from its bracket.
- 17. Remove compressor and alternator bracket.



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18. Remove both rocker covers.

LC

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19. Remove cylinder head with exhaust manifold.

A warped or cracked cylinder head could result from removing in incorrect order.

Cylinder head bolts should be loosened in two or three steps.

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Disassembly Remove exhaust manifolds from cylinder head.

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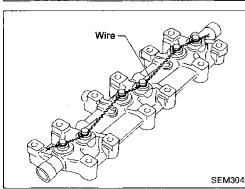
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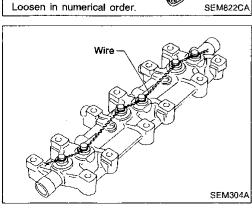
Remove rocker shafts with rocker arms.

Bolts should be loosened in two or three steps.

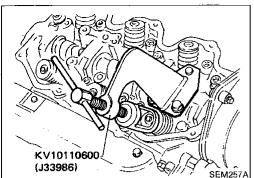
- Remove hydraulic valve lifters and lifter guide.
- Hold hydraulic vaive lifters with wire so that they will not drop from lifter guide.
- Remove oil seal and camshaft.
- Before removing camshaft, measure camshaft end play.



(5)



IDX



Straightedge Feeler gauge

Disassembly (Cont'd)

- 5. Remove valve components with Tool.
- 6. Remove valve oil seals with Tool or suitable tool.

Inspection

CYLINDER HEAD DISTORTION

Head surface flatness:

Less than 0.1 mm (0.004 in)

If beyond the specified limit, replace it or resurface it.

Resurfacing limit:

SEM868A

The resurfacing limit of cylinder head is determined by the cylinder block resurfacing in an engine.

Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)

After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

Nominal cylinder head height:

106.8 - 107.2 mm (4.205 - 4.220 in)

CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.

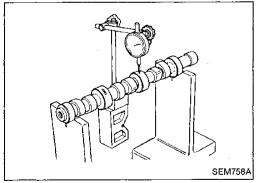
CAMSHAFT RUNOUT

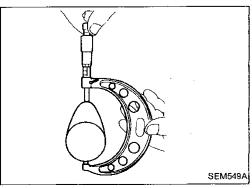


Runout (Total indicator reading):

Limit 0.1 mm (0.004 in)

2. If it exceeds the limit, replace camshaft.





CAMSHAFT CAM HEIGHT

1. Measure camshaft cam height.

Standard cam height:

39.537 - 39.727 mm (1.5566 - 1.5641 in)

Cam wear limit:

0.15 mm (0.0059 in)

2. If wear is beyond the limit, replace camshaft.

RH camshaft H camshaft SEM893BA

Inspection (Cont'd) **CAMSHAFT JOURNAL CLEARANCE**

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Bore gauge SEM879A Measure inner diameter of camshaft bearing.

Standard inner diameter:

47.000 - 47.025 mm (1.8504 - 1.8514 in)

42.500 - 42.525 mm (1.6732 - 1.6742 in)

C 48.000 - 48.025 mm (1.8898 - 1.8907 in)

EF & EC

LC

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MIT

Measure outer diameter of camshaft journal.

Standard outer diameter:

A 46.920 - 46.940 mm (1.8472 - 1.8480 in)

B 42.420 - 42.440 mm (1.6701 - 1.6709 in)

C 47.920 - 47.940 mm (1.8866 - 1.8874 in)

ΔT

If clearance exceeds the limit, replace camshaft and/or cylinder head.

> Camshaft journal clearance limit: 0.15 mm (0.0059 in)

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CAMSHAFT END PLAY

SEM012A

End play

Locate plate

SEM392E

Install camshaft and locate plate in cylinder head.

FA

Measure camshaft end play.

Camshaft end play:

Standard 0.03 - 0.06 mm (0.0012 - 0.0024 in)

BR

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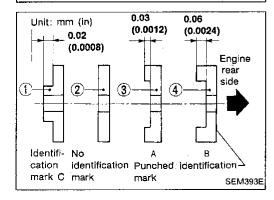
If it is out of the specified range, select thickness of camshaft locate plate to obtain standard specified end play.

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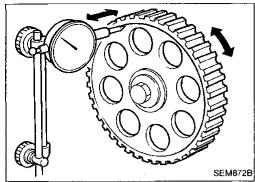
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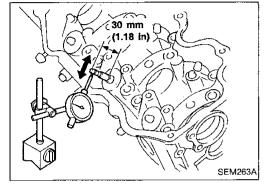
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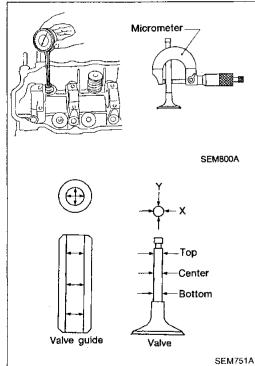


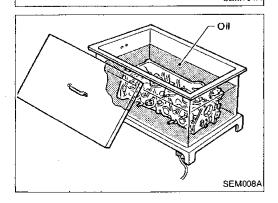
Dial gauge

When camshaft end play is 0.08 mm (0.0031 in) with camshaft locate plate (2), replace camshaft locate plate (2) with camshaft locate plate 3 to set the end play at 0.05 mm (0.0020 in).









CAMSHAFT SPROCKET RUNOUT

- Install sprocket on camshaft.
- Measure camshaft sprocket runout. 2.

Runout (Total indicator reading): Limit 0.1 mm (0.004 in)

If it exceeds the limit, replace camshaft sprocket.

VALVE GUIDE CLEARANCE

Measure valve deflection in a right-angled direction with camshaft. (Valve and valve guide mostly wear in this direc-

Valve deflection limit (Dial gauge reading): 0.20 mm (0.0079 in)

- If it exceeds the limit, check valve to valve guide clearance.
- Measure valve stem diameter and valve guide inner diam-
- Check that clearance is within specification.

Valve to valve guide clearance:

Intake

0.020 - 0.053 mm (0.0008 - 0.0021 in)

Exhaust

0.040 - 0.073 mm (0.0016 - 0.0029 in)

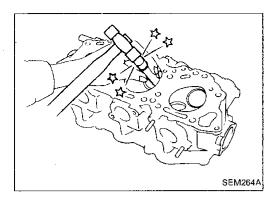
Limit

0.10 mm (0.0039 in)

If it exceeds the limit, replace valve or valve guide.

VALVE GUIDE REPLACEMENT

To remove valve guide, heat cylinder head to 150 to 160°C (302 to 320°F) by soaking in heated oil.



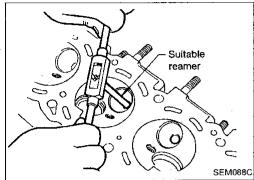
 Drive out valve guide with a press [under a 20 kN (2 ton, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and suitable tool.



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3. Ream cylinder head valve guide hole.

Valve guide hole diameter (for service parts):

Intake

11.175 - 11.196 mm (0.4400 - 0.4408 in)

Exhaust

12.175 - 12.196 mm (0.4793 - 0.4802 in)



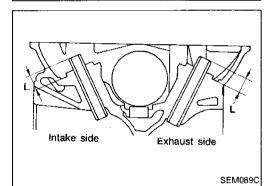
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4. Heat cylinder head to 150 to 160°C (302 to 320°F) and press service valve guide onto cylinder head.

Projection "L":

13.2 - 13.4 mm (0.520 - 0.528 in)

5. Ream valve guide.

Finished size:

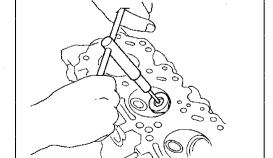
Intake

7.000 - 7.018 mm (0.2756 - 0.2763 in)

Exhaust

8.000 - 8.018 mm (0.3150 - 0.3157 in)

PD



VALVE SEATS

SEM090C

Check valve seats for any evidence of pitting at valve contact surface, and reseat or replace if it has worn out excessively.

 Before repairing valve seats, check valve and valve guide for wear. If they have worn, replace them. Then correct valve seat.

Cut with both hands to maintain a uniform cutting surface.

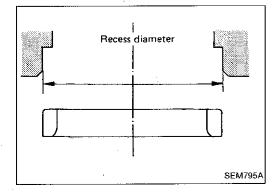
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REPLACING VALVE SEAT FOR SERVICE PARTS

 Bore out old seat until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.

2. Ream cylinder head recess.

Reaming bore for service valve seat Oversize [0.5 mm (0.020 in)]:

Intake

44.500 - 44.516 mm (1.7520 - 1.7526 in)

Exhaust

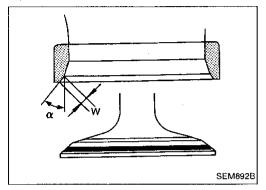
37.500 - 37.516 mm (1.4764 - 1.4770 in)

10%

EM-27

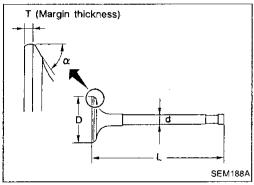
Reaming should be done in circles concentric to the valve guide center so that valve seat will have the correct fit.

- Heat cylinder head to 150 to 160°C (302 to 320°F) by soaking in heated oil.
- 4. Press fit valve seat until it seats on the bottom.



- Cut or grind valve seat using suitable tool at the specified dimensions as shown in SDS (EM-47).
- 6. After cutting, lap valve seat with abrasive compound.
- 7. Check valve seating condition.

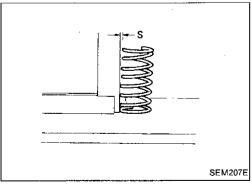
		Intake	Exhaust
Seat face angle ''α''	degree	45	45
Contacting width "W"	mm (in)	1.75 (0.0689)	1.7 (0.067)



VALVE DIMENSIONS

Check dimensions in each valve. For dimensions, refer to SDS. When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace valve.

Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.



VALVE SPRING

Squareness

1. Measure "S" dimension.

Out-of-square:

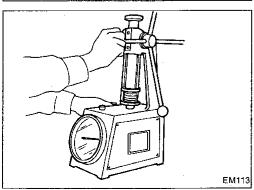
Outer

Less than 2.2 mm (0.087 in)

Inner

Less than 1.9 mm (0.075 in)

2. If it exceeds the limit, replace spring.



Pressure

Check valve spring pressure.

Standard pressure: N (kg, lb) at height mm (in)

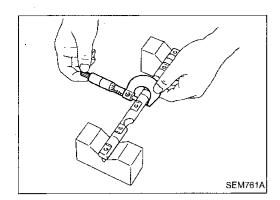
Outer: 523.7 (53.4, 117.7) at 30.0 (1.181) Inner: 255.0 (26.0, 57.3) at 25.0 (0.984)

Limit pressure: N (kg, lb) at height mm (in)

Outer: More than 228.5 (23.3, 51.4) at 25.0 (0.984) Inner: More than 225.6 (23.0, 50.7) at 25.0 (0.984)

If it exceeds the limit, replace spring.

CYLINDER HEAD



Inspection (Cont'd)

- Check rocker shafts for scratches, seizure and wear.
- Check outer diameter of rocker shaft.

ROCKER SHAFT AND ROCKER ARM

Diameter:

17.979 - 18.000 mm (0.7078 - 0.7087 in)

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Check inner diameter of rocker arm.

Diameter:

18.007 - 18.028 mm (0.7089 - 0.7098 in)

Rocker arm to shaft clearance:

0.007 - 0.049 mm (0.0003 - 0.0019 in)

Keep rocker arm with hydraulic valve lifter standing to prevent air from entering hydraulic valve lifter when checking.

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HYDRAULIC VALVE LIFTER Check contact and sliding surfaces for wear or scratches.

Outer diameter:

Check diameter of valve lifter.

15.947 - 15.957 mm (0.6278 - 0.6282 in)

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3. Check valve lifter guide inner diameter.

Inner diameter:

16.000 - 16.013 mm (0.6299 - 0.6304 in)

Standard clearance between valve lifter and lifter guide:

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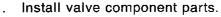
0.043 - 0.066 mm (0.0017 - 0.0026 in)

BR

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Always use new valve oil seal. Refer to OIL SEAL **REPLACEMENT (EM-18).**

Before installing valve oil seal, install inner valve spring

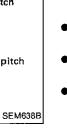
Install outer valve spring (uneven pitch type) with its narrow pitch side toward cylinder head side.

After installing valve component parts, use plastic hammer to lightly tap valve stem tip to assure a proper fit.

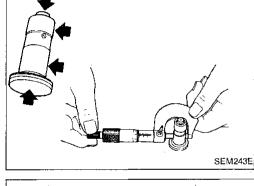
EL

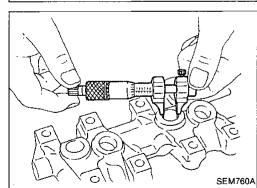
 $\mathbb{A}\mathbb{H}$

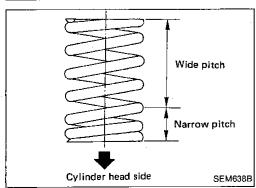
IDX

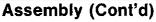


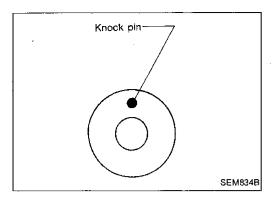
SEM762A



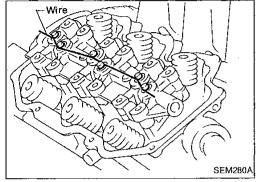




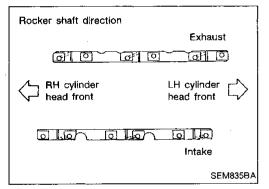




- 2. Install camshafts, locate plates and cylinder head rear covers
- Set knock pin of camshaft at the top.



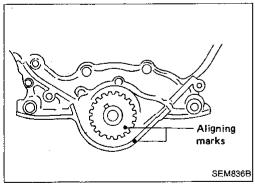
- 3. Install valve lifters into valve lifter guide.
- Assemble valve lifters to their original position and hold all valve lifters with wire to prevent lifters from falling off.
- After installing, remove the wire.



- 4. Install rocker shafts with rocker arms.
- Tighten bolts gradually in two or three stages.
- Before tightening, be sure to set camshaft the lobe at the position where lobe is not lifted.
- Set No. 1 piston at TDC on its compression stroke and tighten rocker shaft bolts for No. 2, No. 4 and No. 6 cylinders.
- Set No. 4 piston at TDC on its compression stroke and tighten rocker shaft bolts for No. 1, No. 3 and No. 5 cylinders.
- Install exhaust manifold to cylinder head in reverse order of removal.



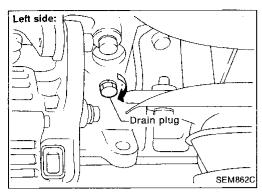
- Set No. 1 piston at TDC on its compression stroke as follows:
- a. Align crankshaft sprocket aligning mark with mark on oil pump body.
- b. Confirm that knock pin on camshaft is set at the top.

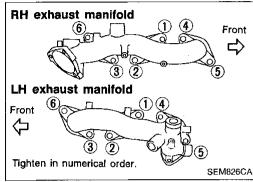


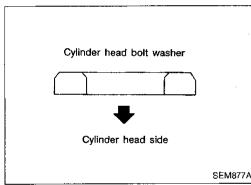
- Right side:

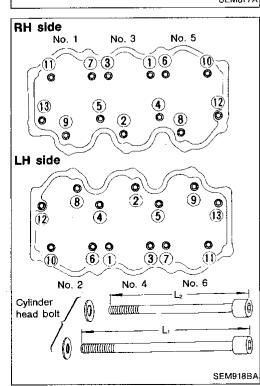
 Drain plug

 SEM861C
- Install both drain plugs.
- Apply sealant to drain plug threads.









3. Install exhaust manifolds to cylinder head.

- Install cylinder head with new gasket.
- Be sure to install washers between bolts and cylinder head.
- Do not rotate crankshaft and camshaft separately, or valves will hit piston heads.

- Tighten cylinder head bolts in numerical order using ST10120000 (J24239-01).
- Tightening procedure:
- (1) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).
- (2) Tighten all bolts to 59 N·m (6.0 kg-m, 43 ft-lb).
- (3) Loosen all bolts completely.
- (4) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).
- (5) Turn all bolts 60 to 65 degrees clockwise. If an angle wrench is not available, tighten all bolts to 54 to 64 N⋅m (5.5 to 6.5 kg-m, 40 to 47 ft-lb).
- Bolts for 4, 5, 12 and 13 are longer than the others.

L₁: 127 mm (5.00 in) for ④, ⑤, ⑫ and ⑬

L₂: 106 mm (4.17 in) for others

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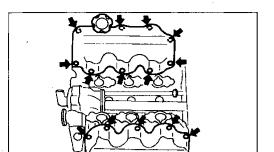
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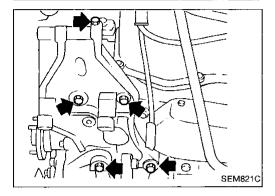
BF

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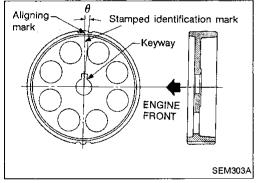
6. Install both rocker covers.



- 7. Install compressor and alternator bracket.
- 8. Install alternator.

SEM403C

- 9. Install compressor.
- 10. Install exhaust front tube to exhaust manifold.



- 11. Install rear belt cover and camshaft sprocket.
- RH camshaft sprocket and LH camshaft sprocket are different parts. Be sure to install them in the correct location.

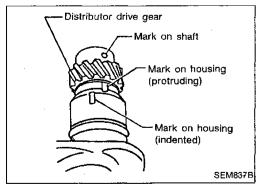
	Identification mark	θ
RH camshaft sprocket	R3 ·	0°53′
LH camshaft sprocket	L3	-3°27′

12. Install timing belt and adjust belt tension.

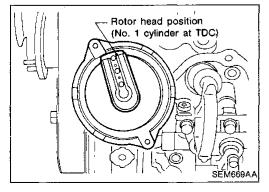
Refer to "TIMING BELT — Installation" (EM-15).

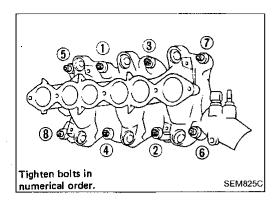


(1) Align mark on shaft with protruding mark on housing.



(2) After installing, confirm that distributor rotor head is set as shown in figure.





Install intake manifold.
 Install all parts which were removed in step 9 under "CYL-INDER HEAD — Removal" (EM-21).

Tightening procedure

(1) Tighten all bolts to 3 to 5 N·m (0.3 to 0.5 kg-m, 2.2 to 3.6 ft-lb).

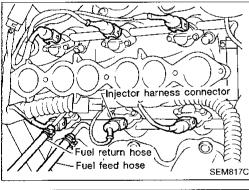
Tighten all nuts to 3 to 5 N·m (0.3 to 0.5 kg-m, 2.2 to 3.6 ft-lb).

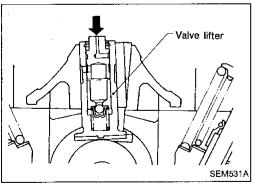
(2) Tighten all bolts to 16 to 20 N·m (1.6 to 2.0 kg-m, 12 to 14 ft-lb).

Tighten all nuts to 24 to 27 N·m (2.4 to 2.8 kg-m, 17 to 20 ft-lb).

(3) Tighten all bolts to 16 to 20 N·m (1.6 to 2.0 kg-m, 12 to 14 ft-lb).

Tighten all nuts to 24 to 27 N·m (2.4 to 2.8 kg-m, 17 to 20 ft-lb).





15. Install injector fuel tube assembly.

16. Connect all injector harness connectors.

17. Install fuel feed and fuel return hoses to injector fuel tube assembly.

Install intake manifold collector.
 Install all parts which were removed in step 5 under "CYL-INDER HEAD — Removal" (EM-21).

19. Install ASCD and accelerator control wire.

20. Check hydraulic valve lifter.

a. Push plunger forcefully with your finger.

 Be sure to check it with rocker arm in its free position (not on the lobe).

b. If valve lifter moves more than 1 mm (0.04 in), air may be inside it.

c. Bleed air off by running engine at 1,000 rpm under no load for about 10 minutes.

d. If hydraulic valve lifters are still noisy, replace them and bleed air off again in the same manner as in step 20 (c).

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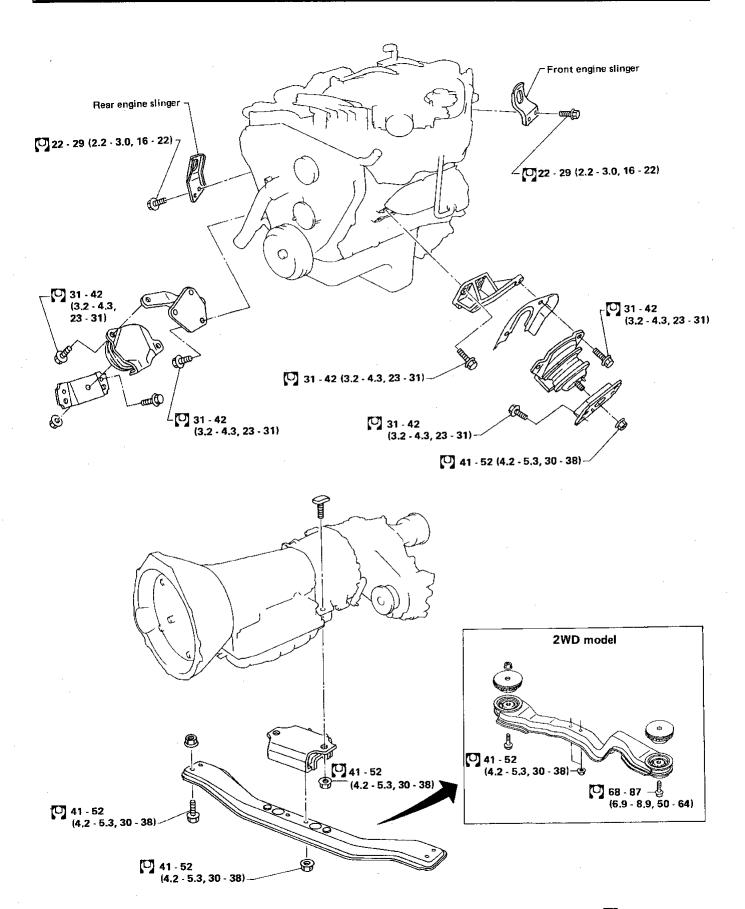
ST.

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O : N·m (kg-m, ft-lb)

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WARNING:

- Situate vehicle on a flat and solid surface.
- b. Place chocks at front and back of rear wheels.
- c. Do not remove engine until exhaust system has completely cooled off. Otherwise, you may burn yourself and/or fire may break out in fuel line.

d. For safety during subsequent steps, the tension of wires should be slackened against the engine.

e. Before disconnecting fuel hose, release fuel pressure from fuel line.

Refer to "Releasing Fuel Pressure" in EF & EC section.

- f. Before removing front axle from transmission, place safety stands under designated front supporting points. Refer to GI section for lifting points and towing.
- g. Be sure to hoist engine and transmission in a safe manner.
- h. For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.

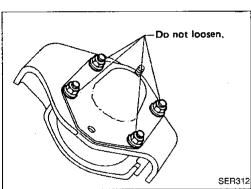
CAUTION:

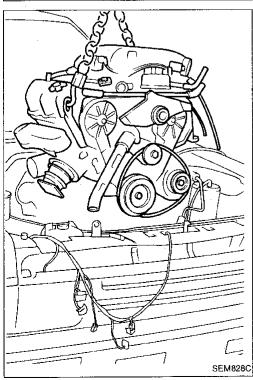
- When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.
- In hoisting the engine, always use engine slingers in a safe manner.
- Do not loosen front engine mounting insulator cover securing nuts.

When cover is removed, damper oil flows out and mounting insulator will not function.

For tightening torque, refer to AT, MT and PD sections. For 4WD model, sealant should be applied between engine and transmission.

Refer to "Installation" in MT section.





Removal

- 1. Remove engine undercover and hood.
- 2. Drain engine coolant.
- Remove vacuum hoses, fuel tubes, wires, harnesses and connectors and so on.
- 4. Remove radiator with shroud and cooling fan.
- 5. Remove drive belts.
- Remove power steering oil pump and air conditioner compressor.
- 7. Remove front exhaust tube.
- 8. Remove transmission from vehicle.

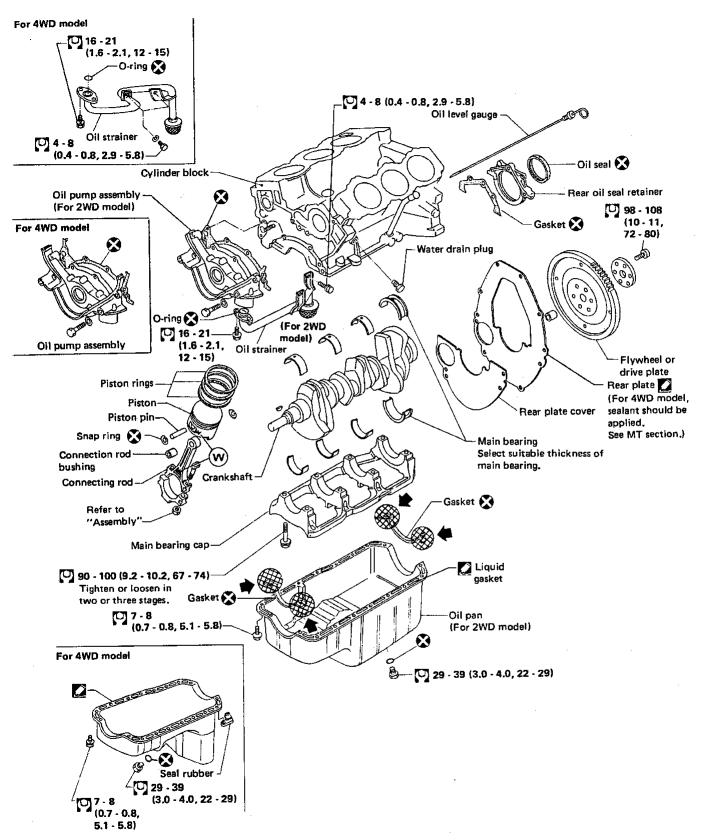
Refer to "Removal" in MT and AT sections.

- Install engine slingers.
- Hoist engine with engine slingers and remove engine mounting bolts from both sides.
- 11. Remove engine from vehicle.

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♣ : Apply sealant.
□ : N·m (kg·m, ft-lb)

CAUTION:

- When installing sliding parts such as bearings and pistons, be sure to apply engine oil on the sliding surfaces.
- Place removed parts such as bearings and bearing caps in their proper order and direction.
- When tightening connecting rod bolts and main bearing cap bolts, apply engine oil to thread portion of bolts and seating surface of nuts.



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Disassembly

PISTON AND CRANKSHAFT

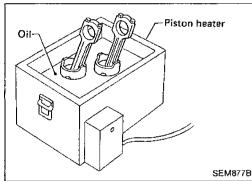
- Place engine on a work stand.
- Drain coolant and oil. 2.
- Remove oil pan and oil pump. 3.
- 4. Remove timing belt.
- 5. Remove water pump.
- 6. Remove cylinder head.



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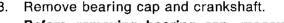
Front

- Remove pistons with connecting rods.
- When disassembling piston and connecting rod, remove snap ring first, then heat piston to 60 to 70°C (140 to 158°F) or use piston pin press stand at room temperature.



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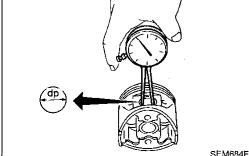
- Before removing bearing cap, measure crankshaft end
- Bolts should be loosened in two or three steps.

RA

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Loosen in numerical order.

Inspection

SEM551E

PISTON AND PISTON PIN CLEARANCE

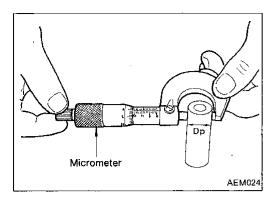
Measure inner diameter of piston pin hole "dp". Standard diameter "dp":

20.969 - 20.981 mm (0.8255 - 0.8260 in)

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2. Measure outer diameter of piston pin "Dp".

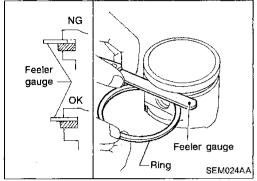
Standard diameter "Dp":

20.971 - 20.983 mm (0.8256 - 0.8261 in)

3. Calculate piston pin clearance.

dp - Dp = 0 - 0.004 mm (0 - 0.0002 in)

If it exceeds the above value, replace piston assembly with pin.



PISTON RING SIDE CLEARANCE

Side clearance:

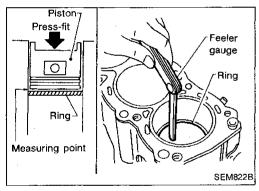
Top ring: 0.040 - 0.073 mm (0.0016 - 0.0029 in)

2nd ring: 0.030 - 0.063 mm (0.0012 - 0.0025 in)

Max. limit of side clearance:

0.1 mm (0.004 in)

If out of specification, replace piston and/or piston ring assembly.



PISTON RING END GAP

End gap:

Top ring: 0.21 - 0.44 mm (0.0083 - 0.0173 in) 2nd ring: 0.18 - 0.44 mm (0.0071 - 0.0173 in)

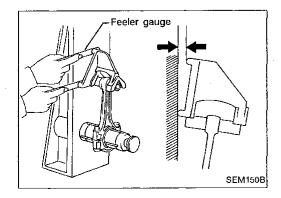
Oil ring: 0.20 - 0.76 mm (0.0079 - 0.0299 in)

Max. limit of ring gap: 1.0 mm (0.039 in)

If out of specification, replace piston ring. If gap still exceeds the limit even with a new ring, rebore cylinder and use oversized piston and piston rings.

Refer to SDS (EM-49).

 When replacing the piston, check the cylinder block surface for scratches or seizure. If scratches or seizure is found, hone or replace the cylinder block.



CONNECTING ROD BEND AND TORSION

Bend:

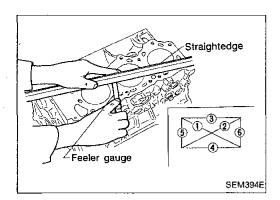
Limit 0.15 mm (0.0059 in) per 100 mm (3.94 in) length

Torsion:

Limit 0.30 mm (0.0118 in)

per 100 mm (3.94 in) length

If it exceeds the limit, replace connecting rod assembly.



CYLINDER BLOCK DISTORTION AND WEAR

Clean upper face of cylinder block and measure the distortion.

Limit:

0.10 mm (0.0039 in)

GI

MA

If out of specification, resurface it.

The resurfacing limit is determined by cylinder head resurfacing in engine.

LC

EF &

EC

Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)

Nominal cylinder block height

from crankshaft center:

227.60 - 227.70 mm (8.9606 - 8.9645 in)

If necessary, replace cylinder block.

CL.

FE

PISTON-TO-BORE CLEARANCE

Using a bore gauge, measure cylinder bore for wear, outof-round and taper.

Standard inner diameter:

87.000 - 87.030 mm (3.4252 - 3.4264 in)

AT

Wear limit:

0.20 mm (0.0079 in)

If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.

PD)

Out-of-round (X - Y) standard:

0.015 mm (0.0006 in)

Taper (A - B or A - C) standard:

0.015 mm (0.0006 in)

cylinder block upper surface.

Check for scratches and seizure. If seizure is found, hone

RA

BR

ST

If both cylinder block and piston are replaced with new

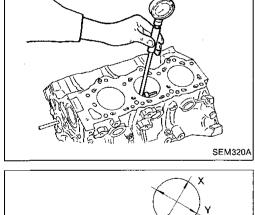
ones, select piston of the same grade number punched on

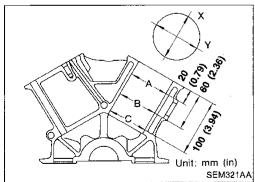
HA

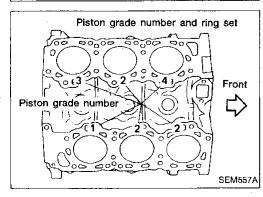
EL

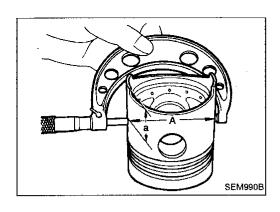
IID)X

EM-39









3. Measure piston skirt diameter.

Piston diameter "A":

Refer to SDS (EM-49).

Measuring point "a" (Distance from the bottom):

18 mm (0.71 in)

4. Check that piston-to-bore clearance is within specification.

Piston-to-bore clearance "B":

0.015 - 0.035 mm (0.0006 - 0.0014 in)

 Determine piston oversize according to amount of cylinder wear

Oversize pistons are available for service. Refer to SDS (EM-49).

6. Cylinder bore size is determined by adding piston-to-bore clearance to piston diameter "A".

Rebored size calculation:

$$D = A + B - C$$

where,

D: Bored diameter

A: Piston diameter as measured

B: Piston-to-bore clearance

C: Honing allowance 0.02 mm (0.0008 in)

- 7. Install main bearing caps, and tighten to the specified torque to prevent distortion of cylinder bores in final assembly.
- 8. Cut cylinder bores.
- When any cylinder needs boring, all other cylinders must also be bored.
- Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.
- 9. Hone cylinders to obtain specified piston-to-bore clearance.
- 10. Measure finished cylinder bore for out-of-round and taper.
- Measurement should be done after cylinder bore cools down.



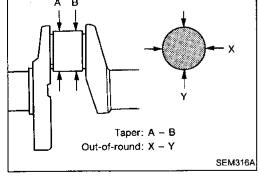
- Check crankshaft main and pin journals for score, wear or cracks.
- With a micrometer, measure journals for taper and out-ofround.

Out-of-round (X - Y):

Less than 0.005 mm (0.0002 in)

Taper (A - B):

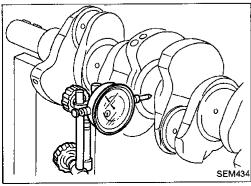
Less than 0.005 mm (0.0002 in)

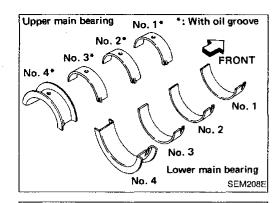


3. Measure crankshaft runout.

Runout (Total indicator re

Runout (Total indicator reading): Less than 0.10 mm (0.0039 in)





Inspection (Cont'd) BEARING CLEARANCE

 Either of the following two methods may be used, however, method A gives more reliable results and is preferable.

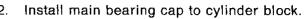
Method A (Using bore gauge & micrometer)

Main bearing

 Set main bearings in their proper positions on cylinder block and main bearing cap. G[

MA

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Tighten all bolts in correct order in two or three stages.

3. Measure inner diameter "A" of each main bearing.

EF & EC

FE

CL

 Measure outer diameter "Dm" of each crankshaft main journal.

MT

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Calculate main bearing clearance.

Main bearing clearance (A - Dm): Standard

0.028 - 0.055 mm (0.0011 - 0.0022 in)

Limit

0.090 mm (0.0035 in)

TF

6. If it exceeds the limit, replace bearing.

If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bear-

ing.

When grinding crankshaft journal, confirm that "L" dimension in fillet roll is more than the specified limit.

"L": 0.1 mm (0.004 in)

p. Refer to SDS for grinding crankshaft and available service

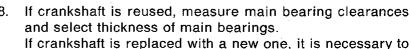
parts.

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select thickness of main bearings as follows:

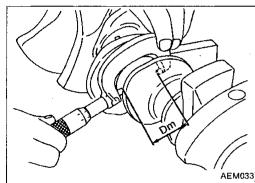
a. Grade number of each cylinder block main journal is punched on the respective cylinder block. These numbers are punched in either Arabic or Roman numerals.

HA

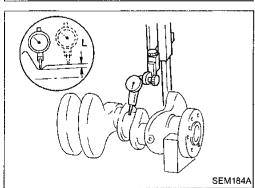
lD)X

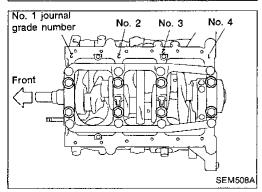
EL

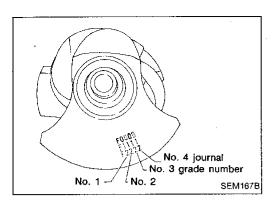
102



SEM505A







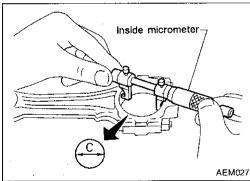
- b. Grade number of each crankshaft main journal is punched on the respective crankshaft. These numbers are punched in either Arabic or Roman numerals.
- Select main bearing with suitable thickness according to the following example or table.

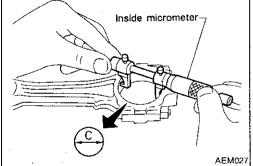
For example:

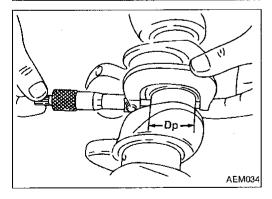
Main journal grade number: 1 Crankshaft journal grade number: 2 Main bearing grade number = 1 + 2= 3 (Yellow)

Main bearing grade number and identification color:

		Main j	ournal grade n	umber
		''0''	''1'' or ''I''	"2" or "II"
Crankshaft	"0"	0 (Black)	1 (Brown)	2 (Green)
journal grade	"1" or "l"	1 (Brown)	2 (Green)	3 (Yellow)
number	"2" or "II"	2 (Green)	3 (Yellow)	4 (Blue)







Connecting rod bearing (Big end)

- Install connecting rod bearing to connecting rod and cap.
- Install connecting rod cap to connecting rod.

Tighten bolts to the specified torque.

3. Measure inner diameter "C" of each bearing.

- Measure outer diameter "Dp" of each crankshaft pin jour-
- Calculate connecting rod bearing clearance.

Connecting rod bearing clearance (C - Dp): Standard

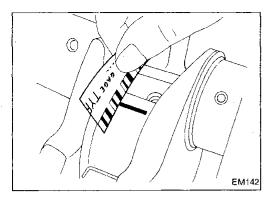
0.014 - 0.054 mm (0.0006 - 0.0021 in)

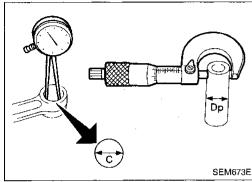
Limit

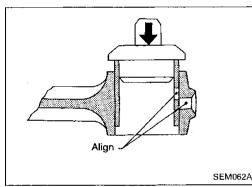
0.090 mm (0.0035 in)

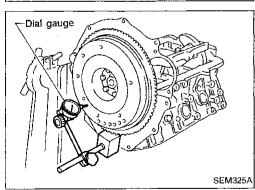
- 6. If it exceeds the limit, replace bearing.
- If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bear-

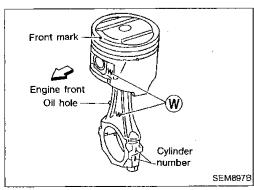
Refer to step 7 of "BEARING CLEARANCE - Main bearing" (EM-41).











Method B (Using plastigage)

- Do not turn crankshaft or connecting rod while plastigage is being inserted.
- When bearing clearance exceeds the specified limit, ensure that the proper bearing has been installed. Then if excessive bearing clearance exists, use a thicker main bearing or undersized bearing so that the specified bearing clearance is obtained.

MA

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CONNECTING ROD BUSHING CLEARANCE (Small end)

- Measure inner diameter "C" of bushing.
- Measure outer diameter "Dp" of piston pin. 2.
- Calculate connecting rod bushing clearance.

Connecting rod bushing clearance = C - DpStandard: 0.005 - 0.017 mm (0.0002 - 0.0007 in) Limit: 0.023 mm (0.0009 in)

If it exceeds the limit, replace connecting rod assembly or connecting rod bushing and/or piston set with pin.



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REPLACEMENT OF CONNECTING ROD BUSHING (Small end)

Drive in small end bushing until it is flush with end surface 1. of rod.

Be sure to align the oil holes.

After driving in small end bushing, ream the bushing so that clearance between connecting rod bushing and piston pin is the specified value.

Clearance between connecting rod bushing and piston

0.005 - 0.017 mm (0.0002 - 0.0007 in)



Runout (Total indicator reading): Flywheel (M/T model) Less than 0.15 mm (0.0059 in)

Drive plate (A/T model) Less than 0.15 mm (0.0059 in) FA

BR

RA

BF

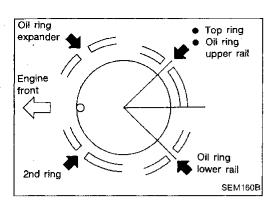
ST

Assembly

PISTON

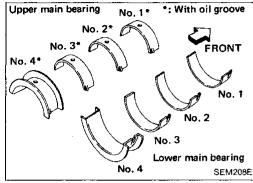
- Install new snap ring on one side of piston pin hole.
- Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.
- Align the direction of piston and connecting rod.
- Numbers stamped on connecting rod and cap correspond to each cylinder.
- After assembly, make sure connecting rod smoothly.

[ID)X



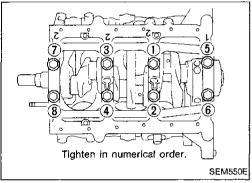
Assembly (Cont'd)

3. Set piston rings as shown.

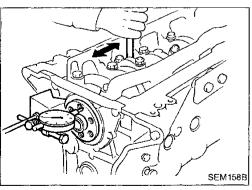


CRANKSHAFT

- 1. Set main bearings in their proper positions on cylinder block and main bearing cap.
- Confirm that correct main bearings are used. Refer to "Inspection" in this section (EM-40).



- 2. Install crankshaft and main bearing caps and tighten bolts to the specified torque.
- Prior to tightening bearing cap bolts, place bearing cap in its proper position by shifting crankshaft in the axial direction.
- Tighten bearing cap bolts gradually in two or three stages.
 Start with center bearing and move outward sequentially.
- After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.



Measure crankshaft end play.

Crankshaft end play:

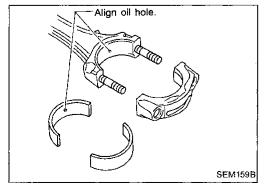
Standard

0.050 - 0.170 mm (0.0020 - 0.0067 in)

Limit

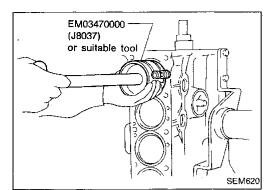
0.30 mm (0.0118 in)

If beyond the limit, replace bearing with a new one.



- Install connecting rod bearings in connecting rods and connecting rod caps.
- Confirm that correct bearings are used. Refer to "Inspection".
- Install bearings so that oil hole in connecting rod aligns with oil hole of bearing.

Assembly (Cont'd)

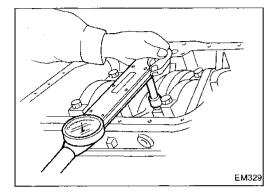


- Install pistons with connecting rods.
- Install them into corresponding cylinders with Tool. a.
- Be careful not to scratch cylinder wall by connecting rod.
- Arrange so that front mark on piston head faces toward front of engine.





EΜ



Install connecting rod bearing caps. Tighten connecting rod bearing cap nuts to the specified



: Connecting rod bearing nut

(1) Tighten to 14 to 16 N·m (1.4 to 1.6 kg-m, 10 to 12 ft-lb).



FE

(2) Turn nuts 60 to 65 degrees clockwise. If an angle wrench is not available, tighten nuts to 38 to 44 N·m (3.9 to 4.5 kg-m, 28 to 33 ft-lb).



Measure connecting rod side clearance.

Connecting rod side clearance: Standard

MIT

0.20 - 0.35 mm (0.0079 - 0.0138 in)

Limit

0.40 mm (0.0157 in)

If beyond the limit, replace connecting rod and/or crankshaft.

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PD









FA



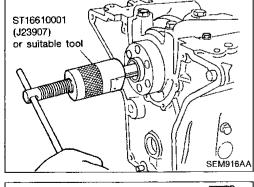
ST



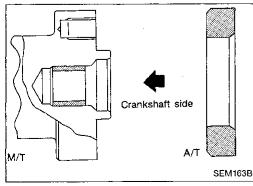
 $\mathbb{B}^{\mathbb{F}}$

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SEM512A

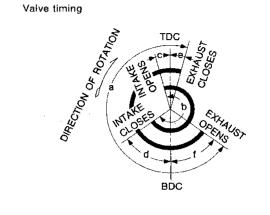


Install pilot bushing (M/T) or pilot converter (A/T).

General Specifications

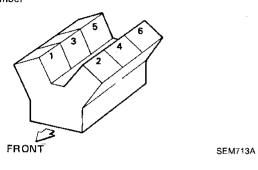
Cylinder arrangeme	ent	V-6	
Displacement cm ³ (cu in)		2,960 (180.62)	
Bore and stroke mm (in)		87 x 83 (3.43 x 3.27)	
Valve arrangement		OHC	
Firing order		1-2-3-4-5-6	
Number of piston rings			
Compression		2	
Oil		1	
Number of main bearings		4	
Compression ratio		9.0	

ŧ	Jnit: kPa (kg/cm², psi)/300 rpm
Compression pressure	
Standard	1,196 (12.2, 173)
Minimum	883 (9.0, 128)
Differential limit between cylind	ers 98 (1.0, 14)



a b c d e f					U	EM12 nit: degre	
	3	b T	С		_	f	
246 246 10 36 10 36	18	248	10	58	10	58	

Cylinder number



Inspection and Adjustment

CYLINDER HEAD

		Unit: mm (in)
	Standard	Limit
Head surface distortion	Less than 0.03 (0.0012)	0.1 (0.004)
Height		Height (nominal) 106.8 - 107.2 (4.205 - 4.220)
		SEM082B

G

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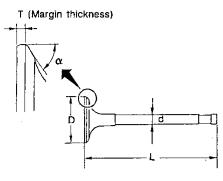
BF

 $\mathbb{H}\mathbb{A}$

Inspection and Adjustment (Cont'd) Hydraulic valve lifter

VALVE

Unit: mm (in)



	SEM188
Valve head diameter "D"	
Intake	42.0 - 42.2 (1.654 - 1.661)
Exhaust	35.0 - 35.2 (1.378 - 1.386)
Valve length "L"	
Intake	125.3 - 125.9 (4.933 - 4.957)
Exhaust	124.2 - 124.8 (4.890 - 4.913)
Valve stem diameter "d"	
Intake	6.965 - 6.980 (0.2742 - 0.2748)
Exhaust	7.965 - 7.970 (0.3136 - 0.3138)
Valve seat angle "α"	
Intake	45°15′ - 45°45′
Exhaust	45 15 - 45 45
Valve margin "T"	
Intake	1.15 - 1.45 (0.0453 - 0.0571)
Exhaust	1.35 ~ 1.65 (0.0531 ~ 0.0650)
Valve margin "T" limit	More than 0.5 (0.020)
Valve stem end surface grinding limit	Less than 0.2 (0.008)
Valve clearance	
intake	0 (0)
Exhaust	0 (0)

Valve spring

Free height	mm (in)	Outer	51.2 (2.016)
	mm (in)	Inner	44.1 (1.736)
Pressure		Outer	523.7 (53.4, 117.7) at 30.0 (1.181)
N (kg, lb) at he	ght mm (in)	Inner	255.0 (26.0, 57.3) at 25.0 (0.984)
Out of aguera	mm (in)	Outer	2.2 (0.087)
Out-of-square	mm (in)	Inner	1.9 (0.075)

	Unit: mm (in)
liften antalda di mastan	15.947 - 15.957
Lifter outside diameter	(0.6278 - 0.6282)

Lifter guide inside diameter 16.000 - 16.013 (0.6299 - 0.6304)

Clearance between lifter and 0.043 - 0.066 lifter guide (0.0017 - 0.0026)

Valve guide

			Unit: mm (in
		Standard	Service
Valve guide			
Outer	Inner	11.023 - 11.034 (0.4340 - 0.4344)	11.223 - 11.234 (0.4418 - 0.4423)
diameter	Exhaust	12.023 - 12.034 (0.4733 - 0.4738)	12.223 - 12.234 (0.4812 - 0.4817)
Valve guide			
Inner Intake diameter		7.000 - 7.018 (0	0.2756 - 0.2763)
(Finished size) Exhaust		8.000 - 8.018 (0	0.3150 - 0.3157)
Cylinder head	Intake	10.975 - 10.996 (0.4321 - 0.4329)	11.175 - 11.196 (0.4400 - 0.4408)
valve guide hole diameter	Exhaust	11.975 - 11.996 (0.4715 - 0.4723)	12.175 - 12.196 (0.4793 - 0.4802)
Interference fit Intake		0.007 0.050 (0.0011 0.0002)	
of vaive guide	Exhaust	0.027 - 0.059 (0.0011 - 0.0023)	
		Standard	Max. tolerance
Stem to guide	Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.40 (0.000)
clearance	Exhaust	0.040 - 0.073 (0.0016 - 0.0029)	0.10 (0.0039)
Valve deflection limit		_	0.20 (0.0079)

Rocker shaft and rocker arm

	Unit: mm (in
Rocker shaft	
Outer diameter	17.979 - 18.000 (0.7078 - 0.7087)
Rocker arm	
Inner diameter	18.007 - 18.028 (0.7089 - 0.7098)
Clearance between rocker arm and rocker shaft	0.007 - 0.049 (0.0003 - 0.0019)

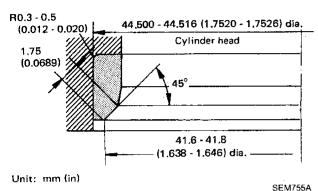
EL

Inspection and Adjustment (Cont'd)

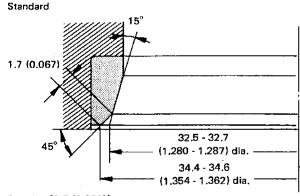
Intake valve seat

Standard 1,75 (0.0689)41.6 - 41.8 (1,638 - 1.646) dia.

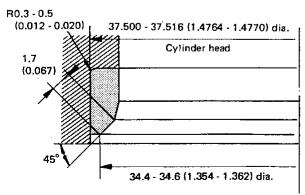
Oversize [0.5 (0.020)]



Exhaust valve seat



Oversize [0.5 (0.020)]

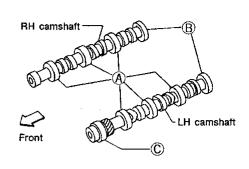


Unit: mm (in)

SEM756A

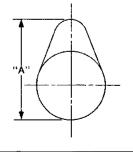
CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)



SEM893BA

		Standard	Max. tolerance
Camshaft journal to bearing clearance		0.045 - 0.090 (0.0018 - 0.0035)	0.15 (0.0059)
	(A):	47.000 - 47.025 (1.8504 - 1.8514)	_
Inner diameter of camshaft bearing	₿:	42.500 - 42.525 (1.6732 - 1.6742)	_
	© :	48.000 - 48.025 (1.8898 - 1.8907)	MARKE
	(A):	46.920 - 46.940 (1.8472 - 1.8480)	-
Outer diameter of camshaft journal	B):	42.420 - 42.440 (1.6701 - 1.6709)	_
	© :	47.920 - 47.940 (1.8866 - 1.8874)	****
Camshaft runout [TIR*]		Less than 0.04 (0.0016)	0.1 (0.004)
Camshaft end play		0.03 - 0.06 (0.0012 - 0.0024)	



EM671

Cam height "A"

Intake 39.537 - 39.727 (1.5566 - 1.5641) Exhaust

Wear limit of cam height 0.15 (0.0059)

*Total indicator reading

EF & EC

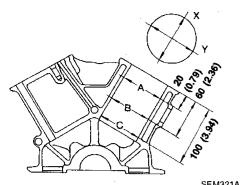
Unit: mm (in)

Inspection and Adjustment (Cont'd)

CYLINDER BLOCK

PISTON, PISTON RING AND PISTON PIN

Available piston



	SEM321A
Surface flatness	
Standard	Less than 0.03 (0.0012)
Limit	0.10 (0.0039)
Cylinder bore	
Inner diameter	
Standard	
Grade No. 1	87.000 - 87.010 (3.4252 - 3.4256)
Grade No. 2	87.010 - 87.020 (3.4256 - 3.4260)
Grade No. 3	87.020 - 87.030 (3.4260 - 3.4264)
Wear limit	0.20 (0.0079)
Out-of-round (X — Y)	Less than 0.015 (0.0006)
Taper (A — B or A — C)	Less than 0.015 (0.0006)
Main journal inner diameter	
Grade No. 0	66.645 - 66.654 (2.6238 - 2.6242)
Grade No. 1	66.654 - 66.663 (2.6242 - 2.6245)
Grade No. 2	66.663 - 66.672 (2.6245 - 2.6249)
Difference in inner diameter between cylinders	

CONNECTING ROD

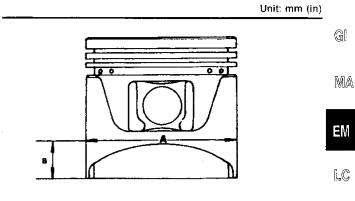
Standard

	t) mm aidu
enter distance	154.1 - 154.2 (6.067 - 6.071)
end torsion [ner 100	

Less than 0.05 (0.0020)

Center distance	154.1 - 154.2 (6.067 - 6.071)
Bend, torsion [per 100 (3.94)]	
Limit	Bend: 0.15 (0.0059) Torsion: 0.30 (0.0118)
Piston pin bushing inner diameter*	20.982 - 20.994 (0.8261 - 0.8265)
Connecting rod big end inner diameter	53,000 - 53.013 (2.0866 - 2.0871)
Side clearance	
Standard	0.20 - 0.35 (0.0079 - 0.0138)
Limit	0.40 (0.0157)

^{*}After installing in connecting rod



	SEM891B	FE
Piston skirt diameter "A"		
Standard		@\l
Grade No. 1	86.965 - 86.975 (3.4238 - 3.4242)	CL
Grade No. 2	86.975 - 86.985 (3.4242 - 3.4246)	
Grade No. 3	86.985 - 86.995 (3.4246 - 3.4250)	MT
0.25 (0.0098) oversize (Service)	87.215 - 87.265 (3.4337 - 3.4356)	A 52
0.50 (0.0197) oversize (Service)	87.465 - 87.515 (3.4435 - 3.4455)	AT
"a" dimension	18 (0.71)	TF
Piston pin hole diameter	20.969 - 20.981 (0.8255 - 0.8260)	0 0
Piston clearance to cylinder block	0.015 - 0.035 (0.0006 - 0.0014)	PD

Piston ring

		Unit: mm (in)	
	Standard	Limit	m A
Side clearance			RA
Тор	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)	BR
2nd	0.030 - 0.063 (0.0012 ~ 0.0025)	0.1 (0.004)	
Oil	0.015 - 0.19 (0.0006 - 0.0075)		ST
Ring gap			
Тор	0.21 - 0.44 (0.0083 - 0.0173)		BF
2nd	0.18 - 0.44 (0.0071 - 0.0173)	1.0 (0.039)	HA
Oil (rail ring)	0.20 - 0.76 (0.0079 - 0.0299)		
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SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment (Cont'd) AVAILABLE MAIN BEARING

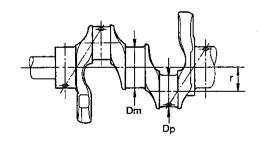
Piston pin

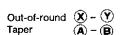
· ·	Unit: mm (in)
Piston pin outer diameter	20.971 - 20.983 (0.8256 - 0.8261)
Interference fit of piston pin to piston	0 - 0.004 (0 - 0.0002)
Piston pin to connecting rod bushing clearance	0.005 - 0.017 (0.0002 - 0.0007)

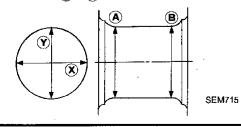
^{*}Values measured at ambient temperature of 20°C (68°F)

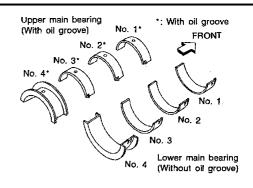
CRANKSHAFT

	Unit: mm (in)
Main journal dia. "Dm"	
Grade No. 0	62.967 - 62.975 (2.4790 - 2.4793)
Grade No. 1	62.959 - 62.967 (2.4787 - 2.4790)
Grade No. 2	62.951 - 62.959 (2.4784 - 2.4787)
Pin journal dia. "Dp"	49.955 - 49.974 (1.9667 - 1.9675)
Center distance "r"	41.5 (1.634)
Out-of-round (X Y)	
Standard	Less than 0.005 (0.0002)
Taper (A — B)	
Standard	Less than 0.005 (0.0002)
Runout [TIR]	
Standard	Less than 0.025 (0.0010)
Limit	Less than 0.10 (0.0039)
Free end play	
Standard	0.050 - 0.170 (0.0020 - 0.0067)
Limit	0.30 (0.0118)









SEM327A

No. 1 main bearing

Grade number	Thickness "T" mm (in)	Width "W" mm (in)	Identification color
0	1.817 - 1.821 (0.0715 - 0.0717)		Black
1	1.821 - 1.825 (0.0717 - 0.0719)		Brown
2	1.825 - 1.829 (0.0719 - 0.0720)	22.4 - 22.6 (0.882 - 0.890)	Green
3	1.829 - 1.833 (0.0720 - 0.0722)		Yellow
4	1.833 - 1.837 (0.0722 - 0.0723)		Blue

No. 2 and 3 main bearing

Grade number	Thickness "T" mm (in)	Width "W" mm (in)	Identification color
0	1.817 - 1.821 (0.0715 - 0.0717)		Black
1	1.821 - 1.825 (0.0717 - 0.0719)		Brown
2	1.825 - 1.829 (0.0719 - 0.0720)	. 18.9 - 19.1 (0.744 - 0.752)	Green
3	1.829 - 1.833 (0.0720 - 0.0722)		Yellow
4	1.833 - 1.837 (0.0722 - 0.0723)		Blue

SEM645

Inspection and Adjustment (Cont'd)

No. 4 main bearing

· Grade number	Thickness "T" mm (in)	Identification color
0	1.817 - 1.821 (0.0715 - 0.0717)	Black
1	1.821 - 1.825 (0.0717 - 0.0719)	Brown
2	1.825 - 1.829 (0.0719 - 0.0720)	Green
3	1.829 - 1.833 (0.0720 - 0.0722)	Yellow
4	1.833 - 1.837 (0.0722 - 0.0723)	Blue

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Main bearing 0.25 mm (0.0098 in) undersize

Unit: mm (in)

Thickness "T"	1,948 - 1,956 (0,0767 - 0,0770)

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AVAILABLE CONNECTING ROD BEARING

Connecting rod bearing undersize

Unit:	mm	(in)
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	Thickness	Crank pin journal diameter "Dp"
Standard	1.502 - 1.506 (0.0591 - 0.0593)	49.955 - 49.974 (1.9667 - 1.9675)
Undersize		
0.08 (0.0031)	1.542 - 1.546 (0.0607 - 0.0609)	
0.12 (0.0047)	1.562 - 1.566 (0.0615 - 0.0617)	Grind so that bearing clearance is the specified value.
0.25 (0.0098)	1 627 - 1 631 (0 0641 - 0 0642)	



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MISCELLANEOUS COMPONENTS

	Unit: mm (in)
Flywheel/Drive plate	
Runout [TIR]	Less than 0.15 (0.0059)



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Bearing clearance

Unit:	mm	(in)
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Main bearing clearance		
Standard	0.028 - 0.055 (0.0011 - 0.0022) 0.090 (0.0035)	
Limit		
Connecting rod bearing clearance		
Standard	0.014 - 0.054 (0.0006 - 0.0021)	
Limit	0.090 (0.0035)	



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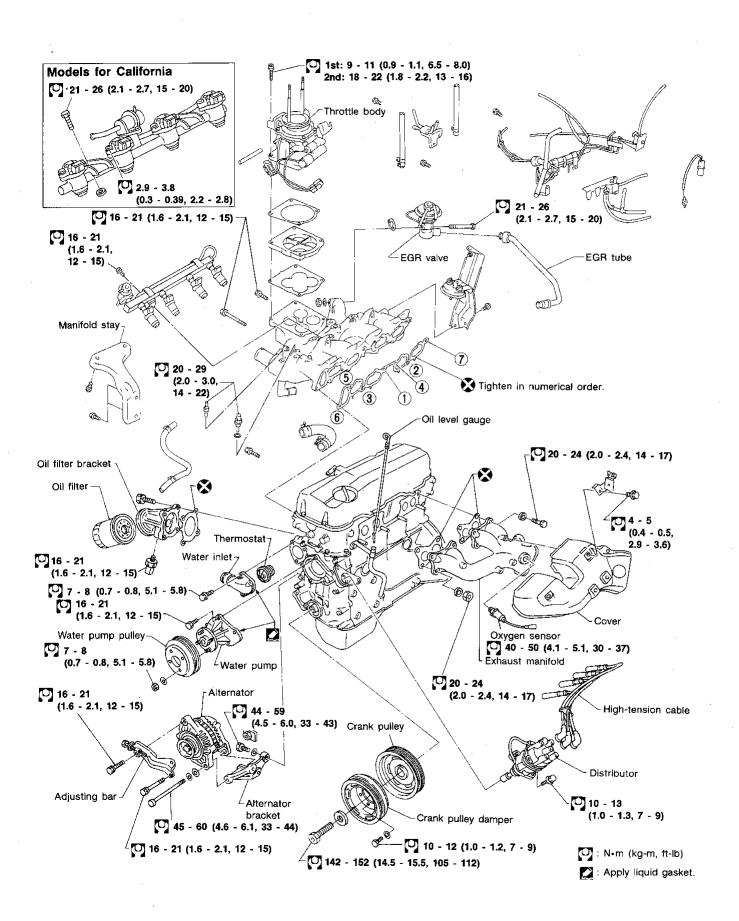
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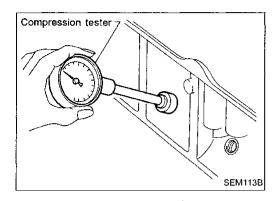


Measurement of Compression Pressure

- Warm up engine.
- Turn ignition switch off.
- Disconnect fusible link for injectors.
- Remove all spark plugs.
- Disconnect distributor center cable.

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Attach a compression tester to No. 1 cylinder.

- Depress accelerator pedal fully to keep throttle valve wide 7.
- 8. Crank engine and record highest gauge indication.
- Repeat the measurement on each cylinder as shown
- Always use a fully-charged battery to obtain specified engine speed.

Compression pressure: kPa (kg/cm², psi)/rpm Standard 1,324 (13.5, 192)/300 Minimum 981 (10, 142)/300 Difference limit between cylinders 98 (1.0, 14)/300

- 10. If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into cylinders through spark plug holes and retest compression.
- If adding oil improves cylinder compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston.
- If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seat. (Refer to SDS) If valve or valve seat is damaged excessively, replace them.
- If compression in any two adjacent cylinders is low and if adding oil does not improve compression, there is leakage past the gasket surface. If so, replace cylinder head gasket.

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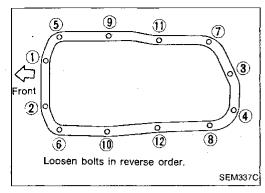
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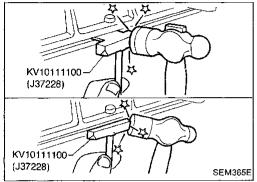
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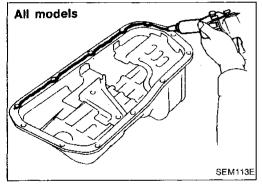
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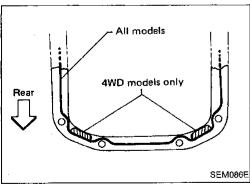
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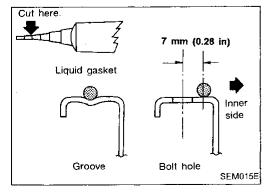
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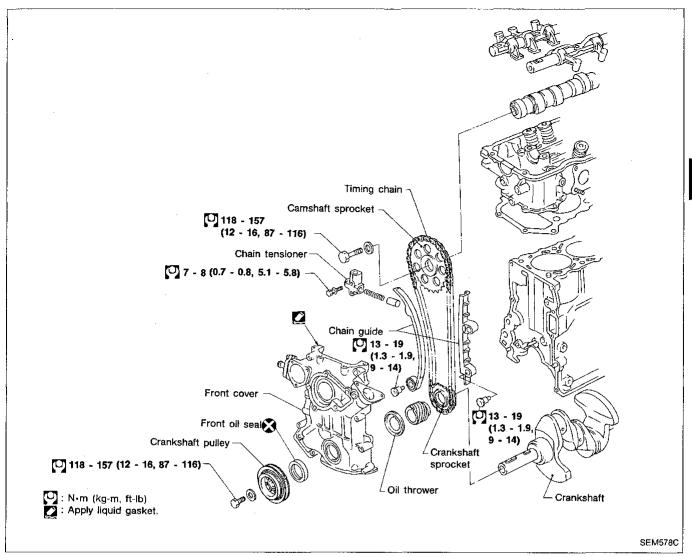
Removal

- Raise vehicle and support it with safety stands.
- 2. Drain engine oil.
- Remove front stabilizer bar securing bolts and nuts from side member.
- 4. Lift engine.
- 5. Remove oil pan bolts.
- Remove oil pan.
- (1) Insert Tool between cylinder block and oil pan.
- Do not drive seal cutter into oil pump or rear oil seal retainer portion, or aluminum mating face will be damaged.
- Do not insert screwdriver, or oil pan flange will be deformed.
- (2) Slide Tool by tapping its side with a hammer, and remove oil pan.
- 7. Pull out oil pan from front side.

Installation

- 1. Before installing oil pan, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.
- Apply a continuous bead of liquid gasket to mating surface of oil pan.
- Use Genuine Liquid Gasket or equivalent.

- Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide.
- Apply liquid gasket to inner sealing surface as shown in figure.
- Attaching should be done within 5 minutes after coating.
- 4. Install oil pan.
- Wait at least 30 minutes before refilling engine oil.

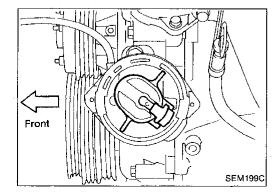


CAUTION:

After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.

Removal

- 1. Disconnect battery terminal.
- Drain coolant from radiator.
- 3. Remove radiator shroud and cooling fan.
- Remove the following belts.
- Power steering drive belt
- Compressor drive belt
- Alternator drive belt
- 5. Remove all spark plugs.
- 6. Set No. 1 piston at TDC on its compression stroke.



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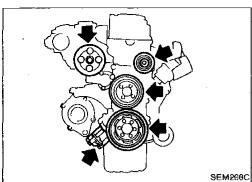
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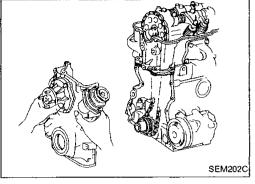
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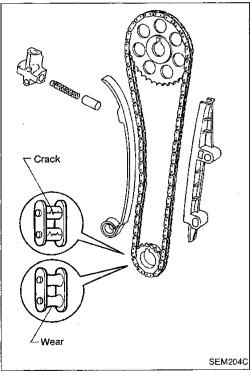
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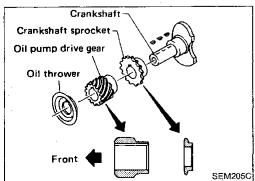
- Remove the following parts.
- Power steering pump, idler pulley and power steering pump brackets
- Compressor idler pulley
- Crankshaft pulley with a suitable puller
- Oil pump with pump drive spindle
- Rocker cover
- Remove oil pan. (Refer to OIL PAN.)
- Remove front cover.



- 10. Remove the following parts.
- Chain tensioner
- Chain guides
- Timing chain and sprocket
- Oil thrower, oil pump drive gear and crankshaft sprocket

Inspection

Check for cracks and excessive wear at roller links. Replace if necessary.

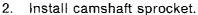


Installation

- Install crankshaft sprocket, oil pump drive gear and oil
- Make sure that mating marks of crankshaft sprocket face engine front.

TIMING CHAIN

Installation (Cont'd)



- 3. Confirm that No. 1 piston is set at TDC on its compression stroke.
- 4. Install timing chain.
- Set timing chain by aligning its mating marks with those of crankshaft sprocket and camshaft sprocket.



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Be careful not to damage cylinder head gasket.

Do not forget oil seal.

Install front cover.

10. Install rubber plug. (Refer to "Installation" of CYLINDER HEAD.)

Apply lithium grease to sealing lip of crankshaft oil seal.

11. Install oil pan. (Refer to OIL PAN.)

Tighten camshaft sprocket bolt.

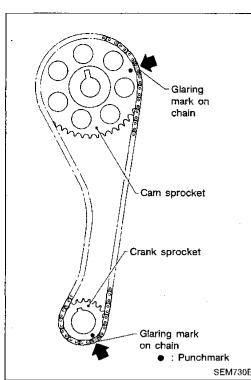
7. Apply liquid gasket to front cover.

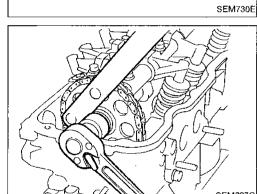
Install chain guide and chain tensioner.

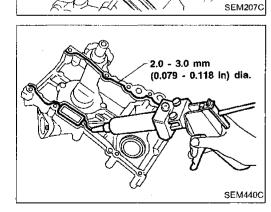
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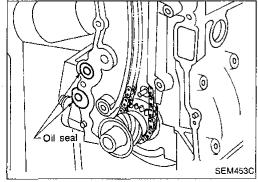
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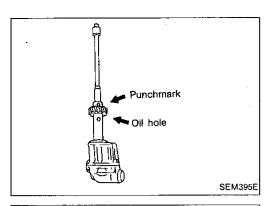




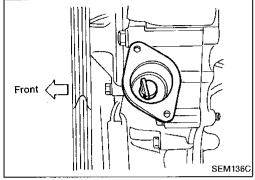




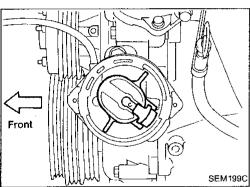
Installation (Cont'd)



- 12. Install oil pump and distributor driving spindle with new gasket in front cover.
- (1) Assemble oil pump and driving spindle, aligning punchmark on driving spindle with oil hole.



(2) Make sure that driving spindle is set as shown in figure.



- 13. Install distributor.
- 14. Make sure that No. 1 piston is set at TDC and that distributor rotor is set at No. 1 cylinder spark position.

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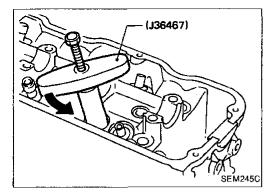
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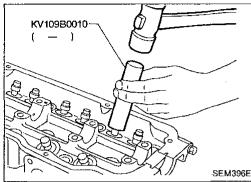
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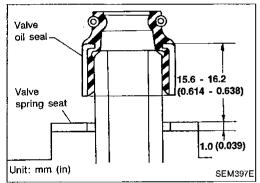
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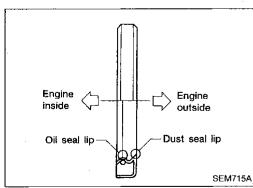
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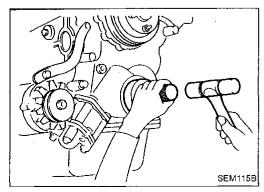
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VALVE OIL SEAL

- Remove rocker cover.
- Remove rocker shaft assembly.
- Remove valve spring and valve oil seal with Tool or suit-

Piston concerned should be set at TDC to prevent valve from falling.

Apply engine oil to new valve oil seal and install it with Tool.

Before installing valve oil seal, install valve spring seat.

OIL SEAL INSTALLING DIRECTION

FRONT OIL SEAL

- Remove radiator shroud and crankshaft pulley.
- Remove front oil seal.

Be careful not to damage crankshaft.

Apply engine oil to new oil seal and install it using suitable

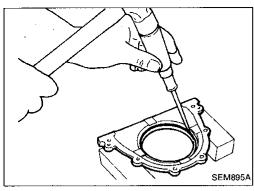
tool.

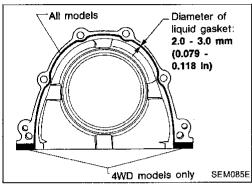
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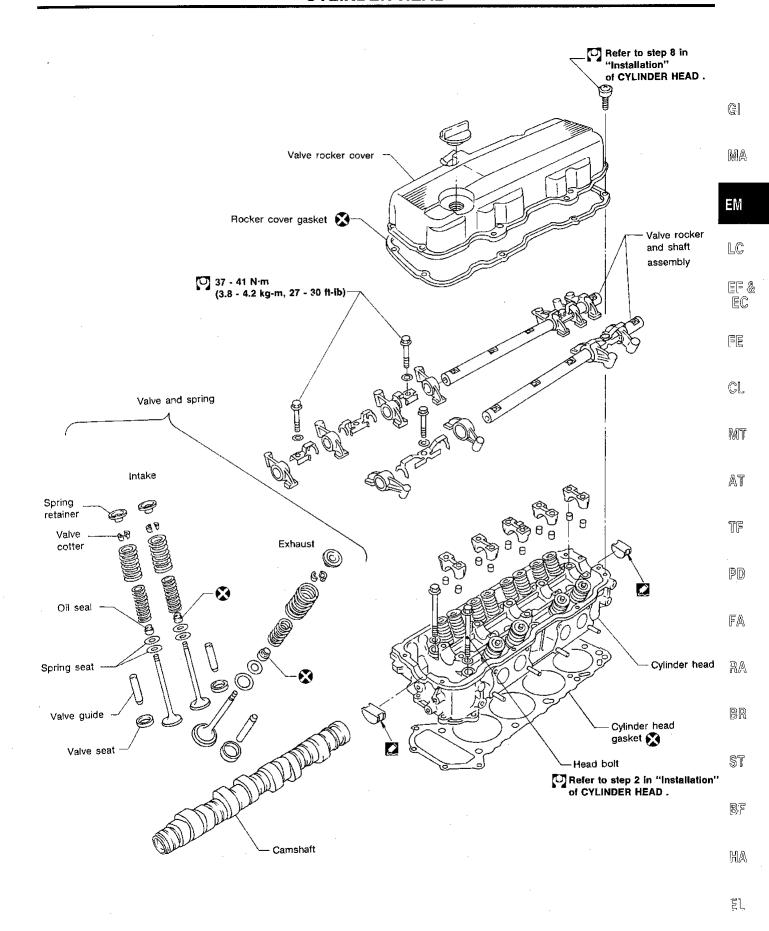




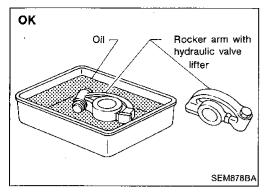
REAR OIL SEAL

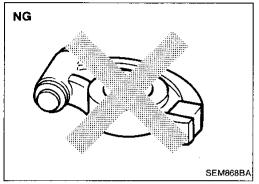
- 1. Remove flywheel or drive plate.
- 2. Remove rear oil seal retainer.
- 3. Remove traces of liquid gasket using scraper.
- 4. Remove rear oil seal from retainer.
- 5. Apply engine oil to new oil seal and install it using suitable tool.

6. Apply liquid gasket to rear oil seal retainer.



SEM552E





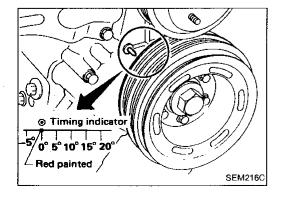
CAUTION:

- When installing sliding parts such as rocker arms, camshaft and oil seal, be sure to apply new engine oil on their sliding surfaces.
- When tightening cylinder head bolts and rocker shaft bolts, apply new engine oil to thread portions and seat surfaces of bolts.
- Hydraulic valve lifters are installed in each rocker arm. If hydraulic valve lifter is kept on its side, even when installed in rocker arm, there is a possibility of air entering it. After removal, always set rocker arm straight up, or when laying it on its side, have it soak in new engine oil.
- Do not disassemble hydraulic valve lifter.
- Attach tags to valve lifters so as not to mix them up.

Removal

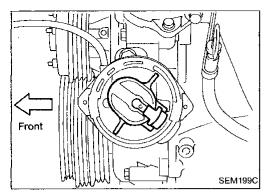
- 1. Drain coolant from radiator and drain plug of block.
- Remove the following parts.
- Power steering drive belt
- Power steering pump, idler pulley and power steering brackets
- Vacuum hoses of SCV and pressure control solenoid valve
- Accelerator wire bracket
- Disconnect EGR tube from exhaust manifold.
- Remove bolts which hold intake manifold collector to intake manifold.
- 5. Remove bolts which hold intake manifold to cylinder head while raising collector upwards.
- 6. Remove rocker cover.

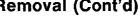
When removing rocker cover, do not hit rocker cover against rocker arm.



7. Set No. 1 piston at TDC on its compression stroke.

Removal (Cont'd)







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SEM219C

SEM210B

Loosen camshaft sprocket bolt.

Support timing chain by using Tool as shown in figure.

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Remove camshaft sprocket.

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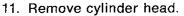
10. Remove front cover tightening bolts to cylinder head.

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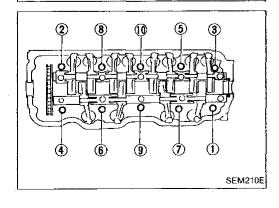
- A warped or cracked cylinder head could result from removing in incorrect order.
- Cylinder head bolts should be loosened in two or three steps.

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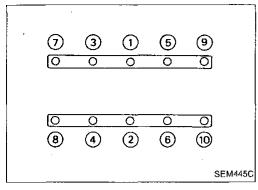
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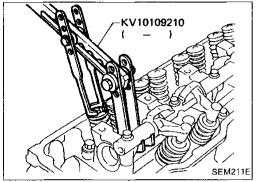
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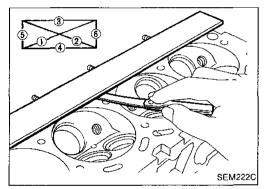
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Disassembly

- 1. Remove rocker shaft assembly.
- a. When loosening bolts, evenly loosen from outside in sequence.
- Bolts should be loosened in two or three steps.
- 2. Remove camshaft.
- Before removing camshaft, measure camshaft end play. (Refer to "Inspection".)
- 3. Remove valve components with Tool.
- Remove valve oil seals. (Refer to OIL SEAL REPLACE-MENT.)

Inspection

CYLINDER HEAD DISTORTION

Head surface flatness:

Less than 0.1 mm (0.004 in)

If beyond the specified limit, replace it or resurface it.

Resurfacing limit:

The resurfacing limit of cylinder head is determined by the cylinder block resurfacing in an engine.

Amount of cylinder head resurfacing is "A"

Amount of cylinder block resurfacing is "B"

The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)

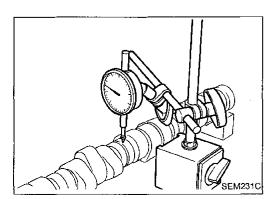
After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

Nominal cylinder head height:

98.8 - 99.0 mm (3.890 - 3.898 in)

CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.



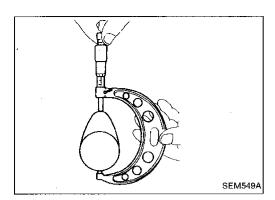
CAMSHAFT RUNOUT

1. Measure camshaft runout at the center journal.

Runout (Total indicator reading):

0 - 0.02 mm (0 - 0.0008 in)

2. If it exceeds the limit, replace camshaft.



CAMSHAFT CAM HEIGHT

Measure camshaft cam height.

Standard cam height:

44.839 - 45.029 mm (1.7653 - 1.7728 in)

Cam wear limit:

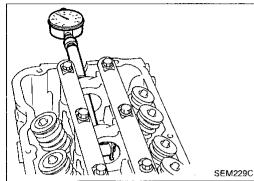
0.2 mm (0.008 in)

If wear is beyond the limit, replace camshaft.

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CAMSHAFT JOURNAL CLEARANCE

Install camshaft bracket and rocker shaft and tighten bolts LC to the specified torque.

Measure inner diameter of camshaft bearing.

Standard inner diameter:

33.000 - 33.025 mm (1.2992 - 1.3002 in)

EF & EC

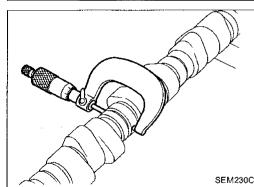
FE

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Measure outer diameter of camshaft journal.

Standard outer diameter:

32.935 - 32.955 mm (1.2967 - 1.2974 in)

If clearance exceeds the limit, replace camshaft and/or cylinder head.

Camshaft journal clearance:

Standard

0.045 - 0.090 mm (0.0018 - 0.0035 in)

Limit

0.12 mm (0.0047 in)

PD)

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CAMSHAFT END PLAY

Install camshaft in cylinder head.

Measure camshaft end play.

Camshaft end play:

Standard

0.07 - 0.15 mm (0.0028 - 0.0059 in)

Limit

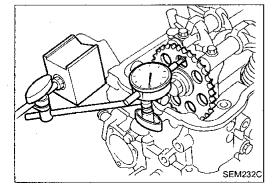
0.2 mm (0.008 in)

BR

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SEM228C

CAMSHAFT SPROCKET RUNOUT

Install sprocket on camshaft.

Measure camshaft sprocket runout.

Runout (Total indicator reading):

Limit 0.12 mm (0.0047 in)

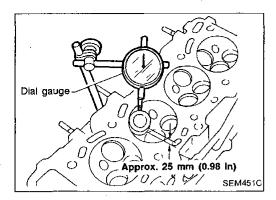
3. If it exceeds the limit, replace camshaft sprocket.

EL

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EM-65

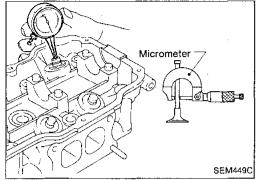
127



VALVE GUIDE CLEARANCE

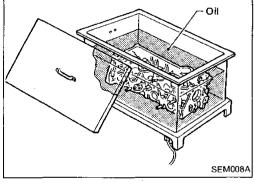
 Measure valve deflection in a right-angled direction with camshaft. (Valve and valve guide mostly wear in this direction.)

Valve deflection limit (Dial gauge reading): 0.15 mm (0.0059 in)



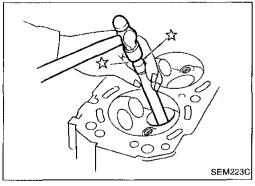
- 2. If it exceeds the limit, check valve to valve guide clearance.
- a. Measure valve stem diameter and valve guide inner diameter.
- b. Check that clearance is within specification.

c. If it exceeds the limit, replace valve or valve guide.

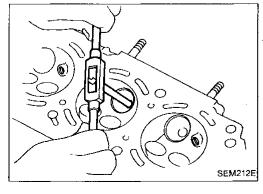


VALVE GUIDE REPLACEMENT

1. To remove valve guide, heat cylinder head to 150 to 160°C (302 to 320°F) by soaking in heated oil.



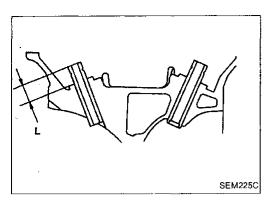
2. Drive out valve guide with a press [under a 20 kN (2 ton, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and suitable tool.



Ream cylinder head valve guide hole.

Valve guide hole diameter (for service parts): Intake 11.175 - 11.196 mm (0.4400 - 0.4408 in)

Exhaust 12.175 - 12.196 mm (0.4793 - 0.4802 in)



4. Heat cylinder head to 150 to 160°C (302 to 320°F) and press service valve guide onto cylinder head.

Projection "L":

14.9 - 15.1 mm (0.587 - 0.594 in)

Ream valve guide.

Finished size:

Intake

7.000 - 7.018 mm (0.2756 - 0.2763 in)

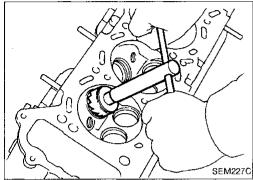
Exhaust

8.000 - 8.018 mm (0.3150 - 0.3157 in)



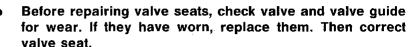
MA

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VALVE SEATS

Check valve seats for any evidence of pitting at valve contact AC surface, and reseat or replace if it has worn out excessively.

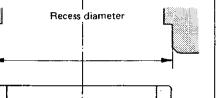




Cut with both hands to uniform the cutting surface.



CL



SEM795A

Oil

REPLACING VALVE SEAT FOR SERVICE PARTS

Bore out old seat until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.

Ream cylinder head recess.

Reaming bore for service valve seat Oversize [0.5 mm (0.020 in)]:

> Intake 36.500 - 36.516 mm (1.4370 - 1.4376 in) Exhaust 42.500 - 42.516 mm (1.6732 - 1.6739 in)

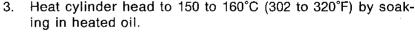
Reaming should be done to the concentric circles to valve guide center so that valve seat will have the correct fit.

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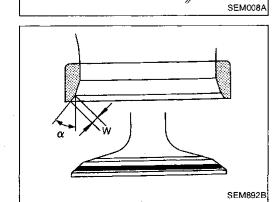






BF

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Cut or grind valve seat using suitable tool at the specified dimensions as shown in SDS.

After cutting, lap valve seat with abrasive compound.

Check valve seating condition.

Seat face angle " α ":

45 deg.

Contacting width "W":

Intake

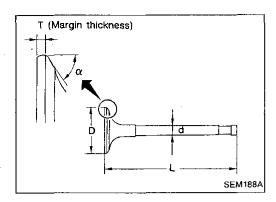
1.6 - 1.7 mm (0.063 - 0.067 in)

1.7 - 2.1 mm (0.067 - 0.083 in)

EL

mx

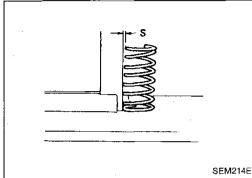
EM-67



VALVE DIMENSIONS

Check dimensions in each valve. For dimensions, refer to SDS. When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace valve.

Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.



VALVE SPRING

Squareness

1. Measure "S" dimension.

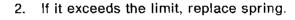
Out-of-square:

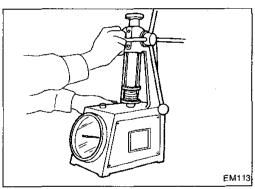
Outer

Intake Less than 2.5 mm (0.098 in) Exhaust Less than 2.3 mm (0.091 in)

Inner

Intake Less than 2.3 mm (0.091 in) Exhaust Less than 2.1 mm (0.083 in)





Pressure

Check valve spring pressure.

Pressure: N (kg, lb) at height mm (in)

Standard

Outer

Intake 604.1 (61.6, 135.8) at 37.6 (1.480)

Exhaust 640.4 (65.3, 144.0) at 34.1 (1.343)

inner

Intake 284.4 (29.0, 63.9) at 32.6 (1.283)

Exhaust 328.5 (33.5, 73.9) at 29.1 (1.146)

Limit

Outer

Intake 567.8 (57.9, 127.7) at 37.6 (1.480)

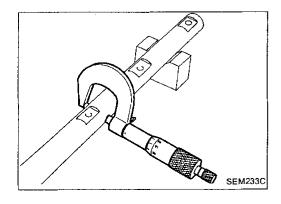
Exhaust 620.8 (63.3, 139.6) at 34.1 (1.343)

Inner

Intake 266.8 (27.2, 60.0) at 32.6 (1.283)

Exhaust 318.7 (32.5, 71.7) at 29.1 (1.146)

If it exceeds the limit, replace spring.

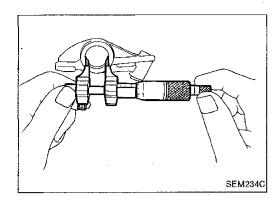


ROCKER SHAFT AND ROCKER ARM

- 1. Check rocker shafts for scratches, seizure and wear.
- 2. Check outer diameter of rocker shaft.

Diameter:

21.979 - 22.000 mm (0.8653 - 0.8661 in)



3. Check inner diameter of rocker arm.

Diameter:

22.012 - 22.029 mm (0.8666 - 0.8673 in)

Rocker arm to shaft clearance:

0.012 - 0.050 mm (0.0005 - 0.0020 in)

 Keep rocker arm with hydraulic valve lifter standing to prevent air from entering hydraulic valve lifter when checking.

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Wide pitch Narrow pitch Cylinder head side SEM638B

Place

upside.

Assembly

Install valve component parts.

Always use new valve oil seal. Refer to OIL SEAL REPLACEMENT.

Before installing valve oil seal, install inner valve spring seat.

 Install outer valve spring (uneven pitch type) with its narrow pitch side toward cylinder head side.

 After installing valve component parts, use plastic hammer to lightly tap valve stem tip to assure a proper fit.

Mount camshaft onto cylinder head, placing knock pin at front end to top position.

Apply engine oil to camshaft when mounting onto cylinder head.

SEM236C

Knock pin

Install camshaft brackets.

Front mark is punched on the camshaft bracket.

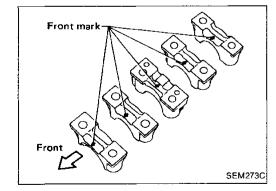
. Install rocker shaft with rocker arms.

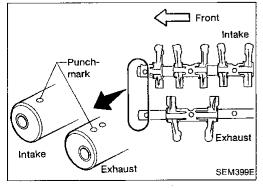
BF

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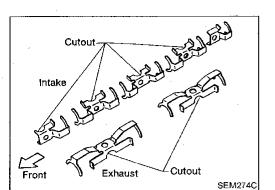
TF





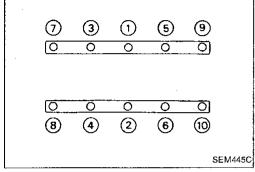




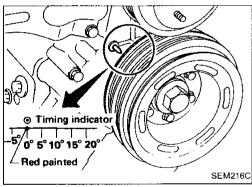


Assembly (Cont'd)

Install retainer with cutout facing direction shown in figure at left.

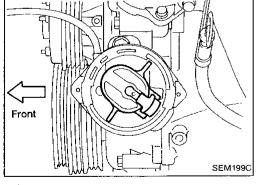


5. Tighten bolts as shown in figure at left.

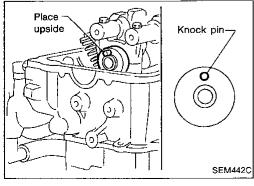


Installation

- Set No. 1 piston at TDC on its compression stroke as follows:
- (1) Align mark on crankshaft pulley with "0°" position and confirm that distributor rotor head is set as shown in figure.

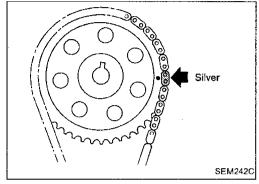


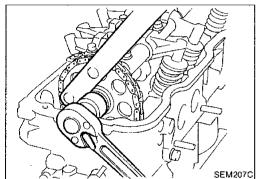
(2) Confirm that knock pin on camshaft is set at the top.

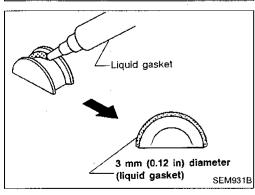


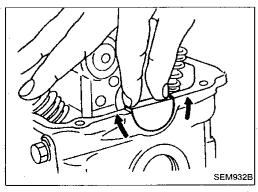
(1) (9) (8) **(2**) **(4**)

SEM238C









Installation (Cont'd)

- Install cylinder head with new gasket and tighten cylinder head bolts in numerical order.
- Do not rotate crankshaft and camshaft separately, or valves will hit piston heads.
- **Tightening procedure**
- Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb). (1)
- (2) Tighten all bolts to 78 N·m (8.0 kg-m, 58 ft-lb).
- (3) Loosen all bolts completely.
- (4) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).
- (5) Turn all bolts 80 to 85 degrees clockwise with an angle wrench, or if an angle wrench is not available, tighten all bolts to 74 to 83 N·m (7.5 to 8.5 kg-m, 54 to 61 ft-lb).
- Set chain on camshaft sprocket by aligning each mating mark. Then install camshaft sprocket to camshaft.

Tighten camshaft sprocket bolt.

- Install rubber plugs as follows:
- (1) Apply liquid gasket to rubber plugs.
- Rubber plugs should be replaced with new ones.
- Rubber plugs should be installed within 5 minutes of applying liquid gasket.

- (2) Install rubber plugs, then move them with your fingers to uniformly spread the gasket on cylinder head surface.
- Rubber plugs should be installed flush with the surface.
- Do not start the engine for 30 minutes after installing rocker
- Wipe clean excessive liquid gasket from cylinder head top surface.

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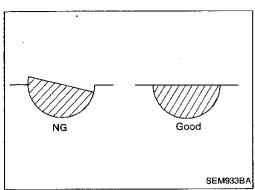
BF

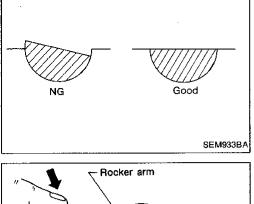
MA

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Installation (Cont'd)

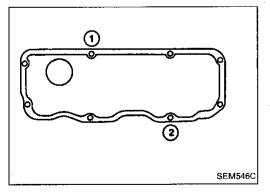




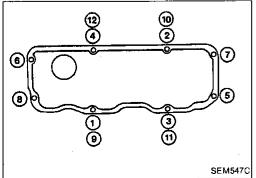
- Check hydraulic valve lifter.
- (1) Push hydraulic valve lifter forcefully with your finger.
- Be sure to check it with rocker arm in its free position.
- (2) If valve lifter moves more than 1 mm (0.04 in), air may be inside of it.
- (3) Bleed air off by running engine at 1,000 rpm under no-load for about 20 minutes.
- (4) If hydraulic valve lifters are still noisy, replace them and bleed air off again in the same manner as in step (3).
- 7. install rocker cover.

SEM275C

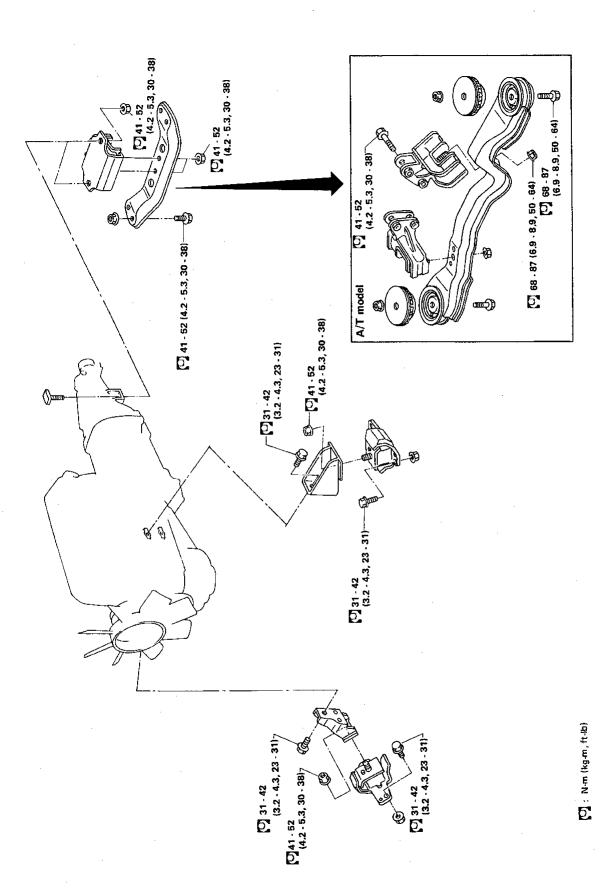
Be sure to avoid interference between rocker cover and rocker arm.



- Tighten bolts as follows:
- (1) Tighten 2 bolts to 3 N·m (0.3 kg-m, 2.2 ft-lb) temporarily in order shown in figure.



- (2) Then tighten bolts to 7 to 11 N·m (0.7 to 1.1 kg-m, 5.1 to 8.0 ft-lb) in order shown in figure.
- Install any parts removed.



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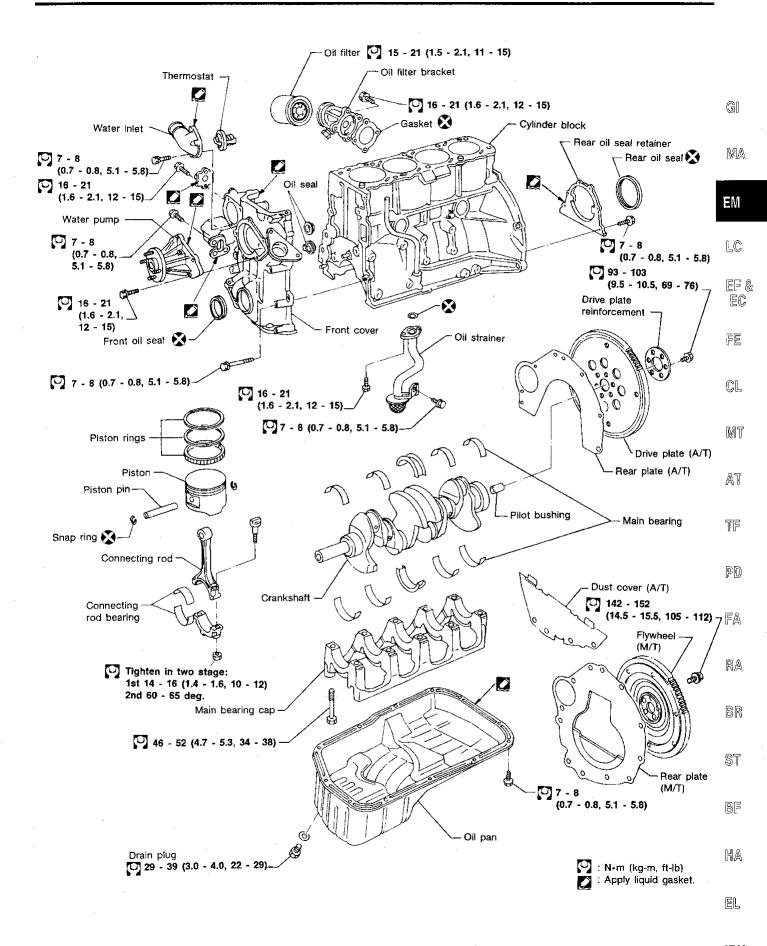
SEM938B

WARNING:

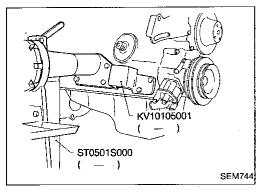
- a. Situate vehicle on a flat and solid surface.
- b. Place chocks at front and back of rear wheels.
- Do not remove engine until exhaust system has completely cooled off.
 - Otherwise, you may burn yourself and/or fire may break out in fuel line.
- d. For safety during subsequent steps, the tension of wires should be slackened against the engine.
- e. Before disconnecting fuel hose, release fuel pressure from fuel line.
 - Refer to "Releasing Fuel Pressure" in section EF & EC.
- f. Be sure to hoist engine and transmission in a safe manner.
- g. For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.

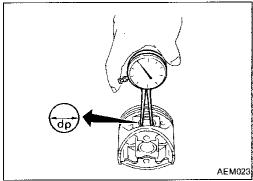
CAUTION:

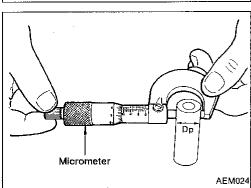
- When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.
- In hoisting the engine, always use engine slingers in a safe manner.

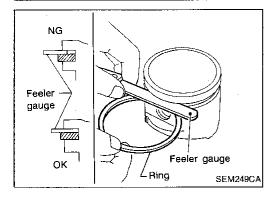


SEM247C IDX









Disassembly

PISTON AND CRANKSHAFT

- 1. Place engine on a work stand.
- 2. Drain coolant and oil.
- 3. Remove oil pan.
- 4. Remove timing chain.
- 5. Remove water pump.
- 6. Remove cylinder head.
- 7. Remove pistons with connecting rod.
- Remove bearing caps and crankshaft.
- Before removing bearing caps, measure crankshaft end play.
- Bolts should be loosened in two or three steps.

Inspection

PISTON AND PISTON PIN CLEARANCE

- Confirm the fitting of piston pin into piston pin hole to such an extent that it can be pressed smoothly by finger at room temperature.
- 1. Measure inner diameter of piston pin hole "dp".

Standard diameter "dp":

21.002 - 21.008 mm (0.8268 - 0.8271 in)

Measure outer diameter of piston pin "Dp".

Standard diameter "Dp":

20.994 - 20.996 mm (0.8265 - 0.8266 in)

3. Calculate interference fit of piston pin to piston.

dp - Dp = 0.008 - 0.012 mm (0.0003 - 0.0005 in)

If it exceeds the above value, replace piston assembly with pin.

PISTON RING SIDE CLEARANCE

Side clearance:

Top ring 0.04 - 0.08 mm (0.0016 - 0.0031 in)

2nd ring 0.03 - 0.07 mm (0.0012 - 0.0028 in) Oil ring 0.065 - 0.135 mm (0.0026 - 0.0053 in)

Max. limit of side clearance:

0.1 mm (0.004 in)

If out of specification, replace piston and/or piston ring assembly.

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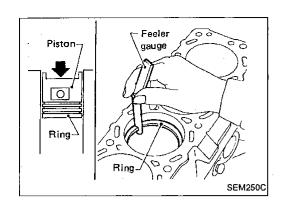
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Inspection (Cont'd)

PISTON RING END GAP

End gap:

Top ring

0.28 - 0.52 mm (0.0110 - 0.0205 in)

2nd ring

0.45 - 0.69 mm (0.0177 - 0.0272 in)

(R or T is punched on the ring.)

0.55 - 0.70 mm (0.0217 - 0.0276 in)

(N is punched on the ring.)

Oil ring

0.20 - 0.69 mm (0.0079 - 0.0272 in)

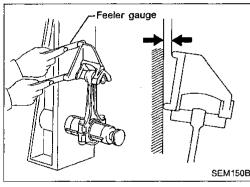
Max. limit of ring gap:

0.5 mm (0.020 in)

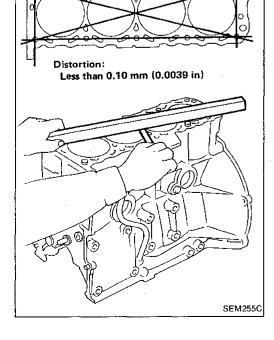
If out of specification, replace piston ring. If gap still exceeds LC the limit even with a new ring, rebore cylinder and use oversized piston and piston rings.

Refer to SDS.

When replacing the piston, inspect cylinder block surface for scratches or a seizure. If scratches or a seizure is found, hone or replace the cylinder block.



SEM150B Measuring points



CONNECTING ROD BEND AND TORSION

Bend:

Limit 0.15 mm (0.0059 in)

per 100 mm (3.94 in) length

Torsion:

Limit 0.30 mm (0.0118 in)

per 100 mm (3.94 in) length

If it exceeds the limit, replace connecting rod assembly.

CYLINDER BLOCK DISTORTION AND WEAR

Clean upper face of cylinder block and measure the distortion.

Limit:

0.10 mm (0.0039 in)

If out of specification, resurface it.

The resurfacing limit is determined by cylinder head resurfacing in engine.

Amount of cylinder head resurfacing is "A"

Amount of cylinder block resurfacing is "B"

The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)

Nominal cylinder block height

from crankshaft center:

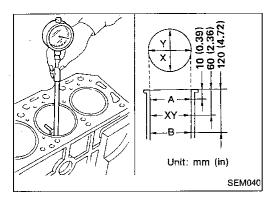
246.95 - 247.05 mm (9.7224 - 9.7264 in)

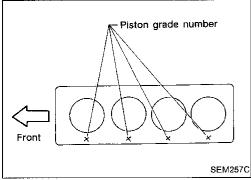
If necessary, replace cylinder block.

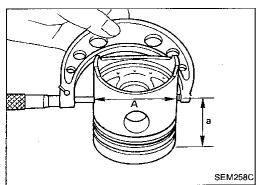
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PISTON-TO-BORE CLEARANCE

1. Using a bore gauge, measure cylinder bore for wear, outof-round and taper.

Standard inner diameter:

89.000 - 89.030 mm (3.5039 - 3.5051 in)

Wear limit: 0.2 mm (0.008 in)

If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.

Out-of-round (X-Y) standard: 0.015 mm (0.0006 in) Taper (A-B) standard: 0.015 mm (0.0006 in)

- 2. Check for scratches and seizure. If seizure is found, hone it
- If both cylinder block and piston are replaced with new ones, select piston of the same grade number punched on cylinder block upper surface.

3. Measure piston skirt diameter.

Piston diameter "A":

Refer to SDS.

Measuring point "a" (Distance from the top):

52 mm (2.05 in)

4. Check that piston-to-bore clearance is within specification.

Piston-to-bore clearance "B":

0.020 - 0.040 mm (0.0008 - 0.0016 in)

 Determine piston oversize according to amount of cylinder wear

Oversize pistons are available for service. Refer to SDS.

6. Cylinder bore size is determined by adding piston-to-bore clearance to piston diameter "A".

Rebored size calculation:

$$D = A + B - C$$

where,

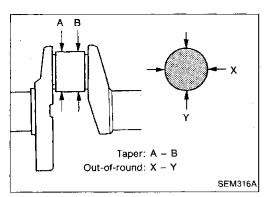
D: Bored diameter

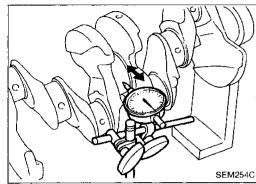
A: Piston diameter as measured

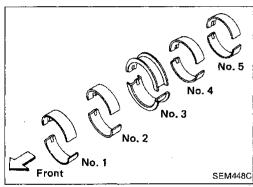
B: Piston-to-bore clearance

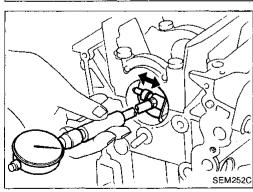
C: Honing allowance 0.02 mm (0.0008 in)

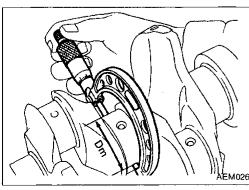
- Install main bearing caps, and tighten to the specified torque to prevent distortion of cylinder bores in final assembly.
- 8. Cut cylinder bores.
- When any cylinder needs boring, all other cylinders must also be bored.
- Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.
- Hone cylinders to obtain specified piston-to-bore clearance.
- 10. Measure finished cylinder bore for out-of-round and taper.
- Measurement should be done after cylinder bore cools down.











CRANKSHAFT

Check crankshaft main and pin journals for score, wear or

With a micrometer, measure journals for taper and out-ofround.

Out-of-round (X - Y):

Main journal Less than 0.01 mm (0.0004 in) Crank pin Less than 0.005 mm (0.0002 in)

Taper (A – B):

Main journal Less than 0.01 mm (0.0004 in) Crank pin Less than 0.005 mm (0.0002 in)

Measure crankshaft runout.

Runout (Total indicator reading): Less than 0.10 mm (0.0039 in)

BEARING CLEARANCE

Method A (Using bore gauge and micrometer)

Main bearing

Set main bearings in their proper positions on cylinder block and main bearing cap.

2. Install main bearing cap to cylinder block.

Tighten all bolts in correct order in two or three stages. Refer to "Assembly".

Measure inner diameter "A" of each main bearing.

Measure outer diameter "Dm" of each crankshaft main journal.

Calculate main bearing clearance. Main bearing clearance = A - Dm

Standard:

0.020 - 0.047 mm (0.0008 - 0.0019 in)

Limit: 0.1 mm (0.004 in)

If it exceeds the limit, replace bearing.

If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing.

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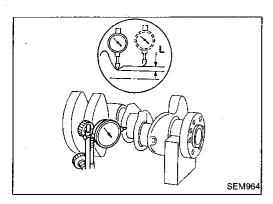
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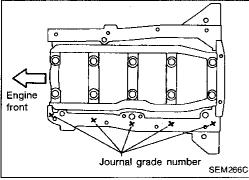
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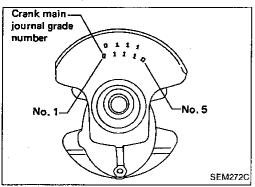


- a. When grinding crankshaft journal, confirm that "L" dimension in fillet roll is more than the specified limit.
 - "L": 0.1 mm (0.004 in)
- b. Refer to SDS for grinding crankshaft and available service parts.



- If crankshaft is reused, measure main bearing clearance and select thickness of main bearing.
 If crankshaft is replaced with a new one, it is necessary to
- select thickness of main bearings as follows:

 a. Grade number of each cylinder block main journal is punched on the respective cylinder block. These numbers



are punched in either Arabic or Roman numerals.

on crankshaft. These numbers are punched in either Arabic or Roman numerals.
c. Select main bearing with suitable thickness according to

Grade number of each crankshaft main journal is punched

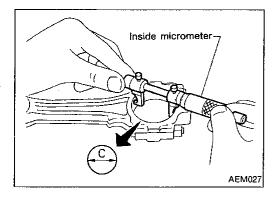
 Select main bearing with suitable thickness according to the following example or table.

For example:

Main journal grade number: 1
Crankshaft journal grade number: 2
Main bearing grade number = 1 + 2
= 3 (Yellow)

Main bearing grade number and identification color:

		Main journal grade number		
		''0''	"1" .	''2''
Crankshaft journal grade number	"0"	0 (Black)	1 (Brown)	2 (Green)
	"1" or "l"	1 (Brown)	2 (Green)	3 (Yellow)
	"2" or "ll"	2 (Green)	3 (Yellow)	4 (Blue)

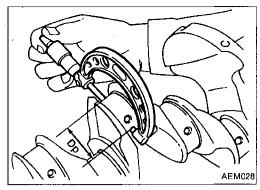


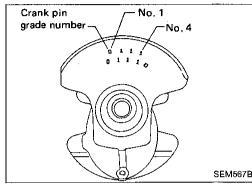
Connecting rod bearing (Big end)

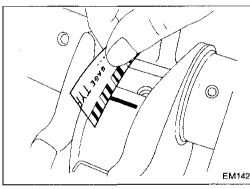
- 1. Install connecting rod bearing to connecting rod and cap.
- 2. Install connecting rod cap to connecting rod.

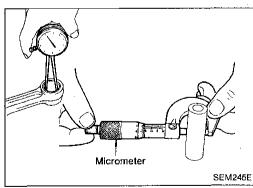
Tighten bolts to the specified torque.

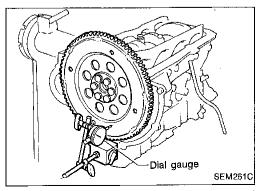
3. Measure inner diameter "C" of each bearing.











- Measure outer diameter "Dp" of each crankshaft pin jour-
- Calculate connecting rod bearing clearance.

Connecting rod bearing clearance = C - DpStandard: 0.010 - 0.035 mm (0.0004 - 0.0014 in) Limit: 0.09 mm (0.0035 in)

- If it exceeds the limit, replace bearing.
- If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing. Refer to step 7 of "BEARING CLEARANCE — Main bearing".
- If crankshaft is replaced with a new one, select connecting rod bearing according to the following table.

Connecting rod bearing grade number:

These numbers are punched in either Arabic or Roman numerals.

Crank pin grade number	Connecting rod bearing grade number	
0	0	
1 or I	1	
2 or 11	2	

Method B (Using plastigage)

CAUTION:

- Do not turn crankshaft or connecting rod while plastigage is being inserted.
- When bearing clearance exceeds the specified limit, ensure that the proper bearing has been installed. Then if excessive bearing clearance exists, use a thicker main bearing or undersized bearing so that the specified bearing clearance is obtained.

CONNECTING ROD BUSHING CLEARANCE (Small end)

- Measure inner diameter "C" of bushing. 1.
- Measure outer diameter "Dp" of piston pin. 2.
- Calculate connecting rod bearing clearance.

C - Dp =--0.015 to --0.033 mm (--0.0006 to --0.0013 in) (Stan-

If it exceeds the limit, replace connecting rod assembly

FLYWHEEL/DRIVE PLATE RUNOUT

and/or piston set with pin.

Runout (Total indicator reading): Flywheel (M/T model) Less than 0.1 mm (0.004 in) Drive plate (A/T model) Less than 0.1 mm (0.004 in)

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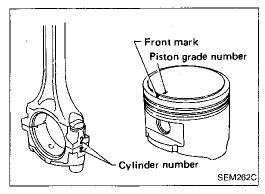
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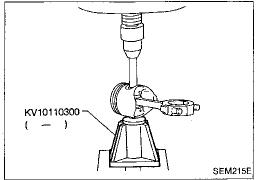
BR

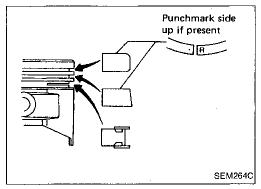
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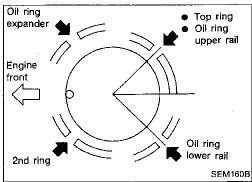
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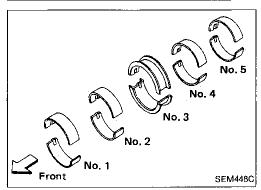
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Assembly

PISTON

- 1. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin and connecting rod.
- Align the direction of piston and connecting rod.
- Numbers stamped on connecting rod and cap correspond to each cylinder.
- After assembly, make sure connecting rod swings smoothly.

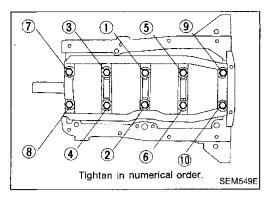
2. Set piston rings as shown.

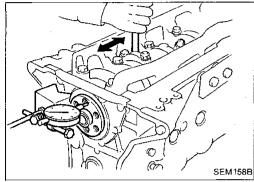
CAUTION:

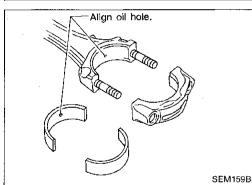
- When piston rings are not replaced, make sure that piston rings are mounted in their original positions.
- When piston rings are being replaced and no punchmark is present, piston rings can be mounted with either side up.

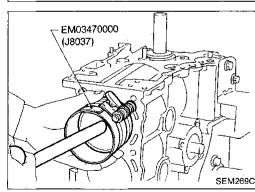
CRANKSHAFT

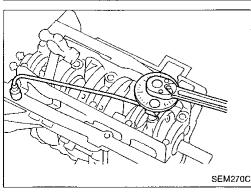
- 1. Set main bearings in their proper positions on cylinder block and main bearing beam.
- Confirm that correct main bearings are used. Refer to "Inspection" of this section.











Assembly (Cont'd)

- 2. Install crankshaft and main bearing beam and tighten bolts to the specified torque.
- Prior to tightening bearing cap bolts, place bearing cap in its proper position by shifting crankshaft in the axial direction.
- Tighten bearing cap bolts gradually in two or three stages.
 Start with center bearing and move outward sequentially.
- After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.



Crankshaft end play:

Standard

0.05 - 0.18 mm (0.0020 - 0.0071 in)

Limit

0.3 mm (0.012 in)

If beyond the limit, replace bearing with a new one.

- Install connecting rod bearings in connecting rods and connecting rod caps.
- Confirm that correct bearings are used.

Refer to "Inspection".

- Install bearings so that oil hole in connecting rod aligns with oil hole of bearing.
- 5. Install pistons with connecting rods.
- a. Install them into corresponding cylinders with Tool.
- Be careful not to scratch cylinder wall by connecting rod.
- Arrange so that front mark on piston head faces toward front of engine.

Install connecting rod bearing caps.
 Tighten connecting rod bearing cap nuts to the specified torque.

Connecting rod bearing nut:

- (1) Tighten to 14 to 16 N·m (1.4 to 1.6 kg-m, 10 to 12 ft-lb).
- (2) Tighten bolts 60 to 65 degrees clockwise with an angle wrench, or if an angle wrench is not available, tighten them to 38 to 44 N·m (3.9 to 4.5 kg-m, 28 to 33 ft-lb).

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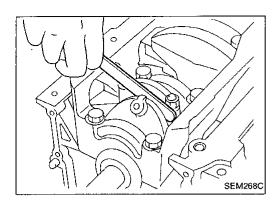
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Assembly (Cont'd)

6. Measure connecting rod side clearance.

Connecting rod side clearance:

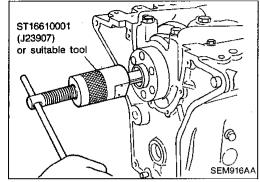
Standard

0.2 - 0.4 mm (0.008 - 0.016 in)

Limit

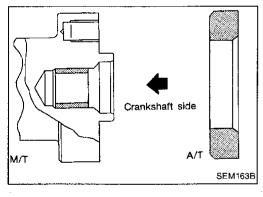
0.6 mm (0.024 in)

If beyond the limit, replace connecting rod and/or crankshaft.



REPLACING PILOT BUSHING

1. Remove pilot bushing (M/T) or pilot convertor (A/T).



2. Install pilot bushing (M/T) or pilot convertor (A/T).

General Specifications

Cylinder arrangement	4, in-line	
Displacement cm ³ (cu in)	2,389 (145.78)	
Bore x stroke mm (in)	89 x 96 (3.50 x 3.78)	
Valve arrangement	OHC	
Firing order	1-3-4-2	
Number of piston rings		
Compression	2	
Oil	. 1	
Number of main bearings	5	
Compression ratio	8.6	

	Unit: kPa (kg/cm², psi)/rpm
Compression pressure	
Standard	1,324 (13.5, 192)/300
Minimum	981 (10, 142)/300
Differential limit between cylinders	98 (1.0, 14)/300

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Inspection and Adjustment

Standard

89.000 - 89.010 (3.5039 - 3.5043)

89.010 - 89.020 (3.5043 - 3.5047)

89.020 - 89.030 (3.5047 - 3.5051)

Less than 0.015 (0.0006)

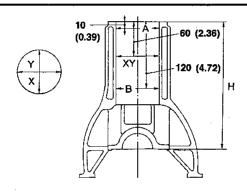
Less than 0.015 (0.0006)

Less than 0.05 (0.0020)

0.020 - 0.040 (0.0008 - 0.0016)

246.95 - 247.05 (9.7224 - 9.7264)

CYLINDER BLOCK



SEM400E

Limit

0.1 (0.004)

0.2 (0.008)*

FA

0.2 (0.008)

0.2 (0.008)**

Unit: mm (in)

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Cylinder block height
(From crankshaft center)

Distortion

Cylinder bore

Grade 1

Grade 2

Grade 3

CYLINDER HEAD

Piston-to-cylinder clearance

		Unit: mm (in)
	Standard	Limit
Height (H)	98.8 - 99.0 (3.890 - 3.898)	0.2 (0.008)*
Surface distortion	0.03 (0.0012)	0.1 (0.004)

Inner diameter

Taper (A - B)

Difference in inner diameter between cylinders

Out-of-round (X - Y)

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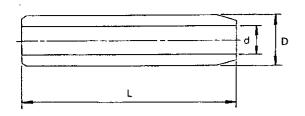
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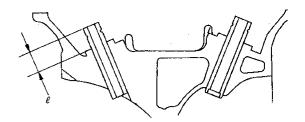
^{*} Wear limit
** Total amount of cylinder head resurfacing and cylinder block resurfacing

^{*} Total amount of cylinder head resurfacing and cylinder block resurfacing

Inspection and Adjustment (Cont'd)

VALVE GUIDE



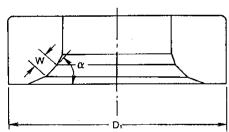


SEM401E

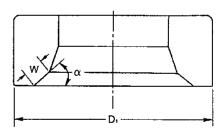
Unit: mm (in)

	Stan	dard	Service		Limit	
	Intake	Exhaust	Intake	Exhaust	_	
Length (L)	52.6 (2.071)	56.0 (2.205)	52.6 (2.071)	56.0 (2.205)	_	
Outer diameter (D)	11.023 - 11.034 (0.4340 - 0.4344)	12.023 - 12.034 (0.4733 - 0.4738)	11.223 - 11.234 (0.4418 - 0.4423)	12.223 - 12.234 (0.4812 - 0.4817)	_	
Inner diameter (d) (Finished size)	7.000 - 7.018 (0.2756 - 0.2763)	8.000 - 8.018 (0.3150 - 0.3157)	7.000 - 7.018 (0.2756 - 0.2763)	8.000 - 8.018 (0.3150 - 0.3157)	<u></u>	
Cylinder head hole diameter	10.975 - 10.996 (0.4321 - 0.4329)	11.975 - 11.996 (0.4715 - 0.4723)	11.175 - 11.196 (0.4400 - 0.4408)	12.175 - 12.196 (0.4793 - 0.4802)		
Interference fit		0.027 - 0.059 (0.0011 - 0.0023)	,		
Stem to guide clearance	0.020 - 0.053 (0.0008 - 0.0021)	0.040 - 0.070 (0.0016 - 0.0028)	0.020 - 0.053 (0.0008 - 0.0021)	0.040 - 0.070 (0.0016 - 0.0028)	0.1 (0.004)	
Tapping length (£)		14	4.9 - 15.1 (0.587 - 0.59	94)		





Service



SEM402E

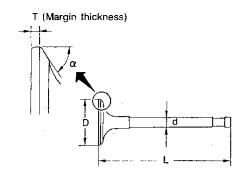
Unit: mm (in)

	Stan	dard	Service		
	Intake	Exhaust	Intake	Exhaust	
Cylinder head seat recess diameter	36.000 - 36.016 (1.4173 - 1.4179)	42.000 - 42.016 (1.6535 - 1.6542)	36.500 - 36.516 (1.4370 - 1.4376)	42.500 - 42.516 (1.6732 - 1.6739)	
Valve seat outer diameter (D ₁)	36.080 - 36.096 (1.4205 - 1.4211)	42:080 - 42:096 (1.6567 - 1.6573)	36.580 - 36.596 (1.4402 - 1.4408)	42.580 - 42.596 (1.6764 - 1.6770)	
Face angle (α)	45°	45°	45°	45°	
Contacting width (W)	1.6 - 1.7 (0.063 - 0.067)	1.7 - 2.1 (0.067 - 0.083)	1.6 - 1.7 (0.063 - 0.067)	1.7 - 2.1 (0.067 - 0.083)	

SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment (Cont'd)

VALVE



SEM188A

Unit: mm (in)

			Onte min (m)
		Standard	Limit
Value band diameter (DV	In.	34.0 - 34.2 (1.339 - 1.346)	_
Valve head diameter (D)	Ex.	40.0 - 40.2 (1.575 - 1.583)	
Valva langth (L)	In.	119.9 - 120.2 (4.720 - 4.732)	_
Valve length (L)	Ex.	120.67 - 120.97 (4.7508 - 4.7626)	_
	In.	6.965 - 6.980 (0.2742 - 0.2748)	
Valve stem diameter (d)	Ex.	7.948 - 7.960 (0.3129 - 0.3134)	_
Valvo foso ongle (a)	ln.	45°30′	_
Valve face angle (α)	Ex.	45°30′	_
Valve head margin (T)	In.	1,15 - 1.45 (0.0453 - 0.0571)	0.5 (0.020)
valve nead margin (1)	Ex.	1.35 - 1.65 (0.0531 - 0.0650)	0.5 (0.020)
Valve clearance		0 (0)	

VALVE SPRING

Unit: mm (in)

		Stan	dard	Limit		
		Intake	Exhaust	Intake	Exhaust	
Free height (H)	Outer	57.44 (2.2614)	53.21 (2.0949)	_		
	Inner	53.34 (2.1000)	47.95 (1.8878)	-	_	
Pressure N (kg, lb) at height	Outer	604.1 (61.6, 135.8) at 37.6 (1.480)	640.4 (65.3, 144.0) at 34.1 (1.343)	567.8 (57.9, 127.7) at 37.6 (1.480)	620.8 (63.3, 139.6) at 34.1 (1.343)	
	Inner	284.4 (29.0, 63.9) at 32.6 (1.283)	328.5 (33.5, 73.9) at 29.1 (1.146)	266.8 (27.2, 60.0) at 32.6 (1.283)	318.7 (32.5, 71.7) at 29.1 (1.146)	
	Outer		_	2.5 (0.098)	2.3 (0.091)	
Out-of-square	Inner			2.3 (0.091)	2.1 (0.083)	

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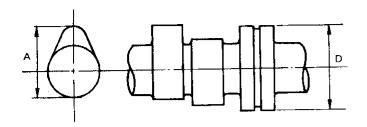
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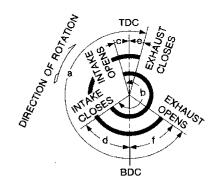
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Inspection and Adjustment (Cont'd)

CAMSHAFT AND CAMSHAFT BEARING





SEM568A

EM120

Unit: mm (in)

		Standard	Limit
Cam height (A)		44.839 - 45.029 (1.7653 - 1.7728)	_
Valve lift (h)		9.86 (0.3882)	
Wear limit of cam height			0.2 (0.008)
Camshaft journal to bearing clearance		0.045 - 0.090 (0.0018 - 0.0035)	0.12 (0.0047)
Inner diameter of camshaft bearing		33.000 - 33.025 (1.2992 - 1.3002)	_
Outer diameter of camshaft journal (D)		32.935 - 32.955 (1.2967 - 1.2974)	
Camshaft runout		0 - 0.02 (0 - 0.0008)	_
Camshaft end play		0.07 - 0.15 (0.0028 - 0.0059)	0.2 (0.008)
	а	248	_
b		240	-
		3	-
Valve timing (Degree on crankshaft)	d	57	_
е		12	
	f	56	

ROCKER ARM AND ROCKER SHAFT

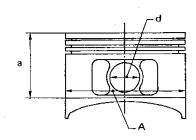
Unit: mm (in)

Rocker arm to shaft clearance	0.012 - 0.050 (0.0005 - 0.0020)
Rocker shaft diameter	21.979 - 22.000 (0.8653 - 0.8661)
Rocker arm rocker shaft hole diameter	22.012 - 22.029 (0.8666 - 0.8673)

Inspection and Adjustment (Cont'd)

PISTON, PISTON RING AND PISTON PIN

Piston



SEM444C

Unit: mm (in)

			Unit: mm (in)
Piston skirt diameter (A)	Standard	Grade No. 1	88.970 - 88.980 (3.5027 - 3.5031)
		Grade No. 2	88.980 - 88.990 (3.5031 - 3.5035)
		Grade No. 3	88.990 - 89.000 (3.5035 - 3.5039)
	Service (Oversize)	0.5 (0.020)	89.470 - 89.500 (3.5224 - 3.5236)
		1.0 (0.039)	89.970 - 90.000 (3.5421 - 3.5433)
Dimension (a)		Approximately 52 (2.05)	
Piston pin hole diameter (d)		21.002 - 21.008 (0.8268 - 0.8271)	
Piston-to-cylinder bore clear- ance		0.020 - 0.040 (0.0008 - 0.0016)	

Piston pin

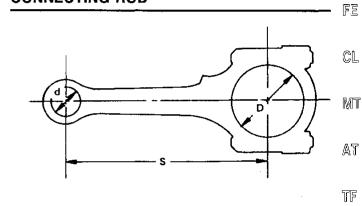
Unit:	mm	(in)
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	Office filter	
<u> </u>	Standard	
Piston pin outer diameter	20.994 - 20.996 (0.8265 - 0.8266)	
Pin to piston pin hole clear- ance	0.008 - 0.012 (0.0003 - 0.0005)	
Piston pin to connecting rod clearance	-0.015 to0.033 (-0.0006 to0.0013)	

Piston ring

			Unit: mm (in)	
		Standard	Limit	
	Тор	0.040 - 0.080 (0.0016 - 0.0031)	0.1 (0.004)	G
Side clearance 2nd Oil	2nd	0.030 - 0.070 (0.0012 - 0.0028)	0.1 (0.004)	D O A
	Oil	0.065 - 0.135 (0.0026 - 0.0053)*	0.1 (0.004)	MA
	Тор	0.28 - 0.52 (0.0110 - 0.0205)	0.5 (0.020)	EM
Ring gap 2nd Oil (rail ring)	2nd	0.45 - 0.69 (0.0177 - 0.0272)	0.5 (0.020)	LC
	0.20 - 0.69 (0.0079 - 0.0272)	0.5 (0.020)		
Riken-make				EC

CONNECTING ROD



SEM216E

PD Unit: mm (in)

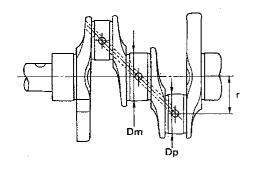
		Orac man (m)	
	Standard	Limit	
Center distance (S)	164.95 - 165.05 (6.4941 - 6.4980)		F#
Bend [per 100 mm (3.94 in)]	_	0.15 (0.0059)	R/
Torsion [per 100 mm (3.94 in)]		0.3 (0.012)	86
Small end inner diameter (d)	20.948 - 20.978 (0.8247 - 0.8259)	B	290
Connecting rod big end inner diameter (D)	53.000 - 53.013 (2.0866 - 2.0871)		\$1
Side clearance	. 0.2 - 0.4 (0.008 - 0.016)	0.6 (0.024)	BF

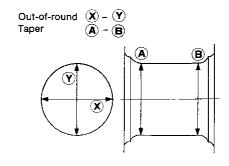
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Inspection and Adjustment (Cont'd)

CRANKSHAFT





SEM394

EM715

Unit: mm (in)

				Unit: mm (in)	
		No. 0 63.645 - 63.652		(2.5057 - 2.5060)	
Main journal diameter (Dm)	Grade	No. 1	63.652 - 63.663 (2.5060 - 2.5064)		
		No. 2 63.663 - 63.672 ((2.5064 - 2.5068)	
Pin journal diameter (Dp)			59.951 - 59.975 (2.3603 - 2.3612)		
Center distance (r)		47.97 - 48.03	47.97 - 48.03 (1.8886 - 1.8909)		
			Standard	Limit	
7	Journal			0.01 (0.0004)	
Taper of journal and pin [(A) - (B)]	Pin			0.005 (0.0002)	
Out-of-round of journal and pin	Journal		_	0.01 (0.0004)	
[% - (®)] Pin		in —		0.005 (0.0002)	
Runout [TIR]*			-	0.10 (0.0039)	
Free end play			0.05 - 0.18 (0.0020 - 0.0071)	0.3 (0.012)	
Fillet roil		More than 0.1 (0.004)			

^{*} Total indicator reading

BEARING CLEARANCE

		Unit: mm (in)
	Standard	Limit
Main bearing clear- ance	0.020 - 0.047 (0.0008 - 0.0019)	0.1 (0.004)
Connecting rod bearing clearance	0.010 - 0.035 (0.0004 - 0.0014)	0.09 (0.0035)

Standard

Grade

number

0

1

2

Identification

color

Brown

Green

AVAILABLE MAIN BEARING

Inspection and Adjustment (Cont'd) **AVAILABLE CONNECTING ROD BEARING**

Standard

Grade number	Thickness mm (in)	Identification color
0	1.821 - 1.825 (0.0717 - 0.0719)	Black
1	1.825 - 1.829 (0.0719 - 0.0720)	Brown
2	1.829 - 1.833 (0.0720 - 0.0722)	Green
3	1.833 - 1.837 (0.0722 - 0.0723)	Yellow
4	1.837 - 1.841 (0.0723 - 0.0725)	Blue

Undersize (service)

Unit: mm (in)		
Crank pin journal diameter "Dp"		
Grind no that boar		

Undersize (service)

		Onit: mim (in)
	Thickness	Main journal diameter ''Dm''
0.25 (0.0098)	1.952 - 1.960 (0.0769 - 0.0772)	Grind so that bear- ing clearance is the specified value.

	Thickness	Crank pin journal diameter "Dp"
0.08 (0.0031)	1.540 - 1.548 (0.0606 - 0.0609)	
0.12 (0.0047)	1.560 - 1.568 (0.0614 - 0.0617)	Grind so that bear- ing clearance is the specified value.
0.25 (0.0098)	1.625 - 1.633 (0.0640 - 0.0643)	

Thickness

mm (in)

1.505 - 1.508

(0.0593 - 0.0594)1.508 - 1.511

(0.0594 - 0.0595)1.511 - 1.514

(0.0595 - 0.0596)

MISCELLANEOUS COMPONENTS

		Unit: mm (in)
Camshaft sprocket ru	nout [TIR]*	Less than 0.12 (0.0047)
Flywheel runout	[TIR]*	Less than 0.1 (0.004)
Drive plate runout	[TIR]*	Less than 0.1 (0.004)

^{*} Total indicator reading

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FRONT AXLE & FRONT SUSPENSION

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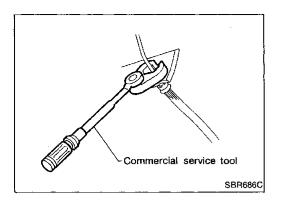
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PRECAUTIONS AND PREPARATION



Precautions

- When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.
 - * Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
- Use flare nut wrench when removing or installing brake tubes.
- After installing removed suspension parts, check wheel alignment and adjust if necessary.
- Always torque brake lines when installing.

Special Service Tools

Tool number		Unit application		
(Kent-Moore No.) Tool name	Description		2WD	4WD
ST29020001 (J24319-01) Gear arm puller		Removing ball joint for knuckle spindle	x	х
HT72520000	NT143	Removing tie-rod outer end		
(J25730-A) Ball joint remover	PATE		X	Х
	NT146		<u></u>	
KV401021S0 (—) Bearing race drift		Installing wheel bearing outer race	x	х
KV40105400 (J36001) Wheel bearing lock nut wrench	NT153	Removing or installing wheel bearing lock nut	_	x
	NT154	<u>-</u>		

Commercial Service Tools

Tool name	Description	
Flare nut crows foot Torque wrench		Removing and installing each brake piping
	NT223	

2WD TRUCKS

When installing rubber parts, final tightening GI must be carried out under unladen condition* with tires on ground. Fuel, radiator coolant and engine oil full. Spare tire, Jack, hand tools and mats in MA designated positions. (1.6 - 2.2, 12 - 16) -O 109 - 147 (11.1 - 15.0, 80 - 108) EM Upper ball joint Shock absorber-Upper link assembly LC 16 - 21 (1.6 - 2.1, 12 - 15)-(1.6 - 22 (1.6 - 2.2, 12 - 16) Torsion bar spring EF & 71 - 103 (7.2 - 10.5, 52 - 76) EC Stabilizer bar Anchor arm-FE CL MT 78 - 147. (8.0 - 15.0, 58 - 108) AT Cotter pin 30 - 40 (3.1 - 4.1, 22 - 30) TF PD Lower ball joint [∠][○] 68 - 88 (6.9 - 9.0, 50 - 65) FA Knuckle spindle ∠Lower link assembly (11.1 - 15.0, 80 - 108) Tension rod Cotter pin RA Baffle plate Rotor disc-118 - 191-/ (12.0 - 19.5, 87 - 141) BRWheel hub-∠<mark>©</mark> 16 - 22 118 - 147 (12 - 15, 87 - 108) (1.6 - 2.2, 12 - 16) O 114 - 147 ST (11.6 - 15.0, 84 - 108) (kg-m, ft-lb) BF

72AA [D]X

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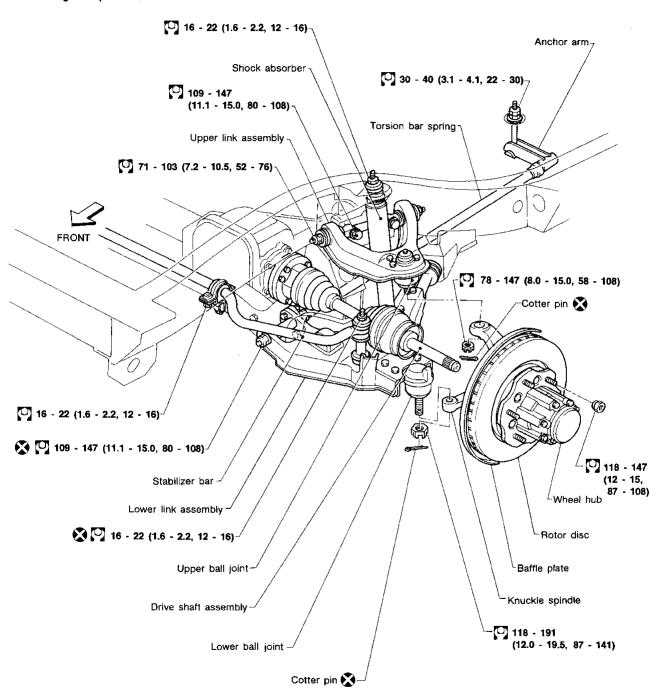
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4WD MODELS

When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.

* Fuel, radiator coolant and engine oil full. Spare tire, Jack, hand tools and mats in designated positions.



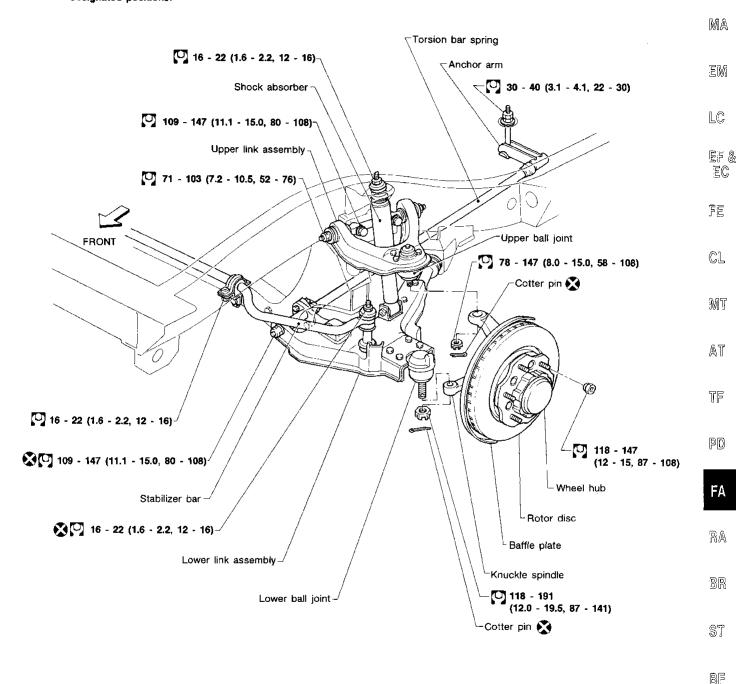
: N•m (kg-m, ft-lb)

SFA566B

2WD PATHFINDER

When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.

Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.



: N·m (kg-m, ft-lb)

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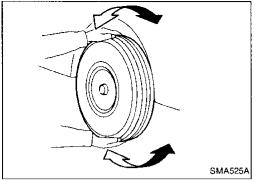
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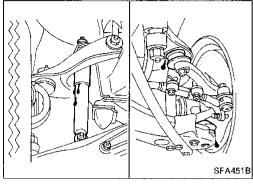
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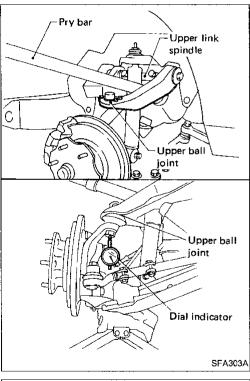


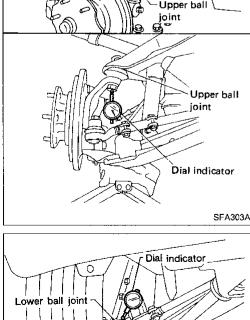
Front Axle and Front Suspension Parts

- Check front axle and front suspension parts for looseness, cracks, wear or other damage.
- (1) Shake each front wheel.
- (2) Make sure that cotter pin is inserted.
- (3) Retighten all nuts and bolts to the specified torque.

Refer to FRONT SUSPENSION (FA-36).

- (4) Check front axle and front suspension parts for wear. cracks or other damage.
- Check shock absorber for oil leakage or other damage.
- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.





Check ball joint for vertical end play.

Upper ball joint:

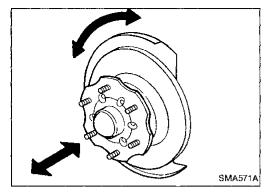
1.6 mm (0.063 in) or less

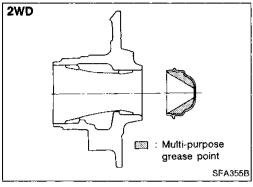
- (1) Jack up front of vehicle and set the stands.
- (2) Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
- (3) Make sure front wheels are straight and brake pedal is depressed.
- (4) Place a try bar between transverse link and inner rim of road wheel.
- While pushing and releasing pry bar, observe maximum dial indicator value.
- (6) If ball joint movement is beyond specifications, remove and recheck it.

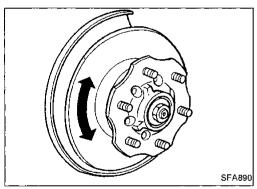
Lower ball joint: [2WD Trucks] 1.6 mm (0.063 in) or less [Except 2WD Trucks] 0.5 mm (0.020 in) or less

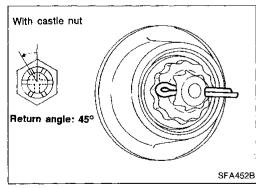
- (1) Jack up front of vehicle and set the stands.
- (2) Remove road wheel.
- (3) Clamp dial indicator onto upper link and place indicator tip on knuckle near ball joint.
- (4) Jack up lower link [Approx. 20 mm (0.79 in).]
- (5) Place a pry bar between upper link and upper link spindle.
- (6) While pushing and releasing pry bar, observe maximum dial indicator value.
- (7) If ball joint movement is beyond specifications, remove and recheck it.

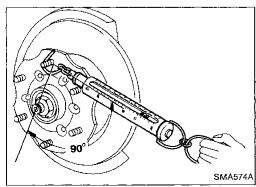
SFA302A











Front Wheel Bearing

- Check that wheel bearings operate smoothly.
- Check axial end play.

Axial end play: 0 mm (0 in)

Adjust wheel bearing preload if there is any axial end play or wheel bearing does not turn smoothly.

PRELOAD ADJUSTMENT (2WD Trucks)

Adjust wheel bearing preload after wheel bearing has been replaced or front axle has been reassembled.

- Before adjustment, thoroughly clean all parts to prevent dirt entry.
- Apply multi-purpose grease sparingly to the following parts:
- Rubbing surface of spindle
- Contact surface between lock washer and outer wheel
- Hub cap (as shown at left)
- Grease seal lip
- Tighten wheel bearing lock nut to the specified torque.

(C): 34 - 39 N·m (3.5 - 4.0 kg-m, 25 - 29 ft-ib) Turn wheel hub several times in both directions to seat

- wheel bearing correctly.
- Again tighten wheel bearing lock nut to the specified torque.

(C): 34 - 39 N·m (3.5 - 4.0 kg-m, 25 - 29 ft-lb)

- Turn back wheel bearing lock nut 45 degrees.
- Fit adjusting cap and new cotter pin. Align cotter pin slot by loosening nut 15 degrees or less.

Measure wheel bearing preload and axial end play.

Axial end play: 0 mm (0 in) Wheel bearing preload

(As measured at wheel hub bolt): [New grease seal]

> 9.8 - 28.4 N (1.0 - 2.9 kg, 2.2 - 6.4 lb) [Used grease seal]

9.8 - 23.5 N (1.0 - 2.4 kg, 2.2 - 5.3 lb)

Repeat above procedures until correct bearing preload is obtained.

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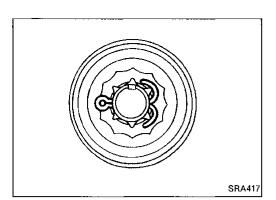
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ON-VEHICLE SERVICE



Front Wheel Bearing (Cont'd)

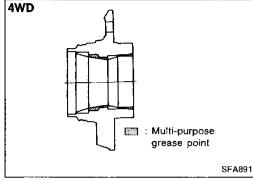
- 9. Spread cotter pin.
- 10. Install hub cap.

PRELOAD ADJUSTMENT (Except 2WD Trucks)

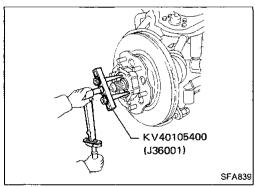
Adjust wheel bearing preload after wheel bearing has been replaced or front axle has been reassembled.

Adjust wheel bearing preload as follows:

1. Before adjustment, thoroughly clean all parts to prevent dirt entry.

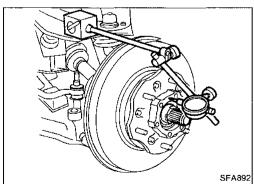


- 2. Apply multi-purpose grease sparingly to the following parts:
- Threaded portion of spindle
- Contact surface between wheel bearing washer and outer wheel bearing
- Grease seal lip
- Wheel hub (as shown at left)



- 3. Tighten wheel bearing lock nut with Tool.
 - (8 10 kg-m, 58 72 ft-lb)
- 4. Turn wheel hub several times in both directions.
- 5. Loosen wheel bearing lock nut so that torque becomes 0 N·m (0 kg-m, 0 ft-lb).
- 6. Retighten wheel bearing lock nut with Tool.

(0.05 - 0.15 kg-m, 0.4 - 1.1 ft-lb)

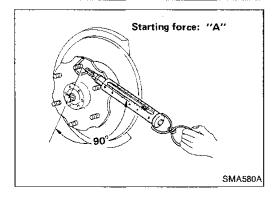


- 7. Turn wheel hub several times in both directions.
- 8. Retighten wheel bearing lock nut with Tool.

(0.05 - 0.15 kg-m, 0.4 - 1.1 ft-lb)

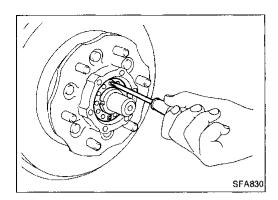
9. Measure wheel bearing axial end play.

Axial end play: 0 mm (0 in)



10. Measure starting force "A" at wheel hub bolt.

ON-VEHICLE SERVICE



Radial runout

Outside

2WD Trucks Lower link spindle center-

Tension rod attaching bolt

Lateral

runout

Front Wheel Bearing (Cont'd)

- 11. Install lock washer by tightening the lock nut within 15 to 30 degrees.
- 12. Turn wheel hub several times in both directions to seat wheel bearing correctly.
- 13. Measure starting force "B" at wheel hub bolt. Refer to procedure 10.
- Wheel bearing preload "C" can be calculated as shown below.



Wheel bearing preload "C":

7.06 - 20.99 N (0.72 - 2.14 kg, 1.59 - 4.72 lb)

- 15. Repeat above procedures until correct axial end play and wheel bearing preload are obtained.
- 16. Install free-running hub and brake pads.

Front Wheel Alignment

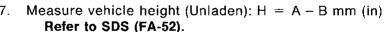
Before checking front wheel alignment, be sure to make a preliminary inspection.

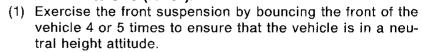
PRELIMINARY INSPECTION

- Check the tires for wear and proper inflation.
- Check the wheel runout for outside and inside.
 Wheel runout average
 (Outside runout value + Inside runout value) × 0.5

[(Outside runout value + Inside runout value) x 0.5]: Refer to SDS (FA-53).

- Check the front wheel bearings for looseness.
- 4. Check the front suspension for looseness.
- 5. Check the steering linkage for looseness.
- 6. Check that the front shock absorbers work properly by using the standard bounce test.





(2) Measure wheel alignment.

Refer to ALLOWABLE LIMIT on SDS (FA-52).

(3) If wheel alignment is not as specified, adjust vehicle posture

Refer to ADJUSTING RANGE on SDS (FA-52).

(4) Adjust wheel alignment.

Refer to ADJUSTING RANGE on SDS (FA-52).

Center of lower link spindle

B Bottom of steering stopper bracket

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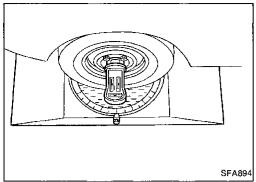
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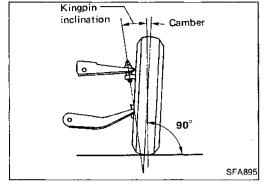
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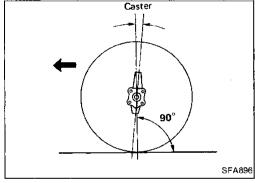
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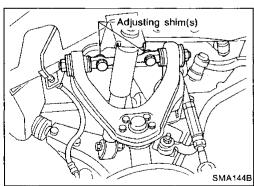
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Front Wheel Alignment (Cont'd)

CAMBER, CASTER AND KINGPIN INCLINATION

Before checking camber, caster or kingpin inclination, move vehicle up and down on turning radius gauge to minimize friction. Ensure that vehicle is in correct posture.

Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge and adjust in accordance with the following procedures.

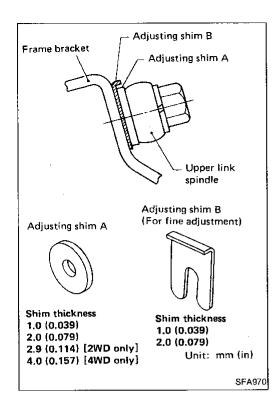
> Camber (Unladen): Refer to SDS (FA-52). Kingpin inclination (Unladen): Refer to SDS (FA-52).

Caster (Unladen): Refer to SDS (FA-52).

ADJUSTMENT

Both camber and caster angles are adjusted by increasing or decreasing the number of adjusting shims inserted between upper link spindle and frame.

ON-VEHICLE SERVICE



Front Wheel Alignment (Cont'd)

Before removing or installing adjusting shim(s), be sure to place a jack under lower link.

Adjusting shim standard thickness:

2WD Trucks

2.9 mm (0.114 in)

Except 2WD Trucks

4.0 mm (0.157 in)

Do not use three or more shims at one place.

 When installing shim B, always face the pawl towards spindle and insert them from bracket side. Use only one shim in a place.

• Total thickness of shims must be within 8.0 mm (0.315 in).

 Difference of total thickness of the front and rear must be within 2.0 mm (0.079 in).

 Determine thickness and number of shims necessary for adjusting camber and caster, in accordance with the following graph.

[Example]

(1) When service data value minus measured value is equal to:

Caster angle: - 30' Camber angle: +30'

(2) Obtain the intersecting point of lines in accordance with the graph.

graph.

(3) Choose shims which are nearest to the intersecting point.

(4) For the above example:

2WD Trucks:

Add 2.0 mm (0.079 in) shim on front side.

Add 3.0 mm (0.118 in) shim on rear side.

Except 2WD Trucks:

Add 1.0 mm (0.039 in) shim on front side.

Add 3.0 mm (0.118 in) shim on rear side.

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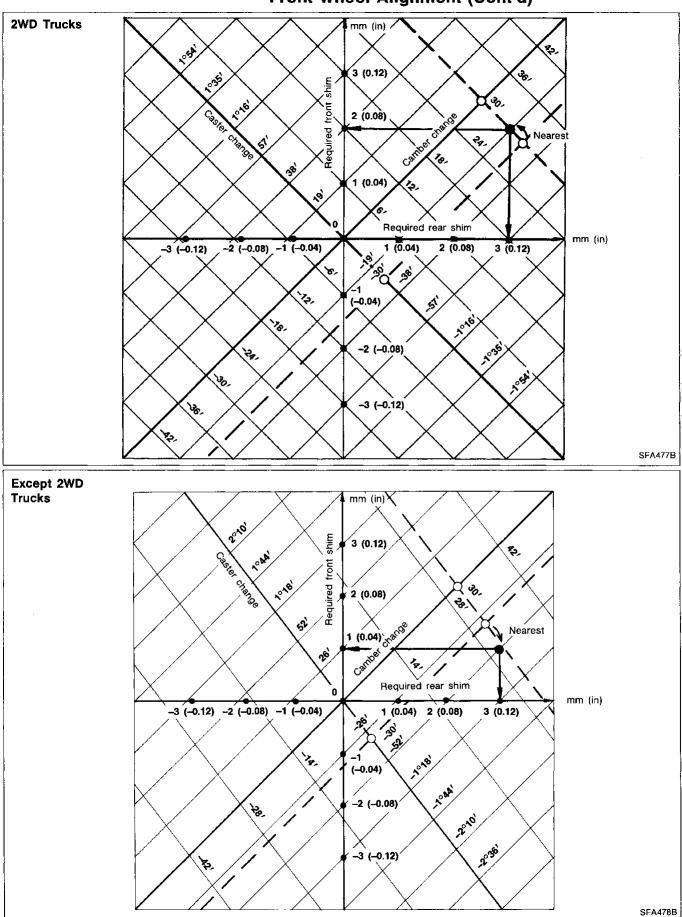
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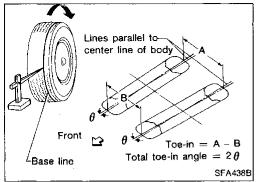
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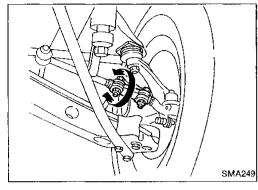
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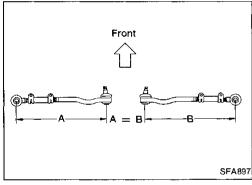
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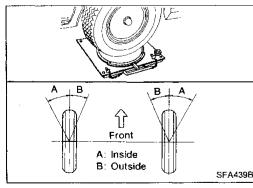
Front Wheel Alignment (Cont'd)

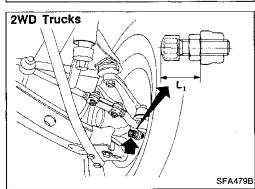












Front Wheel Alignment (Cont'd)

TOE-IN

Mark a base line across the tread.

After lowering front of vehicle, move it up and down to eliminate friction, and set steering wheel in straight ahead position.

Measure toe-in.

Measure distance "A" and "B" at the same height as hub cen-

Toe-in (Unladen): Refer to SDS (FA-52).

Adjust toe-in by varying the length of steering tie-rods.

(1) Loosen clamp bolts or lock nuts.

(2) Adjust toe-in by turning the left and right tie-rod tubes an equal amount.

Make sure that the tie-rod bars are screwed into the tie-rod tube more than 35 mm (1.38 in).

Make sure that the tie-rods are the same length.

Standard length (A = B):

2WD Trucks

344 mm (13.54 in) **Except 2WD Trucks**

281 mm (11.06 in)

(3) Tighten clamp bolts or lock nuts, then torque them.

FRONT WHEEL TURNING ANGLE

Set wheels in straight ahead position and then move vehicle forward until front wheels rest on turning radius gauge

Rotate steering wheel all the way right and left; measure turning angle.

Wheel turning angle: Refer to SDS (FA-52).

Adjust by stopper bolt if necessary.

Standard length "L1": 20 mm (0.79 in)

[2WD Trucks]

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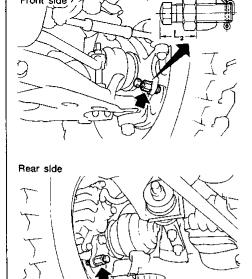
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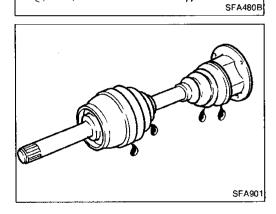
ON-VEHICLE SERVICE

Except 2WD Trucks Front side



Front Wheel Alignment (Cont'd)

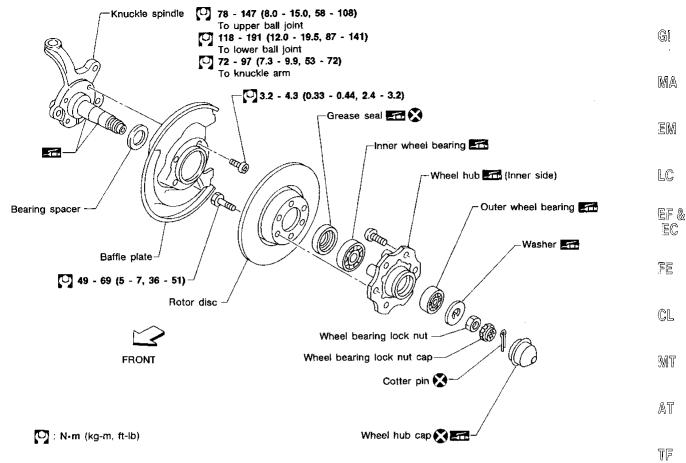
[Except 2WD Trucks]
Standard length "L2":
26.5 mm (1.043 in)
[Except tire size: 31x10.5R15]
37.5 mm (1.476 in)
[Tire size: 31x10.5R15]



Drive Shaft

• Check for grease leakage or other damage.

2WD TRUCKS



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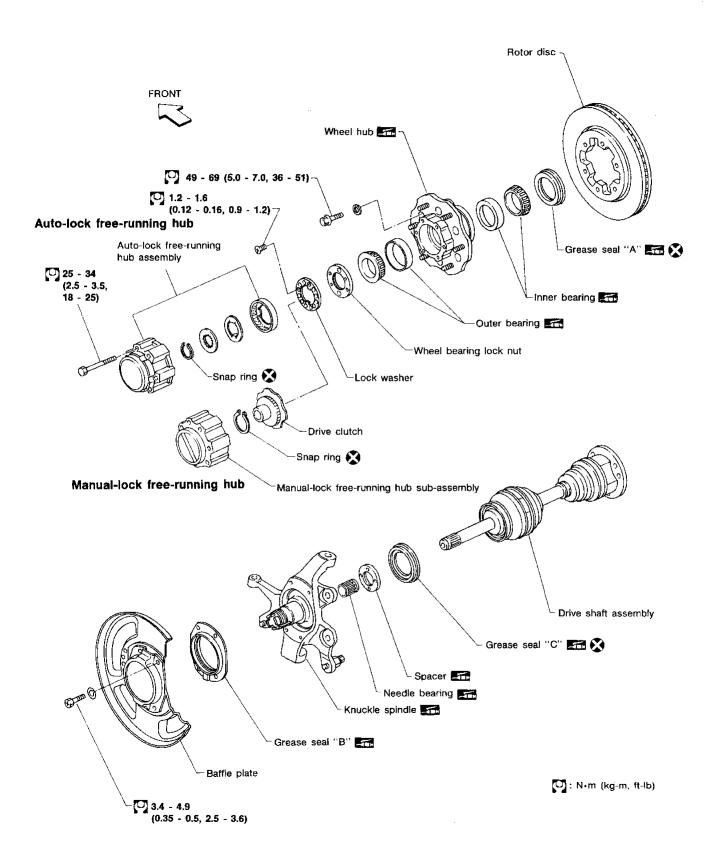
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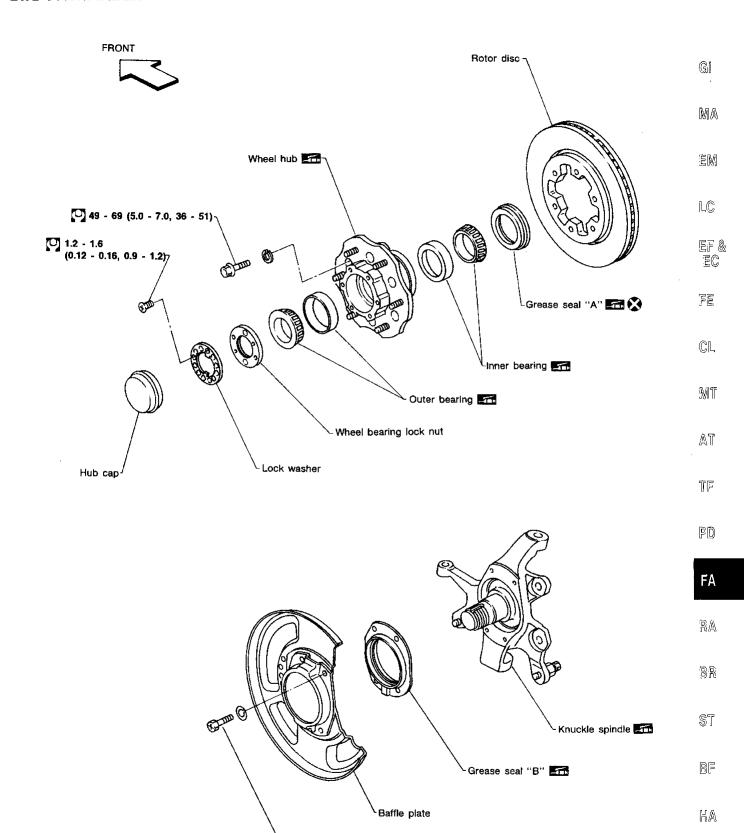
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2WD PATHFINDER

: N•m (kg-m, ft-lb)



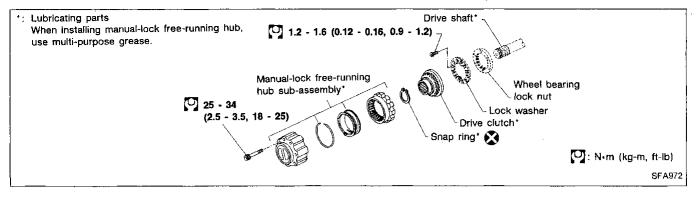
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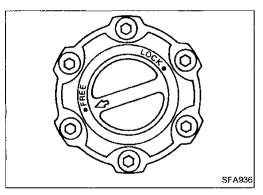
(0.35 - 0.5, 2.5 - 3.6)

3.4 - 4.9

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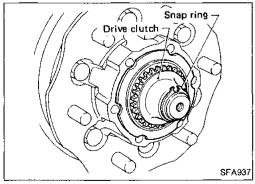
Manual-lock Free-running Hub





REMOVAL AND INSTALLATION

- Set knob of manual-lock free-running hub in position "Free".
- Remove manual-lock free-running hub with brake pedal depressed.



Remove snap ring and then draw out drive clutch.

 When installing manual-lock free-running hub, make sure the position is in "Free".

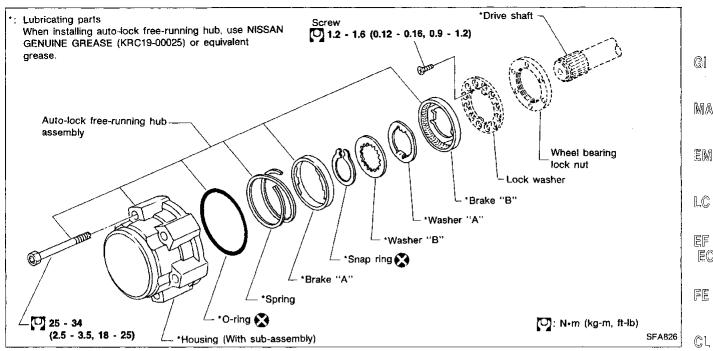
Apply multi-purpose grease to the parts shown in the above illustration.

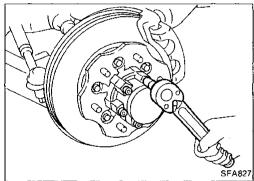
 Check operation of manual-lock free-running hub after installing it.

INSPECTION

- Check that knob moves smoothly and freely.
- Check that the clutch moves smoothly in the body.

Auto-lock Free-running Hub

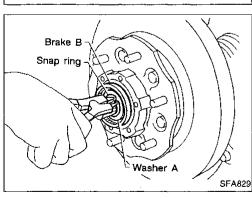






Set auto-lock free-running hub in position "Free".

Remove auto-lock free-running hub with brake pedal depressed.

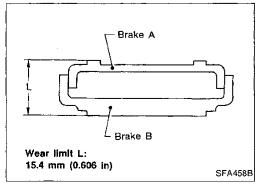


Remove snap ring.

Remove washer B, washer A and brake B.

After installing auto-lock free-running hub, check operation.

When installing it, apply recommended grease to the parts shown in the above illustration.



INSPECTION

Thoroughly clean parts with cleaning solvent and dry with compressed air.

Brake "A" and "B"

Measure the thickness "L" of brake "A" and "B". If thickness is less than the specified limit, replace brake "A" and "B" as a set.

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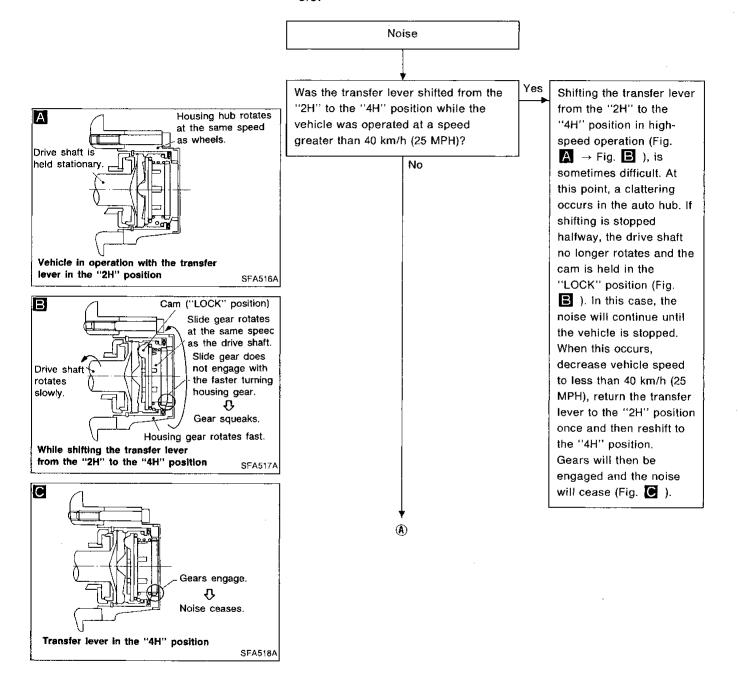
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Auto-lock Free-running Hub (Cont'd) TROUBLE-SHOOTING

Noise occurring in the auto hub under any of the conditions described below is not indicative of a problem. Noise can be eliminated by properly operating the transfer lever or the vehicle.



Auto-lock Free-running Hub (Cont'd)

Was the transfer lever shifted from the "2H" to the "4H" position while the vehicle was operated at a speed less than 40 km/h (25 MPH)?

When noise occurs in the auto hub while shifting from the "2H" to the "4H" position (Fig.

Yes

 $A \rightarrow Fig. B$), do not stop shifting halfway. When shifted to the "4H" position, the "4WD" pilot lamp will come on to indicate that the gears are engaged properly and that the vehicle is set in the 4WD mode. Noise will then cease (Fig. C). If shifting is stopped halfway, noise will continue. In such a case, return the transfer lever to the "2H" position once and re-shift it to the "4H" position. Gears will then be engaged and the

noise will cease (Fig.

(If the lever is left in the "2H" position, the noise will continue until the vehicle is stopped.)

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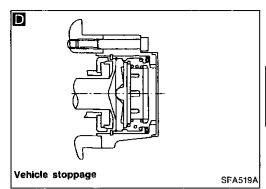
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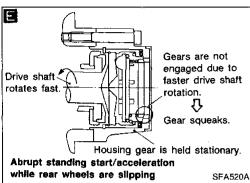
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Auto-lock Free-running Hub (Cont'd)





Was the vehicle started after the transfer lever was shifted from the "2H" to the "4H" or "4L" position?

No

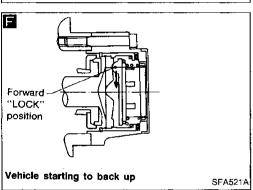
A clicking noise can sometimes occur in the auto hub when the gears are engaged. This is not a problem.

Noise can be encountered during rapid acceleration while rear wheels are slipping on snowy roads, muddy roads, slopes, etc. (Fig. ▶ → Fig. ▶).

In such a case, release the accelerator pedal to reduce engine speed.
Gears will then be engaged and the noise will cease (Fig. (C)).

Yes

Yes



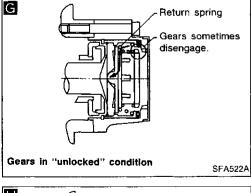
Was the vehicle backed up when the transfer lever was in the "4H" or the "4L" position, or was the vehicle backed up while on a downgrade when the transfer lever was in the "4H" or the "4L" position?

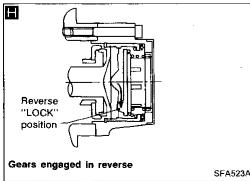
No

When backing up the vehicle with the transfer in the "4H" or the "4L" position, auto-hub gears sometimes disengage but soon reengage (Fig.

Fig. G → Fig.
 I) with a clicking noise. This is not a problem.

Noise will also occur if the vehicle is accelerated rapidly while the gears are disengaged. In such a case, release the accelerator pedal once to decrease engine speed. Gears will then be engaged and the noise will cease (Fig.).





Was the vehicle turned on a dry pavement, when the transfer lever was in the "4H" or the "4L" position?

hen the transfer lever was or the "4L" position?

No

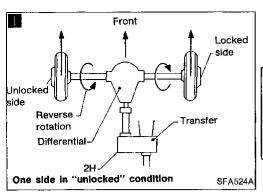
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Under these conditions, noise occurs in tires (creaking) or in the power train (rattling) — not in the auto hub.

Avoid driving in the conditions described above as it may lead to tire wear.

Auto-lock Free-running Hub (Cont'd)

Yes



Was the vehicle moved in one direction after the vehicle was driven in another direction when the transfer lever was in the "4H" or the "4L" position and then returned to the "2H" position?

No

Auto-hub gears will disengage with a resultant noise (clicking). If the distance the vehicle is moved in the opposite direction is short [less than 1 m (3 ft)] or if the rotation angle of the left and right wheels is not the same (as in rounding a corner), gears on one side will disengage (Fig.

condition, a noise (crushing, etc.) might occur while driving in the "2H" position. If only gears on one side are unlocked, the locked drive shaft rotates at the same speed as wheels: however, the unlocked drive shaft is made to rotate in the reverse direction by the differential. This forces the auto hub's slide gear to lock in the reverse direction. As a result, noise occurs. If this happens, slowly move the vehicle straight back approximately 2 to 3 m (7 to 10 ft) with the transfer lever in the "2H" position to disengage the gears on the other side.

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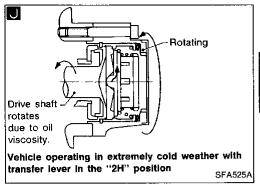
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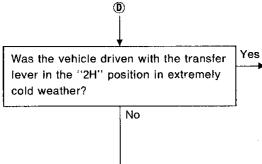
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Auto-lock Free-running Hub (Cont'd)



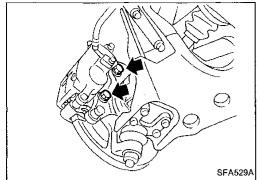


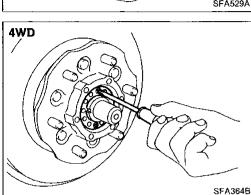
In extremely cold weather (areas), the viscosity of differential oil is greater than in moderate weather. When the auto hubs are unlocked with the transfer lever set to the "2H" position, one auto hub can sometimes remain locked.

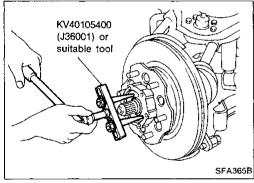
This causes noise during operation. Noise can also occur in the auto hub when the front propeller shaft is rotated due to the viscosity resistance of the transfer fluid (Fig.).

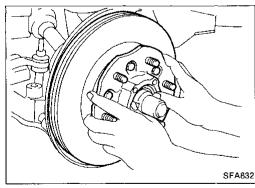
In such a case, drive in the "4H" position for approximately 10 minutes until the vehicle warms up, and return the transfer lever to the "2H" position to eliminate the noise.

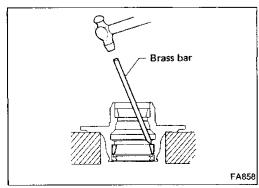
Disassemble and check the auto hub. (Refer to page FA-19.)











Wheel Hub and Rotor Disc

REMOVAL AND INSTALLATION

- Remove free-running hub assembly. Refer to FRONT AXLE (4WD) --- Auto-lock Free-running Hub or Manual-lock Free-running Hub.
- Remove brake caliper assembly.

Brake hose does not need to be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out.

Make sure brake hose is not twisted.

Remove lock washer. — 4WD and 2WD PATHFINDER —

Remove wheel bearing lock nut. 2WD Trucks: With suitable tool Except 2WD Trucks: With Tool

Remove wheel hub and wheel bearing.

Be careful not to drop outer bearing.

After installing wheel hub and wheel bearing, adjust wheel bearing preload.

Refer to PRELOAD ADJUSTMENT of Front Wheel Bearing in ON-VEHICLE SERVICE (FA-7).

DISASSEMBLY

Remove bearing outer races with suitable brass bar.

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Wheel Hub and Rotor Disc (Cont'd) INSPECTION

Thoroughly clean wheel bearings and wheel hub.

Wheel bearing

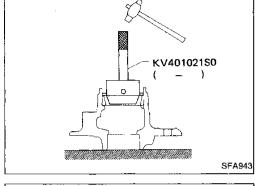
 Make sure wheel bearing rolls freely and is free from noise, crack, pitting or wear.

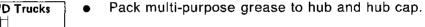
Wheel hub

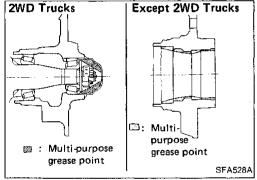
 Check wheel hub for crack by using a magnetic exploration or dyeing test.

ASSEMBLY

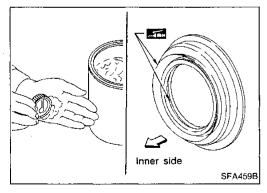
Install bearing outer race with Tool until it seats in hub.







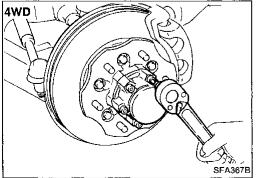
- Apply multi-purpose grease to each bearing cone.
- Pack grease seal lip with multi-purpose grease, then install it into wheel hub with suitable drift.



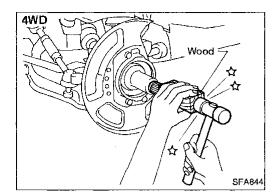
Knuckle Spindle

REMOVAL

Remove free-running hub assembly. — 4WD —
Refer to FRONT AXLE (4WD) — Auto-lock Free-running Hub
or Manual-lock Free-running Hub (FA-18).



FRONT AXLE



Knuckle Spindle (Cont'd)

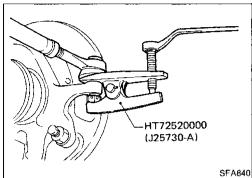
Separate drive shaft from knuckle spindle by slightly tapping drive shaft end. — 4WD —



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Separate tie-rod from knuckle spindle with Tool.

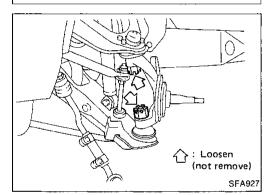
Install stud nut conversely on stud boit so as not to damage stud bolt.



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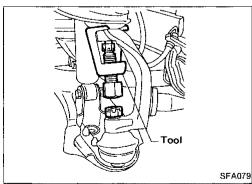
Separate knuckle spindle from ball joints.

(1) Loosen (not remove) upper and lower ball joint tightening nuts.

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(2) Separate knuckle spindle from upper and lower ball joint studs with Tool.

During above operation, never remove ball joint nuts which are loosened in step (1) above.

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Tool:

2WD Trucks ST29020001 (J24319-01)

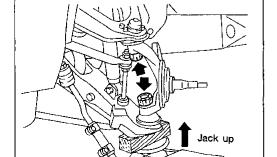
Except 2WD Trucks

HT72520000 (J25730-A)

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(3) Remove ball joint tightening nuts.

Support lower link with jack.

(4) Remove knuckle spindle from upper and lower links.

INSPECTION

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Knuckle spindle

Check knuckle spindle for deformation, cracks or other EL damage by using a magnetic exploration or dyeing test.

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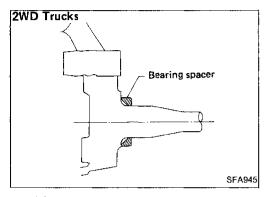
Knuckle Spindle (Cont'd)

Bearing spacer — 2WD Trucks —

Check bearing spacer for damage.

Needle bearing — 4WD —

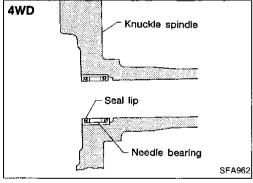
 Check needle bearing for wear, scratches, pitting, flaking and burn marks.



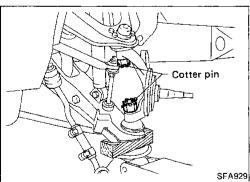
INSTALLATION

• Install bearing spacer onto knuckle spindle. — 2WD Trucks

Make sure that bearing spacer is facing in proper direction. Apply multi-purpose grease.



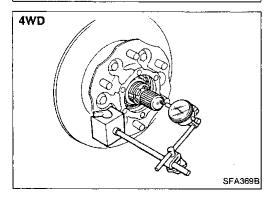
Install needle bearing into knuckle spindle. — 4WD —
 Make sure that needle bearing is facing in proper direction.
 Apply multi-purpose grease.



 Install knuckle spindle to upper and lower ball joints with lower link jacked up.

CAUTION:

Make sure that oil or grease does not come into contact with tapered areas of ball joint and knuckle spindle and threads of ball joint.

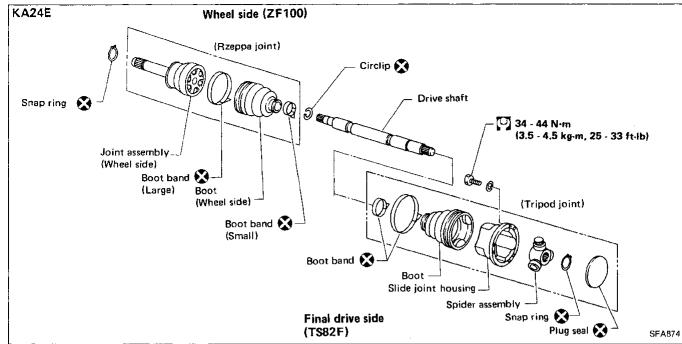


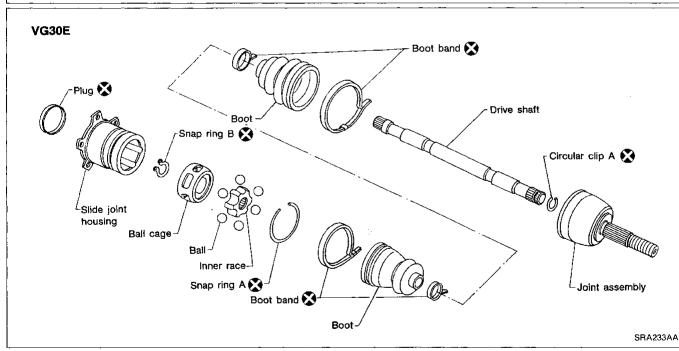
- After installing knuckle spindle, adjust wheel bearing preload. Refer to PRELOAD ADJUSTMENT of Front Wheel Bearing in ON-VEHICLE SERVICE (FA-7).
- After installing drive shaft, check drive shaft axial end play.

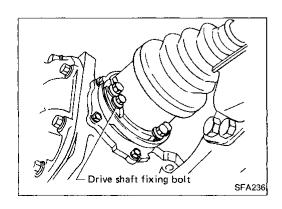
Do not reuse snap ring once it has been removed.

Refer to FRONT AXLE (4WD) — Drive shaft (FA-29).

Drive Shaft







REMOVAL

- 1. Remove bolts fixing drive shaft to final drive.
- Remove free-running hub assembly with brake pedal depressed. Refer to FRONT AXLE (4WD) — Auto-lock Freerunning Hub or Manual-lock Free-running Hub (FA-18).
- Remove brake caliper assembly without disconnecting brake hydraulic line.

Make sure that brake hose is not twisted.

 Remove tie-rod ball joint. Refer to FRONT AXLE (4WD) — Knuckle Spindle (FA-26).

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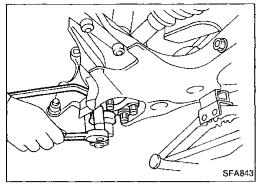
MA

Drive Shaft (Cont'd)



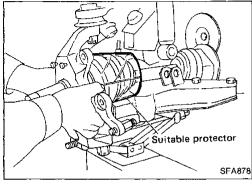
Support lower link with jack.

- 4. Remove upper ball joint fixing bolt.
- 5. Remove shock absorber lower bolt.

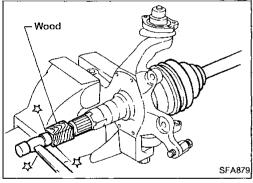


6. Remove drive shaft with knuckle.

Cover drive shaft boot with a suitable protector.



7. Separate drive shaft from knuckle by slightly tapping it.

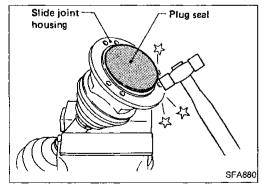


DISASSEMBLY

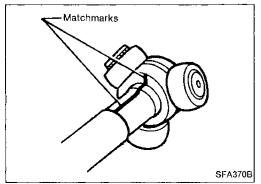
Final drive side

- TS82F type -

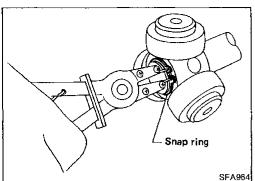
- 1. Remove plug seal from slide joint housing by lightly tapping around slide joint housing.
- 2. Remove boot bands.



Move boot and slide joint housing toward wheel side, and put matchmarks.



Drive Shaft (Cont'd)



4. Pry off snap ring.



Detach spider assembly with press.

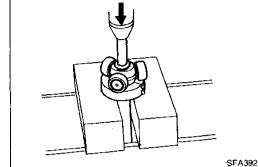


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EF & EC

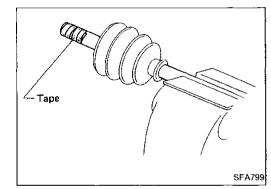
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6. Draw out boot.

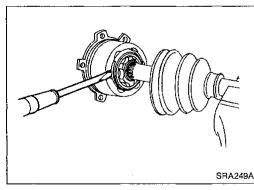
Cover drive shaft serration with tape so as not to damage the MT



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— DS90 type —

Remove boot bands.

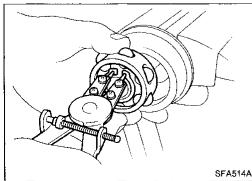
2. Put matching marks on slide joint housing and inner race,

before separating joint assembly.

Pry off snap ring "A" with a screwdriver, and pull out slide RA joint housing.







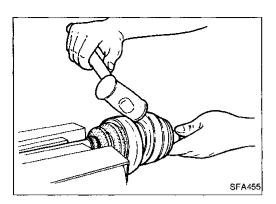
Put matching marks on inner race and drive shaft.

Pry off snap ring "B", then remove ball cage, inner race and balls as a unit.

6. Draw out boot.

boot.





Drive Shaft (Cont'd)

Wheel side (ZF100)

CAUTION:

The joint on the wheel side cannot be disassembled.

- Before separating joint assembly, put matching marks on drive shaft and joint assembly.
- Separate joint assembly with suitable tool.

Be careful not to damage threads on drive shaft.

Remove boot bands.

INSPECTION

Thoroughly clean all parts in cleaning solvent, and dry with compressed air. Check parts for evidence of deformation or other damage.

Drive shaft

Replace drive shaft if it is twisted or cracked.

Boot

Check boot for fatigue, cracks, or wear. Replace boot with new boot bands.

Joint assembly (Final drive side)

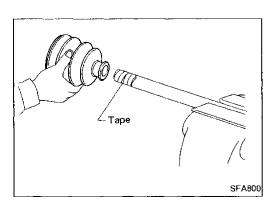
- Replace any parts of double offset joint which show signs of scorching, rust, wear or excessive play.
- Check serration for deformation. Replace if necessary.
- Check slide joint housing for any damage. Replace if necessary.

Joint assembly (Wheel side)

Replace joint assembly if it is deformed or damaged.

ASSEMBLY

- After drive shaft has been assembled, ensure that it moves smoothly over its entire range without binding.
- Use NISSAN GENUINE GREASE or equivalent after every overhaul.

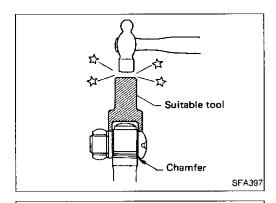


Final drive side

— TS82F type —

 Install new small boot band, boot and side joint housing to drive shaft.

Cover drive shaft serration with tape so as not to damage boot during installation.



Length "L₁": 102 - 104 mm (4.02 - 4.09 in) [

Drive Shaft (Cont'd)

- Install spider assembly securely, ensuring marks are properly aligned.
- Press-fit with spider assembly serration chamfer facing shaft.
- 3. Install new snap ring.



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. Pack with grease.

Specified amount of grease: 150 - 160 g (5.29 - 5.64 oz)

LC

 Set boot so that it does not swell and deform when its length is "L₁".

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Make sure that boot is properly installed on the drive shaft groove.

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- 6. Lock new larger boot band securely with a suitable tool, then lock new smaller boot band.
- Install new plug seal to slide joint housing by lightly tapping it

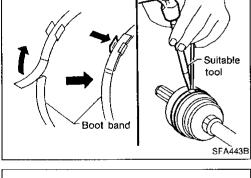
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Apply sealant to mating surface of plug seal.

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— DS90 type —

1. Install boot and new small boot band on drive shaft.

Cover drive shaft serration with tape so as not to damage boot

during installation.

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Securely install ball cage, inner race and balls as a unit, making sure the marks which were made during disassembly are properly aligned.

3. Install new snap ring "B".

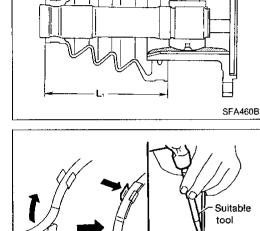
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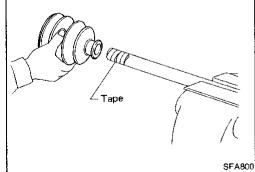
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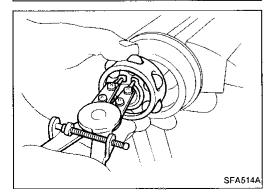
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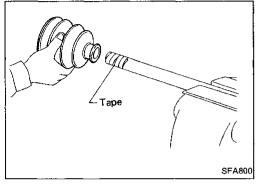


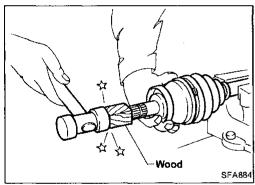


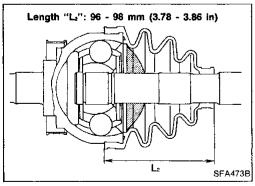


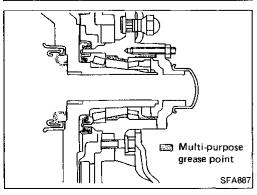
FRONT AXLE (4WD)

Length "L₁": 93 - 95 mm (3.66 - 3.74 in) SFA472B









Drive Shaft (Cont'd)

Pack drive shaft with specified amount of grease.

Specified amount of grease:

165 - 175 g (5.82 - 6.17 oz)

Install slide joint housing, then install new snap ring "A".

Set boot so that it does not swell and deform when its length is "L1".

Make sure that boot is properly installed on the drive shaft groove.

7. Lock new larger and smaller boot bands securely with a suitable tool.

Wheel side (ZF100)

1. Install new small boot band and boot on drive shaft.

Cover drive shaft serration with tape so as not to damage boot during installation.

Set joint assembly onto drive shaft by lightly tapping it. Install joint assembly securely, ensuring marks which were made during disassembly are properly aligned.

Pack drive shaft with specified amount of grease.

Specified amount of grease:

210 - 220 g (7.41 - 7.76 oz)

Set boot so that it does not swell and deform when its length is "L2".

Make sure that boot is properly installed on the drive shaft groove.

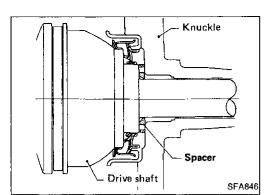
- Lock new larger boot band securely with a suitable tool. 5.
- Lock new smaller boot band.

INSTALLATION

Apply multi-purpose grease.

FRONT AXLE (4WD)

Drive Shaft (Cont'd)



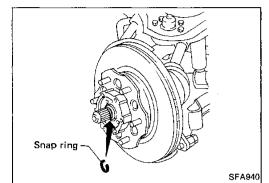
Install bearing spacer onto drive shaft.
 Make sure that bearing spacer is facing in proper direction.



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 When installing drive shaft, adjust drive shaft axial end play by selecting a suitable snap ring.

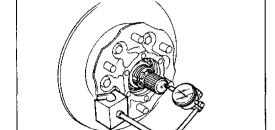
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(1) Temporarily install new snap ring on drive shaft in the same thickness as it was installed before removal.

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(2) Set dial gauge on drive shaft end.

(3) Measure axial end play of drive shaft.

Axial end play: 0.1 - 0.3 mm (0.004 - 0.012 in)

(4) If axial end play is not within the specified limit, select another snap ring.

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1.1 mm (0.043 in)

1.3 mm (0.051 in)

1.5 mm (0.059 in)

1.7 mm (0.067 in)

1.9 mm (0.075 in)

2.1 mm (0.083 in)

2.3 mm (0.091 in)

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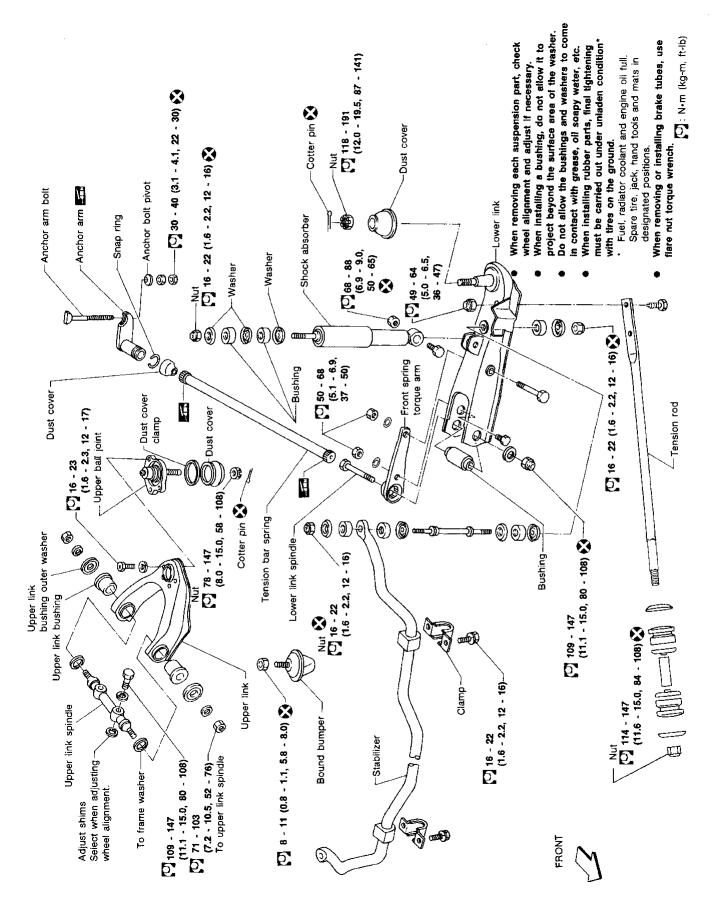
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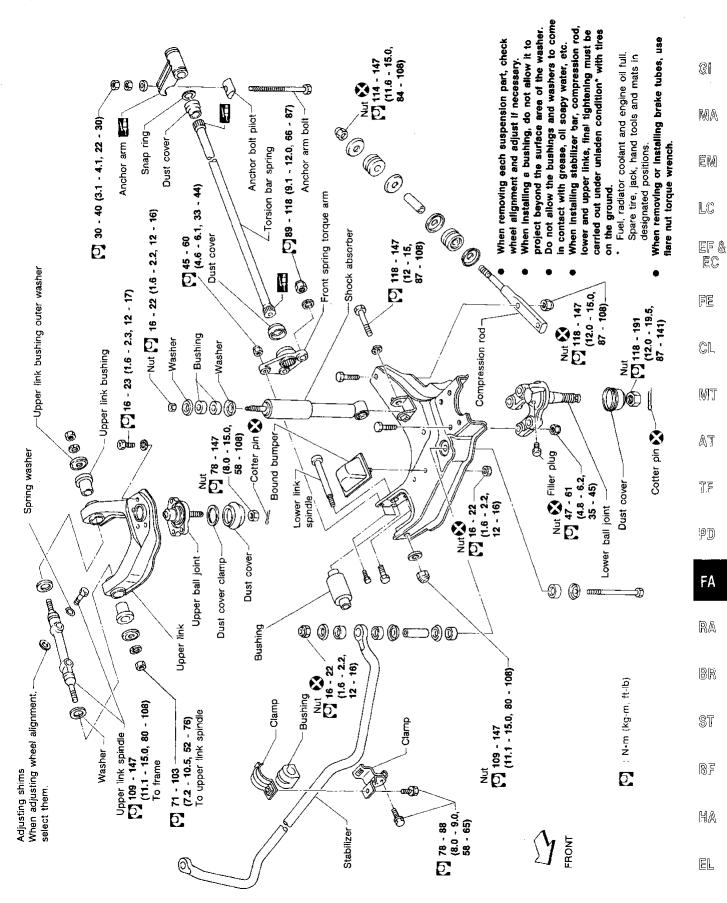
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2WD TRUCKS



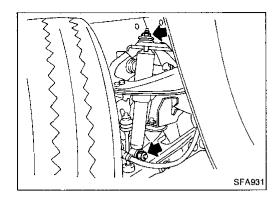
SFA557B

EXCEPT 2WD TRUCKS



SFA558B

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Shock Absorber

REMOVAL AND INSTALLATION

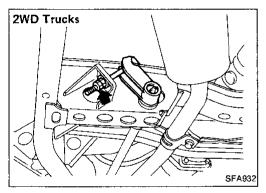
When removing and installing shock absorber, do not allow oil or grease to come into contact with rubber parts.

INSPECTION

Wash all parts, except for nonmetallic parts, clean with suitable solvent and dry with compressed air.

Blow dirt and dust off of nonmetallic parts with compressed air.

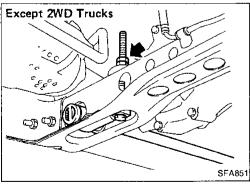
- Check for oil leakage and cracks. Replace if necessary.
- Check piston rod for cracks, deformation or other damage.
 Replace if necessary.
- Check rubber parts for wear, cracks, damage or deformation. Replace if necessary.



Torsion Bar Spring

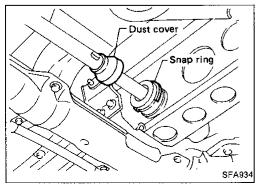
REMOVAL

Remove adjusting nut.



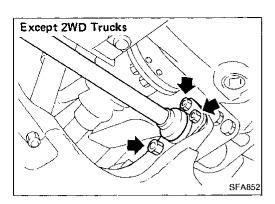
- Move dust cover, then detach snap ring from anchor arm.

 Dull out anchor arm required then with draw to refer to the control of the
- Pull out anchor arm rearward, then withdraw torsion bar spring rearward. — 2WD Trucks —
- Remove torque arm. 2WD Trucks —



FA-38 940

other damage.



Torsion Bar Spring (Cont'd)

Remove torque arm fixing nuts, then withdraw torsion bar spring forward with torque arm. — Except 2WD Trucks —

INSPECTION

Check torsion bar spring for wear, twist, bend and other damage.

Check serrations of each part for cracks, wear, twist and

Check dust cover for cracks.

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INSTALLATION AND ADJUSTMENT

Adjustment of anchor arm adjusting nut is in tightening direction only.

Do not adjust by loosening anchor arm adjusting nut.

Install torque arm to lower link. — 2WD Trucks —

Coat multi-purpose grease on the serration of torsion bar spring.

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Place lower link in the position where bound buffer clearance "C" is 0. Clearance "C": 0 mm (0 in)

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Install torsion bar spring with torque arm. — Except 2WD Trucks ---

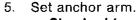
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Be sure to install right and left torsion bar springs correctly.

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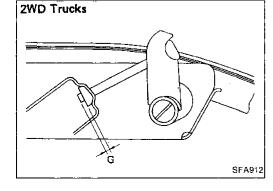
Standard length "G": **2WD Trucks** 6 - 18 mm (0.24 - 0.71 in) **Except 2WD Trucks** 50 - 60 mm (1.97 - 2.36 in)

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Bound

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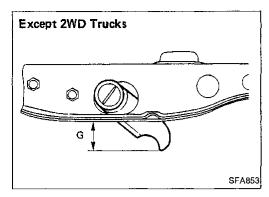
SFA549

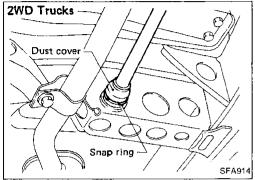
SFA854

link



Torsion Bar Spring (Cont'd)

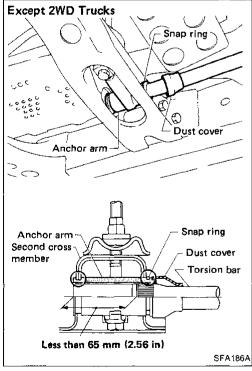




6. Install snap ring to anchor arm and dust cover.

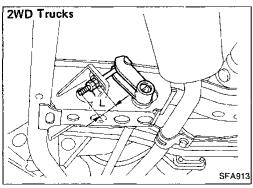
— 2WD Trucks —

Make sure that snap ring is properly installed on the anchor arm groove.



- Except 2WD Trucks -

Make sure that snap ring and anchor arm are properly installed.



7. Tighten anchor arm adjusting nut to get L dimension.

Standard length "L":

2WD Trucks

For Heavy Duty, Cab & Chassis and

STD models

35 mm (1.38 in)

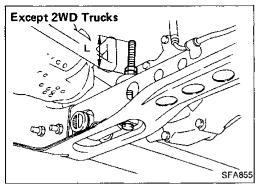
Except above models

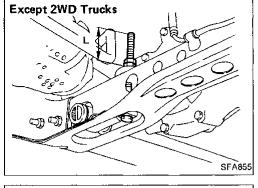
49 mm (1.93 in)

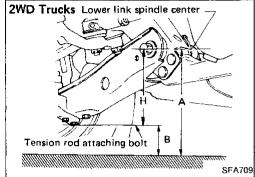
Except 2WD Trucks

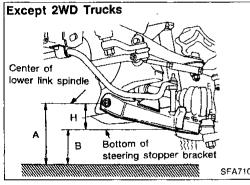
77 mm (3.03 in)

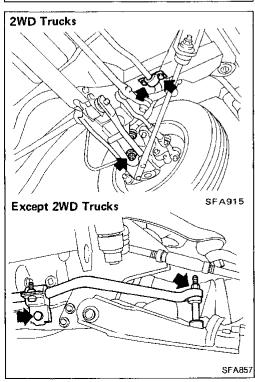
Torsion Bar Spring (Cont'd)











Bounce vehicle with tires on ground (Unladen) to eliminate friction of suspension.

Measure vehicle posture "H".

(1) Exercise the front suspension by bouncing the front of the vehicle 4 or 5 times to ensure that the vehicle is in a neutral height attitude.

(2) Measure vehicle posture ... Dimension "H".

H = A - B mm (in) "Unladen" Refer to WHEEL ALIGNMENT (Unladen) on SDS (FA-52).

10. If height of the vehicle is not within allowable limit, adjust vehicle posture.

Refer to WHEEL ALIGNMENT (Unladen) on SDS (FA-52).

11. Check wheel alignment if necessary. Refer to WHEEL ALIGNMENT (Unladen) on SDS (FA-52).

Stabilizer Bar

REMOVAL

Remove stabilizer bar connecting bolt and a clamp bolt.

INSPECTION

Check stabilizer bar for twist and deformation. Replace if necessary.

Check rubber bushing for cracks, wear or deterioration. Replace if necessary.

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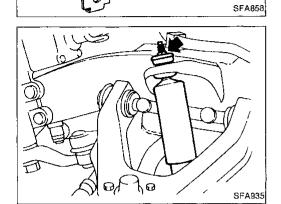
[DX

FA-41

- White mark

Stabilizer Bar (Cont'd) INSTALLATION

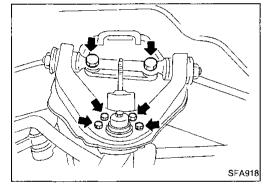
Install bushing outside white mark painted on stabilizer.



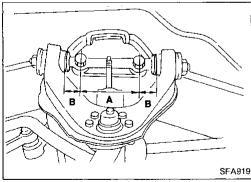
Upper Link

REMOVAL

Remove shock absorber upper fixing nut.



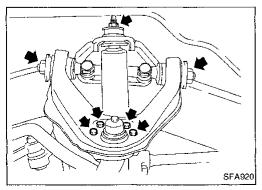
- Remove bolts fixing upper ball joint on upper link.
 Support lower link with jack.
- Remove upper link spindle fixing bolts.



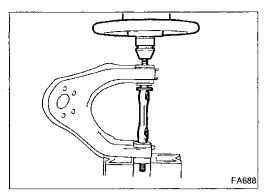
INSTALLATION

- Tighten upper link spindle with camber adjusting shims.
- After fitting, check dimensions "A" and "B".

A: 110 mm (4.33 in) B: 32 mm (1.26 in)



- Install upper ball joint on upper link.
- Install shock absorber upper fixing nut.
- Tighten upper link spindle lock nuts under unladen condition with tires on ground.
- After installing, check wheel alignment. Adjust if necessary. Refer to Front Wheel Alignment of ON-VEHICLE SER-VICE (FA-9).



Suitable

Inner

washers

2WD Trucks

Upper Link (Cont'd)

DISASSEMBLY

Press out upper link spindle with bushings.

INSPECTION

- Check upper link spindle and rubber bushings for damage. Replace if necessary.
- Check upper link for deformation or cracks. Replace if necessary.

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ASSEMBLY

Upper link

bushing

Upper link

SFA102

SFA103

SFA921

- Apply soapsuds to rubber bushing.
- Press upper link bushing.

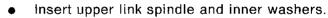
Press bushing so that flange of bushing securely contacts end surface of upper link collar.

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Install inner washers with rounded edges facing inward.

MT.

Press another bushing.

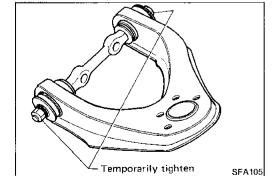
Press bushing so that flange of bushing securely contacts end surface of upper link collar.

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Temporarily tighten nuts.

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Tension Rod or Compression Rod REMOVAL AND INSTALLATION

Remove fixing nuts on lower link and frame.

Support lower link with jack.

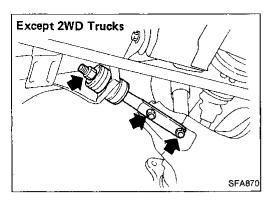
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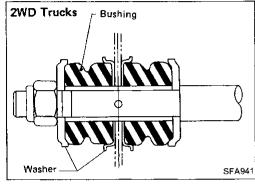
FA-43



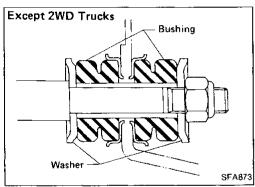
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Tension Rod or Compression Rod (Cont'd)

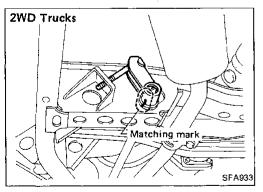




Install tension rod. — 2WD Trucks —
 Make sure that bushings and washers are installed properly.



Install compression rod. — Except 2WD Trucks —
 Make sure that bushings and washers are installed properly.

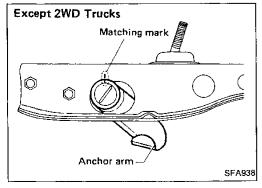


Lower Link

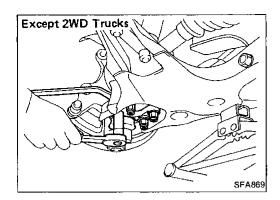
REMOVAL AND INSTALLATION

 Remove torsion bar spring. Refer to REMOVAL of Torsion Bar Spring (FA-38).

Make matching mark on anchor arm and crossmember when loosening adjusting nut until there is no tension on torsion bar spring.



Lower Link (Cont'd)



Separate lower link ball joint from knuckle spindle (FA-26). - 2WD Trucks -

Refer to FRONT AXLE — Knuckle Spindle (FA-26).

Separate lower ball joint from lower link. — Except 2WD Trucks -

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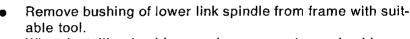
Remove front lower link fixing nut.

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When installing bushing, apply soapy water on bushing. After installing lower link, adjust wheel alignment and vehi-

cle height. Refer to Front Wheel Alignment of ON-VEHICLE AT SERVICE (FA-9).

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SFA872

Suitable tool

Lower link and lower link spindle

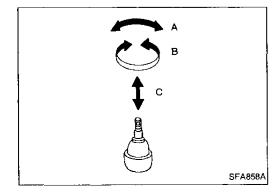
Check lower link and lower link spindle for deformation or cracks. Replace if necessary.

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Lower link bushing

Check bushing for distortion or other damage. Replace if necessary.

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Upper Ball Joint and Lower Ball Joint

REMOVAL AND INSTALLATION

Separate knuckle spindle from upper and lower links. Refer to FRONT AXLE — Knuckle Spindle (FA-26).

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INSPECTION

Check ball joint for turning torque "A".

Upper ball joint:

31.87 - 199.38 N

(3.25 - 20.33 kg, 7.17 - 44.83 lb)

FA-45

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Upper Ball Joint and Lower Ball Joint (Cont'd)

```
Lower ball joint:
[2WD Trucks]
13.63 - 54.43 N
(1.39 - 5.55 kg, 3.06 - 12.24 lb)
[Except 2WD Trucks]
0 - 67.7 N
(0 - 6.9 kg, 0 - 15.2 lb)
```

If turning torque A is not within above specifications, replace ball joint assembly.

Check ball joint for turning torque "B".

```
Upper ball joint:
    1.0 - 4.9 N·m
    (10 - 50 kg-cm, 8.7 - 43.4 in-lb)

Lower ball joint:
    [2WD Trucks]
    1.0 - 3.9 N·m
    (10 - 40 kg-cm, 8.7 - 34.7 in-lb)
    [Except 2WD Trucks]
    0 - 4.9 N·m
    (0 - 50 kg-cm, 0 - 43 in-lb)
```

If turning torque B is not within above specifications, replace ball joint assembly.

Check ball joint for vertical end play "C".

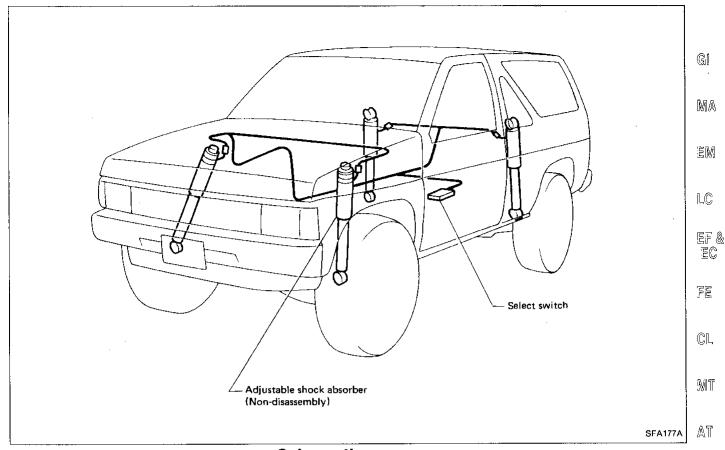
```
Upper ball joint:
1.6 mm (0.063 in) or less
Lower ball joint:
[2WD Trucks]
1.6 mm (0.063 in) or less
[Except 2WD Trucks]
0.5 mm (0.020 in) or less
```

Replace ball joint if movement is beyond specifications.

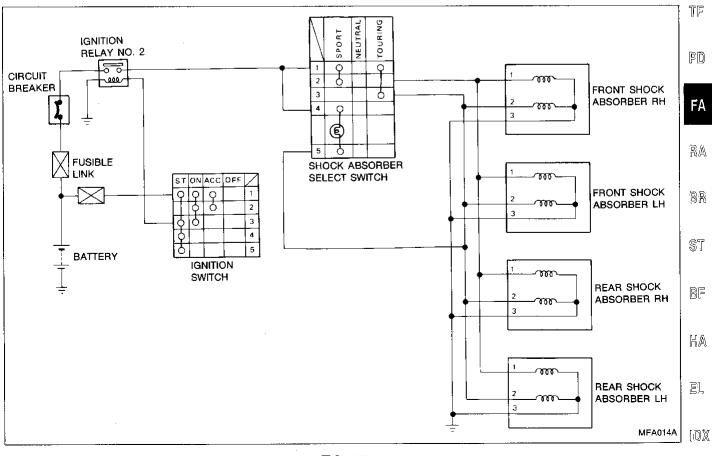
Check dust cover for damage.
 Replace dust cover and dust cover clamp if necessary.

ADJUSTABLE SHOCK ABSORBER

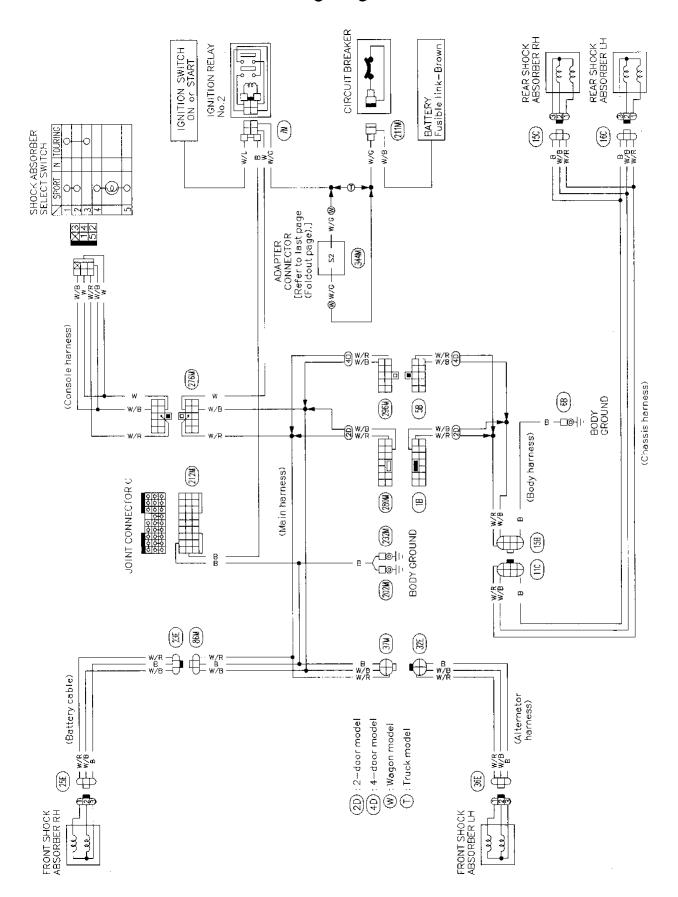
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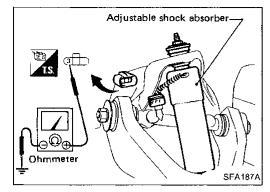
Schematic

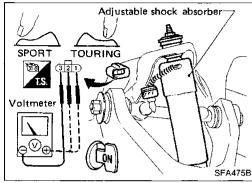


Wiring Diagram



ADJUSTABLE SHOCK ABSORBER





Terminal Check

POWER SUPPLY CIRCUIT CHECK

- Disconnect adjustable shock absorber connector.
- Check for continuity between terminal 3 and body ground.

Ohmmetei	r terminal	Continuity
(+)	()	Continuity
3	Body ground	Yes

EM

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- Connect a voltmeter from terminal side.
- Measure voltage across terminal 3 and terminals 2 &

Voltr	neter	Valtana	Colored and the land the	er &
(+)	(-)	Voltage	Select switch position	EC
1		Approx. 12V	Push the SPORT end of the switch continuously.	FE
		0	Release the switch.	
2	3	Approx. 12V	Push the TOURING end of the switch continuously.	CL
		0	Release the switch.	
41. 4.414	•	•	· · · · · · · · · · · · · · · · · · ·	MT

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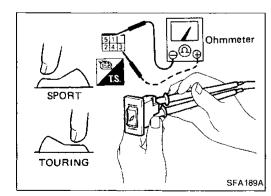
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SELECT SWITCH CHECK

- Disconnect select switch connector, then connect an ohmmeter to switch.
- Check for continuity between terminals at each switch position.

Curitab position			Terminal		
Switch position	1	2	3	4	(5)
NEUTRAL				<i>⊶6</i> 0	<i>y</i> _°
SPORT	0			Appro	x 200
TOURING	0-		— o	Approx. 20Ω	

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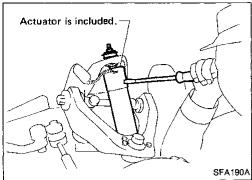
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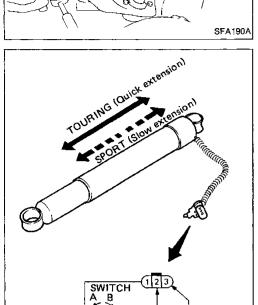
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ADJUSTABLE SHOCK ABSORBER





TOURING

Battery

SFA191A

SPORT

Shock Absorber Check

[Method A]

Attach a suitable tool to the shock absorber. Check operating sound of the actuator when the select switch is moved from one position (SPORT) to the other (TOURING) and vice versa.

[Method B]

- 1. Compress the shock absorber as much as possible.
- 2. Apply battery voltage across terminals (3 and 1, 3 and 2) of the shock absorber.
- Check if speed varies with expansion of the shock absorber when switching to A side and B side.
 If speed changes, the actuator is functioning properly. (In other words, oil passages in the shock absorber are properly switched by the actuator.)

General Specifications

TORSION BAR SPRING

j					
Applied model	.2WD		4WD	Pathfinder	
	Except Heavy duty	Heavy duty	1 400		
Spring diameter x length mm (in)	22.6 x 885 (0.890 x 34.84)	24.4 x 885 (0.961 x 34.84)	26.0 x 1,205 (1.024 x 47.44)	26.0 x 1,230 (1.024 x 48.43)	
Spring constant N/mm (kg/mm, lb/in)	16.5 (1.68, 94.1)	22.8 (2.32, 129.9)	25.7 (2.62, 146.7)	25.3 (2.58, 144.5)	

SHOCK ABSORBER

		Truck						LC	
Applied model	2WD		4٧	4WD		Pathfinder			
Applica model	Except Heavy duty	Heavy duty	Except Canada	Canada		, animao		EF &	
0							Adjustable		
Shock absorber type			Non-adjustable	1		Touring	Sport	FE	
Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb)								۸٦	
Expansion	579 - 794 (59 - 81, 130 - 179)	1,089 - 1,461 (111 - 149, 245 - 329)	1,599 - 2,128 (163 - 217, 359 - 478)	1,687 - 2,236 (172 - 228, 379 - 503)	2,501 - 3,285 (255 - 335, 562 - 739)	2,491 - 3,295 (254 - 336, 560 - 741)	2,972 - 3,933 (303 - 401, 668 - 884)	CL Mis	
Compression	216 - 333 (22 - 34, 49 - 75)	314 - 471 (32 - 48, 71 - 106)	559 - 814 (57 - 83, 126 - 183)	432 - 647 (44 - 66, 97 - 146)	883 - 1,275 (90 - 130, 198 - 287)	716 - 1,069 (73 - 109, 161 - 240)	1,334 - 1,903 (136 - 194, 300 - 428)	- M1 - AT	

STABILIZER BAR

Applied model	2WD Truck	Except 2WD Truck
Stabilizer bar diameter mm (in)	23.0 (0.906)	24.0 (0.945)

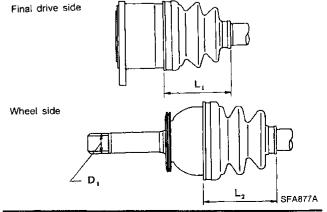
TENSION ROD OR COMPRESSION ROD

Rod diameter mm (in) 22.0 (0.866) 23.5 (0.925)	Applie	ed model	2WD Truck	Except 2WD Truck
	Rod diameter	mm (in)	22.0 (0.866)	23.5 (0.925)

DRIVE SHAFT (4WD models)

Applied model	KA24E	VG30E	
Drive shaft joint type			
Final drive side	TS82F	DS90	
Wheel side	ZF100	ZF100	
Fixed joint axial end play limit mm (in)	0.1 (0	0.004)	
Diameter mm (in)	 		
Wheel side (D ₁)	29.0 (1.142)		
Grease			
Quality	_	ne grease or alent	
Capacity g (oz)			
Final drive side	150 - 160 (5.29 - 5.64)	165 - 175 (5.82 - 6.17)	
Wheel side	210 - 220 (7.41 - 7.76)	

Applied model	KA24E	VG30E	
Boot length mm (in)			
Final drive side (L ₁)	102 - 104 (4.02 - 4.09)	93 - 95 (3.66 - 3.74)	
Wheel side (L ₂)	96 - 98 (3.78 - 3.86)		



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SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

Applied model F		ALLOWA	BLE LIMIT	ADJUSTING RANGE		
Applied	i model	2WD Truck	Except 2WD Truck	2WD Truck	Except 2WD Truck	
Camber	degree	-0°20' to 1°10'	-0°05' to 1°25'	-0°05' to 0°55'	0°10′ - 1°10′	
Caster	degree	-0°23′ to 1°07′	0°33′ - 2°03′	-0°08' to 0°52'	0°48′ ~ 1°48′	
Kingpin inclination	degree	8°20′ - 9°50′	7°21′ - 8°51′	8°35′ - 9°35′	7°36′ - 8°36′	
Camber, caster, and kingpin inclinding	nation degree		4	5'		
Toe-in						
Radial tire						
A – B n	mm (in)	1 - 5 (0.04 - 0.20)	2 - 6 (0.08 - 0.24)	2 - 4 (0.08 - 0.16)	3 - 5 (0.12 - 0.20)	
Total angle 20	degree	5' - 25'	9' - 29'	10' - 20'	14' - 24'	
Front wheel turning angle						
Full turn*2	degree					
Except 31 x 10.5R15 tire						
Inside		34° - 38° 31° - 35°		36° - 38°	33° - 35°	
Outside		31° - 35°	29° - 33°	33° - 35°	. 31° - 33°	
31 x 10.5R15 tire						
Inside			25° - 29°	_	27° - 29°	
Outside			23° - 27°		25° - 27°	
Vehicle posture						
Lower arm pivot height (H)	mm (in)	108 - 118 (4.25 - 4.65)	41 - 51 (1.61 - 2.01)	111 - 115 (4.37 - 4.53)	44 - 48 (1.73 - 1.89)	
		2WD Trucks Lower I	ink spindle center —	Except 2WD Trucks		
	•	Tension rod attachin	ng bolt B SFA709		ttom of ering stopper bracket	

^{*1:} Fuel, radiator, coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

^{*2:} On power steering models, wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle.

SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment (Cont'd) DRIVE SHAFT

WHEEL BEARING

2WD Trucks

Wheel bearing axial end play mm (in)	0 (0)
Wheel bearing lock nut Tightening torque	34 - 39
N-m (kg-m, ft-lb)	(3.5 - 4.0, 25 - 29)
Return angle degree	45° - 60°
Wheel bearing starting torque	
At wheel hub bolt With new grease seal N (kg, lb)	9.8 - 28.4 (1.0 - 2.9, 2.2 - 6.4)
With used grease seal N (kg, lb)	9.8 - 23.5 (1.0 - 2.4, 2.2 - 5.3)

Except 2WD Trucks

Wheel bea	ring lock nut		
Tighte	ning torque N·ก	78 - 98 (8 - 10, 58 - 72)	
-	tening torque wheel bearing Nor		0.5 - 1.5 (0.05 - 0.15, 0.4 - 1.1)
Axial	end play	mm (in)	0 (0)
Startir bolt	ng force at w	neel hub N (kg, lb)	A
Turnin	g angle	degree	15° - 30°
Startir bolt	ng force at w	heel hub N (kg, lb)	В
Wheel bea	ring preload	at wheel N (kg, lb)	
B - A			7.06 - 20.99 (0.72 - 2.14, 1.59 - 4.72)

WHEEL RUNOUT AVERAGE*

Wheel type	Alu- minum	Steel		
		de tarbar	14 inches	
		15 inches	Painted	Plated
Radial runout limit : mm (in)	0.3 (0.012)	0.8 (0.031)	0.5 (0.020)	0.6 (0.024)
Lateral runout limit mm (in)	0.3 (0.012)	0.8 (0.031)	0.8 (0.031)	0.8 (0.031)

^{*} Wheel runout average = (Outside runout value + Inside runout value) x 0.5

Drive shaft axial end play 0.1 - 0.3 (0.004 - 0.012)

Drive shaft end snap ring

Part No.	Thickness mm (in)
39253-88G10	1.1 (0.043)
39253-88G11	1.3 (0.051)
39253-88G12	1.5 (0.059)
39253-88G13	1.7 (0.067)
39253-88G14	1.9 (0.075)
39253-88G15	2.1 (0.083)
39253-88G16	2.3 (0.091)

UPPER BALL JOINT

Applied model	2WD Trucks	Except 2WD Trucks
Turning torque "A" (Measuring point: cotter pin hole of ball stud) N (kg, lb)	• -	199.38 7.17 ~ 44.83)
Turning torque "B" N·m (kg-cm, in-lb)		- 4.9 8.7 - 43.4)
Vertical end play limit "C" mm (in)	1.6 (0	0.063)

LOWER BALL JOINT

Applied model	2WD Trucks	Except 2WD Trucks
Turning torque "A" (Measuring point: cotter pin hole of balf stud) N (kg, lb)	13.63 - 54.43 (1.39 - 5.55, 3.06 - 12.24)	0 - 67.7 (0 - 6.9, 0 - 15.2)
Turning torque "B" N·m (kg-cm, in-lb)	1.0 - 3.9 (10 - 40, 8.7 - 34.7)	0 - 4.9 (0 - 50, 0 - 43)
Vertical end play limit "C" mm (in)	1.6 (0.063)	0.5 (0.020)



























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ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS



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CCELERATOR CONTROL SYSTEM2	FUEL SYSTEM 3
Adjusting Accelerator Wire2	EXHAUST SYSTEM5

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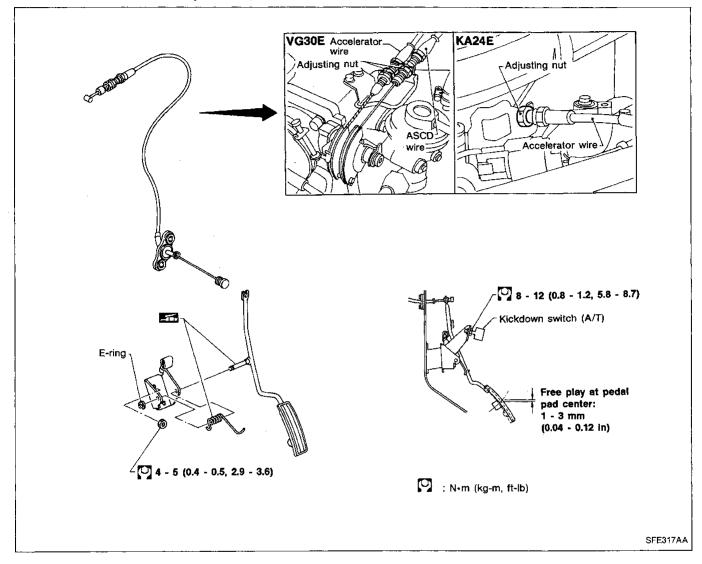
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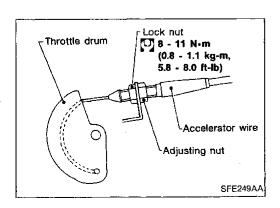
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CAUTION:

- When removing accelerator wire, make a mark to indicate lock nut's initial position.
- Check that throttle valve opens fully when accelerator pedal is fully depressed and that it returns to idle position when pedal is released.
- Check accelerator control parts for improper contact with any adjacent parts.
- When connecting accelerator wire, be careful not to twist or scratch its inner wire.
- Refer to EL section for ASCD wire adjustment.
- For A/T throttle wire adjustment, refer to "ON-VEHICLE SERVICE" in AT section.





Adjusting Accelerator Wire

- 1. Loosen lock nut, and tighten adjusting nut until throttle drum starts to move.
- 2. From that position turn back adjusting nut 1.5 to 2 turns, and secure lock nut.

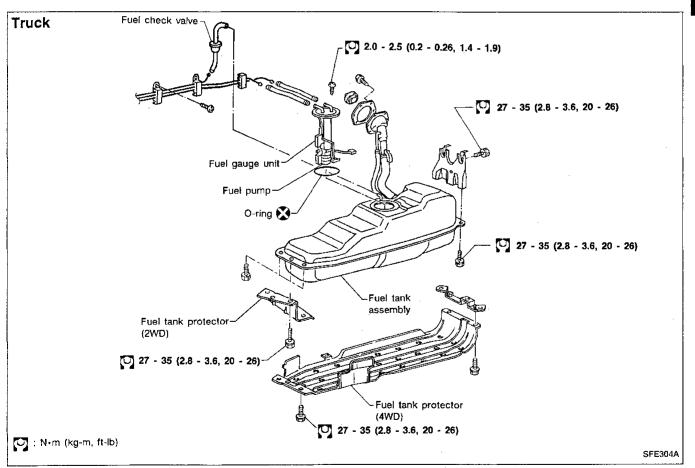
WARNING:

When replacing fuel line parts, be sure to observe the following:

- Put a "CAUTION: INFLAMMABLE" sign in workshop.
- Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Be sure to furnish the workshop with a CO₂ fire extinguisher.
- Be sure to disconnect battery ground cable before conducting operations.
- Drain fuel from Fuel Tank and put drained fuel in an explosion-proof container and attach lid securely.

CAUTION:

- Before disconnecting fuel hose, release fuel pressure from fuel line. Refer to the "Changing Fuel Filter" in MA section.
- Do not disconnect any fuel line unless absolutely necessary.
- Plug hose and pipe openings to prevent entry of dust or dirt.
- Always replace O-ring with new ones.
- Do not kink or twist hose and tube when they are installed.
- Do not tighten hose clamps excessively to avoid damaging hoses.
- When installing fuel check valve, be careful of its designated direction. (Refer to EVAPORATIVE EMISSION SYSTEM in EF & EC section.)
- After installation, run engine and check for fuel leaks at connections.



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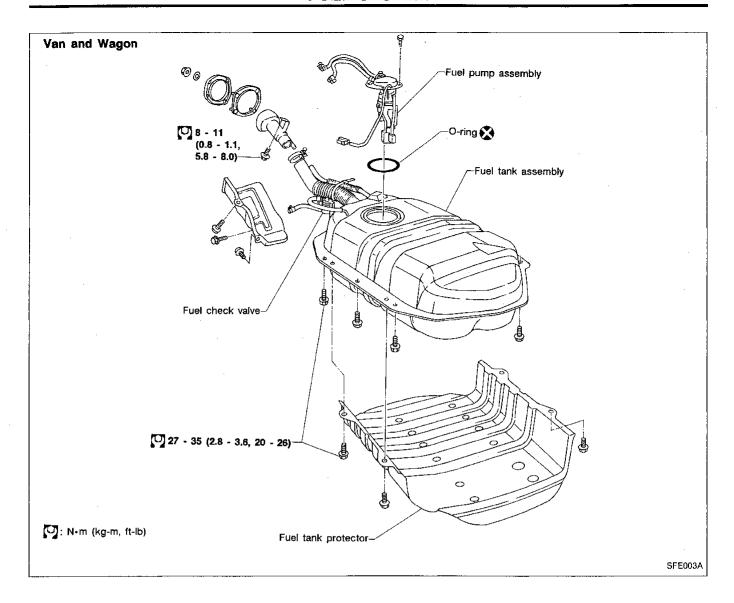
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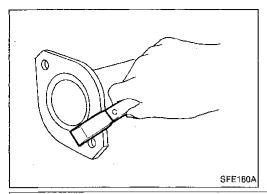
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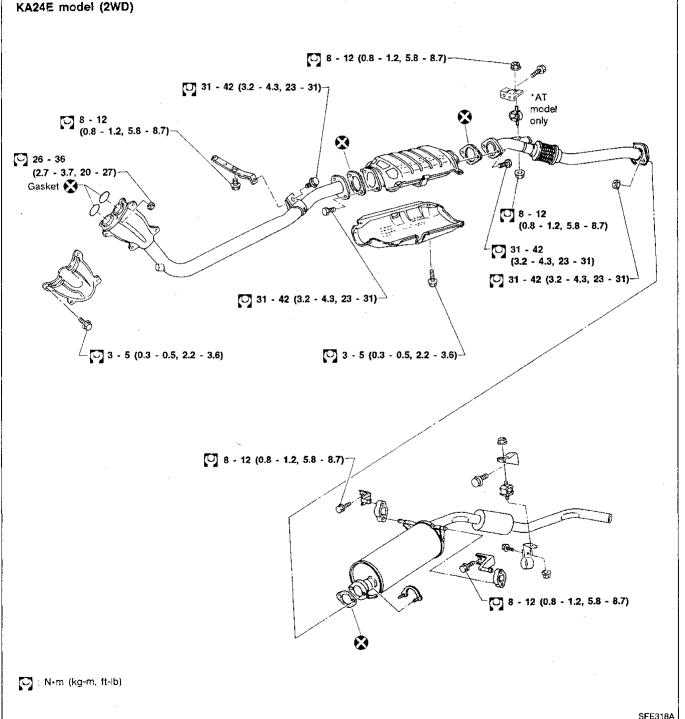
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CAUTION:

- Always replace exhaust gaskets with new ones when reassembling.
 - If gasket is left on flange surface, scrape off completely as shown at left.
- With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.
- After installation, check to ensure that mounting brackets and mounting insulators are free from undue stress. If any of the above parts are not installed properly, excessive noise or vibration may be transmitted to the vehicle body.



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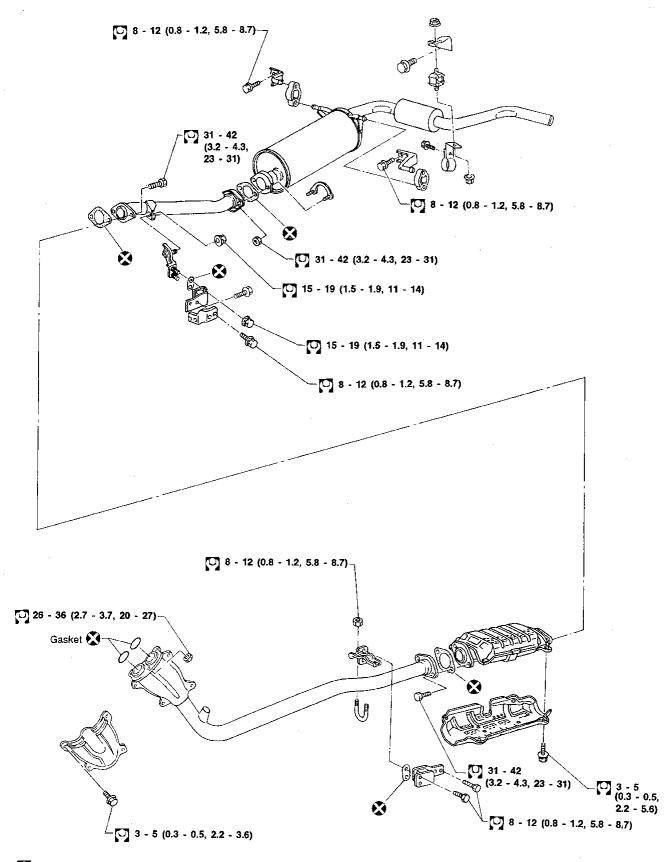
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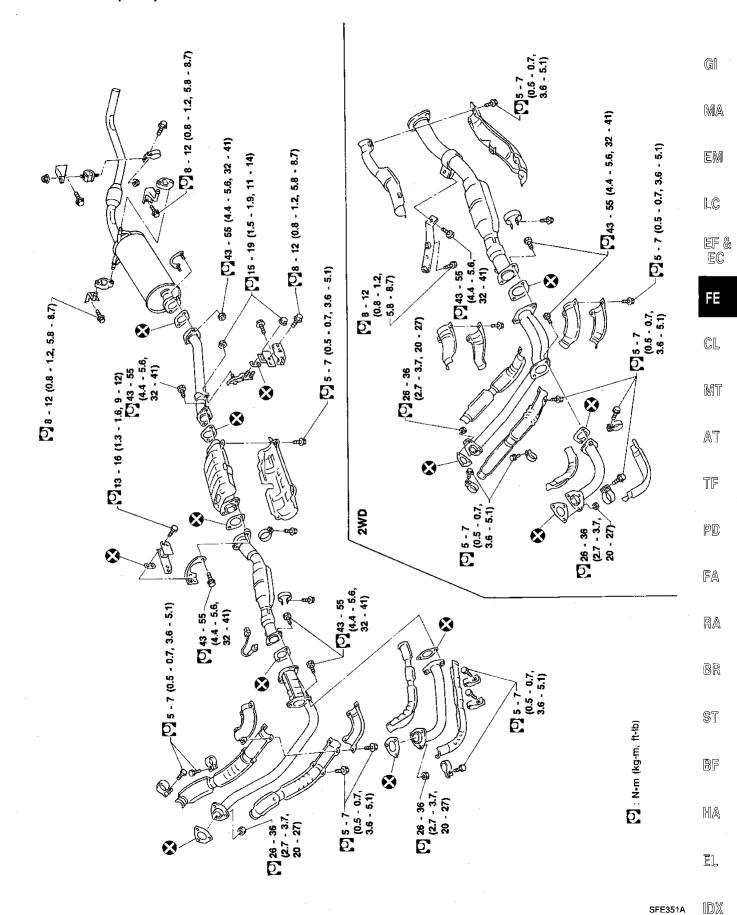
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KA24E model (4WD)



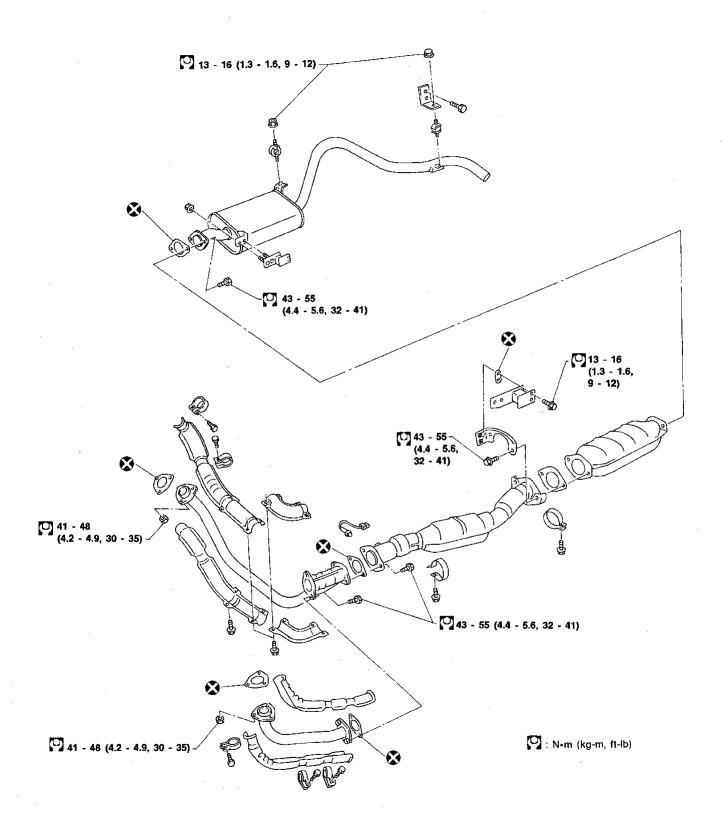
: N·m (kg-m, ft-lb)

VG30E model (4WD) for Truck

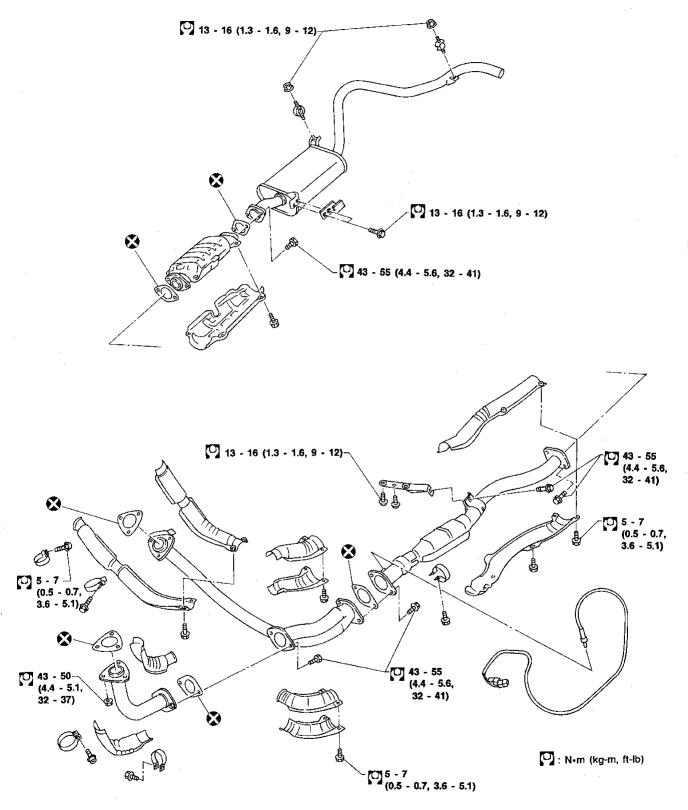


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VG30E model (4WD) for Wagon



VG30E model (2WD) for Wagon



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GENERAL INFORMATION

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STARTING IDENTIFICATION NUMBER NISSAN SHATAI HIRATSUKA PLANT

JN8HD17S*RW200001 JN8HD17Y*RW200001 JN6HD17S*RW200001

KYUSHU PLANT

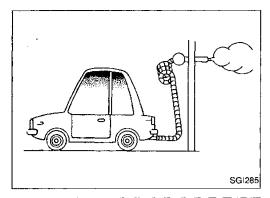
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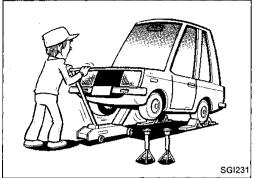
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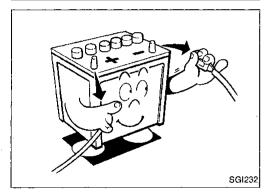
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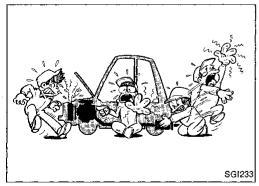
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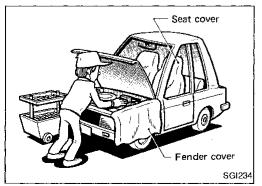
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The following precautions should be observed to ensure safe and proper service operations. These precautions are not described in each individual section.

General Precautions

- Do not operate the engine for an extended period of time without proper exhaust ventilation.
 Keep the work area well ventilated and free of any inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When working in a pit or other enclosed area, be sure to properly ventilate the area
 - before working with hazardous materials.

 Do not smoke while working on the vehicle.
- Before jacking up the vehicle, apply wheel chocks or other tire blocks to the wheels to prevent the vehicle from moving. After jacking up the vehicle, support the vehicle weight with safety stands at the points designated for proper lifting before working on the vehicle.
 - These operations should be done on a level surface.
- When removing a heavy component such as the engine or transaxle/transmission, take care not to lose your balance and drop it. Also, do not allow it to hit against adjacent parts, especially brake tube and brake master cylinder.
- Before starting repairs which do not require battery power, always turn off the ignition switch, then disconnect the ground cable from the battery to prevent accidental short circuit.

To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe and muffler.

Do not remove the radiator cap when the engine is hot.

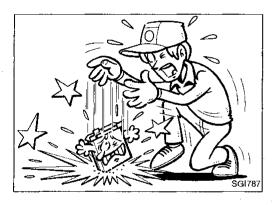
 To prevent scratches and soiling, protect fenders, upholstery and carpeting with appropriate covers before starting servicing.

Take caution that keys, buckles or buttons on your person do not scratch the paint.

PRECAUTIONS

General Precautions (Cont'd)

- 7. Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.
- 8. Replace oil seals, gaskets, packings, O-rings, locking washers, cotter pins, self-locking nuts, etc. as instructed and discard used ones.
- 9. Tapered roller bearings and needle bearings should be replaced as a set of inner and outer races.
- 10. Arrange the disassembled parts in accordance with their assembled locations and sequence.
- 11. Do not touch the terminals of electrical components which utilize microcomputers such as ECMs. Static electrical charges stored in your body may damage internal electronic components.
- 12. After disconnecting vacuum hose or air hose, attach tag which indicates the proper connection to prevent incorrect connection.
- 13. Use only the fluids and the lubricants specified in MA section, or their equivalents.
- 14. Use approved bonding agent, sealants or their equivalents when required.
- 15. The use of the proper tools and recommended essential tools should be used where specified for proper, safe and efficient service repairs.
- 16. When effecting repairs on the fuel, oil, water, vacuum or exhaust systems, make certain to check all affected lines for leaks.
- 17. Dispose of drained oil or the solvent used for cleaning parts in an appropriate manner.



Precautions for Multiport Fuel Injection System or ECCS Engine

- Before connecting or disconnecting multiport fuel injection system or ECCS harness connector to or from any multiport fuel injection system or ECM (ECCS control module), be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal. Otherwise, there may be damage to ECM.
- Before disconnecting pressurized fuel line from fuel pump to injectors, be sure to release fuel pressure to eliminate danger.
- Be careful not to jar components such as ECM and mass air flow sensor.

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Precautions for a Three Way Catalyst

If a large amount of unburned fuel flows into the converter, the converter temperature will be excessively high. To prevent this, follow the procedure below.

- 1. Use unleaded gasoline only. Leaded gasoline will seriously damage the three way catalyst.
- When checking for ignition spark or measuring engine compression, make tests quickly and only when necessary.
- 3. Do not run engine when the fuel tank level is low, otherwise the engine may misfire causing damage to the converter.
- 4. Do not place the vehicle on inflammable material. Keep inflammable material off the exhaust pipe.

Engine Oils

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

HEALTH PROTECTION PRECAUTIONS

- Avoid prolonged and repeated contact with oils, particularly used engine oils.
- 2. Wear protective clothing, including impervious gloves where practicable.
- 3. Do not put oily rags in pockets.
- Avoid contaminating clothes, particularly underpants, with oil.
- 5. Heavily soiled clothing and oil-impregnated footwear should not be worn. Overalls must be cleaned regularly.
- First Aid treatment should be obtained immediately for open cuts and wounds.
- 7. Use barrier creams, applying them before each work period, to help the removal of oil from the skin.
- Wash with soap and water to ensure all oil is removed (skin cleansers and nail brushes will help). Preparations containing lanolin replace the natural skin oils which have been removed.
- 9. Do not use gasoline, kerosine, diesel fuel, gas oil, thinners or solvents for cleaning skin.
- 10. If skin disorders develop, obtain medical advice without delay.
- 11. Where practicable, degrease components prior to handling.
- 12. Where there is a risk of eye contact, eye protection should be worn, for example, chemical goggles or face shields; in addition an eye wash facility should be provided.

ENVIRONMENTAL PROTECTION PRECAUTIONS

Burning used engine oil in small space heaters or boilers can be recommended only for units of approved design. The heating system must meet the requirements of HM Inspectorate of Pollution for small burners of less than 0.4 MW. If in doubt check with the appropriate local authority and/or manufacturer of the approved appliance.

PRECAUTIONS

Engine Oils (Cont'd)

Dispose of used oil and used oil filters through authorized waste disposal contractors to licensed waste disposal sites, or to the waste oil reclamation trade. If in doubt, contact the local authority for advice on disposal facilities.

It is illegal to pour used oil on to the ground, down sewers or drains, or into water courses.

The regulations concerning the pollution of the environment will vary from country to country.

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Precautions for Fuel

CAUTION:

Use unleaded gasoline with an octane rating of at least 87 AKI (Anti-Knock Index) number (research octane number 91).

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Do not use leaded gasoline. Using leaded gasoline will damage the three way catalyst.



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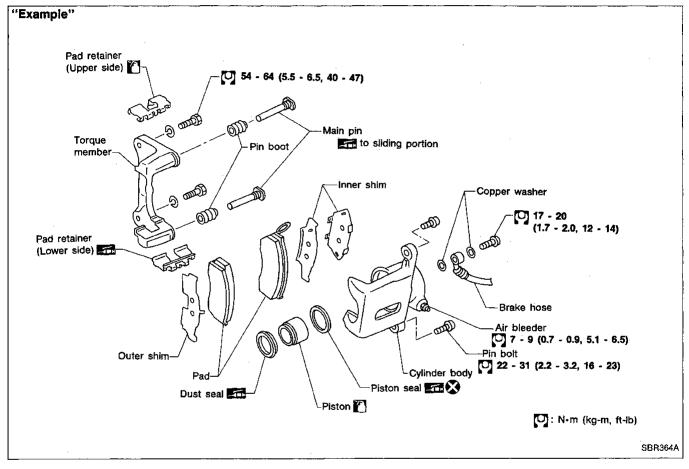
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HOW TO USE THIS MANUAL

- 1. ALPHABETICAL INDEX is provided at the end of this manual so that you can rapidly find the item and page you are searching for.
- 2. A QUICK REFERENCE INDEX, a black tab (e.g. **ER**) is provided on the first page. You can quickly find the first page of each section by mating it to the section's black tab.
- 3. **THE CONTENTS** are listed on the first page of each section.
- 4. THE TITLE is indicated on the upper portion of each page and shows the part or system.
- 5. **THE PAGE NUMBER** of each section consists of two letters which designate the particular section and a number (e.g. "BR-5").
- 6. THE LARGE ILLUSTRATIONS are exploded views (See below) and contain tightening torques, lubrication points and other information necessary to perform repairs. The illustrations should be used in reference to service matters only. When ordering parts, refer to the appropriate PARTS CATALOG.



7. **THE SMALL ILLUSTRATIONS** show the important steps such as inspection, use of special tools, knacks of work and hidden or tricky steps which are not shown in the previous large illustrations. Assembly, inspection and adjustment procedures for the complicated units such as the automatic transaxle or transmission, etc. are presented in a step-by-step format where necessary.

HOW TO USE THIS MANUAL

8. The following SYMBOLS AND ABBREVIATIONS are used: (C): Tightening Torque LH, RH: Left-Hand, Right-Hand : Should be lubricated with grease. M/T: Manual Transaxle/Transmission Unless otherwise indicated, use A/T: Automatic Transaxle/Transmission 4X4 . 4WD : 4-Wheel Drive GI recommended multi-purpose grease. : Should be lubricated with oil. 2WD: 2-Wheel Drive : Sealing point Tool: Special Service Tools : Apply locking sealant. MA ATF: Automatic Transmission Fluid . Checking point D₁: Drive range 1st gear : Always replace after every disassem-D₂: Drive range 2nd gear EM blv. D₃: Drive range 3rd gear Apply petroleum jelly. D₄: Drive range 4th gear High-temperature grease points OD: Overdrive LC (ATF) : Apply ATF. 2₂: 2nd range 2nd gear * : Select with proper thickness. 2, : 2nd range 1st gear ☆ : Adjustment is required. 1₂: 1st range 2nd gear EF & SDS: Service Data and Specifications 1, : 1st range 1st gear EC SE 9. The UNITS given in this manual are primarily expressed as the SI UNIT (International System of Unit), and alternatively expressed in the metric system and in the yard/pound system. CL "Example" Tightening torque: 59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb) MT 10. TROUBLE DIAGNOSES are included in sections dealing with complicated components. 11. SERVICE DATA AND SPECIFICATIONS are contained at the end of each section for quick reference of data. AT 12. The captions WARNING and CAUTION warn you of steps that must be followed to prevent personal injury and/or damage to some part of the vehicle. WARNING indicates the possibility of personal injury if instructions are not followed. TF CAUTION indicates the possibility of component damage if instructions are not followed. BOLD TYPED STATEMENTS except WARNING and CAUTION give you helpful information. PD FA RA BR

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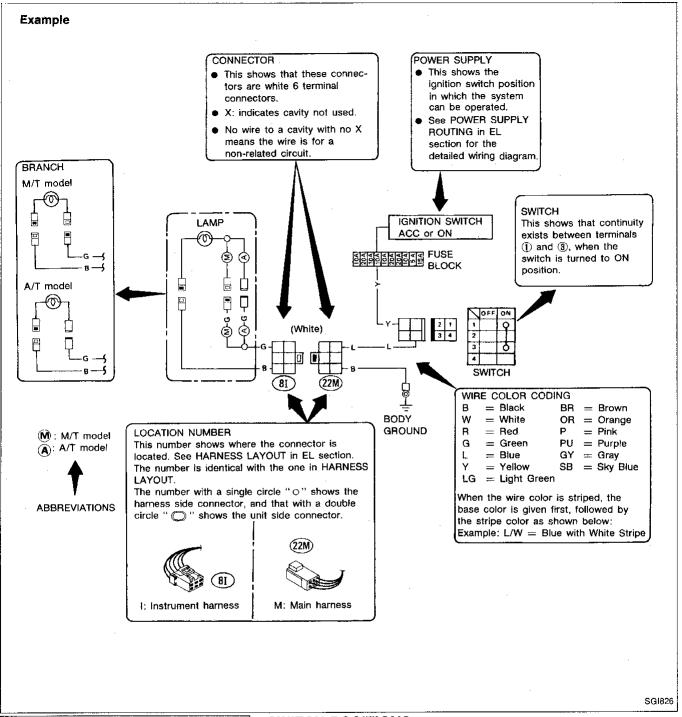
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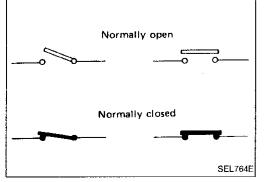
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WIRING DIAGRAM

Symbols used in WIRING DIAGRAM are shown below.





SWITCH POSITIONS

Wiring diagram switches are shown with the vehicle in the following condition.

- Ignition switch "OFF".
- Doors, hood and trunk lid/back door closed.
- Pedals are not depressed and parking brake is released.

Example Connector symbol Connector SG1362

Male terminal

Female terminal

Guide

Connector

Connector

Guide

CONNECTOR SYMBOLS

All connector symbols in wiring diagrams are shown from the terminal side.

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Male and female terminals Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.

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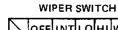
The continuity of the multiple switch is identified in the switch chart in wiring diagrams.

Example

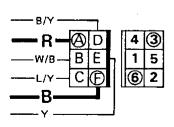
Connector symbol

Example

Connector symbol



SG1363



		OFF	INT	LO	HI	WASH
Ì	1					Q
	2				Q	
	<u>ල</u>	Q	Q	0		
	4	Q	Q			
	5		Q			
	6		Q	0	Q	Q

Continuity	circuit	of winer	ewitch

SWITCH POSITION	CONTINUITY CIRCUIT
OFF	3 - 4
INT	3 - 4, 5 - 6
LO	3 - 6
ні	2 - 6
WASH	1 - 6

Example: Wiper switch in LO position

Continuity circuit: Red wire - (A) terminal - (3) terminal - Wiper switch (\bigcirc - \bigcirc :

LO) - 6 terminal - F terminal - Black wire

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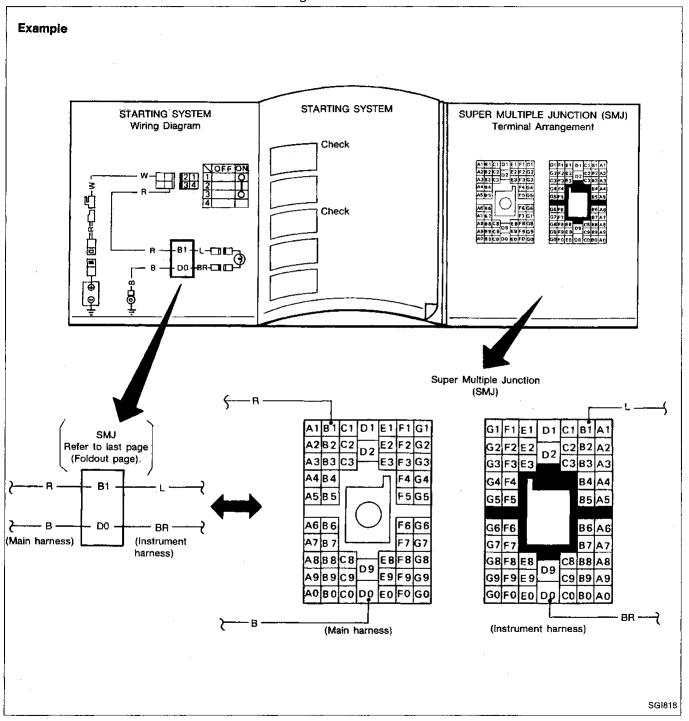
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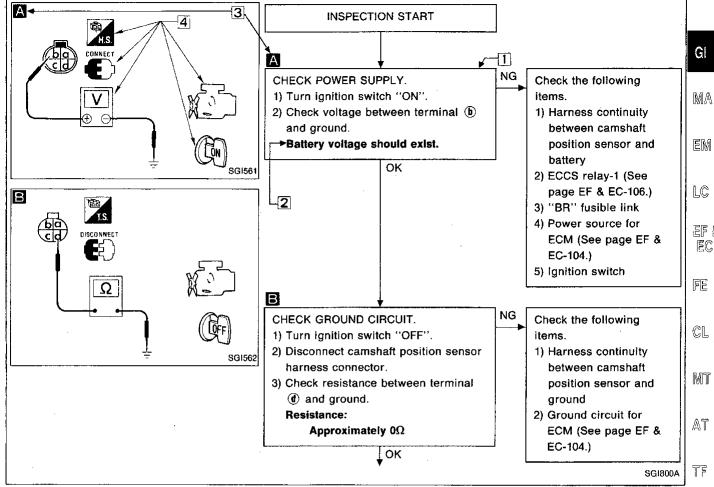
MULTIPLE SWITCH

SUPER MULTIPLE JUNCTION (SMJ)

- The "SMJ" indicated in wiring diagrams is shown in a simplified form. The terminal arrangement should therefore be referred to in the foldout at the end of the Service Manual
- The foldout should be spread to read the entire wiring diagram.



Example



NOTICE

The flow chart indicates work procedures required to diagnose problems effectively. Observe the following instructions before diagnosing.

1) Use the flow chart after locating probable causes of a problem following the "Preliminary Check" or the "Symptom Chart".

- 2) After repairs, re-check that the problem has been completely eliminated.
- Refer to Component Parts Location and Harness Layout for the Systems described in each section for identification/ location of components and harness connectors.
- Refer to the Circuit Diagram for Quick Pinpoint Check. If \$\int \textstyle \t you must check circuit continuity between harness connectors in more detail, such as when a sub-harness is used. refer to Wiring Diagram and Harness Layout in EL section for identification of harness connectors.
- When checking circuit continuity, ignition switch should be "OFF".
- Before checking voltage at connectors, check battery volt-6)
- After accomplishing the Diagnostic Procedures and Electrical Components Inspection, make sure that all harness connectors are reconnected as they were.

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HOW TO FOLLOW THIS FLOW CHART

Work and diagnostic procedure

Start to diagnose a problem using procedures indicated in enclosed blocks, as shown in the following example.

CHECK POWER SUPPLY.

1) Turn ignition switch "ON".

2) Check voltage between terminal (b) and ground.

Battery voltage should exist.

Check item being performed.

Procedure, steps or measurement results

2 Measurement results

Required results are indicated in bold type in the corresponding block, as shown below: These have the following meanings:

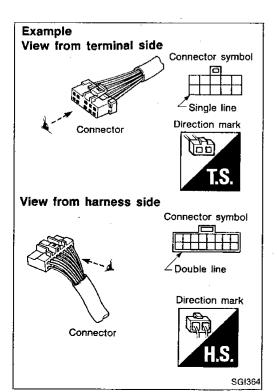
Battery voltage \rightarrow 11 - 14V or approximately 12V Voltage: Approximately 0V \rightarrow Less than 1V

3 Cross reference of work symbols in the text and illustrations

Illustrations are provided as visual aids for work procedures. For example, symbol A indicated in the left upper portion of each illustration corresponds with the symbol in the flow chart for easy identification. More precisely, the procedure under the "CHECK POWER SUPPLY" outlined previously is indicated by an illustration A.

4 Symbols used in illustrations

Symbols included in illustrations refer to measurements or procedures. Before diagnosing a problem, familiarize yourself with each symbol.



Direction mark

A direction mark is shown to clarify the side of connector (terminal side or harness side). Direction marks are mainly used in the illustrations indicating terminal inspection.



: View from terminal side ... TS

 All connector symbols shown from the terminal side are enclosed by a single line.



: View from harness side ... HS

 All connector symbols shown from the harness side are enclosed by a double line.

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HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES

Key to symbols signifying measurements or procedures

				-
Symbol	Symbol explanation	Symbol	Symbol explanation	
DISCONNECT	Check after disconnecting the connector to be measured.		A/C switch is "OFF"	GI
CONNECT	Check after connecting the connector to be measured.		A/C switch is "ON".	
G-	Insert key into ignition switch.		REC switch is "ON".] M/
COFF	Turn ignition switch to "OFF" position.		REC switch is "OFF".	en
(Con)	Turn ignition switch to "ON" position.	•	DEF switch is "ON".	LC
(C5)	Turn ignition switch to "START" position.	•	VENT switch is "ON".	EF E(
(GFF)ACC	Turn ignition switch from "OFF" to "ACC" position.	\$ OFF 1 2 3 4	Fan switch is "ON". (At any position except for "OFF" position)	FE
(ACC) DEF	Turn ignition switch from "ACC" to "OFF" position.	\$ OFF 1 2 3 4	Fan switch is "OFF".	CL
(GFF+)ON	Turn ignition switch from "OFF" to "ON" position.	FUSE	Apply battery voltage directly to components.] Mi
(Con of t	Turn ignition switch from "ON" to "OFF" position.		Drive vehicle.	AT
X.	Do not start engine, or check with engine stopped.	BAT	Disconnect battery negative cable.	TF
	Start engine, or check with engine run- ning.		Depress brake pedal.	PD
and the	Apply parking brake.	(Release brake pedal.	FA
and in	Release parking brake.		Depress accelerator pedal.	RA
сФн	Check after engine is warmed up sufficiently.		Release accelerator pedal.	88
V © O	Voltage should be measured with a voltmeter.	C/UNIT PO CONNECTOR	Pin terminal check for SMJ type ECM and A/T control unit connec- tors.	I ST
	Circuit resistance should be measured with an ohmmeter.	B DISCONNECTOR H.S. DISCONNECT	For details regarding the terminal arrangement, refer to the foldout page.	BF HA
	Current should be measured with an ammeter.	<u></u>		

Model Variation

2-WHEEL DRIVE TRUCK

пć			Engine		KA24E	· · · · · · · · · · · · · · · · · · ·	VG	30E
Destination			Transmission	FS5W71C	RL4R01A (Floor shift)	RL4R01A (Column shift)	FS5R30A	RE4R01A (Floor shift)
۵	Body		Differential carrier	H190A	H190A	H190A	H233B	H233B
U.S.A.	Regular Cab	E	Standard wheelbase	SLD21FBU	-	SLD21YBU	_	_
	12: 0.1	E		KSLGD21FBU	KSLGD21KBU	_		_
liforni	King Cab	SE	Long wheelbase			_	KHLGD21PFBU	KHLGD21PKBU
Non-California,	Regular Cab (Heavy duty)	E		_	_	_	EHLGD21FBU	
S.A.	Regular Cab	E	Standard wheelbase	SLD21FBV	_	SLD21YBV		_ :
⇒	King Cab	E		KSLGD21FBV	KSLGD21KBV	<u> </u>		
rnia,	King Cab	SE	Long wheelbase	_			KHLGD21PFBV	KHLGD21PKBV
California,	Regular Cab (Heavy duty)	E				_	EHLGD21FBV	*******
ß	Regular Cab	E	Standard wheelbase	SLD21FBN		SLD21YBN		
Canada	King Cah	E	Long wheelbase	KSLGD21FBN	KSLGD21KBN		KHLGD21FBN	KHLGD21KBN
Ö	King Cab	SE	Long wheelbase	· <u>-</u>		_	KHLGD21PFBN	KHLGD21PKBN

4-WHEEL DRIVE TRUCK

	{		Engine	KA	24E		VG	30E	
tion	Destination		Transmission	FS5V	V71C	FS5I	R30A	RE4R01A	
tina			Transfer	TX	10	TX	(10	TX	(10
Des	Body		Differential carrier	Front R180A	Rear H233B	Front R200A	Rear H233B	Front R200A	Rear H233B
U.S.A.	Regular Cab	E	Standard wheelbase	SLYD2	21FBU	. –	.	_	_
Non-California,		Ë		KSLMD	21FBU	KHLMD21PFBU		KHLMD21PKBU	
Non-Ca	King Cab	SE	Long wheelbase	_	_				
U.S.A.	Regular Cab	E	Standard wheelbase	SLYD2	21FBV	-			
	King Only	E		KSLMD	21FBV	<u>-</u> -		_	
Califo	King Cab		Long wheelbase	_		KHLMD21PFBV		KHLMD21PKBV	
œ	5		Standard wheelbase	SLYD2	21FBN	_		_	_
Canada	Regular Cab King Cab Regular Cab Regular Cab King Cab	E	Long wheelbase	_	_	KHLMI	D21FBN	KHLMI	21KBN
ථ	King Cab	SE	Long wheelbase	_			21PFBN	KHLMD21PKBN	

Model Variation (Cont'd)

2-WHEEL DRIVE PATHFINDER

Destination			Engine	VG3	30E	
			Transmission	FS5R30A (Manual)	RE4R01A (Auto)	
Destination	Body Grade		Differential carrier	H233B	H233B	
Non-California, U.S.A.	MI	VE	Adaay	WHLD21DJFBU	WHLD21DJKBU	
California, U.S.A.	Wagon	XE .	4-door	WHLD21DJFBV	WHLD21DJKBV	

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4-WHEEL DRIVE PATHFINDER

			Engine	VG30E				
Destination			Transmission	FS5R30A (Manual) TX10		RE4R01	A (Auto)	
			Transfer			TX10		
	Body	Grade	Differential carrier	Front R200A	Rear H233B	Front R200A	Rear H233B	
Non-California,		XE		WHLYD21DJFBU WHLYD21DPFBU WHLYD21DJFBV WHLYD21DJFBN WHLYD21DJFBN WHLYD21DPFBN		WHLYD21DJKBU		
U.S.A.		SE	1			WHLYD21DPKBU		
California,	10/	XE] ,,,,, [WHLYD21DJKBV WHLYD21DPKBV WHLYD21DJKBN WHLYD21DPKBN		
U.S.A.	Wagon	SE	4-door					
0		XE	1 – –					
Canada		SE	1 -					

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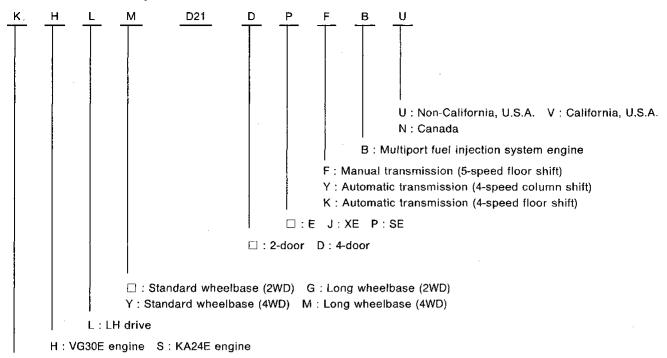
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Model Variation (Cont'd)

Prefix and suffix designations:

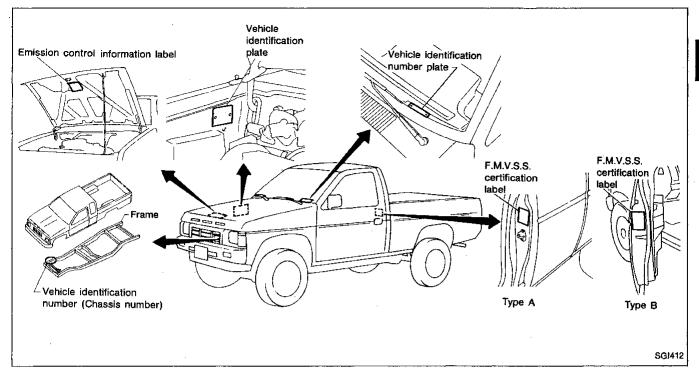


☐ : Regular Cab K: King Cab E: Regular Cab (Heavy duty) W: Wagon

Note:

means no indication.

Identification Number



VEHIC	LE IC	ENTI	FICA	TION	NUM	BER	ARRA	NGE	MENT
JN6	H	D		1	S	Ť	R	Man W:	Vehicle serial number ufacturing plant Kyushu X: Nissan Shatai Hiratsuka C: Smyrna, Tennessee R: 1994 model year
							_	•	check digit is determined by mathematical computation.
				İ	Gross	s vehic	cle weig	ht rati	ing
					S:S	tandar	d (2-wh	eel dri	ve) or heavy duty version Y: Standard (4-wheel drive)
				Body	type				
				1 : St	andard	whee	lbase	2 : Lo	ng wheelbase 6: King Cab 7: 4-door Wagon & Van
}			Mode	el chan	ge				

Manufacturer

JN6: Japan produced truck 1N6: U.S.A. produced truck JN8: Japan produced multi-purpose passenger vehicle

Vehicle line D: Nissan Truck, Nissan Pathfinder

Engine type H: VG30E S: KA24E

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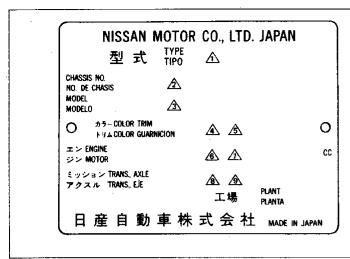
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Identification Number (Cont'd)

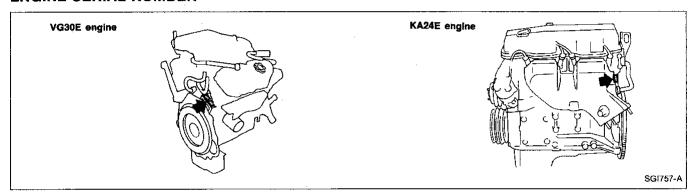
IDENTIFICATION PLATE



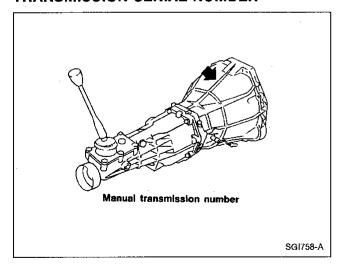
- 1 Type
- 2 Vehicle identification number (Chassis number)
- 3 Model
- 4 Body color code
- 5 Trim color code
- 6 Engine model
- 7 Engine displacement
- 8 Transmission model 9 Axle model

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ENGINE SERIAL NUMBER

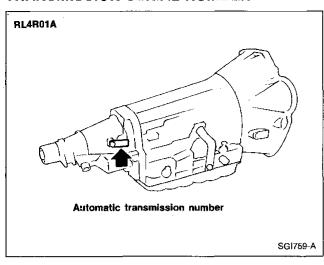


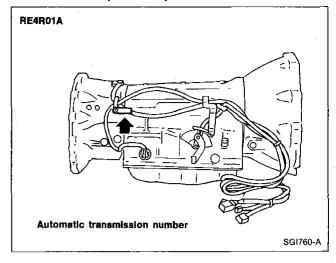
TRANSMISSION SERIAL NUMBER



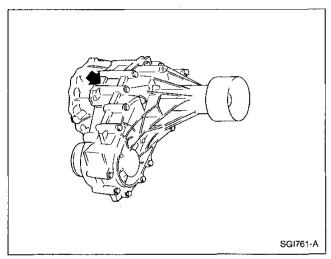
Identification Number (Cont'd)

TRANSMISSION SERIAL NUMBER





TRANSFER SERIAL NUMBER



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Dimensions

Truck

Unit: mm (in)

			2-wheel drive		4-whee	drive
		Regular Cab	King Cab	Heavy duty	Regular Cab	King Cab
		Standard wheelbase		ong elbase	Standard wheelbase	Long wheelbase
Overall length*		4,435 (174.6)	4,825 (190.0)	4,825 (190.0)	4,435 (174.6)	4,825 (190.0)
Overall width		1,650 (65.0)	1,650 (65.0)	1,650 (65.0)	1,690 (66.5)	1,690 (66.5)
Overall height KA24E engine n	nodels)	1,575 (62.0)	1,575 (62.0)	_	1,705 (67.1)	1,705 (67.1)
Overall height VG30E engine n	nodels)		1 ,575 (62.0)	1,575 (62.0)	_	1,705 (67.1)
Front tread KA24E engine n	nodels)	1,395 (54.9)	1,395 (54.9)	_	1,445 (56.9)	1,445 (56.9)
Front tread VG30E engine n	nodels)	_	1,415 (55.7)	1,395 (54.9)	_	1,445 (56.9)
Rear tread KA24E engine n	nodels)	1,385 (54.5)	1,385 (54.5)	_	1,430 (5 6 .3)	1,430 (56.3)
Rear tread VG30E engine n	nodels)	_	1,430 (56.3)	1,410 (55.5)		1,430 (56.3)
Vheelbas e		2,650 (104.3)	2,950 (116.1)	2,950 (116.1)	2,650 (104.3)	2,950 (116.1)
Cargo space	Length	1,875 (73.8)	1,895 (74.6)	2,265 (89.2)	1,875 (73.8)	1,895 (74.6)
	Width	1,520 (59.8)	1,520 (59.8)	1,520 (59.8)	1,520 (59.8)	1,520 (59.8)
	Height	435 (17.1)	435 (17:1)	435 (17.1)	435 (17,1)	435 (17.1)

^{*:} On step bumper equipped models, the bumper adds 140 mm (5.5 in) to the overall length.

Pathfinder

Unit: mm (in)

	Wagon
	VG30E
Overall length*1	4,365 (171.9)
Overall width	1,690 (66.5)
Overall height	1,670 (65.7)/1,680 (66.1)*2
Front tread	1,425 (56.1)/1,445 (56.9)*2
Rear tread	1,410 (55.5)/1,430 (56.3)*2
Wheelbase	2,650 (104.3)

^{*1:} On models with a spare tire carrier, the overall length is increased by the following lengths depending on the spare tire.

²³⁰ mm (9.1 in) for P215/75R tires, 260 mm (10.2 in) for P235/75R tires, 275 mm (10.8 in) for 10.5R tires.

^{*2:} SE model

Wheels & Tires

FOR U.S.A.

	Grade Road wheel/offset mm (in) Tire Spare tire size		
g (g Cab E 14x5J/40 (1.57) P195/75R14 T135/70D16 14x6JJ/30 (1.18)*1 P195/75R14*1	Regular and King Cab	(
	SE 14x6JJ/30 (1.18) P215/75R14 T135/70D16 14x6JJ Aluminum/30 (1.18)*1 P215/75R14*1		
	E 14x5J/40 (1.57) LT195/75R14 LT195/75R14	Heavy duty	
	XE 15x5-1-2K/40 (1.57) P215/75R15 P215/75R15 15x6JJ/30 (1.18) P235/75R15 P235/75R15*1 T155/90D16	PATHFINDER	
ıb	b and E 15x6JJ aluminum/30 (1.18) P235/75R15 P215/75R15	Regular, King Cab and	
PATHFINDER	XE 15x5-1/2K/40 (1.57) P215/75R15 P215/75R15 15x6JJ/30 (1.18) P235/75R15 P235/75R15*1 T155/90D16		
	SE 15x6JJ/30 (1.18) P235/75R15 P215/75R15 15x7JJ aluminum/25 (0.98)*1 31x10.5R15 P235/75R15*1	. •	•••
		· · · · · · · · · · · · · · · · · · ·	

FOR CANADA

		Grade	Road wheel/offset mm (in)	Tire	Spare tire size
4x2 Re	Regular and King Cab	E	14x5J/40 (1.57), 14x6J*2 14x6JJ/30 (1.18)	P195/75R14 P215/75R14	T135/70D16
		SE	14x6JJ/30 (1.18) 14x6JJ Aluminum/30 (1.18)*1	P215/75R14	T135/70D16
4x4 Regular, King Cat PATHFINDER	Regular, King Cab and PATHFINDER	E	15x6JJ/30 (1.18) 15x6JJ aluminum/30 (1.18)	P235/75R15	P215/75R15 P235/75R15
		XE	15x5-1/2K/40 (1.57) 15x6JJ/30 (1.18)	P215/75R15 P235/75R15	P215/75R15*1 P235/75R15 T155/90D16
		SE	15x6JJ/30 (1.18) 15x7JJ Aluminum/25 (0.98)*1	P235/75R15 31x10.5R15	P215/75R15

*1: Option *2: For VG30E engine models

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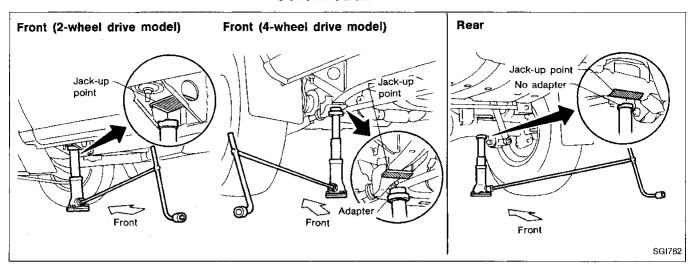
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WARNING:

- a. Never get under the vehicle while it is supported only by the jack. Always use safety stands to support the frame when you have to get under the vehicle.
- b. Place wheel chocks at both front and back of the wheels on the ground.

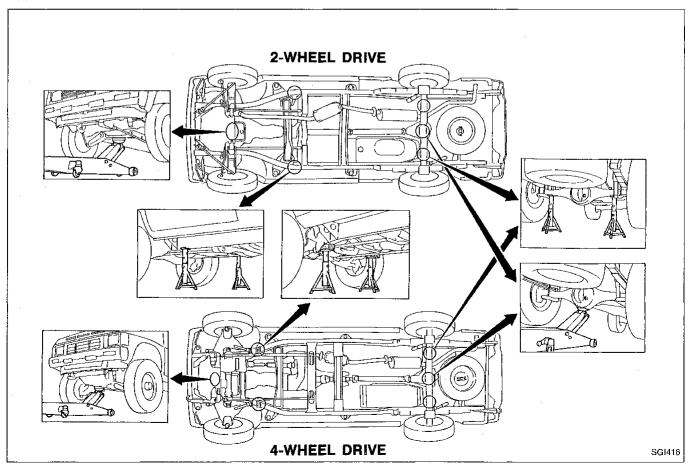
Screw Jack



Garage Jack and Safety Stand

CAUTION:

Place a wooden or rubber block between safety stand and vehicle body when the supporting body is flat.

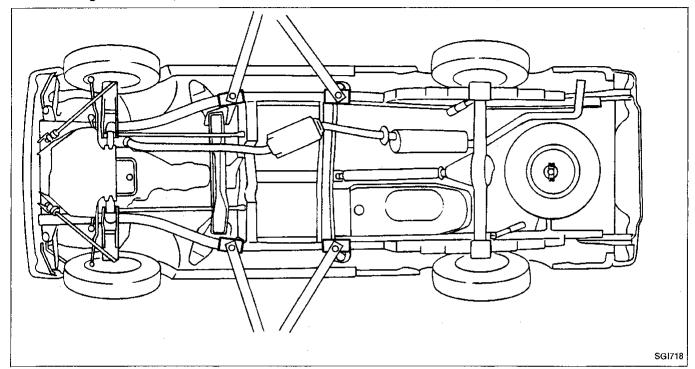


2-pole Lift

WARNING:

When lifting the vehicle, open the lift arms as wide as possible and ensure that the front and rear of the vehicle are well balanced.

When setting the lift arm, do not allow the arm to contact the brake tubes, brake cable and fuel lines.



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Tow Truck Towing

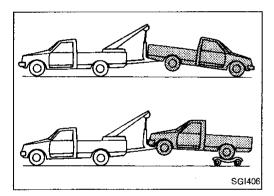
CAUTION:

- All applicable state or Provincial (in Canada) laws and local laws regarding the towing operation must be obeyed.
- It is necessary to use proper towing equipment to avoid possible damage to the vehicle during towing operation.

Towing is in accordance with Towing Procedure Manual at dealer.

- Attach safety chains for all towing.
- When towing, make sure that the transmission, steering system and power train are in good order.
 If any unit is damaged, a dolly must be used.
- When towing with the front wheels on the ground: Turn the ignition key to the "OFF" position and secure the steering wheel in a straightahead position with a rope or similar device. Never place the ignition key in the "LOCK" position. This will result in damage to the steering lock mechanism.
- When towing with the rear wheels on the ground, release the parking brake and move the gearshift lever to neutral position ("N" position).
- Never tow vehicle from the rear (i.e., backward) with four wheels on the ground as this may cause serious and expensive damage to the transmission.
- For 4-wheel drive model:

Set the free-running hubs to the free position and move both the gearshift and transfer levers to neutral position ("N" position).



2-WHEEL DRIVE MODELS

NISSAN recommends that vehicle be towed with the driving (rear) wheels off the ground as illustrated.

Towing with four wheels on ground or towing with front wheels raised (With rear wheels on ground)

Observe the following restricted towing speeds and distances.

Automatic transmission model:

Speed: Below 50 km/h (30 MPH) Distance: Less than 65 km (40 miles)

Manual transmission model with KA24E engine:

Speed: Below 95 km/h (60 MPH)

Distance: Less than 800 km (500 miles)

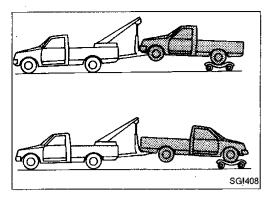
Manual transmission model with VG30E engine:

Speed: Below 95 km/h (60 MPH)

Distance: Less than 320 km (200 miles)

If the speed or distance must necessarily be greater, remove the propeller shaft beforehand to prevent damage to the transmission.

LIFTING POINTS AND TOW TRUCK TOWING



Tow Truck Towing (Cont'd) **4-WHEEL DRIVE MODELS**

NISSAN recommends that a dolly be used as illustrated when towing 4-speed drive models.

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Towing with four wheels on ground or towing with front or rear wheels raised

Observe the following restricted towing speeds and distances.

Automatic transmission model:

Speed: Below 50 km/h (30 MPH) Distance: Less than 65 km (40 miles)

Manual transmission model:

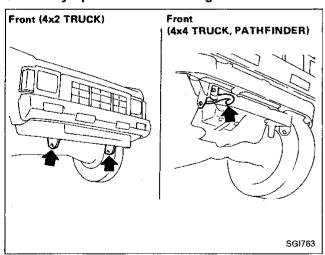
Speed: Below 95 km/h (60 MPH)

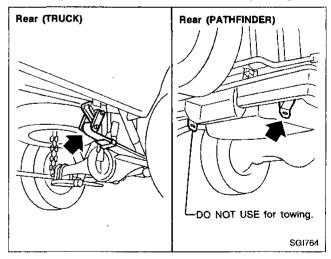
Distance: Less than 800 km (500 miles)

If the speed or distance must necessarily be greater, remove the front and rear propeller shafts beforehand to prevent damage to the transmission.

TOWING POINT

- Never tow the vehicle using only the towing hooks. Use proper towing equipment when towing. Otherwise, the vehicle body will be damaged.
- Always pull the cable straight out from the vehicle. Never pull on the hook at a sideways angle.





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TIGHTENING TORQUE OF STANDARD BOLTS

		Bolt diame-	Pitch mm	Tightening torque (Without lubricant)					
Grade	Bolt size	ter*		Н	Hexagon head bolt		He	xagon flange l	oolt
		mm		N·m	kg-m	ft-lb	N-m	kg-m	ft-lb
	М6	6.0	1.0	5.1	0.52	3.8	6.1	0.62	4.5
	M8	8.0	1.25	13	1.3	9	15	1.5	11
	IVIO	6.0	1.0	13	1.3	9	16	1.6	12
A***	M10	10.0	1.5	25	2.5	18	29	3.0	22
4T	MITO	10.0	1.25	25	2.6	19	30	3.1	22
	M12	10.0	1.75	42	4.3	31	51	5.2	38
	IM12	12.0	1.25	46	4.7	34	56	5.7	41
	M14	14.0	1.5	74	7.5	54	88	9.0	65
	М6	6.0	1.0	8.4	0.86	6.2	10	1.0	7
	М8	8.0	1.25	21	2.1	15	25	2.5	18
			1.0	22	2.2	16	26	2.7	20
	M10	10.0	1.5	41	4.2	30	48	4.9	35
7 T			1.25	43	4.4	32	51	5.2	38
	M12	12.0	1.75	71	7.2	52	84	8.6	62
			1.25	77	7.9	57	92	9.4	68
	M14	14.0	1.5	127	13.0	94	147	15.0	108
	М6	6.0	1.0	12	1.2	9	15	1.5	11
	M8	0.0	1.25	29	3.0	22	35	3.6	26
	IVIO	8.0	1.0	31	3.2	23	37	3.8	27
9Т	MIO	10.0	1.5	59	6.0	43	70	7.1	51
91	M10	10.0	1.25	62	6.3	46	74	7.5	54
	M12	12.0	1.75	98	10.0	72	118	12.0	87
e .	MIZ	12.0	1.25	108	11.0	80	137	14.0	101
	M14	14.0	1.5	177	18.0	130	206	21.0	152

*: Nominal diameter

Grade	Mark		
4T	 4	<u>M</u>	<u>6</u>
7 T	 7		Nominal diameter of bolt threads (Unit: mm)
9T	 9	Metric scre	ew threads

Special parts are excluded.
 This standard is applicable to bolts having the following marks embossed on the bolt head.

SAE J1930 Terminology List

All emission related terms used in this publication are listed in accordance with SAE J1930. Accordingly, new terms, new acronyms/abbreviations and old terms are listed in the following chart.

***: Not applicable

NEW TERM	NEW ACRONYM / ABBREVIATION	OLD TERM	GI
Air cleaner	ACL	Air cleaner	M/
Barometric pressure	BARO	***	
Barometric pressure sensor-BCDD	BAROS-BCDD	BCDD	— En
Camshaft position	CMP	***	
Camshaft position sensor	CMPS	Crank angle sensor	— lc
Carburetor	CARB	Carburetor	
Charge air cooler	CAC	Intercooler	 EF
Closed loop	CL	Closed loop	E(
Closed throttle position switch	CTP switch	Idle switch	
Clutch pedal position switch	CPP switch	Clutch switch	39,
Continuous fuel injection system	CFI system	***	
Continuous trap oxidizer system	CTOX system	***	CL
Crankshaft position	CKP	***	
Crankshaft position sensor	CKPS	***	 Mi
Data link connector	DLC	***	
Data link connector for CONSULT	DLC for CONSULT	Diagnostic connector for CONSULT	 AT
Diagnostic test mode	DTM	Diagnostic mode	
Diagnostic test mode selector	DTM selector	Diagnostic mode selector	
Diagnostic test mode I	DTM I	Mode I	— TF
Diagnostic test mode II	DTM II	Mode II	
Diagnostic trouble code	DTC	Malfunction code	— PD
Direct fuel injection system	DFI system	***	
Distributor ignition system	DI system	Ignition timing control	_ FA
Early fuel evaporation-mixture heater	EFE-mixture heater	Mixture heater	_
Early fuel evaporation system	EFE system	Mixture heater control	 RA
Electrically erasable programmable read only memory	EEPROM	***	
Electronic ignition system	El system	Ignition timing control	— BR
Engine control module	ECM	ECCS control unit	_
Engine coolant temperature	ECT	Engine temperature	ST
Engine coolant temperature sensor	ECTS	Engine temperature sensor	
Engine modification	ЕМ	***	 BF
Engine speed	RPM	Engine speed	
Erasable programmable read only memory	EPROM	***	 HA
Evaporative emission system	EVAP system	Evaporative emission control system	0.06-7
Exhaust gas recirculation valve	EGR valve	EGR valve	 El

SAE J1930 TERMINOLOGY LIST SAE J1930 Terminology List (Cont'd)

***: Not applicable

		***: Not applicat
NEW TERM	NEW ACRONYM / ABBREVIATION	OLD TERM
Exhaust gas recirculation control -BPT valve	EGRC-BPT valve	BPT valve
Exhaust gas recirculation control -solenoid valve	EGRC-solenoid valve	EGR control solenoid valve
Exhaust gas recirculation temperature sensor	EGR temperature sensor	Exhaust gas temperature sensor
Flash electrically erasable programmable read only memory	FEEPROM	***
Flash erasable programmable read only memory	FEPROM	***
Flexible fuel sensor	FFS	***
Flexible fuel system	FF system	***
Heated oxygen sensor	HO2S	Exhaust gas sensor
dle air control system	IAC system	Idle speed control
dle air control valve-air regulator	IACV-air regulator	Air regulator
ldle air control valve-auxiliary air control valve	IACV-AAC valve	Auxiliary air control(AAC) valve
ldle air control valve-FICD solenoid valve	IACV-FICD solenoid valve	FICD solenoid valve
ldle air control valve-idle up control solenoid valve	IACV-idle up control sole- noid valve	ldle up control solenoid valve
dle speed control-FI pot	ISC-FI pot	FI pot
dle speed control system	ISC system	***
gnition control module	ICM	***
ndirect fuel injection system	IFI system	***
ntake air temperature sensor	IATS	Air temperature sensor
Knock	***	Detonation
Knock sensor	KS	Detonation sensor
Malfunction indicator lamp	MIL	Check engine light
Manifold absolute pressure	MAP	***
Manifold absolute pressure sensor	MAPS	***
Manifold differential pressure	MDP	***
Manifold differential pressure sensor	MDPS	***
Manifold surface temperature	MST	***
Manifold surface temperature sensor	MSTS	***
Manifold vacuum zone	MVZ	***
Manifold vacuum zone sensor	MVZS	***
Mass air flow sensor	MAFS	Air flow meter
Mixture control solenoid valve	MC solenoid valve	Air-fuel ratio control solenoid valve
Multiport fuel injection System	MFI system	Fuel injection control
Neutral position switch	***	Neutral switch
Non-volatile random access memory	NVRAM	***
On-board diagnostic system	OBD system	Self-diagnosis
Open loop	OL	Open loop
Oxidation catalyst	ос	Catalyst

SAE J1930 TERMINOLOGY LIST

SAE J1930 Terminology List (Cont'd)

***: Not applicable

		***: Not applicable	i)
NEW TERM	NEW ACRONYM / ABBREVIATION	OLD TERM	
Oxidation catalytic converter system	OC system	***	
Oxygen sensor	028	Exhaust gas sensor	
Park position switch	***	Park switch	
Park/neutral position switch	PNP switch	Park/neutral switch	R
Periodic trap oxidizer system	PTOX system	***	
Powertrain control module	РСМ	***	(8
Programmable read only memory	PROM	***	
Pulsed secondary air injection control sole- noid valve	PAIRC solenoid valve	AIV control solenoid valve	. :[
Pulsed secondary air injection system	PAIR system	Air induction valve(AIV) control	
Pulsed secondary air injection valve	PAIR valve	Air induction valve	
Random access memory	RAM	***	
Read only memory	ROM	***	. [
Scan tool	ST	***	
Secondary air injection pump	AIR pump	***	
Secondary air injection system	AIR system	***	
Sequential multiport fuel injection system	SFI system	Sequential fuel injection	
Service reminder indicator	SRI	***	
Simultaneous multiport fuel injection system	***	Simultaneous fuel injection	
Smoke puff limiter system	SPL system	***	
Supercharger	sc	大分 文	
Supercharger bypass	SCB	***	•
System readiness test	SRT	***	
Thermal vacuum valve	TVV	Thermal vacuum valve	
Three way catalyst	TWC	Catalyst	
Three way catalytic converter system	TWC system	***	
Three way+oxidation catalyst	TWC+OC	Catalyst	
Three way + oxidation catalytic converter system	TWC+OC system	***	
Throttle body	ТВ	Throttle chamber	
		SPI body	
Fhrottle body fuel injection system	TBI system	Fuel injection control	
Fhrottle position	TP	Throttle position	;
Throttle position sensor	TPS	Throttle sensor	
Throttle position switch	TP switch	Throttle switch	
Forque converter clutch solenoid valve	TCC solenoid valve	Lock-up cancel solenoid	
		Lock-up solenoid	
Furbocharger	тс	Turbocharger	
/ehicle speed sensor	vss	Vehicle speed sensor	
Volume air flow sensor	VAFS	Air flow meter	Ē

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SAE J1930 TERMINOLOGY LIST SAE J1930 Terminology List (Cont'd)

***: Not applicable

NEW TERM	NEW ACRONYM / ABBREVIATION	OLD TERM
Warm up oxidation catalyst	wu-oc	Catalyst
Warm up oxidation catalytic converter system	WU-OC system	***
Warm up three-way catalyst	WU-TWC	Catalyst
Warm up three-way catalytic converter system	WU-TWC system	***
Wide open throttle position switch	WOTP switch	Full switch

HEATER & AIR CONDITIONER

SECTION H

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When you read wiring diagrams:

• Read GI section, "HOW TO READ WIRING DIAGRAMS".

• See EL section, "POWER SUPPLY ROUTING" for power distribution circuit. When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

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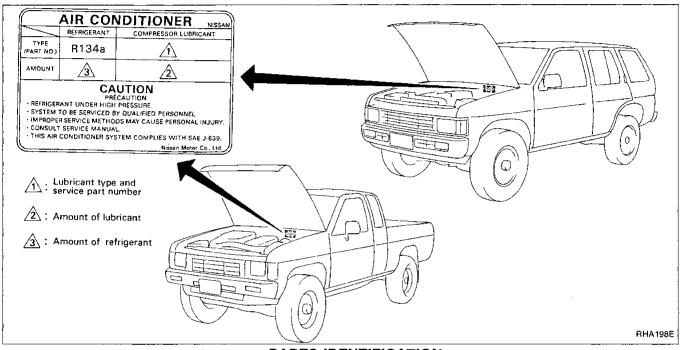
Introduction

To prevent the ozone layer from being destroyed, the HFC-134a (R-134a) refrigerant has replaced the previously used CFC-12 (R-12).

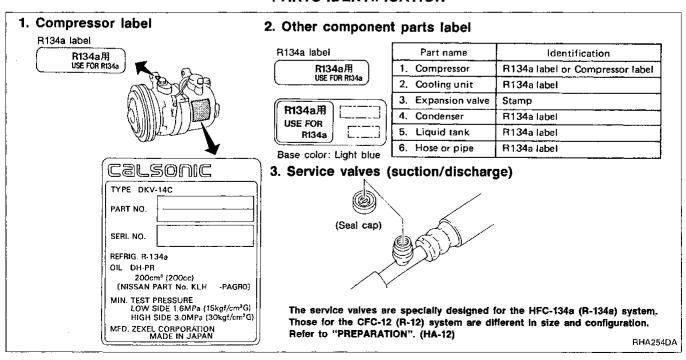
The new and previous service tools, refrigerant, lubricant, etc. are not interchangeable due to differences in their physical properties and characteristics.

Always service the HFC-134a (R-134a) air conditioning system using the specified tools, lubricant and refrigerant, observing the following precautions:

Identification IDENTIFICATION LABEL FOR VEHICLE



PARTS IDENTIFICATION



PRECAUTIONS

Precautions for Working with HFC-134a (R-134a)

WARNING:

- CFC-12 (R-12) refrigerant and HFC-134a (R-134a) refrigerant must never be mixed, even in the smallest amounts, as they are incompatible with each other. If the refrigerants are mixed, compressor failure is likely to occur.
- Use only specified lubrication oil for the HFC-134a (R-134a) A/C system and HFC-134a (R-134a) components. If lubrication oil other than that specified is used, compressor failure is likely to occur.
- The specified HFC-134a (R-134a) lubrication oil absorbs moisture from the atmosphere at a rapid rate, therefore the following handling precautions must be observed:
 - a: When removing refrigerant components from a vehicle, immediately cap (seal) the component to minimize the entry of moisture from the atmosphere.
 - b: When installing refrigerant components to a vehicle, do not remove the caps (unseal) until just before connecting the components. Also, complete the connection of all refrigerant loop components as quickly as possible to minimize the entry of moisture into the system.
 - c: Use the specified lubrication oil from a sealed container only. Containers must be re-sealed immediately after dispensing the lubrication oil. Lubrication oil in containers which are not properly sealed will become moisture saturated, and such lubrication oil is no longer suitable for use and should be properly disposed of.
 - d: Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. To remove R-134a from the A/C system, use service equipment certified to meet the requirements of SAE J2210 (R-134a recycling equipment) or J2209 (R-134a recovery equipment). If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.
 - e: Do not allow lubrication oil (Nissan A/C System Oil Type R) to come in contact with styrofoam parts. Damage may result.

General Refrigerant Precautions

WARNING:

- Do not release refrigerant into the air. Use approved recovery/recycling equipment to capture the refrigerant every time an air conditioning system is discharged.
- Always wear eye and hand protection (goggles and gloves) when working with any refrigerant or air conditioning system.
- Do not store or heat refrigerant containers above 52°C (125°F).
- Do not heat a refrigerant container with an open flame; if container warming is required, place the bottom of the container in a warm pail of water.
- Do not intentionally drop, puncture, or incinerate refrigerant containers.
- Keep refrigerant away from open flames: poisonous gas will be produced if refrigerant burns.
- Refrigerant will displace oxygen, therefore be certain to work in well ventilated areas to prevent suffocation.
- Do not introduce compressed air to any refrigerant container or refrigerant component.

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Precautions for Refrigerant Connection

WARNING:

Make sure all refrigerant is discharged into the recycling equipment and the pressure in the system is less than atmospheric. Then gradually loosen the discharge side hose fitting and remove it. CAUTION:

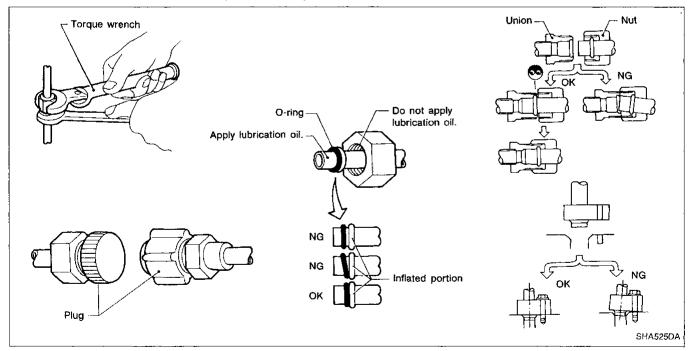
When replacing or cleaning refrigerant cycle components, observe the following.

- Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil
 will enter low pressure chamber.
- When connecting tubes, always use a torque wrench and a back-up wrench.
- After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.
- When installing an air conditioner in the vehicle, the pipes must be connected as the final stage of the operation. The seal caps of the pipes and other components must not be removed until their removal is required for connection.
- To prevent the condensation of moisture inside A/C components, components stored in cool areas should be allowed to warm to the working area temperature before removing the seal caps.
- Thoroughly remove moisture from the refrigeration system before charging the refrigerant.
- Always replace used O-rings.
- When connecting tube, apply lubrication oil to portions shown in illustration. Be careful not to apply oil to threaded portion.

Lubrication oil name: Nissan A/C System Oil Type R

Part number: KLH00-PAGR0

- O-ring must be closely attached to inflated portion of tube.
- After inserting tube into union until O-ring is no longer visible, tighten nut to specified torque.
- After connecting line, conduct leak test and make sure that there is no leakage from connections.
 When the gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.



PRECAUTIONS

Precautions for Servicing Compressor

- Attach a blind plug to the suction port (low pressure) and discharge port (high pressure) of the compressor to prevent oil from leaking out and dust from getting inside.
- When the compressor is removed, store it in the same position as it was mounted on the car.
- When replacing or repairing compressor, be sure to remove oil from the compressor and check the oil quantity extracted.
- When replacing with a new compressor, be sure to remove oil from the new compressor so that the quantity of oil remaining in the new compressor is equal to the quantity collected from the removed MA compressor. See the section "LUBRICATION OIL".
- Pay attention so as not to allow dirt and oil to attach on the friction surfaces between clutch and pulley. If the surface is contaminated, with oil, wipe it off by using a clean waste cloth moistened with thinner.
- After completing the compressor service operation, be sure to rotate the compressor shaft more than five turns in both directions by hand to equalize oil distribution inside the compressor, then run the 👢 compressor for about one hour by idling the engine.
- When the compressor magnet clutch has been replaced, be sure to check the magnet clutch for normal operation by applying voltage to the clutch.

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DESCRIPTION — Overall System

Introduction — Auto Air Conditioner

The automatic temperature control (ATC) system provides automatic regulation of the discharged air temperature and the discharged air volume (Blower speed).

The air outlet door, intake door and compressor magnet clutch are controlled by the manual operation of each switch.

Features — Auto Air Conditioner

Air mix door control (Automatic temperature control)

The air mix door is automatically controlled so that in-vehicle temperature will reach, and be maintained at the operator selected "set temperature". For a given set temperature, the air mix door position will depend on: Ambient temperature, in-vehicle temperature, amount of sunload, set temperature and A/C switch signals.

Fan speed control

When the fan control switch is in the Auto position, the blower speed is automatically controlled, depending on: Ambient temperature, in-vehicle temperature, amount of sunload, set temperature, and A/C switch signals. It is also controlled by the manual operation of the fan control switch.

Starting fan speed control

When engine coolant temperature is low, the air outlet door position is detected by the microswitch and if this is set in B/L, FOOT or FOOT/DEF blower speed is controlled to prevent a large amount of cold air from being discharged into the floor area.

Outlet door control

This can be selected by operation of the mode switch.

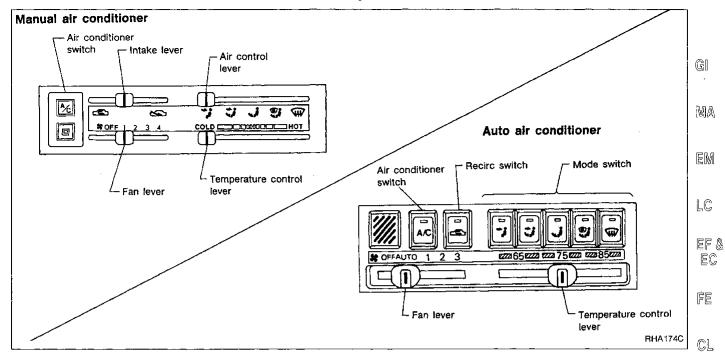
Intake door control

This can be selected by changing the REC switch position.

Compressor magnet clutch control

When the A/C switch is ON, the thermistor detects evaporator temperature. The thermo control amplifier controls clutch ON/OFF operation depending on the evaporator temperature.

Control Operation



FAN LEVER

This LEVER controls fan speed. (The fan turns ON when the fan lever is in all but the OFF position.)

MODE SWITCHES

These switches allows outlet air to flow. When the mode is set to "DEF" or "F/D", the push control unit sets the intake door to "FRE (Fresh)". The compressor turns on when the MODE is set to "DEF". (Auto Air Conditioner type only)

TEMPERATURE CONTROL LEVER

This lever allows the temperature of the outlet air to be adjusted.

RECIRC SWITCH

OFF position or slide to

Outside air is drawn into the passenger compartment.

ON position or slide to ____:

Interior air is recirculated inside the vehicle.

"RECIRC" is canceled when "DEF" or "F/D" is selected. "RECIRC" resumes when another mode is chosen. (Auto Air Conditioner type only)

AIR CONDITIONER SWITCH

Start the engine, move the fan switch to the desired (1 to 4 or Auto to 3) position and press the air conditioner switch to turn ON the air conditioner. The indicator light will come on when the air conditioner is ON. To stop the air conditioner, push the switch again to return it to the original position.

The air conditioner cooling function operates only when the engine is running.

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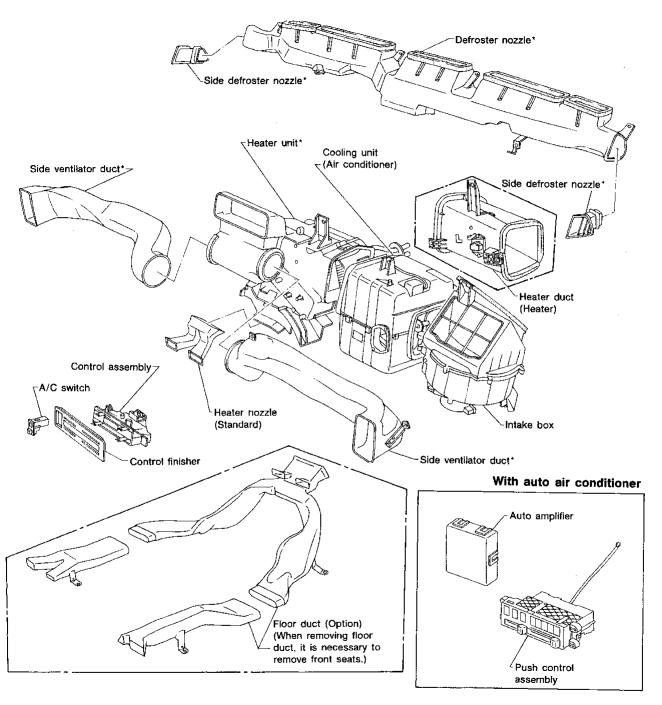
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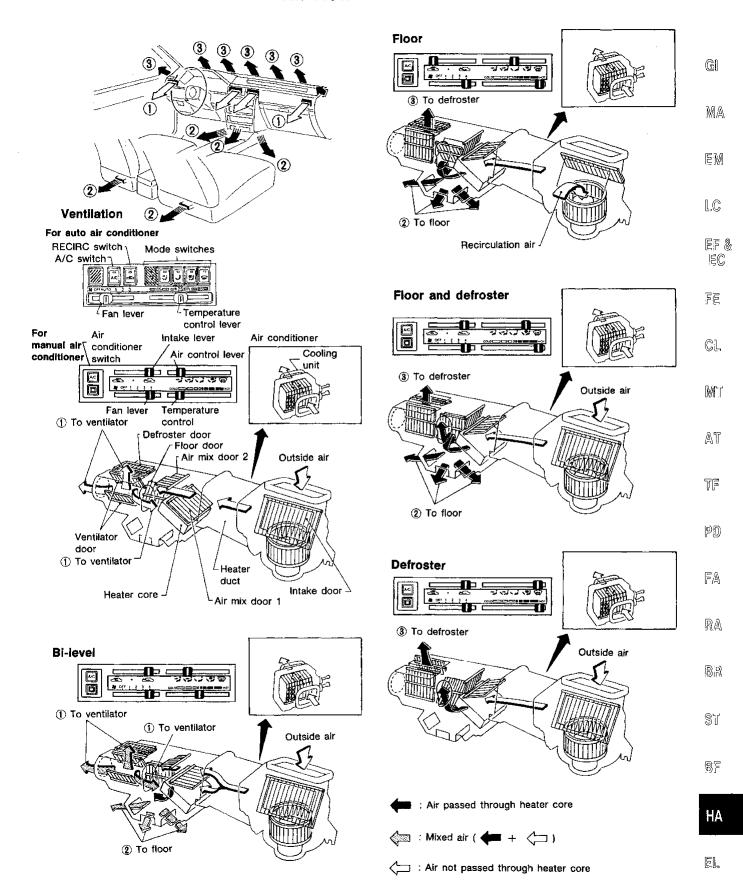
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Component Layout



*: For removal, it is necessary to remove instrument assembly.

Air Flow



Refrigeration Cycle

REFRIGERANT FLOW

The refrigerant flows in the standard pattern, that is, through the compressor, the condenser, the liquid tank, through the evaporator, and back to the compressor.

The refrigerant evaporation through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

FREEZE PROTECTION

The compressor cycles on and off to maintain the evaporator temperature within a specified range. When the evaporator coil temperature falls below a specified point, the thermo control amplifier interrupts the compressor operation. When the evaporator coil temperature rises above the specification, the thermo control amplifier allows compressor operation.

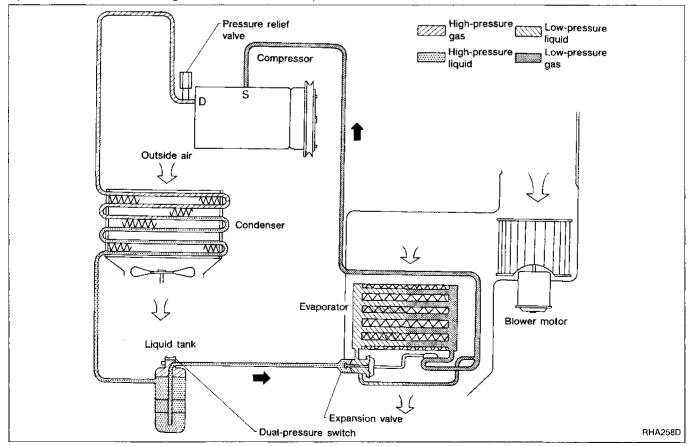
REFRIGERANT SYSTEM PROTECTION

Dual-pressure switch

The refrigerant system is protected against excessively high or low pressures by the dual-pressure switch, located on the liquid tank. If the system pressure rises above, or falls below the specifications, the dual-pressure switch opens to interrupt the compressor operation.

Pressure relief valve

The refrigerant system is also protected by a pressure relief valve, located on the end of high flexible hose near compressor. When the pressure of refrigerant in the system increases to an abnormal level [more than 3,727 kPa (38 kg/cm², 540 psi)], the release port on the pressure relief valve automatically opens and releases refrigerant into the atmosphere.



PREPARATION

Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description		 GI
KV99231260 (J-38874) Clutch disc wrench	NT204	Removing shaft nut and clutch disc	MA
KV99232340 (J-38874) Clutch disc puller		Removing clutch disc	— EM LC
KV99234330 (J-39024) Pulley installer	NT206	Installing pulley	EF & EC FE
KV99233130 (J-39023) Pulley puller		Removing pulley	- Cl MT
. 10 10	NT208		<u> </u>

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HFC-134a (R-134a) Service Tools and Equipment

It is important to understand that HFC-134a (R-134a) refrigerant, and the specified lubricant which must be used with HFC-134a (R-134a), must never be mixed with CFC-12 (R-12) refrigerant and/or the CFC-12 (R-12) lubricant.

This means that separate and non-interchangeable service equipment must be used for handling each type of refrigerant/lubricant.

To prevent the mixing of refrigerants/lubricants, refrigerant container fittings, service hose fittings, and service equipment fittings (equipment which handles refrigerant and/or lubricant) are different between CFC-12 (R-12) and HFC-134a (R-134a).

Adaptors to convert from one size fitting to the other must never be used: refrigerant/lubricant contamination will occur and compressor failure will result.

Tool number (Kent-Moore No.) Tool name	Description	Note
HFC-134a (R-134a) refrigerant	NT196	Container color: Light blue Container marking: HFC-134a (R-134a) Fitting size: Thread size Large container 1/2"-16 ACME
KLH00-PAGR0 (- —) Nissan A/C System Oil Type R	NSSAN	Type: Poly alkyline glycol oil (PAG), type R Application: HFC-134a (R-134a) vane rotary compressors (Nissan only) Lubricity: 40 ml (1.4 US fl oz, 1.4 Imp fl oz)
(J-39500-NI) Recovery/Recycling equipment (ACR4)	NT197	Function: Refrigerant Recovery and Recycling and Recharging
(J-39400) Electrical leak detector	NT195	Power supply: • DC 12 V (Cigarette lighter)

PREPARATION

HFC-134a (R-134a) Service Tools and Equipment (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	Note	GI
(J-39183) Manifold gauge set (with hoses and cou- plers)		Identification: The gauge face indicates R-134a. Fitting size: Thread size 1/2"-16 ACME	MA
			em Lc
	NT199		
Service hoses • High side hose		Hose color: • Low hose: Blue with black stripe	EC
(J-39501-72) • Low side hose (J-39502-72)		High hose: Red with black stripe Utility hose: Yellow with black stripe or green with black	
Utility hose (J-39476-72)	NT201	stripe Hose fitting to gauge: • 1/2"-16 ACME	CL
Service couplers • High side coupler (J-39500-20) • Low side coupler		Hose fitting to service hose: • M14 x 1.5 fitting (optional) or permanently attached	MT AT
(J-39500-24)			717
(J-39650) Refrigerant weight scale	NT202	For measuring of refrigerant Fitting size: Thread size • 1/2"-16 ACME	PD
			FA
	NT200		RA
(J-39649) Vacuum pump (Including the isolator		Capacity: • Air displacement: 4 CFM • Micron rating: 20 microns	BR
valve)		Oil capacity: 482 g (17 oz) Fitting size: Thread size 1/2"-16 ACME	ST
	NT203		BF

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Precautions for Service Equipment

RECOVERY/RECYCLING EQUIPMENT

Be certain to follow the manufacturers instructions for machine operation and machine maintenance. Never introduce any refrigerant other than that specified into the machine.

ELECTRONIC LEAK DETECTOR

Be certain to follow the manufactures instructions for tester operation and tester maintenance.

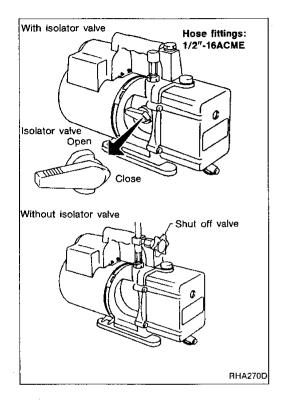
VACUUM PUMP

The lubricant contained inside the vacuum pump is not compatible with the specified lubricant for HFC-134a (R-134a) A/C systems. Since the vent side of the vacuum pump is exposed to atmospheric pressure, it is possible for the vacuum pump lubricant to migrate out of the pump into the service hose if the pump is switched off after evacuation (vacuuming) and the service hose is not isolated from the vacuum pump.

To prevent the migration of vacuum pump lubricant into service hoses, it is necessary to use a valve (which can be manually opened or closed) near the connection of the service hose to the pump.

- On a vacuum pump which is equipped with an isolator valve (usually part of the vacuum pump), closing this valve will isolate the service hose from the pump.
- For pumps without an isolator valve, be certain that the service hose is equipped with a manual shut off valve near the pump end of the hose.
- Hoses which contain an automatic shut off valve at the end
 of the service hose must be disconnected from the vacuum
 pump to prevent the migration of lubricant: as long as the
 hose is connected, the valve is open and lubricant may
 migrate.

One-way valves which open when vacuum is applied and close under a no vacuum condition are not recommended, because this valve may restrict the pump's ability to pull a deep vacuum.



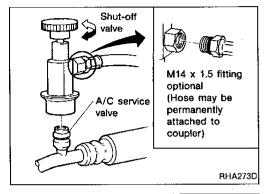
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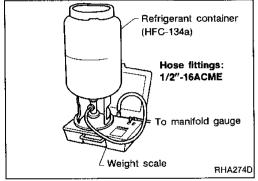
MANIFOLD GAUGE SET

Be certain that the gauge face indicates R-134a or 134a. Be certain that the manifold gauge set has the 1/2"-16 ACME threaded connections for service hoses, and that no refrigerants other than HFC-134a (R-134a) (along with only specified lubricants) have been used with the manifold gauge set.

PREPARATION

Hose fittings to manifold gauge or recovery/recycling equipment; 1/2"-16ACME SAE J2196/R13 3AF /2196/F1346 M14 x 1.5 fitting optional (Hose may be permanently attached to coupler) RHA272D





Precautions for Service Equipment (Cont'd) SERVICE HOSES

Be certain that the service hoses display the markings described (colored hose with black stripe). Be certain that all hoses include positive shut off devices (either manual or automatic) near the end of the hoses opposite the manifold gauge.

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SERVICE COUPLERS

Never attempt to connect HFC-134a (R-134a) service couplers to LC an CFC-12 (R-12) A/C system. Although the HFC-134a (R-134a) couplers will not secure on to the CFC-12 (R-12) system, CFC-12 (R-12) refrigerant and lubricant will be discharged into the HFC 134a (R-134a) coupler, causing contamination.

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Shut off valve rotation	A/C service valve	. [5]
Clockwise	Open	י ניייני
Counterclockwise	Close	. 🙉

REFRIGERANT WEIGHT SCALE

If the scale allows electronic control of the flow of refrigerant MT through the scale, be certain that the hose fitting size is 1/2"-16 ACME, and that no refrigerant other than HFC-134a (R-134a) (along with only specified lubricant) has been used with the AT scale.

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CHARGING CYLINDER

The charging cylinder is not recommended because refrigerant FA may be vented into the air from the top valve on the cylinder when filling the cylinder with refrigerant. Also, the accuracy of the cylinder is generally less than that of an electronic scale or RA of quality recycle/recharge equipment.

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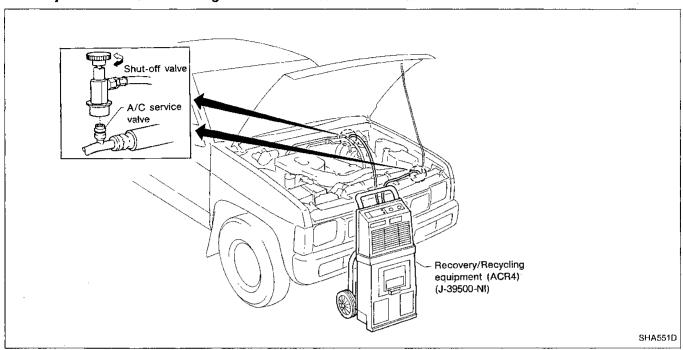
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HFC-134a (R-134a) Service Procedure

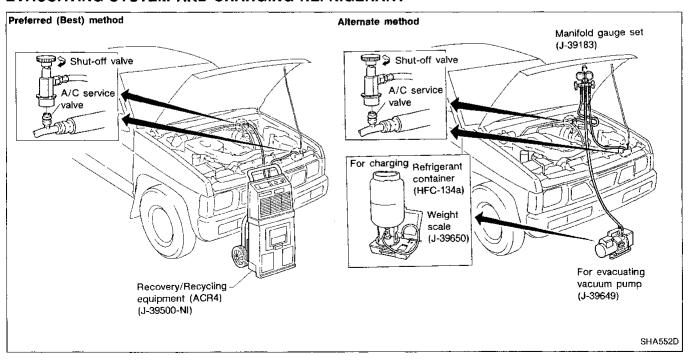
DISCHARGING REFRIGERANT

WARNING:

Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. To remove R-134a from the A/C system, use service equipment certified to meet the requirements of SAE J2210 (R-134a recycling equipment) or J2209 (R-134a recovery equipment). If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.

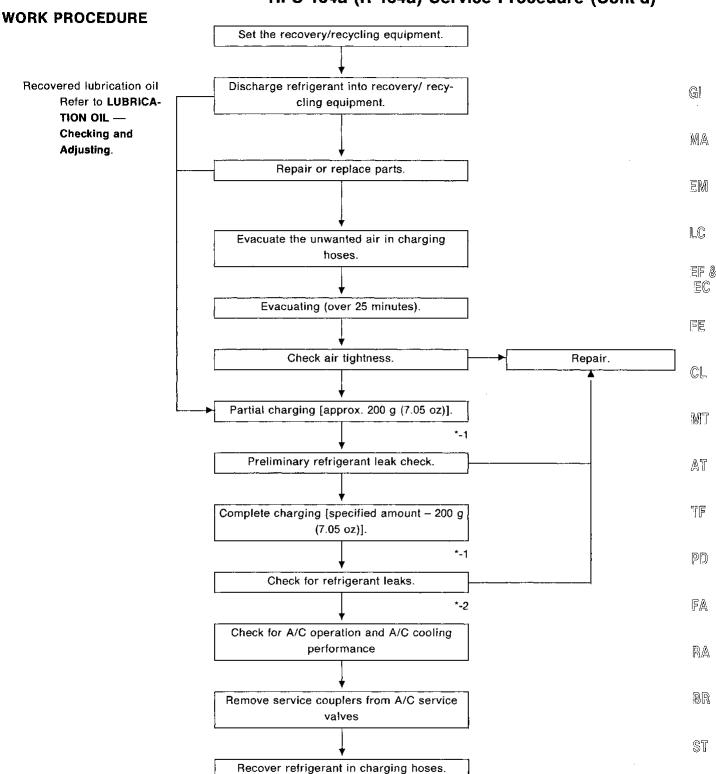


EVACUATING SYSTEM AND CHARGING REFRIGERANT



SERVICE PROCEDURES

HFC-134a (R-134a) Service Procedure (Cont'd)



Note: *-1 Before charging refrigerant, ensure engine is off.

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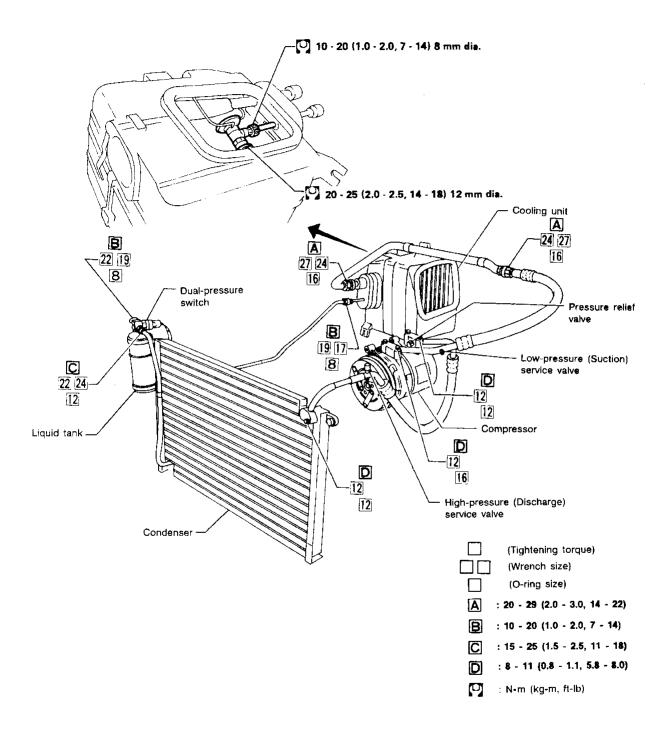
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^{*-2} Before checking for leaks, start engine to activate air conditioning system then turn in off. Service valve caps must be attached to valves (to prevent leak).

Refrigerant Lines

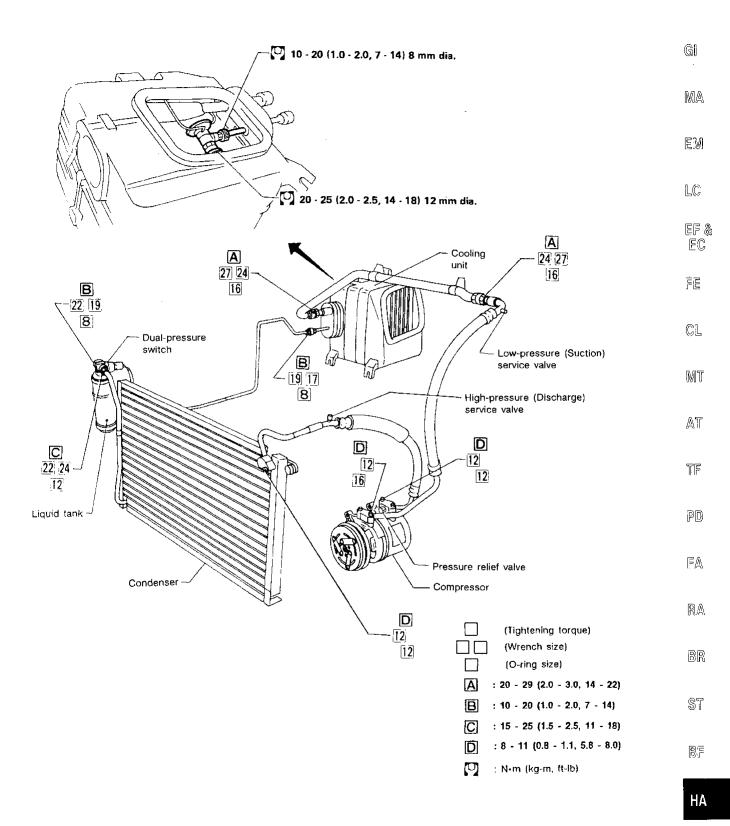
VG ENGINE MODEL



SERVICE PROCEDURES

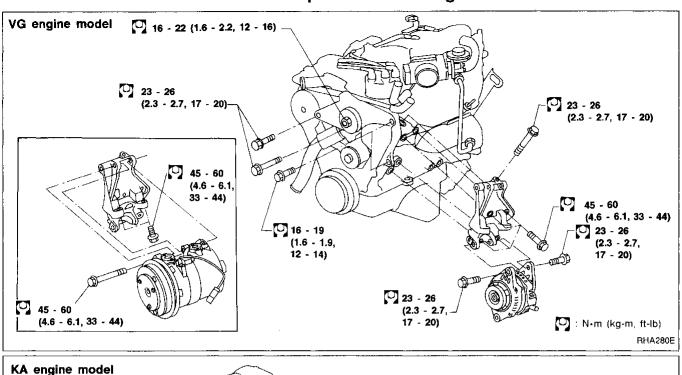
Refrigerant Lines (Cont'd)

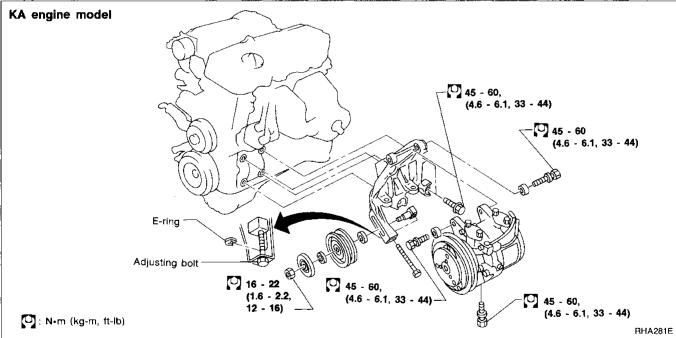
KA ENGINE MODEL



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Compressor Mounting





Belt Tension

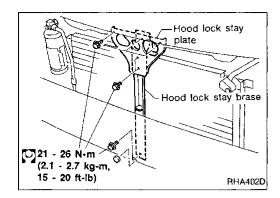
Refer to "Checking Drive Belts" in MA section.

Fast Idle Control Device (FICD)

Refer to EF & EC section.

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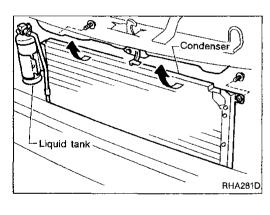
SERVICE PROCEDURES



Condenser

REMOVAL

- 1. Discharge refrigerant using the recovery/recycling equipment (ACR4).
- 2. Remove coolant reservoir tank (3 screws).
- 3. Remove side marker lamps.
- 4. Remove front grille (5 fasteners).
- Remove harness clip from hood lock stay, if equipped (gently press out).
- 6. Remove hood lock stay plate (4 bolts) and hood lock stay brace (2 bolts).



- 7. Remove hose (high pressure) clamp bracket from radiator core support.
- 8. Disconnect high pressure hose at condenser.
- 9. Disconnect dual pressure switch harness connector.
- Disconnect high pressure tube (liquid tank to cooling unit) at liquid tank.
- 11. Remove condenser mounting bolts (2 bolts).
- 12. Remove condenser assembly.

CAUTION

Carefully lift condenser without damaging radiator (fin and tube).

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Lubrication Oil

Name: Nissan A/C System Oil Type R

Part number: KLH00-PAGR0

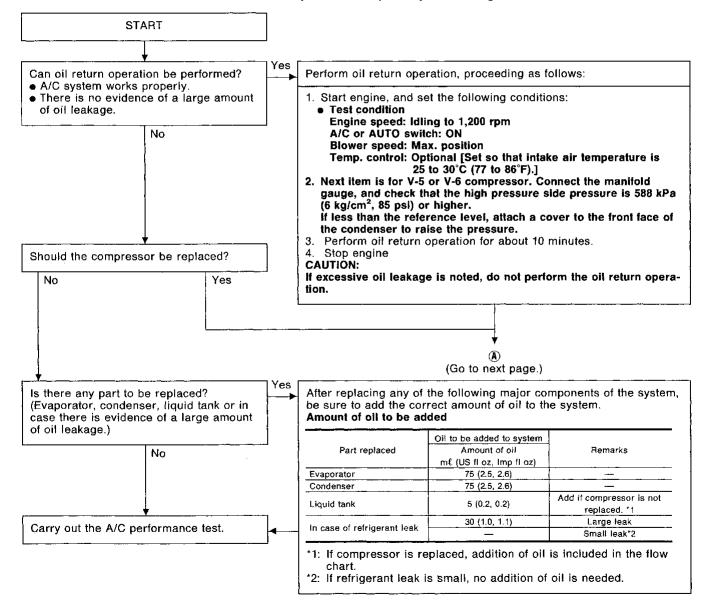
Maintenance of Oil Quantity in Compressor

The oil used to lubricate the compressor circulates through the system with the refrigerant. Whenever any component of the system is replaced or a large amount of gas leakage occurs, add oil to the compressor to maintain the specified amount. If oil quantity is not maintained properly, the following malfunctions may result:

- Lack of oil: May lead to a seized compressor
- Excessive oil: Inadequate cooling (thermal exchange interference)

Checking and Adjusting

Adjust the oil quantity according to the flowchart shown below.



LUBRICATION OIL — Checking and Adjusting

Checking and Adjusting (Cont'd)



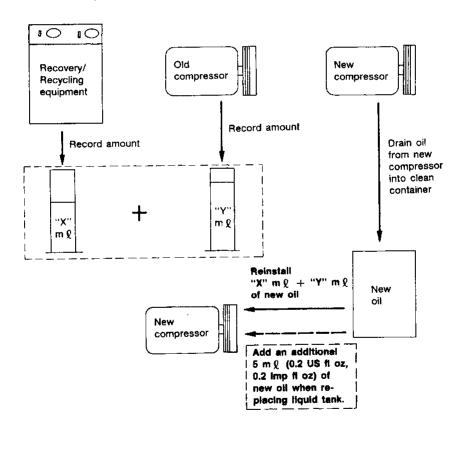
- 1. Discharge refrigerant into the refrigerant recovery/recycling equipment. Measure oil discharged into the recovery/recycling equipment.
- 2. Remove the drain plug (for V-5 or V-6, and DKS-16H compressor) and drain the oil from the "old" (removed) compressor into a graduated container, and record the amount of oil drained.
- 3. Remove the drain plug and drain the oil from the "new" compressor into a separate, clean container.
- 4. Measure an amount of the new oil equal to that drained from the "old" compressor, and add this oil to the "new" compressor through the drain plug or suction port opening.
- 5. Measure an amount of the "new" oil equal to that recovered during discharging, and add this oil to the "new" compressor through the drain plug or suction port opening.
- 6. Torque the drain plug.

V-5 or V-6 compressor: 18 - 19 N·m (1.8 - 1.9 kg-m, 13 - 14 ft-lb) DK\$-16H compressor: 14 - 16 N·m (1.4 - 1.6 kg-m, 10 - 12 ft-lb)

7. If the liquid tank also needs to be replaced, add an additional 5 mℓ (0.2 US fl oz, 0.2 Imp fl oz) of oil at this time.

Do not add this 5 mℓ (0.2 US fl oz, 0.2 Imp fl oz) of oil if only replacing the compressor.

Oil adjusting procedure for compressor replacement



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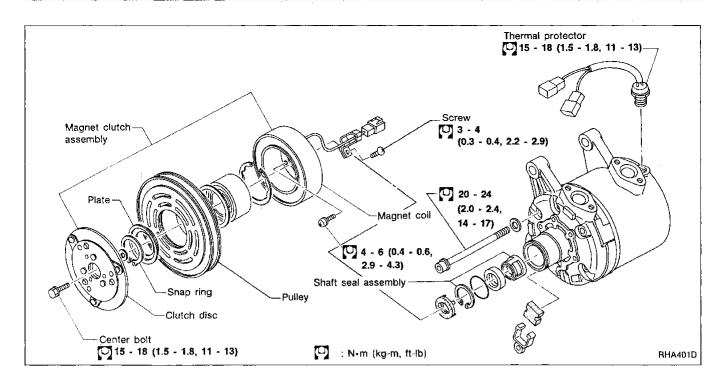
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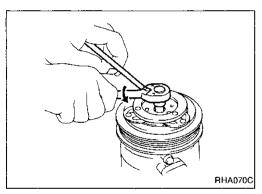
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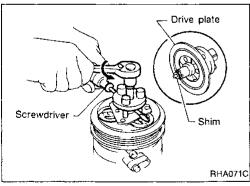




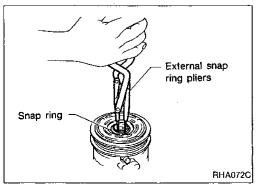


REMOVAL

 When removing center bolt, hold clutch disc with clutch disc wrench.

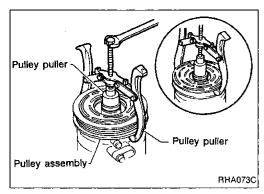


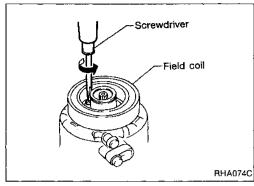
- Remove the drive plate using the drive plate puller. Insert the holder's three pins into the holes in the drive plate, and rotate the holder clockwise to hook it onto the plate. Then, tighten the center bolt to remove the drive plate.
 - When tightening the center bolt, insert a round bar (screwdriver, etc.) between two of the pins (as shown in the left-hand figure) to prevent drive plate rotation. After removing the drive plate, remove the shims from either the drive shaft or the drive plate.

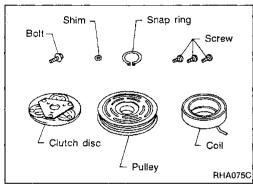


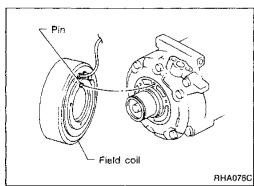
Remove the snap ring using external snap ring pliers.

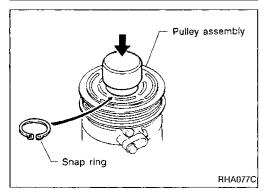
COMPRESSOR — Model DKV-14C (ZEXEL make)











Compressor Clutch (Cont'd)

Pulley removal

Position the center pulley puller on the end of the drive shaft, and remove the pulley assembly using any commercially available pulley puller.

For pressed pulleys

To prevent deformation of the pulley groove, the puller claws should be hooked into (not under) the pulley groove. For machine latched pulleys

Align the pulley puller groove with the pulley groove, and then remove the pulley assembly.

Remove the field coil harness clip using a screwdriver.

Remove the three field coil fixing screws and remove the field coil.

INSPECTION

Clutch disc: If the contact surface shows signs of damage due to excessive heat, the clutch disc and pulley should be replaced.

Pulley: Check the appearance of the pulley assembly. If the contact surface of the pulley shows signs of excessive grooving due to slippage, both the pulley and clutch disc should be replaced. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before reinstallation.

Coil: Check coil for loose connection or cracked insulation.

INSTALLATION

Install the field coil.

Be sure to align the coil's pin with the hole in the compressor's front head.

Install the field coil harness clip using a screwdriver.

Install the pulley assembly using the installer and a hand press, and then install the snap ring using snap ring pliers.

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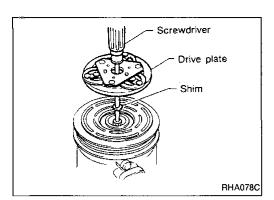
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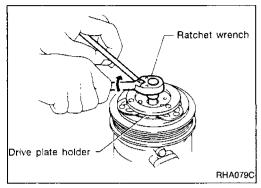
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COMPRESSOR — Model DKV-14C (ZEXEL make)

Compressor Clutch (Cont'd)

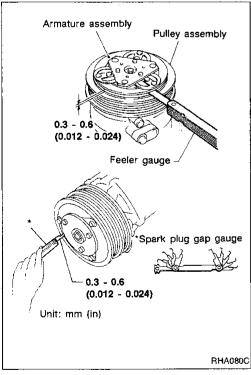


• Install the drive plate on the drive shaft, together with the original shim(s). Press the drive plate down by hand.



 Using the holder to prevent drive plate rotation, tighten the bolt to 12 to 15 N·m (1.2 to 1.5 kg-m, 9 to 11 ft-lb) torque.

After tightening the bolt, check that the pulley rotates smoothly.



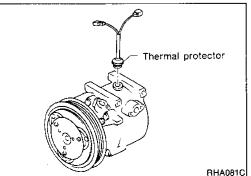
Check clearance around the entire periphery of clutch disc.
 Disc-to-pulley clearance:

0.3 - 0.6 mm (0.012 - 0.024 in)

If the specified clearance is not obtained, replace adjusting spacer and readjust.

BREAK-IN OPERATION

When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch about thirty times. Break-in operation raises the level of transmitted torque.



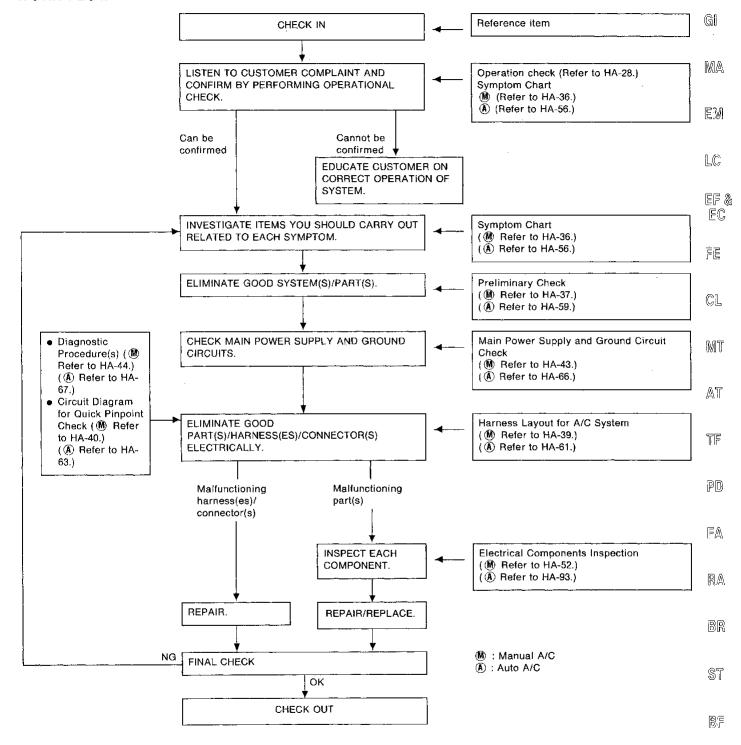
Thermal Protector

INSPECTION

- When servicing, do not allow foreign matter to get into compressor.
- Check continuity between two terminals.

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



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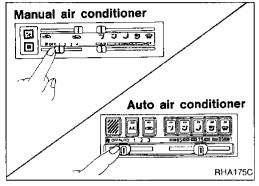
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Operation Check

The purpose of the operational check is to confirm that the system is as it should be. The systems which will be checked are the blower, mode (discharge air), intake air, temperature decrease, temperature increase and A/C switch systems.

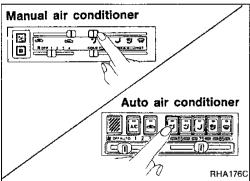
CONDITIONS:

Engine running and at normal operating temperature.



PROCEDURE:

- 1. Check blower
- Slide FAN lever to AUTO or 1.
 Blower should operate at speed AUTO or 1.
- 2) Then slide lever to speed 1 or 2.
- Continue checking blower speed until all speeds are checked.
- 4) Leave blower on speed 3 or 4.



2. Check discharge air

- Press button or slide mode lever to position. VENT indicator should illuminate (Auto Air Conditioner type only).
- 2) Confirm that all discharge air comes out of face vents.
- 3) Press button or slide mode lever to position. B/L indicator should illuminate (Auto Air Conditioner type only).
- Confirm that discharge air comes out of face vents and foot vents.
- Press button or slide mode lever to position. FOOT indicator should illuminate (Auto Air Conditioner type only).
- Confirm that discharge air comes out of foot vents, with some air from defroster vents.
- Press button or slide mode lever to position. F/D indicator should illuminate (Auto Air Conditioner type only).
- Confirm that discharge air comes out of foot vents with some air from defroster vents. Intake door position is at FRESH. (Auto Air Conditioner type only).
- Press position or slide mode lever to position.
 DEF indicator should illuminate (Auto Air Conditioner type only).
- 10) Confirm that all discharge air comes out of defroster vents. At the same time compressor should turn ON and intake door position be at FRESH. (Auto Air Conditioner type only).

HA-28

DIAGNOSES — Overall System

Operation Check (Cont'd)

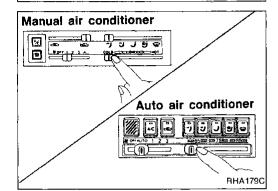
Manual air conditioner Auto air conditioner

3. Check recirc

- 1) Press button or slide intake lever to position. RECIRC indicator should illuminate (Auto Air Conditioner type only).
- 2) Listen for intake door position change (you should hear sound change slightly).

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4. Check temperature decrease

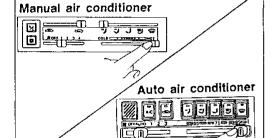
- 1) Slide temperature lever to full cold.
- 2) Check for cold air at discharge air outlets.

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5. Check temperature increase

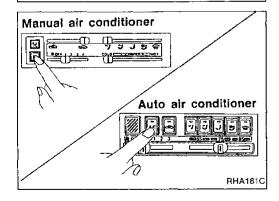
- 1) Slide temperature lever to full hot.
- 2) Check for hot air at discharge air outlets.

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6. Check A/C switch

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Move fan control lever to the desired position (AUTO to 3 or 1 FA to 4) and press air conditioner button to turn ON air conditioner. Indicator light will come on when air conditioner is ON.

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Performance Chart

TEST CONDITION

Testing must be performed as follows:

Vehicle location:

Doors:

Door window:

Hood:

TEMP. control lever position: AIR control lever position: INTAKE lever position:

FAN lever:

Engine speed:

Time required before starting testing after air conditioner starts operating:

Indoors or in the shade (in a well-ventilated place)

Closed

Open (Front driver side only)

Open

Max. COLD

(Ventilation) (Recirculation)

Max. speed

1,500 rpm

More than 10 minutes

TEST READING

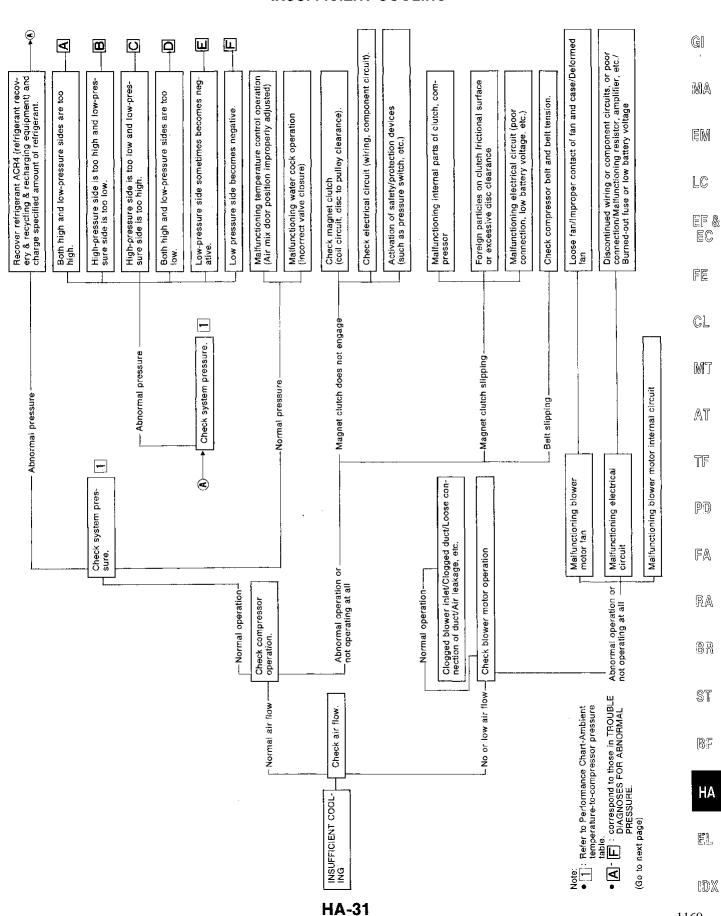
Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator
Relative humidity %	Air temperature °C (°F)	°C (°F)
	20 (68)	6.6 - 8.3 (44 - 47)
	25 (77)	10.4 - 12.4 (51 - 54)
50 - 60 30 (86)		14.2 - 16.7 (58 - 62)
35 (95)	35 (95)	18.2 - 21.0 (65 - 70)
	40 (104)	22.0 - 25.2 (72 - 77)
	20 (68)	8.3 - 9.8 (47 - 50)
	25 (77)	12.4 - 14.4 (54 - 58)
60 - 70	30 (86)	16.7 - 18.9 (62 - 66)
	35 (95)	21.0 - 23.6 (70 - 74)
	40 (104)	25.2 - 28.1 (77 - 83)

Ambient air temperature-to-compressor pressure table

Ambie	ent air	High property (Discharge side)	Law propure (Susting side)
Relative humidity %	Air temperature °C (°F)	High-pressure (Discharge side) kPa (kg/cm², psí)	Low-pressure (Suction side) kPa (kg/cm², psi)
	20 (68)	961 - 1,187 (9.8 - 12.1, 139 - 172)	108 - 157 (1.1 - 1.6, 16 - 23)
	25 (77)	1,295 - 1,599 (13.2 - 16.3, 188 - 232)	161.8 - 215.8 (1.65 - 2.2, 23.5 - 31.3)
50 - 70	30 (86)	1,285 - 1,569 (13.1 - 16, 186 - 228)	167 - 216 (1.7 - 2.2, 24 - 31)
	35 (95)	1,520 - 1,863 (15.5 - 19, 220 - 270)	235 - 284 (2.4 - 2.9, 34 - 41)
	40 (104)	1,765 - 2,158 (18 - 22, 256 - 313)	289.3 - 353.1 (2.95 - 3.6, 41.9 - 51.2)

Performance Test Diagnoses INSUFFICIENT COOLING



DIAGNOSES — Overall System

Performance Test Diagnoses (Cont'd) TROUBLE DIAGNOSES FOR ABNORMAL PRESSURE

Whenever there is abnormal pressure of high and/or low sides of the system, diagnosis must be conducted by using a manifold gauge. The large-line zone on the gauge scale (see illustrations.) shown in the following table refers to the standard (normal) pressure range for the corresponding pressure side (high or low). Since the standard (normal) pressure, however, differs from vehicle to vehicle, refer to the "Ambient air temperature-to-compressor pressure table".

Gauge indication	Refrigerant cycle	Probable cause	Corrective action				
Both high and low-pressure sides are too high.	 Pressure is reduced soon after water is splashed on condenser. 	Excessive refrigerant charge in refrigeration cycle	Reduce refrigerant until specified pressure is obtained.				
	Air suction by radiator or condenser fan is insufficient.	Insufficient condenser cooling performance 1 Condenser fins are clogged. 2 Improper rotation of cooling fan or condenser fan	Clean condenser. Check and repair radiator or condenser fan as necessary.				
AC359A	 Low-pressure pipe is not cold. When compressor is stopped high-pressure value quickly drops by approximately 196 kPa (2 kg/cm², 28 psi). It then decreases gradually thereafter. 	Poor heat exchange in condenser (After compressor operation stops, high pressure decreases too slowly.) Air in refrigeration cycle	Evacuate repeatedly and recharge system.				
	Engine tends to overheat.	Engine cooling systems mal- function.	Check and repair each engine cooling system.				
	Areas near low-pressure pipe connection and service valves are considerably cold compared with areas near expansion valve outlet or evaporator. Plates are sometimes covered with frost.	Excessive liquid refrigerant on low-pressure side Excessive refrigerant discharge flow Expansion valve is open a little compared with the specification. Improper thermal valve installation Improper expansion valve adjustment	Replace expansion valve.				

DIAGNOSES — Overall System Performance Test Diagnoses (Cont'd)

Cause indication	Refrigerant cycle	Probable cause	Corrective action	
Gauge indication High-pressure side is too high and low-pressure side is too low.	Upper side of condenser and high-pressure side are hot, however, liquid tank is not	High-pressure tube or parts located between compressor and condenser are clogged	Check and repair or replace malfunctioning parts.	
B	so hot.	or crushed.	Check compressor oil for contamination.	GI
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(ro) (HI)				EF &
AC360A				EC
High-pressure side is too low and low-pressure side is too high.	High and low-pressure sides become equal soon after compressor operation stops.	Compressor pressure operation is improper.	Replace compressor.	ĖE
	compressor operation stops.	Damaged inside compressor packings		CL
				MIT
	No temperature difference between high and low-pres-	Compressor discharge capacity does not change.	Replace compressor.	AΤ
	sure sides	(Compressor stroke is set at maximum.)		TF
AC356A				PD
Both high-and low-pressure sides are too low.	difference between liquid tank outlet and inlet. Outlet	Liquid tank inside is clogged a little.	Replace liquid tank Check compressor oil for contamination.	≊/ <u>M</u>
	temperature is extremely low. • Liquid tank inlet and			RA
	expansion valve are frosted.	Walana and a same and a same and a same and a same and a same and a same and a same and a same and a same and a	Charles de la constant de la constan	BR
(IO) (HI)	Temperature of expansion valve inlet is extremely low as compared with areas near liquid tank.	High-pressure pipe located between liquid tank and expansion valve is clogged.	 Check and repair malfunctioning parts. Check compressor oil for contamination. 	ST
A A A	Expansion valve inlet may be frosted. Temperature difference			
AC353A	occurs somewhere in high- pressure side			НА

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DIAGNOSES — Overall System

	Performa	nce Test Diagnoses	(Cont'd)
Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Both high and tow-pressure sides are too low.	There is a big temperature difference between expansion valve inlet and outlet while the valve itself is frosted.	Expansion valve closes a little compared with the specification. 1 Improper expansion valve adjustment 2 Malfunctioning thermal valve 3 Outlet and inlet may be clogged.	 Remove foreign particles by using compressed air. Check compressor oil for contamination.
AC353A	Areas near low-pressure pipe connection and service valve are extremely cold as compared with areas near expansion valve outlet and evaporator.	Low-pressure pipe is clogged or crushed.	 Check and repair malfunctioning parts. Check compressor oil for contamination.
	Air flow volume is not enough or is too low.	Evaporator is frozen. Compressor discharge capacity does not change. (Compressor stroke is set at maximum length.)	Replace compressor.
Low-pressure side sometimes becomes negative.	 Air conditioning system does not function and does not cyclically cool the compartment air. The system constantly functions for a certain period of time after compressor is stopped and restarted. 	Refrigerant does not discharge cyclically. Moisture is frozen at expansion valve outlet and inlet. Water is mixed with refrigerant.	 Drain water from refrigerant or replace refrigerant. Replace liquid tank.

AC354A

DIAGNOSES — Overall System

**	Performance Test Diagnoses							
Gauge Indication	Refrigerant cycle	Probable cause	Corrective action					
Low-pressure side becomes	Liquid tank or front/rear side of expansion valve's pipe is	High-pressure side is closed	After the system is left a					

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Low-pressure side becomes negative. F AC362A	Liquid tank or front/rear side of expansion valve's pipe is frosted or dewed.	High-pressure side is closed and refrigerant does not flow. Expansion valve or liquid tank is frosted.	After the system is left at rest, start it again in order to confirm whether or not problem is caused by water or foreign particles. If the problem is due to water, drain water from refrigerant or replace refrigerant. If it is due to foreign particles, remove expansion valve and remove them with dry and compressed air. If either of the above methods cannot correct the problem, replace expansion valve. Replace liquid tank. Check compressor oil for contamination.

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TROUBLE DIAGNOSES — Manual Air Conditioner

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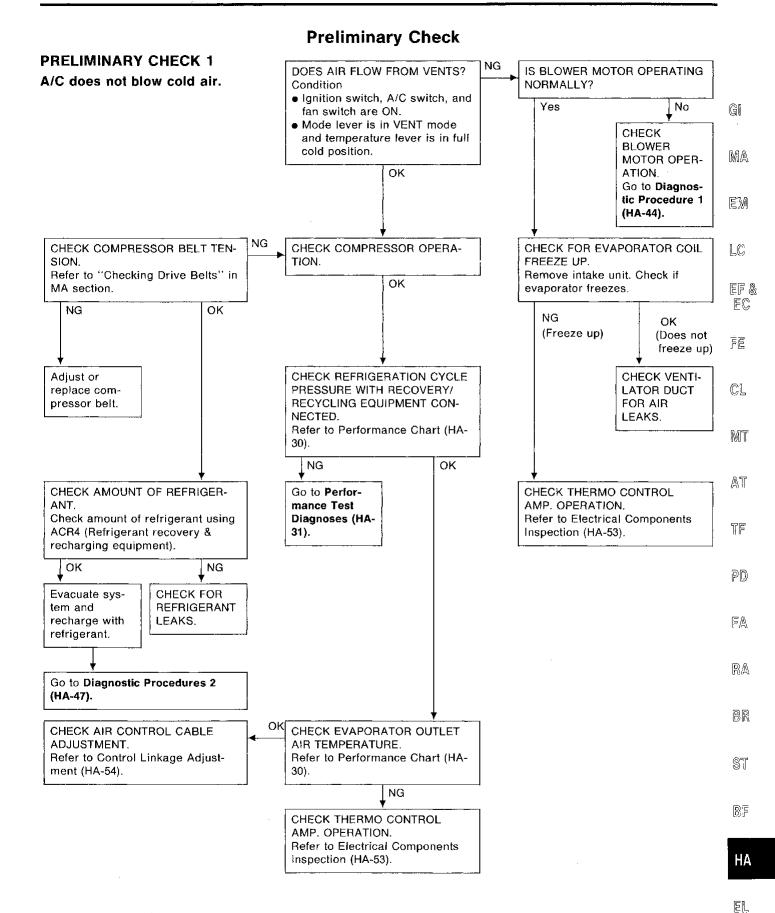
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Symptom Chart

DIAGNOSTIC TABLE

PROCEDURE	na	limi- ary eck	no: Pro	ag- stic oce- ire	Su Grou	in Pov pply a und Ci Check	ınd rcuit	Electrical Components Inspection									
			re 1	re 2									۔			Compressor	
SYMPTOM	Preliminary check 1	Preliminary check 2	Diagnostic procedure	Diagnostic procedure	15A Fuses	10A Fuse	10A Fuse	Blower motor	Resistor	A/C switch	Fan switch	Blower relay	A/C relay	Dual-pressure switch	Magnet clutch	Thermal protector	Harness
A/C does not blow cold air.	0	A	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Blower motor does not rotate.	0		0		0		0	0	0		С	0					0
Magnet clutch does not engage when A/C switch and fan switch are ON.	0			0		0	0			0	0	0	0	O	0	0	0
Noise	<u></u>	0															

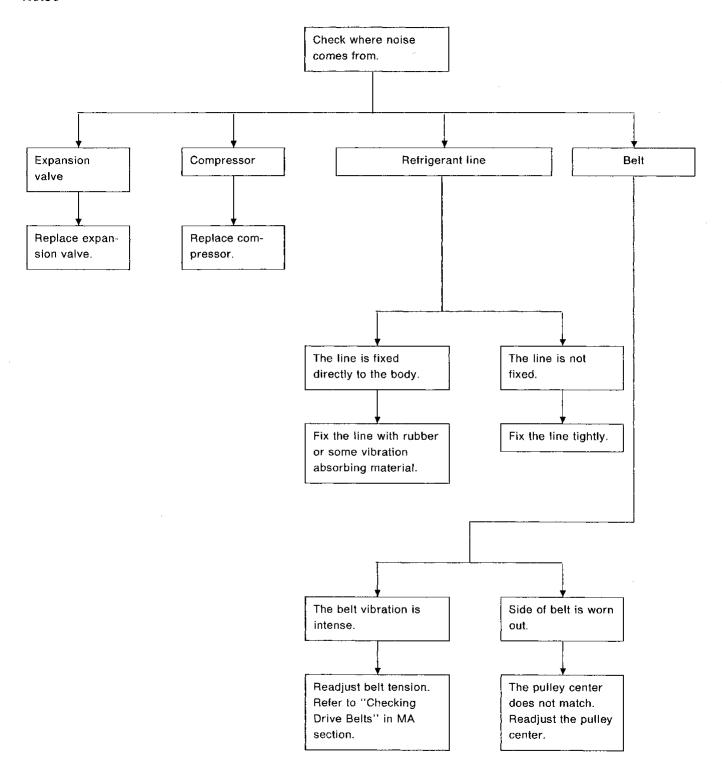
①: The number means checking order.○: As for checking order, refer to each flow chart. (It depends on malfunctioning portion.)



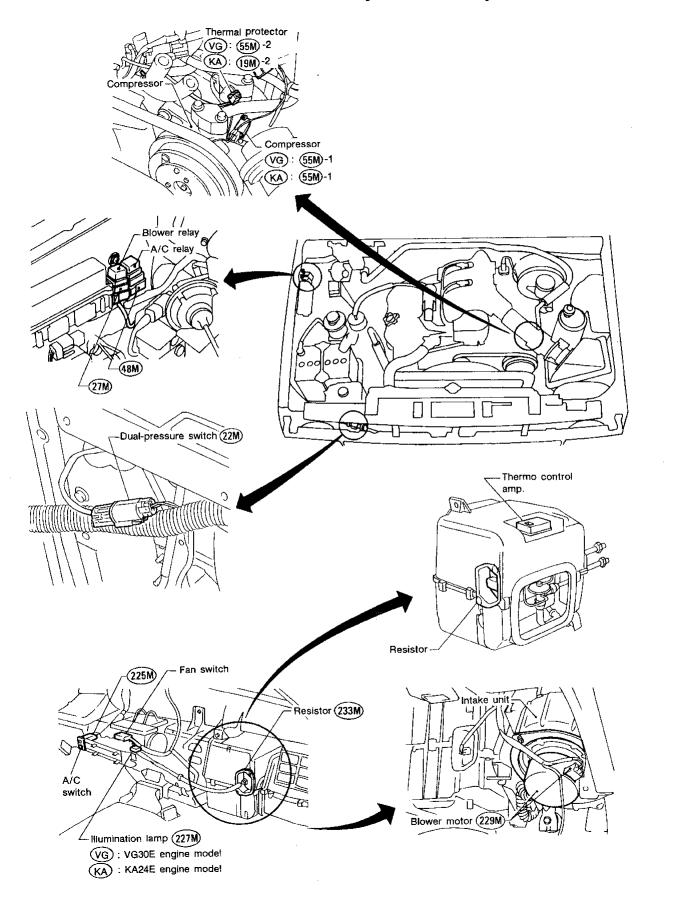
Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

Noise



Harness Layout for A/C System



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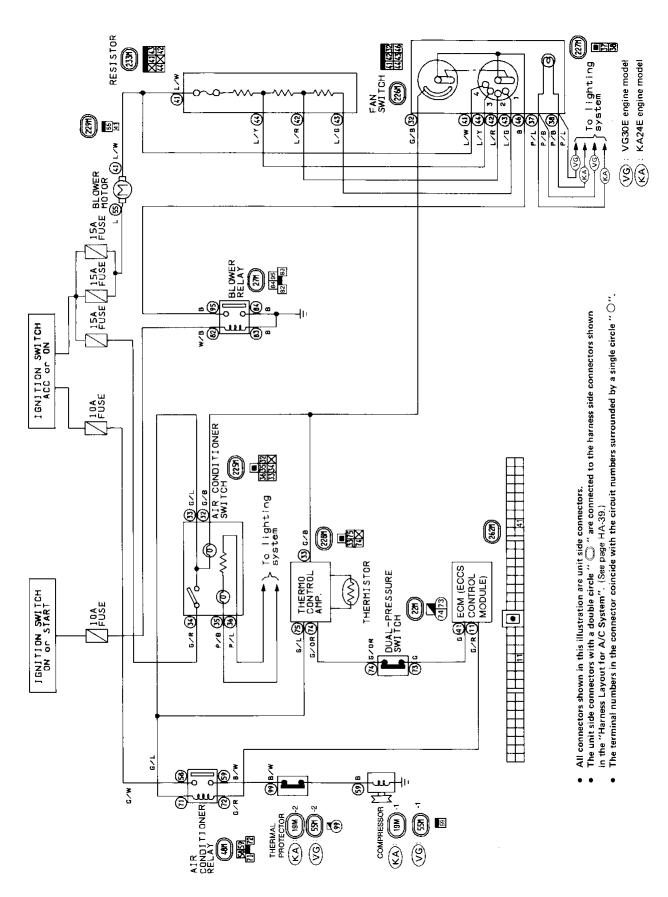
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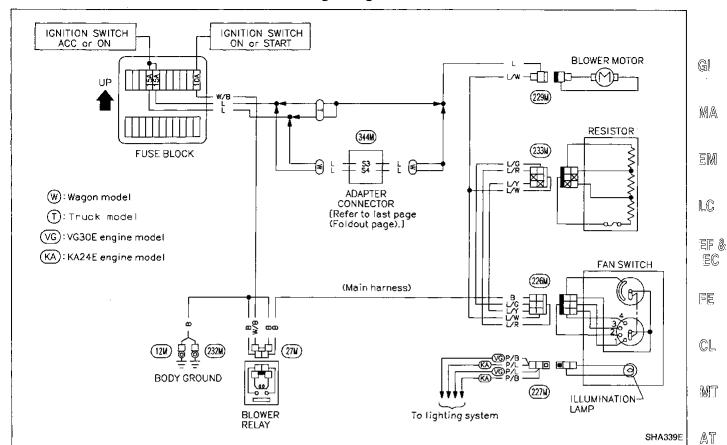
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Circuit Diagram for Quick Pinpoint Check



TROUBLE DIAGNOSES — Manual Air Conditioner

Wiring Diagram — Heater



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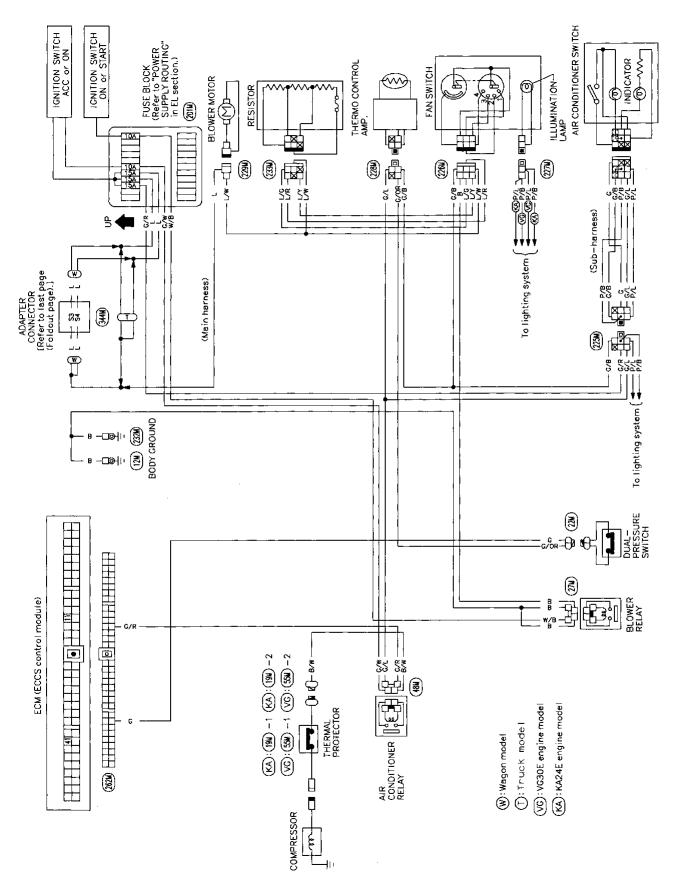
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Wiring Diagram



Main Power Supply and Ground Circuit Check

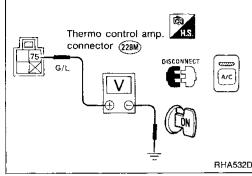
POWER SUPPLY CIRCUIT CHECK FOR A/C SYSTEM

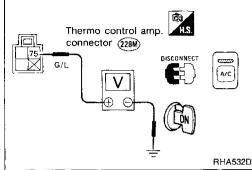
Check power supply circuit for air conditioning system. Refer to "POWER SUPPLY ROUTING" in EL section and "Wiring Diagram".

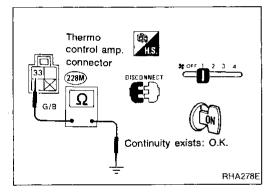


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THERMO CONTROL AMP. CHECK

Check power supply circuit for thermo control amp. with ignition switch ON.

1. Disconnect thermo control amp, harness connector.

2. Connect voltmeter from harness side.

Measure voltage across terminal No. (5) and body ground.

Voltmete	r terminal	Voltago
•	⊖	Voltage
7 5	Body ground	Approx. 12V

Check body ground circuit for thermo control amp, with ignition switch ON and fan switch ON.

Disconnect thermo control amp. harness connector.

2. Connect ohmmeter from harness side.

Check for continuity between terminal No. 3 and body ground.

Ohmmeter terminal		Continuity
Φ	Θ	Continuity
53)	Body ground	Yes

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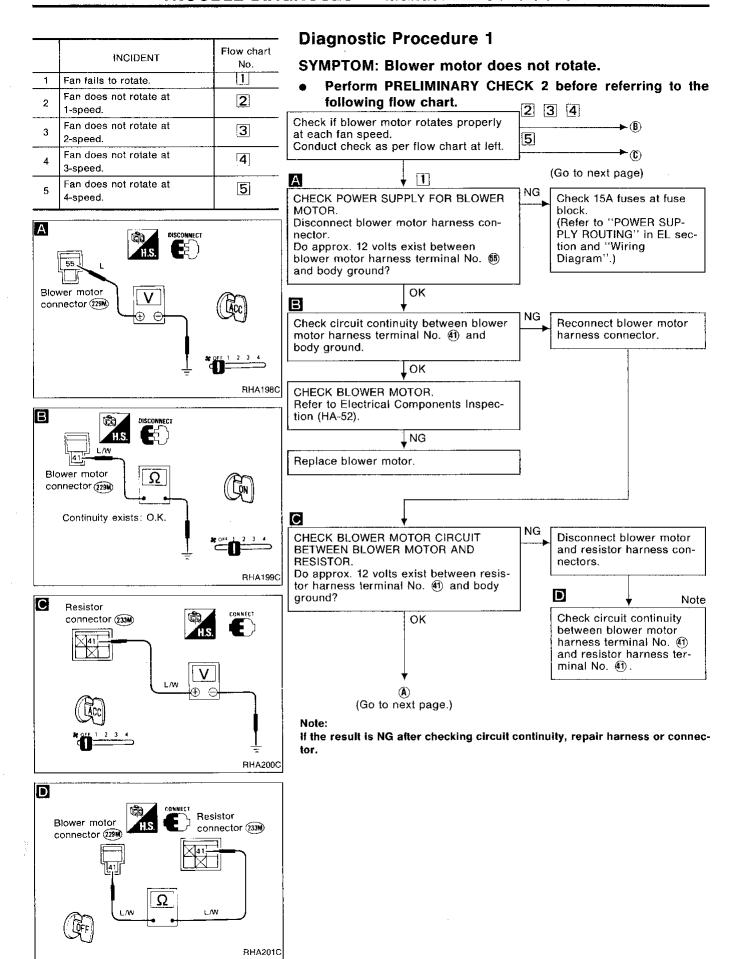
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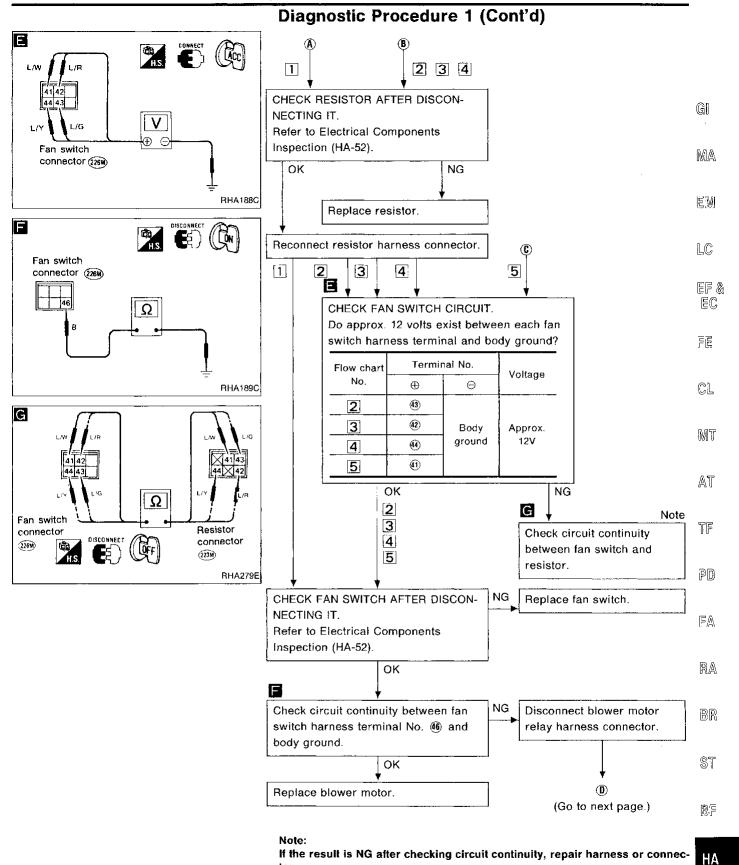
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TROUBLE DIAGNOSES — Manual Air Conditioner



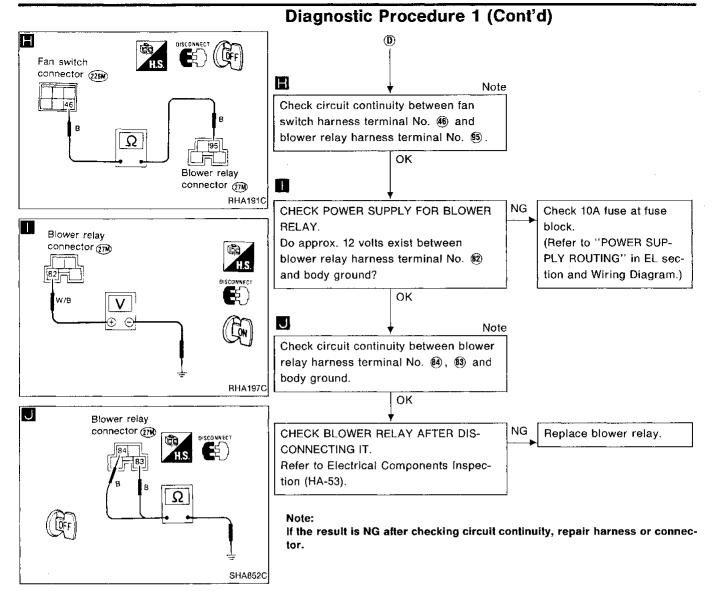
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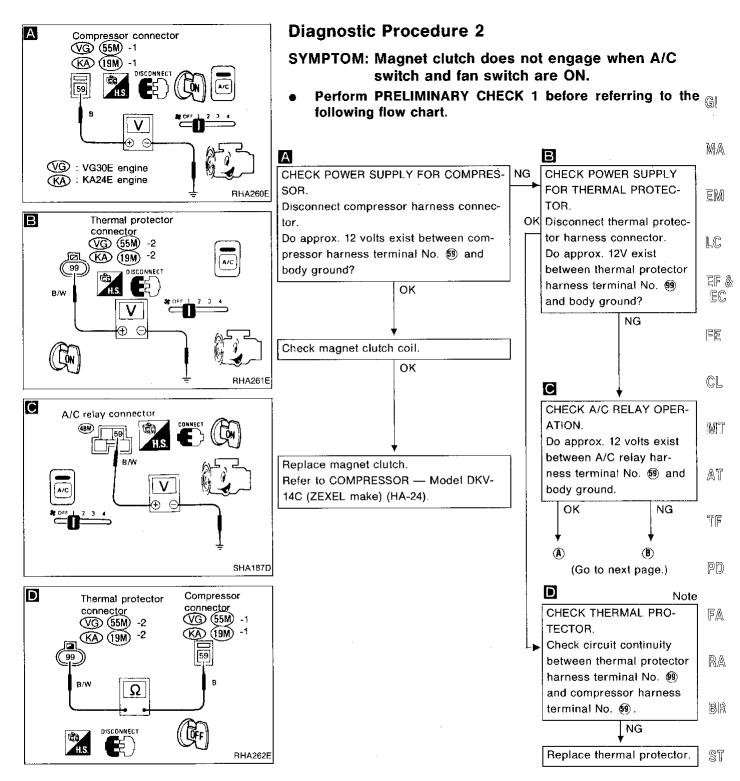
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TROUBLE DIAGNOSES — Manual Air Conditioner





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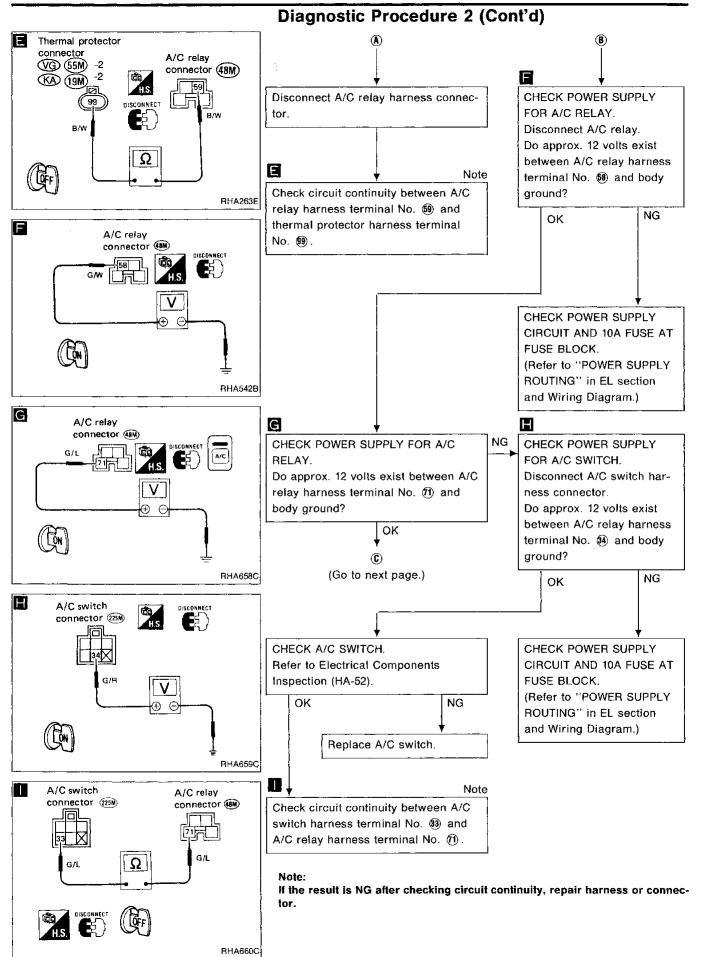
If the result is NG after checking circuit continuity, repair harness or connector. \mathbb{R}^2

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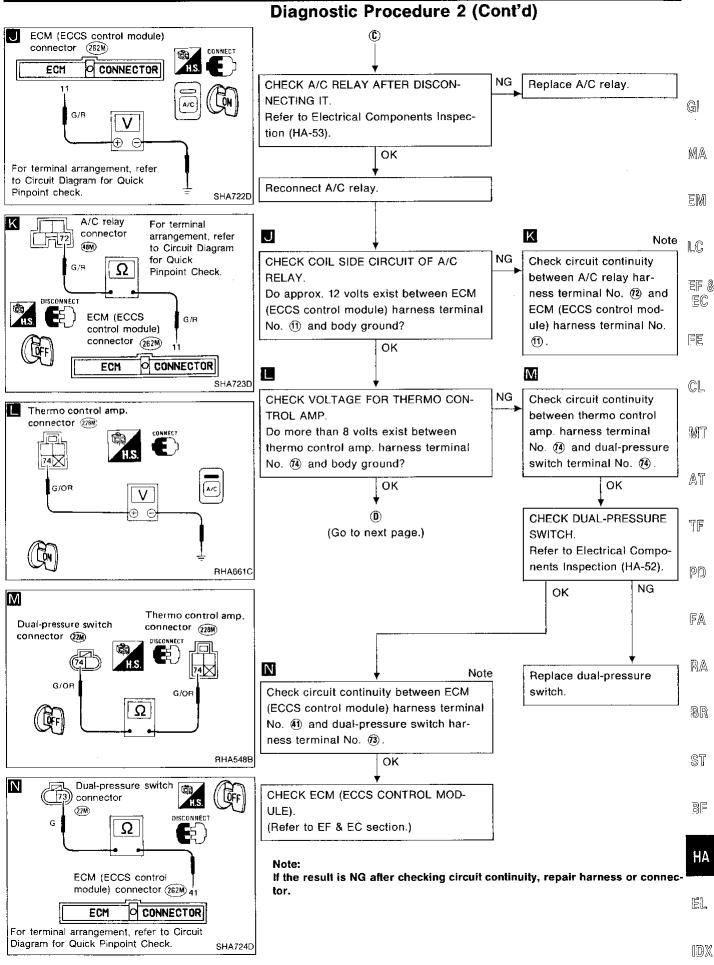
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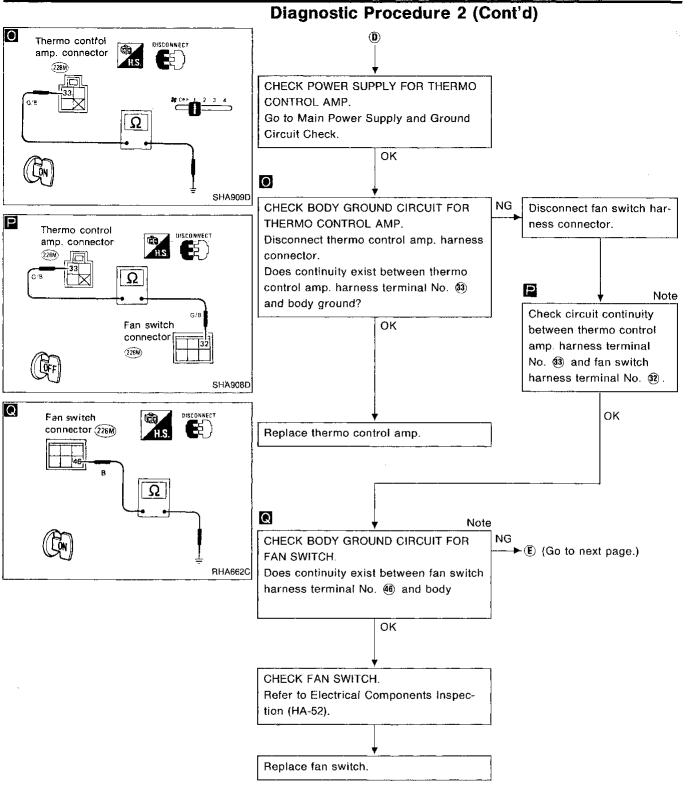
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TROUBLE DIAGNOSES — Manual Air Conditioner



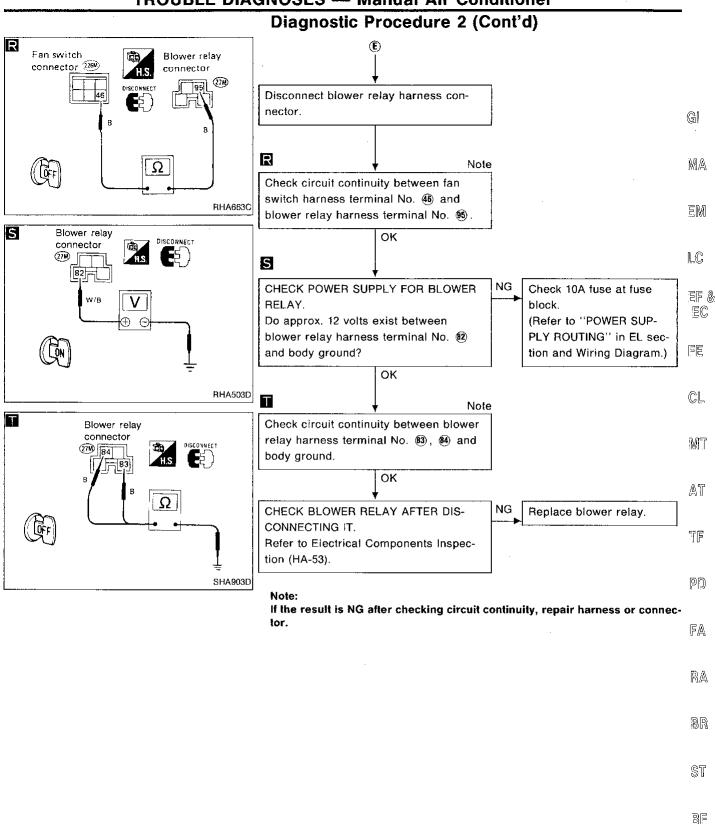
TROUBLE DIAGNOSES — Manual Air Conditioner





Note:

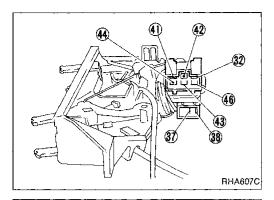
If the result is NG after checking circuit continuity, repair harness or connector.



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Electrical Components Inspection FAN SWITCH

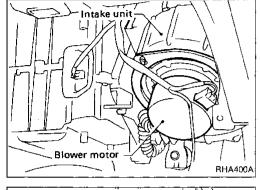
Check continuity between terminals at each switch position.

TERMINAL POSITION	OFF	1	2	Э	4	
41			[Q	
43		Q		Π.	П	
42	Ι	ĪΤ	Q	Γ	\prod	
44		П	П	Q	П	
46		Q	þ	Ò	φ.	
32		Q	Q	Q	Q	/ Illumination lamp
37		Ò	_	<u>万</u>		- mornination lamp
38		Q		9	,-	

BLOWER MOTOR

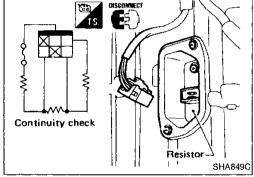
Confirm smooth rotation of the blower motor.

 Ensure that there are no foreign particles inside the intake unit.



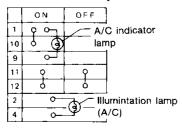
BLOWER RESISTOR

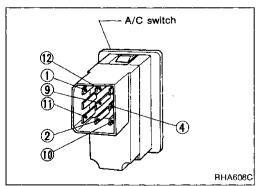
Check continuity between terminals.



A/C SWITCH

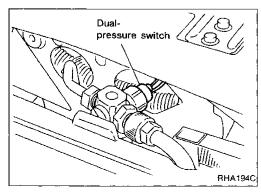
Check continuity between terminals at each switch position.

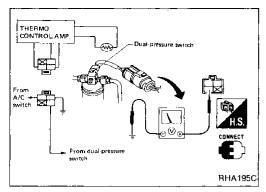




DUAL-PRESSURE SWITCH

High-pressure side line pressure kPa (kg/cm², psi)	Operation	Continuity
Decreasing to 157 - 216 (1.6 - 2.2, 23 - 31) Increasing to 2,452 - 2,844 (25 - 29, 356 - 412)	Turn OFF	Does not exist
Increasing to 157 - 235 (1.6 - 2.4, 23 - 34) Decreasing to 1,863 - 2,256 (19 - 23, 270 - 327)	Turn ON	Exists





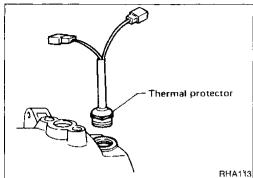
Electrical Components Inspection (Cont'd) THERMO CONTROL AMP.

Evaporator outlet air temperature °C (°F)	Thermo amp. operation	Tester
Decreasing to 0.1 - 0.9 (32 - 34)	Turn OFF	Approx. 12V
Increasing to 2.5 - 3.5 (37 - 38)	Turn ON	Approx. 0V

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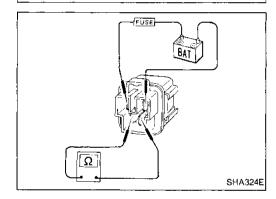


THERMAL PROTECTOR

Temperature of compressor °C (°F)	Operation	I,C
Increasing to approx. 145 - 155 (293 - 311)	Turn OFF	 EF_&
Decreasing to approx. 130 - 140 (266 - 284)	Turn ON	EC

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A/C RELAY AND BLOWER RELAY

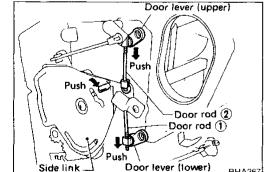
Check circuit continuity between terminals by supplying 12 volts MT to coil side terminal of relay.

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-Side link

Door rod

Control Linkage Adjustment VENTILATOR DOOR CONTROL ROD

Move side link in direction of arrow.

With upper and lower ventilator door levers held in the direction of the arrow, connect rods 1 and 2 to their corresponding ventilator door levers in that order.

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DEFROSTER DOOR CONTROL ROD

Move side link in direction of arrow.

Connect rod to side link while pushing defroster door lever in direction of arrow.

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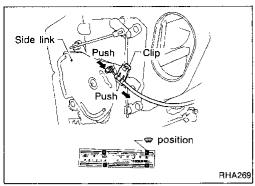


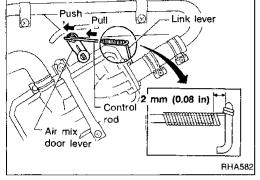
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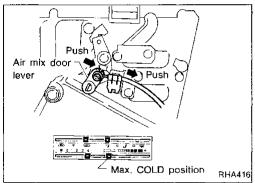
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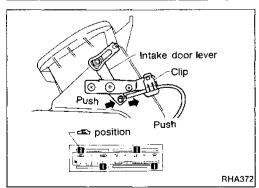
Defroster door

HA-53









Control Linkage Adjustment (Cont'd) AIR CONTROL CABLE

Move air control lever to w position. Set side link in DEF mode.

Pull on outer cable in direction of arrow and then clamp it.

After positioning control cable, check it operates properly.

WATER COCK CONTROL ROD

- When adjusting water cock control rod, first disconnect temperature control cable from air mix door lever and then adjust control rod. Reconnect temperature control cable and readjust it. (Refer to next item.)
- Push air mix door lever in direction of arrow.
- 2. Pull control rod of water cock in direction of arrow so as to make clearance of about 2 mm (0.08 in) between ends of rod and link lever and connect the rod to door lever.

After connecting control rod, check it operates properly.

TEMPERATURE CONTROL CABLE

- When adjusting ventilator door rod and defroster door rod, first disconnect air control cable from side link. Reconnect and readjust air control cable.
- Move temperature control lever to max. COLD position. Set air mix door lever in full hot mode. Pull on outer cable in direction of arrow and then clamp it.

After positioning control cable, check it operates properly.

INTAKE DOOR CONTROL CABLE

Move intake door lever to position. Set intake door lever in REC mode. Pull on outer cable in direction of arrow and then clamp it.

After positioning control cable, check it operates properly.

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SYMPTOM: Ambient sensor circuit is open or shorted.	HA-85	BR
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Electrical Components Inspection		LLA
Control Linkage Adjustment	HA-93	HA

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Symptom Chart

DIAGNOSTIC TABLE

PROCEDURE	Pre	elimi	nary	/ Che	eck 						Diag	nost	ic P	roce	dure	!						and	Gro	Sup und heck	,
SYMPTOM	Preliminary check 1	Preliminary check 2	Preliminary check 3	Preliminary check 4	Preliminary check 5	Diagnostic Procedure 1	Diagnostic Procedure 2	Diagnostic Procedure 3	Diagnostic Procedure 4	Diagnostic Procedure 5	Diagnostic Procedure 6	Diagnostic Procedure 7	Diagnostic Procedure 8	Diagnostic Procedure 9	Diagnostic Procedure 10	Diagnostic Procedure 11	Diagnostic Procedure 12	Diagnostic Procedure 13	Diagnostic Procedure 14	Diagnostic Procedure 15	15A Fuses	10A Fuse	10A Fuse	Push control unit	Auto amp.
A/C does not blow cold air.		0				0									0						0	0	0	Ó	0
Blower motor does not rotate at all.		0				0															0		0		
(Fan switch [AUTO] [1] [2] [3]) Blower motor does not rotate at all when the fan speed is in AUTO. (It operates in 1, 2, or 3-speed only)			_				0														0		0		0
Blower motor fan speed does not change when fan speed is in AUTO. (Fan speed is fixed in Hi or MH.)								•	:												0		0		0
Blower motor fan speed does not change when fan speed is in AUTO. (Fan speed is fixed in LO.)									0												0		0		0
Starting fan speed control does not operate.										0						•							0		0
There is too much difference between setting temp, on PTC and in-vehicle temp.		•									0											0	0		0
Air mix door motor does not operate normally.		•										0											0		0
Air outlet does not change. Intake door does not change in				0									0									0			
VENT, B/L or FOOT mode. Intake door is not set at "FRESH"												_	_	0			_	_	<u> </u>		_	0		-	-
in DEF or F/D mode. Magnet clutch does not engage	0					_							<u> </u>	0					<u> </u>	ļ ··		0		_	<u> </u>
when A/C switch and fan switch are ON.		0		,	!							<u></u>			0							0	0		
Magnet clutch does not engage in DEF mode.		0	0												0							0	0		
Ambient sensor circuit is open or shorted.																0							0		0
In-vehicle sensor circuit is open or shorted.																	0						0		0
Sunload sensor circuit is open or shorted.																		•					0		0
Water temperature sensor circuit is open or shorted.																			0				0		0
Illumination or indicators of push control unit do not come on.																				0		0	0		
Noise		[<u> </u>	0					_		l							Г						

^{1, 2:} The number means checking order.

O: As for checking order, refer to each flow chart. (It depends on malfunctioning portion.)

Symptom Chart (Cont'd)

	Electrical Components Inspection																Gl																			
						Push control unit													sensor						:		Ď.	.	Com-	pressor	module)					M/ En
	Resistor	A/C switch	REC switch	VENT switch	B/L switch	FOOT switch	F/D switch	DEF switch	○ Fan switch	O PTC	O Air mix door motor	O PBR	Mode door motor	Intake door motor	Auto amp.	Ambient sensor	In-vehicle sensor	Sunload sensor	Water temperature sensor		Auto amp, relay	Blower relay	LO relay	ML relay	MH relay	HI relay	Thermo control amp.	Dual-pressure switch	Magnet clutch	Thermal protector	O ECM (ECCS control module)	Illumination system	Microswitch	Aspirator motor	O Harness	LC EF
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Checking Resistor

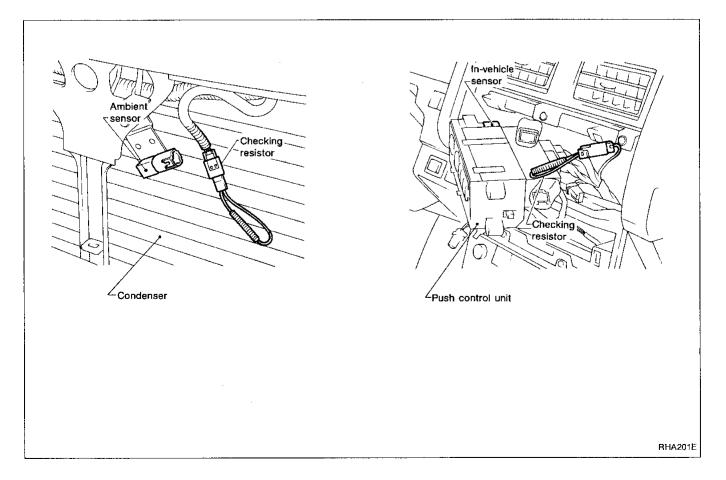
Checking resistors are used for trouble diagnoses of blower motor operation and air mix door motor operation. Use checking resistor when inspecting portions with C/R *1, C/R *2 in flow chart.

CAUTION:

Select checking resistors which have resistance values corresponding with those indicated in table below, and connect to respective sensors.

	Checking resistor	Ambient sensor	In-vehicle sensor	Wattage
Blower motor opera- tion check	C/R *1	1 0000	1,500Ω	4 (4)01
Air mix door motor operation check	C/R *2	1,000Ω	2,490Ω	1/4W

- Disconnect ambient sensor and in-vehicle sensor harness connectors.
- 2. Connect checking resistor as shown in figure.
- 3. Turn ignition switch ON.
- 4. Turn A/C switch ON.
- 5. Turn VENT switch ON.
- 6. Keep sunload sensor away from sunlight by covering it.



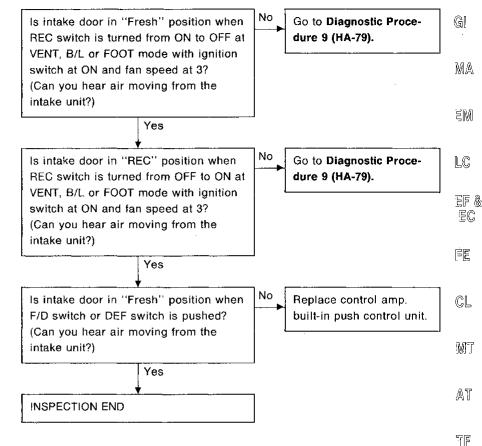
HA-58

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Preliminary Check

PRELIMINARY CHECK 1

Intake door is not set at "FRESH" in DEF or F/D mode.



PRELIMINARY CHECK 2 A/C does not blow cold air.

Refer to HA-37.

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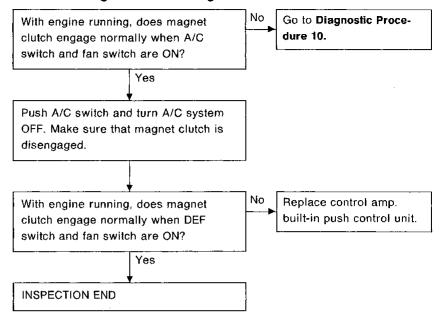
 \mathbb{M}

Preliminary Check (Cont'd)

PRELIMINARY CHECK 3

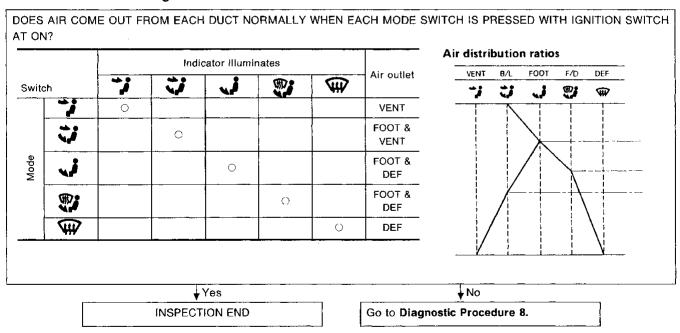
Magnet clutch does not engage in DEF mode.

• Perform PRELIMINARY CHECK 2 before referring to the following flow chart.



PRELIMINARY CHECK 4

Air outlet does not change.



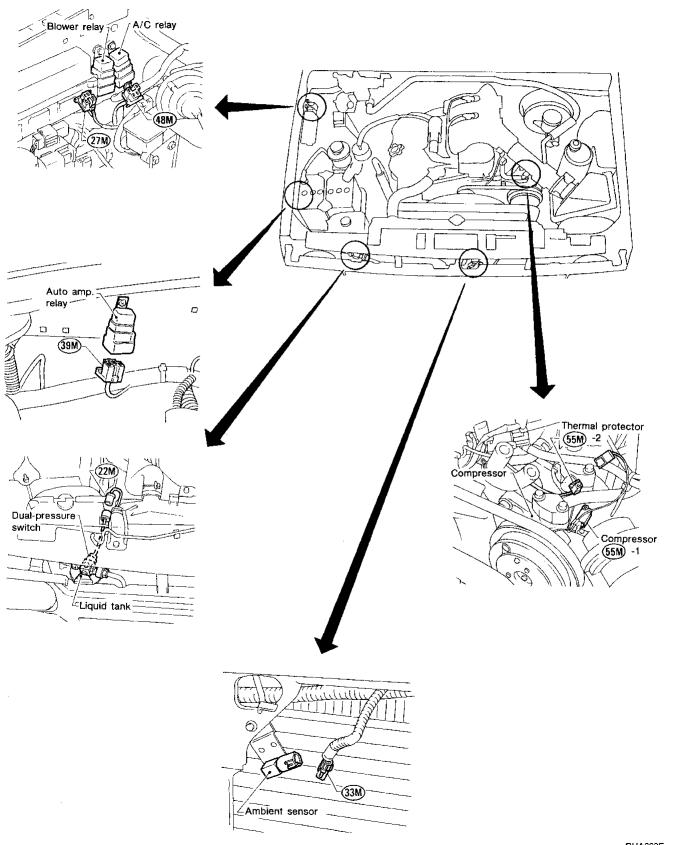
PRELIMINARY CHECK 5

Noise

Refer to HA-38.

Harness Layout for A/C System

Engine compartment



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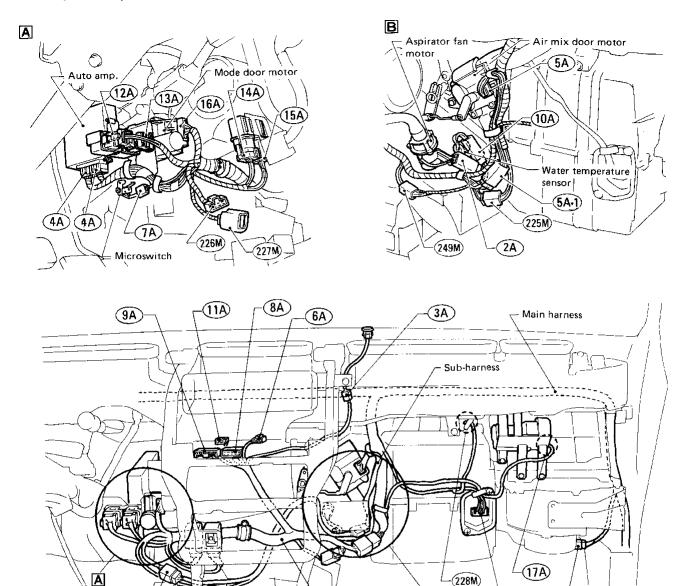
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Harness Layout for A/C System (Cont'd)

Passenger compartment



Main harness

22M): Dual-pressure switch

(225M)

- (27M): Blower relay
- 3M : Ambient sensor
- (48M): A/C relay
- (55M): Compressor
- 225M : Auto A/C harness
- : Thermo control amp.
- ②29M): Blower motor
- 233M : Resistor

Auto A/C harness

- ②A : Aspirator motor
- 3A : Sunload sensor
- Auto amp.
- (4A) : Auto amp.
- Air mix door motor
- €A : PTC

227M)

- (A): Microswitch
- Push control unit
- 9A : Fan switch

В

Auto A/C harness

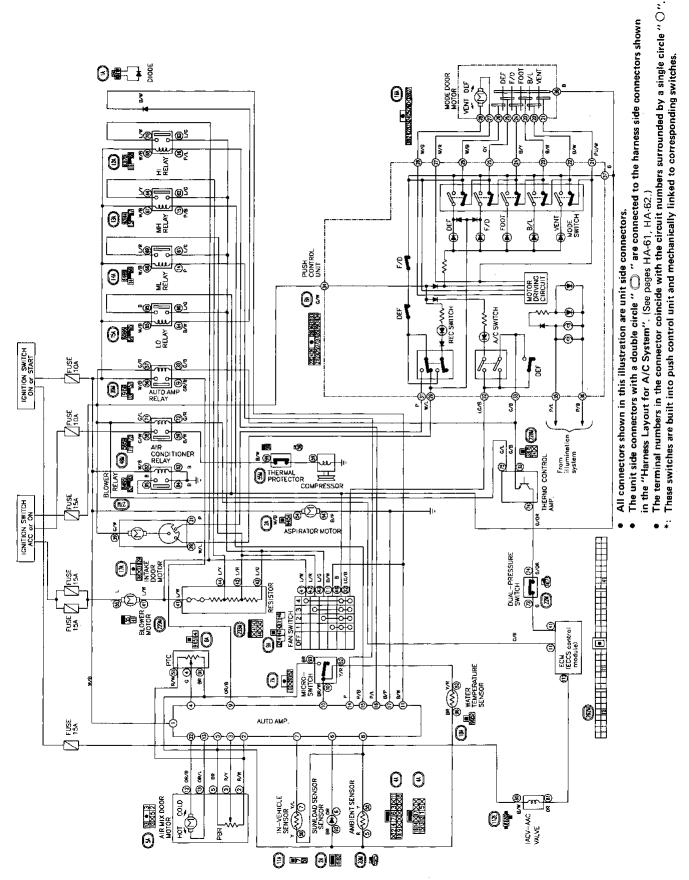
Water temperature sensor

(233M)

229M

- 11A : In-vehicle sensor
- (Taping color: Yellow)
- (3A) : MH relay (Taping color: Blue)
- (Taping color: White)
- 15A : LO relay
- Mode door motor
- : Intake door motor

Circuit Diagram for Quick Pinpoint Check



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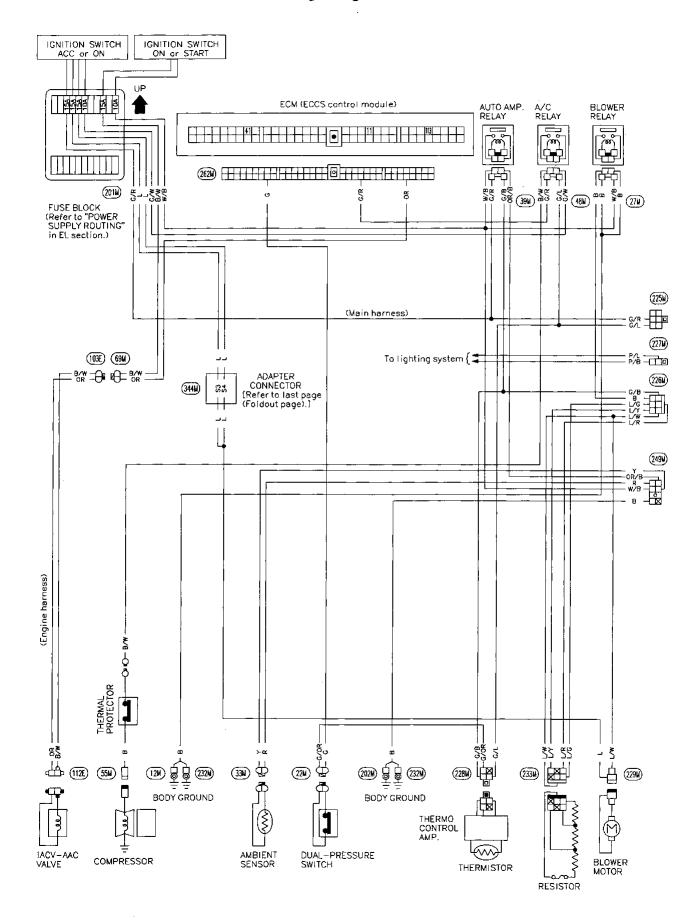
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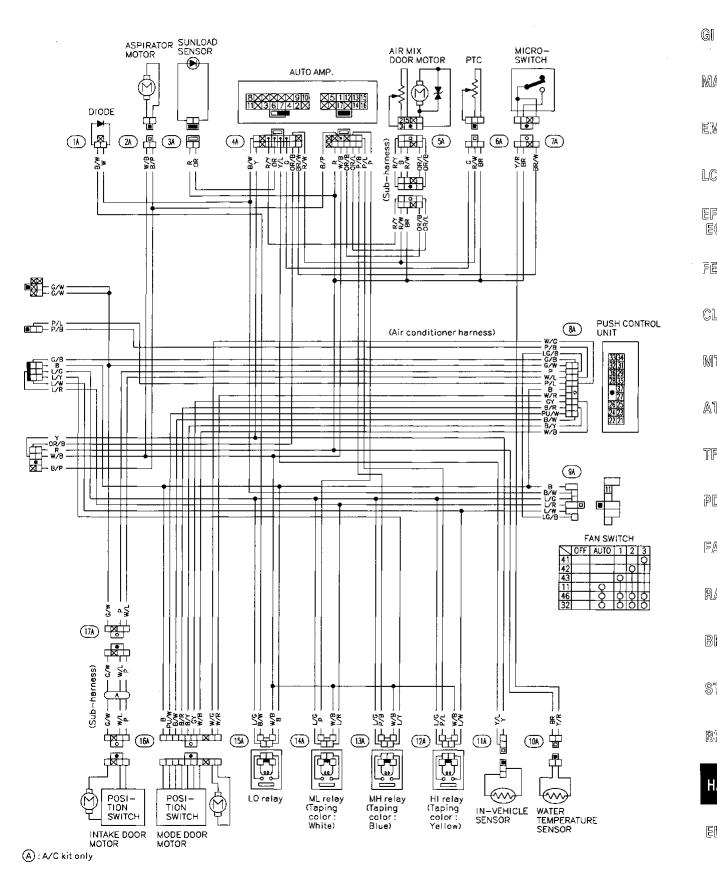
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Wiring Diagram



Wiring Diagram (Cont'd)



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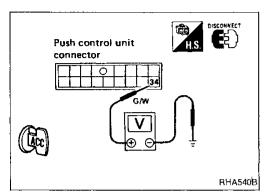
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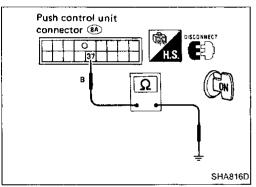
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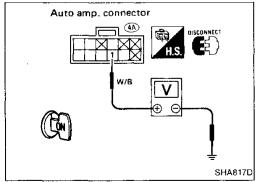
Main Power Supply and Ground Circuit Check POWER SUPPLY CIRCUIT CHECK FOR AUTO A/C SYSTEM

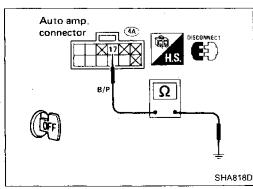
Check power supply circuit for auto air conditioning system.

Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.









PUSH CONTROL UNIT CHECK

Check power supply circuit for push control unit with ignition switch at ACC.

- 1. Disconnect push control unit harness connector.
- 2. Connect voltmeter from harness side.
- 3. Measure voltage across terminal No. 🥸 and body ground.

Voltmeter	terminal	Valtage
\oplus	Θ	Voltage
34)	Body ground	Approx. 12V

Check body ground circuit for push control unit with ignition switch ON.

- 1. Disconnect push control unit harness connector.
- 2. Connect ohmmeter from harness side.
- 3. Check for continuity between terminal No. 37 and body ground.

AUTO AMP. CHECK

Check power supply circuit for auto amp. with ignition switch ON.

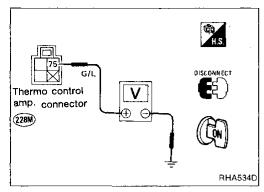
- 1. Disconnect auto amp, harness connector.
- 2. Connect voltmeter from harness side.
- 3. Measure voltage across terminal No. ① and body ground.

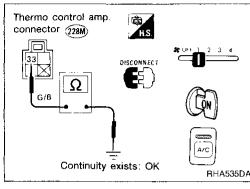
Voltmeter	terminal	Voltage
⊕	Θ	Voltage
1	Body ground	Approx. 12V

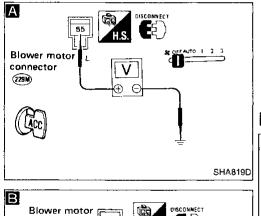
Check body ground circuit for auto amp. with ignition switch OFF.

- 1. Disconnect auto amp. harness connector.
- 2. Connect ohmmeter from harness side.
- 3. Check for continuity between terminal No. (7) and body ground.

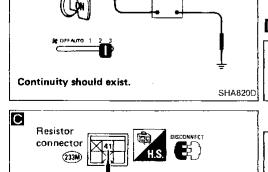
Ohmmete	r terminal	Continuitu
(Θ	Continuity
10	Body ground	Yes







connector



Main Power Supply and Ground Circuit Check (Cont'd)

THERMO CONTROL AMP. CHECK

Check power supply circuit for thermo control amp. with ignition switch ON.

- Disconnect thermo control amp. harness connector.
- 2. Connect voltmeter from harness side.
- Measure voltage across terminal No. (5) and body ground.

Voltmete	r terminal	Voltago	' 18V57/A
\oplus	0	Voltage	
75	Body ground	Approx. 12V	EM

Check body ground circuit for thermo control amp. with ignition switch OFF, A/C switch ON and fan switch ON.

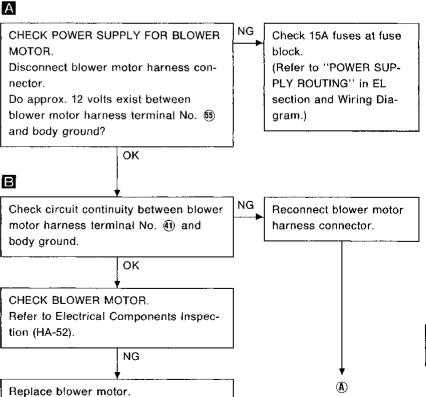
- Disconnect thermo control amp, harness connector.
- Connect ohmmeter from harness side.
- Check for continuity between terminal No. 33 and body E.F. & ground.

	Ohmmete	r terminal	Combination	
	\oplus	θ	Continuity	
	33)	Body ground	Yes	
_				— Cl

Diagnostic Procedure 1

SYMPTOM: Blower motor does not rotate at all. (Fan switch "AUTO", "1", "2", "3")

Perform PRELIMINARY CHECK 2 before referring to the AT following flow chart.



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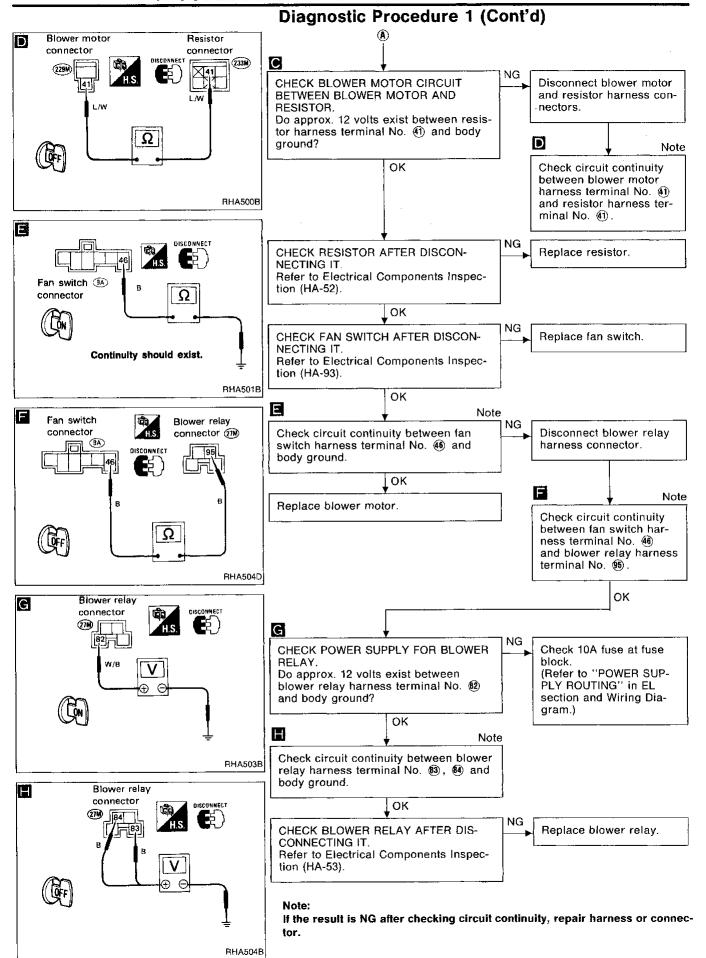
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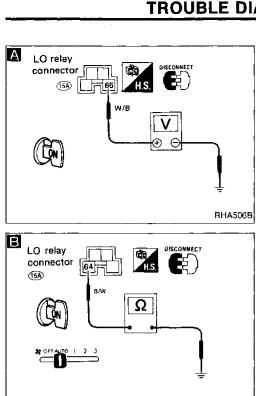
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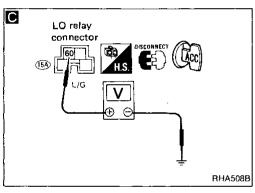
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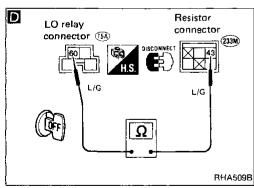
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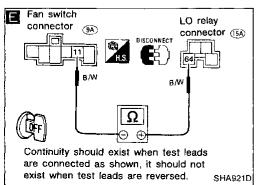
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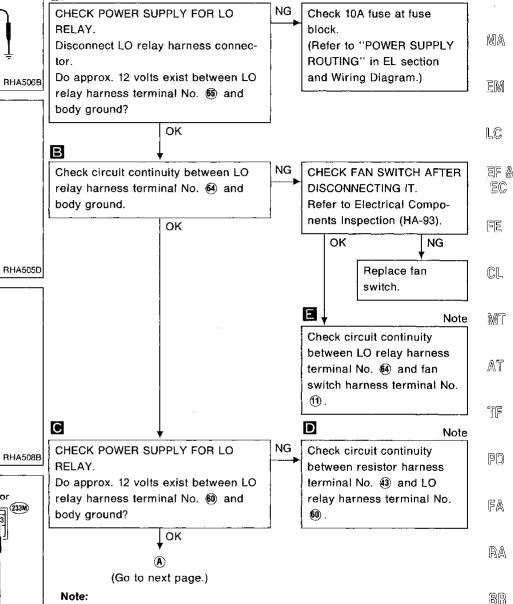






Diagnostic Procedure 2

SYMPTOM: Blower motor does not rotate at all when the fan speed is in AUTO. (It operates in 1, 2, or 3-speed only.) Α



Note:

If the result is NG after checking circuit continuity, repair harness or connector.

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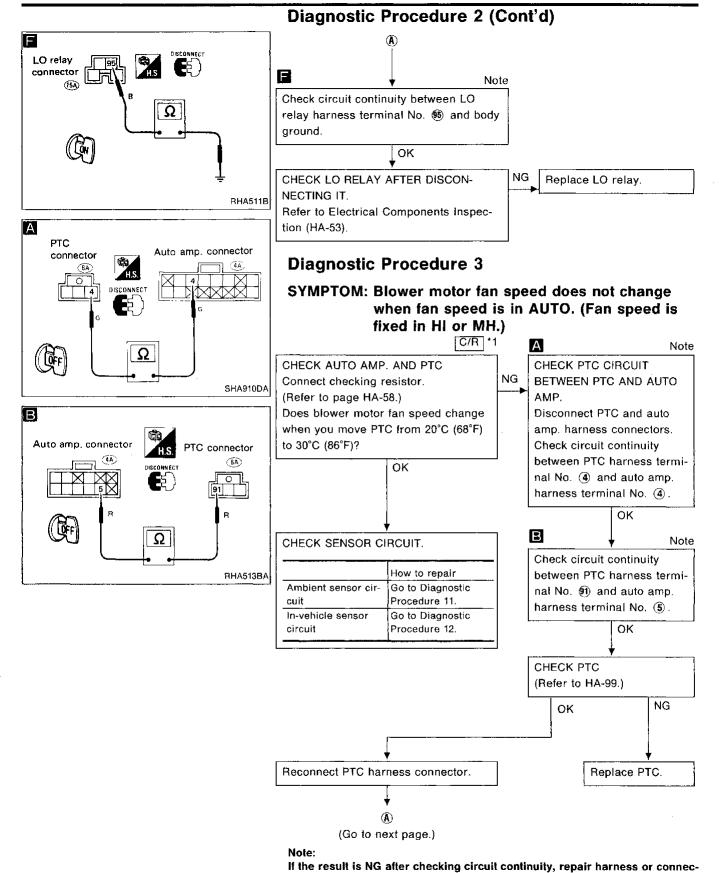
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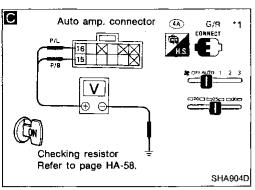
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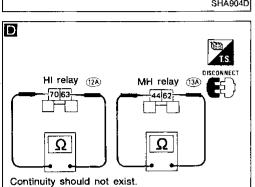
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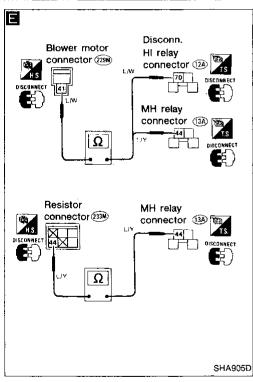
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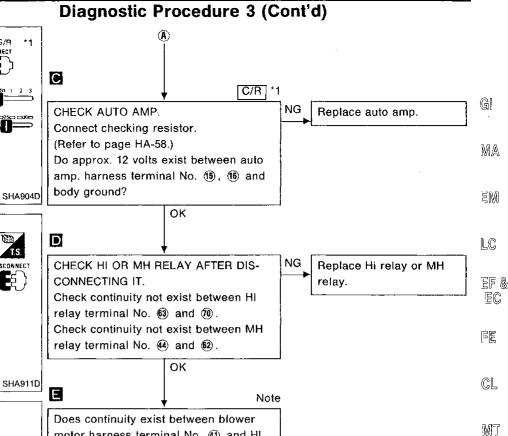


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Note:

minal No. 44?

harness terminal No. 49?

motor harness terminal No. (4) and HI

relay terminal No. (70) or MH relay ter-

Does continuity exist between resistor harness terminal No. 44 and MH relay

If the result is NG after checking circuit continuity, repair harness or connec-

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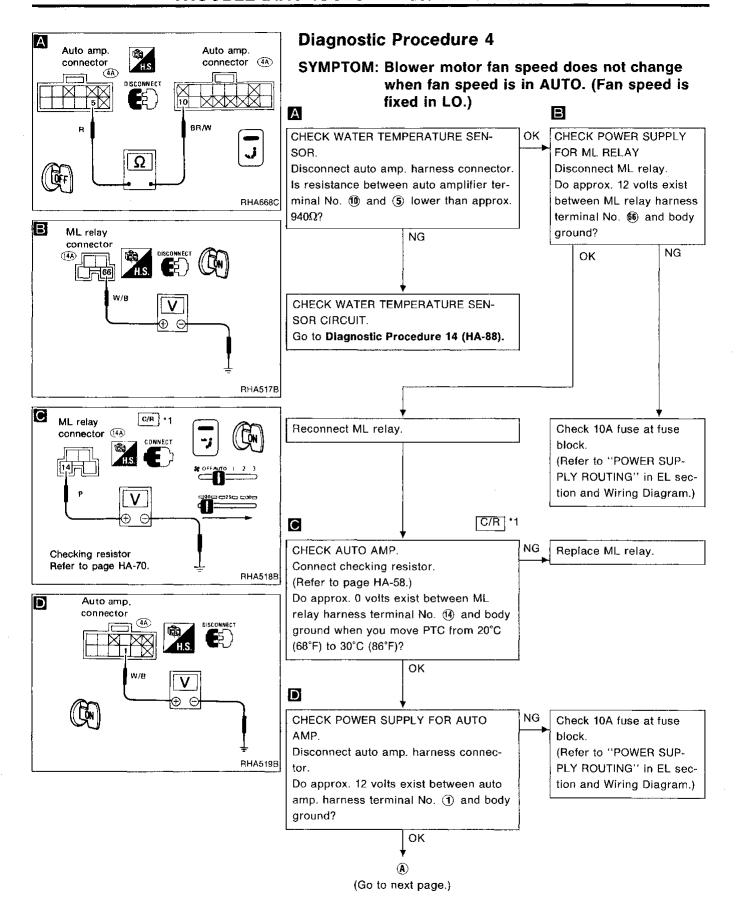
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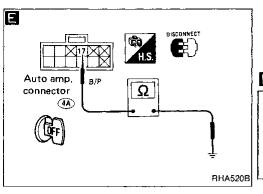
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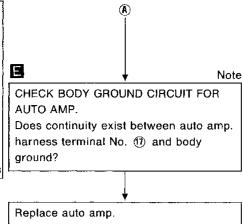
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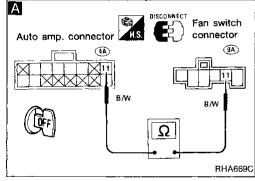
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Diagnostic Procedure 4 (Cont'd)

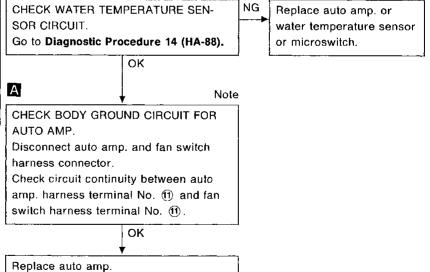








SYMPTOM: Starting fan speed control does not operate.



Note:

If the result is NG after checking circuit continuity, repair harness or connector.

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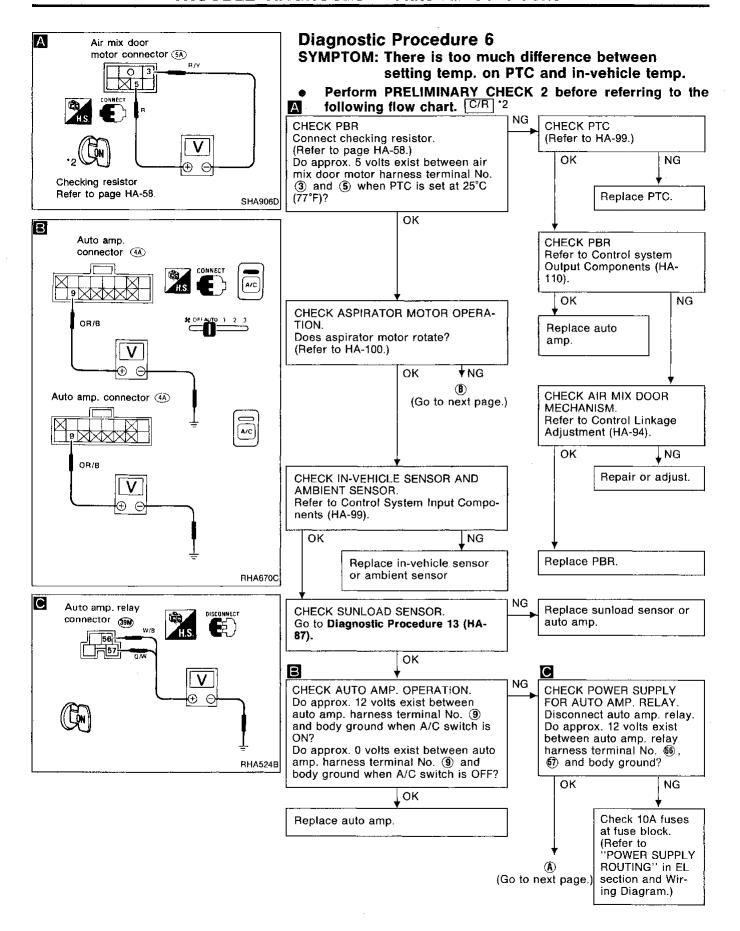
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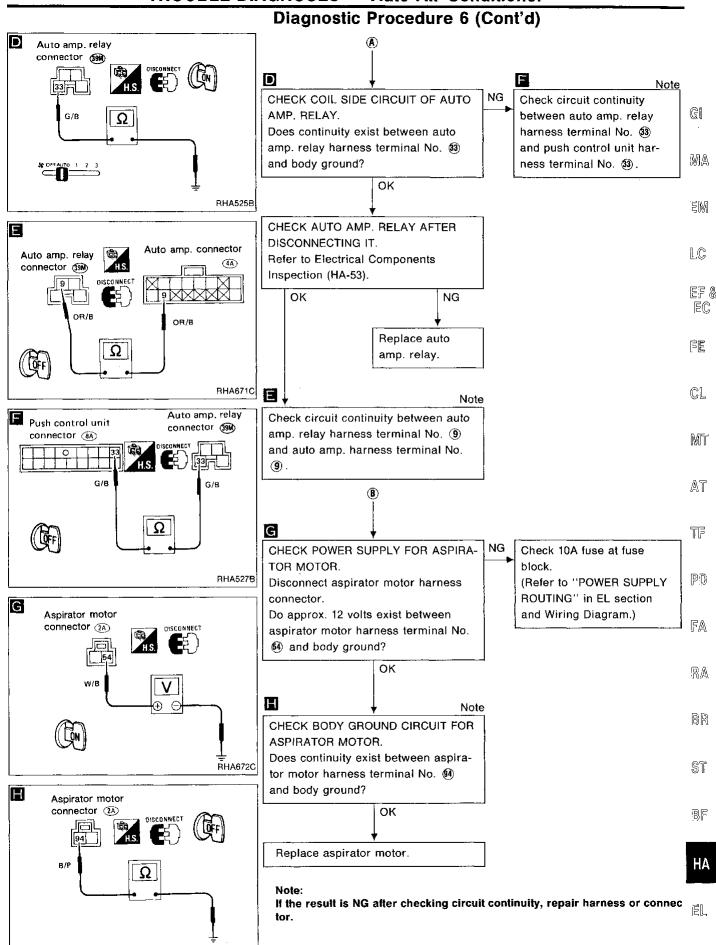
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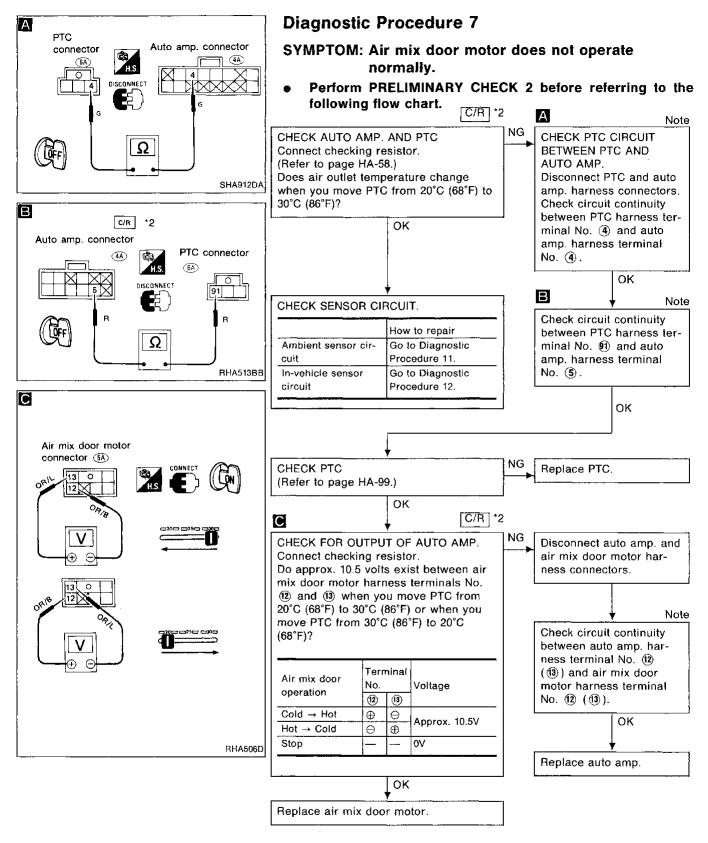
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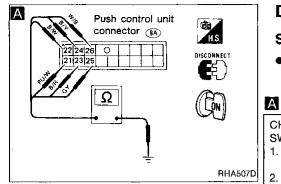
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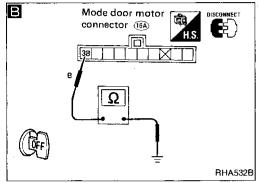
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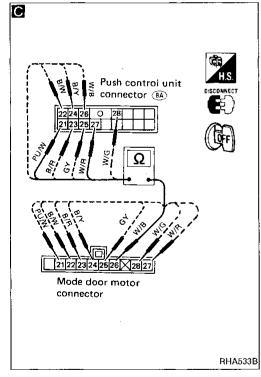


Note:

If the result is NG after checking circuit continuity, repair harness or connector







Diagnostic Procedure 8

SYMPTOM: Air outlet does not change.

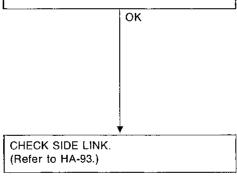
 Perform PRELIMINARY CHECK 4 and Main Power Supply and Ground Circuit Check before referring to the following flow chart.

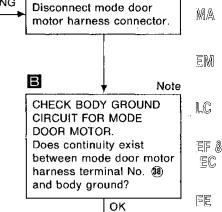
CHECK MODE DOOR MOTOR POSITION SWITCH.

1. Turn VENT switch ON with ignition

- Turn VENT switch ON with ignition switch at ON position.
- Turn ignition switch OFF.
 Disconnect push control unit connector.
- Check if continuity exists between each terminal on push control unit harness connector and body ground.
- Using above procedures, check for continuity in any other mode, as indicated in chart.

Mode	Termina⊦ No .		Continuity	
switch	⊕	Θ	Continuity	
VENT	21) or 22)			
B/L	22 or 23	Dad.		
FOOT	23 or 24	Body ground	Yes	
F/D	24 or 25	ground		
DEF	26 or 26			





Check circuit continuity				
between each terminal on				
push control unit and on				
mode door motor.				

C

Termin	Conti-	
⊕	Θ	nuity
Push	Mode	1
control	door	
unit	motor	
(21)	(21)	ļ
22)	22	
23	23	Yes
<u>24</u>)	24)	
2 5)	25)	
2 6	26)	
27	2 7	
28	28	
	(A)	

Note:

If the result is NG after checking circuit continuity, repair harness or connector.

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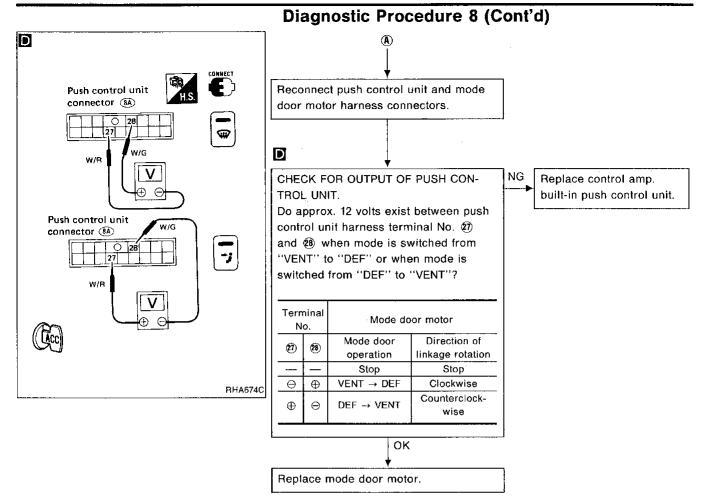
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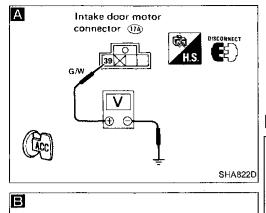
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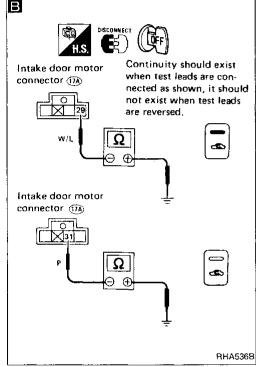
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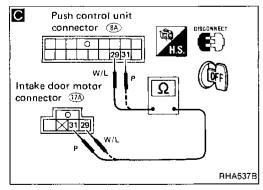
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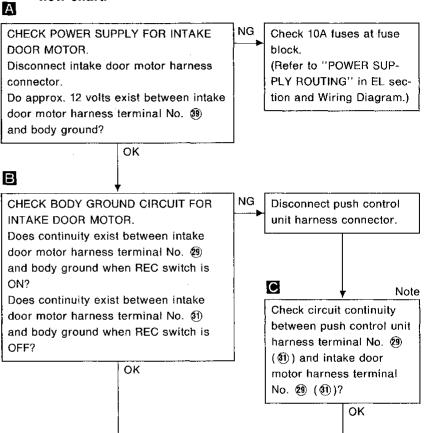




Diagnostic Procedure 9

SYMPTOM: Intake door does not change in VENT, B/L or FOOT mode.

 Perform PRELIMINARY CHECK 1 and Main Power Supply and Ground Circuit Check before referring to the following flow chart.



Note:

Replace intake door motor.

If the result is NG after checking circuit continuity, repair harness or connector.

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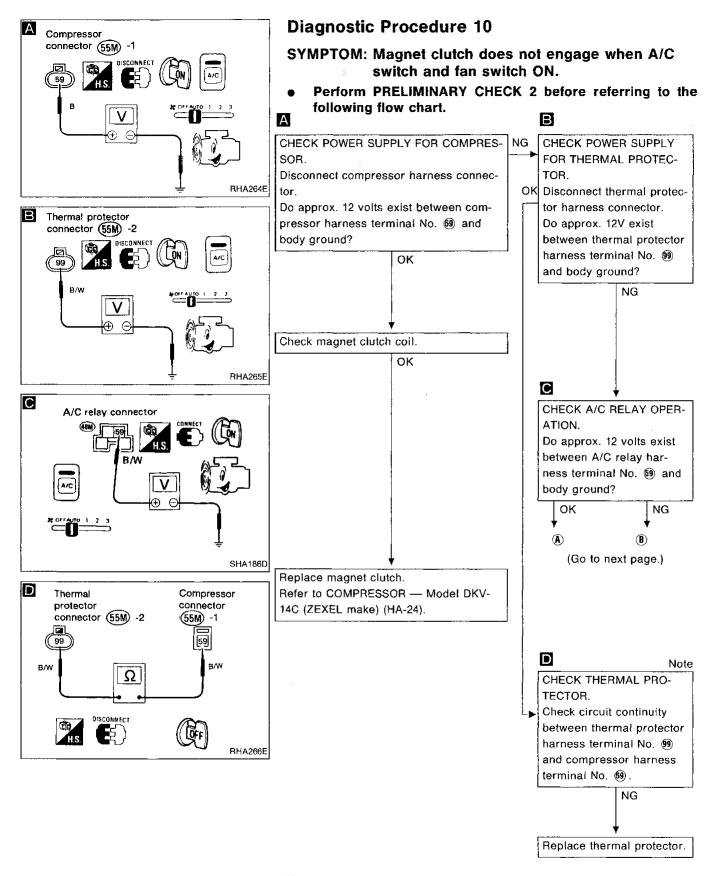
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Replace control amp.

built-in push control unit.

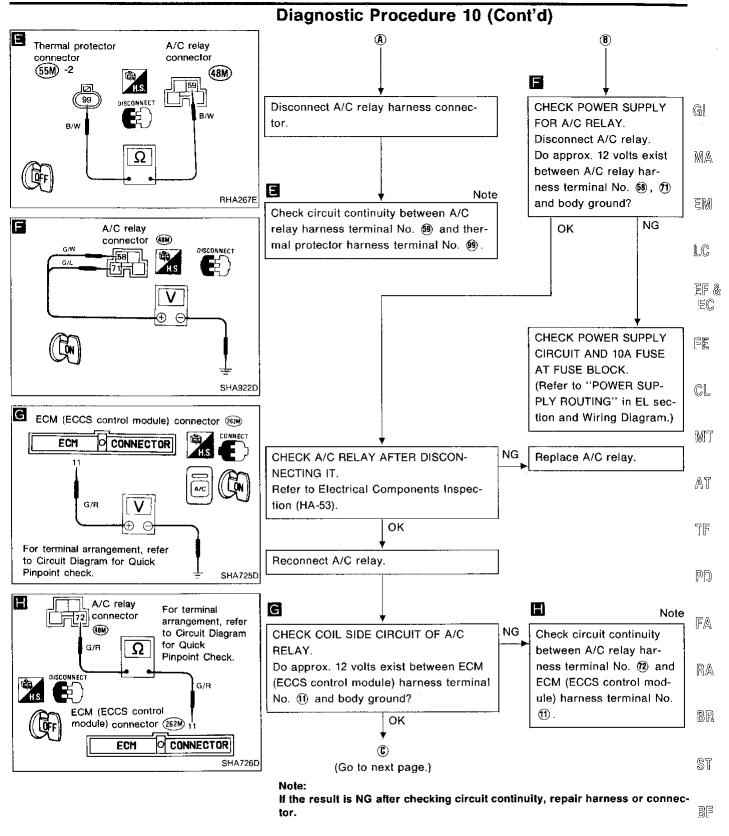
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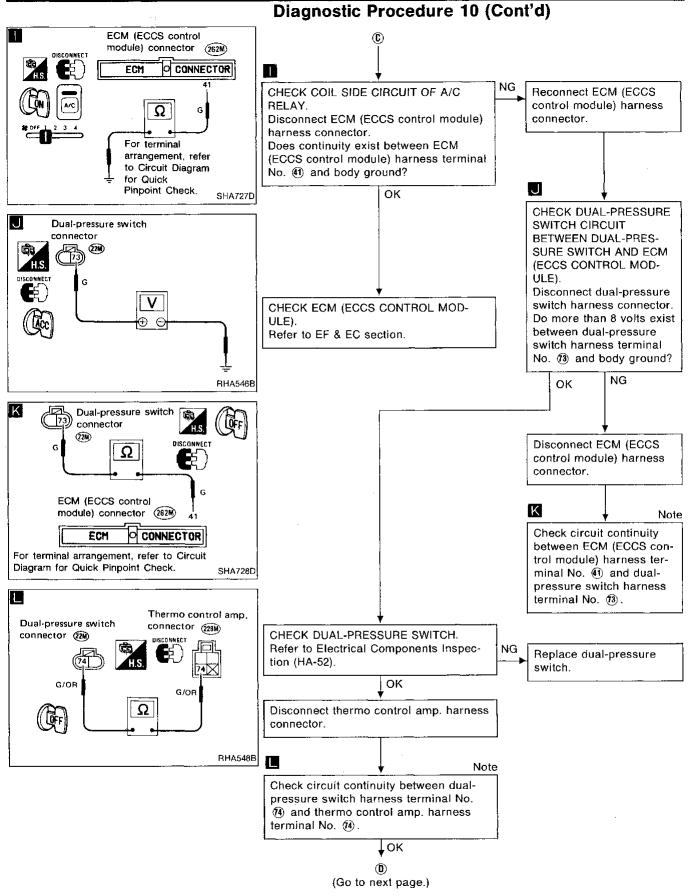


Note:

If the result is NG after checking circuit continuity, repair harness or connector.

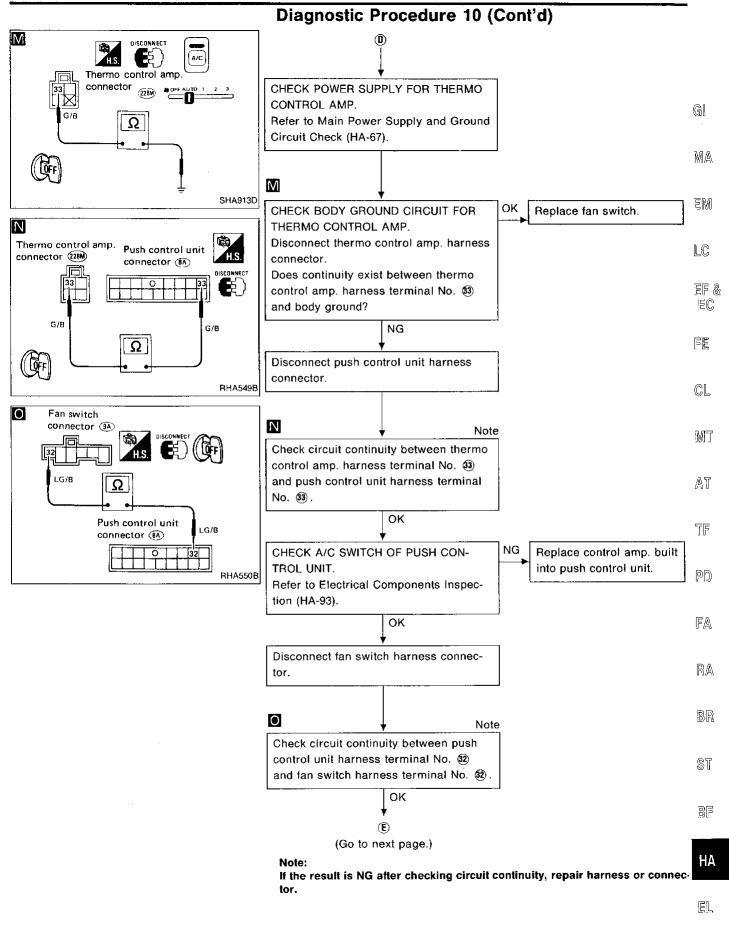


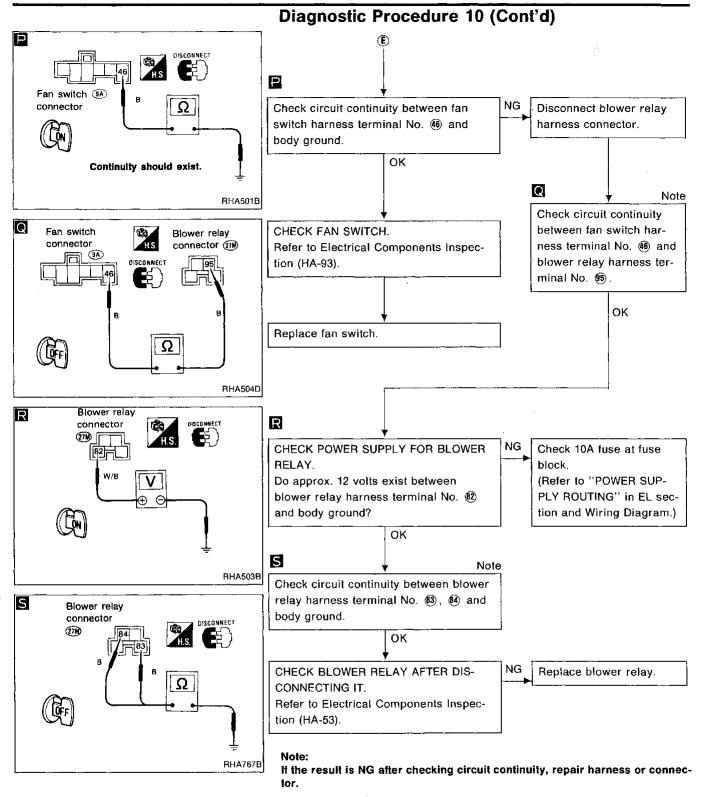
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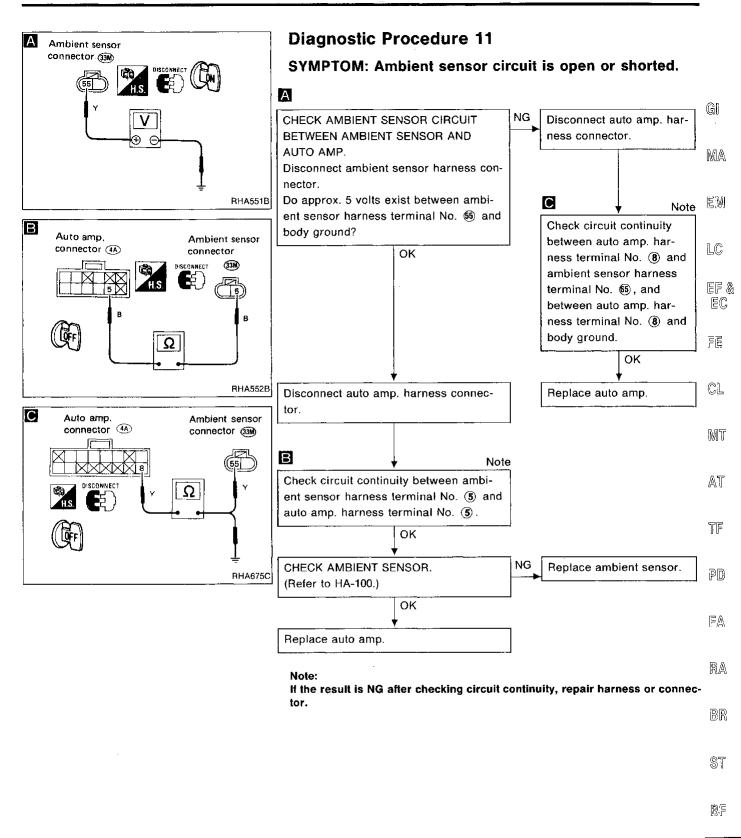


Note:

If the result is NG after checking circuit continuity, repair harness or connector.



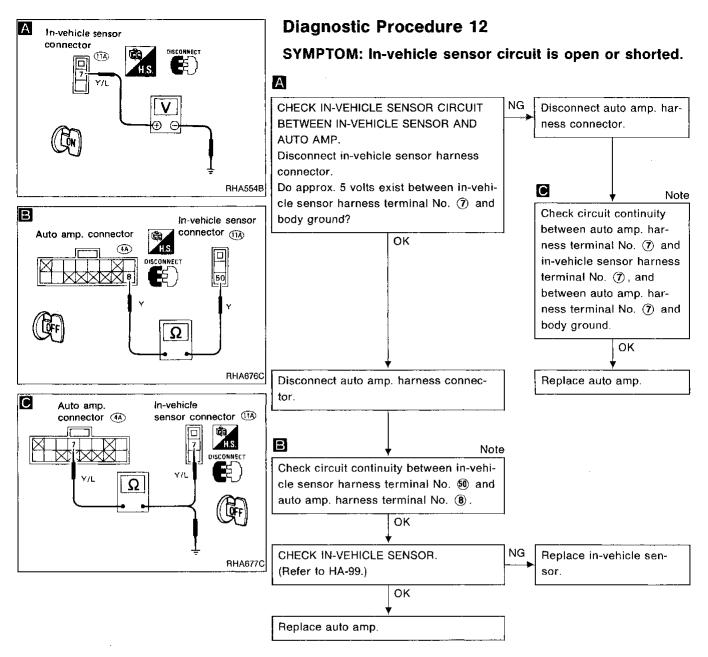




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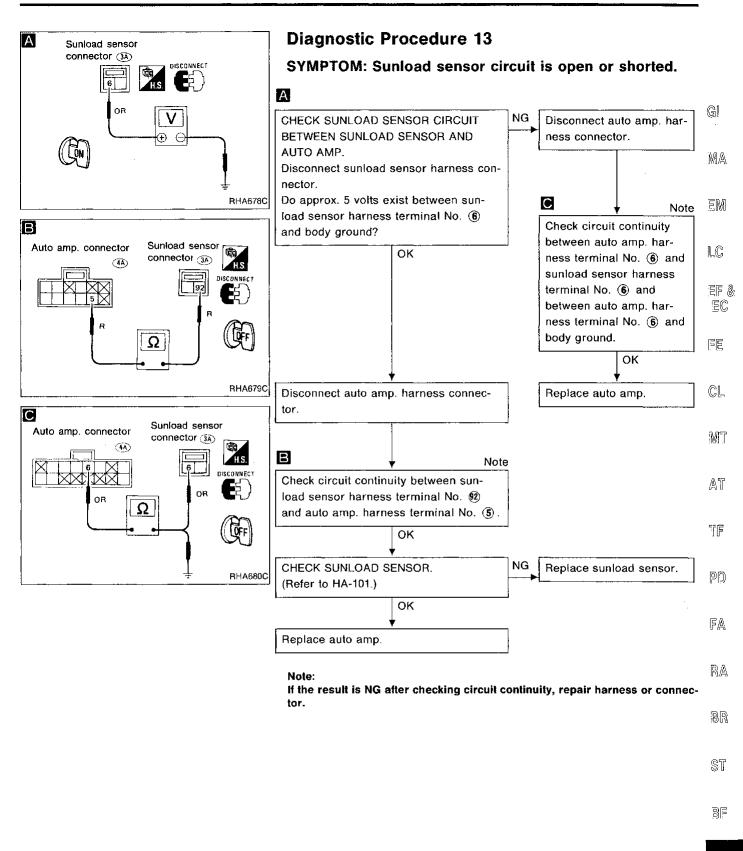
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Note:

If the result is NG after checking circuit continuity, repair harness or connector.

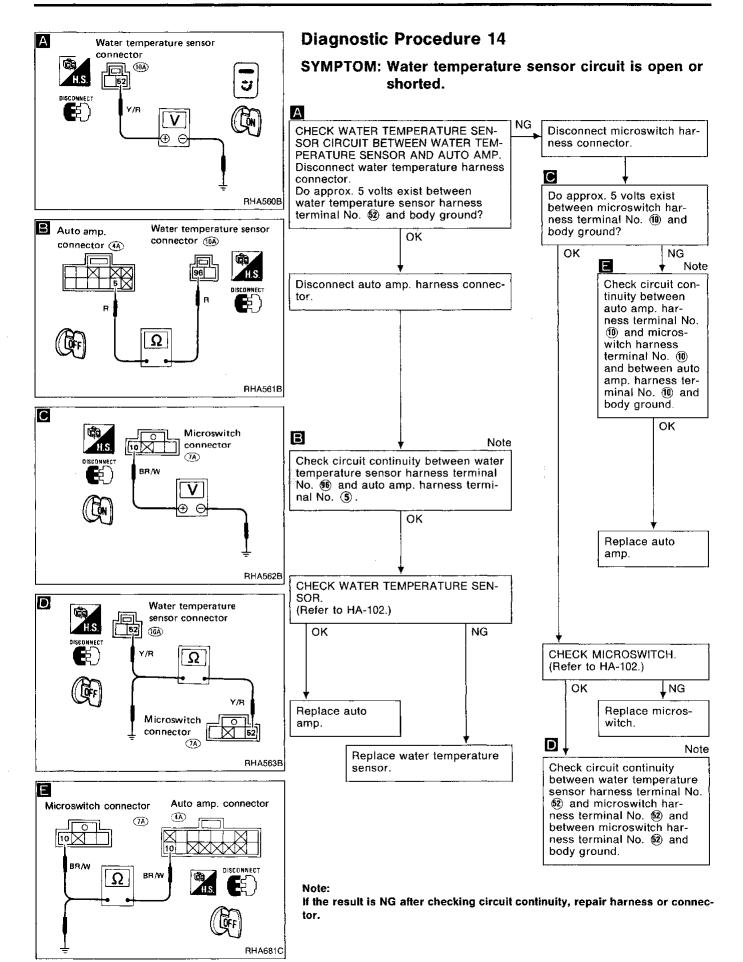


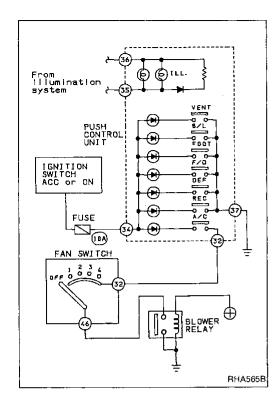
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Diagnostic Procedure 15

SYMPTOM: Illumination or indicators of push control unit do not come on.

 Perform Main Power Supply and Ground Circuit Check before referring to the following flow chart.

Turn ignition switch and lighting switch ON. CHECK ILLUMINATION AND INDICATORS. • Turn A/C, REC and fan switches ON. • Push VENT, B/L, FOOT, F/D and DEF switches in order. • Check for incidents and follow the repairing methods as shown: INCIDENTS ILL. "How to repair" Push VENT B/L FOOT F/D DEF REC A/C control unit Go to DIAGNOSTIC Х 0 0 0 0 0 0 PROCEDURE 15-1. Go to DIAGNOSTIC 0 0 0 0 0 0 Х PROCEDURE 15-2. Go to DIAGNOSTIC 0 Χ Χ Х Х Х PROCEDURE 15-3. Replace control amp. built into push control Δ unit. Replace control amp. 0 Х Х Х Х Х х 0 built into push control unit. Go to DIAGNOSTIC Х Χ Х PROCEDURE 15-4. O: Illumination or indicator comes on. X: Illumination or indicator does not come on.

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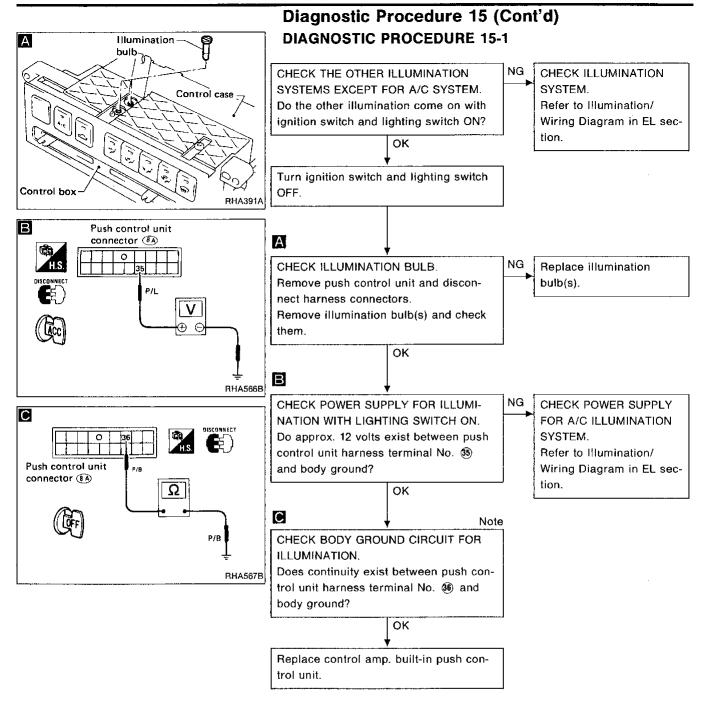
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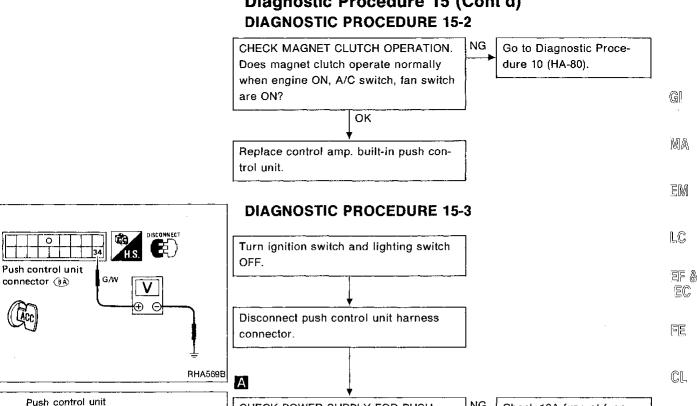
^{△:} Some indicators for VENT, B/L, FOOT, F/D, DEF or REC come on.

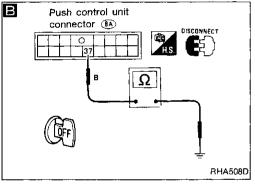


Note:

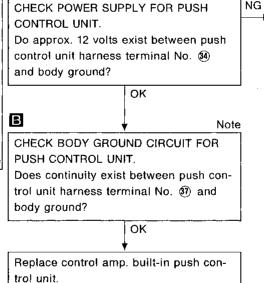
If the result is NG after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 15 (Cont'd) **DIAGNOSTIC PROCEDURE 15-2**





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If the result is NG after checking circuit continuity, repair harness or connec-

Check 10A fuse at fuse block.

(Refer to "POWER SUP-PLY ROUTING" in EL section and Wiring Diagram.)

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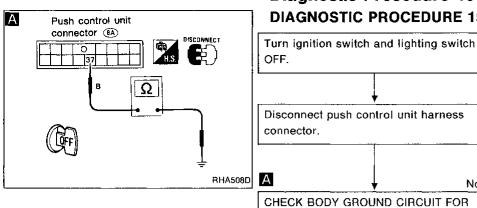
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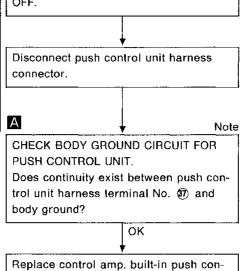
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Note:



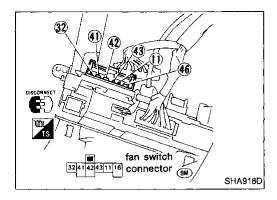
Diagnostic Procedure 15 (Cont'd) **DIAGNOSTIC PROCEDURE 15-4**



Note:

trol unit.

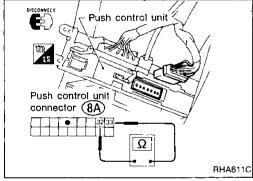
If the result is NG after checking circuit continuity, repair harness or connector.

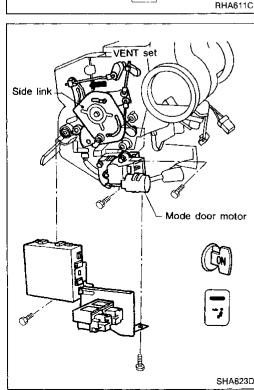


Electrical Components Inspection FAN SWITCH

Check continuity between terminals at each switch position.

TEDAMAIAI	LEVER POSITION							
TERMINAL	OFF	AUTO	1	2	3			
(11)					_ ?			
42		:		P				
43)			ρ					
11)		ρ						
46)			7	9	6			
32)		0	6					





A/C SWITCH

Check continuity between terminals at each switch position.

Switch o	Switch condition		Terminal No.		
A/C	DEF	⊕	Θ	Continuity	
ON	ON				
ON	OFF	33	32)	Yes	
OFF	ON				

Control Linkage Adjustment MODE DOOR

- Remove auto amplifier and relay bracket.
- 2. Move side link by hand and hold mode door in VENT mode.
- 3. Install mode door motor on heater unit and connect it to the auto A/C harness.
- 4. Turn ignition switch to ON.
- 5. Turn VENT switch ON.
- 6. Attach mode door motor rod to side link rod holder.
- Turn DEF switch ON. Check that side link operates at the fully-open position. Also turn VENT switch ON to check that side link operates at the fully-open position.

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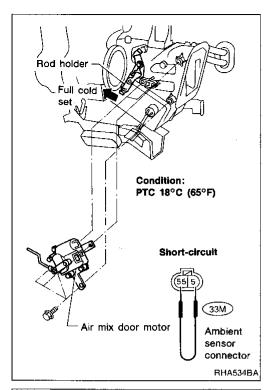
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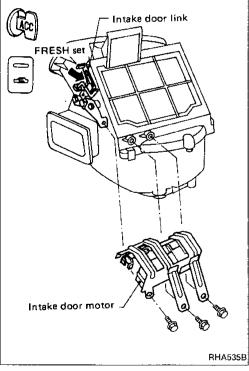
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Control Linkage Adjustment (Cont'd)

AIR MIX DOOR

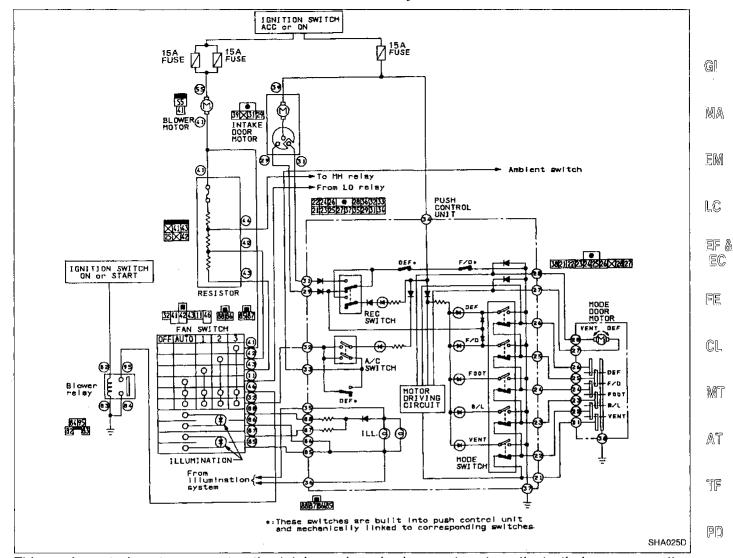
- Install air mix door motor on heater unit and connect it to the auto A/C harness.
- 2. Disconnect ambient sensor harness connector and connect terminals No. (5) and (6) with a jumper cable.
- 3. Set PTC at 18°C (65°F) and air mix door motor at "full cold".
- 4. Move air mix door lever by hand and hold it at the full-cold position.
- 5. Attach air mix door lever to rod holder.
- 6. Check that air mix door operates properly when PTC is moved from 18 to 32°C (65 to 85°F).



INTAKE DOOR

- Connect intake door motor harness connector before installing to intake door motor.
- 2. Turn ignition switch to ACC.
- 3. Turn REC switch OFF.
- Set intake door lever in FRE and install intake door motor on intake unit.
- Check that intake door operates properly when REC switch is turned ON and OFF.

Push Control System



This push control system operates the intake and mode door motors to activate their corresponding doors.

SWITCHES AND THEIR CONTROL FUNCTIONS

	Indicator illuminates										
Swit	ch	A/C	~;	**	ų,	(III)	W	æ	Air outlet	Intake air	Compressor
	A/C	0									ON*1
	~;		0						VENT		_
	**			O					B/L	_	
Mode	·,i				0				FOOT		_
_	®			 		0			F/D	FRE] _
	W						0		DEF	FRE	ON*1
	<u>-C</u>)	 						O*2	-	REC*2	_

^{*1:} Compressor is operated by thermo control amp.

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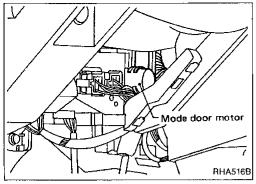
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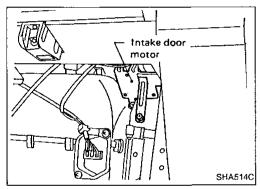
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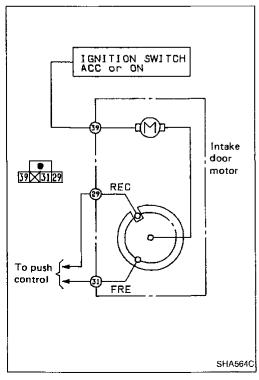
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^{*2:} Depending on mode switch position



(16M) Mode door motor connection **38**|21|22|23|24|25|26]★|**28**|27 Current flows as indicated by the arrow, motor Τo actuates as indipush control cated by the words. RHA612C





Push Control System (Cont'd) MODE DOOR MOTOR

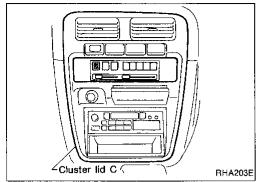
The mode door motor is located on the left side of the heater unit. Through the side link it opens and closes the vent, foot and defroster doors.

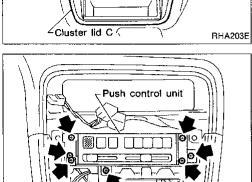
When one mode switch is pushed, the position switch built into it reads the corresponding mode to determine the direction of motor rotation. As soon as the desired mode is set, the position switch stops the motor.

Termi	nal No.	Mode door motor	
Ø	28	Mode door oper- ation	Direction of link- age rotation
		Stop	Stop
Θ	⊕	VENT → DEF	Clockwise
•	Θ	DEF → VENT	Counterclock- wise

INTAKE DOOR MOTOR

The intake door motor is installed on the intake unit. When the door position is determined by pushing the "REC" switch on the control panel, the motor rotates and the air inlet is changed.





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Removal and Installation

1. Remove cluster lid C.

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- Remove seven screws of push control unit and BRKT.
- Disconnect push control unit, in-vehicle sensor and PTC harness connectors.
- Remove push control unit.
- Installation is in the reverse order of removal.

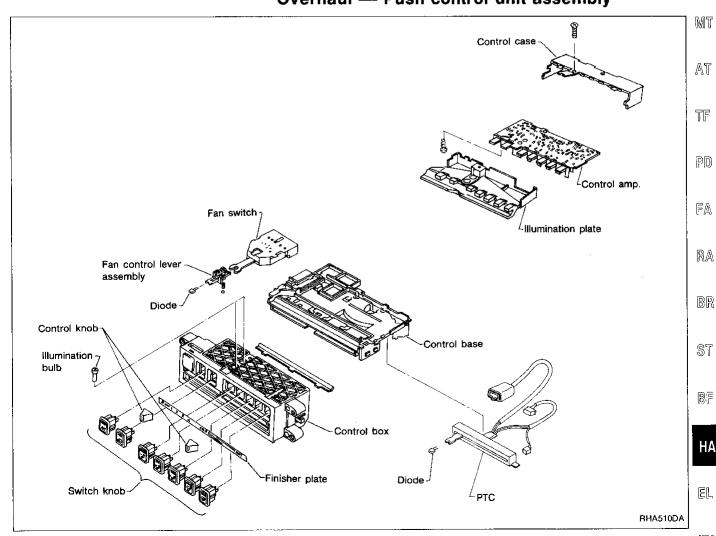
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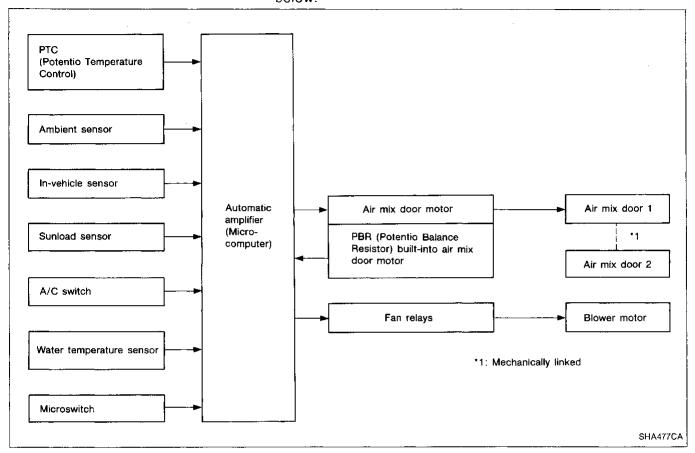
Overhaul — Push control unit assembly

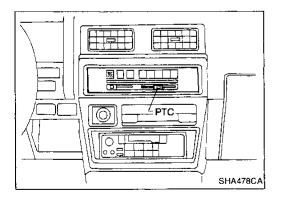


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Overview of Control System

The control system consists of a) input sensors and switches, b) the automatic amplifier (microcomputer), and c) outputs. The relationship of these components is shown in the diagram below.





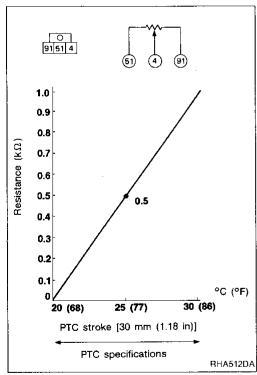
Control System Input Components POTENTIO TEMPERATURE CONTROL (PTC)

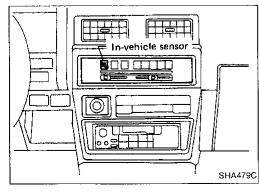
The PTC is built into the control unit. It has a variable resistance which changes according to the set temperature. This resistance is connected to the temperature lever.

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Control System Input Components (Cont'd) PTC After disconnecting PTC harness connector, measure resistance between terminals (4) and (9) at PTC harness side.





IN-VEHICLE SENSOR

The in-vehicle sensor is attached to the left side of the control unit. It converts variations in the temperature of the compartment air drawn in by the aspirator into a resistance value, which is then input into the auto amplifier.

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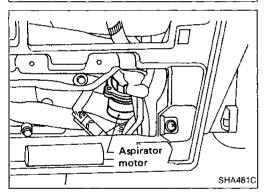
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In-vehicle sensor In-vehicle sensor In-vehicle sensor In-vehicle sensor RHA613C

Control System Input Components (Cont'd)

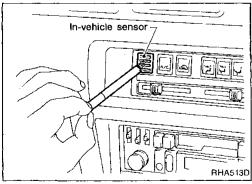
After disconnecting in-vehicle sensor harness connector, measure resistance between terminals (7) and (9) at sensor harness side, using the table below.

Temperature °C (°F)	Resistance kΩ
0 (32)	6.19
5 (41)	4.95
10 (50)	3.99
15 (59)	3.24
20 (68)	2.65
25 (77)	2.19
30 (86)	1.81
35 (95)	1.51
40 (104)	1.27

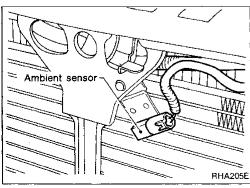


ASPIRATOR MOTOR

The aspirator motor is located in front of the heater unit. The aspirator motor continuously draws compartment air into the in-vehicle sensor while the ignition switch is ON.



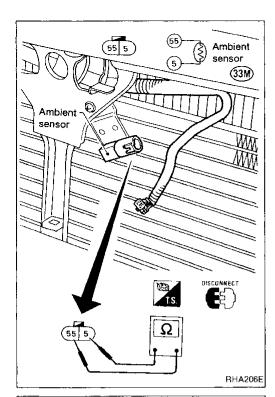
Check that smoke is properly sucked into in-vehicle sensor when a lighted cigarette is moved close to the sensor.



AMBIENT SENSOR

The ambient sensor is located on the hood lock stay. It detects the ambient temperature and converts it into a resistance value, which is then input into the auto amplifier.

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Control System Input Components (Cont'd)

After disconnecting ambient sensor harness connector, measure resistance between terminals (5) and (6) at sensor harness side, using the table below.

Temperature °C (°F)	Resistance kΩ
-20 (-4)	9.93
-10 (14)	5.57
0 (32)	3.26
10 (50)	1.98
20 (68)	1.25
25 (77)	1.00
30 (86)	0.81
40 (104)	0.54

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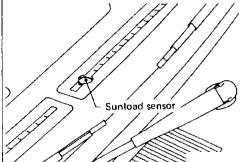
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SUNLOAD SENSOR

The sunload sensor is located on the center defroster grille. It detects sunload entering through the windshield by means of a photo diode and converts it into a current value which is then input to the auto amplifier.

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Measure voltage between terminals (5) and (6) at auto air conditioner harness side, using the table below.

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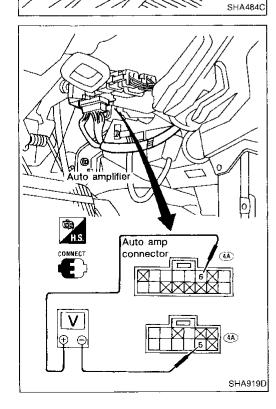
Input current mA	Output voltage V
0	5.00
0.1	4.09
0.2	3.18
0.3	2.27
0.4	1.36
0.5	0.45

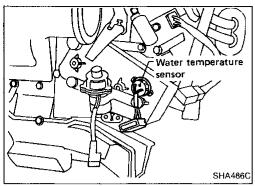
When checking sunload sensor, select a place where sun shines directly on it.

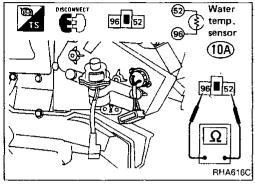
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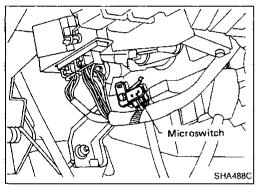
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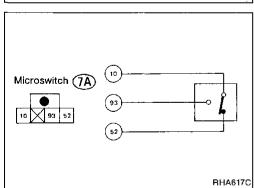
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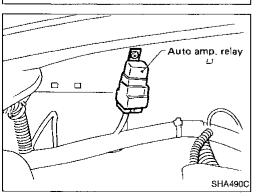












Control System Input Components (Cont'd) WATER TEMPERATURE SENSOR

The water temperature sensor is attached to the heater unit and is in contact with the heater core assembly. It detects engine coolant temperature through the heater core and converts it into a resistance value, which is then input into the auto amplifier. When the VENT switch or DEF switch is ON, signals from the water temperature sensor are not input into the auto amplifier. After disconnecting water temperature sensor harness connector, measure resistance between terminals 52 and 96 at sensor harness side, using the table below.

Temperature °C (°F)	Resistance kΩ
0 (32)	3.99
10 (50)	2.54
20 (68)	1.67
30 (86)	1.12
40 (104)	0.78
50 (122)	0.55
60 (140)	0.40
70 (158)	0.29
80 (176)	0.22

MICROSWITCH

The microswitch is installed around the side link of the heater unit and operates the link in response to the position of the mode switch.

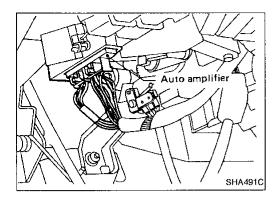
The operation of this microswitch is as shown below:

Microswitch operation

MODE		VENT	B/L	FOOT	FOOT/DEF	DEF
	10	P	9	Ŷ	Ŷ	P
Terminal No.	93	6				
140.	62		9	-		

AUTO AMP. RELAY

The auto amp, relay is located on the left side of the engine room. When the A/C switch and fan switch are ON, the auto amp. relay operates and transmits A/C operation signals to the auto amplifier.



Control System Auto Amplifier (Auto amp.)

The auto amplifier has a built-in microcomputer which processes the information sent from the various sensors needed for air conditioner operation. The air-mix door motor and blower motor are then controlled.

Signals from the various switches and the Potentio Temperature Control (PTC) are directly entered into the auto amplifier.

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SUNLOAD INPUT PROCESS

The auto amp. also includes a processing circuit which $_{\mathbb{IC}}$ "averages" the variations in detected sunload over a period of time. This prevents drastic swings in the ATC system operation due to small of quick variations in detected sunload.

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For example, consider driving along a road bordered by an occasional group of large trees. The sunload detected by the sunload sensor will vary whenever the trees obstruct the sun- FE light. The processing circuit averages the detected sunload over a period of time, so that the (insignificant) effect of the trees momentarily obstructing the sunlight does not cause any GL change in the ATC system operation. On the other hand, shortly after entering a long tunnel, the system will recognize the change in sunload, and the system will react accordingly.

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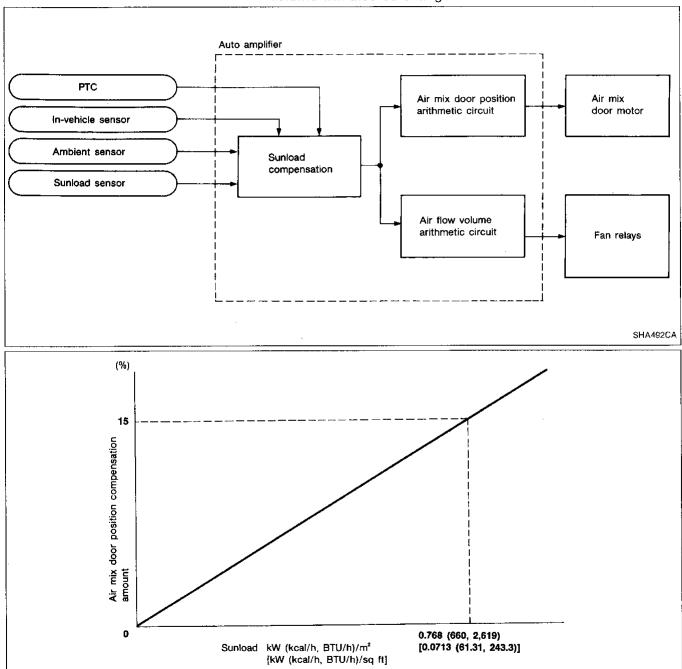
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Control System Auto Amplifier (Auto amp.) (Cont'd)

SUNLOAD COMPENSATION

The auto amplifier compensates for sunload by altering the air mix door position and air flow volume according to the amount of sunload detected by the sunload sensor. When the amount of sunload is great, the air mix door is moved toward the "COLD" side. Along with this air mix door movement, air flow volume will also be changed.



Sunload compensation specifications

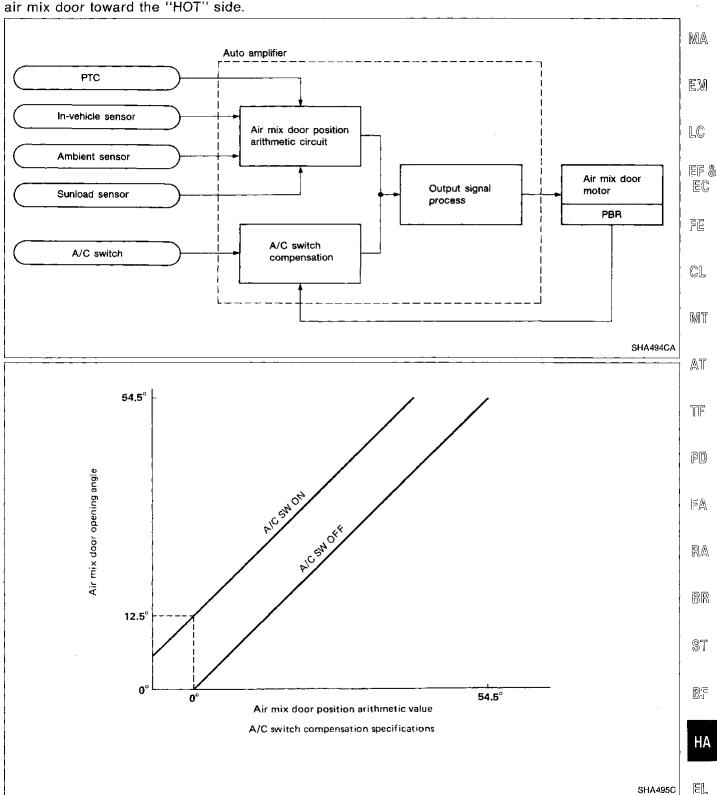
SHA824D

Control System Auto Amplifier (Auto amp.) (Cont'd)

A/C SWITCH COMPENSATION

The auto amplifier alters the air mix door position and air flow volume according to a signal emitted from the A/C switch.

When the A/C switch is "ON", the auto amplifier compensates for the PBR's input signal and moves the Glair mix door toward the "HOT" side.



Control System Output Components

AIR MIX DOOR CONTROL (Automatic temperature control)

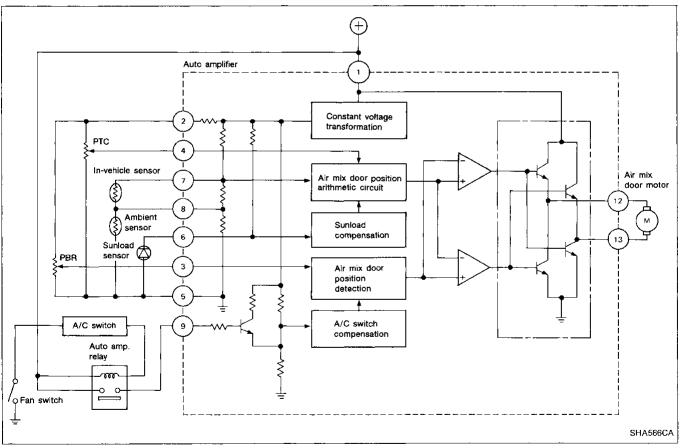
Component parts

Air mix door control system components are:

- 1) Auto amplifier
- 2) Ambient sensor
- 3) In-vehicle sensor
- 4) Sunload sensor
- 5) Air mix door motor (PBR)
- 6) A/C switch

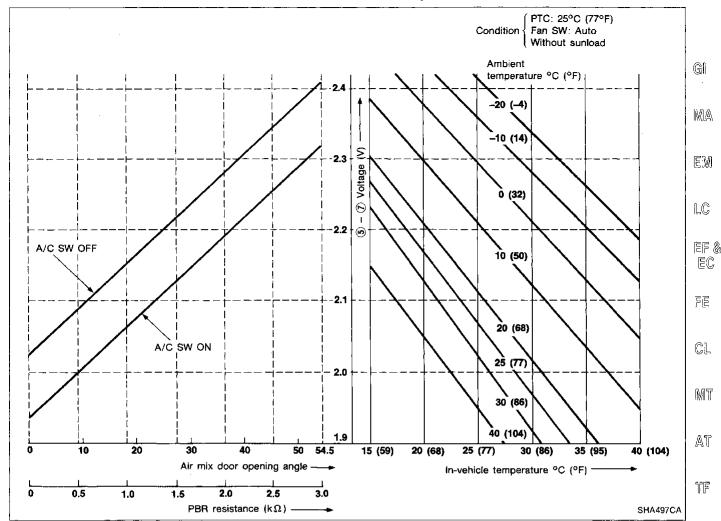
System operation

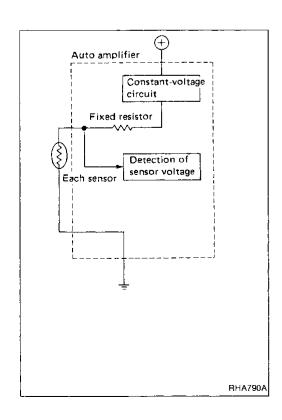
The air mix door is automatically controlled so that in-vehicle temperature is maintained to the set temperature. The temperature set by the PTC (Potentio Temperature Control) and the temperature detected by the in-vehicle sensor and ambient sensor are compensated by the sunload sensor signal he auto amplifier then determines the air-mix door position. The air mix door position detected by the PBR is compensated by the ON-OFF operation of the A/C switch. The air mix door position determined by the auto amplifier is compared with that detected by the PBR. The auto amplifier then transmits the signal to the air mix door motor in order to activate it.



Control System Output Components (Cont'd)

Air mix door control specifications





SENSOR INPUT PROCESS

The auto amplifier detects the voltage produced by each FA sensor, the PBR and fixed resistor. The fixed resistor is built into the auto amplifier. 12-volt power voltage is first converted to approximately 5 volts by the constant voltage circuit where it is then applied to the ground line of the auto amplifier via the fixed resistor and the sensor. In this manner, the auto amplifier monitors the voltages of the fixed resistor, each sensor and the PBR to determine sensor input.

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Auto amp. Air mix door position arithmetic circuit PBR Compressor (2) Tr (3) Tr (3) Tr (3) Tr (2)

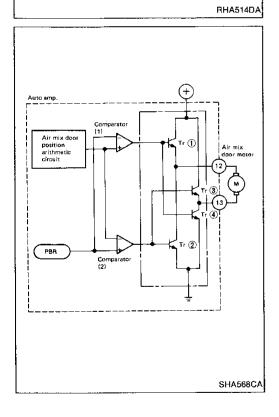
Control System Output Components (Cont'd) OPERATION OF AIR MIX DOOR MOTOR

• Example (1)

When the temperature in the vehicle is lower than the set temperature.

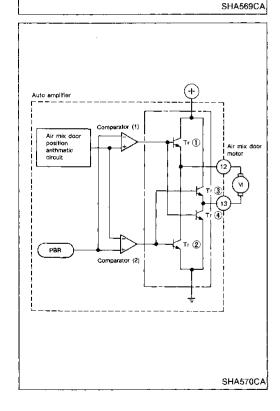
When the temperature in the vehicle is low, in-vehicle sensor resistance is great and the input voltage to the auto amplifier becomes great. As a result, the voltage from the air mix door position arithmetic circuit also becomes great. When this voltage is greater than the voltage from the PBR, comparator (1), Tr ① and Tr ④ turn ON.

Accordingly terminal No. 2 becomes \oplus and terminal No. 3 becomes \ominus . The air mix door motor rotates clockwise and the air mix door moves toward the "HOT" side.



As the air mix door moves toward the "HOT" side, the voltage from the PBR becomes greater and consequently becomes equal to that from the air mix door position arithmetic circuit. As a result, comparator (1) turns OFF and the air mix door motor stops.

Auto amplifier Air mix door position arithmetic circuit PBR Air mix door motor 12 M Tr (1) Air mix door motor 17 Tr (2)



Control System Output Components (Cont'd)

• Example 2

When the temperature in the vehicle is higher than the set temperature.

When the temperature in the vehicle is high, in-vehicle sensor resistance is small and the input voltage to the auto amplifier becomes small. As a result, the voltage from the air mix door position arithmetic circuit also becomes small. When this voltage is smaller than the voltage from the PBR, comparator (2), Tr ② and Tr ③ turn ON. Accordingly terminal No. ③ becomes ⊕ and terminal No. ② becomes ⊖. The air mix door motor rotates counterclockwise and the air mix door moves toward the "COLD" side.

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As the air mix door moves toward the "COLD" side, the voltage from the PBR becomes smaller and consequently becomes equal to that from the air mix door position arithmetic circuit. As a result, comparator (2) turns OFF and the air mix door motor stops.

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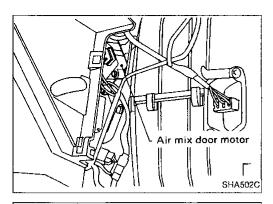
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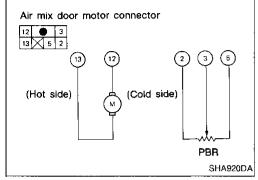
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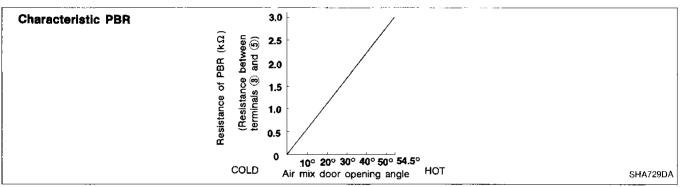


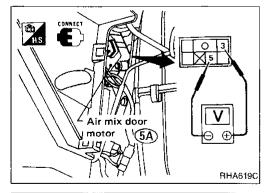
Control System Output Components (Cont'd) AIR MIX DOOR MOTOR

The air mix door motor is attached to the heater unit. It rotates so that the air mix door is opened to a position set by the auto amplifier. Motor rotation is conveyed through a shaft. The air mix door position is then fed back to the auto amplifier by the PBR built into the air mix door motor.



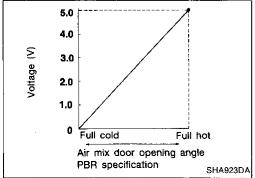
12	13	Air mix door operation	Direction of lever movement
⊕	Θ	COLD → HOT	Clockwise (Toward passenger compart- ment)
		STOP	STOP
Θ	⊕	HOT → COLD	Counterclockwise (Toward engine compartment)





PBR

Measure voltage between terminals 3 and 5 at vehicle harness side.



Ignition switch: ON

 Ensure tester pointer deflects smoothly when PTC is moved from 18°C (65°F) to 32°C (85°F) and vice versa.

Control System Output Components (Cont'd)

FAN SPEED CONTROL

Component parts

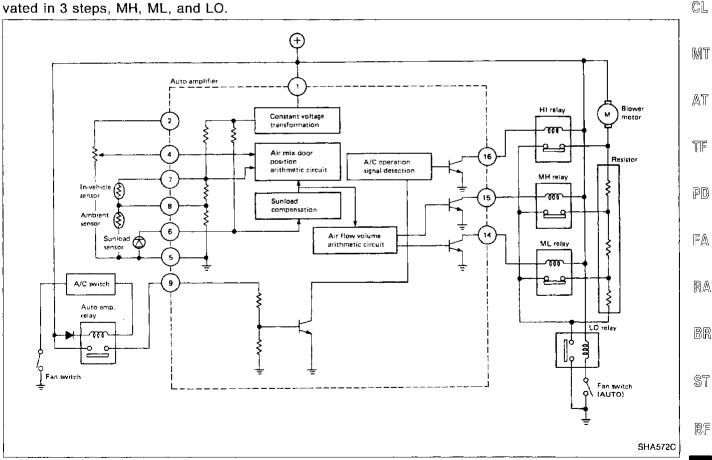
Fan speed control system components are:

- 1) Auto amplifier
- 2) In-vehicle sensor
- 3) Ambient sensor
- 4) Sunfoad sensor
- 5) Auto amp. relay
- 6) A/C switch
- 7) Fan switch
- 8) Blower motor
- 9) Resistance

System operation

Blower fan speed is automatically controlled so that the in-vehicle temperature is maintained to the set temperature.

The temperature set by the PTC (Potentio Temperature Control) and the temperature detected by the in-vehicle sensor and ambient sensor are compensated by the sunload sensor signal. The auto amplifier then determines fan speed from the ON-OFF operation of the A/C switch. The fan speed decision by the auto amplifier activates the fan relay and the blower fan motor rotates. When the A/C switch is ON, fan speed is activated in 4 steps, HI, MH, ML, and LO. When the A/C switch is OFF, fan speed is activated in 3 steps, MH, ML, and LO.



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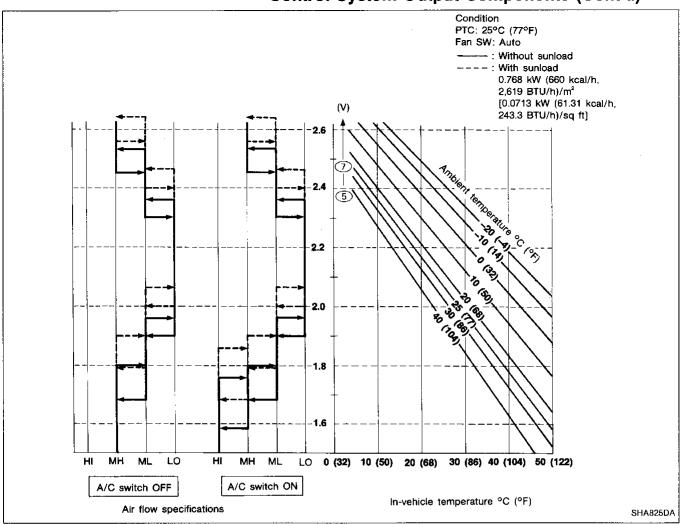
EF &

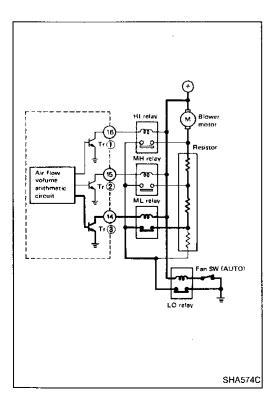
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Control System Output Components (Cont'd)





Signals from each sensor, PTC, A/C switch etc. are sent to the air flow volume arithmetic circuit in the auto amplifier. Air flow volume is determined by this circuit.

When the air flow volume is set to ML
 The air flow volume arithmetic circuit gives current to Tr
 ③, which turns the ML relay on. Thus, the blower motor rotates in the ML condition.

Blower motor MH relay Air flow volume arithmetic circuit (AUTO) LO relay

Control System Output Components (Cont'd)

(2) When set to HI

The air flow volume arithmetic circuit gives current to Tr ①, which turns the HI relay on. Thus, the blower motor rotates in the HI condition. Also, Tr 2 and Tr 3 are receiving current and as a result the ML and MH relays are on.

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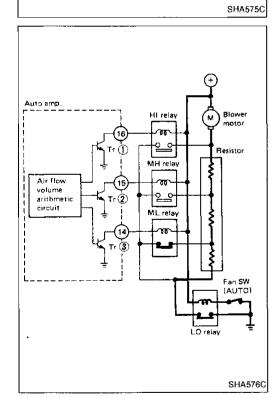
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(3) When set to LO

The air flow volume arithmetic circuit does not give any current to Tr 1, 2 nor 3.

Only the LO relay turns on and so the blower motor rotates in the LO condition.



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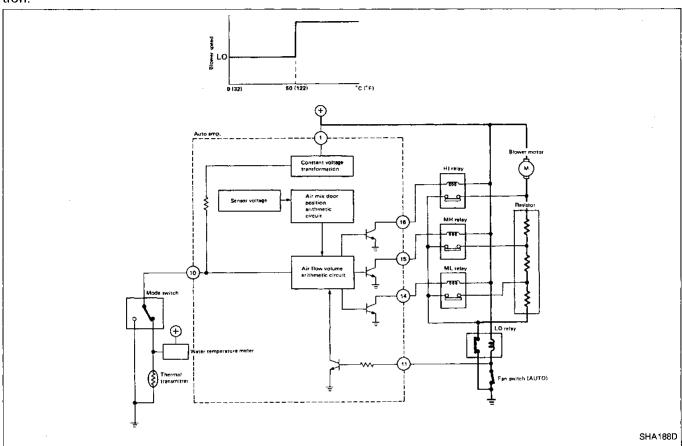
Control System Output Components (Cont'd)

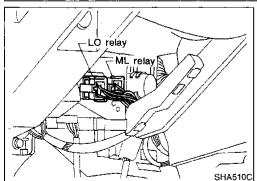
STARTING FAN SPEED CONTROL

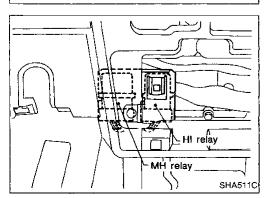
The starting fan control system is so designed to prevent excess cold air from being expelled after the engine is started when the engine coolant temperature is low.

The component parts related to this system are the water temperature sensor microswitch, fan relays, blower motor, resistance and auto amplifier.

When the fan switch is set to AUTO, the microswitch to ON (either B/L, FOOT or FOOT/DEF) and the engine coolant temperature is below 50°C (122°F), the speed of the blower motor is fixed in the LO position.



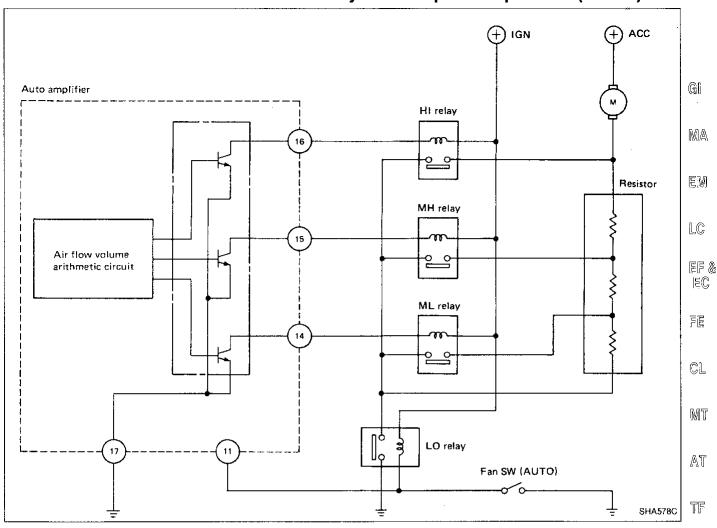


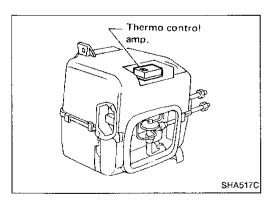


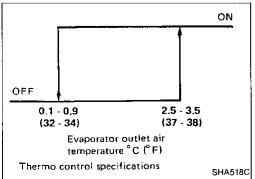
FAN RELAY

The LO and ML fan relays are located on the auto amplifier bracket, and the MH and HI fan relays are installed on the back side of the audio unit. Each fan relay operates according to the air flow volume determined by the auto amplifier. The blower motor then operates accordingly.

Control System Output Components (Cont'd)







THERMO CONTROL AMP.

The thermo control amplifier is installed on the top of the cooling unit. It detects the temperature of the evaporator using a thermistor and turns the compressor on or off.

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SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

COMPRESSOR

Model	DKV-14C
Туре	Vane rotary
Displacement cm3 (cu in)/Rev	140 (8.54)
Direction of rotation	Clockwise (Viewed from drive end)
Orive belt	A type

LUBRICATION OIL

Model	ZEXEL make DKV-14C		
Name	Nissan A/C System Oil Type R		
Part number	KLH00-PAGR0		
Capacity ml (US fl oz, Imp fl oz)			
Total in system	200 (6.8, 7.0)		
Compressor (Service parts) charging amount	200 (6.8, 7.0)		

REFRIGERANT

Туре		R134a
Capacity	kg (lb)	0.75 - 0.85 (1.65 - 1.87)

Inspection and Adjustment COMPRESSOR

ENGINE IDLING SPEED

When A/C is ON (FICD is actuated) Refer to EF & EC section.

BELT TENSION

Refer to Checking Drive Belts (MA section).

Model	DKV-14C
Clutch disc-to-pulley clearance	0.3 - 0.6
mm (in)	(0.012 - 0.024)

SECTION IDX

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LC

ef & ec

FE

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	Acceleration cut control
Α	(KA engine)EF&EC-165
	Acceleration cut control
ABS actuatorBR-30	(VG engine)EF&EC-22
	Accelerator control systemFE-2
ABS circuit diagramBR-37	Accelerator wire adjustmentFE-2
ABS component parts and connector	Activated carbon canister
locationsBR-36	(KA engine)EF&EC-157
ABS control unitBR-30	Activated carbon canister inspection
ABS hydraulic circuitBR-28	
ABS self-diagnosisBR-35	(VG engine)EF&EC-141
ABS symptom chartBR-33	Air bleeding for brake systemBR-3
ABS system componentsBR-28	Air cleaner filter replacement
ABS trouble diagnosesBR-31	(KA24E)MA-17
ABS wheel sensorsBR-30	Air cleaner filter replacement
ABS wiring diagramBR-29	(VG30E)MA-12
A/C air flowHA-9	Air control cable adjustmentHA-54
A/C circuit diagram (auto A/C)HA-63	Air mix door control linkage
A/C circuit diagram (manual A/C)HA-40	adjustmentHA-94
A/C component layoutHA-8	AlternatorEL-19
A/C compressor clutch removal and	Ambient sensorHA-100
installationHA-24	Angular tightening applicationEM-2
A/C compressor mountingHA-20	Anti-freeze coolantMA-8
A/C compressor precautionHA-5	ASCD (automatic speed control
A/C compressor special service toolHA-11	device)EL-61
A/C control operation (auto A/C)HA-7	AT control unitAT-68
A/C control operation (manual A/C)HA-7	AT fluid temperature sensorAT-72
A/C diagnostic work flow (auto A/C)HA-27	AT indicator lampEL-42
A/C diagnostic work flow (manual	AT removal and installationAT-112
A/C)HA-27	AT self-diagnosesAT-39
A/C harness layout (auto A/C)HA-61	AT trouble diagnosesAT-13
A/C harness layout (manual A/C)HA-39	AudioEL-57
A/C HFC134a (R134a) system	Auto lock free running hubFA-19
identificationHA-2	Automatic transmission fluidMA-8
	Automatic transmission fluid
A/C HFC134a (R134a) system	replacementMA-2
introductionHA-2	Automatic transmission numberGI-19
A/C HFC134a (R134a) system	Auxiliary air control (AAC)
precautionHA-3	(VG engine)EF&EC-14
A/C HFC134a (R134a) system service	(va origino)
equipment precautionHA-14	
A/C HFC134a (R134a) system service	В
procedureHA-16	
A/C HFC134a (R134a) system service	Builden BE
toolsHA-12	Back doorBF-6
A/C lubrication oilHA-22	Back door windowBF-48
A/C operational checkHA-28	Back-up lampEL-30
A/C performance chartHA-30	Back-up lamp switch (MT) FS5R30AMT-33
A/C performance test diagnosesHA-31	Back-up lamp switch (MT) FS5W71CMT-10
A/C push controlHA-95	Ball joint front axleFA-45
A/C relayHA-53	BatteryEL-8
A/C switch (auto A/C)HA-93	Baulk ring (MT) FS5R30AMT-34
A/C switchHA-52	Baulk ring (MT) FS5W71CMT-1
A/C symptom chart (auto A/C)HA-56	Belt inspection (drive belt) (KA24E)MA-15
A/C symptom chart (manual A/C)HA-36	Belt inspection (drive belt) (VG30E)MA-10
A/C system description (auto A/C)HA-95	Blower motorHA-52
A/C trouble diagnoses (auto A/C)HA-55	Blower relayHA-53
A/C trouble diagnoses (manual A/C)HA-36	Blower resistorHA-52
A/C wiring diagram (auto A/C)HA-64	Body alignmentBF-58
A/C wiring diagram (manual A/C)HA-42	Body mountingBF-56

IDX-2

Brake booster		Compressor precaution		
Brake fluid		Compressor special service tool		
Brake fluid change		Connecting rod (KA engine)		
Brake fluid level		Connecting rod (VG engine)	. EM-38	
Brake fluid level and line check	BR-3	Connecting rod bearing clearance		@I
Brake hydraulic line	BR-4	(KA engine)	. EM-80	GI
Brake inspection	MA-23	Connecting rod bearing clearance		
Brake lines and cables inspection	MA-23	(VG engine)	. EM-42	MA
Brake master cylinder	BR-8	Connecting rod bushing clearance		2000
Brake pedal	BR-6	(KA engine)	EM-81	
		Connecting rod bushing clearance	-1. 40	EM
С		(VG engine)	. EM-43	(=)300
C		Control lever (MT) FS5R30A		
		Control lever (MT) FS5W71C	MI-13	LC
Cab body	RF-55	Control lever Transfer	1F-8	
Camshaft inspection (KA engine)		Control valve (AT) RE4R01A	AT-140	ee :
Camshaft inspection (VG engine)		Control valve (AT) RL4R01A	A1-140	EF (
Camshaft position sensor (CMPS)	LIVI 24	Converter housing installation		<u> </u>
(KA engine) [F8FC-152	Coolant replacement (KA24E)		
Camshaft position sensor (CMPS)	1 420 102	Coolant replacement (KA24E)		FE
(VG engine)	FF&FC-11	Cooling sirguit (KA angina)		
Camshaft position sensor inspection	21 020 11	Cooling circuit (KA engine)	LU-13	
(KA engine) [F&FC-280	Cooling circuit (VG engine) Cooling fan (KA engine)	LU-0	CL
Camshaft position sensor inspection	2. 0.20 200	Cooling fan (VG engine)		
(VG engine)	FF&FC-133	Counter gear (MT) FS5R30A		0.052
Cargo space		Counter gear (MT) FS5W71C		UWU U
Center bearing assembly	5. 25	Counter gear (NT) 133W710		
(propeller shaft)	PD-12	Coupling sleeve (MT) FS5R30A		A ST
Center bearing disassembly		Coupling sleeve (MT) FS5W71C		AU II
(propeller shaft)	PD-11	Crankcase emission control system	1011-11	
Charging system		(KA engine) EF8	REC_201	TF
Check connector for ECCS checker		Crankshaft assembly (KA engine)		0.0
box (KA engine)	EF&EC-157	Crankshaft assembly (VG engine)		
Check connector for ECCS checker		Crankshaft bearing clearance (KA	, L. WI TT	PD
box (VG engine)	EF&EC-16	engine)	FM-79	0 (_5
Cigarette lighter		Crankshaft bearing clearance (VG	בויו	
Clearance lamp		engine)	FM-41	FA
Clock	EL-52	Crankshaft inspection (KA engine)		
Clutch cover	CL-13	Crankshaft inspection (VG engine)		
Clutch damper	CL-9	Cylinder block (KA engine)		$\mathbb{R}\mathbb{A}$
Clutch disc	CL-12	Cylinder block (VG engine)		
Clutch fluid		Cylinder block boring (KA engine)		
Clutch fluid level		Cylinder block boring (VG engine)		BR
Clutch master cylinder		Cylinder head (KA engine)		
Clutch operating cylinder		Cylinder head (VG engine)	. EM-20	@E3
Clutch pedal		Cylinder head bolt tightening		ST
Clutch pedal free play		(KA engine)	EM-71	
Clutch pedal height		Cylinder head bolt tightening		@12
Clutch release bearing		(VG engine)	EM-31	BF
Clutch withdrawal lever				
Coil spring (rear)		D		пп∧
Combination meter				HA
Combination switch				
Compression pressure (KA engine)		Daytime light system	EL-23	æn.
Compression pressure (VG engine)	EM-8	Defroster door control rod		EL
Compressor clutch removal and		adjustment	HA-53	
installation		·····		
Compressor mounting	HA-20			IDX

Differential carrier assembly	EGR control (EGRC) - BPT valve
(H190A)PD-68	(VG engine) EF&EC-15
Differential carrier assembly	EGR control (EGRC) - solenoid valve
(H233B) PD-91	(KA engine) EF&EC-156
Differential carrier assembly	EGR control (EGRC) - solenoid valve
(R180A) PD-31	(VG engine) EF&EC-16
Differential carrier assembly	EGR temperature sensor
(R200A) PD-50	(KA engine) EF&EC-157
Differential carrier disassembly	EGR temperature sensor
(H190A) PD-57	(VG engine) EF&EC-16
Differential carrier disassembly	EGR temperature sensor inspection
(H233B) PD-75	(KA engine) EF&EC-282
Differential gear oil MA-8	
Differential gear oil replacement MA-22	EGR temperature sensor inspection
Dimensions GI-20	(VG engine) EF&EC-135
Door adjustment (front)BF-12	EGR valve inspection (KA engine) EF&EC-281
Door adjustment (rear)BF-13	EGR valve inspection (VG engine) EF&EC-135
Door mirror BF-52	EGRC - BPT valve inspection
Drive plate runout (KA engine) EM-81	(KA engine) EF&EC-281
Drive plate runout (VG engine) EM-43	EGRC - BPT valve inspection
Drive shaft (front) FA-29	(VG engine) EF&EC-135
Dropping resistor (AT) AT-72	Electrical units location EL-75
Dual pressure switchHA-52	Engine control module (ECM)
·	(KA engine) EF&EC-152
F	Engine control module (ECM)
E	(VG engine) EF&EC-11
18, 18 · · · · · · · · · · · · · · · · · ·	Engine coolant temperature sensor
ECCS basic inspection (VG engine) EF&EC-48	(ECTS) (KA engine) EF&EC-153
ECCS basic inspection (VG engine) EF&EC-195	Engine coolant temperature sensor
ECCS circuit diagram (KA engine) EF&EC-149	(ECTS) (VG engine) EF&EC-12
ECCS circuit diagram (VG engine) EF&EC-10	Engine coolant temperature sensor
ECCS component parts location	inspection (KA engine) EF&EC-280
(KA engine) EF&EC-145	Engine coolant temperature sensor
ECCS component parts location	inspection (VG engine) EF&EC-133
(VG engine) EF&EC-4	Engine oil MA-8
ECCS on-board diagnostic system	Engine oil filter replacement
(KA engine) EF&EC-177	(KA24E) MA-18
ECCS on-board diagnostic system	Engine oil filter replacement
(VG engine) EF&EC-34	(VG30E) MA-13
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ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

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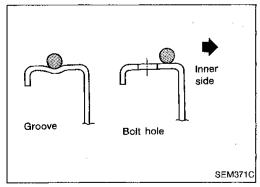
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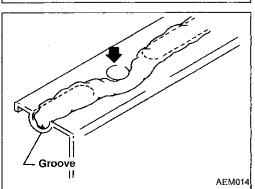
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Special Service Tools

Tool number	0		Engine a	pplication
(Kent-Moore No.) Tool name	Description	on	VG30E	KA24E
ST25051001 (J25695-1) Oil pressure gauge	NT050		х .	X
ST25052000 (J25695-2) Hose	NT051	Adapting oil pressure gauge to cylinder block	X	х
EG17650301 (J33984-A) Radiator cap tester adapter	NT053	Adapting radiator cap tester to radiator filler neck	X .	х
WS39930000 (—) Tube presser		Pressing the tube of liquid gasket	x	x
	NT052			





Liquid Gasket Application Procedure

- a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surface.
- b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
 - Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide (for oil pan).
 - Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).
- c. Apply liquid gasket to inner sealing surface around hole perimeter area.
 - (Assembly should be done within 5 minutes after coating.)
- d. Wait at least 30 minutes before refilling engine oil and engine coolant.

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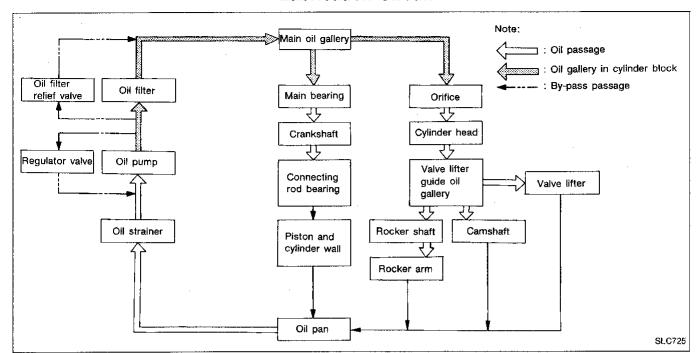
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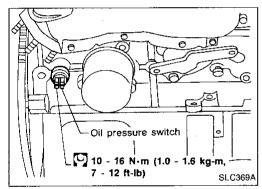
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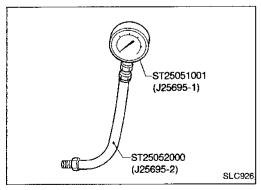
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Lubrication Circuit







Oil Pressure Check

WARNING:

- Be careful not to burn yourself, as the engine and oil may be hot.
- Oil pressure check should be done in "Neutral" gear position.
- 1. Check oil level.
- 2. Remove oil pressure switch.
- 3. Install pressure gauge.
- 4. Start engine and warm it up to normal operating temperature.

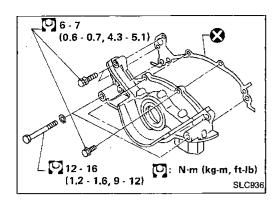
Check oil pressure with engine running under no-load.

Engine speed rpm	Approximate discharge pressure kPa (kg/cm², psi)	
ldle speed	More than 59 (0.6, 9)	
3,200	363 - 451 (3.7 - 4.6, 53 - 65)	

If difference is extreme, check oil passage and oil pump for oil leaks.

Install oil pressure switch with sealant.

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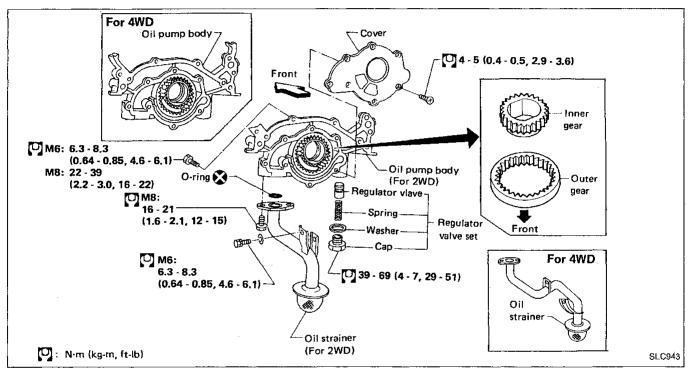


Oil Pump

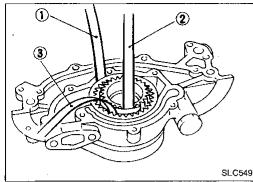
REMOVAL

- 1. Drain oil.
- 2. Remove oil pan.
- 3. Remove oil pump assembly.

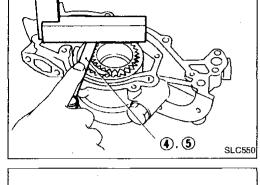
DISASSEMBLY AND ASSEMBLY

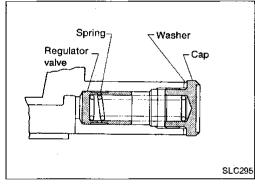


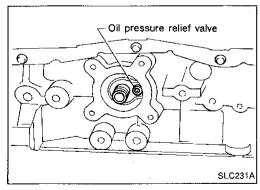
- Always replace with new oil seal and gasket.
- When installing oil pump, apply engine oil to inner and outer gears.
- Be sure that O-ring is properly installed.



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Oil Pump (Cont'd) INSPECTION

Using a feeler gauge, check the following clearances:

Standard clearance:

	Unit: mm (in)
Body to outer gear clearance ①	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.12 - 0.23 (0.0047 - 0.0091)
Outer gear to crescent clearance ③	0.21 - 0.32 (0.0083 - 0.0126)
Housing to inner gear clearance 4	0.05 - 0.09 (0.0020 - 0.0035)
Housing to outer gear clearance (5)	0.05 - 0.11 (0.0020 - 0.0043)

If any clearance exceeds the limit, replace gear set or entire oil pump assembly.

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REGULATOR VALVE INSPECTION

- Visually inspect components for wear and damage. 1.
- Check oil pressure regulator valve sliding surface and valve spring.
- Coat regulator valve with engine oil and check to make AT sure that it falls smoothly into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump assembly.



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OIL PRESSURE RELIEF VALVE INSPECTION

Inspect oil pressure relief valve for movement, cracks and FA breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with a suitable tool. Install a new valve by tapping it.



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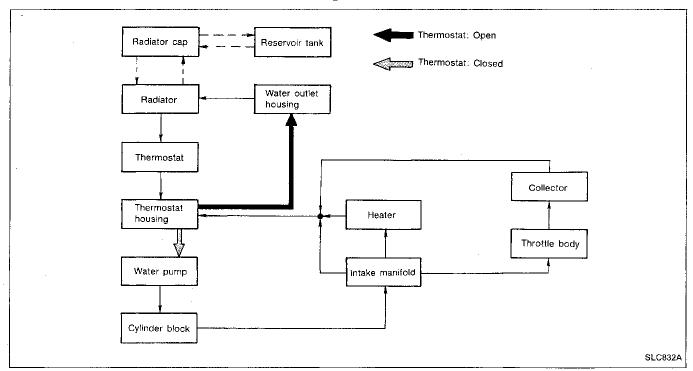
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Cooling Circuit

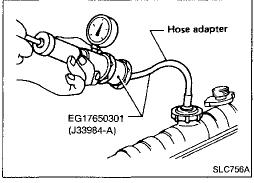


System Check

WARNING:

Never remove the radiator cap when the engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around the cap and carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then continue turning the cap until it can be removed safety.



EG17650301 (J33984-A) SLC755A

CHECKING COOLING SYSTEM HOSES

Check hoses for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.

CHECKING COOLING SYSTEM FOR LEAKS

To check for leakage, apply pressure to the cooling system with a tester.

Testing pressure: 157 kPa (1.6 kg/cm², 23 psi)

Higher than the specified pressure may cause radiator damage.

CHECKING RADIATOR CAP

To check radiator cap, apply pressure to cap with a tester.

Radiator cap relief pressure:

78 - 98 kPa (0.8 - 1.0 kg/cm², 11 - 14 psi)

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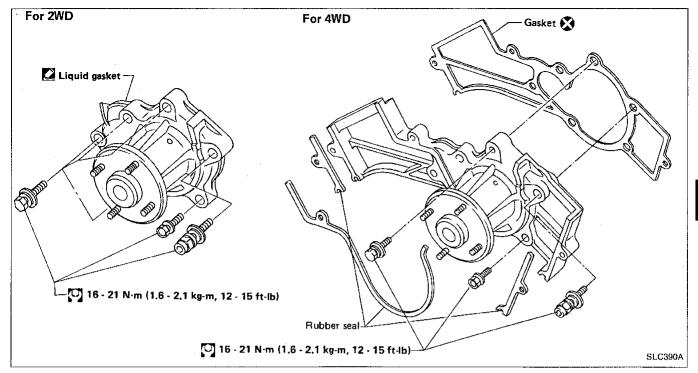
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Water Pump

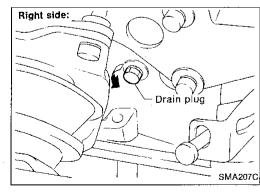


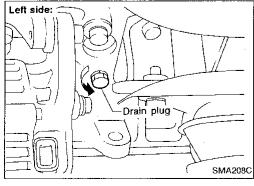
CAUTION:

- When removing water pump assembly, be careful not to get coolant on timing belt.
- Water pump cannot be disassembled and should be replaced as a unit.
- To avoid deforming timing cover, make sure there is adequate clearance between it and the hose clamp.
- After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.

REMOVAL AND INSTALLATION

Drain coolant from drain cocks on both sides of cylinder block $\ \ \mathbb{F}\mathbb{A}$ and radiator.





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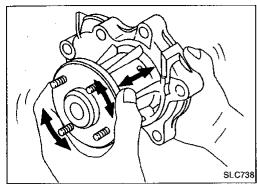
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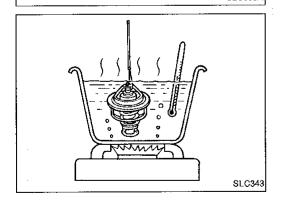
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Top side mark Top side Top side Liquid gasket Top side Liquid gasket SLC833A



Water Pump (Cont'd)

INSPECTION

- Check for badly rusted or corroded body assembly and vanes.
- 2. Check for rough operation due to excessive end play.

Thermostat

INSPECTION

 Check valve seating condition at ordinary temperatures. It should seat tightly.

2. Check valve opening temperature and maximum valve lift.

Valve opening temperature	°C (°F)	76.5 (170)
Maximum valve lift	mm/°C (in/°F)	10/90 (0.39/194)

- Then check if valve is closed at 5°C (9°F) below valve opening temperature.
- After installation, run engine for a few minutes, and check for leaks.
- Be careful not to spill coolant over engine compartment.
 Use a rag to absorb coolant.

Radiator

REMOVAL AND INSTALLATION

- 1. Remove under cover.
- 2. Drain coolant from radiator drain cock.
- 3. Disconnect radiator upper and lower hoses.
- 4. Remove A/T oil cooler hoses. (A/T model only)
- 5. Remove radiator lower shroud.
- 6. Disconnect reservoir tank hose.
- 7. Remove radiator.

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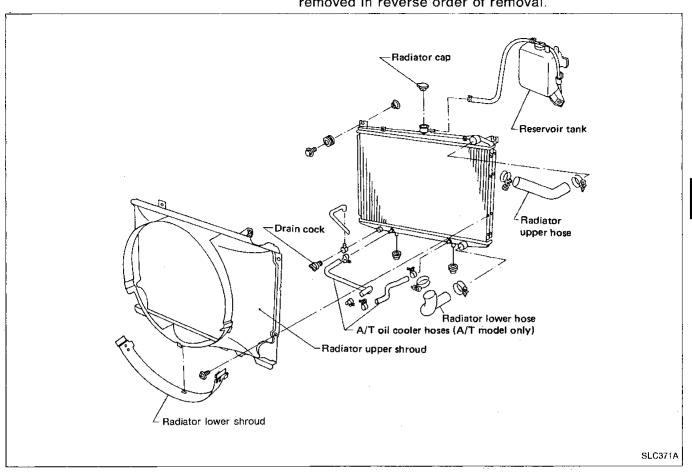
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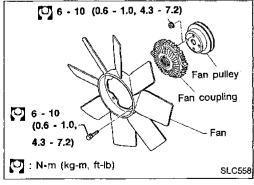
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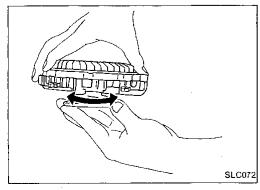
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Radiator (Cont'd)

 After repairing or replacing radiator, install any part removed in reverse order of removal.







Cooling Fan

INSPECTION

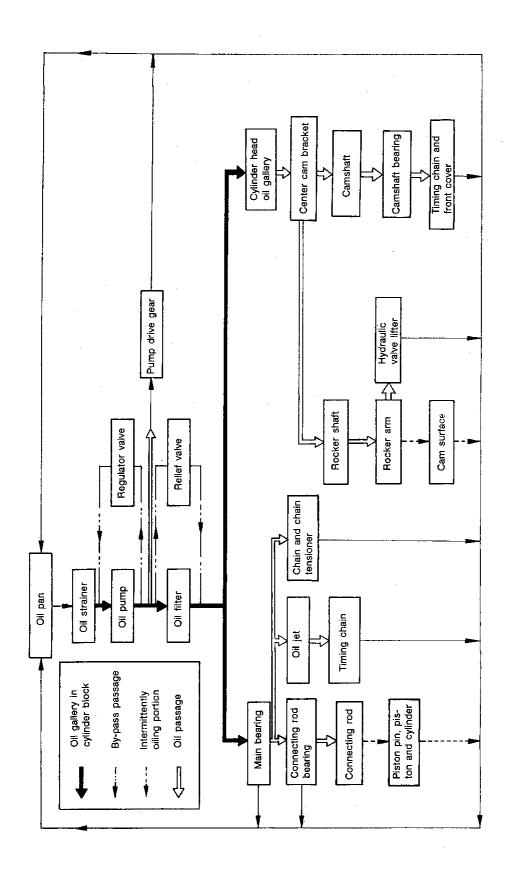
Check fan coupling for oil leakage or bent bimetal.

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Lubrication Circuit



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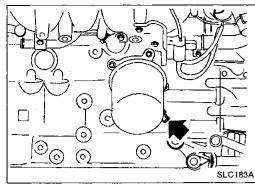
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SLC183A ST25051001 (J25695-1)

ST25052000

(J25695-2)

Oil Pressure Check

WARNING:

- Be careful not to burn yourself, as the engine and oil may
- Oil pressure check should be done in "Neutral" gear position.
- 1. Check oil level.
- 2. Remove oil pressure switch.
- 3. install pressure gauge.
 - Start engine and warm it up to normal operating tempera-
- Check oil pressure with engine running under no-load.

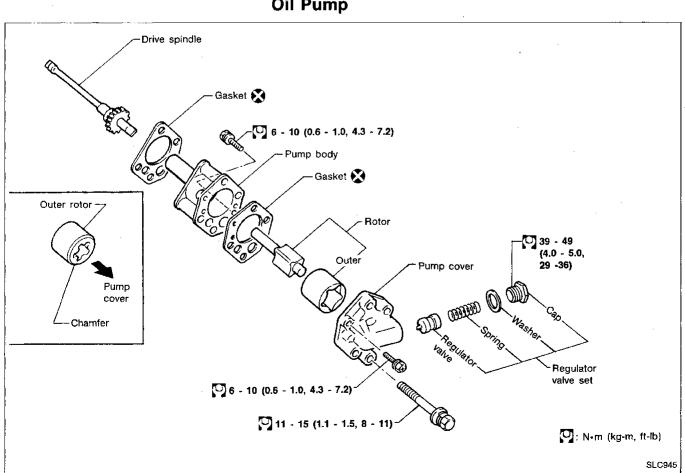
Engine speed rpm	Approximate discharge pressure kPa (kg/cm², psi)
ldle speed	More than 78 (0.8, 11)
3,000	412 - 481 (4.2 - 4.9, 60 - 70)

If difference is extreme, check oil passage and oil pump for oil leaks.

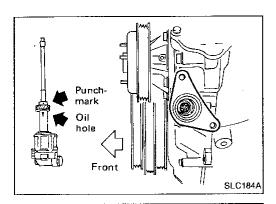
Install oil pressure switch with sealant.

Oil Pump

SLC926

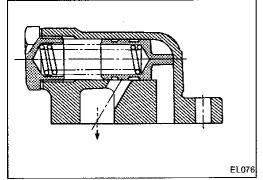


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Oil Pump (Cont'd)

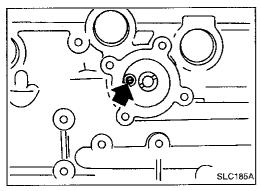
- Always replace with new oil seal and gasket.
- When removing oil pump, turn crankshaft so that No. 1 piston is at TDC on its compression stroke.
- When installing oil pump, align punchmark on drive spindie and oil hole on oil pump.



REGULATOR VALVE INSPECTION

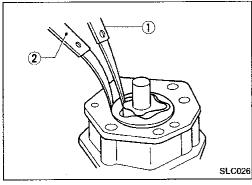
- 1. Visually inspect components for wear and damage.
- 2. Check oil pressure regulator valve sliding surface and valve spring.
- Coat regulator valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump assembly.



OIL PRESSURE RELIEF VALVE INSPECTION

Inspect oil pressure relief valve for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with suitable tool. Install a new valve in place by tapping it.

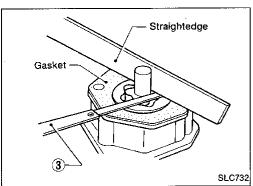


OIL PUMP INSPECTION

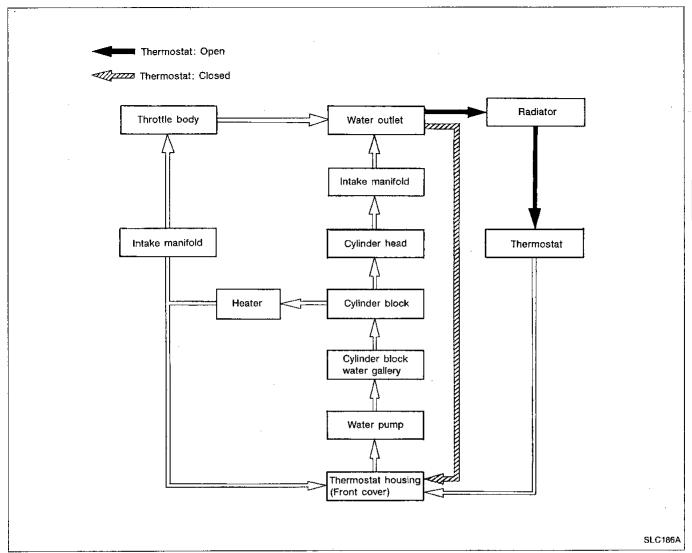
Using a feeler gauge, check the following clearance.

	Unit: mm (in)
Rotor tip clearance ①	Less than 0.12 (0.0047)
Outer rotor to body clearance ②	0.15 - 0.21 (0.0059 - 0.0083)
Side clearance (with gasket) 3	0.04 - 0.08 (0.0016 - 0.0031)

If it exceeds the limit, replace gear set or entire oil pump assembly.



Cooling Circuit

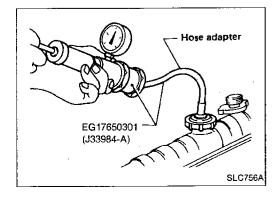


System Check

WARNING:

Never remove the radiator cap when the engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around cap and carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape and then turn the cap all the way off.



CHECKING COOLING SYSTEM HOSES

Check hoses for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.

CHECKING COOLING SYSTEM FOR LEAKS

To check for leakage, apply pressure to the cooling system with a tester.

Testing pressure: 157 kPa (1.6 kg/cm², 23 psi) **CAUTION:**

Higher than the specified pressure may cause radiator damage.

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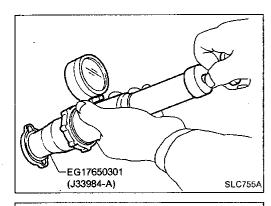
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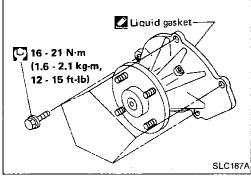


System Check (Cont'd) CHECKING RADIATOR CAP

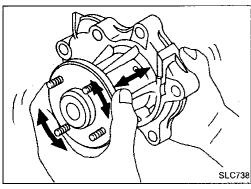
To check radiator cap, apply pressure to cap with a tester.

Radiator cap relief pressure:

78 - 98 kPa (0.8 - 1.0 kg/cm², 11 - 14 psi)

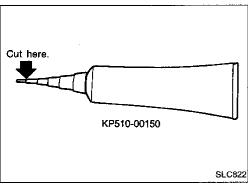


Water Pump



INSPECTION

Check for excessive end play and rough operation.

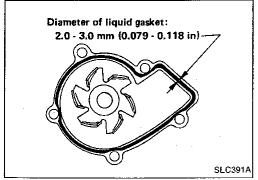


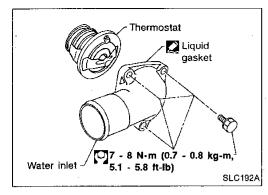
INSTALLATION

Remove liquid gasket from mating surface of pump housing using a scraper.

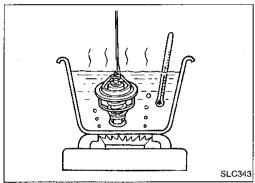
Be sure liquid gasket in grooves is also removed.

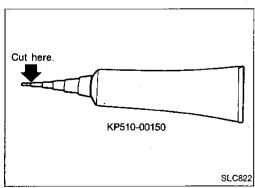
- Remove liquid gasket from mating surface of cylinder block.
- Clean all traces of liquid gasket using white gasoline.
- Cut off tip of nozzle of liquid gasket tube at point shown in figure.
- Use Genuine Liquid Gasket or equivalent.
- Apply a continuous bead of liquid gasket to mating surface of pump housing as shown.

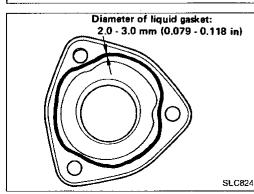




Upper Jiggle valve .Air bleeder SLC097







Thermostat

INSPECTION

Check for valve seating condition at ordinary temperatures. It should seat tightly.

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Check valve opening temperature and maximum valve lift.

°C (°F) 76.5 (170) Valve opening temperature Max. valve lift 8/90 (0.31/194) mm/°C (in/°F)

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Then check if valve closes at 5°C (9°F) below valve opening temperature.

After installation, run engine for a few minutes, and check for leaks.

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INSTALLATION

Remove liquid gasket from mating surface of thermostat FA using a scraper.

Similarly, remove liquid gasket from mating surface of cylinder block.

RA

Clean all traces of liquid gasket using white gasoline.

Cut off tip of nozzle of liquid gasket tube at point shown in figure.

BR

Use Genuine Liquid Gasket or equivalent.

ST

Apply a continuous bead of liquid gasket to mating surface of water inlet.

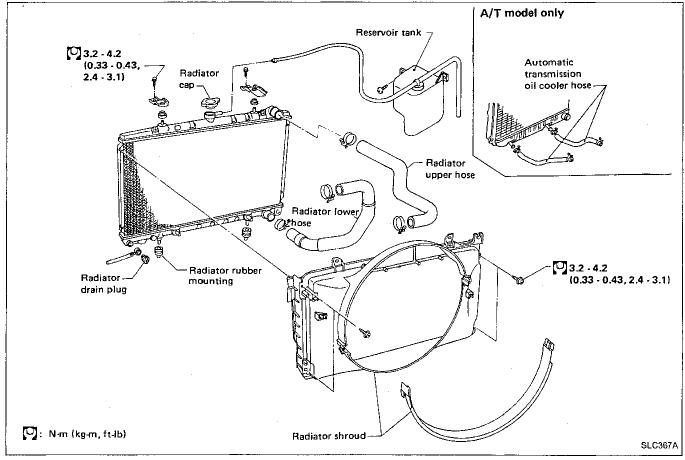
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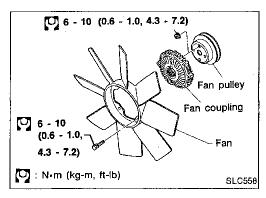
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Radiator



CAUTION:

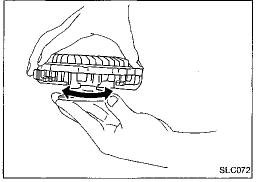
When filling radiator with coolant, refer to MA section.



Cooling Fan

DISASSEMBLY AND ASSEMBLY





Check fan coupling for rough operation, oil leakage or bent bimetal.

Engine Lubrication System (VG30E)

Oil pressure check

Engine speed rpm	Approximate discharge pressure kPa (kg/cm², psi)
Idle speed	More than 59 (0.6, 9)
3,200	363 - 451 (3.7 - 4.6, 53 - 65)

Oil pump

	Unit: mm (in)
Body to outer gear clearance	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance	0.12 - 0.23 (0.0047 - 0.0091)
Outer gear to crescent clearance	0.21 - 0.32 (0.0083 - 0.0126)
Housing to inner gear clearance	0.05 - 0.09 (0.0020 - 0.0035)
Housing to outer gear clearance	0.05 - 0.11 (0.0020 - 0.0043)

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Engine Cooling System (VG30E)

The	rmo	stat
-----	-----	------

Valve opening temperature	°C (°F)	76.5 (170)
Maximum valve lift	mm/°C (in/°F)	10/90 (0.39/194)

Radiator

	Unit: kPa (kg/cm², psi)
Cap relief pressure	78 - 98 (0.8 - 1.0, 11 - 14)
Leakage test pressure	157 (1.6, 23)

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Engine Lubrication System (KA24E)

Oil pressure check

Engine speed rpm	Approximate discharge pressure kPa (kg/cm², psi)
Idle speed 3,000	More than 78 (0.8, 11) 412 - 481 (4.2 - 4.9, 60 - 70)
	<u> </u>

Oil pump

Side clearance (with gasket)

	Unit: mm (in
Rotor tip clearance	Less than 0.12 (0.0047)
Outer rotor to body clearance	0.15 - 0.21 (0.0059 - 0.0083)

0.04 - 0.08 (0.0016 - 0.0031)

Unit: kPa (kg/cm², psi)

TF

AT

Engine Cooling System (KA24E)

Thermostat

Valve opening temperature	°C (°F)	76.5 (170)
Max. valve lift	mm/°C (in/°F)	8/90 (0.31/194)

Radiator

	- · · · · · · · · · · · · · · · · · · ·
Cap relief pressure	78 - 98 (0.8 - 1.0, 11 - 14)
Leakage test pressure	157 (1.6, 23)



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MAINTENANCE

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PREPARATION

Special Service Tool

For engine maintenance

Tool number			Engine A	pplication
(Kent-Moore No.) Tool name	Description		VG30E	KA24E
KV10105900 (J34274) Oil filter cap wrench	NT005	Removing oil filter	x	X

GENERAL MAINTENANCE

General maintenance includes those items which should be checked during the normal day-to-day operation of the vehicle. They are essential if the vehicle is to continue operating properly. The owners can perform the checks and inspections themselves or they can have their NISSAN dealers do them.

ltem	Reference page	
OUTSIDE THE VEHICLE The maintenance items listed here should be performed from time to time, unless otherwise specified.		
Tires Check the pressure with a gauge periodically when at a service station, including the spare, and adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear.	_	
Wheel nuts When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary.	_	
Tire rotation Tires should be rotated every 12,000 km (7,500 miles).	MA-23	
Wheel alignment and balance If the vehicle should pull to either side while driving on a straight and level road, or if you detect uneven or abnormal tire wear, there may be a need for wheel alignment. If the steering wheel or seat vibrates at normal highway speeds, wheel balancing may be needed.	MA-23, FA-9	,
Windshield wiper blades Check for cracks or wear if they do not wipe properly.	Warrange .	
Doors and engine hood Check that all doors and the engine hood operate smoothly as well as the trunk lid and back hatch. Also ensure, that all latches lock securely. Lubricate hinges, latches, rollers and links if necessary. Make sure that the secondary latch keeps the hood from opening when the primary latch is released. When driving in areas using road salt or other corrosive materials, check lubrication frequently.	MA-26	
INSIDE THE VEHICLE The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle, etc.		
Lights Make sure that the headlights, stop lights, tail lights, turn signal lights, and other lights are all operating properly and installed securely. Also check headlight aim.	-	
Warning lights and buzzers/chimes Make sure that all warning lights and buzzers/chimes are operating properly.	<u> </u>	
Windshield wiper and washer Check that the wipers and washer operate properly and that the wipers do not streak.		
Windshield defroster Check that the air comes out of the defroster outlets properly and in sufficient quantity when operating the heater or air conditioner.		
Steering wheel Check that it has the specified free play. Be sure to check for changes in the steering condition, such as excessive free play, hard steering or strange noises. Free play: Less than 35 mm (1.38 in)	_	
Seats Check seat position controls such as seat adjusters, seatback recliner, etc. to ensure they operate smoothly and that all latches lock securely in every position. Check that the head restrains move up and down smoothly and that the locks (if so equipped) hold securely in all latched positions. Check that the latches lock securely for folding-down rear seatbacks.		
Seat belts Check that all parts of the seat belt system (e.g. buckles, anchors, adjusters and retractors) operate properly and smoothly, and are installed securely. Check the belt webbing for cuts, fraying, wear or damage.	MA-27	
Cluich pedal Make sure the pedal operates smoothly and check that it has the proper free travel.	CL-5	
Brakes Check that the brake does not pull the vehicle to one side when applied.	_	

GENERAL MAINTENANCE

ltem	Reference page
Brake pedal and booster Check the pedal for smooth operation and make sure it has the proper distance under it when depressed fully. Check the brake booster function. Be certain to keep floor mats away from the pedal.	BR-6, 10
Parking brake Check that the lever has the proper travel and confirm that your vehicle is held securely on a fairly steep hill with only the parking brake applied.	BR-27
Automatic transmission "Park position" mechanism Check that the lock release button on the selector lever operates properly and smoothly. On a fairly steep hill check that your vehicle is held securely with the selector lever in the "P" position without applying any brakes.	_
JNDER THE HOOD AND VEHICLE The maintenance items listed here should be checked periodically (e.g. each time you check the engine oil or refuel).	
Windshield washer fluid Check that there is adequate fluid in the tank.	
Engine coolant level Check the coolant level when the engine is cold.	MA-11, 16
Radiator and hoses Check the front of the radiator and clean off any dirt, insects, leaves, etc., that may have accumulated. Make sure the hoses have no cracks, deformation, rot or cose connections.	_
Brake and clutch fluid levels Make sure that the brake and clutch fluid levels are between the "MAX" and "MIN" lines on the reservoir.	MA-20, 23
Battery Check the fluid level in each cell. It should be between the "MAX" and "MIN" ines.	_
Engine drive belts Make sure that no belt is frayed, worn, cracked or oily.	MA-10, 15
ingine oil level Check the level on the dipstick after parking the vehicle on a level spot and turning off the engine.	MA-13, 18
Power steering fluid level and lines Check the level when the fluid is cold and the engine s turned off. Check the lines for proper attachment, leaks, cracks, etc.	MA-25
Automatic transmission fluid level Check the level on the dipstick after putting the selector lever in "P" with the engine idling.	MA-20
Exhaust system Make sure there are no loose supports, cracks or holes. If the sound of the exhaust seems unusual or there is a smell of exhaust fumes, immediately locate the trouble and correct it.	MA-20
Underbody The underbody is frequently exposed to corrosive substances such as those used on icy roads or to control dust. It is very important to remove these substances, otherwise rust will form on the floor pan, frame, fuel lines and around the exhaust system. At the end of winter, the underbody should be thoroughly flushed with plain water, being careful to clean those areas where mud and dirt can easily accumulate.	
Fluid leaks Check under the vehicle for fuel, oil, water or other fluid leaks after the vehicle has been parked for a while. Water dripping from the air conditioner after use is normal. If you should notice any leaks or gasoline fumes are evident, check for the cause and correct it immediately.	_

PERIODIC MAINTENANCE

Two different maintenance schedules are provided, and should be used, depending upon the conditions in which the vehicle is mainly operated. After 60,000 miles (96,000 km) or 48 months, continue the periodic maintenance at the same mileage/time intervals.

SCHEDULE 1

Follow Periodic Maintenance Schedule 1 if your driving habits frequently includes one or more of the following driving conditions:

- Repeated short trips of less than 5 miles (8 km).
- Repeated short trips of less than 10 miles (16 km) with outside temperatures remaining below freezing.
- Operating in hot weather in stop-and-go "rush hour" traffic.
- Extensive idling and/or low speed driving for long distances, such as police, taxi or door-to-door delivery use.
- Driving in dusty conditions.
- Driving on rough, muddy, or salt spread roads.
- Towing a trailer, using a camper or a car-top carrier.

SCHEDULE 2

Follow Periodic Maintenance Schedule 2 if none of the driving conditions shown in Schedule 1 apply to your driving habits.

Maintenance for off-road driving (conly)

Whenever you drive off-road through sand, mud or water, more frequent maintenance may be required of the following items:

- ▲ Brake pads and discs
- ▲ Brake lining and drums
- ▲ Brake lines and hoses
- ▲ Wheel bearing grease and free-running hub grease
- ▲ Differential, transmission and transfer oil
- ▲ Steering linkage
- ▲ Propeller shaft and drive shafts
- ▲ Air cleaner filter
- ▲ Clutch housing (Check water entry. Refer to MA-20.)

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MA-24 MA-23

Schedule 1

MAINTENANCE OPERATION						MAI	VTENA	NCE	MAINTENANCE INTERVAL	'AL							
	Miles x 1,000	3.75	3.75 7.5 11.25 15 18.75 22.5 26.25 30 33.75 37.5 41.25 45 48.75 52.5 56.25	15	18.75 2	2.5 26	.25 31	33.7	5 37.5	41.25	45 4	8.75 5	32.5 56	25 90		Deference name	900
Perform at number of miles, kilometers or months, whichever comes first.	(km × 1,000)	9)	(12) (18) (24) (30) (36) (42) (48) (54) (60) (66) (72) (78) (84) (90) (96)	(24)	(30)	36) (4	(5)	95	(09)	(99)	(72)) (82)	(84)	(0)		2) D
	Months	တ	6 9	12	15	81	21 24	4 27	8	33	36	33	42	45 48			
Emission control system maintenance						ļ									KA24E		VG30E
Drive belts							-							*-	MA-15	⊢	MA-10
Air cleaner filter	See NOTE (1)						[R]	-						Œ	J MA-17	\dashv	MA-12
Positive crankcase ventilation (PCV) filter (KA24E engine only)	See NOTE (3)						[8]	=						E.	.] MA-19	_	
Pulsed secondary air injection valve filter (KA24E engine only)	See NOTE (2)												ŀ		MA-19		ļ
Vapor lines							-							*_ '	MA-19	_	MA-14
Fuel lines							*							*	MA-16	\dashv	MA-12
Fuel filter	See NOTE (3)*														MA-16	-	MA-12
Engine coolant	See NOTE (4)													ř	* MA-15		MA-11
Engine oil		œ	R	œ	æ	œ	R	۳.	ΩC	۳	m	-	<u>-</u>	ر س	MA-17	-	MA-13
Engine oil fifter (Use Nissan PREMIUM type or equivalent)		Œ	6C	Œ	œ	Œ	æ	Я	Œ	œ	æ	Œ	œ	<u>т</u>	MA-18		MA-13
Spark plugs							[8]	2						Œ	() MA-18		MA-14
Timina belt (VG30E engine only)					Repla	ce eve	iry 105	,000 n	Replace every 105,000 miles (168,000 km)	168,000	km)				1	-	EM-12
			l						١				l				

[]: At the mileage intervals only

Correct or replace if necessary.

i = Inspect.

Abbreviations: R = Replace

Chassis and body maintenance		
Brake lines & cables		-,
Brake pads, discs, drums & linings	_	-
Manual and automatic transmission, transfer & differential gear oil (exc. LSD) See NOTE (5)	NOTE (5)	-
Limited-slip differential (LSD) gear oil	See NOTE (5)	
Steering gear (box) & linkage, (steering damper 2x27), axle & suspension parts	-	_
Drive shaft boots & propeller shaff ([[]		-
Steering linkage ball joints & front suspension ball joints		-
Front wheel bearing grease (4x2)		
Front wheel bearing grease & free-running hub grease ([XX])	See NOTE (6)	-
T. John C. C. C. C. C. C. C. C. C. C. C. C. C.		_

Exhaust system

NOTE: (1) If operating mainly in dusty conditions, more frequent maintenance may be required.

(2) If operating mainly in dusty conditions, replace every 30,000 miles (48,000 km).

(3) If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately.

After 60,000 miles (96,000 km) or 48 months, replace every 30,000 miles (48,000 km) or 24 months.

If towing a trailer, using a camper or a car-top carrier, or driving on rough or muddy roads, change (not just inspect) oil at every 30,000 miles (48,000 km) <u>4</u>.0

or 24 months except for LSD. Change LSD gear oil every 15,000 miles (24,000 km) or 12 months. If operating frequently in water, replace grease every 3,750 miles (6,000 km) or 3 months.

Maintenance items and intervals with "*" are recommended by NISSAN for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required **@**E

Schedule 2

[]; At the mileage intervals only

Correct or replace if necessary.

Abbreviations: R = Replace I = Inspect.

MAINTENANCE OPERATION				MAIN	TENANC	MAINTENANCE INTERVAL	VAL			
	Miles x 1,000	7.5	15	22.5	30	37.5	45	52.5	09	
Perform at number of miles, kilometers or	(km × 1,000)	(12)	(24)	(36)	(48)	(09)	(72)	(84)	(96)	neieleike page
	Months	9	12	18	24	30	36	42	. 48	
Emission control system maintenance										KA24E VG30E
Drive belts					*_				*_	MA-15 MA-10
Air cleaner filter					[R]				田田	MA-17 MA-12
Positive crankcase ventilation (PCV) filter (KA24E engine only)	See NOTE (1)		!		[R]				[R]	MA-19 —
Vapor lines					*				*_	MA-19 MA-14
Fuel lines					<u>*</u>				*_	MA-16 MA-12
Fuel filter	See NOTE (1)*						!			MA-16 MA-12
Engine coolant	See NOTE (2)								ъ.	MA-15 MA-11
Engine oil		œ	æ	æ	ш	œ	œ	Œ	Œ	MA-17 MA-13
Engine oil filter (Use Nissan PREMIUM type or equivalent)	quivalent)		œ		æ		Œ		Œ	MA-18 MA-13
Spark plugs					[ਸ਼]				[R]	MA-18 MA-14
Timing belt (VG30E engine only)			Repl	ace ever	y 105,00	0 miles	Replace every 105,000 miles (168,000 km)	km)		— EM-12
Chassis and body maintenance										
Brake lines & cables			_		-		_		_	MA-23
Brake pads, discs, drums & linings			-		-		_		-	MA-24
Manual and automatic transmission, transfer & differential gear oil (exc. LSD)	lifferential gear oil (exc. LSD)		-		-		-		-	MA-20, 22
Limited-slip differential (LSD) gear oil			ı —		æ		_		Я	MA-23
Steering gear (box) & linkage, (steering damper [232]), axle &	exc), axle & suspension parts				1				_	MA-25, FA-6, RA-4
Drive shaft boots & propeller shaft (ZXZ)			-		-		_		-	MA-22, FA-14
Steering linkage ball joints & front suspension bail joints	ail joints									MA-25, FA-6
Front wheel bearing grease (4x2)					-				-	FA-7
Front wheel bearing grease & free-running hub grease (2323)	grease (zxz)		_		ч		_		н	FA-7, 18
Exhaust eystem					-				_	MA-20

filters might become clogged. In such an event, replace them immediately.

(2) After 60,000 miles (96,000 km) or 48 months, replace every 30,000 miles (48,000 km) or 24 months.

(3) Maintenance items and intervals with "*" are recommended by NISSAN for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.

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RECOMMENDED FLUIDS AND LUBRICANTS

Fluids and Lubricants

•				Ca	pacity (Approxima	te)	
				US measure	Imp measure	Liter	Recommended Fuel/Lubricants
Engine oil (Re	efill)						
VCOOT	Truck	With oil fil	ter	4-1/4 qt	3-1/2 qt	4.0	
VG30E	(2WD)	Without oi	l filter	3-7/8 qt	3-1/8 qt	3.6	
	Truck	With oil fil	ter	3-5/8 qt	3 qt	3.4	
VG30E	(4WD) & Pathfinder	Without oi	l filter	3-1/8 qt	2-5/8 qt	3.0	Energy Conserving Oils*2 of API
		With oil fill	ter	4-1/8 qt	3-3/8 qt	3.9	SG
KA24E	2WD	Without oi	l filter	3-3/4 qt	3-1/8 qt	3.5	
		With oil fil	ter	3-1/2 qt	2-7/8 qt	3.3	
KA24E	4WD	Without oi	l filter	3-1/8 qt	2-1/2 qt	2.9	
Cooling syste	m (With reserv	voir)					
			2WD	11-3/8 qt	9-3/8 qt	10.7	
		VG30E	4WD	12-3/8 qt	10-1/4 qt	11.7	Anti-freeze coolant
			2WD	8-5/8 qt	7-1/8 qt	8.1	(Ethylene glycol base)
		KA24E	4WD	9-1/2 qt	7-7/8 qt	9.0	
Manual transmission g	,	E0511540	2WD	4-1/4 pt	3-1/2 pt	2.0	
	mission gear	FS5W71C	4WD	8-1/2 pt	7 pt	4.0	ADLOL 414
lio			2WD	5-1/8 pt	4-1/4 pt	2.4	API GL-4*1
		FS5R30A	4WD	7-5/8 pt	6-3/8 pt	3.6	
Transfer gear	oil			2-3/8 qt	2 qt	2.2	Genuine Nissan ATF*3 or equiva- lent Type DEXRON TM II
Manual steeri	ing gear oil			3/4 pt	5/8 pt	0.33	API GL-4*1
Differential ca	arrier gear oil				•		
		H190A		3-1/8 pt	2-5/8 pt	1.5	Standard differential gear:
Rear:		C200		2-3/4 pt	2-1/4 pt	1.3	API GL-5*1
		H233B		5-7/8 pt	4-7/8 pt	2.8	Limited-slip differential (LSD) gear Use only LSD gear oil API GL-5
Event / 414/	(D):	R180A		2-3/4 pt	2-1/4 pt	1.3	and SAE 80W-90*4 approved for
Front (4W	υ):	R200A		3-1/8 pt	2-5/8 pt	1.5	Nissan LSD*5.
Automatic tra	nsmission	2WD		8-3/8 qt	7 qt	7.9	Genuine Nissan ATF*3 or equiva-
fluid		4WD		9 qt	7-1/2 qt	8.5	lent Type DEXRON™
Power steering	ng fluid			2-1/8 pt	1-3/4 pt	1.0	Type DEXRON™ II or equivalent
Brake and clu	utch fluid			_	_	_	Genuine Nissan Brake Fluid*3 or equivalent DOT 3 (US FMVSS No. 116)
Multi-purpose	grease						NLGI No. 2 (Lithium soap base)
Free-running	hub grease (A	uto-lock)			_		Genuine Nissan grease or equiva- lent

^{*1:} For further details, see the recommended SAE viscosity number chart.

^{*2:} These oils can be identified by such labels as EC-I, EC-II, energy conserving, energy saving, improved fuel economy, etc.

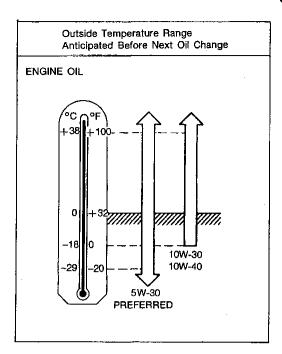
^{*3:} Available in mainland U.S.A. through your Nissan dealer.

^{*4:} SAE 90 is acceptable in ambient temperatures above -18°C (0°F).

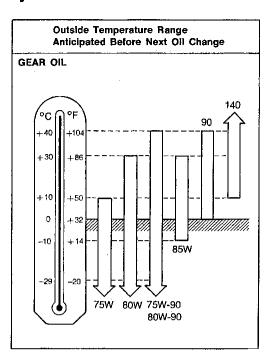
^{*5:} Contact a Nissan dealer for a list of approved oils.

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SAE Viscosity Number



5W-30 is preferable for all ambient temperatures. 20W-40 and 20W-50 are usable if the ambient temperature is above 10° C (50° F) for all seasons.



75W-90 for transmission, and 80W-90 for differential are preferable if the ambient temperature is below 40° C (104° F).

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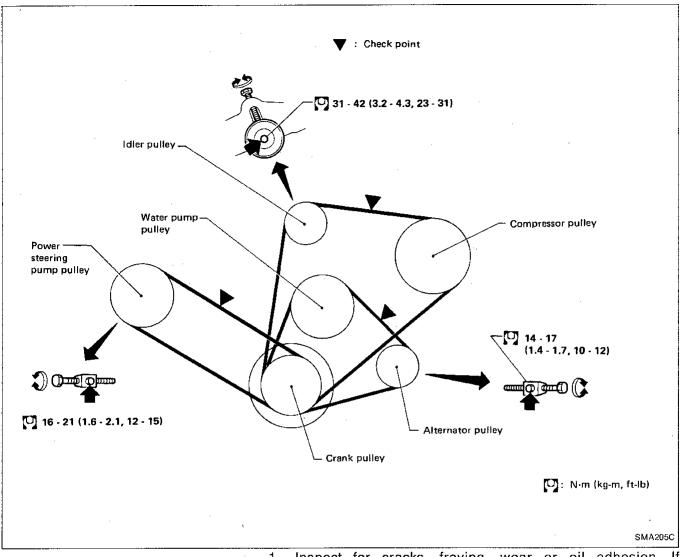
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Checking Drive Belts



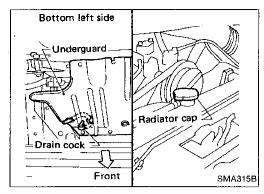
- 1. Inspect for cracks, fraying, wear or oil adhesion. If necessary, replace with a new one.
- 2. Inspect drive belt deflections by pushing on the belt midway between pulleys.

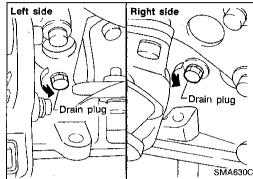
Adjust if belt deflections exceed the limit. Belt deflection:

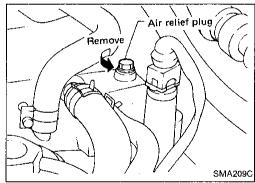
Unit: mm (in)

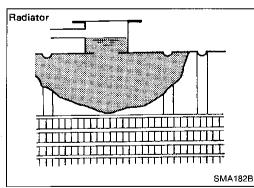
	Offic filling		
	Used be	It deflection	Deflection of new
	Limit	Deflection after adjustment	belt
Alternator	12 (0.47)	6 - 8 (0.24 - 0.31)	5 - 7 (0.20 - 0.28)
Air conditioner compressor	16 (0.63)	9 - 11 (0.35 - 0.43)	7 - 9 (0.28 - 0.35)
Power steering oil pump	17 (0.67)	11 - 13 (0.43 - 0.51)	9 - 11 (0.35 - 0.43)
Applied pushing force		98 N (10 kg, 22 lb)	

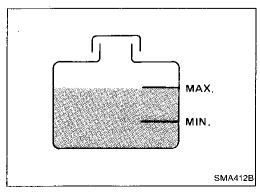
Inspect drive belt deflections when engine is cold.











Changing Engine Coolant

WARNING:

To avoid being scalded, never change the coolant when the engine is hot.

1. Move heater "TEMP" control lever all the way to "HOT" position or the highest temperature position.

For Auto-air conditioner:

Turn ignition switch "ON" to open water cock.

2. Open drain cock at the bottom of radiator, and remove radiator cap.

Be careful not to allow coolant to contact drive belts.

- 3. Remove drain plugs on both sides of cylinder block.
- 4. Close drain cock and tighten drain plugs securely.

(3.5 - 4.5 kg-m, 25 - 33 ft-lb)

Apply sealant to the drain plug thread.

- 5. Open air relief plug.
- Fill radiator with water and close air relief plug.
- 7. Start engine and warm it up sufficiently.
- 8. Stop engine and wait until it cools down.
- 9. Repeat step 3 through step 8 until clear water begins to drain from radiator.
- Drain water.
- 11. Open air relief plug again.
- 12. Fill radiator with coolant up to specified level.

 Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

		arrive a face also contact also
•	Coolant	capacity
	2WD	4WD
Without reservoir tank	9.9 (10-1/2, 8-3/4)	10.9 (11-1/2, 9-5/8)
Reservoir tank	0.8 (7.	/8, 3/4)

Pour coolant through coolant filler neck slowly to allow air in system to escape.

- Remove reservoir tank, drain coolant, then clean reservoir lank.
- 14. Fill reservoir tank with coolant up to "MAX" level.
- 15. Close air relief plug again.
- 16. Run engine and warm it up.
- 17. Stop engine and cool it down, then add coolant as necessary.

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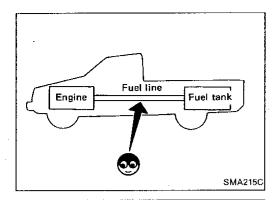
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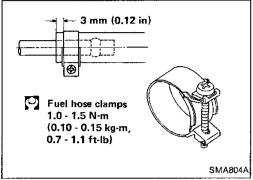
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Checking Fuel Lines

Inspect fuel lines and tank for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.

If necessary, repair or replace malfunctioning parts.

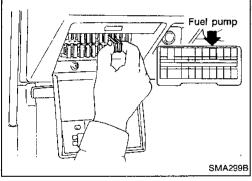


CAUTION:

Tighten high-pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end.

Tightening torque specifications are the same for all rubber hose clamps.

Ensure that screw does not contact adjacent parts.

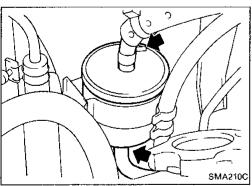


Changing Fuel Filter

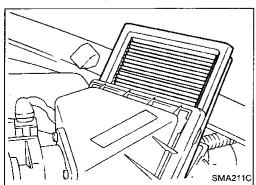
WARNING:

Before removing fuel filter, release fuel pressure from fuel line to eliminate danger.

- 1. Remove fuse for fuel pump.
- 2. Start engine.
- After engine stalls, crank engine two or three times to make sure that fuel pressure is released.
- 4. Turn ignition switch off and install fuse for fuel pump.

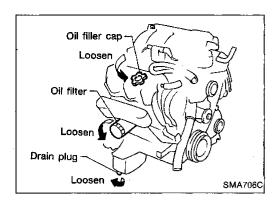


- 5. Loosen fuel hose clamps.
- 6. Replace fuel filter.
- Be careful not to spill fuel over engine compartment. Place a shop towel to absorb fuel.
- Use a high-pressure type fuel filter. Do not use a synthetic resinous fuel filter.
- When tightening fuel hose clamps, refer to "Checking Fuel Lines".



Changing Air Cleaner Filter

The viscous paper type filter does not need cleaning between renewals.



Changing Engine Oil

WARNING:

- Be careful not to burn yourself, as the engine oil is hot.
- Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.

1. Warm up engine, and check for oil leakage from engine components.

2. Remove drain plug and oil filler cap.

3. Drain oil and refill with new engine oil.

Oil grade: API SG

Viscosity: See "RECOMMENDED FLUIDS AND LUBRICANTS"

in MA section.

Refill oil capacity (Approximately):

		Unit: (US qt, Imp qt)
	Truck 2WD	Truck 4WD & Path- finder
With oil filter change	4.0 (4-1/4, 3-1/2)	3.4 (3-5/8, 3)
Without oil filter change	3.6 (3-7/8, 3-1/8)	3.0 (3-1/8, 2-5/8)

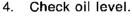
CAUTION:

Be sure to clean drain plug and install with new washer. Oil pan drain plug:

(C): 29 - 39 N·m

(3.0 - 4.0 kg-m, 22 - 29 ft-lb)

The refill capacity changes depending on the oil temperature and drain time, use these values as a reference and be certain to check with the dipstick when changing the oil.



- 5. Start engine and check area around drain plug and oil filter for oil leakage.
- Run engine for a few minutes, then turn it off. After several minutes, check oil level.

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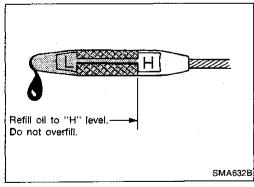
Changing Oil Filter

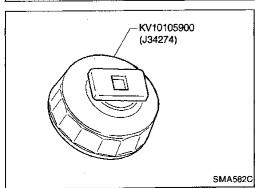
Remove oil filter with Tool.

WARNING:

Be careful not to burn yourself, as the engine and engine oil are











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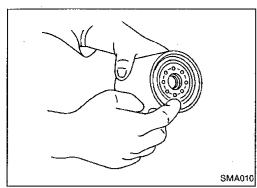




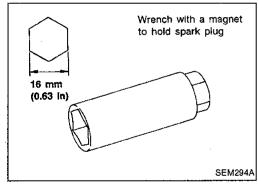


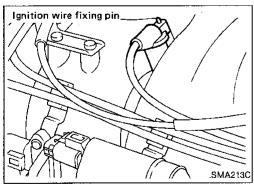


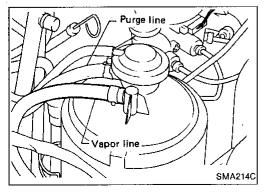




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Changing Oil Filter (Cont'd)

- Before installing a new oil filter, clean the oil filter mounting surface on cylinder block, and coat the oil filter rubber seal with a little engine oil.
- 3. Screw in the oil filter until a slight resistance is felt, then tighten additionally more than 2/3 turn.
- 4. Add engine oil.

Refer to Changing Engine Oil.

Changing Spark Plugs

1. Disconnect ignition wires from spark plugs at boot. Do not pull on the wire.

2. Remove spark plugs with spark plug wrench.

Spark plug:

	For California	Except for California
Standard type	BKR6EY	BKR5EY
Cold type	BKR7EY	BKR6EY
Hot type	BKR5EY	

Check spark plug gap of each new spark plug.

Gap:

0.8 - 0.9 mm (0.031 - 0.035 in)

4. Install spark plugs. Reconnect ignition wires according to numbers indicated on them.

When installing spark plugs to No. 2 and 4 cylinders, securely fit each ignition wire mounting hole onto the ignition wire fixing pin.

Spark plug:

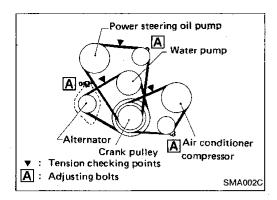
(C): 20 - 29 N·m

(2.0 - 3.0 kg-m, 14 - 22 ft-lb)

Checking Vapor Lines

- Visually inspect vapor lines for improper attachment and for cracks, damage, loose connections, chafing and deterioration.
- Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc.

Refer to "EVAPORATIVE EMISSION SYSTEM" in EF & EC section.



Checking Drive Belts

1. Inspect for cracks, fraying, wear or oil adhesion. If necessary, replace with a new one.

2. Inspect drive belt deflections by pushing on the belt midway between pulleys.

Adjust if belt deflections exceed the limit. Belt deflection:

Unit:	mm	(in)
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	Used belt deflection		Deflection of new
	Limit	Deflection after adjustment	Deflection of new belt
Alternator	17 (0.67)	10 - 12 (0.39 - 0.47)	8 - 10 (0.31 - 0.39)
Air conditioner compressor	16 (0.63)	10 - 12 (0.39 - 0.47)	8 - 10 (0.31 - 0.39)
Power steering oil pump	15 (0.59)	9 - 11 (0.35 - 0.43)	7 - 9 (0.28 - 0.35)
Applied pushing force		98 N (10 kg, 22 lb)	

Inspect drive belt deflections when engine is cold.

Changing Engine Coolant

WARNING:

To avoid being scalded, never change the coolant when the engine is hot.

1. Move heater "TEMP" control lever all the way to "HOT" position or the highest temperature position.

2. Open drain cock at the bottom of radiator, and remove radiator cap.

Be careful not to allow coolant to contact drive belts.

Remove cylinder block drain plug.

4. Close drain cock and tighten drain plug securely.

Apply sealant to the thread of drain plug.

(3.5 - 4.5 kg-m, 25 - 33 ft-lb)

5. Open air relief plug.

6. Fill radiator with water and close air relief plug and radiator cap.

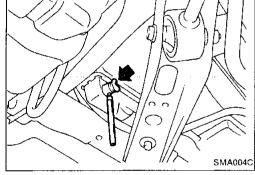
7. Run engine and warm it up sufficiently.

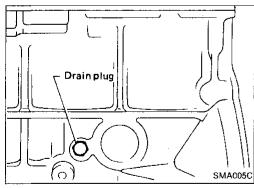
8. Race engine 2 or 3 times under no-load.

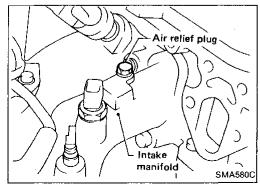
9. Stop engine and wait until it cools down.

Repeat step 2 through step 9 until clear water begins to drain from radiator.

11. Drain water.



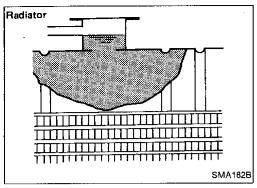


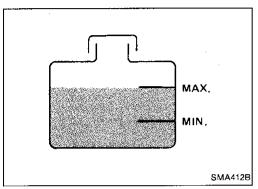


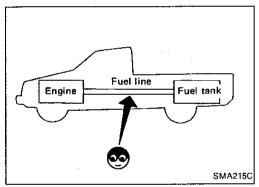
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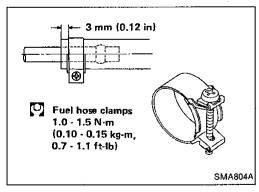
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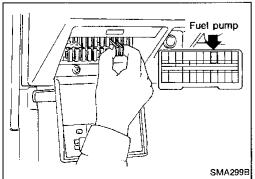
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Changing Engine Coolant (Cont'd)

- 12. Open radiator cap and air relief plug.
- 13. Fill radiator with coolant up to specified level.

 Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

 Unit: (US qt, Imp qt)

	Coolant	capacity
	2WD	4WD
Without reservoir tank	7.3 (7-3/4, 6-3/8)	8.2 (8-5/8, 7-1/4)
Reservoir tank	0.8 (7/	(8, 3/4)

Pour coolant through coolant filler neck slowly to allow air in system to escape.

- 14. Close air relief plug.
- 15. Remove reservoir tank, drain coolant, then clean reservoir tank.
- 16. Install reservoir tank and fill it with coolant up to "MAX" level and then install radiator cap.
- 17. Run engine and warm it up sufficiently.
- 18. Race engine 2 or 3 times under no-load.
- 19. Stop engine and cool it down, then add coolant as necessary.

Checking Fuel Lines

Inspect fuel lines and tank for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.

If necessary, repair or replace faulty parts.

CAUTION:

Tighten high-pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end.

Ensure that screw does not contact adjacent parts.

Changing Fuel Filter

WARNING:

Before removing fuel filter, release fuel pressure from fuel line.

- 1. Remove fuse for fuel pump.
- 2. Start engine.
- 3. After engine stalls, crank engine two or three times to make sure that fuel pressure is released.
- 4. Turn ignition switch off and install fuse for fuel pump.

Changing Fuel Filter (Cont'd)

- Loosen fuel hose clamps.
- 6. Replace fuel filter.
- Be careful not to spill fuel over engine compartment. Place a shop towel to absorb fuel.
- Use a high-pressure type fuel filter. Do not use a synthetic (resinous fuel filter.
- When tightening fuel hose clamps, refer to "Checking Fuel Lines" in MA-16.





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Changing Air Cleaner Filter

The viscous paper type filter does not need cleaning between LC renewals.





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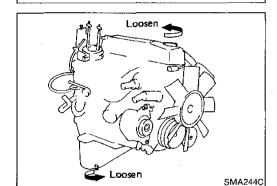
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Fuel filter

Changing Engine Oil

WARNING:

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- Be careful not to burn yourself, as the engine oil is hot.
- Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.
- 1. Warm up engine, and check for oil leakage from engine components.
- Remove drain plug and oil filler cap.

Refill oil capacity (Approximately):

Drain oil and refill with new engine oil.

Oil grade: API SG

Viscosity:

CAUTION:

See RECOMMENDED FLUIDS AND LUBRICANTS in MA section.

RA

Unit: f (US gt, Imp qt)

2WD 4WD With oil filter change 3.9 (4-1/8, 3-3/8) 3.3 (3-1/2, 2-7/8) Without oil filter 3.5 (3-3/4, 3-1/8) 2.9 (3-1/8, 2-1/2) change

Be sure to clean drain plug and install with new washer. Drain plug:

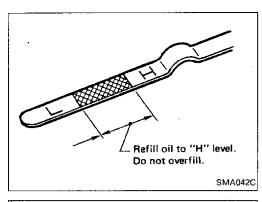
(C): 29 - 39 N·m

(3.0 - 4.0 kg-m, 22 - 29 ft-lb)

The refill capacity changes depending on the oil temperature and drain time, use these values as a reference and be certain to check with the dipstick when changing the oil.

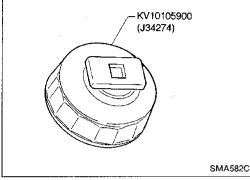
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Changing Engine Oil (Cont'd)

- 4. Check oil level.
- 5. Start engine and check area around drain plug and oil filter for oil leakage.
- 6. Run engine for a few minutes, then turn it off. After several minutes, check oil level.

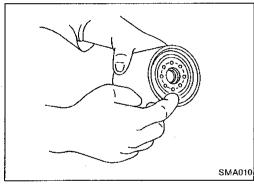


Changing Oil Filter

1. Remove oil filter with tool.

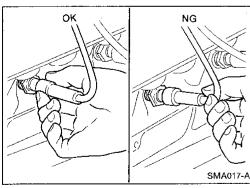
WARNING:

Be careful not to burn yourself, as the engine and the engine oil are hot.



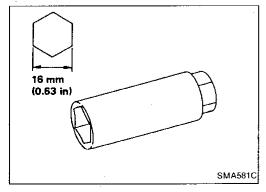
- 2. Before installing new oil filter, clean the oil filter mounting surface on cylinder block, and coat the rubber seal of oil filter with a little engine oil.
- 3. Screw in the oil filter until a slight resistance is felt, then tighten additionally more than 2/3 turn.
- 4. Add engine oil.

Refer to Changing Engine Oil in MA-17.



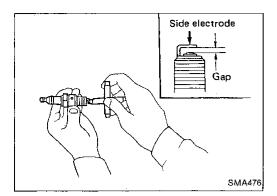
Changing Spark Plugs

Disconnect ignition wires from spark plugs at boot.
 Do not pull on the wire.



2. Remove spark plugs with spark plug wrench.

Spark plug:
Standard type
ZFR5E-11
Hot type
ZFR4E-11
Cold type
ZFR6E-11



Vapor line

PAIR valve case

2WD

SMA011C

SMA656C

Filter

Changing Spark Plugs (Cont'd)

Check plug gap of each new spark plug.

Gap: 1.0 - 1.1 mm (0.039 - 0.043 in)

Install spark plugs. Reconnect ignition wires according to numbers indicated on them.

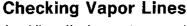
> Spark plug: (I): 20 - 29 N·m

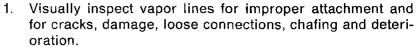
(2.0 - 3.0 kg-m, 14 - 22 ft-lb)

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Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc.

section.

EF & EC

Refer to EVAPORATIVE EMISSION SYSTEM in EF & EC

CL

Changing Pulsed Secondary Air Injection (PAIR) Valve (PAIR valve) Filter

Remove PAIR valve case and take out PAIR valve filter. Then install new PAIR valve filter.

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Changing Positive Crankcase Ventilation (PCV)

Remove air cleaner cover and take out PCV filter located inside air cleaner cover. Then install new PCV filter.

HA

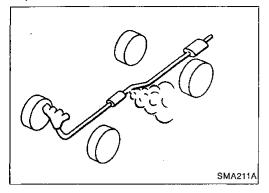
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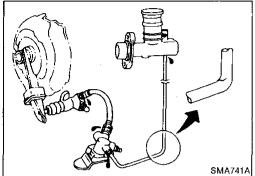


PD FA RA BR BF



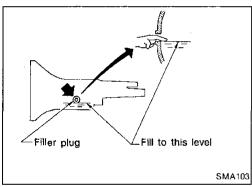
Checking Exhaust System

Check exhaust pipes, muffler and mounting for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.



Checking Clutch Fluid Level and Leaks

If fluid level is extremely low, check clutch system for leaks.

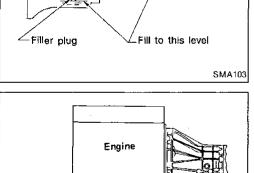


Checking M/T Oil

Check for oil leakage and oil level.

Never start engine while checking oil level.

[O]: Filler plug 25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)



Changing M/T Oil

- 1. Drain oil from drain plug and refill with new gear oil.
- 2. Check oil level.

Oil capacity: FS5W71C

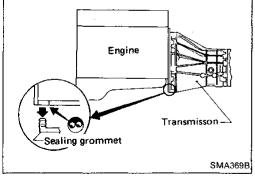
2WD 2.0 liters (4-1/4 US pt, 3-1/2 lmp pt) 4WD 4.0 liters (8-1/2 US pt, 7 lmp pt)

FS5R30A

2WD 2.4 liters (5-1/8 US pt, 4-1/4 lmp pt)

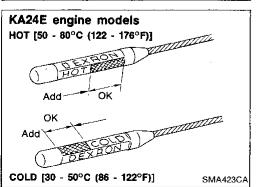
4WD 3.6 liters (7-5/8 US pt, 6-3/8 Imp pt)

(C): Drain plug 25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)



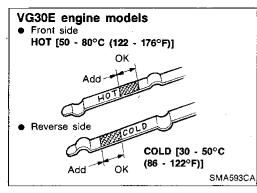
Checking Water Entry — For 4WD model

Check water entry in the clutch housing by removing the sealing grommet, whenever driving in deep water or mud.



Checking A/T Fluid

Check for fluid leakage and fluid level.
Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) after vehicle has been driven approximately 5 minutes in urban areas after engine is warmed up. But it can be checked at fluid temperatures of 30 to 50°C (86 to 122°F) using "COLD" range on dipstick for reference after engine is warmed up and before driving. However, fluid level must be rechecked using "HOT" range.





Checking A/T Fluid (Cont'd)

- (1) Park vehicle on level surface and set parking brake.
- (2) Start engine and then move selector lever through each gear range, ending in "P".
- (3) Check fluid level with engine idling.
- (4) Remove dipstick and wipe it clean with lint-free paper.
- (5) Reinsert dipstick into charging pipe as far as it will go.
- (6) Remove dipstick and note reading. If level is at low side of either range, add fluid to the charging pipe.

Do not overfill.

 Check fluid for contamination. If fluid is very dark or smells burned, or contains the frictional material (clutches, band, etc.), check operation of A/T.
 Refer to section AT for checking operation of A/T.

•

Changing A/T Fluid

- Warm up A/T fluid.
- 2. Stop engine.
- 3. Drain A/T fluid from drain plug and refill with new A/T fluid. Always refill same volume with drained fluid.

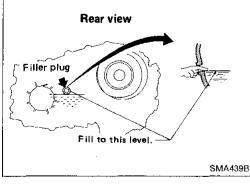
Oil grade:

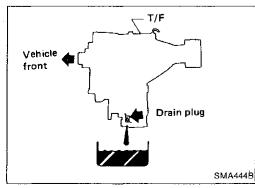
Genuine Nissan ATF or equivalent type DEXRONTMII

Oil capacity (With torque converter):
2WD 7.9 liters (8-3/8 US qt, 7 Imp qt)
4WD 8.5 liters (9 US qt, 7-1/2 Imp qt)

4. Run engine at idle speed for five minutes.

5. Check fluid level and condition. Refer to "Checking A/T Fluid". If fluid is still dirty, repeat step 2. through 5.





Checking Transfer Oil

· Check for oil leakage and oil level.

Automatic Transmission Fluid is used for the transfer in the factory. Never add gear oil (75W-90) to Automatic Transmission Fluid

Never start engine while checking oil level.

Filler plug:

(2.5 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)

Changing Transfer Oil

When changing transfer oil completely, Genuine Nissan ATF or equivalent type DEXRONTM II or gear oil (75W-90) may be used.

Do not mix Automatic Transmission Fluid and gear oil.
Oil capacity:

2.2 liters (2-3/8 US qt, 2 lmp qt)

Drain plug:

[C]: 25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)

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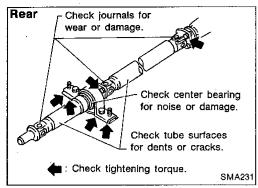
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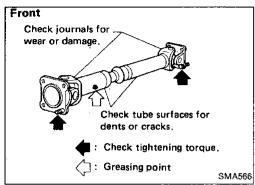
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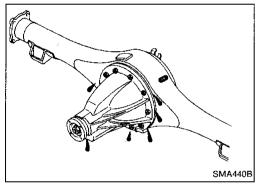
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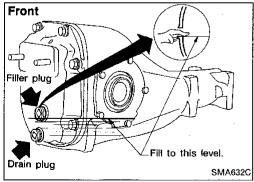
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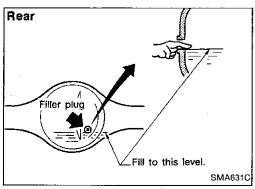
MA-21 55











Checking Propeller Shaft

Check propeller shaft for damage, looseness or grease leakage.

Tightening torque: Refer to section PD.

Checking Differential Gear Oil

1. Check for oil leakage and oil level.

```
Filler plug
Front
39 - 59 N·m (4 - 6 kg-m, 29 - 43 ft-lb)
Rear
H190A, H233B
59 - 98 N·m (6 - 10 kg-m, 43 - 72 ft-lb)
C200
39 - 59 N·m (4 - 6 kg-m, 29 - 43 ft-lb)
```

Changing Differential Gear Oil

- Drain oil from drain plug and refill with new gear oil.
- Check oil level.

```
Oil capacity:
    Front
        R180A
          1.3 liters (2-3/4 US pt, 2-1/4 Imp pt)
          1.5 liters (3-1/8 US pt, 2-5/8 Imp pt)
    Rear
        H190A
          1.5 liters (3-1/8 US pt, 2-5/8 Imp pt)
        C200
          1.3 liters (2-3/4 US pt, 2-1/4 Imp pt)
        H233B
          2.8 liters (5-7/8 US pt, 4-7/8 Imp pt)
: Drain plug
    Front
        39 - 59 N·m (4 - 6 kg-m, 29 - 43 ft-lb)
    Rear
        59 - 98 N·m (6 - 10 kg-m, 43 - 72 ft-lb)
```

Changing Differential Gear Oil (Cont'd) Limited-slip differential gear

- Use only approved limited-slip differential gear oil.
- Limited-slip differential identification.
- (1) Lift both rear wheels off the ground.
- (2) Turn one rear wheel by hand.
- (3) If both rear wheels turn in the same direction simultaneously, vehicle is equipped with limited-slip differential.



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Balancing Wheels

Tire Rotation

of a flat tire, etc.)

Wheel nuts:

tire when rotating the tires.

Adjust wheel balance using the road wheel center. Wheel balance (Maximum allowable unbalance): Refer to "Chassis and Body Maintenance" in SDS (MA-28).

After rotating the tires, adjust the tire pressure.

Retighten the wheel nuts after the aluminum wheel has been run for the first 1,000 km (600 miles). (also in cases

Do not include the T-type spare tire and small size spare

(12 - 15 kg-m, 87 - 108 ft-lb)



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Checking Brake Fluid Level and Leaks

If fluid level is extremely low, check brake system for leaks.



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Checking Brake System

Check brake fluid lines and parking brake cables for improper attachment and for leaks, chafing, abrasion, deterioration, etc.

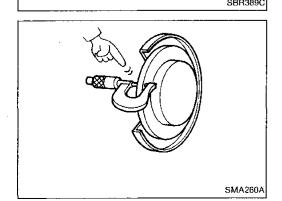
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5 WHEELS

FRONT

SMA633C

FRONT

4 WHEELS

Checking Disc Brake

ROTOR

Check condition and thickness.

Minimum thickness:

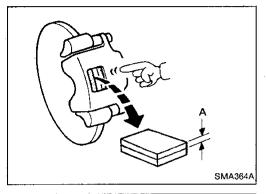
CL28VA 20 mm (0.79 in) CL28VD 24 mm (0.94 in) AD14VB

16 mm (0.63 in)

SMA922A

Checking Disc Brake (Cont'd) CALIPER

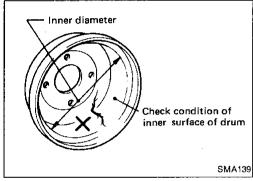
Check for leakage.



PAD

Check wear or damage.

Minimum thickness: 2 mm (0.08 in)



Checking Drum Brake

WHEEL CYLINDER

Check for leakage.

DRUM

Check condition and inner surface.

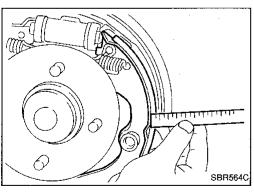
Drum repair limit (Inner diameter):

LT26B 26

261.5 mm (10.30 in)

LT30A 296.5 mm (11.67 in)

DS19HB 191.0 mm (7.52 in)



LINING

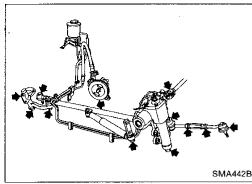
Check wear or damage.

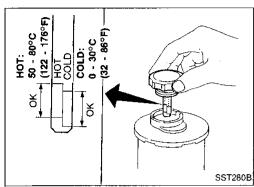
Lining wear limit (Minimum thickness): 1.5 mm (0.059 in)

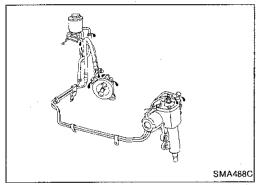
PARKING DRUM BRAKE

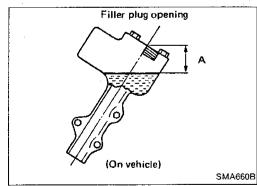
Adjust lining and drum as follows:

- (1) Set the transfer lever in the "2H" position. Using either low or 2nd transmission speed, drive the unloaded vehicle at approximately 30 km/h (19 MPH) on a safe, level and dry road.
- (2) Depress the release button of the parking brake lever and pull the lever back with a force of 98 N (10 kg, 22 lb).
- (3) While holding the lever back, continue to drive the vehicle 100 m (328 ft).
- (4) Repeat steps 1 through 3 two or three times.









Checking Steering Gear and Linkage STEERING GEAR

- Check gear housing and boots for looseness, damage or grease leakage.
- Check connection with steering column for looseness.

STEERING LINKAGE

 Check ball joint, dust cover and other component parts for looseness, wear, damage or grease leakage.



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Checking Power Steering Fluid and Lines

Check fluid level.

Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) or using "COLD" range on dipstick at fluid temperatures of 0 to 30°C (32 to 86°F).

CAUTION:

- Do not overfill.
- Recommended fluid is Automatic Transmission Fluid "DEXRONTM II" type or equivalent.
 - Check lines for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.

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Checking Steering Gear Oil Level and Leaks

- Check steering gear for oil level and leakage.
- Check oil level.

Oil level:

Distance "A"

20 mm (0.79 in) or less

Be careful not to overflow gear oil when filling up.

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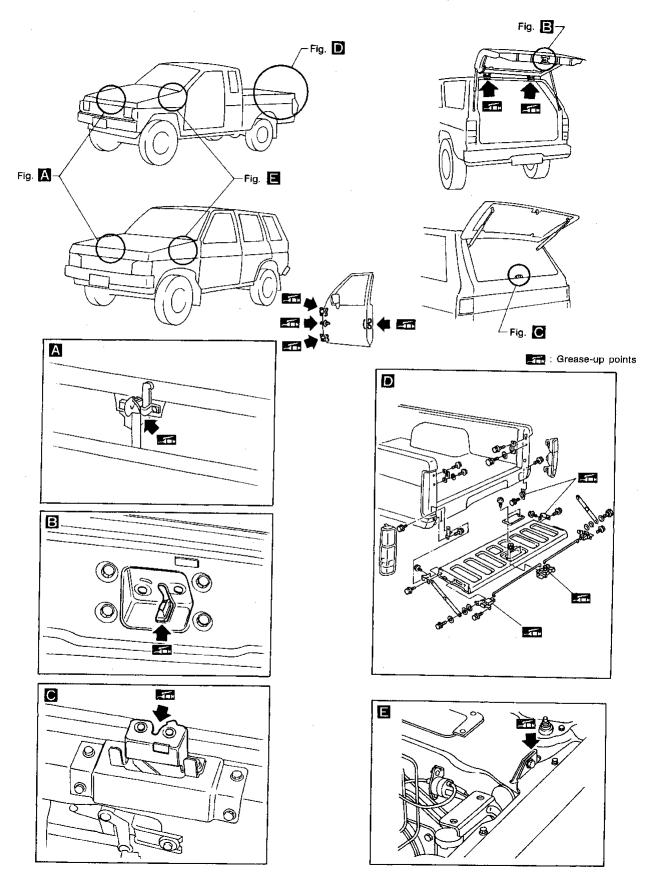
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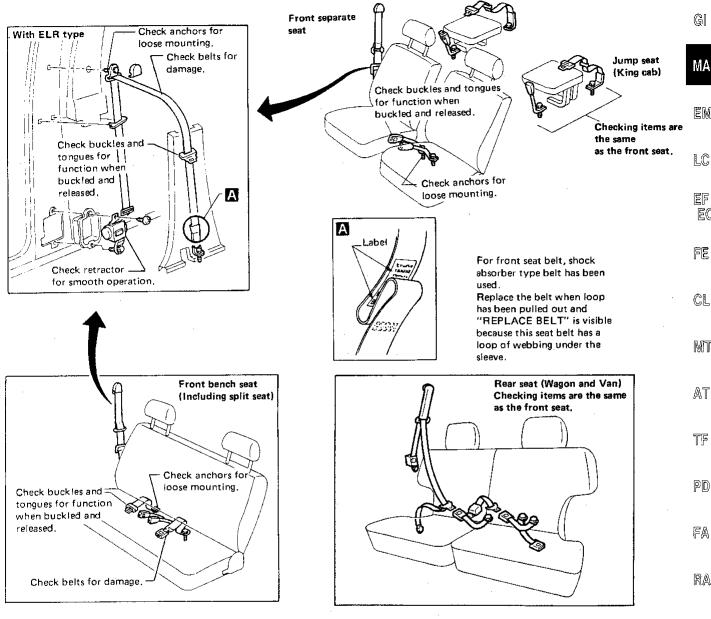
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Lubricating Hood Latches, Locks and Hinges



Checking Seat Belts, Buckles, Retractors, **Anchors and Adjusters**



CAUTION:

- 1, If the vehicle is collided or overturned, replace the entire belt assembly, regardless of nature of accident.
- 2. If the condition of any component of a seat belt is questionable, do not repair seat belt, but replace it as a belt assembly.
- 3. If webbing is cut, frayed, or damaged, replace belt assembly.
- 4. Do not spill drinks, oif, etc. on inner lap belt buckle. Never oil tongue and buckle.
- 5. Use a NISSAN genuine seat belt assembly.

Anchor bolt:

35.8 - 45.6 N·m (3.65 - 4.65 kg-m, 26.4 - 33.6 ft-lb)

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SERVICE DATA AND SPECIFICATIONS (SDS)

Engine Maintenance

INSPECTION AND ADJUSTMENT (VG30E)

Drive belt deflection

Unit: mm (in)

	Used bel	t deflection	
	Limit	Deflection after adjust- ment	Deflection of new belt
Alternator	12 (0.47)	6 - 8 (0.24 - 0.31)	5 - 7 (0.20 - 0.28)
Air conditioner compressor	16 (0.63)	9 - 11 (0.35 - 0.43)	7 - 9 (0.28 - 0.35)
Power steer- ing oil pump	17 (0.67)	11 - 13 (0.43 - 0.51)	9 - 11 (0.35 - 0.43)
Applied push- ing force	41-1-1-2	98 N (10 kg, 22 lb)

Spark plug

Standard type	BKR6EY
Hot type	BKR5EY
Cold type	BKR7EY
Plug gap	0.8 - 0.9 mm (0.031 - 0.035 in)

INSPECTION AND ADJUSTMENT (KA24E)

Drive belt deflection

Unit:	

	Used belt deflection			
	Limit	Deflection after adjust- ment	Deflection of new belt	
Alternator	17 (0.67)	10 - 12 (0.39 - 0.47)	8 - 10 (0.31 - 0.39)	
Air conditioner compressor	16 (0.63)	10 - 12 (0.39 - 0.47)	8 - 10 (0.31 - 0.39)	
Power steer- ing oil pump	15 (0.59)	9 - 11 (0.35 - 0.43)	7 - 9 (0.28 - 0.35)	
Applied push- ing force		98 N (10 kg, 22 lb)	

Spark plug

Standard type	ZFR5E-11
Hot type	ZFR4E-11
Cold type	ZFR6E-11
Plug gap	1.0 - 1.1 mm (0.039 - 0.043 in)

Chassis and Body Maintenance

INSPECTION AND ADJUSTMENT

Wheel balance

Maximum allowable unbalance	Dynamic (At rim fl	ange) g (oz)	10 (0.35) (one side)
	Static	g (oz)	20 (0.71)

Brake

Unit:	mm	(in
-------	----	-----

Disc brake	
Pad wear limit	2.0 (0.079)
Rotor thickness repair limit	
CL28VA	20 (0.79)
CL28VD	24 (0.94)
AD14VB	16 (0.63)
Drum brake	
Drum inner dia. repair limit	
LT26B	261.5 (10.30)
LT30A	296.5 (11.67)
DS19HB	191.0 (7.52)
Lining wear limit	1.5 (0.059)

MANUAL TRANSMISSION

SECTION T

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Special Service Tools

Tool number	Description	
(Kent-Moore No.)	Description	
Tool name	·	
		
ST23810001		Fixing adapter plate with gear assembly
(—)		
Adapter setting plate		
	/:-//	
	NT066	
KV32101330		Removing overdrive mainshaft bearing
(See J26349-A)		Tromoving overante manional souring
Puller		
		δ
•		
	NT067	110
KV31100401	(000	Pressing counter gear and mainshaft
(—)		
Transmission press stand	1 dtath	
	Nitoco	
ST22520000	NT068	Tightening mainshaft lock nut
(J26348)	()	riginening mainshall lock hut
Wrench		
WI GITCH		
	NT069	
ST23540000		Removing and installing fork rod retaining
(J25689-A)		pin
Pin punch		
	NT070	
ST30031000		Removing and installing 1st gear bushing
(J22912-01)		Removing main drive gear bearing
Puller		manifer and goar boaring
	100	
	NT071	
ST23860000		Installing counter drive gear
(—)		
Drift	This	
	a l	a: 38 mm (1.50 in) dia.
	NT065	b: 33 mm (1.30 in) dia.
ST22360002		Installing counter gear front and rear end
(J25679-01)		bearings
Drift		· ·
 ,	a 763	a: 29 mm (1.14 in) dia.
		b: 23 mm (0.91 in) dia.
***************************************	NT065	
ST22350000		Installing OD gear bushing
(J25678-01)		
Drift	1010	
	a)	a: 34 mm (1.34 in) dia.
	NTOGE	b: 28 mm (1.10 in) dia.
	NT065	

PREPARATION

Special Service Tools (Cont'd)				
Tool number (Kent-Moore No.) Tool name	Description			
ST23800000 (J25691-01)		Installing front cover oil seal		
Orift	a To I	a: 44 mm (1.73 in) dia. b: 31 mm (1.22 in) dia.		
5T33400001 J26082) Drift	NT066	Installing rear oil seal		
THE	NT086	a: 60 mm (2.36 in) dia. b: 47 mm (1.85 in) dia.		
ST33290001 J25810-A) Puller		Removing rear oil seal		
	NT076			
ST30720000 (—) Orift		Installing mainshaft ball bearing		
3. MC	NT115	a: 77 mm (3.03 in) dia. b: 55.5 mm (2.185 in) dia.		
ST30613000 (J25742-3) Orift	b	Installing main drive gear bearing		
· ,	NT073	a: 71.5 mm (2.815 in) dia. b: 47.5 mm (1.870 in) dia.		
ST33200000 J26082) Drift		Installing counter rear bearing		
7111	a b	a: 60 mm (2.36 in) dia. b: 44.5 mm (1.752 in) dia.		
	Commer	cial Service Tools		
ool name	Description			
Puller		Removing counter bearings, counter drive and OD gears		
Drift	NT077	Installing countershaft rear end bearing (FS5W71C-4WD model)		
	albi	a: 40 mm (1.57 in) dia. b: 30 mm (1.18 in) dia.		
	NT074			

Special Service Tools

Description		
		Removing and installing retaining pin
		Removing 1st & 2nd synchronizer assembly Removing counter gear rear thrust bearing Removing main drive bearing
		Removing rear oil seal
	a b	Removing mainshaft and counter gear a: 51 mm (2.01 in) dia. b: 28.5 mm (1.122 in) dia.
	a [b]	Removing counter gear front bearing (Use with KV38100300) a: 34 mm (1.34 in) dia. b: 28 mm (1.10 in) dia.
	a hil	Removing counter gear front bearing (Use with ST22350000) Installing counter gear rear bearing a: 54 mm (2.13 in) dia. b: 32 mm (1.26 in) dia.
	a b	 ① Removing mainshaft front bearing ② Installing mainshaft front bearing a: 77 mm (3.03 in) dia. b: 55.5 mm (2.185 in) dia.
	a b	Removing and installing counter gear rear end bearing (4WD model) a: 37 mm (1.46 in) dia. b: 22 mm (0.87 in) dia.
	a b	 Installing counter gear front bearing Installing front cover oil seal 44 mm (1.73 in) dia. 24.5 mm (0.965 in) dia.
NT084	b	Installing main drive gear bearing a: 72 mm (2.83 in) dia. b: 48 mm (1.89 in) dia.
	NT070 NT071 NT076 NT084 NT065 NT065 NT084 NT084	NT070 NT071 NT076 NT084 NT065 NT084 NT084

PREPARATION

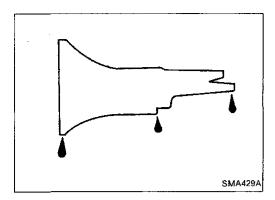
Special	Service	Tools ((Cont'd)
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Tool number (Kent-Moore No.) Tool name	Description	
ST37750000 ① (J34286) ② (J34332) ③ (J34334) ④ (J25679-01) Drift	a [6]	 Removing counter gear rear bearing Installing OD gear bushing Installing reverse cone Installing reverse counter gear Installing counter gear rear end bearing a: 40 mm (1.57 in) dia.
	NT065	b: 31 mm (1.22 in) dia.
ST22452000 (J34337) Drift	a To I	Installing reverse hub Installing mainshaft rear bearing (2WD model) a: 45 mm (1.77 in) dia. b: 36 mm (1.42 in) dia.
CT22400001	NT065	
ST33400001 (J26082) Drift	a b	Installing rear oil seal a: 60 mm (2.36 in) dia.
	NT086	b: 47 mm (1.85 in) dia.
(J26349-3) Puller leg	NI COO	Installing mainshaft and counter gear (Use with J34328)
	NT078	
(J34328) Puller		Installing mainshaft and counter gear (Use with J26349-3)
(J26092)	NT079	Installing sub-gear snap ring
Drift	NTOGE	a: 44.5 mm (1.752 in) dia. b: 38.5 mm (1.516 in) dia.
(J34342)	NT065	Installing OD main gear
Drift		Installing reverse gear bushing
	a To I	a: 44.5 mm (1.752 in) dia. b: 40.5 mm (1.594 in) dia.
•	NT065	

Commercial Service Tool

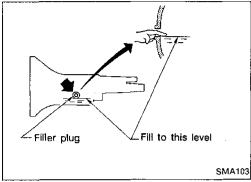
Tool name	Description		
Puller	NT077	Removing counter gear rear end bearing Removing mainshaft rear bearing (2WD model) Removing reverse synchronizer hub Removing reverse counter gear	HA. El

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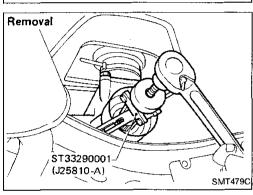


Checking M/T Oil

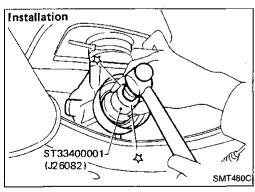
Check manual transmission for oil leakage.



Check oil level.



Replacing Rear Oil seal — 2WD Model



Removal — 2WD Model

- Remove propeller shaft. Refer to section PD.
- Insert plug into rear oil seal after removing propeller shaft. **CAUTION:**

Be careful not to damage spline, sleeve yoke and rear oil seal, when removing propeller shaft.

Remove exhaust front tube A. (VG30E engine model) — Refer to section FE.

Remove shift lever.

Support engine by placing a jack under oil pan.

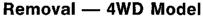
Do not place jack under the oil pan drain plug.

Remove transmission from engine.

Support Manual Transmission, while removing it.



SMT478A



- Remove front and rear propeller shafts. Refer to section
- Insert plug into rear oil seal of transfer after removing propeller shaft.

CAUTION:

Be careful not to damage spline, sleeve yoke and rear oil seal $\ensuremath{\,{\mbox{\tiny TE}}}$ of transfer, when removing propeller shaft.

- Remove exhaust front tube A. (VG30E engine model) Refer to section FE.
- Remove torsion bar springs. Refer to REMOVAL of Torsion Bar Spring in section FA. Then remove second crossmember.



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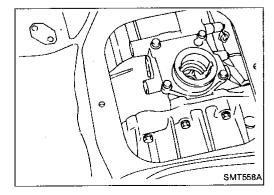
- Remove shift lever of transmission and transfer.
- Support engine by placing a jack under oil pan.

Do not place jack under the oil pan drain plug.

Remove transmission with transfer from engine.

WARNING:

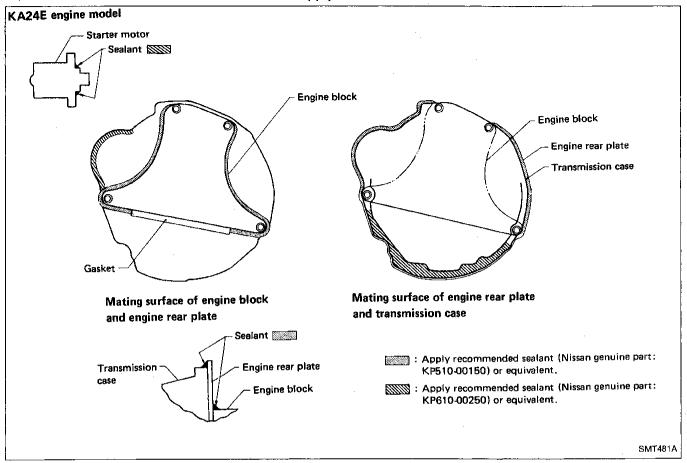
Support Manual Transmission with transfer, while removing it.



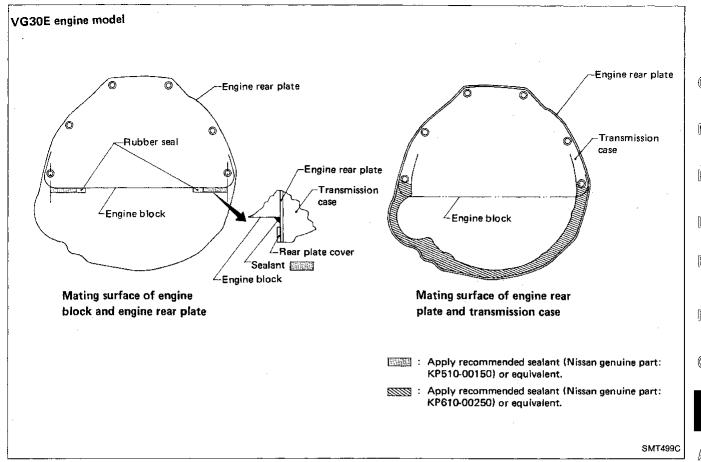


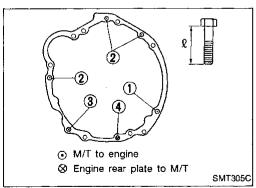
Installation

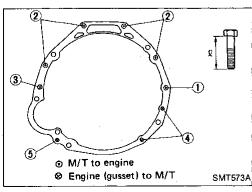
• Apply sealant as below: — 4WD model



Installation (Cont'd)







- Tighten bolt securing transmission.
- KA24E engine model

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	ℓ mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	65 (2.56)
3	39 - 49 (4.0 - 5.0, 29 - 36)	60 (2.36)
③ *	16 - 22 (1.6 - 2.2, 12 - 16)	25 (0.98)
4	16 - 22 (1.6 - 2.2, 12 - 16)	20 (0.79)

*: With nut

VG30E engine model

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	ℓ mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	65 (2.56)
2	39 - 49 (4.0 - 5.0, 29 - 36)	60 (2.36)
3	29 - 39 (3.0 - 4.0, 22 - 29)	55 (2.17)
4	29 - 39 (3.0 - 4.0, 22 - 29)	25 (0.98)
<u>(5)</u>	29 - 39 (3.0 - 4.0, 22 - 29)	25 (0.98)

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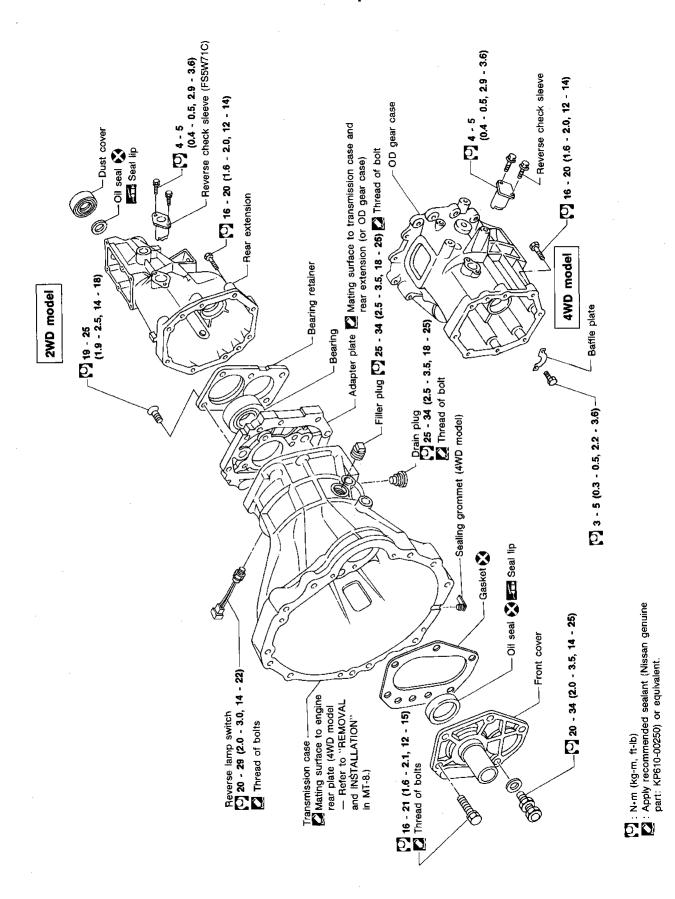
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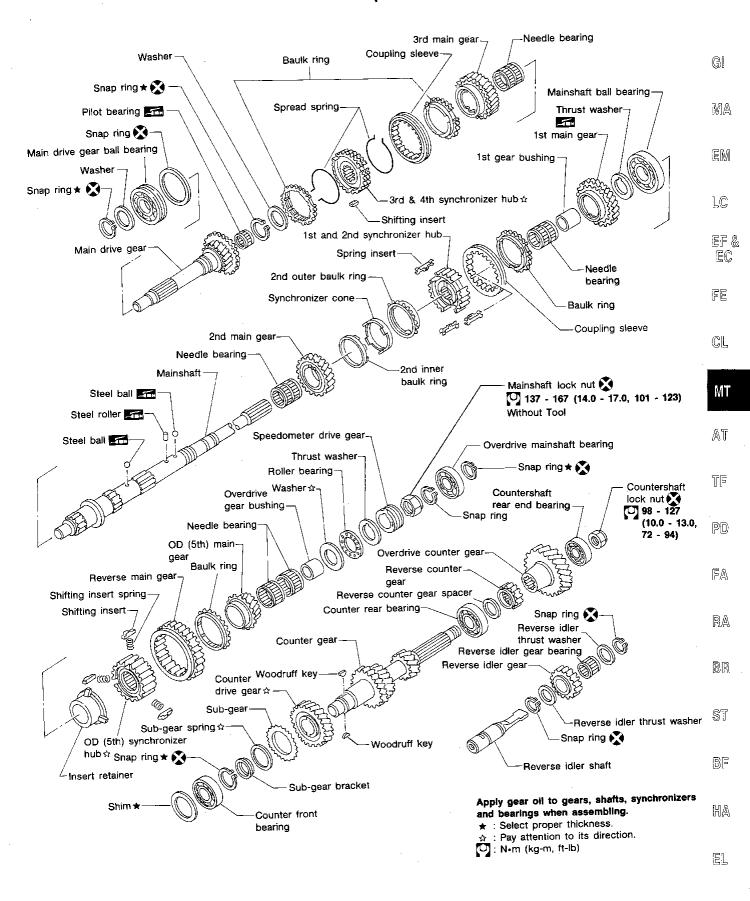
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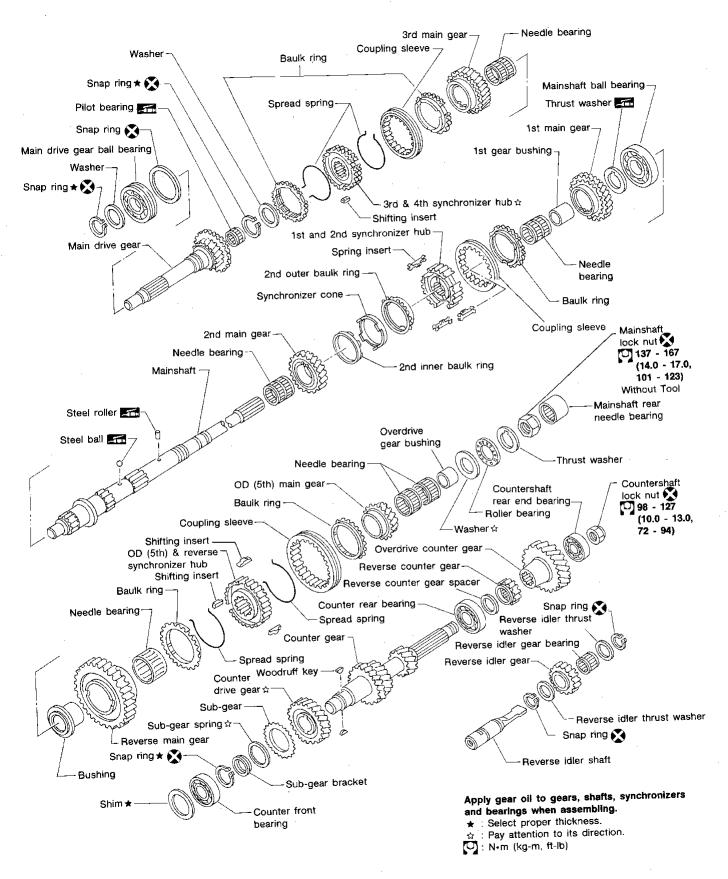
Case Components



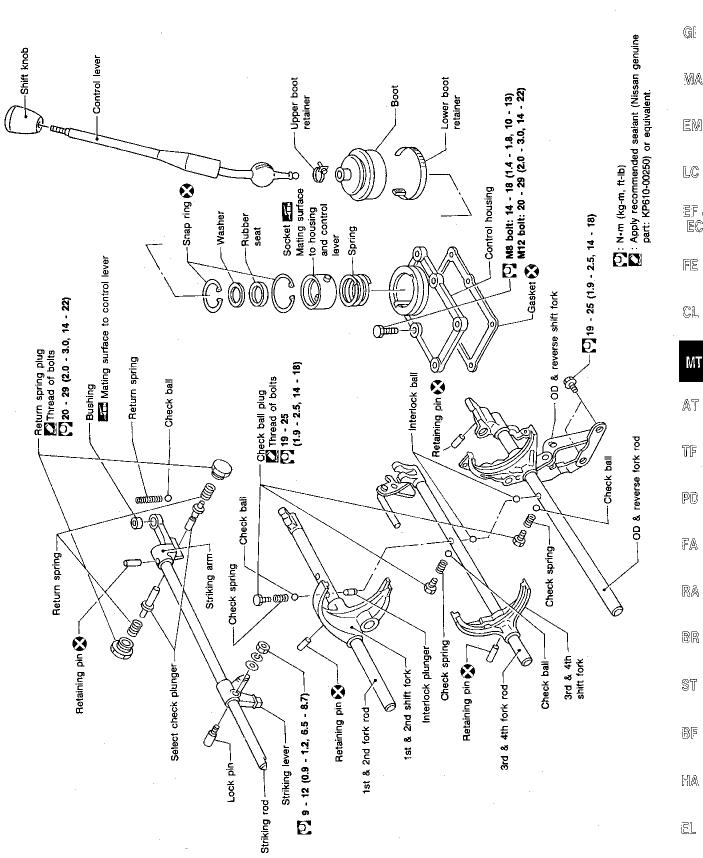
Gear Components — 2WD model



Gear Components — 4WD model



Shift Control Components — 2WD model



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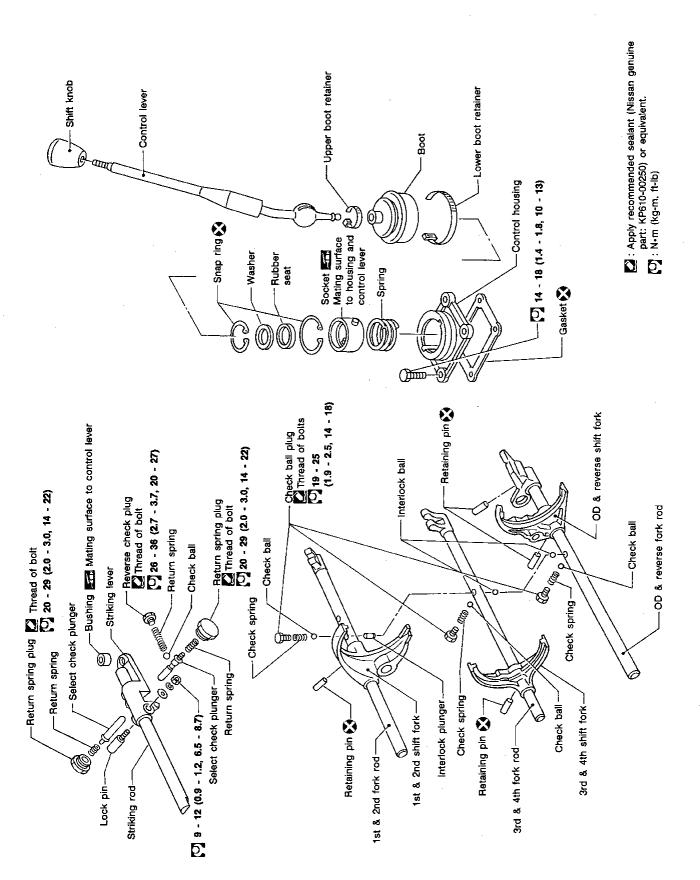
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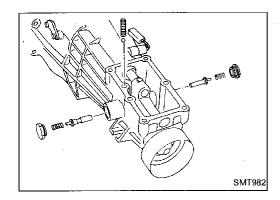
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Shift Control Components — 4WD model





Case Components

- Remove rear extension.
- Remove control housing, check ball, return spring plug, select check plunger and return springs.



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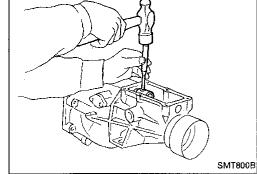
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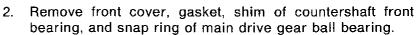
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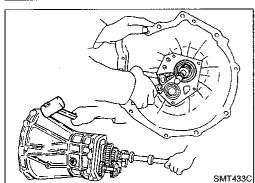
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- Drive out striking arm retaining pin.
- Remove striking arm from striking rod.
- Remove rear extension by lightly tapping it.





Separate transmission case from adapter plate.



Remove oil seal of front cover.

Be careful not to damage mating surface of front cover.



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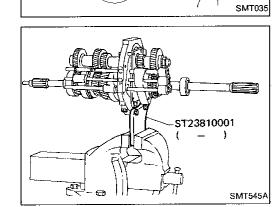
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Shift Control Components

- Set up Tool on adapter plate. 1.
- 2. Remove striking rod from adapter plate.
- Remove check ball plugs, check springs, and check balls.

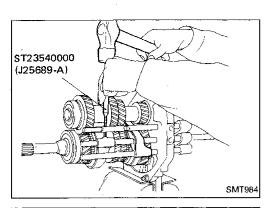
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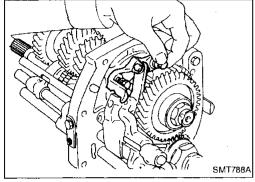
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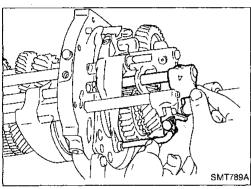
Shift Control Components (Cont'd)



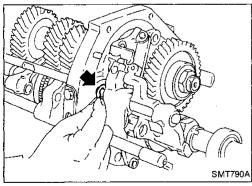
4. Drive out retaining pins. Then drive out fork rods and remove interlock balls.



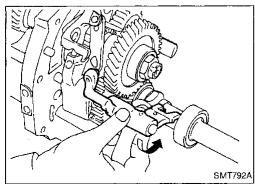
5. Remove lever bracket securing bolt (2WD model).



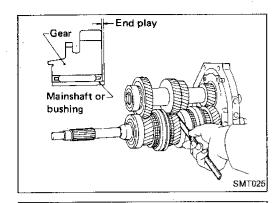
6. Draw out 3rd-4th fork rod (2WD model).



7. Remove E-ring from OD-rev. fork rod (2WD model).



8. Draw out OD-rev. fork shaft by rotating OD-rev. bracket counterclockwise (2WD model).



Gear Components

- Before disassembly, measure each gear end play.
- If end play is not within the specified limit, disassemble and check the parts.
- Replace any part which is worn or damaged.

Gear end play:

Refer to SDS, MT-57.



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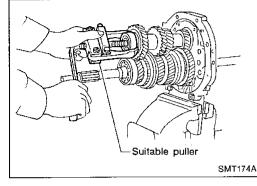
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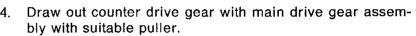
Mesh 2nd and reverse gear, then draw out counter front bearing with suitable puller.

3. Remove snap ring and then remove sub-gear bracket, sub-

gear spring and sub-gear.



Suitable puller



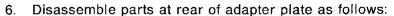
When drawing out main drive gear assembly, be careful not to drop pilot bearing and baulk ring.

Remove snap ring and draw out 3rd & 4th synchronizer and AT



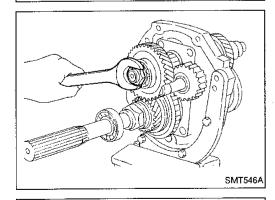
3rd gear.





Release staking on countershaft nut and mainshaft nut and loosen these nuts.

Mainshaft nut: Left-hand thread



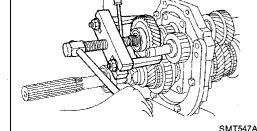
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- Pull out OD counter gear with bearing with suitable puller.
- Draw out reverse counter gear and spacer.
- Remove snap rings from reverse idler shaft, and draw out reverse idler gear, thrust washers and reverse idler gear bearing.



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Suitable puller



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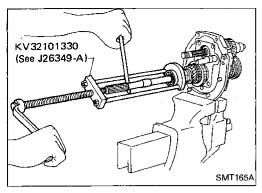


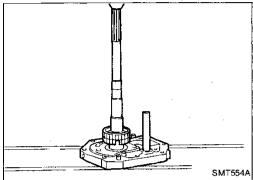


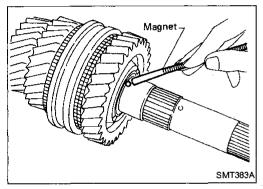


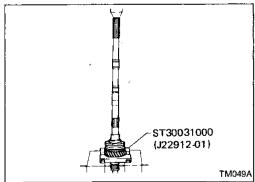


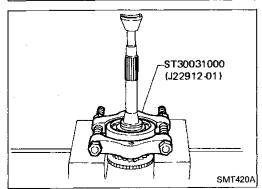












Gear Components (Cont'd)

- e. Remove snap ring and pull out overdrive mainshaft bearing, then remove snap ring. (2WD model)
- f. Remove mainshaft nut.
 - Remove speedometer drive gear and steel ball. (2WD model)
- h. Remove thrust washer, steel roller, roller bearing and washer.
- i. Remove OD main gear, needle bearing and baulk ring (OD).
- j. Remove reverse main gear (2WD), OD & reverse coupling sleeve (4WD), shifting inserts and shifting insert springs.
- k. Remove counter gear by tapping rear end of counter gear.
- Press out OD gear bushing, insert retainer and OD synchronizer hub.

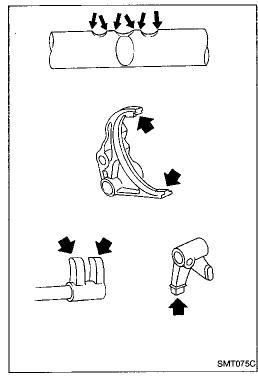
7. Remove thrust washer, steel ball, 1st main gear and needle bearing.

Be careful not to lose steel ball.

8. Press out 1st gear mainshaft bushing together with 2nd main gear with Tool.

Then remove 2nd gear needle bearing.

- 9. Remove main drive gear bearing.
- a. Remove snap ring and washer.
- Remove main drive gear bearing.



Shift Control Components

 Check contact surface and sliding surface of fork rods for wear, scratches, projections or other damage.

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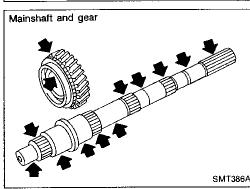
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Counter gear

Gear Components

GEARS AND SHAFTS

Check shafts for cracks, wear or bending.

Check gears for excessive wear, chips or cracks.

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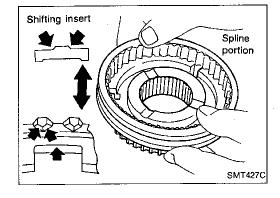
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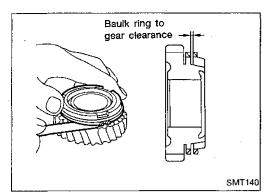
- Check spline portion of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check shifting inserts for wear or deformation.
- Check insert springs for deformation.

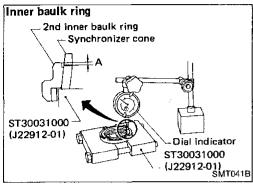
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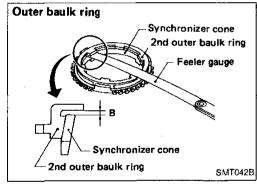
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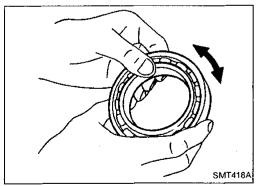
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Gear Components (Cont'd)

- Measure wear of baulk rings.
- a. Measure clearance between baulk ring and gear.

Clearance between baulk ring and gear: Refer to SDS, MT-57.

If the clearance is smaller than the wear limit, replace baulk ring.

- Measure wear of 2nd baulk rings.
- a. Place baulk rings in position on synchronizer cone.
- b. While holding baulk rings against synchronizer cone as far as it will go, measure dimensions "A" and "B".

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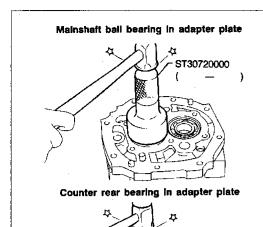
Dimension	Standard	Wear limit
. A	0.6 - 1.1 (0.024 - 0.043)	
В	0.7 - 0.9 (0.028 -0.035)	0.2 (0.008)

c. If dimension "A" or "B" is smaller than the wear limit, replace baulk ring.

BEARINGS

 Make sure bearings roll freely and are free from noise, crack, pitting or wear.

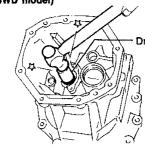
Gear Components



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Be flush with front surface of OD gear case.

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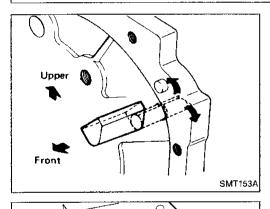
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1. Install bearings into case components.

2. Assemble adapter plate parts.

Install oil gutter on adapter plate and expand on rear side.

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Install bearing retainer.

Insert reverse shaft, then install bearing retainer.

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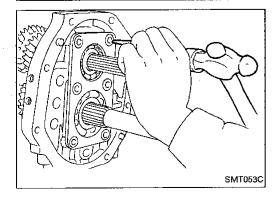
Tighten each screw, then stake each at two points.

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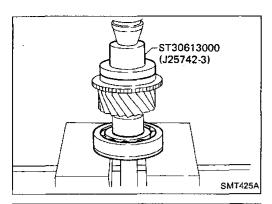
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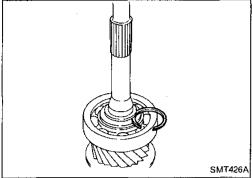


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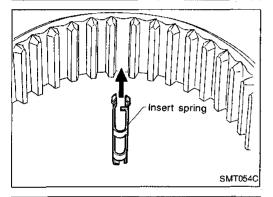
Gear Components (Cont'd)

- 3. Install main drive gear bearing.
- a. Press main drive gear bearing.
- b. Install main drive gear spacer.

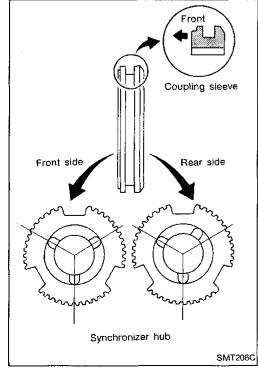


c. Select proper main drive gear snap ring to minimize clearance of groove and install it.

Allowable clearance of groove: 0 - 0.13 mm (0 - 0.0051 in) Main drive gear snap ring: Refer to SDS, MT-57.

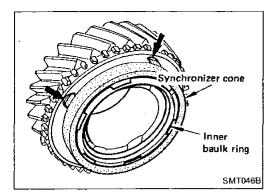


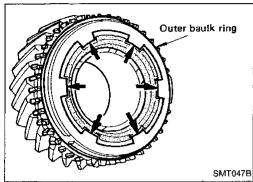
- 4. Assemble synchronizers.
- 1st synchronizer

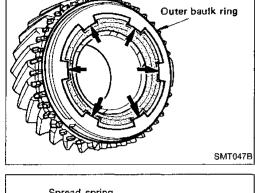


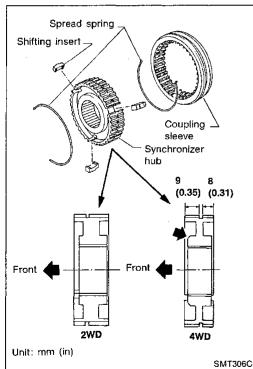
Check coupling sleeve and synchronizer hub orientation.

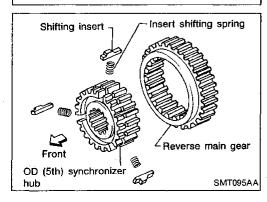
2nd double baulk ring type synchronizer











3rd & 4th synchronizer

The 3 gutters of synchronizer should be at the rear.

OD & reverse synchronizer (2WD model)

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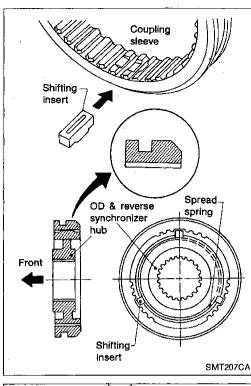
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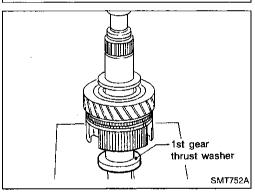
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MT-23

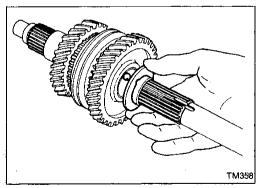
(4WD model)





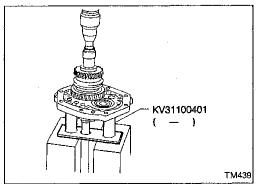


- a. Assemble 2nd main gear, needle bearing and 1st & 2nd synchronizer assembly, then press 1st gear bushing on mainshaft.
- b. Install 1st main gear.



c. Install steel ball and 1st gear washer.

Apply multi-purpose grease to steel ball and 1st gear washer before installing.



- Install mainshaft and counter gear on adapter plate and main drive gear on mainshaft as follows:
- a. Press mainshaft assembly to adapter plate with Tool.

ST33200000 (J26082) V31100401 KV31100401 SMT750

ST23860000

KV31100401-

Front

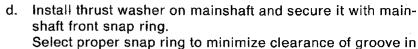
Gear Components (Cont'd)

- Press counter gear into adapter plate with Tool.
- Install 3rd main gear and then press 3rd & 4th synchronizer assembly.
- Pay attention to direction of 3rd & 4th synchronizer.





EM



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mainshaft.

TM441

SMT412C

Allowable clearance of groove:

0 - 0.18 mm (0 - 0.0071 in)

EF & EC

Mainshaft front snap ring: Refer to SDS, MT-57.

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Apply gear oil to mainshaft pilot bearing and install it on mainshaft.

CL

- f. Press counter drive gear with main drive gear with Tool.
- Pay attention to direction of counter drive gear.



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Install sub-gear components.

FA

(1) Install sub-gear and sub-gear bracket on counter drive gear and then select proper snap ring to minimize clearance of groove in counter gear.

Allowable clearance of groove:

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0 - 0.18 mm (0 - 0.0071 in) Counter drive gear snap ring:

Refer to SDS, MT-57. (2) Remove snap ring, sub-gear bracket and sub-gear from

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counter gear.

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Reinstall sub-gear, sub-gear spring and sub-gear bracket.

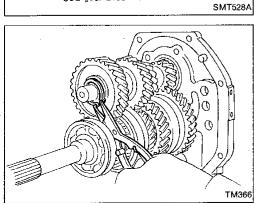
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Install selected counter drive gear snap ring.

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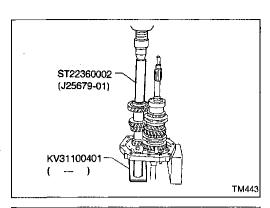
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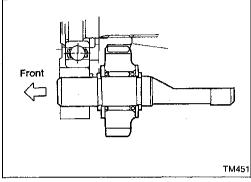
Sub-gear

Sub-gear spring

Sub-gear bracket

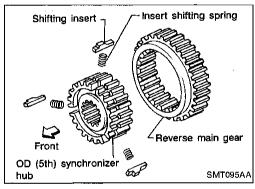


i. Press counter gear front bearing onto counter gear.



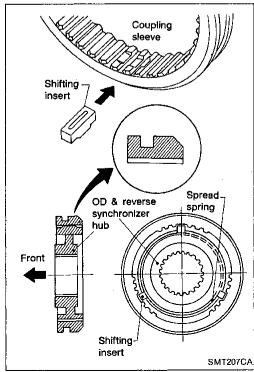
7. Install rear side components on mainshaft and counter gear as follows:

a. Install reverse idler gear to reverse idler shaft with spacers, snap rings and needle bearing.



 b. Install insert retainer and OD synchronizer to mainshaft. (2WD model)

Pay attention to direction of hub.

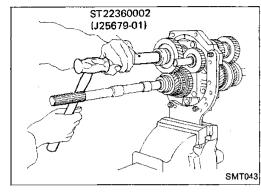


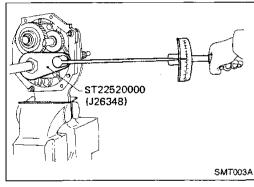
b. Install bushing and OD & reverse synchronizer to main-shaft. (4WD model)

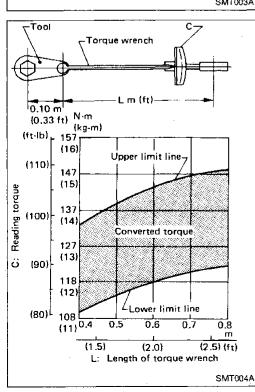
Pay attention to direction of hub.

Gear bushing ST22350000

(J25678-01) SMT531

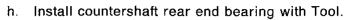






Gear Components (Cont'd)

- Install OD gear bushing with Tool.
- Install OD main gear and needle bearing. d.
- install spacer, reverse counter gear and OD counter gear.
- OD main gear and OD counter gear should be handled as a matched set.
- Install washer, roller bearing, steel roller and thrust washer.
- Tighten mainshaft lock nut temporarily.
- Always use new lock nut.



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Mesh 2nd and reverse gears, then tighten mainshaft lock nut with Tool.

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- Use the left chart when deciding the reading torque. (Length of torque wrench vs. setting or reading torque)
- Tighten countershaft lock nut.
- Always use new lock nut.

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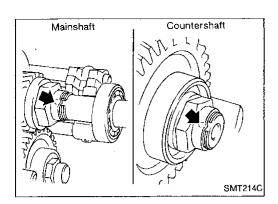
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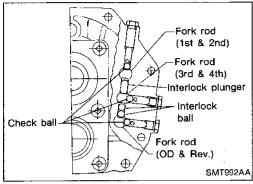
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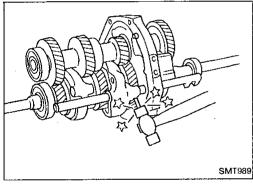


- 10. Stake mainshaft lock nut and countershaft lock nut with a punch.
- 11. Measure gear end play. For the description, refer to DIS-ASSEMBLY for Gear Components, MT-17.

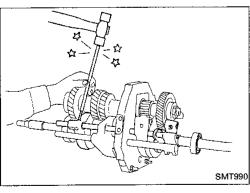


Shift Control Components

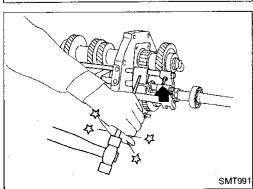
1. Install shift rods, interlock plunger, interlock balls and check balls.



a. 1st-2nd shift fork

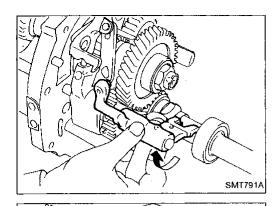


b. 3rd-4th shift fork



c. OD-reverse shift fork or reverse shift fork

Shift Control Components (Cont'd)



Install OD-rev. fork shaft by rotating OD-rev. bracket clockwise (2WD model).



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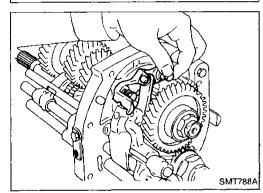
3. Install E-ring on OD-rev. fork rod (2WD model).



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SMT790A

Install lever bracket securing bolt (2WD model).



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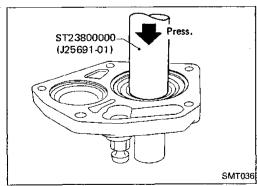
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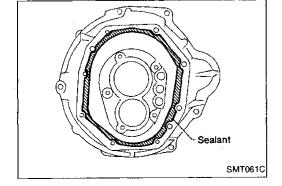
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Case Components

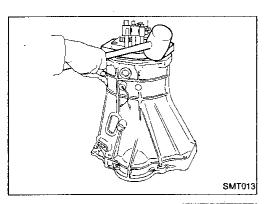
Install front cover oil seal.

Apply multi-purpose grease to seal lip.

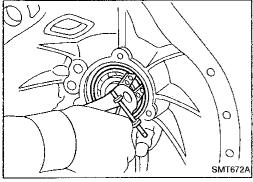


2. Apply sealant to mating surface of transmission case.

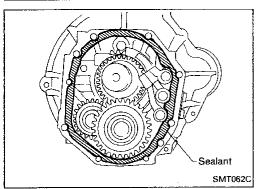
Case Components (Cont'd)



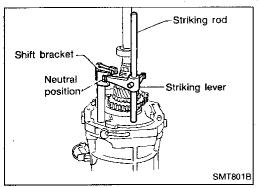
3. Slide gear assembly onto adapter plate by lightly tapping with a soft hammer.



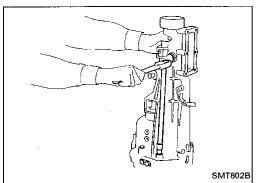
4. Install main drive bearing snap ring.



5. Apply sealant to mating surface of adapter plate.



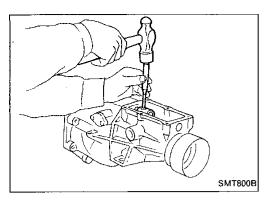
- 6. Set shift forks in neutral position.
- 7. Install striking lever onto adapter plate and align striking lever with shift brackets.

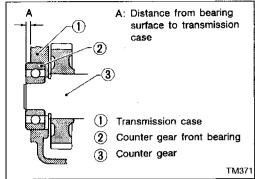


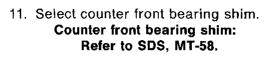
- 8. Install rear extension.
- 9. Fit main drive bearing snap ring.

Case Components (Cont'd)

10. Install striking arm retaining pin.









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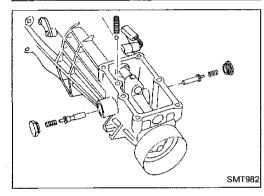
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12. Install gasket and front cover.

13. Install return spring plugs, check ball, return springs and select check plunger.

14. Install control housing and gasket.



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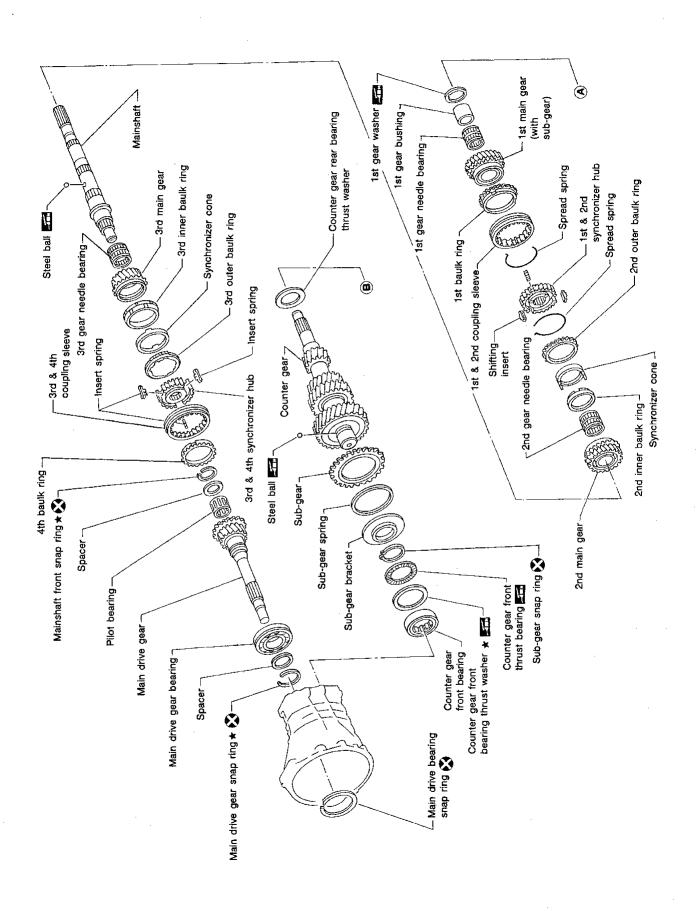
MT-32

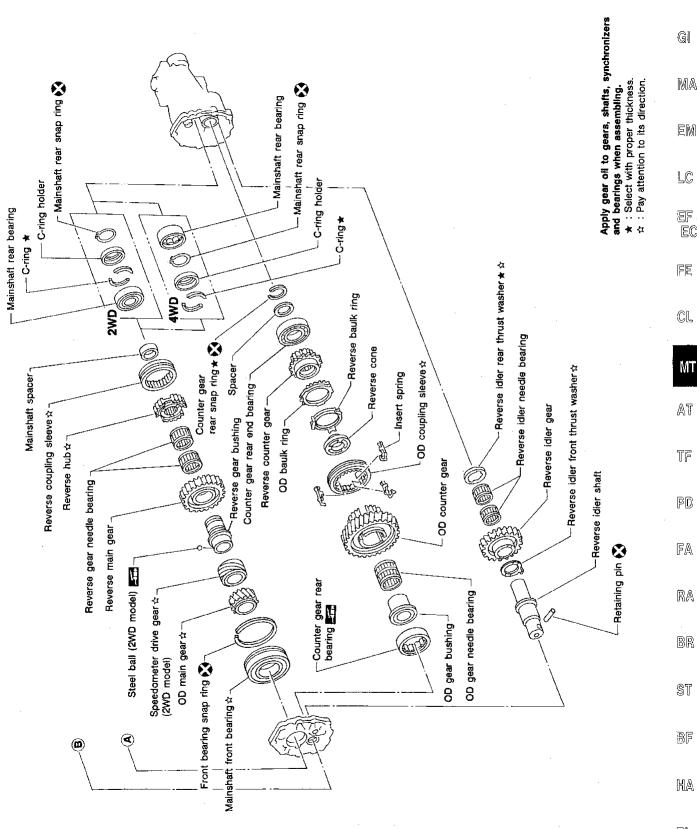
Case Components (0.64 - 0.85, 4.6 - 6.1) Control housing Mating surface to rear extension Control housing Mating surface to OD [J] 31 - 42 (3.2 - 4.3, 23 - 31) . 33 - 42 (3.2 - 4.3, 23 - 31) GI Plug Mating surface to rear Rear oil seal 💸 63 - 83 Baffle plate - 1 16 - 21 (1.6 - 2.1, 12 - 15) - 1 16 - 21 (1.6 - 2.1, 12 - 15) Seal lip - Rear extension MA extension EM LC 2WD model 4WD model ef & EC - 7 16 - 21 (1.6 - 2.1, 12 - 15) d S FE Neutral position switch 20 - 29 (2.0 - 3.0, 14 - 22) Neutral position switch 20 - 29 (2.0 - 3.0, 14 - 22)/ Thread of bolt Slide ball bearing OD gear case Reverse lamp switch 20 - 29 (2.0 - 3.0, 14 - 22) CL S. Thread of bolt Slide ball bearing 20 - 29 (2.0 - 3.0, 14 - 22) MT Drain plug 25 - 34 (2.5 - 3.5, 18 - 25) Thread of bolt Reverse lamp switch Thread of bolt AT Bearing retainer TF -Sealing grommet (4WD model) Thread of bolt — Refer to "ASSEMBLY" in MT-54. and rear extension (or OD gear case) Adapter plate — Mating surface to transmission case [○]: N•m (kg-m, ft-lb) Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent. PD) FA RA 1 16 - 21 (1.6 - 2.1, 12 - 15) Front cover oil seal BR Mating surface to engine Refer to "REMOVAL rear plate (4WD model (2.5 - 3.5, 18 - 25) Seal lip and INSTALLATION" in MT-9.) Thread of bolt Slide ball bearing ST Transmission case Filler plug Gasket 🐯 BF - Ball pin [2] 31 - 42 (3.2 - 4.3, 23 - 31) MA Front cover

DX

SMT434AA

Gear Components





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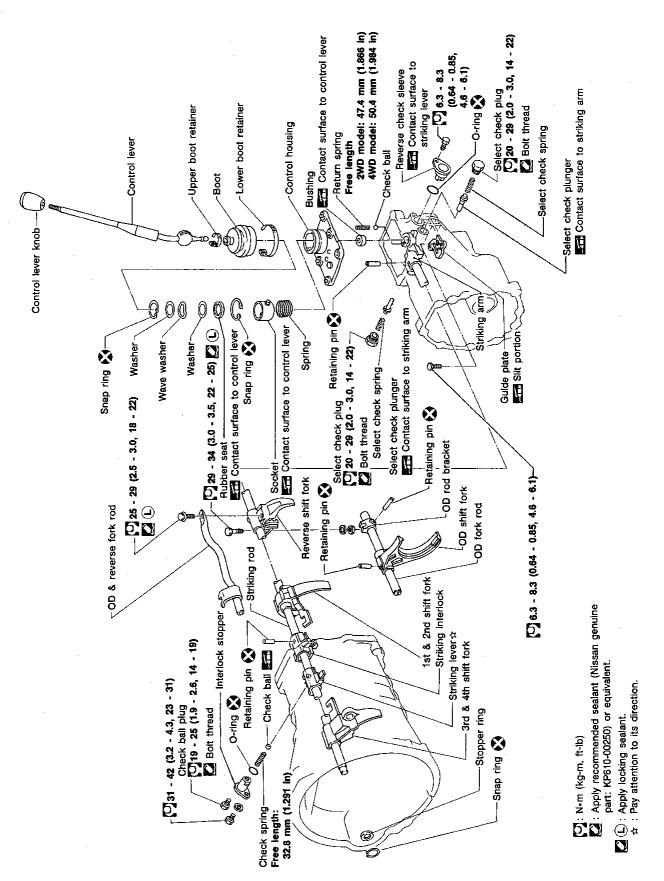
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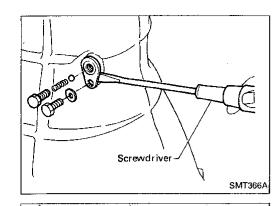
[DX]

SMT500CA

Shift Control Components



SMT436AA



Case Components

 Remove check ball plug, check spring and check ball. Then remove interlock stopper.

If interlock assembly is removed as a unit, the check ball can fall into transmission case.



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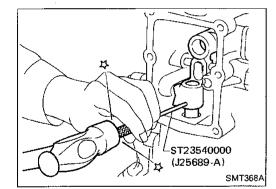
2. Remove control housing, return spring and check ball.

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SMT367A

3. Drive out retaining pin from striking arm.

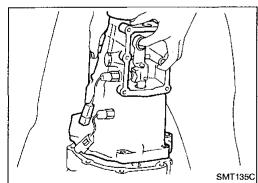
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 Remove rear extension (or OD gear case) together with striking arm by tapping lightly.

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5. Remove front cover and gasket.

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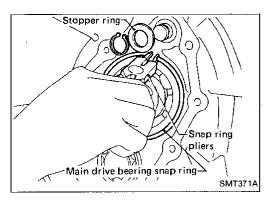
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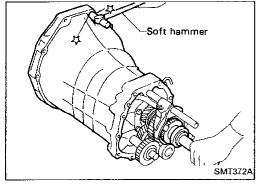


Screwdriver

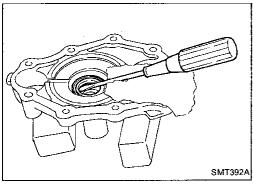
Case Components (Cont'd)



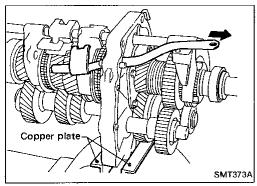
6. Remove stopper ring and main drive bearing snap ring.



7. Remove transmission case by tapping lightly.

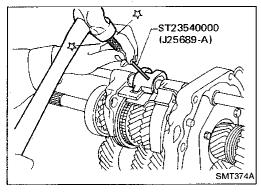


8. Remove front cover oil seal.



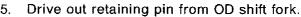
Shift Control Components

- f. Mount adapter plate on vise.
- 2. Remove OD & reverse fork rod.

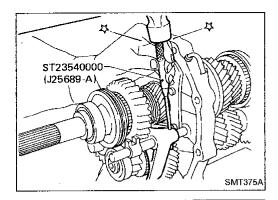


- 3. Drive out retaining pin from striking lever.
- 4. While pulling out striking rod, remove striking lever and striking interlock. Then remove 1st & 2nd, 3rd & 4th and reverse shift fork.

Shift Control Components (Cont'd)



Pull out OD fork rod and then remove OD shift fork.





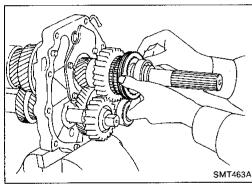
LC Before removing gears and shafts, measure each gear end play.

> Gear end play: Refer to SDS, MT-59.

If not within specification, disassemble and check contact surface of gear to hub, washer, bushing, needle bearing and shaft.

Remove rear side components on mainshaft and counter

Remove reverse coupling sleeve.



Remove mainshaft rear snap ring and counter gear rear

shaft. Use punch and hammer to remove C-rings.

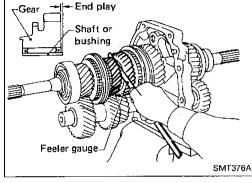
Remove C-ring holder and mainshaft C-rings from main-

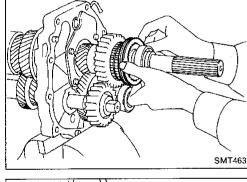
Pull out counter gear rear end bearing.

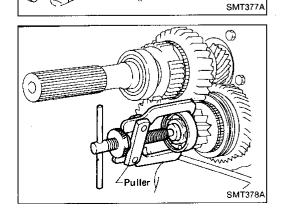
Remove reverse idler gear and reverse idler thrust wash-

ers.

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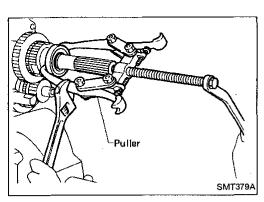
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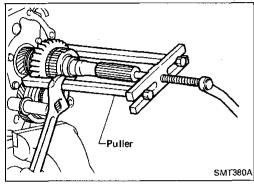
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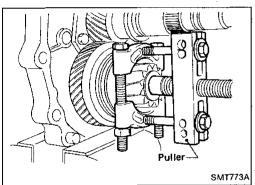
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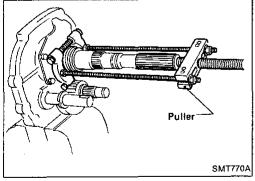
f. Pull out mainshaft rear bearing (2WD model).



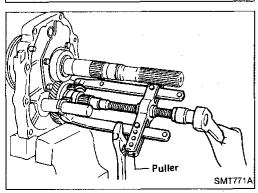
g. Pull out reverse main gear together with mainshaft spacer and reverse synchronizer hub. Then remove reverse gear needle bearings.



- h. Pull out reverse counter gear.
- i. Remove OD coupling sleeve together with OD baulk ring, reverse baulk ring and spring inserts.



j. Pull out reverse gear bushing.



k. Pull out OD counter gear together with reverse cone.

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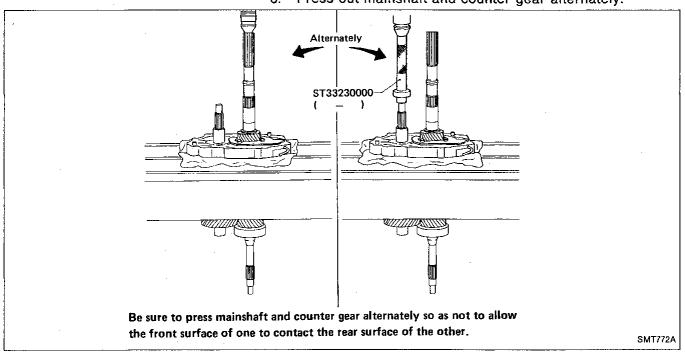
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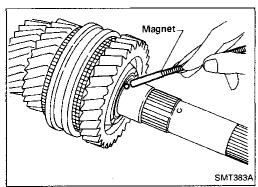
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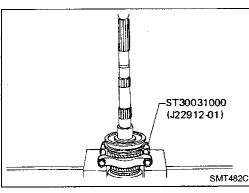
Gear Components (Cont'd)

3. Press out mainshaft and counter gear alternately.

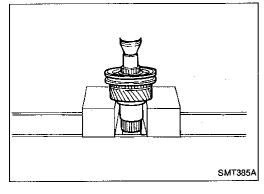




- 4. Remove front side components on mainshaft.
- a. Remove 1st gear washer and steel ball.
- b. Remove 1st main gear and 1st gear needle bearing.

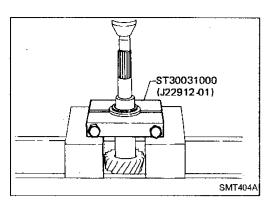


- Press out 2nd main gear together with 1st gear bushing and 1st & 2nd synchronizer assembly.
- d. Remove mainshaft front snap ring.

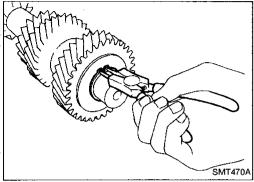


- e. Press out 3rd main gear together with 3rd & 4th synchronizer assembly and 3rd gear needle bearing.

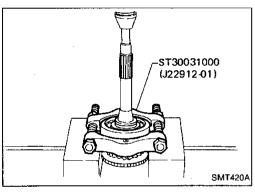
HA



- 5. Remove front side components on counter gear.
- a. Remove counter gear rear thrust bearing.

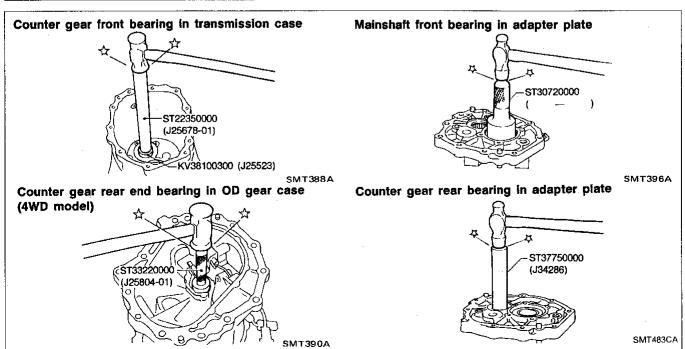


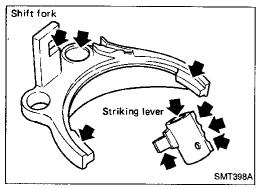
b. Remove sub gear components.

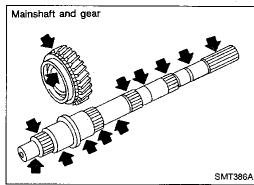


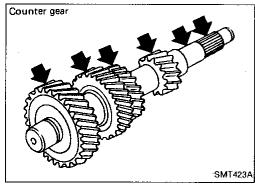
- 6. Remove main drive gear bearing.
- a. Remove main drive gear snap ring and spacer.
- b. Press out main drive gear bearing.

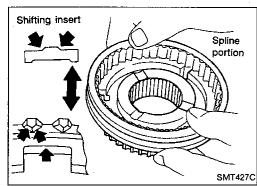


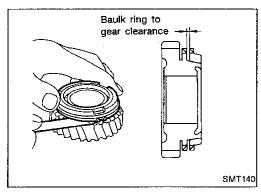












Shift Control Components

 Check contact surface and sliding surface for wear, scratches, projections or other damage.

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Gear Components GEARS AND SHAFTS

- · Check shafts for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

EF & EC

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SYNCHRONIZERS

 Check spline portion of coupling sleeves, hubs, and gears for wear or cracks.

Check baulk rings for cracks or deformation.

Check shifting inserts for wear or deformation.

Check insert springs for deformation.

RA

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Clearance between baulk ring and gear

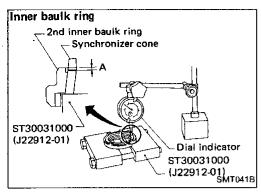
Measure wear of main drive, 1st and OD baulk rings.

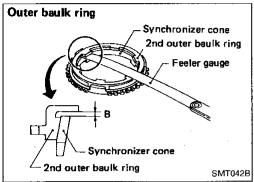
Unit: mm (in)

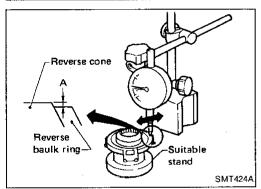
	Standard	Wear limit
1st	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
Main drive	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
OD	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)

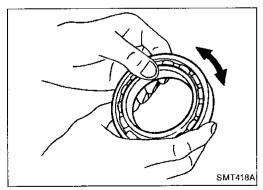
If the clearance is smaller than the wear limit, replace baulk ring.

IDX









- Measure wear of 2nd and 3rd baulk rings.
- a. Place baulk rings in position on synchronizer cone.
- While holding baulk rings against synchronizer cone as far as it will go, measure dimensions "A" and "B".

		Unit: mm (in)
Dimension	Standard	Wear limit
Α	0.6 - 1.1 (0.024 - 0.043)	0.0 (0.000)
В	0.7 - 0.9 (0.028 - 0.035)	0.2 (0.008)

c. If dimension "A" or "B" is smaller than the wear limit, replace baulk ring.

- Measure wear of reverse baulk ring.
- a. Place baulk ring in position on reverse cone.
- b. While holding baulk ring against reverse cone as far as it will go, measure dimension "A" with dial indicator.

Dimension "A":

Standard -0.1 to 0.35 mm (-0.0039 to 0.0138 in) Wear limit 0.7 mm (0.028 in)

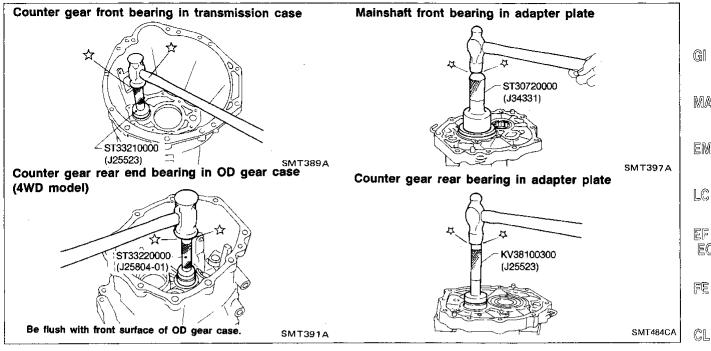
c. If dimension "A" is larger than the wear limit, replace baulk ring.

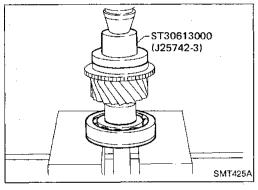
BEARINGS

 Make sure bearings roll freely and are free from noise, crack, pitting or wear.

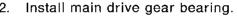
MT-44

Gear Components

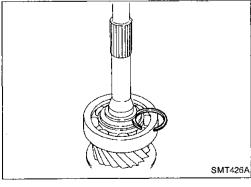








- Press main drive gear bearing.
- Install main drive gear spacer.



Select proper main drive gear snap ring to minimize clearance of groove.

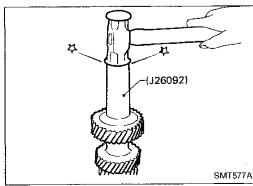
Allowable clearance of groove:

0 - 0.1 mm (0 - 0.004 in)

Main drive gear snap ring:

Refer to SDS, MT-59.

Install selected snap ring on main drive gear.



- Install components on counter gear.
- Install sub-gear components.

When installing sub-gear snap ring, tap sub-gear snap ring into position on counter gear.

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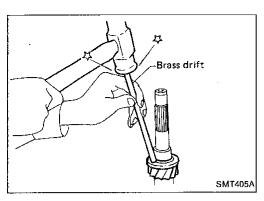
ST

BF

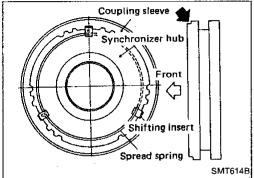
HA

EL

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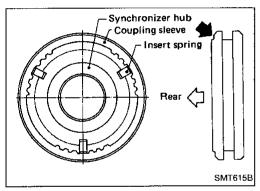


b. Install counter gear rear thrust bearing.

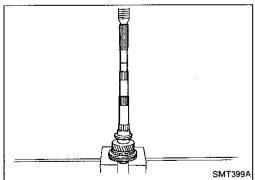


4. Install front side components on mainshaft.

a. Assemble 1st & 2nd synchronizer.

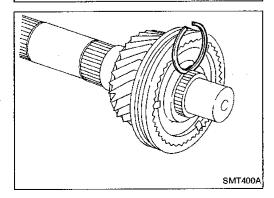


b. Assemble 3rd & 4th synchronizer.



c. Press on 3rd & 4th synchronizer assembly together with 3rd main gear and 3rd gear needle bearing.

Pay attention to direction of synchronizer assembly.



d. Select proper snap ring to minimize clearance of groove.

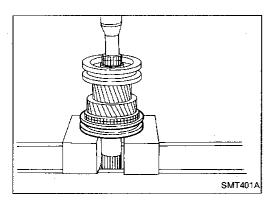
Allowable clearance of groove:

0 - 0.1 mm (0 - 0.004 in)

Mainshaft front snap ring:

Refer to SDS, MT-59.

e. Install selected snap ring on mainshaft.

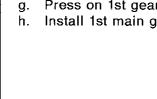


Press on 1st & 2nd synchronizer assembly together with 2nd main gear and 2nd gear needle bearing.



MA

EM



Press on 1st gear bushing using 1st gear washer.

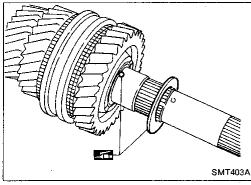
Install 1st main gear and needle bearing.

LC



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1st gear washer

SMT402A

SMT427AA

Install steel ball and 1st gear washer.

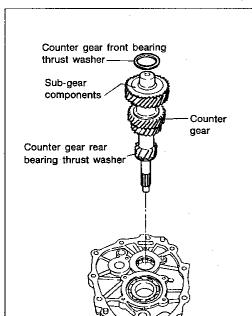
Apply multi-purpose grease to steel ball and 1st gear washer before installing.

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Select proper counter gear front bearing thrust washer when replacing transmission case, counter gear, counter gear thrust bearing or sub-gear components.

RA

Install counter gear with sub-gear components, counter gear front and rear bearing thrust washer on adapter plate. Remove counter gear front bearing thrust washer from

Place adapter plate and counter gear assembly in trans-

BR

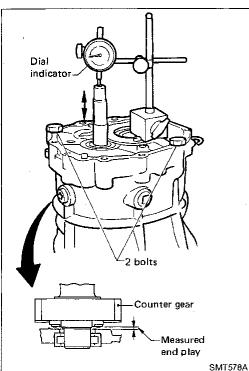
BF

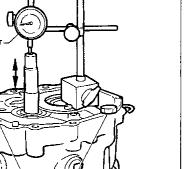
HA

IDX

transmission case.

mission case (case inverted).





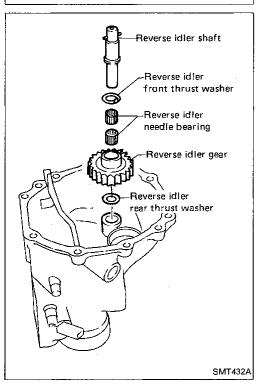
- Tighten adapter plate to transmission case using 2 bolts.
- Place dial indicator on rear end of counter gear.
- Move counter gear up and down and measure dial indicator deflection.
- Select proper thrust washer using table below as a guide.

Counter gear end play:

0.10 - 0.25 mm (0.0039 - 0.0098 in)

Table for selecting proper counter gear front bearing thrust washer:

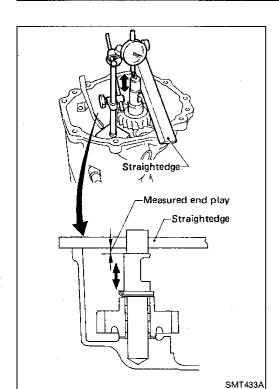
Refer to SDS, MT-60.



- Select proper reverse idler rear thrust washer when replacing rear extension (or OD gear case), reverse idler gear, reverse idler shaft or reverse idler thrust washer.
- a. Install reverse idler gear, reverse idler needle bearings, reverse idler thrust washers and reverse idler shaft into rear extension (or OD gear case).

When replacing reverse idler rear washer, install either A or B.

Reverse idler rear thrust washer: Refer to SDS, MT-60.



- b. Place dial indicator on front end of reverse idler shaft.
- c. Put straightedge on front surface of rear extension (or OD gear case) as a stopper of reverse idler shaft.
- d. Move reverse idler shaft up and down and measure reverse idler gear end play.

Reverse idler gear end play:

0.30 - 0.53 mm (0.0118 - 0.0209 in)

e. If not within specification, replace reverse idler rear thrust washer with the other (A or B) and check again.



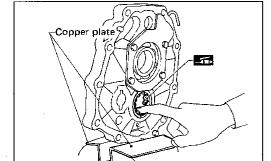
EM

LC

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SMT438A

SMT440A

Soft hammer

7. Install mainshaft and counter gear on adapter plate and main drive gear on mainshaft.

a. Mount adapter plate on vise and apply multi-purpose grease to counter gear rear bearing.



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Install mainshaft a little on mainshaft front bearing.
 To allow for installation of counter gear, do not install mainshaft completely.

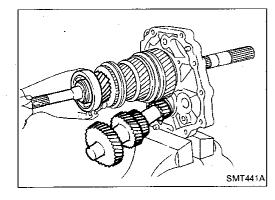


BR

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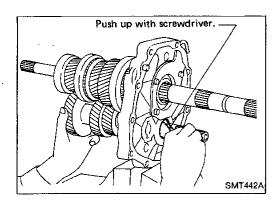
c. Install counter gear on counter gear rear bearing and install main drive gear, pilot bearing and spacer on mainshaft.



EL

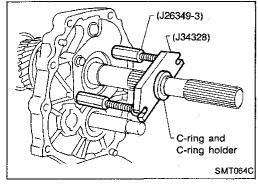
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ASSEMBLY

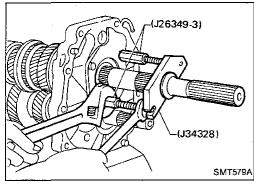


Gear Components (Cont'd)

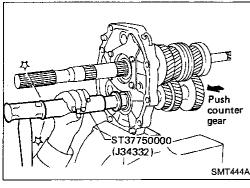
When installing counter gear into counter gear rear bearing, push up on upper roller of counter gear rear bearing with screwdriver.



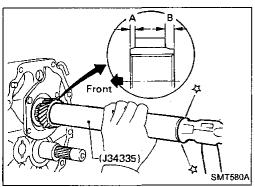
- d. Install Tools (J26349-3) onto adapter plate and C-ring and C-ring holder on mainshaft.
- e. Install Tool (J34328) on mainshaft.



f. Install mainshaft and counter gear completely by extending length of J26349-3.



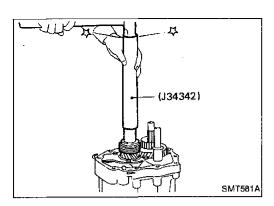
- Install rear side components on mainshaft and counter gear.
- a. Install OD gear bushing while pushing on the front of counter gear.



b. Install OD main gear.

Pay attention to direction of OD main gear. (B is wider than A as shown at left.)

- Install adapter plate with gear assembly onto transmission case.
- d. Install OD gear needle bearing and then install OD counter gear and reverse idler shaft.



ST37750000

SMT582A

e. Install reverse gear bushing with speedometer drive gear (2WD model).



MA

f. Install reverse cone.



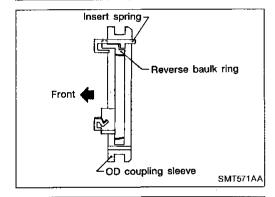
EM







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g. Install insert springs and reverse baulk ring on OD coupling sleeve. Then install them and OD baulk ring on OD counter gear.

Pay attention to direction of OD coupling sleeve.

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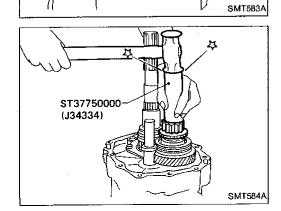
FA

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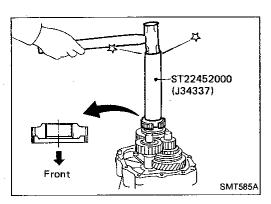
h. Install reverse counter gear.

 Install reverse gear needle bearing and then install reverse main gear, reverse idler gear and reverse idler thrust washers.

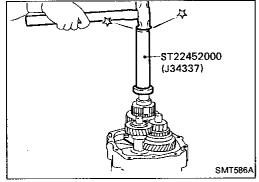
HA

EL

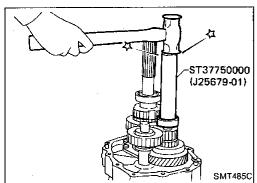
IDX



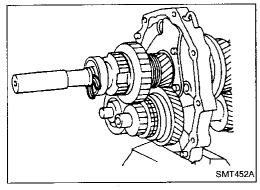
j. Install reverse hub.Pay attention to its direction.



k. Install mainshaft spacer and mainshaft rear bearing (2WD model).



- I. Install counter gear rear end bearing.
- m. Separate adapter plate from transmission case and mount adapter plate on vice again.

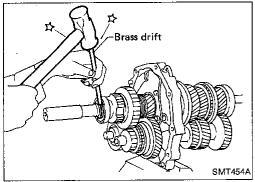


 Select proper mainshaft C-ring to minimize clearance of groove.

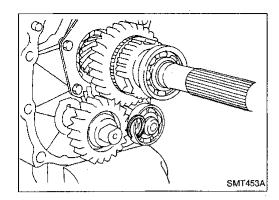
Allowable clearance of groove: 0 - 0.1 mm (0 - 0.004 in)

Mainshaft C-ring:

Refer to SDS, MT-60.



 Install selected C-ring, C-ring holder and mainshaft rear snap ring.



Install spacer and then select proper counter gear rear snap ring to minimize clearance of groove.

Allowable clearance of groove:

0 - 0.1 mm (0 - 0.004 in)

Counter gear rear snap ring: Refer to SDS, MT-60.

Install selected counter gear rear snap ring.



MA

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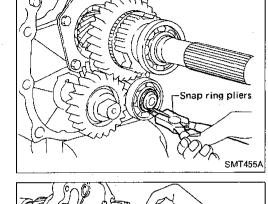
LC

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Install reverse coupling sleeve.

Pay attention to its direction.

Shift Control Components

Measure each gear end play as a final check — Refer to "DISASSEMBLY", MT-39.



TF

PD



FA





SMT456A

SMT457A

Install OD fork rod and OD shift fork. Then install retaining pin into OD shift fork.

Install 1st & 2nd, 3rd & 4th and reverse shift fork onto cou-RA

pling sleeve.

BR

ST

ST23540000 (J25689-A)

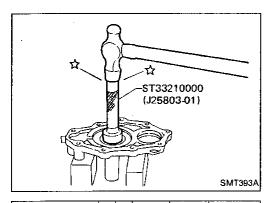
Install striking rod into hole of shift forks, striking lever and interlock and then install retaining pin into striking lever. Make sure that striking rod moves smoothly.

BF

MA

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IDX



Case Components

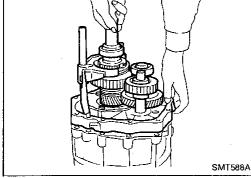
1. Install front cover oil seal.

Apply multi-purpose grease to seal lip.

2. Install selected counter gear front bearing shim onto transmission case.

Apply multi-purpose grease.

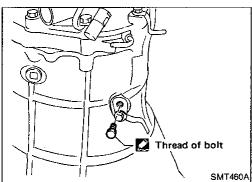
3. Apply sealant to mating surface of transmission case.



4. Install gear assembly onto transmission case.

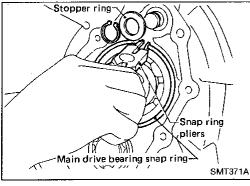
5. Install check spring and check ball into interlock stopper.

Apply multi-purpose grease to check ball.

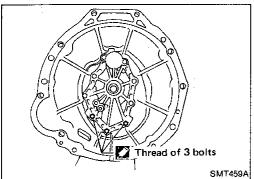


6. Install interlock stopper assembly and then tighten check ball plug.

Apply sealant to thread of check ball plug.



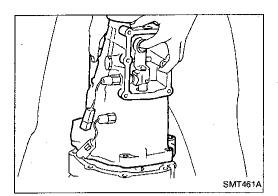
7. Install stopper ring and main drive bearing snap ring.



8. Install front cover and gasket.

Apply sealant to thread of 3 bolts shown left.

9. Apply sealant to mating surface of adapter plate.



Case Components (Cont'd)

10. Install rear extension (or OD gear case) together with striking arm.

GI

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EM

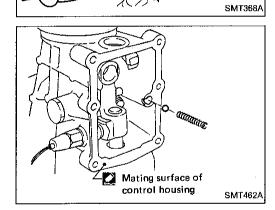
11. Install retaining pin into striking arm.

LC

EF & EC

FE

CL



4WD model

SMT572A

2WD model

ST23540000 (J25689-A)

12. Install return spring and check ball and then install control

Apply sealant to mating surface of rear extension (or OD gear case).

AT

MΤ

TF

PD

FA

13. Tighten control housing bolts.

Bolt head size:

A bolts 12 mm (0.47 in)

B bolts 13 mm (0.51 in)

RA

BR

ST

BF

MA

EL

1DX

MT-55

General Specifications

Applied model				VG30E		
			2WD		440	
	2WD	4WD	Truck	Wagon	4WD	
Transmission	FS5	W71C		FS5R30A		
Number of speed			5			
Shift pattern	1 3 5 N 1 2 4 R					
Synchromesh type			Warner			
Gear ratio						
1st	3.321	3.985	3.580	4.06	:1	
2nd	1,902	2.246	2.077	2.357		
3rd	1.308	1.415	1.360	1.490		
4th	1.000	1.000	1.000	1.000		
OD ,	0.838	0.821	0.811	0.862		
Reverse	3.382	3.657	3.636	4.125		
Number of teeth			·			
Mainshaft						
Drive	22	21	22	20		
1st	33	34	32	32		
2nd	27	28	30	30		
3rd	26	26	29	28		
OD	22	21	24	23		
Reverse	36	36	30	30		
Countershaft				···		
Drive	31	32	32	33		
1st	14	13	13	13		
2nd	20	19	21	21		
3rd	28 ·	28	31	31		
OD	37	39	43	44		
Reverse	15	15	12	12		
Reverse idler gear	21	21	22	. 22		
Oil capacity ℓ (US pt, Imp pt)	2.0 (4-1/4, 3-1/2)	4.0 (8-1/2, 7)	2.4 (5-1/8, 4-1/4)	3.6 (7-5/8	, 6-3/8)	
Remarks	Mainshaft braking mechanism	Reverse synchro- nizer	2nd & 3rd dou	uble baulk ring type sy	nchronizer	

Inspection and Adjustment

GEAR END PLAY

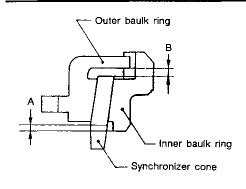
	Unit: mm (in)
1st gear	0.31 ~ 0.41 (0.0122 ~ 0.0161)
2nd gear	0.11 - 0.21 (0.0043 - 0.0083)
3rd gear	0.11 - 0.21 (0.0043 - 0.0083)
OD gear	0.24 - 0.41 (0.0094 - 0.0161)

CLEARANCE BETWEEN BAULK RING AND GEAR

	Unit: mm (in)
Standard	
1st	1.20 - 1.60 (0.0472 - 0.0630)
3rd & main drive	1.20 - 1.60 (0.0472 - 0.0630)
OD	1.20 - 1.60 (0.0472 - 0.0630)
Reverse (4WD)	1.10 - 1.55 (0.0433 - 0.0610)
Wear limit	
1st	0.80 (0.0315)
3rd & main drive	0.80 (0.0315)
OD	0.80 (0.0315)
Reverse (4WD)	0.70 (0.0276)

2nd baulk ring

Unit: mm (in)



SMT044B

Dimension	Standard	Wear timit	
Α	0.6 - 1.1 (0.024 - 0.043)	0.2 (0.008)	
В	0.7 - 0.9 (0.028 - 0.035)		

AVAILABLE SNAP RINGS

Main drive gear bearing

Allowable clearance	0 - 0.13 mm (0 - 0.0051 in)	
Thickness mm (in)	Part number	
1.73 (0.0681)	32204-78005	
1.80 (0.0709)	32204-78000	
1.87 (0.0736)	32204-78001	
1.94 (0.0764)	32204-78002	
2.01 (0.0791)	32204-78003	
2.08 (0.0819)	32204-78004	

Mainshaft front

Allowable clearance	0 - 0.18 mm (0 - 0.0071 in)	
Thickness mm (in)	Part number	
2.4 (0.094)	32263-V5200	
2.5 (0.098)	32263-V5201	
2.6 (0.102)	32263-V5202	

Mainshaft rear end bearing (2WD model)

Allowable clearance	0 - 0.14 mm (0 - 0.0055 in)
Thickness mm (in)	Part number
1.1 (0.043)	32228-20100
1.2 (0.047)	32228-20101
1.3 (0.051)	32228-20102
1.4 (0.055)	32228-20103

Counter drive gear

Allowable clearance	0 - 0.18 mm (0 - 0.0071 in)	
Thickness mm (in)	Part number	
1.4 (0.055)	32215-E9000	
1.5 (0.059)	32215-E9001	
1.6 (0.063)	32215-E9002	
	1	

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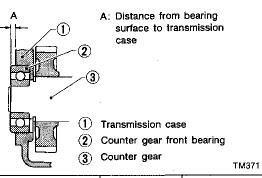


Inspection and Adjustment (Cont'd)

AVAILABLE SHIMS

Counter front bearing

Unit: mm (in)



"A"	Thickness of shim	Part number
4.52 - 4.71 (0.1780 - 0.1854)	Not ned	essary
4.42 - 4.51 (0.1740 - 0.1776)	0.1 (0.004)	32218-V5000
4.32 - 4.41 (0.1701 - 0.1736)	0.2 (0.008)	32218-V5001
4.22 - 4.31 (0.1661 - 0.1697)	0.3 (0.012)	32218-V5002
4.12 - 4.21 (0.1622 - 0.1657)	0.4 (0.016)	32218-V5003
4.02 - 4.11 (0.1583 - 0.1618)	0.5 (0.020)	32218-V5004
3.92 - 4.01 (0.1543 - 0.1579)	0.6 (0.024)	32218-V5005

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Inspection and Adjustment

GEAR END PLAY

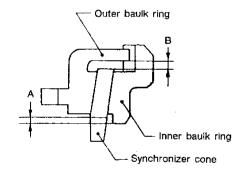
Gear	End play mm (in)
1st main gear	0.23 - 0.33 (0.0091 - 0.0130)
2nd main gear	0.23 - 0.33 (0.0091 - 0.0130)
3rd main gear	0.23 - 0.33 (0.0091 - 0.0130)
OD counter gear	0.23 - 0.33 (0.0091 - 0.0130)
Reverse main gear	0.33 - 0.43 (0.0130 - 0.0169)
Counter gear	0.10 - 0.25 (0.0039 - 0.0098)
Reverse idler gear	0.30 - 0.53 (0.0118 - 0.0209)

CLEARANCE BETWEEN BAULK RING AND GEAR

Unit: mm (in)

	Standard	Wear limit
1st	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
Main drive	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
OD	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)

2nd and 3rd baulk ring

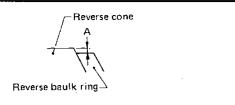


SMT044B

Unit: mm (in)

Dimension	Standard	Wear limit
A	0.6 - 1.1 (0.024 - 0.043)	0.2 (0.008)
В	0.7 - 0.9 (0.028 - 0.035)	0.2 (0.008)

DISTANCE BETWEEN REAR SURFACE OF **REVERSE CONE AND REVERSE BAULK** RING



	Onit: min (in)	
	Standard	Wear fimit
Dimension "A"	-0.1 to 0.35 (-0.0039 to 0.0138)	0.7 (0.028)

AVAILABLE SNAP RING Main drive gear snap ring

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)	– _ Cl
Thickness mm (in)	Part number	- 615
1.89 (0.0744)	32204-01G60	
1.95 (0.0768)	32204-01G61	MT
1.99 (0.0783)	32204-01G62	
2.03 (0.0799)	32204-01G63	AT
2.07 (0.0815)	32204-01G64	
2.11 (0.0831)	32204-01G65	TE
2.15 (0.0846)	32204-01G66	U 1.
2.19 (0.0862)	32204-01G67	
		- PD

Mainshaft front snap ring

		_
Allowable clearance	0 - 0.1 mm (0 - 0.004 in)	_
Thickness mm (in)	Part number	_
1.89 (0.0744)	32204-01G60	_
1.95 (0.0768)	32204-01G61	
1.99 (0.0783)	32204-01G62	
2.03 (0.0799)	32204-01G63	
2.07 (0.0815)	32204-01G64	
2.11 (0.0831)	32204-01G65	
2.15 (0.0846)	32204-01G66	
2.19 (0.0862)	32204-01G67	

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SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment (Cont'd) AVAILABLE SHIM AND WASHER

Counter gear rear snap ring

Allowable clearance 0 - 0.1 mm (0 - 0.004 in	
Thickness mm (in)	Part number
1.26 (0.0496)	32236-01G08
1.32 (0.0520)	32236-01G00
1.38 (0.0543)	32236-01G01
1,44 (0.0567)	32236-01G02
1.50 (0.0591)	32236-01G03
1.56 (0.0614)	32236-01G04
1.62 (0.0638)	32236-01G05
1.68 (0.0661)	32236-01G06
1.74 (0.0685)	32236-01G07

AVAILABLE C-RING

Mainshaft C-ring

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
2.63 (0.1035)	32348-01G15
2.70 (0.1063)	32348-01G00
2.77 (0.1091)	32348-01G01
2.84 (0.1118)	32348-01G02
2.91 (0.1146)	32348-01G03
2.98 (0.1173)	32348-01G04
3.05 (0.1201)	32348-01G05
3.12 (0.1228)	32348-01G06
3.19 (0.1256)	32348-01G07
3.26 (0.1283)	32348-01G08
3.33 (0.1311)	32348-01G09
3.40 (0.1339)	32348-01G10
3.47 (0.1366)	32348-01G11
3.54 (0.1394)	32348-01G12
3.61 (0.1421)	32348-01G13
3.68 (0.1449)	32348-01G14

Table for selecting proper counter gear front bearing thrust washer

Dial indicator deflection mm (in)	Thickness of proper washer mm (in)	Part number
0.93 - 1.02 (0.0366 - 0.0402)	0.88 (0.0346)	32218-01G11
1.03 - 1.12 (0.0406 - 0.0441)	0.96 (0.0378)	32218-01G12
1.13 - 1.22 (0.0445 - 0.0480)	1.04 (0.0409)	32218-01G13
1.23 - 1.32 (0.0484 - 0.0520)	1.12 (0.0441)	32218-01G14
1.33 - 1.42 (0.0524 - 0.0559)	1.28 (0.0504)	32218-01G15
1,43 - 1,52 (0.0563 - 0.0598)	1.36 (0.0535)	32218-01G16
1.53 - 1.62 (0.0602 - 0.0638)	1.44 (0.0567)	32218-01G17

Reverse idler rear thrust washer

Thickness mm (in)	Part number
1.97 (0.0776)	32284-01G10
2.07 (0.0815)	32284-01G11

PROPELLER SHAFT & DIFFERENTIAL CARRIER

SECTION PD

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Special Service Tools

Tool number (Kent-Moore No.)	Description		опи ар	plication	
Cool name	Description	R180A	R200A	H190A	H233B
ST3217S000 (See J25765-A) Preload gauge ① GG91030000 (J25765) Torque wrench ② HT62940000 (—) Socket adapter ③ HT62900000 (—) Socket adapter	Measuring pinion bearing preload and total preload 1 2 3 0 NT124	x	x	х	x
CV38100800 —) Differential attachment Equivalent tool J25604-01)	Mounting final drive (To use, make a new hole.) a: 152 mm (5.98 in)	x	x	_	
ST06310000 —) Differential attachment Equivalent tool (J25602-01)	Mounting final drive	_	_	x	_
ST06340000 (—) Differential attachment Equivalent tool (J24310)	Mounting final drive	-	_	_	х
ST32580000 (J34312) Differential side bearing adjusting nut wrench	Adjusting side bearing pre- load and backlash (ring gear-drive pinion)	_			x
ST33290001 (J25810-A) Side bearing outer race puller	Removing side bearing outer race and side oil seal	x	_		
ST38060002 J34311) Drive pinìon flange wrench	Removing and installing propeller shaft lock nut, and drive pinion lock nut	×	×	x	
KV38104700 (J34311) Drive pinion flange wrench	Removing and installing propeller shaft lock nut, and drive pinion lock nut			_	x

Special Service Tools (Cont'd)

Tool number			Unit application				
(Kent-Moore No.) Tool name	Description		R180A	R200A	H190A	H233B	
ST3090S000 (—) Drive pinion rear inner race puller set (1) ST30031000 (J22912-01) Puller (2) ST30901000 (—) Base Equivalent tool (J26010-01)	NT132	Removing and installing drive pinion rear inner cone	x	x	x	x	
ST3306S001 Differential side bearing puller set ① ST33051001 (—) Body Equivalent tool (J22888) ② ST33061000 (J8107-2) Adapter	NT133	Removing and installing differential side bearing inner cone	x	X	X	x	
ST33230000 (J25805-01) Differential side bearing drift	a b c	Installing side bearing inner cone a: 51 mm (2.01 in) dia. b: 41 mm (1.61 in) dia. c: 28.5 mm (1.122 in) dia.	x	-	x	_	
KV38100300 (J25523) Differential side bearing drift	a b c	installing side bearing inner cone a: 54 mm (2.13 in) dia. b: 46 mm (1.81 in) dia. c: 32 mm (1.26 in) dia.	_	x	_		
ST33190000 (—) Differential side bearing drift Equivalent tool (J25523)	a b c	Installing side bearing inner cone a: 52 mm (2.05 in) dia. b: 45.5 mm (1.791 in) dia. c: 34 mm (1.34 in) dia.	pagenn.	_	_	×	
ST33081000 (—) Side bearing puller adapter		Installing side bearing inner cone	_	_	_	x	

Special Service Tools (Cont'd) Tool number Unit application (Kent-Moore No.) Description R180A R200A H190A H233B Tool name KV38100600 Installing side bearing GI (J25267) spacer Side bearing spacer Х drift MA NT123 ST30611000 Installing pinion rear EM (J25742-1) bearing outer race Drift Х Х Х Х LC NT090 ST30621000 Installing pinion rear bear-EF & (J25742-5) ing outer race EC Drift a: 79 mm (3.11 in) dia. Х Χ Х Х b: 59 mm (2.32 in) dia. FE NT073 ST30701000 Installing pinion front bear-(J25742-2) ing outer race CL Drift a: 61.5 mm (2.421 in) dia, Χ b: 41 mm (1.61 in) dia. MT NT073 ST30613000 Installing pinion front bearing outer race (J25742-3) AT Drift a: 72 mm (2.83 in) dia. Х Χ Х b: 48 mm (1.89 in) dia. TF NT073 KV381025S0 Installing front oil seal (-)PD Oil seal fitting tool ① ST30720000 (-)FA Drift bar Х Х Х Equivalent tool (J25405) RA ② KV38102510 (-)Drift BR NT122 KV38100500 Installing front oil seal (--) ST Gear carrier front oil Х seal drift Equivalent tool BF (J25273) NT121 ST33720000 Installing side retainer (J25817) HA Differential side retainer Χ guide EL NT138

IDX

Special Service Tools (Cont'd) Tool number Unit application (Kent-Moore No.) Description R180A R200A H190A H233B Tool name ST33270000 Installing side oil seal (J25809) Side oil seal drift Х NT139 KV38100200 Installing side oil seal (J26233)Gear carrier side oil Χ seal drift NT120 (J34309) Adjusting bearing pre-load Differential shim and gear height selector Χ Х Х Х NT134 (J25269-4) Selecting pinion height adjusting washer Side bearing discs (2 Req'd) Χ Χ NT136 (J25269-18) Selecting pinion height adjusting washer Side bearing discs (2 Req'd) Х X NT135 (J8129)Spring gauge Х Χ Χ Χ Measuring carrier turning torque NT127 (J35764) Installing side oil seal Gear carrier side oil seal drift Х NT120

Special Service Tools (Cont'd)

Tool number				Unit ap	olication		
(Kent-Moore No.) Tool name	Description		R180A	R200A	H190A	H233B	-
KV381051S0 (—) Rear axle shaft dummy ① KV38105110 (—) Torque wrench side ② KV38105120 (—) Vice side	NT142	Checking differential torque on limited slip differential	_	_	x	_	G M
KV381052S0 (—) Rear axie shaft dummy ① KV38105210 (—) Torque wrench side ② KV38105220 (—) Vice side	NT142	Checking differential torque on limited slip differential	_	_	_	x	- L(

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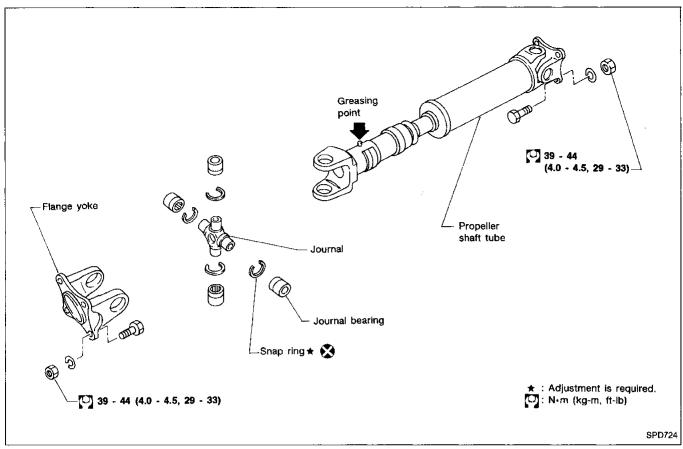
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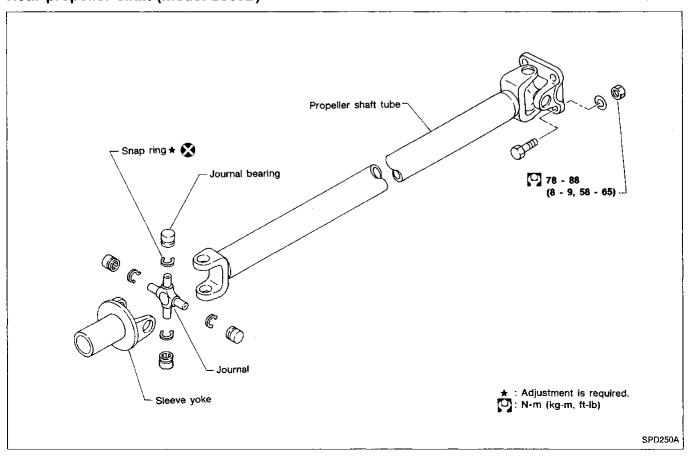
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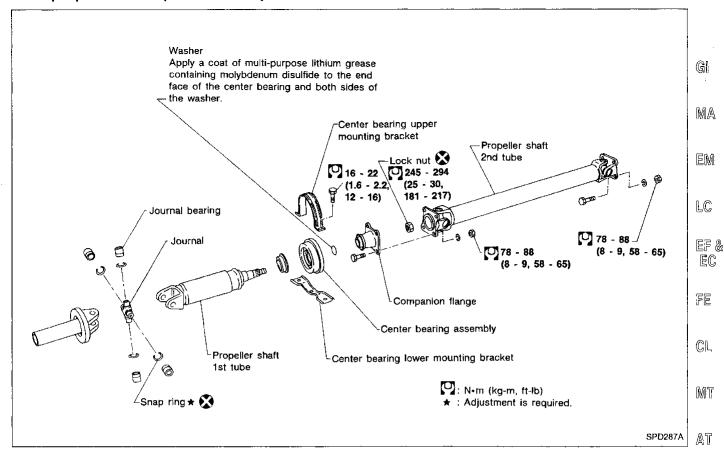
Front propeller shaft (Model 2F71H)



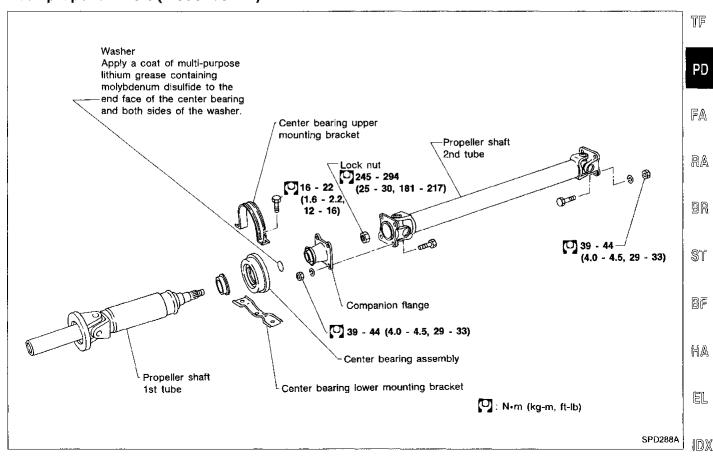
Rear propeller shaft (Model 2S80B)

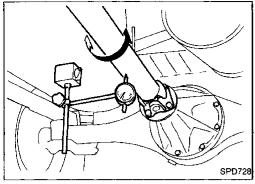


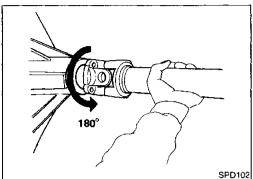
Rear propeller shaft (Model 3S80B)

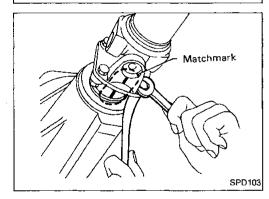


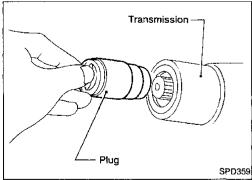
Rear propeller shaft (Model 3S71A)

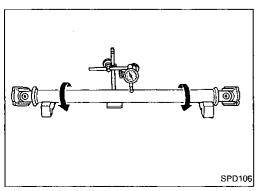












On-vehicle Service

PROPELLER SHAFT VIBRATION

If vibration is present at high speed, inspect propeller shaft runout first.

- Raise rear wheels.
- Measure propeller shaft runout at several points by rotating final drive companion flange with hands.
- 3. If runout exceeds specifications, disconnect propeller shaft at final drive companion flange; then rotate companion flange 180 degrees and reconnect propeller shaft.

Runout limit: 0.6 mm (0.024 in)

- 4. Check runout again. If runout still exceeds specifications, replace propeller shaft assembly.
- 5. Perform road test.

APPEARANCE CHECKING

- Inspect propeller shaft tube surface for dents or cracks. If damaged, replace propeller shaft assembly.
- If center bearing is noisy or damaged, replace center bearing.

Removal and Installation

 Put match marks on flanges and separate propeller shaft from final drive.

 Draw out propeller shaft from transmission and plug up rear end of transmission rear extension housing.

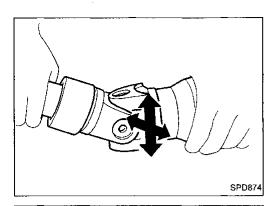
Inspection

 Inspect propeller shaft runout. If runout exceeds specifications, replace propeller shaft assembly.

Runout limit: 0.6 mm (0.024 in)

PROPELLER SHAFT

Inspection (Cont'd)



Match mark

Match mark

Tool

SPD109

SPD110

SPD170A

Inspect journal axial play. If the play exceeds specifications, replace propeller shaft assembly.

> Journal axial play: 0.02 mm (0.0008 in) or less

GI

MA

EM

Disassembly

CENTER BEARING



Put match marks on flanges, and separate 2nd tube from 1st tube.

EF & EC

FE

CL

MT

AT

TF

PD

Remove locking nut with Tool.

Tool number:

R180A, R200A, H190A ST38060002 (J34311)

H233B

KV38104700 (J34311)

Put match marks on the flange and shaft.

Remove companion flange with puller.

RA

FA

BR

ST

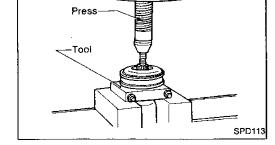
5. Remove center bearing with Tool and press. Tool number: ST30031000 (J22912-01)

BF

MA

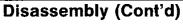
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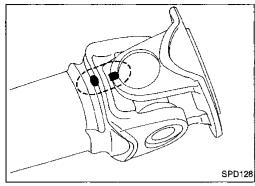
PROPELLER SHAFT

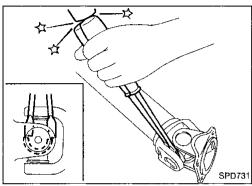


JOURNAL (71H and 80B)

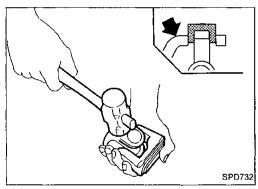
71H: Do not disassemble.

1. Put match marks on shaft and flange or yoke.

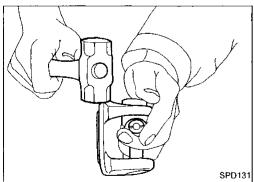




2. Remove snap ring.



 Remove pushed out journal bearing by lightly tapping yoke with a hammer, taking care not to damage journal and yoke hole.



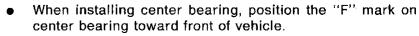
4. Remove bearing at opposite side in above operation.

Put marks on disassembled parts so that they can be reinstalled in their original positions from which they were

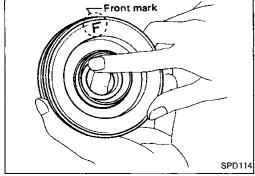
removed.



CENTER BEARING

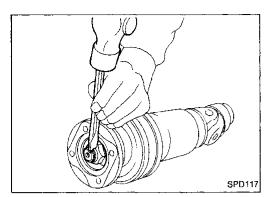


 Apply a coat of multi-purpose lithium grease containing molybdenum disulfide to the end face of the center bearing and both sides of the washer.



PROPELLER SHAFT

Assembly (Cont'd)

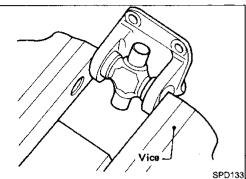


- Stake the nut. Always use new one.
- Align match marks when assembling tubes.



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JOURNAL (71H and 80B)

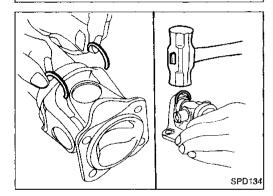
1. Assemble journal bearing. Apply recommended multi-purpose grease on bearing inner surface.

When assembling, be careful that needle bearing does not fall down.

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Select snap ring that will provide specified play in axial direction of journal, and install them. Refer to SDS (PD-97).

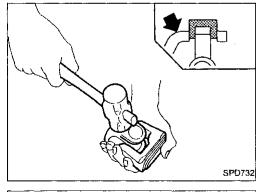
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Select snap rings with a difference in thickness at both sides within 0.06 mm (0.0024 in).

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Adjust thrust clearance between bearing and snap ring to zero by tapping yoke.

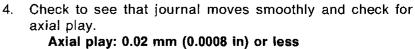
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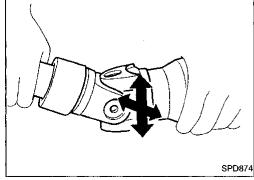
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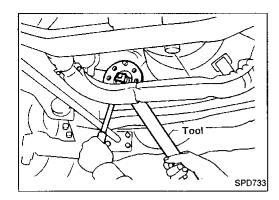


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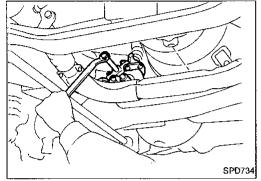
PD-13



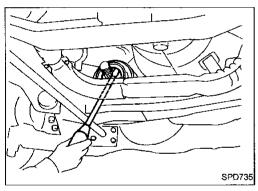
Front Oil Seal Replacement (Front final drive)

- Remove front propeller shaft.
- Loosen drive pinion nut.

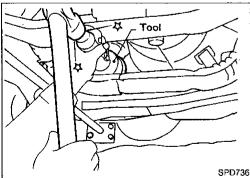
Tool number: ST38060002 (J34311)



Remove companion flange.



Remove front oil seal.



- Apply multi-purpose grease to cavity at sealing lips of oil seal. Press front oil seal into carrier.
- Install companion flange and drive pinion nut.

```
Install propeller shaft.
              Tool number:
                  R180A
                  R200A
SPD736
```

ST30720000 (—) Equivalent tool (J25405) KV38100500 (--) Equivalent tool (J25273)

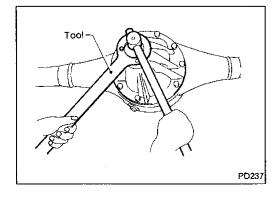
Front Oil Seal Replacement

CAUTION:

For final drive models using collapsible spacer (H190A) bearing preload must be adjusted whenever companion flange is removed. Therefore, final drive overhaul is required.

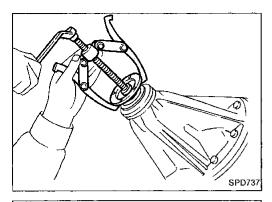
- Remove propeller shaft.
- Loosen drive pinion nut.

Tool number: KV38104700 (J34311)



PD-14 812

Front Oil Seal Replacement (Cont'd)



Remove companion flange.



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Remove front oil seal.

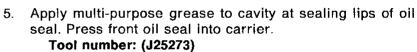


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Install companion flange and drive pinion nut.

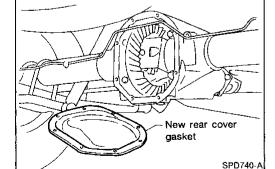
Install rear propeller shaft.

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Rear Cover Gasket Replacement

Drain gear oil.

SPD738

SPD739

Remove rear cover and rear cover gasket.

Install new rear cover gasket and rear cover.

Fill final drive with recommended gear oil.

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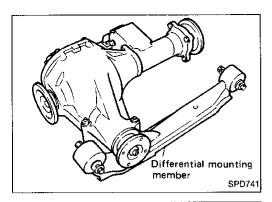
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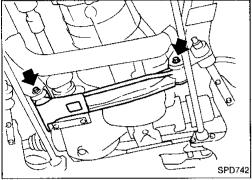
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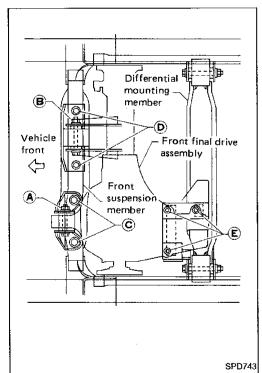
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PD-15







Removal

- Remove front propeller shaft.
- 2. Remove drive shaft. Refer to "FRONT AXLE (4WD)" in FA section.
- 3. Remove engine mounting bolts and raise up engine.
- Remove front final drive together with differential mounting member.

Installation

 Install front final drive assembly together with differential mounting member.

- 2. Perform tightening front final drive securing bolts and nuts by following procedure to prevent drive train vibration.
- (1) Temporarily tighten nut (A).
- (2) Temporarily tighten nut (B).
- (3) Tighten bolt **©** to the torque of 68 to 87 N·m (6.9 to 8.9 kg-m, 50 to 64 ft-lb).
- (4) Tighten bolt ① to the torque of 68 to 87 N·m (6.9 to 8.9 kg-m, 50 to 64 ft-lb).
- (5) Tighten nut **(A)** to the torque of 68 to 87 N·m (6.9 to 8.9 kg-m, 50 to 64 ft-lb).
- (6) Tighten nut **(B)** to the torque of 68 to 87 N·m (6.9 to 8.9 kg-m, 50 to 64 ft-lb).
- (7) Tighten nut **(E)** to the torque of 68 to 87 N·m (6.9 to 8.9 kg-m, 50 to 64 ft-lb).
- Install drive shaft. Refer to "FRONT AXLE (4WD)" in FA section.
- 4. Install front propeller shaft.

PD-16 814

Removal

Remove propeller shaft.

Plug front end of transfer.

Remove axle shaft. Refer to "REAR AXLE" in RA section.

GI

CAUTION:

- Be careful not to damage spline, sleeve yoke and front oil seal when removing propeller shaft.
- Before removing the final drive assembly or rear axle assembly, disconnect the ABS sensor harness connector from the assembly and move it away from the final drive/ rear axle assembly area. Failure to do so may result in the sensor wires being damaged and the sensor becoming $\mathbb{L}\mathbb{C}$ inoperative.







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Installation

Filler opening

Gasket

ot Final drive

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Oil fevel

Axle case

Grav

SPD123

SPD767

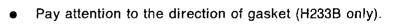
Fill final drive with recommended gear oil.



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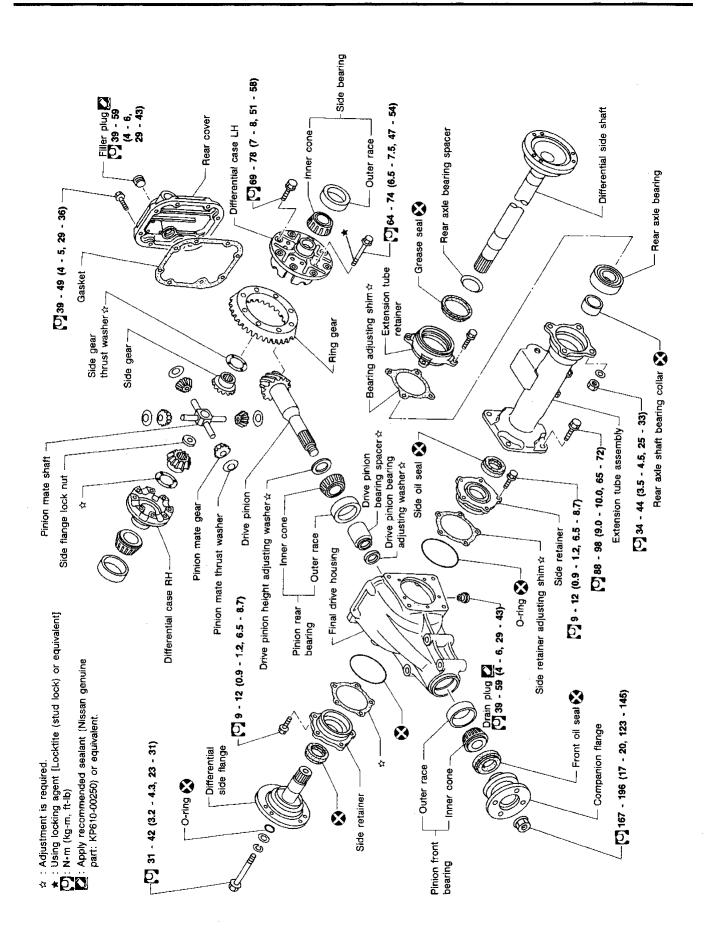
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PD-17



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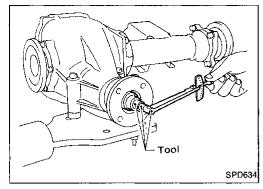
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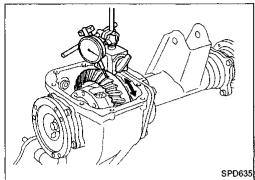
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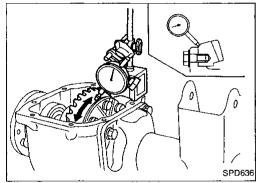
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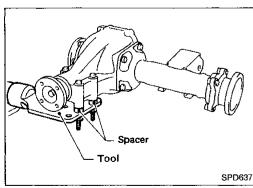
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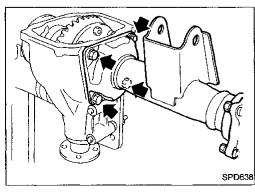
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Pre-inspection

Before disassembling final drive, perform the following inspection.

- Total preload
- 1) Turn drive pinion in both directions several times to set @ bearing rollers.
- Check total preload with Tool.

Tool number: ST3127S000 (J25765-A) Total preload:

1.2 - 2.3 N·m

(12 - 23 kg-cm, 10 - 20 in-lb)

Ring gear to drive pinion backlash Check backlash of ring gear with a dial indicator at several points.

Ring gear to drive pinion backlash:

0.13 - 0.18 mm (0.0051 - 0.0071 in)

Ring gear runout Check runout of ring gear with a dial indicator.

Runout limit:

0.05 mm (0.0020 in)

Tooth contact Check tooth contact. Refer to ADJUSTMENT (PD-30).

Final Drive Housing

Using three spacers [20 mm (0.79 in)], mount final drive FA assembly on Tool.

Tool number:

KV38100800 (---

Equivalent tool (J34310), (J25604)

Remove extension tube and differential side shaft assem-

bly.

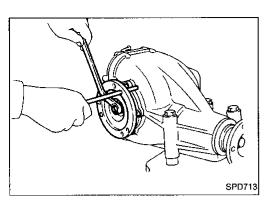
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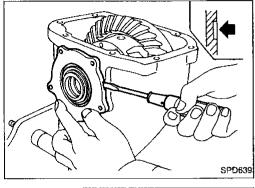
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PD-19

Final Drive Housing (Cont'd)

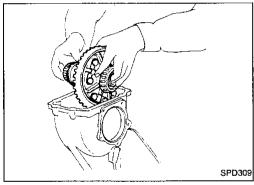


3. Remove differential side flange.

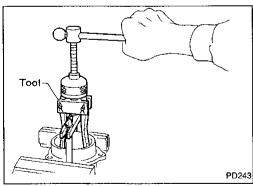


4. Mark side retainers for identification. Remove side retainers

Be careful not to confuse right and left side retainers and shims.



5. Extract differential case from final drive housing.

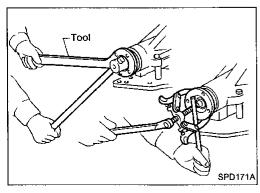


6. Remove side outer races.

Tool number: \$T33290001 (J25810-A)

Be careful to keep the side bearing outer races together with their respective inner cones — do not mix them up.

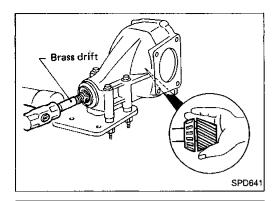
Remove side oil seal.



8. Loosen drive pinion nut.

Tool number: ST38060002 (J34311)

9. Remove companion flange with puller.



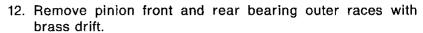
Final Drive Housing (Cont'd)

- 10. Take out drive pinion together with pinion rear bearing inner cone, drive pinion bearing spacer and pinion bearing adjusting washer.
- 11. Remove front oil seal and pinion front bearing inner cone.



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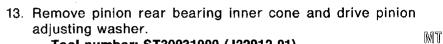


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Tool number: \$T30031000 (J22912-01)

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Tool

Remove side bearing inner cones.

To prevent damage to bearing, engage puller jaws in grooves. Tool number:

- **A** ST33051001 (Equivalent tool (J22888)
- **B** \$T33061000 (J8107-2)

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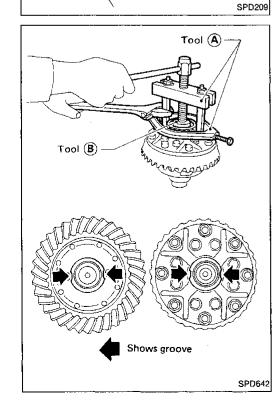
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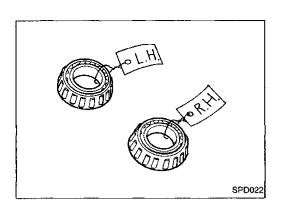
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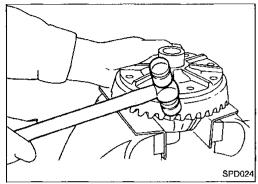
PD-21





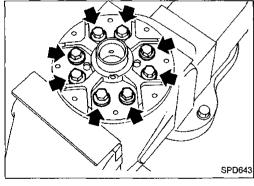
Differential Case (Cont'd)

Be careful not to confuse the right and left hand parts.



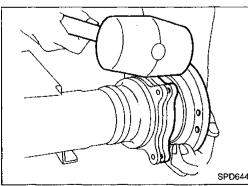
- 2. Loosen ring gear bolts in a criss-cross fashion.
- 3. Tap ring gear off differential case with a soft hammer.

Tap evenly all around to keep ring gear from binding.



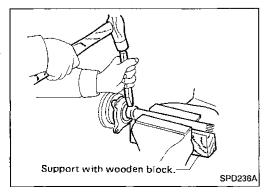
4. Separate differential case LH and RH.

Put match marks on both differential case LH and RH sides prior to separating them.



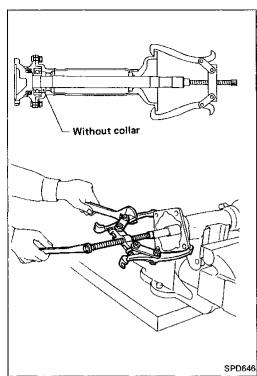
Extension Tube and Differential Side Shaft

 Remove differential side shaft assembly from extension tube.



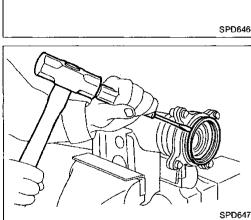
Cut rear axle bearing collar with cold chisel. Be careful not to damage differential side shaft.

PD-22 820



Extension Tube and Differential Side Shaft (Cont'd)

3. Reinstall differential side shaft into extension tube and secure with bolts. Remove rear axle bearing by drawing out differential side shaft from rear axle bearing with puller.



4. Remove grease seal.



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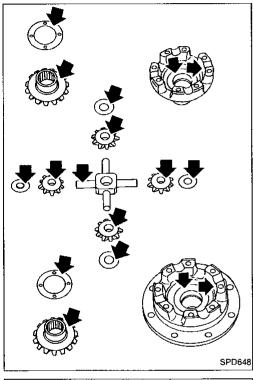
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PD-23

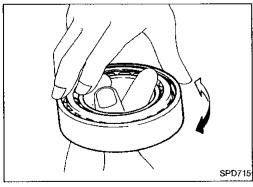
Ring Gear and Drive Pinion

Check gear teeth for scoring, cracking or chipping. If any damaged part is evident, replace ring gear and drive pinion as a set (hypoid gear set).



Differential Case Assembly

Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft and thrust washers.



Bearing

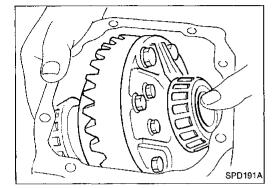
- . Thoroughly clean bearing.
- Check bearing for wear, scratches, pitting or flaking.
 Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner cone as a set.

For guiet and reliable final drive operation, the following five adjustments must be made correctly:

- Side bearing preload.
- Pinion gear height.
- Pinion bearing preload.
- Ring gear to pinion backlash. Refer to ASSEMBLY (PD-34).
- Ring and pinion gear tooth contact pattern.



EM



SPD192A

SPD193A

SPD194A

Side Bearing Preload

Note: A selection of carrier side retainer adjusting shims is LC regulred for successful completion of this procedure.

- Make sure all parts are clean and that the bearings are well lubricated with light oil or Dexron type automatic transmission fluid.
- Install differential carrier and side bearing assembly into the final drive housing.



Place all of the original side retainer adjusting shims onto



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the side bearing retainer that goes at the ring gear end of the carrier.



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Install both bearing retainers onto the final drive housing and torque the retainer bolts.

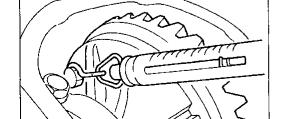
Bolt torque specification:

9 - 12 N·m (0.9 - 1.2 kg-m, 6.5 - 8.7 ft-lb)



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- Turn the carrier several times to seat the bearings.
- Measure the carrier turning torque with a spring gauge, J8129, at the ring gear retainer bolt.

Turning torque specification:

34.3 - 39.2 N (3.5 - 4.0 kg, 7.7 - 8.8 lb) of pulling force at the ring gear boit.



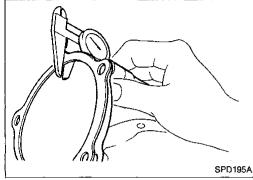
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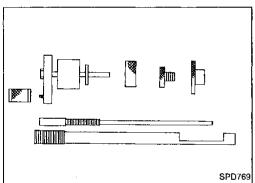


Side Bearing Preload (Cont'd)

- 7. If the turning torque measured is incorrect, establish the correct bearing preload by adding to or subtracting from the total amount of shim thickness.
- Increase shim thickness to decrease turning torque on the carrier.
- Decrease shim thickness to increase turning torque on the carrier.

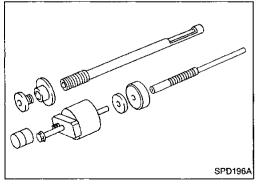


 Record the correct, selected total thickness of the side retainer adjusting shims, and remove the carrier and bearings from the final drive housing. Save all shims for later re-use.

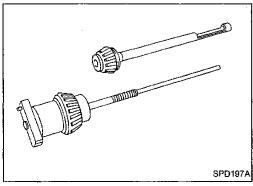


Pinion Gear Height and Pinion Bearing Preload

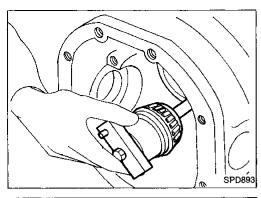
- Make sure all parts are clean and that the bearings are well lubricated.
- 2. Assemble the pinion gear bearings into the pinion pre-load shim selector tool, J34309.
- Front Pinion Bearing make sure the J34309-3 front pinion bearing seat is secured tightly against the J34309-2 gauge anvil. Then turn the front pinion bearing pilot, J34309-7, to secure the bearing in its proper position.



 Rear Pinion Bearing — the rear pinion bearing pilot, J34309-8, is used to center the rear pinion bearing only. The rear pinion bearing locking seat, J34309-4, is used to lock the bearing to the assembly.



PD-26 824



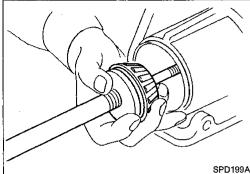
Pinion Gear Height and Pinion Bearing Preload (Cont'd)

Place the pinion preload shim selector tool gauge screw, J34309-1, with the pinion rear bearing inner cone installed, into the final drive housing.



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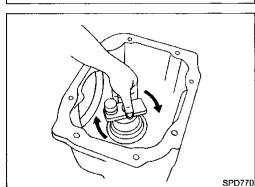
Install the J34309-2 gauge anvil with the front pinion bearing into the final drive housing and assemble it to the J34309-1 gauge screw. Make sure that the J34309-16 gauge plate will turn a full 360 degrees, and tighten the two sections by hand.



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Turn the assembly several times to seat the bearings.

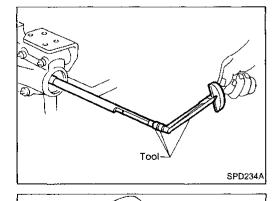
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Measure the turning torque at the end of the J34309-2 shaft using torque wrench J25765-A.

Turning torque specification:

0.6 - 1.0 N·m (6 - 10 kg-cm, 5.2 - 8.7 in-lb)

Place the J34309-10 "R180A" pinion height adapter onto the gauge plate and tighten it by hand.

Make sure all machined surfaces are clean.

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Place the solid pinion bearing adjusting spacer squarely BF into the recessed portion of the J34309-2 gauge anvil.

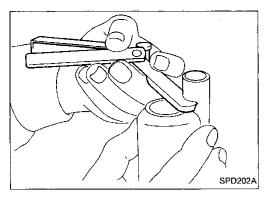
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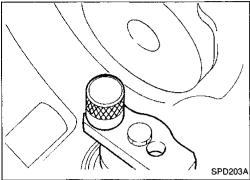
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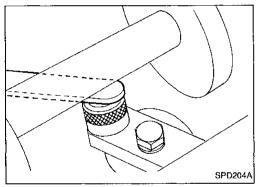
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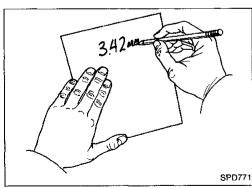


SPD201A









Pinion Gear Height and Pinion Bearing Preload (Cont'd)

 Select the correct thickness of pinion bearing preload adjusting washer using a standard gauge of 6 mm (0.24 in) and your J34309-101 feeler gauge. The exact total measure you get with the gauges is the thickness of the adjusting washer required. Select the correct washer.

Drive pinion bearing adjusting washer: Refer to SDS (PD-99).

 Set your selected, correct pinion bearing preload adjusting washer aside for use when assembling the pinion and bearings into the final drive housing.

PINION HEIGHT ADJUSTING WASHER SELECTION

11. Position the side bearing discs, J25269-4, and arbor firmly into the side bearing bores.

12. Select the correct standard pinion height adjusting washer thickness using a standard gauge of 3 mm (0.12 in) and your J34309-101 feeler gauge. Measure the distance between the J34309-10 "R180A" pinion height adapter and the arbor.

13. Write down your exact total measurement.

PD-28 826

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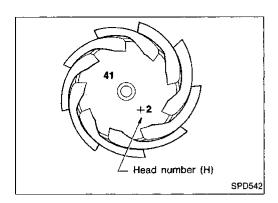
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Pinion Gear Height and Pinion Bearing Preload (Cont'd)

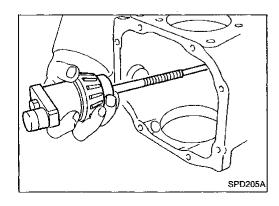
14. Correct the pinion height washer size by referring to the "pinion head number".

Note: There are two numbers painted on the pinion gear. The first one refers to the pinion and ring gear as a matched set and should be the same as the number on the ring gear. The second number is the "pinion head height number", and it refers to the ideal pinion height from standard for quietest operation. Use the following chart to determine the correct pinion height washer.

Pinion Head Height Number	Add or Remove from the Standard Pinion Height Washer Thickness Measurement			
-6	Add 0.06 mm (0.0024 in)			
5	Add 0.05 mm (0.0020 in)			
-4	Add 0.04 mm (0.0016 in)			
-3	Add 0.03 mm (0.0012 in)			
-2	Add 0.02 mm (0.0008 in)			
-1	Add 0.01 mm (0.0004 in)			
0	Use the selected washer thickness			
+1	Subtract 0.01 mm (0.0004 in)			
+2	Subtract 0.02 mm (0.0008 in)			
+3	Subtract 0.03 mm (0.0012 in)			
+4	Subtract 0.04 mm (0.0016 in)			
+5	Subtract 0.05 mm (0.0020 in)			
+6	Subtract 0.06 mm (0.0024 in)			

15. Select the correct pinion height washer.

Drive pinion height adjusting washer: Refer to SDS (PD-99).



16. Remove the J34309 pinion preload shim selector tool from the final drive housing and disassemble to retrieve the pinion bearings.

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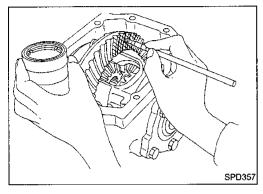
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PD-29

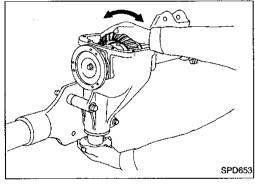
Tooth Contact

Gear tooth contact pattern check is necessary to verify correct relationship between ring gear and drive pinion.

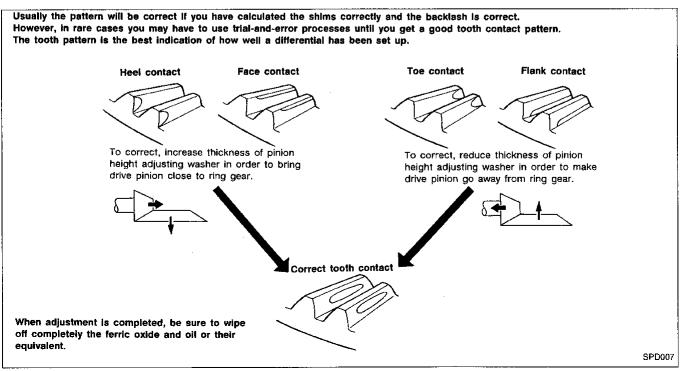
Hypoid gear sets which are not positioned properly in relation to one another may be noisy, or have short life, or both. With a pattern check, the most desirable contact for low noise level and long life can be assured.

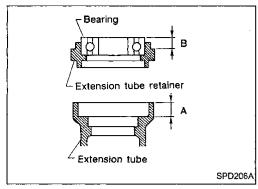


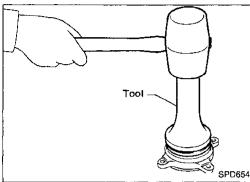
- 1. Thoroughly clean ring gear and drive pinion teeth.
- 2. Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.

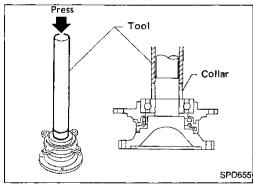


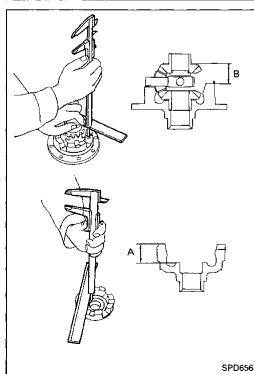
3. Hold companion flange steady by hand and rotate the ring gear in both directions.











Extension Tube and Differential Side Shaft

1. Measure rear axle bearing end play.

Rear axle bearing end play (A - B):

0.1 mm (0.0039 in) or less

The end play can be adjusted with bearing adjusting shim.

Available bearing adjusting shims:

Refer to SDS (PD-99).

Install grease seal.

Tool number: (J35764)

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 Install extension tube retainer, rear axle bearing and rear axle shaft bearing collar on differential side shaft.

4. Install differential side shaft assembly into extension tube.

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Differential Case

 Measure clearance between side gear thrust washer and differential case.

Clearance between side gear thrust washer and differential case (A - B):

0.10 - 0.20 mm (0.0039 - 0.0079 in)

The clearance can be adjusted with side gear thrust washer.

Available side gear thrust washers: Refer to SDS (PD-99).

Apply gear oil to gear tooth surfaces and thrust surfaces and check to see they turn properly.

BF

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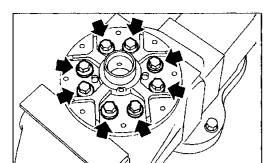
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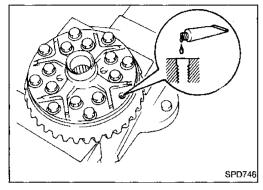
PD-31



SPD643

Differential Case (Cont'd)

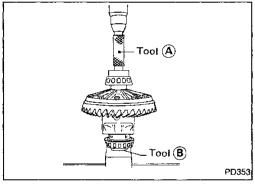
3. Install differential case LH and RH.



4. Place differential case on ring gear.

5. Apply locking agent [Locktite (stud lock) or equivalent] to ring gear bolts, and install them.

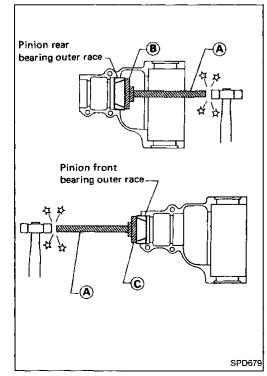
Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.



Press-fit side bearing inner cones on differential case with Tool.

Tool number:

- **(A)** ST33230000 (J25805-01)
- **B** ST33061000 (J8107-2)

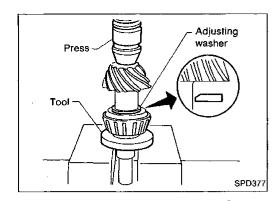


Final Drive Housing

1. Press-fit front and rear bearing outer races with Tools.

Tool number:

- **(A)** ST30611000 (J25742-1)
- **B** ST30621000 (J25742-5)
- © ST30701000 (J25742-2)



Tool

Drive pinion bearing spacer Drive pinion bearing adjusting washer

SPD657

SPD658

SPD659

Final Drive Housing (Cont'd)

Select pinion bearing adjusting washer and drive pinion bearing spacer. Refer to ADJUSTMENT (PD-26).

Install drive pinion height adjusting washer in drive pinion, and press-fit pinion rear bearing inner cone in it, using press and Tool.

Tool number: \$T30901000 (

GI

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Equivalent tool (J26010-01)

EM

Place pinion front bearing inner cone in final drive housing.

Apply multi-purpose grease to cavity at sealing lips of oil seal. Install front oil seal.

Tool number: \$T30720000 (—

LC

Equivalent tool (J25405)

EC

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Place drive pinion bearing spacer, pinion bearing adjusting washer and drive pinion in final drive housing.

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7. Insert companion flange into drive pinion by tapping the companion flange with a soft hammer.

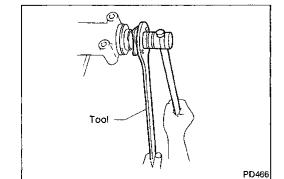
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Tighten pinion nut to the specified torque.

The threaded portion of drive pinion and pinion nut should be free from oil or grease.

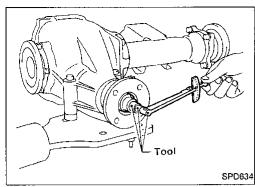
Tool number: ST38060002 (J34311)

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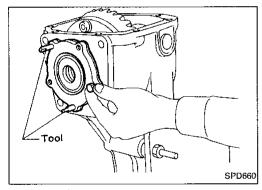
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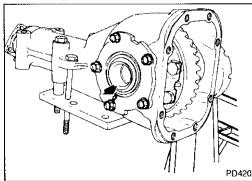
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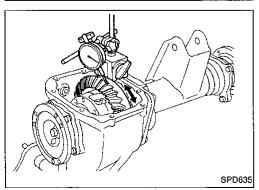
PD-33



Tool (A) Tool (B) SPD332







Final Drive Housing (Cont'd)

9. Turn drive pinion in both directions several revolutions, and measure pinion bearing preload.

Tool number: ST3127S000 (J25765-A)

Pinion bearing preload:

1.1 - 1.7 N·m (11 - 17 kg-cm, 9.5 - 14.8 in-lb)

When pinion bearing preload is outside the specifications, replace pinion bearing adjusting washer and spacer with a different thickness.

10. Select side retainer adjusting shim. Refer to ADJUSTMENT (PD-25).

11. Press-fit side bearing outer race into side retainer.

Tool number:

- (A) ST30611000 (J25742-1)
- **B** ST30621000 (J25742-5)
- 12. Install side oil seal.
- 13. Install differential case assembly.
- 14. Place side retainer adjusting shims (Refer to ADJUST-MENT, PD-25.), and O-ring on side retainer, and install them in final drive housing.

Tool number: ST33720000 (J25817)

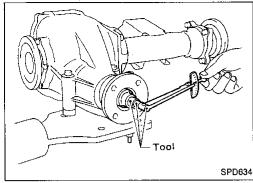
Align arrows stamped on side retainer and final drive housing.

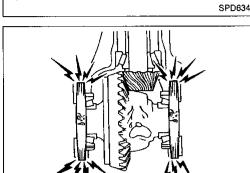
15. Measure ring gear to drive pinion backlash with a dial indicator.

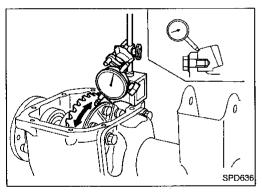
Ring gear to drive pinion backlash: 0.13 - 0.18 mm (0.0051 - 0.0071 in)

 If backlash is too small, decrease thickness of right shim and increase thickness of left shim by the same amount.
 If backlash is too great, reverse the above procedure.

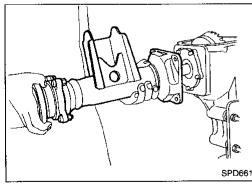
Never change the total amount of shims as it will change the bearing preload.







SPD561



Final Drive Housing (Cont'd)

16. Check total preload with Tool.

When checking preload, turn drive pinion in both directions several times to set bearing rollers.

> Tool number: \$T3127\$000 (J25765-A) Total preload:

1.2 - 2.3 N·m

(12 - 23 kg-cm, 10 - 20 in-lb)

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- If preload is too great, add the same amount of shim to each side.
- If preload is too small, remove the same amount of shim from each side.

Never add or remove a different number of shims for each side EF & as it will change ring gear to drive pinion backlash.



17. Recheck ring gear to drive pinion backlash because increase or decrease in thickness of shims will cause FE change of ring gear to pinion backlash.

CL

18. Check runout of ring gear with a dial indicator.

Runout limit:

0.05 mm (0.0020 in)

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- If backlash varies excessively in different places, the variance may have resulted from foreign matter caught \mathbb{AT} between the ring gear and the differential case.
- If the backlash varies greatly when the runout of the ring gear is within a specified range, the hypoid gear set or differential case should be replaced.
- 19. Check tooth contact. Refer to ADJUSTMENT (PD-30).
- 20. Install rear cover and gasket.
- 21. Install extension tube and differential side shaft assembly.

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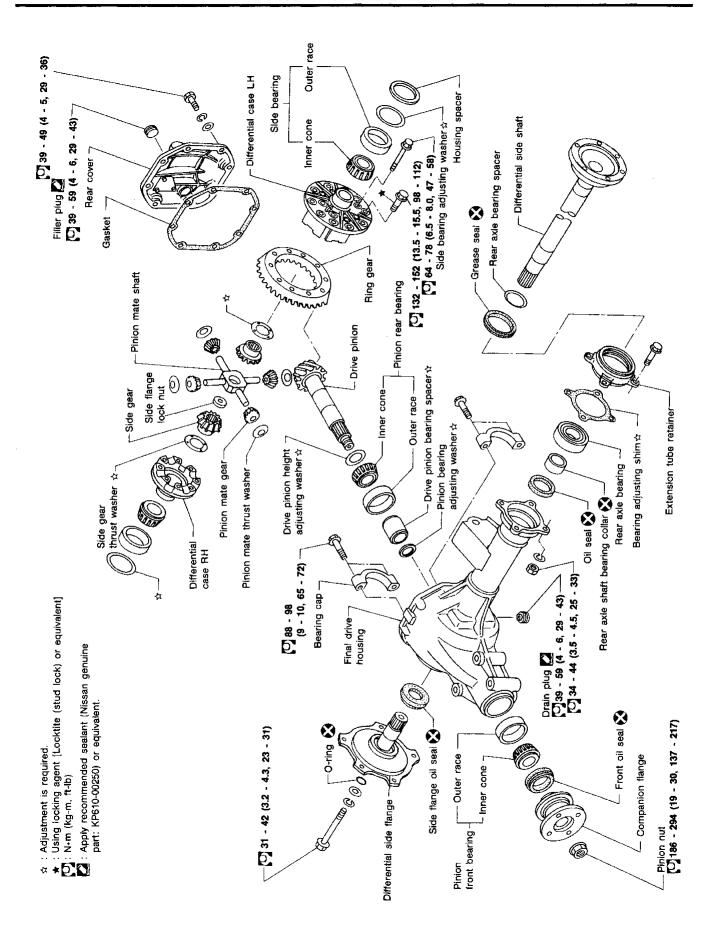
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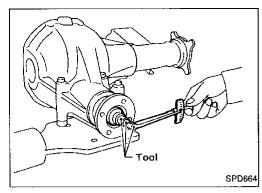
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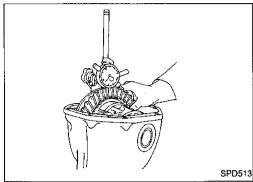
EL

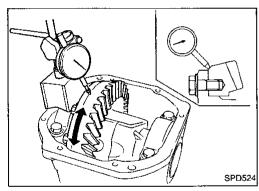
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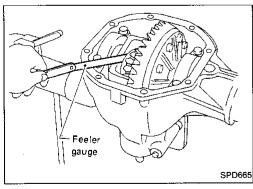
PD-35

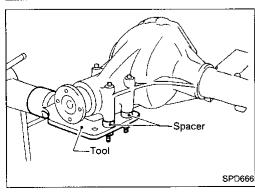












Pre-inspection

Before disassembling final drive, perform the following inspection.

- Total preload
- Turn drive pinion in both directions several times to set @ 1) bearing rollers.
- Check total preload with Tool.

Tool number: ST3127S000 (J25765-A) Total preload:

1.4 - 3.1 N·m (14 - 32 kg-cm, 12 - 28 in-lb)

Ring gear to drive pinion backlash Check backlash of ring gear with a dial indicator at several points.

Ring gear to drive pinion backlash:

0.13 - 0.18 mm (0.0051 - 0.0071 in)

Ring gear runout Check runout of ring gear with a dial indicator. Runout limit:

0.05 mm (0.0020 in)

Tooth contact Check tooth contact. Refer to ADJUSTMENT (PD-49).

Side gear to pinion mate gear backlash Using a feeler gauge, measure clearance between side FA gear thrust washer and differential case.

Clearance between side gear thrust washer and differential case:

0.10 - 0.20 mm (0.0039 - 0.0079 in)

Final Drive Housing

Using three spacers [20 mm (0.79 in)], mount final drive BF assembly on Tool.

Tool number:

KV38100800 (

Equivalent tool (J34310), (J25604)

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PD-37 835

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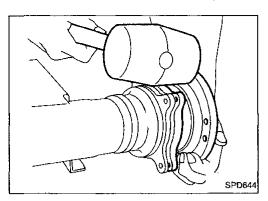
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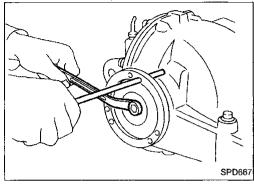
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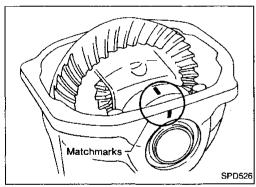
EL



2. Remove differential side shaft assembly.

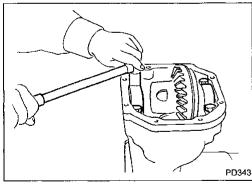


3. Remove differential side flange.

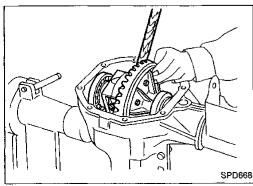


 Put match marks on one side of side bearing cap with paint or punch to ensure that it is replaced in proper position during reassembly.

Bearing caps are line-bored during manufacture and should be put back in their original places.

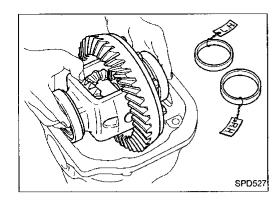


5. Remove side bearing caps.



6. Remove differential case assembly with a pry bar.

PD-38 836



Be careful to keep the side bearing outer races together with their respective inner cones — don't mix them up.

CAUTION:

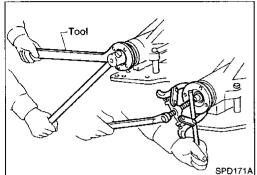
Side bearing spacer is placed on either the left or right depending upon final drive gear ratio. It should be labeled so that it may be replaced correctly.



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Brass

Loosen drive pinion nut.

Tool number: ST38060002 (J34311)

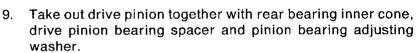
Remove companion flange with puller.



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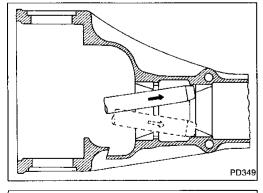


10. Remove front oil seal and pinion front bearing inner cone.

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SPD670

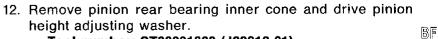
11. Remove pinion bearing outer races with a brass drift.

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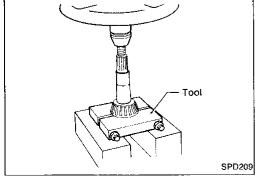
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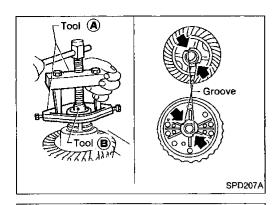
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Tool number: ST30031000 (J22912-01)

PD-39



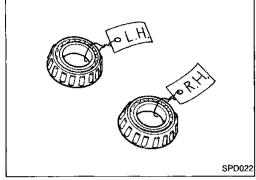
Differential Case

1. Remove side bearing inner cones.

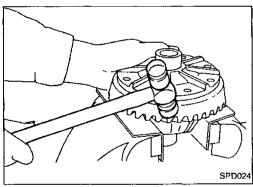
To prevent damage to bearing, engage puller jaws in grooves.

Tool number:

- A ST33051001 () Equivalent tool (J22888)
- **B** ST33061000 (J8107-2)

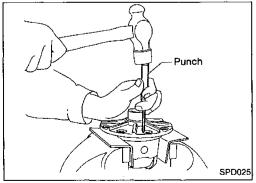


Be careful not to confuse the right and left hand parts.

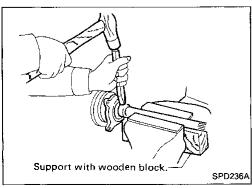


- 2. Loosen ring gear bolts in a criss-cross fashion.
- 3. Tap ring gear off the differential case with a soft hammer.

Tap evenly all around to keep ring gear from binding.



4. Punch off pinion mate shaft lock pin from ring gear side.



Differential Side Shaft

Cut collar with cold chisel. Be careful not to damage differential side shaft.

Differential Side Shaft (Cont'd)

2. Reinstall differential side shaft into extension tube and secure with bolts. Remove rear axle bearing by drawing out differential side shaft from rear axle bearing with puller.



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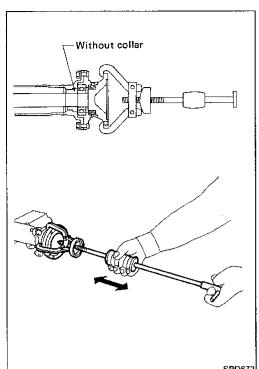
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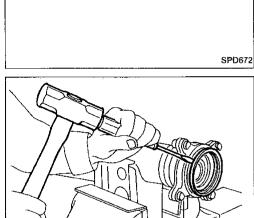
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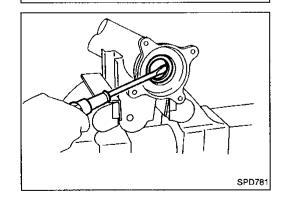
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PD-41



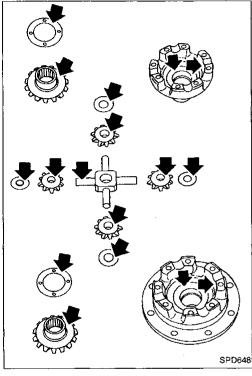




Remove grease seal and oil seal.

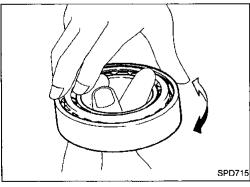
Ring Gear and Drive Pinion

Check gear teeth for scoring, cracking or chipping. If any damaged part is evident, replace ring gear and drive pinion as a set (hypoid gear set).



Differential Case Assembly

Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft and thrust washers.



Bearing

- 1. Thoroughly clean bearing.
- 2. Check bearing for wear, scratches, pitting or flaking.
 Check tapered roller bearing for smooth rotation. If
 damaged, replace outer race and inner cone as a set.

PD-42 840

For quiet and reliable final drive operation, the following five adjustments must be made correctly:

- 1. Side Bearing Preload.
- 2. Pinion Gear Height.
- 3. Pinion Bearing Preload.
- 4. Ring Gear to pinion Backlash. Refer to ASSEMBLY (PD-54).
- 5. Ring and Pinion Gear Tooth Contact Pattern.

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Side Bearing Preload

Note: A selection of carrier side bearing adjusting washer is LC required for successful completion of this procedure.



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- Make sure all parts are clean and that the bearings are well lubricated with light oil or Dexron type automatic transmission fluid.
- 2. Place the differential carrier, with side bearings and bearing races installed, into the final drive housing.

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SPD527

SPD894

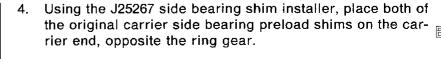
3. Put the side bearing spacer in place.

Side bearing spacer is placed on either the right or left depending upon final drive gear ratio. Be sure to replace it on the correct side

RA

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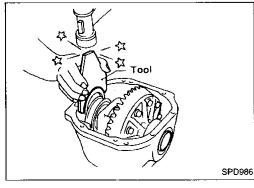


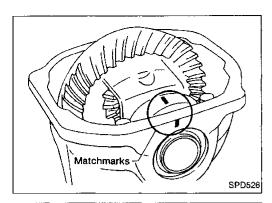
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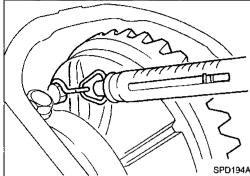
Side Bearing Preload (Cont'd)

5. Install the side bearing caps in their correct locations and torque the bearing cap retaining bolts.

Specification:

88 - 98 N·m (9 - 10 kg-m, 65 - 72 ft-lb)

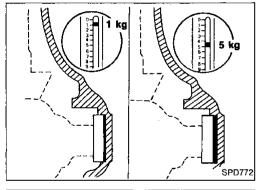
6. Turn the carrier several times to seat the bearings.



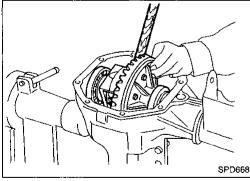
7. Measure the turning torque of the carrier at the ring gear retaining bolts with a spring gauge, J8129.

Specification:

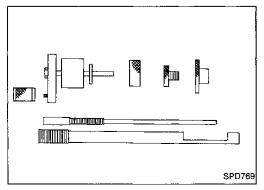
34.3 - 39.2 N (3.5 - 4 kg, 7.7 - 8.8 lb) of pulling force at the ring gear bolt.



- 8. If the carrier turning torque is not within the specification range, increase or decrease the total thickness of the side bearing adjusting washers until the turning torque is correct. If the turning torque is less than the specified range, install washers of greater thickness; if the turning torque is greater than the specification, install thinner washers. See the SDS section for washer dimensions and part numbers.
- Record the total amount of washer thickness required for the correct carrier side bearing preload.

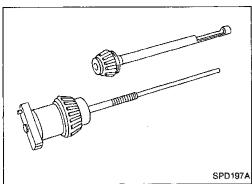


 Remove the carrier from the final drive housing, saving the selected preload washers for later use during the assembly of the final drive unit.



Pinion Gear Height and Pinion Bearing Preload

- Make sure all parts are clean and that the bearings are well lubricated.
- 2. Assemble the pinion gear bearings into the pinion pre-load shim selector Tool, J34309.



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Pinion Gear Height and Pinion Bearing Preload (Cont'd)

Front Pinion Bearing — make sure the J34309-3 front pinion bearing seat is secured tightly against the J34309-2 gauge anvil. Then turn the front pinion bearing pilot, J34309-5, to secure the bearing in its proper position.



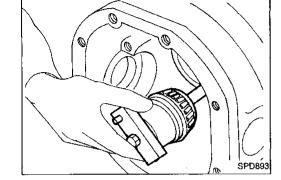
Rear Pinion Bearing — the rear pinion bearing pilot, J34309-15, is used to center the rear pinion bearing only. The rear pinion bearing locking seat, J34309-4, is used to lock the bearing to the assembly.

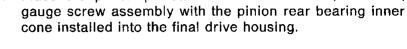


Place the pinion preload shim selector Tool, J34309-1,



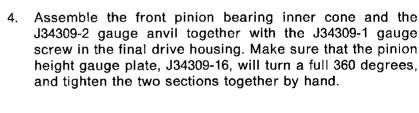
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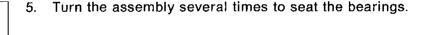


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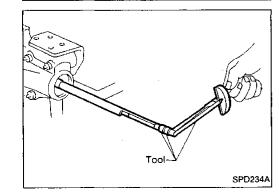


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Measure the turning torque at the end of the J34309-2 gauge anvil using torque wrench J25765A.



1.0 - 1.3 N·m (10 - 13 kg-cm, 8.7 - 11.3 in-lb)

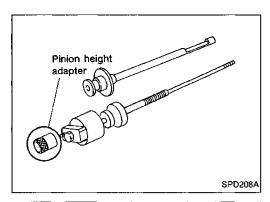


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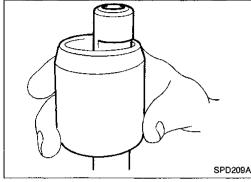


Pinion Gear Height and Pinion Bearing Preload (Cont'd)

7. Place the J34309-1 "R200A" pinion height adapter onto the gauge plate and tighten it by hand.

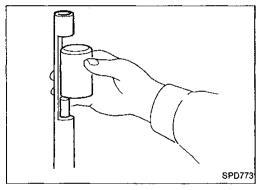
CAUTION:

Make sure all machined surfaces are clean.



PINION BEARING PRELOAD WASHER SELECTION

8. Place the solid pinion bearing spacer, small end first, over the J34309-2 gauge anvil and seat the small end squarely against the tip of the J34309-1 gauge screw in the tool recessed portion.

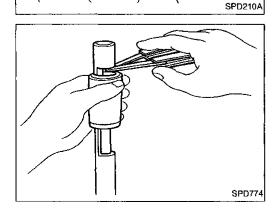


 Select the correct thickness of pinion bearing preload adjusting washer using a standard gauge of 3.5 mm (0.138 in) and your J34309-101 feeler gauge. The exact measure you get with your gauges is the thickness of the adjusting washer required. Select the correct washer.



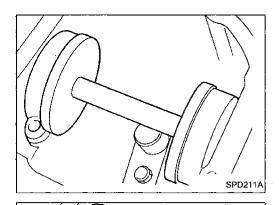
Drive pinion bearing preload adjusting washer: Refer to SDS (PD-100).

10. Set your selected, correct pinion bearing preload adjusting washer aside for use when assembling the pinion gear and bearings into the final drive.



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the arbor.



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SPD204A

\$PD775

Pinion Gear Height and Pinion Bearing Preload (Cont'd)

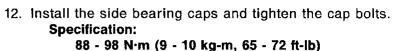
PINION HEIGHT ADJUSTING WASHER SELECTION

11. Now, position the side bearing discs, J25269-4, and arbor firmly into the side bearing bores.



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13. Select the correct standard pinion height adjusting washer thickness by using a standard gauge of 3.0 mm (0.118 in) and your J34309-101 feeler gauge. Measure the gap between the J34309-11 "R200A" pinion height adapter and

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Write down your exact total measurement.

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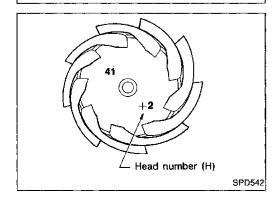
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15. Correct the pinion height washer size by referring to the "pinion head number".

Note: There are two numbers painted on the pinion gear. The first one refers to the pinion and ring gear as a matched set and should be the same as the number on the ring gear. The second number is the "pinion head height number," and it refers to the ideal pinion height from standard for quietest operation.

Pinion Gear Height and Pinion Bearing Preload (Cont'd)

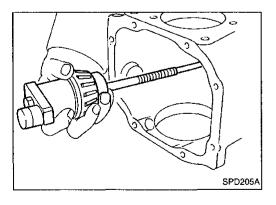
Use the following chart to determine the correct pinion height washer.

Pinion Head Height Number	Add or Remove from the Standard Pinion Height Washer Thickness Measurement
-6	Add 0.06 mm (0.0024 in)
-5	Add 0.05 mm (0.0020 in)
4	Add 0.04 mm (0.0016 in)
-3	Add 0.03 mm (0.0012 in)
-2	Add 0.02 mm (0.0008 in)
_1	Add 0.01 mm (0.0004 in)
0	Use the selected washer thickness
+1	Subtract 0.01 mm (0.0004 in)
+2	Subtract 0.02 mm (0.0008 in)
+3	Subtract 0.03 mm (0.0012 in)
+4	Subtract 0.04 mm (0.0016 in)
+5	Subtract 0.05 mm (0.0020 in)
+6	Subtract 0.06 mm (0.0024 in)

16. Select the correct drive pinion height washer.

Drive pinion height adjusting washer:

Refer to SDS (PD-100).



17. Remove the J34309 pinion preload shim selector tool from the final drive housing and disassemble to retrieve the pinion bearings.

Tooth Contact

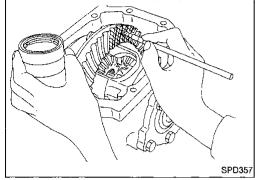
Gear tooth contact pattern check is necessary to verify correct relationship between ring gear and drive pinion.

Hypoid gear sets which are not positioned properly in relation to one another may be noisy, or have short life, or both. With a pattern check, the most desirable contact for low noise level and long life can be assured.



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Thoroughly clean ring gear and drive pinion teeth.

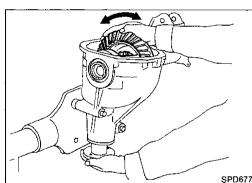
Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.



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Hold companion flange steady by hand and rotate the ring gear in both directions.



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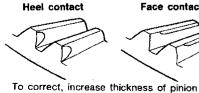
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Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct. However, in rare cases you may have to use trial-and-error processes until you get a good tooth contact pattern. The tooth pattern is the best indication of how well a differential has been set up. Face contact Toe contact Flank contact



height adjusting washer in order to bring

drive pinion close to ring gear.





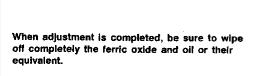
To correct, reduce thickness of pinion height adjusting washer in order to make

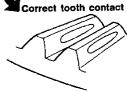
drive pinion go away from ring gear.

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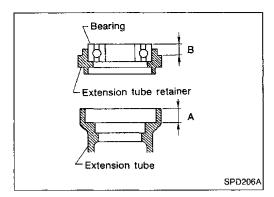
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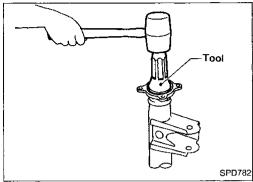
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Differential Side Shaft

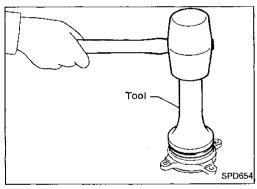
Measure rear axle bearing end play.
 Rear axle bearing end play (A - B):
 0.1 mm (0.0039 in) or less

The end play can be adjusted with bearing adjusting shim. Refer to SDS (PD-100).

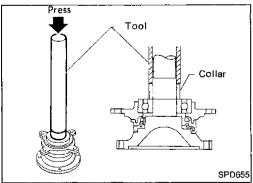


2. Install oil seal and grease seal.

Tool number: \$T33190000 (—)
Equivalent tool (J26233)

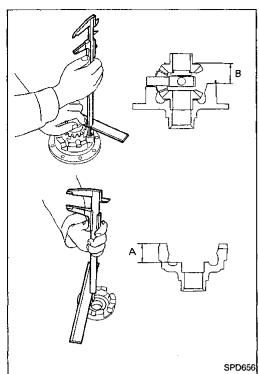


Tool number: (J26233)



 Install extension tube retainer, rear axle bearing and rear axle shaft bearing collar on differential side shaft.

PD-50 848



Differential Case

Measure clearance between side gear thrust washer and differential case.

> Clearance between side gear thrust washer and differential case (A - B):

0.10 - 0.20 mm (0.0039 - 0.0079 in)

The clearance can be adjusted with side gear thrust washer.

Available side gear thrust washers: Refer to SDS (PD-100).

Apply gear oil to gear tooth surfaces and thrust surfaces and check to see they turn properly.

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Install differential case LH and RH.

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Place differential case on ring gear.

Apply locking agent [Locktite (stud lock) or equivalent] to ring gear bolts, and install them.

Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.

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Press-fit side bearing inner cones on differential case with Tool.

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Tool number:

(A) KV38100300 (J25523)

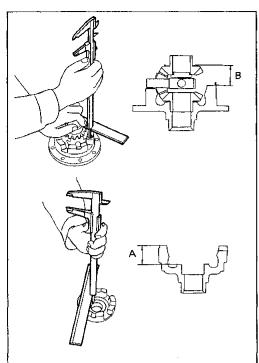
B ST33061000 (J8107-2)

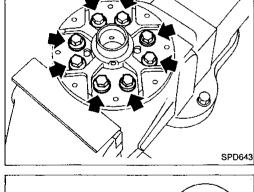
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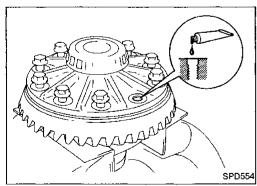
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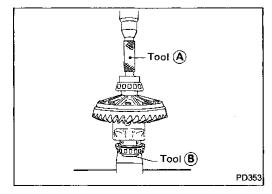
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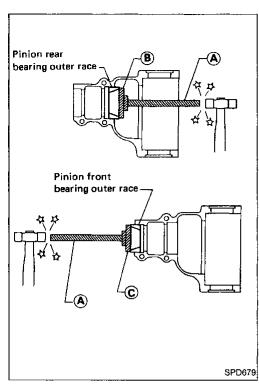
PD-51





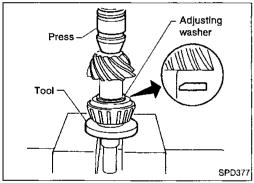






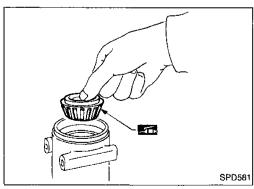
Final Drive Housing

- 1. Press-fit front and rear bearing outer races with Tools.
 - **Tool number:**
 - **(A)** ST30611000 (J25742-1)
 - **B** ST30621000 (J25742-5)
 - © \$T30613000 (J25742-3)

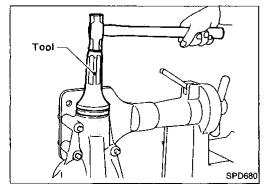


- 2. Select drive pinion height adjusting washer and pinion bearing adjusting washer. Refer to ADJUSTMENT (PD-44).
- 3. Install drive pinion height adjusting washer in drive pinion, and press-fit pinion rear bearing inner cone in it, using press and Tool.

Tool number: \$T30901000 (—)
Equivalent tool (J26010-01)

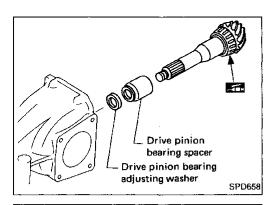


4. Place pinion front bearing inner cone in final drive housing.



Apply multi-purpose grease to cavity at sealing lips of oil seal. Install front oil seal.

Tool number: KV38100500 (—)
Equivalent tool (J25273)

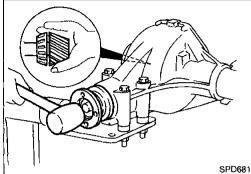


Place drive pinion bearing spacer, drive pinion bearing adjusting washer and drive pinion in final drive housing.



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Insert companion flange into drive pinion by tapping the companion flange with a soft hammer.



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Tighten pinion nut to the specified torque.

The threaded portion of drive pinion and pinion nut should be free from oil or grease.

Tool number: \$T38060002 (J34311)

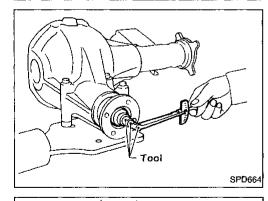
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Tool

Turn drive pinion in both directions several revolutions, and measure pinion bearing preload.

> Tool number: ST3127S000 (J25765-A) Pinion bearing preload:

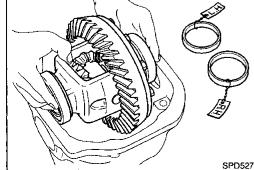
1.1 - 1.7 N·m

(11 - 17 kg-cm, 9.5 - 14.8 in-lb)

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When pinion bearing preload is outside the specifications, replace pinion bearing adjusting washer and spacer with a different thickness.

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Select side bearing adjusting washer. Refer to ADJUSTMENT (PD-43).

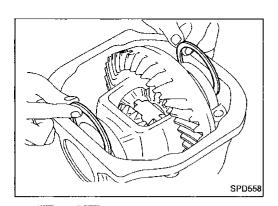
11. Install differential case assembly with side bearing outer races into final drive housing.

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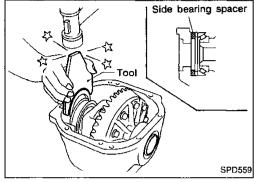
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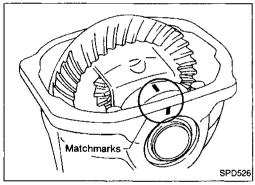


12. Insert left and right side bearing adjusting washers in place between side bearings and final drive housing.

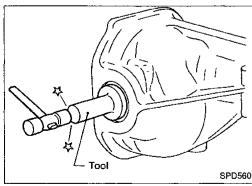


13. Drive in side bearing spacer with Tool.

Tool number: KV38100600 (J25267)

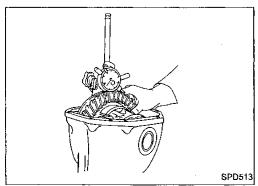


14. Align mark on bearing cap with that on final drive housing and install bearing cap on final drive housing.



15. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install side oil seal.

Tool number: KV38100200 (J26233)

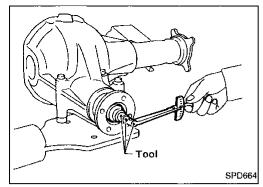


16. Measure ring gear to drive pinion backlash with a dial indicator.

Ring gear to drive pinion backlash: 0.13 - 0.18 mm (0.0051 - 0.0071 in)

 If backlash is too small, decrease thickness of right shim and increase thickness of left shim by the same amount.
 If backlash is too great, reverse the above procedure.

Never change the total amount of shims as it will change the bearing preload.

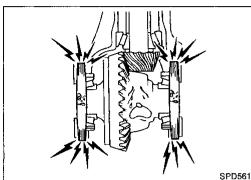


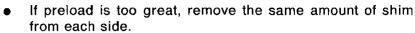
17. Check total preload with Tool.

When checking preload, turn drive pinion in both directions several times to set bearing rollers.

Tool number: ST3127S000 (J25765-A)
Total preload:
1.4 - 3.1 N·m

(14 - 32 kg-cm, 12 - 28 in-lb)

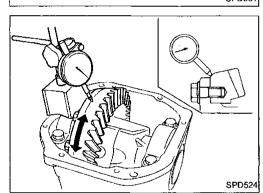




 If preload is too small, add the same amount of shim to each side.

Never add or remove a different number of shims for each side as it will change ring gear to drive pinion backlash.

18. Recheck ring gear to drive pinion backlash because increase or decrease in thickness of shims will cause change of ring gear-to-pinion backlash.

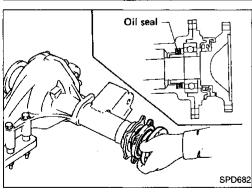


Check runout of ring gear with a dial indicator.
 Runout limit:

0.05 mm (0.0020 in)

- If backlash varies excessively in different places, the variance may have resulted from foreign matter caught between the ring gear and the differential case.
- If the backlash varies greatly when the runout of the ring gear is within a specified range, the hypoid gear set or differential case should be replaced.
- 20. Check tooth contact. Refer to ADJUSTMENT (PD-49).
- 21. Install rear cover and gasket.

22. Install differential side shaft assembly.





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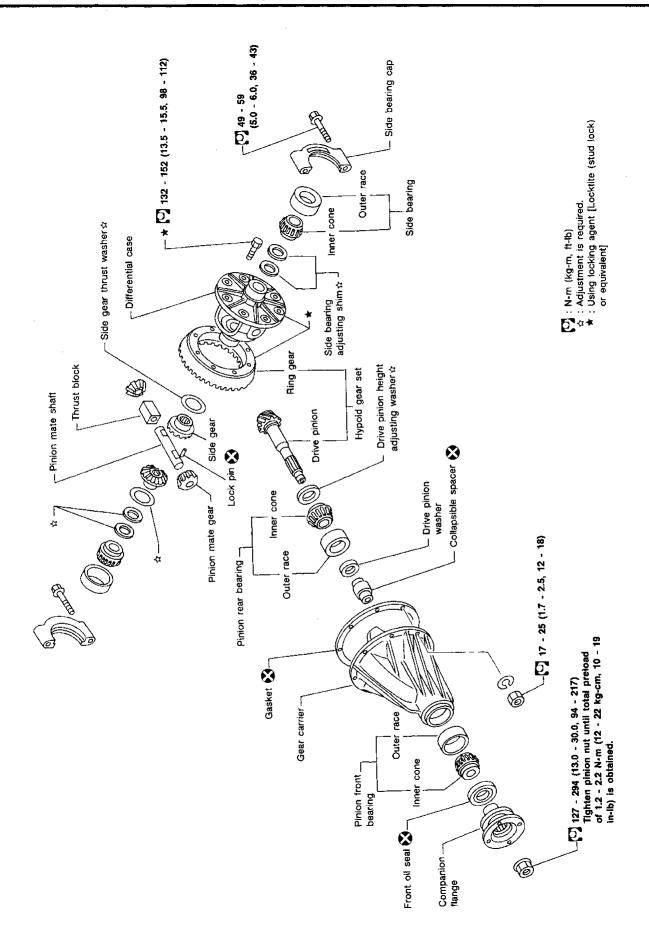
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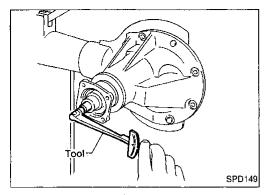
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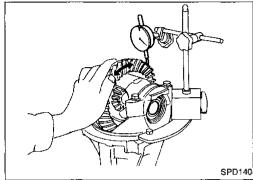
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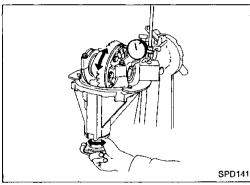
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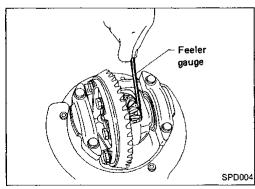
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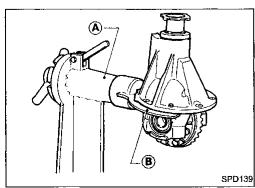
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Pre-inspection

Before disassembling final drive, perform the following inspec-

- Total preload
- 1) Turn drive pinion in both directions several revolutions to seat bearing rollers correctly.
- Check total preload with Tool.

Tool number: \$T3127\$000 (J25765-A) Total preload:

1.2 - 2.2 N·m

(12 - 22 kg-cm, 10 - 19 in-lb)

Ring gear to drive pinion backlash Check backlash of ring gear with a dial indicator at several points.

Ring gear to drive pinion backlash:

0.13 - 0.18 mm (0.0051 - 0.0071 in)

Ring gear runout Check runout of ring gear with a dial indicator. **Runout limit:**

0.05 mm (0.0020 in)

Tooth contact Check tooth contact. Refer to ADJUSTMENT (PD-67).

Side gear to pinion mate gear backlash Measure clearance between side gear thrust washer and differential case with a feeler gauge.

Clearance between side gear thrust washer and differential case:

0.10 - 0.20 mm (0.0039 - 0.0079 in)

Differential Carrier

Mount differential carrier on Tools.

Tool number:

A ST0501S000 (—)

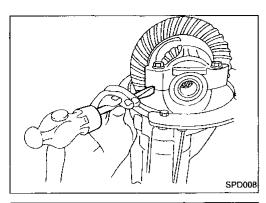
B ST06310000 (J25602-01)

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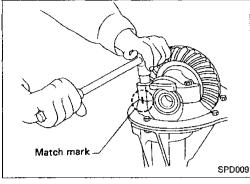
PD-57 855



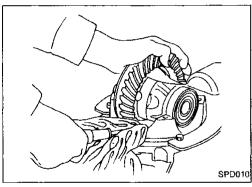
Differential Carrier (Cont'd)

2. Put match marks on one side of side bearing cap with paint or punch to ensure that it is replaced in proper position during reassembly.

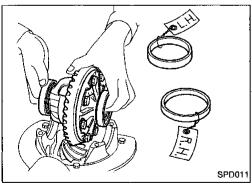
Bearing caps are line-bored during manufacture and should be put back in their original places.



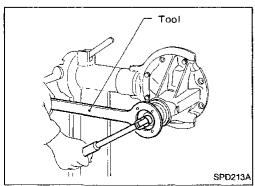
3. Remove side bearing caps.



4. Remove differential case assembly with a pry bar.



Be careful to keep the side bearing outer races together with their respective inner cones — do not mix them up.



- 5. Remove drive pinion nut with Tool.
 - Tool number: ST38060002 (J34311)
- 6. Remove companion flange with puller.

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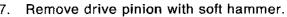
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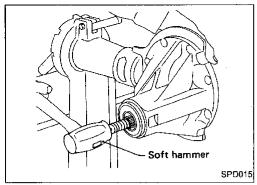
ST

DISASSEMBLY

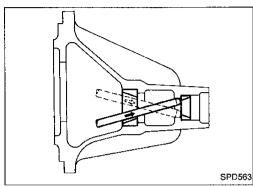
Differential Carrier (Cont'd)



8. Remove oil seal.





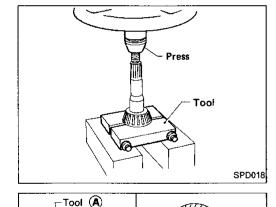


Remove pinion bearing outer races with a brass drift.

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10. Pull out rear bearing inner cone with a press and Tool. Tool number: \$T30031000 (J22912-01)

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Groove

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Differential Case

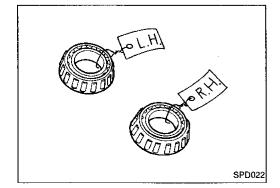
Remove side bearing inner cones.

To prevent damage to bearing, engage puller Jaws in groove. Tool number:

(A) ST33051001 (Equivalent tool (J22888)

B ST33061000 (J8107-2)

Be careful not to confuse the left and right hand parts.



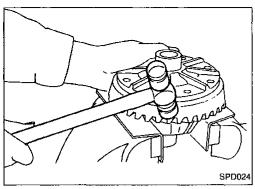
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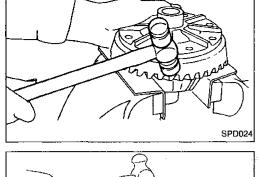
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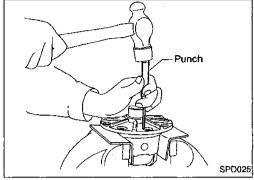






- 2. Spread out lock straps and loosen ring gear bolts in a criss-cross fashion.
- Tap ring gear off differential case with a soft hammer.

Tap evenly all around to keep ring gear from binding.



4. Drive out pinion mate shaft lock pin, with Tool from ring gear side.

Lock pin is calked at pin hole mouth on differential case.

PD-60 858

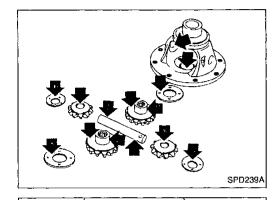
Ring Gear and Drive Pinion

Check gear teeth for scoring, cracking or chipping. If any damaged part is evident, replace ring gear and drive pinion as a set (hypoid gear set).



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Differential Case Assembly

Check mating surfaces of differential case, side gears, pinion LC mate gears, pinion mate shaft, and thrust washers.



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Thoroughly clean bearing.

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Check bearings for wear, scratches, pitting or flaking. Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner cone as a set.

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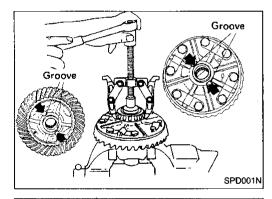
For quiet and reliable final drive operation, the following five adjustments must be made correctly:

- 1. Side Bearing Preload.
- 2. Pinion Gear Height.
- 3. Pinion Bearing Preload. Refer to ASSEMBLY (PD-71).
- 4. Ring Gear-to-pinion Backlash. Refer to ASSEMBLY (PD-71).
- 5. Ring and Pinion Gear Tooth Contact Pattern.

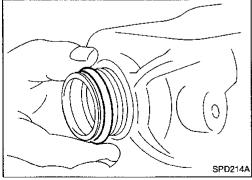
Side Bearing Preload

Note:

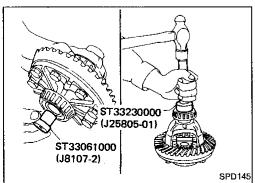
A selection of carrier side bearing preload shims is required for successful completion of this procedure.



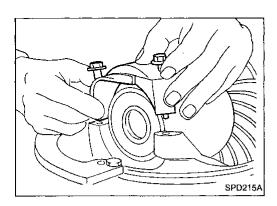
- Make sure all parts are clean and that the bearings are well lubricated with light oil or Dexron type automatic transmission fluid.
- 2. Attach side bearing puller Tools J22888 and J8107-2 to the carrier side bearing and remove the bearings.



Reinstall all of the original side bearing adjusting shims on the carrier side, away from the ring gear.



4. Reinstall the carrier side bearing using Tools J25805-01 and J8107-2. Press on the bearings.



Side Bearing Preload (Cont'd)

5. Install carrier and bearings into the final drive housing. Install side bearing caps. Torque the bolts and tap on the caps with a soft hammer to seat the bearings.

> Side bearing cap bolt torque: Specification 49 - 59 N·m (5 - 6 kg-m, 36 - 43 ft-lb)

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After turning the carrier several times to seat the bearings, measure carrier turning force with spring gauge J8129.

LC

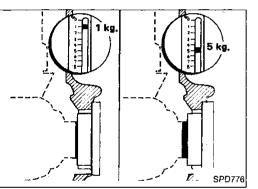
Turning force specification: 34.3 - 39.2 N (3.5 - 4.0 kg, 7.7 - 8.8 lb) of pulling force at the ring gear bolt.

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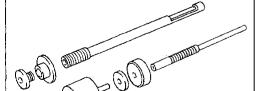


If necessary, correct the carrier bearing preload by adding to or subtracting from the total amount of shim thickness. Add shim thickness to increase turning force on the carrier. Subtract shim thickness to decrease turning force on the carrier.

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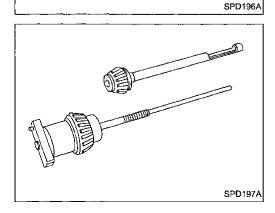
Pinion Gear Height Make sure all parts are clean and that the bearings are well



lubricated. Assemble the pinion gear bearings into the pinion pre-load shim selector tool, J34309.

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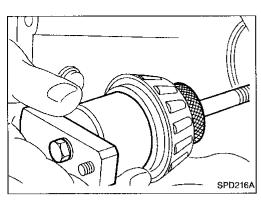


- Front Pinion Bearing --- make sure the J34309-3 front pinion bearing is secured tightly against the J34309 gauge anvil. Then turn the front pinion bearing pilot J34309-5 to secure the bearing in its proper position.
- Rear Pinion Bearing the rear pinion bearing pilot, J34309-15, is used to center the rear pinion bearing only. The rear pinion bearing locking seat, J34309-4 is used to lock the bearing to the assembly.

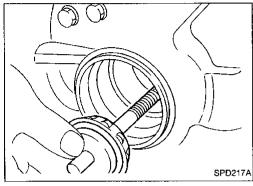
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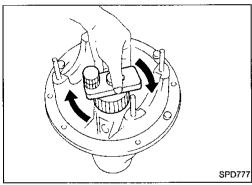
Pinion Gear Height (Cont'd)



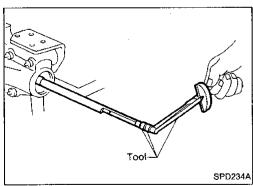
3. Place the pinion pre-load shim selector Tool J34309-1 gauge screw assembly with the pinion rear bearing inner cone installed into the final drive housing.



4. Assemble the front pinion bearing inner cone and the J34309-2 gauge anvil together with the J34309-1 gauge screw in the final drive housing. Make sure that the pinion height gauge plate, J34309-16, will turn a full 360 degrees, and tighten the two sections together by hand.



Turn the assembly several times to seat the bearings.

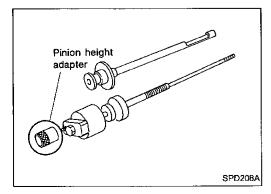


 Measure the turning torque at the end of the J34309-2 gauge anvil using torque wrench J25765A.

Turning torque specification:

1.0 - 1.3 N·m

(10 - 13 kg-cm, 8.7 - 11.3 in-lb)

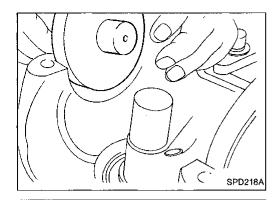


7. Place the J34309-14 pinion height adapter onto the gauge plate and tighten it by hand.

CAUTION:

Make sure all machined surfaces are clean.

PD-64



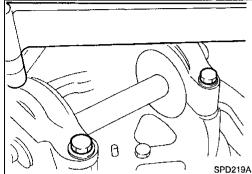
Pinion Gear Height (Cont'd) PINION HEIGHT ADJUSTING WASHER SELECTION

Now, position the side bearing discs, J25269-18, and arbor firmly into the side bearing bores.



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9. Install the side bearing caps and torque the cap bolts. **Specification:**

49 - 59 N·m (5 - 6 kg-m, 36 - 43 ft-lb)

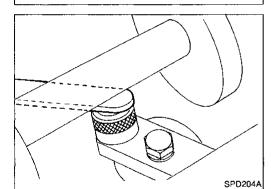


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 Select the correct standard pinion height adjusting washer thickness by using J34309-101 feeler gauge. Measure the gap between the J34309-14 pinion height adapter and the arbor.



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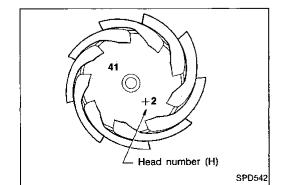
11. Write down your exact total measurement.



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12. Correct the pinion height washer size by referring to the "pinion head number".

Note:

There are two numbers painted on the pinion gear. The first one refers to the pinion and ring gear as a matched set and should be the same as the number on the ring gear. The second number is the "pinion head height number," and it refers to the ideal pinion height from standard for quietest operation.



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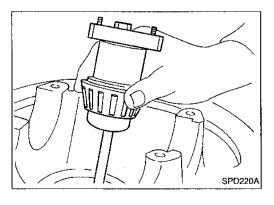
Pinion Gear Height (Cont'd)

Use the following chart to determine the correct pinion height washer.

Pinion Head Height Number	Add or Remove from the Standard Pinion Height Washer Thickness Measurement
6	Add 0.06 mm (0.0024 in)
- 5	Add 0.05 mm (0.0020 in)
-4	Add 0.04 mm (0.0016 in)
-3	Add 0.03 mm (0.0012 in)
2	Add 0.02 mm (0.0008 in)
-1	Add 0.01 mm (0.0004 in)
0	Use the selected washer thickness
+1	Subtract 0.01 mm (0.0004 in)
+2	Subtract 0.02 mm (0.0008 in)
+3	Subtract 0.03 mm (0.0012 in)
+4	Subtract 0.04 mm (0.0016 in)
+5	Subtract 0.05 mm (0.0020 in)
+6	Subtract 0.06 mm (0.0024 in)

13. Select the correct pinion height washer.

Drive pinion height adjusting washer: Refer to SDS (PD-101).



14. Remove the J34309 pinion preload shim selector tool from the final drive housing and disassemble to retrieve the pinion bearings.

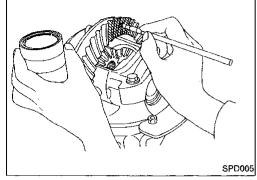
Tooth Contact

Checking of gear tooth contact pattern is necessary to verify correct relationship between ring gear and drive pinion. Hypoid gear sets which are not positioned properly in relation to one another may be noisy, or have short life, or both. With a pattern check, the most desirable contact for low noise level and long life can be assured.



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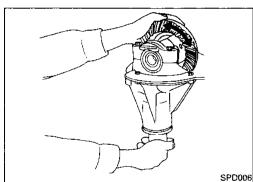
Thoroughly clean ring gear and drive pinion teeth.

Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.



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equivalent.

Hold companion flange steady by hand and rotate the ring gear in both directions.



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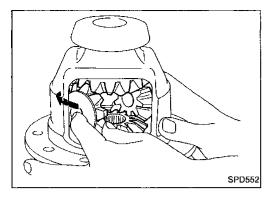
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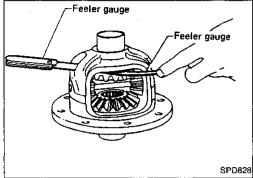
EL

Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct. However, in rare cases you may have to use trial-and-error processes until you get a good tooth contact pattern. The tooth pattern is the best indication of how well a differential has been set up. Heel contact Face contact Toe contact Flank contact To correct, increase thickness of pinion To correct, reduce thickness of pinion height adjusting washer in order to bring height adjusting washer in order to make drive pinion close to ring gear. drive pinion go away from ring gear. Correct tooth contact When adjustment is completed, be sure to wipe off completely the ferric oxide and oil or their



Differential Case

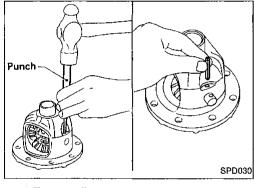
 Install side gears, pinion mate gears and thrust washers into differential case.



- 2. Fit pinion mate shaft to differential case so that it meets lock pin holes.
- Adjust backlash between side gear and pinion mate gear by selecting side gear thrust washer. Refer to SDS (PD-101).
 Backlash between side gear and pinion mate gear

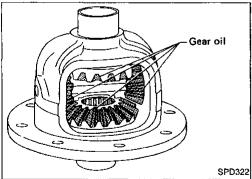
(Clearance between side gear thrust washer and differential case):

0.10 - 0.20 mm (0.0039 - 0.0079 in)

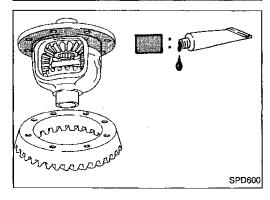


4. Install pinion mate shaft lock pin with a punch.

Make sure lock pin is flush with case.

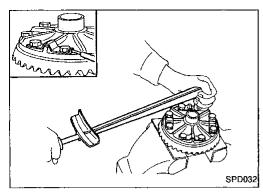


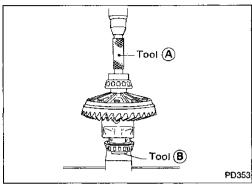
5. Apply gear oil to gear tooth surfaces and thrust surfaces and check to see they turn properly.

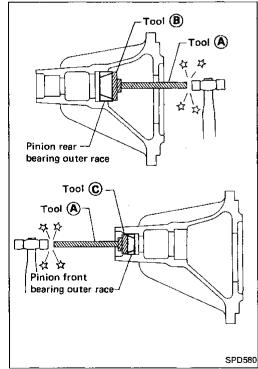


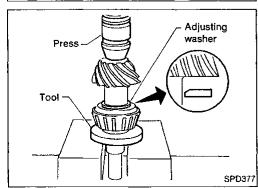
 Apply locking agent [Locktite (stud lock) or equivalent] to contacting surfaces of ring gear and differential case, then place differential case on ring gear.

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Differential Case (Cont'd)

- 7. Apply a small amount of locking agent (described on previous page) to ring gear bolts.
- 8. Install new lock straps and ring gear bolts.
- Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.
- Then bend up lock straps to lock the bolts in place.

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Select side bearing adjusting shims. Refer to ADJUSTMENT (PD-62).

10. Install the shims behind each bearing and press on side bearing inner cones with Tool.

Tool number:

- **(A)** ST33230000 (J25805-01)
- **B** ST33061000 (J8107-2)

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Differential Carrier

1. Press fit front and rear bearing outer races with Tools.

Tool number:

- **(A)** ST30611000 (J25742-1)
- © ST30613000 (J25742-3)

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Select pinion height adjusting washer. Refer to ADJUST-MENT (PD-63).

B. Install pinion height adjusting washer in drive pinion, and press fit rear bearing inner cone in it with press and Tool.

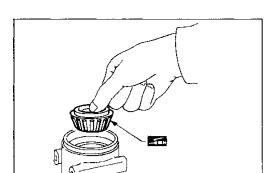
Tool number: ST30901000 (—)
Equivalent tool (J26010-01)

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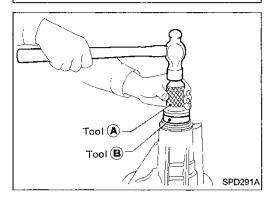
PD-69



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Differential Carrier (Cont'd)

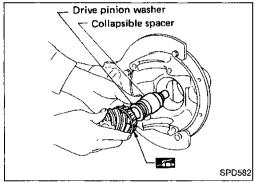
4. Place pinion front bearing inner cone in gear carrier.



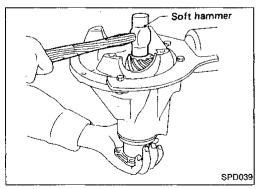
5. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install front oil seal.

Tool number:

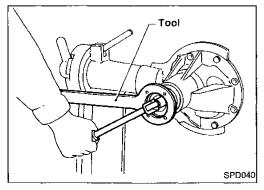
A ST30720000 (—)
 Equivalent tool (J25405)
 B KV38102510 (—)



6. Install drive pinion washer, collapsible spacer and drive pinion in gear carrier.

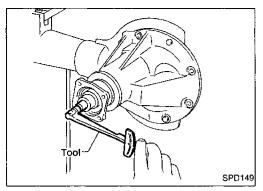


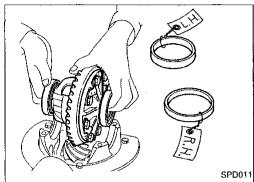
7. Install companion flange and hold it firmly.
Insert pinion into companion flange by tapping its head with a soft hammer.

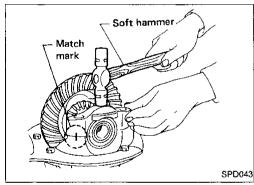


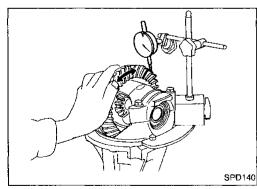
8. Temporarily tighten pinion nut until there is no axial play. The threaded portion of drive pinion and pinion nut should be free from oil or grease.

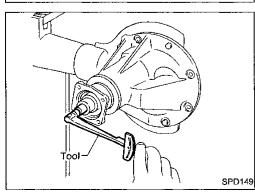
Tool number: ST38060002 (J34311)











Differential Carrier (Cont'd)

Tighten pinion nut by degrees to the specified preload while checking the preload with Tools.

When checking preload, turn drive pinion in both directions several times to seat bearing rollers correctly.

Pinion bearing preload:

1.1 - 1.6 N·m (11 - 16 kg-cm, 9.5 - 13.9 in-lb)

Tool number: ST3127S000 (J25765-A)

CAUTION:

The preload is achieved by using the permanent set of collapsible spacer. So here, if an overpreload results from excessive turning of the pinion nut, the spacer should be replaced by new

10. Install differential case assembly with side bearing outer races into gear carrier.

11. Align mark on bearing cap with that on gear carrier and install bearing cap on gear carrier.

12. Measure ring gear to drive pinion backlash with a dial indicator.

Ring gear to drive pinion backlash: 0.13 - 0.18 mm (0.0051 - 0.0071 in)

If backlash is too small, decrease thickness of left shim and increase thickness of right shim by the same amount.

If backlash is too great, reverse the above procedure.

Never change the total amount of shims as it will change the bearing preload.

13. Check total preload with Tool.

When checking preload, turn drive pinion in both directions several times to set bearing rollers.

Tool number: ST3127S000 (J25765-A)

Total preload:

1.2 - 2.2 N·m (12 - 22 kg-cm, 10 - 19 in-lb)

PD-71

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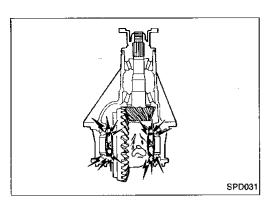
BR

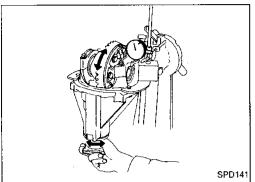
ST

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Differential Carrier (Cont'd)

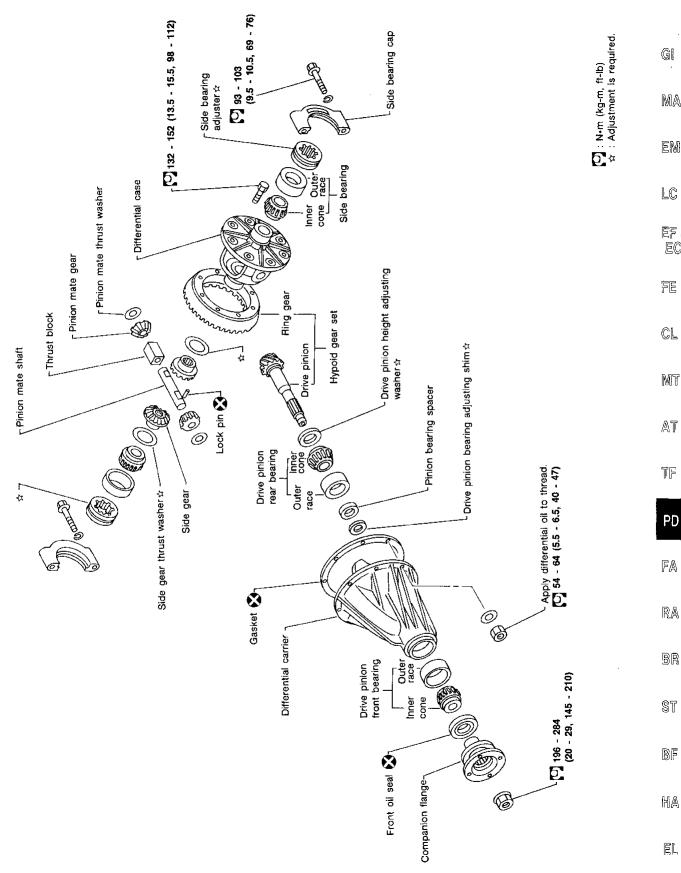
- If preload is too great, remove the same amount of shims from each side.
- If preload is too small, add the same amount of shims to each side.

Never add or remove a different number of shims for each side as it will change ring gear-to-drive pinion backlash.

- 14. Recheck ring gear-to-drive pinion backlash because an increase or decrease in thickness of shims will cause change of ring gear-to-pinion backlash.
- 15. Check runout of ring gear with a dial indicator.

 Runout limit: 0.05 mm (0.0020 in)
- If backlash varies excessively in different places, the variance may have resulted from foreign matter caught between the ring gear and the differential case.
- If the backlash varies greatly when the runout of the ring gear is within a specified range, the hypoid gear set or differential case should be replaced.
- Check tooth contact. Refer to ADJUSTMENT (PD-67).

2-pinion type



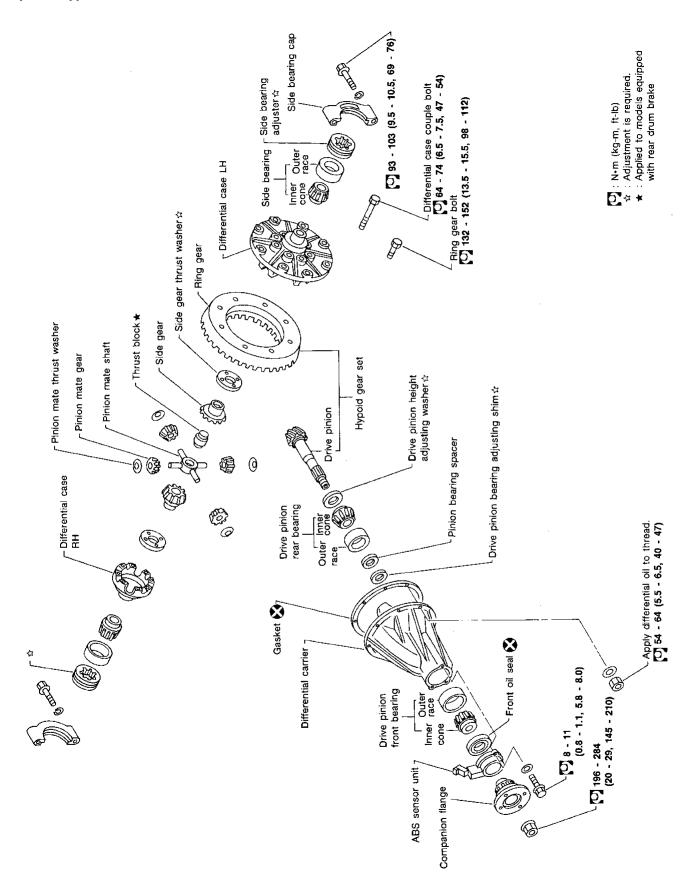
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(D)X SPD289A

4-pinion type



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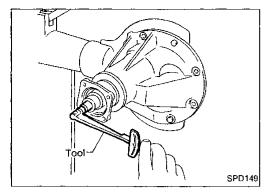
RA

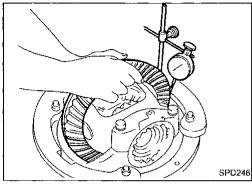
 $\mathbf{B}\mathbf{R}$

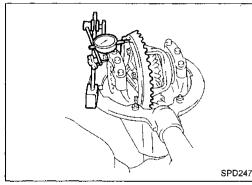
ST

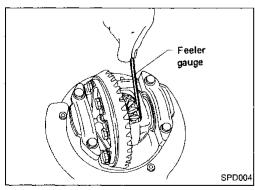
BF

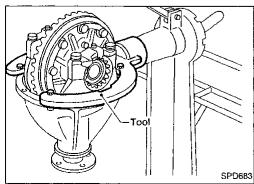
HA











Pre-inspection

Before disassembling final drive, perform the following inspection.

- Total preload
- 1) Turn drive pinion in both directions several times to seat bearing rollers correctly.
- Check total preload with Tool.

Total preload:

1.7 - 2.5 N·m

(17 - 25 kg-cm, 15 - 22 in-lb)

Tool number: ST3127S000 (J25765-A)

Ring gear to drive pinion backlash Check backlash of ring gear with a dial indicator at several points.

Ring gear-to-drive pinion backlash:

0.15 - 0.20 mm (0.0059 - 0.0079 in)

Ring gear runout Check runout of ring gear with a dial indicator.

Runout limit: 0.08 mm (0.0031 in)

Tooth contact

Check tooth contact, referring to ADJUSTMENT (PD-90).

Side gear to pinion mate gear backlash Measure clearance between side gear thrust washer and differential case with a feeler gauge.

Clearance between side gear thrust washer and differential case:

0.10 - 0.20 mm (0.0039 - 0.0079 in)

Differential Carrier

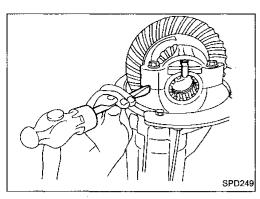
Mount final drive assembly on Tool. Tool number: ST06340000 (

Equivalent tool (J25602-3), (J34310)

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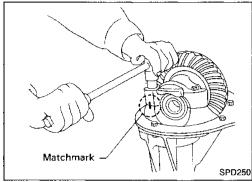
PD-75



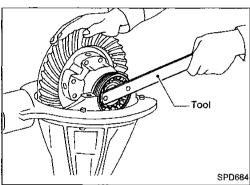
Differential Carrier (Cont'd)

Put match marks on one side of side bearing cap with paint or punch to ensure that it is replaced in proper position during reassembly.

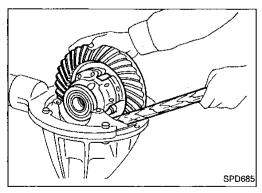
Bearing caps are line-bored during manufacture and should be put back in their original places.



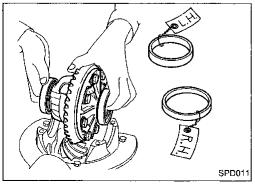
3. Remove side lock fingers and side bearing caps.



4. Remove side bearing adjuster with Tool. Tool number: \$T32580000 (J34312)



5. Remove differential case assembly with a pry bar.



Be careful to keep the side bearing outer races together with their respective inner cones — do not mix them up.

DISASSEMBLY

Differential Carrier (Cont'd)

Remove drive pinion nut with Tool. Tool number: KV38104700 (J34311)

- Remove companion flange with puller.
- Remove ABS sensor. (Models with ABS)



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SPD563

SPD213A

Tool

Take out drive pinion together with pinion rear bearing inner cone, drive pinion bearing spacer and pinion bearing adjusting shim.



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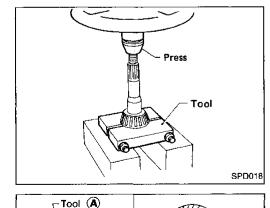
10. Remove front oil seal and pinion front bearing inner cone. 11. Remove pinion bearing outer races with a brass drift.



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Brass drift

12. Remove pinion rear bearing inner cone and drive pinion adjusting washer.

Tool number: \$T30031000 (J22912-01)



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1. Remove side bearing inner cones.

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To prevent damage to bearing, engage puller jaws in groove. Tool number:

> (A) ST33051001 (Equivalent tool (J22888)

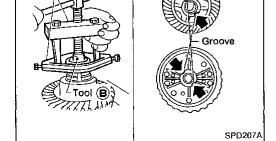
HA

B \$T33061000 (J8107-2)

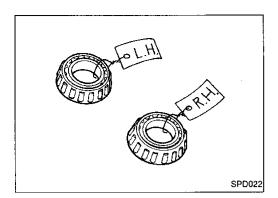
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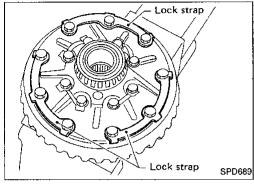




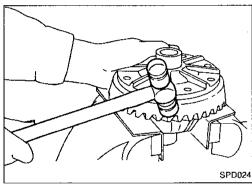
Differential Case (Cont'd)



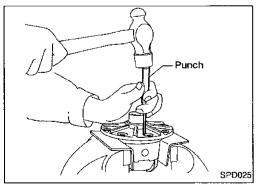
Be careful not to confuse the left and right hand parts.



Spread out lock straps and loosen ring gear bolts in a criss-cross fashion.

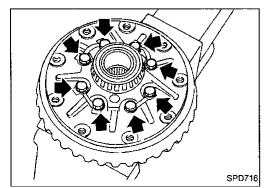


3. Tap ring gear off differential case with a soft hammer. Tap evenly all around to keep ring gear from binding.



4. Drive out pinion mate shaft lock pin, with punch from ring gear side (2-pinion type differential case).

Lock pin is calked at pin hole mouth on differential case.



Separate differential case LH and RH (4-pinion type differential case).

Put match marks on both differential case LH and RH sides prior to separating them.

PD-78 876

Ring Gear and Drive Pinion

Check gear teeth for scoring, cracking or chipping. If any damaged part is evident, replace ring gear and drive pinion as a set (hypoid gear set).

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2-pinion type

4-pinion type

Differential Case Assembly

Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft, and thrust washers.

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SPD717

1. Thoroughly clean bearing.

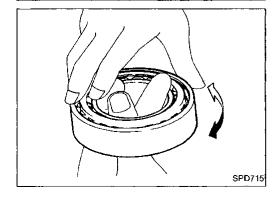
BF

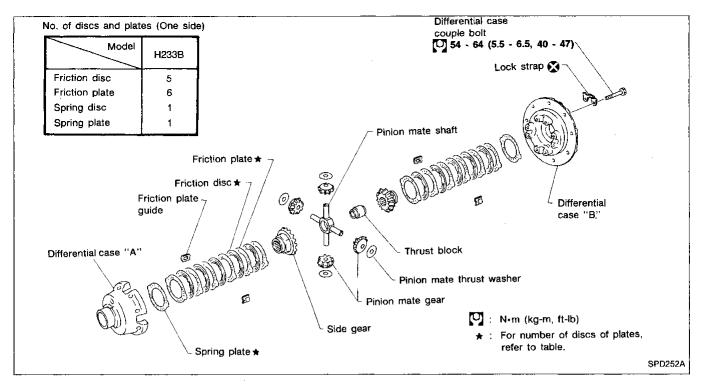
 Check bearings for wear, scratches, pitting or flaking.
 Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner cone as a set.

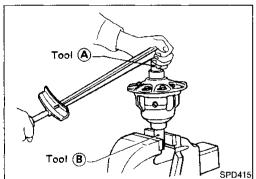
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CAUTION:

Do not run engine when one wheel (rear) is off the ground.

Preparation for Disassembly

CHECKING DIFFERENTIAL TORQUE

Measure differential torque with Tool.

If it is not within the specifications, inspect components of limited slip differential.

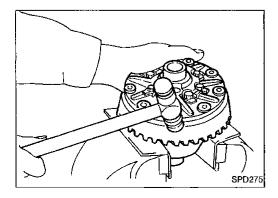
Differential torque:

353 - 392 N·m

(36 - 40 kg-m, 260 - 289 ft-lb)

Tool number:

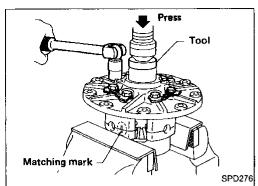
- **A** KV38105210 (—

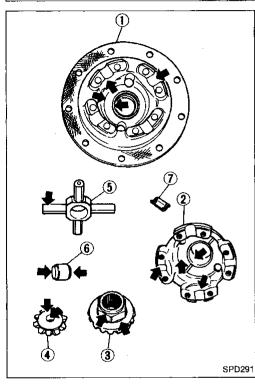


Disassembly

- Remove side bearing inner cone with Tool.
- 2. Remove ring gear by spreading out lock straps.
- 3. Loosen ring gear bolts in a criss-cross fashion.
- Tap ring gear off gear case with a soft hammer.

Tap evenly all around to keep ring gear from binding.





Disassembly (Cont'd)

Remove differential case by spreading out lock straps.

Remove couple boits on differential cases A and B with a press.

Tool number: ST33081000 (

7. Separate differential case A and B. Draw out component parts (discs and plates, etc.).

Put marks on gears and pressure rings so that they can be reinstalled in their original positions from which they were removed.

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Inspection

CONTACT SURFACES

Clean the disassembled parts in suitable solvent and blow dry with compressed air.

If following surfaces are found with burrs or scratches, smooth with oil stone.

- (1) Differential case A
- ② Differential case B
- 3 Side gear
- 4 Pinion mate gear
- (5) Pinion mate shaft
- (6) Thrust block
- 7) Friction plate guide

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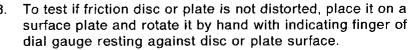
DISC AND PLATE

- Clean the discs and plates in suitable solvent and blow dry with compressed air.
- Inspect discs and plates for wear, nicks and burrs.



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Allowable warpage:

0.05 - 0.15 mm (0.0020 - 0.0059 in)

If it exceeds limits, replace with a new plate to eliminate possibility of clutch slippage or sticking.

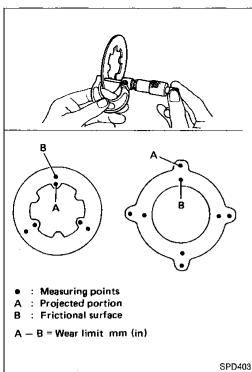


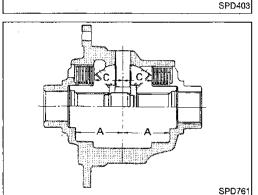
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Inspection (Cont'd)

- Measure frictional surfaces and projected portions of friction disc, friction plate, spring plate, and determine each part's differences to see if the specified wear limit has been exceeded.
- Measure frictional surfaces and projected portions of friction disc, friction plate; spring plate and spring disc (H233B only).

If any part has worn beyond the wear limit, replace it with a new one that is the same thickness as the projected portion.

Wear limit:

0.1 mm (0.004 in) or less

Adjustment

FRICTION DISC AND FRICTION PLATE END PLAY

End play of friction disc and friction plate can be calculated by using following equation and should be adjusted within following range.

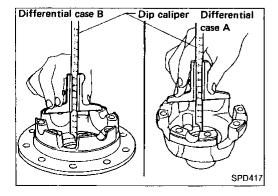
Adjustment can be made by selecting friction disc having two different thicknesses.

End play E:

0.05 - 0.15 mm (0.0020 - 0.0059 in)

E = A - (B + C)

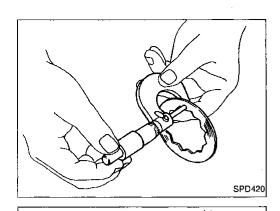
- A: Length of differential case contact surface to differential case inner bottom.
- B: Total thickness of friction discs, friction plates, spring disc and spring plate in differential case on one side.
- C: Length of differential case contact surface to back side of side gear.



1. Measure values of "A".

Standard length A:

49.50 - 49.55 mm (1.9488 - 1.9508 in)



Suitable block

Suitable block [master gauge 30mm

(1.18in)]

[master gauge 30mm

(1.18 in)]

Adjustment (Cont'd)

Measure thickness of each disc and plate.

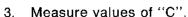
Total thickness "B":

19.24 - 20.26 mm (0.7575 - 0.7976 in)



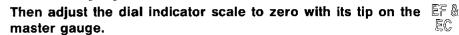
MA

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(1) Attach a dial indicator to the base plate.

(2) Place differential case B on the base plate, and install a master gauge on case B.





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(3) Install pinion mate gears, side gears and pinion mate shaft in differential case B.

(4) Set dial indicator's tip on the side gear, and read the indication.



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Example:

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SPD419

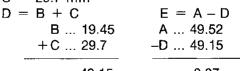
SPD421

$$E = A - D = A - (B + C) = 0.05 \text{ to } 0.15 \text{ mm}$$

A = 49.52 mm

B = 19.45 mm

C = 29.7 mm





49.15 0.37



From the above equation, end play of 0.37 mm exceeds the specified range of 0.05 to 0.15 mm.

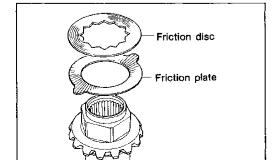
Select suitable discs and plates to adjust correctly.



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Assembly

Prior to assembling discs and plates, properly lubricate them BF by dipping them in limited slip differential oil.

Alternately position specified number of friction plates and friction discs on rear of side gear.

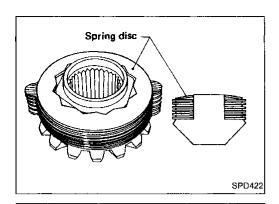
Always position a friction plate first on rear of side gear.



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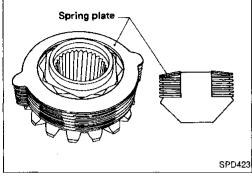
PD-83



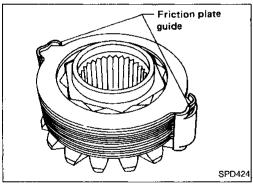
Assembly (Cont'd)

2. Install spring disc.

Align the twelve angular holes in spring disc with the hexagonal area of the side gear.

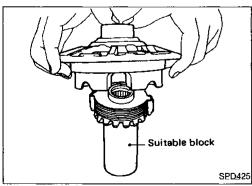


3. Install spring plate.

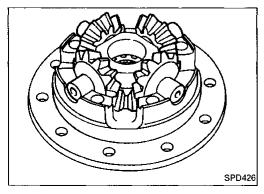


4. Install friction plate guides.

Correctly align the raised portions of friction plates, and apply grease to inner surfaces of friction plate guides to prevent them from falling.



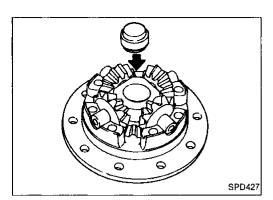
- 5. Install differential case B over side gear, discs, plates and friction plate guide assembly.
- Install differential case B while supporting friction plate guides with your middle finger inserted through oil hole in differential case.
- Be careful not to detach spring disc from the hexagonal part of the side gear.



Install pinion mate gears and pinion shaft to differential case B.

PD-84 882

Assembly (Cont'd)



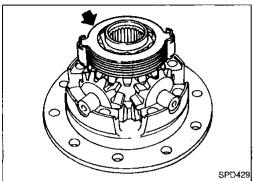
7. Install thrust block.



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Match mark

Install side gear to pinion mate gears.

Install each disc and plate.

Use same procedures as outlined in steps 1. through 4. above.

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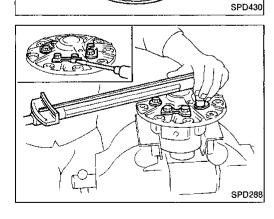
10. Install differential case A.

Position differential cases A and B by correctly aligning marks stamped on cases.

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11. Tighten differential case bolts.

12. Place ring gear on differential case and install new lock straps and bolts.

Tighten bolts in a criss-cross fashlon, lightly tapping bolt head with a hammer.

Then bend up lock straps to lock the bolts in place.

13. Install side bearing inner cone.

14. Check differential torque.

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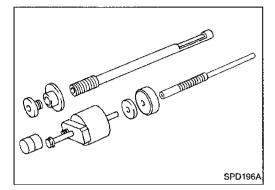
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PD-85

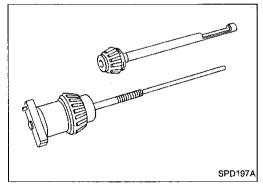
For quiet and reliable final drive operation, the following five adjustments must be made correctly:

- Side Bearing Preload.
- 2. Pinion Gear Height.
- Side Bearing Preload.
- 4. Ring Gear to pinion Backlash. Refer to ASSEMBLY (PD-95).
- 5. Ring and Pinion Gear Tooth Contact Pattern.

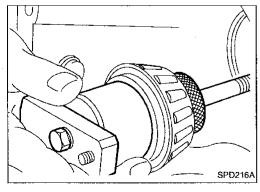


Pinion Bearing Preload and Pinion Gear Height

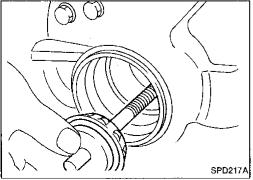
- Make sure all parts are clean and that the bearings are well lubricated.
- 2. Assemble the pinion gear bearings into the pinion pre-load shim selector tool, J34309.



- Rear Pinion Bearing the rear pinion bearing pilot, J34309-8, is used to center the rear pinion bearing only. The rear pinion bearing locking seat, J34309-4, is used to lock the bearing to the assembly.
- Front Pinion Bearing make sure he J34309-3, front pinion bearing seat is secured tightly against the J34309-2 gauge anvil. Then turn the front pinion bearing pilot, J34309-5, to secure the bearing in its proper position.

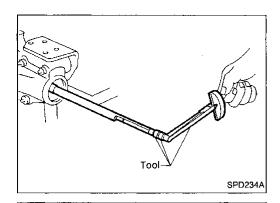


3. Place the pinion preload shim selector tool gauge screw assembly, J34309-1, with the pinion rear bearing inner cone installed, into the final drive housing.



- 4. Install the J34309-2 gauge anvil with the front pinion bearing into the final drive housing and assemble it to the J34309-1 gauge screw. Make sure that the J34309-16 gauge plate will turn a full 360 degrees, and tighten the two sections by hand to set bearing pre-load.
- 5. Turn the assembly several times to seat the bearings.

PD-86 884



Pinion height

adapter

Pinion Bearing Preload and Pinion Gear Height (Cont'd)

Measure the turning torque at the end of the J34309-2 gauge anvil using torque wrench J25765A.

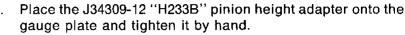
Turning torque specification:

0.4 - 0.9 N·m (4 - 9 kg-cm, 3.5 - 7.8 in-lb)



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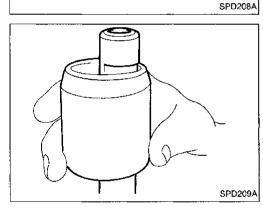


Make sure all machined surfaces are clean.





FE

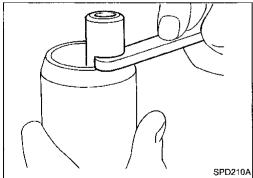


PINION BEARING PRELOAD WASHER SELECTION

Place the solid pinion bearing adjusting spacer squarely into the recessed portion of the J34309-2 gauge anvil. Rest its end on the J34309-1 gauge screw.

AT





Select the correct thickness of pinion bearing preload adjusting washer using your J34309-101 feeler gauge. The exact measurement you get with your feeler gauge is the thickness of the adjusting shim required. Select the correct shim.

RA

FA

Drive pinion bearing preload adjusting shim: Refer to SDS (PD-103).

10. Set correct pinion bearing preload adjusting shim aside for use when assembling the pinion and bearings into the final drive housing.

ST



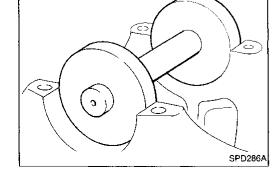
11. Position the J25269-18 side bearing discs and the arbor into the side bearing bores.

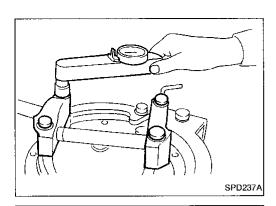
HA

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(ID)X





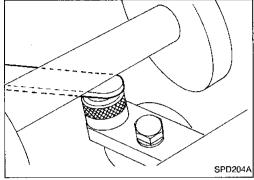


Pinion Bearing Preload and Pinion Gear Height (Cont'd)

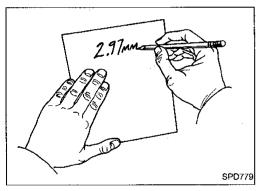
12. Install the bearing caps and torque the bolts.

Specification:

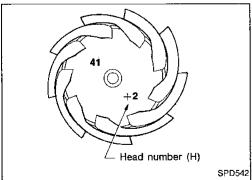
93 - 103 N·m (9.5 - 10.5 kg-m, 69 - 76 ft-lb)



13. Select the correct standard pinion height adjusting washer thickness using a standard gauge of 2.5, 3.0, or 3.5 mm (0.098, 0.118, or 0.138 in) and your J34309-101 feeler gauge. Measure the distance between the J34309-12 "H233B" pinion height adapter and the arbor.



14. Write down your exact total measurement.



15. Correct the pinion height washer size by referring to the "pinion head height number".

Note: There are two numbers painted on the pinion gear. The first one refers to the pinion and ring gear as a matched set and should be the same as the number on the ring gear. The second number is the "pinion head height number," and it refers to the ideal pinion height from standard for the quietest operation. Use the following chart to determine the correct pinion height washer.

PD-88 886

Pinion Bearing Preload and Pinion Gear Height (Cont'd)

Pinion Head Height Number	Add or Remove from the Selected Standard Pinion Height Washer Thickness Measurement
-6	Add 0.06 mm (0.0024 in)
- 5	Add 0.05 mm (0.0020 in)
-4	Add 0.04 mm (0.0016 in)
-3	Add 0.03 mm (0.0012 in)
-2	Add 0.02 mm (0.0008 in)
-1	Add 0.01 mm (0.0004 in)
0	Use the selected washer thickness
+1	Subtract 0.01 mm (0.0004 in)
+ 2	Subtract 0.02 mm (0.0008 in)
+3	Subtract 0.03 mm (0.0012 in)
+4	Subtract 0.04 mm (0.0016 in)
+5	Subtract 0.05 mm (0.0020 in)
+6	Subtract 0.06 mm (0.0024 in)

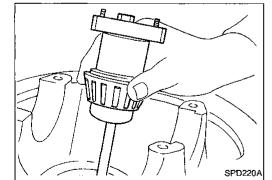
16. Select the correct pinion height washer. Drive pinion height adjusting washer: Refer to SDS (PD-102).

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17. Remove the J34309 pinion preload shim selector tool from the final drive housing and disassemble to retrieve the pinion bearings.

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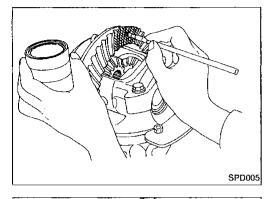
 $\mathbb{D}X$

PD-89

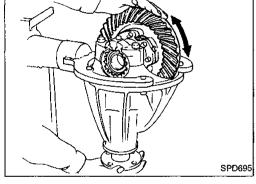
Tooth Contact

Gear tooth contact pattern check is necessary to verify correct relationship between ring gear and drive pinion.

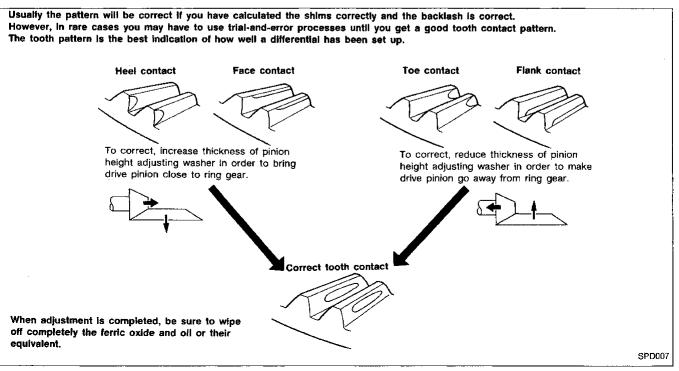
Hypoid gear sets which are not positioned properly in relation to one another may be noisy, or have short life or both. With a pattern check, the most desirable contact for low noise level and long life can be assured.

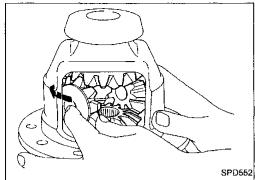


- 1. Thoroughly clean ring gear and drive pinion teeth.
- 2. Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.



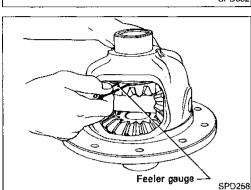
Hold companion flange steady by hand and rotate the ring gear in both directions.





Differential Case — 2-pinion type —

 Install side gears, pinion mate gears and thrust washers into differential case.

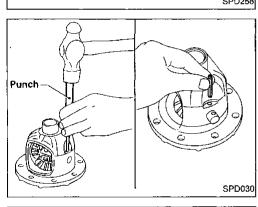


2. Fit pinion mate shaft to differential case so that it meets lock pin holes.

 Adjust backlash between side gear and pinion mate gear by selecting side gear thrust washer. Refer to SDS (PD-102).

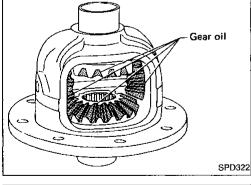
Backlash between side gear and pinion mate gear (Clearance between side gear thrust washer and differential case):

0.10 - 0.20 mm (0.0039 - 0.0079 in)



4. Install pinion mate shaft lock pin with a punch.

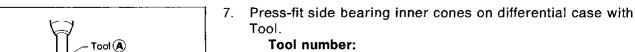
Make sure lock pin is flush with case.



Apply gear oil to gear tooth surfaces and thrust surfaces and check to see they turn properly.

Install differential case assembly on ring gear.

Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.



(A) ST33190000 (—)
Equivalent tool (J25523)
(B) ST33081000 (—)

10010

Tool (B)

PD244

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889

EF & EC

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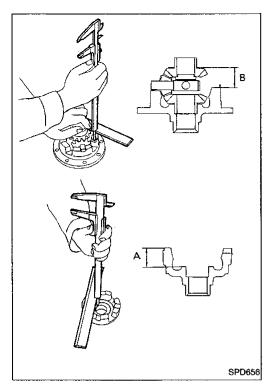
BR

ST

86

HA

[DX



Differential Case — 4-pinion type —

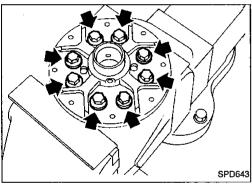
 Measure clearance between side gear thrust washer and differential case.

Clearance between side gear thrust washer and differential case (A - B):

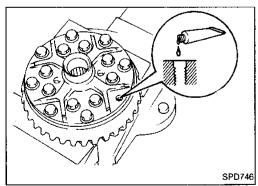
0.10 - 0.20 mm (0.0039 - 0.0079 in)

The clearance can be adjusted with side gear thrust washer. Refer to SDS (PD-102).

Apply gear oil to gear tooth surfaces and thrust surfaces and check to see they turn properly.

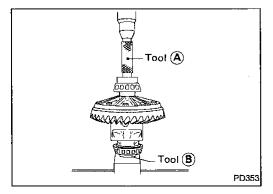


- 3. Install differential case LH and RH.
- 4. Install differential case on ring gear.



- 5. Place differential case on ring gear.
- 6. Apply locking agent [Locktite (stud lock) or equivalent] to ring gear bolts, and install them.

Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.

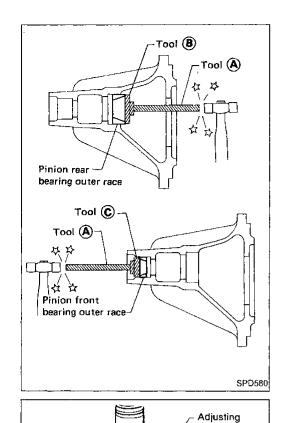


Press-fit side bearing inner cones on differential case with Tool.

Tool number:

- A ST33190000 () Equivalent tool (J25523)
- ® ST33081000 ()

PD-92 890



Press

Tool

washer

Tool (A)

Tool (B)

SPD377

SPD581

Differential Carrier

Press-fit front and rear bearing outer races with Tools.

- **(A)** ST30611000 (J25742-1)
- **B** ST30621000 (J25742-5)
- © \$T30613000 (J25742-3)

G

MA

EM

LC

EF & EC

FE

CL

Select drive pinion adjusting washer. Refer to ADJUST-MENT (PD-86).

MT

Install drive pinion adjusting washer in drive pinion, and press-fit pinion rear bearing inner cone in it, with press and Tool.

AT

Tool number: ST30901000 (---Equivalent tool (J26010-01)

TF

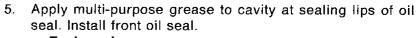
PD FA

Place pinion front bearing inner cone in gear carrier.

RA

BR

ST



BF

Tool number:

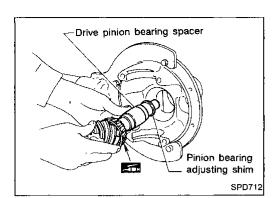
- (A) ST30720000 (Equivalent tool (J25405)
- B KV38102510 ()

MA

EL

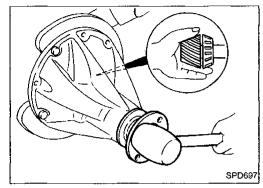
[DX



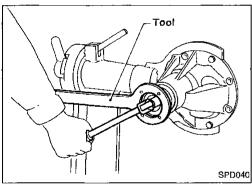


Differential Carrier (Cont'd)

Install drive pinion bearing spacer, pinion bearing adjusting shim and drive pinion in gear carrier.



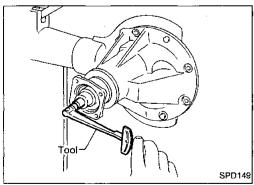
7. Insert companion flange into drive pinion by tapping the companion flange with a soft hammer.



8. Tighten pinion nut to the specified torque.

The threaded portion of drive pinlon and pinion nut should be free from oil or grease.

Tool number: KV38104700 (J34311)

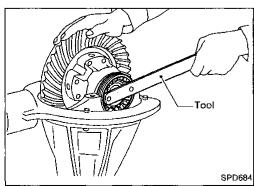


9. Turn drive pinion in both directions several times, and measure pinion bearing preload.

Tool number: ST3127S000 (J25765-A)

Pinion bearing preload (Without front oil seal):

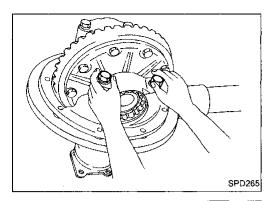
1.2 - 1.5 N·m (12 - 15 kg-cm, 10 - 13 in-lb)



- 10. Install differential case assembly with side bearing outer races into gear carrier.
- 11. Position side bearing adjusters on gear carrier with threads properly engaged; screw in adjusters lightly at this stage of assembly.

Tool number: \$T32580000 (J34312)

PD-94



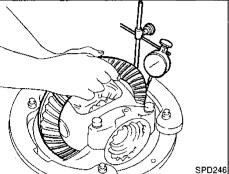
Differential Carrier (Cont'd)

- 12. Align mark on bearing cap with that on gear carrier and install bearing cap on gear carrier.
- Do not tighten at this point to allow further tightening of side bearing adjusters.



MA

EM



13. Tighten both right and left side bearing adjusters alternately and measure ring gear backlash and total preload at the same time. Adjust right and left side bearing adjusters by tightening them alternately so that proper ring gear backlash and total preload can be obtained.

LC

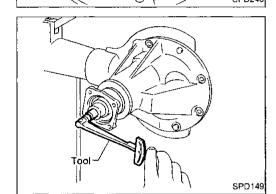
Ring gear-to-drive pinion backlash:

0.15 - 0.20 mm (0.0059 - 0.0079 in)

EC

FE

CL



When checking preload, turn drive pinion in both directions several times to set bearing rollers.

Tool number: ST3127S000 (J25765-A)

Total preload:

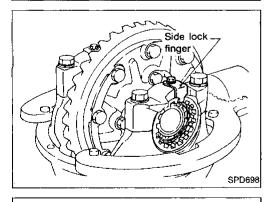
1.7 - 2.5 N·m (17 - 25 kg-cm, 15 - 22 in-lb)

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14. Tighten side bearing cap bolts.

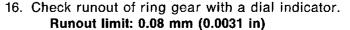
15. Install side lock finger in place to prevent rotation during operation.

RA

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ST

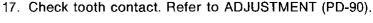


If backlash varies excessively in different places, the variance may have resulted from foreign matter caught between the ring gear and the differential case.

MA

If the backlash varies greatly when the runout of the ring gear is within a specified range, the hypoid gear set or differential case should be replaced.

EL



SPD247

Propeller Shaft

GENERAL SPECIFICATIONS

2WD models

Engine	KA24E				VG	30E		
Wheelbase	Stan	dard	Long		Standard		Long	
Transmission	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T
Propeller shaft model		3S71A			3\$80B			
Number of joints		3					•	
Coupling method with transmission				Sleev	e type			
Type of journal bearings	Sh	Shell type (non-disassembly type) Solid type (disassen				assembly type)		
Distance between yokes mm (in)	71 (2.80)			80 (3.15)				
Shaft length mm (in) (Spider to spider)								
1st	665 (26.18)	565 (22.24)	665 (26.18)	565 (22.24)	690 (27.17)	590 (23.23)	690 (27.17)	590 (23.23)
2nd	680 (2	680 (26.77) 980 (38.58)			650 (25.59) 960 (37.80)			37.80)
Shaft outer diameter mm (in)								
1st		75 (2.95)						
2nd		65 (2.56)						

Location	Front		Rear			
Wheelbase	_	_	Stand	dard	Long	
Engine	-	_	KA24E	VG30E	KA24E	VG30E
Transmission	M/T	A/T	A/T -		_	
Propeller shaft model	2F7	71H	258	0В	3\$80B	
Number of joints		2	2	·	3	3
Coupling method with transmission	Flange type Sleeve			e type		
Type of journal bearings	Solid type (disassembly type)					
Distance between yokes mm (in)	71 (;	2.80)	80 (3.15)			
Shaft length mm (in) (Spider to spider)						
1st	542 (21.34)	540 (21.26)	940 (37.01)		430 (16.93)	
2nd		-			8 ⁻ (31	10 .89)
Shaft outer diameter mm (in)						
1st	65 (2.56)	50.8 (2.000)	65 (2.56)	75 (2.95)	65 (2.56)	75 (2.95)
2nd		_			65 (2.56)	75 (2.95)

Propeller Shaft (Cont'd)

SERVICE DATA

Unit: mm (in)

Propeller shaft runout limit	0.6 (0.024)
Journal axial play	0.02 (0.0008) or less

Snap ring (80B)

Unit: mm (in)

Thickness	Color	Part number
1.99 (0.0783)	White	37146-C9400
2.02 (0.0795)	Yellow	37147-C9400
2.05 (0.0807)	Red	37148-C9400
2.08 (0.0819)	Green	37149-C9400
2.11 (0.0831)	Blue	37150-C9400
2.14 (0.0843)	Light brown	37151-C9400
2.17 (0.0854)	Black	37152-C9400
2.20 (0.0866)	No paint	37153-C9400

Snap ring (71H)

Unit: mm (in)

Thickness	Color	Part number
1.99 (0.0783)	White	37146-01G00
2.02 (0.0795)	Yellow	37147-01G00
2.05 (0.0807)	Red	37148-01G00
2.08 (0.0819)	Green	37149-01G00
2.11 (0.0831)	Blue	37150-01G00
2.14 (0.0843)	Light brown	37151-01G00
2.17 (0.0854)	Pink	37152-01G00
2.20 (0.0866)	No paint	37153-01G00

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Final Drive

GENERAL SPECIFICATIONS

2WD models

Engine	KA24E		VG30E				
Vehicle type	-	_		Tri	Truck		Wagon
Transmission	M/T	A/T	M/T	A/T	M/T	A/T	_
Body type	— Except Heavy duty		avy duty	Heavy duty		_	
Final drive model							
Rear	H190A			H233B			
Number of pinions	2			4			
Gear ratio	3.545	3.7	700	3.900	4.625	4.375	4.375 4.625*1
Number of teeth (Ring gear/drive pinion)	39/11	37	/10	39/10	37/8	35/8	35/8 37/8*1
Oil capacity (Approx.) ℓ (US pt, Imp pt)	1.5 (3-1/8, 2-5/8)			2.8 (5-7/8, 4-7/8)	<u> </u>	<u> </u>	

^{*1:} Optional tire (P235/75) equipped models

4WD models

Engine	KA24E	VG30E				
Vehicle type	_	-		Truck	Wagon	
Transmission		M/T		A/T		
Vehicle grade	_	_		SE	Except SE	
Final drive model						
Front	R180A					
Rear			H233B			
Gear ratio	4.3	375	4.6	525	4.375 4.625*1	
Number of pin-						
Front	4					
Rear	4					
Number of teeth (Ring gear/drive pinion)	35	35/8 37/8			35/8 37/8*1	
Oil capacity (Approx.) { (US pt, Imp pt)						
Front	1.3 (2-3/4, 2-1/4)		1.5 (3-1/	(8, 2-5/8)		
Rear		2.8 (5-7/8, 4-7/8)				

^{*1:} Optional tire (31 x 10.5R15LT and P235/75) equipped models.

Final Drive (Cont'd)

INSPECTION AND ADJUSTMENT (R180A)

Ring gear runout

Ring gear runout limit	mm (in)	0.05 (0.0020)
		<u> </u>

Axle bearing adjustment

Axle bearing end play	mm (in)	0 - 0.1 (0 - 0.004)
Available axle be	earing adjustin	g shims
Thickness m	ım (in)	Part number
0.10 (0.00	39)	38233-01G11
0.20 (0.00	79)	38233-01G12
0.30 (0.01	18)	38233-01G13
0.40 (0.01	57)	38233-01G14
0.50 (0.01	97)	38233-01G10

Side gear adjustment

Side gear backlash	l	0.10 - 0.20
(Clearance between side g	ear and	(0.0039 - 0.0079)
differential case)	mm (in)	(0.0009 - 0.0079)

Available side gear thrust washers

Thickness mm (in)	Part number
0.75 - 0.78 (0.0295 - 0.0307)	38424-W2010
0.78 - 0.81 (0.0307 - 0.0319)	38424-W2011
0.81 - 0.84 (0.0319 - 0.0331)	38424-W2012
0.84 - 0.87 (0.0331 - 0.0343)	38424-W2013
0.87 - 0.90 (0.0343 - 0.0354)	38424-W2014
0.90 - 0.93 (0.0354 - 0.0366)	38424-W2015
0.93 - 0.96 (0.0366 - 0.0378)	38424-W2016
0.96 - 0.99 (0.0378 - 0.0390)	38424-W2017

Side bearing adjustment

Differential carrier assembly turn- ing resistance N (kg, lb)	34.3 - 39.2 (3.5 - 4.0, 7.7 - 8.8)
Available side retainer shim:	S
Thickness mm (in)	Part number
0.20 (0.0079)	38453-01G00
0.25 (0.0098)	38453-01G01
0.30 (0.0118)	38453-01G02
0.40 (0.0157)	38453-01G03
0.50 (0.0197)	38453-01G04

Total preload adjustment

Total preload N·m (kg-cm, in-lb)	1.2 - 2.3 (12 - 23, 10 - 20)
Ring gear backlash mm (in)	0.13 - 0.18 (0.0051 - 0.0071)

Drive pinion height adjustment

Available pinion height adjusting washers

Thickness mm (in)	Part number	
 3.09 (0.1217)	38154-B4017	
3.12 (0.1228)	38154-B4018	G1
3.15 (0.1240)	38154-B4019	Gell
3.18 (0.1252)	38154-B4020	
3.21 (0.1264)	38154-E4600	n n r
3.24 (0.1276)	38154-E4601	M
3.27 (0.1287)	38154-E4602	
3.30 (0.1299)	38154-E4603	
3.33 (0.1311)	38154-E4604	EN
3.36 (0.1323)	38154-E4605	
3.39 (0.1335)	38154-E4606	
3.42 (0.1346)	38154-E4607	1 6
3.45 (0.1358)	38154-E4608	LC
3.48 (0.1370)	38154-E4609	
3.51 (0.1382)	38154-E4610	F
3.54 (0.1394)	38154-E4611	EF
3.57 (0.1406)	38154-E4612	E(
3.60 (0.1417)	38154-E4613	
3.63 (0.1429)	38154-E4614	ėe
3.66 (0.1441)	38154-E4615	FΕ

Drive pinion preload adjustment

Drive pinion prefoad N·m (kg-cm, in-lb)	
With front oil seal	1.1 - 1.7 (11 - 17, 9.5 - 14.8)

Available driv	e pinion bearing	preload adj	usting washers
----------------	------------------	-------------	----------------

asners	preload adjusting v	able drive pinion bearing
	Part numbe	Thickness mm (in)
	38127-01G0	6.59 (0.2594)
	38127-01G0	6.57 (0.2587)
	38127-01G0	6.55 (0.2579)
;	38127-01G0	6.53 (0.2571)
	38127-01G0	6.51 (0.2563)
į	38127-01G0	6.49 (0.2555)
;	38127-01G0	6.47 (0.2547)
,	38127-01G0	6.45 (0.2539)
j.	38127-01G0	6.43 (0.2531)
)	38127-01G0	6.41 (0.2524)
)	38127-01G1	6.39 (0.2516)
	38127-01G1	6.37 (0.2508)
<u>)</u>	38127-01G1	6.35 (0.2500)
;	38127-01G1	6.33 (0.2492)
ļ	38127-01G1	6.31 (0.2484)
		· · - /

Available drive pinion bearing preload adjusting spacers

Part number	Length mm (in)
 38130-78500	52.20 (2.0551)
38131-78500	52.40 (2.0630)
38132-78500	52.60 (2.0709)
38133-78500	52.80 (2.0787)
38134-78500	53.00 (2.0866)
38135-78500	53.20 (2.0945)

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Final Drive (Cont'd)

INSPECTION AND ADJUSTMENT (R200A)

Ring gear runout

Ring gear runout limit	mm (in)	0.05 (0.0020)
		····

Axle bearing adjustment

Axle bearing end play	mm (in)	0 - 0.1 (0 - 0.004)
Available axle bearing adjusting shims		
Thickness m	nm (in)	Part number
0.10 (0.00	039)	38233-01G11
0.20 (0.00	079)	38233-01G12
0.30 (0.01	118)	38233-01G13
0.40 (0.01	157)	38233-01G14
0.50 (0.0	197)	38233-01G10

Side gear adjustment

Side gear backlash	0.10 - 0.20
(Clearance between side gear and differential case) mm (in)	(0.0039 - 0.0079)

Available side gear thrust washers

Thickness mm (in)	Part number
0.775 (0.0305)	38424-E3000
0.825 (0.0325)	38424-E3001
0.875 (0.0344)	38424-E3002
0.925 (0.0364)	38424-E3003

Side bearing adjustment

Differential carrier assembly		34.3 - 39.2
turning resistance	N (kg, lb)	(3.5 - 4.0, 7.7 - 8.8)

Available side bearing adjusting washers

Thickness mm (in)	Part number
2.00 (0.0787)	38453-N3100
2.05 (0.0807)	38453-N3101
2.10 (0.0827)	38453-N3102
2.15 (0.0846)	38453-N3103
2.20 (0.0866)	38453-N3104
2.25 (0.0886)	38453-N3105
2.30 (0.0906)	38453-N3106
2.35 (0.0925)	38453-N3107
2.40 (0.0945)	38453-N3108
2.45 (0.0965)	38453-N3109
2.50 (0.0984)	38453-N3110
2.55 (0.1004)	38453-N3111
2.60 (0.1024)	38453-N3112

Total preload adjustment

Total preload	1.4 - 3.1
N·m (kg-cm, in-lb)	(14 - 32, 12 - 28)
Ring gear backlash mm (in)	0.13 - 0.18 (0.0051 - 0.9071)

Drive pinion height adjustment

Available pinion height adjusting washers

Thickness mm (in)	Part number
3.09 (0.1217)	38154-P6017
3.12 (0.1228)	38154-P6018
3.15 (0.1240)	38154-P6019
3.18 (0.1252)	38154-P6020
3.21 (0.1264)	38154-P6021
3.24 (0.1276)	38154-P6022
3.27 (0.1287)	38154-P6023
3.30 (0.1299)	38154-P6024
3.33 (0.1311)	38154-P6025
3.36 (0.1323)	38154-P6026
3.39 (0.1335)	38154-P6027
3.42 (0.1346)	38154-P6028
3.45 (0.1358)	38154-P6029
3.48 (0.1370)	38154-P6030
3.51 (0.1382)	38154-P6031
3.54 (0.1394)	38154-P6032
3.57 (0.1406)	38154-P6033
3.60 (0.1417)	38154-P6034
3.63 (0.1429)	38154-P6035
3.66 (0.1441)	38154-P6036

Drive pinion preload adjustment

Drive pinion preload	
N·m (kg-cm, in-lb)	
	1.1 - 1.7
With front oil seal	(11 - 17, 9.5 - 14.8)

Available drive pinion bearing preload adjusting washers

Thickness mm (in)	Part number
3.80 - 3.82 (0.1496 - 0.1504)	38125-61001
3.82 - 3.84 (0.1504 - 0.1512)	38126-61001
3.84 - 3.86 (0.1512 - 0.1520)	38127-61001
3.86 - 3.88 (0.1520 - 0.1528)	38128-61001
3.88 - 3.90 (0.1528 - 0.1535)	38129-61001
3.90 - 3.92 (0.1535 - 0.1543)	38130-61001
3.92 - 3.94 (0.1543 - 0.1551)	38131-61001
3.94 - 3.96 (0.1551 - 0.1559)	38132-61001
3.96 - 3.98 (0.1559 - 0.1567)	38133-61001
3.98 - 4.00 (0.1567 - 0.1575)	38134-61001
4.00 - 4.02 (0.1575 - 0.1583)	38135-61001
4.02 - 4.04 (0.1583 - 0.1591)	38136-61001
4.04 - 4.06 (0.1591 - 0.1598)	38137-61001
4.06 - 4.08 (0.1598 - 0.1606)	38138-61001
4.08 - 4.10 (0.1606 - 0.1614)	38139-61001

Available drive pinion bearing preload adjusting spacers

Part number
38165-B4000
38165-B4001
38165-B4002
38165-B4003
38165-B4004
38165-61001

Final Drive (Cont'd)

INSPECTION AND ADJUSTMENT (H190A)

Ring gear runout

Ring gear runout limit	mm (in)	0.05 (0.0020)

Side gear adjustment

Side gear backlash	0.10 - 0.20
(Clearance between side gear	(0.0039 - 0.0079)
and differential case) mm (in)	(0.0003 - 0.0073)

Available side gear thrust washers

Conventional models

Thickness mm (in)	Part number
0.775 (0.0305)	38424-E3000
0.825 (0.0325)	38424-E3001
0.875 (0.0344)	38424-E3002
0.925 (0.0364)	38424-E3003

Drive pinion height adjustment

Available pinion height adjusting washers

Thickness mm (in)	Part number
2.58 (0.1016)	38154-P6000
2.61 (0.1028)	38154-P6001
2.64 (0.1039)	38154-P6002
2.67 (0.1051)	38154-P6003
2.70 (0.1063)	38154-P6004
2.73 (0.1075)	38154-P6005
2.76 (0.1087)	38154-P6006
2.79 (0.1098)	38154-P6007
2.82 (0.1110)	38154-P6008
2.85 (0.1122)	38154-P6009
2.88 (0.1134)	38154-P6010
2.91 (0.1146)	38154-P6011
2.94 (0.1157)	38154-P6012
2.97 (0.1169)	38154-P6013
3.00 (0.1181)	38154-P6014
3.03 (0.1193)	38154-P6015
3.06 (0.1205)	38154-P6016
3.09 (0.1217)	38154-P6017
3.12 (0.1228)	38154-P6018
3.15 (0.1240)	38154-P6019
3.18 (0.1252)	38154-P6020

Drive pinion preload adjustment

Drive pinion preload N·m (kg-cm, in-lb)	
With front oil seal	1.1 - 1.6 (11 - 16, 9.5 - 13.9)

Side bearing adjustment

Differential carrier assembly

turning resistance	in (kg, ib)	(3.5 - 4.0, 7.7 - 8.8)
Available side bearing adjusting shims		
Thickness r	nm (in)	Part number
0.12 (0.0	047)	38453-61201
0.15 (0.0	059)	38453-61202
0.17 (0.0	067)	38453-61203
0.25 (0.0098)		38453-61204
0.30 (0.0	118)	38453-61205
0.40 (0.0	157)	38453-61206

34.3 - 39.2

Total preload adjustment

Total preload N·m (kg-cm, in-lb)	1.2 - 2.2 (12 - 22, 10 - 19)	<u>L</u> C
Ring gear backlash mm (in)	0.13 - 0.18 (0.0051 - 0.0071)	

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Final Drive (Cont'd)

INSPECTION AND ADJUSTMENT (H233B)

Ring gear runout

	I
Ring gear runout limit mm (in)	0.08 (0.0031)

Side gear adjustment

Side gear backlash (Clearance between sid differential case)	de gear and mm (in)	0.10 - 0.20 (0.0039 - 0.0079)
Available side gear thrust washers		

Thickness mm (in)	Part number
1.75 (0.0689)	38424-T5000
1.80 (0.0709)	38424-T5001
1.85 (0.0728)	38424-T5002

- Additional service for limited slip differential model —

Differential torque adjustment

Differential torque N⋅m (kg-m, ft-lb)	353 - 392 (36 - 40, 260 - 289)
Number of discs and plates (One side)	
Friction disc	5
Friction plate	6
Spring disc	1
Spring plate	1
Wear limit of plate and disc mm (in)	0.1 (0.004)
Allowable warpage of friction disc and plate mm (in)	0.05 - 0.15 (0.0020 - 0.0059)
Available discs and plates	

Plate name	Thickness mm (in)	Part number
Friction disc	1.48 - 1.52 (0.0583 - 0.0598) 1.58 - 1.62 (0.0622 - 0.0638)	38433-C6000 (Standard type) 38433-C6001 (Adjusting type)
Friction plate	1.48 - 1.52 (0.0583 - 0.0598)	38432-C6000
Spring disc	1.48 - 1.52 (0.0583 - 0.0598)	38436-C6000
Spring plate	1.48 - 1.52 (0.0583 - 0.0598)	38435-C6010

Drive pinion height adjustment

Available pinion height adjusting washers

Thickness mm (in)	Part number
2.58 (0.1016)	38151-01J00
2.61 (0.1028)	38151-01J01
2.64 (0.1039)	38151-01J02
2.67 (0.1051)	38151-01J03
2.70 (0.1063)	38151-01J04
2.73 (0.1075)	38151-01J05
2.76 (0.1087)	38151-01J06
2.79 (0.1098)	38151-01J07
2.82 (0.1110)	38151-01J08
2.85 (0.1122)	38151-01J09
2.88 (0.1134)	38151-01J10
2.91 (0.1146)	38151-01J11
2.94 (0.1157)	38151-01J12
2.97 (0.1169)	38151-01J13
3.00 (0.1181)	38151-01J14
3.03 (0.1193)	38151-01J15
3.06 (0.1205)	38151-01J16
3.09 (0.1217)	38151-01J17
3.12 (0.1228)	38151-01J18
3.15 (0.1240)	38151-01J19
3.18 (0.1252)	38151-01J60
3.21 (0.1264)	38151-01J61
3.24 (0.1276)	38151-01J62
3.27 (0.1287)	38151-01J63
3.30 (0.1299)	38151-01J64
3.33 (0.1311)	38151-01J65
3.36 (0.1323)	38151-01J66
3.39 (0.1335)	38151-01J67
3.42 (0.1346)	38151-01J68
3.45 (0.1358)	38151-01J69
3.48 (0.1370)	38151-01J70
3.51 (0.1382)	38151-01J71
3.54 (0.1394)	38151-01J72
3.57 (0.1406)	38151-01J73
3.60 (0.1417)	38151-01J74
3.63 (0.1429)	38151-01J75
3.66 (0.1441)	38151-01J76

Final Drive (Cont'd)

Drive pinion preload adjustment

5.25 (0.2067)

5.50 (0.2165)

Drive pinion preload	
N·m (kg-cm, in-lb)	
Without front oil seal	1.2 - 1.5 (12 - 15, 10 - 13)

Total preload	. 1.7 - 2.5
N·m (kg-cm, in-lb)	(17 - 25, 15 - 22)
Ring gear backlash mm (in)	0.15 - 0.20 (0.0059 - 0.0079)

Total preload adjustment

	(12 - 15, 10 - 13)
Available front drive pinion	bearing adjusting shims
Thickness mm (in)	Part number
2.31 (0.0909)	38125-82100
2.33 (0.0917)	38126-82100
2.35 (0.0925)	38127-82100
2.37 (0.0933)	38128-82100
2.39 (0.0941)	38129-82100
2.41 (0.0949)	38130-82100
2.43 (0.0957)	38131-82100
2.45 (0.0965)	38132-82100
2.47 (0.0972)	38133-82100
2.49 (0.0980)	38134-82100
2.51 (0.0988)	38135-82100
2.53 (0.0996)	38136-82100
2.55 (0.1004)	38137-82100
2.57 (0.1012)	38138-82100
2.59 (0.1020)	38139-82100
Available drive pinion bear	ing adjusting spacers
Thickness mm (in)	Part number
4.50 (0.1772)	38165-76000
4.75 (0.1870)	38166-76000
5.00 (0.1969)	38167-76000
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38166-01J10

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REAR AXLE & REAR SUSPENSION

SECTION RA

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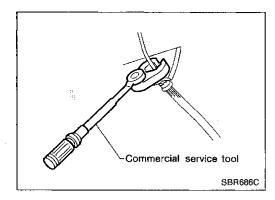
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PRECAUTIONS AND PREPARATION



Precautions

- When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.
 - *: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
- Use flare nut wrench when removing or installing brake tubes.
- After installing removed suspension parts, check wheel alignment and adjust if necessary.
- Always torque brake lines when installing.

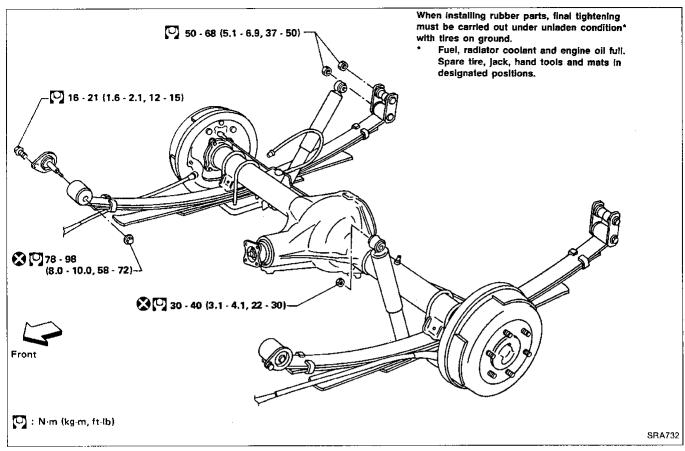
Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description	
KV40101000 (J25604-01) Axle stand	NT 159	Removing rear axle shaft
ST36230000 (J25840-A) Sliding hammer	NT126	Removing rear axle shaft
ST38020000 (—) Bearing lock nut wrench	NT160	Removing wheel bearing lock nut
HT72480000 (J25852-B) Rear axle shaft bearing puller	NT161	Removing wheel bearing
ST37840000 (—) Rear axle shaft guide	NT162	Instailing rear axle shaft

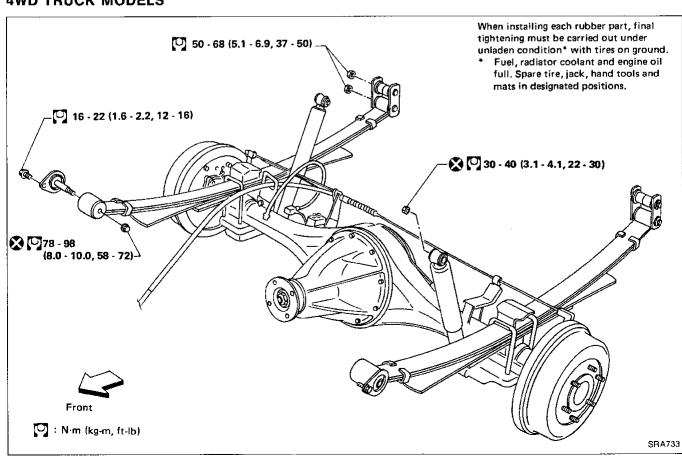
Commercial Service Tools

Tool name	Description	
 Flare nut crows foot Torque wrench 	NT223	Removing and installing each brake piping 1 2
Rear axle oil seal drift	NT163	Installing oil seal a: 74 mm (2.91 in) dia. b: 68 mm (2.68 in) dia. c: 10 mm (0.39 in)

2WD TRUCK MODELS



4WD TRUCK MODELS



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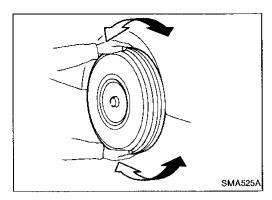
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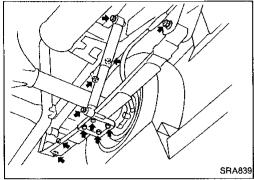
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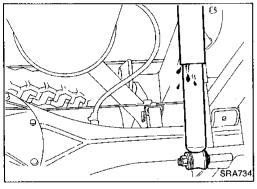
Rear Axle and Rear Suspension Parts

Check rear axle and rear suspension parts for looseness, wear or damage.

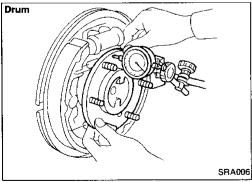
Shake each rear wheel to check for excessive play.



 Retighten all nuts and bolts to the specified torque.
 Tightening torque: Refer to REAR SUSPENSION (RA-13).



- Check shock absorber for oil leakage or other damage.
- Check shock absorber bushing for excessive wear or other damage.

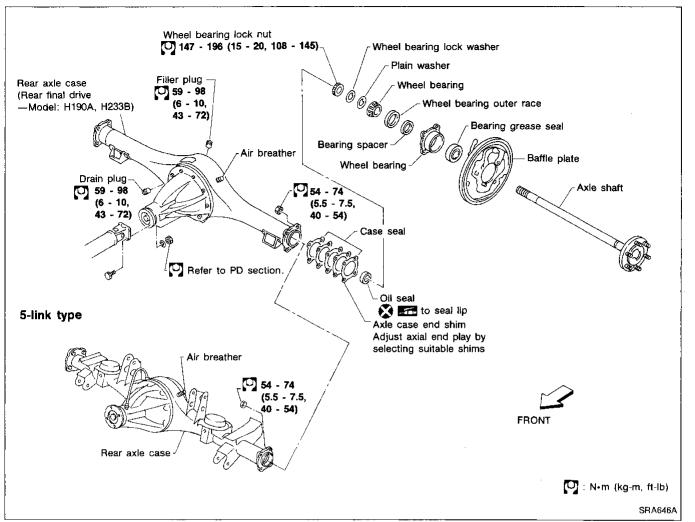


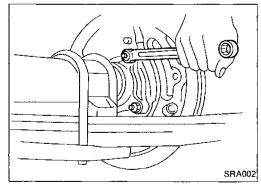
Rear Wheel Bearing

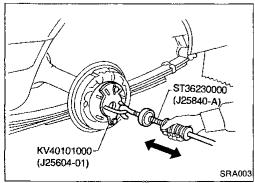
- Check that wheel bearings operate smoothly.
- Check axial end play.

Axial end play: Refer to SDS (RA-21).

Drum Brake Type COMPONENTS







REMOVAL

Disconnect parking brake cable and brake tube.

 Remove nuts securing wheel bearing cage with baffle plate.

Draw out axle shaft with Tool.

When drawing out axle shaft, be careful not to damage oil seal.

Remove oil seal.

Do not reuse oil seal once it is removed. Always install new one.

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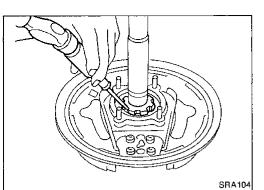
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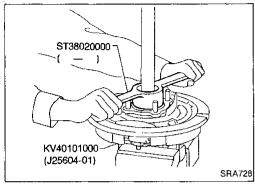
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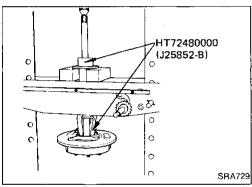
Drum Brake Type (Cont'd)



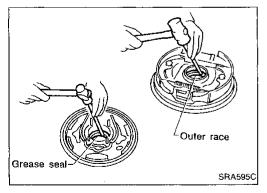
Unbend lock washer with a screwdriver.



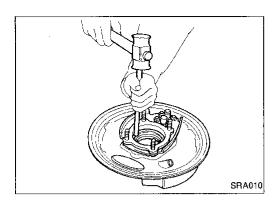
Remove bearing lock nut with Tool.



 Remove wheel bearing together with bearing cage and baffle plate from axle shaft.



- Remove grease seal in bearing cage with suitable bar.
- Remove wheel bearing outer race with a brass drift.



Drum Brake Type (Cont'd) INSPECTION

Axle shaft

Check axle shaft for straightness, cracks, damage, wear or distortion. Replace if necessary.

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Wheel bearing

Make sure wheel bearing rolls freely and is free from noise, cracks, pitting or wear.

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Axie case

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Check axle case for yield, deformation or cracks. Replace if necessary.

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INSTALLATION

Install wheel bearing outer race with a brass drift.

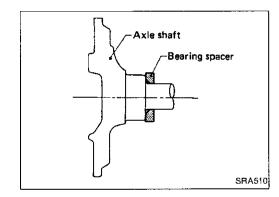
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Install a new grease seal in bearing cage.

After installing new grease seal, coat sealing lip with multipurpose grease.

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Install bearing spacer with chamfer side facing axle shaft flange.

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Install wheel bearing inner race with a brass drift.

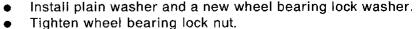
Coat each bearing cone with multi-purpose grease.

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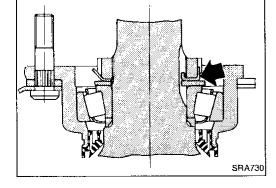
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Fit wheel bearing lock washer lip in wheel bearing lock nut groove correctly by tightening lock nut. Be sure to bend it up.

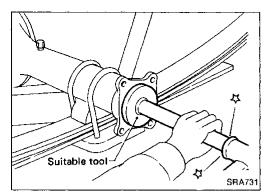
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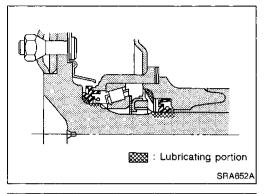
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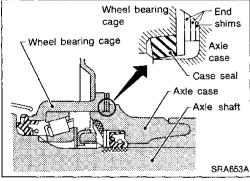
Drum Brake Type (Cont'd)

• Install a new oil seal with suitable tool.

After installing new oil seal, coat sealing lip with multi-purpose grease.



- Apply recess of axle case end with multi-purpose grease.
- Apply gear oil to the spline of axle shaft. Coat seal surface of axle shaft with multi-purpose grease (as shown left).

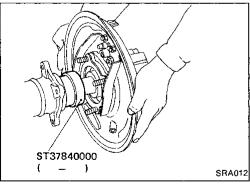


- Adjust axial end play.
- (1) Select end shims.

Standard thickness: 1.5 mm (0.059 in)

Axle case end shim: Refer to SDS (RA-21).

Do not insert end shims between case seal and bearing cage.



(2) Insert axle shaft with Tool as a guide.

When inserting axle shaft, be careful not to damage oil seal.

(3) Measure end play of axle shaft.

Axial end play:

Servicing one side axle

0.02 - 0.15 mm (0.0008 - 0.0059 in)

Servicing both side axles

On first axle (right or left)

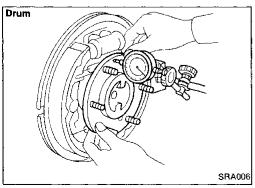
0.30 - 0.90 mm (0.0118 - 0.0354 in)

On second axle

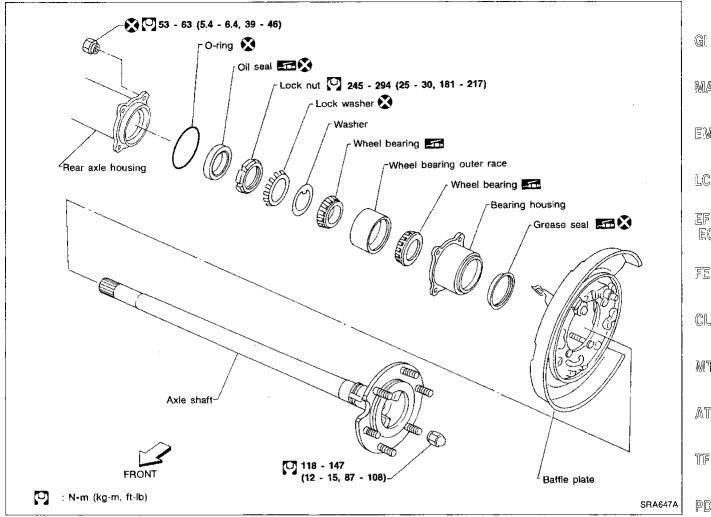
0.02 - 0.15 mm (0.0008 - 0.0059 in)

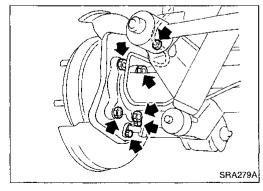
(4) If axial end play is not within the specified limit, reselect axle case end shims.

While adjusting axial end play, be careful not to damage oil seal.



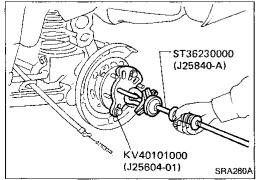
Disc Brake Type COMPONENTS







- Remove brake caliper assembly and rotor.
- Disconnect parking brake cable and brake tube.
- Remove nuts securing bearing housing to baffle plate.



Draw out axle shaft with Tool.

When drawing out axle shaft, be careful not to damage oil seal.

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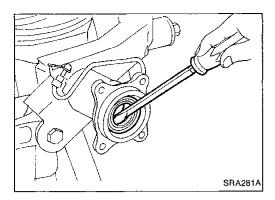
RA-9

Disc Brake Type (Cont'd)

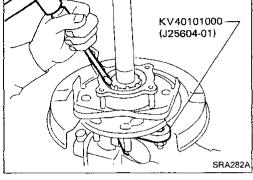
• Remove oil seal.

Always install new one.

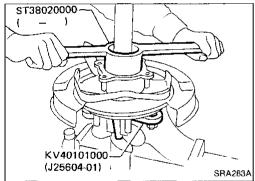
Do not reuse oil seal once it is removed. Always install new one.



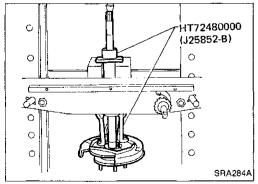
Unbend lock washer with a screwdriver.
 Do not reuse once removed lock washer.



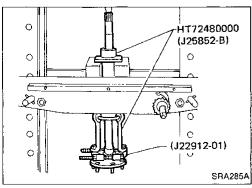
Remove bearing lock nut with Tool.

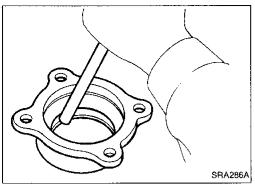


 Remove wheel bearing together with bearing housing and baffle plate from axle shaft.



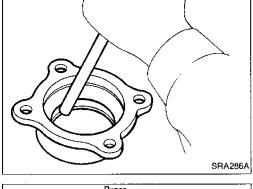
 Remove wheel bearing outer side inner race from axle shaft.



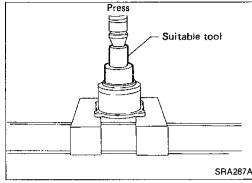


Disc Brake Type (Cont'd)

Remove grease seal in bearing housing with suitable bar.



Remove wheel bearing outer race with a suitable tool.



INSPECTION

Axle shaft

Check axle shaft for straightness, cracks, damage, wear or distortion. Replace if necessary.

Bearing housing

Check bearing housing for deformation or cracks. Replace if necessary.

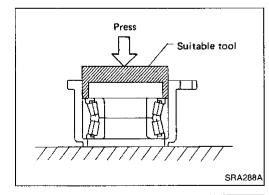
Rear axle housing

Check rear axle housing for yield, deformation or cracks. Replace if necessary.

INSTALLATION

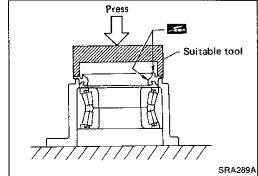
Press new wheel bearing until it bottoms end face of bearing housing.

Always press outer race of wheel bearing during installation.



Press new grease seal until it bottoms end face of bearing housing.

After installing new grease seal, coat sealing lip with multipurpose grease.



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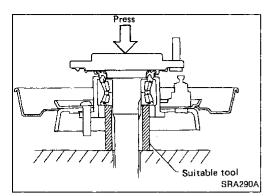
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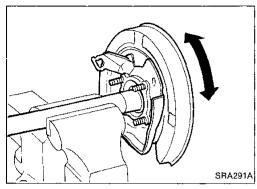
Disc Brake Type (Cont'd)

 Install baffle plate over bearing housing and press axle shaft into inner race of wheel bearing.

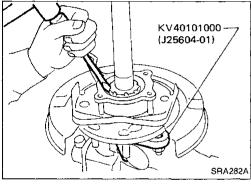
Be careful not to damage or deform grease seal.

 Before installing lock nut, apply a coat of wheel bearing grease to its seat. Tighten lock nut to specified torque.

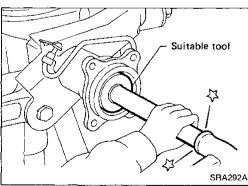
(25 - 30 kg-m, 181 - 217 ft-lb)



 Turn bearing housing (with respect to axle shaft) two or three times. It must turn smoothly.



Lock lock nut by bending one portion of lock washer.



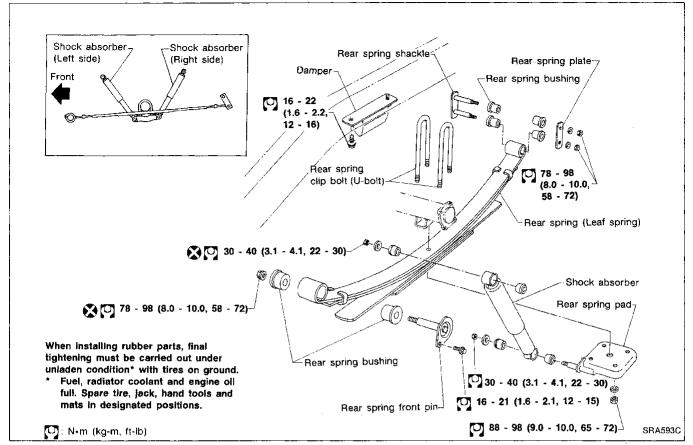
 Install new oil seal to rear axle housing using a suitable tool.

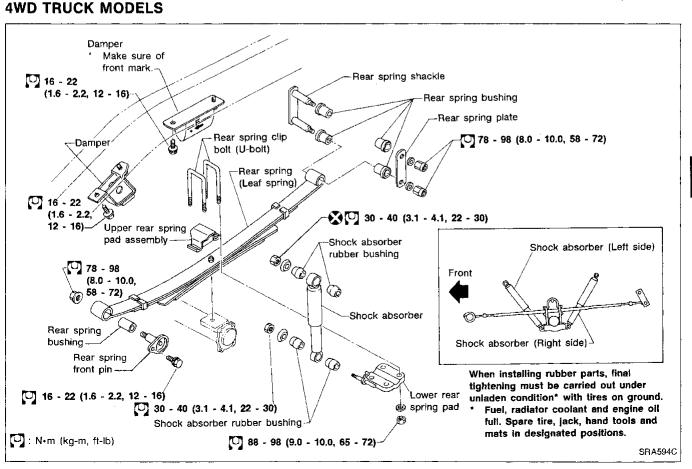
After installing new oil seal, coat sealing lip with multi-purpose grease.

Position axle shafts in rear axle housing.

Be careful not to damage oil seal.

2WD TRUCK MODELS





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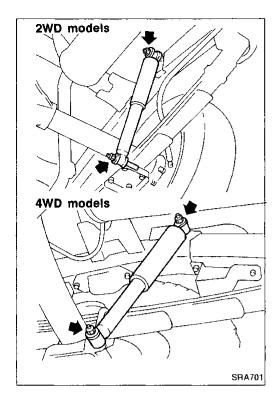
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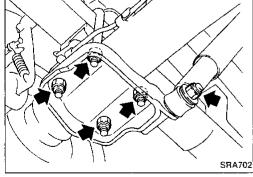
Shock Absorber

REMOVAL AND INSTALLATION

 Remove shock absorber by disconnecting upper and lower end.

INSPECTION

- If oil leakage, cracks of deformation occurs, replace shock absorber assembly.
- If rubber bushings are cracked or deformed, replace rubber bushings.



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Leaf Spring

REMOVAL AND INSTALLATION

Disconnect shock absorber lower end, and remove U-bolts.

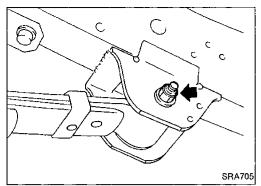
Disconnect spring shackle.

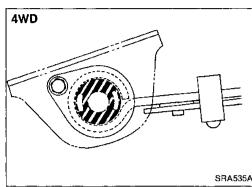
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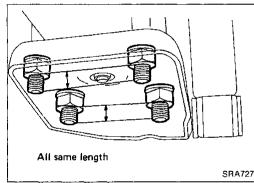
REAR SUSPENSION

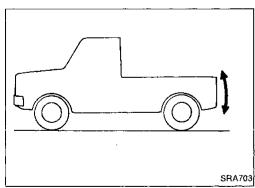
Leaf Spring (Cont'd)

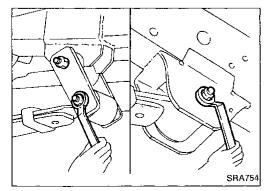
• Disconnect front pin.











INSPECTION

Check leaf spring for cracks. Replace if necessary.

 Check front bracket and pin, shackle, U-bolts and spring pad for wear, cracks, straightness or damaged threads. Replace if necessary.

 Check all bushings for deformation or cracks. Replace if necessary.

[4WD: Rear spring front bushing]
Make sure that front bushing is properly installed.

INSTALLATION

Apply soapsuds to rubber bushing.

 Install spring shackle and front pin, and finger tighten the nuts.

• Install spring pad and nuts under leaf spring or axle case.

Tighten U-bolt mounting nuts diagonally.

Tighten U-bolts so that the lengths of all U-bolts under spring pad are the same.

Install shock absorber, and finger tighten the nuts.

Remove stands and bounce the vehicle to stabilize suspension. (Unladen)

 Tighten spring shackle nuts, front pin nuts and shock absorber nuts.

When installing rubber parts, final tightening must be carried out under unladen condition* with tires on the ground.

Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

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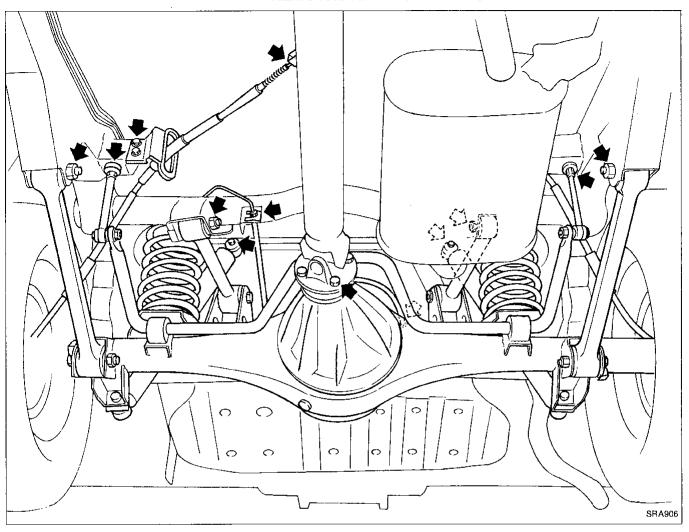
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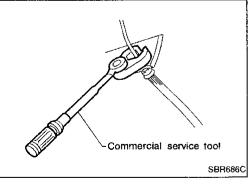
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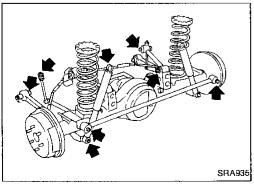
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5-link Type REMOVAL AND INSTALLATION







- Support axle and suspension components with a suitable jack and block.
- Disconnect brake hydraulic line and parking brake cables at back plates.

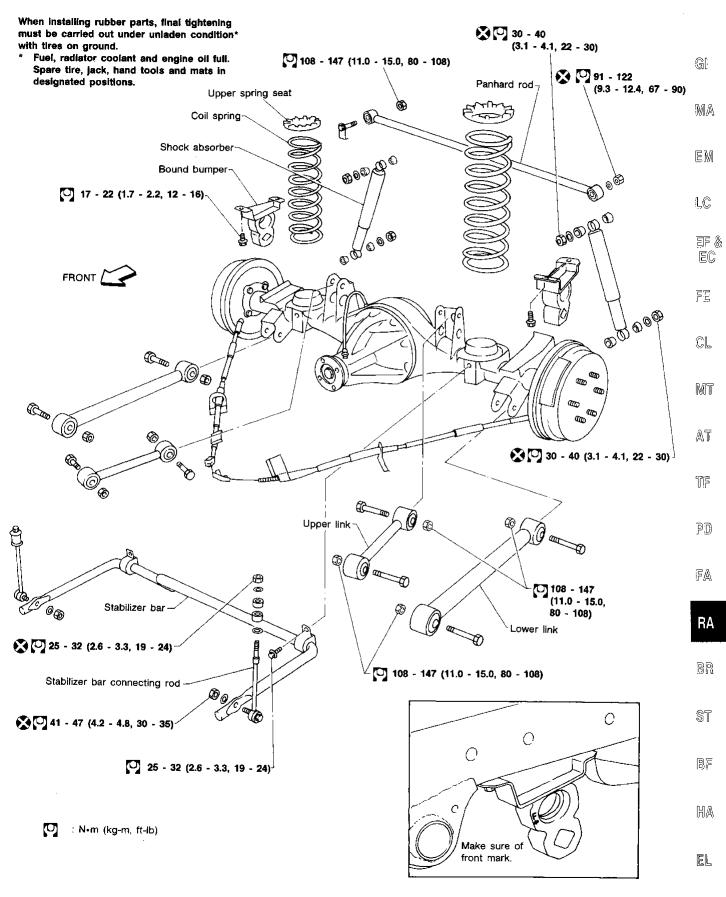
CAUTION:

Use flare nut wrench when removing or installing brake tubes.

- Remove stabilizer bar from body.
- Remove upper links and lower links from body.
- Remove panhard rod from body.
- Disconnect propeller shaft. Refer to PD section.
- Remove upper end nuts of shock absorber.

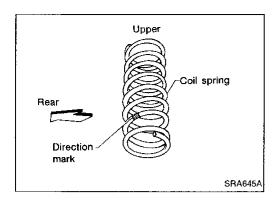
Final tightening for rubber parts requires to be carried out under unladen condition with tires on ground.

5-link Type



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REAR SUSPENSION



5-link Type (Cont'd) COIL SPRING AND SHOCK ABSORBER

Removal and Installation

 Refer to Removal and Installation of REAR AXLE AND REAR SUSPENSION - 5 link Type (RA-16).

When installing coil spring, pay attention to its direction. Be sure spring rubber seat is not twisted and has not slipped off when installing coil spring.

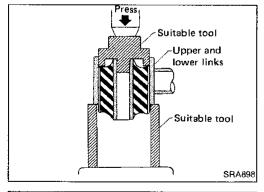
Inspection

- Check coil spring for yield, deformation or cracks.
- Check coil spring specifications. Refer to SDS (RA-21).
- Check shock absorber for oil leakage, cracks or deformation.
- Check shock absorber specifications. Refer to SDS (RA-21).
- Check all rubber parts for wear, cracks or deformation.
 Replace if necessary.

UPPER LINK, LOWER LINK AND PANHARD ROD

Inspection

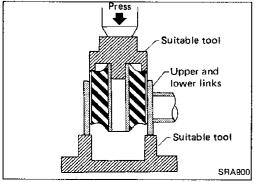
Check for cracks, distortion or other damage. Replace if necessary.



Bushing Replacement

Check for cracks or other damage. Replace with suitable tool if necessary.

Remove bushing with suitable tool.



When installing bushing, apply a coating of 1% soap water to outer wall of bushing.

Always install new bushing.

Do not tap end face of bushing directly with a hammer.

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REAR SUSPENSION

5-link Type (Cont'd)

Installation

When installing each link, pay attention to direction of bolts and nuts.

When installing each rubber part, final tightening must be carrier out under unladen condition with tires on ground.



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Stabilizer bar

Stabilizer bar

connecting rod

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Removal and Installation

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When removing and installing stabilizer bar, fix portion A.

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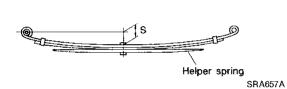


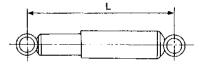
SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

LEAF SPRING AND SHOCK ABSORBER (Trucks)

		2WD			
Applied model		Except Heavy duty			4WD
		U.S.A. Canada		Heavy duty	
eaf spring					
Spring length x width	mm (in)		1,200 x 60 (47.24 x 2.36)	
Spring thickness - number of leaves	mm (in)	7 (0.28) - 2 13 (0.51) - 1	7 (0.28) - 2 12 (0.47) - 2	8 (0.31) - 2 14 (0.55) - 2	7 (0.28) - 1 8 (0.31) - 1 12 (0.47) - 1 13 (0.51) - 1
Free camber "S"	mm (in)	174.9 (6.89)	169.1 (6.66)	138.7 (5.46)	103.8 (4.09)
hock absorber					
Shock absorber type			Non-ad	justable	
Maximum length	mm (in)		508 (20.00)		528 (20.79)
Compression	N (kg, lb)	1!	57 - 275 (16 - 28, 35 - 6	2)	265 - 422 (27 - 43, 60 - 95





SRA658A

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications (Cont'd)

COIL SPRING AND SHOCK ABSORBER (Pathfinder)

STABILIZER BAR (Pathfinder)

Coil spring			
Wire diameter mm (in)	13.2 (0.520)	
Coil diameter mm (in)	117.2 (4.61)		
Free length mm (in)	417.0 (16.42)		
Identification color	White x 1, Blue x 1		
Shock absorber			
Shock absorber type	Non- adjustable	Adjustable	
Maximum length mm (in)	586 (23.07)	585 (23.03)	
	L	SRA658A	

Stabilizer bar diameter mm (in)	25.0 (0.984)

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Inspection and Adjustment

WHEEL BEARING (Drum brake models)

Total end play	mm (in)	0.02 - 0.15 (0.0008 - 0.0059)			
Available rear axle case		Thickness mm (in)	Part number		
		0.05 (0.0020)	43086-P0110		
	de case	0.07 (0.0028)	43087-P0110		
end shims	iic case	0.10 (0.0039)	43088-P0110		
cha chimo		0.15 (0.0059)	43086-B9500		
		0.20 (0.0079)	43089-P0110		
		0.50 (0.0197)	43090-P0110		
	[1.00 (0.0394)	43036-01G00		

WHEEL BEARING (Disc brake models)

Total end play	nm (in)	0 (0)
Bearing preload measure bearing cage under load 32,363 N (3,300 kg, 7,277 N	of [6.9 - 48.1 (0.7 - 4.9, 1.5 - 10.8)

STEERING SYSTEM

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Precautions

- Before disassembly, thoroughly clean the outside of the unit.
- Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- When disassembling parts, be sure to place them in order on a part rack so they can be reinstalled in their proper positions.
- Use nylon cloths or paper towels to clean the parts; common shop rags can leave fint that might interfere with their operation.
- Before inspection or reassembly, carefully clean all parts with a general purpose, non-flammable solvent.
- Before assembly, apply a coat of recommended ATF* to hydraulic parts. Vaseline may be applied to O-rings and seals. Do not use any grease.
- Replace all gaskets, seals and O-rings. Avoid damaging O-rings, seals and gaskets during installation. Perform functional tests whenever designated.
 - *: Automatic transmission fluid

Special Service Tools

Tool number			Unit app	olication
(Kent-Moore No.) Tool name	Description		Manual steering	Power steering
ST27180001 (J25726-A) Steering wheel puller	NT170	Removing steering wheel	X	X
HT72520000 (J25730-A) Ball joint remover	NT146	Removing ball joint and swivel joint	X	х
ST29020001 (J24319-01) Steering gear arm puller	NT143	Removing pitman arm	х	х
KV48101500 (J28802) Lock nut wrench	NT171		х	
KV48101400 (J28803) Adjusting plug wrench	NT172	Adjusting and tightening lock nut	х	
ST3127S000 (See J25765-A) () GG91030000 (J25765-A) Torque wrench (2) HT62940000 (—) Socket adapter (3) HT62900000 (—) Socket adapter	① - ① - ② - ② - ③ - ③ - ③ - ③ - ③	Measuring turning torque	X	X

PRECAUTIONS AND PREPARATION

Special	I Service	Tools ((Cont'd)

Tool number			Unit ap	olication	
(Kent-Moore No.) Tool name	Description		Manual steering	Power steering	_
KV48100301 (—) Strut & steering gear- box attachment	000000	Steering gear is installed.	х	X	GI Ma
ST27091000* (J26357) Pressure gauge	To oil To control valve	Measuring oil pressure	<u></u>	x	- EM LC
KV481009S0	NT176	Installing oil seal			ef & EC
(—) Oil seal drift set ① KV48100910	3 (2)				
(—) Drift ② KV48100920 (J26367) Adapter ③ KV48100930			_	X	Cl Mit
(J26367) Adapter	NT174				AT
KV48100700 (J26364) Torque adapter		Adjusting worm bearing preload	×	X	TF
	NT169				PD

Commercial Service Tool

		Unit application	
Tool name	Description	Manual steering	Power steering
Boot band attachment	Installing boot band Unit: mm (in) 42 (1.65) all (0.31) 25 (0.98) NT175	X	x

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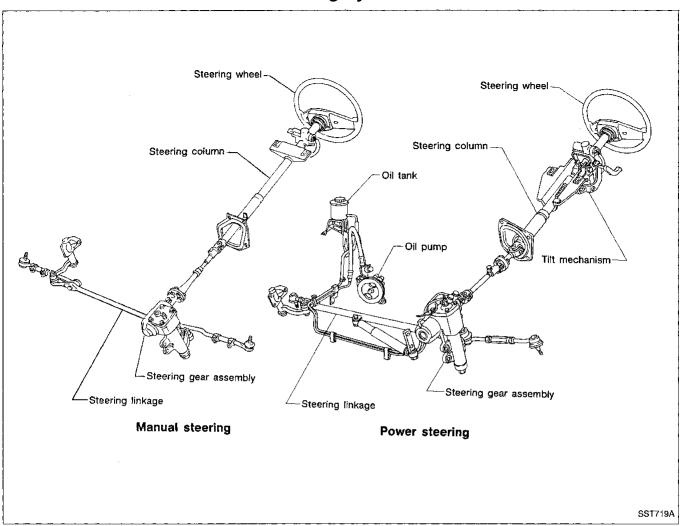
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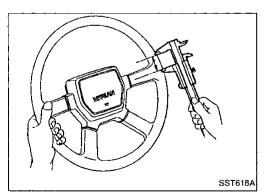
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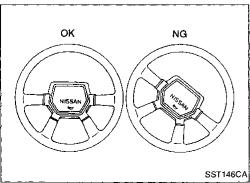
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Steering System







Checking Steering Wheel Play

 With wheels in a straight ahead position and check steering wheel play.

Steering wheel play: 35 mm (1.38 in) or less

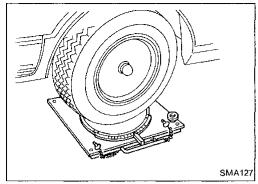
 If it is not within specification, check backlash of steering gear, tie-rod outer and inner ball joints.

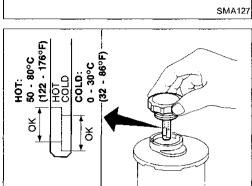
Checking Neutral Position on Steering Wheel Pre-checking

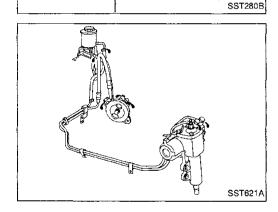
 Verify that the steering gear is centered before removing the steering wheel.

Checking

- Check that the steering wheel is in the neutral position when driving straight ahead.
- If it is not in the neutral position, remove the steering wheel and reinstall it correctly in the neutral position.
- If the neutral position is between two serrated teeth, loosen tie-rod lock nut and move tie-rod in the opposite direction by the same amount on both left and right sides to compensate for error in the neutral position.







Checking Front Wheel Turning Angle

 Rotate steering wheel all the way right and left; measure turning angle.

Turning angle:

Refer to SDS in FA section.

Checking and Adjusting Drive Belts (Power steering)

Refer to Drive Belt Inspection in MA section.

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Checking Fluid Level (Power steering)

Check fluid level.

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Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) or using "COLD" range on dipstick at fluid temperatures of 0 to 30°C (32 to 86°F).

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CAUTION:

Do not overfill.

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 Recommended fluid is Automatic Transmission Fluid "DEXRONTM II" type or equivalent.

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Checking Fluid Leakage (Power steering)

Check lines for proper attachment, cracks, damage, loose MT connections, chafing and deterioration.

- 1. Run engine at idle speed or 1,000 rpm.
 - Make sure temperature of fluid in oil tank rises to 60 to 80°C \mathbb{AT} (140 to 176°F).

2. Turn steering wheel right-to-left several times.

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 Hold steering wheel at each "lock" position for five seconds and carefully check for fluid leakage.

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CAUTION:

Do not hold steering wheel at lock position for more than fifteen seconds at a time.

4. If fluid leakage at connectors is noticed, loosen flare nut A and then retighten.

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Do not overtighten connector as this can damage O-ring, washer and connector.

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Bleeding Hydraulic System (Power steering)

- 1. Raise front end of vehicle until wheels clear ground.
- 2. While adding fluid, quickly turn steering wheel fully to right and left until it lightly touches steering stoppers.

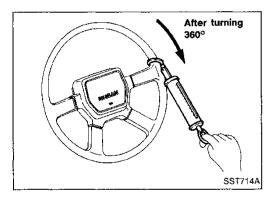
CAUTION:

Do not hold steering wheel in lock position for more than fifteen seconds.

Repeat steering wheel operation until fluid level no longer decreases.

- Start engine.Repeat step 2 above.
- Incomplete air bleeding will cause the following to occur.
 When this happens, bleed air again.
- (1) Generation of air bubbles in reservoir tank
- 2) Generation of clicking noise in oil pump
- 3) Excessive buzzing in oil pump

In steering while the vehicle is stationary, or when moving wheel slowly, fluid noise may be caused in the valve or oil pump. This type of fluid noise is inherent in an integral power steering system, and it will not affect performance or durability of the system.



Checking Steering Wheel Turning Torque (Power steering)

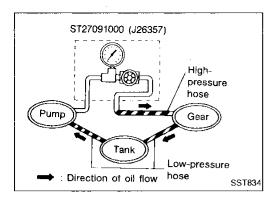
- 1. Park vehicle on a level, dry surface and set parking brake.
- 2. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F).]

Tires need to be inflated to normal pressure.

3. Check steering wheel turning force when steering wheel has been turned 360° from neutral position.

Steering wheel turning force:

PB48S-type 24.5 - 29.4 N (2.5 - 3.0 kg, 5.5 - 6.6 lb) PB59K-type 39 N (4 kg, 9 lb) or less



Checking Hydraulic System (Power steering)

Before starting, check belt tension, driving pulley and tire pressure.

- Set Tool. Open shut-off valve. Then bleed air. (See "Bleeding Hydraulic System".)
- 2. Run engine.

Make sure temperature of fluid in tank rises to 60 to 80° C (140 to 176° F).

WARNING:

Warm up engine with shut-off valve fully opened. If engine is started with shut-off valve closed, oil pressure in oil pump will increase to relief pressure, resulting in an abnormal rise in oil temperature.

Check pressure with steering wheel fully turned to left and right positions.

CAUTION:

Do not hold the steering wheel at lock position for more than fifteen seconds.

Oil pump standard pressure:

7.649 - 8,238 kPa

(78 - 84 kg/cm², 1,109 - 1,194 psi) at idling

- 4. If oil pressure is below the standard, slowly close shut-off valve and check pressure.
- When pressure becomes standard, gear is damaged.
- When pressure remains beyond standard, pump is damaged.
- 5. If oil pressure is higher than the standard level, pump is damaged.

CAUTION:

Do not close shut-off valve for more than fifteen seconds.

6. After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.

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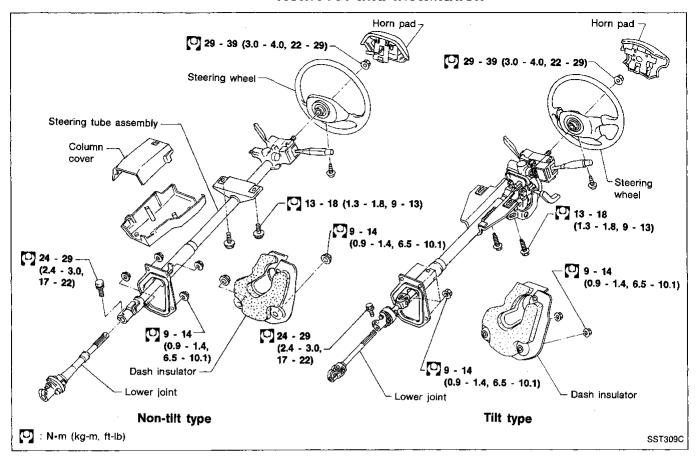
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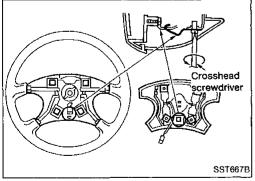
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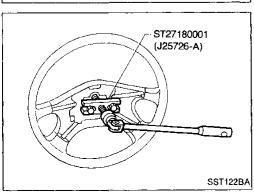
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Removal and Installation





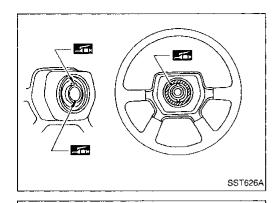


STEERING WHEEL

- Remove horn pad.
- Insert a crosshead screwdriver into hole on lower side of spoke and remove screw and clamps. Lift horn pad off by hand.

2. Remove steering wheel with Tool.

STEERING WHEEL AND STEERING COLUMN



Lower joint

Tightening bolt

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Cutout

portion

Removal and Installation (Cont'd)

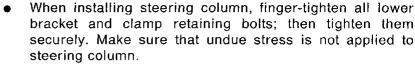
- When installing steering wheel, apply multi-purpose grease to entire surface of turn signal cancel pin (both portions) and also to horn contact slip ring.
- Install steering wheel on column shaft in a straight-ahead position.
- After installing, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal.

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STEERING COLUMN



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When fitting steering lower joint, be sure tightening bolt faces cutout portion perfectly.

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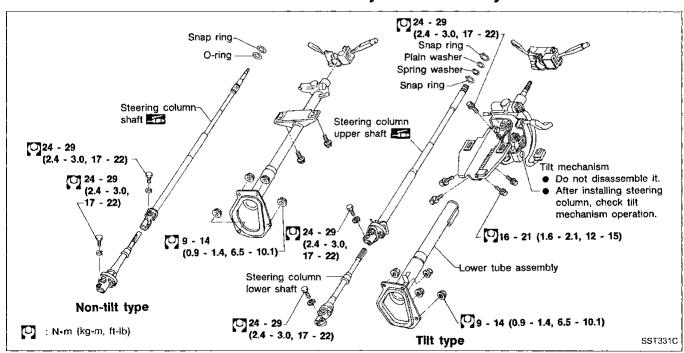
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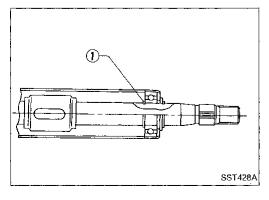
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Disassembly and Assembly





- When disassembling and assembling, unlock steering lock with key.
- Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.
- Install snap ring ① before inserting shaft into jacket tube.

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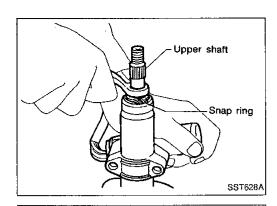
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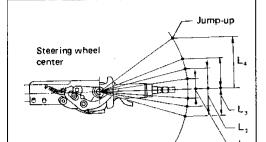
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STEERING WHEEL AND STEERING COLUMN

Disassembly and Assembly (Cont'd)

Install snap ring on upper shaft with tool.

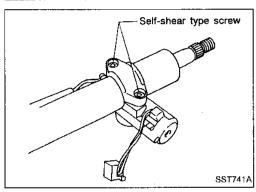




• Tilt type

After installing steering column, check tilt mechanism operation.

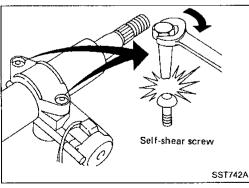
L₁: 8.7 mm (0.343 in) L₂: 17.3 mm (0.681 in) L₃: 26.0 mm (1.024 in) L₄: 100.0 mm (3.94 in)

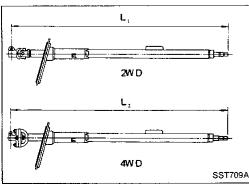


Steering lock

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Break self-shear type screws with a drill or other appropriate tool.





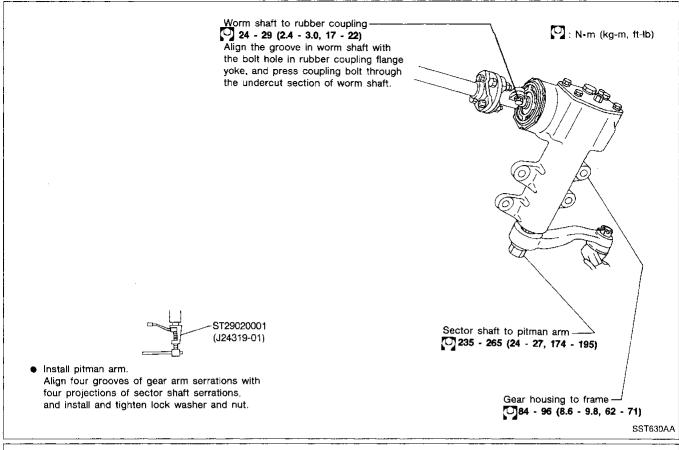
b) Install self-shear type screws and then cut off self-shear type screw heads.

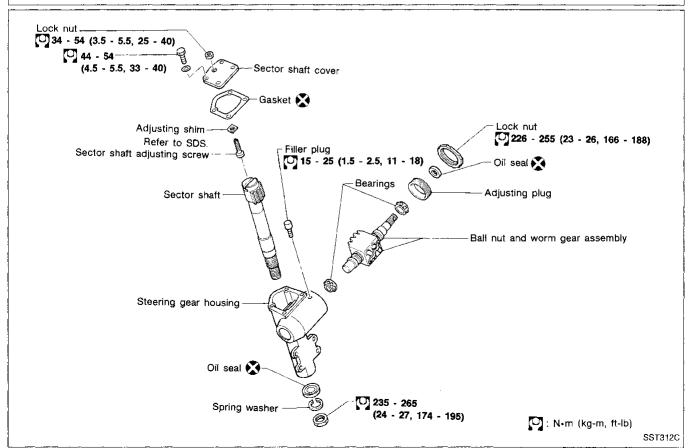
Inspection

- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts.
- (1) Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.
- (2) Check jacket tube for deformation or breakage. Replace if necessary.
- When the vehicle is involved in a light collision, check dimension "L". If it is not within specifications, replace steering column as an assembly.

Column length "L₁ & L₂": L₁ = 918.0 - 919.6 mm (36.14 - 36.20 in) L₂ = 886.1 - 887.7 mm (34.89 - 34.95 in)

Removal and Installation





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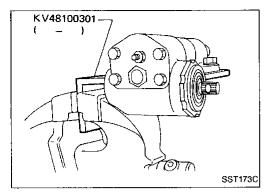
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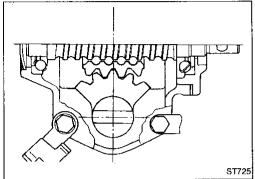
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Disassembly

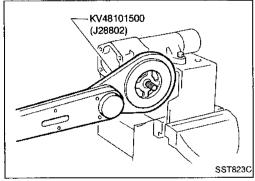
1. Place steering gear in a vise with Tool.



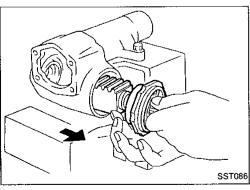
- 2. Set worm gear in a straight-ahead position.
- 3. Remove sector shaft with sector shaft cover.

CAUTION:

- When pulling sector shaft out, be careful not to damage oil seal or associated parts.
- b. Set worm gear in a straight-ahead position.
- Do not remove sector shaft needle bearings from steering gear housing. If necessary, replace gear housing assembly.



4. Loosen adjusting plug lock nut with Tool.



5. Draw out worm gear with worm bearing.

CAUTION:

- Be careful not to allow ball nut to run down to either end of worm.
 - Ends of ball guides will be damaged if nut is rotated until it stops at end of worm.
- b. Do not detach ball nut from worm shaft assembly.
 If necessary, replace entire unit as an assembly.
- Do not remove sector shaft needle bearings from steering gear housing.
 - If necessary, replace entire gear housing as an assembly.

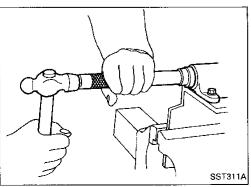


Fill space between sealing lips of new sector shaft and adjusting plug oil seals with multi-purpose grease.

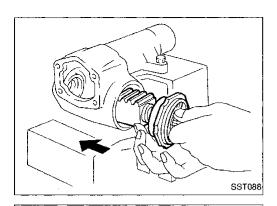
WORM BEARING PRELOAD

1. Drive oil seal into place.

Before pressing oil seal, coat seal contacting face of oil seal with gear fluid.



Assembly and Adjustment (Cont'd)



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(J28802)

KV48101400-(J28803)

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(J28803)

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Apply sealant

Adjusting plug

Lock nut

SST090

SST825C

(J26364)

Fit worm gear assembly with worm bearing in gear hous-

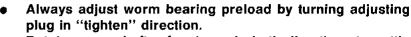


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3. Adjust worm bearing preload with Tools.

CAUTION:



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Rotate worm shaft a few turns in both directions to settle down worm bearing and measure preload. Worm bearing preload:

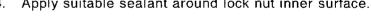
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0.69 - 0.88 N·m (7.0 - 9.0 kg-cm, 6.1 - 7.8 in-lb)

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Apply suitable sealant around lock nut inner surface.

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After tightening lock nut, check worm bearing preload to make sure it is within specification.

Tighten lock nut using Tools.

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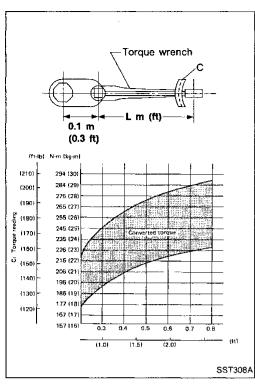
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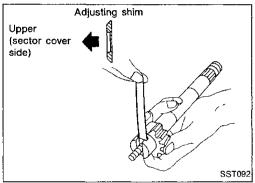
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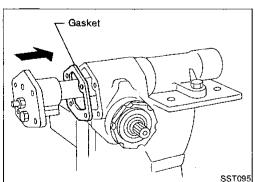
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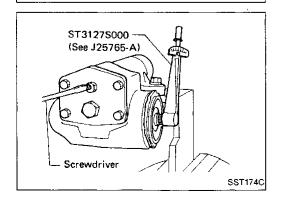
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Assembly and Adjustment (Cont'd)









SECTOR SHAFT END PLAY

Select suitable adjusting shim and adjust end play between sector shaft and adjusting screw.

Sector shaft end play: 0.01 - 0.03 mm (0.0004 - 0.0012 in) Sector shaft adjusting screw shims: Refer to SDS (ST-39).

STEERING GEAR PRELOAD AND BACKLASH

1. Set worm gear in a straight-ahead position.

Carefully insert sector shaft in place, using care not to scratch oil seal.

- 2. Adjust adjusting screw until sector shaft just contacts ball nut. Temporarily tighten lock nut.
- 3. Lubricate contacting portion of sector shaft and ball nut with gear oil or bearing grease.
- Adjust steering gear turning torque in a straight-ahead position, and lock with lock nut.

CAUTION:

- Always adjust steering gear preload by turning adjusting screw in "tighten" direction.
- Rotate worm gear a few turns in both directions to settle down steering gear.
- Measure turning torque at 360° position from straightahead position with Tools.

Turning torque at 360°: 0.69 - 0.88 N·m (7.0 - 9.0 kg-cm, 6.1 - 7.8 in-lb)

Assembly and Adjustment (Cont'd)

2) Measure turning torque at straight-ahead position.

Straight-ahead position is a position where stub shaft is turned 2.14 turns (two full turns and 50°) from lock position.

Turning torque at straight-ahead position:

0.20 - 0.39 N·m (2.0 - 4.0 kg-cm, 1.7 - 3.5 in-lb) higher than at 360°

Maximum turning torque:

1.08 N·m (11.0 kg-cm, 9.5 in-lb)

If they are not within specifications, adjust turning torque by turning sector shaft adjusting screw.

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Turn worm gear several times by hand to properly break in worm bearing.

6. Check steering gear preload. If not within specification, readjust it.

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7. Measure total preload.

8. Check backlash.

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Measure backlash at pitman arm top end in straight-ahead position.

Backlash (in straight-ahead position):

0.1 mm (0.004 in) or less

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Wash clean all the disassembled parts in solvent and check for condition.

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SECTOR SHAFT

1. Check gear tooth surface for pitting, burrs, cracks or any other damage, and replace if necessary.

2. Check sector shaft for distortion on its serration, and replace if necessary. Also check gear housing for deformation.

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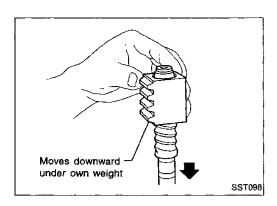
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Inspection (Cont'd)

STEERING WORM ASSEMBLY

- Inspect ball nut gear tooth surface, and replace if pitting, burrs, wear or any other damage is found.
- Ball nut must rotate smoothly on worm gear. If found too tight, assembly should be replaced. Check rotation of ball nut as follows:
- (1) Move ball nut to either end of worm gear, and gradually stand worm shaft and ball nut assembly until ball nut moves downward on worm gear under its own weight.
- (2) If ball nut does not move freely over entire stroke, replace assembly.

Be careful not to damage ball nut guide tube while check is being made.

CAUTION:

Be careful not to allow ball nut to run down to either end of worm.

BEARING

Inspect worm bearing for wear, pitting or any other damage. Replace as required.

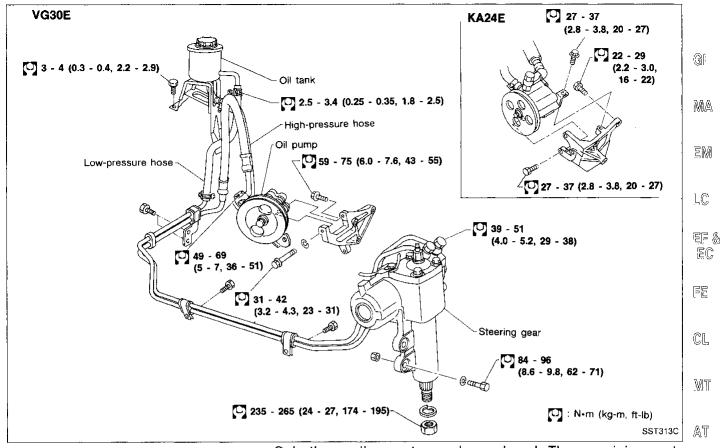
When replacing worm bearing, replace it as a set of bearing and outer race.

If sector shaft needle bearings are worn or damaged, replace as an assembly of gear housing and bearings.

OIL SEALS

- Discard any oil seal which has once been removed.
- Replace oil seal if sealing lip is deformed or cracked.
- Discard oil seal if spring is fatigued or dislocated.

Description



Only the sealing parts can be replaced. The remaining parts must be replaced as an assembly.

CAUTION:

- a. The parts which can be disassembled are strongly restricted, and never disassemble other parts than the specified ones.
- Disassembly should be performed in a place as clean as possible.
- c. Hands should be cleaned before disassembly.
- d. Do not use a rag. Be sure to use nylon or paper cloth.
- e. Be sure to follow procedures and cautions indicated in the Service Manual.

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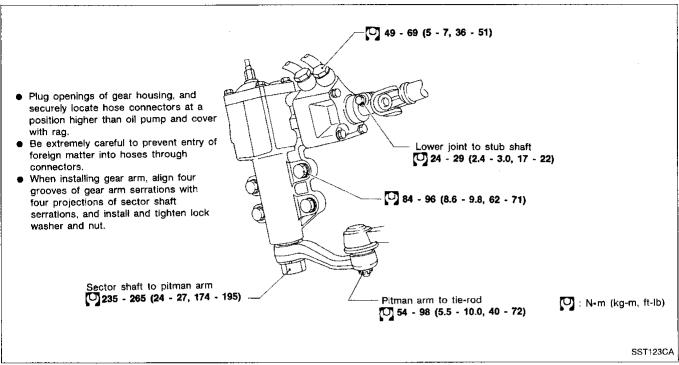
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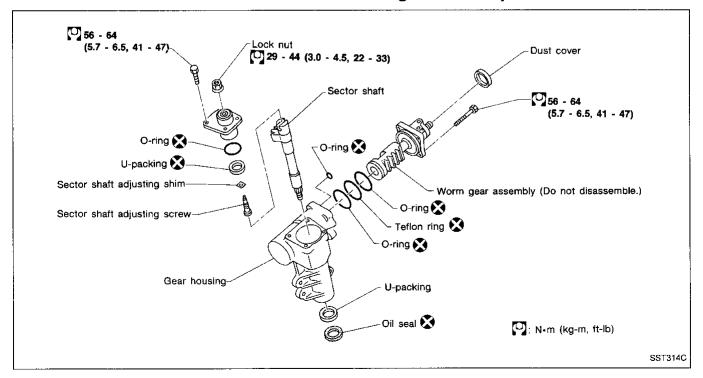
Removal

Before removing, clean exteriors or gear housing and oil pump with steam and dry with compressed air.

STEERING GEAR



Power Steering Gear Component



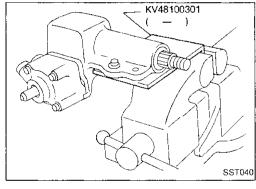
Inspection and Adjustment

Before disassembling power steering gear component parts, make sure there is no oil leakage around sealing portion and check steering turning torque as follows:

Check sealing portion.

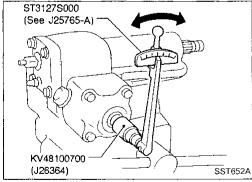
- Sector shaft cover O-ring
- Sector shaft U-packing
- Sector shaft oil seal
- Rear housing O-ring
- Gear housing O-ring

Discard any oil seal and O-ring which have once been removed. Replace oil seal and O-ring if sealing surface is deformed or cracked.



TURNING TORQUE MEASUREMENT

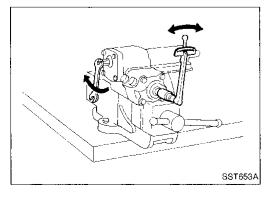
- Measure turning torque at 360° position.
- (1) Install steering gear on Tool.



- (2) Turn stub shaft all the way to right and left several times.
- (3) Measure turning torque at 360° position from straightahead position with Tools.

Turning torque at 360°:

0.15 - 0.78 N·m (1.5 - 8.0 kg-cm, 1.3 - 6.9 in-lb)



(4) Measure turning torque at straight-ahead position.

Straight-ahead position is a position where stub shaft is turned 2.14 turns (two full turns and 50°) from lock position.

Turning torque at straight-ahead position:

0.25 - 1.32 N·m (2.5 - 13.5 kg-cm, 2.2 - 11.7 in-lb) higher than at 360°

Maximum turning torque:

1.03 - 1.47 N·m (10.5 - 15 kg-cm, 9.1 - 13.0 in-lb)

If they are not within specifications, adjust turning torque by turning sector shaft adjusting screw.

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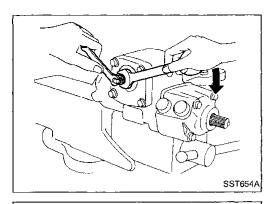
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Inspection and Adjustment (Cont'd)

2. Tighten adjusting screw lock nut with tools.



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Disassembly

Before disassembly, measure turning torque.

If they are not within specifications, replace steering gear assembly.

CAUTION:

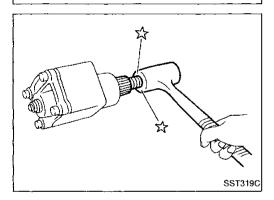
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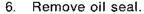
Each oil sealing parts, dust cover, copper washer and snap ring once removed must not be used again.

- 1. Place steering gear in a vise with Tool.
- 2. Set worm gear in a straight-ahead position.



- 4. Knock out end of sector shaft with plastics hammer.
- 5. Remove sector shaft by hand.

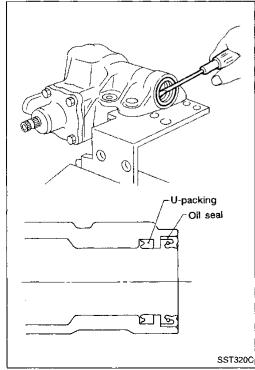


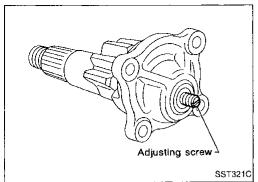


7. Remove U-packing.

CAUTION:

When removing oil seal and U-packing, be careful not to scratch gear housing.





Disassembly (Cont'd)

Remove lock nut, then loosen adjusting screw using a screwdriver. Separate sector cover and sector shaft.

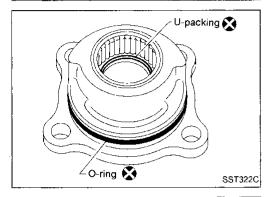


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Remove O-ring. 10. Remove U-packing.

When removing U-packing, be careful not to scratch sector cover, needle bearing, etc.

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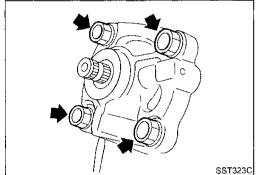
Needle bearing cannot be disassembled. If it is damaged, remove sector cover assembly.

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11. Remove dust seal.

12. Remove rear housing bolts.

13. Remove rear housing together with worm gear assembly.

CAUTION:

Worm gear assembly cannot be disassembled. When it is removed, be careful not to disengage worm gear from shaft or allow it to drop.

14. Remove teflon ring and O-ring of worm gear assembly.

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Install new O-ring on worm gear assembly.

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Apply a thin coat of ATF to new O-ring.

Install new teflon ring on worm gear assembly.

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Be sure that teflon ring settles in its correct position.

Install new O-ring into rear housing.

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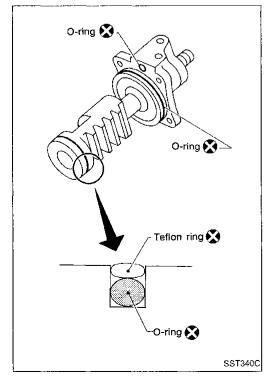
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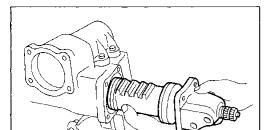
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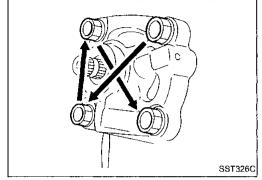
Assembly (Cont'd)

4. Install worm gear assembly with rear housing into the gear housing.

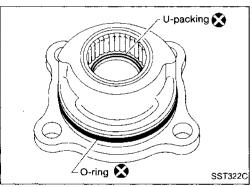
CAUTION:

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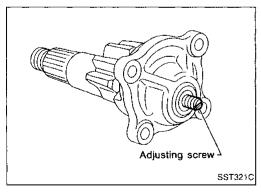
- Apply a thin coat of ATF inside gear housing and piston before insertion.
- Be sure that teflon ring at piston end is not damaged during insertion of gear housing.



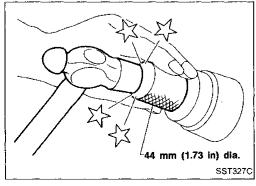
Gradually tighten rear housing bolts in a criss-cross fashion.



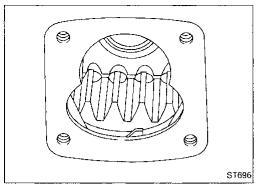
- 6. Install new O-ring into sector shaft cover.
- Before installing, apply a thin coat of ATF to O-ring.
- 7. Install new U-packing into sector shaft cover.
- Before installing, apply a thin coat of ATF to U-packing.
- Direct grooved side of U-packing to needle bearing.

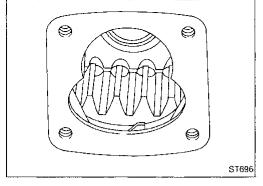


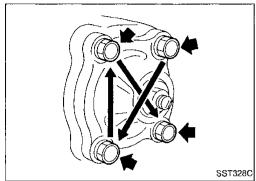
- Install sector shaft into sector shaft cover.
 Set adjusting screw to its outermost position.
- Before installing sector shaft, apply multi-purpose grease to adjusting screw and adjusting screw shim.



- 9. Install new oil seal into gear housing with suitable tool.
- Before installing oil seal, apply multi-purpose grease to oil seal lips.







Assembly (Cont'd)

10. Set piston rack at straight-ahead position.

Turn piston rack about 10° to 15° toward yourself with your finger.

This is for smooth insertion of sector gear.

11. Gradually insert sector shaft into gear housing.

12. Tighten sector shaft cover bolts.

13. Set worm gear turning torque by turning adjusting screw of sector shaft and locking with lock nut.

Refer to "TURNING TORQUE MEASUREMENT" of Inspection and Adjustment. (ST-19)

If there is a great difference between values of turning torque before and after disassembly, it must be assumed that some new problem has occurred. It will be necessary to replace the entire assembly.

14. Check sector shaft end play in neutral position.

End play: Less than 0.1 mm (0.004 in)

If not within specification, adjust it with adjusting screw.

15. Check worm gear preload. If not within specification, readjust it.

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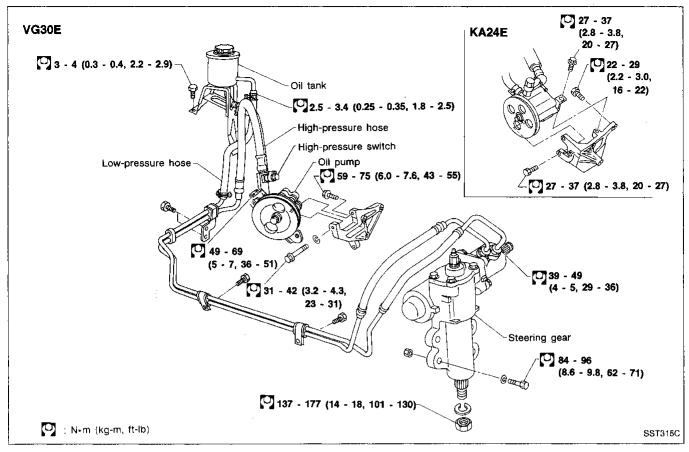
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Description



This power steering adopts spool valve control which was developed in a technical tie-up with the ZF Company.

Only the sealing parts can be replaced. The remaining parts must be replaced as an assembly.

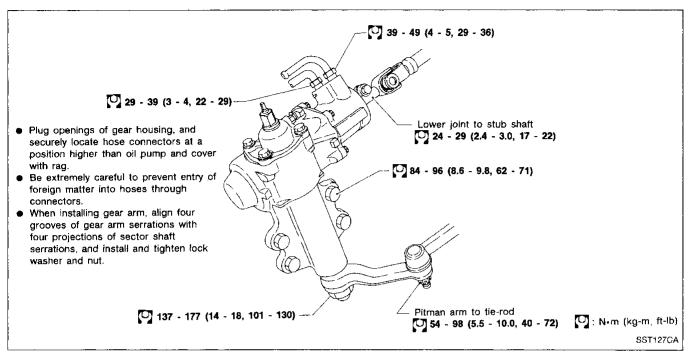
CAUTION:

- a. The parts which can be disassembled are strongly restricted, and never disassemble other parts than the specified ones.
- Disassembly should be performed in a place as clean as possible.
- c. Hands should be cleaned before disassembly.
- d. Do not use a rag. Be sure to use nylon or paper cloth.
- e. Be sure to follow procedures and cautions indicated in the Service Manual.

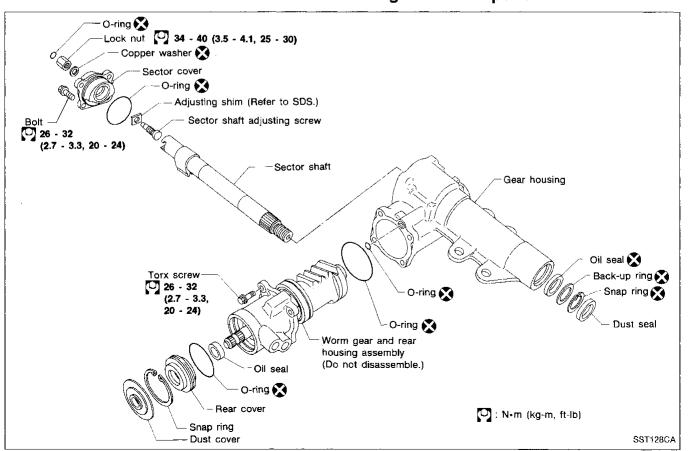
Removal

Before removing, clean exteriors or gear housing and oil pump with steam and dry with compressed air.

STEERING GEAR



Power Steering Gear Component



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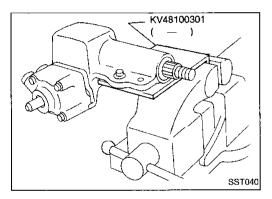
Inspection and Adjustment

Before disassembling power steering gear component parts, make sure there is no oil leakage around sealing portion and check steering turning torque as follows:

Check sealing portion.

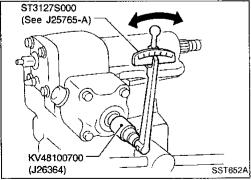
- Adjusting screw nut O-ring
- Sector shaft cover O-ring
- Sector shaft oil seal
- · Rear cover oil seal and O-ring
- · Rear housing O-ring
- Gear housing O-ring

Discard and oil seal and O-ring which have once been removed. Replace oil seal and O-ring if sealing surface is deformed or cracked.



TURNING TORQUE MEASUREMENT

- 1. Measure turning torque at 360° position.
- (1) Install steering gear on Tool.

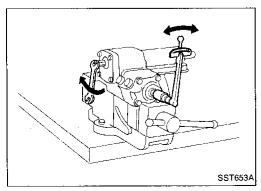


- (2) Turn stub shaft all the way to right and left several times.
- (3) Measure turning torque at 360° position from straightahead position with Tools.

Turning torque at 360°:

0.7 - 1.2 N·m

(7 - 12 kg-cm, 6.1 - 10.4 in-lb)



(4) Measure turning torque at straight-ahead position.

Straight-ahead position is a position where stub shaft is turned 2.14 turns (two full turns and 50°) from lock position.

Turning torque at straight-ahead position:

0.1 - 0.4 N·m

(1 - 4 kg-cm, 0.9 - 3.5 in-lb) higher than at 360°

If they are not within specifications, adjust turning torque by turning sector shaft adjusting screw.

Inspection and Adjustment (Cont'd)

2. Tighten adjusting screw lock nut with tools.

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Disassembly

Before disassembly, measure turning touque.

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If they are not within specifications, replace steering gear assembly.

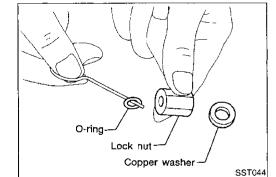
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CAUTION:

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Eeach oil sealing parts, dust cover, copper washer and snap ring once removed must be used again.

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ADJUSTING SCREW LOCK NUT O-RING

Remove adjusting screw lock nut, and replace O-ring.

Set stub shaft in a straight-ahead position.

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SECTOR SHAFT OIL SEAL

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Straight-ahead position is a position where stub shaft is turned 2.14 turns (two full turns and 50°) from lock position.

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Disconnect sector shaft cover bolt.

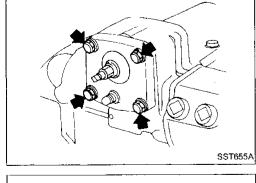
Do not turn lock nut unless necessary; otherwise it will damage O-ring, resulting in an oil leak.

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3. Draw out sector shaft.

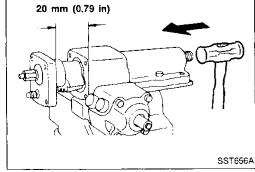
Knock out end of sector shaft approximately 20 mm (0.79 in).

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Disassembly (Cont'd)

4. Connect a roll of plastic film to sector shaft.

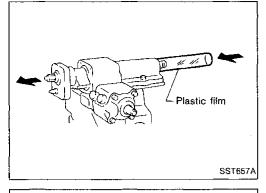


Thickness 0.1 mm (0.004 in) Length x width

200 x 200 mm (7.87 x 7.87 in)

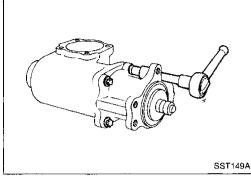
5. Pull out sector shaft by hand.

Attach plastic film to needle bearings located at two places inside gear housing while simultaneously pulling out sector shaft so that bearings will not drop into housing.

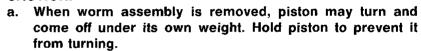


REAR HOUSING O-RING

1. Remove torx screw.

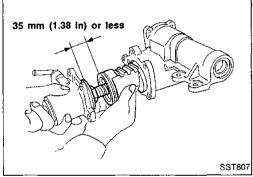


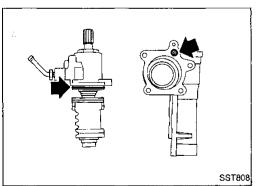
2. Remove rear housing together with worm gear assembly. **CAUTION:**



If piston-to-rear housing clearance exceeds 35 mm (1.38 in) by loosening recirculating ball will be out of groove of worm; do not reinstall piston but replace the entire assembly.

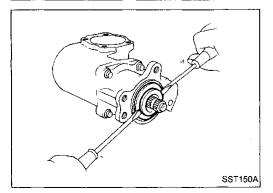
- Take care not to damage teflon ring at piston end when removing.
- 3. Remove O-rings.

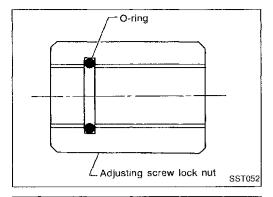




REAR COVER O-RING AND OIL SEAL

- 1. Remove snap ring, then rear cover.
- 2. Remove O-ring and oil seal.





Assembly

ADJUSTING SCREW LOCK NUT O-RING

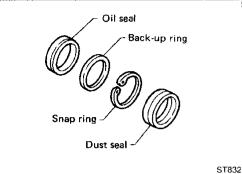
Insert new O-ring into adjusting screw lock nut.

- Before inserting, apply a thin coat of vaseline to O-ring.
- Insert O-ring to make sure it fits into groove.

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SECTOR SHAFT OIL SEAL

- When installing, be sure to use new oil seal, dust seal, back-up ring and snap ring.
- Before installing, apply a thin coat of vaseline to new oil seal and dust seal.

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1. Press new oil seal and then install back-up ring with Tool.

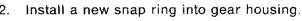
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Snap ring

Outside

Inside

R face

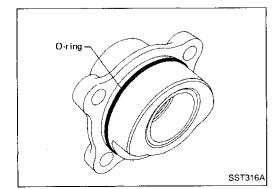
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- Turn snap ring to make sure it fits into groove.
- Always install snap ring with R face facing inward.

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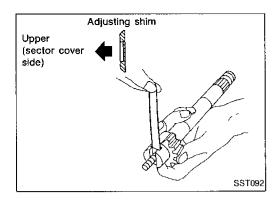
- Press a new dust seal.
- Fit new O-ring into sector shaft cover.
- Before installing, apply a thin coat of vaseline to O-ring.
- Make certain that O-ring is installed properly, and not damaged by sector shaft.

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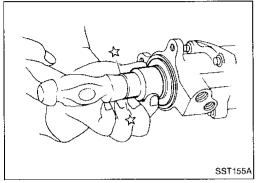


Assembly (Cont'd)

SECTOR SHAFT END PLAY

Select suitable adjusting shim and adjust end play between sector shaft and adjusting screw.

Sector shaft end play: 0.01 - 0.03 mm (0.0004 - 0.0012 in) Sector shaft adjusting screw shims: Refer to SDS (ST-39).

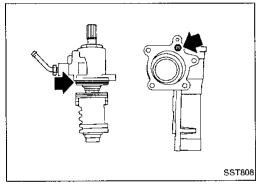


REAR COVER O-RING AND OIL SEAL

- 1. Install new O-ring and oil seal.
- 2. Install rear cover, then snap ring.

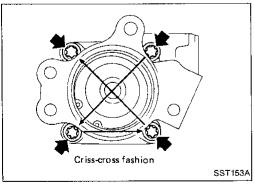
CAUTION:

- a. Turn snap ring to make sure it fits into grooves.
- Always install snap ring with its rounded edge facing rear cover.

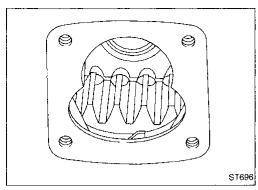


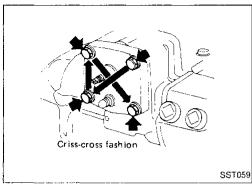
REAR HOUSING O-RING

- 1. Install new O-rings.
- a. Before installing, apply a thin coat of vaseline to O-ring.
- b. Make sure O-ring is installed correctly and is not damaged by worm gear.



- Gradually insert worm gear and rear housing assembly into gear housing, being careful not to damage oil seal and O-rings.
- Install torx screws.





Assembly (Cont'd)

SECTOR SHAFT

1. Set piston rack at straight-ahead position.

Turn piston rack about 10° to 15° toward yourself with your finger. This is for smooth insertion of sector gear.

2. Wrap vinyl tape around serration area of sector shaft.

The reason is that vinyl tape prevents oil seal lip from being damaged during insertion.

3. Gradually insert sector shaft into gear housing, being careful not to damage oil seal.

When inserting sector shaft into gear housing, remove plastic film. Be careful not to drop bearings into gear housing.

- 4. Tighten sector shaft cover bolts.
- 5. Check turning torque and steering gear preload.

Refer to Inspection and Adjustment of POWER STEERING GEAR. (ST-26)

If there is a great difference between values of turning torque before and after disassembly, it must be assumed that some new problem has occurred. It will be necessary to replace the entire assembly.

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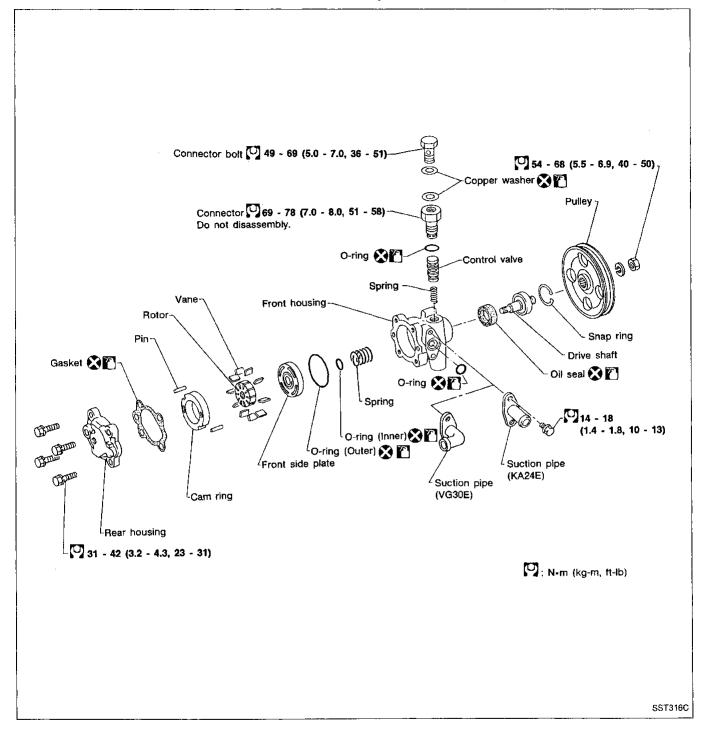
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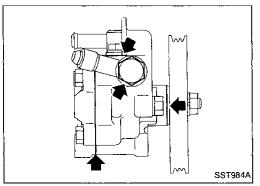
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Disassembly and Assembly





Pre-disassembly Inspection

Disassemble the power steering oil pump only if the following items are found.

- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.
- Poor performance.

Disassembly

CAUTION:

- Parts which can be disassembled are strictly limited. Never disassemble parts other than those specified.
- Disassemble in as clean a place as possible.

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- Clean your hands before disassembly.
- Do not use rags; use nylon cloths or paper towels.
- Follow the procedures and cautions in the Service Manual.
- When disassembling and reassembling, do not let foreign

matter enter or contact the parts.

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Remove snap ring, then draw drive shaft out.

Be careful not to drop drive shaft.

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Remove oil seal.

Be careful not to damage front housing.

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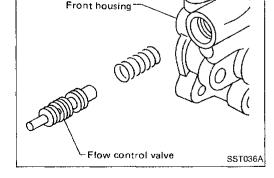
Remove connector.

Be careful not to drop control valve.

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Extension bar

Drive shaft

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Inspection

Inspect each component part for wear, deformation, scratches, and cracks. If damage is found, replace the part.

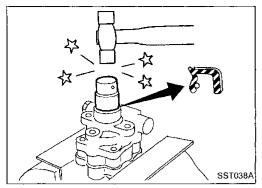
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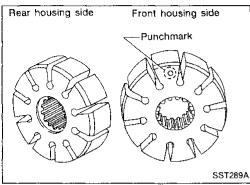
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POWER STEERING OIL PUMP

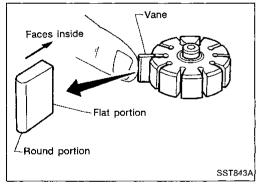




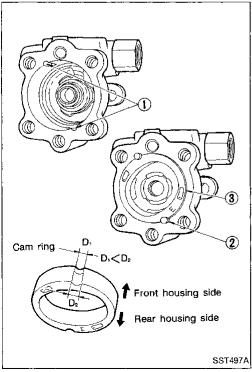


Assemble oil pump, noting the following instructions.

- Make sure O-rings and oil seal are properly installed.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.
- Cam ring, rotor and vanes must be replaced as a set if necessary.
- Coat each part with ATF when assembling.
- · Pay attention to the direction of rotor.

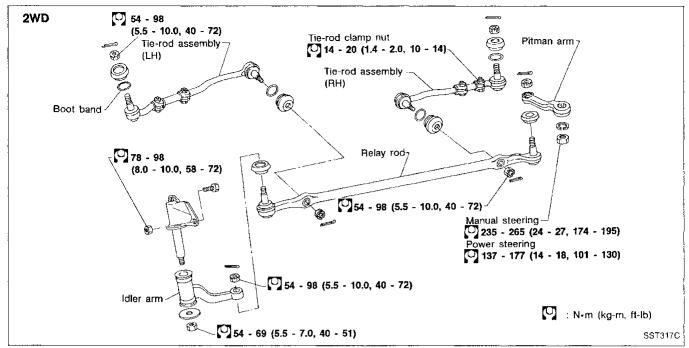


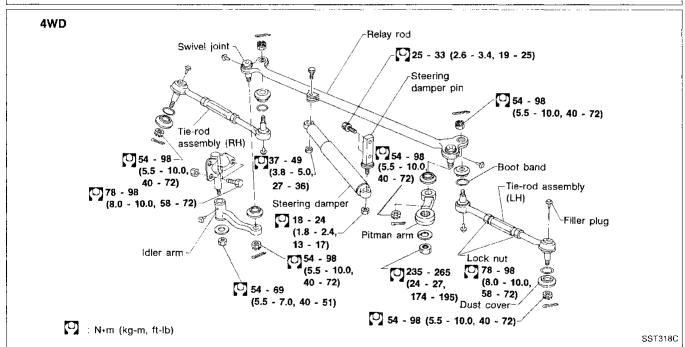
When assembling vanes to rotor, rounded surfaces of vanes must face cam ring side.

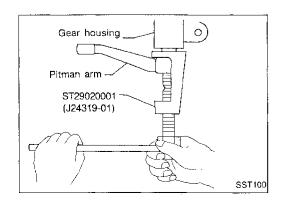


 Insert pin ② into pin groove ① of front housing and front side plate. Then install cam ring ③ as shown at left.

Removal and Installation







Remove gear arm with Tool.

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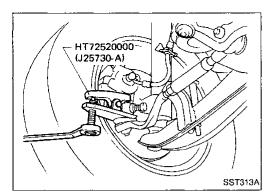
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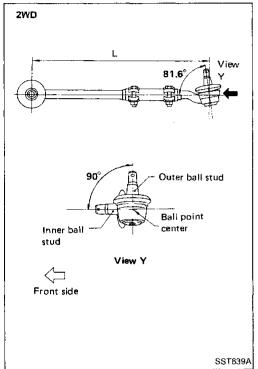
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STEERING LINKAGE



Removal and Installation (Cont'd)

Remove tie-rod from knuckle arm with Tool.



Disassembly

IDLER ARM ASSEMBLY

- Apply coat of multi-purpose grease to bushing.
- Press bushing into idler body, and insert shaft of idler bracket carefully until bushing protrudes.

CROSS ROD AND TIE-ROD

- When tie-rod ball joints and tie-rod bar are separated, adjust tie-rod length correctly.
 - Adjustment should be done between ball stud centers.
 - L: Standard

344 mm (13.54 in) ... 2WD

2. Lock tie-rod clamp nut so that ball joint on outer ball stud is as follows with respect to that on inner ball stud.

CALITION

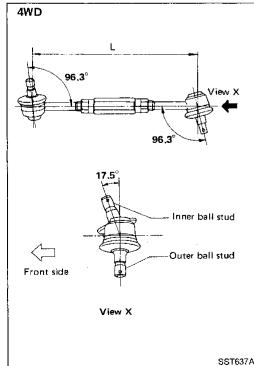
Make sure that tie-rod bars are screwed into tie-rod tube more than 35 mm (1.38 in).



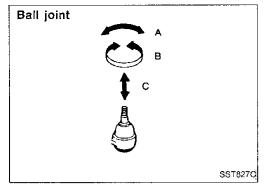
L: Standard 281 mm (11.06 in) ... 4WD

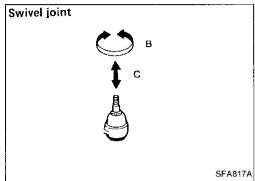
CAUTION:

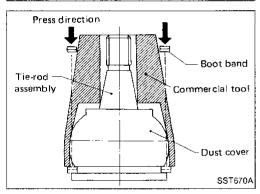
Make sure that tie-rod bars are screwed into tie-rod tube more than 35 mm (1.38 in).



STEERING LINKAGE







Inspection

BALL JOINT AND SWIVEL JOINT

Check joints for play. If ball or swivel stud is worn and play in axial direction is excessive or joint is hard to swing, replace as a complete unit.

Swinging force (Measure point: Cotter pin hole) "A": **Ball ioint**

10.8 - 107.9 N (1.1 - 11.0 kg, 2.4 - 24.3 lb)

Rotating torque "B":

0.5 - 4.9 N·m (5 - 50 kg-cm, 4.3 - 43.4 in-lb) Axial end play "C":

Ball joint

0.1 - 0.8 mm (0.004 - 0.031 in)

Swivel joint

0.1 - 1.0 mm (0.004 - 0.039 in)

Check condition of dust cover. If it is cracked excessively, EF & replace dust cover.

When replacing dust cover, be careful not to damage it.

Lubricate joint with multi-purpose grease, if necessary.

When installing boot band with *commercial service tool, be careful not to overexpand it.

* Refer to Preparation (ST-3).

CAUTION:

Be careful not to apply grease or oil to taper of joint.

IDLER ARM ASSEMBLY

Check rubber bushing of idler arm for breakage, wear or play, and if necessary replace.

Lubricate idler arm assembly with recommended multipurpose grease, if necessary.

When lubricating, refer to BALL JOINT AND SWIVEL JOINT.

CROSS ROD AND TIE-ROD

Check tie-rod and cross rod for breakage, bend or crack, and PD replace with a new one if necessary.

STEERING DAMPER

Check for oil leakage of damper, and replace if necessary.

FIXING LOCATION

Check fixing location (nuts and cotter pins) for looseness, play or breakage.

When looseness or play is found, check for wear on tapered portion of joints, gear arm of idler arm.

When reassembling each joint, use new cotter pins.

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SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

	:	Power steering	
Steering column type (Collapsible)	Manual steering	2WD TRUCK	Except 2WD truck
Steering gear type	VB66K	PB48S	PB59K
Turns of steering wheel on the vehicle (Lock-to-lock)	5.8 (2WD) 5.9 (4WD)	3.7	3.4 2.5*1
Steering gear ratio	24.4 - 26.84	16.5	15

Steering wheel axial play mm (in)	0 (6)
Steering wheel play mm (in)	35 (1.38) or less

Inspection and Adjustment

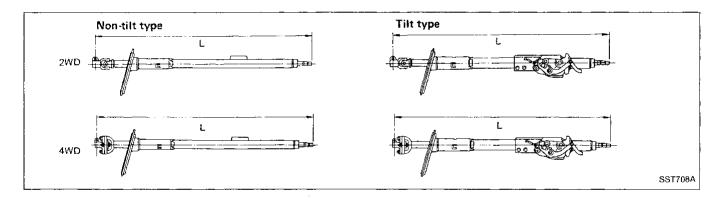
STEERING COLUMN

Unit: mm (in)

Dimension "L"

2WD model 918.0 - 919.6 (36.14 - 36.20)

4WD model 886.1 - 887.7 (34.89 - 34.95)



^{*1: 4}WD: Tire size ... 10.50R15

SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment (Cont'd)

MANUAL STEERING GEAR (Model: VB66K)

Worm bearing preload N·m (kg-cm, in-lb)		- 0.88 , 6.1 - 7.8)
Steering gear turning torque N·m (kg-cm, in-lb)		
360° position from straight-ahead position	}	- 0.88 6.1 - 7.8)
Straight-ahead position (As compared with steering wheel turned 360°)		- 0.39 1.7 - 3.5)
Maximum turning torque	1.08 (11.0, 9.5)	
Backlash at pitman arm top end (in a straight-ahead position) mm (in)	0 - 0.1 ((0 - 0.004)
End play (Between sector shaft and adjusting screw) mm (in)	0.01 - 0.03 (0.	0004 - 0.0012)
	Thickness mm (in)	Part number
Adjusting shim thickness	1.95 (0.0768)	48219-84500
	2.00 (0.0787)	48130-84500
	2.05 (0.0807)	48131-84500
Oil capacity £ (US pt, Imp pt)	Approx. 0.62	(1-3/8, 1-1/8)

STEERING LINKAGE

Applied model		2WD	4WD
Relay-rod swivel joint			
Rotating torque N·m (kg-cn	n, in-lb)	_	0.5 - 4.9 (5 - 50, 4.3 - 43.4)
Axial end play r	nm (in)		0.1 - 1.0 (0.004 - 0.039)
Tie-rod & relay-rod ball jo	oint		
Swinging force at cotton N	er pin (kg, lb)	10.8 - (1.1 - 11.0,	
Rotating torque N·m (kg-cn	n, in-lb)	0.5 - (5 - 50, 4	
Axial end play r	nm (in)	0.1 - 0.8 (0.	004 - 0.031)
Tie-rod standard engine (L) nm (in)	344 (13.54)	281 (11.06)

		-	
Steering wheel turning force (at 360° from neutral position and circumference of steering wheel) N (kg, lb)	24.5 - 29.4 (2.5	- 3.0, 5.5 - 6.6)	G
Oil pump pressure kPa (kg/cm², psi)	7,649 - 8,238 (78 - 84, 1,109 - 1,194) at idling		MA
Fluid capacity m& (US fl oz, Imp fl oz)	Approximately 900 - 1,000 (30.4 - 33.8, 31.7 - 35.2)		
Normal operating temperature °C (°F)	60 - 80 (1	140 - 176)	EM
Steering gear turning torque N·m (kg-cm, in-lb)			LC
360° position from straight-ahead position	0.7 - 1.2 (7 -	12, 6.1 - 10.4)	EF &
Straight-ahead position (As compared with steering wheel turned 360°)	0.1 - 0.4 (1 - 4,	0.9 - 3.5) higher	EC FE
Backlash at pitman arm top end (in a straight- ahead position) mm (in)	0 - 0.1 (0 - 0.004)		CL
End play (Between sector shaft and adjusting screw) mm (in)	0.01 - 0.03 (0.0004 - 0.0012)		MT
Adjusting shim thickness	Thickness mm (in)	Part number	AT
	1.575 - 1.600 (0.0620 - 0.0630)	48213-B0100	IALU
	1.550 - 1.575 (0.0610 - 0.0620)	48214-B0100	TE
	1.525 - 1.550 (0.0600 - 0.0610)	48215-B0100	PD
	1.500 - 1.525 (0.0591 - 0.0600)	48216-B0100	_
	1.475 - 1.500 (0.0581 - 0.0591)	48217-B0100	FA
	1.450 - 1.475 (0.0571 - 0.0581)	48218-B0100	RA

POWER STEERING SYSTEM (Model: PB48S)





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SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment (Cont'd)

POWER STEERING SYSTEM (Model: PB59K)

Steering wheel turning force (at 360° from neutral position and circumference of steering wheel) N (kg, lb)	39 (4, 9) or less
Oil pump pressure kPa (kg/cm², psi)	7,649 - 8,238 (78 - 84, 1,109 - 1,194) at idling
Fluid capacity mt (US fl oz, 1mp fl oz)	Approximately 1,000 - 1,100 (33.8 - 37.2, 35.2 - 38.7)
Normal operating temperature °C (°F)	60 - 80 (140 - 176)
Steering gear turning torque N·m (kg-cm, in-lb)	
360° position from straight-ahead position	0.15 - 0.78 (1.5 - 8.0, 1.3 - 6.9)
Straight-ahead position (As compared with steering wheel turned 360°)	0.25 - 1.32 (2.5 - 13.5, 2.2 - 11.7) higher
Maximum turning torque	1.03 - 1.47 (10.5 - 15, 9.1 - 13.0)
Backlash at pitman arm top end (in a straight- ahead position) mm (in)	0 - 0.1 (0 - 0.004)
End play (at sector shaft end in neutral position) mm (in)	0.1 (0.004) or less

TRANSFER

SECTION I

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PREPARATION

Special Service Tools

Tool number		
(Kent-Moore No.)	Description	
Tool name		
ST38060002	9	Removing companion flange nut
(J34311)		Installing companion flange nut
Flange wrench	(S) B	
	NT113	
ST30021000		Removing counter gear front bearing
(J22912-01)		(Use with ST36710010)
Puller		Removing L & H hub
ST30031000	NT071	Removing counter gear rear bearing
(J22912-01)		(Use with ST36710010)
Puller		(030 Willi 0100710010)
T dilet		
	608	
	l Names	
ST33290001	NT071	Removing center case oil seal
(J25810-A)		Removing rear oil seal
Puller		v
	00	
	NTOTO	
ST33051001	NT076	Removing companion flange
(J22888)		, , ,
Puller		
	HEATE WWW	
	9 9	
ST30720000	NT114	① Installing center case oil seal
① (J25273)		2 Installing rear oil seal
② (J25405)		
Drift	T.T(())	
	a \ b	
	<u>*</u>	a: 77 mm (3.03 in) dia.
	NT115	b: 55.5 mm (2.185 in) dia.
ST36710010		Removing counter gear front bearing
(—)		(Use with ST30021000)
Drift		Removing counter gear rear bearing
		(Use with ST30031000)
	a	
		a: 34.5 mm (1.358 in) dia.
	NT063	as one that there my dia.

PREPARATION

Special Service Tools (Cont'd)				
Tool number (Kent-Moore No.) Tool name	Description			
ST33061000 (J8107-2) Drift	Remov	ving main gear bearing		
	•	MA mm (1.122 in) dia. nm (1.50 ln) dia.		
ST30613000 ① (J25742-3) ② (J34339)) ins	stalling main gear bearing EM stalling cover oil seal		
Drift	ا اما	nm (2.83 in) dia. LC nm (1.89 in) dia.		
(J35864) Drift	Installi	ing shift shaft oil seal EF		
	b: 20 m	nm (1.02 in) dia. nm (0.79 in) dia.		
(J26092) Drift	191111	g counter gear assembly		
	a To TO	MT		
(10.1004)	NT065 b: 38.5	mm (1.752 in) dia. mm (1.516 in) dia.		
(J34291) Shim setting gauge set	Selection shim	ing counter gear rear bearing		
	BOBOR E	PD		
(J34291-20) Plunger-shim setting gauge	NT101 Select shim	ing counter gear rear bearing		
•		BA		
	NT118	BR		

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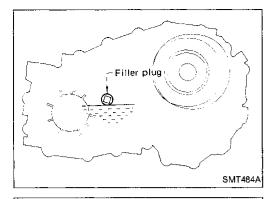
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PREPARATION

Commercial Service Tools

Tool name	Description	
Puller	NT077	Removing front drive shaft front bear- ing Removing front drive shaft rear bear- ing Removing main gear bearing
Drift	a bi	① Installing mainshaft rear bearing ② Installing L & H hub ① a: 50 mm (1.97 in) dia. b: 42 mm (1.65 in) dia. c: 180 mm (7.09 in) ② a: 60 mm (2.36 in) dia. b: 50 mm (1.97 in) dia. c: 60 mm (2.36 in)



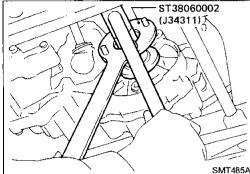
Checking Transfer Oil

- Check transfer for oil leakage.
- Check oil level.

Genuine Nissan ATF or equivalent type $DEXRON^{TM}II$ fluid is used for the transfer .

Never add gear oil (75W-90) to Automatic Transmission Fluid.

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(J22888)

Replacing Oil Seal

CENTER CASE OIL SEAL

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- Remove front propeller shaft. Refer to PD section.
- 2. Remove companion flange nut.

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Remove companion flange.

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4. Remove center case oil seal.

Install companion flange.

5. Install center case oil seal.

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Before installing, apply multi-purpose grease to seal lip.

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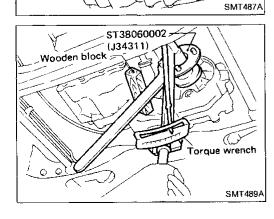
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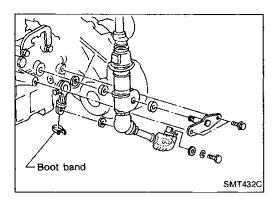


ST33290001 (J25810-A)

7. Tighten nut to the specified torque.

8. Install front propeller shaft.

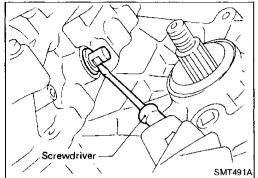
ON-VEHICLE SERVICE



Replacing Oil Seal (Cont'd)

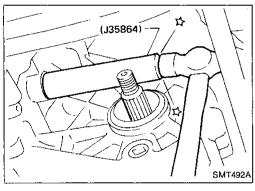
SHIFT SHAFT OIL SEAL

- 1. Remove front propeller shaft. Refer to PD section.
- Remove companion flange. Refer to center case oil seal service on previous page.
- 3. Remove transfer control lever from transfer outer shift lever. Then remove outer shift lever.



4. Remove shift shaft oil seal.

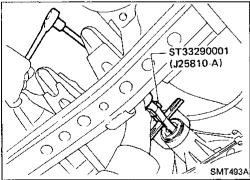
Be careful not to damage cross shaft.



Install shift shaft oil seal.

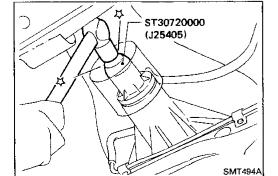
Before installing, apply multi-purpose grease to seal lip.

- 6. Install transfer control linkage.
- 7. Install companion flange. Refer to center case oil seal service on previous page.
- 8. Install front propeller shaft.



REAR OIL SEAL

- 1. Remove rear propeller shaft. Refer to PD section.
- 2. Remove rear oil seal.

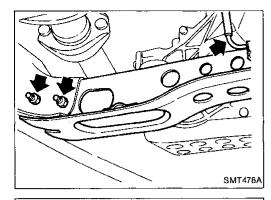


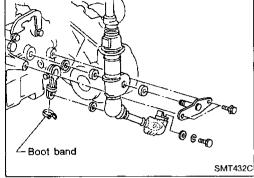
3. Install rear oil seal.

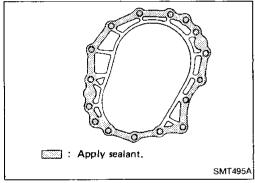
Before installing apply multi-purpose grease to seal lip.

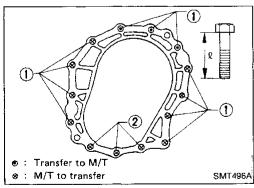
4. Install rear propeller shaft.

REMOVAL AND INSTALLATION









Removal

- Drain oil from transfer and transmission.
- Remove front and rear propeller shaft. Refer to section PD.
- Insert plug into rear oil seal after removing propeller shaft.

CAUTION:

Be careful not to damage spline, sleeve yoke and rear oil seal, when removing propeller shaft.

- Remove torsion bar spring. Refer to REMOVAL of Torsion Bar Spring in section FA. Then remove second crossmember.
- Remove transfer control lever from transfer outer shift lever.
- Remove transfer from transmission.

WARNING:

Support transfer while removing it.



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Installation

 Apply recommended sealant to mating surface to transmission. (M/T model only)

Recommended sealant:

Nissan genuine part (KP610-00250) or equivalent

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Tighten bolts securing transfer.

M/T model

Bolt No.	Tightening torque N-m (kg-m, ft-lb)	l mm (in)	- - RA
1	31 - 41 (3.2 - 4.2, 23 - 30)	45 (1.77)	- 0.00-0
2	31 - 41 (3.2 - 4.2, 23 - 30)	60 (2.36)	_ @.o

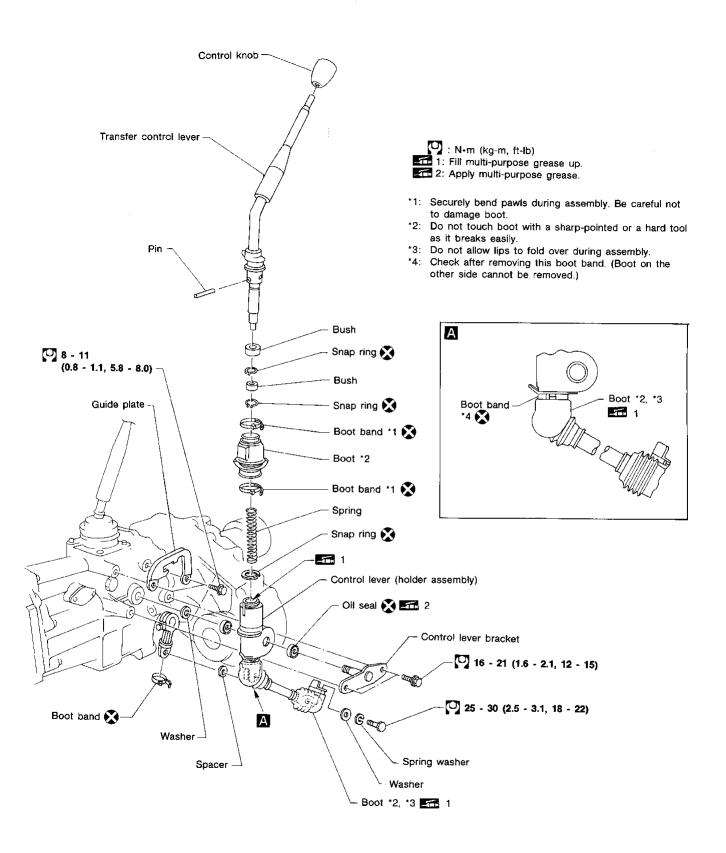
A/T model

		,	· ST
Bolt No.	Tightening torque N⋅m (kg-m, ft-lb)	l mm (in)	<u>⊗</u> ∥
1	31 - 41 (3.2 - 4.2, 23 - 30)	60 (2.36)	3F
2	31 - 41 (3.2 - 4.2, 23 - 30)	60 (2.36)	

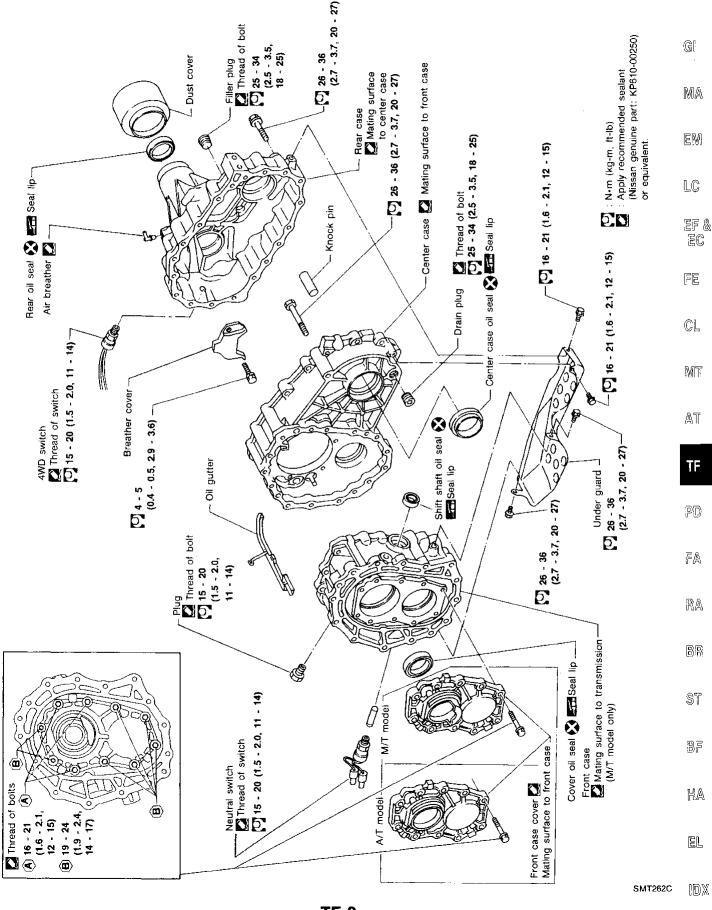
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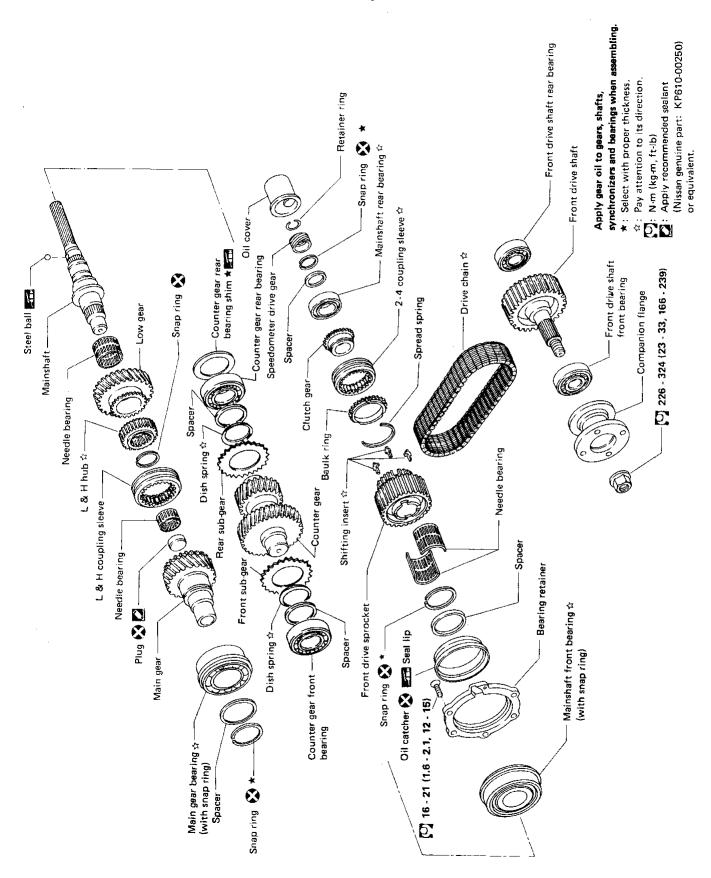
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Case Components

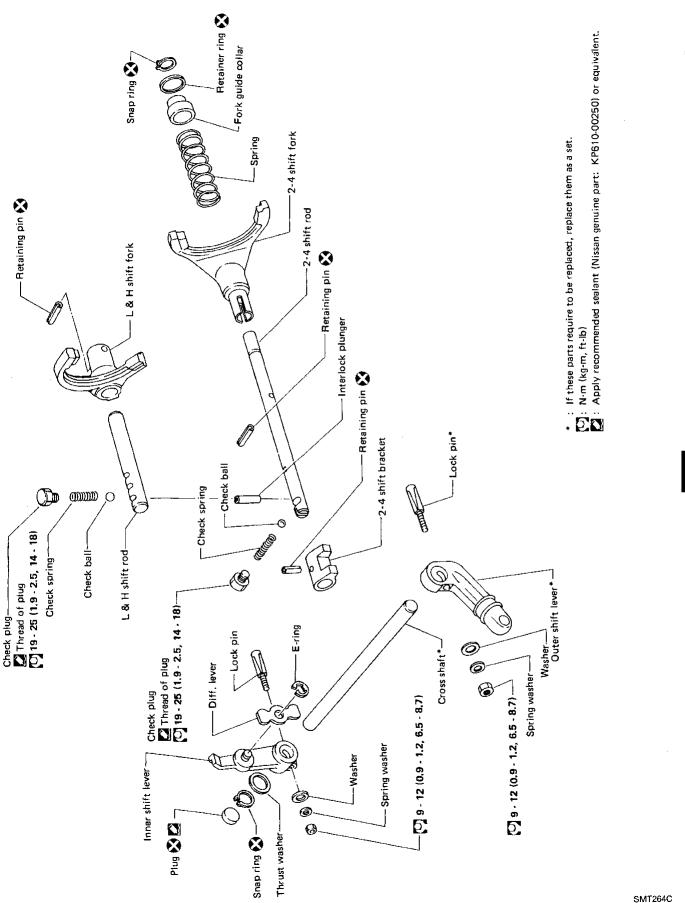


Gear Components



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Shift Control Components



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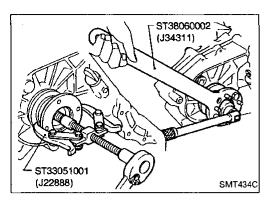
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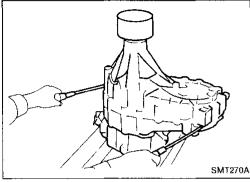
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DISASSEMBLY

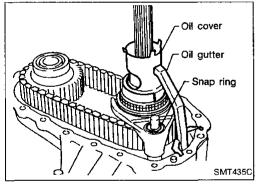


- 1. Remove nut of companion flange.
- 2. Remove companion flange.

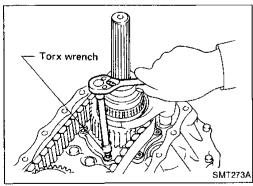


- 3. Remove 4WD switch.
- 4. Remove rear case.

Be careful not to damage the mating surface.

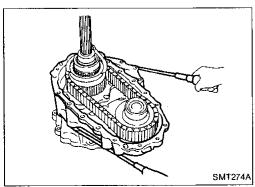


- 5. Remove oil cover and oil gutter.
- 6. Remove snap ring from 2-4 shift rod.



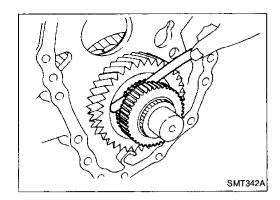
7. Remove bolts securing bearing retainer.

This step is necessary to remove mainshaft from center case.



Remove bolts securing center case to front case and then separate center case and front case.

DISASSEMBLY



Measure end play of low gear.

Standard:

0.2 - 0.35 mm (0.0079 - 0.0138 in)

If end play is beyond the maximum value, check low gear and L & H hub for wear.

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10. Disassemble center case assembly. Remove snap ring from mainshaft.

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b. Pull out low gear with L & H hub.

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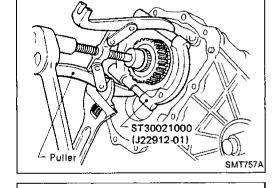
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Make sure of the direction of the drive chain before removing it. (It must be reinstalled in the same direction.)

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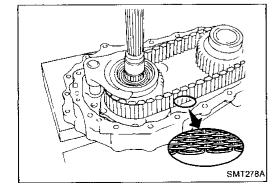
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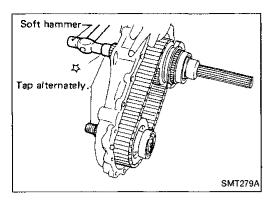
Remove needle bearing of low gear.

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Check whether spring part of drive chain is installed on front or rear side.

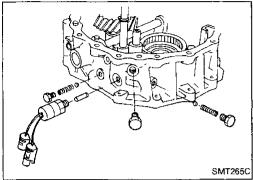


DISASSEMBLY

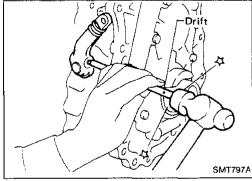


e. Remove mainshaft, front drive and drive chain as a set by tapping front end of mainshaft and front drive shaft alternately.

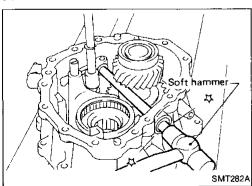
Be careful not to bend drive chain.



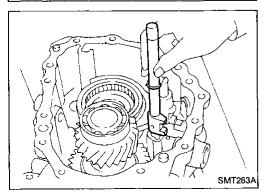
- 11. Disassemble front case assembly.
- a. Remove switch, plugs, check springs and check balls.



b. Remove outer shift lever.

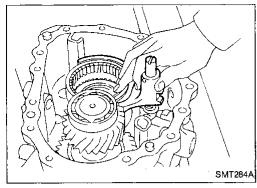


 Remove lock pin of inner shift lever and drive out cross shaft with plug.



d. Remove 2-4 shift rod.

DISASSEMBLY



Remove L & H shift rod and fork assembly with coupling sleeve.



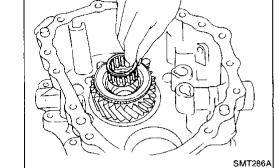
Remove needle bearing from main gear.



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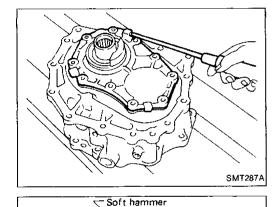
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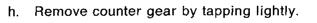
Remove bolts securing front case cover and then remove case.



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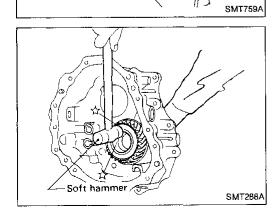




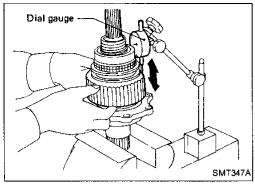
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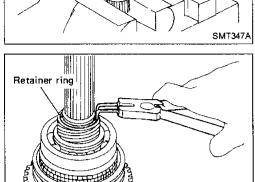
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Remove main gear by tapping lightly.







DISASSEMBLY

1. Check end play of front drive sprocket.

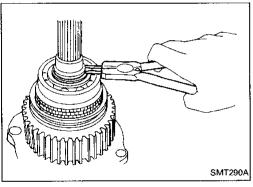
Standard:

0.2 - 0.35 mm (0.0079 - 0.0138 in)

If end play is beyond the maximum value, check front drive sprocket and clutch gear for wear.

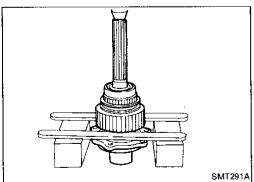
2. Remove retainer ring, speedometer drive gear and steel ball.

Be careful not to lose the steel ball.

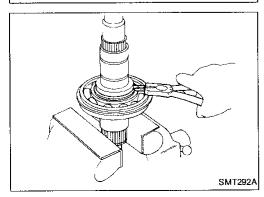


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3. Remove snap ring and spacer.



- 4. Press out front drive sprocket with mainshaft rear bearing and clutch gear together.
- 5. Remove needle bearing.

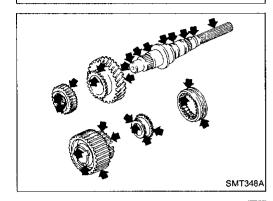


Remove bearing retainer and then remove snap ring and spacer.

Mainshaft (Cont'd)

7. Press out mainshaft front bearing from mainshaft.





INSPECTION

SMT293A

Gear and shaft

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- Check gears for excessive wear, chips or cracks.
- Check shaft for cracks, wear or bending.
- Check coupling sleeve for wear or damage.

EC FE

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Baulk ring

Check baulk ring for cracks or deformation.

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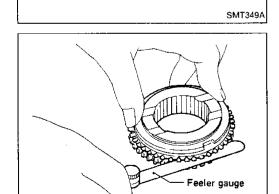
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11-14- ----- (1-)



Measure clearance between baulk ring and gear.

Baulk ring to gear clearance:

	Unit: mm (in)
Standard	Wear limit
1.0 - 1.5 (0.039 - 0.059)	0.5 (0.020)

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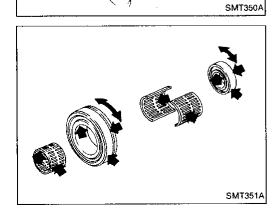


 Make sure bearings roll freely and are free from noise, BF crack, pitting or wear.

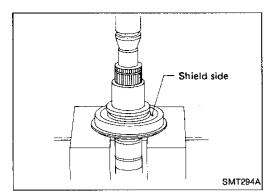
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TF-17

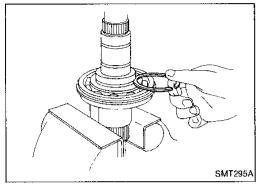


Mainshaft (Cont'd)

ASSEMBLY

1. Press mainshaft front bearing onto mainshaft.

Pay special attention to its direction.

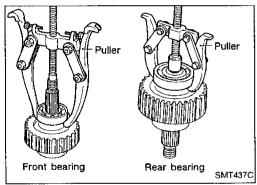


- 2. Install spacer.
- 3. Select snap ring with proper thickness and install it.

Allowable clearance between snap ring and groove: 0 - 0.15 mm (0 - 0.0059 in)

Available snap ring for mainshaft front bearing: Refer to SDS, TF-31.

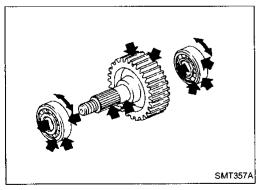
 Regarding to further procedures, refer to "ASSEMBLY", TF-24.



Front Drive Shaft

DISASSEMBLY

Front drive shaft front bearing and rear bearing



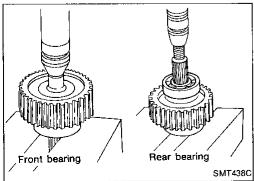
INSPECTION

Sprocket and shaft

- Check sprocket for excessive wear, chips or cracks.
- · Check shaft for cracks or wear.

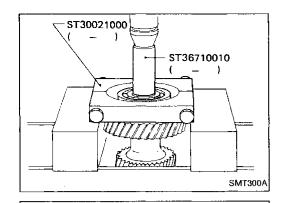
Bearing

 Make sure bearings roll freely and are free from noise, crack, pitting or wear.



ASSEMBLY

Press front drive shaft front bearing and rear bearing.



ST36710010

SMT301A

ST30031000

(J22912-01)

Counter Gear

DISASSEMBLY

1. Press out counter gear front bearing and then remove front sub-gear, spacer and dish spring.

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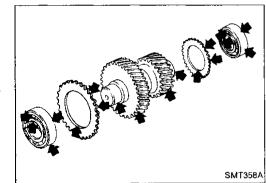
2. Press out counter gear rear bearing and then remove rear sub-gear, spacer and dish spring.

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INSPECTION

Gear and shaft

Check gears for excessive wear, chips or cracks.

Check shaft for cracks or wear.

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Bearing

Make sure bearings roll freely and are free from noise, crack, pitting or wear.

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1. Install front sub-gear, dish spring and spacer, and then $\[\]$ press on counter gear front bearing.

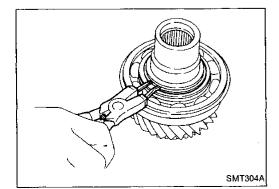
Install rear sub-gear, dish spring and spacer, and then press on counter gear rear bearing.

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Rear bearing

SMT439C

Front bearing

Main Gear

DISASSEMBLY

Main gear bearing

1. Remove snap ring and spacer.

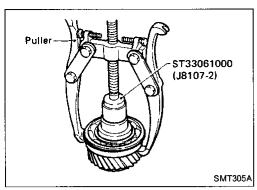
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Main Gear (Cont'd)

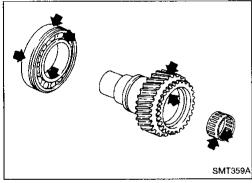
2. Pull out main gear bearing.



Drift SMT306A

Plug

Always replace it with new one whenever it is removed.



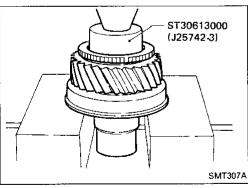
INSPECTION

Gear and shaft

- Check gears for excessive wear, chips or cracks.
- · Check shaft for cracks or wear.

Bearing

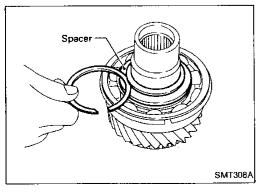
 Make sure bearings roll freely and are free from noise, crack, pitting or wear.



ASSEMBLY

Main gear bearing

- 1. Press on main gear bearing.
- 2. Install spacer.

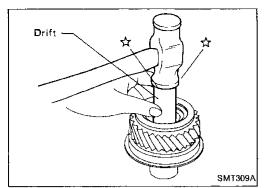


3. Select snap ring with proper thickness and install it.

Allowable clearance between snap ring and groove:

0 - 0.15 mm (0 - 0.0059 in)

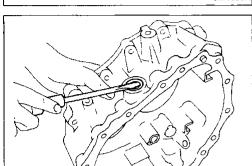
Available snap ring for main gear bearing: Refer to SDS, TF-31.



Main Gear (Cont'd)

Plug

Apply sealant to plug and install it.

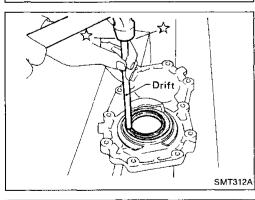


Front Case
SHIFT SHAFT OIL SEAL
Removal

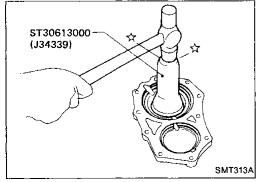
SMT310A

Installation

SMT311A



Front Case Cover COVER OIL SEAL Removal



Installation

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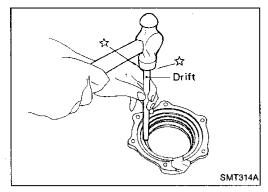
BF

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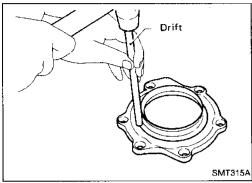
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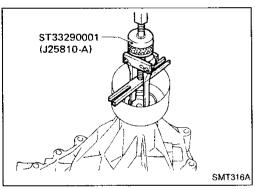
TF-21



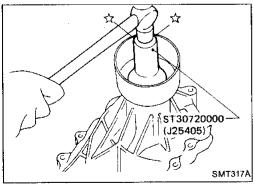
Bearing Retainer
OIL CATCHER
Removal



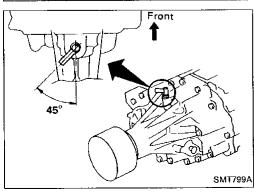
Installation



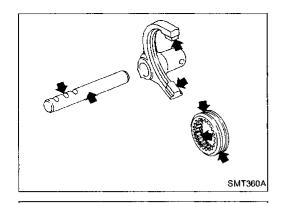
Rear Case REAR OIL SEAL Removal



Installation



AIR BREATHER Install as shown in illustration.



Shift Control Components

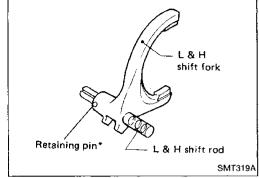
INSPECTION

Check contact surface and sliding surface for wear, scratches, projections or other faulty conditions.



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Retaining pin*

2-4 shift bracket -

2-4 shift fork

Retainer ring -

Fork guide collar

Spring

2-4 shift rod-

Retaining pin*

SMT320A

SMT321A

L & H SHIFT ROD & FORK

Assemble as shown in illustration.

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* Retaining pin is the same size as the one for 2-4 shift rod.

CL

2-4 SHIFT ROD & FORK

Assemble as shown in illustration.

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* Retaining pins are the same size.

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Pay special attention to the direction of fork guide collar.

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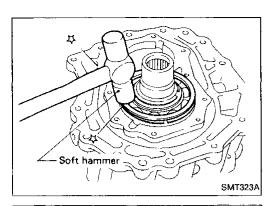
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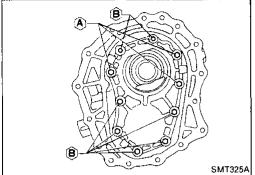
EL

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TF-23



- 1. Assemble front case.
- a. Install main gear assembly by tapping lightly.



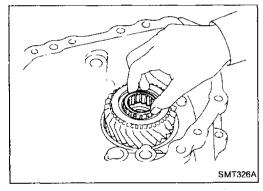
- b. Apply sealant to the mating surface and bolts of front case cover and install it on front case.
- These ten bolts should be coated with sealant.
- Tightening torque

A: 16 - 21 N·m

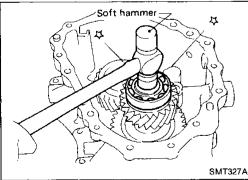
(1.6 - 2.1 kg-m, 12 - 15 ft-lb)

B: 19 - 24 N·m

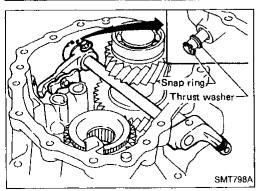
(1.9 - 2.4 kg-m, 14 - 17 ft-lb)



 Apply gear oil to needle bearing and install it into main gear.

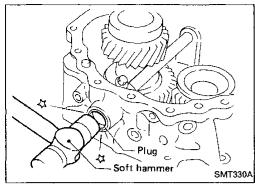


d. Install counter gear assembly by tapping lightly.

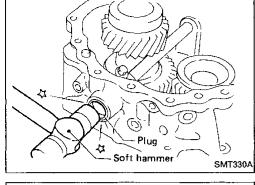


e. Install cross shaft and inner shift lever.

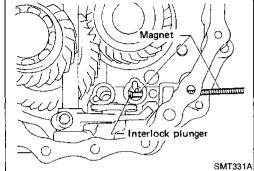
When replacing cross shaft, outer shift lever or lock pin of outer shift lever, replace them as a set.

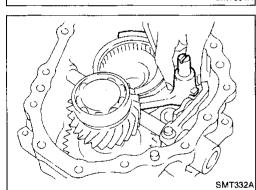


Apply sealant to plug and install it into front case.

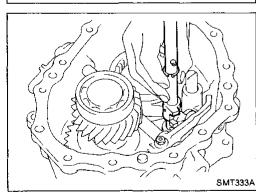


Insert interlock plunger into front case.

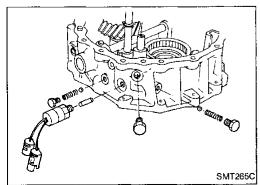




h. Install L & H shift rod and fork assembly with coupling sleeve.



Install 2-4 shift rod.



Install switches, check balls, check springs and plugs. Apply sealant to switches and plugs.

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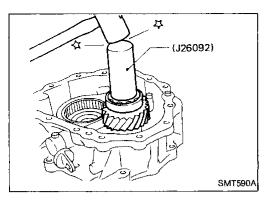
FA

RA

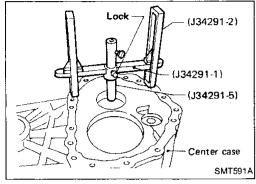
BR

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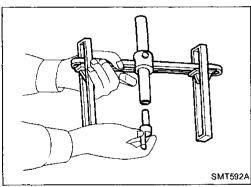
IDX



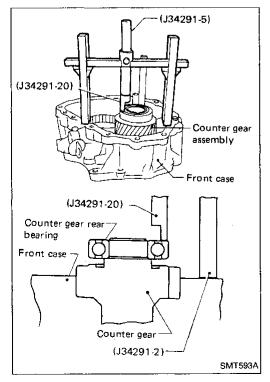
- 2. Select counter gear rear bearing shim.
- a. Seat counter gear assembly.



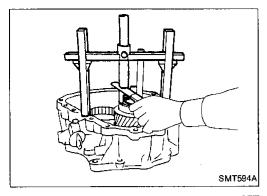
D. Place J34291-1 (bridge), J34291-2 (legs) and J34291-5 (gauging cylinder) on machined surface of center case and allow gauging cylinder to rest on top outer portion of counter gear rear bearing. Lock gauging cylinder in place.

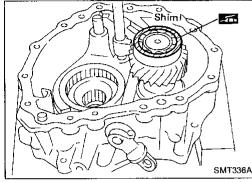


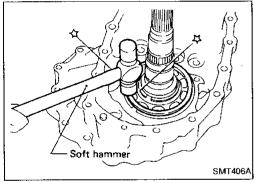
c. Insert J34291-20 (gauging plunger) into J34291-5 (gauging cylinder).

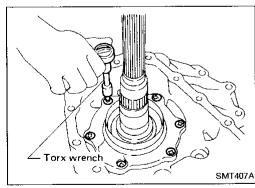


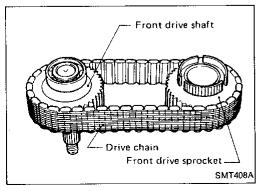
d. Place bridge, legs, gauging cylinder and gauging plunger onto machined surface of front case assembly, and allow gauging plunger to drop until it contacts counter gear rear bearing mating surface.











- e. Lock gauging plunger in place and use feeler gauge to measure gap between gauging cylinder and gauging plunger.
- f. Use measured distance and following chart to select correct shim.

Counter gear end play:

0 - 0.2 mm (0 - 0.008 in)

Counter gear rear bearing shim: Refer to SDS, TF-31.

Select counter gear rear bearing shim.

3. Place suitable shim on counter gear rear bearing with grease.

4. Apply gear oil to each part in front case.

5. Assemble center case assembly.

a. Install mainshaft on center case by tapping lightly.

Apply gear oil to mainshaft front bearing.

b. Install bearing retainer.

c. Put drive chain onto the front drive sprocket and front drive shaft, and then put them in center case.

Pay attention to direction of drive chain. Refer to DISASSEM-BLY, TF-13.

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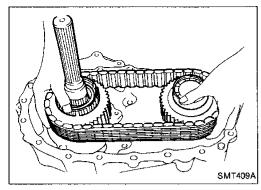
BR

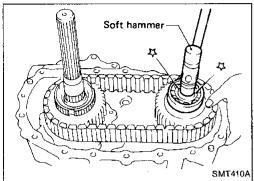
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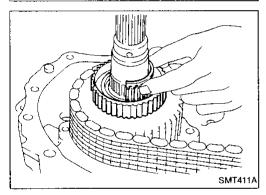
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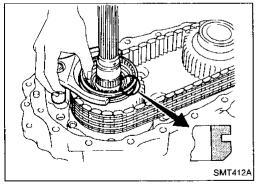


d. Install front drive shaft by tapping lightly. Make sure shafts are lined up in the case.



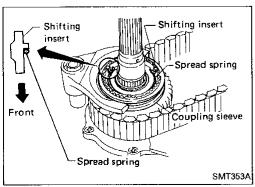
e. Apply gear oil to needle bearings and install them into front drive sprocket.

These needle bearings will be installed move easily if front drive sprocket is rotated while installing them.



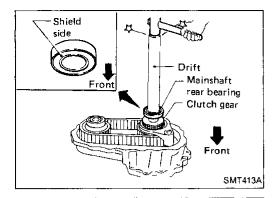
f. Install 2-4 coupling sleeve with 2-4 shift fork.

Pay special attention to direction of coupling sleeve.



g. Install shifting inserts and spread spring.

Pay special attention to direction of shifting inserts.



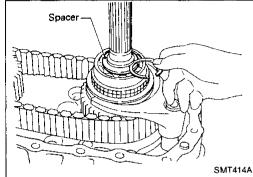
install baulk ring and then install clutch gear and mainshaft rear bearing.

Place wooden block under mainshaft in order to protect mainshaft front bearing.



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Install spacer.

Select snap ring with proper thickness and install it.

LC

Allowable clearance between snap ring and groove: 0 - 0.15 mm (0 - 0.0059 in)

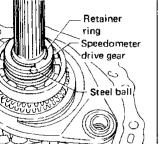
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Available snap ring for mainshaft rear bearing: Refer to SDS, TF-31.

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SMT415A

SMT340A

Install steel ball, speedometer drive gear and retainer ring. Steel ball is the smallest of check balls for this unit.

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Install low gear and its bearing to mainshaft. Apply gear oil to needle bearing.

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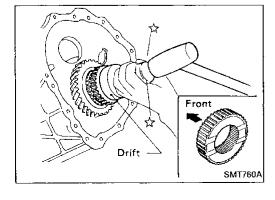
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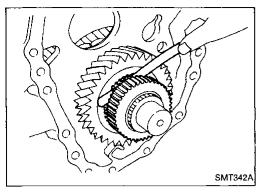
m. Install L & H hub and snap ring to mainshaft. Pay special attention to direction of L & H hub.

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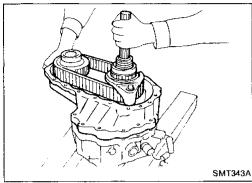
IDX



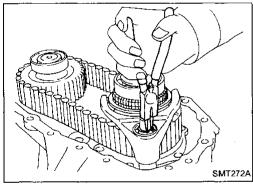


n. Measure end play of low gear.

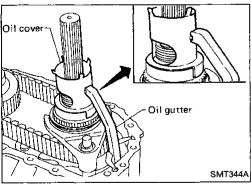
Standard: 0.2 - 0.35 mm (0.0079 - 0.0138 in)



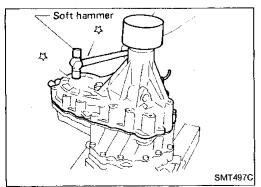
6. Apply sealant to mating surface and put center case assembly onto front case and tighten bolts.



7. Install snap ring to 2-4 shift rod.



- 8. Install oil gutter and oil cover.
- 9. Apply gear oil to each part in center case.



- 10. Apply sealant to mating surface and install rear case on center case.
- 11. Install 4WD switch.

Apply sealant to thread of switch.

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

Transfer model			TX10A
Coonside	High		1.000
Gear ratio Low			2.020
·	Main ge	ar	29
	Low gea	r	37
Number of teeth Counter gear Front dri	Counter	High	38
	Low	24	
	ve sprocket	41	
Front dri		ve shaft	41
Oil capacity	ℓ (US qt, Imp qt)		2.2 (2-3/8, 2)

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Inspection and Adjustment

GEAR END PLAY

	Unit: mm (in)	
Front drive sprocket	0.2 - 0.35 (0.0079 - 0.0138)	
Low gear	0.2 - 0.35 (0.0079 - 0.0138)	
Counter gear	0 - 0.2 (0 - 0.008)	

Mainshaft rear bearing

lowable clearance	0 - 0.15 mm (0 - 0.0059 in)
Thickness mm (in)	Part number
1.8 (0.071)	33138-33G20
1.9 (0.075)	33138-33G21
2.0 (0.079)	33138-33G22
2.1 (0.083)	33138-33G23
2.2 (0.087)	33138-33G24

CLEARANCE BETWEEN BAULK RING AND CLUTCH GEAR

11.11	
Unit: mm	ın

Standard	Wear limit
1.0 - 1.5 (0.039 - 0.059)	0.5 (0.020)

Main gear bearing

Allowable clearance	0 - 0.15 mm (0 - 0.0059 in)	
Thickness mm (in)	Part number	
2.6 (0.102)	33114-33G00	
2.7 (0.106)	33114-33G01	
2.8 (0.110)	33114-33G02	
2.9 (0.114)	33114-33G03	

AVAILABLE SNAP RING

Mainshaft front bearing

Allowable clearance	0 - 0.15 mm (0 ~ 0.0059 in)	
Thickness mm (in)	Part number	
3.1 (0.122)	33138-33G10	
3.2 (0.126)	33138-33G11	
3.3 (0.130)	33138-33G12	
3.4 (0.134)	33138-33G13	

AVAILABLE SHIM

Counter gear rear bearing

flowable clearance 0 - 0.2 mm (0 - 0.008 in)		- BR
Thickness mm (in)	Part number	***
0.1 (0.004)	33112-C6900	- ST
0.2 (0.008)	33112-C6901	
0.3 (0.012)	33112-C6902	35
0.4 (0.016)	33112-C6903	الق
0.5 (0.020)	33112-33G00	
0.6 (0.024)	33112-33G01	HA

EL