

Vehicle: Application and ID

Description

DEFINITION

The Vehicle Identification Number (**VIN**) is the seventeen digit legal identifier of the vehicle. It is located on a plate which is attached to the left top of the instrument panel and can be seen through the windshield from the outside of the vehicle. To find the manufacturer, model and chassis type, engine type, Gross Vehicle Weight (**GVW**), model year, plant code and sequential number, refer to the VIN plate of the vehicle in question.

# Vehicle: Application and ID

## GM Automobile VIN Charts

**TYPICAL VIN**

**POSITION NO**

**1=U.S. BUILT**  
**2=CANADIAN BUILT**

**MAKE**

**SERIES**

**ENGINE TYPE**

**PLANT**

**PRODUCTION SEQUENCE NUMBER**

**GENERAL MOTORS** **RESTRAINT SYSTEM** **C=1982 MODEL YEAR**

**3 MAKE**

1-CHEVROLET 3-OLDSMOBILE 6-CADILLAC  
2-PONTIAC 4-BUICK 7-GM OF CANADA

**4 RESTRAINT SYSTEM**

A - NON PASSIVE/MANUAL BELTS  
B - PASSIVE/AUTOMATIC BELTS

**5 CARLINE/SERIES**

CHEVROLET PONTIAC  
B - CHEVETTE B - J2000  
D - CAVALIER C - J2000 LE  
E - CAVALIER TYPE 10 F - PONTIAC 6000  
J - CHEVETTE SCOOTER G - PONTIAC 6000 LE  
L - IMPALA J - GRAND PRIX  
N - CAPRICE CLASSIC K - GRAND PRIX LJ  
P - CAMARO SPORT L - T1000  
S - CAMARO BERLINETTA M - BONNEVILLE MODEL G  
W - CELEBRITY P - GRAND PRIX  
X - CITATION R - BONNEVILLE  
Y - CORVETTE BROUGHAM  
Z - MONTE CARLO S - FIREBIRD  
T - PHOENIX GJ  
W - FIREBIRD TRANS AM  
X - FIREBIRD SPECIAL  
Y - PHOENIX  
Z - PHOENIX LJ

OLDSMOBILE  
B - OMEGA  
C - J CAR  
D - J CAR  
E - OMEGA BROUGHAM  
G - CUTLASS CIERA\*  
H - CUTLASS CRUISER  
J - CUTLASS CIERA LS\*  
K - CUTLASS CALAIS  
L - DELTA 88  
M - CUTLASS SUPREME  
BROUGHAM+  
N - DELTA 88 ROYALE  
P - CUSTOM CRUISER  
R - CUTLASS SUPREME  
W - 98 REGENCY  
BROUGHAM  
X - 98 REGENCY  
Y - DELTA 88 ROYALE  
BROUGHAM  
Z - TORONADO  
BROUGHAM

BUICK  
B - SKYLARK  
C - SKYLARK LIMITED  
D - SKYLARK SPORT  
G - CENTURY SPORT  
H - CENTURY  
J - REGAL  
K - REGAL SPORT  
L - CENTURY LIMITED  
M - REGAL LIMITED  
N - LE SABRE  
P - LE SABRE LIMITED  
R - LE SABRE ESTATE  
S - SKYHAWK  
T - SKYHAWK LIMITED  
V - ELECTRA ESTATE  
W - ELECTRA PARK AVENUE  
X - ELECTRA LIMITED  
Y - RIVIERA T  
Z - RIVIERA LUXURY

GM  
CANADA ONLY  
B - ACADIAN  
F - GRAND LEMANS  
J - ACADIAN "S"  
L - PARISIENNE  
N - PARISIENNE  
BROUGHAM  
R - GRAND LEMANS  
BROUGHAM

CADILLAC  
B - FLEETWOOD  
BROUGHAM  
D - DEVILLE  
F - FLEETWOOD  
LIMOUSINE  
G - CIMAARROM  
L - ELDORADO  
S - SEVILLE

**6-7 BODY TYPE**

07 COUPE 2 DOOR HATCHBACK  
08 SEDAN 2 DOOR HATCHBACK  
19 SEDAN 4 DOOR NOTCHBACK  
23 SEDAN 4 DOOR AUK SEAT  
27 COUPE 2 DOOR NOTCHBACK  
35 STATION WAGON 4 DOOR  
37, 47, 57 COUPE 2 DOOR NOTCHBACK SPECIAL  
68 SEDAN 4 DOOR PLAIN BACK HATCHBACK  
69 SEDAN 4 DOOR NOTCHBACK  
77 COUPE 2 DOOR PLAIN BACK HATCHBACK  
87 COUPE 2 DOOR PLAIN BACK SPECIAL

**8 ENGINE TYPE**

CODE	DISP.	CYL	CARB	DIVISION	USAGE	PRODUCER
A	3.8	V6	2BBL	12347	4	
B	2.0	L4	2BBL	134	1	
C	1.6	L4	2BBL	127	1	
D	1.8	L4	DIESEL	17	ISUZU	
E	3.0	V6	2BBL	34	4	
F	2.5	L4	2BBL	12	2	
G	1.8	L4	2BBL	12346	1	
H	5.0	V8	4BBL	12347	17	
J	4.4	V8	2BBL	12347	7	
K	3.8	V6	2BBL	1	1	
L	5.7	V8	4BBL	1	1	
N	5.7	V8	DIESEL	123467	3	
R	2.5	L4	EFI	1234	2	
T	4.3	V6	DIESEL	1234	3	
V	4.3	V6	DIESEL	134	3	
X	2.8	V6	2BBL	1234	17	
Y	5.0	V8	4BBL	34	3	
Z	2.8	V6	2BBL	1234	1	
0	1.8	L4	EFI	24	2	
1	2.8	V6	2BBL	12	1	
2	2.5	L4	EFI	12	2	
3	3.8	V6	4BBL	4	4	
4	4.1	V6	4BBL	2346	4	
5	2.5	L4	2BBL	1234	2	
7	5.0	V8	CFI	12	1	
8	5.7	V8	CFI	1	1	
8	4.3	V8	2BBL	3	3	
8	4.1	V8	DFI	6	6	
9	6.0	V8	DFI	6	6	

CFI = CROSS FIRE INJECTION EFI = ELECTRONIC FUEL INJECTION  
DFI = DIGITAL FUEL INJECTION T = TURBOCHARGED  
\* OR GM MEXICO

**11 PLANT**

A - LAKEWOOD GA	N - FLINT (BUICK) MI	R - ARLINGTON TX	2 - FREMONT CA	4 - ORION MI
B - BALTIMORE MD	J - JAMESVILLE WI	S - ST LOUIS MO	0 - PONTIAC (GMC) MI	4 - SCARBOROUGH ONT
C - SOUTHGATE CA	4 - LEEDS MO	T - TARRYTOWN NY	1 - OSMANA ONT	5 - BOWLING GREEN KY
D - OORAVILLE CA	L - VAN NUYS CA	V - PONTIAC (GMC) MI	2 - MORRIS OH	5 - LONDON ONT
E - LINDEN NJ	M - LANSING MI	W - WILLOW RUN MI	PQ - STE THERESE MI	6 - OKLAHOMA CITY OK
F - FLINT (CHEV) MI	B - NORWOOD OH	X - FAIRFAX KS	3 - DETROIT (CHEV) MI	7 - LORDSTOWN OH
G - FRAMINGHAM MA	P - PONTIAC (PONT) MI	Y - WILMINGTON DE	3 - ST EUSTACHE PQ	8 - SHREVEPORT LA
				8 - FUJISAWA JAP
				9 - DETROIT (CAD) MI

BODY TYPES 19 and 27 ONLY  
BODY TYPES 35 and 69 ONLY  
+ BODY TYPES 47 and 69 ONLY

1982 Cars - Vehicle Identification Label (VIN)

**TYPICAL VIN** 1 G 1 A Z 3 7 A 3 D R 1 2 3 4 5 6

**POSITION NO** 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

1=U.S. BUILT  
2=CANADIAN BUILT

MAKE

SERIES

ENGINE TYPE

PLANT

GENERAL MOTORS

RESTRAINT SYSTEM

0 = 1983 MODEL YEAR

**3 MAKE**

1 - CHEVROLET 3 - OLDSMOBILE 6 - CADILLAC  
2 - PONTIAC 4 - BUICK 7 - GM OF CANADA

**4 RESTRAINT SYSTEM**

A - NON-PASSIVE/MANUAL BELTS

**5 CARLINE/SERIES**

**CHEVROLET**

B - CHEVETTE  
C - CAVALIER  
D - CAVALIER CS  
E - CAVALIER  
CS TYPE 10  
H - CITATION COUPE  
J - CHEVETTE SCOOTER  
L - IMPALA  
N - CAPRICE CLASSIC  
P - CAMARO SPORT COUPE  
S - CAMARO BERLINETTA  
W - CELEBRITY\*\*  
X - CITATION  
Y - CORVETTE  
Z - MONTE CARLO

**OLDSMOBILE**

B - OMEGA  
C - FIRENZA  
D - FIRENZA  
BROUGHAM  
E - OMEGA BROUGHAM  
G - CUTLASS CIERA  
M - CUTLASS CRUISER  
J - CUTLASS CIERA LS  
K - CUTLASS CALAIS  
L - DELTA 88  
M - CUTLASS SUPREME  
BROUGHAM\*  
M - CUTLASS CIERA  
BROUGHAM\*  
N - DELTA 88 ROYALE  
P - CUSTOM CRUISER  
R - CUTLASS SUPREME  
W - 98 REGENCY  
BROUGHAM  
X - 98 REGENCY  
Y - DELTA 88 ROYALE  
BROUGHAM  
Z - TORONADO  
BROUGHAM

**PONTIAC**

B - PONTIAC 2000  
C - PONTIAC 2000 LE  
D - PONTIAC 2000 SE  
F - PONTIAC 6000  
G - PONTIAC 6000 LE  
H - PONTIAC 6000 STE  
J - GRAND PRIX  
K - GRAND PRIX LJ  
L - PONTIAC 1000  
M - BONNEVILLE  
P - GRAND PRIX  
R - BONNEVILLE  
BROUGHAM  
S - FIREBIRD  
T - PHOENIX SJ  
W - FIREBIRD TRANS AM  
X - FIREBIRD SPECIAL EDITION  
Y - PHOENIX  
Z - PHOENIX LJ

**BUICK**

B - SKYLARK CUSTOM  
C - SKYLARK LIMITED  
D - SKYLARK T-TYPE  
E - SKYHAWK T-TYPE  
G - CENTURY T-TYPE  
N - CENTURY CUSTOM  
J - REGAL  
K - REGAL T-TYPE  
L - CENTURY LIMITED  
M - REGAL LIMITED  
N - LE SABRE CUSTOM  
P - LE SABRE LIMITED  
R - LE SABRE ESTATE  
S - SKYHAWK CUSTOM  
T - SKYHAWK LIMITED  
V - ELECTRA ESTATE  
W - ELECTRA PARK AVENUE  
X - ELECTRA LIMITED  
Y - RIVIERA T-TYPE  
Z - RIVIERA LUXURY

**CADILLAC**

B - FLEETWOOD  
BROUGHAM  
D - DEVILLE\*  
F - FLEETWOOD  
LIMOUSINE  
G - CIMAARON  
L - ELOORADO  
S - SEVILLE

**GM CANADA ONLY**

B - ACADIAN  
BROUGHAM  
F - GRAND LEMANS  
J - ACADIAN SCOOTER  
L - PARISIENNE  
N - PARISIENNE  
BROUGHAM  
R - GRAND LEMANS  
BROUGHAM

**GM**

B - ACADIAN  
BROUGHAM  
F - GRAND LEMANS  
J - ACADIAN SCOOTER  
L - PARISIENNE  
N - PARISIENNE  
BROUGHAM  
R - GRAND LEMANS  
BROUGHAM

**6-7 BODY TYPE**

07 - COUPE - 2 DOOR HATCHBACK  
08 - SEDAN - 2 DOOR HATCHBACK  
11 - SEDAN - 2 DOOR NOTCHBACK  
19 - SEDAN - 4 DOOR NOTCHBACK  
23,33 - SEDAN - 4 DOOR AUX. SEAT  
27 - COUPE - 2 DOOR NOTCHBACK  
35 - STATION WAGON - 4 DOOR  
37,47,57 - COUPE - 2 DOOR NOTCHBACK SPECIAL  
67 - COUPE - 2 DOOR CONVERTIBLE  
68 - SEDAN - 4 DOOR PLAIN BACK HATCHBACK  
69 - SEDAN - 4 DOOR NOTCHBACK  
77 - COUPE - 2 DOOR PLAIN BACK HATCHBACK  
87 - COUPE - 2 DOOR PLAIN BACK

**8 ENGINE TYPE**

CODE	DISP.	CYL.	CARB.	DIVISION	USAGE	PRODUCER
A	3.8	V6	2BBL	1,2,3,4,7	4	
B	2.0	L4	2BBL	1,2,3,4,6	1	
C	1.6	L4	2BBL	1,2,7	1	
D	1.8	L4	DIESEL	1,2,7	1	ISUZU
E	3.0	V6	2BBL	3,4	4	
F	2.5	L4	2BBL	1,2	2	
H	5.0	V8	4BBL	1,2,3,4,7	1,7	
L	2.8	V6	2BBL	2	1	
M	5.7	V8	DIESEL	1,2,3,4,6,7	3	
P	2.0	L4	EFI	1,2,3,4,6	1	
R	2.5	L4	EFI	1,2,3,4	2	
S	5.0	V8	EFI	1,2	1	
T	4.3	V6	DIESEL	1,2,3,4	3	
V	4.3	V6	DIESEL	1,3,4	3	
X	2.8	V6	2BBL	1,2,3,4	1,7*	
Y	5.0	V8	4BBL	3,4	3	
Z	2.8	V6	2BBL	1,2,3,4	1	
D	1.8	L4	EFI	2,3,4	**	
1	2.8	V6	2BBL	1,2	1	
2	2.5	L4	EFI	1,2	2	
4	4.1	V6	4BBL	3,4,6	4	
5	2.5	L4	2BBL	1,2,3,4	2	
6	5.7	V8	4BBL	1	1	
6	5.0	V8	4BBL	6	6	
8	5.7	V8	CFI	1	1	
8	3.8	V6	4BBL T	4	4	
8	4.1	V8	DFI	6	6	
9	6.0	V8	DFI	6	6	
9	3.8	V6	2BBL	1	1	
9	5.0	V8	4BBL	3	3	

CFI - CROSS-FIRE INJECTION EFI - ELECTRONIC FUEL INJECTION  
DFI - DIGITAL FUEL INJECTION T - TURBOCHARGED  
\*OR GM MEXICO \*\* GM do BRAZIL

**11 PLANT**

A - LAKEWOOD	GA	IN - LEEDS	MO	TX - TARRYTOWN	NY	1 - WENTZVILLE	MO	5 - BOWLING GREEN KY
B - BALTIMORE	MD	IL - VAN NUYS	CA	UT - HAMTRAMCK	MI	1 - OSHAWA	ONT	5 - LONDON
D - DORAVILLE	GA	MI - LANSING	MI	Y - PONTIAC (GMC)	MI	2 - MORRIS	OH	6 - OKLAHOMA CITY OK
E - LINDEN	NI	IN - NORWOOD	OH	W - WILLOW RUN	MI	2 - STE THERESE	PQ	7 - LORDSTOWN OH
F - FLINT (CHEV)	MI	P - PONTIAC	MI	X - FAIRFAX	KS	3 - DETROIT (CHEV)	MI	8 - SHREVEPORT LA
G - FRAMINGHAM	MA	(PONT)	MI	Y - WILMINGTON	DE	3 - ST EUSTACHE	PO	8 - FUJISAWA JAP
M - FLINT (BUICK)	MI	A - ARLINGTON	TX	MO	MI	4 - ORION	MI	9 - DETROIT (CAD)
J - JANSVILLE	WI	S - ST LOUIS	MO	MI - PONTIAC (GMC)	MI	4 - SCARBOROUGH	ONT	

1983 Cars - Vehicle Identification Label (VIN)

**TYPICAL VIN**

**POSITION NO**

1=U.S. BUILT  
2=CANADIAN BUILT

MAKE

SERIES

BODY TYPE

CHECK DIGIT

ENGINE TYPE

PLANT

PRODUCTION SEQUENCE NUMBER

E = 1984 MODEL YEAR

**3 MAKE**

1 - CHEVROLET 3 - OLDSMOBILE 6 - CADILLAC  
2 - PONTIAC 4 - BUICK 7 - GM OF CANADA

**5 CARLINE/SERIES**

CHEVROLET (CODE 1)  
B - CHEVETTE CS  
C - CAVALIER  
D - CAVALIER CS  
E - CAVALIER TYPE 10  
H - CITATION II COUPE  
J - CHEVETTE  
L - IMPALA  
N - CAPRICE CLASSIC  
P - CAMARO SPORT COUPE  
S - CAMARO BERLINETTA  
W - CELEBRITY  
X - MALIBU CLASSIC (35-69)  
Y - CITATION II  
Z - CORVETTE  
Z - MONTE CARLO

OLDSMOBILE (CODE 3)  
B - OMEGA  
C - FIRENZA  
D - FIRENZA BROUGHAM  
E - OMEGA BROUGHAM  
G - 98 REGENCY (RWD)  
H - 98 REGENCY BROUGHAM (RWD)  
J - CUTLASS CIERA LS  
K - CUTLASS CALAIS  
L - DELTA 88  
M - CUTLASS SUPREME BROUGHAM+  
N - CUTLASS CIERA BROUGHAM\*  
P - DELTA 88 ROYALE  
R - CUTLASS SUPREME  
W - 98 REGENCY BROUGHAM (FWD)  
Y - 98 REGENCY (FWD)  
Z - DELTA 88 ROYALE BROUGHAM  
Z - TORONADO BROUGHAM

GM CANADA ONLY  
B - PONTIAC ACADIAN  
I - PONTIAC ACADIAN SCOOTER  
L - PONTIAC PARISIENNE  
N - PONTIAC PARISIENNE BROUGHAM  
T - PONTIAC PARISIENNE BROUGHAM

PONTIAC (CODE 2)  
B - SUNBIRD 12000  
C - SUNBIRD 12000 LE  
D - SUNBIRD 12000 SE  
E - FIERO COUPE

F - FIERO SE COUPE  
F - PONTIAC 6000+  
G - PONTIAC 6000 LE  
H - PONTIAC 6000 STE  
I - GRAND PRIX  
K - GRAND PRIX LE  
L - PARISIENNE\*\*  
L - PONTIAC 1000\*\*\*  
M - FIERO SPORT COUPE  
N - BONNEVILLE  
P - GRAND PRIX BROUGHAM  
R - BONNEVILLE BROUGHAM  
S - FIREBIRD  
S - BONNEVILLE LE  
T - PHOENIX SE\*\*  
T - PARISIENNE BROUGHAM

W - FIREBIRD TRANS AM  
X - FIREBIRD SE  
Y - PHOENIX  
Z - PHOENIX LE

BUICK (CODE 4)  
B - SKYLARK CUSTOM  
C - SKYLARK LIMITED  
D - SKYLARK T-TYPE  
E - SKYHAWK T-TYPE  
F - ELECTRA T-TYPE (FWD)  
G - CENTURY T-TYPE  
H - CENTURY CUSTOM  
J - REGAL  
K - REGAL T-TYPE  
L - CENTURY LIMITED  
M - REGAL LIMITED  
N - LE SABRE CUSTOM  
P - LE SABRE LIMITED  
R - ELECTRA LIMITED (RWD)  
S - SKYHAWK CUSTOM  
T - SKYHAWK LIMITED  
U - ELECTRA PARK AVENUE (RWD)  
V - ELECTRA ESTATE (RWD)  
W - ELECTRA PARK AVENUE (FWD)  
X - ELECTRA (FWD)  
Y - RIVIERA T-TYPE  
Z - RIVIERA LUXURY

CADILLAC (CODE 6)  
B - FLEETWOOD (FWD)  
D - DEVILLE (FWD)  
F - FLEETWOOD LIMOUSINE  
G - CIMARRON  
L - ELDORADO  
M - DEVILLE (RWD)  
S - SEVILLE  
W - FLEETWOOD BROUGHAM (RWD)

BMC TRUCK & COACH (CODE 5)  
W - CABALLERO

**6-7 BODY TYPE**

07 - COUPE - 2 DOOR HATCHBACK  
08 - SEDAN - 2 DOOR HATCHBACK  
11 - SEDAN - 2 DOOR NOTCHBACK  
19 - SEDAN - 4 DOOR NOTCHBACK  
23 33 - SEDAN - 4 DOOR AUX SEAT  
27 - COUPE - 2 DOOR NOTCHBACK  
35 - STATION WAGON - 4 DOOR  
37 47 57 - COUPE - 2 DOOR NOTCHBACK SPECIAL  
67 - COUPE - 2 DOOR CONVERTIBLE  
68 - SEDAN - 4 DOOR PLAIN BACK HATCHBACK  
69 - SEDAN - 4 DOOR NOTCHBACK  
77 - COUPE - 2 DOOR PLAIN BACK HATCHBACK  
87 - COUPE - 2 DOOR PLAIN BACK SPECIAL

**8 ENGINE TYPE**

CODE	DISP	CYL	CAMB	DIVISION USAGE	PRODUCER
A	3.8	V6	2BBL	1 2 3 4 7	4
B	2.0	L4	2BBL	1 2 3 4 6	1
C	1.6	L4	2BBL	1 2 7	1
D	1.8	L4	DIESEL	1 2 7	ISUZU
E	3.0	V6	2BBL	3 4	4
G	5.0	V8	4BBL	1 2	1
N	5.0	V8	4BL	1 2 3 4 7	1 7
J	1.8	L4	MFI	2 4	2
L	2.8	V6	2BBL	2	1
M	5.7	V8	DIESEL	1 2 3 4 6 7	3
P	2.0	L4	EFI	1 2 3 4 6	1
R	2.5	L4	EFI	1 2 3 4	2
T	4.3	V6	DIESEL	1 2 3 4 6	3
V	4.3	V6	DIESEL	3 4	3
X	2.8	V6	2BBL	1 2 3 4	1 7
Y	5.0	V8	4BBL	3 4	3
Z	2.8	V6	2BBL	1 2 3 4	1
B	1.8	L4	TBI	2 3 4	**
1	2.8	V6	2BBL	1 2	1
2	2.5	L4	EFI	1 2	2
3	3.8	V6	MFI	3 4	4
4	4.1	V6	4BBL	3 4	4
6	5.7	V8	4BBL	1	1
8	5.7	V8	CFI	1	1
8	4.1	V8	DFI	6	6
9	3.8	V6	2BBL	1	1
9	5.0	V8	4BBL	3	3
9	3.8	V6	SFI	4	4
9	6.0	V8	DFI	6	6

CFI CROSS-FIRE INJECTION  
DFI DIGITAL FUEL INJECTION  
EFI ELECTRONIC FUEL INJECTION  
MFI MULTIPOINT FUEL INJECTION  
SFI SEQUENTIAL FUEL INJECTION

TBI THROTTLE BODY INJECTION  
\*OR GM MEXICO  
\*\*GM do BRAZIL

\* BODY TYPES 19 and 27 ONLY  
\*\* BODY TYPES 35 and 69 ONLY  
+ BODY TYPES 47 and 69 ONLY  
\*\*\* BODY TYPES 08 and 68 ONLY  
• BODY TYPES 19, 27 and 35 ONLY  
•• BODY TYPES 37 and 68 ONLY

1984 Cars - Vehicle Identification Label (VIN)



**TYPICAL VIN** 1 G 1 G Z 3 7 H 0 F R 1 2 3 4 5 6

**POSITION NO** 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

1 = U.S. BUILT  
2 = CANADIAN BUILT  
J = JAPAN BUILT

6 = GENERAL MOTORS  
G = SUZUKI  
H = ISUZU  
Y = NUMMI

**ENGINE TYPE**

**CHECK DIGIT**

**BODY TYPE/RESTRAINT SYSTEM**

**MAKE** **CARLINE/SERIES**

**F = 1985 MODEL YEAR**

**3. MAKE**

1 - CHEVROLET 3 - OLDSMOBILE 6 - CADILLAC  
2 - PONTIAC 4 - BUICK 7 - GM OF CANADA

**4-5 CARLINE/SERIES**

**CHEVROLET**

A/W - CELEBRITY B/V - DELTA 88 ROYALE  
B/L - IMPALA B/Y - DELTA 88 ROYALE  
B/N - CAPRICE CLASSIC Brouham  
F/P - CAMARO SPORT COUPE C/W - 98 REGENCY Brouham  
F/S - CAMARO BERLINETTA C/X - 98 REGENCY Brouham  
G/Z - MONTE CARLO E/Z - TORONADO Brouham  
J/C - CAVALIER G/X - CUTLASS SALON COUPE  
J/D - CAVALIER CS  
J/E - CAVALIER TYPE 10 & CONVERTIBLE G/M - CUTLASS SUPREME Brouham  
M/R - SPRINT G/R - CUTLASS SUPREME  
R/F - SPECTRUM J/C - FIRENZA  
LEVEL I J/D - FIRENZA Brouham  
R/G - SPECTRUM N/T - CALAIS  
LEVEL II N/T - CALAIS SUPREME

**BUICK**

S/N - NOVA A/G - CENTURY T-TYPE  
T/B - CHEVETTE GS A/M - CENTURY CUSTOM  
T/J - CHEVETTE A/L - CENTURY LIMITED  
X/M - CITATION II COUPE B/W - LE SABRE CUSTOM  
X/X - CITATION II B/P - LE SABRE LIMITED  
Y/Y - CORVETTE B/R - LE SABRE ESTATE WAGON

**PONTIAC**

A/F - PONTIAC 6000 B/V - ELECTRA ESTATE WAGON  
A/G - PONTIAC 6000 LE B/Y - ELECTRA T-TYPE  
A/M - PONTIAC 6000 STE C/F - ELECTRA PARK AVENUE  
B/L - PARISIENNE C/W - ELECTRA  
B/T - PARISIENNE Brouham C/X - ELECTRA  
F/S - FIREBIRD E/Y - RIVIERA T-TYPE  
F/W - FIREBIRD TRANS AM E/Z - RIVIERA LUXURY  
F/X - FIREBIRD SE G/I - REGAL  
G/I - GRAND PRIX G/R - REGAL T-TYPE  
G/K - GRAND PRIX LE G/M - REGAL LIMITED  
G/N - BONNEVILLE I/E - SKYHAWK T-TYPE  
G/P - GRAND PRIX Brouham J/S - SKYHAWK CUSTOM  
G/R - BONNEVILLE J/T - SKYHAWK LIMITED  
Brouham N/U - SOMERSET REGAL  
G/S - BONNEVILLE LE N/W - SOMERSET REGAL LIMITED  
J/B - SUNBIRD N/D - SKYLARK CUSTOM  
J/C - SUNBIRD LE J/C - SKYLARK LIMITED  
J/D - SUNBIRD SE J/D - SKYLARK T-TYPE  
N/E - GRAND AM CADILLAC  
N/V - GRAND AM LE C/D - FLEETWOOD (FWD)  
P/E - FIERO COUPE C/O - DEVILLE (FWD)  
P/F - FIERO SE COUPE C/M - FLEETWOOD  
P/G - FIERO GT COUPE LIMOUSINE (FWD)  
P/M - FIERO SPORT COUPE Brouham (RWD)  
T/L - PONTIAC 1000 FLEETWOOD  
OLDSMOBILE EL - ELDOORADO  
A/J - CUTLASS CIERA LS J/G - CIMARRON  
and CUTLASS CRUISER W/S - SEVILLE  
A/M - CUTLASS CIERA SM OF CANADA  
Brouham T/B - ACADIAN  
B/N - DELTA 88 ROYALE T/I - ACADIAN SCOOTER  
B/P - CUSTOM CRUISER W/R - FIREFLY  
STATION WAGON R/F - SUNBURST  
R/G - SUNBURST LE

**6-7 BODY TYPE RESTRAINT SYSTEM**

07 - COUPE - 2 DOOR PLAIN BACK (HATCHBACK)  
08 - SEDAN - 2 DOOR PLAIN BACK (HATCHBACK)  
11 - SEDAN - 2 DOOR NOTCHBACK  
19 - SEDAN - 4 DOOR 6 WINDOW NOTCHBACK  
23 - SEDAN - 4 DOOR 6 WINDOW NOTCHBACK AUXILIARY SEAT  
27 - COUPE - 2 DOOR NOTCHBACK  
33 - SEDAN - 4 DOOR 6 WINDOW NOTCHBACK AUXILIARY SEAT (CENTER PARTITION)  
35 - STATION WAGON - 4 DOOR 2 SEAT  
37 - COUPE - 2 DOOR NOTCHBACK SPECIAL  
47 - COUPE - 2 DOOR NOTCHBACK SPECIAL  
57 - COUPE - 2 DOOR NOTCHBACK SPECIAL  
67 - COUPE - 2 DOOR CONVERTIBLE  
68 - SEDAN - 4 DOOR 6 WINDOW PLAIN BACK HATCHBACK  
69 - SEDAN - 4 DOOR 4 WINDOW NOTCHBACK  
77 - COUPE - 2 DOOR PLAIN BACK HATCHBACK  
87 - COUPE - 2 DOOR PLAIN BACK SPECIAL

**8 ENGINE TYPE**

CODE	DISP	CYL	CARB	DIVISION USAGE	PRODUCED IN
A	2.8	V6	2BBL	1,2,3,4	U
C	1.6	L4	2BBL	1,2,7	J
D	1.8	L4	Diesel	1,2,7	J
E	3.0	V6	2BBL	3,4	U
F	5.0	V8	TPI	1,2	U
G	5.0	V8	4BBL	1,2	U
M	5.0	V8	4BBL	1,2,3,4	U,C
J	1.8	L4	MFI	2,4	B
K	1.5	L4	2BBL	1,7	J
L	3.0	V6	MFI	2,3,4	U
M	1.0	L3	2BBL	1,7	J
N	5.7	V8	Diesel	1,2,3,4,6	U
P	2.0	L4	EFI	1,2,3,4,6	U
R	2.5	L4	EFI	1,2,3,4	U
S	2.8	V6	MFI	1,2	U
T	4.3	V6	Diesel	1,2,3,4,6	U
U	2.5	L4	TBI	2,3,4	U
W	2.8	V6	MFI	1,2,3,4,6	U
X	2.8	V6	2BBL	1,2,3,4	U,C,M
Y	5.0	V8	4BBL	3,4	U
Z	4.3	V6	EFI	1,2,4	U
D	1.8	L4	TBI	2,3,4	B
2	2.5	L4	TBI	1,2	U
3	3.8	V6	MFI	3,4	U
4	1.6	L4	2BBL	1	J
6	5.7	V8	4BBL	1,2	U
8	4.1	V8	DFI	6	U
B	5.7	V8	TPI	1	U
9	2.8	V6	MFI	2	U
9	3.8	V6	SFI	4	U
9	5.0	V8	4BBL	3	U

DFI = DIGITAL FUEL INJECTION U = U.S.  
EFI = ELECTRONIC FUEL INJECTION C = CANADA  
MFI = MULTIPOINT FUEL INJECTION M = MEXICO  
SFI = SEQUENTIAL FUEL INJECTION B = BRAZIL  
TBI = THROTTLE BODY INJECTION J = JAPAN  
TPI = TUNED PORT INJECTION

1985 Cars - Vehicle Identification Label (VIN)



**TYPICAL VIN** 1 G 1 G Z 1 1 H 0 H R 1 2 3 4 5 6

**POSITION NO.** 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

1 = U.S. BUILT  
2 = CANADIAN BUILT  
J = JAPAN BUILT

G = GENERAL MOTORS  
G = SUZUKI  
H = ISUZU  
Y = NUMMI

ENGINE TYPE

CHECK DIGIT

RESTRAINT CODES

PLANT

H = 1987 MODEL YEAR

MAKE BODY TYPE/SERIES

### 3 MAKE

1 - CHEVROLET	3 - OLDSMOBILE	6 - CADILLAC
2 - PONTIAC	4 - BUICK	7 - GM OF CANADA

### 4-5 BODYTYPE SERIES

CHEVROLET	OLDSMOBILE
A/W - CELEBRITY	C/A - 98 REGENCY
B/L - CAPRICE	E/Z - TORONADO BROUGHAM
B/M - CAPRICE CLASSIC	G/M - CUTLASS SALON COUPE
B/U - CAPRICE BROUGHAM	G/M - CUTLASS SUPREME BROUGHAM
F/P - CAMARO SPORT COUPE	G/R - CUTLASS SUPREME
G/Z - MONTE CARLO	N/M - DELTA 88 ROYALE
I/C - CAVALIER	N/Y - DELTA 88 ROYALE BROUGHAM
I/D - CAVALIER CS	I/C - FIRENZA
I/E - CAVALIER RS & CONVERTIBLE	I/D - FIRENZA LC/LX/GT
I/F - CAVALIER Z24	N/F - CALAIS
L/T - CORSICA	N/T - CALAIS SUPREME
L/V - BARETTA	
M/R - SPRINT	<b>BUICK</b>
M/S - SPRINT ER	A/G - CENTURY T-TYPE
R/F - SPECTRUM COUPE	A/M - CENTURY CUSTOM
R/G - SPECTRUM SEDAN	A/L - CENTURY LIMITED AND ESTATE WAGON
S/M - NOVA	B/R - LE SABRE ESTATE WAGON
T/B - CHEVETTE CS	B/V - ELECTRA ESTATE WAGON
Y/Y - CORVETTE	C/F - ELECTRA T-TYPE
	C/W - ELECTRA PARK AVENUE
	E/Y - ELECTRA 380
	E/Z - RIVIERA T-TYPE
	G/J - RIVIERA LUXURY
	G/J - REGAL
	G/M - REGAL T-TYPE
	G/M - REGAL LIMITED
	N/M - LE SABRE
	N/P - LE SABRE CUSTOM
	N/R - LE SABRE LIMITED
	I/E - SKYHAWK T-TYPE
	I/S - SKYHAWK CUSTOM
	I/T - SKYHAWK LIMITED
	N/C - SKYLARK
	N/D - SKYLARK LIMITED
	N/J - SOMERSET CUSTOM
	N/K - SOMERSET T-TYPE
	N/M - SOMERSET LIMITED
	<b>CADILLAC</b>
	C/D - FLEETWOOD D'ELEGANCE
	C/D - DEVILLE
	C/M - LIMOUSINE
	D/W - BROUGHAM
	E/L - ELDORADO
	I/G - CIMARRON
	N/S - SEVILLE
	V/R - ALLANTE
	<b>GM OF CANADA</b>
	T/B - ACADIAN
	M/R - FIREFLY
	R/F - SUNBURST COUPE
	R/G - SUNBURST SEDAN
	L/T - TEMPEST

\*U.S. CUSTOMS TERRITORIES

### 6 BODY STYLE

1	TWO-DOOR COUPE/SEDAN STYLES: 11, 27, 37, 47, 57, 97
2	TWO-DOOR HATCHBACK STYLES: 07, 08, 17, 87
3	TWO-DOOR CONVERTIBLE STYLES: 67
5	FOUR-DOOR SEDAN STYLES: 19, 23, 33, 69
6	FOUR-DOOR HATCHBACK STYLES: 58
8	FOUR-DOOR STATION WAGON STYLES: 35

### 7 RESTRAINT CODES

1	MANUAL BELTS
4	AUTOMATIC BELTS

### 8 ENGINE TYPE

CODE	DISP.	CYL.	CARB.	DIVISION USAGE	PRODUCED IN
A	3.8	V6	2BBL	1,2,3,4	U
C	1.6	L4	2BBL	1,2,7	U
D	2.3	L4	FI	3	U
F	5.0	V8	FI	1,2	U,C
G	5.0	V8	4BBL	1	U,C
H	5.0	V8	4BBL	1,2,3,4	U,C
K	2.0	L4	FI	2,3,4	U
L	3.0	V6	FI	2,3,4	U
M	2.0	L4	FI	2,4	U
R	2.5	L4	FI	1,2,3,4	U
S	2.8	V6	FI	1,2	M
U	2.5	L4	FI	2,3,4	U
W	2.8	V6	FI	1,2,3,4,6,7	U,C,M
Y	5.0	V8	4BBL	1,2,3,4,6	U
Z	4.3	V6	FI	1,2	U
1	2.0	L4	FI	1,3,4,6,7	U
2	1.0	L3	FI	1,7	J
3	3.8	V6	FI	2,3,4	U
4	1.6	L4	2BBL	1	J
5	1.0	L3	2BBL	1,7	J
6	5.7	V8	4BBL	1	U,C
7	1.5	L4	2BBL	1,7	J
7	3.8	V6	FI	4	U
7	4.1	V8	FI	6	U
8	4.1	V8	FI	6	U
8	5.7	V8	FI	1,2	U,C
9	2.8	V6	FI	2	M
9	5.0	V8	4BBL	3,6	U
9	1.5	L4	FI	1	J

U = U.S.  
C = CANADA  
M = MEXICO  
B = BRAZIL  
J = JAPAN

1987 Cars - Vehicle Identification Label (VIN)

**TYPICAL VIN**

**POSITION NO**

1 = U.S. BUILT  
2 = CANADIAN BUILT  
J = JAPAN BUILT  
K = KOREAN BUILT  
3 = MEXICO

6 = GENERAL MOTORS  
G = SUZUKI  
B = ISUZU  
Y = NUMMI  
L = DAEWOO

ENGINE TYPE

CHECK DIGIT

RESTRAINT CODES

BODY STYLE

MAKE

CARLINE/SERIES

PLANT

1 = 1986 MODEL YEAR

**3 MAKE**

1 - CHEVROLET 3 - OLDSMOBILE 6 - CADILLAC  
2 - PONTIAC 4 - BUICK 7 - GM OF CANADA

**4-5 CARLINE SERIES**

**CHEVROLET**

A/W - CELEBRITY  
B/L - CAPRICE  
B/N - CAPRICE CLASSIC  
B/U - CAPRICE BROUGHAM  
F/P - CAMARO SPORT COUPE AND CONV.  
G/Z - MONTE CARLO  
J/C - CAVALIER  
J/D - CAVALIER CS  
J/E - CAVALIER RS  
J/F - CAVALIER Z24 AND CONVERTIBLE  
L/T - CORSICA  
L/V - BERETTA  
M/M - SPRINT  
M/S - SPRINT ER  
R/F - SPECTRUM COUPE  
R/G - SPECTRUM SEDAN  
S/M - NOVA  
Y/T - CORVETTE

**PONTIAC**

A/E - 6000 SE  
A/F - 6000  
A/G - 6000 LE  
A/H - 6000 STE  
B/L - SAFARI WAGON  
F/S - FIREBIRD  
F/W - FIREBIRD TRANS AM  
N/Z - BONNEVILLE LE  
N/Y - BONNEVILLE SSE  
N/Z - BONNEVILLE SE  
J/B - SUNBIRD  
J/D - SUNBIRD SE  
J/U - SUNBIRD GT  
M/R\* - FIREFLY  
N/E - GRAND AM  
N/N - GRAND AM LE  
N/M - GRAND AM SE  
P/E - FIERO COUPE  
P/F - FIERO SE COUPE  
P/C - FIERO GT COUPE  
P/M - FIERO SPORT COUPE  
T/M - LE MANS  
T/R - LE MANS SE  
T/S - LE MANS GSE  
T/A - LE MANS COUPE  
W/J - GRAND PRIX  
W/N - GRAND PRIX LE  
W/P - GRAND PRIX SE

**OLDSMOBILE**

A/I - CUTLASS CIERA and CUTLASS CRUISER WAGON  
A/M - CUTLASS CIERA BROUGHAM AND SL  
A/S - CUTLASS CIERA - INTERNATIONAL SERIES  
B/P - CUSTOM CRUISER WAGON  
C/N - 98 TOURING SEDAN  
C/W - 98 REGENCY BROUGHAM

**OLDSMOBILE**

C/X - 98 REGENCY  
E/V - TROFEO  
E/Z - TORONADO  
B/M - CUTLASS SUPREME CLASSIC BROUGHAM  
G/R - CUTLASS SUPREME CLASSIC  
N/N - DELTA 88 ROYALE  
N/Y - DELTA 88 ROYALE BROUGHAM  
J/C - FIRENZA  
N/F - CUTLASS CALAIS  
N/K - CUTLASS CALAIS INTERNATIONAL  
N/T - CUTLASS CALAIS SL  
W/M - CUTLASS SUPREME  
W/N - SPORT COUPE/ES SEDAN  
W/S - CUTLASS BROUGHAM

**BUICK**

A/N - CENTURY CUSTOM  
A/L - CENTURY LIMITED AND ESTATE WAGON  
B/R - LE SABRE ESTATE WAGON  
B/V - ELECTRA ESTATE WAGON  
C/F - ELECTRA T-TYPE  
C/W - ELECTRA PARK AVENUE  
D/X - ELECTRA LIMITED  
E/C - REATA  
E/Z - RIVIERA LUXURY  
N/B - LE SABRE CUSTOM  
N/R - LE SABRE LIMITED  
I/S - SKYHAWK SPORT  
N/C - SKYLARK CUSTOM (4-DR)  
N/D - SKYLARK LIMITED (4-DR)  
N/J - SKYLARK CUSTOM (2-DR)  
N/M - SKYLARK LIMITED (2-DR)  
W/B - REGAL CUSTOM  
W/D - REGAL LIMITED

**CADILLAC**

C/B - FLEETWOOD D'ELEGANCE  
C/D - DEVILLE  
C/S - FLEETWOOD SIXTY SPECIAL  
D/W - BROUGHAM  
E/L - ELDORADO  
J/G - CIMARRON  
N/S - SEVILLE  
V/R - ALLANTE

**GM OF CANADA**

L/T - TEMPEST  
M/R - FIREFLY  
R/G - SUNBURST SEDAN  
T/N - OPTIMA LS  
T/R - OPTIMA GLS  
T/S - OPTIMA GSi  
T/X - OPTIMA

\*U.S. CUSTOMS TERRITORIES

**6 BODY STYLE**

1 TWO-DOOR COUPE/SEDAN (GM STYLES 11, 27, 37, 47, 57, 97)  
2 TWO-DOOR HATCHBACK (GM STYLES 07, 08, 77, 87)  
3 TWO-DOOR CONVERTIBLE (GM STYLE 67)  
5 FOUR-DOOR SEDAN (GM STYLES 19, 69)  
6 FOUR-DOOR HATCHBACK (GM STYLE 68)  
8 FOUR-DOOR STATION WAGON (GM STYLE 35)

**7 RESTRAINT CODES**

1 MANUAL BELTS  
3 MANUAL BELTS W/DRIVER INFLATABLE RESTRAINT SYSTEM  
4 AUTOMATIC BELTS

**8 ENGINE TYPE**

CODE	DISP.	CYL.	CARB.	DIVISION USAGE	PRODUCED IN
C	3.8	V6	FI	2,3,4	U
D	2.3	L4	FI	2,3,4	U
E	5.0	V8	FI	1,2	U,C
F	5.0	V8	FI	1,2	U
G	5.0	V8	4	1	U,C
H	5.0	V8	4	1,3	U,C
K	2.0	L4	FI	2,3,4	U
L	3.0	V6	FI	1,4	U
M	2.0	L4	FI	2,3,4	U
R	2.5	L4	FI	1,2,3,4	U
S	2.8	V6	FI	1,2	M
T	3.1	V6	FI	2	M
U	2.5	L4	FI	2,3,4	U
W	2.8	V6	FI	1,2,3,4,6,7	U,C,M
Y	5.0	V8	4	1,2,3,4,6	U
Z	4.3	V6	FI	1	U
1	2.0	L4	FI	1,3,4,7	U
2	1.0	L3	FI	1,7	J
3	3.8	V6	FI	2,3,4	U
4	1.6	L4	2	1	J
5	1.0	L3	2	1,7	J
5	4.5	V8	FI	6	U
5	1.6	L4	FI	1	J
6	5.7	V8	4	1	U,C
6	1.6	L4	FI	2	K
7	1.5	L4	2	1,7	J
7	4.1	V8	FI	6	U
8	5.7	V8	FI	1,2	U
9	2.8	V6	FI	2	M
9	5.0	V8	4	6	U
9	1.5	L4	FI	1,7	J

U = U.S.  
C = CANADA  
M = MEXICO  
K = KOREA  
J = JAPAN

1988 Cars - Vehicle Identification Label (VIN)

**TYPICAL VIN**

**POSITION NO**

1 = U.S. BUILT  
2 = CANADIAN BUILT  
J = JAPAN BUILT  
K = KOREAN BUILT  
L = MEXICO BUILT

6 = GENERAL MOTORS  
G = SUZUKI  
H = ISUZU  
Y = NUMMI  
L = DAEWOO

**ENGINE TYPE**

**CHECK DIGIT**

**RESTRAINT CODES**

**BODY STYLE**

**MAKE**

**CARLINE/SERIES**

**PLANT**

**K = 1989 MODEL YEAR**

**3 MAKE**

1 - CHEVROLET 3 - OLDSMOBILE 6 - CADILLAC  
2 - PONTIAC 4 - BUICK 7 - GM OF CANADA

**4-5 CARLINE SERIES**

**CHEVROLET**

A/W - CELEBRITY  
B/L - CAPRICE  
B/M - CAPRICE CLASSIC  
B/U - CAPRICE BROUGHAM  
F/P - CAMARO SPORT COUPE AND CONV.  
J/C - CAVALIER  
J/F - CAVALIER Z24 AND CONVERTIBLE  
L/T - CORSICA  
L/Y - BERETTA  
L/W - BERETTA GT  
L/Z - CORSICA LTZ  
M/R - GEO METRO LS (SPRINT C1\*)  
M/S - GEO METRO  
M/T\* - SPRINT  
N/E - GEO SPECTRUM  
N/F - GEO SPECTRUM COUPE  
N/G - GEO SPECTRUM SEDAN  
S/R - GEO PRIZM  
Y/Y - CORVETTE  
Y/Z - CORVETTE ZR1

**OLDSMOBILE**

C/X - 98 REGENCY  
E/V - TORONADO TROFED  
E/Z - TORONADO  
H/M - DELTA 88 ROYALE  
H/Y - DELTA 88 ROYALE BROUGHAM  
N/F - CUTLASS CALAIS S  
N/M - CUTLASS CALAIS INTERNATIONAL SERIES  
N/L - CUTLASS CALAIS  
N/T - CUTLASS CALAIS SL  
W/M - CUTLASS SUPREME  
W/R - CUTLASS SUPREME INTERNATIONAL SERIES  
W/S - CUTLASS SUPREME SL

**BUICK**

A/M - CENTURY CUSTOM  
A/L - CENTURY LIMITED AND ESTATE WAGON  
B/R - LE SABRE ESTATE WAGON  
B/V - ELECTRA ESTATE WAGON  
C/F - ELECTRA T-TYPE  
C/U - ELECTRA PARK AVENUE ULTRA  
C/W - ELECTRA PARK AVENUE  
C/X - ELECTRA LIMITED  
E/C - REATTA  
E/Z - RIVIERA  
N/P - LE SABRE CUSTOM  
N/R - LE SABRE LIMITED  
J/S - SKYLARK  
N/C - SKYLARK CUSTOM (4-DR)  
N/D - SKYLARK LIMITED (4-DR)  
N/J - SKYLARK CUSTOM (2-DR)  
N/M - SKYLARK LIMITED (2-DR)  
W/D - REGAL CUSTOM  
W/D - REGAL LIMITED

**CADILLAC**

C/B - FLEETWOOD D'ELEGANCE  
C/D - DEVILLE  
C/S - FLEETWOOD SIXTY SPECIAL  
D/W - BROUGHAM  
E/L - EL DORADO  
H/S - SEVILLE  
V/R - ALLANTE

**GM OF CANADA**

L/T - TEMPEST  
M/R - FIREFLY  
T/N - OPTIMA LS  
T/R - OPTIMA GLS  
T/S - OPTIMA GSi  
T/X - OPTIMA

**OLDSMOBILE**

A/J - CUTLASS CIERA and CUTLASS CRUISER WAGON  
A/M - CUTLASS CIERA BROUGHAM AND SL  
A/S - CUTLASS CIERA INTERNATIONAL SERIES  
B/P - CUSTOM CRUISER WAGON  
C/V - TOURING SEDAN  
C/W - 98 REGENCY BROUGHAM

**PONTIAC**

A/E - 6000 SE  
A/F - 6000  
A/G - 6000 LE  
A/H - 6000 STE  
B/L - SAFARI WAGON  
F/S - FIREBIRD  
F/W - FIREBIRD TRANS AM  
H/X - BONNEVILLE LE  
H/Y - BONNEVILLE SSE  
H/Z - BONNEVILLE SE  
J/B - SUNBIRD  
J/D - SUNBIRD SE  
J/U - SUNBIRD GT  
M/R\* - FIREFLY  
N/E - GRAND AM LE  
N/W - GRAND AM SE  
T/N - LEMANS  
T/R - LEMANS SE  
T/S - LEMANS GSE  
T/X - LEMANS AERO COUPE  
W/J - GRAND PRIX  
W/M - GRAND PRIX LE  
W/P - GRAND PRIX SE

**5 BODY STYLE**

1 TWO-DOOR COUPE/SEDAN (GM STYLES 11, 27, 37, 47, 57, 97)  
2 TWO-DOOR HATCHBACK/LIFTBACK (GM STYLES 07, 08, 77, 87)  
3 TWO-DOOR CONVERTIBLE (GM STYLE 67)  
5 FOUR-DOOR SEDAN (GM STYLES 19, 69)  
6 FOUR-DOOR HATCHBACK/LIFTBACK (GM STYLE 68)  
8 FOUR-DOOR STATION WAGON (GM STYLE 35)

**7 RESTRAINT CODES**

1 MANUAL BELTS  
3 MANUAL BELTS W/DRIVER INFLATABLE RESTRAINT SYSTEM  
4 AUTOMATIC BELTS

**8 ENGINE TYPE**

CODE	DISP	CYL	CARB	DIVISION USAGE	PRODUCED IN*
A	2.3	L4	FI	2,3	U
C	3.6	V6	FI	2,3,4	U
D	2.3	L4	FI	2,3,4	U
E	5.0	V8	FI	1,2	U,C
F	5.0	V8	FI	1,2	U
J	5.7	V8	FI	1	U
K	2.0	L4	FI	2	U
M	2.0	L4	FI	2	U
N	3.3	V6	FI	3,4	U
R	2.5	L4	FI	1,2,3,4	U
S	2.8	V6	FI	1,2	M
T	3.1	V6	FI	2,3,4	M
U	2.5	L4	FI	2,3,4	U
V	3.1	V6	FI	2	U
W	2.8	V6	FI	1,2,3,4,7	U,C,M
Y	5.0	V8	4	1,2,3,4,6	U
Z	4.3	V6	FI	1	U
1	2.0	L4	FI	1,4,7	U
2	1.0	L3	FI	7	?
5	4.5	V8	FI	6	U
5	1.6	L4	FI	1	J
6	1.6	L4	FI	2,7	K
6	1.0	L3	FI	1,7	J
6	1.6	L4	FI	1	J
7	1.5	L4	2	1,7	J
7	3.8	V6	FI	2	U
7	5.7	V8	FI	1	U,C
8	5.7	V8	FI	1,2	U
8	4.5	V8	FI	6	U
9	5.0	V8	4	6	U

\*LEGEND:

U - U.S.  
C - CANADA  
M - MEXICO  
K - KOREA  
J - JAPAN

1989 Cars - Vehicle Identification Label (VIN)

**TYPICAL VIN**

**POSITION NO**

1 = U.S. BUILT  
2 = CANADIAN BUILT  
3 = MEXICO BUILT  
J = JAPAN BUILT  
K = KOREAN BUILT

6 = GENERAL MOTORS  
G = SUZUKI  
B = ISUZU  
Y = NUMMI  
L = DAEWOO  
C = CAMI

**ENGINE TYPE**

**CHECK DIGIT**

**RESTRAINT CODES**

**BODY STYLE**

**PLANT**

**L = 1990 MODEL YEAR**

**3 MAKE**

1 - CHEVROLET 4 - BUICK 6 - CADILLAC  
2 - PONTIAC 5 - PONTIAC INCOMPLETE 7 - GM OF CANADA  
3 - OLDSMOBILE

**4-5 CARLINE/SERIES**

**CHEVROLET**

C/W CELEBRITY  
C/L CAPRICE  
C/M CAPRICE CLASSIC  
C/U CAPRICE BROUGHAM  
Y/P CAMARO SPORT COUPE AND CONV  
J/C CAVALIER  
J/F CAVALIER 224  
L/T CORSA  
L/V BERETTA  
C/W BERETTA GT  
L/Z CORSA LTZ & BERETTA GTZ  
M/R GEO METRO LSi & CONV  
M/S GEO METRO SPRINT  
M/T GEO STORM  
M/V GEO STORM GS  
S/K GEO PRIZM  
S/L GEO PRIZM GS  
W/L LUMINA  
W/M LUMINA EUROSPORT  
Y/Y CORVETTE  
Y/Z CORVETTE ZR1

**PONTIAC**

A/J 6000 SE  
A/F 6000 LE  
F/S FIREBIRD  
F/M TRANS AM  
M/X BONNEVILLE LE  
M/Y BONNEVILLE SSE  
M/Z BONNEVILLE SE  
J/B SUNBIRD LE  
J/D SUNBIRD SE  
J/U SUNBIRD GT  
M/R FIREFLY LE TURBO  
M/T FIREFLY  
M/E GRAND AM LE  
M/W GRAND AM SE  
T/N LEMANS  
T/S LEMANS GSE  
T/X LEMANS AERO COUPE  
W/J GRAND PRIX LE  
W/T GRAND PRIX STE  
W/P GRAND PRIX SE

**OLDSMOBILE**

A/J CUTLASS CIERA S and CUTLASS CRUISER WAGON  
A/L CUTLASS CIERA  
A/M CUTLASS CIERA SL and CUTLASS CRUISER SL WAGON  
A/S CUTLASS CIERA INTERNATIONAL SERIES  
M/P CUSTOM CRUISER WAGON  
C/V TOURING SEDAN  
C/W NINETY EIGHT REGENCY BROUGHAM

**OLDSMOBILE**

C/X NINETY EIGHT REGENCY  
E/V TORONADO TROFEO  
E/Z TORONADO  
M/M EIGHTY EIGHT ROYALE  
M/Y EIGHTY EIGHT ROYALE BROUGHAM  
N/F CUTLASS CALAIS S  
N/K CUTLASS CALAIS INTERNATIONAL SERIES  
N/L CUTLASS CALAIS  
N/T CUTLASS CALAIS SL  
W/H CUTLASS SUPREME  
W/R CUTLASS SUPREME INTERNATIONAL SERIES  
W/S CUTLASS SUPREME SL  
W/T CUTLASS SUPREME CONV

**BUICK**

A/H CENTURY CUSTOM  
A/L CENTURY LIMITED AND ESTATE WAGON  
B/B COACHBUILDER WAGON  
B/R ESTATE WAGON  
C/F ELECTRA T TYPE  
C/U ELECTRA PARK AVENUE ULTRA  
C/W ELECTRA PARK AVENUE  
C/X ELECTRA LIMITED  
E/C REATTA  
E/Z RIVIERA  
M/P LE SABRE CUSTOM  
M/R LE SABRE LIMITED  
N/C SKYLARK CUSTOM (4 DR)  
M/D SKYLARK LUXURY (4 DR)  
M/J SKYLARK CUSTOM (2 DR)  
M/M SKYLARK GRAND SPORT (2 DR)  
M/V SKYLARK  
W/B REGAL CUSTOM  
W/D REGAL LIMITED

**CADILLAC**

C/D FLEETWOOD  
C/O DEVILLE  
C/S FLEETWOOD SIXTY SPECIAL  
D/W BROUGHAM  
E/L ELDORADO  
K/S SEVILLE  
K/Y SEVILLE TOURING SEDAN  
V/R ALLANTE (CONV HARDTOP)  
V/S ALLANTE (CONV)

**GM OF CANADA**

L/T TEMPEST  
M/R FIREFLY  
M/T FIREFLY LE  
T/N OPTIMA LS  
T/R OPTIMA GLS  
T/S OPTIMA GS  
T/X OPTIMA

**6 BODY STYLE**

1 TWO-DOOR COUPE/SEDAN (GM STYLES 11, 27, 37, 47, 57, 97)  
2 TWO-DOOR HATCHBACK/LIFTBACK (GM STYLES 07, 08, 77, 87)  
3 TWO-DOOR CONVERTIBLE (GM STYLE 67)  
4 TWO-DOOR STATION WAGON (GM STYLE 15)  
5 FOUR-DOOR SEDAN (GM STYLES 19, 69)  
6 FOUR-DOOR HATCHBACK/LIFTBACK (GM STYLE 68)  
7 FOUR-DOOR LIFTBACK (GM STYLE 68)  
8 FOUR-DOOR STATION WAGON (GM STYLE 35)

**7 RESTRAINT CODES**

1 MANUAL BELTS  
3 MANUAL BELTS W/DRIVER INFLATABLE RESTRAINT SYSTEM  
4 AUTOMATIC BELTS

**8 ENGINE TYPE**

CODE	DISP.	CYL.	FUEL SYSTEM	DIVISION USAGE	PRODUCED IN*
A	2.3	L4	FI	1,2,3	U
C	3.8	V6	FI	2,3,4	U
D	2.3	L4	FI	2,3,4	U
E	5.0	V8	FI	1,2	U,C
F	5.0	V8	FI	1,2	U
G	2.2	L4	FI	1	U
J	5.7	V8	FI	1	U
K	2.0	L4	FI	2	B
L	3.8	V6	FI	4	U
M	2.0	L4	FI	2	B
N	3.3	V6	FI	3,4	U
R	2.5	L4	FI	1,2,3,4	U
T	3.1	V6	FI	1,2,3,4	M,C
U	2.5	L4	FI	2,3,4	U
V	3.1	V6	FI	2	U
Y	5.0	V8	4BBL	1,3,4,6	U
Z	4.3	V6	FI	1	U
2	1.0	L3	FI	7	J
3	4.5	V8	FI	5	U
5	1.6	L4	FI	1	J
6	1.6	L4	FI	2,7	K
6	1.0	L3	FI	1,7	J
6	1.6	L4	FI	1	J
7	5.7	V8	FI	1,6	U,C
8	5.7	V8	FI	1,2	U
9	4.5	V8	FI	6	U
9	5.0	V8	4BBL	6	U

**\*LEGEND**

U = U.S. K = KOREA  
C = CANADA J = JAPAN  
M = MEXICO B = BRAZIL

\*U.S. CUSTOMS TERRITORIES AND/OR CANADA

1990 Cars - Vehicle Identification Label (VIN)

**TYPICAL VIN**

**POSITION NO**

1 = U.S. BUILT  
2 = CANADIAN BUILT  
3 = MEXICO BUILT  
J = JAPAN BUILT  
K = KOREAN BUILT

G = GENERAL MOTORS  
G = SUZUKI  
B = ISUZU  
Y = NUMMI  
L = DAEWOO  
C = CAMI

**ENGINE TYPE**

**CHECK DIGIT**

**REstraint CODES**

**BODY STYLE**

**PLANT**

**M = 1991 MODEL YEAR**

**3 MAKE**

1 - CHEVROLET 4 - BUICK 6 - CADILLAC  
2 - PONTIAC 5 - PONTIAC 7 - GM OF CANADA  
3 - OLDSMOBILE INCOMPLETE 8 - SATURN

**4-5 CARLINE/SERIES**

**CHEVROLET**

B L - CAPRICE  
B N - CAPRICE CLASSIC  
F P - CAMARO SPORT COUPE & CONV  
J C - CAVALIER & CONV  
J F - CAVALIER Z24  
L T - CORSICA LT  
L V - BERETTA  
L W - BERETTA GT  
L Z - BERETTA GTZ  
M R - GEO METRO  
M S - GEO METRO XFI  
M T - SPRINT  
M F - GEO STORM  
(Series 15 & 77)  
R T - GEO STORM GS  
S K - GEO PRIZM  
S L - GEO PRIZM GS  
W L - LUMINA  
W N - LUMINA EURO  
W P - LUMINA Z34  
Y Y - CORVETTE  
Y Z - CORVETTE ZR1

**PONTIAC**

A F - 6000 LE  
A J - 6000 SE  
F S - FIREBIRD  
F W - FIREBIRD TRANS AM  
H K - BONNEVILLE LE  
H Y - BONNEVILLE SSE  
H Z - BONNEVILLE SE  
J B - SUNBIRD LE  
J C - SUNBIRD  
J D - SUNBIRD SE  
J U - SUNBIRD GT  
M R - FIREFLY  
N G - GRAND AM  
N E - GRAND AM LE  
N W - GRAND AM SE  
T N - LEMANS LE  
T X - LEMANS AERO COUPE  
W H - GRAND PRIX LE  
W J - GRAND PRIX SE  
W P - GRAND PRIX GT  
W T - GRAND PRIX STE

**OLDSMOBILE**

A J - CUTLASS CIERA S & CUTLASS CRUISER S WAGON  
A L - CUTLASS CIERA  
A M - CUTLASS CIERA SL & CUTLASS CRUISER SL WAGON  
B P - CUSTOM CRUISER WAGON  
C V - TOURING SEDAN  
C W - NINETY EIGHT REGENCY ELITE  
E V - TORONADO TROFEO  
E Z - TORONADO  
H N - EIGHTY EIGHT ROYALE  
H Y - EIGHTY EIGHT ROYALE BROUGHAM  
N F - CUTLASS CALAIS S

**N K - CUTLASS CALAIS INTERNATIONAL SERIES**

N L - CUTLASS CALAIS  
N T - CUTLASS CALAIS SL  
W N - CUTLASS SUPREME  
W R - CUTLASS SUPREME INTERNATIONAL SERIES  
W S - CUTLASS SUPREME SL  
W T - CUTLASS SUPREME CONV

**BUICK**

A H - CENTURY CUSTOM  
A L - CENTURY LIMITED  
B B - COACHBUILDER WAGON  
B R - ROADMASTER ESTATE WAGON  
C U - PARK AVENUE ULTRA  
C W - PARK AVENUE  
E C - REGATTA  
E Z - RIVIERA  
H P - LE SABRE CUSTOM  
H R - LE SABRE LIMITED  
N C - SKYLARK CUSTOM (4-DR)  
N D - SKYLARK LUXURY (4-DR)  
N J - SKYLARK CUSTOM (2-DR)  
N M - SKYLARK GRAND SPORT (2-DR)  
N V - SKYLARK  
W B - REGAL CUSTOM  
W D - REGAL LIMITED

**CADILLAC**

C B - FLEETWOOD  
C D - DEVILLE  
C G - FLEETWOOD SIXTY SPECIAL  
C Z - COMMERCIAL CHASSIS  
D W - BROUGHAM  
E L - ELDORADO  
K S - SEVILLE  
K Y - SEVILLE TOURING SEDAN  
V R - ALLANTE (CONV. HARDTOP)  
V S - ALLANTE (CONV.)

**GM OF CANADA**

L T - TEMPEST  
M R - FIREFLY LE TURBO  
M T - FIREFLY  
R T - STYLUS (4-DR)  
R T - IMPULSE (2-DR)  
T N - OPTIMA LS  
T S - OPTIMA GS  
T X - OPTIMA

**SATURN**

Z B - SC (2-DR)  
Z D - SL1 (4-DR)  
Z F - SL1  
Z G - SC (2-DR)  
Z H - SC (14-DR)  
Z J - SL2  
Z M - SL2

**6 BODY STYLE**

1 - TWO-DOOR COUPE/SEDAN (GM STYLES 11, 27, 37, 47, 57, 97)  
2 - TWO-DOOR HATCHBACK/LIFTBACK (GM STYLES 07, 08, 77, 87)  
3 - TWO-DOOR CONVERTIBLE (GM STYLE 67)  
4 - TWO-DOOR STATION WAGON (GM STYLE 15)  
5 - FOUR-DOOR SEDAN (GM STYLES 19, 89)  
6 - FOUR-DOOR HATCHBACK/LIFTBACK (GM STYLE 88)  
8 - FOUR-DOOR STATION WAGON (GM STYLE 35)

**7 RESTRAINT CODES**

1 - ACTIVE (MANUAL) BELTS  
3 - ACTIVE (MANUAL) BELTS W DRIVER INFLATABLE RESTRAINT SYSTEM  
4 - PASSIVE (AUTOMATIC) BELTS

**8 ENGINE TYPE**

CODE	ENG OPT.	DISP.	CYL.	FUEL SYSTEM	DIV USAGE	PROD IN*
A	LG0	2.3L	L4	FI	1,2,3	U
B	L26	4.9L	V6	FI	6	U
C	LN3	3.8L	V6	FI	2,3,4	U
D	LD2	2.3L	L4	FI	2,3,4	U
E	LC3	5.0L	V8	FI	1,2,3,4,6	U,C
F	LB9	5.0L	V8	FI	1,2	U
G	LM3	2.2L	L4	FI	1	U
J	LT5	5.7L	V8	FI	1	U
K	LT2	2.0L	L4	FI	2,7	B
L	L27	3.8L	V6	FI	3,4	U
N	LG7	3.3L	V6	FI	3,4	U
R	LR8	2.5L	L4	FI	1,2,3,4	U
T	LH0	3.1L	V6	FI	1,2,3,4	M,C
U	L68	2.5L	L4	FI	2,3,4	U
X	LO1	3.4L	V6	FI	1,2,3	U
Z	LS3	1.0L	L3	FI	7	J
5	LW0	1.6L	L4	FI	1,7	J
6	LT3	1.6L	L4	FI	2,7	K
6	LP2	1.0L	L3	FI	1,7	J
6	LO1	1.6L	L4	FI	1,7	J
7	LO5	1.9L	L4	FI	8	U
7	LL0	5.7L	V8	FI	1,6	U,C
8	LO6	4.5L	V8	FI	6	U
8	L98	5.7L	V8	FI	1,2	U
8	LV4	1.6L	L4	FI	7	J
9	LK0	1.9L	L4	FI	8	U

**\*LEGEND**

U = U.S. K = KOREA  
C = CANADA J = JAPAN  
M = MEXICO B = BRAZIL

1991 Cars - Vehicle Identification Label (VIN)

**TYPICAL VIN** 1 G 3 H Y 5 3 L 5 N H 3 2 6 2 9 9

**POSITION NO.** 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

1 = U.S. BUILT  
2 = CANADIAN BUILT  
3 = MEXICO BUILT  
J = JAPAN BUILT  
K = KOREAN BUILT

G = GENERAL MOTORS  
G = SUZUKI  
B = ISUZU  
Y = NUMMI  
L = DAEWOO  
C = CAMI

**ENGINE TYPE**

**CHECK DIGIT**

**PRODUCTION SEQUENCE NUMBER**

**PLANT**

**RESTRAINT CODES**

**BODY STYLE**

**MAKE**

**CARLINE/SERIES**

**3 MAKE**

1 - CHEVROLET 4 - BUICK 6 - CADILLAC  
2 - PONTIAC 7 - GM OF CANADA  
3 - OLDSMOBILE 8 - SATURN

**4-5 CARLINE/SERIES**

**CHEVROLET**  
B/L - CAPRICE &  
CAPRICE WAGON  
B/N - CAPRICE CLASSIC  
F/P - CAMARO SPORT  
COUPE & CONV  
J/C - CAVALIER CONV  
& WAGON  
J/F - CAVALIER Z24 & CONV  
L/T - CORSA LT  
L/V - BERETTA  
L/W - BERETTA GT  
L/Z - BERETTA GTZ  
M/R - GEO METRO  
METRO LSI & CONV  
M/S - GEO METRO XF  
M/T - SPRINT  
R/F - GEO STORM  
(Series 15 & 77)  
R/T - GEO STORM GSi  
S/L - GEO PRIZM  
S/L - GEO PRIZM GSi  
W/L - LUMINA  
W/P - LUMINA EURO  
W/P - LUMINA Z24  
Y/Y - CORVETTE & CONV  
Y/Z - CORVETTE ZR1

**PONTIAC**  
F/S - FIREBIRD & CONV  
F/W - FIREBIRD TRANS AM  
& CONV  
H/X - BONNEVILLE SE  
H/Y - BONNEVILLE SSE  
H/Z - BONNEVILLE SSE  
J/B - SUNBIRD SE & CONV  
J/C - SUNBIRD LE  
J/D - SUNBIRD GT  
M/R - FIREFLY  
M/E - GRAND AM SE  
M/W - GRAND AM GT  
R/T - SUNFIRE  
(CANADA ONLY)  
T/M - LEMANS SE  
AFRO COUPE & SEDAN  
T/X - LEMANS  
W/H - GRAND PRIX LE  
W/J - GRAND PRIX SE  
W/P - GRAND PRIX GT/GTP  
W/T - GRAND PRIX STE

**OLDSMOBILE**  
A/J - CUTLASS CIERA &  
CUTLASS CRUISER S  
WAGON  
A/L - CUTLASS CIERA S  
A/M - CUTLASS CIERA SL &  
CUTLASS CRUISER SL  
WAGON  
B/P - CUSTOM CRUISER  
WAGON  
C/M - TOURING SEDAN  
C/W - NINETY EIGHT  
REGENCY ELITE  
C/X - NINETY EIGHT  
REGENCY

**BUICK**  
A/G - CENTURY  
A/H - CENTURY CUSTOM  
& WAGON  
A/L - CENTURY LIMITED  
& WAGON  
B/M - ROADMASTER  
B/R - ROADMASTER  
ESTATE WAGON  
B/T - ROADMASTER  
ITT LIMITED  
C/U - PARK AVENUE-ULTRA  
C/W - PARK AVENUE  
E/Z - RIVIERA LUXURY  
H/P - LE SABRE CUSTOM  
H/R - LE SABRE LIMITED  
M/J - SKYLARK CUSTOM  
M/M - SKYLARK GRAND  
SPORT  
W/B - REGAL CUSTOM  
W/D - REGAL LIMITED  
W/F - REGAL GRAN SPORT

**CADILLAC**  
C/D - FLEETWOOD  
C/D - DEVILLE  
C/G - FLEETWOOD SIXTY  
SPECIAL  
C/T - DEVILLE TOURING  
SEDAN  
D/W - BROUGHAM  
E/L - ELDOURADO  
K/S - SEVILLE  
K/Y - SEVILLE TOURING  
SEDAN  
V/R - ALLANTE  
(CONV. HARDCOPY)  
V/S - ALLANTE (CONV.)

**SATURN**  
Z/R - SC (2-DR)  
Z/L - SLT (4-DR)  
Z/D - SL2  
Z/F - SLT  
Z/G - SC (2-DR)  
Z/H - SLT (4-DR)  
Z/J - SL2  
Z/K - SL2

**6 BODY STYLE (GM STYLE)**

1 TWO-DOOR COUPE SEDAN  
(11, 27, 37, 47, 57, 97)  
2 TWO-DOOR HATCHBACK/LIFTBACK  
(07, 08, 77, 87)  
3 TWO-DOOR CONVERTIBLE (67)  
4 TWO-DOOR STATION WAGON (15)  
5 FOUR-DOOR SEDAN (19, 69)  
6 FOUR-DOOR HATCHBACK/LIFTBACK (6R)  
8 FOUR-DOOR STATION WAGON (35)

**7 RESTRAINT CODES**

1 ACTIVE (MANUAL) BELTS  
2 ACTIVE (MANUAL) BELTS W/DRIVER  
& PASSENGER INFLATABLE RESTRAINT SYSTEM  
3 ACTIVE (MANUAL) BELTS W/DRIVER  
INFLATABLE RESTRAINT SYSTEM  
4 PASSIVE (AUTOMATIC) BELTS  
5 PASSIVE (AUTOMATIC) BELTS W/DRIVER  
INFLATABLE RESTRAINT SYSTEM

**8 ENGINE TYPE**

CODE	ENG. OPT.	DISP.	CYL.	FUEL SYSTEM	DIV. USAGE	PROD. IN.
A	L60	2.3L	L4	MFI	1, 2, 3	U
B	L26	4.9L	V8	MFI	6	U
D	L02	2.3L	L4	MFI	2, 3	U
E	L03	5.0L	V8	TBI	1, 2, 3, 4, 6	U, C
F	L89	5.0L	V8	MFI	1, 2	U
H	LE4	2.0L	L4	MFI	2	B
J	L75	5.7L	V8	MFI	1	U
L	L27	3.8L	V6	MFI	2, 3, 4	U
N	LG7	3.3L	V6	MFI	2, 3, 4	U
P	LT1	5.7L	V8	MFI	1	U
R	LR6	2.5L	L4	TBI	1, 3, 4	U
T	LH0	3.1L	V6	MFI	1, 2, 3, 4	M, C, U
X	LQ1	3.4L	V6	MFI	1, 2, 3	C
Z	LB4	4.3L	V6	TBI	1	U
1	L67	3.8L	V6	MFI	2, 3, 4	U
3	L40	2.3L	L4	MFI	2, 3, 4	U
4	LN2	2.2L	L4	MFI	1	U
5	LW0	1.6L	L4	MFI	1	J
6	L73	1.5L	L4	TBI	2, 7	K
6	LP2	1.0L	L3	TBI	1	J
6	LO1	1.6L	L4	MFI	1, 7	J
7	LU0	1.6L	L4	MFI	7	J
7	LOS	5.7L	V8	TBI	1, 3, 4, 6	U
7	LL0	1.9L	L4	MFI	6	U
8	LV6	1.8L	L4	MFI	1, 7	J
8	LO6	4.5L	V8	MFI	6	U
8	L96	5.7L	V8	MFI	1, 2	U
9	L72	1.3L	L4	MFI	1	J
9	LV4	1.6L	L4	MFI	7	J
9	LK0	1.9L	L4	TBI	6	U

**LEGEND**  
U = U.S. K = KOREA MFI = MULTIPOINT  
C = CANADA J = JAPAN FUEL INJECTION  
M = MEXICO B = BRAZIL TBI = THROTTLE  
BODY INJECTION

1992 Cars - Vehicle Identification Label (VIN)



**TYPICAL VIN**

**POSITION NO**

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

1 4 = U.S. BUILT  
2 = CANADIAN BUILT  
3 = MEXICO BUILT  
J = JAPAN BUILT  
K = KOREAN BUILT

G = GENERAL MOTORS  
G = SUZUKI  
S = ISUZU  
Y = NUMMI  
L = DAEWOO  
C = CAMI

**ENGINE TYPE**

**CHECK DIGIT**

**RESTRAINT CODE**

**PRODUCTION SEQUENCE NUMBER**

**PLANT**

**P = 1993 MODEL YEAR**

**3 MAKE**

1 - CHEVROLET 4 - BUICK 5 - CADILLAC  
2 - PONTIAC 5 - PONTIAC 7 - GM OF CANADA  
3 - OLDSMOBILE INCOMPLETE 8 - SATURN

**4-5 CARLINE/SERIES**

**CHEVROLET**

B/B - COMMERCIAL CHASSIS N/L - ACHIEVA SL  
B/L - CAPRICE & CAPRICE WAGON W/H - CUTLASS SUPREME S  
B/N - CAPRICE CLASSIC LS & W/R - CUTLASS SUPREME  
CAPRICE CLASSIC LTZ INTERNATIONAL SERIES  
P/P - CAMARO SPORT W/T - CUTLASS SUPREME  
COUPE CONV

J/C - CAVALIER, CONV. BUICK  
& WAGON A/G - CENTURY SPECIAL &  
J/E - CAVALIER 224 & CONV. WAGON  
L/T - CORSSICA LT A/H - CENTURY CUSTOM  
L/V - BERETTA & WAGON  
L/W - BERETTA GT A/L - CENTURY LIMITED  
L/Z - BERETTA GTZ B/R - ROADMASTER  
M/R - GEO METRO & METRO B/R - ROADMASTER  
LSI & METRO GSI ESTATE WAGON  
(Canada Only) B/T - ROADMASTER  
M/S - GEO METRO Xfi LIMITED  
R/F - GEO STORM C/U - PARK AVENUE-ULTRA  
(Series77) C/W - PARK AVENUE  
R/T - GEO STORM GSI E/Z - RIVIERA  
S/X - GEO PRIZM H/P - LE SABRE CUSTOM  
W/L - LUMINA H/R - LE SABRE LIMITED  
W/M - LUMINA EURO N/J - SKYLARK LIMITED  
W/P - LUMINA Z34 N/M - SKYLARK GRAN  
Y/Y - CORVETTE & CONV. SPORT  
Y/Z - CORVETTE ZR1 N/V - SKYLARK CUSTOM

**PONTIAC**

F/S - FIREBIRD W/B - REGAL CUSTOM  
F/Y - FORMULA/TRANS AM W/D - REGAL LIMITED  
H/X - BONNEVILLE SE C/D - DEVILLE  
H/Y - BONNEVILLE SSE C/T - DEVILLE TOURING  
H/Z - BONNEVILLE SSE  
J/B - SUNBIRD SE & CONV. D/W - FLEETWOOD  
J/C - SUNBIRD LE BROUGHAM  
J/D - SUNBIRD GT (2 Dr) E/L - ELDOORADO  
L/T - TEMPEST (Export Only) K/S - SEVILLE  
N/E - GRAND AM SE K/Y - SEVILLE TOURING  
N/W - GRAND AM GT V/S - ALLANTE (CONV.)  
T/M - LEMANS SE  
T/X - LEMANS AERO COUPE & SEDAN  
W/H - GRAND PRIX LE SATURN  
W/J - GRAND PRIX SE Z/E - SC1 (2 Dr)  
W/P - GRAND PRIX GT/GTP Z/F - SC1 (2 Dr)  
W/T - GRAND PRIX STE Z/G - SC2 (2 Dr)  
OLDSMOBILE SLT (4 Dr)  
A/J - CUTLASS CIERA S SW1 (Wagon)  
A/G - CUTLASS CIERA S Z/H - SC2 (2 Dr)  
A/M - CUTLASS CIERA SL & SLT (4 Dr)  
CUTLASS CRUISER SL SW1 (Wagon)  
WAGON Z/J - SL2 (4 Dr)  
C/V - NINETY EIGHT TOURING SL2 (4 Dr)  
SEDAN Z/K - SL2 (4 Dr)  
C/W - NINETY EIGHT SW2 (Wagon)  
REGENCY ELITE SL2 (4 Dr)  
NINETY EIGHT R/T - ASUNA SUNFIRE  
REGENCY  
H/M - EIGHTY EIGHT ROYALE  
H/Y - EIGHTY EIGHT ROYALE LS

**6 BODY STYLE (GM STYLE)**

1 TWO-DOOR COUPE (27, 37, 47, 57, 97)  
2 TWO-DOOR HATCHBACK/LIFTBACK (07, 08, 77, 87)  
3 TWO-DOOR CONVERTIBLE (67)  
4 TWO-DOOR STATION WAGON (15)  
5 FOUR-DOOR SEDAN (19, 69)  
6 FOUR-DOOR HATCHBACK/LIFTBACK (29, 68)  
8 FOUR-DOOR STATION WAGON (35)

**7 RESTRAINT CODES**

1 ACTIVE (MANUAL) BELTS  
2 ACTIVE (MANUAL) BELTS W/DRIVER & PASSENGER INFLATABLE RESTRAINT SYSTEM  
3 ACTIVE (MANUAL) BELTS W/DRIVER INFLATABLE RESTRAINT SYSTEM  
4 PASSIVE (AUTOMATIC) BELTS  
5 PASSIVE (AUTOMATIC) BELTS W/DRIVER INFLATABLE RESTRAINT SYSTEM

**8 ENGINE TYPE**

CODE	ENG. OPT.	DISP.	CYL.	FUEL SYSTEM	DIV. USAGE	PROD. IN*
A	L60	2.3L	L4	MFI	1,2,3	U
B	L26	4.9L	V8	MFI	6	U
D	L02	2.3L	L4	MFI	2,3	U
E	L03	5.0L	V8	TBI	1	U,C
H	LE4	2.0L	L4	MFI	2	B
J	LT5	5.7L	V8	MFI	1	U
L	L27	3.8L	V6	MFI	2,3,4	U
M	L82	3.1L	V6	MFI	3	U
N	LG7	3.3L	V6	MFI	2,3,4	U
P	LT1	5.7L	V8	MFI	1,2	U
S	L32	3.4L	V6	MFI	1,2	U
T	LH0	3.1L	V6	MFI	1,2,3,4	M,C,U
W	L64	3.1L	V6	MFI	1	U
X	L01	3.4L	V6	MFI	1,2,3	C
Y	L08	4.8L	V8	MFI	5	U
Z	L84	4.3L	V6	TBI	1	U
1	L67	3.8L	V6	MFI	2,3,4	U
3	L40	2.3L	L4	MFI	2,3,4	U
4	LN2	2.2L	L4	MFI	1,3,4	U
6	L73	1.6L	L4	TBI	2,7	K
6	LP2	1.0L	L3	TBI	1	J
6	L01	1.6L	L4	MFI	1	J
7	L05	5.7L	V8	TBI	1,4,6	U,C
7	LL0	1.8L	L4	MFI	8	U
8	LV6	1.8L	L4	MFI	1,7	J
9	L72	1.3L	L4	MFI	7	J
9	LK0	1.9L	L4	TBI	8	U
9	L37	4.8L	V8	MFI	6	U

**\*LEGEND**

U = U.S. K = KOREA MFI = MULTIPOINT  
C = CANADA J = JAPAN FUEL INJECTION  
M = MEXICO B = BRAZIL TBI = THROTTLE  
BODY INJECTION

1993 Cars - Vehicle Identification Label (VIN)

**TYPICAL VIN** 1G6KY5298RU803268

**POSITION NO** 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

1,4 = U.S. BUILT  
2 = CANADIAN BUILT  
3 = MEXICO BUILT  
J = JAPAN BUILT

0 = GENERAL MOTORS  
G = SUZUKI  
B = ISUZU  
Y = HONDA  
C = CAMI

ENGINE TYPE  
CHECK DIGIT  
RESTRAINT CODE  
BODY STYLE  
MAKE  
CARLINE/SERIES  
R = 1994 MODEL YEAR  
PRODUCTION SEQUENCE NUMBER  
PLANT

### 3 MAKE

1 - CHEVROLET	5 - PONTIAC	6 - CADILLAC
2 - PONTIAC	INCOMPLETE (19S)	7 - GM OF CANADA
3 - OLDSMOBILE	MEXICO	8 - SATURN
4 - BUICK	DOMESTIC (36S)	

### 4-5 CARLINE/SERIES

CHEVROLET	BUICK
B/B - COMMERCIAL CHASSIS	A/G - CENTURY SPECIAL & WAGON
B/L - CAPRICE CLASSIC & CLASSIC WAGON	A/M - CENTURY CUSTOM
B/N - CAPRICE CLASSIC LS	B/B - COACHBUILDER
F/P - CAMARO SPORT COUPE & CONV	B/W - ROADMASTER
J/C - CAVALIER, CONV.	B/R - ROADMASTER ESTATE WAGON
J/F - CAVALIER Z24 & CONV.	B/T - ROADMASTER LIMITED
L/D - CORSICA	C/U - PARK AVENUE-ULTRA
L/V - BERETTA	C/W - PARK AVENUE
L/W - BERETTA Z26	H/P - LE SABRE CUSTOM
M/R - GEO METRO & METRO	H/R - LE SABRE LIMITED
LSI & METRO GSI (Canada Only)	N/J - SKYLARK LIMITED
M/S - GEO METRO XR	N/M - SKYLARK GRAN SPORT
S/K - GEO PRIZM	N/Y - SKYLARK CUSTOM
W/L - LUMINA (Sedan)	W/B - REGAL CUSTOM
W/M - LUMINA (Coupe)	W/D - REGAL LIMITED
W/N - LUMINA EURO	W/F - REGAL GRAN SPORT
W/P - LUMINA Z34	
Y/Y - CORVETTE & CONV.	CADILLAC
Y/Z - CORVETTE ZR1	D/N - COMMERCIAL CHASSIS (RWD)
	D/W - FLEETWOOD
PONTIAC	EL - ELDERADO
F/S - FIREBIRD	E/T - ELDERADO TOURING
F/V - FORMULA & CONV.	K/D - DEVILLE
TRANS AM	K/F - CONCORDS
H/K - BONNEVILLE SE	K/S - SEVILLE (SLs)
H/Z - BONNEVILLE SSE	K/Y - SEVILLE (STS)
J/B - SUNBIRD LE & CONV.	
J/L - SUNBIRD SE	SATURN
M/E - GRAND AM SE	Z/E - SC1 COUPE
M/W - GRAND AM GT	Z/F - SC1 COUPE
W/J - GRAND PRIX SE	- SL SEDAN
OLDSMOBILE	Z/G - SC2 COUPE
A/G - CUTLASS CIERA S	- SW1 WAGON
A/J - CUTLASS CIERA S WAGON	- SL1 SEDAN
C/W - NINETY EIGHT	Z/H - SC2 COUPE
REGENCY ELITE	- SW1 WAGON
C/X - NINETY EIGHT	- SL1 SEDAN
REGENCY	Z/J - SW2 WAGON
M/N - EIGHTY EIGHT	- SL2 SEDAN
ROYALE	Z/K - SW2 WAGON
M/Y - EIGHTY EIGHT	- SL2 SEDAN
ROYALE LS	GM OF CANADA
M/F - ACHIEVA GL & SC	M/R - FIREFLY
A/L - ACHIEVA S	
W/N - CUTLASS SUPREMES	
W/T - CUTLASS SUPREME CONV.	

### 6 BODY STYLE (GM STYLE)

1 TWO-DOOR COUPE (27, 37, 47, 57, 97)
2 TWO-DOOR HATCHBACK/LIFTBACK (07, 08, 77, 87)
3 TWO-DOOR CONVERTIBLE (67)
4 TWO-DOOR STATION WAGON (15)
5 FOUR-DOOR SEDAN (19, 69)
6 FOUR-DOOR HATCHBACK/LIFTBACK (29, 68)
8 FOUR-DOOR STATION WAGON (35)

### 7 RESTRAINT CODES

1 ACTIVE (MANUAL) BELTS
2 ACTIVE (MANUAL) BELTS W/DRIVER & PASSENGER INFLATABLE RESTRAINT SYSTEM
3 ACTIVE (MANUAL) BELTS W/DRIVER INFLATABLE RESTRAINT SYSTEM (FOR GEO PRIZM: ACTIVE (MANUAL) BELTS W/DRIVER & PASSENGER INFLATABLE RESTRAINT SYSTEM)
4 PASSIVE (AUTOMATIC) BELTS
5 PASSIVE (AUTOMATIC) BELTS W/DRIVER INFLATABLE RESTRAINT SYSTEM
6 PASSIVE (AUTOMATIC) BELTS W/DRIVER & PASSENGER INFLATABLE RESTRAINT SYSTEM

### 8 ENGINE TYPE

CODE	ENG. OPT.	DISP.	CYL.	FUEL SYSTEM	DIV. USAGE	PROD. IN*
A	L60	2.3L	L4	MFI	1,2,3	U
B	L26	4.9L	V8	MFI	6	U
D	L02	2.3L	L4	MFI	2,3	U
H	LE4	2.0L	L4	MFI	2	B
J	LT5	5.7L	V8	MFI	1	U
L	L27	3.8L	V6	MFI	2,3,4	U
M	L82	3.1L	V6	MFI	1,2,3,4	U
P	LT1	5.7L	V8	MFI	1,2,4,6	U
S	L32	3.4L	V6	MFI	1,2	U
T	LHD	3.1L	V6	MFI	1,2	M,C,U
W	L99	4.3L	V8	MFI	1	U
X	L01	3.4L	V6	MFI	1,2,3	C
Y	L08	4.6L	V8	MFI	6	U
1	L67	3.8L	V6	MFI	2,3,4	U
3	L40	2.3L	L4	MFI	2,3,4	U
4	LM2	2.2L	L4	MFI	1,3,4	U
6	LP2	1.0L	L3	TBI	1	J
8	L01	1.6L	L4	MFI	1,7	J
7	LL0	1.9L	L4	MFI	8	U
8	LV6	1.8L	L4	MFI	1,7	J
9	L72	1.3L	L4	MFI	7	J
9	LK0	1.9L	L4	TBI	8	U
9	L37	4.6L	V8	MFI	6	U

\*LEGEND  
U = U.S.  
C = CANADA  
M = MEXICO  
J = JAPAN  
B = BRAZIL  
MFI = MULTIPOINT FUEL INJECTION  
TBI = THROTTLE BODY INJECTION

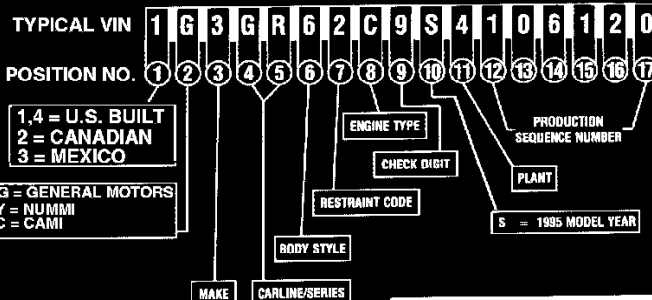
### 11 PLANT

B BALTIMORE (T&R)	MD	S ROSAR	JAPAN	T WILMINGTON	DE	1 OSHAWA #2	ON	7 LORSTOWN	ON
C LANSING (G)	MI	X LANSING (T&R)	MI	2 FRENCHTOWN	CA	2 MONROE (T&R)	ON	7 RUSSELL	JAPAN
D CORVALLIS	OR	3 LANSING (G)	MI	2 SPRING HILL	TN	3 STE THERESA	PO	8 SHREVEPORT	LA
E PORTAGE EAST (T&R)	MI	4 MEXICO CITY	MEXICO	2 PORT WATNE	IN	3 DETROIT (T&R)	MI	8 TILLSONBURG (CANEXPO)	ON
F FAWCETT	NS	5 ARLINGTON	TX	0 PONTIAC WEST (T&R)	MI	4 OROON	MI	9 OSHAWA #1	ON
G PLANT (T&R)	MI	6 RAMAPOLE	WISCONSIN	1 OSHAWA (T&R)	ON	5 BOWLING GREEN	KY		
H PLANT	MI	7 TARRANT	TX	1 WENTZVILLE	MO	6 INDIANAPOLIS	IN		
I JANDVILLE (T&R)	MI	8 TARRANT	TX			7 OKLAHOMA CITY	OK		

1994 Cars - Vehicle Identification Label (VIN)

**GM**

# 1995 PASSENGER CAR VIN SYSTEM



## 3 MAKE

1 - CHEVROLET	5 - PONTIAC	6 - CADILLAC
2 - PONTIAC	INCOMPLETE (1GS)	7 - GM OF CANADA
3 - OLDSMOBILE	MEXICO	8 - SATURN
4 - BUICK	DOMESTIC (3GS)	

## 4-5 CARLINE/SERIES

CHEVROLET	BUICK
B/L - CAPRICE CLASSIC, CLASSIC WAGON & IMPALA SS	A/G - CENTURY SPECIAL & WAGON
F/P - CAMARO SPORT COUPE & CONV.	A/H - CENTURY CUSTOM
J/C - CAVALIER	B/N - ROADMASTER
J/F - CAVALIER Z24, LS & CONV.	B/R - ROADMASTER ESTATE WAGON
L/D - CORSICA	B/T - ROADMASTER LIMITED
L/V - BERETTA	C/U - PARK AVENUE-ULTRA
L/W - BERETTA Z26	C/W - PARK AVENUE
M/R - GEO METRO & METRO	D/D - RIVIERA
S/K - GEO PRIZM	H/P - LE SABRE CUSTOM
W/L - LUMINA (Sedan)	H/R - LE SABRE LIMITED
W/M - LUMINA LS	N/V - SKYLARK CUSTOM/LTD/GRAN SPORT
W/W - MONTE CARLO LS	W/B - REGAL CUSTOM & GRAN SPORT (2 DR.)
W/X - MONTE CARLO Z34	W/D - REGAL LIMITED
Y/Y - CORVETTE & CONV.	W/F - REGAL GRAN SPORT (4 DR.)
Y/Z - CORVETTE ZR1	
PONTIAC	CADILLAC
F/S - FIREBIRD & CONV.	DAW - FLEETWOOD
F/V - FORMULA/TRANS AM & CONV.	E/L - ELDORADO
H/K - BONNEVILLE SE	E/T - ELDORADO TOURING
H/Z - BONNEVILLE SSE	K/D - DEVILLE
J/B - SUNFIRE SE & CONV.	K/F - CONCOURS
J/D - SUNFIRE GT	K/S - SEVILLE
N/E - GRAND AM SE	K/Y - SEVILLE TOURING
N/W - GRAND AM GT	
W/J - GRAND PRIX SE	SATURN
	Z/E - SC1 COUPE
	Z/F - SC1 COUPE
	Z/G - SC2 SEDAN
	Z/H - SC2 COUPE
	Z/I - SW1 WAGON
	Z/J - SW1 SEDAN
	Z/K - SW2 WAGON
	Z/L - SW2 SEDAN
	Z/M - SW2 SEDAN
OLDSMOBILE	GM OF CANADA
A/J - CUTLASS CIERA SL & WAGON	M/R - FIREFLY
C/X - NINETY EIGHT REGENCY ELITE	
G/R - AURORA	
H/N - EIGHTY EIGHT	
H/Y - EIGHTY EIGHT	
N/F - ACHIEVA SL & SC	
N/L - ACHIEVA S	
W/H - CUTLASS SUPREME SL	
W/T - CUTLASS SUPREME CONV.	

## 6 BODY STYLE (GM STYLE)

1 - TWO-DOOR COUPE (27, 37, 47, 57, 97)
2 - TWO-DOOR (07, 08, 77, 87)
3 - TWO-DOOR CONVERTIBLE (67)
4 - TWO-DOOR STATION WAGON (15)
5 - FOUR-DOOR SEDAN (19, 69)
6 - FOUR-DOOR (29, 68)
8 - FOUR-DOOR STATION WAGON (35)

## 7 RESTRAINT CODES

1 - ACTIVE (MANUAL) BELTS
2 - ACTIVE (MANUAL) BELTS W/DRIVER & PASSENGER INFLATABLE RESTRAINT SYSTEM
3 - ACTIVE (MANUAL) BELTS W/DRIVER INFLATABLE RESTRAINT SYSTEM
4 - PASSIVE (AUTOMATIC) BELTS
5 - PASSIVE (AUTOMATIC) BELTS W/DRIVER INFLATABLE RESTRAINT SYSTEM
6 - PASSIVE (AUTOMATIC) BELTS W/DRIVER & PASSENGER INFLATABLE RESTRAINT SYSTEM

## 8 ENGINE TYPE

CODE	ENG. OPT.	DISP.	CYL.	FUEL* SYSTEM	DIV. USAGE	PROD. IN*
B	L26	4.9L	V8	MFI	6	U
C	L47	4.0L	V8	MFI	3	U
D	LD2	2.3L	L4	MFI	1,2,3,4	U
J	LT5	5.7L	V8	MFI	1	U
K	L36	3.5L	V6	MFI	1,2,3,4	U
L	L27	3.5L	V6	MFI	4	U
M	L82	3.1L	V6	MFI	1,2,3,4	U,C
P	LT1	5.7L	V8	MFI	1,2,4,6	U
S	L32	3.4L	V6	MFI	1,2	M
W	L99	4.3L	V8	MFI	1	U
X	LQ1	3.4L	V6	MFI	1,2,3	C
Y	LO6	4.6L	V8	MFI	6	U
1	L67	3.8L	V6	MFI	2,3,4	U
4	LN2	2.2L	L4	MFI	1,2,3,4	U
5	LP2	1.0L	L3	TBI	1,7	J
6	LO1	1.6L	L4	MFI	1,7	J
7	LL0	1.9L	L4	MFI	8	U
8	LV6	1.8L	L4	MFI	1,7	J
9	L24	1.9L	L4	MFI	8	U
9	L72	1.3L	L4	TBI	1,7	J
9	L37	4.6L	V8	MFI	6	U

### \*LEGEND

U = U.S.  
C = CANADA  
M = MEXICO  
J = JAPAN

MFI = MULTIPOINT FUEL INJECTION  
TBI = THROTTLE BODY INJECTION

## 11 PLANT

B - BALTIMORE (T&B)	MD	G - SILAO	MEXICO	U - HANTRAMCK	MI	2 - SFE THERESE	PD	8 - SHREVEPORT	LA
D - LANSING (GENASYS)	MI	H - FLINT	MI	V - WILMINGTON	DE	3 - DETROIT (T&B)	MI	8 - TILLSONBURG	ON
C - LANSING	MI	J - JAMESVILLE (T&B)	WI	Z - FREMONT	CA	4 - ORION	MI	9 - OSHAWA #1	ON
D - CORRAVILLE	GA	K - LINDEN (T&B)	IL	Z - SPRING HILL	TN	5 - BOWLING GREEN	KY		
E - PONTIAC EAST (T&B)	MI	M - LANSING	MI	Z - FORT WAYNE (T&B)	IN	6 - INDIANAPOLIS	IN		
F - FARMEX II	KS	N - MEXICO CITY	MEXICO	1 - OSHAWA (T&B)	ON	7 - OKLAHOMA CITY	OK		
F - PLANT (T&B)	MI	R - ARLINGTON	TX	2 - OSHAWA #2	ON	7 - LORDSTOWN	OH		
		S - RAMOS ARIZPE	MEXICO	2 - MORRIS (T&B)	OH	7 - FUJISAWA	JAPAN		
		T - TARRYTOWN	NY						

The information shown is correct at time of printing, but may be changed during model year.

## 1995 Cars - Vehicle Identification Label (VIN)



## 1996 PASSENGER CAR VIN SYSTEM

**TYPICAL VIN** → 1 6 4 A G 5 5 M 0 T 6 4 0 0 0 1 6

**POSITION NO.** 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

**1,4 = U.S. BUILT**  
**2 = CANADIAN BUILT**  
**3 = MEXICO BUILT**  
**J = JAPAN BUILT**

**6 = GENERAL MOTORS, GENASYS L.C.**  
**Y = NUMMI**  
**C = CAMI**  
**8 = ISUZU**

**ENGINE TYPE**

**CHECK DIGIT**

**RESTRANT CODE**

**BODY STYLE**

**MAKE**      **CARLINE/SERIES**

**PRODUCTION SEQUENCE NUMBER**

**PLANT**

**T = 1996 MODEL YEAR**

### 3 MAKE

1 - CHEVROLET	5 - PONTIAC	6 - CADILLAC
2 - PONTIAC	INCOMPLETE	7 - GM OF CANADA
3 - OLDSMOBILE	TOYOTA (4G3)	8 - SATURN
4 - BUICK		

### 4-5 CARLINE/SERIES

<b>CHEVROLET</b> B/L - CAPRICE CLASSIC, CLASSIC WAGON & IMPALA SS F/P - CAMARO SPORT COUPE & CONV. J/C - CAVALIER J/F - CAVALIER Z24, LS & CONV. J/G - TOYOTA (SEDAN) J/H - TOYOTA (COUPE & SEDAN) L/D - CORSECA L/V - BERETTA L/W - BERETTA Z26 M/R - GEO METRO & METRO LSI S/R - GEO PRIZM W/L - LUMINA (SEDAN) W/N - LUMINA LS W/W - MONTE CARLO LS W/X - MONTE CARLO Z34 Y/Y - CORVETTE & CONV.  <b>PONTIAC</b> F/S - FIREBIRD & CONV. F/V - FORMULA/TRANS AM & CONV.  H/V - BONNEVILLE SE H/W - BONNEVILLE (SSESSE) J/B - SUNFIRE SE & CONV. J/D - SUNFIRE GT N/E - GRAND AM SE N/W - GRAND AM GT W/U - GRAND PRIX SE W/W - GRAND PRIX  <b>OLDSMOBILE</b> A/J - CUTLASS Ciera SL & WAGON C/X - NINETY EIGHT REGENCY ELITE G/R - AURORA H/W - EIGHTY EIGHT & LS M/Y - LSS N/L - ACHIEVA SL & SC W/H - CUTLASS SUPREME SL	<b>BUICK</b> A/G - CENTURY SPECIAL SEDAN & WAGON B/W - ROADMASTER B/R - ROADMASTER ESTATE WAGON B/T - ROADMASTER LIMITED C/U - PARK AVENUE-ULTRA C/W - PARK AVENUE G/D - RIVERA H/P - LE SABRE CUSTOM H/R - LE SABRE LIMITED N/J - SKYLARK W/B - REGAL CUSTOM W/D - REGAL LIMITED W/F - REGAL GRAN SPORT  <b>CADILLAC</b> D/W - FLEETWOOD E/L - ELDORADO E/T - ELDORADO TOURING K/D - DEVILLE K/F - CONCOURS K/S - SEVILLE K/Y - SEVILLE TOURING  <b>SATURN</b> Z/E - SC1 COUPE Z/F - SC1 COUPE Z/G - SC2 SEDAN Z/H - SC2 COUPE Z/I - SC1 WAGON Z/J - SC2 WAGON Z/K - SC2 WAGON Z/L - SC2 SEDAN  <b>GM OF CANADA</b> M/R - FIREFLY
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### 6 BODY STYLE (GM STYLE)

1	TWO-DOOR COUPE (27, 37, 47, 57)
2	TWO-DOOR (67, 68, 77, 87)
3	TWO-DOOR CONVERTIBLE (67)
4	TWO-DOOR STATION WAGON (15)
5	FOUR-DOOR SEDAN (19, 69)
6	FOUR-DOOR (29, 68)
8	FOUR-DOOR STATION WAGON (35)

### 7 RESTRAINT CODES

1	ACTIVE (MANUAL) BELTS
2	ACTIVE (MANUAL) BELTS W/DRIWER & PASSENGER INFLATABLE RESTRAINT SYSTEM
3	ACTIVE (MANUAL) BELTS W/DRIWER INFLATABLE RESTRAINT SYSTEM
4	PASSIVE (AUTOMATIC) BELTS
5	PASSIVE (AUTOMATIC) BELTS W/DRIWER INFLATABLE RESTRAINT SYSTEM
6	PASSIVE (AUTOMATIC) BELTS W/DRIWER & PASSENGER INFLATABLE RESTRAINT SYSTEM
7	ACTIVE (MANUAL) BELT DRIVER AND PASSIVE (AUTOMATIC) BELT PASSENGER W/DRIWER & PASSENGER INFLATABLE RESTRAINT SYSTEM

### 8 ENGINE TYPE

CODE	ENG. OPT.	DISP.	CYL.	FUEL* SYSTEM	DN. USAGE	PROD. IN*
C	L47	4.0L	V8	MFI	3	U
K	L36	3.8L	V6	MFI	1,2,3,4	U
M	L82	3.1L	V6	MFI	1,2,3,4	U,C
P	L71	5.7L	V8	MFI	1,2,4,6	U
T	L06	2.4L	L4	MFI	1,2,3,4,BJ	U
W	L99	4.3L	V8	MFI	1	U
X	L01	3.4L	V6	MFI	1,2,3	C
Y	L08	4.6L	V8	MFI	6	U
1	L67	3.8L	V6	MFI	2,3,4	U
4	LN2	2.2L	L4	MFI	1,2,3,4	U
5	L74	5.7L	V8	MFI	1	U
6	LP2	1.0L	L3	TBI	1	J
6	L01	1.6L	L4	MFI	1,7	J
7	LLO	1.9L	L4	MFI	6	U
8	UV6	1.8L	L4	MFI	1	J
8	L24	1.8L	L4	MFI	6	U
9	L72	1.3L	L4	MFI	1,7	J
9	L37	4.6L	V8	MFI	6	U

**\*LEGEND**

U = U.S.      MFI = MULTIPORT FUEL INJECTION  
 C = CANADA      TBI = THROTTLE BODY INJECTION  
 J = JAPAN      BJ = TOYOTA BADGED J-CAR

### 11 PLANT

B BALTIMORE (T&B)	MD	F FLINT (T&B)	MI	M MEXICO	T TARRYTOWN	NY	1 OSHAWA #2	ON	6 OKLAHOMA CITY	OK
B LANSING	MI	G SAO	MI	U HAMTRAMCK	MI	1 WENTZVILLE (T&B)	MO	7 LORSTOWN	OH	
C LANSING	MI	H FLINT	MI	Y WILMINGTON	DE	2 MORAN (T&B)	OH	7 ILIUSAWA	JAPAN	
C CHARLOTTE (T&B)	NC	J JAMESVILLE (T&B)	WI	Z FREMONT	CA	2 STE THERESA	PO	6 SHREVEPORT	LA	
D DORVILLE	GA	K LINDEN (T&B)	NJ	2 SPRING HILL	TN	3 DETROIT (T&B)	MI	8 TELLSONBURG	ON	
E PONTIAC EAST	MI	M LANSING	MI	2 FORT WAYNE (T&B)	IN	3 KAWASAKI	JAPAN	8 (CANADIAN)	ON	
F FARRAFAX #1	KS	N TOLEDO	MEXICO			4 OREGON	OR			
		R ARLINGTON	TX			5 BOWLING GREEN	KY	9 OSHAWA #1	ON	
		S RAMOS ARIZPE	MEXICO	1 OSHAWA (T&B)	ON	6 INDIANAPOLIS	IN			

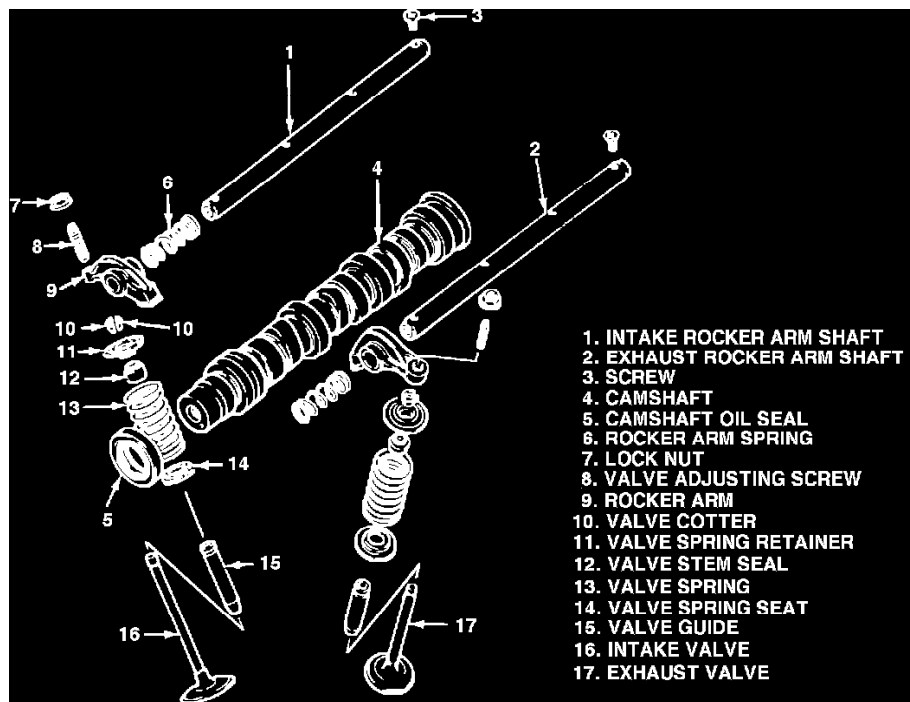
The information shown is correct at time of printing, but may be changed during model year.

## 1996 Cars - Vehicle Identification Label (VIN)

## Engine: Service and Repair

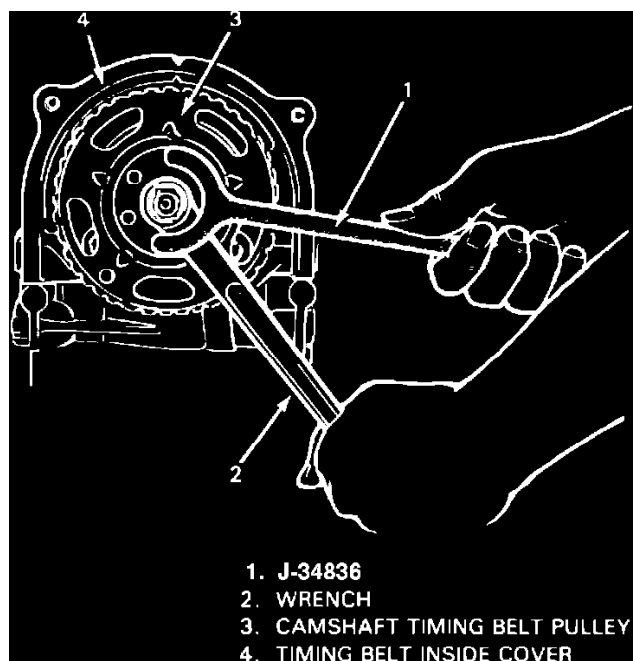
1. Disconnect battery cables.
2. Remove hood.
3. Remove battery and tray.
4. Remove air cleaner.
5. Drain cooling system and disconnect radiator hoses at engine.
6. Disconnect cooling fan wires.
7. Remove radiator and fan as an assembly.
8. Disconnect fuel lines at fuel pump.
9. Disconnect heater hoses at engine.
10. Disconnect vacuum hoses.
11. Disconnect brake booster vacuum hose at intake manifold.
12. Disconnect accelerator cable from carburetor.
13. Disconnect speedometer cable from transmission.
14. Disconnect outside air duct.
15. Disconnect clutch cable and bracket from transmission.
16. Disconnect wiring harnesses at engine and transmission.
17. Remove A/C compressor adjusting bolt, if equipped.
18. Remove drive belt splash shield.
19. Raise and support vehicle.
20. Disconnect exhaust pipe from manifold.
21. Loosen A/C compressor pivot bolt, if equipped.
22. Remove A/C compressor drive belt, if equipped.
23. Remove A/C compressor bracket from engine, if equipped.
24. Disconnect gearshift control shaft from transmission.
25. Disconnect gearshift extension rod from transmission.
26. Disconnect ball joints.
27. Drain transaxle.
28. Remove drive axles from transaxle.
29. Drain engine oil.
30. Disconnect engine torque rods.
31. Remove transmission mount nut.
32. Lower vehicle.
33. Remove engine side mount.
34. Remove engine mount nuts.
35. Using suitable hoist, remove engine and transaxle as an assembly.
36. Reverse procedure to install.

## Camshaft: Service and Repair



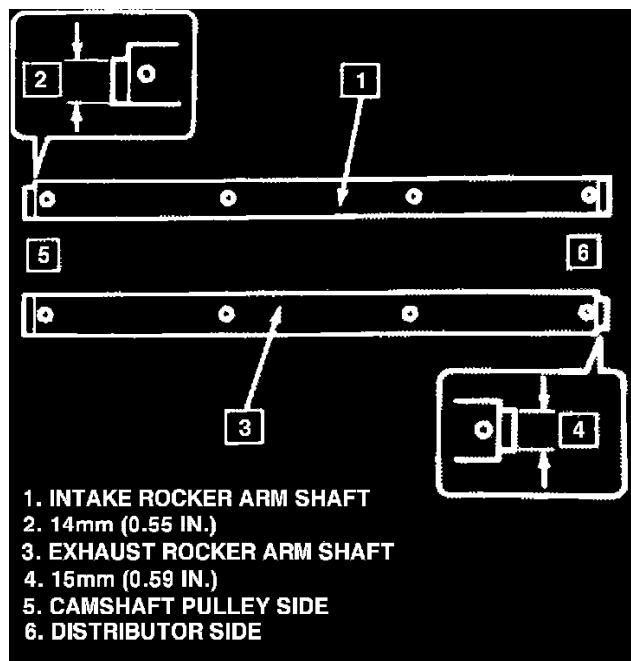
**Fig. 14 Exploded view of valve train assembly**

1. Disconnect battery ground cable.
2. Remove air cleaner and cylinder head cover.
3. Remove distributor and case from cylinder head.
4. Loosen all valve adjusting screw locknuts and turn adjusting screws completely back to allow rocker arms to move freely.
5. Remove rocker arm shaft screws and rocker arm shafts. Then, remove rocker arms and springs, **Fig. 14**.
6. Remove fuel pump and pushrod from cylinder head.
7. Refer to "Timing Belt & Cover, Replace" procedure to remove crankshaft pulley and timing belt outer cover.



**Fig. 15 Timing belt sprocket removal**

8. Using tool J-34836, remove timing belt sprocket and timing belt inner cover, **Fig. 15**.
9. Remove camshaft from cylinder head.



**Fig. 16 Rocker arm shaft identification**

10. Reverse procedure to install. Torque camshaft sprocket to 41-46 ft. lbs. Refer to **Fig. 16** for rocker shaft identification.

Connecting Rod: Service and Repair

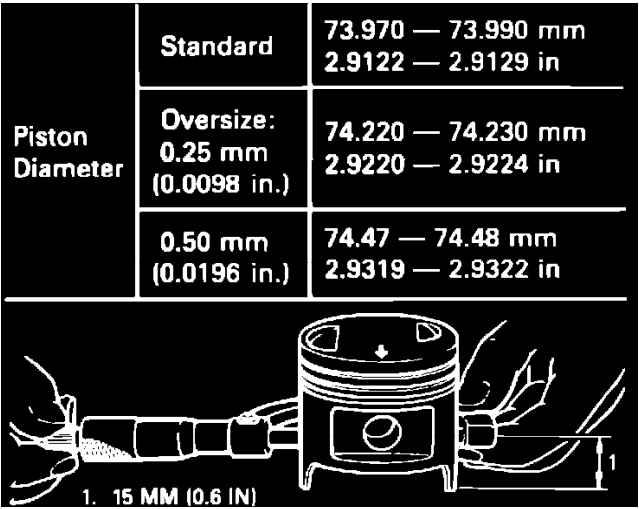


Fig. 17 Measuring piston diameter

INSPECTION

- 1. Inspect piston for cracks or other damage. Replace as necessary.
- 2. Measure piston diameter at a height of .59 inches (15 mm) from piston skirt end in perpendicular direction to piston pin, **Fig. 17**.

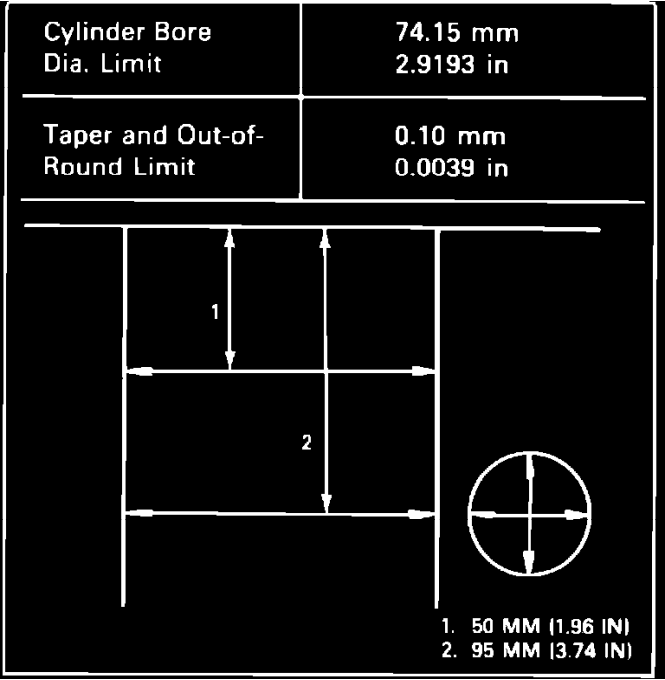
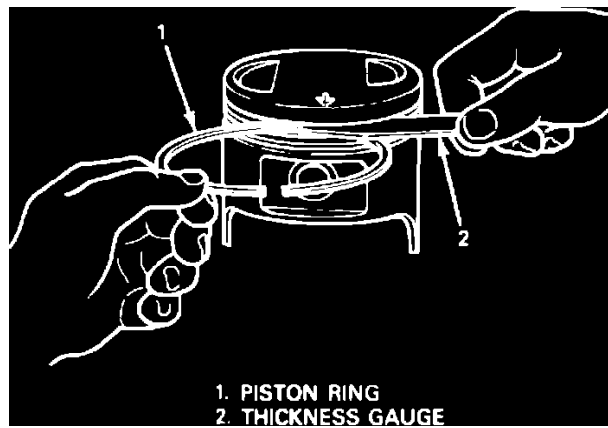


Fig. 18 Measuring piston bore diameter

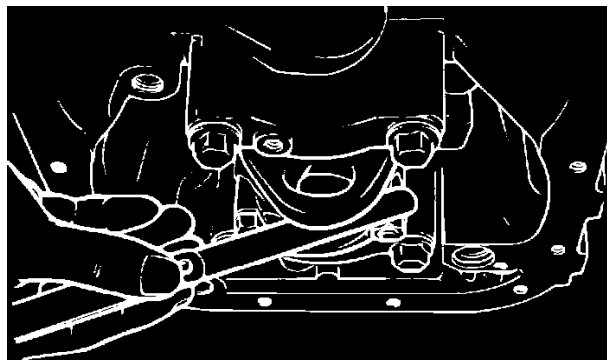
- 3. Measure cylinder bore diameter, **Fig. 18**, and piston diameter to determine piston clearance. Piston clearance should be .0008-.0015 inch. If clearance is excessive, rebore cylinder and install oversize piston. All cylinders must be overbored to same size to ensure balance.





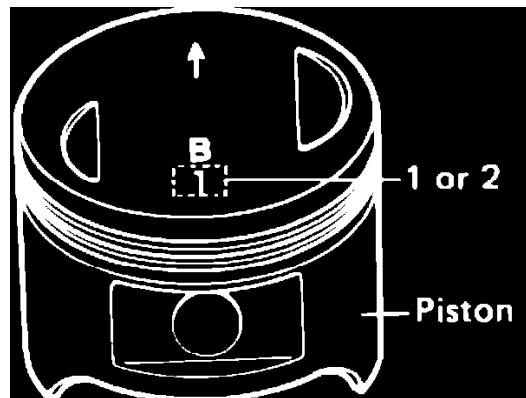
**Fig. 19 Measuring piston ring side clearance**

4. With piston grooves clean, dry and free of carbon, insert piston ring into groove, and measure clearance between ring and ring land with feeler gauge, **Fig. 19**. If clearance is out of specification, replace piston.
5. Piston pin should fit into piston bore with easy finger push at normal room temperature. Check piston pin and piston pin bore for wear or damage. If badly worn or damaged, replace pin or piston as necessary.

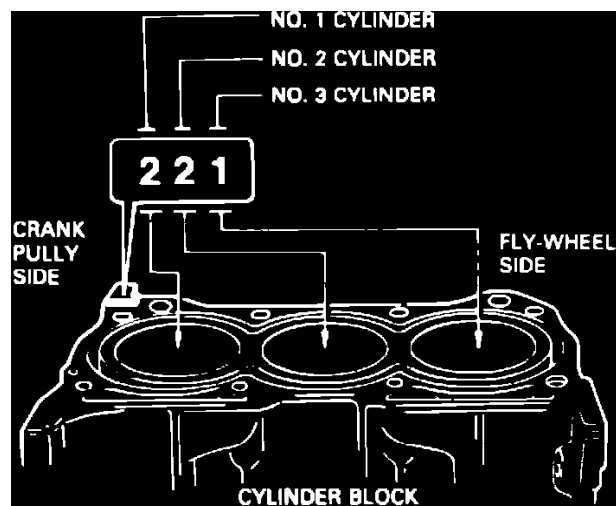


**Fig. 20 Measuring rod bearing side clearance**

6. Install connecting rod on its journal and check that side clearance does not exceed .0137 inch, **Fig. 20**. If so, replace connecting rod.



**Fig. 21 Piston identification**

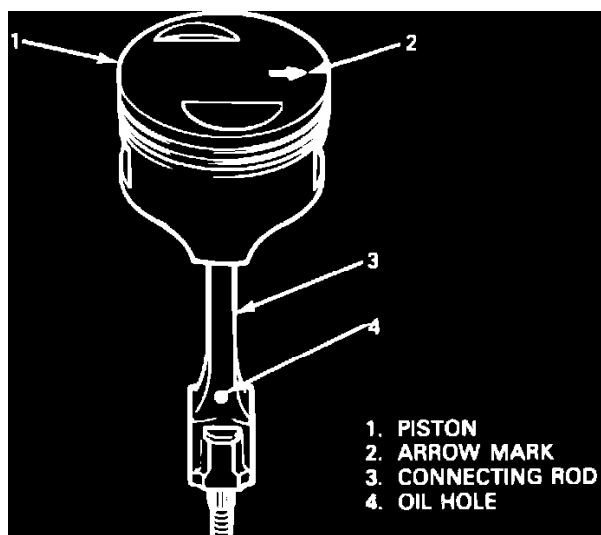


**Fig. 22 Engine block stamping**

## ASSEMBLY

Two sizes of pistons are available as standard size spare parts to ensure proper piston-to-cylinder clearance. When installing standard piston, match piston to its bore as follows:

- a. Each piston has number 1 or 2 stamped on top, **Fig. 21**, to indicate its outside diameter.
- b. The engine block is stamped as shown in **Fig. 22**, to indicate size of piston in each bore.



**Fig. 23 Piston to connecting rod installation**

Assemble pistons, rings and rods as follows:

1. Apply engine oil to piston pin bores in piston and rod and fit connecting rod to piston as shown in **Fig. 23**.

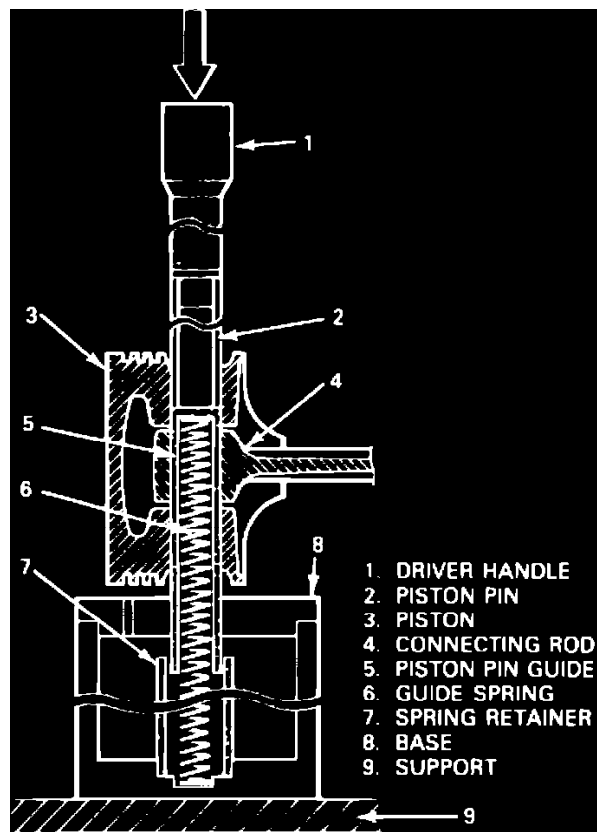


Fig. 24 Piston pin installation

2. Place piston on tool J-34838 so arrow mark on piston head faces up. Press piston pin into piston and connecting rod, **Fig. 24**.

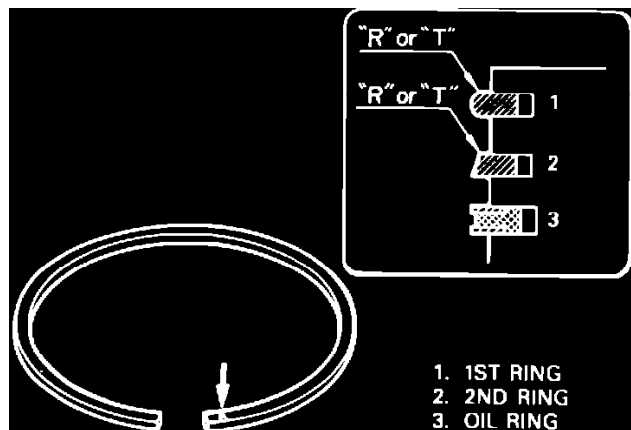


Fig. 25 Piston ring installation

3. Install piston rings so marked side of each ring faces top of piston, **Fig. 25**. Note shape of rings 1 and 2.

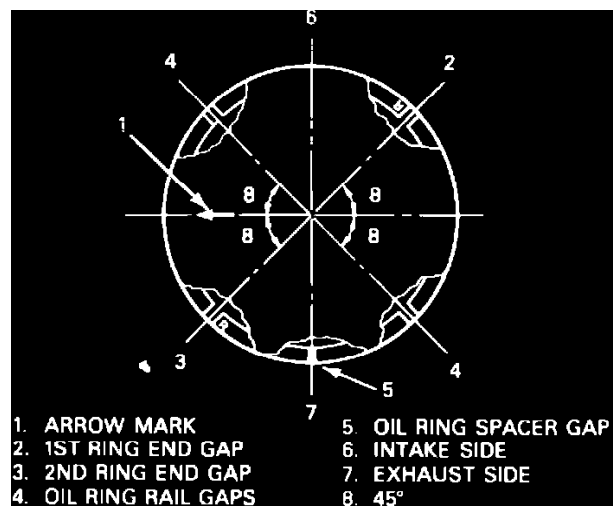
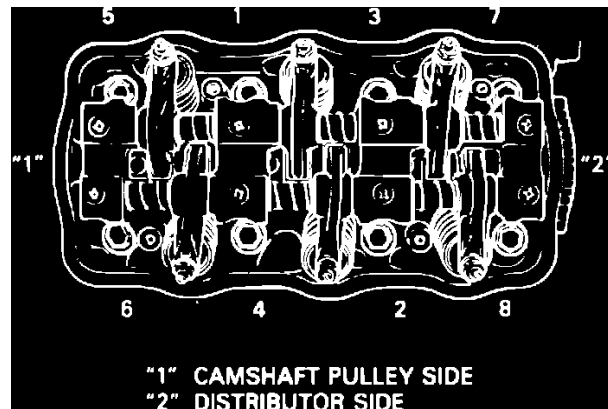


Fig. 26 Ring end gap alignment

4. Install oil ring spacer first, then 2 rails.
5. Align ring end gaps as shown in **Fig. 26**. Pistons and connecting rod assemblies must be installed in block so arrows on pistons face front (pulley end) of engine.

## Cylinder Head Assembly: Service and Repair

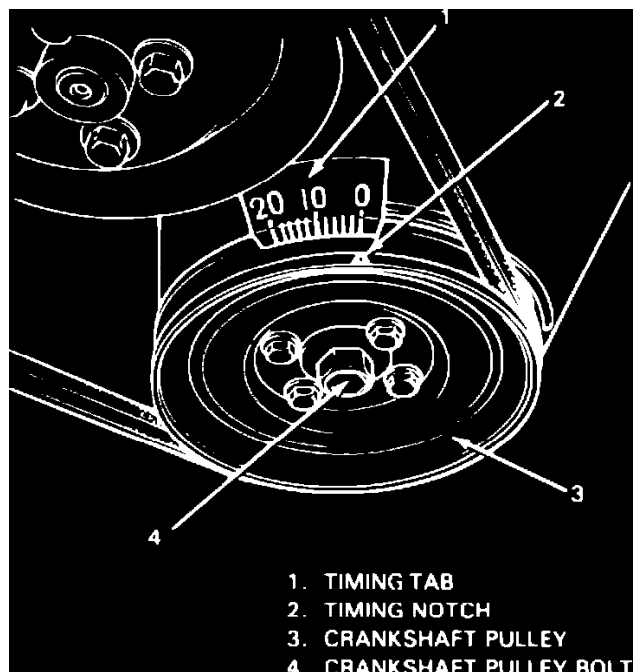
1. Disconnect battery ground cable.
2. Drain cooling system.
3. Remove air cleaner, valve cover and distributor.
4. Disconnect accelerator cable from carburetor.
5. Disconnect emission control hoses from carburetor and intake manifold.
6. Disconnect cooling system hoses from intake manifold.
7. Disconnect wiring from carburetor and intake manifold.
8. Disconnect fuel lines from fuel pump.
9. Disconnect brake booster vacuum hose from intake manifold.
10. Disconnect oxygen sensor lead.
11. Disconnect exhaust pipe from manifold and second air valve.
12. Remove fuel pump.
13. Remove rocker shafts, rocker arms, springs and camshaft.
14. Disconnect engine side mounting at cylinder head.
15. Remove cylinder head bolts.
16. Remove cylinder head with carburetor, intake and exhaust manifolds.



**Fig. 1** Cylinder head bolt tightening sequence

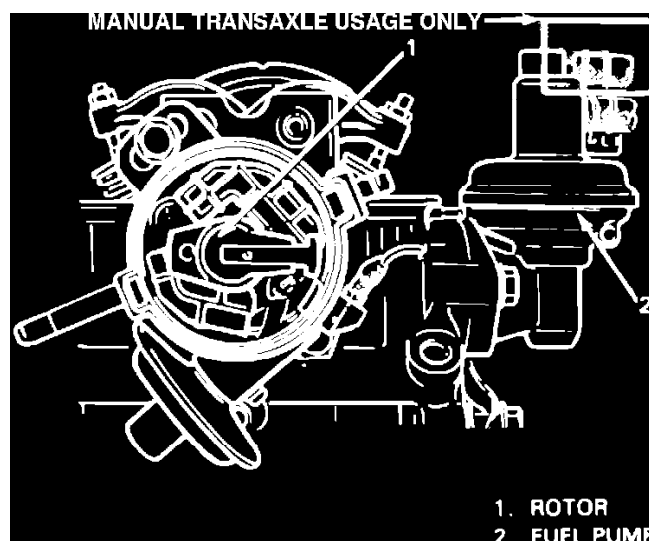
17. Reverse procedure to install. Torque cylinder head bolts to specification sequentially according to pattern shown in **Fig. 1**.

## Valve Clearance: Adjustments



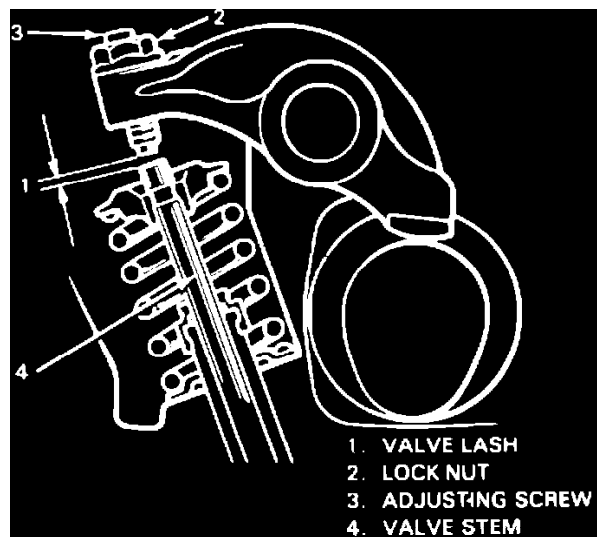
**Fig. 2 Aligning crankshaft pulley**

1. Remove air cleaner and cylinder head cover.
2. Turn crankshaft clockwise and align timing notch on crankshaft pulley with 0 mark on timing tab, **Fig. 2**.



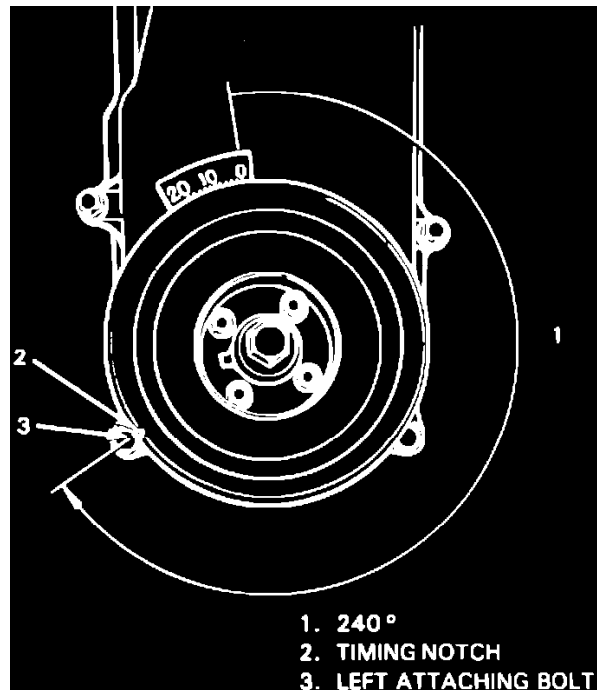
**Fig. 3 Distributor rotor at TDC position**

3. Remove distributor cap. Engine is at TDC when distributor rotor is positioned as shown in **Fig. 3**. If engine is not at TDC, turn crankshaft 360 degrees so timing notch is at 0 mark again.



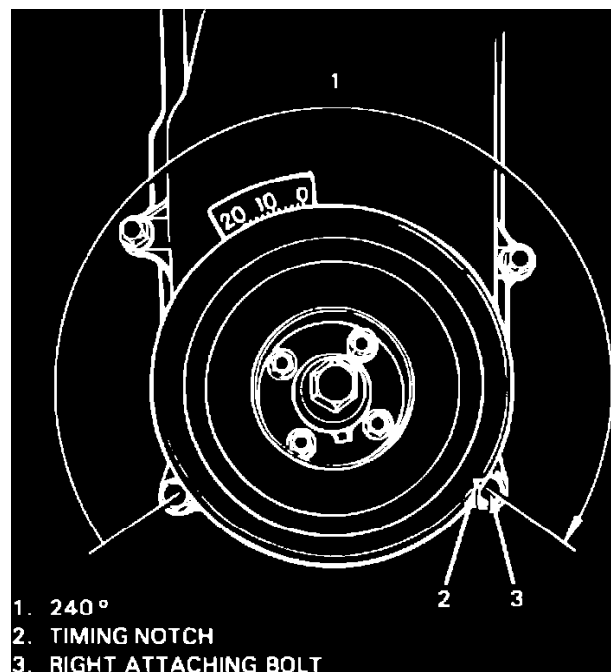
**Fig. 4 Adjusting valve lash**

4. Using feeler gauge, measure No. 1 cylinder intake and exhaust valve clearances at 1 in **Fig. 4**.
5. Adjust valve lash, if necessary, by turning adjusting screw after loosening locknut, **Fig. 4**. After adjustment, tighten locknut to specified torque.



**Fig. 5 Crankshaft pulley alignment w/left side timing belt cover bolt**

6. After checking No. 1 cylinder, turn crankshaft 240 degrees clockwise and align timing notch on pulley with left mounting bolt of timing belt cover, **Fig. 5**. Check and, if necessary, adjust intake and exhaust valves of No. 3 cylinder.



**Fig. 6 Crankshaft pulley alignment w/right side timing belt cover bolt**

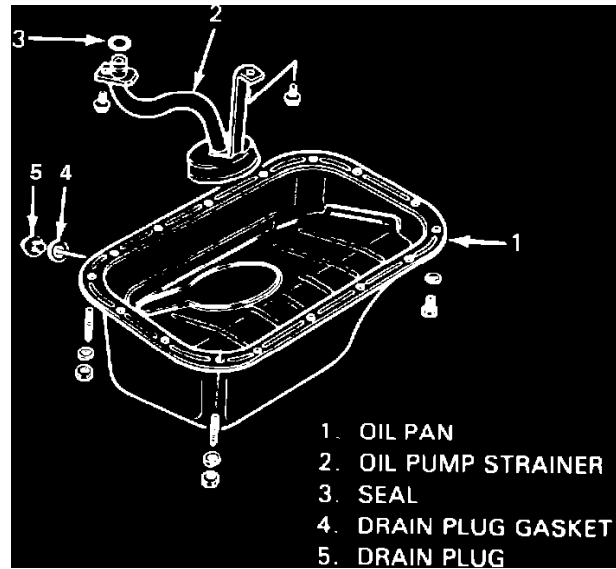
7. Rotate crankshaft 240 degrees clockwise from left mounting bolt, and align timing notch with right mounting bolt as shown in **Fig. 6**. Then, check and, if necessary, adjust intake and exhaust valves of No. 2 cylinder.
8. After checking and adjusting valves, install distributor cap, cylinder head cover and air cleaner.



## Fuel Pressure Release: Service and Repair

1. To prevent a dangerous spray of fuel, remove fuel tank cap to release fuel pressure, then reinstall cap.
2. With engine running, remove fuel line connector from fuel pump relay, then allow engine to stop from lack of fuel. **Main relay and fuel pump relay are identical. Identify fuel pump relay by pink, pink/white, white/blue, and white/blue wire harness.**
3. Once engine has stopped, crank engine a few more times with starter for approximately 3 seconds each.
4. If fuel pressure cannot be relieved by these methods because engine fails to run as described in step 2, disconnect battery ground cable, cover union bolt of high pressure fuel line with a suitable rag, then slowly loosen union bolt to release fuel pressure gradually. After pressure has been released, retighten union bolt as not to allow a fuel leak.

## Oil Pan: Service and Repair



**Fig. 27 Oil pan removal**

1. Disconnect battery ground cable.
2. Raise and support vehicle.
3. Drain oil pan.
4. Remove flywheel dust cover.
5. Disconnect exhaust pipe at manifold.
6. Remove oil pan bolts and pan, **Fig. 27**.
7. Remove oil pump screen.
8. Reverse procedure to install. Apply continuous bead of silicon type sealer to oil pan flange inside bolt holes. Starting at center and working outwards, torque oil pan bolts to 7-9 ft. lbs. Torque drain plug to 22-29 ft. lbs.

# Oil Pump: Service and Repair

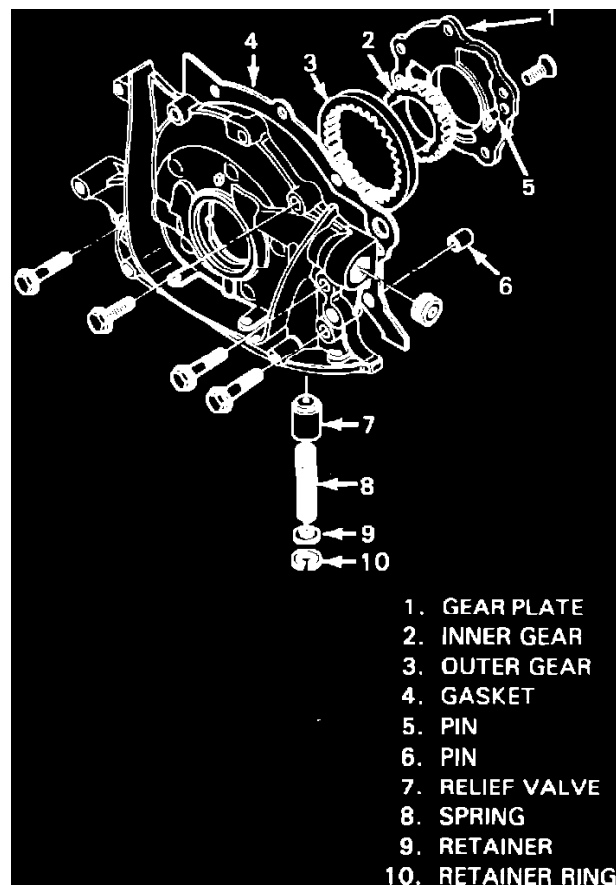


Fig. 28 Oil pump removal 1985-87 Gear Type

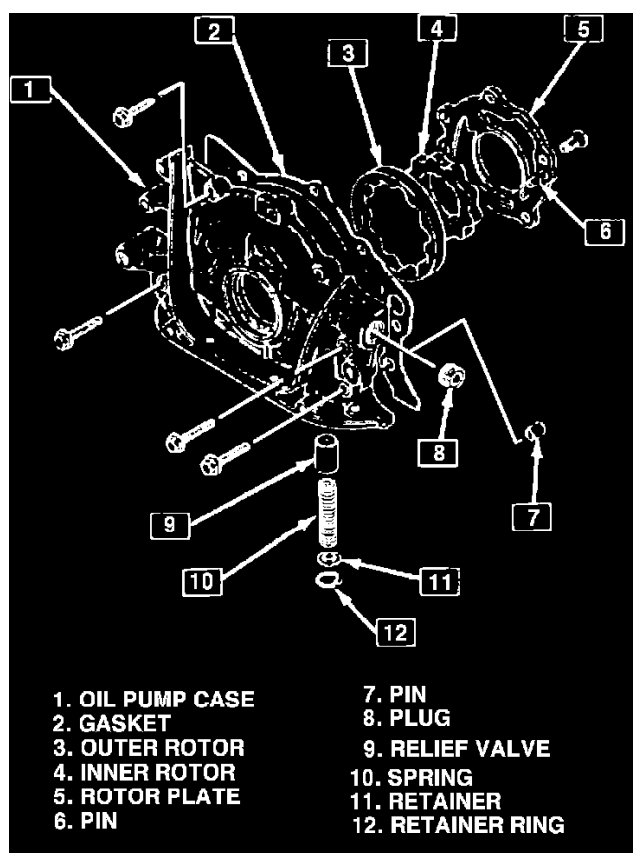
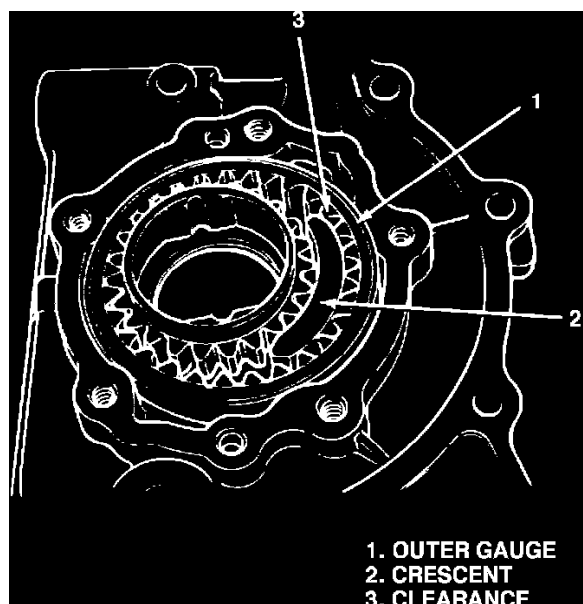


Fig. 29 Oil pump removal 1988 Rotary Type (Trochoid)

## REMOVAL

1. Refer to "Timing Belt, Replace" procedure to remove timing belt.
2. Refer to "Oil Pan, Replace" procedure to remove oil pan.

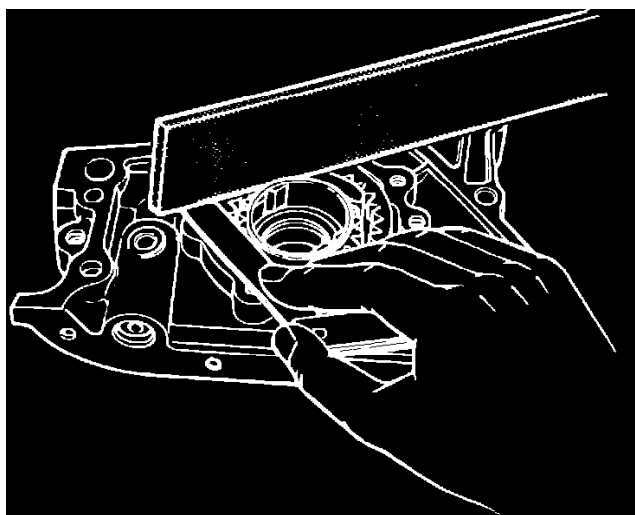
3. Remove crankshaft timing belt sprocket.
4. Remove alternator mounting bracket.
5. Remove A/C compressor mounting bracket, if so equipped.
6. Remove alternator adjusting bolt and upper cover bolt.
7. Remove oil pump bolts and pump, **Fig. 28 and 29.**



**Fig. 30 Checking oil pump gear radial clearance. Rotory type similar**

#### INSPECTION

1. Remove dipstick tube from oil pump.
2. Remove gear plate screws and gear plate.
3. Remove outer and inner gears and/or rotors.
4. Inspect oil seal lip for damage and replace as necessary.
5. Inspect outer and inner gears and/or rotors, gear plate, and oil pump case for excessive wear or damage.
6. Using feeler gauge, check radial clearance between outer gear and/or rotor and crescent, **Fig. 30.** If clearance exceeds .0122 inch, replace outer gear and/or rotor.



**Fig. 31 Checking oil pump gear side clearance. Rotory type similar**

7. Using straightedge and feeler gauge, measure side clearance which should not exceed .0059 inch, **Fig. 31.**
8. Wash, clean and dry all oil pump parts.
9. Apply light coat of engine oil to inner and outer gears and/or rotors, oil seal lip portion, and inside surfaces of oil pump case and plate.
10. Install outer and inner gears and/or rotors in pump case.
11. Install gear plate and tighten screws securely. Check that gears turn smoothly by hand.
12. Install O-ring in pump case, then dipstick tube.

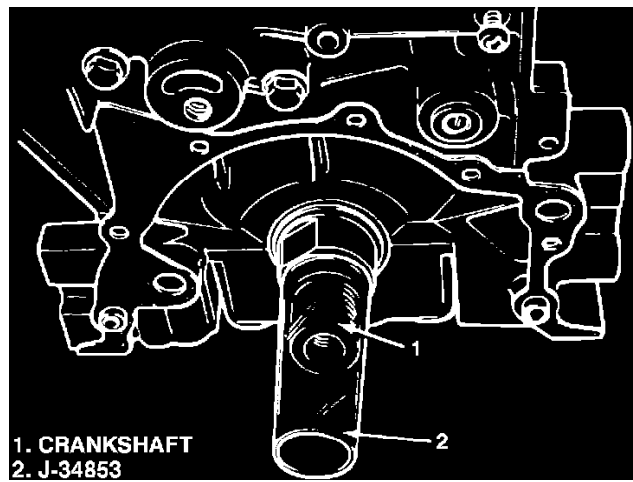


Fig. 32 Tool J-34853 installation

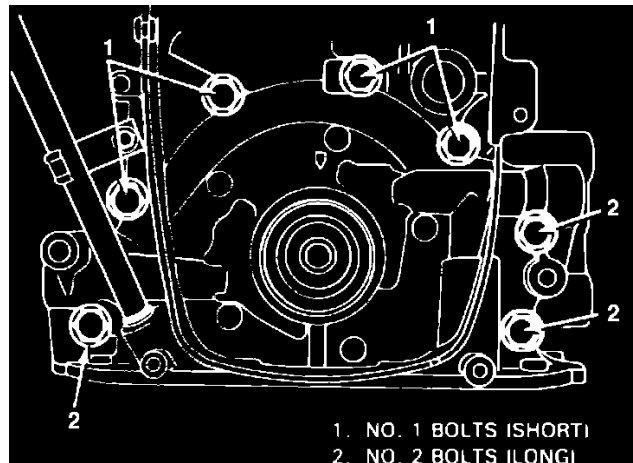


Fig. 33 Oil pump bolt location

## ASSEMBLY

1. Install oil pump pins and gasket on engine block.
2. Install tool J-34853 (oil seal guide) onto crankshaft to prevent damage to oil seal lip, **Fig. 32**. Apply engine oil to special tool.
3. Install oil pump onto crankshaft and engine block. Note location of mounting bolts, **Fig. 33**. **No. 1 bolts are shorter than No. 2 bolts in length. Install bolts as shown in Fig. 33, and torque bolts to 7-9 ft. lbs.**
4. After installing oil pump, check that oil seal lip is not twisted, then remove tool.

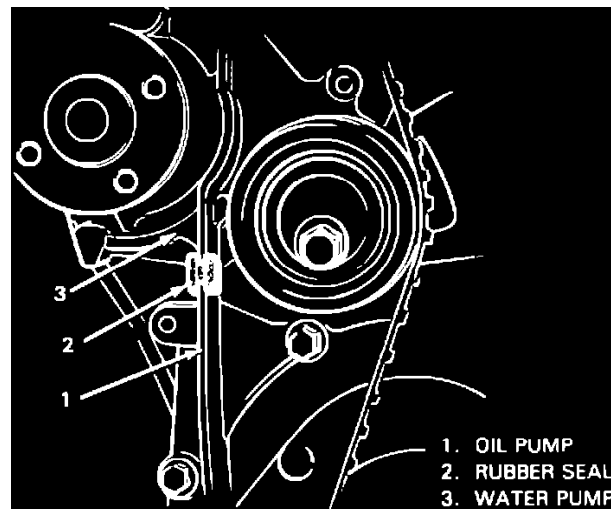


Fig. 34 Rubber seal installation

5. Install rubber seal between oil pump and water pump, **Fig. 34**.
6. If necessary, trim edges of oil pump seal flush with oil pan mating surface.
7. Install timing belt guide, key and crankshaft timing sprocket. Note that timing belt guide must be installed so that curved side faces oil pump.
8. Torque crankshaft timing sprocket bolt to 47-54 ft. lbs.

### **Chevrolet Sprint L3-61 1.0L**

9. Install timing belt and tensioner components.
10. Adjust intake and exhaust valves.
11. Adjust water pump tension.
12. Fill crankcase.
13. Connect battery ground cable.
14. Run engine to check that oil pressure is correct.

## Timing Belt: Service and Repair

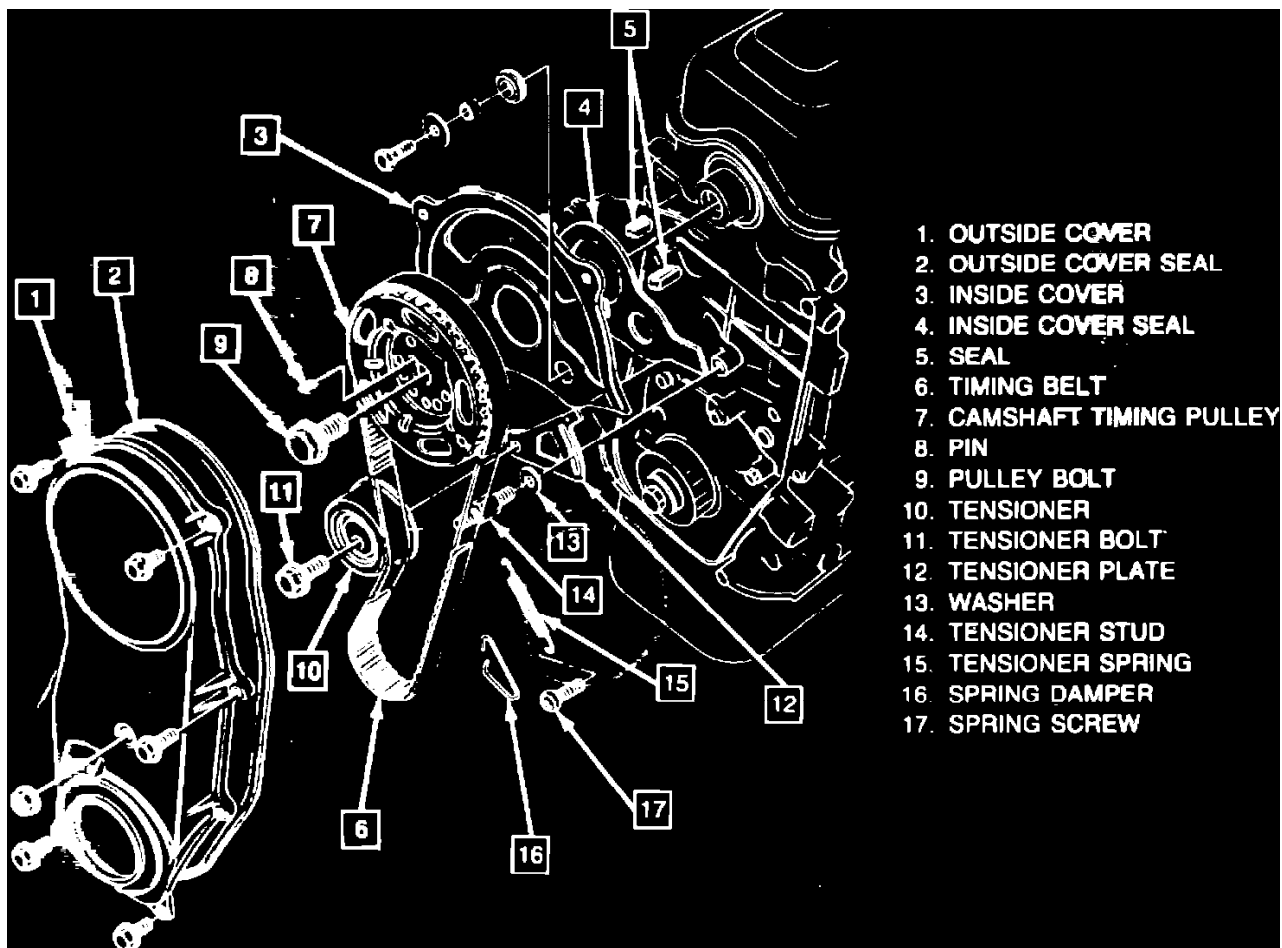
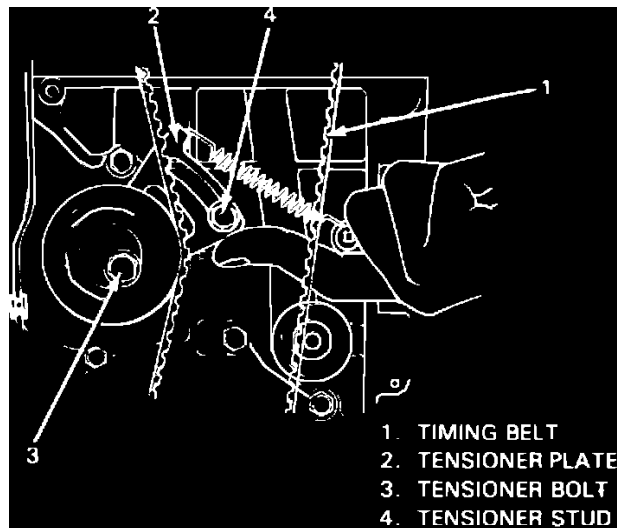


Fig. 7 Timing belt and cover assembly

### REMOVAL

1. Disconnect battery ground cable.
2. Loosen water pump pulley bolts.
3. Remove A/C compressor adjusting bolt, if equipped.
4. Loosen alternator adjusting bolt.
5. Raise and support vehicle.
6. Remove drive belt splash shield.
7. Remove plug in right fender well.
8. Remove A/C compressor drive belt, if equipped.
9. Remove alternator belt.
10. Remove crankshaft pulley and water pump pulley.
11. Remove bolts at bottom of timing belt cover, Fig. 7.
12. Lower vehicle.

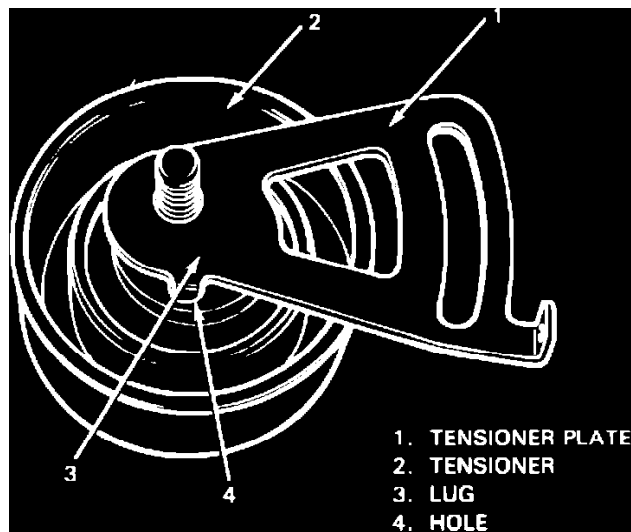


**Fig. 8 Timing belt removal**

13. Remove bolts at top of timing belt cover and cover.
14. Remove cylinder head cover.
15. Loosen rocker arm adjusting screws.
16. Remove distributor cap.
17. Loosen tensioner bolt and stud, and remove belt as shown in **Fig. 8**.
18. Remove tensioner, tensioner plate and tensioner spring.

#### INSPECTION

1. Check timing belt for wear or cracks. Replace as necessary.
2. Check tensioner for smooth rotation.



**Fig. 9 Tensioner assembly**

#### INSTALLATION

1. Install tensioner plate to tensioner. Insert lug of tensioner plate into hole of tensioner, **Fig. 9**.



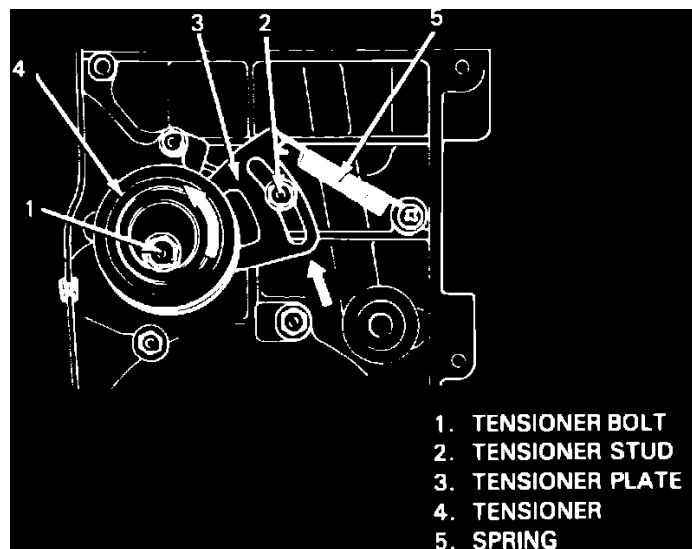


Fig. 10 Checking tensioner plate movement

2. Install tensioner, tensioner plate and spring. Hand tighten tensioner bolt and stud only. Check that plate movement is in direction shown in **Fig. 10**. If no movement occurs between plate and tensioner, remove tensioner and plate and re-insert plate lug into tensioner hole.

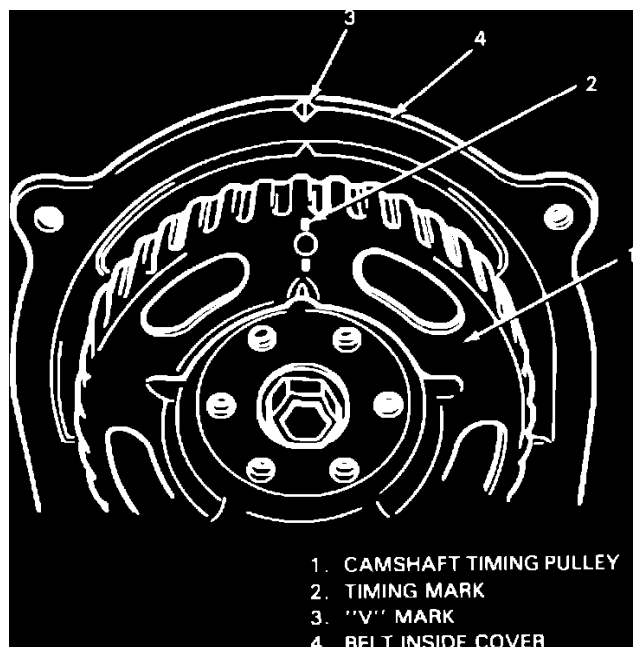


Fig. 11 Camshaft pulley alignment

3. Turn camshaft pulley clockwise and align timing mark on camshaft pulley with V mark on inside belt cover, **Fig. 11**.

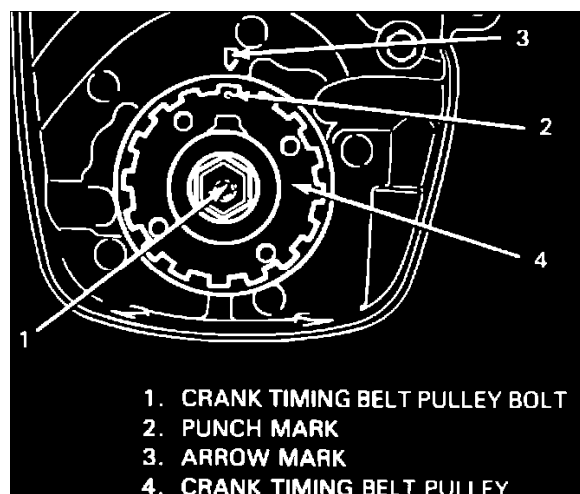
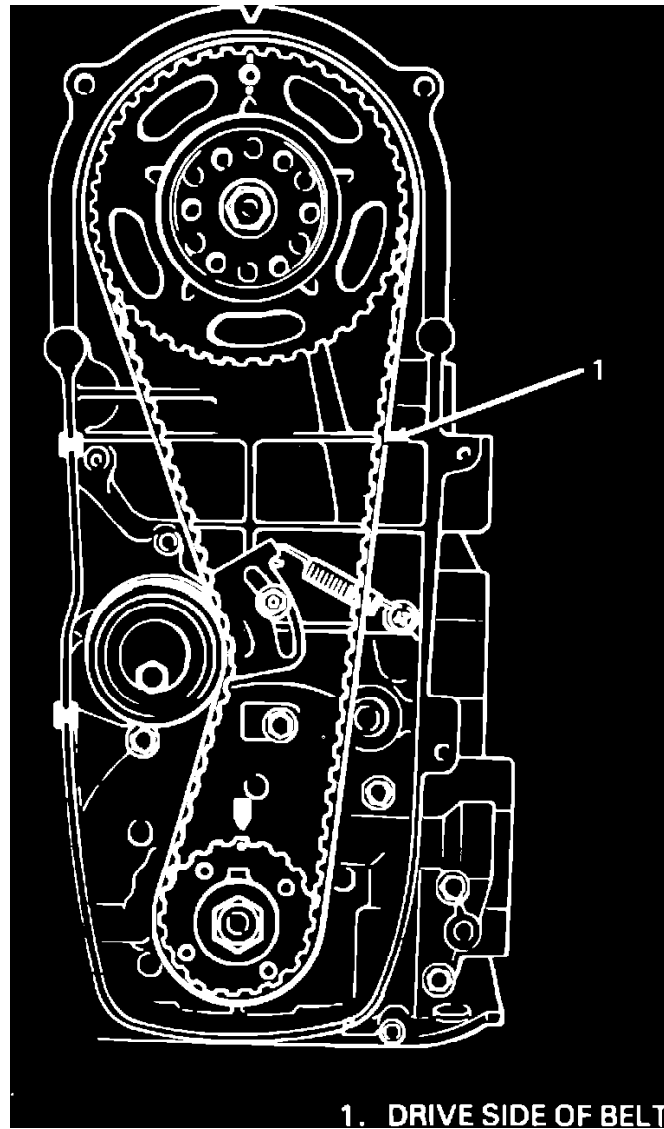


Fig. 12 Aligning timing belt pulley punch mark with oil pump arrow

4. Using 17 mm wrench, turn crankshaft clockwise and align punch mark on timing belt pulley with arrow mark on oil pump, **Fig. 12**.



**Fig. 13 Timing belt installation**

5. With all 4 marks aligned, install timing belt on sprockets so that drive side of belt is free of any slack and so tensioner plate is positioned as shown in **Fig. 13**.
6. To ensure timing belt is free of slack, turn crankshaft one rotation clockwise after installing belt. After removing slack, first torque tensioner stud, and then tensioner bolt to 17-21 ft. lbs.
7. Install timing belt outer cover.
8. Install crankshaft pulley and torque 4 bolts to 7-9 ft. lbs.
9. Refer to "Valves, Adjust" procedure and adjust intake and exhaust valves.
10. Install water pump pulley and drive belt.
11. Install cylinder head cover and air cleaner.
12. Connect battery ground cable.

## Timing Component Alignment Marks: Locations

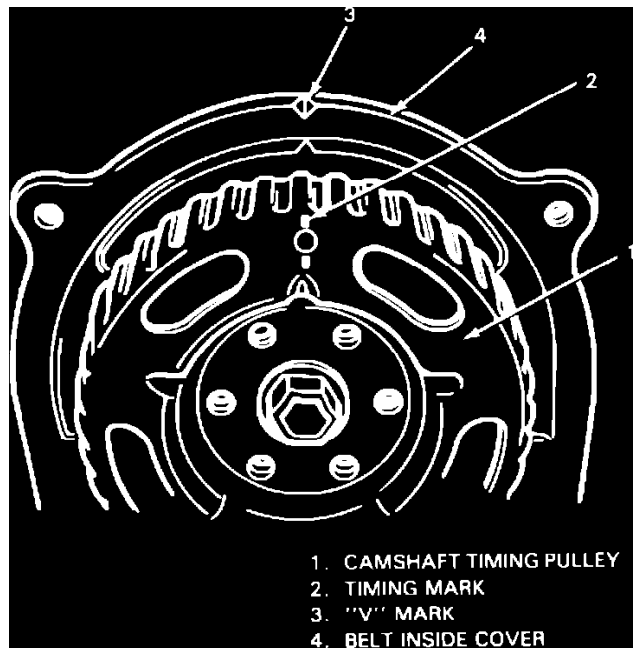


Fig. 11 Camshaft pulley alignment

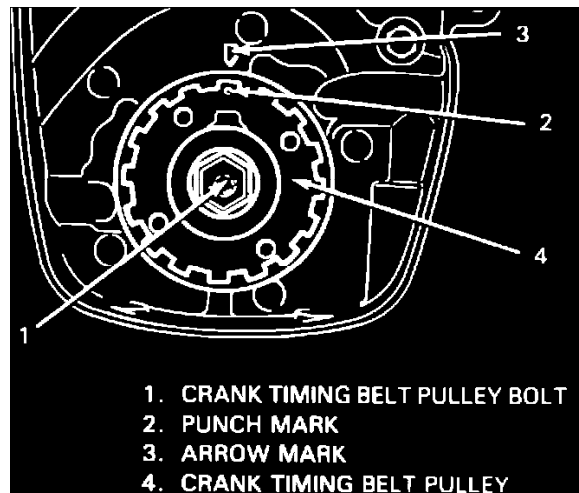


Fig. 12 Aligning timing belt pulley punch mark with oil pump arrow

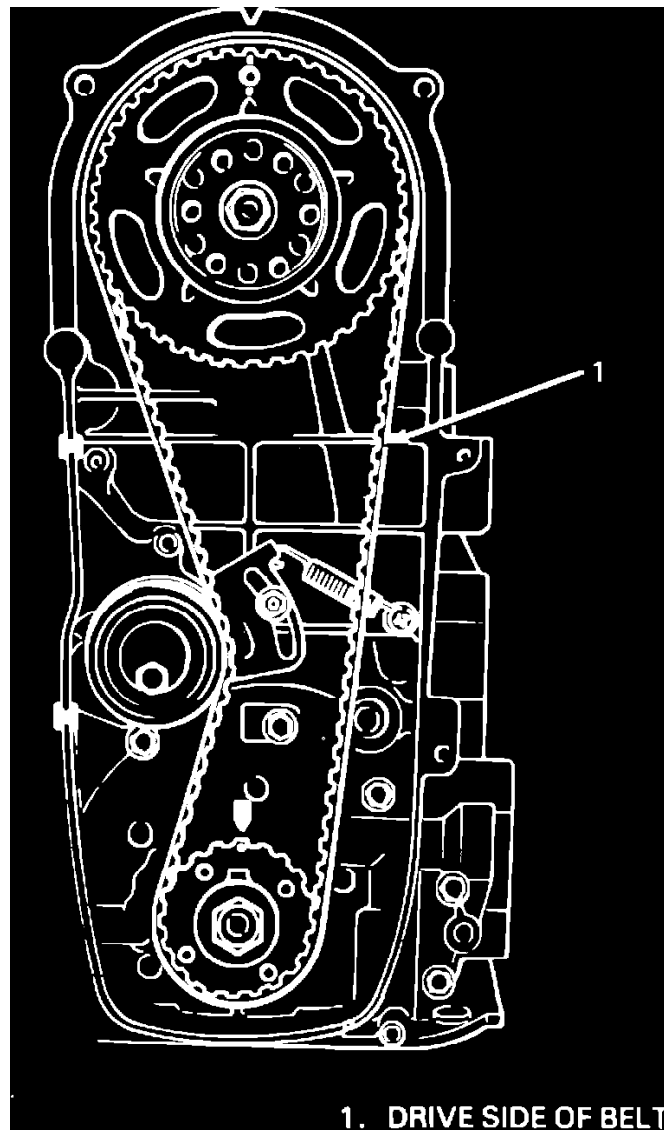


Fig. 13 Timing belt installation

**CAUTION:** Incorrect removal or installation of the timing belt can result in damage to internal engine components.

For complete Timing Belt Removal and Installation information, See: Timing Belt/Service and Repair

## Idle Speed: Adjustments

**1.0L** Set idle speed with all accessories and cooling fan off. Set idle up with lights and heater on. To set fast idle, disconnect and plug coolant hoses at carburetor thermo element and set fast idle cam on index mark. Set fast idle with engine at operating temperature.

**1.0L, 1.5L Turbo:** Set idle to specified speed. To set electrical speed-up (1.0L), turn headlights on and adjust screw on solenoid. To set AC speed-up (1.0L), turn AC on and adjust screw on solenoid.

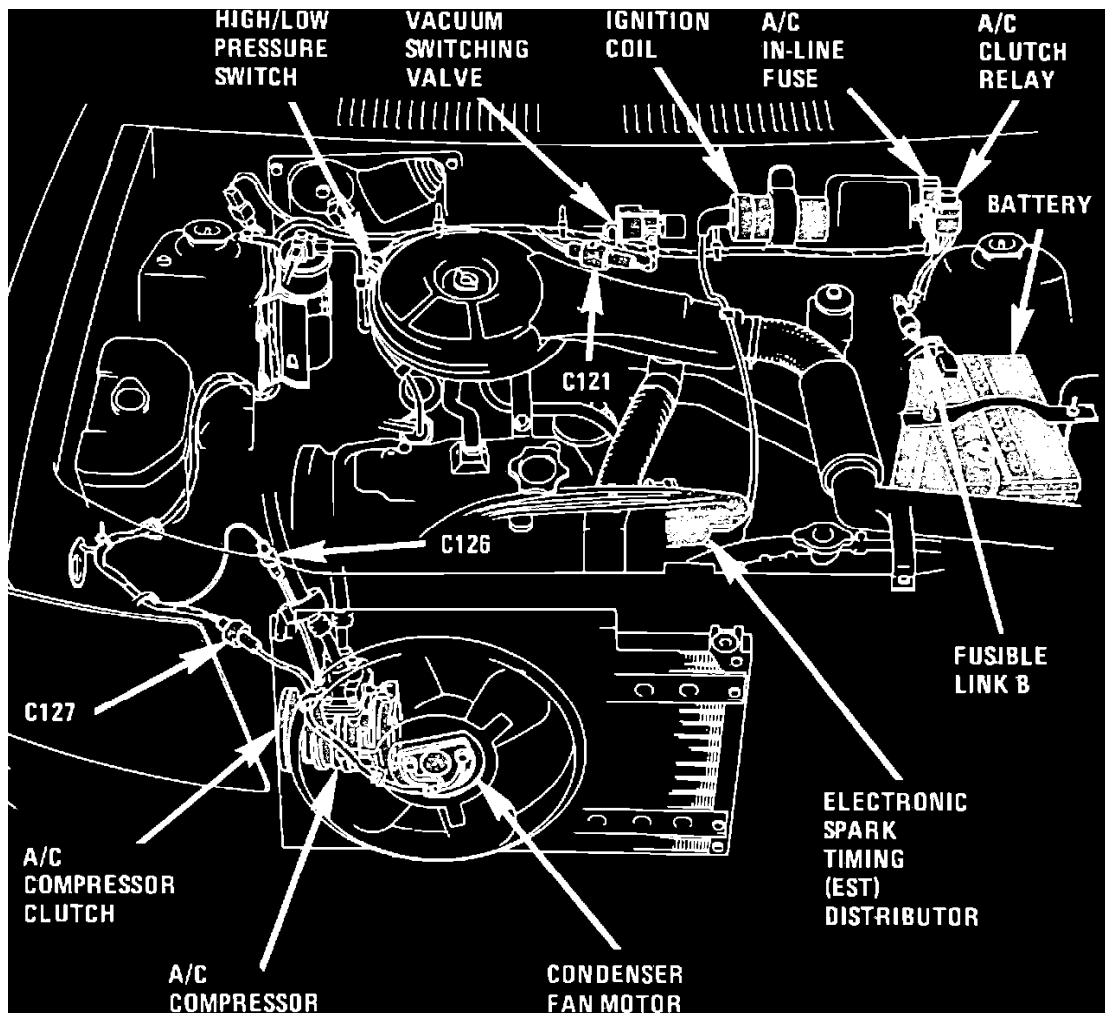
**1.5L 2V:** Disconnect and plug distributor vacuum, canister purge, EGR, ITC, vacuum hoses.

Air-conditioned models equipped with idle speed-up solenoid, turn AC on and with solenoid fully extended, adjust solenoid to obtain specified rpm.

**1.6L Nova 2V:** Set idle speed to specified value. To set fast idle, disconnect hose from M port of thermo vacuum switching valve. To set speed-up speed (first step), disconnect vacuum hose from rear of vacuum solenoid. Check speed-up speed against specified value. Reconnect hose and disconnect first hose by linkage to check second step speed-up speed.

**1.6L Nova, Prizm FI:** Set idle to specified value.

## Distributor: Locations



Engine Compartment

LH Side Of Engine

Applicable to: Non-Turbo

## Distributor: Service and Repair

### Distributor Replace

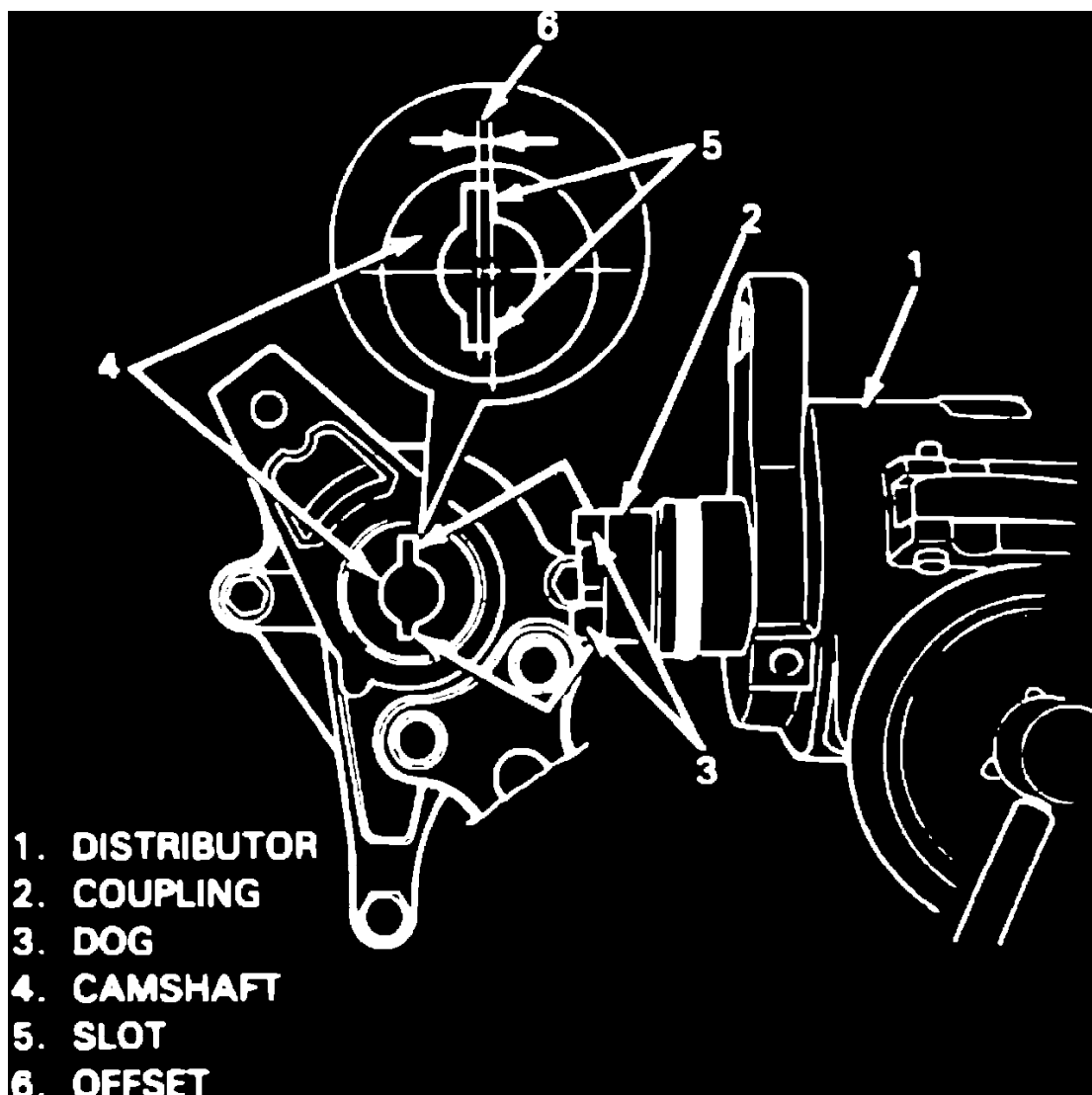
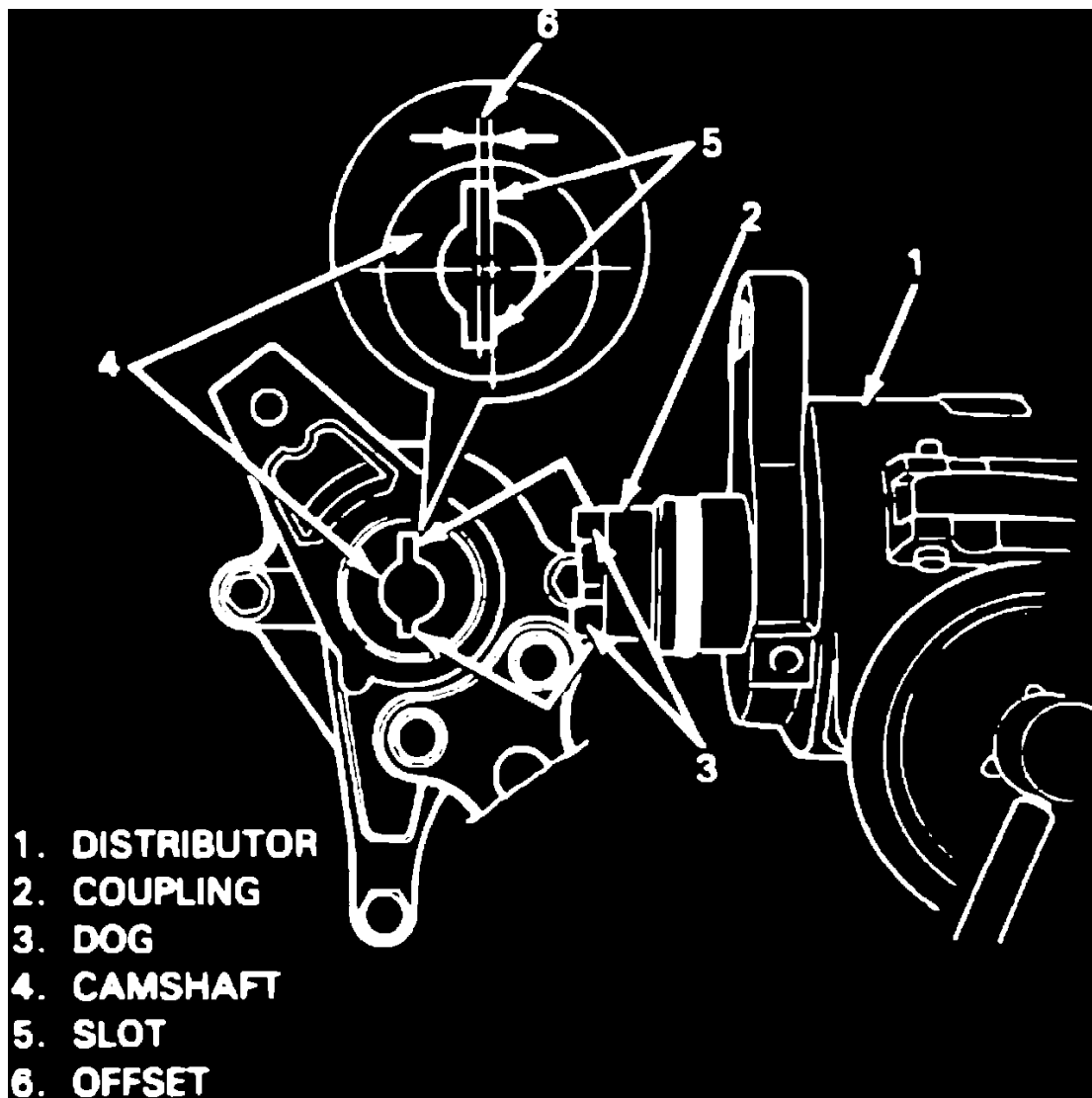


Fig. 3 Aligning distributor drive tang

#### MODELS Less EFI & TURBOCHARGER

1. Disconnect battery ground cable.
2. Disconnect vacuum hose and electrical connector.
3. Disconnect spark plug cables by gripping cables at boots.
4. Remove distributor flange bolt, then distributor from cylinder head. Use suitable container to catch any oil that may drain from cylinder head when removing distributor.
5. Remove cap from distributor. Align distributor coupling tang with slots in camshaft, **Fig. 3**, and install distributor. Finger tighten flange bolt.
6. Install distributor cap on distributor and connect spark plug cables.
7. Connect vacuum line, distributor electrical connector, and battery ground cable.
8. Start engine and adjust ignition timing. Tighten distributor flange bolt.



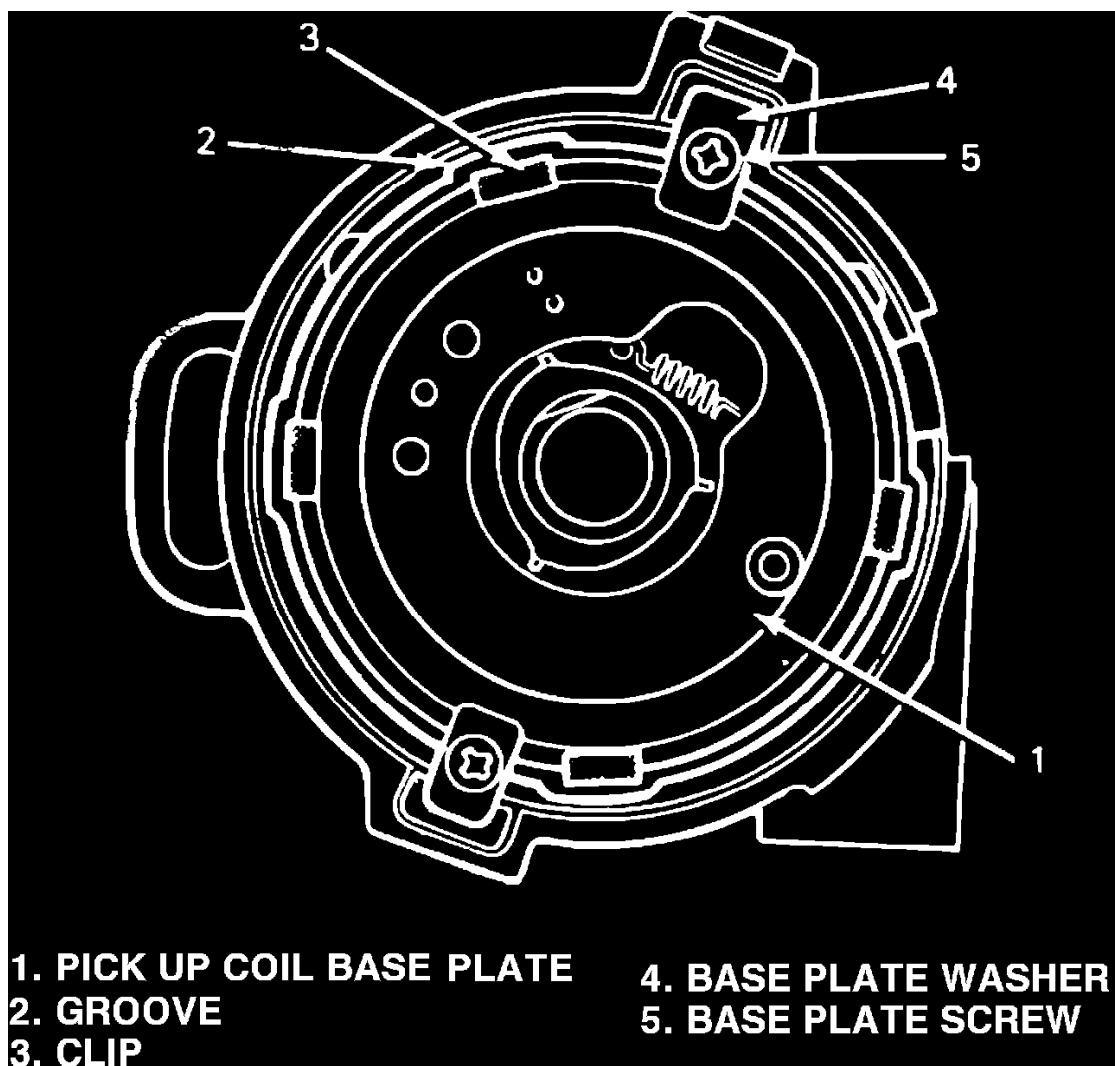
**Fig. 3 Aligning distributor drive tang**

#### MODELS w/EFI & TURBOCHARGER

1. Disconnect battery ground cable.
2. Disconnect and cap intercooler lines.
3. Disconnect vacuum hose at advance unit, then the electrical connector.
4. Disconnect spark plug cables by gripping cables at boots, then the coil wire.
5. Remove distributor flange bolt, then distributor from cylinder head. Use suitable container to catch any oil that may drain from cylinder head when removing distributor.
6. Remove cap from distributor. Align distributor coupling tang with slots in camshaft, **Fig. 3**, and install distributor. Finger tighten flange bolt.
7. Install distributor cap on distributor and connect spark plug cables.
8. Connect vacuum line and distributor electrical connector.
9. Reconnect intercooler lines, then the battery ground cable.
10. Start engine and adjust ignition timing. Tighten distributor flange bolt.



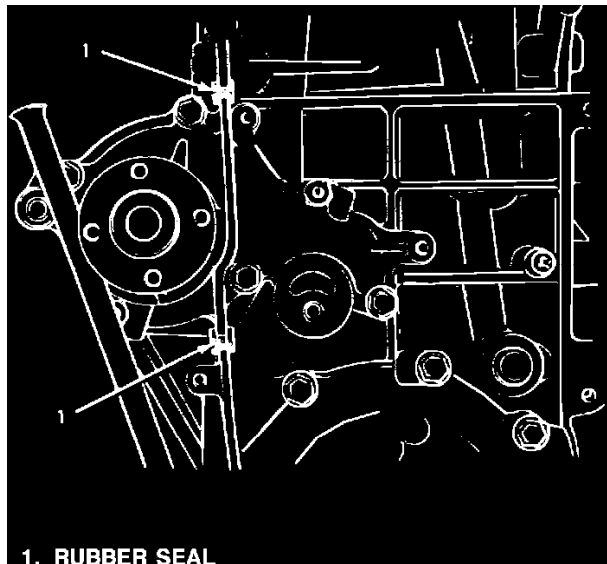
## Distributor: Service and Repair Assembly



**Fig. 6 Installing pickup coil base plate in distributor housing**

1. Position pickup coil base plate in distributor. Install 4 clips on base plate into 4 grooves of distributor housing, **Fig. 6**.
2. Install vacuum advance unit.
3. Install pickup coil on base plate. Refer to "Air Gap, Adjust" procedure and adjust air gap. Tighten pickup coil screws.
4. Install module in distributor housing.
5. Install distributor rotor, cap and gasket.

## Water Pump: Service and Repair



**Fig. 35 Installing rubber seals**

1. Disconnect battery ground cable.
2. Drain cooling system.
3. Remove drive belt, water pump pulley, crankshaft pulley, timing belt outside cover, timing belt and timing belt tensioner.
4. Remove water pump mounting bolts and nuts, and water pump.
5. If pump is defective, it must be replaced.
6. Place new water pump gasket on engine block.
7. Install water pump on engine block.
8. Install rubber seals between water pump and oil pump, and between water pump and cylinder head, **Fig. 35**.
9. Install timing belt tensioner, timing belt, timing belt outside cover, crankshaft pulley, water pump pulley and drive belt.
10. Tighten drive belt so it deflects .25-.35 inch on span between water pump pulley and crankshaft pulley.
11. Adjust intake and exhaust valves. Install valve cover and air cleaner.
12. Fill cooling system.
13. Connect battery ground cable.

## Radiator Cooling Fan Motor: Service and Repair

### ELECTRIC COOLING FAN

#### REPLACE

1. Disconnect battery ground cable.
2. Disconnect air cleaner inlet tube.
3. Disconnect fan motor electrical connector, then remove attaching screws, fan motor and shroud.
4. Remove fan blade from motor.
5. Reverse procedure to install.

### THERMOSTAT

#### REPLACE

#### EXC. 1987-88 TURBOCHARGED MODELS

1. Disconnect battery ground cable.
2. Drain cooling system.
3. Disconnect electrical connectors at thermo switch on thermostat cap.
4. Disconnect radiator inlet hose at thermostat cap.
5. Remove thermostat cap, then thermostat.
6. Reverse procedure to install.

#### 1987-88 TURBOCHARGED MODELS

1. Disconnect battery ground cable, then drain cooling system.
2. Remove throttle body intake air hose.
3. Remove water hose from thermostat cap.
4. Remove thermostat cap and thermostat from intake manifold.
5. Reverse procedure to install, using a new gasket.

### THERMO SWITCH

#### REPLACE

#### EXC 1987-88 TURBOCHARGED MODELS

1. Disconnect battery ground cable, then drain cooling system.
2. Remove air cleaner and air inlet tube.
3. Disconnect switch electrical lead, then remove switch from thermostat cap.
4. Reverse procedure to install, wrapping switch threads with sealing tape before installation.

#### 1987-88 TURBOCHARGED MODELS

1. Disconnect battery ground cable, then drain cooling system.
2. Remove throttle body intake air hose.
3. Remove fan thermo switch coupler and thermo switch.

### TROUBLESHOOTING

#### FAN MOTOR DOES NOT OPERATE

1. Blown fuse.
2. Defective fan motor.
3. Defective thermo switch.

#### FAN MOTOR OPERATES CONTINUOUSLY

1. Defective thermo switch.

### DIAGNOSIS

#### FAN MOTOR

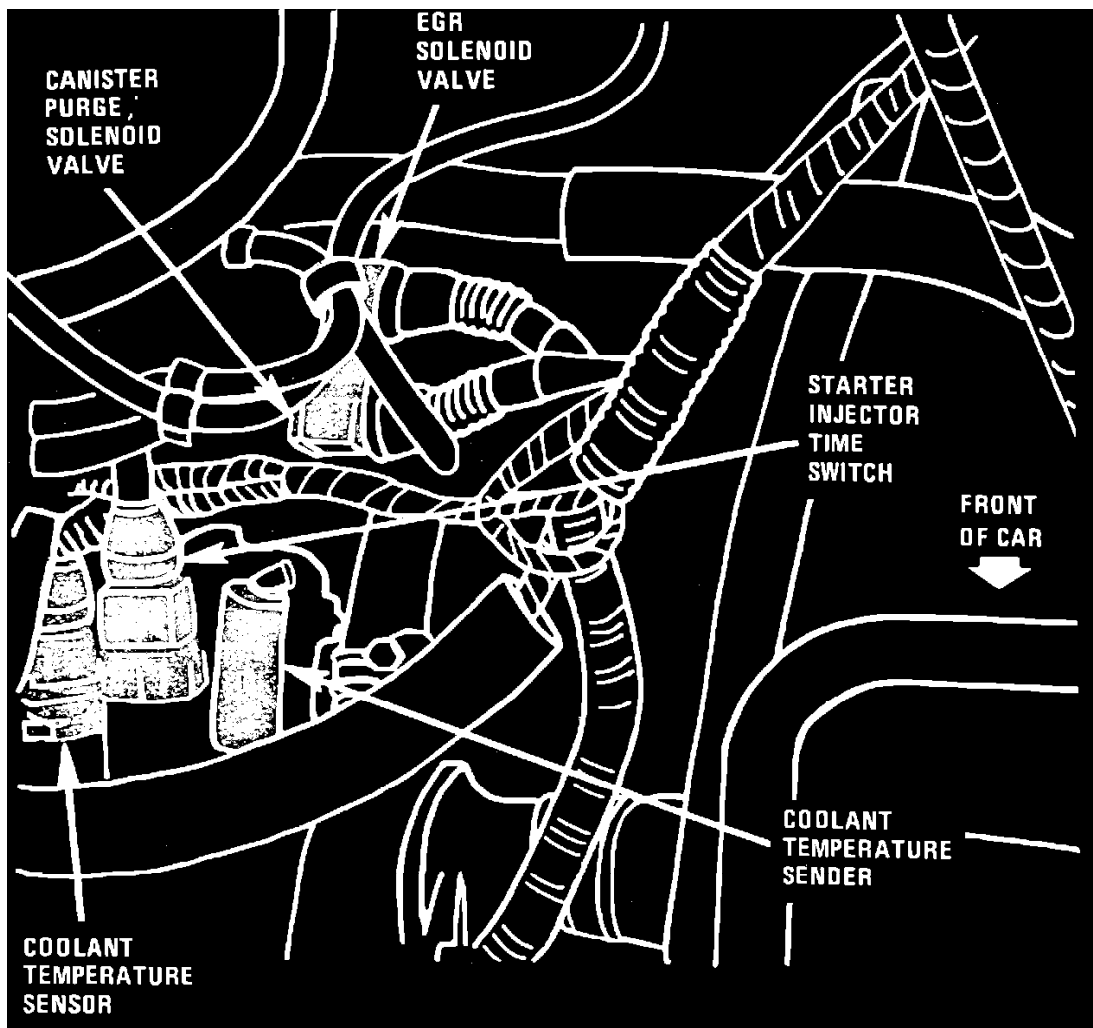
1. Apply battery voltage to fan motor electrical connector.
2. If motor fails to operate, it should be replaced.

#### THERMO SWITCH

1. Connect a suitable ohmmeter to thermo switch.
2. Immerse switch in water, then heat water gradually and check for continuity. Continuity should exist when water temperature reaches a range of 201-208°F and above, and should not exist when temperatures are between 192-199°F and below.
3. If switch does not operate as specified, it should be replaced.

## Radiator Cooling Fan Temperature Sensor / Switch: Locations

### Coolant Temperature Sender



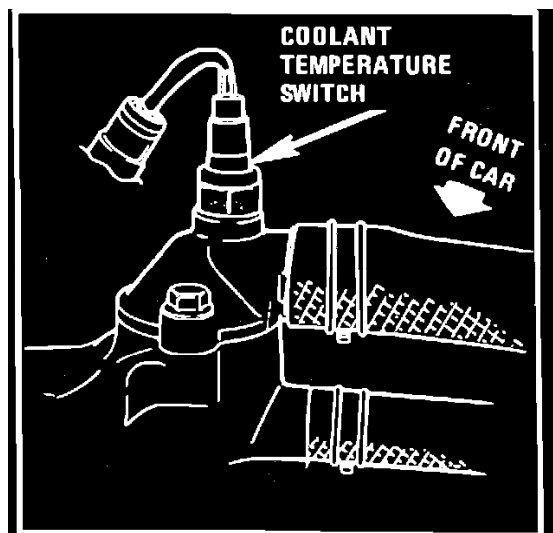
Top Left Side Of Engine

LH Side Of Engine

Applicable to: Turbo

## Radiator Cooling Fan Temperature Sensor / Switch: Locations

### Coolant Temperature Switch



Top Center Of Engine

Mounted To Top Of Thermostat Housing

# Heater Core: Service and Repair

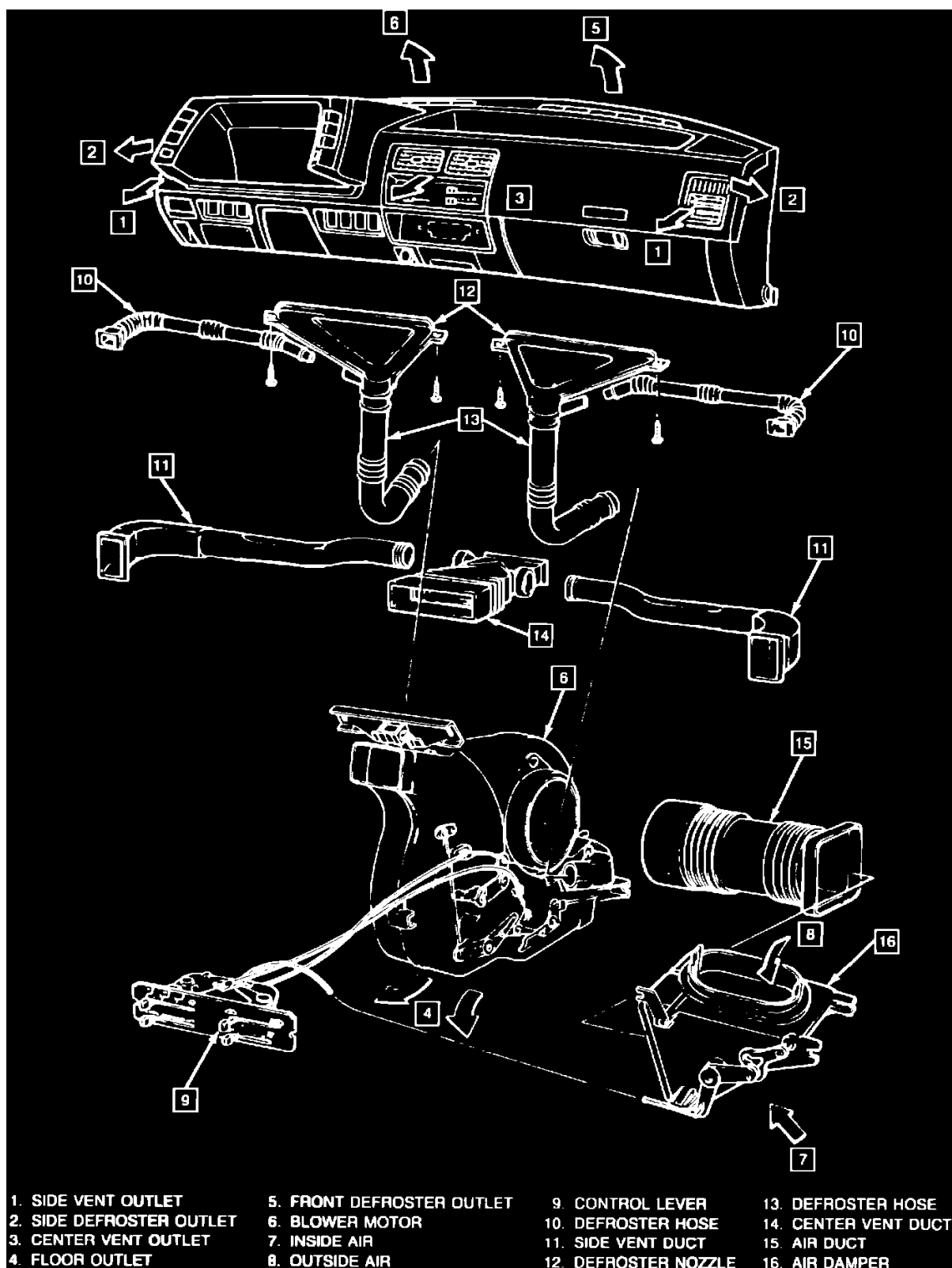


Fig. 8 Heater & defroster assembly

1. Drain cooling system.
2. Disconnect water hoses from heater core.
3. Remove glove box compartment.
4. Disconnect defroster hoses from heater housing, **Fig. 8**.
5. Disconnect connectors from blower motor and heater resistor.
6. Disconnect 3 control cables from heater case side levers.
7. Pull out center vent louvre.
8. Disconnect right and left side vent ducts from center vent duct.
9. Remove center vent duct.
10. Remove ashtray upper plate.
11. Remove instrument member stay.

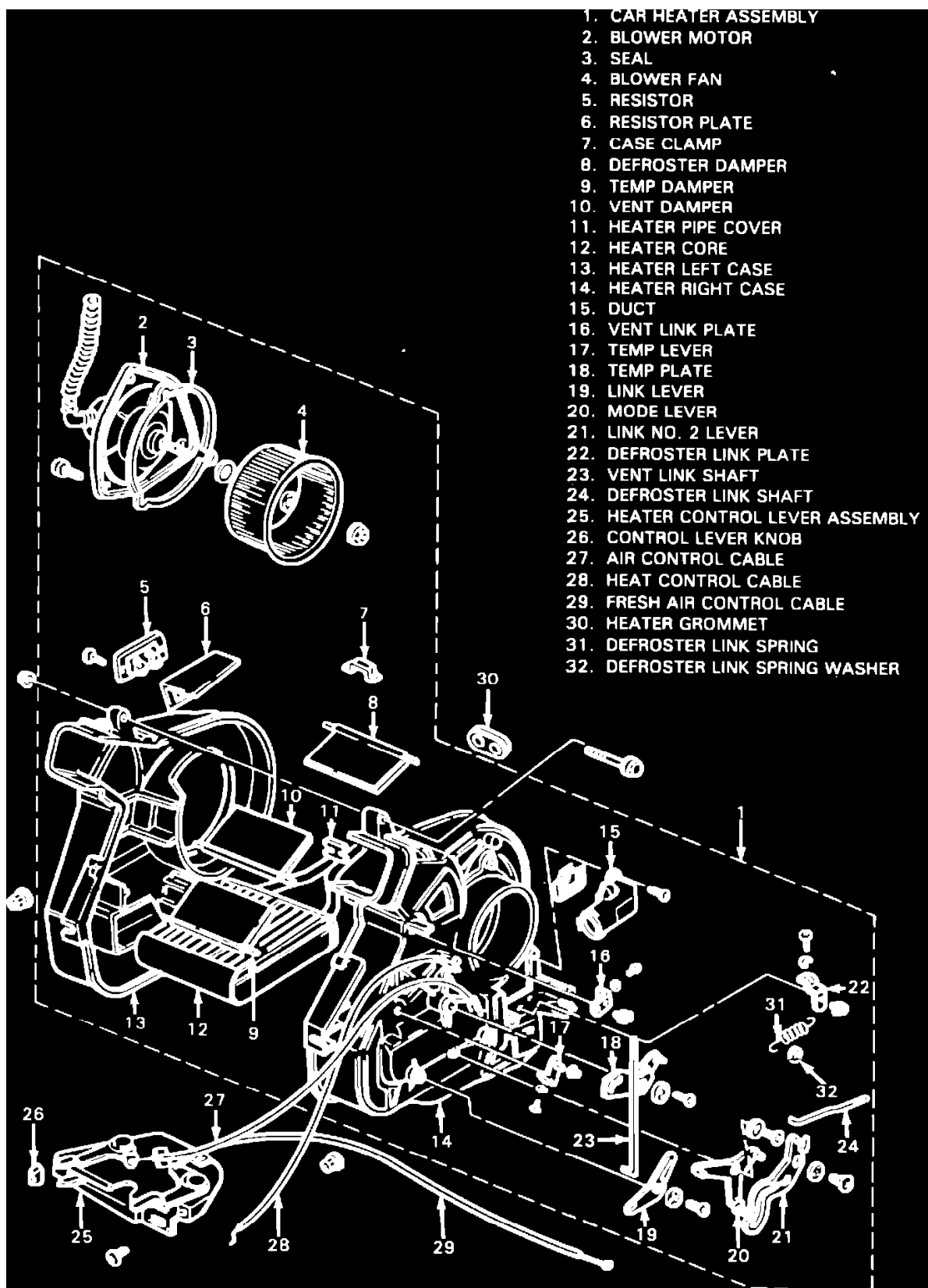
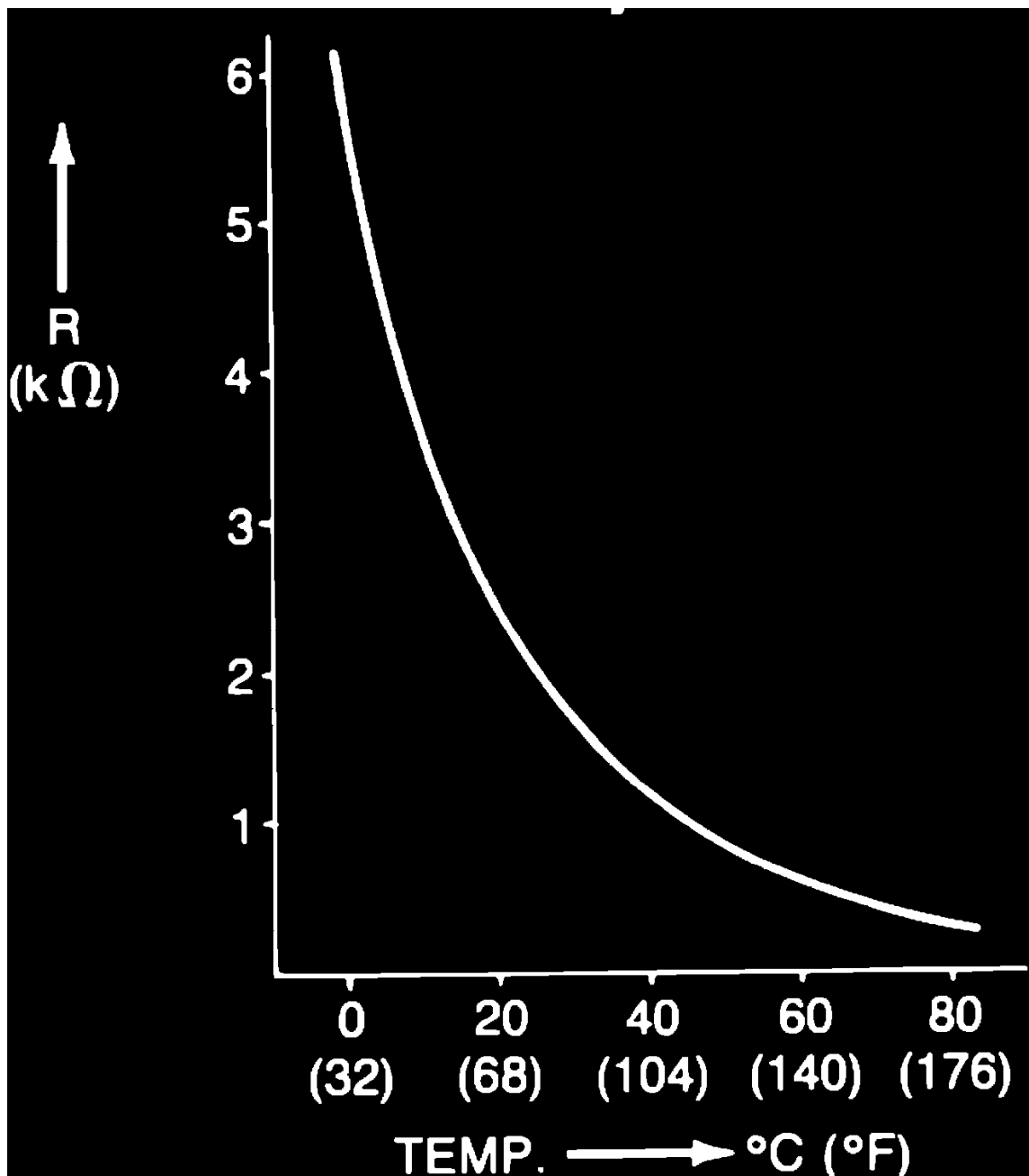


Fig. 9 Heater core case assembly

12. Remove 2 heater assembly mounting nuts.
13. Loosen heater case top side mounting bolts from glove box side.
14. Remove heater control assembly.
15. Remove retaining clips from heater case halves, Fig. 9.
16. Remove heater core from housing.



**Coolant Temperature Sensor/Switch (For Computer): Testing and Inspection****Fig. 13 Checking coolant temperature sensor**

Warm temperature sensor, then check temperature-to-resistance relationship as shown, **Fig. 13**.

## **Ignition System: Testing and Inspection Diagnosis By Symptom**

### **Engine Cranks But Will Not Start/No Spark**

#### **All Models**

1. Defective spark plug.
  - a. Adjust gap or replace.
2. Faulty spark plug cable.
  - a. Replace defective cables.
3. Cracked rotor or cap.
  - a. Replace defective components.
4. Defective module, pickup coil, breaker or igniter with knock controller.
  - a. Replace defective components.
5. Defective ignition coil.
  - a. Replace defective component.
6. Improper pickup coil air gap.
  - a. Adjust as necessary.
7. Loose or disconnected wires or spark plug cables.
  - a. Connect securely.
8. Improperly adjusted ignition timing.
  - a. Adjust as necessary.
9. Blown Fuse.
  - a. Replace as necessary.

### **Engine Knock Occurs Continuously**

#### **Models w/EFI & Turbocharger**

1. Defective vacuum advance distributor unit.
  - a. Replace unit.
2. Defective ECM.
  - a. Replace ECM.
3. Loose engine knock sensor.
  - a. Torque to specifications.
4. Defective igniter with knock controller.
  - a. Replace unit.

### **Ignition Timing Varies**

#### **Models w/EFI & Turbocharger**

1. Defective igniter with knock controller.
  - a. Replace component.
2. Defective distributor.
  - a. Replace component.

### **Insufficient Engine Output**

#### **Models w/EFI & Turbocharger**

1. Defective igniter with knock controller.
  - a. Replace component.
2. Defective engine knock sensor.
  - a. Replace component.

# Ignition System: Testing and Inspection

## Knock Control System

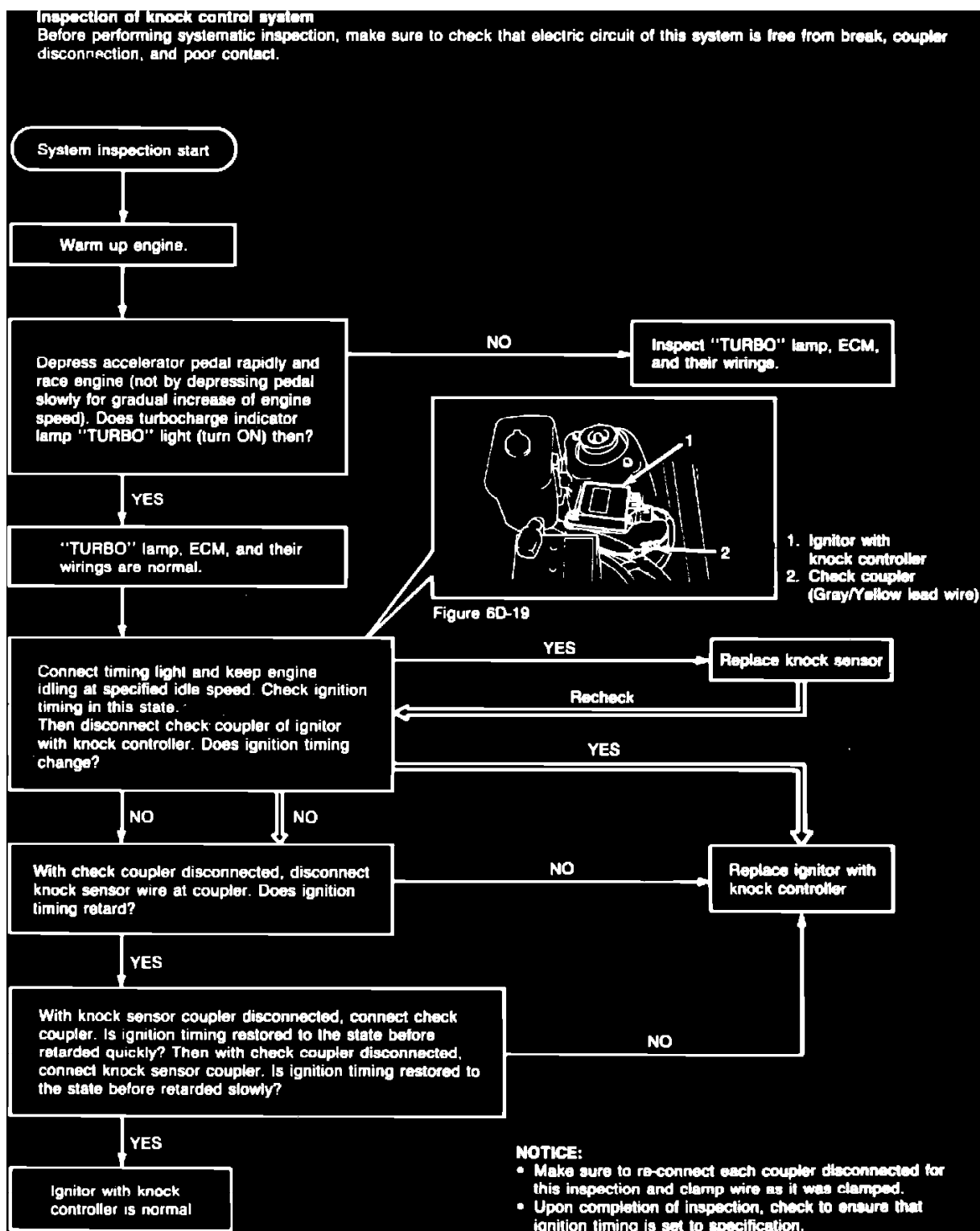
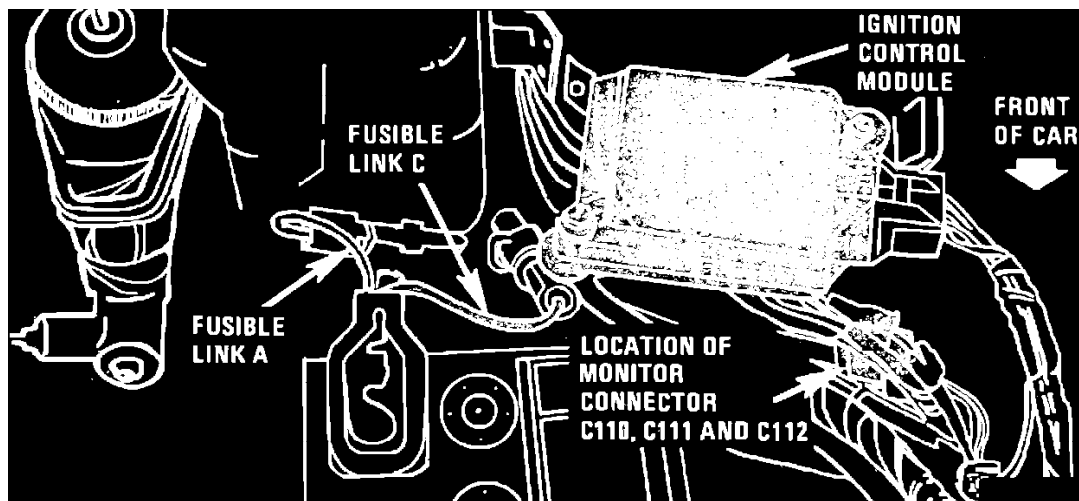


Fig. 9 Knock control system diagnostic chart. 1987 - 88 models w/EFI & turbocharger

### DIAGNOSIS

When diagnosing the knock control system, refer to Fig. 9.

## Ignition Control Module: Locations



Left Side Of Engine Compartment

Mounted On Left Strut Tower

Applicable to: Turbo

# Ignition Control Module: Testing and Inspection Igniter W/Knock Controller

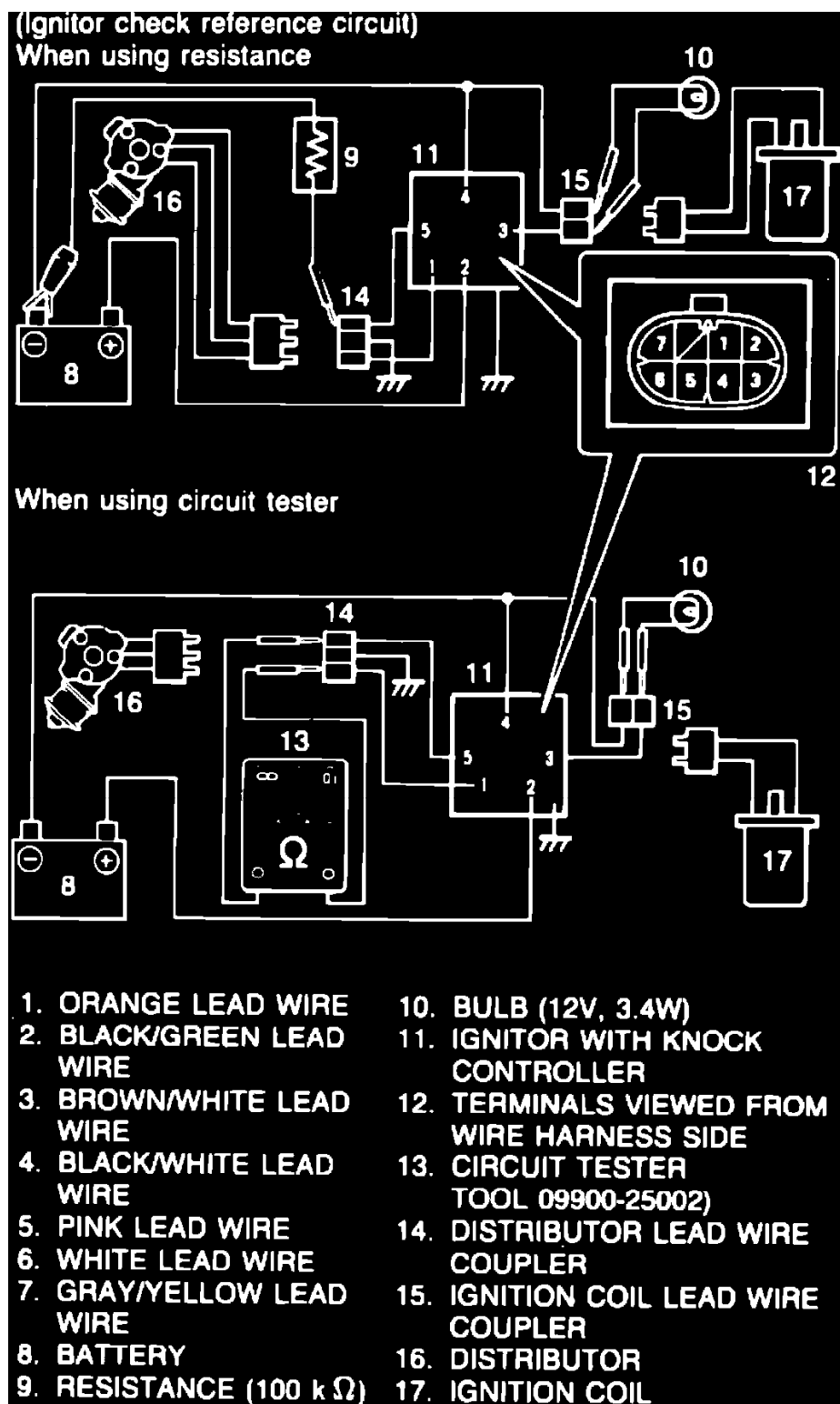


Fig. 8 Testing igniter w/knock controller. 1987 - 88 Models w/EFI & turbocharger

## TESTING

1. Disconnect ignition coil lead wire at connector.
2. Disconnect distributor lead wire at connector.
3. Connect a suitable test lamp to ignition coil connector at wiring harness side, then turn ignition switch "On."
4. Connect 100 ohms of resistance between pink wire terminal of disconnected distributor connector and battery positive terminal, Fig. 8. If 100 ohms of resistance is not available, set circuit tester to ohms range, then connect positive probe of tester to orange wire terminal and negative lead to pink wire terminal, Fig. 8.
5. If lamp lights, igniter is satisfactory. If lamp does not light, replace defective igniter.

## Ignition Control Module: Testing and Inspection

### Module Testing

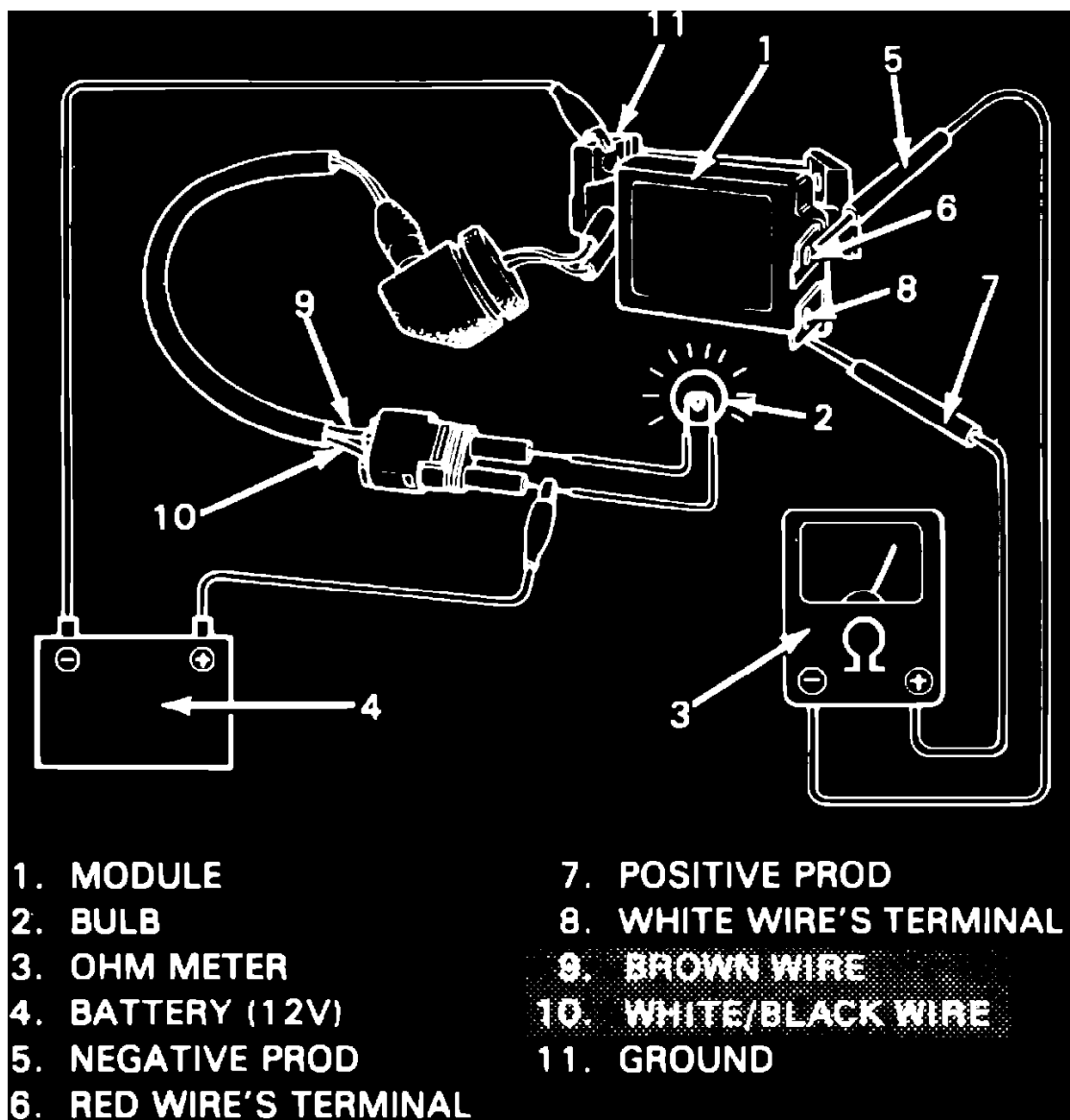
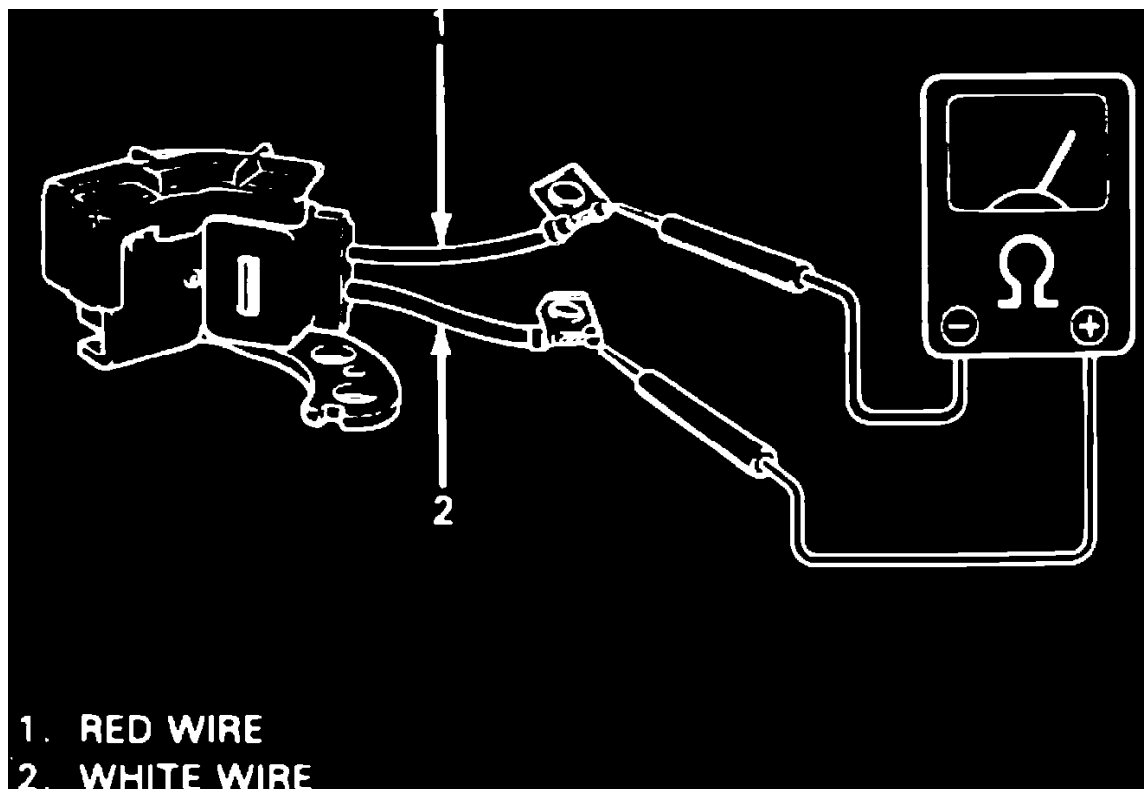


Fig. 5 Checking ignition module

1. Remove dust cover from module and disconnect red and white wires.
2. Connect ohmmeter, test lamp, and 12 volt battery as shown in **Fig. 5**.
3. Set ohmmeter to 1 - 10 ohm range. Connect negative probe to red wire terminal of module and positive probe to white wire terminal. If test lamp illuminates, module is satisfactory. If not, replace module. **Ohmmeter leads should only be connected as outlined above. Reversing leads may cause damage to module.**
4. Connect red and white wires to module and install dust cover.

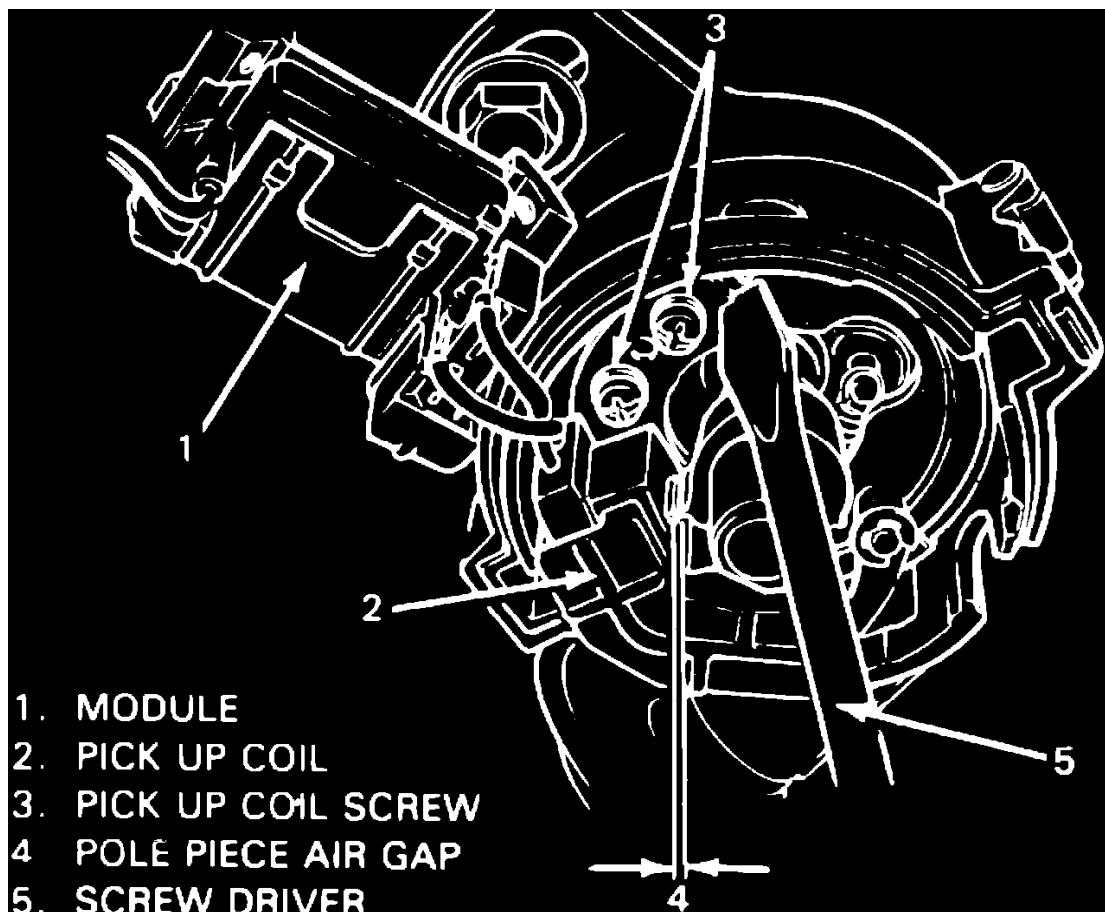
## Pick-Up Coil: Testing and Inspection



**Fig. 4 Checking pickup coil resistance**

1. Check base plate for smooth rotation. Replace base plate if faulty.
2. Remove dust cover from module and disconnect red and white wires, **Fig. 4**.
3. Connect ohmmeter to red and white wires and measure resistance. Pickup coil resistance should be 130 - 190 ohms. Replace pickup coil if resistance is not within specification.
4. Connect red and white wires to module and install dust cover.

## Pick-Up Coil: Adjustments

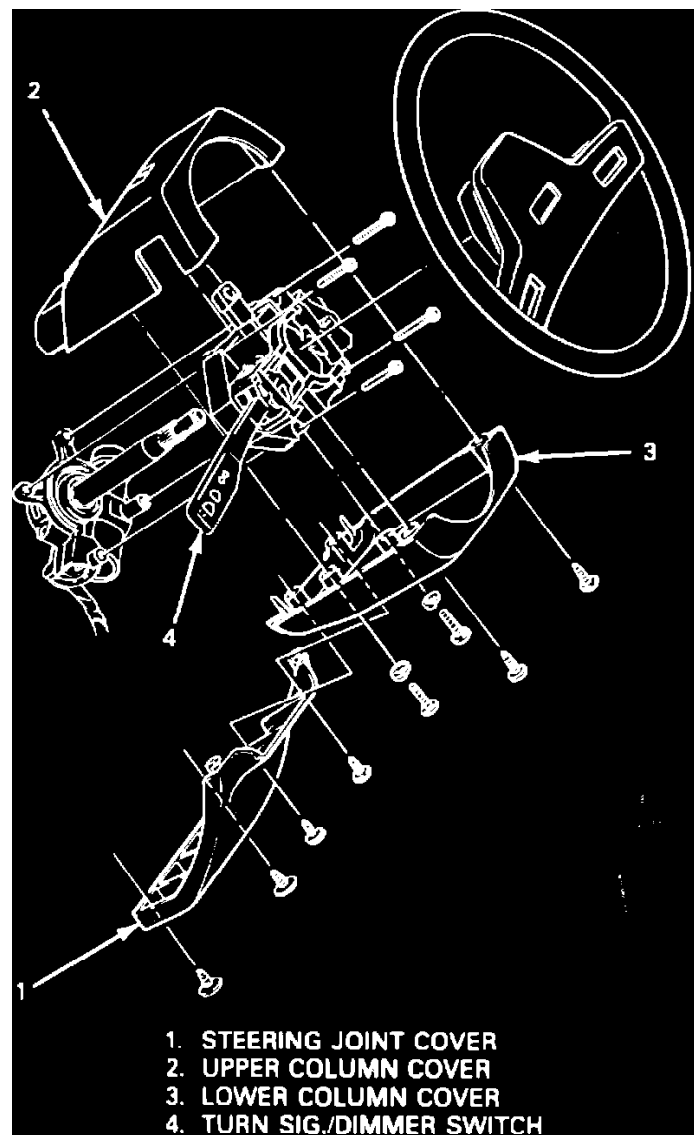


**Fig. 7 Adjusting air gap**

1. Remove distributor cap and rotor.
2. Using feeler gauge, measure air gap between pole piece tooth and pickup coil, **Fig. 7**. Air gap should be .008 - .015 inch (.2 - .4 mm).
3. If gap is incorrect, remove module and loosen 2 screws holding pickup coil.
4. Using screwdriver, move pickup coil to adjust gap to specification.
5. Tighten 2 screws and recheck air gap.
6. Install module, rotor, and distributor cap.

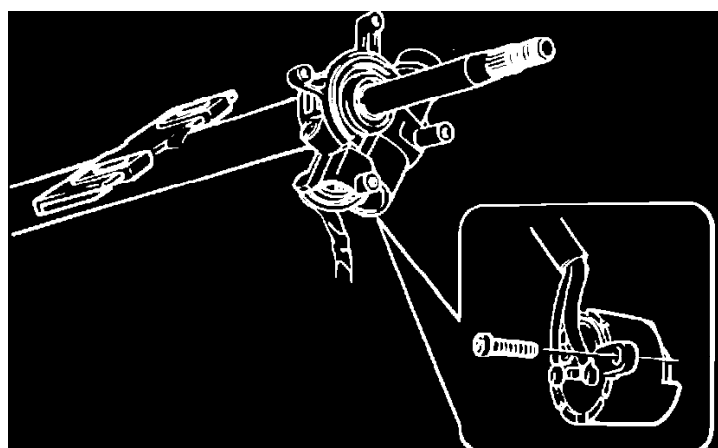


## Ignition Switch: Service and Repair



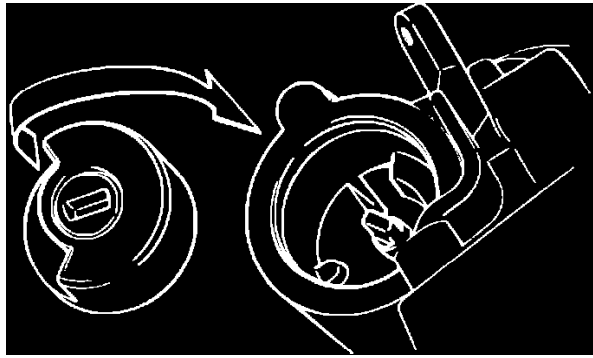
**Fig. 2 Turn signal/dimmer switch removal**

1. Disconnect battery ground cable.
2. Remove steering joint cover.
3. Remove steering wheel pad.
4. Using suitable puller, remove steering wheel.
5. Remove steering column lower cover, **Fig. 2**.
6. Disconnect main switch and turn signal/dimmer switch connectors.
7. Remove turn signal/dimmer switch, **Fig. 2**.



**Fig. 3 Ignition switch removal**

8. Remove ignition switch screws, then switch, **Fig. 3**.



**Fig. 4 Ignition switch installation**

9. Reverse procedure to install. Position ignition switch so recess is mated with tab on bracket, **Fig. 4**.

# Fuel Delivery and Air Induction: Description and Operation

## EFI (Electronic Fuel Injection) Turbo System

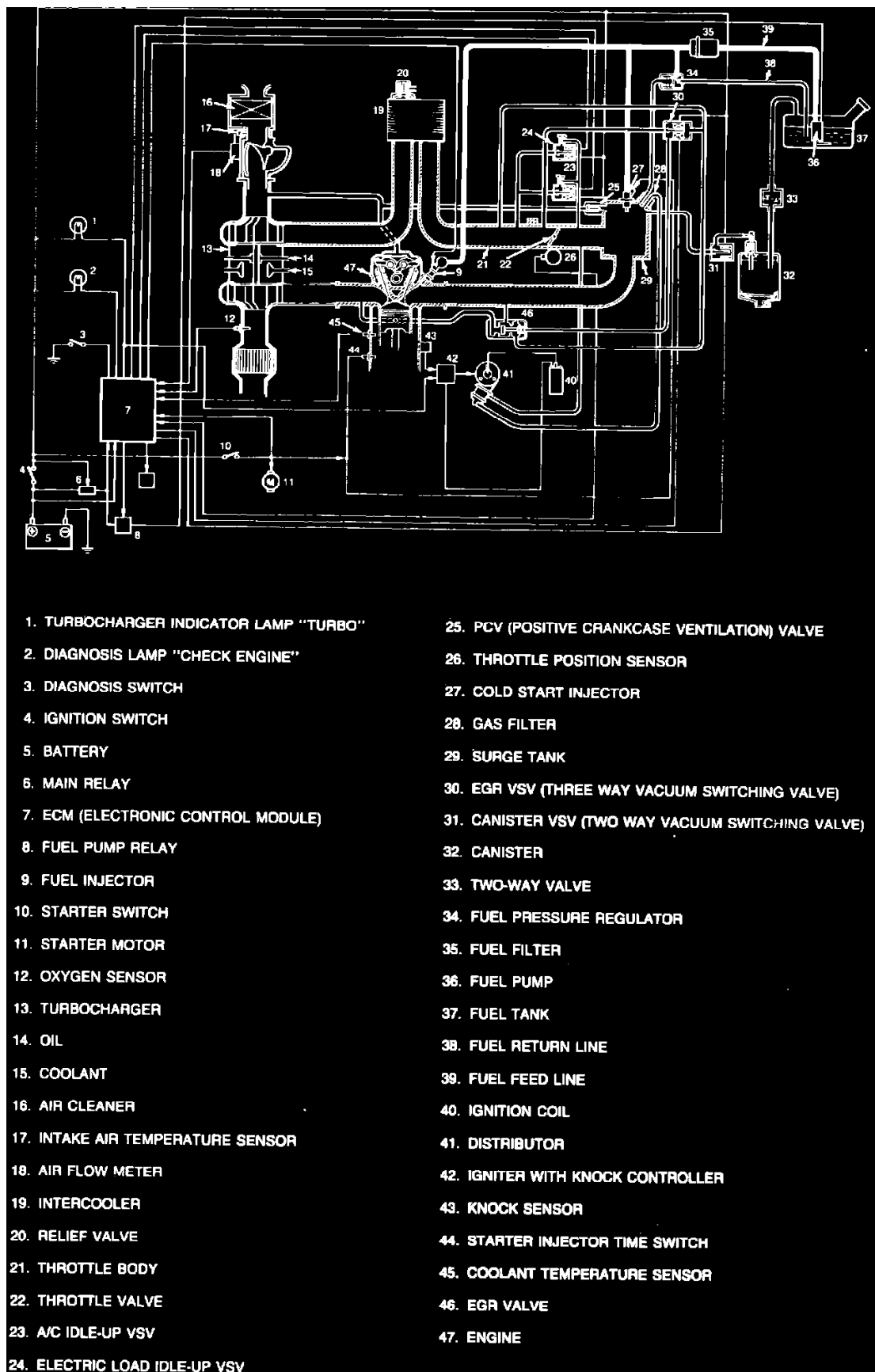


Fig. 1 Electronic fuel injection system

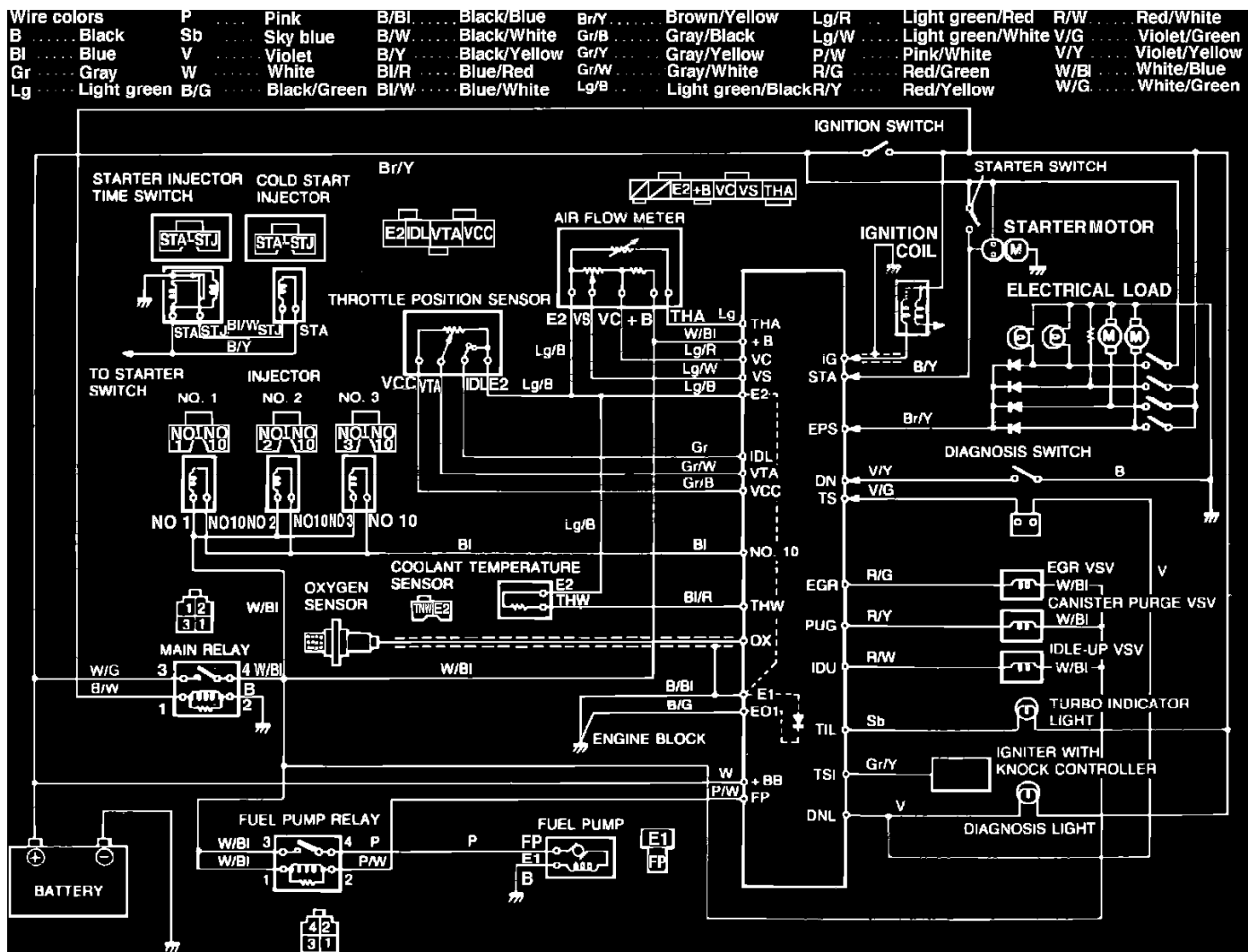
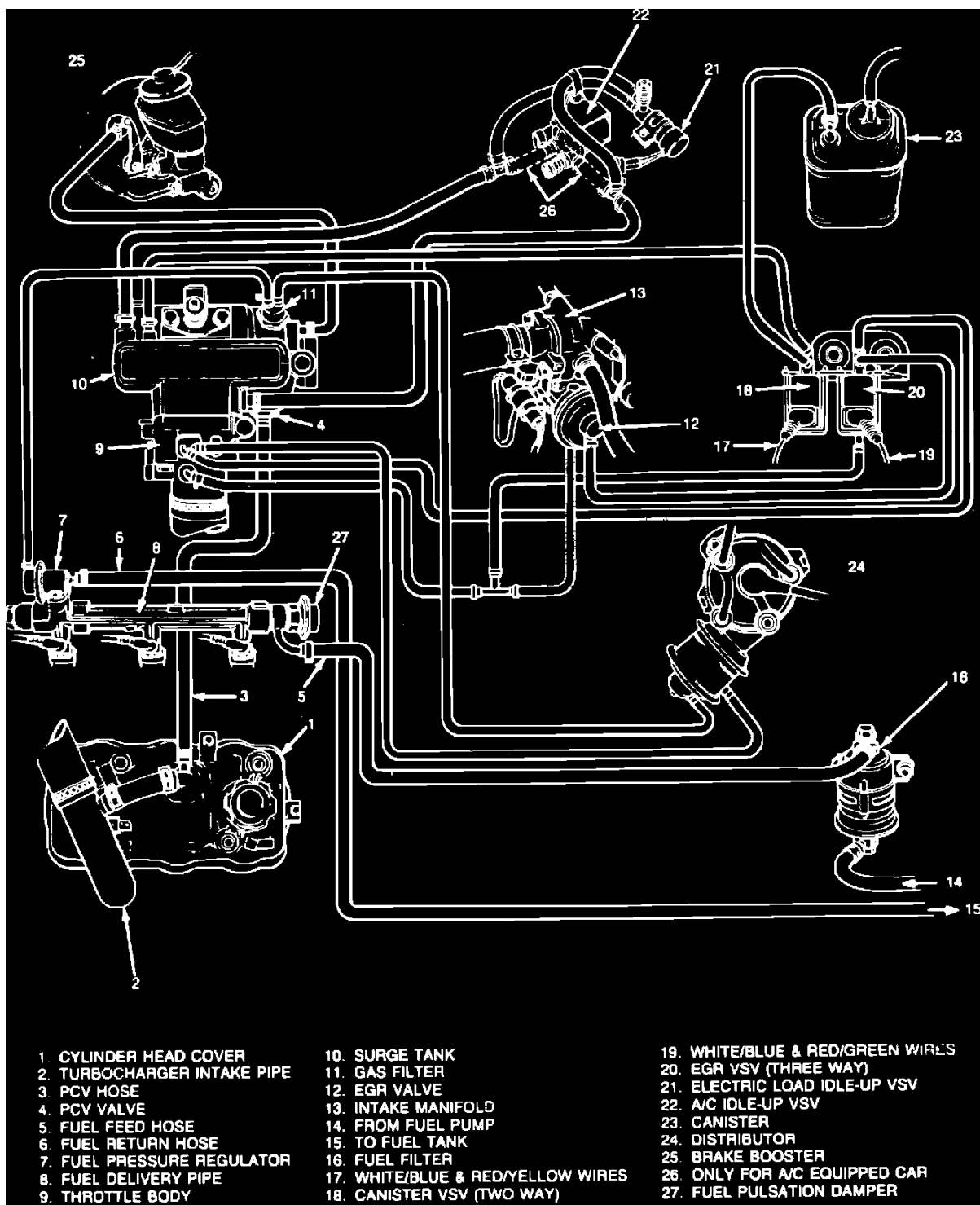


Fig. 2 Electronic fuel injection system wiring diagram



**Fig. 3 Electronic fuel injection system fuel routing diagram**

The electronic control type fuel injection system with turbocharger and intercooler, **Figs. 1 through 3**, consists of an ECM (Electronic Control Module), an in-tank electric fuel pump, a pressure regulator, an air flow meter, fuel injectors, a turbocharger, an intercooler, an inlet air temperature sensor, a coolant temperature sensor and various other related components.

The ECM in the system features self diagnosis and a failsafe function. The self diagnosis function identifies troubles in the area related to the sensors that pick up various data and send them to the ECM. The failsafe function serves as a back-up in the event of trouble, and the data fails to reach the ECM.

In this system, the intake air and fuel are processed and mixed into a specific air/fuel mixture that is optimum for each driving condition, then burned and exhausted as follows:

1. The intake air filtered by the air cleaner flows through the air flow meter which has a built in intake air temperature sensor. While passing through it, the air flow volume is metered, its temperature measured then the resulting data is fed to the ECM.
2. The intake air is then compressed by the turbocharger and flows into the intercooler.
3. As the turbocharged air is warm and expanded, the intercooler cools and condenses it so as to improve engine intake efficiency.
4. The turbocharged and condensed intake air flows into the surge tank through the throttle body. Meanwhile, the throttle position sensor detects the opening of the throttle valve in the throttle body and the data is sent to the ECM.
5. While the air passes through the surge tank, surge of the air is reduced, then the air goes out into the intake manifold.

## **Fuel Delivery and Air Induction: Description and Operation**

### **Fail Safe Function**

When the ECM fails to operate properly due to a malfunctioning EFI system sensor or an excessive drop in battery voltage, this system takes a back-up measure for proper operation. This back-up system is called the failsafe function.

In case of a coolant temperature sensor malfunction, the failsafe system will override the ECM control and input a signal to maintain a temperature of 176°F.

In case of throttle position sensor failure, the failsafe system will override the ECM control and input a signal to maintain about 25° of throttle opening.

In case of an intake air temperature sensor failure, the failsafe system will override the ECM control and input a signal to maintain a temperature of 68°F.

In case of an excessively high turbocharger pressure, the failsafe system will override the ECM control and input a signal to execute the exhaust fuel cutout operation.

In case of an air flow failure, the failsafe system will override the ECM control and input a signal to allow the fuel to be injected at the specified value equal to the normal value.

If no ignition signal is sent to the ECM for 2 seconds after the starter switch is turned "On," the failsafe system will override the ECM control and input a signal to execute the fuel cut operation.

If battery voltage drops excessively and the ECM fails to operate properly, the failsafe system will override the ECM control and input a signal to inject the fuel at a specified value, equal to the average value.

## Fuel Delivery and Air Induction: Description and Operation

### Fuel Injection Control

The fuel pressure applied to the fuel injector by the fuel pump is constant relative to the intake manifold pressure by the pressure regulator. The injection fuel amount is determined by the injector operation time.

Injector operation time is determined by adding several compensations to the basic injection time which is calculated on the basis of the intake air volume and engine speed. The information of the intake air volume and that of the engine speed are sent to the ECM from the air flow meter and the ignition coil respectively in the form of electrical signals.

Under this system, the air/fuel ratio is controlled to optimum air/fuel ratio by using the oxygen sensor information. The compensation is as follows:

- Warm-Up Enrichment Compensation--during cold engine operation, the air/fuel ratio is adjusted to compensate for coolant temperature.

- Starting Enrichment Compensation--improves starting performance.

- After Start Enrichment Compensation--maintains engine speed ability after engine start. This compensation gradually decreases according to engine speed.

- Acceleration Enrichment Compensation--compensates for engine load during acceleration during warm-up.

- After Start Acceleration Enrichment Compensation--Compensates for engine load during acceleration immediately after engine start. This compensation gradually diminishes in proportion to the increase in coolant temperature.

- Power Enrichment Compensation--Compensates for high engine loads.

- Battery Voltage Compensation--Compensates for injector operation delay time.

- Inlet Air Temperature Compensation--Inlet air volume is compensated for depending on its temperature.

- Air/Fuel Ratio Compensation--Adjusts air/fuel ratio to its optimum value according to information from the oxygen sensor according to the need of the three-way catalytic converter.

- Base Air/Fuel Ratio Compensation--Adjusts air/fuel ratio to its optimum value according to information from the oxygen sensor to compensate for altitude change or barometric pressure change.

- Fuel Cut--Fuel cut is implemented during deceleration to reduce HC emissions by stopping injector operation.

## Fuel Delivery and Air Induction: Description and Operation

### Self Diagnosis Function

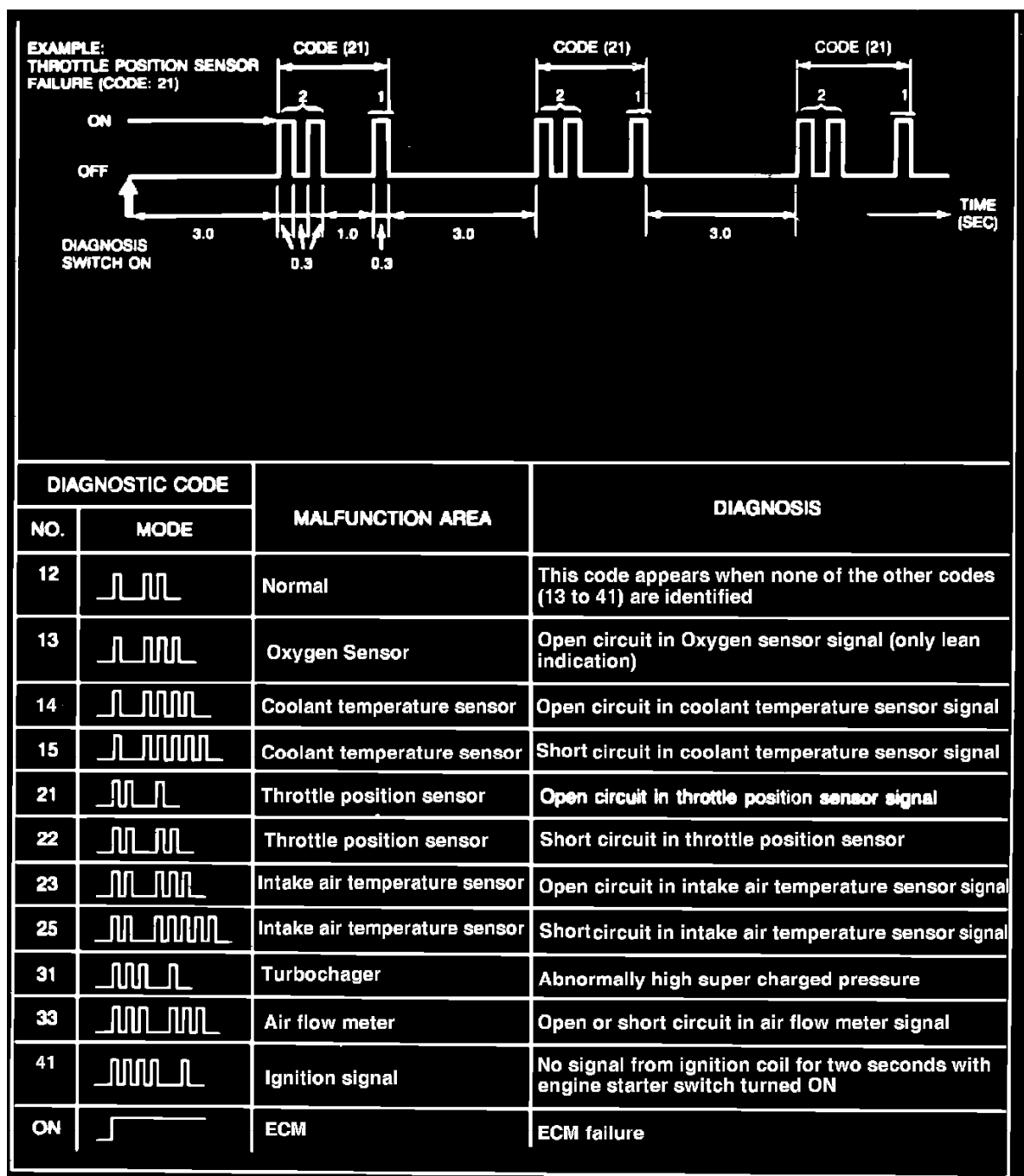


Fig. 4 Determining diagnostic codes

The EFI system has a self diagnosis function to identify signals from the sensors with which the ECM controls the EFI system. If any trouble related to these sensors occurs, the difficulty in pinpointing the location of the malfunctioning component or area is greatly reduced. The areas being diagnosed are the oxygen sensor, coolant temperature sensor, turbocharger, air flow meter, ignition signal and the CPU (Central Processing Unit) of the ECM.

When a malfunction exists in the input signal to the ECM the instrument panel "Check Engine" lamp lights. This lamp remains lit until the malfunction is found and corrected. During this time, the malfunction is encoded in a two digit diagnostic code and stored in the ECM memory. To access this code, turn the diagnostic switch, located on the underside of the instrument panel to the right of the steering column, to the "On" position and note that the check engine lamp will begin flashing. Refer to **Fig. 4**, analyzing flashing codes.



## Fuel Delivery and Air Induction: Description and Operation

### Fuel System

The main components of the fuel system are the in-tank electric fuel pump, fuel filter, fuel pulsation damper, injector, cold start injector and pressure regulator.

The fuel, under high pressure supplied by the fuel pump, is sent through the fuel feed lines and fuel filter and delivery pipe where it is delivered to each injector. There it is injected to the inlet port of the engine under the control of the ECM. At cold engine start, the fuel is also injected into the surge tank from the cold start injector. In the delivery pipe, the fuel pressure is regulated at a constant, relative to intake manifold pressure by the pressure regulator which is incorporated in the delivery pipe. When the fuel pressure is approximately 37 psi higher than intake manifold pressure, the fuel flows out from the pressure regulator, through the fuel return line and back to the fuel tank. Also attached to the delivery pipe is a pulsation damper which dampens the fuel pulsation that occurs in the delivery pipe when the fuel is injected, so that the noise caused by the pulsation is reduced.

#### Fuel Pump

The electric fuel pump is an integral part of the fuel tank and its operation is controlled by the ECM. When in operation, it pumps fuel from the fuel tank and feeds it under pressure to the injector.

When power is supplied to the fuel pump by the ECM, the motor in the pump and the impeller both operate. This causes a pressure difference to occur between both sides of the impeller as there are many grooves around it. The fuel is then drawn through the inlet port and with its pressure increased, it is discharged through the outlet port. The fuel pump also has a relief valve to prevent an excessive rise of the discharge pressure and a check valve to retain some pressure in the fuel feed line, even when pump operation is stopped.

#### Fuel Filter

As the filter is located in the fuel line, exposed to high fuel pressure, a high fuel pressure type filter is used.

#### Fuel Pressure Regulator

The fuel pressure regulator keeps the fuel pressure applied to the injector at approximately 37 psi higher than that in the intake manifold at all times. When pressure increases above 37 psi, the fuel pushes the valve in the regulator open and excess fuel returns to the fuel tank through the return pipe.

#### Fuel Injector

There are three injectors (one for each cylinder), each of which are installed between the cylinder head and delivery pipe. It is an electromagnetic type injection nozzle which injects fuel into the intake port of the cylinder head according to the signal from the ECM.

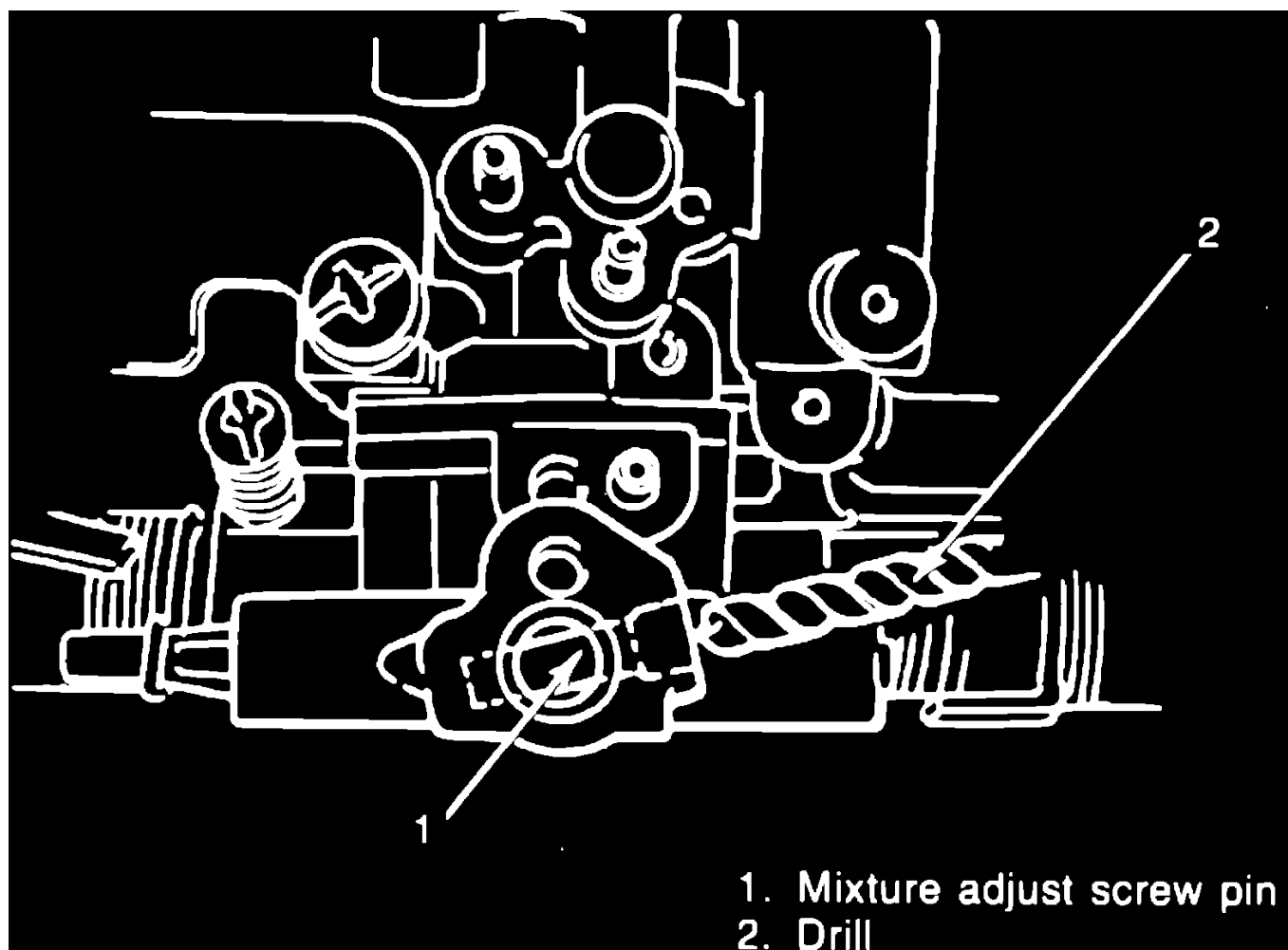
When the solenoid coil of the injector is energized by the ECM, it becomes an electromagnet and attracts the plunger. Simultaneously, the needle valve which is incorporated with the plunger, opens, and the injector, which is under fuel pressure, injects the fuel. Since the lift stroke of the injector needle valve is constant, the amount of fuel injected at one time is determined by the length of time, during which the solenoid coil is energized.

#### Cold Start Injector

The cold start injector is an electromagnetic valve provided for the purpose of improving starting performance on a cold engine. It is controlled by the starter injector time switch so that it injects fuel only during a cold engine start. The shape of the nozzle tip allows the fuel to be injected in swirls, for better atomization of injected fuel.

## Fuel Delivery and Air Induction: Service and Repair

### Adjusting Screw Pin Removal



**Fig. 10 Mixture adjusting screw pin removal**

The idle mixture adjusting screw is recessed into the throttle body and blocked by a steel pin to prevent tampering. Idle mixture should not be adjusted unless carburetor is overhauled or diagnosis indicates the carburetor as the cause of driveability or emissions related complaints. If idle mixture adjustment is required, remove pin sealing adjusting screw using the following procedure:

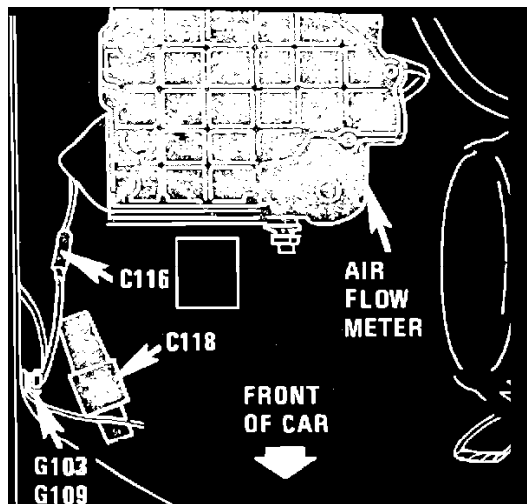
1. Remove carburetor from manifold.
2. Drill hole in pin as shown in **Fig. 10**, using 4 - 4.5 mm drill bit.
3. Drive pin from throttle body using suitable drift, supporting throttle body to prevent breakage.
4. Install carburetor, then adjust idle mixture as required.

## Fuel Delivery and Air Induction: Service and Repair

### Fuel System Pressure Relief Procedure

1. To prevent a dangerous spray of fuel, remove fuel tank cap to release fuel pressure, then reinstall cap.
2. With engine running, remove fuel line connector from fuel pump relay, then allow engine to stop from lack of fuel. **Main relay and fuel pump relay are identical. Identify fuel pump relay by pink, pink/white, white/blue, and white/blue wire harness.**
3. Once engine has stopped, crank engine a few more times with starter for approximately 3 seconds each.
4. If fuel pressure cannot be relieved by these methods because engine fails to run as described in step 2, disconnect battery ground cable, cover union bolt of high pressure fuel line with a suitable rag, then slowly loosen union bolt to release fuel pressure gradually. After pressure has been released, retighten union bolt as not to allow a fuel leak.

## Air Flow Meter/Sensor: Locations



Right Front Corner Of Engine Compartment

Right Front Corner Of Engine Compartment

Applicable to: Turbo

## Air Flow Meter/Sensor: Testing and Inspection

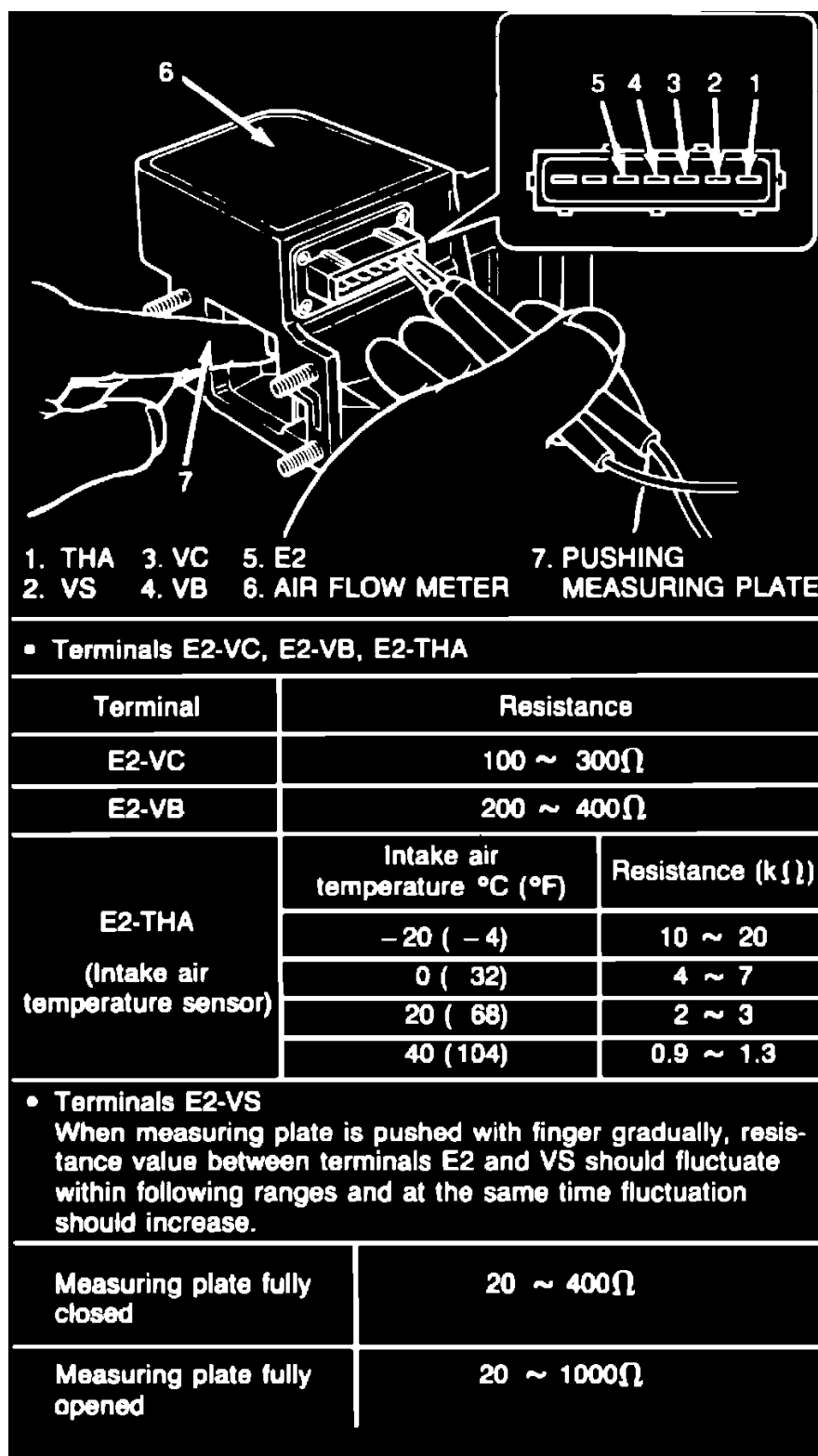
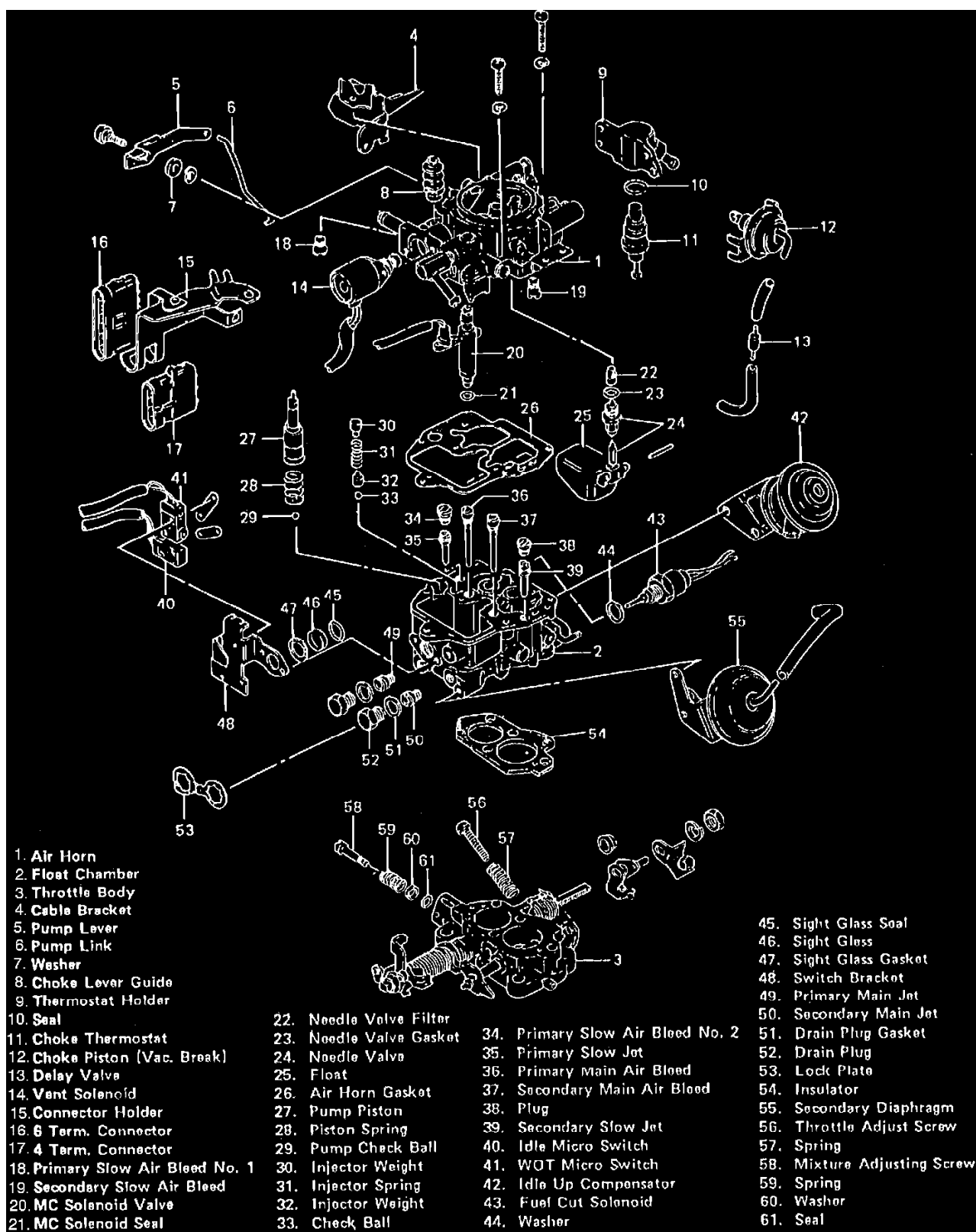


Fig. 10 Checking air flow meter

1. Check resistance between terminals of air flow meter as shown, Fig. 10.

# Carburetor: Description and Operation

## Carburetion



**Fig. 1 Typical Exploded View Of Hitachi MR08 Carburetor**

The Hitachi MR08 carburetor is a staged two barrel downdraft unit with separate primary and secondary metering systems fed from a common float chamber, **Fig. 1**. The primary throttle plate is directly actuated by the accelerator linkage and the primary system functions under all operating conditions. The secondary throttle plate is vacuum operated and opens only during high RPM or high load operation.

Fuel enters the carburetor through a conventional float operated needle valve and the float chamber is vented by an ECM controlled solenoid valve. Fuel is drawn into the primary and secondary metering circuits through main metering jets located in the float chamber floor. A piston type accelerator pump provides enrichment compensation for sudden throttle openings and a blade type choke, operated by a coolant temperature sensitive wax element, provides enrichment during cold engine operation. The accelerator pump and choke operate only with the primary system.

Both the primary and secondary systems include conventional main and transition fuel metering circuits which utilize air bleeds and emulsion tubes to improve fuel atomization, and the primary system includes an idle circuit regulated by a sealed adjustable needle. In addition, the primary circuit includes a mixture control solenoid valve and a fuel cut solenoid valve.

The Mixture Control (MC) solenoid is operated by an Electronic Control Module (ECM) and controls opening of the primary system main air bleed. The ECM monitors engine and vehicle operating conditions through a group of sensors, computes the ideal air/fuel mixture ratio for proper engine operation based on information from these sensors, and controls MC solenoid operation in order to maintain the ideal mixture ratio. The ECM cycles the MC solenoid on and off, causing the solenoid plunger to cycle up and down 16 times per second. When the solenoid is energized, the plunger is held down opening the air bleed and air/fuel mixtures are lean. When the solenoid is de-energized, spring tension forces the plunger up, closing the air bleed and providing richer mixtures. Although the number of solenoid plunger cycles remains constant at 16 per second, the ECM is able to control air/fuel mixtures by varying the amount of time the solenoid is "on" (dwell period) per cycle.

The fuel cut solenoid is also ECM controlled. This solenoid is used to block fuel mixture flow through the idle circuit in order to prevent engine run-on and backfiring. When the ignition is switched off, or if the ECM senses high manifold vacuum such as during deceleration, the ECM energizes the fuel cut solenoid to block fuel flow through the idle circuit.

The ECM, MC solenoid, fuel cut solenoid and bowl vent solenoid are all considered part of the "Computer Controlled Emission Control System." Refer to the "Computerized Engine Controls" section for diagnosis and testing of these components.





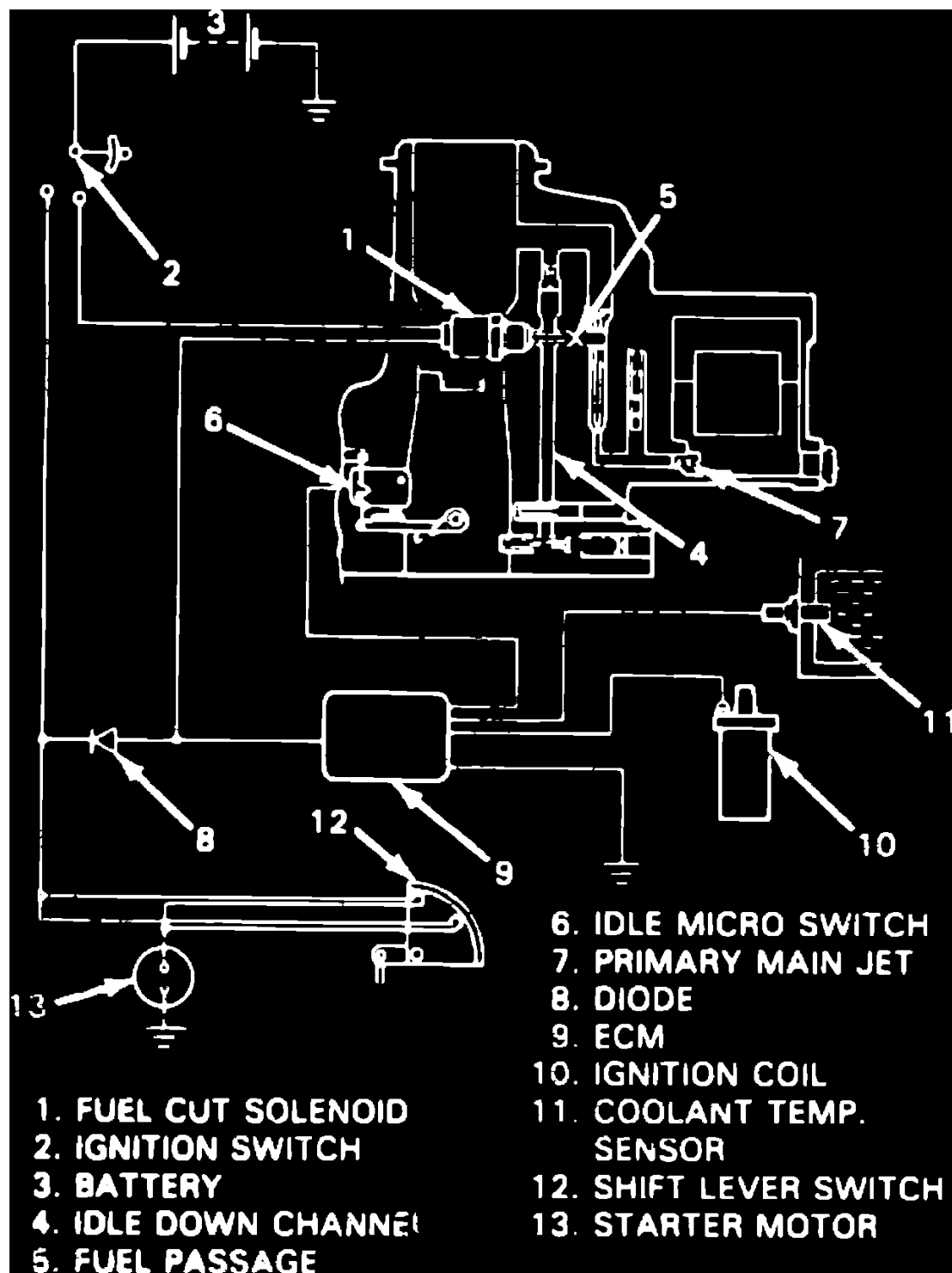
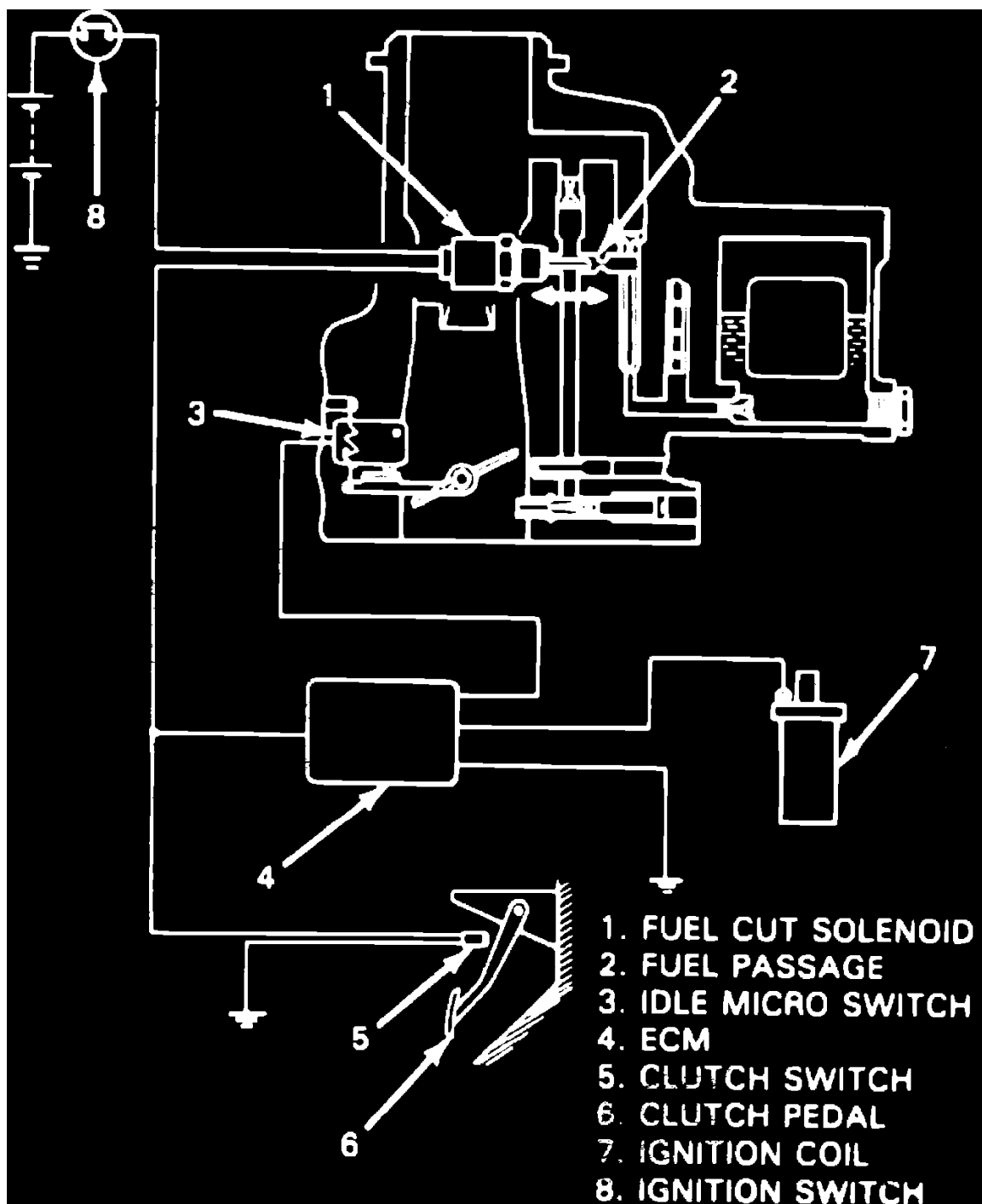


Fig. 20 Fuel cut system schematic. 1987 - 88 Models w/automatic transmission



**Fig. 21 Fuel cut system schematic. 1987 - 88 models w/manual transmission**

This system consists of a solenoid valve mounted in the primary idle circuit of the carburetor, **Figs. 19, 20 and 21**. The solenoid valve cuts off fuel supply to prevent dieseling when the ignition is shut off, and to improve fuel economy and reduce catalyst overheating during deceleration.

Fuel supply is cut when the following conditions are met:

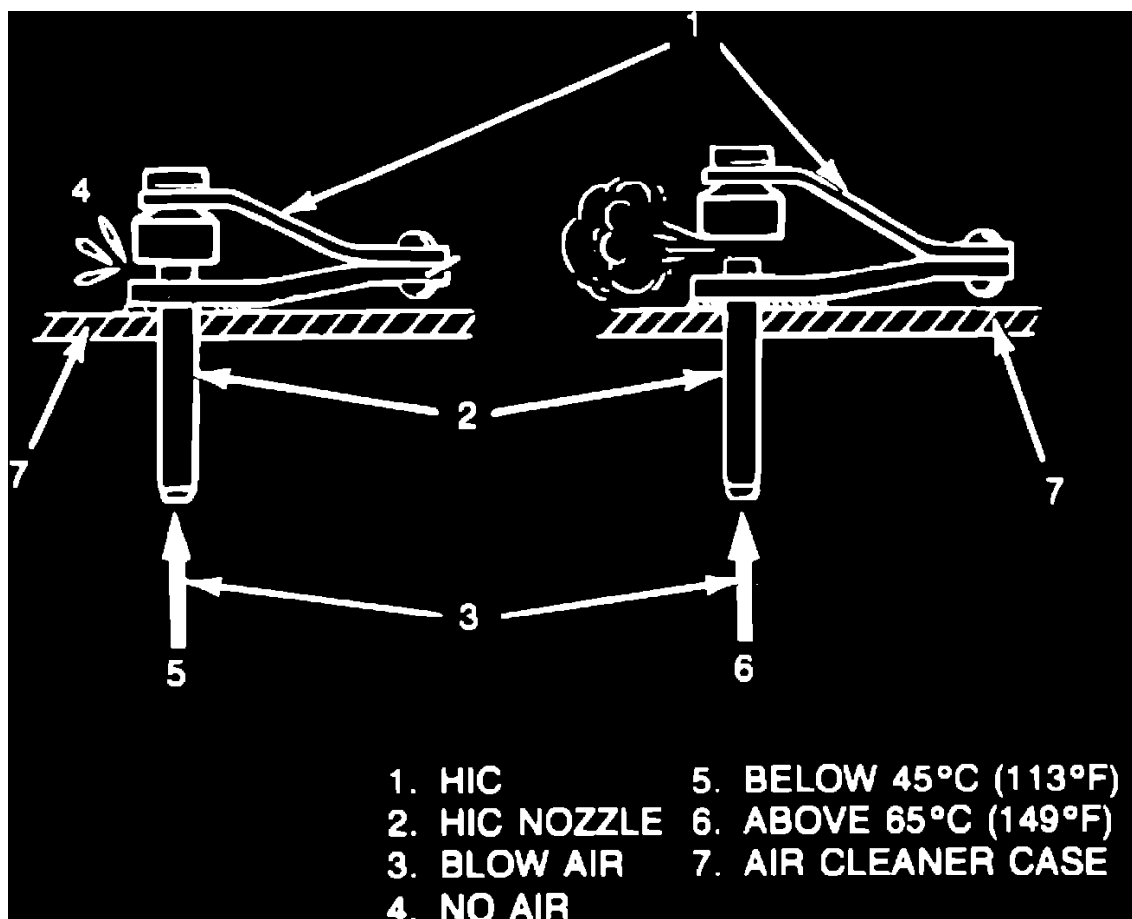
- a. Coolant is at normal operating temperature.
- b. Clutch is not depressed (switch off).
- c. Throttle closed (idle switch on).
- d. Engine speed above 2500 RPM.

#### 1987 - 88 Testing

For testing procedures on the fuel cut system components, refer to the "Computer Controlled Emission Control System" section.

## Carburetor: Description and Operation

### Hot Idle Compensator (HIC)



**Fig. 23 Checking hot idle compensator operation**

The HIC, **Fig. 23**, uses a bi-metallic spring to allow additional air flow into the engine during very high engine compartment temperatures. This additional air flow prevents an unstable idle caused by the rich air/fuel mixture that results from these high temperatures.

#### Testing

1. Remove air cleaner.
2. Disconnect vacuum hose from HIC.
3. Check temperature at HIC with thermometer.
4. Blow air into HIC. HIC should be closed at temperatures below 113°F, and open at temperatures above 149°F, **Fig. 23**.
5. Reconnect vacuum hose and reinstall air cleaner.

# Carburetor: Testing and Inspection

## Fuel Cut System

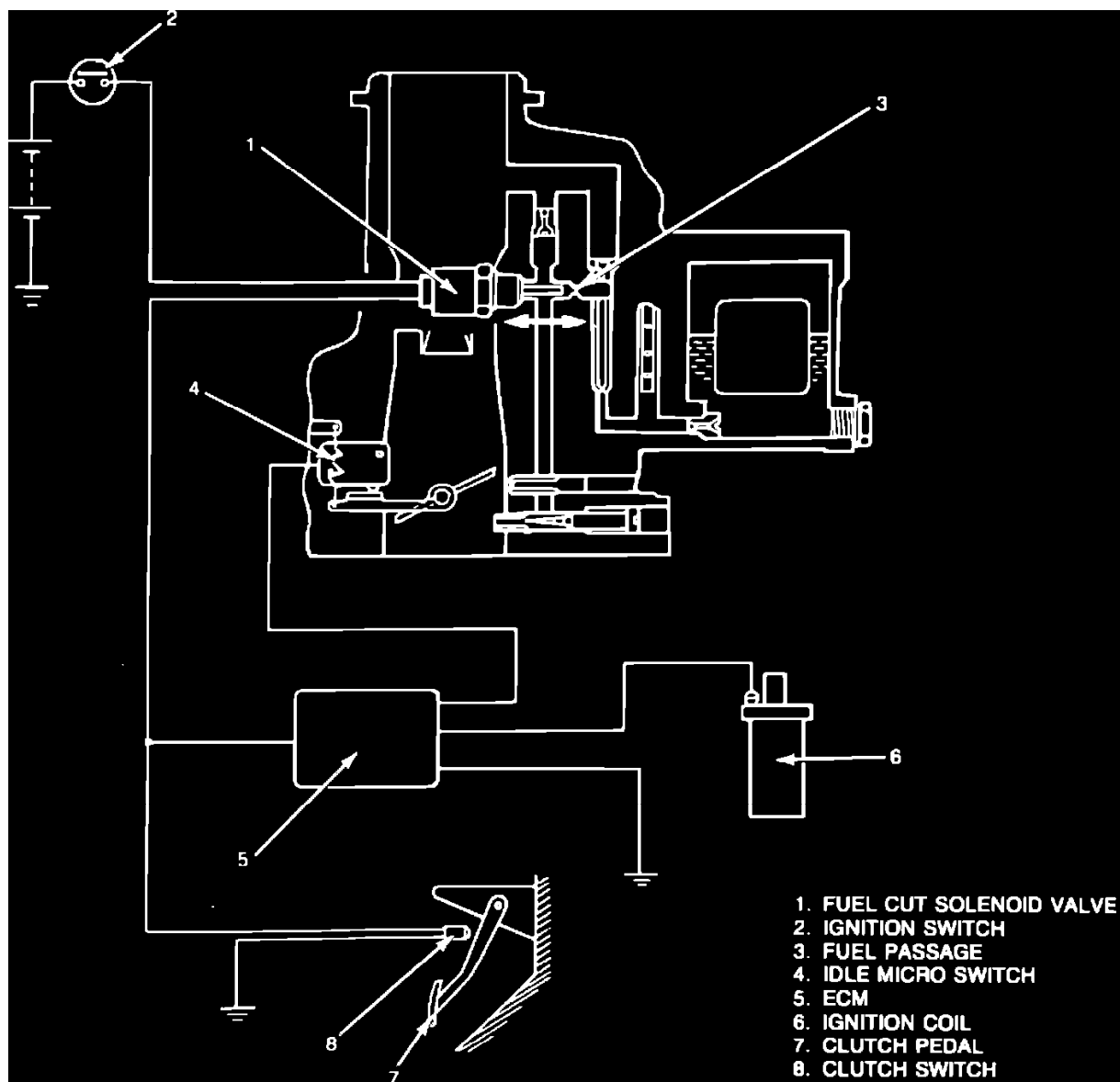


Fig. 19 Fuel cut system schematic. 1985 - 86 models

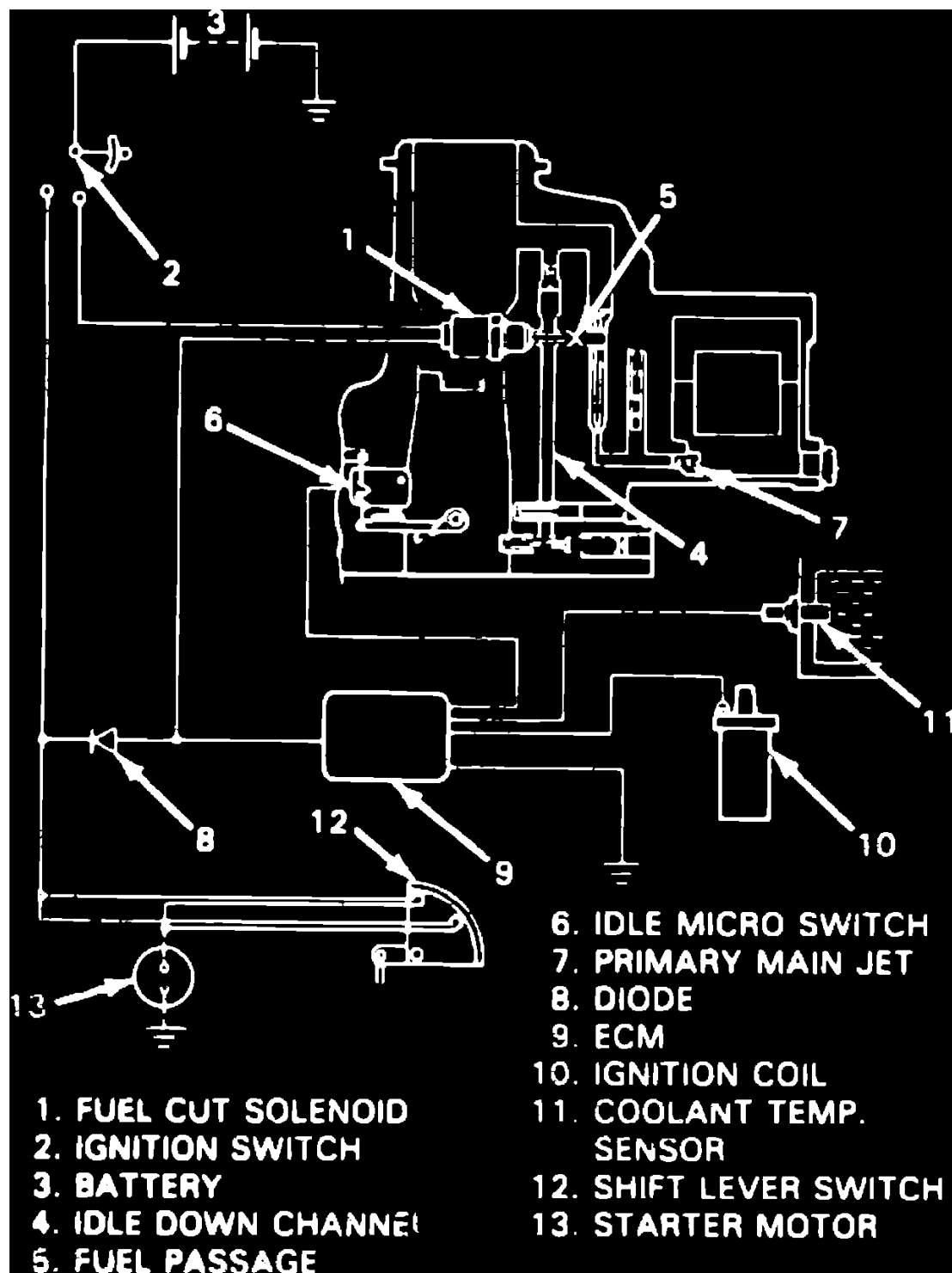
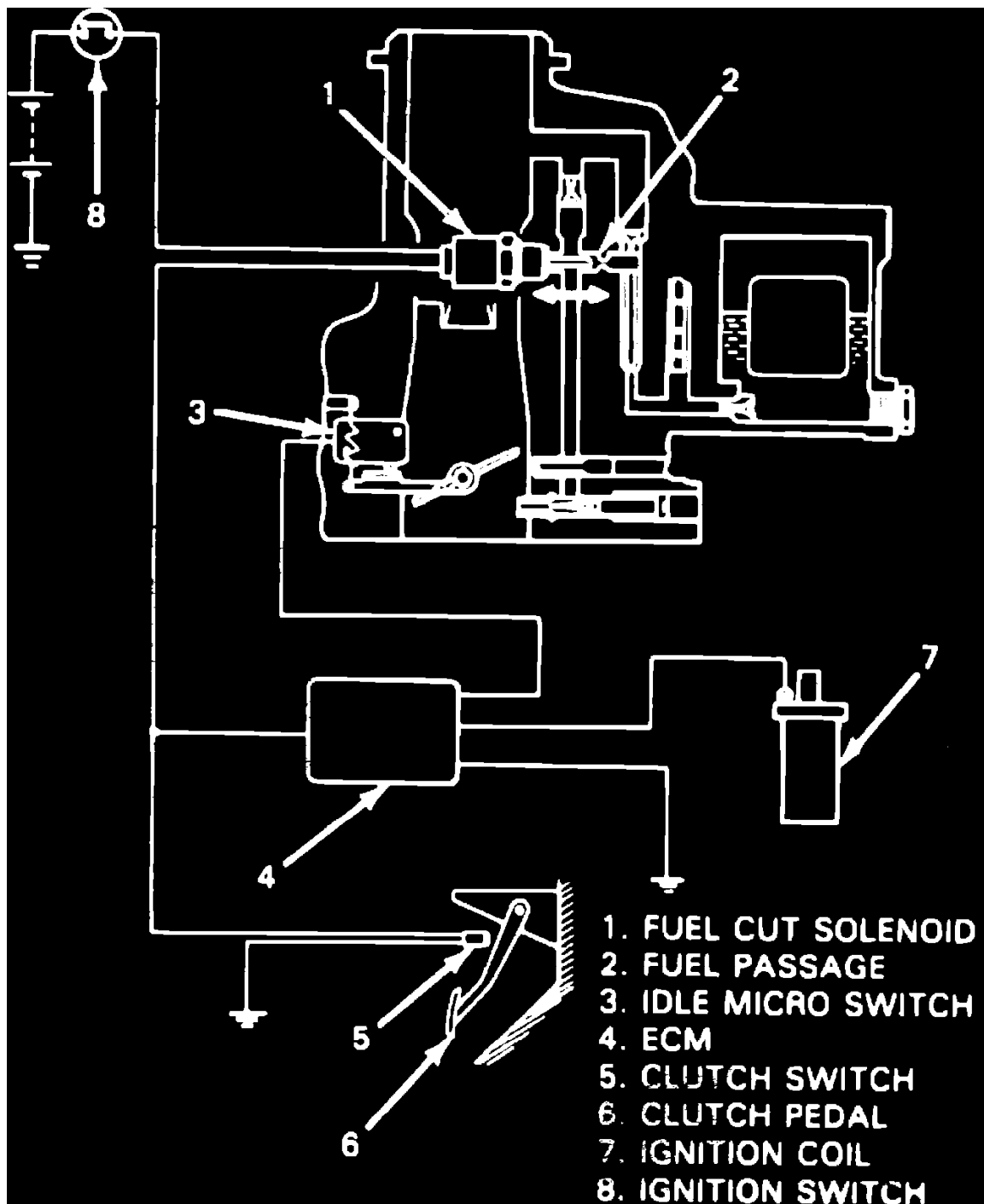


Fig. 20 Fuel cut system schematic. 1987 - 88 Models w/automatic transmission



**Fig. 21 Fuel cut system schematic. 1987 - 88 models w/manual transmission**

This system consists of a solenoid valve mounted in the primary idle circuit of the carburetor, **Figs. 19, 20 and 21**. The solenoid valve cuts off fuel supply to prevent dieseling when the ignition is shut off, and to improve fuel economy and reduce catalyst overheating during deceleration.

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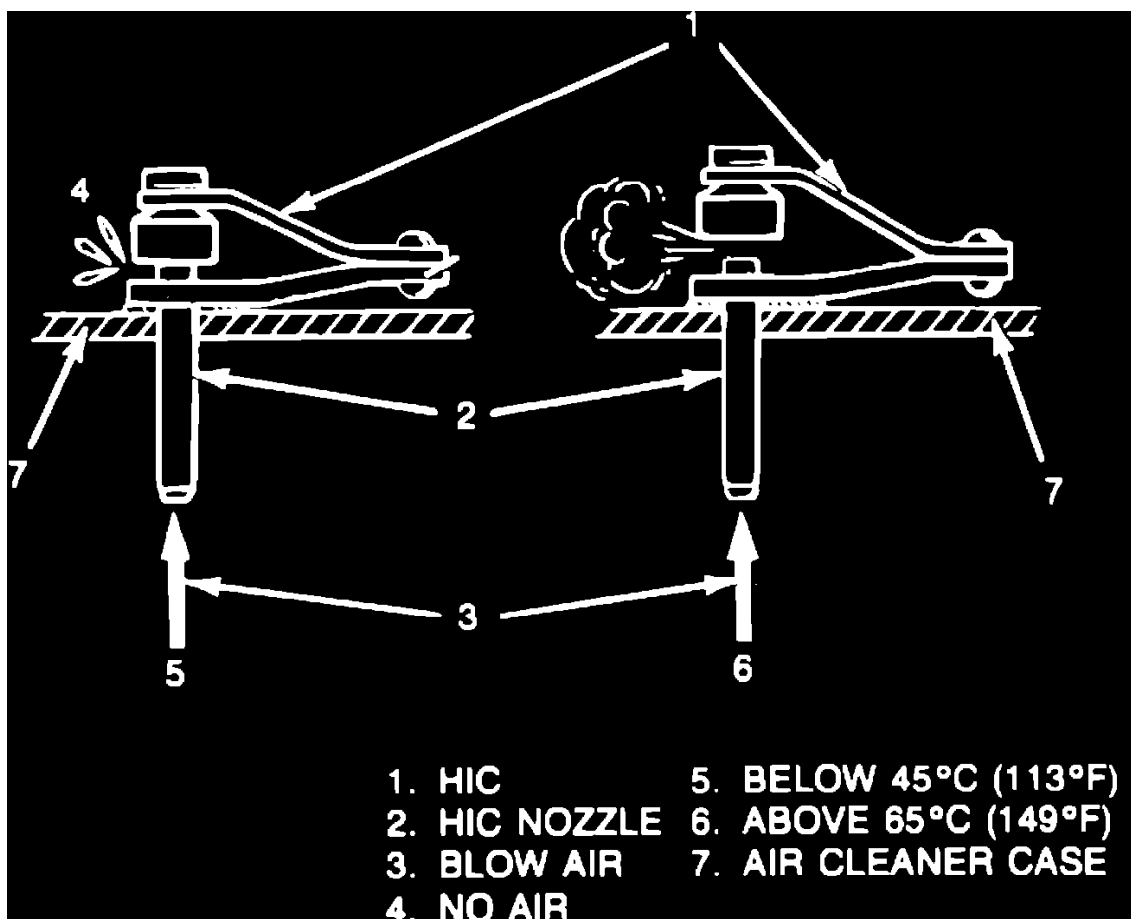
- Coolant is at normal operating temperature.
- Clutch is not depressed (switch off).
- Throttle closed (idle switch on).
- Engine speed above 2500 RPM.

#### 1987 - 88 Testing

For testing procedures on the fuel cut system components, refer to the "Computer Controlled Emission Control System" section.

## Carburetor: Testing and Inspection

### Hot Idle Compensator (HIC)



**Fig. 23 Checking hot idle compensator operation**

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#### Testing

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3. Check temperature at HIC with thermometer.
4. Blow air into HIC. HIC should be closed at temperatures below 113°F, and open at temperatures above 149°F, **Fig. 23**.
5. Reconnect vacuum hose and reinstall air cleaner.

# Carburetor: Service and Repair

## Disassembly

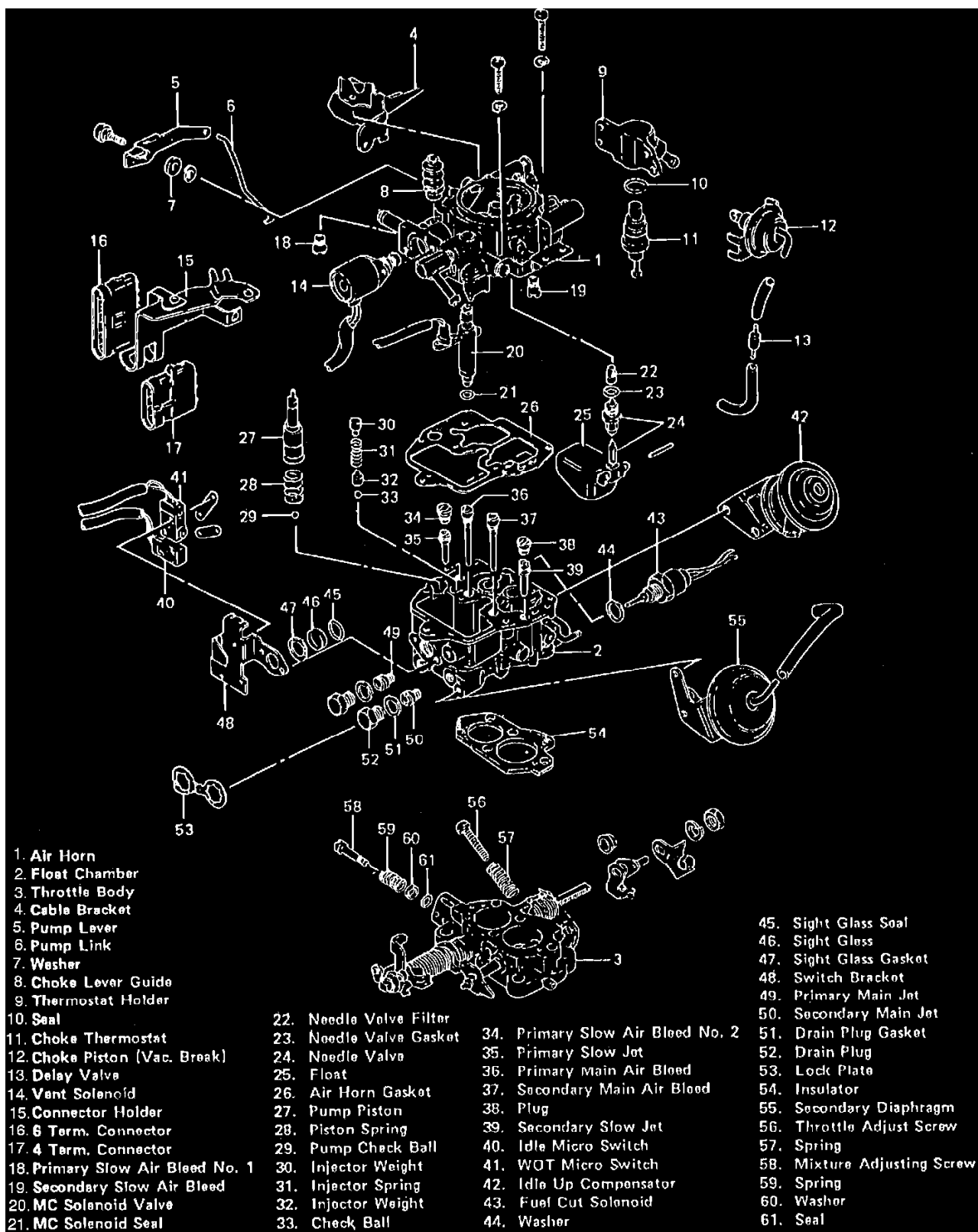
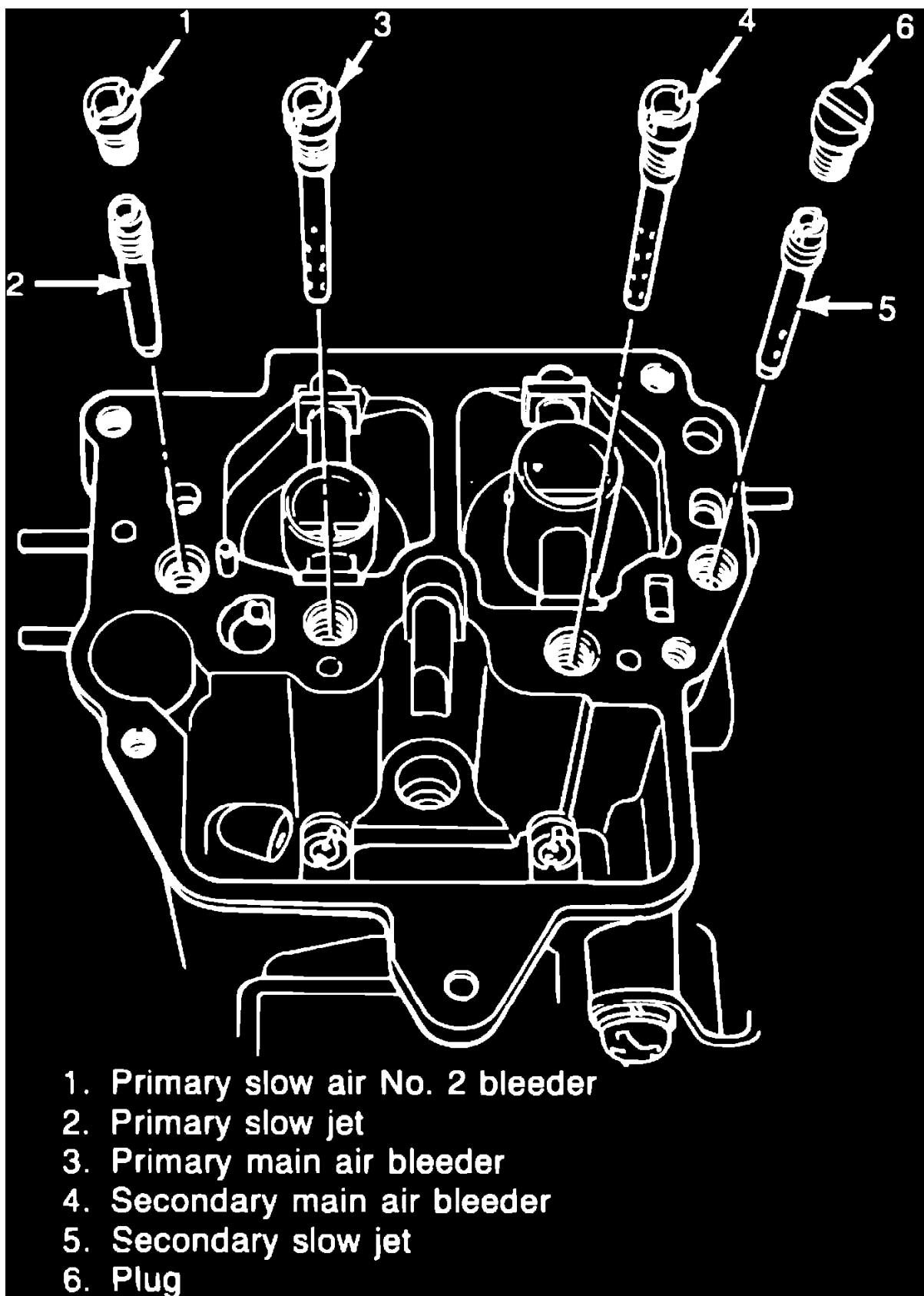


Fig. 1 Typical Exploded View Of Hitachi MR08 Carburetor





**Fig. 2 Jet & air bleed identification**

Keep all components in order by sub-system to aid assembly. Note installation position of all calibrated components, keeping primary and secondary system components separate, so that they can be installed in proper position.

1. Disconnect fuel line at inlet and vacuum hoses from choke piston, secondary throttle actuator and idle-up compensator, then remove hoses, **Fig. 1.**
2. Remove bolt securing accelerator pump lever, then remove lever and actuating link.
3. Remove bowl vent solenoid and air horn retaining screws, then separate air horn from carburetor body.
4. Withdraw float hinge pin, then remove float, needle valve and seat, and fuel filter from air horn.
5. Remove primary and secondary slow air bleeds from air horn.
6. Remove choke thermostat housing and thermostat, choke piston assembly, accelerator pump and MC solenoid from air horn.
7. Disconnect return springs, then remove micro switch and bracket assembly. **Do not remove micro switches from bracket.**
8. Remove lock plate and float bowl drain plugs, then the primary and secondary main jets, inserting screwdriver through drain plug holes.

## Chevrolet Sprint L3-61 1.0L

9. Remove accelerator pump spring and check ball, then the injector spring and weight.
10. Remove bleed orifices and jets from body, **Fig. 2**, noting installation position.
11. Remove fuel cut solenoid, secondary throttle actuator diaphragm capsule and idle-up compensator.
12. Remove float bowl sight glass retainer, sight glass and seal.
13. Remove screws securing throttle plate, then separate throttle plate from body. Note installation position of serrated washers for assembly.
14. Remove pin sealing idle mixture screw as outlined under ``Adjusting Screw Pin Removal."
15. Turn mixture adjusting screw in (clockwise) until lightly seated, recording number of turns necessary, then remove screw.

## Carburetor: Service and Repair

### Cleaning & Inspection

1. Clean components with suitable solvent and blow dry with compressed air, noting the following:
  - a. Do not immerse micro switches, solenoids, float, accelerator pump plunger, diaphragm capsules, choke thermostat, gaskets or seals in carburetor cleaner, as they will be damaged.
  - b. Ensure that dirt, solvent and all foreign material is removed from casting passages and calibrated orifices. **Do not insert drills or wires into fuel passages, jets or air bleeds as they will be damaged.**
2. Check continuity and operation of solenoids and replace as needed.
3. Check diaphragm capsules for damage and leaks, and replace as needed.
4. Check choke and throttle valves for free operation, damage and looseness. **Screws securing choke and throttle plates are staked to prevent loosening. Do not remove screws unless plates or operating shafts must be replaced. If replacement is required, ensure that new screws are properly installed and staked to prevent loosening.**
5. Inspect accelerator pump piston and replace if rubber cup is damaged or deteriorated.
6. Inspect MC solenoid seal and replace as needed.
7. Inspect needle valve and seat and replace if worn, grooved or damaged.
8. Inspect float for fuel saturation, wear and damage.
9. Replace body casting if worn, distorted or damaged.
10. Replace all gaskets seals and linkage retainers during assembly.

## Carburetor: Service and Repair Assembly

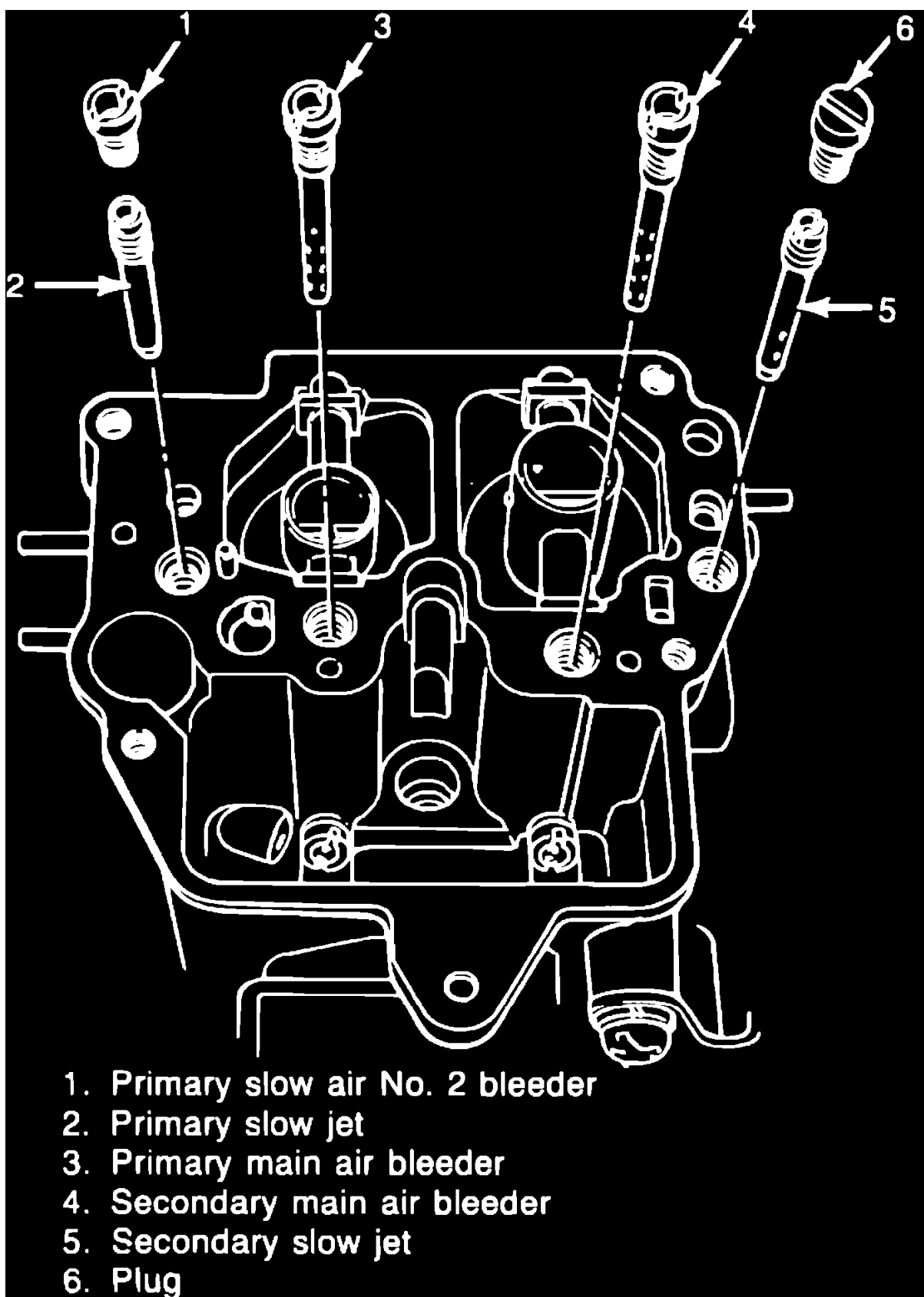


Fig. 2 Jet & air bleed identification

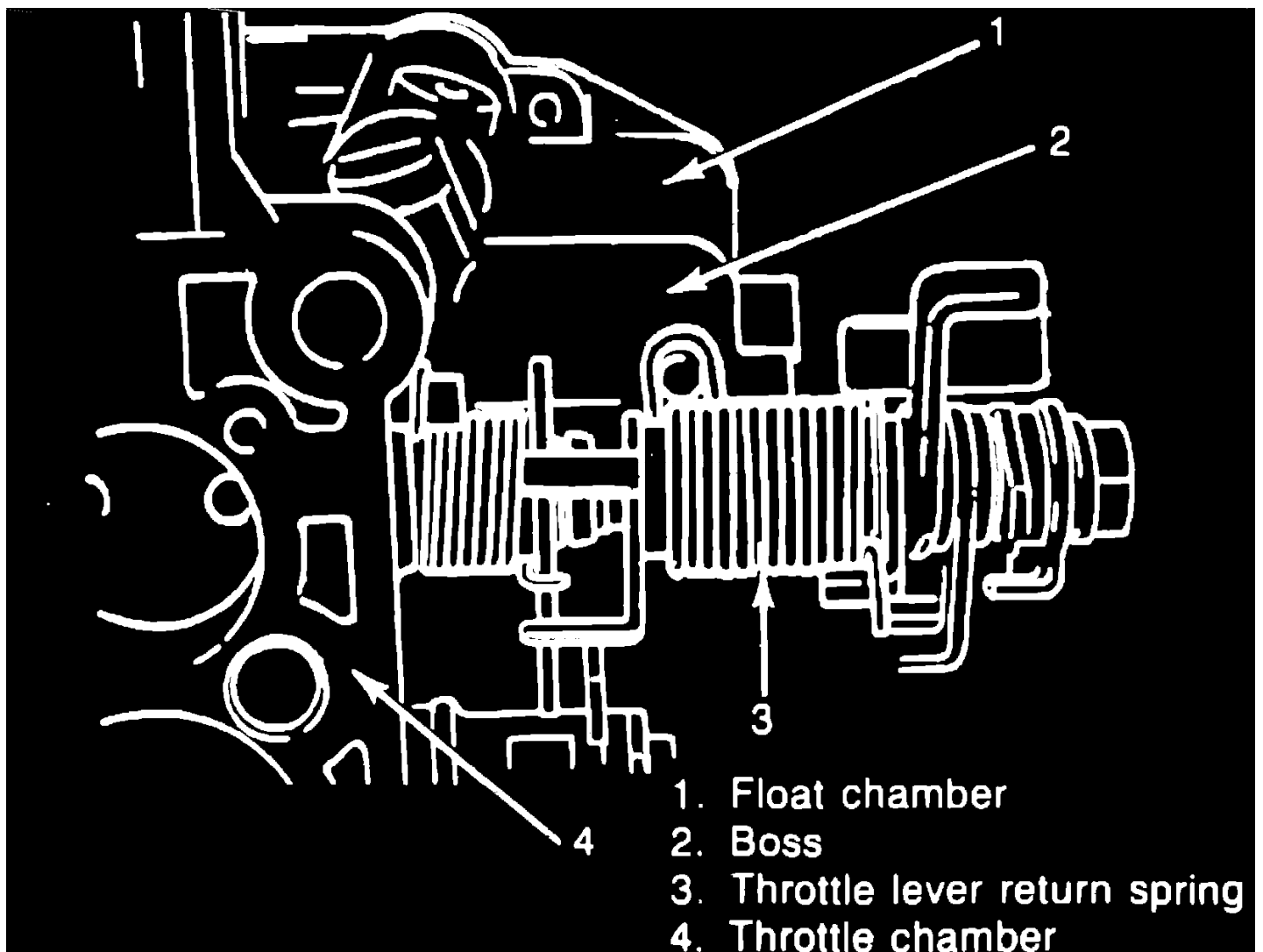
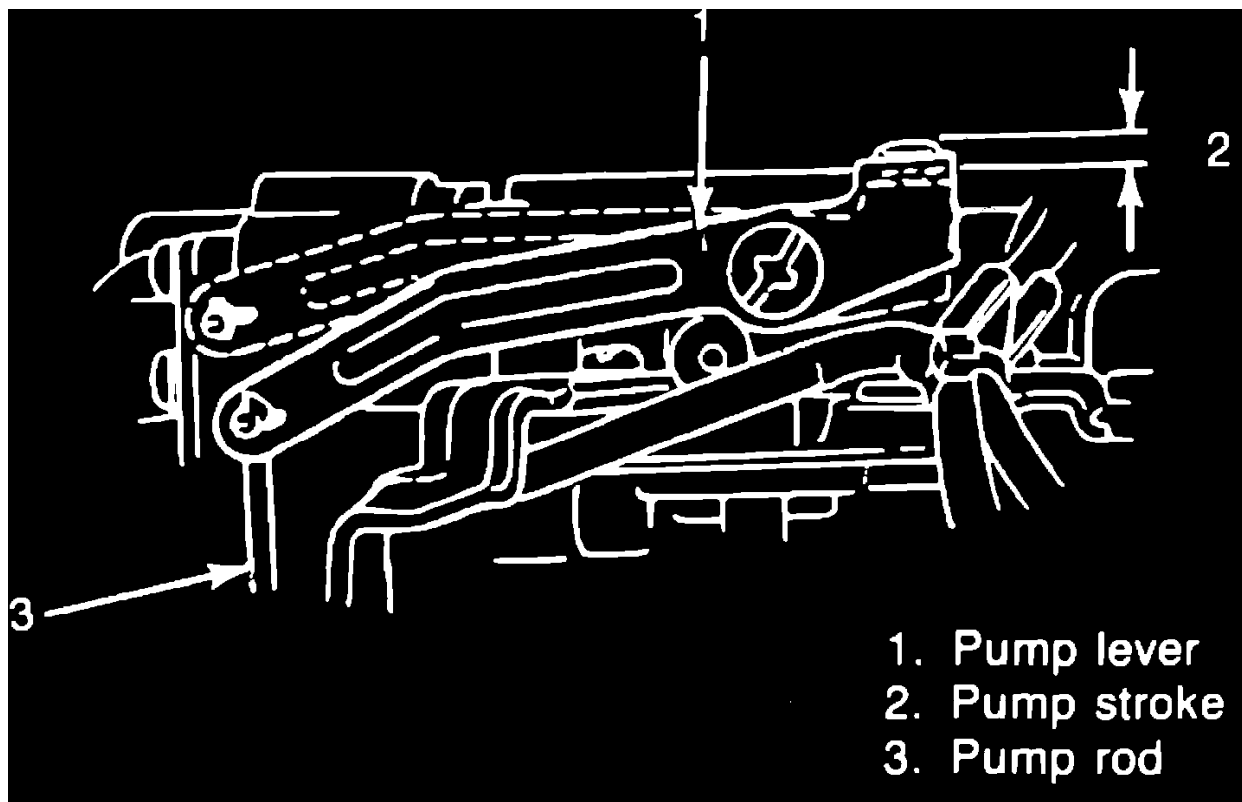


Fig. 3 Throttle return spring installation

1. Install mixture adjusting screw, turning screw in until lightly seated, then backing screw out number of turns recorded during disassembly. **Do not install new pin sealing mixture screw until mixture adjustment has been checked.**
2. Position new throttle plate gasket on body, hook throttle valve side of return spring as shown in **Fig. 3**, then install throttle plate and torque retaining screws to 3 - 5 ft. lbs.
3. Install primary and secondary main jets, float bowl drain plugs and retainer, then bend over tabs on retainer to secure plugs.
4. Install float bowl sight glass seal, sight glass and retainer, ensuring that index mark on glass is toward float bowl.
5. Install fuel cut solenoid, secondary throttle actuator and idle-up compensator.
6. Install micro switch and bracket assembly, then connect linkage springs to bracket. **After assembling carburetor, check adjustment of micro switches as outlined in "Computer Controlled Emission Control System" section. Wide open throttle switch is adjusted prior to carburetor installation, while the idle switch is adjusted after carburetor is installed.**
7. Install metering tubes, jets and air bleed orifices, **Fig. 2**.
8. Install injector weight and spring, accelerator pump check balls and pump spring, positioning U-shaped bend of spring downward.
9. Install accelerator pump piston and MC solenoid in air horn.
10. Install filter, needle and seat, and the float, then adjust float level as outlined under "Carburetor Adjustments."
11. Install primary and secondary slow air bleed orifices in air horn.
12. Position new air horn gasket on float bowl, coat MC solenoid seal with silicone grease, then install air horn.
13. Install choke thermostat and housing assembly, and the bowl vent solenoid.
14. Install accelerator pump link lever and retaining bolt, then connect vacuum and fuel hoses.
15. Check choke, accelerator pump and secondary throttle adjustments and correct as needed.

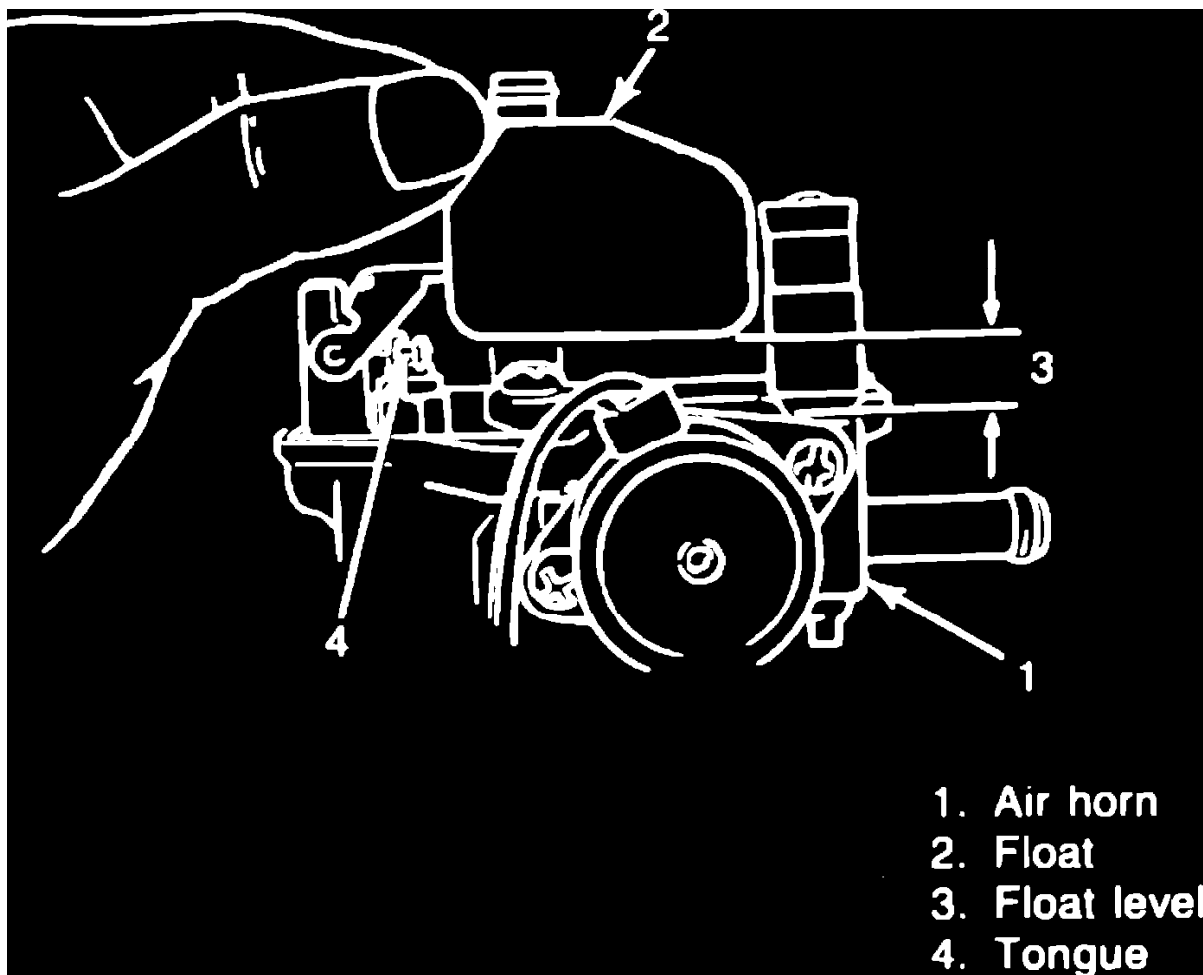
## Accelerator Pump: Adjustments



**Fig. 8 Accelerator pump stroke adjustment**

1. Remove air cleaner, open throttle while observing pump operation and ensure that fuel comes out of pump discharge nozzle.
2. Start engine and run until it reaches normal operating temperature, then stop engine.
3. Measure accelerator pump lever stroke at point shown in **Fig. 8**, while moving throttle from fully closed to fully open position.
4. If pump stroke is not as specified in ``Adjustment Specifications," check operation of pump lever and link, and repair linkage or adjust length of link as needed to obtain specified stroke.

## Carburetor Float: Adjustments



**Fig. 4** Float level adjustment

1. With carburetor installed on engine, inspect fuel level through float bowl sight glass.
2. If fuel level is not within round mark on sight glass, remove air horn to adjust float.
3. Invert air horn, then raise and lower float, allowing it to rest on needle valve.
4. Measure clearance between air horn gasket surface and toe of float, **Fig. 4**, with air horn gasket removed.
5. If clearance is not as specified in ``Adjustment Specifications," adjust float level by bending tongue of float up or down as needed.
6. After adjusting float, reinstall air horn and recheck fuel level in float bowl.

## Choke Plate: Adjustments

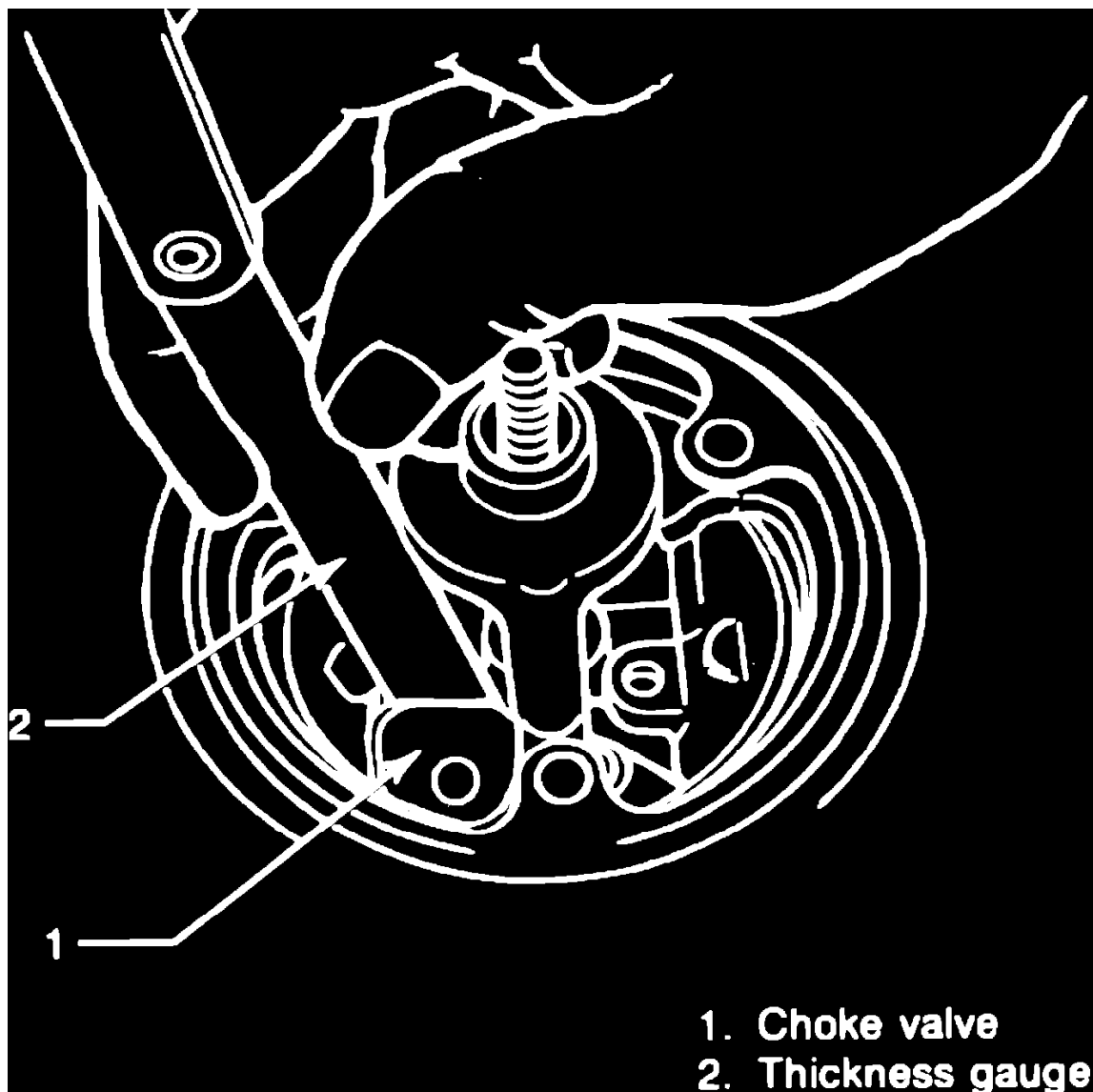
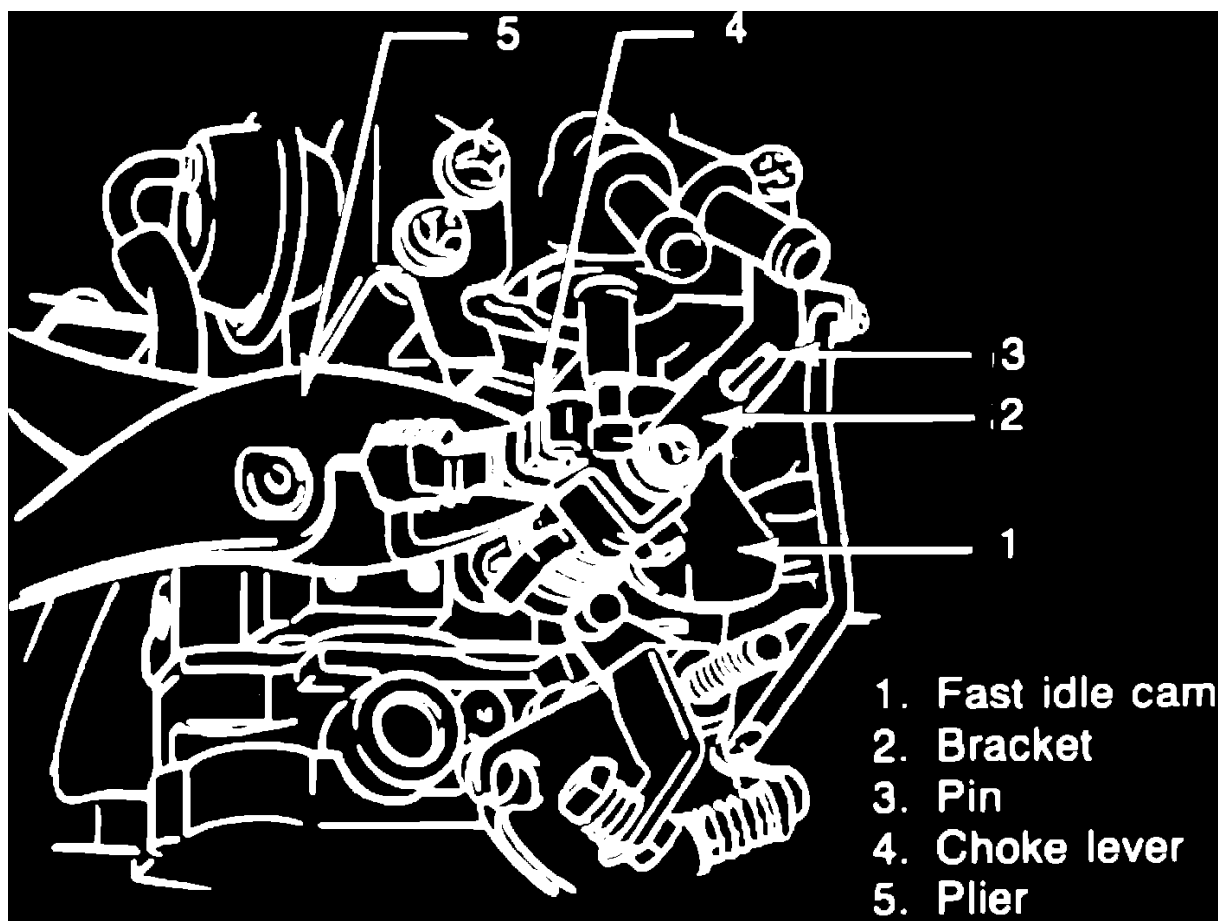


Fig. 5 Measuring choke valve clearance



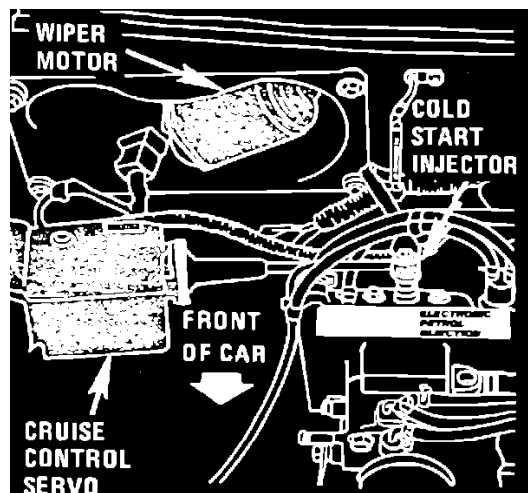


**Fig. 6 Choke lever adjustment**

1. Ensure that choke valve moves freely throughout its range, without binding or sticking.
2. With engine cold and ambient temperature below 77°F, open and close throttle and ensure that choke blade is almost completely closed.
3. Measure clearance between choke blade and carburetor bore with suitable gauges, **Fig. 5**. Clearance should be within range specified in "Adjustment Specifications."
4. If choke blade clearance is greater or less than specified, remove air cleaner housing, then inspect strangler spring, choke piston and linkage for free and proper operation. Lubricate choke valve shaft and links as required.
5. If clearances are still not within specifications, remove carburetor from manifold and idle-up compensator from carburetor.
6. Rotate fast idle cam counterclockwise and insert pin through holes in cam and bracket to lock cam in place, **Fig. 6**.
7. Bend choke lever up or down, as needed, to obtain specified choke blade clearance, **Fig. 6**. **Bending choke lever upward decreases choke blade clearance, while bending lever downward increases clearance.**
8. Remove pin from fast idle cam, reinstall idle-up compensator and carburetor, then ensure that clearances are still within specifications.

## Cold Start Injector: Locations

### Cold Start Fuel Injector



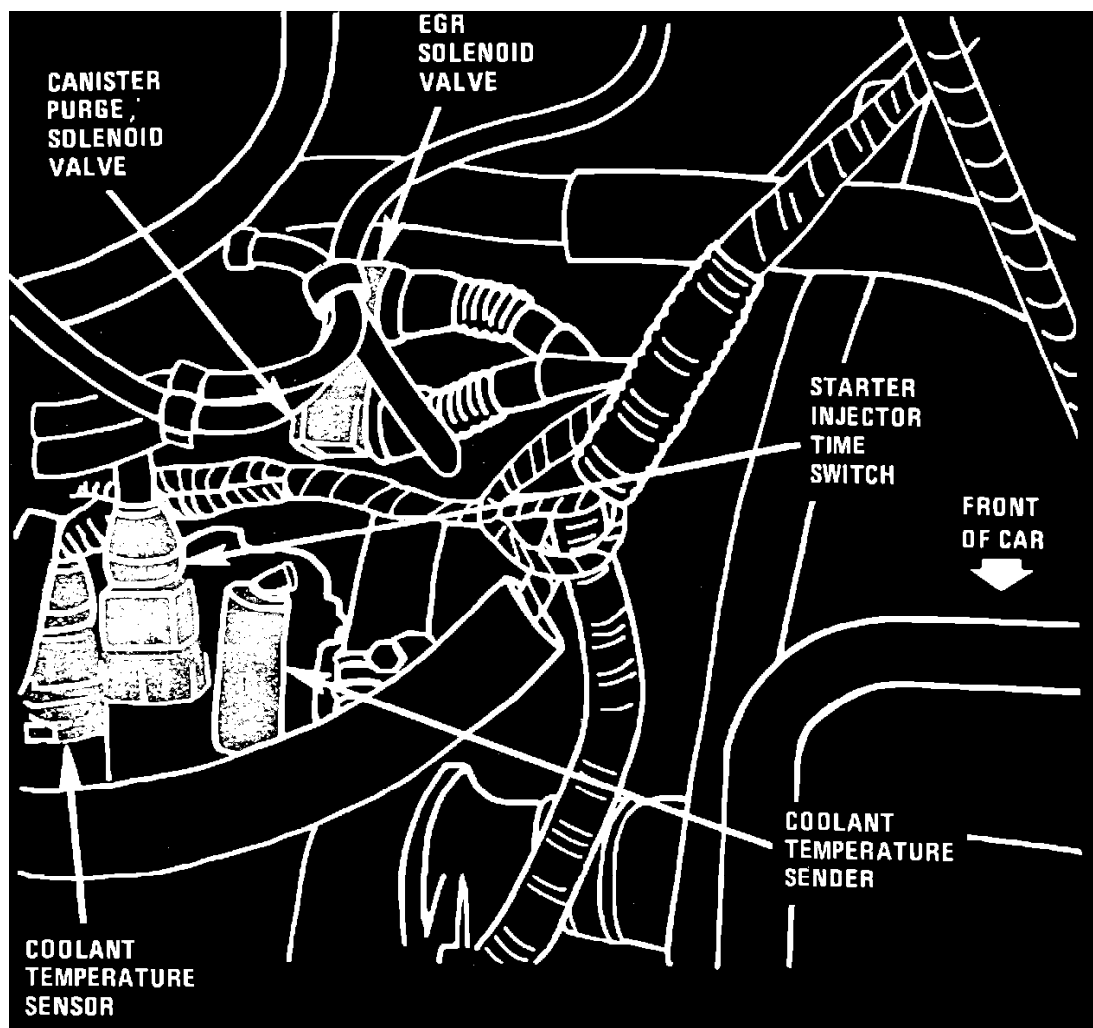
Top Right Side Of Engine

Mounted To Rear Of Engine Near Wiper Motor

Applicable to: Turbo

## Cold Start Injector: Locations

### Starter Injector Time Switch



Top Left Side Of Engine

LH Side Of Engine

Applicable to: Turbo

## Fuel Injector: Testing and Inspection

### Injector Balance Test

#### INJECTOR BALANCE TEST

The injector balance tester is a tool used to turn the injector on for a precise amount of time, thus spraying a measured amount of fuel into the manifold. This causes a drop in fuel rail pressure that we can record and compare between each injector. All injectors should have the same amount of pressure drop ( $\pm 10$  kPa). Any injector with a pressure drop that is 10 kPa (or more) greater or less than the average drop of the other injectors should be considered faulty and replaced.

##### STEP 1

Engine "cool down" period (10 minutes) is necessary to avoid irregular readings due to "Hot Soak" fuel boiling. With ignition "OFF" connect fuel gauge J34730-1 or equivalent to fuel pressure tap. Wrap a shop towel around fitting while connecting gauge to avoid fuel spillage.

Disconnect harness connectors at all injectors, and connect injector tester J-34730-3 or equivalent to one injector. Ignition must be "OFF" at least 10 seconds to complete ECM shutdown cycle. Fuel pump should run about 2 seconds after ignition is turned "ON". At this point, insert clear tubing attached to vent valve into a suitable container and bleed air from gauge and hose to insure accurate gauge operation. Repeat this step until all air is bled from gauge.

##### STEP 2

Turn ignition "OFF" for 10 seconds and then "ON" again to get fuel pressure to its maximum. Record this initial pressure reading. Energize tester one time and note pressure drop at its lowest point (Disregard any slight pressure increase after drop hits low point.). By subtracting this second pressure reading from the initial pressure we have the actual amount of injector pressure drop.

##### STEP 3

Repeat step 2 on each injector and compare the amount of drop. Usually, good injectors will have virtually the same drop. Retest any injector that has a pressure difference of 10 kPa, either more or less than the average of the other injectors on the engine. Replace any injector that also fails the retest. If the pressure drop of all injectors is within 10 kPa of this average, the injectors appear to be flowing properly. Reconnect injectors.

**NOTE:** The entire test should not be repeated more than once without running the engine to prevent flooding. (This includes any retest on faulty injectors)

Fig. 19a Injector balance test

## INJECTOR BALANCE TEST

**NOTE:** If injectors are suspected as being dirty, they should be cleaned using an approved tool and procedure prior to performing this test. The fuel pressure test in Figure 6C20-121, should be completed prior to this test.

**Step 1.** If engine is at operating temperature, allow a 10 minute "cool down" period then connect fuel pressure gauge and injector tester.

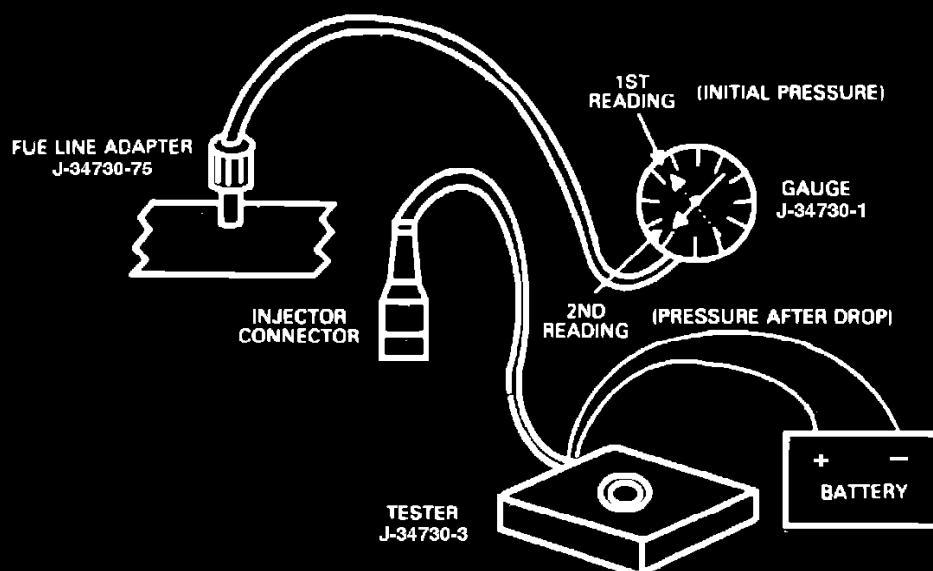
1. Ignition "OFF"
2. Connect fuel pressure gauge and injector tester.
3. Ignition "ON".
4. Bleed off air in gauge. Repeat until all air is bled from gauge.

**Step 2. Run test:**

1. Ignition "OFF" for 10 seconds.
2. Ignition "ON". Record gauge pressure. (Pressure must hold steady, if not see the fuel system diagnosis, (Figure 6C20-121).
3. Turn injector on by depressing button on injector tester and note pressure at the instant the gauge needle stops.

**Step 3.**

1. Repeat step 2 on all injectors and record pressure drop on each. Retest injectors that appear faulty (Any injectors that have a 10 kPa difference, either more or less, in pressure from the average).



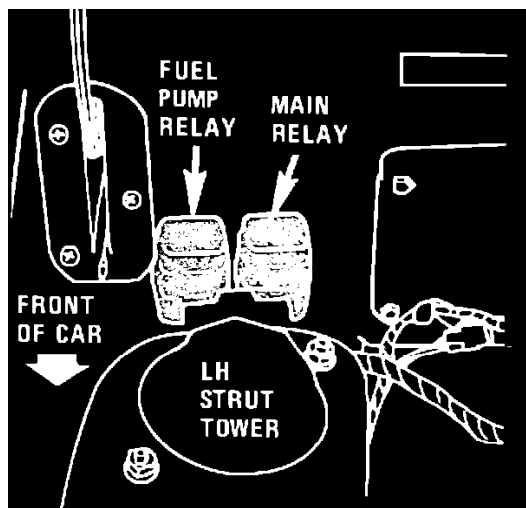
### — EXAMPLE —

CYLINDER	1	2	3	4	5	6
1ST READING	225	225	225	225	225	225
2ND READING	100	100	100	90	100	115
AMOUNT OF DROP	125	125	125	135	125	110
	OK	OK	OK	FAULTY, RICH (TOO MUCH) (FUEL DROP)	OK	FAULTY, LEAN (TOO LITTLE) (FUEL DROP)

Fig. 19b Injector balance test

Refer to Fig. 19, when performing this test.

## Fuel Pump Relay: Locations



Right Side Strut Tower Components

Right Rear Corner Of Engine Compartment

## Fuel Tank: Service and Repair

### Fuel System Cleaning

#### PROCEDURE:

##### REMOVE:

1. Remove the negative battery cable.
2. Disable the engine spark system to prevent accidental starting.  
^ Have a dry chemical (Class B) fire extinguisher near the work area.
3. Remove the fuel from the tank.
4. Remove the fuel tank.
5. Remove the fuel gauge and pump unit.
6. Purge the fuel from the tank.
7. Remove the fuel filter.

##### INSPECTION:

- Inspect fuel filter for contamination.
- Replace the fuel filter, if it is plugged.

##### CLEAN:

Clean fuel lines, by applying air pressure in the opposite direction of the fuel flow.

##### INSTALL:

1. A new fuel strainer (if necessary) on the fuel sender and pump unit.
2. Install the fuel gauge and pump unit, with a new seal into the fuel tank.  
**NOTE:** Care should be taken not to fold over or twist the strainer, when installing the sending unit, as this will restrict fuel flow.
3. Install fuel tank.

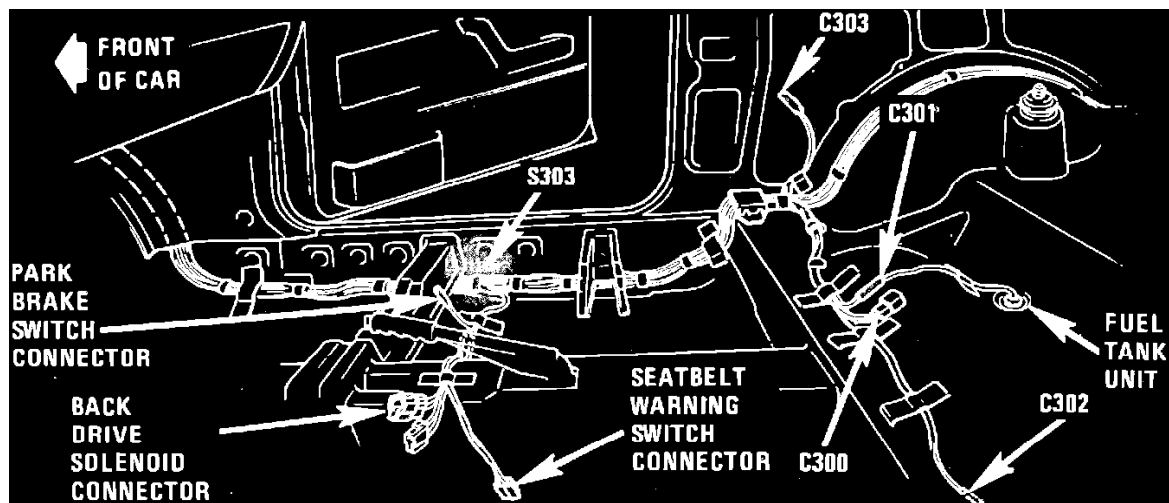
##### FLUSH: (FUEL INJECTED MODELS)

1. Disconnect the fuel feed line at the front of the vehicle.
2. Install a hose to the fuel feed line at the front of the vehicle and insert the other end of the hose into a 3.8L (One gallon) fuel can.
3. Reconnect the negative battery cable.
4. Fill tank with twenty-three liters (six gallons) of clean fuel into the tank.
5. Energize the fuel pump relay, to operate the fuel pump, until two liters (one half gallons) of fuel flows into the fuel can. This will purge the fuel pump.
6. Reconnect the engine harness connector to the distributor.

##### CHECK:

1. Check all connections, for leaks, and tighten all hose clamps.

## Fuel Gauge Sender: Locations

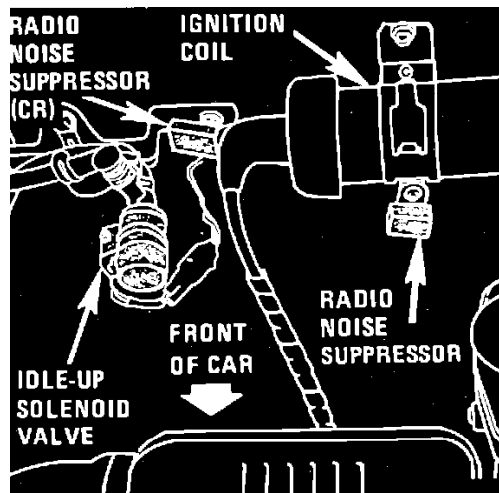


Passenger Compartment Splices & Connectors

Under Rear Of Car, Under Right Rear Seat



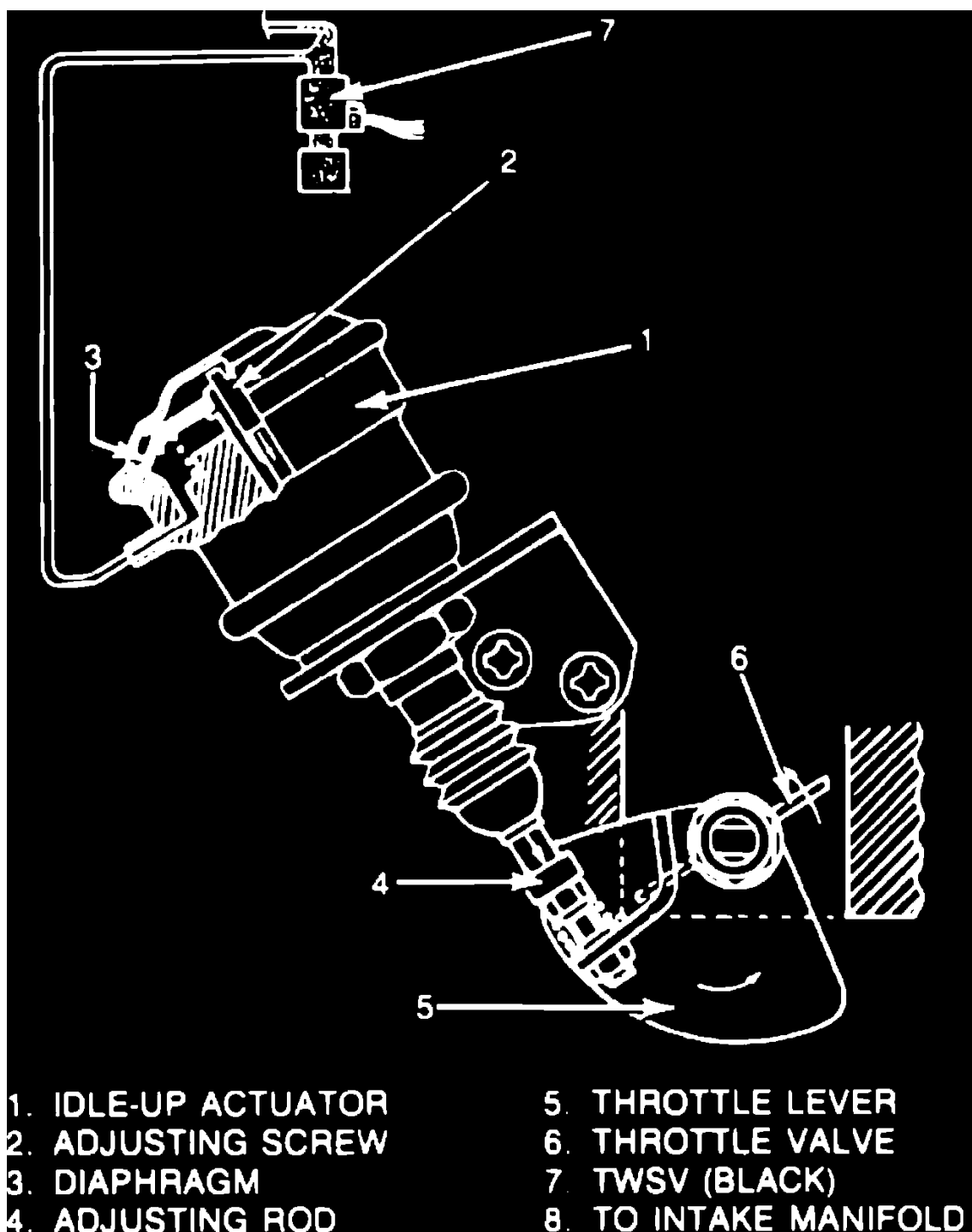
## Idle Speed Vacuum Solenoid Valve: Locations



Left Side Of Cowl

Rear Of Engine Compartment, Mounted To Center Of Cowl

## Idle-Up Compensator: Description and Operation



**Fig. 7 Idle-up compensator system**

Idle speed compensation is provided for varying engine loads by a vacuum operated idle-up compensator which is controlled by a Three-Way Switching Valve (TWSV), **Fig. 7**. The ECM sends electrical signals to the TWSV in order to control idle-up compensator operation. When an electrical signal is transmitted to the TWSV, the inner diaphragm of the valve opens and allows manifold vacuum to be applied to the compensator. Manifold vacuum is applied to the compensator diaphragm which in turn operates an adjusting rod and screw assembly. The rod and screw move down in response to vacuum applied to the diaphragm, opening the throttle to compensate for increased engine loads.

### Manual Transmission

On models with manual transmission, the idle-up compensator is used to raise idle speed to compensate for the following conditions:

When electrical accessories are operated, the ECM energizes the TWSV to stabilize engine idle speed. When the electrical load is removed, the TWSV is switched off and idle speed is controlled by the throttle stop screw.

The TWSV is energized for approximately 5 seconds after a warm engine is started.

The TWSV is energized when oxygen sensor temperature is low and the sensor is not satisfactorily activated.

### Automatic Transmission

On models with automatic transmission, the idle-up compensator system is activated when the transmission selector is placed in any drive range and road speed is below 15 mph. In addition, the system is activated when oxygen sensor temperature is low and the sensor is not satisfactorily activated.

Refer to "Emission Control Systems" section for description of bowl vent, fuel cut and pulse air or secondary air control system operation.

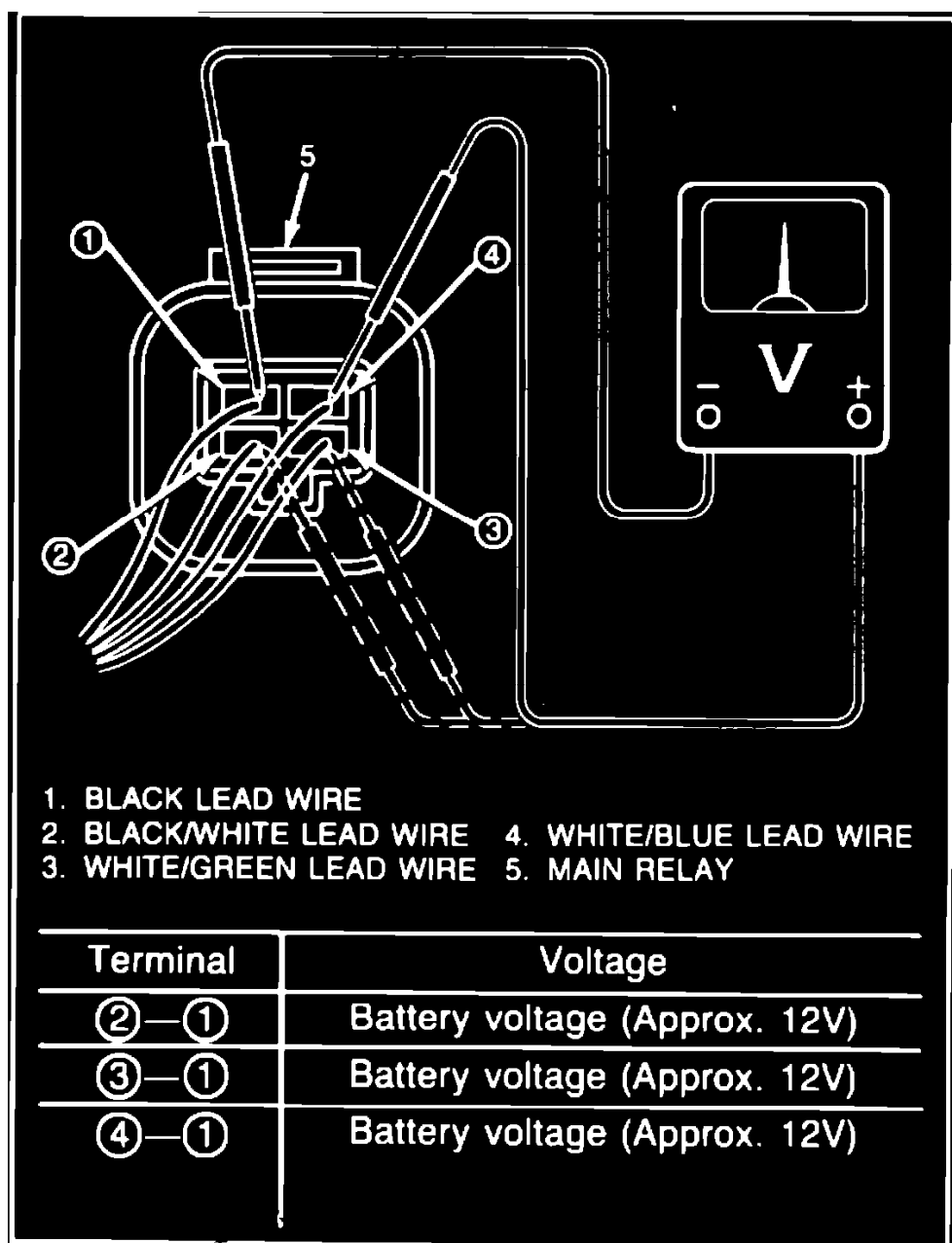
**Main Relay (Computer/Fuel System): Testing and Inspection**

Fig. 16 Checking main relay voltage

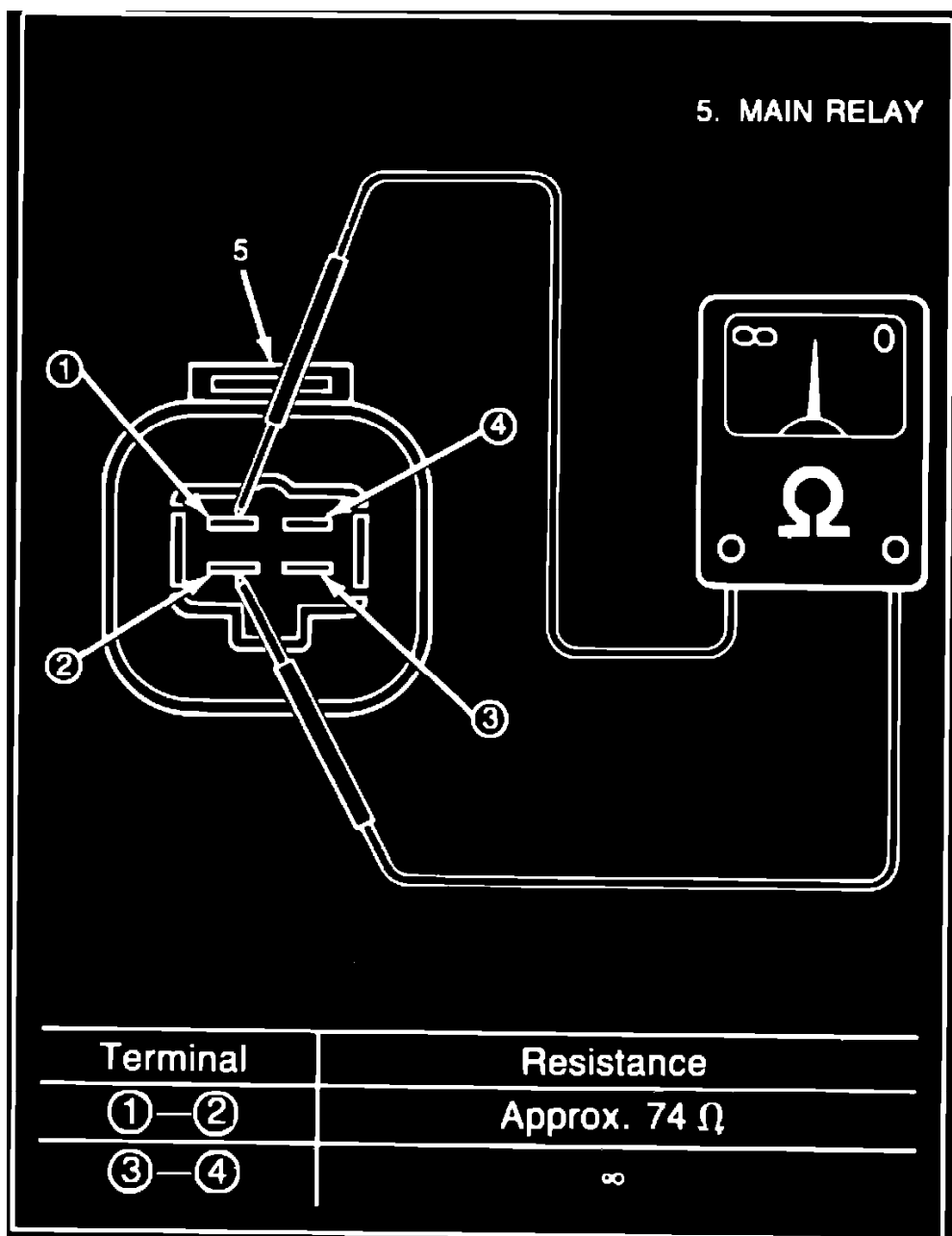


Fig. 17 Checking main relay resistance

1. Check main relay for sound of operation when ignition switch is turned "On." If no sound is heard, proceed to step 2.
2. With ignition switch "On," check voltage between terminals as indicated, Fig. 16. **The same component is used for main and fuel pump relay. To identify main relay, check lead wire for black, black/white, white/blue, and white/green wire.**
3. With ignition switch "Off," remove main relay and disconnect electrical connector. Check resistance between each terminal as shown, Fig. 17.
4. Check for continuity between terminals 3 and 4 when battery voltage is applied to terminals 1 and 2.

## Thermo Time Switch: Description and Operation

The starter injector time switch consists of a bi-metallic strip and heat coil. By operation of this switch, the cold start injector is controlled for its injection time when starting the engine at a low engine coolant temperature so that the fuel is injected by the amount optimum for the particular temperature then. The lower the coolant temperature, the longer the injection time.

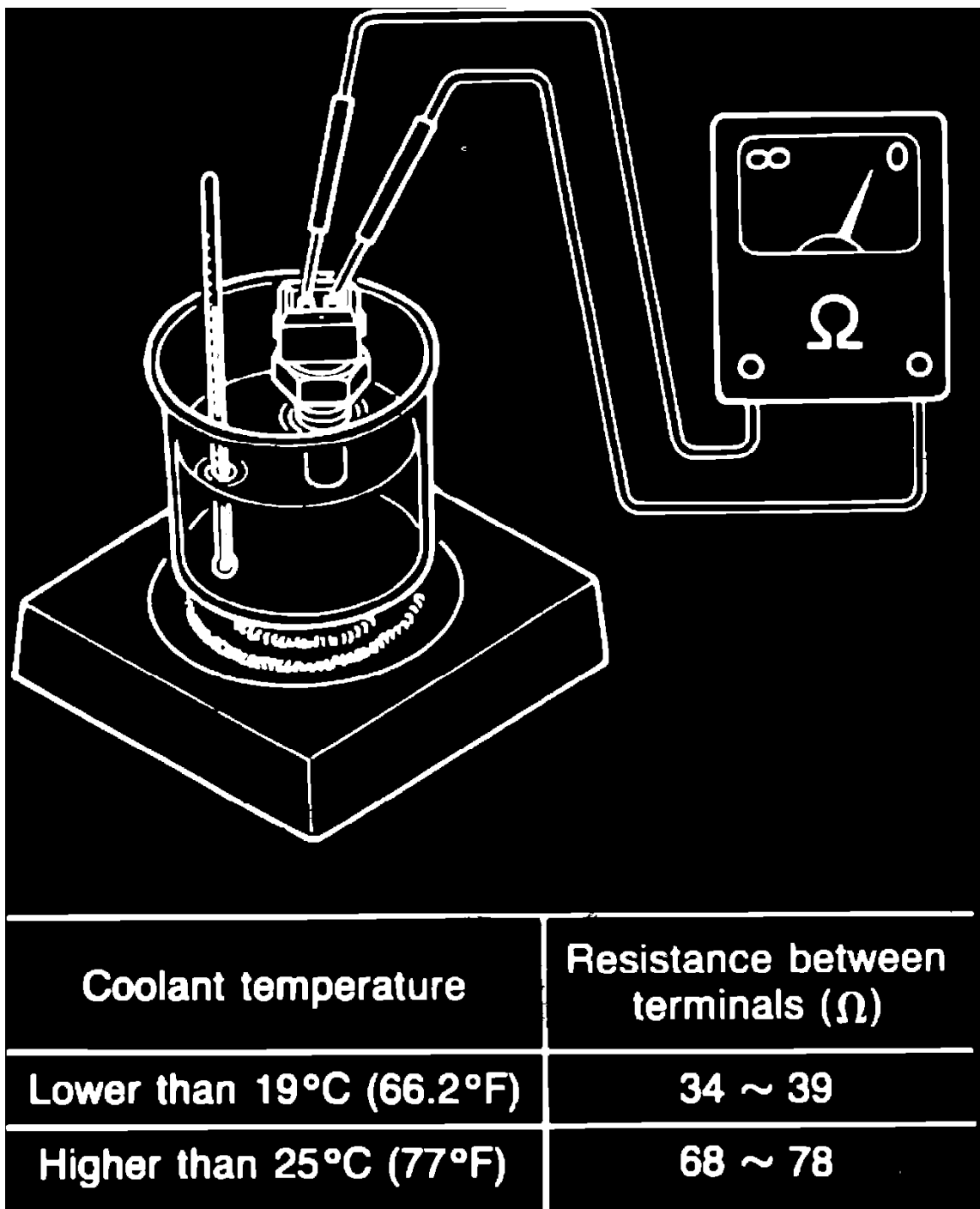
**Thermo Time Switch: Testing and Inspection**

Fig. 14 Checking starter injector time switch

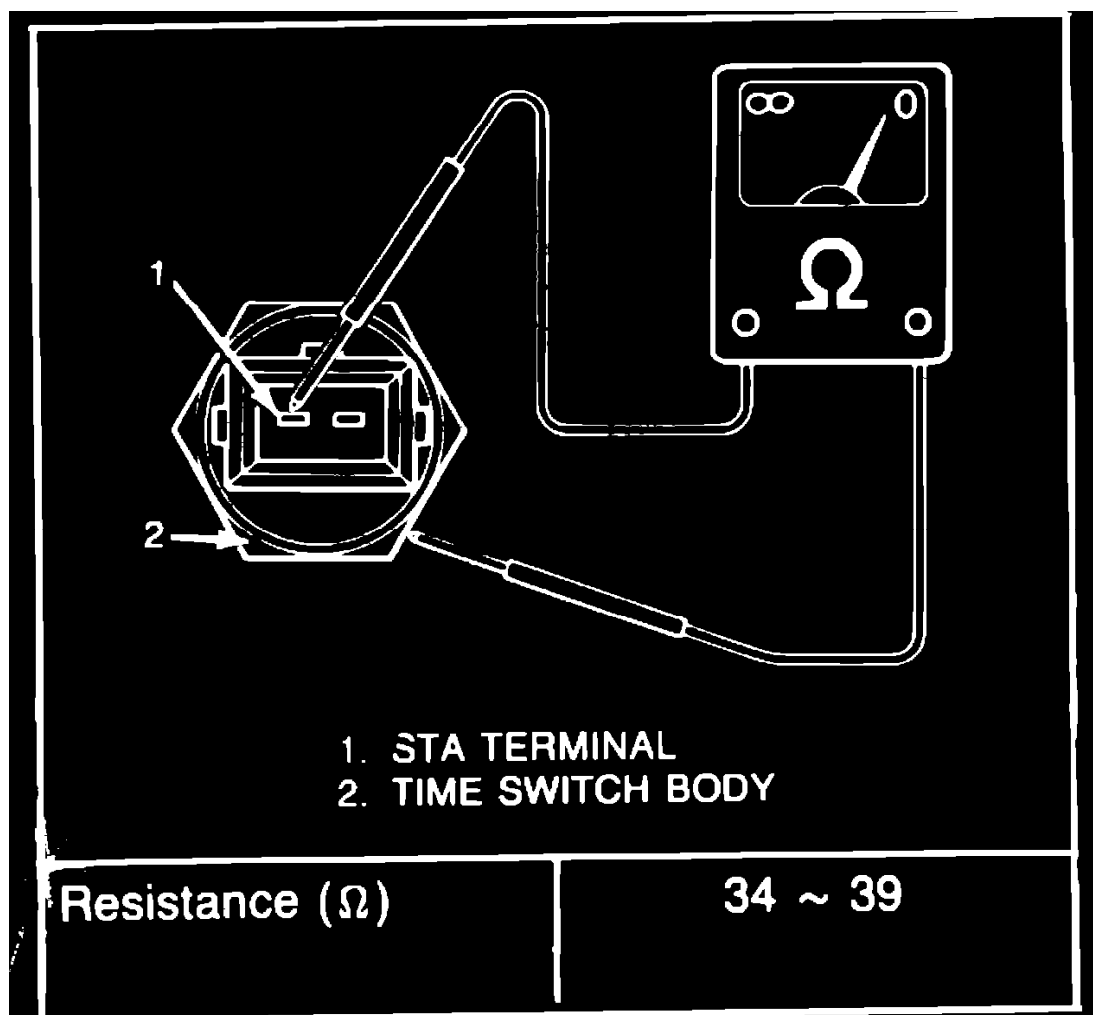


Fig. 15 Checking starter injector time switch terminal

1. Gradually warm switch, then check for specified resistance at temperatures shown, Fig. 14.
2. Check resistance between starter injector time switch body and STA terminal as shown, Fig. 15.

## Idle Switch: Testing and Inspection

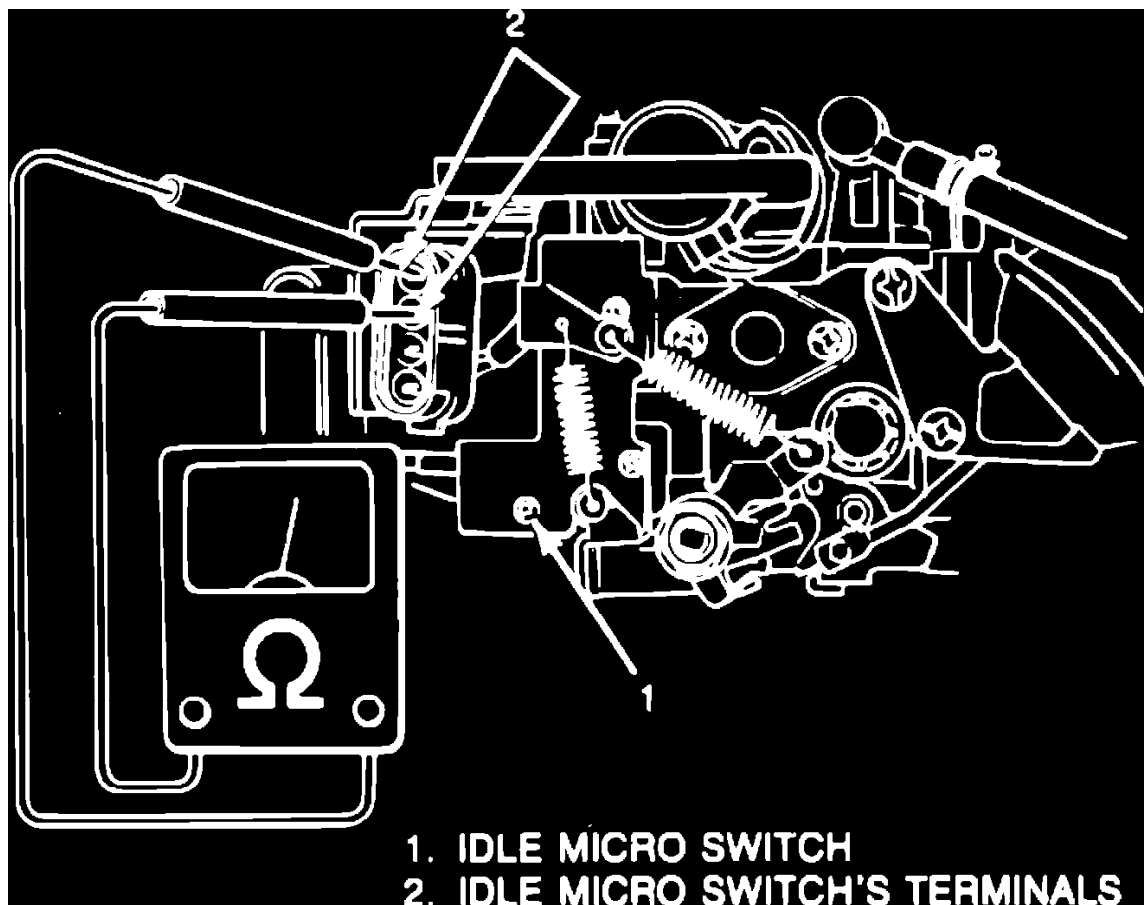


Fig. 10 Idle micro switch test connections

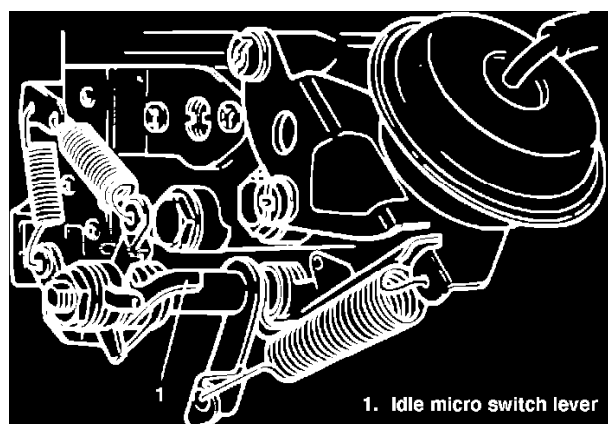


Fig. 47 Idle micro switch lever. 1987 - 88 models

### Diagnostic Code 21, Idle Microswitch

1. Start engine and allow to reach normal operating temperature.
2. Disconnect microswitch electrical connector, **Fig. 10**, and connect an ohmmeter to switch terminals.
3. Check that ohmmeter indicates zero ohms with engine at idle.
4. Connect tachometer to engine.
5. Gradually increase engine speed from idle speed. Check that engine speed is in range of 1500 - 2400 RPM when ohmmeter indicates infinite resistance. If speed is outside of range, adjust by bending lever as shown in **Fig. 47**.



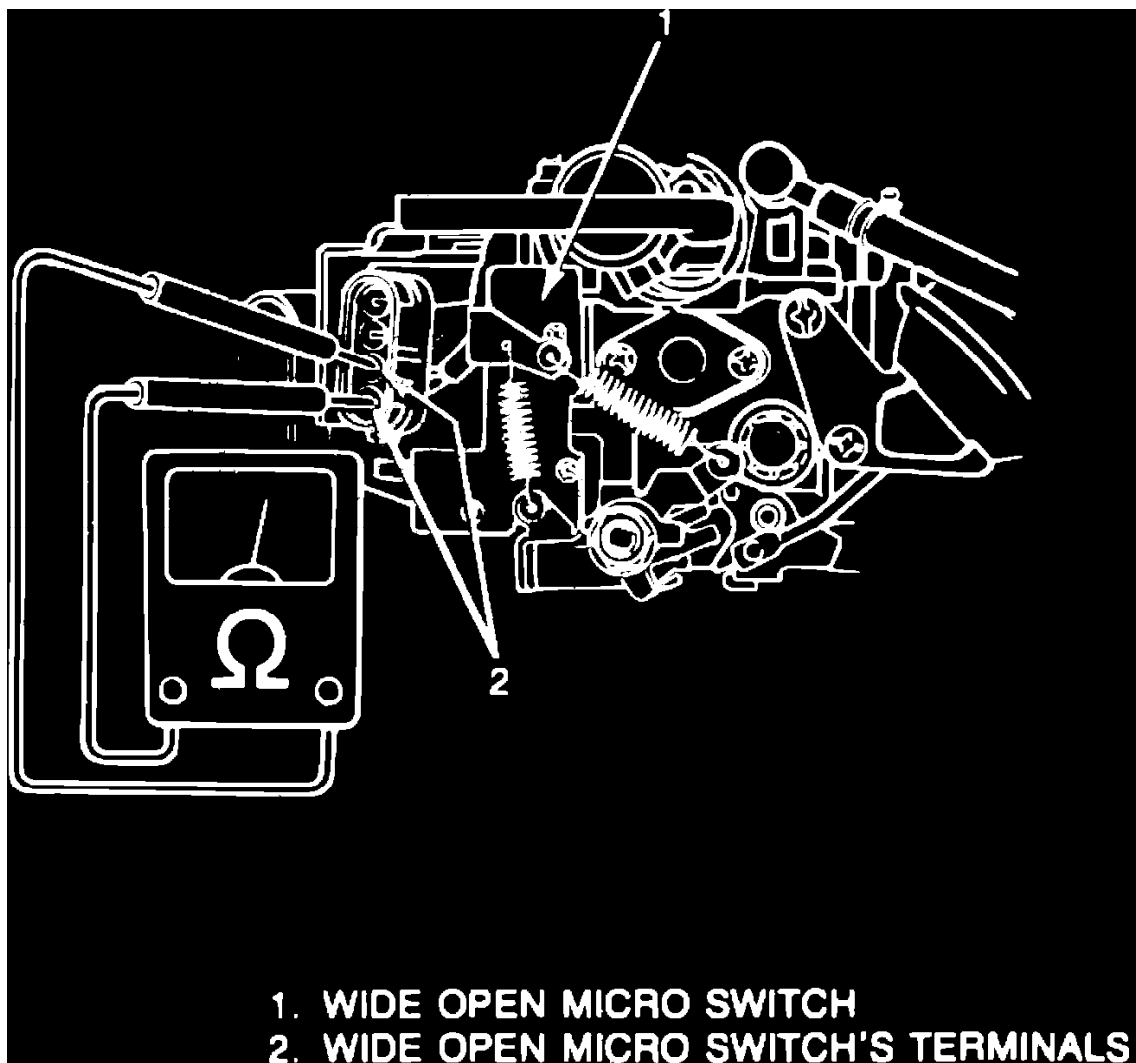


Fig. 12 Wide open throttle micro switch test connections

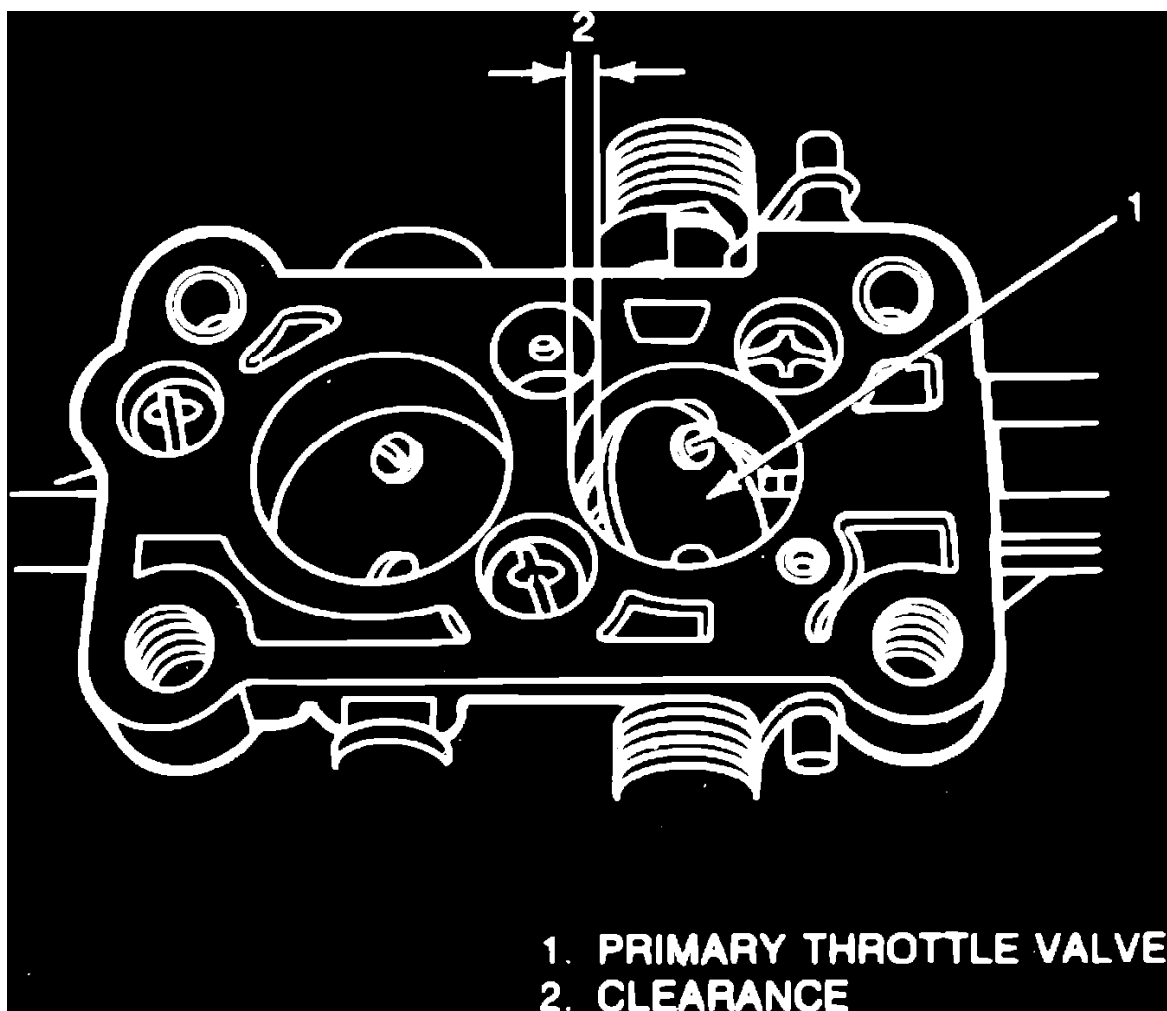


Fig. 13 Throttle plate clearance measurement

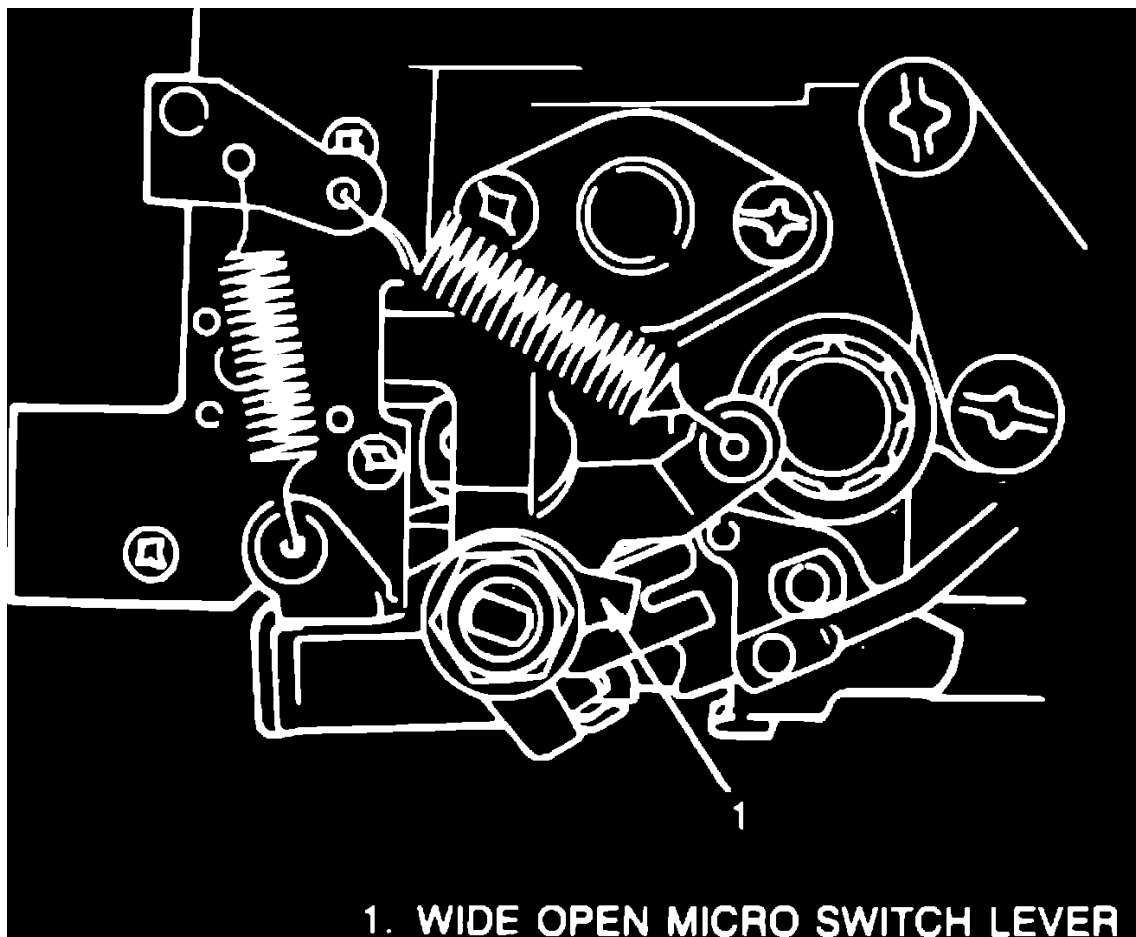


Fig. 14 Wide open throttle micro switch adjustment

**Diagnostic Code 21, Wide Open Throttle Microswitch**

1. Remove air cleaner and carburetor.
2. Connect ohmmeter to switch as shown in **Fig. 12**. Resistance between terminals should be infinite.
3. Open throttle gradually until ohmmeter indicates zero ohm. Measure clearance between throttle butterfly and carburetor bore, **Fig. 13**. Clearance should be .29 - .33 inch (7.2 - 8.4 mm). If clearance is out of range, adjust by bending lever, **Fig. 14**.

## Throttle Full Open Switch: Testing and Inspection

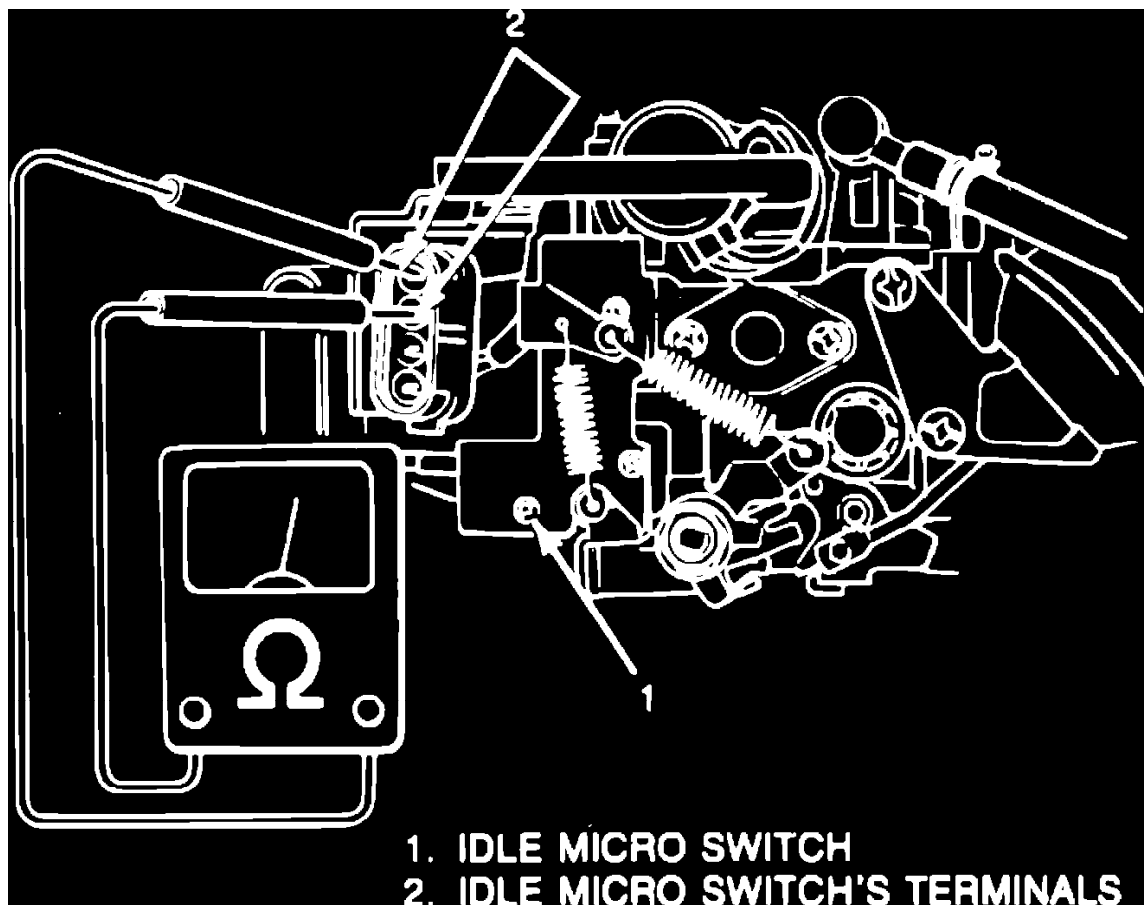


Fig. 10 Idle micro switch test connections

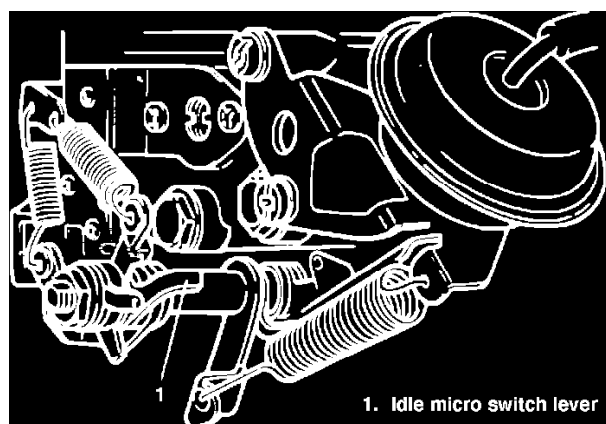


Fig. 47 Idle micro switch lever. 1987 - 88 models

### Diagnostic Code 21, Idle Microswitch

1. Start engine and allow to reach normal operating temperature.
2. Disconnect microswitch electrical connector, **Fig. 10**, and connect an ohmmeter to switch terminals.
3. Check that ohmmeter indicates zero ohms with engine at idle.
4. Connect tachometer to engine.
5. Gradually increase engine speed from idle speed. Check that engine speed is in range of 1500 - 2400 RPM when ohmmeter indicates infinite resistance. If speed is outside of range, adjust by bending lever as shown in **Fig. 47**.

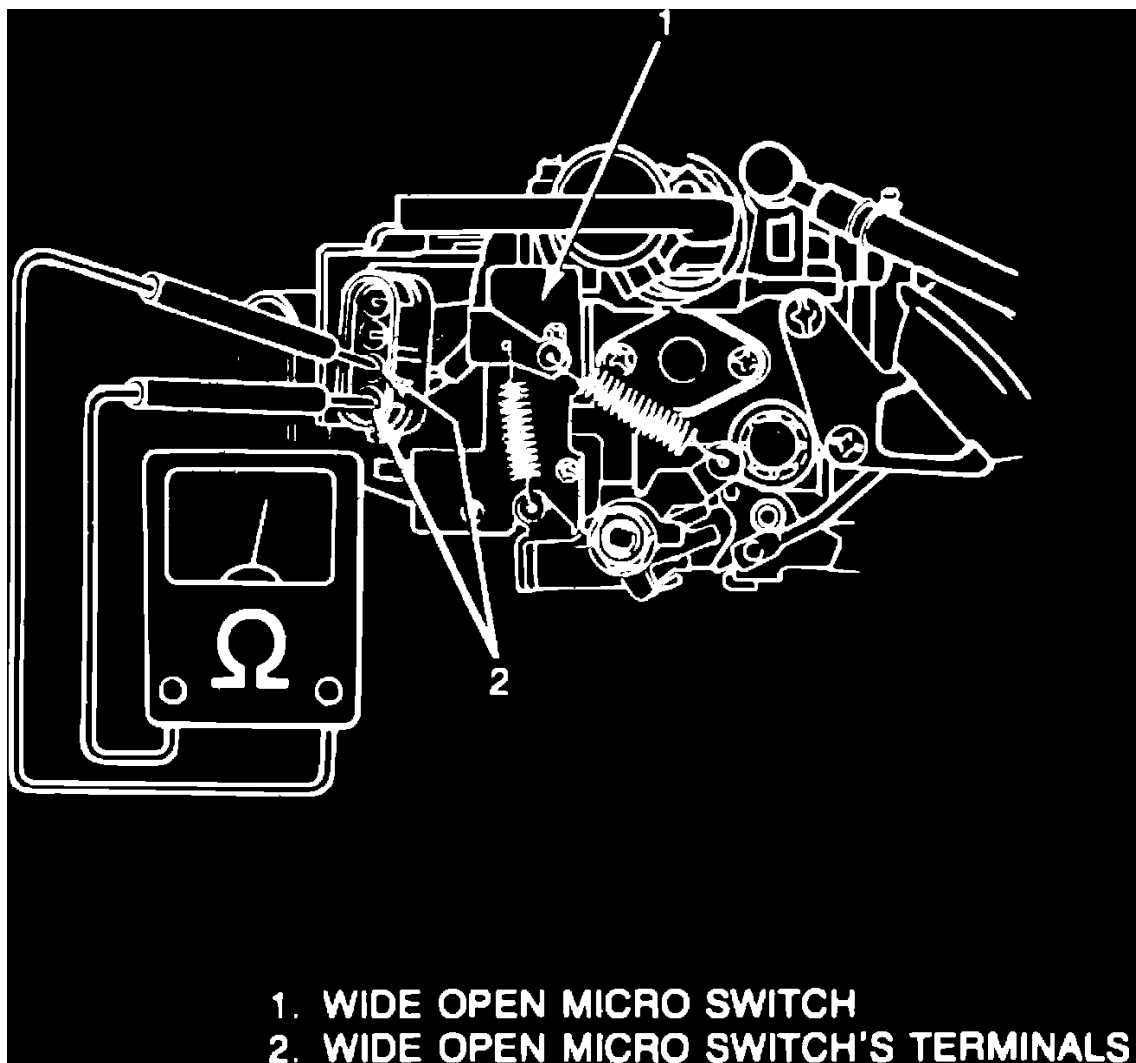


Fig. 12 Wide open throttle micro switch test connections

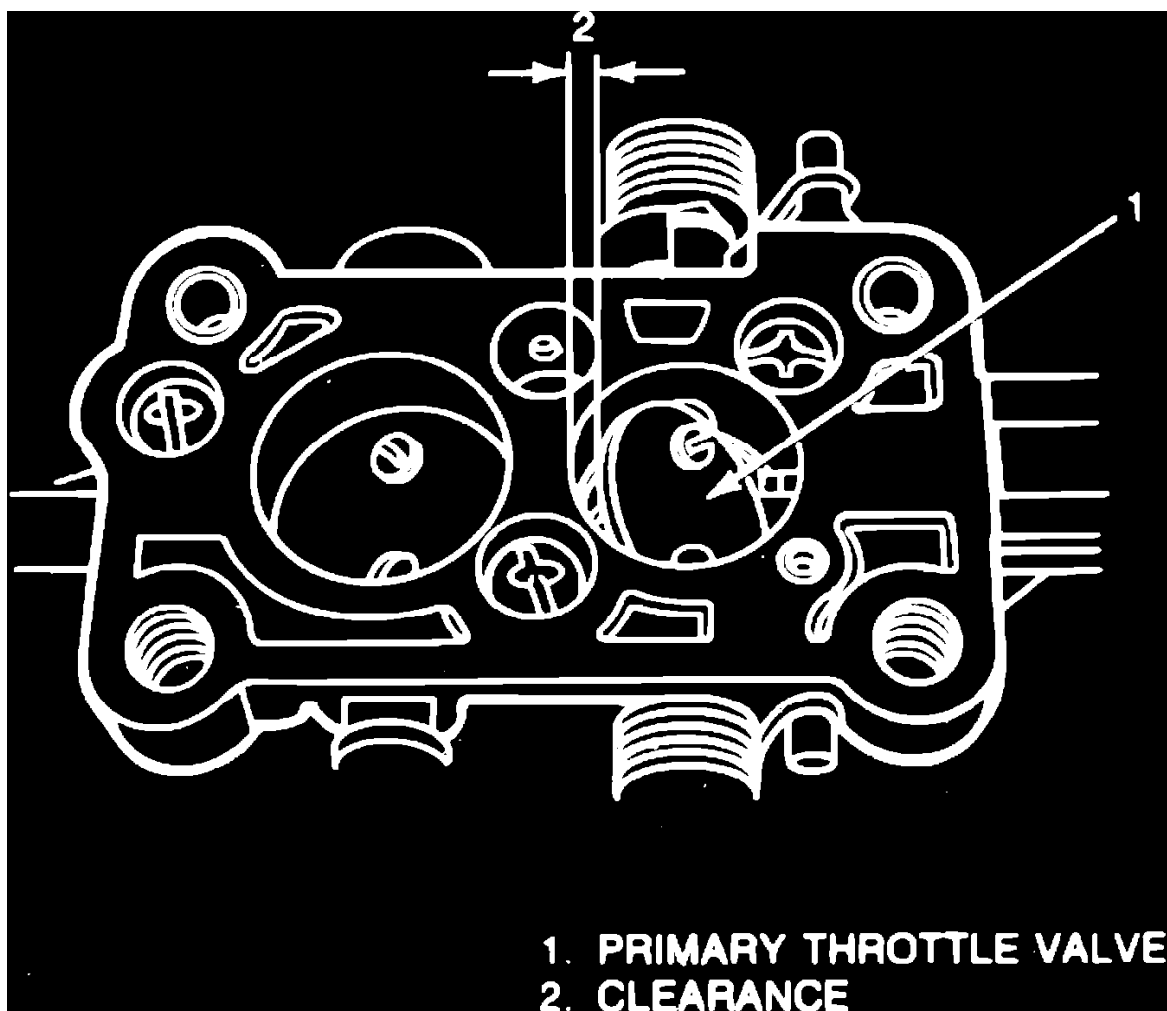


Fig. 13 Throttle plate clearance measurement

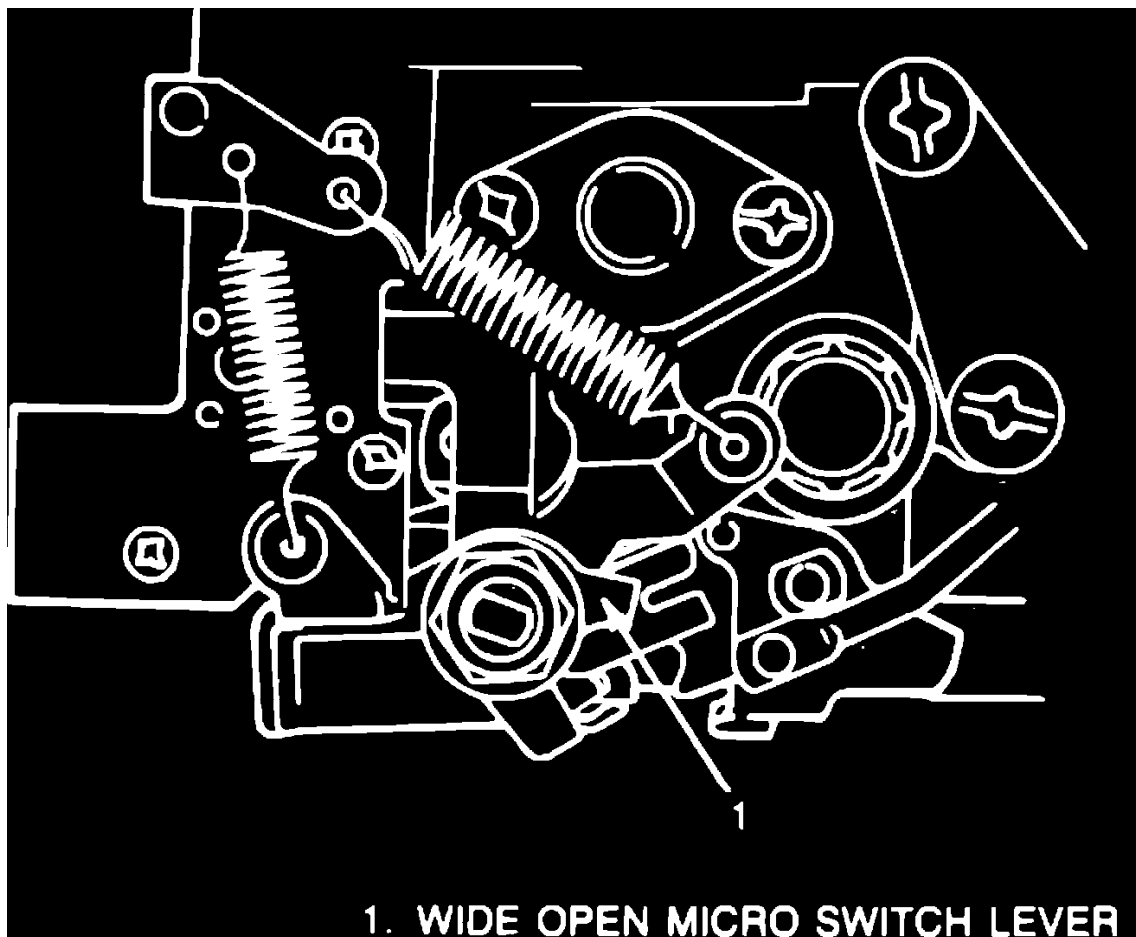
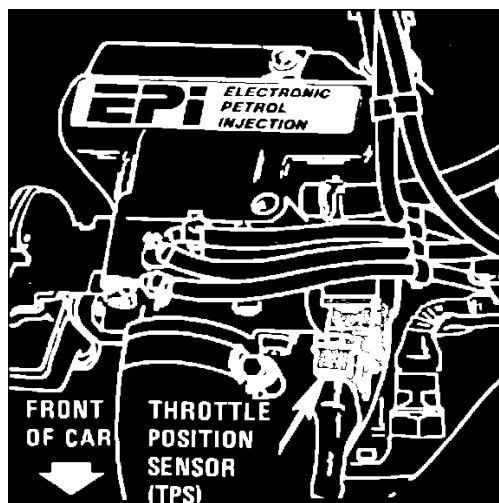


Fig. 14 Wide open throttle micro switch adjustment

**Diagnostic Code 21, Wide Open Throttle Microswitch**

1. Remove air cleaner and carburetor.
2. Connect ohmmeter to switch as shown in **Fig. 12**. Resistance between terminals should be infinite.
3. Open throttle gradually until ohmmeter indicates zero ohm. Measure clearance between throttle butterfly and carburetor bore, **Fig. 13**. Clearance should be .29 - .33 inch (7.2 - 8.4 mm). If clearance is out of range, adjust by bending lever, **Fig. 14**.

## Throttle Position Sensor: Locations



Top Of Engine

LH Side Of Engine

Applicable to: Turbo



## Throttle Position Sensor: Testing and Inspection

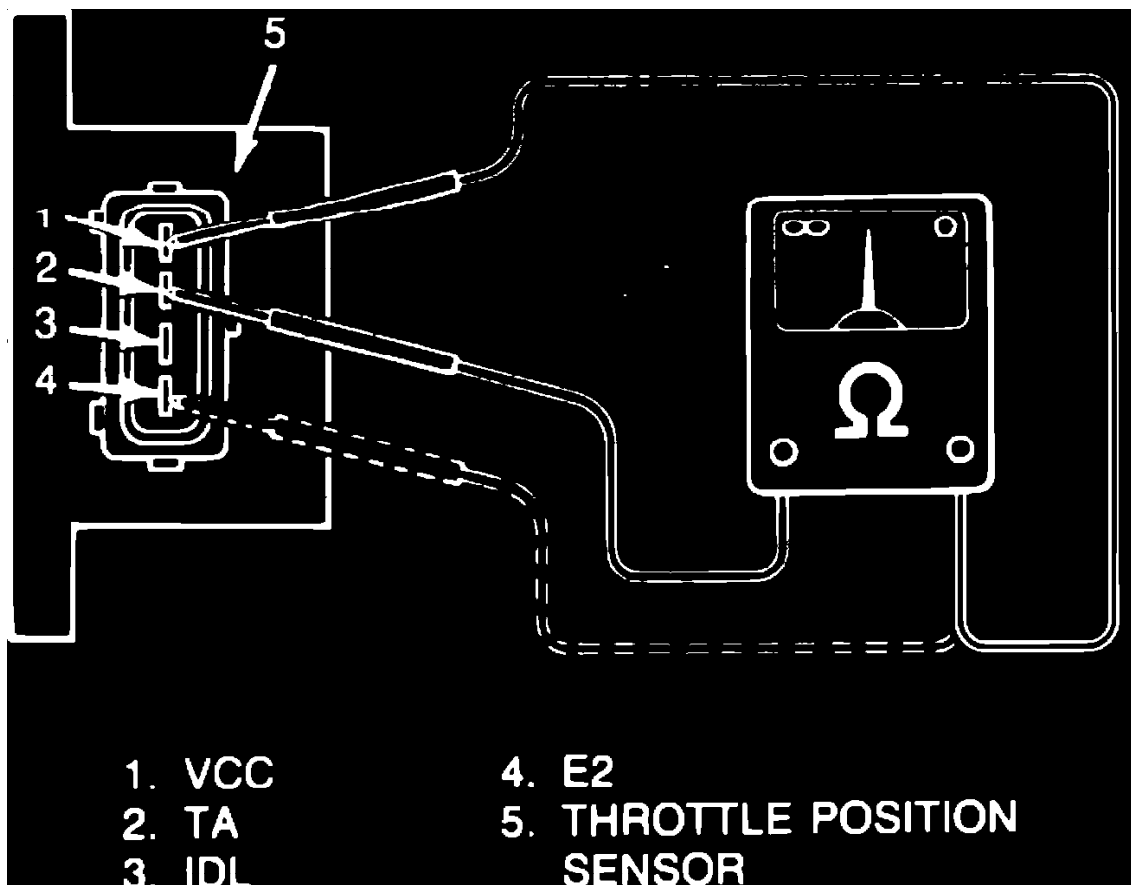


Fig. 11 Checking throttle position sensor (VCC-TA & TA-E2)

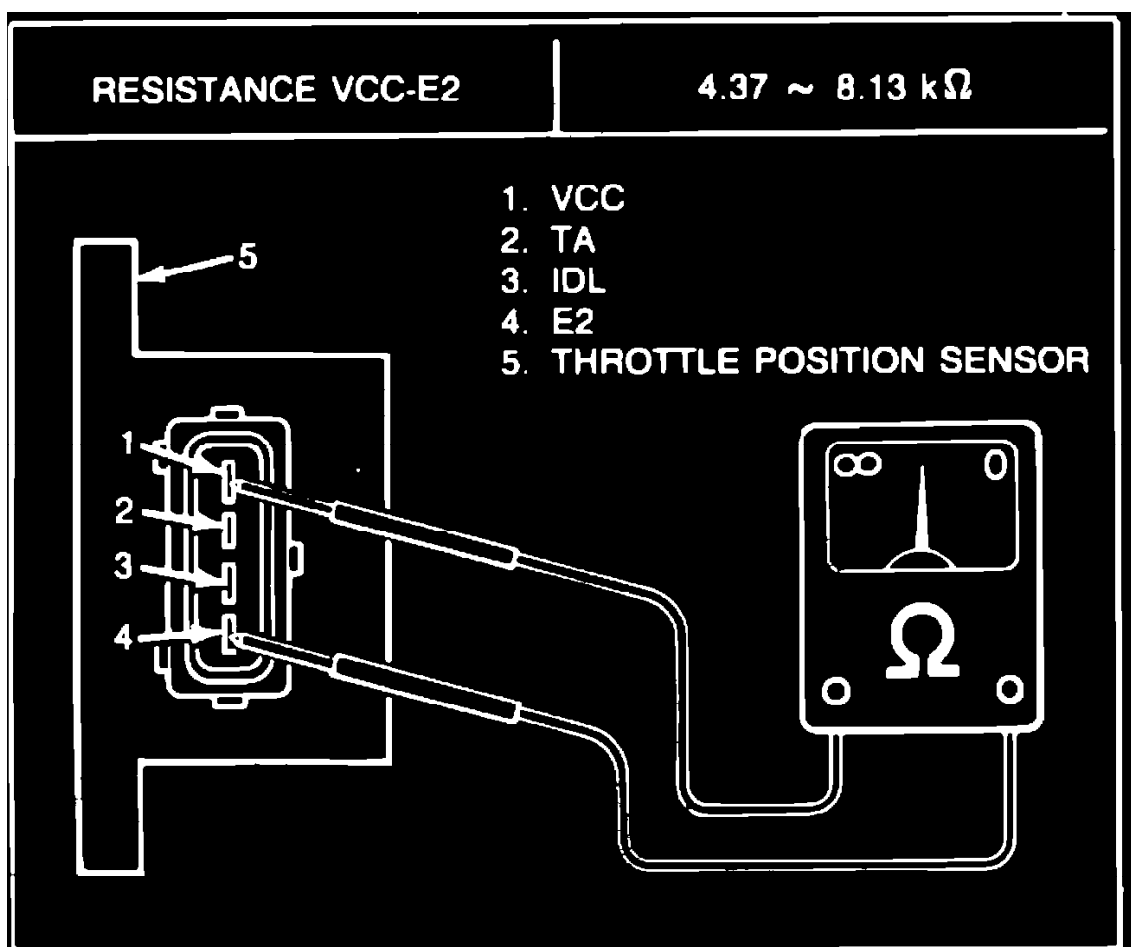


Fig. 12 Checking throttle position sensor (VCC-E2)

1. Check continuity between VCC-TA and TA-E2. Although a value is given, only a continuity check is necessary, Fig. 11.

## Chevrolet Sprint L3-61 1.0L

2. Check that throttle lever contacts throttle stopper bolt when when throttle valve is fully closed.
3. Check for continuity after inserting a .016 inch thick gauge between throttle lever and throttle stopper bolt. Continuity should exist. Continuity should not exist when a .031 inch thick gauge is inserted. If check is not as specified, adjust installation angle throttle position angle as described under ``Throttle Position Sensor, Replace" procedure.
4. Check resistance of VCC-E2 as described, **Fig. 12.**

## Throttle Position Sensor: Service and Repair

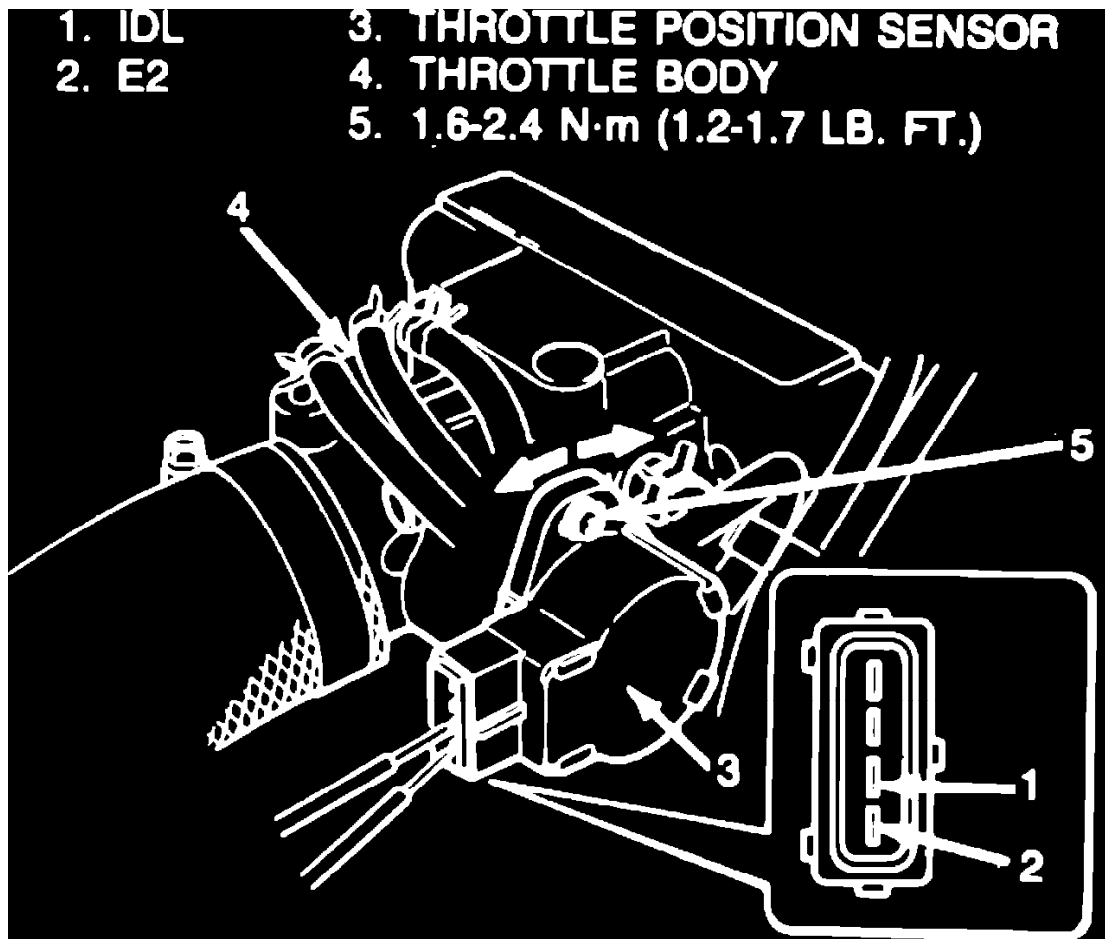


Fig. 20 Installing throttle position sensor

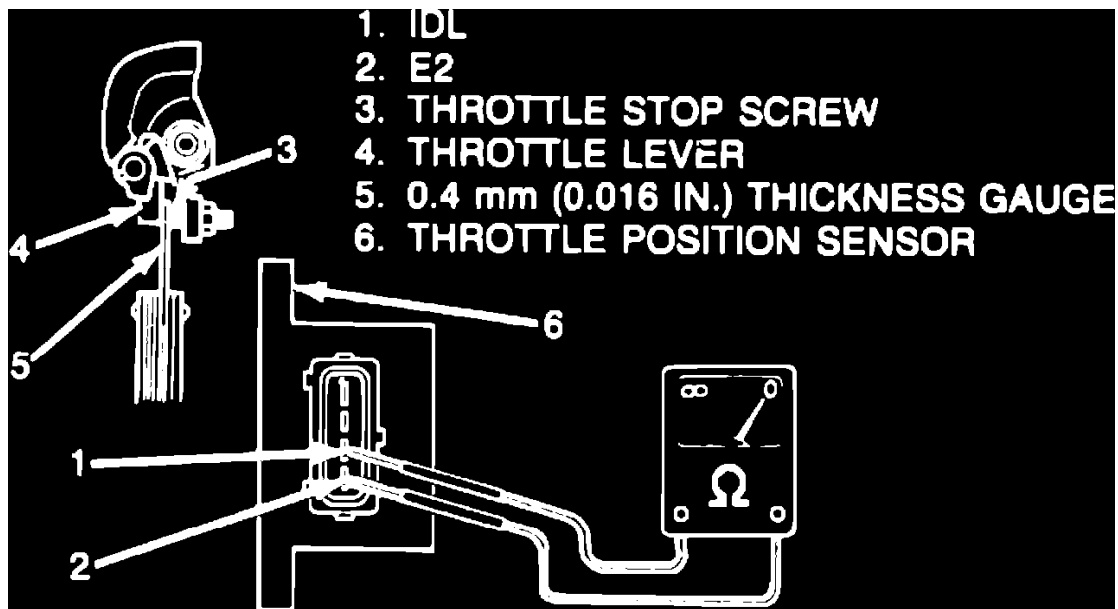


Fig. 21 Adjusting throttle position sensor

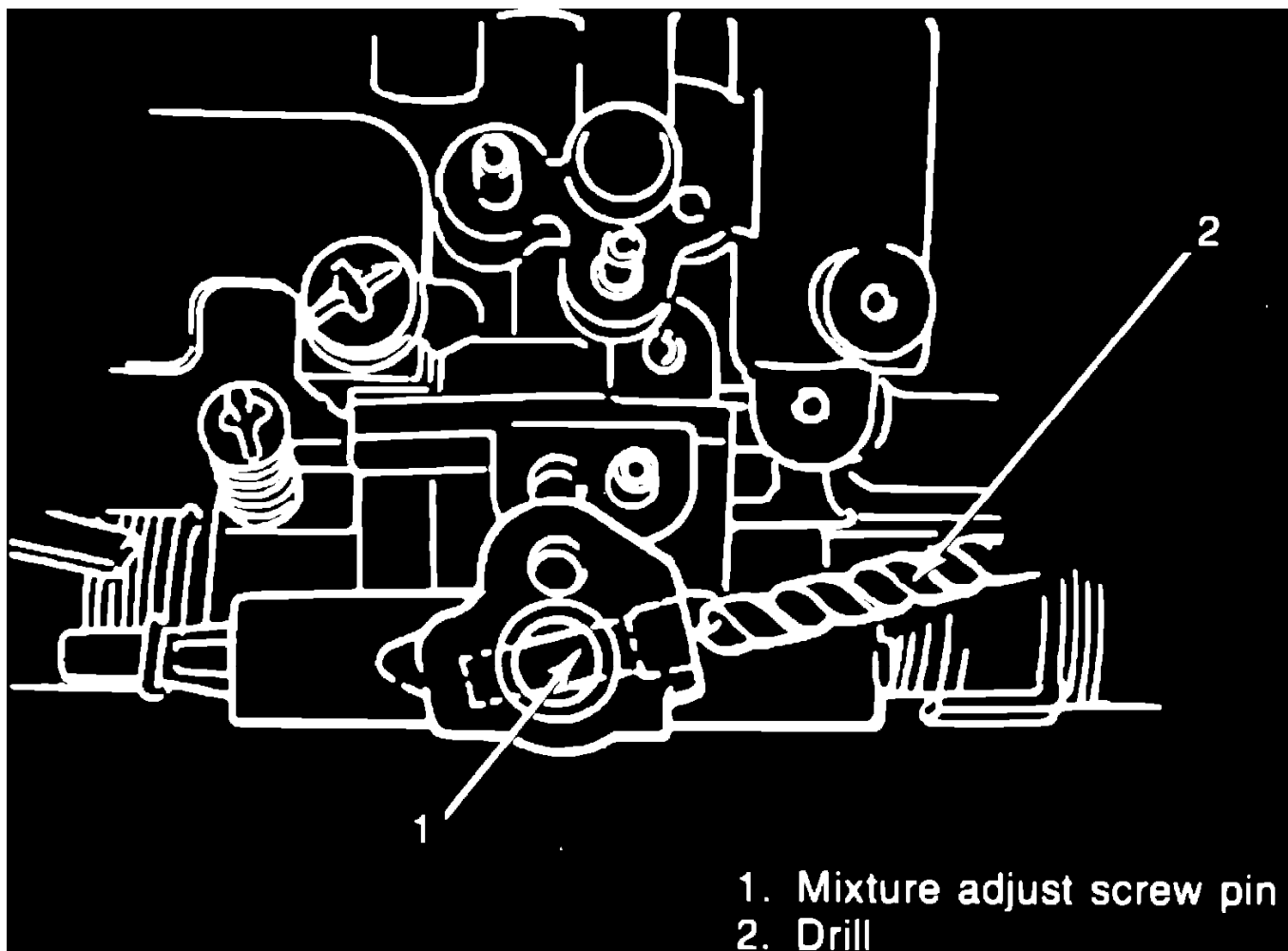
### Replace

1. Remove throttle position attaching screws, then the throttle position sensor from throttle body.
2. Install new throttle position sensor on throttle body, then insert and temporarily tighten attaching bolts so that installation angle of sensor can be adjusted.
3. Adjust angle of throttle position as follows:
  - a. Insert a .024 inch thickness gauge between throttle stop screw and throttle lever. Move throttle position lever as necessary until continuity between terminals IDL and E2 is present, **Fig. 20**. At that position, torque sensor screw to 1.2 - 1.7 ft. lbs.
  - b. Ensure no continuity exists between IDL and E2 of throttle position sensor when a .031 inch thickness gauge is inserted between throttle stop screw and throttle lever, **Fig. 21**.
  - c. Ensure continuity exists between terminals IDL and E2 of throttle position sensor when .016 inch thick gauge is inserted between throttle stop screw and throttle lever.

## **Chevrolet Sprint L3-61 1.0L**

- d. If checks are not as specified, adjust angle of throttle position sensor until satisfactory results are obtained.
4. Connect connector to throttle position sensor.

## Throttle Body: Service and Repair

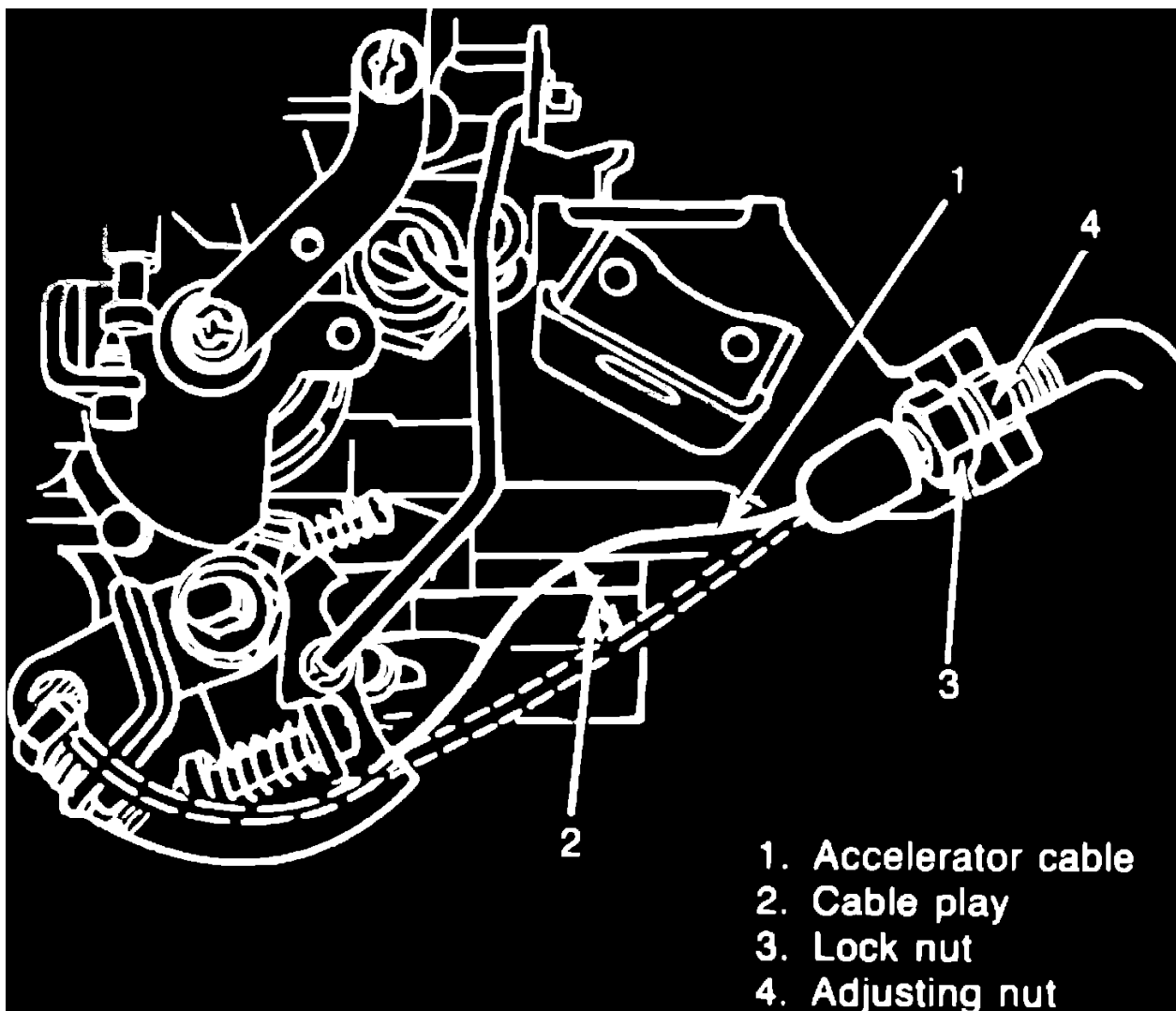


**Fig. 10 Mixture adjusting screw pin removal**

The idle mixture adjusting screw is recessed into the throttle body and blocked by a steel pin to prevent tampering. Idle mixture should not be adjusted unless carburetor is overhauled or diagnosis indicates the carburetor as the cause of driveability or emissions related complaints. If idle mixture adjustment is required, remove pin sealing adjusting screw using the following procedure:

1. Remove carburetor from manifold.
2. Drill hole in pin as shown in **Fig. 10**, using 4 - 4.5 mm drill bit.
3. Drive pin from throttle body using suitable drift, supporting throttle body to prevent breakage.
4. Install carburetor, then adjust idle mixture as required.

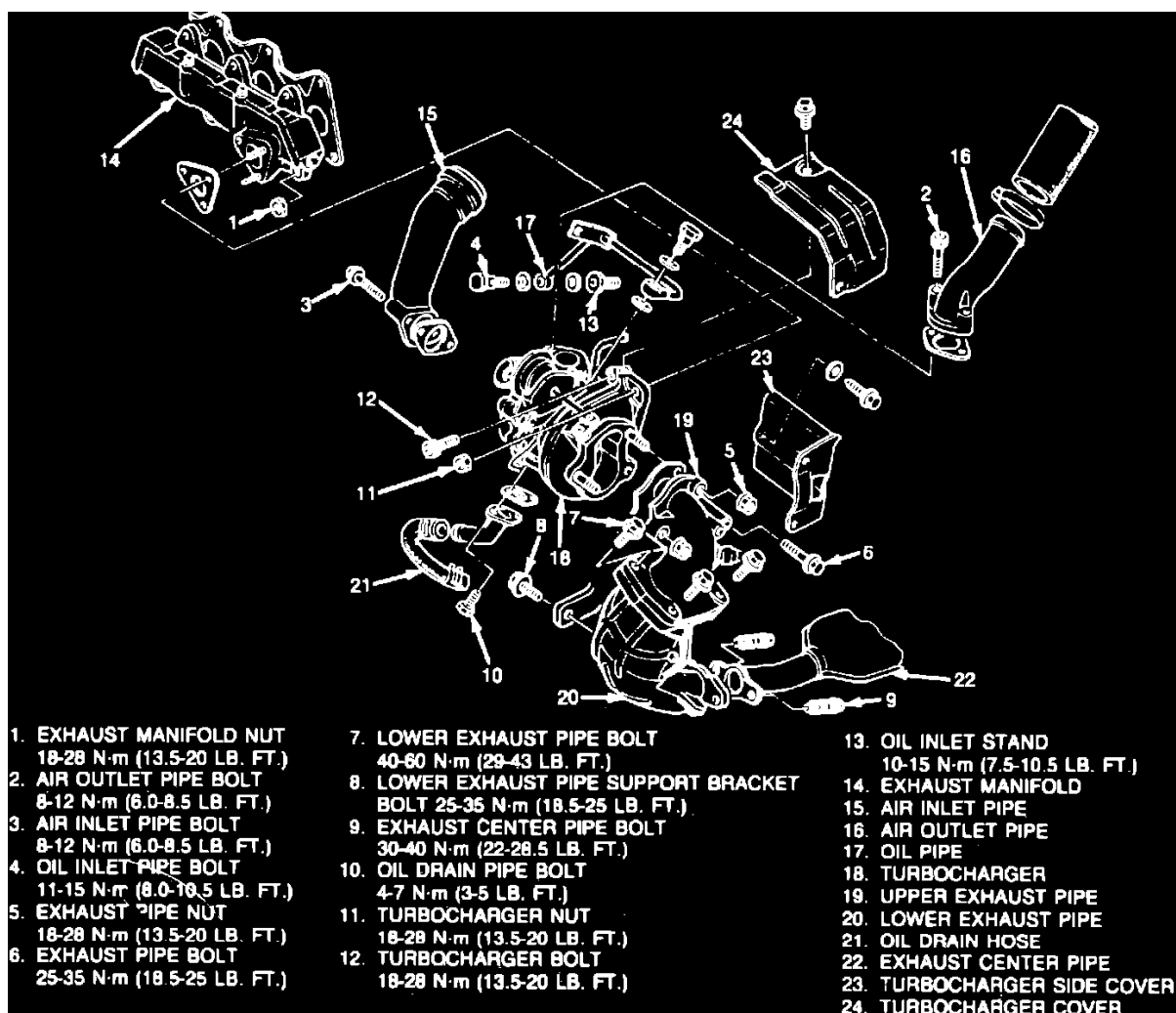
## Throttle Cable/Linkage: Adjustments



**Fig. 9 Accelerator cable adjustment**

1. Check freeplay of accelerator cable between cable bracket and throttle lever, **Fig. 9**.
2. Freeplay should be .40 - .59 inch with engine cold and .12 - .19 inch with engine at normal operating temperature.
3. If freeplay is not within specifications, loosen cable adjuster locknut and turn adjusting nut as needed to obtain specified play, **Fig. 9**.
4. Securely tighten locknut while holding adjusting nut, then recheck cable freeplay.

## Turbocharger: Description and Operation



**Fig. 1 Turbocharger assembly**

The turbocharger, **Fig. 1**, is a mechanism used to increase horsepower. The high temperature and high pressure and high energy of the exhaust gas runs the exhaust turbine. The compressor is on the same shaft as the turbine. The compressor is on the same shaft as the turbine, and is driven to compress the air drawn in. This allows more air to enter the combustion chamber and the power strokes become stronger. The turbocharger is installed on the exhaust manifold and consists of a turbine wheel which utilizes energy in the exhaust gasses to drive the compressor; a compressor wheel which compresses the intake air and supercharges it to the intercooler; a center bearing and center housing which retains the shaft linking the compressor wheel and turbine wheel; a compressor housing and turbine housing which guides the intake air and exhaust gasses and a wastegate valve which controls the turbocharged pressure.

The shaft rotates at a speed as high as a hundred thousand RPM. A full floating type bearing is used for the center bearing which retains the shaft. With the full floating bearing, the bearing can rotate freely between the shaft and housing. As the oil is filled between shaft and bearing as well as bearing and housing, the shaft vibration is absorbed. Also, as the bearing rotates, the relative slip velocity with the shaft reduced.

The turbocharger bearings are lubricated by engine oil and cooled by engine coolant. The engine oil drawn from the main gallery in the cylinder block wall is delivered through the oil pan into the turbocharger center housing. There it lubricates the bearings and flows through the oil drain hose back to the oil pan.

## **Turbocharger: Testing and Inspection Troubleshooting**

### **INSUFFICIENT ENGINE OUTPUT**

#### **Low Supercharged Pressure**

1. Defective wastegate valve.
2. Defective relief valve.
3. Compressed air leakage.
4. Exhaust gas leakage.
5. Defective turbocharger.

### **RELIEF VALVE IN OPERATION**

1. Defective wastegate valve.

### **“CHECK ENGINE” LAMP, ON**

1. Defective wastegate valve and relief valve.

### **FREQUENT ENGINE KNOCK**

#### **Excessive Supercharged Pressure**

1. Wastegate valve, relief valve and ECM fuel cut operation all simultaneously defective.

### **TOO WHITE EXHAUST GAS**

1. Defective turbocharger oil seal.



## Turbocharger: Service and Repair

### TURBOCHARGER, REPLACE

1. Disconnect battery ground cable.
2. Drain cooling system, then mark position of hood and remove.
3. Remove four front grille attaching screws, then pull grill outward to remove.
4. Remove intercooler attaching bolts, then the intercooler.
5. Remove radiator hoses, then the radiator fan motor connector.
6. Remove front upper member, then the A/C condenser, if equipped.
7. Remove radiator attaching bolts, then the radiator.
8. Support front bumper with a suitable stand, then remove connectors, clamps and front bumper attaching bolts. Pull bumper outward, then separate bumper from damper flange.
9. Remove exhaust pipe attaching bolts, then the exhaust pipe.
10. On models with A/C, remove compressor attaching bolts, then the compressor.
11. Remove turbocharger cover, then disconnect oxygen sensor wire.
12. Remove turbocharger side cover, then lower exhaust pipe support bracket bolt.
13. Remove upper and lower exhaust pipe, then the air outlet pipe.
14. Remove air inlet hose clamp from cylinder head, then the air inlet pipe.
15. Remove oil pipe from cylinder block, then the oil drain hose.
16. Remove water pipe cylinder head clamp attaching bolt, then the water hose.
17. Remove turbocharger assembly.
18. Reverse procedure to install.

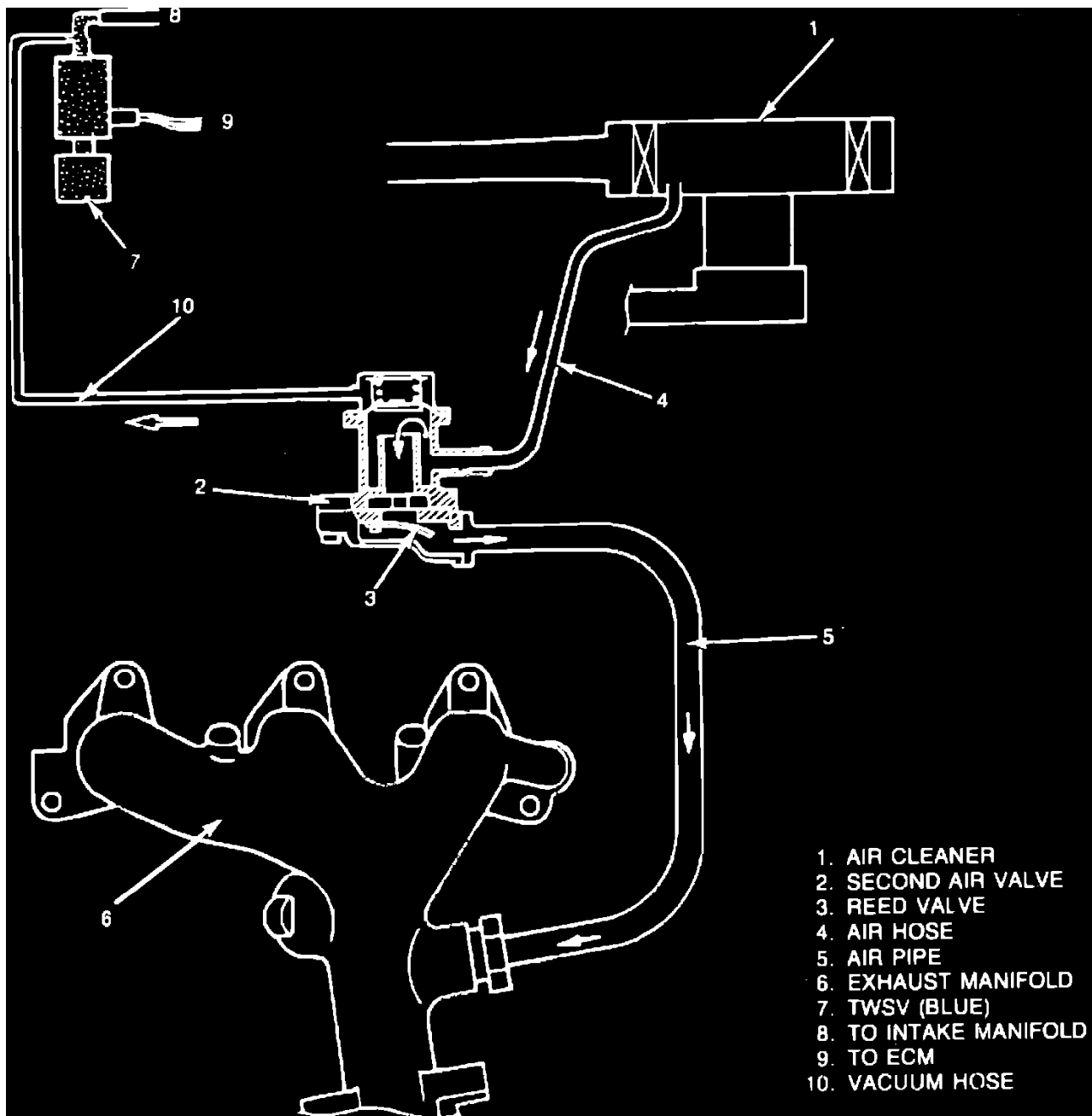
### INTERCOOLER, REPLACE

1. Remove intercooler cover.
2. Remove intercooler inlet and outlet hoses.
3. Remove intercooler attaching bolts, then the intercooler.
4. Remove intercooler relief valve from intercooler.
5. Reverse procedure to install.

### AIR CLEANER, REPLACE

1. Remove air flow meter bracket.
2. Remove air cleaner cap.
3. Remove air cleaner element.
4. Install new air cleaner element.
5. Install air cleaner cap, with positioning lug of air cleaner cap aligned with dent in air cleaner case.
6. Install air flow meter bracket.

## Pulsair Valve: Description and Operation



**Fig. 26** Pulse air control (secondary air control) system schematic

This system reduces HC and CO emissions during cold engine operation or deceleration by supplying secondary air into the exhaust manifold, **Fig. 26**. System operation is controlled by the ECM through a Three-Way Solenoid Valve (TWSV). According to the signal received from the ECM, the TWSV applies intake manifold vacuum to the second air valve, **Fig. 26**. This allows the reed valve, which responds to exhaust system pulsation, to draw filtered air into the exhaust manifold where it aids the combustion of HC and CO.

## Emissions Maintenance Light: Testing and Inspection

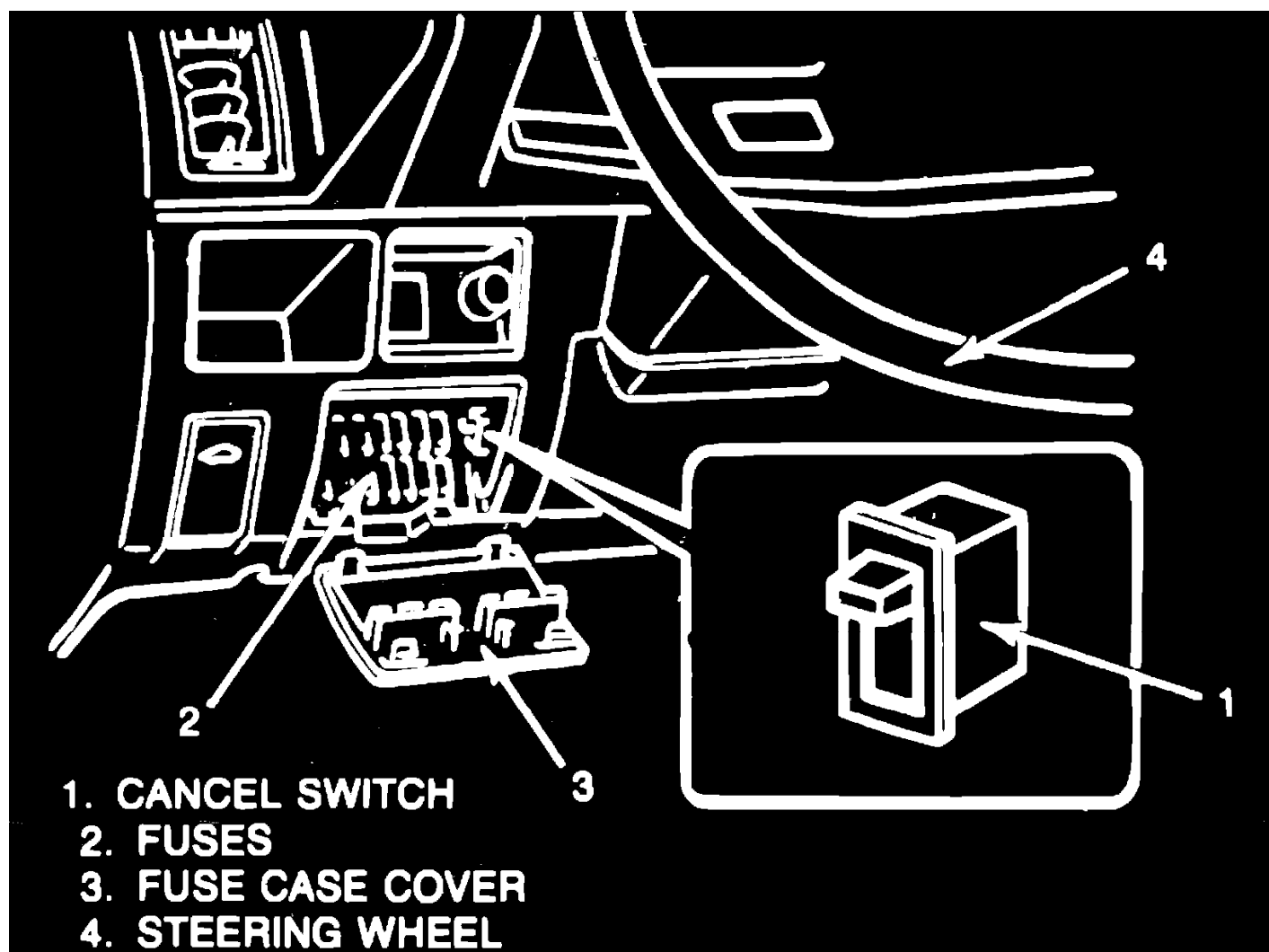


Fig. 6 Oxygen sensor indicator lamp cancel switch

OXYGEN SENSOR  
1985 - 86

A "Sensor" lamp is included on the instrument panel to indicate proper operation of the oxygen sensor feedback circuit. Every 30,000 miles of vehicle operation, the lamp will begin to flash. When the lamp begins to flash, the feedback circuit should be checked and the lamp reset using the following procedure.

1. Ensure that ignition switch is off, remove fuse panel cover and move cancel switch to on position, **Fig. 6**.
2. Turn ignition switch to on position and observe "Sensor" lamp. If lamp does not light (without flashing), check for defective bulb or open feed circuit and repair as needed.
3. After lighting of lamp is confirmed, start engine and run until it reaches normal operating temperature.
4. Run engine at 1500 - 2000 RPM while observing lamp.
5. If lamp flashed, system is operating properly. If lamp does not flash, refer to "Computer Controlled Emission Control System" section for diagnosis and testing procedures.
6. After proper system operation has been verified, place cancel switch in off position to reset automatic indicator system.

## Evaporative Emissions System: Description and Operation

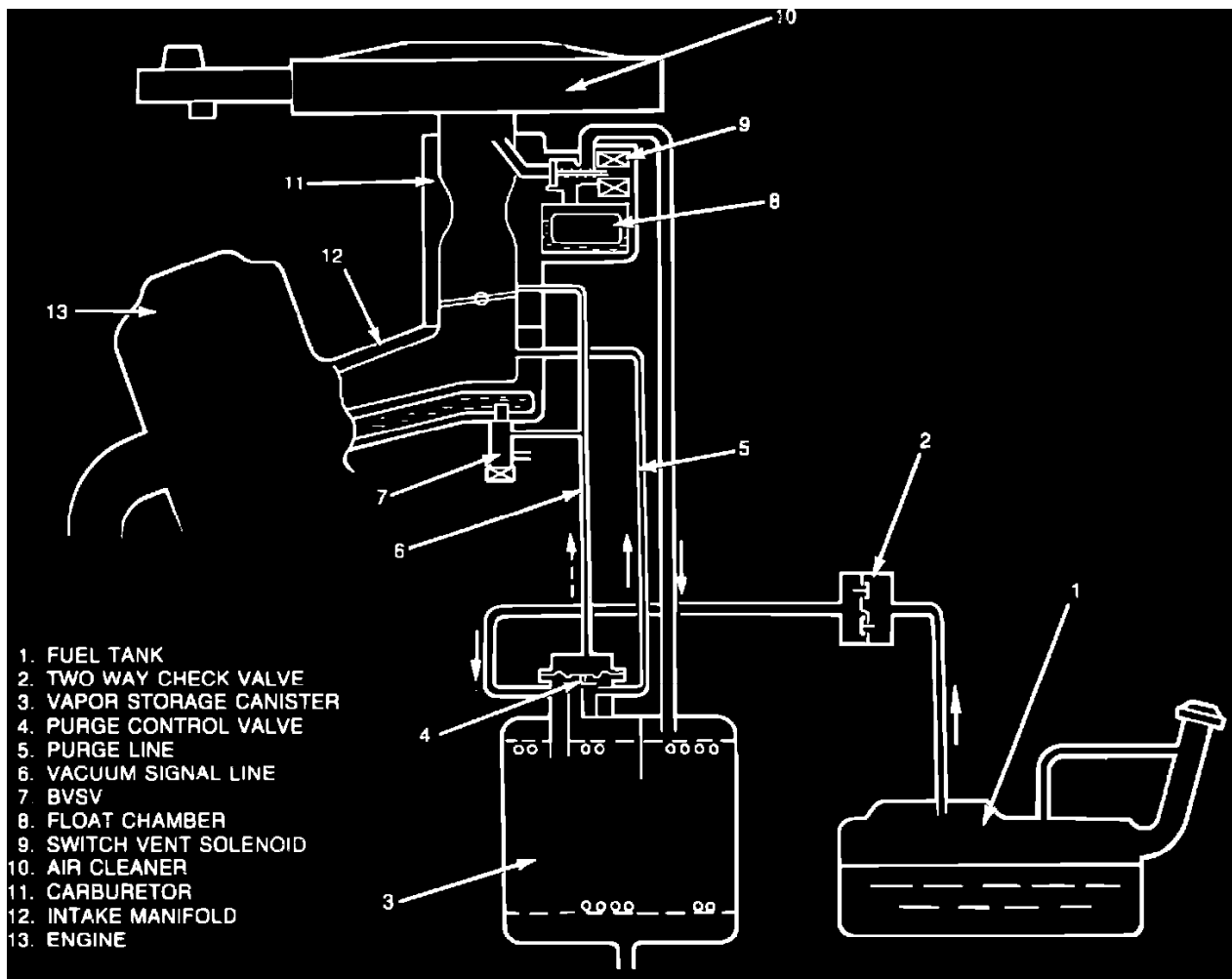
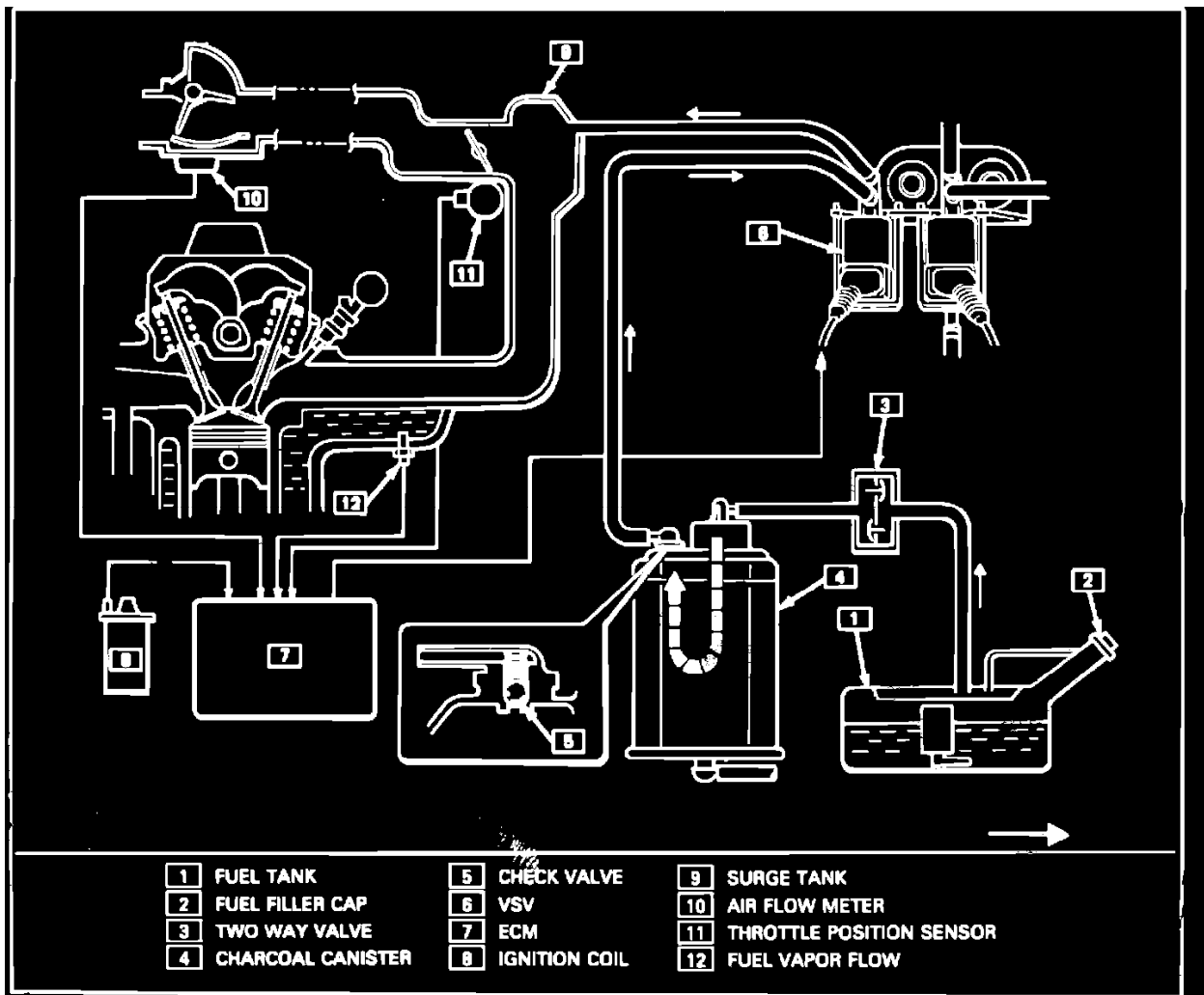
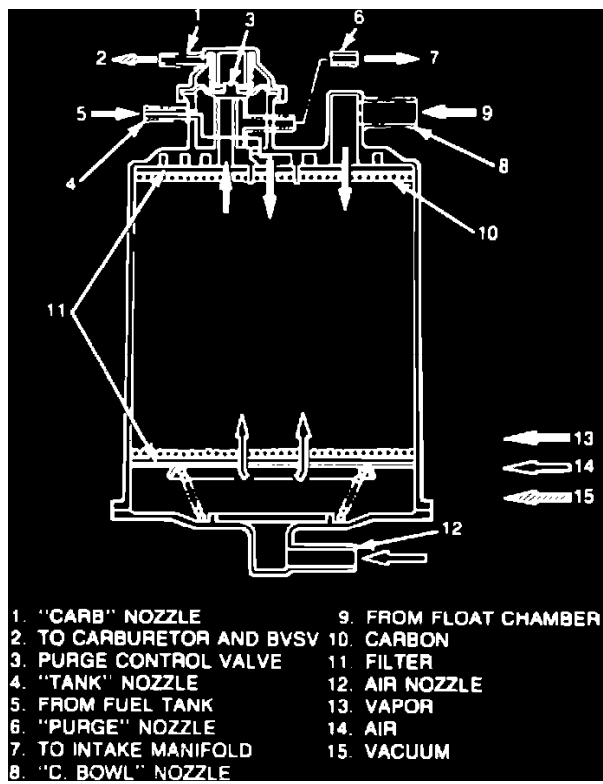


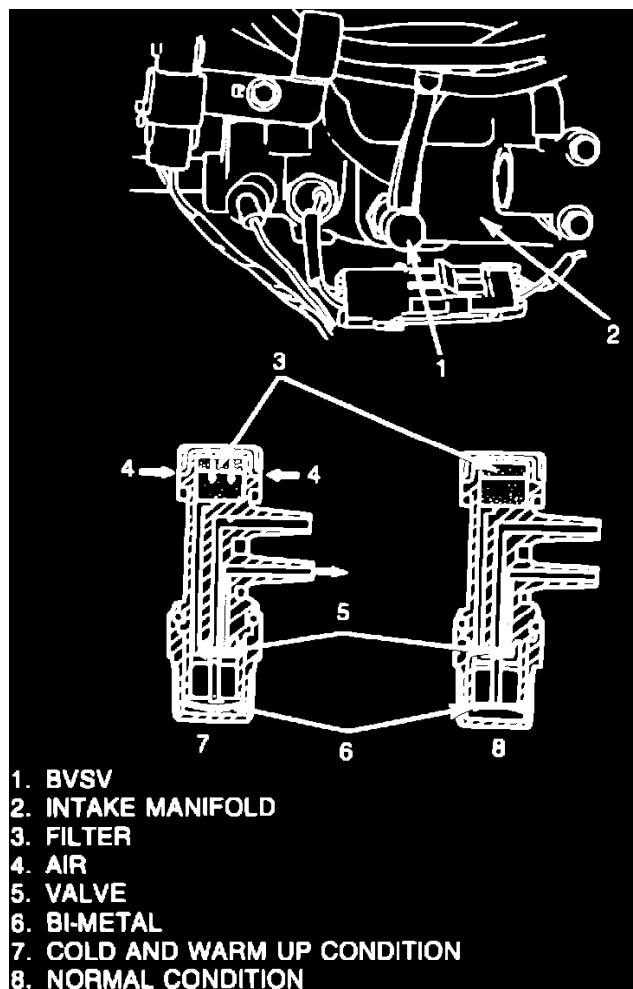
Fig. 3 Evaporative emission control system schematic. 1985 - 86 models



**Fig. 4** Evaporative emission control system schematic. 1987 - 88 Models w/EFI & turbocharger



**Fig. 5 Vapor storage canister cross sectional view**



**Fig. 6 Bi-metal vacuum switching valve (BVSF)**

This system prevents the emission of fuel vapors from the vehicle fuel system. The major components of the system are the vapor storage canister, switch vent solenoid, bi-metal vacuum switching valve (BVSF), and two-way check valve, **Figs. 3 and 4.**

Fuel vapors from the fuel tank and carburetor float chamber are vented to the canister which contains charcoal. When the engine is running, manifold vacuum is applied to a purge control valve on the canister. The purge valve opens and allows the fuel vapors to be drawn into the intake manifold through the purge line. Air is drawn in through a filter in the bottom of the canister, **Fig. 5.**

Fuel vapors are not purged while coolant temperature is low. The BVSF bleeds off the vacuum which would otherwise be applied to the purge valve. As coolant temperature rises, the BVSF closes off the vacuum bleed, thus directing full manifold vacuum to the purge valve, **Fig. 6.**

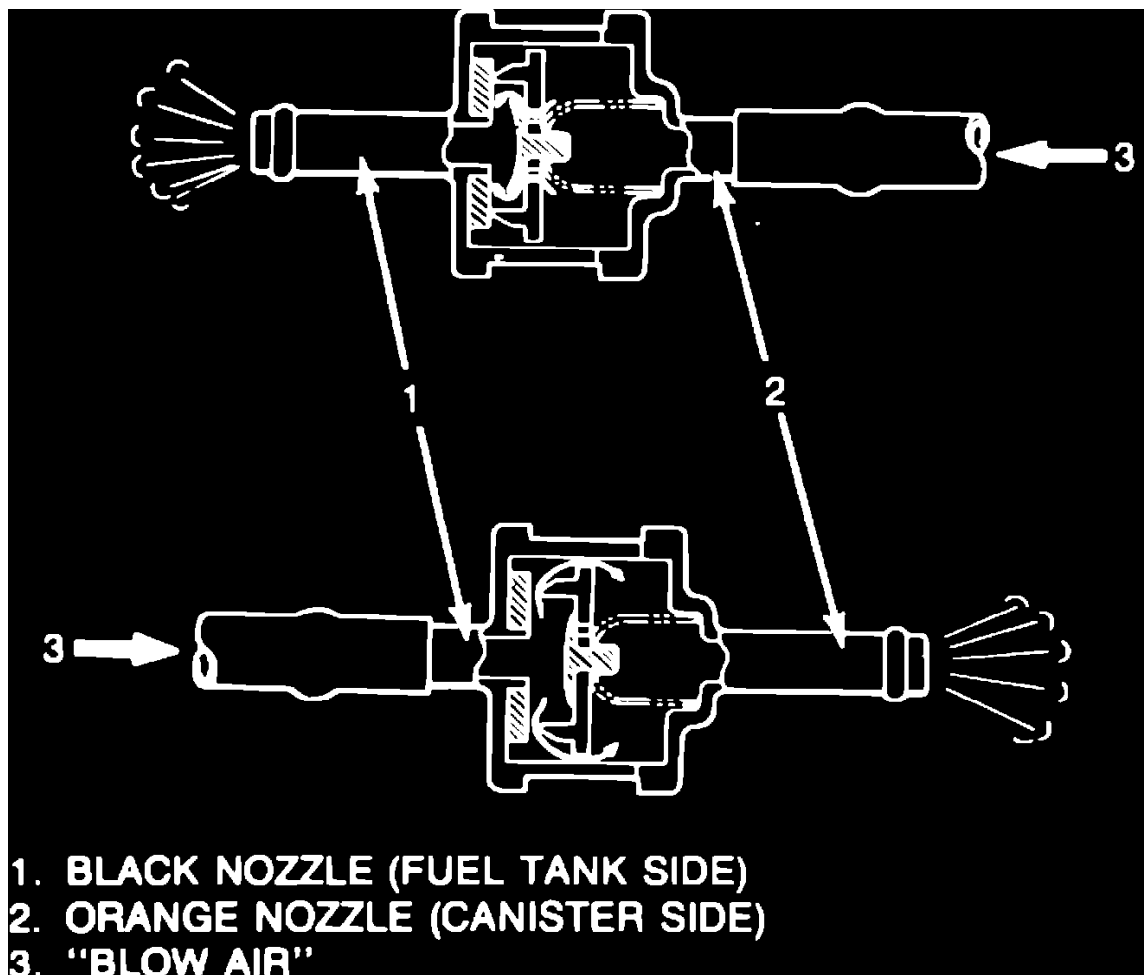


Fig. 7 Checking two-way check valve

#### Testing

#### TWO-WAY CHECK VALVE

**Take care not to inhale fuel vapor inside valve.**

1. Connect new hose to orange nozzle (canister side). Blow into new hose and check that air escapes from black nozzle (fuel tank side), **Fig. 7**.
2. Install new hose to black nozzle. Blow air into hose and check that air escapes from orange nozzle.

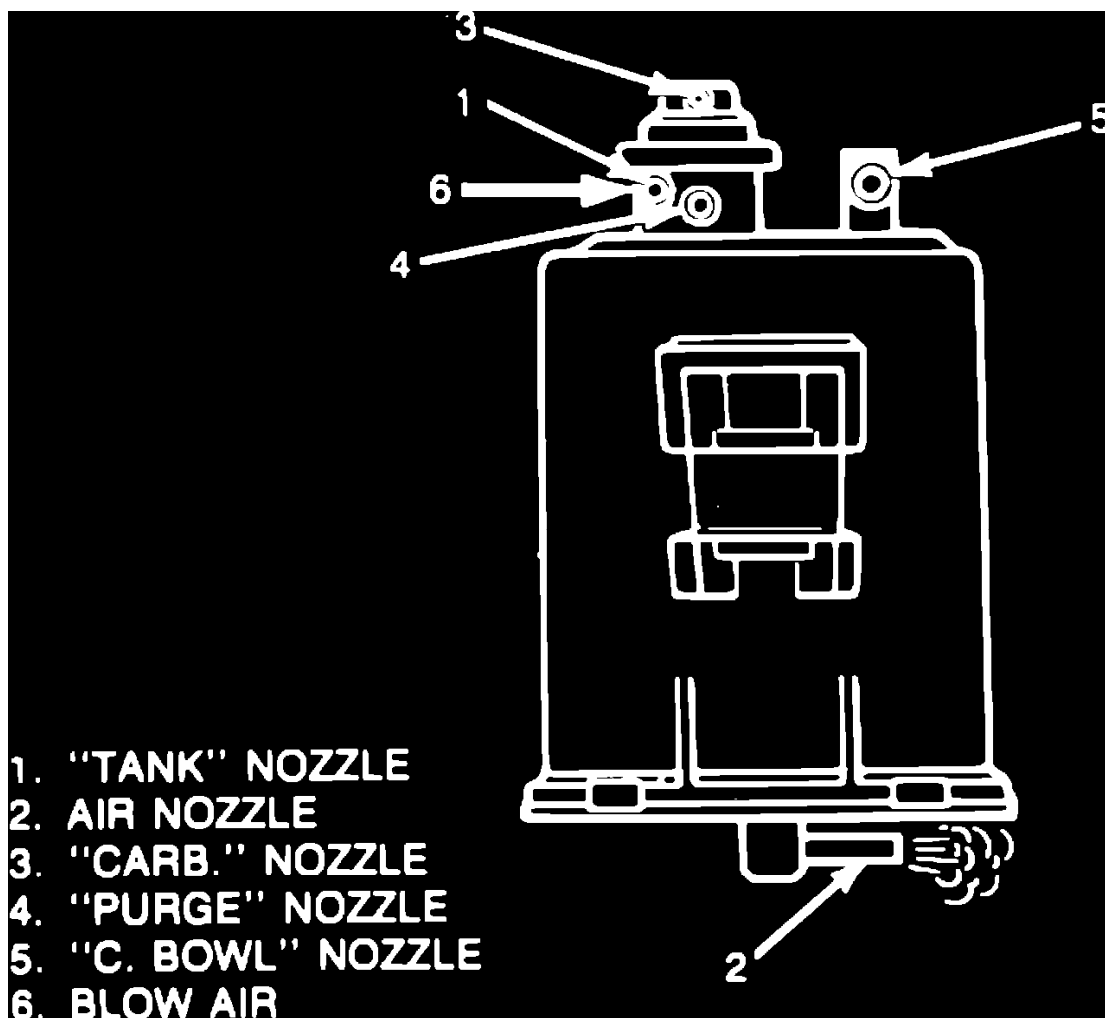


Fig. 8 Checking air flow from TANK nozzle



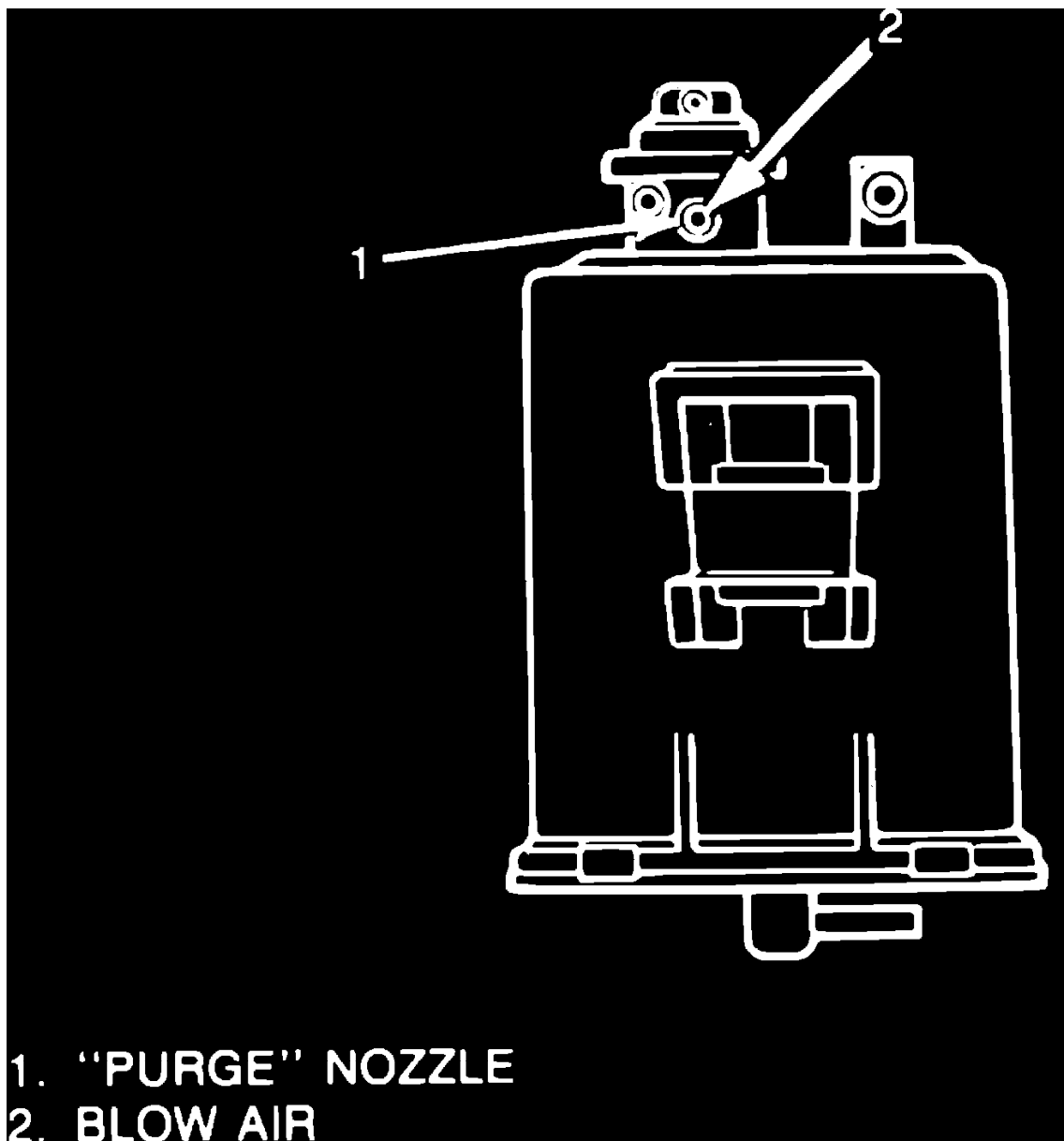
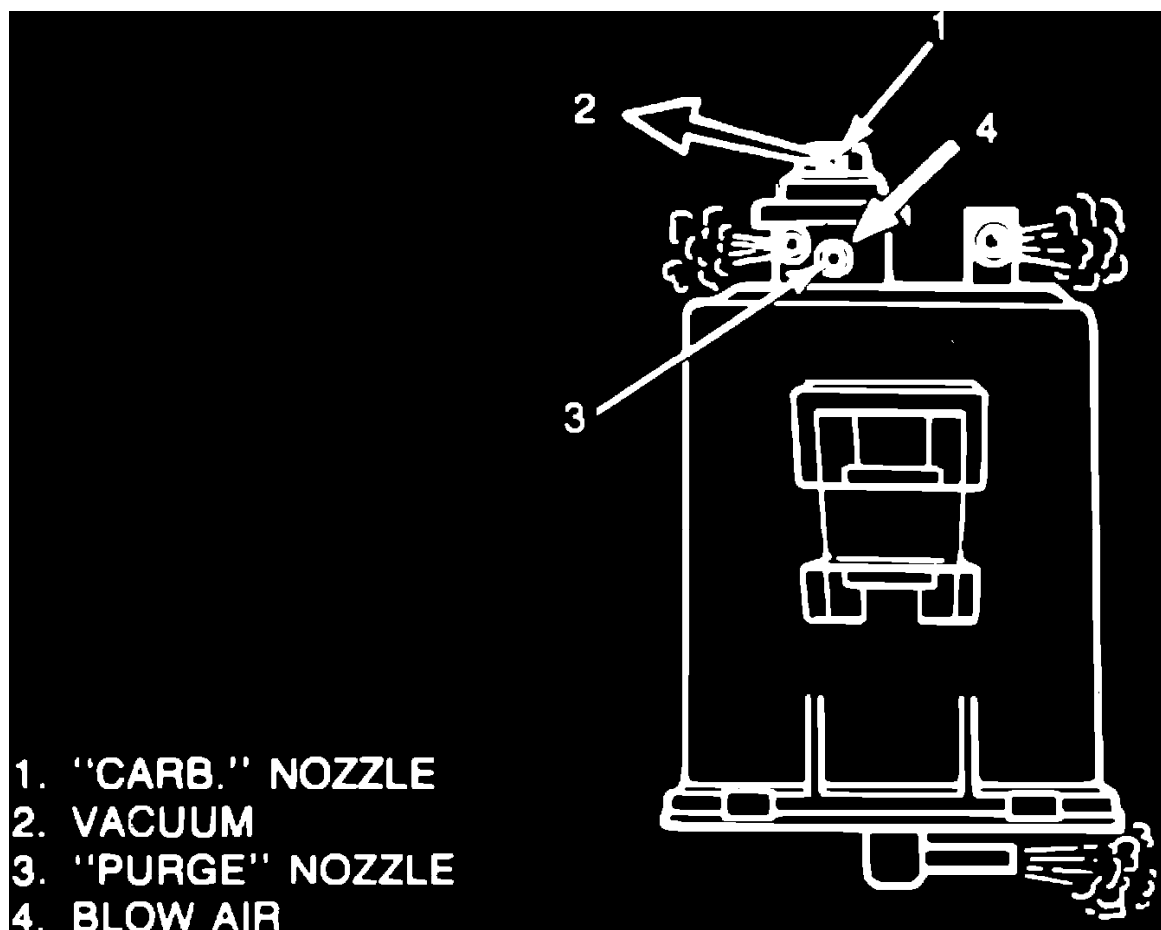


Fig. 9 Checking air flow from PURGE nozzle



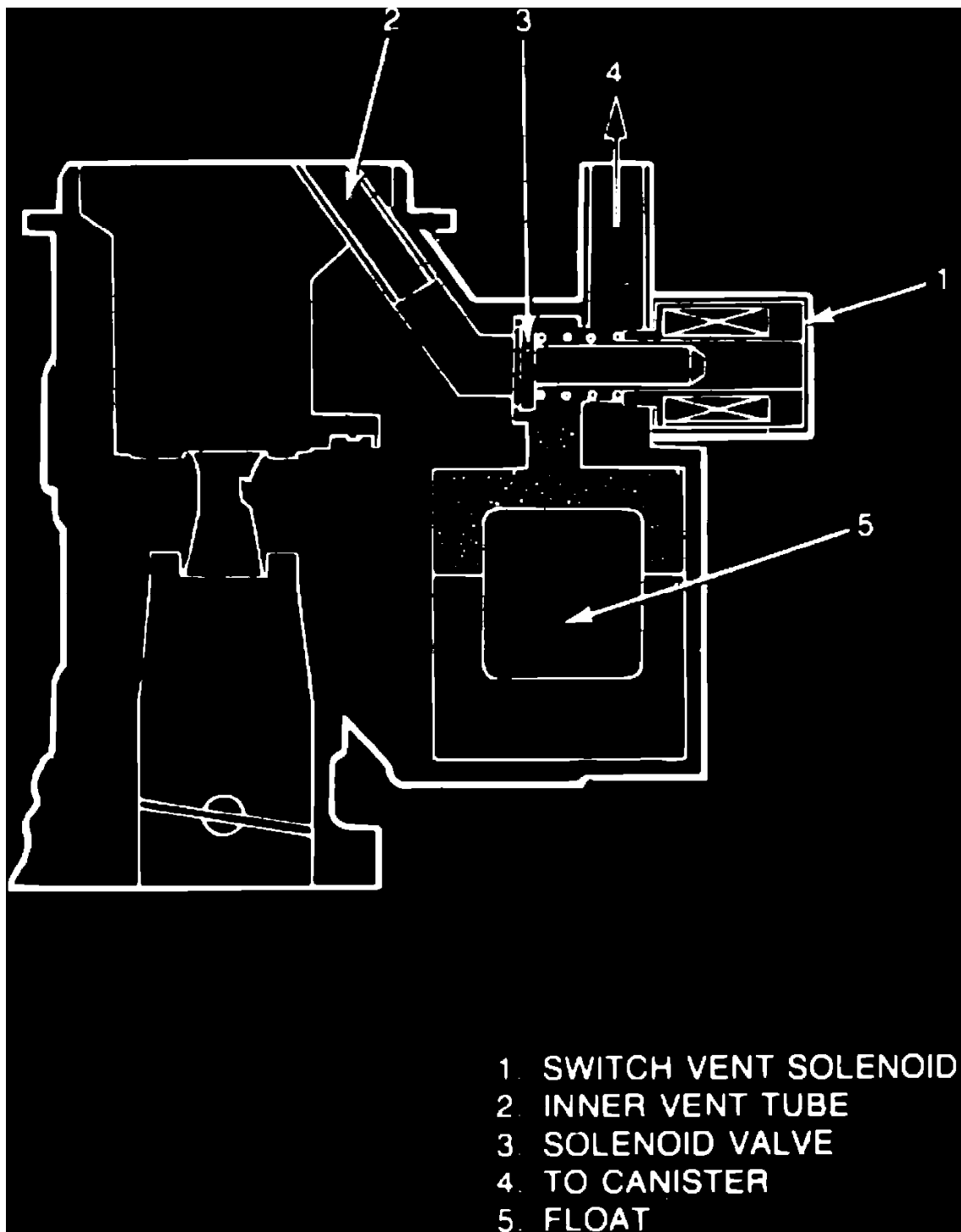
**Fig. 10 Checking operation of purge valve with vacuum applied**

#### VAPOR STORAGE CANISTER

**Take care not to inhale fuel vapor inside canister.**

1. Blow air into TANK nozzle and check that air escapes from air nozzle at bottom of canister, **Fig. 8**.
2. Blow air into PURGE nozzle and check that no air escapes from other 4 nozzles since purge control valve should close, **Fig. 9**.
3. Apply a vacuum of at least 3.15 inches Hg (80 mm Hg) to CARB nozzle and blow air into PURGE nozzle. Air should escape from TANK and C. BOWL nozzles and air nozzle at bottom of canister, **Fig. 10**.

## Bowl Vent Valve: Description and Operation



**Fig. 1 Bowl ventilation system cross sectional view**

This system consists of a carburetor mounted switch vent solenoid (SVS), **Fig. 1**, and prevents carburetor fuel bowl vapors from being discharged into the atmosphere. When the engine is stopped, the SVS directs fuel bowl vapors into the EEC system vapor storage canister where they remain until the canister is purged. During normal engine operation, the SVS directs fuel bowl vapors into the inner vent tube, **Fig. 1**, where they are drawn into the intake air stream and burned. The SVS receives operating signals from the ignition switch and the Computer Controlled Emission Control System ECM.

1987 - 88 Testing

For testing procedures on the bowl ventilation system components, refer to the "Computer Controlled Emission Control System" section.

## Exhaust Gas Recirculation: Testing and Inspection

### Diagnosis & Testing

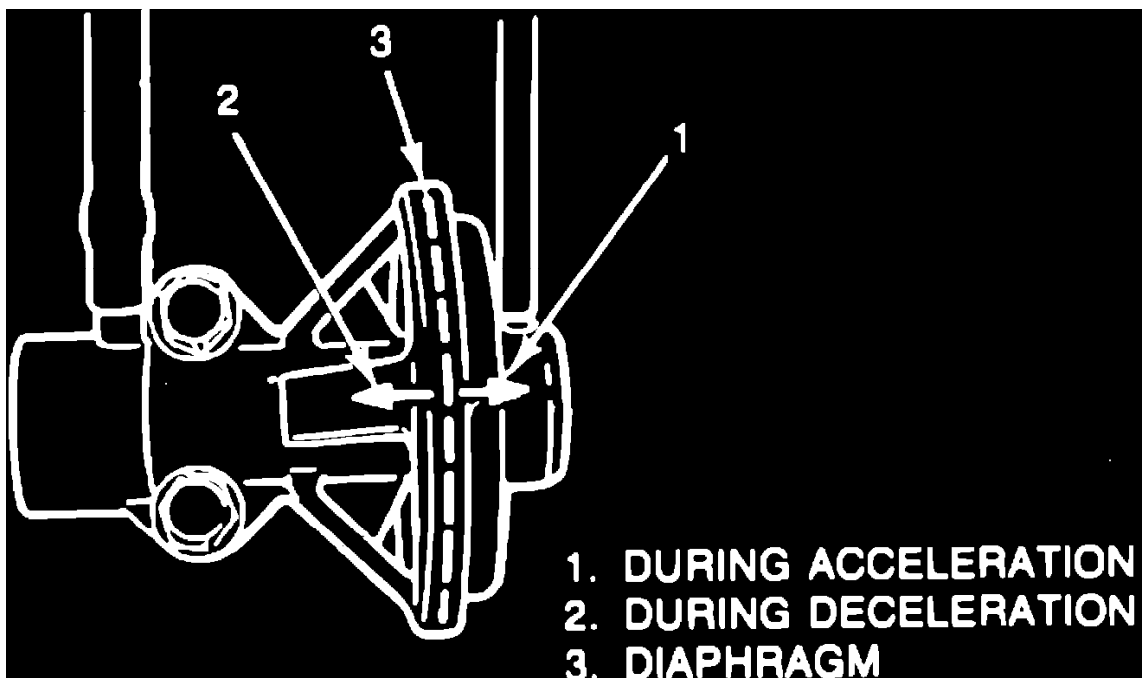


Fig. 13 Checking movement of EGR valve diaphragm

#### EXHAUST GAS RECIRCULATION (EGR) SYSTEM CHECK

1. With engine running and coolant temperature below 113°F (45°C), check that EGR valve is not open by feeling diaphragm.
2. Allow engine to reach normal operating temperature. Race engine and check that diaphragm moves toward 1, **Fig. 13**, during acceleration and toward 2 during deceleration.

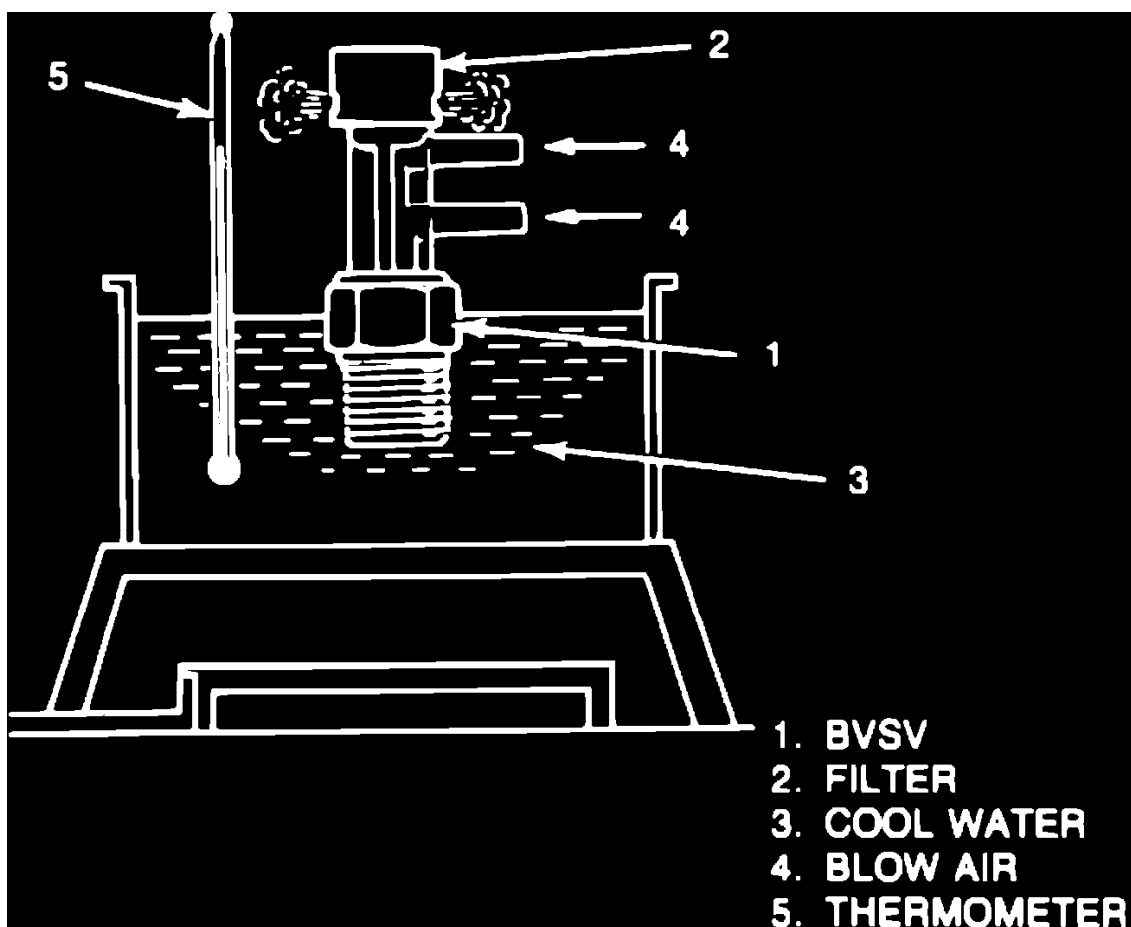


Fig. 14 Checking bi-metal vacuum switching valve low temperature operation

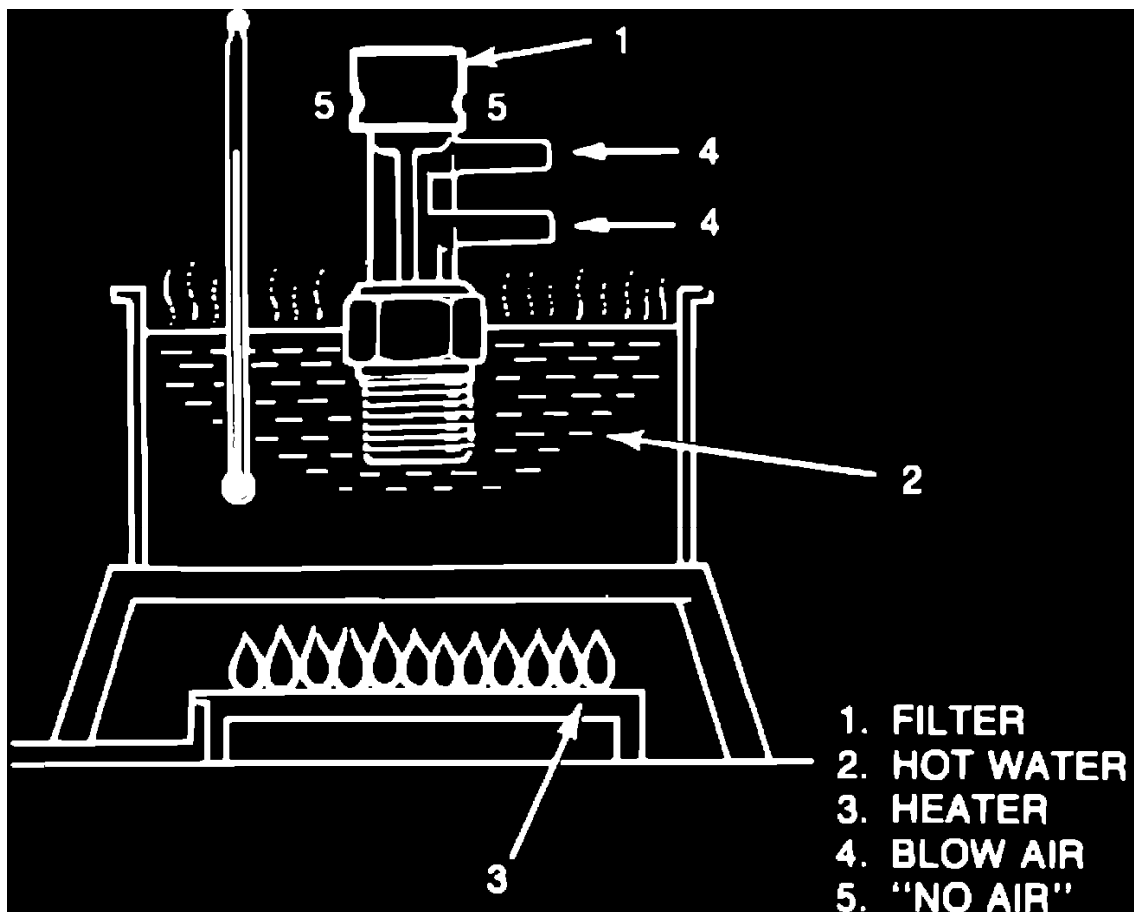


Fig. 15 Checking bi-metal vacuum switching valve high temperature operation

#### BI-METAL VACUUM SWITCHING VALVE (BVSV) CHECK

1. With engine cold, drain cooling system.
2. Remove BVSV from intake manifold.
3. With BVSV below 113°F (45°C), blow air into each nozzle individually, **Fig 14**. Air should escape from filter.
4. With BVSV heated above 140°F (60°C) in hot water, blow air into each nozzle individually, **Fig. 15**. Air should not escape from filter.
5. Wrap sealing tape around threads and reinstall BVSV in intake manifold.
6. Reconnect vacuum hoses.

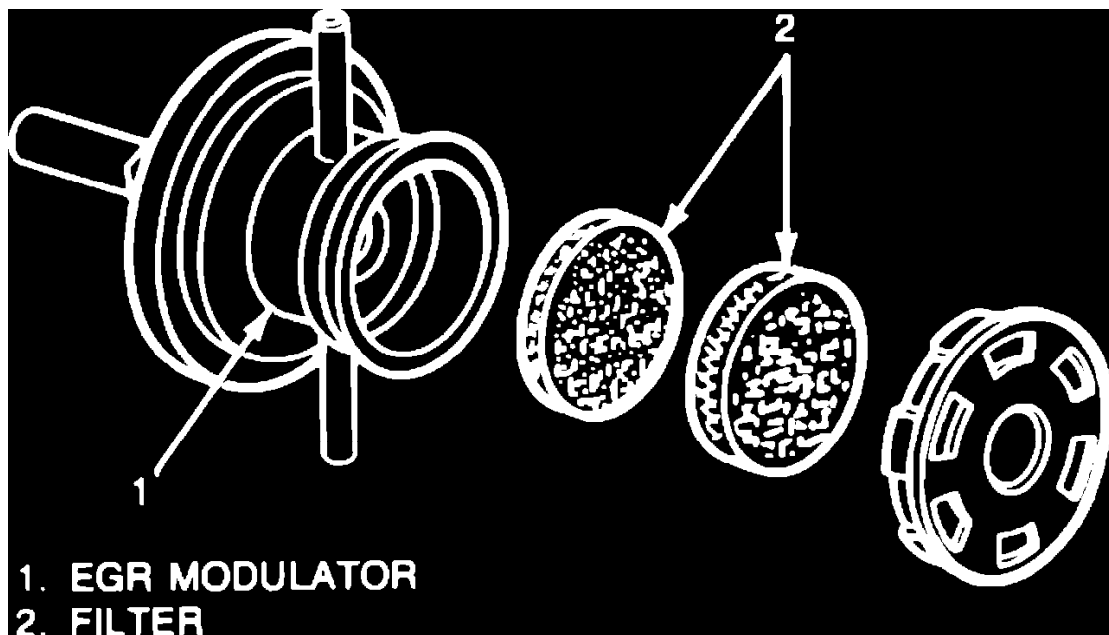


Fig. 16 EGR modulator. Exploded view

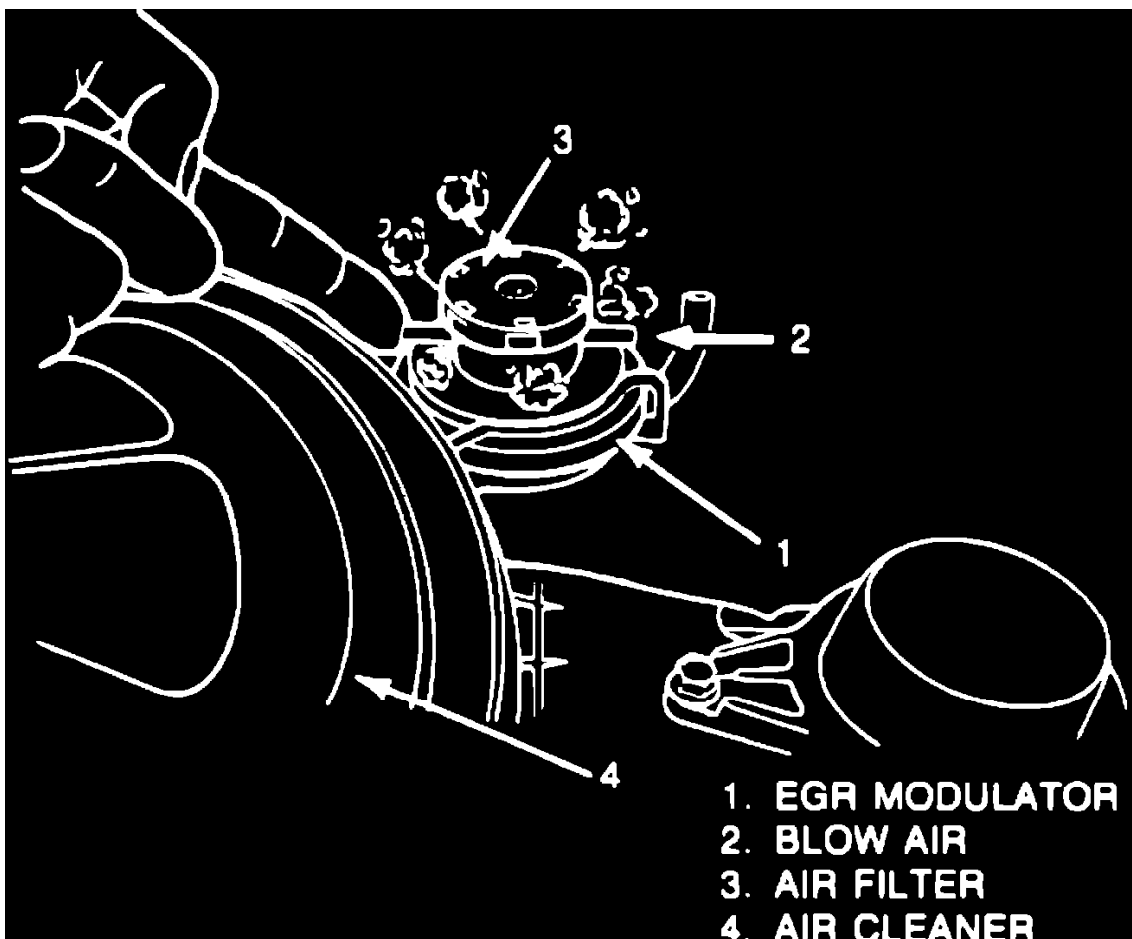


Fig. 17 Testing EGR modulator

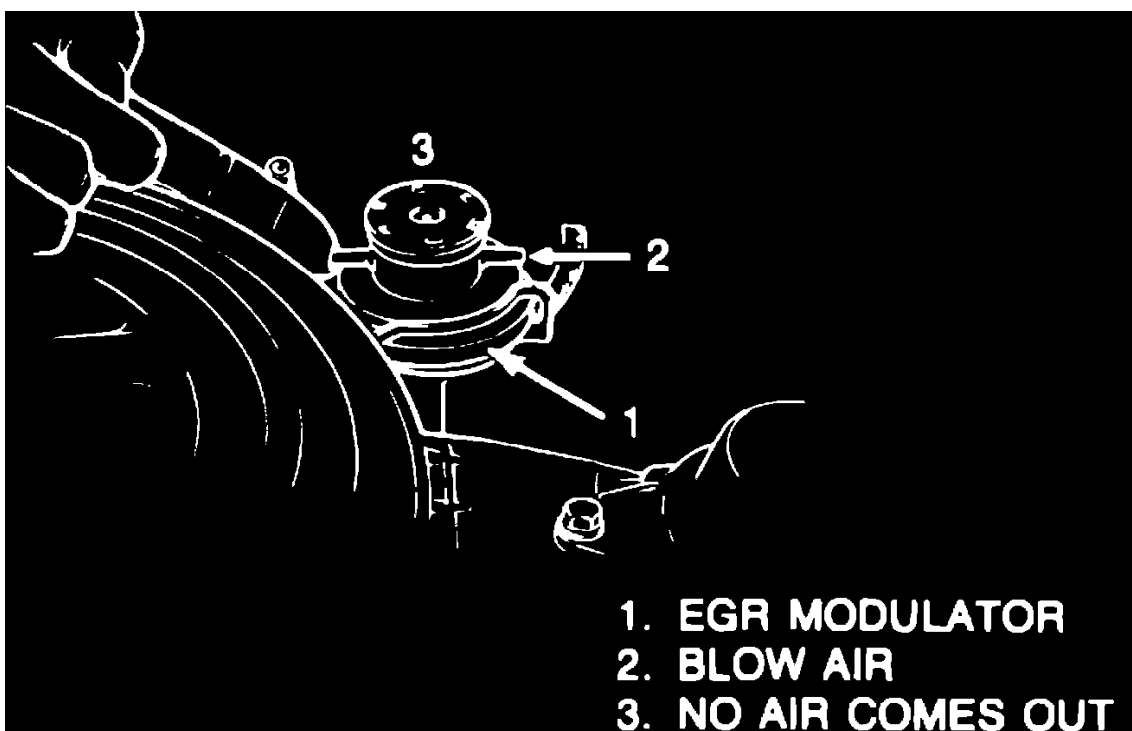


Fig. 18 High speed EGR modulator test

#### EGR MODULATOR

1. Inspect filter for dirt or damage, **Fig. 16**. Clean filter using compressed air.
2. With engine off, disconnect 2 vacuum hoses from EGR modulator and plug nozzle. Blow air into other nozzle and check that air escapes freely through filter, **Fig. 17**.
3. Start engine and allow to reach normal operating temperature.
4. Increase engine speed to 5000 RPM and plug one nozzle of modulator. Blow air into other nozzle. Strong resistance to air flow should be felt, **Fig. 18**.
5. Reconnect vacuum hoses.

**EGR VALVE**

1. Remove EGR valve and inspect for sticking or exhaust deposits.
2. Reinstall EGR valve with new gasket.
3. Reconnect vacuum hoses.

## **Exhaust Gas Recirculation: Testing and Inspection Troubleshooting**

### **Rough Idle**

1. EGR vacuum hoses improperly routed.
  - a. Check hose routing; correct as necessary.
2. EGR valve leaking.
  - a. Check EGR valve operation.
3. EGR valve gasket faulty or bolts loose.
  - a. Check that EGR valve bolts are tight.
  - b. If bolts are tight, remove EGR valve and inspect gasket.
4. Vacuum improperly applied to EGR valve at idle.
  - a. Check vacuum from carburetor EGR port with engine at normal operating temperature and curb idle speed.

### **Engine Rough at Part Throttle Under Load Conditions**

1. EGR vacuum hoses improperly routed.
  - a. Check hose routing; correct as necessary.
2. Loose EGR valve.
  - a. Tighten valve.
3. Sticking or binding EGR valve.
  - a. Clean EGR valve passages.
  - b. Perform EGR system check.
4. Missing or incorrect EGR gasket.
  - a. Install new gasket and tighten valve.

### **Engine Stalls on Deceleration**

1. EGR modulator valve blocked or air flow restricted.
  - a. Check modulator operation.
2. EGR vacuum line restricted.
  - a. Inspect EGR vacuum lines for kinks, bends, etc. Service as necessary.
3. Sticking or binding EGR valve.
  - a. Check EGR valve for excessive deposits.

### **Part Throttle Engine Detonation**

1. EGR modulator valve blocked or air flow restricted.
  - a. Check modulator operation.
2. Insufficient EGR flow during part throttle acceleration.
  - a. Check EGR valve vacuum hose routing.
  - b. Check EGR valve operation. Service as necessary.
  - c. Check EGR passages and valve for excessive deposits.

### **Engine Stalls When Cold**

1. EGR vacuum hoses improperly routed.
  - a. Check hose routing; correct as necessary.
2. Faulty BVSV.
  - a. Check BVSV; replace as necessary.



## Positive Crankcase Ventilation: Description and Operation

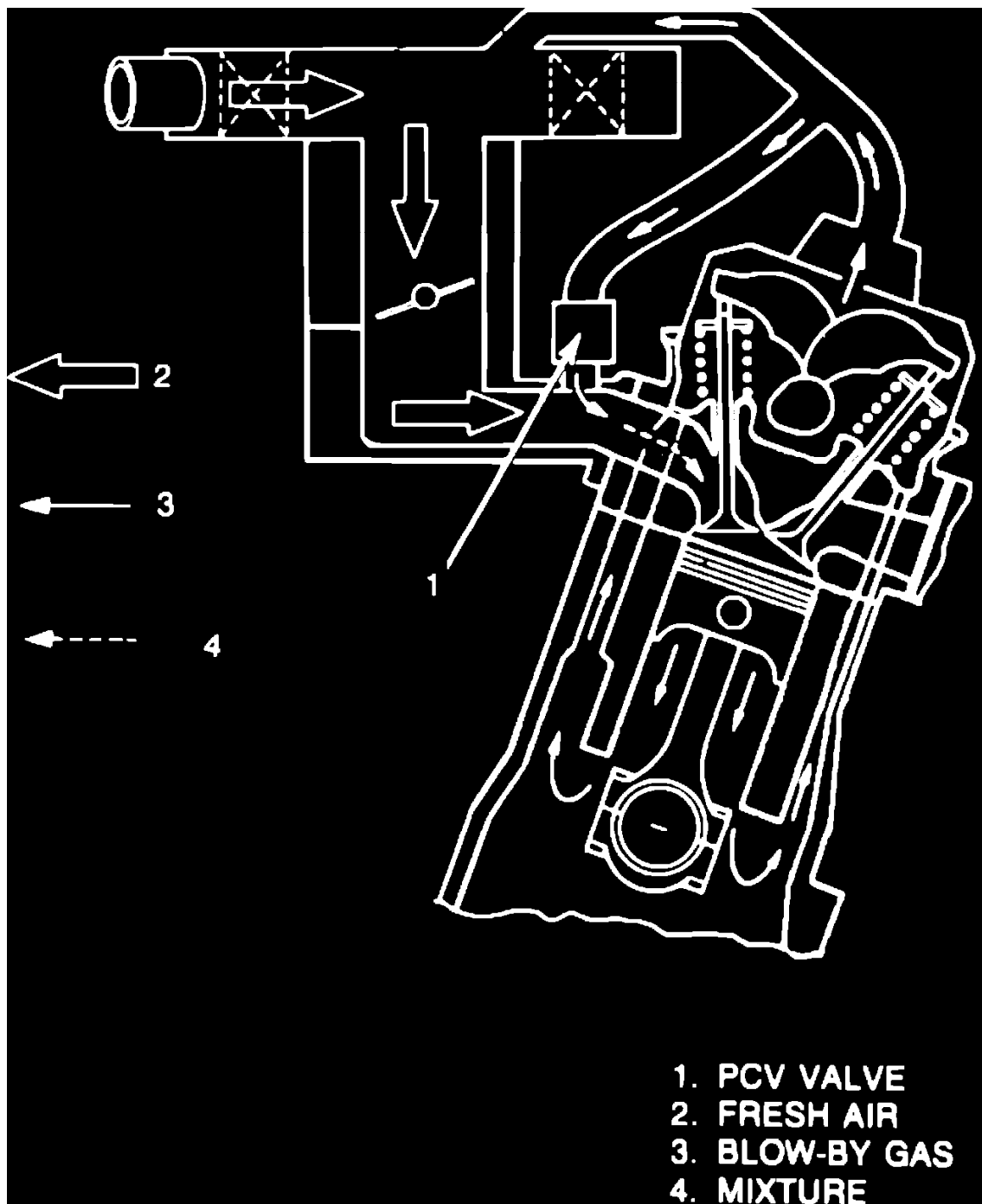
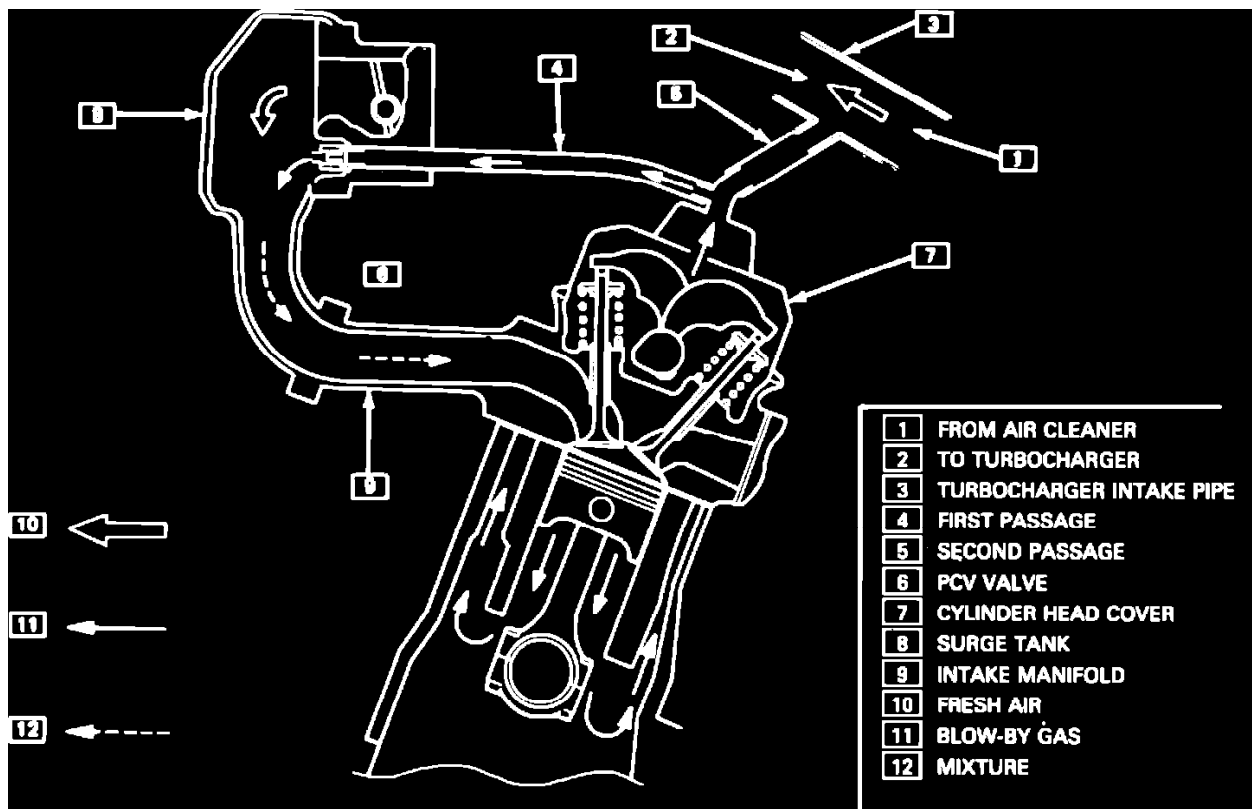


Fig. 24 PCV system. 1985 - 88 exc. 1987 - 88 models w/EFI & turbocharger



**Fig. 25 PCV system. 1987 - 88 models w/EFI & turbocharger**

The PCV system, **Figs. 24 and 25**, consists of a PCV valve mounted on the intake manifold connected to a hose that is teed into a hose connecting the air cleaner to the valve cover. During small throttle opening/high vacuum conditions, crankcase gasses flow from the valve cover thru the PCV valve. During large throttle openings/low vacuum conditions, crankcase gasses flow from the valve cover to the air cleaner.

#### Diagnosis

1. Unstable idle; frequent stalling.
  - a. PCV valve plugged or stuck. Replace valve.
2. Oil in air cleaner.
  - a. PCV system plugged. Replace valve.

#### Testing

1. Disconnect PCV hose at breather hose.
2. With engine running at idle, place thumb over end of disconnected PCV hose to check for vacuum.
3. If no vacuum is felt, check for clogged hose or valve. Replace as necessary.
4. Stop engine and connect new hose to PCV valve. Blow air through hose to verify that air flows with difficulty from cylinder head side to intake manifold side.
5. If air flows easily, valve is stuck and must be replaced. Wrap threads of new valve with sealing tape before installing.
6. Connect PCV valve hose securely.

## Positive Crankcase Ventilation: Testing and Inspection

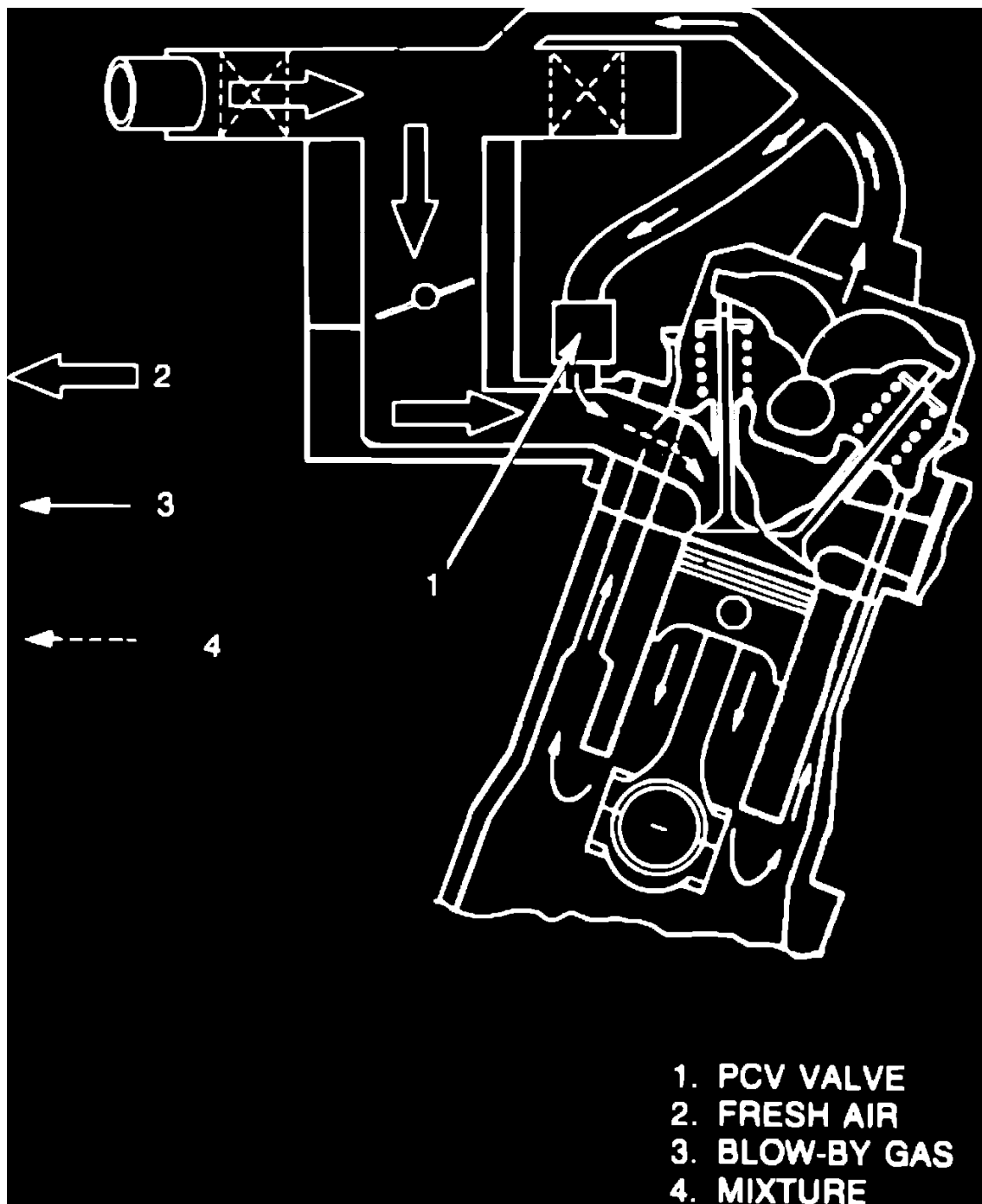
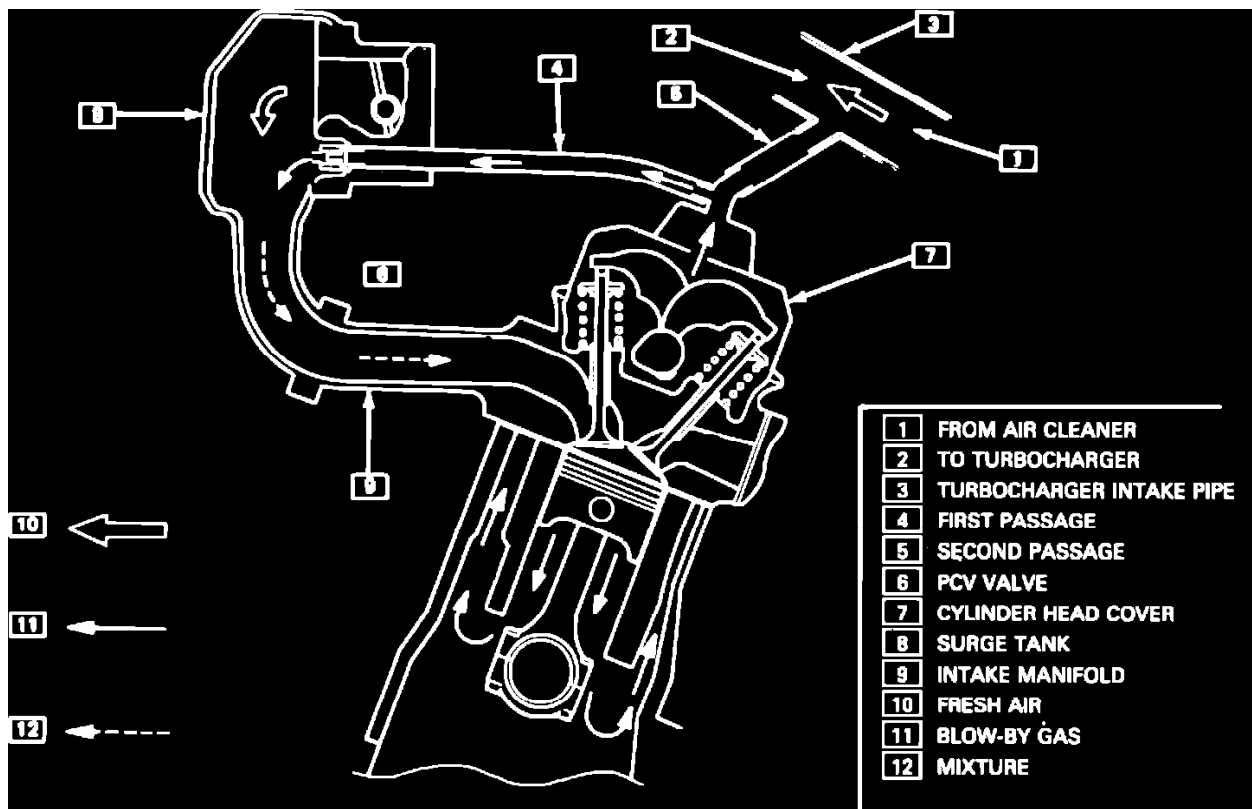


Fig. 24 PCV system. 1985 - 88 exc. 1987 - 88 models w/EFI & turbocharger



**Fig. 25 PCV system. 1987 - 88 models w/EFI & turbocharger**

The PCV system, **Figs. 24 and 25**, consists of a PCV valve mounted on the intake manifold connected to a hose that is teed into a hose connecting the air cleaner to the valve cover. During small throttle opening/high vacuum conditions, crankcase gasses flow from the valve cover thru the PCV valve. During large throttle openings/low vacuum conditions, crankcase gasses flow from the valve cover to the air cleaner.

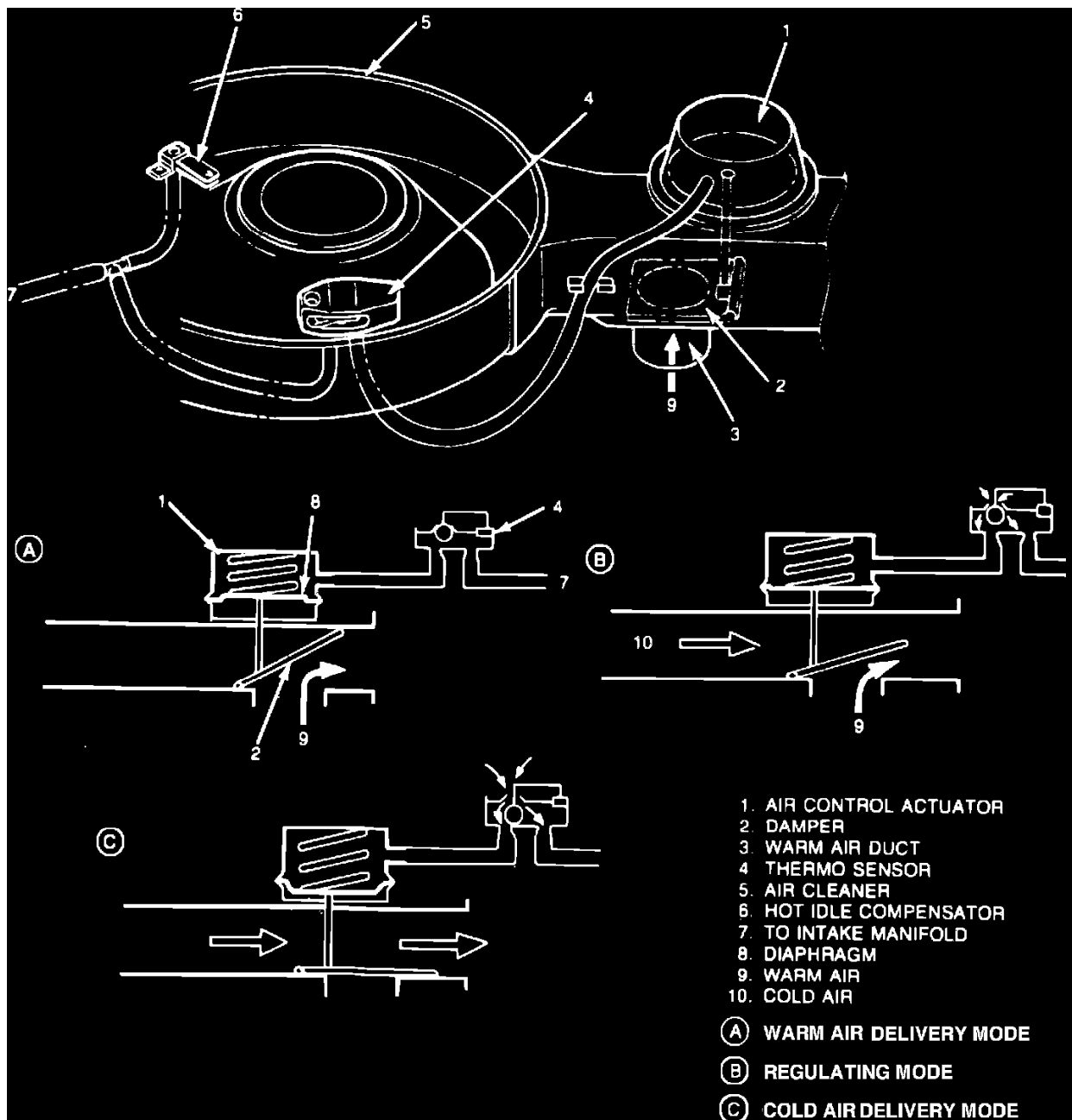
#### Diagnosis

1. Unstable idle; frequent stalling.
  - a. PCV valve plugged or stuck. Replace valve.
2. Oil in air cleaner.
  - a. PCV system plugged. Replace valve.

#### Testing

1. Disconnect PCV hose at breather hose.
2. With engine running at idle, place thumb over end of disconnected PCV hose to check for vacuum.
3. If no vacuum is felt, check for clogged hose or valve. Replace as necessary.
4. Stop engine and connect new hose to PCV valve. Blow air through hose to verify that air flows with difficulty from cylinder head side to intake manifold side.
5. If air flows easily, valve is stuck and must be replaced. Wrap threads of new valve with sealing tape before installing.
6. Connect PCV valve hose securely.

## Thermostatic Air Cleaner: Description and Operation



**Fig. 32 Thermostatically controlled air cleaner & air control actuator operation**

This system, consisting of an air control actuator and a thermo-sensor, **Fig. 32**, controls the temperature of the intake air by mixing preheated air and cool air to improve fuel vaporization and engine warm-up operation. The thermo-sensor senses the inside temperature of the air cleaner and regulates the vacuum applied to the air control actuator, thus controlling the damper position, **Fig. 32**.

### Testing

#### THERMOSTATICALLY CONTROLLED AIR CLEANER (TCAC) SYSTEM

1. Check vacuum hoses for proper installation, deterioration, or damage. Replace as necessary.
2. With air cleaner cool, disconnect warm air hose from warm air duct.
3. Reach into warm air duct to check that damper is closed with engine off.
4. Start engine and run at idle. Damper should open warm air duct.

#### AIR CONTROL ACTUATOR

1. Disconnect vacuum hose from ACA.
2. Using suitable vacuum pump, apply 7.87 inches Hg (200 mm Hg) of vacuum to ACA.
3. Damper should open fully and remain open with vacuum applied.

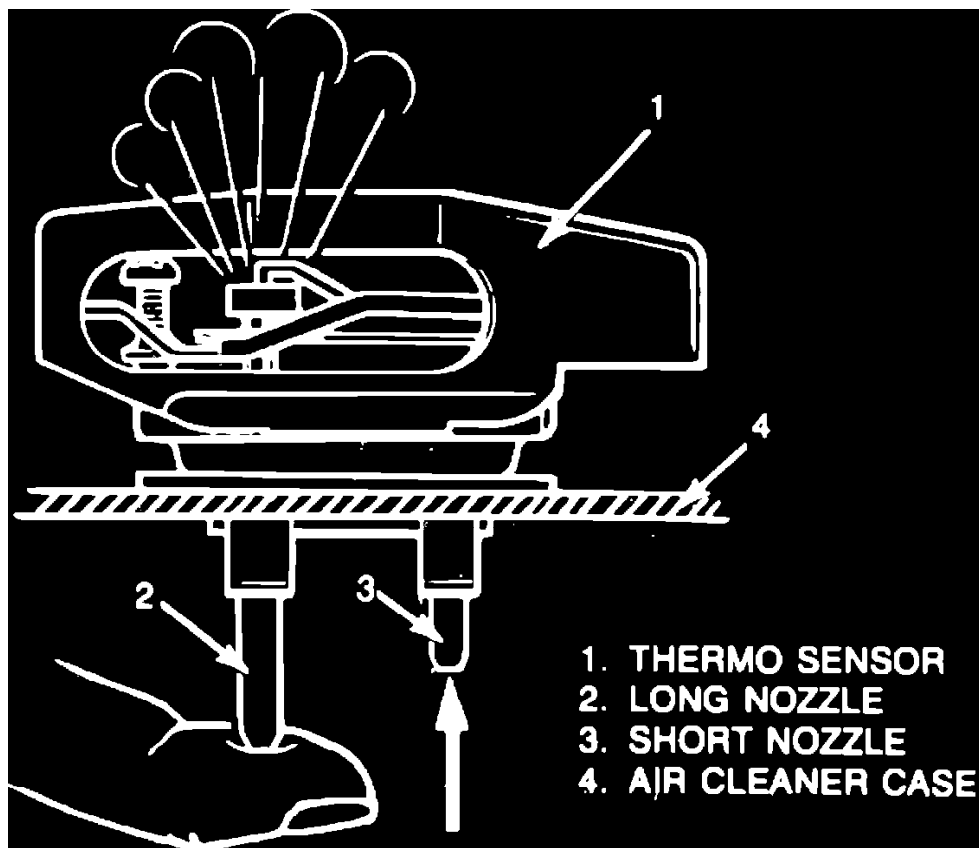


Fig. 33 Testing thermo-sensor

#### THERMO SENSOR

1. Remove air cleaner.
2. Disconnect 2 vacuum hoses from thermo-sensor.
3. Measure temperature around thermo-sensor.
4. Cover long nozzle with finger and blow air into short nozzle, **Fig. 33**. Valve should be open at temperatures above 104°F and closed at temperatures below 77°F.
5. After testing, reconnect vacuum hoses and reinstall air cleaner.

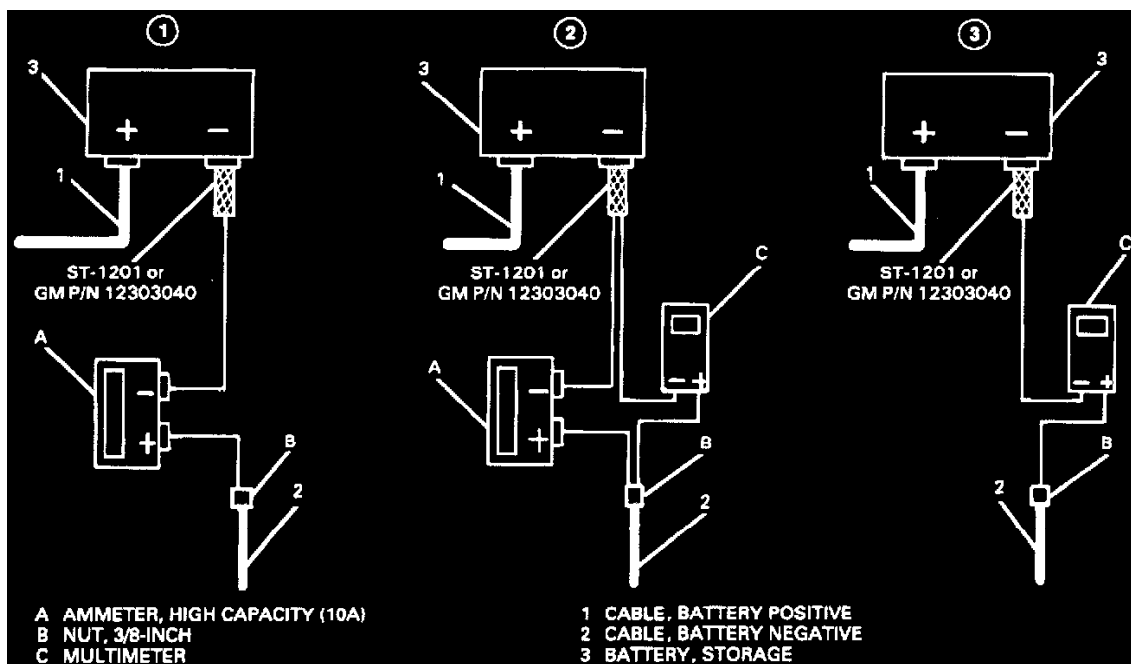
## Starting and Charging: Testing and Inspection

### Alternate Parasitic Draw Test

#### BATTERY ELECTRICAL DRAIN / PARASITIC DRAW TEST

**NOTE:** Always check Technical Service Bulletins for any revised procedures or specifications.

The following alternate procedure may be used when testing for parasitic load if Parasitic Draw Test Switch (J 38758) is not available.

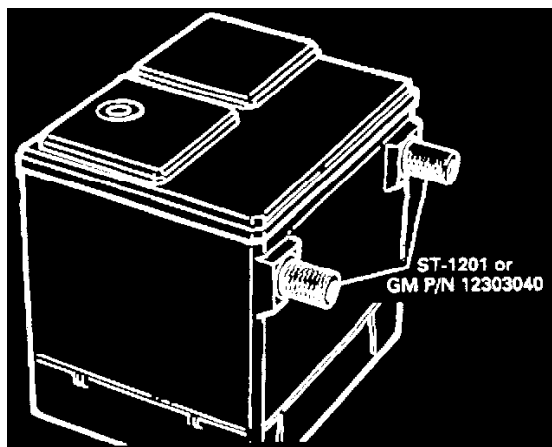


#### Alternate Parasitic Load Diagnosis Procedure

#### TOOL REQUIRED:

A/C Delco P/N ST-1201 or GM P/N 12303040 Battery Side Terminal Adapters

1. Disconnect negative battery cable.



#### Battery Side Terminal Adapters

2. Install the battery side terminal adapter from, AC Delco P/N ST-1201 or GM P/N 12303040 or equivalent, in the negative terminal of the battery.
3. Install the other battery side terminal adapter or a 3/8-inch nut with standard threads (16 UNC) on the negative battery cable to assure a good electrical contact with metal face on cable for testing (add a washer behind nut if nut does not contact firmly). Yellow or black finish nuts are generally non-conductive and should not be used.
4. With all lights, accessories, retained accessory power (**RAP**), and ignition switch off, connect a high capacity ammeter (at least **10 amps**) from the negative battery cable to side terminal adapter. This high capacity ammeter is connected to verify whether or not a high current draw is occurring at a constant rate. It is this type of high current draw which will blow the fuse in lower capacity ammeters.

**NOTICE:** If a high capacity ammeter is not available, install a section of heavy wire (preferably battery cable section) between existing battery negative cable and side terminal adapter. Allow time for initial draw to occur or check for reduced current with an inductive ammeter (current clamp) and proceed to step 5. With the high capacity ammeter or battery cable section still connected, connect a digital multimeter, set on **2000 mA** dc range, in parallel with the high capacity ammeter.

5. Disconnect the high capacity ammeter and take a reading with the digital multimeter.

<u>Component</u>	
*Body Control Module (BCM)	<u>Approximate Parasitic Draw mA</u>
Without Universal Theft Deterrent	1.7
With Universal Theft Deterrent	2.4
PASS-Key II®	2
Powertrain Control Module (PCM)	5-10
Radio Control Head	5
Voltage Regulator in Generator	1
*After specified timeout period elapses, component switches from "AWAKE" to "ASLEEP" mode. The "Timeout" period can take up to 20 minutes. Most vehicles can have a Maximum Parasitic load of 30 milliamps Some vehicles can have up to 50 milliamps	
<b>Total Parasitic Draw</b>	

- ^ If after 20 minutes current draw is above specifications listed in component parasitic load chart, remove system fuses and mini-breakers one at a time until current draw returns to a value less than or equal to specifications listed. This should be done while monitoring the ammeter so that a disruption of drain will be evident. Refer to Figure above for approximate parasitic loads for various vehicle components. Set ammeter on maximum scale when pulling fuses to avoid damage.

6. When cause of excessive draw has been located and repaired, repeat step 5 to verify the repair. Reconnect negative battery cable to battery terminal.

#### **Tighten**

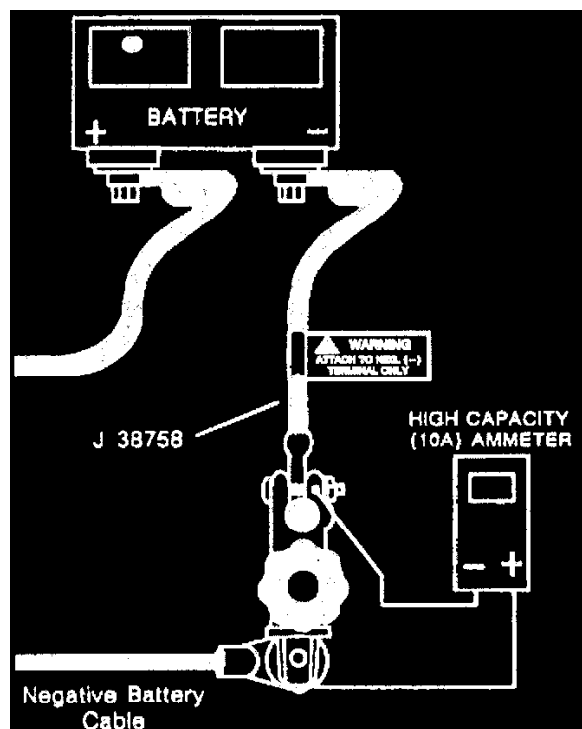
- ^ Negative battery cable to **15 Nm (11 lb. ft.)**.



## Starting and Charging: Testing and Inspection

### Parasitic Draw Test

#### BATTERY ELECTRICAL DRAIN / PARASITIC DRAW TEST



Parasitic Draw Test

**NOTE:** Always check Technical Service Bulletins for any revised procedures or specifications.

#### TOOLS REQUIRED:

J 39200 Digital Multi meter

J 38758 Parasitic Draw Test Switch

**NOTE:** The parasitic draw test switch should never be turned to the "OFF" position with the engine running or damage could occur to the attached ammeter or the vehicle electrical system.

#### IMPORTANT

^ The switch knob on the J38758 is marked "ON" and "OFF." When the switch knob is in the "ON" position, the circuit is closed and electrical current may pass through the switch. When the switch knob is in the "OFF" position, the circuit is open and electrical current may not pass through the switch.

1. Remove the battery ground (negative) cable from the battery negative terminal.
2. Install the J 38758 male end to the battery negative terminal.
3. Turn the J 38758 knob to the "OFF" position.
4. Install the battery ground (negative) cable to the female end of the J 38758.
5. Turn the J 38758 knob to the "ON" position.
6. Road test the vehicle and activate all of the accessories (radio, A/C, etc.).
7. Stop the vehicle. Turn the ignition switch to the "OFF" position and remove the ignition key.
8. SET the J 39200 to the **10 ampere** scale and connect it to the terminals on test switch tool.
9. Turn the J 38758 knob to the "OFF" position to allow the current to flow through the J 39200.
10. Wait at least 20 minutes. Check and record the current reading. If the current reading is at or below two amperes, turn the J 38758 knob to the "ON" position (to maintain continuity in the electrical system) and switch the J 39200 down to the two ampere scale for a more accurate reading when the J 38758 knob is turned "OFF"
11. Note the reserve capacity rating for the vehicle's battery. If the battery does not specify the reserve capacity, 30 milliamps can be used for a maximum parasitic draw on most vehicles. However some vehicles can have up to 50 milliamp parasitic draw.
  - Divide the reserve capacity number by four.
  - Compare this number to the ampere reading taken in step ten.
  - The parasitic current drain should not exceed this number.
  - Example: If the battery has a reserve capacity rating of **100 minutes**, the current drain should not exceed **25 milliamps**.

<u>Component</u>	
*Body Control Module (BCM)	<u>Approximate Parasitic Draw mA</u>
Without Universal Theft Deterrent _____	1.7
With Universal Theft Deterrent _____	2.4
PASS-Key II® _____	2
Powertrain Control Module (PCM) _____	5-10
Radio Control Head _____	5
Voltage Regulator in Generator _____	1
*After specified timeout period elapses, component switches from "AWAKE" to "ASLEEP" mode.	<b>Total Parasitic Draw</b>
<b>The "Timeout" period can take up to 20 minutes.</b>	
<b>Most vehicles can have a</b>	
<b>Maximum Parasitic load of 30 milliamps</b>	
<b>Some vehicles can have up to 50 milliamps</b>	

12. If the vehicle has an acceptable amount of current drain and the vehicle battery was weak or failed a load test, check the charging system for proper operation, refer to **Charging System**.
13. If the vehicle has an unacceptable amount of current drain, remove each fuse one at a time until the current drain is at an acceptable level (this will indicate which circuit is causing the drain). Then diagnose exactly which part of the suspect circuit is causing the drain. In some rare cases, a "non-fused" circuit or component, such as a generator, may be the cause of excessive current drain.

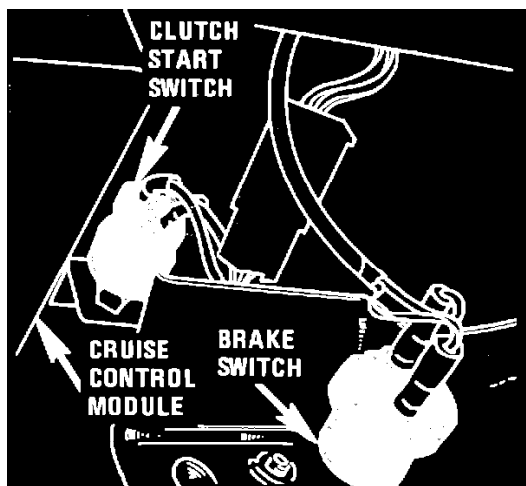
**NOTE:** Always turn the parasitic draw test switch knob to the "ON" position before removing each fuse to maintain continuity in the electrical system and to avoid damaging the ammeter due to accidental overloading (I.E. opening door to change fuse etc.).

**IMPORTANT:**

- ^ Repeat the parasitic current drain procedure after any repair has been completed to insure that the current drain has returned to an acceptable level.
14. When the cause of the excessive current drain has been located and repaired, remove the J 387S8 and connect the battery ground (negative) cable to the battery.

## Clutch Start Switch: Locations

### Clutch Start Switch

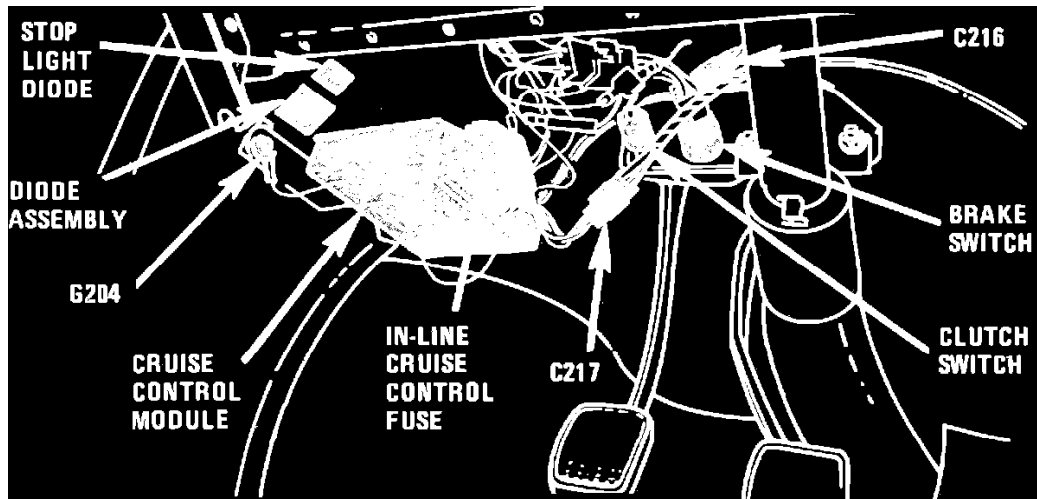


Under Left Side I/P Components

Mounted To Clutch Pedal Support

## Clutch Start Switch: Locations

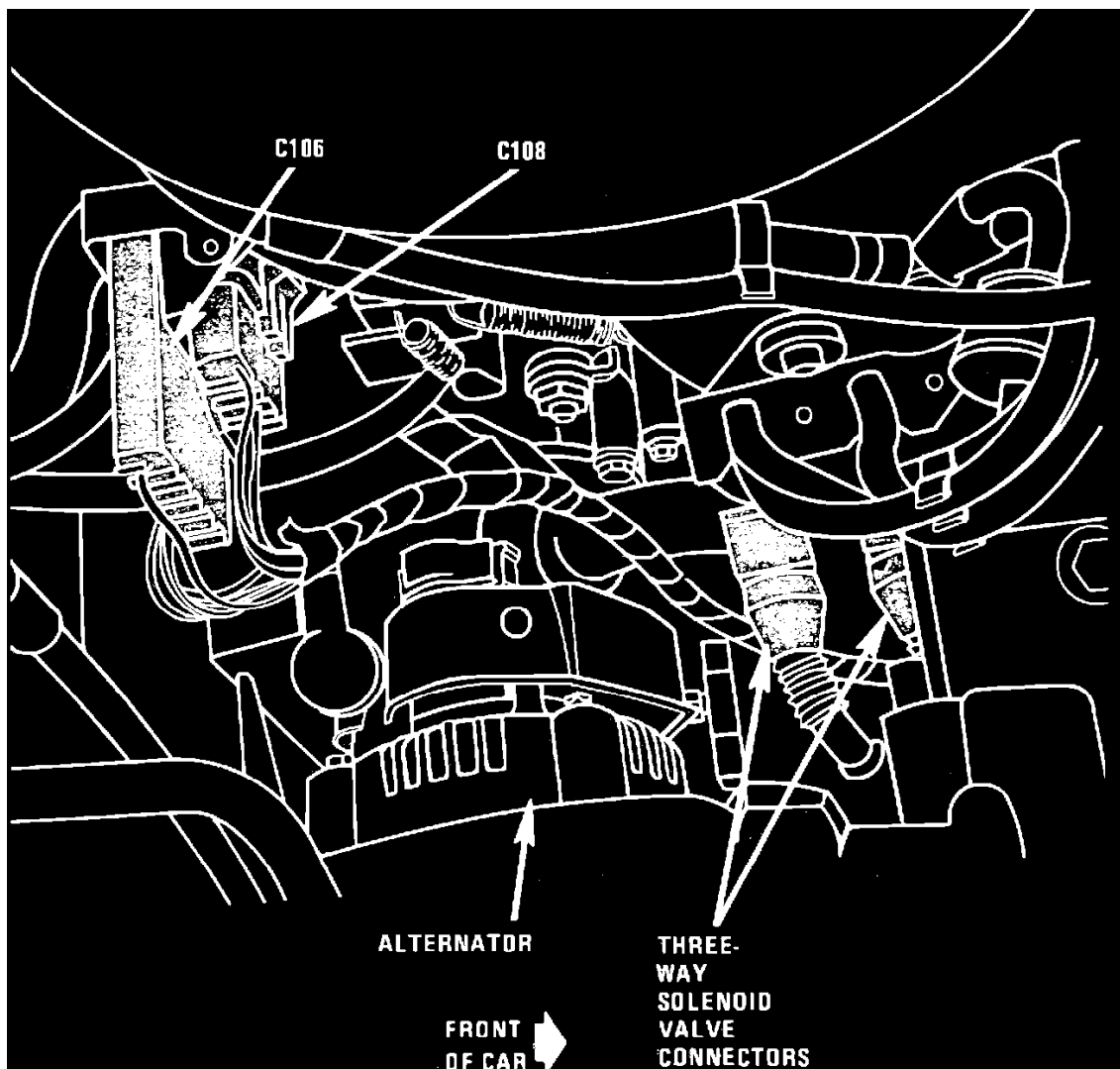
### Clutch Switch



Under I/P Components

Mounted To Clutch Pedal Support

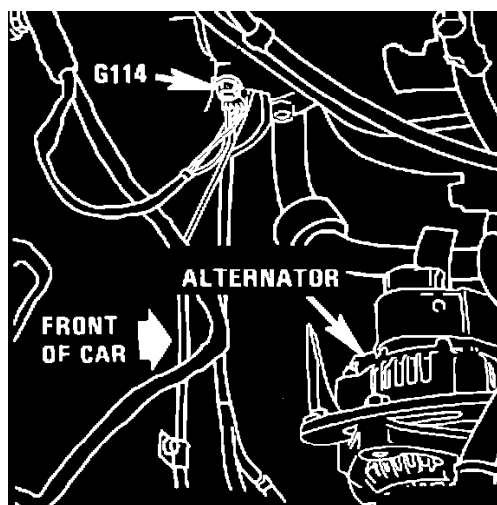
## Alternator: Locations



Lower Right Side Of Engine

RH Side Of Engine Compartment

Applicable to: Non-Turbo

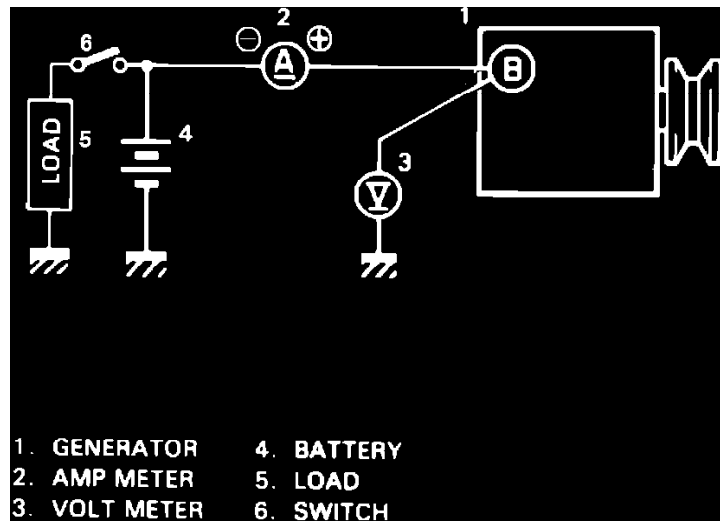


Right Rear Of Engine

RH Side Of Engine Compartment

Applicable to: Turbo

## Alternator: Testing and Inspection



**Fig. 1 Alternator test connections**

### When testing alternator, observe the following:

1. Do not reverse polarities of IG and L terminals.
2. Do not short IG and L terminals. Always connect these terminals through a lamp.
3. Do not connect any load between L and E terminals.

### UNDERCHARGED BATTERY

1. Check that undercharged condition has not been caused by accessories left on for extended periods.
2. Check drive belt for proper tension.
3. Inspect wiring for defects. Check that all connections are clean and tight, including slip connectors at alternator and bulkhead. Also check battery cable connections at battery, starter and ignition ground cable.
4. Connect voltmeter and ammeter as shown in **Fig. 1**. Connect voltmeter between alternator B terminal and ground. Connect ammeter between alternator B terminal and battery positive terminal.
5. Perform no-load check as follows:
  - a. Increase engine speed from idle to 2000 RPM and read meters. Note that voltage readings will vary with regulator case temperature.
  - b. If voltage is higher than 14.2-14.8 volts @ 77 degrees F, replace IC regulator.
6. If voltage is below specification, check IC regulator and alternator by measuring voltage at B terminal while grounding F terminal. If voltage is above specification, replace IC regulator. If voltage is below specification, test alternator.
7. Perform load check as follows:
  - a. Run engine at 2000 RPM and switch on headlights and heater blower motor. Check that current is at least 20 amps. If less, alternator is defective.

### OVERCHARGED BATTERY

If an obvious overcharging condition exists such as spewing of electrolyte, proceed to unit repair section and check field windings for grounds and shorts. If defective, replace rotor and test regulator with suitable tester.

## Alignment: Service and Repair

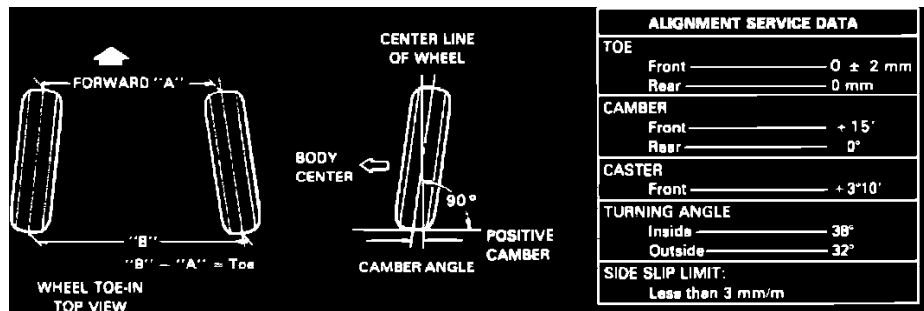


Fig. 1 Wheel alignment specifications

### CAMBER & CASTER ADJUSTMENT

1. Position vehicle on suitable alignment fixture following manufacturer's instructions and check caster and camber angles. Refer to **Fig. 1** for specifications. Bumper should be bounced three times before inspection, to prevent incorrect reading.
2. Camber and caster cannot be adjusted. Should either be found out of specification, locate the cause first.
3. If improper alignment is caused by damaged, worn or loose suspension parts, they should be replaced. If vehicle body or chassis is damaged, it should be repaired.

### TOE ADJUSTMENT

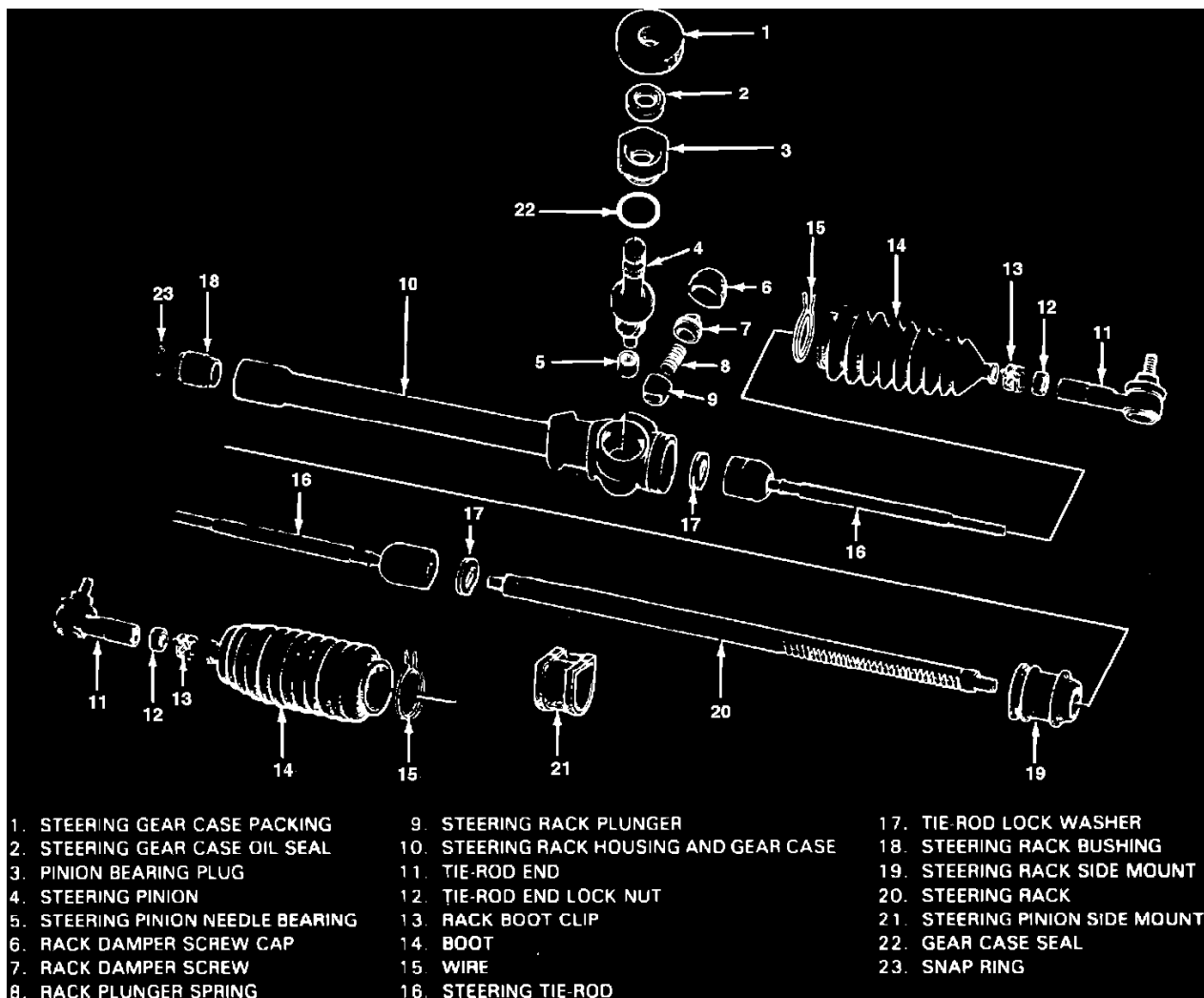
1. Loosen right and left tie rod end locknuts.
2. Turn right and left tie rods by the same amount to align toe to specification. **Right and left tie rods should become equal in length.**
3. After adjustment, tighten locknuts to a torque of 25.5-39.5 ft. lbs. and ensure rack boots are not twisted.

### STEERING ANGLE

1. When a tie rod or tie rod end is replaced, check toe and steering angle with turning radius gages. If steering angle is not correct, check right and left tie rods for equal length.

# Steering Gear: Service and Repair

## Steering Gear Service



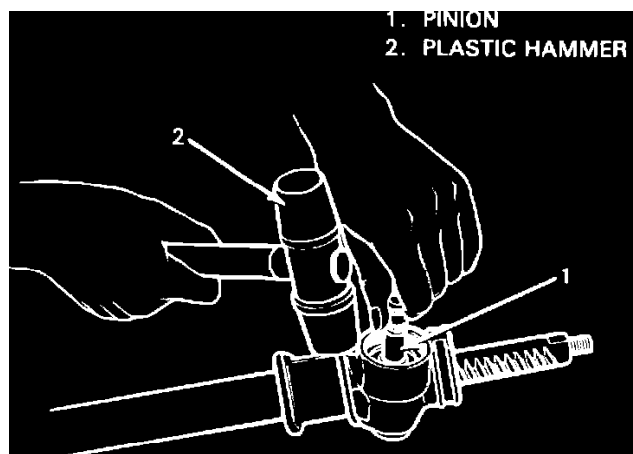
**Fig. 1 Manual rack & pinion steering assembly**

Refer to Fig. 1 when servicing steering gear assembly.

### STEERING PINION

#### Removal

1. Remove rack damper screw cap and damper screw.
2. Remove rack plunger spring and rack plunger.
3. Remove steering gear case packing.
4. Using tool J-34859 or equivalent, remove pinion bearing plug with oil seal.



**Fig. 2 Separating pinion from housing**

5. Tap on position shown in Fig. 2 with a plastic hammer to separate pinion assembly from housing.

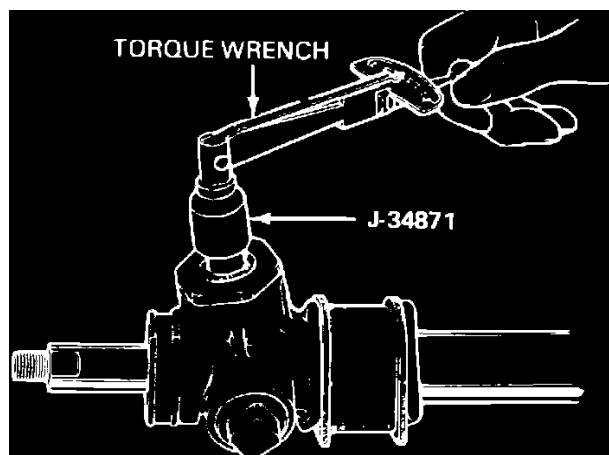


## Inspection

1. Inspect pinion teeth for wear or damage.
2. Inspect oil seal for wear or damage.
3. Inspect plunger spring for deterioration and screw cap, screw and plunger for wear or damage.
4. Inspect gear case packing for damage. Replace all seals and any parts found defective.

## Assembly

1. Apply grease to pinion teeth and gear case oil seal lip.
2. Install pinion assembly.
3. Install pinion case seal and bearing plug. Torque plug to 58-79.5 ft. lbs.
4. Install oil seal and gear case packing.
5. Install rack plunger, plunger spring and damper screw.

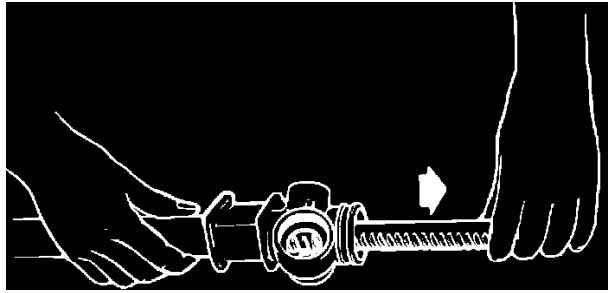


**Fig. 3 Checking pinion torque**

6. After tightening damper screw, back it off 90 degrees and check rotational torque of pinion. Pinion torque should be 58-94 ft. lbs., Fig. 3.

## Steering Gear: Service and Repair

### Steering Rack Removal



**Fig. 4** Removing rack from gear case

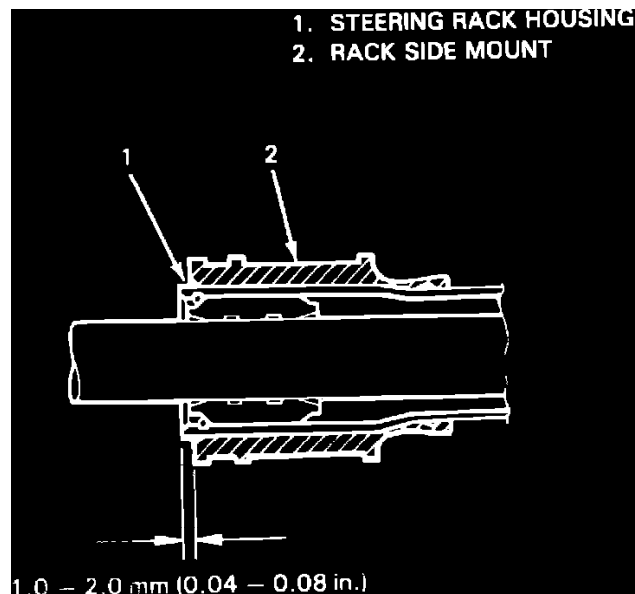
1. Remove boot wires and clips. Slide boots toward tie rod end.
2. Unbend tie rod lock washers and remove tie rods. Mark left and right tie rods.
3. Remove rack plunger and pinion assembly as described under Steering Pinion.
4. Remove rack from gear case as shown in **Fig. 4**.

#### Inspection

1. Inspect steering rack for deflection and rack teeth for wear or damage. Rack deflection should not exceed .016 in.

#### Assembly

1. Apply a suitable lithium based grease to rack teeth surface.
2. Install rack into steering gear case, in opposite direction of removal.
3. Install pinion assembly and plunger assembly as described under "Steering Rack" Removal.



**Fig. 5** Ensuring that rack side mount is positioned

4. Install boot to steering rack housing, ensuring that rack side mount is positioned as shown in **Fig. 5**.
5. Install tie rods as described under "Steering Rack."

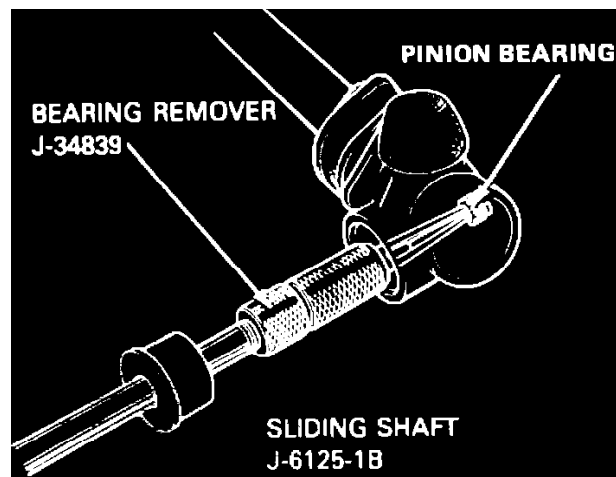


Fig. 6 Removing pinion bearing

## PINION BEARING

### Removal

1. Remove rack from steering gear case as described under "Steering Rack Removal."
2. Remove pinion bearing using tools J-34839 and J-6125-1B, as shown in **Fig. 6**.

### Inspection

Check pinion bearing for wear or damages. Replace if found defective.

### Assembly

1. Apply a suitable lithium based grease to pinion bearing rollers.
2. Press fit pinion bearing into gear case using tool J-934840 or equivalent.
3. After bearing has been installed, ensure that rollers are installed properly.
4. Refer to "Steering Rack Assembly" for steering rack installation.

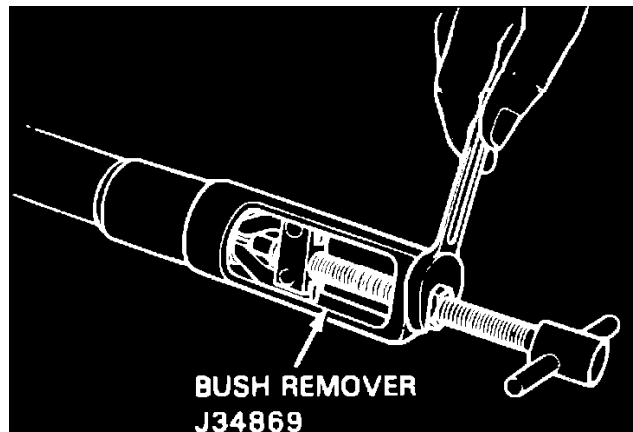


Fig. 7 Removing rack bushing

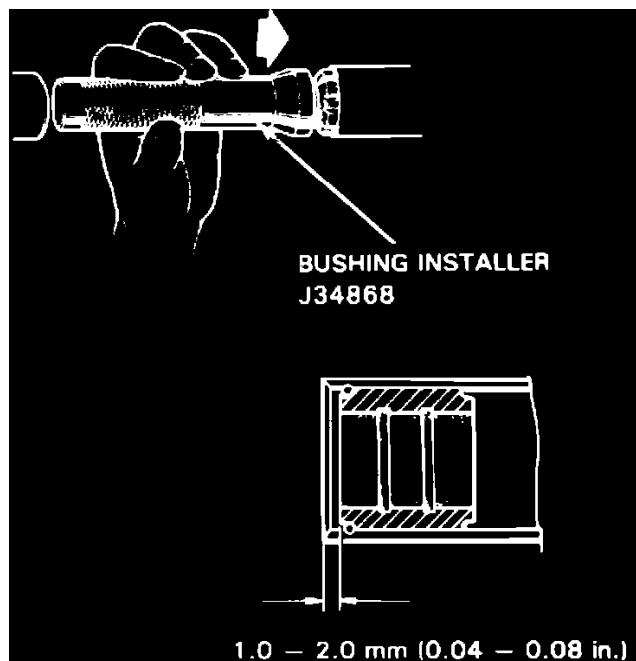
## RACK BUSHING

### Removal

1. Remove rack from steering gear case as described under "Steering Rack Removal."
2. Remove snap ring. **When removing bushing, be careful not to pull bushing while holding gear case in vise as the housing may come off gear case.**
3. Remove bushing from rack housing using tool J-34869 or equivalent, **Fig. 7**.

### Inspection

Inspect bushing for wear or damage and replace if necessary.

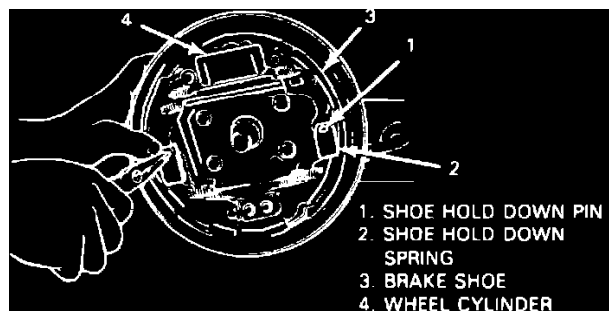


**Fig. 8 Installing rack bushing**

#### Assembly

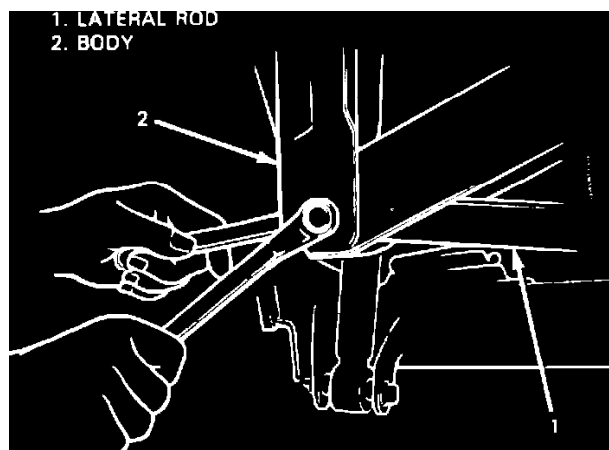
1. Apply a suitable lithium based grease to inner surface of bushing.
2. Using tool J-34868 or equivalent, install bushing into rack housing, ensuring bushing to housing clearance is as shown, **Fig. 8**.
3. Install snap ring.
4. Install steering rack assembly as described under Steering Rack Assembly.

## Axle Beam: Service and Repair



**Fig. 3 Brake shoe hold down spring removal**

1. Raise and support vehicle.
2. Remove rear brake drums.
3. Disconnect brake hoses from lines.
4. Disconnect brake hoses and retainers from trailing arm.
5. Plug brake hoses to prevent loss of brake fluid.
6. Remove brake shoe hold down spring by turning shoe hold down pin as shown in **Fig. 3**.
7. Disconnect parking brake cable from parking brake shoe lever and remove brake shoes. Remove cable from back plate.
8. Remove brake back plate from rear axle.
9. Support center of axle with suitable jack.



**Fig. 4 Lateral rod body side bolt location**

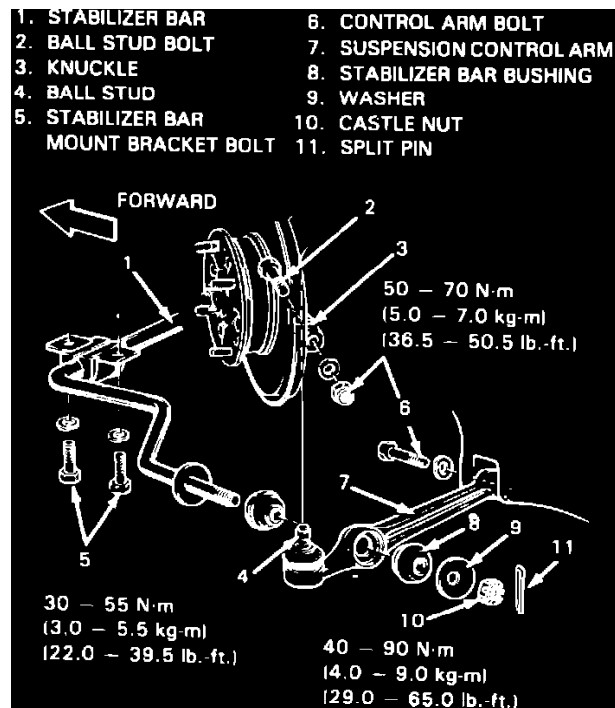
10. Remove lateral rod body side bolt, **Fig. 4**.
11. Remove shock absorber lower mounting bolt.
12. Lower rear axle slowly, until tension of suspension spring is relieved. Remove spring.
13. Remove trailing arm front side bolt and lower rear axle.
14. Remove trailing arm bushing with suitable tool.
15. Reverse procedure to install. **When press fitting bushing into trailing arm, direct its slit side toward front and rear.**

RECOMMENDED TORQUE SPECIFICATIONS			
Fastening parts	Tightening torque		
	N-m	kg-m	lb-ft
Shock absorber upper lock nut	18 - 28	1.8 - 2.8	13.5 - 20.0
Shock absorber upper nut	18 - 28	1.8 - 2.8	13.5 - 20.0
Shock absorber lower bolt	45 - 70	4.5 - 7.0	32.5 - 50.5
Lateral rod nut	45 - 70	4.5 - 7.0	32.5 - 50.5
Lateral rod bolt	45 - 70	4.5 - 7.0	32.5 - 50.5
Rear axle castle nut	80 - 120	8.0 - 12.0	58.0 - 86.5
Rear brake back plate bolt	18 - 28	1.8 - 2.8	13.5 - 20.0
Brake pipe flare nut	14 - 18	1.4 - 1.8	10.5 - 13.0
Rear wheel nut	40 - 70	4.0 - 7.0	29.0 - 50.5
Trailing arm front side nut	70 - 90	7.0 - 9.0	50.5 - 65.0

**Fig. 5 Rear axle torque specifications**

16. Refer to **Fig. 5** for torque specifications.

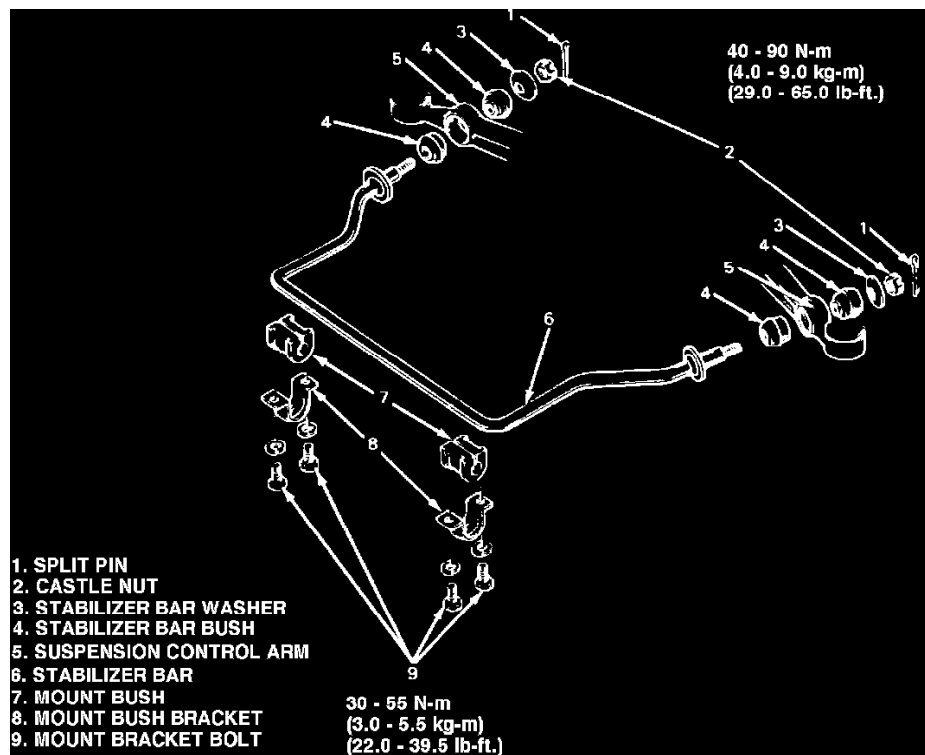
## Control Arm: Service and Repair



**Fig. 9 Removing lower control arm**

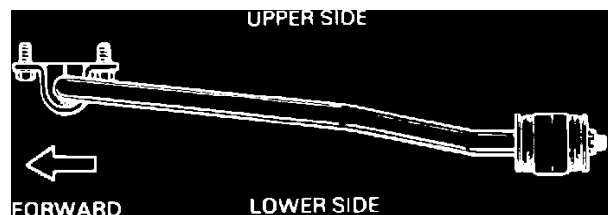
1. Raise and support vehicle.
2. Remove stabilizer bar cotter pin, castle nut, washer and bushing, **Fig. 9**.
3. Remove stabilizer bar bracket bolts on same side as control arm to be removed.
4. Remove ball joint stud bolt 2, **Fig. 9**.
5. Remove control arm bolt 5, **Fig. 9**, and control arm.
6. Reverse procedure to install.

## Stabilizer Shaft: Service and Repair



**Fig. 3 Stabilizer bar and bushings**

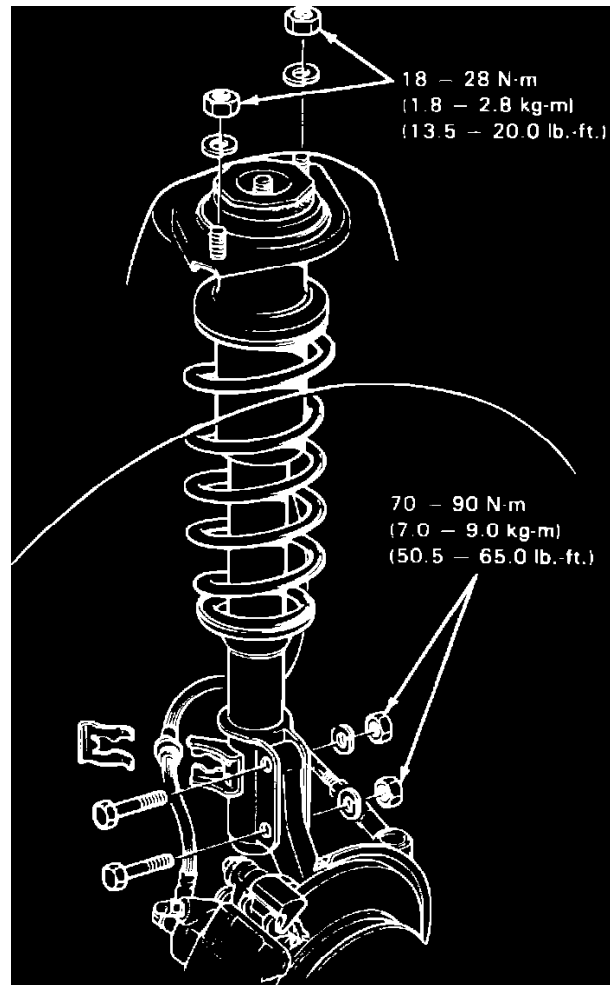
1. Raise and support vehicle.
2. Remove both front wheels.
3. Remove stabilizer bar bracket bolts, **Fig. 3**.
4. Remove nuts from stabilizer bar ends and disconnect stabilizer bar ends from suspension control arms.



**Fig. 4 Correct installation of stabilizer bar**

5. Reverse procedure to install. Refer to **Fig. 4** for proper orientation of stabilizer bar.

## Suspension Strut: Service and Repair Removal/Installation



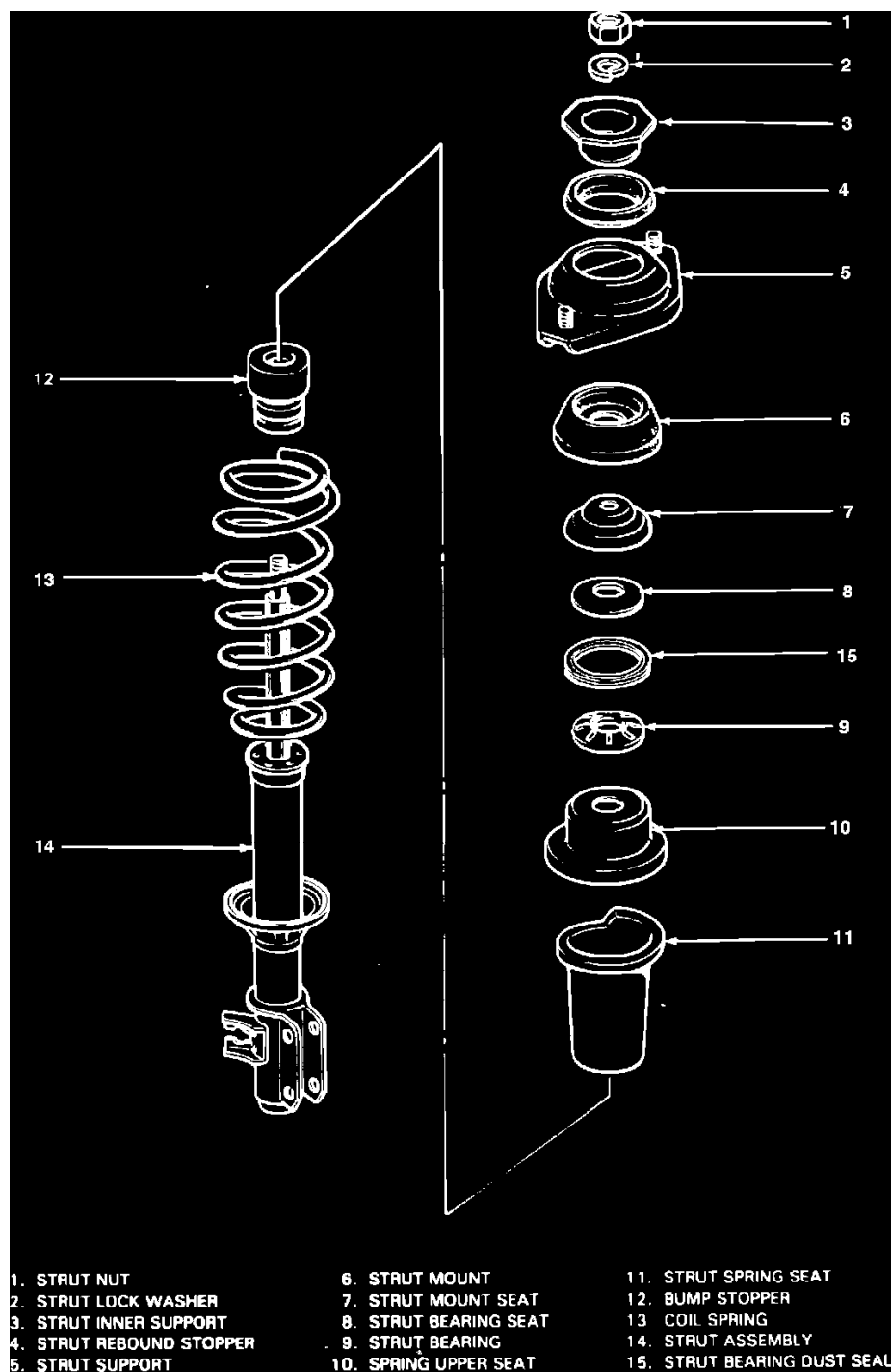
**Fig. 1 Removing MacPherson strut**

1. Raise and support vehicle allowing front suspension to hang free.
2. Remove front wheel.
3. Remove E-clip from brake hose and disengage hose from strut bracket, **Fig. 1**.
4. Support lower control arm and knuckle assembly and remove strut to knuckle bolts.
5. Remove upper strut mount nuts and remove strut from vehicle.
6. Reverse procedure to install.



# Suspension Strut: Service and Repair

## Disassembly/Assembly



**Fig. 2 MacPherson strut assembly exploded view**

1. Mount strut in suitable spring compressor.
2. Compress spring to about 1/2 its height. Do not bottom spring.
3. Remove nut from strut shaft and remove components, **Fig. 2**.
4. Reverse procedure to assemble. Compress spring so strut shaft protrudes through cap by about 1 inch. Torque nut to 29 ft. lbs.

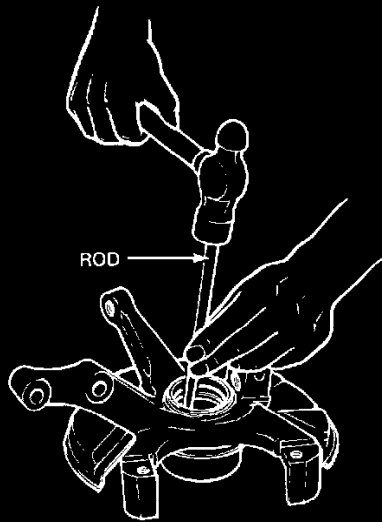
# Wheel Bearing: Service and Repair

## Wheel Bearing Replace - Front

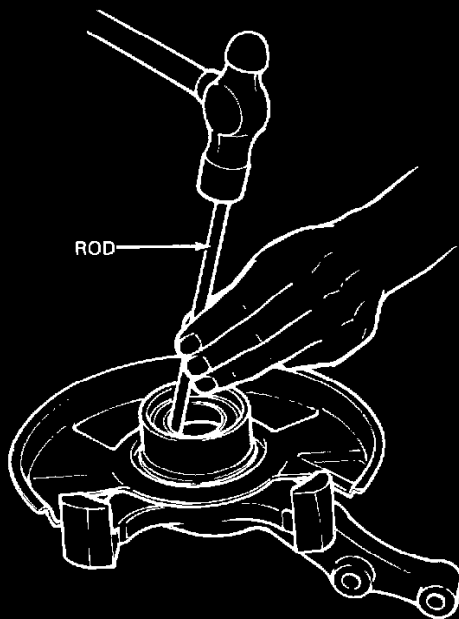
### FRONT WHEEL BEARINGS AND/OR HUB

#### REMOVE WHEEL BEARING

##### Wheel outer bearing



##### Wheel inner bearing

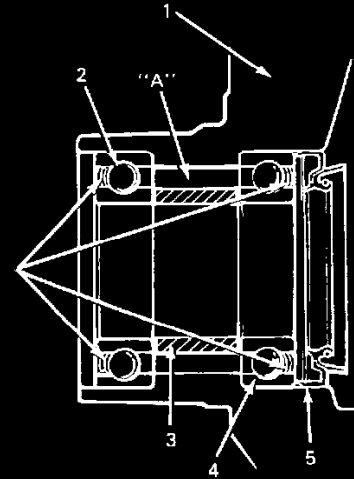


#### INSTALL WHEEL BEARING

Before installing wheel bearings, apply wheel bearing lithic grease to balls and oil seal lips of wheel bearings. Also fill it in the clearance outside spacer (shown as "A" in figure) with 40% amount of the clearance capacity.

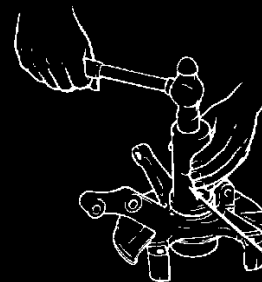
1. KNUCKLE
2. OUTER BEARING
3. SPACER
4. INNER BEARING
5. SEAL

The bearings own internal seal should be installed facing outward as shown.

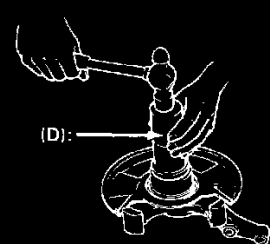


**NOTE:** Spacer must be snug and centered between inner and outer bearings.

##### Wheel inner bearing



##### Wheel outer bearing



(D):  
SPECIAL TOOL  
(BEARING INSTALLER)  
J34856

##### Front knuckle seal

Use tool J34881 to install seal.

#### Knuckle And/Or Bearing

##### Front knuckle seal

Use tool J34881 to install seal.

##### Remove Wheel Bearing

1. Wheel outer bearing.
2. Wheel inner bearing.

##### Install Wheel Bearing

Before installing wheel bearings, apply wheel bearing lithic grease to balls and oil seal lips of wheel bearings. Also fill it in the clearance outside spacer (shown as "A" in image) with 40% amount of the clearance capacity.

## Wheel Bearing: Service and Repair

### Wheel Hub & Bearing Replace

#### FRONT WHEEL BEARINGS AND/OR HUB

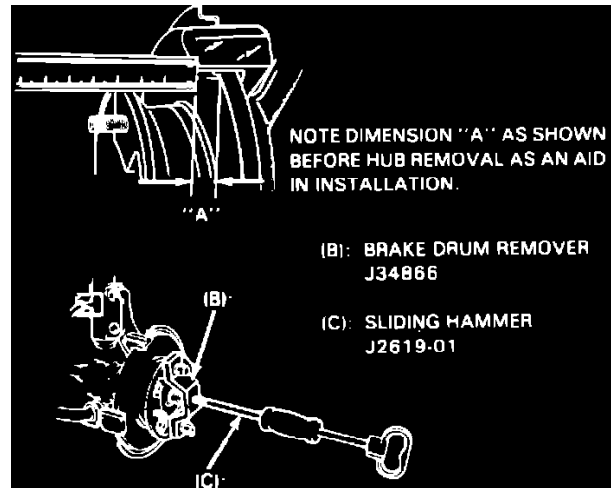


Fig. 5 Checking dimension "A" to assure proper installation of hub

1. Raise and support vehicle and remove front wheel.
2. Remove cotter pin and driveshaft castle nut.
3. Remove caliper bolts and caliper. Hang caliper aside.
4. Refer to **Fig. 5**, and measure dimension A for assembly reference. Pull hub out of knuckle.

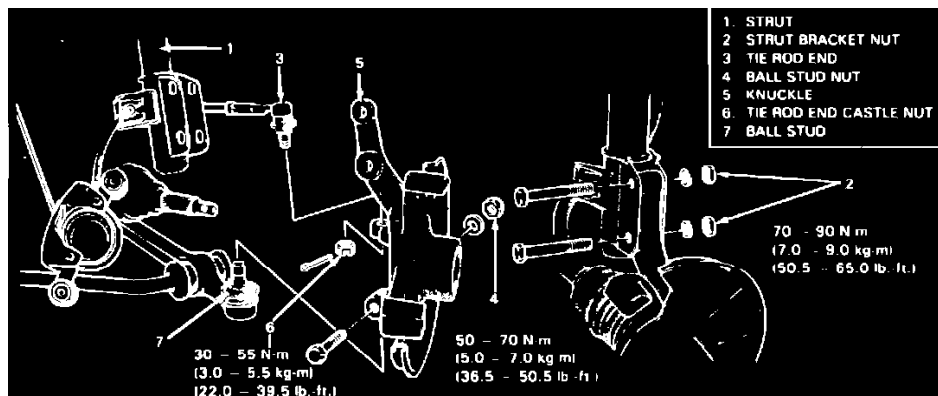


Fig. 6 Removing steering knuckle

5. Disconnect tie rod end from knuckle with tool J-21687-02 or equivalent.
6. Remove strut to knuckle bolts and then ball joint stud pinch bolt, **Fig. 6**.
7. Remove knuckle.
8. Using suitable drift, remove outer, then inner bearing from knuckle.

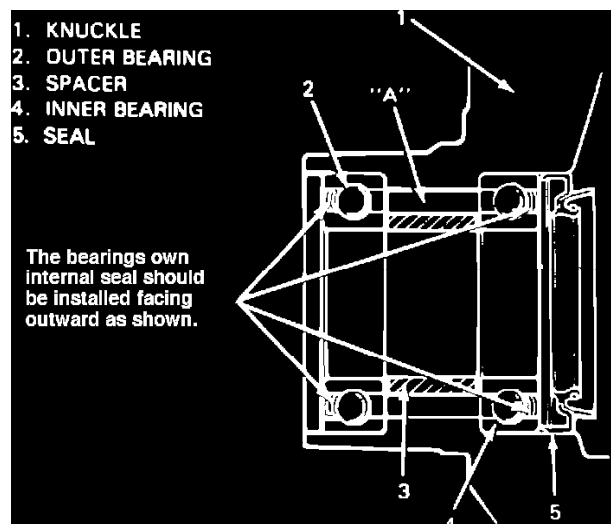
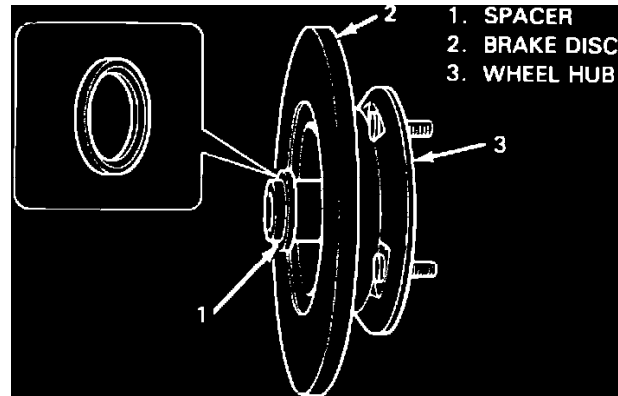


Fig. 7 Steering knuckle hub bearings and seal

9. Apply suitable grease to balls and oil seal lips of wheel bearings. Fill area A, **Fig. 7**, with grease.
10. Install wheel bearings using bearing installer J-34856 or equivalent.
11. Install wheel bearing seal 5, **Fig. 7**, using tool J-34881 or equivalent.

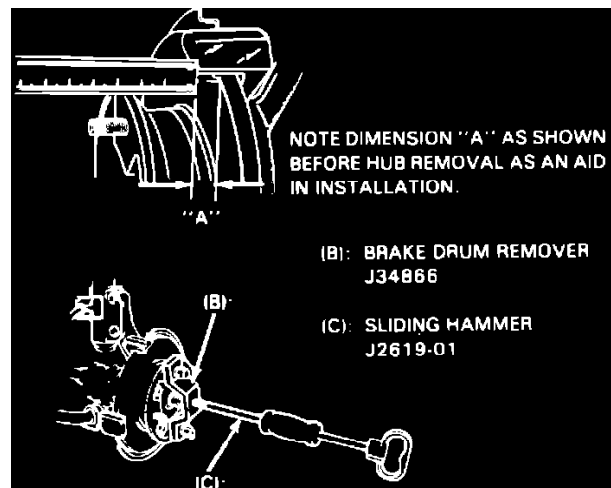


**Fig. 8 Installing spacer on wheel hub**

12. Install spacer on hub with bevel side first, **Fig. 8**.
13. Check that wheel bearing spacer bore is aligned with bearing bores. If not, move spacer until aligned.
14. Using plastic hammer, tap hub lightly into knuckle, taking care that hub does not cock.
15. Using installing tool J-34856 or J-7079-2 or equivalent, drive hub until dimension A, noted in step 4, is obtained.
16. Install brake pad and caliper.
17. Torque caliper bolts to 17.5-26 ft. lbs.
18. Torque drive shaft castle nut to 108.5-195 ft. lbs.
19. Install cotter pin.
20. Install wheel and lower vehicle.

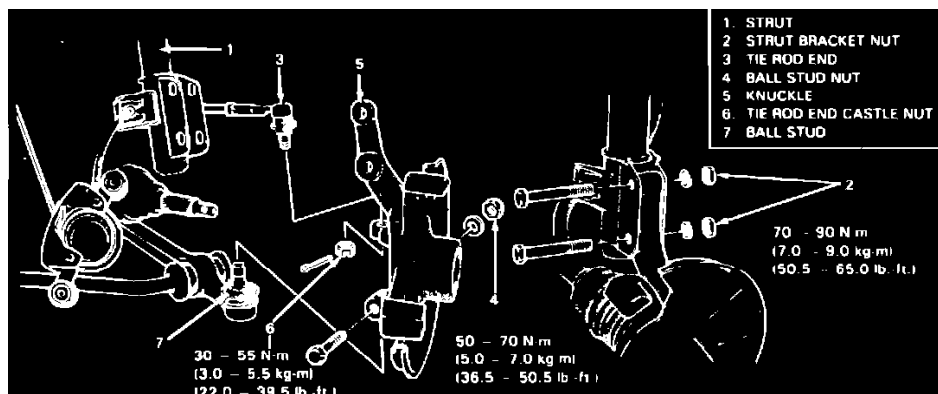
# Wheel Hub: Service and Repair

## FRONT HUB/BEARING



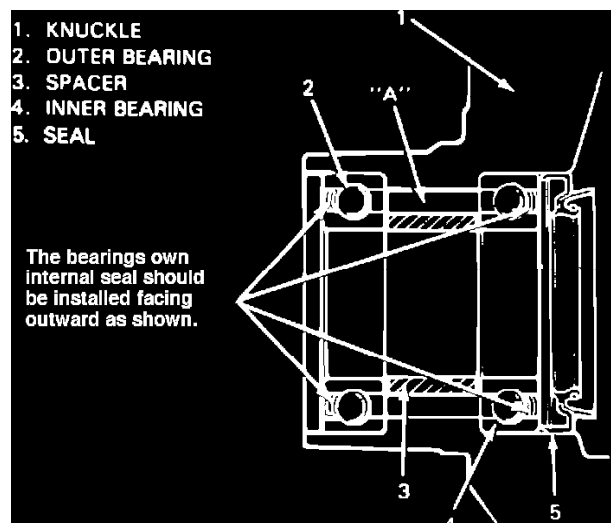
**Fig. 5** Checking dimension "A" to assure proper installation of hub

1. Raise and support vehicle and remove front wheel.
2. Remove cotter pin and driveshaft castle nut.
3. Remove caliper bolts and caliper. Hang caliper aside.
4. Refer to **Fig. 5**, and measure dimension A for assembly reference. Pull hub out of knuckle.



**Fig. 6** Removing steering knuckle

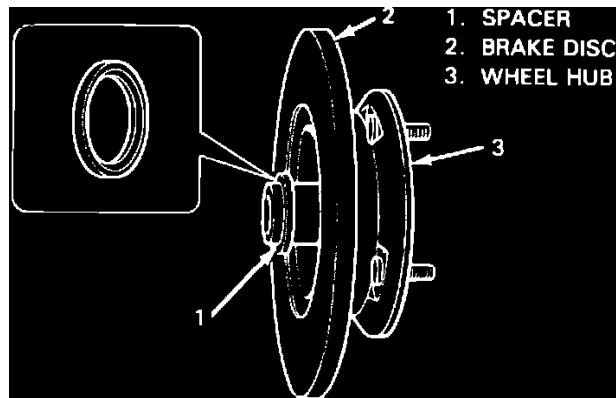
5. Disconnect tie rod end from knuckle with tool J-21687-02 or equivalent.
6. Remove strut to knuckle bolts and then ball joint stud pinch bolt, **Fig. 6**.
7. Remove knuckle.
8. Using suitable drift, remove outer, then inner bearing from knuckle.



**Fig. 7** Steering knuckle hub bearings and seal

9. Apply suitable grease to balls and oil seal lips of wheel bearings. Fill area A, **Fig. 7**, with grease.

10. Install wheel bearings using bearing installer J-34856 or equivalent.
11. Install wheel bearing seal 5, **Fig. 7**, using tool J-34881 or equivalent.



**Fig. 8 Installing spacer on wheel hub**

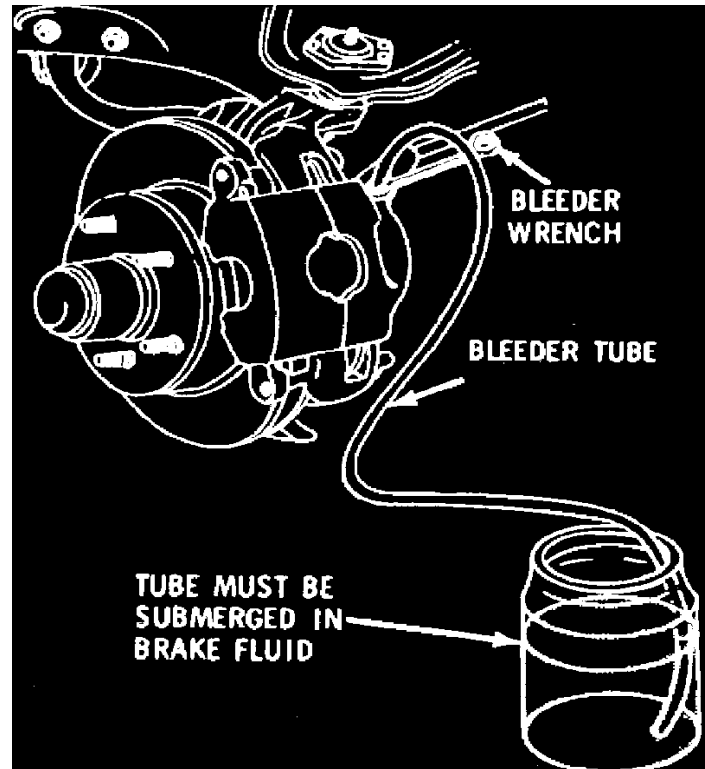
12. Install spacer on hub with bevel side first, **Fig. 8**.
13. Check that wheel bearing spacer bore is aligned with bearing bores. If not, move spacer until aligned.
14. Using plastic hammer, tap hub lightly into knuckle, taking care that hub does not cock.
15. Using installing tool J-34856 or J-7079-2 or equivalent, drive hub until dimension A, noted in step 4, is obtained.
16. Install brake pad and caliper.
17. Torque caliper bolts to 17.5-26 ft. lbs.
18. Torque drive shaft castle nut to 108.5-195 ft. lbs.
19. Install cotter pin.
20. Install wheel and lower vehicle.

## Brakes and Traction Control: Service and Repair

### Flushing Hydraulic System

Whenever new brake components are installed in the hydraulic system, it is recommended that the entire hydraulic system be thoroughly flushed with clean brake fluid. If brake fluid becomes contaminated, it may lose some of its original qualities. It is good practice to bleed the brake system until all old fluid is removed when performing major brake work. Old fluid should be bled from the system and replaced with new brake fluid if any of the hydraulic system parts are corroded or the fluid is discolored or dirty. If any of the rubber parts of the hydraulic system are soft or swollen, old fluid should be removed and all rubber components in the hydraulic system should be replaced. Do not reuse old brake fluid at any time. In the event that improper fluid has entered the system, it will be necessary to service the system as follows:

- Drain the entire system.
- Thoroughly flush the system with brake fluid.
- Replace all rubber parts of the system, brake hoses and combination valve.
- Refill the system.
- Bleed the system.



**Fig. 27 Flushing Hydraulic System**

Flushing is performed at each wheel in the same manner as the bleeding operation except that the bleeder valve is opened 1-1/2 turns and the fluid is forced through the lines and bleeder valve until it emerges clear in color. Approximately one quart of clean brake fluid is required to flush the hydraulic system. After completing the flushing operation at all bleeder valves, check to ensure the master cylinder is filled to the proper level.

## Brake Bleeding: Service and Repair

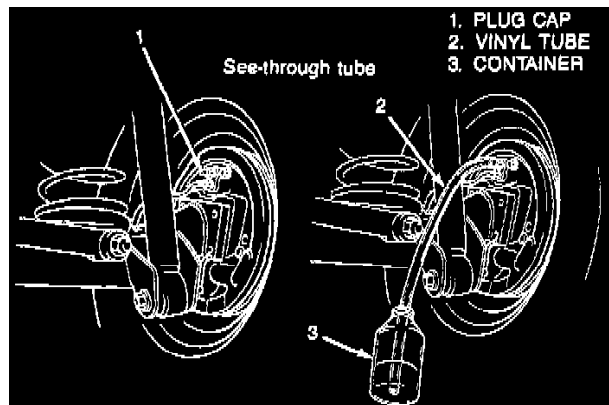
### Hydraulic System Bleeding

**NOTE:** Perform bleeding operation starting with wheel cylinder farthest from master cylinder and then at front caliper of the same brake line. Do the same on the other brake line.



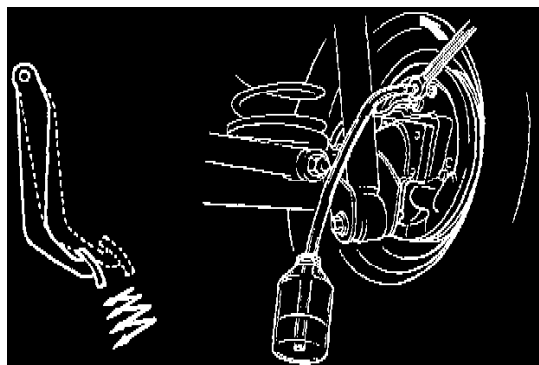
#### Bleeding Sequence

- Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.



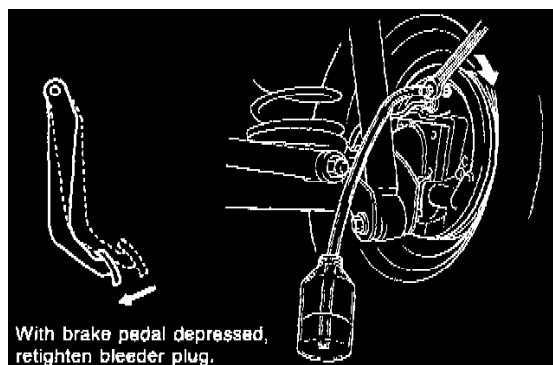
#### Attaching Bleeder Tube

- Remove bleeder plug cap.
- Attach a vinyl tube to the bleeder plug of wheel cylinder, and insert the other end into a container.



#### Depressing Brake Pedal/Bleeding Fluid

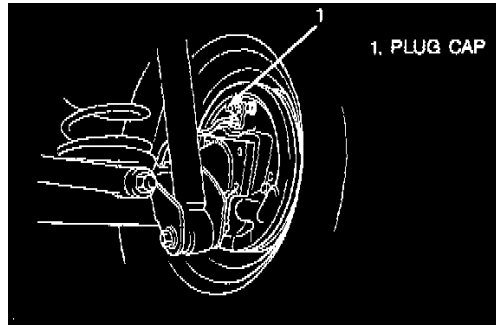
- Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one third to one-half turn.



#### Tightening Bleeder Plug

- When the fluid pressure in the cylinder is almost depleted, retighten the bleeder plug.
- Repeat this operation until there are no more air bubbles in hydraulic line.





#### **Attaching Bleeder Plug Cap**

7. When bubbles stop, depress and hold brake pedal and tighten bleeder plug then attach bleeder plug cap.
8. After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.



#### **Replenishing Fluid To Specified Level**

9. Replenish the fluid in the reservoir to specified level and check brake pedal for "sponginess". If found spongy, repeat entire procedure of bleeding.

## Brake Caliper: Service and Repair

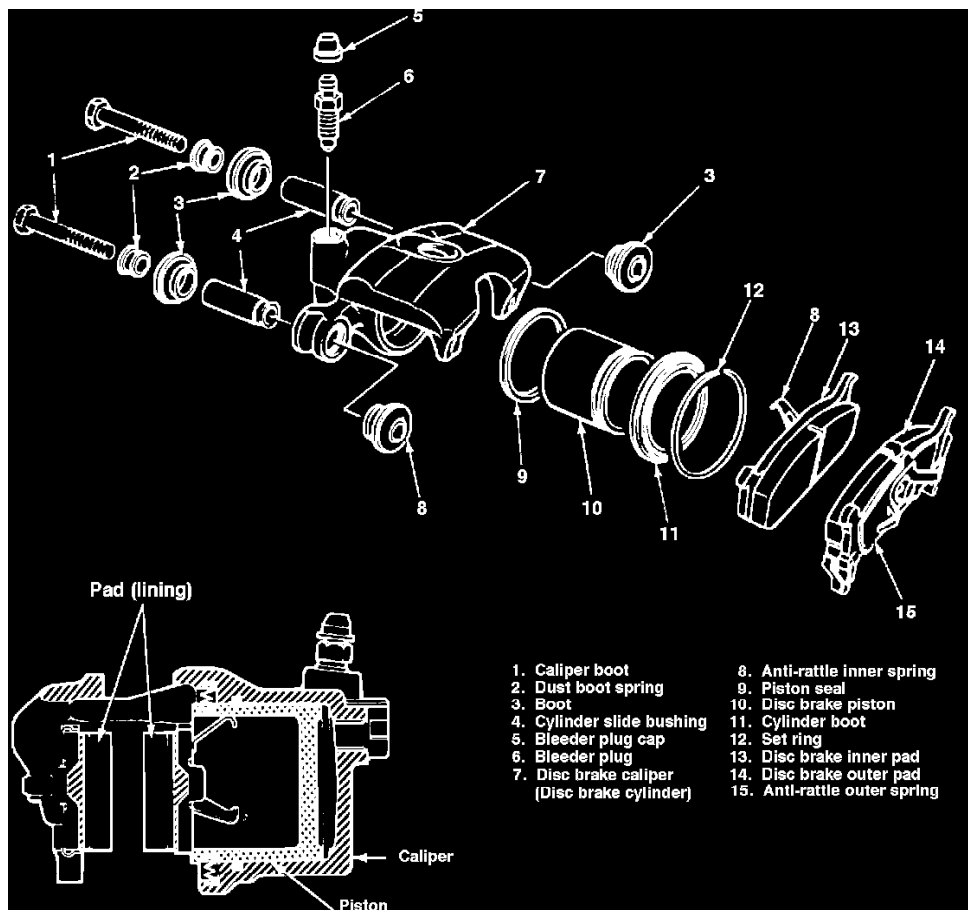
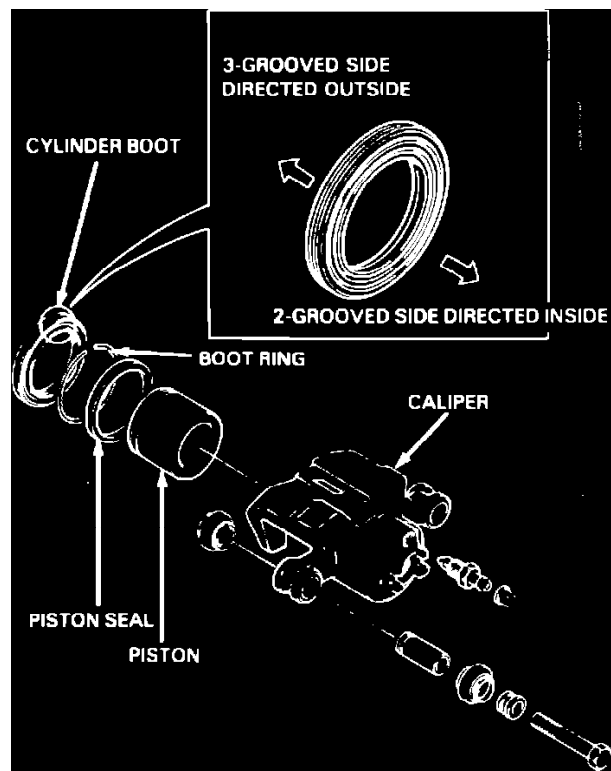


Fig. 7 Disassembled view of brake caliper

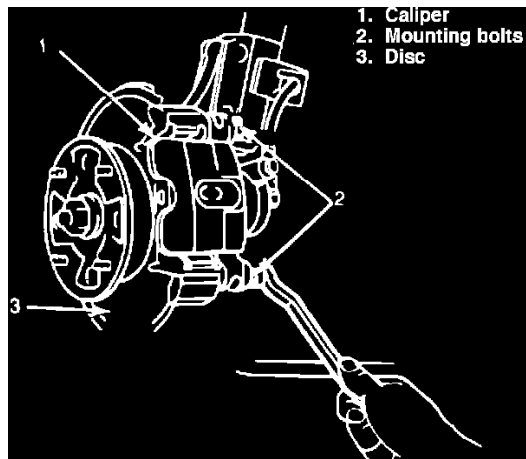
1. Raise and support vehicle.
2. Disconnect brake hose from caliper.
3. Remove caliper mounting bolts.
4. Remove caliper from knuckle.
5. Clean caliper with brake fluid.
6. Remove cylinder boot set ring and boot from cylinder groove, **Fig. 7**.
7. Using compressed air, remove brake cylinder. Keep fingers away from piston.
8. Remove piston seal, taking care not to damage cylinder bore.
9. Install new piston seal in cylinder.



**Fig. 8 Installing caliper boot**

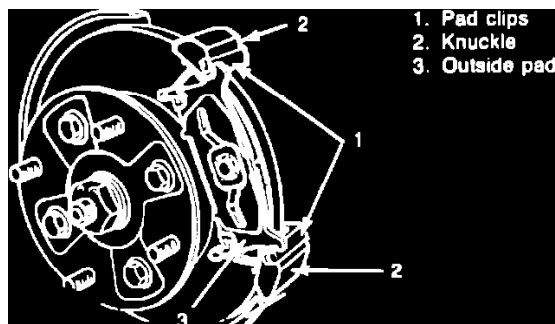
10. Install new boot on piston so side with 2 grooves faces in toward cylinder and side with 3 grooves faces out, **Fig. 8**.
11. Install piston in caliper so it projects about .4 inch to ease installation. Install boot set ring.
12. Check that caliper slide bushings are lubricated with rubber grease. Check that slide bushing in each carrier hole can be moved smoothly in each direction.
13. Install caliper and inside pad on knuckle.
14. Tighten caliper bolts.
15. Connect brake hose.
16. Install wheel.
17. Lower vehicle and test brakes.

## Brake Pad: Service and Repair



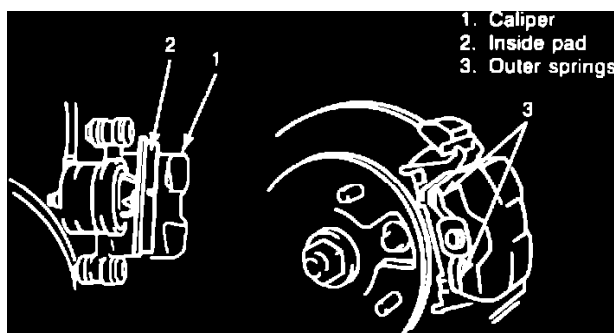
**Fig. 4 Removing caliper mounting bolts**

1. Raise and support vehicle and remove wheel.
2. Remove caliper mounting bolts, **Fig. 4**.
3. Remove caliper from knuckle, taking care not to drop inside pad. Hang caliper aside.
4. Remove outside pad.



**Fig. 5 Installing outside pad**

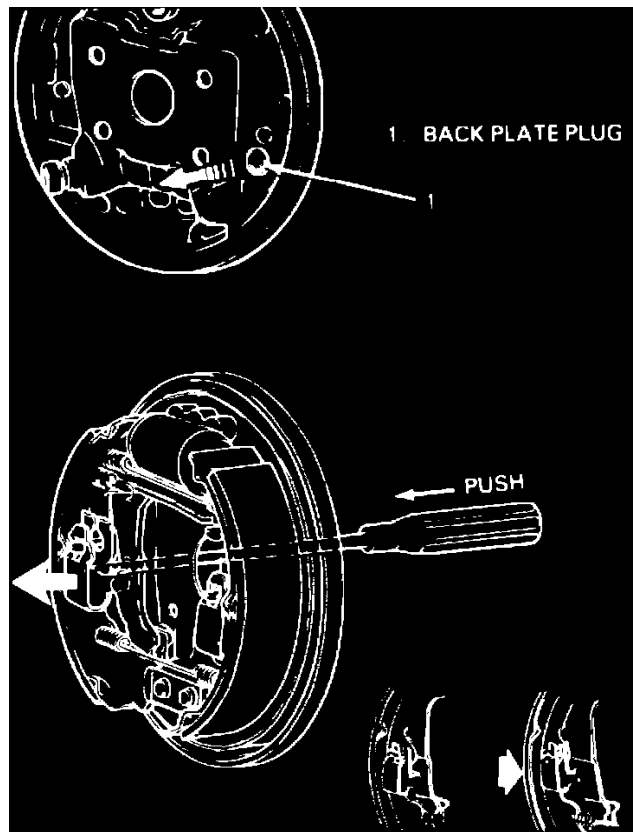
5. Install caliper and inside pad to knuckle, **Fig. 5**.



**Fig. 6 Installing inside pad & caliper**

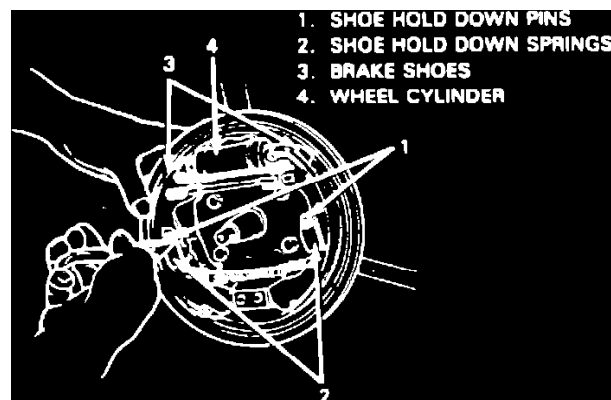
6. Install caliper and inside pad to knuckle, **Fig. 6**. Position outer springs over caliper as shown.
7. Torque caliper bolts to 17.5-26 ft. lbs.
8. Install front wheel.
9. Lower vehicle and perform brake test.

## Brake Shoe: Service and Repair



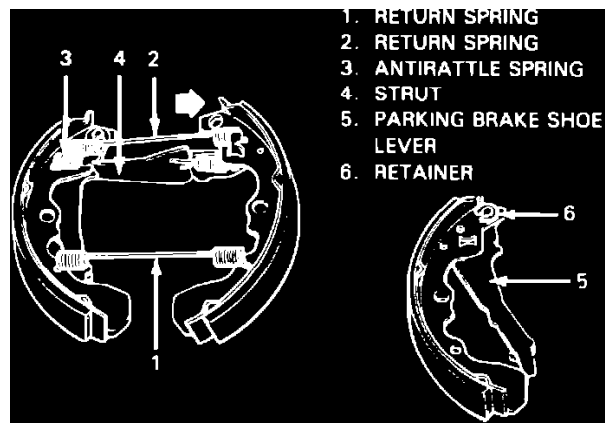
**Fig. 2 Removing backing plate plug**

1. Raise and support vehicle.
2. Remove spindle cap by hammering lightly at 3 points around cap.
3. Remove cotter pin, castle nut and washer.
4. Loosen parking brake cable adjusting nuts.
5. Remove backing plate plug, **Fig. 2**.
6. Insert screwdriver into plug hole and push in direction shown. This pushes hold down spring up and releases parking brake shoe lever from hold down spring, resulting in added clearance between shoe and drum.
7. Using slide hammer J-2619-01 and brake drum remover J-34866, pull off brake drum.



**Fig. 3 Removing brake lining hold down springs**

8. Remove brake shoe hold down springs by turning shoe hold down springs, **Fig. 3**.
9. Disconnect parking brake cable from parking brake shoe lever and remove brake shoes.



**Fig. 4 Brake shoe return spring identification**

10. Remove spring 1 in **Fig. 4**, pull primary shoe in direction of arrow and disengage strut 4 and return spring 2.
11. Disconnect return spring 3 from shoe.
12. Disconnect parking brake shoe lever from shoe.
13. Remove bleeder screw from wheel cylinder.
14. Slightly loosen brake line flare nut.
15. Remove wheel cylinder mounting bolts. Disconnect brake line from wheel cylinder and put bleeder cap plug onto brake line to prevent brake fluid spillage.
16. Install new gasket on wheel cylinder. Remove bleed cap plug from brake line and connect line to wheel cylinder. Do not final tighten.
17. Torque wheel cylinder mounting bolts to 7.5-9 ft. lbs.
18. Torque brake line flare nut to 10.5-13 ft. lbs.
19. Install bleeder cap plug on bleeder.

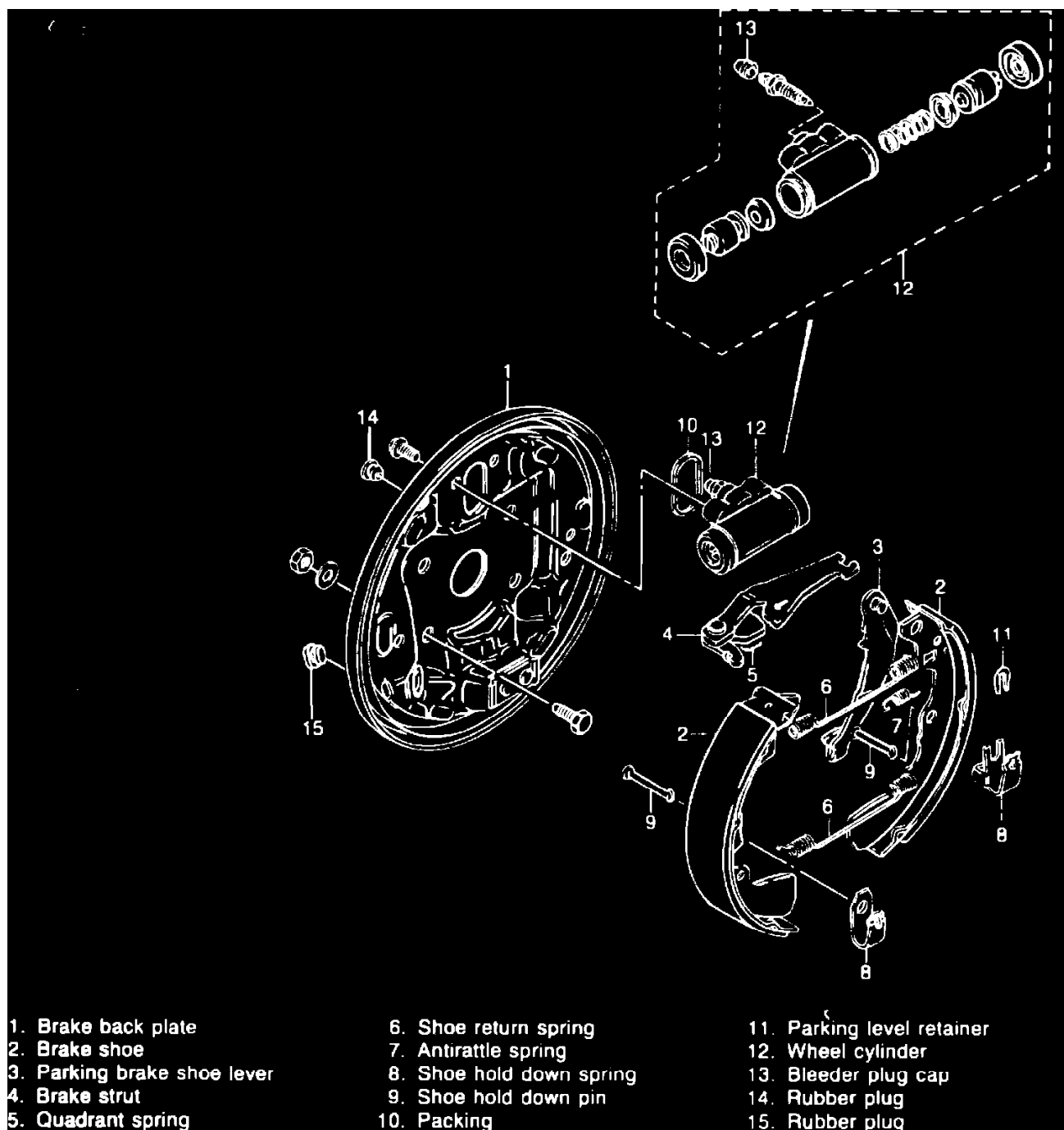


Fig. 5 Assembling rear brake unit

20. Assemble brake shoes, levers and springs as shown in Fig. 5.  
21. Push shoe hold down springs down into place. Turn hold down pins to engage springs.

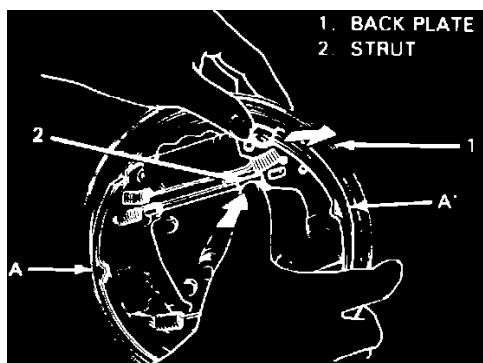


Fig. 6 Brake lining installation

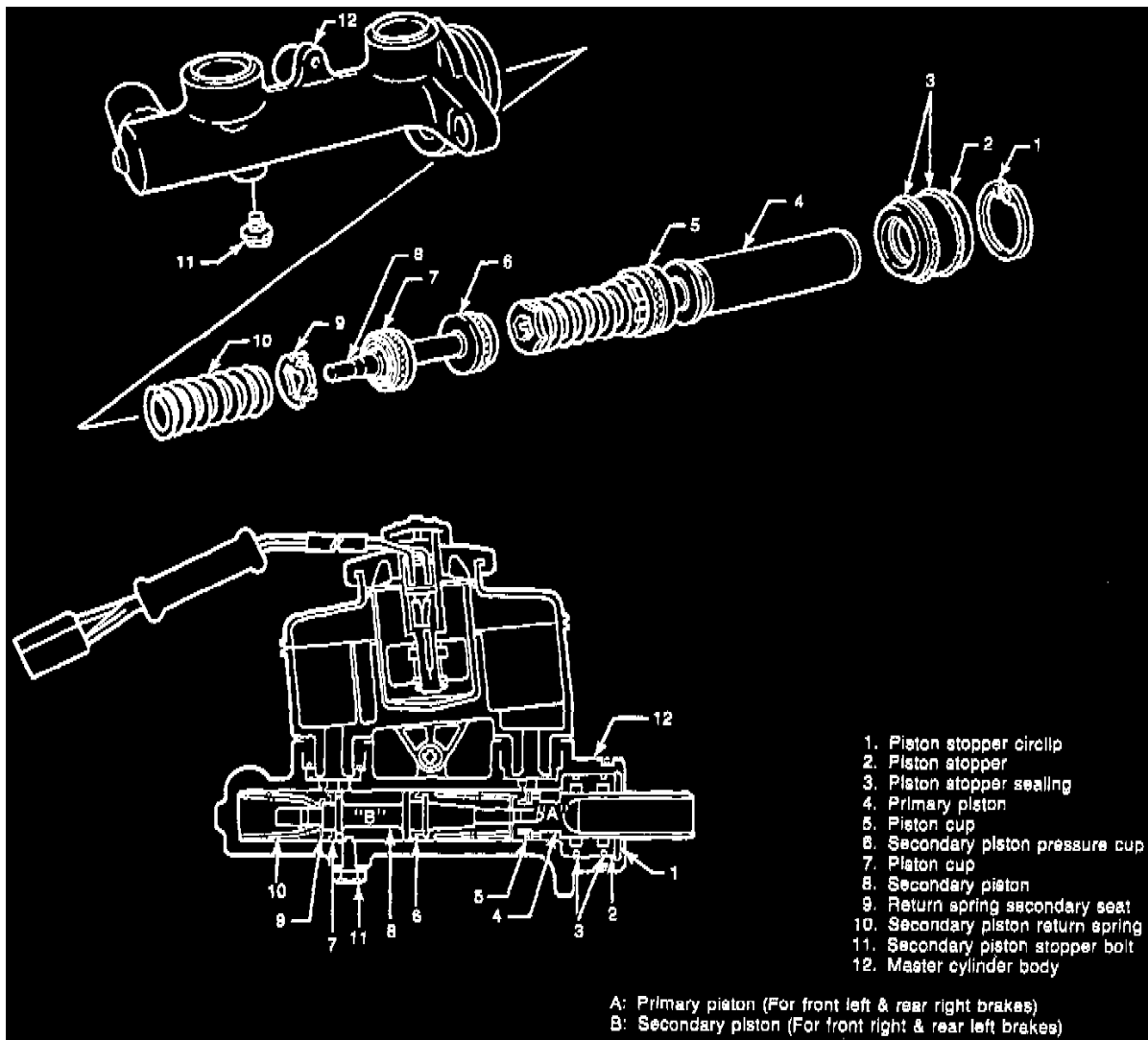
22. To minimize dimension 'A-A,' Fig. 6, push strut towards backplate while pushing out on shoe as shown.  
23. Position tab of spring clip behind parking lever.  
24. Install brake drum and torque castle nut to 58-86.5 ft. lbs. Install cotter pin.

## **Chevrolet Sprint L3-61 1.0L**

25. Install spindle cap.
26. Install wheel.
27. Depress brake pedal several times to obtain proper drum to shoe clearance and adjust parking brake.
28. Check that brake drum does not drag.
29. Lower vehicle and test brake operation.



## Brake Master Cylinder: Description and Operation

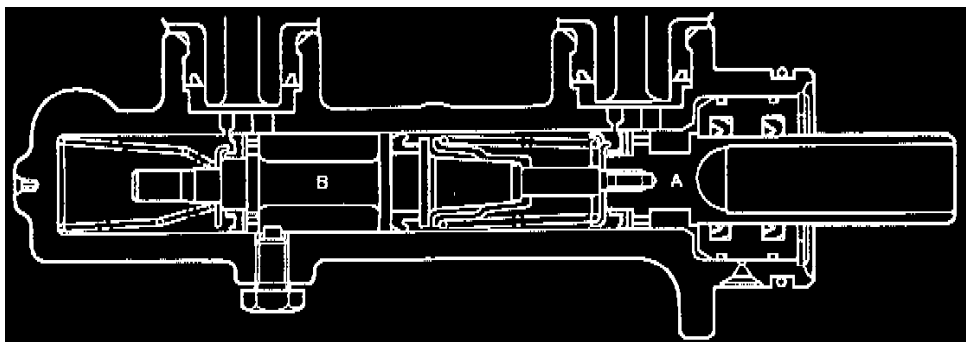


**Exploded View Of Master Cylinder Assembly**

This master cylinder is designed for use in a diagonal split system (one front and one rear brake served by the primary piston, and the opposite front and rear brakes served by the secondary piston).

The tandem master cylinder is similar in construction to an ordinary master cylinder, the principal differences being that it has two pistons and three cups and that hydraulic pressure is developed in two chambers, one for front left & rear right brakes and the other for front right & rear left brakes.

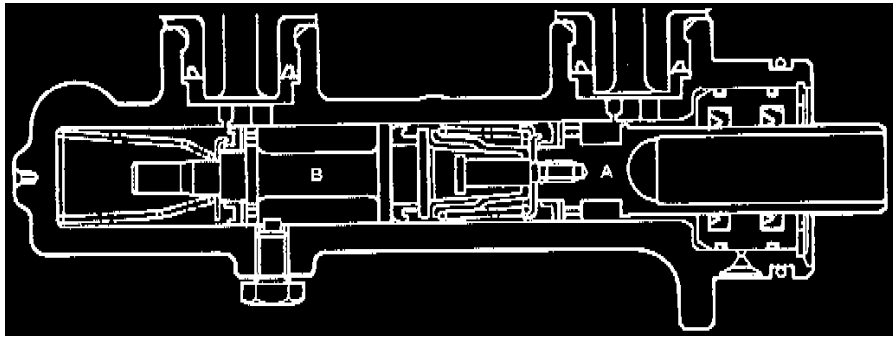
### MASTER CYLINDER OPERATION:



**Master Cylinder - Normal Operation**

### Normal operation:

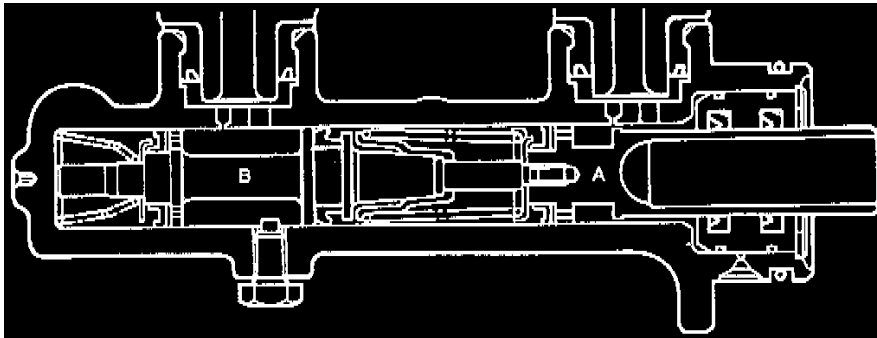
Depressing the brake pedal forces primary piston "A" toward the left (in Figure) to pressurize the fluid immediately ahead for front left & rear right brakes. By this pressure and by the force of return spring, secondary piston "B" moves similarly to pressurize the fluid for front right & rear left brakes.



#### Master Cylinder-One Circuit Operation-Front Left & Rear Right Brakes Circuit Failure

##### Single circuit operation (front left & rear right brakes circuit failure):

Depressing the brake pedal causes primary piston "A" to move as above but, because the front left & rear right brakes circuit cannot hold pressure, the fluid immediately ahead of this piston does not get pressurized. Piston "A" keeps moving, compressing the spring and when it reaches the piston "B" retainer, it begins to push piston "B". From this point on, piston "B" moves to pressurize the fluid ahead and thus actuate the front right & rear left brakes.



#### Master Cylinder-One Circuit Operation-Front Right & Rear Left Brakes Circuit Failure

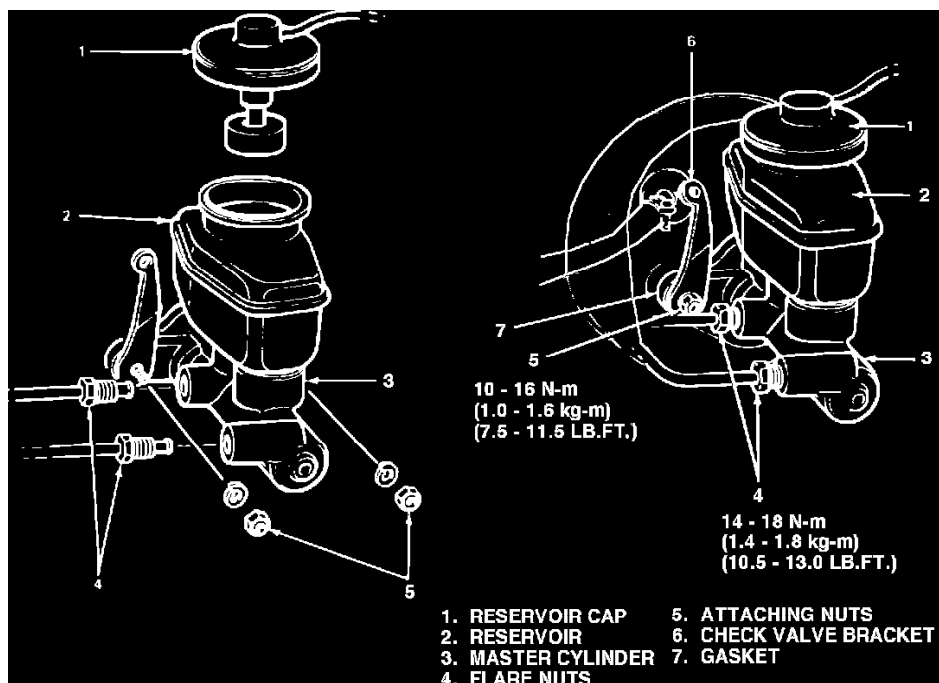
##### Single circuit operation (front right & rear left brakes circuit failure):

In this case, the leftward movement of piston "A" has but little effect in pressurizing its fluid (for front left & rear right brakes) at first, because the initial rise in fluid pressure causes piston "B" to promptly yield and move toward the left. Very soon the forward end of piston "B" comes to and bears against the head of the cylinder. From this point on, the leftward movement of piston "A" becomes effective to pressurize the fluid ahead of it for the front left & rear right brakes. The below Figure shows secondary piston "B" at halt.

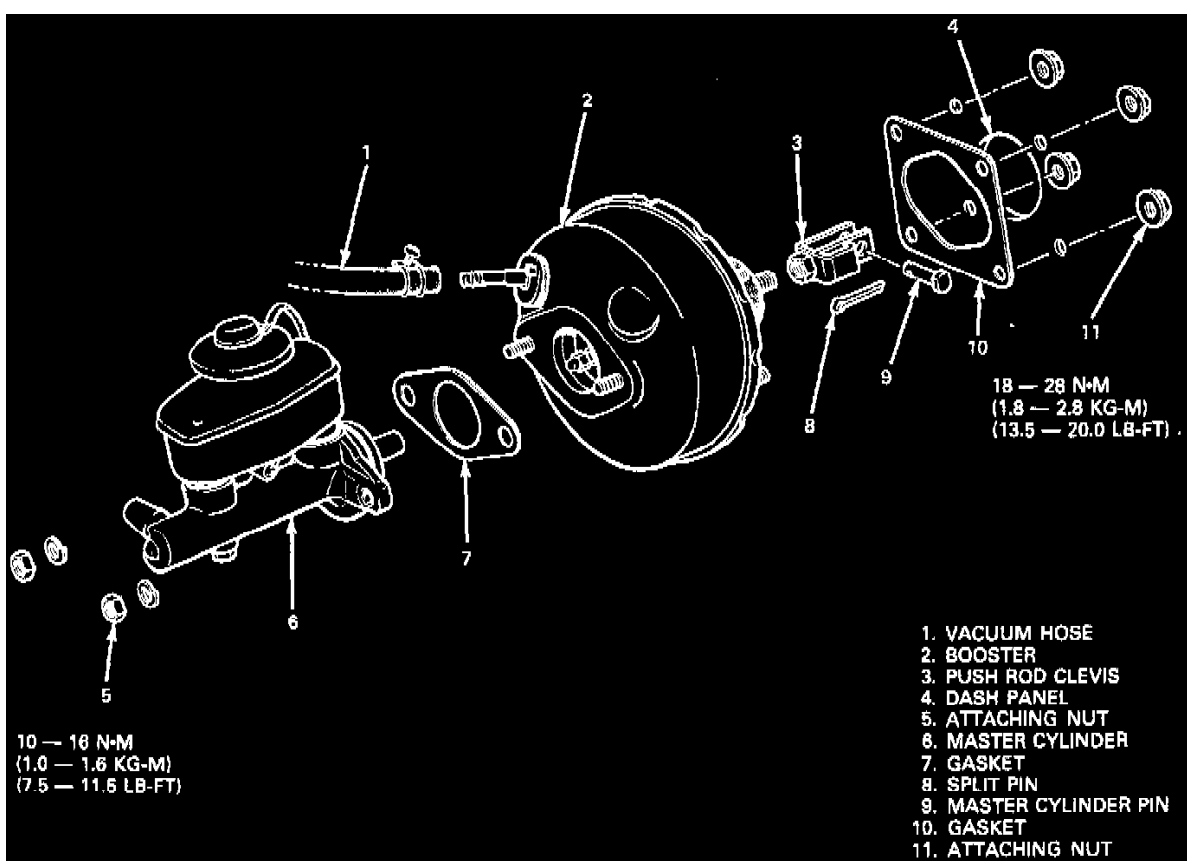
## Brake Master Cylinder: Service and Repair

### Master Cylinder Removal and Installation

**CAUTION:** Brake fluid will damage electrical connections and painted surfaces. Use shop cloths, drip pans and fender covers to prevent brake fluid from contacting these areas.



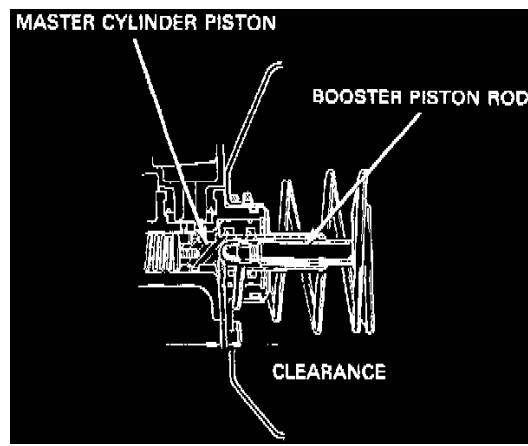
Removing/Installing Master Cylinder Assembly



Exploded View Of Master Cylinder Assembly And Booster

#### Removal:

1. Clean around reservoir cap and take out fluid with a syringe.
2. Disconnect two brake pipes from master cylinder.
3. Remove two attaching nuts and washers.
4. Remove master cylinder.

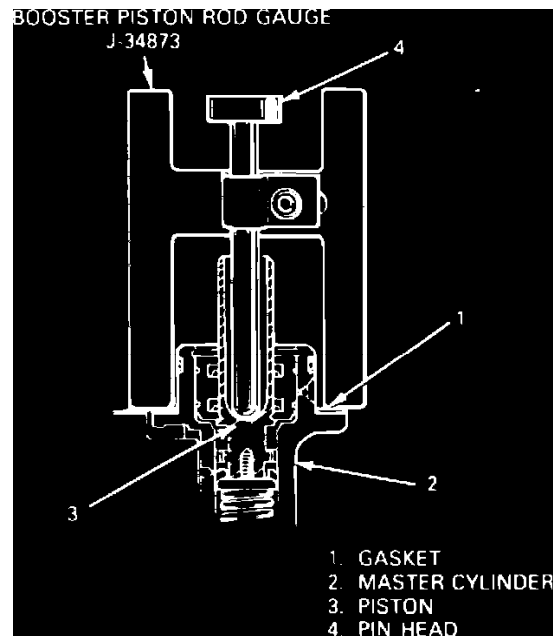


**Master Cylinder Piston To Booster Piston Rod Clearance**

5. Adjust clearance of booster piston rod to master cylinder piston as follows:

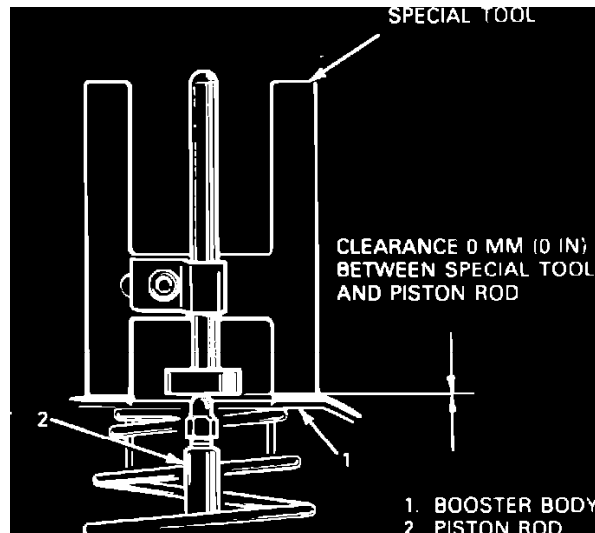
**NOTES:**

- Before measuring clearance, push piston rod several times so as to make sure reaction disc is in place.
- Take measurement with gasket installed to master cylinder.
- Keep inside of booster at atmospheric pressure for measurement.



**Fig. 4 Tool J-34873 installation**

a. Set measuring tool J-34873 on master cylinder and push pin until it contacts piston.



**Fig. 5 Adjusting clearance between tool and piston rod**

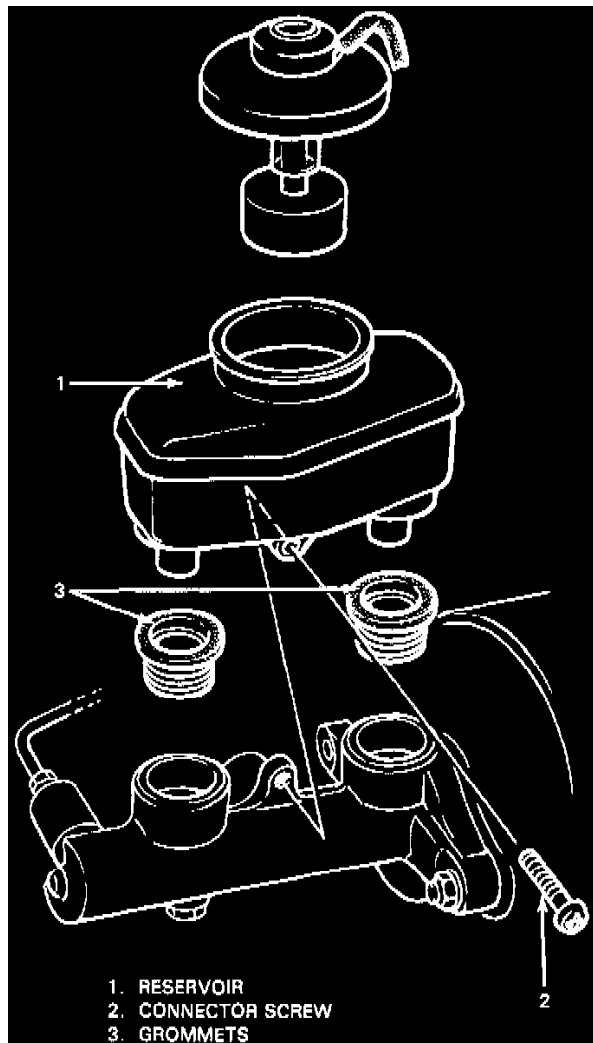
- b. Turn tool upside down and place on booster. Adjust booster piston rod length until rod end contacts pin head.
- c. Adjust clearance by turning adjusting bolt of piston rod.

**NOTE:** When adjusted as above, if negative pressure is applied to booster with engine at idle, piston to piston rod clearance should become **0.1 - 0.5 mm (0.004 - 0.020 in)**.

**Installation:**

1. Install master cylinder as shown and torque attaching nuts to **10-16 Nm ( 7.5 - 11.5 ft. lb.)**.
2. Attach two hydraulic lines and torque flare nuts to **14-18 Nm ( 10.5 - 13.0 ft.lb.)**.
3. Fill reservoir with brake fluid.
4. Check brake pedal height.
5. Bleed brakes. **Refer to Brakes/Service and Repair/Bleeding Procedure.** See: Service and Repair

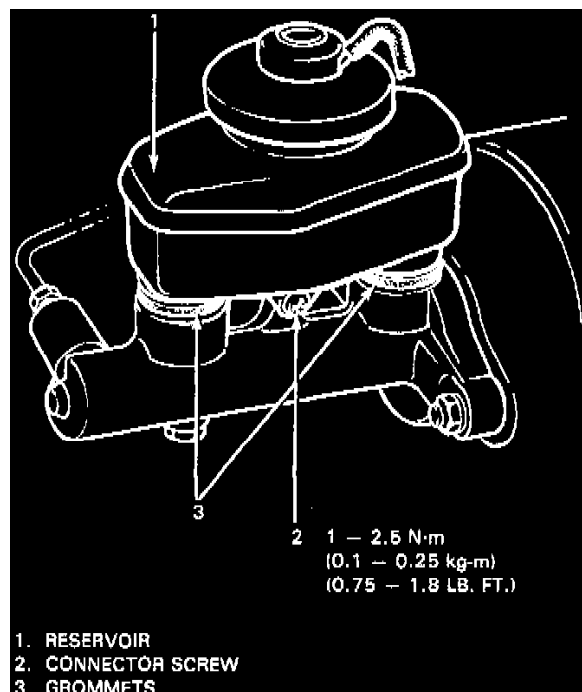
## Brake Master Cylinder: Service and Repair Reservoir Replacement



Removing Master Cylinder Reservoir

### REMOVAL:

1. Clean outside of reservoir.
2. Take out fluid with a syringe.
3. Remove reservoir connector screw.
4. Remove reservoir.

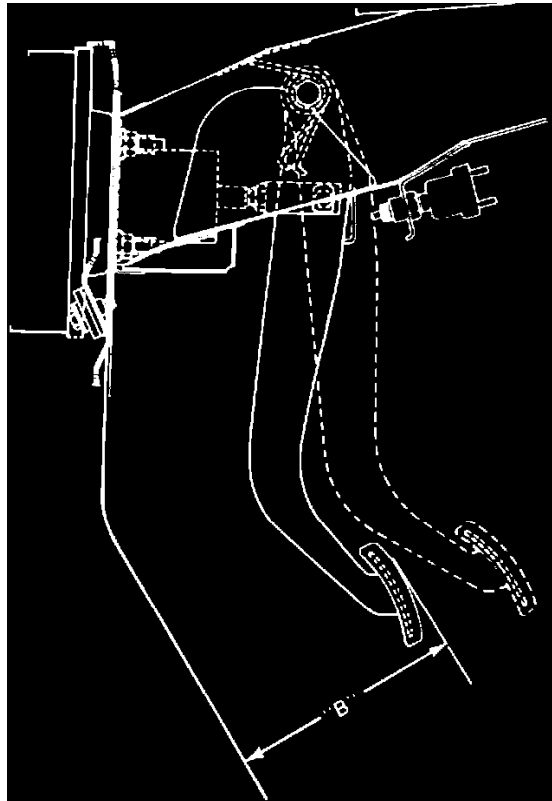


### Installing Master Cylinder Reservoir

#### INSTALLATION

1. When using new grommets, lubricate them with brake fluid. Then press-fit grommets to master cylinder. Grommets must be seated in place.
2. Install reservoir and tighten screw to **1-2.5 Nm (0.75-1.8 ft. lb.)**.
3. Fill reservoir with specified fluid.
4. Upon completion of installation, check for fluid leakage.

## Brake Pedal Assy: Testing and Inspection



**Fig. 10** Checking brake pedal travel

1. With engine off, pump brake pedal several times to exhaust all vacuum from booster.
2. Apply about 66 lb. load to brake pedal and measure pedal arm to firewall clearance B, **Fig. 10**. Clearance must not be less than 3.35 inches.
3. Possible causes for a low pedal are:
  - a. Worn rear brake shoes.
  - b. Brake lines need bleeding.
  - c. Booster pushrod out of alignment.
  - d. Rear brake shoe adjusters malfunctioning.



**Vehicle: Specifications****Model - Nipponenso / Manual Transmission****Model - Nipponenso / Manual Transmission**

Current Rating	45 A at 2500 rpm
Regulator Voltage	14.2-14.8 V at 77 deg F

**Standard Battery****Standard Battery**

BCI Group Number	45
Cranking Performance	410 A

**Battery Electrical Drain / Parasitic Load****BATTERY ELECTRICAL DRAIN / PARASITIC LOAD**

Maximum Parasitic Draw ..... 0.050 Milliamps.

**NOTE:** Refer to Battery / Testing and Inspection for specific procedure and specification.

Engine	Year	Sensor	Resistance Ohms @ deg. F/C
1.0L 2V	1987-88	Coolant, Manifold Air	6000 @ 32/0 2000 @ 80/27 1000 @ 120/49 800 @ 140/60 600 @ 165/74 200 @ 212/100
1.0L TBI, 1.6L Tracker, 1.6L Storm	1989-90	Coolant, Manifold Air	13,500 @ 20/-7 7500 @ 40/4 1800 @ 100/38 450 @ 160/71 185 @ 210/100
1.0L Turbo	1987-89	Coolant	5600 @ 32/0 2500 @ 68/20 1200 @ 104/40 600 @ 140/60 320 @ 176/80 180 @ 212/100
		Manifold Air	4000-7000 @ 32/0 2000-3000 @ 68/20 900-1300 @ 104/40

**TEMPERATURE SENSORS**

Winding Resistance (ohms at 75°F or 24°C)			
Engine	Year	Windings	Resistance (ohms)
1.0L 2V	1985-88	Primary	1.06-1.43
		Secondary	10,800-16,200
Turbo	1987-88	Primary	1.08-1.32
		Secondary	11,600-15,800
1.0L	1989-90	Primary	1.33-1.55
		Secondary	10,700-14,500
1.5L	1985	Primary	1.10-1.40
		Secondary	12,100-14,900
1.5L 2V	1986-87	Primary	1.2-1.5
		Secondary	10,200-13,800
1.5L 2V	1988-89	Primary	1.1-1.8
		Secondary	11,200-20,500
1.5L Turbo	1987-88	Primary	0-2
		Secondary	6,000-30,000

## IGNITION COIL SPECIFICATIONS

Engine	Year	Man. Trans. (degrees) @ RPM	Auto. Trans. (degrees) @ RPM
1.0L	1985-88	10 ±1	6 ±1
Canada	1985-86	10 ±1	4 ±1
Canada	1987-88	8 ±1	6 ±1
1.0L: Set	1989-90	6	6
Check, LSI	1990	12 ±1	12 ±1
1.5L	1985	5	10
1.5L 2V	1986-89	15	10
1.5L Turbo	1987-88	15	—
1.6L 2V Nova	1985-88	5	5
1.6L FI Nova, Prizm	1988-90	10	10
1.6L Storm	1990	10	10
1.6L Tracker	1989-90	8	8

## BASE TIMING

Engine	Year	Sensor	Resistance Ohms @ deg. F/C
1.0L 2V	1987-88	Coolant, Manifold Air	6000 @ 32/0 2000 @ 80/27 1000 @ 120/49 800 @ 140/60 600 @ 165/74 200 @ 212/100
1.0L TBI, 1.6L Tracker, 1.6L Storm	1989-90	Coolant, Manifold Air	13,500 @ 20/-7 7500 @ 40/4 1800 @ 100/38 450 @ 160/71 185 @ 210/100
1.0L Turbo	1987-89	Coolant	5600 @ 32/0 2500 @ 68/20 1200 @ 104/40 600 @ 140/60 320 @ 176/80 180 @ 212/100
		Manifold Air	4000-7000 @ 32/0 2000-3000 @ 68/20 900-1300 @ 104/40

## TEMPERATURE SENSORS

Engine	Year	Resistance (ohms)	Air Gap (in./mm)
1.0L	1985-90	130-190	.008-.016/.2-.4
1.5L 2V	1985-89	140-180	.008-.016/.2-.4
1.5L Turbo	1987-88	500-1500	—
1.6L Nova, Prizm	1985-90	140-180	.008-.016/.2-.4
1.6L Storm	1990	500-1500	—
1.6L Tracker	1989-90	—	.008-.016/.2-.4

## Distributor Pickup

## System Operating Voltage

## System Operating Voltage

Voltage Setting	14.2-14.8 V Note: At Cold Test Temperature
-----------------	---

Front	Caster Angle	+1 1/6 to +5 1/6 deg
	Caster Angle Desired	3 1/6 deg















**Chevrolet Sprint L3-61 1.0L**

	Camber Angle	0.5 deg
	Camber Angle Desired	0.25 deg
	Toe	0 in

Rear	Camber Angle	-1 to +1 deg
	Camber Angle Desired	0 deg
	Toe	0 in

Nut Torque	183 - 192 ft.lb
------------	-----------------

Front	Cylinder Bore Diameter	2.01 in
-------	------------------------	---------

Rear	Inside Diameter	7.09 in
------	-----------------	---------

**Hydraulic Brake System Specifications****TORQUE SPECIFICATIONS:**

Brake Flare Nuts .....	<b>14-18 Nm (10.5-13.0 ft. lb.)</b>
Master Cylinder to Booster .....	<b>10-16 Nm (7.5-11.5 ft. lb.)</b>
Secondary Piston Stopper Bolt .....	<b>8-12 Nm (6.0 -8.5 ft. lb.)</b>

Cylinder Bore Diameter	0.75 in
------------------------	---------

Front	Nominal Thickness	0.394 in
	Minimum Thickness	0.315 in
	Runout (T.I.R.)	0.0028 in

**Camshaft, Lifters and Push Rods**

Engine tightening specifications are found under Engine / Specifications.

Connecting Rod Cap Bolts	24- 26 ft.lb
--------------------------	--------------

**Crankshaft Main Bearing**

Engine tightening specifications are found under Engine / Specifications.

**Main Cap Torque****Main Cap Torque**

Main Bearing Cap Bolts	36- 41 ft.lb
------------------------	--------------

**Chevrolet Sprint L3-61 1.0L**

Connecting Rod Bearings	.0012-.0019 in
Main Bearings	.0008-.0015 in
Shaft Endplay	.0044-.0122 in

Shaft Diameter	1.7710-1.7716 in
Thrust On Bearing No.	3

Rod Journal Diameter	1.6529-1.6535 in
----------------------	------------------

Head Bolt Torque	46- 50 ft.lb
------------------	--------------

Intake Cold engine	0.006 in
Exhaust	0.008 in

Free Length	1.8937-1.9409 in
Valve Spring Pressure	54.7-64.3 lbf at 1.63 in

	Intake	Exhaust
Stem Clearance	.0008-.0019 in	.0014-.0025 in
Stem Diameter	.2742-.2748 in	.2737-.2742 in

**Distributor, Ignition**

Engine	Trans- mission	Year	Distributor Number	Degrees @ 2500 RPM	
				Total	Centrifugal
1.0L 2V	MT	1985-88	96052001	24-32	5-9
1.0L 2V lead fuel	MT	1985-86	96053177	4.8-12.8	0.8-4.8
1.0L 2V lead fuel	MT	1987-88	96055619	13.2-21.2	7.2-11.2
1.0L 2V ER	MT	1987-88	96056787	17-25	8-12
1.0L 2V	AT	1986-88	96054065	28.5-36.5	6.5-10.5
1.0L Turbo	MT	1987-88	96055620	20-28	6-10
1.5L 2V	MT	1985	94109580	31.1-38.1	5.1-8.1
1.5L 2V	MT	1986-89	94419559	30.5-38.5	4.5-8.5
1.5L 2V	AT	1985	94157468	29.1-36.1	5.1-8.1
1.5L 2V	AT	1986-89	94178219	28.5-36.5	4.5-8.5
1.6L Nova	MT & AT	1985	16050	34.5-42.5	8.5-12.5
1.6L	MT & AT	1986	16081	33.9-41.9	7.9-11.9
1.6L	MT & AT	1986-88	16082	14.8-22.8	2.8-6.8
1.6L Tracker	MT & AT	1989	96058488	19.8-27.8	7.3-11.3

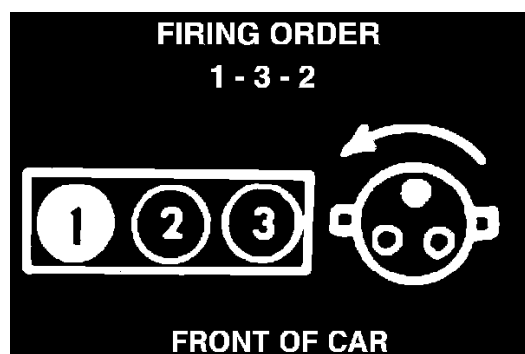
### Distributor Timing Advance

Engine degrees at engine rpm, no load, in addition to basic timing setting.  
Mechanical advance distributors only.

Engine	Year	Alternator	Power Steering	Air Conditioning
Deflection method				
1.0L (inches)	1985-88	1/4-11/32	—	5/16-7/16
(mm)	1985-88	6-9	—	8-12
1.0L (inches)	1989-90	3/16-1/4	3/16-1/4	3/16-1/4
(mm)	1989-90	5-7	5-7	5-7
1.6L Tracker (inches)	1989-90	3/16-5/16	3/16-5/16	5/16-1/2
(mm)	1989-90	5-8	5-8	8-12
Strand Tension method				
1.5L	1985-89	70-110	70-110	70-110
1.6L Nova, Prizm	1985-90	110-150	60-100	60-100
1.6L Storm	1990	70-110	70-110	130-160

### BELT TENSION

Exhaust Manifold Bolts	14- 20 ft.lb
------------------------	--------------



Engine	Year	SLOW		FAST		Step of Cam
		Man. Trans.	Auto. Trans.	Man. Trans.	Auto. Trans.	
1.0L 2V	1985-88	700-800	800-900 N	2100-2700	2100-2700 N	High
Canada	1985-88	700-800	800-900 N	1500-2500	1500-2500 N	High
idle-up	1985-88	750-850	750-850 N			
1.0L ER	1986-88	650-750	—	2100-2700	—	High
idle-up	1986-88	750-850	—			
1.0L Turbo	1987-89	700-800	—	—	—	—
Elect. speed-up	1987-89	750-850	—			
AC speed-up	1987-89	950-1050	—			

## Idle Speed W/O Computer Control

Engine	Year	SLOW		FAST		Step of Cam
		Man. Trans.	Auto. Trans.	Man. Trans.	Auto. Trans.	
1.0L 2V	1985-88	700-800	800-900 N	2100-2700	2100-2700 N	High
Canada	1985-88	700-800	800-900 N	1500-2500	1500-2500 N	High
idle-up	1985-88	750-850	750-850 N			
1.0L ER	1986-88	650-750	—	2100-2700	—	High
idle-up	1986-88	750-850	—			
1.0L Turbo	1987-89	700-800	—	—	—	—
Elect. speed-up	1987-89	750-850	—			
AC speed-up	1987-89	950-1050	—			

## Idle Speed W/O Computer Control

		Model MR08	
Float Level		.21-.24 in	
Choke Lever Note: Measured between choke valve and carburetor bore.	at 77 deg F	.009-.019 in	
	at 95 deg F	.03-.06 in	
Choke Piston	Primary	.09 - .10 in	
	Secondary	.16 - .18 in	
Choke Unloader		.10-.12 in	
Accelerator Pump Stroke		.16-.18 in	

Engine	Year	SLOW		FAST		Step of Cam
		Man. Trans.	Auto. Trans.	Man. Trans.	Auto. Trans.	
1.0L 2V	1985-88	700-800	800-900 N	2100-2700	2100-2700 N	High
Canada	1985-88	700-800	800-900 N	1500-2500	1500-2500 N	High
idle-up	1985-88	750-850	750-850 N			
1.0L ER	1986-88	650-750	—	2100-2700	—	High
idle-up	1986-88	750-850	—			
1.0L Turbo	1987-89	700-800	—	—	—	—
Elect. speed-up	1987-89	750-850	—			
AC speed-up	1987-89	950-1050	—			

## Idle Speed W/O Computer Control

Engine	Year	SLOW		FAST		Step of Cam
		Man. Trans.	Auto. Trans.	Man. Trans.	Auto. Trans.	
1.0L 2V	1985-88	700-800	800-900 N	2100-2700	2100-2700 N	High
Canada	1985-88	700-800	800-900 N	1500-2500	1500-2500 N	High
idle-up	1985-88	750-850	750-850 N			
1.0L ER	1986-88	650-750	—	2100-2700	—	High
idle-up	1986-88	750-850	—			
1.0L Turbo	1987-89	700-800	—	—	—	—
Elect. speed-up	1987-89	750-850	—			
AC speed-up	1987-89	950-1050	—			

## Idle Speed W/O Computer Control

Vibration Damper Or Pulley	7- 9 ft.lb
----------------------------	------------

Manifold Bolt Torque	14- 20 ft.lb
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Oil Pressure Switch	10 ft.lb
---------------------	----------

	Compression Ring	Oil Ring
Piston Ring End Gap	.0079-.0137 in	.0079-.0275 in

Piston Clearance	.0008-.0015 in
------------------	----------------

**Chevrolet Sprint L3-61 1.0L**

Plug Tightening Torque

15- 22 ft.lb

Engine	Year	Gap (Inches)	Gap (mm)	Torque (ft-lb)
1.0L	1985-90	.039-.043	1.0-1.1	21
1.5L	1985-89	.039-.043	1.0-1.1	14
1.6L Nova	1985-88	.039-.043	1.0-1.1	11-15
1.6L Prizm	1989-90	.031	0.8	21
1.6L Storm SOHC	1990	.041	1.05	21
1.6L Storm DOHC	1990	.043	1.1	21
1.6L Tracker	1989-90	.028	0.7	18

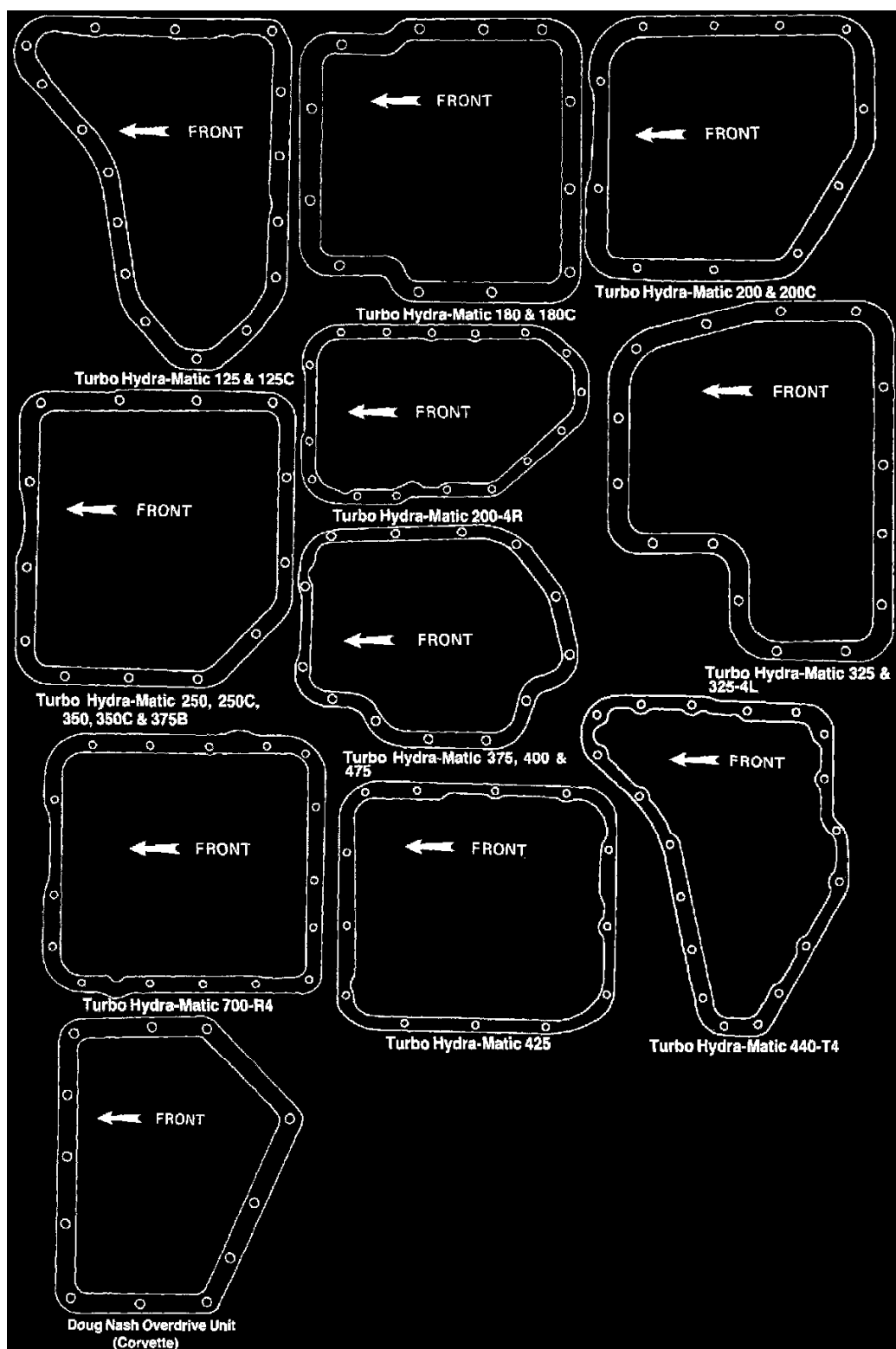
**SPARK PLUGS****Load Tests****Load Tests**

		Manual Trans	Auto Trans
No Load Test	Max. Amps.	50 A at 5000 rpm Note: At 11 volts.	90 A at 3000 rpm Note: At 11.5 volts.
Load Test	Max. Amps.	270 A at 1200 rpm Note: At 9.5 volts.	230 A at 1160 rpm Note: At 8 volts.
	Torque	5.06 ft.lb	4.7 ft.lb
Locked Rotor Test	Max. Amps.	600 A	300 A
	Volts	7.7 V	2.5 V
	Torque	9.4 ft.lb	5.06 ft.lb

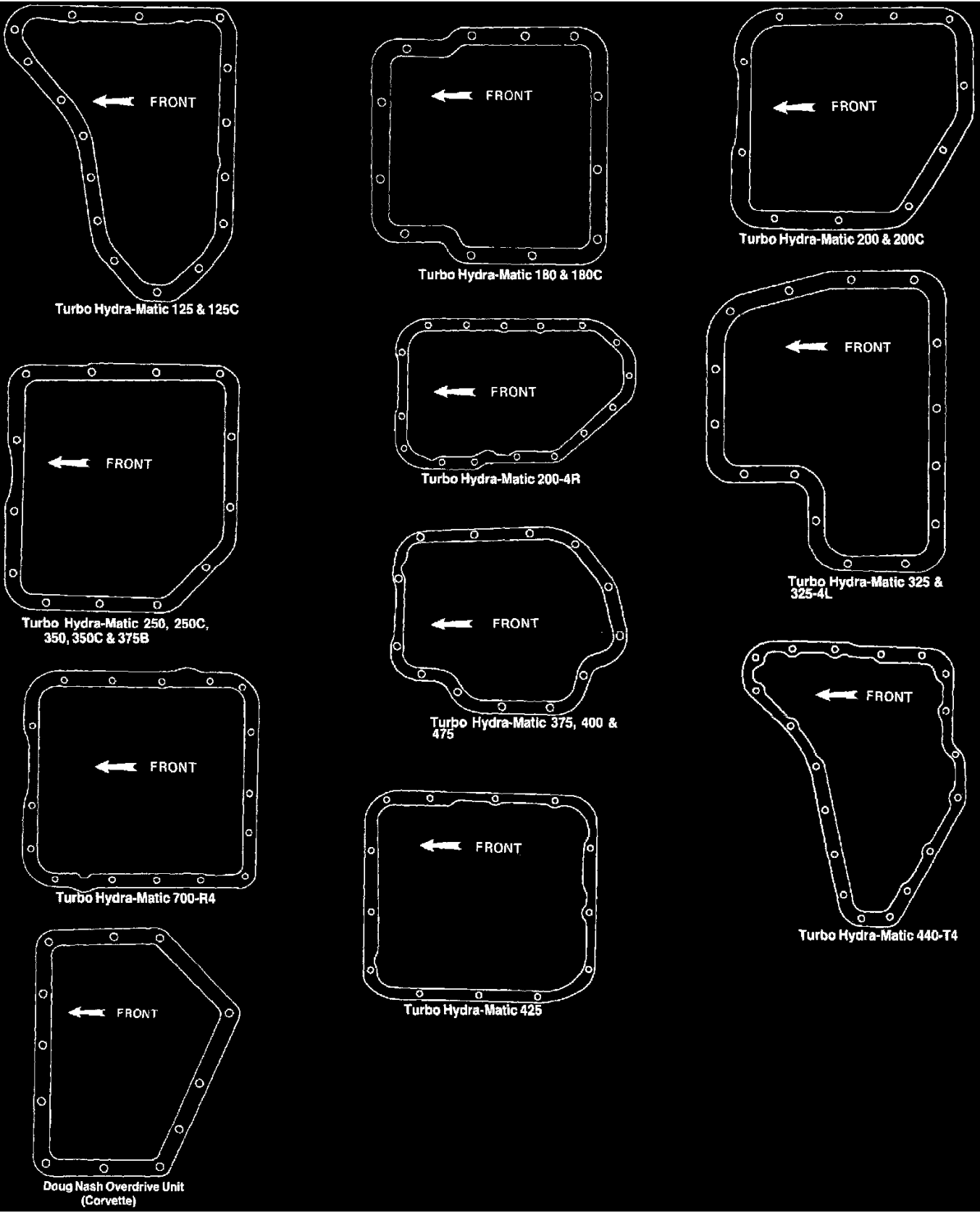
Manual Transmission	Volt	12 V
	Output	0.8 kW
	Direction Of Rotation	CW
	Brush Length	0.63 in
	No. of Pinion Teeth	8 ct
	Max. Solenoid Operating Voltage	8 V
Automatic Transmission	Volt	12 V
	Output	1 kW
	Direction of Rotation	CW
	Brush Length	0.53 in
	No. of Pinion Teeth	9 ct
	Max. Solenoid Operating Voltage	8 V

**Automatic****Transmission Identification**

Visually Inspect Transmission Type For Proper Application



Transmission Identification, Pan Configuration



Transmission Identification/Pan Configuration

**Torque Specifications**

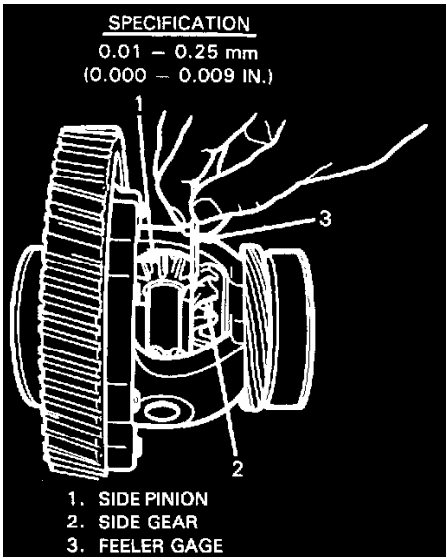
**5 SPEED MANUAL TRANSMISSION TORQUE SPECIFICATIONS**

ISUZU 76mm

Transaxle Case Bolts (using a diagonal sequence)	22 to 33 ft lbs
Transaxle Rear Cover Bolts	11 to 16 ft lbs
Differential Ring Gear Bolts	



(using a diagonal sequence)	73 to 79 ft lbs
Input Shaft Retaining Nuts	87 to 101 ft lbs
Output Shaft Retaining Nuts	87 to 101 ft lbs
Reverse Idler Shaft Bolt - Transaxle Case	22 to 33 ft lbs



Backlash Specifications

	mm	IN.
Available side gear	0.90	0.035
	0.95	0.037
Washer sizes	1.00	0.039
	1.05	0.041
	1.10	0.043
	1.15	0.045
	1.20	0.047

Side Gear Washer Size Chart

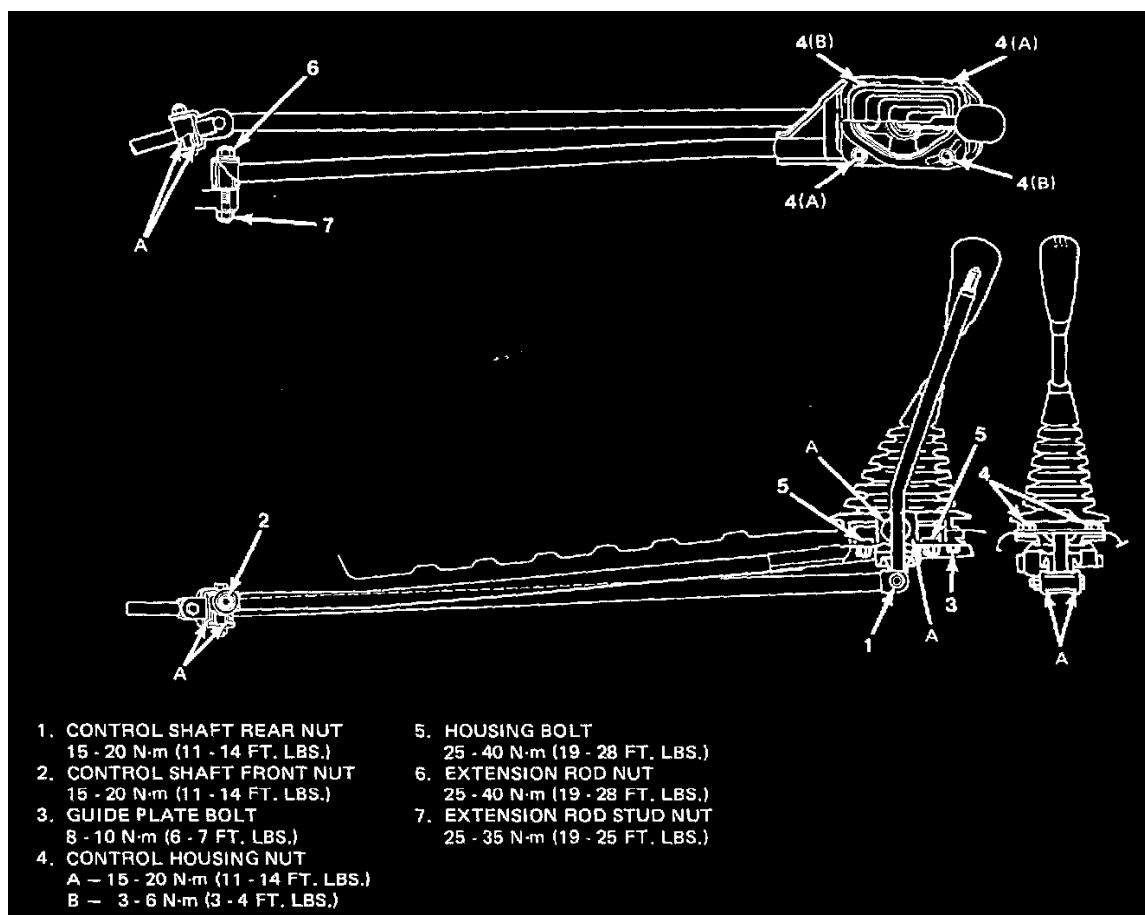
Dial gauge reading (mm)	Thickness of bearing set shim to be installed (mm)
0.42 – 0.47	0.60
0.48 – 0.52	0.65
0.53 – 0.57	0.70
0.58 – 0.62	0.75
0.63 – 0.67	0.80
0.68 – 0.72	0.85
0.73 – 0.77	0.90
0.78 – 0.82	0.95
0.83 – 0.87	1.00
0.88 – 0.92	1.05
0.93 – 0.97	1.10
0.98 – 1.02	1.15

Shim Chart (Countershaft)

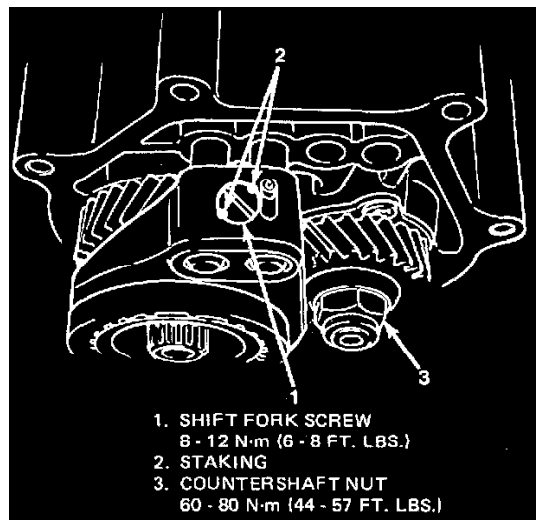
Shim Chart (countershaft)

## Design and Clearance Specifications

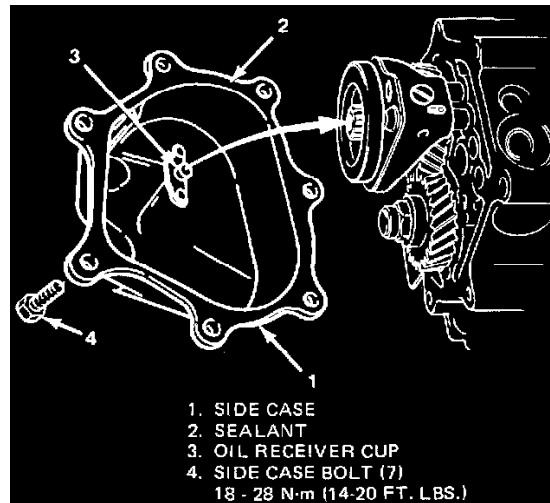
### Torque Specifications



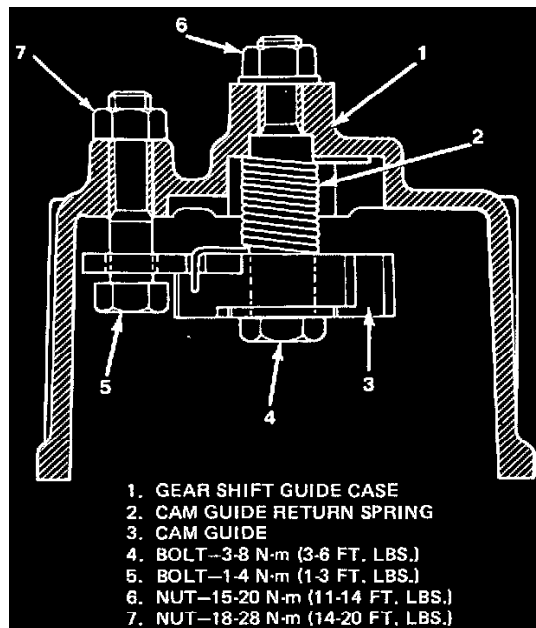
Shift Control Torque Specifications



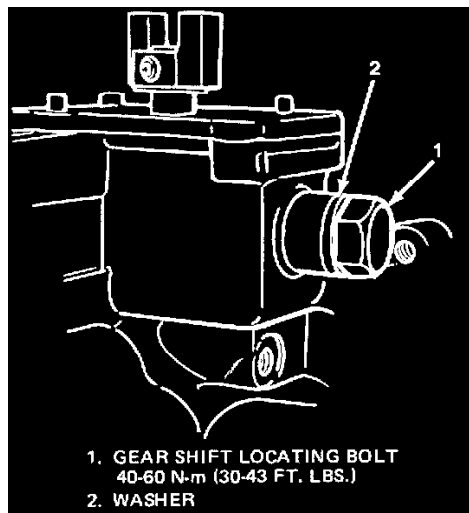
Shift Fork Screw Torque



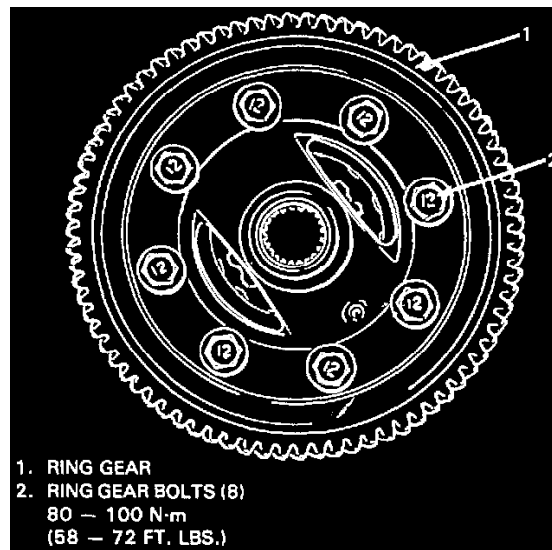
Side Case Torque Specifications



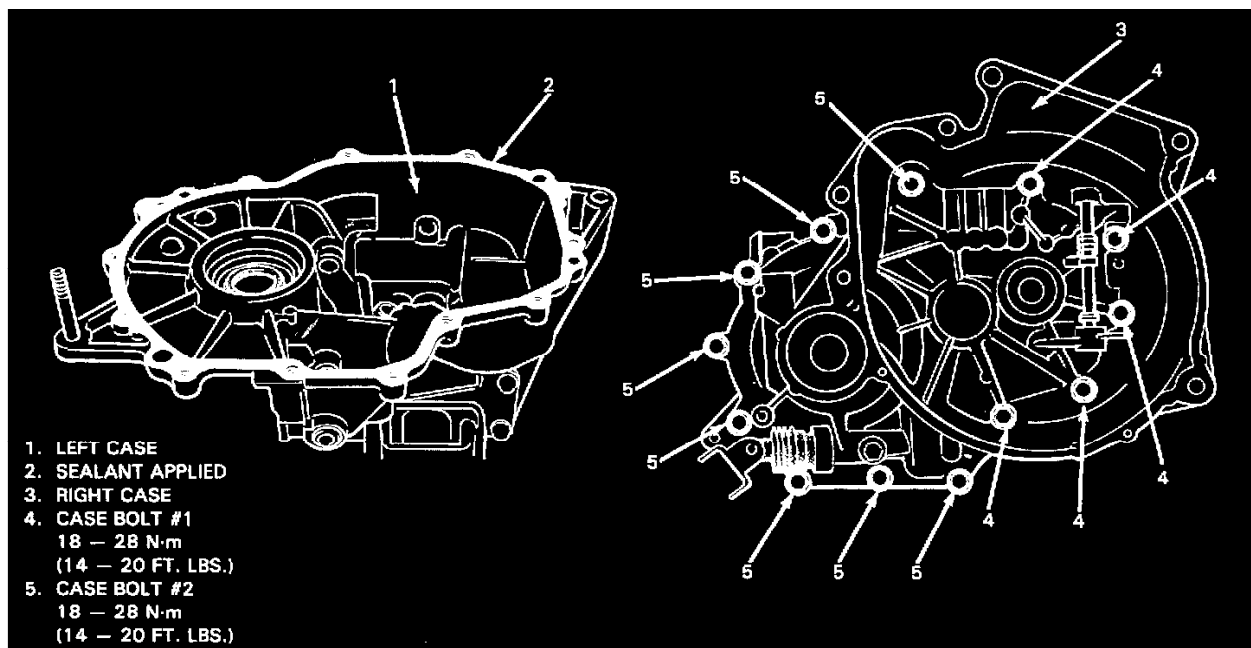
Gear Shift Guide Torque Specifications



Shift Locating Bolt



Ring Gear Bolt Torque Specifications



Left Case Bolt Torque Specifications

## Differential

Differential specifications.

Differential pinion gear crosspin tolerance **0.0012 to 0.0031 inch**

## Clutch Linkage

Reverse Shift Bracket - Clutch Housing ..... **22 to 33 ft lbs**

## Drive/Propeller Shaft

84-87 SPRINT

All MODELS

**TORQUE**..... **Ft.lbs. (N.m)**

Axle shaft nut..... 109-195 148-264

88-89 SPRINT

Axle shaft nut..... 145 197

Flywheel to Crankshaft Bolts	41 - 47 ft.lb
------------------------------	---------------

## Torque Values

Control Box Assembly to

Transaxle Case Retaining Bolts ..... **11 to 16 ft lbs**

## Clearances, Gear/Bearing

Differential pinion gear crosspin tolerance **0.0012 to 0.0031 inch**

## Input Shaft, M/T

Input Shaft Retaining Nuts ..... **87 to 101 ft lbs**

## Output Shaft, M/T

Output Shaft Retaining Nuts ..... **87 to 101 ft lbs**

## Ring Gear, M/T

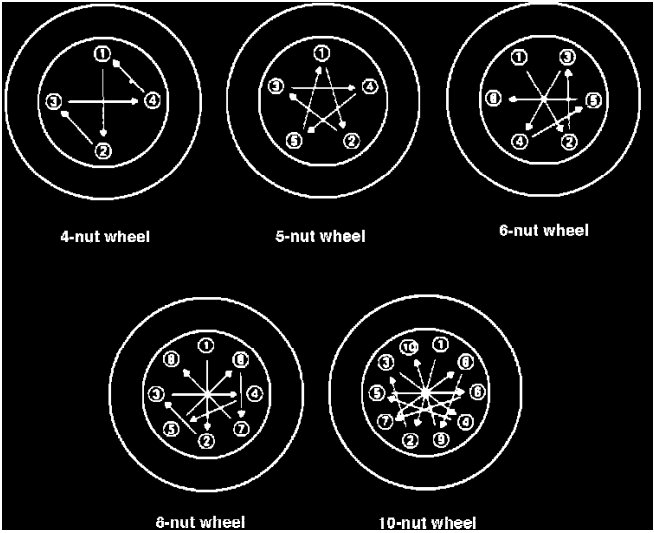
Differential Ring Gear Bolts

(using a diagonal sequence) ..... **73 to 79 ft lbs**

Model	Integral
Voltage @ 77°F	14.2-14.8 V

Rear	Cylinder Bore Diameter	0.69 in
------	------------------------	---------

## Wheel Fastener



Lug Nut Torque Patterns

IMPORTANT

Check all parts, including rims, lug studs, lug nuts, and mating surfaces of hubs and tire rims for rust, damage, or dirt. Clean mating surfaces with wire brush. Tighten the fasteners a quarter turn at a time using the tightening sequence diagram as a guide. This is very important to prevent misalignment of wheels.

**CAUTION:** Improper torque or tightening sequence can cause distortion, fatigue cracks, or alignment problems. After driving the vehicle for a short distance, recheck the torque.

Compression Check

The lowest reading cylinder should not be less than 14 psi of the highest and no cylinder reading should be less than **1076-1372 kPa (156-199 psi)**.

System Specifications

Oil pressure Specifications can be found at **Engine Lubrication / Engine Oil Pressure / Specifications**. See: Engine, Cooling and Exhaust/Engine.

Engine Oil

Oil pressure Specifications can be found at **Engine Lubrication / Engine Oil Pressure / Specifications**. See: Engine, Cooling and Exhaust/Engine.

Oil Pressure	48 psi at 4000 rpm
--------------	--------------------

Oil Pump, Engine

Oil pressure Specifications can be found at **Engine Lubrication / Engine Oil Pressure / Specifications**. See: Engine, Cooling and Exhaust/Engine.

At idle unless otherwise indicated.				
Engine	Year	PSI		RPM
<b>Carburetted:</b>				
1.6L Nova	1985-88	3.5		idle
1.0L Sprint	1985-88	3.5		5,000 rpm
		Pressure		
Engine	Year	PSI*	PSI**	Fuel Pump†
<b>Fuel Injected:</b>				
1.0L TBI	1989-90	23.2-30.5●	—	—
		13-20	—	—
1.0L Turbo	1987-90	25-33	35-43	—
1.5L Turbo	1987-88	28.4	35.6	—
1.6L Nova, Prizm	1988-90	30-33	38-44	57
1.6L Storm	1990	35-42	—	65 min.
1.6L Tracker	1989-90	34-40	—	57 min.

\* Vacuum hose connected to fuel pressure regulator.

\*\* Vacuum hose disconnected from fuel pressure regulator.

† Fuel pump pressure with return line restricted.

● Ignition on.

FUEL SYSTEM PRESSURE

## FUEL SYSTEM PRESSURE

Turbo	Opening Temperature	180 F
Except Turbo	Opening Temperature	190 F

Fill the clutch master cylinder to the "Full" or "MAX" mark on the reservoir. Do not overfill.

**Caution:** Should accidental spillage occur, rinse the area thoroughly with water. Pay special attention to any electrical wires, parts, harnesses, rub

**MAKE, YEAR & MODEL**

**LITERS      QUARTS**

1988-85	All	4.0	4.5
---------	-----	-----	-----

Engine Oil Capacity	3.7 qt (US) Note: Includes filter. Make final check with dipstick.
---------------------	---

Fluid Capacity	Oil Pan Only	1.08 qt (US)
	After Overhaul Less Converter	3.7 qt (US)
	After Overhaul With Converter	4.2 qt (US)

Nova 3-speed w/AT..... **AF(DEXRON-II (R) Automatic Transmission Fluid)**

Nova..... **1.4 liters**   **3.0 pints**

## GM (Isuzu 76 mm) 5 Speed

Capacity ..... **5.4 pints**

## Refrigerant Capacities

**MAKE, YEAR & MODEL**

**Kg.**

**Oz.**

CHEVROLET

1992	Beretta, Corsica	1.2	42
1992-91	Caprice	1.4	50
1992-90	Lumina	1.0	36
1992-88	Camaro, Corvette	1.0	36
1992-86	Cavalier	1.0	36
1991-89	Beretta, Corsica	1.3	44
1990-86	Celebrity	1.1	40
1990-82	Caprice	1.6	54
1989-87	Spectrum	0.8	28
1988-87	Beretta, Corsica, Corvette	1.0	36
1988-85	Sprint	0.7	24
1988-83	Monte Carlo	1.6	54
1987-83	Camaro	1.4	48
	Chevette	1.0	36
1986-85	Spectrum	0.7	24
1986-83	Impala, Malibu	1.6	54
1985-83	Cavalier, Celebrity, Corvette	1.3	44
	Citation	1.3	44

## Refrigerant Oil

System capacity Refrigerant Oil specs are found under Refrigerant Oil. See: Heating and Air Conditioning/Refrigerant Oil

## Refrigerant

**MAKE, YEAR & MODEL**

**Kg.**

**Oz.**

## CHEVROLET

1992	Beretta, Corsica	1.2	42
1992-91	Caprice	1.4	50
1992-90	Lumina	1.0	36
1992-88	Camaro, Corvette	1.0	36
1992-86	Cavalier	1.0	36
1991-89	Beretta, Corsica	1.3	44
1990-86	Celebrity	1.1	40
1990-82	Caprice	1.6	54
1989-87	Spectrum	0.8	28
1988-87	Beretta, Corsica, Corvette	1.0	36
1988-85	Sprint	0.7	24
1988-83	Monte Carlo	1.6	54
1987-83	Camaro	1.4	48
	Chevette	1.0	36
1986-85	Spectrum	0.7	24



Chevrolet Sprint L3-61 1.0L			
1986-83	Impala, Malibu	1.6	54
1985-83	Cavalier, Celebrity, Corvette	1.3	44
	Citation	1.3	44

## Refrigerant Oil

System .....	2.96 oz
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## Crankcase

Type.....	SG(Motor Oil, API Service SG)	
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### CAPACITY, Refill:

Sprint, Firefly (includes filter).....	3.5 liters	3.7 quarts
Spectrum, Sunburst.....	2.8 liters	3.0 quarts
Nova 2V.....	3.0 liters	3.2 quarts
Nova FL.....	3.4 liters	3.6 quarts

Ex. Sprint, Firefly, capacity shown is without filter. When replacing filter, additional oil may be needed

### 1985 ex. Nova

Above 40°F (4°C).....	30
Above 20°F (-7°C).....	20W-20
Above 10°F (-12°C).....	15W-40
Above 0°F (-18°C).....	10W-30
Below 100°F (38°C).....	5W-30*

### 1985-88 Nova

Above 10°F (-12°C).....	15W-40, 20W-40‡, 20W-50‡
Above 0°F (-18°C).....	10W-30*, 10W-50‡
Below 50°F (10°C).....	5W-30

### 1988 Spectrum Turbo

Above 40°F (4°C).....	30**
Above 0°F (-18°C).....	10W-30*
Below 60°F (16°C).....	5W-30

### 1988 Sprint, Firefly Turbo

Above 40°F (4°C).....	30**
All temperatures.....	10W-30*

### 1986-88 Others

Above 40°F (4°C).....	30
Above 0°F (-18°C).....	10W-30
All temperatures.....	5W-30*

\*Preferred

‡Not recommended for 1985-87 models

\*\*May be used only if other recommended viscosities are not available

## Transaxle/Transmission, Automatic

Type.....	AF(DEXRON-II (R) Automatic Transmission Fluid)	
-----------	--	--

### CAPACITY, Initial Refill\*:

Spectrum, Sunburst**.....	6.0 liter	6.3 quarts
Sprint, Firefly.....	1.5 liters	1.6 quarts
Nova 3-speed‡.....	2.3 liters	2.4 quarts
4-speed‡‡.....	3.1 liters	3.3 quarts

\*With the engine at operating temperature, shift transmission through all gears. Check fluid level in PACK and add fluid as needed

‡Does not include differential

‡‡Has overdrive switch on selector lever

\*\*Total or dry fill shown, use less fluid when refilling

## Transmission/Transaxle, Manual

Sprint, Firefly.....	GLS(Gear Lubricant, Special)	
----------------------	------------------------------	--

Spectrum, Sunburst.....	5W-30	SG(Motor Oil, API Service SG)
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Nova .....	75W-90*, 80W-90	GL-5(Gear Oil, API Service GL-5)
------------	-----------------	----------------------------------

\*Vehicles operated in Canada, 80W

### CAPACITY, Refill:

Sprint, Firefly.....	2.3 liters	4.8 pints
Spectrum, Sunburst		
1985-87.....	2.8 liters	5.8 pints
1988.....	1.9 liters	4.0 pints
Nova.....	2.6 liters	5.4 pints

## Differential, Final Drive

Nova 3-speed w/AT..... **AF(DEXRON-II (R) Automatic Transmission Fluid)**

### CAPACITY, Refill:

Nova..... **1.4 liters    3.0 pints**

## Clutch Fluid

Hydraulic Clutch Fluid ..... **GM P/N 12345347 or DOT 3 Brake Fluid**

## Refrigerant Oil

### REFRIGERANT OIL TYPE

^ R-12 Refrigerant oil 500 viscosity (See Note).

**NOTE:** If vehicle has been converted to R-134a use PAG (Polyalkaline Glycol) synthetic refrigerant oil (GM Part No. 12345923) or equivalent.

## Wheels and Tires

### 1988 CHEVROLET SPRINT 1.0 Liter L3, 61 CI, FI, GAS

Front & Rear Tires

**Tire Size** ..... **P165/70R12**

Load Index ..... --

Speed Rating ..... --

Inflation - Front ..... 32 psi

Inflation - Rear ..... 32 psi

Lug Torque ..... 50 ft-lb

### 1988 CHEVROLET SPRINT 1.0 Liter L3, 61 CI, CARB, GAS

### 1988 CHEVROLET SPRINT ER 1.0 Liter L3, 61 CI, CARB, GAS

Front & Rear Tires

**Tire Size** ..... **P145/80R12**

Load Index ..... --

Speed Rating ..... --

Inflation - Front ..... 32 psi

Inflation - Rear ..... 32 psi

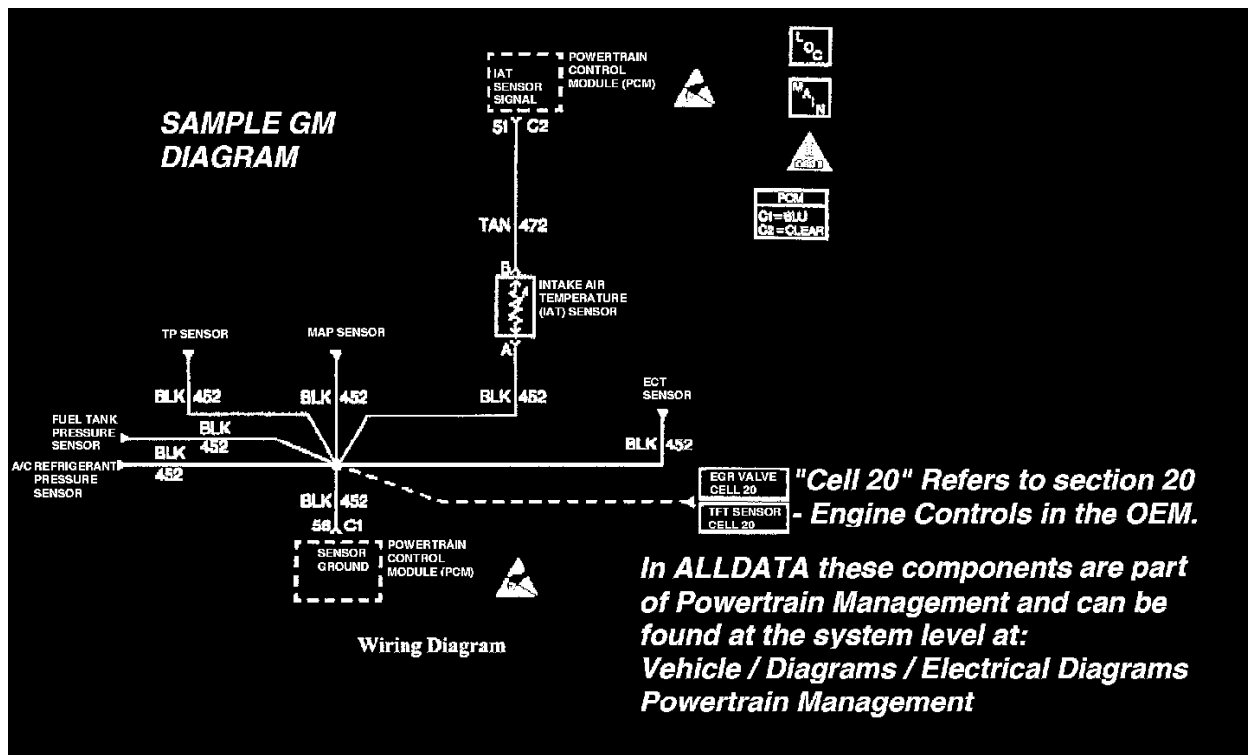
Lug Torque ..... 50 ft-lb

## Vehicle: Diagrams

### Diagram Information and Instructions

#### CELL REFERENCES

General Motors vehicles often use "CELL" references in their electrical wiring diagrams. These references are used in the Original Equipment Manual to refer to a section in the manual and not a specific diagram(s).

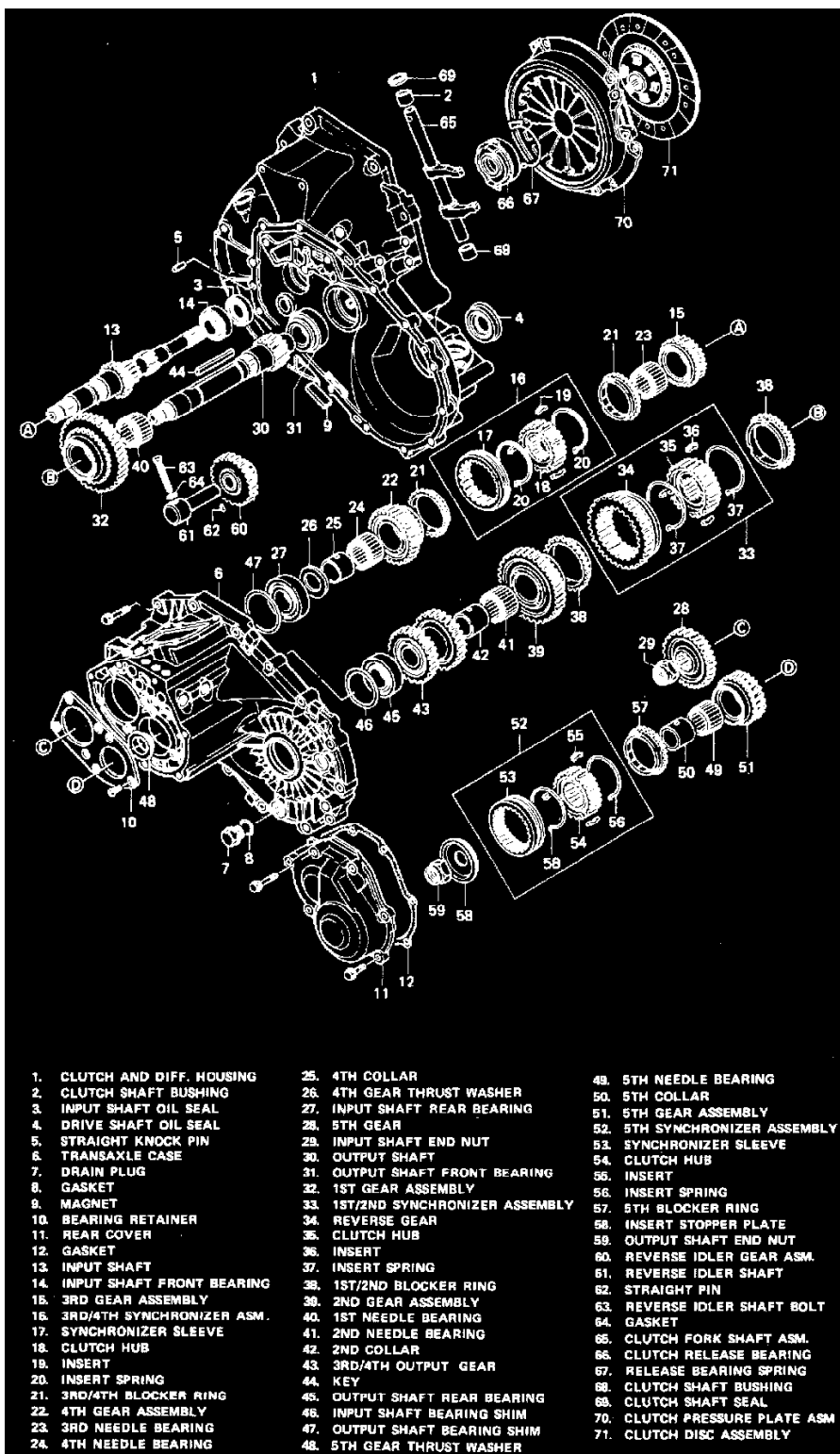


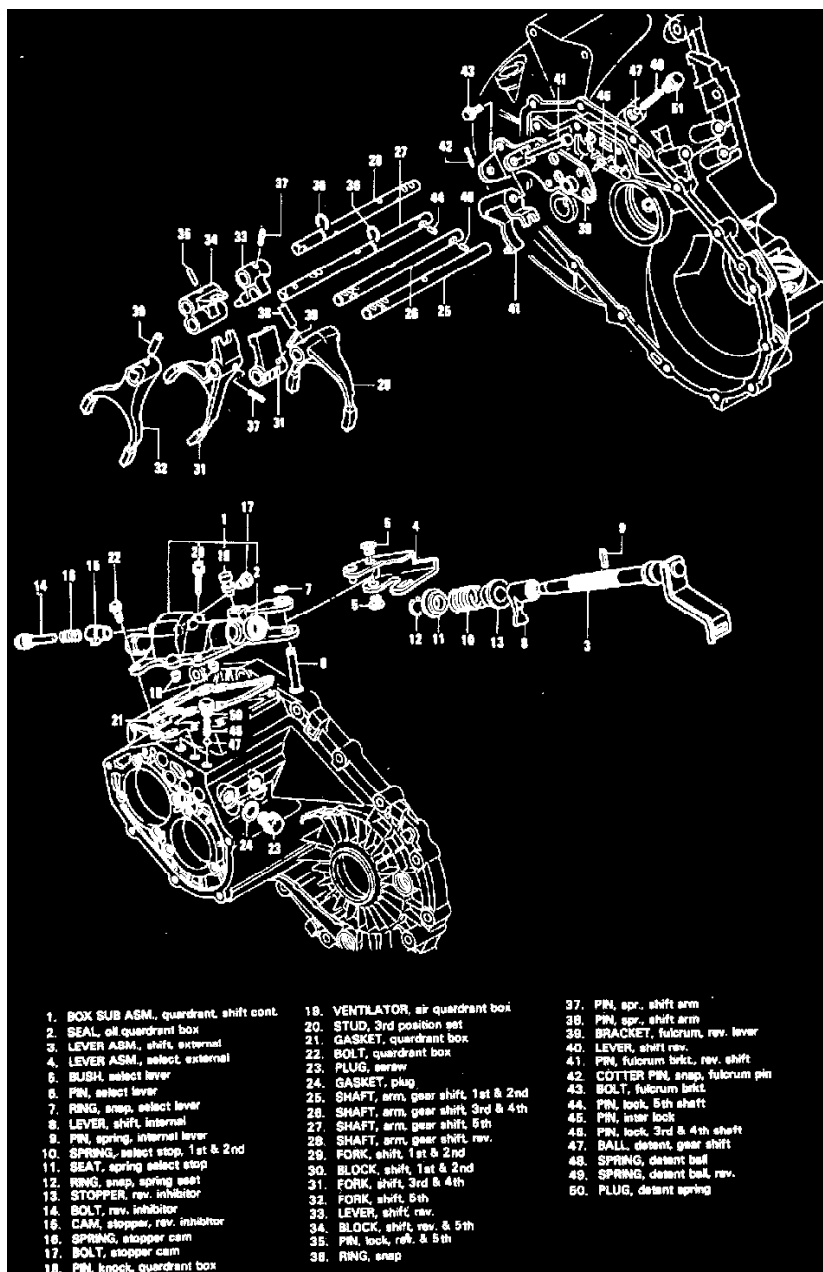
#### GM Sample Diagram W/ Cell Reference

For instance, in the diagram illustrated "Cell 20" is not a reference to another diagram but a reference to "Section 20" in the OE manual. In the example, "Section 20" is the engine control section of the manual.

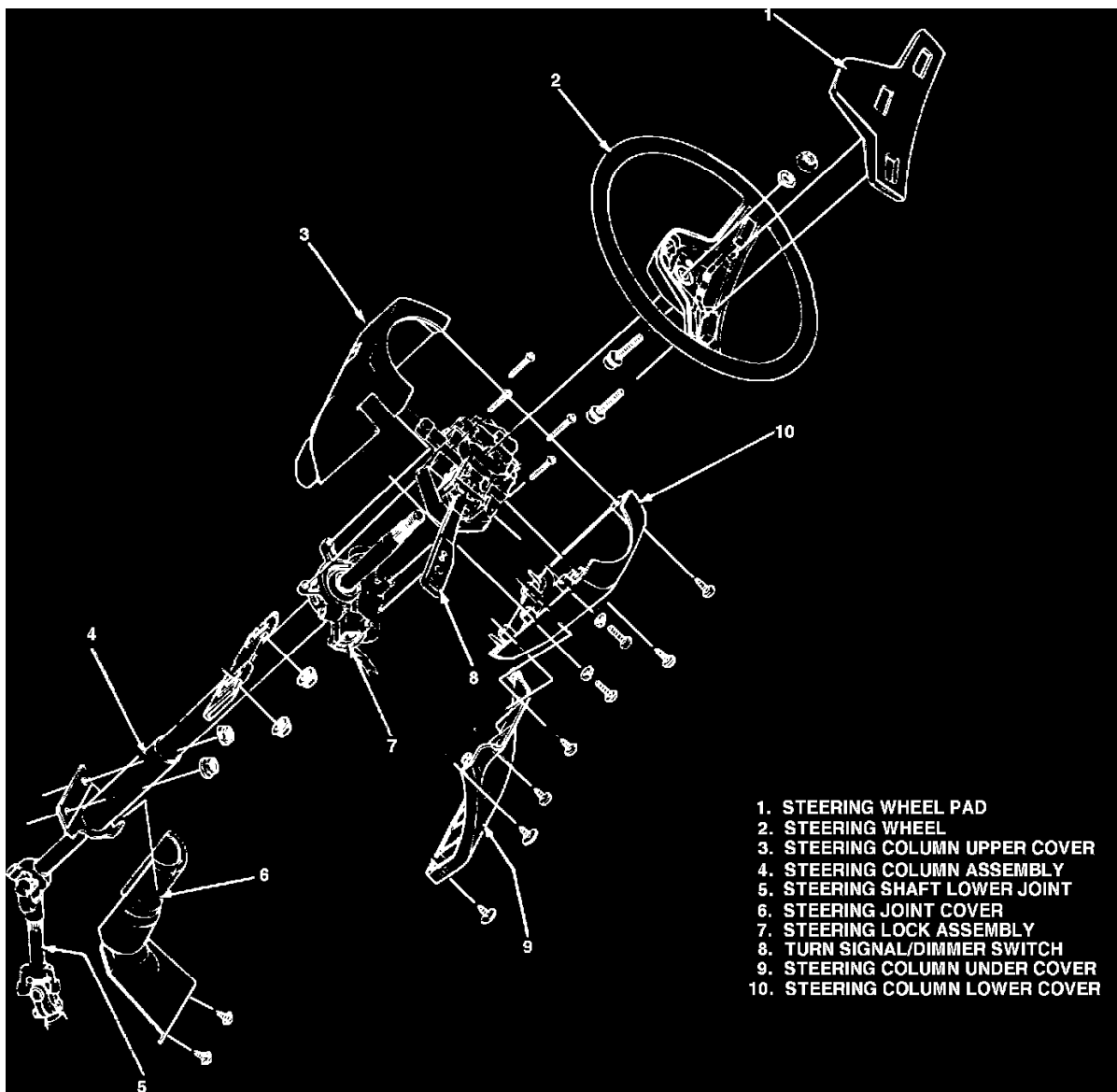
To navigate through these "Cell" references start at the vehicle level and go to: **Diagrams / Electrical Diagrams** - for a complete list of the diagrams available for the vehicle. Choose the **system** you are working on and view those diagrams.

**Note:** If unsure of the system - try utilizing the search feature. Type a component in the search feature that belongs to the system and when the results are displayed note the path displayed. This will show the system the component belongs in.





- |  |                                       |                                    |
|--|---------------------------------------|------------------------------------|
| 1. BOX SUB ASM., quadrant, shift cont. | 19. VENTILATOR, air quadrant box      | 37. PIN, spr. shift arm            |
| 2. SEAL, oil quadrant box              | 20. STUD, 3rd position set            | 38. PIN, spr. shift arm            |
| 3. LEVER ASM., shift, external         | 21. GASKET, quadrant box              | 39. BRACKET, fulcrum, rev. lever   |
| 4. LEVER ASM., select, external        | 22. BOLT, quadrant box                | 40. LEVER, shift rev.              |
| 5. BUSH, select lever                  | 23. PLUG, screw                       | 41. PIN, fulcrum brkt., rev. shift |
| 6. PIN, select lever                   | 24. GASKET, plug                      | 42. COTTER PIN, snap, fulcrum pin  |
| 7. RING, snap, select lever            | 25. SHAFT, arm, gear shift, 1st & 2nd | 43. BOLT, fulcrum brkt.            |
| 8. LEVER, shift, internal              | 26. SHAFT, arm, gear shift, 3rd & 4th | 44. PIN, lock, 5th shaft           |
| 9. PIN, spring, internal lever         | 27. SHAFT, arm, gear shift, 5th       | 45. PIN, inter lock                |
| 10. SPRING, select stop, 1st & 2nd     | 28. SHAFT, arm, gear shift, rev.      | 46. PIN, lock, 3rd & 4th shaft     |
| 11. SEAT, spring select stop           | 29. FORK, shift, 1st & 2nd            | 47. BALL, detent, gear shift       |
| 12. RING, snap, spring seat            | 30. BLOCK, shift, 1st & 2nd           | 48. SPRING, detent ball            |
| 13. STOPPER, rev. inhibitor            | 31. FORK, shift, 3rd & 4th            | 49. SPRING, detent ball, rev.      |
| 14. BOLT, rev. inhibitor               | 32. FORK, shift, 5th                  | 50. PLUG, detent spring            |
| 15. CAM, stopper, rev. inhibitor       | 33. LEVER, shift, rev.                |                                    |
| 16. SPRING, stopper cam                | 34. BLOCK, shift, rev. & 5th          |                                    |
| 17. BOLT, stopper cam                  | 35. PIN, lock, rev. & 5th             |                                    |
| 18. PIN, knock, quadrant box           | 36. RING, snap                        |                                    |

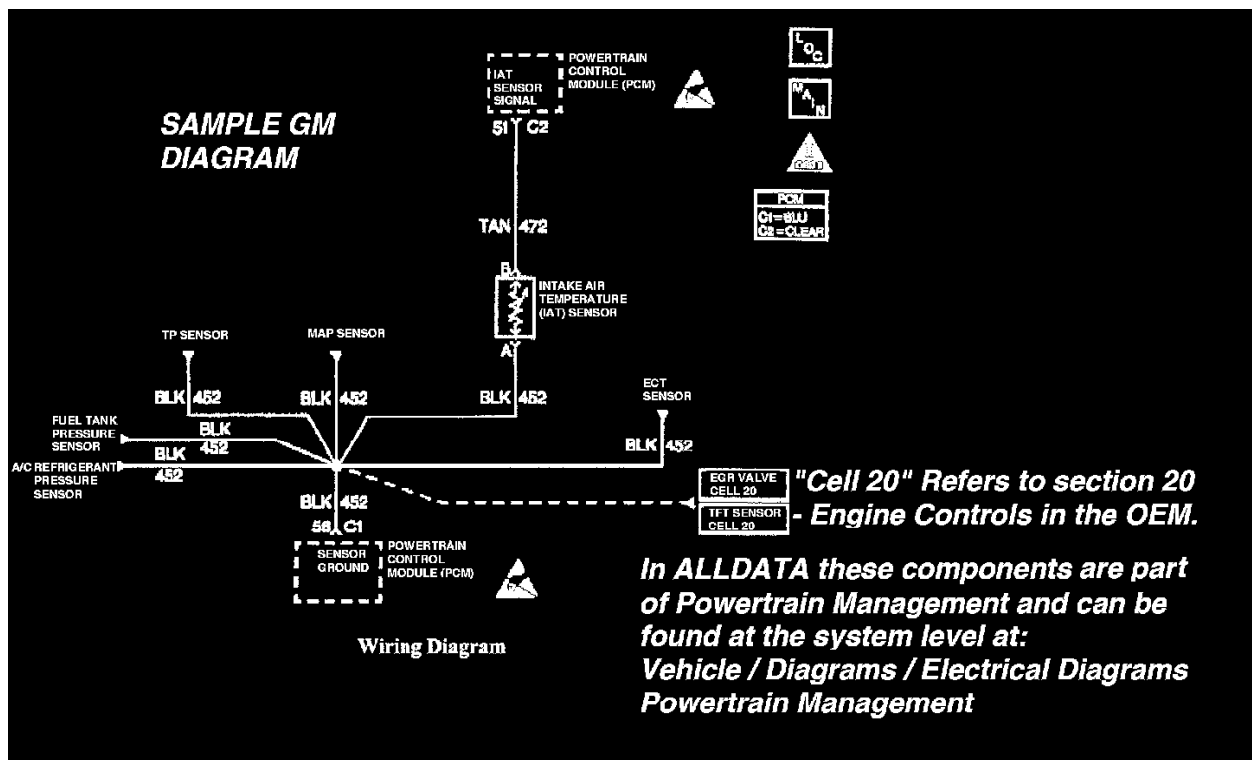


**Fig. 1 Exploded view of steering column**

## Cell References

### CELL REFERENCES

General Motors vehicles often use "**CELL**" references in their electrical wiring diagrams. These references are used in the Original Equipment Manual to refer to a section in the manual and not a specific diagram(s).



GM Sample Diagram W/ Cell Reference

For instance, in the diagram illustrated "Cell 20" is not a reference to another diagram but a reference to "Section 20" in the OE manual. In the example, "Section 20" is the engine control section of the manual.

To navigate through these "Cell" references start at the vehicle level and go to: **Diagrams / Electrical Diagrams** - for a complete list of the diagrams available for the vehicle. Choose the **system** you are working on and view those diagrams.

**Note:** If unsure of the system - try utilizing the search feature. Type a component in the search feature that belongs to the system and when the results are displayed note the path displayed. This will show the system the component belongs in.

### Fig. 48 Back-Up Lamps Wiring Circuit



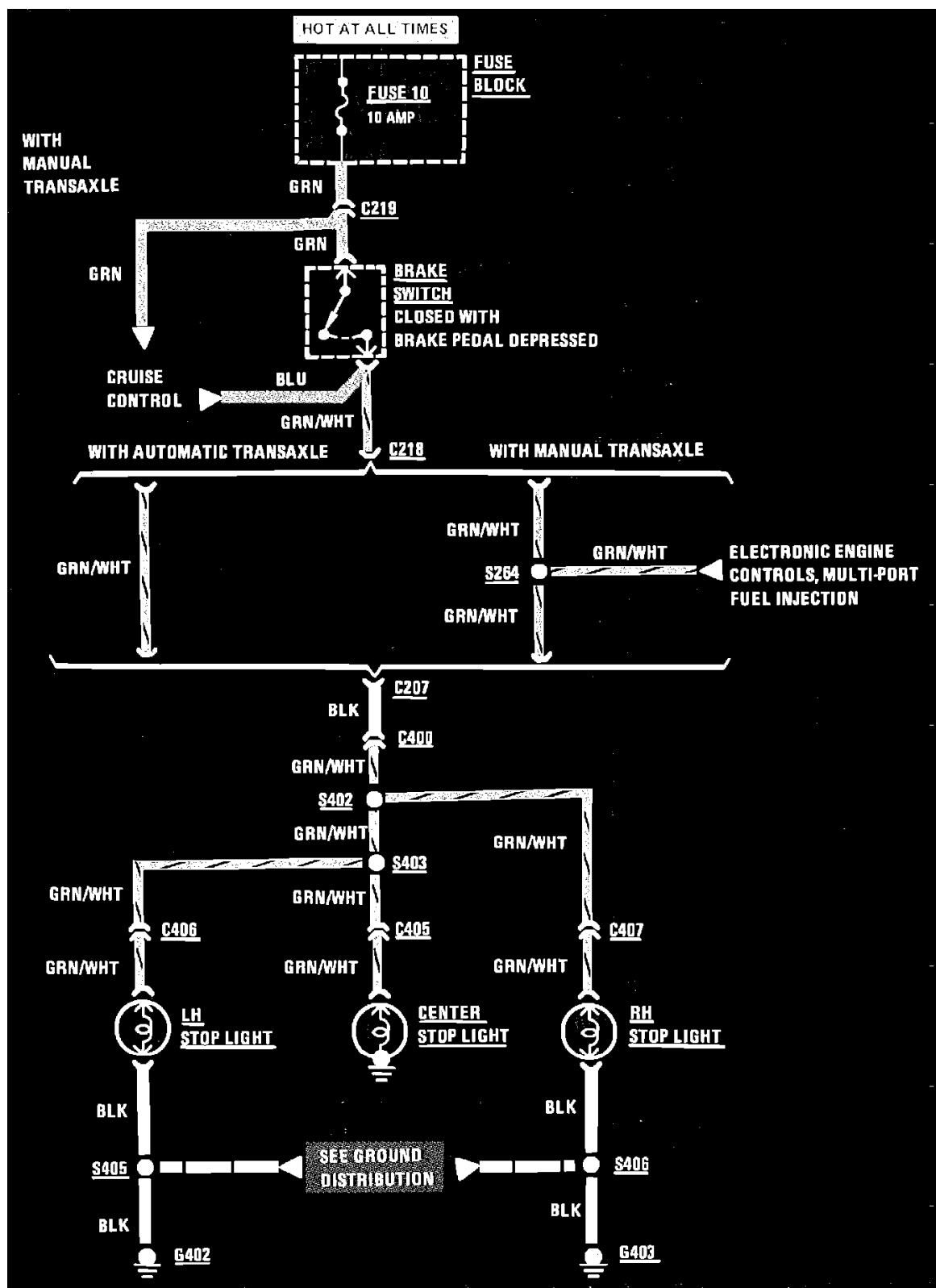


Fig. 43a Stop Lamps Wiring Circuit (W/Cruise)



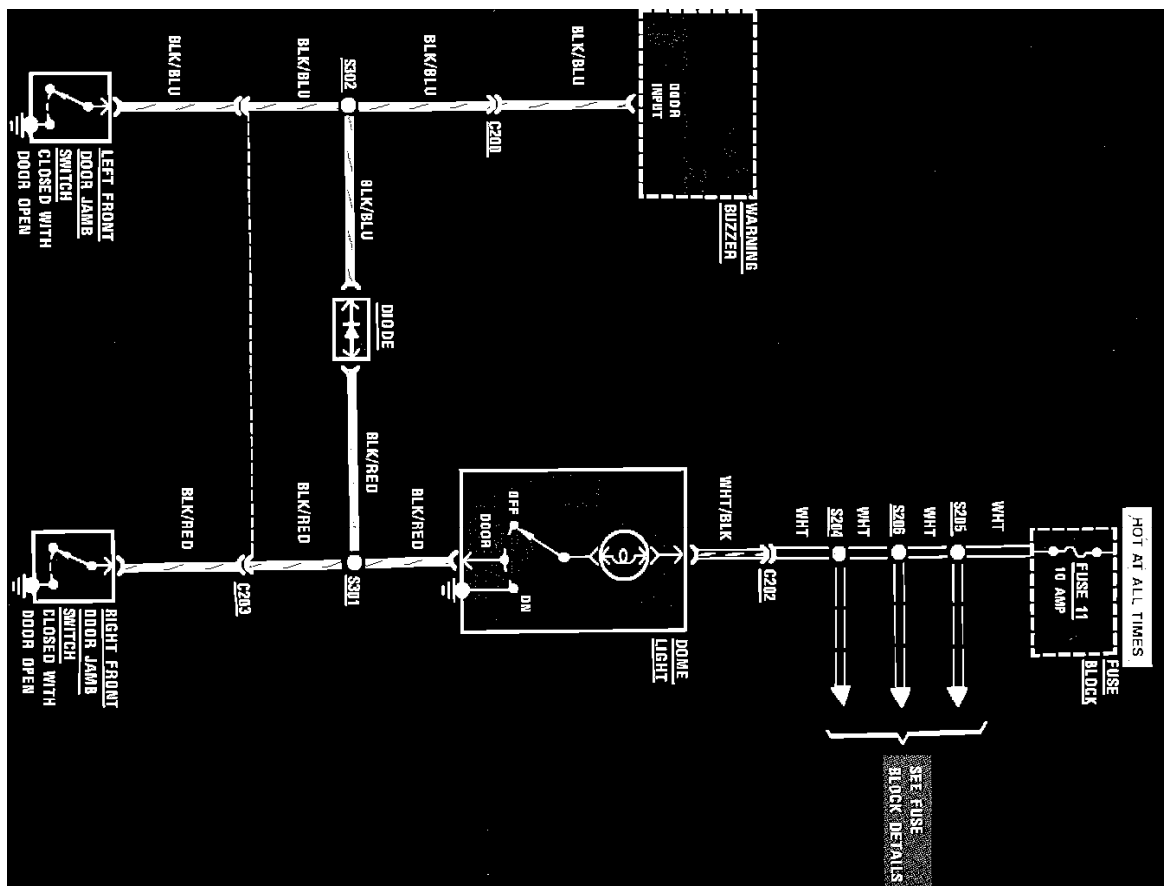
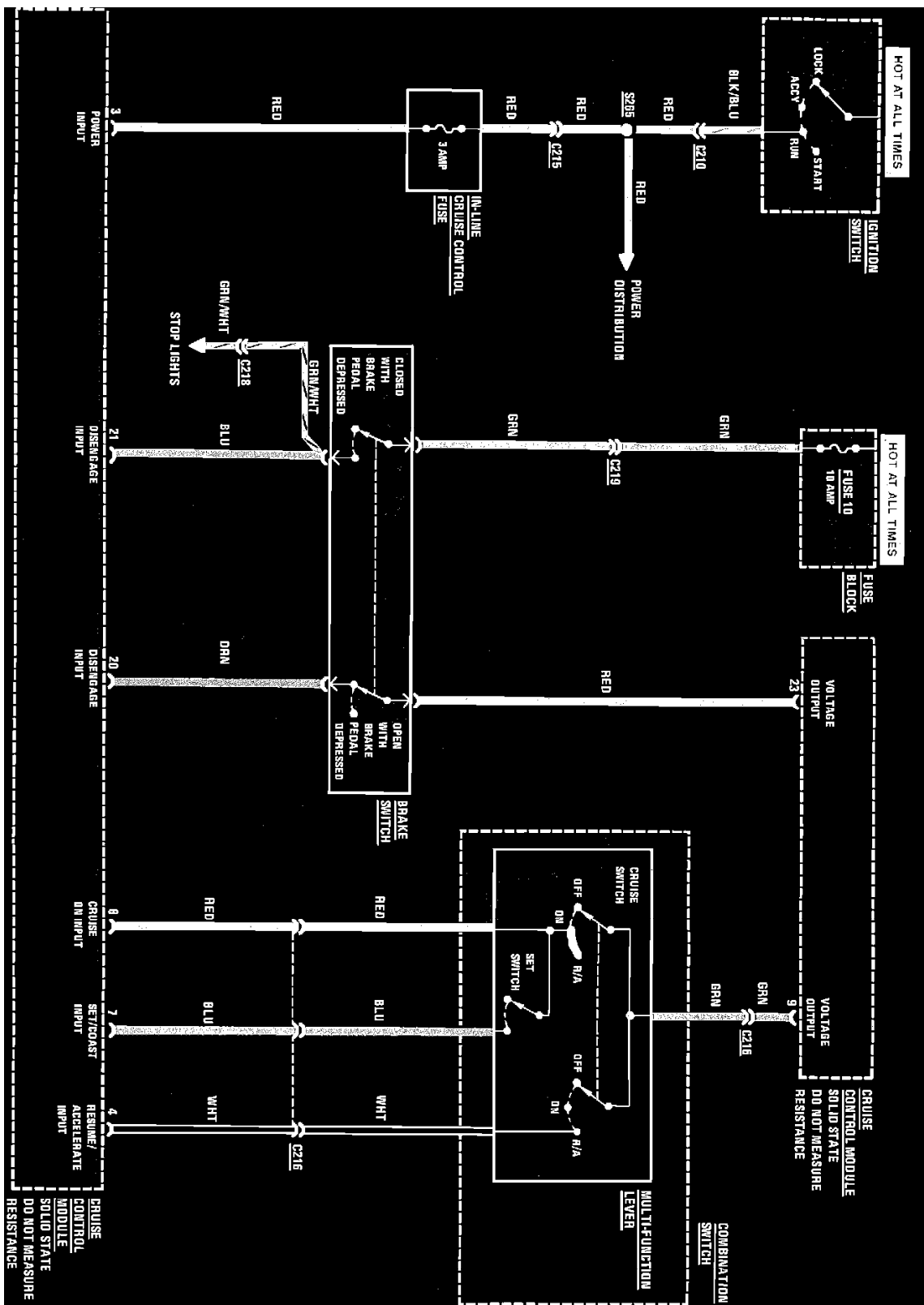
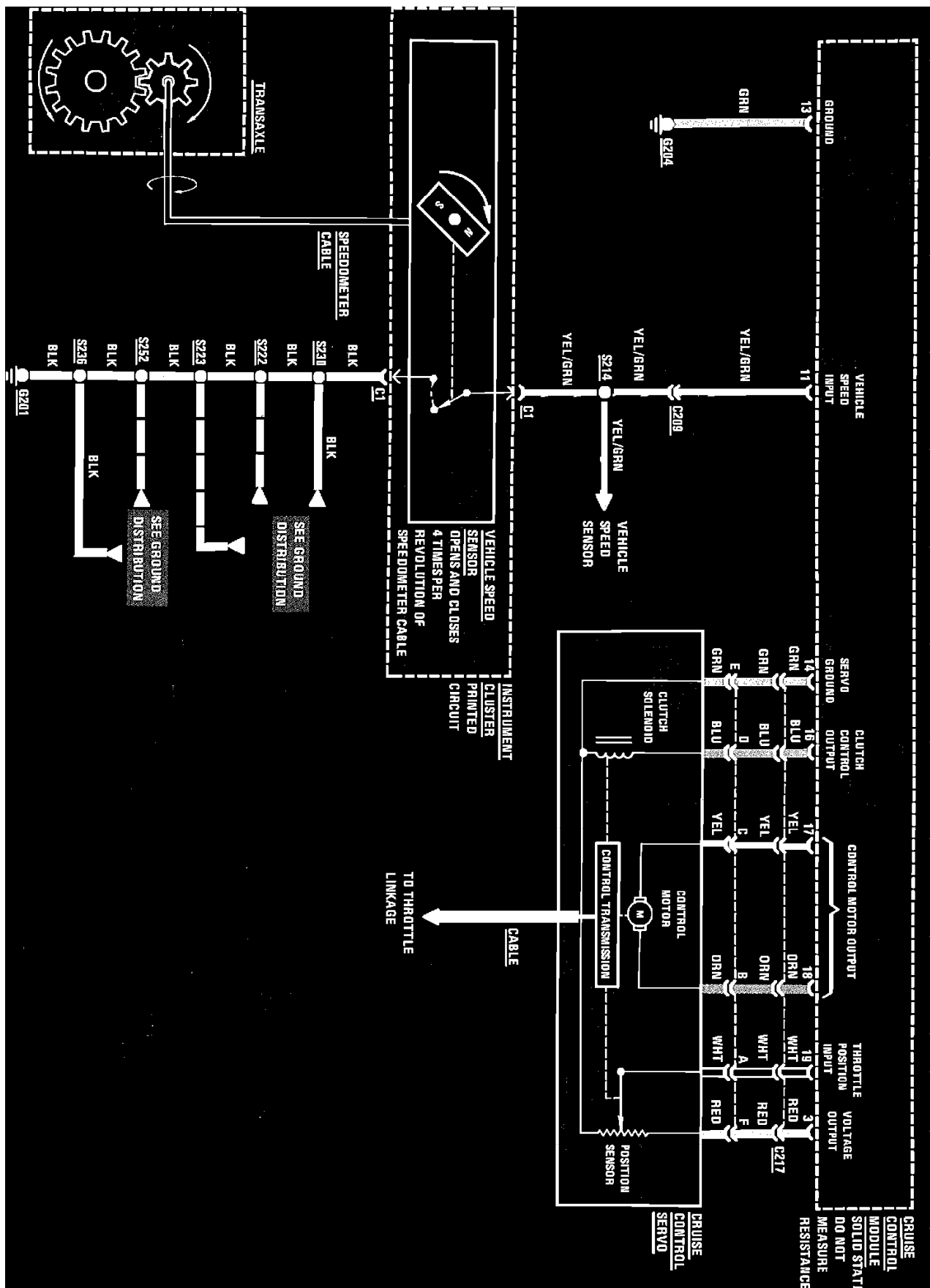


Fig. 13 Dome Lamp Wiring Circuit

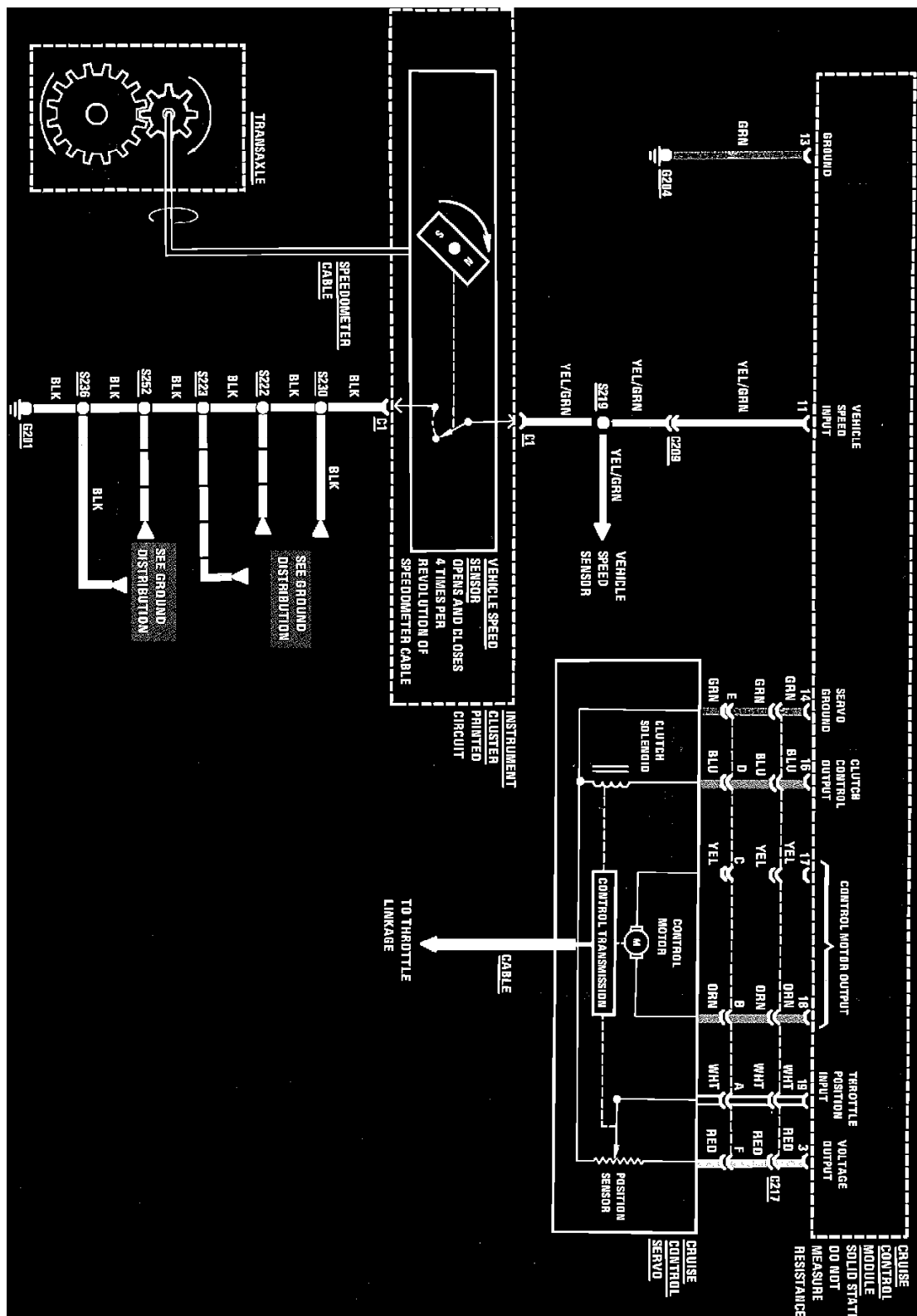


**Fig. 12a Cruise Control Wiring Circuit. Automatic Transmission. (Part 1 of 2)**

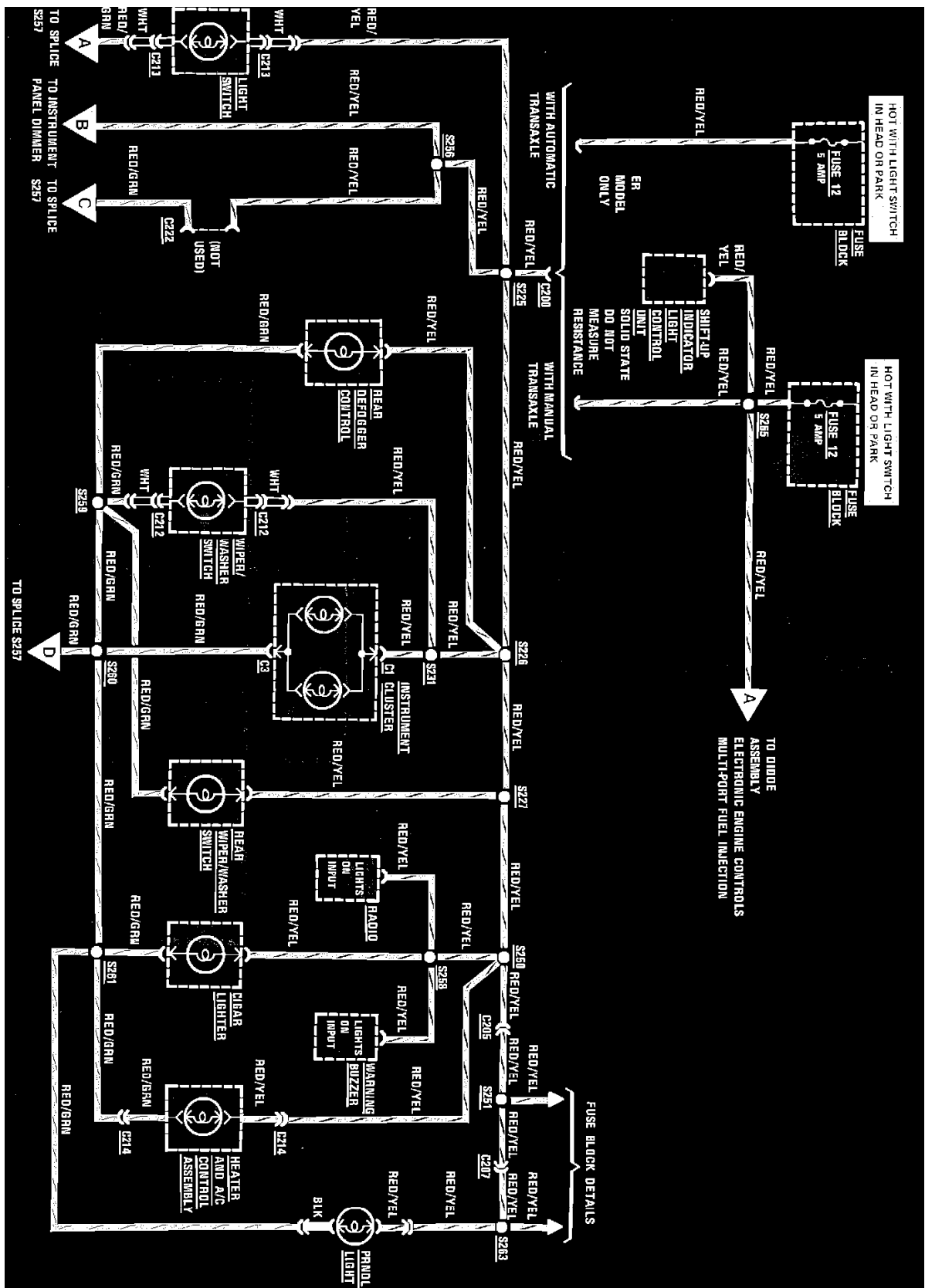


**Fig. 12b Cruise Control Wiring Circuit. Automatic Transmission. (Part 2 of 2)**





**Fig. 12d Cruise Control Wiring Circuit. Manual Transmission. (Part 2 of 2)**



**Fig. 33a Instrument Panel Wiring Circuit. (Part 1 of 2). Dimming.**



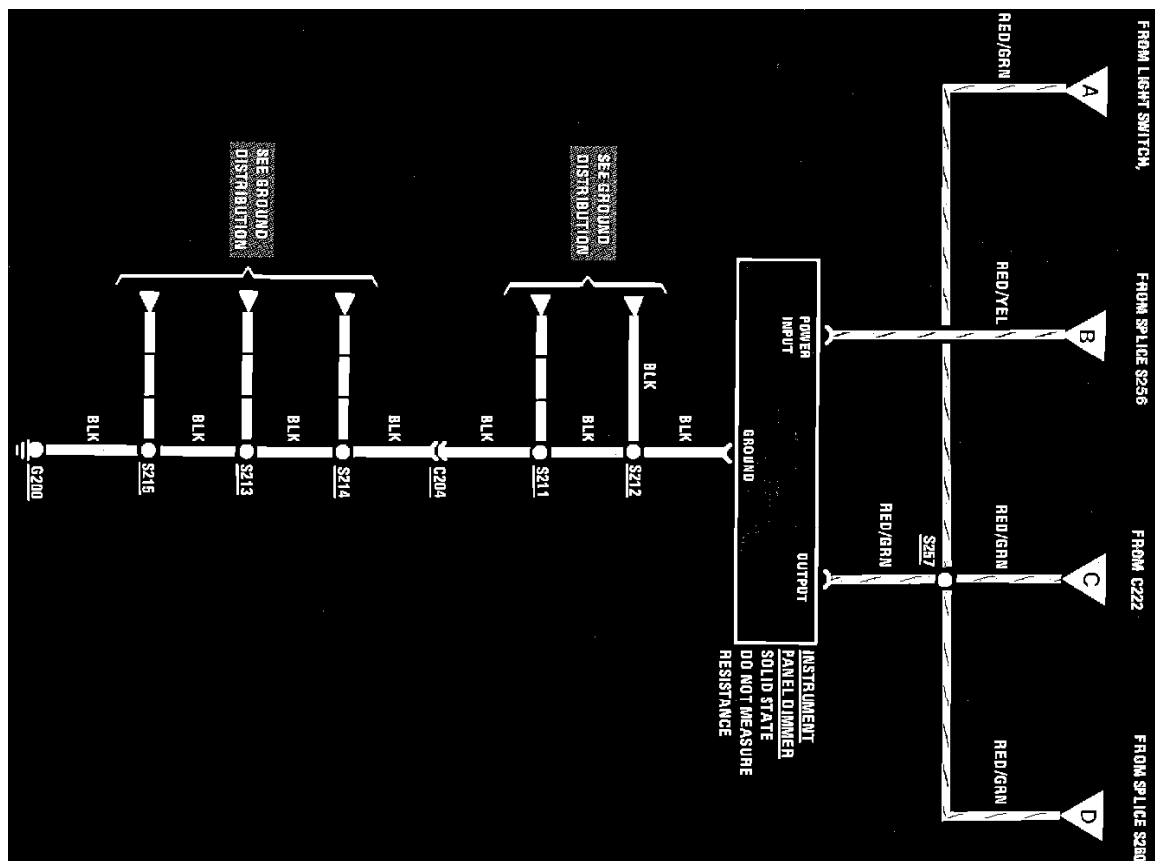


Fig. 33b Instrument Panel Wiring Circuit. (Part 2 of 2). Dimming.

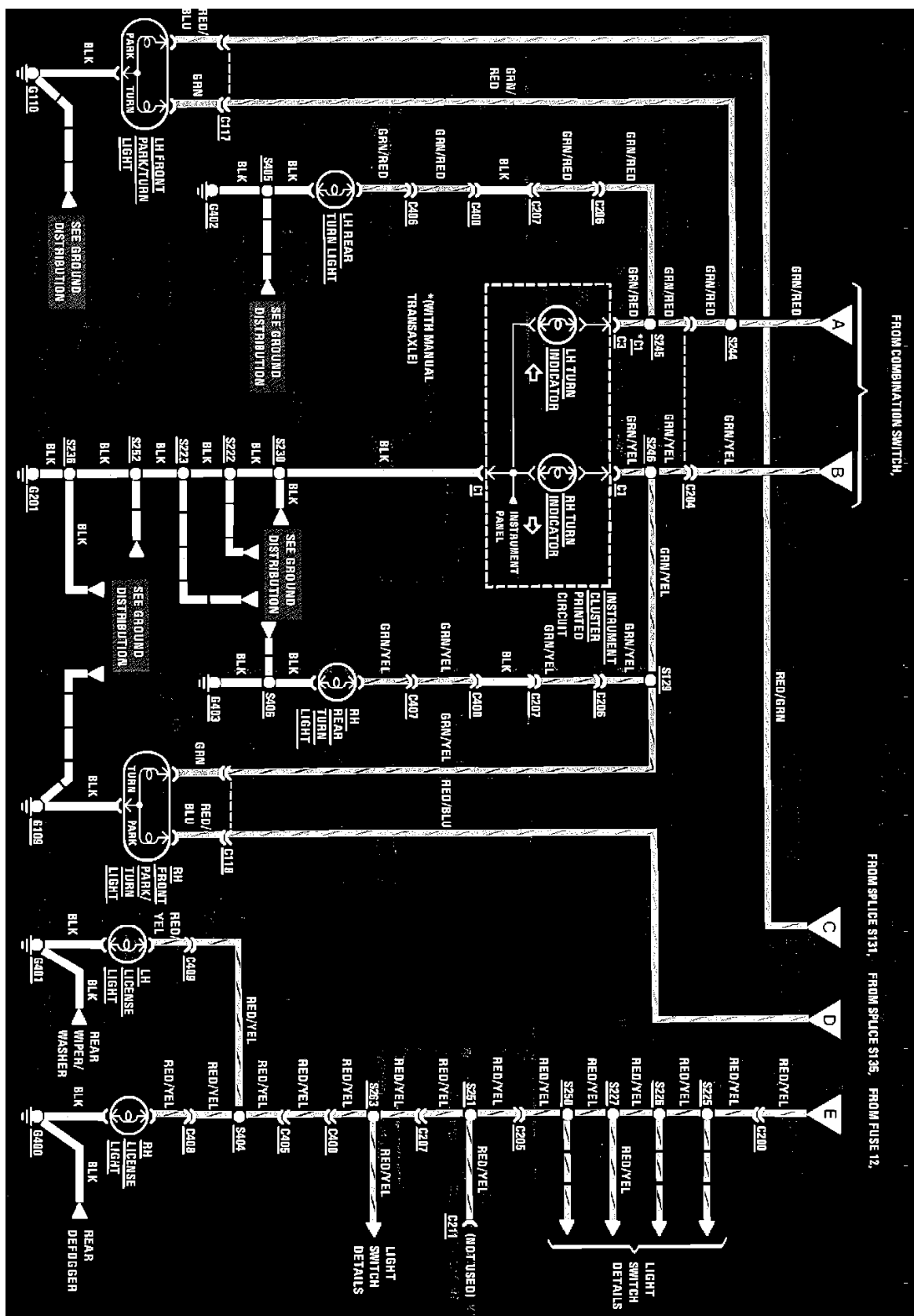


Fig. 27b Hazard, License, Marker, Tail &amp; Turn Lamp Wiring Circuit (Part 2 of 2)

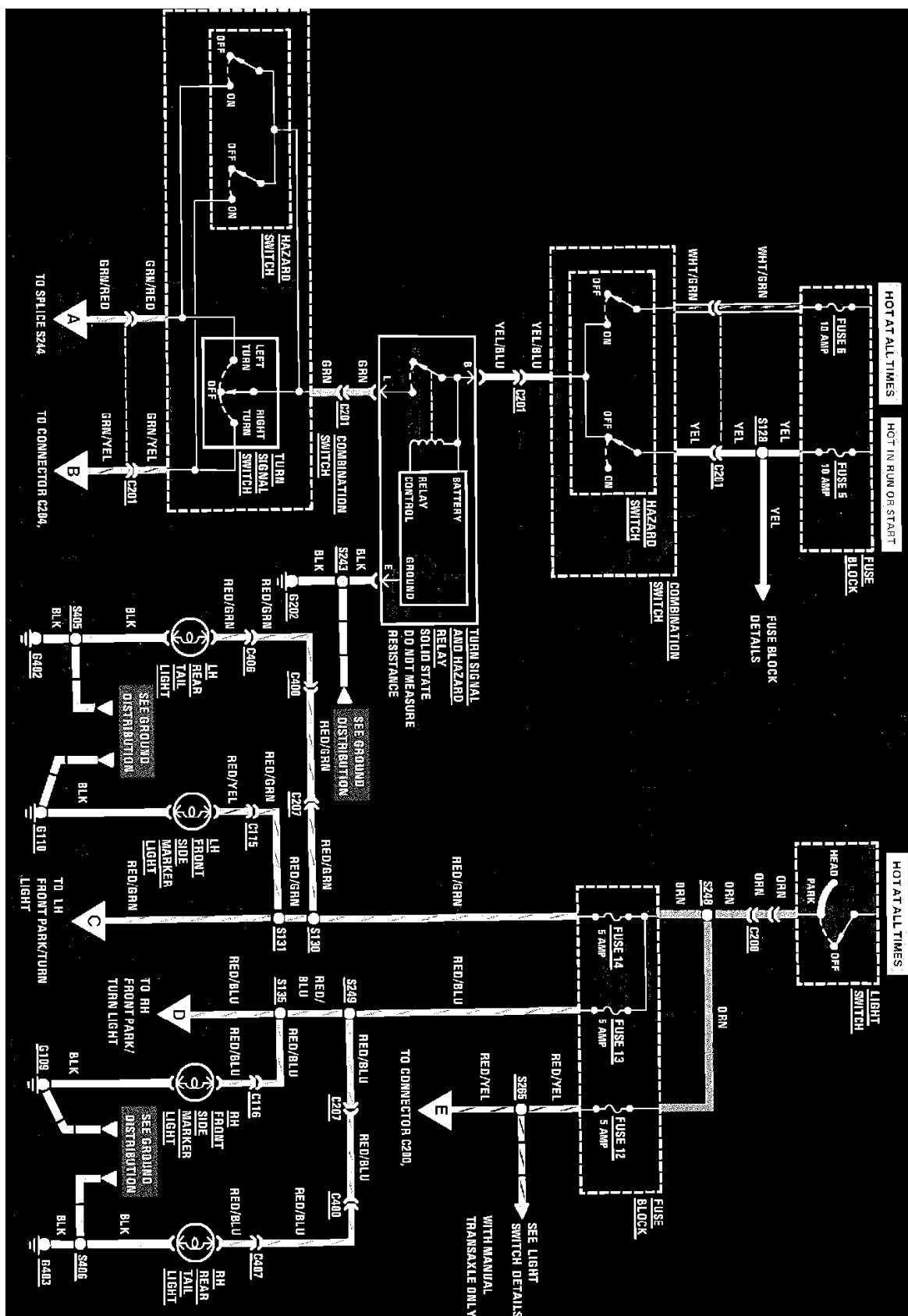


Fig. 27a Hazard, License, Marker, Tail &amp; Turn Lamp Wiring Circuit (Part 1 of 2)

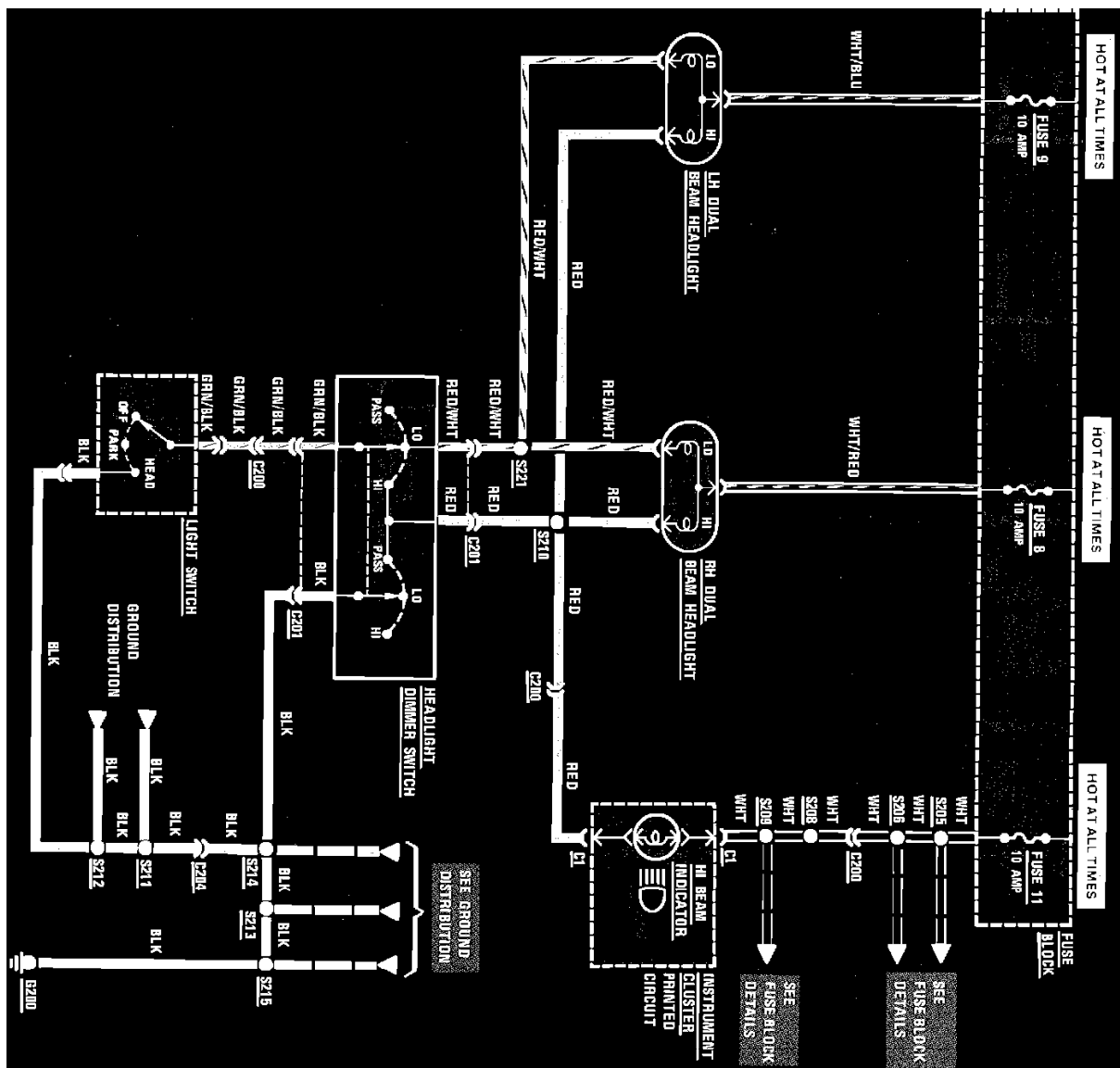
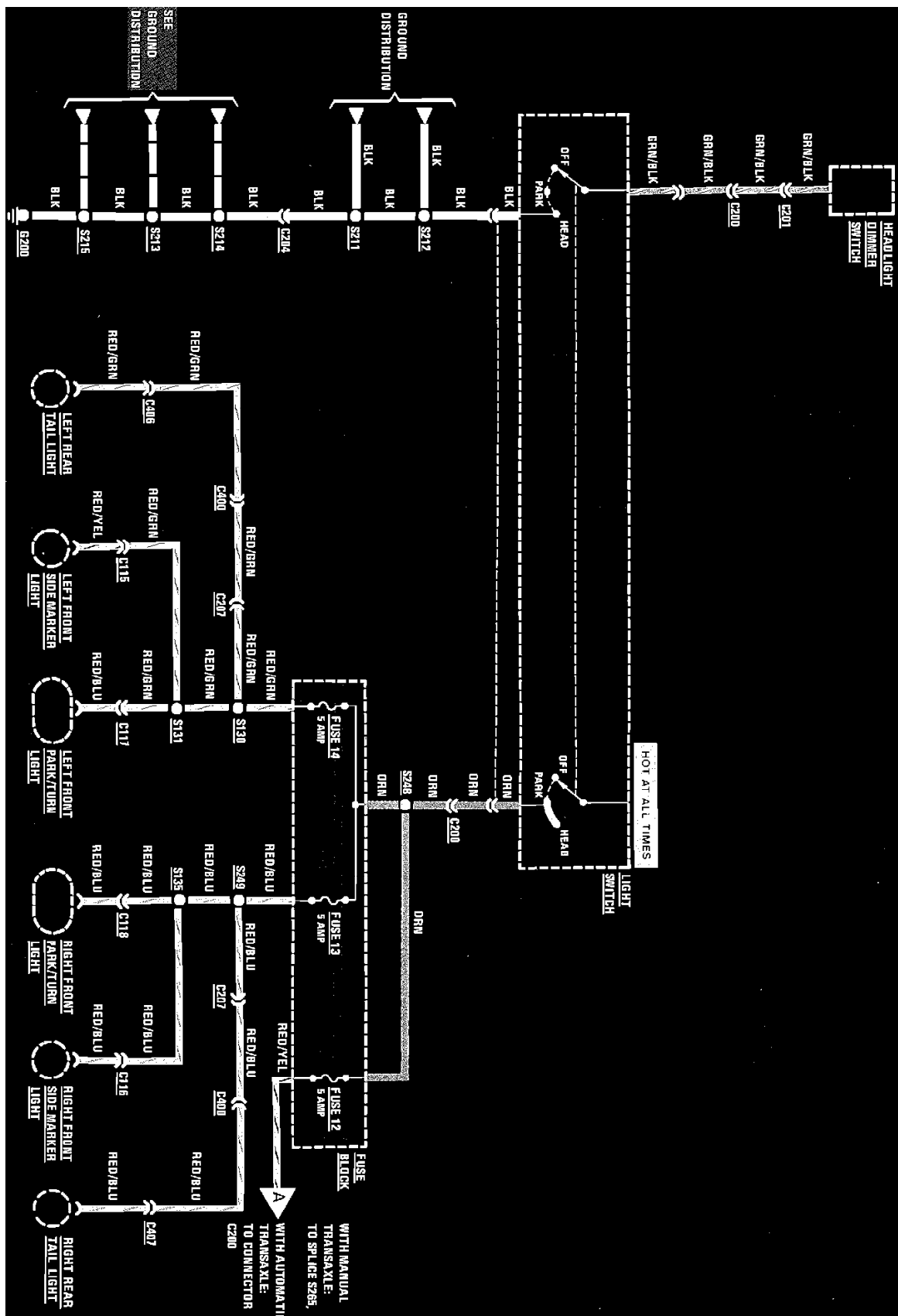
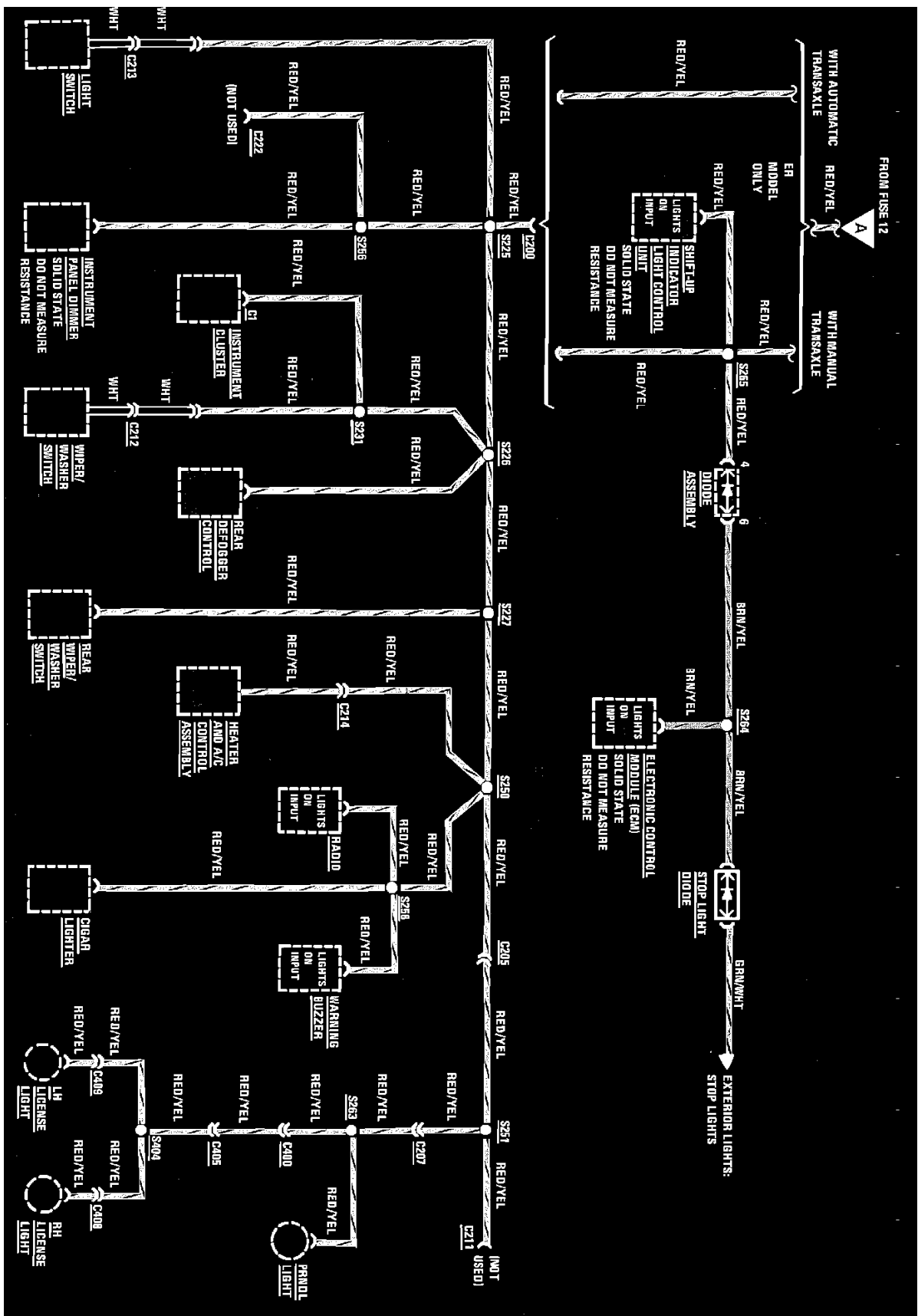


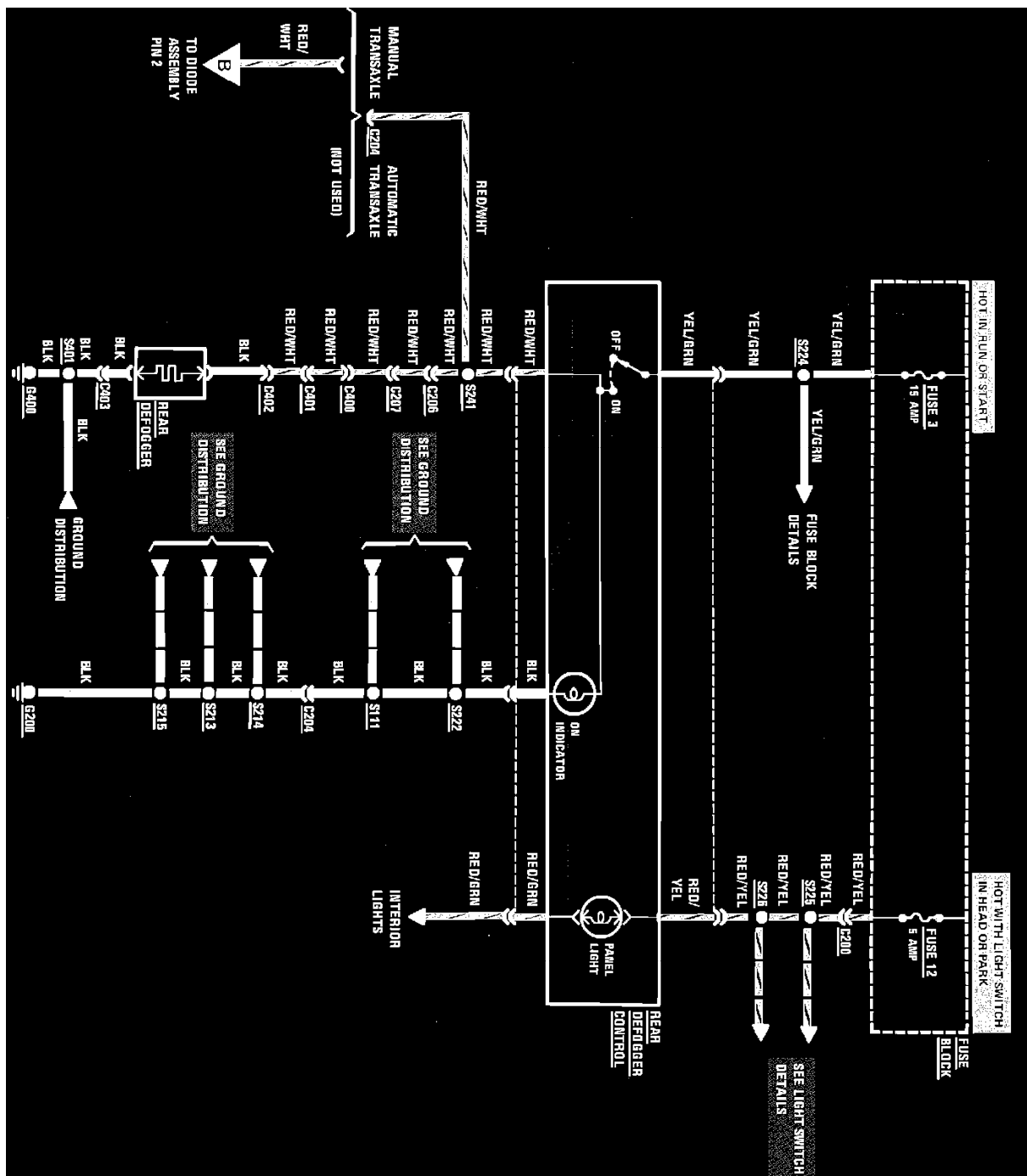
Fig. 28 Headlamp Wiring Circuit



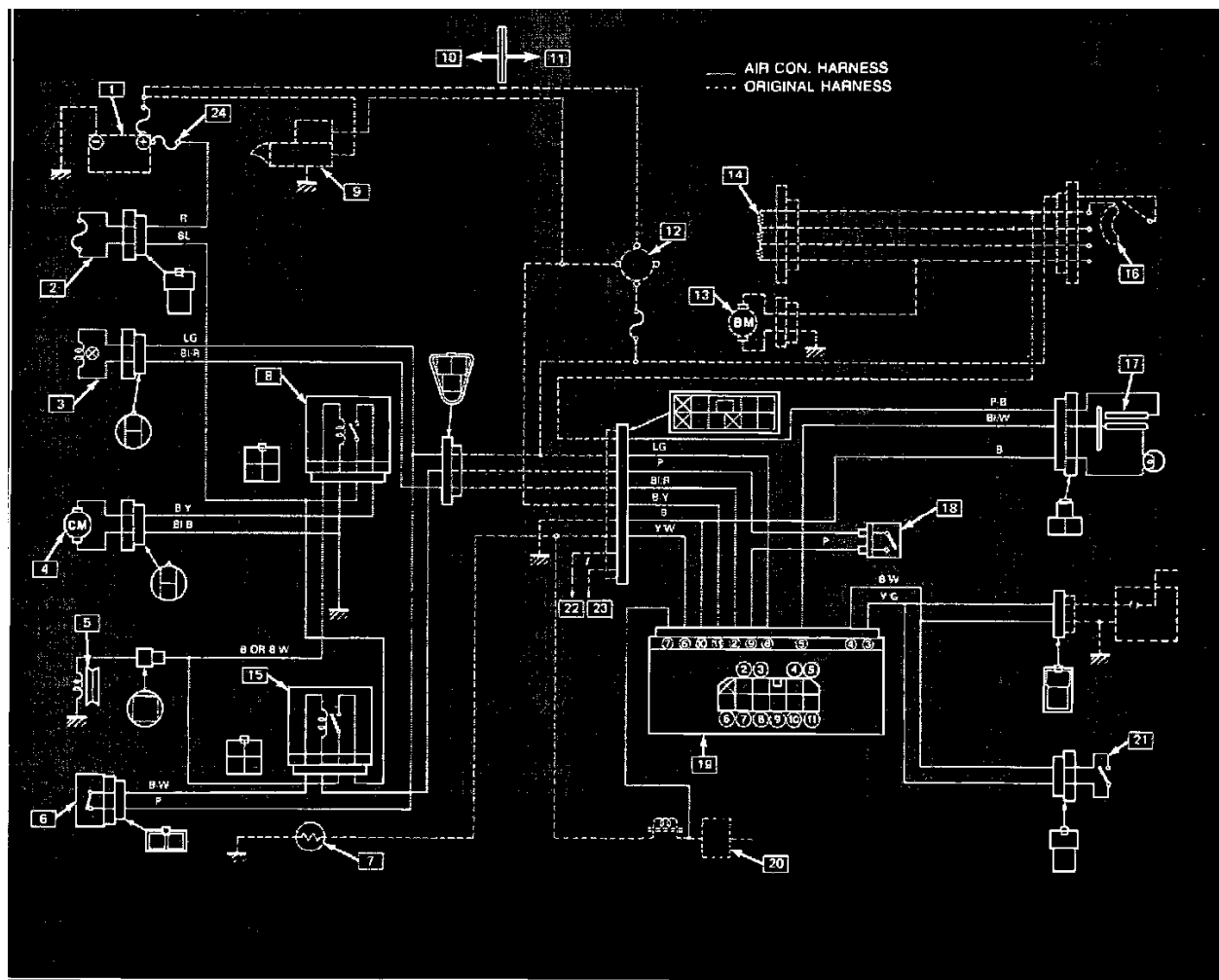
**Fig. 34a Lamp Switch Wiring Circuit. (Part 1 of 2)**



**Fig. 34b Lamp Switch Wiring Circuit. (Part 2 of 2)**

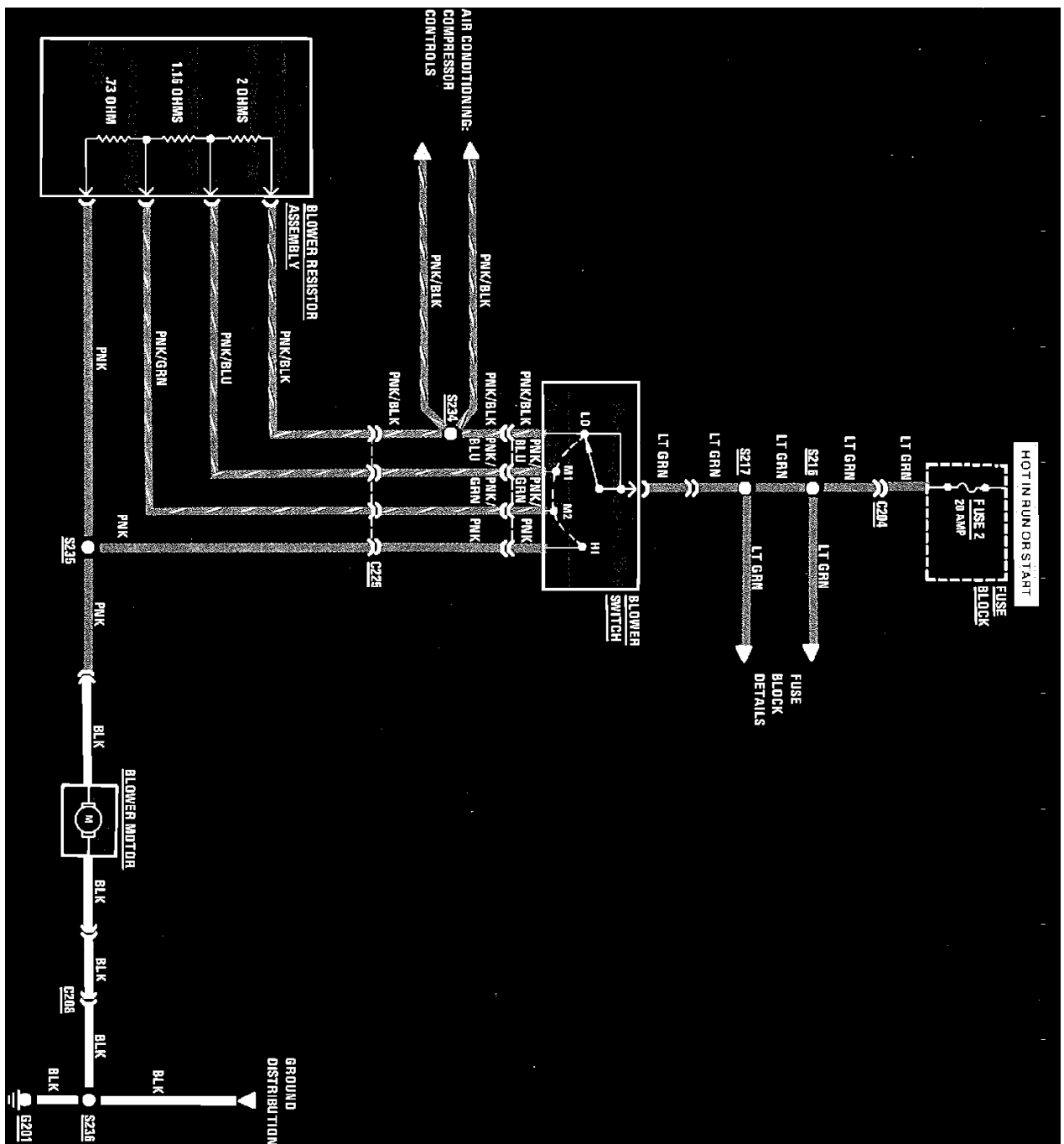


### Fig. 41 Rear Defogger Wiring Circuit

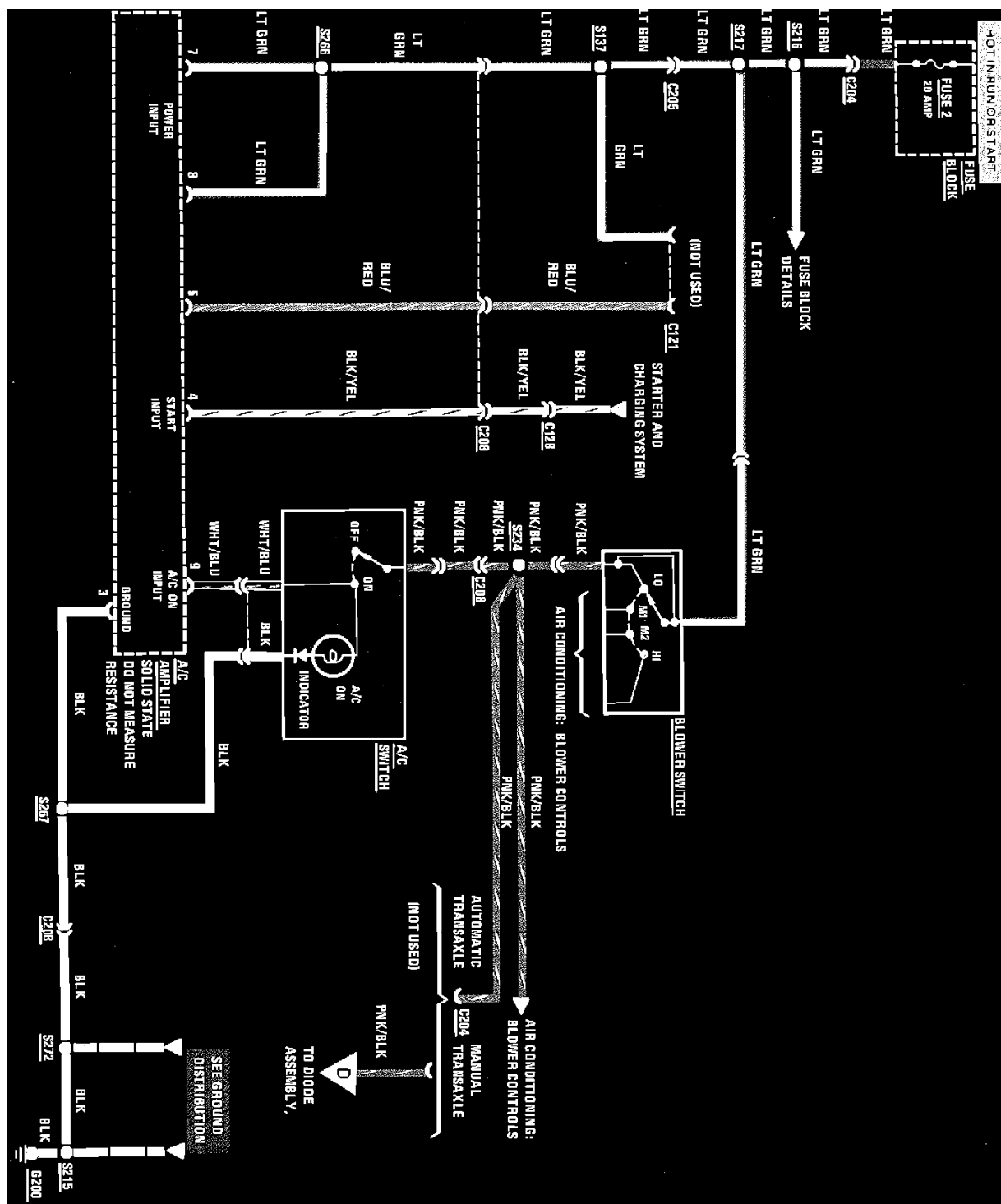


A/C Wiring Diagram (Manual Transmission) &amp; V5 Compressor





### Fig. 2 Air Conditioning & Heater Blower Control Wiring Circuit



**Fig. 3a Air Conditioning & Heater Compressor Controls Wiring Circuit (Part 1 of 2). Early Production Models**

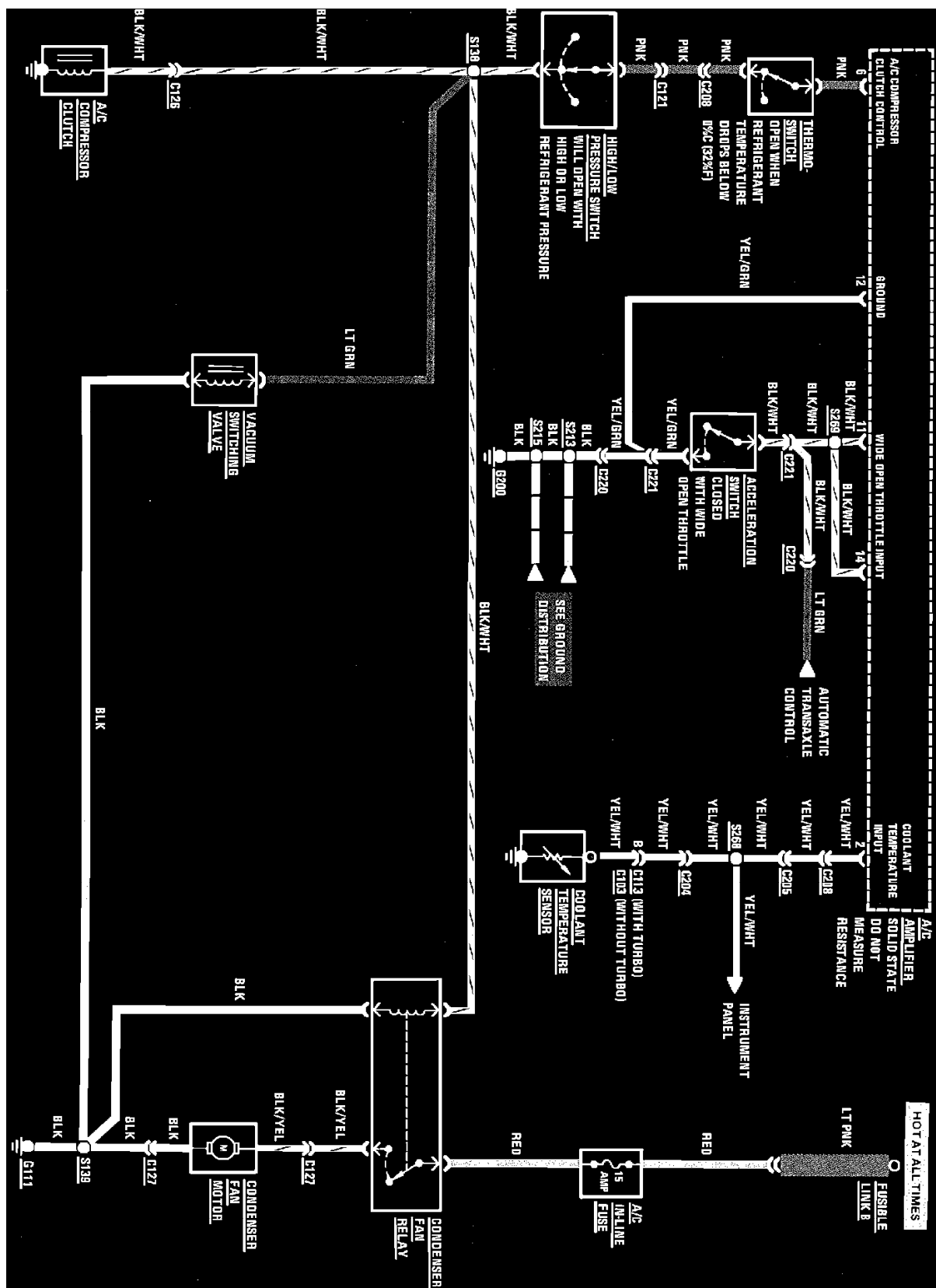


Fig. 3b Air Conditioning &amp; Heater Compressor Controls Wiring Circuit (Part 2 of 2). Early Production Models

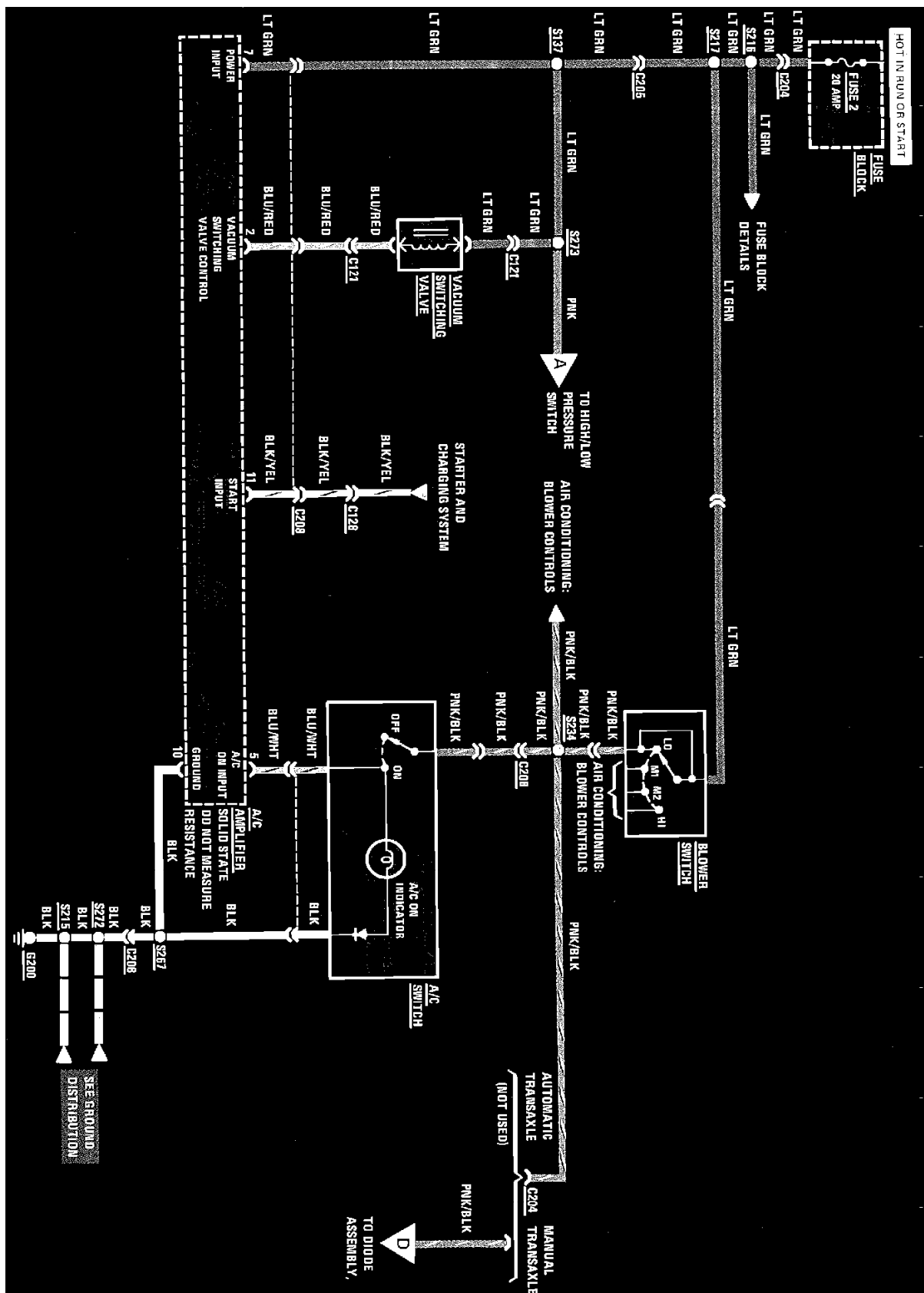
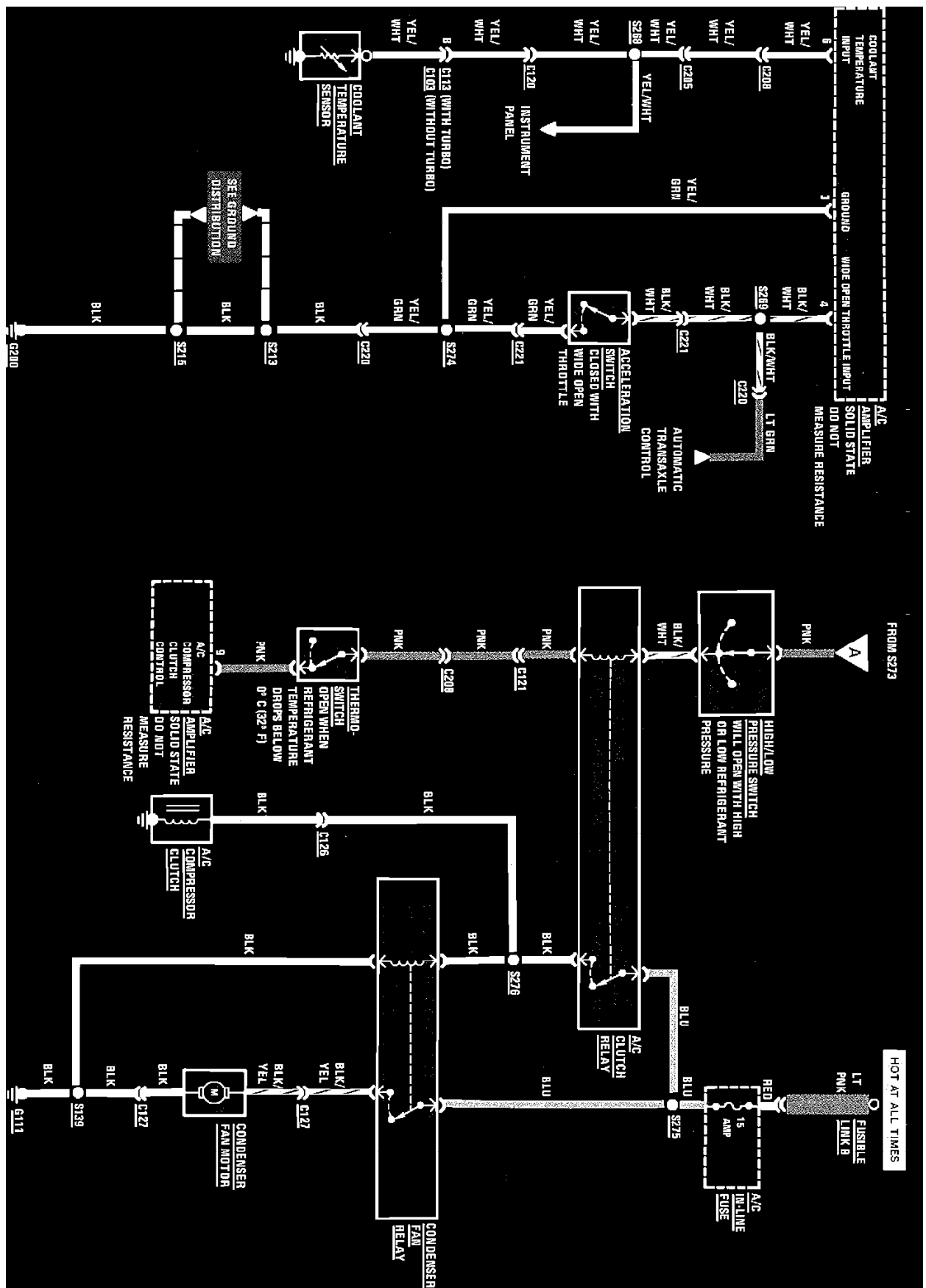


Fig. 4a Air Conditioning &amp; Heater Compressor Controls Wiring Circuit (Part 1 of 2). Late Production Models



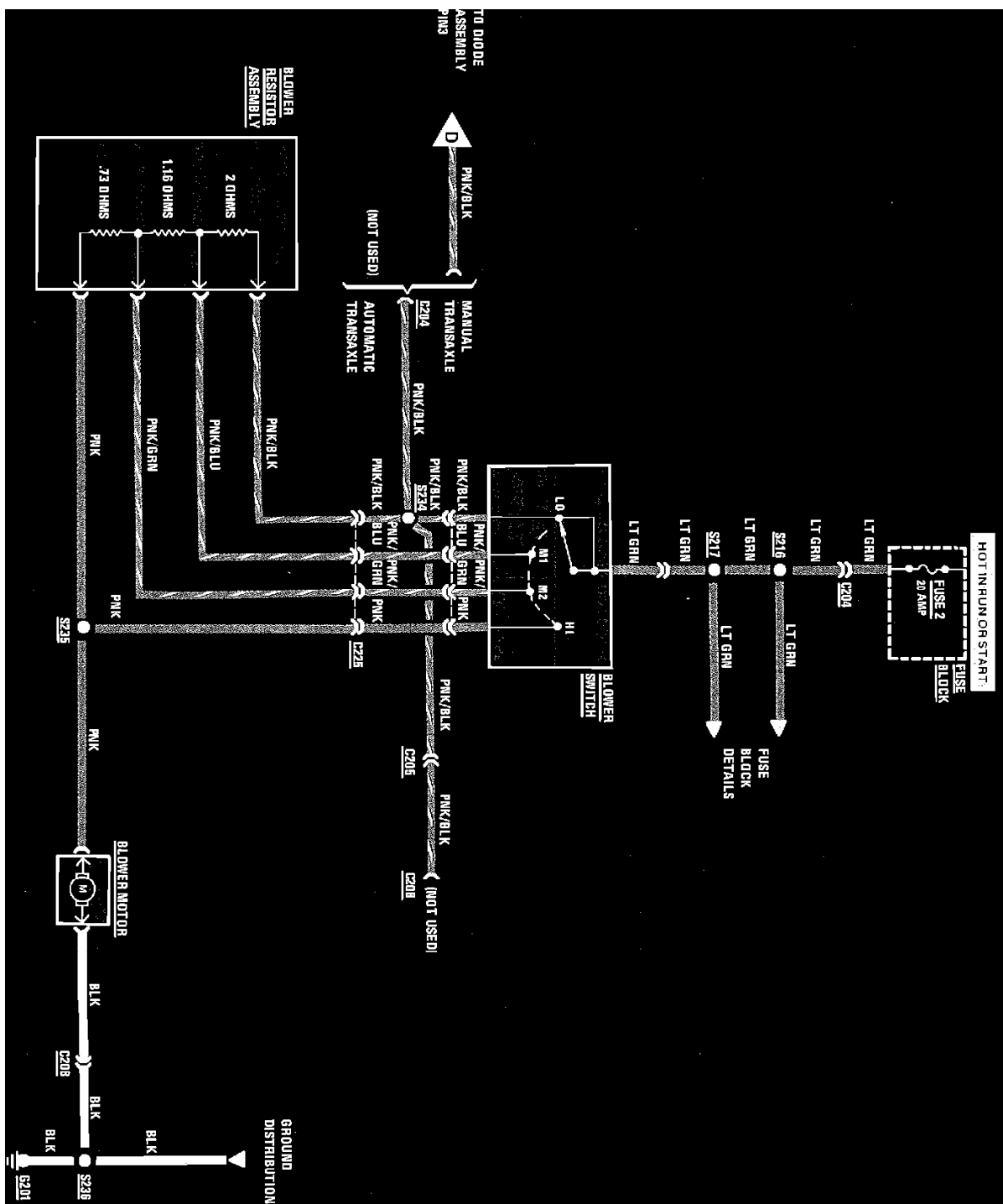


Fig. 29 Heater Wiring Circuit

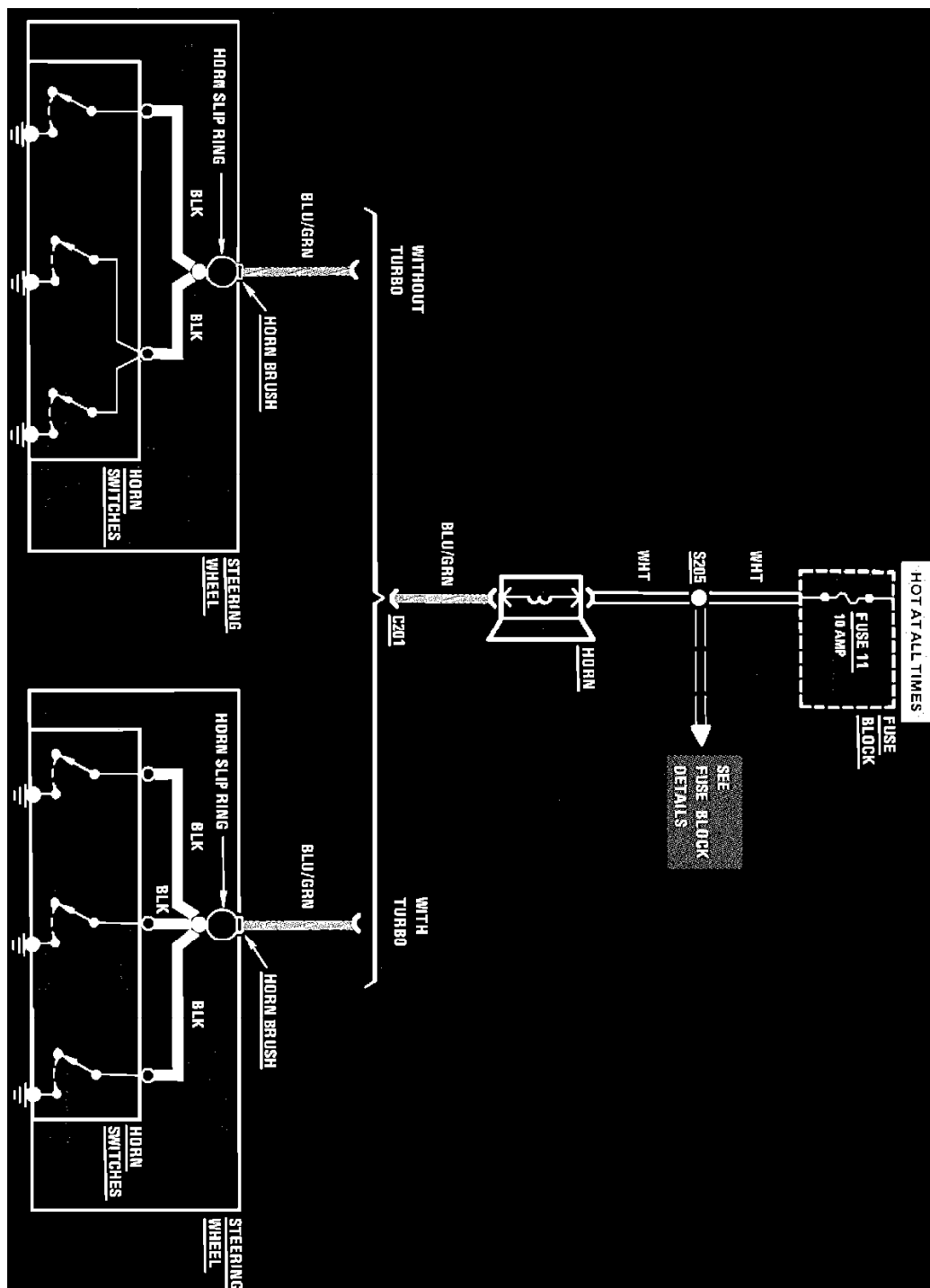


Fig. 30 Horn Wiring Circuit

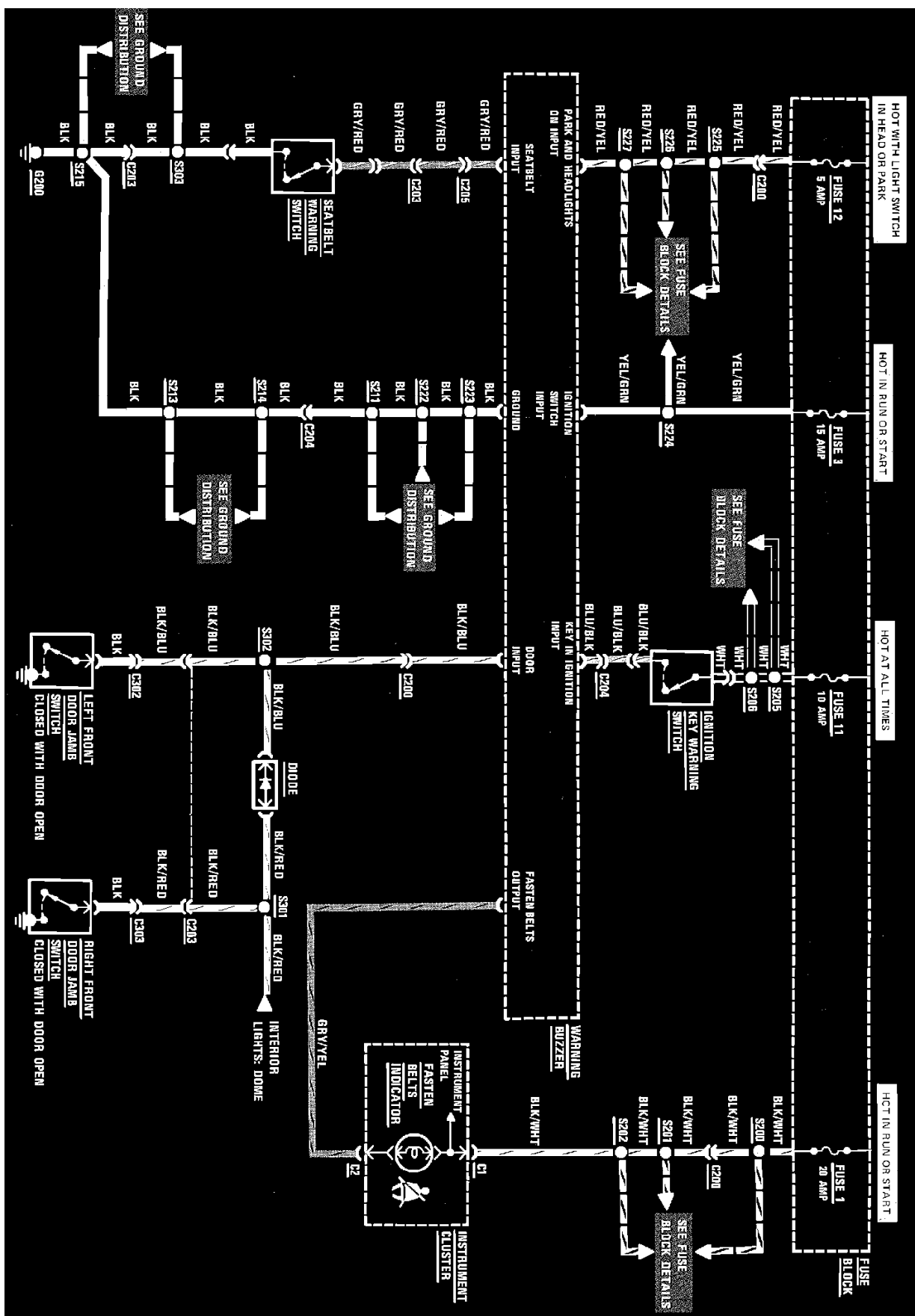
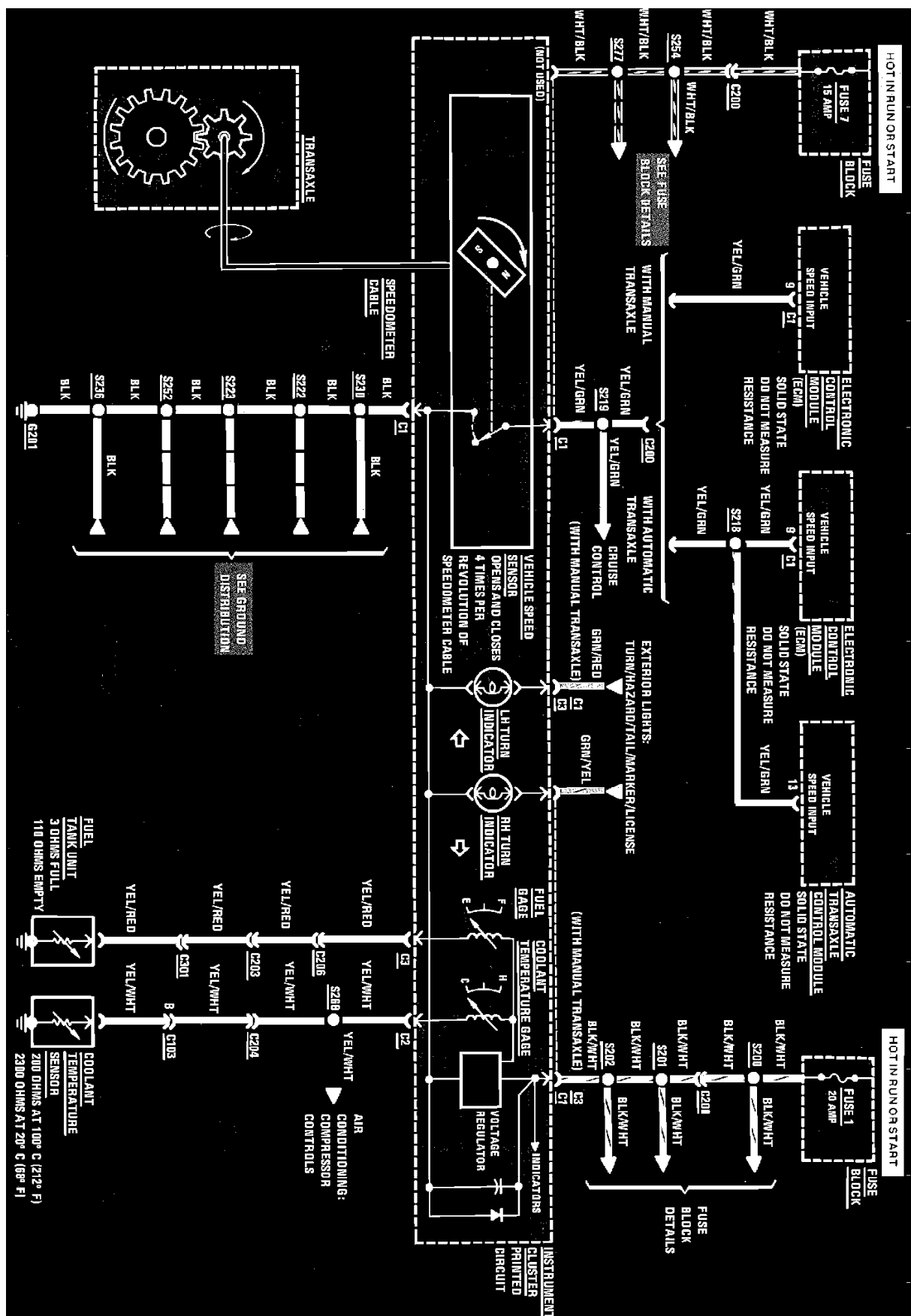
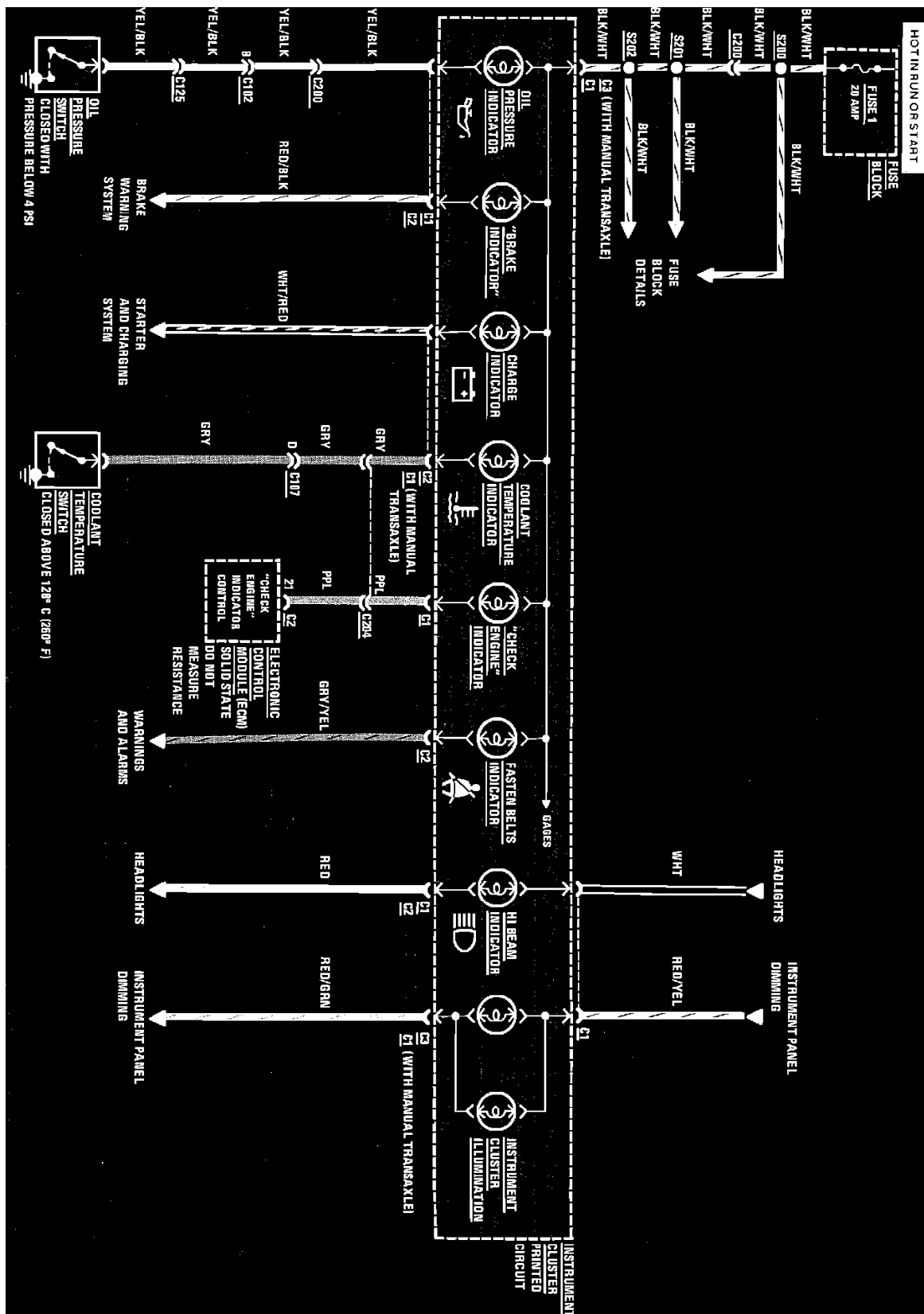


Fig. 5 Alarm &amp; Warning Wiring Circuit

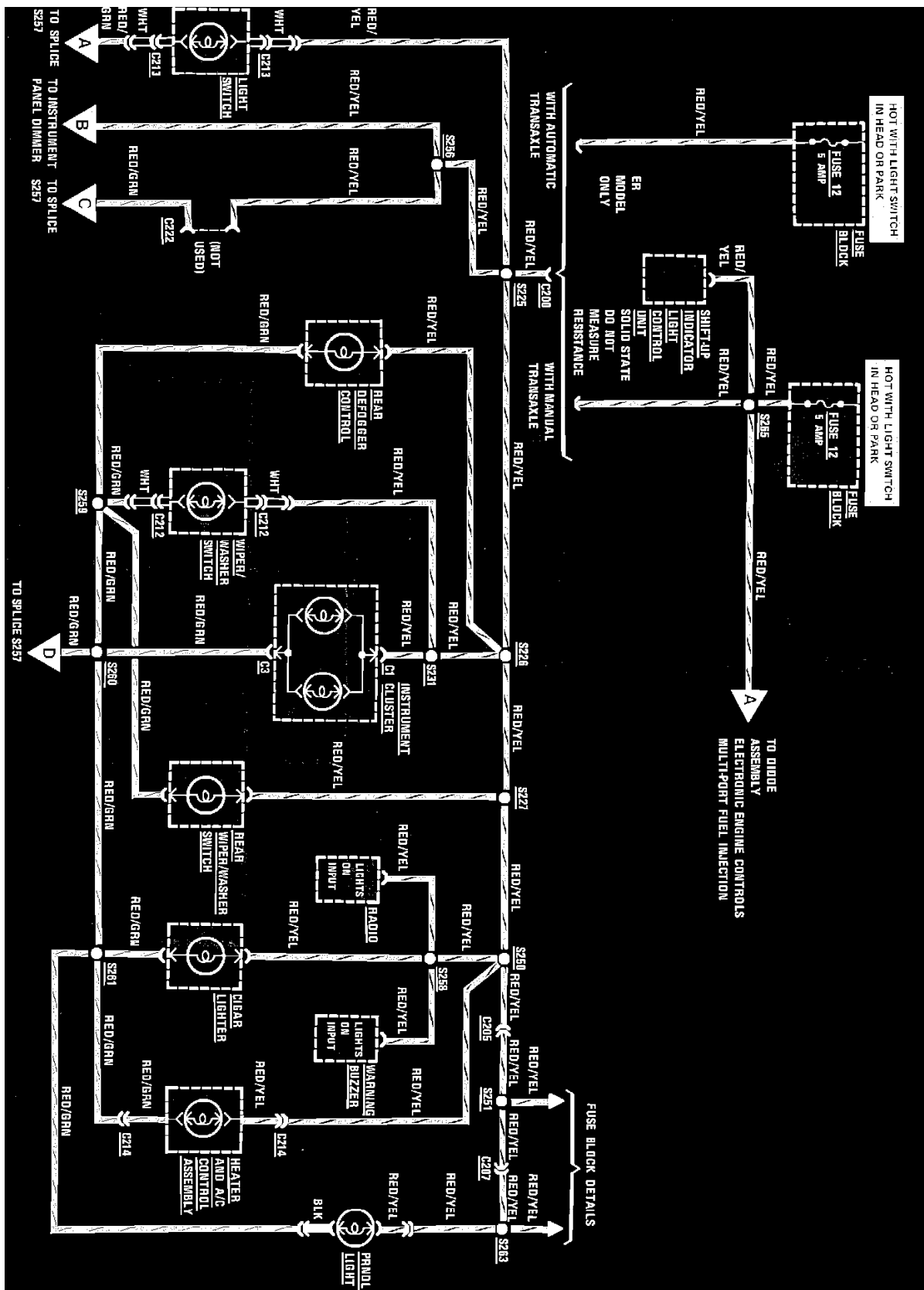




**Fig. 32a Instrument Panel Wiring Circuit. (Part 1 of 2). Indicators Cluster**



**Fig. 32b Instrument Panel Wiring Circuit. (Part 2 of 2). Indicators Cluster**



**Fig. 33a Instrument Panel Wiring Circuit. (Part 1 of 2). Dimming.**



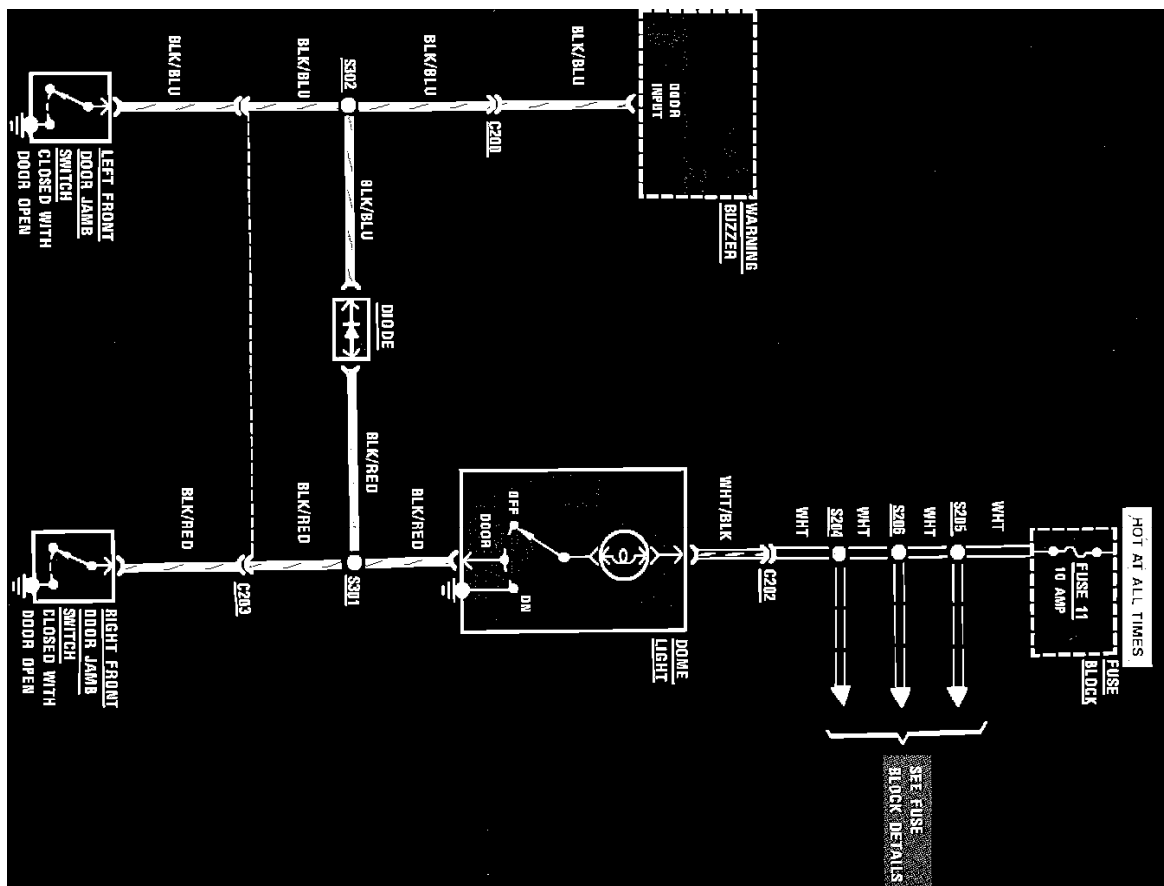
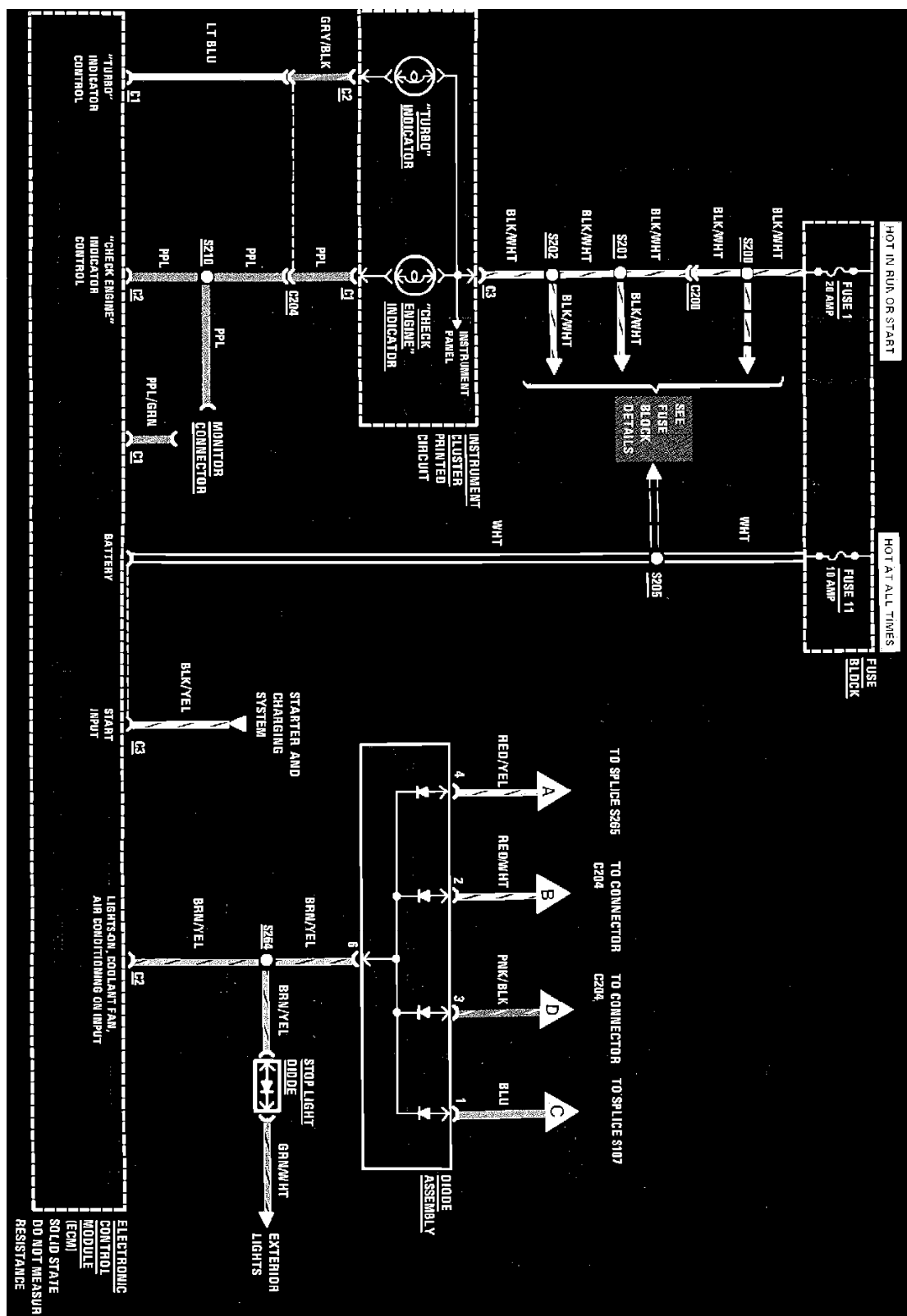
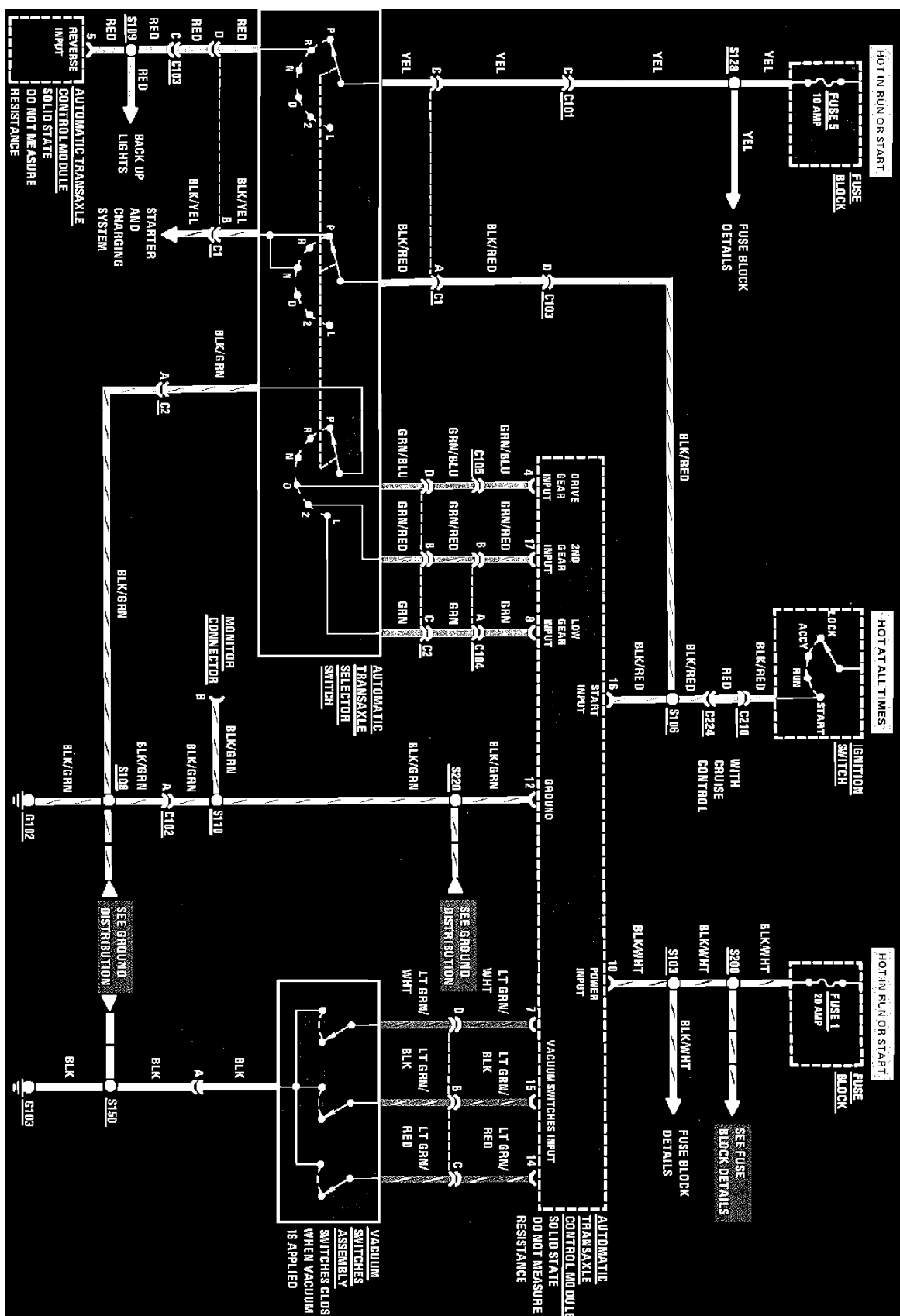
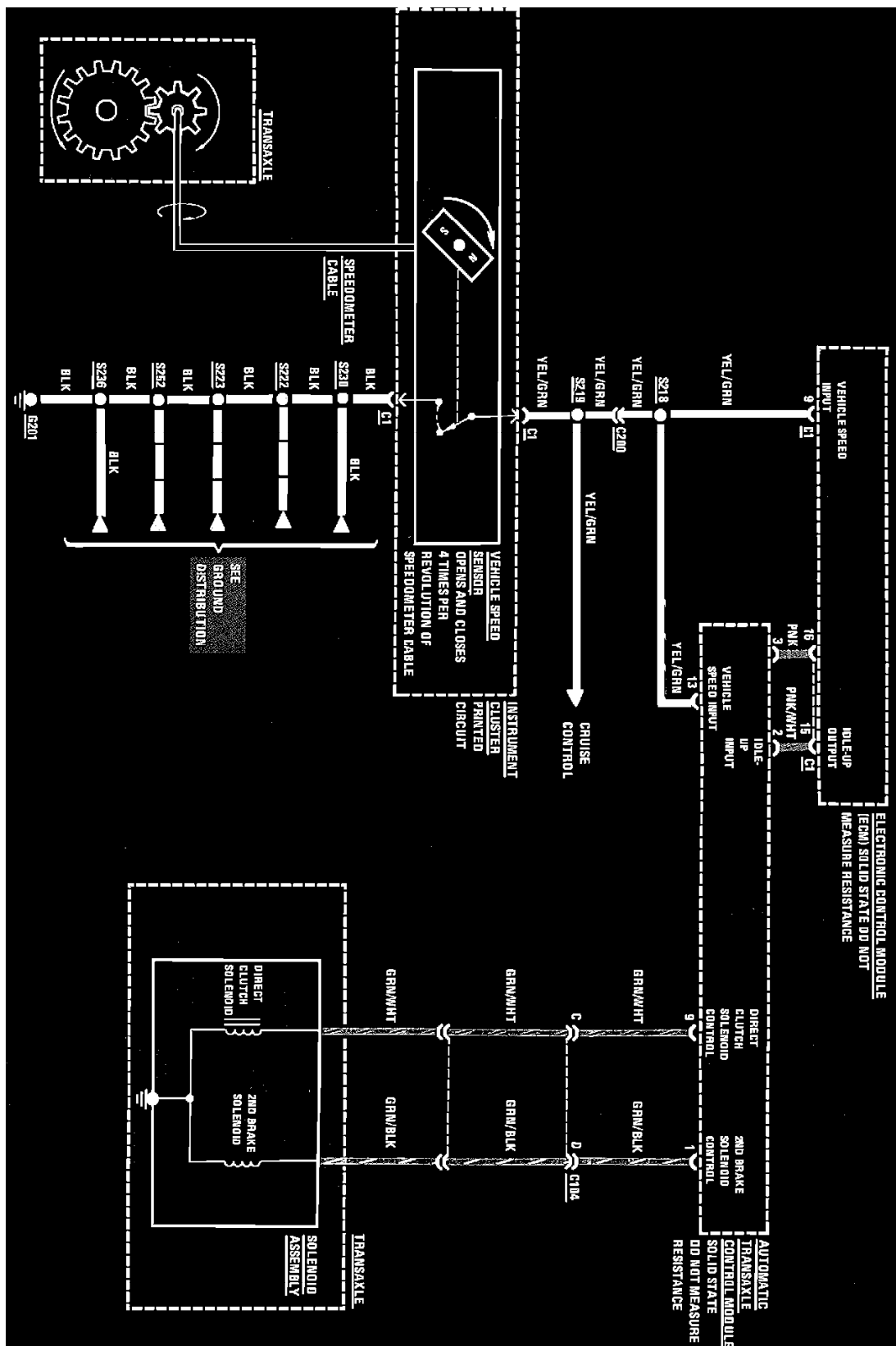


Fig. 13 Dome Lamp Wiring Circuit

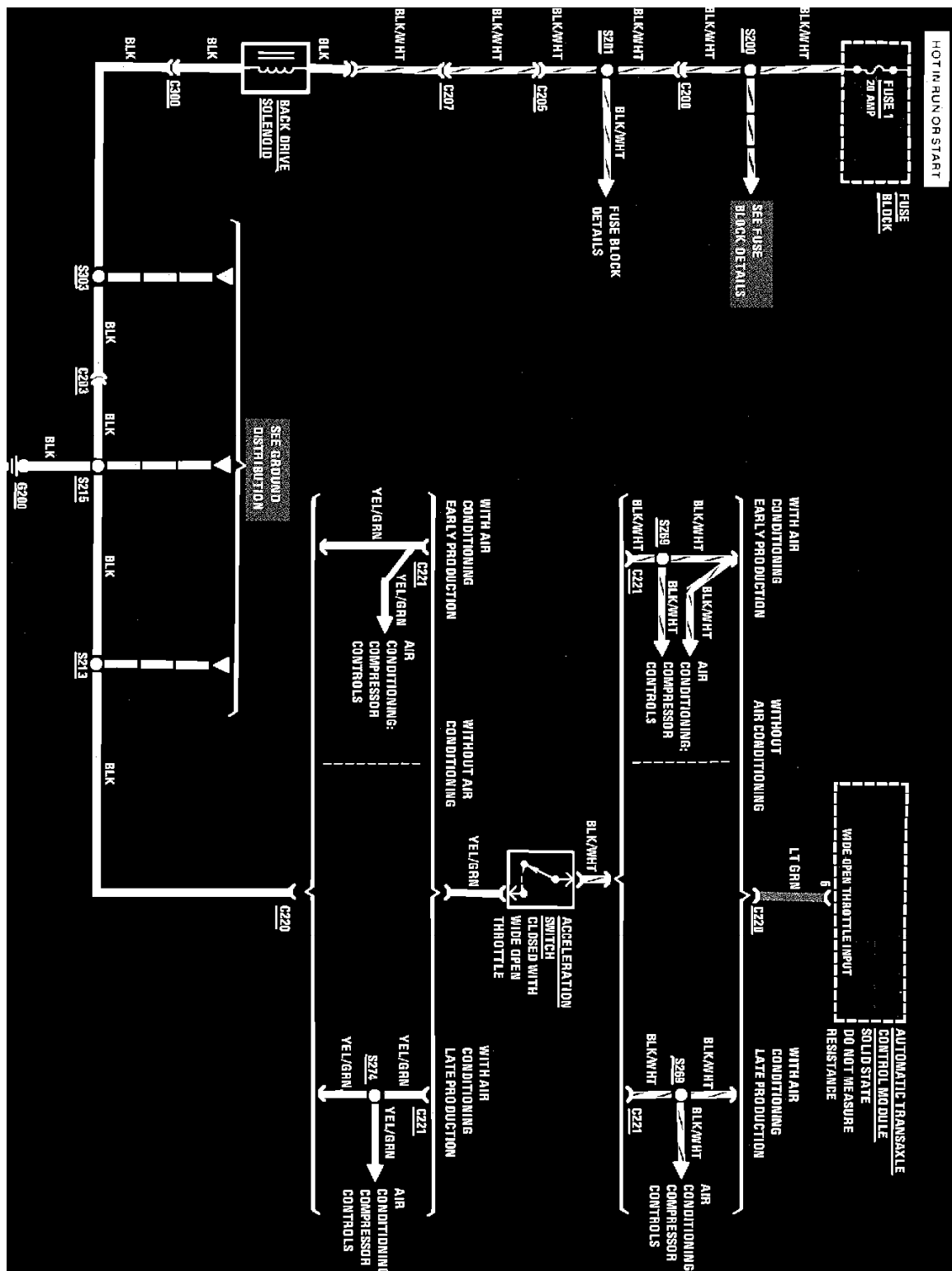




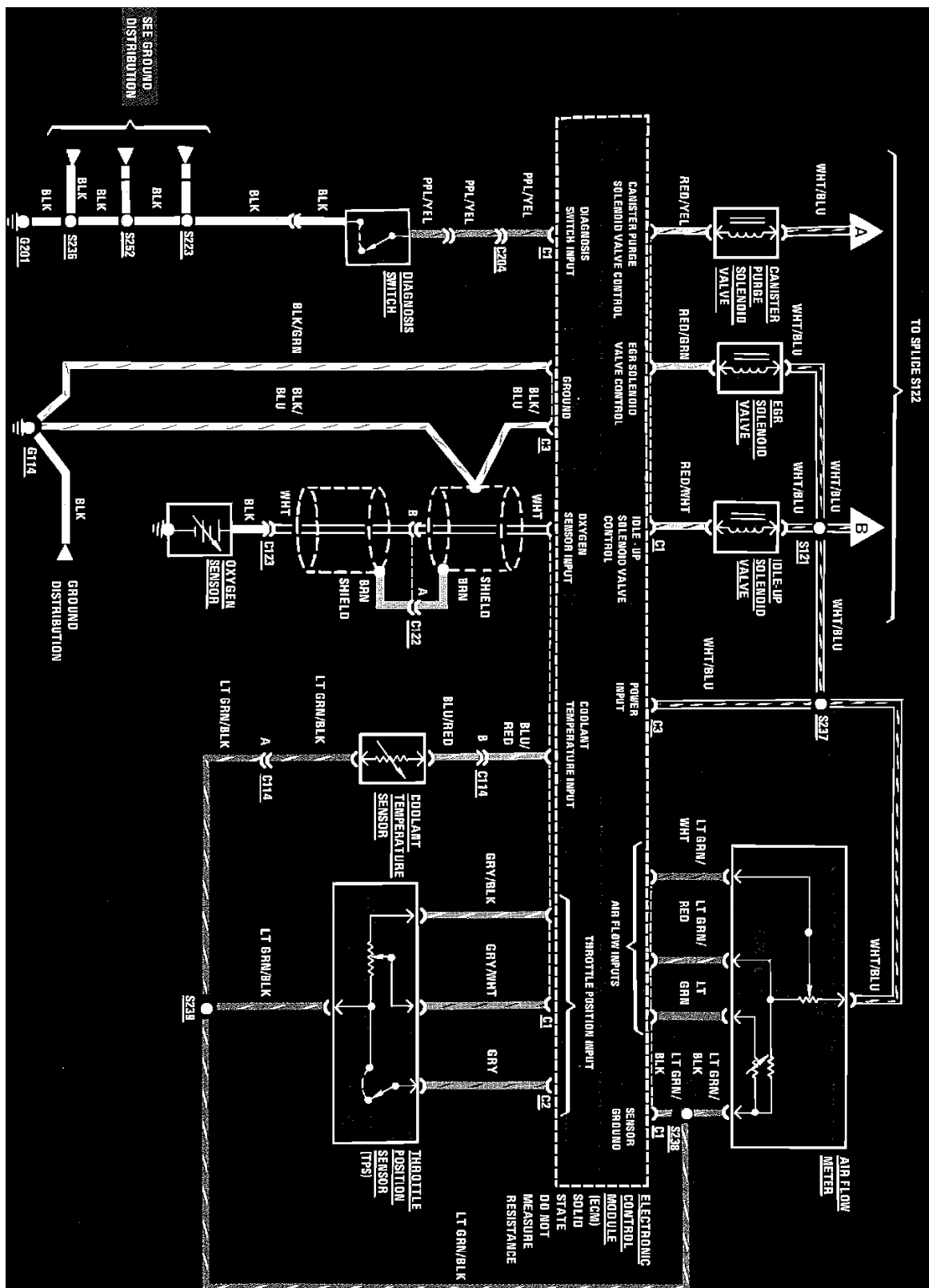


### Fig. 6b Automatic Transaxle Control Wiring Circuit (Part 2 of 3)

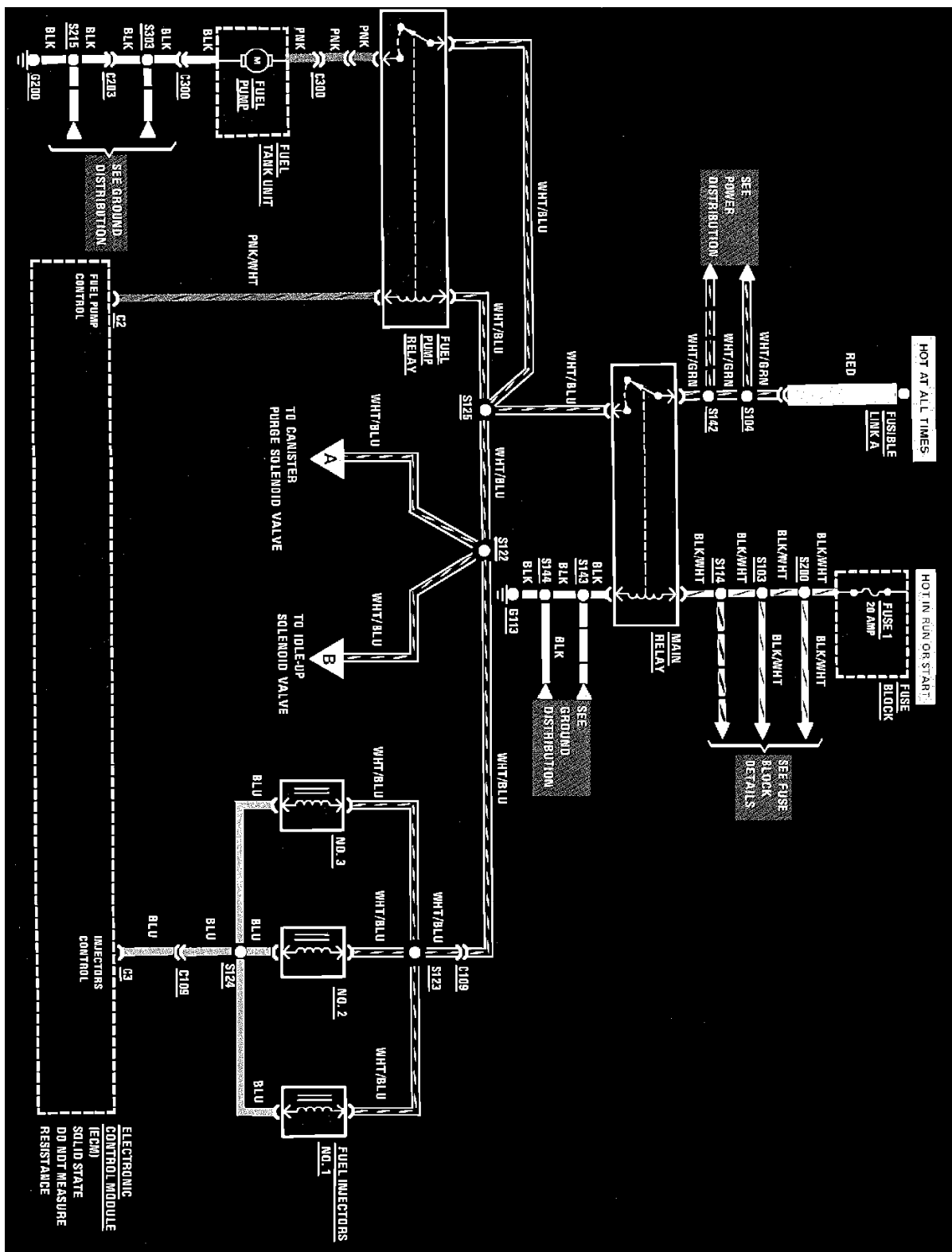




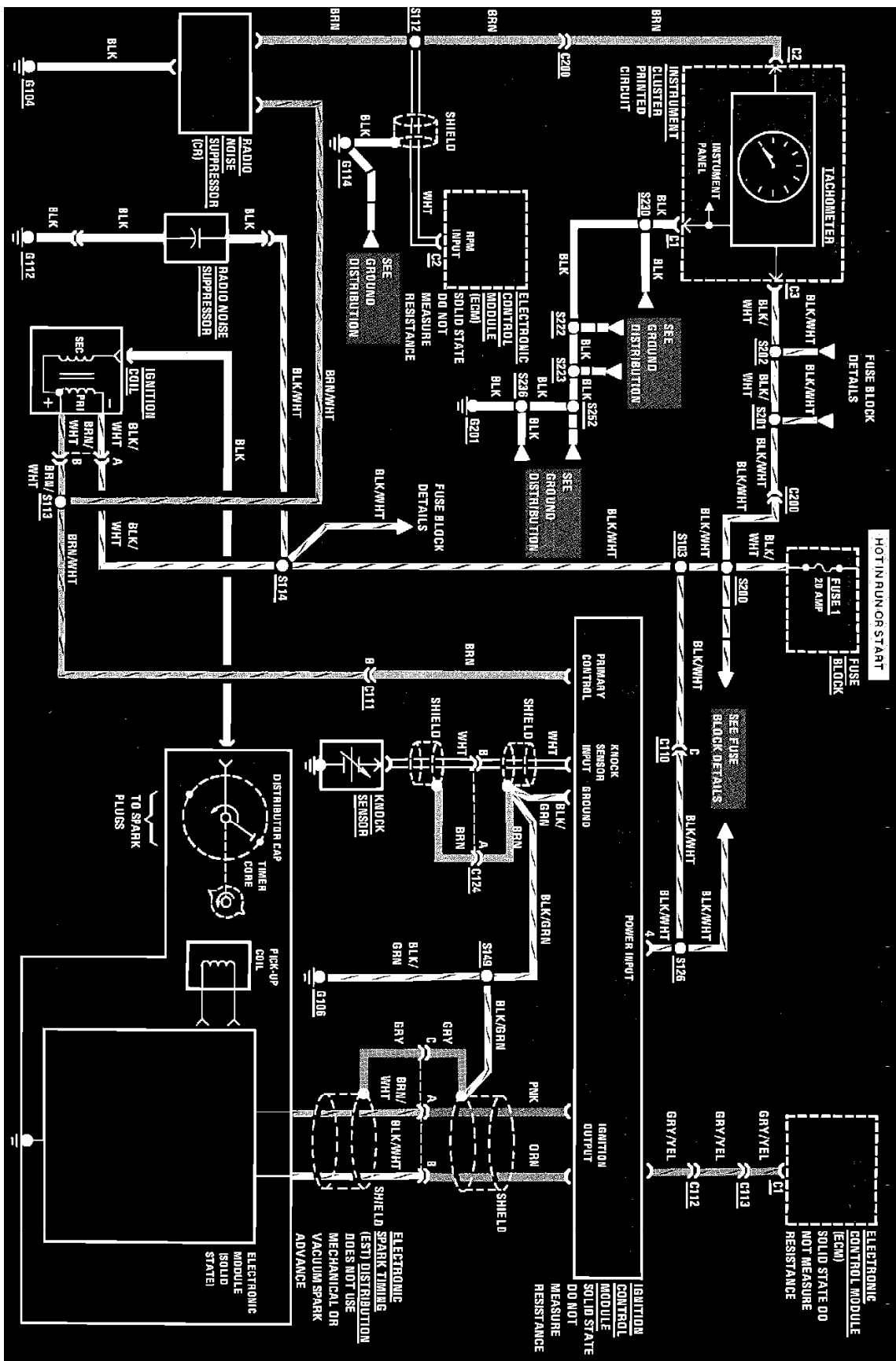
**Fig. 6c Automatic Transaxle Control Wiring Circuit (Part 3 of 3)**



**Fig. 35 Multi-Port Fuel Injection Wiring Circuit. Turbo Engine (Air, Diagnosis, Emission Control & Engine Data Sensors)**



**Fig. 37 Multi-Port Fuel Injection Wiring Circuit. Turbo Engine (Fuel Control & Injectors)**



**Fig. 38 Multi-Port Fuel Injection Wiring Circuit. Turbo Engine (Ignition)**

For information regarding diagrams for this component, please refer to Powertrain Management diagrams. See: Powertrain Management/Diagrams/Electrical Diagrams

### Fig. 44 Vehicle Speed Sensor Wiring Circuit

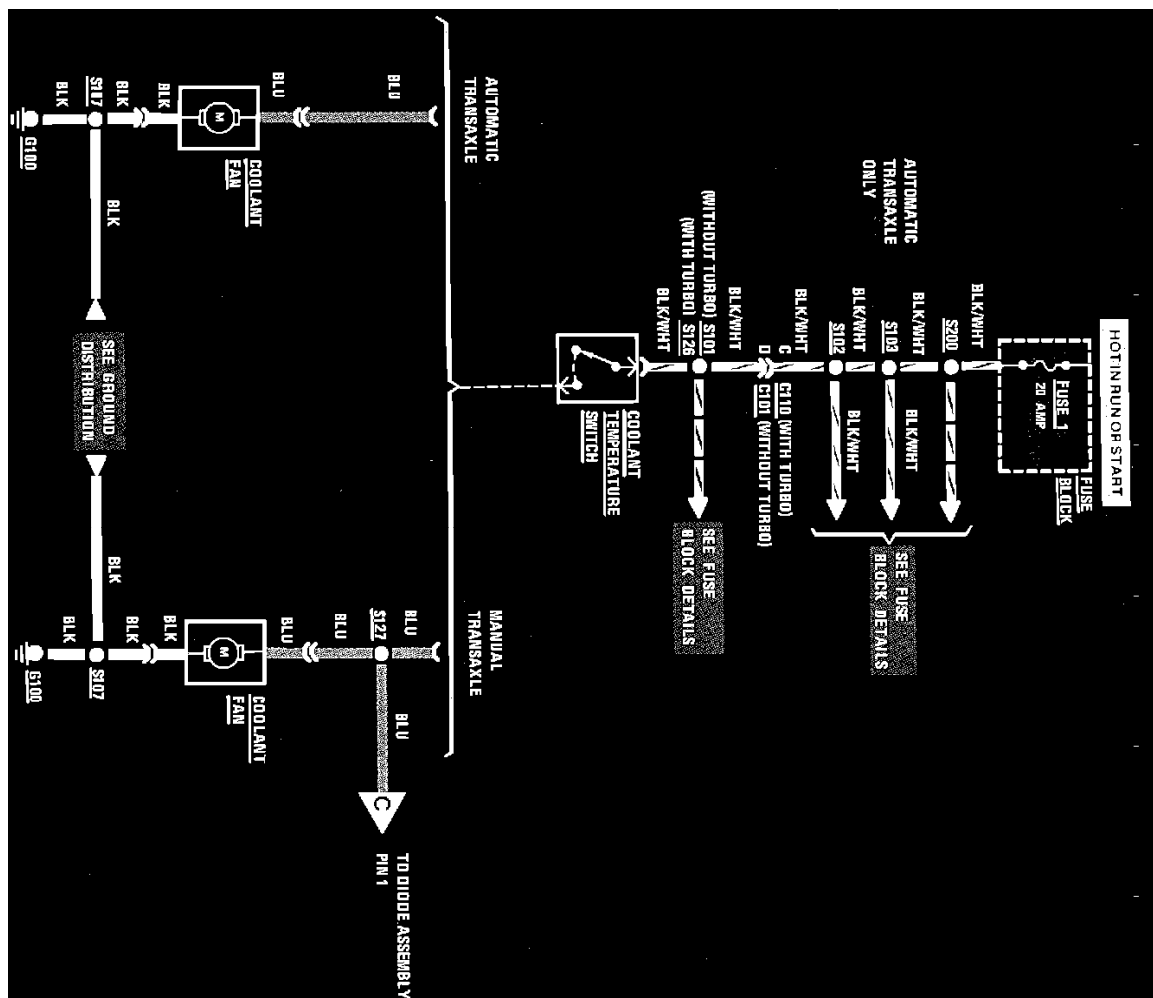
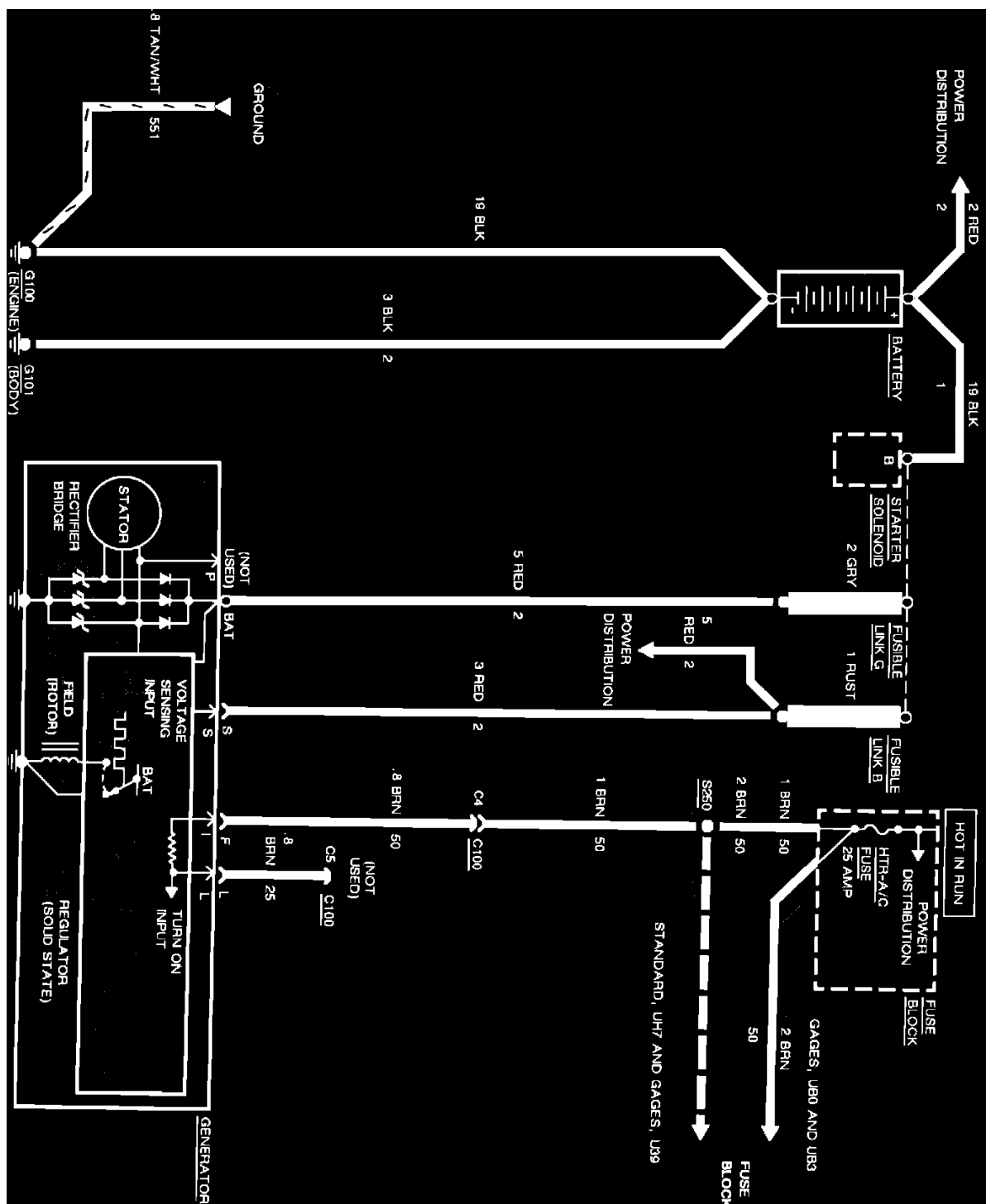
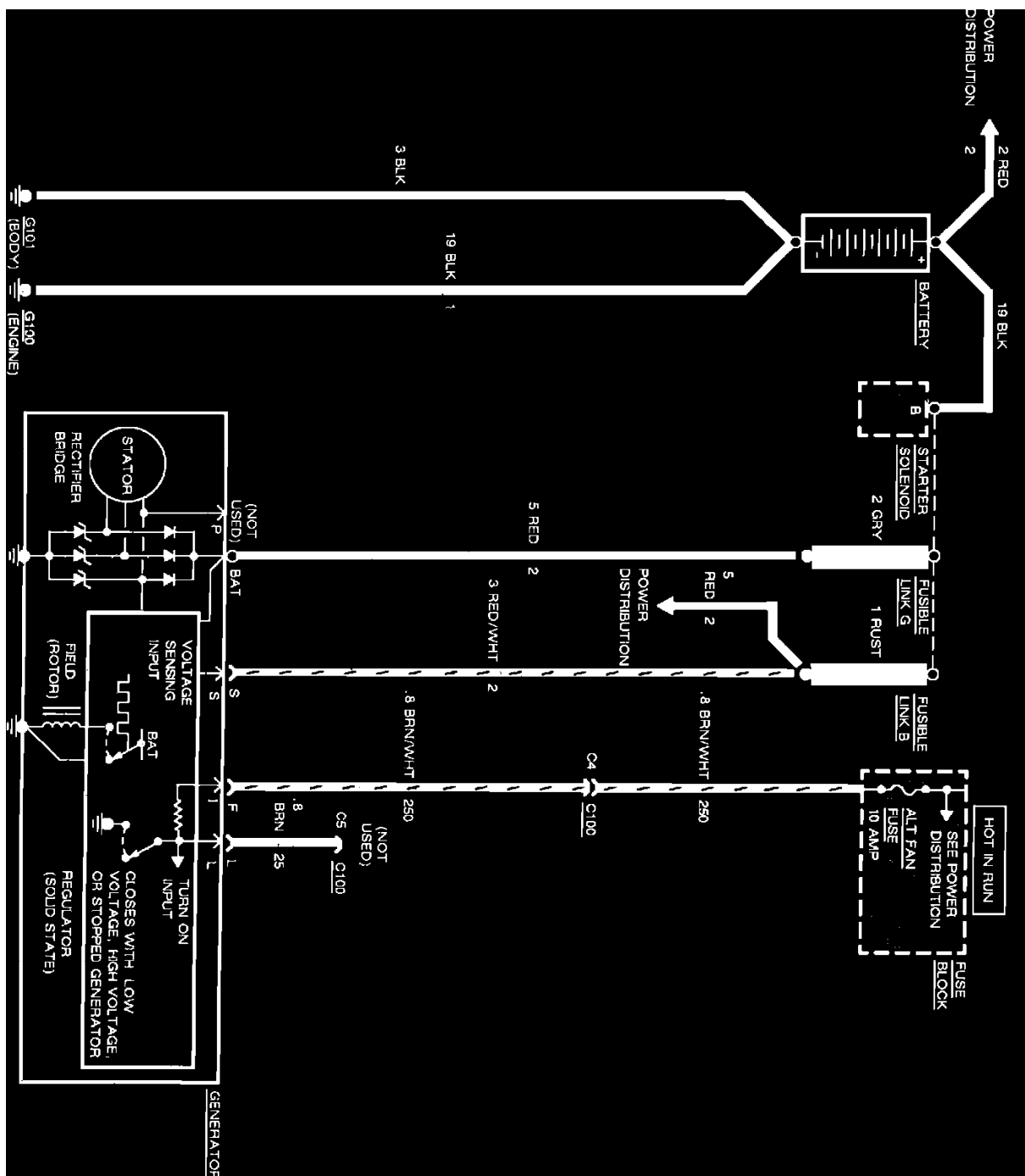


Fig. 11 Coolant Fan Wiring Circuit









Charging System (Turbo)



### Charging System: Non-Turbo

### Charging System (Less Turbo)

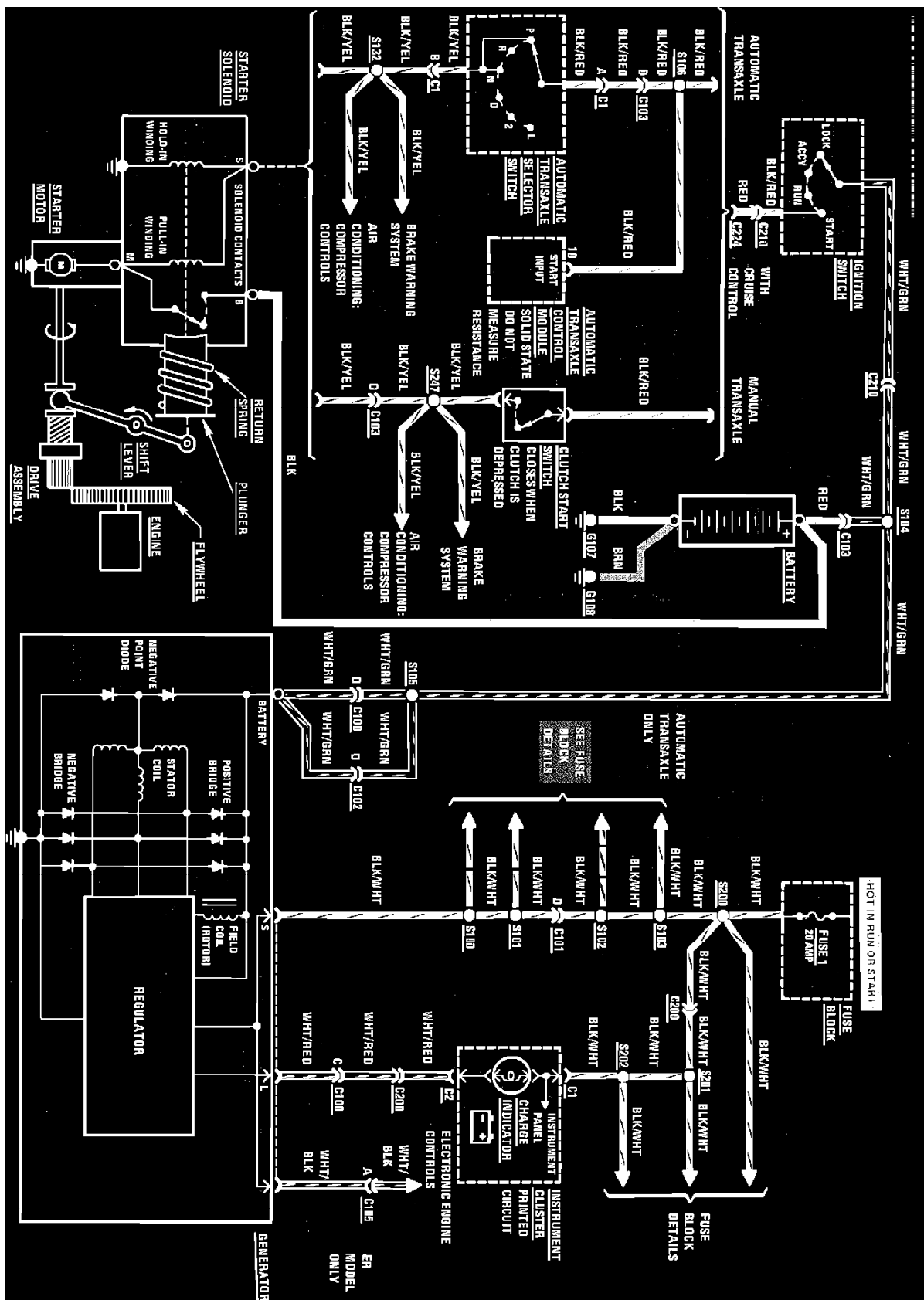
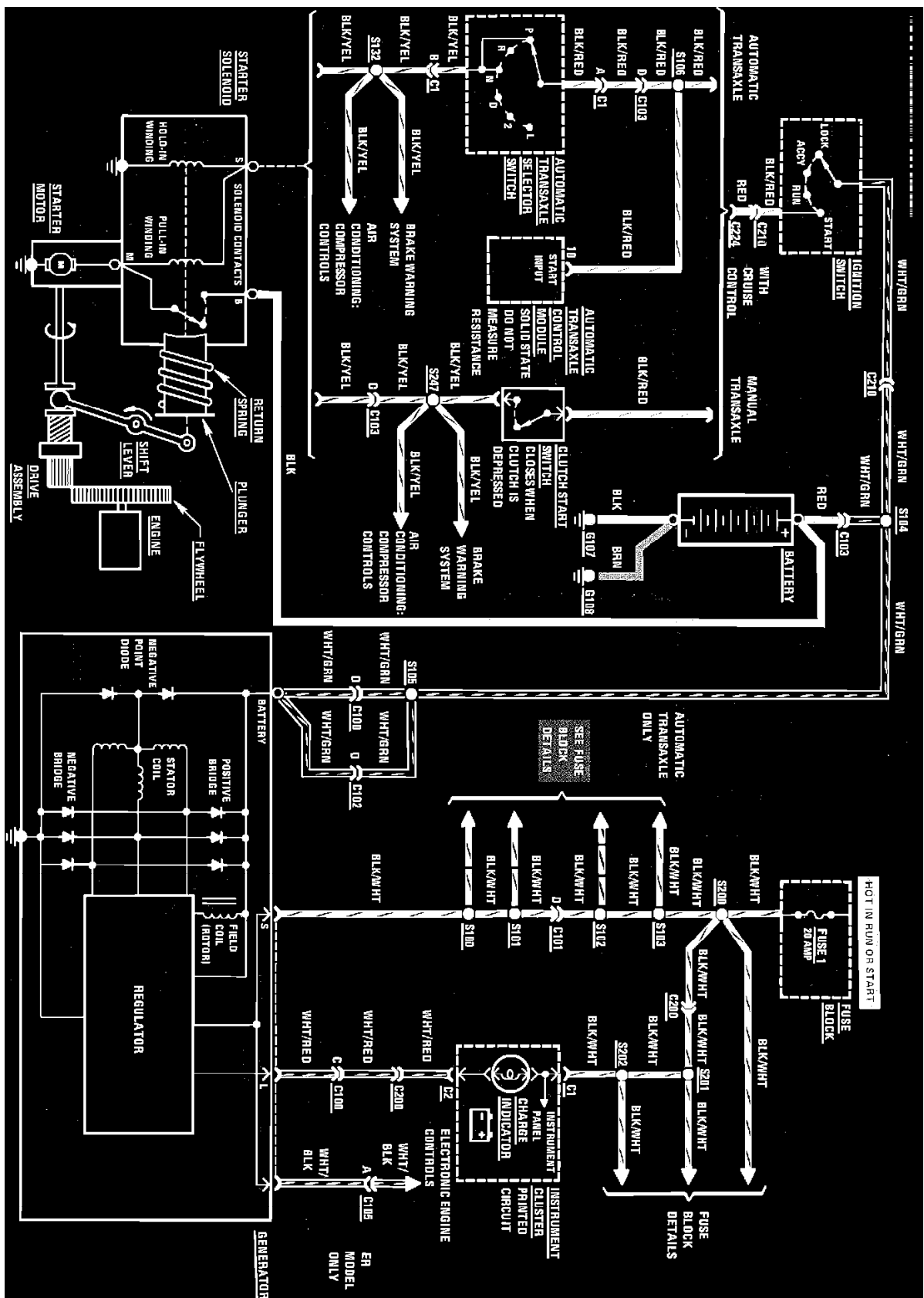


Fig. 9 Charging &amp; Starter Wiring Circuit. Non-Turbo



### Fig. 9 Charging & Starter Wiring Circuit. Non-Turbo

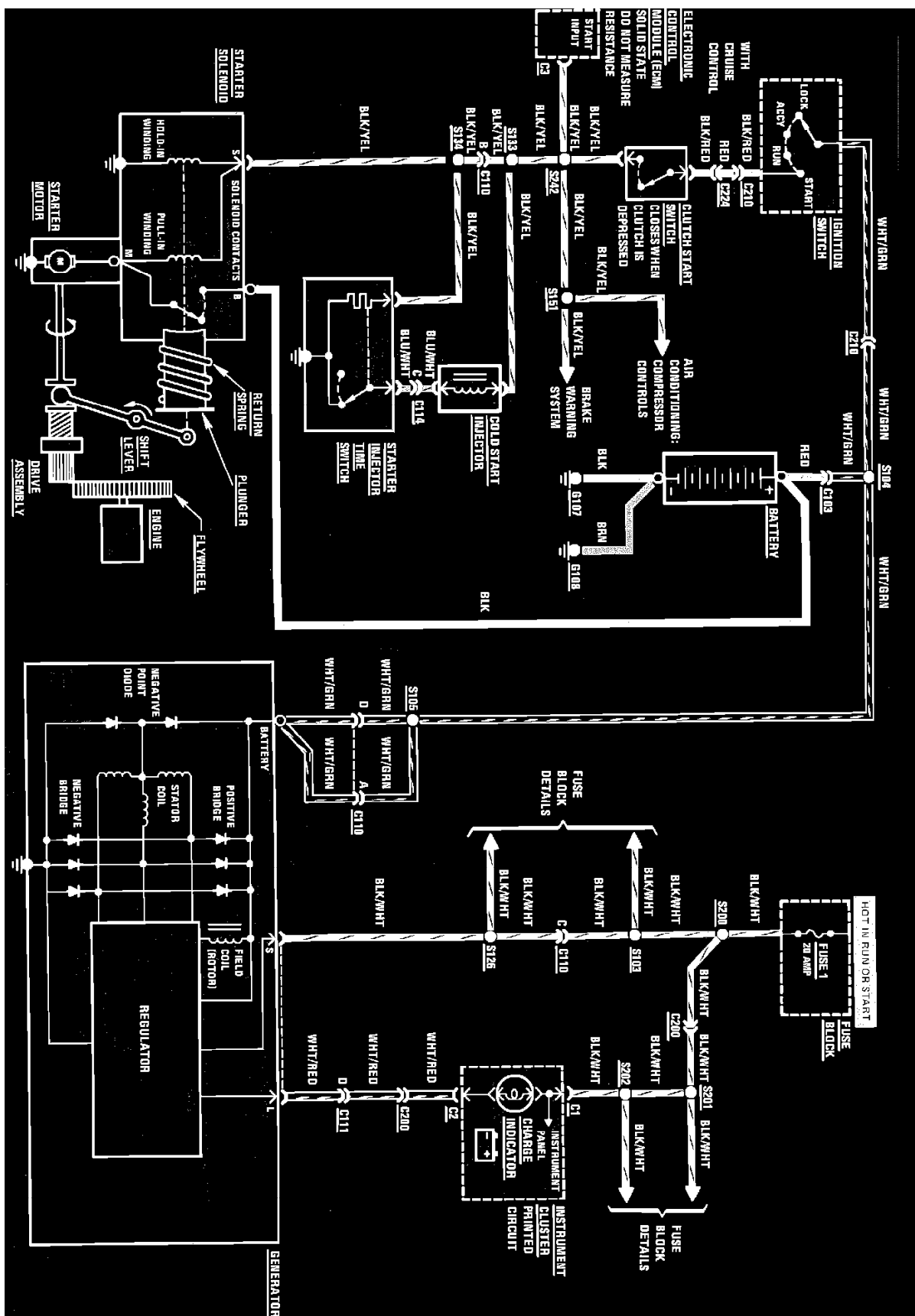
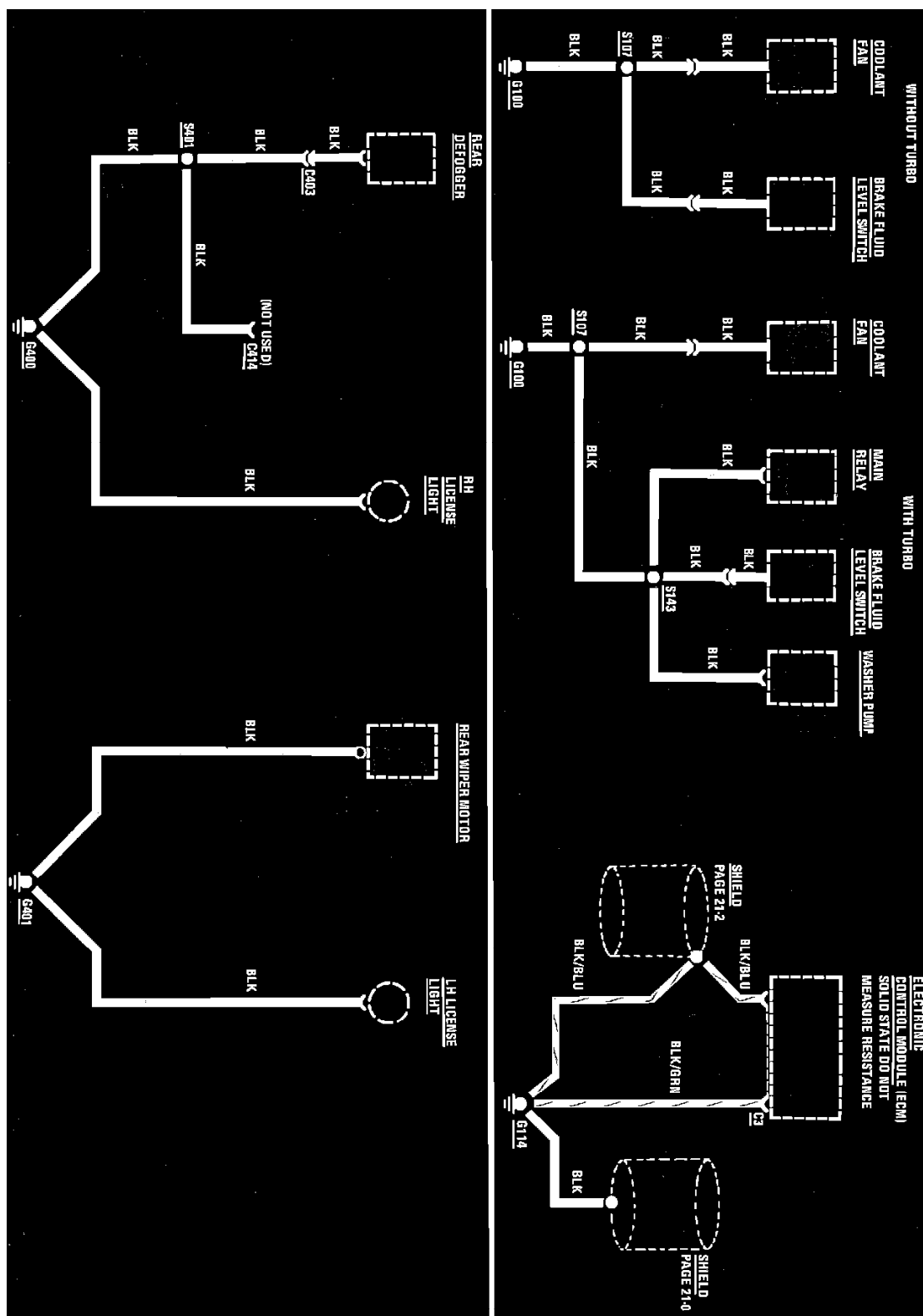


Fig. 10 Charging &amp; Starter Wiring Circuit. Turbo





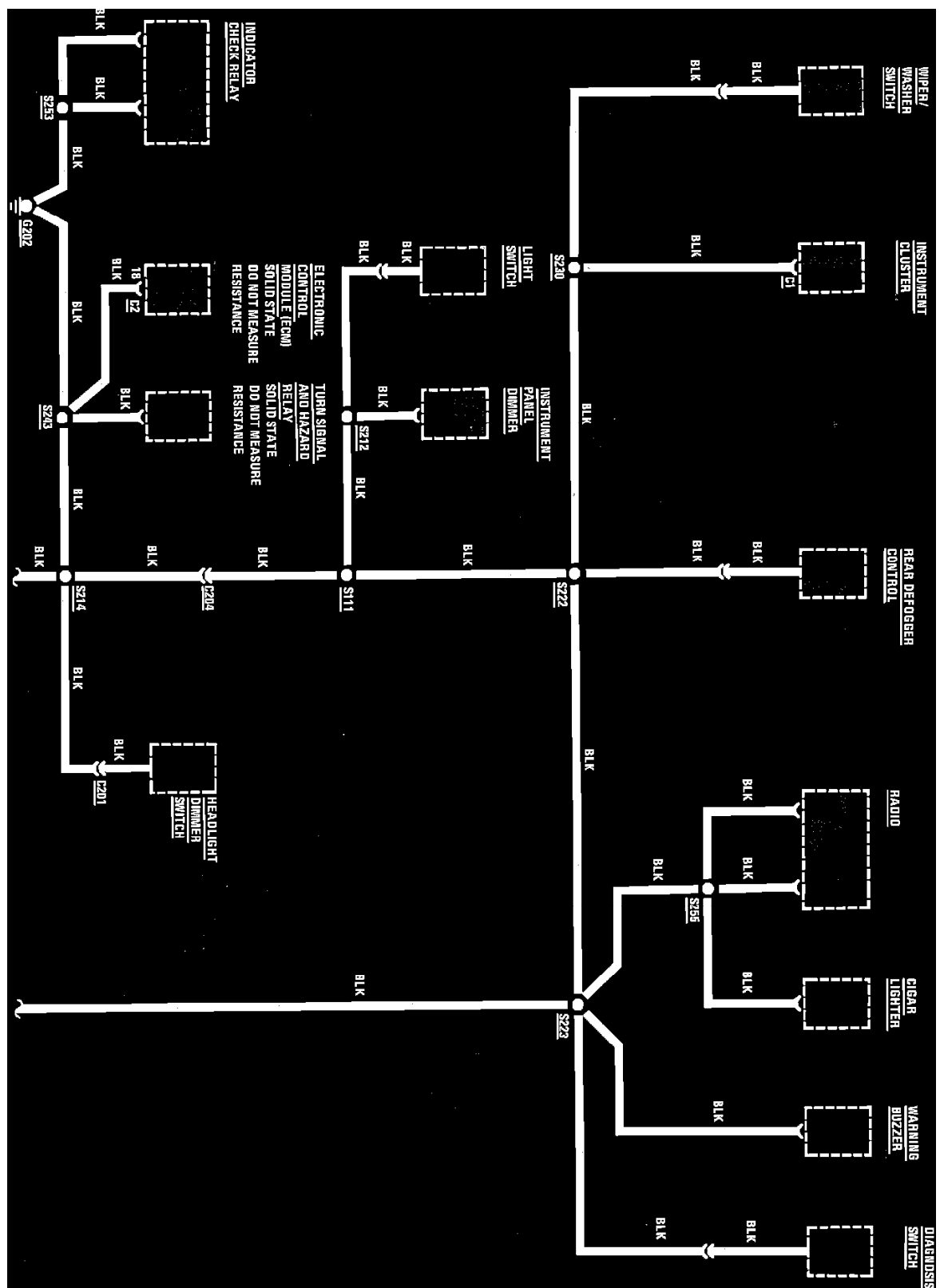


Fig. 26a Ground Distribution. (Part 1 of 2). G200, G201 &amp; G202

**Fig. 26b Ground Distribution. (Part 2 of 2). G200, G201 & G202**

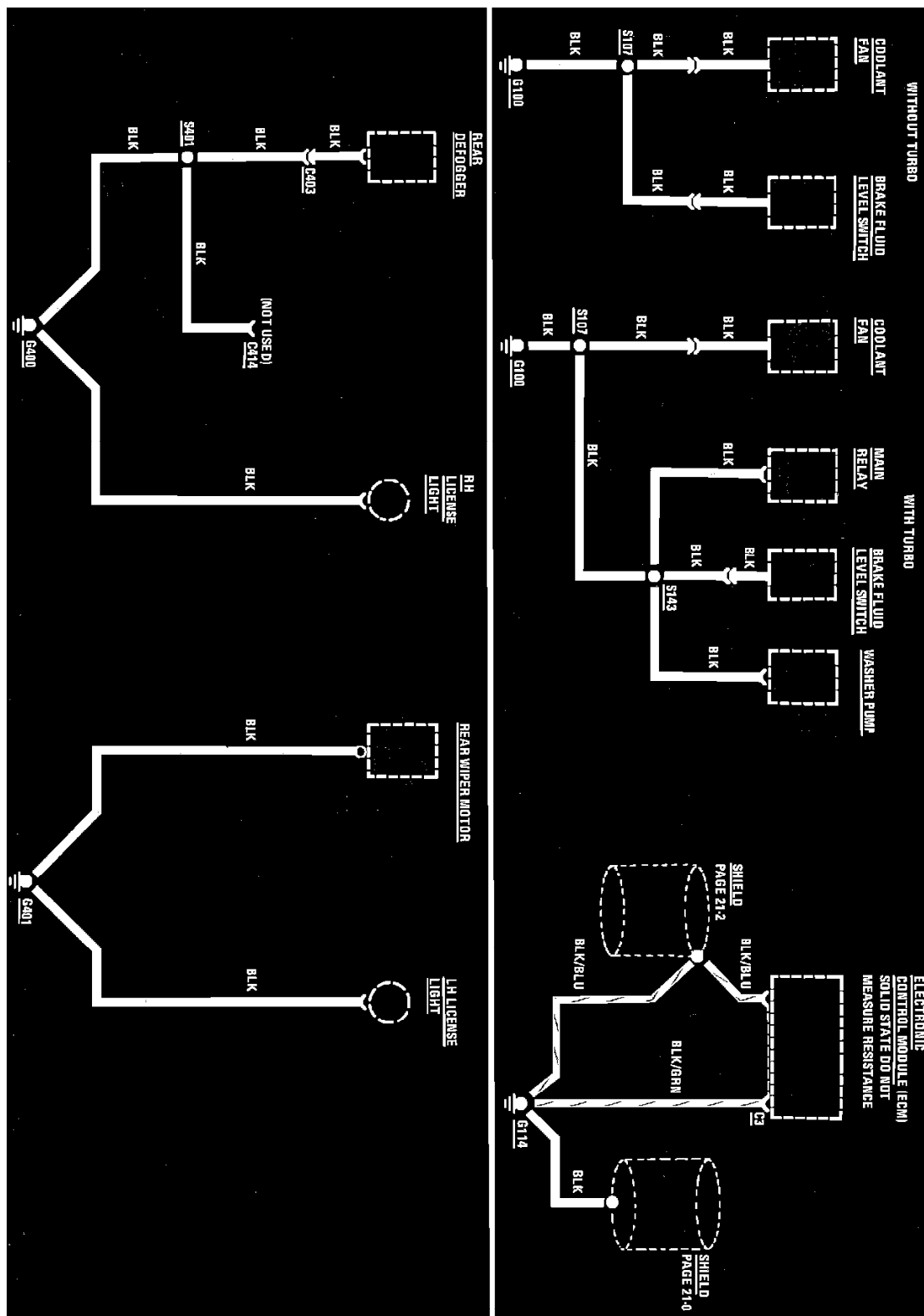


Fig. 23 Ground Distribution. G100, G114, G400 &amp; G401

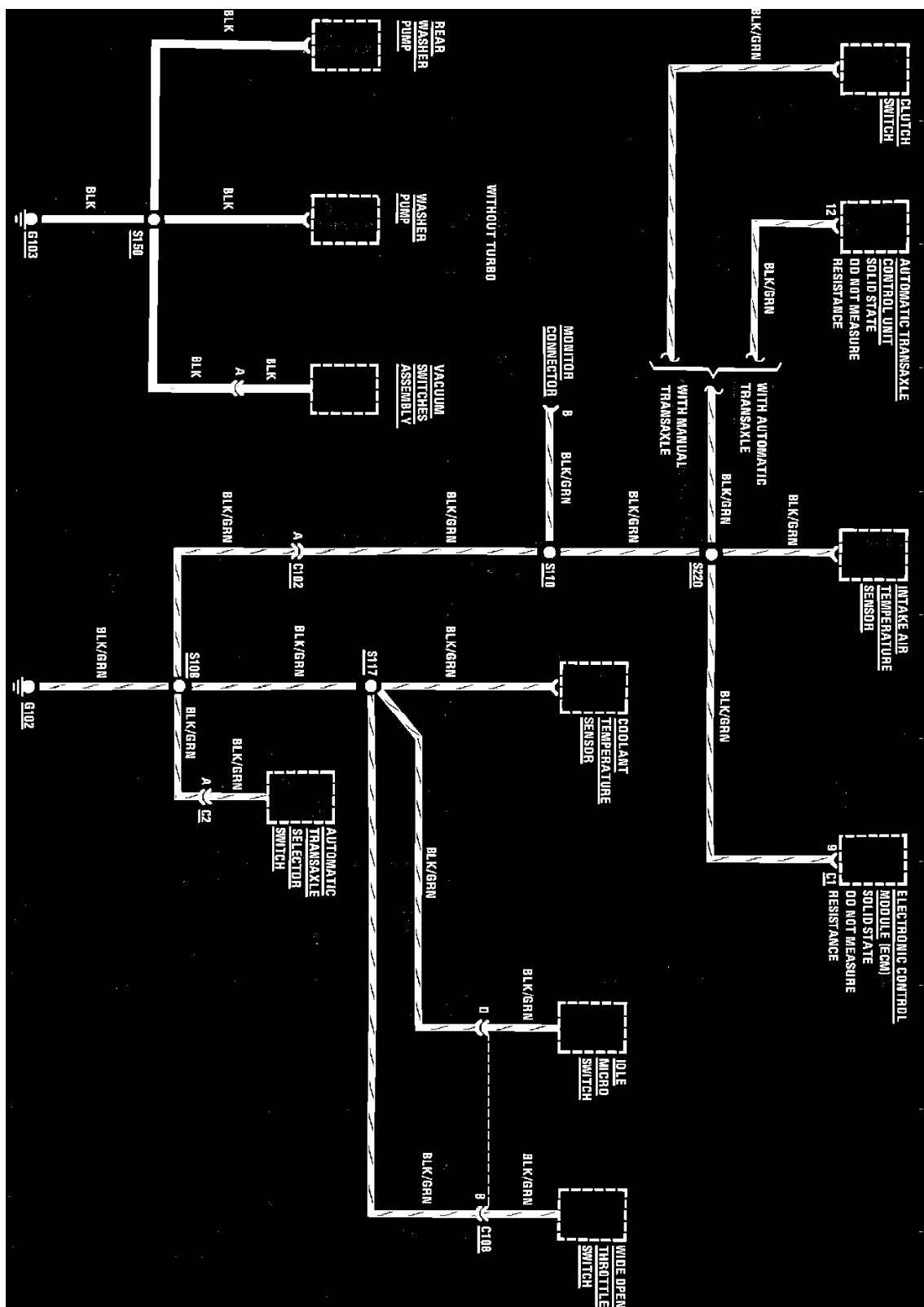


Fig. 24 Ground Distribution. G102 &amp; G103

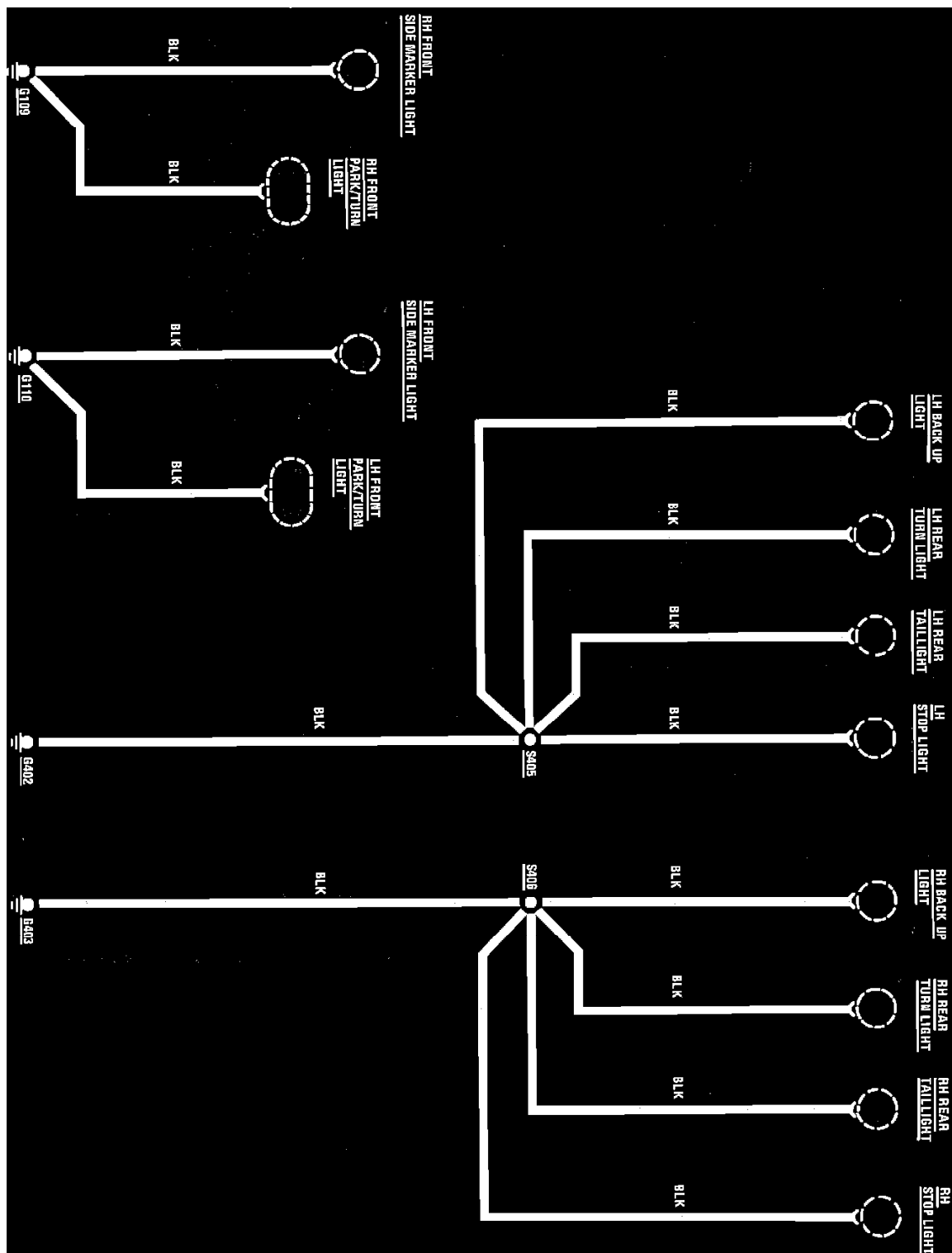


Fig. 25 Ground Distribution. G109, G110, G402 & 403

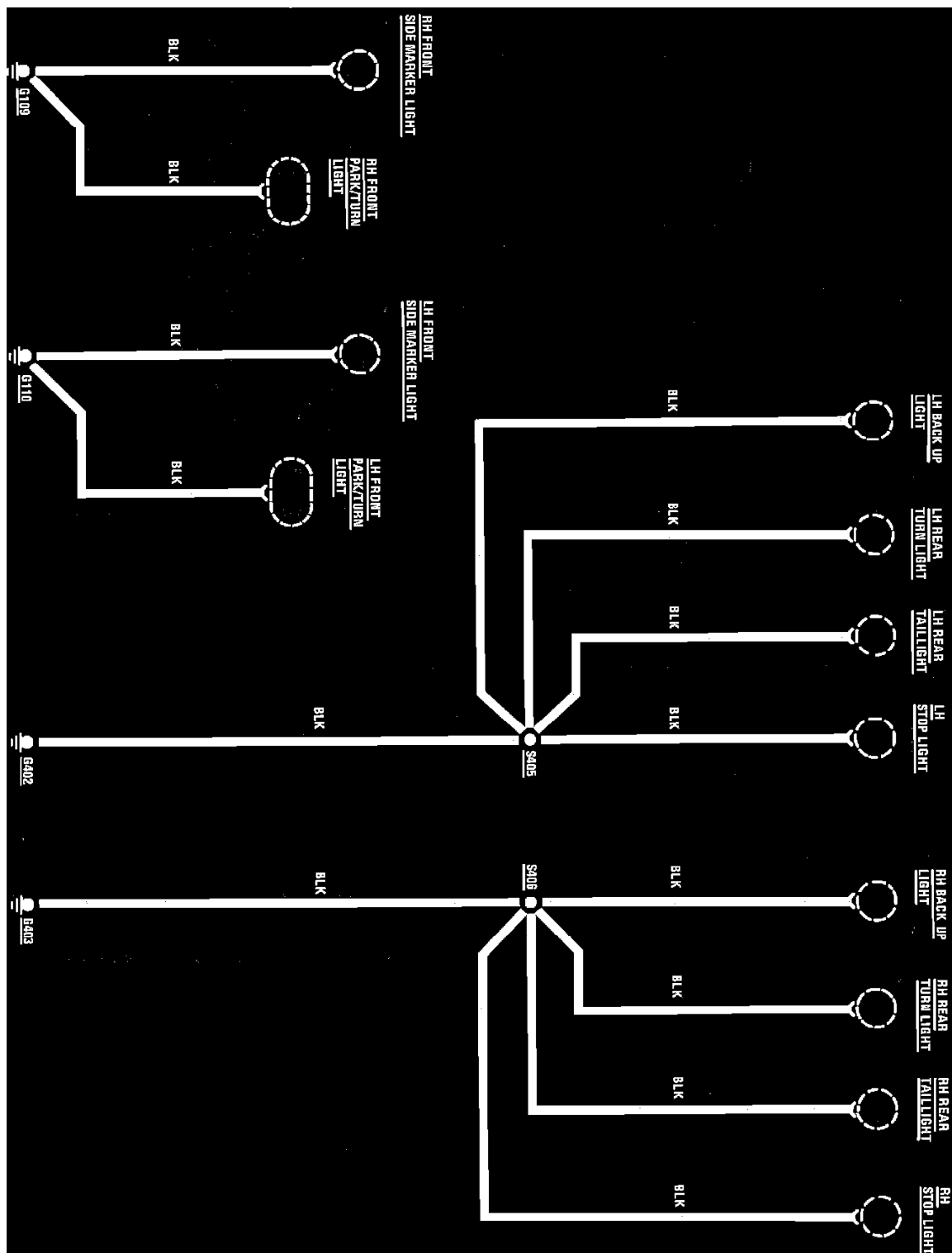
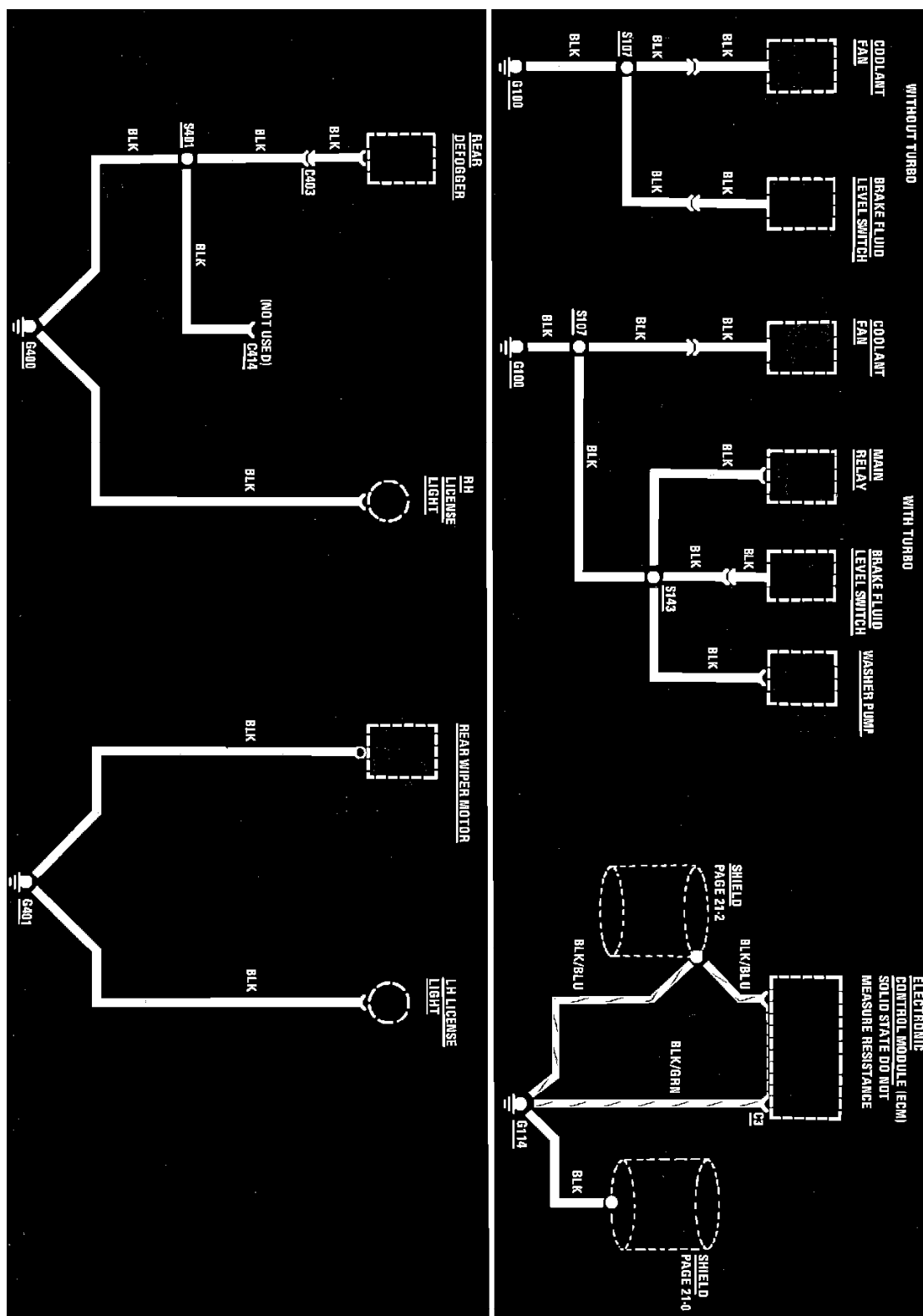


Fig. 25 Ground Distribution. G109, G110, G402 & 403



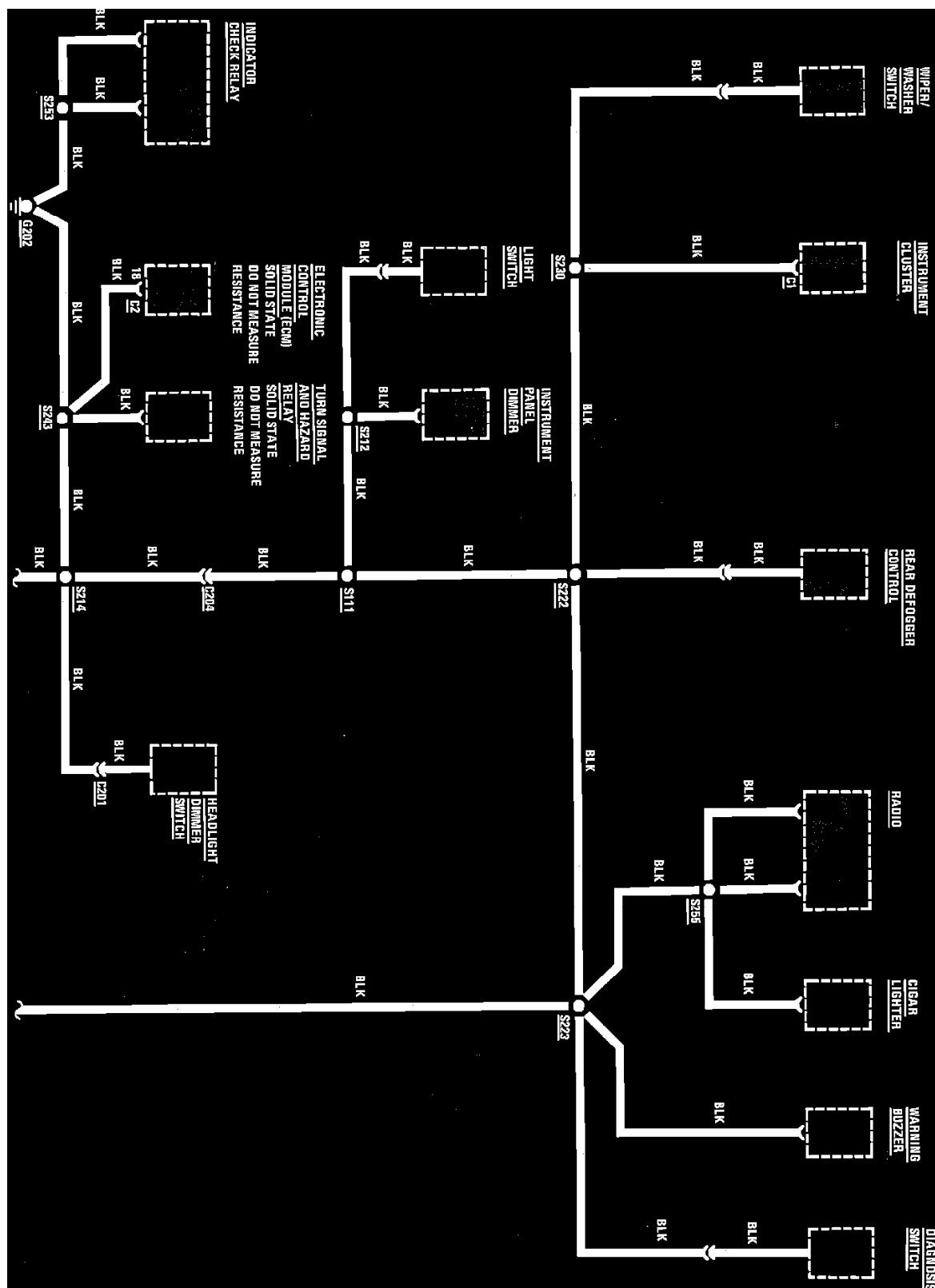


Fig. 26a Ground Distribution. (Part 1 of 2). G200, G201 &amp; G202





Fig. 26b Ground Distribution. (Part 2 of 2). G200, G201 &amp; G202

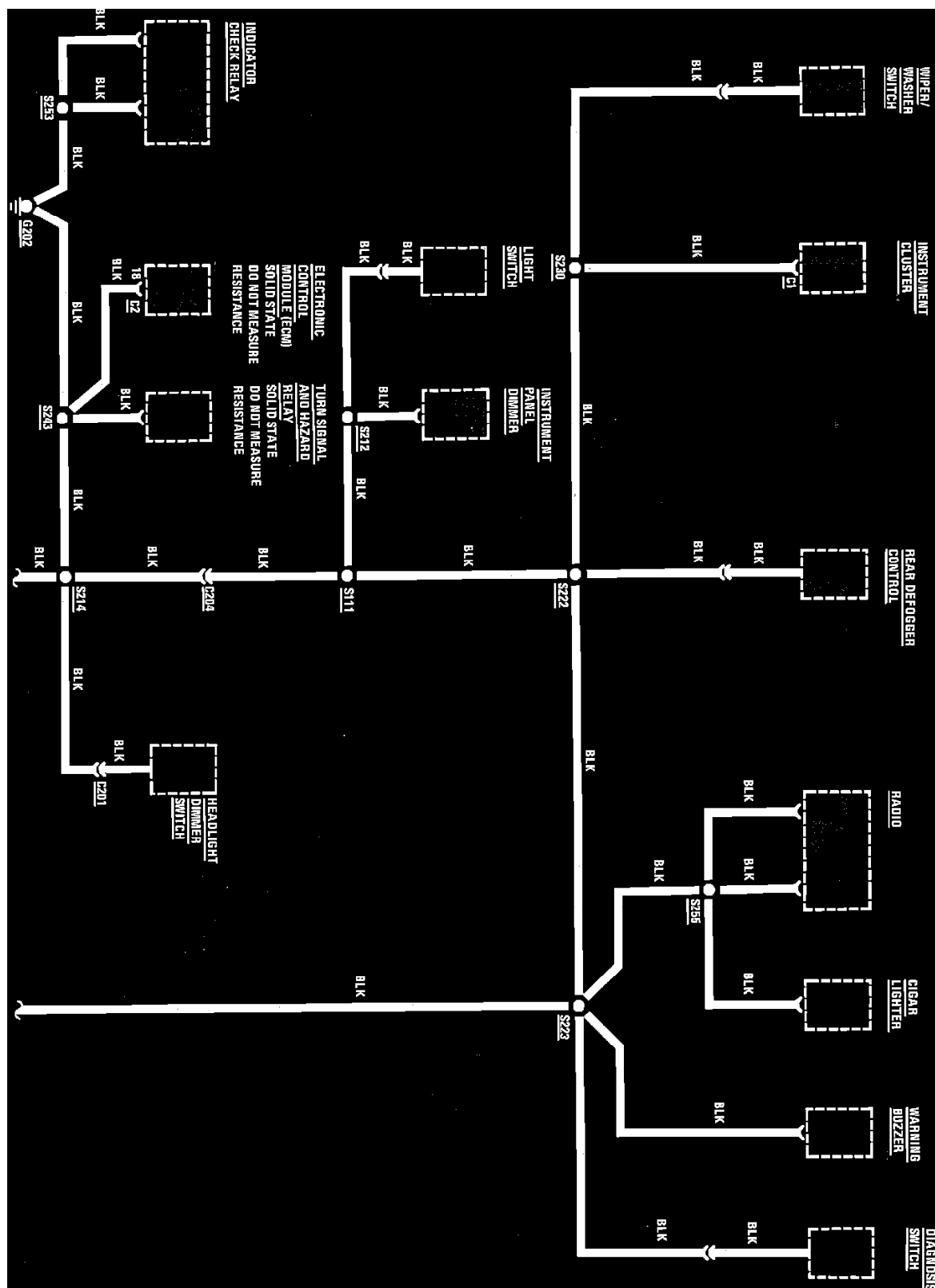


Fig. 26a Ground Distribution. (Part 1 of 2). G200, G201 &amp; G202



Fig. 26b Ground Distribution. (Part 2 of 2). G200, G201 &amp; G202

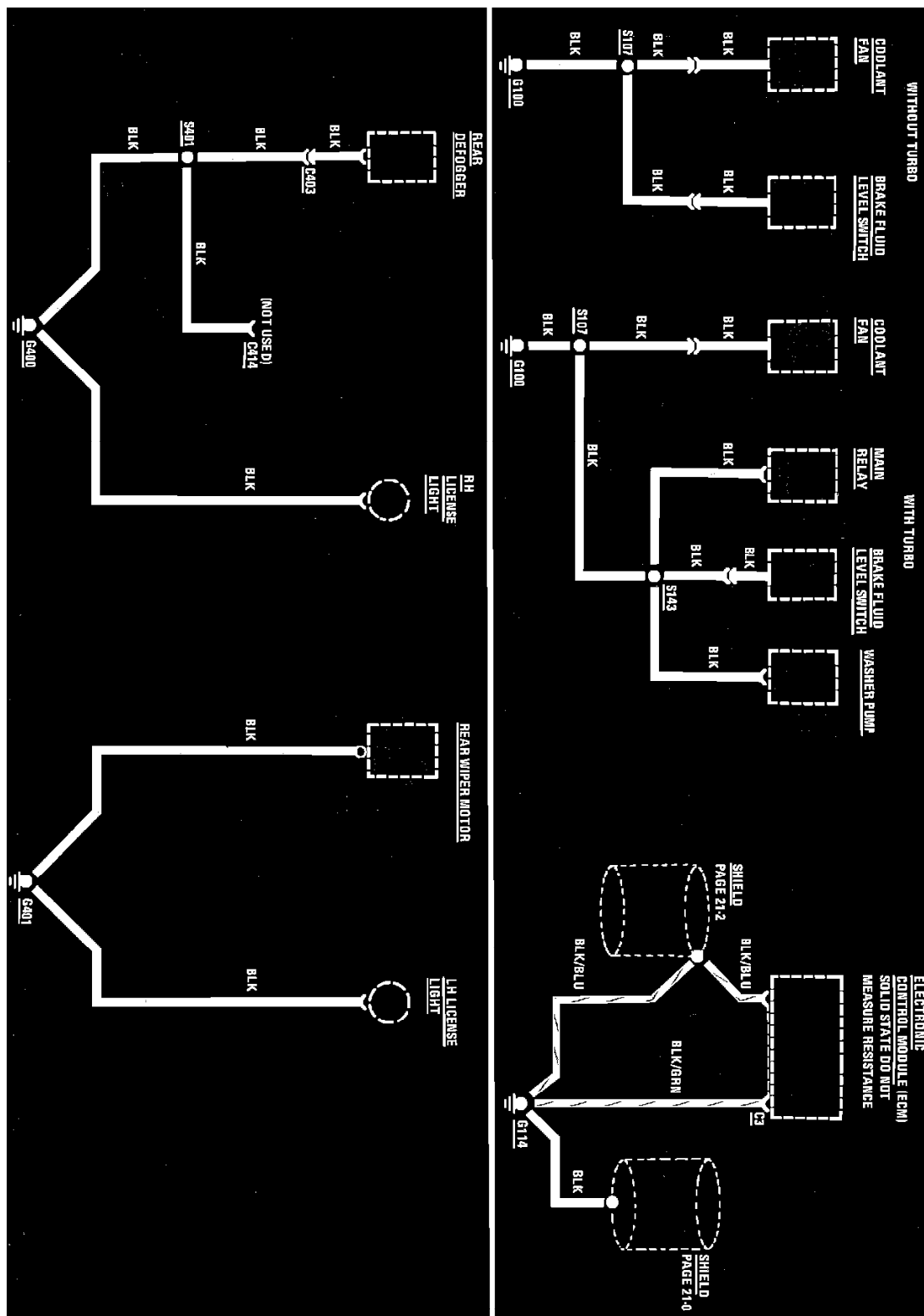


Fig. 23 Ground Distribution. G100, G114, G400 &amp; G401

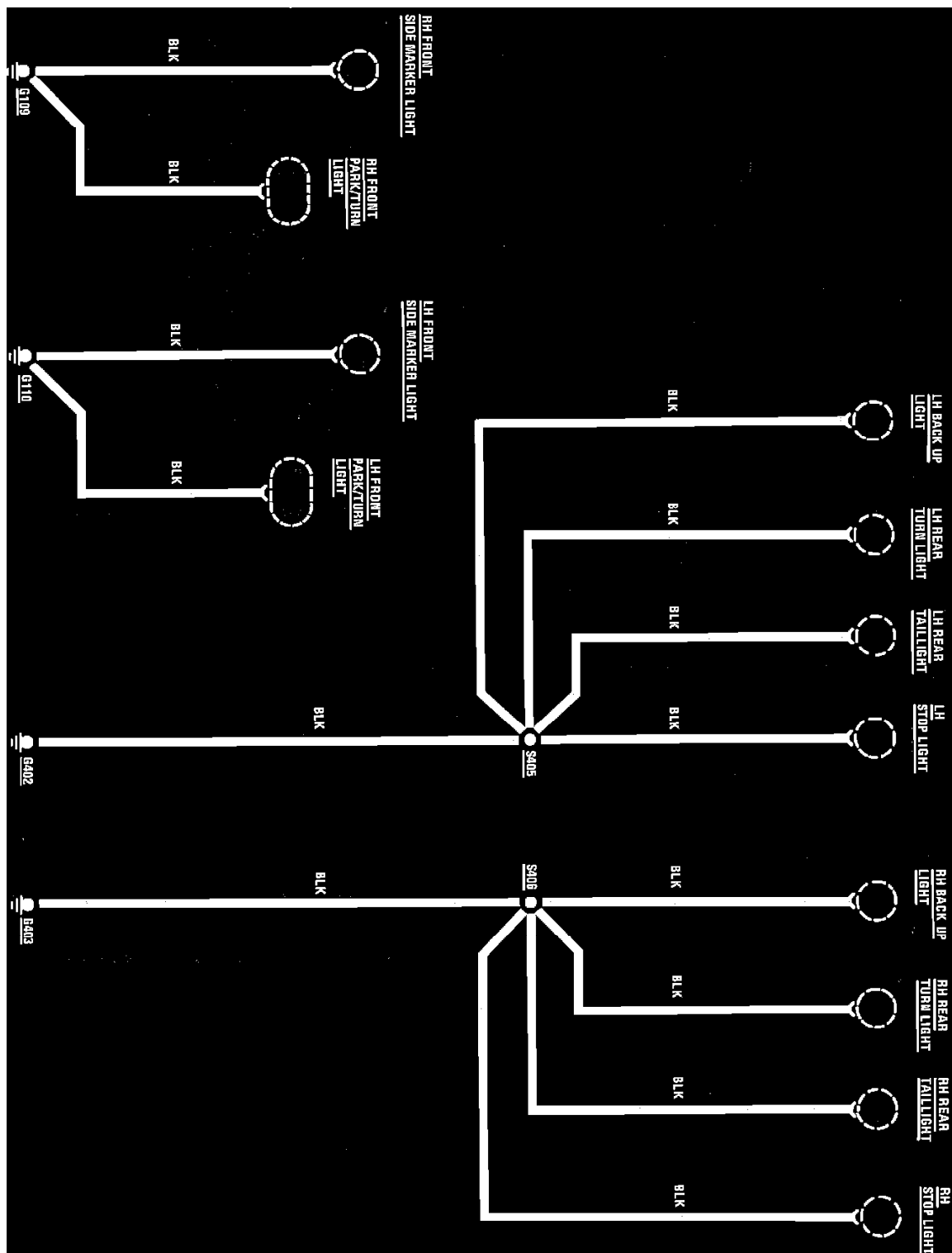


Fig. 25 Ground Distribution. G109, G110, G402 & 403

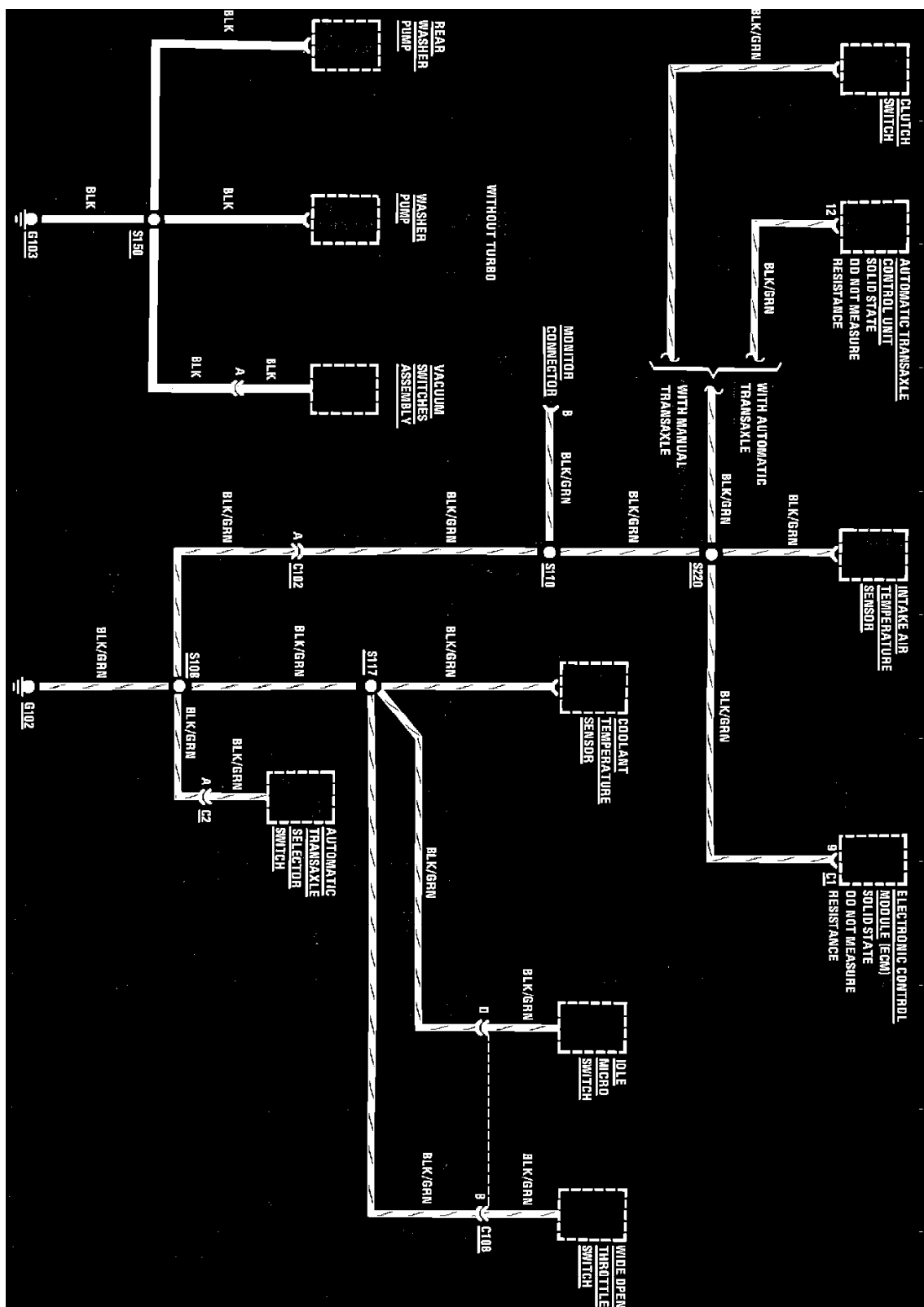


Fig. 24 Ground Distribution. G102 &amp; G103

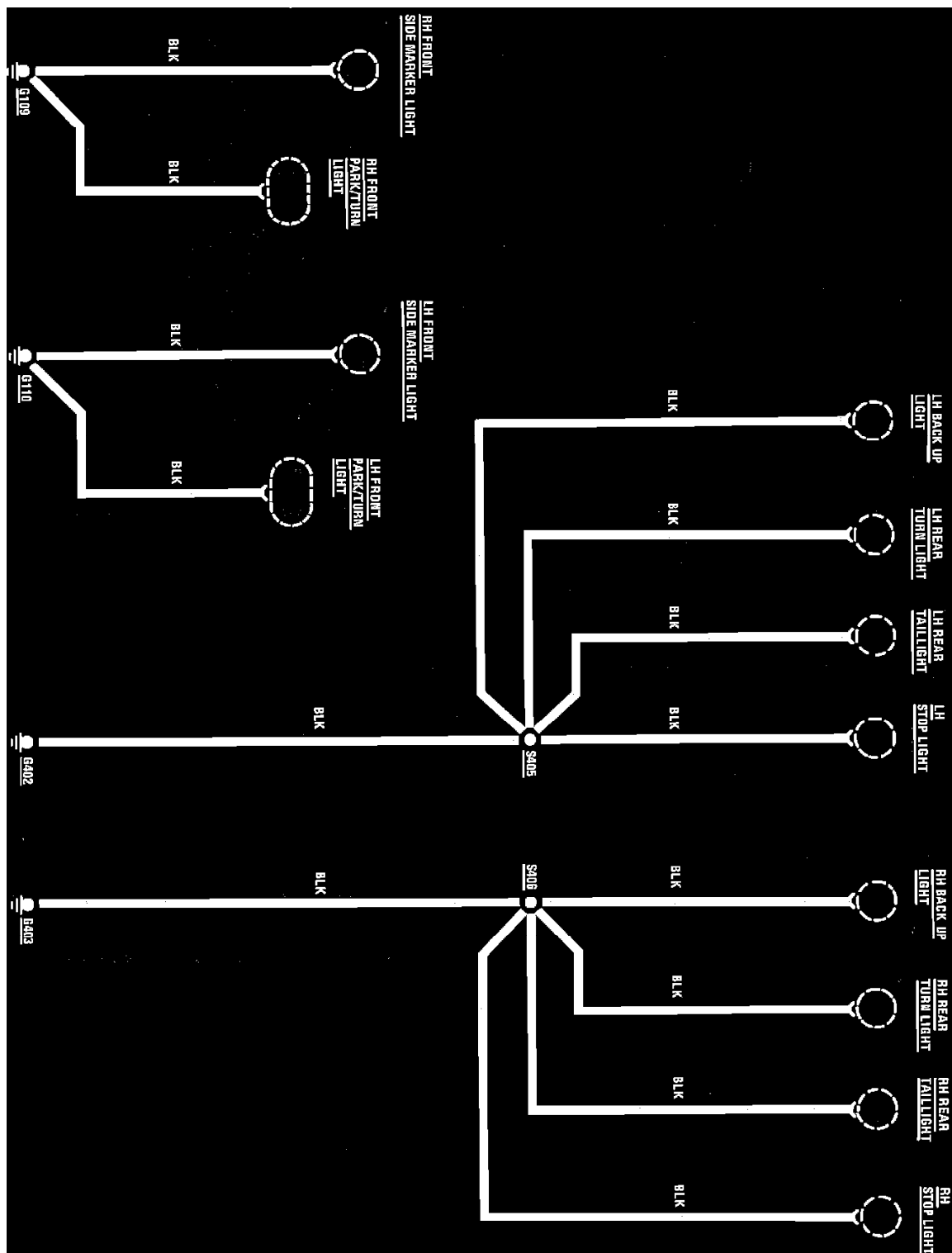


Fig. 25 Ground Distribution. G109, G110, G402 & 403

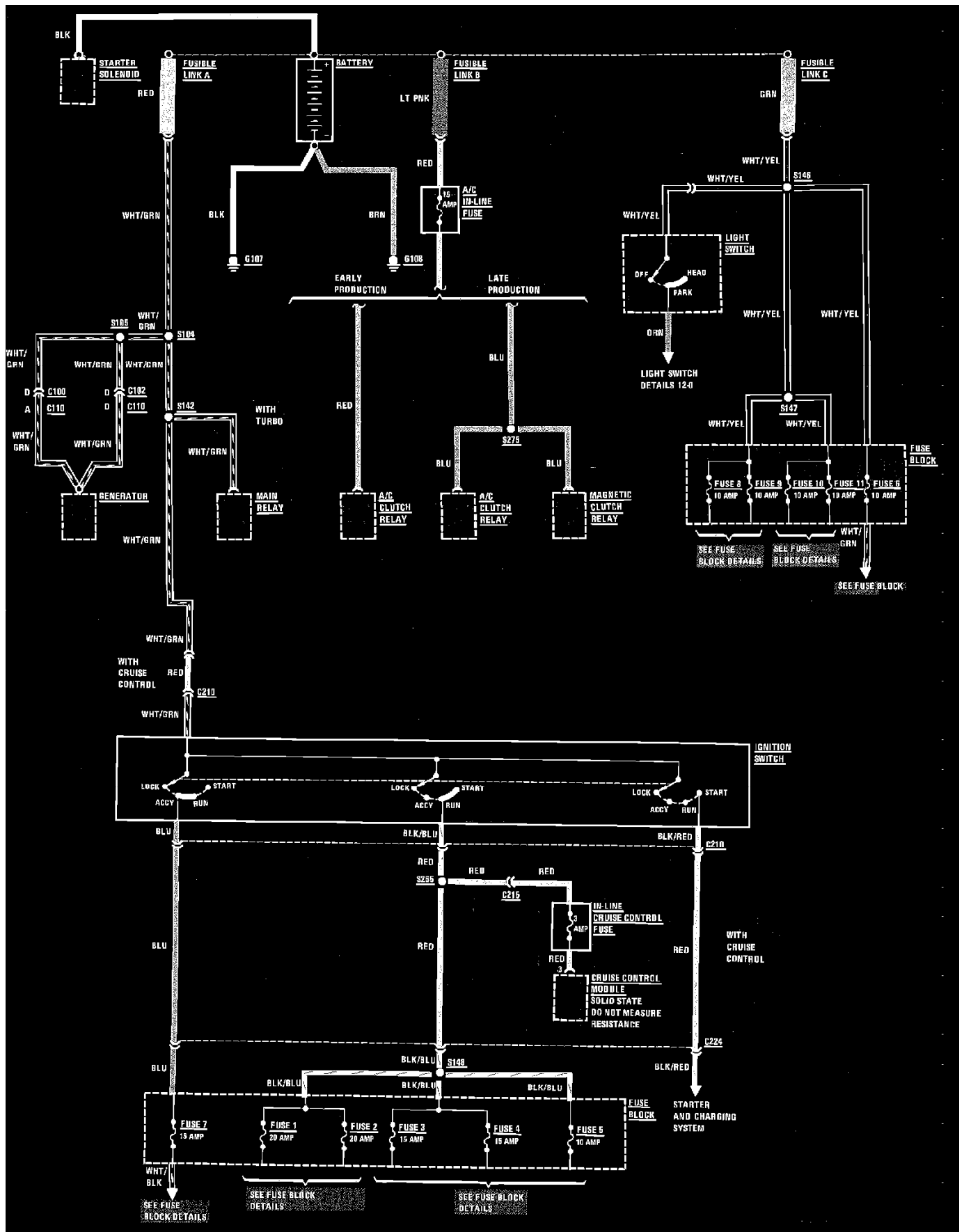


Fig. 39d Power Distribution Wiring Circuit.



**Fig. 18 Fuse Block Details. Fuses 1 & 2 (Non-Turbo)**

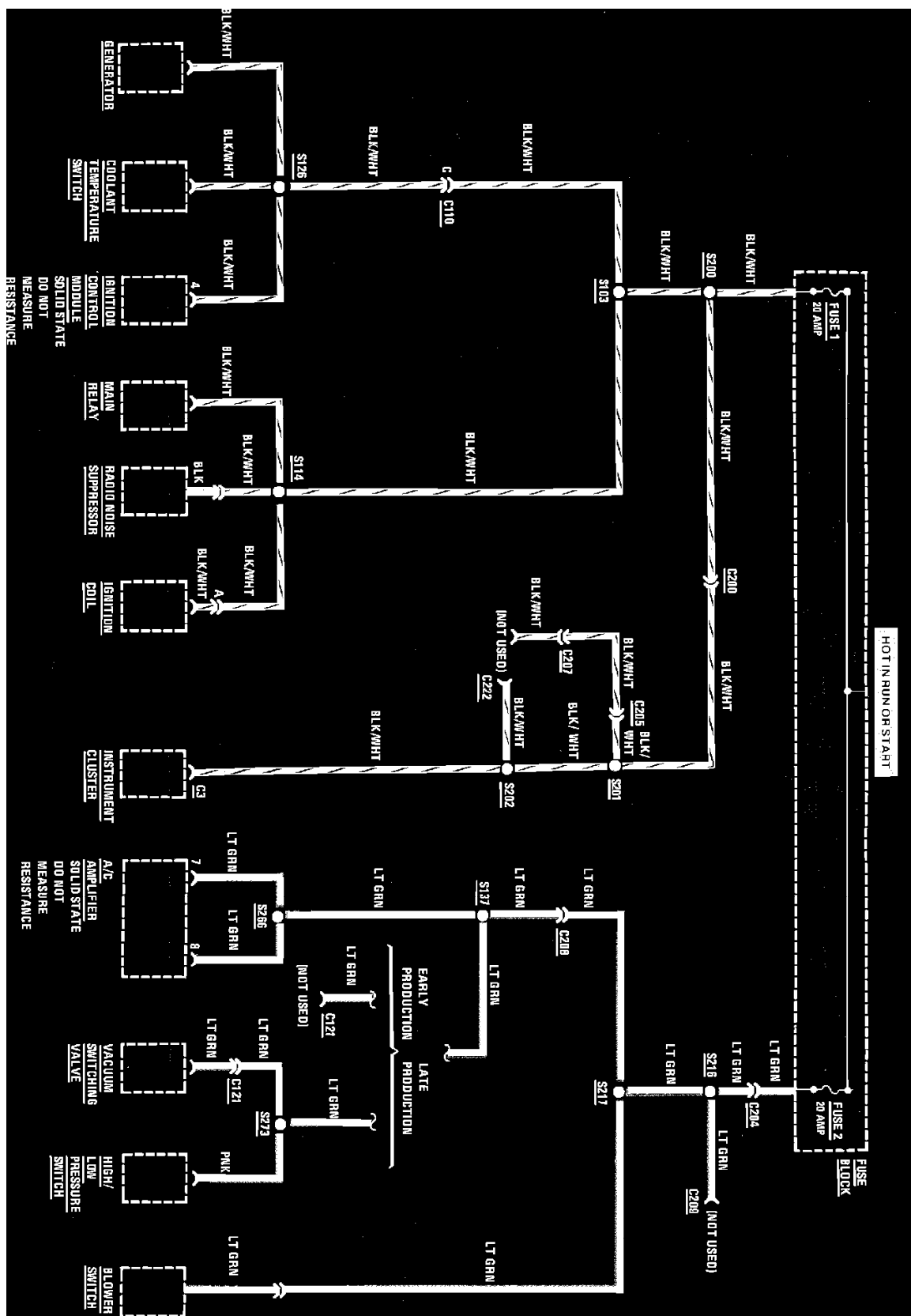


Fig. 19 Fuse Block Details. Fuses 1 &amp; 2 (Turbo)

**Fig. 18 Fuse Block Details. Fuses 1 & 2 (Non-Turbo)**

**Fig. 18 Fuse Block Details. Fuses 1 & 2 (Non-Turbo)**

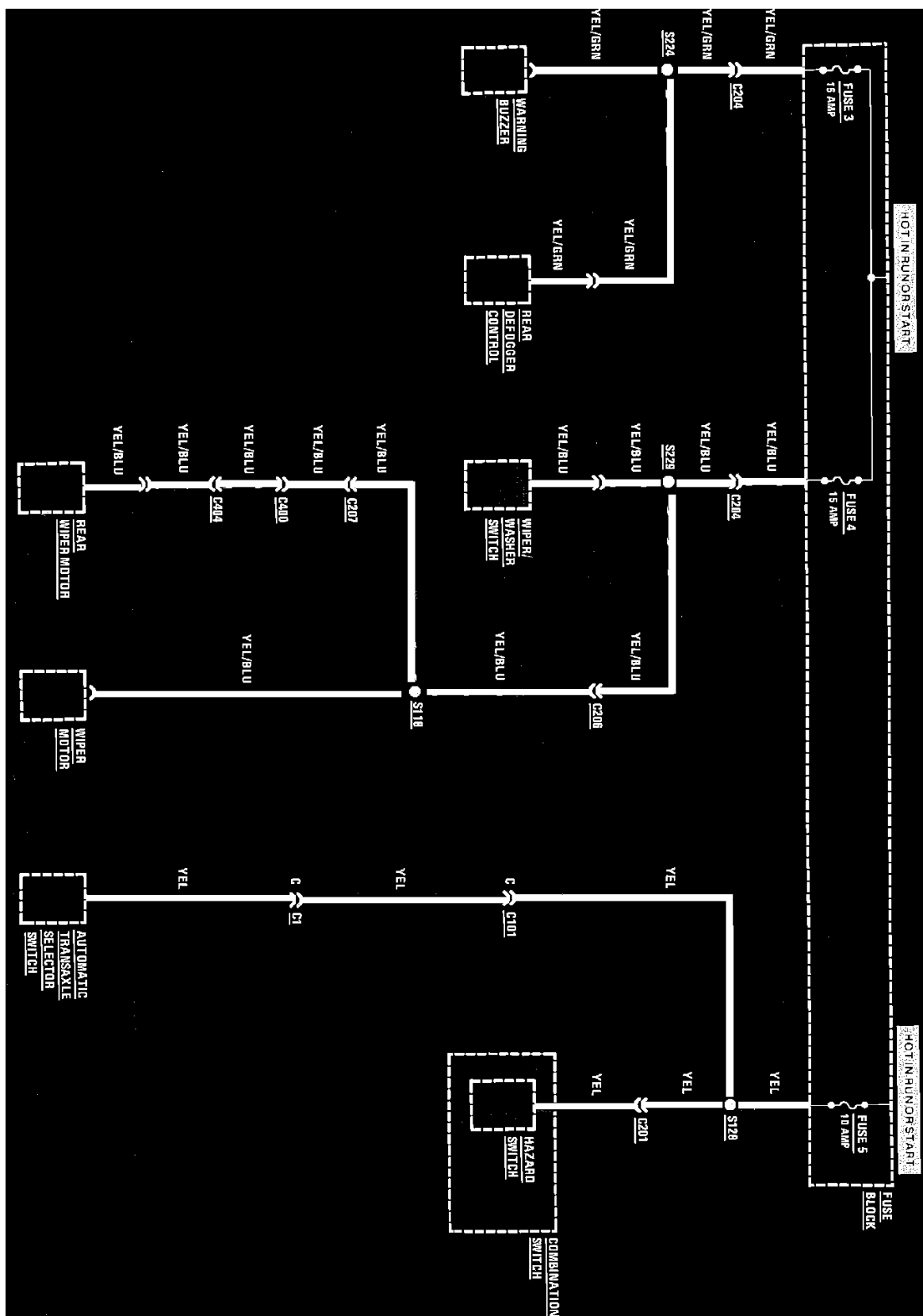


Fig. 20 Fuse Block Details. Fuses 3, 4 &amp; 5

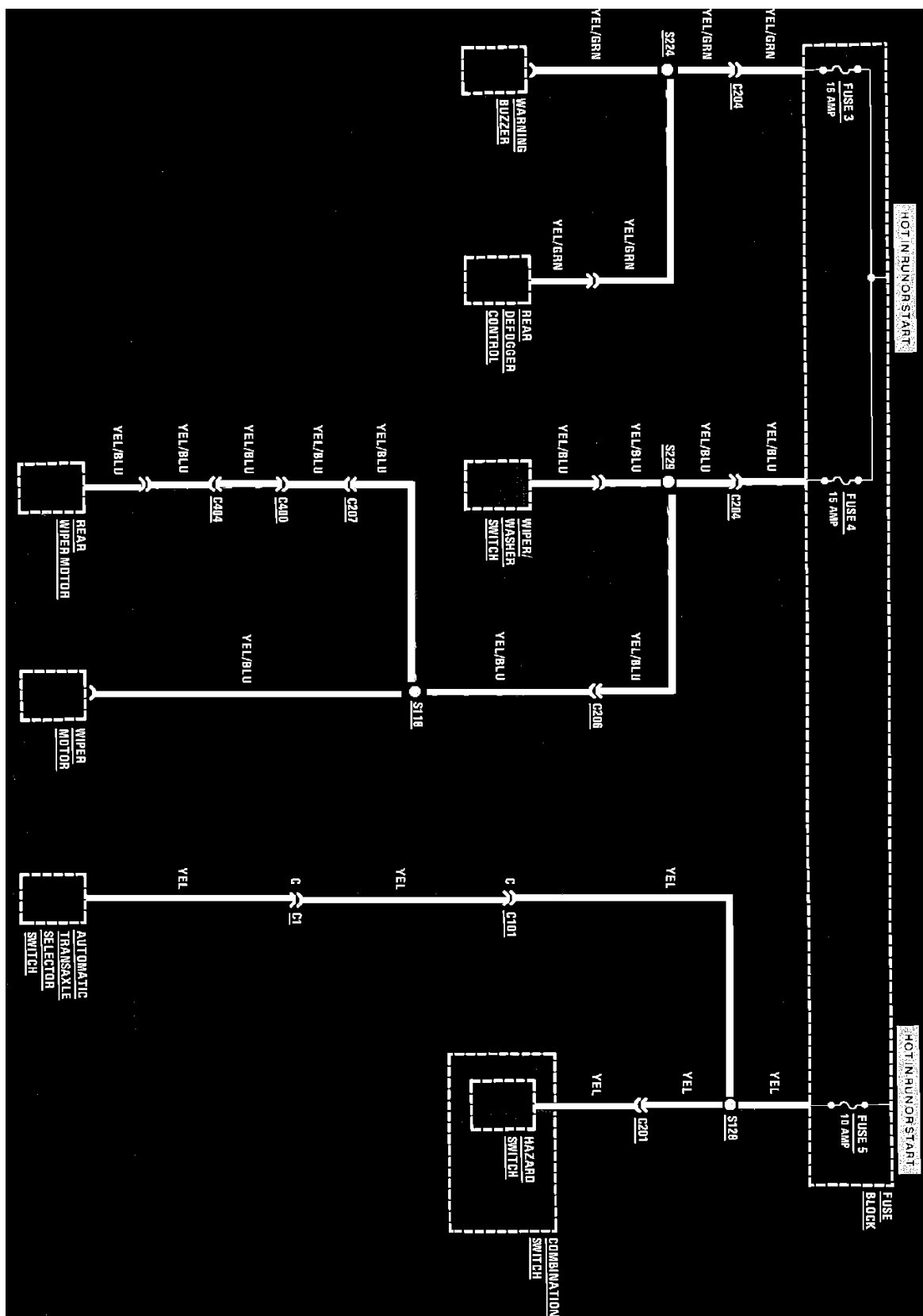


Fig. 20 Fuse Block Details. Fuses 3, 4 &amp; 5

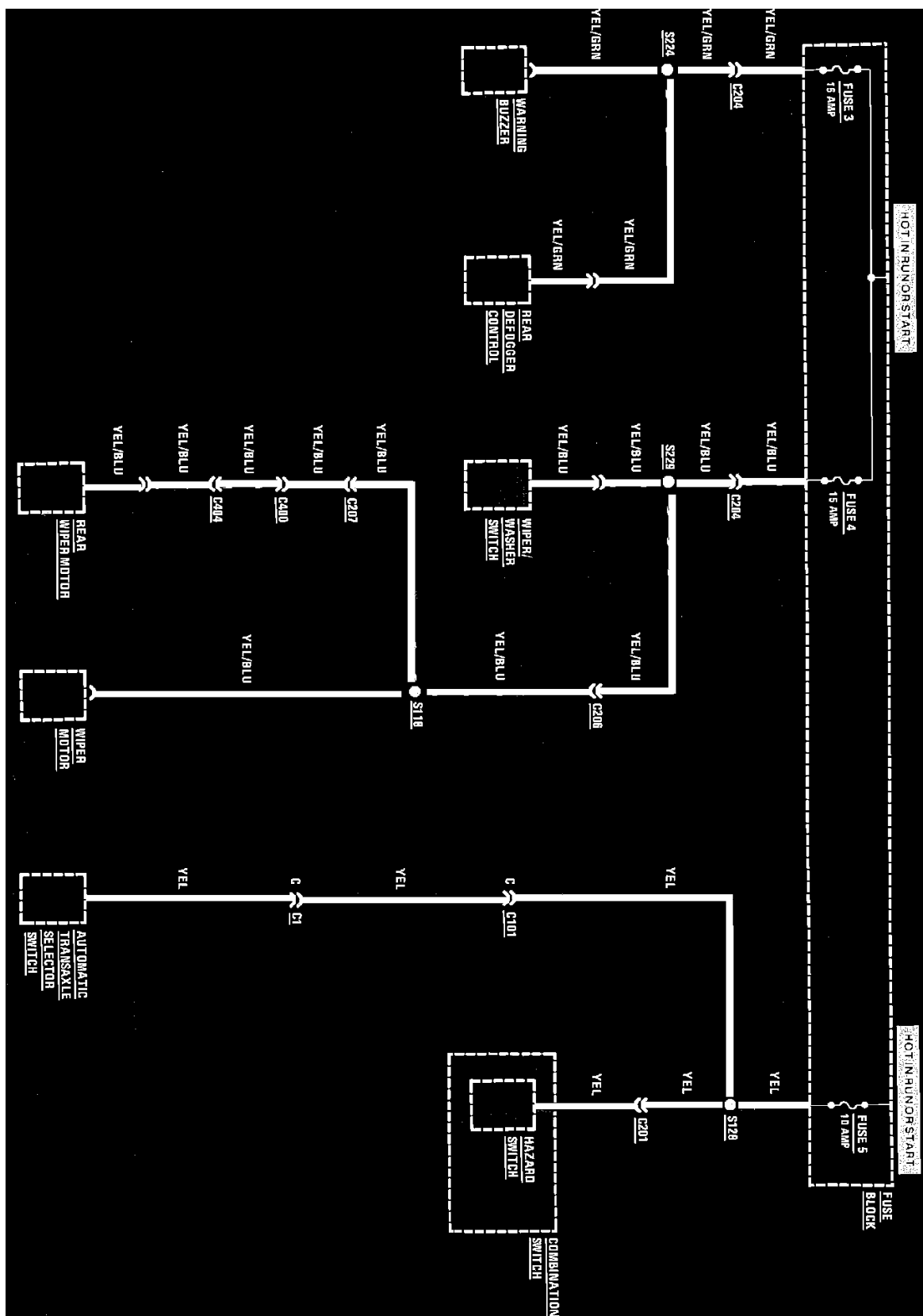


Fig. 20 Fuse Block Details. Fuses 3, 4 &amp; 5

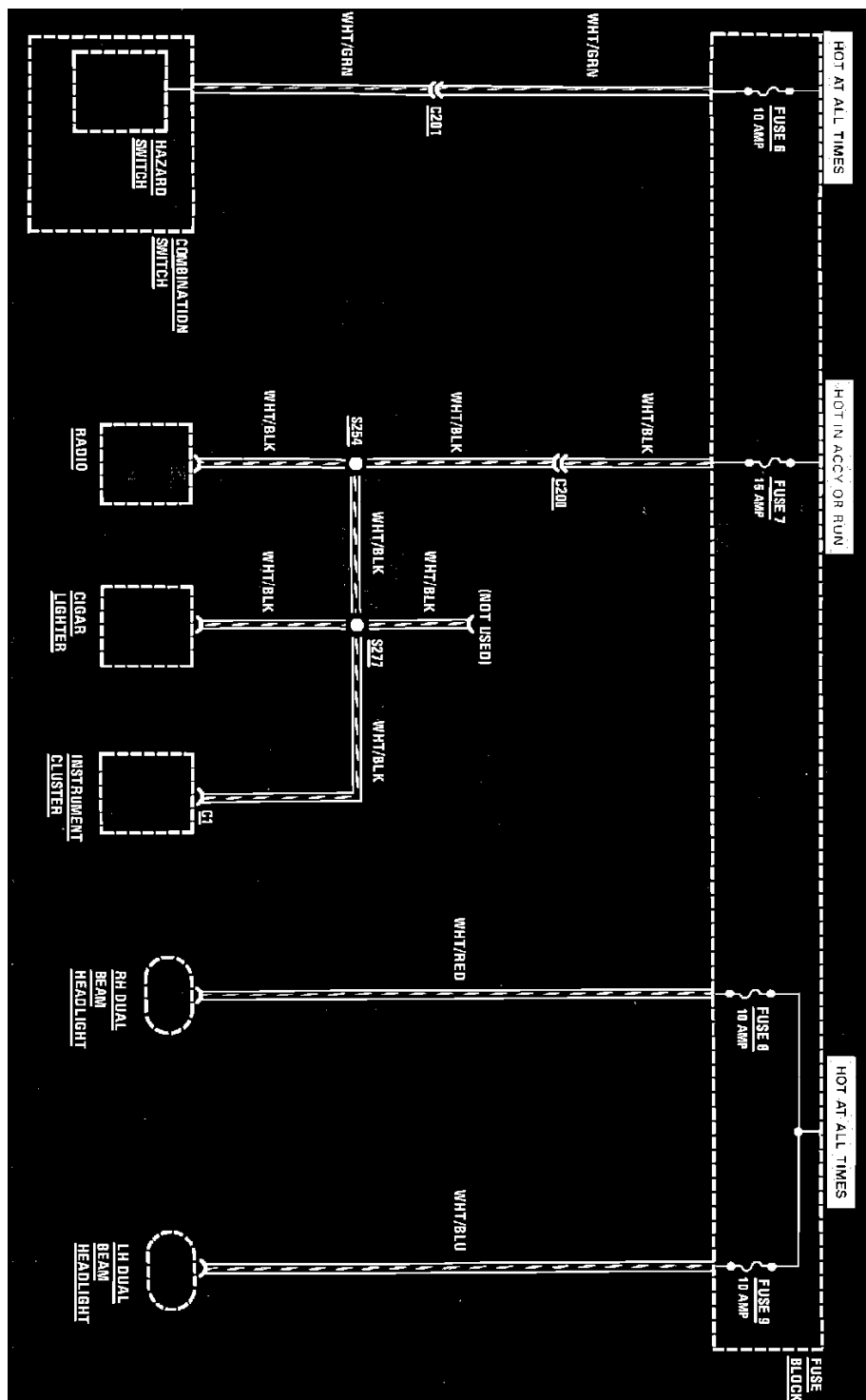


Fig. 21 Fuse Block Details. Fuses 6, 7, 8 &amp; 9



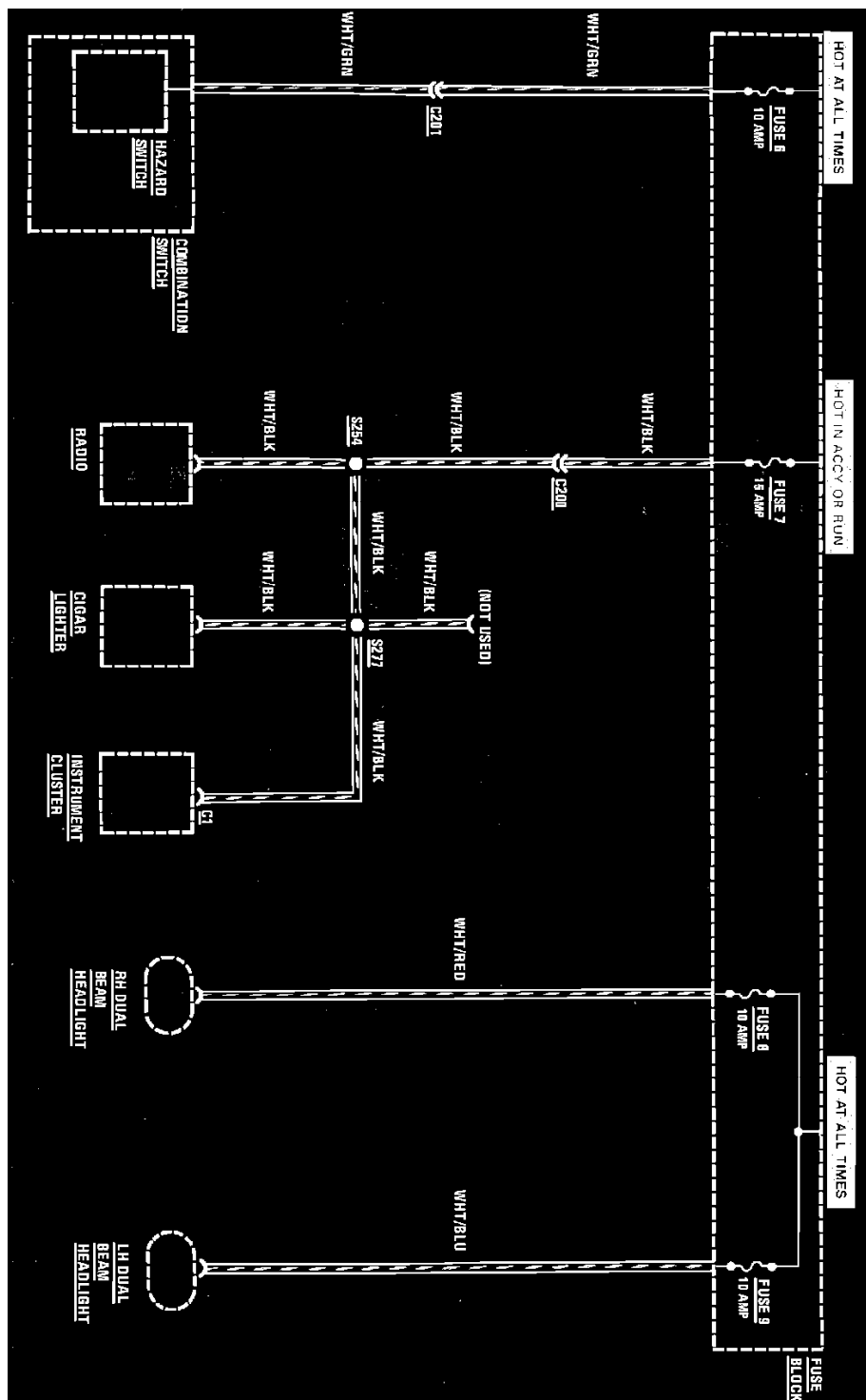


Fig. 21 Fuse Block Details. Fuses 6, 7, 8 &amp; 9

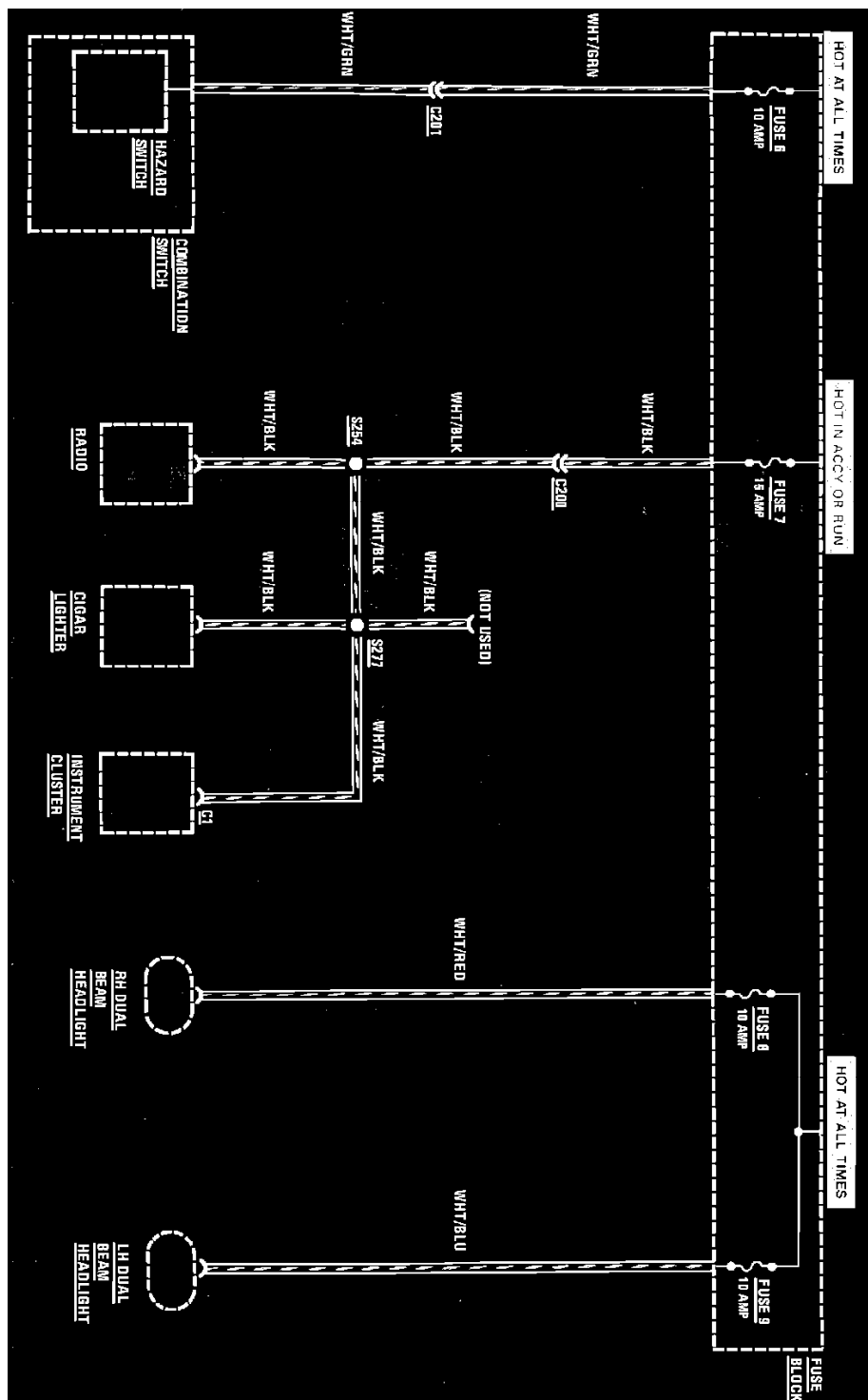


Fig. 21 Fuse Block Details. Fuses 6, 7, 8 &amp; 9

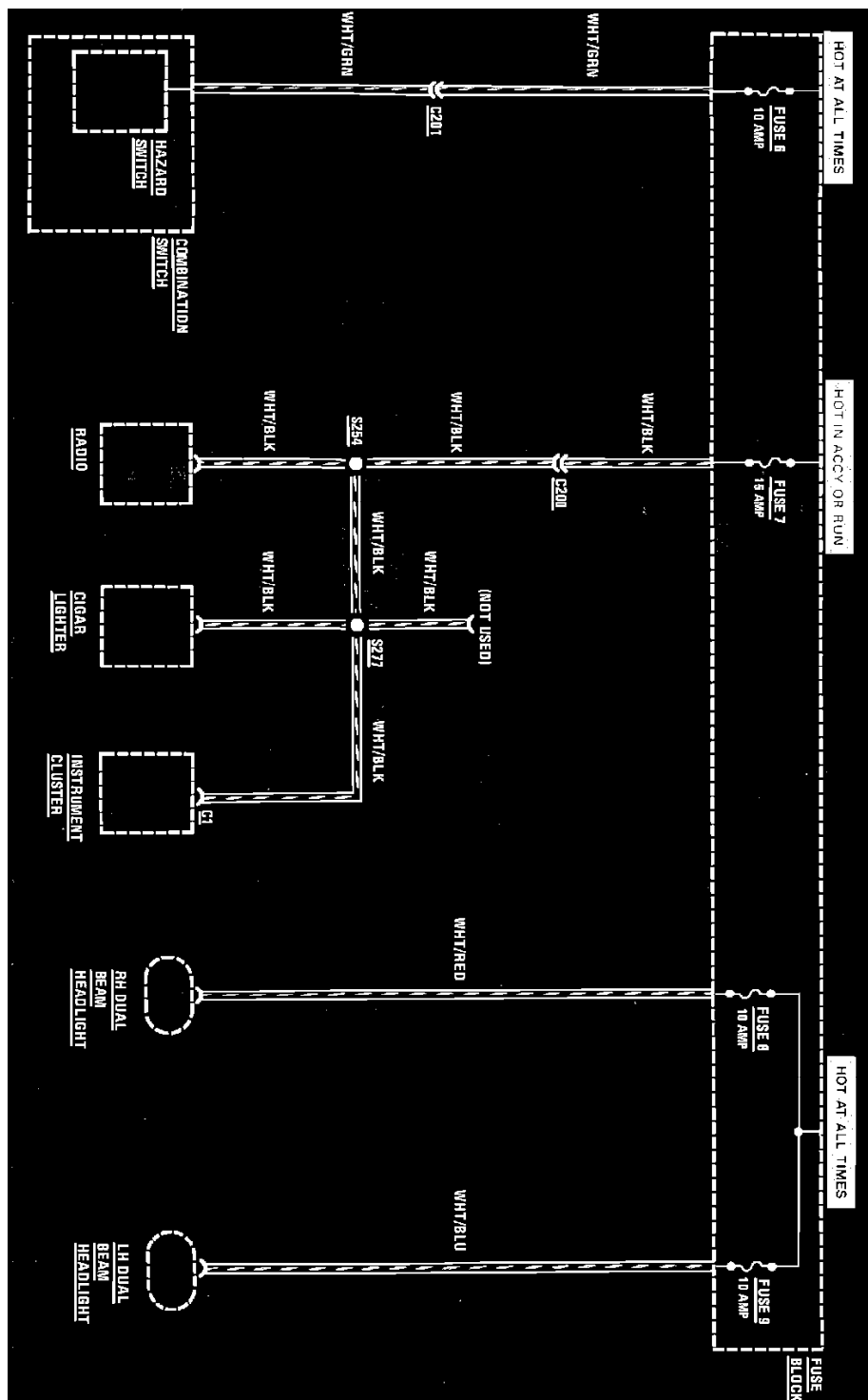


Fig. 21 Fuse Block Details. Fuses 6, 7, 8 &amp; 9

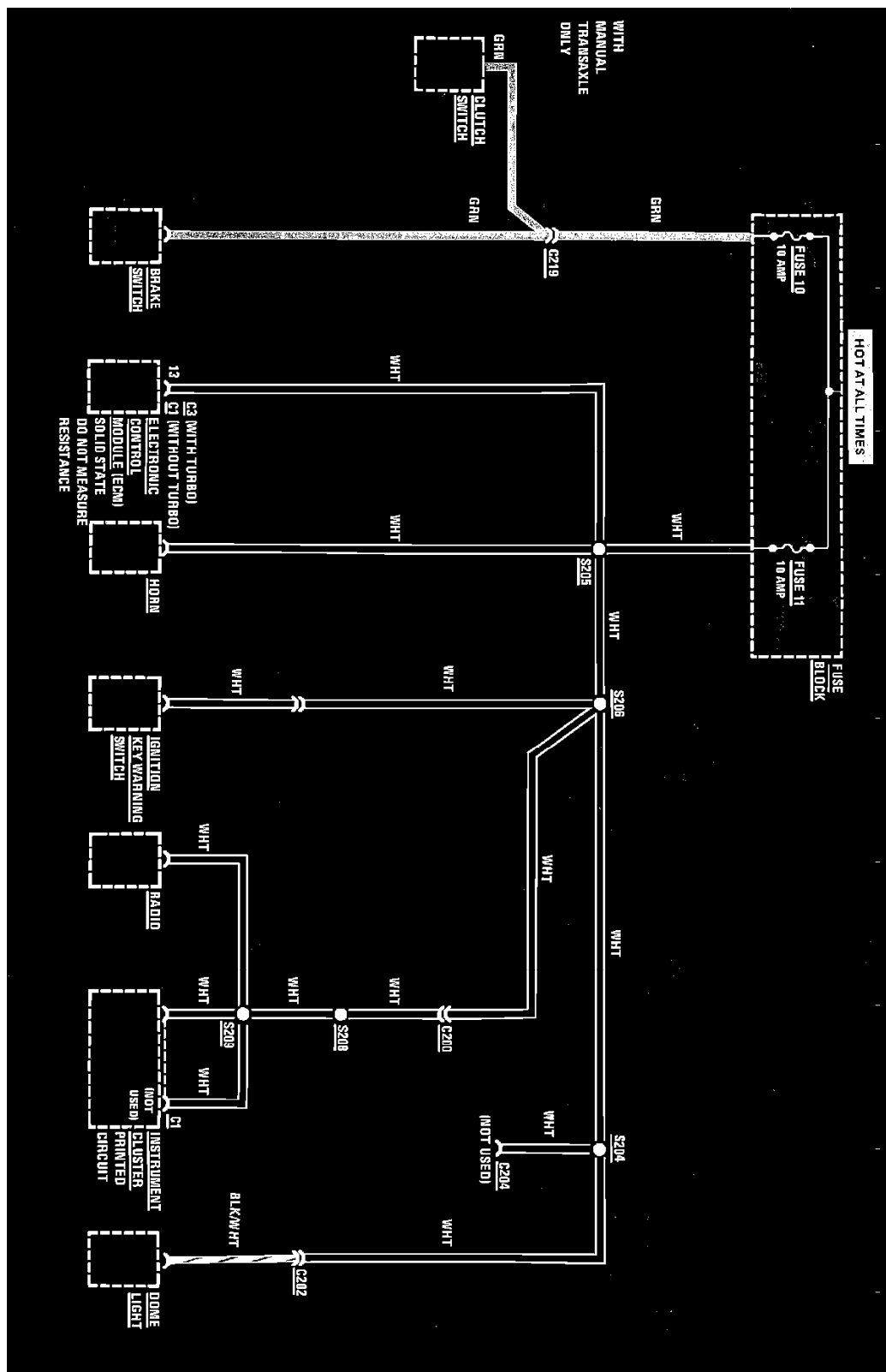


Fig. 22 Fuse Block Details. Fuses 10 &amp; 11

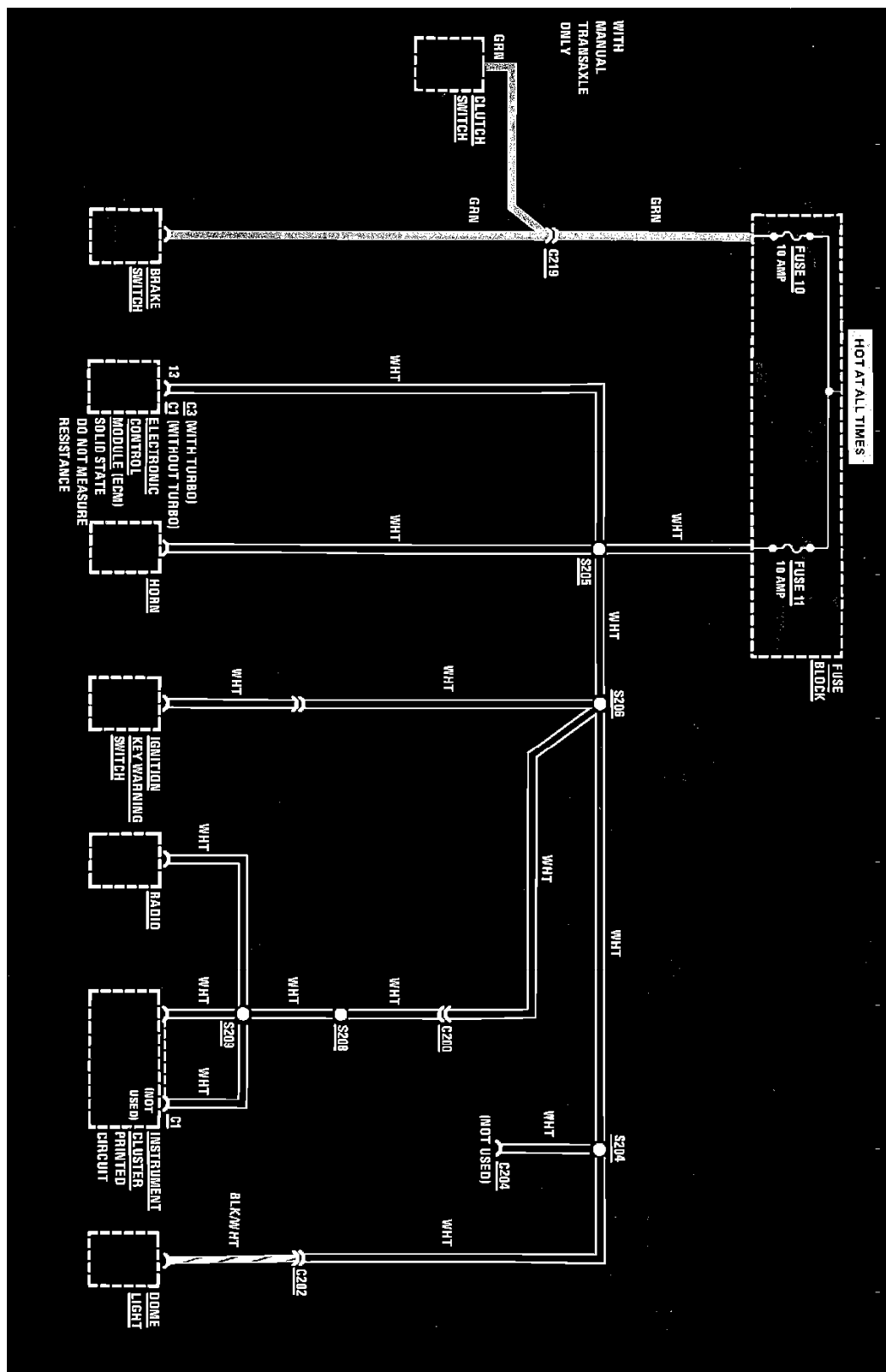


Fig. 22 Fuse Block Details. Fuses 10 &amp; 11

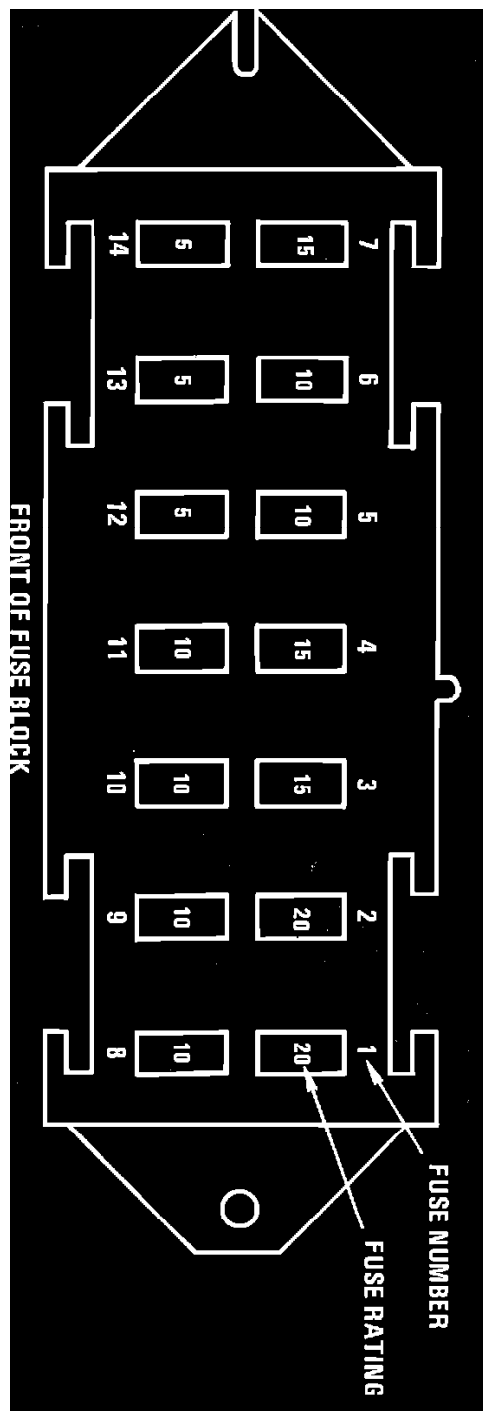


Fig. 1 Fuse Block

## System Diagram

For wiring diagram information please refer to Starting and Charging/Diagrams See: Starting and Charging/Diagrams/Electrical Diagrams

## Battery Cable

For wiring diagram information please refer to Starting and Charging/Diagrams See: Starting and Charging/Diagrams/Electrical Diagrams

## System Diagram

For wiring diagram information please refer to Starting and Charging/Diagrams See: Starting and Charging/Diagrams/Electrical Diagrams

## Alternator

For wiring diagram information please refer to Starting and Charging/Diagrams See: Starting and Charging/Diagrams/Electrical Diagrams

## System Diagram

For wiring diagram information please refer to Starting and Charging/Diagrams See: Starting and Charging/Diagrams/Electrical Diagrams

## Ignition Switch

For wiring diagram information please refer to Starting and Charging/Diagrams See: Starting and Charging/Diagrams/Electrical Diagrams

## Neutral Safety Switch

For wiring diagram information please refer to Starting and Charging/ Diagrams See: Starting and Charging/Diagrams/Electrical Diagrams

## Starter Motor

For wiring diagram information please refer to Starting and Charging/Diagrams See: Starting and Charging/Diagrams/Electrical Diagrams



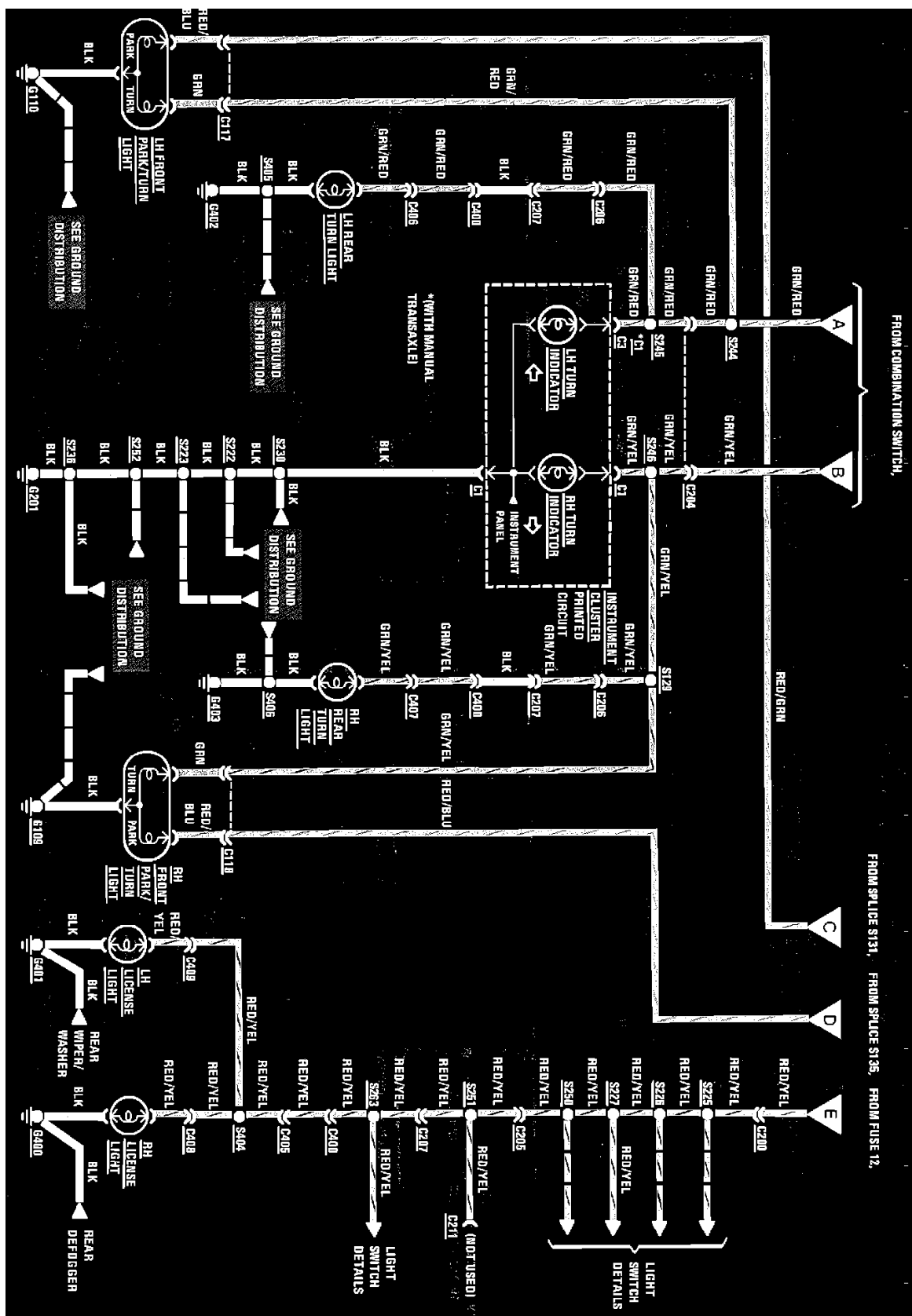


Fig. 27b Hazard, License, Marker, Tail &amp; Turn Lamp Wiring Circuit (Part 2 of 2)

## Transmission and Drivetrain

For information regarding diagrams for this component, please refer to Powertrain Management diagrams. See: Powertrain Management/Diagrams/Electrical Diagrams



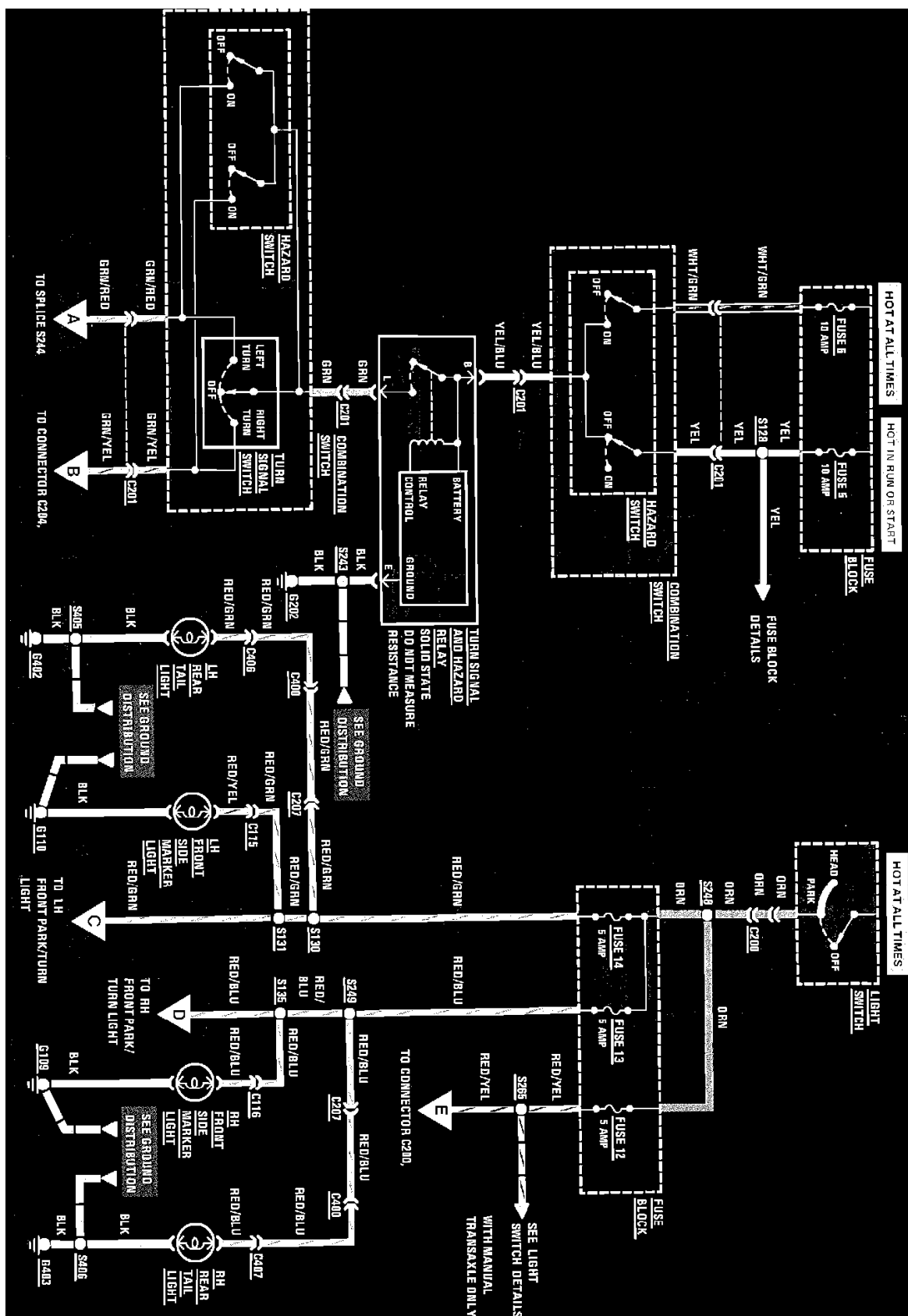


Fig. 27a Hazard, License, Marker, Tail &amp; Turn Lamp Wiring Circuit (Part 1 of 2)



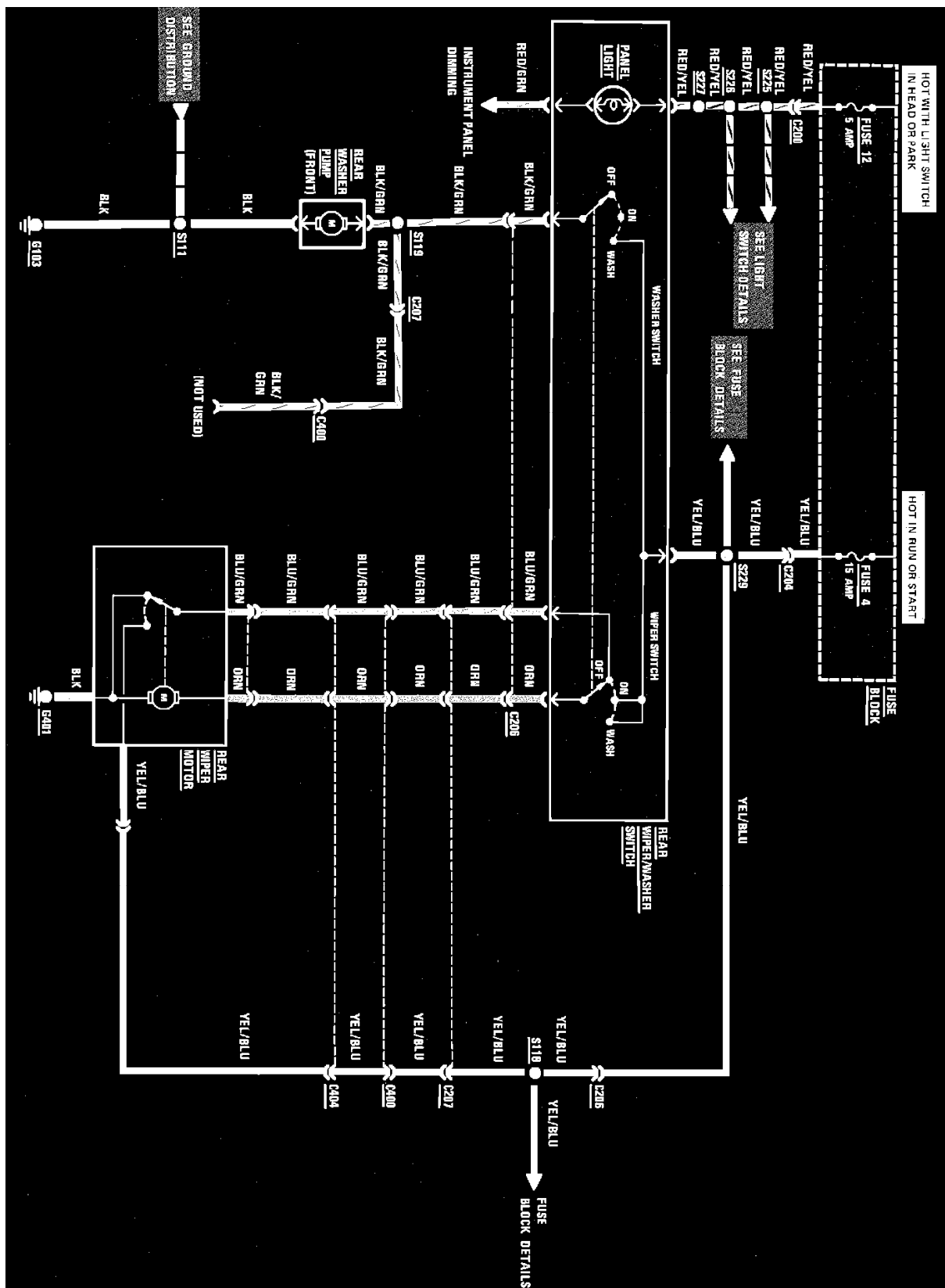


Fig. 42 Rear Washer/Wiper Wiring Circuit

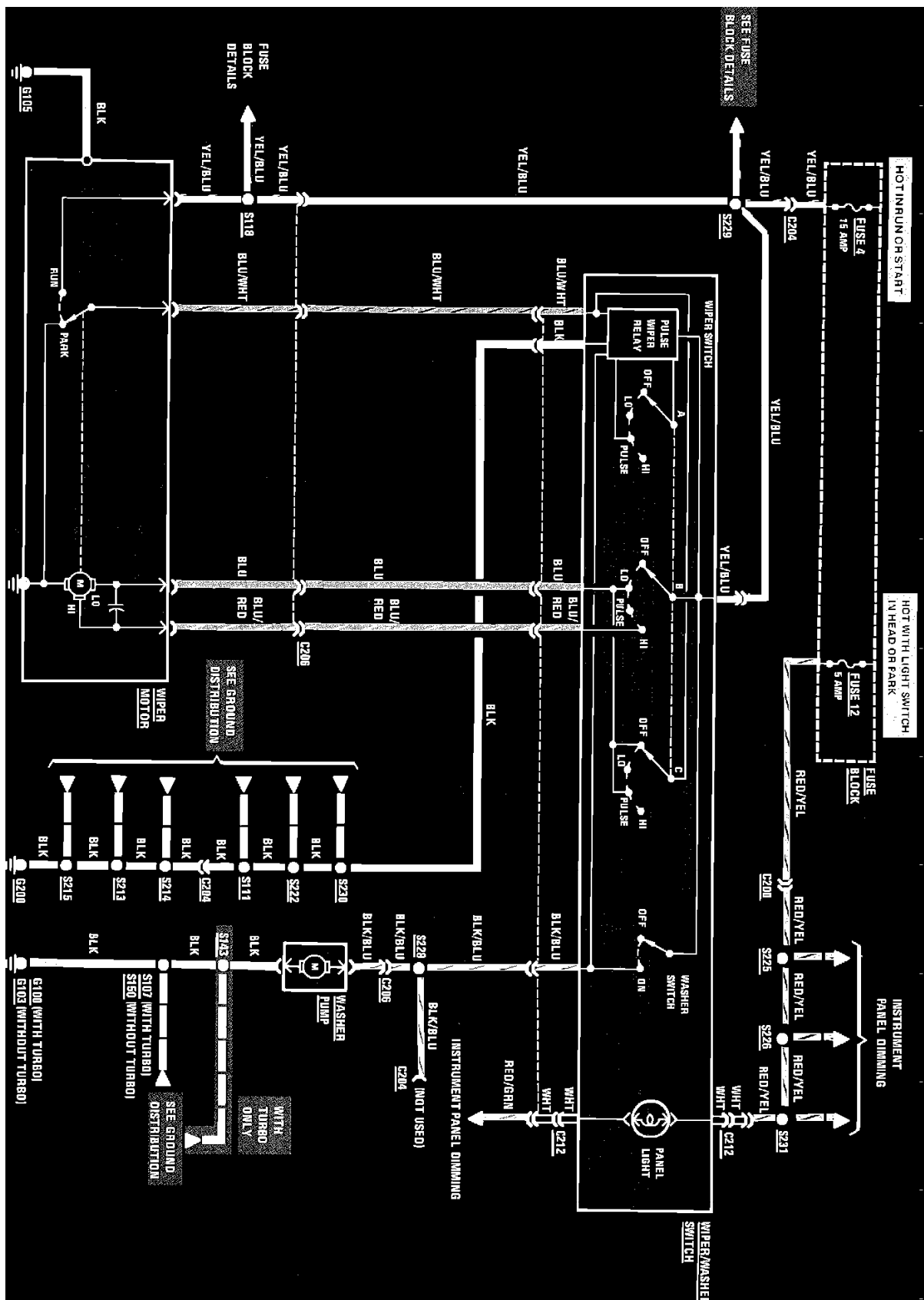


Fig. 46 Wiper/Washer Wiring Circuit. With Pulse

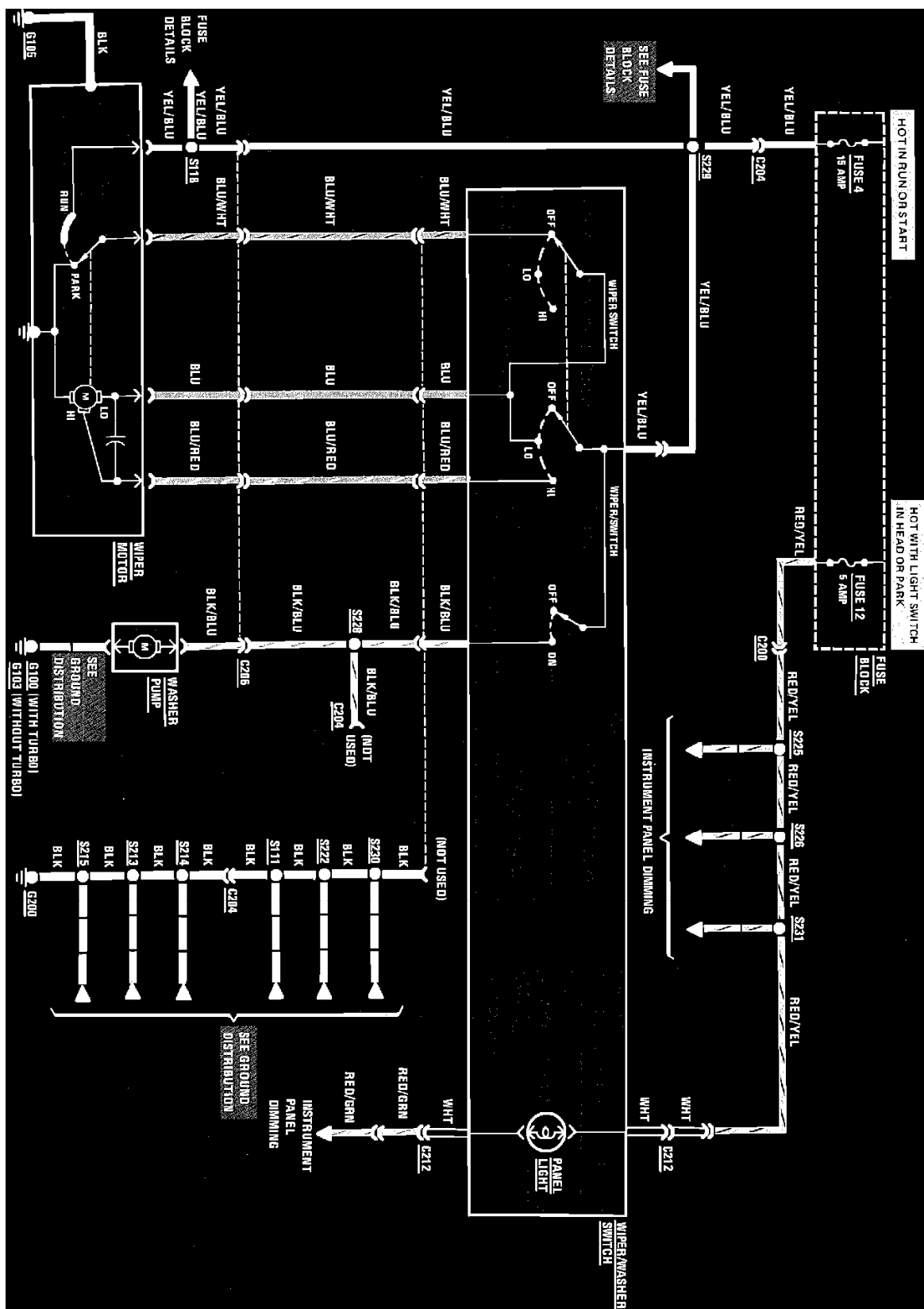
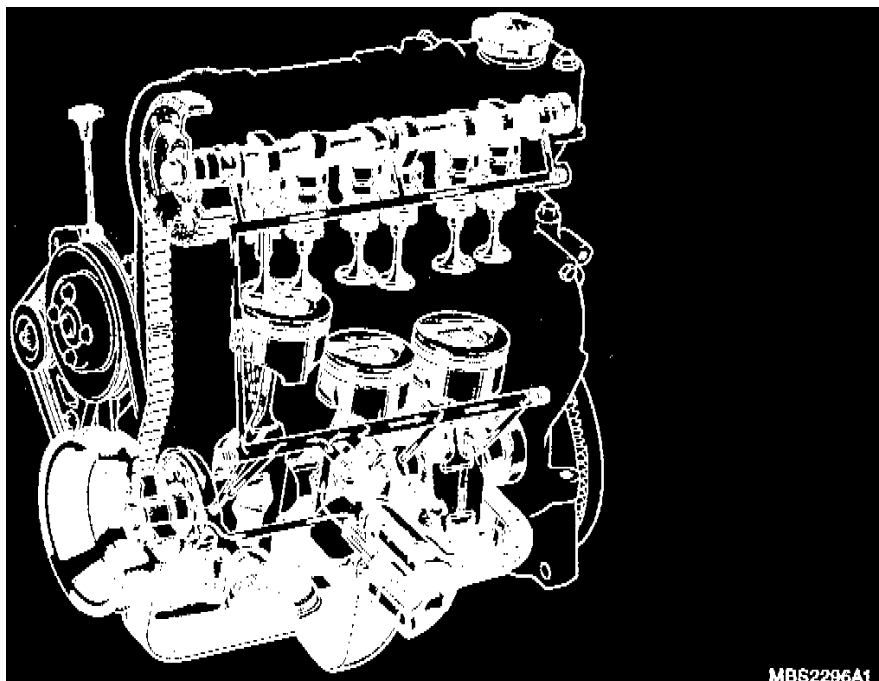


Fig. 45 Wiper/Washer Wiring Circuit. Less Pulse



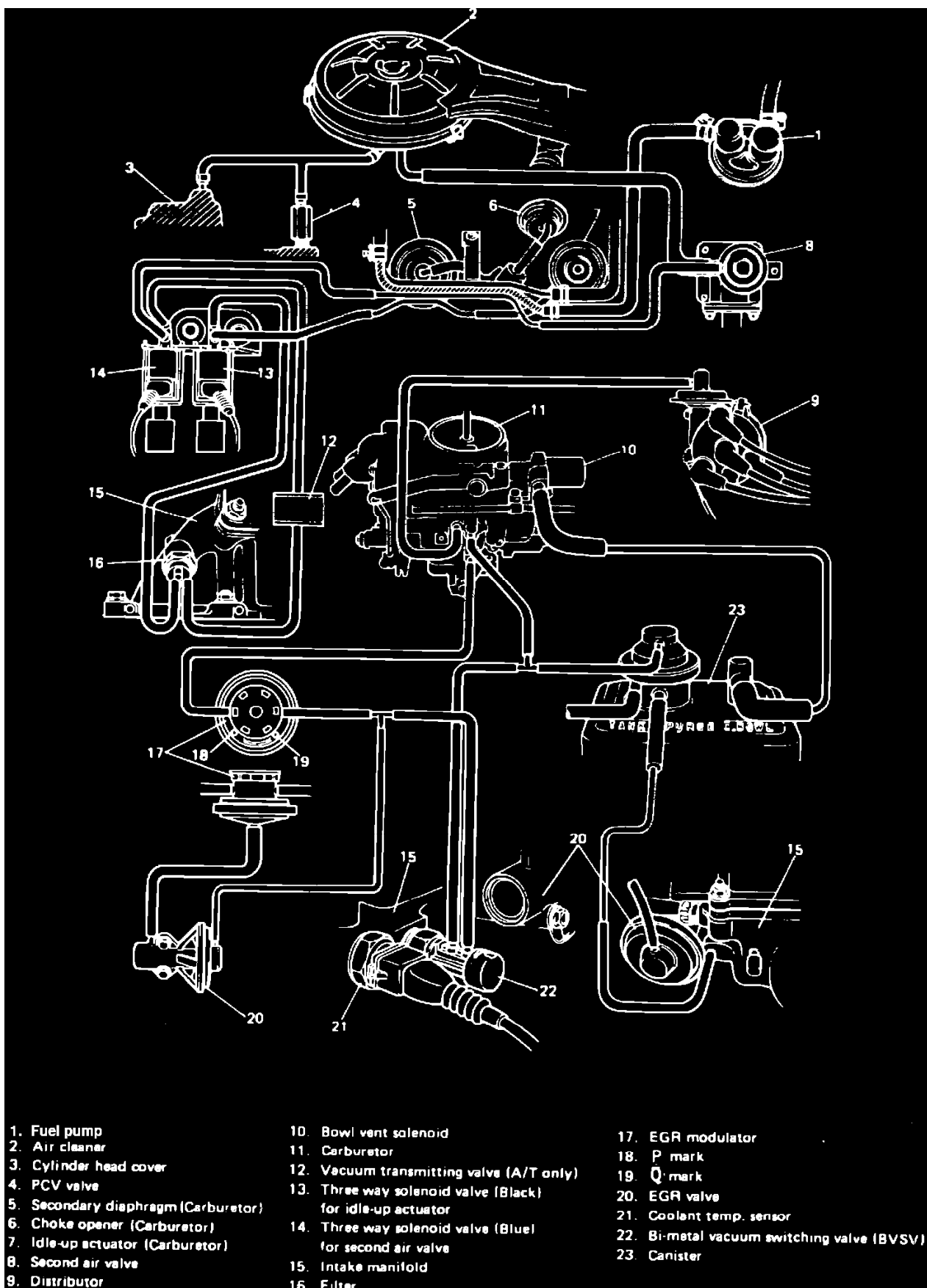


Fig. 3 Vacuum hose routing. 1987 - 88 3-61/1.0L, 2 Bbl.

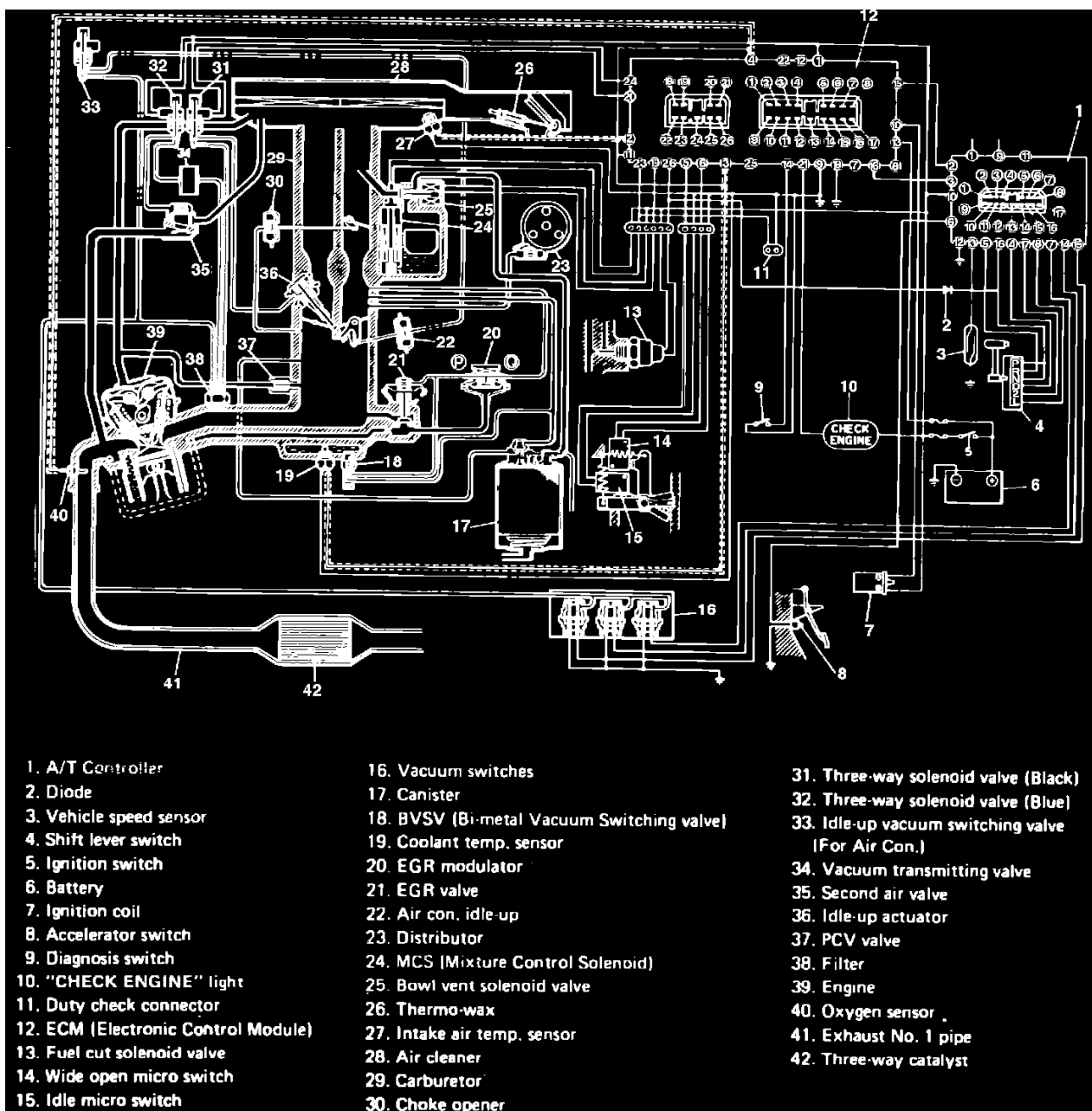


Fig. 4 Emission control system schematic. 1987 - 88 3-61/1.0L, 2 Bbl. w/automatic transmission



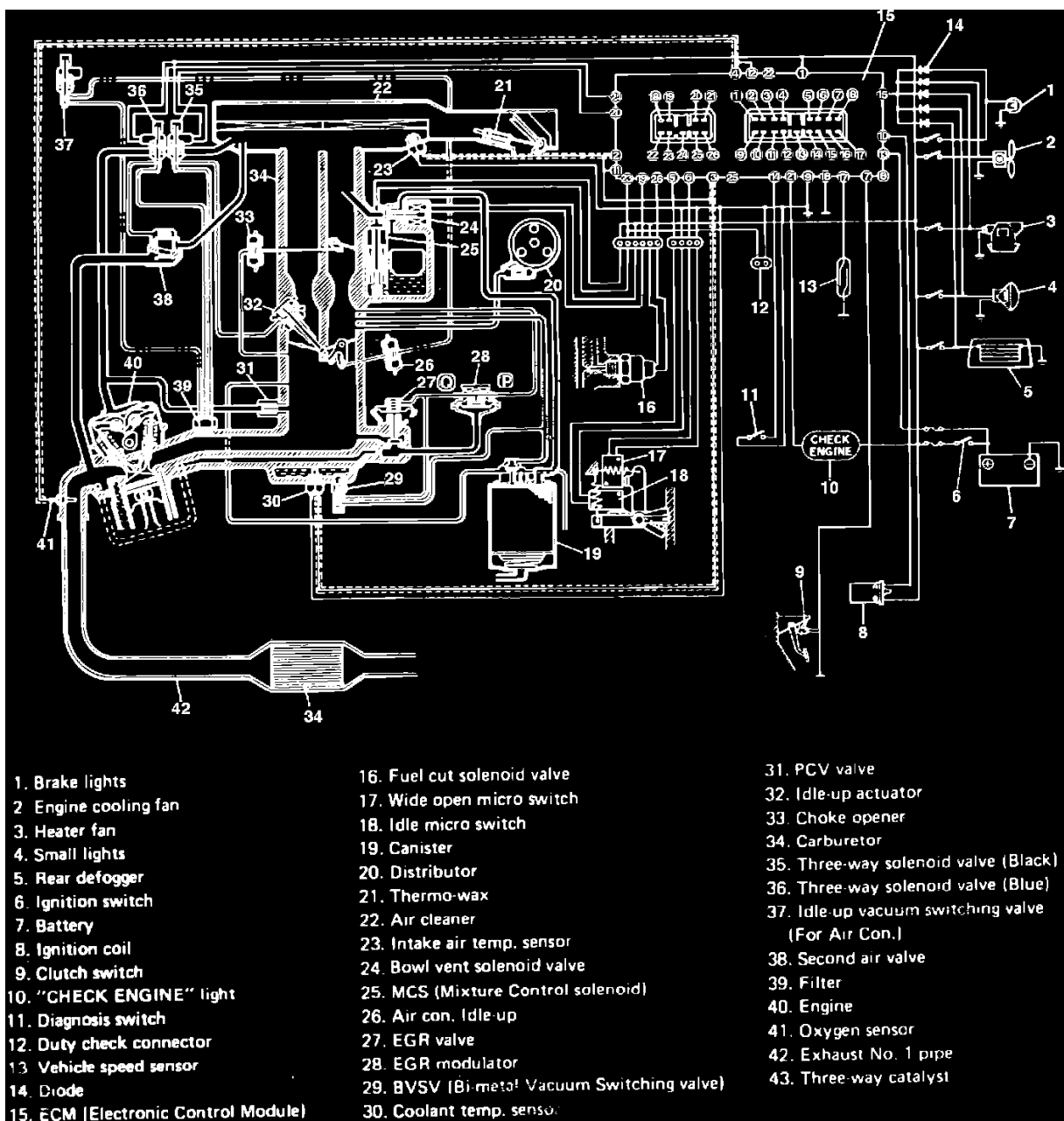


Fig. 5 Emission control system schematic. 1987 - 88 3-61/1.0L, 2 Bbl. w/manual transmission

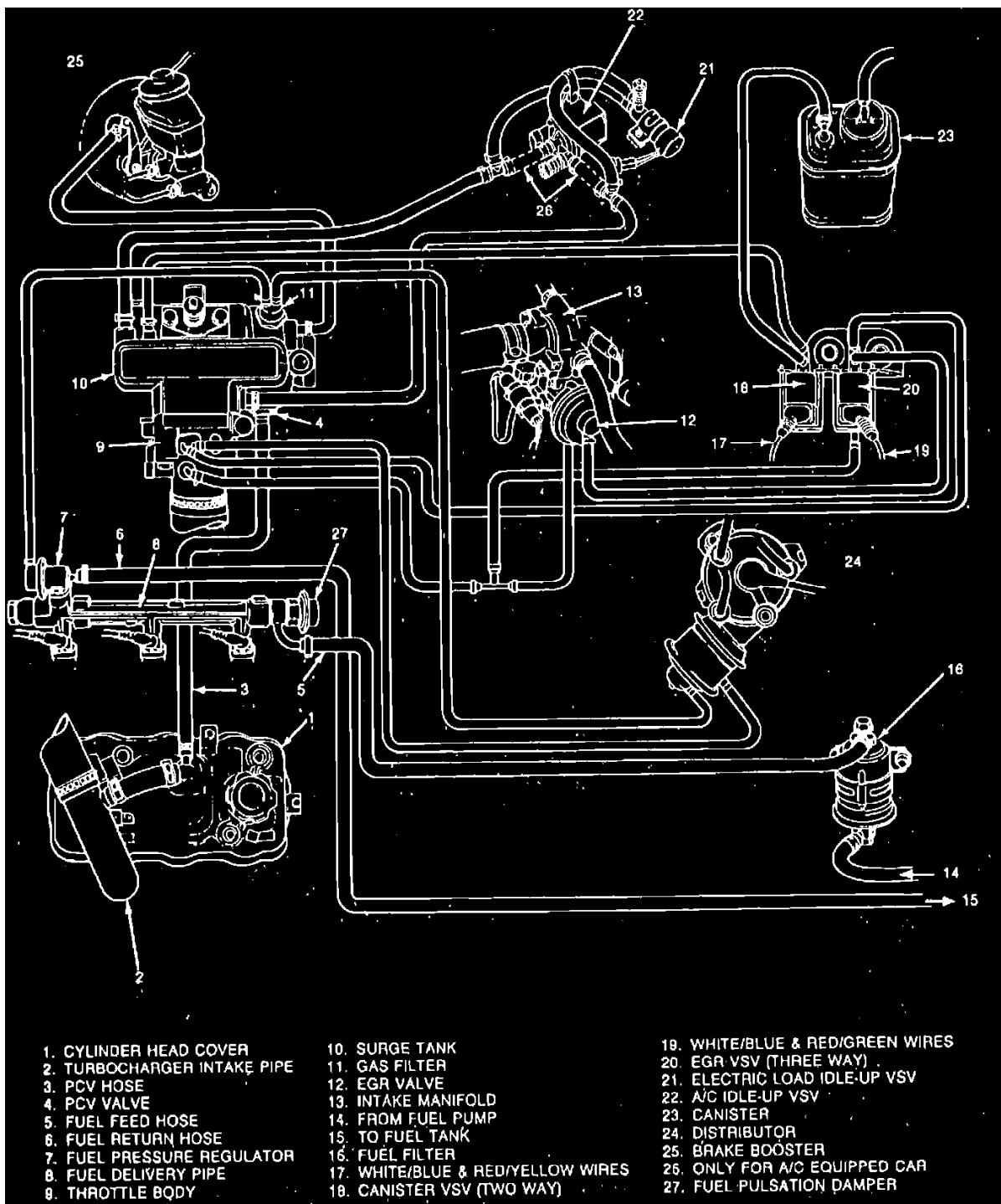


Fig. 6 Vacuum hose routing. 1987 - 88 3-61/1.0L, w/EFI & turbocharger

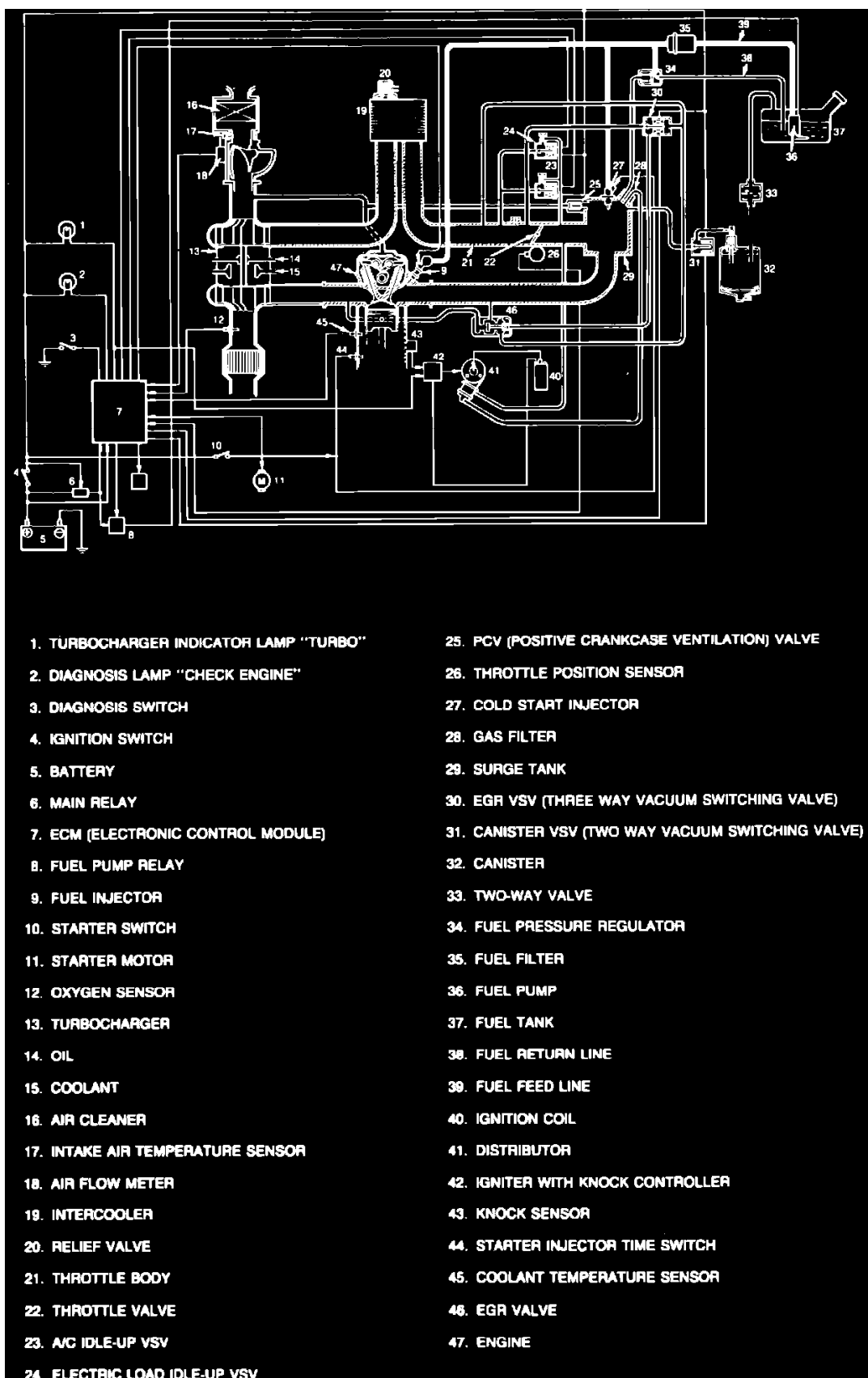
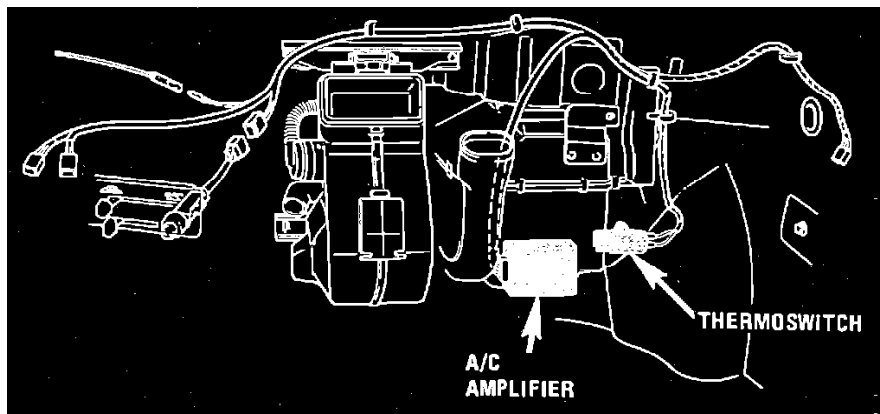


Fig. 7 Emission control system schematic. 1987 - 88 3-61/1.0L, w/EFI & turbocharger

## Additional Information

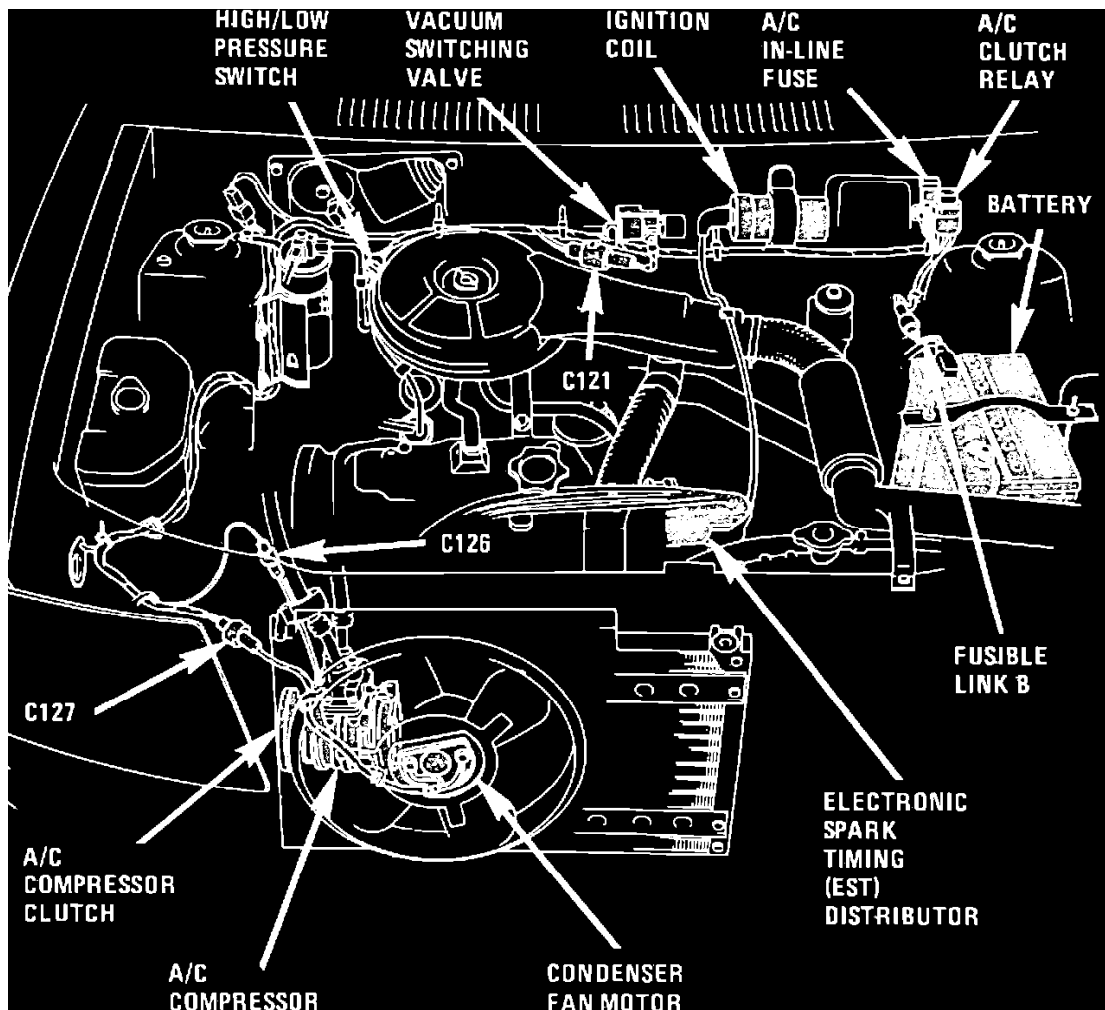
If the component you are looking for is not listed here, please refer to **System** or **Sub-Assembly Locations**. Example: If Air Flow Meter is not found here, refer to **Powertrain Management/Computers and Control Systems/Air Flow Meter/Locations**.

## A/C Amplifier

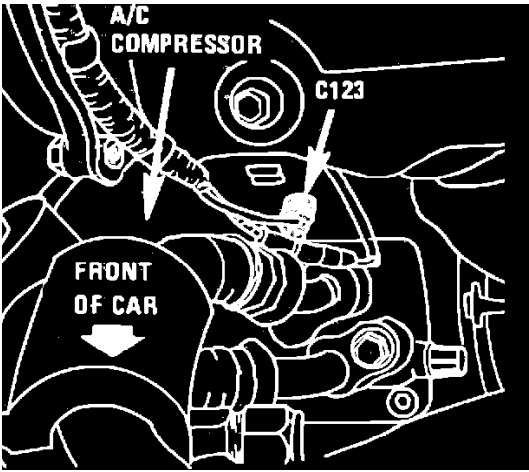


A/C Components Under I/P

Behind Right Side Of I/P  
A/C Compressor



Engine Compartment

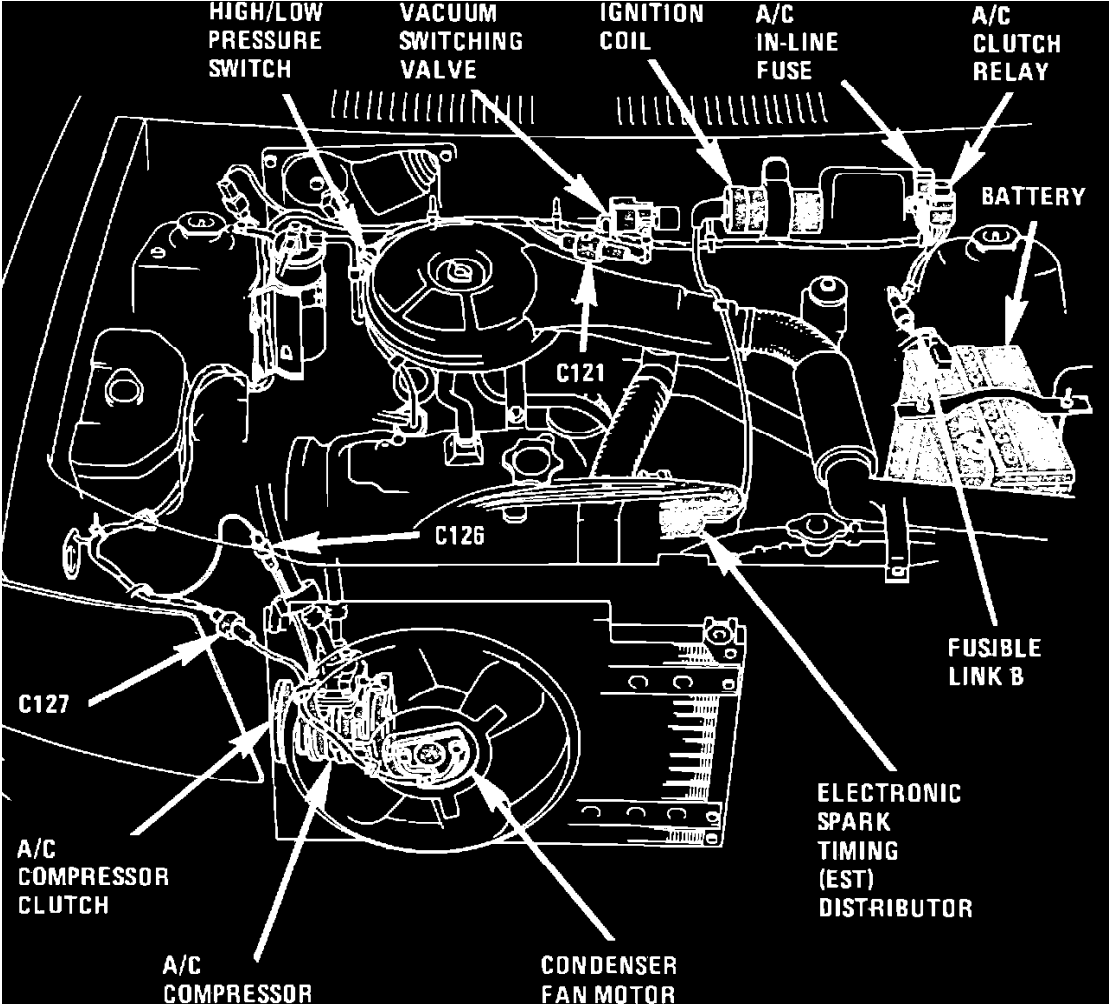


Lower Right Front Of Engine

Lower Right Front Of Engine Compartment

Applicable to: Non-Turbo

**A/C Compressor Clutch**

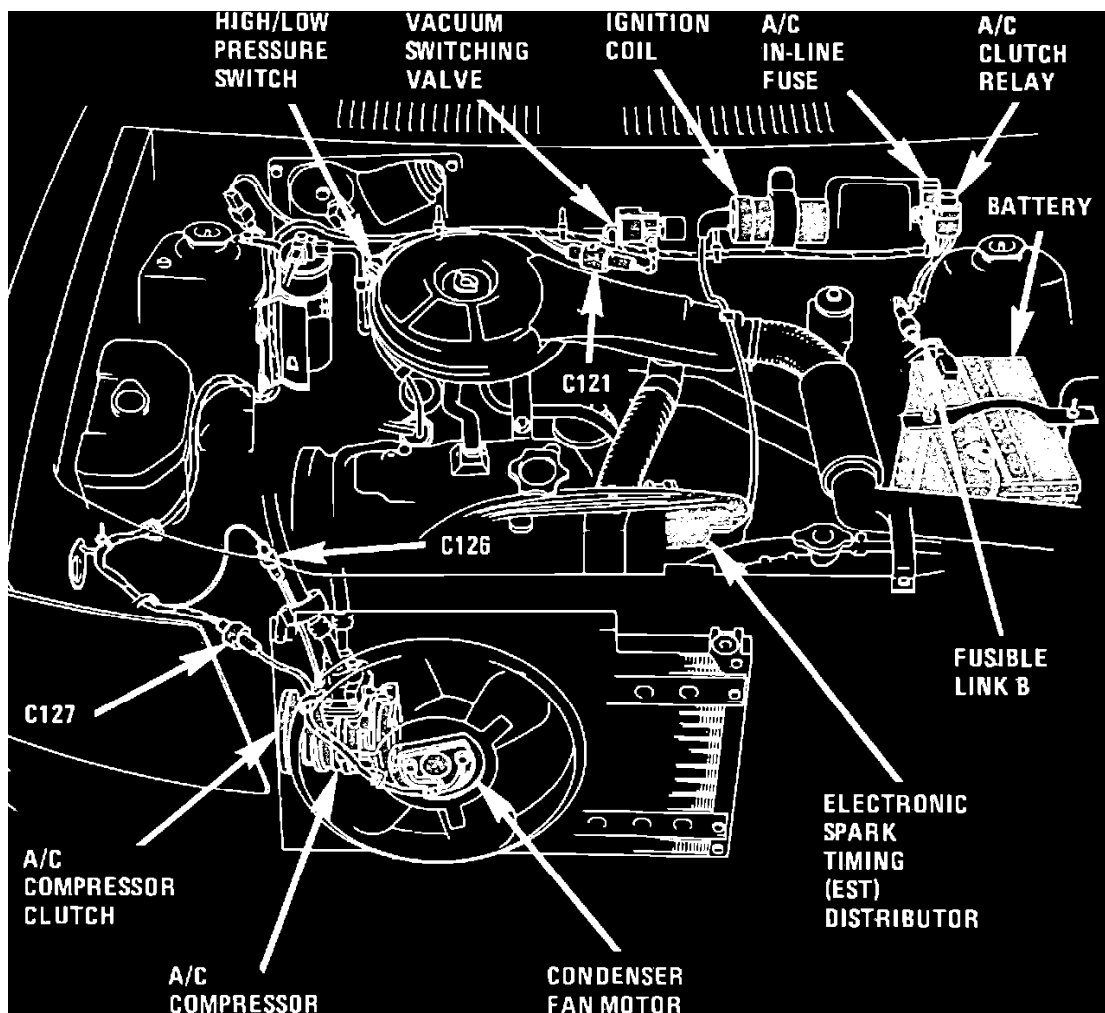


Engine Compartment

Lower Right Front Of Engine Compartment

Applicable to: Non-Turbo

**A/C In-Line Fuse**

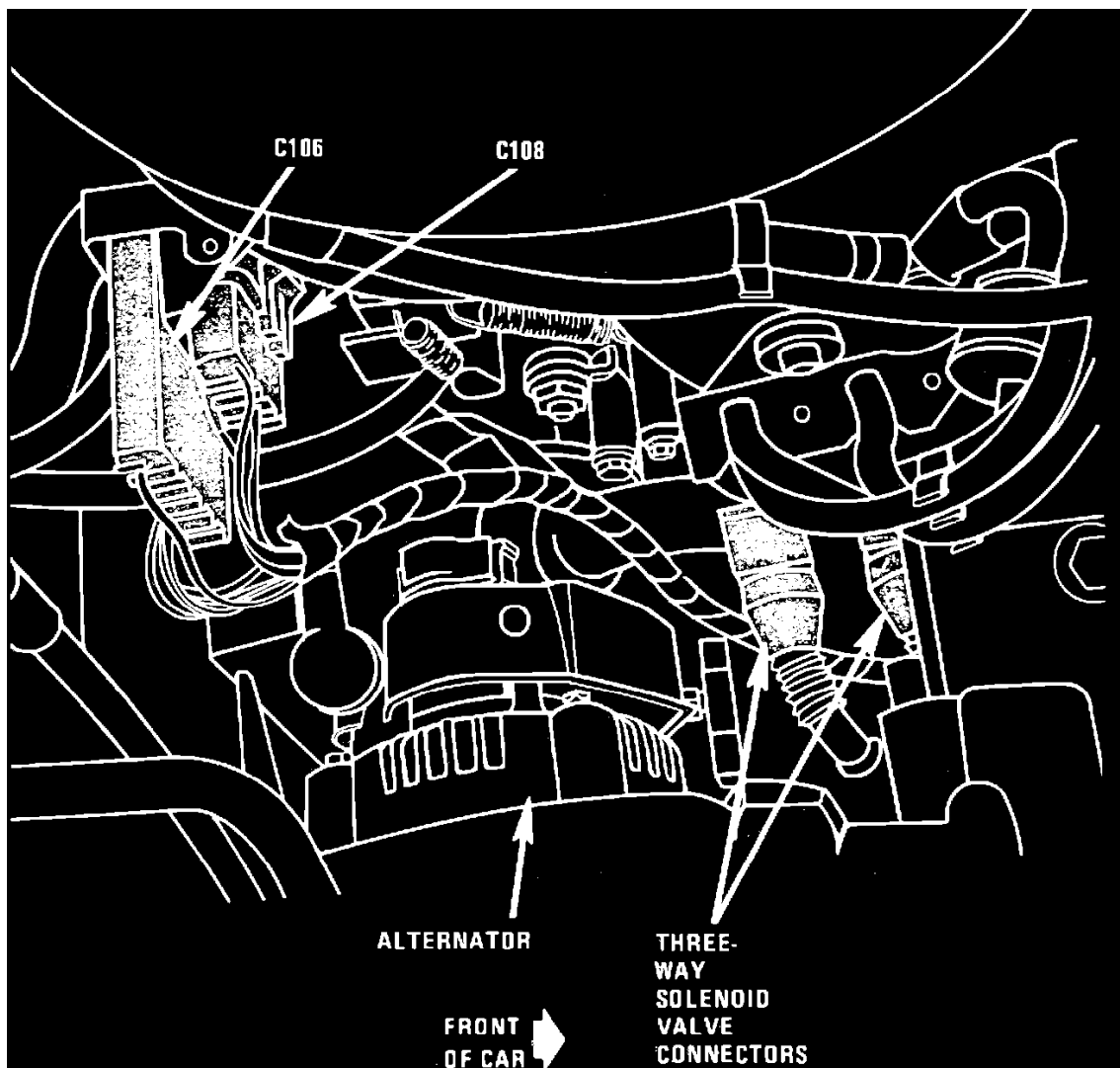


Engine Compartment

LH Side Of Engine Compartment Mounted To Cowl

Applicable to: Non-Turbo

**Alternator**

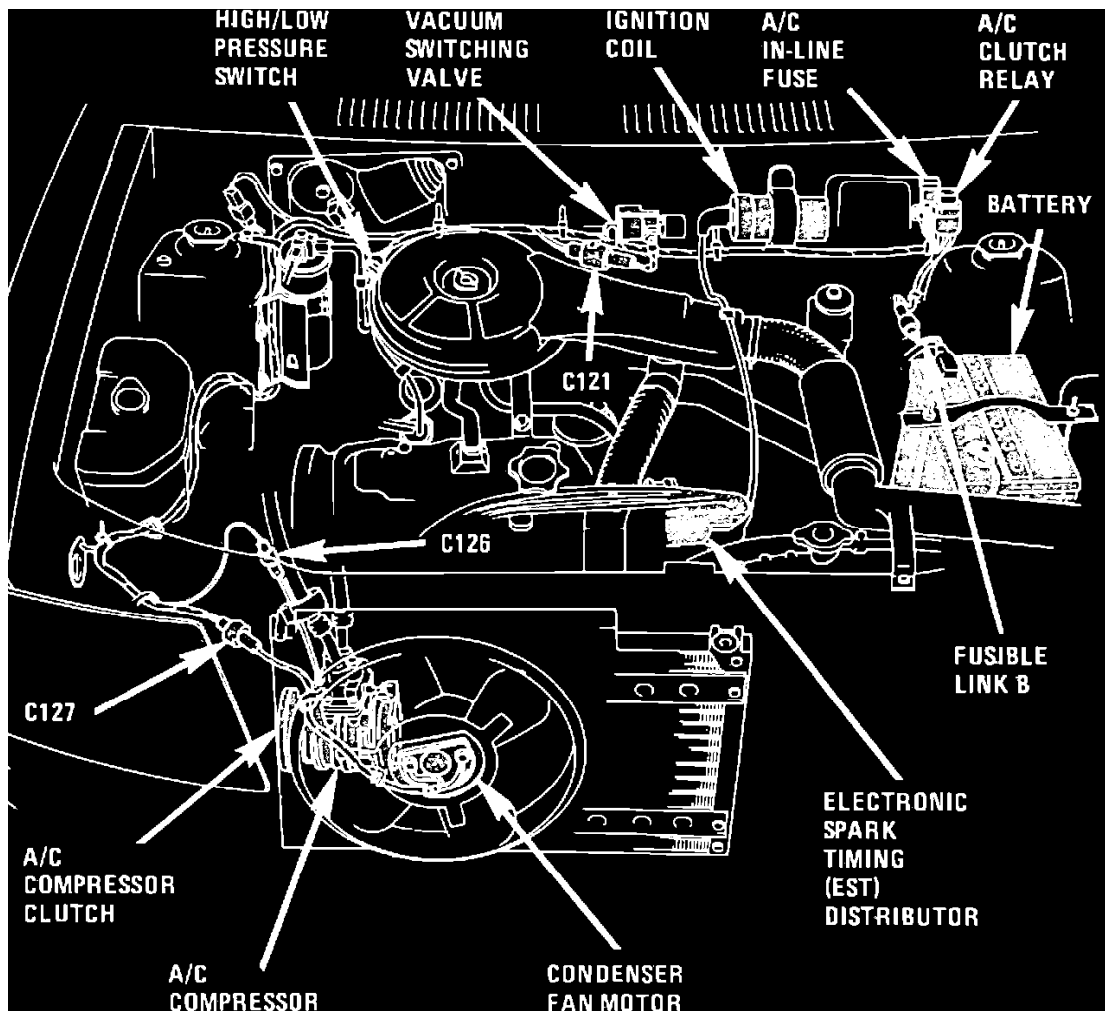


Lower Right Side Of Engine

RH Side Of Engine Compartment

Applicable to: Non-Turbo

**Battery**

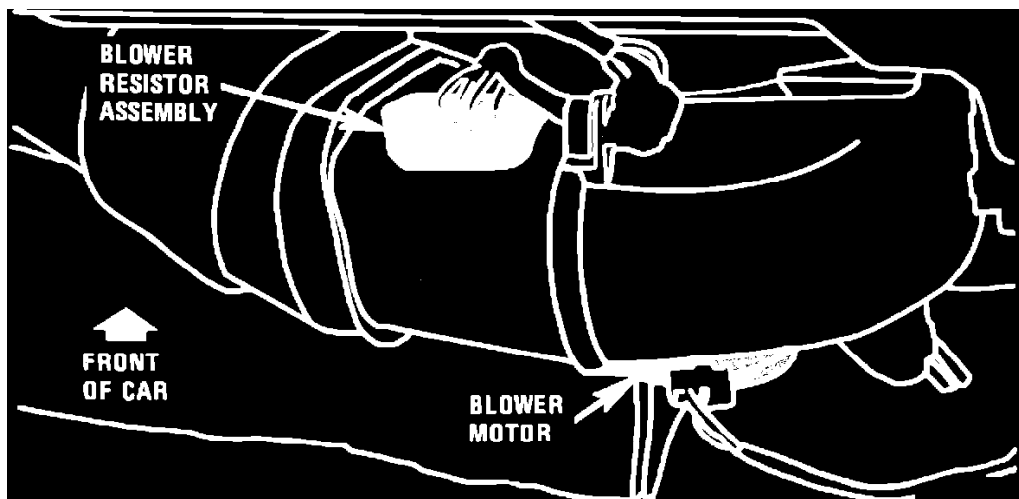


Engine Compartment

LH Side Of Engine Compartment

Applicable to: Non-Turbo

## Blower Resistor Assembly



Under Right Side I/P Components

Behind Right Side Of I/P

## Brake Warning Diodes

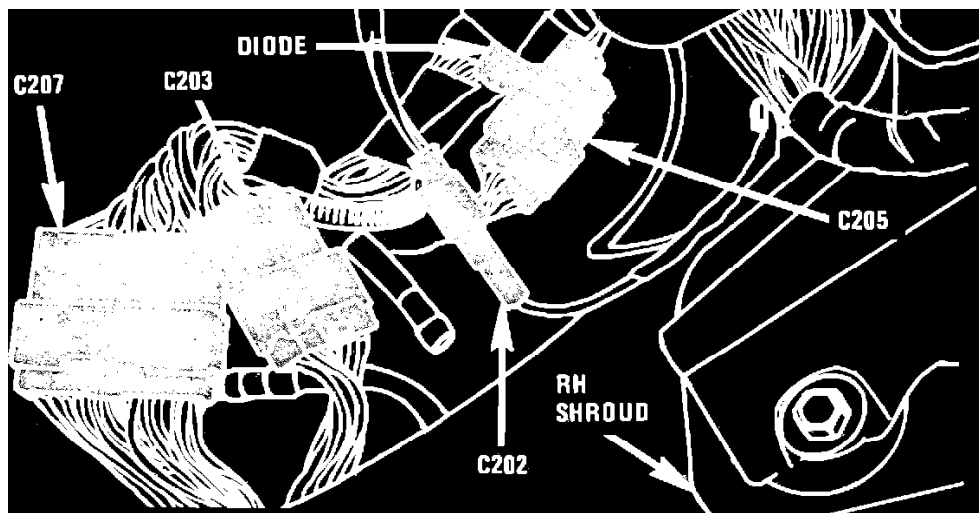
LH Side Of I/P

## Cruise Control Servo

Right Rear Corner Of Engine Compartment

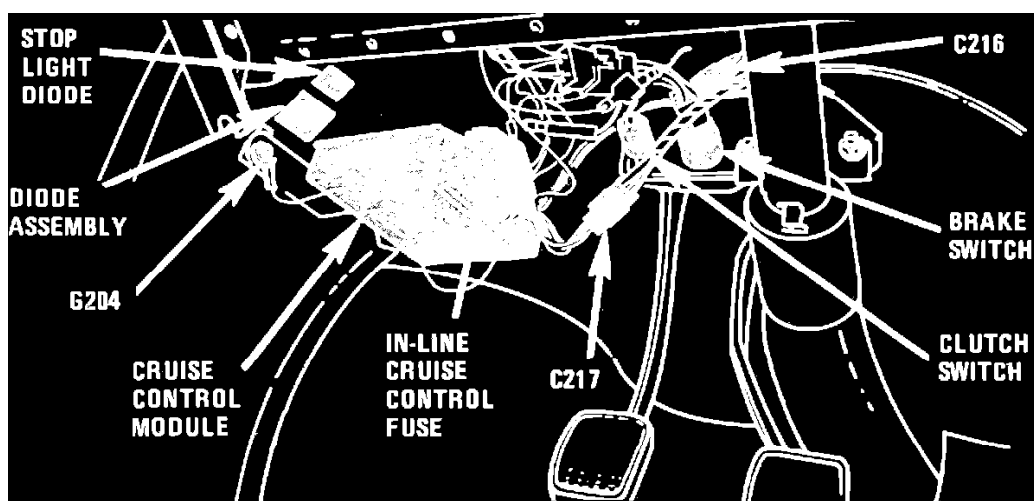
## Diode





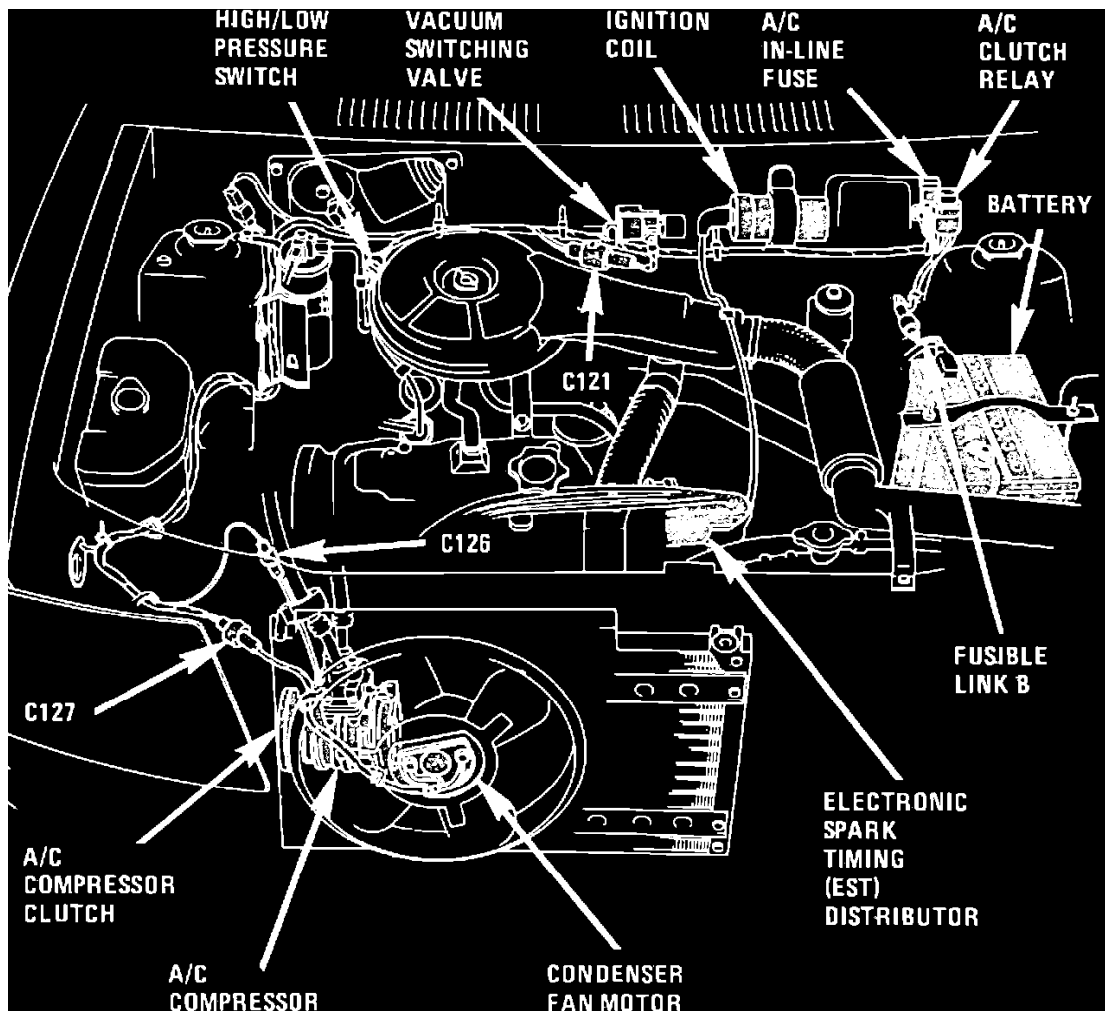
Lower Right Side Of I/P Splices & Connectors

Behind RH Side Of I/P  
**Diode Assembly**



Under I/P Components

Behind LH Side Of I/P  
**Electronic Spark Timing**

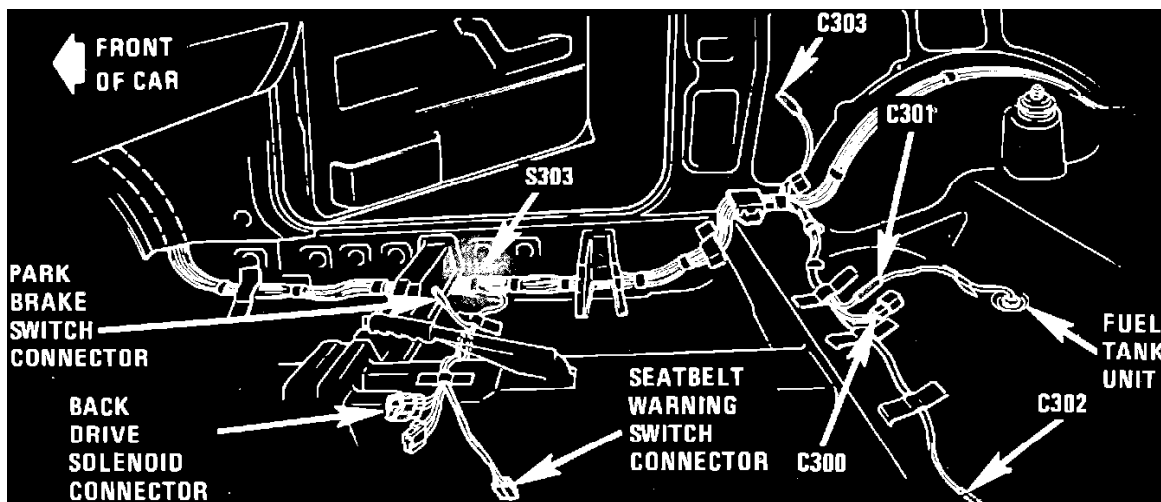


Engine Compartment

LH Side Of Engine

Applicable to: Non-Turbo

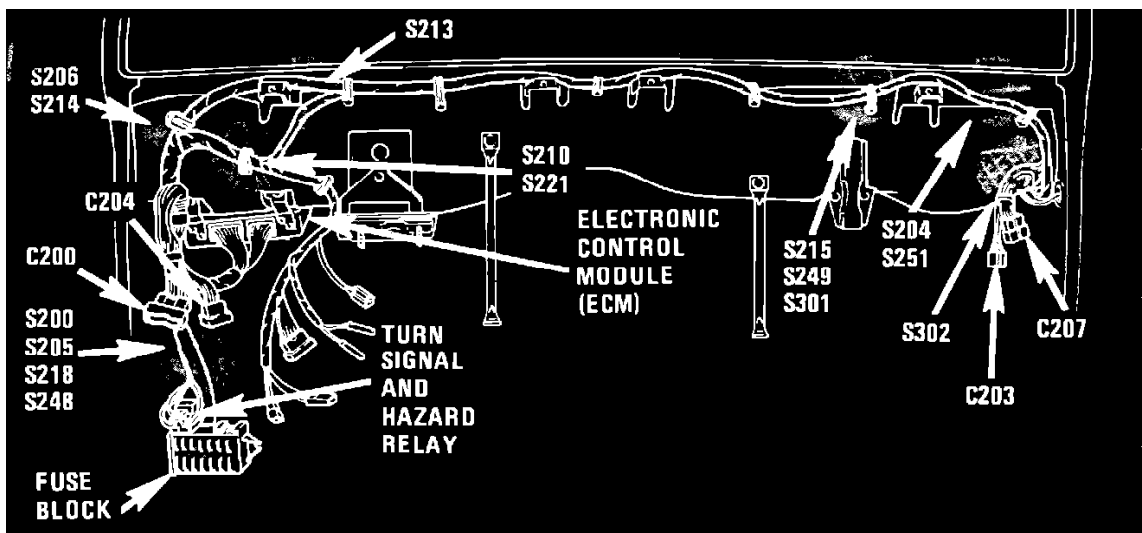
## Fuel Tank Unit



Passenger Compartment Splices & Connectors

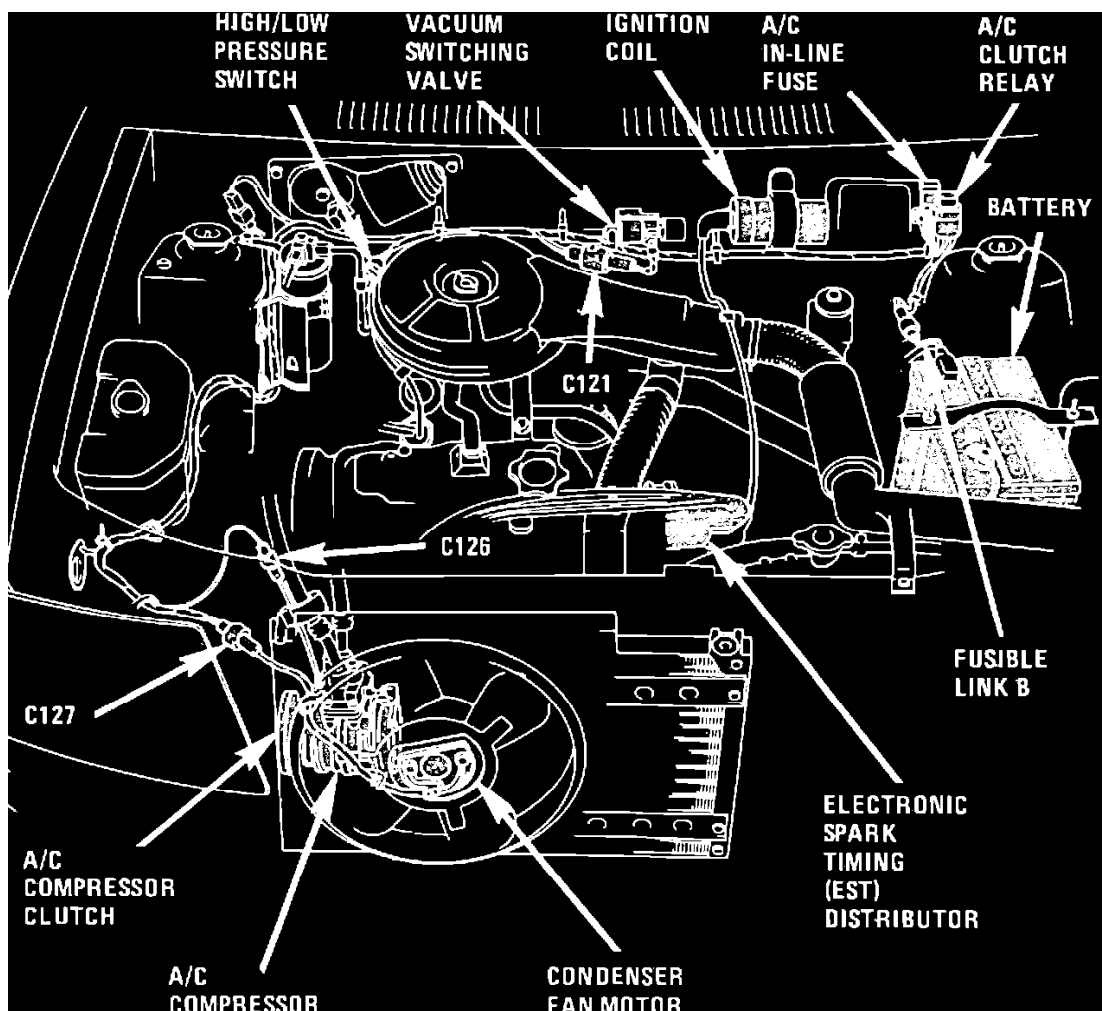
Under Rear Of Car, Under Right Rear Seat

## Fuse Block



Lower I/P Splices & Connectors

Behind LH Side Of I/P  
**Fusible Link B**

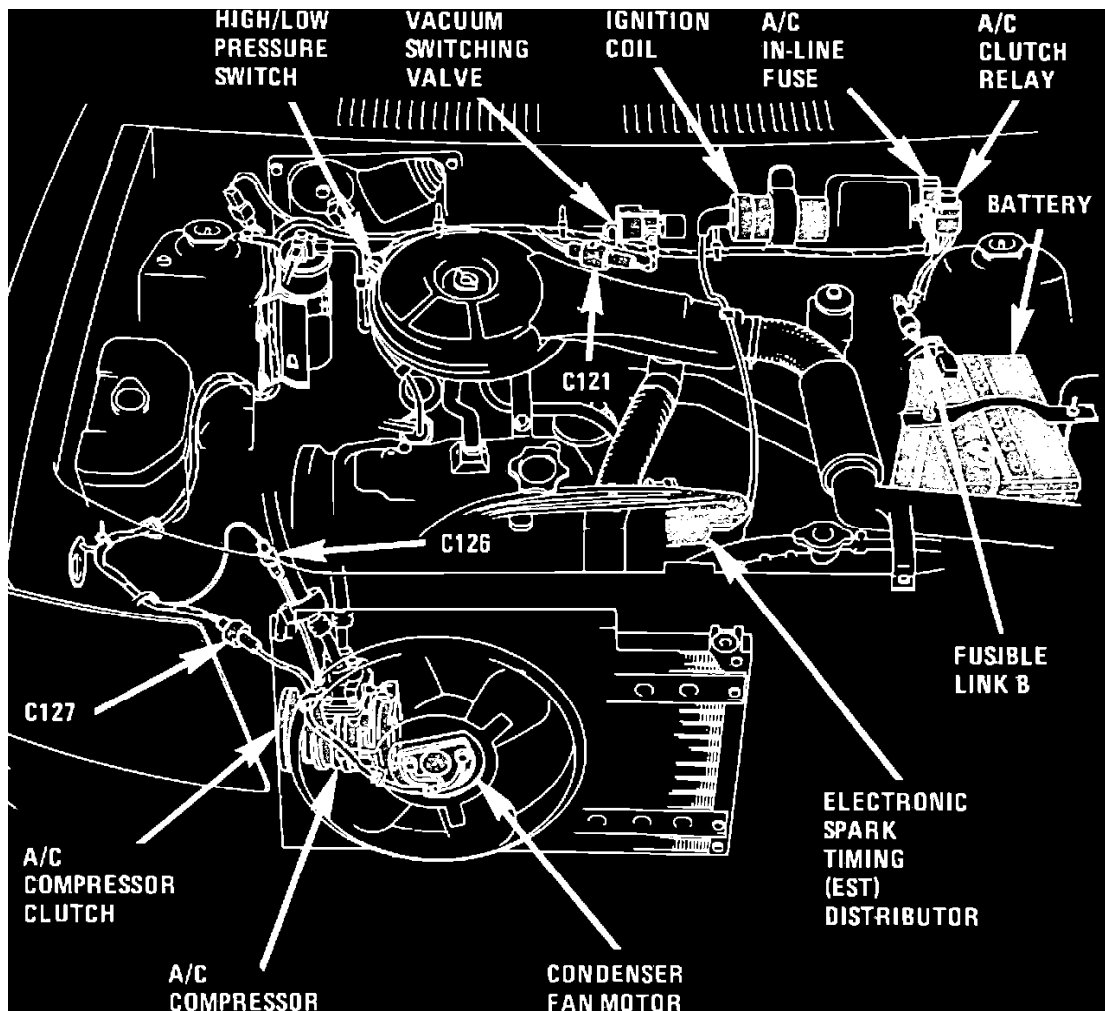


Engine Compartment

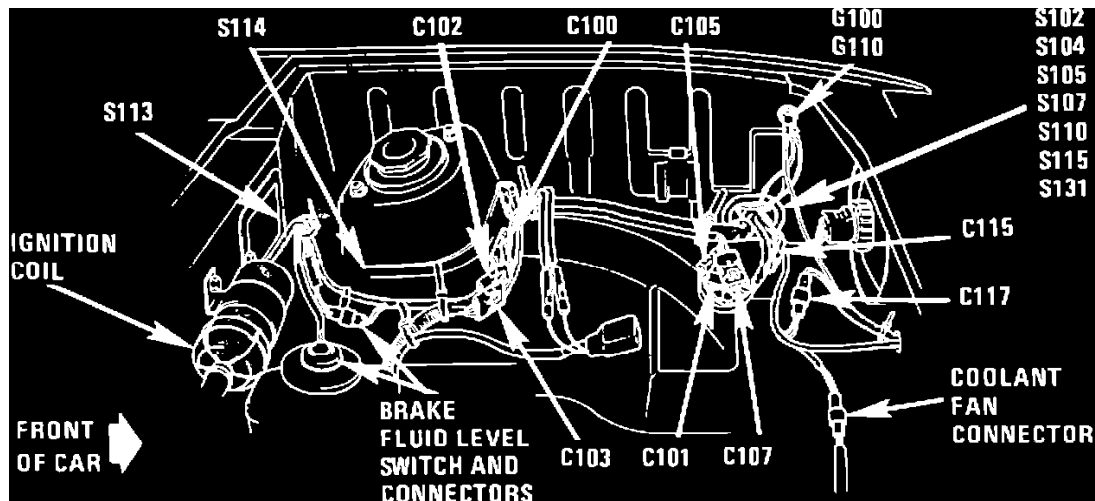
LH Side Of Engine Compartment

Applicable to: Non-Turbo

**Ignition Coil**



Engine Compartment

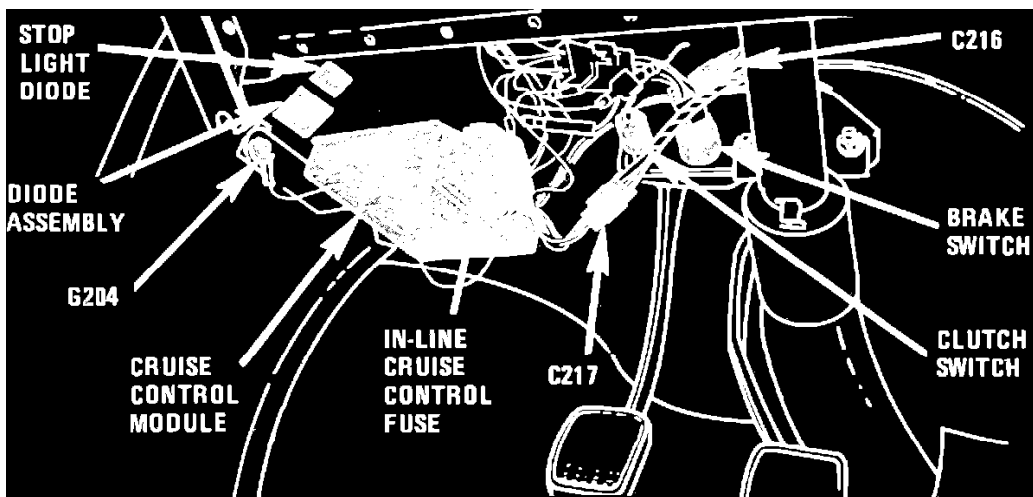


Lower Left Side Of Engine Compartment

LH Side Of Engine Compartment, Mounted To Cowl

Applicable to: Non-Turbo

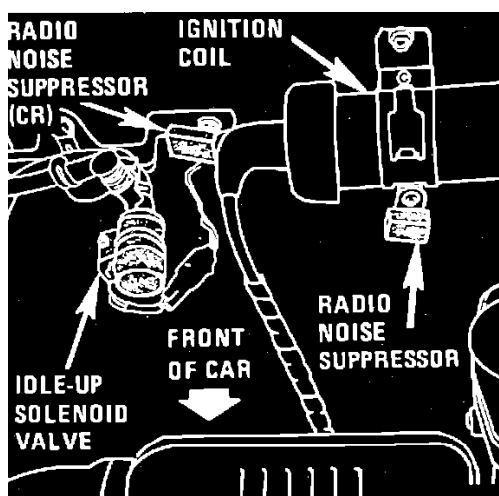
## In-Line Cruise Control Fuse



Under I/P Components

Behind LH Side Of I/P

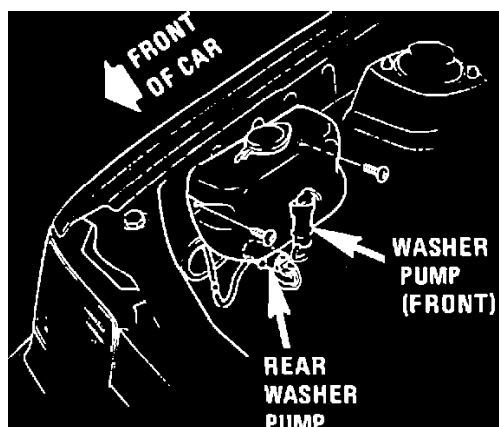
## Radio Noise Suppressor



Left Side Of Cowl

Mounted On Cowl Next Ignition Coil

## Rear Washer Pump



Right Front Corner Of Engine Compartment

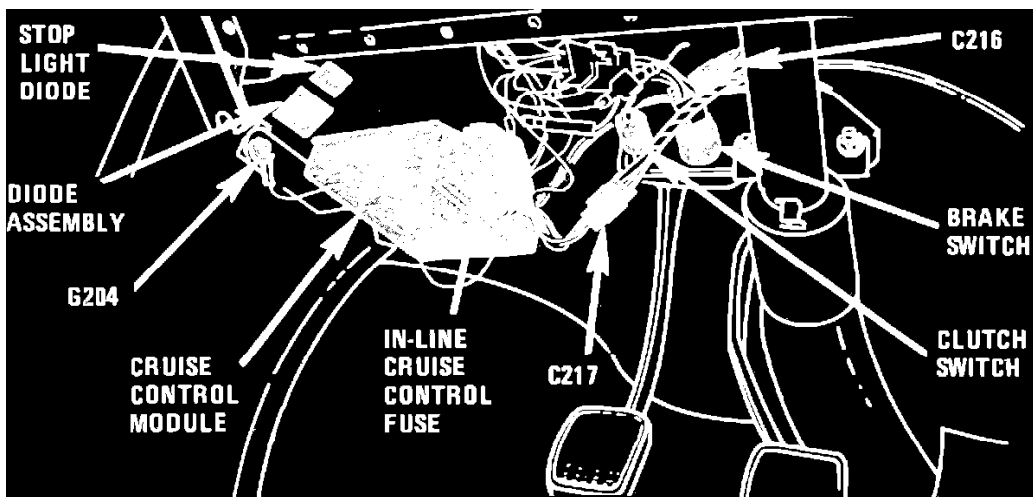
RH Side Of Engine Compartment

Applicable to: Non-Turbo

## Shift-Up Indicator Light Control Unit

Behind LH Side Of I/P

## Stop Light Diode



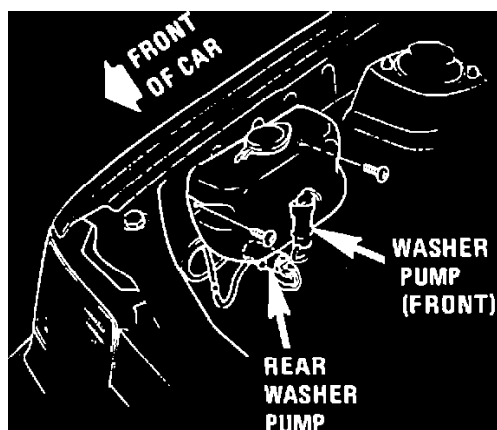
Under I/P Components

Behind LH Side Of I/P

## Warning Buzzer

Behind LH Side Of I/P

## Washer Pump

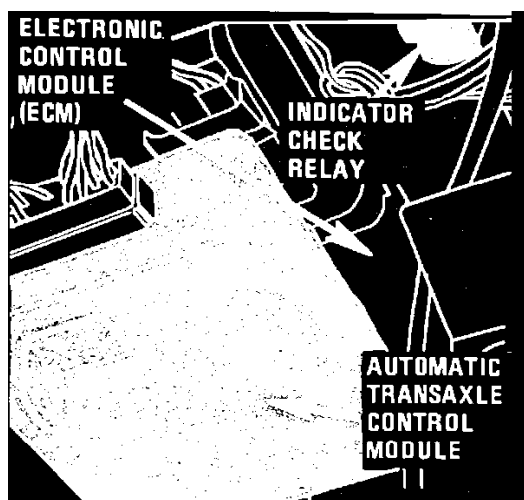


Right Front Corner Of Engine Compartment

RH Side Of Engine Compartment

Applicable to: Non-Turbo

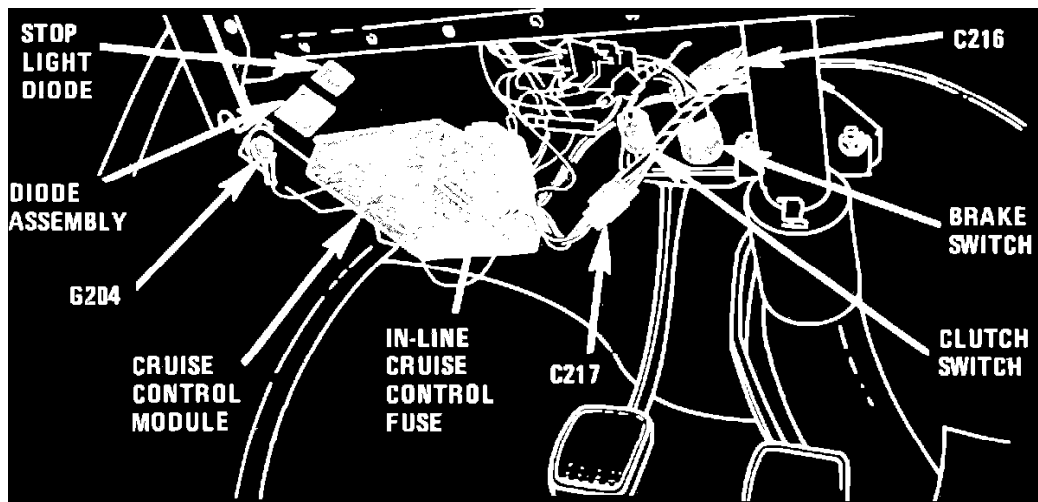
## Automatic Transaxle Control Module



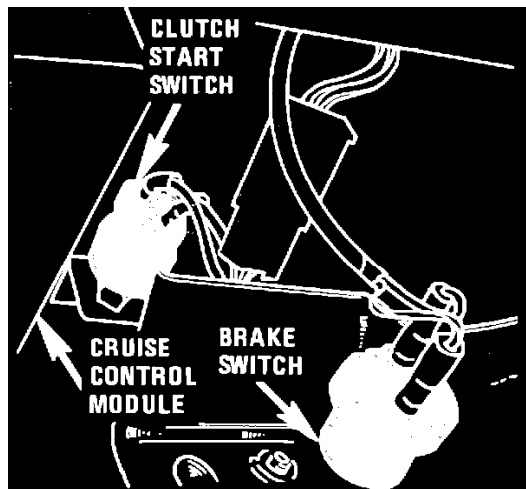
Behind Left Side I/P Components

Behind Left Side Of I/P

## Cruise Control Module



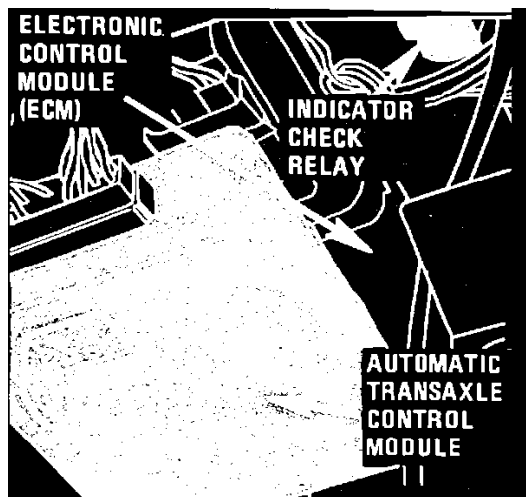
Under I/P Components



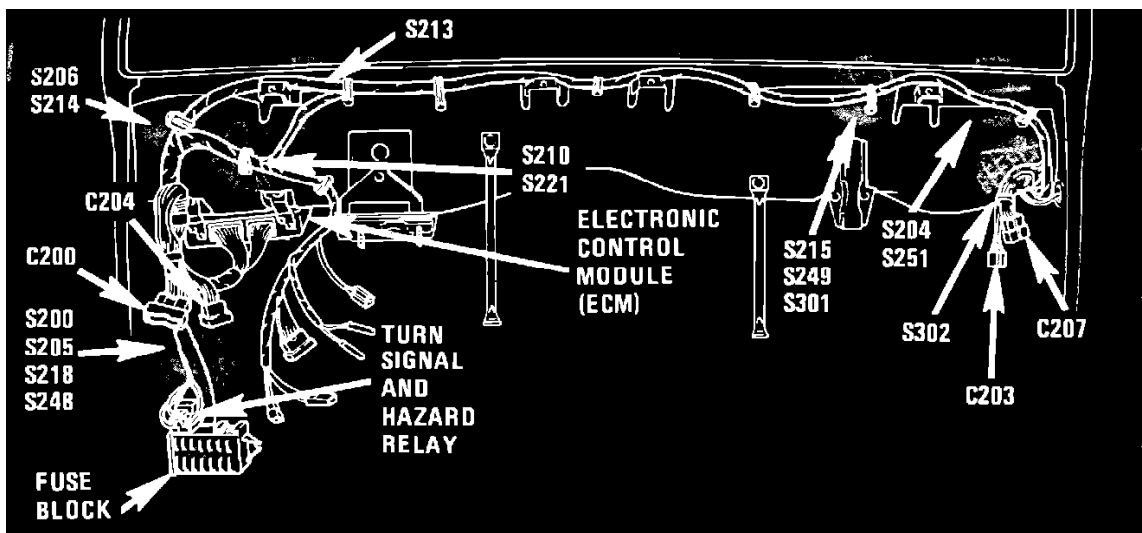
Under Left Side I/P Components

LH Side Of I/P

## Electronic Control Module (ECM)

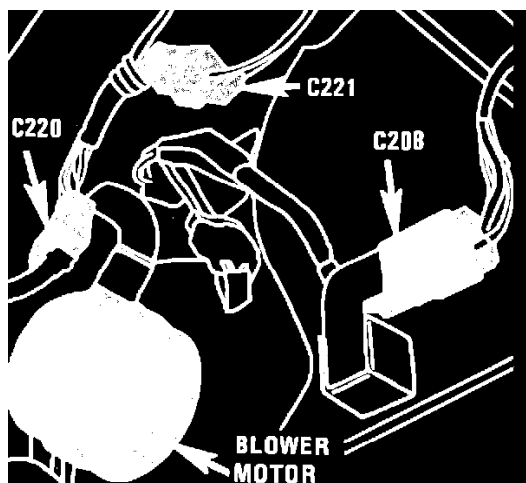


Behind Left Side I/P Components

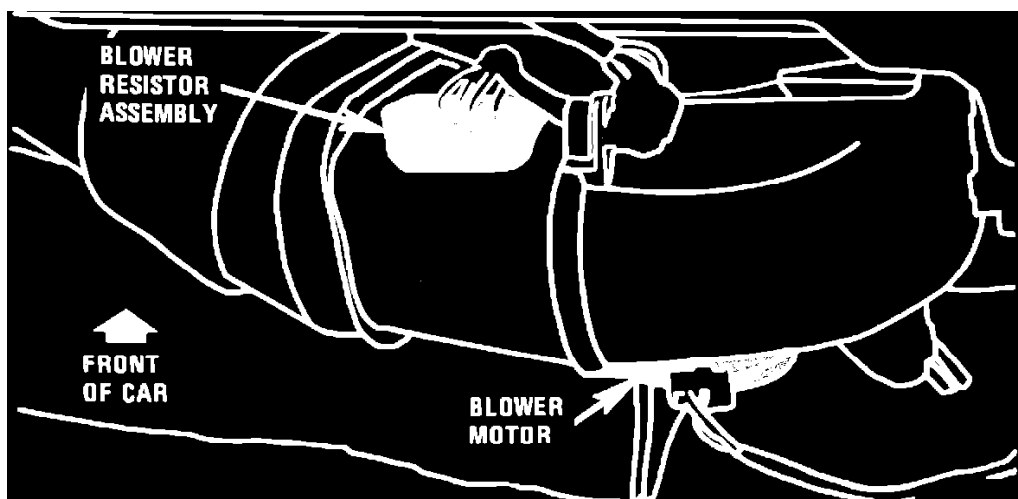


Lower I/P Splices & Connectors

Behind LH Side Of I/P  
**Blower Motor**



Under Right Side I/P Connectors



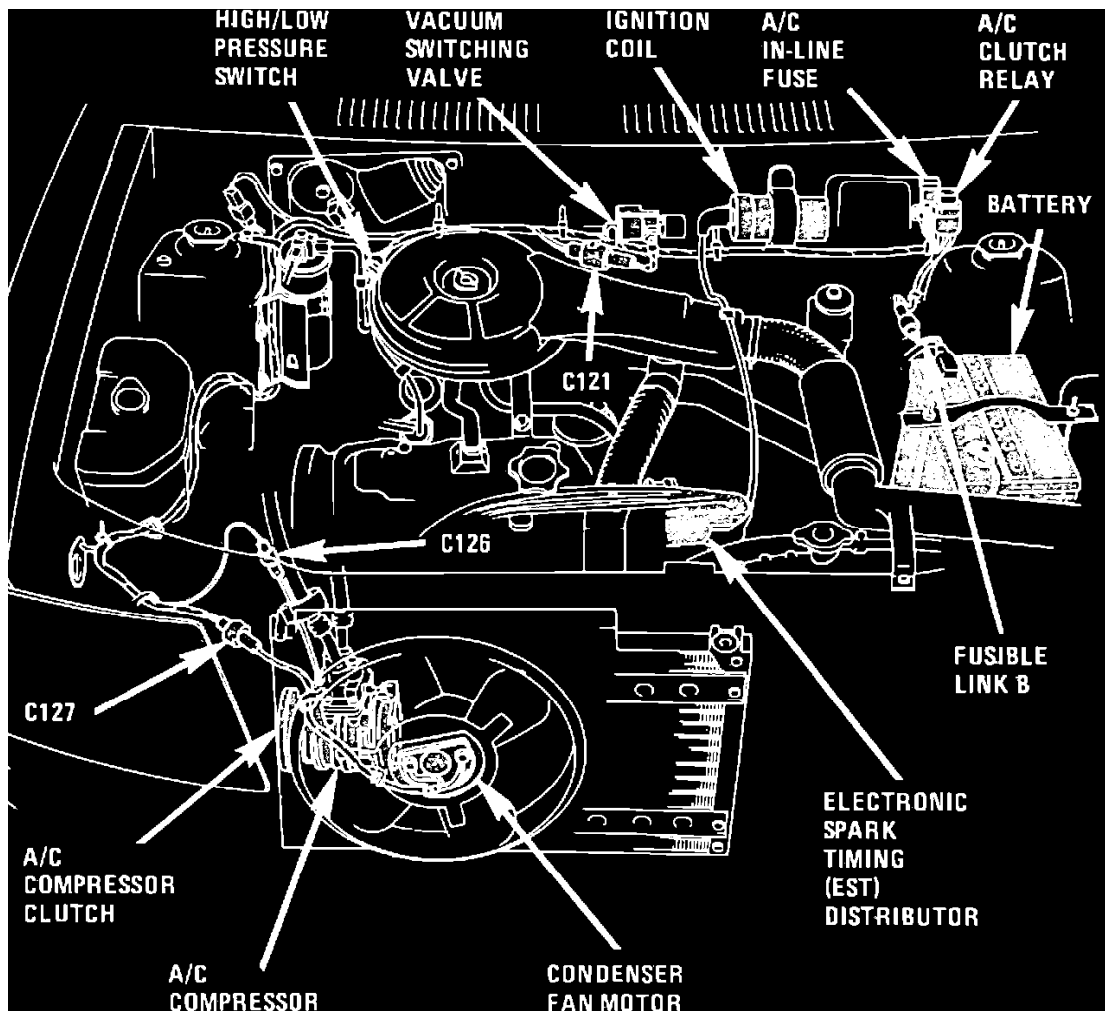
Under Right Side I/P Components

Behind Right Side Of I/P  
**Condenser Fan Motor**



Diagram illustrating the engine compartment components and their locations, labeled as follows:

- HIGH/LOW PRESSURE SWITCH
- VACUUM SWITCHING VALVE
- IGNITION COIL
- A/C IN-LINE FUSE
- A/C CLUTCH RELAY
- BATTERY
- FUSIBLE LINK B
- ELECTRONIC SPARK TIMING (EST) DISTRIBUTOR
- CONDENSER FAN MOTOR
- A/C COMPRESSOR
- A/C COMPRESSOR CLUTCH
- C126
- C127
- C121

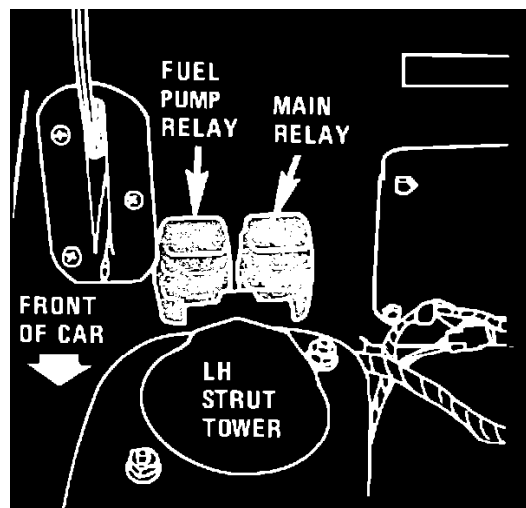


Engine Compartment

LH Side Of Engine Compartment Mounted To Cowl

Applicable to: Non-Turbo

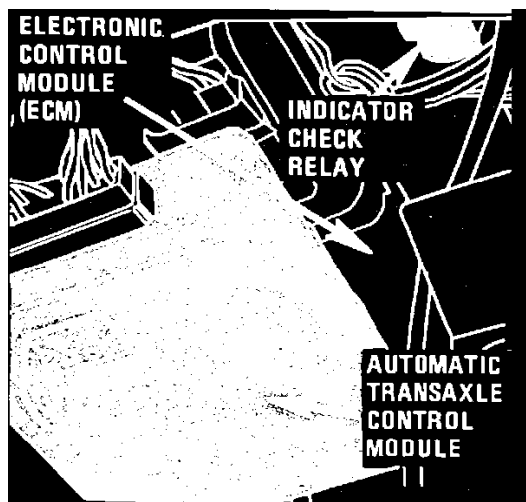
## Fuel Pump Relay



Right Side Strut Tower Components

Right Rear Corner Of Engine Compartment

## Indicator Check Relay



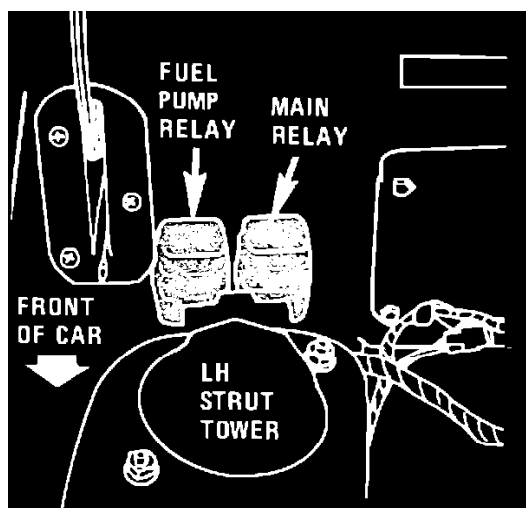
Behind Left Side I/P Components

Behind LH Side Of I/P

## Magnetic Clutch Relay

Left Rear Corner Of Engine Compartment Next To Ignition Coil

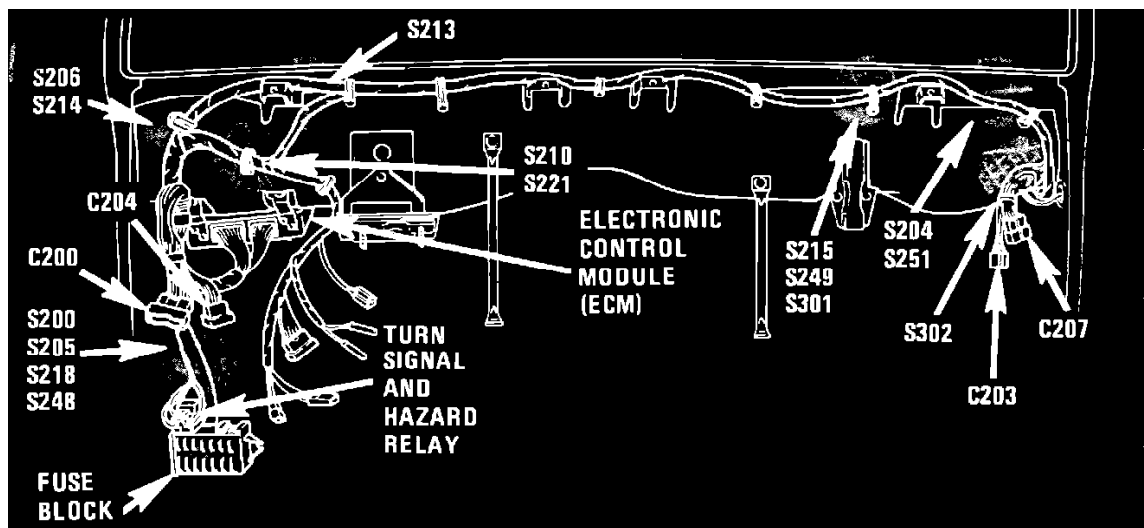
## Main Relay



Right Side Strut Tower Components

Right Rear Corner Of Engine Compartment

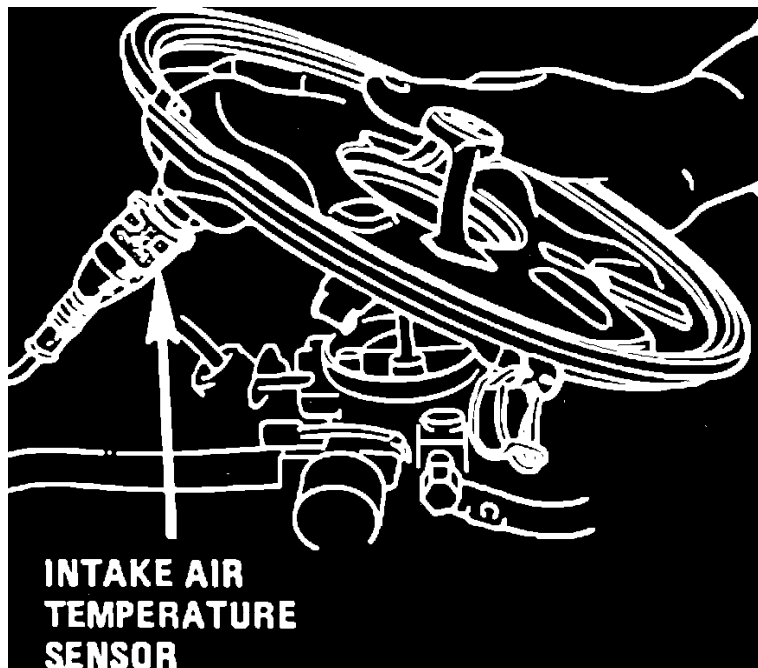
## Turn Signal & Hazard Relay



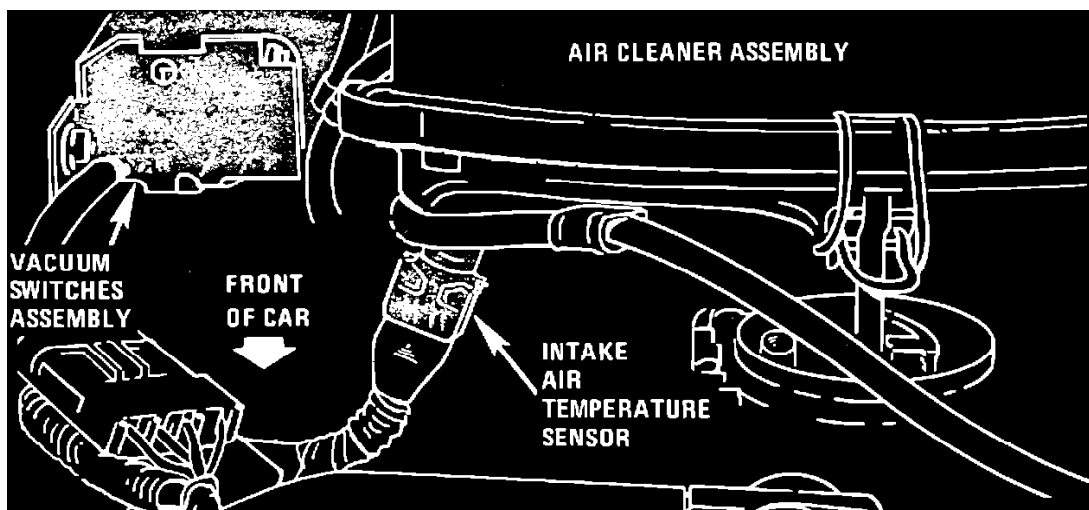
Lower I/P Splices & Connectors

Under LH Side Of I/P, Mounted To Fuse Block

## Intake Air Temperature (IAT) Sensor



Top Of Engine



Top Right Side Of Engine

Mounted On Bottom Of Air Cleaner

Applicable to: Non-Turbo

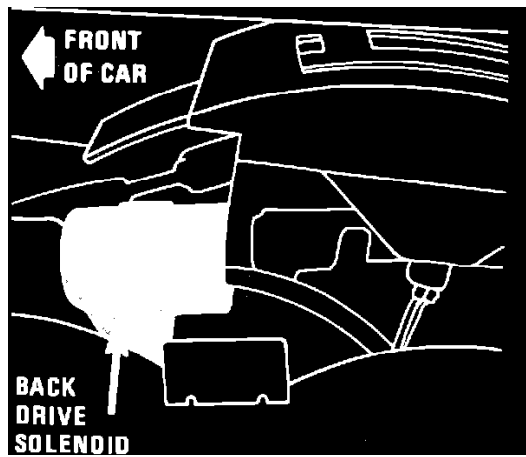
### Knock Sensor

Mounted Above Starter Solenoid

### Oxygen Sensor

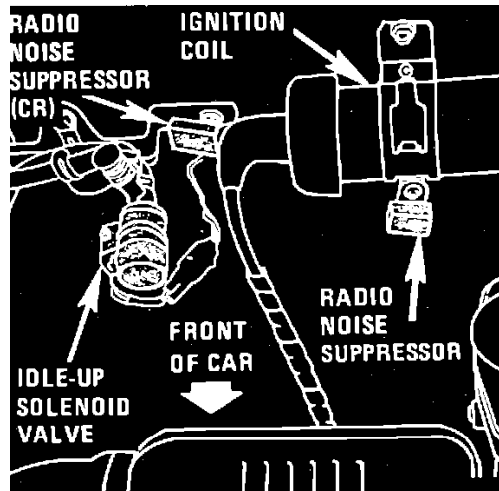
Front Of Engine Mounted To Exhaust Manifold

### Back Drive Solenoid



Under Console Components

Under Center Console  
**Idle-Up Solenoid Valve**



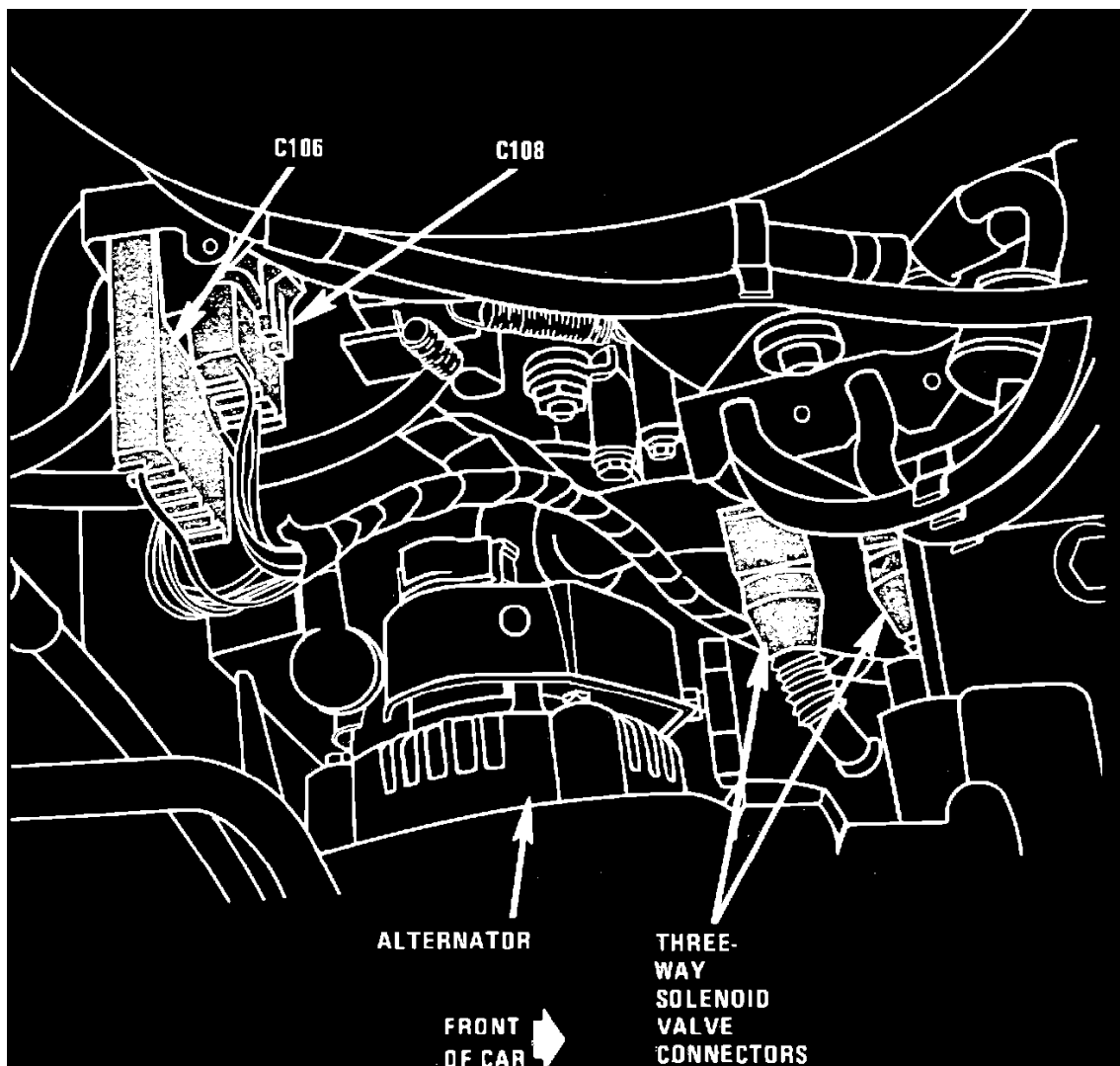
Left Side Of Cowl

Rear Of Engine Compartment, Mounted To Center Of Cowl

**Starter Solenoid**

Bottom Rear Of Engine

**Three-Way Solenoid Valve**



Lower Right Side Of Engine

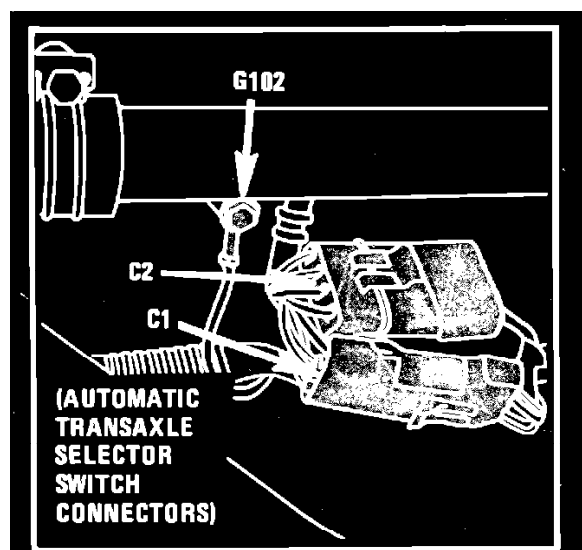
RH Side Of Engine

Applicable to: Non-Turbo

**Acceleration Switch**

Behind Acceleration Pedal

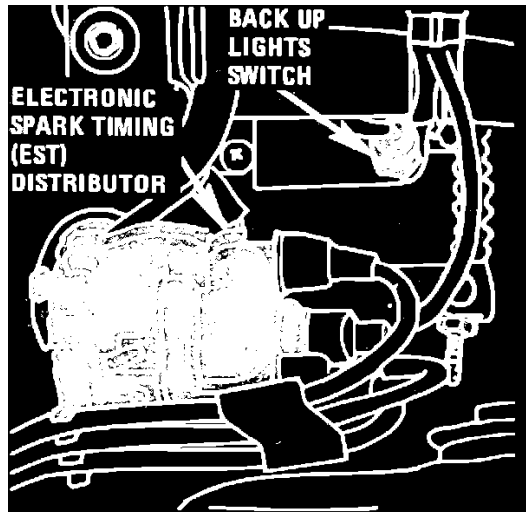
**Automatic Transaxle Selector Switch**



Top Of Transaxle

Mounted To Top Of Transaxle

**Back-Up Lamp Switch**



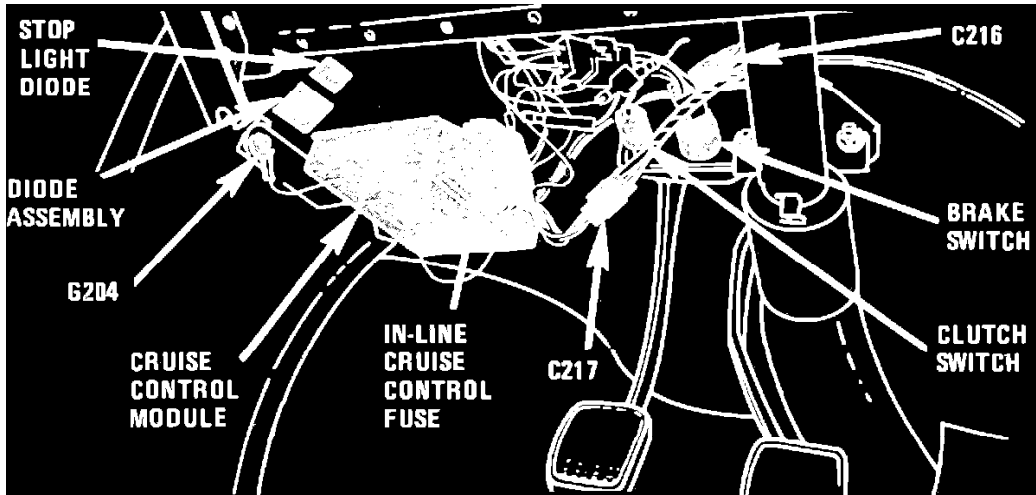
Left Front Of Engine

Mounted To Top Of Transaxle

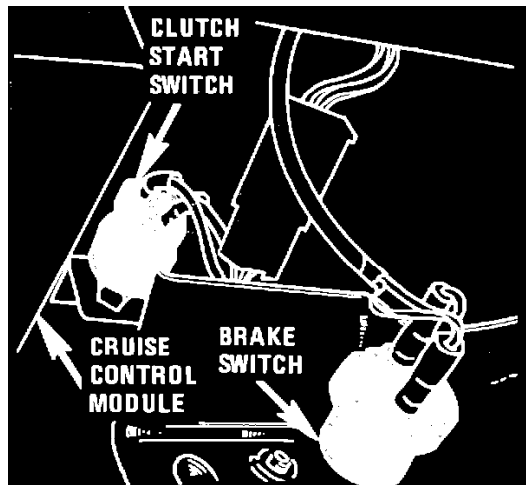
## Brake Fluid Level Switch

LH Side Of Engine Compartment

## Brake Switch



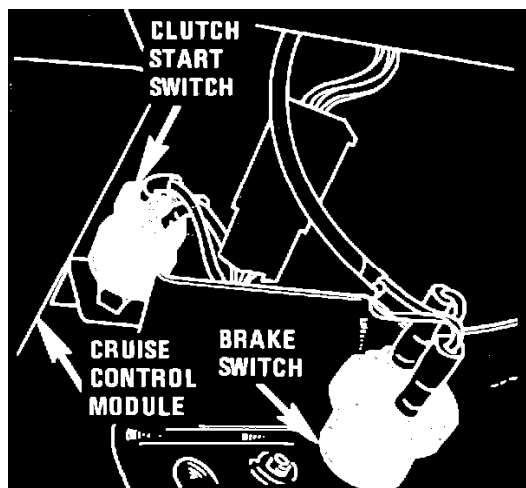
Under I/P Components



Under Left Side I/P Components

Mounted To Brake Pedal Support

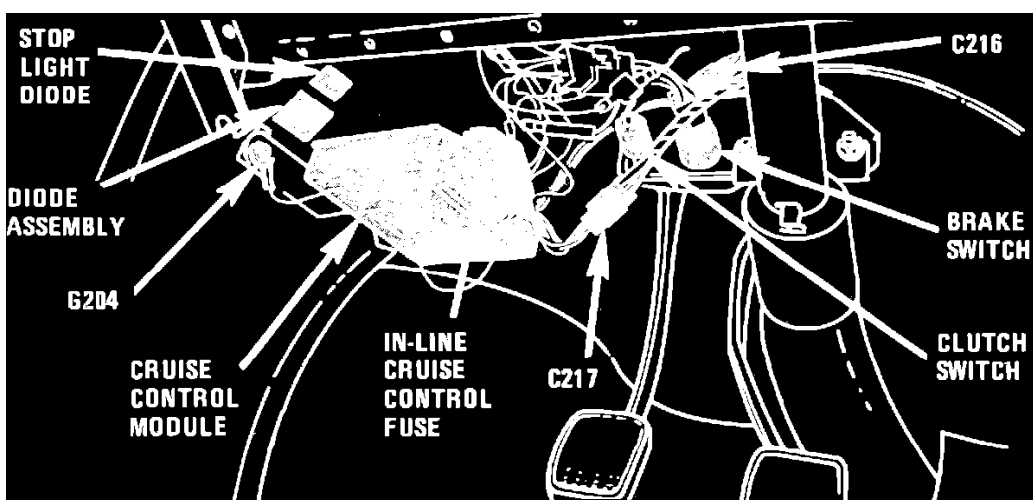
## Clutch Start Switch



Under Left Side I/P Components

Mounted To Clutch Pedal Support

## Clutch Switch



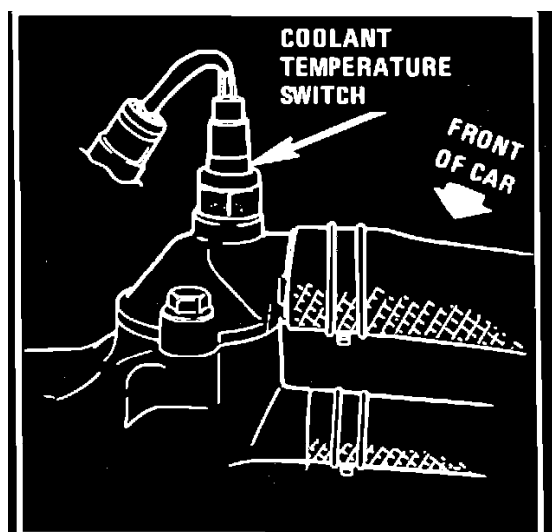
Under I/P Components

Mounted To Clutch Pedal Support

## Combination Switch

LH Side Of Steering Column

## Coolant Temperature Switch

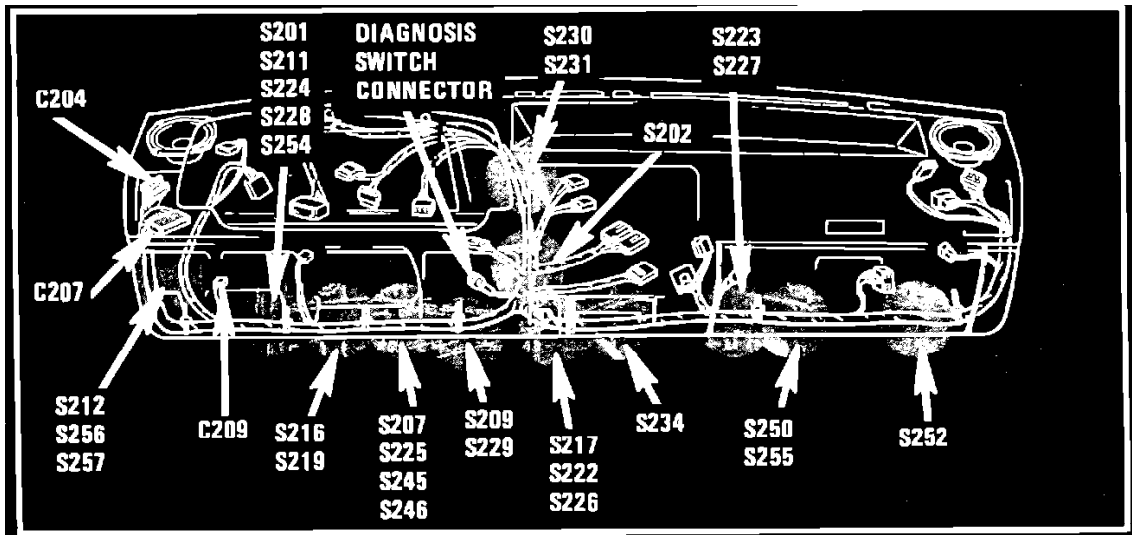


Top Center Of Engine

Mounted To Top Of Thermostat Housing

## Diagnosis Switch





Behind I/P Splices & Connectors

Behind LH Side Of I/P

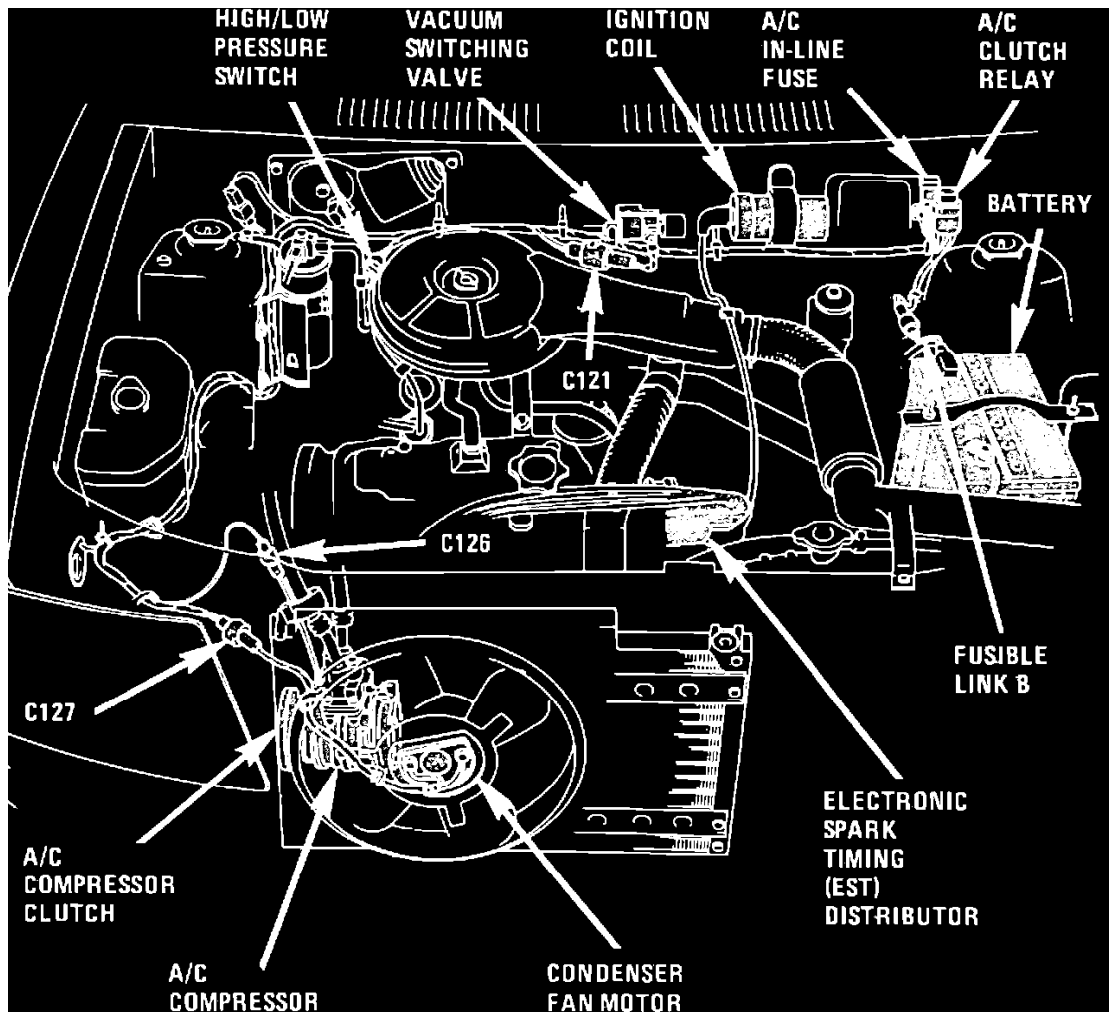
### Door Jamb Switches

Mounted In Each Door Jamb

### Headlight Dimmer Switch

Mounted To Bottom Of Steering Column

### High/Low Pressure Switch



Engine Compartment

Right Rear Of Engine Compartment, Mounted To A/C Line

Applicable to: Non-Turbo

### Idle Micro Switch

Top Of Engine, Mounted On Carburetor

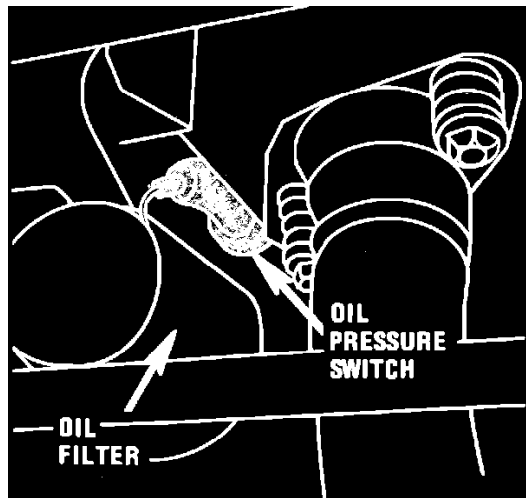
## Ignition Key Warning Switch

RH Side Of Steering Column

## Ignition Switch

RH Side Of Steering Column

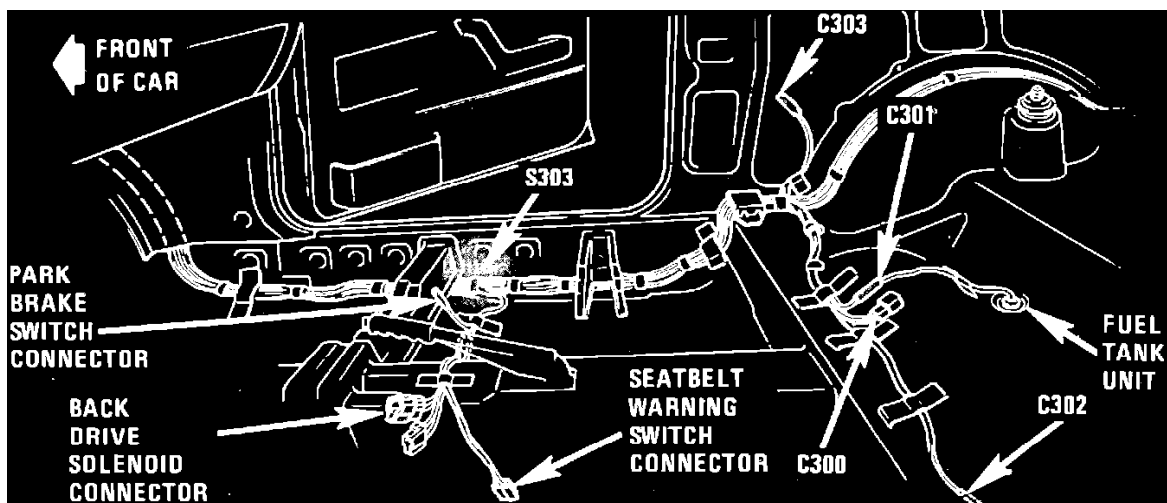
## Oil Pressure Switch



Lower Front Of Engine

Front Of Engine Near Oil Filter

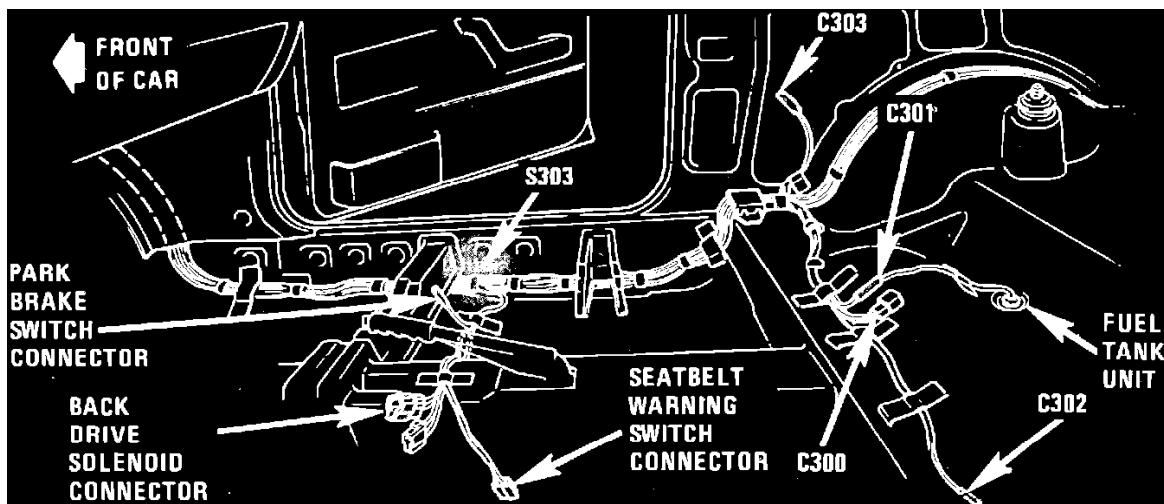
## Park Brake Switch



Passenger Compartment Splices & Connectors

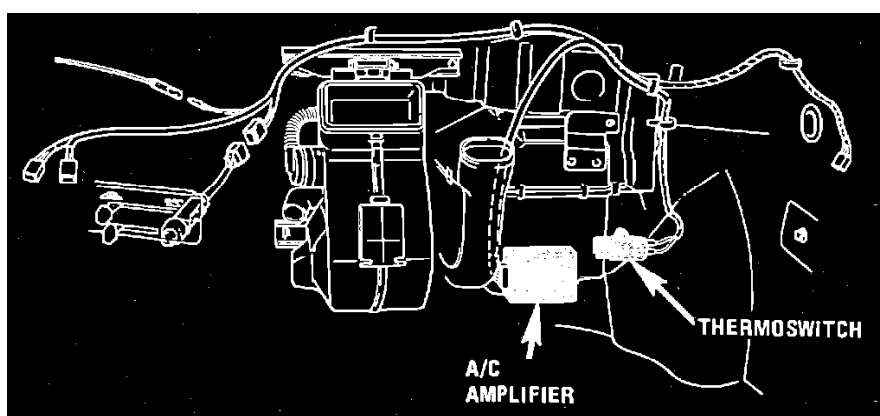
Under Center Console

## Seat Belt Warning Switch



Passenger Compartment Splices & Connectors

In Left Seat Belt Buckle  
**Thermoswitch**



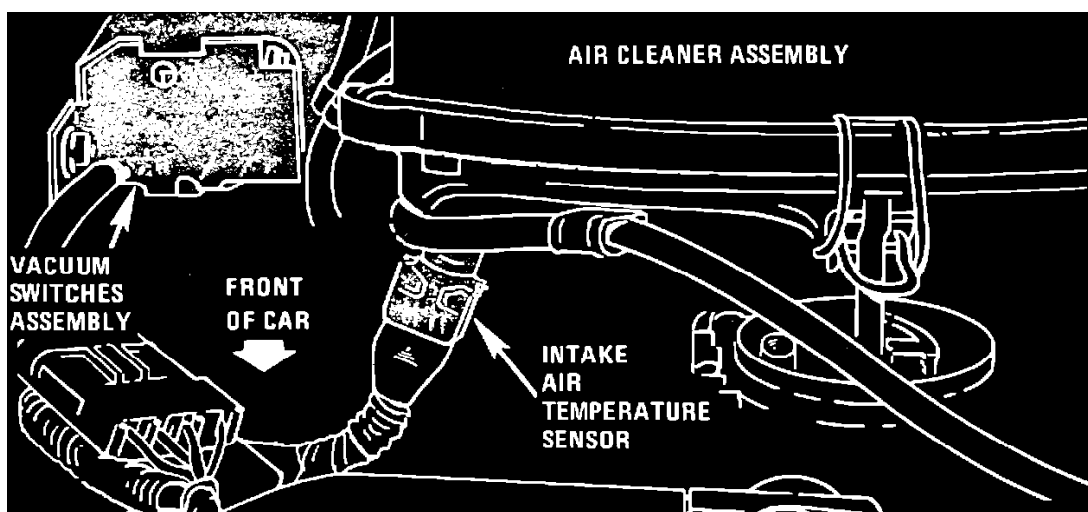
A/C Components Under I/P

Behind RH Side Of I/P

**Vacuum Switch**

RH Side Of Dash

**Vacuum Switches Assembly**

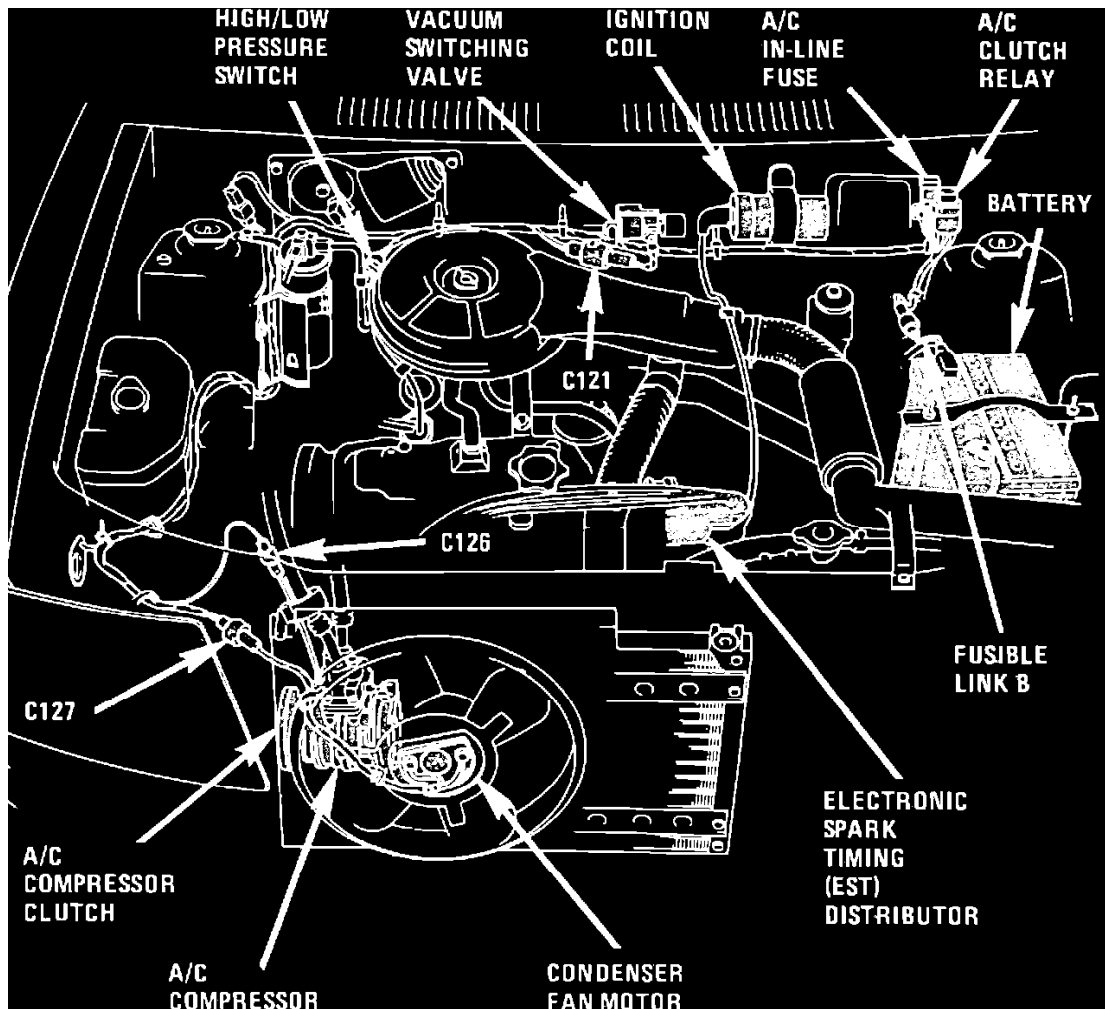


Top Right Side Of Engine

RH Side Of Engine Compartment

Applicable to: Non-Turbo

**Vacuum Switching Valve**



**Engine Compartment**

Rear Of Engine Compartment, Mounted To Center Of Cowl

Applicable to: Non-Turbo

## **Wide Open Throttle Switch**

Mounted On Carburetor

### **C100-C199**

**Connector C100:** LH Side Of Engine Compartment Near Strut Tower

**Connector C101:** Left Front Corner Of Engine Compartment

**Connector C102:** LH Side Of Engine Compartment Near Strut Tower

**Connector C103:** LH Side Of Engine Compartment Near Strut Tower

**Connector C104:** Left Front Corner Of Engine Compartment

**Connector C105:** Left Front Corner Of Engine Compartment

**Connector C106:** RH Side Of Engine

**Connector C107:** Left Front Corner Of Engine Compartment

**Connector C108:** RH Side Of Engine

**Connector C109:** Top Of Engine

**Connector C110:** LH Side Of Engine Compartment Near Strut Tower

**Connector C111:** LH Side Of Engine Compartment Near Strut Tower

**Connector C112:** LH Side Of Engine Compartment Near Strut Tower

**Connector C113:** LH Side Of Engine Compartment Front Of Strut Tower

**Connector C115:** Left Front Corner Of Engine Compartment

**Connector C116:** Right Front Corner Of Engine Compartment

**Connector C117:** Left Front Corner Of Engine Compartment

**Connector C118:** Right Front Corner Of Engine Compartment

**Connector C121:** Center Of Engine Compartment Mounted To Cowl

**Connector C122:** Left Front Corner Of Engine Compartment

**Connector C123:** Right Front Corner Of Engine Compartment

**Connector C124:** Top Of Transaxle

**Connector C126:** Right Front Corner Of Engine Compartment

**Connector C127:** Upper RH Side Of Radiator

**Connector C128:** LH Side Of Engine Compartment Near Strut Tower

## **C200-C299**

**Connector C200:** LH Side Of I/P, Near Fuse Block

**Connector C201:** LH Side Of I/P, Above Brake Pedal

**Connector C202:** RH Side Of I/P

**Connector C203:** RH Side Of I/P

**Connector C204:** LH Side Of I/P, Near Fuse Block

**Connector C205:** RH Side Of I/P

**Connector C206:** RH Side Of I/P

**Connector C207:** RH Side Of I/P

**Connector C208:** RH Side Of I/P

**Connector C209:** LH Side Of I/P

**Connector C210:** LH Side Of I/P, Above Brake Pedal

**Connector C212:** LH Side Of I/P, Near Wiper Switch

**Connector C213:** LH Side Of I/P, Near Light Switch

**Connector C215:** LH Side Of I/P

**Connector C216:** LH Side Of I/P, Near Brake Switch

**Connector C217:** LH Side Of I/P, Near Cruise Control Module

**Connector C218:** LH Side Of I/P

**Connector C219:** LH Side Of I/P

**Connector C220:** RH Side Of I/P

**Connector C221:** RH Side Of I/P

**Connector C222:** LH Side Of I/P

**Connector C223:** LH Side Of I/P, Above Brake Pedal

**Connector C224:** LH Side Of I/P

**Connector C225:** LH Side Of I/P

**Connector C226:** LH Side Of I/P

## **C300-C399**

**Connector C300:** Under Right Rear Seat

**Connector C301:** Under Right Rear Seat

**Connector C302:** Behind Left Rear Inner Trim Panel

**Connector C303:** Behind Right Rear Inner Trim Panel

## **C400-C499**

**Connector C400:** Right Rear Corner Of Cargo Compartment

**Connector C401:** Left Rear Comer Of Cargo Compartment

**Connector C402:** Behind Rear Hatch Trim Panel

**Connector C403:** Behind Rear Hatch Trim Panel

**Connector C405:** Left Rear Corner Of Cargo Compartment

**Connector C406:** Left Rear Corner Of Cargo Compartment

**Connector C407:** Right Rear Corner Of Cargo Compartment

**Connector C408:** Behind Rear Hatch Trim Panel

**Connector C409:** Right Rear Corner Of Cargo Compartment

**Connector C410:** Behind Rear Hatch Trim Panel

**Connector C411:** Behind Rear Hatch Trim Panel

**Connector C412:** Left Rear Corner Of Cargo Compartment

**Connector C413:** Left Rear Corner Of Cargo Compartment

**Connector C414:** Behind Rear Hatch Trim Panel

**Connector C415:** Behind Rear Hatch Trim Panel

## **Fuse and Fusible Link Locations**

**Fuse Block:** Behind LH Side Of I/P

**Fusible Link A:** LH Side Of Engine Compartment

**Fusible Link B:** LH Side Of Engine Compartment

**Fusible Link C:** LH Side Of Engine Compartment

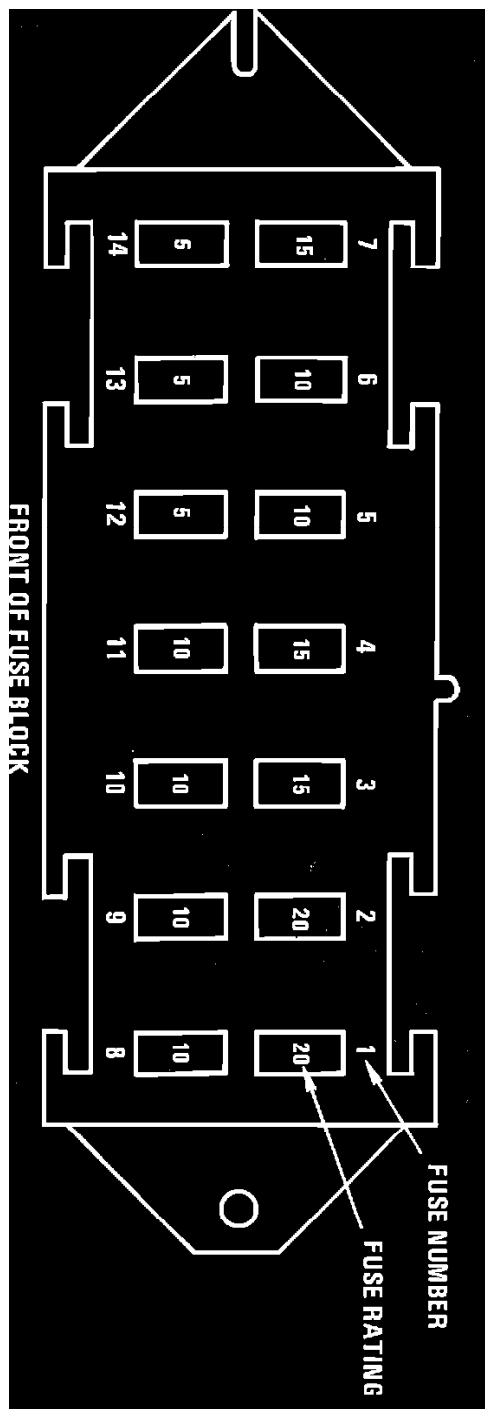


Fig. 1 Fuse Block

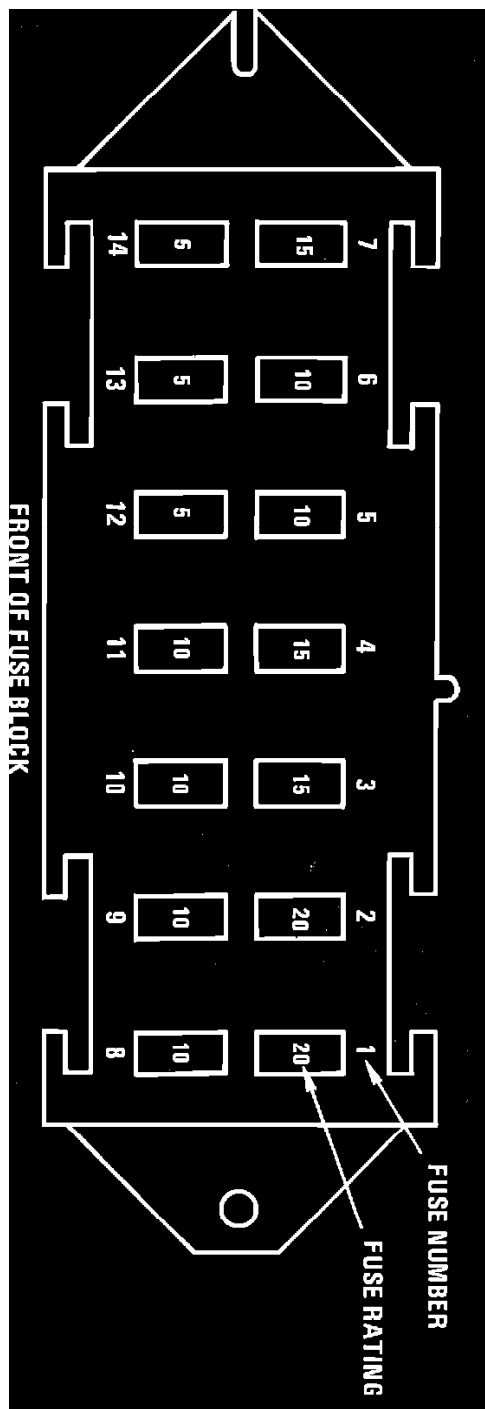


Fig. 1 Fuse Block

## G100-G199

**Ground G100:** Left Front Corner Of Engine Compartment

**Ground G102:** Top Of Transaxle

**Ground G103:** Right Front Corner Of Engine Compartment

**Ground G104:** LH Side Of Engine Compartment Near Ignition Coil

**Ground G105:** RH Side Of Engine Compartment Near Wiper Motor

**Ground G106:** Top Of Transaxle

**Ground G107:** Left End Of Transaxle

**Ground G108:** Left Front Corner Of Engine Compartment

**Ground G109:** Right Front Corner Of Engine Compartment



**Ground G110:** Left Front Corner Of Engine Compartment

**Ground G112:** Rear Of Transaxle

**Ground G113:** Right Rear Corner Of Engine Compartment

**Ground G114:** RH Side, Mounted To Rear Of Engine

## **G200-G299**

**Ground G200:** Behind RH Side Of I/P

**Ground G201:** Behind LH Side Of I/P

**Ground G202:** Behind LH Side Of I/P, Near Fuse Block

**Ground G204:** Behind LH Side Of I/P

## **G400-G499**

**Ground G400:** Behind Rear Hatch Panel

**Ground G401:** Behind Rear Hatch Panel

**Ground G402:** Left Rear Corner Of Cargo Compartment

**Ground G403:** Right Rear Corner Of Cargo Compartment

## **S100-S199**

**Splice S100:** Engine Harness, Top Of Transaxle

**Splice S101 (Non-Turbo):** Engine Harness, Top Of Transaxle

**Splice S101 (Turbo):** Engine Harness, Top Of Engine

**Splice S102 (Non-Turbo):** Main Harness, Left Front Corner Of Engine Compartment

**Splice S102 (Turbo):** Main Harness, Left Front Corner Of Engine Compartment

**Splice S103 (Non-Turbo):** Main Harness, Outside Of Left Inner Fender Panel

**Splice S103 (Turbo):** Main Harness, LH Side Of Engine Compartment

**Splice S104 (Non-Turbo):** Main Harness, Left Front Corner Of Engine Compartment

**Splice S104 (Turbo):** Behind LH Side Of I/P

**Splice S105 (Non-Turbo):** Main Harness, Left Front Corner Of Engine Compartment

**Splice S105 (Turbo):** Main Harness, LH Side Of Engine Compartment

**Splice S106:** Main Harness, LH Side Of Engine Compartment

**Splice S107:** Main Harness, Left Front Corner Of Engine Compartment

**Splice S108:** Engine Harness, Top Of Engine

**Splice S109:** Main Harness, Outside Of Left Inner Fender Panel

**Splice S110:** Main Harness, Left Front Corner Of Engine Compartment

**Splice S111:** Main Harness, Outside Of Right Inner Fender Panel

**Splice S112 (Non-Turbo):** Main Harness, Outside Of Left Inner Fender Panel

**Splice S112 (Turbo):** Main Harness, LH Side Of Cowl

**Splice S113 (Non-Turbo):** Main Harness, LH Side Of Engine Compartment Near Strut Tower

**Splice S113 (Turbo):** Main Harness, LH Side Of Cowl

**Splice S114 (Non-Turbo):** Main Harness, LH Side Of Engine Compartment Near Strut Tower

**Splice S114 (Turbo):** Main Harness, LH Side Of Cowl

**Splice S115:** Main Harness, Left Front Corner Of Engine Compartment

**Splice S116:** Engine Harness, Top Of Engine

**Splice S117:** Engine Harness, Top Of Transaxle

**Splice S118:** Main Harness, Outside Of Right Inner Fender Panel

el

**Splice S119:** Main Harness, Outside Of Right Inner Fender Panel

**Splice S123:** Injector Harness, Top Of Engine

**Splice S124:** Injector Harness, Top Of Engine

**Splice S125:** Main Harness, Right Rear Corner Of Engine Compartment

**Splice S126:** Engine Harness, Top Of Engine

**Splice S127:** Engine Harness, Top Of Engine

**Splice S128:** Main Harness, Outside Of Left Inner Fender Panel

**Splice S129:** Main Harness, Outside Of Right Inner Fender Panel

**Splice S130:** Main Harness, Outside Of Left Inner Fender Panel

**Splice S131:** Main Harness, Left Front Corner Of Engine Compartment

**Splice S132:** Engine Harness, Top Of Engine

**Splice S133:** Main Harness, Behind LH Side Of I/P

**Splice S134:** Engine Harness, LH Side Of Engine Compartment

**Splice S135:** Main Harness, Outside Right Inner Fender Panel

**Splice S137:** Main Harness, Outside Right Inner Fender Panel

**Splice S140:** Main Harness, Outside Left Inner Fender Panel

**Splice S141:** Main Harness, Outside Left Inner Fender Panel

**Splice S142:** Main Harness, LH Side Of Engine Compartment

**Splice S143:** Main Harness, LH Side Of Engine Compartment

**Splice S144:** Main Harness, LH Side Of Engine Compartment

**Splice S145:** Main Harness, LH Side Of Engine Compartment

**Splice S146:** Main Harness, LH Side Of I/P

**Splice S147:** Main Harness, LH Side Of I/P

**Splice S148:** Main Harness, LH Side Of I/P

**Splice S149:** Engine Harness, Top Of Engine

**Splice S150:** Main Harness, Right Front Corner Of Engine Compartment

**Splice S151:** Main Harness, LH Side Of I/P

## **S200-S299**

- Splice S200:** Main Harness, LH Side Of I/P
- Splice S201:** I/P Harness, Behind Left Side Of I/P
- Splice S202:** I/P Harness, Behind Left Side Of I/P
- Splice S204:** Main Harness, Behind Right Side Of I/P
- Splice S205:** Main Harness, Behind Left Side Of I/P
- Splice S206:** Main Harness, Behind Left Side Of I/P
- Splice S207:** I/P Harness, Behind Left Side Of I/P
- Splice S208:** I/P Harness, Behind Left Side Of I/P
- Splice S209:** I/P Harness, Behind Left Side Of I/P
- Splice S210:** Main Harness, Behind Left Side Of I/P
- Splice S211:** I/P Harness, Behind Left Side Of I/P
- Splice S212:** I/P Harness, Behind Left Side Of I/P
- Splice S213:** Main Harness, Behind Left Side Of I/P
- Splice S214:** Main Harness, Behind Left Side Of I/P
- Splice 8215:** Main Harness, Behind Right Side Of I/P
- Splice S216:** Main Harness, Behind Left Side Of I/P
- Splice S217:** Main Harness, Behind Center Of I/P
- Splice S218:** Main Harness, Behind Left Side Of I/P
- Splice S219:** I/P Harness, Behind Left Side Of I/P
- Splice S221:** Main Harness, Behind Left Side Of I/P
- Splice S222:** I/P Harness, Behind Center Of I/P
- Splice S223:** I/P Harness, Behind Right Side Of I/P
- Splice S224:** I/P Harness, Behind Left Side Of I/P
- Splice S225:** I/P Harness, Behind Left Side Of I/P
- Splice S226:** I/P Harness, Behind Center Of I/P
- Splice S227:** I/P Harness, Behind Right Side Of I/P
- Splice S228:** I/P Harness, Behind Left Side Of I/P
- Splice S229:** I/P Harness, Behind Left Side Of I/P
- Splice S230:** I/P Harness, Behind Left Side Of I/P
- Splice S231:** I/P Harness, Behind Left Side Of I/P
- Splice S234:** I/P Harness, Behind Center Of I/P
- Splice S236:** I/P Harness, Behind Right Side Of I/P
- Splice S238:** Engine Harness, Top Of Engine

**Splice S239:** Engine Harness, Top Of Engine

**Splice S241:** I/P Harness, Behind Center Of I/P

**Splice S242:** Main Harness, Behind Left Side Of I/P

**Splice S243:** Main Harness, Right Side Of Engine Compartment

**Splice S244:** Main Harness, Behind Left Side Of I/P

**Splice S245:** I/P Harness, Behind Left Side Of I/P

**Splice S246:** I/P Harness, Behind Left Side Of I/P

**Splice S247:** Main Harness, Behind Left Side Of I/P

**Splice S248:** Main Harness, Behind Left Side Of I/P

**Splice S249:** Main Harness, Behind Right Side Of I/P

**Splice S250:** I/P Harness, Behind Right Side Of I/P

**Splice S251:** Main Harness, Behind Right Side Of I/P

**Splice S252:** I/P Harness, Behind Right Side Of I/P

**Splice S253:** Main Harness, Behind Left Side Of I/P

**Splice S254:** I/P Harness, Behind Left Side Of I/P

**Splice S255:** I/P Harness, Behind Right Side Of I/P

**Splice S256:** I/P Harness, Behind Left Side Of I/P

**Splice S257:** I/P Harness, Behind Left Side Of I/P

**Splice S258:** Main Harness, Behind Left Side Of I/P

**Splice S259:** Main Harness, Behind Left Side Of I/P

**Splice S260:** Main Harness, Behind Left Side Of I/P

**Splice S261:** Main Harness, Behind Left Side Of I/P

**Splice S263:** Main Harness, Behind Left Side Of I/P

**Splice S264:** Main Harness, Behind Left Side Of I/P

**Splice S265:** Main Harness, Behind Left Side Of I/P

**Splice S268:** I/P Harness, Behind Left Side Of I/P

**Splice S269:** Main Harness, LH Side Of Engine Compartment

**Splice S274:** Main Harness, LH Side Of Engine Compartment

**Splice S277:** I/P Harness, Behind Left Side Of I/P

## **S400-S499**

**Splice S400:** Rear Harness, Right Rear Corner Of Cargo Compartment

**Splice S401:** Rear Hatch Harness, Center Of Rear Hatch

**Splice S402:** Rear Harness, Right Rear Corner Of Cargo Compartment

**Splice S403:** Rear Harness, Left Rear Corner Of Cargo Compartment

**Splice S404:** Rear Hatch Harness, Center Of Rear Hatch

**Splice S405:** Rear Harness, Left Rear Corner Of Cargo Compartment

**Splice S406:** Rear Harness, Right Rear Corner Of Cargo Compartment

**Splice S407:** Rear Hatch Harness, Left Rear Corner Of Cargo Compartment

**Splice S408:** Rear Hatch Harness, Left Rear Corner Of Cargo Compartment

**Splice S410:** Rear Hatch Harness, Left Rear Corner Of Cargo Compartment

**Splice S411:** Rear Hatch Harness, Left Rear Corner Of Cargo Compartment

## Computers and Control Systems: Flow of Diagnosis

1. Following a Flow of Diagnosis will usually lead to the correct test procedure and help repair the problem.
2. **The Diagnostic Circuit Check** under **Computers and Control Systems/System Diagnosis/Procedures** should ALWAYS be performed whether or not a computer related problem is suspected. The "Diagnostic Circuit Check" may reveal computer problems which were not originally suspected. Bypassing this test during diagnosis may lead to replacement of good parts.
3. If test procedures cannot fix the problem (or is not available), you can find additional component and system information in these areas:
  - ^ **A-Charts (System Testing)** - may contain useful system descriptions, circuit description, wiring diagrams or diagnostic notes. Look here to see if the system you are working on has a related system test. You may perform these tests even if you have not been directed (unless otherwise noted).
  - ^ **C-Charts (Component Testing)** - may contain useful component descriptions, circuit description, wiring diagrams or diagnostic notes. Look here to see if the component you are working on has a specific component test. You may perform these tests even if you have not been directed (unless otherwise noted).
  - ^ **Diagnostic Charts** under **Computers and Control Systems/System Diagnosis/Procedures** - may be reviewed for diagnostic notes and circuit descriptions.

### CAUTION:

- Trouble Code charts should **Never** be used to diagnose a component unless that trouble code has been stored.
- Using the trouble code chart without a stored trouble code may lead to incorrect diagnosis and replacement of good parts.
- ^ **Diagnosis by Symptom** - under **Computers and Control Systems/System Diagnosis/Procedures** should be used when no computer related problems appear. Refer to the related system (Computers and Control Systems, Fuel Control Systems, Ignition Control System, etc.).
- ^ **System or Component Descriptions** - Sometimes getting a better idea of HOW the system or component works can help with diagnosis of a problem.

## Computers and Control Systems: Reading and Clearing Diagnostic Trouble Codes

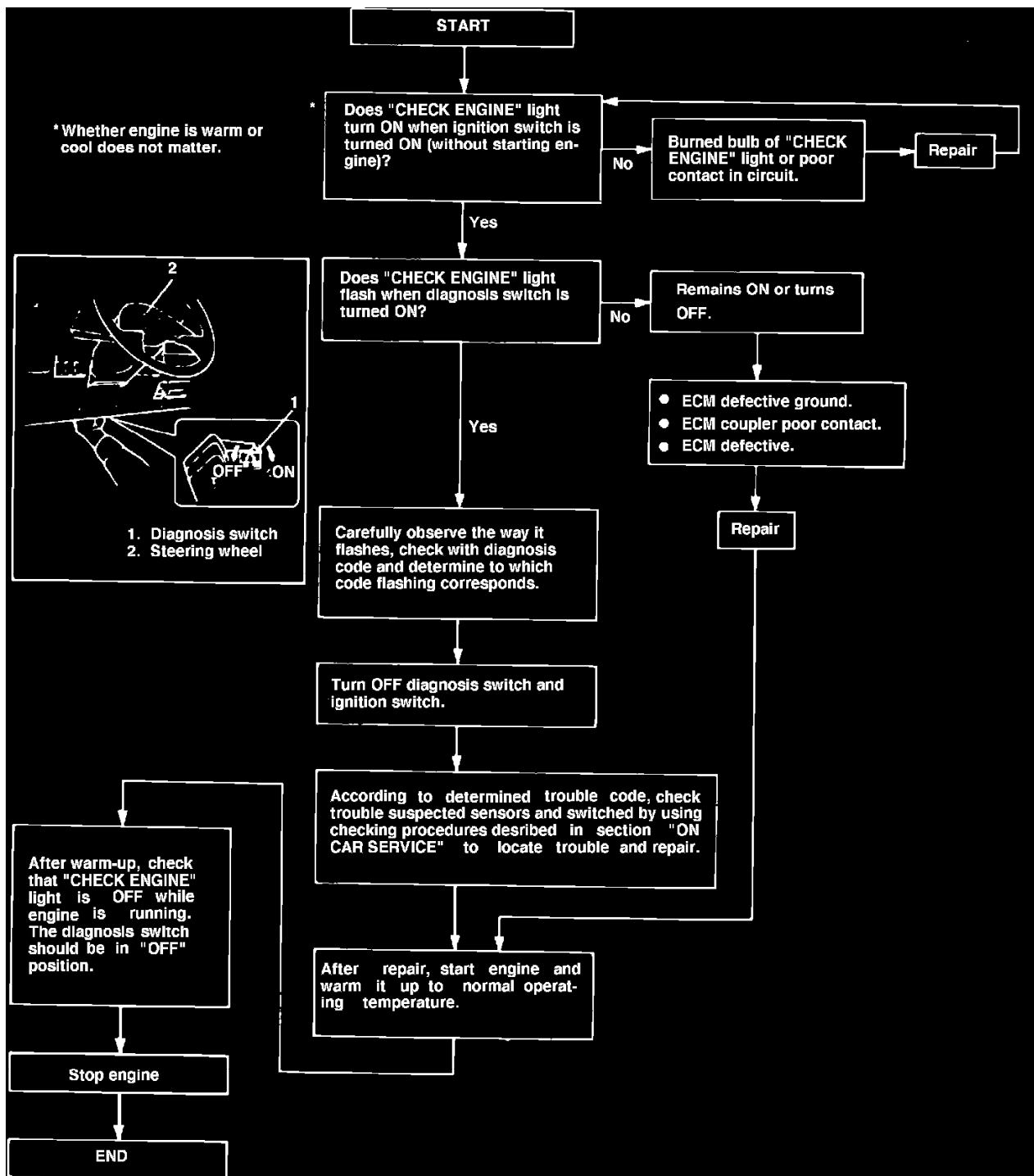


Fig. 36 Engine diagnosis flow chart.












Diagnosis Code No.	System	"CHECK ENGINE" light flashing condition	Trouble
12	Ignition		This code indicates that the diagnosis system functions properly.
13	Oxygen sensor		<ul style="list-style-type: none"> <li>• Oxygen sensor or its circuit faulty.</li> <li>• ECM faulty.</li> </ul>
14	Coolant temp. sensor		<ul style="list-style-type: none"> <li>• Coolant temp. sensor or its circuit faulty.</li> <li>• ECM faulty.</li> </ul>
21	Throttle position switches		<ul style="list-style-type: none"> <li>• Idle/Wide open micro switches or its circuit faulty.</li> <li>• ECM faulty.</li> </ul>
23	Intake air temp. sensor		<ul style="list-style-type: none"> <li>• Intake air temperature sensor or its circuit faulty.</li> <li>• ECM faulty.</li> </ul>
32	Ambient pressure sensor		Ambient pressure sensor (provided in ECM) faulty.
51	ECM		ECM faulty.
52	Fuel cut solenoid		<ul style="list-style-type: none"> <li>• Fuel cut solenoid or its circuit faulty.</li> <li>• ECM faulty.</li> </ul>
53	Second air solenoid		<ul style="list-style-type: none"> <li>• Second air three-way solenoid or its circuit faulty.</li> <li>• ECM faulty.</li> </ul>
54	Mixture control solenoid		<ul style="list-style-type: none"> <li>• Mixture control solenoid or its circuit faulty.</li> <li>• ECM faulty.</li> </ul>
55	Bowl vent solenoid		<ul style="list-style-type: none"> <li>• Bowl vent solenoid or its circuit faulty.</li> <li>• ECM faulty.</li> </ul>

Fig. 37 Interpreting diagnostic codes.



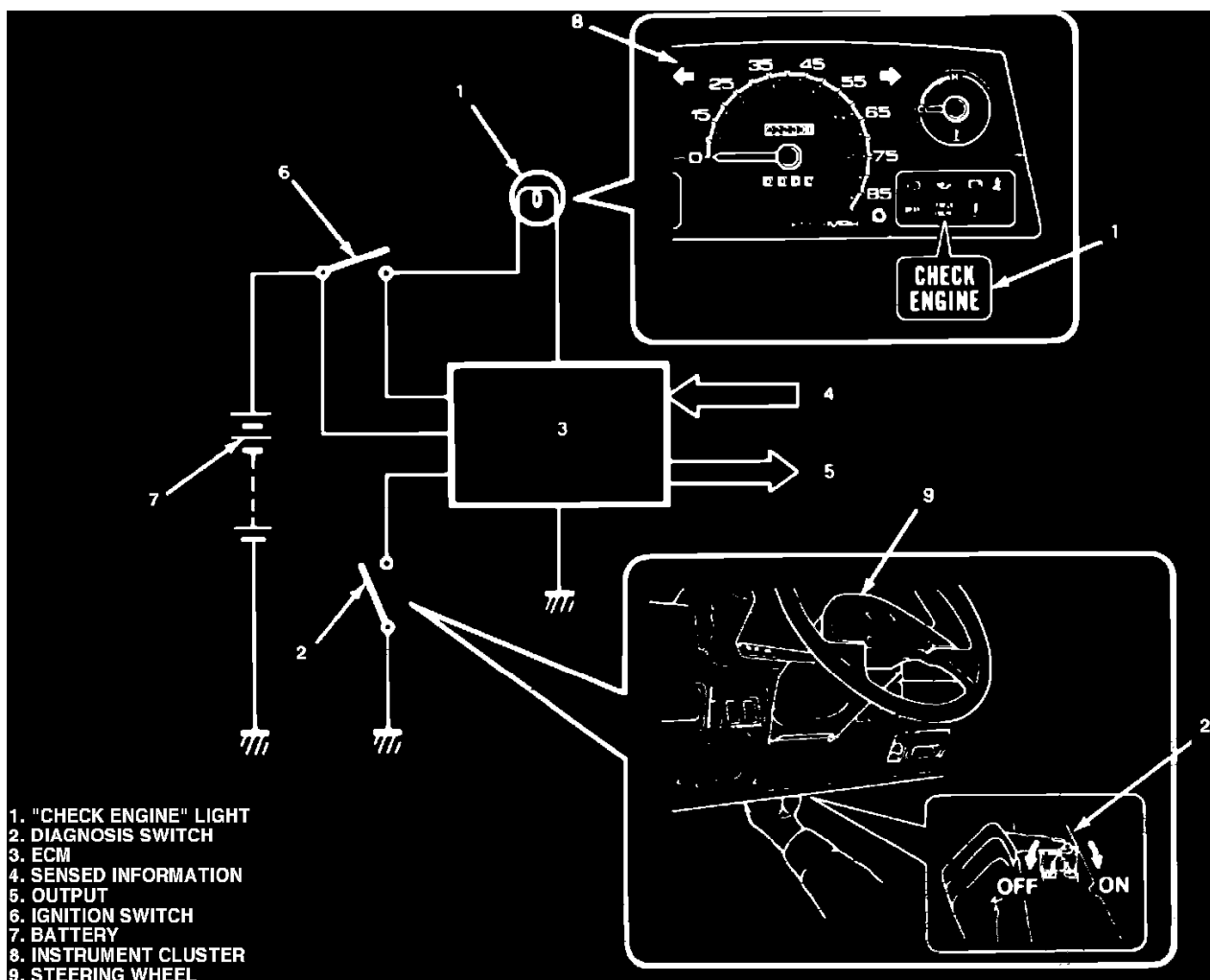


Fig. 38 "Check Engine" lamp &amp; diagnostic switch

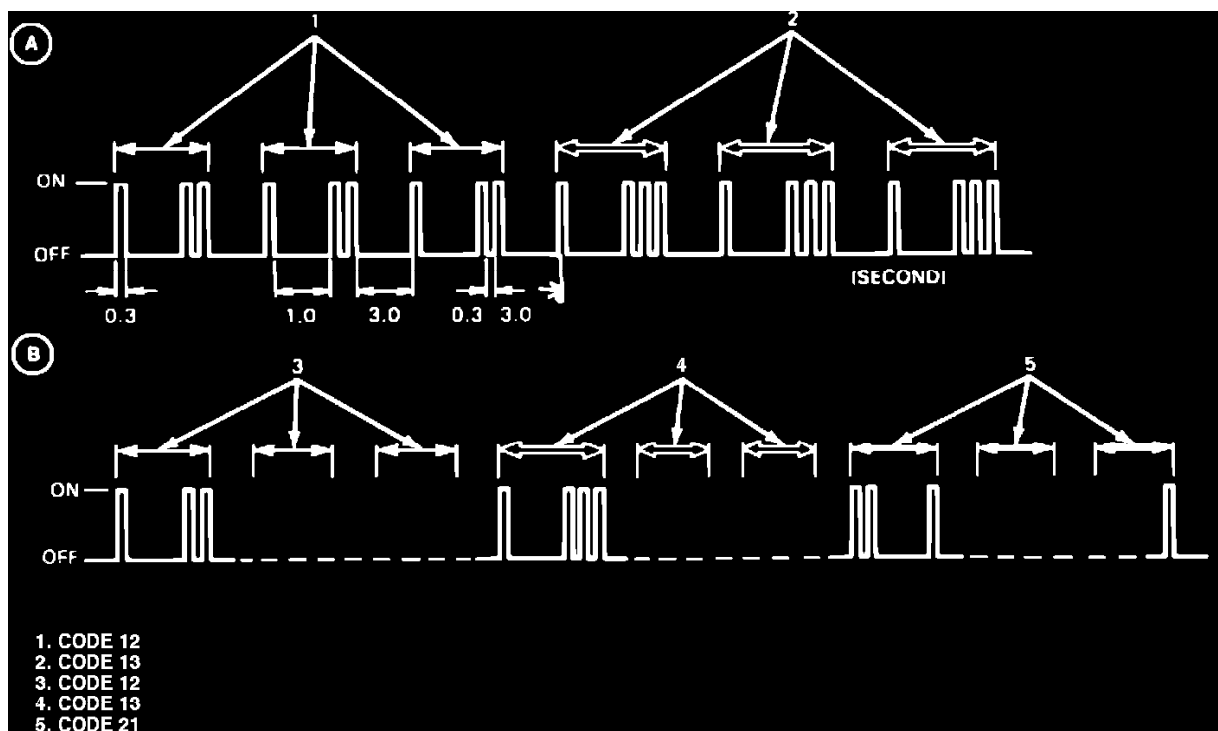


Fig. 39 Reading "Check Engine" lamp codes.

On these models, the ECM continually monitors operating conditions of their controlled systems for possible malfunctions. When a problem is detected, a two-digit numerical "trouble-code" is stored in the computer memory. These codes can be displayed as an aid in system repair. Any malfunctions which the vehicle operator should be aware of will illuminate the "Check Engine" lamp on the instrument panel.

The computer controlled emission control system incorporates a self diagnostic code function which lights the "Check Engine" lamp on the instrument panel in the event of a system malfunction. As long as the emission control system is operating properly, the "Check Engine" lamp will light along with the other indicator lamps when the ignition switch is turned on. After the engine is started, the lamp goes out while the engine is

running. If there is trouble in the system, the "Check Engine" lamp remains "On" and the trouble code is stored in the ECM trouble code memory.

The system has a diagnosis switch which is usually set in the "Off" position, but when turned on for diagnosis, it indicates the trouble code in the ECM memory by flashing the "Check Engine" lamp in a diagnostic code to indicate the area where the malfunctioning devices can be detected.

If the "Check Engine" lamp is "On" when the engine is running, a system malfunction is indicated. Refer to **Figs. 36 and 37** to determine diagnostic codes.

When the ignition switch and the diagnosis switch, **Fig. 38**, are turned "On," the "Check Engine" lamp indicates code 12 three times, then the trouble codes three times each, and continues to cycle between code 12 and the trouble code (13) as shown (A), **Fig. 39**. Code 12 consists of one flash, a short pause, then two flashes, which indicates the system is functioning properly. The code following code 12 is a trouble code, which means that trouble has occurred in the system to which the particular code corresponds.

If two or more trouble codes are stored in trouble code memory (trouble has occurred in more than two systems), the "Check Engine" lamp indicates code 12 three times, then each of the trouble codes in ascending order. **Fig. 39**, (B) illustrates codes 12, 13 and 21.

## Computers and Control Systems: Diagnostic Trouble Code Tests and Associated Procedures

### DTC 13

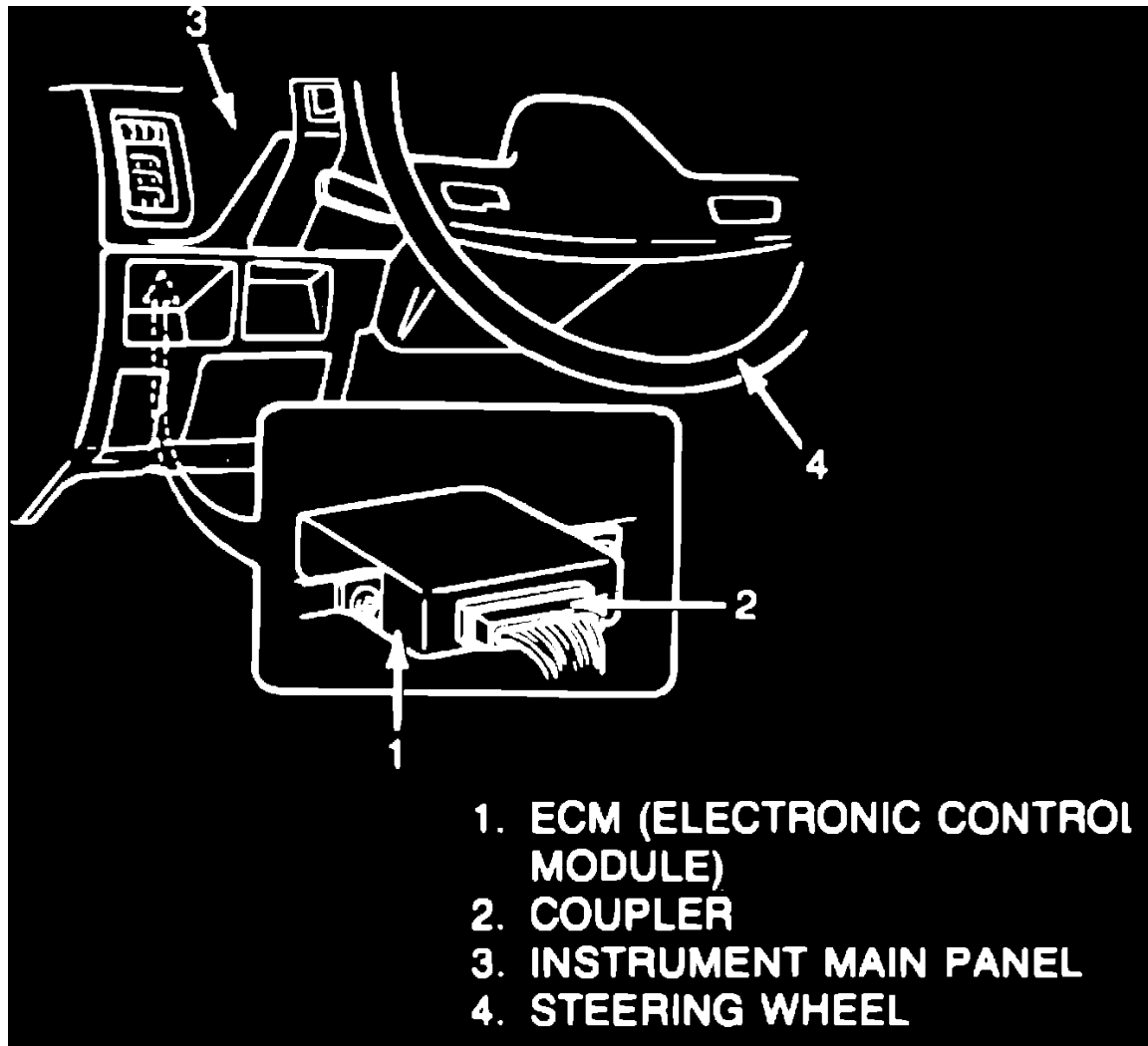


Fig. 26 ECM installation

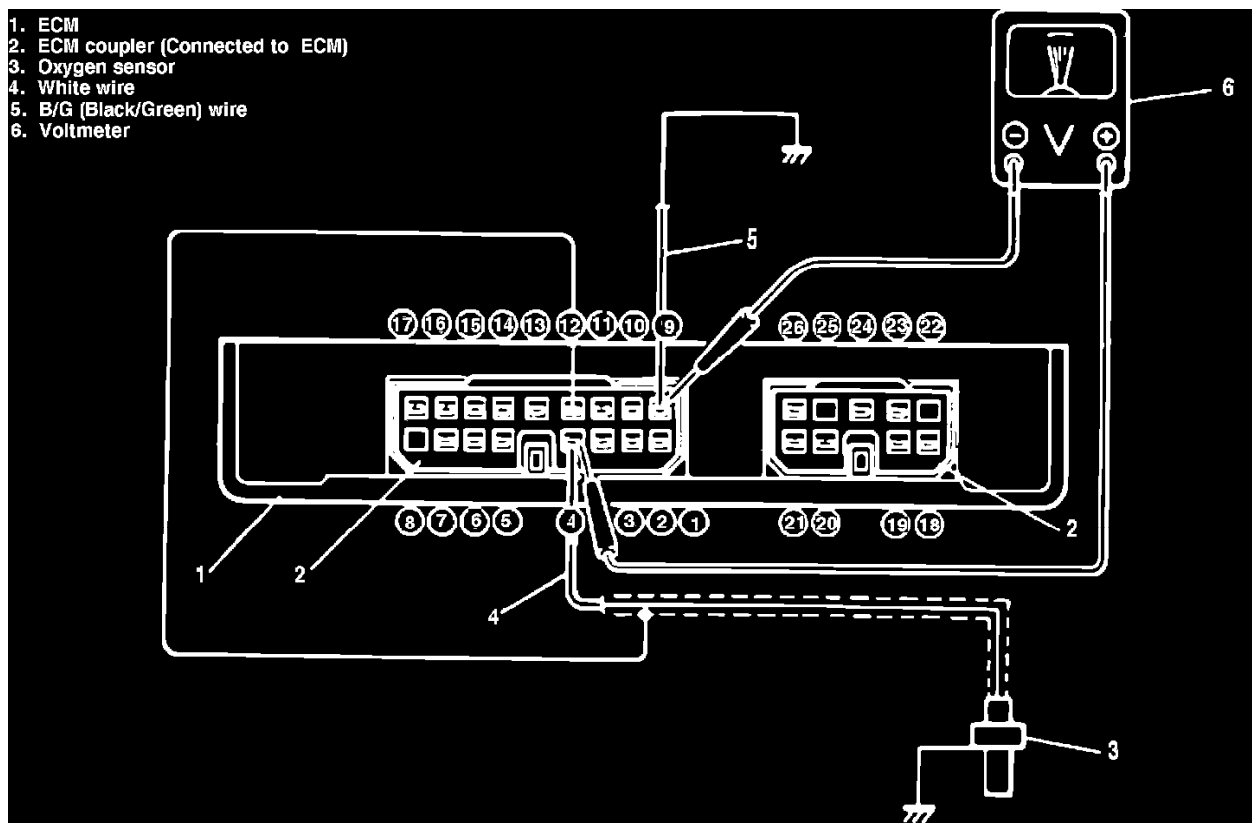


Fig. 45 Checking oxygen sensor signal. 1987 - 88 models

## Diagnostic Code 13, Circuit Check

If oxygen sensor fails to send signals to the ECM, the feedback system will not operate. Check feedback system operation as follows:

1. Remove ECM from instrument panel, **Fig. 26**, leaving connector connected.
2. Start engine and allow to idle at normal operating temperature.
3. Connect voltmeter between terminals 4 (oxygen sensor signal) and 9 (ground), **Fig. 45**.
4. Between idling and 1500 - 2000 RPM, voltmeter needle should deflect between 0 and .8 volts. If voltmeter needle, indicates zero, check the following:
  - a. Oxygen sensor wire disconnected or making poor contact.
  - b. Leaking intake system or faulty carburetor causing lean mixture.
  - c. Secondary air system constantly sending air to exhaust manifold.
  - d. Inner resistance of voltmeter is too low.
  - e. Defective oxygen sensor.
5. If voltmeter needle remains at .8 volt and does not deflect, check the following:
  - a. Choke operating because engine is not warmed up.
  - b. Defective coolant temperature sensor.
  - c. Defective wide open throttle switch.
  - d. Disconnected mixture control solenoid wire.
6. After checking, install ECM into instrument panel, and check for secure connection of ECM connector.

## Diagnostic Code 13, O2 Sensor Check

1. Start and operate engine until coolant reaches normal operating temperatures.
2. Disconnect oxygen sensor electrical connector, then connect a suitable voltmeter between disconnected connector and body ground.
3. With engine RPM operating at 1500 - 2000 RPM, turn wide open micro switch "On" by moving throttle lever down. Voltmeter reading should indicate approximately .8 volts.
4. With engine operating at 1000 - 1500 RPM, disconnect vacuum hose at intake manifold next to EGR valve. Voltmeter reading should indicate almost "0" volts.
5. If oxygen sensor is malfunctioning, replace with a new one. When installing new oxygen sensor, torque to 33.0 - 39.5 ft. lbs.
6. Reconnect vacuum hose.

## DTC 14

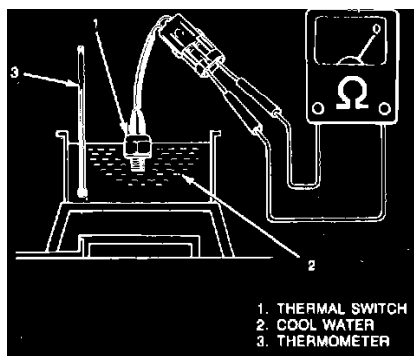


Fig. 17 Coolant temperature thermal switch test. Low temperature

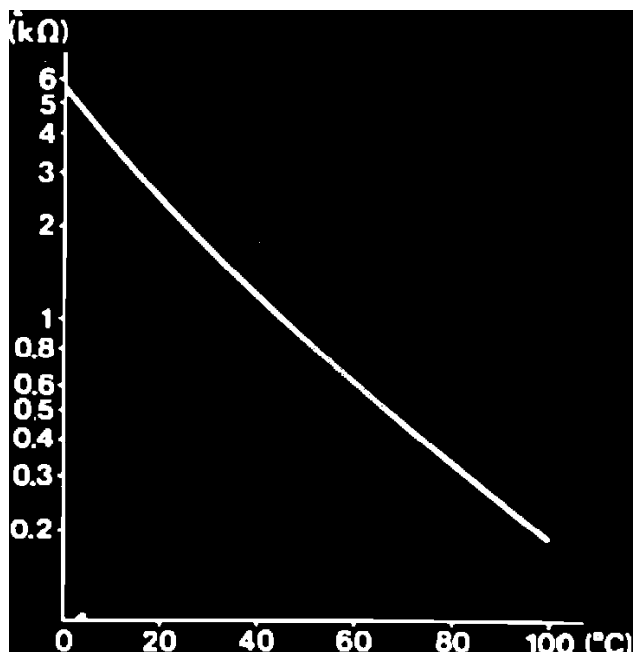


Fig. 46 Coolant temperature sensor, temperature-to-resistance curve. 1987 - 88 models

#### Diagnostic Code 14

1. Disconnect battery ground cable, then drain cooling system.
2. Disconnect coolant temperature sensor connector, remove coolant temperature sensor from intake manifold.
3. Connect temperature sensor to a suitable ohmmeter, then immerse temperature sensing part into water and read resistance on ohmmeter while slowly raising water temperature, **Fig. 17**. Temperature to resistance relationship should be as shown, **Fig. 46**.
4. If measured resistance at each temperature is not equal to that indicated in graph, replace sensor.
5. Install sensor in intake manifold with new gasket, then torque sensor to 9.5 - 12.0 ft. lbs.
6. Connect electrical connector to temperature sensor, then refill cooling system.
7. Connect battery ground cable.

#### DTC 21

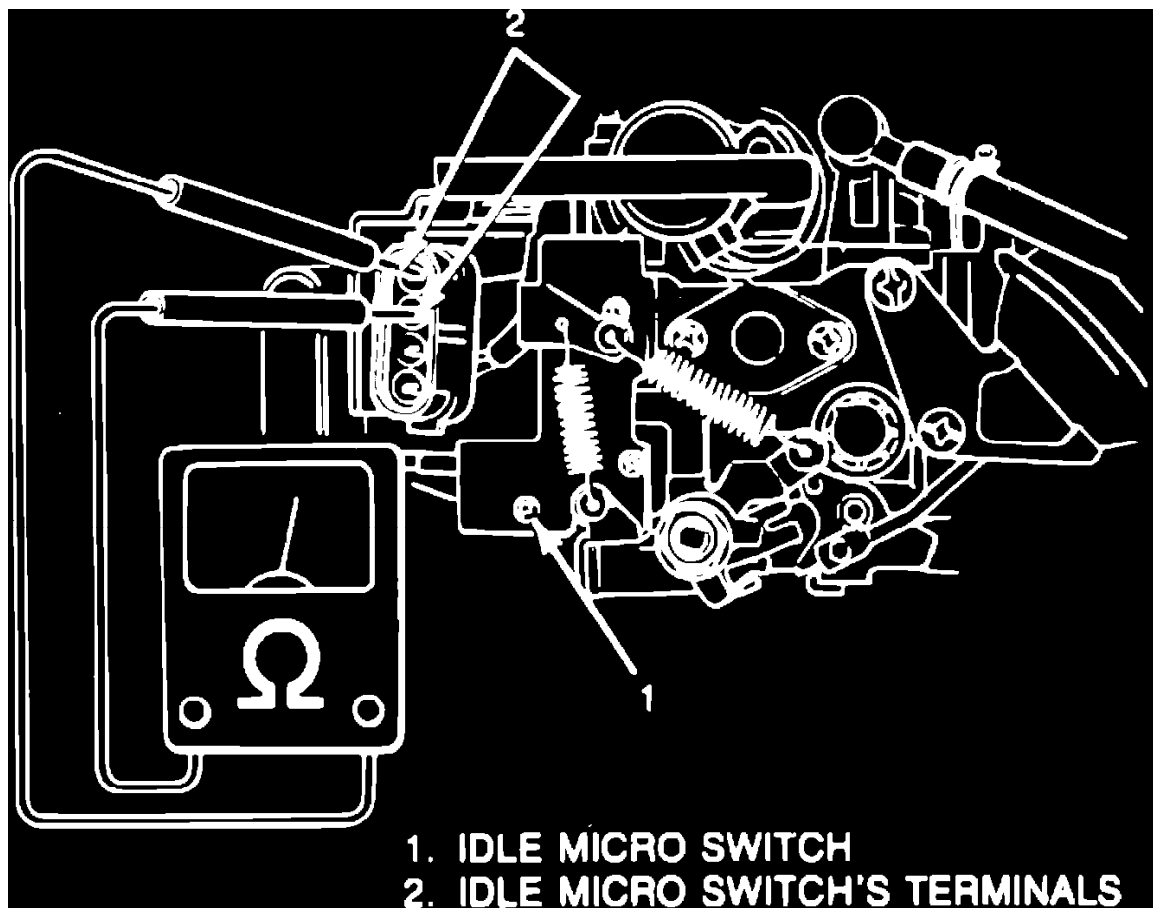


Fig. 10 Idle micro switch test connections

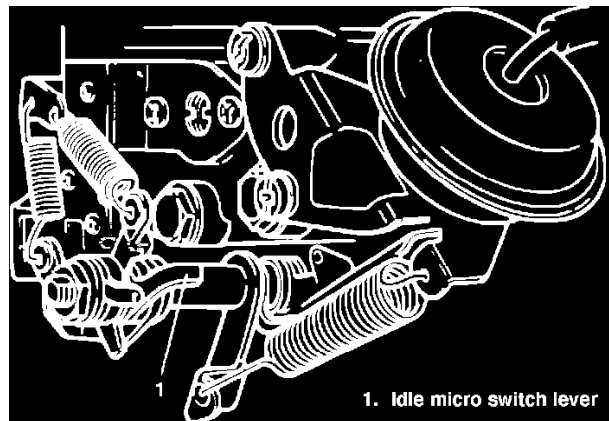


Fig. 47 Idle micro switch lever. 1987 - 88 models

#### Diagnostic Code 21, Idle Microswitch

1. Start engine and allow to reach normal operating temperature.
2. Disconnect microswitch electrical connector, **Fig. 10**, and connect an ohmmeter to switch terminals.
3. Check that ohmmeter indicates zero ohms with engine at idle.
4. Connect tachometer to engine.
5. Gradually increase engine speed from idle speed. Check that engine speed is in range of 1500 - 2400 RPM when ohmmeter indicates infinite resistance. If speed is outside of range, adjust by bending lever as shown in **Fig. 47**.

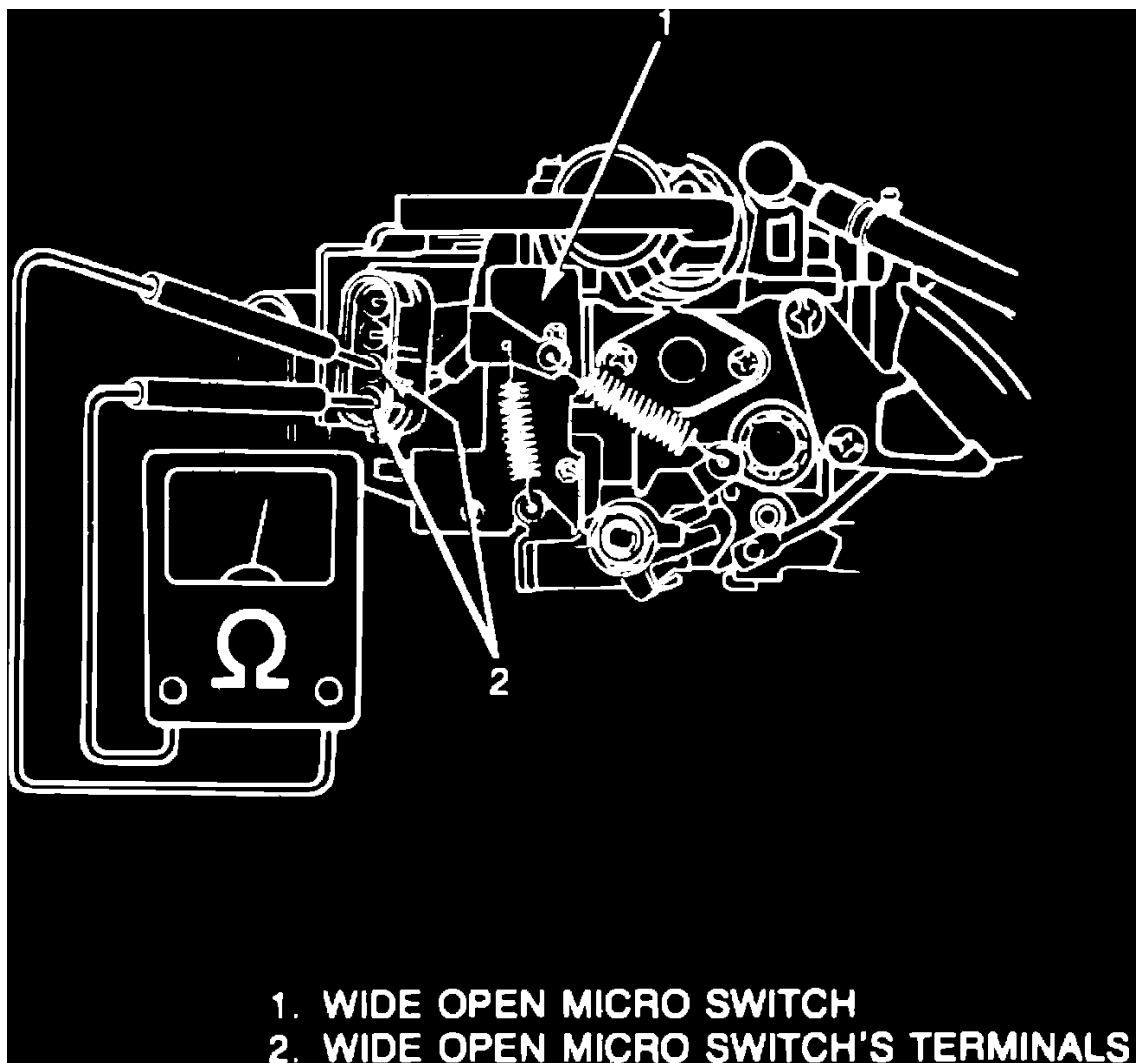


Fig. 12 Wide open throttle micro switch test connections

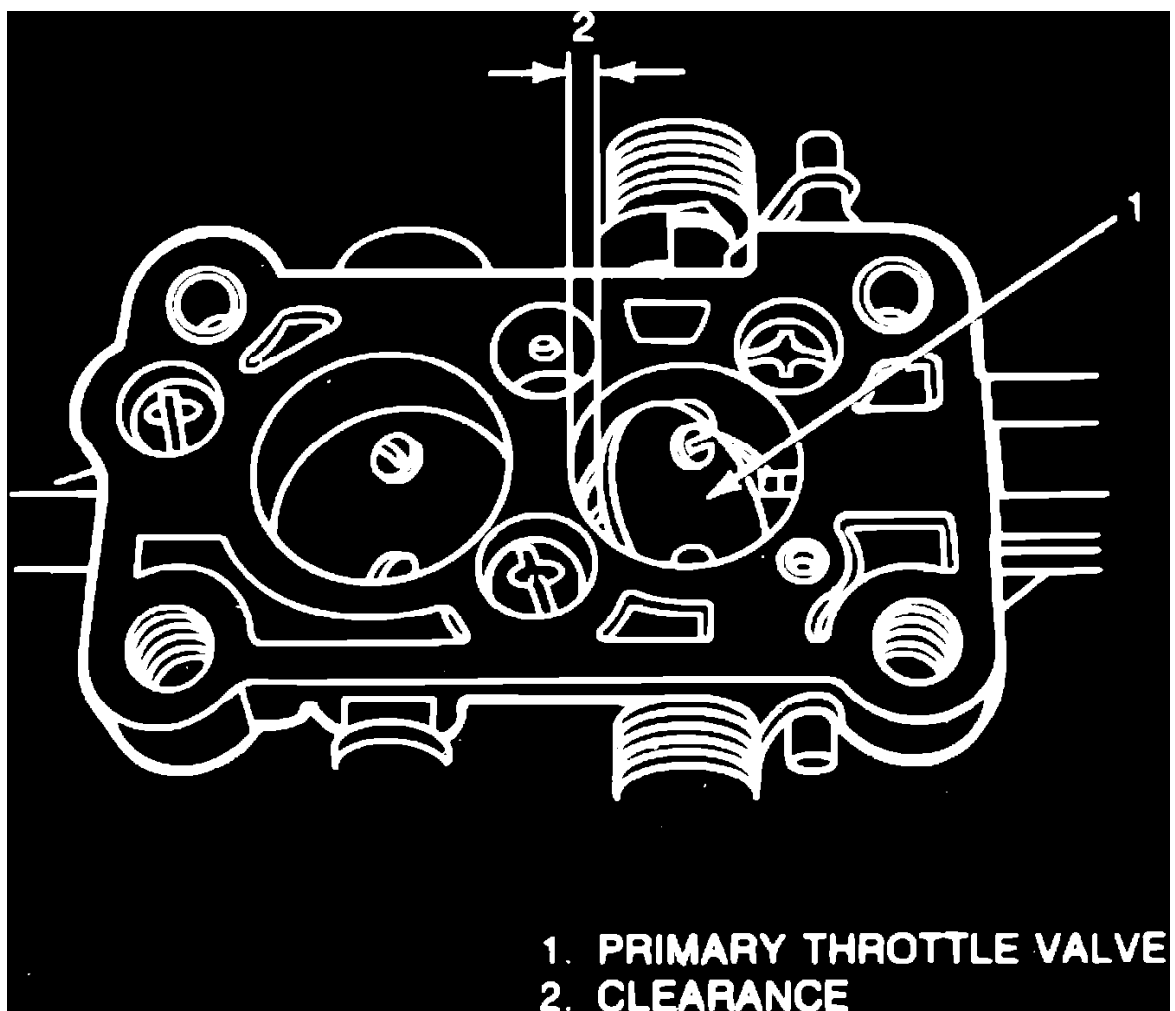


Fig. 13 Throttle plate clearance measurement

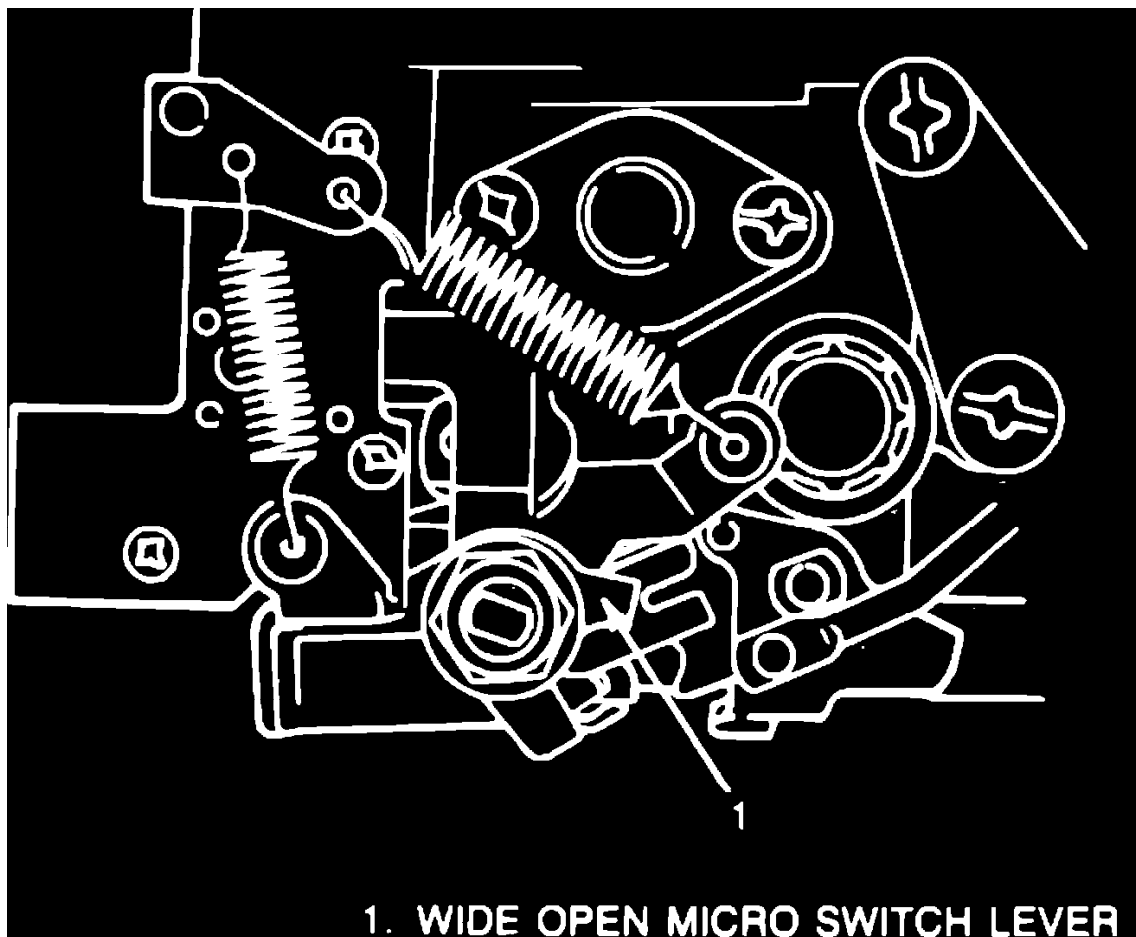


Fig. 14 Wide open throttle micro switch adjustment



## Diagnostic Code 21, Wide Open Throttle Microswitch

1. Remove air cleaner and carburetor.
2. Connect ohmmeter to switch as shown in **Fig. 12**. Resistance between terminals should be infinite.
3. Open throttle gradually until ohmmeter indicates zero ohm. Measure clearance between throttle butterfly and carburetor bore, **Fig. 13**. Clearance should be .29 - .33 inch (7.2 - 8.4 mm). If clearance is out of range, adjust by bending lever, **Fig. 14**.

## DTC 23

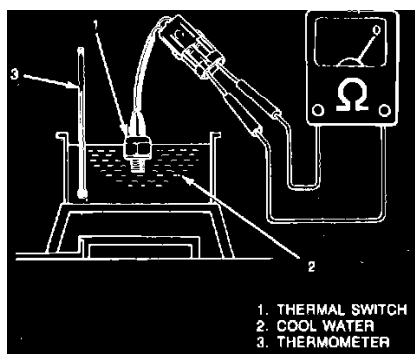


Fig. 17 Coolant temperature thermal switch test. Low temperature

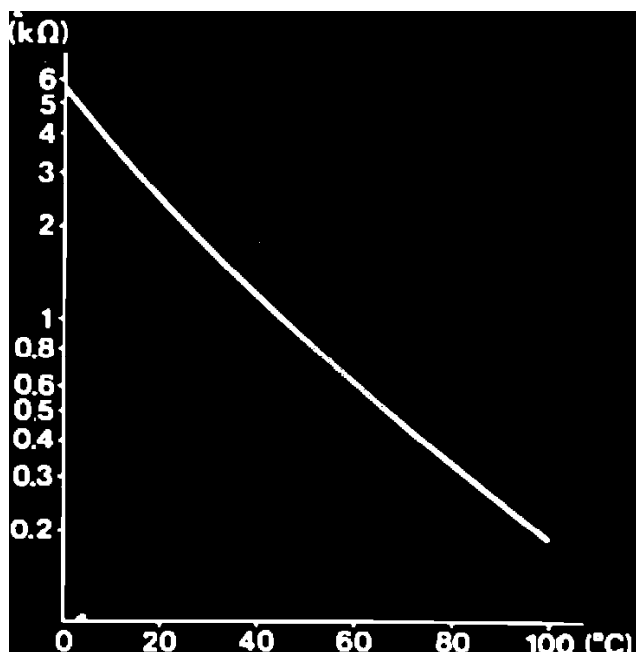
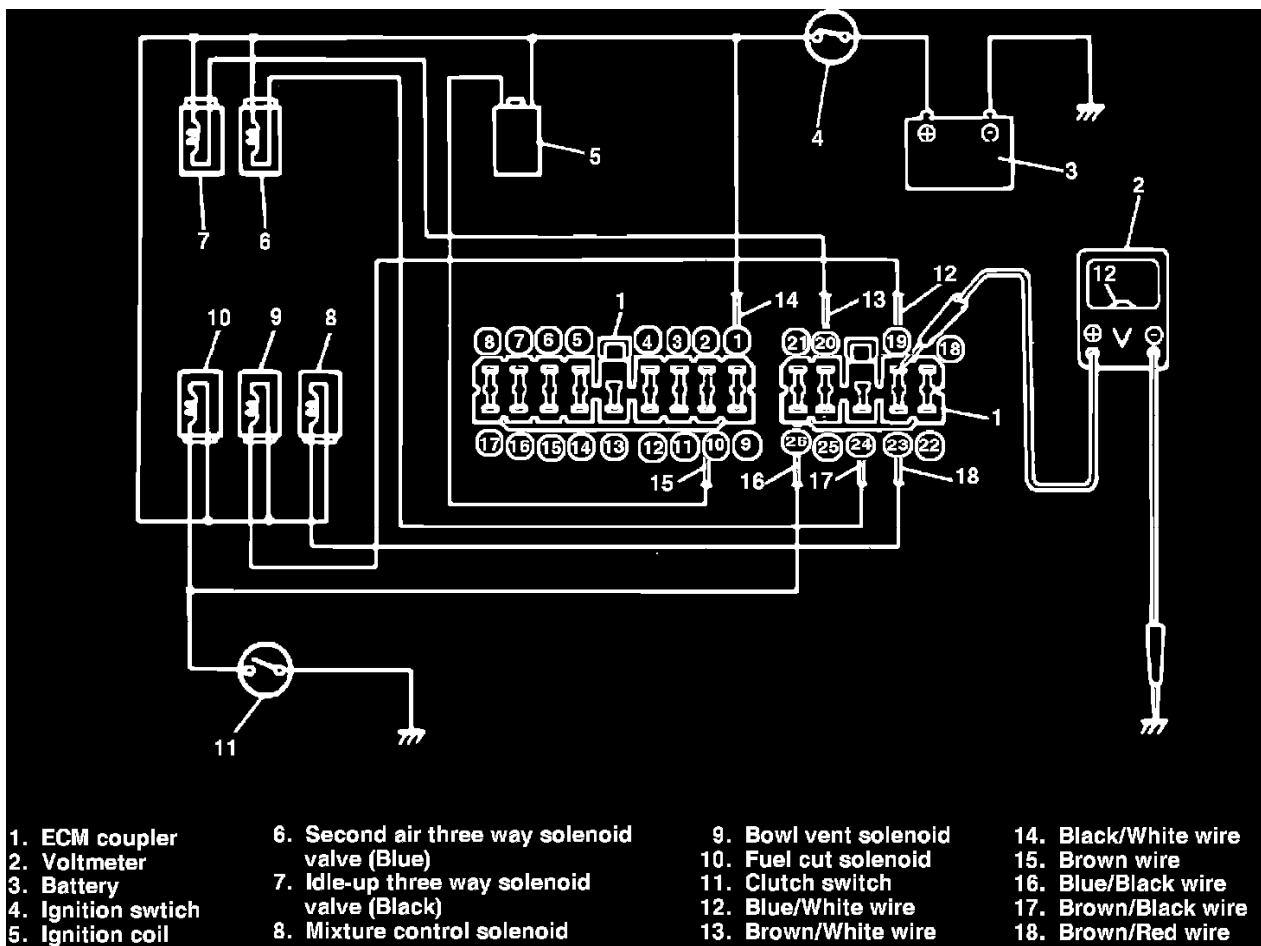


Fig. 46 Coolant temperature sensor, temperature-to-resistance curve. 1987 - 88 models

## Diagnostic Code 23

1. Disconnect battery ground cable, then remove air cleaner upper case and air cleaner element
2. Remove air cleaner lower case, then disconnect intake air temperature sensor electrical connector.
3. Remove intake air temperature sensor from air cleaner lower case.
4. Connect temperature sensor to a suitable ohmmeter, then immerse temperature sensing part into water and read resistance on ohmmeter while slowly raising water temperature, **Fig. 17**. Temperature to resistance relationship should be as shown, **Fig. 46**.
5. Install intake air temperature sensor into air cleaner lower case, then torque to 5 - 12 ft. lbs.
6. Connect electrical connector to temperature sensor, then install air cleaner lower case. Install air cleaner element, then the air cleaner upper case.
7. Connect battery ground cable.

## DTC 52



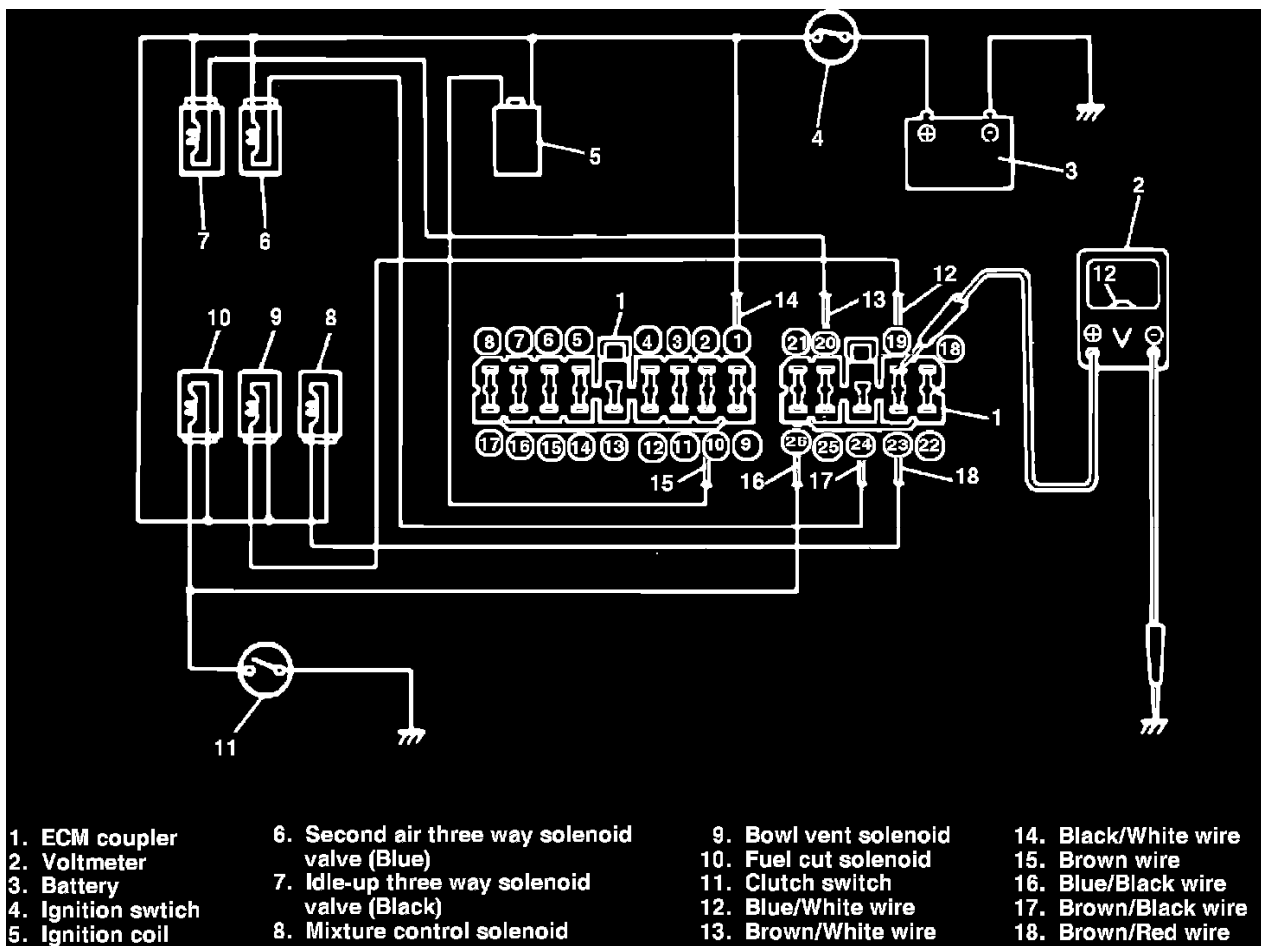
**Fig. 42 Checking ECM power circuits. 1987 - 88 models**

#### Diagnostic Codes 52, 53, 54 & 56

The ignition coil, solenoids and solenoid valves are all connected to the ECM. A loose or open connection in any of these circuits will cause a loss of signal to the ECM, thus causing the system to malfunction. Check all power circuits as follows:

1. Disconnect ECM connector.
2. Turn ignition on without starting engine.
3. Connect voltmeter between terminal 19 of ECM connector and body ground, **Fig. 42**, and measure voltage. Voltage should be 12 volts. Repeat with terminals 20, 23, 24, 26, 1 and 10.
4. Connect voltmeter between terminal 26 of ECM connector and body. Voltage should be 12 volts. Depress clutch pedal. Voltage should drop to zero. If not check wiring.
5. Turn ignition "Off," then reconnect ECM connector securely.

## DTC 53



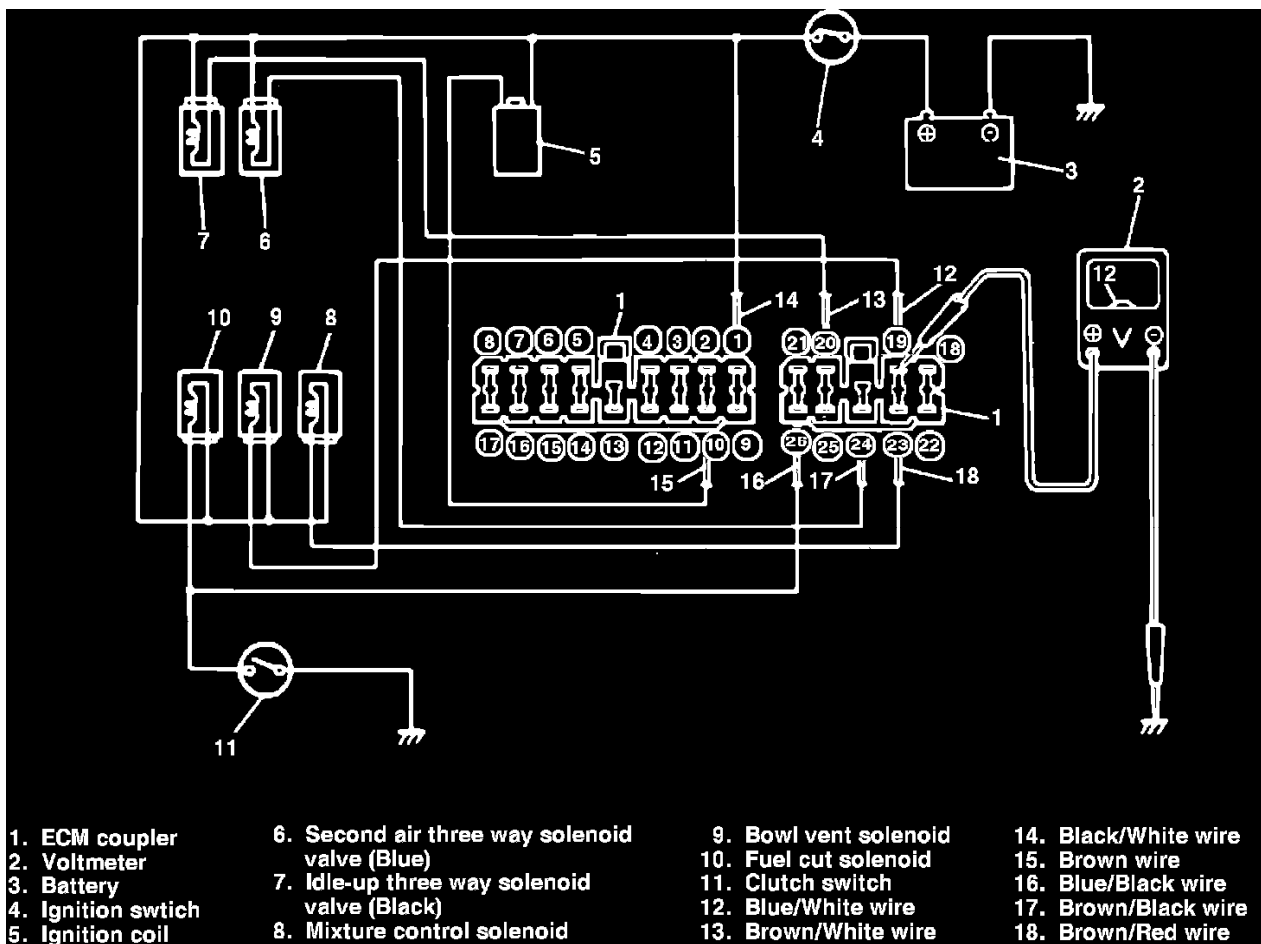
**Fig. 42 Checking ECM power circuits. 1987 - 88 models**

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4. Connect voltmeter between terminal 26 of ECM connector and body. Voltage should be 12 volts. Depress clutch pedal. Voltage should drop to zero. If not check wiring.
5. Turn ignition "Off," then reconnect ECM connector securely.

#### DTC 54



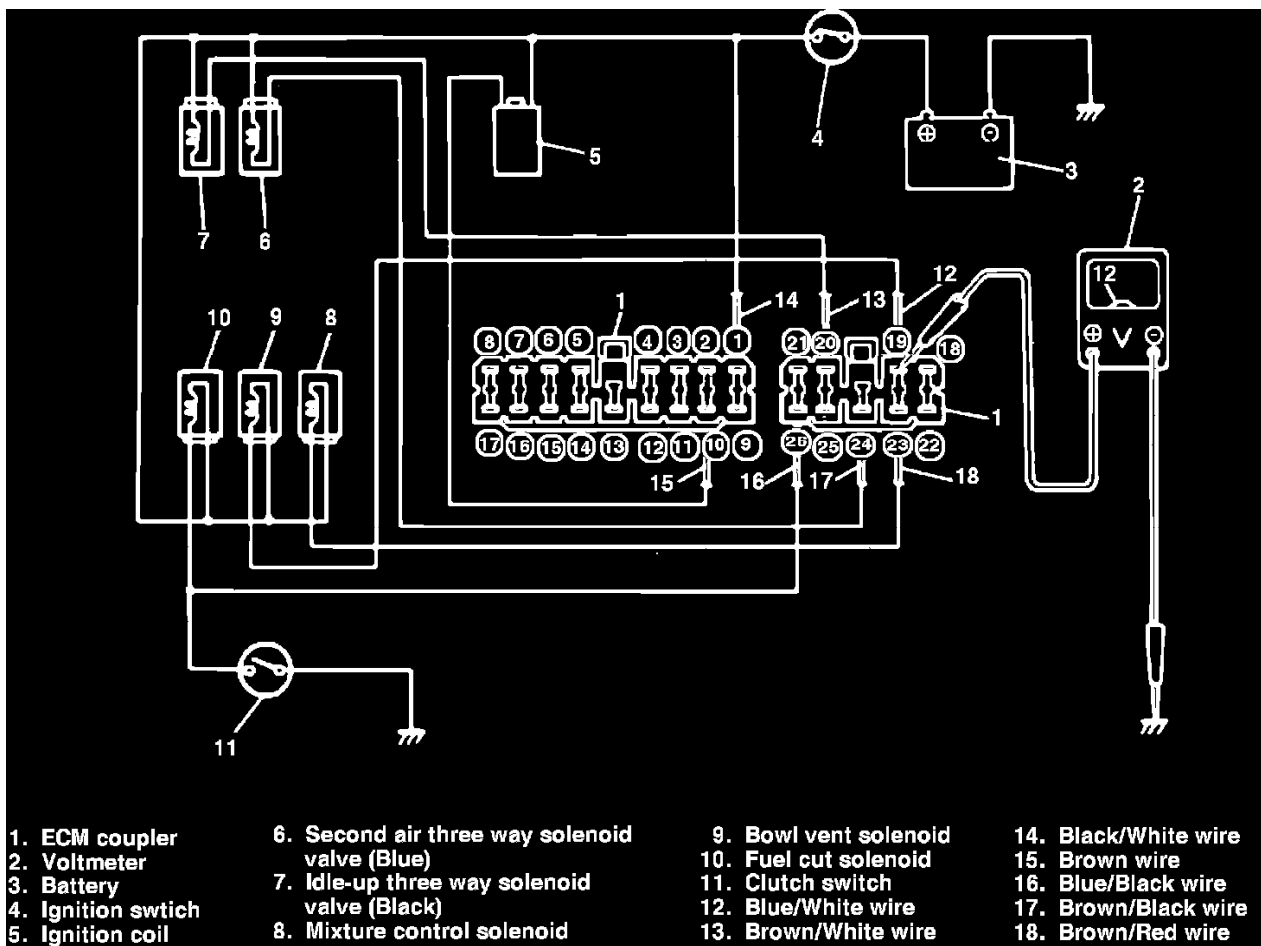
**Fig. 42 Checking ECM power circuits. 1987 - 88 models**

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4. Connect voltmeter between terminal 26 of ECM connector and body. Voltage should be 12 volts. Depress clutch pedal. Voltage should drop to zero. If not check wiring.
5. Turn ignition "Off," then reconnect ECM connector securely.

## DTC 55



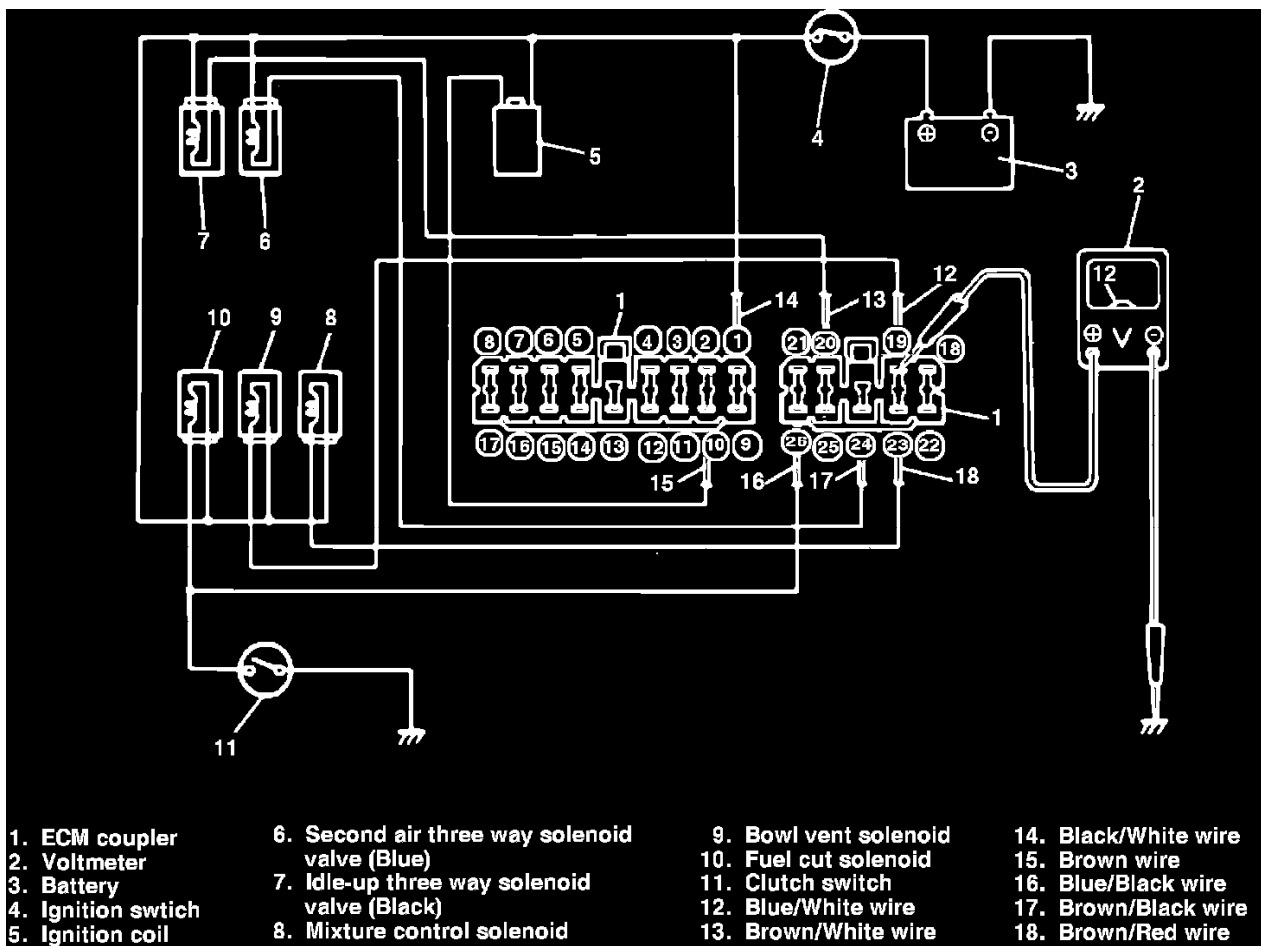
**Fig. 42 Checking ECM power circuits. 1987 - 88 models**

#### Diagnostic Codes 52, 53, 54 & 56

The ignition coil, solenoids and solenoid valves are all connected to the ECM. A loose or open connection in any of these circuits will cause a loss of signal to the ECM, thus causing the system to malfunction. Check all power circuits as follows:

1. Disconnect ECM connector.
2. Turn ignition on without starting engine.
3. Connect voltmeter between terminal 19 of ECM connector and body ground, **Fig. 42**, and measure voltage. Voltage should be 12 volts. Repeat with terminals 20, 23, 24, 26, 1 and 10.
4. Connect voltmeter between terminal 26 of ECM connector and body. Voltage should be 12 volts. Depress clutch pedal. Voltage should drop to zero. If not check wiring.
5. Turn ignition "Off," then reconnect ECM connector securely.

#### DTC 56



**Fig. 42 Checking ECM power circuits. 1987 - 88 models**

#### Diagnostic Codes 52, 53, 54 & 56

The ignition coil, solenoids and solenoid valves are all connected to the ECM. A loose or open connection in any of these circuits will cause a loss of signal to the ECM, thus causing the system to malfunction. Check all power circuits as follows:

1. Disconnect ECM connector.
2. Turn ignition on without starting engine.
3. Connect voltmeter between terminal 19 of ECM connector and body ground, **Fig. 42**, and measure voltage. Voltage should be 12 volts. Repeat with terminals 20, 23, 24, 26, 1 and 10.
4. Connect voltmeter between terminal 26 of ECM connector and body. Voltage should be 12 volts. Depress clutch pedal. Voltage should drop to zero. If not check wiring.
5. Turn ignition "Off," then reconnect ECM connector securely.

## Computers and Control Systems: Symptom Related Diagnostic Procedures

SYMPTOM	POSSIBLE CAUSES
Hard or No starting (Engine cranks OK)	<ul style="list-style-type: none"> <li>• Open or short circuit or defect in injector, cold start injector, air valve or starter injector time switch</li> <li>• Fuel pressure out of specification (Check pressure regulator, fuel filter, fuel pump and line and the wiring, fuel pump relay.)</li> <li>• Clogged air cleaner element.</li> <li>• Starter signal not fed to ECM</li> <li>• Air leakage in air intake system.</li> </ul>
Improper engine idling	<ul style="list-style-type: none"> <li>• Clogged air cleaner element</li> <li>• Maladjusted idle speed adjusting screw.</li> <li>• Open or short circuit, or defect in injector, cold start injector, starter injector time switch, idle switch (in throttle position sensor)</li> <li>• Fuel pressure out of specification (Check pressure regulator, fuel filter, fuel pump and line and the wiring, fuel pump relay)</li> <li>• Air leakage in air intake system.</li> </ul>
Idling speed doesn't reduce even after warmed up	<ul style="list-style-type: none"> <li>• Defect in injector, cold start injector, air valve or starter injector time switch</li> <li>• Too high fuel pressure (Check pressure regulator)</li> <li>• Defective A/C idle-up system</li> </ul>
Engine has no or poor power	<ul style="list-style-type: none"> <li>• Defective injector</li> <li>• Too low fuel pressure (Check pressure regulator, fuel filter, fuel pump and line)</li> <li>• Defective turbocharger</li> </ul>
Back fire (Lean fuel mixture)	<ul style="list-style-type: none"> <li>• Malfunction of injector, fuel pressure regulator or fuel pump</li> <li>• Clogged fuel filter</li> <li>• Air leakage in air intake system.</li> </ul>
After fire (Rich fuel mixture)	<ul style="list-style-type: none"> <li>• Malfunction of injector, cold start injector, starter injector time switch, or fuel pressure regulator</li> </ul>
Knocking	<ul style="list-style-type: none"> <li>• Knock sensor, knock controller and their wiring defective.</li> </ul>
No idle-up even when one of lights, heater fan, rear defogger (if equipped), cooling fan, and brake light is turned ON or when air conditioner is operated	<ul style="list-style-type: none"> <li>• Idle-up VSV and its wiring defective or its hose leaking or clogged</li> </ul>
Excessive hydrocarbons (HC) emission (Rich or lean fuel mixture)	<ul style="list-style-type: none"> <li>• Malfunction of injector, cold start injector, starter injector time switch</li> <li>• Fuel pressure is too high or low (pressure regulator, fuel filter, fuel pump)</li> <li>• Malfunction of feedback control (oxygen sensor)</li> <li>• Insufficient warming up</li> <li>• Leakage at air intake system</li> <li>• Defective catalyzer</li> </ul>

Fig. 6a Electronic fuel injection system symptom diagnostic chart (Part 1 of 2)

SYMPTOM	POSSIBLE CAUSES
Excessive carbon monoxide (CO) emission  Rich fuel mixture	<ul style="list-style-type: none"> <li>• Leaky injector nozzle</li> <li>• Malfunction of injector, cold start injector, starter injector time switch</li> <li>• Fuel pressure is too high (pressure regulator)</li> <li>• Malfunction of feedback control (oxygen sensor)</li> <li>• Insufficient warming up</li> <li>• Defective catalyzer</li> </ul>
Excessive oxides of nitrogen (NOx) emission  (Lean fuel mixture)	<ul style="list-style-type: none"> <li>• Clogged or defective injector</li> <li>• Fuel pressure is too low (pressure regulator, fuel filter, fuel pump)</li> <li>• Malfunction of feedback control (oxygen sensor)</li> <li>• Leakage at air intake system</li> <li>• Leakage at exhaust system</li> </ul>

**Fig. 6b Electronic fuel injection system symptom diagnostic chart (Part 2 of 2)**

Refer to **Fig. 6**, for conditions related to the EFI system but are not subject to the self diagnostic function.

If a problem still exists, and the component checks prove to be satisfactory after the diagnostic checks, recheck the ECM for proper connections. If trouble code cannot be eliminated, replace ECM with a known good one and perform diagnostic check. If same trouble occurs, and it is one of the self diagnostic functions, stop engine and turn on both the ignition switch and the diagnostic switch and check that the check engine lamp indicates code 12 (Normal). If trouble code is eliminated, ECM is defective and should be replaced.

If the problem area has occurred in the oxygen sensor area, operate vehicle in 3rd, 4th or 5th gear position and when engine speed has risen to 2,000 RPM, depress the accelerator pedal fully for more than 2 seconds. Stop engine, then with ignition switch on, operate diagnostic switch. **To minimize the chance of personal injury or vehicle damage, operate vehicle in a safe area when performing test.**

When removing or installing connectors, ensure ignition switch is off or battery ground cable is disconnected. Do not inspect ECM by using a circuit tester as tester probes may short between terminals and cause damage to components. Do not expose ECM to excessive shock.



# Computers and Control Systems: Component Tests and General Diagnostics

## Backup Power Circuit

1. Disconnect battery ground cable, then the positive cable.
2. Disconnect ECM connectors.
3. Connect a suitable ohmmeter between terminal 13 and disconnected battery positive cable. Ensure ohmmeter reading is "0" and continuity exists.
4. If ohmmeter reading is not zero check circuit for open or poor contact.
5. Reconnect battery positive, then the negative cables to battery.

## Fuel Cut Check

1. Start and operate vehicle until coolant reaches normal operating temperature.
2. Listen to sound of injector, using a suitable stethoscope scope or equivalent, then increase engine speed to 3,000 RPM or higher.
3. Listen for sound to indicate operation of injector has stopped when throttle valve is closed instantly, then heard again when engine speed is increased to less than 1,900 RPM. **The lower the water temperature, the higher the engine speed must be before the injector starts operating again. Ensure vehicle is at normal operating temperature when performing this test.**
4. If sound of injector is not heard, check throttle position sensor as previously described.

## Idle-Up Signal Check

Equipment	Terminal	Condition	Voltmeter reading
Small light, tail light, side marker light and license light	7	Turn ON small light switch	11 — 14V
Heater fan	8	Turn ON heater fan switch	11 — 14V
Engine cooling fan.	11	Operate engine cooling fan. * Cooling fan can be operated by disconnecting couple of fan thermo switch and shorting two coupler terminals on the wiring harness side with a wire available.	11 — 14V
Rear defogger (if equipped)	17	Turn ON rear defogger switch.	11 — 14V

Fig. 34 Idle-up compensator signal test specifications. Models w/manual transmission

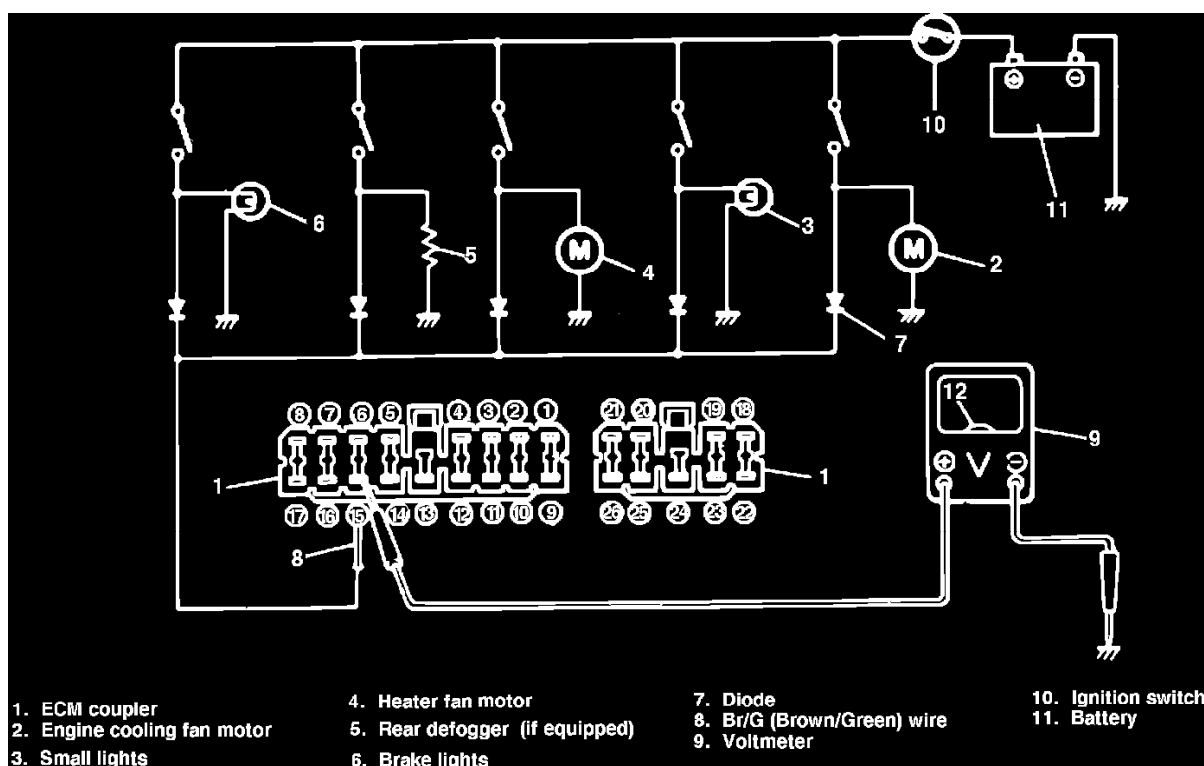
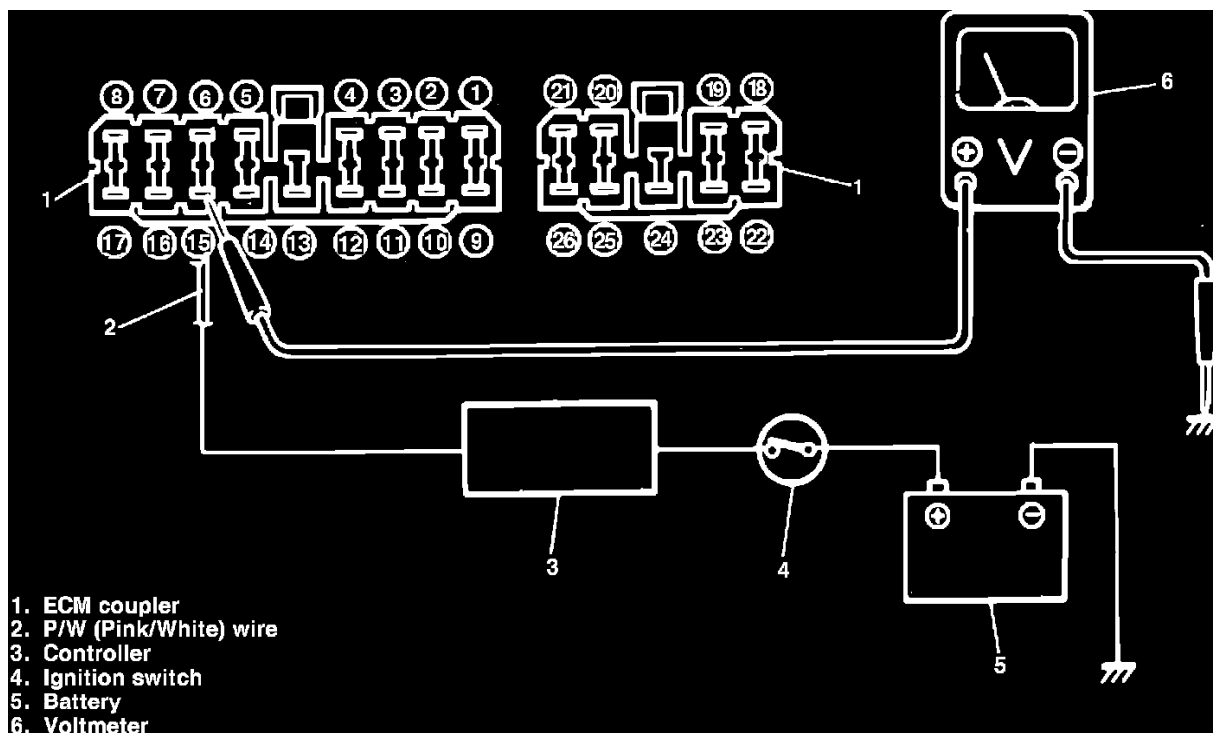


Fig. 51 Checking idle-up signal. 1987 - 88 models w/manual transmission

## Manual Transmission

The idle-up system should operate when the running lights, heater fan, cooling fan, or rear defogger are put into operation. If idle-up actuator fails to operate when any of these accessories are switched on, check if proper signal is sent to ECM as follows:

1. Disconnect ECM connector.
2. Turn ignition switch "On" without starting engine.
3. Connect voltmeter between terminal 15 and body (ground) individually, **Fig. 51**. Activate each component as described in **Fig. 34**. If voltmeter reads 11 - 14 volts as each component is activated, the idle-up signal is being sent to the ECM. If reading of 11 - 14 volts is not obtained, circuit is making poor contact or is open. Correct as necessary.
4. Reconnect ECM connector securely.



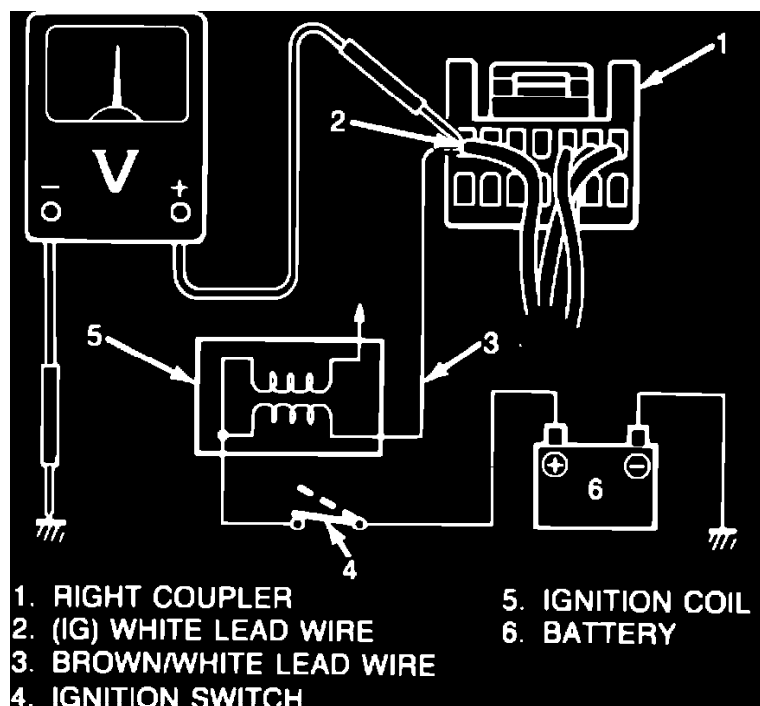
**Fig. 52 Checking idle-up signal. 1987 - 88 models w/automatic transmission**

## Automatic Transmission

The idle-up system should operate when the vehicle is stopped and the shift lever is in D, 2, L or R ranges. If idle-up actuator fails to operate during these ranges, check if proper signal is sent to ECM as follows:

1. Disconnect ECM connector.
2. Switch on ignition without starting engine, then connect voltmeter between terminal 15 and body ground as shown in **Fig. 52**.
3. Position shift lever in each range indicated above and observe voltmeter. Voltmeter should read 11 - 14 volts. If reading of 11 - 14 volts is not obtained, the circuit is making poor contact or is open, or the controller is defective. Correct as necessary.
4. Reconnect ECM connector securely.

## Ignition Signal



**Fig. 18 Checking ignition signal**

**This inspection should only be performed if engine fails to start.**

1. With ignition switch "Off," remove right connector from ECM.
2. Insert positive tester probe into white lead wire terminal from cord side of disconnected right connector and negative tester probe connected to body ground, check that 0 volts is detected with ignition switch "Off," and battery voltage applied as shown, **Fig. 18**.
3. If battery voltage is not present, check ignition coil and related circuit.
4. Turn ignition switch "Off," then reconnect ECM connector.

## Vehicle: Technical Service Bulletins

### How to Find Technical Service Bulletins by Category/Symptom

#### Selecting TSB's "By Symptom"

If you have a vehicle which displays system-related symptoms, ALLDATA provides a way to quickly search for any relevant Technical Service Bulletins (TSB's). When you select TSB's "By Symptom," all relevant TSB's display at the top of the TSB title list. Viewing TSB's by Symptom is helpful when the vehicle displays a distinct, system related, malfunction. You may also wish to review the symptom list with your customer to uncover additional information that was not indicated on the Driveability Worksheet.

You can view TSB's by Symptom at any System or Sub-System level of the TurboView hierarchy. For example, a Symptom list will appear when selecting Powertrain Management or Computers and Control Systems. Symptoms will not appear when selecting a component (such as Mass Air Flow Sensor).

#### To view TSB's by Symptom:

1. Select the desired System or Sub-System and click the TSB icon.
2. Select "By Symptom" from the TSB list.
3. Select the symptom you wish to display.
4. Click on the desired TSB to display the article

#### Example:

Your customer complains of a noise in his 1989 Toyota Corolla (1.6L DOHC). The noise seems to be coming from the automatic transmission. To find TSB's related to transmission noise:

1. Select Transmission and Drivetrain, then Automatic Transmission.
2. Click the TSB icon and select "Noise" from the TSB symptom list.
3. Notice that TSB's related to transmission noise are now located at the top of the TSB title list while non-related TSB's for the transmission are listed below.

Technical Service Bulletin # **93966C**

Date: **930201**

### Fuel System - Factors That Affect Economy/Mileage

Number: 93-96-6C

Section: 6C

Date: FEB. 1993

Corporate Bulletin No.: 306502

ASE No.: A1, A8

Subject:

FACTORS THAT AFFECT FUEL ECONOMY

Model and Year:

ALL YEARS ALL MODELS

#### BACKGROUND INFORMATION:

EPA fuel economy estimates are posted on the fuel economy label of all new vehicles. The only intended use of these values is for comparison among the different vehicles. Fuel economy estimates are generated from data taken during a laboratory test using pre-production prototype vehicles under extremely controlled conditions using a professional driver, with the vehicle operating on an instrument similar to a treadmill. The comparisons of current vehicle fuel economy to the EPA fuel economy estimates is a misuse of the information and should be discouraged.

The EPA GAS MILEAGE GUIDE, available at each dealership, points out that the actual mileage when driving a vehicle may differ considerably from the estimated mileage. The guide also describes how vehicles are tested under identical conditions to insure the results can be compared with confidence.

The EPA GAS MILEAGE GUIDE also points out that city fuel economy estimate simulates a 7.5 mile, stop-and-go trip with an average speed of 20 mph. The trip takes 23 minutes and has 18 stops. About 18 percent of the time is spent idling, as in waiting at traffic lights or in rush hour traffic. Two kinds of engine starts are used - the cold start, which is similar to starting a car in the morning after it has been parked all night - and the hot start, similar to restarting a vehicle after it has been warmed up, driven and stopped for a short time.

The test to determine the highway fuel economy estimate represents a mixture of "non-city" driving. Segments corresponding to different kinds of rural roads and interstate highways are included. The test simulates a 10 mile trip and averages 48 mph. The test is run from a hot start and has little idling time and no stops.

The EPA GAS MILEAGE GUIDE explains that the actual test results are adjusted downward to arrive at the estimates used in the booklet and on the labels. City estimates are lowered by 10 percent and the highway estimate by 22 percent from the laboratory test results. The guide also points out that traveling at higher speeds lowers fuel economy and traveling at 65 mph instead of 55 mph lowers fuel economy over 15 percent.

#### FACTORS THAT AFFECT FUEL ECONOMY:

##### Axle Ratio

Numerically lower axle ratios generally produce better highway fuel economy. The exception to this is if the engine is "working" exceptionally hard, (heavy vehicle loads pulling a trailer, small engine in a large vehicle ... ). In these cases a numerically higher axle may provide better fuel economy. Numerically higher axle ratios will also tend to provide more fuel economy in congested city traffic and stop and go conditions.

##### Brakes

Brake drag (even a minimal amount undetectable by coasting), can have a significant negative impact on fuel economy. Pull upward on the brake pedal to assure that the stoplight switch and cruise switch at the brake pedal are full and properly adjusted. A "click" sound when the pedal is pulled upward indicates that the switch was improperly adjusted. This causes the front brake pads to lightly rub the rotors, causing a fuel economy loss, without generating excessive heat or brake pad wear.

##### Driving Habits

Frequent short trips (less than 5 miles), especially in cooler ambient temperatures (less than 65 degrees), will necessitate fuel enrichment on start-ups, especially after "soaks" with the engine off for approximately a half hour or more.

Frequent accelerator pedal movement while driving will reduce fuel economy because of fuel enrichment during the periods of acceleration. Under such driving conditions the torque converter clutch (TCC) also disengages, contributing to fuel economy losses. Prolonged idle periods reduce fuel economy especially in cold ambients when vehicle is allowed to "Warm up".

##### Fuels

Oxygenated fuels, with methanol and/or ethanol blended into the gasoline have lower energy and thus reduce fuel economy. Typically there is about a 1 MPG penalty for a vehicle which gets 25 to 30 MPG on 100 percent gasoline.

Using fuels of a lower octane than the vehicle was calibrated to will cause increased "KS" Knock Sensor system activity. This will result in a net decrease in spark advance and thus poorer fuel economy. Using fuel of a higher octane than the vehicle was calibrated for WILL NOT increase fuel economy.

Variations in how much fuel is added to the fuel tank during re-fueling can greatly affect calculated fuel economy. These effects decrease as the distance traveled and the number of tank fillups increase.

##### Green Engine

New vehicles have not yet had an opportunity for the engine to break in, (rings to seat ... ). A typical engine will take 3 to 5 thousand miles to break in and during this time period a gradual increase in fuel economy can be expected.

##### Parasitic Loads

Air conditioning and/or electrical loads, (headlights, heated backglass ... ) also result in lower fuel economy, (typically less than 1 MPG difference, each 10 AMPs takes approximately .4 MPG).

##### Road Conditions

Road surface condition impacts fuel economy. Gravel and/or pot holed roads decrease fuel economy. Hills (vs. level terrain) also negatively impact fuel economy. Even gradual unperceptible increases in elevation result in real measurable decreases in fuel economy. Similarly, driving in the rain or snow decreases fuel economy.

##### Suspension

Vehicle suspension misalignment can cause poor fuel economy. Check all four tires for abnormal and/or premature tire wear.

New tires, tire rotation, and/or front end alignment may be required to correct fuel economy.

##### Tires

Performance tires and/or tires with larger "contact areas," (like 60 series aspect ratio), can cause as much as 3 MPG lower fuel economy when

## **Chevrolet Sprint L3-61 1.0L**

compared to hard "thin" tires. Find out if the tire size currently on the car is the same as original equipment. Replacement tires tailor than original equipment tires cause the odometer to read LESS THAN actual distance traveled. This will result in lower calculated fuel economy than actual fuel economy.

### **Tire Pressure**

Harder tires, (more air pressure, or different tire compositions) result in better fuel economy. Do not exceed maximum pressure as labeled on the tire, typically 30-35 psi. The disadvantage of this is that the greater the tire pressure, the harsher the vehicle ride.

### **Transmission**

On 4-Speed automatics, it is possible to drive the vehicle in 3rd gear rather than "overdrive" and not perceive it. Typically this condition occurs when the shift indicator, or the shift linkage/detent is misadjusted. Misadjusted shift linkage can also result in improper signals to the ECM, which can result in less spark advance, and results in a drop in fuel economy.

Driving a vehicle in 3rd gear rather than overdrive at highway speeds typically results in a 3 to 5 MPG penalty.

Torque Converter Clutch operation is essential for good fuel economy. A non-locking torque converter typically results in a 1 to 2 MPG penalty at highway speeds.

### **Vehicle Weight**

Each 125 lbs. of additional weight results in a .3 MPG loss of fuel economy. Thus, additional passengers, luggage ... will decrease fuel economy.

### **Vehicle Wind Resistance**

More wind "DRAG" means less fuel economy. Thus, hang-on luggage carders, cat toppers, open windows and/or open trunk... mean less fuel economy. (See "Driving Habits").

Technical Service Bulletin # **8824210**

Date: **880601**

## **Dash Board - Cleaning of Upper Panel Surfaces**

Number: 88-242-10  
Section: 10  
Date: JUNE, 88  
Subject: CLEANING OF UPPER INSTRUMENT PANEL SURFACES

Model and Year: 1977-88 CHEVROLET MODELS  
TO: ALL CHEVROLET DEALERS

With the advent of longer sunlight days, comments on reflection into the windshield of the upper instrument panel may be received. The condition of instrument panel reflection into the windshield in direct sunlight may be aggravated by dealers and owners applying a wax or silicone base material to the pad surface. The higher gloss of such application results in a "veiling reflection" in the windshield. Advise customers and the new car make ready area that materials containing wax or silicone should not be used to clean the instrument panel pad due to possible long term effects on durability. A warm water and mild soap solution such as saddle soap, or an equivalent should be used whenever the instrument panel pad needs cleaning.

Technical Service Bulletin # **882181B**

Date: **880501**

## **A/C - Odor**

Number: 88-218-1B  
Section: 1B  
Date: MAY, 1988  
Subject: A/C ODOR

Model and Year: 1985-88 CHEVROLET MODELS WITH AIR CONDITIONING  
TO: ALL CHEVROLET DEALERS

Some customers may experience odors emitted from the air conditioning system primarily at start up in hot, humid climates. This odor may be the result of debris in the heater/evaporator case or microbial growth on the evaporator core. To repair this condition, the following equipment and procedure should be utilized:

Required Equipment:

GM Goodwrench air conditioning system disinfectant kit, P/N 25533404  
Kent-Moore tool number J-36645 or equivalent Air Conditioning Cleaning Gun  
Rubber gloves  
Safety goggles or face shield (ordinary safety glasses are not sufficient)  
NIOSH-approved acid gas/organic vapor respirator with chlorine dioxide cartridges, 3M P/N C1842 or equivalent.

**CAUTION:**

Procedure should only be performed on a cold car to prevent the disinfectant from coming in contact with hot engine components.

Disinfectant can cause substantial but temporary eye injury. Do not get in eyes or on clothing. Wash thoroughly with soap and water after handling disinfectant.

**FIRST AID:**

If disinfectant gets into eyes, hold eyelids open and flush with a steady, gentle stream of water for fifteen minutes. Obtain medical attention if irritation persists.

**Procedure:**

1. Put on rubber gloves, safety goggles, and NIOSH-approved respirator.
2. Pour the small bottle of the two-part GM Goodwrench air conditioning system disinfectant kit, P/N 25533404, into the large bottle. Seal and invert the large container once or twice to mix contents.
3. Connect battery charger to avoid draining the battery during cleaning procedure.
4. Check underneath vehicle to verify that drain outlet is not plugged.
5. Remove blower resistor as described in service manual, leaving wiring connectors attached.

**WARNING:** Do not allow the metal coils of the blower resistor to become grounded to any metal surface as this may result in internal circuitry damage.

**CAUTION:** Blower resistor may be hot.

6. Check heater/evaporator case for debris. Remove any debris present through blower resistor opening. If debris is imbedded into the evaporator core face and cannot be removed, the core will have to be removed from the vehicle and cleaned. If a large amount of debris is present in the heater/evaporator case the air inlet screen will require sealing around the air intake in the cowl area.
7. Turn the ignition to the "ON" position but do not start vehicle.
8. Set mode selector to vent, blower switch to low speed and temperature lever to full cold.
9. Open all windows and doors. Exit vehicle.

**CAUTION:** Do not enter vehicle until procedure is completed to avoid exposure to disinfectant.

10. Place drain pan with at least a two quart capacity below heater/evaporator drain hole to collect disinfectant and rinse water runoff.
11. Use Kent-Moore tool J-36645 or equivalent siphon-type parts cleaning spray gun capable of delivering two ounces/minute of liquid when driven with 80-90 psi of compressed air. Insert the nozzle of the spray gun through the blower resistor opening and insert siphon hose into container of disinfectant. Direct spray toward evaporator face taking extra care to ensure adequate coverage of the corners and edges, completely saturating the entire core. Use the entire container of solution.

**NOTICE:** Do not allow disinfectant to come into contact with hot resistor coils.

12. Reach into vehicle and turn the ignition to the "OFF" position and allow the core to soak for five minutes.
13. Double check underneath vehicle to verify proper drain operation. If necessary, unclog and increase drain plug slits with a razor blade or sharp knife.
14. Reach into the vehicle and turn the ignition to the "ON" position, but do not start vehicle.
15. Thoroughly rinse the evaporator core with one quart of clean water using the spray gun to remove any disinfectant residue.
16. Reach into the vehicle and turn the ignition to the "OFF" position and then reinstall the blower resistor.

**NOTICE:** Blower resistor may be hot.

17. Dispose of disinfectant and rinse water runoff collected in the drain pan in an approved manner.

NOTE: This procedure will eliminate debris or microbial growth which can cause odors but will not prevent the possibility that debris or microbes present in the environment may return.

For warranty purposes, use Labor Operation T6235 for 1.1 hours. If debris needs to be removed from heater/evaporator case and the air inlet screen needs to be sealed, use an add time of .2 hour. If evaporator drain needs to be unclogged, use an add time of .2 hour.

Technical Service Bulletin # **88801B**

Date: **871101**

## **A/C - Delayed Cooling After Engine Start Up**

Number: 88-80-1B

Section: 1B

Date: NOV., 1987

Subject: DELAYED A/C COOLING AFTER ENGINE START UP

Model and Year: ALL VEHICLES WITH V5 COMPRESSOR

TO: ALL CHEVROLET DEALERS

The V5 is a variable displacement, five-cylinder compressor that automatically adjusts displacement to match air conditioning demand under all conditions. A control valve, located in the rear of the compressor, regulates the compressor capacity.

The V5 compressor runs continuously in the A/C mode except during periods when over-ridden by A/C system control switches (Wide Open Throttle-WOT, etc.). Because the compressor is operating continuously, the engine will perform more smoothly due to lack of clutch cycling.

Due to its variable displacement feature, special caution is necessary when diagnosing insufficient cooling conditions with the V5 compressor.

It is normal for liquid refrigerant to collect in the compressor crankcase during periods of shutdown, therefore, cooling action may be delayed up to two (2) minutes until the refrigerant is pumped from the crankcase.

If you experience a delay in cooling upon start-up beyond two (2) minutes, and the normal service manual procedure for A/C compressor clutch and electrical engine cooling fan operation has been accomplished, follow the procedure outlined below:

1. operate the A/C system by setting to Norm A/C mode and high blower.
2. Be sure the compressor clutch has engaged and that the electrical engine cooling fan is operating.
3. Idle the engine for two (2) minutes with the A/C system operating.
4. If no cooling, run the engine at approximately 3000 rpm for one (1) minute with the A/C system operating.
5. If no cooling, change the mode control to Vent position for one (1) minute at idle.
6. Set A/C system back to Norm A/C mode, then run the engine at approximately 3000 rpm for one (1) minute with the A/C system operating.
7. If no cooling, drive the car in a normal manner for five (5) minutes with the A/C operating.
8. If there is still no cooling, discharge the refrigerant system, check orifice tube installation, evacuate, and recharge. The refrigerant should be introduced into the accumulator-dehydrator as rapidly as possible in liquid form. When using the small individual cans of refrigerant, the can should be turned upside down to accomplish the rapid recharge.
9. Check for proper cooling. If lack of cooling persists, remove and replace the compressor.

Technical Service Bulletin # **883633B**

Date: **881101**

## **Steering - Diagnosing Torque Steer**

Number: 88-363-3B

Section: 3B

Date: NOV., 1988

Subject: "TORQUE STEER"

Model and Year: 1980-88 CHEVROLET FRONT WHEEL DRIVE VEHICLES

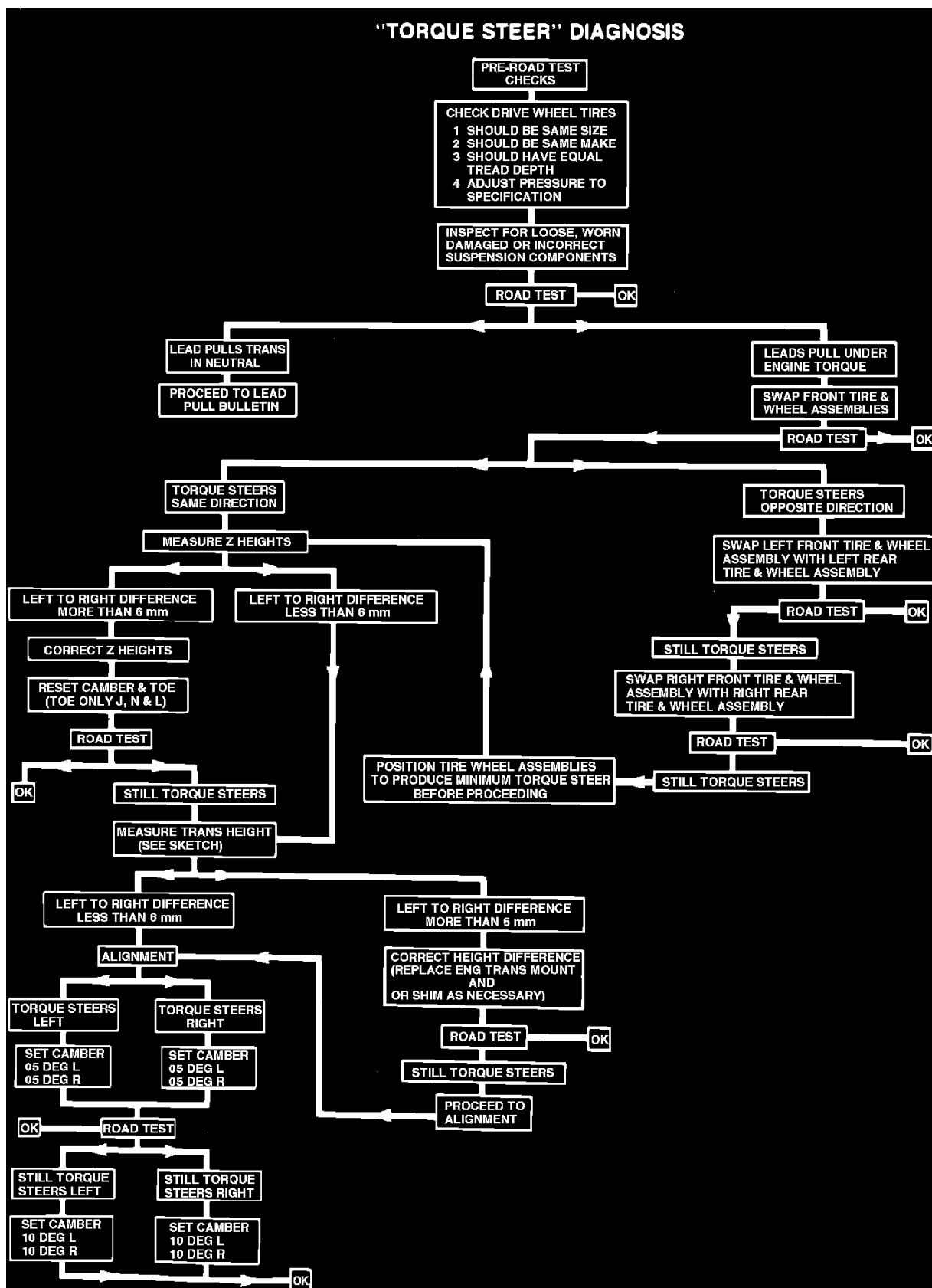
TO: ALL CHEVROLET DEALERS

Chevrolet Dealer Service Bulletin 88-260-3B dated June, 1988, is being revised to include manual transaxle equipped vehicles. All copies of 88-260-3B should be discarded.

Some vehicles may exhibit a tendency to steer left or right while driving straight. This bulletin provides a procedure for identifying "Torque Steer"



(left or right steer forces that result from applied engine torque).



## DEFINITIONS

**"TORQUE STEER":** Under heavy acceleration from 40 mph on a smooth, flat road the vehicle has a left or right steering force that is eliminated when the transmission is placed in neutral. The magnitude of the steering force is normally dependent upon the amount of applied engine torque.

**"LEAD":** On a smooth, flat road with the transmission in neutral, the vehicle does not require a noticeable torque input to the steering wheel to maintain a straight direction; however, with hands removed from the steering wheel, the vehicle steers left or right.

**"PULL":** On a smooth, flat road with the transmission in neutral, the vehicle requires a noticeable torque input to the steering wheel to maintain a straight direction.

A road test will be necessary to determine if a "Lead/Pull" or "Torque Steer" condition exists. Prior to a road test, the following should be checked and corrected:

1. Tires should be the same size, make, and tread depth.
2. Adjust tire pressure to specification.
3. Inspect for loose, worn, damaged or incorrect suspension components.

Drive the vehicle on a straight, smooth, flat (crown free), road surface at 40 mph. Shift the transmission to neutral and allow the vehicle to coast. Momentarily release the steering wheel and note if there is a change in the direction of vehicle travel.

**CAUTION:** THE DRIVER'S HANDS SHOULD NOT BE MOVED FROM THEIR STEERING POSITION DURING THE MOMENTARY RELEASE OF THE STEERING WHEEL.

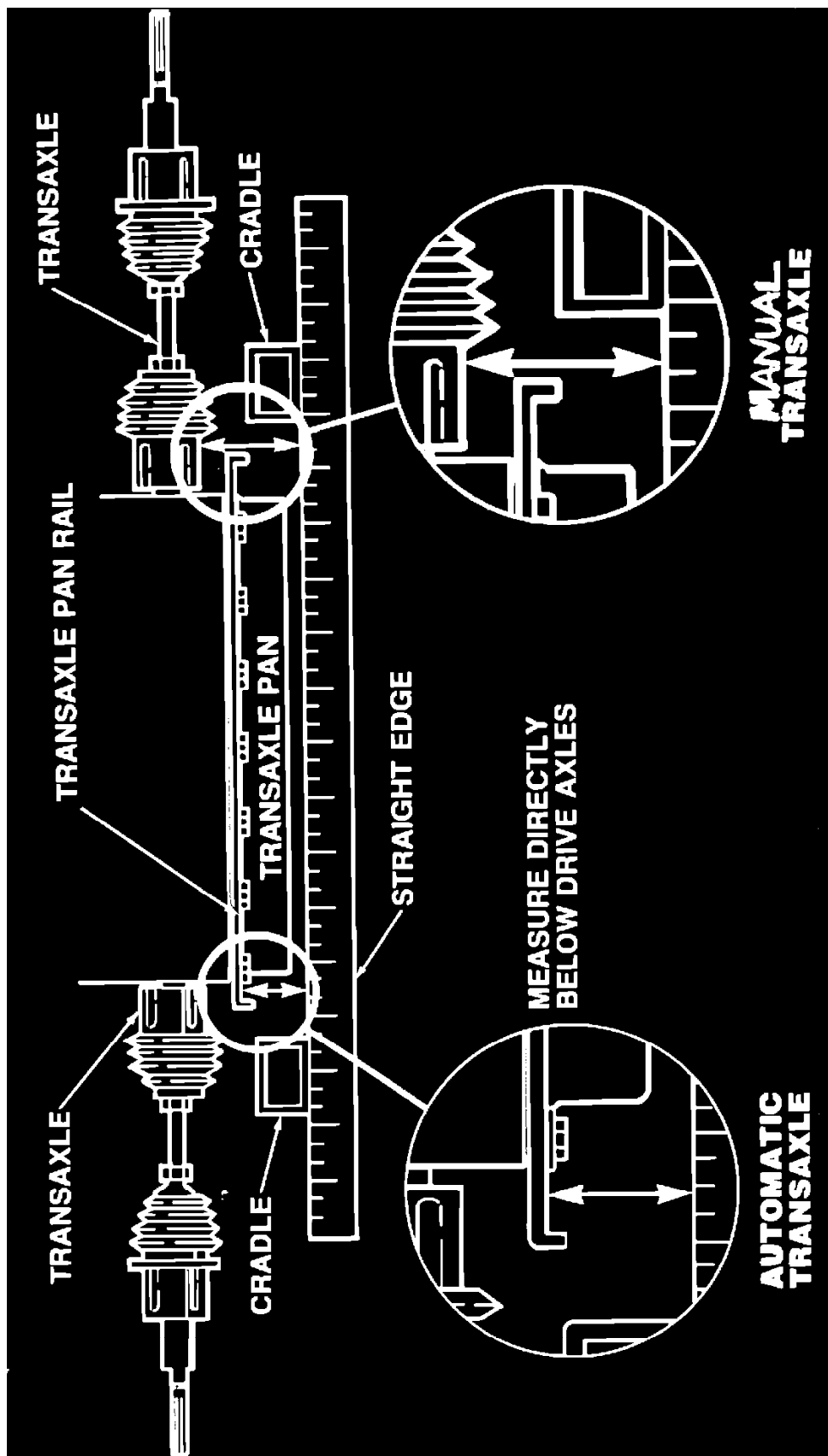
A deviation from a straight direction indicates a "Lead/Pull" condition. If a "Lead/Pull" condition exists, follow the procedures outlined in Chevrolet Dealer service Bulletin 87-212-3 dated October, 1987.

If no change in steering direction occurs with the transmission in neutral, place the transmission in gear, and while proceeding at 40 mph, momentarily apply maximum acceleration (WOT - wide open throttle). If a change in steering direction is noted, the vehicle exhibits "Torque Steer".

**NOTICE:** IT IS IMPORTANT TO REPEAT EACH ROAD TEST WHILE TRAVELING IN THE OPPOSITE DIRECTION TO ELIMINATE FACTORS SUCH AS CROSSWIND.

In conjunction with the attached "Torque Steer" Diagnosis Chart, the following possible causes of "Torque Steer" should be evaluated and repaired as necessary:

1. Slight difference in drive wheel tire diameter (cannot be measured). Vehicle will steer in direction of the smallest diameter tire.
2. Difference in left and right "Z" heights. Refer to service manual for "Z" height measurement procedure and specification. Vehicle must be resting on its wheels when "Z" height measurement is taken. When correcting "Z" height always match the lowest reading.



3. Difference in left and right drive axle angles.

Automatic Transmission - Differences in drive axle angles will be indicated by measuring a difference in the transmission left and right pan rail height. (See Illustration).

Manual Transmission - Differences in drive axle angles will be indicated by measuring a difference in the height of the axles as measured at the largest diameter of the inboard axle joint. (See Illustration).

4. Loose, worn, incorrect or damaged suspension components. Check items that could result in unequal drive wheel toe during acceleration.

Labor Operation Number: T1347

Labor Time:

NOTICE: THIS IS A ST. (STRAIGHT TIME) OPERATION WHICH REQUIRES TIME DOCUMENTATION AS DETAILED IN THE CLAIMS PROCESSING MANUAL. BRANCH APPROVAL IS REQUIRED BEYOND .5

## Steering - Identifying Rack and Pinion System Noises

Number: 88-253-3B

Section: 3B

Date: JUNE, 1988

Subject: IDENTIFYING RACK AND PINION  
STEERING SYSTEM NOISES

Model and Year: 1982-88 CHEVROLET MODELS WITH  
RACK AND PINION STEERING  
TO: ALL CHEVROLET DEALERS

The increased activity in steering gear service, due to Special Policy Bulletin 84-272-3b, dated January, 1988, has resulted in an increase in the number of comments regarding steering system related noises which can be heard inside the vehicle.

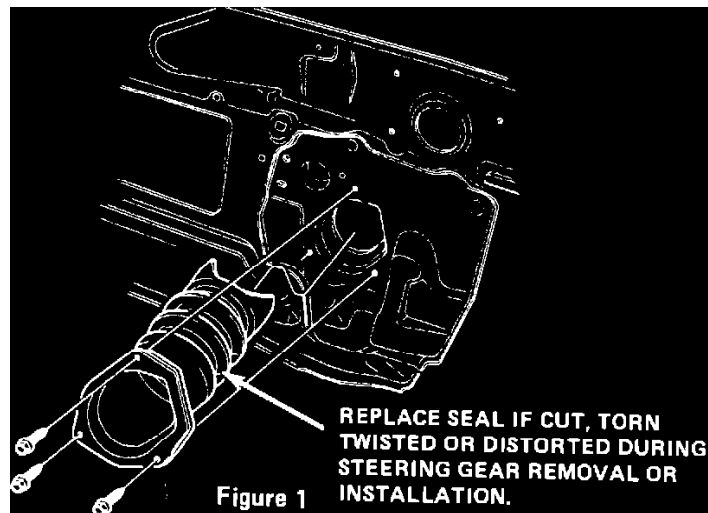


FIGURE 1

When removing or installing any rack and pinion steering gear for service, be sure to inspect the intermediate steering shaft or steering coupling seal for cuts or tears which would allow noises to be transmitted into the passenger area. Also inspect the seal for being twisted, crushed or distorted as this can cause a clunk or rubbing sound. See Figure 1 for typical cavalier car seal. Replace the seal as necessary.

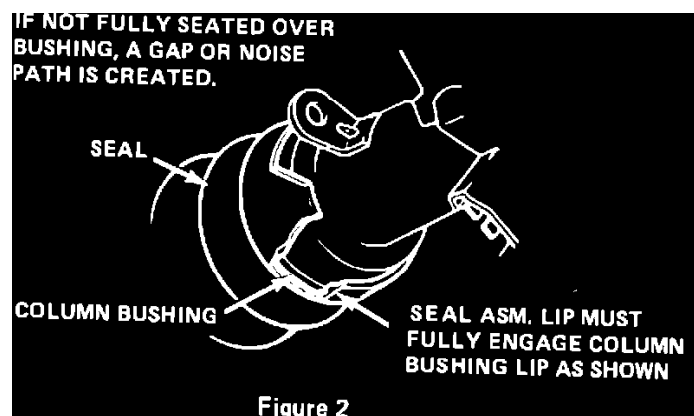


FIGURE 2

On Cavalier models, check the upper portion of the steering coupling seal to be sure it is fully seated over the bushing or a noise path could be created. The seal is retained by the lip on the bushing. Refer to Figure 2. On Celebrity models, check the seal to be sure it is securely fastened to the cowl and lower column.

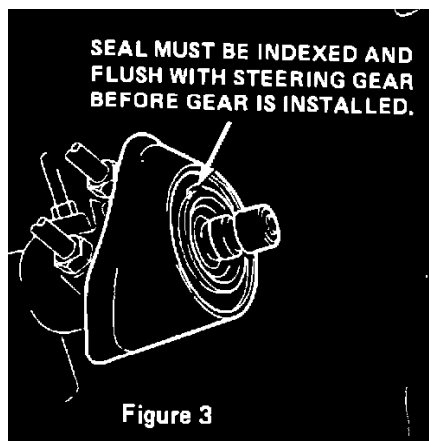


FIGURE 3

The center-take-off gears used on the Cavalier models, also use a dash seal which must be properly indexed on the housing before the gear is installed in the car. See Figure

3. If the dash seal is mispositioned another noise path can be created. A mispositioned dash seal could also cause a condition of stiff steering if the seal is rubbing on the steering coupling.

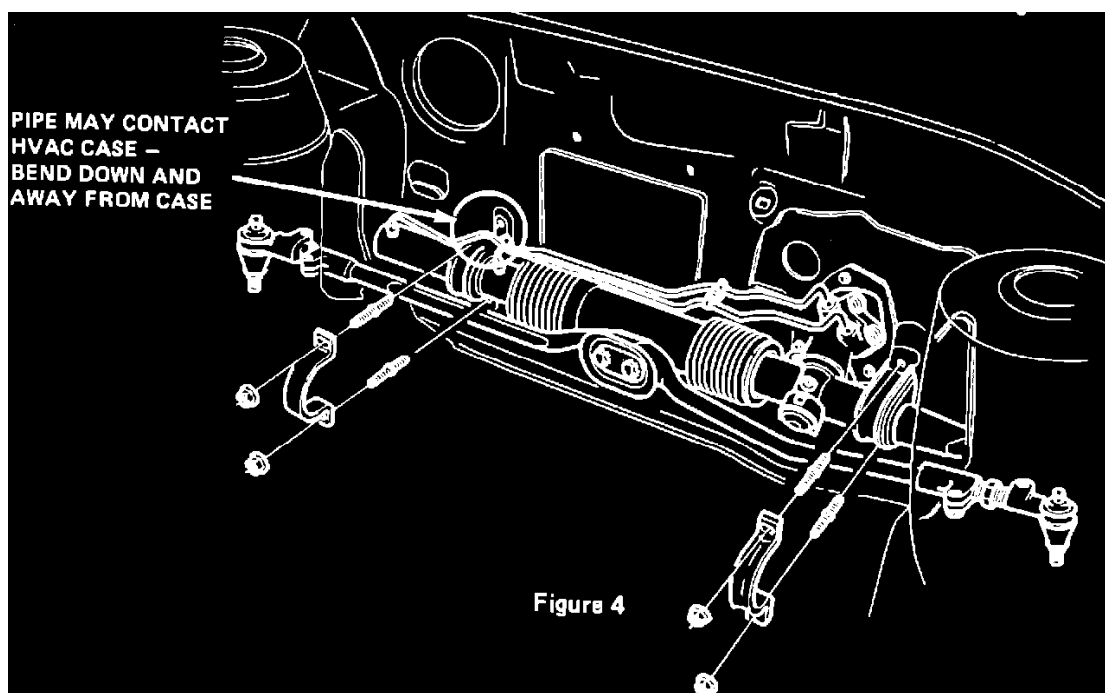


FIGURE 4

When diagnosing a growl, ground out, or rattle noise on Cavalier models, there is a possibility that one of the cylinder lines of the gear could be grounding out on the heater case on the right side of the cowl. See Figure 4. If this condition exists, bend the pipe away from the contact area to gain clearance.

All models are susceptible to having the power steering pump hoses lay against other components which could transmit steering system noises into the car. Hoses should be inspected to be sure they are not grounding out and creating a noise path.

Technical Service Bulletin # **882456B**

Date: **880601**

## Cooling System - Leaks

Number: 88-245-6B

Suction: 6B

Date: JUNE, 1988

Subject: ENGINE COOLING SYSTEM LEAKS

Model and Year: CHEVROLET PASSENGER AND LIGHT DUTY VEHICLES

TO: ALL CHEVROLET DEALERS

The cause of engine cooling system leaks can be due to several possible reasons. Refer to the Service Manual to properly diagnose the reason for a leak. MAKE SURE THE SYSTEM IS FULL OF COOLANT BEFORE PERFORMING THE DIAGNOSIS. Also, the following systems should be

inspected for proper function:

1. All hose joints for possibility of loose or misaligned clamps.
2. All gasketed joints for possibility of loose fasteners, damaged gaskets, or damaged surfaces.
3. Coolant recovery system for possibility of vacuum leaks or a damaged seal surface at the coolant filler cap assembly.
4. Water pump assembly for possibility of a slight leak from the weep hole.

**NOTICE:** A VERY SLIGHT AMOUNT OF WEEPAGE OCCURS AT THE WATER PUMP WEEP HOLE DURING NORMAL OPERATION. TRACKS OF RESIDUE FROM THE LOWER WEEP HOLE ARE NOT UNUSUAL. ONLY REPLACE THE WATER PUMP IF COOLANT IS DRIPPING FROM THE WEEP HOLE WHILE THE ENGINE IS IN OPERATION OR WHILE THE COOLING SYSTEM IS PRESSURIZED.

The use of an engine coolant supplement or sealant pellets, P/N 3634621, is recommended to eliminate slight leaks from the cooling system. Two sealant pellets should be added to the cooling system through the radiator filler neck.

**NOTICE:** DO NOT ADD THE SEALANT INTO THE COOLANT RECOVERY BOTTLE.

After adding the sealant to the cooling system, the engine should be allowed to run for approximately 15 minutes to dissolve the sealant and verify that the leak has been eliminated.

DO NOT REPLACE THE WATER PUMP ASSEMBLY IF LEAK IS NOT EVIDENT.

**NOTICE:** THE USE OF AN ENGINE COOLANT SUPPLEMENT MAY CAUSE A FILM TO APPEAR AROUND THE SIDES OF THE COOLANT RESERVOIR BOTTLE. THE PRESENCE OF THIS FILM IS CONSIDERED TO BE NORMAL.

Use applicable labor time and operation codes.

Technical Service Bulletin # **92427A**

Date: **911101**

## **A/T - Intermittent Slip, Downshift, or Busy Cycling TCC**

Number: 92-42-7A

Section: 7A

Date: NOV. 1991

Corporate Bulletin No.: 167105

ASE No.: A2

Subject: INTERMITTENT TRANSMISSION DOWNSHIFT, SLIP OR BUSY/CYCLING TCC

Model and Year: 1983-92 ALL PASSENGER CARS AND TRUCKS WITH AUTOMATIC TRANSMISSION

Some owners may comment that their vehicle is experiencing one or more of the following transmission conditions:

- Intermittent slipping.
- Intermittent downshift followed by an upshift, both with no apparent reason.
- Busyness or cycling of the TCC at steady throttle conditions and level roadway.

The cooling fan operates when the thermostat on the fan clutch reaches a preset temperature. When this temperature is reached, the fan engages to draw additional air through the radiator and lower the engine temperature. When the cooling fan engages, noise increases and may sound very similar to an increase in engine RPM due to transmission downshift, slipping or TCC cycling. When engine temperature lowers to a preset point the fan clutch will disengage. When the cooling fan disengages, noise levels will decrease and may sound very similar to a decrease in engine RPM.

The type of concern described above requires further definition and the customer should be asked several questions:

- Is the situation more pronounced at higher vehicle loads or pulling a trailer?
- Do warmer ambient temperatures make the situation more pronounced as well?

If the customer's responses indicate that both of these conditions apply, and your observation of the vehicle confirms a properly operating vehicle, provide the customer the vehicle operating description included in this bulletin. Further action may not be necessary.

A service procedure follows if further definition is required.

**SERVICE PROCEDURE:**

When attempting to diagnose an intermittent transmission downshift, slip or busy/cycling TCC:

1. Check fluid level and condition as outlined in section 7A of the appropriate service manual.
2. Test drive the vehicle under the conditions described by the customer (ambient temperature, engine coolant temperature, trailering, etc.). It may be necessary to partially restrict airflow to the radiator to raise engine coolant temperature to match customer conditions.
3. Monitor engine RPM and engine coolant temperature using a scan tool.
4. Listen for an apparent increase in engine RPM.

If engine RPM sounds like it increases, check the scan tool RPM and coolant temperature readings. If the noise increase is due to engagement of the fan the engine RPM will not increase and engine coolant temperature will begin to decrease after the fan engages. As the fan runs the engine coolant temperature will drop and the fan will disengage reducing noise levels, engine RPM will not decrease. This cycle will repeat as engine coolant temperature again rises.

If the above procedure shows the condition to be cooling fan related, no further action is necessary. The vehicle should be returned to the customer and the condition explained.

If the above procedure shows the condition to be other than cooling fan related, refer to section 7A of the appropriate service manual for transmission diagnosis information.

#### Intermittent Transmission Downshift

All light duty trucks are equipped with a thermostatic engine cooling fan. This fan is designed to provide greater fuel efficiency and quieter operation than a standard fan. These benefits are possible through the addition of a thermostatic clutch to the fan drive.

When the engine is cool the clutch allows the fan to "slip" or turn at a speed slower than the engine. By turning at a slower speed the fan uses less horsepower, which saves fuel, and is quieter. When the engine temperature reaches a preset temperature, the fan "engages" and turns at the same speed as the engine.

"Engagement" of the fan provides increased airflow through the radiator to cool the engine. As the airflow increases, fan operation becomes clearly audible. This increase in noise can easily be mistaken for an increase in engine RPM and may be incorrectly blamed on the automatic transmission.

When operating an unloaded vehicle in cooler ambient temperatures, the thermostatic clutch usually won't engage. However, if the vehicle is pulling a trailer, heavily loaded or operated at high ambient temperatures the thermostatic clutch may cycle on and off as the engine temperature rises and falls.

The sound of fan operation under the conditions described above is a sign that the cooling system on your vehicle is working correctly.

Replacement or modification of cooling system or transmission parts will not change or reduce the noise level. Attempts to reduce this noise will only give you, the customer, a false sense of vehicle unreliability and the inconvenience of having your vehicle out of service.

Technical Service Bulletin # **883181B**

Date: **880701**

### **A/C - Poor Performance/Excessive Noise**

Number: 88-318-1B

Section: 1B

Date: JULY, 1988

Subject: LOSS OF A/C PERFORMANCE/EXCESSIVE A/C NOISE

Model and Year: 1987-88 SPRINT

TO: ALL CHEVROLET DEALERS

Some of the subject vehicles may exhibit excessive noise or loss of performance from the air conditioning system. These conditions may occur as a result of a loss of torque by the A/C compressor mounting bracket fasteners. In extreme circumstances, the loss of torque at one or more of the bracket fasteners may result in a cracked upper or lower bracket.

Vehicles exhibiting the above conditions should first be examined to establish if the fasteners are at the correct torque values and that the A/C compressor brackets are not cracked before performing A/C diagnostic procedures.

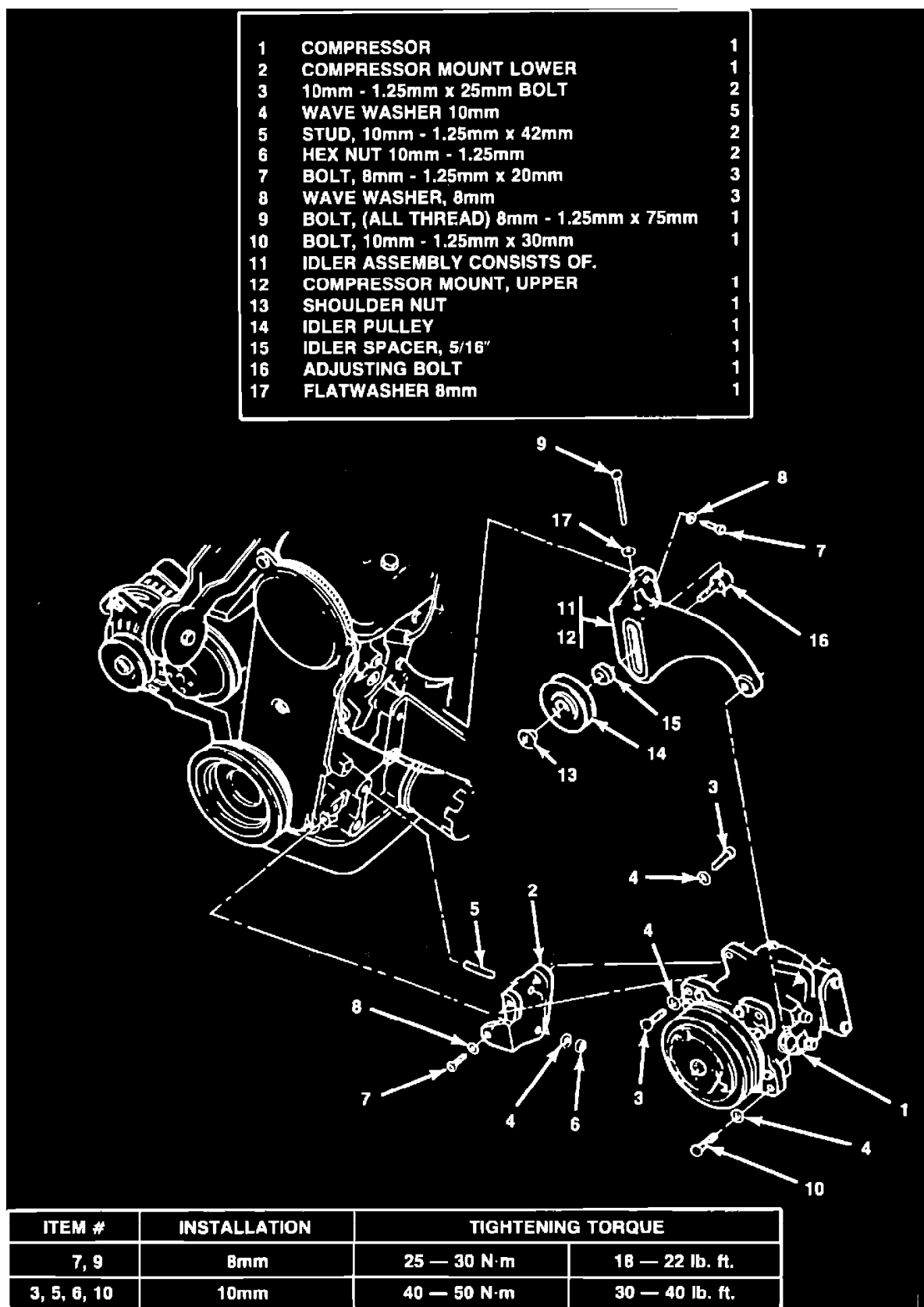


FIGURE 1

Fastener location and torques are provided in Figure 1. All compressor mounting hardware is to be checked for proper torque.

Both upper and lower compressor mounting brackets are to be visually inspected for cracks and replaced as necessary following the procedures detailed for the installation or reinstallation of the A/C compressor and mounting brackets.

#### A/C COMPRESSOR MOUNTING BRACKET AND COMPRESSOR ASSEMBLY INSTALLATION PROCEDURES:

**NOTICE:** FAILURE TO SECURE ALL FASTENERS BY THE FOLLOWING INSTRUCTIONS MAY RESULT IN LOSS OF TENSION ON BOLTS DUE TO INSUFFICIENT TORQUE ON FASTENERS.

Reference Figure 1 for component identification numbers.

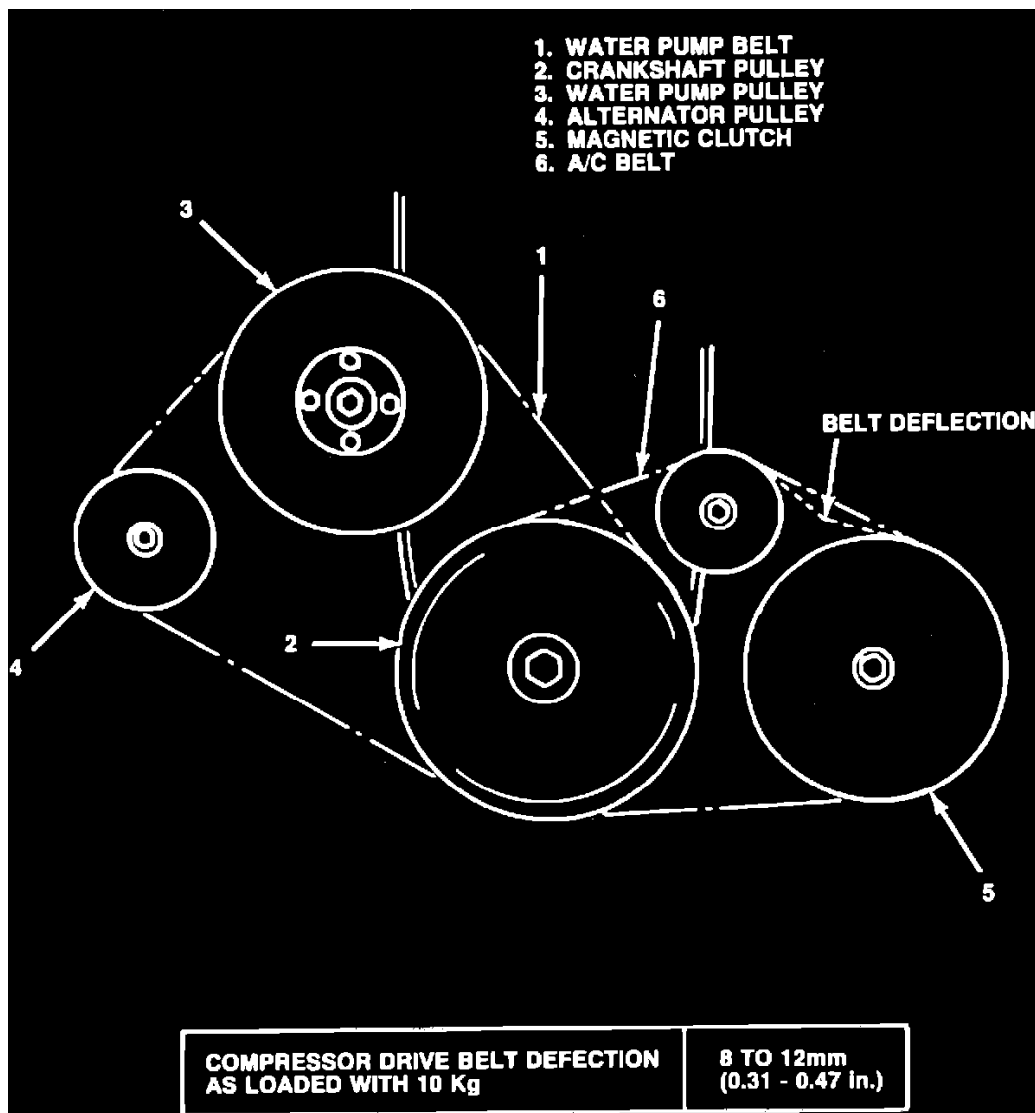


1. Install compressor (1) to lower bracket (2) using two (2) bolts 10 mm x 1.25 mm x 25 mm (3) place three (3) drops of Loctite 271 or equivalent on each bolt, and two (2) 10 mm wave washers (4). Snug the bolts until the compressor will stay in position but still rotate around bolts.
2. Install lower bracket and compressor on studs previously installed. Finger tighten two (2) nuts 10 mm x 1.25 mm (6) and wave washers (4) on studs. Install one (1) 8 mm x 1.25 mm x 20 mm bolt (7) and 8 mm wave washer (8) through ear of lower bracket into engine.

THE FOLLOWING SEQUENCE MUST BE USED: REFERENCE FIGURE 1 FOR TORQUE SPECIFICATIONS.

First tighten the 8 mm bolt (7). Second, tighten two (2) 10 mm nuts (6) Final assembly must be done from below vehicle using hand wrenches to assure sufficient torque.

3. Install upper bracket with idler pulley attached to engine using two (2) 8 mm x 1.25 mm x 20 mm bolts (7) and wave washers (8) and to compressor using one (1) 10 mm x 1.25 mm x 30 mm bolt (10) and wave washer (4). Tighten two (2) 8 mm bolts (7) and one 10 mm bolt (10).
4. **THIS STEP IS VERY IMPORTANT:** From below vehicle, tighten two (2) bolts (3) previously snugged through compressor ears (with Loctite), using hand wrenches to assure proper torque.



**FIGURE 2**

5a. For Non Turbocharged Vehicles:

Install compressor drive belt around crank shaft pulley. Compressor clutch and idler pulley. Adjust belt to proper tension and torque idler pulley shoulder nut to 40 ft.lbs. See Figure 2.

5b. For Turbocharged Vehicles:

Install compressor drive belt around crankshaft and compressor pulleys. Adjust belt tension by positioning compressor, tighten retaining nut to 40 ft.lbs.

Labor Operation Number: T1353

Labor Time : 1.1 Hours

Technical Service Bulletin # **89593E**

Date: **890101**

## **Wheels - Air Leak, Cast Aluminim Wheel Porosity**

Number: 89-59-3E section: 3E

Date: JAN., 1989

Subject: CAST ALUMINIM WHEEL POROSITY

Model and Year: ALL MODELS WITH CAST ALUMINUM WHEELS

TO: ALL CHEVROLET DEALERS

This bulletin cancels and replaces Dealer Service Bulletin 87-89 (Section 3E) dated March, 1987, to expand model year application through 1989 vehicles. All copies of 87-89 should be discarded.

Should a vehicle equipped with cast aluminum wheels exhibit a slow leak due to a porous condition existing in the wheel, the wheel can be repaired by using Dow Corning silastic 732 RTV, part number 1052366 or equivalent, as described in the following procedure:

1. Remove wheel and tire assembly from car.
2. Locate leaking areas by inflating tire to 40 PSI and dipping wheel-tire assembly into water bath.
3. Mark leak areas and remove tire from wheel.
4. Scuff inside rim surface at leak area with # 80 grit paper and clean area with general purpose cleaner, such as 3m # 08984 or equivalent.
5. Apply 1/8" thick layer of adhesive/sealant to leak area and allow six hours of drying time.
6. Mount tire on wheel, pressurize to 40 PSI and check for leaks. NOTICE: Caution must be used when mounting the tire so as not to damage the sealer.
7. Adjust tire pressure to meet specifications.
8. Balance wheel and tire assembly using nylon coated wheel weights.
9. Water test wheel again.
10. Reinstall wheel-tire assembly on car.

### **WARRANTY INFORMATION**

Labor Operation Number: T3032

Time Allowance: .6 hours

Trouble Code: 92

Technical Service Bulletin # **931693E**

Date: **930401**

## **Tires - Slipping on Rim**

Number: 93-169-3E

Section: 3E

Date: APRIL 1993

Corporate Bulletin No.: 393501

ASE No.: A4

Subject:  
TIRES SLIPPING ON WHEELS (USE PROPER TIRE MOUNTING PROCEDURE)

Model and Year:  
1988-93 ALL PASSENGER CARS AND LIGHT DUTY TRUCKS

Some incidents of tires slipping (rotating) on wheels have been reported on 1988-93 passenger cars and light duty trucks. Most incidents have occurred when driven aggressively immediately after tire mounting. Hard acceleration and/or braking is usually required. This condition will affect wheel balance, which could result in a vibration.

To reduce the chance of tires rotating on their wheels, any excess lube should be wiped from the tire and rim after tire mounting, but before inflating to seat the bead. (Never exceed 40 psi to seat the bead.) Also, the vehicle should not be driven aggressively for at least four hours after tire mounting to allow the lube to dry.

GM Goodwrench Rubber Lubricant, p/n 12345884, is the recommended lube for tire mounting.

Technical Service Bulletin # **9313310**

Date: **930301**

## **Door Locks - Binding or Sticking or Key Hard to Insert**

Number: 93-133-10

Section: 10

Date: MARCH 1993

Corporate Bulletin No.: 1341070R

ASE No.: B1

Subject:  
DOOR LOCK CYLINDERS (RECOMMENDED LUBRICATION)

Model and Year:  
ALL 1993 AND PREVIOUS MODEL CARS AND TRUCKS

THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN 92-41-10, DATED NOV. 1991. THE 1993 MODEL YEAR HAS BEEN ADDED AS WELL AS A NOTE. PLEASE DISCARD ALL COPIES OF 92-41-10.

Customer comments of binding/sticking door lock cylinders, or keys that are hard to insert or extract may be corrected in many cases by applying the proper lubrication.

The recommended materials for lubricating these components are (in order of preference):

- GM # 12345120 Multi purpose lubricant (9 oz. spray) or # 12345121 (12 oz.).
- 5 W 30 Motor Oil
- GM # 1052276 or 1052277 spray type Silicone (4.5 oz. or 12 oz. cans).

Penetrating oil type lubricants (such as GM # 1052949 or 1052950, WD-40 lubricants) ARE NOT RECOMMENDED because they wash out the original lubrication and eventually evaporate, leaving little or no lubricating material. However, if these type materials are used to "unfreeze" or loosen lock cylinder components, refer to steps 2 through 4 listed below for the proper methods of lubricating.

NOTE:  
DO NOT REPLACE THE DOOR LOCK CYLINDERS UNTIL AFTER THE LUBRICATING MATERIALS HAVE BEEN USED AND THE CYLINDER REMAINS FROZEN/BOUND.

If door lock cylinders require replacement for any reason, apply a coating of GM # 12345120 Multi purpose Lubricant to the inside of the lock case and the cylinder keyway prior to assembling and installing the cylinder.

Parts are currently available from GMSPO.

Frozen cylinders due to cold weather may be repaired using the following procedure:

1. Apply heat to the cylinder area with a heat gun while being careful not to damage the painted surfaces.
2. Hold the shutter door open with a paper clip (or similar item) and force air into the cylinder using compressed air and a blow gun attachment.
3. While holding the shutter door open, inject a small amount of lubricant (see above recommendations) into the cylinder.
4. Work the key into the cylinder several times and wipe any excess lubrication residue from the key.

Use applicable Labor Time Number and Time allowance.

Technical Service Bulletin # **914858C**

Date: **920301**

## **Instrument Cluster - Oil Contamination**

Number: 91-485-8C

Section: 8C

Date: MARCH 1992

Corporate Bulletin No.: 237202

ASE No.: B1

Subject:  
OIL LEAKAGE INTO INSTRUMENT CLUSTER

Model and Year:  
1985-88 GEO SPRINT 1989-91 GEO METRO

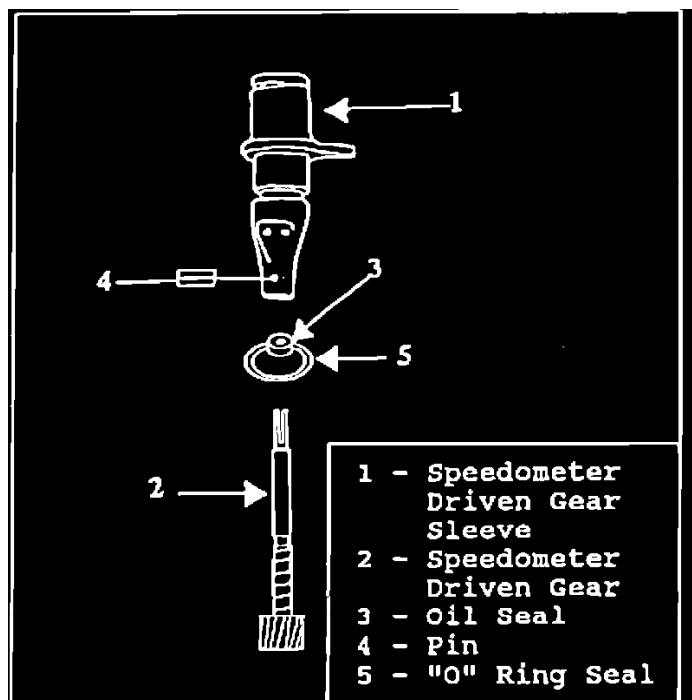
CONDITION:

Oil may leak into the instrument cluster on some 1985-91 M cars. In severe instances, the oil could drip onto the carpet or the driver's clothing.

CAUSE:

The oil used to lubricate the speedometer cable cannot drain back into the transmission because of the design of the driven gear sleeve. The new style has an oil drain hole added.

CORRECTION:



Replace the parts shown in the illustration, following the instructions in Section 7B of the Service Manual. Although the sleeve (# 1) is the only revised part, all the parts should be replaced to prevent any remaining oil from getting into the cluster again. In rare instances, the instrument cluster and/or carpet may also have to be replaced.

INSTALLATION PRECAUTIONS:

- Be certain the oil seal is fully seated and square to the bore.
- Be certain the slotted end of the driven gear has no sharp edges that might damage the seal when installing.
- Lubricate driven gear and "O" ring seal.

PARTS INVOLVED:

- |    |                                |                |
|----|--------------------------------|----------------|
| 1. | Speedometer driven gear sleeve | - 96066895     |
| 2. | Speedometer driven             | - M/T 96060271 |
|    |                                | - A/T 96060272 |
| 3. | Oil Seal                       | - M/T 96064510 |
|    |                                | - A/T 96051417 |
| 4. | Pin                            | - 96059915     |
| 5. | "O" Ring Seal                  | 96059932       |
| 6. | Speedometer Cable              | 30003204       |

PARTS AVAILABILITY:

Parts are currently available from GMSPO.

Warranty Information:

Use existing Labor Operations. (Except for 1989. When using K2060 Labor Operation the time published in the Labor Time Guide was incorrect. Should read 0.3 Hour not 3.8 Hrs.)

Technical Service Bulletin # **882518A**Date: **880601****ECM - Intermittent Connection**

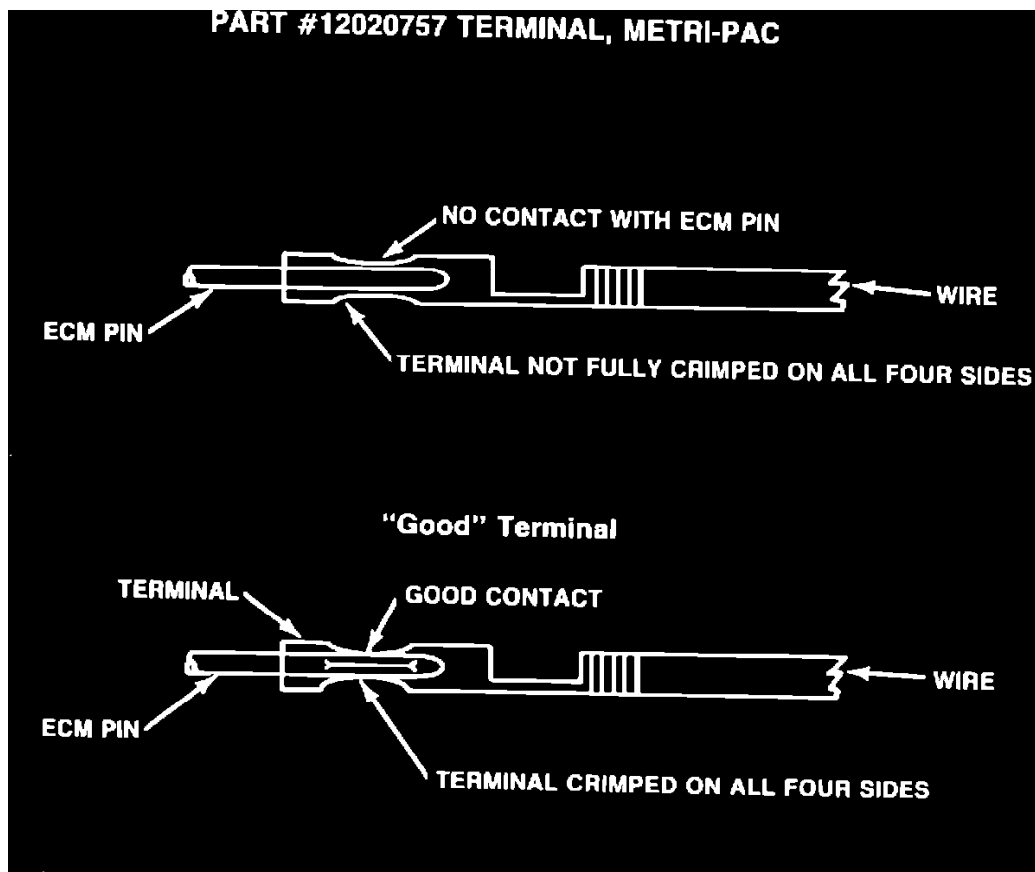
Number: 88-251-8A

Section: 8A

Date: JUNE, 1988

Subject: INTERMITTENT CONNECTION TO THE ECM

Model and Year: 1988 CHEVROLET PASSENGER CARS AND LIGHT DUTY TRUCKS



TO: ALL CHEVROLET DEALERS

A condition may exist in which the female terminals in the connector to the ECM do not make a solid connection to the male pins in the ECM (see illustration). This can result in an intermittent condition, in any circuit operated by the ECM. The Service Manuals direct a check of connections any time an intermittent condition is found, and this may be the cause of some of these conditions.

Visually inspect the terminal using a flashlight, or use a .95 mm pin gauge. The gauge should not pass freely through the female terminal. Do not probe the terminal with anything other than the pin gauge, as probing could damage the terminal. If the female terminal does not grip properly, replace the terminal with P/N 12020757. General directions on wiring repair are shown in Section 8A of the service Manual.

Technical Service Bulletin # **883475**Date: **880901****Brakes - Rubbing/Grinding Noise From Rear**

Number: 88-347-5

Section: 5

Date: SEPT., 1988

Subject: RUBBING/GRINDING NOISE FROM REAR BRAKES

Model and Year: 1985-88 SPRINT

TO: ALL CHEVROLET DEALERS

Some of the above vehicles may exhibit a grinding or rubbing noise from the rear brakes on application after an extended period of non-use, approximately 8 hours or more. This condition may be aggravated by high humidity, condensation or rain during the park period.

A new lining material has been developed which eliminates the described noise condition. This lining material was introduced on late 1988 model year vehicles beginning with the following VIN's: Model Year Code J.

**VIN BREAKPOINT**

3 Door (VIN Body Code 2)	769929
"Metro" 3 Dr. (VIN Carline Code MS)	769666
5 Door (VIN Body Code 6)	769691
"Turbo" (VIN Engine Code 2)	N/A

For vehicles built before these VIN breakpoints that exhibit the described condition, new style brake shoe assemblies should be installed in place of the existing parts.

Following service manual procedures remove and replace four rear brake shoes using parts obtained in kit, P/N 96061639, shoe set, brake. This kit provides parts for one wheel only, 2 kits will be required for each vehicle.

Parts are currently available from GMSPO.

Labor Operation Number: H0257

Labor Time: 1.0 Hour

Technical Service Bulletin # **882145**

Date: **880601**

**Brakes - Rattle Noise At Idle With Brakes Applied**

Number: REISSUE 88-214-5

Section: 5

Date: JUNE, 1988

Subject: RATTLE NOISE AT IDLE WITH BRAKES APPLIED

Model and Year: 1985-88 SPRINT

TO: ALL CHEVROLET DEALERS

Dealer Service Bulletin 88-214-5 is being reissued to correct the involved models. The bulletin affects 1985-88 sprint vehicles, not Spectrums. All copies of 88-214-5 dated May, 1988 should be discarded.

Some of the subject vehicles may exhibit a rattle noise from the area of the brake booster when the engine is idling and the brake applied. This condition is more common on vehicles equipped with automatic transmission and occurs only when the engine is cold.

The repair is to replace the vacuum check valve at the booster using P/N 96057459 available from GMSPO.

This part has been revised in order to prevent the check valve being agitated by the vacuum pulses present in the vacuum line to the booster at idle.

Labor Operation Number: T1338

Labor Time: .3 Hours

Technical Service Bulletin # **921078A**

Date: **920201**

**Cruise Control - Intermittent Dropout/Fail to Set/Resume**

Number: 92-107-8A

Section: 8A

Date: FEB. 1992

Corporate Bulletin No.: 239001

ASE No.: A8

Subject:  
CRUISE CONTROL INTERMITTENT DROP-OUT AND/OR FAIL TO SET OR RESUME

Model and Year:

1988-92 ALL PASSENGER CARS AND TRUCKS EXCEPT CAPRICE IS 1988-90 ONLY

**CONDITION:** On 1988-92 vehicles using the vacuum servo cruise control system, the cruise control may intermittently lose speed and/or drop-out (release), while using cruise control. It may also fail to initially set, or resume, at times. Vehicles using the Electro-Motor Cruise Control system (Stepper Motor Cruise) are not affected.

When driving the vehicle, the cruise control will operate normally for 10 to 30 miles, then may gradually lose speed and/or drop out of cruise. If you experience this condition, accelerate to a speed higher than the cruise set speed, using the accelerator pedal only. DO NOT use the set or resume controls. Then allow the vehicle to coast down, and see whether the cruise catches and holds at the set speed. If the cruise catches and holds at the set speed, the diagnostic procedure below should be used to test the servo and vacuum system. Because of the intermittent nature of this condition, you may have to try several times to reproduce this condition.

**CAUSE:** In a small percentage of servos, the vent valve, which normally cycles to control the amount of vacuum needed to maintain a set speed, may fail to close at times. When this happens, the vacuum is being continually vented, so the servo cannot pull the throttle open to increase the vehicle speed. The valve may close correctly the next time the cruise is cycled by setting or resuming.

Because this condition is intermittent, testing the vehicle following the Service Manual diagnostic procedures may lead to the replacement of good parts, which will not correct the vehicle. This may lead to the customer having to bring the vehicle back for service again. It is recommended that the following diagnostic procedure be performed to determine if the trouble can be found.

#### DIAGNOSTIC PROCEDURE:

First evaluate the cruise system as specified in the Service Manual. Then make the following additional checks that may detect conditions with the vacuum portion of the cruise system.

##### Source Vacuum Check:

Disconnect the vacuum supply hose from the servo (small hose). Install a vacuum gage at the hose end and start the engine. The gage should read at least 10 in. Hg. (34 Kp/m<sup>2</sup>). If there is no vacuum, or very little vacuum, inspect for leaking or pinched hoses.

##### Servo Vacuum Valve Check:

With engine off, remove the vacuum supply hose (small hose) from the servo. Using a hand held vacuum pump connected to the vacuum port on the servo, stroke the pump until the gage reads 10-15 in.Hg. (34 - 50 Kp/m<sup>2</sup>). Replace the servo if either of the following conditions occur:

1. Vacuum valve will not hold any vacuum.
2. Gage reads 10-15 in.Hg. (34 - 50 Kp/m<sup>2</sup>), but vacuum may decrease quickly (less than 10 seconds). In a good servo, the vacuum may decrease slowly (more than 30 seconds).

##### Servo Vent Valve Check:

Disconnect the servo from the throttle linkage. Disconnect the electrical connector from the servo. Using a fused jumper wire, apply 12 volts to terminal "A" on the servo. Connect a jumper wire from terminal "C" on the servo to ground. You should hear a click noise as the vent valve closes. Remove the vacuum release valve hose (large hose) from the servo. Using a hand held vacuum pump connected to the large port, stroke the pump until the servo diaphragm pulls in and the gage reads 10-20 in.Hg. (34 - 68 Kp/m<sup>2</sup>). Replace the servo if either of the following conditions occur:

1. Diaphragm will not move in completely.
2. Diaphragm moves in completely. Gauge reads 10-15 in.Hg. (34 - 50 Kp/m<sup>2</sup>), but vacuum decreases quickly (In a good servo the vacuum may decrease slowly).

##### Vacuum Release Valve (On Brake Pedal) Check:

Disconnect the vacuum release hose from the servo (large hose). Apply vacuum (10-20 in.Hg. (34-68 Kp/m<sup>2</sup>)) to the hose using a hand vacuum pump and gage. The vacuum reading on the gage should remain steady. If gage reading does not hold, or leaks down slowly, inspect for a leaking or misadjusted vacuum release valve (at the brake pedal), or a leaking hose. A leaking vacuum release system will dramatically effect the operation and life of the servo.

Other items that could affect servo life and operation are:

- Improper servo cable or rod adjustment;
- Binding throttle linkage;
- Loose or bent servo bracket; or
- Poor electrical connections.

If the previous diagnostic procedures fail to determine the cause of the cruise system intermittent condition, replace the servo.

**WARRANTY INFORMATION:**

Use Labor Operation T1821,

Labor Time: 0.5 hrs., for diagnostic time only

Use existing labor operations for replacement of parts.

Technical Service Bulletin # **891089A**

Date: **890301**

**Audio - Poor AM or FM Radio Reception**

Number: 89-108-9A

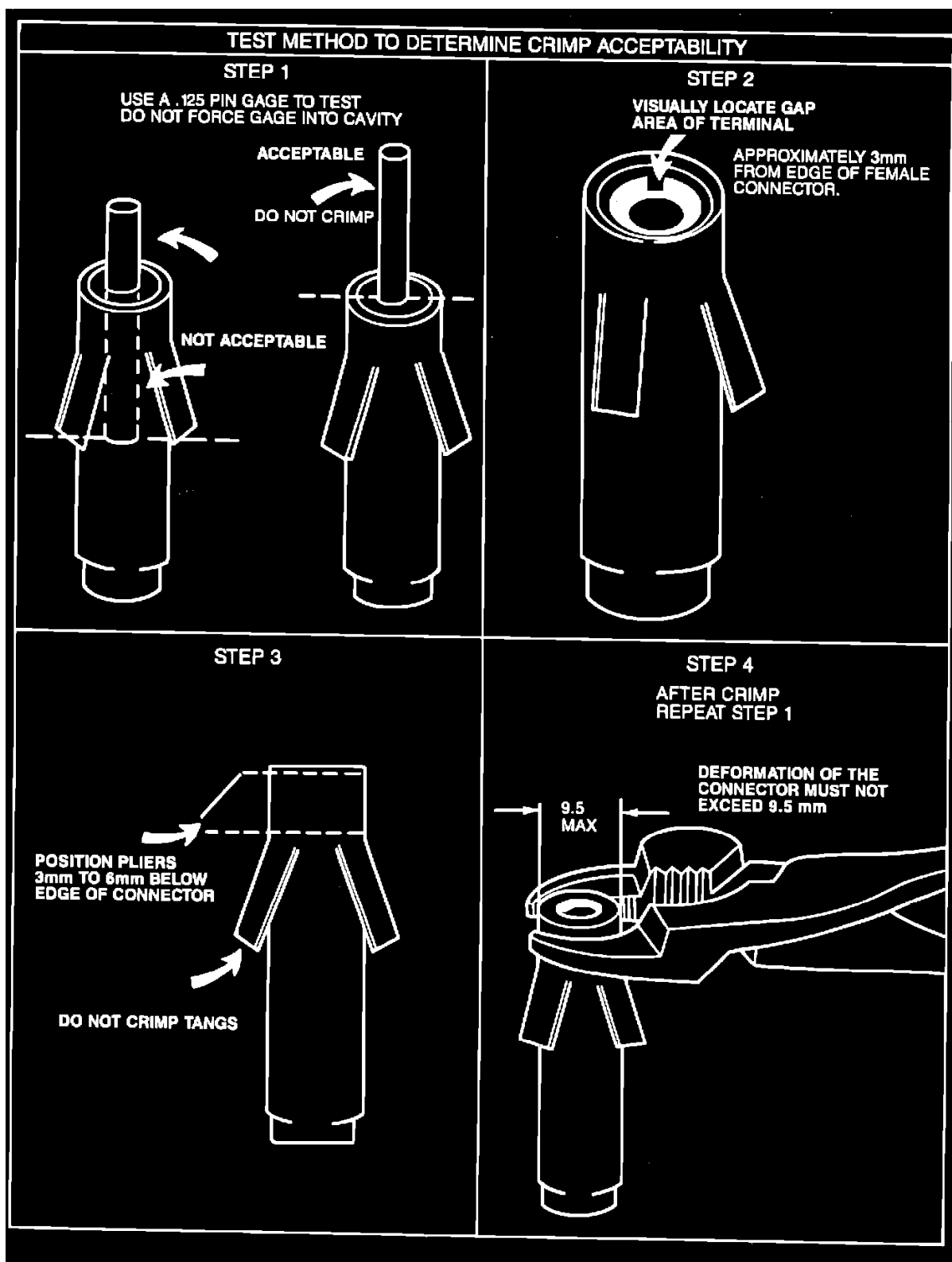
Section: 9A

Date: MARCH, 1989

Subject: POOR AM OR FM RADIO RECEPTION

Model and Year: 1980-89 CHEVROLET VEHICLES





TO: ALL CHEVROLET DEALERS

Some Chevrolet models may exhibit a condition of poor AM or FM radio reception. This may be caused by a poor contact on the female terminal of the antenna coaxial cable lead.

The illustration contains a four-step procedure to test and repair the female terminal. The opening in the female terminal should range from .120" to .125" in diameter. If the gage passes through freely, the terminal should be repaired as illustrated. Gage sets are available from Kent Moore, tool number J26900-14.

For warranty purposes use Labor Operation T6369 at .5 hour for all carlines.  
Technical Service Bulletin # **902166**

Date: **900401**

## Oil Filters (Small 75 mm) - Leakage Prevention

Number: 90-216-6

Section: 6

Date: April 1990

Corp. Bulletin No.: 906106

Subject: PROPER INSTALLATION OF 75 MM OIL FILTER

Model and Year: 1981-90 CHEVROLET MODELS

THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN NO. 90-187-6, DATED MARCH 1990. THE 1990 MODEL YEAR HAS BEEN ADDED. ALL COPIES OF 90-187-6 SHOULD BE DISCARDED.

To prevent leakage of small 75 mm oil filters such as PF-40, PF-45, PF-47, PF-51, etc., it is very important that the installation instructions listed below are closely followed.

Remove old filter by turning counter clockwise. Clean gasket sealing area on Engine Oil Filter Mounting Surface. (If engine has an adapter base, make sure threaded nipple or bolt is properly torqued.)

Lightly oil gasket with clean oil and install filter. After the oil filter gasket contacts the oil filter adapter base, tighten 3/4 to 1 full turn. When necessary, use a cap-type wrench, AC Delco OF17W or equivalent, or strap type wrench with swivel handle to insure proper installation.

With engine oil at proper level, run engine three minutes and thoroughly check filter area for leaks.

IMPORTANT: Be certain to follow replacement oil filter usage applications.

Technical Service Bulletin # **902935**

Date: **900701**

## **Brakes - Poor Rotor Finish/Hard Pedal Feel**

Number: 90-293-5

Section: 5

Date: July 1990

Corp. Bulletin No.: 005003

Subject: BRAKE ROTOR REFINISH

Model and Year: 1981-90 ALL PASSENGER CARS AND TRUCKS

TO: ALL CHEVROLET DEALERS

Comments have been received of poor brake rotor finish and/or hard brake pedal feel after refinishing brake rotors using the On-Vehicle Brake Lathe (VGB 320/366, Kent-Moore 38- 070400) sold through GM Dealer Equipment program.

CAUSE:

This condition results from using non-original cutting tips. Only original equipment replacement tips should be used.

CORRECTION:

When replacing the original cutting tips for an On-Vehicle Brake Lathe, use only replacement tips ordered from Kent-Moore Tool and Equipment Division.

The replacement cutting tips can be ordered from Kent-Moore (1-800-GM-TOOLS) as follows:

Part Number: J-37704-13 Cufting Tips (Box of Ten)

We believe this source and their equipment to be reliable. There may be additional manufacturers of such equipment. General Motors does not endorse, indicate any preference for or assume any responsibility for the products or equipment from this firm or for any such items which may be available from other sources.

Technical Service Bulletin # **891271B**

Date: **890401**

## **A/C - R12 Loss From Loose or Missing Access Fitting Caps**

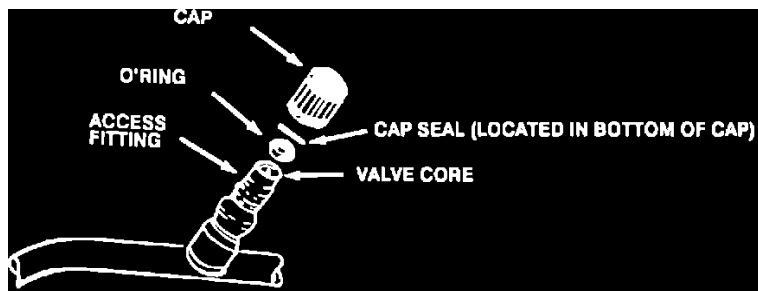
Number: 89-127-1B

Section: 1B

Date: APRIL, 1989

Subject: A/C REFRIGERANT LOSS DUE TO LOOSE OR MISSING ACCESS FITTING CAPS

Model and Year: 1980-89 CHEVROLET MODELS WITH A/C



**FIGURE 1**

TO: ALL CHEVROLET DEALERS

All Chevrolet air conditioning Hi side and Low side access fittings are supplied with a black plastic cap and seal assembly which provides the primary refrigerant seal for the service fittings.

If the cap and seal assembly is missing or loose, a significant amount of refrigerant may leak through the valve core located in the access fitting, which could result in poor A/C performance or failure.

When servicing any vehicle's A/C system, make sure all access fitting cap seals (refer to Figure 1) are in place and tight. Caps should be threaded on until contact with the O-ring seal is made and then tightened another 1/4 - 1/2 turn to ensure proper sealing.

High Side  
Valve - Cap and Seal  
P/N 3033974

Low Side  
Valve - Cap and Seal  
P/N 6551640

Parts are currently available from GMSPO.

Technical Service Bulletin # **93356D**

Date: **921001**

## **Engine - Miss, Hesitation, or Roughness**

Number: 93-35-6D

Section: 6D

Date: OCT. 1992

Corporate Bulletin No.: 716404R

ASE No.: A1, A8

Subject:

ENGINE MISS HESITATION OR ROUGHNESS DUE TO PIERCED SECONDARY IGNITION COMPONENTS

Model and Year:

1980-93 ALL PASSENGER CARS AND TRUCKS

THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN NO. 87-121, DATED MAY 1987. THE 1989-93 MODEL YEARS HAVE BEEN ADDED. ALL COPIES OF 87-121 SHOULD BE DISCARDED.

During the diagnosis procedure for an engine miss, hesitation or roughness, a spark plug or spark plug wire condition may be suspected. Several types of commercial or homemade diagnostic equipment required the secondary ignition boots or wire to be pierced. This is normally done to check for spark plug firing or to perform a cylinder balance test. Similarly the use of pliers or other such tools to disengage a spark plug boot may pierce or damage the boot or wire. Secondary ignition components should not be pierced for any reason.

Piercing a spark plug wire and/or distributor boot may create a condition that will not be immediately apparent. Over time, the hole in the pierced boot may allow a ground path to develop creating a plug misfire condition. Heavily moisture laden air in the vicinity of the pierced boot may accelerate this effect.

Piercing a secondary ignition wire creates a gap in the wire's conductive core. This gap is a point of high resistance. The current flow in the wire will increase to compensate for the higher wire resistance. Over time, the wire may fail creating a plug misfire condition. The time required for the condition to appear depends upon the extent of damage to the conductive core.

To help prevent future condition that are spark plug wire related, do not pierce or otherwise damage any secondary ignition component. Only use diagnostic equipment containing an inductive pick-up to check for spark plug firing or to perform cylinder balance tests. When disengaging a spark plug boot from the spark plug, twist the flanged boot 1/2 turn then pull on the boot only to remove the wire.

Technical Service Bulletin # **638111**

Date: **960401**

## **Headlamp Lens - Distortion Caused by Aiming Equipment**

File In Section: 8 - Chassis/Body Electrical

Bulletin No.: 63-81-11

Date: April, 1996

## **INFORMATION**

Subject:  
Headlamp Lens Distortion Caused by Headlamp Aiming Equipment

Models:  
1996 and Prior Passenger Cars and Trucks  
with Plastic Headlamp Lenses

When using headlamp aiming equipment which attaches to the headlamp assembly with a suction cup type device, **DO NOT LEAVE THE LAMPS ON** while the equipment is attached. On vehicles with "plastic" headlamps (body styled composite or sealed beam), having the head lamps illuminated when the equipment is attached may cause heat to build-up between the plastic headlamp lens and the suction cup. This heat build-up, combined with the suction cup, may cause the plastic headlamp lens to become distorted, requiring lamp replacement.

Many aftermarket parts suppliers currently offer replacement headlamps made of plastic for past model vehicles which were originally equipped with headlamps made of glass. As a result, you may encounter vehicles that have a mix of both glass and plastic headlamp assemblies.

**Notice:**  
In order to avoid any possibility of damage, regardless of whether a vehicle has glass or plastic headlamps, it is recommended that the headlamps not be illuminated when using headlamp aiming equipment which uses a suction cup device for attachment.

On vehicles with concealed headlamps, follow the instructions in the Owner's Manual on how to keep the headlamp doors open and the headlamps not illuminated.

Technical Service Bulletin # **99-09-41-004**

Date: **000101**

## **Air Bag (SIR) On-Off Switch Kits, New Parts and Service**

Bulletin Number:  
99-09-41-004

Section:  
09 - Restraints

Date:  
January, 2000

Title:  
Frontal Supplemental Inflatable Restraints (SIR) On-Off Switch Kits, New Parts and Procedures

Models:  
1988-2000 Passenger Cars and Trucks

This bulletin is being revised to add the 1999 & 2000 model years. Please discard Corporate Bulletin Number 73-90-23 (Section 9 - Accessories).

Never consider installing an air bag on-off switch unless the following conditions are met:

1. The customer presents a letter from NHTSA authorizing the installation of the air bag on-off switch.
2. The dealership gives the customer a copy of the NOTICE TO GM OWNERS ABOUT AIR BAG ON-OFF SWITCHES.
3. The customer still wants the air bag on-off switch installed.

This bulletin includes information regarding switches to turn off and on frontal air bags, additional switch/display light diagnosis, switch installation kit content descriptions and ordering directions for special parts (if required).

Some time ago, the National Highway Traffic and Safety Administration (NHTSA) announced a new regulation about air bags. The new regulation includes procedures that will permit the installation of air bag on-off switches for the few customers who, in NHTSA's opinion, fit the criteria for switches.

**Important:**  
Due to the new regulation, DEALERS SHOULD NO LONGER USE THE INFORMATION ON AIR BAG DISCONNECTION (Corporate Bulletin # 73-90-12, dated June, 1997). INSTEAD, USE THE INFORMATION INCLUDED WITH THIS BULLETIN.

The switch installation kit contains the necessary components (switch, bracket, attaching hardware, display light, applique, sheet for switch and

light, tie straps and instruction sheets) for system operation.

Some kits also include a replacement safety belt for certain vehicles that are designed with specific FORCE LIMITING safety belt systems. Special Owner's Manual inserts are included in the installation kit for system operation review by the owner.

Additional equipment such as a 12 volt test lamp and the J 38125-B (-A or -500 will also apply) Terminal Repair Kit, are required to complete the switch kit installation. In some cases, scan tools (Tech II or equivalent) may be required to reprogram certain control modules.

SUGGESTED INSTALLATION TIME ALLOWANCES		
VEHICLE YEAR/LINE	ONE SWITCH	ADD FOR 2ND SWITCH
1993-96 A Cars	1.0 hr	N/A
1991-96 B Cars	0.8 hr	0.5 hr
1989-96 C Cars	0.9 hr	0.4 hr
1997-2000 C Cars	1.0 hr	0.4 hr
1993-96 D Cars	1.1 hrs	0.5 hr
1990-2000 E Cars	1.1 hrs	0.5 hr
1990-92 F Cars	1.3 hrs	N/A
1993-2000 F Cars	0.9 hr	0.5 hr
1995-99 G Cars @	1.0 hr	0.6 hr
1988-93 H Cars	0.9 hr	N/A
1994-2000 H Cars	1.0 hr	0.5 hr
1995-2000 J Cars (Coupes/Sedans)	0.8 hr	0.4 hr
1995-2000 J Cars (Convertibles)	0.9 hr	0.5 hr
1990-97 K Cars	0.9 hr	0.5 hr
1998-2000 K Cars	1.0 hr	0.5 hr
1994-1999 K-Spl Cars	0.9 hr	0.5 hr
2000 K-Spl Cars	1.0 hr	0.5 hr
1991-96 L Cars	0.9 hr	N/A
1994-98 N Cars	0.9 hr	0.5 hr
1997-2000 N Cars (Malibu/Cutlass)	1.0 hr	0.6 hr
1999-2000 N Cars (Alero/Grand Am)	1.0 hr	0.5 hr
1994-2000 U Vans	0.8 hr	N/A
1997-2000 U Vans	0.9 hr	0.5 hr
1990-93 V Cars (Allante)	1.1 hrs	N/A
1997-2000 V Cars (Catera) #	1.7 hrs (Driver)	1.4 hrs (Passenger)
1994-2000 W Cars	0.9 hr	0.5 hr
1990-93 Y Cars	1.1 hrs	N/A
1994-96 Y Cars	1.3 hrs	0.6 hr
1997-2000 Y Car @	1.6 hrs	0.7 hr
1995-2000 C/K Trucks	0.8 hr	0.4 hr
1999-2000 C/K Trucks (Silverado/Sierra)	1.3 hrs	0.5 hr
1994-2000 G Vans	1.3 hrs	0.5 hr
1993-2000 M/L Vans	1.1 hrs	0.5 hr
1995-2000 S/T Trucks	1.2 hrs	0.5 hr
@ = The kits for these vehicles include replacement seat belts. Aurora and Riviera models built on or after January 1, 1998 will include DEPOWERED air bags and the safety belts on these vehicles will not be included in the switch kits and MUST NOT BE CHANGED. The 1997-00 Corvette models will require safety belt changes regardless of build dates. The suggested time does NOT include times to replace safety belts.		
# = Catera model suggested times are specific to location (driver or passenger). The suggested time for installing both switches at the same time reduces the total by 0.6 hr (or 2.5 hrs to install both)		

The cost of the switch kit and labor to install the switch kit are the responsibility of the customer. Suggested times for installation are in the illustration.

#### Important:

In rare instances, the installation of switch(es) may turn on the vehicle air bag warning light. This condition may exist due to the additional resistance of the switch and harness when added to the SIR system. In these rare instances, a SPECIAL SERVICE ONLY Diagnostic Energy Reserve Module (DERM) of Sensing and Diagnostic Module (SDM) will be made available to the owner from GMSP0 at no charge for the parts and labor. Prior to ordering and/or installing a switch kit, the customer should be advised that this potential does exist and can be resolved by one of the following options:

If the light does come on after switch installation (AND PROPER INSTALLATION AND CONNECTIONS HAVE BEEN VERIFIED), advise the customer that the light has come on and that the vehicle:

^ May be driven with the light on until the special DERM or SDM is available. The switch portion to turn off the air bag will still function properly, but the warning light will be on until the additional part can be obtained. When the DERM or 5 SDM is available, the customer should return to have the part installed (at no cost to the customer) OR

^ May have the existing air bag system reconnected and leave the switch (inoperative) in the vehicle until the additional part can be obtained. When the DERM or SDM is available, the customer should return to have the part installed (at no cost to the customer).

The standard SIR system diagnosis can be made by disconnecting the switch from the SIR wiring harness and following the directions for SIR

System Diagnosis found in the appropriate Service Manual.

A description of the major components of the installation kit is as follows:

## SWITCHES

One switch kit will be required for each air bag (driver or passenger) and will be ignition key operated. When the switch is in the OFF position, the air bag will remain OFF until the switch is turned to the ON position. Turning the switch to the ON position will allow the air bag to function.

The recommended locations for the switches on most vehicles is in the instrument panel glove compartment (center console if vehicle has no glove compartment) or, in the case of some vans, in the center stowage compartment (see the recommended location illustrations that are provided with each switch kit).

### Important:

Switches or display light indicators **MUST NOT** be placed on any instrument panel surfaces directly in front of the driver's or passenger's leg or knee areas.

## DISPLAY LIGHT

Each switch requires a display light to indicate the OFF status of the air bag. Each display light includes a harness to be connected to the switch harness. The recommended mounting locations for the display lights vary, but are typically located at the center front edge of the roof headliner (or windshield garnish molding) above the rear view mirror (see the recommended location illustrations provided with each switch kit).

### Important:

When installed, driver and/or passenger display light(s) must be visible by all front seat occupants.

### Important:

Switches or display light indicators **MUST NOT** be placed on any instrument panel surfaces directly in front of the driver's or passenger's leg or knee areas.

## WIRING CONNECTIONS

In general terms, the switch will be connected **IN SERIES** with the appropriate air bag (at the service disconnect) and will require additional connection of a feed wire to an ignition fed circuit and a ground wire to the body to complete the circuit for the display light indicator.

Display Light OFF with Switch in the OFF Position				
Step	Action	Value(s)	Yes	No
1	1. Turn the ignition switch to the LOCK position. Remove the key. 2. Disconnect the Display Light. 3. Inspect the GRY/BLK (1357) wire between the Display Light and the Switch Assembly for any damage to the insulation or terminations which would allow a short to B+. Is there any damage to the GRY/BLK (1357) wire?	—	Go to <i>Step 2</i>	Go to <i>Step 3</i>
2	Repair the GRY/BLK (1357) wire and the suspected source of B+, if needed. Is the repair complete?	—	System OK	System OK
3	Replace the switch assembly. Is the repair complete?	—	System OK	—

Display Light ON with Switch in the On Position				
Step	Action	Value(s)	Yes	No
1	1. Turn the ignition switch to the LOCK position. Remove the key. 2. Remove and inspect the 5A inline fuse in the PNK (39/139) wire. Is the fuse open?	—	Go to <i>Step 2</i>	Go to <i>Step 9</i>
2	1. Replace the 5A inline fuse. 2. Place the switch in the ON position. 3. Turn the ignition switch to the RUN position. 4. Wait five seconds. 5. Turn the ignition switch to the LOCK position. Remove the key. 6. Remove and inspect the 5A inline fuse in the PNK (39/139) wire. Is the fuse open?	—	Go to <i>Step 3</i>	Go to <i>Step 4</i>
3	1. Repair the short to ground in the PNK (39/139) wire. 2. Replace the 5A inline fuse. Is the repair complete?	—	System OK	—
4	1. Place the suppression switch in the OFF position. 2. Turn the ignition switch to the RUN position. 3. Wait five seconds. 4. Turn the ignition switch to the LOCK position. Remove the key. 5. Remove and inspect the 5A inline fuse in the PNK (39/139) wire. Is the fuse open?	—	Go to <i>Step 6</i>	Go to <i>Step 5</i>
5	Install the 5A inline fuse. Is the repair complete?	—	System OK	—
6	1. Disconnect the display light. 2. Replace the 5A inline fuse. 3. Turn the ignition switch to the RUN position. 4. Wait five seconds. 5. Turn the ignition switch to the LOCK position. Remove the key. 6. Remove and inspect the 5A inline fuse in the PNK (39/139) wire. Is the fuse open?	—	Go to <i>Step 7</i>	Go to <i>Step 8</i>

Display Light ON with Switch in the On Position (cont'd)				
Step	Action	Value(s)	Yes	No
7	1. Repair the short to ground in the GRY/BLK (1357) wire. 2. Replace the 5A inline fuse. Is the repair complete?	—	System OK	—
8	1. Replace the display light. 2. Install the 5A inline fuse. Is the repair complete?	—	System OK	—
9	1. Turn the ignition switch to the RUN position. 2. Connect an unpowered test lamp from the power feed side of the fuse holder to the ground. Does the test lamp illuminate?	—	Go to <i>Step 11</i>	Go to <i>Step 10</i>
10	1. Turn the ignition switch to the OFF position. 2. Repair the open in the power feed to the 5A inline fuse. If the open is in the vehicle wiring harness, refer to Wiring Systems sub-section of the appropriate Service Manual. 3. Install the 5A inline fuse. Is the repair complete?	—	System OK	—
11	1. Turn the ignition switch to the OFF position. 2. Install the 5A inline fuse. 3. Disconnect the display light. 4. Turn the ignition switch to the RUN position. 5. Connect an unpowered test lamp from the GRY/BLK (1357) wire to the ground. Does the test lamp illuminate?	—	Go to <i>Step 12</i>	Go to <i>Step 15</i>
12	Connect an unpowered test lamp from the GRY/BLK (1357) wire to the BLK (150) wire. Does the test lamp illuminate?	—	System OK	—
13	1. Turn the ignition switch to the OFF position. 2. Repair the open in the BLK (150) wire. Is the repair complete?	—	System OK	—
14	1. Turn the ignition switch to the OFF position. 2. Replace the display light. Is the repair complete?	—	System OK	—
15	1. Turn the ignition switch to the OFF position. 2. Replace the switch assembly. Is the repair complete?	—	System OK	—

Diagnostics for the switch and display light are included in the illustrations. As always, the technician should make sure to review the wiring harness routing and installation for pinching, rubbing and chafing to brackets, braces (etc.) and take appropriate actions to protect the wiring from those potential conditions.

## PARTS INFORMATION

Order the appropriate Installation Kit(s) (passenger, driver, or both) from GMSPO. For kit part numbers and usage, see Group 14.865 of the appropriate GMSPO Parts Catalog.

If special DERMs or SDMs are required to resolve a WARNING LIGHT ON condition, order the part from GMSPO in the normal manner. For part numbers and usage see Group 14.865 of the appropriate GMSPO Parts Catalog.

## Important:

1995-98 G (Aurora and Riviera) and 1997-00 Y (Corvette) switch kits include replacement safety belts. These belts MUST replace the original safety belts when installing a switch kit. Aurora and Riviera models built on or after January 1, 1998 will include DEPOWERED air bags, and the safety belts on these vehicles will not be included in switch kits and MUST NOT BE CHANGED. The 1997-00 Corvette models will require safety belt changes regardless of build dates. The belts will be replaced at no charge for the parts or the labor.

## WARRANTY INFORMATION

Switch kits and installation are NOT considered a warranty repair. Parts and labor charges (except for special DERM or SDM and replacement safety belt installation if required) are the responsibility of the customer. If special DERMs or SDMs are required to resolve a WARNING LIGHT ON condition, USE THE EXISTING LABOR OPERATION AND TIME ALLOWANCES WITH THE SPECIAL CUSTOMER AND FAILURE CODES WHEN SUBMITTING CLAIMS:

## DERMs

USE LABOR OPERATION C8815, CUSTOMER COMPLAINT CODE WK AND FAILURE CODE 93. USE PUBLISHED LABOR



## OPERATION TIMES.

### SDMs

USE LABOR OPERATION C8817, CUSTOMER COMPLAINT CODE WK AND FAILURE CODE 93. USE PUBLISHED LABOR OPERATION TIMES. When installing switch kits on 1995-98 Aurora, Riviera and 1997-00 Corvette models, the appropriate safety belts must be replaced. When submitting claims, use the existing labor operation and time allowances with special customer complaint and failure codes. The LABOR ONLY may be claimed. The cost of the belt is included in the kit price.

USE C9040 RIGHT SIDE ONLY, C9041 LEFT SIDE ONLY OR C9047 FOR BOTH AND INCLUDE THE CUSTOMER COMPLAINT CODE MH AND FAILURE CODE 93 USE PUBLISHED LABOR OPERATION TIMES.

## ADMINISTRATIVE INFORMATION

When the dealer decides to install an air bag on-off switch under NHTSA's new regulation, the dealer should fill out and send to NHTSA the form entitled INSTALLATION OF AIR BAG ON-OFF SWITCHES. The dealer should also keep:

1. A copy of the INSTALLATION form.
2. A copy of the letter NHTSA sent to the customer authorizing the switch.
3. A copy of any waiver the dealer obtains from the customer when the switch is installed.

### Important:

In addition, the new regulations require dealers to send the original of the customer's signed authorization form to NHTSA at the following address:

National Highway Traffic Safety Association  
Attention: Air Bag Switch Forms  
400 Seventh Street, S.W.  
Washington, D.C. 20590-1000

Technical Service Bulletin # **884057A**

Date: **890401**

## A/T - Gear Whine At Highway Speeds

Number: 88-405-7A

Section: 7A

Date: APRIL, 1989

Subject: AUTOMATIC TRANSMISSION GEAR WHINE AT HIGHWAY SPEEDS

Model and Year: 1985-88 "M" CARS

TO: ALL CHEVROLET DEALERS

Some of the subject vehicles may exhibit a gear noise condition which can be recognized as a medium-high pitch whine at highway speeds (commonly 45-55 mph.), the volume of the noise changes as the accelerator is depressed or released and load is applied or reduced at the mating gears.

Changes have been made to the manufacturing process to provide quieter running output gears. Vehicles beginning with the following VINs incorporate these revised parts:

2 Door JG1MR215XJK771366 4 Door JG1MR6154JK771368

Vehicles produced prior to the above VINs should be serviced using P/N 96061778 - shaftset, output; during installation, the ring, output shaft seal - P/N 96053887 should also be replaced, both of these parts are available from GMSPO.

Removal and installation of the components can be carried out following Service Manual procedures.

Labor Operation Number: K7610

Labor Time : 5.8 Hours

Technical Service Bulletin # **883517B**

Date: **881001**

## M/T - Neutral/Drive Gear Rattle

Number: 88-351-7B

Section: 7B

Date: OCT., 1988  
Subject: NEUTRAL/DRIVE MANUAL TRANSMISSION GEAR RATTLE

Model and Year: 1980-88 CHEVROLET VEHICLES WITH MANUAL TRANSMISSIONS  
TO: ALL CHEVROLET DEALERS

Various levels of minor gear "rattle" are inherent in all manual transmission gear boxes. Customers may perceive gear "rattle" as clutch, engine and/or transmission noise. The noise "rattle" is normal and will not affect the function or durability of the vehicle.

The amount of "rattle" is dependent on several factors including the size and design of both the transmission and engine, as well as the temperature of the transmission fluid. Generally, the larger transmissions have more "rattle", however, smaller engines generate a higher level of torsional vibrations which induce gear "rattle". As the temperature of the fluid increases, so will the level of rattle.

#### Neutral "Rattle"

Verify that the customer noise comment is neutral gear "rattle" by using the following steps. Also use the statements as guidelines for addressing the condition.

1. Place vehicle on a level surface with engine at idle, transmission in neutral, and parking brake set.
2. Depress the clutch pedal and check to see if the noise disappears.
  - a. If the noise does disappear, then neutral gear "rattle" most likely exists:
    - Check the transmission fluid level and fill if necessary. Low fluid level can result in increased "rattle". Also, verify that the correct fluid is being used.
    - Check the shifter boot for tears and proper attachment and replace or service as required.
    - Check for any other service bulletins which may release specific service parts for a vehicle line with a known gear rattle concern.
    - "Only" (after checking the above items and no corrections can be made) install a replacement clutch driven disc. A replacement disc may decrease "rattle" due to production variations in damper spring rates and/or hub to spline clearances, however, for the same reasons "rattle" may increase.
  - IMPORTANT: DO NOT CHANGE THE FOLLOWING COMPONENTS AS THEY WILL NOT AFFECT GEAR RATTLE.
    - Release Bearing
    - Hydraulic Clutch Linkage Assembly
    - Clutch Cover Assembly (Pressure Plate)
  - b. If the noise doesn't disappear, then the source of the noise is likely to be engine related.
    - Look for any holes in the front-of-dash which may not be properly sealed. This could result in additional engine compartment noise passing into the passenger compartment.

#### Drive "Rattle"

A customer noise comment of drive rattle must be verified by duplicating the driving condition (acceleration, deceleration, road load, grade) and gear at which the noise is heard. Drive "rattle" will generally disappear as the vehicle engine speed approaches 1800 to 2200 RPM in each gear.

Once the noise has been determined to be drive "rattle" then use the above statements in section (a) of step (2) as guidelines for addressing the condition (also see IMPORTANT).

If the noise is not transmission related, use section (b) of step (2).

Technical Service Bulletin # **649601**

Date: **970101**

## Compact Disc Players - CD Changer Loading Procedures

File In Section: 9 - Accessories

Bulletin No.: 64-96-01

Date: January, 1997

### INFORMATION

Subject:  
Compact Disc Players - Procedures for Correct Use and Maintenance

Models:  
1997 and Prior Passenger Cars and Trucks

CD Changer Loading Procedures

Because of differences in CD changer loading procedures, some confusion exists regarding this issue. Although correct loading procedures are included with each changer's Owner's Manual, often this information is not available to the dealer service personnel.

Verify proper loading when evaluating customer concerns of "CD inoperative".

Delco Electronics Product Type	Loading Procedure
--------------------------------	-------------------

Radio w/intergral CD	label side up
6 disc changer (LLAI)	label side up
10 disc changer (FMI)	label side up
12 disc changer (LLAI)	label side down

**Important:**

Failure to load magazine/player correctly will disable the operation.

**Important:**

Only the 12 disc changer is to be loaded with the label side down.

**CD Cleaners**

Avoid use of commercially available CD cleaners.

The use of CD cleaners is not recommended and can damage the player's CD mechanism.

Technical Service Bulletin # **83-81-34**

Date: **990301**

**SIR - Operating Vehicle with Warning Light On**

File In Section: 8 - Chassis/Body Electrical

Bulletin No.: 83-81-34

Date: March, 1999

**INFORMATION**

**Subject:**

Operating Vehicle with Supplemental Inflatable Restraint (SIR) Warning Light Illuminated

**Models:**

1999 and Prior Passenger Cars and Light Duty Trucks with SDM Controlled Air Bag System

The AIR BAG warning light is the key to driver notification of Supplemental Inflatable Restraint (SIR) system malfunctions. When the warning light remains illuminated or continues to flash, one or more of the following conditions may occur if vehicle operation is continued.

- ^ Non-deployment of the air bags in the event of a crash.
- ^ Deployment of the air bags without a crash.
- ^ Deployment of the air bags in crashes less severe than intended.

If an AIR BAG warning light is illuminated or flashing, you should advise the customer of these possibilities and that the vehicle should be serviced right away. Technical Service Bulletin # **884007A**

Date: **890401**

**A/T - Paint Flakes In Fluid**

Number: 88-400-7A

Section: 7A

Date: APRIL, 1989

Subject: EVIDENCE OF PAINT FLAKES IN TRANSMISSION FLUID

Model and Year:

1988 PASSENGER CARS WITH AUTOMATIC TRANSAXLES

TO: ALL CHEVROLET DEALERS

Black paint flakes may be found in the transaxle fluid, bottom pan, fluid level indicator and filter assembly as the result of paint peeling from inside the transaxle fill tube. After the paint peels the unprotected areas of the fill tubes can corrode (interior and exterior), leaving corrosion on the fluid level indicator and the fill tube.

The fill tube paints used on the interior and exterior of the tube may not withstand temperatures over 260 degrees Fahrenheit. Transaxle durability should not be affected in vehicles equipped with these fill tubes, but paint flakes can cause filter clogging over a period of time.

**DATE OF PRODUCTION CHANGE:**

The suspect fill tubes may be found in vehicles produced between October 17, 1987 (Julian Date 289) through June 30, 1988 (Julian Date 184).

**SERVICE ACTION:**

If vehicles are found with flaking paint fill tubes they should be changed along with Transaxle Fluid, Filter and Fluid Level Indicator.

Labor Operation Number: T5181

Labor Time: .9

**SERVICE MANUAL REFERENCE:**

Refer to the On-Car Section of your Service Manual whenever service of the Fluid Level Indicator and Fill Tube is necessary.

Technical Service Bulletin # **99-08-49-006**

Date: **990401**

## **Instrument Panel - Upper Surface Reflection**

File In Section: 08 - Body and Accessories

Bulletin No.: 99-08-49-006

Date: April, 1999

**INFORMATION**

Subject:

Cleaning of Upper Instrument Panel Surfaces

Models:

1999 and Prior Passenger Cars and Light Duty Trucks

Comments on a reflection of the upper instrument panel pad into the windshield, when driving in direct sunlight, may be received. This condition, sometimes referred to as a "veiling reflection", may be aggravated by the use of wax or silicone based products when cleaning the surface.

Advise customers, technicians and new car prep or make ready personnel, that products containing wax or silicone should not be used to clean the top instrument panel pad. A warm water and mild soap solution such as saddle soap, oil soap or an equivalent, should be used whenever the top instrument panel pad needs cleaning.

If a customer requests that a protectant type product be applied, **ONLY USE THOSE THAT LEAVE A FLAT OR SATIN FINISH**. Do NOT apply products that leave a glossy finish or those that increase the shine level above the original production level.

**93316C**

Date: **921001**

## **Fuels - Effect of Volatility on Driveability**

Number: 93-31-6C

Section: 6C

Date: OCT. 1992

Corporate Bulletin No.: 249128R

ASE No.: A1, A8

Subject:

**EFFECT OF FUEL VOLATILITY ON DRIVEABILITY CONDITIONS**

Model and Year:

**ALL MODEL YEARS, ALL PASSENGER CARS AND TRUCKS**

**THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN NO. 92-281-6C, DATED SEPT. 1992. THE 1993 MODEL YEAR HAS BEEN ADDED. ALL COPIES OF 92-281-6C SHOULD BE DISCARDED.**

Recent changes in EPA regulations have effectively lowered the maximum allowable fuel volatility. Volatility, which can be defined as a gasoline's ability to change from a liquid to a vapor, directly affects the amount of evaporative emissions produced by the fuel. Higher volatility means that more unburned hydrocarbons will be released into the atmosphere. Unfortunately, reducing fuel volatility can cause problems during cold engine operation when low temperatures impede the fuel's ability to vaporize and burn.

Two terms are often used to describe volatility characteristics. These are:

- Distillation Curve

A graph showing the relationship between temperature and the percentage of fuel evaporated. The fuel components that boil at relatively low temperatures (below about 90 degrees F) are known as the "light ends", and are essential for good cold engine performance. The "heavy ends", which begin to boil at about 300 degrees F, contain the most energy but are more difficult to burn. Laboratory analysis is usually required to determine the distillation curve of a gasoline sample.

- Reid Vapor Pressure (RVP)  
RVP is the pressure (psi) that vaporized fuel exerts within a sealed container as it is heated to 100 degrees F. The higher the RVP the higher the fuel volatility. While RVP is readily tested in the field, fuels of the same RVP can have different distillation curves and cold driveability characteristics.

Fuel volatility will vary depending on geographic location and time of year (fuel intended to be used in higher ambient conditions is formulated with less volatility). This can make cold driveability as big a problem during summer months as during the winter. There may be additional variation in the volatility characteristics of pump gasoline, caused by the differences in fuel manufacturers, blends and storage times. As EPA fuel volatility standards are lowered, variations between fuels (which may further reduce volatility) becomes a critical factor influencing cold engine performance. No matter how thoroughly the relationship between fuel quality and cold driveability is understood, eliminating fuel quality as an issue can be difficult, because:

TOOLS WHICH TEST FUEL VOLATILITY MEASURE ONLY RVP, NOT THE DISTILLATION CURVE.

- The distillation curve has a greater effect on cold driveability than RVP.

THE CUSTOMER MAY PERCEIVE RAISING THE FUEL QUALITY ISSUE AS AN ATTEMPT TO EVADE HIS PROBLEM.

- This may cause difficulty in getting accurate fuel usage information.

WATER, AND OTHER TYPES OF FUEL CONTAMINATION, MAY CAUSE CONTINUED DRIVEABILITY COMPLAINTS.

- The problem symptoms may remain even though the vehicle has been refueled several times with a quality gasoline.

CUSTOMER CONCERNS

CONDITION:

Poor Cold Engine Operation, symptoms may include; hard start/extended crank, stalling, backfiring, hesitation and/or lack of power.

POSSIBLE CAUSE:

Low volatility fuel will not vaporize sufficiently to allow normal combustion.

CORRECTION:

Replace Fuel.

DIAGNOSTIC PROCEDURE:

1. Perform basic system checks in section 6E of the service manual.
2. Check for service bulletins which relate to cold driveability issues specific to the problem vehicle.
  - An updated engine control calibration, or service procedure, may be available to make the engine less susceptible to low volatility fuels.
3. If basic checks do not reveal a vehicle fault, then advise the customer that fuel quality may be an issue. Recommend the following actions:
  - Change brands of fuel
  - Use 87 octane gasoline, unless the vehicle is designed for premium gasoline.
  - Try to empty the fuel tank as much as practical before refilling.
  - Run a minimum of three tanks of new fuel before returning for service.
4. If above steps are ineffective, do not proceed with additional vehicle diagnosis and/or parts replacement until the fuel tank has been drained and refilled with a known good quality gasoline AT THE DEALERSHIP.
5. If the problem remains refer to service manual, service bulletins and/or technical assistance.

Technical Service Bulletin # **892126**

Date: **890701**

## **Cruise Control - Incorrect Resume Operation**

Number: 89-212-6

Section: 6

Date: July 1989

Subject: INCORRECT CRUISE CONTROL RESUME OPERATION

Model and Year: 1987-89 PASSENGER CARS AND TRUCKS WITH CRUISE

TO: ALL CHEVROLET DEALERS

This bulletin pertains to 1987-89 passenger cars and trucks with Option K34. It will help in diagnosing an intermittent condition which may otherwise be difficult to correct. This condition occurs only on vehicles using a "Multi-function" lever, with turn signal, beam change, wash/wipe, and cruise control functions, and on Chevrolet Y, which do not use multi-function levers.

**Condition:**

When using the cruise control resume switch, the cruise control may resume to a new set speed that is different from the original set speed. If the new set speed is well below the original speed, this could also be reported as inoperative resume. The brake switch and the on/off switch still function properly to disengage the cruise control system. Another condition is that the resume/accel function may be totally inoperative, but the set/coast switch will still work.

These conditions usually occur with some accumulated mileage, depending on how often the cruise control system is used.

**Cause:**

An intermittent condition in the turn signal lever switch causes the cruise control system to set a new speed when the slider is moved to resume. The intermittent condition is so short that it cannot be detected by normal methods, and the switch will test good.

**Correction:**

Replace the switch (Multi-Function Lever) or turn signal lever on Y cars.

**Parts Information:**

All parts in stock at GMSPO have been replaced with new part numbers. If replacing a switch for this condition, do not use parts in dealer stock. All new orders will automatically receive the new part numbers.

If a switch is being replaced for any other condition, switches in dealer stock may be used.

**Warranty Information:**

Use Labor Operation E7060 with applicable time.

**Technical Service Bulletin # 881351010**

**Date: 880101**

**Paint - Removal of Minor Imperfections**

Number: 88-135-10

Section: 10

Date: Jan., 1988

Subject: REMOVAL OF "CHEMICAL SPOTTING" AND OTHER MINOR PAINT IMPERFECTIONS WITHOUT REPAINTING

Model and Year: ALL MODELS WITH BASECOAT/CLEARCOAT PAINT

TO: ALL CHEVROLET DEALERS

This bulletin cancels and supersedes Chevrolet Dealer Service Bulletin 87-166 (Section 10) dated June 1987. This bulletin provides new materials which are available for use on basecoat/clearcoat systems.

Some Chevrolet models equipped with basecoat/clearcoat paint applications may experience a condition of small etched spots on horizontal surfaces of the paint finish. This condition is referred to as chemical spotting and may be caused by industrial fallout (acid rain).

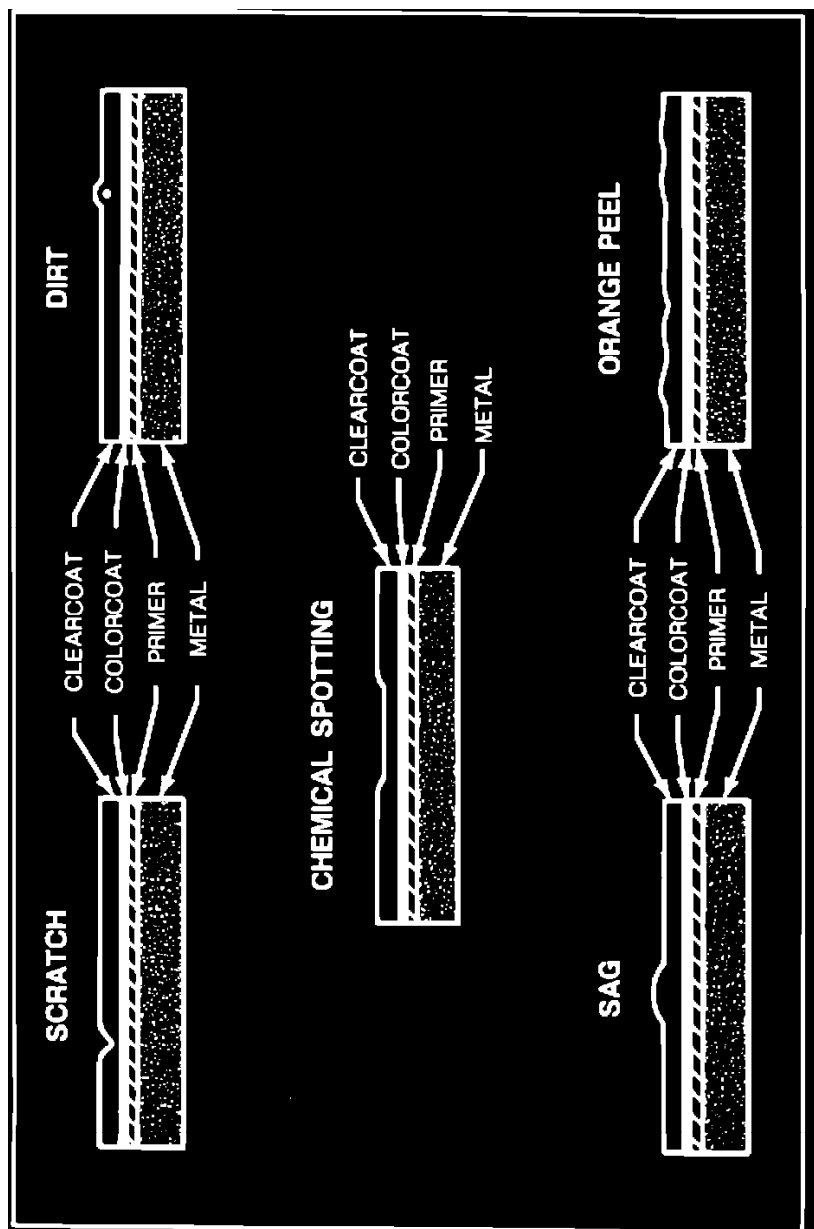


FIGURE 1

Chemical spotting along with other minor paint imperfections on basecoat/clearcoat finishes, such as sand scratches, dirt in paint, sags and orange peel may be repaired without paint application. Examples of these imperfections are shown in Figure 1.

To repair these conditions use the following procedures:

1. Wash the subject panel with water to remove any foreign material such as dirt, grit, etc.
2. Wet sand subject panel with 3M Micro fine 1500 grit sandpaper, P/N 2023 or equivalent. Wrap the sandpaper around a 3M rubber sponge back up pad, P/N 5530, to prevent leaving finger marks in the clearcoat. NOTE: Always sand the length of the panel and use a mild dish soap detergent in the wet sand operation for sandpaper lubricant.
3. Wheel compound sanded panel with 3M Finesse it II, P/N 5928, polishing compound and 3M Super Buff Polishing Pad, P/N 5705 or equivalent.
4. Swirl marks, left in the clearcoat, can be removed by rebuffing the affected area with a non-directional, dual action (D.A.) orbital sander. A clean terry cloth polishing bonnet and 3M Finesse II compound should be used.

**CAUTION:** Buffing wheels are not recommended for routine new car pre-delivery preparation of basecoat/ clearcoat finishes.

We believe this source and their equipment to be reliable. There may be additional manufacturers of such equipment. General Motors does not endorse, indicate any preference for or assume any responsibility for the products or equipment from these firms or for any such items which may be available from other sources.

Technical Service Bulletin # 033206

Date: 940301

## P/S - Reduced Assist When Cold

Group Ref.: Steering/Suspension

Bulletin No.: 033206

Date: March 1994

SUBJECT:  
REDUCED POWER STEERING ASSIST AT LOW AMBIENT TEMPERATURES (NEW POWER STEERING FLUID)

MODELS:  
1994 AND PRIOR PASSENGER CARS AND LIGHT DUTY TRUCKS

**BULLETIN BEING REVISED TO ADD MODEL YEARS 1993-94, ADDED LIGHT TRUCKS  
AND REVISED "IMPORTANT" STATEMENT FOUND LISTED BELOW STEP 3.  
UNDER SUB-TITLE 'BLEEDING THE POWER STEERING SYSTEM'.  
PREVIOUS DIVISIONAL PUBLICATION NUMBERS WERE:**

DIVISION	BULLETIN NUMBER
BUICK	91-3-8
CADILLAC	T-91-83
CANADA	91-3-117
CHEVROLET	91-208-3B
OLDSMOBILE	91-3-117
PONTIAC	91-3-12

Applications:

Appropriate for all passenger vehicles, but particularly beneficial in 1980 and later FWD Models equipped with Power Rack and Pinion Steering.

CONDITION:

Comments of reduced power steering assist at low ambient temperatures (approximately 10°F and lower) may be noted by some vehicle operators when turning the steering wheel in BOTH the right and left direction during warm-up after cold start. All vehicles with power steering exhibit this condition to varying degrees, but condition may be more noticeable with power rack and pinion steering systems that typically have longer hoses and cooler lines.

DIVISION	BULLETIN NUMBER
BUICK	88-POL-4
CADILLAC	88-P-1
CHEVROLET	88-417-3B
OLDSMOBILE	88-T-139
PONTIAC	88-SM-10

**Note:**

This condition, which is related to power steering fluid viscosity, should not, however, be confused with conditions having similar symptoms such as that described divisional Special Policy numbers listed:

CAUSE:

In cold weather, power steering fluid thickens in the same manner as any other petroleum-based oil or fluid. Upon cold starting, the fluid resists movement through the system and the driver senses reduced power assist (sometimes referred to as "stiff steer"). As the vehicle operates and fluid circulates through the power steering system, the fluid warms and thins to its normal operating viscosity.

CORRECTION:

Saginaw Division has developed a new Low Temperature Climate Service Fluid for use in cold climates. Compared with conventional power steering fluid, this new fluid flows better at low temperatures and resists the thickening which contributes to reduced power assist upon start up.

RACK AND PINION STEERING SYSTEMS

Reduced power assist upon cold weather starting may be more noticeable in Power Rack and Pinion steering systems that may contain six or more feet of pressure and return hose along with long cooler lines. Such long systems contain greater volumes of fluid and vehicles so equipped tend to have longer periods of reduced power assist. The new fluid performs particularly well with current designed Rack and Pinion steering systems and special remanufactured Rack and Pinion Steering Assemblies.

PARTS INFORMATION:



Container Size	Part Number
16 ounce	12345866
32 ounce	12345867

Low Temperature Climate Service Fluid is available from GMSPO. Order as:

Parts are currently available from GMSPO.

**SERVICE PROCEDURE:**

The power steering fluid replacement procedure is a two-stage process: first, flushing the old fluid from the system with new fluid; and second, bleeding the system to remove any trapped air. The two sequences outline the steps in each procedure.

**FLUSHING THE POWER STEERING SYSTEM**

1. Raise the front end of the vehicle off the ground until the wheels are free to turn.
2. Remove the fluid return line at the pump reservoir inlet connector.
3. Plug the inlet connector port on the pump reservoir.
4. Position the fluid return line toward a large container in order to catch the draining fluid.
5. While a second person fills the reservoir with new Low Temperature Climate Service Fluid, start and run the engine at idle.
6. Turn the steering wheel from stop to stop.

**NOTICE:**

Do not hold the wheel against stops while flushing the system, Holding steering wheel against wheel stops will cause high system pressure, overheating, and damage to the pump and/or gear.

7. Continue draining until all of the old fluid is cleared from the power steering system. Addition of approximately 1 quart of new fluid will be required to flush system.
8. Unplug pump reservoir inlet and reconnect return line.
9. Turn engine off, and fill reservoir to the "Full Cold" mark.
10. Continue with following procedure "Bleeding the Power Steering System".

# Bleeding Air from Power Steering Systems

**Before bleeding:** Inspect steering system. Check, and correct as needed:



Hoses must not touch any other part of vehicle.

- Steering system noise could be caused by hose touching frame, body, or engine.



All hose connections must be tight.

- Loose connections might not leak but could allow air into system.

## When to bleed:

After any component replacement  
After disconnecting fluid line  
In case of steering system noise

## Why bleed?

To prevent pump damage  
To ensure proper system operation  
To stop steering system noise

## Power Steering Fluid

Use only clean, new power steering fluid. Fluid must be:

### Conventional Climate:

GM #1052884 - 16 ounce

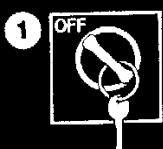
#1050017 - 32 ounce

### Cold Climate:

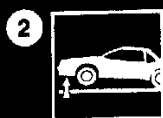
GM #12345866 - 16 ounce

#12345867 - 32 ounce

## How to bleed:



Switch ignition off.



Raise front wheels off ground.



Turn steering wheel full left.



Fill fluid reservoir to "FULL COLD" level. Leave cap off.



With assistant checking fluid level and condition, turn steering wheel lock-to-lock at least 20 times. Engine remains off.

- On systems with long return lines or fluid coolers, turn steering wheel lock-to-lock at least 40 times.
- Trapped air may cause fluid to overflow. Thoroughly clean any spilled fluid to allow for leak check.
- Keep fluid level at "FULL COLD."



While turning wheel, check fluid constantly.

- No bubbles are allowed.
- For any sign of bubbles, recheck connections. Repeat step 5.



Start engine. With engine idling, maintain fluid level. Reinstall cap.



Return wheels to center. Lower front wheels to ground.



Keep engine running for two minutes.



Turn steering wheel in both directions.

### Verify:

- ☒ Smooth power assist
- ☒ Noiseless operation
- ☒ Proper fluid level
- ☒ No system leaks
- ☒ Proper fluid condition
- No bubbles, no foam, no discoloration

11 If all proper conditions apply, procedure is complete.

12 If any problem remains, see "Special Conditions."

## Special Conditions:

### Fluid



- Foam or bubbles in fluid  
Fluid must be completely free of bubbles. In step 5, be alert to periodic bubbles that could indicate a loose connection or leaky O-ring seal in either the return hose or pressure hose.
- Discolored fluid  
(milky, opaque, or light tan color)

Switch ignition off. Wait two minutes. Recheck hose connections. Repeat steps 7-10. If condition still exists, replace and check a possible cause:

- ☒ Return hose clamps
- ☒ Return hose O-ring
- ☒ Pressure hose O-rings
- ☒ Gear cylinder line O-rings

Fill system and repeat bleed procedure for each possible cause. Repeat steps 7-10 to verify whether noise has been eliminated.

### Noise



- Pump whine or groan

With engine running, recheck hoses for possible contact with frame body or engine. If no contact is found, follow either method below to cool down fluid and repressurize system.

### Method 1: Normal Cool Down

Switch engine off.  
Wait for system to cool.  
Install reservoir cap.

### Method 2: Partial Fluid Replacement

Switch engine off.  
Use a suction device to remove fluid from reservoir.  
Refill with cool, clean fluid.  
Install reservoir cap.

After either method of cooling, start engine and allow engine to come up to operating temperature. If noise persists, remove and replace power steering pump. Repeat bleed procedure following pump replacement.

## BLEEDING THE POWER STEERING SYSTEM

After replacing the fluid or servicing the power steering hydraulic system, you must bleed air from the system. Air in the system prevents an accurate fluid level reading, causes pump cavitation noise and over time could damage the pump. To bleed the power steering system proceed as follows:

- Begin with the engine off, front wheels off the ground, and wheels turned all the way to the left.
- Add Low Temperature Climate Service Fluid to the "FULL COLD" mark on the fluid level indicator.
- Bleed the system by turning the wheels from side to side without hitting stops.

### Important:

This may require turning the wheels from side to side twenty times. On systems with long return lines or fluid coolers, turning steering wheel lock-to-lock forty times may be required. Keep the fluid level at the "FULL COLD" mark. Fluid with air in it has a light tan appearance. This air must be eliminated from the fluid before normal steering action can be obtained.

4. Start the engine. With the engine idling, recheck the fluid level. If necessary, add fluid to bring the level to the "FULL COLD" mark.
5. Return the wheels to the center position. Lower front wheels to the ground. Continue running the engine for two or three minutes.
6. Test the vehicle to be sure the steering functions normally and is free from noise.

**Important:**

Inspect for fluid leakage at connection points along the power steering system.

7. Recheck the fluid level as described in Steps 3 and 4 except that the fluid level should now be up to the "FULL HOT" mark after the system has stabilized at its normal operating temperature.

Technical Service Bulletin # **912083B**

Date: **910201**

## **Power Steering - Reduced Assist At Low Temperatures**

Number: 91-208-3B

Section: 3B

FEBRUARY 1991 Date:

Corporate Bulletin No.: 033206R

Subject: REDUCED POWER STEERING ASSIST AT LOW AMBIENT TEMPERATURES

Model and Year: ALL 1980-91 PASSENGER CARS

### **Applications**

Appropriate for all passenger vehicles, but particularly beneficial in 1980 and later FWD Models equipped with Power Rack and Pinion Steering.

### **CONDITION**

Comments of reduced power steering assist at low ambient temperatures (approximately 10 degrees Fahrenheit and lower) may be noted by some vehicle operators when turning the steering wheel in BOTH the right and left direction during warm-up after cold start. All vehicles with power steering exhibit this condition to varying degrees, but condition may be more noticeable with power rack and pinion steering systems that typically have longer hoses and cooler lines.

Note: This condition, which is related to power steering fluid viscosity, should not, however, be confused with conditions having similar symptoms such as that described in divisional bulletins indicated below, related to internal steering gear fluid by-pass.

Chevrolet # 88-417-3B

### **CAUSE:**

In cold weather, power steering fluid thickens in the same manner as any other petroleum-based oil or fluid. Upon cold starting, the fluid resists movement through the system and the driver senses reduced power assist (sometimes referred to as "stiff steer"). As the vehicle operates and fluid circulates through the power steering system, the fluid warms and thins to its normal operating viscosity.

### **CORRECTION:**

Saginaw Division has developed a new Low Temperature Climate Service Fluid for use in cold climates. Compared with conventional power steering fluid, this new fluid flows better at low temperatures and resists the thickening which contributes to reduced power assist upon start up.

### **RACK AND PINION STEERING SYSTEMS**

Reduced power assist upon cold weather starting may be more noticeable in Power Rack and Pinion steering systems that may contain six or more feet of pressure and return hose along with long cooler lines. Such long systems contain greater volumes of fluid and vehicles so equipped tend to have longer periods of reduced power assist. The new fluid performs particularly well with current designed Rack and Pinion steering systems and special remanufactured Rack and Pinion Steering Assemblies.

### **PARTS INFORMATION:**

Low Temperature Climate Service Fluid is available from GMSPO. Order as:

Container Size	Part Number
16 ounce	12345866
32 ounce	12345867

Parts are currently available from GMSPO.

#### **SERVICE PROCEDURE:**

The power steering fluid replacement procedure is a two-stage process: first, flushing the old fluid from the system with new fluid; and second, bleeding the system to remove any trapped air. The following two sequences outline the steps in each procedure.

#### **FLUSHING THE POWER STEERING SYSTEM**

1. Raise the front end of the vehicle off the ground until the wheels are free to turn.
2. Remove the fluid return line at the pump reservoir inlet connector.
3. Plug the inlet connector port on the pump reservoir.
4. Position the fluid return line toward a large container in order to catch the draining fluid.
5. While a second person fills the reservoir with new Low Temperature Climate Service Fluid, start and run the engine at idle.
6. Turn the steering wheel from stop to stop.

**NOTICE:** Do not hold the wheel against stops while flushing the system. Holding steering wheel against wheel stops will cause high system pressure, overheating, and damage to the pump and/or gear.

7. Continue draining until all of the old fluid is cleared from the power steering system. Addition of approximately 1 quart of new fluid will be required to flush system.
8. Unplug pump reservoir inlet and reconnect return line.
9. Turn engine off, and fill reservoir to the "Full Cold" mark.
9. Continue with following procedure "Bleeding the Power Steering System".

#### **BLEEDING THE POWER STEERING SYSTEM**

After replacing the fluid or servicing the power steering hydraulic system, you must bleed air from the system. Air in the system prevents an accurate fluid level reading, causes pump cavitation noise and over time could damage the pump. To bleed the power steering system proceed as follows:

1. Begin with the engine off, front wheels off the ground, and wheels turned all the way to the left.
2. Add Low Temperature Climate Service Fluid to the "FULL COLD" mark on the fluid level indicator.
3. Bleed the system by turning the wheels from side to side without hitting stops.

**IMPORTANT:** This may require turning the wheels from side to side several times. Keep the fluid level at the "FULL COLD" mark. Fluid with air in it has a light tan appearance. This air must be eliminated from the fluid before normal steering action can be obtained.

4. Start the engine. With the engine idling, recheck the fluid level. If necessary, add fluid to bring the level to the "FULL COLD" mark.
5. Return the wheels to the center position. Lower front wheels to the ground. Continue running the engine for two or three minutes.
6. Test the vehicle to be sure the steering functions normally and is free from noise.

**IMPORTANT:** Inspect for fluid leakage at connection points along the power steering system.

7. Recheck the fluid level as described in Steps 3 and 4 except that the fluid level should now be up to the "FULL HOT" mark after the system has stabilized at its normal operating temperature.

Technical Service Bulletin # **435009**

Date: **941201**

## **Brakes, Front - Pulsation Diagnosis, Correction, Repair**

File In Section: 5 - Brakes

Bulletin No.: 43-50-09

Date: December, 1994

Subject:  
Front Brake Pulsation - "New" Diagnosis, Correction and Prevention

Models:  
1995 and Prior Year Passenger Cars

### Preventing Brake Pulsation with Uniform Wheel Nut Torque and Unrestricted Pad Movement

Extensive testing has proven that the leading contributor to brake pulsation is non-uniform wheel nut torque. Because of the importance of this information, the following steps are being taken:

- ^ Issued service bulletin on front brake pulsation.
- ^ Video on diagnosing and fixing front brake pulsation issued with bulletin.
- ^ Essential tools shipped to dealer.

### Condition

Vehicle pulsates with light brake apply. (Refer to the following Pulsation Test Drive Procedure to properly diagnose customer concerns.)

### Important:

A vibrating/pulsating brake pedal is normal with a stop where ABS is activated.

### Cause

Front brake pulsation is caused by thickness variation of the rotor braking surfaces. The two leading causes of thickness variation are uneven wear and/or corrosion of the rotor.

Uneven wear accounts for 60% of all pulsation concerns. Rotor corrosion accounts for the rest of pulsation concerns. Rotor corrosion can be affected by the geographic area you live in and/or by the amount of time a vehicle sits without being driven.

The most significant contributors to thickness variation (uneven wear), which causes pulsation, are:

1. Non-uniform wheel nut torque (causes distortion of the braking surface).
2. Pad slide force restriction combined with # 1 (Non-uniform wheel torque).
  - a. Caliper to knuckle/shoe to knuckle interface
  - b. Slide bushing lube
  - c. Corroded slide bushing (pin binding)

### Important:

Both rotor distortion and pad slide force restriction must be present to lead to thickness variation.

### Correction

The only way to eliminate thickness variation is to replace or properly turn the rotor. Be sure to check the minimum thickness before attempting to turn a rotor. Refer to shop manual for proper rotor turning procedures.

### Prevention

To prevent/minimize thickness variation/uneven wear from recurring, follow this procedure:

### Important:

This should be done every time disc brakes are serviced.

1. Clean the caliper to knuckle or shoe to knuckle interface and lubricate with a thin film of silicone grease GM P/N 18010909 (or equivalent).
2. Clean the attaching/slide system and lubricate all moving surfaces with silicone grease. Do not use any abrasive cleaners on the pins. Remove the rubber bushings and clean the bores and bushings before lubricating.
3. Clean all rotor, bearing, and wheel mounting surfaces of any corrosion and/or dirt.
4. Use a torque stick on an impact wrench, or a torque wrench to consistently and uniformly fasten the wheel to the specified torque for the vehicle. The star pattern must be followed.

**Important:**

Torque sticks must be used any time an impact wrench is used to tighten wheel nuts.

**Summary**

Non-uniform wheel nut torque and improper tightening sequence are the leading causes of rotor distortion which leads directly to front brake pulsation when combined with pad slide force restriction.

**Pulsation Test Drive Procedures**

**Caution:**

Verify braking ability before test and obey laws while performing the road test, test the brakes at low speed to be sure the vehicle stops properly. Also, be sure to perform the road test in a safe area where traffic laws can be observed to protect both public and personal safety.

**Coast Down Vibration Test:**

1. Accelerate to approximately 40-50 mph (70-80 kph).
2. Place transmission in neutral.
3. Allow vehicle to coast down to 20 mph (35 kph) (do not use brakes).
4. Observe: Any tire/wheel imbalance or vehicle vibration, (other than road surface induced).
5. Correct or proceed to next section if none present.

**Rear Brake Pulsation Test:**

1. Accelerate to approximately 10-15 mph (16-25 kph).
2. Place transmission in neutral.
3. On vehicles equipped with a park brake release, hold release in return position and lightly apply the park brake to slow the vehicle.

**Notice:**

Failure to hold the release in the return position could result in rear brake lock up.

4. Observe: Does the park brake pedal pulsate or is there a noticeable vibration - other than road induced?
5. Correct or proceed to next section if OK.

**Vehicles with Push to Release Park Brake**

1. Accelerate to approximately 10-15 mph (16-25 kph).
2. Place transmission in neutral.
3. On vehicles so equipped, gently apply the park brake until you can feel the car slowing down due to the park brake action. Let vehicle come to a stop before pushing the park brake pedal to release it.
4. Observe: Does the park brake pedal pulsate or is there a noticeable vibration - other than road induced?
5. Correct or proceed to next section if OK.

**Front Brake Pulsation Test:**

1. Perform 20 mph (35 kph) brake test.
  - a. Accelerate to 20 mph (35 kph).
  - b. Place transmission in neutral.
  - c. Lightly apply brakes to stop the vehicle.
  - d. Optional - If pulsation is present, turn vehicle 180. and repeat stop. If pulsation is still present in the opposite direction, it is only on 1 (one) rotor. If pulsation is greatly reduced or gone, it is on both rotors (the thickness variation on each rotor will go in and out of phase with each other after turning and reduce and/or cancel the effects on braking pulsation).
  - e. Correct or proceed to Step 2 if OK.

2. Perform 45-50 mph (75-80 kph) brake test.
  - a. Accelerate to 50 mph (80 kph).
  - b. Place transmission in neutral.
  - c. Apply brakes using medium pressure.
  - d. Optional - If pulsates, do 180° turn test in 1-d above.
  - e. Correct or proceed to Step 3 if OK.
3. Heat up brake system by making 10 stops from 30 mph (50 kph) using medium pressure.
  - a. Repeat step 1 - 20 mph (35 kph) brake test.
  - b. Optional - If pulsates, do 180° turn test in 1-d above.
  - c. Correct or if no pulsation found, further diagnostics required to determine cause(s) of customer concern.

**Parts Information**

Parts are currently available from GMSPO.

**Important:**

Kent-Moore torque stick numbers and the divisions listed below completes the division torque stick essential tool requirement for servicing GM vehicles. All other divisions received torque stick tools in prior years essential tool packages. Additional torque sticks can be ordered through Kent-Moore Tools at 1-800-345-2233.

Division	Essential Stick Number	Stick Color
Chevrolet	J 39544-14	Brown
	J 39544-18	White
Cadillac	J 39544-14	Brown
	J 39544-15	Gray

**Tool Information**

Technical Service Bulletin # **04-07-30-013B**

Date: **070201**

**Engine, A/T - Shift/Driveability Concerns/MIL ON**

Bulletin No.: 04-07-30-013B

Date: February 01, 2007

**INFORMATION****Subject:**

Automatic Transmission Shift, Engine Driveability Concerns or Service Engine Soon (SES) Light On as a Result of the Use of an Excessively/Over-Oiled Aftermarket, Reusable Air Filter

**Models:**

2007 and Prior GM Cars and Light Duty Trucks

2007 and Prior Saturn Models

2003-2007 HUMMER H2

2006-2007 HUMMER H3

2005-2007 Saab 9-7X

**Supercede:**

This bulletin is being revised to add models and model years. Please discard Corporate Bulletin Number 04-07-30-013A (Section 07 - Transmission/Transaxle).

DO THIS	DON'T DO THIS
First, Inspect the vehicle for a reusable aftermarket excessively/over-oiled air filter	DO NOT repair MAF sensors under warranty if concerns result from the use of an excessively/over-oiled aftermarket, reusable air filter.

The use of an excessively/over-oiled aftermarket, reusable air filter may result in:

Service Engine Soon (SES) light on

Transmission shift concerns, slipping and damaged clutch(es) or band(s)

Engine driveability concerns, poor acceleration from a stop, limited engine RPM range

The oil that is used on these air filter elements may be transferred onto the Mass Air Flow (MAF) sensor causing contamination of the sensor. As a result, the Grams per Second (GPS) signal from the MAF may be low and any or all of the concerns listed above may occur.

When servicing a vehicle with any of these concerns, be sure to check for the presence of an aftermarket reusable, excessively/over-oiled air filter. The MAF, GPS reading should be compared to a like vehicle with an OEM air box and filter under the same driving conditions to verify the concern.

The use of an aftermarket reusable air filter DOES NOT void the vehicle's warranty.

If an aftermarket reusable air filter is used, technicians should inspect the MAF sensor element and the air induction hose for contamination of oil prior to making warranty repairs.

Transmission or engine driveability concerns (related to the MAF sensor being contaminated with oil) that are the result of the use of an aftermarket reusable, excessively/over-oiled air filter are not considered to be warrantable repair items.

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



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Disclaimer Technical Service Bulletin # **05-03-10-003C**

Date: **080115**

## Wheels/Tires - Low Tire Pressure

Bulletin No.: 05-03-10-003C

Date: January 15, 2008

### TECHNICAL

Subject:  
Low Tire Pressure Leaking Cast Aluminum wheels (Repair with Adhesive Sealant)

Models:  
2008 and Prior GM Passenger Cars and Light Duty Trucks (including Saturn)  
2008 and Prior HUMMER H2, H3  
2008 and Prior Saab 9-7X

with Cast Aluminum wheels

Supersede:

This bulletin is being revised to add the 2008 model year and update the Warranty Information section. Please discard Corporate Bulletin Number 05-03-10-003B (Section 03 - Suspension).

Condition



Some customers may comment on a low tire pressure condition.

Diagnosis of the low tire pressure condition indicates an air leak through the cast aluminum wheel.

Cause

Porosity in the cast aluminum wheel may be the cause.

Correction

Remove the tire and wheel assembly from the vehicle. Refer to the appropriate service procedure in SI.

Locate the leaking area by inflating the tire to 276 kPa (40 psi) and dipping the tire/wheel assembly in a water bath or use a spray bottle with soap and water to locate the specific leak location.

If the porosity leak is located in the bead area of the aluminum rim (where the tire meets the rim), the wheel should be replaced.

If two or more leaks are located on one wheel, the wheel should be replaced.

If air bubbles are observed mark the location.

If the leak location is on the tire/rubber area refer to Corporate Bulletin Number 04-03-10-001D or newer - Tire Puncture Repair Procedures for All Cars and Light Duty Trucks.

If the leak is located on the aluminum wheel area continue with the next step.

Inscribe a mark on the tire at the valve stem in order to indicate the orientation of the tire to the wheel.

Dismount the tire from the wheel. Refer to Tire Mounting and Dismounting.

Remove the tire pressure sensor. Refer to Corporate Bulletin Number 04-03-16-002 regarding tire pressure sensor grommet replacement and the appropriate Tire Pressure Sensor removal procedure in SI.

Scuff the INSIDE rim surface at the leak area with # 80 grit paper and clean the area with general purpose cleaner such as 3M(R) General Purpose Adhesive Cleaner P/N 08984 or equivalent.

Apply a 3 mm (0.12 in) thick layer of Silicone - Adhesive/Sealant P/N 12378478 (in Canada use 88900041) or equivalent to the leak area. Allow for the adhesive/sealant to dry.

Caution must be used when mounting the tire so as not to damage the sealer. Damaging the repair area may result in an air leak.

Align the inscribed mark on the tire with the valve stem on the wheel.

Reinstall the Tire Pressure Sensor. Refer to Corporate Bulletin Number 04-03-16-002 regarding tire pressure sensor grommet replacement and the appropriate Tire Pressure Sensor installation procedure in SI.

Mount the tire on the wheel. Refer to Tire Mounting and Dismounting.

Pressurize the tire to 276 kPa (40 psi) and inspect for leaks.

Adjust tire pressure to meet the placard specification.

Balance the tire/wheel assembly. Refer to Tire and wheel Assembly Balancing - Off-Vehicle.

Install the tire and wheel assembly onto the vehicle. Refer to the appropriate service procedure in SI.

Part Number	Description
12378478 (in Canada, use 88900041)	Silicone – Adhesive/Sealant
3M® 08984	3M® General Purpose Adhesive Cleaner

Parts Information

Warranty Information (excluding Saab U.S. Models)

The Silicone - Adhesive/Sealant comes in a case quantity of six. ONLY charge warranty one tube of adhesive/sealant per wheel repair.

One leak repair per wheel.		
Labor Operation	Description	Labor Time
E0420	Wheel - One – R&R Or Replace	Use Published Labor operation Time
Add:	To Repair Porosity On Aluminum Wheel	Use Published Labor operation Time
Add:	To Repair Each Additional Wheel	Use Published Labor operation Time

For vehicles repaired under warranty use, the table.

Warranty Information (Saab U.S. Models)

Labor Operation	Description	Failed Object	Fault/Reason	Location Code	Warranty Type	Repair/Action Code	Labor Time
7711001	Wheel - One – R&R Or Replace	77110	55	3-left 4-right 5-all	01	05	Use Published Labor Operation Time
add 7711003	To Repair Porosity On Aluminum Wheel	—	—	—	—	—	0.1 hr
add 7711002	To Repair Each Additional Wheel	—	—	—	—	—	Use Published Labor Operation Time

For vehicles repaired under warranty, use the table.

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Disclaimer Technical Service Bulletin # 06-08-44-015A

Date: 080201

## Audio System - Noise When Using Portable Playback Unit

Bulletin No.: 06-08-44-015A

Date: February 01, 2008

INFORMATION

Subject:

**Information on Eliminating Noise in Audio System when Using Portable Playback Device****Models:**

2008 and Prior GM Passenger Cars and Trucks (Including Saturn)

2008 and Prior HUMMER H2, H3

2005-2008 Saab 9-7X

**Supercede:**

This bulletin is being revised to add model years. Please discard Corporate Bulletin Number 06-08-44-015 (Section 08 - Body and Accessories).

Some portable audio equipment may be susceptible to certain types of electronic noise present in the vehicle's 12V power outlet.

Here are two ways to eliminate this type of interference:

If the audio device is capable of being self-powered (battery) use it that way instead of plugging it into the vehicle's power outlet.

Have the customer purchase a Ground Loop Isolator such as \*Radio Shack Catalog # 270-054. This device plugs in between the radio and the customer's audio device. It is packed with one included Y-Adapter. If purchasing the \*Radio Shack product you will require an additional Y-Adapter (Catalog # 274-369). This device should be installed between the audio player and the AUX input of the vehicle radio. These catalog numbers are stocked nationally at \*Radio Shack Retail Stores in the U.S. and are currently available. Other similar products are available through other electronics or car stereo retailers defined as Ground Loop Isolators.

Parts are currently available nationally in the U.S. through \*Radio Shack retail locations or through the mail at Radio Shack direct ordering 1-800-843-7422. In Canada, parts are available nationally through \*The Source By Circuit City retail locations or at [www.thesourcecc.com](http://www.thesourcecc.com).

Part Number	Description	Qty
270-054 (U.S.) 2700054 (Canada)	Ground Loop Isolator	1
274-369 (U.S.) 2740883 (Canada)	Y-Adapter	1

\*We believe these sources and their products to be reliable. There may be additional manufacturers of such products/materials. General Motors does not endorse, indicate any preference for or assume any responsibility for the products or material from these firms or for any such items that may be available from other sources.

**Parts Information**

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**Disclaimer****Technical Service Bulletin # 08-07-30-027****Date: 080604****A/T - No Movement in Drive or 3rd Gear****TECHNICAL**

Bulletin No.: 08-07-30-027

Date: June 04, 2008

**Subject:**

No Movement When Transmission is Shifted to Drive or Third - Normal Operation When Shifted to Second, First or Reverse (Replace Forward Sprag Assembly)

**Models:**

1982 - 2005 GM Passenger Cars and Light Duty Trucks

2006 - 2007 Buick Rainier

2006 Cadillac Escalade, Escalade ESV, Escalade EXT

2006 Chevrolet SSR

2006 - 2008 Chevrolet Avalanche, Colorado, Express, Silverado Classic, Silverado, Suburban, Tahoe, TrailBlazer

2006 GMC Yukon Denali, Yukon Denali XL

## Chevrolet Sprint L3-61 1.0L

2006 - 2008 GMC Canyon, Envoy, Savana, Sierra Classic, Sierra, Yukon, Yukon XL

2006 Pontiac GTO

2006 - 2007 HUMMER H2

2006 - 2008 HUMMER H3

2006 - 2008 Saab 9-7X

with 4L60, 4L60E, 4L65E or 4L70E Automatic Transmission (RPOs MD8, M30, M32, M33 or M70)

### Condition

Some customers may comment that the vehicle has no movement when the transmission is shifted to DRIVE or THIRD position, but there is normal operation when it is shifted to SECOND, FIRST or REVERSE position.

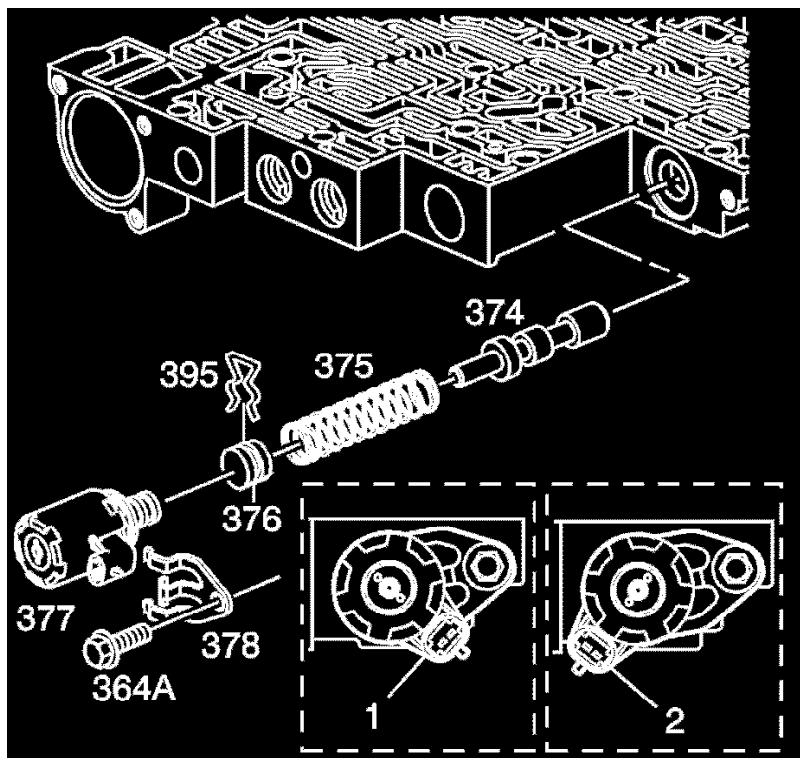
### Cause

This condition may be caused by a damaged forward sprag assembly (642).

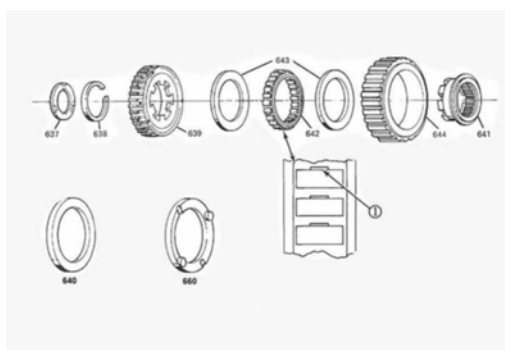
### Correction

When inspecting the sprag, it is important to test the sprag for proper operation by holding the outer race (644) with one hand while rotating the input sun gear (640) with the other hand. The sun gear should rotate only in the counterclockwise direction with the input sun gear facing upward. If the sprag rotates in both directions or will not rotate in either direction, the sprag elements should be inspected by removing one of the sprag assembly retaining rings (643). Refer to SI Unit Repair section for forward clutch sprag disassembly procedures.

If the sprag is found to be damaged, make repairs to the transmission as necessary. A new forward roller clutch sprag assembly is now available from GMSPO.



If clutch debris is found, it is also very important to inspect the Pressure Control (PC) solenoid valve (377) fluid screens. Clean or replace the PC solenoid (377) as necessary. It is also important to flush and flow check the transmission oil cooler using J45096. Refer to SI Automatic Transmission Oil Cooler Flushing and Flow Test for the procedure.



The notches above each sprag must point up as shown when assembled into the outer race.

Bearing Assembly, Input Sun Gear

Snap Ring, Overrun Clutch Hub Retaining

Hub, Overrun Clutch

Wear Plate, Sprag Assembly

Retainer and Race Assembly, Sprag

Forward Sprag Assembly

Retainer Rings, Sprag Assembly

Outer Race, Forward Clutch

Washer, Thrust (Input Carrier to Race)

The following information applies when this sprag is used in 1982-86 transmissions.

The new design sprag can be used on models 1982 through 1986, by replacing the entire assembly (637 - 644). Individual components are NOT interchangeable.

**Important:**

The wear plate (640) and input thrust washer (660) are not required with the new sprag. Use of the thrust washer and wear plate with the new sprag assembly will cause a misbuild (correct end play cannot be obtained).

Part Number	Description
24241477	Sprag, Forward Clutch

Parts Information

Warranty Information

Labor Operation	Description	Labor Time
K7253	Sprag, Forward Clutch — Replace	Use Published Labor Operation Time

For vehicles repaired under warranty, use the table.

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DisclaimerTechnical Service Bulletin # 882145

Date: 880601

## Brakes - Rattle Noise At Idle With Brakes Applied

Number: REISSUE 88-214-5

Section: 5

Date: JUNE, 1988

Subject: RATTLE NOISE AT IDLE WITH BRAKES APPLIED

Model and Year1985-88 SPRINT

TO: ALL CHEVROLET DEALERS

Dealer Service Bulletin 88-214-5 is being reissued to correct the involved models. The bulletin affects 1985-88 sprint vehicles, not Spectrums. All copies of 88-214-5 dated May, 1988 should be discarded.

Some of the subject vehicles may exhibit a rattle noise from the area of the brake booster when the engine is idling and the brake applied. This condition is more common on vehicles equipped with automatic transmission and occurs only when the engine is cold.

The repair is to replace the vacuum check valve at the booster using P/N 96057459 available from GMSPO.

This part has been revised in order to prevent the check valve being agitated by the vacuum pulses present in the vacuum line to the booster at idle.

Labor Operation Number: T1338

Labor Time: .3 Hours

Technical Service Bulletin # **902166** Date: **900401**

## **Oil Filters (Small 75 mm) - Leakage Prevention**

Number: 90-216-6

Section: 6

Date: April 1990

Corp. Bulletin No.: 906106

Subject: PROPER INSTALLATION OF 75 MM OIL FILTER

Model and Year: 1981-90 CHEVROLET MODELS

THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN NO. 90-187-6, DATED MARCH 1990. THE 1990 MODEL YEAR HAS BEEN ADDED. ALL COPIES OF 90-187-6 SHOULD BE DISCARDED.

To prevent leakage of small 75 mm oil filters such as PF-40, PF-45, PF-47, PF-51, etc., it is very important that the installation instructions listed below are closely followed.

Remove old filter by turning counter clockwise. Clean gasket sealing area on Engine Oil Filter Mounting Surface. (If engine has an adapter base, make sure threaded nipple or bolt is properly torqued.)

Lightly oil gasket with clean oil and install filter. After the oil filter gasket contacts the oil filter adapter base, tighten 3/4 to 1 full turn. When necessary, use a cap-type wrench, AC Delco OF17W or equivalent, or strap type wrench with swivel handle to insure proper installation.

With engine oil at proper level, run engine three minutes and thoroughly check filter area for leaks.

IMPORTANT: Be certain to follow replacement oil filter usage applications.

Technical Service Bulletin # **04-08-50-006** Date: **040601**

### **04-08-50-006 - 06/01/04**

This TSB number 04-08-50-006, dated 06/01/04 has been superceded by TSB number 04-08-50-006B , dated 01/25/08

Technical Service Bulletin # **04-08-50-006A** Date: **071201**

### **04-08-50-006A - 12/01/07**

This TSB number 04-08-50-006A, dated 12/01/07 has been superceded by TSB number 04-08-50-006B , dated 01/25/08

Technical Service Bulletin # **00-06-01-012A** Date: **050208**

### **00-06-01-012A - 02/08/05**

This TSB number 00-06-01-012A, dated 02/08/05 has been superceded by TSB number 00-06-01-012C , dated 04/14/08

Technical Service Bulletin # **933E106** Date: **030701**

### **933E106 - 07/01/93**

This TSB number 933E106, dated 07/01/03 has been superceded by TSB number 05-03-10-003C , dated 01/15/08

Technical Service Bulletin # **93966C** Date: **931001**

### **93966C - 10/01/93**

This TSB number 93966C, dated 10/01/93 has been superceded by TSB number 306502 , dated 10/01/93

Technical Service Bulletin # **932633E** Date: **930701**

### **932633E - 07/01/93**

This TSB number 932633E, dated 07/01/93 has been superceded by TSB number 05-03-10-003C , dated 01/15/08

Technical Service Bulletin # **932549A** Date: **930701**

### **932549A - 07/01/93**

This TSB number 932549A, dated 07/01/93 has been superceded by TSB number 349212R , dated 07/01/93

Technical Service Bulletin # **93-6-107**

Date: **970701**

**93-6-107 - 07/01/97**

This TSB number 93-6-107, dated 07/01/97 has been superceded by TSB number 00-06-02-006D , dated 08/15/06

Technical Service Bulletin # **926102**

Date: **951001**

**926102 - 10/01/95**

This TSB # 926102, dated 10/01/95, has been superseded by TSB # 186103, dated 10/01/95.

Technical Service Bulletin # **922816C**

Date: **920901**

**922816C - 09/01/92**

This TSB number 922816C, dated 09/01/92 has been superceded by TSB number 93316C , dated 10/01/92

Technical Service Bulletin # **91576E**

Date: **900801**

**91576E - 08/01/90**

This TSB number 91576E, dated 08/01/90 has been superceded by TSB number 913446E , dated 06/01/91

Technical Service Bulletin # **91390B**

Date: **900801**

**91390B - 08/01/90**

This TSB number 91390B, dated 08/01/90 has been superceded by TSB number 913500B , dated 06/01/91

Technical Service Bulletin # **913117**

Date: **940301**

**913117 - 03/01/94**

This TSB number 913117, dated 03/01/94 has been superceded by TSB number 033206 , dated 03/01/94

Technical Service Bulletin # **912083B**

Date: **940301**

**912083B - 03/01/94**

This TSB number 912083B, dated 03/01/94 has been superceded by TSB number 033206 , dated 03/01/94

Technical Service Bulletin # **90523E**

Date: **891001**

**90523E - 10/01/89**

This TSB number 90523E, dated 10/01/89 has been superceded by TSB number 911713E , dated 01/01/91

Technical Service Bulletin # **903165**

Date: **900801**

**903165 - 08/01/90**

This TSB number 903165, dated 08/01/90 has been superceded by TSB number 911335 , dated 12/01/90

Technical Service Bulletin # **901876**

Date: **900301**

**9018769 - 03/01/90**

This TSB number 901876, dated 03/01/90 has been superceded by TSB number 902166 , dated 04/01/90

Technical Service Bulletin # **891726**

Date: **890601**

**891726 - 06/01/89**

This TSB number 891726, dated 06/01/89 has been superceded by TSB number 902166 , dated 04/01/90

Technical Service Bulletin # **891450B**

Date: **890501**

**891450B - 05/01/89**

This TSB number 891450B, dated 05/01/89 has been superceded by TSB number 892347A , dated 08/01/89

Technical Service Bulletin # **87121**

Date: **870501**

**87121 - 05/01/87**

This TSB number 87121, dated 05/01/87 has been superceded by TSB number 93356D , dated 10/01/92

Technical Service Bulletin # **73-90-23**

Date: **000101**

**73-90-23 - 01/01/00**

This TSB number 73-90-23, dated 01/01/00 has been superceded by TSB number 99-09-41-004 , dated 01/01/00

Technical Service Bulletin # **73-90-12**

Date: **000101**

**73-90-12 - 01/01/00**

This TSB number 73-90-12, dated 01/01/00 has been superceded by TSB number 99-09-41-004 , dated 01/01/00

Technical Service Bulletin # **631208**

Date: **970401**

### **631208 - 04/01/97**

This TSB number 631208, dated 04/01/97 has been superceded by TSB number 631208A , dated 04/01/97

Technical Service Bulletin # **431018**

Date: **940501**

### **431018 - 01/05/94**

This TSB number 431018, dated 05/01/94 has been superceded by TSB number 431018A , dated 05/01/94

Technical Service Bulletin # **420515**

Date: **941201**

### **420515 - 12/01/94**

This TSB number 420515, dated 12/01/94 has been superceded by TSB number 420515A , dated 02/01/95

Technical Service Bulletin # **40-05-01C**

Date: **991001**

### **40-05-01C - 10/01/99**

This TSB # 40-05-01C, dated 10/01/99, has been superseded by TSB # 99-00-89-019, dated 10/01/99. Technical Service Bulletin #

**310503B**

Date: **961201**

### **310503B - 01/12/96**

This TSB number 310503B, dated 12/01/96 has been superceded by TSB number 310503C , dated 12/01/96

Technical Service Bulletin # **23-62-03**

Date: **970701**

### **23-62-03 - 07/01/97**

This TSB number 23-62-03, dated 07/01/97 has been superceded by TSB number 00-06-02-006D , dated 08/15/06

Technical Service Bulletin # **12-92-43**

Date: **970701**

### **12-92-43 - 07/01/97**

This TSB number 12-92-43, dated 07/01/97 has been superceded by TSB number 00-06-02-006D , dated 08/15/06

Technical Service Bulletin # **99-00-84-021A**

Date: **000301**

### **Warranty - Expediting parts**

This TSB number 99-00-84-021A, dated 03/01/00 has been superceded by TSB number 99-00-84-021B , dated 04/01/00

Technical Service Bulletin # **99-00-89-019**

Date: **991001**

### **Warranty - Parts Returning Program**

File In Section: 00 - General Information

Bulletin No.: 99-00-89-019

Date: October, 1999

Subject:

Warranty Parts Center/Corporate Parts Return Program

Models:

2000 and Prior Passenger Cars and Trucks

Attention:

Parts Managers, Service Managers, Warranty Administrators

This bulletin is being revised to update changes to the Warranty Parts Center/Corporate Parts Return Program such as:

Request Number Layout Revised

Lotus Notes Address for WPC

Warranty Core Parts Retention Period

Special Part Request Process

Please discard Corporate Bulletin Number 40-05-01C

(Section - Warranty Administration).

This bulletin is effective October 1, 1999 and its purpose is to clarify instructions with regard to the Corporate Parts Return (CPR) Program/Warranty Parts Center (WPC) in the areas of parts retention, parts preparation for shipping, and administration. This bulletin supersedes all previous written communication regarding WPC operation.

CPR is considered a valuable tool for root cause analysis of customer product concerns. The GM Warranty Parts Center (WPC) has contracted with United Parcel Service Worldwide Logistics to transport and inventory all parts returned from dealerships requested by the CPR program. The following information will assist in returning parts to the WPC.



## Requests, Reminders and Debits

For examples of return requests and reminders, refer to Part Return Request Example, Request for Part Return/Repair Order Only/Reminder Example and Request for Repair Order Only Example at the end of this bulletin.

^ Requests - When a part (and repair order copy) is needed, the dealership will receive a "GM Part and Repair Order Return Request" message.

When a repair order ONLY is needed, the dealership will receive an "R.O. Only Request" message. All CPR requests will be received via DCS within the "PART RETURN CPR" report application on Tuesdays and Fridays of each week as warranty claims are paid.

^ Reminders - A reminder notice of previously requested parts/R.O.'s which have not been received by the WPC will also be provided. These reminders will be listed in categories of "14-20 days old" and "at least 21 days old." Until parts are received, or the WPC has been contacted for non-return of parts, or the parts have reached 28 days, these reminders will repeat with each claim cycle. If dealer records indicate that the requested part has been returned and the reminder notices continue, it is imperative that the dealer follow-up with the WPC to RESOLVE the issue to avoid possible debit. Fax (248-371-9005) is recommended for proof of follow-up with the WPC. If the original request is misplaced or unreadable, the reminder notice may be used for shipping parts with their paperwork to the WPC.

For dealer information, the Request Number is nine-digits. As an example, 924523457 would be translated as follows:

- The first position indicates the year of the request. 9 = 1999.
- The next three positions indicate the julian date. 245 = September 2, 1999.
- The next four positions indicate the unique sequence number. In this example, it is 2345.
- The last number is the check digit. In this example it is 7.

^ Debits - If, after 28 days, parts have not been received, or the WPC has not been contacted with an approved explanation for non-return of parts, the WPC will submit a total claim debit to the WINS process. The Debit Reason Code WP will be assigned to each debit case. If the dealer has any questions regarding a debit, the dealer must contact the divisional representative or the Dealer Business Center contact. The WPC has NO authority to waive or reverse debits after issuance. Regarding debits, the following responses are unacceptable at any time and will result in a debit:

- WPC received the part without paperwork.
- Dealer never received the original request.
- The dealer sent the part to an unapproved location.
- The dealer returned the pan for Core Value.
- WPC received paperwork without the part.
- The dealer scrapped the part prior to retention period.

## Part Preparation For Shipping

The return request message will list specific claims for which parts (and repair orders) are to be returned as follows:

ONLY PARTS ASSOCIATED WITH THE LABOR CODE ARE TO BE RETURNED AND SHOULD BE BUNDLED TOGETHER AND SHIPPED USING THE UPS/ARS SHIPPING LABELS (WPC002). PLASTIC PACKING BAGS (WPC001) ARE AVAILABLE FROM THE WPC FOR THE PROTECTION OF THE PAPERWORK TO BE INCLUDED WITH THE PARTS (LEGIBLE COPIES OF THE REPAIR ORDER - WITH THE TECHNICIAN'S COMMENTS - AND THE CPR "REQUEST"). THESE BAGS MUST BE SECURELY ATTACHED TO THE APPROPRIATE PARTS.

When additional WPC/ARS shipping labels or plastic bags are needed, complete the Material Request form (WPC005) and fax it to the WPC at (248) 371-9005 OR via Lotus Notes at WARRANTY PARTS CENTER USA @ US\_GM\_PON\_OPM01.  
(Refer to Form WPC005 at the end of this bulletin.)

Supply requests are shipped via UPS within 24 hours.

There may be instances where multiple return requests are included on one DCS message. When this occurs, dealers should ship each individual request in a separate box with its own UPS/ARS label.

DO NOT BATCH MULTIPLE REQUESTS IN THE SAME BOX. Copies of the "request" and repair order must be attached to each pan sent to the WPC. The dealer should highlight the particular request pertaining to the part and place the folded paperwork in the plastic packing bag with the highlighted Request Number facing out. This process will assist the WPC in handling and crediting the dealership for returning the pan in a timely manner.

When possible, the container from the new/replacement part should be used for the return of the tailed part. Parts containing or soaked by fluids, such as oil or fuel, MUST be drained, wiped clean and placed in an appropriate packing container and securely packaged in order to prevent leakage or contamination.

If there are special packaging costs, they should be included as a Net Item amount when submitting a Z7200 claim. Special packaging situations may include crating an engine assembly, reassembly of components, or draining and sealing components in order to prevent leakage during shipment. Appropriate handling charges for these situations should be calculated at a rate for unskilled labor (not at the warranty or retail labor rate) and appropriately documented on the Z7200 claim.

When returning parts, complete the UPS/ARS shipping label by writing in the dealer name, address, city, state and zip code. At the present time, the Ref. # field should contain the Request Number being returned. Attach the label to the package and detach the lower portion for dealer records. The lower portion of the label contains the shipment tracking number and should be attached to the dealer's "Warranty Parts Center Shipping Log" (Refer to Warranty Parts Center Shipping Log at the end of this bulletin). This ARS receipt can be used for tracking purposes through UPS. Any questions regarding status or delivery of UPS shipments is available via UPS tracking at 1-800-742-5877 or via the Internet at [www.ups.com](http://www.ups.com).

If a part (and appropriate paperwork) cannot be shipped via UPS due to size or weight limitations, the following GM-approved common carrier (LTL) must be used to return the parts "Third Party Freight Collect" to the WPC.

Carrier	Phone Number
Central Transport	1-800-462-1964

Ship To:	Warranty Parts Center 45 Northpointe Drive Orion, MI 48359
Bill To:	THIRD PARTY FREIGHT COLLECT Corpay Solutions WPC Cisco Code: 18002 P.O. Box 9115 Norwood, MA 02062-9115

The bill of lading should reflect the following information:

The bill of lading should contain the following description: "USED AUTO PARTS NO COMMERCIAL VALUE. ITEM 18630.3 CLASS 70"

When this process is used, the dealer will not need to pre-pay shipments to the WPC. Parts delivered by any other common carrier (LTL), will be rejected by the WPC and returned to the dealership.

In order to prevent paperwork loss on common carrier (LTL) shipments, attach two copies of the DCS message and repair order as follows:

^ Attach one copy to the inside of the crated shipment (attached to the part).

^ Attach one copy to the Bill of Lading.

On those occasions when a part is not available for return to the WPC, fax or Lotus Notes a completed Parts Waiver Form (WPCOO6) with an explanation. (Refer to Form WPCOO6 at the end of this bulletin.) Please note that not all explanations will prevent a debit.

## Warranty Core Parts

Dealers should hold all warranty core parts until date of claim payment. On the date of claim payment, the dealer should also verify any CPR requests for any of the core parts paid on that claim cycle. If NO CPR request is received on paid claims for core parts, the dealer should return those parts to GMSPO Core Return Center. When the CPR requested parts are returned to the WPC, the GMSPO core allowance should be submitted as a Net Item amount of the Z7200 claim.

## Hazardous Material

Do not ship batteries, air bags, or fuel tanks to the WPC. These parts are considered hazardous. Contact the WPC immediately at 248-371-9901/9902 if any of the following situations exists:

^ The dealership receives a request and believes the parts is hazardous.

^ The UPS driver refuses to accept a package that may be hazardous.

A Parts Waiver will be requested and the request will be excused.

## Tires

Most tires replaced under the New Vehicle Limited Bumper to Bumper Warranty must be returned to the tire manufacturer. Refer to the P&P Manual, Section 1.5.12 for procedures on tire replacement and shipping instructions. There may be instances when CPR will request certain tires to be returned to the WPC. If the dealer receives a request for returning tires to the WPC, shipping instructions outlined in this bulletin should be followed. Copies of all paperwork should be kept at the dealership for proof of request by the WPC.

## Campaign Parts and Special Parts Return Request

### Campaign Parts

Occasionally, certain campaign parts will be requested for return to the WPC. Dealers should submit claim for payment as soon as possible after the repair. Parts should be retained for the period stated in the campaign bulletin or at least until the claim is paid. The WPC will request the part via

CPR on the day the claim is paid. Campaign parts should be returned using the process outlined in this bulletin.

### Special Parts Return Request

Dealers may be contacted to return "one-of-a-kind" parts for specific engineering analysis. These parts have not been identified as a return to the WPC. This process is not intended to replace the regular CPR parts request process. The dealer should follow the procedures outlined in this bulletin for special part return. A copy of the Special Parts Return Request must be included in the shipment and the box/crate labeled "SPECIAL PART RETURN." The Special Part Return form has a section for the dealership to use if the part is requested, at a later date, for return to the WPC. Refer to Special Part Request at the end of this bulletin.

## Repair Order Only Requests

### Important:

Never return a "Repair Order Only" request to the WPC.

If a "Repair Order Only" request (refer to the Request for Repair Order Only Example at this end of this bulletin) is received, return legible copies of the R.O. only, including all technician comments, directly to the requester using the mailing label provided on the CPR request. Do not use the UPS/ARS label and DO NOT RETURN PARTS on this type of request. When returning "Repair Order Only" requests, use REGULAR US Postal Service mail. Do not use Registered mail of any type.

## Forms WPC006 and WPC005

Copies of Forms WPC006 and WPC005 (Parts Waiver and Material Order Form) are available by "polling" the WPC fax at 248-371-9005. In order to poll, follow the instructions in the dealership fax machine manual. When the dealership fax machine asks for a password to the WPC fax machine, enter 1111. The dealership fax machine will receive a copy of Forms WPC006 and WPC005. The dealership Techline terminal should be used to obtain additional copies of this bulletin without attachments.

Forms WPC006 and WPC005 are also available by sending a request via Lotus Notes to Warranty Parts Center USA @ US\_GM\_PON\_OPM01. The WPC Customer Assistance will reply with copies of the forms.

## Return and Method of Reimbursement

Field of Entry	Enter
RO#	Repair Order Number
RO Date	Date of shipment
VIN	Enter one of the valid VINs from the return requests being reimbursed on the claim.
ODOMETER	Enter mileage for the same VIN.
S. ADVISOR	Enter Service Consultant's/Manager's ID Number
TYP	Enter "F"
CC	Enter "MD"
FC	Enter "00"
LBROP	Enter "Z7200"
LHRS	From 0.0 to 0.3 hours FOR EACH PART REQUESTED (with Repair Order) and 0.0 to 0.2 hours FOR EACH "REPAIR ORDER ONLY" REQUEST being reimbursed on this claim
TECH-#	Enter the Service Consultant's/Manager's ID Number
NET-ITM	Total amount of packaging material costs, part core charges, and postage for R.O. only requests, where applicable.

### Return Reimbursement

The following conditions qualify for dealer reimbursement:

#### 1. Administrative Allowances

Enter as "Labor Hours" - A range from 0.0 to 0.3 hours may be claimed for each line involving the return of parts (and copies of R.O.s including technician comments). The time requested for reimbursement depends on the complexity of the request as determined by the dealer.

A range from 0.0 to 0.2 hours can be claimed for each line where repair order only copies are returned, again as determined by the dealer.

#### 2. Shipping Expenses

Enter as "Net Item" - There will be no dealer-incurred postage or shipping costs associated with parts returned to the WPC. However, any postage charges for "repair order only" requests will be reimbursed.

3. Packaging Material Costs (where applicable) Enter as "Net Item" - Packaging material costs include such things as boxes, tape, etc. Labor charges (for crating an engine assembly, draining and sealing components in order to prevent leakage during shipment, etc.) associated with packaging costs are to be calculated and billed at a cost for unskilled labor and not at the dealer's warranty or retail labor rate.
4. GMSPO Core Part Allowance Amounts (where applicable) Enter in "Net Item."

#### Method of Reimbursement

Each return request may be recorded using a separate repair order or up to ten requests may be (physically) listed on a repair order. Entries must include the VIN, request number, number of parts returned, and associated costs.

When submitting a single return request for reimbursement, use the normal submission procedures and Labor Operation Z7200 with claim type "F." In order to receive reimbursement for multiple part return requests, choose one of the VINs for the one line claim. Submit for the total of all corresponding charges (up to 10 requests) on that one line. Submit the claim using normal submission procedures and Labor Operation Z7200 with claim type "F." Refer to the description of claim submission entries below.

All related documentation, including a copy of the CPR return request, must be retained for future reference in accordance with the GM Service Policies & Procedures Manual, Article 1.6.

### Dealer Feedback

Important WPC Information to Remember	
WPC Customer Assistance	248-371-9901/9902
WPC Fax	248-371-9005
Lotus Notes Address	Warranty Parts Center USA@US_GM_PON_OPM01

The WPC recognizes the need to provide information regarding our progress and accomplishments in product improvements as a direct result of the Corporate Parts Return program. Information gathered by the WPC will be provided to dealers in the form of a newsletter.

### Part Return Request Example

GM WARRANTY PARTS CENTER RETURN REQUESTS FOR DEALER XXXXX - CLAIM MEMO XXX.

BELOW ARE PARTS AND REPAIR ORDERS WHICH ARE REQUIRED FOR PRODUCT REVIEW THE FOLLOWING MUST BE RETURNED TO THE WARRANTY PARTS CENTER AT:

WARRANTY PARTS CENTER

45 NORTHPOINTE DRIVE  
ORION, MI 48359

USE THE PROVIDED PRE-PRINTED AND PRE-PAID UPS/ARS LABELS TO SHIP THE FOLLOWING:

- COPY OF THE REQUEST BELOW
- REPAIR ORDER (INCLUDING TECHNICIAN COMMENTS)
- ONLY PARTS ASSOCIATED WITH THE LABOR CODE

REQUEST NUMBER	LABOR CODE	RO DATE	RO NUMBER	VEHICLE ID NUMBER
YJJJ###C	H1220	042299	018675	1GCEC14Z3SZ157998
YJJJ###C	D1180	042299	018927	2G1WL52MXS9135972
YJJJ###C	J5500	042999	019780	1GNCS13W4S2150230

ALL FLUIDS MUST BE DRAINED FROM PARTS BEING RETURNED. PLACE THE ABOVE ITEMS IN A PLASTIC BAG AND SECURELY ATTACH TO PART PRIOR TO SHIPPING. EACH REQUEST SHOULD BE SHIPPED INDIVIDUALLY.

LISTED BELOW ARE PART REQUESTS THAT HAVE NOT BEEN RECEIVED AT THE WARRANTY PARTS CENTER AS OF THIS DATE. IF YOUR RECORDS INDICATE THAT YOU HAVE RETURNED THE REQUESTED PART (ALLOW 7 DAYS FOR SHIPPING AND HANDLING), IT IS IMPERATIVE THAT YOU FOLLOW-UP WITH THE WPC AT 248/371-9901/9902 (OR FAX AT 248/371-9005) TO RESOLVE THE ISSUE AND AVOID POSSIBLE DEBIT.

REQUEST NUMBER	LABOR CODE	RO DATE	RO NUMBER	VEHICLE ID NUMBER
YJJJ###C	H1220	042699	163067	1G6KF5290TU278381

REQUESTS ARE 14 TO 20 DAYS OLD

REQUEST NUMBER	LABOR CODE	RO DATE	RO NUMBER	VEHICLE ID NUMBER
YJJJ###C	D0790	042399	018839	2GCEC19K1S1271972

REQUESTS ARE AT LEAST 21 DAYS OLD

### Request For Part Return/Repair Order Only/Remind. Example

GM WARRANTY PARTS CENTER RETURN REQUESTS FOR DEALER XXXXX - CLAIM MEMO XXX.

BELOW ARE PARTS AND REPAIR ORDERS WHICH ARE REQUIRED FOR PRODUCT REVIEW. THE FOLLOWING MUST BE RETURNED TO THE WARRANTY PARTS CENTER AT:

WARRANTY PARTS CENTER  
45 NORTHPOINTE DRIVE  
ORION, MI 48359

USE THE PROVIDED PRE-PRINTED AND PRE-PAID UPS/ARS LABELS TO SHIP THE FOLLOWING:

- COPY OF THE REQUEST BELOW
- REPAIR ORDER (INCLUDING TECHNICIAN COMMENTS)
- ONLY PARTS ASSOCIATED WITH THE LABOR CODE

REQUEST NUMBER	LABOR CODE	RO DATE	RO NUMBER	VEHICLE ID NUMBER
YJJJ###C	H1220	042299	018675	3GKEK13R3XR901034
YJJJ###C	D1180	042299	018927	1G4CU5214W4606371
YJJJ###C	J5500	042999	019780	3GKFK16R6XG505423

ALL FLUIDS MUST BE DRAINED FROM PARTS BEING RETURNED. PLACE THE ABOVE ITEMS IN A PLASTIC BAG AND SECURELY ATTACH TO PART PRIOR TO SHIPPING. EACH REQUEST SHOULD BE SHIPPED INDIVIDUALLY.

LABOR CODE	RO DATE	RO NUMBER	VEHICLE ID NUMBER
A1370	042699	163067	1G6KF5290TU278381
J9995	042999	019780	1GNCS13W4V211023
TO: ANY PERSON ANY COMPANY 1111 ANY STREET ANYWHERE, USA 00000		MAILING LABEL ANY PERSON ANY COMPANY 1111 ANY STREET ANYWHERE, USA 00000	

BELOW ARE R.O. ONLY REQUESTS WHICH SHOULD BE RETURNED TO THE REQUESTOR VIA THE POST OFFICE USING THE MAILING LABEL PROVIDED. NO R.O. ONLY REQUESTS SHOULD BE RETURNED TO THE WARRANTY PARTS CENTER.

LISTED BELOW ARE PART REQUESTS THAT HAVE NOT BEEN RECEIVED AT THE WARRANTY PARTS CENTER AS OF THIS DATE. IF YOUR RECORDS INDICATE THAT YOU HAVE RETURNED THE REQUESTED PART (ALLOW 7 DAYS FOR SHIPPING AND HANDLING), IT IS IMPERATIVE THAT YOU FOLLOW-UP WITH THE WPC AT 248/371-9901/9902 (OR FAX AT 248/371-9005) TO RESOLVE THE ISSUE AND AVOID POSSIBLE DEBIT.

REQUEST NUMBER	LABOR CODE	RO DATE	RO NUMBER	VEHICLE ID NUMBER
YJJJ###C	H1220	042699	163067	1G6KF5290TU278381

REQUESTS ARE 14 TO 20 DAYS OLD

REQUEST NUMBER	LABOR CODE	RO DATE	RO NUMBER	VEHICLE ID NUMBER
YJJJ###C	D0790	042399	018839	2GCEC19K1S1271972

REQUESTS ARE AT LEAST 21 DAYS OLD

END OF WPC TRANSMISSION

**Request For Repair Order Only Example**

GM WARRANTY PARTS CENTER RETURN REQUESTS FOR DEALER XXXXX - CLAIM MEMO XXX.

BELOW ARE R.O. ONLY REQUESTS WHICH SHOULD BE RETURNED TO THE REQUESTOR VIA THE POST OFFICE USING THE MAILING LABEL PROVIDED. NO R.O. ONLY REQUESTS SHOULD BE RETURNED TO THE WARRANTY PARTS CENTER.

LABOR CODE	RO DATE	RO NUMBER	VEHICLE ID NUMBER
A1370	042699	163067	1G6KF5290TU278381
J9995	042989	019780	1GNCS13W4V211023
TO: ANY PERSON ANY COMPANY 1111 ANY STREET ANYWHERE, USA 00000		MAILING LABEL ANY PERSON ANY COMPANY 1111 ANY STREET ANYWHERE, USA 00000	

LISTED BELOW ARE PART REQUESTS THAT HAVE NOT BEEN RECEIVED AT THE WARRANTY PARTS CENTER AS OF THIS DATE. IF YOUR RECORDS INDICATE THAT YOU HAVE RETURNED THE REQUESTED PART (ALLOW 7 DAYS FOR SHIPPING AND HANDLING), IT IS IMPERATIVE THAT YOU FOLLOW-UP WITH THE WPC AT 248/371-9901/9902 (OR FAX AT 248/371-9005) TO RESOLVE THE ISSUE AND AVOID POSSIBLE DEBIT.

REQUEST NUMBER	LABOR CODE	RO DATE	RO NUMBER	VEHICLE ID NUMBER
YJJJ####C	H1220	042699	163067	1G6KF5290TU278381

REQUESTS ARE 14 TO 20 DAYS OLD

REQUEST NUMBER	LABOR CODE	RO DATE	RO NUMBER	VEHICLE ID NUMBER
YJJJ####C	D0790	042399	018839	2GCEC19K1S1271972

REQUESTS ARE AT LEAST 21 DAYS OLD

**Reminders Only Example**

GM WARRANTY PARTS CENTER RETURN REQUESTS FOR DEALER XXXXX - CLAIM MEMO XXX.

LISTED BELOW ARE PART REQUESTS THAT HAVE NOT BEEN RECEIVED AT THE WARRANTY PARTS CENTER AS OF THIS DATE. IF YOUR RECORDS INDICATE THAT YOU HAVE RETURNED THE REQUESTED PART (ALLOW 7 DAYS FOR SHIPPING AND HANDLING), IT IS IMPERATIVE THAT YOU FOLLOW-UP WITH THE WPC AT 248/371-9901/9902 (OR FAX AT 248/371-9005) TO RESOLVE THE ISSUE AND AVOID POSSIBLE DEBIT.

REQUEST NUMBER	LABOR CODE	RO DATE	RO NUMBER	VEHICLE ID NUMBER
YJJJ####C	H1220	042699	163067	1G6KF5290TU278381

REQUESTS ARE 14 TO 20 DAYS OLD

REQUEST NUMBER	LABOR CODE	RO DATE	RO NUMBER	VEHICLE ID NUMBER
YJJJ####C	D0790	042399	018839	2GCEC19K1S1271972

REQUESTS ARE AT LEAST 21 DAYS OLD

SHIPMENT DATE	UPS/ARS TRACKING LABEL	REQUEST NUMBER

## WARRANTY PARTS CENTER SHIPPING LOG

All parts shipped to:

GM Warranty Parts Center  
 45 Northpointe Drive  
 Orion, MI 48359  
 (248) 371-9901/02

REPRODUCE LOCALLY

Form WPC007

Rev. 9/99

## Form WPC006

DATE:

SUBJECT: Parts Walver

TO:

Warranty Parts Center

FAX 248-371-9005

Lotus Notes: Warranty Parts Center USA@US GM\_PON\_OPM01

Customer Assistance 248-371-9901/02

We are unable to fulfill the Warranty Parts Center (WPC) request asking for parts replaced on behalf of General Motors Corporation for the following reason(s).

**Important:** Parts are to be sent ONLY to the WPC or released by the GM organizations listed below:

- Area Sales or Service Managers
- Brand Quality Managers
- Service Operations TAC Liaison
- Service Operations field service engineer or techline specialist
- Warranty Concern Detection Center (WCDC) personnel
- Warranty Parts Center Managers

Please remove the following from the outstanding request listing:

REQUEST NUMBER

R.O. NUMBER

DEALER CODE

DEALER NAME

DEALER CITY, STATE

TELEPHONE

AUTHORIZING INDIVIDUAL

GM EMPLOYEE &amp; UNIT

DEALER EMPLOYEE

REPRODUCE LOCALLY

Form WPC006

Rev. 9/99

Form WPC005	
<b>DATE:</b>	
TO:	
WARRANTY PARTS CENTER	
FAX: 248-371-9005	
Lotus Notes: Warranty Parts Center USA@US_GM_PON OPM01	
Customer Assistance: 248-371-9901/02	
<b>RE: WARRANTY PARTS CENTER (WPC) MATERIAL REQUEST</b>	
Please mail the following WPC items to the dealer listed below:	
Please Indicate the number of packages needed.	
WPC001 - Plastic Packing Bags (50 per package)	
WPC002 - UPS/ARS Shipping Labels (50 per package)	
Please Print Legibly	
DEALER NAME	
ADDRESS (No P.O. Boxes)	
CITY, STATE	
ZIP CODE	
ATTENTION	
TELEPHONE	
REPRODUCE LOCALLY	
Form WPC005	
Rev. 9/99	

<b>DATE:</b>	
The part below is being requested by GM Product Engineering. Please return the part to the Warranty Parts Center using the procedure outlined in Warranty Administration Bulletin 40-05-01	
<b>DEALER: ATTACH THE ORIGINAL OF THIS FORM, ALONG WITH THE TECHNICIAN'S COPY OF THE REPAIR ORDER TO THE PART BEING RETURNED. KEEP A COPY OF ALL INFORMATION FOR YOUR RECORDS. PLEASE MARK BOX "SPECIAL PART REQUEST".</b>	
WPC Special Request	
Attention:	
Dealer Name	
Dealer City, State, Zip Code	
Dealer Phone Number	
Dealer Fax Number	
Repair Order Number	
Labor Operation	
Part Number and/or Description	
VIN	
<b>PARTS WAIVER INFORMATION</b>	
If, at a later date, the dealership receives a CPR request to return this part, please insert the Request Number in the area below and fax to the WPC to waive the return (248-371-9005)	
CPR Request Number	
<b>ENGINEERING</b>	
Engineer's Name	
Organization	
Phone/Fax Number	
WPC Contacts:	
Gary Smits 248-371-9910	
Jenny Lawrence 248-371-9920	
Ann Danowski 248-371-9930	

**Warranty - Expediting Parts**

This TSB number 99-00-84-021, dated 11/01/99 has been superceded by TSB number 99-00-84-021B , dated 04/01/00



## Parts - Expediting Information

This TSB number 48-05-02C, dated 02/01/98 has been superceded by TSB number 99-00-84-021B , dated 04/01/00  
Technical Service Bulletin # **620502**

Date: **960701**

## Warranty - Personal Property Damage

This TSB number 620502, dated 07/01/96 has been superceded by TSB number 62-05-02A , dated 11/01/97  
Technical Service Bulletin # **92478A**

Date: **911101**

## Electrical - Diode Replacement Information

This TSB number 92478A, dated 11/01/91 has been superceded by TSB number 931638A , dated 05/01/93  
Technical Service Bulletin # **06-08-43-003**

Date: **060630**

## Windshield Wipers - Performance/Cleaning and Maintenance

This TSB number 06-08-43-003, dated 06/30/06 has been superceded by TSB number 06-08-43-003A , dated 06/08/07  
Technical Service Bulletin # **00-08-48-005B**

Date: **060912**

## Body - Distortion On Outer Glass Surfaces

This TSB number 00-08-48-005B, dated 09/12/06 has been superceded by TSB number 00-08-48-005C , dated 02/01/08  
Technical Service Bulletin # **668304**

Date: **960701**

## Odometer/Speedometer - Repair Facilities

This TSB number 668304, dated 07/01/96 has been superceded by TSB number 668304A , dated 09/01/96  
Technical Service Bulletin # **03-00-89-008C**

Date: **070524**

## Body - Metal Panel Corrosion Protection

This TSB number 03-00-89-008C, dated 05/24/07 has been superceded by TSB number 03-00-89-008D , dated 11/02/07  
Technical Service Bulletin # **99-08-51-001**

Date: **990401**

## Body - Paint-less Dent Repair Process

This TSB number 99-08-51-001, dated 04/01/99 has been superceded by TSB number 99-08-51-001A , dated 11/21/05  
Technical Service Bulletin # **99-08-64-016**

Date: **990901**

## Weatherstrips - Use of Silicone Grease for Maintenance

This TSB number 99-08-64-016, dated 09/01/99 has been superceded by TSB number 99-08-64-016B , dated 06/22/07  
Technical Service Bulletin # **912510B**

Date: **910301**

## Paint - Etching/Staining

Number: 91-251-0B

Section: 0B

Date: MARCH 1991

Corp. Bulletin No.: 130101

Subject:  
PAINT ETCHING/STAINING

Model and Year:  
1985-91 ALL PASSENGER CARS AND TRUCKS

A recent long term investigation has indicated that improper car wash procedures contribute to paint staining, etching and permanent water spotting.

Dealer personnel in both new and used car facilities should be advised of the following:

- Avoid washing cars in direct sunlight
- Avoid using strong soaps or chemical detergents
- Avoid using products containing acids
- Cleaning agents should be dried promptly and not allowed to dry on surface

- Standing rinse water should be dried promptly and not allowed to air dry or sun dry on surface
- Drying with a soft chamois is recommended

Should a customer inquire about proper washing procedures, the above recommendations should be given and are in accordance with the information in the owners manuals.

Technical Service Bulletin # **924110**

Date: **911101**

## **Locks - Binding/Sticking Door Lock Cylinders**

This TSB number 924110, dated 11/01/91 has been superceded by TSB number 9313310 , dated 03/01/93

Technical Service Bulletin # **8834910**

Date: **881001**

## **Door Locks - Freezing Lock Cylinder**

This TSB number 8834910, dated 10/01/88 has been superceded by TSB number 9313310 , dated 03/01/93

Technical Service Bulletin # **689601**

Date: **960901**

## **Policy - Procedure to Handle Customer Radio Concerns**

This TSB number 689601, dated 09/01/96 has been superceded by TSB number 689601A , dated 10/01/96

Technical Service Bulletin # **349212**

Date: **950601**

## **Audio - Radio Frequency Interference (RFI) Diagnosis**

This TSB number 349212, dated 06/01/95 has been superceded by TSB number 83-96-05 , dated 07/01/98

Technical Service Bulletin # **01-08-46-004**

Date: **010801**

## **Cellular Phones - Operating Characteristics**

File In Section: 08 Body and Accessories

Bulletin No.: 01-08-46-004

Date: August, 2001

### **INFORMATION**

Subject:  
Vehicle Integration of Cellular Phones and Normal Operating Characteristics

Models:  
2002 and Prior Passenger Cars and Trucks

What is a Cell Phone

The cellular telephone is a small portable device which allows communication with others from remote or moving locations using Ultra High Frequency (UHF) radio signals.

### **Important:**

All communication devices which use air waves as a means of communication are regulated by the Federal Communication Commission (FCC) (the Canadian Radio-Television and Telecommunications Commission (CRTC) in Canada). These regulations cover cell phones and, as such, the handheld, all-in-one cell phone cannot exceed 0.6 watts in output.

Currently, cell phones are available in three different styles:

A bag phone with a handheld receiver attached to a module with an antenna by way of a cord, typically plugged into a cigarette lighter receptacle in the vehicle and placed on the floor: A three watt device. A self-contained handheld device with antenna attached directly to the device with an internal antenna and battery: A 0.6 watt device using an analog signal.

A self-contained handheld device with antenna attached directly to the device with an internal antenna and battery: A 0.6 watt device using a digital signal.

### **Cell Phone Characteristics**

The cell phone uses air waves to transmit information.

The following are some of the factors that influence its usage:

^ Cell phone UHF signals are like FM radio signals. They are low level line of sight signals as compared to the AM signal which is bounced off

the ionosphere. Tall buildings, hills and other natural and man-made obstacles interfere with cellular phone UHF signals.

- ^ Each cell site (towers) service area is a circle. If the provider has not placed the towers perfectly, there will be holes which will be encountered and service will be unavailable.
- ^ Each cell site will service a radius of approximately 16 km (10 mi) from the site, with a three watt bag phone, and 10 km (6 mi) with a handheld 0.6 watt phone.
- ^ Each cell site is restricted as to the number of individual calls it may handle at one time, about 800 with current technology. Typically, at peak times (rush hour in the morning and evening). the number of customers using the cell phone on the commute saturates the cell site. Technical Service Bulletin # **99-09-40-005D** Date: **061220**

### **Restraints - Availability of Seat Belt Extenders**

This TSB number 99-09-40-005D, dated 12/20/06 has been superceded by TSB number 99-09-40-005E , dated 01/09/08  
Technical Service Bulletin # **73-90-12**

Date: **970601**

### **Airbags - Disconnect Procedures**

This TSB number 73-90-12, dated 06/01/97 has been superceded by TSB number 73-90-23 , dated 01/01/98  
Technical Service Bulletin # **00-00-89-027C**

Date: **051025**

### **Interior, A/C - Vehicle Odor Elimination**

This TSB number 00-00-89-027C, dated 10/25/05 has been superceded by TSB number 00-00-89-027E , dated 09/29/08  
Technical Service Bulletin # **431218**

Date: **940701**

### **Tools - A/C Leak Detector Kit Maintenance**

This TSB number 431218, dated 07/01/94 has been superceded by TSB number 431218A , dated 03/01/95  
Technical Service Bulletin # **00-00-89-027D**

Date: **061003**

### **Interior - Eliminating Unwanted Odors**

This TSB number 00-00-89-027D, dated 10/03/06 has been superceded by TSB number 00-00-89-027E , dated 09/29/08  
Technical Service Bulletin # **931463B**

Date: **930301**

### **Power Steering - Noise**

This TSB number 931463B, dated 03/01/93 has been superceded by TSB number 383001 , dated 12/01/93  
Technical Service Bulletin # **882573B**

Date: **880601**

### **Steering - Spool Valve Split Rings**

This TSB number 882573B, dated 06/01/88 has been superceded by TSB number 891533B , dated 05/01/89  
Technical Service Bulletin # **06-08-44-015**

Date: **060419**

### **Audio System - Portable Audio Equipment Noise**

This TSB number 06-08-44-015, dated 04/19/06 has been superceded by TSB number 06-08-44-015A , dated 02/01/08  
Technical Service Bulletin # **06-00-89-051**

Date: **061122**

### **Locks - KeyCode Security Rules and Information**

This TSB number 06-00-89-051, dated 11/22/06 has been superceded by TSB number 06-00-89-051A , dated 01/24/07  
Technical Service Bulletin # **03-07-29-004C**

Date: **060828**

### **M/T - Normal Operating Characteristics**

This TSB number 03-07-29-004C, dated 08/28/06 has been superceded by TSB number 03-07-29-004E , dated 05/02/08  
Technical Service Bulletin # **76-02-02**

Date: **970801**

### **Drivetrain - Axle Lubricant Recommended**

This TSB number 76-02-02, dated 08/01/97 has been superceded by TSB number 76-02-02A , dated 10/01/98  
Technical Service Bulletin # **99-04-20-002D**

Date: **060608**

### **A/T - Clunk When Shifting From PARK/DRIVE/REVERSE**

This TSB number 99-04-20-002D, dated 06/08/06 has been superceded by TSB number 99-04-20-002E , dated 06/06/08  
Technical Service Bulletin # **99-07-30-020**

Date: **990901**

### **Automatic Transmission - Service Procedure Change**

This TSB number 99-07-30-020, dated 09/01/99 has been superceded by TSB number 99-07-30-020A , dated 04/01/01

Technical Service Bulletin # **36-71-06B**

Date: **970601**

## A/T - Service Procedure

This TSB number 36-71-06B, dated 06/01/97 has been superceded by TSB number 99-07-30-020A , dated 04/01/01

Technical Service Bulletin # **99-07-30-017**

Date: **990901**

## A/T - Oil Cooler Flushing and Flow Check Procedures

File In Section: 07 - Transmission/Transaxle

Bulletin No.: 99-07-30-017

Date: September, 1999

### INFORMATION

Subject:

Automatic Transmission Oil Cooler Flushing and Flow Check Procedures

Models:

1999 and Prior GM Vehicles with Automatic Transmissions

This bulletin is being revised to add the 1998-1999 Model Years. Please discard Corporate Bulletin Number 77-71-59 (Section 7 - Transmission).

GM studies indicate that plugged or restricted transmission oil coolers and pipes cause insufficient transmission lubrication and elevated operating temperatures which can lead to premature transmission wear-out. Many cases could have been prevented by following published procedures for transmission oil cooler flushing and flow checking. This procedure includes flushing and flow checking the auxiliary transmission oil cooler, if equipped. GM requires that transmission oil cooler flushing and flow checking be performed whenever a transmission is removed from the vehicle for service within warranty, including:

- ^ Goodwrench SRTA
- ^ Major overhaul
- ^ Torque converter replacement
- ^ Oil pump replacement

Only GM Goodwrench DEXRON(R)-III automatic transmission fluid should be used when doing warranty repair on GM transmissions.

Time allowance for performing the cooler flushing and flow checking procedure has been included in the appropriate labor time guide operations since the 1987 model year. The service procedure steps for oil cooler flushing are as follows:

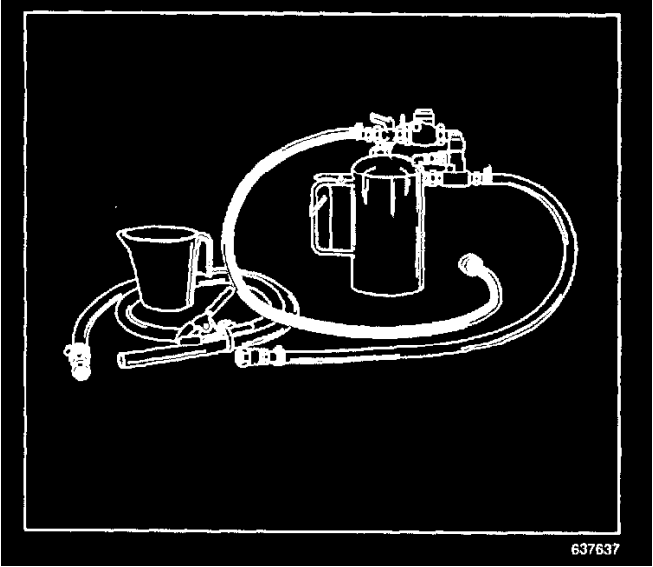
### Cooler Flushing and Flow Check Steps

- ^ Equipment needed
- ^ Preparation
- ^ Initial flush
- ^ Back flush
- ^ Flow check
- ^ Clean-up Equipment needed

Transmission	Oil Cooler Feed (Exiting Transmission)	Oil Cooler Return (Entering Transmission)
200-4R	top connector	bottom connector
3L30 (180)	front connector	rear connector
3L80 (400)	bottom connector	top connector
4L30-E	front connector	rear connector
4L60 (700-R4)	bottom connector	top connector
4L60-E	bottom connector (may require J 35944-200)	top connector (may require J 35944-200)
4L80-E	front connector (may require J 35944-200)	rear connector (may require J 35944-200)
3T40	bottom connector	top connector
4T40-E	top connector (requires J 35944-440)	bottom connector (requires J 35944-440)
4T60 (440-T4/F7)	vertical (top) connector	horizontal (bottom) connector
4T60-E	vertical (top) connector	horizontal (bottom) connector
4T65-E	vertical (top) connector	horizontal (bottom) connector
4T80-E	front connector (case cover)	rear connector (case)

Table 1: Direction Of Fluid Flow In The Oil Cooler Pipes At The Transmission

Equipment Needed



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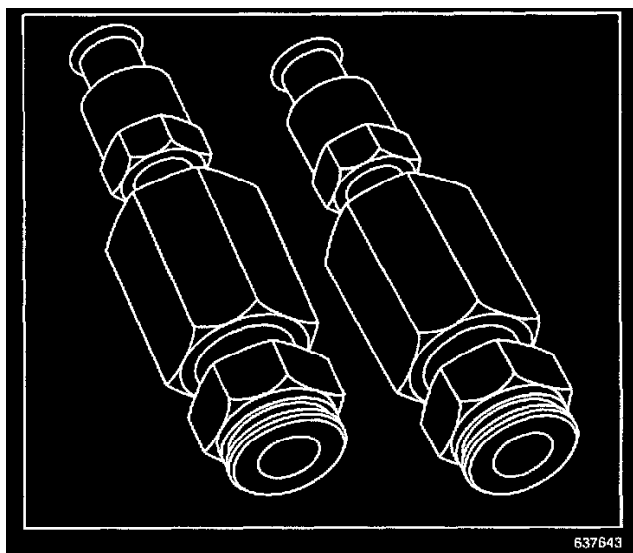
^ J 35944-A cooler flushing tool



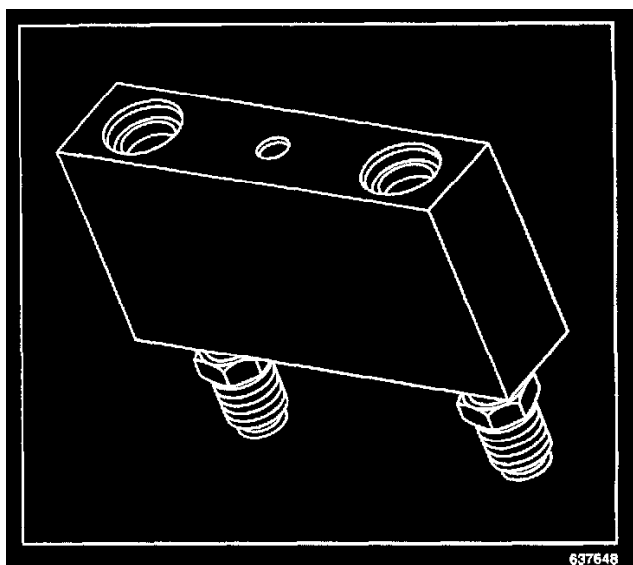
^ J 35944-22 or J 35944-CSE-A flushing solution

**Notice:**

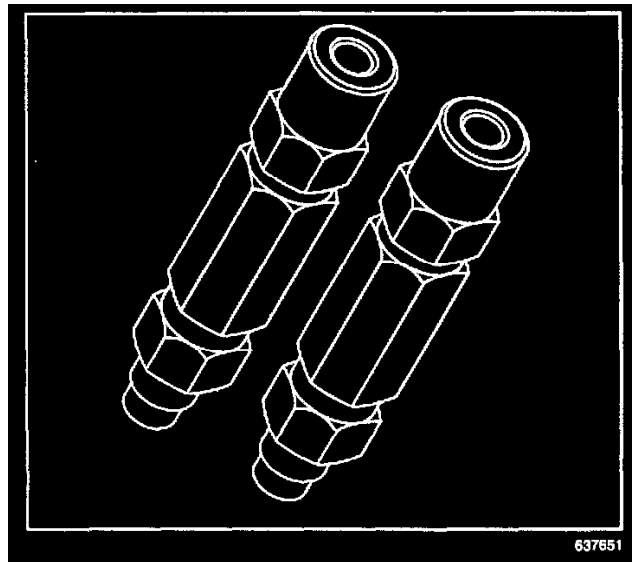
Do not substitute with solutions that contain alcohol or glycol. Use of solutions that contain alcohol or glycol may damage J 35944-A, oil cooler components or transmission components.



^ J 35944-200 cooler flushing adapter (4L60-E and 4L80-E)

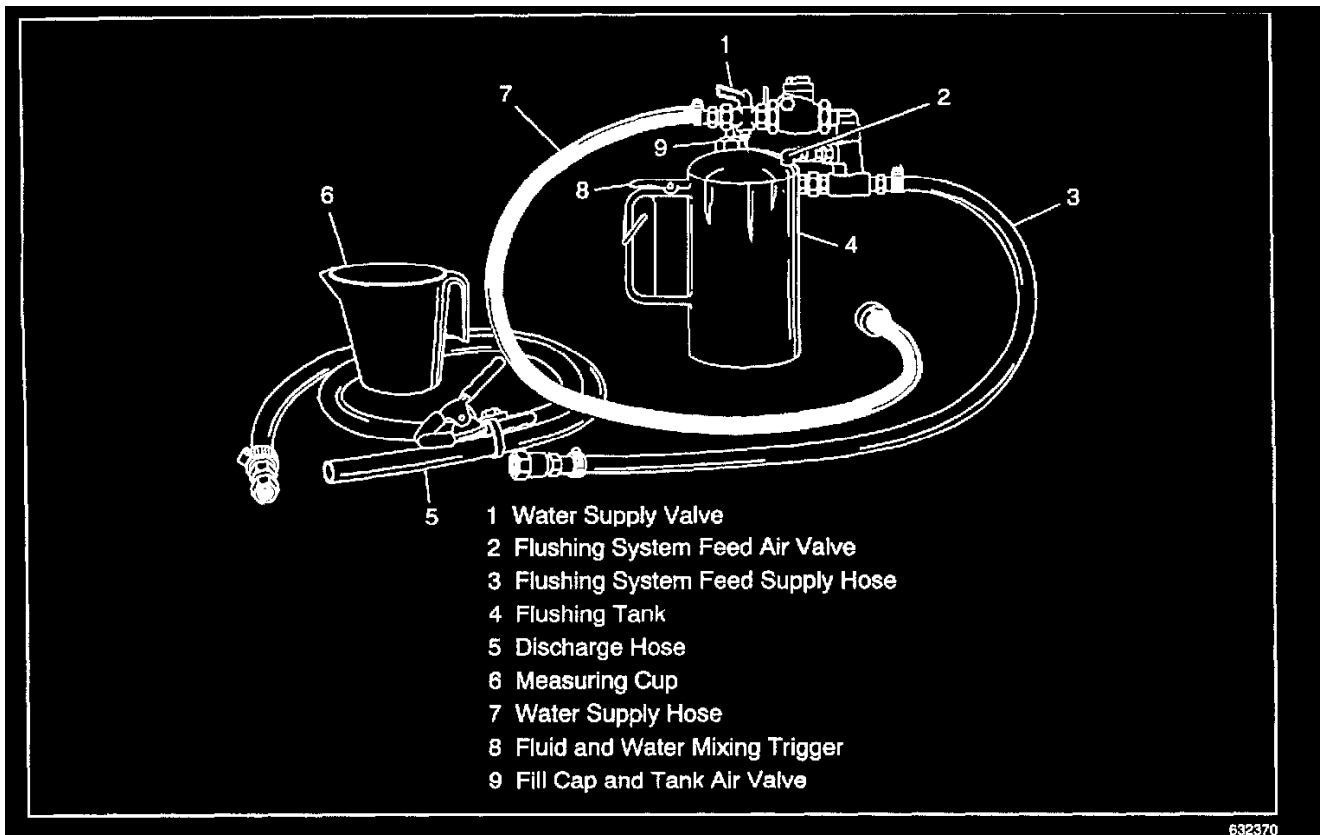


^ J 35944-440 cooler flushing adapter (4T40-E)



- ^ J 35944-600 cooler flushing adapter (4L60-E Y-Car)
- ^ Measuring cup
- ^ Funnel
- ^ Water supply (hot water recommended)
- ^ Water hose (at least 5/8" (16mm) ID)
- ^ Shop air supply (with water/oil filters, regulator and pressure gauge)
- ^ Air chuck (with clip if available)
- ^ Oil drain container
- ^ Five gallon (19 L) pail with lid
- ^ Eye protection
- ^ Rubber gloves

## Preparation



1. After the repair or replacement transmission is installed in the vehicle, do not reconnect the oil cooler pipes.

### Important:

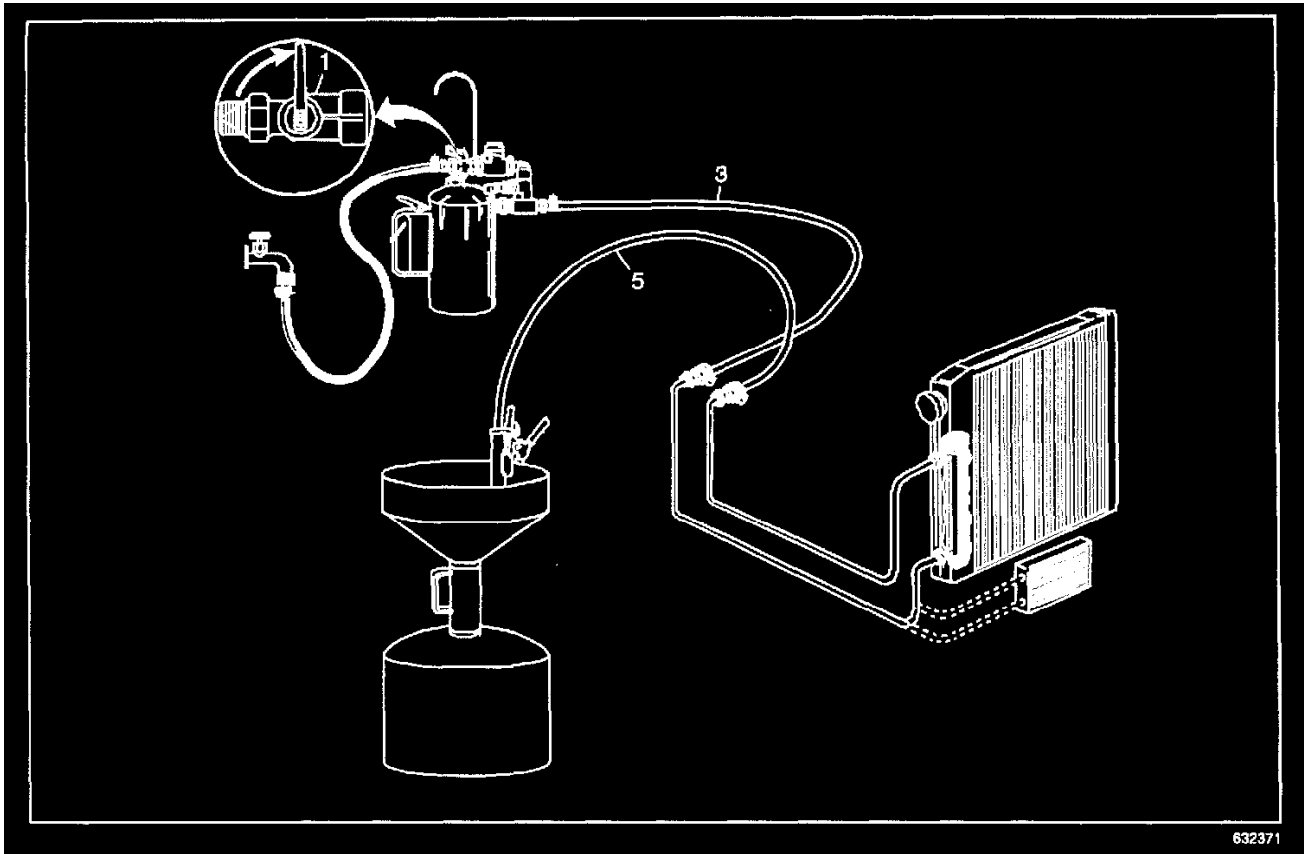
The flushing fluid (J 35944-22) is environmentally safe, yet powerful enough to cut through transmission fluid to dislodge any contaminants from the cooler. The safety precautions on the label regarding potential skin and eye irritations associated with prolonged exposure are typical precautions that apply to many similar cleaning solutions. It should be noted that according to GM, use of other non-approved fluids for cooler

flushing can have an adverse reaction to the seals inside the transmission.

2. Remove the fill cap (9) on the J 35944-A and fill the flusher tank (4) with 0.6 L (20-21 oz) of J 35944-22 flushing solution using the measuring cup (6). Do not overfill.
3. Install the fill cap (9) on the J 35944-A and pressurize the flusher tank (4) to 550-700 kPa (80-100 psi), using the shop air supply at the tank air valve (9).

**Important:**

Refer to Table 1 to determine the correct pipe for each application.

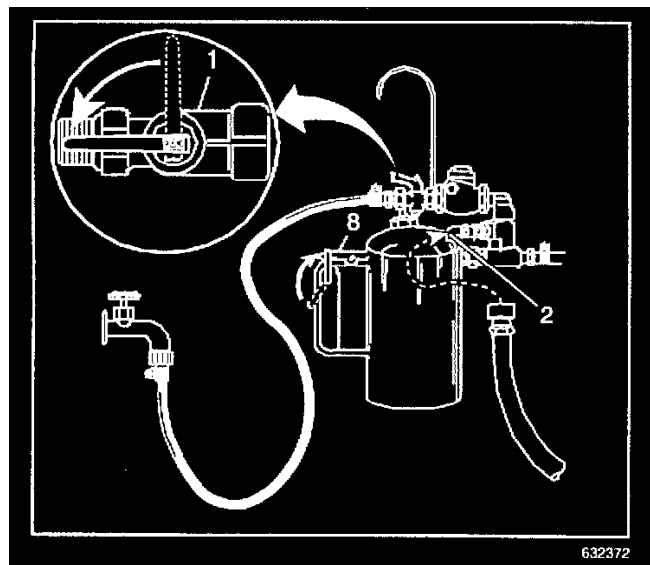


4. Connect the J 35944-A discharge hose (5) to the oil cooler return pipe. Use the J 35944-200 or the J 35944-440 if required.
5. Clip the discharge hose (5) onto the oil drain container.
6. Attach the J 35944-A to the undercarriage of the vehicle with the hook provided and connect the flushing system feed supply hose (3) from the J 35944-A to the other (feed) oil cooler pipe. Use the J 35944-200 or the J 35944-440 if required.
7. With the water supply valve (1) on the J 35944-A in the OFF position, connect the water supply hose (7) from the J 35944-A to the water supply at the faucet.
8. Turn ON the water supply at the faucet.

**Initial/Back Flush**

Initial Flush





1. Turn the J 35944-A water supply valve (1) to the ON position and allow water to flow through the oil cooler and pipes for 10 seconds to remove any remaining transmission fluid. If water does not flow through the oil cooler and pipes, the cause of the blockage must be diagnosed and the plugged component must be repaired or replaced. Continue with the cooler flushing and flow check procedure once the blockage is corrected.
2. Turn the J 35944-A water supply valve (1) to the OFF position and clip the discharge hose (5) onto a five gallon (19 L) pail with a lid, to avoid splashback.
3. Turn the J 35944-A water supply valve (1) to the ON position and depress the trigger (8) to mix cooler flushing solution into the water flow. Use the clip provided on the handle to hold the trigger (8) down. The discharge will foam vigorously when the solution is introduced into the water stream.

#### Important:

Flushing for approximately 2 minutes in each cooler line direction will result in a total of about 8 to 10 gallons of waste fluid. This mixture of water and flushing fluid is to be captured in a five-gallon bucket or similar container.

4. Flush the oil cooler and pipes with water and solution for two minutes. During this flush, attach the shop air supply 825 kPa (120 psi) to the flushing system feed air valve (2) located on the J 35944-A for 3 to 5 seconds at the end of every 15-20 second interval to create a surging action.
5. Release the trigger (8) and turn the J 35944-A water supply valve (1) to the OFF position.

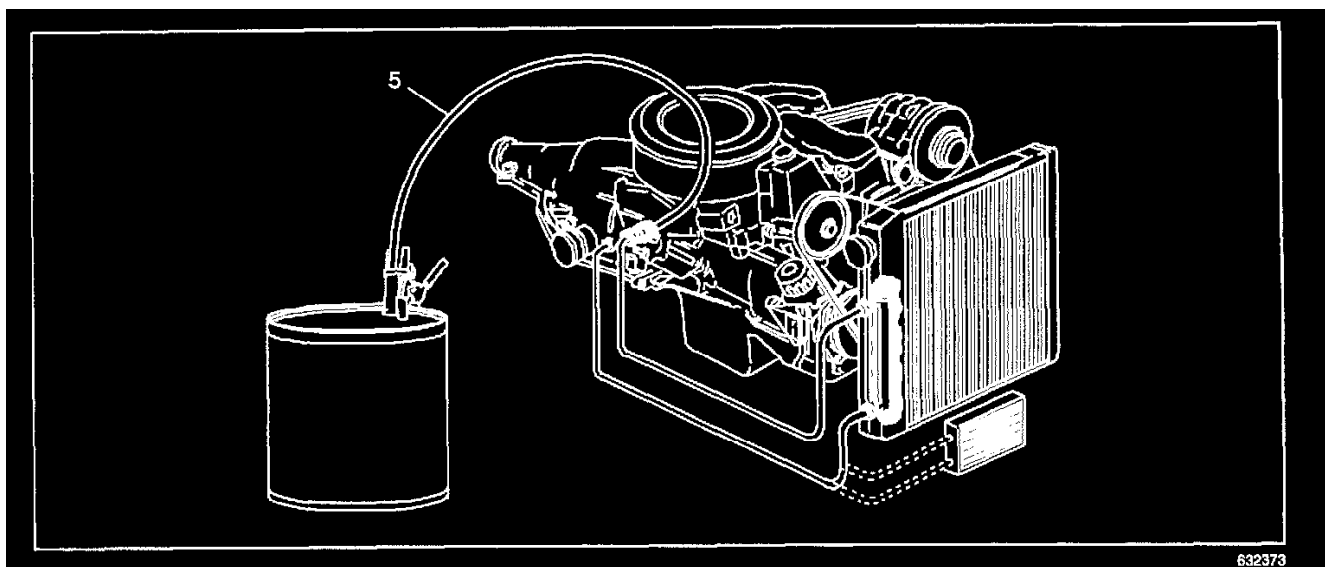
#### Back Flush

1. Disconnect both hoses from the oil cooler pipes and then connect them to the opposite oil cooler pipe. This will allow the oil cooler and pipes to be back flushed.
2. Repeat steps 3 and 4 of the INITIAL FLUSH procedure.
3. Release the trigger (8) of the J 35944-A and allow water only to rinse the oil cooler and pipes for one minute.
4. Turn the J 35944-A water supply valve (1) to the OFF position and turn OFF the water supply at the faucet.
5. Attach the shop air supply to the flushing system feed air valve (2) on the J 35944-A and blow out the water from the oil cooler and pipes. Continue until no water comes out of the discharge hose (5).

#### Flow Check

##### Important:

Refer to Table 1 to determine the correct pipe for each application.



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1. Disconnect both hoses from the oil cooler pipes. Connect the oil cooler feed pipe to the transmission and the return pipe to the discharge hose (5). Clip the discharge hose (5) onto the empty oil drain container.
2. Confirm the transmission is filled with automatic transmission fluid. Refer to SPECIFICATIONS in Section 7 of the appropriate Service Manual for the correct automatic transmission fluid capacity.
3. Start the engine with the transmission in PARK range and run for 30 seconds. A minimum of two (2) quarts (1.9 L) must be discharged during this 30 second run time.
  - ^ If fluid flow is greater than 2 qt (1.9 L) in 30 seconds, go to step 4.
  - ^ If fluid flow is less than 2 qt (1.9 L) in 30 seconds, perform the following diagnosis:
 

Disconnect the oil cooler feed line at the radiator. Connect the discharge hose (5) to the cooler feed line. Clip the discharge hose (5) to the empty oil drain container. Start the engine with the transmission in PARK range and run for 30 seconds. A minimum of two (2) quarts (1.9 L) must be discharged during this 30 second run time. Do the following according to the flow rate:

    - Insufficient feed flow: inspect the transmission
    - Sufficient feed flow: inspect the oil cooler return pipe and the oil cooler (and auxiliary cooler, if equipped).
4. Remove the discharge hose (5), reconnect the cooler feed and return pipes to the transmission and refill the unit to the proper fluid level. Inspect the transmission oil cooler pipe connections at the radiator, the auxiliary cooler (if equipped) and the transmission for leaks. Refer to Section 7 of the appropriate Service Manual.

## Clean-Up

1. Disconnect the water supply hose (7) from the J 35944-A and bleed any remaining air pressure from the flusher tank (4).
2. Remove the fill cap (9) from the J 35944-A and return any unused flushing solution to its container. Rinse the J 35944-A with water. Do not store the J 35944-A with flushing solution in it.
3. After every third use, clean the J 35944-A as described in the instructions included with the tool.
4. Dispose of any waste water/solution and transmission fluid in accordance with local regulations.

Technical Service Bulletin # **77-71-59**

Date: **970601**

## A/T - Oil Cooler Flushing/Flow Check

File In Section: 7 - Transmission

Bulletin No.: 77-71-59

Date: June, 1997

## INFORMATION

Subject:  
Automatic Transmission Oil Cooler Flushing and Flow Check Procedures

Models:

1997 and Prior GM Vehicles with Automatic Transmissions

Including:

Jaguar Cars Limited

Rolls-Royce Motor Car

Aston Martin Lagonda Limited

Reumech Ermetek

AM General

Isuzu

GM Brazil

GM Venezuela

GM Holden

Daewoo Motor Company

GM studies indicate that plugged or restricted transmission oil coolers and pipes cause insufficient transmission lubrication and elevated operating temperatures which can lead to premature transmission wearout. Many cases could have been prevented by following published procedures for transmission oil cooler flushing and flow checking. This procedure includes flushing and flow checking the auxiliary transmission oil cooler, if equipped.

GM requires that transmission oil cooler flushing and flow checking be performed whenever a transmission is removed from the vehicle for service within warranty, including:

- Goodwrench SRTA installation
- major overhaul
- torque converter replacement
- oil pump replacement

Only GM Goodwrench DEXRON(R)-III automatic transmission fluid should be used when doing warranty repair on GM transmissions.

Time allowance for performing the cooler flushing and flow checking procedure has been included in the appropriate labor time guide operations since the 1987 model year. The service procedure steps for oil cooler flushing are as follows:

## **Cooler Flushing and Flow Check Steps**

- Equipment needed
- Preparation
- Initial flush
- Back flush
- Flow check
- Clean-up

## **Equipment Needed**

J 35944 cooler flushing tool

J 35944-22 or J 35944-CSE flushing solution

J 35944-200 cooler flushing adapter (4L60-E and 4L80-E)

J 35944-440 cooler flushing adapter (4T40-E) Measuring cup Funnel Water supply (hot water recommended) Water hose (at least 5/8" I.D.) Shop air supply (with water/oil filters, regulator and pressure gauge) Air chuck (with clip if available) Oil drain container Five gallon pail with lid Eye protection Rubber gloves

\*Do not substitute with solutions that contain alcohol or glycol. Use of solutions that contain alcohol or glycol may damage J 35944, oil cooler

components or transmission components.

## **Preparation**

1. After the repaired or replacement transmission is installed in the vehicle, do not reconnect the oil cooler pipes.
2. Remove the fill cap on J 35944 and fill the can with 0.6 L (20-21 oz.) of flushing solution. Do not overfill.
3. Install the fill cap on J 35944 and pressurize the flusher can using the shop air supply to 550-700 kPa (80-100 psi).
4. Connect the J 35944 discharge hose to the oil cooler return pipe (refer to Table 1). Use J 35944-200 or J 35944-440 if required.
5. Clip the discharge hose onto the oil drain container.
6. Attach J 35944 to the undercarriage of the vehicle with the hook provided and connect the hose from J 35944 to the other (feed) oil cooler pipe. Use J 35944-200 or J 35944-440 if required.
7. With the water valve on J 35944 in the "OFF" position, connect the water hose from the water supply to J 35944.
8. Turn "ON" the water supply at the faucet.

## **Initial Flush**

1. Turn the water valve on J 35944 to the "ON" position and allow the water to flow through the oil cooler and pipes for 10 seconds to remove any remaining transmission fluid. If water does not flow through the oil cooler and pipes, the cause of the blockage must be diagnosed and the plugged component must be repaired or replaced. Continue with the cooler flushing and flow check procedure once the blockage is corrected.
2. Turn the water valve on J 35944 to the "OFF" position and clip the discharge hose onto the five gallon pail with a lid.
3. Turn the water valve on J 35944 to the "ON" position and depress the trigger to mix cooler flushing solution into the water flow. Use the clip provided on the handle to hold the trigger down. The discharge will foam vigorously when the solution is introduced into the water stream.
4. Flush the oil cooler and pipes with water and solution for two minutes. During this flush, attach the air supply to the air valve located on J 35944 for 3 to 5 seconds at the end of every 15-20 second interval to create a surging action.
5. Release the trigger and turn the water valve on J 35944 to the "OFF" position.

## **Back Flush**

1. Disconnect both hoses from the oil cooler pipes and then connect them to the opposite oil cooler pipe. This will allow the oil cooler and pipes to be back flushed.
2. Repeat steps 3 and 4 of the INITIAL FLUSH procedure.
3. Release the trigger of J 35944 and allow water only to rinse the oil cooler and pipes for one minute.
4. Turn the water valve on J 35944 to the "OFF" position and turn "OFF" the water supply at the faucet.
5. Attach the air supply to the air valve on J 35944 and blow out the water from the oil cooler and pipes. Continue until no water comes out of the discharge hose.

## **Flow Check**

1. Disconnect both hoses from the oil cooler pipes. Connect the oil cooler feed pipe to the transmission and the return pipe to the discharge hose (refer to Table 1). Clip the discharge hose onto the empty oil drain container.
2. Confirm the transmission is filled with automatic transmission fluid. Refer to SPECIFICATIONS in Section 7 of the appropriate Service Manual for the correct automatic transmission fluid capacity.
3. Start the engine with the transmission in PARK range and run for 30 seconds. A minimum of two (2) quarts (1.9 L) must be discharged during this 30 second run time.

If fluid flow is greater than 2 qt. in 30 seconds, go to step 4.

If fluid flow is less than 2 qt. in 30 seconds, perform the following diagnosis:

Disconnect the oil cooler feed line at the radiator. Connect the discharge hose to the cooler feed line. Clip the discharge hose onto the empty oil drain container. Start the engine with the transmission in PARK range and run for 30 seconds. A minimum of two (2) quarts (1.9 L) must be discharged during this 30 second run time. Do the following according to the flow rate:

Insufficient feed flow:  
Inspect the transmission

Sufficient feed flow:  
Inspect the oil cooler return pipe and the oil cooler (and auxiliary cooler, if equipped).

4. Remove the discharge hose, reconnect the cooler feed and return pipes to the transmission and refill the unit to the proper fluid level. Inspect the transmission oil cooler pipe connections at the radiator, auxiliary cooler (if equipped) and transmission for leaks. Refer to Section 7 of the appropriate Service Manual.

Transmission	Oil Cooler Feed (Exiting Transmission)	Oil Cooler Return (Entering Transmission)
200-4R	top connector	bottom connector
3L30 (180)	front connector	rear connector
3L80 (400)	bottom connector	top connector
4L30-E	front connector	rear connector
4L60 (700-R4)	bottom connector	top connector
4L60-E	bottom connector (may require J 35944-200)	top connector (may require J 35944-200)
4L80-E	front connector (may require J 35944-200)	rear connector (may require J 35944-200)
3T40	bottom connector	top connector
4T40-E	top connector (requires J 35944-440)	bottom connector (requires J 35944-440)
4T60 (440-T4/F7)	vertical (top) connector	horizontal (bottom) connector
4T60-E	vertical (top) connector	horizontal (bottom) connector
4T65-E	vertical (top) connector	horizontal (bottom) connector
4T80-E	front connector (case cover)	rear connector (case)

Table 1: Direction Of Fluid Flow In The Oil Cooler Pipes At The Transmission

## Clean-Up

1. Disconnect the water supply hose from J 35944 and bleed any remaining air pressure from the can.
2. Remove the fill cap from J 35944 and return any unused flushing solution to its container. Rinse J 35944 with water. Do not store J 35944 with flushing solution in it.
3. After every third use, clean J 35944 as described in the instructions included with the tool.
4. Dispose of any waste water/solution/transmission fluid in accordance with local regulations. Technical Service Bulletin #

**04-06-04-051A**

Date: **040901**

## Fuel System - Maintenance Cleaning of Fuel Injectors

This TSB number 04-06-04-051A, dated 09/01/04 has been superseded by TSB number 04-06-04-051B , dated 01/04/06  
Technical Service Bulletin # **05-06-04-022D**

Date: **070726**

## Fuel System - TOP TIER Gasoline Usage (Canada)

This TSB number 05-06-04-022D, dated 07/26/07 has been superseded by TSB number 05-06-04-022E , dated 08/06/08  
Technical Service Bulletin # **05-06-04-022C**

Date: **061128**

## Fuel System - TOP TIER Detergent Gasoline Usage

This TSB number 05-06-04-022C, dated 11/28/06 has been superseded by TSB number 05-06-04-022E , dated 08/06/08  
Technical Service Bulletin # **04-06-04-047G**

Date: **061128**

## Fuel System - TOP TIER Detergent Gasoline

This TSB number 04-06-04-047G, dated 11/28/06 has been superseded by TSB number 04-06-04-047H , dated 06/24/08  
Technical Service Bulletin # **05-00-89-078A**

Date: **060914**

### **Fuel System - GM Fuel System Treatment Plus(R)**

This TSB number 05-00-89-078A, dated 09/14/06 has been superceded by TSB number 05-00-89-078B , dated 02/06/08  
Technical Service Bulletin # **05-06-04-022B**

Date: **060727**

### **Fuel System - TOP TIER Gasoline Information (Canada)**

This TSB number 05-06-04-022B, dated 07/27/06 has been superceded by TSB number 05-06-04-022E , dated 08/06/08  
Technical Service Bulletin # **04-06-04-047F**

Date: **060721**

### **Fuel System - TOP TIER Gasoline Information**

This TSB number 04-06-04-047F, dated 07/21/06 has been superceded by TSB number 04-06-04-047H , dated 06/24/08  
Technical Service Bulletin # **06-06-04-035**

Date: **060713**

### **Fuel System - E85 Fuel Usage Information**

This TSB number 06-06-04-035, dated 07/13/06 has been superceded by TSB number 06-06-04-035A , dated 02/05/08  
Technical Service Bulletin # **05-00-89-078**

Date: **051109**

### **Fuel System - Fuel System Treatment PLUS(R)**

This TSB number 05-00-89-078, dated 11/09/05 has been superceded by TSB number 05-00-89-078B , dated 02/06/08  
Technical Service Bulletin # **73-62-14**

Date: **970701**

### **Cooling System - Approved Coolant Recycling Processes**

This TSB number 73-62-14, dated 07/01/97 has been superceded by TSB number 00-06-02-006D , dated 08/15/06  
Technical Service Bulletin # **73-62-13A**

Date: **970901**

### **A/C - Servicing of Aluminum Heater Cores/Radiators**

This TSB number 73-62-13A, dated 09/01/97 has been superceded by TSB number 05-06-02-001A , dated 07/16/08  
Technical Service Bulletin # **73-62-13**

Date: **970701**

### **A/C - Aluminum Heater Core and/or Radiator Replacements**

This TSB number 73-62-13, dated 07/01/97 has been superceded by TSB number 05-06-02-001A , dated 07/16/08  
Technical Service Bulletin # **05-06-01-010A**

Date: **070416**

### **Engine - Sealant Usage/procedures**

This TSB number 05-06-01-010A, dated 04/16/07 has been superceded by TSB number 05-06-01-010B , dated 09/28/07  
Technical Service Bulletin # **00-06-01-012B**

Date: **060118**

### **Engine - Surface Conditioning Disc Usage Prohibition**

This TSB number 00-06-01-012B, dated 01/18/06 has been superceded by TSB number 00-06-01-012C , dated 04/14/08  
Technical Service Bulletin # **05-06-01-010**

Date: **050307**

### **Engine - Sealant Usage Recommendations**

This TSB number 05-06-01-010, dated 03/07/05 has been superceded by TSB number 05-06-01-010B , dated 09/28/07  
Technical Service Bulletin # **00-06-01-012**

Date: **000501**

### **Gasket Surfaces - Use of Surface Conditioning Discs**

This TSB number 00-06-01-012, dated 05/01/00 has been superceded by TSB number 00-06-01-012C , dated 04/14/08  
Technical Service Bulletin # **186103**

Date: **951001**

### **Oil - Normal Oil Consumption**

File In Section: 6 - Engine

Bulletin No.: 18-61-03

Date: October, 1995

INFORMATION

Subject:  
Oil Economy

Models:

This bulletin is being revised to update models and to revise text. Previous divisional publication number was:

GM Canada

92-6-102

We have received dealer requests for information they may use to advise owners what is considered normal oil consumption in today's engines. What normal oil consumption is, can best be answered if specific driving conditions to which a car is subjected are known. It is similar to asking what is the normal fuel economy for any given model. There are many variables involved in determining acceptable oil consumption; therefore, a simple specific statement can not be offered.

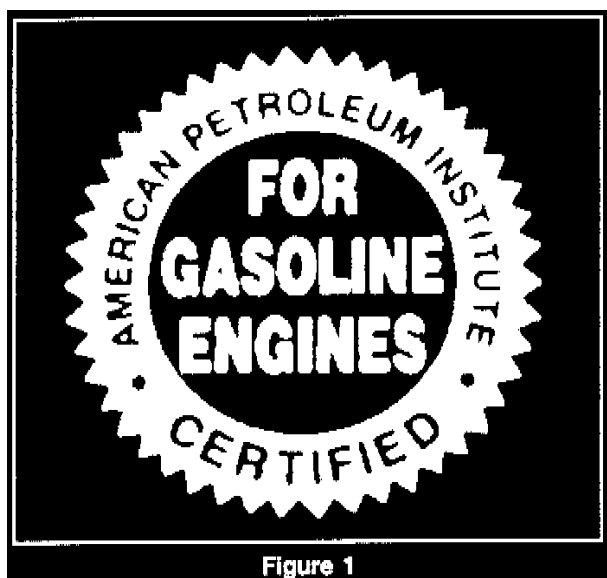


Figure 1

Oils recommended for your vehicle can be identified by looking for the "Starburst" symbol. This symbol indicates that the oil has been certified by the American Petroleum Institute (API). Do not use any oil which does not carry this Starburst symbol. (Figure 1)

If you change your own oil, be sure you use oil that has the Starburst symbol on the front of the oil container.

If you have your oil changed for you, be sure the oil put into your engine is American Petroleum Institute certified for gasoline engines.

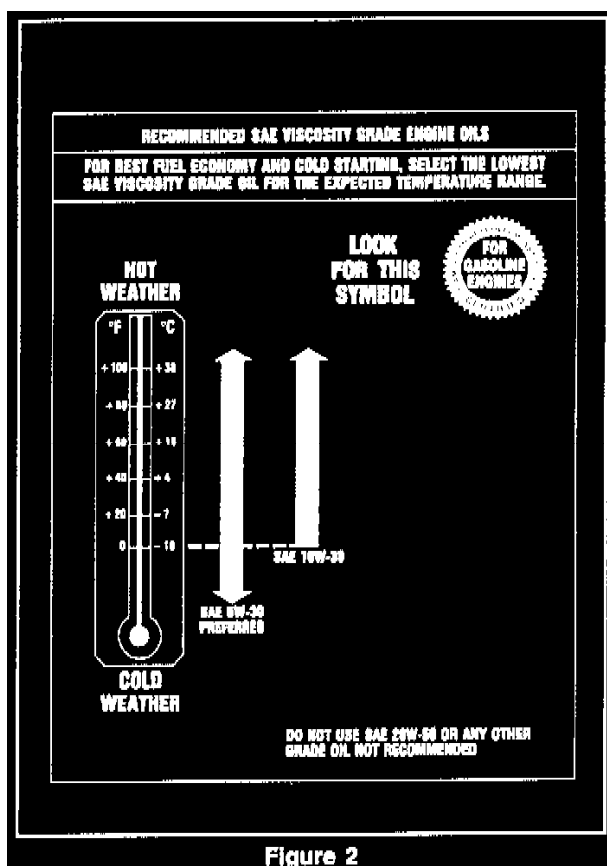


Figure 2

You should also use the proper viscosity oil for your vehicle, as shown in the following chart: (Figure 2) As shown in the chart, if you have the 3.1L engine, SAE 5W-30 is best for your vehicle. However, you can use SAE 10W-30 if it's going to be 0° F (-18° C) or above. These numbers on

an oil container show its viscosity, or thickness. Do not use other viscosity oils, such as SAE 20W-50.

The following information is in agreement with our Engineering Department, and since it is a down-to-earth reply, we are hopeful that it will be useful in answering owners' inquiries concerning oil consumption for all size engines used in today's products. Along with this information is a list of possible causes for increased oil consumption which is published in Section 6 of all 1991 Pontiac service manuals. Reference this information when all concerns mentioned in the following reply have been addressed.

"A gasoline engine depends upon oil to lubricate the cylinder walls, pistons and piston rings. When the piston moves downward, a thin film of oil is left on the cylinder walls and on the firing stroke it is burned by the flame combustion. For example, if an engine were to burn as much as one drop of oil every firing stroke, then it would use more than one quart every two miles. Modern engines use much less oil than one drop, but all efficient engines use some oil. If they did not, they would quickly wear out."

The rate of oil consumption depends upon engine sizes, the quality and viscosity of the oil, the speed at which the engine is operated, the temperature and the amount of dilution and oxidation which takes place. These conditions are frequently misleading. As an example, a car that has run 1,000 miles or more in city operation may have consumed a normal amount of oil, yet actually measures up to the full mark due to dilution (condensation and fuel) in the crankcase. The car then might be driven at higher speeds on the highway; the dilution elements boil off and the car appears to have used two quarts of oil in a hundred miles.

**Important:**

Importance of changing the oil. As the preceding paragraph discusses flame combustion and oil consumption; the reverse of the process can take place. Combustion by-products can be deposited in the oil causing the oil level to stay at or near the full mark on the dipstick, but the oil is diluted.

"Car owners should expect increased oil consumption at high speeds. No standard rate of consumption can be established because under various combinations of the engine sizes and conditions mentioned above, one engine might use a quart in 2,500 miles and another use a quart in 1,500 miles and yet both engines might be normal."

"New engines require considerable running time before the piston rings and cylinder walls become 'conditioned' and during this time they use oil more rapidly than later. Typically, an engine's oil economy should not be judged until it has run at least 4,000 miles."

Also, improper methods of checking oil level may lead a customer to believe that their vehicle has excessive oil consumption. Check oil on a level surface, engine off and at operating temperature. Allow adequate time for the oil to drain back into the oil pan.

Keeping the above information in mind, be certain that the customer is using the oil recommended in the Owner's Manual. Always use an oil which is American Petroleum Institute (API) certified for use in gasoline engines, and which displays the API certification mark (Starburst Symbol). Also, always use an oil of proper viscosity as specified in the vehicle's Owners Manual.

While normal oil consumption varies, we believe the use of 2 quarts (1.9L) or more of engine oil within 2,000 miles or 3,200 kilometers should be cause for investigation. Address the following items to determine the source of the oil consumption.

- ^ External oil leaks. Perform OIL LEAK DIAGNOSIS found in Service Manual, Section 6.
- ^ Oil leaking into the cooling system via a cracked engine block. Check radiator for the presence of engine oil.
- ^ Crankcase ventilation system malfunction.
- ^ Valve guides and/or valve seals worn or seals omitted.
- ^ Piston rings broken, improperly installed, worn or not seated.
- ^ Piston improperly installed or misfitted.

Technical Service Bulletin # **05-00-89-072A**

Date: **071016**

**Engine/Fuel - Additive Information**

This TSB number 05-00-89-072A, dated 10/16/07 has been superceded by TSB number 05-00-89-072B , dated 06/17/08

Technical Service Bulletin # **03-07-29-004D**

Date: **071017**

**Manual Transmission - Operating Characteristics**

This TSB number 03-07-29-004D, dated 10/17/07 has been superceded by TSB number 03-07-29-004E , dated 05/02/08

Technical Service Bulletin # **93736B**

Date: **930101**

**Engine Coolant - Approved Recycle Systems**

This TSB number 93736B, dated 01/01/93 has been superceded by TSB number 00-06-02-006D , dated 08/15/06

Technical Service Bulletin # **89653E**

Date: **890102**

**Wheels - Nylon Coated Wheel Weights**

This TSB number 89653E, dated 01/02/89 has been superceded by TSB number 91353E , dated 08/01/90



Technical Service Bulletin # **83-35-08**

Date: **981101**

### **Chrome Wheels - Chemical Staining Precautions**

This TSB number 83-35-08, dated 11/01/98 has been superceded by TSB number 00-03-10-002D , dated 08/01/06

Technical Service Bulletin # **99-08-51-007**

Date: **991001**

### **Aluminum Wheel - Refinishing Recommendations**

This TSB number 99-08-51-007, dated 10/01/99 has been superceded by TSB number 99-08-51-007C , dated 06/19/06

Technical Service Bulletin # **00-03-10-002**

Date: **000301**

### **Chrome Wheels - Chemical Staining**

This TSB number 00-03-10-002, dated 03/01/00 has been superceded by TSB number 00-03-10-002D , dated 08/01/06

Technical Service Bulletin # **05-03-10-003**

Date: **050331**

### **Aluminum Wheels - Low Tire Pressure Condition**

This TSB number 05-03-10-003, dated 03/31/05 has been superceded by TSB number 05-03-10-003C , dated 01/15/08

Technical Service Bulletin # **05-03-10-003B**

Date: **060413**

### **Wheels/Tires - Slow Leaks From Aluminum Wheels**

This TSB number 05-03-10-003B, dated 04/13/06 has been superceded by TSB number 05-03-10-003C , dated 01/15/08

Technical Service Bulletin # **04-03-10-001B**

Date: **060120**

### **Tires - Puncture Repair Procedure**

This TSB number 04-03-10-001B, dated 01/20/06 has been superceded by TSB number 04-03-10-001D , dated 01/07/08

Technical Service Bulletin # **02-07-30-052D**

Date: **060206**

### **A/T - Fluid Cooler Flushing**

This TSB number 02-07-30-052D, dated 02/06/06 has been superceded by TSB number 02-07-30-052E , dated 02/22/08

Technical Service Bulletin # **436201A**

Date: **940801**

### **Coolant - Current Information on Propylene Glycol Blend**

This TSB number 436201A, dated 08/01/94 has been superceded by TSB number 436201B , dated 04/01/95

Technical Service Bulletin # **436201**

Date: **940201**

### **Coolant - Use of Propylene Glycol Based Blend**

This TSB number 436201, dated 02/01/94 has been superceded by TSB number 436201B , dated 04/01/95

Technical Service Bulletin # **00-06-02-006**

Date: **000801**

### **Engine Coolant - Information**

This TSB number 00-06-02-006, dated 08/01/00 has been superceded by TSB number 00-06-02-006D , dated 08/15/06

Technical Service Bulletin # **00-06-02-006B**

Date: **060330**

### **Cooling System - DEX-COOL(R) Coolant Usage Information**

This TSB number 00-06-02-006B, dated 03/30/06 has been superceded by TSB number 00-06-02-006D , dated 08/15/06

Technical Service Bulletin # **00-06-02-006C**

Date: **060501**

### **Cooling System - DEX-COOL(R) Coolant Information**

This TSB number 00-06-02-006C, dated 05/01/06 has been superceded by TSB number 00-06-02-006D , dated 08/15/06

Technical Service Bulletin # **04-07-30-037**

Date: **040901**

### **A/T - DEXRON III(R) (H-Revision) Specification Upgrade**

This TSB number 04-07-30-037, dated 09/01/04 has been superceded by TSB number 04-07-30-037B , dated 06/12/06

Technical Service Bulletin # **05-03-10-003A**

Date: **051219**

### **Tires/Wheels - Low Tire Pressure With Aluminum Wheels**

This TSB number 05-03-10-003A, dated 12/19/05 has been superceded by TSB number 05-03-10-003C , dated 01/15/08

Technical Service Bulletin # **05-03-10-020**

Date: **051222**

### **Tires/Wheels - Nitrogen Gas Usage for Filling Tires**

This TSB number 05-03-10-020, dated 12/22/05 has been superceded by TSB number 05-03-10-020A , dated 01/03/08

Technical Service Bulletin # **04-06-01-029A**

Date: **061128**

### **Engine - Unnecessary Flushing Services**

This TSB number 04-06-01-029A, dated 11/28/06 has been superceded by TSB number 04-06-01-029B , dated 02/05/08  
Technical Service Bulletin # **04-03-10-012A**

Date: **060922**

### **Wheels - Pitting/Brake Dust On Chrome Wheels**

This TSB number 04-03-10-012A, dated 09/22/06 has been superceded by TSB number 04-03-10-012B , dated 02/01/08  
Technical Service Bulletin # **03-03-10-007B**

Date: **060817**

### **Tires - Original Equipment Tire Characteristics**

This TSB number 03-03-10-007B, dated 08/17/06 has been superceded by TSB number 03-03-10-007C , dated 09/21/07  
Technical Service Bulletin # **00-00-90-002D**

Date: **060822**

### **Tires - Inflation Pressure Information**

This TSB number 00-00-90-002D, dated 08/22/06 has been superceded by TSB number 00-00-90-002I , dated 10/23/07  
Technical Service Bulletin # **04-03-10-001C**

Date: **061002**

### **Tires - Tread Puncture Repair Procedures**

This TSB number 04-03-10-001C, dated 10/02/06 has been superceded by TSB number 04-03-10-001D , dated 01/07/08  
Technical Service Bulletin # **00-03-10-006B**

Date: **070110**

### **Tires - Radial Force Variation (RFV) Information**

This TSB number 00-03-10-006B, dated 01/10/07 has been superceded by TSB number 00-03-10-006C , dated 01/09/08  
Technical Service Bulletin # **05-03-07-009A**

Date: **060928**

### **Wheel Alignment - Recommendations/Requirements**

This TSB number 05-03-07-009A, dated 09/28/06 has been superceded by TSB number 05-03-07-009B , dated 06/27/08  
Technical Service Bulletin # **00-00-90-002E**

Date: **070226**

### **Tires - Proper Tire Pressure Information**

This TSB number 00-00-90-002E, dated 02/26/07 has been superceded by TSB number 00-00-90-002I , dated 10/23/07  
Technical Service Bulletin # **00-00-90-002F**

Date: **070424**

### **Tires - Proper Inflation Pressure Information**

This TSB number 00-00-90-002F, dated 04/24/07 has been superceded by TSB number 00-00-90-002I , dated 10/23/07  
Technical Service Bulletin # **04-07-30-037C**

Date: **070411**

### **A/T - DEXRON-VI(R) Fluid Availability**

This TSB number 04-07-30-037C, dated 04/11/07 has been superceded by TSB number 04-07-30-037D , dated 11/21/07  
Technical Service Bulletin # **05-03-10-005B**

Date: **070207**

### **Wheels/Tires - 'Upsized' Wheel & Tire Information**

This TSB number 05-03-10-005B, dated 02/07/07 has been superceded by TSB number 05-03-10-005D , dated 09/11/08  
Technical Service Bulletin # **00-00-90-002G**

Date: **070518**

### **Tires - Proper Inflation Pressure Info.**

This TSB number 00-00-90-002G, dated 05/18/07 has been superceded by TSB number 00-00-90-002I , dated 10/23/07  
Technical Service Bulletin # **07-06-01-016**

Date: **070814**

### **Engine - Noise Damage Caused By The Oil Filter**

This TSB number 07-06-01-016, dated 08/14/07 has been superceded by TSB number 07-06-01-016A , dated 09/17/07  
Technical Service Bulletin # **00-00-90-002H**

Date: **070926**

### **Tires - Information on Proper Tire Pressure**

This TSB number 00-00-90-002H, dated 09/26/07 has been superceded by TSB number 00-00-90-002I , dated 10/23/07  
Technical Service Bulletin # **05-03-10-005C**

Date: **070821**

### **Wheel/Tire - Upsized Wheel/Tire Performance Info.**

This TSB number 05-03-10-005C, dated 08/21/07 has been superceded by TSB number 05-03-10-005D , dated 09/11/08  
Technical Service Bulletin # **07-03-10-016**

Date: **071217**

# Wheels/Tires - Changing Tire and Wheel Assemblies

Bulletin No.: 07-03-10-016

Date: December 17, 2007

## INFORMATION

### Subject:

GM Guidelines for Changing Tire and Wheel Assemblies

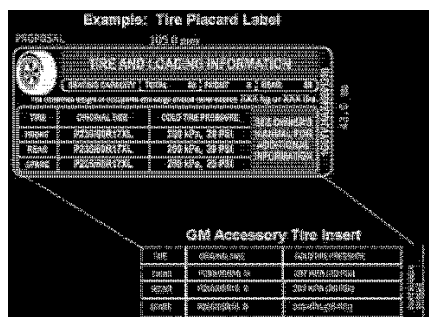
### Models:

2008 and Prior GM Passenger Cars and Light Duty Trucks (including Saturn)

2008 and Prior HUMMER H2, H3

The purpose of this bulletin is to provide additional information and guidance when changing out tire and wheel assemblies on any General Motors vehicle. Given the market demand to personalize vehicles with different tire and wheel assemblies, it is important to remind dealers of the vehicle implications and requirements that are the responsibility of your dealership.

The National Traffic and Canadian Motor Vehicle Safety Act (Safety Act) provides, in part, a dealer may not sell vehicles or equipment that do not comply with the applicable safety standards. Dealers are prohibited from making inoperative, in whole or in part, any part of a device or element of design installed on or in a motor vehicle in compliance with an applicable motor vehicle safety standard. Accordingly, a dealer must replace the vehicle tire and loading placard if, after the dealer installs GM Accessory Wheels and Tires, the information required is no longer accurate.



As a reminder, GM Accessory Wheel and Tire Assemblies are released in approved tire and wheel combinations that have been designed and validated by GM Engineering for a specific vehicle application. Each GM Accessory wheel contains the appropriate installation instructions which may include, but not limited to, change to the TPMS (Tire Pressure Monitoring System), updating the ABS Module to reflect correct tire size, vehicle calibration and updating the tire size information using the Tire Placard insert (as shown in the example).

FMVSS and CMVSS 110, Tire Selection and Rims, requires the "Tire Placard Label Insert" (refer to graphic-English shown - French and Spanish included for accessory wheels) to be affixed to each vehicle.

Do not use the information offered in the ABS module (tire size selection) as a guide to determine what tires are applicable to the vehicle in question. Changing the tire size in the ABS module will only affect ABS wheel speed sensor calibrations that are direct inputs to the ABS module. It will not correct or calibrate the speedometer's accuracy or other sensor values. To verify if GM Accessories offers optional tire and wheel combinations for a specific vehicle configuration, refer to GM Dealer World - "Accessory Information Center". In Canada, refer to GMinfoNET - "Product Information - Accessories" located under Parts & Accessories page.

### Installation of Non-GM Products:

Before non-GM products are installed on new vehicles, dealers should refer to Article 5.1.1 of the GM Dealer Sales and Service Agreement ("Dealer Agreement"). If a dealer modifies or sells a modified new vehicle, or installs any equipment, accessory, recycled part or part not supplied by General Motors, the dealer must disclose this fact on the purchase order and bill of sales, indicating that the modification, equipment, accessory or part is not warranted by General Motors. Refer to form "Dealer Disclosure of Non-GM Products Used" in section 3.3 (3.2.1 in Canada) of the GM Service Policy and Procedures Manual.

### Vehicle Repairs:

Refer to Article 7.2 of the Dealer Agreement - The dealer agreement provides that dealers will only use genuine GM or GM approved Parts and Accessories in performing warranty repairs, special policy repairs and any other repairs paid for by General Motors. This also is addressed in Article 1.2.4e of the GM Service Policy and Procedures Manual.

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



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## Warranty - Claims Submission

Bulletin No.: 06-00-89-054

Date: November 30, 2006

### WARRANTY ADMINISTRATION

Subject:  
Warranty Claims Submission - Importance of GM Part Numbers and Date Coded Parts

Models:  
2007 and Prior GM Passenger Cars and Light Duty Trucks  
2003-2007 HUMMER H2, H3  
2005-2007 Saab 9-7X

### GM Part Numbers

All parts used on GM vehicles are assigned a GM part number. Additionally, most of the parts used in the manufacturing of GM vehicles are marked with GM part numbers directly on the part. This allows for easy verification of Genuine GM parts whether stocked at the warehouse, installed on a vehicle, or being returned for warranty claims. Running changes are also sometimes necessary during a model year resulting in additional part number changes mid-year.

### Date Coded Parts and Identification Marks

Many of the parts used on powertrain, chassis, electrical and interior assemblies are marked and date coded in a variety of ways. You may find stickers, bar codes, embossed clock faces, number stampings and riveted tags among many other methods on the parts you possess. While many of these components are supplied to General Motors, almost all suppliers track these identifications as a method of quality assurance and containment if ever an issue arises about a specific part.

### Date Code Example



The sample picture is from a 2.4L 4 cylinder front engine cover. On this part, the date code appears as a "clock" wheel.

On the first day for each month of production, the casting dye is pulled. Using a center punch, an operator manually punches another point on the date code wheel. To decode, you simply count the number of center punches, or impression, in the dial of the clock and you have the month.

The example picture has eight impressions, or center punch marks, on the wheel. The year is cast into the center of the dial or clock face. Therefore, the example is identified as being from August 2006. This date along with the part number, and many different identifiers cast into the parts, are used to track variations with multiple dies or production locations. When these marks are on the exterior surfaces when installed, they give GM dealers a powerful advantage when used for inspection purposes.

When the above information is tied to the correct VIN of the vehicle, along with a complete and detailed repair order, it becomes an effective tool to isolate parts with a given concern. This all depends on your dealership and care you take in regards to returned parts.

### Warranty Claims Submittal and Accompanying Returned Parts Guidelines

It is vital that the exact part(s) replaced during a warranty repair be returned when requested. These parts must be the specific ones associated with

the repair order requested and must carry the proper date codes for the production run of the vehicle or component. Substitute parts are not acceptable. This information is used during warranty part reviews and is tracked to determine possible problems with a specific production run. The more precisely that GM can isolate a production time frame that is causing customer concerns, the quicker and more effectively we can target a solution.

#### Warranty Debits

Parts that are returned out of date range for the specified vehicle on the repair order will first be cross-checked under the vehicle warranty system for past replacements. If a past replacement is noted the warranty data will be recorded as such and the claim will be processed. Parts returned out of date range for the vehicle repaired may be debited back to the dealer.

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



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Disclaimer Technical Service Bulletin # **68-05-03**

Date: **960601**

## Warranty - Goodwrench Service Lifetime Service Guarantee

File in Section:

Warranty Administration

Bulletin No.:

68-05-03

Date:

June, 1996

### WARRANTY ADMINISTRATION

Subject:

Goodwrench Service Plus Lifetime Service Guarantee

Models:

All Models - All Years

The information in this bulletin applies to all divisions excluding Saturn and GM of Canada.

The purpose of this bulletin is to explain details of the the Lifetime Serve Guarantee (LSG).

### LSG Coverage Requirements

The GM vehicle owner and original purchaser of a covered part must return to the original servicing GM dealership and present repair order and warranty folder.

### Eligible Parts

^ Air Conditioning Accumulators

^ Air Conditioning Compressors

^ Air Conditioning Condensers

^ CV Joint/Boot Seal Kits

^ EGR Valve

^ Fuel Injectors

^ Fuel pumps

^ Individual Ignition Wires

^ Ignition Coils

^ Ignition Wire Sets

- ^ Ignition Modules
- ^ New/Remanufactured Generators
- ^ New/Remanufactured Starter Motors
- ^ Oxygen Sensors
- ^ Shock Absorbers/Struts
- ^ Throttle Body Injectors
- ^ Water Pumps

#### General Information

- ^ Lifetime Service Guarantee is only available to and offered by participating GM Goodwrench Service Plus dealers/retailers.
- ^ Parts warranty handling allowance is per the General Motors Service Policy and Procedures Manual - 40% for 1994 and later model years, and 30% for 1993 and prior years.
- ^ Parts sold over the counter are not covered under LSG.
- ^ A customer paid repair order is required for future part coverage consideration.
- ^ Parts installed on vehicles in dealer inventory (new or used) are not eligible for LSG. Only a customer paid repair by the original retail purchaser.
- ^ Towing is not covered under the LSG.

Any questions regarding the LSG or GSP should not be directed to your GMSPO representative.

Technical Service Bulletin # **99-00-84-021B**

Date: **000401**

## Warranty - GM Dealer Parts Procurement

BULLETIN NUMBER:

99-00-84-021B

SECTION:

00 - General Information

DATE:

April, 2000

SUBJECT:

Expediting Parts

MODELS:

2000 and Prior Passenger Cars and Trucks

ATTENTION:

"GM of Canada" and "IPC" Dealers are not authorized to utilize this Service Bulletin.

This bulletin is being revised to exclude GM of Canada Dealers. Please discard Corporate Bulletin Number 99-00-84-021A (Section 00 - General Information).

The following policy is in place to address those occasions when it is necessary to procure a part from another local GM dealer or by express shipping (CSO-3).

General Motors is making a significant commitment to help reduce comebacks and maintain the level of customer service demanded by customers in your dealership. The following procedure provides dealers with a tool to help achieve total customer satisfaction during any applicable GM warranty period. This procedure will provide reimbursement of expenses beyond normal dealer parts costs, up to 25% greater than the GMSPO dealer net price or \$100 (whichever is less), for parts obtained locally. Expenses incurred for expediting GM ordered parts (CSO-3) not in dealer stock can also be reimbursed. This procedure should be utilized only during any applicable GM warranty coverage period.

Effective immediately, dealers will be required to input the part number without the part cost on all Z5000 and Z5001 claims. In instances where the integrated system automatically loads a part price, the calculation/price should be overridden so that the part price is zero. If multiple parts were procured, the total number of parts expedited should be inputted in the part count field. In those instances, the part with the greatest cost should be entered into the part number field.

All records and invoices in support of your claim must be retained in vehicle history record in accordance with Article 1.6 of the GM Service Policies and Procedures Manual. Parts expediting is not considered to be an add-on repair to the Repair Order, and does not require service management approval (Article 1.6.2.p.).

You may submit a claim for reimbursement under either of these operation numbers:

- Z5000 for parts obtained from a local GM dealer
- Z5001 for CSO-3 freight expenses

#### RECOMMENDED PARTS EXPEDITING PROCEDURE

1. Inform the customer if a part availability issue exists, and if eligible, offer appropriate Courtesy Transportation.
2. Contact a local dealer in an attempt to obtain the needed parts for same day repair. GM will reimburse the difference between the dealer price and the actual cost, up to the trade price, as published in the GMSPO Parts and Accessories Price Guide. If no trade price is listed, reimbursement will not exceed 25% of GMSPO dealer cost or \$100, whichever is less. In either case, the reimbursement request must not exceed \$100.
3. In the event the needed part is not available locally, it should be ordered on a Customer Order from GM Parts. If the part is needed for next day repair, order the part CSO-3 (or use CSO if overnight service is not available in your area). GM will reimburse the shipping expenses.

If a part is on back-order, IMMEDIATELY upgrade the order to a SPAC case.

4. Please review the parts application and add the part to your normal inventory, if appropriate.
5. Always keep the customer informed of the status of the repair.

#### CLAIM SUBMISSION PROCEDURE Z5000 - PART OBTAINED LOCALLY

If you do not have the required part in stock and are able to obtain it locally, GM will reimburse you for the additional dealer trade markup. You may have to pay to obtain the part from another local GM dealer. The allowance is for up to 25% of the GMSPO dealer cost or \$100, whichever is less.

The following example uses an evaporator core that you need. It has a dealer net cost of \$199.80. The part is being obtained by you from another local GM dealer (Hometown Motors), who has it in stock.

Field of Entry	Data Required
R.O. Number	Same as Repair R.O.
Date	Same as Repair R.O.
VIN	Same as Repair R.O.
Odometer	Same as Repair R.O.
Part Count	Actual # of parts expedited
Part Number	Primary failed part number or part with the greatest cost
Part Cost	Leave Blank or Zero Out
Complaint Code	Enter MD
Failure Code	Enter 93
Labor Operation	Enter Z5000
Labor Hours	Leave Blank
Other Labor Hours	Leave Blank
Net Amount	Enter \$\$ Amount Claimed
Line Total	Enter \$\$ Total Amount
Service Advisor I.D.	Same as Repair R.O.

You are able to purchase the evaporator core from Hometown Motors at a 20% dealer trade price of \$240.00 ( $\$199.80 + 20\% = \$240.00$ ), a \$40.20 markup. When your dealership submits a warranty claim, the part amount will be figured on the dealer net cost of \$199.80 at the normal dealer markup (30% for 1993 and prior or 40% for 1994 and newer). For example,  $\$199.80 + 30\% = \$259.74$ . The warranty repair order would use labor operation D3320 with the part amount of \$259.74. To recover the 20% markup of \$40.20 that you paid Hometown Motors, you would submit an additional warranty claim for operation Z5000 for a net item amount of \$40.20.

Part Count	Part No.	Part Cost	Comp Code	Failure Code	Labor Op	Labor Hours	Net Amount	Line Total
1	342525	0.00	MD	93	Z5000	—	\$40.20	\$40.20

The detail elements for this claim may appear on your computer screen in this manner (some screen layouts may be different).

#### CLAIM SUBMISSION PROCEDURE Z5001 - PARTS ORDERED CSO-3

If a CSO-3 order is necessary, the freight expense will be reimbursed. A claim for the repair should be submitted in the normal manner. An additional claim/case should be submitted for the actual amount of the freight expense.

- With one part ordered, request the entire freight charges for the CSO-3 order.
- With more than one part shipped from GMSPO in the same box, refer to the RAPID 2000 Advise of Shipment Answer back for itemized freight cost for each part.

If the evaporator core in the previous example had been obtained from GMSPO through a CSO-3 parts order, the following example shows correct warranty claim submission for the additional cost. The published GMSPO dealer price for the core is \$199.80. The GMSPO charges associated with the order are only freight charges, as all surcharges are eliminated with this implementation of the new GM Parts system. The repairing division would reimburse any applicable freight charges, submitted under labor operation Z5001 as a net amount (as an example, \$18.00 express shipping charges).

Field of Entry	Data Required
R.O. Number	Same as Repair R.O.
Date	Same as Repair R.O.
VIN	Same as Repair R.O.
Odometer	Same as Repair R.O.
Part Count	Actual # of parts expedited
Part Number	Primary failed part number or part with the greatest cost
Part Cost	Leave Blank or Zero Out
Complaint Code	Enter MD
Failure Code	Enter 93
Labor Operation	Enter Z5001
Labor Hours	Leave Blank
Other Labor Hours	Leave Blank
Net Amount	Enter \$\$ Amount Claimed
Line Total	Enter \$\$ Total Amount
Service Advisor I.D.	Same as Repair R.O.

The claim submission is shown in the example.

Part Count	Part No.	Part Cost	Comp Code	Failure Code	Labor Op	Labor Hours	Net Amount	Line Total
1	342525	0.00	MD	93	Z5001	—	\$18.00	\$18.00

The detail elements for this claim may appear on your computer screen in this manner (some screen layouts may be different).

Claim Type Compatibility		
Claim Type	Z5000	Z5001
Regular Warranty	X	X
A Type	X	X
B Type	X	X
C Type	X	X
D Type	—	—
E Type (Cadillac Only)	X	X
F Type	—	—
G Type	—	—
N Type	X	X
S Type	—	—
U Type (GMC/Chevy Only)	X	X

Refer to the table which details the type of claims (including special claims) when parts expediting is applicable for the covered vehicle (or part) failure. Please refer to your WINS Claim Processing Manual, Section VII for special claim type details. The Z5000 and Z5001 operations DO NOT require a special claim type.

#### CLAIM TYPE COMPATIBILITY

**Important:** No additional dealer markup on Z5000 or Z5001 is allowed.

Those operations are intended to reimburse dealers for the actual expense that occurred, as detailed above.

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.

#### Disclaimer



**Warranty - Notice of Delayed Start Process**

File In Section: Warranty Administration

Bulletin No.: 86-05-02

Date: December, 1998

**WARRANTY ADMINISTRATION**

Subject:

Delayed Warranty Start Process

Models:

All Past, Present and Future Passenger Cars and Trucks - Select Sales Type

**Important:**

Effective December 31, 1998, GMC will no longer be accepting Delayed Warranty Start Applications via DCS.

**GENERAL MOTORS DELAYED WARRANTY START****General Motors Vehicle Information****Vehicle Identification Number**

(GM VIN, ALL 17 CHARACTERS)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----

Vehicle Date \*: \_\_\_\_/\_\_\_\_/\_\_\_\_ Odometer Reading \*: \_\_\_\_ .X (NO 10ths) Check if kilometers ☐Vehicle Application:      RV      Political Subdivision      Commercial      Coach  
(CIRCLE ONLY ONE)

\* Date, odometer reading at first retail sale of upfitted (special body/equipment) recreational, commercial or coach vehicle.

-or-

\* Date, odometer reading when vehicle is placed in service by a GM authorized fleet or political subdivision.

**Customer Information**

Customer Name: \_\_\_\_\_

Business/

Political Subdivision: \_\_\_\_\_

Address: \_\_\_\_\_  
STREET CITY STATE/ PROVINCE ZIP/ POSTAL CODEPhone: ( ) \_\_\_\_\_ - \_\_\_\_\_  
AREA

Customer Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

**Sales Information**

GM Dealer/Retailer Code (if retailed by GM dealer/retailer): \_\_\_\_\_ - \_\_\_\_\_

Retail Outlet: \_\_\_\_\_

Address: \_\_\_\_\_  
STREET CITY STATE/ PROVINCE ZIP/ POSTAL CODEPhone: ( ) \_\_\_\_\_ - \_\_\_\_\_  
AREA

Retail Outlet/Dealer Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

Reason for Delayed Warranty Start: \_\_\_\_\_

This form is to be completed, signed and mailed to:

**GM DELAYED WARRANTY START**  
**PO BOX 51850**  
**LIVONIA MI 48150**

-Send one copy to PO BOX above, provide one copy to customer, place one copy in your file.-

March 98

EFFECTIVE JANUARY 1, 1999, the "Notice of Delayed Warranty Start" process must follow the guidelines contained in the 1999 GM Service Policies and Procedures Manual, Article 1.4.13. The form titled "General Motors Delayed Warranty Start" may be reproduced locally. It is very important that the signed, completed form is mailed to the address printed on the bottom of the form.

GM of Canada dealers should refer to Article 1.4.17 of the 1999 GM Service Policy and Procedure Manual.

Previous GMC and Chevrolet Medium Duty delayed warranty start processes will be discontinued effective December 31, 1998. These processes included the paper form "GMT 191" which may have been in the vehicle glove box, and includes the GMC DCS Delayed Warranty Start Process. This DCS process was detailed in GMC "Warranty Information Letter" D-90-12 and D-90-12A and may be detailed in your Dealer DCS Operators Manual.

Refer to the GM Service Policy and Procedure Manual for specific vehicle eligibility.

## **Warranty - Parts Warranty Special Claims B and C**

File In Section: Warranty Administration

Bulletin No.: 80-05-03

Date: August, 1998

### **WARRANTY ADMINISTRATION**

Subject:

Redefined Use of Parts Warranty Special Claim Types B and C

Models:

All Past and Future Passenger Cars and Light/Medium Duty Trucks

The contents of this bulletin supersedes all other publications that may contain explanations for use of Claim Types B and C that are different than covered below (e.g., GM WINS Claims Processing Manual and Warranty Administration Service Bulletins).

Future revisions of the GM Service Policies and Procedures Manual and the GM WINS Claims Processing Manual will include all changes described in this bulletin.

The purpose of this bulletin is to announce a major change impacting the use of Special Claim Types B (previously used for parts warranty claims that involved labor for replacement/repair), and C (previously used for parts warranty claims when no labor was involved).

This change introduces the new GM Goodwrench Service Plus claim to the parts warranty claim type selection process. The new Goodwrench Service Plus Lifetime Service Guarantee-Limited Warranty Process is designed to bring customers back to your dealership after the new vehicle warranty has expired. Eligible parts are warranted to the original retail purchaser by the original selling dealer. Dealer enrollment, additional details and any other questions concerning the Goodwrench Service Plus Process should be directed to your GM Parts representative or contact Goodwrench Service Plus Headquarters at 1-800-283-6609.

The following information is intended to simplify the claim type selection process by clearly defining the use of each. The described changes will be effective for all claims submitted on or after August 27, 1998 for processing in credit cycle 885.

### **Claim Type B - Dealer Parts and Accessories Warranty**

Claim Type B is to be used any time a purchased/replaced part fails for a warrantable reason within 12 months or 12,000 miles from date or miles of installation (12 months regardless of mileage for medium duty trucks and over-the-counter purchases) and a vehicle is beyond the GM New Vehicle Warranty.

Any Claim Type B submissions that include parts and labor or a net item amount will require a VIN. Anytime a non-GM VIN is involved, the non-GM VIN indicator must be entered in the claim submission record.

#### **Important:**

Any warrantable parts failures, including subsequent parts failures, that occur during the GM New Vehicle Warranty must be submitted as a warranty claim. Claim Type B must not be used.

On or after August 27, 1998, any claim submitted to WINS showing Claim Type B while a vehicle is still within the GM New Vehicle Warranty will be returned to the dealer for reason NM, CLAIM TYPE INVALID FOR THE REPAIR.

### **Claim Type C - GM Goodwrench Service Plus Claim**

Claim Type C will be used exclusively for Goodwrench Service Plus Lifetime Service Guarantee Limited Warranty claims on select dealer installed retail purchased parts. The GSP Lifetime Service Guarantee Limited Warranty provides reimbursement to the dealer for part(s) only.

GSP parts that fail for a warrantable reason within the 12 month/12,000 mile Dealer Parts and Accessories Warranty and beyond the GM New Vehicle Warranty must be submitted as Claim Y Type B.

A VIN will be required. Labor, Other Labor and Net Amounts will not be allowed with Claim Type C. Anytime a non-GM VIN is involved, the non-GM VIN indicator must be entered in the claim submission record.

When GSP Dealers use Claim Type C, WINS will verify the claim is beyond the GM New Vehicle Warranty for that repair, if not - the claim will be returned to the dealer for reason NM, CLAIM TYPE INVALID FOR THE REPAIR.

Non-GSP Dealers are not eligible to use Claim Type C on any claims submitted on or after August 27, 1998. Any Claim Type C submitted to WINS by a non-GSP Dealer will be returned to the dealer for reason NA, CLAIM TYPE INELIGIBLE FOR DEALER.

#### **Claim Type N:**

This claim type will continue to be used by all dealers for Consumer Parts and Accessories Warranty claims for those specific parts that are eligible for extended warranty coverage beyond the 12 month/12,000 mile Dealer Parts and Accessories Warranty, and the subsequent failure occurs beyond those limits. Refer to Claim Type B for failures during the Dealer Parts and Accessories Warranty. See Article 1.1.3 of the GM Service Policies and Procedures Manual for a listing of eligible parts. Any parts warranty claims submitted that includes parts and labor or a net item amount will require a VIN. Anytime a non-GM VIN is involved, the non-GM VIN indicator must be entered in the claim submission record.

Claim Type N is not to be used for any parts failures during the Dealer Parts and Accessory Warranty (within 12 months and/or 12,000 miles from date/miles of purchase).

Type	Current	Effective 8/27/98
B	Service Replacement Parts Warranty with labor	Use only after the GM New Vehicle Warranty has expired and within the standard 12 month/12,000 mile Dealer Parts and Accessories Warranty (12 months regardless of miles for medium duty trucks and over-the-counter sales). A VIN will always be required, GM or non-GM, anytime labor/net item amount is requested.

Type	Current	Effective 8/27/98
C	Service Replacement Parts Warranty without labor	Goodwrench Service Plus Lifetime Service Guarantee parts which fail beyond 12 months/12,000 miles from date and/or miles of retail purchase and the vehicle is beyond the GM New Vehicle Warranty. Parts only, VIN required.
N	Consumer Parts and Accessories Warranty. Parts eligible for Extended Warranty beyond 12 months/12,000 miles from date and/or miles of retail purchase and the vehicle is beyond the GM New Vehicle Warranty.	No change except a VIN will always be required, GM or non-GM, anytime labor/net item amount is requested.

The matrix is provided as an administrative reference.

\* Anytime a non-GM VIN is involved, the non-GM VIN indicator must be entered in the claim submission record.

#### Important:

Above reference to GM New Vehicle Warranty includes all applicable vehicle warranties in effect, e.g., Bumper To Bumper, Emissions, Diesel Engine, and Corrosion Warranties.

Additionally, although the GSP Lifetime Service Guarantee Limited Warranty brochure explicitly states that only the original installing GSP dealer can honor the lifetime warranty, procedural enhancements have been established to accommodate the tourist down, terminated dealer and the relocated GSP customer.

Tourist Down - A Goodwrench Service Plus tourist down customer is someone who had an LSG part installed on their vehicle and a subsequent failure occurs with the repair being performed more than 50 miles from their original installing dealer. If the part is past the standard 12 month/12,000 mile warranty, and the vehicle is beyond the GM New Vehicle Warranty, the customer will be instructed in their GSP Lifetime Service Guarantee Limited Warranty brochure to call the GSP Referral Center at 1-800-96 GM PLUS (1-800-964-6758) for the closest GSP dealer.

At the repairing dealership, the customer must present their original repair order and GSP Lifetime Service Guarantee Limited Warranty brochure before any further action can occur. Once verified, and the vehicle diagnosed, the dealer calls the Lifetime Service Guarantee (LSG) Authorization Center at 1-800-433-6961 for approval. The LSG Authorization Center will ask the dealer a series of questions pertinent to approval and when appropriate, issue a GSP authorization number. Once approved, the dealer then performs the repair and gets the customer back on the road - without any out-of-pocket expense. The repairing dealer then submits a Claim Type C claim to WINS for reimbursement of part(s), part handling allowance, and labor. Any GSP claim that includes labor will require a dealer service management authorization code G and the GSP authorization number in the claim comment field to be considered for payment. Terminated Dealer - A terminated dealer is defined as a dealer going out of business and the point being permanently closed by the vehicle division, not as a dealer who sells the dealership to another dealer (buy/sell agreement).

**Important:**

This does not include any former GSP dealers who are no longer participating in the program or dealers who have changed ownership through a buy/sell agreement (see the GSP Dealer/Retailer Agreement for terms related to buy/sell agreement). These dealers retain the labor cost responsibility for any services performed for their customers during the period of time they were active GSP dealers. As well, GM will continue to cover the cost of part plus handling allowance.

GSP customers of a terminated dealer will be referred to another GSP dealer of their vehicle make through an established Preferred GSP dealer list maintained at the 1-800-96 GM PLUS Referral Center. If a same "make" GSP dealer is not available, the next closest GSP dealer will be recommended. In either case, the GSP dealer selected will be within 50 miles of the terminated dealer location.

The repairing GSP dealer will be reimbursed for the part, handling allowance and labor for the first failure of the terminated GSP dealer's customer's LSG repair. The repairing dealer follows the same authorization procedure as described in Tourist Down.

All GSP dealers have been given the opportunity to participate in the Preferred referral system. They agree to accept a new customer providing all deliverables of the GSP process, including the labor portion of the GSP Lifetime Service Guarantee Limited Warranty. GM will continue to handle the cost of the part and handling allowance.

The referral list will be maintained through the 1-800-96-GM PLUS Referral Center. Dealers can verify participation by contacting their GM Parts District Manager, or by calling the Referral Center.

**Relocated Customer** - If a customer has moved from his/her principle residence and is no longer within 50 miles of their originating GSP dealer, the customer can call the 1-800-96 GM PLUS Referral Center to inquire which GSP dealers are accepting new customers. Again, these are GSP dealers who have elected to participate as a Preferred GSP dealer and have agreed to provide the customer all deliverables of the GSP process, including the labor portion of the GSP Lifetime Service Guarantee Limited Warranty. GM will continue to handle, as a Claim Type C, the cost of the part and handling allowance.

**Important:**

In all three above situations: tourist down, terminated dealer or relocated customer, in the interest of customer satisfaction, if there is not a GSP dealer within a 50 mile radius a non-GSP dealer may be identified for the customer's vehicle make.

**GMPP and Other Service Contract Providers** - Customers are entitled to the LSG Limited Warranty on covered parts that are replaced under the provisions of a service contract by a GSP dealer. Any subsequent failure of such LSG covered parts, beyond the standard GM Parts and Accessories Warranty, (12 months/12,000 miles) may be submitted as a GSP claim using Claim Type C for reimbursement of part(s) and handling allowance by the servicing GSP dealer. Any questions concerning labor reimbursement to the dealer should be directed to the service contract provider. **Technical Service Bulletin # 82-05-02** **Date: 980501**

## **Warranty - Request for Wholesale Authorization**

File In Section: Warranty Administration

Bulletin No.: 82-05-02

Date: May, 1998

### **WARRANTY ADMINISTRATION**

Subject:

Requests for Wholesale Authorization of Warranty Claims; Proper Utilization of Comment Routing Code "H"

Models:

All Past, Present, and Future Passenger Cars, Light and Medium Duty Trucks

Attention: Service Managers/Claims Administrators

In conjunction with the introduction of the Dealer Business Center, General Motors introduced a common procedure for obtaining wholesale approval for warranty claims. Claims requiring approval beyond dealership authorization empowerment levels are to be entered via DCS using Comment Routing Code "H". This process allows dealers to enter comments on the "Comment" screen of DCS explaining the reason wholesale authorization is requested. These claims and comments are routed electronically to your District Service Manager for review/approval. The H-routing process has been successfully used by several GM Divisions as a means to expedite the wholesale authorization of warranty claims.

The Comment Routing Code "H" and the Comments screen are available on your DCS system. Routing Codes are explained in the General Motors Claim Processing Manual (Section IV). If you are not familiar with this function, please contact your DOS Vendor.

Claims utilizing routing code "H" should be submitted with any appropriate authorization codes the dealer is empowered to use. All claims requiring authorization must be supported with valid business reasons. These business reasons must be clearly communicated via your H-routed comments for claims requiring wholesale approval. Inbound comments must include information similar to the documentation detailed on the repair order. Additionally, comments must indicate why you are requesting wholesale authorization and the rationale for this request.

In an effort to standardize information contained in H-routed comments, and to further clarify warranty claim submissions, please be guided by the

following:

Comments must clearly indicate what wholesale authorization is being requested.

Comments must clearly indicate customer complaint/cause/correction.

#### Other Labor Hours

Explain the repair steps taken that necessitated OLH. Indicate whether a divisional technical assistance group was involved. Include the TAC case number if applicable. Please note: Involvement of a divisional TAC does not necessarily substantiate a request for OLH.

#### Excessive Parts

Explain what additional parts were needed. Explain why these parts were necessary. Indicate additional part numbers if space allows.

#### Excessive Courtesy Transportation

Indicate the number of rental days incurred, the rate per day, and the reason for that number of days. If delays are due to part procurement, indicate part numbers and SPAC or CS0-3 case numbers. Include the dates parts were ordered and the dates parts were received.

Goodwill Requests Beyond Dealer Empowerment Indicate the rationale for an out-of-warranty adjustment. Include the delivery date and any pertinent information, such as the history of previous related repairs.

#### Prohibited Labor Operations

Explain why it was necessary to use this labor operation to complete warranty repairs.

Comments can contain up to 256 characters (letters/punctuation/spaces). You are encouraged to use abbreviations if necessary in order to allow sufficient space to fully explain your request. Comments must be clear and concise. H-routed warranty claim submissions with incomplete comments will be returned for clarification, and resolution of these warranty claims will be delayed.

As a reminder, all warranty claims are subject to review by General Motors representatives. Dealers should thoroughly review the General Motors Service Policies and Procedures Manual, WINS Claims Processing Manual, as well as Warranty Administration Corporate Bulletins 72-05-09 and 62-05-04 (GMCL Dealers please refer to Home Office Letter 98-005 titled "Summary of Key Service Policies and Procedures and Shop Supervision Requirements"). These documents provide details regarding proper warranty administration, repair order documentation, Dealer Operating Procedures, and GM Dealer empowerment. It is essential that all dealers follow established policies for maintaining dealer records in support of warranty claims.

We are confident that you will find the Comment flouting Code "H" process to be a convenient and effective method to obtain wholesale approvals for warranty claims. Familiarity with this new procedure, coupled with clear and concise H-routed comments, will allow dealers to achieve timely warranty claim review and resolution.

Technical Service Bulletin # **82-05-05**

Date: **980501**

## Warranty Inquiry System

File In Section: Warranty Administration

Bulletin No.: 82-05-05

Date: May, 1998

Subject:

General Motors Warranty Inquiry System

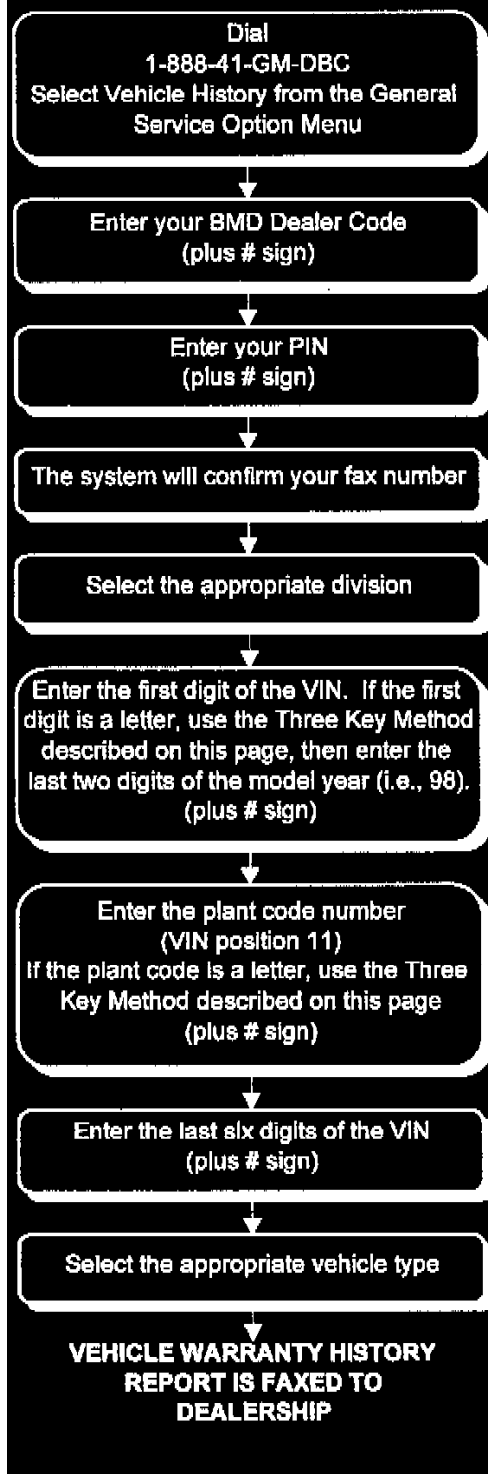
Models:

All Past, Present and Future Passenger Cars and Trucks (Excluding Saturn) - Ten (10) Most Current Model Years

#### Important:

Warranty Inquiry System will be updated yearly (February) to add latest model year vehicles and delete oldest model year.

# GENERAL MOTORS WARRANTY INQUIRY SYSTEM USER GUIDE



## GENERAL GUIDELINES

- A touch-tone phone is required.
- Use the pound sign (#) as prompted.
- Follow the system prompts for complete instructions.
- Your vehicle warranty history report will be faxed to you at the completion of your call. Your fax machine must be available to receive the information. If your fax machine is busy, the system will attempt to connect every 15 minutes for one hour.
- Please note: additional credits, debits and special claim types are not displayed.
- We recommend multiple vehicle warranty history report be requested during each call. A maximum of 10 VINs can be requested per call.
- System availability –  
Monday through Friday, 8:00 am to 6:00 pm EST.  
Saturday, 8:00 am to 9:00 pm EST.

## Three Key Method for VIN Letter Entry plus #sign (First Digit and/or Plant Code)

EXAMPLE: 1G4HR52K1VH475875

Plant Code = H (VIN position 11)

Key Pad 4 contains letters - "G", "H" and "I".

Letter "H" is the 2nd letter on the key pad.

To enter the letter "H" enter the following: \*42#

A = *21	B = *22	C = *23	D = *31	E = *32	F = *33
G = *41	H = *42	I = *43	J = *51	K = *52	L = *53
M = *61	N = *62	O = *63	P = *71	Q = *01	R = *72
S = *73	T = *81	U = *82	V = *83	W = *91	X = *92
Y = *93	Z = *02				

## Contact DBC:

If your fax number needs updating.  
For PIN changes/problems.  
If you experience problems with the system.

General Motors is pleased to announce that an enhanced GM Warranty Inquiry System is now being made available to all GM Dealers in the U.S. (excluding Saturn), effective Monday, May 4, 1998. This system, accessed by contacting the DBC at 1-888-41-GM-DBC using any touch-tone telephone in your dealership, provides a vehicle history print via return fax. This vehicle history, which consists of warranty repairs and other key service-related information, may be particularly useful when repairing units that have not been consistently serviced at your dealership.

The GM Warranty Inquiry System now provides a common method of supplying vehicle history to all dealers in a similar format.

Business Management Division Dealer Code

All requests will be made using the Business Management Division Dealer Code. This is the same seven-digit code used for submitting claims to WINS for processing and appears at the top of the WINS Claim Memo.

Pin Number

A PIN number must be entered during each call. Based on Business Management Division (BMD), Buick and Chevrolet Dealers will use previously assigned PIN numbers for Warranty Inquiry as described. All other dealers will initially be assigned a PIN number of "9999". Lost PIN number inquiries can be handled by calling the DBC.

Chevrolet Dealer - Chevrolet is BMD	Use previous Chevrolet PIN number
Chevrolet Dealer - Buick is BMD	Use previous Buick PIN number
Chevrolet Dealer - Other is BMD	Use previous Chevrolet PIN number
Buick Dealer - Buick is BMD	Use previous Buick PIN number
Buick Dealer - Chevrolet is BMD	Use previous Chevrolet PIN number
Buick Dealer - Other is BMD	Use previous Buick PIN number
Other	Use "9999"

#### Fax Number

The Dealership fax number is confirmed during each call. If the number is not correct, the call should be terminated and the procedure listed should be followed.

The dealership fax machine should be available to receive the vehicle history print when the request is submitted. If the fax machine is not available, the system will attempt to connect every 15 minutes for up to an hour.

#### PIN and Fax Number Updates



# DEALER BUSINESS CENTER



**GMC**

## GM WARRANTY INQUIRY SYSTEM P.I.N. & FAX NUMBER CHANGE FORM

The General Motors DBC must be notified of changes in dealer code, fax number or area code.

**Dealer Name** \_\_\_\_\_

**Division** \_\_\_\_\_

**BMD Dealer code** \_\_\_\_\_

**Current P.I.N.** \_\_\_\_\_

**New P.I.N. (optional)** \_\_\_\_\_

**Area Code and Fax Number** \_\_\_\_\_

**Your name and position** \_\_\_\_\_

**Dealer Authorized Signature** \_\_\_\_\_

**Date** \_\_\_\_\_

**Please fax completed form to:**  
**313-667-7046**

**Or mail to:**  
**General Motors Dealer Business Center**  
**Mail Code 482-D12-C21**  
**400 Renaissance Center**  
**P.O. Box 400**  
**Detroit, MI 48265-4000**

The PIN and Fax Number can be updated as needed by completing a "PIN & FAX NUMBER CHANGE FORM" and faxing or mailing it to the DBC. It is also recommended that dealers who were originally assigned PIN code "9999" complete this form to request a new dealer-selected PIN. Copies should be made locally from the form included in this bulletin.

### Multiple VINs and Franchises

Up to 10 vehicle histories - for any combination of GM franchise vehicles (excluding Saturn) - can be requested during each call. Access to GM Warranty Inquiry is not restricted based on franchise.

### Hours of Availability

The system will be available Monday through Friday,  
8:00 am - 6:00 PM EST, and on Saturday,  
8:00 am - 9:00 PM EST

### Billing Charges

Charges for any vehicle histories requested, plus any applicable sales/use taxes, will be rebilled to your Business Management Division dealer code's Open Account. Charges have been kept to a minimum and cover only the actual cost of extracting and sending the vehicle history prints. The charge structure is listed below:

1 VIN per call = \$1.92 per VIN (\$1.92) plus \$.37 per faxed report page  
2 VINs per call = \$1.08 per VIN (\$2.16) plus \$.37 per faxed report page  
3 VINs per call = \$0.81 per VIN (\$2.43) plus \$.37 per faxed report page  
4 VINs per call = \$0.67 per VIN (\$2.68) plus \$.37 per faxed report page  
5 VINs per call = \$0.58 per VIN (\$2.90) plus \$.37 per faxed report page  
6 VINs per call = \$0.53 per VIN (\$3.18) plus \$.37 per faxed report page  
7 VINs per call = \$0.49 per VIN (\$3.43) plus \$.37 per faxed report page  
8 VINs per call = \$0.46 per VIN (\$3.68) plus \$.37 per faxed report page  
9 VINs per call = \$0.44 per VIN (\$3.96) plus \$.37 per faxed report page  
10 VINs per call = \$0.42 per VIN (\$4.20) plus \$.37 per faxed report page

Technical Service Bulletin # **83-01-14**

Date: **980301**

## **VIN Plate - Replacement Policy and Procedure**

File In Section: 0 - General Information

Bulletin No.: 83-01-14

Date: March, 1998

### **INFORMATION**

Subject:  
VIN Plate Replacement

Models:  
1998 and Prior Passenger Cars and Trucks  
(U.S. and Canada)

Dealers may receive requests from customers and insurance companies to replace a VIN plate(s) as the result of theft, damage or other reasons.

The Motor Vehicle Registration Agency in each State has a procedure for providing identification plates or decals for vehicles with damaged or missing VIN plates. In some States, the State procedure is the only legal way to replace a damaged or stolen VIN plate. GM is no longer in the position to provide replacement VIN plates because of theft, accident or other damage. Dealer is to advise customers to contact the Motor Vehicle Registration Agency in these cases.

In the event it is suspected that a VIN plate with an incorrect number was installed at the factory, or if the plate was damaged during a warranty repair (windshield replace) GM may arrange for a replacement plate to be installed with the concurrence of the State Motor Vehicle Registration Agency. However, such replacements will be limited to vehicles currently owned and registered to the original purchaser, of current model still in production, and within the Bumper to Bumper time and mileage coverage period. In such cases, dealer is to compare the VIN plate number with all other VIN's on the vehicle including the certification/tire pressure labels, anti theft labels (if applicable), service parts identification label, vehicle invoice (if available), Manufacturers Statement of Origin (unsold vehicle) and any other documents on which the VIN appears, including the title and registration. Dealer is to then contact the Division Service Contact Representative with the details and for further handling with the Division VIN Plate Coordinator.

Article 3.2.7 g. of the GM Service Policies and Procedures Manual will be changed to reflect the above policy with the printing of the next edition.

Technical Service Bulletin # **72-05-09**

Date: **980201**

## **Warranty - GM Dealer Empowerment Program**

File In Section: Warranty Administration

Bulletin No.: 72-05-09

Date: February, 1998

### **WARRANTY ADMINISTRATION**

Subject:  
GM Dealer Empowerment Program

Models:  
1998 and Prior Passenger Cars and Trucks

### **Program Intent /Responsibility**

The purpose of dealer empowerment is to provide prompt, responsible, point of service decision making capability which results in quality service and a completely satisfied customer service experience. This empowerment program provides all GM Dealers with a determined level of responsibility to make decisions regarding payment of repairs. These decisions are typically in the form of dealer management approvals and claim

authorizations for specific types of situations that typically involve additional costs and repairs outside the written time and/or mileage (kilometres) limits of the New Vehicle Limited Warranty. Empowered decisions must be supported with valid business reasons.

## **Making Decisions**

The warranty covers repairs to correct any vehicle defect related to materials used or workmanship performed during the manufacturing process. Such repairs must be made during the warranty period, using the appropriate GM part(s) and published GM labor times. However, dealers are empowered to various levels, with the discretion to make case by case decisions, that are exceptions to GM standard policy, for good business reasons, when the circumstances surrounding the transactions are special. The main purpose is to effect quality repairs, and meet reasonable and rational customer expectations.

Future revisions or supplements to this bulletin, in the form of case studies, are expected to assist in the training of the decision making process. Through the process of continuous improvement, training, and communication, GM will strive to reach a level of consistency in decision making across the breadth of GM and its dealer network. Please contact your wholesale service representative if assistance, guidance, or clarification is necessary.

## **Identifying the Facts/Partial- Shared Responsibilities**

Empowerment should be exercised when it appears that, in the interests of customer loyalty, an adjustment should be made. Empowerment should not be exercised to correct conditions occurring from aging, physical damage, lack of proper maintenance, or abuse. Vehicle concerns should be assessed on their own merits within the context of the current owner's reasonable expectations and with appropriate concern for the cost to GM.

In exercising your judgment in each case, the following questions are some which should be considered.

- ^ Is the vehicle covered by other service or extended warranty contracts? If "YES," repairs must be performed under that contract.
- ^ Does the vehicle show a lack of proper care and maintenance?
- ^ Is the overall condition of the vehicle such that the cost to repair will approximate the vehicle's value?
- ^ If the vehicle was purchased used by the current owner, is it likely the vehicle exhibited the condition before purchase?
- ^ Did the condition occur while the vehicle was in the possession of a second or third owner and no vehicle history is available?
- ^ Could the customer have done anything to prevent or cause the condition?
- ^ Has the vehicle been used in ways for which it was not intended?
- ^ Did the condition result from an after market conversion or alteration?
- ^ Did the condition result from the use of non-GM parts or accessories?
- ^ Is there evidence of odometer tampering or alteration?
- ^ Is the vehicle condition a normal operating characteristic?
- ^ Is the condition largely a result of unusual localized environmental, geographical or climate factors?
- ^ Additional questions when paint condition is the concern:

Is the condition largely the result of normal paint aging or environmental damage (fading, gloss loss, chalking, flaking, yellowing?)

- ^ Is the condition only on a physically damaged panel that the customer declines to repair?

The above list is not intended to be all inclusive. However, if the answer to any of these or similar questions is "yes," then it probably is not a concern you should address at General Motors expense.

Justifying empowered decisions with an opinion that "they're a good customer," without other supporting business reasons is not an acceptable practice. In such situations you can help strengthen your position by committing to an equally shared responsibility between GM and your dealer. If you cannot commit to a shared responsibility, then perhaps the correct decision should be one of offering no goodwill adjustment.

In situations beyond the warranty period, but within your claim authorization empowerment, customers have received value from the use of their vehicle. It may be reasonable to consider partial payment by the customer, dealer, and/or GM, thus sharing responsibility for the repair expense. Consider the interests of the customer, the dealership and General Motors when determining the sharing of costs. Use these guidelines to assist in the decision making process:

- ^ Determine what the customer expects before making an offer to assist.
- ^ Evaluate the reasonableness of the customer's expectations.
- ^ Determine what offer would satisfy the customer as a fair and equitable adjustment.

- ^ Make your evaluation of the situation through direct communication with the customer.
- ^ Always strive for a mutually acceptable agreement.
- ^ Using the rationale of "because they are a good customer," if General Motors did not cover the repair, would you?
- ^ Would the dealership be willing to match what General Motors will pay?

## Empowerment Information

- ^ Permission to deviate from General Motors Service Policies and Procedures Manual repair order write up and documentation requirements, or shop supervision requirements, or the WINS Claims Processing Manual.
- ^ Permission to authorize claims which are not a General Motors responsibility, including:
  - Repairs, adjustments, or reconditioning required as the result of damage.
  - Used vehicle reconditioning.
  - Repairs covered by extended service plans or contracts.
  - Unjustified, undocumented, unsubstantiated additional labor time.
  - Unnecessary parts, replacements.
  - Repetitive repairs resulting from poor dealer diagnosis or workmanship.
- ^ Permission for the claims administrator to apply approval codes for claims payment.

Dealer is to designate one person responsible and accountable for all approvals issued by service management. Typically, this would be the Service Manager or Service Director. When portions of responsibilities are delegated to others, those who become empowered are to be members of the service management team, responsible for supervision of employees, the performance of the service department and the contractual responsibility to properly administer GM warranties. Service technicians, claims administrators, or other support personnel are not to be empowered for these types of management approvals. All such delegation of approval is to be monitored by the Service Manager or Director, on a routing basis.

The decision making responsibility of empowerment translates into use and application of GM labor operation numbers, claim types, and authorization codes. It is GM's expectation for all dealers to operate at the maximum levels of empowerment. Each element of empowerment may be independently adjusted among the listed alternatives. Additionally, the use of certain labor operation numbers and/or claim types may be prohibited from dealer use, without wholesale authorization.

Use of authorization code A =	24 months/24,000 miles (40,000 kilometres)*
For exterior paint conditions =	24 months/unlimited miles (kilometres)*
Use of authorization code B =	Yes
Use of authorization code E =	Up to 5 hours
Use of authorization code G =	Yes
Use of authorization code P =	Yes
Customer reimbursement maximum =	\$1,000
Use of labor operation numbers =	Unrestricted **
Use of claim types =	Unrestricted **
* Beyond the time and/or mileage (kilometres) limits of the Bumper-to-Bumper New Vehicle Limited Warranty.	
** Except for certain GM program eligibility related codes.	

Use of authorization code A =	24/24,000 miles (40,000 kilometres)*, 12/12,000 miles (20,000 kilometres)*, none
For exterior paint conditions =	24/unlimited miles (kilometres)*, 12/unlimited miles (kilometres)*, none
Use of authorization code B =	Yes or no
Use of authorization code E =	Up to 5,4,3,2,1, or 0 hrs
Use of authorization code G =	Yes or no
Use of authorization code P =	Yes or no
Customer reimbursement maximum =	\$1,000, \$300, or none
Use of labor operation numbers =	Unrestricted, specific labor restrictions, or restricted ranges of operations **
Use of claim types =	Unrestricted, specific claim types restrictions **
* Beyond the time and/or mileage (kilometres) limits of the Bumper-to-Bumper New Vehicle Limited Warranty.	
** Except for certain GM program eligibility related codes.	

At maximum levels, a dealer will be empowered as shown:

The full range of empowerment level alternatives are as shown:

The scope of empowerment will be decided upon and set within GM systems by the division having business management responsibility at the site, also known as the Business Management Division, or BMD. The empowerment profile will apply to all GM franchises operating at the site.

## Monitoring

Current customer satisfaction and warranty expense reports are available for use in monitoring performance trends associated with empowerment. As the process of common empowerment matures, the creation of more specific measurements and reports may be necessary or appropriate.

Using the information available, your wholesale service representative will also monitor your use of empowerment. If areas of specific concern arise, your wholesale service representative may offer specific counsel, or suggest certain dealer administrated controls be placed into effect. In unresponsive situations, or where substantial risk exists, your empowerment in the specific area(s) of concern may be reduced or eliminated until the risk or situation is corrected. As the risks become managed to acceptable levels, empowerment will be restored to higher levels.

## Code A

Goodwill adjustments include the ability to make case by case decisions on repairs that are beyond the time and/or mileage (kilometres) limits of the Bumper to Bumper New Vehicle Limited Warranty period. Empowerment does not apply to the corrosion, diesel engine or emission warranties that exceed the Bumper to Bumper New Vehicle Limited Warranty period. There may be situations where goodwill adjustments beyond the dealer's empowerment level are appropriate. In such cases, wholesale authorization is required prior to the repair being made.

Goodwill should NOT be considered in any of the following events:

- ^ Recently purchased vehicles (used cars, auction vehicles, fleet vehicles, etc.) that exhibited the condition at time of purchase.
- ^ Failures covered by an extended warranty or service contract. Goodwill adjustments are intended to increase/gain owner loyalty, not to reduce the liability of contract underwriters.
- ^ Repairs benefiting any licensed dealer (including non-GM) for used vehicles being traded, purchased from GM auction or in dealer inventory as a means of increasing the value of the unit or to reduce reconditioning expenses.
- ^ Repairs needed due to lack of maintenance, wear, misuse, physical damage, accidents or alterations made to a vehicle.
- ^ Paint finish concerns presented for consideration beyond five years from in service date.

Dealer authorization empowerment for paint claims covers exterior body panels only. The following paint labor operations are excluded from the

unlimited mileage (kilometres) paint empowerment:

A0110 - Finesse Sand and Buff

A3740 - A4260 Replace Paint Stripe

A4340 - A4700 Replace Decal Stripe

A5020 - A5127 Replace Wood Grain Transfer

A5541 - A5560 Paint Chemical Spotting

A5575 - A5580 Rail Dust Removal

A7000 - A8200 Interior Paint

A9040 - A9640 Panel Repairs

## Code B

Authorizes payment for repairs to be performed which repeat or overlap previously performed repairs. Allows you to consider authorizing repairs identical or similar to repairs that have previously been performed on the vehicle. Facts must support that the repair is justifiable and is not the result of previous improper, or incomplete workmanship or diagnosis.

Authorization for Repeat/Related Repair would be used in these instances:

- ^ Repairs caused by defective parts and/or workmanship on the part of the manufacturer.
- ^ Repairs previously but unsuccessfully attempted by a different authorized GM servicing agent, to address customer's complaint.

The following are not to be considered for Repeat/Related Repair authorization:

- ^ Improper diagnosis.
- ^ Inadequate technician training.
- ^ Use of improper tools, equipment and repair procedures.
- ^ Repairs by an independent shop or other individual.
- ^ GM part warranty claims.
- ^ Non-GM part failures or failures attributable to such parts.

It is the responsibility of the dealer to perform repairs correctly the first time. Authorization code "B" should not be used for the following repairs:

- ^ Wheel alignments.
- ^ Wheel balancing.
- ^ Paint repairs.
- ^ "Labor only" repairs. Authorization Code E - Other Labor Hours

## Code E

Those exceptional cases where a repair requires Other Labor Hours (OLH) considered as part of the repair procedure. All "published" add times, such as sublet allowance, add times, diagnosis times, mix times, etc. are submitted as regular labor hours and do not require authorization.

Instances when OLH may be required include:

- ^ Unusual repair procedure not covered in the GM Service Manual and Labor Time Guide (LTG). Such may be the case where a bolt was broken and extra time was required to drill it out.
- ^ Diagnosis time not published.
- ^ Labor times to complete electrical connector/wire repairs in excess of published "ST" 0.5 hour limit.
- ^ Labor times to address any additional damage caused by the primary failed component. Total not to exceed established labor time if applicable.
- ^ Variable strip time for involved panel refinishing. Not to exceed "calculated" limit.

Instances when OLH is NOT the responsibility of General Motors:

- ^ Inadequate technician training.
- ^ Lack of and/or improper tools and equipment.
- ^ Improper repair procedures.
- ^ Unnecessary and/or excessive repairs.
- ^ Improper shop supervision.

If unusual circumstances are encountered which would require straight time:

- ^ The technician is to contact service management for approval PRIOR to the work being performed.
- ^ Service management approval is required for the technician to proceed on a straight time basis.
- ^ Service management must sign the "on time" and record the reason for the repair. Separate on/off time recording is required for each straight time operation.
- ^ Service management must justify the reasonableness of the straight time request.
- ^ Technician inefficiency or lack of training is not sufficient justification for straight time.

## Code G

As a means to reduce service management authorization workload, the requirement for use of the authorization code G is reduced. The "G" authorization code is no longer required on the following claim types:

- ^ B = Service Parts Replacement With Labor Claim.
- ^ C = Service Parts Replacement Without Labor Claim.
- ^ D = Case Add Credit Claim.
- ^ M = Vehicle Warranty Deductible Override Claim.
- ^ N = GM Consumer Parts and Accessories Warranty Claim (GMSPO)

Although these claims no longer require service management authorization, it may be appropriate to establish an internal management control process to monitor compliance with GM Service Policies and Procedures.

Authorization code "G" is required when submitting the following claim types:

- ^ S = Customer Reimbursement Claim.
- ^ 1 = MIC/GMPP Case Add Credit.
- ^ 3 = MIC/GMPP Deductible Override.
- ^ B = Certified Used Vehicle Claim (US Only).

Authorization code "G" is required in response to the following claim return codes:

- ^ 15 = VIN Missing.
- ^ 16 = VIN Invalid.
- ^ LR = Labor Op Requires Dealer Authorization.
- ^ MD = No Original Claim Found For Case Debit.
- ^ PA = Part Number Not On File.
- ^ PC = Part Number Requires Authorization.
- ^ PD = Part Number Requires

Repair-Replacement Not Allowed.

- ^ VA = VIN Not Found On File.
- ^ VF = VIN Warranty Is Blocked For Repair.
- ^ VJ = VIN Warranty Has Been Voided.
- ^ WA = VIN Past Model.
- ^ WB = VIN Beyond Policy Approval Guidelines.

Refer to General Motors Service Policies and Procedures and WINS Claims Processing Manual (Section VII) for appropriate use of these special claim types. Authorization code "G" is not required for use in conjunction with any other special claim type. Some return codes may be overridden with authorization code "G". Dealer should refer to the authorization matrix (Section V, page 5 of the WINS Claims Processing Manual) as required.

Customer Reimbursement (Claim Type "S") is to be used when a decision has been made to reimburse a customer for warranted repair costs incurred by the customer. Reimbursement is made in the form of a check issued by the dealer directly to the customer. Customer reimbursement is to be made only to the person who owns or leases the vehicle at the time of repair, or the person who incurred the expense, if different. Dealer should obtain and retain the customer's original paid receipt or invoice and provide the customer with a photocopy for their records. Repair orders written for customer reimbursement must include the customer's description of the event causing the out of pocket expense and note the dealer's reimbursement check number(s). Dealer is to provide canceled check upon request as proof of reimbursement.

## Code P

Exceptional cases where a repair requires additional parts and/or net amounts exceeding the amount(s) allowed for the labor operation involved. Tows are not included in net amount field of the repair claim line. Labor operation T:2020 must be submitted as a separate line item to cover the tow expense. An explanation of the excessive part or net amount must be noted on the repair order. If additional parts are required for the excessive repair, note the part numbers used on the repair order.

Maximum dealer empowerment is \$5 or 5% of the case line total, whichever is greater. Amounts exceeding this limit will require wholesale authorization. General Motors reserves the right to adjust the ceiling of the retail limit at anytime.

## Documentation Requirements

Repair order documentation of claim authorizations are to include the specific code applied, reason for issuing, date approved, and signature of service management.

Properly maintained files should provide a complete history for yourself and General Motors in support of your empowered decisions. From time to time, your records will be reviewed. If your records do not support your claims, the claims will be debited, even if previously authorized either by wholesale or retail.

Technical Service Bulletin # **62-05-02A**

Date: **971101**

## Labor - Revised Operation Z1241/Personal Property Damage

File In Section: Warranty Administration

Bulletin No.: 62-05-02A

Date: November, 1997

### WARRANTY ADMINISTRATION

Subject:

Labor Operation Z1241 - Personal Property Damage

Models:

All Past, Present, and Future Passenger Cars and Trucks

This bulletin is being revised to update text and to add involved divisions. Please discard Corporate Bulletin Number 62-05-02 (Section - Warranty Administration).

The purpose of this Warranty Administration Bulletin is to provide Retail and Wholesale Service personnel with the policies/procedures and the warranty claims submission procedures that support the bulletin subject matter.

Labor Operation Z1241 - Personal Property Damage

Effective immediately, Retail Service Management personnel now have the ability to react quickly and decisively to customer concerns regarding personal property damage that is the result of a warrantable failure. Claims that are the result of a collision, fire or involve bodily injury are not included in this process. All other claims for personal property loss of up to \$1,000.00 can be settled directly with the customer using Labor Operation Z1241 - Personal Property Damage. Personal property claims that exceed \$1,000.00 or involve collision, fire and/or bodily injury should be referred to your Divisional Customer Assistance Center Product Allegation Resolution Team for claim management.



Dealer Service Management must review all requests for reimbursement. The perspective of the Customer, General Motors Corporation, and the Dealer should be considered and a fair settlement produced for all parties. Consideration of age, mileage, prior damage and maintenance of the vehicle are some of the typical factors used in these decisions. An example of an appropriate request would be a piece of leather luggage with water damage caused by a weatherstrip leak in the trunk. Another example would include a pair of slacks torn by a mis-positioned seat frame wire protruding through the seat upholstery.

#### Case Example 1 - Water Damaged Leather

##### Luggage

The customer experienced water damage to a genuine leather suitcase as a result of a defect in material and workmanship, no sealer under the trunk weatherstrip, which produced a severe water leak. The customer provided the dealership with a receipt for the piece of luggage which was purchased a year prior. Except for the water damage, the luggage showed no other signs of wear. The customer requested and Dealership management agreed that a full value reimbursement was appropriate since the luggage showed no other wear or damage beyond the water damage.

ACKNOWLEDGEMENT	
This document acknowledges receipt of \$ _____ from	
_____ Division which was provided to me as settlement for the	
loss/damage of _____	
_____ (item(s))	
incurred on _____ (date).	
<b><u>This incident did not involve a collision, fire or bodily injury to myself or others.</u></b>	
_____	
Customer Signature	
_____	
Print Customer Name	

The customer signed the Acknowledgment Document, surrendered the damaged luggage piece, and the original receipt to the dealership. The dealership assembled the appropriate documents in the tile, submitted the claim and tagged the luggage for later scrapping. The trunk weatherstrip repair was performed and a claim submitted separate to the reimbursement transaction. The luggage was destroyed by Dealership management after the part retention period expired.

Case Example 2 - Torn Slacks by Seat Frame The customer experienced a tear on two pair of slacks as a result of a defect in material and/or workmanship; seat frame wire. The customer did not have sales receipts for these items but was able to produce a document showing their current list price, replacement value at \$55.00 each. It was agreed that repairing the clothing was not a reasonable option. It was further agreed that settlement of \$70.00 covering both pair of slacks was appropriate given their overall condition, age and lack of documented purchase price. After signing the Acknowledgment Document, and surrendering the slacks and estimate, the dealership processed the claim and reimbursed the customer the agreed amount.

The personal property claim should be handled as follows:

- ^ Obtain reasonable documentation from the customer regarding the items of loss and the current value. This may consist of receipt or estimate of current value from a reputable source concerning the item of loss.
- ^ Complete the Acknowledgment Document included with this bulletin. The Acknowledgment Document may be reproduced locally or if you wish you may create your own. The Acknowledgment Document should read, "This document acknowledges receipt of \$\_\_\_\_\_ (amount) from \_\_\_\_\_ Division which was provided to \_\_\_\_\_ (name) as settlement for the loss/damage of (item) incurred on \_\_\_\_\_ (date)." THIS INCIDENT DID NOT INVOLVE A COLLISION, FIRE OR BODILY INJURY TO MYSELF OR OTHERS. Include the dollar amount to be reimbursed, a brief description of the item involved and the date of the incident.
- ^ Any available receipts and Acknowledgement Document should be retained as covered in Article 1.6 of the GM Service Policies and Procedures Manual.
- ^ Dealer Service Manager must obtain the damaged goods and retain them according to the parts retention period. Collected goods should be scrapped at the end of the retention period in accordance with GM Service Policies and Procedures.

<b>Labor Operation</b>	<b>Z1241</b>
<b>Parts</b>	<b>\$0.00</b>
<b>Regular Hours</b>	<b>0.2 hr</b>
<b>Other Hours</b>	<b>0.0 hr</b>
<b>Net Item</b>	<b>Up to \$1,000.00</b>
<b>Claim Type</b> <b>Wholesale Authorization</b> <b>Retail Authorization</b>	None. Within claim submission parameters "P" for excessive net item amount would be needed if the amount being reimbursed was greater than \$1,000.00. Contact your Divisional Customer Assistance Center Product Allegation Resolution Team to receive their written approval (740) prior to claim submission. Failure to follow this authorization process will likely result in a chargeback of the entire claim amount.

Claim Submission Procedures

Technical Service Bulletin # **72-05-13**

Date: **980101**

## Warranty - Repair/Replace Policies & Procedures

File In Section: Warranty Administration

Bulletin No.: 72-05-13

Date: January, 1998

### WARRANTY ADMINISTRATION

Subject:  
Repair/Replace Policies and Procedures

Models:  
All Past, Present, and Future Passenger Cars and Trucks

The purpose of this bulletin is to provide retail and wholesale service personnel with enhanced service policies for assembly replacements during the GM New Vehicle Limited Warranties.

The GM Service Policies and Procedures Manual, dated 10/97, Article 1.2.1.j Assembly Replacements currently states, "Where it is more economical to repair than to replace a failed part or component.... Dealer will be reimbursed for such repairs (parts and labor) based on GM Labor Time Guide." GM strongly supports that the most economical warranty repair be performed. That is, if it is more economical (parts and labor total) to repair a failed component instead of replacing it, the repair of the component must be performed.

Effective with repair orders dated on or after January 15, 1998 dealers are to be guided by the following when attempting to repair/replace an assembly (excludes active Exchange Programs):

- ^ If service parts/kits are available through GMSPO for assemblies (i.e. brake master cylinder, steering gear) then it must be used in lieu of an assembly.
- ^ Qualified trained technicians using recommended or essential tools must perform all repairs.
- ^ Component disassembly must be performed to determine what sub-components have failed.
- ^ When a complete assembly is used, an itemized list recapping the repair vs. replacement decision must be included. This information, including the total amount for required parts and labor for the repair, must be provided on the Repair Order.
- ^ With respect to transmission repairs, if it has been determined that an assembly is the most economical repair, the SRTA Form must be filled out and a copy attached to the repair order and placed in the vehicle history file.
- ^ Seat Trims must be repaired vs. replaced when possible.

Technical Service Bulletin # **48-05-02B**

Date: **971201**

## **Parts Expediting - Reimbursement Policy**

File In Section: Warranty Administration

Bulletin No.: 48-05-028

Date: December, 1997

### **WARRANTY ADMINISTRATION**

Subject:  
Information on Expediting Parts

Models:  
All Passenger Cars and Trucks

This bulletin is being revised to clarify the intent of the parts expediting reimbursement policy on vehicles within the applicable warranty period and eliminate reference to beyond warranty application. Also to detail the maximum allowed reimbursement, define Courtesy Transportation rental vehicle use in conjunction with a dealer-traded part and reference GMSPO information to identify specific CSO-3 freight expense. Please discard Corporate Bulletin 48-05-02A (Section - Warranty Administration).

The following policy is enacted to address those rare occasions when it is necessary to procure a part from another local GM dealer or by express shipping (CSO-3).

The following procedure provides dealers with an additional tool to help achieve total customer satisfaction during any new vehicle warranty period. This procedure will provide reimbursement of expenses beyond normal dealer parts costs, up to 25 percent greater than the GMSPO dealer net price or 100 dollars (whichever is less), for parts obtained locally. Expenses incurred for expediting General Motors ordered parts (CSO-3) not in dealer stock can also be reimbursed. This procedure should be utilized only for vehicles within the warranty period.

All records and invoices in support of your claim must be retained in vehicle history record in accordance with Article 1.6 of the GM Service Policies and Procedure Manual.

When submitting for reimbursement under either of the operation numbers, Z5000 for parts obtained from a local GM dealer or Z5001 for CSO-3 freight expenses, the service manager is required to initial and provide an appropriate explanation on the repair order to indicate approval of the added expense.

## **Recommended Parts Expediting Procedure**

1. Inform the customer if a part availability issue exists, and if eligible, offer appropriate "Courtesy Transportation". Parts expediting reimbursement (Z5000) will require prior divisional approval and authorization where more than a one day rental is provided.
2. Contact a local dealer in an attempt to obtain needed parts for same day repair. Divisions will reimburse the difference between dealer price and actual cost, up to trade price, as published in the GMSPO Parts And Accessories Price Guide. If no trade price is listed, reimbursement will not exceed 25% of GMSPO Dealer cost or \$100 whichever is less. In either case, reimbursement will not exceed \$100.
3. In the event the needed part is not available locally, it should be ordered on a Customer Order from GM Parts. If the part is needed for next day repair, order the part "CSO-3" (CSO if overnight service is not available in your area). Divisions will reimburse shipping expenses.

If a part is on back order, IMMEDIATELY upgrade the order to a SPAC (VIP for Canada) case.

**\*Important:**

Canadian dealers should call 1-800-263-3770 for Parts Procurement.

4. Please review the parts application and add the part to your normal inventory if appropriate.

5. Always keep the customer informed of the status of the repair.

## Claim Submission

Procedure:

Z5000 - Part Obtained Locally:

If you do not have the required part in stock and are able to obtain it locally, GM will reimburse you for the additional dealer trade markup you may have to pay to obtain the part from another local GM dealer up to 25% of the GMSPO dealer cost or \$100 whichever is less.

Field Of Entry	Data Required
R.O. Number	Same as repair R.O.
Date	Same as repair R.O.
VIN	Same as repair R.O.
Odometer	Same as repair R.O.
Part Count	Leave Blank
Part Number	Leave Blank
Part Cost	Leave Blank
Complaint Code	Enter MD
Failure Code	Enter 93
Labor Operation	Enter Z5000
Labor Hours	Leave Blank
Other Labor Hours	Leave Blank
Net Amount	Enter \$\$ Amount Claimed
Line Total	Enter \$\$ Total Amount
Service Advisor I.D.	Same as Repair R.O.

The following example uses an evaporator core that you need, that has a dealer net cost of \$199.80, the part is being obtained by you from another local GM dealer (Hometown Motors) who has it in stock:

You are able to purchase the evaporator core from Hometown Motors at a 20% dealer trade price of \$240.00, ( $\$199.80 + 20\% = \$240.00$ ), a \$40.20 markup. When your dealership submits a warranty claim, the part amount will be figured on the dealer net cost of \$199.80, at the normal dealer markup, 30% for 1993 and prior or 40% for 1994 and newer. Ex:  $\$199.80 + 30\% = \$259.74$ . The warranty repair order would use labor operation D3320 with the part amount of \$259.74. To recover the 20% markup of \$40.20 that you paid Hometown Motors you would submit an additional warranty claim for operation Z5000 for a net item amount of \$40.20.

Part Cnt	Part No.	Part Cost	Comp Code	Failure Code	Labor Op	Labor Hours	Net Amt	Line Total
			MD	93	Z5000		\$40.20	\$40.20

The detail elements for this claim may appear on your DOS screen in the following manner (some screen layouts may be different).

### \*Important:

Canadian dealers should call 1-800-263-3770 for Parts Procurement.

Procedure:

Z5001 Part Ordered "CSO-3" (Guaranteed Overnight Service For Canada).

If a CSO-3 order is necessary, the freight expense will be reimbursed. A claim for the repair should be submitted in the normal manner. An additional claim/case should be submitted for the actual amount of freight expense;

^ With one part ordered, request the entire freight charges for the CSO-3 order.

^ With more than one part shipped from GMSPO in the same box, refer to the RAPID 2000 Advise of Shipment Answer back for itemized freight cost for each part (GMSPO Bulletin IB # 97-312).

If the evaporator core in the previous example had been obtained from GMSPO through a 050-3 parts order, the following example shows correct warranty claim submission for the additional cost. The published GMSPO dealer price for the core is \$199.80. The GMSPO charges associated with the order are only freight charges, as all surcharges are eliminated with this implementation of the (remove "new") G.M. Parts System. The repairing division would reimburse any applicable freight charges, submitted under labor operation Z5001 as a net amount (as an example, \$18.00 express shipping charges).

Field of Entry	Data Required
R.O. Number	Same As Repair R.O.
Date	Same As Repair R.O.
VIN	Same As Repair R.O.
Odometer	Same As Repair R.O.
Part Count	Leave Blank
Part Number	Leave Blank
Part Cost	Leave Blank
Complaint Code	Leave Blank
Failure Code	Enter 93
Labor Operation	Enter Z5001
Labor Hours	Leave Blank
Other Labor Hours	Leave Blank
Net Amount	Enter \$\$ Amount Claimed
Line Total	Enter \$\$ Total Amount
Service Advisor I.D.	Same as Repair R.O.

The claim submission is shown in the example.

Part Cnt	Part No.	Part Cost	Comp Code	Failure Code	Labor Op	Labor Hours	Net Amt	Line Total
			MD	93	Z5001		\$18.00	\$18.00

The detail elements for this claim may appear on your DCS screen in the following manner (some of screen layouts may be different).

Refer to the table (Claim Type Compatibility) which details the type of claims (including special claims) when parts expediting is applicable for the covered vehicle (or part) failure. Please refer to your WINS Claim Processing Manual, Section VII for special claim type details. The Z5000 and Z5001 operations DO NOT require a special claim type.

## Claim Type Compatibility

Claim Type	Z5000	Z5001
Regular Warranty	X	X
A Type	X	X
B Type	X	X
C Type	X	X
D Type		
E Type (Cadillac Only)	X	X
F Type		
G Type		
N Type	X	X
S Type		
U Type (GMC/Chevy Only)	X	X

Claim Type Compatibility

### Important:

No additional Dealer markup on Z5000 or Z5001 is allowed.

Those operations are intended to reimburse Dealers for the actual expense that occurred as defined above.

GM is making a significant financial commitment to help reduce comebacks and maintain the level of customer service demanded by customers in your dealership. Please use good judgment to administer this policy. We feel exceeding customer expectations will pay great dividends to all GM dealers. Technical Service Bulletin # 72-05-14

Date: 980101

## Warranty - Enhanced Sublet Repair Policy

File In Section: Warranty Administration

Bulletin No.: 72-05-14

Date: January, 1998

## **WARRANTY ADMINISTRATION**

Subject:  
Enhanced Sublet Repair Policy

Models:  
All Past, Present, and Future Passenger Cars and Trucks

The purpose of this bulletin is to provide retail and wholesale service personnel with enhanced sublet repair policies.

Effective with repair orders dated on or after January 15, 1998, the following policies apply for repairs sublet by dealer to repair shops:

- Sublet repairs are to be submitted to General Motors at the Dealer's actual cost less any discounts or allowances that apply to the sublet invoice or made available to the Dealer on non-warranty repairs. These repairs are not to exceed the Dealer's parts and/or labor allowance as set forth in Articles 1.5.1 and 1.5.2. See article 1.2.4.c for reimbursement details when non-GM parts are used. GM Service Policies and Procedures Manual, Article 1.5.7 SUBLET REPAIRS.
- Dealers are not to solicit "higher than customary" charges from sublet repair independents.
- Dealer supplied parts used in the performance of sublet warranty repairs are eligible for the appropriate handling allowance.
- Sublet repairs must not be shown on a warranty claim as if a Dealer performed the actual repair.
- For warranty repairs on Diesel engines subject to a deductible provision, dealer is to collect the first \$100.00 (deductible) from the customer.

See Article 1.5.9 for details on sublet items subject to administrative allowance. Also, refer to article 1.6 for details on required Dealer records and Article 1.4.17 for reference to paint finish standards requirements.

Technical Service Bulletin # **620504**

Date: **970401**

## **Warranty - Required Claim Submission Procedures**

File In Section: Warranty Administration

Bulletin No.: 62-05-04

Date: April, 1997

## **WARRANTY ADMINISTRATION**

Subject:  
Operating Procedures

Models:  
General Motors Passenger Cars and Trucks

The following list contains eighteen points taken, in part, from the 1997 GM Service Policies and Procedures Manual dated 10/96, the WINS Claims Processing Manual (e.g. Claim Preparation, Routing, Authorization, Filing, and Submission), and in some cases, just a recommended process to follow. Because warranty administration is governed by GM Service Policies and Procedures, dealers should verify they have process compliance in place to ensure the policies and procedures are being followed in their daily warranty administration. The benefit of doing so guarantees compliance with the GM Service Policies and Procedures.

### **Important:**

Most information in this bulletin relates to "Document," "Hybrid," and in most instances, "Electronic" dealer repair order systems. However, the policies and procedures Articles referenced in this bulletin should be checked for information that may be more specific to "Electronic" systems.

Recent dealer warranty reviews have revealed substantial deviations from these practices (P&P) and in some cases a lack of familiarity with these requirements. Accordingly we have extracted eighteen of the most common areas of deviation and captured the essence of the requirements in this bulletin. Additional and specific references are provided on each point to further detail these procedures.

1. **ACCURATE AND COMPLETE REPAIR ORDER INFORMATION:** All repair order header information must be completed accurately, including the in-service date and the odometer reading taken directly from the vehicle by the person writing the repair order. This is necessary to determine if the vehicle is within warranty and if a deductible applies. The name of the owner or the name of the operator of the vehicle must be included on the repair order. (Reference GM P&P Articles 1.6.2.b, and WINS CPM Section II.C.1.A.-K.)
2. **ACCURATE AND COMPLETE CUSTOMER CONCERN DESCRIPTIONS:** A clear and concise repair order write-up is required with a brief description of each customer concern. Customer problem analysis is the process of translating the customer's problems into a symptom which is the responsibility of Service Management and/or their service advisors. Repair diagnosis time is published in the Labor Time Guide

with appropriate labor operations. Customers must not be charged for diagnosis time related to warranty repairs. Vaguely written complaints such as "engine stalls" or "check brakes" will not be accepted. (Reference GM P&P Articles 1.5.4, 1.6.2c WINS CPM Sections II.C.2.A.-O. AND IV.C.2.I.&J.)

3. **CLEAR UNDERSTANDING OF CHARGES:** There must be a clear understanding of responsibility for charges at the time the repair order is written and while the customer is present. Service Management must authorize any changes in responsibility for charges prior to the work being performed. The reason for these changes and the signature of Service Management giving authorization must be recorded on the shop copy of the repair order. If additional charges will be made to the customer, the customer must be called for authorization prior to performing the work.
4. **CUSTOMER'S SIGNATURE REQUIRED:** A customer's signature must be obtained to authorize customer pay and/or warranty repairs. If the customer is not present when the repair order is generated, then a signed authorization must be attached to the R.O., for example, early bird envelopes or hand written "prep sheet". If the customer drops the vehicle off and provides authorization by telephone, the name and telephone number of the person giving the authorization and the date and the time of authorization, along with the signature of Service Management, must be included with the customer's instructions. For vehicles in dealer inventory, all repairs must be authorized and signed by Service Management prior to the work being performed. This includes warranty repairs done to new vehicles during the PDI process. (Reference GM P&P Articles 1.6.1.c, 1.6.2.b, WINS CPM Section II.C.1.H.)
5. **SEPARATION OF THE RO SHOP COPY:** Following authorization (signature) by the customer, the shop copy should be separated from the other repair order copies. The shop copy is to be given to the technician as the working copy. The original copy bearing the customer's signature must be retained as outlined in the current GM Service Policies and Procedures. This is regardless of which type of repair order or repair order/invoice system is used by the dealership. (Reference GM P&P Article 1.6.2.c.2.)
6. **ACCURATE AND COMPLETE CAUSE AND CORRECTION:** Each technician is to note what was found as the cause of the customer's concern and what was done to correct the concern. The cost of labor and the hours paid to the technician must be clearly shown on the time ticket and referenced to the repair order. (Reference GM P&P Article 1.6.2 c&g, WINS CPM Section II.C.2.C.,H., and J.)
7. **APPROVED AND RECORDED STRAIGHT TIME:** If unusual circumstances are encountered which would require straight time, the technician is to contact Service Management for authorization prior to the work being performed. Service Management must authorize the technician to proceed on a straight time basis and sign the "on-time," noting the reason for the authorization. Separate on/off time recording is required for each straight time operation performed. Service Management must justify the reasonableness of the straight time request and provide an explanation on the shop copy along with the authorization signature. Technician "inefficiency" or "lack of training" is not sufficient justification for straight time. (Reference GM P&P Article 1.6.2 d&g, WINS CPM Section IV.C.2.J.&K.)
8. **APPROVAL REQUIRED FOR ADDITIONAL WORK:** If, in the course of correcting a customer concern, a technician discovers an additional potential warranty repair that the customer did not "comment" about, Service Management must be contacted for authorization prior to the additional corrective warranty repair being performed. Service Management must verify the need for the additional warranty repair and must add the warranty operation to the shop copy, stating the reason necessary and authorize by signature adjacent to the operation. In cases where the additional necessary work will result in an increase of charges to the customer, the customer must be contacted for authorization. (Reference GM P&P Article 1.6.2d.)
9. **PROPER DOCUMENTATION AND RETENTION OF WARRANTY PARTS:** All parts used in repairs must be cross-referenced (line coded) on the repair order to the specific repair to which they apply. All warranty parts removed must be returned to the parts department for retention and disposition as required by the current GM Service Policies and Procedures Manual. All replaced parts with visible defects must have the defective area clearly marked. Acknowledgment of receipt of the used parts by the parts department must be clearly indicated on the shop copy of the repair order. Repair operations that require parts for proper repair will not be accepted without supportive replaced parts or an explanation justifying the repair. (Reference GM P&P Article 1.6.2e, WINS CPM Section II.C.2.L.)
10. **TRANSFERENCE OF WRITTEN CAUSE AND CORRECTION:** The cause of failure and correction as stated by the technician on the shop copy must be transferred to all other copies of the repair order or invoice. If separate repair order/invoicing systems are used, it is not necessary to transfer the information to the original write-up copy of the repair order. However, when transferring the information to an invoice, the phrase "added operation" must be included next to each operation that was added after the initial repair order write-up, and all items originally entered on the repair order at the time of write-up must be accounted for on the invoice. (Reference GM P&P Article 1.6.2.i, WINS CPM Section II.C.2.C.)
11. **ACCURATE SUBLET CHARGES AND RECEIPTS:** Sublet charges cannot exceed the amount a dealer would have been paid if the work was performed by that dealer using GM parts and published GM labor times or net cost to dealer, whichever is lower. Only the original sublet receipt will be accepted and must include repair order number and VIN. Shop supplies are not to be claimed on a warranty repair order. (Reference GM P&P Articles 1.21n, 1.5.7, 1.5.9a, 1.6.2h, WINS CPM Section II.C.2.M. AND IV.C.2.L.)
12. **ACCURATE LABOR OPERATION NUMBERS AND TIMES:** Service Management is responsible to ensure that the proper labor operation and labor time is recorded on the repair order. There must be no more than one labor operation per customer complaint. Multiple repair cases for one customer complaint will be considered to be added operations. The Dealer is responsible for the satisfactory completion of all repair work claimed for warranty credit. If a repair of the same item is needed again as a result of improper inspection, diagnosis, or workmanship, the repair is to be classified as "shop comeback" and is not subject to any additional warranty claim payment. (Reference GM P&P Articles 1.5.11, 1.6.2g, 1.5.5, WINS CPM II.C.2.)
13. **CLOSURE OF REPAIR ORDERS IS SUGGESTED:** It is suggested when repairs are completed and/or replacement parts are ordered and the vehicle is safely operable, the repair order must be closed and processed through the dealership's internal accounting procedures. Revisions to invoices must not be permitted. Any changes to final invoices must be made using established accounting procedures to account

for all adjustments.

14. **SERVICE MANAGEMENT APPROVALS:** Each dealer must designate one person responsible and held accountable for all authorizations and approvals issued by Service Management. Typically, this would be the service manager or director. When portions of authorization responsibilities are delegated to other members of Service Management, those who become empowered must be salaried members of the dealer service management staff, responsible for supervision of employees and the performance of the service department. Service technicians, claims administrators, other support, or hourly personnel are not to be empowered for these type of management approvals. All such delegation of authorization and approvals is to be monitored by the Service Manager or Director, on a routine basis, for compliance with Program Guidelines and GM Service Policies and Procedures. All approval codes applied to warranty claims must be approved and signed by Service Management prior to claim submission. The approval code, date approved, dollar/line amount, and signature must be recorded on the warranty claim copy. (Reference GM P&P Article 1.6.2.d.)
15. **COURTESY TRANSPORTATION PROGRAM ADMINISTRATION:** Courtesy transportation guidelines state the customer is eligible to receive a loaner or overnight rental vehicle any time an eligible vehicle is brought in for a warranty repair and the nature of that repair requires more than one business day. A copy of the rental agreement or other receipts (i.e., Cab, service station receipt for gasoline) documenting the transportation expense is to be attached to the warranty copy of the repair order. For shuttle, a notation should be entered on the face of the warranty repair order stating "shuttle required". Prior wholesale authorization is required anytime a courtesy vehicle is provided to a customer for six days or more; Cadillac four days or more. When calculating the number of days a vehicle has been in use, a day is defined as one 24 hour period based on time of day the courtesy transportation vehicle is released to the customer. Scheduling service visits late in the afternoon when service will not be performed until the next work day does not constitute an overnight repair, unless the vehicle is inoperative or a safety related concern is present. Some dealers have agreements with rental companies that provide a "rebate, discount or other allowance" for rental vehicles used for non-warranty related repairs. General Motors expects these allowances to be applied on eligible courtesy transportation claims (Reference GM P&P Article 1.4.14, Warranty Administration Bulletin Number 680502A.)
16. **PARTS EXPEDITING PROGRAM ADMINISTRATION:** Parts expediting guidelines require that if it has been determined a vehicle needs a part and the dealer does not have the part in stock, every attempt should be made to obtain the part locally utilizing the dealer trade portion of the parts expediting program. If the part is unavailable locally, the Parts Manager should inform the Service Department that the part will need to be ordered from GMSPO. Service Management should determine the level of urgency and inform the Parts Department to order the part either CSO-3 or CSO. If the part is on national back order, a SPAC case should be initiated. In both cases, dealer trade and overnight delivery, Service Management must initial the repair order. (Reference GM P&P Article 1.5.17d, Warranty Administration Bulletin 480502A.)
17. **USE OF CUSTOMER CONCERN NOT DUPLICATED:** Customer concerns that may be addressed by "Service Management" and/or Service Consultants in the service reception area are not eligible for consideration under these labor operations. **ONLY** customer concerns that require the skills of a "Trained Technician" would be eligible for claim consideration. Customer concern not duplicated (\*9995) should only be used in conjunction with a customer originated concern and only when inspection reveals that no corrective action is indicated during diagnosis. Vehicles in dealer inventory, new or used, are not eligible. Customer concern not duplicated usage must be reviewed and approved by Service Management, with signature on the R.O. prior to claim submission. These labor operations must not be used in conjunction with a repair labor operation of the same group (i.e. D9995 with D4440) on the same repair order. Technician must be properly trained in the area being diagnosed. Additionally, these labor operation numbers provide for a range of labor time that would be submitted as regular hours. Unlike flat rate time, where the full amount of published time would be claimed, only the technician's actual time dedicated towards duplicating the customer's concern should be claimed. Reference GM P&P Article 1.5.5.)
18. **DOCUMENT AND RECORDS RETENTION:** All documents and records must be retained as required by the current GM Service Policies and Procedures. Vehicle history files must be maintained in a manner whereby complete information is quickly and easily retrievable for review by dealership personnel with customer and/or division personnel. The customer must be provided with a copy of the warranty repair order covering any warranty or policy adjustment made to the vehicle. This copy must reflect both parts and labor required to fully complete the necessary repair. (Reference GM P&P Article 1.6.3a, b, and c.)

Technical Service Bulletin # **600503**

Date: **970101**

## **Warranty - Repair and Claims Procedures**

File In Section: Warranty Administration

Bulletin No.: 60-05-03

Date: January, 1997

### **WARRANTY ADMINISTRATION**

Subject:

GM Certified Used Vehicle Warranty Repairs and Claims Procedures

Vehicles involved:

All GM Certified used passenger cars, including GEO and light duty trucks for Chevrolet, Buick, Pontiac/GMC, and Oldsmobile. Cadillac and Saturn vehicles are excluded from this process.

### **Important:**

Chevrolet Corvette and Oldsmobile Aurora vehicles may be certified and sold by a GM Certified Used Vehicle Dealer, however, only Chevrolet and Oldsmobile Dealers respectively, can perform repairs under the terms of the New Vehicle Warranty.



THIS BULLETIN IS INTENDED FOR USE ONLY BY DEALERS WHO HAVE ENROLLED IN THE GM CERTIFIED USED VEHICLE PROCESS. ALL OTHER DEALERS SHOULD CONSIDER THIS BULLETIN AS INFORMATIONAL ONLY.

The purpose of this bulletin is to provide dealers with warranty and administration information concerning the recently announced GM Certified Used Vehicle Process. This process is designed to enhance dealers ability to compete in the used vehicle market which is rapidly going through competitive changes.

For information regarding the selection, inspection, certification, application and administration of vehicles under the GM Certified Used Vehicle Warranty refer to the GM Certified Used Vehicle Operations Manual.

#### Definition of Terms

**Certified Dealer and GM Dealer** - For the purposes of the GM Certified Used Vehicle Process, when referred to as a participating dealer in the GM Certified Used Vehicle process, they will be referred to as a Certified Dealer. Non-participating dealers will be referred to as a GM Dealer.

#### Nameplate and Non-nameplate

**Nameplate** - means vehicles and models for which dealer has a signed Dealer Sales and Service Agreement. **Non-nameplate** means GM vehicles and models for which certified dealer does not have a signed Dealer Sales and Service Agreement.

#### Participating Dealers

Participating GM Certified Used Vehicle Dealers who have sold a certified used vehicle will be authorized to perform qualifying warranty repairs on eligible GM Certified Used Vehicles. These vehicles may be covered not only by the GM Certified Used Vehicle Warranty but the New Vehicle Warranty, as well.

#### Timing

Beginning December 1, 1996, the selling Certified Dealer became eligible to submit warranty claims through the WINS Processing System for warranty repairs on GM Certified Used Vehicles.

#### Important:

Certified Dealers are not permitted to advertise cross-divisional warranty service in any manner what-so-ever, including direct mail and all other forms of dealer advertising.

### **Certified Dealer Service Management empower./repair approval**

**EMPOWERMENT WITHIN THE GM CERTIFIED USED VEHICLE LIMITED WARRANTY (REGARDLESS OF GM NAMEPLATE)**

Following expiration of the New Vehicle Warranty and within the terms of the GM Certified Used Vehicle Warranty, Service Management and/or the service consultant handling the customer transaction is to first contact the GMPP Claim Center at 1-800-MIC-Care (1-800-642-2273) to confirm component/vehicle coverage and obtain repair approval prior to proceeding with repairs.

**EMPOWERMENT WITHIN THE NEW VEHICLE LIMITED WARRANTY (NAMEPLATE VEHICLES)**

When performing Nameplate warranty repairs on GM Certified Used vehicles during the New Vehicle Warranty period, service management is empowered to make decisions in-line with divisional administrative practices.

**EMPOWERMENT WITHIN THE NEW VEHICLE LIMITED WARRANTY (NON-NAMEPLATE VEHICLES)**

When the selling Certified Dealer performs Non-nameplate warranty repairs on GM Certified Used Vehicles during the New Vehicle Warranty period, service management is empowered to make decisions in-line with divisional administrative practices applicable to their Business Management Division (BMD).

### **Customer Satisfaction**

It is imperative that all Certified Dealer personnel involved with the GM Certified Used Vehicle process become familiar with the specific details of handling cross divisional warranty situations. It is also imperative that customers be accommodated in a thorough and professional manner when a vehicle requires warranty repairs.

Recognizing that this is a new process and that issues may arise that are unfamiliar to Certified Dealers and their personnel, please be sure the customer is not placed in an uncomfortable situation while an issue or concern is being resolved.

Should questions arise regarding customer concerns for a Non-nameplate vehicle, contact your BMD service contact representative.

### **Dealer Repair Options**

Certified Dealers have two options in the event of a needed warranty repair within the GM New Vehicle Warranty period on Non-nameplate vehicles.

1. They may repair the Non-nameplate vehicle if the Certified Dealer has obtained necessary essential tools, equipment and acquired additional training for personnel.
2. If the Certified Dealer does not have, or does not elect to purchase the necessary essential tools and equipment or acquire the training for dealer personnel, they are to arrange for vehicle repair, including movement of the vehicle through a Nameplate GM dealer. These arrangements should always be made keeping the customer's best interest in mind.

In the event a GM Certified Used Vehicle Dealer sublets a Non-nameplate vehicle to a Nameplate Dealer for warranty repairs, sublet policies in Article 1.5.7 of the GM Service Policies and Procedures apply, as well as, policies on Dealer Records in Article 1.6, and Administration Allowance Article 1.5.9.

#### **Important:**

Certified dealers should purchase Service Manuals, Labor Time Guides, Essential Tools and Equipment necessary to service all GM Vehicles.

### **Coverage Guidelines/GM Certified Used Vehicle Coverage**

These vehicles are covered by a GM Certified Used Vehicle Warranty which provides warranty coverage separate from the GM New Vehicle Warranty. For repairs performed under the GM Certified Used Vehicle Warranty, policies and procedures published in the GM Certified Used Vehicle Operations Guide apply.

Customer handling should be no different than if their vehicle were within the limits of the New Vehicle Warranty except that the vehicle coverage may differ somewhat and should be explained to the customer.

Service Management and Service Consultants are to become familiar with the warranty coverage and contact the GMPP Claim Center at 1-800-MIC-CARE (1-800-642-2273) to confirm component/vehicle coverage and obtain repair approval prior to proceeding with repairs.

#### **NEW VEHICLE WARRANTY COVERAGE**

For repairs performed under the New Vehicle Warranty, policies and procedures published in the GM Service Policies and Procedures Manual apply.

<b>GM Certified Used Vehicles Purchased Prior to Expiration of the New Vehicle Warranty</b>	<b>GM Certified Used Vehicles Purchased After Expiration of Bumper-to-Bumper Portion of the New Vehicle Warranty</b>
Remaining New Vehicle Warranty Coverage including Emissions and Corrosion Rust-Through Coverage.	1 year/12,000 mile GM Certified Used Vehicle Coverage from date of used vehicle purchase, which includes: - towing coverage and road service - rental coverage
GM used vehicle "wrap-around" coverage effective on the date of used vehicle purchase.	
After expiration of Bumper-to-Bumper coverage, Certified Used Vehicle Coverage rounds up to 4 years/50,000 miles from the date of original New Vehicle Purchase. (5 years/62,000 miles on Aurora)	<b>Important:</b> New Vehicle Warranty Emissions and Corrosion Rust-Through coverage continues in effect up to their time and mileage expiration limits.
Divisional Roadside Assistance and Courtesy Transportation are in effect on eligible GM Certified Vehicles within their respective warranties.	
GM Certified Used Vehicle Warranty Towing Coverage, Road Service and Rental Coverage are in effect on eligible vehicles for non-new vehicle warranty repairs.	

The chart above as well as the chart shown at the end of this bulletin provides a brief summary of coverages when a certified vehicle is within or beyond the New Vehicle Warranty. Refer to the GM Certified Used Vehicle Limited Warranty and Owner Assistance Information booklet and the appropriate New Vehicle Warranty and Owner Assistance Information booklet for coverage details.

### **Warranty Coverage - Cause of Failure**

The GM Certified Used Vehicle Warranty provides "wrap-around" coverage during the Bumper-Bumper coverage period that rounds up to 4 years/50,000 miles (5 years/62,000 miles on Aurora) The following policies apply:

The GM Certified Used Vehicle Warranty covers failures resulting from causes beyond defects in materials or workmanship.

Failure means a covered part does not function as intended and is not the result of any of the items listed in the GM Certified Used Vehicle Warranty under "What is Not Covered."

If a failure is not covered by the New Vehicle Warranty during the Bumper-to-bumper coverage period, the GM Certified Used Vehicle Warranty will provide coverage as long as the part/component is covered and the cause of failure is not due to abuse, misuse or neglect.

### **GM Certified Used Vehicle Warranty Verification**

Each purchaser of a GM Certified Used Vehicle will receive a GM Certified Used Vehicle Warranty and Owner Assistance Information booklet at the time of delivery. Dealer is to complete the booklet to contain the selling Certified Dealer name, the customer's name, address, VIN, purchase date and odometer reading (miles) of the vehicle when purchased as a GM Certified Used Vehicle.

In the event the customer visits a GM Dealer during the New Vehicle Warranty coverage period or during the GM Certified Used Vehicle Warranty coverage period, warranty coverage may be verified by referencing:

1. GM Certified Used Vehicle Limited Warranty and Owner Assistance Information booklet
2. Vehicle Information Service System (VISS)
3. 1-800 MIC CARE (1-800-642-2273)
4. Selling Dealer documents
5. Nameplate Warranty and Owner Assistance Information booklet

## **Warranty Administration**

During the GM Certified Used Vehicle Warranty period administration of the warranty will be the responsibility of MIC. This includes the "wrap-around" coverage in effect during the New Vehicle Warranty.

During any unused portion of the New Vehicle Warranty coverage period, Division service contact representative will administer the New Vehicle Warranty on nameplate vehicles. BMD service contact representative will be responsible for Non-Nameplate vehicles.

Goodwill adjustment consideration is administered by the appropriate nameplate division. Normal divisional guidelines should be followed. Questions concerning divisional guidelines should first be addressed by referring to GM Service Bulletin 57-05-01 (dated April 1995, filed in Warranty Administration section) followed by contacting your divisional representative if necessary.

## **Courtesy Transportation**

Vehicles requiring warranty repairs during the New Vehicle Warranty and GM Certified Used Vehicle Warranties may be eligible for courtesy transportation. For details refer to the GM Service Policies and Procedures Manual, GM Certified Used Vehicle Operations Guide, and/or corresponding bulletins released on the subject.

## **Campaigns**

Until otherwise notified, due to pre-shipped parts, special tool requirements, safety issues and bulletins with specific repair procedures, vehicles with open campaigns must be completed and the claim submitted by a Nameplate GM dealer.

## **Dealer Reimbursement Guidelines (Warranty Claims Submission)**

There are two different dealer reimbursement methods depending on which warranty coverage is in effect.

1. Repairs performed on Certified Vehicles that are not included in the New Vehicle Warranty coverage.  
  
After component/vehicle coverage has been confirmed by contacting GMPP Claim Center at 1-800-MIC-CARE (1-800-642-2273), submit a GMPP claim using the existing claims process.
2. Repairs performed on Certified Vehicles covered by the New Vehicle Warranty.  
  
All existing claims submission rules apply for claims involving Nameplate vehicles. When Certified Dealers are submitting claims for Non-nameplate vehicles, all existing claims submission rules apply along with the following additional items.  
  
Claim Type "8" must be used beginning December 1, 1996 for Non-nameplate warranty claims on certified vehicles only. **Note:** The use of Claim Type "8" is limited to GM Certified Used Vehicle dealers only. Contact your BMD service contact representative for claims assistance if necessary.

Authorization code G is required in conjunction with Claim Type "8."

Dealers performing Non-nameplate warranty repairs are to follow Business Management Division (BMD) empowerment guidelines. (e.g. O.L.H. limitations, Restricted Labor Operations, etc).

Repairs made to vehicles that are not covered by the New Vehicle Warranty are to be handled according to terms of the GM Certified Used Vehicle Warranty and MIC claims processing procedures. This includes courtesy transportation claims and claims for replacement of failed parts/components that were not the result of warrantable defects during the used vehicle "wrap-around" coverage previously explained in this bulletin. This type of claim is not to be submitted as a New Vehicle Warranty claim.

For New Vehicle Warranty claims handling information see the GM Service Policies and Procedures Manual, Article 1.5 (Payments to Dealers) and the WINS Claims Processing Manual.

**Important:**

A copy of the information shown under the heading of Dealer Reimbursement Guidelines (Warranty Claims Submission) should be retained in the WINS Claims Processing Manual for future reference. This information will be included in the next WINS Claims Processing Manual revision.

## **Customer Reimbursements**

### **GM CERTIFIED USED VEHICLE WARRANTY COVERAGE**

Customer reimbursements for repairs covered by the GM Certified Used Vehicle Warranty should be referred to the GMPP Claims Hotline at 1-800-642-7000 for assistance.

### **NEW VEHICLE WARRANTY COVERAGE**

Customer reimbursements for repairs covered by the New Vehicle Warranty are to be handled according to the information listed in the GM Service Policies and Procedures Manual, Article 1.5.14, and the WINS Claims Processing Manual, Section VII, item 11.

Customer reimbursements involving a Nameplate vehicle are to follow existing claims processing procedures. Customer reimbursements involving a Non-nameplate GM vehicle are to be submitted using a Claim Type "8" along with authorization code G.

## **Warranty Repairs on Used Vehicles In Inventory**

If a campaign or warrantable repair is needed on a used Nameplate vehicle in inventory for which the Certified Dealer has a signed Dealer Sales and Service Agreement, the repair(s) can be performed. In the event a warrantable repair is needed on a Non-nameplate used vehicle in inventory for a GM vehicle line for which the Certified Dealer does not have a signed Dealer Sales and Service Agreement, that vehicle must be taken to a Nameplate dealer for warranty repair. The ability to perform warranty repairs on Non-nameplate vehicles is initiated following the vehicle being certified and sold retail.

If a campaign repair is needed on a used Non-nameplate vehicle in inventory, the repair must be performed by a Nameplate dealer.

## **Reconditioning**

Reconditioning or refurbishing a GM vehicle (not to be submitted as a New Vehicle Warranty claim) refers to improving the vehicle's condition and value prior to its resale. This involves repair or replacement of maintenance items, wear and tear components, damage to the vehicle, or any other non-warrantable failure. This type of repair is not to be submitted as a New Vehicle Warranty Claim.

For example, if a seat has a cut, it is damaged, NOT defective, but would require repair or reconditioning. Reconditioning or refurbishing involves improving the value of the vehicle prior to its resale, and would include repairs/replacements such as worn brake pads, damaged trim and upholstery, repairing chips, scratches and nicks in the vehicle's paint surface and general maintenance items, etc. RECONDITIONING OR REFURBISHING DIFFERS FROM WARRANTY. A manufacturer's warranty deals only with defects in materials and workmanship while the vehicle is under the New Vehicle or Emissions Warranties. For more information on non-warrantable items involving the New Vehicle Warranty refer to the GM Service Policies and Procedures Manual, Article 1.2, Warranty Coverage Guidelines. Concerning items not covered by the GM Certified Used Vehicle Limited Warranty refer to the GM Certified Used Vehicle Limited Warranty and Owner Assistance Information booklet or GM Certified Used Vehicle Operations Guide.

## **Inspection and Warranty Repairs**

Certified Dealers must thoroughly inspect used vehicles and adhere to both mechanical and appearance standards prior to certification and sale to a customer.

This improvement process MUST NOT be associated with repairing warrantable defects. However, required repairs to legitimate warrantable defects during the warranty period must be addressed during the inspection process.

In the event a suspected warranty defect is discovered by the Reconditioning Technician during the inspection process, it is to be brought to the attention of Service management for a decision to either warrant the item (Manufacturer responsibility) or recondition the item (Dealer responsibility).

## **Buy-Back Vehicles**

To uphold the integrity of the GM Certified Used Vehicle process, GM buy-back vehicles will not be eligible for certification and cannot be sold as GM Certified Used Vehicles. Such vehicles include Dealer Empowered Trade Assistance (DETA), division requested trade-outs, arbitration, customer satisfaction repurchase, or any other buy-back vehicles for similar reasons.

## **Diesel Engine Repairs/Deductible**

The GM Certified Used Vehicle Warranty will pay the deductible amount on Light Duty Trucks that have a 5 year/100,000 mile diesel engine warranty, which is subject to a \$100 deductible amount beyond the Bumper to Bumper coverage period of the New Vehicle Warranty. The customer is not to be charged the deductible. Dealers requesting reimbursement for the warranty deductible amount should report the claim(s) to the GMPP Claim Center at 1-800-MIC-CARE (1-800-642-2273), obtain a claim number and submit a GMPP claim for the \$100 deductible amount using the existing claims process.

## **Corrosion Protection and Emissions Warranties**

When a Non-Nameplate Dealer sells a certified used vehicle with remaining New Vehicle Warranty, the Certified Dealer can perform warranty repairs on corrosion related defects and emissions warranties that extend beyond the GM Certified Used Vehicle coverage period.

## **U.S. Touring Owner Service**

Customers who have purchased GM Certified Used Vehicles, that are still within the terms of the New Vehicle Warranty continue to have warranty coverage as explained in the GM Service Policies and Procedures Manual, Article 1.4.9. Beyond the terms of the New Vehicle Warranty, purchasers of GM Certified Used vehicles are covered by the GM Certified Used Vehicle Warranty within the continental United States, Alaska, Hawaii and Canada. Details can be found in the GM Certified Used Vehicle Limited Warranty and Owner Assistance Information booklet.

Technical Service Bulletin # **310503C**

Date: **961201**

## **Warranty - Claim Processing**

File In Section: Warranty Administration

Bulletin No.: 31-05-030

Date: December, 1996

Subject:  
Warranty Claims Processing

Models:  
All Buick, Cadillac, Chevrolet, GMC, Oldsmobile and Pontiac Models

Attention:  
Warranty Claims Administrator and Service Manager

This bulletin is being revised to update the GM Warranty claims validation schedule for the 1997 calendar year. Please discard Bulletin 31-05-03B (Section 5 - Warranty Administration).

Enclosed is the General Motors Warranty claims validation schedule with cycle numbers. All claim memos will be dated on the ACTUAL DATE of processing. If you have any questions concerning the new cycle schedule, contact your Divisional Service Representative.

Cadillac

Claims submitted via DCS through Wednesday will be validated Thursday and the claim memo will arrive in your DCS mailbox on Friday.

Oldsmobile

Oldsmobile Division Retailers will have Friday as the cutoff day for weekly warranty submissions. However, Oldsmobile warranty claims will not be processed until the following Sunday night. The claim memo will then be available electronically in your DCS mailbox on Monday and printed on Tuesday.

Pontiac

The cutoff day for claim submission will be Monday. Pontiac will validate claims Tuesday and the claim memo will arrive in your DCS mailbox on Wednesday.

Buick

Claims submitted via DCS through Tuesday will be validated on Wednesday and the claim memo will arrive in your DCS mailbox on Thursday.

Chevrolet

Claims submitted via DCS through Thursday will be validated Friday and the claim memo will arrive in your DCS mailbox on Monday.

GMC Truck

Claims submitted to GMC Truck (all GMC Truck and Chevrolet Medium Duty) through Friday will be validated Monday night. Claim memos will be available on Tuesday mornings.

OLDSMOBILE 1997 CYCLE DATE MONDAY	GMC TRUCK 1997 CYCLE DATE MONDAY	PONTIAC 1997 CYCLE DATE TUESDAY	BUICK 1997 CYCLE DATE WEDNESDAY	CADILLAC 1997 CYCLE DATE THURSDAY	CANADA 1997 CYCLE DATE THURSDAY	CHEVROLET 1997 CYCLE DATE FRIDAY	WEEK ENDING
701 12/31/96 (01/01)	701 12/31/96 (01/01)	701 12/31/96 (01/01)	701 01/01 (01/01)	701 01/02	701 01/02	701 01/03	01/04/97
702 01/06	702 01/06	702 01/07	702 01/08	702 01/09	702 01/09	702 01/10	01/11/97
703 01-13	703 01-13	703 01-14	703 01-15	703 01-16	703 01-16	703 01-17	01/18/97
704 01/20	704 01/20	704 01/21	704 01/22	704 01/23	704 01/23	704 01/24	01/25/97
705 01/27	705 01/27	705 01/28	705 01/29	705 01/30	705 01/30	705 01/31 (02/01)	02/01/97
706 02/03	706 02/03	706 02/04	706 02/05	706 02/06	706 02/06	706 /01 706 02/07	02/08/97
707 02/10	707 02/10	707 02/11	707 02/12	707 02/13	707 02/13	707 02/14	02/15/97
708 02/17	708 02/17	708 02/18	708 02/19	708 02/20	708 02/20	708 02/21	02/22/97
709 02/24	709 02/24	709 02/25	709 02/26	709 02/27	709 02/27	709 02/28 (03/01)	03/01/97
710 03/03	710 03/03	710 03/04	710 03/05	710 03/06	710 03/06	710 03/07	03/08/97
711 03/10	711 03/10	711 03/11	711 03/12	711 03/13	711 03/13	711 03/14	03/15/97
712 03/17	712 03/17	712 03/18	712 03/19	712 03/20	712 03/20	712 03/21	03/22/97
713 03/24	713 03/24	713 03/25	713 03/26	713 03/27	713 03/27	713 03/28	03/29/97

\*Statement Ending Date (Month End)

11/25/96

OLDSMOBILE 1997 CYCLE DATE	GMC TRUCK 1997 CYCLE DATE	PONTIAC 1997 CYCLE DATE	BUICK 1997 CYCLE DATE	CADILLAC 1997 CYCLE DATE	CANADA 1997 CYCLE DATE	CHEVROLET 1997 CYCLE DATE	WEEK ENDING
714 03/31	* 714 03/31 (04/01)	714 04/01	714 04/02	714 04/03	714 04/03	714 04/04	04/05/97
715 04/07	715 04/07	715 04/08	715 04/09	715 04/10	715 04/10	715 04/11	04/12/97
716 04/14	716 04/14	716 04/15	716 04/16	716 04/17	716 04/17	716 04/18	04/19/97
717 04/21	717 04/21	717 04/22	717 04/23	717 04/24	717 04/24	717 04/25	04/26/97
718 04/28	* 718 04/28	718 04/29	* 718 04/30 (05/01)	718 05/01	718 05/01	718 05/02	05/03/97
719 05/05	719 05/05	719 05/06	719 05/07	719 05/08	719 05/08	719 05/09	05/10/97
720 05/12	720 05/12	720 05/13	720 05/14	720 05/15	720 05/15	720 05/16	05/17/97
721 05/19	721 05/19	721 05/20	721 05/21	721 05/22	721 05/22	721 05/23	05/24/97
722 05/26	* 722 05/26	722 05/27	722 05/28	722 05/29	722 05/29	722 05/30	05/31/97
723 06/02	723 06/02	723 06/03	723 06/04	723 06/05	723 06/05	723 06/06	06/07/97
724 06/09	724 06/09	724 06/10	724 06/11	724 06/12	724 06/12	724 06/13	06/14/97
725 06/16	725 06/16	725 06/17	725 06/18	725 06/19	725 06/19	725 06/20	06/21/97
726 06/23	726 06/23	* 726 06/24	* 726 06/25	* 726 06/26	* 726 06/26	* 726 06/27	06/28/97

\*Statement Ending Date (Month End)

OLDSMOBILE 1997 CYCLE DATE MONDAY	GMC TRUCK 1997 CYCLE DATE MONDAY	PONTIAC 1997 CYCLE DATE TUESDAY	BUICK 1997 CYCLE DATE WEDNESDAY	CADILLAC 1997 CYCLE DATE THURSDAY	CANADA 1997 CYCLE DATE THURSDAY	CHEVROLET 1997 CYCLE DATE FRIDAY	WEEK 1997 ENDING
727	* 727	727	727	727	727	727	07/05/97
06/30	06/30 (07/01)	07/01	07/02	07/03	07/03	07/04	
728	728	728	728	728	728	728	07/12/97
07/07	07/07	07/08	07/09	07/10	07/10	07/11	
729	729	729	729	729	729	729	07/19/97
07/14	07/14	07/15	07/16	07/17	07/17	07/18	
730	730	730	730	730	* 730	730	* 07/26/97
07/21	07/21	07/22	07/23	07/24	07/24	07/25	
731	* 731	731	731	* 731	731	731	08/02/97
07/28	07/28	07/29	07/30	07/31 (08/01)	07/31 (08/01)	08/01	
732	732	732	732	732	732	732	08/09/97
08/04	08/04	08/05	08/06	08/07	08/07	08/08	
733	733	733	733	733	733	733	08/16/97
08/11	08/11	08/12	08/13	08/14	08/14	08/15	
734	734	734	734	734	734	734	08/23/97
08/18	08/18	08/19	08/20	08/21	08/21	08/22	
735	* 735	735	735	* 735	735	735	* 08/30/97
08/25	08/25	08/26	08/27	08/28	08/28	08/29	
736	736	736	736	736	736	736	09/06/97
09/01	09/01	09/02	09/03	09/04	09/04	09/05	
737	737	737	737	737	737	737	09/13/97
09/08	09/08	09/09	09/10	09/11	09/11	09/12	
738	738	738	738	738	738	738	09/20/97
09/15	09/15	09/16	09/17	09/18	09/18	09/19	
739	739	739	739	* 739	739	739	* 09/27/97
09/22	09/22	09/23	09/24	09/25	09/25	09/26	



OLDSMOBILE 1997 CYCLE DATE	GMC TRUCK 1997 CYCLE DATE	PONTIAC 1997 CYCLE DATE	BUICK 1997 CYCLE DATE	CADILLAC 1997 CYCLE DATE	CANADA 1997 CYCLE DATE	CHEVROLET 1997 CYCLE DATE	WEEK ENDING
740 09/29 MONDAY	* 740 09/29 MONDAY	* 740 09/30 (10/01) TUESDAY	740 10/01 WEDNESDAY	740 10/02 THURSDAY	740 10/02 THURSDAY	740 10/03 FRIDAY	10/04/97
741 10/06	741 10/06	741 10/07	741 10/08	741 10/09	741 10/09	741 10/10	10/11/97
742 10/13	742 10/13	742 10/14	742 10/15	742 10/16	742 10/16	742 10/17	10/18/97
743 10/20	743 10/20	743 10/21	743 10/22	743 10/23	743 10/23	743 10/24	10/25/97
744 10/27	* 744 10/27	* 744 10/28	744 10/29	* 744 10/30	* 744 10/30	744 10/31 (11/01)	11/01/97
745 11/03	745 11/03	745 11/04	745 11/05	745 11/06	745 11/06	745 11/07	11/08/97
746 11/10	746 11/10	746 11/11	746 11/12	746 11/13	746 11/13	746 11/14	11/15/97
747 11/17	747 11/17	747 11/18	747 11/19	747 11/20	747 11/20	747 11/21	11/22/97
748 11/24	* 748 11/24	* 748 11/25	748 11/26	* 748 11/27	* 748 11/27	748 11/28	11/29/97
749 12/01	749 12/01	749 12/02	749 12/03	749 12/04	749 12/04	749 12/05	12/06/97
750 12/08	750 12/08	750 12/09	750 12/10	750 12/11	750 12/11	750 12/12	12/13/97
751 12/15	751 12/15	751 12/16	751/752 12/17	* 751/752 12/18	* 751/752 12/18	* 751/752 12/19	12/20/97
752 12/22	* 752 12/22	* 752 12/23					

\*Statement Ending Date (Month End)

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11/25/96

1997 CALENDAR YEAR WARRANTY CREDIT CYCLES AND CLAIM MEMO DATES

Technical Service Bulletin # 400501A

Date: 960901

**Warranty - Corporate Parts Return Program Instructions**

File In Section: Warranty Administration

Bulletin No.: 40-05-O1A

Date: September, 1996

## **WARRANTY ADMINISTRATION**

**Subject:**  
Corporate Parts Return Program

**Models:**  
1997 and Prior Passenger Cars and Trucks

**Attention:**  
Parts Managers, Service Managers, Warranty Administrators

This bulletin is being revised to advise of various enhancements to the Corporate Parts Return Program/Warranty Parts Center. Please discard Corporate Bulletin Number 400501 (Group Ref. - Warranty Administration).

This bulletin is effective September 1, 1996 and its purpose is to clarify instructions with regard to certain enhancements being made to the Corporate Parts Return (CPR) Program/Warranty Parts Center (WPC) in the areas of parts retention, parts preparation and shipping, and administration.

CPR is considered a valuable tool for root cause analysis of customer product concerns. Recent changes in parts retention and GMSPO procedures have afforded GM the opportunity to enhance the CPR program. Also, for your information, the newly-created GM Warranty Parts Center (WPC) has contracted with United Parcel Service Worldwide Logistics to transport and inventory all parts returned from your dealership via the CPR program. The following information will assist you in returning parts to the Warranty Parts Center.

### **Requests, Reminders and Debits**

**Requests** - When a part and/or repair order copy is needed, your dealership will receive a "GM Part and/or Repair Order Return Request" message via DCS. These requests will normally be received immediately following your weekly warranty claim memo.

#### **Important:**

The Document Number listed on each request is for WPC internal use only.

**Reminders** - A reminder notice of previously requested parts and R.O.'s which have not been received by the WPC will also follow your weekly warranty claim memo. These reminders will be listed in categories of 7 - 14 - 21 days and will list the original request numbers of parts not received at the WPC. Until parts are received, or you have contacted the WPC for non-return of parts, these reminders will continue through the 21-day time period. If the original request is misplaced or unreadable, contact the WPC for assistance (810-371-9901/9902).

See Attachments 1 and 2 for examples of return requests and reminders.

**Debits** - If, after 21 days, a parts request still has not been honored, and you have not contacted the WPC with explanation for non-return of parts, the WPC will submit a total claim debit via the WINS process. The Debit Reason Code WP will be assigned to each debit case.

### **Part Preparation and Shipping**

The return request message will list specific claims for which parts and/or repair orders are to be returned as follows:

ALL PARTS ASSOCIATED WITH THE DOCUMENT AND LINE NUMBER ARE TO BE RETURNED. UNDER SEPARATE COVER, YOU WILL RECEIVE A SUPPLY OF PRE-PRINTED UPS/WPC SHIPPING LABELS AND PLASTIC PACKING BAGS WHICH ARE PROVIDED FOR THE PROTECTION OF THE LEGIBLE REPAIR ORDER COPIES, INCLUDING TECHNICIAN COMMENTS, AND COPIES OF THE ORIGINAL CPR "REQUEST". THESE BAGS SHOULD THEN BE SECURELY ATTACHED TO THE APPROPRIATE PART.

If you have not received your initial distribution of this material by September 20, or when additional supplies are needed, please contact the GM Fulfillment Center at 1-800-269-5100 or Fax (313) 525-0659 (see Attachment 3).

There may be instances where multiple return requests are included on one DOS message. In these cases, you must make enough copies of the "request" in order to attach one copy to each returned part. Also, highlight the request pertaining to each part. This will assist the WPC in tracking the parts in order to alleviate any debits to your dealership.

The container from the new/replacement part should be used for the return of the failed part, whenever possible. Parts containing fluids, such as fuel pumps, MUST be drained and placed in an appropriate packing container and securely packaged to prevent leakage or contamination of other parts. Parts and their corresponding plastic bag (containing the R.O. copies and original CPR "request") can be packaged together as a group for shipping purposes not to exceed UPS size and weight limitations. This method will minimize dealer inconvenience and also reduce shipping expense. You should instruct the local UPS driver to pick up the WPO packages twice weekly.

If there are special packaging costs, they should be included as a Net Item amount when submitting your Z7200 claim. Certain situations may include crating an engine assembly, reassembly of components, or draining and sealing components to prevent leakage during shipment. Appropriate handling time for these situations should be calculated at a rate for unskilled labor (not at your warranty or retail labor rate) and appropriately documented on the Z7200 claim.

When returning the parts, attach the pre-printed shipping label to the package and detach the lower portion for your records. Complete the upper left portion with your dealer name and address. At the present time, the Ref. # field should remain blank.

On the rare occasions when a part is not available for return to the WPC, you must either contact the WPC (810-371-9901/9902) or fax the attached form with a valid explanation (see Attachment 4).

#### Warranty Core Parts

All generators, starters, steering gears, and catalytic converters replaced under the New Vehicle Limited Bumper to Bumper warranty are to be retained by the dealership until date of claim credit. These parts are subject to return to the WPC if requested. If these parts are requested and returned to the WPC, the GMSPO core allowance should be submitted as a Net Item amount through your Z7200 claim. If no return request is received via DOS, the core part should be returned to GMSPO.

THE RULE FOR ALL OTHER CORE PARTS RETURN REMAINS IN EFFECT. DEALERS SHOULD CONTINUE TO RETURN THESE OTHER FAILED PARTS TO GMSPO AS SOON AS POSSIBLE AFTER THE FAILED PART IS REMOVED FROM THE VEHICLE.

#### Hazardous Material

At the present time, the WPC will not be requesting any part that is considered hazardous. If you receive a request and the part is considered hazardous, or if the UPS driver refuses to accept a package that may be hazardous, contact the WPC immediately.

#### Repair Order Only Requests

If you receive a "Repair Order Only" request, please return legible copies of the R.O. including all technician comments directly to the requester.

### Return Reimbursement

The following qualify for dealer reimbursement:

#### 1. Administrative Allowances

A range from 0.0 to 0.3 hours can be claimed for each line involving the return of parts and copies of R.O.'s including technician comments. The time requested for reimbursement depends on the complexity of the request as determined by the dealer.

A range from 0.0 to 0.2 hours can be claimed for each line where only the requested repair order copies are returned, again as determined by the dealer.

This reduction in Administrative Allowances is being made because you will no longer need to call for pickup of parts for shipping, postage is pre-paid, and less administration is needed for program.

#### 2. Shipping Expenses

There will be no dealer-incurred postage or shipping costs associated with the UPS pickup. In the rare cases where UPS is unable to pickup parts due to size or weight limitations and another carrier is used, submit your postage and/or shipping expenses as a Net Item via your Z7200 claim.

#### 3. Packaging Material Costs, where applicable

Packaging material costs are to be calculated and billed at a cost for unskilled labor, and not at the dealer's warranty or retail labor rate.

#### 4. GMSPO Core Part Allowance Amounts, where applicable.

#### Method of Reimbursement

Field of Entry	Enter
RO #	Repair Order #
RO Date	Date of shipment
VIN	Enter one of the valid VINS from the return requests being reimbursed on the claim.
ODOMETER	Enter mileage for the same VIN
S. ADVISOR	Enter Service Advisor's/ Manager's I.D. Number
TYP	Enter "F"
CC	Enter "MD"
FC	Enter "00"
LBROP	Enter "Z7200"
LHRS	From 0.0 to 0.3 hours for each part requested with repair order and 0.0 to 0.2 hours for each "repair order only" request being reimbursed on this claim.
TECH-#	Enter the Service Advisor's/Manager's I.D. Number.
NET-ITM	Total amount of prepaid shipping and postage for a carrier other than UPS, packaging, administrative allowances, and applicable part core charges.

Up to ten parts return requests may be recorded on one R.O. for return reimbursement. R.O. entries must include the VIN, request number, number of parts returned, and associated costs. Submit a claim using the normal submission procedure and Labor Operation Z7200 with claim type "F". All related documentation, including the return request, must be retained for future reference in accordance with the GM Service Policies & Procedures Manual, Article 1.6.

#### Dealer/Retailer Feed back

The WPC recognizes the need to provide information regarding our progress and accomplishments in product improvements as a direct result of the Corporate Parts Return program. Information gathered by WPC will be provided to dealers.

**PART RETURN REQUEST EXAMPLE:**

GM PART AND/OR R.O. RETURN REQUEST(S) FOR DEALER XXXXX-CLAIM MEMO XXX

CLAIM LINES LISTED BELOW INVOLVE PARTS AND/OR REPAIR ORDERS REQUIRED FOR PRODUCT REVIEW. PLEASE RETURN A LEGIBLE COPY OF THE R.O. (INCLUDING TECHNICIAN COMMENTS), A COPY OF THIS REQUEST, AND, IF INDICATED, ALL PARTS PERTAINING TO THE SPECIFIC REPAIR LINE INDICATED.

PARTS AND THEIR REPAIR ORDERS CAN BE BATCHED AND WILL BE PICKED UP BY UPS TWICE WEEKLY. R.O.'S ONLY SHOULD BE RETURNED TO THE REQUESTER VIA THE U.S. POSTAL SERVICE USING THE MAILING LABEL.

ALL FLUIDS MUST BE DRAINED FROM PARTS BEING RETURNED. PLACE COPIES OF R.O. AND REQUEST IN PLASTIC BAG AND SECURELY ATTACH TO PART.

SPECIAL INSTRUCTIONS: WANT PART & REPAIR ORDER

PLEASE RETURN BOTH PART AND REPAIR ORDER

REQUEST NUMBER	DOCUMENT NUMBER	LN NO	RO DATE	RO NUMBER	VEHICLE ID NUMBER	LABOR CODE
YYJJJ###	000290	01	042696	163067	1G6KFS290TU278381	H1220
YYJJJ###	000330	02	042296	018675	1GCEC14Z3SZ157998	D1180
YYJJJ###	000332	04	042296	018927	2G1WL52MXS9135972	D0790
YYJJJ###	000240	07	042396	018839	2GCEC19K1S1271972	R0916
YYJJJ###	000241	08	042996	019780	1GNCS13W4T2150230	J5500

\*\*\*\*\*  
LISTED BELOW ARE REQUESTS THAT HAVE NOT BEEN RECEIVED AT THE WARRANTY PARTS CENTER AS OF THIS DATE. IF THERE ARE QUESTIONS OR COMMENTS PLEASE CONTACT THE WPC AT (810) 371-9901/2

**REQUEST NUMBER**

REQUESTS ARE 7 TO 13 DAYS OLD

YYJJJ###

YYJJJ###

REQUESTS ARE 14 TO 20 DAYS OLD

YYJJJ###

YYJJJ###

REQUESTS ARE AT LEAST 21 DAYS OLD

YYJJJ###

YYJJJ###

END OF REPORT

**REQUEST FOR REPAIR ORDER ONLY EXAMPLE:**

GM PART AND/OR R.O. RETURN REQUEST(S) FOR DEALER XXXXX-CLAIM MEMO XXX

CLAIM LINES LISTED BELOW INVOLVE PARTS AND/OR REPAIR ORDERS REQUIRED FOR PRODUCT REVIEW. PLEASE RETURN A LEGIBLE COPY OF THE R.O. (INCLUDING TECHNICIAN COMMENTS), A COPY OF THIS REQUEST, AND, IF INDICATED, ALL PARTS PERTAINING TO THE SPECIFIC REPAIR LINE INDICATED.

PARTS AND THEIR REPAIR ORDERS CAN BE BATCHED AND WILL BE PICKED UP BY UPS TWICE WEEKLY. R.O.'S ONLY SHOULD BE RETURNED TO THE REQUESTER VIA THE U.S. POSTAL SERVICE USING THE MAILING LABEL.

ALL FLUIDS MUST BE DRAINED FROM PARTS BEING RETURNED. PLACE COPIES OF R.O. AND REQUEST IN PLASTIC BAG AND SECURELY ATTACH TO PART.

TO: DELPHI CHASSIS SYSTEMS  
C/O OMEGA TOOL & DIE  
6192 NORTH WEBSTER DRIVE  
ATTN.: JOE SMITH  
DAYTON, OH 454140000

\*\*\*\*\*MAILING LABEL\*\*\*\*\*  
\* DELPHI CHASSIS SYSTEMS \*  
\* C/O OMEGA TOOL & DIE \*  
\* 6192 NORTH WEBSTER DRIVE \*  
\* ATTN.: JOE SMITH \*  
\* DAYTON, OH 454140000 \*  
\*\*\*\*\*

SPECIAL INSTRUCTIONS: WANT REPAIR ORDER ONLY

PLEASE RETURN THE REPAIR ORDER ONLY

DOCUMENT NUMBER	LN NO	RO DATE	RO NUMBER	VEHICLE ID NUMBER	LABOR CODE
000290	01	042696	163067	1G6KF5290TU278381	H1220
000231	03	042996	019666	1GBGC344SE183920	H1220
000241	05	042996	019780	1GNCS13W4P2150230	R0940

\*\*\*\*\*  
LISTED BELOW ARE REQUESTS THAT HAVE NOT BEEN RECEIVED AT THE WARRANTY PARTS CENTER AS OF THIS DATE. IF THERE ARE QUESTIONS OR COMMENTS PLEASE CONTACT THE WPC AT (810) 371-9901/2

REQUEST NUMBER

REQUESTS ARE 7 TO 13 DAYS OLD

YYJJJ###

YYJJJ###

REQUESTS ARE 14 TO 20 DAYS OLD

YYJJJ###

YYJJJ###

REQUESTS ARE AT LEAST 21 DAYS OLD

YYJJJ###

YYJJJ###

END OF REPORT

DATE: \_\_\_\_/\_\_\_\_/\_\_\_\_

**TO: GM FULFILLMENT CENTER**  
**FAX: 313-525-0659****RE: WARRANTY PARTS CENTER (WPC) MATERIAL REQUEST**

Please mail the following WPC items to the dealer listed below:

WPC001	Plastic Packing Bags	_____ (50 per package)
WPC002	WPC/UPS Shipping Labels	_____ (50 per package)
WPC003	UPS International Waybill	_____ (50 per package)
WPC004	Waybill Pouch	_____ (50 per package)

Please Print Legibly

<b>BUSINESS MANAGEMENT DEALER CODE</b>	_____
<b>DEALER NAME</b>	_____
<b>ADDRESS</b>	_____
<b>CITY, STATE (PROVINCE)</b>	_____
<b>COUNTRY</b>	_____
<b>ZIP CODE</b>	_____

Form WPC005  
Rev. 8/96

DATE: \_\_\_\_/\_\_\_\_/\_\_\_\_

SUBJECT: Parts Return Request

TO: Warranty Parts Center  
FAX - 810-371-5500

We are unable to fulfill the indicated Warranty Parts Center request asking for parts replaced on behalf of General Motors Corporation. These parts cannot be returned because of the reason(s) below. Please remove the following from the request listing and take no further action on this particular request.

REQUEST NUMBER \_\_\_\_\_

DOCUMENT NUMBER \_\_\_\_\_

R.O. NUMBER \_\_\_\_\_

DEALER CODE \_\_\_\_\_

DEALER NAME \_\_\_\_\_

DEALER CITY, STATE \_\_\_\_\_  
(PROVINCE)

REASON FOR NON-RETURN:

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AUTHORIZED DEALER REPRESENTATIVE \_\_\_\_\_

TITLE \_\_\_\_\_

Form WPC006  
Rev. 8/96

ATTACHMENT 4 Technical Service Bulletin # 531021

Date: 951101

**Waterleak - Diagnostic Guide**

File In Section: 10 - Body

Bulletin No: 53-10-21

Date: November, 1995

## INFORMATION

Subject:  
Waterleak Diagnostic GuideModels:  
1987-96 Chevrolet Beretta, Corsica Condition



Cause	Correction
1. Sealer skip/void or spot weld burn through at plenum seam. Refer to Figures 1 and 2.	1. Remove air inlet screen. Refer to Section 10-5 of the Service Manual. 2. Inspect for a skip or void in the plenum seam sealer or for spot weld burn through. 3. Apply clear sealer to any skip or void in the plenum seam sealer or to any spot weld burn through. 4. Allow sealer to dry. 5. Direct water over the plenum seam. 6. Inspect from passenger compartment for leaks. 7. Install air inlet screen. Refer to Section 10-5 of the Service Manual.
2. Sealer skip/void or spot weld burn through at the right front body hinge pillar seam. Refer to Figure 3.	1. Inspect for a skip or void in the right front body hinge pillar seam sealer or for spot weld burn through. 2. Apply clear sealer to any skip or void in the right front body hinge pillar seam sealer or to any spot weld burn through. 3. Allow sealer to dry. 4. Direct water over the right front body hinge pillar seam. 5. Inspect from passenger compartment for leaks.
3. Sealer skip/void or spot weld burn through at the right side shroud seam. Refer to Figure 4.	1. Inspect for a skip or void in the right side shroud seam sealer or for spot weld burn through. 2. Apply clear sealer to any skip or void in the right side shroud seam sealer or to any spot weld burn through. 3. Allow sealer to dry. 4. Direct water over the right side shroud seam. 5. Inspect from passenger compartment for leaks.

Cause	Correction
4. Distortion or void in ECM connector gasket. Refer to Figure 5.	<ol style="list-style-type: none"> <li>1. Remove air Inlet screen. Refer to Section 10-5 of the Service Manual.</li> <li>2. Inspect for lumps in the seam sealer which could distort the ECM connector gasket. Refer to Step 6 if there are not any lumps in the seam sealer which could cause the ECM gasket to distort.</li> <li>3. Remove the ECM connector.</li> <li>4. Remove seam sealer lumps.</li> <li>5. Install ECM connector.</li> <li>6. Inspect for a void in the ECM connector gasket.</li> <li>7. Apply clear sealer around entire perimeter of ECM connector.</li> <li>8. Allow sealer to dry.</li> <li>9. Direct water around ECM connector.</li> <li>10. Inspect from passenger compartment for leaks.</li> <li>11. Install air Inlet screen. Refer to Section 10-5 of the Service Manual.</li> </ol>
5. Distortion or void in HVAC air inlet stack assembly gasket. Refer to Figure 6.	<ol style="list-style-type: none"> <li>1. Remove air Inlet screen. Refer to Section 10-5 of the Service Manual.</li> <li>2. Inspect for lumps in the seam sealer which could distort the HVAC air Inlet stack gasket. Refer to Step 6 if there are not any lumps in the seam sealer which could cause the HVAC air inlet stack gasket to distort.</li> <li>3. Remove HVAC air Inlet stack.</li> <li>4. Remove seam sealer lumps.</li> <li>5. Install HVAC air Inlet stack.</li> <li>6. Inspect for a void in the HVAC air Inlet stack assembly gasket.</li> <li>7. Apply clear sealer around entire perimeter of HVAC air inlet cover base.</li> <li>8. Allow air sealer to dry.</li> <li>9. Direct water around HVAC air inlet stack assembly gasket.</li> <li>10. Inspect from passenger compartment for leaks.</li> <li>11. Install air Inlet screen. Refer to Section 10-5 of the Service Manual.</li> </ol>

Carpet Wet Under Right Side Of Instrument Panel

Cause	Correction
1. Sealer skip/void or spot weld burn through at plenum seam. Refer to Figures 1 and 2.	<ol style="list-style-type: none"> <li>1. Remove air inlet screen. Refer to Section 10-5 of the Service Manual.</li> <li>2. Inspect for a skip or void in the plenum seam sealer or for spot weld burn through.</li> <li>3. Apply clear sealer to any skip or void in the plenum seam sealer or to any spot weld burn through.</li> <li>4. Allow sealer to dry.</li> <li>5. Direct water over the plenum seal.</li> <li>6. Inspect from passenger compartment for leaks.</li> <li>7. Install air inlet screen. Refer to Section 10-5 of the Service Manual.</li> </ol>

Cause	Correction
2. Sealer skip/void or spot weld burn through at the left front body hinge pillar seam. Refer to Figure 3.	<ol style="list-style-type: none"> <li>1. Inspect for a skip or void in the left front body hinge pillar seam sealer or for spot weld burn through.</li> <li>2. Apply clear sealer to any skip or void in the left front body hinge pillar seam sealer or to any spot weld burn through.</li> <li>3. Allow sealer to dry.</li> <li>4. Direct water over the left front body hinge pillar seam.</li> <li>5. Inspect from passenger compartment for leaks.</li> </ol>
3. Sealer skip/void or spot weld burn through at the left side shroud seam. Refer to Figure 7.	<ol style="list-style-type: none"> <li>1. Inspect for a skip or void in the left side shroud seam sealer or for spot weld burn through.</li> <li>2. Apply clear sealer to any skip or void in the left side shroud seam sealer or to any spot weld burn through.</li> <li>3. Allow sealer to dry.</li> <li>4. Direct water over the left side shroud seam.</li> <li>5. Inspect from passenger compartment for leaks.</li> </ol>
4. Hood release cable grommet not seated or distorted. Refer to Figure 8.	<ol style="list-style-type: none"> <li>1. Inspect for lumps in the seam sealer which could distort the hood release cable grommet. Refer to Step 5 if there are not any lumps in the seam sealer which could cause the hood release cable grommet to distort.</li> <li>2. Remove the hood release cable grommet.</li> <li>3. Remove seam sealer lumps.</li> <li>4. Install the hood release cable grommet.</li> <li>5. Assure the hood release cable grommet is seated.</li> <li>6. Apply clear sealer around entire perimeter of the hood release cable grommet.</li> <li>7. Allow sealer to dry.</li> <li>8. Direct water around the hood release grommet.</li> <li>9. Inspect from passenger compartment for leaks.</li> </ol>
5. Accelerator cable grommet not seated or distorted. Refer to Figure 9.	<ol style="list-style-type: none"> <li>1. Inspect for lumps in the seam sealer which could distort the accelerator cable grommet. Refer to Step 5 if there are not any lumps in the seam sealer which could cause the accelerator cable grommet to distort.</li> <li>2. Remove the accelerator cable grommet.</li> <li>3. Remove seam sealer lumps.</li> <li>4. Install the accelerator cable grommet.</li> <li>5. Assure the accelerator cable grommet is seated.</li> <li>6. Apply clear sealer around entire perimeter of the accelerator cable grommet.</li> <li>7. Allow sealer to dry.</li> <li>8. Direct water around the accelerator cable grommet.</li> <li>9. Inspect from passenger compartment for leaks.</li> </ol>

Cause	Correction
8. Distortion or void in bulkhead connector gasket. Refer to Figure 10.	<ol style="list-style-type: none"> <li>1. Inspect for lumps in seam sealer which could distort the bulkhead connector gasket. Refer to Step 5 if there are not any lumps in the seam sealer which could cause the bulkhead connector gasket to distort.</li> <li>2. Remove the bulkhead connector.</li> <li>3. Remove seam sealer lumps.</li> <li>4. Install the bulkhead connector.</li> <li>5. Inspect for a void in the bulkhead connector gasket.</li> <li>6. Apply clear sealer around entire perimeter of bulkhead connector.</li> <li>7. Allow sealer to dry.</li> <li>8. Direct water around the bulkhead connector.</li> <li>9. Inspect from passenger compartment for leaks.</li> </ol>

Cause	Correction
1. Insufficient door weatherstrip compression.	1. Adjust door alignment. Refer to Section 10-6 of the Service Manual.
2. Pinched door weatherstrip.	1. Inspect door alignment. 2. Align door, if needed. Refer to Section 10-6 of the Service Manual. 3. Replace door weatherstrip.
3. Void between door weatherstrip carrier and pinch weld.	1. Apply a solution of 50% soap and 50% water around the exterior of the weatherstrip carrier. 2. Apply 40 psi air pressure around the interior of the weatherstrip carrier. 3. Inspect for soap bubbles. 4. Pull weatherstrip from pinch weld at void. 5. Pinch weatherstrip carrier at void. 6. Apply black weatherstrip adhesive to void between weatherstrip carrier and pinch weld. 7. Install weatherstrip.
4. Void at door water deflector.	1. Adjust door water deflector to seal void.
5. Sealer skip or void at door hem flange seam. Refer to Figure 11.	1. Inspect for skip or void at door hem flange sealer. 2. Apply clear sealer to skip or void in door hem flange sealer. 3. Allow sealer to dry. 4. Direct water around the door hem flange seam. 5. Inspect for leaks.

## Carpet Wet Under Doors

Cause	Correction
1. Urethane skip or void at backglass.	1. Spray a solution of 50% soap and 50% water around the perimeter of the window reveal molding. 2. Apply 40 psi air pressure around the interior of the weatherstrip carrier. 3. Inspect for soap bubbles on the outside of the window reveal molding. 4. Remove any interior trim at area of leak. Refer to the appropriate section of the Service Manual. 5. Apply urethane adhesive to the leak area and 127 mm (5 in.) on both sides of the leak area using a flat bladed tool. 6. Allow urethane to cure. 7. Inspect for leaks. Refer to Steps 1 through 3. 8. Remove and install window if leak is not corrected. Refer to Section 10-2 of the Service Manual.
2. Sealer skip or void at roof ditch seam. Refer to Figure 12.	1. Remove quarter trim panel. Refer to Section 10-7 of the Service Manual. 2. Pull headliner down enough to apply 40 psi of air pressure between sheet metal panels from inside vehicle. 3. Direct water over roof ditch. 4. Bubbles will appear along roof ditch if a leak exists. 5. Remove roof ditch molding. 6. Apply clear sealer to area of leak. 7. Install roof ditch molding. 8. Install quarter trim panel. Refer to Section 10-7 of the Service Manual.

## Wet Rear Shelf

Cause	Correction
1. Sealer skip/void or spot weld burn through at the tail panel seams, deck gutter seams, tail light seams, wheel-well panel seams, or quarter panel to rear compartment floor pan seams. Refer to Figures 13 through 16.	<ol style="list-style-type: none"> <li>1. Remove rear compartment trim.</li> <li>2. Inspect for a skip or void in seam sealer or for spot weld burn through.</li> <li>3. Apply clear sealer to a skip or void in the seam sealer or to any spot weld burn through.</li> <li>4. Allow sealer to dry.</li> <li>5. Direct water over the seam from the exterior of the rear compartment.</li> <li>6. Inspect from inside rear compartment for leaks.</li> <li>7. Install rear compartment trim.</li> </ol>
2. Sealer skip or void at gas tank filler opening seam. Refer to Figure 17.	<ol style="list-style-type: none"> <li>1. Remove right side rear compartment trim.</li> <li>2. Direct water from under vehicle and around gas tank filler opening seam.</li> <li>3. Inspect inside rear compartment for leaks.</li> <li>4. Apply urethane adhesive to area of leak.</li> </ol>

Cause	Correction
3. Spot weld burn through at gutter under rear window.	<ol style="list-style-type: none"> <li>1. Inspect for spot weld burn through.</li> <li>2. Apply clear sealer to any spot weld burn through.</li> </ol>
4. Insufficient rear compartment lid weatherstrip compression.	<ol style="list-style-type: none"> <li>1. Apply tracing powder to the rear compartment lid surface.</li> <li>2. Close the rear compartment lid, but do not slam.</li> <li>3. Open the rear compartment lid and inspect for voids of tracing powder on the weatherstrip.</li> <li>4. Adjust weatherstrip by bending upward on weatherstrip flange where a void is indicated.</li> </ol>
5. Pinched rear compartment lid weatherstrip.	<ol style="list-style-type: none"> <li>1. Inspect rear compartment lid alignment.</li> <li>2. Align rear compartment lid, if needed. Refer to Section 10-8 of the Service Manual.</li> <li>3. Adjust weatherstrip, if needed, by bending weatherstrip flange.</li> <li>4. Replace rear compartment lid weatherstrip.</li> </ol>
6. Void between rear compartment lid weatherstrip carrier and pinch weld.	<ol style="list-style-type: none"> <li>1. Apply a solution of 50% soap and 50% water around the exterior of the weatherstrip carrier.</li> <li>2. Apply 40 psi air pressure around the interior of the weatherstrip carrier.</li> <li>3. Inspect for soap bubbles.</li> <li>4. Pull weatherstrip from pinch weld at void.</li> <li>5. Pinch weatherstrip carrier at void.</li> <li>6. Apply black weatherstrip adhesive to void between weatherstrip carrier and pinch weld.</li> <li>7. Install weatherstrip.</li> </ol>
7. Loose or missing tail light nut.	<ol style="list-style-type: none"> <li>1. Install tail light nut.</li> <li>2. Tighten tail light nut.</li> </ol>

## Wet Rear Compartment Area

Cause	Correction
1. Gasket void at rear compartment lock cylinder.	<ol style="list-style-type: none"> <li>1. Direct water over rear compartment lock cylinder.</li> <li>2. Inspect inside rear compartment for leaks.</li> <li>3. Remove rear compartment lock cylinder. Refer to Section 10-8 of the Service Manual.</li> <li>4. Sedan Only - Install new rear compartment lock gasket.</li> <li>5. Coupe Only - Install rear compartment lock gasket.</li> <li>6. Install rear compartment lock cylinder. Refer to Section 10-8 of the Service Manual.</li> </ol>

## Wet Rear Compartment Area

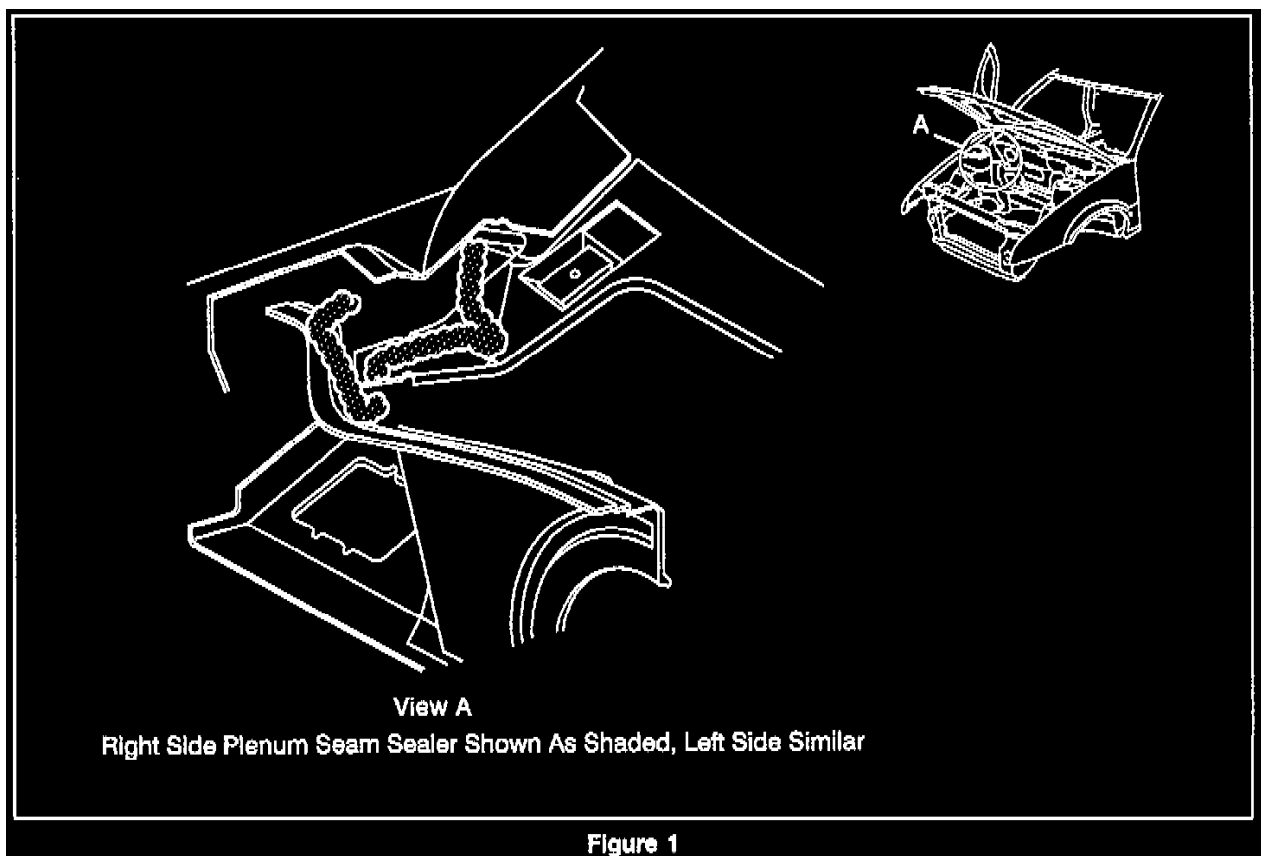


Figure 1

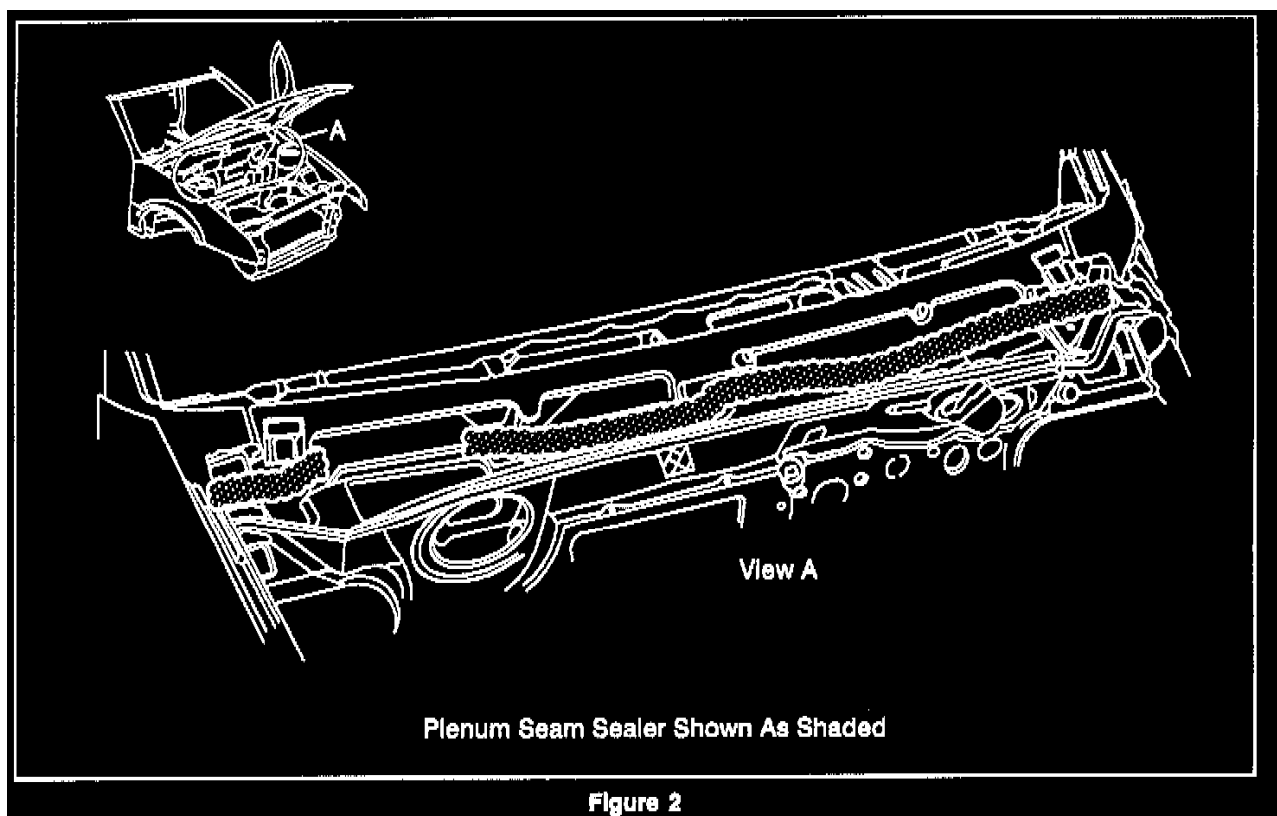


Figure 2

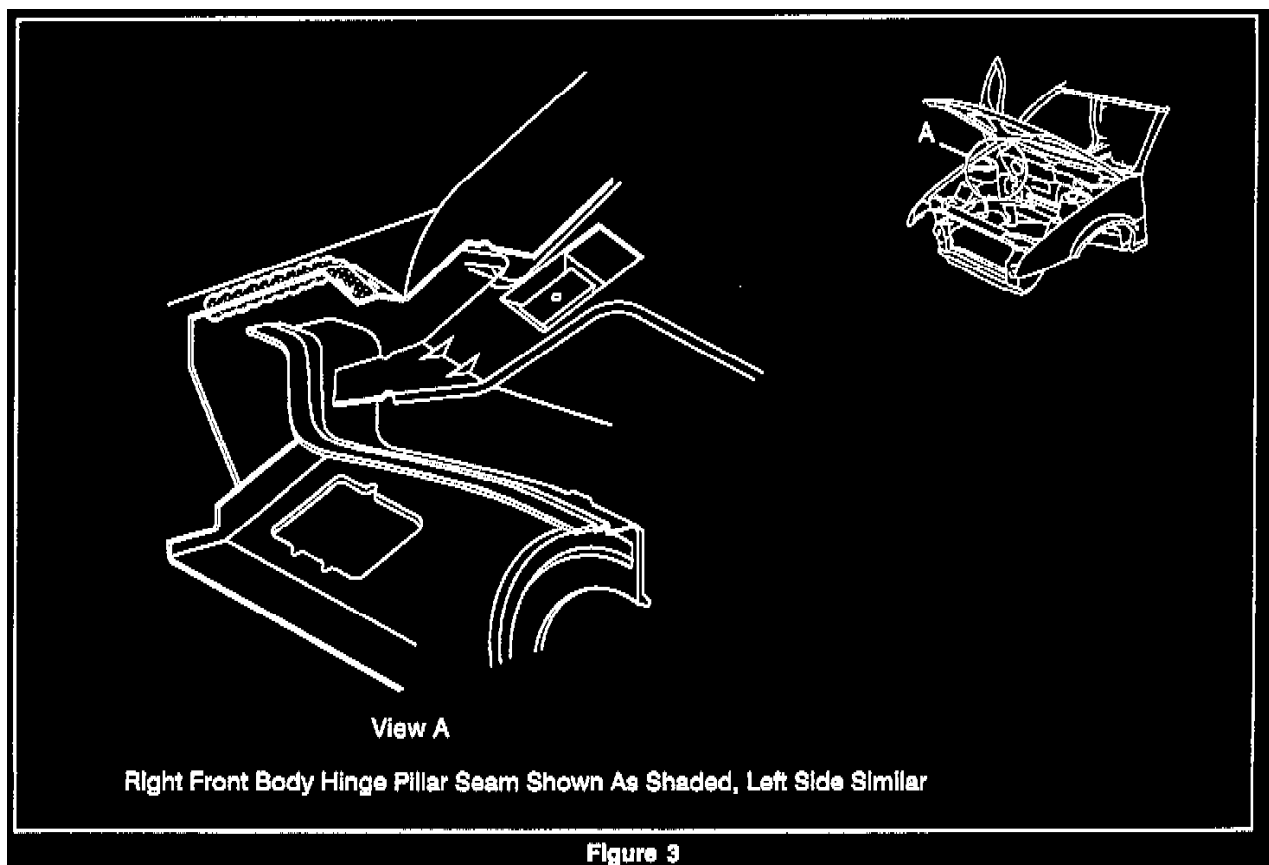


Figure 3

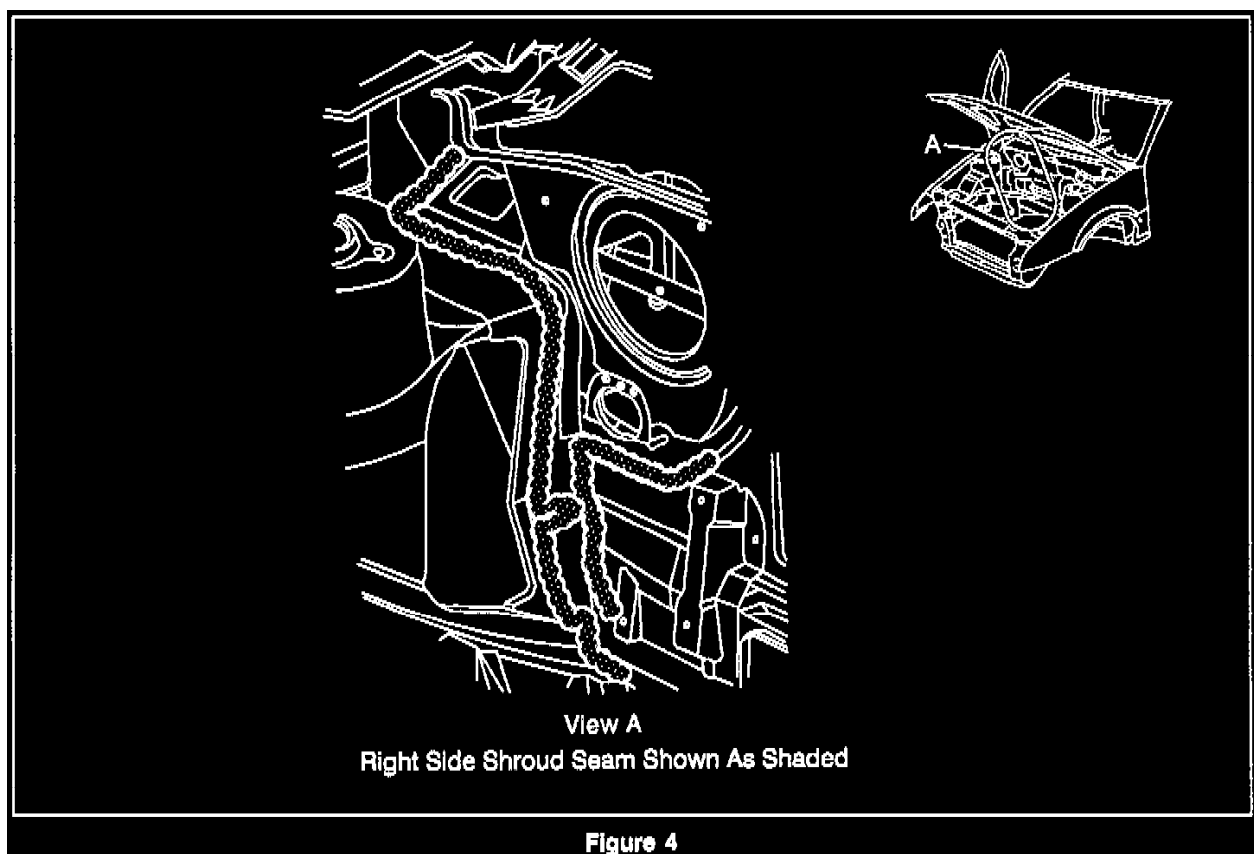


Figure 4

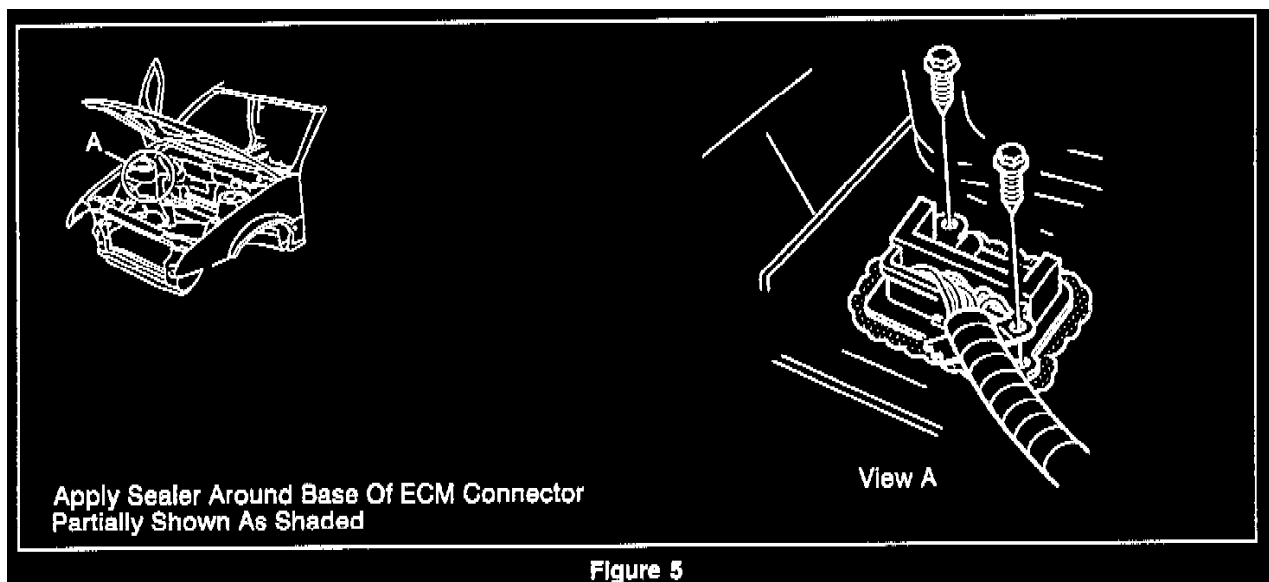


Figure 5

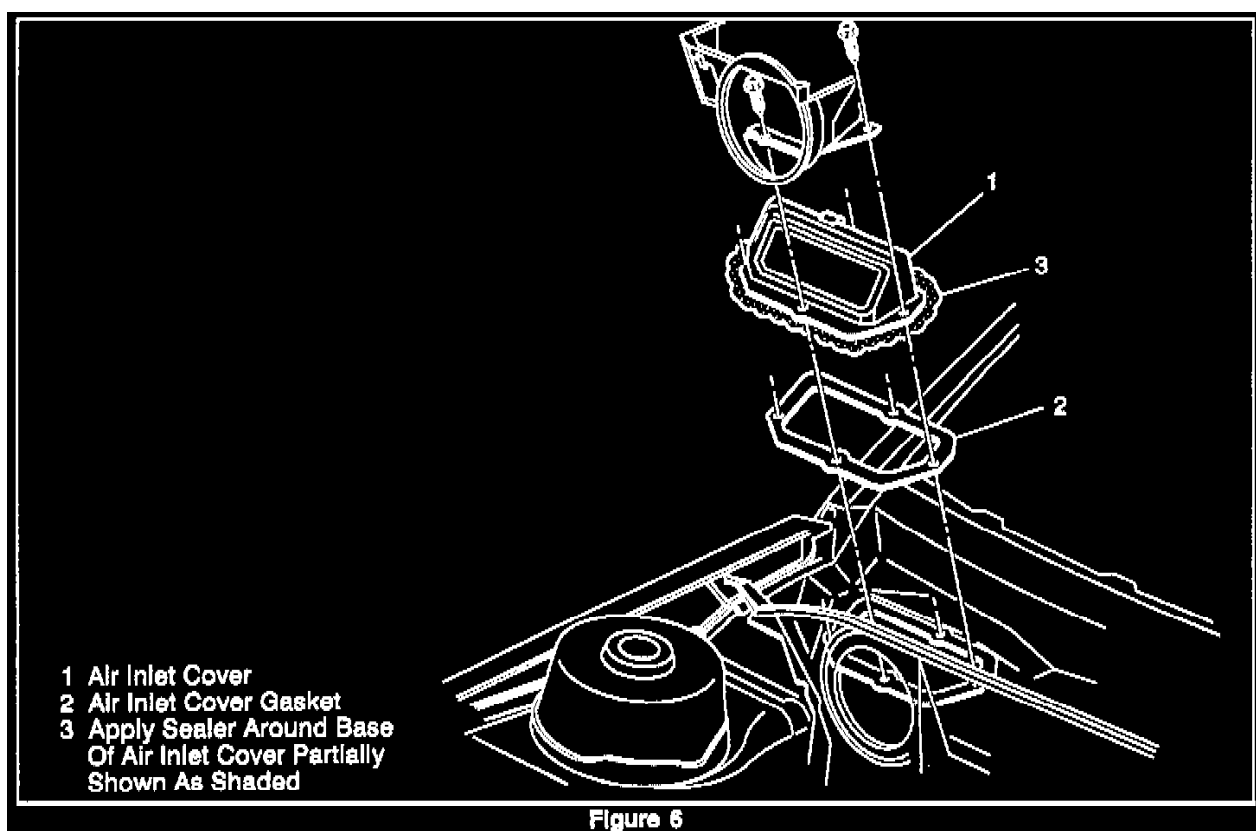


Figure 6



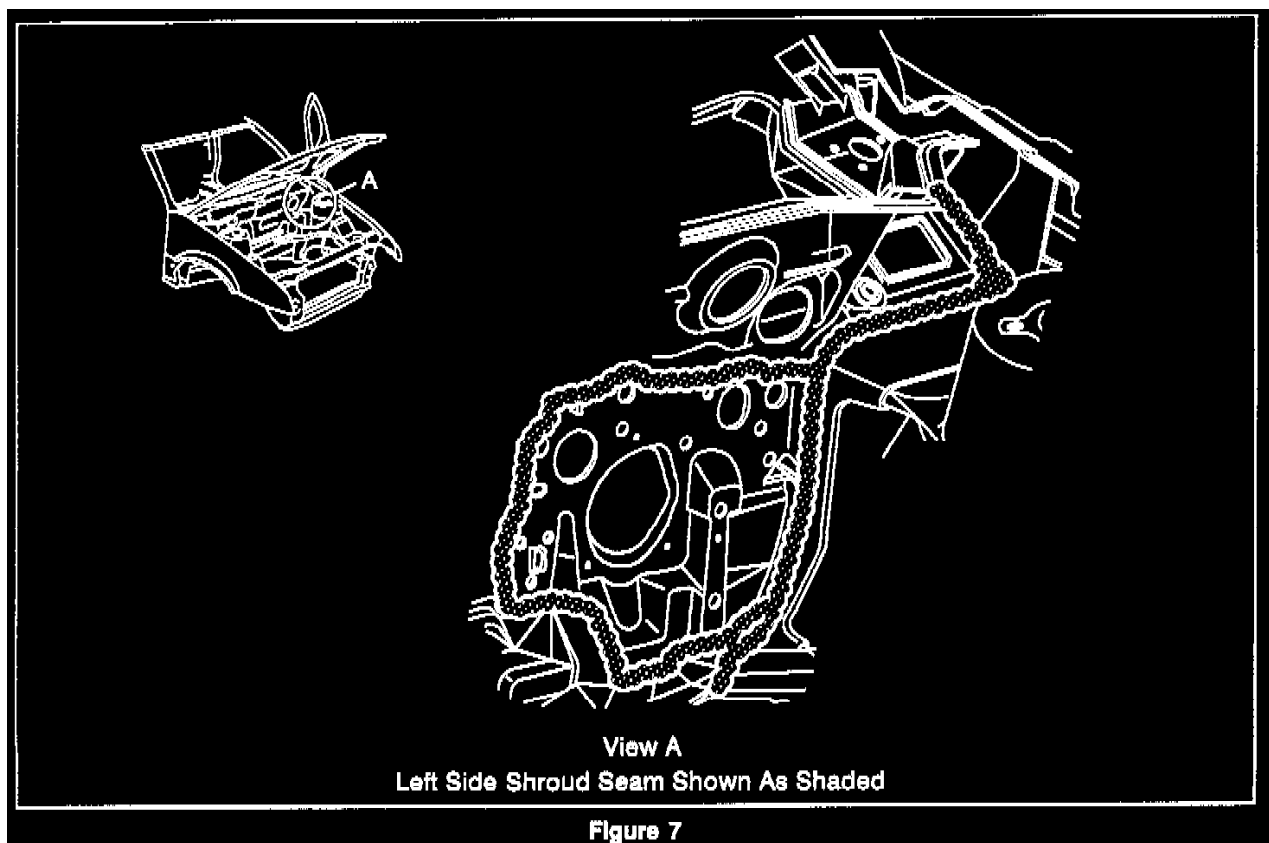


Figure 7

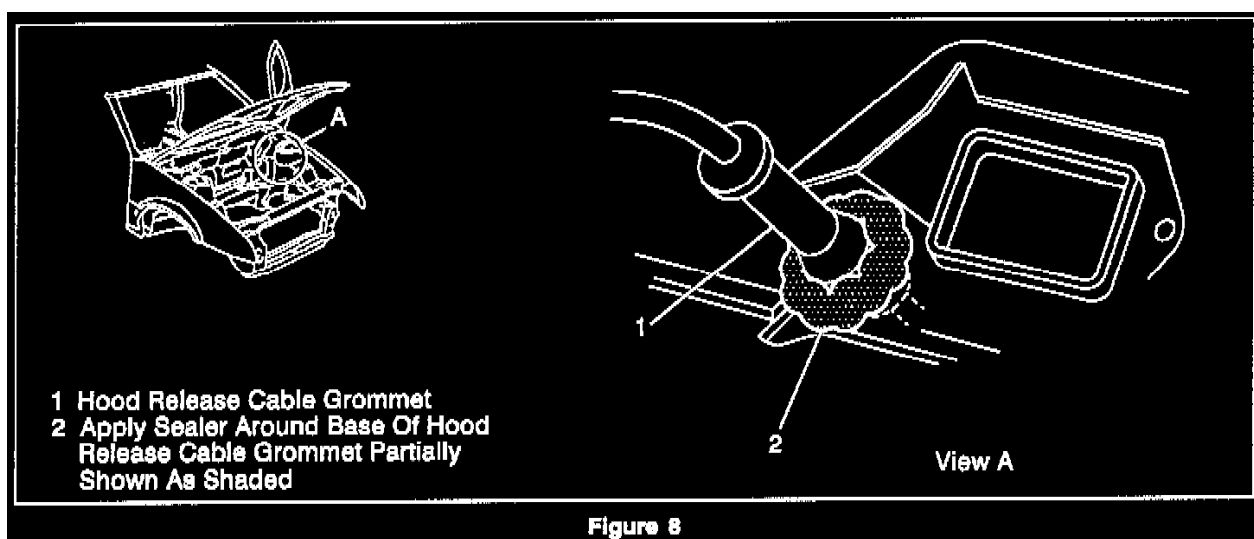


Figure 8

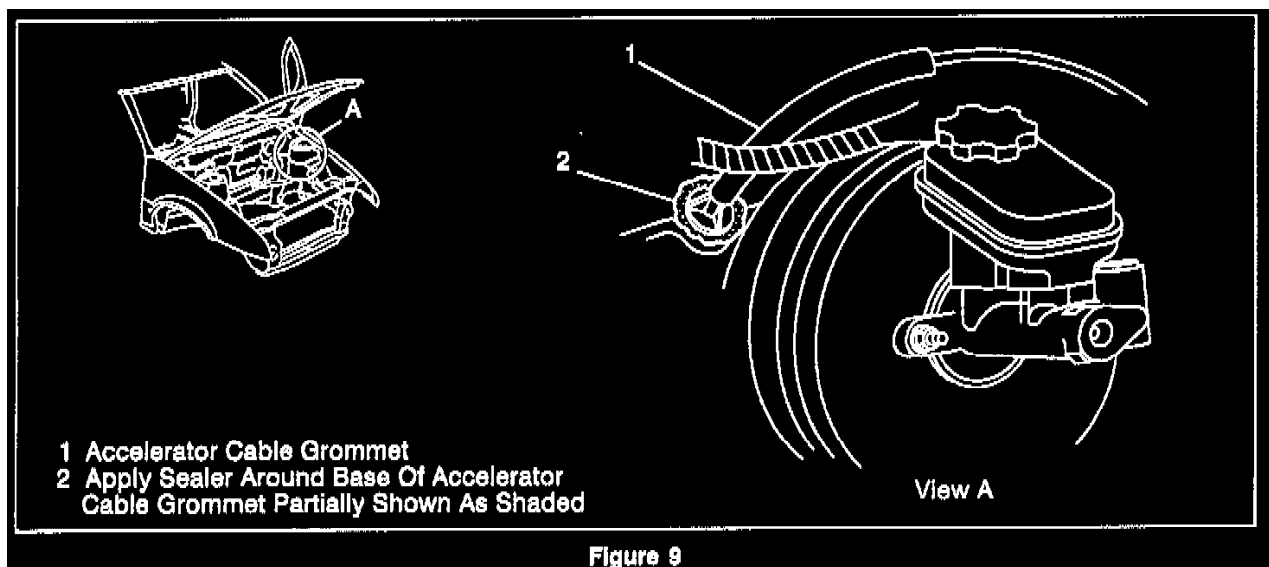


Figure 9

Figure 9

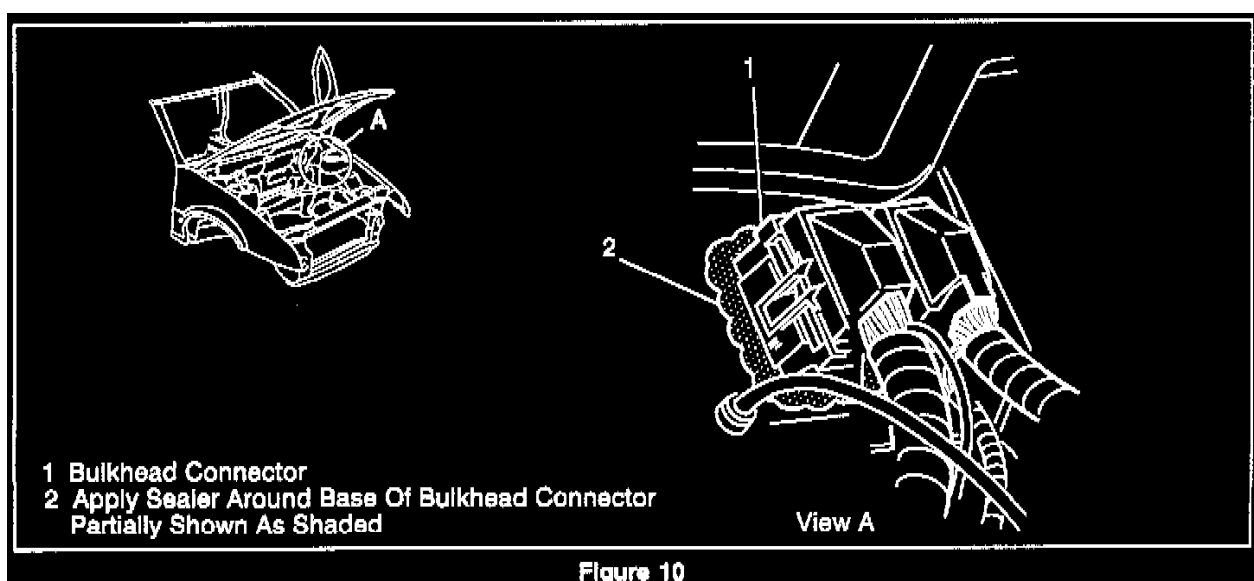


Figure 10

Figure 10

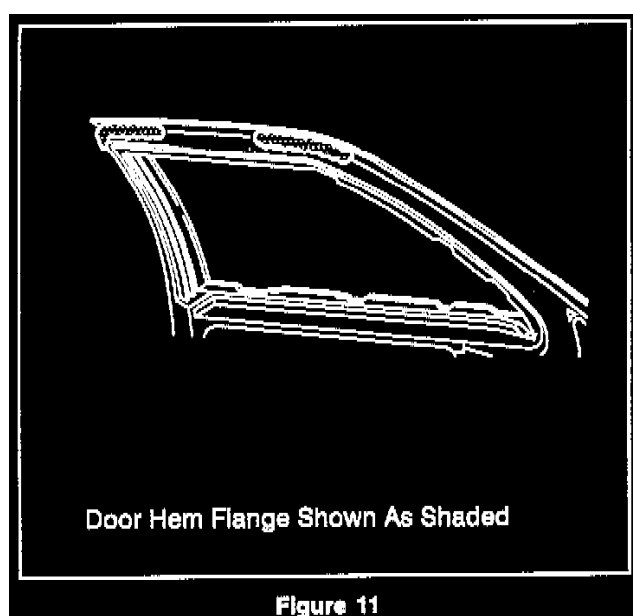


Figure 11

Figure 11

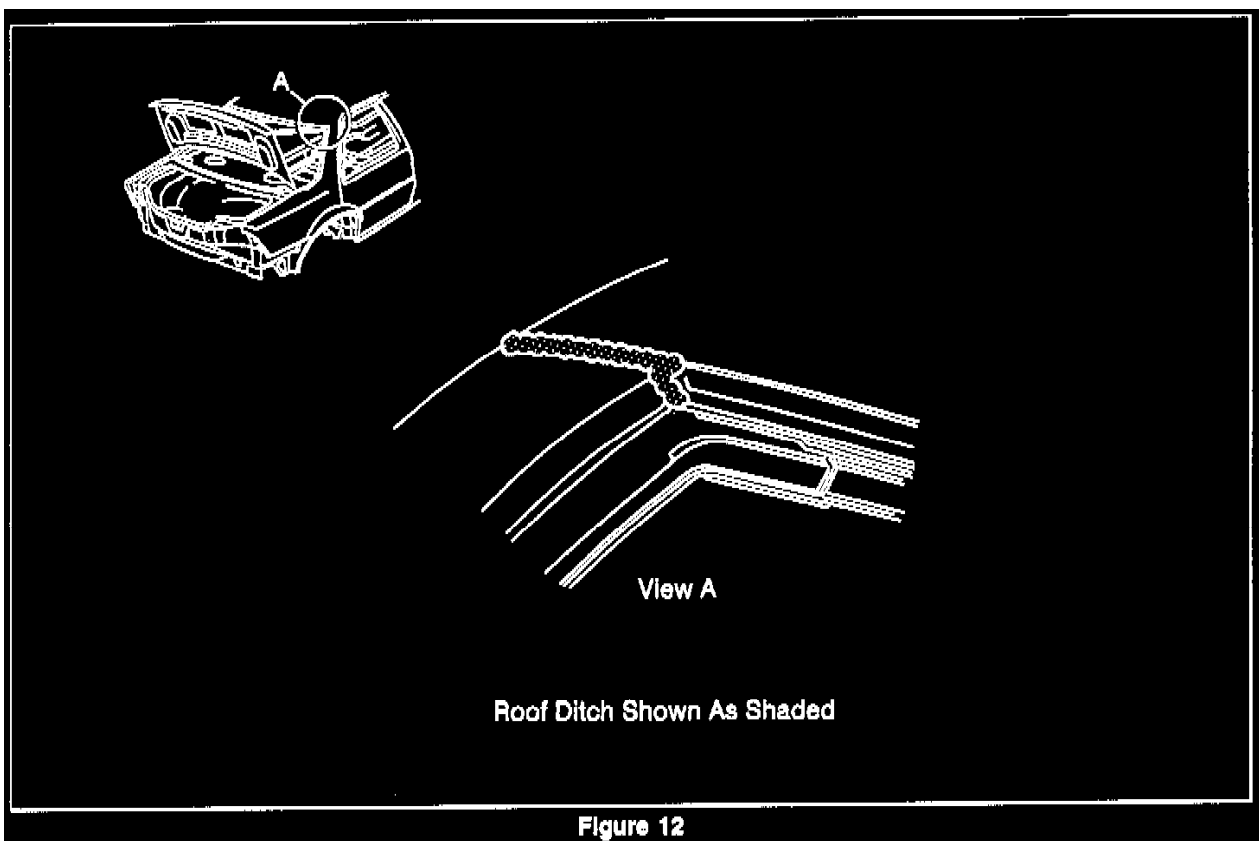


Figure 12

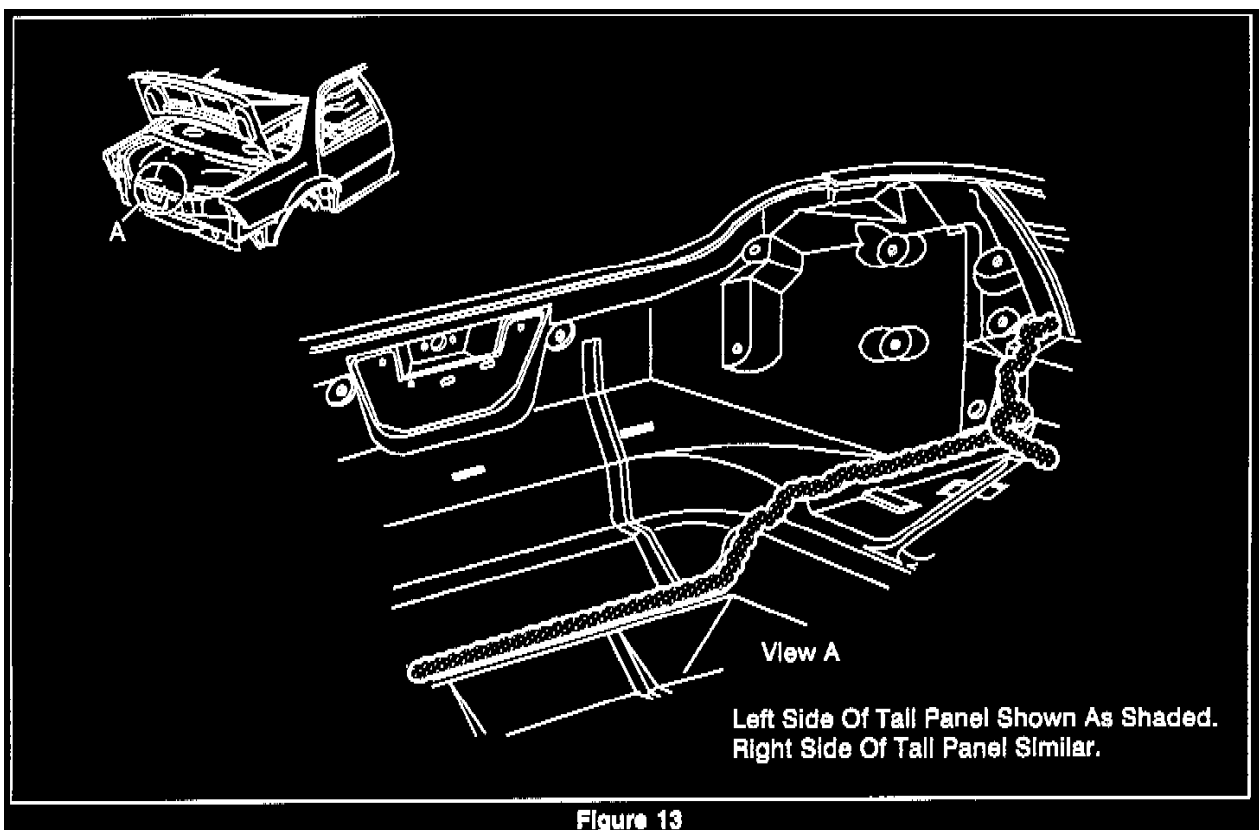


Figure 13

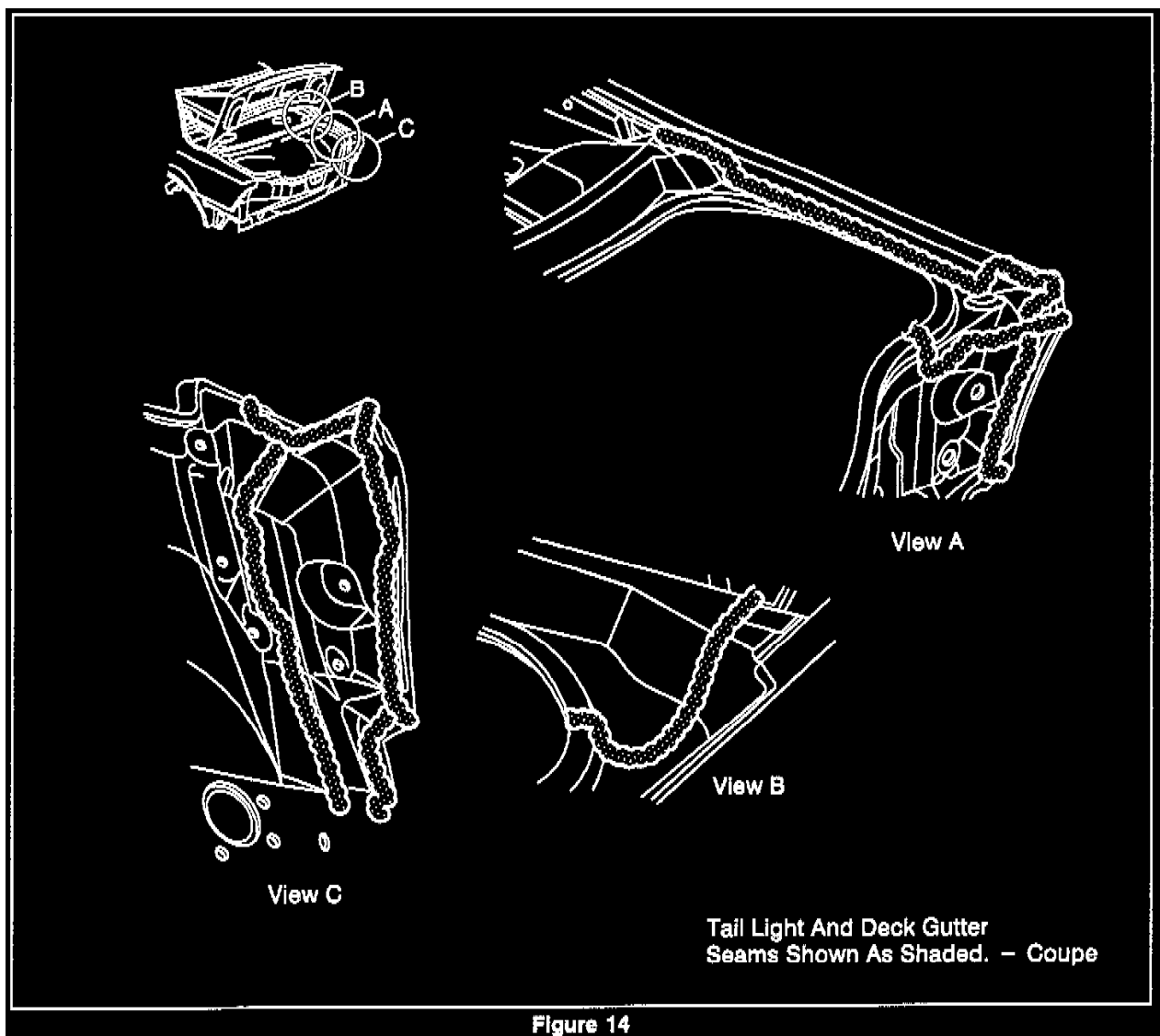


Figure 14

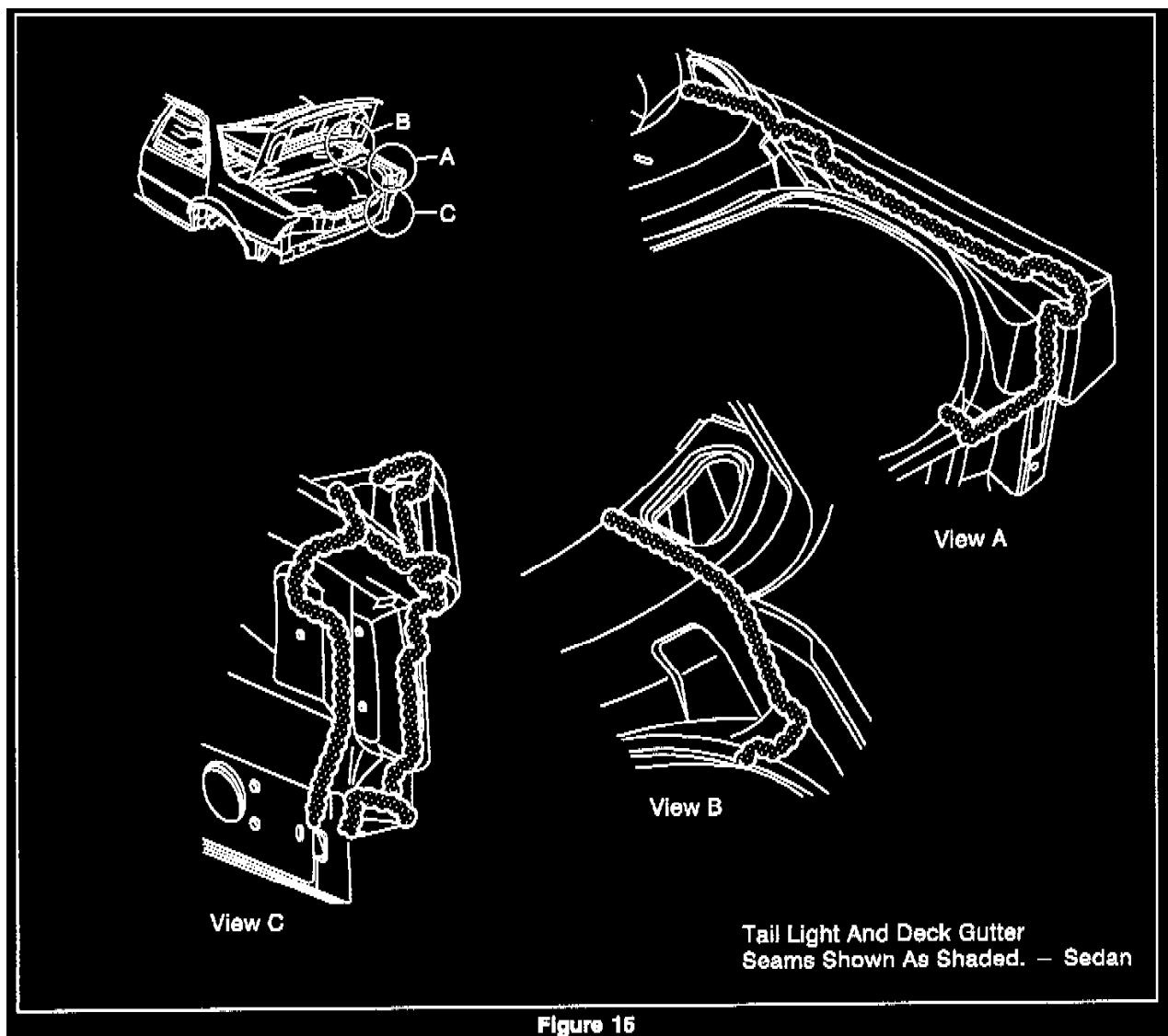


Figure 15

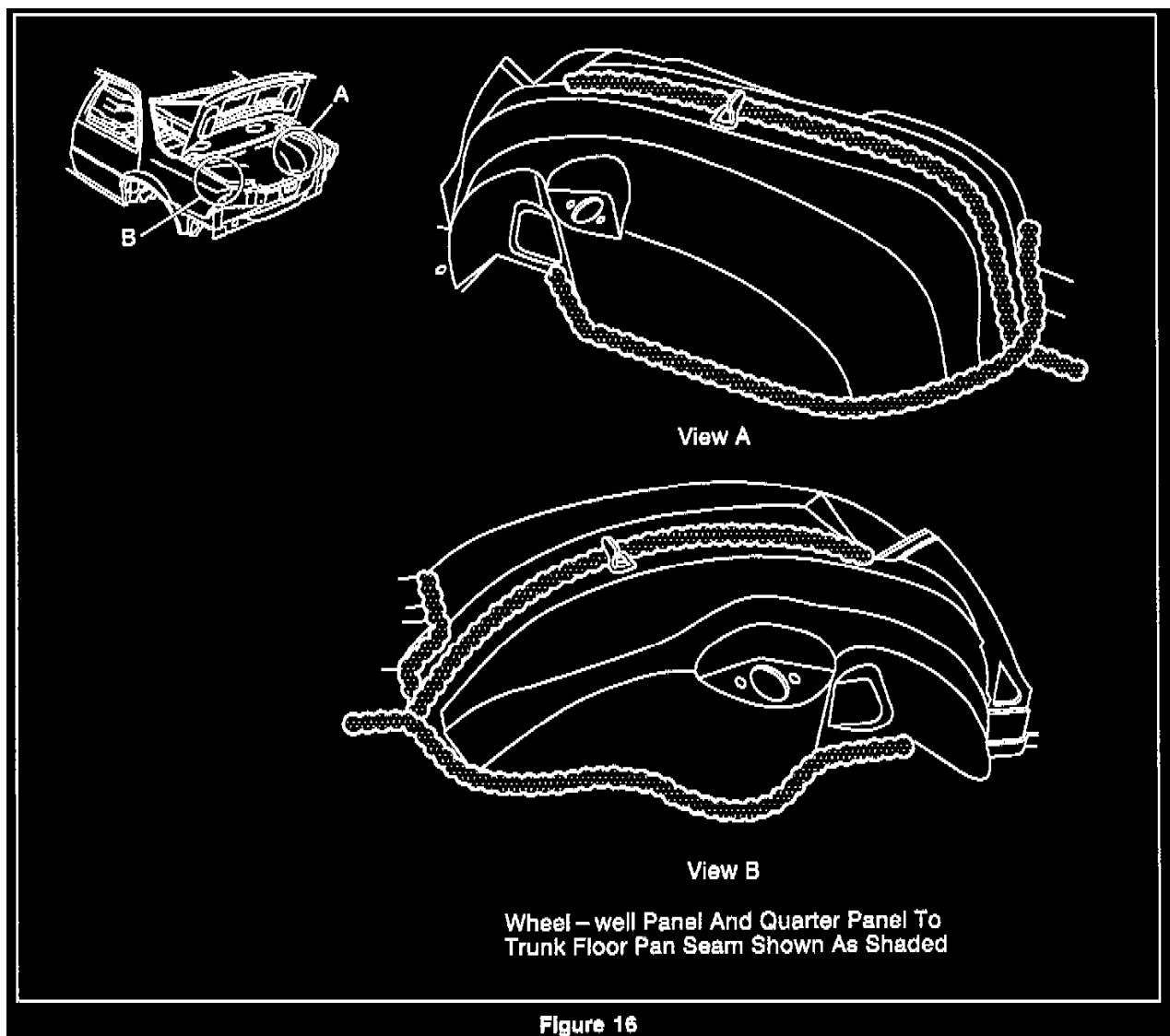


Figure 16

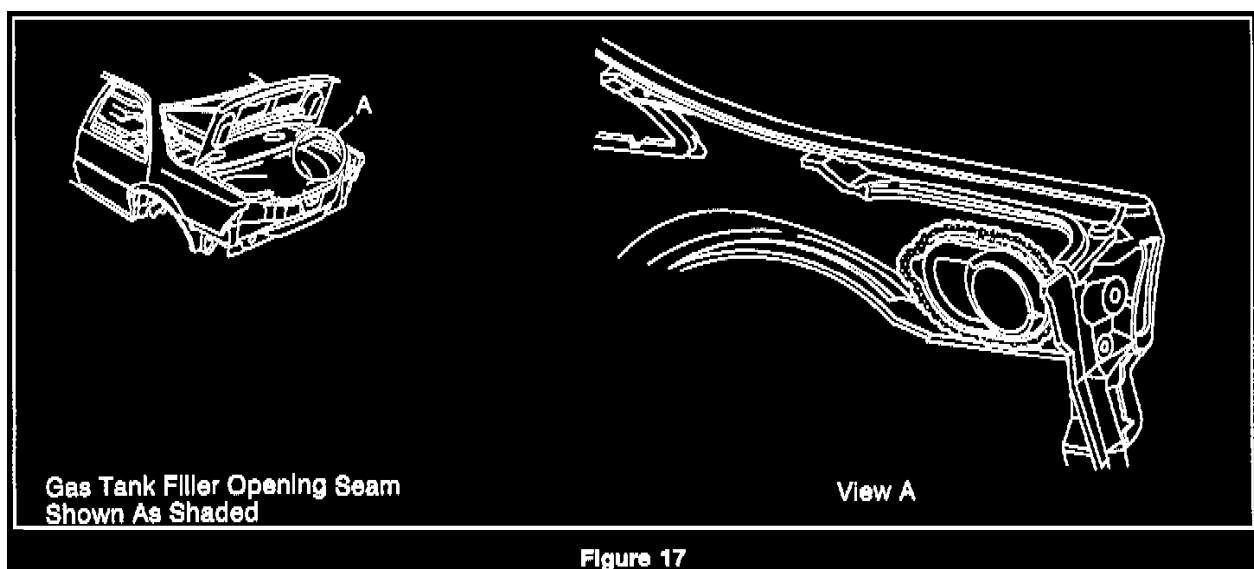


Figure 17

#### Parts Information

Description	P/N
Kent Leak Check (Clear) (or equivalent)	10200
Black Weatherstrip Adhesive (or equivalent)	12345097
Urethane Adhesive (or equivalent)	12346284
Lock Gasket (or equivalent)	22645381

Parts are currently available from GMSPO.

Technical Service Bulletin # **580101**

Date: **950601**

## **Vehicle - Use of a Diagnostic Worksheet**

File In Section: 0 - General Information

Bulletin No.: 58-01-01

Date: June, 1995

Subject:  
Use of a Diagnostic Worksheet

Models:  
1995 and Prior Model Year Passenger Cars and Trucks

During the last few years we have made great strides in the quality of services we deliver to our customers. Customer satisfaction levels are high but as it goes up so does our customers expectations. In order to remain competitive and retain our valuable customers in the future, we will have to keep improving customer services. The key to future improvement will be bettering communications with our customers.

One of the most difficult and critical lines of communication is from service customers to the technician. The more clearly the technician understands the concern and its symptoms, the more likely the problem will be "fixed right the first time". With that in mind, there has never been a better time to revitalize the use of a Diagnostic Worksheet. Recent STG field programs and current dealer/retailer usage have proven them to be valuable tools to help technicians diagnose and repair customer concerns. Dealers/retailers also report they are very helpful in reducing shop comebacks, increasing technician productivity and producing satisfied customers. There are many other benefits gained from using the worksheets, a few of which are listed below:

- ^ Reduces "No Trouble Finds"
- ^ Increases customer involvement
- ^ Customer perception of "they really care and listen"
- ^ Saves time during peak write-up periods
- ^ Reduces recontacting customers for additional information
- ^ Improves night drop information
- ^ Insures all the right questions are asked at write-up

Enclosed is a copy of an all new GM-wide Diagnostic Worksheet that is available for use in dealerships/retail facilities. They are available to you at no cost. To obtain these worksheets, call MASCOTECH at 1-800-393-4831 and request form number DWS95. Please limit your requests to a reasonable quantity. You may also have this reproduced locally. If you have any comments or suggestions regarding this form, call STG Customer Support at 1-800-828-6860.

THE INFORMATION BELOW CONTAINS IDEAS AND THOUGHT STARTERS THAT MAY BE HELPFUL IN GETTING YOU STARTED USING THE "DIAGNOSTIC WORKSHEET".

- ^ Have your service advisors fill out this form with the customer whenever possible.
- ^ Place in your night drop for the customer to fill out along with an instruction sheet to help them understand what to do.
- ^ Have a porter or greeter give the form to customers while they wait in line during peak morning rush and ask them to fill it out. It will save time for all concerned and improve the quality of information received from the customer.
- ^ Make sure it is attached to the hard copy when it goes to the technician.
- ^ Place a copy with the glove box papers and review it at delivery.
- ^ Review the sheet at your Service Department introduction during the delivery process.
- ^ Require that you personally see a copy of all worksheets filled out on shop comebacks.
- ^ Hold an all Service Department meeting to get employee buy-in and their ideas on how to make it effective in your dealership service operations.

^ Put a worksheet in the glovebox of all departing service customers.

^ Cover this as part of your new owner clinics.

There are many other ways to utilize the concept, but as with every other idea, successful implementation depends on employee involvement and buy-in.

## DIAGNOSTIC WORKSHEETS

**Dear Valued Customer:**  
Our goal is to fix your problem correctly and get you back on the road as soon as possible in the unlikely event that you experience a problem with your vehicle. Help us identify the exact nature of the concern by taking a few moments to complete the appropriate section of this diagnostic worksheet. Thank you.

**CUSTOMER NAME:** \_\_\_\_\_ **PHONE NO.:** \_\_\_\_\_ **REPAIR ORDER NO.:** \_\_\_\_\_








# DIAGNOSTIC WORKSHEET

**SYMPTOM (CHECK ALL THAT APPLY)**

**ENGINE**

☐ "Service Engine Soon"/"Malfunction Indicator Light" on

☐ Hard start / no start (cranks OK)

☐ Won't crank

☐ Engine stalls

☐ Engine miss

☐ Miss while driving

☐ Hesitates, stumbles or sags

☐ Rough idle

☐ Idle is too high ☐ Idle is too low

☐ Poor power/performance

☐ Surge or chuggle, buck - jerk - skip

☐ Poor gas mileage ☐ Highway ☐ City

☐ Pings, detonates

☐ Sulphur / rotten egg odor

☐ Backfires (popping noise) - underhood / tailpipe

☐ Exhaust smoke ☐ Increased oil consumption

☐ Runs on after key is turned off

☐ Speed fluctuates without moving accelerator

☐ Engine noise (explain) \_\_\_\_\_

\_\_\_\_\_ (whine, rattle, groan, clunk, etc.)

☐ Other: \_\_\_\_\_

\_\_\_\_\_

**TRANSMISSION**

☐ Does not shift properly ☐ Hard shift

☐ Will not shift ☐ Up ☐ Down

☐ Will not shift into overdrive

☐ Engine starts in other than "P" or "N"

☐ Noise (describe) \_\_\_\_\_

\_\_\_\_\_ (whine, rattle, groan, clunk, buzz, etc.)

☐ Shifts into next gear too early

☐ Overdrive doesn't work with speed control, but is otherwise O.K.

☐ Highway speed - shudder, surge, etc.

☐ Other: \_\_\_\_\_

**EXPLAIN:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**OPERATING CONDITIONS (CHECK ALL THAT APPLY)**

**HOW OFTEN DOES IT OCCUR? (Engine and/or Transmission)**

☐ Always ☐ Few seconds ☐ Few minutes

☐ Few hours ☐ Few days ☐ Few weeks

☐ Few months ☐ Variable ☐ Only during event

☐ Every \_\_\_\_\_ to \_\_\_\_\_ miles ☐ Unknown

☐ Other (explain) \_\_\_\_\_

☐ Just started ☐ Getting better ☐ Getting worse

☐ Since new

**WHEN DOES IT OCCUR? (Engine and/or Transmission)**

**When Engine Temperature is:**

☐ Cold ☐ Warm ☐ Hot

☐ All the time ☐ Only during warmup

**Weather Conditions:**

☐ Very cold - below 0 deg. F ☐ Cold - 0 to 32 deg. F

☐ Cool - 32 to 60 deg. F ☐ Warm - 60 to 80 deg. F

☐ Hot - above 80 deg. F ☐ Any environment

☐ Raining ☐ Dry ☐ Humid

☐ Snow / Ice ☐ Wet roads ☐ Other (explain below)

**Driving Conditions:**

☐ Light throttle ☐ Med. throttle ☐ Hard throttle

☐ Starting ☐ At idle ☐ Decelerating

☐ Over bumps ☐ When shifting ☐ While turning

☐ Cruising - steady at \_\_\_\_\_ MPH ☐ While braking

☐ Anytime ☐ Uphill ☐ Downhill

☐ Highway ☐ City / town ☐ Stop and go

☐ Between \_\_\_\_\_ MPH and \_\_\_\_\_ MPH

☐ Only with A/C or Defrost on

**What Type of Fuel?**

☐ Regular UL ☐ Mid range UL ☐ Premium Unleaded

☐ Gasohol ☐ Ethanol ☐ Methanol

☐ Diesel #1 ☐ Diesel #2 ☐ Various brands

**When Gear Selector is In:**

☐ Park/Neutral ☐ Reverse ☐ Overdrive

☐ Drive/3 ☐ Drive/2 ☐ Drive/1

**Between Gears:**

☐ Park to P or D ☐ Rev / Drive ☐ First / Second

☐ Second / Third ☐ Third / O-Drive



# DIAGNOSTIC WORKSHEET

## WATER LEAK

### Leak Occurs When?

- ☐ Setting level      ☐ Any time it rains      ☐ While driving in the rain      ☐ Car wash only  
☐ Back lower than front (facing uphill)      ☐ Front lower than back (facing downhill)

### Location of Leak (where water appears):

- ☐ LF door      ☐ RF door      ☐ LR door      ☐ RR door      ☐ Windshield      ☐ Rear window  
☐ LF window      ☐ RF window      ☐ LR window      ☐ RR window      ☐ Side door      ☐ Sunroof / T-Top  
☐ Under instrument panel      ☐ Rear door / rear hatch      ☐ Carpet      ☐ Other

## WINDNOISE

### Location:

- ☐ LF door      ☐ RF door      ☐ LR door      ☐ RR door      ☐ Windshield      ☐ Rear window  
☐ LF window      ☐ RF window      ☐ LR window      ☐ RR window      ☐ Side door      ☐ Sunroof / T-Top  
☐ Under instrument panel      ☐ Rear door / rear hatch      ☐ Other

### EXPLAIN:

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## SYMPTOM - MANUAL GEAR SHIFT

- ☐ Hard to shift      ☐ Doesn't shift  
☐ Grinds going into \_\_\_\_\_ gear  
☐ Noisy when in \_\_\_\_\_ gear or neutral \_\_\_\_\_  
☐ Slips/pops out of gear  
☐ Noise (describe) \_\_\_\_\_  
☐ Upshift light stays on  
☐ Upshift light doesn't light

### WHEN DOES IT OCCUR?

- ☐ All the time      ☐ Light load      ☐ Heavy load

### EXPLAIN:

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## SYMPTOM - CLUTCH

- ☐ Hard to push      ☐ Falls to release  
☐ Noise when pressing pedal down (describe) \_\_\_\_\_  
☐ Slips      ☐ Chattering (grabbing)  
☐ Odor present      ☐ Pedal stays on the floor  
☐ Squealing sound

### WHEN DOES IT OCCUR?

#### When Engine Temperature is:

- ☐ Cold      ☐ Hot  
☐ Accelerating      ☐ Decelerating

## FOR DEALER USE ONLY:

VIN #: \_\_\_\_\_ MILES: \_\_\_\_\_ TECHNICIAN #: \_\_\_\_\_ ADVISOR #: \_\_\_\_\_

# DIAGNOSTIC WORKSHEET

## SYSTEM OR AREA AFFECTED

- |  |  |                                      |                                  |                                   |                                     |
|--|--|--------------------------------------|----------------------------------|-----------------------------------|-------------------------------------|
| <input type="checkbox"/> Air conditioner | <input type="checkbox"/> Heater                        | <input type="checkbox"/> Defroster   | <input type="checkbox"/> Vent    | <input type="checkbox"/> BI-Level | <input type="checkbox"/> Fan/blower |
| <input type="checkbox"/> Max A/C         | <input type="checkbox"/> Automatic Temperature Control | <input type="checkbox"/> Mix / blend | <input type="checkbox"/> Economy | <input type="checkbox"/> All      |                                     |

## SYMPTOM

- |  |  |  |   |
|--|--|--|---|
| <input type="checkbox"/> Does not work   | <input type="checkbox"/> Blows wrong temperature air | <input type="checkbox"/> No air comes out of vents | <input type="checkbox"/> Rapid Cycling                |
| <input type="checkbox"/> Noisy (explain) | <input type="checkbox"/> Broken                      | <input type="checkbox"/> Odor                      | <input type="checkbox"/> Air comes from wrong outlets |
| <input type="checkbox"/> Leaks           | <input type="checkbox"/> Insufficient heat or cool   | <input type="checkbox"/> Other (explain below)     | <input type="checkbox"/> Blows Fuse                   |

## WHEN DOES IT OCCUR?

- |  |  |   |                                       |  |
|--|--|---|---------------------------------------|--|
| <input type="checkbox"/> All the time              | <input type="checkbox"/> Hot                   | <input type="checkbox"/> Cold             | <input type="checkbox"/> Intermittent | <input type="checkbox"/> Right after startup |
| <input type="checkbox"/> When change controls only | <input type="checkbox"/> Other (explain below) | <input type="checkbox"/> Fan/blower speed | High / Med / Low                      |  |

## EXPLAIN:

## SYMPTOM - MUSIC SYSTEM

- |   |                                     |  |                                     |                                      |   |
|---|-------------------------------------|--|-------------------------------------|--------------------------------------|---|
| <input type="checkbox"/> Does not work        | <input type="checkbox"/> Noisy      | <input type="checkbox"/> Static                | <input type="checkbox"/> Won't load | <input type="checkbox"/> Won't eject | <input type="checkbox"/> Poor reception |
| <input type="checkbox"/> Controls do not work | <input type="checkbox"/> Blows fuse | <input type="checkbox"/> Other (explain below) |                                     |                                      |   |

## SYSTEM AFFECTED

- |                                      |                                    |   |   |  |
|--------------------------------------|------------------------------------|---|---|--|
| <input type="checkbox"/> Radio only  | <input type="checkbox"/> AM        | <input type="checkbox"/> FM                       | <input type="checkbox"/> FM stereo              | <input type="checkbox"/> Graphic equalizer |
| <input type="checkbox"/> Tape player | <input type="checkbox"/> CD player | <input type="checkbox"/> Whole system             | <input type="checkbox"/> Steering wheel buttons | <input type="checkbox"/> Phone             |
| <input type="checkbox"/> Speakers    | <input type="checkbox"/> Front     | <input type="checkbox"/> Rear                     | <input type="checkbox"/> Left                   | <input type="checkbox"/> Right             |
| <input type="checkbox"/> Antenna     | <input type="checkbox"/> Clock     | <input type="checkbox"/> Radio or player controls | <input type="checkbox"/> Rear seat controls     |  |

## ALL OTHER ELECTRICAL ITEMS OR ACCESSORIES

Please list the complaint accessory or item and check any applicable symptom(s) from the list that follows:

- |  |  |  |   |
|--|--|--|---|
| <input type="checkbox"/> Inoperable                              | <input type="checkbox"/> Noisy                                   | <input type="checkbox"/> No control                              | <input type="checkbox"/> Erratic                          |
| <input type="checkbox"/> Check light on or flashing              | <input type="checkbox"/> Blows fuse                              | <input type="checkbox"/> Intermittent                            | <input type="checkbox"/> Works improperly (explain below) |
| <input type="checkbox"/> Related system affected (explain below) | <input type="checkbox"/> Inoperable                              | <input type="checkbox"/> Noisy                                   | <input type="checkbox"/> No control                       |
| <input type="checkbox"/> Erratic                                 | <input type="checkbox"/> Check light on or flashing              | <input type="checkbox"/> Blows fuse                              | <input type="checkbox"/> Intermittent                     |
| <input type="checkbox"/> Works improperly (explain below)        | <input type="checkbox"/> Related system affected (explain below) | <input type="checkbox"/> Inoperable                              | <input type="checkbox"/> Noisy                            |
| <input type="checkbox"/> No control                              | <input type="checkbox"/> Erratic                                 | <input type="checkbox"/> Check light on or flashing              | <input type="checkbox"/> Blows fuse                       |
| <input type="checkbox"/> Intermittent                            | <input type="checkbox"/> Works improperly (explain)              | <input type="checkbox"/> Related system affected (explain below) |   |

## WHEN DOES IT OCCUR?

- |  |   |  |   |
|--|---|--|---|
| <input type="checkbox"/> All the time          | <input type="checkbox"/> Hot                          | <input type="checkbox"/> Cold                      | <input type="checkbox"/> Just after starting - malfunctions for a while |
| <input type="checkbox"/> Intermittent          | <input type="checkbox"/> After runs for _____ minutes | <input type="checkbox"/> Rough roads or bumps only |   |
| <input type="checkbox"/> Other (explain below) |   |  |   |

## EXPLAIN:

# DIAGNOSTIC WORKSHEET

## SYMPTOM

- ☐ Vehicle pulls right - When \_\_\_\_\_  
☐ Vehicle pulls left - When \_\_\_\_\_  
☐ Steering wheel vibrates at \_\_\_\_\_ MPH  
☐ Excessive play in steering  
☐ Erratic steering when braking  
☐ Poor steering wheel return after cornering

- ☐ Suspension bottoms out  
☐ Leans or sways in corners  
☐ Brake light on  
☐ Traction control light on  
☐ Uneven tire wear  
☐ Sits uneven  
☐ "Dog" tracks  
☐ ABS light on  
☐ Soft ride

### Hard to steer

- ☐ Effort  
☐ Wanders  
☐ Steering wheel off center

### Shimmy/vibration (check box below for location)

- |                                |                                |                                      |
|--------------------------------|--------------------------------|--------------------------------------|
| <input type="checkbox"/> Front | <input type="checkbox"/> Rear  | <input type="checkbox"/> Don't know  |
| <input type="checkbox"/> Seat  | <input type="checkbox"/> Floor | <input type="checkbox"/> Other _____ |

### Brake pedal

- ☐ Noise  
☐ Pulses  
☐ Squeaks  
☐ Hard  
☐ Mushy  
☐ Excessive travel

### WHEN DOES IT OCCUR?

- ☐ Cold days  
☐ Hot days  
☐ Wet / rain  
☐ All the time  
☐ Intermittent  
☐ Parking maneuvers  
☐ At road speed  
☐ Accelerating  
☐ Decelerating

### EXPLAIN:

## AREA OF NOISE

- |  |                                     |                                      |                                    |                                     |
|--|-------------------------------------|--------------------------------------|------------------------------------|-------------------------------------|
| <input type="checkbox"/> Engine compartment    | <input type="checkbox"/> Left       | <input type="checkbox"/> Right       | <input type="checkbox"/> Center    | <input type="checkbox"/> Don't know |
| <input type="checkbox"/> Front suspension      | <input type="checkbox"/> Left       | <input type="checkbox"/> Right       | <input type="checkbox"/> Center    | <input type="checkbox"/> Don't know |
| <input type="checkbox"/> Rear suspension       | <input type="checkbox"/> Left       | <input type="checkbox"/> Right       | <input type="checkbox"/> Center    | <input type="checkbox"/> Don't know |
| <input type="checkbox"/> Passenger compartment | <input type="checkbox"/> Left       | <input type="checkbox"/> Right       | <input type="checkbox"/> Center    | <input type="checkbox"/> Don't know |
| <input type="checkbox"/> Instrument Panel      | <input type="checkbox"/> Left       | <input type="checkbox"/> Right       | <input type="checkbox"/> Center    | <input type="checkbox"/> Don't know |
| <input type="checkbox"/> Doors                 | <input type="checkbox"/> Left front | <input type="checkbox"/> Right front | <input type="checkbox"/> Left rear | <input type="checkbox"/> Right rear |
| <input type="checkbox"/> Rear seat area        | <input type="checkbox"/> Console    | <input type="checkbox"/> Other _____ |                                    |                                     |

### NOISE SOUNDS LIKE

- ☐ Knocks  
☐ Hard metal  
☐ Light metal  
☐ Roars  
☐ Ticking  
☐ Whine  
☐ Squeaks  
☐ Rattles  
☐ Scraping  
☐ Other \_\_\_\_\_

### HOW OFTEN DOES IT OCCUR?

- ☐ Continuous  
☐ Often  
☐ Intermittent  
☐ Just started  
☐ Since new

### WHEN DOES IT OCCUR?

- ☐ All the time  
☐ Speed \_\_\_\_\_  
☐ RPM \_\_\_\_\_  
☐ Only moving  
☐ On turns  
☐ Braking  
☐ Hard throttle  
☐ Light throttle  
☐ Decelerate  
☐ Steady speed  
☐ Idle in gear  
☐ Idle out of gear  
☐ Hot days  
☐ Cold days  
☐ Humid or rainy  
☐ Temperature \_\_\_\_\_  
☐ Heavy bumps  
☐ Light bumps  
☐ Smooth pavement

### EXPLAIN:

Brakes - Steering - Suspension; Squeak - Rattle - Noise Conditions

Technical Service Bulletin # 510103

Date: 950501

## GM Campaign Identification Label

FILE IN SECTION: 0 - General Information

BULLETIN NO.: 51-01-03

DATE: May, 1995

SUBJECT:

GM Campaign Identification Label

**MODELS:**

1995 and Prior Passenger Cars and Trucks

GM of Canada and NAES Dealers Are Not Authorized to Utilize This Service Bulletin.

As part of our continuing effort to consolidate business processes, this bulletin introduces a common GM Campaign Identification Label. This new corporate label replaces all similar divisional campaign labels and is to be used by all General Motors dealers/retailers to signify the completion of a product recall campaign.

Each label provides space to include the subject corporate campaign number and the divisional identification code of the dealer/retailer completing the campaign service. This information must be inserted with a typewriter or a ball point pen. Servicing dealers/retailers are to ensure that these numbers are recorded and the label is properly affixed on a clean, dry surface of the radiator core support in an area clearly visible when the hood is raised.

This new label is to be used in conjunction with a clear protective plastic cover which will also be provided to dealers when labels are ordered.

All current divisional Campaign Identification Labels should be destroyed.

Additional labels and covers are available at no charge to you in sheet stock of forty nine (49) per sheet from the following source:

VISPAC, Incorporated  
35000 Industrial Road  
Livonia, Michigan 48150  
1-800-269-5100 (Monday through Friday 8:00 AM to 4:30 PM EST)

**Important:**

Refer to Item Number S-1015 when ordering GM Campaign Identification Labels.

Label ordering information along with application instructions will also be included in all future Dealer Product Campaign Bulletins for easy reference.

If you have any other questions about this subject, please contact your divisional service representative.

Technical Service Bulletin # **588302A**

Date: **950701**

**Vehicle - AC Delco Locator Service, Electronics Exchange**

FILE IN SECTION: 8 - Chassis/Body Electrical

BULLETIN NO.: 58-83-02A

DATE: July, 1995

**SUBJECT:**

AC Delco Locator Service for Delco Electronics Exchange Products

**MODELS:**

1995 and Prior Passenger Cars  
1995 and Prior Trucks Excluding W Series

This bulletin is being revised to correct service center addresses and phone numbers. Please discard all copies of Corporate Bulletin Number 58-83-02 (Section 8 - Chassis/Body Electrical).

AC Delco established a locator service in 1990 to assist GM Dealers in locating Delco Electronics exchange products at AC Delco Service Centers. These exchange products include Instrument Clusters, Radios, Cellular Phones and DERMS (air bag module). The locator service is only available to GM Dealers.

The following steps should be taken when utilizing the AC Delco Locator service.

1. First, a dealer should contact their local AC Delco Service Center (list included) when an exchange product is required. A dealer may use any of the listed service centers.
2. If the local service center does not have the required exchange product, the dealer should contact the AC Delco Locator at 810-635-1542.
3. The dealer will need to provide the following information to the locator:
  - ^ Part number of requested exchange
  - ^ Dealer Code
  - ^ Name of person requesting exchange
  - ^ Phone number

^ Name of center that was unable to provide exchange

4. A person at the locator will advise the dealer of a service center where an exchange product is available and provide an 800 number for the service center.
5. The dealer should call the 800 number provided and request an exchange.

The locator service is designed to assist GM Dealers in locating exchange products at the AC Delco Service Centers. When exchange units are unavailable at local service centers, dealers should contact the AC Delco Locator, at 810-635-1542.

## **Instrument and Display Service Centers**

### **ARIZONA**

Jimmy's Radio - TV Corporation  
3839 N. 16th St.  
Phoenix, AZ 85016  
Phone #: (602) 264-1379  
(800) #: 227-7234  
Fax #: (602) 254-6697

### **CALIFORNIA**

Auto Electric Radio  
1841 West Commonwealth  
Fullerton, CA 92633  
Phone #: (714) 871-7357  
(800) #: 321-6970 In State  
(800) #: 321-6969 Out of State  
Fax #: (714) 871-2062

Speed-O-Tach  
2198 N. Main St.  
Walnut Creek, CA 94596  
Phone #: (510) 935-2040  
(800) #: 442-4491  
Fax #: (510) 935-2219

### **COLORADO**

Downtown Radio of Denver, Inc.  
2525 West Sixth Avenue  
Denver, CO 80204  
Phone #: (303) 573-6288  
(800) #: 373-3539  
Fax #: (303) 572-3196

### **FLORIDA**

Techni-Car, Inc.  
450 Commerce Blvd.  
Oldsmar, FL 34677  
Phone #: (813) 855-0022  
(800) #: 886-0022  
Fax #: (813) 855-2101

### **GEORGIA**

Speedometer Service Company  
8471 Roswell Road  
Atlanta, GA 30350  
Phone #: (404) 998-1666  
(800) #: 332-1827 In State  
(800) #: 241-2385 Out of State  
Fax #: (404) 993-0252

### **ILLINOIS**

D & B Auto Radio  
2140 Corporate Drive  
Addison, IL 60101  
Phone #: (708) 916-8787  
(800) #: 323-4813  
Fax #: (708) 916-8934 or 8922

### **MARYLAND**

Caton Radio, Inc.

## **Chevrolet Sprint L3-61 1.0L**

6328 Baltimore National Pike  
Catonsville, MD 21228  
Phone #: (410) 747-8667  
(800) #: 443-6709  
Fax #: (410) 788-4386

MASSACHUSETTS  
Modern Radio Shop  
34 Broadway  
Wakefield, MA 01880-3288  
Phone #: (617) 246-2052  
(800) #: 848-4001  
Fax #: (617) 246-2078

MICHIGAN  
Specmo Enterprises, Inc.  
2850W.11 Mile Road  
Berkley, MI 48072  
Phone #: (810) 399-7778  
(800) #: 545-7911  
Fax #: (810) 399-0493

MINNESOTA  
Auto Sound Entronix  
9600 54th Avenue North  
Minneapolis, MN 55442  
Phone #: (612) 559-9654  
(800) #: 328-0795  
Fax #: (612) 559-9652

MISSOURI  
Autronics Auto Spec.  
1450 Page Industrial Court  
St. Louis, MO 63132  
Phone #: (314) 423-2323  
(800) #: 325-1325  
Fax #: (314) 423-2841

NEW JERSEY  
Eastern Electronics, Inc.  
180 Essex Street  
Hackensack, NJ 07601  
Phone #: (201) 342-3945  
(800) #221-2138  
Fax #: (201)342-1163

NEW YORK  
Model Electronics, Inc.  
1-9 Roosevelt Avenue  
Spring Valley, NY 10977  
Phone #: (914) 356-5669  
(800) #: 433-9657  
Fax #: (914)356-6542

United Radio Service  
5705 Enterprise Pkwy.  
East Syracuse, NY 13057  
Phone #: (315) 446-5570  
(800) #: 448-0944  
Fax #: (315) 446-2434

NORTH CAROLINA  
Downtown Radio Service  
2908 Stewart Creek Blvd.  
Charlotte, NC 28216  
Phone #: (704) 391-0801  
(800) #: 537-0116  
Fax #: (704) 393-9145

OHIO

Dayton Speedometer Service  
7476 Webster Street  
Dayton, OH 45414  
Phone #: (513)454-4700  
(800) #: 543-9687  
Fax #: (513) 454-4711

Electra Sound, Inc.  
5260 Commerce Parkway West  
Parma, OH 44130  
Phone #: (216) 433-9600  
(800) #: 262-9606  
Fax #: (216) 433-9425

PENNSYLVANIA  
H & R Radio Service  
155 York Road  
Warminster, PA 18974  
Phone #: (215) 672-3707  
(800) #: 523-6605  
Fax #: (215) 672-2248

R.T. Grim  
400 Regis Avenue  
Pittsburgh, PA 15236  
Phone #: (412)655-1574  
(800) # : 222-5509  
Fax #: (412) 655-0988

TENNESSEE  
Rickwood Radio Service of TN  
1830 Airline Drive, Suite 12  
Nashville, TN 37210  
Phone #: (615) 889-3270  
(800) #: 423-4142  
Fax #: (615) 391-3842

TEXAS  
Speedometer Service, Inc.  
3227 Skylane Drive  
Carrollton, TX 75006  
Phone #: (214) 380-8944  
(800) #: 336-3998  
Fax #: (214) 733-4210

Zener Electronics, Inc.  
10535 Harwin Dr.  
Houston, TX 77036-1505  
Phone #: (713) 981-5700  
(800) # 992-1092  
Fax #: (713)981-8400

VIRGINIA  
Southern Autotronics, Inc.  
3300 Norfolk Street  
Richmond, VA 23230  
Phone #: (804) 353-5400  
(800) #: 446-2880  
Fax #: (804) 358-3216

WASHINGTON  
Instrument Sales & Service  
18814 72nd Avenue South  
Kent, WA 98031  
Phone #: (206) 251-9092  
(800) #: 444-7976  
Fax #: (206) 251-6543

CANADA  
Custone Auto Radio

## **Chevrolet Sprint L3-61 1.0L**

1150 Champlain Court  
Whitby, Ontario  
Canada L1N 6K9  
Phone #: (905) 668-2664  
Fax #: (905) 668-2917

Lebeau Techni Centre  
6825 Place Pascal-Gagon  
Montreal-Nord, Quebec  
Canada H1P2V8  
Phone #: (514) 327-1122  
(800) #: 361-4124 (In Canada Only)  
Fax #: (514) 327-3694

United Automotive  
5340 Lougheed Highway  
Burnaby, British Columbia  
Canada V5B2Z8  
Phone #: (604)291-7480  
Fax #: (604) 291-9417

SWITZERLAND  
Autometer AG  
Aresenalstrasse 51  
CH-6010 Kriens  
Switzerland  
Phone #: (011)-41-41-414241  
FAX #: (011)41-41-41-1424

UNITED EMIRATES  
Bin Hamoodah Trading & Services  
P.O. Box 203  
Abu Dhabi  
United Arab Emirates  
Phone #: 9-011-971-2-448888 (9 hours ahead of our time)  
FAX #: 9-011-971-2-449073 (Letters Only)

Technical Service Bulletin # **420515A**

Date: **950201**

## **Warranty - Diagnostic Claim Processing Revisions**

File In Section: Warranty Administration

Bulletin No.: 42-05-15A

Date: February, 1995

Subject:  
Chevrolet Claim Processing

Models:  
All Chevrolet Models

Attention: Dealer Service Manager/Warranty Administrator

This bulletin is being revised to offer retail and wholesale service personnel further explanation of the Chevrolet/WINS transitional issues relating to "symptom Diagnosis," "CAMS diagnosis," 1993 and 1994 Labor Time Guides (LTG), and Appendix "D" of the Chevrolet Processing Manual (CPM). Please discard bulletin number 42-05-15 (Section - Warranty Administration).

To begin with, 1993 and prior Chevrolet LTG's were published with "symptom diagnosis" as part of the base time for various electrical and emission labor operations. Chevrolet dealers were allowed to submit additional "CAMS diagnosis" time to specified electrical and emission labor operations found in Appendix "D" of the CPM; warranty files would accommodate this combination without the need for excessive authorization.

Effective with the 4/15/94 Revision to the 94 LTG, "symptom diagnosis" was eliminated from the base time of most electrical and emission labor operations. In its place, dealers were advised, via the LTG forward section entitled "Diagnosis," to use the new add condition "variable diagnosis." Also, effective with the 04/15/94 revision, labor operation J9997 "CAMS diagnosis" time was eliminated.

Dealers were advised of the elimination of "CAMS diagnosis" time, labor operation J9997, in Warranty Administration bulletin number 420505 dated 4/94. This bulletin also advised dealers to begin using "variable diagnosis" in place of the "CAMS diagnosis"; it did not specifically read that "variable diagnosis" also replaced "symptom diagnosis," but should have. As a transitional item, dealers could continue to add the "CAMS



diagnosis" time to the labor operations specified in Appendix "D" of the CPM up until 09/14/94. As of 09/15/94, dealers were no longer allowed to use the "CAMS diagnosis" time for 1994 and future model years. Claim processing procedures for 1993 and prior model years remained unaffected by bulletin 420505.

In July of 1994, warranty administration bulletin 480501, for all divisions except Buick, introduced "customer concern not duplicated/verified labor operations" and announced that "CAMS diagnosis" time was discontinued for 1989 and future model years; this was incorrect for Chevrolet Dealers. To correct this, Chevrolet "CAMS diagnosis" misinformation, Warranty Administration bulletin number 420510 dated 08/94, reminded Chevrolet Dealers that on 09/14/94 "CAMS diagnosis" time was discontinued for 1994 and future model years, not 1989 and later.

Warranty Administration bulletin number 42-05-15, dated 12/94, advised Chevrolet Dealers that "CAMS diagnosis" time for 1993 and prior model years was discontinued; which is correct. In its place, dealers were advised to use "variable diagnosis" and would be able to do so without the need for authorization for up to 0.3 hrs; this is not correct. This bulletin is being revised to advise dealers that for 1993 and prior model years "symptom diagnosis" is included in the base time of various labor operations and that any time in "other labor hours" will require an "E" authorization.

Technical Service Bulletin # **891528B**

Date: **890501**

## Electrical - Wiring Repair Temp Range Precaution

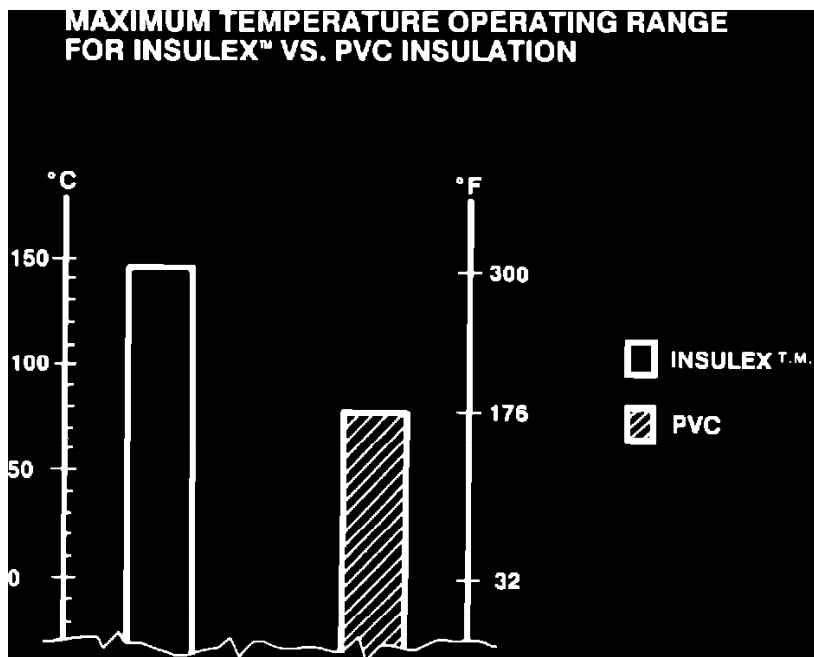
Number: 89-152-8B

Section: 8B

Date: May, 1989

Subject: SELECTION OF CORRECT WIRE INSULATION MATERIAL FOR WIRE REPAIRS

Model and Year: 1980-89 ALL CHEVROLET MODELS



TO: ALL CHEVROLET DEALERS

Wiring repairs on a vehicle in an area that is not subjected to high temperatures (i.e. passenger compartment, instrument panel or cargo compartment) may be accomplished using a cable of sufficient size (sq.mm or gage) with a general purpose insulation. The common general purpose cable insulation material is polyvinyl chloride (PVC). PVC insulation should not be used for wiring repairs in areas where temperatures exceed 80 degrees C (176 degrees F).

For wiring repairs in areas where temperatures exceed 80 degrees C (176 degrees F), a cable of sufficient size with a special thermo set compound is required. Cross link polyethylene (Insulex (TM)) is such a material and should be used where temperatures exceed 80 degrees C (176 degrees F) such as the engine compartment, especially when the wiring harness is near the exhaust manifold or exhaust system. Cross link polyethylene can withstand continuous operating temperatures of up to 148 degrees C (300 degrees F), see Fig. 1, and has 25% more resistance to abrasion and 10% more "pinch" protection than general purpose PVC cable insulation. Should a short occur, the cross link polyethylene insulation will not burn.

Insulex (TM) (cross link polyethylene) cable is available from .8 sq.mm (18 GA) to 13 sq.mm (6 GA) and sizes .8 sq.mm (18 GA) to 5 sq.mm (10 GA) are available in various colors. Bulk insulation cable is available on 50 foot, 100 foot or 1000 foot spools, depending on the cable size.

The AC-Delco Wire and Cable Catalog, number 16A-100, contains cable and part number information for orders from a local AC-Delco supplier. The catalog (16A-100) is also available from local suppliers and contains a GMSPO to AC-Delco part number conversion guide. Some cable part numbers are available through GMSPO but, generally, cable would be ordered by the AC-Delco "short" number through a local AC-Delco supplier. If a dealership does not want to stock bulk spools of both PVC and Insulex (TM) cable in all of the various sizes, it is recommended to stock only

Insulex (TM) cable to help control parts inventory, since Insulex (TM) can be used to replace PVC cable.

Insulex (TM) may not be used to replace the wiring to the throttle body injector connector or to replace wire on a fuel tank unit since gasoline or fuel vapors can damage the polyethylene compounds. Insulex (TM) may not be used to replace fusible link cable or to repair the lead on an oxygen sensor due to the extremely high temperature at the oxygen sensor location. Insulex (TM) can be used for all other cable repairs.

The Wire and Terminal Repair Kit (essential tool) J 38125 contains three sizes of crimp and seal splice sleeves, crimping tools, heating torch and an instruction manual which should be used for cable repair. The crimp and seal splice sleeves, like Insulex (TM) cable, are suitable for use in high temperature areas and will provide a good environment seal for the splice.

Technical Service Bulletin # **410103**

Date: **940901**

## **Campaign - Product Bulletin Numbering System**

File in Section: 0 - General Information

Bulletin No.: 41-01-03

Date: September, 1994

Subject:  
Dealer Product Campaign Bulletin Numbering System

Models:  
1995 and Prior Passenger Cars and Trucks

General Motors believes that the development of common processes and systems is strategic to the strengthening of business partnerships with its dealers/retailers to ensure mutual success. As a preliminary step toward this goal, this bulletin introduces a common numbering system for all General Motors Product Recall Campaigns.

Effective immediately, the use of unique divisional identification numbers for Dealer Product Campaign Bulletins will be discontinued. A common corporate identification number will be issued for all new campaigns so that those campaigns involving vehicles from multiple General Motors divisions can be identified by a single number.

This new number will retain the same form and qualities as the current five position campaign number (i.e., 95-0-01). The first two positions will indicate the most current model year involved with the "C" in the third position indicating recall campaign (all types including Emission) and the last two positions indicating the sequence number of the campaign for that model year.

This corporate campaign number will be applied sequentially to all General Motors campaigns as they are released regardless of divisional involvement. For example, during the 1995 model year, a division could be involved in product recall campaigns 95-0-02, 95-0-03, 95-0-09, 95-C-17, and 95-0-24 either singularly or with other General Motors divisions. A variation of this common numbering system will also be utilized for all new campaigns involving past model vehicles (i.e., prior to the 1995 model) with the only difference in application being that the first sequential number will start at "50" for any given model year.

To assist dealers/retailers in the administration of this activity, the GM Service Bulletin Index, which is published quarterly, will contain campaign bulletin reference information for all General Motors product recalls that have been assigned a common corporate identification number. This will enable dealers/retailers to verify that they have received all campaigns that pertain to their franchises.

If you have any questions about this subject, please contact your divisional service representative. Technical Service Bulletin # **89970A**  
Date: **890301**

## **Vehicle - Current Model Line Designators**

Number: 89-97-OA  
Section: OA  
Date: MARCH, 1989  
Subject: USE OF CAR/TRUCK LINE INDICATOR IN PLACE OF MODEL NAMES

Model and Year: ALL FUTURE DEALER SERVICE BULLETINS  
TO: ALL CHEVROLET DEALERS

Future Chevrolet Dealer Service Bulletins will use the recognized car/truck line designator to identify involved models, in place of the vehicle names. Vehicle line designators are listed in service manuals, parts manuals, training aids, and the VIN cards supplied each year to all dealers.

Listed below are all current designators for Chevrolet passenger cars and light duty trucks.

### **PASSENGER CARS**

DESIGNATOR	MODEL
A	Celebrity

### **TRUCKS**

DESIGNATOR	MODEL
C	Conven. Cab 4 x 2

B	Caprice
F	Camaro
J	Cavalier
L	Corsica/Beretta
M	GEO Metro/Sprint
R	GEO Spectrum
S	GEO Prizm
Y	Corvette

D	Military Trk 4 x 4
G	Van 4 x 2
J	Compact Cab 4 x 4
K	Conven. Cab 4 x 4
M	Small Van 4 x 2
P	Forward Ctrl. 4 x 2
R	Conven. Cab 4 x 2
S	Sml. Conven. Cab 4 x 2
T	Sml. Conven. Cab 4 x 4
V	Conv. Cab 4 x 4

Technical Service Bulletin # 480502

Date: 940801

**Parts - Expediting Procedures**

Group Ref.: Warranty Administration

Bulletin No.: 480502

Date: August, 1994

**WARRANTY ADMINISTRATION**

**SUBJECT:**  
**INFORMATION ON EXPEDITING PARTS**

**MODELS:**  
**ALL PASSENGER CARS AND TRUCKS**

General Motors continues to reduce the number of service parts on backorder. These improvements are to aid and assure success of our mutual goals of exceeding our customer's expectations in all areas of our business. The following policy is being enacted to address those rare occasions when it is necessary to procure a part locally from another dealer/retailer distributor or by express shipping.

The following procedure provides dealers/retailers with the tools to help achieve total customer satisfaction. This procedure will provide reimbursement of expenses beyond normal dealer/retailer parts costs, up to dealer/retailer trade for parts obtained locally, or expenses incurred for expediting General Motors parts not in dealer/retailer stock.

**Recommended Parts Expediting Procedure:**

1. Inform the customer if a part availability issue exists, and if eligible, offer appropriate "Courtesy Transportation". See Divisional Manual for guidelines.
2. Contact local dealers/retailers distributors and your local PDC in an attempt to obtain needed parts and provide same day repair. Participating divisions will reimburse the difference between dealer/retailer price and actual cost, up to trade price, as published in The GMSPO Parts And Accessories Price Guide.
3. In the event same day repairs cannot be provided, order the part "VIP-Overnight" ("VIP" if overnight service is not available in your area). Participating division will reimburse VIP charges and shipping expenses. (if a part is on back order, IMMEDIATELY upgrade the order to a SPAC case).
4. Please review the parts application and add part to your normal inventory if appropriate.
5. Always keep the customer informed of the status of the repair.

**CLAIM SUBMISSION****Part Obtained Locally:**

When a General Motors part is obtained from a local dealer or distributor, the dealer/retailer will be reimbursed for the added cost up to the published dealer trade price. Should the GM Parts book not have a trade price listed, the trade price parts handling allowance should not exceed 25% of the listed dealer cost. A claim for the repair should be submitted in the normal manner. An additional claim/case should be submitted for the actual amount paid, up to dealer trade price, for the added cost incurred, (dealer/retailer amount paid less the normal GMSPO dealer price = handling allowance).

The following example utilizes an evaporator core as the required part. In the example, the dealer/retailer purchased the part from another dealer/retailer for \$240.00. The repairing division will compensate the dealer/retailer for the dealer net plus the normal parts allowance (30% for 93 and prior, 40% for 94 and future)  $\$199.80 + 59.94 = \$259.74$  as part of the regular labor operation D3320. The additional part cost over and above dealer price,  $(\$240.00 - 199.80 = \$40.20)$  should be submitted under labor operation Z5000 as a net amount.

Field Of Entry	Data Required
R.O. Number	Same as repair R.O.
Date	Same as repair R.O.
VIN	Same as repair R.O.
Odometer	Same as repair R.O.
Part Count	Leave Blank
Part Number	Leave Blank
Part Cost	Leave Blank
Complaint Code*	Enter MD
Failure Code	Enter 93
Labor Operation	Enter Z5000
Labor Hours	Leave Blank
Other Labor Hours	Leave Blank
Net Amount	Enter \$\$ Amount Claimed
Line Total	Enter \$\$ Total Amount
Tech SSN	Same As Repair R.O.

\*NOTE: Not all divisions use complaint codes, make entry where required.

The claim submission is shown in the example.

PART CNT	PART NO.	PART COST	COMP CODE	FAILURE CODE	LABOR OP	LABOR HOURS	NET AMT	LINE TOTAL
			MD	93	Z5000		\$40.20	\$40.20

The elements for this claim may appear on your DCS screen in the following manner (some of screen layouts may be different).

Part Ordered "VIP Overnight Or VIP"

If a VIP overnight order is necessary, the VIP service charge and freight expense will be reimbursed. A claim for the repair should be submitted in the normal manner. An additional claim/case should be submitted for the actual amount of the VIP charge and freight expense, (Freight charges can be obtained from the package invoice included with the part, form number PC-82).

If the evaporator core in the previous example had been obtained from GMSPO through a VIP overnight parts order, the following example shows correct warranty claim submission for the additional cost. The published GMSPO dealer price for the core is \$199.80. The GMSPO charges associated with the VIP overnight order would be \$11.99 (\$2.00 per line plus 5% of the dealer price). The repairing division would reimburse this amount, plus any applicable freight charges, submitted under labor operation Z5001 as a net amount, (VIP charges of \$11.99 + \$18.00 express shipping charges = \$29.99).

Field Of Entry	Data Required
R.O. Number	Same as repair R.O.
Date	Same as repair R.O.
VIN	Same as repair R.O.
Odometer	Same as repair R.O.
Part Count	Leave Blank
Part Number	Leave Blank
Part Cost	Leave Blank
Complaint Code*	Enter MD
Failure Code	Enter 93
Labor Operation	Enter Z5001
Labor Hours	Leave Blank
Other Labor Hours	Leave Blank
Net Amount	Enter \$\$ Amount Claimed
Line Total	Enter \$\$ Total Amount
Tech SSN	Same As Repair R.O.

\*NOTE: Not all divisions use complaint codes, make entry where required.

The claim submission is shown in the example.

PART CNT	PART NO.	PART COST	COMP CODE	FAILURE CODE	LABOR OP	LABOR HOURS	NET AMT	LINE TOTAL
			MD	93	Z5001		\$29.99	\$29.99

The elements for this claim may appear on your DCS screen in the manner (some of screen layouts may be different).

All records and invoices in support of your claim must be retained and attached to your warranty copy of the repair order in accordance with Article 1.6 of the GM Service Policies And Procedure Manual.

When submitting for reimbursement under either of the operation numbers, Z5000 for parts obtained locally or Z5001 for VIP overnight expenses, the service manager is required to initial and provide an appropriate explanation on the repair order to indicate approval of the added expense. These claims will only require authorization when the vehicle is out of the normal new vehicle warranty.

GM is making a significant financial commitment to help reduce comebacks and maintain the level of customer service demanded by customers in your dealership. Please use good judgment to administer this policy. We feel exceeding customer expectations will pay great dividends to all GM dealers.

Technical Service Bulletin # **431048**

Date: **941101**

## Glass - Adhesive Caulking Kit Revisions

File In Section: 10 - Body

Bulletin No.: 43-10-48

Date: November, 1994

### INFORMATION

Subject:

Revisions to Adhesive Caulking Kit, New Primers and Part Numbers; New Extended Method Procedures

Models:

1994 and Prior Passenger Cars and Trucks Using Urethane Adhesive Applications

(Stationary Glass, Roof Panels, etc.)

Recently, some changes were made to the current Adhesive Caulking Kit, GM P/N 12345633.

Qty.	Description
1	Cartridge of Urethane Adhesive
1	Nozzle for Urethane Cartridge
1	10cc bottle of Glass Prep Primer (Clear, #1)
1	10cc bottle of Glass Primer (Black, #2)
1	30cc bottle of Pinchweld Primer (Black, #3) for use on pinchweld flanges for extended (long method) windshield replacements and Urethane bonded S.M.C. parts (Camaro/Firebird roof panels).
1	30cc bottle of P V C Primer (Clear, #4) for use with encapsulated glass (modules).
4	Applicator Daubers

The new Urethane Adhesive Caulking Kit, GM P/N 12346284 contains some additional primers, and has broader applications than the previous kit. The contents for the new kit include as shown.

Included in the above changes, is an instruction sheet which has been modified to the new contents.

GM Kit Product	Equivalent Product
Urethane Adhesive	Essex # U400
Glass Prep Primer (Clear, #1)	Essex # U401
Glass Primer (Black, #2)	Essex # U402
Pinchweld Primer (Black, #3)	Essex # U413

GM Kit Product	Equivalent Product
P V C Primer (Clear, #4)	Essex # U555

Alternate equivalent materials for this kit may be available from a local glass repair shop under the following product numbers:

Other manufacturers of Urethane Adhesive that have documented their ability to meet or exceed General Motors' Specification # 3651M are also considered to be equivalent to GM Kit P/N 12346284.

In addition to the Kit changes, the following information contains revised procedures for Extended Method Windshield Replacements.

#### Process Steps For Extended Method Windshield Replacements

Windshield replacements that require a complete urethane bead application. No (or slight) urethane remains in the windshield opening.

This condition can occur as a result of:

- ^ The original bead not being able to serve as a good base.
- ^ Collision damage repair to the sheet metal in the opening.
- ^ The need for the opening to be repainted.

Follow the procedures in the Service Manual EXCEPT IN THE FOLLOWING CASES:

1. Where the extended method is to be used WITHOUT DAMAGED SHEET METAL REPLACEMENTS, or REPAINTING OF THE OPENING IS NOT REQUIRED;
  - A. Apply the black pinchweld primer (# 3) from NEW URETHANE KIT P/N 12346284 to any exposed painted surface in the windshield opening. DO NOT apply primer over the existing urethane bead surface.
  - B. DO NOT USE THE BLACK # 2 PRIMER FOR PINCHWELD APPLICATIONS.
2. Where the extended method is to be used WITH DAMAGED SHEET METAL REPLACEMENTS, or THE OPENING NEEDS TO BE REPAINTED;

The bonding area should be a primer surface ONLY, and NO an aftermarket top coated (paint, or color coated) surface. Materials such as BASF DE17, DUPONT 2610 or PPG DP40 (or equivalent) are appropriate for this application.

**Note:**

If bare metal is present, apply an appropriate metal cleaner and conditioner prior to the application of one of the above indicated primers.

- A. Apply a coating of primer (as indicated above) to the bonding area of the windshield opening flange, following the manufacturer's directions for mix and dry times.
- B. Apply the black pinchweld primer (# 3) from NEW URETHANE KIT P/N 12346284 to the primed area of the windshield opening for adhesive application.

**Note:**

APPLY OVER SURFACES that have been coated with Primer ONLY. If paint repair is necessary, mask the flange bonding area prior to painting to allow a "primer only" surface.

#### Parts Information

Parts are currently available from GMSPO.

Technical Service Bulletin # **913500B**

Date: **910601**

## Vehicle - Federal Theft Prevention Standard

Number: 91-350-0B

Section: 0B

Date: JUNE 1991

Corporate Bulletin No.: 770104R

Subject:

**FEDERAL VEHICLE THEFT PREVENTION STANDARD**

Model and Year:

1987-91 SELECT CHEVROLET MODELS

THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN NO. 91-39-0B, DATED AUGUST 1990. THE BULLETIN PURPOSE HAS BEEN CLARIFIED. ALL COPIES OF 91-39-0B SHOULD BE DISCARDED.

Beginning with the 1987 model year, Federal law required General Motors to label certain parts, on selected cars, with the Vehicle Identification Number or, in the case of the engine and transmission, transaxle, the VIN derivative. The C,D,E,F,H,K,P,V, and W models are affected. Additional models may be affected in future model years. These parts include:

- ^ Engine and transmission/transaxle (to be stamped)
- ^ Front and rear bumper assemblies
- ^ Hood
- ^ Right and left front doors
- ^ Right and left rear doors
- ^ Right and left rear quarter panels
- ^ Right and left front fenders
- ^ Rear compartment lid

\* Certification label on driver's door qualities as theft prevention label.

The label containing the Vehicle Identification Number or VIN derivative, as applicable, is required to be permanently affixed to a designated location on the part surface. Replacement parts are also required to have labels affixed to them. Replacement parts labels must be imprinted with the letter "R", the manufacturer's trademark (GM logo) and the letters "DOT"; however, the imprinting or labeling on replacement parts must be done in locations different from those designated for OEM parts.

These federal vehicle theft prevention labels ARE NOT TO BE REMOVED, DEFACED, ALTERED, OR COVERED OVER. They must also be masked prior to any painting, rustproofing, undercoating, etc. The mask MUST then be removed following such operations. Failure to keep the labels clean and readable may result in liability proceedings for violation of the Federal Vehicle Theft Prevention Act and subject the owner or operator to possible criminal investigation or suspicion of vehicle theft (dealer prep included).

Technical Service Bulletin # **400501**

Date: **940701**

**Warranty - Corporate Parts Return Program**

Group Ref.: Warranty Administration

Bulletin No.: 400501

Date: July, 1994

WARRANTY ADMINISTRATION

SUBJECT:  
CORPORATE PARTS RETURN PROGRAM

MODELS:  
ALL BUICK, CADILLAC, CHEVROLET, OLDSMOBILE AND PONTIAC MODELS

ATTENTION: Service Managers

Warranty Administrators

Parts Managers

The purpose of this bulletin is to introduce improvements that are being made to the Corporate Parts Return Program in the areas of compensation, preparation, and administration. In the process, we want to stress the importance GM places on dealer participation in the program. It remains one of the most valuable tools our engineers and suppliers have available to them for root cause analysis of customer product concerns. Your participation is the key to the success of the program.

Recent visits to several GM dealerships resulted in a number of suggestions for improvements to the program. With this feedback, some changes have been made to enhance the program.

We would like to take this opportunity to refresh your awareness of the program as well as notify you of the changes which have been made. These changes are indicated by \*.

RETURN REQUEST:

When a part and/or repair order is needed, a Return Request will be generated and transmitted to the dealer via DCS. Please note that Return Requests will be transmitted only to dealers who have received payment for replacement or repair of the requested part(s). See example of the new

return request shown on last page of this bulletin and note that the address of the person requesting the part and/or repair order is printed twice. The first address can be cut out and used as a shipping label.

The return request will list specific cases for which parts and/or repair orders are to be returned. There are different ways parts and/or repair orders can be requested:

- ^ If there are no special instructions under the shipping address, the part(s) and legible copies of the front side and the technician comment section of the repair order should be shipped together.
- ^ If "Send Repair Order Only" is given as a special instruction, legible copies of both the front side and the technician comments section of the repair order should be returned.
- ^ If a part is requested on a Labor-Only claim, legible copies of both the front side and technician comments section of the repair order should be sent instead. This situation can occur occasionally since the Corporate Parts Return system request matching process can be triggered by the submission of a labor operation with or without a part installation.
- ^ If the part is not available for some reason, a copy of the repair order should be sent with a note indicating that the part is unavailable and the reason it is unavailable.

#### RETURNING REQUESTED PARTS:

- ^ Technician comments have proven to be one of the most important inputs for root cause analysis of customer concerns. Because of the value of these comments, the returned repair order should be copies of both sides of the technician's copy which contains such comments. Make a legible copy of both the front side and the technician comments section of the repair order and enclose with any part(s). Use the container from the new/replacement part for the return of the failed part, whenever possible. Parts containing fluids, such as fuel pumps, should be drained and placed in plastic bags and securely packaged to prevent leakage or contamination of other parts.

Ship "prepaid" using the least expensive method. Use UPS whenever possible. Sorry, we cannot accept C.O.D. shipments. Please use first class mail when only repair order copies are returned.

#### PACKAGING:

Special packaging costs, where applicable, are to be included in the "Net-Amt" on your special disbursement claim. Appropriate situations may include crating an engine assembly, reassembly of components, or draining and sealing components to prevent leakage during shipment. These situations should be documented on the repair order.

#### CORE CHARGE PARTS:

GMSPD Information Bulletin 94-34 urges the return of parts containing core charges on a daily basis. This is completely voluntary on the part of the dealers. Sometimes core parts are requested through the Corporate Parts Return Program and having them available to return will aid in root cause analysis. Part core charges will be fully reimbursed through the Corporate Parts Return Program.

#### REIMBURSEMENT OF DEALER EXPENSE:

The following qualify for dealer reimbursement:

1. Administrative Allowances:
  - \* Recognizing that more time is involved in making copies of both sides of the repair orders containing the technician comments, and that not all requests require the same amount of effort to complete, a significant change has been made to the reimbursement of administrative allowances:
    - a. A range from 0.0 to 0.4 hours can be claimed for each case involving the return of part(s) and copies of both sides of the technician's repair order. The time reimbursed depends on the complexity of the request as determined by the dealer.
    - b. A range from 0.0 to 0.2 hours can be claimed for each case where only the requested repair order copies are returned, again as determined by the dealer.
2. Shipping expenses and any first class postage paid by the dealer.
3. Packaging Costs, where applicable
4. Part core charges, where applicable

#### DEALERS METHOD OF REIMBURSEMENT

- \* Up to 10 parts return requests may be recorded on one repair order, regardless of how many locations the parts are being shipped to. Submit a reimbursement claim using the normal submission procedure and Labor Operation Z7200 with Claim type "F". Copies of shipping expense invoices and shipment request must be retained for future reference.



FIELD OF ENTRY	ENTER
REPAIR ORDER NUMBER	Shipment repair order number
REPAIR ORDER DATE	Date of shipment
VEHICLE I.D. NUMBER	Enter ONE of the valid VINS from the return requests that are being reimbursed on the claim
MILES	Enter mileage for the same VIN from the return request
FAILURE/TROUBLE CODE	Enter 00
LABOR OPERATION	Enter Z7200
LABOR HOURS	Leave blank
OTHER LABOR HOURS	From 0.0 to 0.4 hours for each part requested with repair order and from 0.0 to 0.2 hours for each 'repair order only' request being reimbursed on this claim.
NET-AMT	Total amount of prepaid shipping, first class postage, packaging, administrative allowances, and applicable part core charges.
CLAIM TYPE	Enter "F"
CC	Enter "SI"
SV-ADV-SS	Enter service manager's social security number
TECH-S-NO	Enter technician's social security number

**Note:**

Each of the items may not apply to all divisions because of DCS software differences until September, 1994. By September there will be new software released, as part of the new General Motors common claims processing system, that will allow entry of all items by all involved divisions.

**\*FEEDBACK COMMITMENT**

The need to provide dealers information regarding our progress and accomplishments in product improvements as a direct result of the Corporate Parts Return program is recognized. We are reviewing several approaches in response to this concern. Once we have identified the most effective communication process, it will be introduced to the dealers.

**PARTS RETURN REQUEST EXAMPLE**

CORP. PART AND R.O. RETURN REQUEST(S) FOR DEALER XXXXX-CLAIM RUN XXX

CLAIM LINES LISTED INVOLVE LABOR CODES AND/OR PARTS DESIRED FOR ENGINEERING ANALYSIS. PLEASE RETURN LEGIBLE COPIES OF TECHNICIAN COPY R.O. FRONT AND BACK, AND, IF INDICATED, THE PARTS RETAINED FOR THAT LINE TO THE ADDRESS INDICATED. EXTRA ADDRESS CAN BE USED AS A MAILING LABEL.

USE Z7200 TO SUBMIT FOR HANDLING COSTS PER WARRANTY ADMINISTRATION BULLETIN 400501. THANK YOU FOR YOUR INPUT.

TO: DOUG REED, PROD. ENG.  
BOWLING GREEN ASSEMBLY PLANT (SHIPPING LABEL)  
600 CORVETTE DRIVE SALVAGE DEPT.  
BOWLING GREEN KY 42102-9006

DOUG REED, PROD. ENG.  
BOWLING GREEN ASSEMBLY PLANT  
600 CORVETTE DRIVE  
SALVAGE DEPT.  
BOWLING GREEN KY 42102-9006

DOCUMENT NUMBER	LN NO	RO DATE	RO NO.	VEHICLE IDENT. NUMBER	PART CT	PART NO.	LABOR OP
077020	02	030994	36219	1G1YY22POR5106443			C0183

DOCUMENT NUMBER	LN NO	RO DATE	RO NO.	VEHICLE IDENT. NUMBER	PART CT	PART NO.	LABOR OP
076021	04	031294	36412	1G1LV15M6RY166983		12345678	C4261

SPECIAL INSTRUCTIONS: SEND PARTS AND REPAIR ORDERS

NOTE:

IN THIS CASE, BECAUSE THERE IS NO PART NUMBER ASSOCIATED WITH THE CLAIM BOTH SIDES OF THE TECHNICIAN'S REPAIR ORDER SHOULD BE COPIED AND SENT.

TO: B-O-C LANSING AUTOMOTIVE DIV  
ATTN: ADAM NGUYEN  
7000 CHICAGO ROAD  
MS S821  
WARREN MI 48090-0000

B-O-C LANSING AUTOMOTIVE DIV  
ATTN: ADAM NGUYEN  
7000 CHICAGO ROAD  
MS S821  
WARREN MI 48090-0000

NOTE:

NO SPECIAL INSTRUCTIONS - SEND BOTH PART AND COPIES OF BOTH SIDES OF TECHNICIAN'S REPAIR ORDER

Technical Service Bulletin # **436506**

Date: **941001**

## I/M 240 Repairs - Obtaining Technical Assistance

File in Section: 6E - Engine Fuel & Emission  
Bulletin No.: 43-65-06  
Date: October, 1994

Subject:  
Obtaining Technical Assistance for Vehicles Requiring VM 240 Repairs

Models:  
1995 and Prior Passenger Cars and Trucks

To better support dealer technicians involved with repairing vehicles which have failed I/M 240 emissions tests, all divisional Technical Assistance staffs will accept calls from ANY General Motors dealership attempting to repair any of that division's products. Specifically, Technical Assistance engineers will now assist GM dealer technicians with emissions repairs on any of their division's products, regardless of whether the servicing dealership's sales and service agreement covers that product. This will optimize technical support for any GM technician attempting to perform emissions related repairs on a GM product.

This extension of Technical Assistance support does not alter Corporate warranty policy. Submission of claims for warranty reimbursement is allowed only by dealerships selling that vehicle brand.

This policy change is effective immediately, but pertains to I/M 240 emissions system repairs only. Please continue to use your respective divisional centers for all other repairs. All Technical Assistance phone numbers are listed in the General Motors Service Policies and Procedures Manual (Section 5.3).

Technical Service Bulletin # **93966C**

Date: **930201**

## Fuel System - Factors That Affect Economy/Mileage

Number: 93-96-6C

Section: 6C

Date: FEB. 1993

Corporate Bulletin No.: 306502

ASE No.: A1, A8

Subject:  
**FACTORS THAT AFFECT FUEL ECONOMY**

Model and Year:  
**ALL YEARS ALL MODELS**

**BACKGROUND INFORMATION:**

EPA fuel economy estimates are posted on the fuel economy label of all new vehicles. The only intended use of these values is for comparison among the different vehicles. Fuel economy estimates are generated from data taken during a laboratory test using pre-production prototype vehicles under extremely controlled conditions using a professional driver, with the vehicle operating on an instrument similar to a treadmill. The comparisons of current vehicle fuel economy to the EPA fuel economy estimates is a misuse of the information and should be discouraged.

The EPA GAS MILEAGE GUIDE, available at each dealership, points out that the actual mileage when driving a vehicle may differ considerably from the estimated mileage. The guide also describes how vehicles are tested under identical conditions to insure the results can be compared with confidence.

The EPA GAS MILEAGE GUIDE also points out that city fuel economy estimate simulates a 7.5 mile, stop-and-go trip with an average speed of 20 mph. The trip takes 23 minutes and has 18 stops. About 18 percent of the time is spent idling, as in waiting at traffic lights or in rush hour traffic. Two kinds of engine starts are used - the cold start, which is similar to starting a car in the morning after it has been parked all night - and the hot start, similar to restarting a vehicle after it has been warmed up, driven and stopped for a short time.

The test to determine the highway fuel economy estimate represents a mixture of "non-city" driving. Segments corresponding to different kinds of rural roads and interstate highways are included. The test simulates a 10 mile trip and averages 48 mph. The test is run from a hot start and has little idling time and no stops.

The EPA GAS MILEAGE GUIDE explains that the actual test results are adjusted downward to arrive at the estimates used in the booklet and on the labels. City estimates are lowered by 10 percent and the highway estimate by 22 percent from the laboratory test results. The guide also points out that traveling at higher speeds lowers fuel economy and traveling at 65 mph instead of 55 mph lowers fuel economy over 15 percent.

**FACTORS THAT AFFECT FUEL ECONOMY:**

**Axle Ratio**

Numerically lower axle ratios generally produce better highway fuel economy. The exception to this is if the engine is "working" exceptionally hard, (heavy vehicle loads pulling a trailer, small engine in a large vehicle ... ). In these cases a numerically higher axle may provide better fuel economy. Numerically higher axle ratios will also tend to provide more fuel economy in congested city traffic and stop and go conditions.

**Brakes**

Brake drag (even a minimal amount undetectable by coasting), can have a significant negative impact on fuel economy. Pull upward on the brake pedal to assure that the stoplight switch and cruise switch at the brake pedal are full and properly adjusted. A "click" sound when the pedal is pulled upward indicates that the switch was improperly adjusted. This causes the front brake pads to lightly rub the rotors, causing a fuel economy loss, without generating excessive heat or brake pad wear.

**Driving Habits**

Frequent short trips (less than 5 miles), especially in cooler ambient temperatures (less than 65 degrees), will necessitate fuel enrichment on start-ups, especially after "soaks" with the engine off for approximately a half hour or more.

Frequent accelerator pedal movement while driving will reduce fuel economy because of fuel enrichment during the periods of acceleration. Under such driving conditions the torque converter clutch (TCC) also disengages, contributing to fuel economy losses. Prolonged idle periods reduce fuel economy especially in cold ambients when vehicle is allowed to "Warm up".

**Fuels**

Oxygenated fuels, with methanol and/or ethanol blended into the gasoline have lower energy and thus reduce fuel economy. Typically there is about a 1 MPG penalty for a vehicle which gets 25 to 30 MPG on 100 percent gasoline.

Using fuels of a lower octane than the vehicle was calibrated to will cause increased "KS" Knock Sensor system activity. This will result in a net decrease in spark advance and thus poorer fuel economy. Using fuel of a higher octane than the vehicle was calibrated for WILL NOT increase fuel economy.

Variations in how much fuel is added to the fuel tank during re-fueling can greatly affect calculated fuel economy. These effects decrease as the distance traveled and the number of tank fillups increase.

**Green Engine**

New vehicles have not yet had an opportunity for the engine to break in, (rings to seat ... ). A typical engine will take 3 to 5 thousand miles to break

in and during this time period a gradual increase in fuel economy can be expected.

#### Parasitic Loads

Air conditioning and/or electrical loads, (headlights, heated backglass ... ) also result in lower fuel economy, (typically less than 1 MPG difference, each 10 AMPs takes approximately .4 MPG).

#### Road Conditions

Road surface condition impacts fuel economy. Gravel and/or pot holed roads decrease fuel economy. Hills (vs. level terrain) also negatively impact fuel economy. Even gradual unperceptible increases in elevation result in real measurable decreases in fuel economy. Similarly, driving in the rain or snow decreases fuel economy.

#### Suspension

Vehicle suspension misalignment can cause poor fuel economy. Check all four tires for abnormal and/or premature tire wear.

New tires, tire rotation, and/or front end alignment may be required to correct fuel economy.

#### Tires

Performance tires and/or tires with larger "contact areas," (like 60 series aspect ratio), can cause as much as 3 MPG lower fuel economy when compared to hard "thin" tires. Find out if the tire size currently on the car is the same as original equipment. Replacement tires tailor than original equipment tires cause the odometer to read LESS THAN actual distance traveled. This will result in lower calculated fuel economy than actual fuel economy.

#### Tire Pressure

Harder tires, (more air pressure, or different tire compositions) result in better fuel economy. Do not exceed maximum pressure as labeled on the tire, typically 30-35 psi. The disadvantage of this is that the greater the tire pressure, the harsher the vehicle ride.

#### Transmission

On 4-Speed automatics, it is possible to drive the vehicle in 3rd gear rather than "overdrive" and not perceive it. Typically this condition occurs when the shift indicator, or the shift linkage/detent is misadjusted. Misadjusted shift linkage can also result in improper signals to the ECM, which can result in less spark advance, and results in a drop in fuel economy.

Driving a vehicle in 3rd gear rather than overdrive at highway speeds typically results in a 3 to 5 MPG penalty.

Torque Converter Clutch operation is essential for good fuel economy. A non-locking torque converter typically results in a 1 to 2 MPG penalty at highway speeds.

#### Vehicle Weight

Each 125 lbs. of additional weight results in a .3 MPG loss of fuel economy. Thus, additional passengers, luggage ... will decrease fuel economy.

#### Vehicle Wind Resistance

More wind "DRAG" means less fuel economy. Thus, hang-on luggage carders, cat toppers, open windows and/or open trunk... mean less fuel economy. (See "Driving Habits").

Technical Service Bulletin # **00-05-22-004**

Date: **000501**

## Brake Fluid - Level & Filling Recommendations

File In Section: 05 - Brakes

Bulletin No.: 00-05-22-004

Date: May, 2000

#### INFORMATION

Subject:  
Brake Fluid Level and Filling Recommendations

Models:  
2001 and Prior Passenger Cars and Trucks

Many dealers and after-market repair shops advertise multi-point fluid "top-ups" in conjunction with oil changes or regular maintenance packages.

These offers often include adding brake fluid to the master cylinder reservoir. There are only two reasons why the brake fluid level in the brake reservoir might go down. The first is that the brake fluid level goes down an acceptable level during normal brake lining wear. When the linings are replaced, the fluid will return to its original level. The second possible reason for a low fluid level is that fluid is leaking out of the brake system. If fluid is leaking, the brake system requires repair and adding additional fluid will not correct the leak. If the system was properly filled during delivery of the vehicle, no additional fluid should be required under most circumstances between brake pad and/or shoe replacements. This information can be reinforced with the customer by referring them to the Brake Fluid section of their vehicle's Owner's Manual.

#### Guidelines

GM vehicles have incorporated a variety of brake fluid reservoir styles. The following guidelines are restricted to the plastic bodied fluid reservoirs and do not affect the original service recommendations for the older style metal bodied units.

You may encounter both black plastic and translucent style reservoirs. You may have reservoirs with:

- ^ A MAX fill mark only
- ^ A MIN fill mark only
- ^ Both MAX and MIN marks

The translucent style reservoirs do not have to have the covers removed in order to view the fluid level. It is a good practice not to remove the reservoir cover unless necessary to reduce the possibility of contaminating the system. Use the following guidelines to assist in determining the proper fluid level.

#### Important:

When adding brake fluid, use Delco Supreme II(R) Brake Fluid, GM P/N 12377967 or equivalent brand bearing the DOT-3 rating only.

#### Important:

At no time should the fluid level be allowed to remain in an overfilled condition. Overfilling the brake reservoir may put unnecessary stress on the seals and cover of the reservoir. Use the following guidelines to properly maintain the fluid level. If the reservoir is overfilled, siphon out the additional fluid to comply with the guidelines below.

#### Important:

If under any circumstance the brake fluid level is extremely low in the reservoir or the BRAKE warning indicator is illuminated, the brake system should be checked for leaks and the system repaired in addition to bringing the fluid level up to the recommended guidelines outlined below. A leaking brake system will have reduced braking performance and will eventually not work at all.

#### Important:

Some vehicles have reservoirs that are very sensitive to brake fluid levels and may cause the BRAKE indicator to flicker on turns as the fluid approaches the minimum required level. If you encounter a vehicle with this concern, increase the fluid level staying within the guidelines outlined below.

- ^ If the reservoir has a MAX level indicator, the reservoir should be returned to the MAX marking only at the time new brake pads and/or shoes are installed. If the reservoir fluid level is at the half-way point or above do not attempt to add additional brake fluid during routine fluid checks.
- ^ If the reservoir has both MAX and MIN indicators, the fluid level should be maintained above the MIN indicator during routine fluid checks and returned to the MAX indication only after new brake pads and/or shoes are installed.
- ^ For reservoirs with only a MIN indication, the fluid level should be maintained above the MIN indicator during routine fluid checks. Return the reservoir fluid level to full only after installing new brake pads and/or shoes. A full reservoir is indicated on translucent, snap cover reservoirs by a fluid level even with the top level of the view window imprinted into the side of the reservoir. On screw top models in black or translucent plastic, the full level is just below the bottom of the filler neck.

#### Parts Information

Part Number	Description
12377967	Brake Fluid

Parts are currently available from GMSPO.

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



WE SUPPORT VOLUNTARY  
TECHNICIAN  
CERTIFICATION

Number: 88-242-10  
Section: 10  
Date: JUNE, 88  
Subject: CLEANING OF UPPER INSTRUMENT PANEL SURFACES

Model and Year: 1977-88 CHEVROLET MODELS  
TO: ALL CHEVROLET DEALERS

With the advent of longer sunlight days, comments on reflection into the windshield of the upper instrument panel may be received. The condition of instrument panel reflection into the windshield in direct sunlight may be aggravated by dealers and owners applying a wax or silicone base material to the pad surface. The higher gloss of such application results in a "veiling reflection" in the windshield. Advise customers and the new car make ready area that materials containing wax or silicone should not be used to clean the instrument panel pad due to possible long term effects on durability. A warm water and mild soap solution such as saddle soap, or an equivalent should be used whenever the instrument panel pad needs cleaning.

Technical Service Bulletin # **06-08-45-004**

Date: **060502**

## **Electrical - Instrument Panel & General Wiring Repair**

Bulletin No.: 06-08-45-004

Date: May 02, 2006

### **INFORMATION**

Subject:  
Instrument Panel (I/P), Body and General Wiring Harness Repair

Models:  
2007 and Prior GM Cars and Trucks  
2003-2007 HUMMER H2  
2006-2007 HUMMER H3

### **Important:**

A part restriction has been implemented on all Body and I/P harnesses and is being administered by the PQC. If a body or I/P harness replacement is required, it can take 12-28 weeks for a harness to be built and delivered to a dealer. The dealer technician is expected to repair any harness damage as the first and best choice before replacing a harness.

In an effort to standardize repair practices, General Motors is requiring that all wiring harnesses be repaired instead of replaced. If there is a question concerning which connector and/or terminal you are working on, refer to the information in the appropriate Connector End Views in SI. The Instruction Manual J 38125-620, which is sent with each new update of the J 38125 Terminal Repair Kit, also has terminal crimping and terminal remove information.

### **Important:**

There are some parts in the J 38125 Terminal Repair Kit (i.e. SIR connector CPAs and heat shrink tube (used in high heat area pigtail replacement) and some TPAs that are not available from GMSP0. It is vitally important that each update to the J 38125 Terminal Repair Kit be done as soon as it arrives at the dealer.

Utilize the Terminal Repair Kit (J 38125) to achieve an effective wiring repair. The Terminal Repair Kit has been an essential tool for all GM Dealers since 1987. Replacement terminals and tools for this kit are available through SPX/Kent Moore. Refer to Corporate Bulletin Number 06-08-45-001 for more information.

The Instruction Manual J 38125-620, which is sent with each new update to the J 38125 Terminal Repair Kit, also has terminal crimping and terminal removal information.

U.S. Dealers Only - Training courses (including Tech Assists, Emerging Issues, Web, IDL and Hands-on) are available through the GM Training website. Refer to Resources and then Training Materials for a complete list of available courses.

Canadian Dealers Only - Refer to the Training section of GM infoNet for a complete list of available courses and a copy of the J 38125 Terminal Repair Kit Instruction Manual.

Wiring repair information is also available in Service Information (SI). The Wiring Repair section contains information for the following types of wiring repairs:

- Testing for intermittent conditions and poor conditions
- Flat wire repairs
- GMLAN wiring repairs
- High temperature wiring repairs

- Splicing copper wire using splice clips
- Splicing copper wire using splice sleeves
- Splicing twisted or shielded cable
- Splicing inline harness diodes

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CERTIFICATION

Disclaimer Technical Service Bulletin # **882181B**

Date: **880501**

## A/C - Odor

Number: 88-218-1B

Section: 1B

Date: MAY, 1988

Subject: A/C ODOR

Model and Year: 1985-88 CHEVROLET MODELS WITH AIR CONDITIONING

TO: ALL CHEVROLET DEALERS

Some customers may experience odors emitted from the air conditioning system primarily at start up in hot, humid climates. This odor may be the result of debris in the heater/evaporator case or microbial growth on the evaporator core. To repair this condition, the following equipment and procedure should be utilized:

### Required Equipment:

- ^ GM Goodwrench air conditioning system disinfectant kit, P/N 25533404
- ^ Kent-Moore tool number J-36645 or equivalent Air Conditioning Cleaning Gun
- ^ Rubber gloves
- ^ Safety goggles or face shield (ordinary safety glasses are not sufficient)
- ^ NIOSH-approved acid gas/organic vapor respirator with chlorine dioxide cartridges, 3M P/N C1842 or equivalent.

### CAUTION:

Procedure should only be performed on a cold car to prevent the disinfectant from coming in contact with hot engine components.

Disinfectant can cause substantial but temporary eye injury. Do not get in eyes or on clothing. Wash thoroughly with soap and water after handling disinfectant.

### FIRST AID:

If disinfectant gets into eyes, hold eyelids open and flush with a steady, gentle stream of water for fifteen minutes. Obtain medical attention if irritation persists.

### Procedure:

1. Put on rubber gloves, safety goggles, and NIOSH-approved respirator.
2. Pour the small bottle of the two-part GM Goodwrench air conditioning system disinfectant kit, P/N 25533404, into the large bottle. Seal and invert the large container once or twice to mix contents.
3. Connect battery charger to avoid draining the battery during cleaning procedure.
4. Check underneath vehicle to verify that drain outlet is not plugged.
5. Remove blower resistor as described in service manual, leaving wiring connectors attached.

**WARNING:** Do not allow the metal coils of the blower resistor to become grounded to any metal surface as this may result in internal

circuitry damage.

**CAUTION:** Blower resistor may be hot.

6. Check heater/evaporator case for debris. Remove any debris present through blower resistor opening. If debris is imbedded into the evaporator core face and cannot be removed, the core will have to be removed from the vehicle and cleaned. If a large amount of debris is present in the heater/evaporator case the air inlet screen will require sealing around the air intake in the cowl area.
7. Turn the ignition to the "ON" position but do not start vehicle.
8. Set mode selector to vent, blower switch to low speed and temperature lever to full cold.
9. Open all windows and doors. Exit vehicle.

**CAUTION:** Do not enter vehicle until procedure is completed to avoid exposure to disinfectant.

10. Place drain pan with at least a two quart capacity below heater/evaporator drain hole to collect disinfectant and rinse water runoff.
11. Use Kent-Moore tool J-36645 or equivalent siphon-type parts cleaning spray gun capable of delivering two ounces/minute of liquid when driven with 80-90 psi of compressed air. Insert the nozzle of the spray gun through the blower resistor opening and insert siphon hose into container of disinfectant. Direct spray toward evaporator face taking extra care to ensure adequate coverage of the corners and edges, completely saturating the entire core. Use the entire container of solution.

**NOTICE:** Do not allow disinfectant to come into contact with hot resistor coils.

12. Reach into vehicle and turn the ignition to the "OFF" position and allow the core to soak for five minutes.
13. Double check underneath vehicle to verify proper drain operation. If necessary, unclog and increase drain plug slits with a razor blade or sharp knife.
14. Reach into the vehicle and turn the ignition to the "ON" position, but do not start vehicle.
15. Thoroughly rinse the evaporator core with one quart of clean water using the spray gun to remove any disinfectant residue.
16. Reach into the vehicle and turn the ignition to the "OFF" position and then reinstall the blower resistor.

**NOTICE:** Blower resistor may be hot.

17. Dispose of disinfectant and rinse water runoff collected in the drain pan in an approved manner.

**NOTE:** This procedure will eliminate debris or microbial growth which can cause odors but will not prevent the possibility that debris or microbes present in the environment may return.

For warranty purposes, use Labor Operation T6235 for 1.1 hours. If debris needs to be removed from heater/evaporator case and the air inlet screen needs to be sealed, use an add time of .2 hour. If evaporator drain needs to be unclogged, use an add time of .2 hour.

**Technical Service Bulletin # 892531B**

**Date: 890901**

## **A/C - CFC Reduction & Refrigerant Recovery Recycling**

**Number:** 89-253-1B

**Section:** 1B

**Date:** September 1989

**Corporate Bulletin No.:** 931203

**Subject:**  
**CFC REDUCTION AND REFRIGERANT RECOVERY RECYCLING PROGRAM**

**Model and Year:**  
**1980-89 ALL MODELS, ALL MODEL YEARS**

**TO:** ALL CHEVROLET DEALERS

Chlorofluorocarbons (CFCs) are believed by the international scientific community to cause harm by depleting the layer of stratospheric ozone which helps protect us from the sun's ultraviolet rays. In response to this discovery, an international accord known as the Montreal Protocol became effective January 1, 1989. This accord controls CFCs internationally and requires reducing the production and consumption of CFCs worldwide.

General Motors Corporation fully supports the Montreal Protocol and has been actively working with the United States Environmental Protection



Agency, the Motor Vehicle Manufacturers Association, the Mobile Air Conditioning Society, the Society of Automotive Engineers, Underwriter Laboratories (UL) and recovery/recycling equipment manufacturers to develop and validate equipment and to implement a program allowing air conditioning service and repair facilities to recover and recycle CFCs. Two materials which are scheduled for reduced usage under the Montreal Protocol and which are frequently used in dealership service areas are R-11 (CFC-11) and R-12 (CFC-12).

CFC-11 is primarily used in dealer service areas to clean failed mobile air conditioning refrigeration systems by flushing. In place of flushing the system with CFC-11 during repair service, General Motors recommends the use of liquid line filters. The filter should be used after repeated orifice tube plugging or when replacing a seized compressor. These filters are available through Service Parts Operations and eliminate the need to use CFC-11 to flush a failed mobile air conditioning system.

The second material, CFC-12, the refrigerant in mobile air conditioning systems, accounts for approximately 25% of all domestically consumed CFCs and makes the mobile air conditioning system the single largest user of CFCs. Procedures to recover CFC-12 were not deemed necessary in the past. Current service practice is to exhaust the CFC-12 refrigerant into the atmosphere when an air conditioning system is being serviced. Emissions of CFC-12 to the atmosphere which result from such practices will be substantially reduced with the adoption of recovery and recycling during service.

An industry research effort has shown that CFC-12 refrigerant recovered from vehicles in service can be reused if recycled. Purity and equipment certification standards have been developed through laboratory analysis and testing. An equipment certification program has been established with Underwriters Laboratories to assure recycling equipment meets standards for operational safety and compliance with SAE Standard J1991, which is the test procedure to validate equipment to industry standards.

General Motors has determined that CFC-12 refrigerant recovery and recycling is a necessary step in reducing the amount of CFC-12 vented to the atmosphere. GM assembly plants and fleet garages are presently developing programs for recovery and recycling during vehicle service for implementation as soon as certified equipment becomes available.

Hawaii and Vermont have already enacted legislation requiring recovery and recycling of CFC-12 refrigerant during the service of mobile air conditioning by January 1, 1991. Many other states have similar bills pending before their legislative bodies. General Motors has announced publicly, that General Motors is encouraging our dealers to recover and recycle CFC-12 and that all GM dealers will have recovery/recycling equipment at the start of model year 1991. Recovery/recycling equipment used by GM dealers under this program must be UL certified to insure new car warranty will not be voided by its use.

CFC-12 recycling equipment will become an essential tool for all General Motors dealerships for model year 1991. Production capacity constraints prevent complete rollout prior to this time. Beginning with the 1990 model year, CFC-12 refrigerant recovery equipment will be available to General Motors dealers through the essential tool program on a first come, first serve basis. All dealers are encouraged to obtain and utilize CFC-12 recovery/recycling equipment as soon as possible to minimize ozone depletion and to maximize the return on investment made in the recovery equipment.

Shipments under this program will begin as Underwriters Laboratory approved equipment becomes available, with delivery of the essential tools to all dealers completed by the start of the 1991 model year. Specific product and pricing has been finalized. Service procedures will be included in the 1991 Service Manual publication.

Technical Service Bulletin # **431223**

Date: **940901**

## **A/C Refrigerant - Contamination**

File In Section: 1 - HVAC

Bulletin No.: 43-12-23

Date: September, 1994

Subject:

Contaminated A/C Refrigerant

Models:

1994 and Prior Passenger Cars and Trucks with R12 Air Conditioning Systems

Government regulations limit the production of R12 refrigerant, commonly referred to as Freon, during 1994/1995 and restrict manufacture of new R12 material effective January 1, 1996. As R12 prices rise and supplies are depleted, it is anticipated non-approved substitute refrigerants and/or poor quality R12 material sold as new or reprocessed may become more prevalent.

The Mobile Air Conditioning Society (MACS) recently expressed concern over reports of the sale of R12 refrigerant containing as high as 15% contamination by R22, a refrigerant commonly used in stationary home systems but unsuitable for use in mobile units. GM dealers should be careful to protect against contaminating their existing supplies of R12 or the A/C systems in customers' vehicles they service by dealing with reputable suppliers. All R12 refrigerant purchased for warranty repairs should be purchased through GM SPO to ensure GM quality standards are met.

The use of non-approved R12 refrigerant substitutes, some of which contain flammable materials, has also been reported by MACS. These products are available to "do-it-yourselfers" who, in many cases, believe they are harmless replacements for the small cans of R12 used so commonly in the past. Once added to the A/C system, the vehicle can no longer be serviced using R12 recovery/recycling equipment without:

- Risking permanent damage to recovery/recycling equipment

- Contaminating the previously recovered R12 material in the recovery tank
- Spreading the contamination when the recovered material is used to charge other vehicles

or

- Possible loss of the recovered material if the contaminated level is high enough to activate the air purge system

Contaminated refrigerant also impacts customer satisfaction through poor vehicle A/C performance and loss of A/C system compressor/component durability. System or component failure resulting from the use of refrigerant which does not meet GM specification is not covered by the "New Vehicle Warranty".

Unfortunately, there is no simple method to identify if a "do-it-yourselfer" or repair shop has added to or recharged a system with a non-approved refrigerant. The inability to protect against the spread of contaminated refrigerant threatens the recycling program and the industry's desire to maximize use of the remaining R12 supply.

Beginning in 1993, General Motors STG, Harrison Division, Research Labs and Kent-Moore worked in conjunction with suppliers of various technologies to develop a tester to identify contaminated refrigerant in vehicle A/C systems before recovery. During development of the technology, several dealer service manager focus group studies were conducted to identify design features to best suit dealership needs.

The discussions and surveys clearly indicated the desire for a dedicated instrument, permanently mounted to the refrigerant recovery cart to ensure ALL vehicles are automatically tested prior to recovering refrigerant. Testing ALL refrigerant for contamination prior to recovery is the ONLY means to ensure customer satisfaction, protect recovery equipment and avoid unintentional venting of refrigerant by your dealership.

General Motors has evaluated all available technology for this project and only the J 39851 R12 "Pureguard" meets General Motors' specifications. The J 39851 R12 Pureguard Refrigerant Monitor has been classified as an essential tool and will be shipped by Kent-Moore to your dealership beginning in September of 1994. The essential price of the R12 "Pureguard" is \$561 (for Canadian dealers the price is \$800 Canadian). If your dealership has multiple R12 recovery equipment, additional units may be ordered from Kent-Moore for \$561 at 1-800-345-2233. Features of the R12 "Pureguard" include:

- Universally mounts to R12 Recovery Equipment
- Automatically interrupts power to the Recovery Equipment when contaminated refrigerant is identified
- Fully automatic design does not require technician action, training or interpretation
- LCD displays Pureguard functions
- Meets GM contamination sensitivity requirements
- Self calibrating
- Micro-processor controlled
- Audio alarm alerts technician

Other Refrigerant Identifiers are being advertised which may be available this A/C season. However, ONLY the Kent-Moore J 39851 R12 "Pureguard" meets General Motors' current specifications which ensure recovered refrigerant is compatible with General Motors vehicles and General Motors approved recovery systems.

An R134a Pureguard Refrigerant Identifier is currently under development and is anticipated to be available in early 1995. The contamination of R134a refrigerant is not expected to be a concern until the program to retrofit R12 vehicles to R134a becomes more widely used.

Future bulletins will be issued to address the recovery and disposal of contaminated refrigerant.

Technical Service Bulletin # **88801B**

Date: **871101**

## **A/C - Delayed Cooling After Engine Start Up**

Number: 88-80-1B

Section: 1B

Date: NOV., 1987

Subject: DELAYED A/C COOLING AFTER ENGINE START UP

Model and Year: ALL VEHICLES WITH V5 COMPRESSOR

TO: ALL CHEVROLET DEALERS

The V5 is a variable displacement, five-cylinder compressor that automatically adjusts displacement to match air conditioning demand under all conditions. A control valve, located in the rear of the compressor, regulates the compressor capacity.

The V5 compressor runs continuously in the A/C mode except during periods when over-ridden by A/C system control switches (Wide Open Throttle-WOT, etc.). Because the compressor is operating continuously, the engine will perform more smoothly due to lack of clutch cycling.

Due to its variable displacement feature, special caution is necessary when diagnosing insufficient cooling conditions with the V5 compressor.

It is normal for liquid refrigerant to collect in the compressor crankcase during periods of shutdown, therefore, cooling action may be delayed up to two (2) minutes until the refrigerant is pumped from the crankcase.

If you experience a delay in cooling upon start-up beyond two (2) minutes, and the normal service manual procedure for A/C compressor clutch and electrical engine cooling fan operation has been accomplished, follow the procedure outlined below:

1. operate the A/C system by setting to Norm A/C mode and high blower.
2. Be sure the compressor clutch has engaged and that the electrical engine cooling fan is operating.
3. Idle the engine for two (2) minutes with the A/C system operating.
4. If no cooling, run the engine at approximately 3000 rpm for one (1) minute with the A/C system operating.
5. If no cooling, change the mode control to Vent position for one (1) minute at idle.
6. Set A/C system back to Norm A/C mode, then run the engine at approximately 3000 rpm for one (1) minute with the A/C system operating.
7. If no cooling, drive the car in a normal manner for five (5) minutes with the A/C operating.
8. If there is still no cooling, discharge the refrigerant system, check orifice tube installation, evacuate, and recharge. The refrigerant should be introduced into the accumulator-dehydrator as rapidly as possible in liquid form. When using the small individual cans of refrigerant, the can should be turned upside down to accomplish the rapid recharge.
9. Check for proper cooling. If lack of cooling persists, remove and replace the compressor.

Technical Service Bulletin # **431218A**

Date: **950301**

## **Tools - A/C Leak Detector Maintenance Kit Availability**

File In Section: 1 - HVAC

Bulletin No. 43-12-18A

Date: March, 1995

Subject:

J 39400 A/C Leak Detector Maintenance Kit Availability

Models:

1995 and Prior Vehicles with A/C

This bulletin is being reissued to remind dealers to perform maintenance on their A/C leak detector prior to the start of the A/C season. It also includes an update on essential tool status. Please discard Corporate Bulletin Number 431218 (Group Reference 1 - HVAC)

### **Important:**

**TUNE UP YOUR LEAK DETECTOR BEFORE A/C SEASON BEGINS!**

Buick, Oldsmobile and GM of Canada made the J 39400-TUNE-UP essential last season.

Cadillac made the J 39400-TUNE-UP essential this spring. (Cadillac franchises dualled with Buick and/or Oldsmobile will not receive another J 39400-TUNE-UP).

Remember:

Even if your leak detector was tuned up last season, it may be time for another tune-up!

### **CONDITION**

Inadequate maintenance reduces the performance of the J 39400 A/C leak detector.

### **CORRECTION**

# KENT-MOORE

## J 39400-Tuneup

### Effective Leak Detector Maintenance!

**Application: All vehicles equipped with air conditioning**

#### CONDITION:

J 39400 Yokogawa Leak Detector is built for long use, but certain parts of it were designed to need periodic service and replacement.

#### J 39400-TUNEUP CONSISTS OF:

- Replacement filters\*
- Replacement air flow balls\*
- Replacement calibrated reference standard\*
- Replacement sensor\*
- Cleaning sticks
- Safety pin
- Tuneup date label reminder
- Instructions

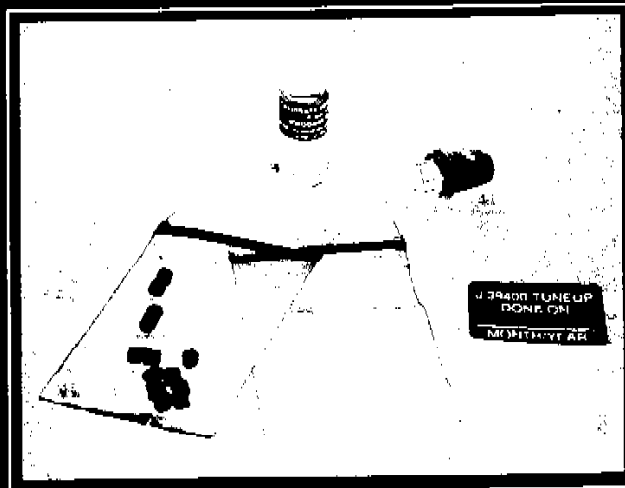
\*Above items can be ordered individually

**J 39400-Tuneup  
\$66.50**

#### CORRECTION:

##### J 39400-TUNEUP

- Protects the unit's air pump and sensor
- Balances and adjusts the tick rate
- Checks for proper air flow
- Maintains the unit's high level of sensitivity!



#### J 39400 HALOGEN LEAK DETECTOR

J 39400 Halogen Leak Detector uses a heated diode sensor, combined with state of the art electronics and built-in air pump, to assure reliable detection and location of all leaks that will affect equipment performance.

#### Features

- Detects R-12 or R-134a refrigerant
- Only detector to meet GM leak sensitivity specifications
- Certified to meet SAE J 1627 specifications
- Accurate detection of 1/2 ounce per year leak
- Simultaneous audible and visible detection alarm
- 12 volts DC power through cigarette lighter or battery clamp adapter, included (not shown)
- Internal air pump
- Calibration reference standard included



**J 39400  
\$399.00**

Prices expire 12-31-94



**1-800-345-2233**



# KENT-MOORE

Automotive Group  
29784 Little Mack  
Roseville, MI 48066-2298

Fax 800-378-7375  
Telex 244040 KMTR UR  
Phone 800-345-2233

*A division of SPX Corporation*

#### Leak Detector

A new maintenance kit, P/N J 39400-TUNE-UP is available from Kent-Moore Tool, which contains the following:

1. Replacement filters (12) (P/N E7076EX includes air flow balls)
2. Replacement air flow balls (4)
3. Replacement calibrated reference bottle (P/N K9344AH)
4. Replacement sensor (P/N H10N04)

5. Cotton swab cleaning sticks (10)
6. Safety pin
7. Tune-up/maintenance date label reminder
8. Instructions

To guarantee uninterrupted service during peak cooling season, ORDER THE J 39400 TUNE-UP KIT ANNUALLY, just before your busy season. Additional tune-up kits or individual components can be ordered as needed.

The J 39400 Leak Detector was shipped to dealers in the spring of 1992 as an essential tool for use on R12 and R134a vehicles. Currently, the J 39400 is the only leak detector which meets GM requirements. Many detectors capable of detecting R12 leaks are not sensitive enough to leak check R134a A/C systems. Even new leak detectors designed for R134a vehicles may not meet GM's sensitivity specifications.

You can extend the life of the sensor and reduce maintenance costs if you calibrate the J 39400 properly and maintain it properly. The J 39400 is a rugged instrument, but it is not indestructible.

## Service Procedure

Be aware of the following basic information covering the sensor, filters, and calibration bottle included with the J 39400:

### Filter

The filter in the tip of the J 39400 protects the pump and sensor from dust and moisture. With the high sensitivity of the J 39400, you need never touch any surface with the tip to locate the leak. Replace the filter often, and immediately if it comes in contact with moisture or is visibly dirty. Use the following schedule.

Occasional Use: Change Weekly

Regular Use: Change Daily

Keep plenty on hand. Use the black rubber probe tip that came with the detector to keep the filter away from accidental contact with the surface under test.

### Calibrated Leak Bottle

This bottle simulates the smallest leak you need to detect. You need to calibrate each time you use the leak detector.

### Important:

NEVER OPEN THE LEAK BOTTLE. THE LEAK BOTTLE IS ACTIVATED WHEN YOU REMOVE AND DISCARD THE BLACK ADHESIVE DOT ON THE TOP OF THE CAP. IF YOU HAVE REMOVED THE INTERNAL WHITE SEAL, YOU HAVE DESTROYED THE ACCURACY OF THE LEAK AND YOU WILL NEED A REPLACEMENT.

NEVER EXPOSE THE J 39400 TO THE LIQUID REFRIGERANT IN THE BOTTLE WITHOUT THE CAP IN PLACE.

### Sensor

Increase the life of your sensor: Use the lowest heater adjustment setting at which the J 39400 detects the calibration leak. Increase heater adjustment setting only when the J 39400 does not respond to the calibration leak bottle. Never calibrate with anything other than the calibrated leak bottle. NEVER INTENTIONALLY EXPOSE THE DETECTOR TO A BLAST OF REFRIGERANT, SUCH AS FROM AN OPEN SCHRADER VALVE.

Advice for Trouble Free Operation - Some Do's and Don'ts:

- ^ Don't press the probe up against a surface under test.
- ^ Don't intentionally pull liquids into the probe.
- ^ Don't block the air flow in the probe, the sensor momentarily overheats and will false alarm.
- ^ Don't poke foam insulation with the probe. The foam contains refrigerant gas and the J 39400 will detect this as a leak.
- ^ Do keep plenty of spare filters on hand.
- ^ Do change the filter often, daily if necessary.
- ^ Do trust the results of the J 39400. It can only detect halogen gas and will not alarm on any other gas.
- ^ Do use all three settings on the J 39400. Think of the labels "Gross", "R12" and "R134a" as three separate sensitivity settings for "Large", "Medium", and "Small". You can detect R12 or R134a on any of these settings.

Detecting Gross Leaks with the J 39400: Always use compressed air liberally to blow out residual gas before attempting to pinpoint gross leaks. Place the leak size switch in the "Gross" position. The leak detector will respond to both R12 and R134a leaks in this position. You may have to work in stages, getting closer to the leak gradually because the escaping gas will fill the area under test quickly. Clear out trapped gas in the area to be tested with shop air. Use the balance control on the J 39400 to obtain a slow click rate while the probe is in the contaminated area. The J 39400 has enough resolution to locate the higher gas level at the source of the leak, as long as you can blow out the area first.

After you locate and repair the gross leak, make sure to test the complete system again. You will probably pick up other smaller leaks you could not find in the high background caused by the gross leak.

REMEMBER, if you perform simple maintenance tasks on the J 39400, you can:

- ^ extend the life of the sensor
- ^ ensure the quick location of leaks
- ^ verify a system to be leak free
- ^ find leaks faster
- ^ and, you will reduce comebacks.

**Technical Service Bulletin # 731204**

**Date: 970201**

## **A/C - Systems With R12 Or R134a Service Issue**

File In Section: 1 - HVAC

Bulletin No.: 73-12-04

Date: February, 1997

Subject:

Service Issues for Vehicles with R12 or R134a Air Conditioning Systems

Models:

All 1997 and Prior Passenger Car and Light Truck Models

Production of R12 refrigerant ceased on December 31, 1995. Although R12 is no longer manufactured, a reserve supply of R12 has been established for GM dealers. This reserve, along with strict adherence to proper A/C refrigerant recycling procedures, should assure continued availability to meet customer needs.

## **R12 System Retrofitting to R134A**

R12 System Retrofitting to R134a

R12 can and should continue to be used to service vehicles built with R12 A/C systems as long as it is available. If R12 is no longer available or affordable, a system retrofit utilizing R134a is recommended. **R134a IS THE ONLY SUBSTITUTE REFRIGERANT RECOMMENDED BY GM FOR USE IN GM VEHICLE A/C SYSTEMS, AND THEN ONLY AFTER FOLLOWING THE PROPER RETROFIT PROCEDURES FOR THE MODEL.** For complete retrofit instructions, reference Corporate Service Bulletin # 43-12-07E, dated January, 1997.

Although retrofitting R12 vehicles to R134a has been minimal up to this point, significant price increases in R12 is making this more attractive. This trend is expected to continue. GM offers a simple, low cost R12 to R134a retrofit on many late model GM vehicles. Dealers should discuss this capability with owners of these specific models whenever A/C system repairs are needed. Early retrofit of these models will aid in prolonging availability of the R12 supply and provide dealer service technicians the opportunity to become more familiar with the proper procedures for performing a retrofit.

## **Servicing R134A Retrofitted Vehicle Systems**

Servicing R134a Retrofitted Vehicle Systems

Vehicles retrofitted from R12 to R134a use conversion fittings on the high and low side R12 service ports which allow connection to your R134a recovery equipment. When servicing a previously retrofitted vehicle, there is concern that if all of the R12 was not removed during the retrofit procedure, your R134a equipment and recovery tank will become contaminated.

## **R12 and R134A Refrigerants Are Not Interchangeable**

R12 and R134a Refrigerants Are Not Interchangeable and Cannot Be Mixed!

Mixing different refrigerants during service will result in a significant pressure increase in the vehicle A/C system and in your recovery equipment. Recovery of even small amounts of R12 or any substitute refrigerant in your R134a service equipment can result in the following A/C service concerns:

- ^ Contamination of previously recovered refrigerant.
- ^ Increased repair costs and down time to R134a recovery/recycling equipment.
- ^ Longer recovery time and/or recovery equipment shutting off prior to complete recovery.
- ^ Refrigerant loss as contaminated refrigerant will activate automatic air purge system.
- ^ Spread of contaminated refrigerant to other vehicles.
- ^ Dissatisfied customers and comebacks for concerns of insufficient cooling, compressor noise, system leaks, durability and other conditions resulting from higher system pressures.

## **J 41810 Pureguard 2 R134A Refrigerant Monitor**

J 41810 Pureguard 2 R134a Refrigerant Monitor

A new R134a refrigerant purity tester similar to the PureGuard R12 refrigerant monitor you now use will be shipped as an essential tool to all GM dealers in 1997. This new tool mounts to the ACR4, R134a Recovery Recycle and Recharge cart and tests refrigerant during recovery. Contamination from any refrigerant currently known will be detected resulting in the immediate shut down of the recovery process.

The J 41810 PureGuard 2 also tests for AIR contamination in refrigerant and the ACR4 recycle tank. Air contaminant is detrimental to A/C system performance. Research has indicated high levels of air in the recovery tanks on R12 and R134a recovery carts. Air contamination is caused by improper recovery procedures and short-cutting refrigerant recycling times.

Many features of the new PureGuard 2 are described below:

- ^ Protects your R134a recovery/recycling equipment and refrigerant supply.
- ^ Automatically tests all R134a refrigerant as it is being recovered from the vehicle. If contamination is detected, an alarm sounds and the recovery process is stopped. The type and percent of contamination is displayed.
- ^ Automatically monitors the ACR4 recovery tank for contamination and indicates the condition on the control panel.
- ^ Access port to test R12 refrigerant from vehicles or previously recovered R12 for refrigerant or AIR contamination.
- ^ Totally automatic, no technician interaction or training required.
- ^ Universal printer port allows test data to be printed.
- ^ LCD display indicates percentage of: AIR, R134a, R12, R22, and hydrocarbons.
- ^ Low maintenance, simple filter change as indicated by red indicators.
- ^ Audible alarm and recovery cart power interruption when contaminated R134a detected.
- ^ Easily installed, requires no disassembly or modification of ACR4 recovery/recycling equipment.
- ^ Includes R12 test function to evaluate R12 systems or tanks for air or refrigerant contamination.
- ^ Two year warranty.

## **Summarizing GM's A/C Service Recommendations**

To summarize GM's A/C service recommendations

1. Service R12 vehicles with high quality new or recycled and tested R12.
2. Purchase R12 from a reliable supplier. Test R12 for purity prior to use. GM SPO has a supply of high quality R12 available. Dealers are requested to use only R12 supplied by SPO for warranty repairs. This high quality refrigerant will insure system performance and avoid the possibility of introducing contaminated material into the customer's A/C system.
3. Carefully test recovered R12 using the PureGuard monitor. On recovery equipment not protected by the PureGuard, always test the recovery cylinder prior to recharging a vehicle's A/C system.
4. Discuss the R12 to R134a retrofit option with owners of GM vehicles when A/C system repairs are required. Provide the owner with a copy of the pamphlet, "Converting Your Auto Air Conditioning System To Use The New Refrigerant."
5. Become familiar with retrofit procedures and exercise care in the handling of dissimilar refrigerants to prevent contamination.
6. Install the PureGuard 2 on your R134a refrigerant recovery cart and carefully test recovered R134a especially when servicing vehicles previously retrofit from R12.
7. Establish a regular procedure using PureGuard 2 for testing for high levels of air in your R12 and R134a recycled refrigerant reserves.

Technical Service Bulletin # **431207E**

Date: **970101**

## **A/C - Retrofitting R-12 to R-134a**

File In Section: 1 - HVAC

Bulletin No.: 43-12-07E

Date: January, 1997

INFORMATION

Subject:

## Guidelines for Retrofitting R-12 Vehicles to R-134a

### Models:

1984-94 Passenger Cars and Trucks (See List Below)

This bulletin is being revised with the following changes:

1. Addition of all remaining GM vehicles, as listed.
2. Format rearranged for easier use.

Please discard Corporate Bulletin Number 43-12-07D (Section 1 - HVAC).

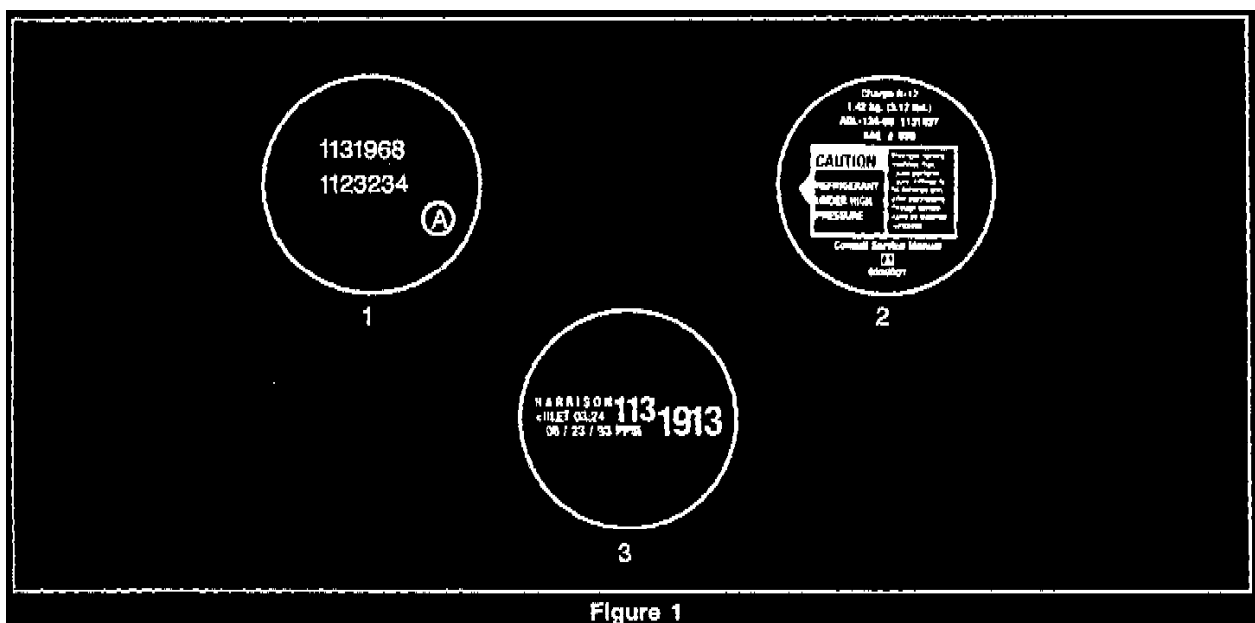
### Car/Truck Platform Coverage Starts:

- 1984 - A, B, D, E, F, J, K, P, Y Carlines
- 1985 - C, M, N, R, S Carlines
- 1986 - H Carline
- 1987 - L, V (Allante) Car lines; M/L, G, R/V, S/T, P Truck lines
- 1988 - T (LeMans), E (Reatta), W Car lines; C/k, MED. Duty Truck lines
- 1989 - Tracker
- 1990 - U Van

Vehicles Not Covered: T (Chevette and T1000), G RWD, C RWD, and X Car

If a vehicle is not covered in the list above, GM's recommendation is that the vehicle continue to be serviced with R-12.

This bulletin outlines the detailed retrofit procedures, as well as providing background information on many components and procedures. It is important to follow the bulletin, since each car and truck line has unique parts and procedures. However, the basic procedure is simple, and will become easier as you complete more retrofits.



### Retrofit Requirements

The customer should be reminded that there is NO requirement in the U.S. to retrofit any vehicle produced with R-12. Vehicles built with R-12 can be serviced with R-12 as long as it is available (except in certain Canadian Provinces). GM has taken steps to extend the supply of R-12 and recommends that all R-12 vehicles continue to be serviced with R-12 as long as it is available.

### Training Video

Before doing a retrofit the first time, it is recommended that you view the Certified Plus Training Video, Program number 51010.15, "R-134a



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### B. General Information

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## Notes on Retrofit

### Important:

Before proceeding with any retrofit, make sure you have all component Parts required on hand to perform a proper and complete repair with Minimal downtime.

### R-12 Removal Prior to Retrofit

To prepare a system for retrofitting, the R-12 must be recovered and the system must be completely evacuated. Evacuation is necessary to insure that small amounts of R-12 and air remaining in the system are removed. This will prevent cross contamination of the two refrigerants, which could lead to reduced A/C system reliability and performance.

It is very **important** that the specified times for waiting after recovery and evacuation not be reduced. This time is required to sufficiently remove residual R-12 from the oil in the system.

A considerable amount of testing has determined that the following procedure is required to achieve satisfactory results and conform to SAE J 1661:

#### 1. Inspect Condition of Vehicle

Install the gauge set on the high and low side ports.

Use normal diagnostic procedures to find the cause of the vehicle's reported condition. One of three conditions will exist with the refrigerant system:

- a. System pressure correct, no leaks - proceed to Step 2 (Recovery). This would normally apply when:
  1. The system must be recovered/recharged for a repair to a system other than the A/C system, or
  2. Where the A/C system condition did not involve leaks, but requires recovery/recharge to replace a component.
- b. Compressor not operating, but some charge. Leak test to find the leak, complete Step 2 (Recovery), then correct the leak before proceeding with Step 3 (Conversion port installation).
- c. No charge in system - proceed with the Conversion port installation in Step 3. Use the ACR4 to evacuate for 5 minutes. If the leak can be heard, repair the leak. If the leak cannot be heard, charge with 1/2 pound of R-134a. Leak test with the J 39400 Leak Detector, recover the R-134a, repair any additional leaks found, and proceed with the evacuation in Step 5.

**2. Recover the R-12 from the System**

**Notice:**

THIS PROCEDURE IS DIFFERENT THAN THE NORMAL (NON-RETROFIT) RECOVERY PROCEDURE. R-12 will be recovered through the HIGH SIDE SERVICE PORT ONLY, WITH THE ENGINE RUNNING. Recovery through the low side will not effectively remove the R-12 from the accumulator, resulting in possible damage to the retrofitted system.

**Important:**

Vehicle must be above 50° F (10° C) to allow for complete recovery of the R-12. If it is not, either allow it to warm up in the shop overnight, or increase the evacuation time in Step 5.a to 30 minutes.

- a. Connect the recovery hose from the R-12 recovery cart (ACR3) to the middle port of the A/C gauge set. Open the oil drain valve on the ACR3 cart long enough to drain the oil. Failure to do so could cause excessive amounts of oil to build up in the separator, resulting in damage to the recovery cart compressor.
- b. Start the engine. Leave the hood up, and the windows open. On vehicles with manual A/C controls, set the A/C controls to normal A/C mode, high blower, and temperature control to full cold. On cars with automatic A/C controls, set the temperature to 75° F, "AUTO" mode, and manually select high blower.

Make sure the vehicle compressor is engaged. Turn the cart on and start the recovery cycle. OPEN ONLY THE HIGH SIDE VALVE ON THE GAUGE SET. The vehicle system should eventually shut the compressor off. If the low side pressure drops below 15 psi, and the compressor does not turn off, turn it off now (go to "VENT" or "ECON" mode), but leave the engine running and the blower on "high".

- c. After the recovery cart shuts off the first time, wait 5 minutes. If the pressure on either the high or the low side rises above 0 psi, restart the recovery process. After the second shutoff, wait 2 minutes. If the pressure again rises above 0 psi, restart, and after shutoff, again wait 2 minutes. The process can be stopped when the pressure does not rise above 0 psi after 2 minutes. The engine can be shut off at this time.
- d. Remove the R-12 reclaim hose and the gauge set from the vehicle.

Any repairs needed should be done at this time. If any components other than the compressor are replaced, they should be installed dry, and no extra oil should be added.

**3. Install the Service Port Conversion Fittings**

**Important:**

For GEO vehicles, skip to Step 4. Fitting installation is covered in that step. For vehicles that require a HPCOS, see Step 4. Some of these vehicles use a specific combination fitting to mount the HPCOS, which includes the high side service port fitting and the HPCOS port. The low side fitting is installed as detailed below. See "Platform Details" for further information.

**Important:**

A new tool kit, P/N J 39500-250, has been released. This kit contains the following items:

- ^ J 39500-71 Oil Injection Bottle Conversion Kit (includes 3 12 oz bottles, an extender tube, caps, and fittings)

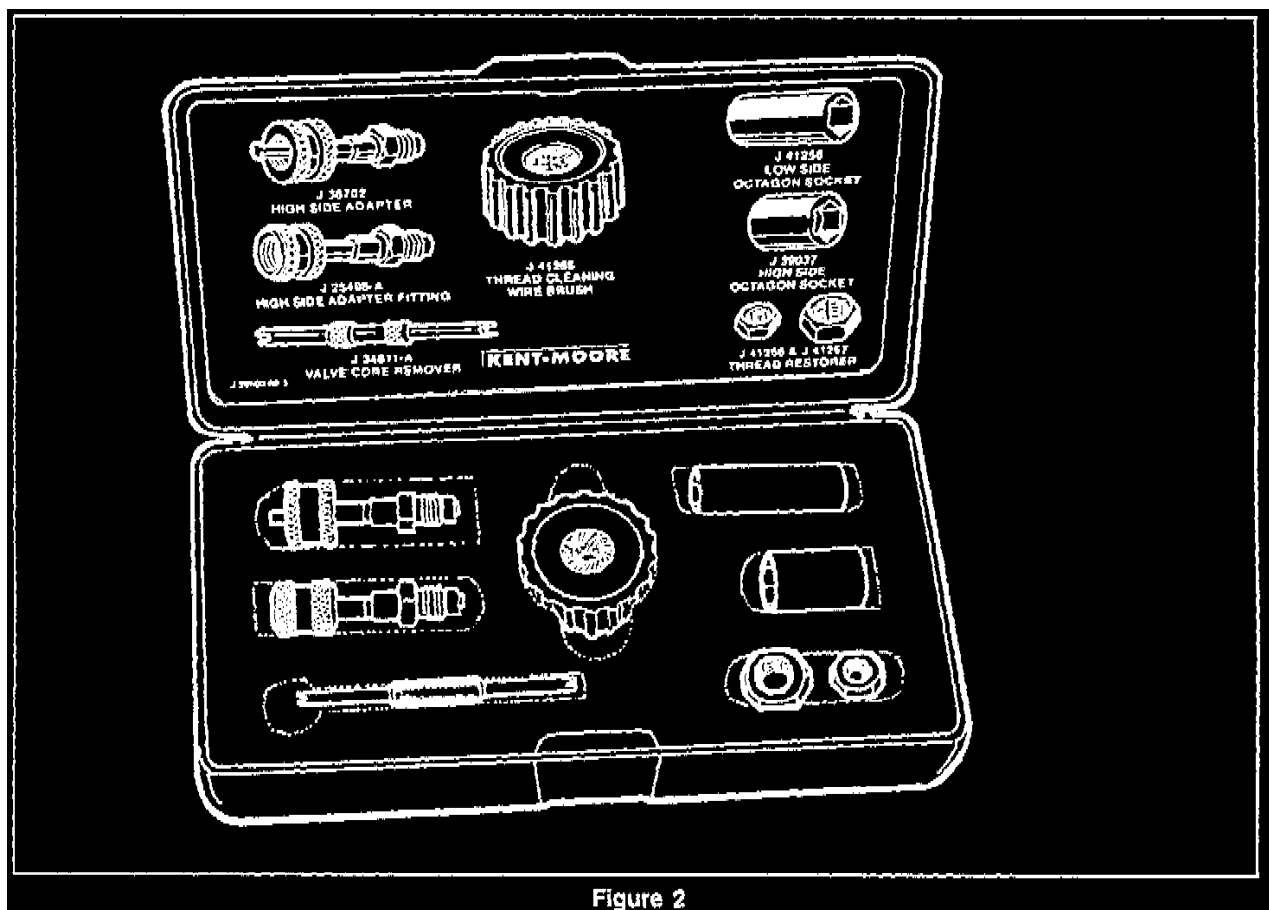


Figure 2

^ J 39500-275 Tool kit, including the following: (See Figure 2)

- J 34611-A Double ended valve core remover
- J 25498-A High side adapter fitting
- J 38702 Deep valve core adapter fitting
- J 41265 Thread cleaning wire brush
- J 41266 Low side port thread restorer
- J 41267 High side port thread restorer
- J 39037 High side octagon socket
- J 41256 Low side octagon socket

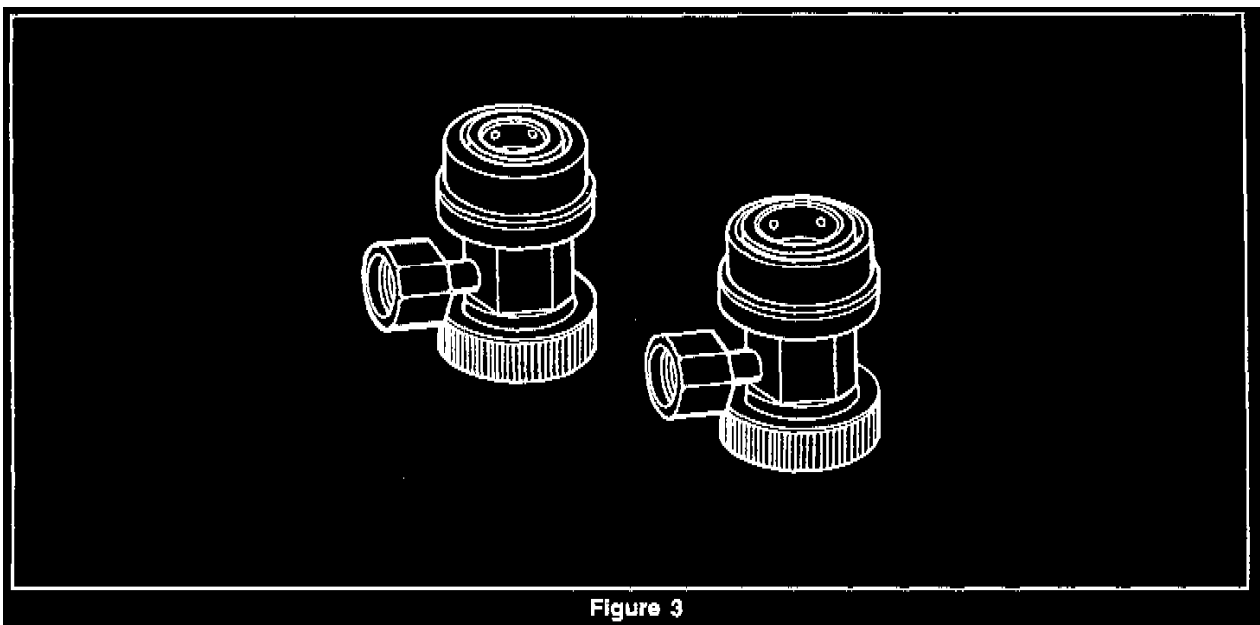
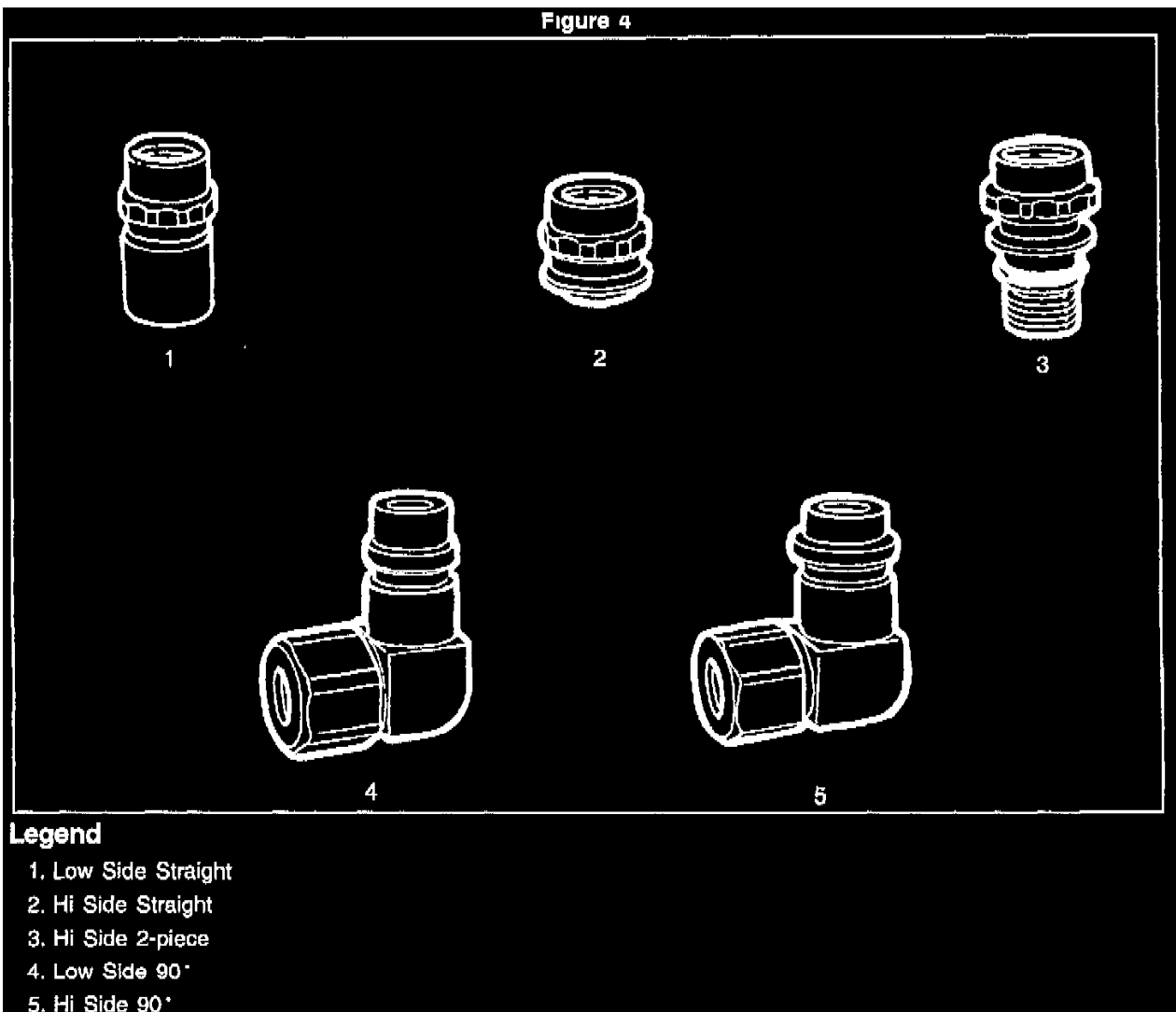


Figure 3

New low profile, quick connect couplers, J 39500-20A (High side), and J 39500-24A (Low side), have been released as essential tools, to attach to the ACR4 (see Figure 3). These are much smaller couplers than the existing ones, and will allow attachment to the port fittings in much tighter quarters.



Select and install the proper R-134a fittings (shown in Figure 4) from the chart below, based on how the ACR4 couplers will attach. Also, remember to check for proper hood clearance with the conversion fittings. Try the straight fittings first. The two-piece high side fitting is used when the existing fitting is screwed into the pipe fitting (some 1992, and nearly all 1993 models, use these fittings). Use the 90° elbow if the straight fitting does not allow the ACR4 couplers to connect.

Fitting Type	High Side	Low Side
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Straight	52467941	52467943
Straight Two-piece	52467324	N/A
90° Elbow	52469054	52469055

The fittings should be installed as follows:

- a. Remove the caps from the R-12 fittings. Remove any dirt or grease from the port threads using the thread cleaning wire brush, J 41265. Inspect the fittings for thread damage. If any damage is found, use the port thread restorer (J 41266 low side, J 41267 high side) to repair the thread.

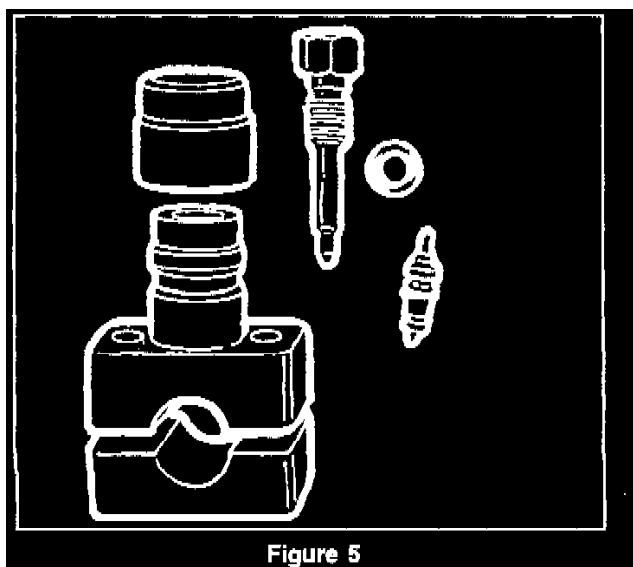
For the two-piece fitting, remove the existing R-12 fitting and discard it. Use tool J 38704A (previously released, not part of the above kit) to remove the fitting. Make sure to hold the line securely to prevent damage when removing the existing fitting. If the fitting cannot be removed easily, use the saddle clamp valve listed below and seal the R-12 port and cap permanently.

- b. Install the selected fitting onto the existing R-12 fitting. Leave the valve core in the straight fittings, and remove the valve core when using the 90° fittings.

If the valve cores need to be removed at a later time, they can be removed with the straight conversion fittings in place. On the low side straight fitting, use the J 34611-A tool to remove the core pin in the conversion fitting, then remove the core valve from the original R-12 fitting. Always recover the charge before valve core removal.

Use the octagon sockets on the straight fittings (J 39037 high side, and J 41256 low side). Torque the new fitting until it seats. The fitting should seat fully BEFORE reaching 11 N.m (8 lb ft). If 11 N.m (8 lb ft) of torque is reached and the fitting has not seated, it is probable that the threads have been damaged. In this case, remove the fitting and use the thread restorer listed above. Reinstall the fitting, adding one drop of a thread locking compound such as Loctite(R) 242.

The fittings (except the two-piece) have a thread locking compound applied to the threads. This compound will set up enough to restrict removal of the fitting in about 15 minutes. The fittings can now be used to evacuate the system (see Step 5).



An additional type of conversion port fitting has been developed. This fitting is called a saddle clamp valve (see Figure 5). It can be clamped directly on a metal refrigerant line, and will be used if the existing fitting is damaged or is inaccessible. A drop of a thread locking compound, such as Loctite(R) 242, should be used on each bolt to prevent the threads from loosening.

52471115	High Side	(3/8" Line Diameter)
52471116	High Side	(1/2" " )
52471117	Low Side	(5/8" " )
52471118	Low Side	(3/4" " )

The R134a saddle clamp valve part numbers are:

If an existing R-12 service port is not used, it must be rendered inoperative. Place several drops of a thread locking compound, such as Loctite(R) 243, in the valve core, and onto the cap threads. Secure the cap and let it set for 15 minutes.

#### 4. Install Any Additional Parts Needed

See "Platform Details" after Step 6. If a vehicle is listed as a "Basic Retrofit", no additional parts are required (except for compressors, see the Compressor Replacement Chart at the beginning of Platform Details). If no parts are required, PROCEED TO STEP 5.

## Compressors

Compressors do not need to be replaced as part of a normal retrofit, unless indicated in the Compressor Replacement Chart. An R-12 compressor that is operating properly can, in most cases, be left in the vehicle when it is retrofitted to R134a. However, if a compressor failure is the reason the vehicle is in for service, and the vehicle will be retrofitted, OR if a vehicle has already been retrofitted with R-134a and the compressor fails at some time in the future, new compressors for use with R-134a are available. See the GMSPO Parts Catalog for specific part numbers. **DO NOT** use a replacement R-12 compressor for any vehicle retrofitted to R-134a (unless it is the new "oil-less" design). See "Compressor Availability" at the end of the Compressor Replacement Chart.

## Accumulator /Dryer

If the vehicle is more than 5 years old, the Accumulator/Dryer (A/D) should be replaced to ensure that moisture is removed from the system. See the instructions for proper A/D identification in General Information.

## High Pressure Cut-Off Switch (HPCOS)

Most trucks, and some 1984-93 B and D cars, require that a HPCOS be added to protect the refrigerant system during long idles at high temperature. The HPCOS kit (P/N 15981985) contains the switch, wire harness, heat sealing splice connectors, switch "O" ring, and installation instructions. A saddle clamp adapter (P/N 15985307), or a special dual fitting, is mounted to the high pressure line, and provides the port to mount the switch. A drop of a thread locking compound, such as Loctite(R) 242, should be used on each bolt of the saddle clamp to prevent the threads from loosening.

Some vehicles produced during the second half of the 1993 model year will already have a factory installed HPCOS. Check the back of the compressor for this switch. If present, the above switch will not have to be added.

### 5. Evacuate the System, and Recharge with PAG or V5 Retrofit Oil and R-134a

Newly designed low profile quick connect couplers for the ACR4, J 39500-20A and J 39500-24A, have been released. These should be installed before proceeding with the evacuation. See Step 3, and Figure 3.

- a. Connect the R-134a cart (ACR4) to the system. Open the coupler valves on the hoses so that the pressures can be read on the gauges. On the cart, open the **HIGH SIDE VALVE ONLY**. **DO NOT OPEN THE LOW SIDE VALVE!** Program the cart for a 15 minute evacuation.

#### **Important:**

If the vehicle has been at outside temperatures of less than 50° F (10° C), or at high altitudes (above 3000 ft), use a 30 minute evacuation to insure complete removal of the R-12.

If the vacuum pump will not start and a "H-P" reading is indicated on the ACR4 display, loosen the fitting at the high side line connection to the ACR4 to relieve pressure in the line. Tighten the fitting after pressure has been relieved. **DO NOT USE THE RECOVERY MODE TO RELIEVE LINE PRESSURE.**

- b. Start the evacuation. For a proper evacuation, the cart must pull down to 28-29 in. Hg. at sea level (reduce by 1 in. for each 1000 ft above sea level). Check the low side gauge for proper vacuum level, to make sure the new fittings are operating properly.

While the evacuation is being done, the Retrofit label can be filled out and installed (see Step 6).

#### **Important:**

If the compressor was replaced at the same time as this retrofit, and the new compressor was shipped with the correct amount of PAG oil already in it, **DO NOT** add any additional oil to the system! Go to Step D. If an "oil-less" compressor was installed, add oil in Step C.

A new retrofit oil for use with V5 compressor vehicles has been released. This oil will be used **ONLY** for retrofitted vehicles in which the original V5 compressor is retained. **IT WILL NOT BE USED IF A COMPRESSOR IS REPLACED AT THE TIME OF THE RETROFIT.** Failure to use this oil may significantly shorten the useful life of the compressor.

#### **Important:**

If the V5 Retrofit oil is not available from GMSPO, the compressor **MUST BE REPLACED!**

To summarize the correct retrofit oil usage:

- ^ Compressor replaced during retrofit
  - NO OIL ADDED if new compressor shipped with oil
  - 8 oz. of PAG oil (9 oz of PAG oil with V5 compressor) added if compressor shipped without oil ("oil-less" design)

Figure 6

**NOTICE: RETROFITTED TO R-134a**  
 RETROFIT PROCEDURE PERFORMED TO SAE J1661  
 USE ONLY R-134a REFRIGERANT AND SYNTHETIC  
 OIL TYPE: \_\_\_\_\_ PN: \_\_\_\_\_ OR  
 EQUIVALENT, OR A/C SYSTEM WILL BE DAMAGED.

REFRIGERANT CHARGE/AMOUNT: \_\_\_\_\_  
 LUBRICANT AMOUNT: \_\_\_\_\_ PAG ☒ ESTER ☐

RETROFITTER NAME: \_\_\_\_\_ DATE: \_\_\_\_\_  
 ADDRESS: \_\_\_\_\_  
 CITY: \_\_\_\_\_ STATE: \_\_\_\_\_ ZIP: \_\_\_\_\_

PART NUMBER 21030857 DO NOT REMOVE

**Legend**

1. Type: Manufacturer of Oil (GM)
2. GM Part Number
3. Refrigerant Amount in Lbs or Kg
4. Lubricant Amount in Ounces or CC/ML
5. Check "PAG" Box
6. Date Retrofit was Performed
7. Name and Address of Facility that Performed the Retrofit

^ PAG oil used for future service if needed (mark PAG on box on label, Figure 6).

^ HR6 or R4 original compressor RETAINED - add 8 oz FAG oil to system

^ V5 original compressor RETAINED - add 9 oz V5 Retrofit oil to system. If V5 Retrofit oil is not available from GMSP0, REPLACE THE COMPRESSOR.

- c. Based on the above chart, add oil if needed. Use the new oil bottle and the extended tube kit, J 39500-71. Fill the bottle with at least 10 oz of oil. Attach the new bottle to the back of the ACR4, and open the oil fill valve. Allow the correct amount of oil to be drawn into the system. DO NOT allow the oil level to drop below the end of the pickup tube. This will prevent any air from being drawn into the system. If any oil was removed during the R-12 recovery evacuation steps, DO NOT add additional oil to replace it.

- d. Determine the correct amount of R-134a to use. Check the existing label of the vehicle for the R-12 charge amount.

Use the formula  $\{(R12 \times .9) - .25 \text{ lb} = R-134a\}$  to determine the correct charge. This can also be stated as: Take 90% of the R12 charge, and subtract 1/4 lb.

Follow the directions for the ACR4 cart to recharge the system. At the end of the process, "CPL" will be displayed. Close the high side valve.

- e. Start the vehicle, turn on the A/C system, and confirm that pressures are within normal operating ranges, as shown in the 1994 Service Manual. The 1994 Service Manuals can be used as a reference for diagnosis and specification of retrofitted systems.

On some vehicles with automatic A/C controls or low charge diagnostics, the A/C compressor may not engage if any diagnostic codes were set during the retrofit. Check to see if any codes were set in either the HVAC or Engine Control systems. If they were, clear the codes following the directions in the Service Manual.

- f. TO INSURE AN ACCURATE CHARGE AMOUNT, IT IS **IMPORTANT** TO CLEAR THE ACR4 OF ANY REMAINING REFRIGERANT. Close the high side coupler valve and remove the high side hose from the vehicle. Then, open both the high and low side valves on the ACR4. After the pressures on both gages are at low side pressure, close the low side coupler valve. See Step G below, then remove the low side hose from the vehicle. Shut off the engine. Install the service port caps on the new fittings. These

serve as a seal and can prevent system leaks.

g. In the unlikely event that the low side fitting leaks when the coupler is removed, use the following procedure:

1. Immediately reinstall the coupler on the fitting.
2. Find the valve core remover J 34611-A.
3. Remove the coupler.
4. Use the double-ended valve core remover to turn the valve core pin counter-clockwise until the leak stops.
5. Install the cap.

If the leak was substantial or continued for an extended period of time, it is highly recommended to evacuate and recharge the system to insure proper performance. If there is any question, the system can be rechecked by repeating Step F.

h. Leak test any new port fittings, adapters, or valves that were installed, and any joints that were opened or repaired during the retrofit process, using tool J 39400.

6. **Install the Retrofit Label**

The retrofit label (P/N 21030857, roll of 250) has been developed following SAF specifications to insure a smooth transition from R-12 to R-134a, and to insure a professional approach to the retrofit and a quality repair. Following the instructions in this bulletin will insure that the retrofit meets the SAE standards.

Fill in the new label using a typewriter or a ball-point pen (see Figure 6). Select a location for the label that will be easily visible. Some suggested areas are the radiator support panel, an area near the existing R-12 charge label, or a flat surface near the high or low side service ports. The area selected should be a clean, underhood, painted sheet metal surface, and should be degreased and wiped down with a non-petroleum based cleaner. Do not install the label on a rubber surface. Apply the label, then apply the clear overlay to the label.

Do not remove, cover, or render unreadable the existing R-12 charge label. DO cover the R-12 refrigerant charge amount on the existing label with an indelible, preferably black, marker.

## **Platform Details**



Car Platforms	
A	<p>Covered: 1984-93, Basic Retrofit</p> <p>Compressor Usage: All V5 except:  84-85 2.5L - R4  84-85 4.3L Diesel - R4  84-86 2.8L - DA6  84-87 3.0/3.8L - DA6  88-93 3.3/3.8L - HR6</p>
B	<p>Covered: 1984-93, Additional Parts Needed:</p> <p>91-93 - 22134515 Fan Asm. *  91-93 - 10254709 Kit, fan mounting *  84-90 - HPCOS Kit 15981985, Saddle clamp 15985307</p> <p>* Required if being done under warranty. Strongly recommended if vehicle will be used in hot climates, or will encounter long periods of idle with A/C running. If this fan is NOT used, add the HPCOS kit 15981985, and saddle clamp 15985307.</p> <p>Compressor Usage: All R4</p>
C	<p>Covered: 1985-93, FWD only, Basic Retrofit</p> <p>Compressor Usage:  85-87 - DA6  88-93 - HR6</p>
D	<p>Covered: 1984-93, Additional Parts Needed:</p> <p>1993 with V08, use fan same as 93 B *  1984-92 - HPCOS Kit 15981985, Saddle clamp 15985307</p> <p>* Required if being done under warranty. Strongly recommended if vehicle will be used in hot climates, or will encounter long periods of idle with A/C running. If this fan is NOT used, add the HPCOS kit 15981985, and saddle clamp 15985307.</p> <p>Compressor Usage: All R4</p>
EKV	<p>Covered: 1984-93, Basic Retrofit</p> <p>Compressor Usage:  84-85 - R4  86-87 - DA6  88-93 - HR6</p>

Car Platforms	
F	Covered: 1984-92, Basic Retrofit Compressor Usage: All R4 except: 84-86 2.5L - DA6
H	Covered: 1986-93, Basic Retrofit, except: 92-93 Pontiac - add hood seal 25616378, per Bulletin #200103 Compressor Usage: 86-87 - DA6 88-93 - HR6
J	Covered: 1984-94, Basic Retrofit (1994 J cars built after 1/1/94 already use R-134a) Compressor Usage: All V5 except: 84 All - DA6 85 All exc. LQ5 - DA6 86 LA5/LB6 - DA6 87 LT3 - DA6 88-90 LT3 - HR6
L	Covered: 1987-93 1987-91 Basic Retrofit 1992-93 Additional Parts Needed: TXV Kit 52477714 Compressor Usage: All V5
N	Covered: 1985-93 1985-91 Basic Retrofit 1992-93 Additional Parts Needed: TXV Kit 52477714 Compressor Usage: All V5 except: 85-86 3.0L - DA6 87-89 2.0L(T) - HR6
P	Covered: 1984-88, Basic Retrofit Compressor Usage: 84-85 All - DA6 86-88 2.5L - V5 86-87 2.8L - DA6 88 2.8L - HR6
T	Covered: 1988-93, Basic Retrofit Compressor Usage: V5

Car Platforms	
W	Covered: 1988-93, Basic Retrofit Compressor Usage: All V5 except: 3.8L - HR6
Y	Covered: 1984-93 1984-87 Basic Retrofit; Compressor Usage: R4 1988-93 Additional Parts Needed: Nippondenso Compressor replacement 88-93 L98/LT1 - 10243781 90-93 LT5 - 10243783  <b>Important:</b> For 1993, check part number on OEM compressor. P/N 10238383 is OK, 10135691 needs replacement.

Truck Platforms	
C/K	<p>Covered: 1988-93, Additional Parts Needed:</p> <p>88-93 All Engines - HPCOS Kit 15981985, cycle switch 52465555</p> <p>88-89 Saddle Clamp 15985307</p> <p>90-93 HS Fitting - 15982611; 15984039 adapter, needed on all 91-93 engines, and on 7.4L only, in 1990</p> <p>91-93 4.3*/6.2(D)/7.4L - condenser 52469067 Condenser requires (2) 15956322 and (2) 15956553 insulators, and (2) 15956321 brackets</p> <p>*4.3L only: Condenser not required if vehicle has heavy-duty radiator</p> <p>Compressor Usage: All R4</p>
R/V	<p>Covered: 1987-91, Additional Parts Needed: (R/V includes Blazer, Suburban, and Crew Cab)</p> <p>87-91 HS fitting 15982611, HPCOS 15981985</p> <p>Compressor Usage: All R4 except: 87 7.4L/6.2L(D) - DA6 88-91 7.4L/6.2L(D) - HR6</p>
G	<p>Covered: 1987-92, Additional Parts Needed:</p> <p>87-92 HPCOS kit - 15981985</p> <p>87-91 HS fitting - 15982612</p> <p>92 HS fitting - 15982611</p> <p>91-92 C69 - Accum./dryer 2724836</p> <p>87-92 Diode 12126487 w/6.2L (D) - See 1993 Service Manual Section 8A for installation</p> <p>Compressor Usage: All R4 except: 87-92 6.2L(D) - HR6</p>

Truck Platforms	
M/L	<p>Covered: 1987-93, Additional Parts Needed:</p> <p>1987- Early 93 HPCOS Kit 15981985, Saddle clamp 15985307 Late 93 has OEM HPCOS</p> <p>Compressor Usage: 87-90 - R4 91-93 - HR6</p>
S/T	<p>Covered: 1987-94, Additional Parts Needed: (1994 S/T Utility {Blazer, Bravada, Jimmy} use R-12)</p> <p>87-94 - Util. - Condenser 52479563 87- Early 93 - HPCOS kit 15981985, Saddle clamp 15985307 - Late 93 has OEM HPCOS</p> <p>Compressor Usage: All R4 except: 87-93 2.5L - V5 91 2.8/4.3L - V5</p>
P	<p>Covered: 1987-93</p> <p>87-93 - Motorhome Chassis - Basis Retrofit</p> <ol style="list-style-type: none"> <li>1. Check for HPCOS. It should be mounted on the high pressure line. Add one if needed.</li> <li>2. Both fittings are the low side type.</li> <li>3. Vehicles used in high ambients may add condenser booster fan 12546082.</li> </ol> <p>87-93 Commercial Chassis - Check rear of compressor for HPCOS. Add one if there is no switch in the head.</p> <p>Compressor Usage: Motorhome Chassis: Sanden, OK to retrofit Commercial Chassis: R4</p>
U	<p>Covered: 1990-92, Basic Retrofit</p> <p>Compressor Usage: 90-91 All - V5 92 3.1L w/o rear air - V5 92 3.8L, 3.1L w/rear air - HR6</p>

Truck Platforms	
Medium Duty	<p>Covered: 1988-93, Additional Part Needed:</p> <p>88-93 HPCOS Kit 15981985, Cycling Sw. 52465555, HS Fitting 15982612</p> <p>90-93 LX0 Engine, Sanden Comp. 15956082 Requires adapter block 15980006 and bolt 15980005</p> <p>88-90 (except GMT530) Condenser 52469967 can be used for improved performance on LF5/L34/L86/LH3/LH4 engines; with RPO T50 (Tilt Front) use 52469957</p> <p>88-93 Receiver 15505227 should be replaced when the accumulator is replaced</p> <p>Compressor Usage: 90-93 LX0 Diesel - Sanden (see above) 88-93 Gas Engines - HR6 88-90 Diesels exc. LX0 - HR6</p>

FOR ALL VEHICLES EXCEPT GEO, see the "Compressor Replacement Chart" at the end of this section. Compressor replacement requirements ARE NOT LISTED in the platform details (except for application details), except as noted below for Y car and P and Medium Duty truck.

## Compressor Replacement Chart

1. V5 Compressors - Use V5 Retrofit oil if retaining the original compressor during a retrofit. If the V5 Retrofit oil is not available from GMSPO, REPLACE THE COMPRESSOR.

1984-87 - OK

1988-89 - Check date code  
Is it between 1/88 and 8/89?  
Yes - Is label royal blue?  
Yes - Replace  
No - OK

1990-93 - OK

2. R4 Compressors

1984-89 - OK

1990-93 - Check date code  
If between 1/1/90 and 6/18/93,  
Replace

1994 - OK

3. 6 Cylinder Compressors

All A6 Compressors - OK

All DA6 Compressors - Replace

Check date code - if after 1988, the unit is an HR6, and is OK

All HR6 Compressors - OK

### Important:

It is important to check the date code on the compressor. Any vehicle may have had a compressor replaced either during or after the warranty period. The date code will determine whether or not the compressor must be replaced.

## Compressor Availability

A new compressor for use with R-134a systems will be shipped with the correct amount of PAG oil installed (see "**IMPORTANT**" below). Do not add any additional oil in Step 5 of the retrofit procedure if a compressor is to be replaced with a new R-134a compressor at the same time the initial retrofit is being done.

### Important:

During 1996, "oil-less" compressors began to be serviced with NO added oil. New part numbers will be issued, and both the box and the compressor will be clearly marked to indicate that no oil is present. If you receive one of these newer compressors, simply add the normal amount of oil to the system in Step 5 of the retrofit procedure (8 oz of PAG oil, or 9 oz of PAG oil with V5 compressor). These "oil-less" compressors are compatible with EITHER R12 or R-134a.

## Geo Models

Compressors DO NOT HAVE TO BE REPLACED as part of the retrofit. New compressors are shipped with enough oil to accommodate the entire A/C system. Do not add additional PAG oil to the system if the compressor is being replaced.

## 1985-88 Nova, 1989-93 Prizm (S)

1. Using the Service Manual, remove the following components in the order given:
  - a. Receiver/dryer.
  - b. Loosen evaporator to compressor (suction) pipe (to be reinstalled)
  - c. 1985-92 only: Loosen compressor to condenser (compressor discharge) pipe (to be reinstalled).
  - d. 1985-88 only: Service Valve & Extension Housing on compressor (to be installed).
  - e. Compressor (only if being replaced).
2. Using the Service Manual, install the following components in the order given. Be sure to use new O-rings whenever a refrigerant connection

has been disconnected.

- a. Compressor (if being replaced).
- b. High and low side adapter fittings (see Step 3 of the retrofit procedure for detailed installation instructions).
- c. 1985-88 only: Service Valve & Extension Housing on compressor using new 0-rings. Six small 0-rings and one large 0-ring are required.
- d. Evaporator to compressor (suction) pipe 0-ring.
- e. 1985-92 Compressor to condenser (discharge) hose 0-ring.
- f. Receiver/dryer and 0-rings.

R-134a amount: 85-92 - 650 grams (1.43 lb)

93 - 700 grams (1.54 lb) PAG oil amount: 100 cc (3.0 oz) Parts Required:

Receiver/dryer:

85-88 - 94855761

89-93 - 94855762

Adapter Fittings:

Low Side - 94855760

High Side - 94855759

0-Rings:

85-88 Compressor - Small 0-rings  
(6 required) - 94857336 -  
Large 0-ring - 94857337

85-93 Receiver/Dryer (2) - 94845949

85-93 Suction hose - 94855765

85-92 Discharge hose - 94845943

## **1985-88 Sprint, 1989-93 Metro (M)**

1. Using the Service Manual, remove the following components in the order given:

- a. Receiver/dryer.
- b. Evaporator to compressor (suction) pipe.
- c. Compressor to condenser (compressor discharge) pipe.
- d. Joint service connector on compressor (to be reinstalled).
- e. Compressor (only if being replaced).

2. Using the Service Manual, install the following components in the the order given. Be sure to use new 0-rings whenever a refrigerant connection has been disconnected.

- a. Compressor (if being replaced).
- b. High and low side adapter fittings (see Step 3 of the retrofit procedure for detailed installation instructions).
- c. Joint service connector to compressor. Use new 0-rings. Six small 0-rings and one large 0-ring are required.
- d. Evaporator to compressor (suction) pipe, and new 0-ring.
- e. Compressor to condenser (discharge) hose and new 0-ring.

- f. Receiver/dryer and O-ring.

R-134a amount: 500 grams (1.10 lb)

PAG oil amount: 100 cc (3.0 oz)

Parts Required:

Receiver/dryer:

85-86 - 91172081

87-88 - 91172079

89-93 - 96068480

Adapter Fittings:

Low Side - 91172092

85-88 - High Side - 91172094

89-93 - High Side - 52467941

O-Rings:

Compressor - Small O-rings (6 required)

- 91172095

- Large O-ring - 96068915

Receiver/Dryer (2) - 96068488

89-93 - Suction hose - 96068490

89-93 - Discharge hose - 96068489

Suction hose:

85-86 - 91172086

85-86 Dealer installed: 91172087

87-88 - 91172088

89-93 - w/turbo - 96069121 - w/o turbo

- 91172089

Discharge hose:

85-86 - 91172082

85-86 Dealer installed: 91172083

87-88 - 91172084

89-93 - 96069024

## **1989-93 Tracker**

1. Using the Service Manual, remove the following components in the order given:

- a. Receiver/dryer.
- b. Evaporator to compressor (suction) pipe.
- c. Compressor to condenser (compressor discharge) pipe.

- d. Joint service connector on compressor (to be reinstalled).
  - e. Compressor (only if being replaced).
2. Using the Service Manual, install the following components in the order given. Be sure to use new O-rings whenever a refrigerant connection has been disconnected.
  - a. Compressor (if being replaced).
  - b. High and low side adapter fittings (see Step 3 of the Retrofit procedure for detailed installation instructions).
  - c. Joint service connector to compressor. Use new O-rings. Six small O-rings and one large O-ring are required.
  - d. Evaporator to compressor (suction) pipe, and new O-ring.
  - e. Compressor to condenser (discharge) hose and new O-ring.
  - f. Receiver/dryer and O-ring.

R-134a amount: 550 grams (1.21 lb)

PAG oil amount: 100 cc (3.0 oz)

**Parts Required:**

Receiver/dryer - 91172080

Adapter, Low Side - 91172092

Adapter, High Side - 91172093

**O-Rings:**

Compressor - Small (6) - 91172095

Large - 96068915

Receiver/dryer (2) - 96068488

Suction hose - 96068490

Discharge hose - 96068489

Suction hose - 91172091

Discharge hose - 91172085

## **1985-89 Spectrum and 1990-93 Storm (R)**

1. Using the Service Manual, remove the following components in the order given:
  - a. Condenser (Storm) or radiator grille (Spectrum) (to be reinstalled).
  - b. Triple switch (Storm) or dual pressure switch (Spectrum) (to be reinstalled).
  - c. Receiver/dryer.
  - d. Evaporator to compressor (suction) pipe.
  - e. Check valve from high side service valve (discard).
  - f. Compressor (only if being replaced).
2. Using the Service Manual, install the following components in the order given. Be sure to use new O-rings whenever a refrigerant connection has been disconnected.
  - a. Compressor (if being replaced).
  - b. High side adapter fitting (see Step 3 of the retrofit procedure for detailed installation instructions). Low Side - Part of suction hose
  - c. Evaporator to compressor (suction) pipe, and new O-rings.



- d. Receiver/dryer and O-rings.
- e. Triple switch or dual switch, and new O-ring.
- f. Condenser or radiator grille.

R-134a amount: 91 - 500 grams (1.10 lb)  
92-93 - 600 grams (1.32 lb)

PAG oil amount: 150 cc (4.50 oz)

Parts Required:

Receiver/dryer:

- 85-89 - 97104795
- 90-91 - 97104797
- 92-93 - 97104798

Adapter, High Side:

- 85-89 - 97104794
- 90-93 - 97104793

Adapter, Low Side: Part of Hose Asm.

O-rings:

Receiver/dryer -

- 85-91 - 94154048
- 92-93 - 94461700

Switch/pipe - 94461902

Suction hose:

- 85-86: 1.5L - 97104799; 1.6L - 97104800
- 90-93: 1.6L - 97104801; 1.8L - 97104803

## **B. General Information**

Several items affecting the performance and durability of the system should be considered:

### **1. Performance**

When performed properly, the retrofit from R-12 to R-134a will have minimal effect on the system's performance in most climatic conditions found in the United States and Canada.

### **2. Leakage**

Experience has shown that most leakage in an A/C system is due to leaks at the joints, or through a small leak in a hose, usually at the coupling. The R-134a molecules are smaller than R-12, and a small leak may result in a faster loss of refrigerant with R-134a. Because of this, it is very important to leak check all vehicles using the J 39400 leak detector, BEFORE the retrofit is performed, and repair any leaks found.

"O" rings and hoses used in most GM vehicles are compatible with R-134a and do not need replacement during a retrofit. "O" rings or hoses installed in previous repairs may have been of non-compatible materials if GM parts were not used and will be more likely to deteriorate and leak than the original equipment materials. All "O" rings and hoses available through GMSP0 are compatible with R-134a. Remember that the normal policy is to replace the "O" rings whenever a joint is opened for any reason.

### **3. Desiccant**

You may have heard that the currently used desiccant in the accumulator is not compatible with R-134a. Extensive testing has shown that it

is, in fact, suitable for use with R-134a, once it has been in service in an R-12 system. The accumulator in these models will not have to be changed during the retrofit procedure, unless the vehicle is more than 5 years old. Vehicles more than 5 years old should have the A/D replaced to add new desiccant for proper system drying.

In the event that an accumulator/dryer (A/D) needs to be replaced on a retrofitted system in the future, only A/D's with XH-7 desiccant should be used. The service parts for the 1993 vehicles contain only XH-7 desiccant. The parts for the 1992 and older vehicles may contain either XH-5 or XH-7. Parts containing XH-7 can be identified (see Figure 1) by 1) an "A" printed on the top of the A/D; or 2) if there is a label on top of the A/D, there will be a square with an "A" inside; or 3) if there is a time code and date printed on top of the A/D just under the "Harrison" logo, the A/D contains XH-7. A/D's containing XH-5 can still be used on R-12 vehicles.

#### 4. Improved Cooling Performance

There have been service bulletins issued in the past with information improving the cooling performance of existing R-12 systems. These bulletins can also be used to improve the performance of retrofitted vehicles in high ambient temperature climates.

#### 5. PAG or V5 Oil Compatibility

Contrary to information published to date outside of General Motors, mineral oil and PAG or V5 oil ARE chemically compatible. The mineral oil left in the system after reclaiming the R-12 can remain in the system with no harmful effects. However, the mineral oil will not mix with the R-134a, and so will not circulate and perform its lubricating function. Testing has shown that most of the mineral oil will eventually collect in the accumulator. The system will operate properly as long as refrigerant charge amounts are strictly adhered to.

#### 6. Refrigerant Charge Level

The retrofit R-134a charge level is more critical than with R-12 systems. Overcharging may push the mineral oil out of the A/D, and cause it to circulate as a liquid. This is more likely to result in compressor damage. Undercharging may lead to loss of performance. It is very important to clear the hoses during the charging operation, to insure that all the refrigerant is delivered to the vehicle A/C system. This is covered in Step 6D of the Retrofit Procedure.

## C. Parts Information

Description	P/N
<b>Generic Parts</b>	
Labels, Retrofit (Roll of 250)	21030857
Fitting, R-134a Straight High Side Port	52467941
Fitting, R-134a Straight Low Side Port	52467943
Fitting, R-134a Straight Two-piece High Side	52467324
Fitting, R-134a 90 degree High Side Port	52469054
Fitting, R-134a 90 degree Low Side Port	52469055
Valve, Saddle clamp port - 3/8" High side	52471115
Valve, Saddle clamp port - 1/2" High side	52471116
Valve, Saddle clamp port - 5/8" Low side	52471117
Valve, Saddle clamp port - 3/4" Low side	52471118

Description	P/N
PAG oil - 16 oz bottle	12345923
V5 retrofit oil - 16 oz bottle	12346305
<b>Specific Parts - Cars</b>	
B/D Fan Mounting Kit - 91-93	10254709
B/D Fan Asm. - 91-93	22134515
Hood seal kit - Pontiac H only	25616378
L/N Thermal Expansion Valve (TXV) Kit	52477714
Y Compressor, L98/LT1 (88-93)	10243781
Y Compressor, LT5 (90-93)	10243783
<b>Specific Parts - Trucks</b>	
HPCOS kit	15981985
Adapter, Saddle clamp - HPCOS port - 3/8"	15985307
Adapter, Saddle clamp - HPCOS port - 1/2"	15987428
Trucks, Cycling switch	52465555
Trucks, High side fitting (dual port)	15982611
Trucks, High side fitting (dual port)	15982612
Trucks, High side fitting adapter	15984039
C/K Truck condenser, 4.3/7.4/6.2D	52469067
C/K Truck insulator (2)	15956322
C/K Truck insulator (2)	15986553
C/K Truck bracket (2)	15956321
G Van A/D with C69	2724836
G Van Diode, with Diesel	12126487
S/T Truck condenser (Utility)	52479563
P Chassis, Condenser booster	12546082
Medium Duty compressor (Sanden)	15956082
Medium Duty compressor adapter bolt	15980005
Medium Duty comp. adapter block	15980006
Medium Duty condenser (exc. GMT530)	52469967
with tilt front use:	52469957
84-93 Medium Duty - Receiver	15505227

**Important:**

All of the following parts are NOT NEEDED for a normal retrofit. Follow the bulletin procedures to determine which parts you need! Individual vehicle kits are not necessary, since most of the parts are generic and only a few parts are needed for most vehicles.

GEO Parts are listed in "Platform Details."

Parts are currently available from GMSPO.

**D. Warranty Information**

- Vehicle Still Within the Original New Vehicle Limited Warranty Period

When GM models for the years listed in the bulletin require repairs to the refrigerant system and the vehicles are still covered under the New Vehicle Limited Warranty, dealers are instructed to proceed as follows:

**Important:**

On vehicles equipped with A/C systems NOT produced by GM (i.e., rear A/C systems in van conversions), consult the manufacturer of that

A/C system for retrofit guidelines.

- ^ Offer the customer the option of repairing and recharging the system with R12, or retrofitting after repair and recharging with R-134a at no additional charge.
- ^ Provide the owner with, and review the information contained in, the "Converting Your Auto Air Conditioning System to Use the New Refrigerant" brochure. (Brochure, Form GM-0011, can be ordered free of charge from GM Fulfillment HQ, Phone 1-800-269-5100).
- ^ Record the customer's choice on the repair order and, as with all properly completed repair orders, ask the customer to sign on the appropriate line acknowledging the repairs requested.
- ^ Under no circumstances should the retrofit to R-134a be performed unless the customer has had the option explained prior to repair. Once the vehicle has been retrofitted to R-134a, a significant expenditure would be incurred to go back to R-12, in the event the customer has changed his/her mind.

THIS OFFER APPLIES ONLY TO VEHICLES REQUIRING A/C REFRIGERANT SYSTEM REPAIRS UNDER THE TERMS OF THE NEW VEHICLE LIMITED WARRANTY. It is not a special policy, and any existing deductibles still apply. This is simply an option being offered to the customer during the warranty period at this time. GM reserves the right to terminate this offer at any time.

If the R-12 refrigerant system does not require discharging for a warranty repair, but the customer requests a retrofit to R-134a, the retrofit WOULD BE PERFORMED AT THE CUSTOMER'S EXPENSE, EVEN DURING THE WARRANTY PERIOD.

## 2. Customer Paid Retrofitting Costs

If the customer requests a retrofit to R-134a, for a specific vehicle whose retrofit parts and procedures have been released in this bulletin, the customer would be expected to pay the costs to retrofit under the following conditions:

- ^ The vehicle is no longer covered by the terms of the New Vehicle Limited Warranty.
- ^ The vehicle is covered by warranty, but the repair covered under the warranty does not require evacuating and recharging the refrigerant system.

## 3. Labor Time Information

For Vehicles Repaired Under Warranty: Use existing labor operations for correcting the original condition. The quantity of R-134a used should be charged to the normal labor operation (not D4500), just as if it were R-12.

Use D4500, 0.3 HR., to charge for parts and labor, for all of the following items:

- ^ Additional time for recovery of R-12 to meet SAE standards;
- ^ Install high and low side service port converter fittings;
- ^ Add PAG or V5 retrofit oil;
- ^ Complete label information and install.

Add 0.2 hours to D4500 for installation of the HPCOS.

Use T5321, 0.3 HR., for the Pontiac Bonneville hood seal installation.

ANY PARTS OR LABOR TIME OTHER THAN THOSE LISTED ABOVE SHOULD BE CHARGED TO THE REGULAR LABOR OPERATION CORRESPONDING TO THE ORIGINAL CONDITION THAT IS BEING REPAIRED.

Technical Service Bulletin # **631208A**

Date: **970401**

## A/C - Tool And Equipment Maintenance

File In Section: 1 - HVAC

Bulletin No.: 63-12-08A

Date: April, 1997

## INFORMATION

Subject:

A/C Tool and Equipment Maintenance; Tune-Up Spring Reminder

Models:

1997 and Prior Passenger Cars and Trucks

This bulletin is being revised to add the 1997 model year and to update "Maintenance/Tune-Up" information. Please discard Corporate Bulletin Number 63-12-08 (Section 1 - HVAC).

Your A/C tools and equipment were built for long use, but certain parts were designed to need periodic service. Inadequate maintenance can significantly reduce the performance on the following tools and equipment:

J 39851 PureGuard (R12)

J 38100, J 38750-A ACR3 (R12)

J 38100-30 ACR3 30 lb. Replacement Tank (R12)

J 39400 Electronic Leak Detector (R12 & R134a)

J 39500 ACR4 (R134a)

J 41810 PureGuard 2 (R134a)

Contact Kent-Moore at 1-800-345-2233 for assistance or to order the above tools.

**Notice:**

When using any R12 or R134a Recovery Station equipped with a refrigerant monitor (PureGuard or PureGuard 2), always inject oil and charge refrigerant into vehicles through the HIGH SIDE ONLY. Injecting oil or charging refrigerant through the low side WILL damage the PureGuard and PureGuard 2.

**Important:**

Never open low side manifold valve when injecting oil.

A/C Maintenance / Tune-Up Quick Reference Chart			
Refrigerant Type	Tools & Equipment	Recommended Maintenance/Tune-Up	Service Period
R12	J 39851 PureGuard	To ensure uninterrupted service of your PureGuard, remember to:  Check and drain oil. The drain port is located on the rear of the unit.	Weekly
R12	J 38100, J 38750-A ACR3 Recovery, Recycling Cart	To ensure efficient operation of your ACR3, use J 38100 MAINT. This kit includes a replacement R12 filter/dryer element and moisture indicator.  <b>Important:</b> If an extension cord is required, use 12 gauge or heavier.	Yearly, or when performance degrades.  Drain oil filter regularly.
R12	J 38100-30 ACR3 30 lb. Replacement tank	Every cooling season, remember to check the retest date on your R12 Recovery Tanks (tanks must be tested every 5 years for leakage). Use J 38100-30 Replacement Tank as an economical alternative to tank retesting.	Every 5 years, look at retest date on tank.

Chart

A/C Maintenance / Tune-Up Quick Reference Chart			
Refrigerant Type	Tools & Equipment	Recommended Maintenance/Tune-Up	Service Period
R12	J 34119 High Vacuum Pump or Equivalent	To ensure efficient operation of your vacuum pump, use J 26695-5 Premium High Vacuum Pump Oil (one quart).	Yearly, or when performance degrades.
R12	J 41709 Tracer Dye Injector	If an A/C leak cannot be found with an electronic leak detector, use the following approved alternative: J 41709 Dye Injector, used with Florescent Dye J 39475 and J 42220 High Intensity Black Light or GM P/N 12377979.	As Required  Inject dye into vehicles through high side only.
R12 and R134a	J 39400 Electronic Leak Detector	To ensure consistent and reliable operation of your Electronic Leak Detector, use J 39400-TUNEUP-A. This kit includes replacement filters, air flow balls, calibration reference bottle, sensor, probe tip protectors, and cleaning sticks.	Yearly, or when performance degrades.
R134a	J 39500 ACR4 Recovery, Recycling, Recharging Cart	To ensure efficient operation of your ACR4, use J 39500 MAINT. This kit includes replacement R134a filter/dryer cartridge, package of coupler O-rings, and a quart of vacuum pump oil.  <b>Important:</b> If an extension cord is required, use 12 gauge or heavier.	Yearly, or when performance degrades.  Change vacuum pump oil every 10 hours of operation.
R134a	J 41459 Tracer Dye Injector	If an A/C leak cannot be found with an electronic leak detector, use the following approved alternative: J 41459 Dye Injector, used with Florescent Dye J 41447 or GM P/N 12346303, and J 42220 High Intensity Black Light or GM P/N 12377979.	As Required  Inject dye into vehicles through high side only.
R12 and R134a	J 41995 Electronic Leak Detector	Approved alternative to J 39400 existing Leak Detector. (Requires yearly maintenance).	Yearly, or when self test indicates.
R134a	J 41810 PureGuard 2	To ensure uninterrupted service of your PureGuard 2, remember to:  1. Replace top panel filter (use J 41810-1 Filter Kit).  2. Change recovery station vacuum pump oil and always maintain the correct oil level. Always check oil level while pump is running.  <b>Important:</b> If an extension cord is required, use 12 gauge or heavier.	1. Replace top panel filter when filter turns RED.  2. Change vacuum pump oil every 10 hours of pump operation. Check oil level on every vehicle.

Chart

## Parts Information

Parts are currently available from GMSPD.

Technical Service Bulletin # 73-12-13

Date: 971101

**A/C - PureGuard 2 Operating Alert**

File In Section: 1 - HVAC

Bulletin No.: 73-12-13

Date: November, 1997

## INFORMATION

Subject:

PureGuard 2 Operating Alert

Models:

1998 and Prior Passenger Cars and Trucks with R134a A/C Systems

A number of PureGuard 2's have been returned from the field as the result of damage from flooding the unit with oil and liquid refrigerant. Improper service procedures and unique A/C service conditions can cause this. To ensure oil and liquid refrigerant never enter the PureGuard 2, a

protective device, called J-41810-100A Active Flow Control (AFC), has been shipped to every General Motors dealership. The AFC MUST be installed to prevent damage to the PureGuard 2.

To assure maximum performance of your PureGuard 2 Refrigerant Identifier and ACR4 Recovery, Recycle and Recharging Station, below are performance tips that need to be followed. Place a copy of this bulletin with the ACR4 instruction manual in the side pocket of the ACR4.

## **Refrigerant Recovery**

^ ALWAYS RECOVER REFRIGERANT FROM BOTH THE HIGH AND LOW SIDE OF THE VEHICLE'S A/C SYSTEM SIMULTANEOUSLY. This will shorten the recovery process and ensure as much refrigerant as possible is removed from the system.

^ The PureGuard 2 is designed to sample refrigerant vapor from the low side of the vehicle during the recovery process. A pressure switch in the high side is used to sense any attempt to bypass the purity test. If pressure is sensed in the high side only, an "alarm" sounds and recovery is halted. When 30 psi is sensed in the low side, power is restored to the ACR4. Reset of the PureGuard 2 is not necessary and eliminates waiting for the warm-up cycle.

^ There have been reports of the PureGuard 2 being removed from the ACR4 due to a misinterpretation of the red excess air light. The light indicates the presence of high levels of air in the refrigerant storage tank, but it does not stop refrigerant recovery or interfere with the operation of the ACR4. A high percentage of air will increase tank pressure and can slow down or in some cases, stop refrigerant recovery. Excess air should be purged from the tank prior to charging a vehicle. This bulletin includes a procedure for quick elimination of excess air without operating the vacuum or recycle modes.

The red excess air light turns on when the air level measured in the vapor at the top of the tank reaches 6%. When charging a vehicle, liquid refrigerant is drawn from the bottom of the tank which contains a lower percentage of air. As the air content increases, the rise in tank pressure forces air into the liquid refrigerant in the tank. Air in excess of 4% in the vehicle's A/C system can cause concerns.

^ Some GM vehicles have A/C systems that are designed with the low side service port located at a very low spot in the system. Liquid refrigerant will "Puddle" in this location when the A/C system is not operating. If the low side service hose is connected and the recovery process started, a slug of liquid may be delivered to the PureGuard 2. To ensure oil and liquid refrigerant never enter the PureGuard 2, make sure the AFC is installed.

## **Oil Injection and Refrigerant Charging**

When using the ACR4 Recovery Station, always close both low and high side manifold gauge valves on the ACR4 control panel as soon as the vacuum pump cycle is complete. To inject oil from the oil bottle on the back of the ACR4, simply open the oil injection valve; oil automatically flows through the high side service hose and into the vehicle without entering the manifold gauge assembly.

ALWAYS CHARGE REFRIGERANT THROUGH THE HIGH SIDE ONLY. General Motors requires high side charging on all GM vehicles, and the flow of liquid refrigerant through the high side is necessary to wash any remaining oil in the high side service hose into the vehicle.

^ There are several oil and tracer dye injectors on the market that are designed to be installed between the ACR4 and the low side service hose. DO NOT USE THIS TYPE OF INJECTOR.

^ Oil and tracer dye injectors designed to connect directly to the vehicle's low side service port can be used. However, you must run the vehicle's A/C system long enough to ensure the oil or dye is distributed evenly throughout the A/C system prior to recovering refrigerant from the vehicle.

^ Indications that technicians are incorrectly injecting oil and leak dye are:

- Large amounts of oil or dye drained from the oil separator after recovery.
- Vacuum pump oil level above the sight glass or tinted the color of dye.
- Large amounts of oil and dye residue covering ACR4.
- Liquid flooding of the PureGuard 2.

This occurs because oil and dye intended for the vehicle's A/C system is trapped in the service hose. The next time refrigerant recovery is performed, the oil and dye are drawn back into the ACR4.

^ To ensure the vehicle receives the correct refrigerant charge, the hose clearing procedure must be performed every time a vehicle is charged. Refer to the ACR4 manual for this procedure. Failure to do so will leave a significant amount of liquid refrigerant in the ACR4 service hose.

^ Disconnect the high and low side service hoses from the vehicle as soon as NC service is complete. Failure to disconnect the couplers will allow the PureGuard 2 to continue to take small samples of refrigerant and test it. Over time, the charge level in the vehicle will decrease to a point where it will be necessary to recharge the system again due to loss of refrigerant.

^ An unsuccessful charging procedure occurs when the refrigerant does not completely transfer from the ACR4 tank into the vehicle.

Unsuccessful charging can be avoided by running the vacuum pump for the full 15-minute vacuum cycle and charging the vehicle as soon after the vacuum cycle as possible. The refrigerant is recycled during the vacuum cycle building up heat and pressure which completely forces the entire

charge into the vehicle.

## Additional ACR4 Operation and Maintenance Tips

### Additional ACR4 Operation and Maintenance Tips

- ^ Be sure both valves on the ACR4 refrigerant tank are open before beginning any A/C recovery, recycling, vacuum and recharging procedures. This prevents pressure build up in the ACR4 and allows for free flow of refrigerant in and out of the tank.
- ^ ACR4 vacuum pump oil must be changed every 10 hours of pump operation. The ACR4 has an internal timer to notify when the oil should be changed. The oil level must be set to the correct level per the ACR4 operating manual. An over-filled reservoir will cause slow start-up of the pump, draw excess current and burnout the 15 amp delay reaction fuse in the PureGuard 2. **THE PUMP OIL LEVEL MUST BE CHECKED ON A WEEKLY BASIS IF THERE IS FREQUENT FUSE BURNOUT.**

## Tank-to-Tank Refrigerant Transfer

- ^ When adding refrigerant from a new tank into the ACR4 tank, a hose clearing procedure must be done to lower the high side pressure below 50 psi. This deactivates the low side alarm. If high side pressure is above 50 psi while low side pressure is below 30 psi, the low side alarm will sound and the PureGuard 2 will turn the ACR4 off before refrigerant transfer is complete. Refer to pages 17-18 of the ACR4 Operating Instructions Manual for a detailed procedure on adding refrigerant.

## Excess Air In Tank

- ^ Do not shortcut the pre-programmed, 15 minute vacuum pump cycle. Short cutting does not allow the ACR4 automatic air purge circuit to fully expel the air in the ACR4 tank. Short cutting will eventually lead to illumination of the tank "excess air" light on the PureGuard 2.
- ^ The quick connect valves on the ACR4 red and blue service hoses must be closed (rotated outward) when they are attached to the storage fittings on the ACR4. Open valves will allow excess air to enter the storage tank during certain ACR4 operating modes.
- ^ The Active Flow Control adds additional hose and line fittings. These connection points are areas for possible leaks. Pliers should be used to tighten all ACR4 fittings and periodic checks should be made to assure none have loosened. Loose fittings can cause refrigerant loss or excess air in the storage tank. Be careful not to over torque and destroy fittings.
- ^ High levels of excess air are not quickly purged out of the Recovery Recharging Station tank. It could take 1 week of purging 4 times per day before the red "excess air" light turns off. You must have patience.

Using the following procedure to manually open and close the air purge valve in the ACR4 can accelerate removal of high levels of excess air. This is most effective if done first thing in the morning before the refrigerant is agitated by any vehicle recovery, vacuum or recycling procedures.

1. With the ACR4 powered up, on the control panel, press "shift" and "enter" keys simultaneously. Screen will go blank.
2. Press "shift" and "charge" keys simultaneously. "D2" will display on screen.
3. Press "1" key. "01" will display and purge valve solenoid will click. Excess air will be vented from the tank but this procedure does not vent any refrigerant to atmosphere. The auto purge mechanism will close an internal valve when the air content reaches a minimal level.

Press "shift" key to exit the manual air purge mode.

Tank pressure can be measured using the high side manifold gauge in the ACR4 by shifting to the charge mode, setting a charge weight of 0.50 lb and pressing the "enter" key, then pressing the "charge" key. The ACR4 valves will open and fill the lines with refrigerant at tank pressure. With the high side gauge valve on the control panel open, read the pressure immediately for an accurate pressure measurement because as the refrigerant begins to cool in the lines, the pressure will decrease. At an ambient room temperature of 70°F (21°C), the pressure in a tank of R134A with no air will be between 70 and 80 psi. The correlation between pressure and temperature is approximately 1 psi for every 1 degree increase.

## Pureguard 2 Error Codes

- ^ Code 1  
Indicates the sensors inside the PureGuard 2 are not properly stabilized. This error code can be caused by high levels of electrical interference, sudden changes in pressure or temperature, or component failure. The error may self-clear by turning the tester off and on. If this does not clear the error, internal parts may require service.
- ^ Code 2  
Indicates one or more of the sensors are outputting voltage outside of the calibration range. This error code can be caused by a sudden change in ambient temperature or operation of the PureGuard 2 out of the temperature range of 32 - 120°F (0 - 49°C). Allow the tester to stabilize in the desired temperature range while powered off. After turning tester on, if the error code does not clear, internal parts may require service.
- ^ Code 3 (with no red in top panel filter)  
Indicates one or more of the sensors did not reach the correct sensitivity level during calibration. This error code can be caused by a sudden change in ambient temperature, poor airflow to the sensors or contaminated calibration air at the sensors. Verify the surrounding air in the area is not contaminated by refrigerant vapors or gas fumes (hydrocarbons). Ventilate the area to bring in fresh air. Inspect the tester's air intake port to verify no obstructions or clogging exist. Power the tester and verify flow out the exhaust port during calibration. The exhaust port is a 1/16 in. (1.5 mm) hole located on the left side of the tester. After turning tester on, if the error code does not clear, internal parts may require service.
- ^ InfoCode 3 (with red in top panel filter)



Indicates oil or liquid refrigerant was charged into the vehicle and has contaminated the filter and the sensors in the PureGuard 2. The tester is damaged and must be serviced or replaced.

## **Active Flow Control**

### **Active Flow Control**

The J-41810-100A Active Flow Control (AFC) protects the PureGuard 2 from damage caused by flooding from liquid refrigerant, oil or leak dye. A 1 amp delay reaction fuse protects the internal electronics in the AFC. The chance that this fuse will burn out is very minimal but if it does, it can be easily diagnosed as follows:

- ^ The red light in the AFC will be on.
- ^ The PureGuard 2 will go through the warm-up procedure and test the ACR4 tank.
- ^ The manifold gauges will show A/C system pressure (if there is refrigerant left in the system), but the PureGuard 2 will not run a test even though the low side gauge shows over 30 psi of pressure.
- ^ The fail-safe design of the AFC keeps its internal solenoid valve closed in a "no power" condition and no refrigerant will flow into the PureGuard 2.

Technical Service Bulletin # **883633B**

Date: **881101**

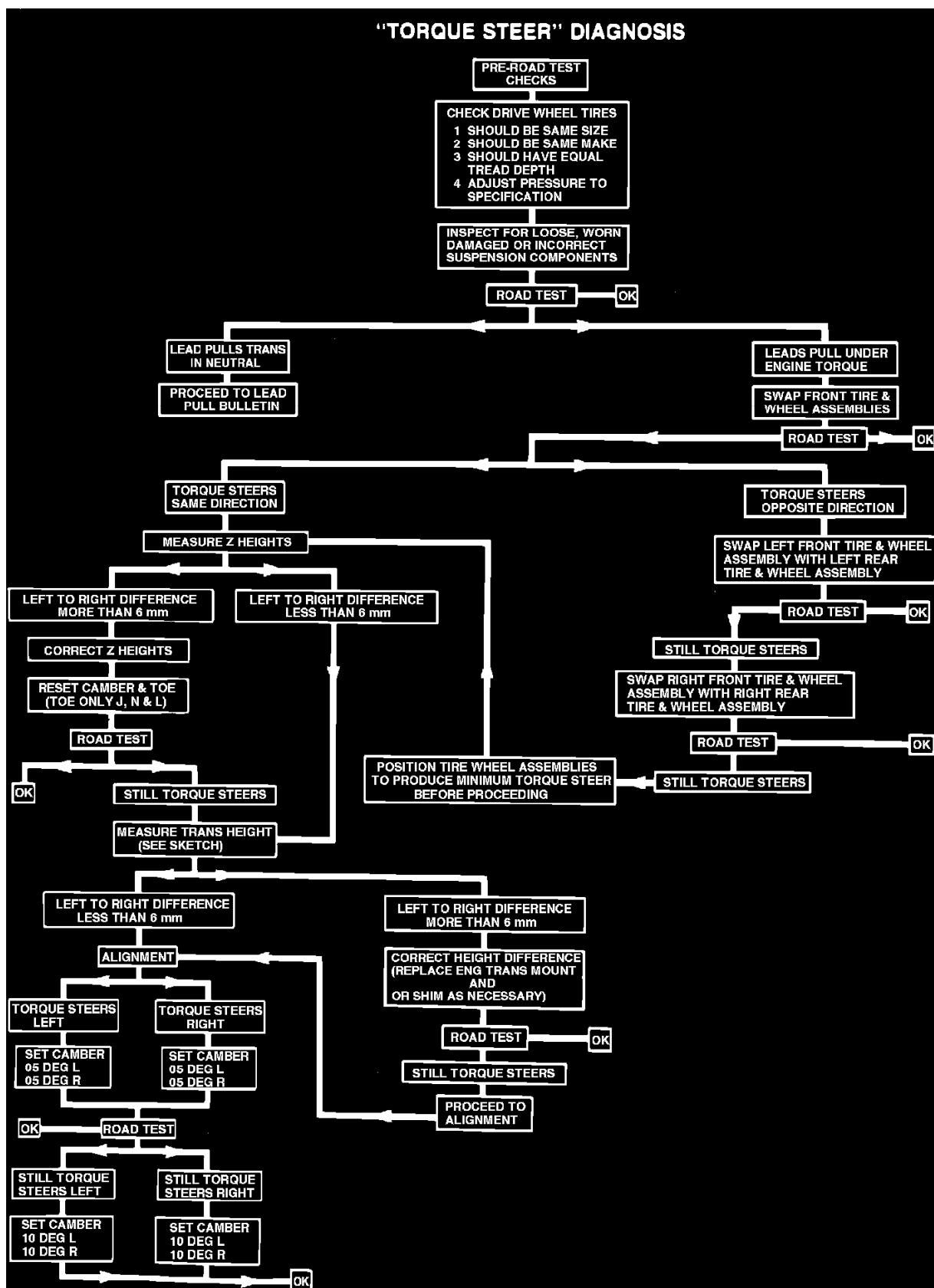
## **Steering - Diagnosing Torque Steer**

Number: 88-363-3B  
Section: 3B  
Date: NOV., 1988  
Subject: "TORQUE STEER"

Model and Year: 1980-88 CHEVROLET FRONT WHEEL DRIVE VEHICLES  
TO: ALL CHEVROLET DEALERS

Chevrolet Dealer Service Bulletin 88-260-3B dated June, 1988, is being revised to include manual transaxle equipped vehicles. All copies of 88-260-3B should be discarded.

Some vehicles may exhibit a tendency to steer left or right while driving straight. This bulletin provides a procedure for identifying "Torque Steer" (left or right steer forces that result from applied engine torque).



## DEFINITIONS

**"TORQUE STEER":** Under heavy acceleration from 40 mph on a smooth, flat road the vehicle has a left or right steering force that is eliminated when the transmission is placed in neutral. The magnitude of the steering force is normally dependent upon the amount of applied engine torque.

**"LEAD":** On a smooth, flat road with the transmission in neutral, the vehicle does not require a noticeable torque input to the steering wheel to maintain a straight direction; however, with hands removed from the steering wheel, the vehicle steers left or right.

**"PULL":** On a smooth, flat road with the transmission in neutral, the vehicle requires a noticeable torque input to the steering wheel to maintain a straight direction.

A road test will be necessary to determine if a "Lead/Pull" or "Torque Steer" condition exists. Prior to a road test, the following should be checked and corrected:

1. Tires should be the same size, make, and tread depth.
2. Adjust tire pressure to specification.
3. Inspect for loose, worn, damaged or incorrect suspension components.

Drive the vehicle on a straight, smooth, flat (crown free), road surface at 40 mph. Shift the transmission to neutral and allow the vehicle to coast. Momentarily release the steering wheel and note if there is a change in the direction of vehicle travel.

**CAUTION:** THE DRIVER'S HANDS SHOULD NOT BE MOVED FROM THEIR STEERING POSITION DURING THE MOMENTARY RELEASE OF THE STEERING WHEEL.

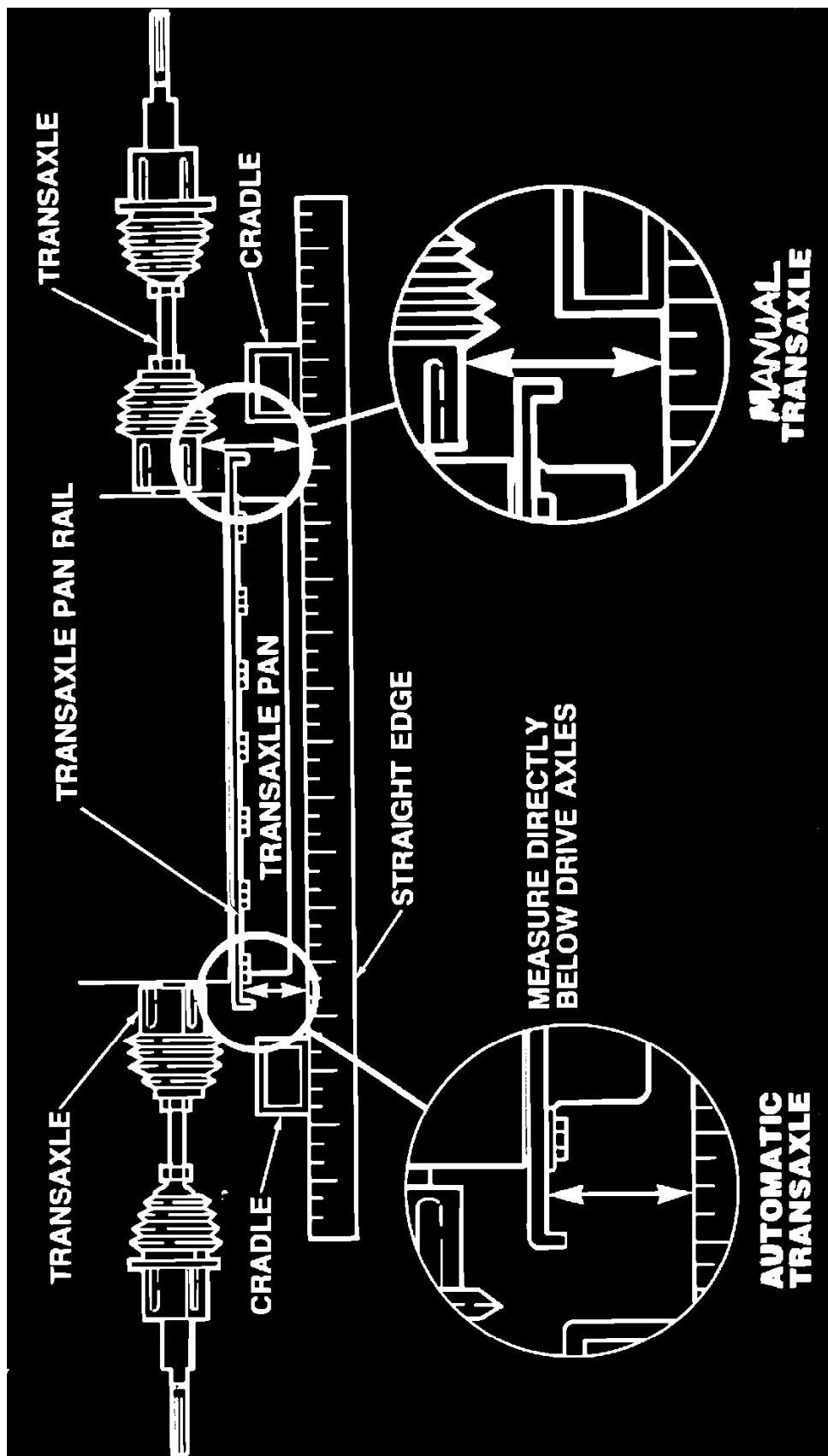
A deviation from a straight direction indicates a "Lead/Pull" condition. If a "Lead/Pull" condition exists, follow the procedures outlined in Chevrolet Dealer service Bulletin 87-212-3 dated October, 1987.

If no change in steering direction occurs with the transmission in neutral, place the transmission in gear, and while proceeding at 40 mph, momentarily apply maximum acceleration (WOT - wide open throttle). If a change in steering direction is noted, the vehicle exhibits "Torque Steer".

**NOTICE:** IT IS IMPORTANT TO REPEAT EACH ROAD TEST WHILE TRAVELING IN THE OPPOSITE DIRECTION TO ELIMINATE FACTORS SUCH AS CROSSWIND.

In conjunction with the attached "Torque Steer" Diagnosis Chart, the following possible causes of "Torque Steer" should be evaluated and repaired as necessary:

1. Slight difference in drive wheel tire diameter (cannot be measured). Vehicle will steer in direction of the smallest diameter tire.
2. Difference in left and right "Z" heights. Refer to service manual for "Z" height measurement procedure and specification. Vehicle must be resting on its wheels when "Z" height measurement is taken. When correcting "Z" height always match the lowest reading.



3. Difference in left and right drive axle angles.

Automatic Transmission - Differences in drive axle angles will be indicated by measuring a difference in the transmission left and right pan rail height. (See Illustration).

Manual Transmission - Differences in drive axle angles will be indicated by measuring a difference in the height of the axles as measured at the largest diameter of the inboard axle joint. (See Illustration).

4. Loose, worn, incorrect or damaged suspension components. Check items that could result in unequal drive wheel toe during acceleration.

Labor Operation Number: T1347

Labor Time:

NOTICE: THIS IS A ST. (STRAIGHT TIME) OPERATION WHICH REQUIRES TIME DOCUMENTATION AS DETAILED IN THE CLAIMS PROCESSING MANUAL. BRANCH APPROVAL IS REQUIRED BEYOND .5

## Steering - Identifying Rack and Pinion System Noises

Number: 88-253-3B

Section: 3B

Date: JUNE, 1988

Subject: IDENTIFYING RACK AND PINION  
STEERING SYSTEM NOISES

Model and Year: 1982-88 CHEVROLET MODELS WITH  
RACK AND PINION STEERING  
TO: ALL CHEVROLET DEALERS

The increased activity in steering gear service, due to Special Policy Bulletin 84-272-3b, dated January, 1988, has resulted in an increase in the number of comments regarding steering system related noises which can be heard inside the vehicle.

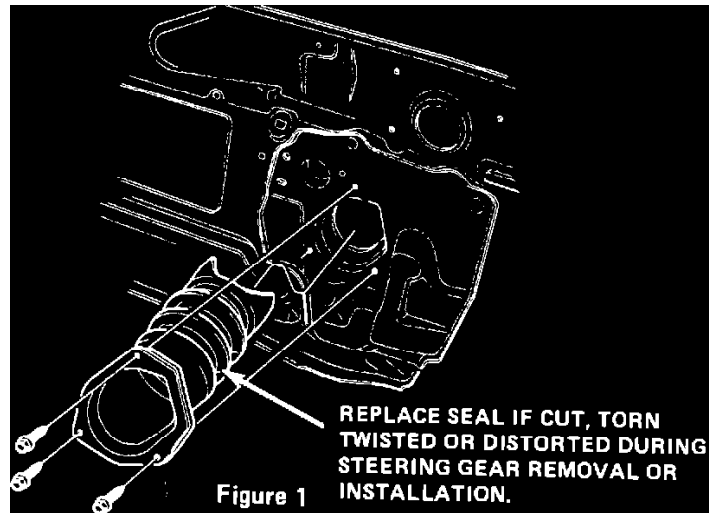


FIGURE 1

When removing or installing any rack and pinion steering gear for service, be sure to inspect the intermediate steering shaft or steering coupling seal for cuts or tears which would allow noises to be transmitted into the passenger area. Also inspect the seal for being twisted, crushed or distorted as this can cause a clunk or rubbing sound. See Figure 1 for typical cavalier car seal. Replace the seal as necessary.

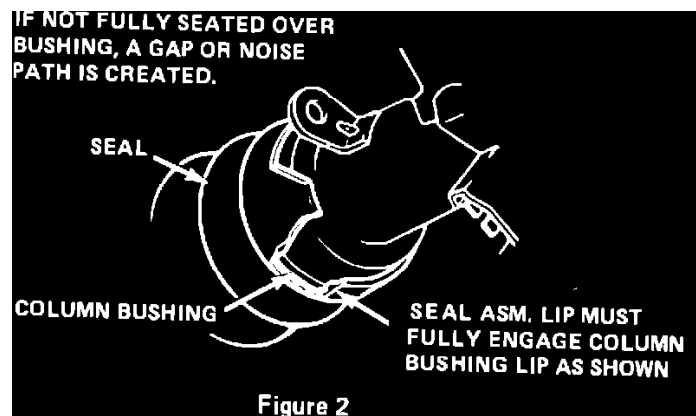


FIGURE 2

On Cavalier models, check the upper portion of the steering coupling seal to be sure it is fully seated over the bushing or a noise path could be created. The seal is retained by the lip on the bushing. Refer to Figure 2. On Celebrity models, check the seal to be sure it is securely fastened to the cowl and lower column.

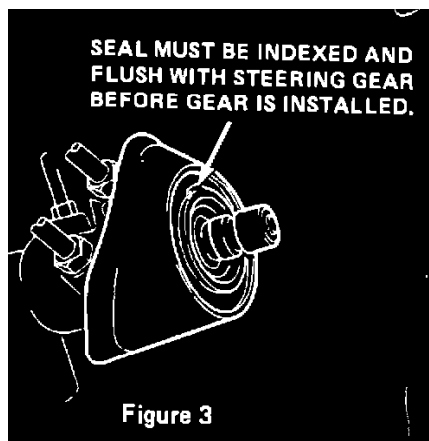


FIGURE 3

The center-take-off gears used on the Cavalier models, also use a dash seal which must be properly indexed on the housing before the gear is installed in the car. See Figure

3. If the dash seal is mispositioned another noise path can be created. A mispositioned dash seal could also cause a condition of stiff steering if the seal is rubbing on the steering coupling.

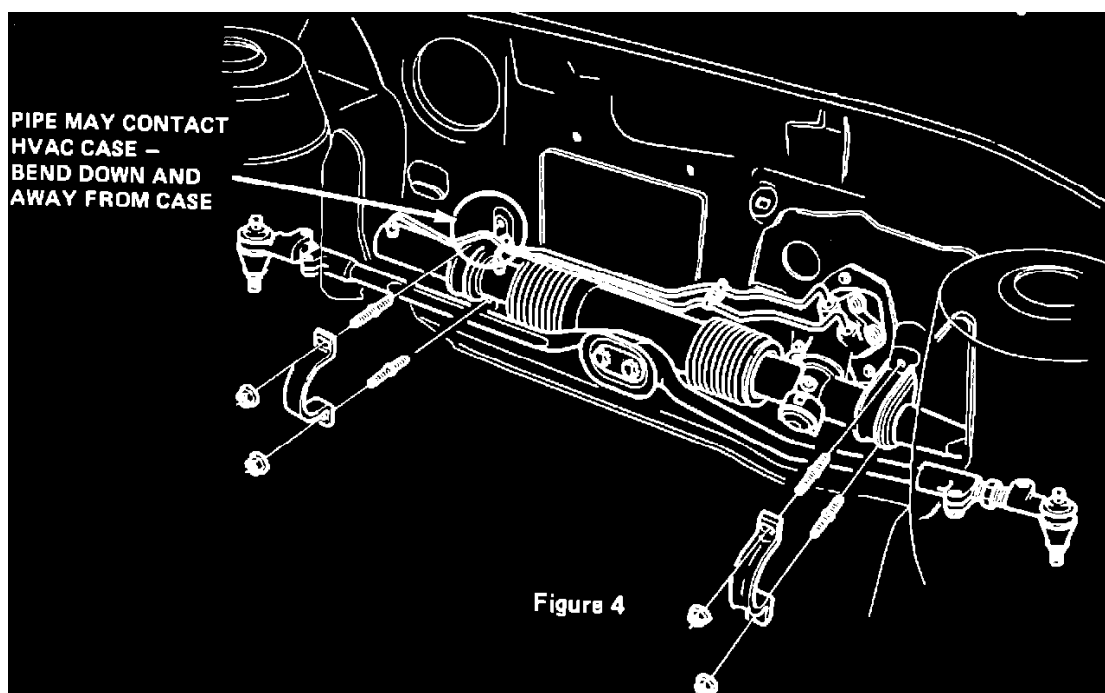


FIGURE 4

When diagnosing a growl, ground out, or rattle noise on Cavalier models, there is a possibility that one of the cylinder lines of the gear could be grounding out on the heater case on the right side of the cowl. See Figure 4. If this condition exists, bend the pipe away from the contact area to gain clearance.

All models are susceptible to having the power steering pump hoses lay against other components which could transmit steering system noises into the car. Hoses should be inspected to be sure they are not grounding out and creating a noise path.

Technical Service Bulletin # 72-05-02

Date: 970801

## A/T & M/T - AC Delco Remanufactured Transmissions

File In Section: Warranty Administration

Bulletin No.: 72-05-02

Date: August, 1997

### WARRANTY ADMINISTRATION

Subject:  
ACDelco Remanufactured Transmissions

Models:

1982-88 General Motors passenger cars and trucks

General Motors Service Parts Operations (GMSPO) is pleased to announce the ACDelco Remanufactured Transmission Program. This new program was announced on April 18, 1997 in General Motors Parts Information Bulletin # 97-157. AC Delco Remanufactured Transmissions are offered with domestic coverage for GM, Ford, and Chrysler applications. Initially, GM coverage will support 1982-1988 models.

AC Delco Remanufactured Transmissions are intended solely for the retail (customer pay) market and are not to be used for new vehicle warranty repair or policy adjustments. We feel it is important to outline our policy regarding proper claim submission procedures which are unique to AC Delco Remanufactured Transmissions. Lack of immediate availability of an acceptable service replacement transmission is not a good business reason to authorize the use of an ACDelco Remanufactured Transmission for a warranty or policy repair.

## Warranty Coverage

AC Delco Remanufactured Transmissions are covered by a 24 month/24,000 mile consumer limited replacement parts warranty (whichever first occurs) for Passenger Car and Light Duty Truck Applications. For Medium Duty Trucks with GVW over 16,000 lbs., Taxi & Police Car Applications, the coverage is limited to 12 Months or 12,000 miles (whichever first occurs). This warranty covers the cost of parts and labor and begins on the date/miles of retail purchase. This warranty coverage continues to apply to subsequent owners provided the original owner 5 repair order or sales slip is submitted with the properly completed warranty certificate when repairs are requested.

This warranty provides for independent repair facilities to perform warranty repairs on failed ACDelco Remanufactured Transmissions. However, independent repair facilities who purchase ACDelco Remanufactured Transmissions from a GM dealer must obtain authorization from dealer to do the work under sublet from dealer. (See consumer warranty statement in the GM Service Policies and Procedures Manual Article 1.1 Page 28)

## Warranty Claim Submission Procedures

All repairs or replacement of the AC Delco Transmission must be pre-approved through the ACDelco Transmission Center on 1-800-ACDelco (1-800-223-3526). The hours of operation are Monday through Friday (except holidays) from 8:00 a.m. to 5:30 p.m. EST. The Transmission Center will reach agreement with dealership personnel regarding the appropriate repair, answer any technical questions, and will provide you with a warranty claim tracking number which will be required in the comments section of the DCS warranty claim input screen. Any claims which fail to have this required documentation may be subject to future adjustment.

To provide you with quality service, the ACDelco Transmission Center requests the following information be available prior to contacting 1-800-ACDelco:

Vehicle identification number (VIN)

Mileage at installation

Current mileage

Serial number of the ACDelco Transmission

Make/model/year of vehicle

Complaint/prior history

Failed part number

After obtaining pre-approval from the AC Delco Transmission Center and repairs have been completed, using the normal DCS warranty claim submission application, the following details must be entered for warranty claim reimbursement consideration:

- Repair Order Number
- Repair Order Date
- Claim Tracking Number - Enter the claim tracking number provided by the ACDelco Transmission Center into the Inbound Comments Section of your DCS claim entry screen. Refer to the General Motors Claims Processing Manual Section IV, page 10 or your DCS Vendor Manual for further instructions.
- Vehicle identification Number-Enter (actual) VIN number (any make/year).
- Mileage-enter the actual mileage on the vehicle at time of repair (do not enter tenths of miles).
- SV-ADV-SS - enter the Service Advisor's social security number.
- PC - Part Count. Total number of parts used in the repair.
- Part Number - The GMSPO part number of the failed ACDelco remanufactured Transmission Assembly or applicable failed part number if a repair to the assembly is performed.

- TOT-PTS - enter the total cost plus applicable handling allowance for all parts used in the repair.
- Complaint Code/Failure Code - See "Appendix A and B" of the General Motors Claims Processing Manual (dated July 1996) and utilize most applicable based on customer complaint and repairs.
- Labor Operation Number - enter "R9220"
- Labor Operation Hours - enter pre-approved labor hours agreed with ACDelco Transmission Center.
- Other Labor Hours - not allowed.
- Sublet/Dealer Material - any towing and/or sublet amounts, if applicable.
- Technician I.D. - repairing technician social security number.
- Claim Type:
  - ^ Enter claim type "B" for claims within 12 months/12,000 miles from date and miles of purchase.
  - ^ Enter claim type "N" for claims after 12 months/12,000 miles from date/miles of purchase up to 24 months/24,000 miles from date and miles of purchase.
- Authorization Code - Enter "G" after manager approval

**Important:**

Core credit will be issued by the GMSPO PDC and must not be a part of the warranty claim 1-800-ACDelco Transmission Center Help Line  
The ACDelco Transmission Center will assist in the following areas:

1. Answer technical questions about the product and catalog.
2. Answer questions concerning the warranty coverage and provide claim tracking numbers for warranty processing.
3. Provide assistance in obtaining appropriate support materials, ordering information and core shipping information.
4. Provide a customer referral service for dealers selling ACDelco Transmissions. **Technical Service Bulletin # 00-07-30-011**      **Date: 000601**

## **ACDelco(R) Remanufactured Transmissions - Program Update**

File In Section: 07 - Transmission/Transaxle

Bulletin No.: 00-07-30-011

Date: June, 2000

### **WARRANTY ADMINISTRATION**

Subject:

ACDelco(R) Remanufactured Transmissions

Models:

1996 and Prior Passenger Cars and Trucks

This bulletin cancels and supercedes Corporate Bulletin Number 72-05-02  
(issued In August, 1997). Please discard Corporate Bulletin Number 72-05-02 (Section 5 - Warranty Administration).

**Important:**

"GM of Canada" and "IPC" Dealers are not authorized to utilize this service bulletin.

General Motors Service Parts Operations (GMSPO) previously announced the ACDelco(R) Remanufactured Transmission Program on April 18, 1997 in General Motors Parts Information Bulletin Number 97-157. ACDelco(R) Remanufactured Transmissions are offered with domestic coverage for GM, Ford, and Chrysler applications and coverage currently supporting 1982-1996 model years.

ACDelco(R) Remanufactured Transmissions are intended solely for the retail (customer pay) market and are not to be used for new vehicle warranty repair or policy adjustments. It is important to outline the policy regarding proper claim submission procedures which are unique to ACDelco(R) Remanufactured Transmissions. Lack of immediate availability of an acceptable service replacement transmission is not a good business reason to authorize the use of an ACDelco(R) Remanufactured Transmission for a warranty or policy repair.



GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, **DO NOT** assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



WE SUPPORT VOLUNTARY  
TECHNICIAN  
CERTIFICATION

Disclaimer

## Warranty Coverage

ACDelco(R) Remanufactured Transmissions are covered by a 24 month/24,000 mile consumer limited replacement parts warranty (whichever occurs first) for passenger car and light duty truck applications. For medium duty trucks with gross vehicle weight (GVW) over 16,000 lbs and taxi and police car applications, the coverage is limited to 12 months or 12,000 miles (whichever occurs first). This warranty covers the cost of parts and labor and begins on the date/mileage of retail purchase. This warranty coverage continues to apply to subsequent owners provided the original owner's repair order or sales slip is submitted with a copy of the original owner's Warranty Registration Form when repairs are requested.

This warranty provides for independent repair facilities to perform warranty repairs on failed ACDelco(R) Remanufactured Transmissions. However, independent repair facilities who purchase ACDelco(R) Remanufactured Transmissions from a GM dealer must obtain authorization from the dealer to do the work under sublet from the dealer. (Refer to the consumer warranty statement in the GM Service Policies and Procedures Manual Article 1.1.)

## New Warranty Registration

ACDelco(R) has implemented a Powertrain Warranty Registration process for ACDelco(R) remanufactured engines and transmissions. This registration process will provide better tracking of our vehicle owner base and improved customer warranty support.

The Powertrain Warranty Registration Form, WA-39A, is now included with all ACDelco(R) engines and transmissions being shipped. This form is triplicate on carbonless paper. One copy is for the vehicle owner, a second is for the installing facility and the third copy is for the ACDelco(R) Powertrain Registration Center. The Registration Center copy is a pre-addressed, postage paid mailer.

The installation facility will be responsible for completion and proper handling of the Powertrain Warranty Registration Form. The installation facility should present the customer the completed warranty registration form, as well as a copy of the repair order, in a specially provided vinyl envelope (WA-39ENV). Finally, the ACDelco(R) copy of the Powertrain Registration Form should be mailed promptly to the Powertrain Registration Center for processing. Upon receipt ACDelco(R) will confirm the warranty registration by mailing the consumer a thank you letter.

Additional quantities of the ACDelco(R) Powertrain Warranty Registration Form, WA-39A, are available through Vispac by calling 1-734-266-5018.

## Warranty Claim Submission Procedures

All repairs or replacement of the ACDelco(R) transmission must be PRE-APPROVED through the ACDelco(R) Powertrain Center on 1-800-ACDelco(R) (1-800-223-3526). The hours of operation are Monday through Friday (except holidays) from 8:00 a.m. to 5:30 p.m. EST. The Powertrain Center will reach an agreement with dealership personnel regarding the appropriate repair, answer any technical questions and will provide you with a warranty claim tracking number which will be REQUIRED in the comments section of the OCS warranty claim input screen. Any claims which fail to have this required documentation may be subject to future adjustment.

Effective June 30, 2000, WINS will restrict payment of all ACDelco(R) transmission claims that have not been pre-authorized through the 1-800-AC Delco(R) Powertrain Center (1-800-223-3526). Any claims which fail to have the required pre-authorization will return with either of the following error messages:

^ PF - US Call 1-800-ACDelco(R)

^ LS - Labor Op requires wholesale authorization in the event you receive one of these error messages on an ACDelco(R) transmission warranty claim, contact 1-800-ACDelco(R). Immediately for assistance.

In order to provide you with quality service, the ACDelco(R) Powertrain Center requests the following information be available prior to contacting 1-800-AC Delco(R):

- Vehicle Identification Number (VIN)
- Mileage at installation
- Current mileage
- Serial number of the failed ACDelco(R) transmission
- Make/model/year of vehicle
- Complaint/prior history
- Failed part number

After obtaining pre-approval from the ACDelco(R) Powertrain Center and repairs have been completed, using the normal DCS warranty claim submission application, the following details must be entered for warranty claim reimbursement consideration:

- Repair Order Number

- Repair Order Date
- Claim Tracking Number

Enter the claim tracking number provided by the ACDelco(R) Powertrain Center into the inbound comments section of your DCS claim entry screen. Refer to the General Motors Claims Processing Manual or your DCS vendor manual for further instructions.

- Vehicle Identification Number Enter (actual) VIN (any make/year)
- Mileage

Enter the actual mileage on the vehicle at the time of repair (do not enter tenths of miles).

- SV-ADV-SS  
Enter the service advisor's social security number.
- PC

Part count. The total number of parts used in the repair.

- Part Number  
The GMSPO part number of the failed ACDelco(R) remanufactured transmission assembly or applicable failed part number if a repair to the assembly is performed.

- TOT-PTS  
Enter the pre-approved total cost plus applicable handling allowance for all parts used in the repair.

- Complaint Code/Failure Code  
Refer to the General Motors Claims Processing Manual and use the most applicable code based on customer complaint and repairs.

- Labor Operation Number  
Enter R9220

- Labor Operation Hours  
Enter the pre-approved labor hours agreed upon with the ACDelco(R) Powertrain Center.

- Other Labor Hours Not allowed.
- Sublet/Dealer Material Sublet amounts, if applicable.

- Technician ID  
Repairing technician's social security number

- Claim Type
  - Enter claim type B for claims within 12 months/ 12,000 miles from date and mile of purchase.
  - Enter claim type N for claims after 12 months/ 12,000 miles from date/miles of purchase up to 24 months/24,000 miles from date and miles of purchase.
  - Authorization Code Leave this field blank.

**Important:**

Core credit will be issued by the GMSPO PDC and must not be a part of the warranty claim. Refer to the General Motors Parts Information Bulletin # 97-170 for complete core return instructions.

The ACDelco(R) Powertrain Center will assist in the following areas:

- ^ Answer technical questions about the product and the catalog.
- ^ Answer questions concerning the warranty coverage and provide claim tracking numbers for warranty processing.

- ^ Provide assistance in obtaining support materials, ordering information and core shipping information.
- ^ Provide customer referral service for dealers selling ACDelco(R) transmissions.
- ^ Authorize all ACDelco(R) transmission claims for payment. **Technical Service Bulletin # 72-05-07**

Date: **971201**

## **Engines - ACDelco Remanufactured**

File In Section: Warranty Administration

Bulletin No.: 72-05-07

Date: December, 1997

### **WARRANTY ADMINISTRATION**

Subject:  
ACDelco Remanufactured Engines

Models:  
1994 and Prior Years Passenger Cars, Light & Medium Duty Trucks

Since April, 1993, General Motors Service Parts Operations (GMSPO) has offered ACDelco Remanufactured Engines to GM dealers for a variety of 1994 and prior GM, Ford, and Chrysler model applications. The purpose of this Bulletin is to provide you with the most recent information regarding ACDelco Remanufactured Engine warranty administration procedures.

ACDelco Remanufactured Engines are intended solely for the retail (customer pay) market and are not to be used for new vehicle warranty repairs or policy adjustments. Any GM New Vehicle Warranty obligation or policy adjustment decision requiring engine replacement is to be satisfied using a replacement engine identified in GMSPO catalog groups 0.000, 0.000A, or 0.000B for the applicable vehicle.

### **Warranty Coverage**

ACDelco Remanufactured Engines are covered by a 24 month/24,000 mile consumer limited replacement parts warranty (whichever first occurs) for Passenger Car and Light Duty Truck Applications. For Medium Duty Trucks with GVW over 16,000 lbs., Taxi & Police Car Applications, the coverage is limited to 12 Months or 12,000 miles (whichever first occurs). This warranty covers the cost of parts and labor and begins on the date/miles of retail purchase. This warranty coverage continues to apply to subsequent owners provided the original owner's repair order or sales slip is submilled with the properly completed warranty certificate when repairs are requested.

This warranty provides for independent repair facilities to perform warranty repairs on failed ACDelco Remanufactured Engines. However, independent repair facilities who purchase ACDelco Remanufactured Engines from a GM dealer must obtain authorization from dealer to do the work under sublet from dealer. (See consumer warranty statement in the GM Service Policies and Procedures Manual Article 1.1 page 28)

### **Warranty Claim Submission Procedures**

All repairs or replacement of the ACDelco Engine must be pre-approved through the ACDelco Engine Center on 1-800-223-3526. The hours of operation are Monday through Friday (except holidays) from 8:00 a.m. to 5:30 p.m. Eastern Standard Time. The ACDelco Engine Center will reach agreement with dealership personnel regarding the appropriate repair, answer any technical questions, and will provide you with a Warranty Claim Tracking Number which will be required for the comments section of the DOS warranty claim input screen. Any claims which fail to have this required documentation may be subject to future adjustment.

To provide you with quality service, the AC Delco Engine Center requests the following information be available prior to contacting 1-800-ACDelco:

- ^ Vehicle Identification Number (VIN)
- ^ Mileage at installation
- ^ Current Mileage
- ^ Serial # of the ACDelco Engine
- ^ Make/Model/Year of vehicle
- ^ Complaint/Prior History
- ^ Failed Part Number

After obtaining pre-approval from the AC Delco Engine Center and repairs have been completed, using the normal DCS warranty claim submission application, the following details must be entered for warranty claim reimbursement consideration:

- ^ Repair Order Number

- ^ Repair Order Date
- ^ Claim Tracking Number - Enter the claim tracking number provided by the ACDelco Engine Center into the Inbound Comments Section of your DCS claim entry screen. Refer to the General Motors Claims Processing Manual Section IV, Page 10 or your DCS Vendor Manual for further instructions.
- ^ Vehicle identification Number-Enter (actual) VIN number (any make/year)
- ^ Mileage-enter the actual mileage on the vehicle at time of repair (do not enter tenths of miles)
- ^ SV-ADV-SS - enter the Service Advisor's social security number
- ^ PC - Part Count. Total number of parts used in the repair
- ^ Part Number - The GMSPO part number of the failed AC-Delco Remanufactured Engine Assembly or applicable failed part number if a repair to the assembly is performed
- ^ TOT-PTS - enter the total cost plus applicable handling allowance for all parts used in the repair
- ^ Complaint Code/Failure Code - See "Appendix A and B" of the General Motors Claims Processing Manual (dated July, 1996)
- ^ Labor Operation Number - enter R9200
- ^ Labor Operation Hours - enter pre-approved labor hours agreed with ACDelco Engine Center
- ^ Other Labor Hours - not allowed
- ^ Sublet/Dealer Material - any towing and/or sublet amounts, if applicable
- ^ Technician I.D. - repairing technician social security number
- ^ Claim Type:
- ^ Enter claim type "B" for claims within 12 months/12,000 miles from date and miles of purchase
- ^ Enter claim type "N" for claims after 12 months/12,000 miles from date/miles of purchase up to 24 months/24,000 miles from date and miles of purchase
- ^ Authorization Code - Enter "G" after manager approval

**Important:**

Core credit will be issued by the GMSPO PDC and must not be a part of the warranty claim. As a reminder, you must affix the red "Warranty Claim" Sticker to the Core Return Tag on all warranted ACDelco Engines returned to the GMSPO PDC for Core Credit.

1-800-ACDelco Engine Center Help Line

The ACDelco Engine Center will assist in the following areas:

1. Answer technical questions about the product and catalog
2. Answer questions concerning warranty coverage and provide claim tracking numbers for warranty claim processing
3. Provide assistance in obtaining appropriate support materials, ordering information and core shipping information
4. Provide a customer referral service for dealers selling ACDelco Engines. Technical Service Bulletin # **87-61-24** Date: **980401**

**Engine - Surface Conditioning Discs Precautions**

File In Section: 6 - Engine

Bulletin No.: 87-61-24

Date: April, 1998

**INFORMATION**

Subject:  
Use of "Surface Conditioning Discs"

**Models:**

1998 and Prior Passenger Cars and Trucks

**The Use of "Surface Conditioning Discs"**

When cleaning engine gasket sealing surfaces, and/or cleaning parts from an engine which are to be reused; surface conditioning discs (typically a woven fiber pad design) which contain abrasives, such as a high amount of Aluminum Oxide, are not recommended.

The use of such surface conditioning discs dislodge Aluminum Oxide (from the Disc) and metal particles, which can lead to premature engine bearing failure.

The presence of Aluminum Oxide in engine oil has been shown to cause premature engine bearing failure. In some cases this failure occurs in as little as 1,000 miles (2,200 km) or less after the repair has been made.

Surface conditioning discs may grind the component part material and imbed it into the disc. This can result when more aggressive grinding of the gasket surface takes place.

**Procedure**

A new product from 3M(R) Automotive Aftermarket Division, the Roloc Bristle Disc\*, is now available which addresses some of the above concerns.

\* We believe this product to be reliable. There may be additional manufacturers of such products. General Motors does not endorse, indicate any preference for or assume any responsibility for any items which may be available from this firm, or for any such items which may be available from other sources.

**Caution:**

- ^ To avoid personal injury follow standard safety precautions, including the use of safety glasses, should be observed during surface preparation
- ^ Read the Safety Instructions included with the product before use.

Remove by hand, with a scrapper (plastic scrapper on aluminum surfaces), the bulk of material on the component surface before using the 3M(R) Roloc Bristle Disc.

**Notice:**

- ^ Due care must be taken to avoid the entry of any material into the engine block oil and coolant passages when cleaning component surfaces.
- ^ The presence of foreign material in engine oil has been shown to cause premature engine bearing failure.

Cover or block all engine ports (engine oil and coolant) and open areas (cylinder bores, lifter valley, etc.) to prevent possible contamination when working on the engine.

Vacuum up all contaminants (i.e. dirt, gasket material, etc.).

**Important:**

Engine components, cleaned with 3M(R) Roloc Bristle Disc, should be thoroughly cleaned before re-installing them on the engine block.

The use of a vacuum, spray cleaner GM P/N 12346139 or 12377981, parts cleaner, etc. to remove all traces of contaminant is suggested.

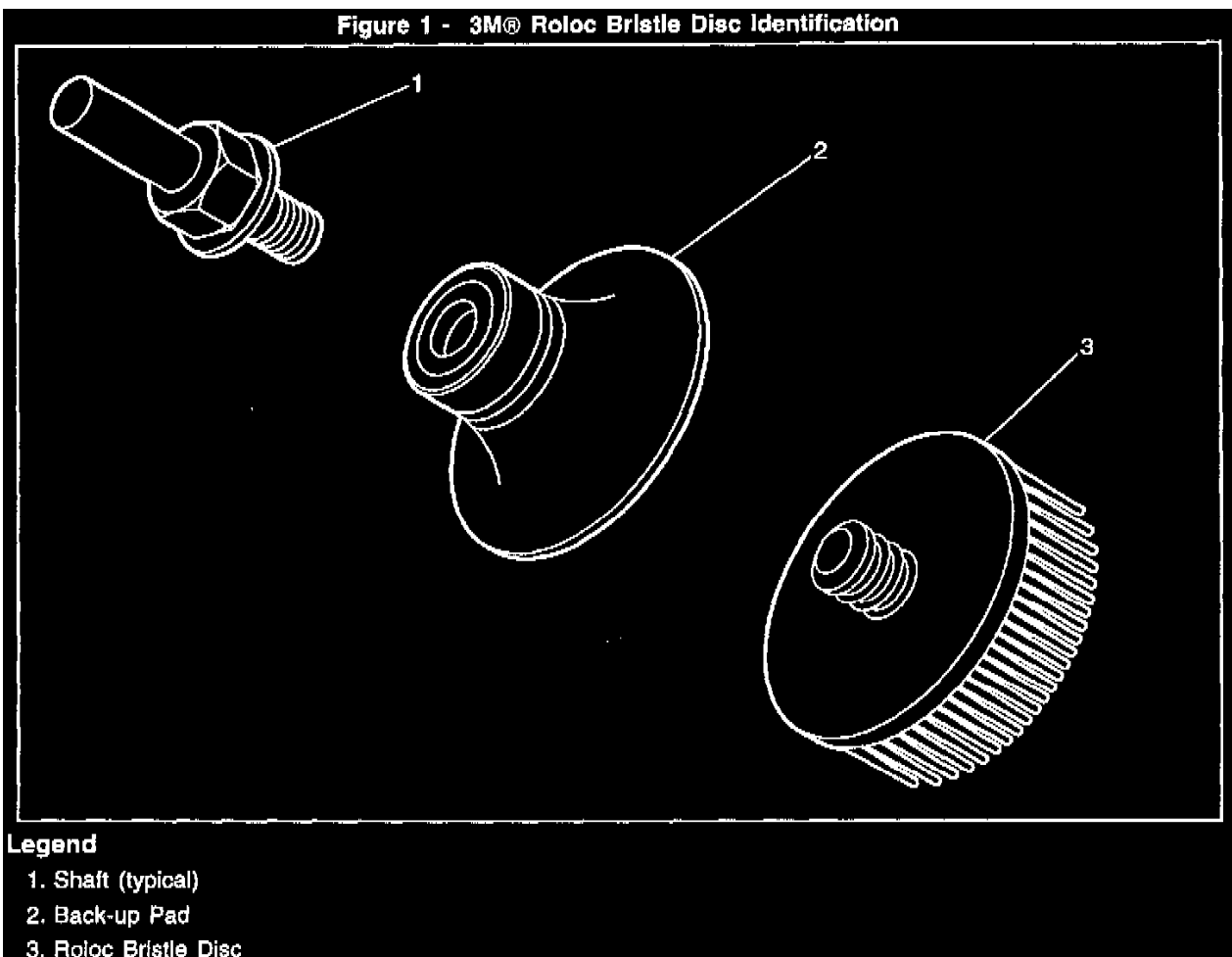
3M® Part Number**	Color/Description***	Suggested Application	Quan.
	White 120X Grit Roloc Bristle Disc	Aluminum (Mild Abrasive)	Box of 10
07532	1" Diameter		
07528	2" Diameter		
07529	3" Diameter		
	Yellow 80X Grit Roloc Bristle Disc	Aluminum or Cast Iron/Steel (Medium Abrasive)	Box of 10
07531	1" Diameter		
07525	2" Diameter		
07527	3" Diameter		
	Green 50X Grit Roloc Bristle Disc	Cast Iron/Steel (Harsh Abrasive)	Box of 10
07530	1" Diameter		
07524	2" Diameter		
07526	3" Diameter		

\*\*\* The above 3M® Roloc Bristle Discs are to be used with the correct Disc Pad Assemblies listed below.

3M® Part Number**	Description	Quantity
05538	1" Roloc Disc Pad Assembly	Box of one (1)
05539	2" Roloc Disc Pad Assembly	
05540	3" Roloc Disc Pad Assembly	

**Notice:** When using any abrasive material, particularly on aluminum surfaces, care must be taken to avoid damage to the surface area. Excessive material removal may result in damage to sealing surfaces.

\*\* These components can be obtained from local 3M® suppliers. The brand names "3M" and "Roloc" are trademarks of Minnesota Mining and Manufacturing Company, St. Paul, Minnesota 55144.

**Figure 1 - 3M® Roloc Bristle Disc Identification**

The Discs (see Figure 1 - 3M(R) Roloc Disc Identification) are available in different grit levels, with suggested applications as shown:

**Caution:**

Non-3M(R) Back-up pad's may have a deeper threaded cavity which causes the button (on the Disc) to continue to tighten down during use. This can cause the button to separate from the disc resulting in disc fly off and potential operator harm.

**Parts Information**

Part Numbers	Description
12346139, 12377981	Spray Cleaner

Parts (spray cleaners only) are currently available from GMSPO.

Technical Service Bulletin # **99-00-01-001**

Date: **990901**

**Engine - AC Delco Remanufactured Engines**

File In Section: 00 - General Information

Bulletin No.: 99-00-01-001

Date: September, 1999

**WARRANTY ADMINISTRATION**

Subject:  
ACDelco(R) Remanufactured Engines

Models:  
1996 and Prior Passenger Cars, Light & Medium Duty Trucks

Attention:  
Dealer Service Manager/Parts Manager/Warranty Administrator

Since April, 1993, General Motors Service Parts Operations (GMSPO) has offered ACDelco(R) Remanufactured Engines to GM dealers for a variety of 1996 and prior GM, Ford, and Chrysler model applications. The purpose of this bulletin is to provide you with the most recent

enhancements to the ACDelco(R) Remanufactured Engine Warranty Statement, updated administrative procedures, and warranty claim submission requirements.

## **Warranty Coverage**

Effective with purchases on or after February 1, 1999, ACDelco(R) remanufactured engines are covered by a 36 month/36,000 mile, consumer limited replacement parts warranty for Passenger Car and Light Duty Truck applications. The warranty coverage will remain 24 months/24,000 miles for all Passenger Car and Light Duty Truck engines purchased prior to this date. For Taxi & Police Car applications and Medium Duty trucks with a GVW over 16,000 pounds, the coverage is limited to 12 months/12,000 miles. This warranty covers the cost of parts and labor and begins on the date/mileage of retail purchase. Warranty coverage continues to apply to subsequent owners provided the original owner's repair order or sales slip is submitted along with the original owner's copy of the Warranty Registration Form when repairs are requested.

## **New Warranty Registration**

Effective immediately, ACDelco(R) is implementing a Powertrain Warranty Registration process for ACDelco(R) remanufactured engines. This registration process will provide better tracking of our vehicle owner base and improved customer warranty support. A Powertrain Warranty Registration Form, WA-39A, is now included with all ACDelco(R) engines and transmissions being shipped. This form is in triplicate on carbonless paper. One copy is for the vehicle owner, a second is for the installing facility, and a third is for the ACDelco(R) Powertrain Registration Center. The Registration Center copy is a pre-addressed, postage paid mailer.

The installation facility will be responsible for completion and proper handling of the Powertrain Warranty Registration Form. The installation facility should present the customer the completed warranty registration form, as well as a copy of the repair order, in a specially provided vinyl envelope (WA-39ENV). Finally, the ACDelco(R) copy of the Powertrain Registration Form should be mailed promptly to the Powertrain Registration Center for processing. Upon receipt, ACDelco(R) will confirm the warranty registration by mailing the consumer a Thank You letter.

Additional quantities of the ACDelco(R) Engine Warranty Statement, WA-39, and the ACDelco(R) Powertrain Warranty Registration Form, WA-39A, are available through Vispac by calling 1-734-266-5018 and ordering form WA-39 and/or WA-39A.

This warranty provides for independent repair facilities to perform warranty repairs on failed ACDelco(R) remanufactured engines. However, independent repair facilities that purchase ACDelco(R) Remanufactured Engines from a GM dealer must obtain authorization from the dealer to do the work under sublet. (See consumer warranty statement in the GM Service Policies and Procedures Manual Article 1.1, Section B - ACDelco(R) Remanufactured Engine Limited Warranty.)

## **Warranty Claim Submission Requirements**

All repairs or replacements of the ACDelco(R) engines MUST be pre-approved through the ACDelco(R) Powertrain Center on 1-800-ACDelco (1-800-223-3526). The hours of operation are Monday through Friday (except holidays) from 8:00 a.m. to 6:30 p.m. Eastern Standard Time. The ACDelco(R) Powertrain Center will reach agreement with dealership personnel regarding the appropriate repair, answer any technical questions, and will provide you with a Warranty Claim Tracking Number which will be required for the comments section of the DCS warranty claim input screen.

Effective September 15, 1999, WINS will restrict payment of all ACDelco(R) engine claims that have not been pre-authorized through the 1-800-ACDelco Powertrain Center (1-800-223-3526). Any claims which fail to have the required pre-authorization will return with either of the following error messages: PF- Call 1-800-ACDelco, LS- Labor op requires wholesale authorization. In the event you receive one of these error messages on an ACDelco(R) engine warranty claim, contact 1-800-ACDelco immediately for assistance.

To provide you with quality service, the ACDelco(R) Powertrain Center requests the following information be available prior to contacting 1-800-ACDelco: Vehicle Identification Number (VIN), Mileage at installation, Current Mileage, Serial # of the failed ACDelco(R) engine, Make/Model/Year of vehicle, Complaint/Prior History, Failed Part Number.

## **Claim Submission Details**

^ Repair Order Number

^ Repair Order Date

^ Claim Tracking Number - Enter the claim tracking number provided by the ACDelco(R) Powertrain Center into the Inbound Comments Section of your DCS claim entry screen. Refer to the General Motors Claims Processing Manual or your DCS Vendor Manual for further instructions.

^ Vehicle Identification Number - Enter full VIN regardless of year or make.

^ Mileage - Enter the actual mileage on the vehicle at the time of repair.

^ SV-ADV-SS - Enter the Service Advisor's social security number

^ PC - Part Count. Total number of parts used in the repair.

^ Part Number - the GMSPO part number of the failed ACDelco(R) remanufactured engine assembly or applicable failed part number if a repair to the assembly is performed.

^ TOT-PTS - Enter the pre-approved total cost plus applicable handling allowance for all parts used in the repair.

^ Compliant Code/Failure Code - See "Appendix A and B" of the General Motors Claims Processing Manual dated March, 1999.

^ Labor Operation Hours - Enter pre-approved labor hours agreed with the ACDelco(R) Powertrain Center.



- ^ Labor Operation Number - Enter R9200.
- ^ Other Labor Hours - Not allowed.
- ^ Sublet/Dealer Material - Sublet amounts, if applicable.
- ^ Technician ID - repairing technician's social security number.
- ^ Enter claim type "B" for claims within 12 months/12,000 miles from date and mileage of purchase.
- ^ Enter claim type "N" for claims after 12 months/12,000 miles from the date/mileage of purchase up to 24 months/24,000 miles for engines purchased prior to February 1, 1999, or 36 months/36,000 miles from date/mileage of purchase for engines purchased after February 1, 1999.
- ^ Authorization Code - leave this field blank.

**Important:**

Core credit will be issued by the GMSPO PDC and must not be a part of the warranty claim. As a reminder, you must affix the red "Warranty Claim" sticker to the Core Return Tag on all warranted ACDelco(R) engines returned to the GMSPO PDC for core credit.

The ACDelco(R) Powertrain Center will also assist in the following areas:

- ^ Answer technical questions about the product and catalog.
- ^ Answer questions concerning warranty coverage and provide claim tracking numbers for warranty claim processing.
- ^ Provide assistance in obtaining appropriate support materials, ordering information and core shipping information.
- ^ Provide a customer referral service for Dealers selling ACDelco(R) engines.
- ^ Authorize all ACDelco(R) engine claims for payment.

**Important:**

ACDelco(R) remanufactured engines are intended solely for the retail customer pay market and are not to be used for new vehicle warranty repairs or policy adjustments. Any GM New Vehicle Warranty obligation or policy adjustment decision requiring engine replacement is to be satisfied using a replacement engine identified in GMSPO catalog groups 0.000, 0.000A, or 0.000B for the applicable vehicle. Technical

Service Bulletin # **882456B**

Date: **880601**

## Cooling System - Leaks

Number: 88-245-6B  
Suction: 6B  
Date: JUNE, 1988  
Subject: ENGINE COOLING SYSTEM LEAKS

Model and Year: CHEVROLET PASSENGER AND LIGHT DUTY VEHICLES  
TO: ALL CHEVROLET DEALERS

The cause of engine cooling system leaks can be due to several possible reasons. Refer to the Service Manual to properly diagnose the reason for a leak. MAKE SURE THE SYSTEM IS FULL OF COOLANT BEFORE PERFORMING THE DIAGNOSIS. Also, the following systems should be inspected for proper function:

1. All hose joints for possibility of loose or misaligned clamps.
2. All gasketed joints for possibility of loose fasteners, damaged gaskets, or damaged surfaces.
3. Coolant recovery system for possibility of vacuum leaks or a damaged seal surface at the coolant filler cap assembly.
4. Water pump assembly for possibility of a slight leak from the weep hole.

NOTICE: A VERY SLIGHT AMOUNT OF WEEPAGE OCCURS AT THE WATER PUMP WEEP HOLE DURING NORMAL OPERATION. TRACKS OF RESIDUE FROM THE LOWER WEEP HOLE ARE NOT UNUSUAL. ONLY REPLACE THE WATER PUMP IF COOLANT IS DRIPPING FROM THE WEEP HOLE WHILE THE ENGINE IS IN OPERATION OR WHILE THE COOLING SYSTEM IS PRESSURIZED.

The use of an engine coolant supplement or sealant pellets, P/N 3634621, is recommended to eliminate slight leaks from the cooling system. Two sealant pellets should be added to the cooling system through the radiator filler neck.

**NOTICE:** DO NOT ADD THE SEALANT INTO THE COOLANT RECOVERY BOTTLE.

After adding the sealant to the cooling system, the engine should be allowed to run for approximately 15 minutes to dissolve the sealant and verify that the leak has been eliminated.

DO NOT REPLACE THE WATER PUMP ASSEMBLY IF LEAK IS NOT EVIDENT.

**NOTICE:** THE USE OF AN ENGINE COOLANT SUPPLEMENT MAY CAUSE A FILM TO APPEAR AROUND THE SIDES OF THE COOLANT RESERVOIR BOTTLE. THE PRESENCE OF THIS FILM IS CONSIDERED TO BE NORMAL.

Use applicable labor time and operation codes.

Technical Service Bulletin # **92427A**

Date: **911101**

## **A/T - Intermittent Slip, Downshift, or Busy Cycling TCC**

Number: 92-42-7A

Section: 7A

Date: NOV. 1991

Corporate Bulletin No.: 167105

ASE No.: A2

Subject: INTERMITTENT TRANSMISSION DOWNSHIFT, SLIP OR BUSY/CYCLING TCC

Model and Year: 1983-92 ALL PASSENGER CARS AND TRUCKS WITH AUTOMATIC TRANSMISSION

Some owners may comment that their vehicle is experiencing one or more of the following transmission conditions:

- Intermittent slipping.
- Intermittent downshift followed by an upshift, both with no apparent reason.
- Busyness or cycling of the TCC at steady throttle conditions and level roadway.

The cooling fan operates when the thermostat on the fan clutch reaches a preset temperature. When this temperature is reached, the fan engages to draw additional air through the radiator and lower the engine temperature. When the cooling fan engages, noise increases and may sound very similar to an increase in engine RPM due to transmission downshift, slipping or TCC cycling. When engine temperature lowers to a preset point the fan clutch will disengage. When the cooling fan disengages, noise levels will decrease and may sound very similar to a decrease in engine RPM.

The type of concern described above requires further definition and the customer should be asked several questions:

- Is the situation more pronounced at higher vehicle loads or pulling a trailer?
- Do warmer ambient temperatures make the situation more pronounced as well?

If the customer's responses indicate that both of these conditions apply, and your observation of the vehicle confirms a properly operating vehicle, provide the customer the vehicle operating description included in this bulletin. Further action may not be necessary.

A service procedure follows if further definition is required.

### **SERVICE PROCEDURE:**

When attempting to diagnose an intermittent transmission downshift, slip or busy/cycling TCC:

1. Check fluid level and condition as outlined in section 7A of the appropriate service manual.
2. Test drive the vehicle under the conditions described by the customer (ambient temperature, engine coolant temperature, trailering, etc.). It may be necessary to partially restrict airflow to the radiator to raise engine coolant temperature to match customer conditions.
3. Monitor engine RPM and engine coolant temperature using a scan tool.
4. Listen for an apparent increase in engine RPM.

If engine RPM sounds like it increases, check the scan tool RPM and coolant temperature readings. If the noise increase is due to engagement of the fan the engine RPM will not increase and engine coolant temperature will begin to decrease after the fan engages. As the fan runs the engine coolant temperature will drop and the fan will disengage reducing noise levels, engine RPM will not decrease. This cycle will repeat as engine coolant temperature again rises.

If the above procedure shows the condition to be cooling fan related, no further action is necessary. The vehicle should be returned to the customer

and the condition explained.

If the above procedure shows the condition to be other than cooling fan related, refer to section 7A of the appropriate service manual for transmission diagnosis information.

#### Intermittent Transmission Downshift

All light duty trucks are equipped with a thermostatic engine cooling fan. This fan is designed to provide greater fuel efficiency and quieter operation than a standard fan. These benefits are possible through the addition of a thermostatic clutch to the fan drive.

When the engine is cool the clutch allows the fan to "slip" or turn at a speed slower than the engine. By turning at a slower speed the fan uses less horsepower, which saves fuel, and is quieter. When the engine temperature reaches a preset temperature, the fan "engages" and turns at the same speed as the engine.

"Engagement" of the fan provides increased airflow through the radiator to cool the engine. As the airflow increases, fan operation becomes clearly audible. This increase in noise can easily be mistaken for an increase in engine RPM and may be incorrectly blamed on the automatic transmission.

When operating an unloaded vehicle in cooler ambient temperatures, the thermostatic clutch usually won't engage. However, if the vehicle is pulling a trailer, heavily loaded or operated at high ambient temperatures the thermostatic clutch may cycle on and off as the engine temperature rises and falls.

The sound of fan operation under the conditions described above is a sign that the cooling system on your vehicle is working correctly. Replacement or modification of cooling system or transmission parts will not change or reduce the noise level. Attempts to reduce this noise will only give you, the customer, a false sense of vehicle unreliability and the inconvenience of having your vehicle out of service.

Technical Service Bulletin # **383001**

Date: **931201**

## Steering - System Bleed Procedures

Group Ref.: Steering/Suspension

Bulletin No.: 383001

Date: December, 1993

### INFORMATION

SUBJECT:  
ILLUSTRATED STEERING SYSTEM BLEED PROCEDURE

MODELS:  
1994 AND PRIOR PASSENGER CARS AND LIGHT DUTY TRUCKS

THIS BULLETIN IS BEING REVISED TO ADD THE 1994 MODEL YEAR AND CHANGE THE ARTWORK. PREVIOUS DIVISIONAL PUBLICATION NUMBERS WERE:

BUICK	93-3-5	3/02/93
CADILLAC	T-93-76	5/12/93
CHEVROLET	93-146-3B	3/29/93
GM OF CANADA	93-3-102	5/05/93
OLDSMOBILE	2-93-59 (S.G.)	5/14/93

The steering system in 1994 and prior model year cars and light duty trucks should be bled after any of the following:

- A power steering component is replaced.
- A fluid line is disconnected.
- A customer comments on steering system noise.

Bleeding air from the steering system should be done in order to prevent pump damage, ensure proper operation, and to eliminate steering system noise.

# Bleeding Air from Power Steering Systems

## Before bleeding: Inspect steering system. Check, and correct as needed:



Hoses must not touch any other part of vehicle.



All hose connections must be tight.

- Steering system noise could be caused by hoses touching frame, body, or engine.

- Loose connections might not leak but could allow air into system.

## When to bleed:

After any component replacement  
After disconnecting fluid line  
In case of steering system noise

## Why bleed?

To prevent pump damage  
To ensure proper system operation  
To stop steering system noise

## Power Steering Fluid

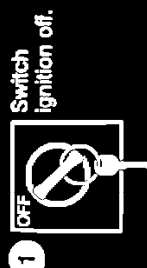
Use only clean, new power steering fluid. Fluid must be:

GM #1050017 – 32 ounce  
#1052884 – 16 ounce

## Cold Climate:

GM #12345866 – 16 ounce  
#12345867 – 32 ounce

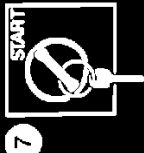
## How to bleed:



- On systems with long return lines or fluid coolers, turn steering wheel lock-to-lock at least 40 times.
- Trapped air may cause fluid to overflow. Thoroughly clean any spilled fluid to allow for leak check.
- Keep fluid level at "FULL COLD."



- No bubbles are allowed.
- For any sign of bubbles, recheck connections. Repeat step 5.



- Verify:
- ☒ Smooth power assist
  - ☒ Noiseless operation
  - ☒ Proper fluid level
  - ☒ No system leaks
  - ☒ Proper fluid condition

- No bubbles, no foam, no discoloration

- 11 If all proper conditions apply, procedure is complete.

- 12 If any problem remains, see "Special Conditions."

## Special Conditions

### Fluid



- Foam or bubbles in fluid  
Fluid must be completely free of bubbles. In step 5, be alert to periodic bubbles that could indicate a loose connection or leaky O-ring seal.
- Discolored fluid  
(milky, opaque, or light tan color)

Switch ignition off. Wait two minutes. Recheck hose connections. Repeat steps 7-10. If condition still exists, replace O-ring seals and hose clamps. Fill system and repeat bleed procedure.

### Noise



- Pump whine or groan

With engine running, recheck hoses for possible contact with frame body or engine. If no contact is found, follow either method below to cool down fluid and repressurize system.

### Method 1:

#### Normal Cool Down

Switch engine off.  
Wait for system to cool.  
Install reservoir cap.

### Method 2:

#### Partial Fluid Replacement

Switch engine off.  
Use a suction device to remove fluid from reservoir.  
Refill with cool, clean fluid.  
Install reservoir cap.

After either method of cooling, start engine and allow engine to come up to operating temperature. If noise persists, remove and replace power steering pump. Repeat bleed procedure following pump replacement.



P/N	DESCRIPTION	SIZE
1052884	Power Steering Fluid	16 oz.
1050017	Power Steering Fluid	32 oz.
12345866	Cold Climate Power Steering Fluid	16 oz.
12345867	Cold Climate Power Steering Fluid	32 oz.

Parts are currently available from GMSPO.

Technical Service Bulletin # **891126C**

Date: **890301**

## **Fuel - Pump Replacement Caution, Strainer**

Number: 89-112-6C  
Section: 6C  
Date: MARCH, 1989  
Subject: FUEL PUMP STRAINER (IN-TANK FILTER/SOCK) REPLACEMENT

Model and Year: 1984-89 CHEVROLET PASSENGER CARS AND LIGHT DUTY TRUCKS WITH ELECTRIC IN-TANK FUEL PUMP  
TO: ALL CHEVROLET DEALERS

There have been some comments of vehicles experiencing multiple fuel pump failures where it has been determined that the failure of the replacement pumps was the direct result of transferring a contaminated strainer from the original pump. Sometimes the contamination is on the inside of the strainer and not readily visible.

In order to eliminate the possibility of damage or diminishing longevity of a service replacement fuel pump, it is always necessary to replace the fuel strainer at the same time as replacing the pump.

Technical Service Bulletin # **90501D**

Date: **890901**

## **A/C Compressor Oval O-Ring Seal - Revised Design**

Number: 90-50-1D

Section: 1D

Date: September 1989

Corporate Bulletin No.: 931204

Subject:  
AIR CONDITIONING COMPRESSOR OVAL O-RING SEAL

Model and Year:  
ALL 1988-90 CARS AND TRUCKS WITH R4, HR6 AND V5 AIR CONDITIONING COMPRESSORS

TO: ALL CHEVROLET DEALERS

During the 1988 model year, approximately June 1, 1988, the cross section design of the A/C compressor O-rings was changed from the standard round type to an oval type design.

Parts are currently available from GMSPO.

The reason for the design change was to improve the durability of the compressor refrigerant joint.

## Rear Head A/C Compressor with Oval O-Ring

Oval

Gap Is Correct



Round

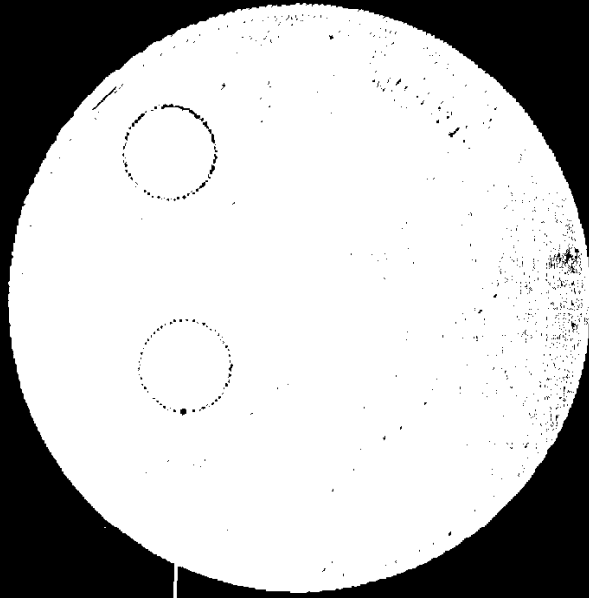





Figure 1

# A/C Compressor O-Rings

Oval

			<b>Part Numbers</b> O.E.M. 6558587 AC Delco 15-3886 GMP 6558587
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Round




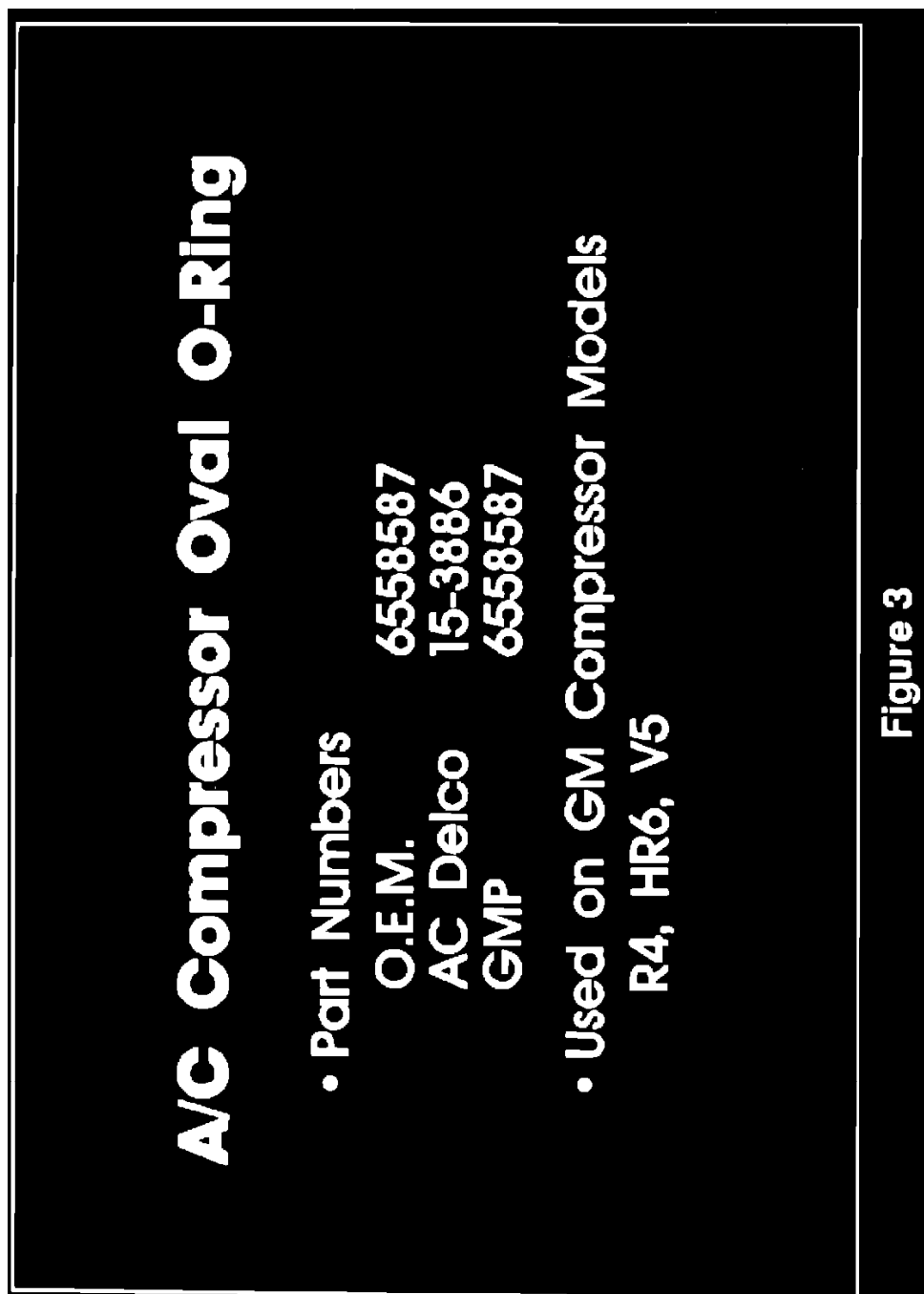
		
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Figure 2

**Figure 3**

It is important to understand, that due to the cross section shape of the oval verses the round design (see Fig. 2), the oval O-ring does not completely fill the machined O-ring groove in the compressor rear head (see Fig. 1). A gap between the oval O-ring inside diameter and the machined groove inside diameter is correct and expected.

In addition, the oval O-ring does not fit freely in the O-ring groove. The O-ring must be coated with approved refrigerant oil and inserted all the way into the O-ring groove prior to the joint assembly.

The service part numbers for the oval O-rings are shown in both Fig. 2 and Fig. 3.

Technical Service Bulletin # **883181B**

Date: **880701**

## **A/C - Poor Performance/Excessive Noise**

Number: 88-318-1B

Section: 1B

Date: JULY, 1988

Subject: LOSS OF A/C PERFORMANCE/EXCESSIVE A/C NOISE

Model and Year: 1987-88 SPRINT

TO: ALL CHEVROLET DEALERS



Some of the subject vehicles may exhibit excessive noise or loss of performance from the air conditioning system. These conditions may occur as a result of a loss of torque by the A/C compressor mounting bracket fasteners. In extreme circumstances, the loss of torque at one or more of the bracket fasteners may result in a cracked upper or lower bracket.

Vehicles exhibiting the above conditions should first be examined to establish if the fasteners are at the correct torque values and that the A/C compressor brackets are not cracked before performing A/C diagnostic procedures.

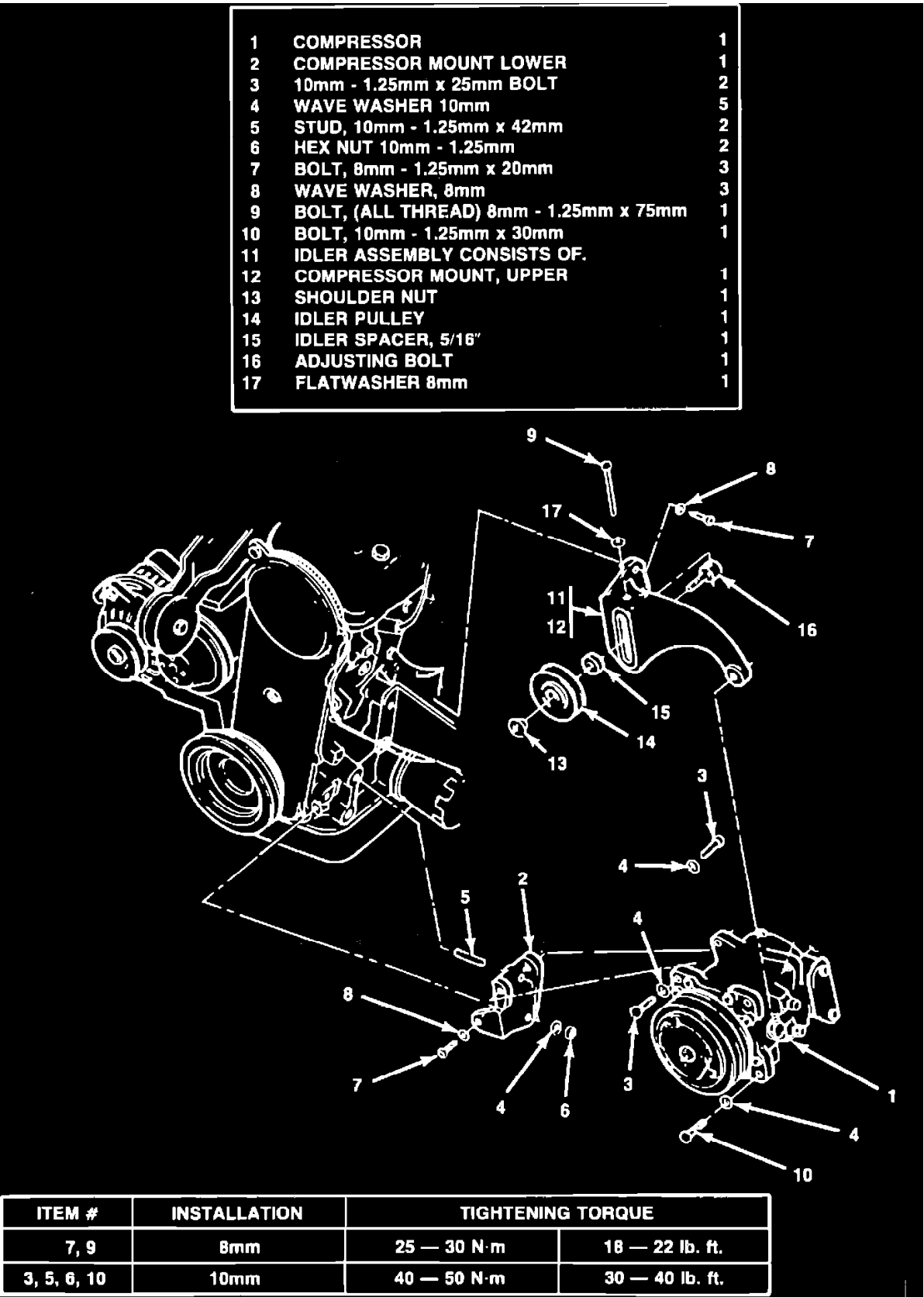


FIGURE 1

Fastener location and torques are provided in Figure 1. All compressor mounting hardware is to be checked for proper torque.

Both upper and lower compressor mounting brackets are to be visually inspected for cracks and replaced as necessary following the procedures

detailed for the installation or reinstallation of the A/C compressor and mounting brackets.

#### A/C COMPRESSOR MOUNTING BRACKET AND COMPRESSOR ASSEMBLY INSTALLATION PROCEDURES:

**NOTICE:** FAILURE TO SECURE ALL FASTENERS BY THE FOLLOWING INSTRUCTIONS MAY RESULT IN LOSS OF TENSION ON BOLTS DUE TO INSUFFICIENT TORQUE ON FASTENERS.

Reference Figure 1 for component identification numbers.

1. Install compressor (1) to lower bracket (2) using two (2) bolts 10 mm x 1.25 mm x 25 mm (3) place three (3) drops of Loctite 271 or equivalent on each bolt, and two (2) 10 mm wave washers (4). Snug the bolts until the compressor will stay in position but still rotate around bolts.
2. Install lower bracket and compressor on studs previously installed. Finger tighten two (2) nuts 10 mm x 1.25 mm (6) and wave washers (4) on studs. Install one (1) 8 mm x 1.25 mm x 20 mm bolt (7) and 8 mm wave washer (8) through ear of lower bracket into engine.

THE FOLLOWING SEQUENCE MUST BE USED: REFERENCE FIGURE 1 FOR TORQUE SPECIFICATIONS.

First tighten the 8 mm bolt (7). Second, tighten two (2) 10 mm nuts (6) Final assembly must be done from below vehicle using hand wrenches to assure sufficient torque.

3. Install upper bracket with idler pulley attached to engine using two (2) 8 mm x 1.25 mm x 20 mm bolts (7) and wave washers (8) and to compressor using one (1) 10 mm x 1.25 mm x 30 mm bolt (10) and wave washer (4). Tighten two (2) 8 mm bolts (7) and one 10 mm bolt (10).
4. **THIS STEP IS VERY IMPORTANT:** From below vehicle, tighten two (2) bolts (3) previously snugged through compressor ears (with Loctite), using hand wrenches to assure proper torque.

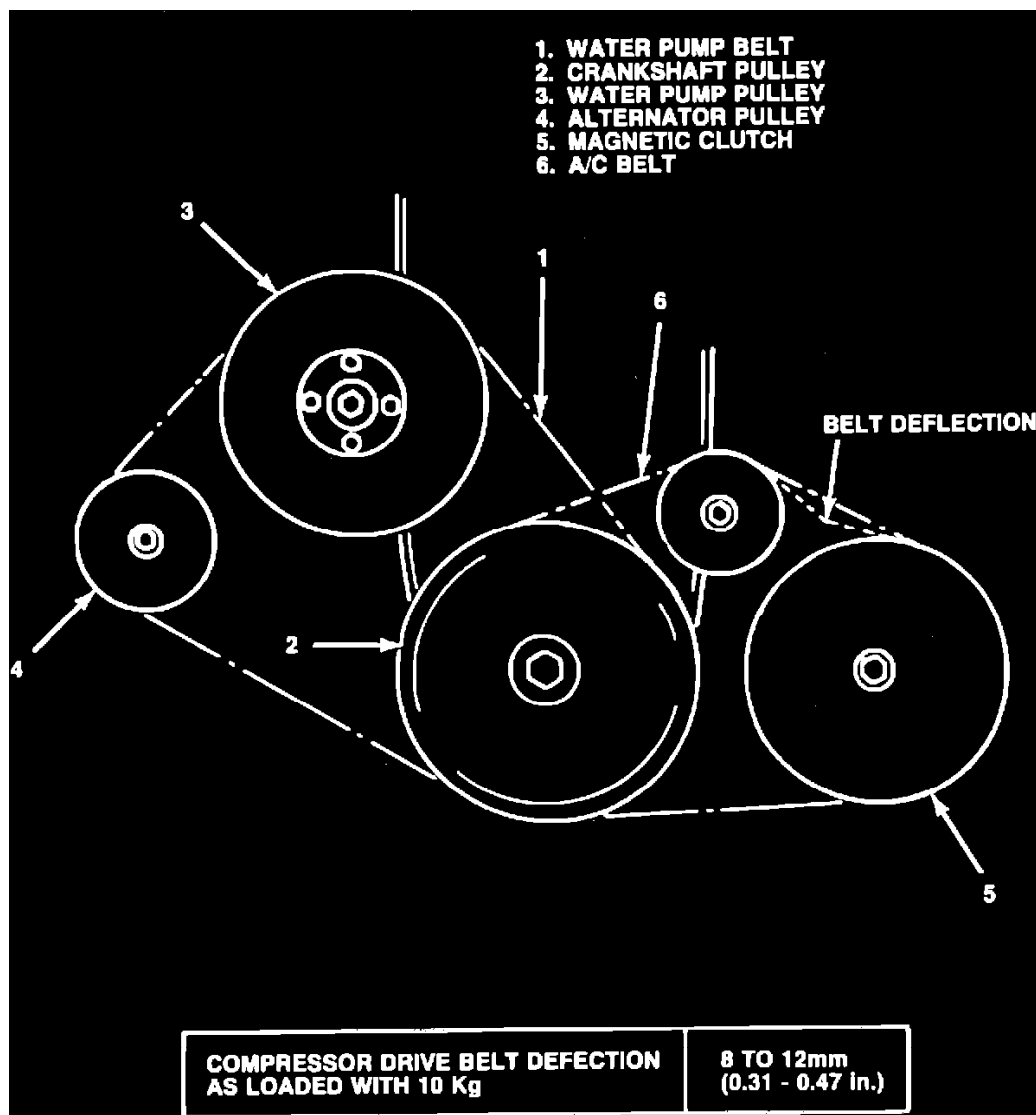


FIGURE 2

5a. For Non Turbocharged Vehicles:

Install compressor drive belt around crank shaft pulley. Compressor clutch and idler pulley. Adjust belt to proper tension and torque idler

pulley shoulder nut to 40 ft.lbs. See Figure 2.

5b. For Turbocharged Vehicles:

Install compressor drive belt around crankshaft and compressor pulleys. Adjust belt tension by positioning compressor, tighten retaining nut to 40 ft.lbs.

Labor Operation Number: T1353

Labor Time : 1.1 Hours

Technical Service Bulletin # **89381B**

Date: **881101**

## **A/C - System Diagnostic Procedure**

Number: 89-38-1B  
Section: 1B  
Date: NOV., 1988  
Subject: V5 AIR CONDITIONING AND REFRIGERANT SYSTEM DIAGNOSTIC PROCEDURE

Model and Year: 1984-89 CHEVROLET MODELS EQUIPPED WITH V5 COMPRESSOR  
TO: ALL CHEVROLET DEALERS

The V5 is a variable displacement compressor that meets air conditioning demand by changing its stroke instead of cycling a clutch. A control valve located in the rear head of the compressor senses compressor suction pressure and causes the compressor to change stroke. Because the V5 Compressor runs constantly and does not cycle, the diagnostic procedure is different from that used for fixed displacement systems. By using this procedure, needless replacement of AC components may be avoided.

This quick check procedure was developed to help you diagnose V5 Compressor and refrigerant system conditions involving reduced cooling. It must be used in conjunction with the proper service manuals and performed in the sequence given.

### **A.Observe All Safety Precautions:**

WEAR GOGGLES TO PROTECT EYES.

IF REFRIGERANT ACCIDENTALLY CONTACTS EYE, SEE A DOCTOR IMMEDIATELY. DO NOT RUB EYES. SPLASH EYES WITH COOL WATER WHILE WAITING FOR MEDICAL ATTENTION.

TREAT SKIN AREAS THAT COME IN CONTACT WITH REFRIGERANT FOR FROSTBITE.

DO NOT ALLOW REFRIGERANT TO ESCAPE INTO CONFINED AREAS WHERE OPEN FLAME IS PRESENT.

DO NOT EXPOSE ANY REFRIGERANT CONTAINER TO HIGH TEMPERATURE.

## **Visual Inspection, Check Charge, Check Electrical & Clutch System**

B. VISUAL INSPECTION: Engine Off

Check for:

1. Blown A/C fuse.
2. Loose or disconnected A/C electrical connectors or broken wires at compressor and line mounted switches.
3. Proper A/C blower operation (Section 1B in service manual).
4. Proper engine cooling fan operation or restricted air flow. (see service manual for procedure.)
5. Loose, damaged, or missing compressor drive belt.
6. Proper temperature door operation. (On mechanical temp door only, move temp door rapidly from cold to hot. Listen for temp door hitting at each end. Adjust as necessary.)
7. Heat damaged compressor clutch or free spinning clutch driver.

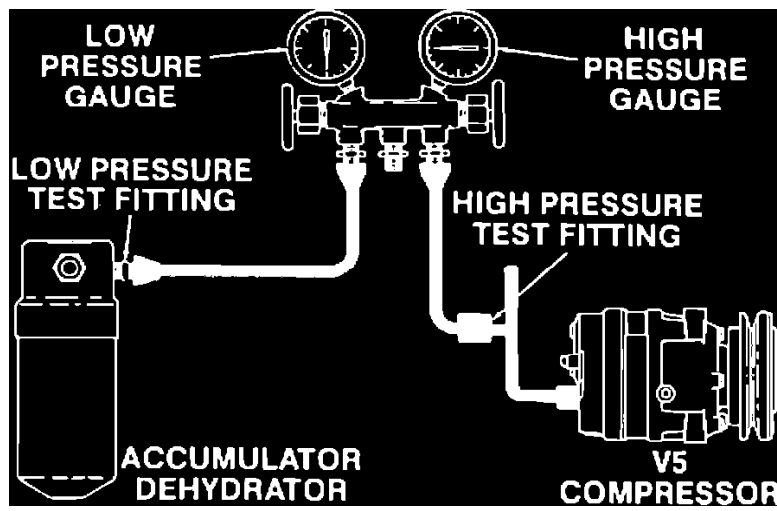


FIGURE 1 - TESTING HOOKUP

### C. CHECK SYSTEM REFRIGERANT CHARGE: Engine Off

1. Connect manifold gage set (Figure 1) to system high and low gage fittings. Check that refrigerant charge is 50 psi minimum before continuing quick check procedure.
2. If system has low or no charge, refer to service manual and:
  - a. Charge system with one can of R12 refrigerant.
  - b. Leak test system.
  - c. Repair leaks.
  - d. Evacuate and charge system with recommended amount of refrigerant.
  - e. Leak test system.

### D. CHECK ELECTRICAL SYSTEM FOR CLUTCH ENGAGEMENT: Engine Running At Idle

1. Set A/C controls to NORMAL, FULL COLD, and HIGH blower speed.
2. Check that clutch engages. If clutch does not engage, disconnect clutch terminal wire connector and temporarily wire directly to battery.
  - a. If clutch engages with direct wiring, problem is electrical. Perform service manual electrical diagnosis.
  - b. If clutch does not engage with direct wiring, replace clutch coil assembly per Section 1B of service manual.

## E. Check Refrigerant System Performance: Engine Off to Start

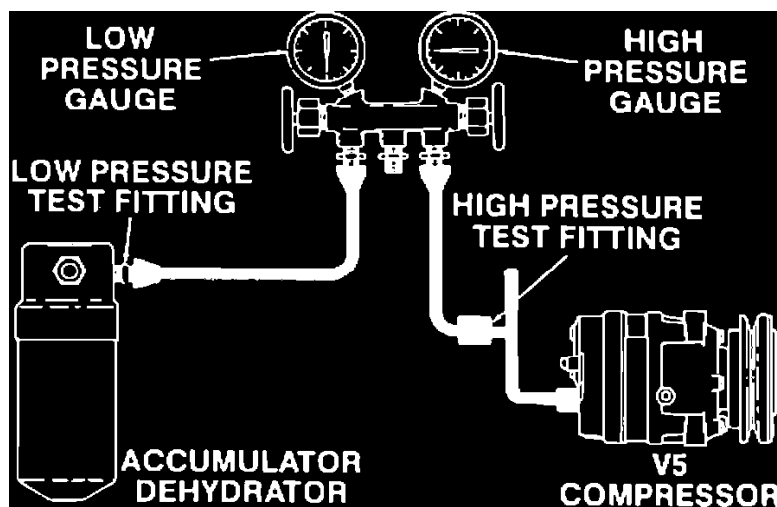


FIGURE 1 - TESTING HOOKUP

**IMPORTANT:** Follow this procedure exactly. It is designed to create enough cooling load to cause the V5 Compressor to go to full stroke which is absolutely necessary for accurate test results. The following test was designed for typical garage conditions - 70-90 degrees Fahrenheit, no sun load. Discharge air temperatures should be at least 20 degrees Fahrenheit cooler than the outside ambient temperature.

1. Connect gage set (Figure 1) to high and low A/C service fittings.

- a. Some Cavalier, Corsica and Beretta application's require removal of the in-line pressure switch to read discharge pressure.
  - b. On some applications the high side fitting is after the orifice tube and reads suction pressure instead of discharge pressure.
2. Check gage set accuracy by reading both gages; readings should be equal. Correct gages as necessary.
3. Set high load test conditions:
- a. Start engine and run at idle speed.
  - b. Open hood, close windows and doors.
  - c. Set A/C controls to HIGH blower and NORMAL cooling.
  - d. Run engine for five minutes.

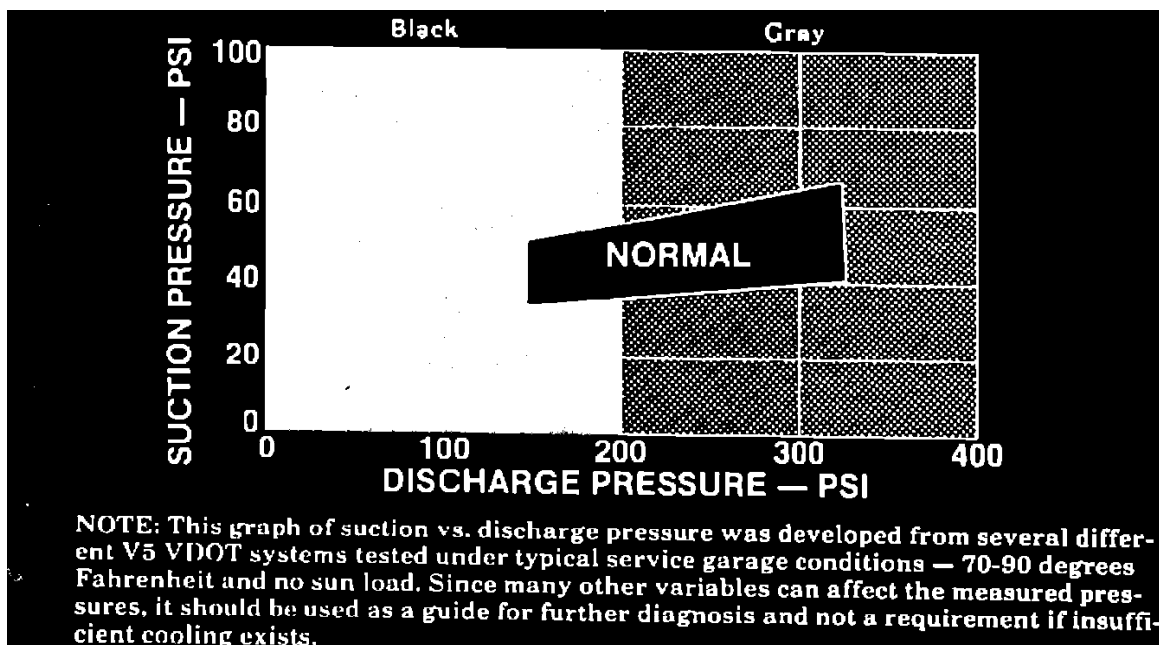


FIGURE 2 - SUCTION VS DISCHARGE PRESSURE

4. Record and evaluate test results:
- a. Record suction and discharge pressures. On systems having condenser fans that cycle on and off, pressure readings should be made when the fan is on.
  - b. Check diagnostic test chart (Figure 2) and locate intersection of recorded suction and discharge pressures. Determine color of area in which the pressures intersect (white, gray, or black).
  - c. Go to the proper color heading for Diagnosis and service Procedures. Diagnose in the sequence given to minimize time and expense of repair. Service tips are given with each diagnosis.

## F. Diagnosis and Service Procedures

### 1. WHITE AREA DIAGNOSIS AND SERVICE

White area diagnosis means that all components of the refrigerant system are functioning properly. If insufficient cooling exists, air handling system is at fault. Check for:

- a. Temperature door setting. Make sure temperature control is set to full cold position. Check and adjust for proper closing.

### 2. GRAY AREA DIAGNOSIS AND SERVICE

Check the following if pressures intersect in the gray area:

- a. Improper condenser operation. This can result from:
  - Extremely high ambient humidity.
  - Insufficient air flow across the condenser.
  - Damaged or dirty condenser fins.

- Defective cooling fan.
  - Improperly calibrated high pressure fan switch.
  - Faulty fan relay.
- b. High side refrigerant restriction. Feel liquid line before expansion tube (orifice). If line feels cold, it indicates restriction in high side. Visually check for frost spot to locate restriction and repair as necessary.
- c. Refrigerant system overcharged (high discharge and high suction pressures). See below.
- d. Orifice tube blocked (low suction pressures). See below.
- e. Air in system (high discharge and high suction pressures). See below.

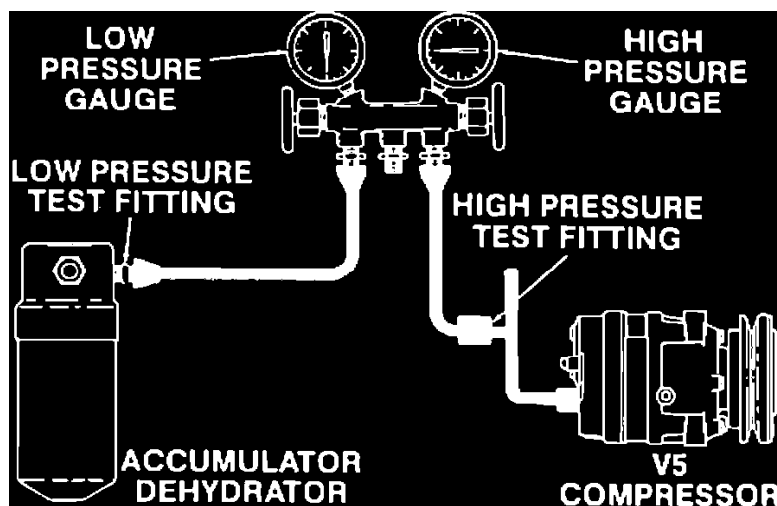
Items c, d, and e above can be corrected by the same procedure:

- Discharge refrigerant system slowly using the low pressure fitting to prevent oil loss.
- Check orifice tube for blockage. Clean or replace as required (small amount of metal chips may be normal).
- Evacuate system to a vacuum (improper evacuation of system prior to recharge will cause air to remain in system).
- Recharge system with proper amount of refrigerant.
- Leak check system.

### 3. BLACK AREA DIAGNOSIS AND SERVICE

Check the following if pressures intersect in the black areas:

- a. Compressor may be internally damaged. If suction and discharge pressures are equal and do not change when the A/C mode is turned on and off, the compressor may be internally damaged. Excess heat at the clutch surfaces or a free wheeling clutch driver are signs of internal compressor damage. When replacing the compressor, follow component replacement procedures to maintain the correct oil charge in the system. Failure to do so may cause excessive noise and early compressor failure.
- b. Missing expansion tube (orifice). Feel liquid line after expansion tube. If line is warm, discharge system and inspect for presence of expansion tube. If expansion tube or O-ring is missing, install new one in system. If expansion tube is present, remove, clean, or replace tube as necessary and install in system. Evacuate and charge system.
- c. Compressor at minimum stroke. If compressor discharge pressure remains only 10-30 psi above suction pressure, compressor may be at minimum stroke. When noted, run engine at approximately 3000 rpm for three minutes until pressures become normal. During this period, cycle mode lever from vent to A/C every 20 seconds. If no change, perform control valve low load test.
- d. Compressor control valve set improperly. Run low load test to verify. Follow this procedure exactly. It is designed to create a low cooling load causing the V5 compressor to go toward minimum stroke which is absolutely necessary for evaluation of control valve set point.



**FIGURE 1 - TESTING HOOKUP**

- Connect gage set (Figure 1) to high and low A/C Service fittings.
- Check gage accuracy by reading both gages. Correct gages as necessary.
- Disconnect blower motor.
- Set test conditions:
  1. Start engine and run at fast idle speed.
  2. Open hood, close windows and doors.
  3. Set A/C controls to LOW blower and MAX cooling.
- Record and evaluate test results:
  1. If suction pressure is 25-35 psi, control valve is functioning properly.

2. If suction pressure is outside limits of 25-35 psi, replace control valve.
- e. Refrigerant system undercharged. This condition may exist when suction pressure is below 35 psi during the high load test. The accumulator (A/D) and the suction line before the A/D, will be warm if charge is low. Add one can of refrigerant and recheck. Pressures should come into white area. If so, find source of refrigerant loss and repair leak. Evacuate and charge system with correct refrigerant amount.
- f. Expansion Tube (orifice) Blocked. See Step e in Grey Area Diagnosis and Service.

Technical Service Bulletin # **92351D**

Date: **911101**

## **A/C - New Compressor Sealing Washer**

Number: 92-35-1D

Section: 1D

Date: NOV. 1991

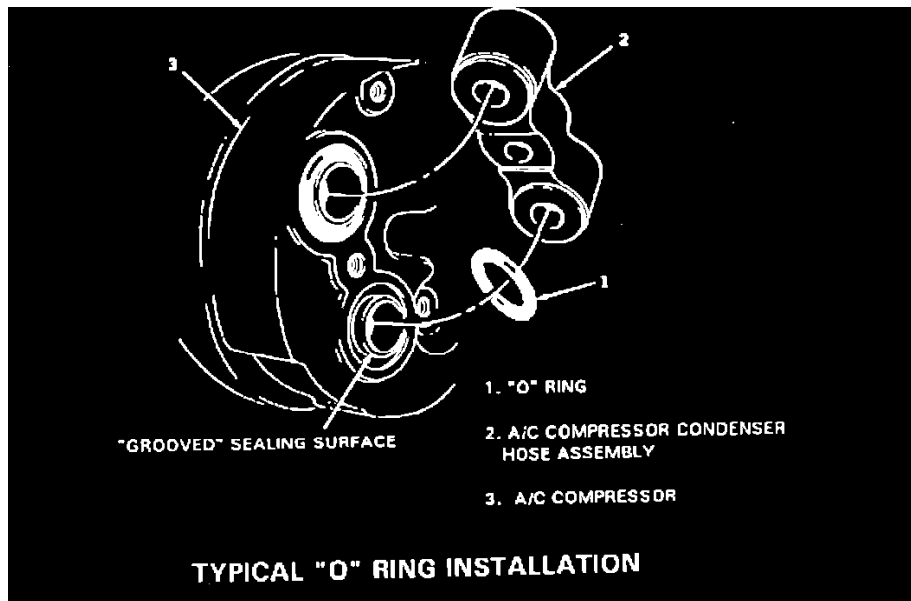
Corporate Bulletin No.: 131212R

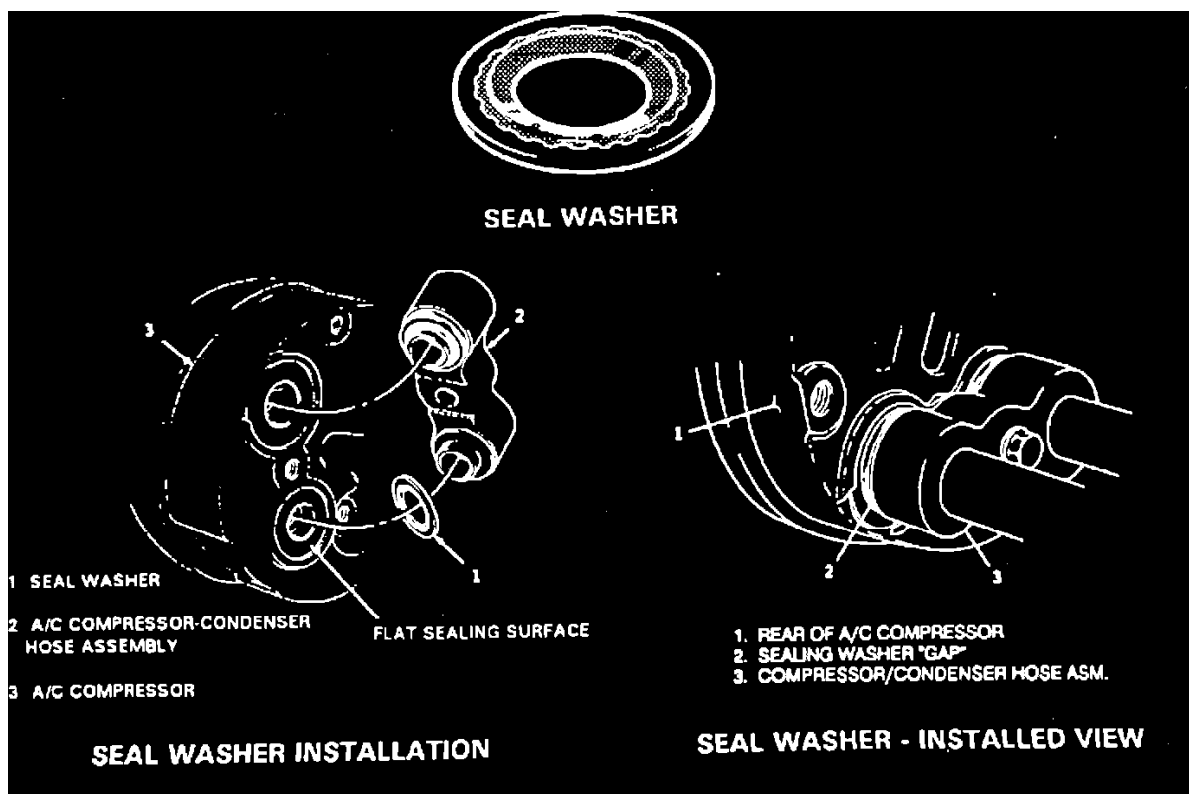
ASE No.: A7

Subject: AIR CONDITIONING COMPRESSOR SEALING WASHER USAGE

Model and Year: 1988-92 ALL PASSENGER CARS AND TRUCKS EXCEPT GEO

THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN NO. 91-187-1A, DATED FEBRUARY 1991. THE AIR CONDITIONING COMPRESSOR REAR HEAD AND THE MATING FACE OF THE ATTACHING HOSE ASSEMBLY HAS BEEN REDESIGNED. ALL COPIES OF 91-187-1A SHOULD BE DISCARDED.





There has been a redesign of the GM Harrison A/C compressor rear head and the mating face of the attaching hose assembly. The redesign eliminates the two "O" ring seals from the compressor, replacing them with two "sealing washers added to the suctional discharge hose set". Each sealing washer consists of a metal washer with an integral molded rubber seal. (Refer to Illustrations).

THE "O" RING AND SEALING WASHER DESIGNS ARE NOT INTERCHANGEABLE. The compressor design will determine which type of washer to use.

Use sealing washers on compressors with suction discharge ports having a flat sealing surface.

Use "O" ring seals on compressors with "O" ring grooves in the suction discharge port sealing surface.

A service compressor ordered from GMSPO may be of either design. If the compressor uses the sealing washers, the washers will be included with the service compressor.

Use of improper seals may result in damage to the seals and cause leaks.

#### Servicing Information:

Lubrication of sealing washers is neither required nor recommended. Follow the installation instructions included with the parts kits below.

When using sealing washers, there will be an intentional "gap" between the compressor rear head and the air conditioning hose assembly block (suction discharge block assembly). Do not mistake this as a loose connection or a mis-assembled joint.

Sealing washers are used in production on the following vehicles:

\* 1991 All J vehicles w/V5 compressor.

\* 1992 All Vehicles.

#### Parts Information:

Seal or Gasket - A/C Compressor Sealing Washer, Service Kits:

Part Number	Application
2724575	All Pre-1992 Compressors except: 1990-91 W-car  1991 J-car
2724576	All 1990-91 W-car
2724577	All 1992 compressors with 5/8" suction port



openings.  
1991 J-car

2724578

All 1992 compressors with 3/4" suction port  
opening.

Parts are currently available from GMSPO.

Technical Service Bulletin # **631215**

Date: **961101**

## **A/C Compressor Seal Washer - Reference Chart**

File In Section: 1 - HVAC

Bulletin No.: 63-12-15

Date: November, 1996

### **INFORMATION**

Subject:

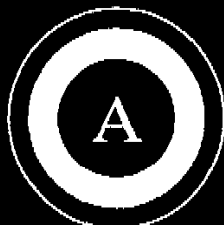

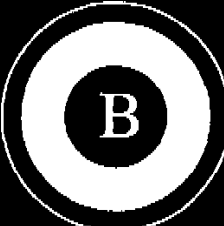

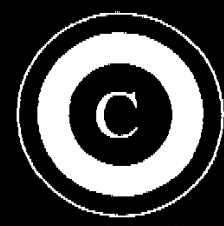









Reference Chart for A/C Compressor Seal Washers

Models:

1997 and Prior Passenger Cars (Except Corvette and GEO) 1997 and Prior Light Duty Trucks (Except Tracker)

GMSPO A/C compressors include a seal washer kit. These kits contain various color edge painted washer seals and inserts in which only two (2) washers and possibly one (1) insert are used. It has come to our attention that some packaging discrepancies were found and some of the seals cannot be properly identified for installation.


These seals are very close in size and some of the seals were inadvertently edge painted the wrong color or not painted.

ACTUAL SIZE	EDGE COLOR	OUTSIDE DIAMETER	INSIDE DIAMETER	THICKNESS	PART OF KIT(S)	A/C DELCO PART NUMBER.
	METAL	31.5MM (1.24in)	17.6MM (.64in)	1.3MM (.05in) 	2724578	15-2723
	YELLOW	33.4MM (1.32in)	15.4MM (.61in)	3.1MM (.12in) 	2724887	15-20058
	BLACK	28.0MM (1.10in)	15.4MM (.61in)	3.1MM (.12in) 	2724575 2724576	15-2720 15-2721
	METAL	28MM (1.10in)	15.4MM (.61in)	1.3MM (.05in) 	2724577 2724578	15-2722 15-2728
	GREEN	29.9MM (1.18in)	15.4MM (.61in)	5.5MM (.22in) 	2724887	15-20058
	RED	29.9MM (1.18in)	15.4MM (.61in)	3.7MM (.19in) 	2724887	15-20058
	METAL	23.6MM (.93in)	15.4MM (.61in)	1.3MM (.05in) 	2724952	15-30917






DUPLICATION OF THIS CHART MAY ALTER ACTUAL SIZES.

S63121501

**INSERTS**

ACTUAL SIZE	INSERT LETTER	LARGE DIAMETER	HEIGHT	SMALL DIAMETER	PART OF KITS	A/C DELCO PART NUMBER
	P1	15.9MM (.63in)	7MM (.28in)	13MM (.51in)	2724887 2724575	15-20058 15-2720
	P2	15.9MM (.63in)	11.4MM (.45in)	13MM (.51in)	2724887 2724575	15-20058 15-2720

**HOSE BLOCKS**

HOSE BLOCK SIDE VIEW	DESCRIPTION	COMPRESSOR SUCTION PORT SIZE	HOSE BLOCK PILOT "NOMINAL" DIA.		
			SUCTION SEAL WASHER		DISCHARGE SEAL WASHER
			5/8	3/4	5/8
	FLAT FACE HOSE BLOCK WITH 4MM PILOTS	5/8 3/4	C B		E / P1 E / P1
	FLAT FACE HOSE BLOCK WITH NO PILOTS	5/8 3/4	C / P1 B / P1		E / P2
	RAISED FACE HOSE BLOCK WITH 7MM PILOTS	5/8 3/4	D B	A	F E F
	STEP HOSE BLOCK WITH 7MM PILOTS	5/8 3/4	D	A	D D
	STEP HOSE BLOCK WITH EXPANDED TUBE PILOTS	5/8 3/4	G		G

**NOTE:**

- 1) Style "V" uses only "slim line" sealing washer G.
- 2) Match block diagram to block for proper use.
- 3) Determine compressor port and block pilot diameters to determine proper seal washer/insert code letters.  
(If both pilots have the same diameter, they are 5/8)  
(If both compressor ports have the same diameter, they are 5/8)
- 4) Remove proper washer and insert from kit and install onto block fitting. Inserts must be fully seated, and sealing washers must be bottomed out against the block surface.
- 5) Position block, hold in place, and hand tighten bolt or nut; then torque to 34Nm (25lbs ft). A small space between the hose block and compressor head in normal, but gasket has sealed.
- 6) All sealing washers have a smaller O.D. than the compressor spot surface recess diameter that they must fit into. Verify prior to assembly

**IMPORTANT** All sealing surfaces must be lint and dirt free.

S63121502

The chart shown will help to properly identify the seals. Use the chart by placing the seal over the pictured seal to identify inside and outside diameters and thickness. Because these seals are very similar in size, specifications are also listed in the chart.

**Important:**

If seals are damaged upon installation, obtain new seal kit. Seals will be available separately at a later date.

Technical Service Bulletin # 72-05-12

Date: 980101

**Suspension - Shock Absorber/Strut Replacement Guidelines**

File In Section: Warranty Administration

Bulletin No.: 72-05-12

Date: January, 1998

## **WARRANTY ADMINISTRATION**

Subject:

Replacement of Shock Absorbers and Struts Labor Operations E3800, E3801, E3807, E5800, E5801, E5807, E3850, E3851, E3857, E5750, E5751, and E5757

Models:

All Past, Present, and Future Passenger Cars & Trucks

The purpose of this bulletin is to provide retail and wholesale service personnel with enhanced service policies for the above listed subject labor operations.

Service Management should make certain that all dealership personnel responsible for replacement of suspension components are familiar with GM Service Manual procedures.

Effective with repair orders dated on or after January 15, 1998 the following must also be followed:

- Shock absorber/strut assemblies are fluid filled components and will normally exhibit seepage. Seepage is defined as oil film or dust accumulation on the exterior of the shock housing. Shock absorber/strut assemblies are not to be replaced under warranty or seepage.
- Defective shock absorber/strut assemblies will have a visible oil path or drip coming from the component. A visible oil path or drip coming from the shock absorber/strut assembly should be replaced as a defective component.
- Only defective shock absorber/strut assemblies should be replaced. DO NOT replace pairs unless both are defective, unless otherwise instructed in the Service Manual and/or Service Bulletin.
- Service Management approval is required on the repair order for replacement of struts or shocks in pairs. This approval includes noting the reason for replacement.

Technical Service Bulletin # **92766A**

Date: **920101**

## **Engine - Do Not Reuse Cylinder Head Bolts**

Number: 92-76-6A

Section: 6A

Date: JAN. 1992

Corporate Bulletin No.: 136010

ASE No.: A1, A8

Subject: DO NOT REUSE HEADBOLTS

Model and Year: 1985-89 SPRINT  
1989-92 METRO  
1989-92 TRACKER

The headbolts on 1985-92 M car (Sprint/Metro) and 1989-92 J truck (Tracker) may elongate while in use, which is normal with aluminum cylinder heads. While this will not cause any operational problems with the vehicle, the bolts should not be reused if the headbolts are removed for any reason. New bolts should always be used. Follow Service Manual instructions for proper torquing procedures.

There are two head bolts used for these vehicles, Part Numbers 96061591 and 96059992. They are different lengths, and are not interchangeable. Consult the Parts Book for the proper application.

Parts are currently available from GMSP0.

Technical Service Bulletin # **884486A**

Date: **910601**

## **Engine - Valve Lash Specifications**

Number: 88-448-6A

Section: 6A

Date: JUNE 1991

Corporate Bulletin No.: 136118

Subject: VALVE LASH SPECIFICATIONS

Model and Year: 1985-88 SPRINT

ENGINE COLD	INTAKE	0.23 – 0.27 mm (0.009 – 0.011")
	EXHAUST	0.28 – 0.32 mm (0.011 – 0.013")
ENGINE HOT	INTAKE	0.13 – 0.17 mm (0.005 – 0.007")
	EXHAUST	0.18 – 0.22 mm (0.007 – 0.009")

HC8701-8A1-88-R5

## SERVICE UPDATE

The valve lash specifications chart contained in this bulletin replaces the valve lash specifications chart found in ENGINE MECHANICAL (SEC.6A1) of the 1985, 1986 and 1987 Chevrolet Sprint Service Manuals (ST-370-85, ST-370-86 and ST-370-87, respectively). The 1988 Service Manual is a carryover from 1987.

Technical Service Bulletin # **99-06-02-017**Date: **991001****Cooling - Radiator Repair/Replacement Guidelines**

File In Section: 06 - Engine/Propulsion System

Bulletin No.: 99-06-02-017

Date: October, 1999

## INFORMATION

Subject:  
Radiator Repair/Replacement Guidelines

Models:  
2000 and Prior Passenger Cars and Trucks

If repair of an aluminum/plastic radiator is required, it is recommended that the following guidelines be followed:

## For Vehicles Under Warranty

For aluminum/plastic radiators that have damage to the face of the core including bent fins, punctures, cuts, leaking tubes or header tubes, the aluminum radiator core section should be replaced with a new one. In these cases, if both of the plastic tanks are not damaged, they can be reused with the new core. If one or both of the plastic tanks are damaged along with the core, it is recommended that a complete new radiator assembly be installed.

Warranty repairs for leaks at the tank to header (gasket leaks), broken/cracked plastic tanks, cross threaded or leaking oil coolers should be repaired without replacing the complete radiator. This type of repair should be handled by the radiator repair facility in your area.

Many of these radiator repair facilities are members of the National Automotive Radiator Service Association (NARSA) who follow industry and General Motors guidelines when repairing radiators. These facilities have the special tools, tanks and pressurizing equipment needed to properly test the repaired radiator prior to returning it to the dealership. Many of these facilities receive the repair components directly from General Motors.

The sublet expense for a new radiator or the repair of the radiator under warranty should be handled following normal procedures.

## For Vehicles No Longer Under Warranty

The GM released epoxy repair kit referenced in previous publications is no longer available. Repairs to the radiator, rather than replacement, is strictly at the owner's discretion. Technical Service Bulletin # **89593E**

Date: **890101****Wheels - Air Leak, Cast Aluminim Wheel Porosity**

## **Chevrolet Sprint L3-61 1.0L**

Number: 89-59-3E section: 3E

Date: JAN., 1989  
Subject: CAST ALUMINIM WHEEL POROSITY

Model and Year: ALL MODELS WITH CAST ALUMINUM WHEELS  
TO: ALL CHEVROLET DEALERS

This bulletin cancels and replaces Dealer Service Bulletin 87-89 (Section 3E) dated March, 1987, to expand model year application through 1989 vehicles. All copies of 87-89 should be discarded.

Should a vehicle equipped with cast aluminum wheels exhibit a slow leak due to a porous condition existing in the wheel, the wheel can be repaired by using Dow Corning silastic 732 RTV, part number 1052366 or equivalent, as described in the following procedure:

1. Remove wheel and tire assembly from car.
2. Locate leaking areas by inflating tire to 40 PSI and dipping wheel-tire assembly into water bath.
3. Mark leak areas and remove tire from wheel.
4. Scuff inside rim surface at leak area with # 80 grit paper and clean area with general purpose cleaner, such as 3m # 08984 or equivalent.
5. Apply 1/8" thick layer of adhesive/sealant to leak area and allow six hours of drying time.
6. Mount tire on wheel, pressurize to 40 PSI and check for leaks. NOTICE: Caution must be used when mounting the tire so as not to damage the sealer.
7. Adjust tire pressure to meet specifications.
8. Balance wheel and tire assembly using nylon coated wheel weights.
9. Water test wheel again.
10. Reinstall wheel-tire assembly on car.

### **WARRANTY INFORMATION**

Labor Operation Number: T3032  
Time Allowance: .6 hours  
Trouble Code: 92

Technical Service Bulletin # **922323E**

Date: **920601**

## **Wheels (Steel) - Damage Due to Improper Mounting**

Number: 92-232-3E

Section: 3E

Date: JUNE 1992

Corporate Bulletin No.: 233002

ASE No.: A4

Subject:  
**AVOIDING DAMAGE TO STEEL WHEELS FROM IMPROPER WHEEL/TIRE CHANGING TECHNIQUES**

Model and Year:  
1983-92 ALL PASSENGER CARS AND TRUCKS WITH STEEL WHEELS

It is important to use proper procedures to prevent damage to either the tire mounting surface or the wheel mounting holes. Damage can result from the improper wheel attachment or tire mounting techniques on vehicles with steel wheels.

### **1. IMPROPER TIRE CHANGING TECHNIQUES:**

It takes about 70 seconds for the air to completely exhaust from a large tire. If the technician doesn't wait this amount of time after removing the valve core, the bead breaker on the tire change could put enough force on the tire to bend the wheel at the mounting surface. Such damage can result in vibration, shimmy, and under severe usage (i.e. police vehicle) lead to cracking.

### **2. OVER TORQUING OF THE WHEEL NUTS:**

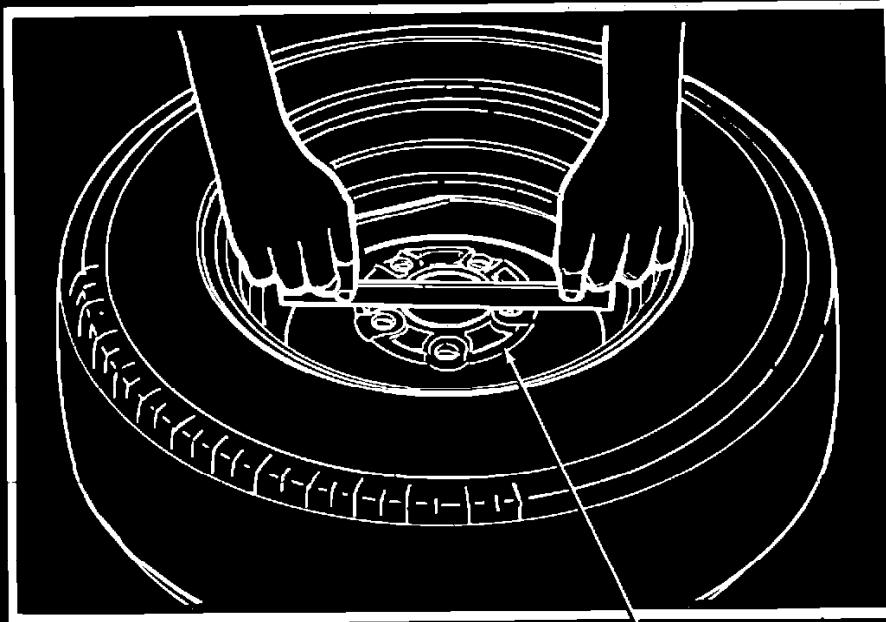
The service specification for wheel nuts is listed in the Service Manuals. Some wheels have been observed with wheel nuts that were over torqued by as much as 50 percent. This may damage the wheel mounting holes and may also lead to cracks.

### **I. PROPER TIRE CHANGING TECHNIQUES:**

Completely deflate the tire before attempting to break the tire bead loose.

### **MOUNTING SURFACE CHECKING PROCEDURE**

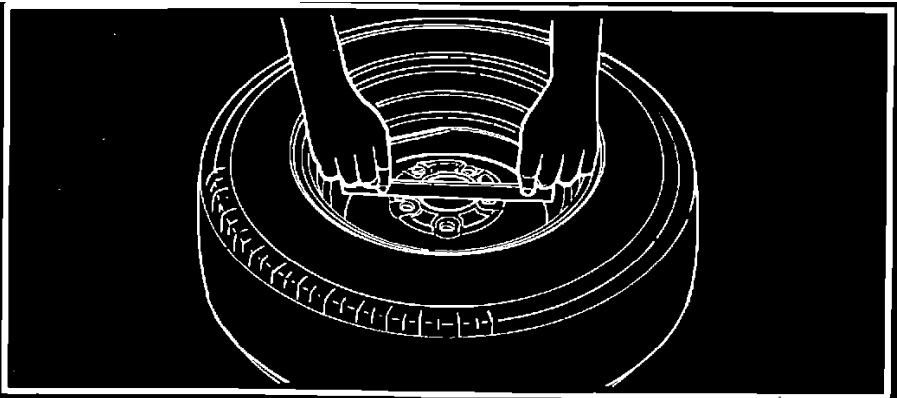
## STRAIGHT EDGE PROCEDURE



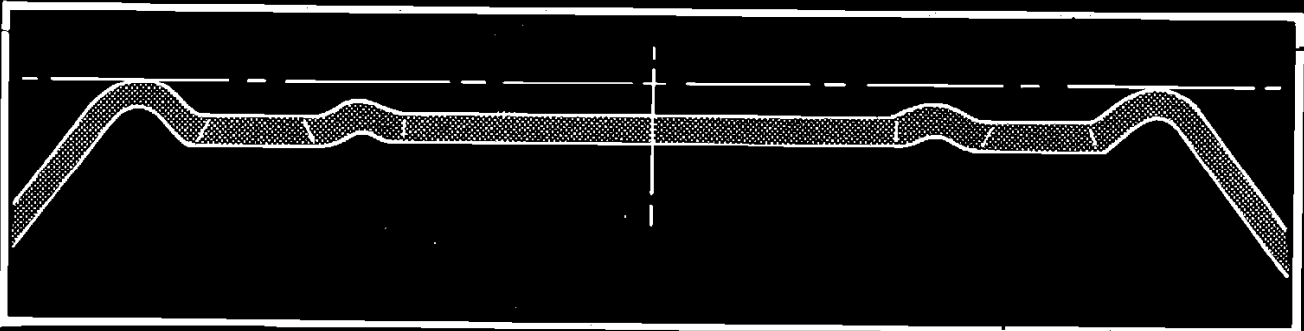
OUTER RING

- A. Obtain a straight edge approximately 8 - 9 inches long and, while holding it in two hands as shown, place it on the mounting surface of the wheel and try to rock it up and down.
- B. Repeat the above procedure on three or four different positions on the wheel mounting surface.
- C. The outer ring of the mounting surface is normally raised above everything inside it. If a wheel mounting surface has been bent on a tire changer, it will be raised above the outer ring and the straight edge will rock on this "raised" portion.
- D. If a bent wheel is found, it must be replaced.

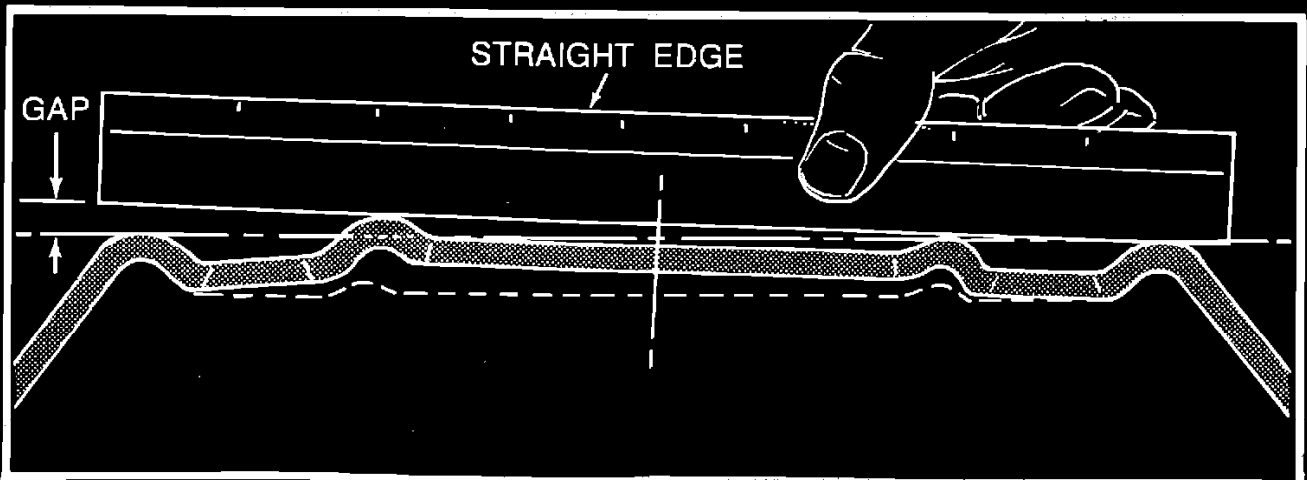
STRAIGHT EDGE  
CHECK



ORIGINAL  
WHEEL MOUNTING  
SURFACE

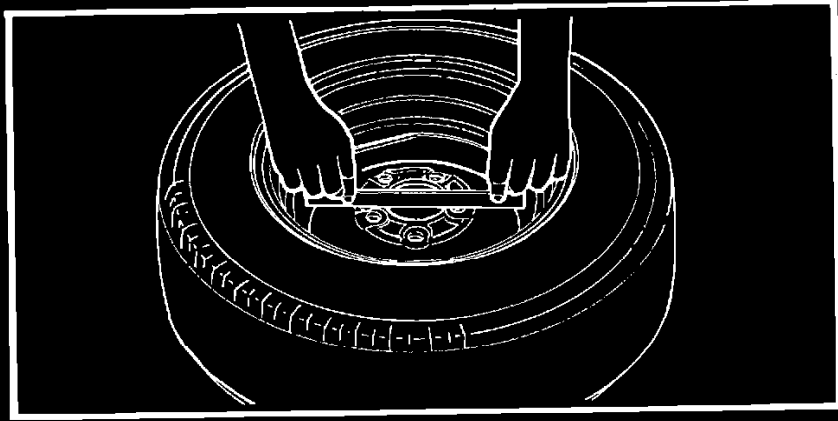


BENT  
WHEEL  
MOUNTING  
SURFACE

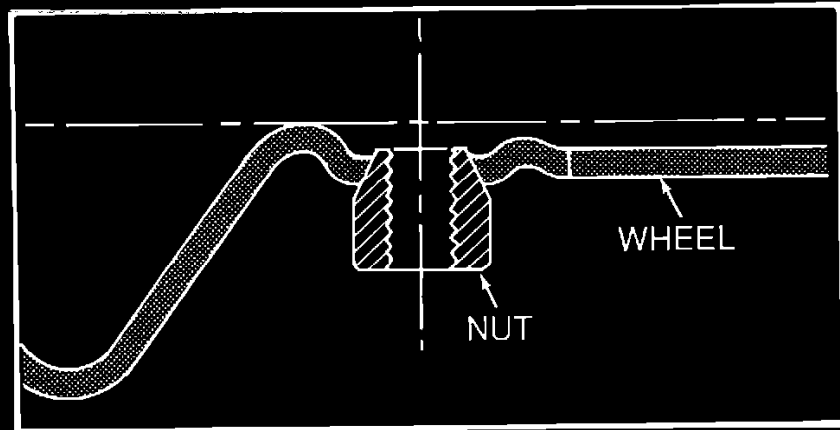




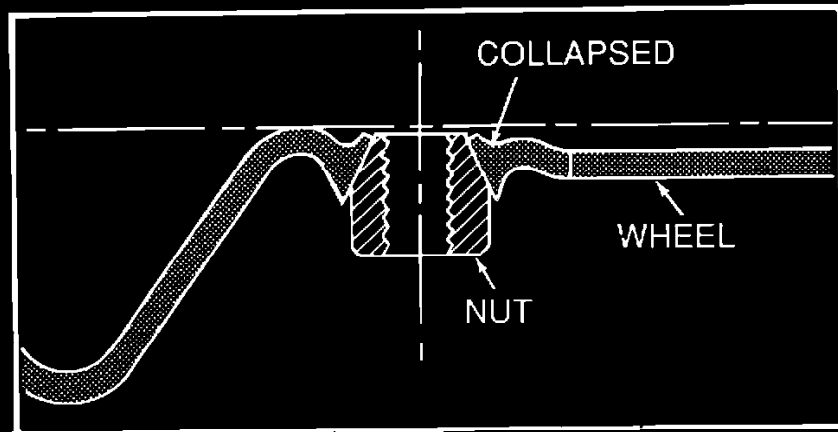
## STRAIGHT EDGE CHECK



## GOOD WHEEL / NUT INTERFACE



## COLLAPSED WHEEL NUT BOSS



- A. Obtain a straight edge approximately 8-9 inches long and, while holding it in two hands, as shown in the attached illustration, place it on the inboard mounting surface of the wheel and try to rock it up and down.
- B. Repeat the above procedure on three or four different positions on the wheel inboard mounting surface.
- C. The outer ring of the mounting surface is normally raised above everything inside it. If a wheel mounting surface has been bent on a tire changer, it will be raised above the outer ring and the straight edge will rock on this "raised" portion.
- D. If a bent wheel is found, it must be replaced.

## II. OVER TORQUING OF WHEEL NUTS:

1. A TORQUE WRENCH MUST BE USED to insure that the wheel nuts are tightened to specification. This should be done in two steps using the star pattern. First, snug the nuts down by hand. Then, using the star pattern and a torque wrench, tighten the wheel nuts to about half the

final torque. Finally, tighten the wheel nuts to specification using the star pattern and a torque wrench.

2. NEVER use lubricants or penetrating fluids on wheel studs, nuts, or mounting surfaces, as this can raise the actual torque on the nut without a corresponding torque reading on the wrench. Wheel nuts, studs, and mounting surfaces must be clean and dry.

Technical Service Bulletin # **882463E**

Date: **880601**

## **Wheels - Installation of After Market Styled Wheels**

Number: 88-246-3E

Section: 3E

Date: JUNE, 88

Subject: INSTALLATION OF AFTER MARKET STYLED WHEELS

Model and Year: 1988 AND PRIOR YEAR CHEVROLET VEHICLES

TO: ALL CHEVROLET DEALERS

Installation of aftermarket styled wheels has become common in today's market. Many designs and sizes are available at parts stores, catalog stores and dealerships.

While installation of aftermarket wheels may offer flexibility to the owner and/or the dealer to give a custom look to their vehicles, the customer should be made aware of General Motors position that it does not encourage or endorse the installation of any wheel not designed and released for that specific application by General Motors. In addition no responsibility for wheels, attaching parts, anti-theft locks or component damage as a result of such installation will be accepted. All warranties, either expressed or implied, involving such products are the sole responsibility of the installer.

Technical Service Bulletin # **393504**

Date: **930701**

## **Wheels - Sealing Leaking Cast Aluminum**

Bulletin Number: 93-3-16

Reference Number: 393504

Publish Date: 7/93

Subject:  
LEAKING CAST ALUMINUM WHEELS (REPAIR WITH ADHESIVE SEALANT)

Models Affected:  
1985-1993 ALL MODELS

Should a vehicle equipped with cast aluminum wheels exhibit a slow leak due to a porous condition existing in the wheel, the wheel can be repaired by using Dow Corning Silastic 732 RTV, p/n 1052366 or equivalent, as described in the following procedure:

1. Remove tire-wheel assembly from vehicle.
2. Locate leaking area by inflating tire to 40 psi and dipping tire-wheel assembly in water bath.
3. If air bubbles are observed, mark leak area and remove tire from wheel.
4. Scuff INSIDE rim surface at leak area with # 80 grit paper and clean area with general purpose cleaner, such as 3M # 08984.
5. Apply 1/8" thick layer of adhesive/sealant to leak area on INSIDE of rim and allow six hours of drying time.
6. Mount tire on wheel, pressurizing to 40 psi and check for leaks.

### **NOTICE:**

Caution must be used when mounting the tire so as not to damage the sealer.

7. Adjust tire pressure to meet placard specification.
8. Balance tire-wheel assembly, using proper coated weights.
9. Water test wheel again.
10. Reinstall tire-wheel assembly on vehicle.

Parts are currently available from GMSPO.

### **WARRANTY INFORMATION:**

Labor Operation Number: E0420

Technical Service Bulletin # **91353E**

Date: **900801**

## **Aluminum Wheels - New Coated Wheel Weights**

Number: 91-35-3E

Section: 3E

Date: August 1990

Corporate Bulletin No.: 003502

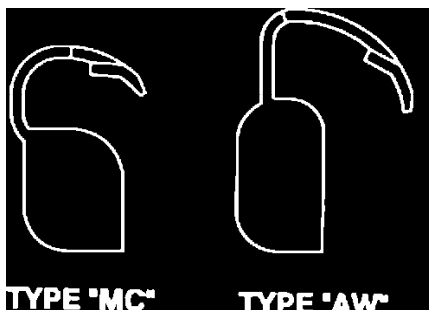
Subject: COATED WHEEL WEIGHTS FOR ALUMINUM WHEELS

Model and Year: 1985-91 MODELS WITH CAST ALUMINUM WHEELS

TO: ALL CHEVROLET DEALERS

THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN NO. 89-65-3E, DATED JANUARY 1989. POLYESTER COATED WHEEL WEIGHTS NOW AVAILABLE FROM GMSPO. THE 1990-91 MODEL YEARS HAVE ALSO BEEN ADDED. ALL COPIES OF 89-65-3E SHOULD BE DISCARDED.

Vehicles with cast aluminum wheels use a coated clip on wheel weight. The coating has recently changed from nylon to polyester, giving a more natural appearance that more closely matches the wheel. Coated balance weights are used on both the inboard and outboard rim flanges. They will not discolor, corrode or damage the appearance of the wheel as may have been the case in the past with uncoated clip on weights. These coated weights will fit most GM cast aluminum wheels.



There are two types of coated wheel weights available to fit the GM vehicles (see illustration). Both types of weights are available from GMSPO in 1/4 ounce increments. See usage chart below to determine which type weight is correct for the vehicle.

	"MC" Type Weight Used On:			"AW" Type Weight	
	1990-1991 "W" Car			Used On All Other	
	1988-1990 "Y" Car			Series Vehicles	
	1989-1991 "L" Car				
	1991 "B" Car, "U" Van				
1/4 oz.	P/N	9591670		P/N	9591669
1/2 oz.		9591584			9591582
3/4 oz.		9591585			9591583
1-1/4 oz.		9591378			9591362
1-1/2 oz.		9591379			9591363
1-3/4 oz.		9591380			9591364
2 oz.		9591381			9591365

"MC" Type Weight Used On:

1990-1991 "W" Car

1988-1990 "Y" Car

1989-1991 "L" Car

"AW" Type Weight

Used On All Other

2-1/4 oz.	1991 "B" Car, "U" Van 9591382	Series Vehicles 9591366
2-1/2 oz.	9591383	9591367
3oz.	9591385	9591369

Parts are currently available from GMSPO.

Dealers should make sure they have a supply of both types weights for balancing GM aluminum wheels.

When installing the coated weights, care must be taken so that the coating does not crack. It is recommended that a Teflon tipped hammer be used, such as 85403 Nicholson Industrial Hammer, their part number CAS 3340551, available through the Charles Strelinger Company, Warren, Mi (313-268-4100), or equivalent.

Technical Service Bulletin # **99-03-10-102**

Date: **990601**

## Warranty - OE Chrome Plated Aluminum Wheel ID

File In Section: 03 - Suspension

Bulletin No.: 99-03-10-102

Date: June, 1999

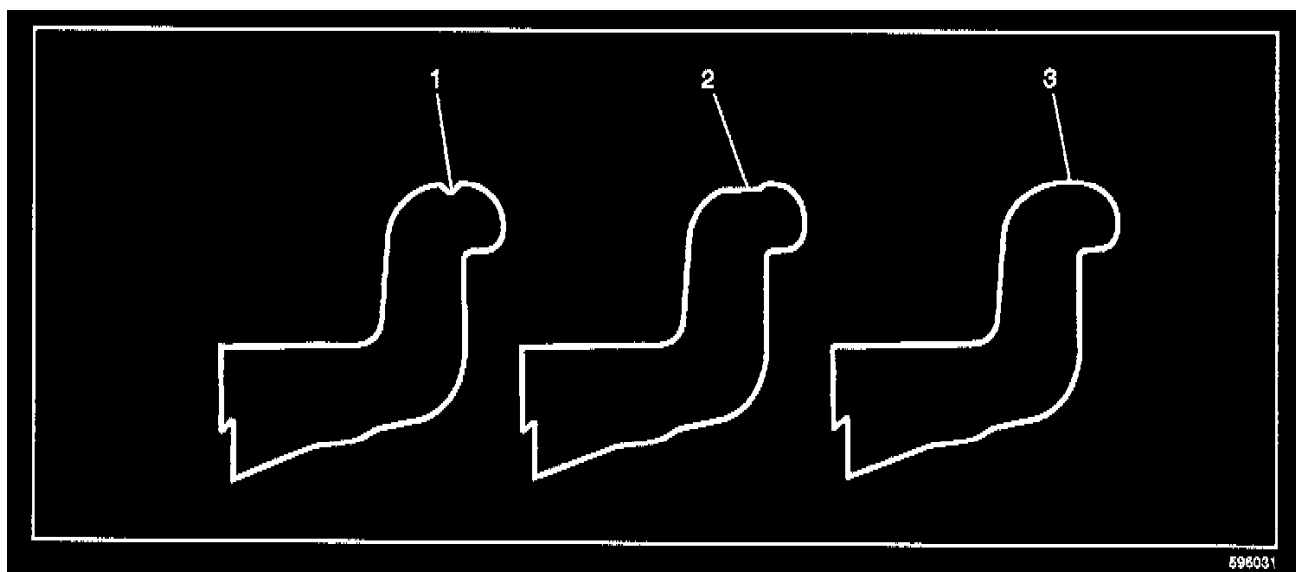
### INFORMATION

Subject:

Original Equipment Chrome Plated Aluminum Wheel Identification

Models:

1999 and Prior Passenger Cars and Light Duty Trucks



Chrome plated aluminum wheels have been returned to the Warranty Parts Center that are not the original equipment (OE) components.

Original equipment chrome plated aluminum wheels can be identified by either a balance weight clip retention groove (1) or a step (2) that is machined around both of the wheel's rim flanges. The rim flanges (3) of painted original equipment aluminum wheels do not have a groove or a step.

Chrome plated aluminum wheels that do not have the wheel rim flange groove or step are aftermarket chrome plated components and are NOT warrantable. Any aftermarket chrome wheels received by the Warranty Parts Center will be charged back to the dealership.

Technical Service Bulletin # **931693E**

Date: **930401**

## Tires - Slipping on Rim

Number: 93-169-3E

Section: 3E

Date: APRIL 1993

Corporate Bulletin No.: 393501

ASE No.: A4

Subject:  
TIRES SLIPPING ON WHEELS (USE PROPER TIRE MOUNTING PROCEDURE)

Model and Year:  
1988-93 ALL PASSENGER CARS AND LIGHT DUTY TRUCKS

Some incidents of tires slipping (rotating) on wheels have been reported on 1988-93 passenger cars and light duty trucks. Most incidents have occurred when driven aggressively immediately after tire mounting. Hard acceleration and/or braking is usually required. This condition will affect wheel balance, which could result in a vibration.

To reduce the chance of tires rotating on their wheels, any excess lube should be wiped from the tire and rim after tire mounting, but before inflating to seat the bead. (Never exceed 40 psi to seat the bead.) Also, the vehicle should not be driven aggressively for at least four hours after tire mounting to allow the lube to dry.

GM Goodwrench Rubber Lubricant, p/n 12345884, is the recommended lube for tire mounting.

Technical Service Bulletin # **99-08-51-007C**

Date: **060619**

## **Wheels - Aluminum Wheel Refinishing Recommendations**

Bulletin No.: 99-08-51-007C

Date: June 19, 2006

### **INFORMATION**

Subject:  
Refinishing Aluminum Wheels

Models:  
2007 and Prior Passenger Cars and Trucks (Including Saturn)  
2003-2007 HUMMER H2  
2006-2007 HUMMER H3  
2005-2007 Saab 9-7X

Supercede:

This bulletin is being revised to add additional models and model years. Please discard Corporate Bulletin Number 99-08-51-007B (Section 08 - Body and Accessories).

This bulletin updates General Motor's position on refinishing aluminum wheels. GM does not endorse any repairs that involve welding, bending, straightening or re-machining. Only cosmetic refinishing of the wheel's coatings, using recommended procedures, is allowed.

### **Evaluating Damage**

In evaluating damage, it is the GM Dealer's responsibility to inspect the wheel for corrosion, scrapes, gouges, etc. The Dealer must insure that such damage is not deeper than what can be sanded or polished off. The wheel must be inspected for cracks. If cracks are found, discard the wheel. Any wheels with bent rim flanges must not be repaired or refinished. Wheels that have been refinished by an outside company must be returned to the same vehicle. The Dealer must record the wheel ID stamp or the cast date on the wheel in order to assure this requirement. Refer to Refinisher's Responsibility - Outside Company later in this bulletin.

### **Aluminum Wheel Refinishing Recommendations**

^ Chrome-plated aluminum wheels

Re-plating these wheels is not recommended.

^ Polished aluminum wheels

These wheels have a polyester or acrylic clearcoat on them. If the clearcoat is damaged, refinishing is possible. However, the required refinishing process cannot be performed in the dealer environment. Refer to Refinisher's Responsibility - Outside Company later in this bulletin.

^ Painted aluminum wheels

These wheels are painted using a primer, color coat, and clearcoat procedure. If the paint is damaged, refinishing is possible. As with polished

wheels, all original coatings must be removed first. Media blasting is recommended. Refer to GM Aluminum Refinishing Bulletin # 53-17-03A for the re-painting of this type of wheel.

#### **Bright, machined aluminum wheels**

These wheels have a polyester or acrylic clearcoat on them. In some cases, the recessed "pocket" areas of the wheel may be painted. Surface refinishing is possible. The wheel must be totally stripped by media blasting or other suitable means. The wheel should be resurfaced by using a sanding process rather than a machining process. This allows the least amount of material to be removed.

#### **Important:**

Do not use any re-machining process that removes aluminum. This could affect the dimensions and function of the wheel.

Painting is an option to re-clearcoating polished and bright machined aluminum wheels. Paint will better mask any surface imperfections and is somewhat more durable than clearcoat alone. GM recommends using Corsican SILVER WAEQ9283 for a fine "aluminum-like" look or Sparkle SILVER WA9967 for a very bright look. As an option, the body color may also be used. When using any of the painting options, it is recommended that all four wheels be refinished in order to maintain color uniformity. Refer to GM Aluminum Refinishing Bulletin # 53-17-03A for specific procedures and product recommendations.

#### **Refinisher's Responsibility - Outside Company**

#### **Important:**

Some outside companies are offering wheel refinishing services. One such company, Transwheel Corporation (800-892-3733), provides this service within GM guidelines. Other companies may also exist. Such refinished wheels will be permanently marked by the refinisher and are warranted by the refinisher. Any process that re-machines or otherwise re-manufactures the wheel should not be used.

A refinisher's responsibility includes inspecting for cracks using the Zygo system or the equivalent. Any cracked wheels must not be refinished. No welding, hammering or reforming of any kind is allowed. The wheel ID must be recorded and follow the wheel throughout the process in order to assure that the same wheel is returned. A plastic media blast may be used for clean up of the wheel. Hand and/or lathe sanding of the machined surface and the wheel window is allowed. Material removal, though, must be kept to a minimum. Re-machining of the wheel is not allowed. Paint and/or clear coat must not be present on the following surfaces: the nut chamfers, the wheel mounting surfaces and the wheel pilot hole. The refinisher must permanently ID stamp the wheel and warrant the painted/clearcoated surfaces for a minimum of one year or the remainder of, the new vehicle warranty, whichever is longer.

#### **Important:**

Whenever a wheel is refinished, the mounting surface and the wheel nut contact surfaces must not be painted or clearcoated. Coating these surfaces could affect the wheel nut torque.

When re-mounting a tire on an aluminum wheel, coated balance weights must be used in order to reduce the chance of future cosmetic damage.

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



**WE SUPPORT  
VOLUNTARY  
TECHNICIAN  
CERTIFICATION**

Disclaimer Technical Service Bulletin # **881163E**

Date: **880101**

## **Tires - Rotation and Warranty Coverage**

Number: 88-116-3E

Section: 3E

Date: Jan., 1988

Subject: CHEVROLET'S RESPONSIBILITIES CONCERNING TIRE WARRANTIES, INCLUDING IRREGULAR/ PREMATURE WEAR

Model and Year: ALL MODELS

TO: ALL CHEVROLET DEALERS

As in the past, tires continue to be warranted by the tire manufacturer against defects in material or workmanship. Details of this limited warranty may be found in each tire company warranty booklet, which is part of the glove box material. The GM warranty and owner assistance booklet also now states that the GM dealer will assist the customer in obtaining a tire adjustment, if necessary.

Tire conditions caused by vehicle defects are warranted by General Motors. This statement is now included in the GM warranty and owner assistance booklet. This applies during the basic warranty coverage period, which is 12 months/12,000 miles, and should be applied to all past and current models. Examples of tire conditions that fall within GM's responsibility may include tire damage during vehicle assembly, tire damage due to tire-to-vehicle interference, and irregular/premature tire wear. Tire wear due to abusive driving is not covered by warranty.

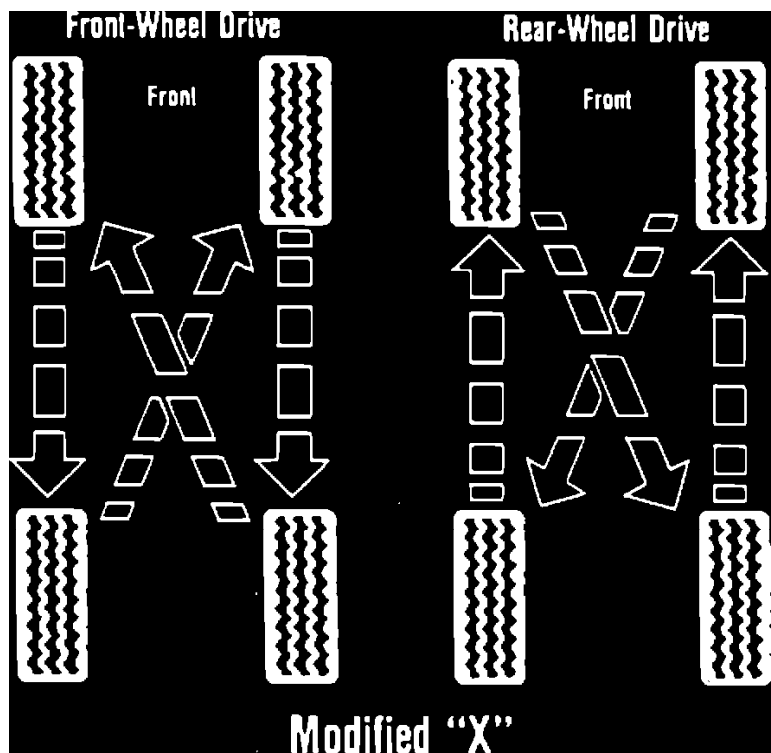


FIGURE 1

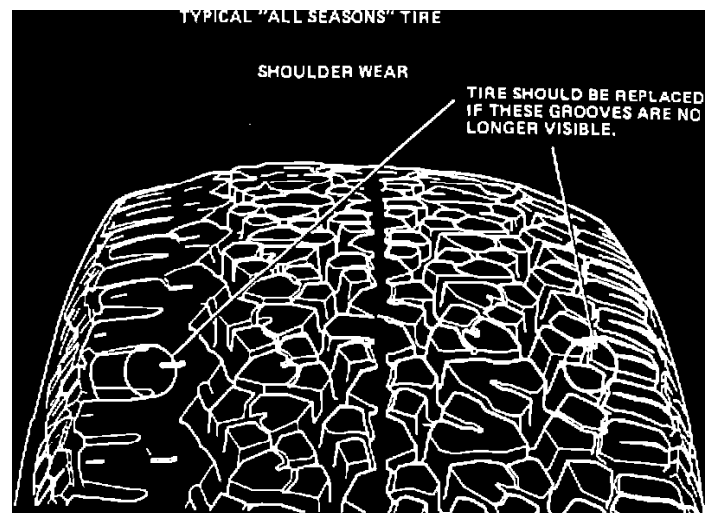


FIGURE 2

Irregular/premature tire wear is aggravated by excessive toe-in (or toe-out). Excessive camber can also be a contributor, as can operating conditions, such as city driving with a lot of cornering. Irregular tire wear usually occurs on non-drive axles, such as the front wheel positions of rear drive vehicles. An early indication may be an increase in tire noise. In most cases, modified "X" tire rotation, which is a scheduled maintenance at 7500 miles, will equalize tire wear (see Figure 1). Some amount of wear is expected and should be considered normal. Only when the cross grooves in the tread disappear within 12,000 miles should the tires be replaced under warranty (see Figure 2). Even when these grooves disappear, however, the tire is normally only half worn in this area. Whenever tires are replaced for this reason, alignment should be checked and reset to specification, if necessary. If tires are needed for any of the above conditions, they should be purchased from your local tire outlet. If tires are not readily available, each tire manufacturer has a toll-free assistance line for car and truck dealers. These numbers have been previously provided. The tire invoice amount should be entered as a net item on the warranty claim. Labor code E0420, replace wheel and/or tire, should be used.

Figure 1 modified "X" tire rotation, front wheel drive, rear wheel drive. This rotation pattern eventually gets each tire on all four positions. It gets those tires on the non-drive axle, which are most prone to irregular wear, to turn in the opposite direction. This will equalize wear quickest, and tire noise related to tread wear will actually become quieter after a few thousand miles.

Figure 2 evaluating tire wear. Typical all-season tire. Tire should be replaced only if these grooves are no longer visible within first 12,000 miles.

Technical Service Bulletin # **911713E**

Date: **910101**

## Tire - Tread Chunking/Torn bead

Number: 91-171-3E

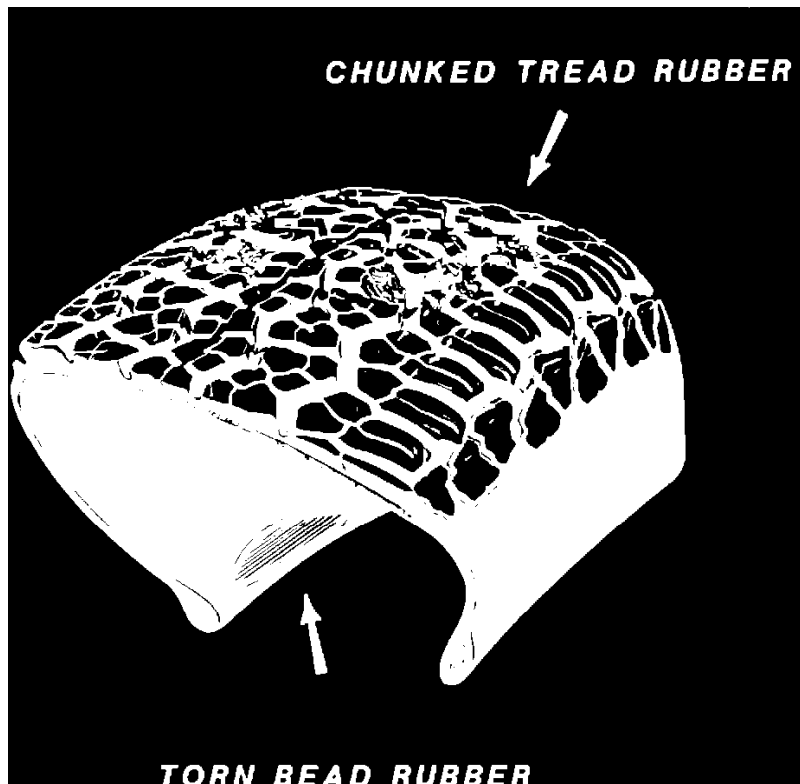
Section: 3E

Date: January 1991

Corp. Bulletin No.: 993501R

Subject: TIRE DAMAGE CAUSED IN GM ASSEMBLY PLANTS - TREAD CHUNKING TORN BEAD

Model and Year: 1988-91 PASSENGER CARS AND TRUCKS



THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN NO. 90-52-3E, DATED OCTOBER 1989. THE 1991 MODEL YEAR HAS BEEN ADDED. ALL COPIES OF 90-52-3E SHOULD BE DISCARDED.

Isolated incidents of the following types of tire damage have recently been reported from the field. Any such damage would be present at time of delivery to the dealer. The probable cause of some of this damage has been traced to the assembly plant. Since such tire conditions are usually not the fault of the tire manufacturer, any tires requiring replacement for these reasons should be considered GM's responsibility. Assembly plant damage should not be confused with transportation damage, which continues to be the responsibility of the transportation company. The purpose of this bulletin is to help identify assembly plant tire damage.

#### Tread Chunking

This condition is identified by small pieces of tread rubber torn or "chunked" out of the tire. This usually occurs in one area of the tread, although more than one area is possible. The missing tread rubber should be apparent upon visual inspection. It can also usually be detected as a once-per-rev tire noise upon road testing. This condition can happen in the assembly plant during the end of line line roll test. Hard braking such that the tire locks up on the roll could be the cause, although other variables during the roll test can also be factors. Other types of tire tread damage noted at delivery should be considered transportation damage.

#### Torn Bead Rubber

This condition is usually not visible unless the tire is dismounted from the wheel and, therefore, may not be detected during new vehicle inspection. Depending on the extent of the tear, the condition may later be detected as a slow air loss, or a slight sidewall bulge. If the tire is dismounted from the wheel and bead rubber is torn, it is possible that this damage occurred in the assembly plant during tire mounting. If it happened in the plant, the tear will usually be on the inboard (blackwall) side of the tire. There should also be evidence of two tears, about 90 degrees apart, although one is usually much more apparent than the other.

Both the above described conditions occur very infrequently, with ongoing enhancements underway to reduce their occurrence even further.

Technical Service Bulletin # 433502

Date: 940701

### Tires - Speed Rated Information

Group Ref.: 3 - Steering/Suspension



Bulletin No.: 433502

Date: July, 1994

## INFORMATION

SUBJECT:  
SPEED RATED TIRESMODELS:  
1995 AND PRIOR YEAR PASSENGER CARS AND LIGHT DUTY TRUCKS

All original equipment passenger car and light duty truck tires used by General Motors have a speed rating symbol molded on their sidewall. This speed symbol, along with the tire's load index, make up the service description that follows the tire's size. The original equipment tire size, speed rating, and recommended inflation pressure are listed on the tire placard usually located on the driver's door edge. **WHEN REPLACING TIRES, NEVER INSTALL A TIRE THAT IS A SMALLER SIZE OR LESSER SPEED RATING THAN THAT USED AS ORIGINAL EQUIPMENT.** As in the past, it is recommended that replacement tires have a TPC (Tire Performance Criteria) number on the sidewall that is identical to that on the original tires.

Speed Symbol	Maximum Speed (km/h)	Maximum Speed (mph)
S	180	112
T	190	118
U	200	124
H	210	130
V	240	149
Z	Over 240	Over 149

Common speed rating on tires used by General Motors are as follows: (see illustration)

## IMPORTANT:

Most base all season tires and touring tires used by GM are S rated. Performance tires will usually have a higher speed rating. High performance tires are usually Z rated. Z rated tires carry the Z symbol within the tire size, rather than after the size in the service description. These speeds apply only at the tire's full pressure. An underinflated tire will not meet its speed rating capability.

Technical Service Bulletin # **9313310**Date: **930301****Door Locks - Binding or Sticking or Key Hard to Insert**

Number: 93-133-10

Section: 10

Date: MARCH 1993

Corporate Bulletin No.: 1341070R

ASE No.: B1

Subject:  
DOOR LOCK CYLINDERS (RECOMMENDED LUBRICATION)Model and Year:  
ALL 1993 AND PREVIOUS MODEL CARS AND TRUCKS

THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN 92-41-10, DATED NOV. 1991. THE 1993 MODEL YEAR HAS BEEN ADDED AS WELL AS A NOTE. PLEASE DISCARD ALL COPIES OF 92-41-10.

Customer comments of binding/sticking door lock cylinders, or keys that are hard to insert or extract may be corrected in many cases by applying the proper lubrication.

The recommended materials for lubricating these components are (in order of preference):

- GM # 12345120 Multi purpose lubricant (9 oz. spray) or # 12345121 (12 oz.).
- 5 W 30 Motor Oil
- GM # 1052276 or 1052277 spray type Silicone (4.5 oz. or 12 oz. cans).

Penetrating oil type lubricants (such as GM # 1052949 or 1052950, WD-40 lubricants) ARE NOT RECOMMENDED because they wash out the original lubrication and eventually evaporate, leaving little or no lubricating material. However, if these type materials are used to "unfreeze" or loosen lock cylinder components, refer to steps 2 through 4 listed below for the proper methods of lubricating.

**NOTE:**

**DO NOT REPLACE THE DOOR LOCK CYLINDERS UNTIL AFTER THE LUBRICATING MATERIALS HAVE BEEN USED AND THE CYLINDER REMAINS FROZEN/BOUND.**

If door lock cylinders require replacement for any reason, apply a coating of GM # 12345120 Multi purpose Lubricant to the inside of the lock case and the cylinder keyway prior to assembling and installing the cylinder.

Parts are currently available from GMSPO.

Frozen cylinders due to cold weather may be repaired using the following procedure:

1. Apply heat to the cylinder area with a heat gun while being careful not to damage the painted surfaces.
2. Hold the shutter door open with a paper clip (or similar item) and force air into the cylinder using compressed air and a blow gun attachment.
3. While holding the shutter door open, inject a small amount of lubricant (see above recommendations) into the cylinder.
4. Work the key into the cylinder several times and wipe any excess lubrication residue from the key.

Use applicable Labor Time Number and Time allowance.

**Technical Service Bulletin # 431606**

**Date: 941001**

## **Leather Seat Covers - Cleaning Procedure**

File In Section: 10 - Body

Bulletin No.: 43-16-06

Date: October, 1994

Subject:

Cleaning Procedure for Leather Seat Covers

Models:

1995 and Prior Passenger Cars and "C/K" and "S/T" Trucks

If leather seat covers are being returned only because they are dirty, a more aggressive cleaning procedure is recommended by General Motors prior to replacing covers.

### **Procedure**

Dirty or soiled leather seat covers should be cleaned with a mild soap and water solution, using clean soft cloths. When this procedure proves inadequate, a commercially available leather cleaner, "Tanner's Preserve Leather Cleaner"\* should be used with a 3M "Type T"\* scrubbing pad.

### **Important:**

The type of scrubbing pad is very critical because the common 3M Scotch-Brite green pad is too aggressive and will damage the leather finish.

The cleaner is available from "First Brands" by calling 1-800-726-1001, identifying yourself as a GM dealership, requesting "Tanner's Preserve Leather Cleaner" product, number AS-330, quantity and shipping address. This product is also available at stores.

The 3M "Type T" scrubbing pad is available from a 3M distributor. Call 1-800-742-9546 for the nearest distributor and then request the Scotch-Brite Clean and Finish Sheet, "Type T", in 6 x 9 inch sheets, UPC code number 048011-01276.

\* We believe these sources and their equipment to be reliable. There may be additional manufacturers of such equipment. General Motors does not endorse, indicate any preference for or assume any responsibility for the products or equipment from these firms or for any such items which may be available from other sources.

**Technical Service Bulletin # 431018A**

**Date: 940501**

## **Webasto Sunroof System - Information Hotline**

Group Ref.: Body

Bulletin No.: 431018A

Date: May, 1994

**INFORMATION**

SUBJECT:  
VEHICLES EQUIPPED WITH A WEBASTO SUNROOF SYSTEM

MODELS:  
1987-94 BUICK MODELS  
1987-94 CADILLAC MODELS  
1988-94 CHEVROLET MODELS  
1987-94 OLDSMOBILE MODELS  
1986-94 PONTIAC MODELS

THIS BULLETIN IS BEING REVISED TO INCLUDE CHEVROLET AND PONTIAC VEHICLES. PLEASE DISCARD BULLETIN 431018.

Webasto Sunroof Corporation has established a hotline for information pertaining to parts or serviceability of Webasto sunroofs. Call 1-800-995-5911 with any questions concerning these issues.

Technical Service Bulletin # **93774B**

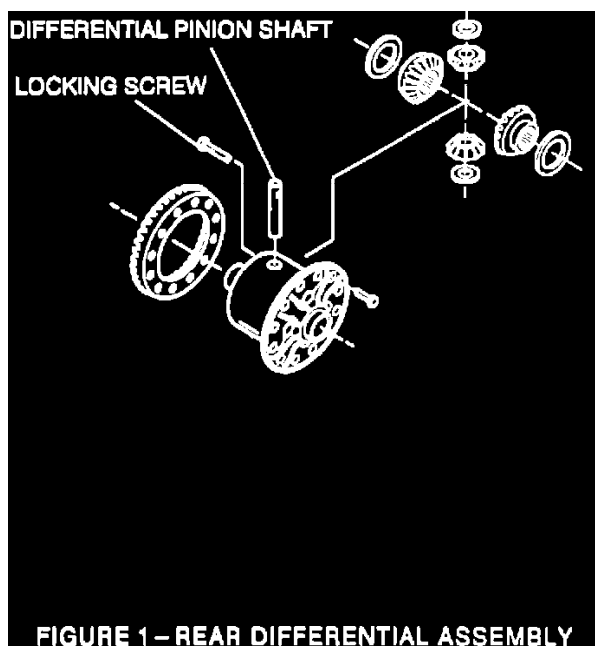
Date: **930101**

## Differential Pinion Shaft Lock Screw - Service

Number: 93-77-4B  
Section: 4B  
Date: JAN. 1993  
Corporate Bulletin No.: 264207  
ASE No.: A3

Subject: DIFFERENTIAL PINION SHAFT LOCKING SCREW

Model and Year: 1984-93 CAPRICE AND CAMARO 1984-93 ALL LIGHT DUTY TRUCKS



Anytime a differential pinion shaft locking screw is removed (Figure 1), it is important to coat the screw threads with Loctite 242 (GM Part number 12345382), or equivalent, before reinstalling. These screws are coated with an adhesive which helps to prevent the screw from loosening in the case. When this screw is removed, the adhesive is also removed. If a new locking screw is necessary, they are available through GMSPO and are coated with the correct adhesive.

Torque the locking screw to the following specifications:

7-1/2", 7-5/8" and 8-1/2" 36 N-m (27 lbs.ft.)

9-1/2" 50 N-m (37 lbs.ft.)

### PARTS INFORMATION:

If a new differential pinion shaft locking screw is required, order the following:

Application	Part Number
7-1/2", 7-5/8" and 8-1/2"	14056196
9-1/2"	12337979

Parts are currently available from GMSP0.

Technical Service Bulletin # **914858C**

Date: **920301**

## Instrument Cluster - Oil Contamination

Number: 91-485-8C

Section: 8C

Date: MARCH 1992

Corporate Bulletin No.: 237202

ASE No.: B1

Subject:  
OIL LEAKAGE INTO INSTRUMENT CLUSTER

Model and Year:  
1985-88 GEO SPRINT 1989-91 GEO METRO

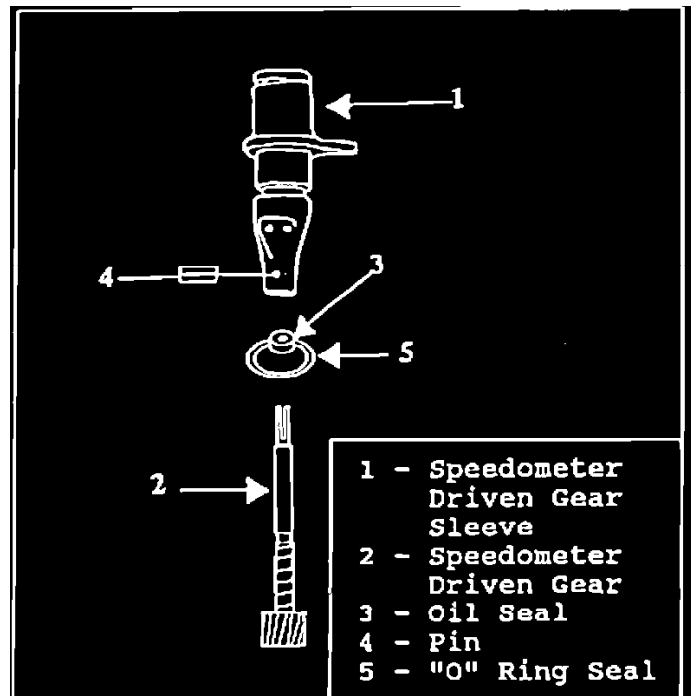
### CONDITION:

Oil may leak into the instrument cluster on some 1985-91 M cars. In severe instances, the oil could drip onto the carpet or the driver's clothing.

### CAUSE:

The oil used to lubricate the speedometer cable cannot drain back into the transmission because of the design of the driven gear sleeve. The new style has an oil drain hole added.

### CORRECTION:



Replace the parts shown in the illustration, following the instructions in Section 7B of the Service Manual. Although the sleeve (# 1) is the only revised part, all the parts should be replaced to prevent any remaining oil from getting into the cluster again. In rare instances, the instrument cluster and/or carpet may also have to be replaced.

### INSTALLATION PRECAUTIONS:

- Be certain the oil seal is fully seated and square to the bore.
- Be certain the slotted end of the driven gear has no sharp edges that might damage the seal when installing.
- Lubricate driven gear and "O" ring seal.

**PARTS INVOLVED:**

- |    |                                |                |
|----|--------------------------------|----------------|
| 1. | Speedometer driven gear sleeve | - 96066895     |
| 2. | Speedometer driven             | - M/T 96060271 |
|    |                                | - A/T 96060272 |
| 3. | Oil Seal                       | - M/T 96064510 |
|    |                                | - A/T 96051417 |
| 4. | Pin                            | - 96059915     |
| 5. | "O" Ring Seal                  | 96059932       |
| 6. | Speedometer Cable              | 30003204       |

**PARTS AVAILABILITY:**

Parts are currently available from GMSPO.

**Warranty Information:**

Use existing Labor Operations. (Except for 1989. When using K2060 Labor Operation the time published in the Labor Time Guide was incorrect. Should read 0.3 Hour not 3.8 Hrs.)

**Technical Service Bulletin # 901996E**

**Date: 900301**

**MAP - Revised Check Chart for DTC's 33, 34, 63, 64**

Number: 90-199-6E

Section: 6E

Date: March 1990

Corporate Bulletin No.: 016510

Subject: REVISED CHART C-1D, CODE 33, 34, 63, 64

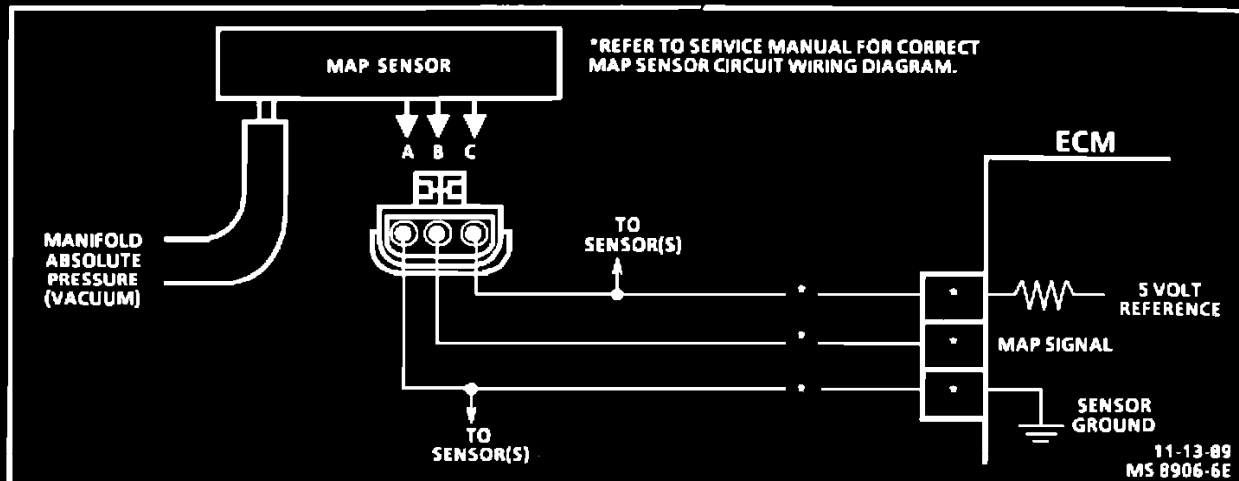
Model and Year: 1980-90 PASSENGER CARS AND TRUCKS

TO: ALL CHEVROLET DEALERS

This bulletin revises the Manifold Absolute Pressure (MAP) Output Check Chart C-1D and updates Code 33, Code 34, Code 63, and Code 64 in the Service Manual section on "Driveability And Emissions" (Section 6E1, 6E2, and 6E3). This information applies to all MAP Sensors on 1980-1990 vehicles with gasoline engines (except turbocharged) with green (standard) MAP sensor electrical connector insert or the solid black MAP sensor electrical connector insert.

The revised chart information:

## DRIVEABILITY AND EMISSIONS



## CHART C-1D

## MANIFOLD ABSOLUTE PRESSURE (MAP) VOLTAGE OUTPUT CHECK

## Circuit Description:

The Manifold Absolute Pressure (MAP) sensor measures the changes in the intake manifold pressure which result from engine load (intake manifold vacuum) and rpm changes; and converts these into a voltage output. The ECM sends a 5 volt reference voltage to the MAP sensor. As the manifold pressure changed, the output voltage of the sensor also changes. By monitoring the sensor output voltage, the ECM knows the manifold pressure. A lower pressure (low voltage) output voltage will be about 1 - 2 volts at idle. While higher pressure (high voltage) output voltage will be about 4 - 4.8 at Wide Open Throttle (WOT). The MAP sensor is also used, under certain conditions, to measure barometric pressure, allowing the ECM to make adjustments for different altitudes. The ECM uses the MAP sensor to control fuel delivery and ignition timing.

**Test Description:** Numbers below refer to circled numbers on the diagnostic chart.

**?** Important

- Be sure to use the same Diagnostic Test Equipment for all measurements.
- 1. When comparing "Scan" readings to a known good vehicle, it is important to compare vehicles that use a MAP sensor having the same color insert or having the same "Hot Stamped" number. See figures on facing page.
- 2. Applying 34 kPa (10" Hg) vacuum to the MAP sensor should cause the voltage to change. Subtract second reading from the first. Voltage value should be greater than 1.5 volts. Upon applying vacuum to the sensor, the change in voltage should be instantaneous. A slow voltage change indicates a faulty sensor.

3. Check vacuum hose to sensor for leaking or restriction. Be sure that no other vacuum devices are connected to the MAP hose.

**NOTE:** Make sure electrical connector remains securely fastened.

4. Disconnect sensor from bracket and twist sensor by hand (only) to check for intermittent connection. Output changes greater than 1 volt indicate a bad connector or connection. If OK, replace sensor.

## CHART C-1D

### MANIFOLD ABSOLUTE PRESSURE (MAP) VOLTAGE OUTPUT CHECK

**NOTE:** THIS CHART ONLY APPLIES TO MAP SENSORS HAVING GREEN OR BLACK COLOR KEY INSERT (SEE BELOW).

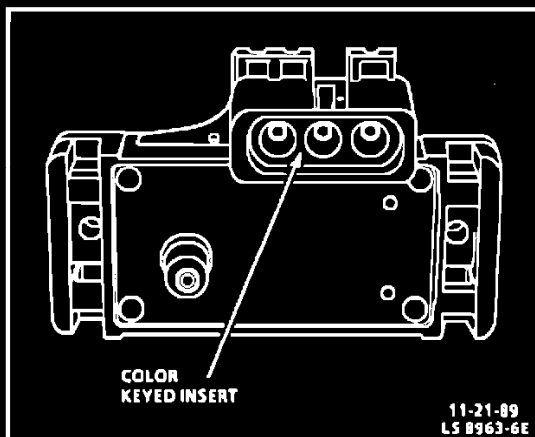
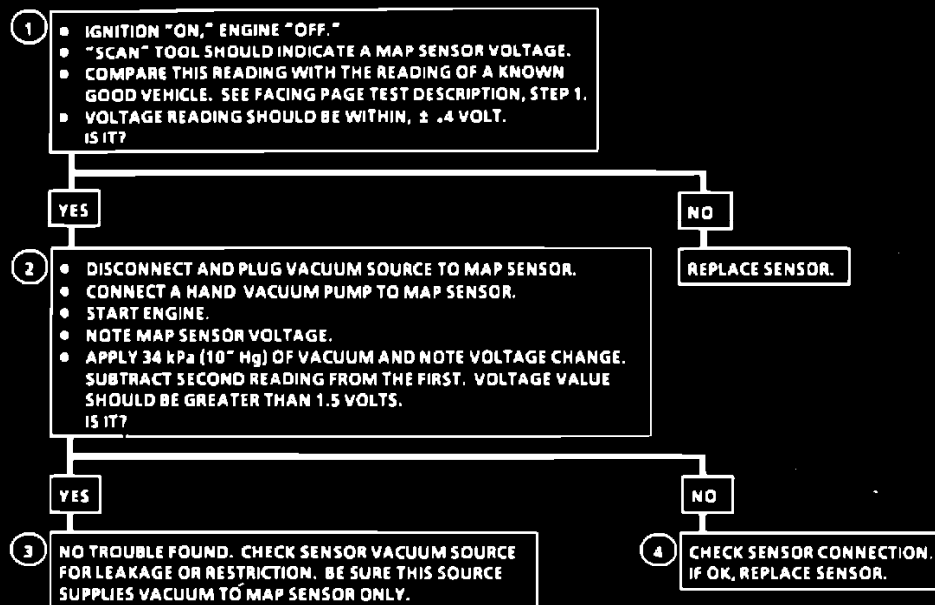


Figure 1 - Color Key Insert

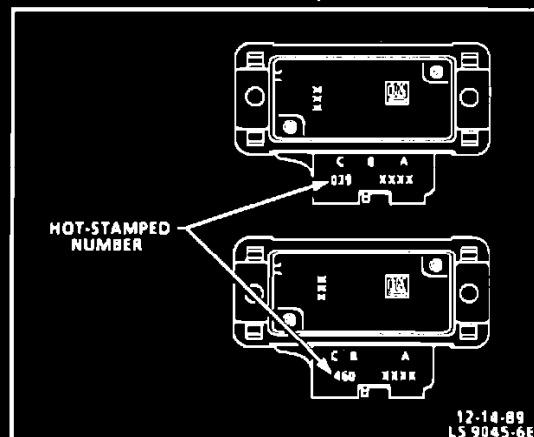


Figure 2 - Hot-Stamped Number

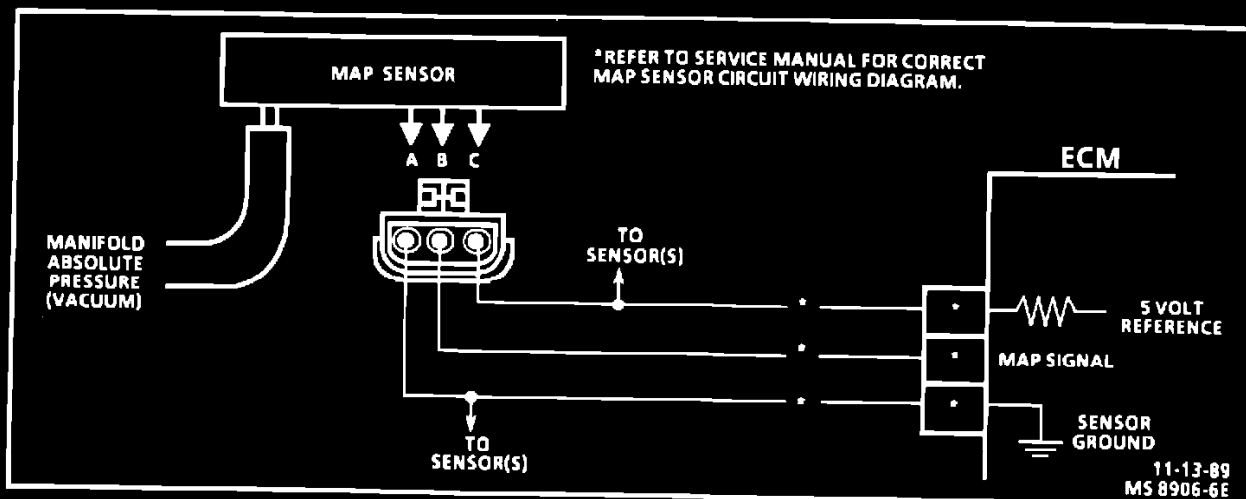
CLEAR CODES AND CONFIRM "CLOSED LOOP" OPERATION AND NO "SERVICE ENGINE SOON" LIGHT.

2-28-90  
• 75 3162-6E

90-199-6E

- Diagnostic Chart C-1D.

The updated chart information:

**DRIVEABILITY AND EMISSIONS****CODE 33****MANIFOLD ABSOLUTE PRESSURE (MAP) OUTPUT CHECK  
(SIGNAL VOLTAGE HIGH - LOW VACUUM)****Circuit Description:**

The Manifold Absolute Pressure (MAP) sensor responds to changes in manifold pressure (vacuum). The ECM receives this information as a signal voltage that will vary from about 1 to 1.5 volts at closed throttle (idle) to 4.5 - 4.8 volts at wide open throttle (low vacuum).

If the MAP sensor fails, the ECM will substitute a fixed MAP value and use the Throttle Position Sensor (TPS) to control fuel delivery.

**Test Description:** Numbers below refer to circled numbers on the diagnostic chart.

- This step will determine if **Code 33** is the result of a hard failure or an intermittent condition.  
A **Code 33** will set under the following conditions:
  - MAP signal voltage is too high (low vacuum).
  - TPS less than 2%.
  - These conditions exist longer than 5 seconds.
- This step simulates conditions for a **Code 34**. If the ECM recognizes the change, the ECM and CKT 416 and CKT 432 are OK. If CKT 469 is open, there may also be a stored Code 23.

**Diagnostic Aids:**

With the ignition "ON" and the engine stopped, the manifold pressure is equal to atmospheric pressure and the signal voltage will be high. This information is used by the ECM as an indication of vehicle altitude. Comparison of this reading with a known good vehicle with the same sensor is a good way to check accuracy of a "suspect" sensor. Readings should be the same  $\pm$  .4 volt.

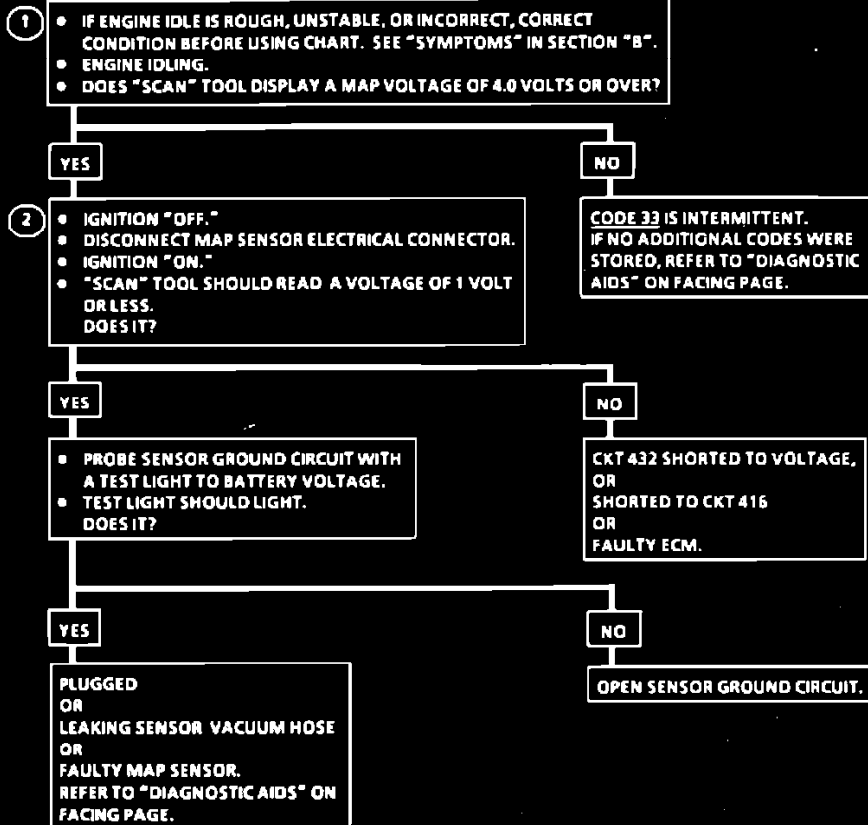
A **Code 33** will result if CKT 469 is open or if CKT 432 is shorted to voltage or to CKT 416.

If **Code 33** is intermittent, refer to Section "B".

**NOTE:** Make sure electrical connector remains securely fastened.

- Check all connections.
- Disconnect sensor from bracket and twist sensor by hand (only) to check for intermittent connections. Output changes greater than .1 volt indicates a bad connector or connection. If OK, replace sensor.
- Refer to CHART C-1D, MAP sensor voltage output check for further diagnosis.



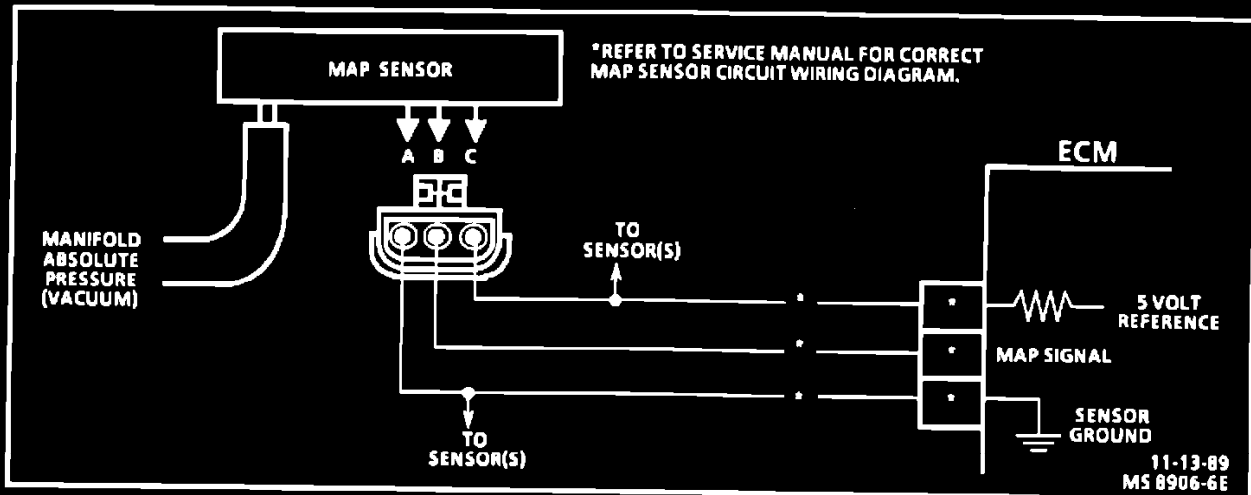
**CODE 33****MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT  
(SIGNAL VOLTAGE HIGH - LOW VACUUM)**

10-26-89  
• 75 3210-6E

90-199-6E

Diagnostic Chart Code 33.

## DRIVEABILITY AND EMISSIONS



## CODE 34

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT  
(SIGNAL VOLTAGE LOW - HIGH VACUUM)

## Circuit Description:

The Manifold Absolute Pressure (MAP) sensor responds to changes in manifold pressure (vacuum). The ECM receives this information as a signal voltage that will vary from about 1 to 1.5 volts at closed throttle (idle) to 4.5 - 4.8 volts at wide open throttle (low vacuum).

If the MAP sensor fails, the ECM will substitute a fixed MAP value and use the Throttle Position Sensor (TPS) to control fuel delivery.

**Test Description:** Numbers below refer to circled numbers on the diagnostic chart.

1. This step determines if **Code 34** is the result of a hard failure or an intermittent condition. A **Code 34** will set when MAP signal voltage is too low and the ignition is "ON."
2. Jumpering harness terminals "B" to "C" (5 volts to signal circuit) will determine if the sensor is at fault, or if there is a problem with the ECM or wiring.
3. The "Scan" tool may not display 5 volts. The important thing is that the ECM recognizes the voltage as more than 4 volts, indicating that the ECM and CKT 432 are OK.

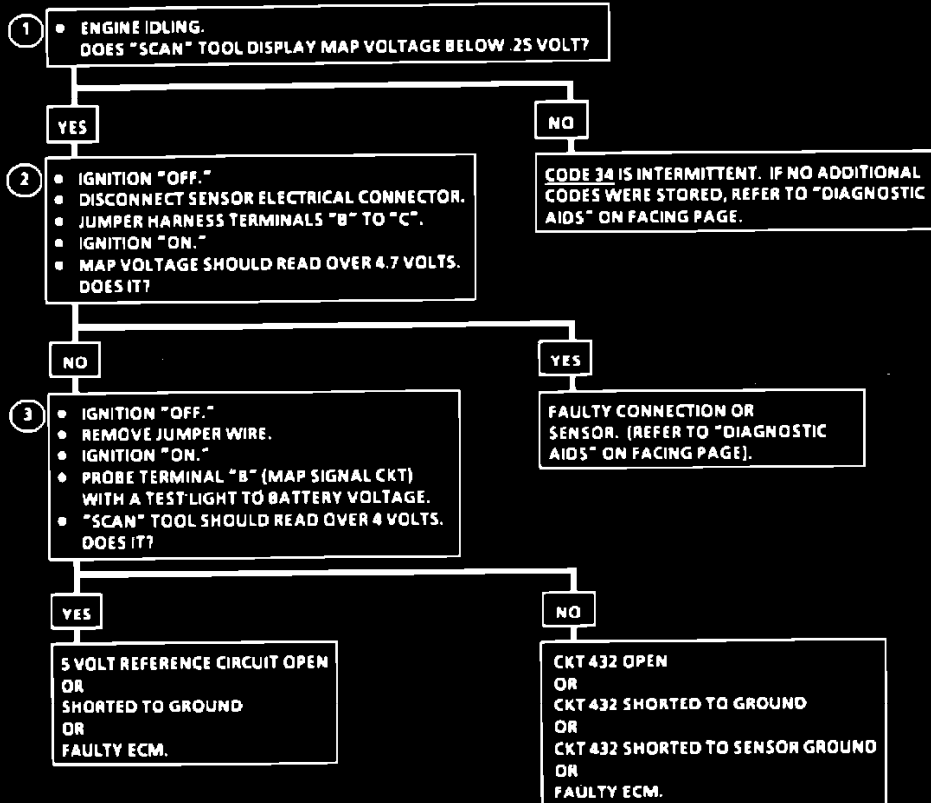
## Diagnostic Aids:

An intermittent open in CKT 432 or CKT 416 will result in a **Code 34**. With the ignition "ON" and the engine "OFF," the manifold pressure is equal to atmospheric pressure and the signal voltage will be high. This information is used by the ECM as an indication of vehicle altitude.

Comparison of this reading with a known good vehicle with the same sensor is a good way to check accuracy of a "suspect" sensor. Readings should be the same  $\pm .4$  volts. Also CHART C-1D can be used to test the MAP sensor. Refer to "Intermittents" in Section "B".

**NOTE:** Make sure electrical connector remains securely fastened.

- Check all connections.
- Disconnect sensor from bracket and twist sensor By hand (only) to check for intermittent connections. Output changes greater than .1 volt indicates a bad connector or connection. If OK, replace sensor.
- Refer to CHART C-1D, MAP sensor voltage output check for further diagnosis.

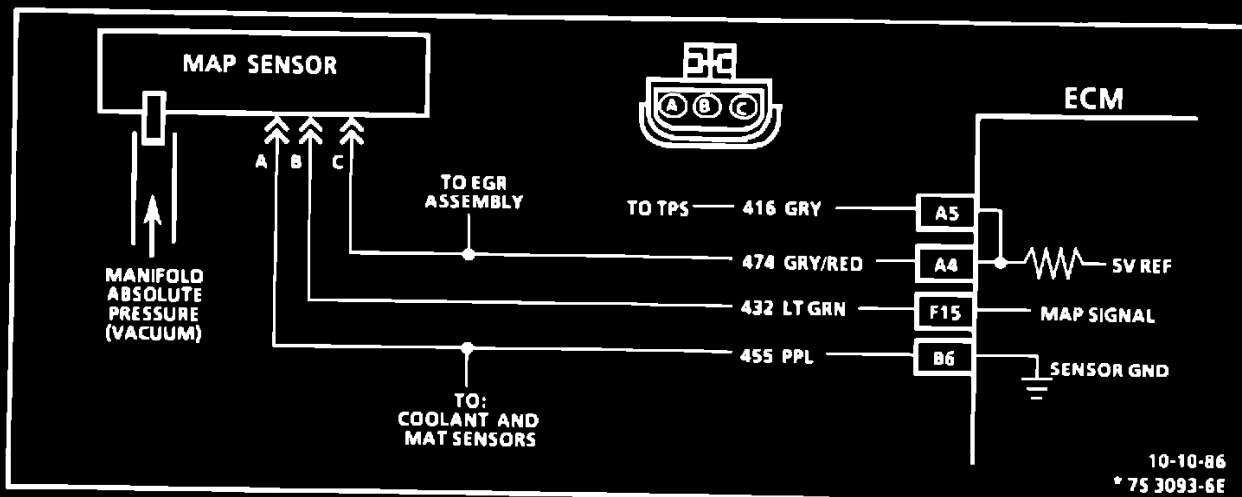
**CODE 34****MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT  
(SIGNAL VOLTAGE LOW - HIGH VACUUM)**

10-29-89  
• 75 3211-6E

90-199-6E

Diagnostic Chart Code 34.

## DRIVEABILITY AND EMISSIONS



## CODE 63

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT  
(SIGNAL VOLTAGE HIGH - LOW VACUUM)

## Circuit Description:

The Manifold Absolute Pressure (MAP) sensor responds to changes in manifold pressure (vacuum). The ECM receives this information as a signal voltage that will vary from about 1 to 1.5 volts at closed throttle (idle) to 4.5 - 4.8 volts at wide open throttle (low vacuum).

If the MAP sensor fails, the ECM will substitute a fixed MAP value and use the Throttle Position Sensor (TPS) to control fuel delivery.

**Test Description:** Numbers below refer to circled numbers on the diagnostic chart.

1. Code 63 will set when:
  - Engine running.
  - Manifold pressure greater than 75.3 kPa (A/C "OFF") 81.2 kPa (A/C "ON").
  - Throttle angle less than 2%.
  - Conditions met for 2 seconds.
 Engine misfire or a low unstable idle may set Code 63.
2. With the MAP sensor disconnected, the ECM should see a low voltage if the ECM and wiring are OK.

## Diagnostic Aids:

With the ignition "ON" and the engine stopped, the manifold pressure is equal to atmospheric pressure and the signal voltage will be high. This information is used by the ECM as an indication of vehicle altitude. Comparison of this reading with a known good vehicle with the same sensor is a good way to check accuracy of a "suspect" sensor. Readings should be the same  $\pm .4$  volt.

If idle is rough or unstable, refer to symptoms in Section "B" for items which can cause an unstable idle.

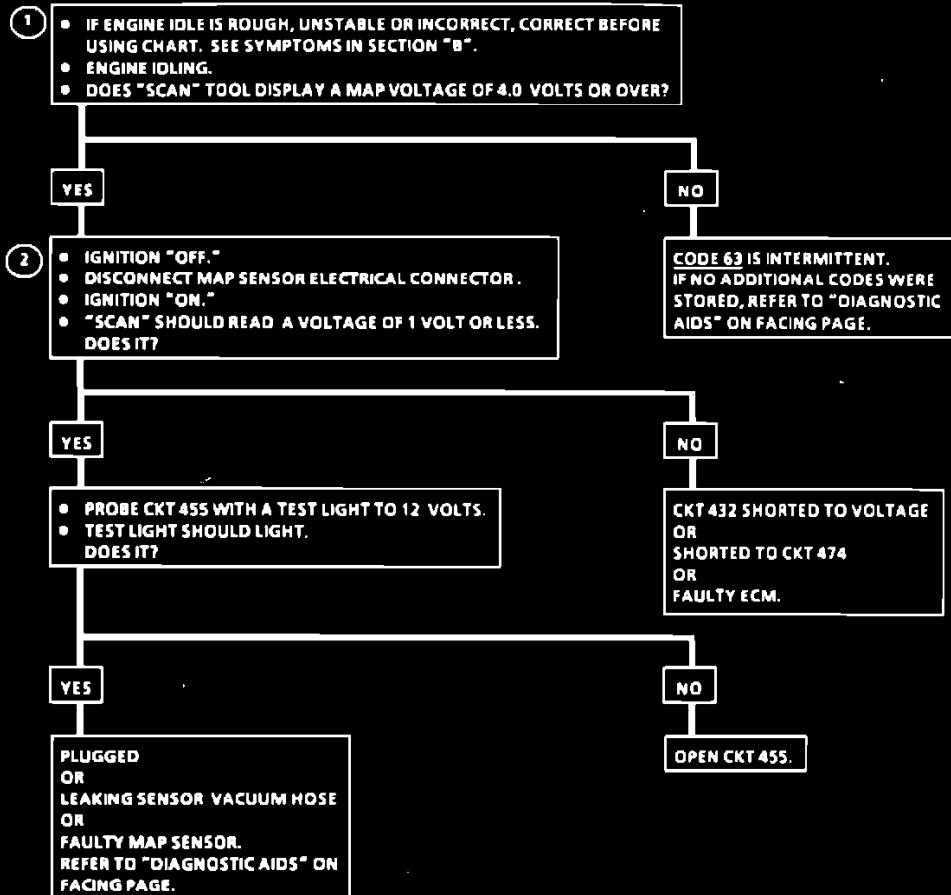
An open in CKT 455 or the connection will result in a Code 63.

**NOTE:** Make sure electrical connector remains securely fastened.

- Check all connections.
- Disconnect sensor from bracket and twist sensor by hand (only) to check for intermittent connections. Output changes greater than .1 volt indicates a bad connector or connection. If OK, replace sensor.
- Refer to CHART C-1D, MAP sensor voltage output check for further diagnosis.

**CODE 63**

**MANIFOLD ABSOLUTE PRESSURE  
(MAP) SENSOR CIRCUIT  
(SIGNAL VOLTAGE HIGH - LOW VACUUM)**

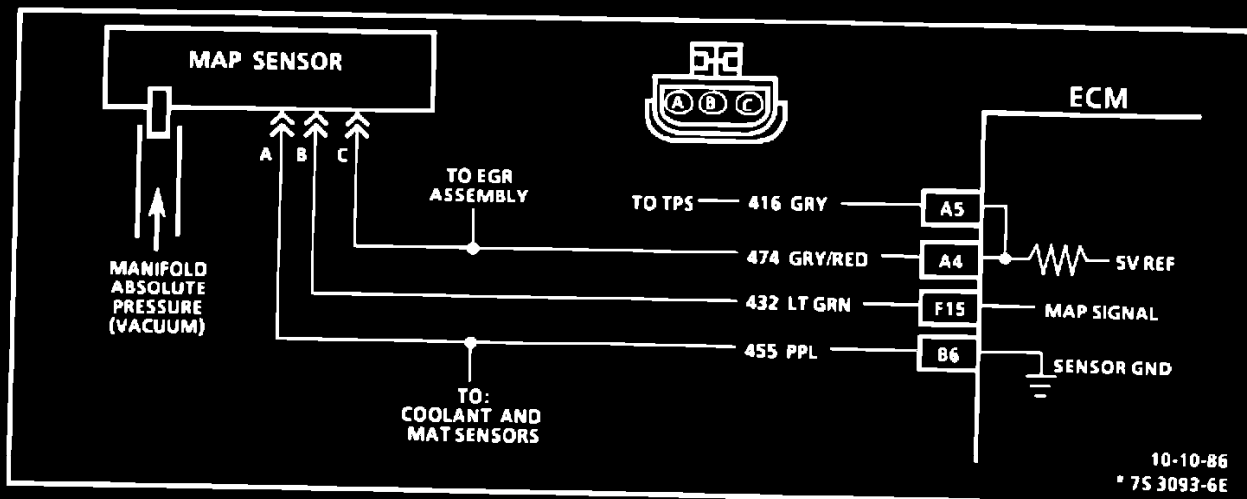


2-23-90  
75 3157-6E

90-199-6E

Diagnostic Chart Code 63.

## DRIVEABILITY AND EMISSIONS



## CODE 64

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT  
(SIGNAL VOLTAGE LOW - HIGH VACUUM)

## Circuit Description:

The Manifold Absolute Pressure (MAP) sensor responds to changes in manifold pressure (vacuum). The ECM receives this information as a signal voltage that will vary from about 1 to 1.5 volts at closed throttle (idle) to 4.5 - 4.8 volts at wide open throttle (low vacuum).

If the MAP sensor fails, the ECM will substitute a fixed MAP value and use the Throttle Position Sensor (TPS) to control fuel delivery.

**Test Description:** Numbers below refer to circled numbers on the diagnostic chart.

1. **Code 64** will set if:
  - Engine rpm less than 600.
  - Manifold pressure reading less than 13 kPa.
  - Conditions met for 1 second.
  - or
  - Engine rpm greater than 600.
  - Throttle angle over 20%.
  - Manifold pressure less than 13 kPa.
  - Conditions met for 1 second.
2. This test to see if the sensor is at fault for the low voltage, or if there is an ECM or wiring problem.
3. This simulates a high signal voltage to check for an open in CKT 432. If the test light is bright during this test, CKT 432 is probably shorted to ground. If "Scan" reads over 4 volts at this test, CKT 474 can be checked by measuring the voltage at terminal "C" (should be 5 volts).

## Diagnostic Aids:

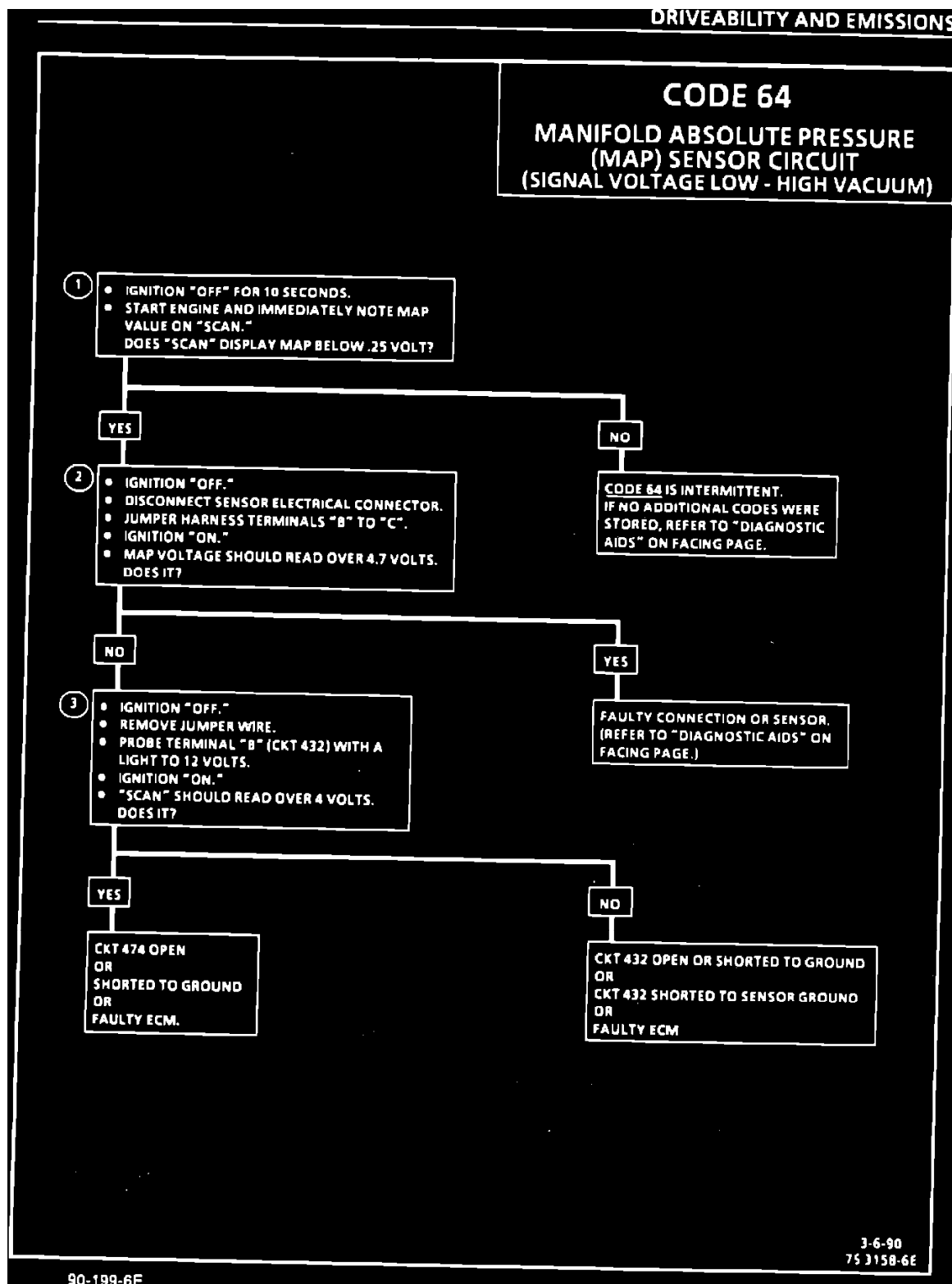
An intermittent open in CKTs 432 or 474 will result in a **Code 64**.

With the ignition "ON" and the engine "OFF," the manifold pressure is equal to atmospheric pressure and the signal voltage will be high. This information is used by the ECM as an indication of vehicle altitude.

Comparison of this reading with a known good vehicle with the same sensor is a good way to check accuracy of a "suspect" sensor. Readings should be the same  $\pm .4$  volts. Also CHART C-1D can be used to test the MAP sensor. Refer to "Intermittents" in Section "B".

**NOTE:** Make sure electrical connector remains securely fastened.

- Check all connections.
- Disconnect sensor from bracket and twist sensor By hand (only) to check for intermittent connections. Output changes greater than .1 volt indicates a bad connector or connection. If OK, replace sensor.
- Refer to CHART C-1D, MAP sensor voltage output check for further diagnosis.



- Diagnostic Chart Code 64.

Technical Service Bulletin # 316501R

Date: 930601

## Tools - Introduction Of The Fuel Injector Tester

NO.: 93-I-39

DATE: June, 1993

GROUP: 6

CORP. NO.: 316501R

SUBJECT:

INFORMATION ON THE INTRODUCTION OF THE FUEL INJECTOR TESTER TOOL J - 39021

This bulletin is being revised to add information about the coil test and a list of driveability problems.

In February, 1993, Kent-Moore shipped a new Fuel Injector Tester, tool J-39021, as part of the Essential Tool Program. This tool has the capability of performing injector balance and coil tests on all GM and many non-GM fuel injection systems. The injector balance test is one familiar to most

technicians where fuel pressure drop is measured as an injector is energized for a set period of time. This fuel pressure drop is compared to that of the other injectors in the vehicle or a published standard.

The injector coil test is a new test whereby the injector's resistance is measured during normal operation by feeding a fixed current through the injector and measuring the voltage across the injector. Injector coil failures are more accurately detected using this method than by simply measuring the injectors resistance with an ohmmeter. Refer to the instructions included with the tool for testing procedures.

This tool, and the injector coil test specifically, were developed to detect deterioration of injector coils due to the introduction of injector cleaners and fuel blends containing high levels of alcohol. Alcohol and water carried by the alcohol may attack and corrode injector coils resulting in a change in coil resistance and one or more of the following driveability symptoms:

- ^ rough idle
- ^ engine miss/surge
- ^ stall after start/hard start
- ^ fails emission test
- ^ poor fuel economy
- ^ exhaust odor

The injector coil test procedure also requires the use of the Digital Voltmeter, J-39200, to measure the voltage across the injector during the test. The Fuel Injector Tester, J-39021, supplies one of three fixed current values throughout the duration of the test. Selection of the supply current value (0.5, 2.5, or 4.0 amps) is based on the injector's specified resistance. When the push-to-start-test button is pressed, the tool energizes the injector coil for five seconds. The condition of the injector coil (pass/fail) is determined by the voltage reading displayed on the voltmeter while the injector is energized. Instructions and specifications for most GM fuel injectors are included with the tool.

Technical Service Bulletin # **04-06-04-051B**

Date: **060104**

## **Fuel System - Fuel Injector Maintenance Cleaning**

Bulletin No.: 04-06-04-051B

Date: January 04, 2006

### **INFORMATION**

Subject:  
Maintenance Cleaning of Fuel Injectors

Models:  
2006 and Prior All General Motors Passenger Cars and Trucks  
2003-2006 HUMMER H2  
2006 HUMMER H3

Supercede:

This bulletin is being revised to add models and model years and update the name and part number of GM Fuel System Treatment. Please discard Corporate Bulletin Number 04-06-04-051A (Section 06 - Engine/Propulsion System).

General Motors is aware that some companies are marketing tools, equipment and programs to support fuel injector cleaning as a preventative maintenance procedure. General Motors does not endorse, support or acknowledge the need for fuel injector cleaning as a preventative maintenance procedure. Fuel injector cleaning is approved only when performed as directed by a published GM driveability or DTC diagnostic service procedure.

Due to variation in fuel quality in different areas of the country, the only preventative maintenance currently endorsed by GM regarding its gasoline engine fuel systems is the addition of GM Fuel System Treatment PLUS, P/N 88861011 (for U.S. ACDelco(R), use P/N 88861013) (in Canada, P/N 88861012), added to a tank of fuel at each oil change. Refer to Corporate Bulletin Number 03-06-04-030A for proper cleaning instructions.

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



**WE SUPPORT  
VOLUNTARY  
TECHNICIAN  
CERTIFICATION**

Disclaimer Technical Service Bulletin # **882518A**

Date: **880601**

## **ECM - Intermittent Connection**

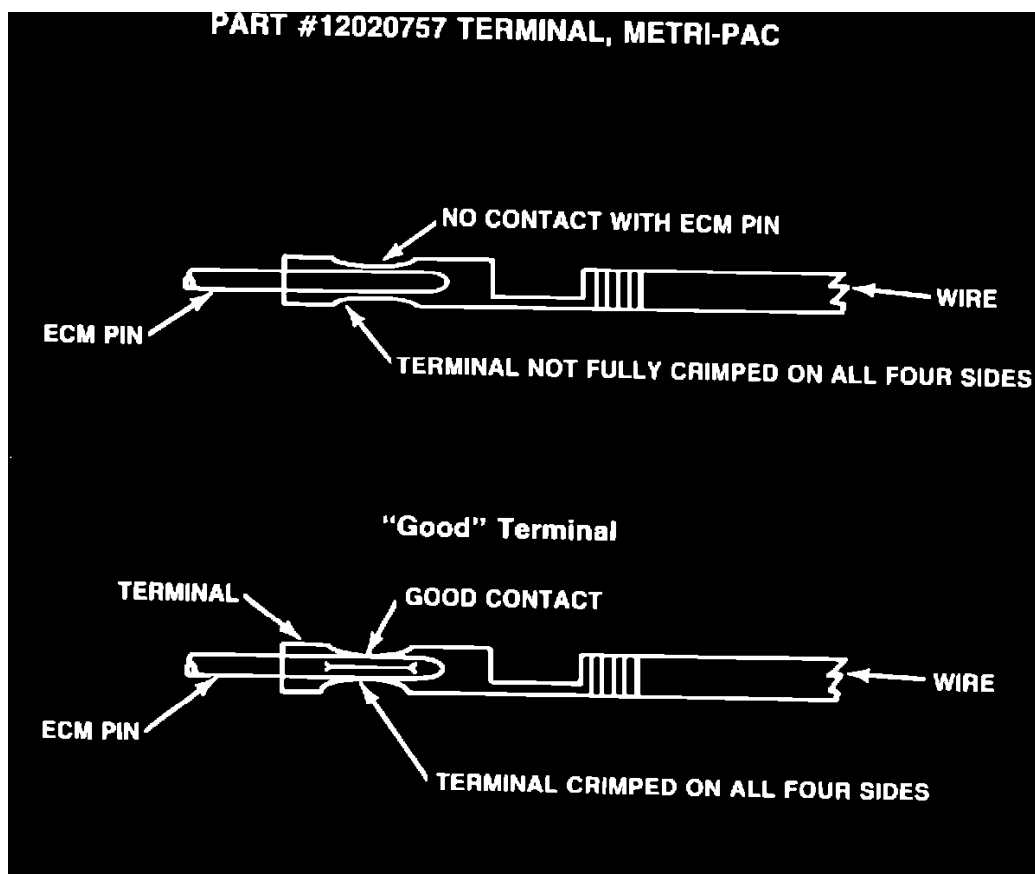
Number: 88-251-8A

Section: 8A



Date: JUNE, 1988  
Subject: INTERMITTENT CONNECTION TO THE ECM

Model and Year: 1988 CHEVROLET PASSENGER CARS AND LIGHT DUTY TRUCKS



TO: ALL CHEVROLET DEALERS

A condition may exist in which the female terminals in the connector to the ECM do not make a solid connection to the male pins in the ECM (see illustration). This can result in an intermittent condition, in any circuit operated by the ECM. The Service Manuals direct a check of connections any time an intermittent condition is found, and this may be the cause of some of these conditions.

Visually inspect the terminal using a flashlight, or use a .95 mm pin gauge. The gauge should not pass freely through the female terminal. Do not probe the terminal with anything other than the pin gauge, as probing could damage the terminal. If the female terminal does not grip properly, replace the terminal with P/N 12020757. General directions on wiring repair are shown in Section 8A of the service Manual.

Technical Service Bulletin # 8842

Date: 870901

## Engine Controls - ECM May Contain Wrong PROM

Number: 88-42

Section: 6E

Date: Sept., 1987  
Subject: SERVICE REPLACEMENT ELECTRONIC MODULES (ECM) WITH PROM INSTALLED

Model and Year: 1981-88 ALL MODELS  
TO: ALL CHEVROLET DEALERS

It has been brought to our attention that some service replacement electronic control modules (ECM's) have contained a PROM. A PROM should not have been included in a replacement ECM as it may not be the correct PROM for the vehicle.

When this situation is encountered, the PROM should be removed from the replacement ECM and the PROM from the vehicle should be installed.  
Technical Service Bulletin # 913846E

Date: 910801

## ECM/PCM - Damaged and/or Misdiagnosed

Number: 91-384-6E

Section: 6E

Date: AUGUST 1991

Corporate Bulletin No.: 176503

Subject: DAMAGED ECM/PCM AND/OR MIS-DIAGNOSED ECM/PCM SYMPTOMS DUE TO INCORRECT "TAP-TESTING" PROCEDURES

Model and Year: 1982-91 ALL PASSENGER CARS AND TRUCKS

CONDITION: Because of the intermittent nature of some Electronic Control Module (ECM) or Powertrain Control Modules (PCM) symptoms, some service technicians have been subjecting the ECM/PCM to vibration and/or shock testing. Commonly known as tap-testing, this procedure involves tapping on the ECM/PCM case, while the engine is running. It is generally accepted that if the engine or ECM/PCM falters due to the tapping, an intermittent internal ECM/PCM defect may be indicated. However, this may not always be true. If too much force is applied to the ECM/PCM during the test the following symptoms may result:

- ^ Immediate ECM/PCM failure.
- ^ ECM/PCM suffers damage which may cause a failure at a later date.
- ^ ECM/PCM Reset (or Glitch), creating a momentary stall, miss Service Engine Soon (SES) light and/or loss of serial data.

CAUSE: The ECM/PCM should be tapped using only the fingertips of one hand. Use of the palm, fist, or any type of tool subjects the ECM/PCM to forces that can cause both the circuit board and the outer aluminum case to flex and distort beyond design limits. The Integrated Circuits (IC) used in today's ECM/PCMs are mounted to the circuit board using a mounting process referred to as "surface technology." There are no circuit board holes for IC leads to go through. The IC leads set on pads, (28 pads or 52 pads depending on the IC) and solder is flowed around the leads to make the electrical connection to the circuit board.

- ^ Any flexing of the circuit board, beyond design limits, places the IC solder connections at risk of damage. Such damage may be apparent immediately, or it may appear at a future date. Circuit board deflection can occur as a result of striking the ECM/PCM, using ONLY THE PALM OF THE HAND.
- ^ If struck on the bottom side (the side opposite the service label), the ECM/PCM's aluminum outer case may deflect inward far enough to contact the electrical leads attached to the circuit board. Once in contact with the case the ECM/PCM electrical components will be shorted directly to ground. Although such shorting certainly has the potential to damage the ECM/PCM, it may not be permanent damage, depending on which circuit is involved. However, even if permanent damage is avoided, a short on any of the circuits will cause a disruption of normal ECM/PCM operation for the instant that the short occurs. This disruption may cause the ECM/PCM to reset (see "reset" above), creating the false impression that it is vibration sensitive or faulty. Reset is the ECM/PCM's normal way of coping with large voltage spikes. An ECM/PCM reset does not indicate that the ECM/PCM is defective or faulty, only that it is being subjected to abnormal conditions.

CORRECTION:

1. TAP THE ECM/PCM ONLY ON THE TOP SIDE (The top side is where the service label is located.)
  - ^ This will minimize the chance of deflecting the ECM/PCM case into the electrical leads on the circuit board. The clearance between the case and the circuit board is closest on the bottom side of the ECM/PCM.
2. TAP THE ECM/PCM USING ONLY THE FINGERTIPS - NO TOOLS.
  - ^ To avoid excessive case deflection, avoid tapping in the center of the case. Tapping close to the edge of the ECM/PCM, especially in the corners, is best.
  - ^ While using greater force may seem more effective, the test itself may cause the ECM/PCM to fail.

Technical Service Bulletin # **913186E**

Date: **910501**

## **ECM/PCM - Damage Prevention**

Number: 91-318-6E

Section: 6E

Date: MAY 1991

Corp. Bulletin No.: 176502R

Subject: DAMAGE TO ECM/PCM CIRCUIT BOARD WHEN INSTALLING A MEM-CAL

Model and Year: 1986-91 ALL PASSENGER CARS AND TRUCKS

**CONDITION:** When installing a service replacement ECM/PCM, the use of incorrect MEMCAL installation procedures may cause the ECM/PCM to fail before it can be installed in the vehicle. This condition may appear as if the ECM/PCM were defective when it was shipped to the dealership, when in fact it was damaged while being installed. In addition this condition may also occur when installing an "updated" service MEM-CAL into the vehicles original equipment ECM/PCM.

**CAUSE:** Excessive vertical force may be applied to the MEM-CAL resulting in flexing of the circuit board and damage to the connections between the circuit board and attached components. Excessive vertical force may be generated in two ways.

1. Incorrect MEM-CAL installation procedure.
2. Interference between MEM-CAL and cover.

**CORRECTION:** Use the following procedure.

**Service Procedure:**

**Important:** This procedure supersedes any instructions regarding MEM-CAL installation dated prior to September 1990.

1. Inspect the MEM-CAL to determine if a cork spacer is glued to the top side of the MEM-CAL assembly. If so, remove it prior to installation.
2. Align small notches with matching notches in the ECM/PCM MEM-CAL socket.
3. VERY GENTLY press down on the ends of the MEM-CAL until the locking levers are rotated toward the sides of the MEM-CAL.

**Notice:** To avoid ECM/PCM damage, do not press on the ends of the MEM-CAL until the levers snap into place.

Do not use any vertical force beyond the minimum required to engage the MEM-CAL into its socket.

4. While continuing light pressure on the ends of MEM-CAL, use your index fingers to press the locking levers inward until they are snapped into place. Listen for click.
5. Install MEM-CAL cover and install ECM/PCM in vehicle.

**Technical Service Bulletin # 81I37**

**Date: 810201**

## **Oxygen Sensors - Silica Contamination**

Model Year: 1981

Bulletin No: 81-I-37

File In Group: 60

Number: 11

Date: Feb. 81

**Subject:**  
Silica Contamination of Oxygen Sensors and Gelation of Oil.

**Models Affected:**  
All

Oxygen sensor performance can deteriorate if certain RTV silicone gasket materials are used. Other RTV's when used with certain oils, may cause gelation of the oil. The degree of performance severity depends on the type of RTV and application of the engine involved.

Therefore, when repairing engines where this item is involved, it is important to use either cork composition gaskets or RTV silicone gasket material approved for such use. GMS (General Motors Sealant) or equivalent material can be used. GMS is available through GMPD with the following part numbers:

1052366            3 oz.

1052434            10.14 oz.

**Technical Service Bulletin # 883475**

**Date: 880901**

## **Brakes - Rubbing/Grinding Noise From Rear**

**Number:**        88-347-5

Section: 5

Date: SEPT., 1988

Subject: RUBBING/GRINDING NOISE FROM REAR BRAKES

Model and Year: 1985-88 SPRINT

TO: ALL CHEVROLET DEALERS

Some of the above vehicles may exhibit a grinding or rubbing noise from the rear brakes on application after an extended period of non-use, approximately 8 hours or more. This condition may be aggravated by high humidity, condensation or rain during the park period.

A new lining material has been developed which eliminates the described noise condition. This lining material was introduced on late 1988 model year vehicles beginning with the following VIN's: Model Year Code J.

**VIN BREAKPOINT**

3 Door	
(VIN Body Code 2)	769929
"Metro" 3 Dr.	
(VIN Carline Code MS)	769666
5 Door	
(VIN Body Code 6)	769691
"Turbo"	
(VIN Engine Code 2)	N/A

For vehicles built before these VIN breakpoints that exhibit the described condition, new style brake shoe assemblies should be installed in place of the existing parts.

Following service manual procedures remove and replace four rear brake shoes using parts obtained in kit, P/N 96061639, shoe set, brake. This kit provides parts for one wheel only, 2 kits will be required for each vehicle.

Parts are currently available from GMSPO.

Labor Operation Number: H0257

Labor Time: 1.0 Hour

Technical Service Bulletin # **882145**Date: **880601****Brakes - Rattle Noise At Idle With Brakes Applied**

Number: REISSUE 88-214-5

Section: 5

Date: JUNE, 1988

Subject: RATTLE NOISE AT IDLE WITH BRAKES APPLIED

Model and Year: 1985-88 SPRINT

TO: ALL CHEVROLET DEALERS

Dealer Service Bulletin 88-214-5 is being reissued to correct the involved models. The bulletin affects 1985-88 sprint vehicles, not Spectrums. All copies of 88-214-5 dated May, 1988 should be discarded.

Some of the subject vehicles may exhibit a rattle noise from the area of the brake booster when the engine is idling and the brake applied. This condition is more common on vehicles equipped with automatic transmission and occurs only when the engine is cold.

The repair is to replace the vacuum check valve at the booster using P/N 96057459 available from GMSPO.

This part has been revised in order to prevent the check valve being agitated by the vacuum pulses present in the vacuum line to the booster at idle.

Labor Operation Number: T1338

Labor Time: .3 Hours

Technical Service Bulletin # **89986D**Date: **890301****Battery - Charging Precautions**

Number: 89-98-6D

Section: 6D

Date: MARCH, 1989

Subject: CHARGING LOW OR COMPLETELY DISCHARGED DELCO FREEDOM BATTERIES

Model and Year: 1987-89 CHEVROLET PASSENGER CARS AND LIGHT DUTY TRUCKS

TO: ALL CHEVROLET DEALERS

Most deeply discharged Delco Freedom batteries can be recharged proper charging procedures are followed. To obtain maximum results and avoid needless replacement of good batteries, attention must be given, to charging time, battery connections and charging procedures.

"CAUTION" Explosive Gases - All lead-acid batteries generate hydrogen gas which is explosive if ignited by spark or flame. Always shield eyes and face from battery. Do not charge or use booster cables or adjust terminal connections without proper instruction and training.

POISON - Causes Severe Burns - Battery contains sulfuric acid. Avoid contact with skin, eyes, or clothing. In event of accident, flush with water and call a physician immediately.

## **Charging Time Required**

The time required to charge a battery will vary depending upon the following factors:

Reserve Capacity of the Battery - Expressed in minutes, reserve capacity is the amount of time required for a fully charged battery at 80 degrees Fahrenheit, discharged at a constant rate of 25 amperes, to reach a terminal voltage of 10.5 volts. When completely discharged, a battery with a reserve capacity rating of 180 minutes requires at least twice as much recharging as a completely discharged battery with a reserve capacity rating of 90 minutes. The reserve capacity rating shown on the battery label or in test specification bulletins may be used to estimate the ampere-hours of recharge (average charging amperes multiplied by the hours of charging) that may be required. For example, a 90 minute reserve capacity battery can usually be completely recharged in 9 hours if the charging current flowing into the battery averages 10 amperes ( $10 \times 9 = 90$ ). If the current averages 30 amperes, 3 hours would be sufficient ( $30 \times 3 = 90$ ). The actual current flow will depend on both the condition of the battery and the output capabilities of the charger. Use the average charging current as indicated by the charger ammeter to calculate ampere hours of charge.

Temperature - A longer time will be needed to charge any battery at 0 degrees Fahrenheit than at 80 degrees Fahrenheit. When a fast charger is connected to a cold battery, the current accepted by the battery will be very low at first, then in time the battery will accept a higher rate as it warms. For best results, allow cold batteries to warm to room temperature before charging.

Charger Capacity - A charger which can supply only 5 amperes will require a much longer period of charging than a charger that can supply 30 amperes or more. To minimize charging time, maximize the charging current flow by utilizing the highest charger voltage output setting for a 12 volt battery. Use of a "maintenance free" setting offered on some chargers is not necessary when charging Delco Freedom batteries, and should be avoided when another setting of the charger will give a higher voltage output. The most efficient charging will occur when a voltage of at least 16 volts can be attained.

NOTE: Do not use "boost", "jump start" or "crank" settings to charge batteries if charger is equipped with any of these settings.

State of Charge - A completely discharged battery requires more than twice as much charge as a fifty percent discharged battery. Because the electrolyte is nearly pure water and a poor conductor in a completely discharged battery, the current accepted by the battery will be very low at first. The charging current will increase as the acid content in the electrolyte increases.

### **BATTERY CONDITIONS**

Adapters that provide good contact with the battery terminal pads, AC-Delco Part Number ST-1201, GM Part Number 1846855, or equivalent, are preferred for attaching chargers and test equipment to side and top terminal batteries. Clean battery terminals, adapters and charger or test equipment clamps to ensure good, low resistance connections. If the recommended adapters are not available, standard fasteners should not be used except as noted below. Failure to follow these procedures could result in damage to the battery terminals or high resistance connections that will prevent adequate charging current from reaching the battery.

Side Terminal Batteries - Two 3/8" standard thread (16 UNC) bolts (UNPLATED), at least 1.5 inches long and two standard 3/8" nuts (UNPLATED) are required. Using fingers, screw nuts onto bolts, screw bolts (with nuts) into side terminals until they bottom out, then back off one full turn. Do not tighten with wrench or pliers as bolts can be driven through the case. Holding the bolt, tighten the nut until it is against the battery terminal pad. Snug nut with wrench or pliers. Do not overtighten as battery terminals could be damaged. Attach the charger clamps to the nuts. Charging current can then flow through the battery terminal pads.

Top Terminal Batteries - Two 3/8" standard thread (16 UNC) nuts, AC-Delco Part Number 7802, GM Part Number 1892161 or equivalent, are required. Charger clamps must be placed between the nuts and the battery terminal pads to ensure good contact with the lead pads. Snug nuts with wrench or pliers. Do not overtighten as battery terminals could be damaged. Charging current can then flow through the battery terminal pads.

NOTE: Good contact must be maintained between the charger and battery terminal pads to ensure maximum results. Failure to provide good contact increases charging time by approximately one third.

## **Charging Procedure**

The following procedure should be used to recharge a very low or completely discharged battery:

**Hydrometer Check** - Clean the cover, look into the built-in hydrometer and use a flashlight if necessary, to observe its reading. To ensure an accurate reading, gently tap the top of the hydrometer to dislodge any air bubbles that might cause a false green, clear or light yellow appearance.

**Green Dot Visible** - Any green appearance is interpreted as a "green dot" and indicates that the battery is 65 percent or above in state of charge and is ready for use or testing. A fully charged battery should have an output of 12.6 or more volts at the terminals.

**Dark (Green Dot Not Visible)** - Indicates the battery is below 65 percent state of charge and needs charging prior to testing.

**Clear or Light Yellow** - Indicates the fluid level is below the bottom of the hydrometer. This may be caused by a cracked or broken case. A battery in this condition should be replaced. Excessive or prolonged charging, excessive tipping or normal battery wearout can cause a clear or yellow light and battery replacement is required. Do not charge, test or jump start. A dark reading may be misinterpreted as a clear or light yellow reading when inspecting a Delco Freedom battery. Gently tap on the top of the hydrometer to dislodge any air bubbles that might cause a false reading. If the hydrometer remains clear or light yellow, the battery should be replaced.

**Measure Terminal Voltage** - Measure voltage across the battery terminals with a voltmeter. If below 11 volts, the initial charge current will be very low (milliamperes) and it may take several hours before the battery can accept a charging current measureable by the ammeters used on most chargers.

**Connect Charger** - Connect battery to charger and connect charger to power source. Set charger on high setting.

**NOTE:** Do not use "boost", "jump start" or "crank" settings to charge batteries if charger is equipped with any of these settings.

**Polarity Protection** - some chargers feature polarity protection circuitry which prevents charging unless the charger leads are connected to the battery terminals correctly. A completely discharged battery may not have enough voltage to activate this circuit, even though the leads are connected properly, making it appear as though the battery will not accept charging current. Therefore, follow the manufacturer's specific charging instructions telling how to bypass or override the circuitry so that the charger will turn on and charge a low voltage battery.

**Measure Charging Voltage** - Measure voltage across the battery terminals with a voltmeter, charger connected and operating. If the initial charging voltage is 16 volts or greater, it may take 4 hours before the typical charger ammeter indicates a measureable charging current for a deeply discharged battery. If the initial charging voltage is below 16 volts, as many as 8 to 16 hours may be required before charging current is noted on the ammeter. If no charging current is apparent on the charger ammeter after these times, the battery should be replaced. Measureable charging current within these times indicates that charging should be continued in the normal manner.

## CHARGING VOLTAGE

Charger Voltage	Hours
16.0 or More	Up to 4.0 Hrs.
14.0 to 15.9	Up to 8.0 Hrs.
13.9 or Less	Up to 16.0 Hrs.

**Monitor Battery** - Monitor battery hourly for gassing or spewing of electrolyte and battery temperature above 125 degrees Fahrenheit as judged by feel. Adjust or temporarily halt charging as required to avoid these conditions and permit cooling. Check hydrometer hourly for green dot. Gently tap the top of the hydrometer to dislodge any trapped air bubbles that might cause a false reading. When the green dot remains in view, the battery is charged and ready for load test. If the green dot does not appear after an ampere-hour charge equal to twice the reserve capacity rating of the battery is applied, replace the battery.

**Load Test** - It is recommended that any battery recharged by this procedure be load tested to establish serviceability.

If the battery is in the vehicle, make sure the engine control switch is off. If there is more than one battery, check each separately.

1. Disconnect the battery cables from the terminals.
2. Install adapter AC-Delco Part Number ST-1201, or equivalent.
3. If adapters are not available, use two 3/8" standard thread (16 UNC) bolts UNPLATED, at least 1.5 inches long, and two standard 3/8" UNPLATED nuts. Finger tighten. Contact must be made through the lead pads at the face of the terminals, not through the threads of the bolt.
4. Install a voltmeter and battery load tester to the adapters.
5. Remove the surface charge from recently charged batteries by applying a 300-ampere load across the adapters for 15 seconds.
6. Do not remove the surface charge from batteries which have been in storage.
7. Turn the load off and wait 15 seconds for the battery to recover.
8. Apply the specified load indicated on the battery label. If a load test figure is not indicated, apply 50% of the cold cranking amp hour rating indicated on the battery specification tag. Observe the battery voltage after 15 seconds with the load connected, then turn off the load.

**NOTE:** Battery tester cable clamps should be between terminal nuts and lead pads of terminals. If not possible, load value should be 275 amperes.

9. If the battery voltage does not drop below the minimum voltage as shown in the following "Voltage and Temperature" chart, the battery is good and should be returned to service. The battery temperature must be estimated by feel and by the temperature the battery has been exposed to for the preceeding few hours. If the battery voltage drops below the minimum voltage listed, replace the battery.

## VOLTAGE AND ELECTROLYTE TEMPERATURE CHART

Estimated  
Electrolyte  
Temperature

Minimum  
Required Voltage  
Under 15 Sec. Load

21 degrees C (70 degrees F and Above) . . . . .	9.6	10 degrees C (50 degrees F) . . . . .	9.4	-1 degree C (30 degrees F) . . . . .	9.1	10 degrees C (15 degrees F) . . . . .	8.8	-18 degrees C (0 degrees F) . . . . .	8.5
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**Battery Replacement Summary**

Replacement of batteries under warranty should occur only when one or more of the following conditions exist:

1. Battery Hydrometer is clear or light yellow after tapping gently on the top of the hydrometer.
2. The charging current is not measurable after the specified time.
3. Physical damage.
4. Load test failure after proper charging (Reference Service Manual, Section 6D).
5. If green dot does not appear in the built in hydrometer after specified ampere hours of charge.

Technical Service Bulletin # **91148A**

Date: **900401**

**Battery - Parasitic Current Drain Diagnosis**

Number: 91-14-8A

Section: 8A

Date: April 1990

Corporate Bulletin No.: 076401

Subject: PARASITIC CURRENT DRAIN ON BATTERY

Model and Year: 1982-91 ALL PASSENGER CARS AND TRUCKS

Vehicles that have one or more on-board solid state control module (such as an Engine Control Module, E.C.M.) may, all some time, exhibit a failure mode of a control module which may result in a high parasitic current drain on the vehicle's battery.

The use of the conventional "Battery Electrical Drain Check" procedure may not find the cause of the electrical drain because when the battery cable is disconnected to install an ammeter, the solid state module that was causing an excessive current drain may not cause an excessive current drain once circuit continuity is restored. Cycling the ignition lock cylinder to the "RUN" and then to the "OFF" position may cause the excessive current drain by the module to recur, but the ignition lock cylinder should not be rotated to the "ACCESSORY," "RUN" or "START" position while an ammeter is installed between the battery terminal and the battery cable. Therefore, the following procedure should be followed when connecting an ammeter to perform a battery electrical drain check:

1. Assure that the ignition lock cylinder is in the "LOCK" position and all electrical accessories are turned off and all doors are closed.
  2. Disconnect the negative battery cable from the negative battery terminal.
  3. Install a side terminal battery adapter ST-1201 (or equivalent) to the negative battery terminal. Torque to 17 N-m (13 lb.ft).
  4. Connect a 3 mm squared (12 gage) jumper wire with an alligator clip on each end between the end of the negative battery cable and the side terminal battery adapter installed on the negative battery terminal.
  5. Rotate the ignition lock cylinder to the "RUN" position.
- CAUTION:** Do not rotate the ignition lock cylinder to the "START" position. Doing so will cause the 3 mm squared (12 gage) jumper wire to become extremely hot and may result in personal injury and vehicle fire.
6. Rotate the ignition lock cylinder to the "LOCK" position and remove the ignition key from the lock cylinder.

**IMPORTANT:** From this point, make sure that circuit continuity between the negative battery cable and the side terminal battery adaptor is not interrupted.

7. Connect an ammeter (set on the highest scale), capable of measuring at least 20 amperes, between the negative battery cable and the side terminal battery adaptor.

**IMPORTANT:** The ammeter will be connected in parallel to the 3 mm 2 (12 gage) jumper wire.

8. Remove the 3 mm squared (12 gage) jumper wire installed in step 4.

9. Adjust ammeter scale to lowest scale possible without going out of range and note ammeter reading.

10. Continue with normal battery electrical drain check procedures.

WARRANTY INFORMATION: Use applicable labor operations and Times.

Technical Service Bulletin # **89358**

Date: **881101**

## **Battery - Diagnosis and Charging**

Bulletin No. T-89-35  
File in Group 8  
Number 89  
Corp. Ref. No. 886401R  
Date Nov. 1988

SUBJECT: DELCO FREEDOM BATTERY DIAGNOSIS AND CHARGING

MODELS AFFECTED: ALL

This bulletin outlines the following service information:

I. Battery Storage: (In-Vehicle storage) Discusses battery storage procedures, parasitic loads, and includes a chart of fuses to pull to reduce these loads during storage.

II. Warranty Policy: Briefly discusses new warranty procedure as it pertains to battery charge and test (as outlined in DSIB 89-I-9).

III. Testing: Some brief tips for visual inspection and charging cautions.

IV. Diagnosing Parasitics: Contains an important procedure required to properly test 1986-1988 Eldorados and Seviles and 1987-1988 Allantes for parasitic drains (recommended for all carlines).

V. Charging: Tips relating to quick charging procedures. Also lists other sources of information.

Read all this information. Try recharging a deeply discharged battery; review training materials if necessary. The majority of deeply discharged batteries can be recharged if proper procedures are followed.

CAUTION: BATTERIES PRODUCE EXPLOSIVE GASES Always shield eyes and face from battery. Cigarettes, flames, or sparks could cause battery to explode. Do not charge or use booster cables or adjust terminal post connections without proper instructions and training.

CAUTION: BATTERIES CONTAIN SULFURIC ACID WHICH CAN CAUSE SEVERE BURNS

Batteries contain sulfuric acid. Avoid contact with skin, eyes or clothing. In the event of accident, flush with water and call a physician immediately.

### **I. Battery Storage In Vehicle**

Cadillacs have several electronic devices which result in very small but continuous current drains on batteries, commonly referred to as "parasitic loads". Parasitic loads may cause vehicles, not used for an extended period of time, to develop deeply discharged and/or permanently damaged batteries. Discharged batteries can freeze at temperatures as high as +20~F, causing permanent damage. Batteries that have been frozen should be scrapped. Never attempt to recharge or use a battery which has been frozen.

To prevent frozen or damaged batteries, assure that the battery green dot is visible before storing the vehicle. The negative battery cable should be disconnected on vehicles which are not going to be in service within a 30-day period. If this is not possible, batteries should be recharged periodically, every 30-60 days, until the green dot is visible (see section on charging). NOTE:

Disconnecting the battery may disable any vehicle security/anti-theft systems!

NOTICE: The ignition switch, headlights, RAP, etc., must be off when connecting or disconnecting battery jumper cables or chargers. Failure to do so may overstress or damage the ECM or other electronic components. Disconnecting jumper cables with the engine running may cause voltage surges that could damage headlamp bulbs or other electronic components.



REMOVE FUSES TO PREVENT PARASITIC DRAIN DURING STORAGE			
CARLINE	PRIMARY FUSE	SECONDARY FUSES	FUSE LOCATION
Allante'	R1 (30 amp) CPS and BCM	R2 (30 amp) ECM	Trunk – by power antenna
		L4 (30A) Cell phone	
Eldorado/ Seville	#5 (15 amp) CPS	#17 (10A) Radio Power	Glove Box
Deville/ Fleetwood	#11 (20A) Radio	(Battery negative cable is next most accessible item)	Fuse Block – drivers side

FIGURE 1 - RECOMMENDED FUSES TO PULL TO MINIMIZE PARASITICS DURING STORAGE

When disconnecting the negative battery cable is not practical for storage, Figure 1 can be used to determine which fuses should be pulled to minimize the parasitic drain. The "Primary" fuse should be pulled and placed in a location in the vehicle where sales and service personnel can easily find and reinstall it.

The fuse-pull suggestions found below, in Figure 1, are not designed to completely eliminate parasitic load; only disconnecting the battery negative cable can accomplish this. Rather, it should help eliminate some of the major draws in a convenient manner.

## II. Warranty Policy

Following proper testing and parasitic diagnosis procedures are in the best interests of the dealership in light of Warranty Policies and procedures outlined in DSIB 89-I-9. This bulletin states that Labor Operation N0100, "Battery charge and test", is to be used only in case of new vehicles received from the carrier with a discharged or "Dark Eye" battery. Recharge and/or replacement of new vehicle batteries on unsold cars in dealer inventory are the responsibility of the dealership.

Black Eye		Green Eye
<b>At Dealer Delivery</b>	<ul style="list-style-type: none"> <li>• Charge Battery and Test</li> <li>• Look for Root Cause of Drain</li> <li>• No Root Cause Found: Charge N0100</li> <li>• Root Cause Found: Charge Root Cause Labor Op and Add No More than .3 Other Labor Hours</li> </ul>	<ul style="list-style-type: none"> <li>• OK to Store</li> <li>• Take precautions</li> <li>• For Prolonged Storage, Disconnect Battery Negative Cable</li> <li>• Shorter Term Storage, Pull Fuses (see chart)</li> </ul>
<b>In Storage (before delivery)</b>	<ul style="list-style-type: none"> <li>• Charge Battery and Test</li> <li>• Look for Root Cause of Drain</li> <li>• No Root Cause Found: Vehicle stored too long without having battery disconnected or fuses pulled – Dealership responsibility</li> <li>• Root Cause Found: Charge Root Cause Labor Op and Add No More than .3 Other Labor Hours (authorization for other labor hours required)</li> </ul>	<ul style="list-style-type: none"> <li>• Take precautions</li> <li>• Disconnect Battery</li> <li>• Pull Fuses (see chart)</li> </ul>
<b>At Delivery (to customer)</b>	<ul style="list-style-type: none"> <li>• Charge Battery and Test</li> <li>• Look for Root Cause of Drain</li> <li>• No Root Cause Found: Vehicle stored too long without having battery disconnected or fuses pulled – Dealership responsibility, Pre-Delivery Inspection for green-eye</li> <li>• Root Cause Found: Charge Root Cause Labor Op and Add No More than .3 Other Labor Hours (authorization for other labor hours)</li> </ul>	<ul style="list-style-type: none"> <li>• OK to Deliver</li> </ul>
<b>In Service</b>	<ul style="list-style-type: none"> <li>• Charge Battery and Test</li> <li>• Look for Root Cause of Drain</li> <li>• No Root Cause Found: Inquire about Storage and Driving habits, inadvertent drains. Battery drain due to courtesy lamps, headlamps, etc inadvertently left on is the owners responsibility.               <ul style="list-style-type: none"> <li>– See notes on internal battery shorts in Section IV.</li> <li>– Check for bulletins which address intermittent conditions which could cause battery drains</li> </ul> </li> <li>• Root Cause Found: Charge Root Cause Labor Op and Add No More than .3 Other Labor Hours</li> </ul>	<ul style="list-style-type: none"> <li>• OK to Deliver</li> <li>• Test Battery if Other Diagnosis Indicates Necessity</li> </ul>

FIGURE 2 - WARRANTY PROCEDURE UNDER VARIOUS CONDITIONS

If a condition of discharged battery is a customer concern on a delivered vehicle, the root cause of the discharge should be diagnosed and repaired before the battery is charged and tested. Battery charge and test on delivered vehicles is to be submitted for approval at no more than 0.3 "Other Labor Hours" and is to accompany the repair operation that corrects the root cause of the discharge. Refer to Figure 2 on the next page.

### III. Testing the Battery

#### A. Visual Test

Check for obvious damage, such as cracked or broken case or cover that is permitting loss of electrolyte. If obvious damage is noted, replace the battery. Determine the cause of damage and correct as needed. If battery terminals are severely damaged, for instance loose, burned, or broken, replacement of the battery is recommended.

Evidence of small amounts of electrolyte leakage, especially around the vent holes, does not necessarily indicate the battery is defective. The leakage could have been caused by overcharging or tipping of the battery. If a small amount of the electrolyte leakage is detected, the battery should be fully charged OUT OF THE CAR so that any electrolyte that may escape does not damage the bumper filler panels or other components.




BUILT-IN HYDROMETER		
		
<b>"GREEN EYE"</b> GREEN DOT VISIBLE	<b>"BLACK EYE"</b> GREEN DOT NOT VISIBLE	<b>CLEAR</b>
<ul style="list-style-type: none"> <li>65% OR ABOVE STATE OF CHARGE</li> <li>READY FOR TESTING</li> </ul>	<ul style="list-style-type: none"> <li>BELOW 65% STATE OF CHARGE</li> <li>NEEDS CHARGE PRIOR TO TESTING</li> <li>CAN BE JUMP-STARTED OBSERVING OWNER'S MANUAL CAUTIONS</li> </ul>	<ul style="list-style-type: none"> <li>FLUID LEVEL BELOW BOTTOM OF HYDROMETER</li> <li>REPLACE BATTERY</li> <li>DO NOT CHARGE, TEST OR JUMP-START</li> </ul>

FIGURE 3 - BUILT-IN HYDROMETER

#### B. Reading Built-In Hydrometer

Look straight down into the built-in hydrometer to observe its reading, clean and use a flashlight if necessary, and tap lightly on top of the hydrometer to dislodge any trapped air bubbles that might prevent a correct reading. Refer to Figure 3.

### IV. Diagnosing Discharged Batteries and Parasitic Battery Drains

All no-start, slow cranking, and/or frequently discharged battery conditions should be thoroughly diagnosed to avoid unnecessary replacement of batteries. The battery should be charged and load tested in accordance with established service procedures as described in the Cadillac Service Information Manual before considering battery replacement. Examples of conditions causing low charged or discharged batteries are:

- Extended storage of vehicles.
- Batteries already discharged when vehicle is received, due to handling in transit and at assembly.
- Extended cranking periods due to plug fouling.
- Accessory lights left on with engine not running (courtesy, glove box, trunk lights).
- Insufficient recharge (ampere-hours) of discharged battery.
- Charging system problems.
- Continuous current draw on battery through parasitic drain.

VEHICLE ELECTRICAL SYSTEM PARASITIC LOAD @ 12.6 V (In mA)		
CARLINE		TYPICAL PARASITIC
ALLANTE'	4.1L	28 mA
ELDORADO	4.5L	22 mA
SEVILLE	4.5L	23 mA
DEVILLE	4.5L	20 mA
BROUGHAM	5.0L	15 mA
CIMARRON	2.8L	11 mA

FIGURE 4 - PARASITIC LOADS BY CARLINE

As was discussed previously in "Battery Storage", today's Cadillacs have several electronic devices which result in very small but continuous current drains on their batteries, commonly referred to as "parasitic loads". A parasitic drain of up to 50mA is considered normal, 30mA being about average. Any battery draw above 50mA, with ignition off and retained accessory power disabled (if so equipped), is excessive. Figure 4 gives approximate average values of design parasitic current draw for each carline.

Also, refer to the table of component parasitic loads found above under "Battery Storage". These values should only be used as general guidelines when diagnosing suspect components.

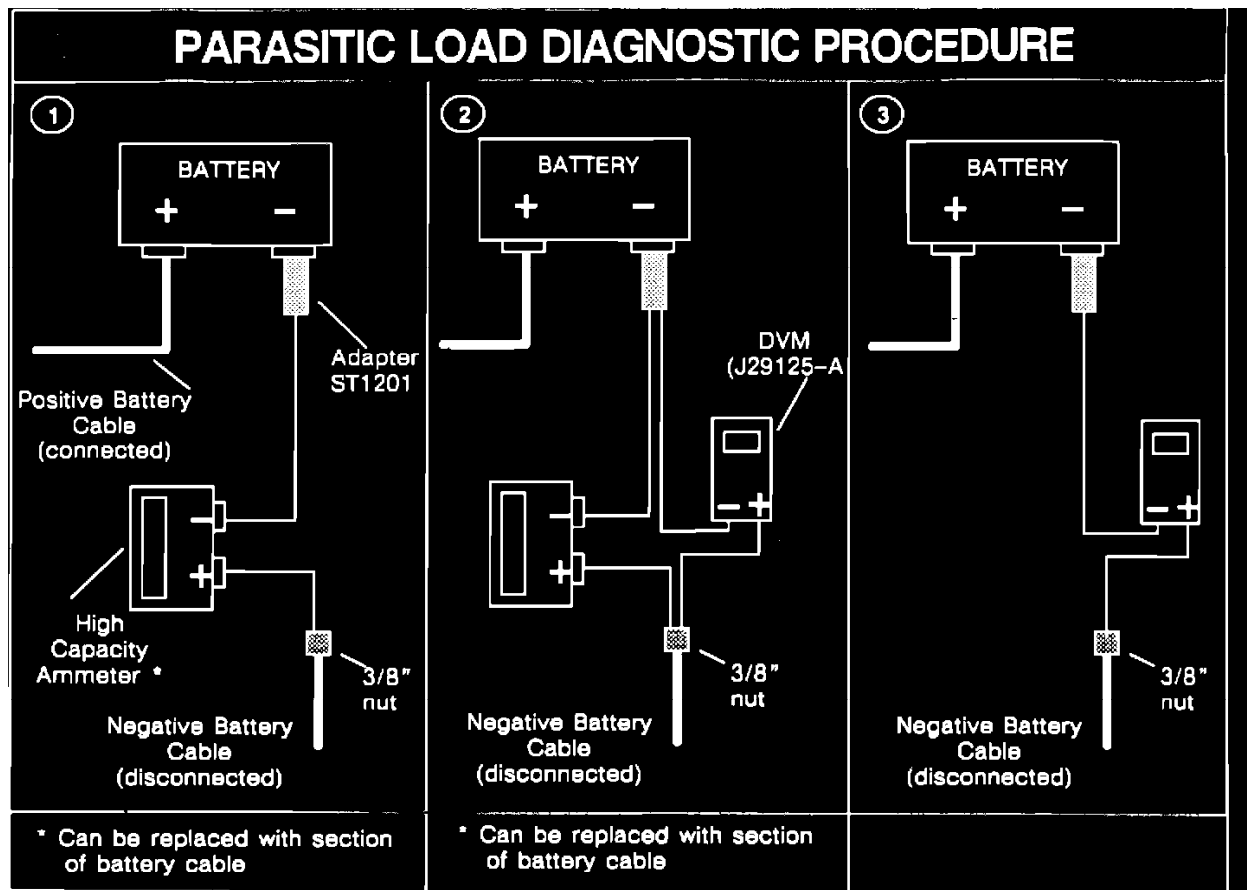


FIGURE 5 - PROPER PARASITIC LOAD DIAGNOSTIC PROCEDURE

A. How to Check the Battery Drain (Refer to Figure 5)

When checking any type of current draw, it is important to use an ammeter or digital multimeter to measure the amperage.

The electrical circuitry of most Cadillac vehicles require that the Body Computer Module (BCM) and the Central Power Supply (CPS) get an initialization charge whenever the battery power is first provided. This initialization occurs with the ignition key in the "OFF" position, and depending on how long the battery has been disconnected, the initial draw may last from 1 to 3 seconds and can range between 0.5 and 9.0 amps. Therefore, to prevent misleading readings or unnecessary fuse replacement on the digital multi-meter, J-29125, or similar equipment, the following procedure is recommended. THIS PROCEDURE is PARTICULARLY CRITICAL ON THE 1987-1988 ALLANTE AND THE 1986-1988 ELDORADO AND SEVILLE. It is recommended as a good practice for all vehicles.

1. Disconnect the negative battery cable.
2. Install a battery side terminal adapter, AC-Delco ST1201 or equivalent, in the negative terminal of the battery.
3. Install a 3/8 nut, with standard threads (16 UNC) on the negative battery cable attaching screw to assure a good electrical contact with the lead face on the cable for testing. Yellow or black finish nuts are generally non-conductive and should not be used.
4. With all lights, accessories, Retained Accessory Power (RAP), and the ignition switch off, connect a high capacity ammeter at least 10 amps from the negative battery cable to the side terminal adapter. This high capacity ammeter is connected to verify whether or not a high current draw is occurring at a constant rate. It is this type of high current draw which will blow the fuse in lower capacity ammeters. After the initial draw occurs, the ammeter reading should drop below 1 amp.

NOTE: If a high capacity ammeter is not available, install a section of heavy wire (preferably a battery cable) between the existing battery negative cable and the side terminal adapter. Allow ample time (approximately 30-60 seconds) for the initial draw to occur and proceed to step 5.

5. With the high capacity ammeter or battery cable section still connected, connect the digital multi-meter, set to the 2000 DCmA range, in parallel with the high reading ammeter.

VEHICLE ELECTRICAL SYSTEM PARASITIC LOAD @ 12.6 V (In mA)		
CARLINE		TYPICAL PARASITIC
ALLANTE'	4.1L	28 mA
ELDORADO	4.5L	22 mA
SEVILLE	4.5L	23 mA
DEVILLE	4.5L	20 mA
BROUGHAM	5.0L	15 mA
CIMARRON	2.8L	11 mA

**FIGURE 4 - PARASITIC LOADS BY CARLINE**

SAMPLE COMPONENT PARASITIC LOADS (mA)		
COMPONENT	TYPICAL PARASITIC	MAXIMUM PARASITIC
BCM	3.6	12.4
ECM	5.6	10.0
RADIO	3.0	6.0
GENERATOR REGULATOR	1.4	2.0 3.5 ALLANTE
ELC/ALC	2.0	3.3
CPS	1.6	2.7
ILLUMINATED ENTRY	1.0	1.0
THEFT	0.35	1.0
AUTO DOOR LOCKS	1.0	1.0
CHIME	1.0	1.0
HVAC POWER MODULE	1.0	1.0

FIGURE 6 - SAMPLE COMPONENT PARASITIC LOADS (IN mA)

6. Disconnect the high capacity ammeter and take the reading with the digital multi-meter.

A current draw of 50mA or less (see values in Figures 4 and 6) indicates that all lights and accessories are off and that there is no unexplained current draw. Care should be taken to allow for a time delay before reading the meter on vehicles equipped with Electronic Level Control (ELC) (not found on Allante).

Due to this initialization process, test lamps CANNOT be used in place of ammeters to diagnose current draw conditions. The voltage drop across the test lamp prevents the initialization process from occurring.

#### Clamp-On Ammeters:

Clamp-on ammeters may be used if the meter can measure in the milli-amp range and if the meter clamp can fit around all of the battery negative or positive cables. All of the cables must fit in the clamp with the clamp closed to be sure that all of the parasitics are being measured. Zero the clamp-on ammeter carefully. Magnetic fields from engine electrical items (generator, ignition, solenoids) and from shop sources (fluorescent lights, power cables) can alter the clamp-on meter readings. If the parasitic readings are not repeatable, use the series measurement method described in this bulletin.

- B. Determining the Source of the Drain

Once it has been determined that a parasitic drain in excess of 50 mA exists, a visual inspection of the vehicle should be conducted. Check to see if there are any unwanted lights on, motors running or switches/relays activating.

VEHICLE ELECTRICAL SYSTEM PARASITIC LOAD @ 12.6 V (In mA)		
CARLINE		TYPICAL PARASITIC
ALLANTE'	4.1L	28 mA
ELDORADO	4.5L	22 mA
SEVILLE	4.5L	23 mA
DEVILLE	4.5L	20 mA
BROUGHAM	5.0L	15 mA
CIMARRON	2.8L	11 mA

FIGURE 4 - PARASITIC LOADS BY CARLINE

If no cause for the draw is immediately apparent, it may be possible to narrow in on the source by systematically removing fuses and circuit breakers, one by one, from the fuse panels. This should be done while monitoring the ammeter so that a disruption of the drain will be evident. Refer to Figure 4 for average and maximum parasitic loads for various vehicle components.

SAMPLE COMPONENT PARASITIC LOADS (mA)		
COMPONENT	TYPICAL PARASITIC	MAXIMUM PARASITIC
BCM	3.6	12.4
ECM	5.6	10.0
RADIO	3.0	6.0
GENERATOR REGULATOR	1.4	2.0 3.5 ALLANTE
ELC/ALC	2.0	3.3
CPS	1.6	2.7
ILLUMINATED ENTRY	1.0	1.0
THEFT	0.35	1.0
AUTO DOOR LOCKS	1.0	1.0
CHIME	1.0	1.0
HVAC POWER MODULE	1.0	1.0

FIGURE 6 - SAMPLE COMPONENT PARASITIC LOADS (IN mA)

Figure 6 gives an approximate indication of typical and maximum parasitic loads by component in milli-amps (mA).

In addition to parasitic loads, a certain amount of self-discharge is always occurring as a result of internal chemical reactions even when the battery is not connected. The higher the ambient temperature, the greater the amount of self-discharge. This explains why the number of discharged batteries may increase at your location in very hot weather. The original equipment battery has a much lower rate of self-discharge than conventional batteries, however, self-discharge at 100 degrees ambient can be as high as 7mA.

## V. Battery Charging

Dealership service personnel are advised to refer to Cadillac Serviceman Bulletin T-83-12, Group 6D for detailed instructions on:

1. Battery Side Terminal Connections
2. Battery Charging

3. Charging Time Required
4. Load Testing

**NOTES:**

1. The majority of discharged batteries can be recharged using normal battery charging procedures. Some deeply discharged batteries or batteries which have been allowed to remain in a discharged state may need a higher charge voltage initially to start the recharging process.
2. The Freedom battery is more resistant to overcharging damage than conventional batteries. Boost or Quick-Charge settings on battery chargers may be safely used in most instances. (This is not true of other non-Delco OE batteries and many aftermarket batteries.)
3. With the battery at room temperature, voltages as high as 15.0 volts to 16.0 volts may be safely used without causing battery damage. Cold batteries require more voltage to cause them to accept current. Warm batteries will accept less voltage without causing overcharging.
4. After starting the battery on charge and periodically during the charging process, the battery should be checked to assure that it is not overcharging. Overcharging can be identified by excessive battery case temperature and electrolyte boiling or bubbling (or spewing out the vents).
  - ^ Battery case temperatures of about 125~F is the maximum which should be allowed. Check by hand feel and reduce the charge rate if high temperatures are found.
  - ^ Excessive electrolyte bubbling or boiling indicates that the charge voltage is too high and that the battery is being forced to accept too much current. Turn down the charge rate if high temperatures are found.
  - ^ A battery with an internally shorted cell will show signs of overcharging at normally acceptable voltages. If charge voltages of around 13 volts result in overcharging (on a battery at room temperature or cooler), disconnect the battery and check the voltage. Batteries with internal shorts will exhibit a drop in voltage over time. Batteries with internal shorts should be scrapped.

Technical Service Bulletin # **912136D**

Date: **910201**

## Battery - Parasitic Draw Test

Number: 91-213-6D

Section: 6D

Date: February 1991

Corporate Bulletin No.: 116401

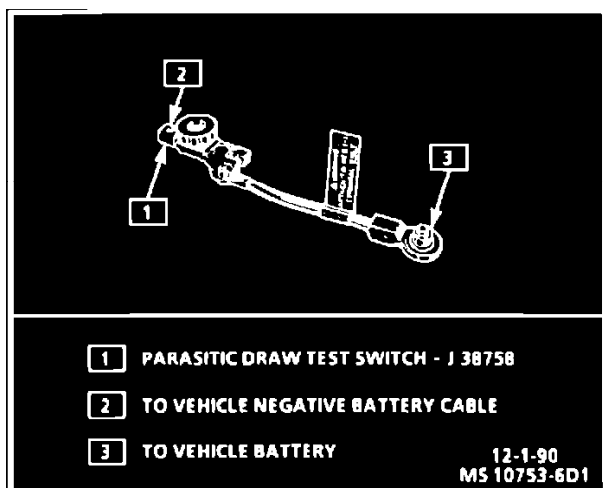
Subject: NO START CONDITION, VEHICLE BATTERY DEAD DUE TO EXCESSIVE CURRENT DRAW

Model and Year: 1980-91 ALL PASSENGERS CARS AND TRUCKS

Vehicles produced between 1980 and 1991 may experience a no start condition due to a dead battery. Follow the service manual procedures to test the battery and charging system. If the battery and charging system are functioning normally, an unusual current draw may have discharged the battery, resulting in the no start. The following procedure has been developed using the parasitic draw test switch, tool J 38758.

Past service procedures do not address solid state failures that appear as intermittent after the battery has been disconnected and reconnected. Utilizing tool J 38758, allows the vehicle to be started, driven, and all electrical system items cycled, without interrupting electrical system continuity. The following procedure supersedes all past "Battery Electrical Drain Test Procedures."

### PARASITIC CURRENT DRAIN PROCEDURE



**Figure 1 - Parasitic Draw Test Switch: J-38758.**

Tools needed:

- J 38758 Parasitic Draw Test Switch (Figure 1)
- Ammeter with at least 10 amp measurement capabilities

**NOTICE:** The parasitic draw test switch should never be turned to the "OFF" position with the engine running or damage could occur to the attached ammeter or the vehicle electrical system.

1. Remove battery cable from battery negative terminal.
2. Install the parasitic draw test switch male-end, to negative battery terminal.
3. Turn test switch knob to the "OFF" position.
4. Install negative battery cable to female end of the test switch tool.
5. Turn the test switch tool knob to the "ON" position.
6. Road test vehicle while activating all accessories (radio, A/C etc.).
7. Turn ignition switch to the "Locked" position and remove ignition key.
8. Set ammeter to the 10 amp scale and connect to terminals on test switch tool.

**NOTICE:** Make sure all electrical accessories have been turned "OFF" (I.E. interior lights, underhood lamp, trunk light, illuminated entry, etc.) before turning the test switch knob to the "OFF" position to avoid damaging the ammeter or an incorrect current reading.

9. Turn test switch tool knob to the "OFF" position to allow current to flow through the ammeter.

**NOTE:** If current reading shows in the negative range, turn the test switch tool knob to "ON," reverse the ammeter probes on the test switch terminals, and turn the test switch tool knob to "OFF."

10. Check current reading. If current reading is at or below two amps, turn the test tool knob to the "ON" position (to maintain continuity in the electrical system) and switch down to the two amp scale for a more accurate reading when drain test tool knob is turned "OFF".

**IMPORTANT**

- Always turn the test switch tool knob to the "ON" position before removing each fuse to maintain continuity in the electrical system and to avoid damaging the ammeter due to accidental overloading (I.E. opening door to change fuse, etc.).
11. If current draw is unusually high for the vehicles overall electrical content, remove system fuses one fuse at a time until the current draw returns to an acceptable value. Perform steps 8 through 10 each time a fuse is removed. Refer to the ELECTRICAL DIAGNOSIS section for specific circuit schematics.

**IMPORTANT**

- On vehicles equipped with a CCM or BCM, check current load readings in "awake" and "asleep" states. Refer to the CCM or BCM Service Manual sections for more information on "awake" and "asleep" states.

12. When cause of excessive current draw has been located and repaired, remove current drain test tool and connect negative battery cable to negative battery terminal.

Please include this procedure in your Service Manuals under Section 6D1 - Battery.

Technical Service Bulletin # **636401**

Date: **960201**

**Updated Battery Replacement Catalog Numbers**

File In Section: 6 - Engine

Bulletin No.: 63-64-01

Date: February, 1996

**INFORMATION**

Subject:  
Updated Battery Replacement Catalog Numbers

Models:  
1988-96 Passenger Cars and Trucks

Replacements For Original Equipment (OE) Batteries

In February of 1995, the catalog numbers of some replacement batteries were upgraded to reflect improvements in the batteries. Because of this change, it is necessary to refer to the current AC Delco catalog (7A-100 or equivalent) when ordering a replacement battery. **DO NOT USE THE NUMBER ON THE OLD BATTERY.**



## Improvements

In order to add a line of maintenance-free batteries with 84-month warranty for aftermarket retail customers, several of the replacement battery models underwent design modifications to lengthen the average service life. These modifications have little effect on the cold cranking ampere (CCA) and reserve capacity (RC) ratings of the batteries.

## Catalog Numbering System

Because the catalog numbering system used by AC Delco includes the aftermarket warranty period for retail customers, several of the catalog numbers of established battery models were changed to reflect the longer warranty period. In a catalog number like 78A-72, the "72" refers to the warranty period applicable to a retail battery purchaser. With the battery improvements, a battery that was 78A-72 was modified for longer life, and the NEW number catalog number is 78A-84. At the same time, however, a new battery with different specifications for CCA and RC was introduced and given the number 78A-72.

Not all battery models were affected by these changes, so some catalog numbers were changed, while others remained the same.

DO NOT RELY on "recommended replacement" catalog numbers on original equipment (OE) batteries built before February, 1995, or on the information in Section 6D of the Service Manuals for 1996 and earlier vehicles. Using these former catalog numbers could, in some cases, result in the use of a battery with lower CCA and RC ratings than is recommended for the vehicle. Refer to the latest AC Delco recommended replacement catalog instead and use the battery listed as being equivalent to the OE battery.

Technical Service Bulletin # **82-05-01**

Date: **980201**

## Warranty - New Vehicle/Replacement Battery

File In Section: Warranty Administration

Bulletin No.: 82-05-01

Date: February, 1998

### WARRANTY ADMINISTRATION

Subject:

New Vehicle and Replacement Battery Warranty Instructions

Models:

All Past and Future Passenger Cars and Light Duty Trucks

The purpose of this bulletin is to provide service personnel with battery warranty information. The following guidelines for battery warranty administration will answer common questions and concerns regarding warranty coverage's and claim submission procedures in the following areas:

- ^ New Vehicle Receiving and Inspection
- ^ Battery Protection During Vehicle Storage
- ^ Battery Warranties
- ^ Warranty Claim Submission Procedures

The Policies and Procedures outlined and/or referenced in this bulletin must be used by all dealers in daily warranty administration controls and processes.

## New Vehicle Receiving and Inspection

In the current "GM VEHICLE RECEIVING AND INSPECTION MANUAL", under Item V, Vehicle Inspection, "Items Deserving Special Attention", dealers are instructed to inspect the battery at the time of vehicle receipt for a "Green Eye." If the green eye is not visible, the Dealer is to note the exception (using damage code 02366) on the Delivery Receipt. Additional copies of the GM Vehicle Receiving and Inspection Manual may be obtained free of charge through the GM Fulfillment Center at 1-800-269-5100.

Dealers are responsible for accurate diagnosis, testing, and proper charging prior to any battery replacement. If only charging is required to correct the problem, the Dealer is to submit a Transportation Claim with labor operation N0100. However, if a battery replacement is required and there is no apparent physical damage, the Dealer is to submit a Warranty Claim using labor operation N0110.

## Battery Protection During Vehicle Storage

Vehicles placed in storage for an extended period of time may experience battery discharge and/or permanent damage.

To prevent this possibility, "the battery negative cable should be disconnected on vehicles which are not going to be in service within a twenty day period; beginning from the date the vehicle is shipped from the assembly plant. If this is not possible, the battery should be recharged periodically (every 20-45 days) until the green dot of the built in hydrometer ("green eye") is visible." See article 2.3.2b-Battery Care in the GM Service Policies and Procedures Manual.

Disconnected batteries will also slowly discharge, especially with higher temperatures; therefore, even disconnected batteries should be checked for a green eye every four months and recharged if necessary.

**Important:**

Battery recharging, swapping or replacement due to damage or lack of maintenance is not covered by the vehicle warranty during the period of Dealer inventory storage. If there is no documented procedure in place for the proper maintenance of batteries while in dealer inventory (along with corresponding documentation which shows that maintenance has been performed), the expense associated with the battery replacement is not covered by the New Vehicle Bumper to Bumper Warranty and is the dealer's responsibility.

## **Battery Warranties**

Warranty Coverage for batteries used in GM vehicles will fall under one of the following categories:

1. **Battery Replacements During The New Vehicle Bumper to Bumper Warranty:**

Warranty coverage on service replacement batteries is up to 12 months or 12,000 miles (whichever comes first), or the remainder of the New Vehicle Bumper to Bumper Warranty, whichever is greater.

2. **Battery Replacements after expiration of the New Vehicle Bumper to Bumper Warranty (applies to retail purchases only covered by the AC Delco Consumer Warranty):**

Batteries purchased retail at either a GM Dealer or AC Delco Retailer will be covered by the terms of the AC Delco Consumer Warranty (this is not a GM Service Replacement Parts and Accessories Warranty). Check with your local AC Delco Battery Distributor for complete warranty coverage details.

## **Battery Replacement/Warranty Claim Submission Procedures**

a. **Original Equipment battery failure during New Vehicle Bumper to Bumper Limited Warranty:**

If after following proper diagnosis procedures, it has been determined that the battery needs to be replaced, the Dealer should procure a replacement AC Delco battery using the AC Delco Replacement Chart located in your current AC Delco Battery Catalog. A normal warranty claim should then be submitted to WINS for the published cost of the battery plus applicable parts handling allowance and replacement labor.

The dealer must convert the AC Delco battery short part number to a GMSPO long part number on the warranty claim. AC Delco short part number to GM long part number conversions are also shown in the GMSPO Parts Price Schedule. **DO NOT SUBMIT THE COST OF THE BATTERY AS A NET ITEM.**

Figure 1 - ACDelco Replacement Battery Warranty Label

**ACDelco**  
Model No. 24-5YR  
REMOVING FOR SCRAPPING  
0 56666 90745 2

**Professional Freedom® 5 Year Battery Limited Warranty**

ACDelco, General Motors Corporation, warrants to the original retail purchaser the new replacement Professional battery for 60 months from the date of purchase when used in private passenger car and light truck applications. Should the battery fail to hold a charge due to a defect in material or workmanship in the first 18 months, the battery will be replaced with a new ACDelco battery of comparable performance. Beginning with the 18th month and continuing through the 60th month, a pro rata exchange based on total months of use will be made. The cost per month of use will be based on the suggested list price at the time of adjustment divided by 60 months.

In the event you wish to make a claim under this warranty, you must return your dated bill of sale and your battery, with its warranty insert intact, to your ACDelco retailer. If your date code as it appears on the battery label, the beginning date for this warranty will be based on the date code as it appears on the battery label.

This warranty does not cover:

1. Discharged batteries that can be recharged and returned to service.
2. Lost for recharging or use of rental batteries or vehicles.
3. Labor costs for battery removal and installation.
4. Damage due to charging system failure, negligence, abuse, accident, improper installation, or freezing.
5. Loss of time, inconvenience, loss of vehicle use or other incidental or consequential damages.
6. Failures which occur outside the United States or Canada.

[Further warranty information on reverse side]  
IMPORTANT: PURCHASER DETACH AND KEEP WITH BILL OF SALE

**SERIAL NO.**  
040633  
UPC 036666907452  
Warranty void if insert removed  
Model No. 24-5YR  
Serial No. 040633

**ACDelco**  
**Professional** 5YR  
*Freedom Car and Truck Battery*  
590 Cranking Amps  
475 Cold Cranking Amps  
270 Load Test Amps  
Model No. 24-5YR

**Legend**

1. ACDelco Replacement Warranty Statement (remove and attach to scrapping copy of Repair Order)
2. Warranty Insert (TAG) (remove and attach to scrapping copy of Repair Order)
3. ACDelco Battery Serial Number (to be entered into the Inbound Comments of your DCS claim entry screen)

**Important:**

All warranty claims submitted to WINS for replacement of the battery must have the AC Delco Battery Serial Number (located on the Battery Tag) entered in the Inbound Comments Section of your DCS claim entry screen. Refer to the General Motors Claims Processing Manual Section IV, Page 10 or your DCS Vendor Manual for further instructions. (See Figure 1).

In the preceding circumstances, the aftermarket AC Delco Consumer Replacement Battery Warranty does not apply, and for this reason, the Dealer is to remove the Warranty Statement and Warranty Insert from the New AC Delco Replacement Battery and retain as part of the Repair Order information as stated in Article 1.5.10c of the GM Service Policies and Procedures Manual. (See Figure 1 for clarification).

b. Subsequent battery failure during New Vehicle Bumper To Bumper Warranty:

Any subsequent battery failure during the New Vehicle Bumper to Bumper Warranty should be submitted through WINS as a claim type B with parts and labor, if the subsequent failure occurred within 12 months or 12,000 miles from the previous replacement. Otherwise, a normal warranty claim should be submitted, up to the remaining portion of the New Vehicle Bumper to Bumper Warranty period.

c. Battery Replacement During the Bumper to Bumper Warranty and the replaced battery fails beyond the Bumper to Bumper Warranty but still within 12 months or 12,000 miles (whichever comes first) from last replacement:

Dealer should procure a replacement AC Delco battery from an AC Delco Battery Distributor and submit a warranty claim to WINS using Claim Type B with parts and labor.

Again, the aftermarket AC Delco Consumer Battery Warranty does not apply and the Dealer is to remove the warranty statement and warranty insert from the new replacement battery and retain for future reference as covered in Article 1.5.10c of the GM Service Policies and Procedures Manual. (See Figure 1).

d. Original Equipment Battery failure outside of New Vehicle Bumper to Bumper Limited Warranty:

No extended coverage is available as The Original Equipment battery is only warranted for the term of the Bumper to Bumper warranty. The customer is responsible for the replacement cost of the battery.

e. Customer purchased AC Delco battery from either a GM Dealer or AC Delco Battery Distributor which subsequently fails during AC Delco Consumer Warranty Period:

The GM Dealer is not to submit a warranty claim to WINS. Customer pay sales that return for warranty are to be handled by the Dealer directly with the customer and the AC Delco Battery Distributor.

The GM Dealer's AC Delco Battery Distributor has complete warranty and pro rata information to assist the GM Dealer in proper handling. The 7A-30 Delco Replacement Battery Suggested Retail Price Schedule contains complete instructions as well.

Technical Service Bulletin # **99-06-03-002**

Date: **990301**

## **Battery - Insulator Replacement & Caution**

File in Section: 06 - Engine/Propulsion System

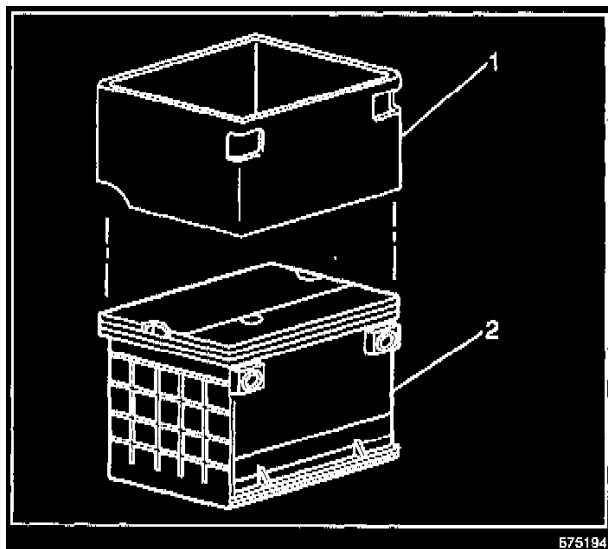
Bulletin No.: 99-06-03-002

Date: March, 1999

### **INFORMATION**

Subject:  
Battery Insulator Replacement

Models:  
1999 and Prior Passenger Cars and Light Duty Trucks



It has been found that the battery thermal insulator (1), installed on many new General Motors vehicles, is not always being placed back on the vehicle's battery (2) when the battery is removed or replaced. The installation of the insulator is essential for battery life.

When a battery insulator is specified for use on a particular vehicle, the underhood temperatures for that vehicle are high enough to be critical to battery life. Omitting the thermal insulator when installing the battery will considerably reduce the life of the battery by exposing it to higher underhood temperatures. Inspect the insulator for any damage. If the insulator is damaged or missing, replace as required.

Refer to GMSPO Parts Group # 02.333 for the correct insulator. Technical Service Bulletin # **83-64-09**

Date: **980301**

## **Tools - Released for CS Generator Diagnosis**

File In Section: 6 - Engine

Bulletin No.: 83-64-09

Date: March, 1998

### **INFORMATION**

Subject:  
New Tool J 41450-B, Released for CS Generator Diagnosis

Models:  
1988-98 Passenger Cars and Light Trucks with CS-Series Generators

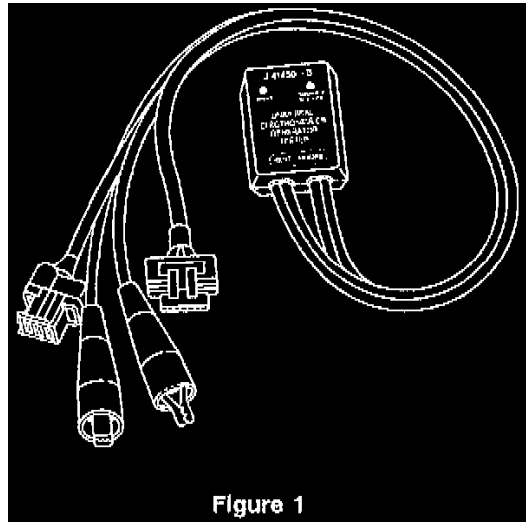


Figure 1

A new CS-Series Generator Tester, J 41450-B, has been sent to all dealers as part of the Essential Tool Package. This tool will work on all CS-Series generators for past model years. The tool is shown in Figure 1.

Step	Action	Value(s)	Yes	No
<b>DEFINITION:</b> Generator on-vehicle test which will test the generator independently from the vehicle wiring.				
1	Perform the Charging System Check. Refer to Charging System Check.  Has the Charging System Check been performed?		Go to Step 2	
2	1. Connect the red alligator clip of a J 41450-B CS Generator Electronic Tester to the generator output terminal. (The output wire is attached to the generator with a ring terminal and nut.) 2. Connect the black alligator clip of the J 41450-B to the metal generator housing. The green POWER lamp of the tester should light and remain lighted while the tester is being used.		Go to Step 9	Go to Step 3
3	Does the green POWER lamp on the tester light? 1. Recheck the alligator clip connections that were made in Step 2. 2. Correct the connections if they were reversed.  Does the green POWER lamp on the tester light after the correct connections are verified?		Go to Step 9	Go to Step 4
4	Connect a J 3430 from the generator output terminal to the generator metal housing.  Is the voltage above the specified value?	12 V	Go to Step 18	Go to Step 5
5	Use a J 3430 to check the voltage between the battery terminals.  Is the voltage above the specified value?	12 V	Go to Step 6	Go to Step 8
6	1. Inspect the circuit between the generator output terminal and the battery positive terminal for a loose connection or open circuit connection. Be sure to check for an open fusible link and/or any blown-in fuses that may be used on the vehicle. 2. If a loose connection or open circuit was located, repair it. If an open fusible link or blown fuse was found, be sure to check the system for possible causes of a circuit overload, such as a direct B+ short to ground.		Go to Step 7	
7	Is the circuit okay between the generator output terminal and the battery positive terminal? Repair the loose connection or open circuit between the battery negative terminal and the generator housing.  Is the repair complete?		Go to Step 2	
8	1. Inspect the battery. Refer to Battery Load Test. 2. Charge or replace the battery if necessary.  Is the battery OK?		Go to Step 2	
9	1. Leave the J 41450-B alligator clips attached as in Step 2, and disconnect the vehicle 4-way generator connector. 2. Locate the matching 4-way connector of the J 41450-B and connect it to the generator.  Does the red DIAGNOSTIC lamp on the tester light?		Go to Step 11	Go to Step 10

10	<p>Perform the following test of the DIAGNOSTIC lamp of the J 41450-B:</p> <ol style="list-style-type: none"> <li>1. Disconnect the J 41450-B 4-way connector from the generator, but leave the J 41450-B alligator clips connected, as in Step 2.</li> <li>2. Prepare a jumper wire with an in-line 100 ohm resistor. The watt rating of the resistor is not important. (An inexpensive 100 resistor can be purchased at an electronics supply store.)</li> <li>3. At one end of the prepared jumper wire, attach a Metri-Pack 150 male terminal probe adapter from a J 35616-A Connector Test Adapter Kit.</li> <li>4. Connect the prepared jumper wire to the J 41450-B L terminal (which is called the B terminal on CS 130D, LR and AD generators). The tester connector terminals are the same as the generator connector terminals, so terminal identification on the J 41450-B can be accomplished by referring to Starting and Charging Connector End Views.</li> <li>5. Connect the other end of the jumper to the battery negative terminal.</li> </ol> <p>Does the red DIAGNOSTIC lamp on the tester light when the jumper is connected?</p>		Go to Step 19	Go to Step 18
11	<p><b>CAUTION</b></p> <p>Make sure that the load is completely turned off before connecting or disconnecting a carbon pile load tester to the battery. Otherwise, sparking could ignite battery gasses which are extremely flammable and may explode violently.</p> <ol style="list-style-type: none"> <li>1. Prior to connecting a carbon pile load tester, make sure that the load dial of the carbon pile tester is turned completely to the OFF position.</li> <li>2. Connect the cable leads of the carbon pile tester to the battery of the vehicle.</li> <li>3. Connect an inductive ammeter to the output lead(s) of the generator. Make sure that all output leads pass through the ammeter inductive clip. The carbon pile tester may have its own inductive ammeter, or use a J 35590 Current Clamp.</li> <li>4. Start the engine and allow it to idle briefly.</li> </ol> <p>Does the red DIAGNOSTIC lamp on the J 41450-B light?</p>		Go to Step 19	Go to Step 12
12	<p>Increase the engine speed to 2500 RPM.</p> <p>Does the red DIAGNOSTIC lamp on the J 41450-B light?</p>		Go to Step 19	Go to Step 13
13	<ol style="list-style-type: none"> <li>1. Maintain the engine speed at 2500 RPM.</li> <li>2. Turn on the load of the carbon pile tester, and increase the load until the generator output is equal to the load test value given in Generator Usage.</li> </ol> <p>As the load is increased, is the generator capable of producing the amount of load test current specified in Generator Usage?</p>		Go to Step 14	Go to Step 19
14	<p>Maintain the engine speed at 2500 RPM and continue to operate the generator at the load test value.</p> <p>Is the red DIAGNOSTIC lamp on the J 41450-B lighted?</p>		Go to Step 19	Go to Step 15

15	<p>1. Maintain the engine speed at 2500 RPM and continue to operate the generator at the load test value.</p> <p>2. Connect a J 3430 from the generator output terminal to the battery positive (+) terminal.</p> <p>Is the voltage above the specified value?</p>	0.5 V	Go to Step 22	Go to Step 16
16	<p>1. Maintain the engine speed at 2500 RPM and continue to operate the generator at the load test value.</p> <p>2. Connect a J 3430 from the generator metal housing to the battery negative (-) terminal.</p> <p>Is the voltage above the specified value?</p>	0.5 V	Go to Step 23	Go to Step 17
17	<p><b>CAUTION</b></p> <p>Make sure that the load is completely turned off before connecting or disconnecting a carbon pile load tester to the battery. Otherwise, sparking could ignite battery gasses which are extremely flammable and may explode violently.</p> <p>1. Disconnect the J 3430.</p> <p>2. Turn OFF the load in the carbon pile tester.</p> <p>3. Turn the ignition switch to LOCK to stop the engine.</p> <p>4. Disconnect the carbon pile tester cable from the battery.</p> <p>5. Disconnect the J 41450-B 4-way connector from the generator.</p> <p>6. Inspect the generator 4-way connector on the vehicle.</p> <p>Does the vehicle have a wire in the L terminal cavity (or B terminal for CS130D, LR, and AD generator) of the generator 4-way connector?</p>		Generator OK	Go to Step 24
18	<p>There is an internal problem in the J 41450-B. Replace the J 41450-B. Has the J 41450-B been replaced?</p>		Go to Step 2	
19	<p><b>IMPORTANT</b></p> <p>Before generator repair or replacement, the L terminal circuit (if applicable) must be tested for resistance in order to avoid a repeat failure. Disconnect and examine the generator 4-way connector.</p> <p>Is there a wire in the L cavity (or B cavity for CS 130D, LR and AD generators) of the generator connector?</p>		Go to Step 20	Go to Step 24
20	<p>1. Be sure the 4-way generator connector is disconnected.</p> <p>2. Turn the ignition key to the RUN position.</p> <p>3. Connect a fused jumper wire J 36169-A (with a 5 amp fuse) from ground to the vehicle 4-way generator connector terminal L (or B terminal for CS 130D, LR, and AD generators). To connect the jumper to the generator, use a Metri-Pack 150 connector test adapter from J 35616-A. Refer to Starting and Charging Connector End Views.</p> <p>Does the fuse blow?</p>		Go to Step 21	Go to Step 25
21	<p>There is a short to B+ voltage when the ignition key is in the RUN position. The short may be a result of a mis-wired condition. The L terminal circuit must be a resistance circuit either through a charge indicator or the PCM. If direct battery voltage is applied to the generator at the L terminal, the regulator will eventually be destroyed, causing a repeat failure. Repair the short to B+ voltage in the L terminal circuit (or B terminal circuit for CS 130/D, LR, and AD generators).</p> <p>Is the short circuit repaired?</p>		Go to Step 25	



22	1. Turn off the engine. 2. Disconnect the battery negative terminal. 3. Inspect the circuit between the battery positive terminal and the generator output terminal for a high-resistance connection. Disassemble and clean all connections in this circuit. 4. Assemble the connection and tighten to specifications. 5. Connect the battery negative terminal. Tighten to specifications. Refer to Fastener Tightening Specifications. Is the repair complete?	Go to Step 2	
23	1. Turn off the engine. 2. Inspect the ground circuit for high resistance from the battery negative terminal to the generator housing. Disassemble and clean all connections. 3. Assemble the connections and tighten to specifications. Refer to Fastener Tightening Specifications.	Go to Step 2	
24	Is the repair complete? The tester turns the generator on in a different way than the vehicle does, so an additional test is necessary. This step is applicable only for vehicles that do not use an L terminal connection (or B terminal for CS 130D, LR and AD generators). 1. Remove the 4-way connector from the generator. 2. Measure the generator internal resistance between the L and I/F terminals (B and C terminals for CS 130D, LR, and AD generators). Use Metri-Pack 150 terminal adapters from a J 35616-A Connector Test Adapter Kit. The L and I/F terminals are the two middle terminals on the generator. Is the resistance between the generator I/F and L terminals equal to or below the specified value?	500 Generator OK	Go to Step 25
25	Repair or replace the generator. Refer to Generator Replacement or Generator Overhauls. Is the repair complete?	Go to Step 2	

### Generator Not Operating Properly

The charts shown can be used in place of the diagnostic procedures in previous Service Manuals when this new tool is used. This information will be included in the 1999 Service Manual.

Inspect the following before testing the generator:

- ^ The battery. Make sure the vehicle battery is in good condition and fully charged. Refer to Battery Load Test.
- ^ The built in hydrometer in the battery. The green eye must be showing in the hydrometer.
- ^ The voltage across the battery terminals with all the loads OFF should be above 12 V. Refer to Battery Load Test.
- ^ Make sure the battery connections are clean and tight.
- ^ The drive belt for damage or looseness.
- ^ The wiring harness at the generator. Make sure the harness connector is tight and latched. Make sure the output terminal of the generator is connected to the vehicle battery (positive) generator lead.
- ^ All the charging system related fuses and electrical connections for damage or looseness. Refer to the starter and charging system schematics.

Technical Service Bulletin # 892248A

Date: 890701

## Generator - Terminal Descriptions & Revised Wiring

Number: 89-224-8A

Section: 8A

Date: July 1989

Subject: GENERATOR WIRING

Model and Year: 1987-89 ALL PASSENGER CARS AND TRUCKS WITH CS SERIES GENERATORS  
TO: ALL CHEVROLET DEALERS

The new CS series generators (CS121, 130 and 144) have slightly different requirements for turning on the generator than the older SI models. The terminals in the four-way connector are used as follows:

**"S" Terminal**

This is the "sense" terminal. It is connected directly to a battery positive lead. It provides the generator with a battery reference voltage so that the regulator can determine the level of charging needed. Some vehicles do not have this lead connected because the generator also has an internal sense function which will operate if the lead is cut or broken.

**"F/I" Terminal**

The F/I terminal is the "field" terminal and is used to turn on the generator through an internal resistor. It is used on cars with gage clusters and is connected directly to an ignition feed (no external resistance is needed).

**"L" Terminal**

This is the "lamp" terminal. It is used to operate the I.P. telltale warning lamp, and also to turn on the generator. It is connected to the generator through the resistance of the lamp or a resistor. General Information on Generator Wiring - Page 2

Important: If this terminal is connected directly to either an ignition feed or a battery feed, without going through a resistor or a bulb, the regulator will eventually be destroyed.

Note 1: Some vehicles may have wires to both the "F/I" and "L" terminals. Either terminal will turn on the generator. In addition, some vehicles may have wires to both terminals, but only one will be connected on the other side of the bulkhead connector. This is done to commonize engine harnesses. Again, either wire will turn on the generator, and no power to one of the wires should not be considered a problem with the vehicle.

Note 2: The 1988 Camaro Car Service Manual is incorrect. It show's both the "F/I" and "L" terminals connected, when only the "F/I" terminal is actually connected. The 1989 Camaro Service Manual is correct for both 1988 and 1989.

**"P" Terminal**

This terminal is not currently used on any application. It can be used to supply an engine speed output signal for a tachometer on diesel engines.

Technical Service Bulletin # **884276C**

Date: **890801**

## **Fuel System - Carburetor Removal and Choke Adjustment**

Number: 88-427-6C

Section: 6C

Date: August 1989

Corporate Bulletin No.: 936303

Subject:  
CARBURETOR REMOVAL AND CARBURETOR CHOKE ADJUSTMENT

Model and Year:  
1985-88 M CAR

TO:  
ALL CHEVROLET DEALERS

The purpose of this bulletin is to provide Carburetor Removal procedure inadvertently omitted from the 1985 through 1988 Sprint Service Manual. Also, included in this bulletin is the Revised Carburetor Choke Adjustment which supersedes procedures printed in Section 6C16 of the 1985 through 1988 Sprint Service Manual.

### **CARBURETOR REMOVAL:**

#### **PROCEDURE**

#### **REMOVE OR DISCONNECT:**

1. Negative battery cable.

2. Air cleaner and duct assembly.
3. Drain engine coolant.
4. Fuel line at carburetor.
5. Two (2) coolant lines at choke housing.
6. Various vacuum lines at carburetor.
7. 6-Way electrical connector at carburetor.
8. 4-Way electrical connector at carburetor.
9. Throttle cable.
10. Four (4) retaining nuts for carburetor.
11. Carburetor assembly.

## INSTALLATION

### INSTALL OR CONNECT:

1. New carburetor base gasket.
2. Carburetor assembly.
3. Four (4) retaining fasteners.  
  
Tighten
  - Torque four (4) retaining fasteners to 18-28 N-m (14-20 lb.ft.)
4. Throttle cable.
5. 4-Way electrical connector at carburetor.
6. 6-Way electrical connector at carburetor.
7. Various vacuum lines to carburetor.
8. Two (2) coolant lines at carburetor choke housing.
9. Fuel line to carburetor.
10. Add engine coolant.
11. Air cleaner and duct assembly.
12. Negative battery cable.
  - Start engine and chock for leaks.

## CHOKE

### ADJUSTMENT CHECK:

1. Remove air cleaner and duct assembly.
2. Engine less than 25 degrees (77 degrees Fahrenheit).
3. Set choke and apply 10 inches of vacuum to choke pull-off.
4. Measure the air gap between air horn and choke plate.
  - Clearance should be 0.1 mm - 0.5 mm (.004 -.019 in.)

### ADJUSTMENT:

1. Air cleaner and duct assembly removed.
2. Remove red epoxy seal on choke opening adjustment screw.
3. Rotate screw clockwise to increase choke plate opening or counter clockwise to decrease choke plate opening.
4. Reinstall air cleaner and duct assembly.

Technical Service Bulletin # **89316C**

Date: **881101**

## **Fuel - Feed/Return Pipe Repair**

Number: 89-31-6C  
Section: 6C  
Date: NOV., 1988  
Subject: FUEL FEED AND/OR RETURN PIPE REPAIR

Model and Year: 1984-89 CHEVROLET PASSENGER AND  
LIGHT DUTY TRUCK VEHICLES  
TO: ALL CHEVROLET DEALERS

When making any repairs to the fuel system, it is IMPORTANT that the following procedures be adhered to:

A minimum of 13.0 mm (1/2") clearance must be maintained around sharp edges such as flanges, pinch weld, etc., to prevent contact and chaffing.  
A minimum of 19 mm (3/4") clearance must be maintained around any moving parts.

- ^ When rubber hose is used to replace pipe, use only reinforced fuel-resistant hose which is identified with the word "Fluorelastomer" or "GM6163-M" on the hose. Hose inside diameter must match pipe outside diameter.
- ^ Do not use rubber hose within 100 mm (4") of any part of the exhaust system or within 254 mm (10") of the catalytic converter.
- ^ In the repairable areas, cut a piece of fuel hose 100 mm (4") longer than portion of the line removed.  
  
If more than a 6 inch length of pipe is removed, use a combination of steel pipe and hose so that the total hose lengths, including the 100 mm (4") additional length will not be more than 254 mm (10") long. Follow the same routing as the original pipe.
- ^ Cut ends of pipe remaining on car square with a tube cutter. Using the first step of a double flaring tool, form a bead on the end of both pipe sections. If pipe is too corroded to withstand the beading operation without damage, the pipe should be replaced. If a new section of pipe is used, form a bead on both ends of it also.
- ^ Use screw-type hose clamp No. 2494772 or equivalent. Slide clamps onto pipe and push hose 51 mm (2") onto each portion of fuel pipe. Tighten clamps on each side of repair.

Technical Service Bulletin # **921078A**

Date: **920201**

## **Cruise Control - Intermittent Dropout/Fail to Set/Resume**

Number: 92-107-8A  
Section: 8A  
Date: FEB. 1992

Corporate Bulletin No.: 239001

ASE No.: A8

Subject:  
CRUISE CONTROL INTERMITTENT DROP-OUT AND/OR FAIL TO SET OR RESUME

Model and Year:  
1988-92 ALL PASSENGER CARS AND TRUCKS EXCEPT CAPRICE IS 1988-90 ONLY

CONDITION: On 1988-92 vehicles using the vacuum servo cruise control system, the cruise control may intermittently lose speed and/or drop-out (release), while using cruise control. It may also fail to initially set, or resume, at times. Vehicles using the Electro-Motor Cruise Control system (Stepper Motor Cruise) are not affected.

When driving the vehicle, the cruise control will operate normally for 10 to 30 miles, then may gradually lose speed and/or drop out of cruise. If you experience this condition, accelerate to a speed higher than the cruise set speed, using the

accelerator pedal only. DO NOT use the set or resume controls. Then allow the vehicle to coast down, and see whether the cruise catches and holds at the set speed. If the cruise catches and holds at the set speed, the diagnostic procedure below should be used to test the servo and vacuum system. Because of the intermittent nature of this condition, you may have to try several times to reproduce this condition.

**CAUSE:**

In a small percentage of servos, the vent valve, which normally cycles to control the amount of vacuum needed to maintain a set speed, may fail to close at times. When this happens, the vacuum is being continually vented, so the servo cannot pull the throttle open to increase the vehicle speed. The valve may close correctly the next time the cruise is cycled by setting or resuming.

Because this condition is intermittent, testing the vehicle following the Service Manual diagnostic procedures may lead to the replacement of good parts, which will not correct the vehicle. This may lead to the customer having to bring the vehicle back for service again. It is recommended that the following diagnostic procedure be performed to determine if the trouble can be found.

**DIAGNOSTIC PROCEDURE:**

First evaluate the cruise system as specified in the Service Manual. Then make the following additional checks that may detect conditions with the vacuum portion of the cruise system.

**Source Vacuum Check:**

Disconnect the vacuum supply hose from the servo (small hose). Install a vacuum gage at the hose end and start the engine. The gage should read at least 10 in. Hg. (34 Kp/m<sup>2</sup>). If there is no vacuum, or very little vacuum, inspect for leaking or pinched hoses.

**Servo Vacuum Valve Check:**

With engine off, remove the vacuum supply hose (small hose) from the servo. Using a hand held vacuum pump connected to the vacuum port on the servo, stroke the pump until the gage reads 10-15 in.Hg. (34 - 50 Kp/m<sup>2</sup>). Replace the servo if either of the following conditions occur:

1. Vacuum valve will not hold any vacuum.
2. Gage reads 10-15 in.Hg. (34 - 50 Kp/m<sup>2</sup>), but vacuum may decrease quickly (less than 10 seconds). In a good servo, the vacuum may decrease slowly (more than 30 seconds).

**Servo Vent Valve Check:**

Disconnect the servo from the throttle linkage. Disconnect the electrical connector from the servo. Using a fused jumper wire, apply 12 volts to terminal "A" on the servo. Connect a jumper wire from terminal "C" on the servo to ground. You should hear a click noise as the vent valve closes. Remove the vacuum release valve hose (large hose) from the servo. Using a hand held vacuum pump connected to the large port, stroke the pump until the servo diaphragm pulls in and the gage reads 10-20 in.Hg. (34 - 68 Kp/m<sup>2</sup>). Replace the servo if either of the following conditions occur:

1. Diaphragm will not move in completely.
2. Diaphragm moves in completely. Gauge reads 10-15 in.Hg. (34 - 50 Kp/m<sup>2</sup>), but vacuum decreases quickly (In a good servo the vacuum may decrease slowly).

**Vacuum Release Valve (On Brake Pedal) Check:**

Disconnect the vacuum release hose from the servo (large hose). Apply vacuum (10-20 in.Hg. (34-68 Kp/m<sup>2</sup>)) to the hose using a hand vacuum pump and gage. The vacuum reading on the gage should remain steady. If gage reading does not hold, or leaks down slowly, inspect for a leaking or misadjusted vacuum release valve (at the brake pedal), or a leaking hose. A leaking vacuum release system will dramatically effect the operation and life of the servo.

Other items that could affect servo life and operation are:

- Improper servo cable or rod adjustment;
- Binding throttle linkage;
- Loose or bent servo bracket; or
- Poor electrical connections.

If the previous diagnostic procedures fail to determine the cause of the cruise system intermittent condition, replace the servo.

**WARRANTY INFORMATION:**

Use Labor Operation T1821,

Labor Time: 0.5 hrs., for diagnostic time only

Use existing labor operations for replacement of parts.

## **General Information**

Bulletin Number: 93-9-10

Reference Number: 349212R

Publish Date: 7/93

Subject:  
**RADIO FREQUENCY INTERFERENCE IDENTIFICATION AND DIAGNOSIS**

Models Affected:  
**1993 AND PRIOR ALL MODELS**

The purpose of this information is to help in the identification and diagnosis of Radio Frequency Interference (RFI). RFI symptoms may include noises, interference, static, whines, pops, and poor reception of stations normally receivable by the radio system. These symptoms may also apply to any two-way communications radio installed in the vehicle including HAM, police, fire, business band and cellular phones.

Radio Frequency Interference is the undesirable disturbance of an electrical system or device with another electrical system or device. The following charts will help identify:

1. If the symptoms are related to RFI, and
2. The source of the interference.

It may be helpful to obtain a copy of the Delco Electronics Audio Systems Diagnostics Guide 1992 edition. This is a manual aimed at identifying, diagnosing, and repairing the radio system. This manual is available from STG; item # 19007.03-1.

You may also want to consult your division's service bulletin concerning Radio Telephone Installation Guidelines. This information will identify the proper methods and routing for all installations of two-way communications devices.

## **Questionnaire**

To begin diagnosing RFI, it is important to understand the nature of the condition and the elements that may be involved. The following questionnaire will help determine vital pieces of information for the diagnostic process.

1. Is the vehicle equipped with any non-factory installed electronics?  
(This includes: radar detectors, scanners, and hand held communications devices.)
2. If the condition occurs with a non-factory installed radio or telephone, have the Radio Installation Guidelines been followed?
3. Identify the frequencies affected.
4. If the concern is with the entertainment radio, is the tape or CD affected.
5. Identify when the condition occurs:  
Key off, Key in accessory, Key on engine not running, Engine running, Other - describe.
6. Is the condition intermittent or related to the operation of another electrical device in the vehicle?
7. If the condition is related to a fleet vehicle answer the following:
  - a. Who installed the radio(s)?
  - b. Were the GM installation guidelines followed?
  - c. Is this the only vehicle that demonstrates this condition?
  - d. Do similar vehicles have different antennas?
  - e. Are the antennas mounted in the same location?

See RFI Diagnostic Charts that follow.

## **RFI Determination and Identifying Chart**

This chart is to be used along with the diagnostic charts to help determine if the condition is RFI related, and to help identify what electronic device in the vehicle is interfering with the radio. Make sure the information in the questionnaire is as accurate as possible. You **MUST** be able to duplicate the customer's condition to diagnose RFI concerns.

The process of identifying RFI and the source of an interference is simply the process of elimination. When the source of the interference is disconnected from power, the radio will work properly.

Box 1

Verify that the condition is present, then disconnect any non-factory add-on electronics, (not including the radio)

Box 2

If the condition goes away when a particular device is disconnected, reconnect the device to verify it as the source of the interference. If the condition is related to non-factory add-on electronics, consult the GM installation guidelines (See Box 6) as an example of how to add an electronic component to the vehicle's electrical system.

**Box 3**

If the condition is **ONLY** present with the engine running, disconnect electrical components that are active only with the engine running. The charging system, various solenoids, and relays may be intermittently disconnected while observing the condition. In some cases a component cannot be disconnected while the engine is running. In these cases, the component can be tested independent of the vehicle (i.e. fuel injectors). For further tips on engine noise diagnostics refer to the Delco Sound Service Guide, Engine Noise Chart.

**Box 4**

If the condition can be eliminated and the interference isolated to a component, determine if a bulletin has been published concerning this particular condition. Contact your Technical Assistance Group for additional information if no bulletins are found.

**Box 5**

If the concern cannot be eliminated by testing in any key position and by disconnecting fuses and components, the condition most likely is not RFI.

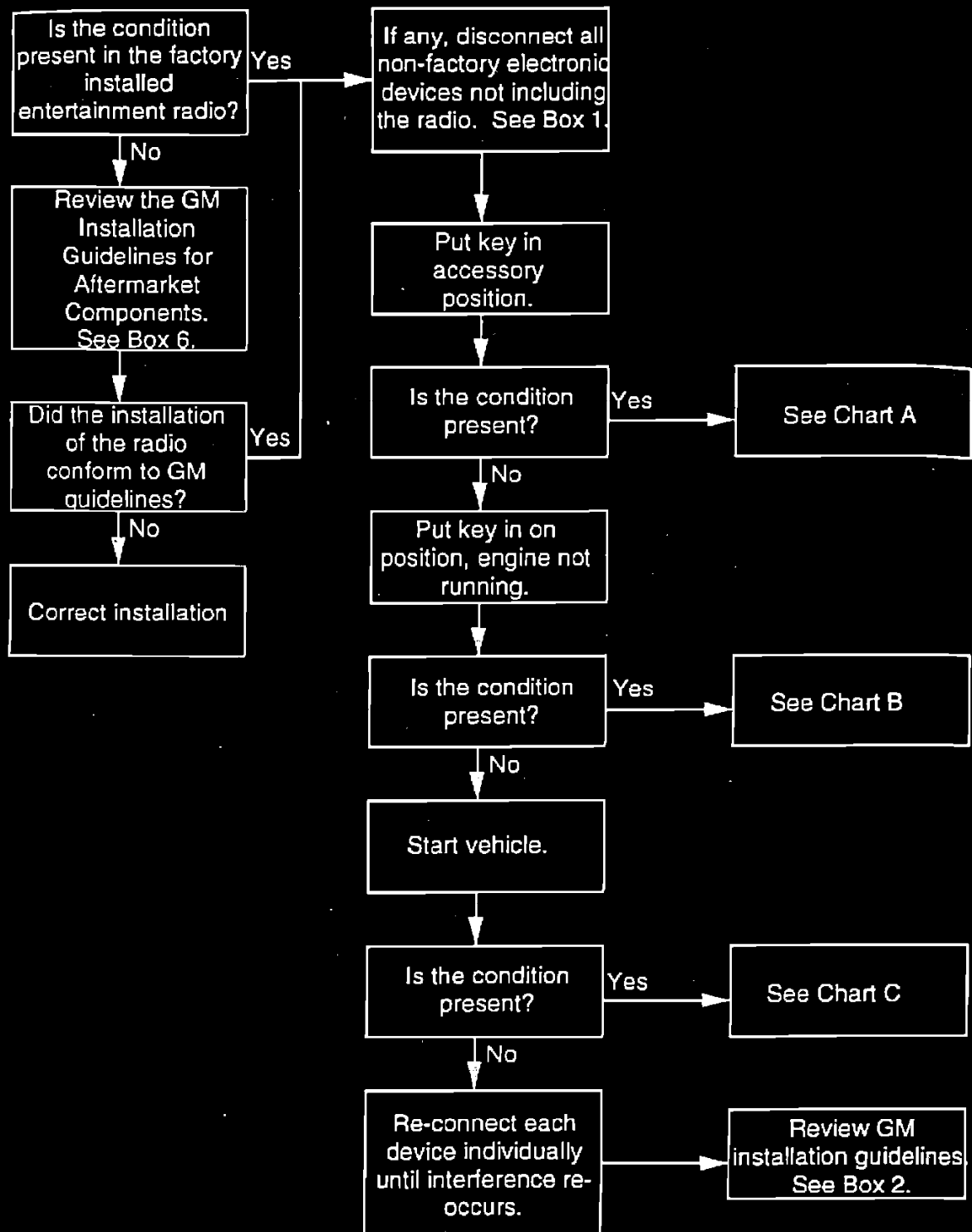
Refer to the Delco Sound Service Guide or the vehicle service manual for further diagnostic tips and check for any published bulletins. If the concern cannot be identified or eliminated, contact your Technical Assistance Group for further assistance.

**Box 6**

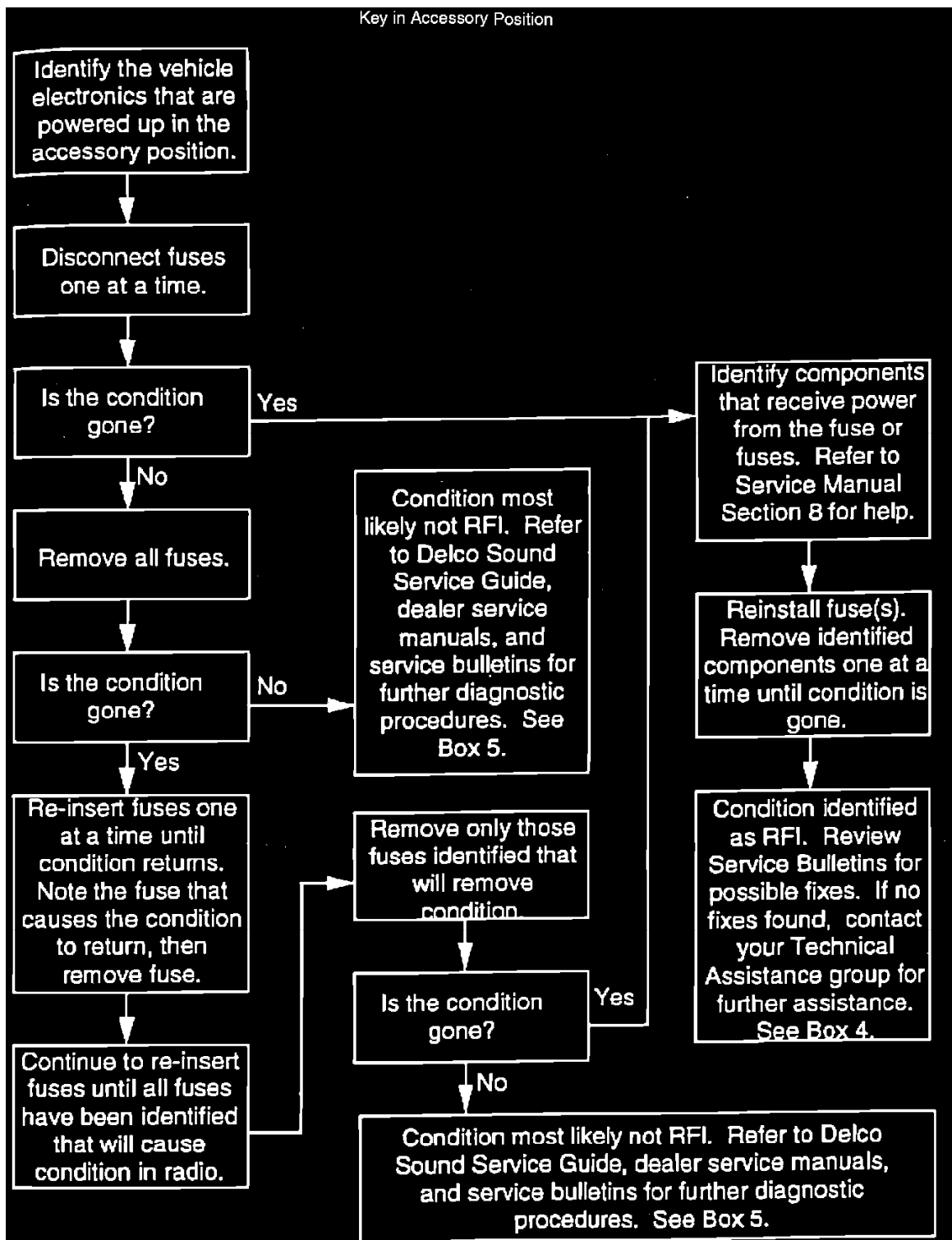
The "Installation Guidelines for Aftermarket Accessories" for all model years and all trucks and carlines are located in the following Service Bulletin 91-8-2.

Also, there may be separate installation guidelines for cellular phones. A search for service bulletins may be necessary to find these.

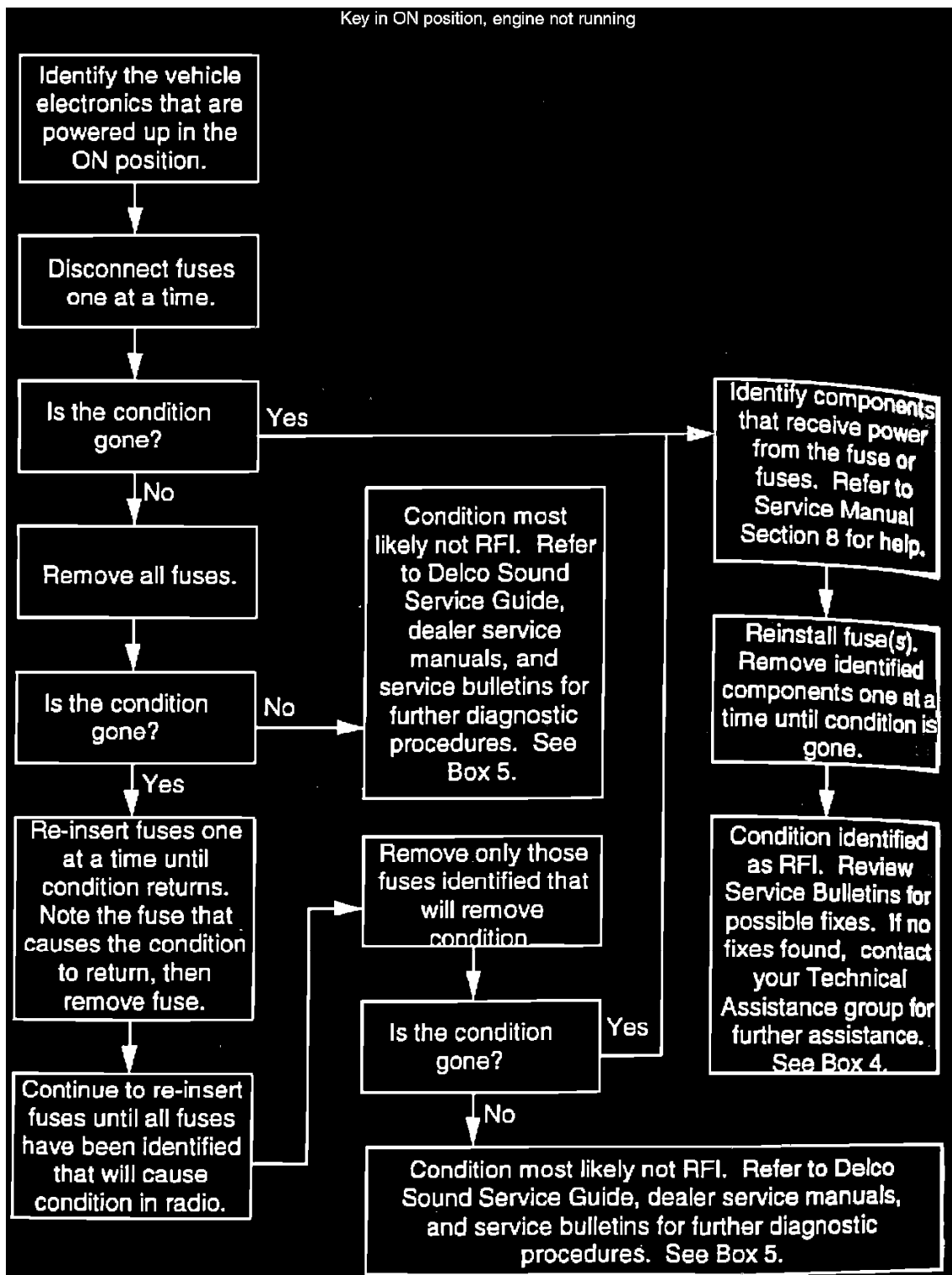
Purpose: To determine if condition is RFI and to identify source of RFI condition.

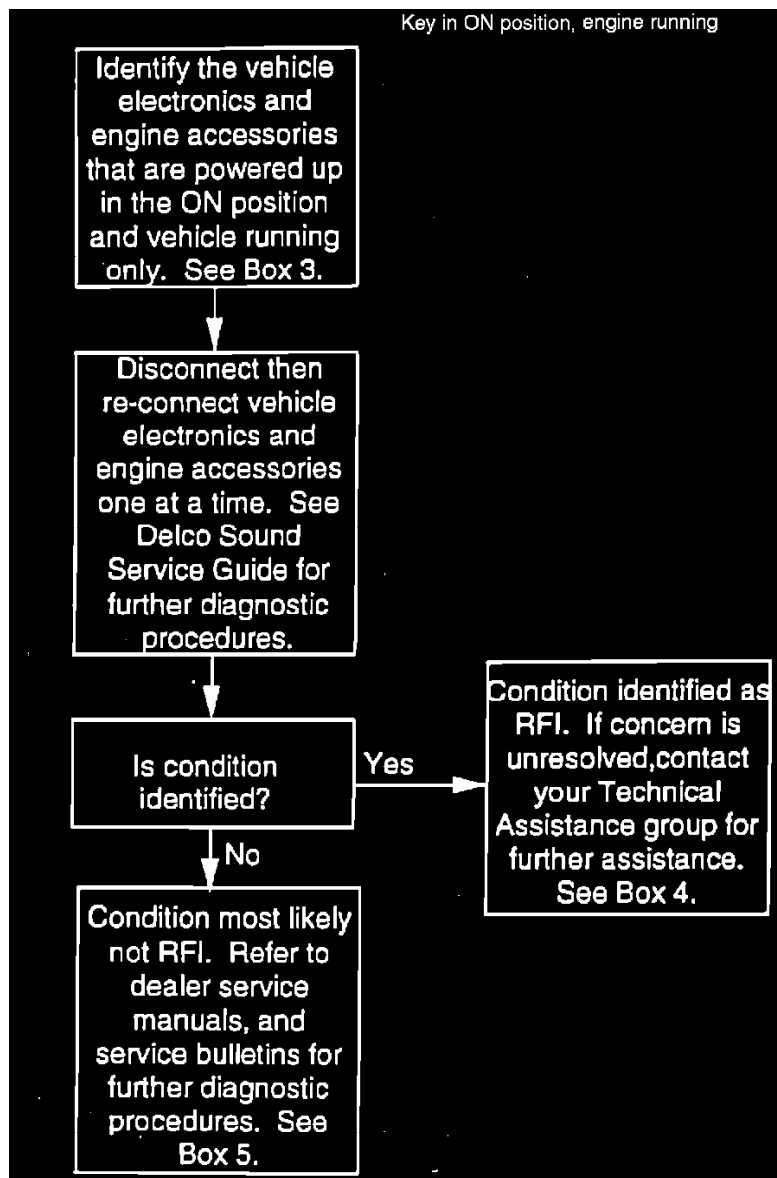






Key in ON position, engine not running





Technical Service Bulletin # 88855

Date: 871101

## Radio - Updated Removal Procedure

Number: 88-85-5

Section: 5

Date: Nov., 1987

Subject: RADIO REMOVAL PROCEDURE

Model and Year: 1987-88 SPRINT

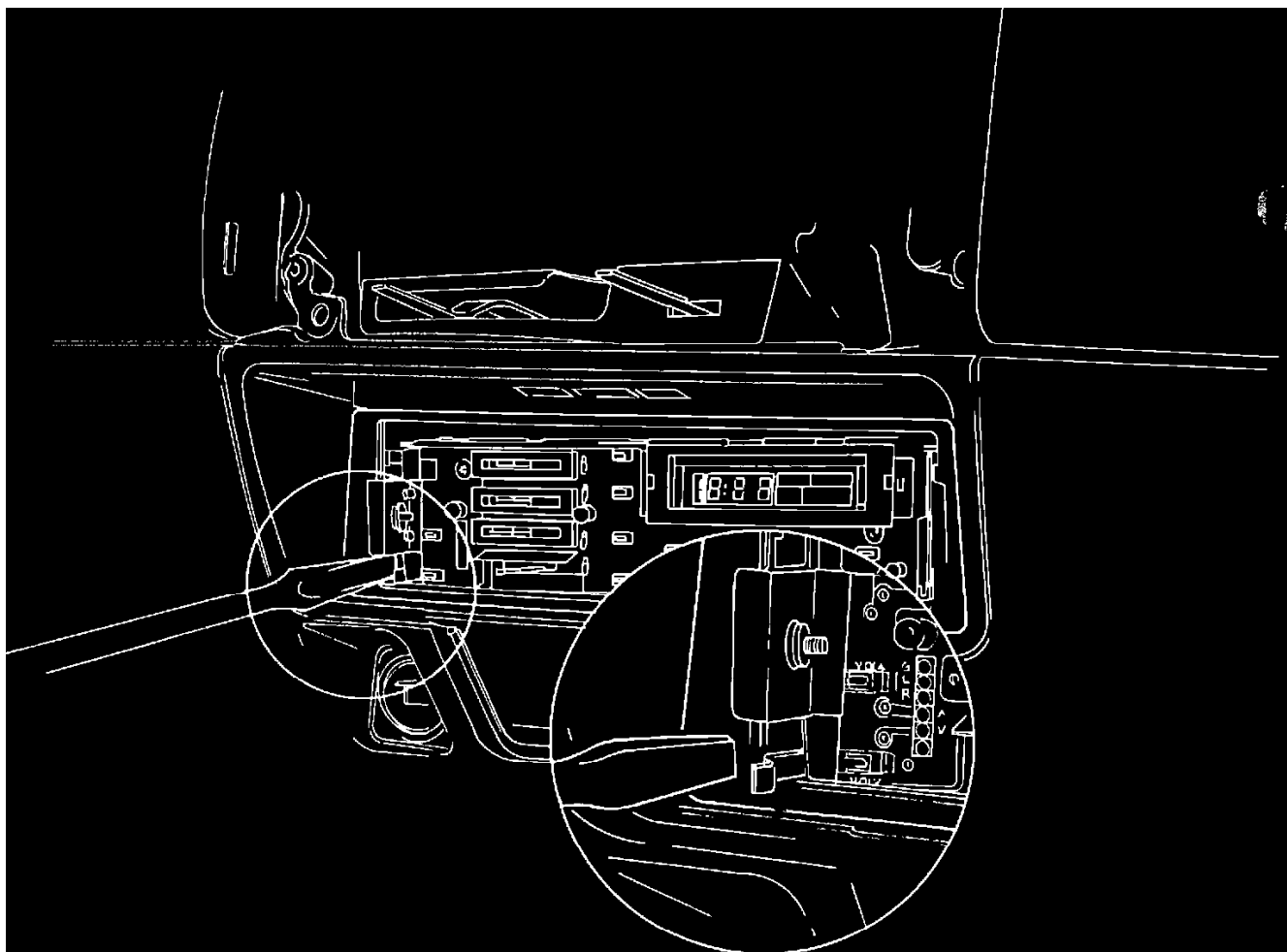
TO: ALL CHEVROLET DEALERS

The radio removal procedure shown on page 8-18 of the 1987 Sprint Service Manual (ST 370-87) is incorrect.

The following procedure should be used for radio removal in 1987 and 1988 Sprints.

Remove:

1. Remove ash try and holder.
2. Remove radio mounting bracket nuts (2).
3. Remove heater control panel garnish.
4. Remove heater control knobs.
5. Remove heater control lever panel and A/C switch.
6. Remove heater control mounting screws.
7. Push heater controls forward into instrument panel.
8. Remove radio control knobs.
9. Through heater control opening, release top of radio front cover.
10. Through ash try opening, release top of radio front cover.
11. Remove radio front cover.



12. Release radio retainers located on both sides of the unit (See Illustration) and remove radio.
13. Disconnect antenna and electrical connectors.

Install

1. Install radio front cover to radio.
2. Install radio control knobs.
3. Connect antenna and electrical connectors.
4. Install radio into instrument panel.
5. Install heater control mounting screws.
6. Install heater control lever panel and A/C switch, 7. Install heater control knobs.
8. Install heater control panel garnish.
9. Install radio mounting bracket nuts (2).
10. Install ash tray and holder.

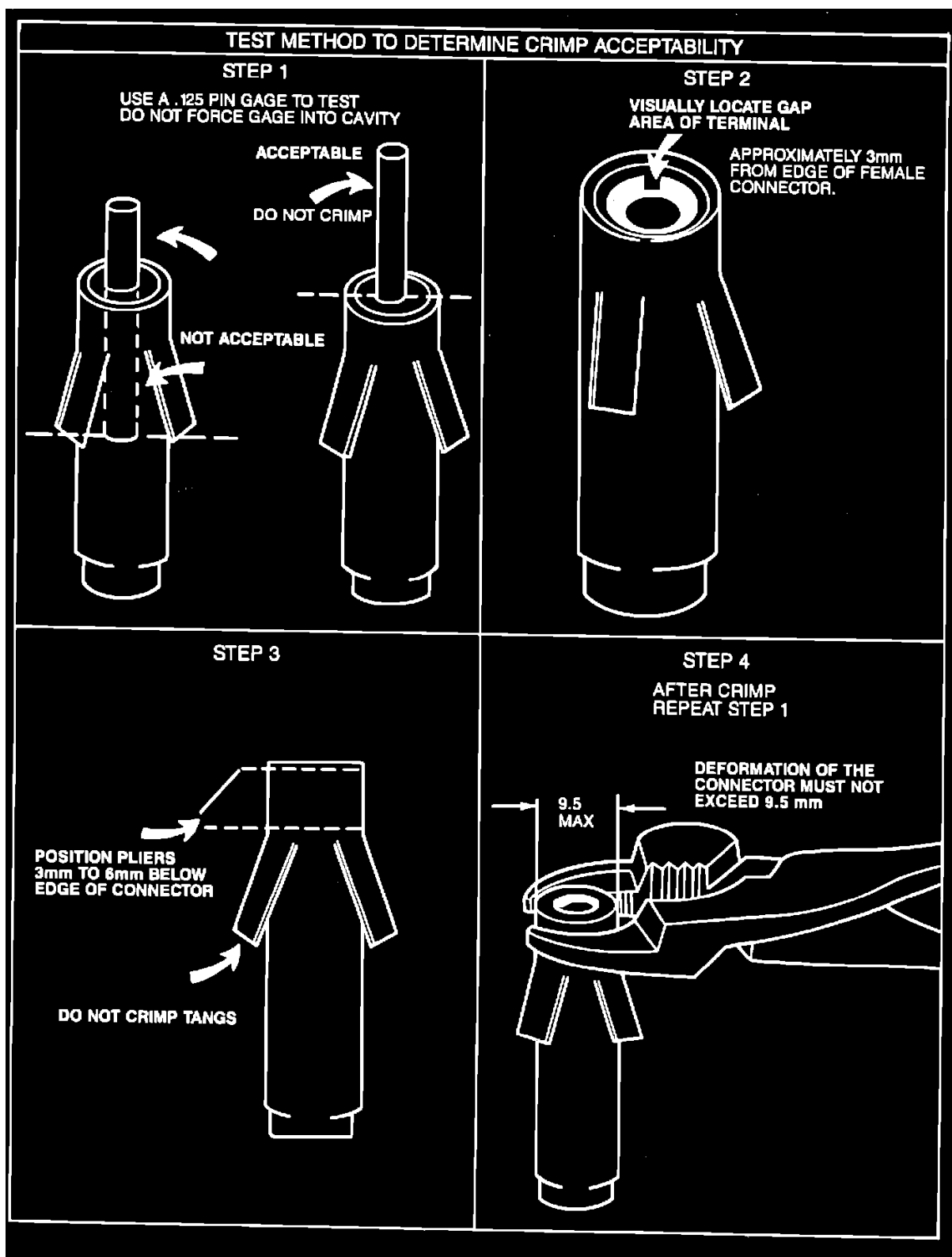
Technical Service Bulletin # **891089A**

Date: **890301**

## Audio - Poor AM or FM Radio Reception

Number: 89-108-9A  
Section: 9A  
Date: MARCH, 1989  
Subject: POOR AM OR FM RADIO RECEPTION

Model and Year: 1980-89 CHEVROLET VEHICLES



TO: ALL CHEVROLET DEALERS

Some Chevrolet models may exhibit a condition of poor AM or FM radio reception. This may be caused by a poor contact on the female terminal of the antenna coaxial cable lead.

The illustration contains a four-step procedure to test and repair the female terminal. The opening in the female terminal should range from .120" to .125" in diameter. If the gage passes through freely, the terminal should be repaired as illustrated. Gage sets are available from Kent Moore, tool number J26900-14.

For warranty purposes use Labor Operation T6369 at .5 hour for all carlines.

Technical Service Bulletin # **99-09-40-006**

Date: **000101**

## Lap/Shoulder Belts - Dealer Installed Rear Kits

File In Section: 09 - Restraints

Bulletin No.: 99-09-40-006

Date: January, 2000

## **INFORMATION**

Subject:

Dealer Installed Rear Seat Lap/Shoulder Belt Kits Models: 1988 and Prior Passenger Cars and Light Duty Trucks

In 1986, General Motors made a commitment to become the first American manufacturer to provide rear seat lap/shoulder belts as standard equipment in new domestic light vehicles. In addition, GM released dealer-installed Rear Seat Lap/Shoulder Belt kits for most current and past model vehicles.

At this time, certain belt kits are still available from GMSPO. Some passenger cars can still be retrofitted with belt kits in the correct matching color, while other cars can only be retrofitted with black belt kits. Light Duty Trucks only have retrofit belt kits available in black.

With seat belt use required now in most states, public acceptance of all kinds of occupant restraints is increasing. As a result, you may see an increase in requests from vehicle owners.

## **Parts Information**

For part number, usage, and availability of Rear Seat Lap/Shoulder Belt kits, see Group 21.040 (Accessories) of the appropriate GMSPO Parts Catalog.

## **Warranty Information**

The cost associated (parts & labor) with installing these Rear Seat Lap/Shoulder Belt kits is the responsibility of the customer.

Technical Service Bulletin # **99-08-42-009**

Date: **991101**

## **IP Dimmer Control - Proper Setting**

File In Section: 08 - Body and Accessories

Bulletin No.: 99-08-42-009

Date: November, 1999

## **INFORMATION**

Subject:

Proper Setting of I/P Dimmer Control to View PRNDL Display with Automatic Headlamp Control

Models:

2000 and Prior All Passenger Cars and Trucks

With Automatic Headlamp Control and Electronic PRNDL Display

Under certain conditions, if the instrument panel dimmer control is turned relatively low, the PRNDL will not be visible until the automatic headlamp control turns the headlamps off and the daytime running lamps (DRL) are turned back on. Such a condition may be if the vehicle is first started in an environment where the headlamp control turns on the headlamps and then the vehicle is driven out into a brighter environment (for example, when a vehicle is backed out of a dark garage into the bright sunlight).

This condition is normal and any repair attempt will not be successful. Demonstrate this condition to the customer using the service lane and then turn the instrument panel dimmer control to a higher setting. This will enable the driver to see the PRNDL display

Technical Service Bulletin # **902166**

Date: **900401**

## **Oil Filters (Small 75 mm) - Leakage Prevention**

Number: 90-216-6

Section: 6

Date: April 1990

Corp. Bulletin No.: 906106

Subject: PROPER INSTALLATION OF 75 MM OIL FILTER

Model and Year: 1981-90 CHEVROLET MODELS

THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN NO. 90-187-6, DATED MARCH 1990. THE 1990 MODEL YEAR HAS BEEN ADDED. ALL COPIES OF 90-187-6 SHOULD BE DISCARDED.

To prevent leakage of small 75 mm oil filters such as PF-40, PF-45, PF-47, PF-51, etc., it is very important that the installation instructions listed

below are closely followed.

Remove old filter by turning counter clockwise. Clean gasket sealing area on Engine Oil Filter Mounting Surface. (If engine has an adapter base, make sure threaded nipple or bolt is properly torqued.)

Lightly oil gasket with clean oil and install filter. After the oil filter gasket contacts the oil filter adapter base, tighten 3/4 to 1 full turn. When necessary, use a cap-type wrench, AC Delco OF17W or equivalent, or strap type wrench with swivel handle to insure proper installation.

With engine oil at proper level, run engine three minutes and thoroughly check filter area for leaks.

**IMPORTANT:** Be certain to follow replacement oil filter usage applications.

Technical Service Bulletin # **902935**

Date: **900701**

## **Brakes - Poor Rotor Finish/Hard Pedal Feel**

Number: 90-293-5

Section: 5

Date: July 1990

Corp. Bulletin No.: 005003

Subject: BRAKE ROTOR REFINISH

Model and Year: 1981-90 ALL PASSENGER CARS AND TRUCKS

TO: ALL CHEVROLET DEALERS

Comments have been received of poor brake rotor finish and/or hard brake pedal feel after refinishing brake rotors using the On-Vehicle Brake Lathe (VGB 320/366, Kent-Moore 38- 070400) sold through GM Dealer Equipment program.

**CAUSE:**

This condition results from using non-original cutting tips. Only original equipment replacement tips should be used.

**CORRECTION:**

When replacing the original cutting tips for an On-Vehicle Brake Lathe, use only replacement tips ordered from Kent-Moore Tool and Equipment Division.

The replacement cutting tips can be ordered from Kent-Moore (1-800-GM-TOOLS) as follows:

Part Number: J-37704-13 Cufting Tips (Box of Ten)

We believe this source and their equipment to be reliable. There may be additional manufacturers of such equipment. General Motors does not endorse, indicate any preference for or assume any responsibility for the products or equipment from this firm or for any such items which may be available from other sources.

Technical Service Bulletin # **883125**

Date: **880801**

## **Brakes - Pulsations and Rotor Surface Refinish**

Number: 88-312-5

Section: 5

Date: AUGUST, 1988

Subject BRAKE PULSATIONS AND DISC BRAKE  
ROTOR SURFACE REFINISH

Model and Year 1982-88 CHEVROLET MODELS

TO: ALL CHEVROLET DEALERS

On today's vehicles the primary reason for brake pulsation is variation in the thickness of the rotor, which generally occurs after some mileage.

The causes of rotor thickness variation tend to occur while the vehicle is in motion and the brake pedal is in the unapplied position. Three events must occur simultaneously:

1. The rotor/bearing system runout must be out of specification enough to produce high spots on the rotor face in relation to the caliper.
2. There must be a condition of caliper drag which causes the inboard and/or outboard shoe to rub on the rotor high spots.

3. The lining material must be sufficiently abrasive to cause wear on the high spots and therefore to develop rotor thickness variation after accumulated mileage.

Following is a discussion of each of these events along with information about the conditions which can contribute to each.

## System Runout Information

### SYSTEM RUNOUT:

Excessive system runout can exist as a result of the stack up of the tolerances of a rotor and a bearing which has been manufactured at one end or the other of their respective design specifications, or if either the rotor or bearing are out of specification.

The manufacturing process controls which determine the amount of rotor or bearing runout are continuously being improved to reduce the amount of system and/or component runout. During manufacturing of the brake rotor, tolerances of the braking surfaces for flatness, thickness variation and lateral runout are held very close. Maintaining these close tolerances on the rotor's braking surface is necessary to prevent brake roughness.

A lateral runout check of the rotor must be performed to determine the extent of runout.

### Lateral Runout Check:

1. Remove the wheel and tire. Invert the wheel nuts and reinstall them on the studs to the specified torque. Be sure to follow the alternating nut torquing sequence to ensure proper rotor alignment.
2. Fasten a dial indicator to the caliper so the dial indicator button contacts the rotor about 13 mm (0.500 inch) from the outer edge.
3. Zero the dial indicator.
4. Move the rotor one complete revolution and observe total indicated runout (T.I.R.). Lateral runout cannot exceed 0.08 mm (0.003-inch).

^ On front wheel drive vehicles, excessive lateral runout of the rotor can often be improved by indexing the rotor on the hub one or two bolt positions from the original position. If the lateral runout CANNOT be corrected by indexing the rotor, check the hub and bearing assembly for looseness.

**NOTICE:** Whenever the brake rotor has been separated from the wheel bearing flange, remove any rust or foreign material from the mating surfaces of the wheel bearing flange and rotor. Failure to do this may result in excessive lateral runout of the rotor, causing brake pedal pulsation.

5. If lateral runout exceeds that specified in Step 4, refinish the rotor to specifications, reinstall rotor, and remeasure lateral runout.

## Wheel Bolt Torque, Caliper and Lining Material

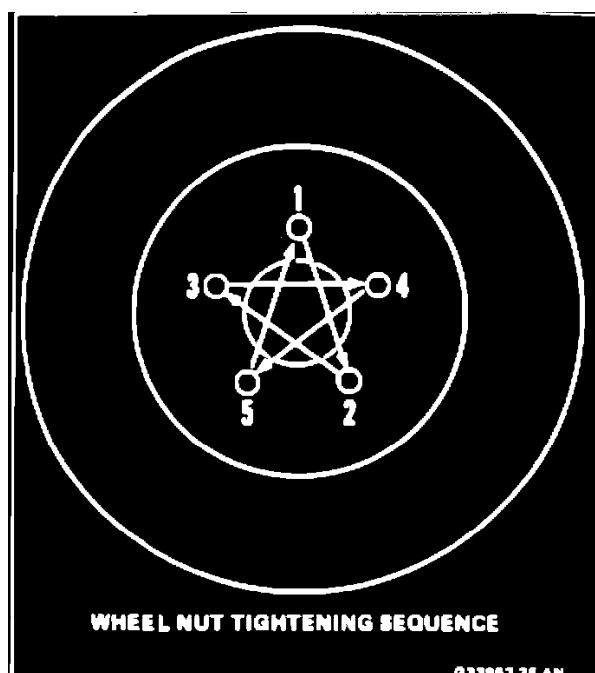


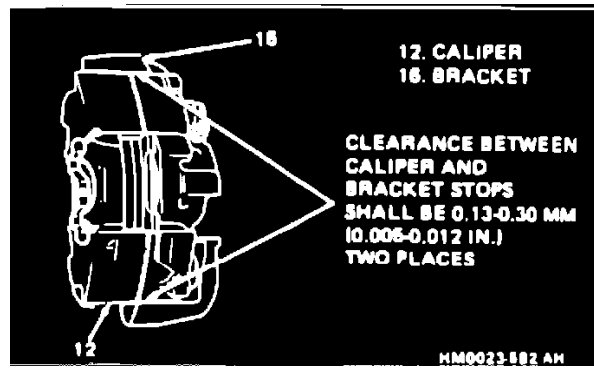
FIGURE 1 - WHEEL NUT TIGHTENING

### WHEEL BOLT TORQUE:

Overtorqued wheel nuts or torquing wheel nuts without alternating the tightening sequence, especially on aluminum wheels, can also create a rotor runout condition. Refer to Figure 1.



The use of a torque wrench when tightening wheel nuts is necessary to prevent distortion of the rotor, hub or wheel. The wheel nuts should be tightened in two steps to assure an even clamp load.

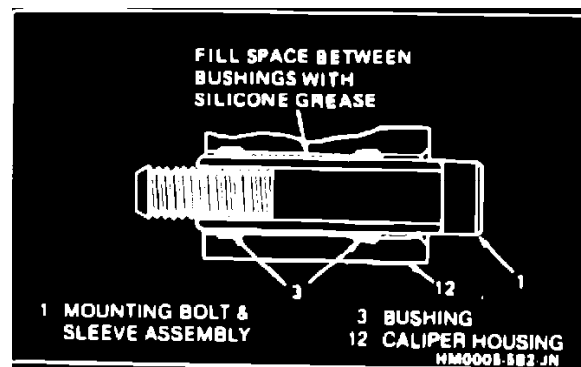


**FIGURE 2 - CALL TO BRACKET CLEARANCE**

#### CALIPER DRAG:

Caliper drag is usually caused by interference between the caliper to knuckle interface or a caliper bolt binding on the caliper bolt bushing.

Caliper to knuckle clearance is important. Clearance should be checked with the caliper in position and the caliper mounting bolts properly torqued. If excessive clearance exists, a clunking noise may occur on each brake apply. Too little clearance can cause caliper drag. The desired clearance is .005 - .012 in. at each caliper to knuckle bracket interface, or a total of .010 - .024 in. The caliper bracket stops can be filed -to obtain proper clearance. Refer to Figure 2.



**FIGURE 3 - LUBRICATING CALIPER CAVITY**

When servicing the caliper, the caliper bolts should be cleaned and the space between the caliper bolt bushings should be filled with silicone grease such as Part Number 1052863 or equivalent. This will prevent the caliper dragging or binding on the mounting bolts. Refer to Figure 3.

#### LINING MATERIAL ABRASIVENESS:

The degree of abrasiveness of the brake lining material is determined by the manufacturer. A highly abrasive material will tend to create a rotor out-of-parallel condition if system runout and caliper drag are present.

The properties and characteristics of brake linings are specified by Product Engineering. Some brake lining designs may be more aggressive when stopping, i.e. higher friction coefficient, while others are less aggressive but may be very durable and long lasting. The linings for any specific vehicle are selected on the basis of friction, wear, etc., to optimize front and rear braking for that specific vehicle.

The brake lining used should be whatever is recommended by the manufacturer in the parts catalog or in the latest service bulletin.

Brake pedal pulsation can also occur in the rear on drum brakes if there is radial runout in the drum and/or axle flange, or bearing.

#### Thickness Variation Check:

If a brake pedal pulsation condition is felt, a thickness variation check should be performed on the rotor.

Thickness variation can be checked by measuring the thickness of the rotor at four or more points around the circumference of the rotor. Use a micrometer calibrated in one tenth increments per .001 inch. All measurements must be made at the same distance in, from the edge of the rotor.

A rotor that varies by more than 0.013 mm (0.0005-inch) can cause pedal pulsation and/or front end vibration during brake applications. A rotor that does not meet these specifications should be refinished or replaced as necessary.

#### Rotor Refinish Recommendations:

Rotor refinish should only be performed because of non-parallelism (thickness variation), runout, or deep scoring grooves deeper than .015 inches.

When replacing a rotor with a new rotor from stock it should NOT require refinishing unless ons of the conditions mentioned above is present. Also, routine replacement of disc brake linings does NOT require rotor refinishing. When rotor refinishing is required the following recommended procedures should be used to obtain the proper micro-inch surface finish which is required for new rotors (10 to 50 micro-inches with non-directional swirl pattern). When refinishing a rotor for a pulsation condition it is recommended that at least 0.010 inch be removed from the inboard and outboard side of the rotor surface to insure removal of the high and low spots on the face of the rotor.

Spindle	Rough Cut	Finish Cut
Depth of Cut Per Side	150 rpm	150 rpm
Tool Cross Feed Per Rev.	.005 inch	.002 inch
Vibration Dampener	0.006-.010 inch	.002 inch max.
Swirl Pattern-120 GRIT	Yes	Yes
	No	yes

The following is also important:

The brake lathe must be in good working order and have capability to produce the intended surface finish.

Excessive spindle speed or too deep a cut can result in a rough finish.

Cutting tools must be sharp.

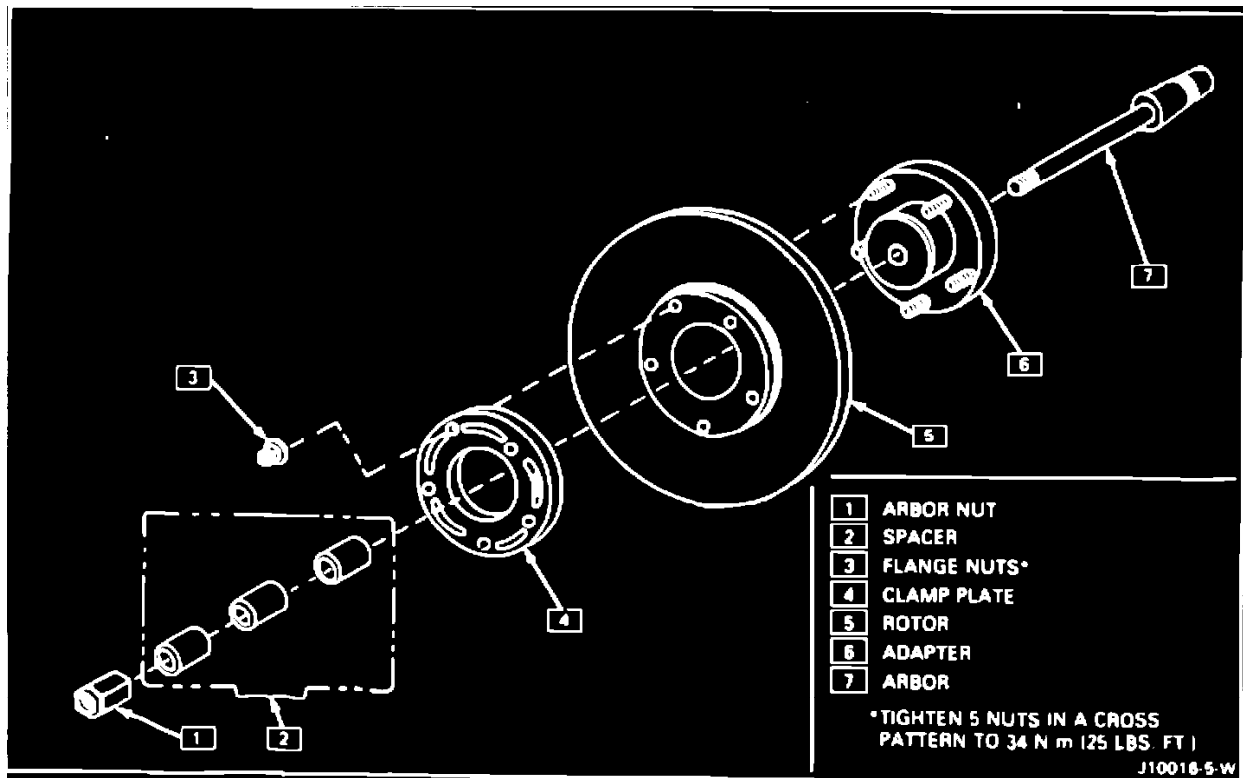


FIGURE 4 - ROTOR MOUNTING ADAPTER - J 37160

Adapters, if used, must be clean and free of nicks. Adapters may be used because of a two piece composite rotor design. (Refer to Figure 4). The rotor surface contacting the arbor and/or the adapter must be free of debris and coarse surface corrosion.

If the dealership's rotor turning equipment cannot produce a finish cut equivalent to a new rotor's surface, finish cuts may be further improved and made non-directional by dressing the rotor surface with a sanding disc power tool.

Light scoring of the rotor surfaces not exceeding 0.38 mm (0.015 inch) in depth, which may result from normal use, will not affect brake operation. To become familiar with the required surface finish, drag a fingernail over the surface of a new rotor from the parts stock or one on a new vehicle. If your brake equipment cannot produce this smooth a finish when correctly used, contact the equipment manufacturer for corrective instructions.

Following these refinishing specifications and recommendations will help to hold the rotor surface finish to the specified range. Controlling the braking surface finish of the rotor is necessary to provide adequate early stopping ability and to avoid pulls and erratic performance and will aid in extending lining life.

Technical Service Bulletin # 911335

Date: 901201

## Brakes - Change In Brake Feel After Rotor Refinishing

Number: 91-133-5

Section: 5

Date: December 1990

Corporate Bulletin No.: 075003R

Subject: CHANGE IN BRAKE EFFECTIVENESS AFTER DISC BRAKE ROTOR REFINISHING/PAD REPLACEMENT

Model and Year: ALL PASSENGER CARS ALL LIGHT DUTY TRUCKS

TO: ALL CHEVROLET DEALERS

THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN NO. 90-316-5, DATED AUGUST 1990. INFORMATION HAS BEEN ADDED REGARDING HUB AND ROTOR CLEANING, PROPER TORQUING TECHNIQUE, REVISED MACHINING TABLE, CHANGE SPECIFICATION FOR MAXIMUM SCORING DEPTH. THE 1991 MODEL YEAR WAS ALSO ADDED. ALL COPIES OF 90-316-5 SHOULD BE DISCARDED.

Some comments have been received about a change in preceived braking effectiveness which occurs after rotors have been refinished and/or disc brake pads have been replaced. New lining materials have been formulated for increased lining life and to reduce brake squeal. Also, Federal regulations currently prohibit the use of asbestos in Original Equipment Manufactured (O.E.M.) front disc brake linings, and will totally ban asbestos from all O.E.M. brake linings in the near future. Due to these changes, initial rotor surface finish is more critical than in the past, and is required for good brake performance.

Following are some recommended actions/procedures to assure proper performance of the brake systems on all vehicles after rotor and/or pad service has been performed:

1. When performing routine brake maintenance such as replacing worn disc brake pads or shoes, DO NOT refinish disc brake rotors or drums unless:
  - A. There is a brake pulsation condition present, and this pulsation is found to be caused by the brake rotors or drums, or
  - B. The rotors and/or drums are excessively scored. Surface scoring that does not exceed 1.2 MM (0.050 in.) on rotors or drums should not affect brake operation.

Before removing rotors from the hub assembly, mark the rotor and on wheel stud so that the rotor may be re-installed in the same position.

If rotors are removed, it is very important that rust and scale be removed from the rotor and hub mating surfaces. Failure to do so may introduce excessive lateral runout when the rotor is mounted on the brake lathe, or when the rotor is re-installed to the hub.

2. When refinishng disc brake rotors, it is important that the brake lathe be in good operating condition and that all tools or bits are sharp. Recommended vibration dampeners and/or adaptors should be used and should be clean and free of nicks (remember, 1988-91 W models require the use of an adaptor, J37160, because of the two-piece design). The following table shows the recommended procedure for rotor machining:

	ROUGH CUT	FINISH CUT
Spindle Speed	150 RPM	150 RPM
Depth of Cut (per side)	0.127 mm (0.005")	0.051 mm (0.002")
Tool Cross Feed per Rev	0.152 mm - 0.254 mm (0.006" - 0.010")	0.051 mm (0.002")Max
Vibration Damper	Yes	Yes
Sand Rotors-Final Finish	No	Yes

It is important that a rough and a finish cut be made. All brake lathes use a single-point cutting tool which is not capable of giving the necessary surface finish. A SECONDARY FINISHING OPERATION MUST BE PERFORMED TO OBTAIN THE NECESSARY SURFACE FINISH.

An acceptable finish can be obtained using the Ammco Model 8350 Safe Swirl Disc Rotor Grinder, or equivalent, using 120 grit sandpaper and sanding each rotor surface with moderate pressure for a minimum of 60 seconds with the rotor turning at 150 RPM. An alternate method is to use a sanding block with 150 grit sandpaper. With the rotor turning at approximately 150 RPM, sand each side for a minimum of 60 seconds using moderate pressure.

After the rotor has been sanded, the surfaces must be cleaned with a solvent such as brake cleaning, denatured alcohol, or equivalent. THE FINISHED ROTOR SURFACE SHOULD BE AS CLOSE TO THAT OF A NEW ROTOR AS POSSIBLE. FAILURE TO OBTAIN THE BEST POSSIBLE ROTOR FINISH WILL AFFECT INITIAL BRAKING PERFORMANCE.

**CAUTION:** ROTORS OR DRUMS SHOULD ALWAYS BE REPLACED IF TURNING WILL RESULT IN A ROTOR OR DRUM THAT DOES NOT MEET MANUFACTURER SPECIFICATIONS FOR MINIMUM ROTOR THICKNESS OR MAXIMUM DRUM DIAMETER.

**NOTICE:** When re-installing tire and wheel assemblies, it is very important that proper procedures be followed when installing and torquing the wheel nuts:

- A. Finger start all wheel nuts.
  - B. Tighten wheel nuts to specified torque (use the "star," or alternating nut pattern) using a torque wrench. **DO NOT USE AN IMPACT WRENCH. UNEVEN AND/OR EXCESSIVE TORQUING OF THE WHEEL NUTS HAS BEEN FOUND TO DISTORT ROTORS, RESULTING IN PREMATURE CUSTOMER COMEBACKS FOR BRAKE PULSATION**
3. After brake pads have been replaced and/or rotors have been refinished, it is recommended that the new braking surfaces be broken in, or burnished, to properly seat them. This can be accomplished by making 20 stops from 30 mph, using medium to firm pressure. Take care to avoid overheating the brakes.
  4. It is strongly recommended that the correct, specified General Motors replacement part(s) be used when servicing G.M. vehicles. General Motors does not test non-G.M. parts for proper performance on G.M. vehicles. Therefore, the use of non-G.M. parts may result in unacceptable vehicle performance. It is also important that the correct G.M. part(s) be used in the correct G.M. application. For example, some "A" model disc brake pads ("A" Heavy) will fit on "C" and "H" models, but will not provide the same performance as the pads specified for use on C and H vehicles. It may seem preferable to stock fewer brake pad part numbers, but customer dissatisfaction may result if vehicle performance is affected.

Technical Service Bulletin # **89855**

Date: **890201**

## **Brakes - On-Car Rotor Turning Tool**

Number: 89-85-5

Section: 5

Date: FEB., 1989

Subject: ON-CAR BRAKE ROTOR TURNING TOOL

Model and Year: 1980-89 CHEVROLET MODELS WITH DISC BRAKES  
TO: ALL CHEVROLET DEALERS

A new tool for on-car turning of brake rotors is now available through General Motors Dealer Equipment. The tool number is 38 70400S10.

This tool is designed to compensate for tolerance stack-ups from hubs, bearings, spindles, etc., by refinishing the rotor while it rotates in it's normal on-car position.

Technical Service Bulletin # **73-50-37**

Date: **980101**

## **Brakes - Rotor & Hub Flange Cleaning Tool Revision**

File In Section: 5 - Brakes

Bulletin No.: 73-50-37

Date: January, 1998

### **INFORMATION**

Subject:  
Revision to J 42450 Tool; Proper Brake Rotor and Hub Flange Surface Cleaning

Models:  
1998 and Prior Passenger Cars and Light Duty Trucks - with Disc Brakes (Rotor and Hub Separate)

This bulletin is being revised to update the following text.

This bulletin is being issued to inform the dealer about a revision to tool J 42450 and reinforce the need for proper hub flange and brake rotor mating surface cleaning during service.

Tool J 42450 is a cleaning pad arbor and pad system that fits over the wheel stud and cleans the portion of the hub surface that is very difficult to reach with normal rotary cleaning pads. Tool J 42450 is being revised to J 42450-A to improve the hook and loop material retention. Any dealer experiencing problems with tool J 42450 should contact Kent-Moore at 1-800-345-2233 for a revised arbor at no charge.

Anytime the brake rotor has been separated from the hub bearing flange or if rotor machining is necessary, the rotor and hub should be marked to maintain the original position. Clean the hub flange of all dirt and foreign material using special tool J 42450 or J 42450-A. Clean both sides of the brake rotor hub using an aggressive (80 grit) abrasive sanding pad on a rotary disc.

Properly cleaning the rotor surfaces before rotor machining or reassembly ensures that dirt and corrosion will not add lateral runout to the rotor. Proper cleaning of the hub flange will also minimize the stack-up of lateral runout. On reassembly, the rotor should be reinstalled aligning the marks made on disassembly.

Always use a torque wrench or the appropriate Torque Socket found in J 39544-KIT on an impact wrench when installing the wheel and tire assembly. Torque all wheel nuts using the correct sequence and torque. Refer to the Tire and Wheel Sub-Section in the applicable Service Manual. Excessive torque or torque variation between wheel nuts may cause distortion of the hub and rotor mating surface. This distortion may cause lateral runout and lead to brake pulsation.

Technical Service Bulletin # **912841A**

Date: **910401**

## A/C - Refrigerant Loss Prevention

Number: 91-284-1A

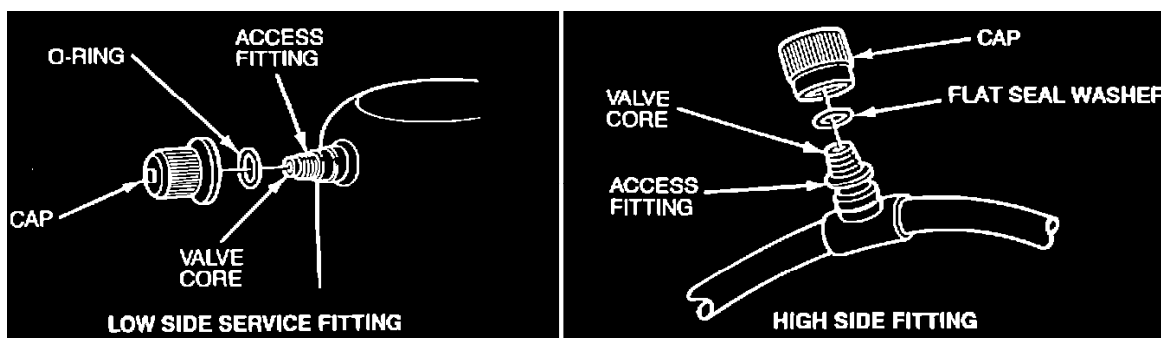
Section: 1A

Date: APRIL 1991

Corp. Bulletin No.: 971202R

Subject: AIR CONDITIONING REFRIGERANT LOSS DUE TO LOOSE OR MISSING ACCESS FITTING CAPS

Model and Year: 1980-91 PASSENGER CARS AND TRUCKS



All GM air conditioning Hi side and Low side access fittings are supplied with a black plastic cap and seal assembly which provides the primary refrigerant seal for the service fittings.

If the cap and seal assembly is missing or loose, a significant amount of refrigerant may leak through the valve core located in the access fitting, which could result in poor A/C performance or failure.

When servicing any vehicle's A/C system, make sure all access fitting cap seals (refer to Figure) are in place and tight. Caps should be threaded on until contact with the "O" ring seal is made and then tightened another 1/4 - 1/2 turn to ensure proper sealing.

High Side  
Valve - Cap and Seal  
P/N 52451233

Low Side  
Valve - Cap and Seal  
P/N 6551640

Parts are currently available from GMSPO.

Technical Service Bulletin # **891271B**

Date: **890401**

## A/C - R12 Loss From Loose or Missing Access Fitting Caps

Number: 89-127-1B

Section: 1B

Date: APRIL, 1989

Subject: A/C REFRIGERANT LOSS DUE TO LOOSE OR MISSING ACCESS FITTING CAPS

Model and Year: 1980-89 CHEVROLET MODELS WITH A/C

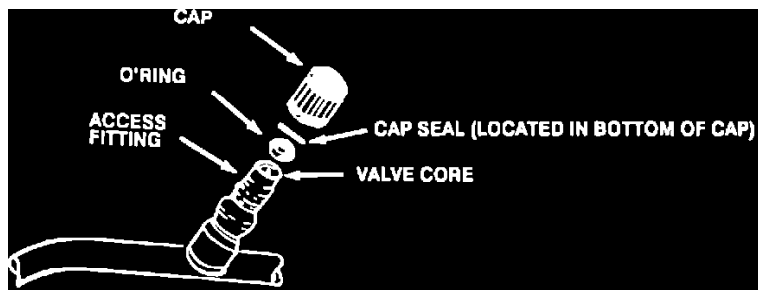


FIGURE 1

TO: ALL CHEVROLET DEALERS

All Chevrolet air conditioning Hi side and Low side access fittings are supplied with a black plastic cap and seal assembly which provides the primary refrigerant seal for the service fittings.

If the cap and seal assembly is missing or loose, a significant amount of refrigerant may leak through the valve core located in the access fitting, which could result in poor A/C performance or failure.

When servicing any vehicle's A/C system, make sure all access fitting cap seals (refer to Figure 1) are in place and tight. Caps should be threaded on until contact with the O-ring seal is made and then tightened another 1/4 - 1/2 turn to ensure proper sealing.

High Side  
Valve - Cap and Seal  
P/N 3033974

Low Side  
Valve - Cap and Seal  
P/N 6551640

Parts are currently available from GMSPO.

Technical Service Bulletin # **93356D**

Date: **921001**

## Engine - Miss, Hesitation, or Roughness

Number: 93-35-6D

Section: 6D

Date: OCT. 1992

Corporate Bulletin No.: 716404R

ASE No.: A1, A8

Subject:

ENGINE MISS HESITATION OR ROUGHNESS DUE TO PIERCED SECONDARY IGNITION COMPONENTS

Model and Year:

1980-93 ALL PASSENGER CARS AND TRUCKS

THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN NO. 87-121, DATED MAY 1987. THE 1989-93 MODEL YEARS HAVE BEEN ADDED. ALL COPIES OF 87-121 SHOULD BE DISCARDED.

During the diagnosis procedure for an engine miss, hesitation or roughness, a spark plug or spark plug wire condition may be suspected. Several types of commercial or homemade diagnostic equipment required the secondary ignition boots or wire to be pierced. This is normally done to check for spark plug firing or to perform a cylinder balance test. Similarly the use of pliers or other such tools to disengage a spark plug boot may pierce or damage the boot or wire. Secondary ignition components should not be pierced for any reason.

Piercing a spark plug wire and/or distributor boot may create a condition that will not be immediately apparent. Over time, the hole in the pierced boot may allow a ground path to develop creating a plug misfire condition. Heavily moisture laden air in the vicinity of the pierced boot may accelerate this effect.

Piercing a secondary ignition wire creates a gap in the wire's conductive core. This gap is a point of high resistance. The current flow in the wire will increase to compensate for the higher wire resistance. Over time, the wire may fail creating a plug misfire condition. The time required for the condition to appear depends upon the extent of damage to the conductive core.

To help prevent future condition that are spark plug wire related, do not pierce or otherwise damage any secondary ignition component. Only use diagnostic equipment containing an inductive pick-up to check for spark plug firing or to perform cylinder balance tests. When disengaging a spark plug boot from the spark plug, twist the flanged boot 1/2 turn then pull on the boot only to remove the wire.

Technical Service Bulletin # **881386D**

Date: **880201**

## Ignition System - Diagnosis Precautions

Number: 88-138-6D

Section: 6D  
Date: Feb., 1988  
Subject: ENGINE MISS, HESITATION, OR ROUGHNESS DUE TO PIERCED SECONDARY IGNITION COMPONENTS

Model and Year: ALL MODELS WITH GASOLINE ENGINE  
TO: ALL CHEVROLET DEALERS

During the diagnosis procedures for an engine miss, hesitation, or roughness condition, a spark plug or spark plug wire condition may be suspected. Several types of commercial or homemade diagnostic equipment require the secondary ignition boots or wire to be pierced. This is normally done to check for spark plug firing or to perform a cylinder balance test. Similarly, the use of pliers or other such tools to disengage a spark plug boot may pierce or damage the boot or wire.

**NOTICE: SECONDARY IGNITION COMPONENTS SHOULD NOT BE PIERCED FOR ANY REASON.**

Piercing a spark plug wire and/or distributor or direct fire module nipple may create a failure condition that will not be immediately apparent. Over time, the hole in the pierced boot may allow a ground path to develop, creating a plug misfire condition. Heavily moisture-laden air in the vicinity of the pierced boot may accelerate this effect.

Piercing a secondary ignition wire creates a gap in the wire's conductive core. This gap is a point of high resistance. The current flow in the wire will increase to compensate for the higher wire resistance. Over time, the wire may fail, creating a plug misfire condition. The time required for the condition to appear depends upon the extent of damage to the conductive core.

To help prevent future customer comments that are spark plug wire related, do not pierce or otherwise damage any secondary ignition component. Only use diagnostic equipment containing an inductive pick-up to check for spark plug firing or to perform cylinder balance tests. When disengaging a spark plug boot from the spark plug, twist the flanged boot 1/2 turn, then pull only on the boot to remove the wire.

Technical Service Bulletin # **882077A**

Date: **880501**

## **A/T - Sporadic Engagement of Torque Converter Clutch**

Number: 88-207-7A  
Section: 7A  
Date: MAY, 1988  
Subject: SPORADIC ENGAGEMENT OF

TORQUE CONVERTER CLUTCH

Model and Year: 1980-88 MODELS WITH COMPUTER COMMAND

CONTROL AND AUTOMATIC TRANSMISSION/ TRANSAXLE AND CABLE DRIVEN SPEEDOMETER  
TO: ALL CHEVROLET DEALERS

Sporadic engagement and disengagement of the converter clutch may be caused by a bent or kinked speedometer cable. This condition may occur with cluster speed sensor systems. A cluster speed sensor system has a cable from the transmission to the cluster to drive the speedometer needle. In addition, the signal from the cable is buffered in the cluster and then sent to the ECM. The ECM has certain fixed values for minimum lock and unlock speeds which typically center around 30-40 mph.

If the speedometer cable is kinked/bent, an inconsistent speed signal will be passed through the buffer and sent to the ECM. The ECM will interpret the varied speed signals as actual vehicle speed changes. If a variation in speed signals occurs at 30-40 mph, the correct criteria could be met in the ECM such that the ECM would command the torque converter to lock and unlock. (This condition can be verified by using a scanner). Customers may describe this condition as momentary loss of power or engine miss at 30-40 mph.

Technical Service Bulletin # **668304A**

Date: **960901**

## **Odometer/Speedometer - AC Delco Service Center Locations**

File In Section: 8 - Chassis/Body Electrical

Bulletin No.: 66-83-04A

Date: September, 1996

INFORMATION

Subject:  
AC Delco Service Center Locations for Odometer/Speedometer Service

Models:  
1997 and Prior Passenger Cars and Trucks  
(excluding Cadillac)

This bulletin is being revised to provide the necessary contact information only. Please discard Corporate Bulletin Number 66-83-04 (Section 8 - Chassis/Body Electrical)

General Motors provides service for sophisticated electronic products through the authorized AC Delco Service Center Program. This program is designed to provide GM vehicle owners with the highest quality and most technically up-to-date product available. Repair products from unauthorized service outlets are not acceptable as warranty replacements.

Currently, there are 25 authorized AC Delco Service Centers who exchange and remanufacture odometer/speedometers (list included). Only these Centers should be contacted for service.

**Important:**

W series and 1997 T series Medium Duty truck odometer/speedometers must be ordered directly from GMSPO.

The following steps should be taken when utilizing the AC Delco Service Centers: Dealers should contact their local AC Delco Service Center (list included). Any listed facility may be used.

The following information must be provided:

Part number  
VIN, Mileage, Vehicle Year, Make and Model  
Dealer Name and Address  
Delivery Date of Vehicle  
Name of the person requesting exchange or service  
Phone number  
Repair Order Number  
P.O. number (if non - warranty)

**Arizona**

Jimmy's Radio-TV  
3839 N. 16th St  
Phoenix, AZ 85016  
(602) 264-1379  
(800) 227-7234 - National  
Fax (602) 254-6697

**California**

Auto Electric Radio  
1841 West Commonwealth  
Fullerton, CA 92633  
(714) 871-7357  
(800) 321-6970 - National  
Fax (714) 871-2062

Speed-O-Tach, Inc.  
4090 Pike Lane  
Concord, CA 94520  
(510) 691-4090  
(800) 442-4491 - National  
Fax (510) 691-4101

**Colorado**

Instrument Sales - Service  
4990 Nome St Suite C  
Denver, CO 80239  
(303) 576-8555  
(800) 666-5469 - National  
Fax (800) 272-3628



**Florida**

Techni-Car, Inc.  
450 Commerce  
Oldsmar, FL 34677  
(813) 855-0022  
(800) 886-0022 - National  
Fax (813) 855-2101

**Georgia**

Speedometer Service Company  
8471 Roswell Road  
Atlanta, GA 30350  
(770) 998-1866  
(800) 322-1827 In-State  
(800) 241-2385 Out-State  
Fax (770) 993-0252

**Illinois**

D & B Auto Radio, Inc.  
2140 Corporate Drive  
Addison, IL 60101  
(630) 916-8787  
(800) 323-4813 - National  
Fax (708) 916-8922

**Maryland**

Caton Radio, Inc.  
6328 Baltimore  
National Pike  
Catonsville, MD 21228  
(410) 747-8667  
(800) 443-6709 - National  
Fax (410) 788-4386

**Massachusetts**

Modern Radio Shop  
34 Broadway  
Wakefield, MA 01880  
(617) 246-2052  
(800) 848-4001 - National  
Fax (617) 246-2078

**Michigan**

Specmo Enterprises  
2850 West 11 Mile Road  
Berkley, MI 48072  
(810) 399-9808  
(800) 545-7910 - National  
Fax (810) 399-0493

**Minnesota**

Auto-Sound Entronix  
9600 54th Avenue North  
Minneapolis, MN 55442  
(612) 559-9654  
(800) 328-0795 - National  
Fax (612) 559-9652

**Missouri**

Autronics Auto Spec.  
1450 Page Ind. Ct  
St Louis, MO 63132  
(314) 423-2323  
(800) 325-1325 Out-State  
Fax (314) 423-2841

**New Jersey**

Eastern Elec., Inc.  
180 Essex St  
Hackensack, NJ 07601  
(201) 342-3945  
(800) 221-2138 - National  
Fax (201) 342-1163

**New York**

United Radio Service  
5705 Enterprise Pkwy.  
E. Syracuse, NY 13057  
(315) 446-5570  
(800) 448-0944 - National  
Fax (315) 446-2434

Model Electronic, Inc.

321 W. Rt 59  
Nanuet, NY 10954  
(914) 623-8020  
(800) 433-9657 - National  
Fax (914) 623-2747

**North Carolina**

Downtown Radio Service  
2908 Stewart Creek  
Charlotte, NC 28216  
(704) 391-0801  
(800) 537-0116 - National  
Fax (704) 393-9145

**Ohio**

Dayton Speedometer  
7476 Webster St.  
Dayton, OH 45414  
(513) 454-4700  
(800) 543-9687 - National  
Fax (513) 454-4711

Electra-Sound, Inc.

5260 Commerce Pkwy. W.  
Parma, OH 44130  
(216) 433-1050  
(800) 262-9606 - National  
Fax (216) 433-9425

**Pennsylvania**

R. T. Grim Co.  
400 Regis Ave  
Pittsburgh, PA 15236  
(412) 655-1574  
(800) 222-5509 - National  
Fax (412) 655-0988

H & R Auto Radio Svc

155 York Road  
Warminster, PA 18974  
(215) 672-3707  
(800) 523-6605 - National  
Fax (215) 672-4277

**Tennessee**

Rickwood Radio Service  
1830 Airline Drive  
Nashville, TN 37210  
(615) 889-3270  
(800) 423-4142 - National  
Fax (615) 391-3842

**Texas**

Speedometer Service Inc.  
3227 Skylane Drive  
Carrollton, TX 75006  
(214) 380-8944  
(800) 336-3998 - National  
Fax (214) 407-0164

Zener Electronics  
10535 Harwin  
Houston, TX 77036  
(713) 981-5700  
(800) 992-1092 - National  
Fax (713) 981-5900

**Virginia**

Southern Autotronics  
3300 Norfolk St  
Richmond, VA 23230  
(804) 353-5400  
(800) 572-2880 In-State  
(800) 446-2880 Out-State  
Fax (804) 358-3216

**Washington**

Instrument Sales-Serv, Inc.  
18814-72nd Ave S  
Kent, WA 98032  
(206) 251-5469  
(800) 666-5469 - National  
Fax (206) 251-6543  
Fax (800) 272-3628

AC Delco Service Centers

Technical Service Bulletin # **638111**

Date: **960401**

## Headlamp Lens - Distortion Caused by Aiming Equipment

File In Section: 8 - Chassis/Body Electrical

Bulletin No.: 63-81-11

Date: April, 1996

### INFORMATION

**Subject:**

Headlamp Lens Distortion Caused by Headlamp Aiming Equipment

**Models:**

1996 and Prior Passenger Cars and Trucks  
with Plastic Headlamp Lenses

When using headlamp aiming equipment which attaches to the headlamp assembly with a suction cup type device, **DO NOT LEAVE THE LAMPS ON** while the equipment is attached. On vehicles with "plastic" headlamps (body styled composite or sealed beam), having the head lamps illuminated when the equipment is attached may cause heat to build-up between the plastic headlamp lens and the suction cup. This heat build-up, combined with the suction cup, may cause the plastic headlamp lens to become distorted, requiring lamp replacement.

Many aftermarket parts suppliers currently offer replacement headlamps made of plastic for past model vehicles which were originally equipped with headlamps made of glass. As a result, you may encounter vehicles that have a mix of both glass and plastic headlamp assemblies.

**Notice:**

In order to avoid any possibility of damage, regardless of whether a vehicle has glass or plastic headlamps, it is recommended that the headlamps not be illuminated when using headlamp aiming equipment which uses a suction cup device for attachment.

On vehicles with concealed headlamps, follow the instructions in the Owner's Manual on how to keep the headlamp doors open and the headlamps not illuminated.

Technical Service Bulletin # **435001**

Date: **940201**

## Anti-Lock Brake - Aftermarket Products Usage Precaution

Group Ref.: Brakes

Bulletin No.: 435001

Date: February, 1994

### INFORMATION

SUBJECT:  
AFTERMARKET ANTI-LOCK BRAKE SYSTEM PRODUCTS

MODELS:  
1994 AND PRIOR PASSENGER CARS AND TRUCKS

The brake system is one of the most important features on any passenger vehicle.

Several products which tap into the master cylinder and/or brake system and claim to improve brake system performance are being sold in the aftermarket. Some of these products imply performance similar to new vehicle anti-lock brake systems.

However, contrary to their claims, add-on systems which deplete fluid from the master cylinder on brake apply may actually increase a vehicle's stopping distance. This may cause the vehicle to fail to comply with Federal Motor Vehicle Safety Standard (FMVSS) 105. If this happens, the facility which altered the vehicle could be liable for rendering the brake system "inoperative".

GM would like to remind each dealer of their legal obligation with regard to any actions which might take a vehicle out of compliance with FMVSS, and to stress the need to understand the operation of any aftermarket system offered to your customers.

Technical Service Bulletin # **731049**

Date: **970201**

## Body - Sealer Tape For Collision Repairs

File In Section: 10 - Body

Bulletin No.: 73-10-49

Date: February, 1997

### INFORMATION

Subject:  
New Body Sealer Tape for Collision Repairs

Models:  
1997 and Prior Passenger Cars and Trucks  
Using Tape Type Sealers In Door Jambs and Compartment Gutters

Some passenger cars and trucks use a tape type sealer for body sealing in rear compartment gutters and door jamb areas. This sealer is very uniform in shape and thickness and provides excellent sealing characteristics.

A new sealing material is available that provides the look of the production sealing material. This new material is an adhesive backed urethane foam that comes in rolls (7/8" x 33 ft) for jambs and gutters and sheets (6" x 9") for irregular shapes. It is black in color, has excellent adhesion to primed surfaces and is paintable. This material is appropriate for use on vehicles involved in collisions to simulate the appearance of production applied sealers.

The tape is available from the sources listed below under the following part numbers:

Dominion Sure Seal\* - 1-800-265-0790

^ Dominion Sure Seal Paintable Sealing Tape

- 33 Foot Roll Per Package

- Stock Code: WGMT

- Part Number: 3075

^ Dominion Sure Seal Paintable Tape Sheets

- 6" x 9" sheets (6 sheets per package)

- Stock Code: WGMT

- Part Number: 30755

Wurth USA Inc.\* - 1-800-526-5228

^ Wurth Paintable Seam Sealing Tape

\_ 33 Foot Roll per package

- Part Number 894-400

^ Wurth Paintable Sealing Sheets

- 6" x 9" sheets (6 sheets per package)

- Part Number: 894-450

As always, follow the manufacturer's directions for surface preparation, application and painting.

If your dealer/retailer location uses a sublet facility for body/paint repairs, a copy of this bulletin should be provided to that repair facility.

\* We believe these sources and their products to be reliable. There may be additional manufacturers of such products. General Motors does not endorse, indicate any preference for or assume any responsibility for the products from these firms or for any such items which may be available from other sources.

Technical Service Bulletin # **91108A**

Date: **900401**

## **Aftermarket Accessories - Installation Guidelines**

Number: 91-10-8A

Section: 8A

Date: April 1990

Corporate Bulletin No.: 038121

Subject: INSTALLATION GUIDELINES FOR AFTERMARKET ACCESSORIES

Model and Year: ALL MODEL YEARS, ALL CAR AND TRUCK LINES

The popularity and variety of electronic aftermarket auto accessories is rapidly growing. Many of these devices require permanent connections to the electrical system of the vehicle. These installations are usually performed by the dealership, a specialty shop, or the customer.

Today's automotive electrical systems are very sophisticated. Improperly installed electrical accessories can interfere with the vehicles operation, performance, and in some circumstances cause damage to the vehicle which would not be covered under the General Motors New Vehicle Warranty. Possible problems to the vehicle are, but are not limited to: stalling, surging, poor performance, detonation, blown fuses, damaged wiring, cluster lighting changes, battery drains, alarm system failures, premature relay failures, poor radio reception, and radio speaker noises.

Many customers who encounter aftermarket accessory related problems may in error fault the original manufacturer of the vehicle as the cause of the problem. Therefore, in the interest of customer satisfaction, technicians should check for add-on (non OEM) electrical equipment as the first step in diagnosing electrical problems. If the vehicle is so equipped, disconnect the system to verify that these add-on "accessories" are not the cause of the resulting noise interference.

Installation guidelines are listed below. These guidelines are intended to supplement, but not to be used in place of, the instructions supplied by the manufacturer. Instructions for add-on installations are the sole responsibility of the manufacturer of the radio telephone, land mobile radio, or other accessory.

NOTE: Due to the variety of the aftermarket accessories, consult the manufacturer for additional details specific to their product.

In general, there are three classes of aftermarket equipment.

### **1.Devices That Only Require Power and Ground Connections.**

Avoid tying directly into the vehicle's wiring system.

Whenever possible use direct power and ground feeds from the battery or the accessory block stud on vehicles so equipped.

To eliminate voltage spikes do not tie into existing ground connections. Accessories that use low current can be grounded at the left door hinge pillar. Drill a 5.3 mm hole and use a 10 mm head screw p/n 11502704 with star washer p/n 11503663.

Parts are currently available from GMSPO.

Install an in-line fuse holder on the power wire as close to the battery as possible. Only use fuses of the correct amperage as specified by the manufacturer of the add-on device.

Twist the lengths of the power and ground wires together, as much as possible to reduce magnetic interference.

Route wires away from all existing harnesses. Pay particular attention to all ECM, ignition, and radio wiring.

If the device must be ignition operated, use the auxiliary ignition jack in the fuse box and install an in-line fuse. In some cases you may have to add a suppression filter (see Delco Service Managers - Sound Guide).

## **2.Devices That Require Connections to Vehicle Systems or Components**

Follow the above procedures for the power and ground connections.

When the manufacturer's directions require the device be tapped into vehicle systems, such as speed sensor, door lock wiring, courtesy light circuits, etc., it is important to verify that the addition does affect the intended function of the circuit or its related components. I.E. reduce signal strength, create a current draw through switches relays and connectors exceeding their ratings, or generates electromagnetic interference.

If a device is powered by tapping into an existing circuit, the power feed to the device must be of equal or numerically higher gauge size than the source circuit. This will help insure adequate failure mode protection.

Splices, taps, and other wiring alterations should be soldered and insulated, preferably with heat shrink tubing to prevent corrosion and resistance buildup. Avoid the use of quick-lock type splices.

## **3.Devices That Transmit A Radio Signal or Magnetic Waves.**

These include mobile telephones, 2-way business radios, C.B. radios, and Ham radios.

The following information has been developed and released previously by Delco Electronics and is included in the service edition of the Delco Sound Service: for managers and technicians Pub-629. We are reprinting this information for your convenience.

# **INSTALLATION GUIDELINE** (refer to the enclosed figures during installation)

## **1. Transmitter Location**

- A. Locate transceiver for remote radios on driver's side of trunk as near to the vehicle body side as possible.
- B. One piece transceivers should be mounted under dash or on transmission hump where they will not interfere with vehicle controls or passenger movement.

## **2. Antenna Installation**

- A. The antenna should be a permanent-mount type located in the center of the roof or center of the rear deck lid. Glass mounted antennas should be kept as high as possible in the center of the rear window or windshield. If a magnetic-mount antenna must be used, care should be taken to mount the antenna in the same location as a permanent mount type. If a disguise-mount antenna is used, great care should be taken to shield the tuning network from vehicle electronics and wiring, or to mount the tuning network in an area completely clear of vehicle electronics and wiring.
- B. Each vehicle model and body style reacts to radio frequency energy differently. When dealing with an unfamiliar vehicle, it is suggested that a magnetic-mount antenna be used to check the proposed antenna location for unwanted effects on the vehicle. Antenna location is a major factor in these effects.

## **3. Antenna Cable Routing**

- A. Always use a high quality coax (at least 95% shield coverage) routed away from the Engine Control Module (ECM) and other electronics modules.
- B. Care should be taken to avoid routing feedline with any vehicle wiring.

## **4. Antenna Tuning**

- A. It is important that the antenna be tuned properly and reflected power be kept to a minimum. (VSWR < 2:1)

## **5. Radio Wiring and Connection Locations**

### **A. Transceiver Power Leads:**

These connections should be made directly to the battery itself, including the ground, or to the jump start block on vehicles so equipped. The transceiver power leads should be #10 AWG wire or larger, twisted if possible. The ground wire should not be attached to the body at any point. Appropriate in-line fuses for both the positive and ground leads should be located as near the battery as possible.

### **NOTE:**

It is recommended that a fuse be placed in the transceiver ground lead to prevent possible damage to the transceiver, in the event the battery to engine-block ground is inadvertently disconnected.

For ONE-PIECE TRANSCEIVERS where ignition switch control is desired, a 12 v power contactor must be installed in the transceiver positive lead. The contactor should be located at the vehicle battery with the coil of the contactor driven through an appropriate in-line fuse from an available accessory circuit or ignition circuit, not powered during cranking. The coil of the contactor must return to battery negative.

### **B. Handset or Control Unit Battery and Ground:**

Any ground lead from a handset or control unit must return to battery negative. It is preferable that the positive lead for a handset or control unit be connected directly to the battery. It is recommended that the handset or control unit positive and ground leads be appropriately fused separately from the transceiver positive and ground leads. If ignition switch control is desired, the handset or control unit positive lead may be connected through an appropriate in-line fuse to an available accessory circuit or ignition circuit, not powered during cranking.

### **C. Connections for Multiple Transceivers and Receivers:**

If multiple transceivers or receivers are to be installed in the vehicle, power leads to the trunk or under dash should be terminated in covered insulated buss bars. All transceivers or receivers may then have their power leads connected to the buss bars. This makes a neater installation and reduces the number of wires running to vehicle underhood.

## **6. Wire Routing**

- A. The power leads should be brought through a grommet on the driver's side firewall. For trunk-mounted transceivers, the cables should continue on along the driver's side door sills, under the rear seat, and into the trunk through the rear bulkhead. If the battery is located on the passenger side, battery leads should cross the vehicle in front of the engine. All attempts should be made to maintain as much distance as possible between radio power leads and vehicle electronic modules and wiring.
- B. For police vehicles, radio power leads should be routed in the conduit provided with the option package.

## **7. Troubleshooting**

- A. Should vehicle problems develop following installation, the source of the problem should be determined prior to further operation of the vehicle.
- B. Possible causes of vehicle problems include:
  1. Power leads connected to points other than the battery.
  2. Antenna location.
  3. Transceiver wiring located too close to vehicle electronic modules or wiring.
  4. Poor shielding or poor connectors on antenna feedline.

## **8. Contact and Feedback**

- A. GM vehicles have been designed and extensively tested for immunity to known sources of RF energy. However, it is impossible to test for every combination of RF sources and installations. If a persistent condition is encountered,

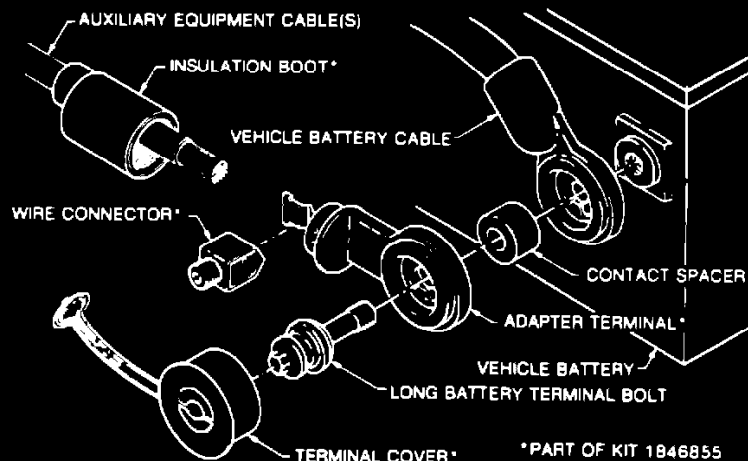
**WRITE TO:**  
**EMC DEPT. - MR**  
**BLDG 40**

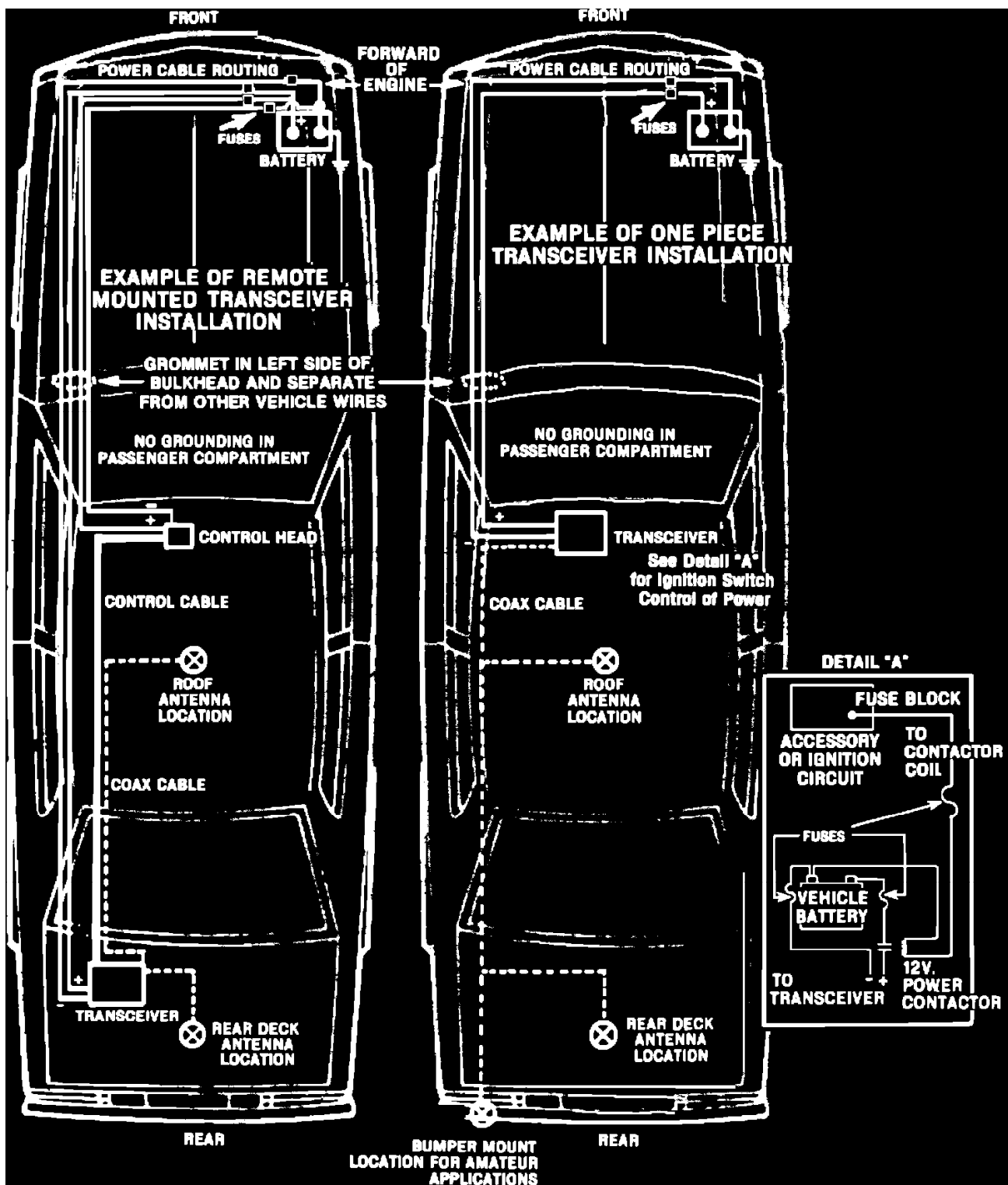
**GENERAL MOTORS PROVING GROUND**  
**MILFORD, MICHIGAN 48042-2001**

## **Auxiliary Electrical Equipment** **GM Recommended Installation**

AC-Delco Side Terminal Adaptor Package 1846855, when combined with the longer battery bolt and spacer will provide the simple, tight, corrosion resistant connection illustrated. Parts can also be purchased at car dealerships.

Item	AC-DELCO Catalog 7A10	CAR DEALER "Parts" Book
Kit	1846855	1846855
Bolt	7803	12004188
Spacer	7804	12004189





Technical Service Bulletin # 99-09-41-004

Date: 000101

## Air Bag (SIR) On-Off Switch Kits, New Parts and Service

Bulletin Number:  
99-09-41-004

Section:  
09 - Restraints

Date:  
January, 2000

Title:  
Frontal Supplemental Inflatable Restraints (SIR) On-Off Switch Kits, New Parts and Procedures

Models:  
1988-2000 Passenger Cars and Trucks

This bulletin is being revised to add the 1999 & 2000 model years. Please discard Corporate Bulletin Number 73-90-23 (Section 9 - Accessories).

Never consider installing an air bag on-off switch unless the following conditions are met:

1. The customer presents a letter from NHTSA authorizing the installation of the air bag on-off switch.
2. The dealership gives the customer a copy of the NOTICE TO GM OWNERS ABOUT AIR BAG ON-OFF SWITCHES.
3. The customer still wants the air bag on-off switch installed.

This bulletin includes information regarding switches to turn off and on frontal air bags, additional switch/display light diagnosis, switch installation kit content descriptions and ordering directions for special parts (if required).

Some time ago, the National Highway Traffic and Safety Administration (NHTSA) announced a new regulation about air bags. The new regulation includes procedures that will permit the installation of air bag on-off switches for the few customers who, in NHTSA's opinion, fit the criteria for switches.

#### Important:

Due to the new regulation, DEALERS SHOULD NO LONGER USE THE INFORMATION ON AIR BAG DISCONNECTION (Corporate Bulletin # 73-90-12, dated June, 1997). INSTEAD, USE THE INFORMATION INCLUDED WITH THIS BULLETIN.

The switch installation kit contains the necessary components (switch, bracket, attaching hardware, display light, applique, sheet for switch and light, tie straps and instruction sheets) for system operation.

Some kits also include a replacement safety belt for certain vehicles that are designed with specific FORCE LIMITING safety belt systems. Special Owner's Manual inserts are included in the installation kit for system operation review by the owner.

Additional equipment such as a 12 volt test lamp and the J 38125-B (-A or -500 will also apply) Terminal Repair Kit, are required to complete the switch kit installation. In some cases, scan tools (Tech II or equivalent) may be required to reprogram certain control modules.

SUGGESTED INSTALLATION TIME ALLOWANCES		
VEHICLE YEAR/LINE	ONE SWITCH	ADD FOR 2ND SWITCH
1993-96 A Cars	1.0 hr	N/A
1991-96 B Cars	0.8 hr	0.5 hr
1989-96 C Cars	0.9 hr	0.4 hr
1997-2000 C Cars	1.0 hr	0.4 hr
1993-96 D Cars	1.1 hrs	0.5 hr
1990-2000 E Cars	1.1 hrs	0.5 hr
1990-92 F Cars	1.3 hrs	N/A
1993-2000 F Cars	0.9 hr	0.5 hr
1995-99 G Cars @	1.0 hr	0.6 hr
1988-93 H Cars	0.9 hr	N/A
1994-2000 H Cars	1.0 hr	0.5 hr
1995-2000 J Cars (Coupes/Sedans)	0.8 hr	0.4 hr
1995-2000 J Cars (Convertibles)	0.9 hr	0.5 hr
1990-97 K Cars	0.9 hr	0.5 hr
1998-2000 K Cars	1.0 hr	0.5 hr
1994-1999 K-Spl Cars	0.9 hr	0.5 hr
2000 K-Spl Cars	1.0 hr	0.5 hr
1991-96 L Cars	0.9 hr	N/A
1994-98 N Cars	0.9 hr	0.5 hr
1997-2000 N Cars (Malibu/Cutlass)	1.0 hr	0.6 hr
1999-2000 N Cars (Alero/Grand Am)	1.0 hr	0.5 hr
1994-2000 U Vans	0.8 hr	N/A
1997-2000 U Vans	0.9 hr	0.5 hr
1990-93 V Cars (Allante)	1.1 hrs	N/A
1997-2000 V Cars (Catera) #	1.7 hrs (Driver)	1.4 hrs (Passenger)
1994-2000 W Cars	0.9 hr	0.5 hr
1990-93 Y Cars	1.1 hrs	N/A
1994-96 Y Cars	1.3 hrs	0.6 hr
1997-2000 Y Car @	1.6 hrs	0.7 hr
1995-2000 C/K Trucks	0.8 hr	0.4 hr
1999-2000 C/K Trucks (Silverado/Sierra)	1.3 hrs	0.5 hr
1994-2000 G Vans	1.3 hrs	0.5 hr
1993-2000 M/L Vans	1.1 hrs	0.5 hr
1995-2000 S/T Trucks	1.2 hrs	0.5 hr
@ = The kits for these vehicles include replacement seat belts. Aurora and Riviera models built on or after January 1, 1998 will include DEPOWERED air bags and the safety belts on these vehicles will not be included in the switch kits and MUST NOT BE CHANGED. The 1997-00 Corvette models will require safety belt changes regardless of build dates. The suggested time does NOT include times to replace safety belts. # = Catera model suggested times are specific to location (driver or passenger). The suggested time for installing both switches at the same time reduces the total by 0.6 hr (or 2.5 hrs to install both)		



The cost of the switch kit and labor to install the switch kit are the responsibility of the customer. Suggested times for installation are in the illustration.

**Important:**

In rare instances, the installation of switch(es) may turn on the vehicle air bag warning light. This condition may exist due to the additional resistance of the switch and harness when added to the SIR system. In these rare instances, a SPECIAL SERVICE ONLY Diagnostic Energy Reserve Module (DERM) or Sensing and Diagnostic Module (SDM) will be made available to the owner from GMSPPO at no charge for the parts and labor. Prior to ordering and/or installing a switch kit, the customer should be advised that this potential does exist and can be resolved by one of the following options:

If the light does come on after switch installation (AND PROPER INSTALLATION AND CONNECTIONS HAVE BEEN VERIFIED), advise the customer that the light has come on and that the vehicle:

- ^ May be driven with the light on until the special DERM or SDM is available. The switch portion to turn off the air bag will still function properly, but the warning light will be on until the additional part can be obtained. When the DERM or 5 SDM is available, the customer should return to have the part installed (at no cost to the customer) OR
- ^ May have the existing air bag system reconnected and leave the switch (inoperative) in the vehicle until the additional part can be obtained. When the DERM or SDM is available, the customer should return to have the part installed (at no cost to the customer).

The standard SIR system diagnosis can be made by disconnecting the switch from the SIR wiring harness and following the directions for SIR System Diagnosis found in the appropriate Service Manual.

A description of the major components of the installation kit is as follows:

**SWITCHES**

One switch kit will be required for each air bag (driver or passenger) and will be ignition key operated. When the switch is in the OFF position, the air bag will remain OFF until the switch is turned to the ON position. Turning the switch to the ON position will allow the air bag to function.

The recommended locations for the switches on most vehicles is in the instrument panel glove compartment (center console if vehicle has no glove compartment) or, in the case of some vans, in the center stowage compartment (see the recommended location illustrations that are provided with each switch kit).

**Important:**

Switches or display light indicators MUST NOT be placed on any instrument panel surfaces directly in front of the driver's or passenger's leg or knee areas.

**DISPLAY LIGHT**

Each switch requires a display light to indicate the OFF status of the air bag. Each display light includes a harness to be connected to the switch harness. The recommended mounting locations for the display lights vary, but are typically located at the center front edge of the roof headliner (or windshield garnish molding) above the rear view mirror (see the recommended location illustrations provided with each switch kit).

**Important:**

When installed, driver and/or passenger display light(s) must be visible by all front seat occupants.

**Important:**

Switches or display light indicators MUST NOT be placed on any instrument panel surfaces directly in front of the driver's or passenger's leg or knee areas.

**WIRING CONNECTIONS**

In general terms, the switch will be connected IN SERIES with the appropriate air bag (at the service disconnect) and will require additional connection of a feed wire to an ignition fed circuit and a ground wire to the body to complete the circuit for the display light indicator.

**Display Light OFF with Switch in the OFF Position**

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition switch to the LOCK position. Remove the key. 2. Disconnect the Display Light. 3. Inspect the GRY/BLK (1357) wire between the Display Light and the Switch Assembly for any damage to the insulation or terminations which would allow a short to B+. Is there any damage to the GRY/BLK (1357) wire?	—	Go to <i>Step 2</i>	Go to <i>Step 3</i>
2	Repair the GRY/BLK (1357) wire and the suspected source of B+, if needed. Is the repair complete?	—	System OK	System OK
3	Replace the switch assembly. Is the repair complete?	—	System OK	—

**Display Light ON with Switch in the On Position**

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition switch to the LOCK position. Remove the key. 2. Remove and inspect the 5A inline fuse in the PNK (39/139) wire. Is the fuse open?	—	Go to <i>Step 2</i>	Go to <i>Step 9</i>
2	1. Replace the 5A inline fuse. 2. Place the switch in the ON position. 3. Turn the ignition switch to the RUN position. 4. Wait five seconds. 5. Turn the ignition switch to the LOCK position. Remove the key. 6. Remove and inspect the 5A inline fuse in the PNK (39/139) wire. Is the fuse open?	—	Go to <i>Step 3</i>	Go to <i>Step 4</i>
3	1. Repair the short to ground in the PNK (39/139) wire. 2. Replace the 5A inline fuse. Is the repair complete?	—	System OK	—
4	1. Place the suppression switch in the OFF position. 2. Turn the ignition switch to the RUN position. 3. Wait five seconds. 4. Turn the ignition switch to the LOCK position. Remove the key. 5. Remove and inspect the 5A inline fuse in the PNK (39/139) wire. Is the fuse open?	—	Go to <i>Step 6</i>	Go to <i>Step 5</i>
5	Install the 5A inline fuse. Is the repair complete?	—	System OK	—
6	1. Disconnect the display light. 2. Replace the 5A inline fuse. 3. Turn the ignition switch to the RUN position. 4. Wait five seconds. 5. Turn the ignition switch to the LOCK position. Remove the key. 6. Remove and inspect the 5A inline fuse in the PNK (39/139) wire. Is the fuse open?	—	Go to <i>Step 7</i>	Go to <i>Step 8</i>

Display Light ON with Switch in the On Position (cont'd)				
Step	Action	Value(s)	Yes	No
7	1. Repair the short to ground in the GRY/BLK (1357) wire. 2. Replace the 5A inline fuse. Is the repair complete?	—	System OK	—
8	1. Replace the display light. 2. Install the 5A inline fuse. Is the repair complete?	—	System OK	—
9	1. Turn the ignition switch to the RUN position. 2. Connect an unpowered test lamp from the power feed side of the fuse holder to the ground. Does the test lamp illuminate?	—	Go to <i>Step 11</i>	Go to <i>Step 10</i>
10	1. Turn the ignition switch to the OFF position. 2. Repair the open in the power feed to the 5A inline fuse. If the open is in the vehicle wiring harness, refer to Wiring Systems sub-section of the appropriate Service Manual. 3. Install the 5A inline fuse. Is the repair complete?	—	System OK	—
11	1. Turn the ignition switch to the OFF position. 2. Install the 5A inline fuse. 3. Disconnect the display light. 4. Turn the ignition switch to the RUN position. 5. Connect an unpowered test lamp from the GRY/BLK (1357) wire to the ground. Does the test lamp illuminate?	—	Go to <i>Step 12</i>	Go to <i>Step 15</i>
12	Connect an unpowered test lamp from the GRY/BLK (1357) wire to the BLK (150) wire. Does the test lamp illuminate?	—	System OK	—
13	1. Turn the ignition switch to the OFF position. 2. Repair the open in the BLK (150) wire. Is the repair complete?	—	System OK	—
14	1. Turn the ignition switch to the OFF position. 2. Replace the display light. Is the repair complete?	—	System OK	—
15	1. Turn the ignition switch to the OFF position. 2. Replace the switch assembly. Is the repair complete?	—	System OK	—

Diagnostics for the switch and display light are included in the illustrations. As always, the technician should make sure to review the wiring harness routing and installation for pinching, rubbing and chafing to brackets, braces (etc.) and take appropriate actions to protect the wiring from those potential conditions.

## PARTS INFORMATION

Order the appropriate Installation Kit(s) (passenger, driver, or both) from GMSPO. For kit part numbers and usage, see Group 14.865 of the appropriate GMSPO Parts Catalog.

If special DERMs or SDMs are required to resolve a WARNING LIGHT ON condition, order the part from GMSPO in the normal manner. For part numbers and usage see Group 14.865 of the appropriate GMSPO Parts Catalog.

## Important:

1995-98 G (Aurora and Riviera) and 1997-00 Y (Corvette) switch kits include replacement safety belts. These belts **MUST** replace the original safety belts when installing a switch kit. Aurora and Riviera models built on or after January 1, 1998 will include DEPOWERED air bags, and the safety belts on these vehicles will not be included in switch kits and **MUST NOT BE CHANGED**. The 1997-00 Corvette models will require safety belt changes regardless of build dates. The belts will be replaced at no charge for the parts or the labor.

## WARRANTY INFORMATION

Switch kits and installation are **NOT** considered a warranty repair. Parts and labor charges (except for special DERM or SDM and replacement safety belt installation if required) are the responsibility of the customer. If special DERMs or SDMs are required to resolve a WARNING LIGHT ON condition, **USE THE EXISTING LABOR OPERATION AND TIME ALLOWANCES WITH THE SPECIAL CUSTOMER AND FAILURE CODES WHEN SUBMITTING CLAIMS:**

## DERMs

USE LABOR OPERATION C8815, CUSTOMER COMPLAINT CODE WK AND FAILURE CODE 93. USE PUBLISHED LABOR

**OPERATION TIMES.**

**SDMs**

USE LABOR OPERATION C8817, CUSTOMER COMPLAINT CODE WK AND FAILURE CODE 93. USE PUBLISHED LABOR OPERATION TIMES. When installing switch kits on 1995-98 Aurora, Riviera and 1997-00 Corvette models, the appropriate safety belts must be replaced. When submitting claims, use the existing labor operation and time allowances with special customer complaint and failure codes. The LABOR ONLY may be claimed. The cost of the belt is included in the kit price.

USE C9040 RIGHT SIDE ONLY, C9041 LEFT SIDE ONLY OR C9047 FOR BOTH AND INCLUDE THE CUSTOMER COMPLAINT CODE MH AND FAILURE CODE 93 USE PUBLISHED LABOR OPERATION TIMES.

**ADMINISTRATIVE INFORMATION**

When the dealer decides to install an air bag on-off switch under NHTSA's new regulation, the dealer should fill out and send to NHTSA the form entitled INSTALLATION OF AIR BAG ON-OFF SWITCHES. The dealer should also keep:

1. A copy of the INSTALLATION form.
2. A copy of the letter NHTSA sent to the customer authorizing the switch.
3. A copy of any waiver the dealer obtains from the customer when the switch is installed.

**Important:**

In addition, the new regulations require dealers to send the original of the customer's signed authorization form to NHTSA at the following address:

National Highway Traffic Safety Association  
Attention: Air Bag Switch Forms  
400 Seventh Street, S.W.  
Washington, D.C. 20590-1000

**Technical Service Bulletin # 73-90-23**

**Date: 980101**

**Airbags - Frontal (SIR) ON-Off Switch Kits, Parts/Procs**

File In Section: 9, Accessories

Bulletin No.: 73-90-23

Date: January, 1998

**INFORMATION**

**Subject:**

Frontal Supplemental Inflatable Restraints (SIR) On-Off Switch Kits, New Parts and Procedures

**Models:**

1988-98 Passenger Cars and Trucks

This bulletin cancels and supersedes Corporate Bulletin Number 73-90-12. Please discard Corporate Bulletin Number 73-90-12 (Section 9 - Accessories).

Never consider installing an air bag on-off switch unless the following conditions are met:

1. The customer presents a letter from NHTSA authorizing the installation of the air bag on-off switch.
2. The dealership gives the customer a copy of the "Notice To GM Owners About Air Bag On-Off Switches".
3. The customer still wants the air bag on-off switch installed.

This bulletin includes information regarding switches to turn off and on frontal air bags, additional switch/display light diagnosis, switch installation kit content descriptions and ordering directions for special parts (if required).

The National Highway Traffic and Safety Administration (NHTSA) recently announced a new regulation about air bags. The new regulation includes procedures that will permit the installation of air bag on-off switches for the few customers who, in NHTSA's opinion, fit the criteria for switches.

**Important:**

Due to the new regulation, DEALERS SHOULD NO LONGER USE THE INFORMATION ON AIR BAG DISCONNECTION (Corporate Bulletin # 73-90-12, dated June, 1997). INSTEAD, USE THE INFORMATION INCLUDED WITH THIS BULLETIN.

The switch installation kit contains the necessary components (switch, bracket, attaching hardware, display light, applique, sheet for switch and light, tie straps and instruction sheets) for system operation.

Some kits also include a replacement safety belt for certain vehicles that are designed with specific "force limiting" safety belt systems. Special owners manual inserts are included in the installation kit for system operation review by the owner.

Additional equipment such as a 12 Volt test lamp and the J 38125-B (-A or -500 will also apply) Terminal Repair kit, are required to complete the switch kit installation. In some cases, scan tools (Tech II or equivalent) may be required to reprogram certain control modules.

SUGGESTED INSTALLATION TIME ALLOWANCES		
VEHICLE YEAR/LINE	ONE SWITCH	ADD FOR 2ND SWITCH
1993-96 A Cars	1.0 Hrs.	N/A
1991-96 B Cars	.8 Hrs.	.5 Hrs.
1989-96 C Cars	.9 Hrs.	.4 Hrs.
1997-98 C Cars	1.0 Hrs.	.4 Hrs.
1993-96 D Cars	1.1 Hrs.	.5 Hrs.
1990-98 E Cars	1.1 Hrs.	.5 Hrs.
1990-92 F Cars	1.3 Hrs.	N/A
1993-98 F Cars	.9 Hrs.	.5 Hrs.
1995-98 G Cars @	1.0 Hrs.	.6 Hrs.
1988-93 H Cars	.9 Hrs.	N/A
1994-98 H Cars	1.0 Hrs.	.5 Hrs.
1995-98 J Cars (Coupes/Sedans)	.8 Hrs.	.4 Hrs.
J Cars (Convertibles)	.9 Hrs.	.5 Hrs.
1990-97 K Cars	.9 Hrs.	.5 Hrs.
1998 K Cars	1.0 Hrs.	.5 Hrs.
1994-98 K-Spl. Cars	.9 Hrs.	.5 Hrs.
1991-96 L Cars	.9 Hrs.	N/A
1994-98 N Cars	.9 Hrs.	.5 Hrs.
1997-98 N Cars (Malibu/Cutlass)	1.0 Hrs.	.6 Hrs.
1994-96 U Vans	.8 Hrs.	N/A
1997-98 U Vans	.9 Hrs.	.5 Hrs.
1990-93 V Cars (Allante)	1.1 Hrs.	N/A
1997-98 V Cars (Catera) #	1.7 Hrs.(Driver)	1.4 Hrs.(Passenger)
1994-98 W Cars	.9 Hrs.	.5 Hrs.
1990-93 Y Cars	1.1 Hrs.	N/A
1994-96 Y Cars	1.3 Hrs.	.6 Hrs.
1997-98 Y Car @	1.6 Hrs.	.7 Hrs.
1995-98 C/K Trucks	.8 Hrs.	.4 Hrs.
1994-98 G Vans	1.3 Hrs.	.5 Hrs.
1993-98 M/L Vans	1.1 Hrs.	.5 Hrs.
1995-98 S/T Trucks	1.2 Hrs.	.5 Hrs.

@ = The kits for these vehicles include replacement seat belts. Aurora and Riviera models built on or after January 1, 1998 will include "Depowered" air bags, and the safety belts on these vehicles will not be included in switch kits and **MUST NOT BE CHANGED**. The 1997-98 Corvette models will require safety belt changes regardless of build dates.

The suggested time does NOT include times to replace safety belts.

# = Catera model suggested times are specific to location (driver or passenger). The suggested time for installing both switches at the same time reduces the total by .6 Hrs., (or 2.5 Hrs. to install both).

The cost of the switch kit and labor to install the switch kit are the responsibility of the customer. Suggested times for installation are included in this bulletin.

#### Important:

In rare instances, the installation of switch(es) may turn on the vehicle air bag warning light. This condition may exist due to the additional resistance of the switch and harness when added to the SIR system. In these rare instances, a "special service only" Diagnostic Energy Reserve Module (DERM) or Sensing and Diagnostic Module (SDM) will be made available to the owner from GMSPO at no charge for the parts or

labor. Prior to ordering and/or installing a switch kit, the customer should be advised that this potential does exist, and can be resolved by one of the following options:

If the light does come on after switch installation (AND PROPER INSTALLATION AND CONNECTIONS HAVE BEEN VERIFIED), advise the customer that the light has come on and that the vehicle:

- a. May be driven with the light on until the special DERM or SDM is available. The switch portion to turn off the air bag will still function properly, but the warning light will be on until the additional part can be obtained. When the DERM or SDM is available, the customer should return to have the part installed (at no cost to the customer) OR
- b. may have the existing air bag system reconnected and leave the switch (inoperative) in the vehicle until the additional part can be obtained. When the DERM or SDM is available, the customer should return to have the part installed (at no cost to the customer).

The standard SIR system diagnosis can be made by disconnecting the switch from the SIR wiring harness and following the directions for SIR System Diagnosis found in the appropriate Service Manual.

A description of the major components of the installation kit is found under switches, display light and wiring connections.

#### Administrative Information

When the dealer decides to install an air bag on-off switch under NHTSA's new regulation, the dealer should fill out and send to NHTSA the form entitled "Installation of air bag on-off switches". The dealer should also keep:

1. A copy of the "Installation" form.
2. A copy of the letter NHTSA sent to the customer authorizing the switch.
3. A copy of any waiver the dealer obtains from the customer when the switch is installed.

#### Important:

In addition, the new regulations require dealers to send the original of the customer's signed authorization form to NHTSA at the following address:

National Highway Traffic Safety Administration  
Attention: Air Bag Switch Forms  
400 Seventh Street, S.W.  
Washington, D.C. 20590-1000

## Switches, Display Light, Wiring Connections

### Switches

One switch kit will be required for each air bag (driver or passenger) and will be ignition key operated. When the switch is in the "OFF" position, the air bag will remain "OFF" until the switch is turned to the "ON" position. Turning the switch to the "ON" position will allow the air bag to function.

The recommended locations for the switches on most vehicles is in the instrument panel glove compartment (center console if vehicle has no glove compartment) or, in the case of some vans, in the center stowage compartment (see the recommended location illustrations that are provided with each switch kit).

#### Important:

Switches or display light indicators must not be placed on any instrument panel surfaces directly in front of the driver's or passenger's leg or knee areas.

### Display Light

Each switch requires a display light to indicate the "OFF" status of the air bag. Each display light includes a harness to be connected to the switch harness. The recommended mounting locations for the display lights vary, but are typically located at the center front edge of the roof headliner (or windshield garnish molding) above the rear view mirror (see the recommended location illustrations provided with each switch kit).

#### Important:

When installed, driver and/or passenger display light(s) must be visible by all front seat occupants.

#### Important:

Switches or display light indicators **MUST NOT** be placed on any instrument panel surfaces directly in front of the driver's or passenger's leg or knee areas.

### Wiring Connections

In general terms, the switch will be connected "in series" with the appropriate air bag (at the service disconnect) and will require additional

connection of a feed wire to an ignition fed circuit and a ground wire to the body to complete the circuit for the display light indicator.

### Display light ON with Switch in the ON Position

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition switch to LOCK and remove the key. 2. Disconnect the Display Light. 3. Inspect the GRY/BLK (1357) wire between the Display Light and the Switch Assembly for any damage to the insulation or terminations which would allow a short to B+. Is there any damage to the GRY/BLK (1357) wire?	—	Go to Step 2	Go to Step 3
2	Repair the GRY/BLK (1357) wire and the suspected source of B+, if necessary. Is the repair complete?	—	System OK	—
3	Replace the Switch Assembly. Is the repair complete?	—	System OK	—

### Display light OFF with Switch in the OFF Position

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition switch to LOCK and remove the key. 2. Remove and inspect the 5 A inline fuse in the PNK (39/139) wire. Is the fuse open?	—	Go to Step 2	Go to Step 9
2	1. Replace the 5 A inline fuse. 2. Place the Switch in the ON position. 3. Turn the ignition switch to RUN. 4. Wait 5 seconds. 5. Turn the ignition switch to LOCK and remove the key. 6. Remove and inspect the 5 A inline fuse in the PNK (39/139) wire. Is the fuse open?	—	Go to Step 3	Go to Step 4
3	1. Repair the short to ground in the PNK (39/139) wire. 2. Replace the 5 A inline fuse. Is the repair complete?	—	System OK	—
4	1. Place the Suppression Switch in the OFF position. 2. Turn the ignition switch to RUN. 3. Wait 5 seconds. 4. Turn the ignition switch to LOCK and remove the key. 5. Remove and inspect the 5 A inline fuse in the PNK (39/139) wire. Is the fuse open?	—	Go to Step 6	Go to Step 5
5	Install the 5 A inline fuse. Is the repair complete?	—	System OK	—
6	1. Disconnect the Display Light. 2. Replace the 5 A inline fuse. 3. Turn the ignition switch to RUN. 4. Wait 5 seconds. 5. Turn the ignition switch to LOCK and remove the key. 6. Remove and inspect the 5 A inline fuse in the PNK (39/139) wire. Is the fuse open?	—	Go to Step 7	Go to Step 8
7	1. Repair the short to ground in the GRY/BLK (1357) wire. 2. Replace the 5 A inline fuse. Is the repair complete?	—	System OK	—
8	1. Replace the Display Light. 2. Install the 5 A inline fuse. Is the repair complete?	—	System OK	—

Step	Action	Value(s)	Yes	No
9	1. Turn the ignition switch to RUN. 2. Connect an unpowered test lamp from the power feed side of the fuse holder to ground. Does the test lamp illuminate?	—	Go to Step 11	Go to Step 10
10	1. Turn the ignition switch to OFF. 2. Repair the open in the power feed to the 5 A inline fuse. If the open is in the vehicle wiring harness, refer to the appropriate service manual. 3. Install the 5 A inline fuse. Is the repair complete?	—	System OK	—
11	1. Turn the ignition switch to OFF. 2. Install the 5 A inline fuse. 3. Disconnect the Display Light. 4. Turn the ignition switch to RUN. 5. Connect an unpowered test lamp from the GRY/BLK (1357) wire to ground. Does the test lamp illuminate?	—	Go to Step 12	Go to Step 15
12	Connect an unpowered test lamp from the GRY/BLK (1357) wire to the BLK (150) wire. Does the test lamp illuminate?	—	Go to Step 14	Go to Step 13
13	1. Turn the ignition switch to OFF. 2. Repair the open in the BLK (150) wire. Is the repair complete?	—	System OK	—
14	1. Turn the ignition switch to OFF. 2. Replace the Display Light. Is the repair complete?	—	System OK	—
15	1. Turn the ignition switch to OFF. 2. Replace the Switch Assembly. Is the repair complete?	—	System OK	—

Diagnostics for the switch and display light are included with this bulletin.

As always, the technician should make sure to review the wiring harness routing and installation for pinching, rubbing and chafing to brackets, braces (etc.) and take appropriate actions to protect the wiring from those potential conditions.

## Parts/Warranty Information

Order the appropriate Installation Kit(s) (passenger, driver, or both) from GMSPO. A parts bulletin containing the switch kit part numbers will be distributed. Parts are expected to be available on January 19, 1998.

If special DERMs or SDMs are required to resolve a "warning light ON" condition, order the part from GMSPO in the normal manner. A parts bulletin containing the special part numbers will be distributed at a later date.

### Important:

1995-98 G (Aurora and Riviera) and 1997-98 Y (Corvette) switch kits include replacement safety belts. These belts **MUST** replace the original safety belts when installing a switch kit. Aurora and Riviera models built on or after January 1, 1998 will include "Depowered" air bags, and the safety belts on these vehicles will not be included in switch kits and **MUST NOT BE CHANGED**. The 1997-98 Corvette models will require safety belt changes regardless of build dates. The belts will be replaced at no charge for the parts or the labor.

Switch kits and installation are **NOT** considered a warranty repair. Parts and labor charges (except for special DERM or SDM, and replacement safety belt installation if required) are the responsibility of the customer. If special DERMs or SDMs are required to resolve a "warning light ON" condition, **USE THE EXISTING LABOR OPERATION AND TIME ALLOWANCES WITH THE SPECIAL CUSTOMER AND FAILURE CODES WHEN SUBMITTING CLAIMS:**

DERMs - USE OPERATION C8815, CUSTOMER COMPLAINT CODE WK AND FAILURE CODE 93.

SDMs - USE OPERATION C8817, CUSTOMER COMPLAINT CODE WK AND FAILURE CODE 93

USE PUBLISHED LABOR OPERATION TIMES.

When installing switch kits on 1995-98 Aurora, Riviera and 1997-98 Corvette models, the appropriate safety belts must be replaced. When submitting claims, use the existing labor operation and time allowances with special customer complaint and failure codes. The **LABOR ONLY** may be claimed. The cost of the belt is included in the kit price. **USE C9040 RIGHT SIDE ONLY C9041 LEFT SIDE ONLY OR C9047 BOTH, AND INCLUDE THE CUSTOMER COMPLAINT CODE MH AND FAILURE CODE 93. USE PUBLISHED LABOR OPERATION TIMES.**

Technical Service Bulletin # **913446E**

Date: **910601**

## State Emissions Testing Information

Number: 91-344-6E



Section: 6E

Date: JUNE 1991

Corporate Bulletin No.: 080101R

Subject:  
STATE EMISSIONS TESTING INFORMATION

Model and Year:  
1982-91 ALL PASSENGER CARS AND TRUCKS

THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN NO. 91-57-6E, DATED AUGUST 1990. SPECIFIC PROCEDURES HAVE BEEN ADDED FOR TRUCKS ABOVE 8500 GVW. ALL COPIES OF 91-57-6E SHOULD BE DISCARDED.

With more emphasis being placed on air quality, many states and municipalities have instituted vehicle inspection/maintenance (I/M) programs, most of which include tailpipe exhaust emissions testing. (DIVISION) desires to do its part both in helping achieve cleaner air and in making sure our customers' vehicles are tested in a satisfactory manner.

PASSENGER CARS AND TRUCKS BELOW 8500 GVW.

A satisfactory exhaust emissions test includes making sure the vehicle's engine and emission control systems are fully warmed up just prior to conducting the test. An engine coolant temperature gauge that reads operating temperature or a warm radiator hose does not necessarily mean the vehicle is ready to be tested. For example, although the engine coolant temperature gauge may be reading at operating temperature, the catalytic converter may not be fully warmed up, which may cause exhaust emissions levels to be artificially high and not representative of whether the vehicle's emission control systems are functioning properly. Therefore, if the vehicle has been turned off or sitting at idle for several minutes, even though the engine coolant temperature gauge indicates the engine is at operating temperature, the vehicle should be driven on the road for a few minutes just prior to starting the official test to ensure that the engine and emission control systems are fully warmed up. An alternative warm up method that can be used and may be more convenient is running the engine at about 2500 rpm for two or three minutes with the transmission in park or neutral.

TRUCKS ABOVE 8500 GVW (NA4)

The use of the L19 (454 cu.in.) engine in any truck or van model above (8500 GVWR) should be preconditioned by driving the vehicle at highway speeds (40-55 MPH) for at least 15 minutes before conducting a state emission test. This will allow the emission control system to be fully warmed up.

Vehicles above 14,000 GVWR should be preconditioned the same as vehicles above 8501 GVWR if empty or lightly loaded. Vehicles above 14,000 GVWR can be preconditioned a shorter time and at a lower speed if loaded.

Note: If vehicles are forced to idle for over 5 minutes while awaiting a state emission test, particularly in cold ambient temperatures, the vehicle should be preconditioned again before a test is conducted. Preconditioning should be considered at least once, in the event of a failed test.

Technical Service Bulletin # **436507**

Date: **941201**

## **Enhanced IM240 Program - Implementation Plan**

File In Section: 6E - Engine Fuel & Emission

Bulletin No. 43-65-07

Date: December, 1994

Subject:  
Enhanced Emission Inspection Maintenance Program - Implementation Plan

Models:  
1995 and Prior Passenger Cars and Trucks

The new Enhanced Emission Inspection Maintenance program is scheduled to begin in various areas of the country beginning January, 1995. A previous bulletin (Engine Fuel & Emission, # 436505) was issued in April, 1994, which described the structure of this new emission program, refer to it for background on the IM240 program.

<u>STATE</u>	<u>AREA</u>	<u>IMPLEMENTATION DATE</u>	<u>COORDINATOR/ PHONE #</u>
Arizona	Phoenix	Jan., 1995	Donald Bauer 602-207-7011 602-207-7020 (FAX)
California	L.A. Bakersfield Fresno Sacramento San Diego	Jan., 1996	Chris Edwards 916-255-4264
Colorado	Denver	Jan., 1995	Doug Decker 303-692-3126 303-782-5693 (FAX)
Connecticut	Statewide	April, 1995	Anthony Armentano 203-566-2796 203-566-6100 (FAX)
Delaware	Statewide	?	Raymond Malenfant 302-739-4791 302-739-3106 (FAX)
Wash. DC	All	Jan., 1996	David Foerter 202-508-3840 202-508-3841 (FAX)
Georgia	Atlanta	May, 1995	Joseph L. Bragg 404-363-7040 404-363-7100 (FAX)
Illinois	Chicago	Jan., 1996	Dale Hench 217-785-7449 217-524-4192 (FAX)
Indiana	Gary-Chicago	July, 1995	Michael Worrell 317-232-8218 317-233-5967 (FAX)
Kentucky	North/Cincinnati	July, 1995	David Gore 502-573-3382 502-573-3787 (FAX)
Louisiana	Baton Rouge	Jan., 1996	Kevin Sweeney 504-765-0905 504-765-0222 (FAX)
Maine	Portland Lewiston-Auburn	July, 1994	Ronald Severence 207-289-2437 207-287-7641 (FAX)

## IM240 Areas

<u>STATE</u>	<u>AREA</u>	<u>IMPLEMENTATION DATE</u>	<u>COORDINATOR/ PHONE #</u>
Maryland	Baltimore Wash., D.C. Wilmington Hagerstown	Jan., 1995	Peggy Lord 410-631-3237 410-631-3202 (FAX)
Massachusetts	Statewide	July, 1995	John Houghton 617-351-9909 617-351-9962 (FAX)
Michigan	G.R. - Muskegon	March, 1995	Susan Clark 517-335-2695 517-373-0964 (FAX)
Missouri	St. Louis	Jan., 1996	Kevin McDonald 314-751-4817 314-751-2706 (FAX)
Nevada	Las Vegas	Sept., 1995	Peter Bellis 702-687-6940
New Hampshire	Portsmouth - Dover Rochester Lawrence - Haverhill Lowell Nashua Manchester	July, 1995	Ginnie Kelly - Todd 603-271-6680 603-271-3093 (FAX)
New Jersey	Statewide	July, 1995	Robert Chatham 609-530-4035 609-530-5342 (FAX)
New York	Albany - Schenectady - Troy Binghamton Buffalo Glen Falls Jamestown - Dunkirk Niagara Falls Nassau - Suffolk Orange County Poughkeepsie Rochester Syracuse Utica - Rome	July, 1995	James Fischer 518-474-4049 518-474-4702 (FAX)
Ohio	Cincinnati Cleveland Dayton Akron	Jan., 1996	Philip Ritz 614-644-3059 614-644-3681 (FAX)
Pennsylvania	Allentown - Bethlehem Philadelphia Pittsburgh Altoona	March, 1995	John Munafo 717-783-6254 717-772-0875 (FAX)

## IM240 Areas

<u>STATE</u>	<u>AREA</u>	<u>IMPLEMENTATION DATE</u>	<u>COORDINATOR/ PHONE #</u>
Pennsylvania (Cont'd.)	Erie Harrisburg - Lebanon - Carlisle Johnstown Lancaster Reading Scranton - Wilkesbarre Sharon State College Williamsport York	March, 1995	John Munafo 717-783-6254 717-772-0875 (FAX)
Rhode Island	Providence	July, 1995	Thomas Barry 401-277-2808 401-277-2017 (FAX)
Texas	Houston - Galveston Dallas - Ft. Worth El Paso	Jan., 1995 July, 1995 Jan., 1995	Michael Fahy 512-239-1490 512-239-1500 (FAX)  Chris Kite 512-239-1959
Utah	Salt Lake Provo - Orem	Jan., 1995 July, 1995	Terry Beebe (Provo) 801-370-8780 801-370-8784 (FAX)  Blaine Shaw (Ogden) 801-399-8108 801-399-8300 (FAX)  Joe Thomas (Salt Lake City) 801-536-4175 801-536-4099 (FAX)  Richard Valentine (Salt Lake City) 801-944-6677 801-944-6608 (FAX)
Vermont	Burlington	?	Thomas Moye 802-241-3840 802-241-2590 (FAX)
Virginia	Wash. D.C. area	July, 1995	John Bowden 703-339-8553 703-339-3722 (FAX)
Washington	Seattle - Tacoma Spokane	Oct., 1995	Dennis Blowers 206-649-7199 206-649-7098 (FAX)
Wisconsin	Milwaukee	July, 1995	Jerry Medinger 414-266-1086 414-266-1082 (FAX)

#### IM240 Areas

Illustrated are those states which will participate in the Enhanced Emission program as well as a state contact and phone number. In most cases, the test program will be limited to major-urban areas, although some states have elected to implement a statewide program. To ascertain if your facility is affected by this program, refer to the attached list which details those areas affected by the IM240 program along with the projected start dates as declared by each state. Check with your local environmental agency to obtain more detailed information.

## KENT-MOORE J 39982 FIVE GAS ANALYZER

**FOR GENERAL MOTORS I/M 240 EMISSION TESTING DIAGNOSIS  
AND REPAIR VERIFICATION**

**\$4195.00**

ESSENTIAL  
PRICE

- **FINANCING AVAILABLE:**

GMAC FIXED RATE FINANCING AVAILABLE FOR ONE, TWO, OR THREE YEARS! CONTACT KENT-MOORE FOR DETAILS!

- **EARLY DELIVERY AVAILABLE**

FOR DEALERS INTERESTED IN EARLY DELIVERY CONTACT KENT-MOORE!

- **DEALERS NEAR I/M 240 AREAS!**

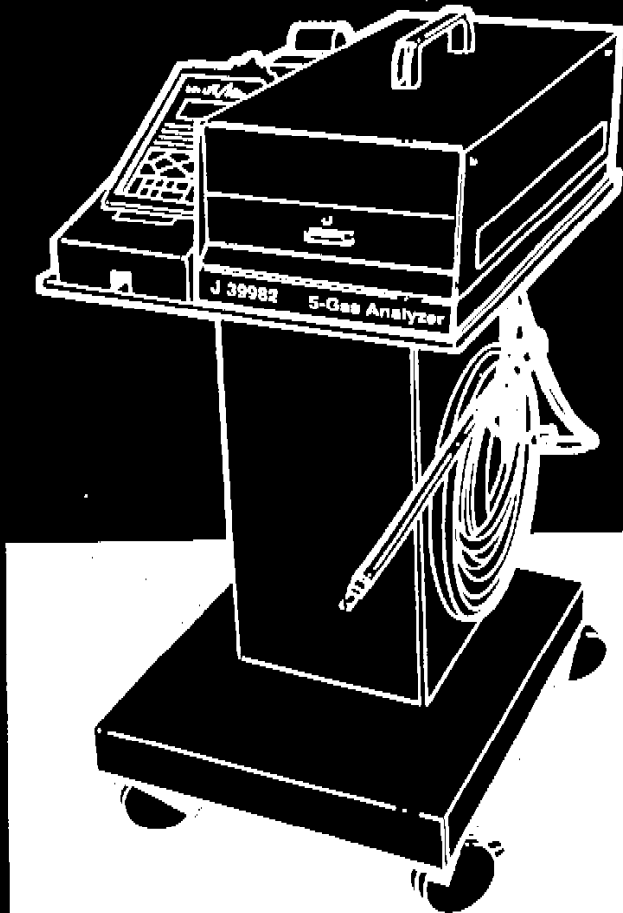
IF YOU ARE A DEALER NEAR AN I/M 240 AREA AND WANT TO ORDER A FIVE GAS ANALYZER (AVAILABLE IN LATE JANUARY) SIMPLY CONTACT KENT-MOORE!

- **ADDITIONAL UNITS AT THE ESSENTIAL PRICE!**

FOR DEALERS INTERESTED IN ADDITIONAL UNITS AT THE ESSENTIAL PRICE, CONTACT KENT-MOORE!

### J 39982 FIVE GAS ANALYZER

- FIVE GAS DIGITAL BENCH - O<sub>2</sub>, CO, CO<sub>2</sub>, HC AND NOX
- EXPANDED HC RANGE EXCEEDS REQUIREMENTS
- MEMORY "SNAP SHOT" CAPABILITY
- LIQUID DETECTION - AUTOMATIC SELF PURGE
- SERIAL PRINTER AND CABLE
- EXHAUST DIFFUSER ATTACHMENT
- FIELD REPLACEABLE FILTERS AND SENSORS
- SAMPLE PROBE AND HOSE
- CONTROL HEAD WITH PROTECTIVE BOOT
- CART ASSEMBLY
- CALIBRATION GAS - FIVE GAS
- CALIBRATION GAS REGULATOR
- DUST COVER
- OPERATION MANUAL



**1-800-345-2233**



Visa/MasterCard



5 Gas Analyzer

Based on our experience, correction of vehicle failures identified by the Enhanced Emission program will require specialized equipment and diagnostic techniques. General Motors Service Technology Group has successfully developed and validated an approach to diagnose and repair vehicles tested under this Enhanced Emission program. As a result, dealerships located within an Enhanced Emission area will receive special equipment and diagnostic information. This essential equipment and associated costs consists of a 5 gas Exhaust Gas Analyzer at \$4195.00, an Evaporative Pressure/Purge Diagnostic Station at \$1500.00, and a Propane Enrichment tool at \$110.00.

Included in this bulletin is information from Kent-Moore concerning the exhaust gas analyzer, financing terms, early delivery program, and additional units. They will be sent in a timely fashion relative to the program's implementation date in your area. Those dealerships located outside an

Enhanced Emission area may purchase this equipment (at essential tool prices) if they wish to take advantage of this new opportunity created by the Enhanced Emission Test program by contacting Kent-Moore (1-800-345-2233).

If your dealership is located within an Enhanced Emission area, and you currently own an exhaust gas analyzer, you may qualify for a waiver for this equipment. Waiver eligibility is dependent upon the features of your gas analyzer. The criteria for waiver of the gas analyzer is as follows, the gas analyzer must possess the following:

- ^ HC, CO2 Measurability.
- ^ HC range 5000 PPM min and CO2 range 10% min.
- ^ Memory capability (60 SEC min) of (HC/CO2).
- ^ Memory display-printing capability or CRT
- ^ Ability to operate on vehicles with exhaust diffusers (trucks).

If your analyzer meets the above criteria (refer to your equipment owner's manual), you may contact Kent Moore at 1-800-345-2233 to request a waiver for the exhaust gas analyzer, but you must do so 30 days prior to your state's implementation date. Please be prepared to report Brand, Model, and Serial Number of your unit. A waiver will also be available for the propane enrichment tool which was essential approximately 15 years ago, if you still possess it. No waiver is available for the Evaporative Pressure/Purge Diagnostic Station due to the unique nature of this tool. This Diagnostic Station includes all necessary gas cap adapters, purge system gauges, and leak detection equipment. Since it will be used on upcoming OBDII applications as well as IM240, it will be shipped to the balance of the GM dealerships coincident with the 1996 model announcement.

To assure that your dealership is adequately prepared for the Enhanced Emission program, you will want to have your technicians trained on this subject. The GM Training Center will offer a course beginning in December, 1994, titled Vehicle Emissions, Enhanced Testing and Repair, Course # 16004.10. Having competent, trained technicians will give your service department a competitive edge, by offering your customers a dependable repair facility which can fix vehicles right the first time. Refer to your local GM Training Center for details on this course.

Technical Service Bulletin # **436505**

Date: **940401**

## **Emission - Enhanced Inspection Maintenance Programs**

Group Ref.: Engine Fuel & Emission

Bulletin No.: 436505

Date: April, 1994

SUBJECT:  
ENHANCED EMISSION INSPECTION MAINTENANCE PROGRAM-EQUIPMENT REQUIREMENTS

MODELS:  
1994 AND PRIOR PASSENGER CARS AND TRUCKS

The intent of this bulletin is twofold; first to inform you of the upcoming Enhanced Inspection Maintenance (I/M) program which will be implemented in specific regions of the country beginning in January 1995 (July 1994 in Maine), and secondly to advise against the purchase of emission related equipment at this time.

This "Enhanced" I/M test (also referred to as the IM240 test) actually consists of three specific tests (and any additional tests individual states may require). They are:

1. The IM240 Test - This test consists of a transient dynamometer test event which will be conducted at centralized (state owned) test facilities. The exhaust gasses measured during the IM240 test event are: HO, CO, and NOx. This test event is much more comprehensive than current I/M tests.
2. The Purge Flow Test - This test measures the flow of unburned hydrocarbons through the purge solenoid during the IM240 test. The objective is to determine that sufficient flow is present under the proper conditions.
3. The Evaporative System Pressure Test - The objective of this test is to evaluate the integrity of the fuel tank vapor recovery system. It is conducted by pressurizing the fuel tank and fuel vapor lines. Pressure is then monitored to assure the system is leak-free.

Currently, there are approximately 30 states which will implement the Enhanced I/M program. In most cases, the test program will be limited to major-urban areas, although some states have elected to implement a statewide program. Check with your local environmental agency to determine if you will be affected by the Enhanced I/M program.

Correction of vehicle failures identified by the Enhanced I/M program will require specialized equipment and diagnostic techniques. General Motors Service Technology Group is developing and validating procedures to diagnose and repair vehicles which fall the new requirements. Our objective is to provide effective repair techniques utilizing proven equipment and to ensure optimal value at the lowest possible cost. Please refrain from purchasing any emission related equipment (i.e. exhaust gas analyzer, dynamometer) until notified by General Motors Service Technology Group to avoid unnecessary expense. Many products currently being marketed are either incapable of performing the required diagnostic and repair functions or include expensive features that may not be required. You will be notified of our findings as information becomes available.

Technical Service Bulletin # **436510**

Date: **950101**

## **I/M 240 Program - Equipment Purchase**

File in Section: 6E - Engine Fuel & Emission

Bulletin No.: 43-65-10

Date: January, 1995

## **INFORMATION**

### **Subject:**

Enhanced Emission Inspection Maintenance Program - Equipment Purchase Considerations

### **Models:**

1995 and Prior Passenger Cars and Trucks

Previous bulletins have been issued regarding the structure of the Enhanced Emission Inspection Program, Bulletin 436505, and the essential tools and training required by General Motors Technology Group, Bulletin 43-65-07. These bulletins should be referred to for information on this new emissions test program including implementation dates and state contact phone numbers.

The purpose of this bulletin is to stress STG's position on the purchase of Enhanced Emissions Inspection equipment, also known as "RG240" equipment. **GM-STG DOES NOT RECOMMEND THE PURCHASE OF ANY ADDITIONAL IM240 EQUIPMENT APART FROM THE ESSENTIAL EQUIPMENT FOR THIS PROGRAM AT THIS TIME.**

Little is known of the actual effectiveness of these devices. Because of this, STG is conducting a detailed study on the subject. The objective: to determine the ability of various RG240 repair validation techniques and equipment to predict IM240 outcome. Any processes that are effective in performing repair verification will be endorsed by GM-STG and merchandised accordingly. The results of this study will be shared with you as soon as they are available, most likely this summer. Until that time, the Strategy Based Diagnostic procedure found in the Enhanced Inspection Maintenance Diagnostic Manual, if adhered to, will result in successful IM240 repairs.

Technical Service Bulletin # **516502**

Date: **950201**

## **I/M Emissions Diagnostic Manual -Program**

NO.: 51-65-02

DATE: February, 1995

SECTION: 6E - Engine Fuel & Emission

### **MODELS:**

1995 and Prior Passenger Cars and Trucks

### **SUBJECT:**

Inspection/Maintenance (I/M) Emissions Diagnostic Manual - Manual Number G MI95-IM24O-2

## **GENERAL INFORMATION**

The Enhanced Inspection/Maintenance (I/M) program is scheduled to begin in designated areas of the country in January 1995. Refer to GM Service Bulletin 43-65-07, dated December 1994, for a list of states participating in this new emissions testing program. Also refer to GM Service Bulletin 43-65-05, dated April 1994, for information on this emissions testing program and a description of the I/M 240 loaded mode test.

## **INSPECTION/MAINTENANCE (I/M) EMISSIONS**

### **DIAGNOSTICS**

Copies of the Inspection/Maintenance (I/M) Emissions Diagnostic manual will be shipped to all dealerships regardless of whether your state is participating in the enhanced I/M testing program. For dealerships in areas performing I/M testing, the subject manual provides a strategy based diagnostic approach to repairing I/M test failures. For dealerships in areas not affected by enhanced I/M testing, the new diagnostic procedures provided in this manual may be helpful for diagnosing the oxygen sensor, oxidation and three way catalytic converter, and EVAP system.

The Inspection/Maintenance (I/M) Emissions Diagnostic Manual provides complete emissions diagnostic procedures for all fuel system types (both open and closed loop carburetor, TBI, and MFI). The manual also provides evaporative (EVAP) emissions system diagnostics for EVAP pressure and EVAP purge flow. The emissions diagnostic procedures outlined in the Inspection/Maintenance (I/M) Emissions Diagnostic Manual follow the strategy based diagnostic approach and include the following new tests developed specifically for the I/M program.

### **OXYGEN SENSOR (O2S) TEST**

There are two versions of the O2S test procedure for use with the Tech 1 scan tool; an automated test using the Tech 1 and Mass Storage Cartridge (MSC), and a manual procedure using the Tech 1's snapshot function. The MSC version of the O2S test is scheduled for release in early 1995.

### **OXIDATION AND THREE WAY CATALYTIC CONVERTER TEST**

Patent Pending Us Patent Office, Serial No. 236837

This test can be used to diagnose excessive emission failures resulting from damaged/poisoned or tampered oxidation and three way catalytic converters. Procedures for both single and dual converter systems are included. This test requires the use of the Propane Enrichment Device (J 26911 or J 41417) and an exhaust gas analyzer meeting the specifications outlined in GM Service Bulletin 43-65-07, dated December 1994.

#### EVAP PRESSURE TEST

The EVAP pressure test is used to diagnose and locate leaks in the fuel tank and EVAP system. This test requires the use of the EVAP System Diagnostic Kit (J 41600).

#### EVAP PURGE FLOW TEST

The EVAP purge flow test is used to diagnose the loss of EVAP purge flow. Detailed procedures for all EVAP system configurations are provided. This test requires the use of the EVAP Pressure/Purge Diagnostic Station (J 41413) and the Purge Flow Indicator (J 41418) supplied as part of the EVAP System Diagnostic kit (J 41600).

#### TECHNICAL ASSISTANCE FOR ENHANCED I/M (I/M 240) FAILURES

Dealer technicians are granted access to all divisional technical assistance staffs when repairing I/M 240 emissions test failures. Refer to GM Service Bulletin 43-65-06, dated October 1994 for complete details.

#### BASIC/ENHANCED I/M EMISSIONS DIAGNOSIS TRAINING

GM has developed the following emissions training program specifically for dealers located in enhanced I/M testing areas: VEHICLE EMISSIONS,

ENHANCED TESTING AND DIAGNOSIS (Course # 16004.10). Contact your local GM training center for class schedules, enrollment information, and prerequisites.

Additional copies of the Inspection/Maintenance Emissions Diagnostic Manual (GM/95-IM240-2) may be obtained from Helm Inc. 1-800-782-4356.

Technical Service Bulletin # **536507**

Date: **951201**

### **Enhanced Emission I/M - Program Update**

File In Section: 6E - Engine Fuel & Emission

Bulletin No.: 53-65-07

Date: December, 1995

#### INFORMATION

Subject:

Enhanced Emission Inspection Maintenance - Program Update

Models:

1996 and Prior Passenger Cars and Trucks

#### Program Status

The purpose of this bulletin is to provide information on the current status of the Enhanced IM Programs in various states. For background information on the Enhanced IM Program, refer to Bulletins 43-65-05, 43-65-07, and 43-65-10. While some states have already started Enhanced IM testing, many states are planning to implement their Enhanced IM Program in 1996. Program implementation delays have resulted due to debate over the type of program to implement. Some states are still planning to implement IM240 test programs, while others are gravitating toward steady speed loaded-mode tests. The logistics of each test program (centralized vs. decentralized) are also being evaluated.

#### Equipment Shipment Procedure

The Service Technology Group works directly with state IM Administrators regarding their Enhanced IM program status. STG will closely track the progress made by each state toward implementing their IM program. When a state approaches and confirms their implementation date, steps will be taken by STG and Kent Moore to produce and ship the essential equipment. If the state decides to delay their program, the shipment of equipment will also be delayed. Using this approach minimizes the risk of premature shipment of equipment to dealers. In isolated situations where a state has implemented an IM program and later suspended it, dealers are urged to retain possession of the equipment since the state will ultimately be required to implement a replacement IM program. **IT IS IMPORTANT TO UNDERSTAND THAT, WITH THE EXCEPTION OF THE BASIC IM IDLE TEST, ALL OTHER EMISSION TEST PROGRAMS UNDER CONSIDERATION WOULD REQUIRE THE USE OF THE ESSENTIAL EQUIPMENT FOR VEHICLE DIAGNOSIS.** And remember, the Evaporative Pressure/Purge Diagnostic Station (J 41600) is



essential for the OBDII program as well as the Enhanced IM program.

#### An Equipment Decision

As each state approaches their implementation date, you will be contacted by Kent Moore personnel to determine if you intend to:

1. Update your existing analyzer\*.
2. Purchase new equipment with required capabilities\* or,
3. Accept 5 gas analyzer per the essential tool program.

\* Must meet the waiver criteria (refer to bulletin 43-65-07 for waiver requirements).

If you elect to update your current gas analyzer, Kent Moore has been instructed to make arrangements with the appropriate manufacturer to initiate the upgrade. If you have any questions regarding the 5 gas analyzer or waiver criteria, contact Kent Moore on 1-800-345-2233. **Technical**

**Service Bulletin # 636532**

**Date: 960501**

## Enhanced Emission Inspection Maintenance - Equipment

File in Section: 6E - Engine Fuel & Emission

Bulletin No.: 63-65-32

Date: May, 1996

### INFORMATION

Subject:

Enhanced Emission Inspection Maintenance Program - Repair Confirmation Equipment Performance

Models:

1996 and Prior Passenger Cars and Trucks

This bulletin supplements information regarding repair confirmation equipment provided in previous bulletins discussing Enhanced Emission Programs (Corporate Bulletin Number(s) 43-65-05, 43-65-07, 43-65-10 and 53-65-07).

STG CONTINUES TO RECOMMEND THAT NO ADDITIONAL ENHANCED EMISSIONS INSPECTION EQUIPMENT BE PURCHASED BEYOND THE DIAGNOSTIC PRODUCTS INCLUDED IN THE ESSENTIAL TOOL PROGRAM. An extensive study has been completed by STG to identify any products/equipment that could be used to verify the effectiveness of the diagnosis and repairs made. The objective of the study was to identify any process(es), preferably low cost, which was capable of predicting IM240 test results before returning the vehicle for retest at a centralized test facility. More specifically, the goal was to identify any test equipment/procedures capable of achieving acceptable levels of correlation and prediction intervals with the IM240 test. Correlation is a statistical term meaning the measure of the strength of the relationship between these equipment/procedures and the IM240 test itself, while the prediction interval predicts the range of performance (IM240 test results) that could result when using these equipment/procedures. THE RESULTS OF THE STUDY INDICATED THAT NONE OF THE EQUIPMENT/PROCEDURES EVALUATED WERE CAPABLE OF MEETING EITHER THE CORRELATION OR PREDICTION INTERVAL STANDARDS.

Equipment included in this study included RG240 systems (dynamometer, constant volume sampler, and gas analysis), portable gas analyzers used to monitor the exhaust under static and driving conditions, as well as combinations of both stationary and portable equipment. While we have yet to identify a satisfactory process for verifying Enhanced Emission repair effectiveness in GM dealerships, we have learned that strict adherence to the Strategy Based Diagnostic procedures (found in the Enhanced Inspection Maintenance Diagnostic Manual), coupled with the use of the essential equipment, will ensure satisfactory performance at the centralized IM240 test facility. In most all cases, the vehicles involved in the forementioned study were correctly repaired and successfully passed their retest the first time. The best way to ensure that you are adequately prepared to perform Enhanced IM240 Emissions repairs is to enroll in training course # 16004.10 "Vehicle Emissions, Enhanced Testing and Repair". **Technical**

**Service Bulletin # 00-06-04-021**

**Date: 000501**

## EVAP System - Service of Connectors

File In Section: 06 - Engine/Propulsion System

Bulletin No.: 00-06-04-021

Date: May, 2000

### INFORMATION

Subject:

Proper Service of Quick Connect EVAP System Connectors

Models:

1985-2001 Passenger Cars and Trucks

The EVAP system must be serviced properly. Improper service of the EVAP system can cause EVAP system leaks and set an engine DTC.

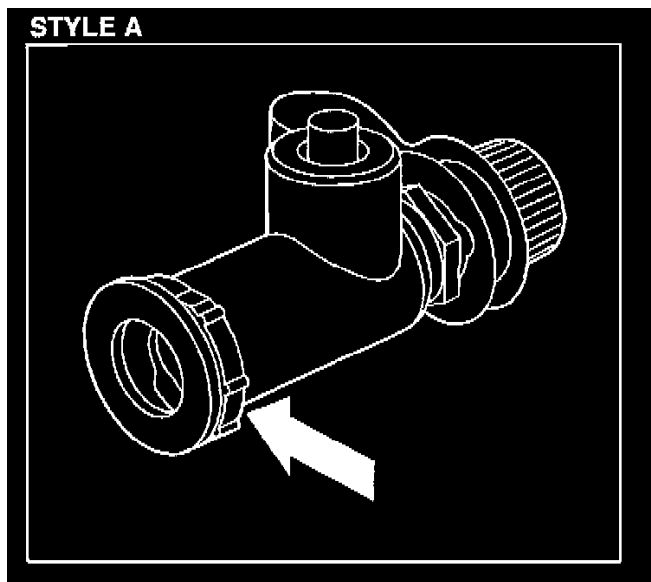
**Important:**

DO NOT cut or kink EVAP hoses/pipes to service the EVAP system. A damaged, cut or kinked EVAP system hose/pipe must be replaced and NOT REPAIRED.

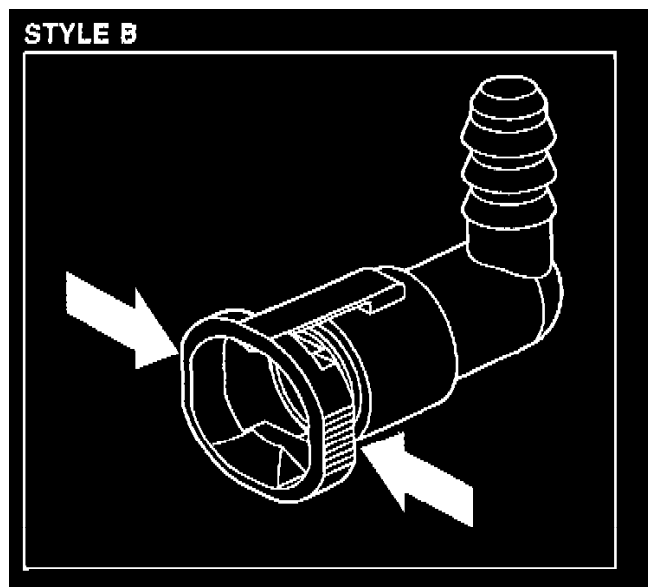
To properly service the EVAP system, it is important to correctly identify the style of quick connect EVAP fitting used in the EVAP system. Correctly identifying the style of fitting will aid in the proper disconnection/connection of the fitting and the ability to reuse the fitting.

Improper disconnection and/or connection of EVAP fittings can cause the following conditions and set engine DTCs:

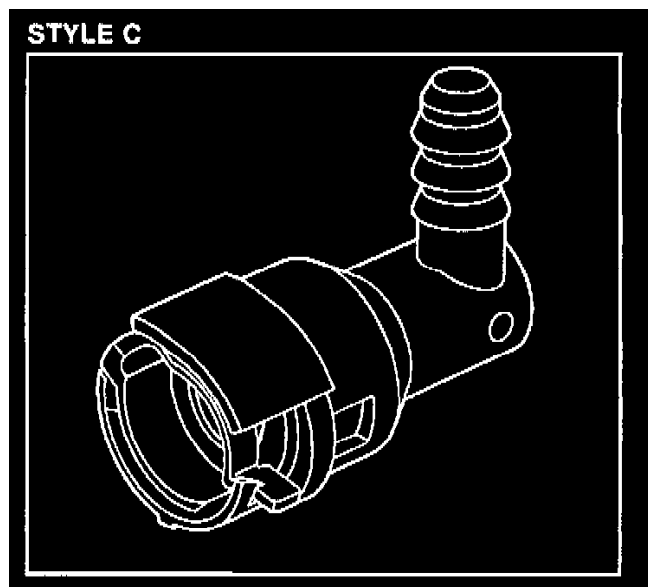
- ^ Leaks in the EVAP system
- ^ Damage to the EVAP fitting(s)
- ^ Damage to and/or adversely effect the function of the EVAP components such as:
  - Purge solenoid
  - Canister
  - Vapor lines



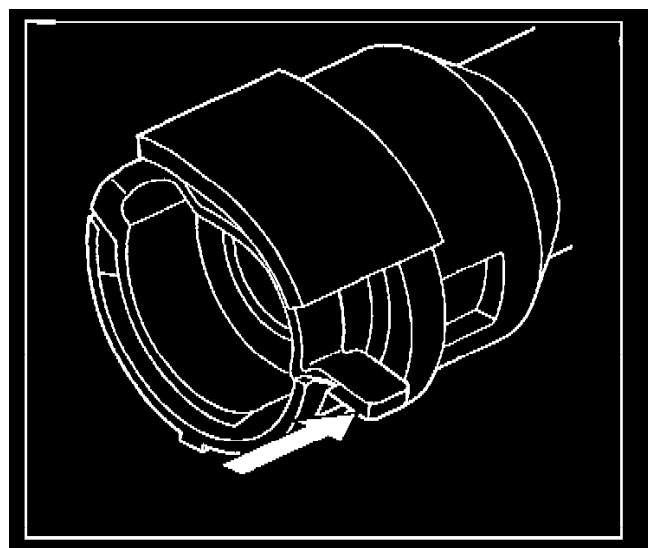
1. To properly disconnect this style of fitting, slide the tab in and pull the fittings apart.
2. To reconnect this style of fitting, install the fittings back together and gently pull back on the fittings to verify proper connection of the fittings.



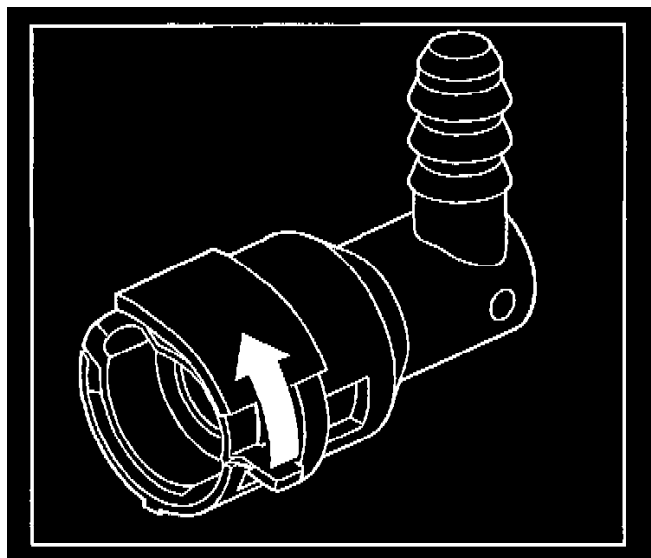
1. To properly disconnect this style of fitting, push in both sides of the retaining feature and pull the fittings apart.
2. To reconnect this style of fitting, install the fittings back together and gently pull back on the fittings to verify proper connection of the fittings.



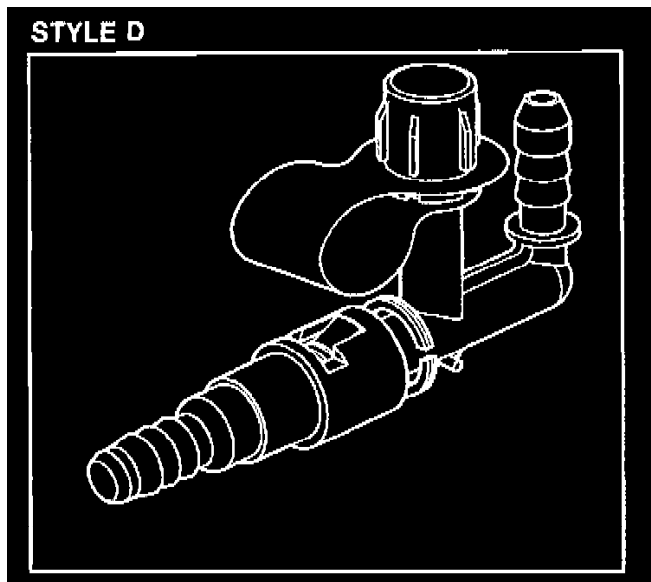
To properly disconnect this style of fitting, use the following procedure:



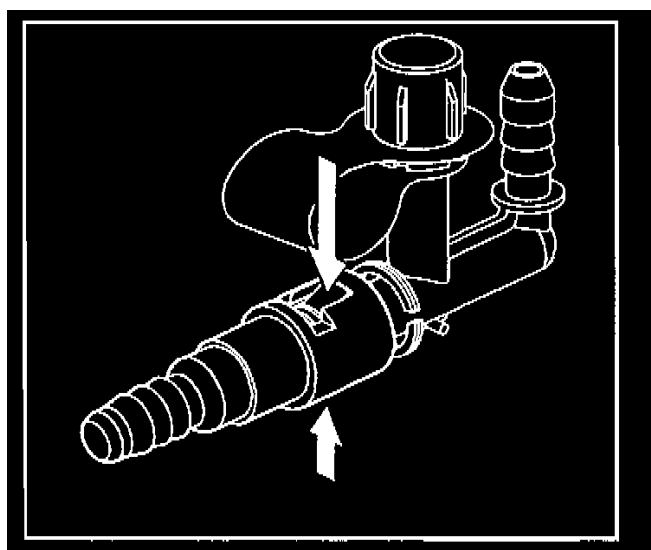
1. Move the tab of the retainer away from the male fitting in order to clear the retaining nub.



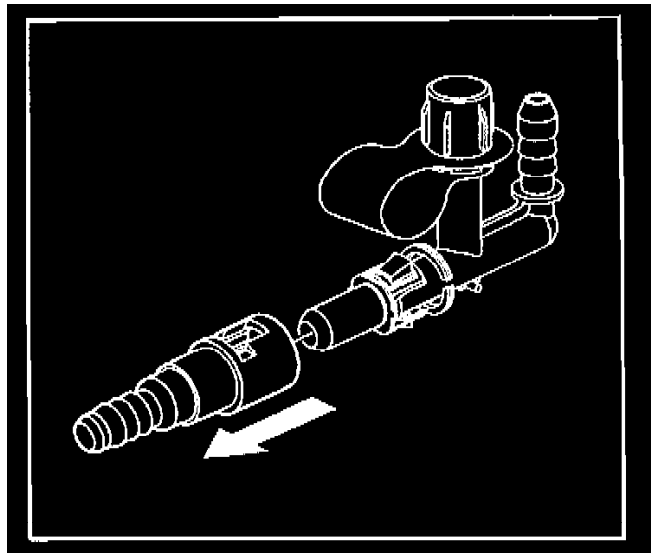
2. Move the tab of the retainer in the direction shown and pull the fittings apart.
3. To reconnect this style of fitting, install the fittings back together and gently pull back on the fittings to verify proper connection of the fittings.



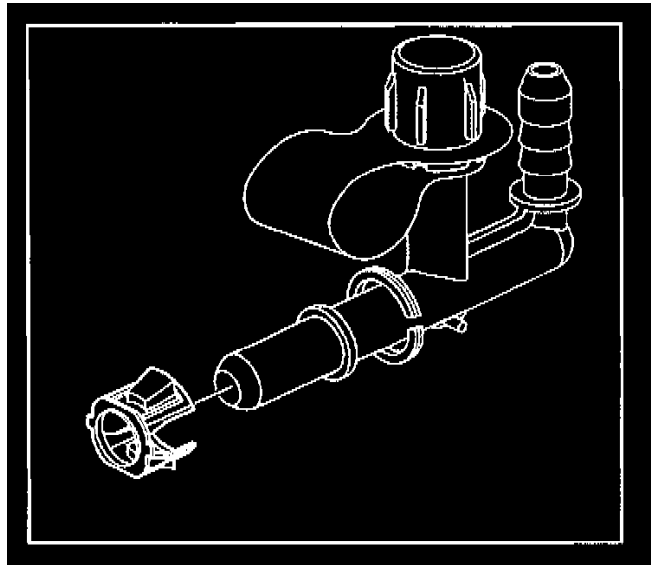
To properly service this style of fitting use the following procedure:



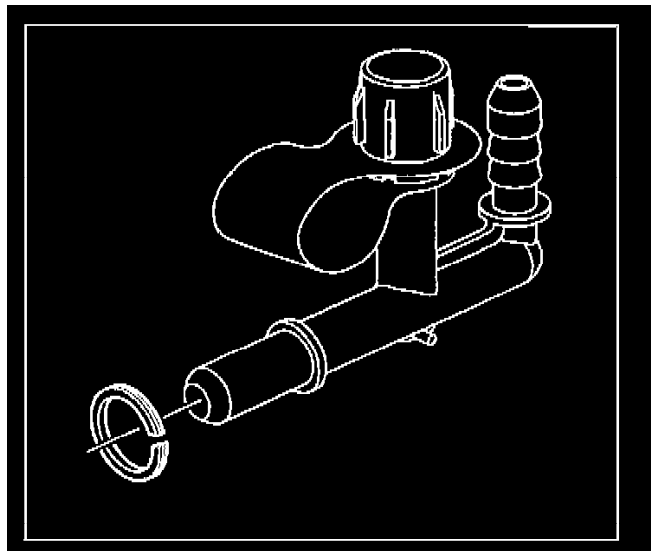
1. Push in both tabs of the retainer.



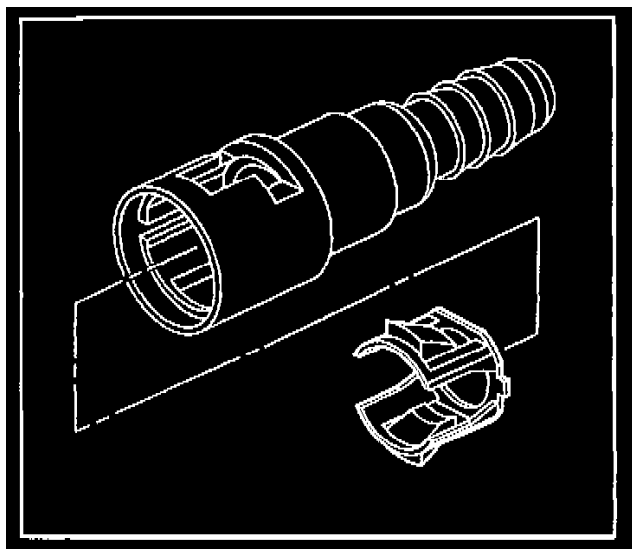
2. Pull the female fitting away from the male fitting.



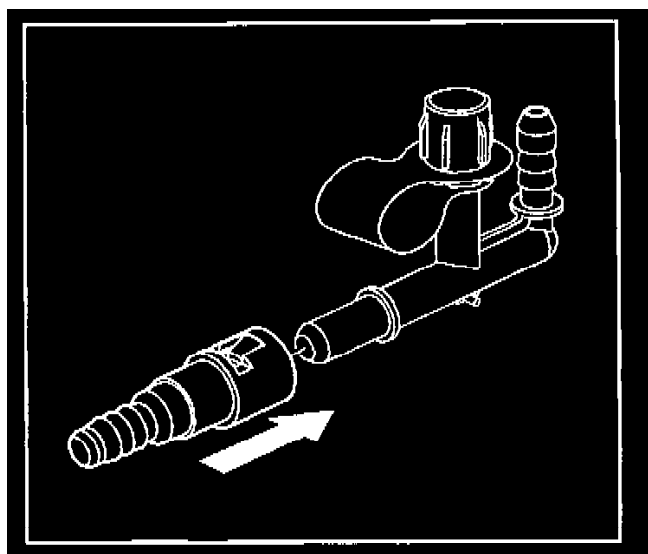
3. Remove and discard the retainer fitting from the male fitting.



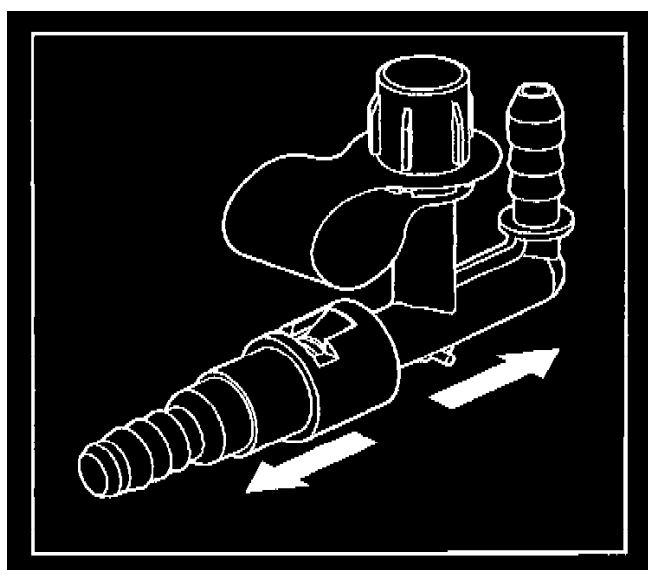
4. Remove and discard the indicator ring (factory use only) from the male fitting.



5. Install a NEW retainer fitting into the female fitting.



6. Connect the fittings together until a snap is heard and/or felt signifying the retainer tabs have engaged the raised feature of the male fitting.



7. Gently pull back on the fittings to verify proper connection of the fittings.

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, **DO NOT** assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



WE SUPPORT VOLUNTARY  
TECHNICIAN  
CERTIFICATION

## Engine Controls - Electrostatic Discharge Damage

Number: 88-283-6E  
 Section: 6E  
 Date: JULY, 1988  
 Subject: ELECTROSTATIC DISCHARGE DAMAGE

Model and Year: 1981-1988 PASSENGER AND LIGHT DUTY TRUCKS

WITH AN ELECTRONIC CONTROL MODULE (ECM)

TO: ALL CHEVROLET DEALERS

Please add the following information to 6E Section "A" Diagnostic Charts/Trouble Codes, and to Section "C1" Electronic Control Module and Sensors.

NOTICE: To prevent possible Electrostatic Discharge damage:

- Do Not touch the ECM connector pins or soldered components on the ECM circuit board.
- When handling a PROM, CAL-PAK or Mem-Cal, Do Not touch the component leads, and Do Not remove integrated circuit from carrier.

Electronic components used in control systems are often designed to carry very low voltage, and are very susceptible to damage caused by electrostatic discharge. It is possible for less than 100 volts of static electricity to cause damage to some electronic components. By comparison, it takes as much as 4,000 volts for a person to even feel the zap of a static discharge.

There are several ways for a person to become statically charged. The most common methods of charging are by friction and by induction. An example of charging by friction is a person sliding across a car seat, in which a charge of as much as 25,000 volts can build up. Charging by induction occurs when a person with well insulated shoes stands near a highly charged object and momentarily touches ground. Charges of the same polarity are drained off, leaving the person highly charged with the opposite polarity. Static charges of either type can cause damage, therefore, it is important to use care when handling and testing electronic components.

Technical Service Bulletin # **881018A**

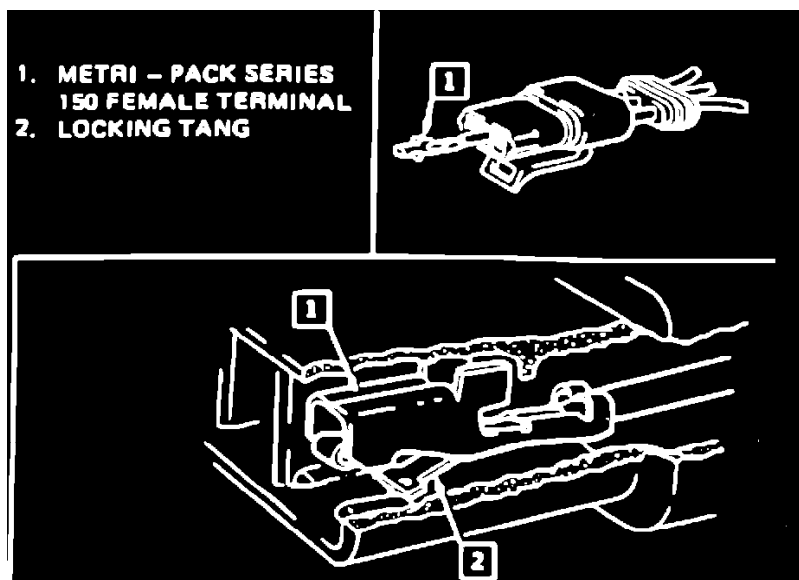
Date: **871201**

## Electrical Terminals - Updated Procedure for Metri-pack

Number: 88-101-8A  
 Section: 8A  
 Date: DEC., 1987  
 Subject: DAMAGE TO WIRING TERMINALS ON ENGINE  
 SENSORS - METRI-PACK 150 SERIES

Model and Year: 1985-88 ALL PASSENGER VEHICLES  
 TO: ALL CHEVROLET DEALERS

Improper handling of the Metri-pack 150 series electrical terminals may result in damage that could affect their performance. The Metri-pack 150 terminals are used on a variety of engine applications on all vehicle lines. Some of these usages include the direct fire ignition (DIS) wiring, MAT, TPS, and coolant sensor/connectors.



Pictured below is a sketch of the Metri-pack series terminals.

**DIAGNOSIS:**

The Metri-pack 150 series terminals are small and can easily be damaged by probing during diagnosis. Any terminal damage may result in an intermittent contact condition.

**DO NOT USE TEST LIGHT PROBES. METER PROBE, PAPER CLIPS, OR ANY OTHER FOREIGN OBJECTS WHEN DIAGNOSING CIRCUITS WITH METRI-PACK 150 SERIES ELECTRICAL TERMINALS.**

The proper way to take measurements at these terminals is to insert the proper mating terminal and use that as a contact for your meter or test light. These terminals can be obtained from the GMSPO standard parts catalog (P/N 12047581) or from the Kent-Moore Connector Test Adapter Kit (J35616).

**TESTING**

To evaluate a Metri-pack 150 terminal for proper operation, insert a new mating terminal and check for a slight drag when the terminals are separated. Loose terminals without drag should be replaced.

**DO NOT ATTEMPT TO REPAIR A DEFECTIVE TERMINAL.**

**SERVICING**

Refer to Chevrolet Dealer Service Bulletin 86-56 (Section 8A) dated March 1986 or the appropriate vehicle Service Manual (Section 8A) for the proper way to replace these terminals. Be sure to crimp and solder all terminals to the wire. A hand crimp alone is not sufficient to guarantee a satisfactory connection.

Technical Service Bulletin # **891776E**

Date: **890601**

**Engine Controls - Revised Code 35 & Chart C2, IAC**

Number: 89-177-6E

Section: 6E

Date: JUNE 1989

Subject: DRIVEABILITY AND EMISSION - REVISED CODE 35/CHT C-2 I.A.C. CHARTS

Model and Year: 1982-89 CHEVROLET WITH IAC SYSTEMS

TO: ALL CHEVROLET DEALERS

This bulletin cancels and supersedes Dealer Service Bulletins 88-170-6E, dated March 1988 and 89-89-6E, dated March 1989. All copies of these two bulletins should be discarded.

The improved diagnostic is a dynamic check of the Idle Air Control (IAC) system. This is accomplished by use of an IAC Tester kit. It includes an IAC driver and IAC node lights. The driver dynamically cycles the valve to see if it is capable of controlling rpm. Lack of rpm control could indicate a faulty valve or foreign material in the IAC passages. Since each engine is different, please consult the appropriate Service Manual for idle rpm information.

The node lights are a dynamic indicator of circuit function including ECM and connections. By varying engine rpm with the IAC driver, the ECM will activate the IAC circuits attempting to control rpm. As this occurs, each node light will be either red or green and will randomly alternate. The pattern will be different for each engine but what is important is that each light cycle red and green and never be "OFF."

The use of the tester kit and improved diagnostics represent a superior IAC testing procedure that will result in a high degree of user confidence. The tester positively concludes that the IAC system is either fully functional or faulty and if faulty whether it is the valve or the circuits. The tester kits can be ordered from Concept Technology, Inc. or Kent-Moore, Inc. Order forms are included with this bulletin.

This procedure and tester kit will work on all IAC equipped vehicles from 1982 through 1989. For 1990 and beyond, Tech I and Cams will develop diagnostics for the bidirectional ECMs (GMP4). Tech I will also require the node lights. For 1990 and beyond, non-bidirectional ECMs (GMCM) will continue to require this diagnostic procedure and tester kit.

"We believe this source and their equipment to be reliable. There may be additional manufacturers of such equipment. General Motors does not endorse, indicate any preference for or assume any responsibility for the products or equipment from these firms or for any such items which may be available from other sources."





CHART C-2 &amp; CODE 35

## IDLE AIR CONTROL (IAC) ALL VEHICLES

## Circuit Description:

The ECM controls engine idle speed with the IAC valve. To increase idle speed, the ECM retracts the IAC valve pintle away from its seat, allowing more air to bypass the throttle bore. To decrease idle speed, it extends the IAC valve pintle towards its seat, reducing bypass air flow. A "Scan" tool will read the ECM commands to the IAC valve in counts. Higher the counts indicate more air bypass (higher idle). The lower the counts indicate less air is allowed to bypass (lower idle).

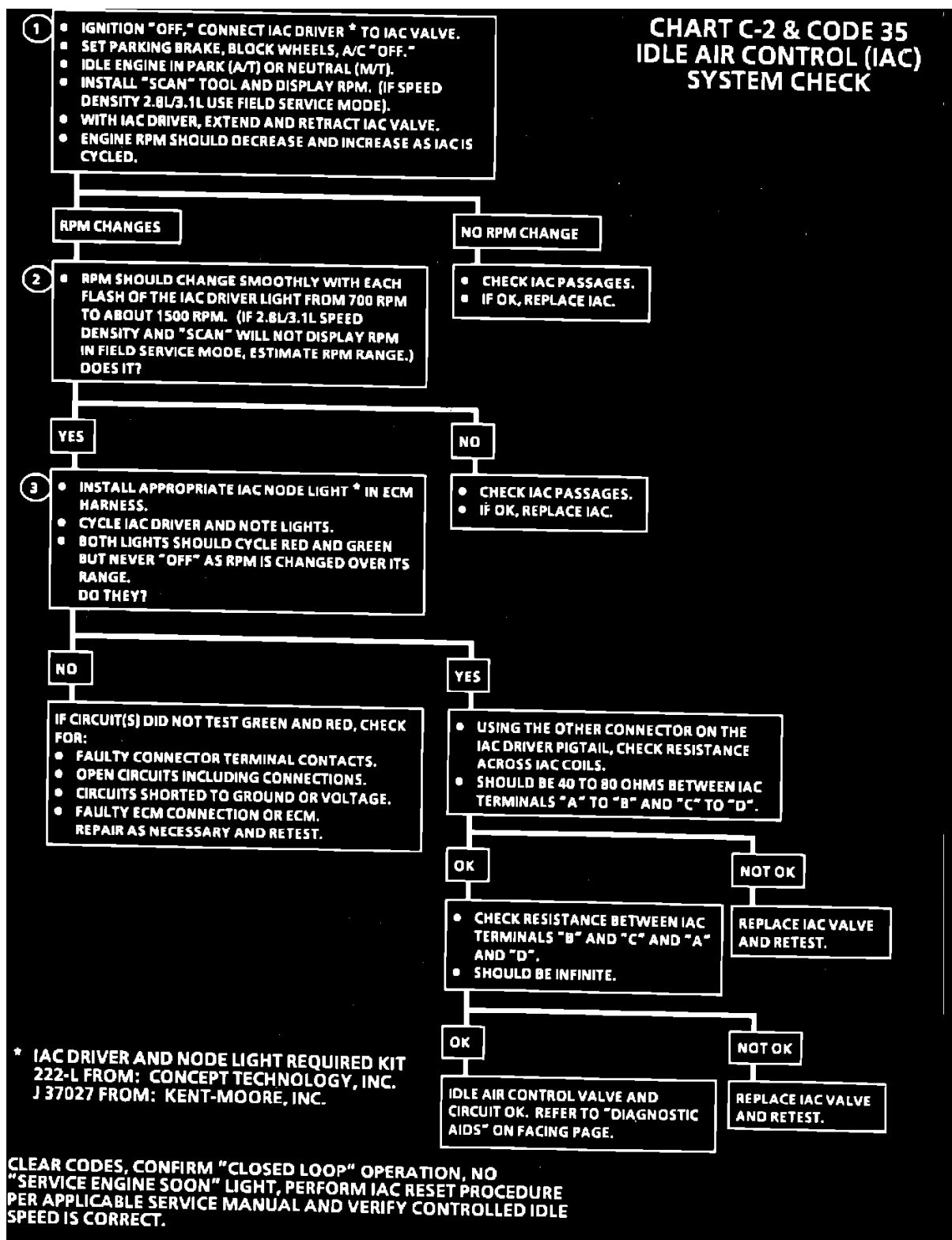


CHART C-2 &amp; CODE 35 IDLE AIR CONTROL (IAC)

Test Description: Numbers below refer to circled numbers on the diagnostic chart.

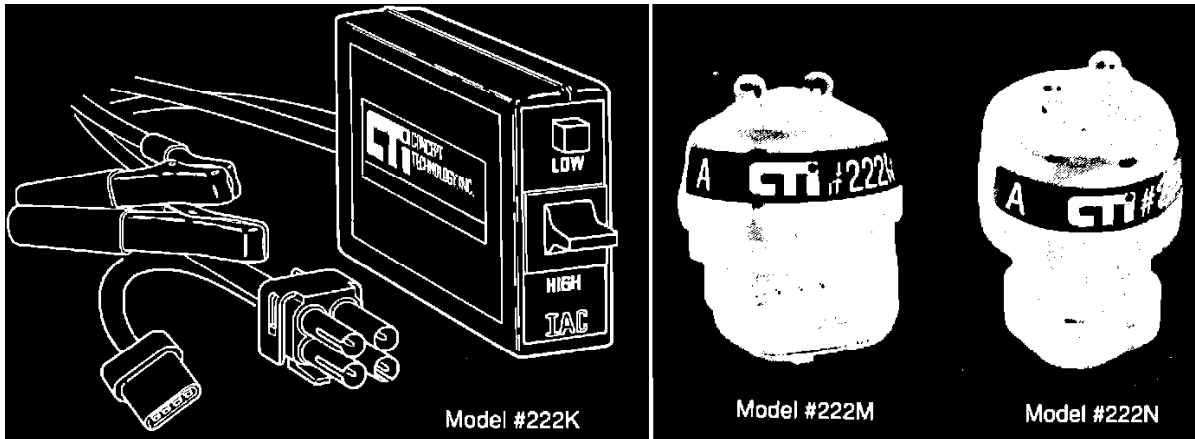
- The IAC tester is used to extend and retract the IAC valve. Valve movement is verified by an engine speed change. If no change in engine speed occurs, the valve can be retested when removed from the throttle body. Unless field service mode is used with 2.8L/3.1L speed density engines, incorrect IAC control will result.
- This step checks the quality of the IAC movement in step 1. Between 700 rpm and about 1500 rpm, the engine speed should change smoothly with each flash of the tester light in both extend and retract. If the IAC valve is retracted beyond the control range (about 1500 rpm), it may take many flashes in the extend position before engine speed will begin to drop. This is normal on certain engines, fully extending IAC may cause engine stall. This may be normal.
- Steps 1 and 2 verified proper IAC valve operation while this step checks the IAC circuits. Each lamp on the node light should flash red and green while the IAC valve is cycled. While the sequence of color is not important if either light is "OFF" or does not flash red and green, check the circuits for faults, beginning with poor terminal contacts.

#### Diagnostic Aids:

A slow, unstable, or fast idle may be caused by a non-IAC system problem that cannot be overcome by the IAC valve. Out of control range "Scan" tool counts will be above 60 if idle is too low, and zero counts if idle is too high. The following checks should be made to repair a non-IAC system

problem:

- ^ Vacuum Leak (High Idle) If idle is too high, stop the engine. Fully extend (low) IAC with tester.
- Start engine. If idle speed is above 800 rpm, locate and correct vacuum leak including PCV system. Also, check for binding of throttle blade or linkage.
- ^ System too lean (High Air/Fuel Ratio) The idle speed may be too high or too low. Engine speed may vary up and down and disconnecting the IAC valve does not help. Code 44 may be set. "Scan" O2 voltage will be less than 300 mV (.3 volts). Check for low regulated fuel pressure, water in the fuel or a restricted injector.
- ^ System too rich (Low Air/Fuel Ratio) The idle speed will be too low. "Scan" tool IAC counts will usually be above 80. System is obviously rich and may exhibit black smoke in exhaust. "Scan" tool O2 voltage will be fixed above 800 mV (.8 volt). Check for high fuel pressure, leaking or sticking injector. Silicone contaminated O2 sensors "Scan" voltage will be slow to respond.
- ^ Throttle Body Remove IAC valve and inspect bore for foreign material.
- ^ IAC Valve Electrical Connections IAC valve connections should be carefully checked for proper contact.
- ^ PCV Valve An incorrect or faulty PCV valve may result in an incorrect idle speed.
- ^ Refer to "Rough, Unstable, Incorrect Idle or Stalling" in "Symptoms," Section "B".
- ^ If intermittent poor driveability or idle symptoms are resolved by disconnecting the IAC, carefully recheck connections, valve terminal resistance, or replace IAC.



## IAC Sub-System

Tester Kit      MODEL #222L KIT  
IDLE AIR CONTROL [IAC] MOTOR TESTER [IAC DRIVER]

The Concept Technology Idle Air Control Motor Tester allows you to test IAC motors for correct functioning and proper response to commands for correct idle speed.

On-vehicle testing saves valuable time by isolating motor failure from system failure immediately. Maintains precise engine RPM control for:  
Ignition Timing Checks Cylinder Balance Checks New Injector Cleaning Process Works on General Motors TBI and Port Fuel engines, from 1982 through current models.

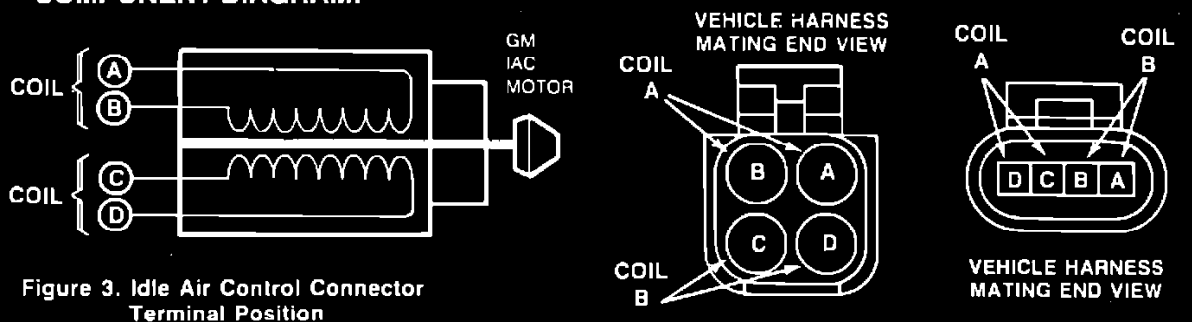
- ^ Late model metric adapter now included
- ^ Clock pulse monitor pilot LED
- ^ Reverse polarity protected
- ^ Rugged control switch
- ^ Heavy-duty cables
- ^ Copper-plated battery clips.

IDLE AIR CONTROL [IAC] SYSTEM MONITORS [NODE LIGHTS]

The Concept Technology Idle Air Control (IAC) System Monitor enables you to observe the signals from the Electronic Control Module (engine computer) to the Idle Air Control Motor, which allows you to test the IAC system for correct functioning and proper response.

The light emitting diodes (L.E.D.) on the model 222M and 222N System Monitors actually monitor all 8 driver transistors in the output stage of the vehicle ECM (engine computer). If any LEDs fail to light it will indicate that the engine computer has one or more defective motor driver transistors.

New kit now includes CTI Model #222K Idle Air Control Motor Tester (IAC Driver), Model #222M and 222N Idle Air Control System Modules (Node Lights).

**COMPONENT DIAGRAM:**

**TO PLACE ORDER CALL 800-PICK-CTI** (800-742-5289)  
**IN MICHIGAN (313) 642-7766**  
**OR USE HANDY ORDER FORM** **OFFER GOOD FOR 90 DAYS**

ORDER FORM		1989 Concept Technology, Inc. #110						
<b>Model #222L Sub-System Tester Kit</b> ..... @ \$85.00 (Kit consists of #222K, #222M and #222N)		<b>FOR OFFICE USE ONLY</b> <b>Please Do Not Write In This Area</b> <table border="1"> <tr> <td>R</td> <td>S</td> </tr> <tr> <td>CO</td> <td>CK</td> </tr> <tr> <td>PO</td> <td>PD</td> </tr> </table>	R	S	CO	CK	PO	PD
R	S							
CO	CK							
PO	PD							
<b>Individual Items:</b>								
<b>Model #222K Idle Air Control Motor Tester</b> ..... @ \$74.95								
<b>Model #222M IAC System Monitor</b> ..... @ \$19.95								
<b>Model #222N IAC System Monitor</b> ..... @ \$19.95								
<b>Model #222M/N (Both of the above)</b> ..... @ \$33.90								
Plus Sales Tax, Where Applicable .....								
Plus UPS Shipping & Handling (\$3.50) or C.O.D. (\$5.50) .....								
<b>Total</b> ..... \$								
Enclosed is my <input type="checkbox"/> corporate <input type="checkbox"/> personal check for \$								
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Signature _____								

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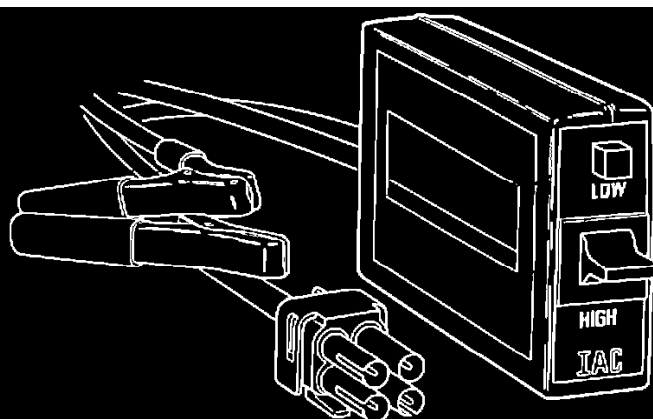
CONCEPT TECHNOLOGY, INC.

144 WIMBLETON DRIVE BIRMINGHAM, MICHIGAN 48009-9990

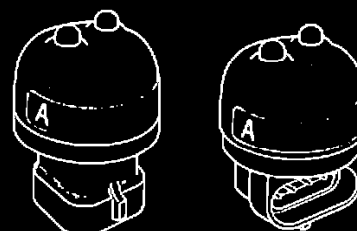
KENT-MOORE

Call Toll Free

1-800-345-2233



## IAC MOTOR TESTER



## IAC SYSTEM MONITORS

The J 37027-3 Kent-Moore Idle Air Control (IAC) System Monitors are included in the J 37027 Tester Kit but are also available separately. These monitors enable you to observe the signals from the Electronic Control Module (engine computer) to the Idle Air Control Motor which allows you to test the IAC system for correct functioning and proper response.

The Kent-Moore Idle Air Control (IAC) Motor Tester allows you to test IAC motors for correct functioning and proper response to commands for correct idle speed. In addition to testing the IAC motor, this tester can be used to set engine RPM to any desired idle speed for; cylinder balance testing, timing checks, performing the new GM injector cleaning process and adding refrigerant to the A/C system.

<b>1. Ordered By:</b>  Name _____  Street Address _____  City _____ State _____ Zip Code _____  Phone number where you can be reached during the day _____	<b>3. Payment Information:</b>  <input type="checkbox"/> C.O.D. <input type="checkbox"/> Check or Money Order Contact Kent-Moore <input type="checkbox"/> Open Account for Freight charges.      (on approved credit)												
	<input type="checkbox"/> Charge to Credit Card Below — Order Subject to Confirmation by Kent-Moore  Check One      Expiration Date _____ <input type="checkbox"/> VISA <input type="checkbox"/> MASTERCARD Enter Credit Card Number in boxes provided below <div style="text-align: center;"> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> <span style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></span> </div>												
<b>2. Ship To: (Only if different than ordered by).</b>  Name _____  Street Address _____  City _____ State _____ Zip Code _____	Authorized Credit Card Signature _____  <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p align="center"><b>THIS SPACE FOR ORDER DEPARTMENT USE ONLY</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 75%;">CUSTOMER</th> <th style="width: 12.5%;">EXEM</th> <th style="width: 12.5%;">VIA</th> <th style="width: 12.5%;">TYPE</th> </tr> </thead> <tbody> <tr> <td>CUST PO</td> <td>Y - N</td> <td>VIA</td> <td>TRANS</td> </tr> <tr> <td></td> <td></td> <td></td> <td>1 - 2</td> </tr> </tbody> </table> </div>	CUSTOMER	EXEM	VIA	TYPE	CUST PO	Y - N	VIA	TRANS				1 - 2
CUSTOMER	EXEM	VIA	TYPE										
CUST PO	Y - N	VIA	TRANS										
			1 - 2										

Quantity	Tool No.	Description	Price	Total
	J 37027	Idle Air Control Tester Kit (including J 37027-3)	\$85.00	
	J 37027-3	Idle Air Control System Monitors	\$47.95	

SIGNED \_\_\_\_\_ PER \_\_\_\_\_ DATE \_\_\_\_\_ TAX \_\_\_\_\_

TOTAL \_\_\_\_\_  
TAX \_\_\_\_\_  
TOTAL \_\_\_\_\_

GM89-171

J 37027  
IDLE AIR CONTROL (IAC) MOTOR TESTER KIT  
BUSINESS REPLY MAIL  
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ATTENTION: ORDER DEPARTMENT

Kent-Moore SPX Corporation 29784 Little Mack Roseville, MI 48066-9984  
Technical Service Bulletin # **516547**

Date: **960101**

# Oxygen Sensor Test - Revised Tech 1 Mass Storage CD

File In Section: 6E - Engine Fuel &amp; Emission

Bulletin No.: 51-65-47

Date: January, 1996

Subject:  
Revised Tech 1 Mass Storage Cartridge (MSC) Oxygen Sensor Test

### Models:

1995 and Prior Passenger Cars and Trucks

All Gasoline Carbureted, TBI, MFI, and CMFI

This bulletin is being revised to modify the text and the art. This bulletin cancels and replaces Corporate Bulletin Number 316520 (Group Reference 6E - Engine Fuel & Emission).

#### General Information

The '95/'94 MSC O2S test for passenger and truck applications is available with the July CD-ROM release of the MSC Powertrain Application software.

The '95/'94 O2S test released with the July CD-ROM provides both a heater circuit test and a rich/lean mean (average) voltage test. This test is available under the Powertrain "Misc. Tests" menu once the "Model Year," "Engine," and "Vehicle" information is entered.

The O2S heater circuit test is not supported for the following applications:

'94/'95 3.1L RPO L82, A-Car

'94/'95 3.4L RPO LQ1, W-Car

The O2S heater circuit test is modified on the following applications:

'94/'95 4.6L RPO L37, E/K-Car and K Special

'95 4.0L RPO L47, G-Car

Once the vehicle information is entered, you are asked the question "Run heater element circuit(s) test?". After answering YES, the screen "Waiting for ECT to cool down to 100° C", will appear. At this point you press ENTER and proceed with test as usual.

The '81 to '95 MSC O2S test for passenger and truck applications is available with the August CD-ROM release of the MSC Powertrain Application software.

#### Purpose

The MSC O2S test is used to verify proper heater operation on vehicles equipped with heated oxygen sensors (HO2S). The O2S test is also used to verify proper O2S voltage response during part throttle operation at a steady 2000 RPM engine speed. Refer to the applicable diagnostic procedures in the vehicle service manual should either portion of the O2S test indicate abnormal O2S performance.

#### Description

The O2S test actually consists of two individual tests: a heater circuit test and the rich/lean mean voltage test. The tests may be performed in series or individually as required.

1. Enter the vehicle specific information and then select "O2S System" under the "Misc. Tests" menu.
2. The Tech 1 displays any DTCs that are present and prompts you to press "Yes" to continue with the test. DTCs associated with either the O2S or fuel trim function should be diagnosed before continuing with the test.
3. Determine if the vehicle has a heated O2S. At the prompt "Is Vehicle Equipped with a Heated O2 Sensor?" press "Yes" or "No" as applicable. Select "Yes" at the prompt "Run Heater Element Circuit Test?" to run the heater circuit test. Non-heated sensors will appear as failures if tested.
4. At the prompt "Heater Element Circuit Test Complete," press the up arrow to display the test results. After reviewing the heater element test results, press the up arrow to display the prompt "Continue Test? Yes/No." Press "No" to exit the test or press "Yes" to continue with the mean voltage test.

A failure of the heater circuit test does not necessarily indicate a bad O2S. Check the heater voltage and ground circuits using the applicable vehicle service manual. If these circuits are OK, replace the O2S.

5. The prompt "Mean (Average) Voltage Test Set Up, Access, A/C, AIR Off" alerts you to prepare the vehicle for the rich/lean mean voltage test. Make sure that all accessories and the air conditioning are turned off. Disable the secondary air injection if so equipped.
6. At the prompt "Raise RPM to 2500" increase the engine speed to 2500 RPM and hold. The Tech 1 initiates a one minute preconditioning timer. This preconditioning phase is used to heat the sensor prior to running the rich/lean mean voltage test.

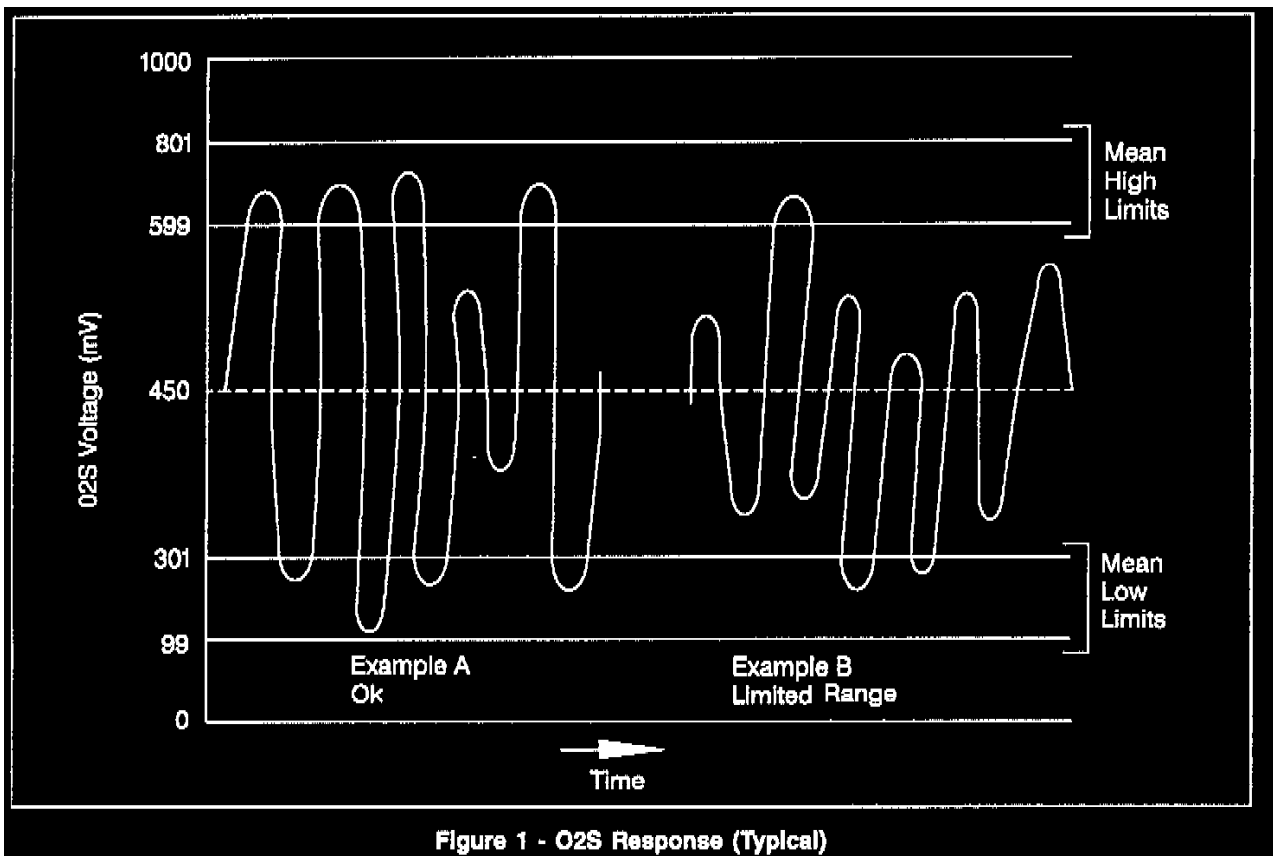
If O2S voltage did not swing a minimum of 100 mV in both directions, the prompt "O2S Voltage Did Not Toggle During Preconditioning" is displayed after the one minute preconditioning phase. Check the O2S reference and ground circuits following the procedures outlined in the applicable service manual. If the circuits are OK, replace the sensor.

7. At the prompt "Decrease and Hold at 2000 RPM," lower engine speed to 2000 RPM. When engine speed is steady at 2000 RPM (+/- 160

RPM) the Tech 1 displays the prompt "Hold at 2000 RPM, Processing Data." The Tech 1 begins capturing O2S voltage samples.

When the required number of samples are obtained, the Tech 1 displays the prompt "Test Complete." Press the up arrow to display the test results screen.

8. The Tech 1 first repeats the results of the heater element circuit test (if run). Press the up arrow to display the limits for the mean high (rich) voltage and the actual mean high voltage calculated during the test. Press the up arrow again to scroll to the next screen. The Tech 1 then displays the limits for the mean low (lean) voltage and the actual mean low voltage calculated during the test.



If both the high and low mean voltages are within the specified range, the O2S is switching through its full range indicating correct performance of the sensor, its circuitry and ECM/PCM closed loop fuel control. This is illustrated in Figure 1, Example A. Example B of Figure 1 shows an O2S waveform with a limited signal range. There are some voltage samples within the high and low mean limits but the majority of samples fail to reach either limit.

A mean high voltage below the 600 mV limit is typically a result of the following:

- ^ Carbon fouled sensor (temporary poisoning)
- ^ Resistance in the O2S circuit
- ^ Exhaust leak
- ^ Water intrusion

A mean low voltage above the 300 mV limit is typically a result of the following:

- ^ Silica or lead fouled sensor (permanent poisoning)
- ^ Poor connection or an open on the O2S signal low (ground)

## O2S Test Messages

"Low O2S Activity. See I/M Service Information and Bulletins"

This message signals that there were fewer than ten recorded O2S voltage samples on either the rich (>450 mV) side or the lean (<450 mV) side. This result does not always indicate a degraded sensor. There are some applications (for example the '88/'89 5.0/5.7L TBI truck) that command O2S voltage under 150 mV during high RPM and low load conditions like those existing during the O2S test. This is a normal response for vehicles with this particular calibration.

To determine if your vehicle has this fuel control calibration, hold engine speed at 2000 RPM while monitoring O2 voltage and short term fuel trim. If the vehicle has this calibration, the short term fuel trim will be fixed at 128 while the O2S voltage remains low (<150 mV). On some

applications, it may be necessary to perform the mean voltage test at idle. If you choose not to run the idle test, you may drive the vehicle and run the test at a steady state cruise (approximately 55 MPH).

**Caution:** Testing the vehicle at a steady state cruise will require two technicians, one to read the scan data and one to drive the vehicle.

The idle test consists of performing the mean average voltage test set up and preconditioning as prompted by the Tech 1. At the prompt "Decrease and Hold at 2000 RPM for Next Test", hold at 2000 RPM (+/- 160 RPM) long enough for data samples to start counting. When samples start, immediately drop the engine RPM to idle until the required number of samples are obtained. When the Tech 1 displays the prompt "Test Complete", press the UP arrow to display the test result screens.

"O2S Voltage Did Not Toggle During Preconditioning"

This message signals that the O2S voltage did not swing a minimum of 100 mV in both directions during the one minute preconditioning phase. Check the O2S reference and ground circuits following the procedures outlined in the applicable service manual. If the circuits are OK, replace the sensor.

There are some applications (for example the '88/'89 5.0/5.7L TBI truck) that command O2S voltage under 150 mV during high RPM and low load conditions like those existing during the O2S test. This is a normal response for vehicles with this particular calibration. On some applications, it may be necessary to perform the mean voltage test at idle. If you choose not to run the idle test, you may drive the vehicle and run the test at a steady state cruise (approximately 55 MPH).

**Caution:** Testing the vehicle at a steady state cruise will require two technicians, one to read the scan data and one to drive the vehicle.

The idle test consists of performing the mean average voltage test set up and preconditioning as prompted by the Tech 1. At the prompt "Decrease and Hold at 2000 RPM for Next Test", hold at 2000 RPM (+/- 160 RPM) long enough for data samples to start counting. When samples start, immediately drop the engine RPM to idle until the required number of samples are obtained. When the Tech 1 displays the prompt "Test Complete", press the UP arrow to display the test result screens.

"O2S Voltage Swing High Limits >9. Actual\_."

This message indicates the actual number of recorded O2S voltage samples above the 450 mV reference level. A mean high voltage is not calculated if there are fewer than ten recorded O2S voltage samples above 450 mV. This result does not always indicate a degraded sensor. Refer to the applicable vehicle service manual for information on diagnosing a lean air/fuel mixture.

"O2S Voltage Swing Low Limits >9. Actual \_."

This message indicates the actual number of recorded O2S voltage samples below the 450 mV reference level. A mean low voltage is not calculated if there are fewer than ten recorded O2S voltage samples below 450 mV. This result does not always indicate a degraded sensor. Refer to the applicable vehicle service manual for information on diagnosing a rich air/fuel mixture.

"Test Ended Coolant Too Hot 120° C"

This message signals that the engine coolant temperature is too high to run the O2S test. The test will automatically continue once ECT falls below 120° C.

"Waiting for Closed Loop to be Achieved"

This message signals that the Tech 1 is waiting for the fuel control system to enter closed loop before running the O2S test. The test will automatically continue once the system enters closed loop operation.

"Waiting for ECT to Warm Up to 85° C"

This message signals that the Tech 1 is waiting for engine coolant to reach normal operating temperature. The test will automatically continue once engine coolant reaches 85° C.

Technical Service Bulletin # **99-09-40-008**

Date: **000101**

## **Child Restraint - Auxiliary Seat Belt**

File In Section: 09 - Restraints

Bulletin No.: 99-09-40-008

Date: January, 2000

### **INFORMATION**

Subject:

Auxiliary Seat Belt for Securing Child Restraint



**Models:**

1996 and Prior Passenger Cars with Door Mounted Lap/Shoulder Belts

Accident statistics show that children are safer if they are restrained in the rear rather than the front seat. We at General Motors, therefore, recommend that child restraints (seats) be used only in the rear seat. In addition, NEVER put a REAR-FACING child restraint in the front passenger seat if the vehicle is equipped with a passenger side air bag.

In the event that it becomes necessary to use a child seat in the right front seat position, the door mounted seat and shoulder belt restraint system used in the described vehicles can be used to secure it. However, to improve stability during normal driving, GM recommends that customers use an auxiliary seat belt that is specifically designed for this purpose. The use of an auxiliary seat belt is described in detail, including several illustrations, in the vehicle Owner's Manual. For additional information, refer to the subject vehicle Owner's Manual.

**Parts Information**

To install an auxiliary seat belt, you must have the correct attaching hardware. For auxiliary seat belt and attaching hardware package part numbers and usage, see Groups 14.870, 21.041 or 21.042 of the appropriate GMSPO parts catalog.

**Warranty Information**

Auxiliary seat belts are a NO CHARGE item to all GM customers who request them for their specific vehicles.

**Technical Service Bulletin # 73-10-54**

**Date: 970501**

**Windshield - Two-Part Urethane Adhesive For Installation**

File In Section: 10 - Body

Bulletin No.: 73-10-54

Date: May, 1997

**INFORMATION**

**Subject:**

Two-Part Urethane Adhesive For Windshield Installations

**Models:**

1997 And Prior Passenger Cars and Trucks

(Using Urethane Adhesive To Retain Windshields)

General Motors passenger cars and trucks use urethane adhesive as a means to retain the windshield in the body opening. The urethane adhesive is used to bond the windshield in the opening, increasing vehicle structure.

The current recommended urethane adhesive, GM P/N 12346284, is a one-part moisture cure product that requires a minimum curing period of 6 hours at room temperature before returning the vehicle to the customer.

Increasing customer demands for faster service in recent years have resulted in quicker cure two-part urethane adhesives.

Essex Beta Seal U216\* (two-part urethane adhesive) meets the General Motors 3651M Specification (Performance Requirements for Stationary Glass Bonding Adhesive System Service) and can be used when the customer demands quicker repair of the vehicle than the current one-part materials can provide.

Either of these products can be used when glass replacement is performed. The differences between these products are as follows:

The CURRENT URETHANE ADHESIVE KIT, GM P/N 12346284, IS A ONE-PART ADHESIVE. It includes the necessary glass and pinchweld primers and is specified in Service Manuals for General Motors' vehicles. Since this is a "moisture cure" product, the curing time for this one-part material will vary with changes to either temperature or humidity. The REQUIRED TIME FOR THIS ONE-PART

MATERIAL to ensure a safe installation of stationary glass before returning the vehicle to the customer IS A MINIMUM OF SIX (6) HOURS AT 70°F (21°C) AND 30% RELATIVE HUMIDITY.

ESSEX BETA SEAL U216 IS A TWO-PART ADHESIVE MATERIAL THAT PROVIDES FOR A ONE (1) TO ONE AND ONE HALF (1 1/2) HOUR CURE BEFORE RETURNING THE VEHICLE TO THE CUSTOMER. This product also requires primers on the glass and pinchweld surfaces. This product requires a special applicator for the mixing and dispensing of the adhesive.

When using this (or any) product, make sure to follow the manufacturer's directions for application and drying times.

**Parts Information**

Parts are currently available from GMSPO.

\* We believe this source and their product to be reliable. There may be additional manufacturers of such products. General Motors does not endorse, indicate any preference for or assume any responsibility for the products from this firm or for any such products which may be available from other sources.

Technical Service Bulletin # **911268E**

Date: **901101**

## **Wiper Blades - Chattering on Windshield**

Number: 91-126-8E

Section: 8E

Date: November 1990

Corporate Bulletin No.: 031066

Subject: CHATTERING WIPER BLADES OR BLADE WIPEABILITY

Model and Year: ALL PASSENGER CARS AND TRUCKS

TO: ALL CHEVROLET DEALERS

Condition:

Chattering and poor wipeability comments may be due to the windshield glass and/or wiper blades becoming contaminated by insect residue, dirt, road grime, carwax etc.

Correction:

1. Clean the windshield glass with GM # 1050011 (Bon Ami) glass cleaner or equivalent.

Important: The glass is clean when rinse water does not "bead-up," but "sheets" across the entire glass surface. Multiple cleanings may be required to remove all contaminants.

2. Clean the wiper blades by using a cloth that has been saturated with full strength washer solution and wipe vigorously. Rinse the blades with water after cleaning.

Technical Service Bulletin # **90496B**

Date: **890801**

## **Cooling System - Reconstituted Anti-Freeze Information**

Number: 90-49-6B

Section: 6B

Date: August 1989

Corporate Bulletin No.: 930107

Subject:  
RECONSTITUTED ANTI-FREEZE

Model and Year:  
ALL MODELS, ALL MODEL YEARS

TO: ALL CHEVROLET DEALERS

This bulletin provides information on "reconstituted anti-freeze".

It has been brought to our attention that a number of manufacturers claim to have the capability of reconstituting engine coolant on site. At this time, General Motors does not endorse this practice or any equipment.

Anti-freeze recycling is a very complex issue. In use as an engine coolant, ethylene glycol becomes oxidized producing a very degraded and deteriorated substance. Contamination by other automotive fluids during draining, handling and storage is also a major detriment to the reclaiming process. There is no additive we are aware of that can be merely put into used coolant that will restore it to an acceptable state.

Typically, a multi-million dollar facility, utilizing sophisticated technology with distillation capabilities along with appropriate quality control would be required to adequately process used coolant to bring it to GM specifications.

Disposal of all chemical products should be done in accordance with all applicable federal, state and local laws and regulations.

Review engine coolant substitutes Dealer Service Bulletin No. 89-57-6B, dated January 1989.

Technical Service Bulletin # **436201B**

Date: **950401**

## **Coolant - Information on Propylene Glycol Usage**

File In Section: 6 - Engine

Bulletin No.: 43-62-01B

Date: April, 1995

Subject:  
Propylene Glycol Engine Coolant

Models:  
1994 and Prior Passenger Cars and Trucks

This bulletin is being revised to reflect most current information on propylene glycol engine coolant. Please discard Corporate Bulletin Number 436201A (Group Reference 6 - Engine).

General Motors has been reviewing data supplied on the performance of propylene glycol engine coolant in GM vehicles. It is our conclusion that propylene glycol engine coolant will perform adequately under most vehicle operating conditions. As a result, propylene glycol engine coolant (meeting performance specification GM 1825M) may be used in GM vehicles and will not affect the warranty coverage.

Prior to adding propylene glycol engine coolant to the cooling system, all the existing (ethylene glycol) coolant must be removed. This can be accomplished either by utilizing water-based coolant flushing equipment or "waterless quick change" equipment available in the GMDE program. As with any coolant change procedure, be sure to thoroughly purge the heater core and block as well as the radiator before attempting to convert the system to propylene glycol coolant.

Freeze/Boil point levels are different for propylene glycol than for ethylene glycol engine coolant. To accurately determine freeze/boil protection level, it is imperative that coolants not be mixed. Removing all the used coolant as previously discussed resolves this concern. Freeze protection of propylene glycol cannot be determined using a standard hydrometer. Rather, a refractometer or test strip must be used.

Propylene glycol engine coolants may be recycled in the same manner as conventional ethylene glycol coolant. No adverse effects will be encountered if these coolants are mixed prior to recycling, however, the ratio of propylene glycol coolant to ethylene glycol coolant should be kept low to minimize the effects on freeze point measurements.

Technical Service Bulletin # **310504**

Date: **940201**

## **Warranty - Recycled Engine Coolant Policy**

Group Ref.: Warranty Administration  
Bulletin No.: 310504  
Date: February, 1994

### **WARRANTY ADMINISTRATION**

SUBJECT:  
RECYCLED ENGINE COOLANT POLICY

MODELS:  
1994 AND PRIOR PASSENGER CARS AND TRUCKS

ATTENTION:  
WARRANTY CLAIMS ADMINISTRATOR AND SERVICE MANAGER

General Motors supports the use of recycled engine coolant for warranty repairs/service, providing a GM approved engine coolant recycling system is used. For detailed information on GM approved engine coolant recycling equipment guidelines refer to the following bulletins: Cadillac 93-1-18, GMC Truck 93-6B-34, Chevrolet 93-73-6B, Pontiac 93-6-18, Oldsmobile 1-93-43, Buick 93-6B-1 (Corporate Number 236203).

Recycled coolant will be reimbursed at the GMSPO dealer price for new coolant plus the appropriate mark-up. When coolant replacement is required during a warranty repair, it is crucial to assure that only the relative amount of engine coolant concentrate be charged, not the total diluted volume. In other words, if you are using two gallons of pre-diluted (50:50) recycled engine coolant to service a vehicle, you may request reimbursement for one gallon of Goodwrench engine coolant concentrate at the dealer price plus the appropriate warranty parts handling allowance.

Technical Service Bulletin # **91626B**

Date: **900801**

## **Coolant - Specification/Usage**

Number: 91-62-6B

Section: 6B

Date: August 1990

Corp. Bulletin No.: 066202

Subject: COOLANT USAGE

Model and Year: ALL 1988-91 PASSENGER CARS AND TRUCKS

TO: ALL CHEVROLET DEALERS

THIS INFORMATION SUPERSEDES INFORMATION PROVIDED BY GMSPO IN PARTS AND ACCESSORIES BULLETINS IB NO. 90-55 AND 90-60 AND INFORMATION PROVIDED IN VARIOUS TRUCK SERVICE AND OWNERS MANUALS AND SHOULD BE USED TO DETERMINE CORRECT COOLANT USAGE IN LIGHT AND MEDIUM DUTY TRUCK APPLICATIONS.

GM coolant specification 6038-M or 1899-M (P/N 1052103) is for use in all light duty trucks with gasoline or diesel engines. This coolant features a low silicate formulation and is intended only for use in engines that have cylinder heads and cylinder blocks made of cast iron.

GM coolant specification 1825-M or 6043-M (P/N 1052753) which until recently has been the recommended coolant for light duty trucks has been superseded by GM coolant 6038-M or 1899-M (P/N 1052103) in cast iron truck engines. GM coolant specification 1825-M has a higher silicate formulation which is recommended for all passenger car engines with cylinder heads or cylinder blocks made of aluminum.

Technical Service Bulletin # **912356B**

Date: **910301**

## **Cooling System - Use of Recycled Engine Coolant**

Number: 91-235-6B

Section: 6B

Date: MARCH 1991

Corporate Bulletin No.: 116201

Subject:

USE OF RECYCLED ENGINE COOLANT

Model and Year:

ALL PASSENGER CARS AND TRUCKS

With the current emphasis on environmental issues and disposal of waste, significant attention is being given to the recycling of engine coolant. Many coolant recycling systems are being aggressively marketed today, ranging from very complex distillation (stationary) to straightforward filtration (mobile).

As stated in previous service bulletins, General Motors does not endorse the use of recycled engine coolants in our products at this point in time. Recycling engine coolant is a very complex procedure and consequently will require a significant amount of research to determine which of the many processes is acceptable by General Motors. While we understand the growing concern being placed on (spent) engine coolant disposal, it is imperative that the quality of engine coolants being used in General Motors vehicles is not affected in any way.

General Motors is addressing the issue of recycled engine coolants for the combined benefit of our dealers, vehicle owners, and the environment. Over the next several months General Motors will conduct an experiment designed to evaluate both distillation and "on-site" recycling processes. The results of this experiment will be provided to all dealers (spring, 1991) and will outline which process(es) is acceptable to General Motors. It is essential that recycled engine coolant not be used in any General Motors products as communicated in previous bulletins.

Technical Service Bulletin # **91090A**

Date: **900401**

## **Coolant - Used Anti-Freeze Policy**

Number: 91-09-0A

Section: OA

Date: April 1990

Corporate Bulletin No.: 976202

Subject: INFORMATION REGARDING RECONSTITUTED ANTI-FREEZE COOLANT TESTING AND THE USE OF A REFRACTOMETER

Model and Year: ALL MODELS AND YEARS  
TO: ALL CHEVROLET DEALERS

## RECONSTITUTED ANTIFREEZE

At present, three types of recycling systems are available:

- 1) chemical addition to coolant;
- 2) filtration and addition of supplemental additives; and
- 3) separation of pure glycol from used coolant and reinhibition.

### 1) Chemical Addition-NOT RECOMMENDED

With chemical addition, chemicals are added to the used engine coolant in an attempt to "clean up" the coolant. This system is the easiest since the only work involved is the addition of chemicals to the radiator. Most of these types of recycling systems use a strong acid to change precipitated corrosion products into a more soluble form. However, in addition to dissolving the corrosion products, the strong acid also attacks and corrodes the metals of the cooling system.

### 2) Filtration and Addition of Supplemental Additives-NOT RECOMMENDED

In this type of system, the used coolant is either taken out of the vehicle or a flush-type unit is connected to the cooling system.

The current technology consists simply of filtration and reinhibition of the spent coolant. While this does remove suspended solids, filtration does nothing to remove harmful degradation and corrosion products that are soluble in glycol solution. The reinhibition step used in current recycling systems may fail to produce a coolant which adequately protects all metals including aluminum in the most critical heat transfer applications, such as occurs in the cylinder heads and blocks.

- 3) Separation of Pure Glycol and InhibitionThe separation of pure glycol and the addition of fresh inhibitors is the ideal method for recycling coolants. Unfortunately, this method is expensive from both a collection standpoint and the technology available to economically extract pure ethylene glycol from used coolant.

At this time, General Motors does not endorse these practices or equipment.

Due to a worldwide shortage of ethylene glycol in 1988, some coolant manufacturers have started to mix other types of glycol in their coolant formulations; propylene glycol is the most common new ingredient. A hydrometer will not provide a correct measurement of freeze protection when anything other than ethylene glycol and water is being tested. The degree of inaccuracy will vary depending on the proportion of other glycols present in the coolant.

Hydrometers test the amount of glycol in a mixture by measuring the specific gravity of the mixture; the more ethylene glycol, the higher the float balls go, and the better the freeze protection. Because ethylene glycol and propylene glycol do not have the same specific gravities, hydrometer readings of mixtures containing propylene glycol give incorrect values.

As the shortage of ethylene glycol continues and/or worsens, more and more variations in antifreeze formulas will be marketed. It is, therefore, recommended that you purchase a "refractometer" and encourage your technicians to use it. Refractometers test for the amount of glycol in a coolant mixture by measuring the speed of light as it passes through the fluid and are not affected by the specific gravity of the glycol. The freeze protection of solutions of ethylene glycol in water, solutions of propylene glycol in water, and solutions of mixtures of propylene glycol and ethylene glycol in water may all be tested with sufficient accuracy using a refractometer.

The following refractometers are available from Kent Moore:

J 23688	Fahrenheit scale, measures to -50 F
J 26568	Centigrade scale, measures to -45.5 C
J 38633	Fahrenheit scale, measures to -84 F (For extreme cold weather regions)

The toll free number for Kent Moore is 1-800-345-2233.

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Technical Service Bulletin # **884057A**

Date: **890401**

## A/T - Gear Whine At Highway Speeds

Number: 88-405-7A

Section: 7A

Date: APRIL, 1989

Subject: AUTOMATIC TRANSMISSION GEAR WHINE AT HIGHWAY SPEEDS

Model and Year: 1985-88 "M" CARS  
TO: ALL CHEVROLET DEALERS

Some of the subject vehicles may exhibit a gear noise condition which can be recognized as a medium-high pitch whine at highway speeds (commonly 45-55 mph.), the volume of the noise changes as the accelerator is depressed or released and load is applied or reduced at the mating gears.

Changes have been made to the manufacturing process to provide quieter running output gears. Vehicles beginning with the following VINs incorporate these revised parts:

2 Door JG1MR215XJK771366 4 Door JG1MR6154JK771368

Vehicles produced prior to the above VINs should be serviced using P/N 96061778 - shaftset, output; during installation, the ring, output shaft seal - P/N 96053887 should also be replaced, both of these parts are available from GMSPO.

Removal and installation of the components can be carried out following Service Manual procedures.

Labor Operation Number: K7610  
Labor Time : 5.8 Hours

Technical Service Bulletin # **01-07-30-029**

Date: **011001**

## **A/T - Core Return Product Feedback Form**

File In Section: 07 - Transmission/Transaxle

Bulletin No.: 01-07-30-029

Date: October, 2001

### **INFORMATION**

Subject:  
New Product Feedback Form and Process For Automatic Transmission Core Returns

Models:  
1980-2002 All Passenger Cars and Trucks  
With All Original Equipment and Goodwrench Automatic Transmissions  
(AC Delco Transmissions Are Not Included)

Quality improvement is a goal of General Motors, and as part of the ongoing quality improvement assessment efforts for automatic transmissions, General Motors is implementing a new product feedback process. The new feedback process was developed after consulting with dealership technicians and service managers, the General Motors Technical Assistance Center, and General Motors Regional Field Engineers.

The new process is being implemented in an effort to improve the quality and quantity of the feedback data. Accurate feedback from the technicians will allow General Motors to accurately inspect and diagnose automatic transmission field returns. The new process utilizes four elements:

- ^ A new and easier-to-complete feedback form. The (US) 2001 Service Policies and Procedures Manual requires completion of this feedback form in Article 1.6, page 10 and Article 1.7, page 2.
- ^ The new feedback form has English, French, and Spanish versions all printed on a single form. The service technician should complete the form in the language of choice, fold/tear it in thirds, and INSERT IT IN THE SEE-THROUGH ENVELOPE, SO THAT THE COMPLETED FEEDBACK INFORMATION CAN BE READ THROUGH THE RETURN ENVELOPE. The dealer copy of the feedback form is to be maintained with the dealer's copy of the repair order. [Refer to the Service Policies and Procedures Manual. Article 1.6, page 10, (US)].
- ^ A new see-through return envelope to hold the feedback form when the transmission is returned to the warehouse.  
  
The see-through return envelope will be attached to the side of the top half of the transmission shipping container at either of the small ends.
- ^ Auditing of/for completed feedback forms will be done during core receiving in Detroit, Michigan. GMSPO core return Code T98 will read "TRANS FEEDBACK FORM NOT REC'D WITH CORE." The T98 zero dollar (\$0) debit notice will be sent by GMSPO each time an OEM or Goodwrench automatic transmission core is received without a completed product feedback form visible in the see-through envelope.

If the dealer should receive a Goodwrench automatic transmission without the see-through envelope attached, use one of the three new feedback forms and envelopes being sent to each dealer with this bulletin.

If additional forms are needed contact:

In the U.S.A.

- GM Dealer World Delivery
- Phone at 1-866-700-0001, Fax 1-313-957-5555 or E-mail to DWD\_orders@Buddco.com
- For the form P/N 24221234 and/or envelopes, P/N 2XJ 19572 In Canada
- DGN Marketing Services LTD.
- Phone 800-668-5539 or Fax 905-670-5777
- For form DGN P/N 150-0-0-532 and/or envelopes, P/N DGN 150-0-0-533

**Important:**

The see-through envelope should be attached to the sides of the top half of the transmission shipping container at either of the small ends. **DO NOT PUT THE ENVELOPE ON THE TOP SURFACE OF THE SHIPPING CONTAINER BECAUSE IT CANNOT BE READ WHEN THE TRANSMISSIONS ARE STACKED IN THE WAREHOUSE OR THE RETURN FORM MAY BECOME DAMAGED/LOST IN THE SHIPPING PROCESS.**

Dealership Process of the Feedback Form For New Vehicle, Goodwrench Parts Warranty, Customer Pay and Over-The-Counter Sales.

For New Vehicle warranty claims, Goodwrench Parts Warranty or Customer Pay repairs, perform the following:

1. Remove the new feedback form from the information packet shipped with the replacement transmission.
2. Complete all the fields in the top third of form and check the appropriate boxes.
3. **INSERT THE ORIGINAL COPY OF THE FORM IN THE SEE-THROUGH ENVELOPE SO THAT THE INFORMATION ON THE COMPLETED FORM IS VISIBLE.**
4. Attach the dealer copy of the feedback form to the dealer repair order hard copy.
5. Return the transmission core to the parts department for return to GM.

For Over-the-Counter Sales, include the following:

- ^ The Dealer Code
- ^ The Dealer Phone Number
- ^ Print the letters "OTC" on the form in large letters (to indicate "over the counter sale").

These new feedback forms are critical to General Motors goal of producing the most reliable and durable transmissions for General Motors cars and trucks. With properly completed forms, General Motors can quickly identify and correct the manufacturing defects, thereby providing the highest quality automatic transmissions for you and your customers.

The General Motors Labor Time Guide includes time allowance for completing the feedback form in the base time for K7000. **Technical Service Bulletin # ATRASIL8915** **Date: 890401**

## **A/T - Cycling Between 2-3 When Speed Levels Off**

SIL 89-15 (Apr)

SUBJECT: SPRINT SERIES

**PROBLEM:**

After the first upshift pattern, continuous cycling occurs between second and third gear when speed levels off.

**CAUSE:**

Figure 1

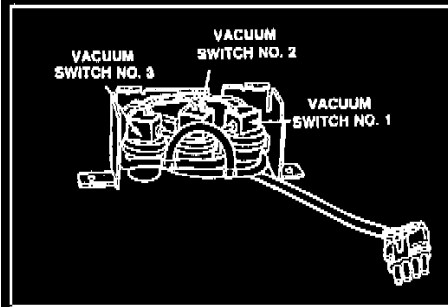


Figure 2

Vacuum (Inches, Hg)	Vacuum Switch		
	No. 1	No. 2	No. 3
More Than 11.8	X	X	X
11.8 - 8.7	○	X	X
8.7 - 3.5	○	○	X
Less Than 3.5	○	○	○
○: Switch "Energized"    X: Switch "Deenergized"			

There are three vacuum controlled switches which are housed in a metal box mounted on the firewall. Manifold vacuum closes the contacts of each switch at given vacuum ranges (See Figure 1). The vacuum switches control the off/on sequence of the shift solenoid (See Figure 2).

#### SOLUTION:

Remove housing cover. If transmission then functions correctly, look for crimped vacuum line inside housing.

Technical Service Bulletin # **ATRATB010**

Date: **900901**

## A/T - Torque Converter Identification

TRANSMISSION: GM

BULLETIN: # 010 REVISED

SUBJECT: Torque Converters

DATE: September 1990

GM Torque Converter I.D.

See the accompanying sections for identification of the 298 mm and 245 mm torque converters.

For Additional Information:

TRANSMISSION DIGEST

April '90 "Technically Speaking"

BULLETIN RECAP

^ The first digit  
= Application

^ The second digit  
= "K" factor; on 298 mm T/C's  
K x 14.2574 = STALL  
On 245 mm T/C's  
K x 11.6438 = STALL.

^ The third digit  
= clutch type

^ The fourth digit



= Cover type

## 298 mm Identification

### 298 mm IDENTIFICATION

GM - Torque Converter Identification is easy once you know what the I.D. codes mean. Although each digit of the four digit code has its own meaning, the value of each code letter or number is different for 298 mm and 245 mm torque converters.

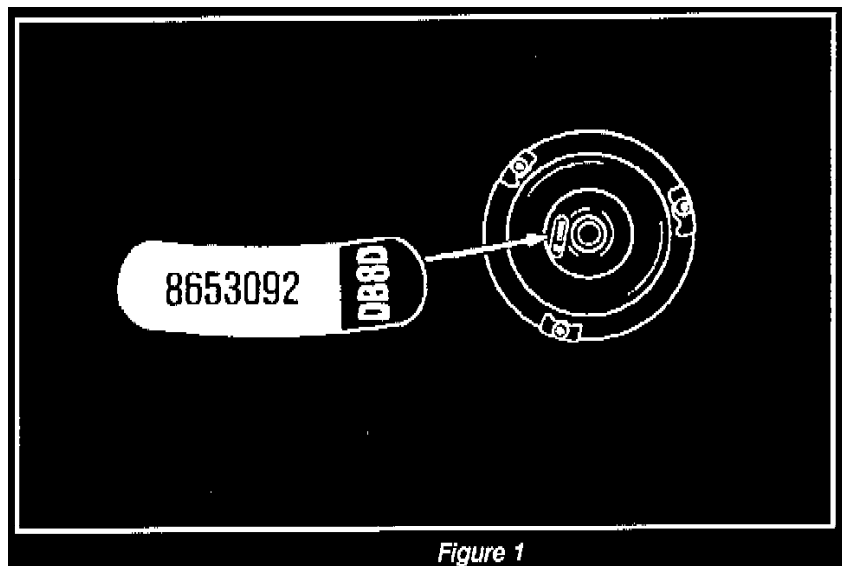


Figure 1

Look at the I.D. code in figure 1. The torque converter in figure 1 is 298 mm in dia. The first digit refers to the application. See figure 2.

B = 250 and 350 Transmissions

C = 200/200-4R 325-4L Transmissions & Pre 1985 700-R4

D = 1985 and later 700-R4 transmissions with the 30 spline input shaft

The second digit refers to the "K" factor. The "K" factor is an engineering term that means the speed of one member divided by the square root of the torque on the same member. This is calculated at stall conditions. On a 298 mm torque you can multiply the "K" factor by 14.2574 to get the stall speed. Use the chart for a quick reference.

#### "K" FACTOR STALL

A = 142 = 2024

B = 140 = 1996

C = 135 = 1925

D = 130 = 1853

E = 115 = 1639

F = 110 = 1568

G = 100 = 1425

H = 97 = 1383

J = 89 = 1269

K = 85 = 1211

<b>0</b>	<b>=</b>	<b>No Clutch</b>	
<b>1</b>	<b>=</b>	<b>300 ft/lb 43 degrees travel</b>	
<b>2</b>	<b>=</b>	<b>240 ft/lb 46 degrees travel</b>	
<b>3</b>	<b>=</b>	<b>290 ft/lb 44 degrees travel</b>	Poppet Valve
<b>4</b>	<b>=</b>	<b>160 ft/lb 37 degrees travel</b>	
<b>5</b>	<b>=</b>	<b>220 ft/lb 35 degrees travel</b>	
<b>6</b>	<b>=</b>	<b>195 ft/lb 42 degrees travel</b>	
<b>7</b>	<b>=</b>	<b>195 ft/lb 30 degrees travel</b>	Poppet Valve
<b>8</b>	<b>=</b>	<b>300 ft/lb 44 degrees travel</b>	
<b>9</b>	<b>=</b>	<b>290 ft/lb 44 degrees travel</b>	*Static Open Poppet Valve
<b>A</b>	<b>=</b>	<b>300 ft/lb 29 degrees travel</b>	
<b>B</b>	<b>=</b>	<b>300 ft/lb 44 degrees travel</b>	
<b>C</b>	<b>=</b>	<b>330 ft/lb 28 degrees travel</b>	

Figure 4

\* A static open poppet valve is normally open and closes during acceleration.

The third digit refers to the clutch type, capacity & travel in degrees.

<b>"A"</b>	<b>=</b>	<b>Open cover (No converter clutch), 3 lugs with one weld per lug. (Gas)</b>
<b>"B"</b>	<b>=</b>	<b>Open cover (no converter clutch), 3 lugs with three welds per lug. (Diesel)</b>
<b>"C"</b>	<b>=</b>	<b>Converter clutch type, 3 lugs with one weld per lug. (Gas)</b>
<b>"D"</b>	<b>=</b>	<b>converter clutch type, 3 lugs with 180 degree weld on each lug. (Diesel)</b>
<b>"E"</b>	<b>=</b>	<b>Converter clutch type, 6 lugs with 180 degree weld on each lug. (Diesel)</b>
<b>"F"</b>	<b>=</b>	<b>Converter clutch type, 3 lugs, 245 mm style lug.</b>

The fourth Digit (optional) refers to the cover style, the number of mounting lugs & the method of welding the lugs.

Look at the I.D. tag on the torque converter in figure 1. It's easy to see that it fits a late 700-R4 with the large input shaft (the first digit is a "D"). It has a 1996 stall speed (the second digit is a "B")

It has a damper assembly rated at 300 ft/lb. of torque and can twist 44 degrees (the third digit is an 8). Finally it has three lugs with 180 degree welds on each lug and belongs in a diesel (the fourth digit is a "D").

## 245 mm Identification

245 mm IDENTIFICATION

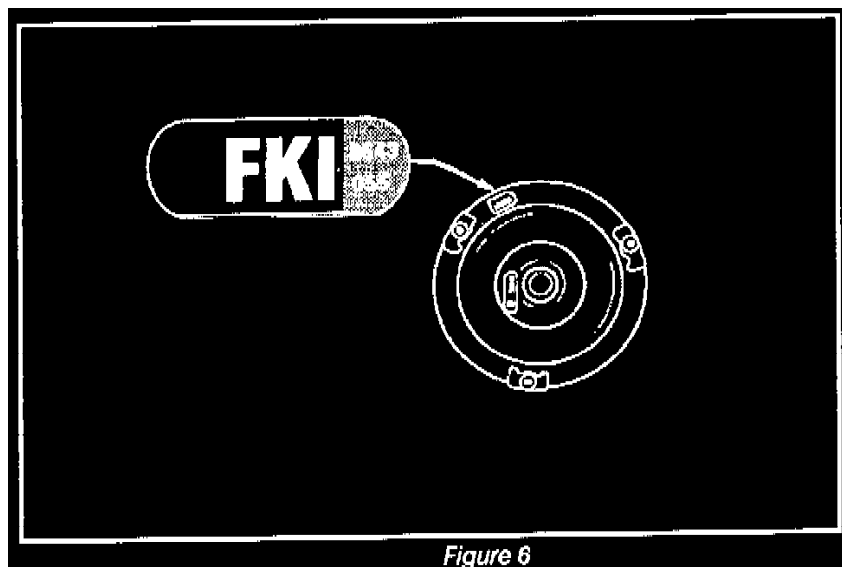


Figure 6

The 245 mm dia torque converter I.D. code works the same way as the 298 mm converters, but with different meanings.

The first digit of a 245 mm converter refers to the application.

F = Front wheel drive  
H = Rear wheel drive (except THM 180's)  
S = THM 180

The second digit is the "K" factor. The chart shows the "K" factor for each code along with the stall speed. **Note:** The "K" factor on a 245 mm torque converter is multiplied by 11.6438 to get the stall speed.

CODE	"K" FACTOR	STALL SPEED
A =	240	-2795
B =	220	-2560
C =	205	-2385
D =	180	-2095
E =	160	-1860
F =	148	-1720
G =	140	-1630
H =	130	-1514
J =	177	-2061
K =	237	-2760
L =	163	-1897
M =	131	-1525
N =	218	-2538
Y =	122	-1420
Z =	203	-2363

The third digit refers to the clutch type.

CODE	DAMPER TYPE
0 =	No converter clutch
1 =	120 ft/lb
2 =	104 ft/lb
3 =	170 ft/lb
4 =	215 ft/lb Heavy Duty
5 =	215 ft/lb *RTC
6 =	170 ft/lb Heavy Duty
7 =	215 ft/lb *RTC Heavy Duty
8 =	Viscous Clutch
9 =	240 ft/lb
A =	215 ft/lb
B =	215 ft/lb *RTC

\* RTC = Reverse Torque Control (poppet valve)

The fourth digit (optional) refers to the type of cover used.

CODE	COVER TYPE (APPLICATION)
A =	FWD 208.2 mm Bolt Circle
B =	FWD 237.0 mm Bolt Circle
C =	FWD 237.0 mm Bolt Circle (viscous Clutch)
D =	RWD 247.65 mm Bolt Circle
E =	RWD 237.0 mm Bolt Circle, No Converter Clutch *
F =	RWD 237.0 mm Bolt Circle *
G =	RWD 247.65 mm Bolt Circle *
H =	RWD 247.65 mm Bolt Circle, No Converter Clutch *
K =	RWD 237.0 mm Bolt Circle, No Converter Clutch *
P =	THM 180 ISUZU
R =	THM 180 Opel
S =	THM 180 BMW

\* 180 degree weld on each lug

Look at the code on the torque converter in figure 6 page 5. You can easily identify it as a front wheel drive model. (The first code is an "F"). The stall speed is 2760 (the second code is a "K"), and it has a damper assembly rated at 120 ft/lb's (the third code is a "1". Notice that the fourth code

has been omitted.

Technical Service Bulletin # **ATRATB023**

Date: **900901**

## **A/T - Computer Diagnosis**

TRANSMISSION: Sprint

BULLETIN: # 023

SUBJECT: Computer Diagnosis

DATE: September 1990

### **ELECTRICAL DIAGNOSIS OF THE CHEVY SPRINT**

The Chevy Sprint and Geo Metro are computer shifted transaxles. The basic operation of the system is similar to other computer shifted transmissions.

The most common calls we receive are on diagnosing a no upshift condition or wrong gear starts. The first procedure to follow when the transaxle will not shift properly, is to disconnect the solenoid wires. The transaxle now should act as if it has a manual valve body. "D" range will be third gear, "2" range will be second and "L" range will be first.

Perform a road test to see if the transaxle will manually upshift with the wires disconnected. If the transaxle will not upshift, check the valve body. You could have stuck shift valves or defective solenoids. If the transaxle operates manually with the wires off, but not with the solenoids connected, you probably have a defective electronic control system.

### **FOR ADDITIONAL INFORMATION**

Trans Digest:

August 90 June 69

ATRA: TSB 87-60

### **BULLETIN RECAP**

- ^ Unplug the wires and manually shift the transaxle.
- ^ Bypass the computer by providing your own signals with two 12 volt wires.
- ^ Check the various switches with a volt-ohm-meter.

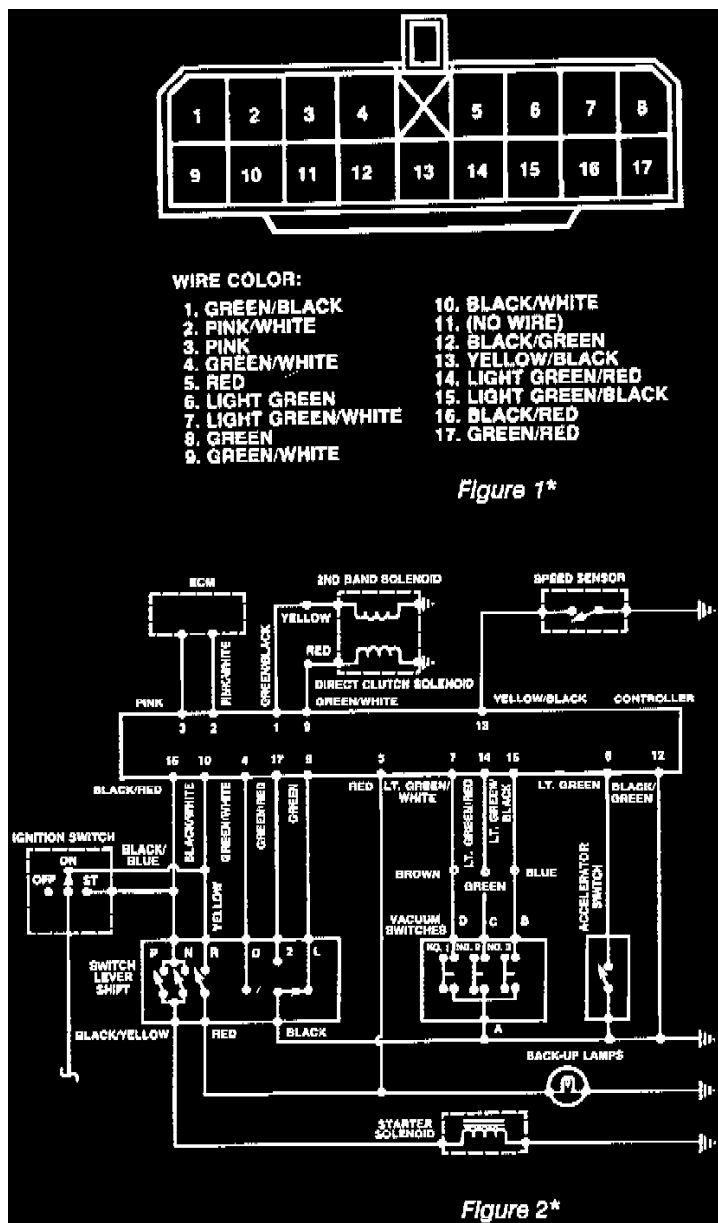
## **Shift the Transaxle**

### **SHIFT THE TRANSAXLE**

Before diagnosing the control system, you should perform one more check on the transaxle itself. You are going to shift the transaxle by providing the electrical signals that should have come from the control system. To do this, run two 12 volts leads from the battery to the transaxle. Disconnect the solenoid wires from the transaxle and connect your 12 volt leads in their place. Originally the transaxle had 1 red wire for the direct clutch solenoid and 1 yellow wire for the 2nd gear solenoid. With both 12 volt leads attached you should be in first gear. Accelerate on the lift and remove the wire to the 2nd gear solenoid. The transaxle should upshift to 2nd. Now remove the wire to the direct clutch solenoid and you should shift to 3rd. If this checks good, then your problem is probably external to the transmission. You now need to check the electronic control system.

## **Diagnose the Control System**

### **DIAGNOSE THE CONTROL SYSTEM**



To diagnose the control system, unplug the controller connector and test with an ohmmeter. Figure 1 shows the terminal numbers and wire colors of the controller connector as viewed from the wire harness side.

Figure 2 shows the wiring diagram for the electronic control system. For each check, bring the ohmmeter probes in contact with the terminals on the wire harness side of the controller connector.

CONNECT TO TERMINAL	READING IN P & N	READING IN D	READING IN 2	READING IN L	READING IN R
4	-	Continuity	Open	Open	-
17	-	Open	Continuity	Open	-
8	-	Open	Open	Continuity	-
16	Continuity	-	-	-	-
5*	0 Volts	0 Volts	0 Volts	0 Volts	12 Volts

\* Multimeter on volts scale, ignition key on. **CAUTION:** Before reading resistance (ohms  $\Omega$ ) in any circuit make sure there is no current (voltage) present to prevent damage to your multimeter.

The first check procedure is for the shift lever switch. Connect one probe of your ohmmeter to terminal 12 while is simply a ground. Leave this probe on terminal 12 for all the following tests. You will move the other probe to various terminals to perform the tests.

## Speed Sensor

### SPEED SENSOR

To perform the speed sensor check, leave one lead of your ohmmeter on pin 12 and connect the other lead to pin 13. Raise the front wheels and turn them by hand. The ohmmeter should alternate between zero and infinity.

## Accelerator Switch & Vacuum Switches

### ACCELERATOR SWITCH & VACUUM SWITCHES

Place one lead of your ohmmeter on pin 12. Start the engine and place the other lead of your ohmmeter to pin 7 then 14 and then 15. In each case you should show an open circuit. If you have continuity, the vacuum switches are defective. Now probe pin 6, it should also be open, if not the accelerator switch may be defective.

Do the checks again during a stall test. With the brake firmly applied and the selector in "D" range FULLY depress the accelerator. Pins 6, 7, 14 and 15 should now all have continuity. Pins 7,14, and 15 are for the vacuum switches and pin 6 is for the accelerator switch.

If ALL the tests have passed to this point, then the controller may be defective. Using these procedures should get you to the cause of the problem in the quickest manner. You will find that diagnosing the Chevy Sprint is actually a simple procedure.

Technical Service Bulletin # **ATRATB028**

Date: **901001**

## A/T - Engine Vacuum Testing

BULLETIN: # 028

DATE: October 1990

SUBJECT: Engine Testing With A Vacuum Gauge

TRANSMISSION: All

Engine Testing With A Vacuum Gauge

### ENGINE/TRANSMISSION RELATIONS

An important part of transmission diagnosis is to make certain the engine operates properly. If the engine performance is incorrect, the transmission will receive the wrong information.

The engine sends signals to the transmission through a vacuum line, throttle cable or both. These signals basically synchronize torque with transmission line pressure, shift feel and shift timing.

Malfunctions in items like the air filter, spark plugs, EGR valves and other parts of the fuel, electrical and emission systems could result in improper transmission performance.

### VACUUM GAUGE ENGINE PERFORMANCE TESTING

A vacuum gauge shows the difference between outside atmospheric pressure and the amount of vacuum present in the intake manifold.

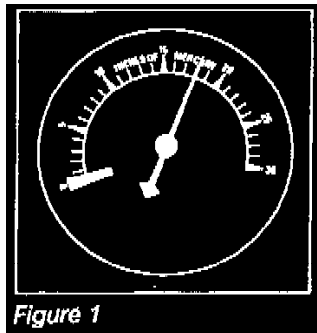
The pistons in the engine serve as suction pumps and the amount of vacuum they create is affected by the related actions of:

- ^ Piston rings
- ^ Valves
- ^ Ignition system
- ^ Fuel control system
- ^ Other parts affecting the combustion process (emission devices, etc.).

Each has a characteristic effect on vacuum and you judge their performance by watching variations from normal.

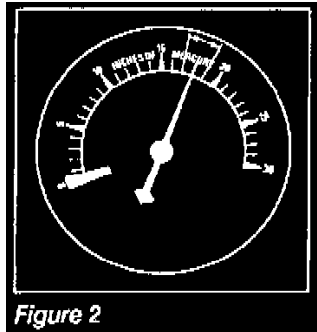
It is important to judge engine performance by the general location and action of the needle on a vacuum gauge, rather than just by a vacuum reading. Gauge readings which may be found are as follows:

### NORMAL ENGINE OPERATION



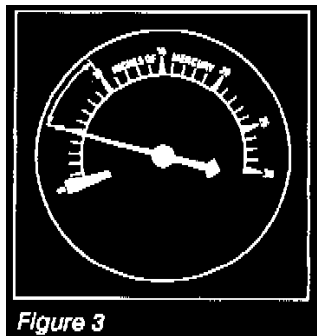
At idling speed, an engine at sea level should show a steady vacuum reading between 14" and 22" HG. A quick opening and closing of the throttle should cause vacuum to drop below 5" then rebound to 23" or more. See figure 1.

#### GENERAL IGNITION TROUBLES OR STICKING VALVES



With the engine idling, continued fluctuation of 1 to 2 inches may indicate an ignition problem. Check the spark plugs, spark plug gap, primary ignition circuit, high tension cables, distributor cap or ignition coil. Fluctuations of 3 to 4 inches may be sticking valves. See figure 2.

#### INTAKE SYSTEM LEAKAGE, VALVE TIMING, OR LOW COMPRESSION



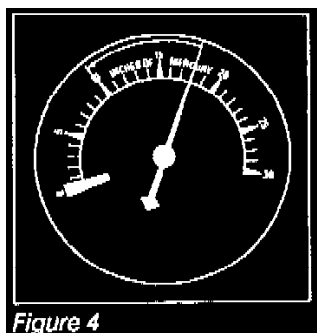
A vacuum reading at idle much lower than normal can indicate leakage through intake manifold gaskets, manifold-to-carburetor gaskets, vacuum brakes or the vacuum modulator. Low readings could also be very late valve timing or worn piston rings. See figure 3.

#### EXHAUST BACK PRESSURE

Starting with the engine at idle, slowly increase engine speed to 3000 RPM, engine vacuum should be equal to or higher than idle vacuum at 3000 RPM.

If vacuum decreases at higher engine RPM's, an excessive exhaust back pressure is probably present.

#### CYLINDER HEAD GASKET LEAKAGE



With the engine Idling, the vacuum gauge pointer will drop sharply, every time the leak occurs. The drop will be from the steady reading shown by the pointer to a reading of 10" to 12" Hg or less. If the leak is between two cylinders, the drop will be much greater. You can determine the location of the leak by compression tests. See figure 4.

FUEL CONTROL SYSTEM TROUBLES

All other systems in an engine must be functioning properly before you check the fuel control system as a cause for poor engine performance. If the pointer has a slow floating motion of 4 to 5 inches - you should check the fuel control.

BULLETIN RECAP

- ^ Engine problems can affect transmission performance.
- ^ If you suspect an engine problem, connect a vacuum gauge to the intake manifold.
- ^ Note the location and action of the vacuum gauge needle.
- ^ Use the information in the bulletin to determine the engine problem.
- ^ Correct the engine problem before doing extensive calibration work on the transmission.

Technical Service Bulletin # **ATRATB078**

Date: **911101**

**A/T - How To Use A Pressure Gauge**

BULLETIN : # 078

SUBJECT: Pressure Gauge

APPLICATION: Misc.

DATE: November 1991

HOW TO USE A PRESSURE GAUGE

A significant number of calls we receive involve improper pressures, so we need to use a pressure gauge when diagnosing problems.

Using a pressure gauge can seem like a formidable task. The reason most people do not use a pressure gauge is because they do not see the value in using one. Technicians do not see the value because the gauge readings do not tell them how to fix the problem. This article will attempt to show the technician how to interpret pressure gauge readings so the technician can find the fix to the problem.

	SLOW IDLE	FAST IDLE	WOT
P			X
R			X
N			
D			
3			
2			
1			

*Figure 1*

It is best to start pressure tests with mainline pressure. Mainline pressure should be checked in each range: P, R, N, D, 3, 2, 1. Each range, except Park and Neutral, should be checked under three conditions: Slow idle, fast idle, and wide open throttle. A form, as in figure 1 should be made to record the readings.

If all pressures are within specification at slow idle then the pump and pressure regulator are functioning properly.

If all pressures are low at slow idle, it indicates a potential problem in the pump, pressure regulator, filter, low fluid, or internal leakage. To help verify where the problem is, check pressures at fast idle. If all the pressures now read normally, it usually indicates a worn pump but the problem could still be internal leaks.

Internal leaks will usually show up in a particular range. For example a forward clutch leak would have normal pressure in Park, Reverse and Neutral but have low pressure in all forward ranges. A direct clutch leak will show a pressure drop when the transmission shifts to third and low pressure in reverse because in most cases, the direct clutch is on in third and reverse.



A restricted filter will usually show up as a gradual pressure drop at higher engine RPM because the filter cannot pass as much fluid as the pump is trying to draw.

A stuck pressure regulator valve will show up as fixed line pressure which means the same pressure all the time. The pressure may vary with engine RPM which means low pressure at slow RPM and higher pressure at higher RPM. There will be no boost in pressure from the TV or modulator system and no reverse boost.

If pressures are high at slow idle it indicates a pressure regulator or throttle pressure problem. On most cars, the modulator controls throttle pressure. If the transmission has a throttle pressure tap, it will tell you if the throttle pressure circuit is the problem. On GM units without a throttle pressure tap, remove the TV plunger. If line pressure is now normal then it's a TV problem, if not it's a pressure regulator problem.

Pressures also need to be checked at stall or wide open throttle (WOT). When doing a stall test, always observe safety precautions such as checking for broken mounts or bad brakes. Testing should always be done under operating conditions. To do a stall test, put the selector in the range to be tested and with one foot firmly on the brake, press the accelerator to the floor then note your pressure reading. Some technicians will pull the vacuum line off or pull the TV cable with the engine at fast idle. That is not operating conditions and will not detect a problem of trapped vacuum or a cable problem.

If all pressure at stall are low, then you should pull the TV cable to maximum or disconnect the vacuum line. If the pressures are now OK, the problem is in the cable or vacuum system. If the pressures are still low, then the problem is in the pump or control system.

If all pressures at stall are high, then look at the idle pressures. If the idle pressures are also high then this could be a pressure regulator or throttle system problem. If idle pressures are normal then the problem is in just the throttle system.

The reverse stall test is also a maximum pump output test. If you suspect a weak pump then this test will help find it. Often this will show up as low pressure at reverse stall but all other pressures including idle will be normal. If a person wanted to become really proficient with a pressure gauge they should first put a pressure gauge on their own vehicle and leave it there for exactly one week. Every time they drive the car they should watch the gauge. After one week, they should then put the pressure gauge on every single car in the shop that DOES NOT have a problem. Don't use the gauge on cars WITH problems yet. After 30 days of using a gauge on units that work properly, they can then start using the gauge on units with problems. The technician is accustomed to normal readings, abnormal readings will stand out like a sore thumb.

To fix today's transmissions, every professional technician must be proficient in the use of a pressure gauge. The only way to gain this proficiency is to use the pressure gauge daily. Practice makes perfect.

Technical Service Bulletin # **ATRATB294**

Date: **950101**

## **A/T - Drive Axle and Wheel Lug Nut Torque Specifications**

TECHNICAL BULLETIN # 294

DATE: 1995

TRANSMISSION: General

SUBJECT: Drive Axle and Wheel Lug Nut Torque

APPLICATION: Service information

### **AXLE AND LUG NUT SERVICE INFORMATION**

It is critical to tighten the axle and lug nuts to factory specifications.

#### **Important:**

The following charts contain both DRIVE AXLE NUT and WHEEL LUG NUT tightening values. Make certain the correct tightening torque is used by referring to the chart headings.

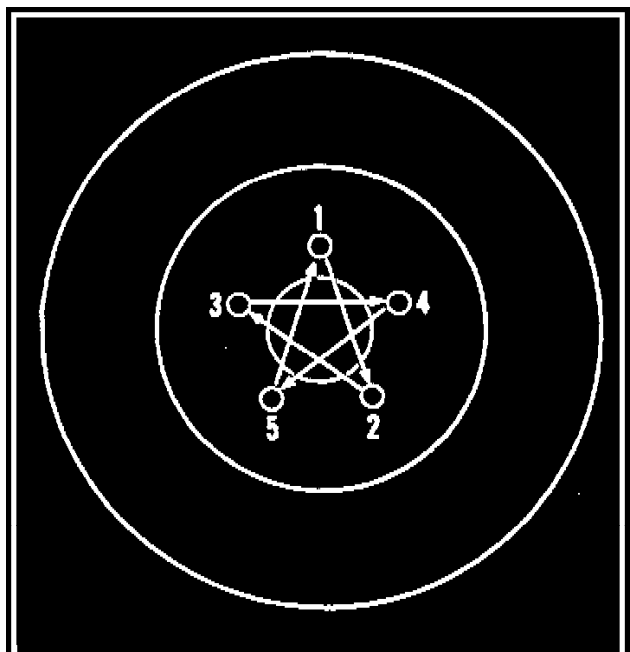
#### **WARNING**

If the factory tightening specifications are not followed, bearing life will be shortened or mechanical loads will not be spread evenly.

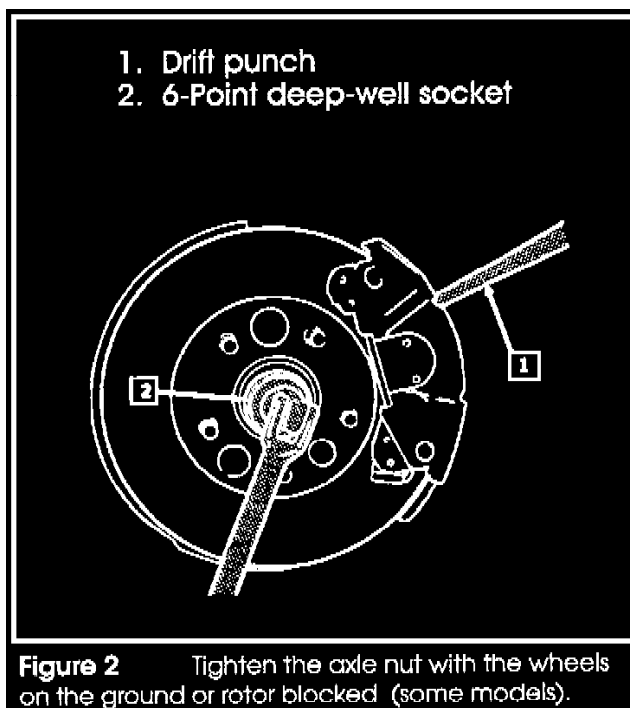
^ Install axle(s) and wheel(s).

^ Install nuts and hand tighten.

^ Lower vehicle until wheels begin to touch the ground.



**Figure 1** Tighten the lug nuts in star pattern.



**Figure 2** Tighten the axle nut with the wheels on the ground or rotor blocked (some models).

^ Using figures one and two, tighten nuts to specifications illustrated in the following tables.

#### Note

Some vehicles use torque-to-yield bolts. These bolts should be tightened an additional amount beyond the listed torque specification. The extra amount is listed in degrees.

## Axle Nut and Lug Nut Tightening Specifications

Application	AXLE NUT CV TYPE	Lug Nuts
	Ft. Lbs. (N.m.)	Ft. Lbs. (N.m.)
<b>Acura</b>		
86-94 Integra .....	134 (182).....	80 (110)
86-91 Legend & Vigor .....	184 (250).....	80 (110)
92-94 Legend .....	240 (325).....	80 (110)
<b>AMC</b>		
84-87 Alliance & Encore .....	154 (210).....	60 (80)
<b>Audi</b>		
88-94 80/90 <sup>1</sup> except Quattro		
1-piece wheel bearing housing <sup>1</sup> ....	195 (265).....	65 (88)
2-piece wheel bearing housing <sup>1</sup> ....	90 (120) + 90° .....	65 (88)
88-94 80/90 Quattro & 100/200 .....	150 (200) + 90° .....	80 (110)
81-87 4000 Except Turbo Quattro/Coupe	170 (230).....	65 (88)
81-87 4000 Turbo Quattro/Coupe .....	202 (275).....	65 (88)
81-88 5000 <sup>1</sup> .....	202 (275).....	80 (110)
90-94 V8 Quattro <sup>1</sup> .....	150 (200) + 90° .....	65 (88)
<b>Buick</b>		
84-87 Century .....	185 (250).....	100 (135)
88-92 Century .....	192 (260).....	100 (135)
93 Century .....	103 (140) + 20° .....	100 (135)
94 Century .....	176 (240).....	100 (135)
85-92 Electra & Park Avenue .....	107 (145).....	100 (135)
93-94 Electra, LeSabre, Park Avenue .....	107 (145).....	100 (135)
86-92 LeSabre .....	180 (245).....	100 (135)
88-94 Regal .....	185 (250).....	100 (135)
84-93 Riviera .....	185 (250).....	100 (135)
84-86 Skyhawk.....	185 (250).....	100 (135)
87-89 Skyhawk.....	192 (260).....	100 (135)
84-92 Skylark & Somerset .....	185 (250).....	100 (135)
93-94 Skylark & Somerset .....	192 (260).....	100 (135)
<b>Cadillac</b>		
87-92 Allante .....	180 (245).....	100 (135)
93-94 Allante, DeVille, Eldorado,		
Fleetwood, Seville .....	107 (145).....	100 (135)
84-86 Cimarron .....	185 (250).....	100 (135)
<sup>1</sup> = Replace nut		

<sup>1</sup> = Replace nut

Application	AXLE NUT CV TYPE Ft. Lbs. (N.m.)	Lug Nuts Ft. Lbs. (N.m.)
<b>Cadillac</b>		
87-88 Cimarron .....	192 (260) .....	100 (135)
85-92 DeVille & Fleetwood .....	180 (245) .....	100 (135)
84-92 Eldorado & Seville .....	180 (245) .....	100 (135)
<b>Chevrolet</b>		
84-94 Except 93 Celebrity & Lumina APV .....	185-192 (250-260) .....	100 (135)
93 Celebrity & Lumina APV .....	103 (140) + 20° .....	100 (135)
<b>Chrysler (Domestic)</b>		
93-94 Concord & Premier .....	70-90 (250-260) .....	95 (130)
94-94 All others .....	180 (245) .....	95 (130)
<b>Chrysler (Imports)</b>		
83-94 .....	150-190 (200-260) .....	Steel 55 (75) Aluminum 65-80 (90-110)
<b>Daihatsu</b>		
88-92 .....	130-166 (177-226) .....	45-70 (60-95)
<b>Dodge</b>		
84-94 Except Intrepid .....	180 (245) .....	95 (130)
93-94 Intrepid .....	70-90 (95-122) .....	95 (130)
<b>Eagle</b>		
88-89 Medallion & Premier .....	185 (250) .....	Steel 65 (88) Aluminum 95 (130)
93-94 Vision .....	70-90 (95-122) .....	95 (130)
<b>Ford</b>		
88-94 Aspire & Festiva .....	116-174 (157-235) .....	70 (95)
84-90 Escape & EXP .....	180-200 (245-270) .....	90 (122)
91-94 Escort .....	174-235 (235-320) .....	90 (122)
89-94 Probe .....	174-235 (235-320) .....	75 (100)
86-94 Taurus .....	180-200 (245-270) .....	90 (122)
84-91 Tempo .....	180-200 (200-270) .....	90 (122)
92-94 Tempo .....	170-236 (230-320) .....	90 (122)
<b>Geo</b>		
93-94 Except Metro, Prizm, Sprint .....	137 (186) .....	75 (100)
89-94 Metro .....	130 (175) Stake nut .....	60 (80)
93-94 Prizm .....	160 (216) .....	75 (100)
85-87 Sprint .....	110-195(150-170) Stake nut .....	30(40)

Application		AXLE NUT CV TYPE	Lug Nuts
		Ft. Lbs. (N.m.)	Ft. Lbs. (N.m.)
<b>Honda</b>			
84-90	Accord & Prelude <sup>1</sup> .....	135 (185) Stake nut .....	80 (110)
91-94	Accord & Prelude <sup>1</sup> .....	184 (250) Stake nut .....	80 (110)
84-94	Civic <sup>1</sup> .....	135 (185) Stake nut .....	80 (110)
<b>Hyundai</b>			
	All models .....	135 (185) .....	Steel 55 (110)
			Aluminum 65 (90)
<b>Infiniti</b>			
	G20 .....	173-232 (235-315) .....	80 (110)
<b>Isuzu</b>			
	I-Mark, Impulse, Stylus .....	137 (186) .....	Steel 75 (100)
			Aluminum 85 (115)
<b>Lexus</b>			
90-91	ES250 .....	137 (186) .....	75 (100)
92-94	ES300 .....	217 (295) .....	75 (100)
<b>Lincoln</b>			
88-94	Continental .....	180-200 (245-270) .....	90 (122)
<b>Mazda</b>			
84-94	Except 88-94 MX-3, MX-6 & 626 .....	120-175 (160-235) Stake nut .....	70 (95)
88-94	MX-3, MX-6 & 626 .....	175-235 (235-320) .....	70 (95)
<b>Mercury</b>			
91-94	Capri & 88-89 Tracer .....	116-175 (157-235) .....	70 (95)
84-94	Except Capri & 88-89 Tracer .....	180-200 (245-270) .....	70 (95)
<b>Mitsubishi</b>			
84-94	.....	150-190 (200-260) .....	Steel 55 (75)
			Aluminum 75 (100)
<b>Nissan</b>			
84-94	Altima, Maxima, Access, Stanza .....	175-230 (235-315) .....	80 (108)
84-86	Pulsar, Sentra .....	87-145 (120-195) .....	80 (108)
87-94	NX, Pulsar, Sentra .....	145-203 (200-275) .....	80 (108)
<b>Oldsmobile</b>			
84-94	Except 93-94 Cutlass Ciera, Cutlass Cruiser, 94 Silhouette, Toronado, Trofeo, 88,98 .....	185-192 (250-260) .....	100 (135)
93	Cutlass Ciera, Cutlass Cruiser .....	103 (140) + 20° .....	100 (135)
94	Cutlass Ciera, Cutlass Cruiser .....	175 (240) .....	100 (135)

Honda/ Hyundai/ Infiniti/ Isuzu/ Lexus/ Lincoln/ Mazda/ Mercury/ Mitsubishi/ Nissan/ Oldsmobile

Application	AXLE NUT CV TYPE Ft. Lbs. (N.m.)	Lug Nuts Ft. Lbs. (N.m.)
<b>Oldsmobile (continued)</b>		
94 Silhouette .....	103 (140) + 20° .....	100 (135)
84-85 Toronado .....	175 (240) .....	100 (135)
86-92 Toronado, Trofeo, 88 .....	180 (245) .....	100 (135)
93-94 88, 98 .....	107 (145) .....	100 (135)
85-92 98 .....	180 (245) .....	100 (135)
<b>Peugeot</b>		
.....	195 (265) .....	Not Available
<b>Plymouth</b>		
.....	180 (245) .....	95 (130)
<b>Pontiac</b>		
84-94 Except Bonneville, 94 Transport & 93-94 6000 .....	185-192 (250-260) .....	100 (135)
87-92 Bonneville .....	180 (245) .....	100 (135)
93-94 Bonneville .....	180 (245) .....	100 (135)
94 Transport .....	103 (140) + 20° .....	100 (135)
93 6000 .....	103 (140) + 20° .....	100 (135)
94 6000 .....	175 (240) .....	100 (135)
<b>Renault</b>		
Fuego, Sportwagon .....	185 (250) .....	60 (80)
<b>Saab</b>		
900 .....	215-225 (290-305) .....	75 (100)
9000 .....	215-225 (290-305) .....	85 (115)
<b>Saturn</b>		
.....	145 (200) .....	100 (135)
<b>Sterling</b>		
.....	215 (290) .....	50 (70)
<b>Subaru</b>		
84-94 Except 87-88 Justy, Legacy .....	145 (200) align to cotter pin .....	65 (90) within 30°
87-88 Justy .....	130 (180) align to cotter pin .....	65 (90) within 30°
90-94 Legacy .....	137 (185) align to cotter pin .....	65 (90) within 30°

Oldsmobile/ Peugeot/ Plymouth/ Pontiac/ Renault/ Saab/ Saturn/ Sterling/ Subaru

Application	AXLE NUT CV TYPE Ft. Lbs. (N.m.)	Lug Nuts Ft. Lbs. (N.m.)
<b>Suzuki</b>		
Swift .....	110-150 (150-200) .....	45 (60)
<b>Toyota</b>		
84-91 Camry, Corolla, Tercel .....	135 (185) .....	75 (100)
92-94 Camry .....	215 (295) .....	75 (100)
86-91 Celica .....	135 (185) .....	75 (100)
92-94 Celica .....	165 (225) .....	75 (100)
92-94 Corolla .....	160 (215) .....	75 (100)
92-94 Paseo, Tercel .....	150 (205) .....	75 (100)
<b>VW</b>		
84-92 Cabriolet, Corrado, Fox, Golf GTI, Jetta, Pickup, Quantum, Scirocco .....	175 (235) Use new nut .....	80 (110)
93-94 Corrado SLC, Golf, GTI, Jetta .....	195 (265) Use new nut .....	80 (110)
93 Euro Van .....	150 (200) Use new nut .....	80 (110)
90-95 Passat .....	195 (265) Use new nut .....	80 (110)
<b>Volvo</b>		
850 .....	110 (140) + 60° .....	80 (110)
<b>Yugo</b>		
.....	160 (215) Stake nut .....	65 (90)

Suzuki/ Toyota/ VW/ Volvo/ Yugo

Technical Service Bulletin # ATRATB861

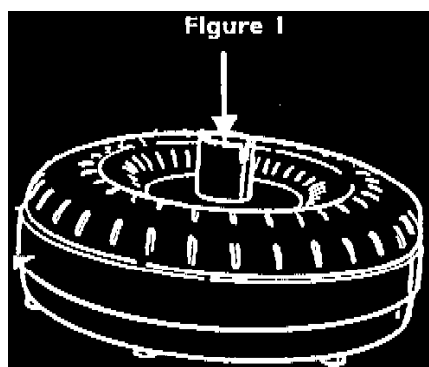
Date: 860101

**A/T - Rapid Converter Pump Bushing Wear**

TSB 86-1 (Jan)

SUBJECT: CONVERTERS

PROBLEM:



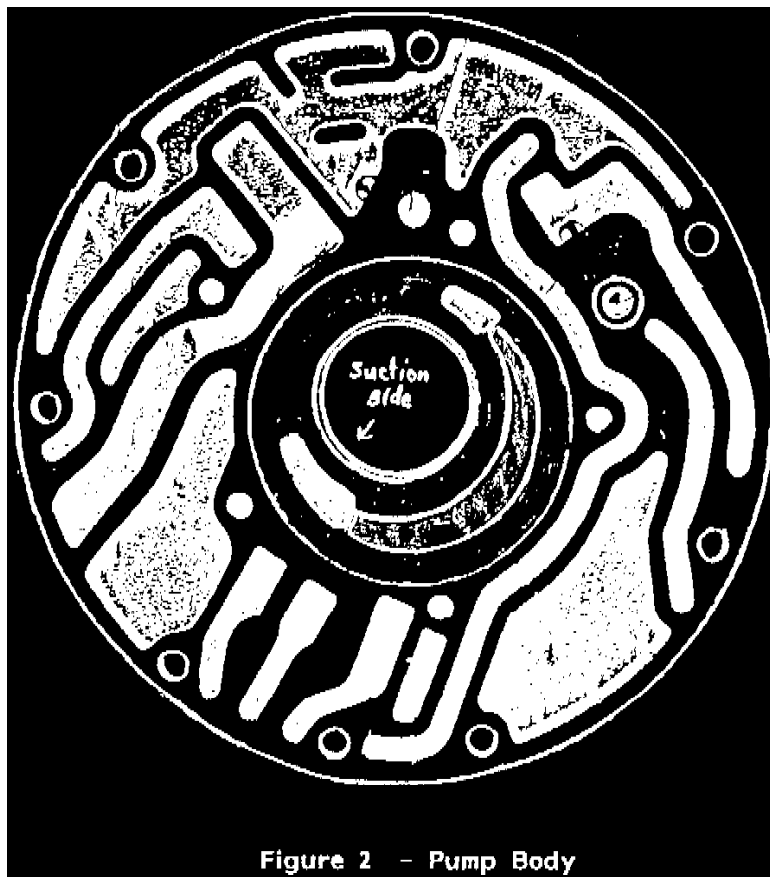


Figure 2 - Pump Body

RAPID pump bushing wear on suction side of bushing, after converter replacement, or hub sanding (Figure 1)

**CAUSE:**

There are several possible causes: Defective bushing, crooked installation, poor lube, etc., - The most common cause (and it seems to be increasing across the continent) is rough converter hub finish. Rough finish, or scratches in the hub, act as a file against the bushing. Suction on one side of the pump, opposed to pressure on the other side will always tend to push the converter hub to the suction side of the bushing.

**SOLUTION:**

Visual checking is not always enough, but be sure to look for scratches. The simplest, yet most effective way, is to run the tip of your fingernail, in a scratching stroke, down the hub, as indicated by the arrow (Figure 1). The hub is too rough, if anything is felt at all. Sand around the hub in the direction of the converter rotation with 1100-600 grit "wetted" paper. (Solvent, or transmission fluid work well).

Hubs must have a mirror finish, and be smooth as glass to insure maximum bushing and seal life.

Technical Service Bulletin # **ATRATB8736**

Date: **870601**

**A/T - Methods to Check for Restricted Exhaust**

TSB 87-36 (June)

SUBJECT: GM RESTRICTED EXHAUST SYSTEM CHECK

**PROBLEM:**

Late shift, sometimes no maximum throttle upshift.

**POSSIBLE CAUSE:**

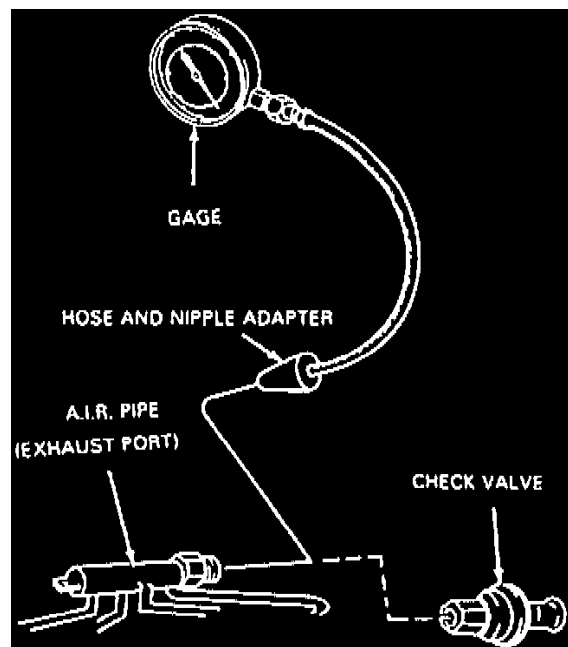
Restricted exhaust system due to bent or collapsed pipe  
or plugged catalytic converter.

**POSSIBLE SOLUTIONS:**

Figures # 1 and # 2 show ways to check for restricted exhaust system.

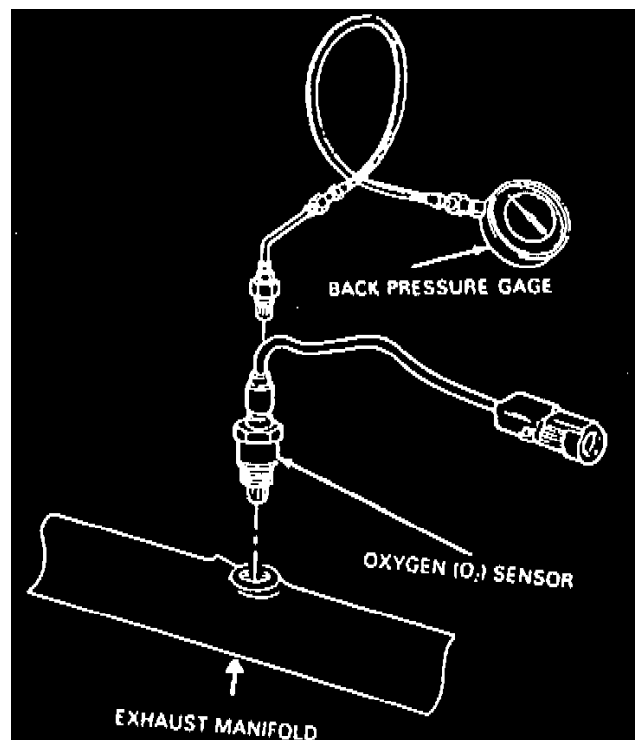
FIGURE 1





1. Remove the rubber hose at the exhaust manifold A.I.R. pipe check valve. Remove check valve.
2. Connect a fuel pump pressure/vacuum gauge to a hose and nipple.
3. Insert the nipple into the exhaust manifold A.I.R. pipe.
4. With the engine idling at normal operating temperature, observe the exhaust system backpressure reading on the gauge. Reading should not exceed 1 to 1-1/2 PSI.
5. Accelerate engine to 2000 RPM, and observe gauge. Reading should not exceed 3 PSI. If the backpressure, at either RPM exceeds specification a restricted exhaust system is indicated.

FIGURE 2



1. Carefully remove oxygen sensor.
2. Install Borroughs exhaust backpressure tester (BT 8515 or or equivalent in place of oxygen sensor).
3. With the engine idling at normal operation temperature, observe the exhaust system backpressure reading on the gauge. Reading should not exceed 1 to 1-1/2 PSI.
4. Accelerate engine to 2000 RPM and observe gauge. Reading should not exceed 3 PSI of backpressure, at either RPM, exceeds specification,

a restricted exhaust system is indicated.

5. After completing test, be sure to coat threads of oxygen sensor with anti-seize compound P/N 5613695, or equivalent prior to re-installation.

Technical Service Bulletin # **ATRATB8748**

Date: **870801**

## **A/T - Slipping or No-Shift/Metal Sealing Rings**

TSB 87-48 (Aug)

SUBJECT: Metal sealing rings

Various Units

PROBLEM: Slipping, or sometimes no-shift

POSSIBLE SOLUTION: Sealing rings could be under-size.

1. Always inspect rings as outlined in SIL 84-29

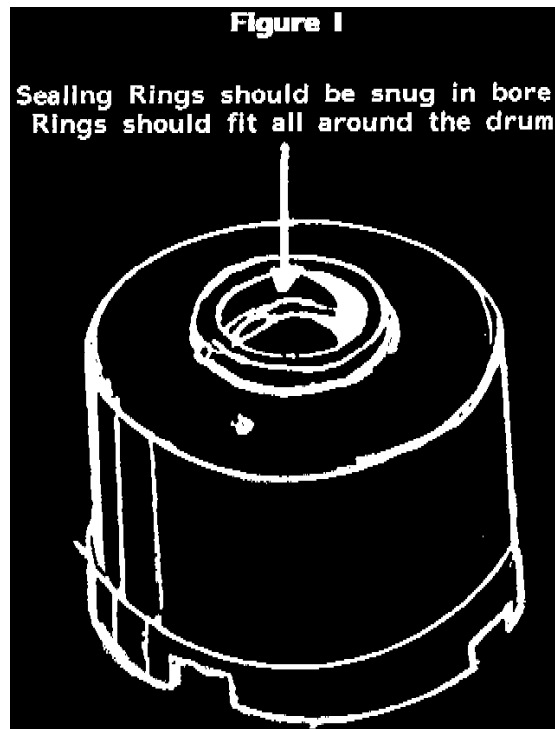
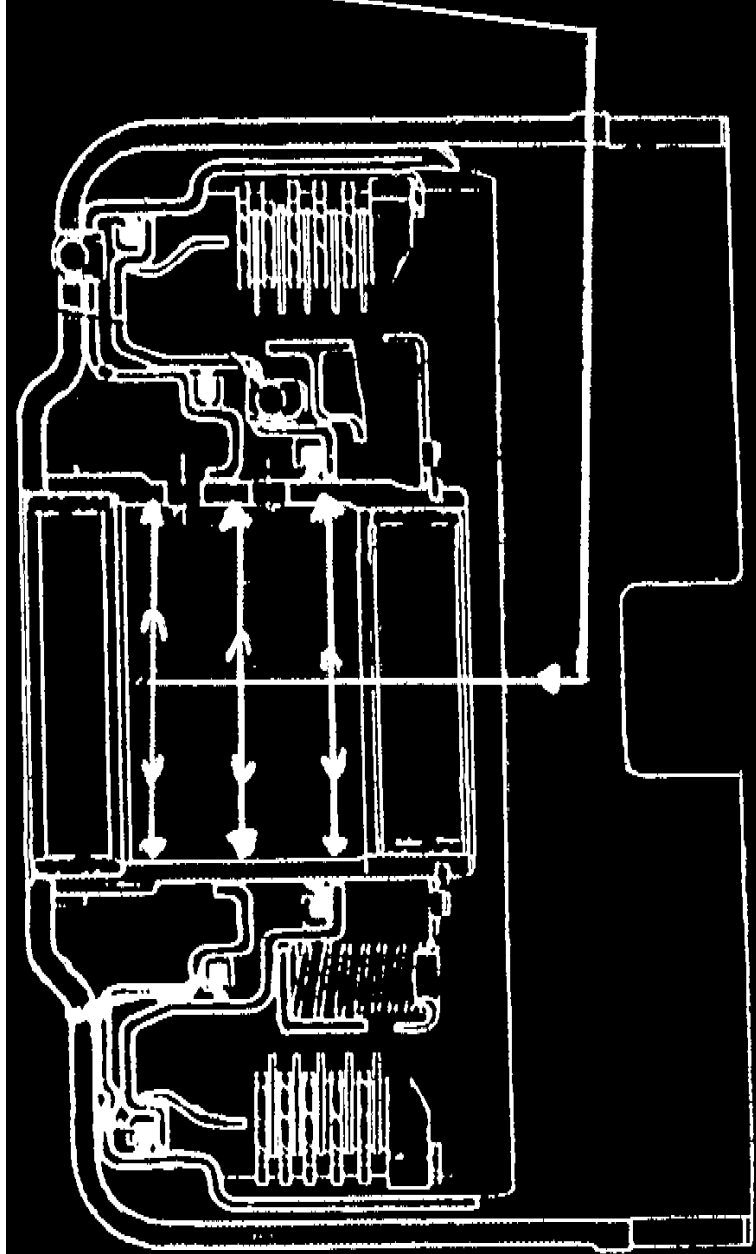


Figure 2

Sealing Ring Area



2. Place ring in bore of drum where they will be running. (See Figures 1 & 2)
3. Sealing rings should be snug in bore; rings should fit all around the drum. (drum could be out-of-round)
4. Air check all drums. (Use 30 PSI air pressure only.) If air escapes you have leaks -- better find now, than later. This represents lost clutch pressure, and could result in soft application and burned friction material.
5. Following these steps will help you save money, plus help you build better units.

Technical Service Bulletin # **ATRATB8754**

Date: **870901**

### **A/T - Front Bushing Wear**

TSB 87-54 (Sept)

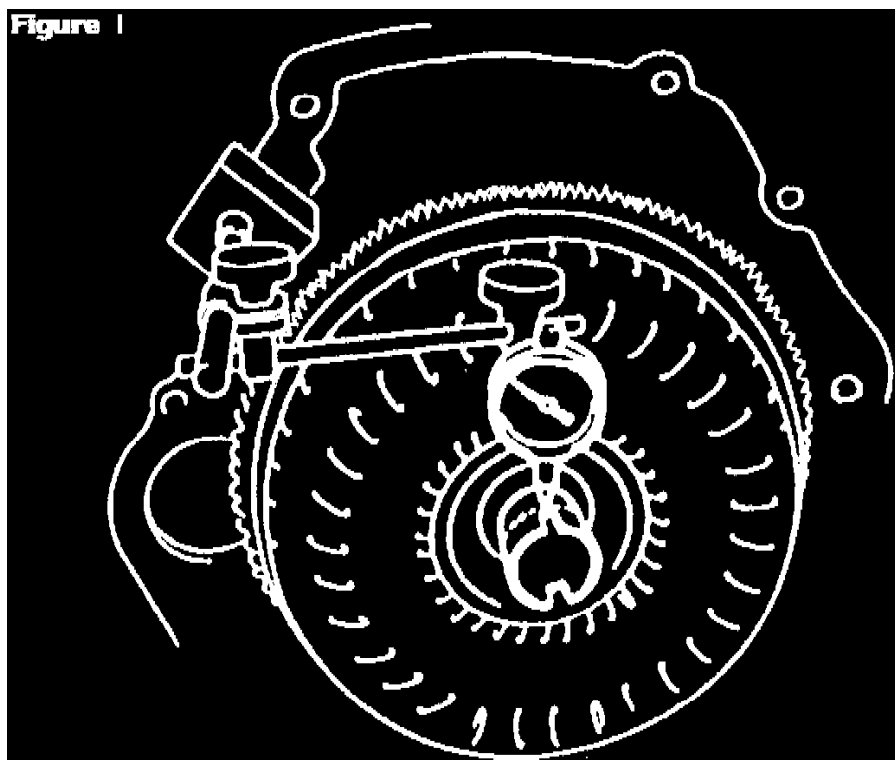
SUBJECT: ALL AUTOMATICS

PROBLEM: Front Bushing Wear

CAUSE:

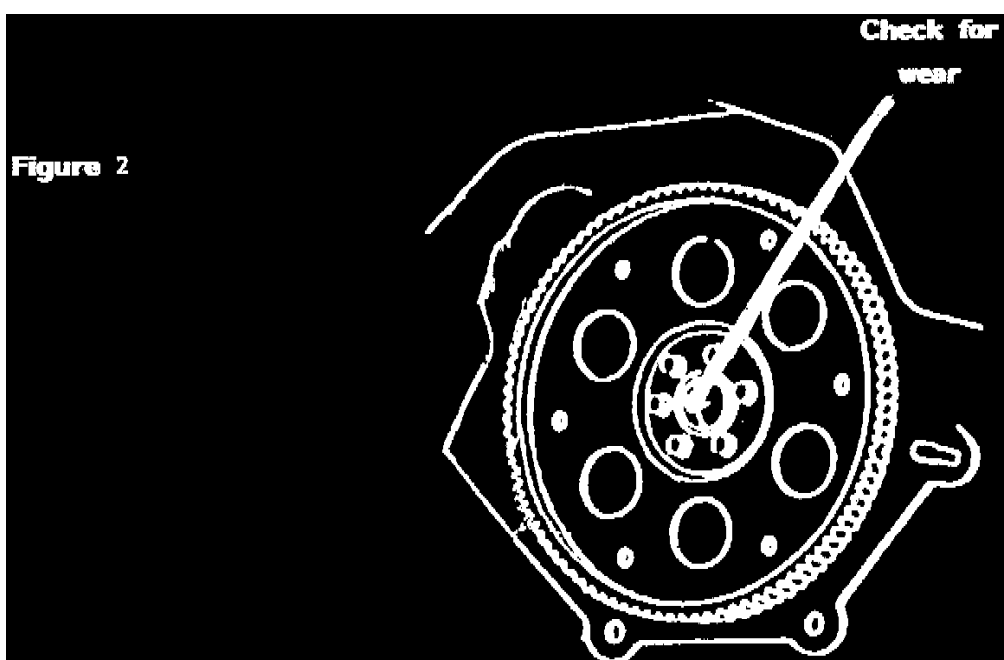
When diagnosing front pump bushing wear, the cause may be:

1. Excessive CONVERTER HUB RUN-OUT. This may, or may not be due to a faulty torque converter.



The torque converter can be checked visually, and with a dial indicator. (See Figure 1) Hub run-out should not exceed .010".

2. BROKEN, BENT OR CRACKED FLYWHEELS can also cause run-out. If the torque-converter-to-flywheel bolts have been loose, the flywheel holes can become egg-shaped, or the torque converter pads may wear into the flywheel, causing run-out.



3. Another possibility is WEAR IN THE CRANKSHAFT, where it supports the torque converter pilot.(See Figure 2)

Often the crankshaft is only worn in a small area where the torque converter pilot has been against it.

If only a portion of the crankshaft is worn, rotate the crankshaft until the worn area is at 12:00 o'clock.

When the torque converter is pushed forward into the crankshaft, the torque converter pilot will bottom on a good portion, and should center properly.

TSB 87-60 (Oct)

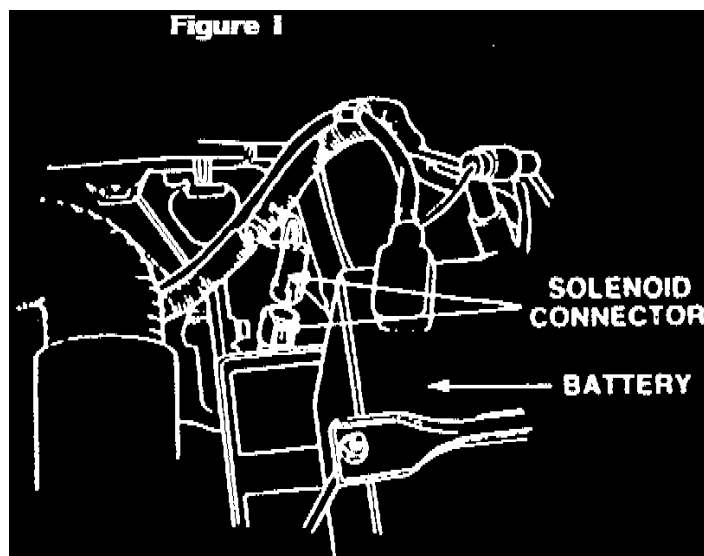
**SUBJECT: CHEV. SPRINT 3 SPD TRANSAXLE**

**PROBLEM:**

How to determine whether the no-shift problem is in the computer, or transmission -- electrical or mechanical.

**PROCEDURE:**

1. Engine should be warm



2. Disconnect solenoid wire (see Figure 1)
3. Start engine, shift to "L" range and accelerate to 18-20 mph. Car should be in first gear.
4. Shift to "2" range, and accelerate to 37-40 mph. Car should be in 2nd gear.
5. Shift to "D" range and accelerate. Car should be in 3rd gear when speed is about 37-40 mph.
6. If the transmission makes these shifts, the problem is not mechanical.

The problem is either a blown fuse to the computer; the or one of its sensors.

Technical Service Bulletin # **ATRATB8816**

Date: **880301**

**A/T - No Upshift/Governor Contamination**

TSB 88-16 (Mar)

**SUBJECT: GM TRANSMISSIONS**

**PROBLEM:** No upshift

**CAUSE:**

May be caused by imprex material lodged in a seat or under a ball in the governor. Imprex material is used to seal transaxle cases against porosity and has the appearance of RTV sealer. This material can prevent the governor balls from seating properly, or can plug the feed passage and result in low governor pressure.

**CURE:**

If it is suspected that imprex material has migrated into the governor, remove the governor from the transaxle. Reinstall the Governor cover without the governor. Start the engine and shift transaxle to drive for approximately 5 minutes. This will flush out the governor oil passages.

Clean the governor and check for proper seating of the governor balls. Hold the weights outward against the balls and pour solvent into the governor shaft. If solvent leaks past the balls, replace the governor. If no leakage is found, reinstall the governor and verify operation.

If the above actions do not correct the no-upshift condition on the THM 440-T4, check these three areas for causes of low governor pressure:

1. Governor pipe retainer bolt loose, or missing
2. Governor pipe retainer gasket missing, or mislocated.

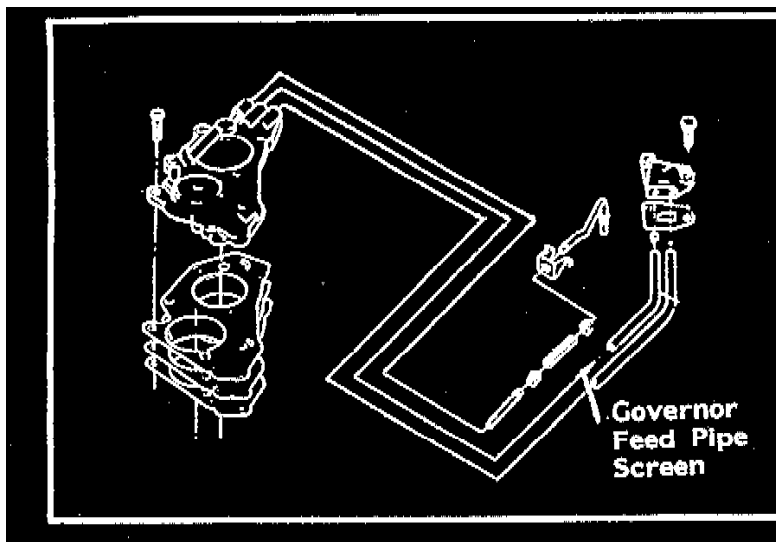


Figure 1

3. Plugged governor feed pipe screen (See Figure 1)

Technical Service Bulletin # ATRATB887

Date: 880201

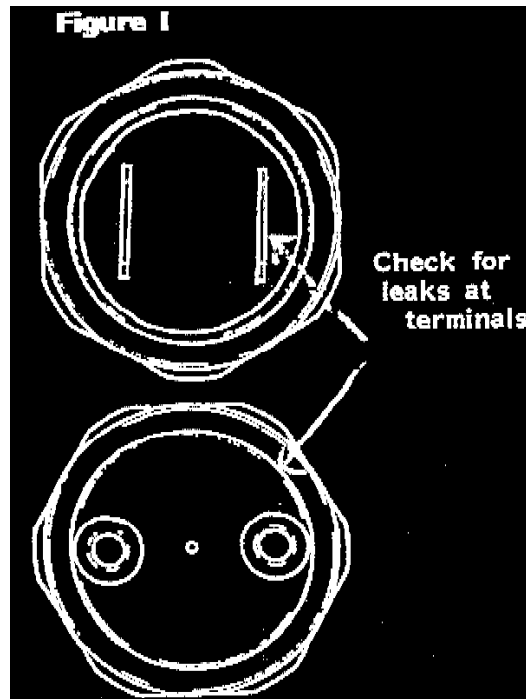
## A/T - Checking Pressure Switches For Leaks

TSB 88-7 (Feb)

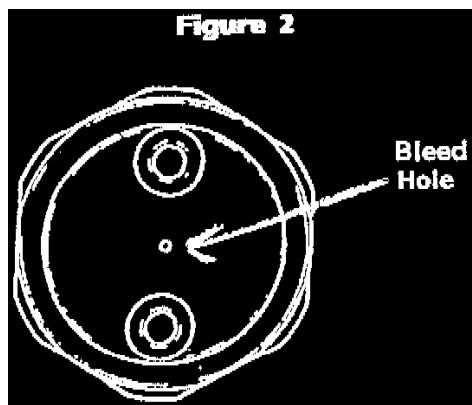
SUBJECT: Pressure Switch Leaks

### CHECKING PRESSURE SWITCHES FOR LEAKS

A simple method to check pressure switches for leaks is to use an air blower with 1/8" pipe thread nozzle fitting. Remove the nozzle fitting from air blower. The thread size of the fitting is the same as most GM pressure switches.



Put a couple drops of ATF into the switch, and tighten it snugly into the air blower. Apply pressure and check for air bubbles. (Figure 1)



Remember some switches have an air bleed. DO NOT MISTAKE AN AIR BLEED FOR AN AIR LEAK. (See Figure 2 - Air bleed.)

Pressure switches should be checked for leaks, because they must hold clutch apply pressure, torque converter apply and release. They also effect computer and emission control systems.

A switch that leaks may not present any problems on road-test (after overhaul), but could cause premature failure of transmission, torque converter, or related controlled systems.

Technical Service Bulletin # **ATRATB8923**

Date: **890801**

## **A/T - Math Formulas Part I**

TSB: 89-23 (Aug)

SUBJECT:  
TRANSMISSION MATH FORMULAS (Your most valuable tool)

Transmission math formulas are not reserved exclusively for engineers. Understanding some basic mathematical formulas can be one of your most valuable tools.

The following information contained in this bulletin will discuss various basic formulas dealing with:

1. Shift Speed
2. Pressure
3. Speedometer ratios

Take the time, now, to understand these relatively simple concepts.

You will be saving yourself many problems, and considerable frustration, and also dollars, in the future.

## **Shift Speed and Pressure**

### **SHIFT SPEED AND PRESSURE**

To figure the area of a circle (valve or servo):

Radius (which is 1/2 the diameter) x Radius x 3.14159 = Area

EXAMPLE: A 1" diameter circle has a radius of 0.5"

$$0.5 \times 0.5 \times 3.14159 = 0.785$$

Therefore a 1" diameter circle has an Area of 0.785 sq. inches

Pressure x Area = Force

EXAMPLE: 100 psi line pressure, on a servo with an area of 2 square inches = force

So, 100 psi line pressure x 2 sq in = 200 pounds of force.

Force divided by Area = Pressure

EXAMPLE: 200 lbs divided by 2" = 100 psi

Force divided by Pressure = Area

EXAMPLE: 200 lbs divided by 100 psi = 2 inches

THINGS WE CAN DO WITH THESE FORMULAS:

EXAMPLE: A 700 R4 has 62 psi of line pressure at Idle.  
The PR spring weighs 6.5 lbs

The tip (reaction end) of the PR valve has a diameter of 0.365" (0.365 divided by 2 = 0.1825 radius)  $0.1825 \times 0.1825 \times 3.14159 = 0.1046$ " area

We want 75 psi of line pressure at Idle

First, let's see if those numbers add up, using: Pressure x Area = Force

$62 \text{ psi} \times 0.1046 = 6.48$ , or 6 1/2 lb PR Spring

We want 75 psi:

Pressure x Area = Force (Spring)  $75 \text{ psi} \times 0.1046 = 7.85$  lb spring

What if we put in an 8 lb Spring? Force divided by Area = Pressure

$8 \text{ lbs} \text{ divided by } 0.1046 = 76.48$  or 76 1/2 line pressure

Now, let's look at RATIO.

Ratio is the relationship in quantity, amount or size, between two or more things.

In our example ratio is: How many psi each pound of spring will add.

Pressure divided by Force = Ratio

EXAMPLE:  $62 \text{ psi} \text{ divided by } 6.5 \text{ lbs} = 9.5$  ratio Each pound of spring will increase pressure 9.5 psi

Force x Ratio = Pressure

EXAMPLE:  $6.5 \text{ lbs} \times 9.5 = 61.75$  or 62 psi

(Let's add 1 lb of spring, and see if we get 9.5 more psi.)

Force x Ratio = Pressure

EXAMPLE:  $7.5 \text{ lbs} \times 9.5 = 71.25$

New pressure Old pressure = Pressure difference

$71.25 \text{ minus } 61.75 = 9.5$  psi change (by adding 1 lb of spring)

Once you know the ratio, a lot can be determined. Pressure divided by Ratio = Force

$62 \text{ psi (actually } 61.75) \text{ divided by } 9.5 = 6.5$  lb spring

The ratio never changes. This means that if I know that line pressure is 55 psi at idle, in a 700 R4, the the PR spring must be 5.78 lbs.

Pressure divided by Ratio = Force

So,  $55 \text{ psi} \text{ divided by } 9.5 = 5.78$  lbs.

Now, let's look at a math formula for shift speeds.

Suppose we had shift speeds of 15 mph and 20 mph, for the 1-2 & 2-3 shifts on a transmission. 20 mph may be too early for the 2-3 shift. If we adjust TV modulator, we will move both shifts. We don't want to do that because the 1-2 shift is fine, so let's work with just the 2-3 shift spring.

EXAMPLE: Original spring divided by Original MPH = Ratio

As,  $4 \text{ lbs} \text{ divided by } 25 \text{ mph} = 0.2$

Ratio x Desired MPH = New Spring

$0.2 \times 25 \text{ mph} = 5$  lb spring

A 5 lb spring will raise the shift on this transmission to 25 mph.



All you need to know is -- Where is it shifting now (at MINIMUM throttle) and what does the spring weigh.

This formula will get you very close, but may be a "tad" off, because we are not accounting for TV pressure helping the spring. This is why you want to check it at minimum throttle, so TV has the least effect.

## **Speedometer Ratios**

Finally, let's look at speedometer ratios.

Suppose we put an exchange transmission in a car, and now the speedometer is off, because the speedometer drive gear has a different tooth count. What do we have to do to the driven gear to correct it?

Let's say the old drive gear had 7 teeth and the old driven gear had 21 teeth. The exchange unit had 8 teeth on the drive gear.

Old Drive Gear divided by the New Drive Gear = Ratio

7 teeth divided by 8 teeth = 0.875

Old Driven Gear divided by Ratio = New Driven Gear

21 teeth divided by 0.875 = 24 teeth

A 24 tooth driven gear will correct the speedometer error.

Let's do one more speedometer change. This time the old drive is 9, and the new drive is 10. The old driven gear is still 21.

Old Drive Gear divided by New Drive Gear = Ratio

9 tooth divided by 10 tooth = 0.9

Old Driven Gear divided by Ratio = New Driven Gear

21 tooth divided by 0.9 = 23.33 teeth

We can't get a 23.3 tooth count so we round it off to 23 teeth. Now the speedometer will be close, but not exact, because we had to round off the number.

Technical Service Bulletin # **ATRATB8927**

Date: **890901**

## **A/T - Twenty Steps To Successful Repairs**

TSB 89-27 (Sept)

SUBJECT: TWENTY STEPS TO SUCCESSFUL TRANSMISSION REPAIR

1. As you start work on a transmission, read your ATRA bulletins pertaining to that transmission. (If you do this every time, before you know it you'll have the bulletins memorized.)
2. Clean the entire transmission, including the valve body.
3. Check pumps, valve bodies, and cases for warpage.
4. Flat file pumps, valve bodies, and cases. (Just a few strokes with the file to knock off high spots and handle burrs.)
5. Check all pump gear clearances.
6. Check planet pinion endplay and side to side motion.
7. Soak all planet assemblies.
8. Soak all friction material for 15-30 minutes.
9. Sand, tumble, or replace all steel plates.
10. Re-surface all drums on which a band rides.
11. Replace all rotating oil control rings.
12. Check all oil control rings, and rubber products in their bores for proper fit.

13. Replace all major support bushings and bushings that control lube oil.
14. Pre-lubricate all bushings and thrust washers.
15. Pre-lube pumps.
16. Pre-fill torque converters.
17. Use available manuals to find specifications.
18. Set correct clutch and band clearances
19. Take the time to set total unit endplay
20. Use a torque wrench on all pumps and valve bodies.

Technical Service Bulletin # **ATRATB8930**

Date: **891001**

## **A/T - Math Part II**

TSB: 89-30 (Oct)

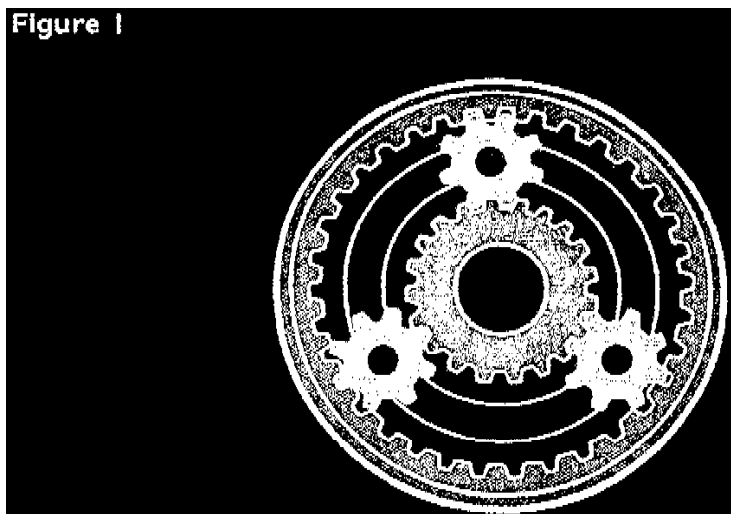
SUBJECT: TRANSMISSION MATH - Part II

Planetary Gear Sets:

Knowing the gear ratios of an automatic transmission can come in handy at times -- especially when you're swapping transmission types or differentials. The problem is in trying to find a manual with the ratios listed. What do you do?

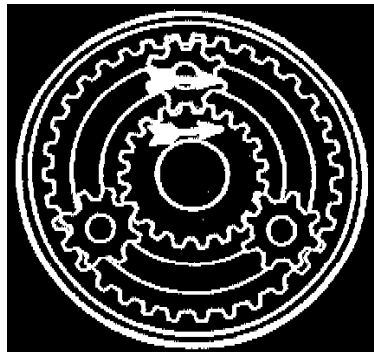
**BREAK OUT THE CALCULATOR, AND FIGURE IT OUT.**

When you figure the gear ratios for planetary gear sets, it is just like any other gear set. You divide the output gear by the input. Also, don't count the idler gear; planetaries are considered idler gears. Set them aside, their tooth count doesn't matter.



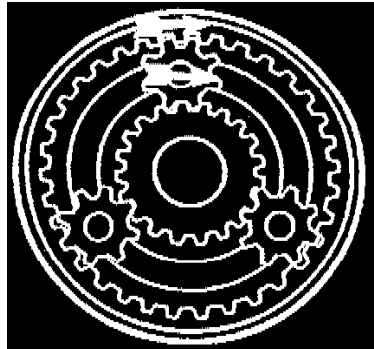
Now for the tricky part -- which gear do you consider the input, and which one the output? Figure 1 shows a planetary gear set with 34 teeth on the ring gear and 20 teeth on the Sun gear.

FOR GEAR REDUCTION, one of the gears is held stationary, and the other is used for the INPUT. THE TOOTH COUNT FOR THE OUTPUT GEAR IS THE SUM OF THE SUN GEAR AND THE RING GEAR, so if you are using the Sun gear for the input, then the ring gear + the Sun gear divided by the Sun gear = Ratio.



EXAMPLE:  $34 + 20$  divided by  $20 = 2.7:1$  This is how 1st gear on a THM 700 R4 is calculated. (See figure)

When the ring gear is used as the input, then the ring gear + the Sun gear divided by the ring gear = Ratio.

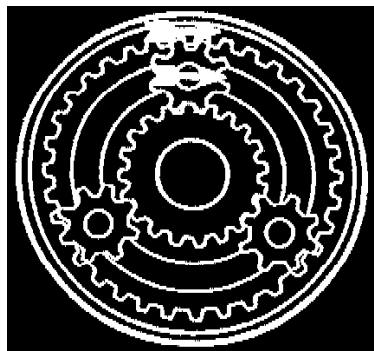


EXAMPLE:  $34 + 20$  divided by  $34 = 1.58$  This is now 2nd gear on a THM 350 is calculated. (See figure)

FOR OVERDRIVE, the sum of the ring gear + Sun gear is used for the input tooth count.

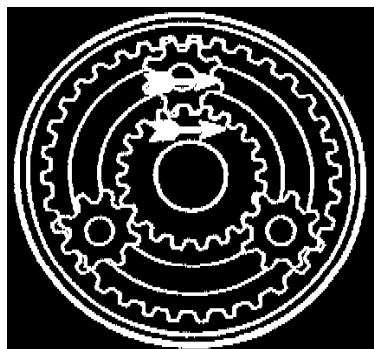
So, IF THE SUN GEAR IS HELD, then the ring gear divided by (ring gear + Sun gear) = Ratio

EXAMPLE:  $34$  divided by  $(34 + 20) = .63:1$  Look familiar?



The A4LD, the THM 200-4R, the A-140E, the A-40D, the THM 325-4L are some of the units that use this method of getting overdrive. (See figure)

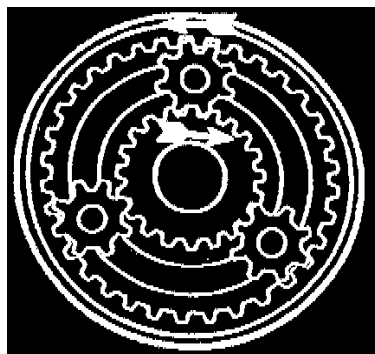
If the ring gear is held, then the Sun gear divided by (ring gear = Sun gear) = Ratio



EXAMPLE:  $20$  divided by  $(34 + 20) = .37:1$  (See figure)

REVERSE IS THE EASIEST - THE PLANET IS HELD.

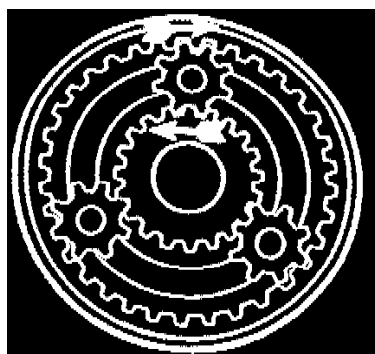
The Sun gear is the input, and the ring gear is the output. The formula for this is: The ring gear divided by the Sun gear = Ratio.



EXAMPLE: 34 divided by 20 = 1.7 (See figure)

Occasionally, the ring gear is used as the input, and the Sun gear as the output.

The formula for this is: The Sun gear divided by the ring gear = Ratio.



EXAMPLE: 20 divided by 34 = .59  
(See figure)

Notice that the output is overdriven.

A transmission using this method must use another planetary gear set to reduce the output. The Mercedes W3A-040 is a good example of this

To get more than one gear forward and a reverse, requires multiple, or compound planetary gear sets.

Two of the most common of these are the SIMPSON GEAR SET, used in transmissions like the THM 350, the Ford C-4, and the TF 6 & 8, and the RAVIGNEAUX GEAR SET, found in transmissions such as the FMX, the AOD, and the T-35.

Figuring out all the ratios for these transmissions is a little tricky, so I'll give you the formulas, and let you figure out how these formulas were derived.

#### THE SIMPSON GEAR SET:

For this example I'll use a THM 200, which has 74 TEETH ON THE FRONT RING GEAR, 42 TEETH ON THE FRONT SUN GEAR, 30 TEETH ON THE REAR SUN GEAR, AND 62 TEETH ON THE REAR RING GEAR.

The formula for 1ST GEAR is: rear ring divided by rear Sun x front Sun plus front Sun + front ring divided by front ring.

EXAMPLE: On the THM 200, it would be:

62 divided by 30 x 42 + 42 + 74 divided by 74 = 2.74:1

SECOND GEAR is easy: Front Sun + front ring divided by front ring.

EXAMPLE: 42 + 74 divided by 74 = 1.57:1

THIRD GEAR is Direct Drive, or 1:1

REVERSE is rear ring divided by rear Sun

EXAMPLE: 62 divided by 30 = 2.06

## THM 440-T4 (BACKWARDS SIMPSON):

The THM 440 T4 is sort of a backwards version of a Simpson gear set, and although it looks complicated, it really is very simple.

The front Sun gear has 26 teeth, while the rear Sun gear has 42. The front ring gear has 62 teeth, but keep in mind that it is part of the rear carrier, just as the rear ring gear is part of the front carrier, with a tooth count of 74.

As I said earlier, the THM 440 T4 is sort of a backwards version of a Simpson gear set, so in figuring the ratio for 1ST GEAR -- it is identical, except you substitute the words "front" and "rear" in the appropriate places. Front ring divided by front sun x rear Sun + rear Sun + rear ring divided by rear ring = Ratio

EXAMPLE:  $62 \div 26 \times 42 + 42 + 74 \div 74 = 2.92:1$

2ND GEAR: Rear Sun + rear ring divided by rear ring

Example:  $42 + 74 \div 74 = 1.57:1$

3RD GEAR: Direct Drive, or 1:1

4TH GEAR: Front ring divided by (front Sun + front ring = Ratio

EXAMPLE:  $62 \div (26 + 62) = .74:1$

## RAVIGNEAUX GEAR SET:

This is considered a compound gear set, and for this example I'll use an AOD, which has:

36 teeth on the front Sun gear

30 teeth on the rear Sun gear, and  
72 teeth on the ring gear

The formula for first gear is: Ring gear divided by rear Sun gear = Ratio

EXAMPLE:  $72 \div 30 = 2.4:1$

SECOND GEAR formula is: Rear Sun + front Sun divided by rear Sun x Ring divided by (Ring + front Sun)

EXAMPLE:  $(30 + 36) \div 30 \times 72 \div (72 + 36) = \text{Ratio } 66 \div 30 \times 72 \div 108 = 1.47$

THIRD GEAR is Direct, or 1:1

FOURTH GEAR is: Ring gear divided by (ring gear + front Sun gear) = Ratio

EXAMPLE:  $72 \div (72 + 36) = .67:1$

REVERSE on a Ford AOD is: Ring gear divided by front Sun gear.

EXAMPLE:  $72 \div 36 = 2:1$

Technical Service Bulletin # **ATRATB9002006**

Date: **900201**

## A/T - Choosing the Right ATF

TRANSMISSION: ALL

BULLETIN: # 9002006

SUBJECT: Automatic Transmission Fluid

DATE: Feb 1990

AUTOMATIC TRANSMISSION FLUID

CHOOSING YOUR ATF

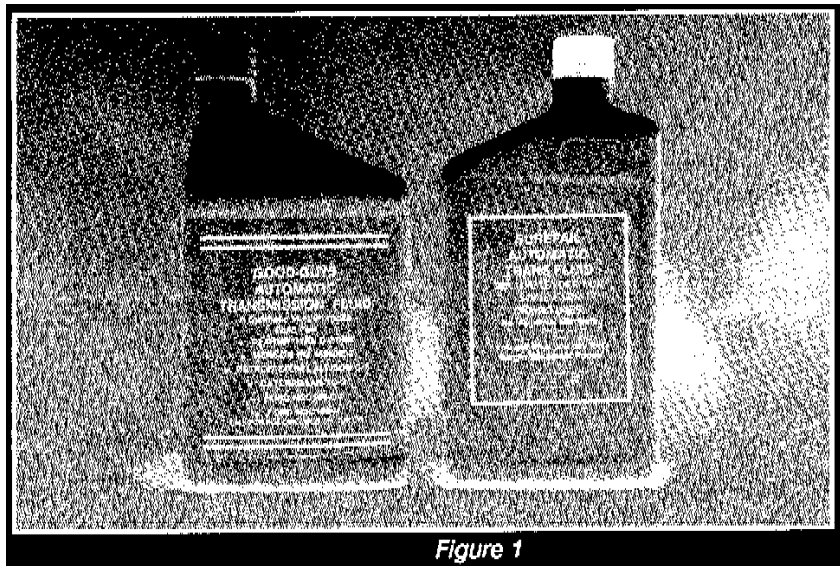


Figure 1

Different ATF's (Automatic Transmission Fluid) can have different frictional properties which can produce different shift characteristics. You may have already experienced problems like lock-up shudder, or squawks on shifts and have corrected them by changing the fluid. This alone tells, you that friction material and fluids are critical in today's cars.

#### MEETING THE O.E.M. SPECIFICATIONS

The first thing to consider when choosing an ATF is "Does it meet the O.E.M. specification?" ATF's wishing to be labeled as DEXRON II and/or MERCON must first meet the respective minimum requirements. It's important to note that even though the specification for DEXRON II and MERCON are currently very similar, **THEY ARE NOT IDENTICAL**. Also note, even fluids which meet the same specification may not be identical. One fluid may just meet a specification and, another may far surpass it. You should know what your fluids properties are! You can get that information from your fluid supplier.

#### EVALUATING YOUR FLUID

Ask your supplier to prove (certify) that the fluid meets O.E.M. specifications (MERCON OR DEXRON II). He will do that by supplying you with the license (certification) number issued to him by the O.E.M.

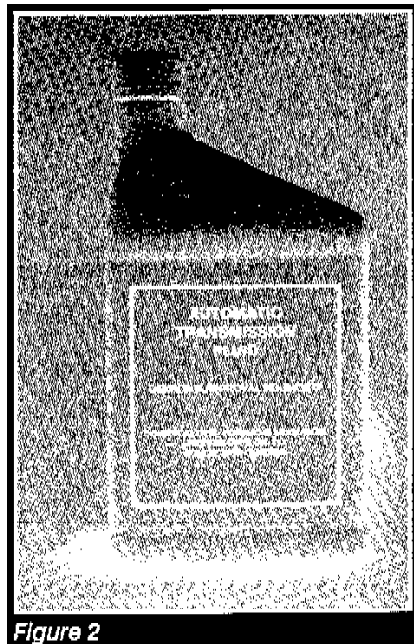


Figure 2

A DEXRON-II license number (sometimes referred to as a "D" number) will always start D-2. A typical DEXRON license number can be seen in Figure 2.

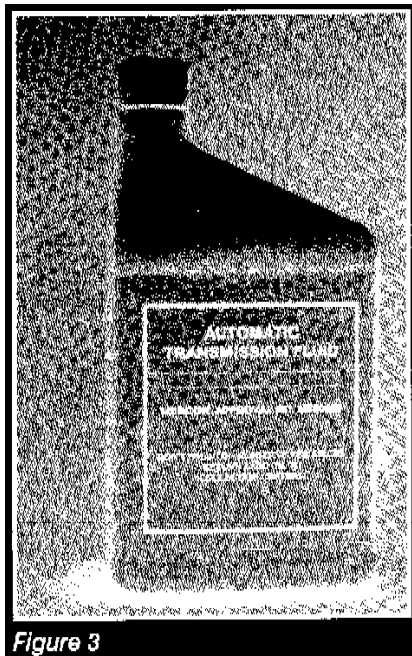


Figure 3

MERCON license numbers will be six digits starting with M as shown in Figure 3..

#### TRY TO MEET SEVERAL SPECIFICATIONS!

DEXRON II and MERCON have different minimum specifications, so a product that meets BOTH specifications may be better than those meeting only one spec. Meeting other specs, in addition to the first two can be an added benefit. If a fluid is licensed as DEXRON II AND MERCON as well as others like Allison C-4, or Caterpillar TO-2/TO-4, it means the fluid had to pass more tests and may be a better fluid.

Lastly, demand that the license numbers be placed on all your invoices especially if you buy in bulk. If your supplier is unwilling, it is very likely that they are supplying you an unlicensed fluid. Licensed suppliers are required to supply the license numbers to their customers as part of their agreement with the O.E.M.

#### OTHER THINGS TO CHECK

So now you've narrowed your choices down to a few suppliers that have O.E.M. license numbers. How do you compare two fluids that meet the same O.E.M. Spec.? Ask your supplier to give you the viscometrics on the fluid you buy.

An excellent "bench mark of the overall quality of a fluid is its viscosity at -40 degrees. This is measured in "centipoise" or "cPs". DEXRON II specification says viscosity will be no more than 50,000 cPs @ - 40 degrees. (Some poor fluids have tested at over 1,000,000 cPs) In general, the lower the number, the better the fluid.

Keep in mind that as the number goes down the price of the fluid usually goes up. (You get what you pay for) Most good fluids will average around 35,000 cPs. Hydrotreated (or Hydrocracked) fluids average around 20,000 cPs or less. (Hydrotreating is a refining process done to the base oil to clean out contaminants or impurities) Synthetic ATF's average 10,000 cPs or less, and some are as low as 5000 cPs. Viscosity at -40 degrees is a function of the base stock from which the ATF is made. A low number indicates a premium base oil OR an expensive refining process. (Hydrotreating)

#### FOR ADDITIONAL INFORMATION:

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Page 91 December '89 Page 51

#### BULLETIN RECAP

- ^ Only use fluids with O.E.M. approvals.
- ^ Try to get a fluid that meets more than one spec (e.g DEXRON II AND MERCON)
- ^ Check the viscosity at -40 degrees. The lower the number the better.
- ^ Avoid bargain basement fluids with no license numbers.

Technical Service Bulletin # **883517B**

Date: **881001**

#### M/T - Neutral/Drive Gear Rattle

Number: 88-351-7B

Section: 7B

Date: OCT., 1988

Subject: NEUTRAL/DRIVE MANUAL TRANSMISSION GEAR RATTLE

Model and Year: 1980-88 CHEVROLET VEHICLES WITH MANUAL TRANSMISSIONS

TO: ALL CHEVROLET DEALERS

Various levels of minor gear "rattle" are inherent in all manual transmission gear boxes. Customers may perceive gear "rattle" as clutch, engine and/or transmission noise. The noise "rattle" is normal and will not affect the function or durability of the vehicle.

The amount of "rattle" is dependent on several factors including the size and design of both the transmission and engine, as well as the temperature of the transmission fluid. Generally, the larger transmissions have more "rattle", however, smaller engines generate a higher level of torsional vibrations which induce gear "rattle". As the temperature of the fluid increases, so will the level of rattle.

#### Neutral "Rattle"

Verify that the customer noise comment is neutral gear "rattle" by using the following steps. Also use the statements as guidelines for addressing the condition.

1. Place vehicle on a level surface with engine at idle, transmission in neutral, and parking brake set.
2. Depress the clutch pedal and check to see if the noise disappears.
  - a. If the noise does disappear, then neutral gear "rattle" most likely exists:
    - Check the transmission fluid level and fill if necessary. Low fluid level can result in increased "rattle". Also, verify that the correct fluid is being used.
    - Check the shifter boot for tears and proper attachment and replace or service as required.
    - Check for any other service bulletins which may release specific service parts for a vehicle line with a known gear rattle concern.
    - "Only" (after checking the above items and no corrections can be made) install a replacement clutch driven disc. A replacement disc may decrease "rattle" due to production variations in damper spring rates and/or hub to spline clearances, however, for the same reasons "rattle" may increase.
  - IMPORTANT: DO NOT CHANGE THE FOLLOWING COMPONENTS AS THEY WILL NOT AFFECT GEAR RATTLE.
    - Release Bearing
    - Hydraulic Clutch Linkage Assembly
    - Clutch Cover Assembly (Pressure Plate)
  - b. If the noise doesn't disappear, then the source of the noise is likely to be engine related.
    - Look for any holes in the front-of-dash which may not be properly sealed. This could result in additional engine compartment noise passing into the passenger compartment.

#### Drive "Rattle"

A customer noise comment of drive rattle must be verified by duplicating the driving condition (acceleration, deceleration, road load, grade) and gear at which the noise is heard. Drive "rattle" will generally disappear as the vehicle engine speed approaches 1800 to 2200 RPM in each gear.

Once the noise has been determined to be drive "rattle" then use the above statements in section (a) of step (2) as guidelines for addressing the condition (also see IMPORTANT).

If the noise is not transmission related, use section (b) of step (2).

Technical Service Bulletin # **649601**

Date: **970101**

## Compact Disc Players - CD Changer Loading Procedures

File In Section: 9 - Accessories

Bulletin No.: 64-96-01

Date: January, 1997

### INFORMATION

Subject:

Compact Disc Players - Procedures for Correct Use and Maintenance

Models:

1997 and Prior Passenger Cars and Trucks



## CD Changer Loading Procedures

Because of differences in CD changer loading procedures, some confusion exists regarding this issue. Although correct loading procedures are included with each changer's Owner's Manual, often this information is not available to the dealer service personnel.

Verify proper loading when evaluating customer concerns of "CD inoperative".

Delco Electronics Product Type	Loading Procedure
--------------------------------	-------------------

Radio w/intergral CD	label side up
6 disc changer (LLAI)	label side up
10 disc changer (FMI)	label side up
12 disc changer (LLAI)	label side down

### **Important:**

Failure to load magazine/player correctly will disable the operation.

### **Important:**

Only the 12 disc changer is to be loaded with the label side down.

## CD Cleaners

Avoid use of commercially available CD cleaners.

The use of CD cleaners is not recommended and can damage the player's CD mechanism.

Technical Service Bulletin # **83-81-34**

Date: **990301**

## **SIR - Operating Vehicle with Warning Light On**

File In Section: 8 - Chassis/Body Electrical

Bulletin No.: 83-81-34

Date: March, 1999

### INFORMATION

Subject:

Operating Vehicle with Supplemental Inflatable Restraint (SIR) Warning Light Illuminated

Models:

1999 and Prior Passenger Cars and Light Duty Trucks with SDM Controlled Air Bag System

The AIR BAG warning light is the key to driver notification of Supplemental Inflatable Restraint (SIR) system malfunctions. When the warning light remains illuminated or continues to flash, one or more of the following conditions may occur if vehicle operation is continued.

- ^ Non-deployment of the air bags in the event of a crash.
- ^ Deployment of the air bags without a crash.
- ^ Deployment of the air bags in crashes less severe than intended.

If an AIR BAG warning light is illuminated or flashing, you should advise the customer of these possibilities and that the vehicle should be serviced right away. Technical Service Bulletin # **882696E**

Date: **880601**

## **Engine - Rough/Unstable/Incorrect Idle**

Number: 88-269-6E

Section: 6E

Date: JUNE, 1988

Subject:

SERVICE MANUAL UPDATE ROUGH, UNSTABLE OR INCORRECT IDLE

Model and Year: 1981-88 CHEVROLET PASSENGER CARS AND LIGHT DUTY TRUCKS

TO: ALL CHEVROLET DEALERS

When diagnosing Rough, Unstable, or Incorrect Idle, make sure to check the motor mounts for damage, grounding out on the frame, or mispositioned, etc.

## **A/T - Updated ATF Fluid Color/Level Check Information**

Number: 89-234-7A

Section: 7A

Date: August 1989

Corporate Bulletin No.: 977126

Subject:  
AUTOMATIC TRANSMISSION/TRANSAXLE FLUID COLOR/LEVEL CHECK INFORMATION

Model and Year:  
1987-89 PASSENGER CARS AND TRUCKS WITH AUTOMATIC TRANSMISSIONS

TO:  
ALL CHEVROLET DEALERS

THE INFORMATION PROVIDED IN THIS BULLETIN SUPERSEDES THE PUBLISHED INFORMATION PERTAINING TO AUTOMATIC TRANSMISSIONS COVERED ON PAGES 3 AND 4 OF DEALER SERVICE BULLETIN 89-145-08 DATED MAY 1989. PLEASE MARK YOUR COPIES OF 89-145-08 TO INDICATE THE INFORMATION CONTAINED IN THIS BULLETIN.

This bulletin provides Service Manual updates for Transmission/Transaxle fluid level and condition information. This information is updated for 1989 service manuals printed prior to June 1989.

### **TRANSMISSION/TRANSAXLE FLUID LEVEL INFORMATION:**

Checking fluid level and condition (color and odor) at regular intervals will provide early diagnosis information about the transmission. This information may then be used to correct a condition that, if not detected early, could result in major transmission repairs.

When adding or changing fluid, use only DEXRONR II. Refer to Maintenance and Lubrication (Service Manual Section OB) for maintenance information and servicing intervals.

**NOTICE:**  
Do not overfill. Overfilling will cause foaming, loss of fluid, shift complaints and possible damage to transmission.

^ Fluid level should only be checked when it reaches a normal operating temperature of 82-93C (180-200F). This temperature is reached after approximately 24 km (15 miles) of driving.

^ Fluid color will be red when new.

**IMPORTANT:**  
When new, automatic transmission fluid is red in color. The red dye is added so the assembly plant can identify as transmission fluid and distinguish it from engine oil or anti-freeze. The red dye is not an indicator of fluid quality and is not permanent. As the vehicle is driven, the transmission fluid will begin to look darker in color. The color may eventually appear light brown. A dark brown color along with a burnt odor may indicate excessive fluid deterioration and signal a need for fluid change.

### **TRANSMISSION/TRANSAXLE FLUID CHECKING PROCEDURE:**

1. Start engine and drive vehicle for a minimum of 24 km (15 miles), or until normal operating temperature is reached.

**NOTICE:**  
The automatic transmission fluid level must be checked with the vehicle at normal operating temperature, 82-93C (180-200F). Temperature will greatly affect transmission fluid level. If the vehicle is not at normal operating temperature and the proper checking procedures are not followed, the result could be a false reading of the fluid level indicator and an incorrect adjustment of the fluid level.

2. Park vehicle on level ground.

3. Move gear selector to "PARK".

4. Apply parking brake and block wheels.

5. Let vehicle idle for 3 minutes with accessories off.

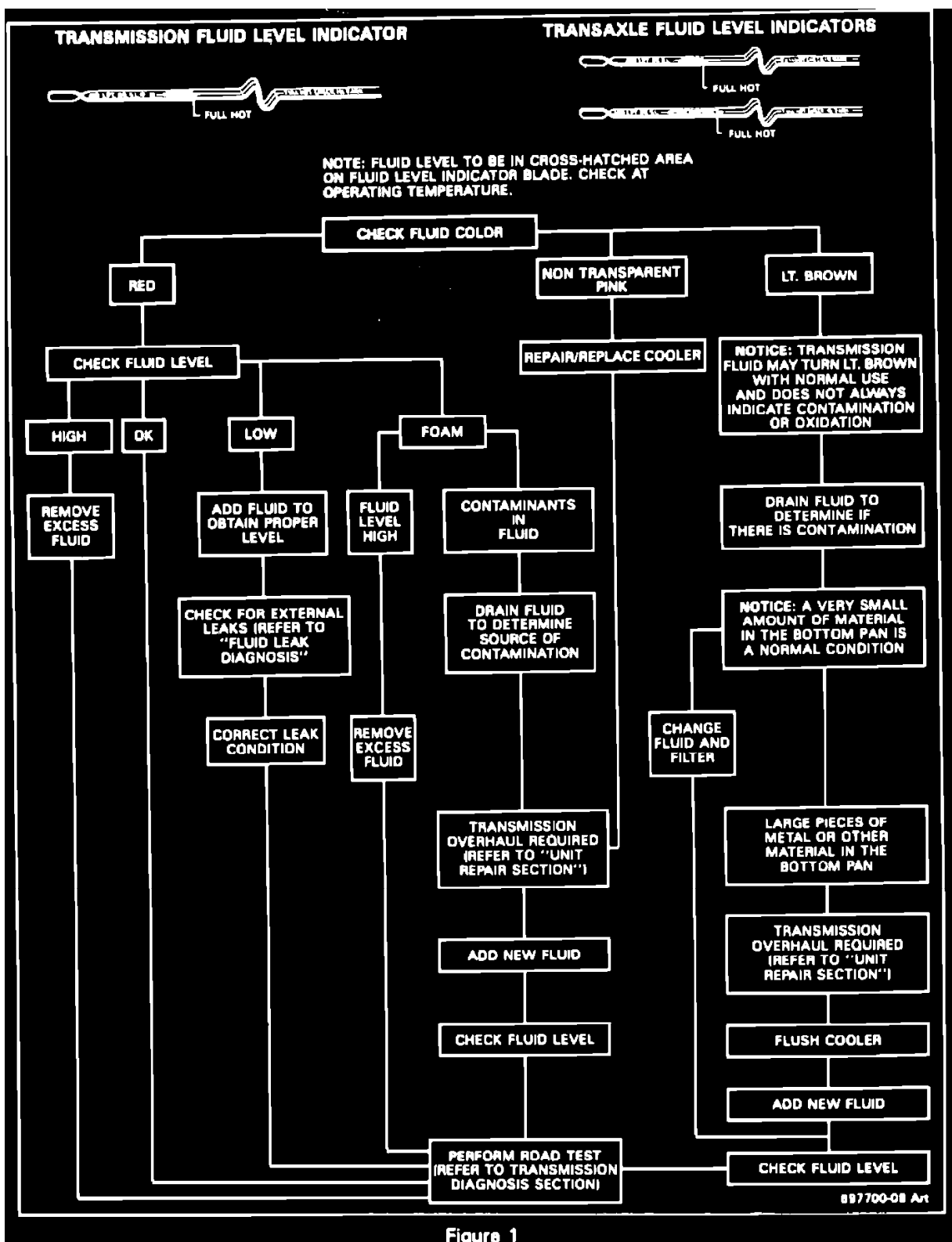


Figure 1

6. Check fluid level, color and condition (refer to Figure 1).

^ Inaccurate fluid level readings will result if the fluid is checked immediately after the vehicle has been operated under certain conditions:

- In high ambient temperature above 32C (90F).
- At sustained high speeds.
- In heavy city traffic during hot weather.
- As a towing vehicle.
- In commercial service (taxi or police use).

^ If the vehicle has been operated under these conditions, shut the engine off and allow the vehicle to "cool" for thirty (30) minutes. After the cooldown period, restart the vehicle and continue from step "2" above.

Technical Service Bulletin # **884007A**

Date: **890401**

## **A/T - Paint Flakes In Fluid**

Number: 88-400-7A

Section: 7A

Date: APRIL, 1989

Subject: EVIDENCE OF PAINT FLAKES IN TRANSMISSION FLUID

Model and Year: 1988 PASSENGER CARS WITH AUTOMATIC TRANSAXLES

TO: ALL CHEVROLET DEALERS

Black paint flakes may be found in the transaxle fluid, bottom pan, fluid level indicator and filter assembly as the result of paint peeling from inside the transaxle fill tube. After the paint peels the unprotected areas of the fill tubes can corrode (interior and exterior), leaving corrosion on the fluid level indicator and the fill tube.

The fill tube paints used on the interior and exterior of the tube may not withstand temperatures over 260 degrees Fahrenheit. Transaxle durability should not be affected in vehicles equipped with these fill tubes, but paint flakes can cause filter clogging over a period of time.

DATE OF PRODUCTION CHANGE:

The suspect fill tubes may be found in vehicles produced between October 17, 1987 (Julian Date 289) through June 30, 1988 (Julian Date 184).

SERVICE ACTION:

If vehicles are found with flaking paint fill tubes they should be changed along with Transaxle Fluid, Filter and Fluid Level Indicator.

Labor Operation Number: T5181

Labor Time: .9

SERVICE MANUAL REFERENCE:

Refer to the On-Car Section of your Service Manual whenever service of the Fluid Level Indicator and Fill Tube is necessary.

Technical Service Bulletin # **88417A**

Date: **870801**

## **A/T - Proper Fluid Level Checking Procedure**

Number: 88-41

Section: 7A

Date: AUG., 1987

Subject: PROPER TRANSMISSION FLUID LEVEL  
CHECKING PROCEDURE

Model and Year: 1987-88 CHEVROLET VEHICLES WITH

THM 125C, 200-4R, 400, 440-T4, AND 700-R4 TRANSMISSIONS

TO: ALL CHEVROLET DEALERS

This bulletin outlines proper hot and cold fluid level checking procedures for the transmissions and transaxles listed above.

### **A. "COLD" CHECK PROCEDURE:**

1. Start vehicle and let idle in Park for 3 minutes.

Note for THM 440-T4: Start vehicle and cycle range selector through 1, 2, D, OD, and R for approximately 3 seconds in each range. Complete check preparation by letting vehicle idle in Park for 3 minutes.

2. With vehicle level, accessories turned off, and engine idling in Park, check fluid level as outlined below.

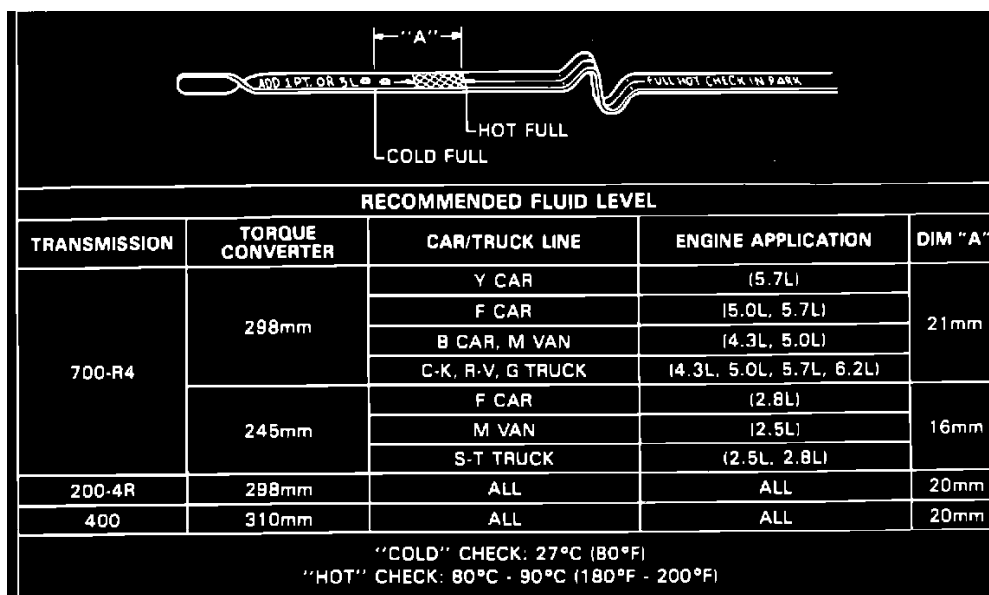


FIGURE 1

^ THM 200-4R, 400, 700-R4 (Refer to Figure 1):

When cold, 27 Degrees C (80 Degrees F), a full transmission will show the fluid level below the "Add" mark on the indicator. As the transmission warms to normal operating temperature, the fluid expands, raising the level to within the cross-hatched area.

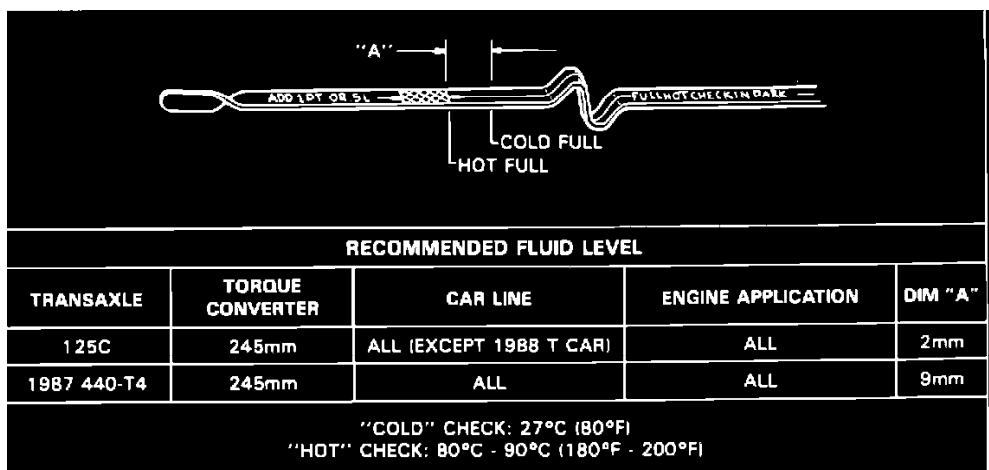


FIGURE 2

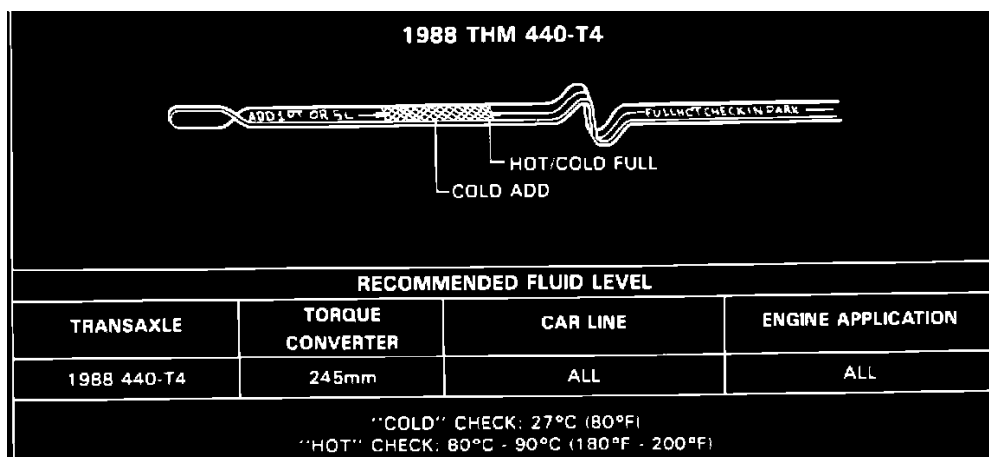


FIGURE 3

^ THM 125C, 440-T4 (Refer to Figures 2 and 3):

When cold, 27 Degrees C (80 Degrees F), a full transaxle will show the fluid level to be above the "Full Hot" mark. This is a result of fluid stored in the bottom pan when cold. As the transaxle warms to normal operating temperature, fluid is captured in the side pan, lowering the fluid level to within the cross-hatched area.

The "cold" check procedure cannot take the place of a "hot check. The "cold" check will let the technician know there is enough fluid to perform a Preliminary check Procedure, an accurate road test, and allow normal operating temperature to be obtained prior to the necessary "hot" check.

**B. "HOT" CHECK PROCEDURE:**

1. Drive vehicle in all ranges to attain a fluid temperature of 80 to 90 Degrees C (180 to 200 Degrees F).
2. Idle at normal idle speed in Park for 3 minutes.
3. With vehicle level, accessories turned off, and engine idling in Park, check fluid level.
4. Fluid level should be within the cross-hatched area. (Read front and back, use the lowest level.)

Technical Service Bulletin # **570201**

Date: **950301**

**A/T - DEXRON III Fluid Introduction**

File In Section: 0 - General Information

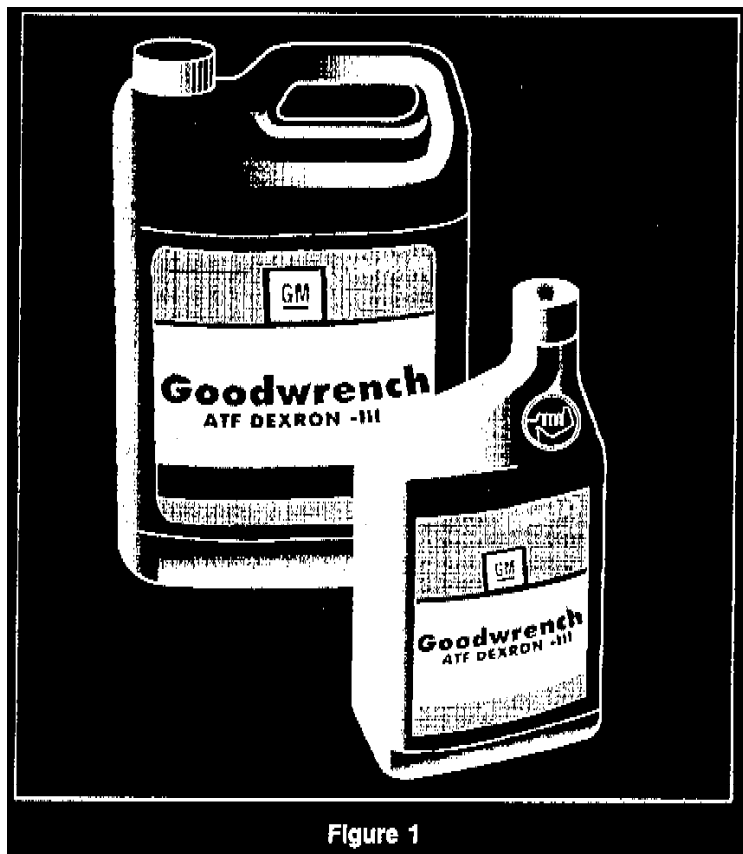
Bulletin No.: 57-02-01

Date: March, 1995

**SERVICE MANUAL UPDATE**

Subject:  
Section 0 - General Information - DEXRON(R)-III Transmission Fluid Introduction

Models:  
1995 and Prior Passenger Cars and Trucks



**Figure 1**

General Motors has phased in a new automatic transmission fluid, DEXRON(R)-III, that does not need replacing under normal service. DEXRON(R)-III is designed to help the transmission deliver the best possible performance under all conditions. Refer to Figure 1.

The improvements in DEXRON(R)-III include better friction stability, more high temperature oxidation stability and better material compatibility. DEXRON(R)-III has the same low temperature fluidity as DEXRON(R)-III, for better transmission performance in cold weather.

DEXRON(R)-III and DEXRON(R)-III are fully compatible.

DEXRON(R)-III is fully compatible with any General Motors passenger vehicle or light truck with automatic transmission and built since 1949.

Dealers should require their supplier to include the DEXRON(R)-III license number on all automatic transmission fluid invoices.

Starting February 1, 1994 DEXRON(R)-III was phased into all North American assembly plants.

DEXRON(R)-III fluid is available from GMSPO (see fluid numbers below):

U.S.

1 Quart	12346143
1 Gallon	12346144
55 Gallon	12346145

In Canada

1 Liter	10952622
4 Liter	10952623
200 Liter	10952624

The 1995 Automatic Transmission/Transaxle fluid change intervals are the following:

(1994 and prior should use the schedules as written in the Owner's Manual.)

If the vehicle is mainly driven under one or more of these conditions:

In heavy city traffic where the outside temperature regularly reaches 90°F (32°C) or higher.

In hilly or mountainous terrain.

When doing frequent trailer towing.

Uses such as found in taxi, police car or delivery service.

Change the fluid and filter every 50,000 miles (63,000 km).

If the vehicle is not used mainly under any of these conditions, the fluid and filter do not require periodic changing for vehicles under 8,600 GVWR.

Vehicles over 8,600 GVWR change the fluid and filter every 50,000 miles (83,000 km) regardless of driving conditions.

Technical Service Bulletin # **04-07-30-037B**

Date: **060612**

## **A/T - DEXRON(R) VI Fluid Availability**

Bulletin No.: 04-07-30-037B

Date: June 12, 2006

### **INFORMATION**

Subject:

Release of DEXRON(R) VI Automatic Transmission Fluid (ATF)

Models:

2007 and Prior Passenger Cars and Light Duty Trucks

2003-2007 HUMMER H2

2006-2007 HUMMER H3

2005-2007 Saturn Relay

2005 and Prior Saturn L-Series

2005-2007 Saturn ION

2005-2007 Saturn VUE with 4T45-E

2005-2007 Saab 9-7X

Except 2007 and Prior Chevrolet Aveo, Epica, Equinox, Optra

Except 2007 and Prior Pontiac Torrent, Vibe, Wave

Except 2003-2005 Saturn ION with CVT or AF23 Only

Except 1991-2002 Saturn S-Series

Except 2007 and Prior Saturn VUE with CVT, AF33 or 5AT (MJ7/MJ8) Transmission Only

Supercede:

This bulletin is being updated with the 2007 model year. Please discard Corporate Bulletin Number 04-07-30-037A (Section 07 - Transmission/Transaxle).

## DEXRON(R)-VI ATF

General Motors Powertrain has recently upgraded to DEXRON(R)-VI ATF with the start of 2006 vehicle production.

Only 2005 and prior models that currently use DEXRON(R)-III may use DEXRON(R)-VI as a replacement.

All 2006 and future models that use DEXRON(R)-VI are to be serviced with DEXRON(R)-VI fluid only.

DEXRON®-VI	
Extended Factory Fill For Life	160,000 km (100,000 mi) For Cars and Light Duty Trucks* 80,000 km (50,000 mi) (Severe Use) For Cars and Light Duty Trucks*
Clutch Friction Stability	Improved 100%
Clutch Durability Due To Fluid	Improved 120%
Oil Film Thickness	Increased 20%
Fluid Oxidation	Improved 100%
Foam/Aeration	Improved 150%
Shear Stability	Improved 200%
* These ATF change intervals remain the same as DEXRON®-III for the time being.	

DEXRON(R)-VI is an improvement over DEXRON(R)-III in the areas shown.

## 2006-2007 Transmission Fill and Cooler Flushing

Some new applications of the 6L80 six speed transmission will require the use of J 45096 - Flushing and Flow Tester to accomplish transmission fluid fill. It is highly recommended that the clean oil reserve of the machine be purged of DEXRON(R)-III and filled with DEXRON(R)-VI.

Part Number	Description
88861003 (US)	DEXRON®-VI Auto Trans Fluid (1 qt bottle)
88861045 (US)	DEXRON®-VI Auto Trans Fluid (1 gal bottle)
88861046 (US)	DEXRON®-VI Auto Trans Fluid (55 gal drum)
88861004 (Canada)	DEXRON®-VI Auto Trans Fluid (1L bottle)
88861043 (Canada)	DEXRON®-VI Auto Trans Fluid (4L bottle)
88861044 (Canada)	DEXRON®-VI Auto Trans Fluid (205L drum)

## Parts Information



GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



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Technical Service Bulletin # **931638A**

Date: **930501**

## Isolation Diodes - Replacement Information

Number: 93-163-8A

Section: 8A

Date: MAY 1993

Corporate Bulletin No.: 178201R

ASE No.: A6

Subject:

ISOLATION DIODES REPLACEMENT INFORMATION

Model and Year:

1993 AND PRIOR YEAR PASSENGER CARS AND TRUCKS

THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN NO. 92-47-8A, DATED NOV. 1991. THE 1993 MODEL YEAR HAS BEEN ADDED AS WELL AS PART NUMBERS HAVE BEEN REVISED. THIS WILL ALSO UPDATE CERTAIN SERVICE MANUALS. ALL COPIES OF 92-47-8A SHOULD BE DISCARDED.

Many of the electrical systems on our vehicles use a diode to isolate certain circuits and protect them from voltage spikes. Some of the circuits which may use such a diode are listed below:

A/C Compressor Clutch

ABS/4WAL

**NOTE:**

The ABS diode on the Delco Moraine system is hidden inside of an electrical connector under the carpet at the right kick panel.

Wiper

Charging System (hidden in wire harness)

Parking Brake (vehicles with ABS)

Relays

Solenoids

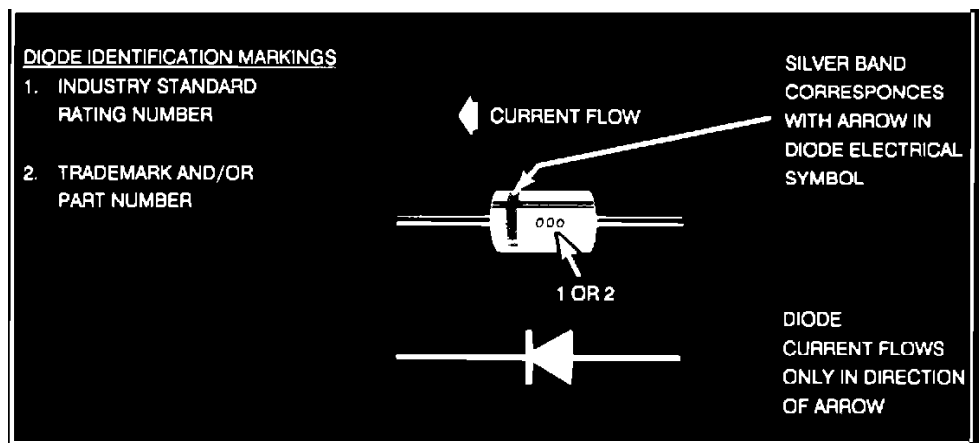
Diesel Glow Plug Circuit

Day Time Running Lights

Obtaining replacement diodes can sometimes be a problem. A universal diode, that meets the specifications in the chart below, may be used for the applications listed above. Since certain diode applications have specific part numbers, always reference the applicable GM parts catalogue before installing one of the universal diodes listed in this bulletin.

When installing the new diode, use the following procedures to obtain a lasting repair:

1. If the diode is taped to the harness, remove all of the tape.
2. Paying attention to current flow direction, remove inoperative diode from the harness with a suitable soldering tool. If the diode is located next to a connector terminal, remove the terminal(s) from the connector to prevent damage from the soldering tool.
3. Carefully strip away a section of insulation next to the old soldered portion of the wire(s). Do not remove any more than is needed to attach the new diode.



4. Check current flow direction of the new diode, being sure to install the diode with correct bias. Reference the appropriate service manual wiring schematic to obtain the correct diode installation position. Reference Figure 1 for replacement diode symbols and current flow explanations.
- Attach the new diode to the wire(s) using 60/40 rosin core solder. Use a heat sink (aluminum alligator clip) attached across the diode wire ends to protect the diode from excess heat. Follow the manufacturers instructions for the solderin equipment you are using.
5. Install terminal(s) into the connector body if previously removed in step number 2.
6. Tape the diode to the harness or connector using electrical tape. To prevent shorts to ground and water intrusion completely cover all exposed wire and diode attachment points.

Diode Brand	Rating Number	Part #	Comments
GMSPPO Radio Shack	1N4004	12112421 276-1103	1 amp, 400 PIV - All applications except A/C compressor clutch
GMSPPO Radio Shack	1N5404 276-1144	*12112422	3 amp, 400 PIV - A/C compressor clutch application
*This part number will be available May 10, 1993. GM parts are currently available from GMSPPO.			

**NOTE:**

A universal diode with a 3 amp, 400 PIV (Peak Inverse Voltage) rating can be used in all of the previously mentioned applications.

The following 1993 Service Manuals will need to be updated with the correct part numbers and rating changes.

Carline	Page
All J, L, W, and UO	8A-5-12

Heat sink, part number 276-1567, can be obtained from Radio Shack.

We believe the diodes and heat sink listed in this article as well as their manufacturer to be reliable. There may be additional manufacturers or equivalent products. General Motors does not endorse, indicate any preference for or assume any responsibility for the products from these firms or for any such items which may be available from other sources.

Technical Service Bulletin # **446501**

Date: **941001**

**PROM/MEMCAL - Identification Marks**

File In Section: 6E - Engine Fuel & Emission

Bulletin No.: 44-65-01

Date: October, 1994

Subject:  
New PROM/MEMCAL Identification Markings

Models:  
1995 and Prior Passenger Cars and Trucks

**Note:**

For the purposes of this document, the terms PROM and MEMCAL will be used interchangeably.

To simplify identification of service PROMs, a new external marking format will be implemented. Parts manufactured after Sept. 1994 will feature these new markings. This change will place the full 8-digit service part number on the PROM, in place of the old 4-digit "EXTERNAL ID" number. In the past, parts and service personnel could not identify a PROM without using a cross-reference table that matched external IDs and service numbers. In the future, the cross-reference table will not be required for PROMs; parts will be ordered directly from the number appearing on the PROM. However, the label will retain the broadcast code alpha characters to allow continued use of cross-reference charts, if so desired.

Line	Label Markings	Explanation
1	"DELCO"	Identifies Delco as manufacturer
2	"ARCL"	BROAD CAST CODE part identifier
3	"4625"	"EXTERNAL ID" number

Old Marking Format:

Line	Label Markings	Explanation
1	"ARCL"	BROAD CAST CODE part identifier
2	"1613"	First four digits of 8-digit part number
3	"4624"	Last four digits of 8-digit part number

New Marking Format:

^ Ordering the above PROM from the old marking format would require using a cross-reference chart to determine a service part number, based on the BROAD CAST CODE and EXTERNAL ID NUMBERS.

^ To order from the new format, simply combine the 2nd and 3rd lines to form an 8-digit part number that can be directly ordered from SPO (number 16134624 in the above example).

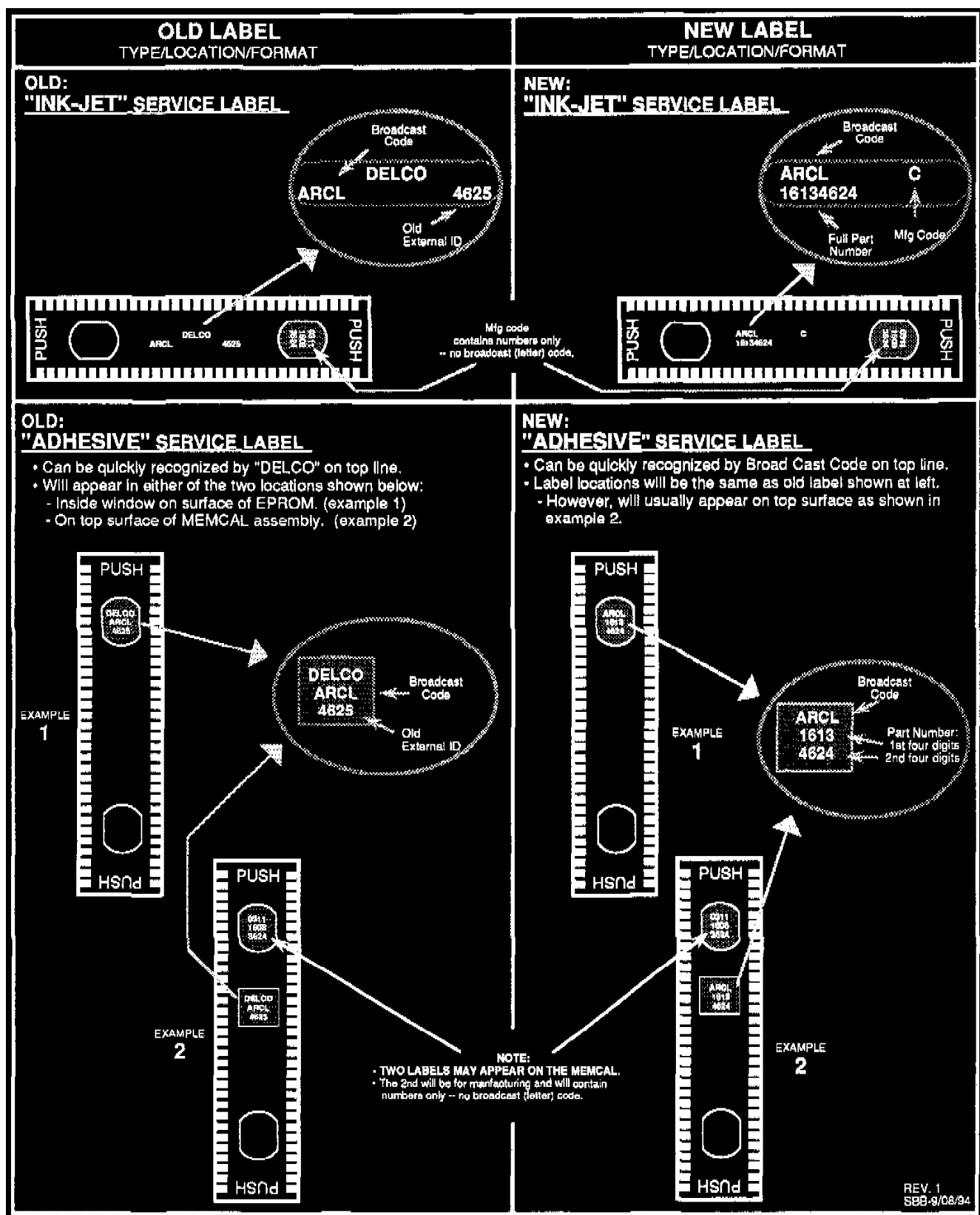
As these changes are phased into the parts inventory, it should be noted that dealers will continue to see parts with both formats for some time in the future. This is because:

^ Millions of vehicles have already been built with the old format.

^ SPO has existing stock of MEMCALs and PROMs with the old format.

^ PROMS with 7-digit part numbers (representing less than 10% of current part numbers) will continue to use the old format. The 7-digit part numbers are easily identified because they always begin with "122xxxx".

Due to manufacturing processes, more than one 8-digit part number may appear on a MEMCAL. In this event, service personnel should use the label on the exterior cover of the MEMCAL assembly. To avoid confusion, only the service label will include the BROAD CAST CODE, consisting of letter characters (I.E., ARCL).



## CHANGES TO MEMCAL/PROM LABELING FORMATS

^ MEMCALs may use either INK-JET or ADHESIVE labels, as shown.

^ PROMs will always use ADHESIVE labels with the same format as shown for MEMCALs. These changes will become effective on parts manufactured after 10/94. Technical Service Bulletin # 99-08-49-006

Date: 990401

## Instrument Panel - Upper Surface Reflection

File In Section: 08 - Body and Accessories

Bulletin No.: 99-08-49-006

Date: April, 1999

## **INFORMATION**

Subject:  
Cleaning of Upper Instrument Panel Surfaces

Models:  
1999 and Prior Passenger Cars and Light Duty Trucks

Comments on a reflection of the upper instrument panel pad into the windshield, when driving in direct sunlight, may be received. This condition, sometimes referred to as a "veiling reflection", may be aggravated by the use of wax or silicone based products when cleaning the surface.

Advise customers, technicians and new car prep or make ready personnel, that products containing wax or silicone should not be used to clean the top instrument panel pad. A warm water and mild soap solution such as saddle soap, oil soap or an equivalent, should be used whenever the top instrument panel pad needs cleaning.

If a customer requests that a protectant type product be applied, **ONLY USE THOSE THAT LEAVE A FLAT OR SATIN FINISH.** Do NOT apply products that leave a glossy finish or those that increase the shine level above the original production level. **Technical Service Bulletin # 912850A** **Date: 910401**

## **Instrument Panel - Upper Surface Cleaning**

Number: 91-285-0A

Section: 0A

Date: APRIL 1991

Corporate Bulletin No.: 101003

Subject:  
CLEANING OF UPPER INSTRUMENT PANEL SURFACES

Model and Year:  
ALL PASSENGER CARS AND TRUCKS ALL YEARS

Comments on reflection into the windshield of the upper instrument panel may be received. The condition of instrument panel reflection into the windshield in direct sunlight may be aggravated by dealers and owners applying a wax or silicone base material to the pad surface. The higher gloss of such application results in a "veiling reflection" in the windshield.

Advise customers and new car make ready area that materials containing wax or silicone should not be used to clean the instrument panel pad. A warm water and mild soap solution such as saddle soap, oil soap, or an equivalent should be used whenever the instrument panel pad needs cleaning.

Technical Service Bulletin # **00-00-90-001**

Date: **001101**

## **Suspension - Chassis Lubrication Importance**

File In Section: 00 - General Information

Bulletin No: 00-00-90-001

Date: November, 2000

## **INFORMATION**

Subject:  
The Importance of Chassis Lubrication

Models:  
2001 and Prior Passenger Cars and Trucks

An Explanation of Required Lubrication

It is important to note that many General Motors trucks and sport utility vehicles do not have the "lubed for life" suspension systems that are becoming common on the passenger cars. It is vital to the longevity of the suspension components that proper lubrication be received at the specified intervals. Extra attention should be given to the ball joints to assure they receive regular greasing.

A Visual Inspection is Not Enough

Many combinations of grease fittings and sealed components may be found on the chassis of General Motors vehicles. The lubrication required for

each vehicle can be located in the Maintenance and Lubrication sub-section of General Information in the Service Manual. This section outlines all lubrication required for the vehicle and also provides chassis diagrams of grease points. Please refer to the maintenance schedule for the recommended service intervals.

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



WE SUPPORT  
VOLUNTARY  
TECHNICIAN  
CERTIFICATION

Disclaimer Technical Service Bulletin # **149301**

Date: **940701**

## **Electrical - New Nickel Tape Shields Harnesses**

Group Ref.: 9 - Accessories

Bulletin No.: 149301

Date: July, 1994

### **INFORMATION**

**SUBJECT:**  
RELEASE OF SERVICE PACKAGE FOR NICKEL TAPE

**MODELS:**  
1994 AND PRIOR PASSENGER CARS AND TRUCKS

A service package is now available through SPO for adhesive back nickel tape (service P/N 1229335), it comes in a roll.

The purpose of this tape is to shield or suppress wiring harnesses and components from EMI/RFI disturbances that affect the electrical functions in the vehicle.

The primary use of this type of tape is for shielding or suppression of magnetic fields which are usually associated with high current devices: such as generator, ignition module, lighting and injectors.

**NOTE:**  
This tape is equally effective in the shielding and suppression of radiated interferences.

**APPLICATION:**  
The tape is generally wrapped around the suspect harness or component and electrically connected to a chassis ground by attaching a braided ground strap to the tape and then to the chassis.

Technical Service Bulletin # **83-90-08**

Date: **980601**

## **Cruise Control - (W/Electro Stepper Mtr.) Diagnostics**

File In Section: 9 Accessories

Bulletin No.: 83-90-08

Date: June, 1998

### **INFORMATION**

**Subject:**  
New Tool J 42958, Revised Charts and Schematics for Cruise Control Diagnosis

**Models:**  
1988-98 Passenger Cars and Trucks with Electro-Motor (Stepper Motor) Cruise Control Systems

A new Cruise Control Tester, J 42958, has been sent to all dealers as part of the 1998 Essential Tool Package. This tool will work on all Stepper Motor Cruise Control systems for past model years.

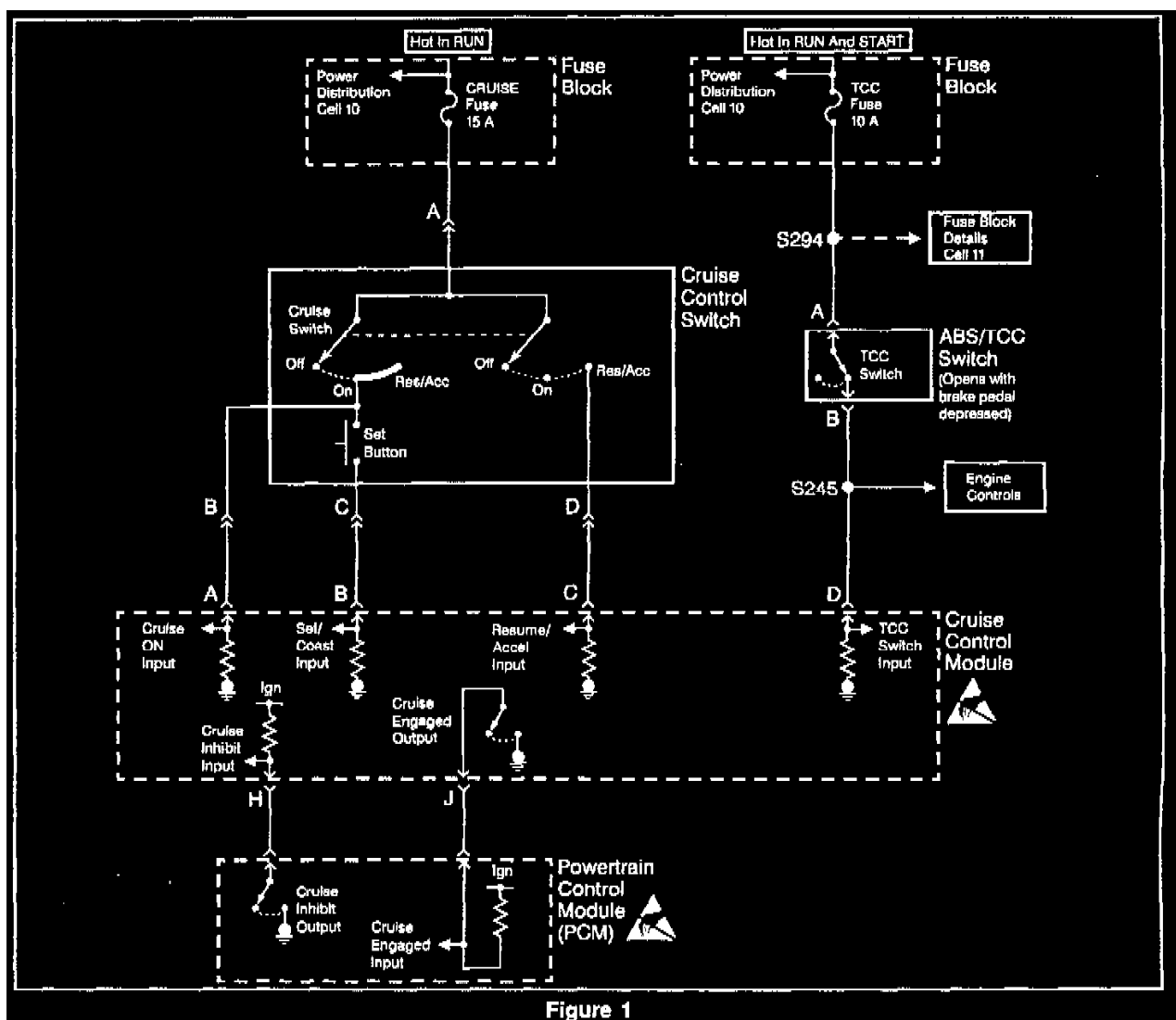


Figure 1

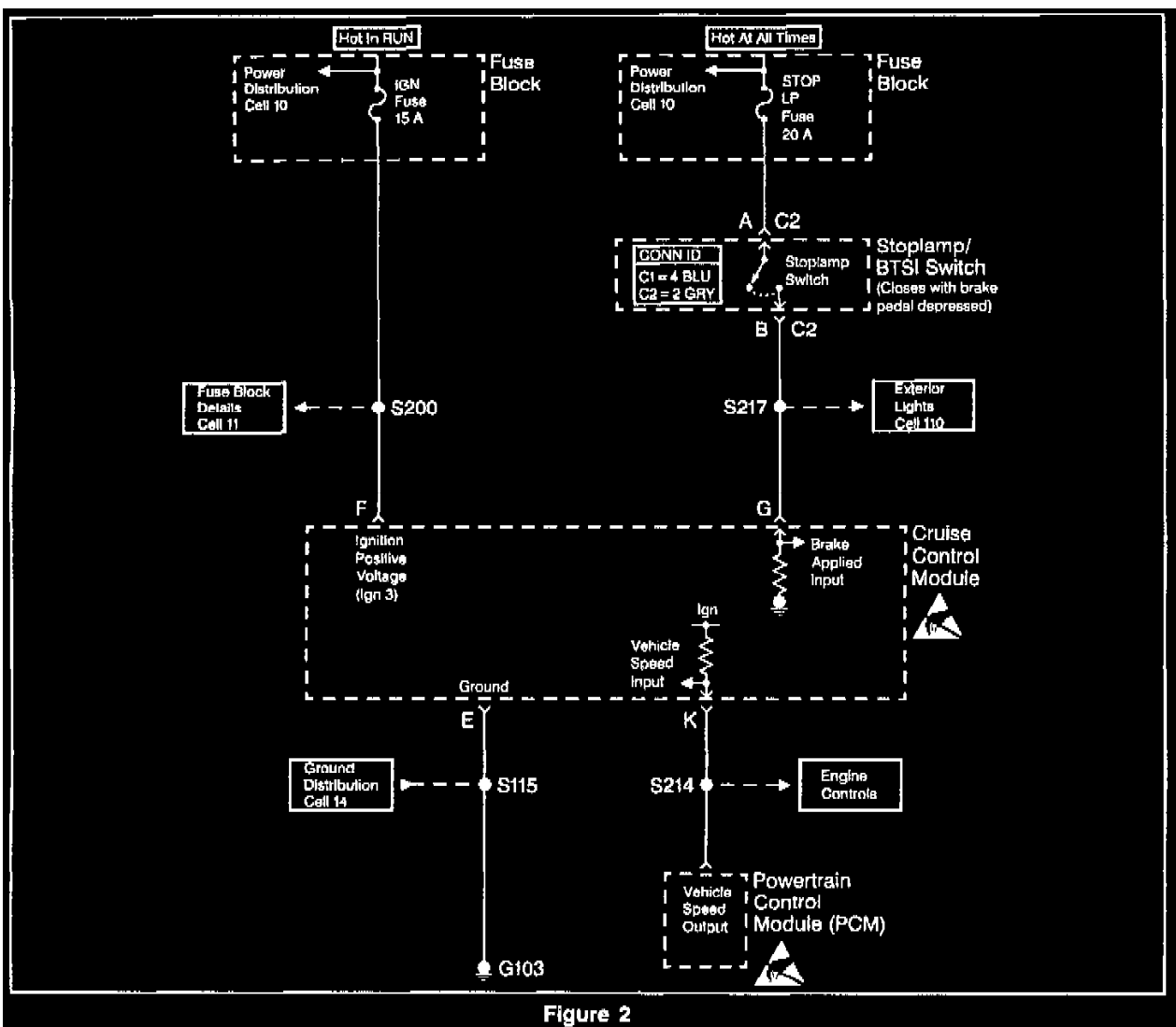


Figure 2



Step	Action	Value(s)	Yes	No
<b>Tools Required:</b> <ul style="list-style-type: none"> <li>• Test Light</li> <li>• J42958 Cruise Control Tester</li> <li>• J39200 DMM</li> <li>• Scan Tool</li> </ul>				
1	Was the Cruise Control System Check performed?	-	Go to Step 2	Go to Cruise Control System Check
2	1. Connect a scan tool. 2. Turn the ignition switch to the ON position. 3. Inspect for PCM DTCs.  Are there any DTCs found?	-	Refer to the Powertrain OBD System Check in Engine Controls	Go to Step 3
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the cruise control module connector. 3. Connect the J 42958 as specified in the user manual. 4. Turn the ignition switch to the ON position. 5. Place the cruise switch in the OFF position.  Are the BRAKE and IGNITION lamps illuminated on the J 42958?	-	Go to Step 5	Go to Step 4
4	Inspect the cruise fuse for an open.  Is the cruise fuse open?	-	Go to Step 36	Go to Step 18
5	Place the cruise control switch in the ON position.  Are the ON/OFF, BRAKE, IGNITION and CRUISE lamps illuminated on the J 42958?	-	Go to Step 6	Go to Step 20
6	Press and hold the set/coast (S/C) switch.  Does the SET/COAST lamp illuminate on the J 42958?	-	Go to Step 7	Go to Step 23
7	Press and hold the res/acc (R/A) switch.  Does the RES/ACC lamp illuminate on the J 42958?	-	Go to Step 8	Go to Step 25
8	Press and hold the brake pedal.  Do the BRAKE LIGHTS lamp illuminate and the BRAKE	-	Go to Step 9	Go to Step 27

Step	Action	Value(s)	Yes	No
	lamp turn off on the J 42958?			
9	<ol style="list-style-type: none"> <li>1. Turn the ignition switch to the OFF position.</li> <li>2. Disconnect the J 42958.</li> <li>3. Leave the cruise control module connector disconnected.</li> <li>4. Using the J 39200, set to AC voltage and on the Hz scale, connect the cruise control module harness connector terminals K and E.</li> <li>5. Turn the ignition switch to the ON position.</li> <li>6. Raise and suitably support the vehicle.</li> <li>7. Inspect the vehicle speed on the scan tool and inspect the J 39200 while rotating one of the vehicle drive wheels.</li> </ol> <p>Is the frequency within the specified value?</p>	1.11 Hz/mph	Go to Step 10	Refer to the Powertrain OBD System Check in Engine Controls
10	<ol style="list-style-type: none"> <li>1. Lower the vehicle.</li> <li>2. Disconnect the J 39200.</li> </ol> <p>Does the cruise control module harness connector cavity H have a wire in it?</p>	-	Go to Step 11	Go to Step 14
11	<ol style="list-style-type: none"> <li>1. Reconnect the cruise control module connector.</li> <li>2. Drive the vehicle above 40 km/h (25 mph).</li> <li>3. Make sure the cruise control switch is in the ON position.</li> <li>4. Press the S/C button on the cruise control switch.</li> <li>5. Inspect the cruise control status on the scan tool.</li> </ol> <p>Does the scan tool display Enabled/Uninhibited?</p>	-	Go to Step 12	Refer to the Powertrain OBD System Check in Engine Controls
12	<ol style="list-style-type: none"> <li>1. Turn the ignition switch to the OFF position.</li> <li>2. Disconnect the scan tool.</li> <li>3. Test the cruise enable/inhibit circuit for an open.</li> </ol> <p>Was an open found?</p>	-	Go to Step 48	Go to Step 13
13	<p>Test the cruise enable/inhibit circuit for short to voltage.</p> <p>Was a short to voltage found?</p>	-	Go to Step 49	Go to Step 14
14	<ol style="list-style-type: none"> <li>1. Turn the ignition switch to the OFF position.</li> <li>2. Reconnect the J 42958.</li> <li>3. Turn the ignition switch to the ON position.</li> <li>4. Press the INHIBIT OVERRIDE button on the J 42958.</li> <li>5. Press the S/C button on the J 42958.</li> </ol> <p>Does the CRUISE ENGAGE lamp illuminate on the J 42958 and the throttle strap extend from the cruise control module with each push of the S/C button?</p>	-	Go to Step 15	Go to Step 50
15	<p>Press the BRAKE button on the J 42958.</p> <p>Does the CRUISE ENGAGE lamp turn off on the J 42958 and the throttle strap extend fully from the cruise control module?</p>	-	Go to Step 16	Go to Step 50
16	<p>Press the R/A button on the J 42958 momentarily.</p> <p>Does the CRUISE ENGAGE lamp illuminate on the J 42958 and the throttle strap retract into the cruise control</p>	-	Go to Step 17	Go to Step 50

Step	Action	Value(s)	Yes	No
	module with each push of the R/A button?			
17	Press the SPD. UP button on the J 42958 momentarily.  Does the CRUISE ENGAGE lamp remain illuminated on the J 42958 and the throttle strap extend fully from the cruise control module and then retract to it's previous position?	-	Refer to Cruise Control Cable Adjustment	Go to Step 50
18	1. Disconnect the J 42958. 2. Using a test light, connect between the cruise control module connector terminal F and ground.  Does the test light illuminate?	-	Go to Step 19	Go to Step 37
19	Using a test light, connect between the cruise control module connector terminals E and F.  Does the test light illuminate?	-	Go to Step 50	Go to Step 38
20	1. Disconnect the J 42958. 2. Using a test light, connect between the cruise control module connector terminal A and ground.  Does the test light illuminate?	-	Go to Step 50	Go to Step 21
21	1. Disconnect the J 42958. 2. Using a test light, connect between the cruise control switch connector cruise on/off signal circuit terminal and ground.  Does the test light illuminate?	-	Go to Step 39	Go to Step 22
22	Using a test light, connect between the cruise control switch connector ignition voltage circuit terminal and ground.  Does the test light illuminate?	-	Go to Step 52	Go to Step 40
23	1. Disconnect the J 42958. 2. Using a test light, connect between the cruise control module connector terminal B and ground. 3. Press and hold the set/coast (S/C) switch.  Does the test light illuminate?	-	Go to Step 50	Go to Step 24
24	1. Using a test light, connect the between cruise control switch connector set/coast signal circuit terminal and ground. 2. Press and hold the set/coast (S/C) switch.  Does the test light illuminate?	-	Go to Step 41	Go to Step 52
25	1. Disconnect the J 42958. 2. Using a test light, connect between the cruise control module connector terminal C and ground. 3. Press and hold the res/acc (R/A) switch.  Does the test light illuminate?	-	Go to Step 50	Go to Step 26
26	1. Using a test light, connect between the cruise control switch connector res/acc signal circuit terminal and ground. 2. Press and hold the res/acc (R/A) switch.	-	Go to Step 42	Go to Step 52

Step	Action	Value(s)	Yes	No
	Does the test light illuminate?			
27	1. Disconnect the J 42958. 2. Using a test light, connect between the cruise control module connector terminal G and ground. 3. Press and hold the brake pedal.  Does the test light illuminate?	-	Go to Step 30	Go to Step 28
28	1. Using a test light, connect between the stoplamp switch connector output circuit terminal and ground. 2. Press and hold the brake pedal.  Does the test light illuminate?	-	Go to Step 43	Go to Step 29
29	Using a test light, connect between the stoplamp switch connector ignition voltage circuit terminal and ground.  Does the test light illuminate?	-	Go to Step 53	Go to Step 44
30	1. Release the brake pedal. 2. Using a test light, connect between the cruise control module connector terminal D and ground.  Does the test light illuminate?	-	Go to Step 50	Go to Step 31
31	Using a test light, connect between the brake pedal cruise control release switch connector output circuit terminal and ground.  Does the test light illuminate?	-	Go to Step 33	Go to Step 32
32	Using a test light, connect between the brake pedal cruise control release switch connector ignition voltage circuit terminal and ground.  Does the test light illuminate?	-	Go to Step 54	Go to Step 45
33	Is the vehicle equipped with a manual transmission?	-	Go to Step 34	Go to Step 46
34	Using a test light, connect between the clutch pedal cruise control release switch connector input circuit terminal and ground.  Does the test light illuminate?	-	Go to Step 35	Go to Step 47
35	Using a test light, connect between the clutch pedal cruise control release switch connector output circuit terminal and ground.  Does the test light illuminate?	-	Go to Step 46	Go to Step 55
36	Repair the short to ground in the ignition voltage circuit to the cruise control module terminal F and replace the cruise fuse.  Is the repair complete?	-	Go to Cruise Control System Check	-
37	Repair the open in the ignition voltage circuit to the cruise control module terminal F.  Is the repair complete?	-	Go to Cruise Control System Check	-
38	Repair the open in the ground circuit to the cruise control module terminal E.  Is the repair complete?	-	Go to Cruise Control System Check	-

Step	Action	Value(s)	Yes	No
39	Repair the open in the cruise on/off signal circuit to the cruise control module terminal A.  Is the repair complete?	-	Go to Cruise Control System Check	-
40	Repair the open in the ignition voltage circuit to the cruise control switch.  Is the repair complete?	-	Go to Cruise Control System Check	-
41	Repair the open in the set/coast signal circuit to the cruise control module terminal B.  Is the repair complete?	-	Go to Cruise Control System Check	-
42	Repair the open in the res/acc signal circuit to the cruise control module terminal C.  Is the repair complete?	-	Go to Cruise Control System Check	-
43	Repair the open in the stoplamp switch signal circuit to the cruise control module terminal G.  Is the repair complete?	-	Go to Cruise Control System Check	-
44	Repair the open in the ignition voltage circuit to the stoplamp switch.  Is the repair complete?	-	Go to Cruise Control System Check	-
45	Repair the open in the ignition voltage circuit to the brake pedal cruise control release switch.  Is the repair complete?	-	Go to Cruise Control System Check	-
46	Repair the open in the cruise release switch signal circuit to the cruise control module terminal D.  Is the repair complete?	-	Go to Cruise Control System Check	-
47	Repair the open in the cruise release switch signal circuit between the brake pedal and clutch pedal cruise release switches.  Is the repair complete?	-	Go to Cruise Control System Check	-
48	Repair the open in the cruise inhibit/enable signal circuit to the cruise control module terminal H.  Is the repair complete?	-	Go to Cruise Control System Check	-
49	Repair the short to voltage in the cruise inhibit/enable signal circuit to the cruise control module terminal H.  Is the repair complete?	-	Go to Cruise Control System Check	-
50	Inspect the cruise control module connector for poor terminal connections/terminal tension. Refer to Connector Repairs.  Did you find and correct the condition?	-	Go to Cruise Control System Check	Go to Step 51
51	Replace the cruise control module. Refer to Cruise Control Module Replacement.  Is the repair complete?	-	Go to Cruise Control System Check	-
52	Replace the cruise control switch. Refer to Cruise Switch	-	Go to Cruise	-

Step	Action	Value(s)	Yes	No
	Replacement. Is the repair complete?		Control System Check	
53	Replace the stoplamp switch. Refer to Stoplamp Switch replacement. Is the repair complete?	-	Go to Cruise Control System Check	-
54	Replace the brake pedal cruise control release switch. Refer to Brake Pedal Cruise Control Release Switch replacement. Is the repair complete?	-	Go to Cruise Control System Check	-
55	Replace the clutch pedal cruise control release switch. Refer to Clutch Pedal Cruise Control Release Switch replacement. Is the repair complete?	-	Go to Cruise Control System Check	-

The charts and schematics in this bulletin can be used in place of the diagnostic charts in previous Service Manuals when this new tool is used. These charts will be included in the 1999 Service Manuals.

### Cruise Control Inoperative

#### Important

To avoid misdiagnosis:

- ^ Check for proper operation of brake lamps.
- ^ Check throttle linkage for mechanical binding which could cause the system to malfunction
- ^ Check for stored Diagnostic Trouble Codes (DTCs) in the PCM. Refer to Powertrain OBD System Check in Engine Controls.

The PCM will inhibit cruise control:

- ^ When vehicle speed is less than 40 km/h (25 mph).
- ^ When PARK, REVERSE, NEUTRAL, or 1st gear is indicated by the Park/Neutral Position Switch,
- ^ When an over/undercharged battery condition exists.
- ^ With low engine RPM.
- ^ With high engine RPM (fuel cut-off). Refer to Powertrain Control Module Description in Engine Controls for additional information.

Technical Service Bulletin # **93316C**

Date: **921001**

## Fuels - Effect of Volatility on Driveability

Number: 93-31-6C

Section: 6C

Date: OCT. 1992

Corporate Bulletin No.: 249128R

ASE No.: A1, A8

Subject:

EFFECT OF FUEL VOLATILITY ON DRIVEABILITY CONDITIONS

Model and Year:

ALL MODEL YEARS, ALL PASSENGER CARS AND TRUCKS

THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN NO. 92-281-6C, DATED SEPT. 1992. THE 1993 MODEL YEAR HAS BEEN ADDED. ALL COPIES OF 92-281-6C SHOULD BE DISCARDED.

Recent changes in EPA regulations have effectively lowered the maximum allowable fuel volatility. Volatility, which can be defined as a gasoline's ability to change from a liquid to a vapor, directly affects the amount of evaporative emissions produced by the fuel. Higher volatility means that more unburned hydrocarbons will be released into the atmosphere. Unfortunately, reducing fuel volatility can cause problems during cold engine operation when low temperatures impede the fuel's ability to vaporize and burn.

Two terms are often used to describe volatility characteristics. These are:

- Distillation Curve

A graph showing the relationship between temperature and the percentage of fuel evaporated. The fuel components that boil at relatively low

temperatures (below about 90 degrees F) are known as the "light ends", and are essential for good cold engine performance. The "heavy ends", which begin to boil at about 300 degrees F, contain the most energy but are more difficult to burn. Laboratory analysis is usually required to determine the distillation curve of a gasoline sample.

- Reid Vapor Pressure (RVP)  
RVP is the pressure (psi) that vaporized fuel exerts within a sealed container as it is heated to 100 degrees F. The higher the RVP the higher the fuel volatility. While RVP is readily tested in the field, fuels of the same RVP can have different distillation curves and cold driveability characteristics.

Fuel volatility will vary depending on geographic location and time of year (fuel intended to be used in higher ambient conditions is formulated with less volatility). This can make cold driveability as big a problem during summer months as during the winter. There may be additional variation in the volatility characteristics of pump gasoline, caused by the differences in fuel manufacturers, blends and storage times. As EPA fuel volatility standards are lowered, variations between fuels (which may further reduce volatility) becomes a critical factor influencing cold engine performance. No matter how thoroughly the relationship between fuel quality and cold driveability is understood, eliminating fuel quality as an issue can be difficult, because:

**TOOLS WHICH TEST FUEL VOLATILITY MEASURE ONLY RVP, NOT THE DISTILLATION CURVE.**

- The distillation curve has a greater effect on cold driveability than RVP.

**THE CUSTOMER MAY PERCEIVE RAISING THE FUEL QUALITY ISSUE AS AN ATTEMPT TO EVADE HIS PROBLEM.**

- This may cause difficulty in getting accurate fuel usage information.

**WATER, AND OTHER TYPES OF FUEL CONTAMINATION, MAY CAUSE CONTINUED DRIVEABILITY COMPLAINTS.**

- The problem symptoms may remain even though the vehicle has been refueled several times with a quality gasoline.

**CUSTOMER CONCERNS**

**CONDITION:**

Poor Cold Engine Operation, symptoms may include; hard start/extended crank, stalling, backfiring, hesitation and/or lack of power.

**POSSIBLE CAUSE:**

Low volatility fuel will not vaporize sufficiently to allow normal combustion.

**CORRECTION:**

Replace Fuel.

**DIAGNOSTIC PROCEDURE:**

1. Perform basic system checks in section 6E of the service manual.
2. Check for service bulletins which relate to cold driveability issues specific to the problem vehicle.
  - An updated engine control calibration, or service procedure, may be available to make the engine less susceptible to low volatility fuels.
3. If basic checks do not reveal a vehicle fault, then advise the customer that fuel quality may be an issue. Recommend the following actions:
  - Change brands of fuel
  - Use 87 octane gasoline, unless the vehicle is designed for premium gasoline.
  - Try to empty the fuel tank as much as practical before refilling.
  - Run a minimum of three tanks of new fuel before returning for service.
4. If above steps are ineffective, do not proceed with additional vehicle diagnosis and/or parts replacement until the fuel tank has been drained and refilled with a known good quality gasoline **AT THE DEALERSHIP.**
5. If the problem remains refer to service manual, service bulletins and/or technical assistance.

**Technical Service Bulletin # 306502**

**Date: 931001**

## **Fuel - How Fuel Economy Is Determined**

Group Ref.: Engine Fuel & Emission

Bulletin No.: 306502

Date: October, 1993

**SUBJECT:**

**INFORMATION ON FACTORS THAT AFFECT FUEL ECONOMY**

**MODELS:**

**1993 AND PRIOR YEARS/ALL MODELS**

Buick	93-6E-12
Chevrolet	93-96-6C
Oldsmobile	03-93-66
Pontiac	93-6-28

This bulletin is being revised to add Cadillac information at the end of the bulletin. Previous divisional publication numbers were:

GM POWERTRAIN RELEASE NAME:  
LARRY THATCHER, NO 8-446-4825

#### BACKGROUND INFORMATION:

EPA fuel economy estimates are posted on the fuel economy label of all new vehicles. The only intended use of these values is for comparison among the different vehicles. Fuel economy estimates are generated from data taken during a laboratory test using pre-production prototype vehicles under extremely controlled conditions using a professional driver, with the vehicle operating on an instrument similar to a treadmill. The comparisons of current vehicle fuel economy to the EPA fuel economy estimates is a misuse of the information and should be discouraged.

The EPA GAS MILEAGE GUIDE, available at each dealership, points out that the actual mileage when driving a vehicle may differ considerably from the estimated mileage. The guide also describes how vehicles are tested under identical conditions to insure the results can be compared with confidence.

The EPA GAS MILEAGE GUIDE also points out that city fuel economy estimate simulates a 7.5 mile, stop-and-go trip with an average speed of 20 mph. The trip takes 23 minutes and has 18 stops. About 18 percent of the time is spent idling, as in waiting at traffic lights or in rush hour traffic. Two kinds of engine starts are used - the cold start, which is similar to starting a car in the morning after it has been parked all night - and the hot start, similar to restarting a vehicle after it has been warmed up, driven and stopped for a short time.

The test to determine the highway fuel economy estimate represents a mixture of "non-city" driving. Segments corresponding to different kinds of rural roads and interstate highways are included. The test simulates a 10 mile trip and averages 48 mph. The test is run from a hot start and has little idling time and no stops.

The EPA GAS MILEAGE GUIDE explains that the actual test results are adjusted downward to arrive at the estimates used in the booklet and on the labels. City estimates are lowered by 10 percent and the highway estimate by 22 percent from the laboratory test results. The guide also points out that traveling at higher speeds lowers fuel economy and traveling at 65 mph instead of 55 mph lowers fuel economy over 15 percent.

#### FACTORS THAT AFFECT FUEL ECONOMY.

##### Axle Ratio

Numerically lower axle ratios generally produce better highway fuel economy. The exception to this is if the engine is "working" exceptionally hard, (heavy vehicle loads pulling a trailer, small engine in a large vehicle, etc.). In these cases a numerically higher axle may provide better fuel economy. Numerically higher axle ratios will also tend to provide more fuel economy in congested city traffic and stop and go conditions.

##### Brakes

Brake drag (even a minimal amount undetectable by coasting), can have a significant negative impact on fuel economy. Pull upward on the brake pedal to assure that the stoplight switch and cruise switch at the brake pedal are full and properly adjusted. A "click" sound when the pedal is pulled upward indicates that the switch was improperly adjusted. This causes the front brake pads to lightly rub the rotors, causing a fuel economy loss, without generating excessive heat or brake pad wear.

##### Driving Habits

Frequent short trips (less than 5 miles), especially in cooler ambient temperatures (less than 65 degrees), will necessitate fuel enrichment on start-ups, especially after "soaks" with the engine off for approximately a half hour or more.

Frequent accelerator pedal movement while driving will reduce fuel economy because of fuel enrichment during the periods of acceleration. Under such driving conditions the torque converter clutch (TCC) also disengages, contributing to fuel economy losses. Prolonged idle periods reduce fuel economy especially in cold ambients when vehicle is allowed to "warm up".

##### Fuels

Oxygenated fuels, with methanol and/or ethanol blended into the gasoline have lower energy and thus reduce fuel economy. Typically there is about a 1 MPG penalty for a vehicle which gets 25 to 30 MPG on 100 percent gasoline.

Using fuels of a lower octane than the vehicle was calibrated to will cause increased "KS" Knock Sensor system activity. This will result in a net decrease in spark advance and thus poorer fuel economy. Using fuel of a higher octane than the vehicle was calibrated for WILL NOT increase fuel economy.

Variations in how much fuel is added to the fuel tank during re-fueling can greatly affect calculated fuel economy. These effects decrease as the distance traveled and the number of tank fillups increase.



#### Green Engine

New vehicles have not yet had an opportunity for the engine to break in, (rings to seat ... ). A typical engine will take 3 to 5 thousand miles to break in and during this time period a gradual increase in fuel economy can be expected.

#### Parasitic Loads

Air conditioning and/or electrical loads, (headlights, heated backglass ... ) also result in lower fuel economy, (typically less than 1 MPG difference, each 10 AMPs takes approximately .4 MPG).

#### Road Conditions

Road surface condition impacts fuel economy. Gravel and/or pot holed roads decrease fuel economy. Hills (vs. level terrain) also negatively impact fuel economy. Even gradual unperceptible increases in elevation result in real measurable decreases in fuel economy. Similarly, driving in the rain or snow decreases fuel economy.

#### Suspension

Vehicle suspension misalignment can cause poor fuel economy. Check all four tires for abnormal and/or premature tire wear.

New tires, tire rotation, and/or front end alignment may be required to correct fuel economy.

#### Tires

Performance tires and/or tires with larger "contact areas," (like 60 series aspect ratio), can cause as much as 3 MPG lower fuel economy when compared to hard "thin" tires. Find out if the tire size currently on the car is the same as original equipment. Replacement tires taller than original equipment tires cause the odometer to read LESS THAN actual distance traveled. This will result in lower calculated fuel economy than actual fuel economy.

#### Tire Pressure

Harder tires, (more air pressure, or different tire compositions) result in better fuel economy. Do not exceed maximum pressure as labeled on the tire, typically 30-35 psi. The disadvantage of this is that the greater the tire pressure, the harsher the vehicle ride.

#### Transmission

On 4-Speed automatics, it is possible to drive the vehicle in 3rd gear rather than "overdrive" and not perceive it. Typically this condition occurs when the shift indicator, or the shift linkage/detent is misadjusted. Misadjusted shift linkage can also result in improper signals to the ECM, which can result in less spark advance, and results in a drop in fuel economy.

Driving a vehicle in 3rd gear rather than overdrive at highway speeds typically results in a 3 to 5 MPG penalty.

Torque Converter Clutch operation is essential for good fuel economy. A non-locking torque converter typically results in a 1 to 2 MPG penalty at highway speeds.

#### Vehicle Weight

Each 125 lbs. of additional weight results in a .3 MPG loss of fuel economy. Thus, additional passengers, luggage will decrease fuel economy.

#### Vehicle Wind Resistance

More wind "DRAG" means less fuel economy. Thus, hang-on luggage carriers, cat toppers, open windows and/or open trunk mean less fuel economy. (See "Driving Habits").

#### CADILLAC INFORMATION BEGINS HERE:

The following information is included in all 1994 Cadillac Owner's Manuals and applies to all years and models of Cadillacs.

Your fuel economy (miles per gallon or liters per 100 kilometers) can vary depending on how your Cadillac is driven. Several vehicles like yours have been driven through a standard test and their actual fuel economy was recorded. These readings were adjusted and printed on the fuel economy window sticker which was attached to your new Cadillac when it was delivered and in the Gas Mileage Guide which is available from your dealership.

The fuel economy estimates are based on results of tests required by the U.S. Environmental Protection Agency (EPA). These tests are used to certify that vehicles meet the Federal emissions and fuel economy standards. Cadillac tests prototypes of new vehicles and submits the results to the EPA. The EPA then confirms the accuracy of the figures provided by Cadillac. The vehicles are driven by a professional driver under controlled laboratory conditions on an instrument similar to a treadmill.

#### NOTE:

All of these tests are done with the A/C off and all other driver-controlled electrical loads off. These procedures ensure that each vehicle is tested under identical conditions.

There are two different fuel economy estimates for each vehicle: one for city driving and one for highway driving. To develop these two estimates separate tests are used to represent typical everyday city and rural driving.

The test used to determine the city fuel economy estimate simulates a 7.5 mile (12 km) stop-and-go trip with an average speed of 20 mph (32 km/h). The trip takes 23 minutes and has 18 stops. About one fifth of the time is spent idling as in waiting at traffic lights or in rush hour traffic. Two kinds of engine starts are used: a cold start, which is similar to starting a car in the morning after it has been parked all night, and a hot start,

which is similar to restarting a vehicle after it has been warmed up, driven, and stopped for a short time.

The test used to determine the highway fuel economy estimate represents a mixture of "non-city" driving. Segments corresponding to different kinds of rural roads and interstate highways are included. The test simulates a 10 mile (17 km) trip with an average speed of 48 mph (77 km/h). The test is run from a hot start and has little idling time and no stops.

To assure that the fuel economy numbers are most useful for consumers, the EPA adjusts these laboratory test results to account for the difference between controlled laboratory conditions and actual driving on the road. The laboratory fuel economy results are adjusted downward to arrive at the estimates on the fuel economy window sticker and the Gas Mileage Guide. The city estimate is lowered by 10 percent and the highway estimate is lowered by 22 percent from the laboratory test results. Experience has proven that these adjustments make the mileage estimates correspond more closely to the actual fuel economy realized by the average driver.

Even though these figures are adjusted, they still represent what the average driver will get. Your fuel economy may be significantly higher or lower, depending on how, when, and where your vehicle is driven. Here are some things you can do to increase fuel economy:

- ^ Combine errands into one trip.
- ^ Turn the engine off rather than letting it idle for more than a minute.
- ^ Have your Cadillac serviced as described in the maintenance booklet.
- ^ Keep tires inflated to recommended pressures.
- ^ Anticipate traffic stops.

Here are some things that will lower fuel economy:

- ^ Quick acceleration.
- ^ Traveling at higher speeds. Traveling at 65 mph instead of 55 mph lowers fuel economy by 15 percent.
- ^ Carrying unnecessary weight in the vehicle.
- ^ Revving the engine. This is not necessary for your vehicle.
- ^ Operating your vehicle with the suspension out of alignment or with the wheels and tires out of balance.
- ^ Use of electrical accessories which require high amperage when they are not needed.

Even things beyond your control, such as weather conditions, affect your fuel economy. Driving up steep hills, in rain or snow, and into a strong wind will lower fuel economy. In the lower left corner of the fuel economy window sticker for your vehicle is the range of city and highway fuel economy you can expect to get from your Cadillac. If you are doing everything to raise your fuel economy but are still not within this range, your vehicle may need service. Collect as much information about your fuel economy as you can find (miles driven, gallons of fuel used, etc.) and provide it to your dealership for their review and assistance.

Technical Service Bulletin # **883329B**

Date: **880801**

## **Cruise Control - Revised Wiring Schematic**

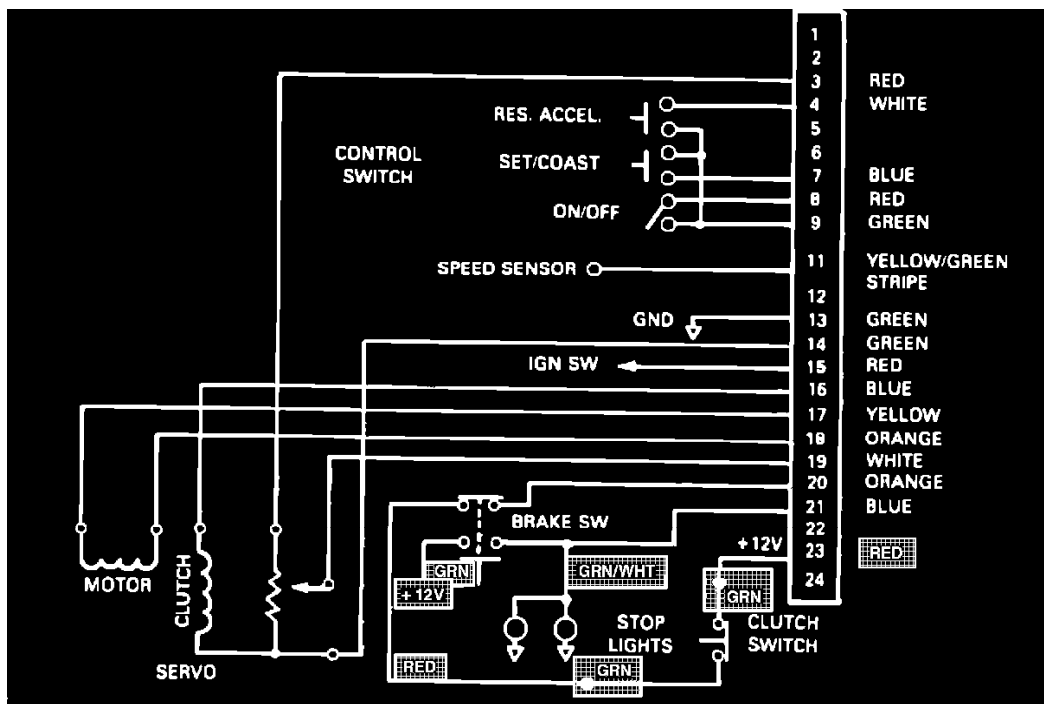
Number: 88-332-9B

Section: 9B

Date: AUGUST, 1988

Subject: SERVICE MANUAL SUPPLEMENT: CRUISE CONTROL CIRCUIT WIRING SCHEMATIC

Model and Year: 1987-88 TURBO SPRINT



TO: ALL CHEVROLET DEALERS

This bulletin is being written to revise the wiring schematic for the 1987-88 Turbo Sprint with manual transaxle. The wiring schematic shown below revises the schematic shown on page 9B-1 of the 1987 Sprint Service Manual Supplement covering Turbo Engines (ST370-87T).

The wiring color changes are screened for your reference.

Technical Service Bulletin # **892126**

Date: **890701**

## Cruise Control - Incorrect Resume Operation

Number: 89-212-6

Section: 6

Date: July 1989

Subject: INCORRECT CRUISE CONTROL RESUME OPERATION

Model and Year: 1987-89 PASSENGER CARS AND TRUCKS WITH CRUISE

TO: ALL CHEVROLET DEALERS

This bulletin pertains to 1987-89 passenger cars and trucks with Option K34. It will help in diagnosing an intermittent condition which may otherwise be difficult to correct. This condition occurs only on vehicles using a "Multi-function" lever, with turn signal, beam change, wash/wipe, and cruise control functions, and on Chevrolet Y, which do not use multi-function levers.

Condition:

When using the cruise control resume switch, the cruise control may resume to a new set speed that is different from the original set speed. If the new set speed is well below the original speed, this could also be reported as inoperative resume. The brake switch and the on/off switch still function properly to disengage the cruise control system. Another condition is that the resume/accel function may be totally inoperative, but the set/coast switch will still work.

These conditions usually occur with some accumulated mileage, depending on how often the cruise control system is used.

Cause:

An intermittent condition in the turn signal lever switch causes the cruise control system to set a new speed when the slider is moved to resume. The intermittent condition is so short that it cannot be detected by normal methods, and the switch will test good.

Correction:

Replace the switch (Multi-Function Lever) or turn signal lever on Y cars.

Parts Information:

All parts in stock at GMSPO have been replaced with new part numbers. If replacing a switch for this condition, do not use parts in dealer stock.

All new orders will automatically receive the new part numbers.

If a switch is being replaced for any other condition, switches in dealer stock may be used.

Warranty Information:

Use Labor Operation E7060 with applicable time.

Technical Service Bulletin # **06-03-10-004**

Date: **060301**

## **Tires/Wheels - Wheel Weight Usage Precautions**

Bulletin No.: 06-03-10-004

Date: March 01, 2006

### **INFORMATION**

Subject:

Proper Use of OEM Service Wheel Weights, Marring and/or Damage Due to Use of Non-OEM and/or Incorrect Wheel Weight Installation

Models:

2007 and Prior GM Cars and Light Duty Trucks

2003-2007 HUMMER H2

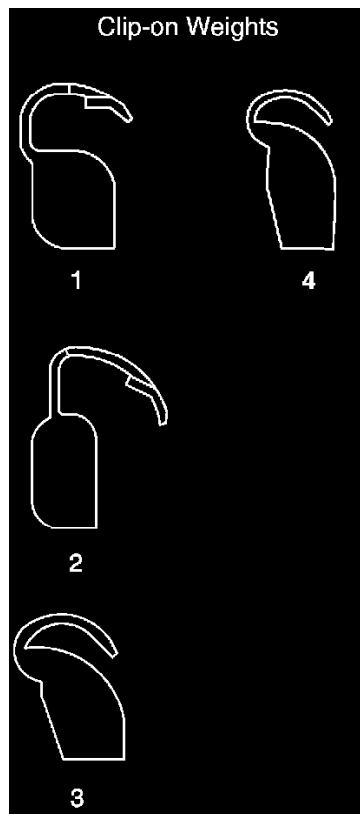
2006-2007 HUMMER H3

2005-2007 Saab 9-7X

### **Note:**

It is critical to use the proper OEM wheel weights when service requires balancing of the tire/wheel assemblies. Failure to use the proper OEM wheel weights may result in damage/marring to the wheel assembly that will NOT be covered under the vehicles warranty.

Service OEM wheels weights are currently available from GMSPO.



### **Important:**

When balancing factory aluminum wheels with clip-on wheel balance weights, be sure to use special polyester-coated weights. These coated weights reduce the potential for corrosion and damage to aluminum wheels.

These coated weights reduce the potential for corrosion and damage to aluminum wheels.

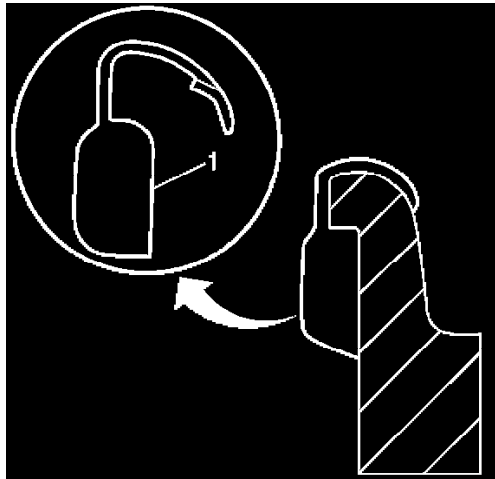
^ MC (1) and AW (2) series weights are approved for use on aluminum wheels.

^ P (3) series weights are approved for use on steel wheels only.

^ T (4) series coated weights are approved for use on both steel and aluminum wheels.

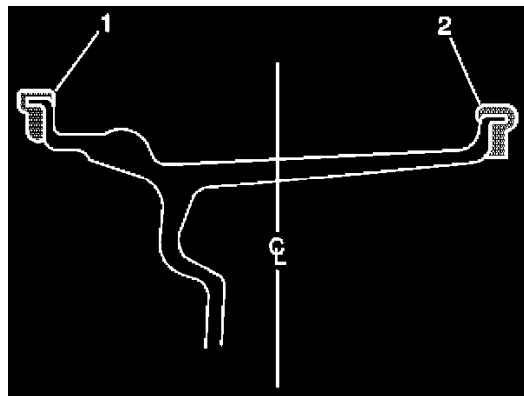
### Important:

Use a nylon or plastic-tipped hammer when installing coated clip-on wheel balance weights to minimize the possibility of damage to the polyester coating.



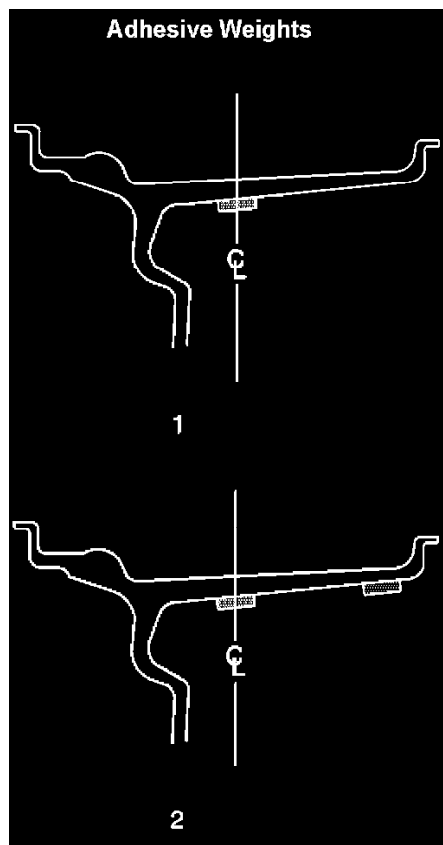
The contour and style of the wheel rim flange will determine which type of clip-on wheel weight (1) should be used. The weight should follow the contour of the rim flange. The weight clip should firmly grip the rim flange.

### Wheel Weight Placement - Clip-on Weights



When static balancing, locate the wheel balance weights on the inboard flange (2) if only 28 g (1 oz) or less is called for. If more than 28 g (1 oz) is called for, split the weights as equally as possible between the inboard (2) and outboard (1) flanges.

When dynamic balancing, locate the wheel balance weights on the inboard (2) and outboard (1) rim flanges at the positions specified by the wheel balancer.

**Important:**

When installing adhesive balance weights on flangeless wheels, do NOT install the weight on the outboard surface of the rim. Adhesive wheel balance weights may be used on factory aluminum wheels.

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



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Disclaimer Technical Service Bulletin # **883450A**

Date: **880901**

## Seat - Rear Lap/Shoulder Belt Kits

Number: 88-345-0A

Section: 0A

Date: SEPT., 1988

Subject: REAR SEAT LAP/SHOULDER BELT KITS

Model and Year: 1977-88 PASSENGER CARS AND LIGHT DUTY TRUCKS

TO: ALL CHEVROLET DEALERS

To ensure that Chevrolet Dealer Service Management and employees are aware of the availability of GM Dealer-Installed Rear Seat Lap/Shoulder Belt Kits, we are providing a copy of General Motors Service Parts Operations Dealer Bulletin No. 88-68.

This information is being provided to assist you in addressing customer comments regarding the availability of dealer installed rear-seat lap/shoulder belt kits in Chevrolet model vehicles.

Parts & Accessories

Information Bulletin

SUBJECT: GM Dealer-Installed Rear Set DATE: May 20, 1988 Lap/Shoulder Belt Kits

TO: All GM Dealers

General Motors made a commitment in 1986 to become the first American automaker to provide rear seat lap/shoulder belts as standard equipment in domestic automobiles. At the same time, GM Parts released newly designed, dealer-installed rear seat lap/shoulder belt kits for most current and past model vehicles. With seat belt use required now in most states, public acceptance of all kinds of occupant restraints is increasing.

**What's Available:** GM Parts distributes more than 90 different kits designed to equip 20 different body styles and over 50 models of GM cars, trucks and vans-some as far back as model year 1976. Older models can be retrofitted with black belts, while owners of some late model vehicles have a choice of as many as eleven colors. A complete list of kits and part numbers is attached for your convenience.

**What's Not Available:** Although parts availability is excellent for passenger cars kits, delivery for some vans and trucks may be delayed. Kits are not released for GM passenger cars imported from Japan. Kits also are not offered for the 1978-88 Oldsmobile Cutlass, Buick Regal, Chevrolet Monte Carlo, or Pontiac Grand Prix, because GM safety engineers have concluded that in these cars, a rear seat lap/shoulder belt combination would not enhance the safety offered to rear seat occupants by the lap belt alone.

**What's In A Kit:** Most kits include right and left outboard lap/shoulder belts, and some kits also include a belt for the middle seating position for color coordination. All kits include installation hardware, instructions and buckles.

**How to Order:** For your convenience, the kits are listed in the Accessories Group (21.040) of the Parts & Illustration Catalog. Kits also are listed as "Dealer Installed Accessories" in the GM Parts Accessories Catalog.

Thank you for your cooperation.

## Dealer-Installed Rear Seat Lap/Shoulder Belt Kits

<u>Model</u>	<u>Years</u>	<u>Colors</u>	<u>Part Number</u>	<u>Notes</u>
A	82-86	Black	999852	
	87	Dk Blue	999650	Type 8 Buckle
	87	Lt Saddle	999651	Type 8 Buckle
	87	Dk Claret	999652	Type 8 Buckle
	87	Black	999567	Type 6 Buckle
	87	Dk Blue	999568	Type 6 Buckle
	87	Med Sage	999569	Type 6 Buckle
	87	Lt Saddle	999570	Type 6 Buckle
	87-88	Dk Claret	999571	Type 6 Buckle
	87-88	Med Dk Gray	999572	Type 6 Buckle
	87-88	Med Dk Gray	999653	Type 8 Buckle
	88	Med Beechwood	12340239	Type 8 Buckle
	88	Vry Dk Sapphire	12340237	Type 6 Buckle
	88	Med Beechwood	12340238	Type 6 Buckle
X	80-85	Black	999852	
B	77-86	Black	999857	
	87	Dk Blue	999708	
	87	Med Sage	999709	
	87	Lt Saddle	999710	
	87-88	Dk Claret	999711	
	87-88	Med Dk Gray	999712	
	88	Dk Sapphire	12340240	
	88	Med Beechwood	12340241	
C(RWD)	77-83	Black	999857	
D	77-86	Black	999857	
	87	White	999713	
	87	Black	999714	
	87	Lt Gray Pearl	999715	
	87	Dk Blue	999716	
	87	Lt Saddle	999717	
	87	Dk Carmine	999718	
	87	Dk Claret	999719	
C(FWD)	85-86	Black	999855	
	87	Med Emerald	999696	
	87	Lt Driftwood	999697	
	87	Lt Pearl Gray	12340185	
	87	Med Amethyst	12340187	
	87-88	Vry Dk Sapphire	999695	
	87-88	Garnet Red	999698	
	87-88	Med Dk Gray	999699	
	87-88	White	12340184	
	87-88	Lt Yellow	12340186	
	88	Med Antelope	12340188	
	88	Dk Rosewood	12340189	

<u>Model</u>	<u>Years</u>	<u>Colors</u>	<u>Part Number</u>	<u>Notes</u>
H	86	Black	999855	
	87	Same as 87 C(FWD)		
E	79-85	Black	999858	
	86	Black	999856	
	87	White	999656	
	87	Black	999657	
	87	Lt Pearl Gray	999658	
	87	Vry Dk Sapphire	999659	
	87	Med Emerald	999660	
	87	Lt Yellow	999661	
	87	Lt Driftwood	999662	
	87	Dk Rosewood	999663	
	87	Garnet Red	999664	
	87	Med Dk Gray	999665	
	87	Med Amethyst	999666	
K	80-85	Black	999859	
	86	Black	999856	
	87	Same as 87E		
F	78-81	Black	999733	
	82-86	Black	999854	
	87	Lt Saddle	999667	
	87-88	Med Dk Gray	999668	
	87-88	Black	999669	
	87-88	Dk Carmine	999670	
	88	Med Beechwood	12340213	
H	78-80	Black	999732	
J	82-86	Black	999861	
	87	Lt Saddle	999724	
	87	Dk Rosewood	999725	
	87-88	Black	999722	
	87-88	Vry Dk Sapphire	999723	
	87-88	Med Dk Gray	999726	
	88	Med Beechwood	12340262	
	88	Dk Carmine	12340263	
	88	Lt Yellow	12340264	
N	85-86	Black	999860	
	87	Dk Copper	999728	
	87	Dk Rosewood	999729	
	87-88	Vry Dk Sapphire	999727	
	87-88	Garnet Red	999730	
	87-88	Med Dk Gray	999731	
	88	Med Beechwood	12340265	
L	87	Vry Dk Sapphire	999897	
	87	Lt Driftwood	999898	
	87	Garnet Red	999899	
	87	Med Dk Gray	999900	



<u>Model</u>	<u>Years</u>	<u>Colors</u>	<u>Part Number</u>	<u>Notes</u>
T	76-87	Black	999853	
W	88	Vry Dk Sapphire	12340271	W/Rear Bench Seat
	88	Med Beechwood	12340272	W/Rear Bench Seat
	88	Garnet Red	12340273	W/Rear Bench Seat
	88	Med Dk Gray	12340274	W/Rear Bench Seat
	88	Med Beechwd/Dk Sienna	12340275	W/Rear Bench Seat
	88	Vry Dk Sapphire	12340266	W/Rear Bucket Seats
	88	Med Beechwood	12340267	W/Rear Bucket Seats
	88	Garnet Red	12340268	W/Rear Bucket Seats
	88	Med Dk Gray	12340269	W/Rear Bucket Seats
	88	Med Beechwd/Dk Sienna	12340270	W/Rear Bucket Seats

## PASSENGER CARS

<u>Model</u>	<u>Years</u>	<u>Colors</u>	<u>Part Number</u>	<u>Notes</u>
CK-06, 16	79-86	Black	996378	Rear Seat
CK-06	82-86	Black	997449	Center Seat
RV-06, 16	87-88	Black	996378	Rear Seat
RV-06	87-88	Black	997449	Center Seat
ST-16	83-88	Black	997922	
M	85-86	Black	998555	Center Seat Bench
	85-88	Black	998556	Center Seat Bucket
	85-86	Black	998682	Rear Seat Bench
	87-88	Black	999720	Center Seat Bench
	87-88	Black	999721	Rear Seat Bench
G	84-87	Black	998537	1st, 2nd, 3rd Seats, LH only
	84-87	Black	998900	3rd Seat, RH only

## TRUCKS

**Information About Dealer-Installed Rear-Seat Lap/Shoulder Belt Kits**

The following information may be useful in responding to inquiries from customers about rear-seat lap/shoulder belts. Any media inquiries on this subject should be referred to Jane Mott, GM Public Relations, (313) 986-5717

Rear-seat shoulder belts have been available as either factory-installed options or dealer accessories sinnce the late 1960s. At that time, studies showed that more people would wear lap belts than lap/shoulder belts, and so GM made both systems available to accommodate the different needs of our customers. New information on the effectiveness of rear-seat lap/shoulder belts, increased consumer acceptance of safety belts, and increased use of safety belts in rear seats (especially in states with mandatory seat belt laws) have led GM to make rear-seat lap/shoulder belts standard equipment.

Q. How long has GM offered rear-seat lap/shoulder belts as standard equipment?

A. GM began to include rear-seat lap/shoulder safety belts as standard equipment on selected 1987 models. Rear-seat lap/shoulder belts will be standard on all domestically produced GM cars by the start of the 1989 model year. We are phasing them in on domestic trucks and vans as soon as technology permits.

Q. Which current models have rear-seat lap/shoulder belts as standard equipment?

A. Buick LeSabre and Riviera; Cadillac Eldorado, Fleetwood Brougham, and Seville; Chevrolet Corsica, Beretta, Nova, Suburban (second seat), full-size van and full-size pickup; Oldsmobile Delta 88 and Toronado; Pontiac Bonneville and LeMans; GMC Sierra and full-size van.

Q. What about models that don't come equipped with rear-seat lap/shoulder belts?

A. GM dealers offer more than 90 different retrofit kits for 20 different body styles and over 50 models of GM cars, trucks and vans, some as far back as model year 1976. Owners of most late model vehicles may have a choice of as many as eleven colors, but older models can only be retrofitted with black belts.

The Chevrolet Sprint and Spectrum which are imported from Japan, do not have dealer-installed kits available. Also, there are no dealer-installed kits available or planned for the 1978-87 G-cars (Oldsmobile Cutlass, Buick Regal, Chevrolet Monte Carlo, Pontiac Grand Prix).

- Q. Why don't you sell dealer-installed kits for the G-cars?
- A. Our engineers concluded that for rear seat occupants in these vehicles the benefit from a lap/shoulder belt would not be greater than that of the lap belt alone.
- Q. What has GM done to inform dealers about the kits?
- A. GM advised dealers about the new seat belt kits when they first became available in 1986, advertised the kits in the GM Parts Accessory Collection Catalog, and sent an information bulletin to all GM dealers in May 1988 (IB 88-68, copy attached) to further familiarize them with availability and ordering procedures for the belts.
- Q. Where are the kits listed in the parts catalog?
- A. If a vehicle was not originally equipped with rear-seat lap/shoulder belts, the part number of its retrofit kit will appear in the accessories section of the parts book, in Group 21.040. For such vehicles, the belts described as "service belts" in Group 14.875 are only lap belts, designed to replace the belts that originally came on the vehicle. (If the vehicle had rear-seat lap/shoulder belts as original equipment, then there is no dealer-installed kit, because the regular service belts that appear in Group 14.875 of the parts catalog are lap/shoulder belts.) For convenience, the dealer-installed kits also are advertised and listed in the GM Parts Accessory Collection catalog, in the section called "Dealer Installed Accessories."
- Q. What does a kit include?
- A. Most kits include a right and left outboard lap/shoulder belt, and some include an additional belt for the middle seating position for color coordination. All kits include buckles, installation instructions And attachment hardware..
- Q. How much does a dealer-installed kit cost?
- A. The prices varies between \$70 and \$99, depending on the model, plus installation.
- Q. How much does installation cost?
- A. The dealer determines the installation cost, and it varies by dealer, model, and area of the country. GM estimates that installation of a kit would take from 1-1/2 to 3 hours. The average labor rate, nationally, is between \$30-40 per hour.
- Q. What is GM's response to recently-televised claims by the National Transportation Safety Board (NTSB) about the potential danger of lap-only belts?
- A. The studies NTSB cites from the 1950s involved front seats and were not relevant to this issue. The NTSB's own, more recent study focused on a few exceptional cases, and by the Board's own admission was not statistically significant. Moreover, the NTSB's report was limited to frontal collisions, so the benefits of lap belts in other kinds of accidents were not analyzed.

No restraint system can guarantee immunity from injury. In very severe crashes, injury can occur from whatever stops the occupant, including any type of restraint. On the other hand, it has been shown that when properly worn, seat belts--including lap belts--improve overall occupant survival and injury rates. We continue to recommend that passengers wear their seat belts.

Technical Service Bulletin # **02-08-48-001B**

Date: **060329**

## **Body - Urethane Adhesives for Glass Applications**

Bulletin No.: 02-08-48-001B

Date: March 29, 2006

### **INFORMATION**

**Subject:**

Urethane Adhesives for Stationary Glass and Other Applications

**Models:**

2007 and Prior GM Passenger Cars and Trucks (Including Saturn)

2007 and Prior Isuzu Trucks

2003-2007 HUMMER H2

2006-2007 HUMMER H3

**Supercede:**

This bulletin is being revised to update the models and model years and update the information for Canada. Please discard Corporate Bulletin Number 02-08-48-001A (Section 08 - Body and Accessories).

Effective with the sale of existing stock, General Motors will no longer offer the URETHANE ADHESIVE KIT P/N 12346392 (which includes all associated primers). Until this stock is depleted, the GM kit is still recommended. In Canada, the GM Urethane Adhesive Kit, P/N 10952983, which

includes all associated primers, is also being discontinued and will no longer be available after current stock is depleted. It is anticipated that stock will be exhausted no later than May 21, 2006.

As an alternative to the GM Kit for bonded glass installation AND some exterior body panels on specific GM vehicles, various aftermarket materials are recognized as meeting the equivalent of the GM performance specification. This specification (GM 3651G, recently updated) outlines material performance requirements and tests for adhesive manufacturers who develop and manufacture Stationary Glass Urethane adhesives.

Those products currently recognized as meeting those equivalencies are as follows:

- ^ Dow Automotive (Essex) 400HV (one part and requires associated primers)
- ^ Dow Automotive (Essex) U216 (two part and requires associated primers) Call Dow Automotive at 1-800-453-3779 for more information.
- ^ 3M(TM) "Fast Cure" Auto Glass Urethane (one part and requires associated primers) Call 3M(TM) at 1-877-666-2277 for more information.

Any use of these materials should be done as a system by the specific manufacturer. DO NOT intermix primers or adhesives from one manufacturer to another.

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DisclaimerTechnical Service Bulletin # **610111**

Date: **961101**

## Key Code - Information

File In Section: 0 - General information

Bulletin No. 61-01-11

Date: November, 1996

### INFORMATION

Subject:

The General Motors Key Code Voice Response System - "TRACS 2000"

Models:

1997 and Prior Passenger Cars and Trucks

The GM Dealer Key Code Voice Response system, offered through GM Service Parts TRACS 2000 has been very successful in providing Key Code information to dealers. As part of GM's efforts to provide common processes and systems, the system is being further enhanced. Effective immediately all GM dealers will have access to all GM key code information for ignition, door and VATS through the GM TRACS System. This enhancement will allow dealers to receive all key code information without telephoning divisional roadside assistance centers or the NAO Dealer Accounting Center. VATS codes for Corvettes and Key codes for GM motor homes are not available through this system.

System logging and monitoring of each call will continue and dealers with unusual call volume or patterns will be notified.

All Fax number changes must be requested through your GM Business Management Division.

Technical Service Bulletin # **01-00-89-009**

Date: **010501**

## Key/Key Number/Security Chip - Replacement

File In Section: 00 - General Information

Bulletin No.: 01-00-89-009

Date: May, 2001

### INFORMATION

Subject:

Replacement of Keys, Key Numbers and/or Security Chips

Models:

2002 and Prior Passenger Cars and Trucks

General Motors has received reports from dealers and law enforcement officials in various parts of the country regarding a new trend in auto theft.

The current mode of operation is for a person (thief) to do the following:

1. Pick out the vehicle he/she wishes to steal from a new/used car sales facility or off the street.
2. Record the Vehicle Identification Number (VIN).
3. Take the VIN to any dealership which cuts keys. In some instances they have presented hand-written registration forms as proof of ownership.
4. The thief then returns and drives the vehicle from the location.

Cutting of replacement keys is serious business. General Motors Policies and Procedures Manual, Section 3.2.5 (3.1.6 in Canada), Replacement of Key Numbers & Security Chips, provides the following guidelines: "For security-and protection against auto theft, dealer should verify vehicle ownership before providing replacement keys, key numbers and/or security chips. Verification should include positive identification of requester and verification of vehicle ownership through registration."

Each dealership should (if they are in the business of cutting keys for walk-in, phone, fax, or other requesters) make a permanent file, by VIN, of all key requests. Copies of the following documents should remain in each file:

- Government-issued picture ID (for example, a driver's license)
- Registration or other proof of ownership Registration should have normal markings from the state/province which issued the registration and possibly the receipt for payment recorded as well. Since each state/province will be different, you will need to set up guidelines for your dealership based on the current registration laws and or policies of your state/province. We know of no law enforcement agency or state/province vehicle registration office which will accept a hand-written registration document.
- Copy of the paid customer receipt which has the name of the employee who cut and sold the key to the customer
- When vehicle ownership cannot be proven beyond a reasonable doubt, Do NOT provide the keys. Refer the customer to the selling dealer or GM Roadside Assistance.

**Important:**

- ^ When a dealership calls the TRACS 2000 voice response system (Vintage Group in Canada) for key codes, the dealer code is recorded by VIN, in a permanent electronic file.
- ^ Cutting keys for anyone other than the registered vehicle owner may result in the dealership and/or employee being charged with aiding and abetting in grand theft auto and determined to be liable, in the event the vehicle is subsequently stolen from another dealership or customer.

Dealers may wish to designate one specific, trusted employee as the person to handle all key requests.

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**DISCLAIMER** Technical Service Bulletin # **923310**

Date: **911101**

**Paint - Acid Rain Damage to Base Coat/Clear Coat**

Number: 92-33-10

Section: 10

Date: NOV. 1991

Corporate Bulletin No.: 131060

ASE No.: B2

Subject: INDUSTRIAL FALLOUT/RAIL DUST DAMAGE TO BASE COAT/CLEAR COAT

Model and Year: 1983-92 ALL PASSENGER CARS AND TRUCKS

Application: 1992 (and previous) models with Base Coat/Clear Coat Paint

The following information regards the use of finesse type repairs to environmental (industrial fallout) and rail dust damage of base coat/clear coat paint finishes.

Since the severity of the condition varies from area to area, **PROPER DIAGNOSIS** of the damage extent is **CRITICAL TO THE SUCCESS OF REPAIRS**. Diagnosis should be performed under high intensity fluorescent lighting, on horizontal surfaces (hood, roof, decklid) after they have been properly cleaned.

#### **INDUSTRIAL FALLOUT (ACID RAIN)**

There are three basic types of acid rain damage:

- Surface level contamination, - may be repaired by simply washing the vehicle, cleaning the surface with a wax and grease remover, neutralizing acidic residue and finesse polishing.
- Clearcoat etching, - slight etching still noticeable after the above washing and finesse polishing procedure.
- Basecoat etching, - severe etching beyond the clearcoat into the basecoat.

#### **PROCEDURES FOR SURFACE LEVEL CONTAMINATION REPAIRS**

1. Wash the vehicle with standard car detergent and water and dry thoroughly.
2. Clean the affected area with a wax and grease remover.
3. Neutralize any left over acidic residue by cleaning the damaged areas with a mixture of baking soda and water (one tablespoon per quart of water), rinse **THOROUGHLY** and dry the panels completely.
4. Apply a finesse type polish with a foam pad.

#### **CLEAN AND INSPECT THE SURFACE**

- A. If the damage has been repaired, remove any swirl marks with a dual action orbital polisher and foam pad.
- B. If some damage remains, proceed to step 5.

#### **SLIGHT CLEARCOAT DAMAGE - WET SANDING, FINESSE POLISHING**

5. Select a small test area on a damaged panel.
6. Wet sand the damaged area with an American Grade ultra fine sandpaper of 1,500 to 2,000 grit and a rubber sponge sanding block. During the wet sand process;
  - a. Use ample amounts of water
  - b. Go slow to prevent removing too much clearcoat.

**Note:** Be sure to use American Sandpaper. European Sandpaper has a "P" before the grit number and European grits do not align with American grits the majority of the time.

7. Remove the excess water with a rubber squeegee and inspect the area.
  - A. If this has repaired the damage, continue the sanding procedure on the entire panel, apply a finesse type polish with a foam pad and remove any swirl marks with a dual action orbital polisher and foam pad.
  - B. If (during the repair) it is suspected or observed that;
    - etching has penetrated into the base coat OR
    - too much clearcoat has been removed during sanding OR
    - base color is transferred to pad during polishing,

The **AFFECTED AREAS MAY REQUIRE RECLEARCOATING/COLORCOATING OR REFINISHING**.

8. In any case, once the proper repairs have been made, the final step in the repair process involves polishing the vehicle.

#### **A WORD ABOUT CLEARCOAT THICKNESS**

The clearcoat on the vehicle is typically 1.5 to 2.0 mils thick (one mil equals .001" or 1/1,000 of an inch). At least one mil thickness is required to provide lasting protection to the vehicle basecoat.

#### **PAINT GAGES**

The best way to accurately measure how much clearcoat has been removed is to use a paint gage before, during and after the sanding process. Paint gages measure the total thickness of the finish and when used, can determine how much clearcoat has been removed during the repair process. Paint gages range from magnetic pull types to sophisticated electronic types, are available from a variety of sources, and can cost from \$30 to \$1800.

The older magnetic type gages, at best, a +/- 5% accuracy range and are not sensitive enough to detect removal of .5 mil clearcoat. The newer type magnetic gages have improved accuracy ranges. Most gages are confined to checking either a ferrous metal (steel) or non-ferrous metal (aluminum) panels. At this time, there are no viable gages for reading film thickness on non-metallic panels.

A more sophisticated gage is the digital Elcometer 300 fn Paint Thickness gage (or equivalent). It has an ability to read film thickness on both ferrous and non-ferrous metal panels. This instrument has an accuracy range of +/- 1% and has thickness standards included for recalibration. Approximate cost = \$1750.

An alternative (for use on steel panels only) would be the digital Elcometer 246 model, or equivalent. This gage has a +/- 3% accuracy range and include thickness standards for recalibration. Approximate cost - \$575.

## REPAIRING RAIL DUST DAMAGE

Rail dust damage comes from the tiny iron particles produced from the friction between the train wheels and the track. It can also be deposited on vehicles if stored near any operation producing iron dust (steel ore yards, etc.). This dust can either lay on top of, or embed into the paint surface. It is usually diagnosed as;

- bumps in the paint surface OR
- rust colored spots in the paint.

### PROCEDURE:

1. Wash the vehicle with soap and water, dry it and clean the affected area with wax and grease remover.
2. Keeping the vehicle in a cool or shaded area, rinse the surface with cold water.

**CAUTION: RAIL DUST REMOVER (OXALIC ACID) IS AN ACIDIC SUBSTANCE CONTAINING CHEMICALS THAT WILL BREAK DOWN THE IRON PARTICLES EMBEDDED IN THE FINISH. WHEN WORKING WITH IT, USE THE NECESSARY SAFETY EQUIPMENT, INCLUDING GLOVES AND GOGGLES. FOLLOW THE MANUFACTURER'S DIRECTIONS CLOSELY BECAUSE IT MAY REQUIRE SPECIAL HANDLING AND DISPOSAL.**

3. Soak several terry cloth towels in a container of rail dust remover solution and, after the damaged areas have been rinsed with cold water, lay the wet towels on the damaged areas.
4. Allow the towels to remain in place for 20 minutes, keeping them moist by spraying with water and not allowing to dry on the surface of the vehicle.
5. After 20 minutes of applying the towels, remove them and rinse the area thoroughly with cold water. Inspect the affected area to ensure the dust has been removed. Use both touch (feeling for bumpy surface) and sight (magnifying glass for close inspection).
6. If upon inspection some particles are still present, the process of applying the towels can be repeated 3 times.
7. Select a test area and hand wet sand with American ultra fine 1,500 grit to 2,000 grit sandpaper to repair damage (surface pitting from dust).
  - a. Use ample amounts of water.
  - b. Go slow to prevent removing too much clearcoat.

**NOTICE: USE A PAINT GAGE TO DETERMINE THE AMOUNT OF CLEARCOAT REMOVED. IF TOO MUCH HAS BEEN REMOVED, ADDITIONAL CLEARCOAT WILL HAVE TO BE APPLIED.**

**IF RAIL DUST HAS PENETRATED INTO THE BASECOAT, THE PANEL REQUIRES REFINISHING. MAKE SURE ALL RAIL DUST HAS BEEN REMOVED PRIOR TO REFINISHING OR THE RUST SPOTS WILL RETURN, CAUSING CUSTOMER COMEBACKS.**

8. If the damage has been repaired, complete the repair to the entire panel.
9. Once the damage has been repaired, the final step in the repair process involves polishing the vehicle.

## PREVENTING INDUSTRIAL FALLOUT DAMAGE

Customers should be urged to wash and dry their vehicles frequently and garage them, or at least cover them with a quality car cover when not in use.

Vehicles in dealer inventories should be kept clean and dry. A vehicle that sits unattended, especially after the sun has dried any water on the body surface, is a target for acid rain damage.

## MATERIALS DESCRIBED IN THIS BULLETIN\*

**WAX AND GREASE REMOVER - USE BELOW OR EQUIVALENT**

- Dupont # 3919S, PPG # DX440, BASF # 900, SIKKENS # 6041

**FINESSE POLISHES - USE BELOW OR EQUIVALENT**

- Dupont # 1500S, 3000S; BASF # 563-808, 560-1502; PPG # DRX10; 3M PERFECT-IT

**\* USE V.O.C. EQUIVALENTS IN STATES WITH V.O.C. RESTRICTIONS**

**RAIL DUST REMOVER - USE BELOW OR EQUIVALENT**

Industrial Fallout Remover # 5029

Zep Corporation

Atlanta, GA. Telephone # 404-352-1680

Stain Away # HBY 0160

Hornby Chemical

Milwaukee, WI. Telephone # 414-462-2833

If the rail dust remover is not available in your area, call one of the numbers listed above for a distributor near your location.

#### PAINT GAGES - USE BELOW OR EQUIVALENT

Elcometer Inc.  
1893 Rochester Ind. Drive  
Rochester Hills, MI. 48309  
(800) 521-0635 or  
(313) 650-0500

Zelcro, Ltd./Zormco  
8520 Garfield Rd.  
Cleveland, OH 44125  
(216) 441-6102

Delfesko Corp.  
410 Cedar St.  
Ogdensburg, NY 13669  
(800) 267-0607 or  
(613) 925-5987

Pro Motorcar Products Inc.  
22025 US-19 North  
Clearwater, FL 34625  
(800) 323-1090  
(813) 726-9225

"We believe these sources and their equipment to be reliable. There may be additional manufacturers of such equipment. General Motors does not endorse, indicate any preference for or assume any responsibility for the products or equipment from these firms or for any such items which may be available from other sources."

Technical Service Bulletin # **8917110**

Date: **890601**

### Warranty - Chipped Paint Diagnosis & Repair

Number: 89-171-10

Section: 10

Date: JUNE 1989

Subject: CHIPPED PAINT DIAGNOSIS AND REPAIR

Model and Year: 1985-89 CHEVROLETS

TO: ALL CHEVROLET DEALERS

Causes for chipped paint are often difficult to diagnose. The following information intended as a guide in determining whether the condition is due to a product condition or owner responsibility.

The paint used on all GM cars is designed to withstand certain impact forces without chipping. However, the color coat may chip off some body panels depending upon a number of factors and circumstances, including a vehicle's design features (hood, slope angle, size of front end panel, rocker panel turn under), age, the severity of impact, and severe owner usage.

Chipping paint is caused by (among other things) the inability of the top coat to flex enough when struck by salt, stones or hard objects. Conditions of chipping paint should be carefully evaluated to determine if the cause is related to a paint condition or severe usage by owner. When determining the cause, the following guidelines should be used as reference.

#### INSPECTION GUIDELINES

1. Prior to inspection the body exterior should be clean and free of dirt.
2. Carefully inspect all horizontal and vertical body panels for chips.
3. Carefully inspect windshield glass, side glass, side view mirrors, grille and exterior moldings for chips and dents.
4. Tape test chipped area:  
Apply a piece of waterproof or masking tape approximately ten (10) inches long, over the chipped area. Remove the tape with one quick, even pulling motion, 90 degrees to body panel.  
**IMPORTANT:** Do not use "duct" type tape with aggressive adhesive.

#### INDICATIONS OF A PAINT CONDITION

^ Body panels are chipped while windshield glass, moldings and other parts are free of chips and dents.

^ Tape test removes anything more than trace of paint from around edges of the chip or undamaged areas of panel.

## INDICATIONS OF SEVERE USAGE BY OWNER

^ Windshield glass, side glass, exterior moldings and other parts in addition to the painted panels show signs of chips and other damage.

## REPAIRS

Repairs to a vehicle, where the chipping has been determined to be the result of a paint condition require the removal of the topcoat and primer-surfacer for best results. The following, based on severity of the condition, are suggested as options for minimizing time and labor.

^ Heavily chipped areas require the removal of the topcoat and primer-surfacer.

^ Moderately chipped areas require the removal of only the topcoat.

^ Spot repair would probably be sufficient to repair panels with occasional chips.

^ Currently available procedures and materials are adequate to complete the repair.

On a typical complaint car, this would involve removing only the topcoat on hood, fender and door panels while the leading edges, where the chip pattern is heaviest, would require the additional step of removing the surfacer.

Technical Service Bulletin # **9133410**

Date: **910501**

## Paint - High Volume Low Pressure Paint Application

Number: 91-334-10

Section: 10

Date: MAY 1991

Corporate Bulletin No.: 161701R

Subject:  
HVLP-HIGH VOLUME LOW PRESSURE  
PAINT APPLICATION

Model and Year:  
1982-91 ALL PASSENGER CARS AND TRUCKS

VOC stands for Volatile Organic Compounds. Most solvents used in automotive refinishing paints are considered volatile organic compounds. Volatile organic compounds react chemically with sunlight and make a variety of pollutants generally referred to as "Photochemical Smog." VOC regulations seek to reduce the amount of VOC getting into the air and thereby limit pollution. One way to reduce the amount of volatile organic compounds being emitted into the air is to increase the transfer efficiency rate of the paint material being transferred between the spray gun and the surface being painted.

Different states throughout the country, such as California, New York, New Jersey, etc., are in the process of writing VOC emission regulations. As an example, the South Coast Air Quality Management District (SCAQMD) in Southern California has a Rule 1151 for automotive refinishing that stipulates that coating applications must be done with either electrostatic application, high-volume, low-pressure (HVLP) spray or "such other coating application methods that are demonstrated to the executive officer to be capable of achieving at least 65 percent transfer efficiency." HVLP spray is defined as "to spray a coating by means of a gun that operates between 0.1 and 10.0 psi air pressure."

What is the difference between the high pressure conventional spray guns now in use and the HVLP spray guns being stipulated in VOC regulations? In the conventional spray gun high pressure air leaves the air cap and rapidly expands. As this air expands, the paint from the fluid tip is blasted apart, sending small paint droplets in all directions at a high velocity. This explosion of paint causes much of the paint to pass or bounce off the surface being painted. Transfer efficiency on conventional spray guns is usually between 20 percent and 50 percent efficiency.

HVLP stands for (H)igh (V)olume (L)ow (P)ressure. HVLP spray guns utilize lower spray pressures upon atomization. The relatively low air pressure causes a much "softer" explosion. The resultant paint droplets are larger and slower. The large volume of air from the air caps can now better control the flight of the droplets. The paint spray tends to move in one direction. Bounce back and paint passing by the substrate are reduced, resulting in increased transfer efficiency. Transfer efficiency of HVLP guns is usually between 65 percent to 90 percent efficient. The amount of savings and transfer efficiency varies with the skill of the painter, gun adjustment, the air pressures, the size of the object being painted, and the viscosity of the paint.

Basically, there are three types of HVLP spray equipment available; turbine units, air conversion units, and spray guns with the air conversion units inside the gun.

The turbine unit is normally a portable or wall-mounted unit that generates a high volume of air at between 3 to 7 psi. Due to friction, the turbine generates heat. The amount of heat generated and the temperature of the air depend on the size of the turbine and length of hose. A large size diameter air hose is used between the turbine and the HVLP spray gun.



Air conversion units are normally portable or wall-mounted units that use high pressure air from an air compressor and then convert it to a high volume of air at a lower pressure set on a regulator. Most air regulators on these units do not exceed 10 psi. A large size diameter air hose is used between the air conversion unit and the HVLP spray gun. These units do not generate any heat, but can be purchased with a heat source.

HVLP spray guns with the air conversion units inside the gun use high pressure air from an air compressor and then convert it to a high volume of air at a preset pressure normally dependent on incoming air line pressure. The spray guns cannot exceed 10 psi no matter how high the incoming air line pressure is. There is no large diameter air hoses or heat to contend with. HVLP equipment that can maintain precise control and maintain close to 10 psi air cap pressure will provide better atomization of materials, especially low VOC paints.

A GM training course on HVLP Paint Application is currently available (Course # 22001.42). Please refer to the GM monthly training schedule for more information.

#### MANUFACTURERS of HVLP SPRAY EQUIPMENT

Accuspray System  
Bessam-Aire  
26881 Cannon Road  
P.O. Box 46478  
Cleveland, OH 44146-0478  
216-439-1200

Binks  
Binks Manufacturing Co.  
9201 West Belmont Ave.  
Franklin Park, IL 60131  
708-671-3000

Can-Am  
Can-Am Engineered  
Products, Inc.  
30850 Industrial Rd.  
Livonia, MI 48150  
313-427-2020

Croix  
Croix Air Products  
520 Airport Rd./Flemingfield  
So. St Paul, MN 55074  
612-455-1213

DevilBiss  
The Devilbiss Co.  
320 Phillips Ave.  
P.O. Box 913  
Toledo, OH 43962  
419-470-2169

Graco Inc.  
P.O. Box 1441  
Minneapolis, MN 55440-1441  
1-800-367-4023

Lex-Air Turbine Spray  
Lex-Air South  
5874 Buford Hwy.  
Doraville, GA 30340  
404-454-8417

Mattson  
230 West Coleman  
P.O. Box 132  
Rice Lake, WI 54868  
715-234-1617

Sata  
Sata Spray Equipment  
P.O. Box 46 Hwy. 16&63 N.  
Spring Valley, MN 55975  
507-346-7102

Sharpe Mfg.  
1224 Wall St.  
P.O. Box 15042  
Los Angeles, CA 90015-0042  
213-749-4368

Xcel Spray  
Smith Eastern Corporation  
5020 Sunnyside Ave. #207  
Beltsville, MD 20705  
301-937-4548

We believe the sources listed in this bulletin and their equipment to be reliable. There may be additional manufacturers of such equipment. General Motors does not endorse, indicate any preference for or assume any responsibility for the products or equipment from this firm or for any such item which may be available from other sources.

Technical Service Bulletin # **9128210**

Date: **910401**

### **Paint - Importance of Checking Clear Coat Thickness**

Number: 91-282-10

Section: 10

Date: APRIL 1991

Corporate Bulletin No.: 111701R

Subject:  
**IMPORTANCE OF CHECKING CLEAR COAT  
THICKNESS BEFORE AND AFTER PAINT  
FINESSE OPERATIONS**

Model and Year:  
1984-91 ALL PASSENGER CARS  
1984-91 M VAN AND C/K TRUCKS  
1987-9.1 R/V TRUCKS  
1990-91 L AND U VAN

THIS BULLETIN CANCELS AND SUPERSEDES DEALER SERVICE BULLETIN NO. 91-255-10, DATED MARCH 1991. THE SUPPLIER ADDRESS HAS BEEN CORRECTED. ALL COPIES OF 91-255-10 SHOULD BE DISCARDED.

Finesse procedures may result in a lowering of the clear coat protective film below the level necessary to provide minimum durability and performance requirements. As time progresses, a severe "whitening" or degradation of the clear coat may occur when the clear coat is removed below the minimum GM specification.

A paint thickness gage should be used to determine how much of the clear coat has been removed by the polishing or compounding process. Readings of the paint film build should be taken prior to the finesse operation. As the finesse operation progresses, additional readings should be taken to determine the impact on the total film build. If the gage indicates the total thickness has been reduced by .5 mils, it will be necessary to re-spray clear on the repair area to restore the needed ultraviolet protection. If the base coat is disturbed, a complete repainting process is required.

There are many types of paint thickness gages available to the refinisher in today's market. The older magnetic-type gages, the best of which have a +/- 5% accuracy range, are not sensitive enough to detect a .5 mil removal of clear coat. Most gages are confined to checking either a ferrous substrate (steel), or a non-ferrous metal substrate. At this time, there is no viable gage for reading film thicknesses on a non-metallic substrate (such as plastic or rubber).

The digital Elcometer 300 fn paint thickness gage, or equivalent, has the ability to read film thicknesses on both ferrous and non-ferrous metal substrates. With thickness standards included for recalibration purposes, this instrument is capable of reading film thicknesses within an accuracy range of +/- 1%. The approximate cost of the unit is \$1750.

As an alternative unit for the refinisher who deals only with traditional steel components. The digital Elcometer 246 model, or equivalent may be used. The gage demonstrates a +/- 3% accuracy range and comes with thickness standards for recalibration. The approximate cost of this unit is \$575.

Other digital paint thickness gages are available from the suppliers listed below which demonstrate the same accuracy levels as the recommended Elcometer models:

Elcometer, Inc.  
1893 RochesterInd. Drive  
Rochester Hills, MI 48309  
(800) 521-0635 or  
(313) 650-0500

Defelsko Corp.  
410 Cedar Street  
Ogdensburg, NY 13669  
(800) 267-0607 or  
(613) 925-5987

Zelcro, Ltd./Zormco  
8520 Garfield Road  
Cleveland, OH 44125  
(216) 441-6102

We believe these sources, their equipment, and materials to be reliable. There may be additional manufacturers of such materials and equipment. General Motors does not endorse, indicate any preference for, or assume responsibility for the products or equipment from these firms or for any such items which may be available from other sources.

Technical Service Bulletin # **881351010**

Date: **880101**

## **Paint - Removal of Minor Imperfections**

Number: 88-135-10

Section: 10  
Date: Jan., 1988

Subject: REMOVAL OF "CHEMICAL SPOTTING" AND OTHER MINOR PAINT IMPERFECTIONS WITHOUT REPAINTING

Model and Year: ALL MODELS WITH BASECOAT/CLEARCOAT PAINT  
TO: ALL CHEVROLET DEALERS

This bulletin cancels and supersedes Chevrolet Dealer Service Bulletin 87-166 (Section 10) dated June 1987. This bulletin provides new materials which are available for use on basecoat/clearcoat systems.

Some Chevrolet models equipped with basecoat/clearcoat paint applications may experience a condition of small etched spots on horizontal surfaces of the paint finish. This condition is referred to as chemical spotting and may be caused by industrial fallout (acid rain).

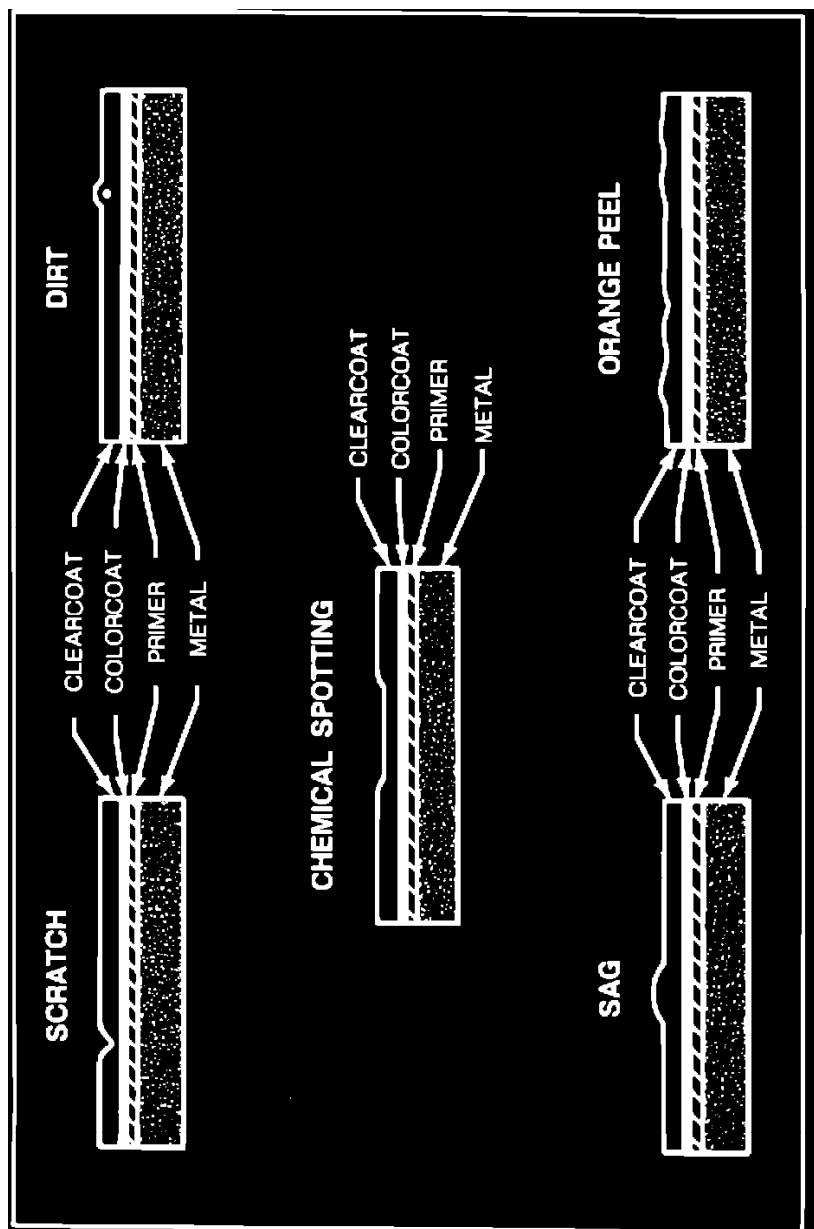


FIGURE 1

Chemical spotting along with other minor paint imperfections on basecoat/clearcoat finishes, such as sand scratches, dirt in paint, sags and orange peel may be repaired without paint application. Examples of these imperfections are shown in Figure 1.

To repair these conditions use the following procedures:

1. Wash the subject panel with water to remove any foreign material such as dirt, grit, etc.
2. Wet sand subject panel with 3M Micro fine 1500 grit sandpaper, P/N 2023 or equivalent. Wrap the sandpaper around a 3M rubber sponge back up pad, P/N 5530, to prevent leaving finger marks in the clearcoat. NOTE: Always sand the length of the panel and use a mild dish soap detergent in the wet sand operation for sandpaper lubricant.
3. Wheel compound sanded panel with 3M Finesse it II, P/N 5928, polishing compound and 3M Super Buff Polishing Pad, P/N 5705 or equivalent.
4. Swirl marks, left in the clearcoat, can be removed by rebuffing the affected area with a non-directional, dual action (D.A.) orbital sander. A clean terry cloth polishing bonnet and 3M Finesse II compound should be used.

**CAUTION:** Buffing wheels are not recommended for routine new car pre-delivery preparation of basecoat/ clearcoat finishes.

We believe this source and their equipment to be reliable. There may be additional manufacturers of such equipment. General Motors does not endorse, indicate any preference for or assume any responsibility for the products or equipment from these firms or for any such items which may be available from other sources.

Technical Service Bulletin # 72-05-11

Date: 971201

## Warranty - Rail Dust Removal & Chemical Spotting Labor

File In Section: Warranty Administration

Bulletin No.: 72-05-11

Date: December, 1997

## **WARRANTY ADMINISTRATION**

### **Subject:**

Clarification of Rail Dust Removal (A5575-A5580) and Chemical Spotting (A5541-A5544) Labor Operations

### **Models:**

All Past and Future Passenger Cars and Light Duty Trucks

The purpose of this Warranty Administration Bulletin is to clarify the usage, limits and guidelines for the proper use of the above subject labor operations.

The above subject labor operations were introduced to correct paint imperfections caused by fallout that occurred either during shipment to the dealer or within the first 12 months or 12,000 miles (20,000 kms) of vehicle ownership. GM vehicle owners are informed that although no defect in the factory applied paint causes this, GM will repair, at no charge to the owner, the surfaces of new vehicles damaged by fallout condition within 12 months or 12,000 miles (20,000 kms) whichever occurs first. Effective with repair orders dated on or after December 1, 1997, labor operations A5575-A5580 Rail Dust Removal and A5541 through A5544 Chemical Spotting will be limited to within the first 12 months or 12,000 miles of the Base Vehicle Warranty (20,000 kms) whichever occurs first.

Technical Service Bulletin # **91858A**

Date: **901001**

## **Electrical Connectors - Service Procedure**

Number: 91-85-8A

Section: 8A

Date: October 1990

Corp. Bulletin No.: 018115

Subject: PROCEDURE FOR CHECKING CONNECTOR TERMINAL CONTACT

Model and Year: 1982-91 PASSENGER CARS AND TRUCKS

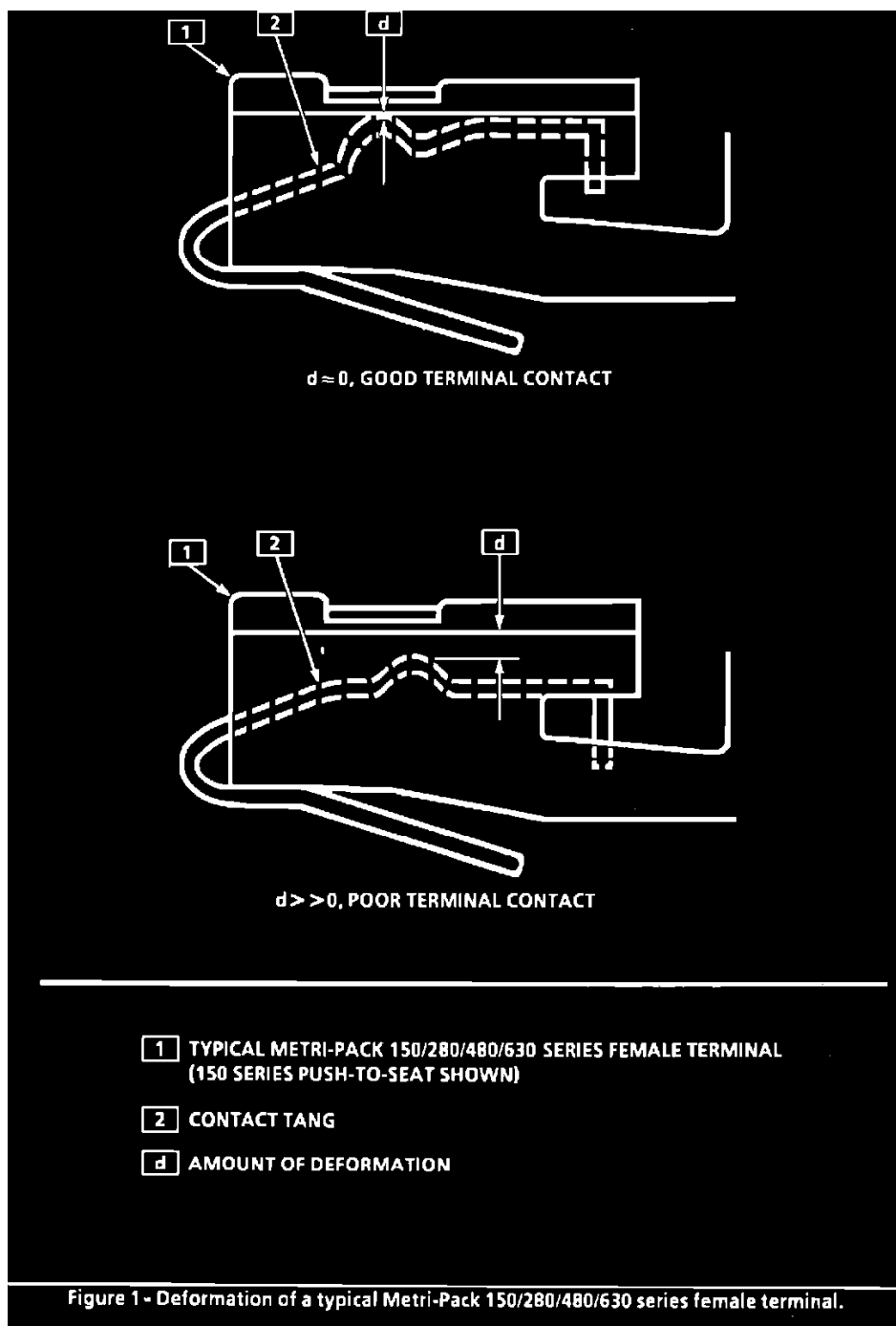


Figure 1

TO: ALL CHEVROLET DEALERS

When diagnosing an electrical system that utilizes Metri-Pack 150/280/480/630 series terminals (refer to Terminal Repair Kit J 38125-4 instruction manual for terminal identification), it is important to check terminal contact between a connector and component, or between in-line connectors, before replacing a suspect component.

Frequently, a diagnostic chart leads to a step that reads: "Check for poor connection or replace...". Mating terminals must be inspected to assure good terminal contact. A poor connection between the male and female terminal at a connector may be the result of contamination or deformation.

Contamination is caused by the connector halves being improperly connected, a missing or damaged connector seal, or damage to the connector itself, exposing the terminals to moisture and dirt. Contamination, usually to underhood or underbody connectors, leads to terminal corrosion, causing an open circuit or intermittently open circuit.

Deformation is caused by probing the mating side of a connector terminal without the proper adapter, improperly joining the connector halves or repeatedly separating and joining the connector halves. Deformation, usually to the female terminal contact tang, can result in poor terminal contact, see Figure 1, causing an open or intermittently open circuit.

Follow the procedure below to check terminal contact.

1. Separate the connector halves, refer to Terminal Repair Kit J 38125-4 instruction manual.

2. Inspect the connector halves for contamination. Contamination will result in a white or green build-up within the connector body or between terminals causing high terminal resistance, intermittent connection or an open circuit. An underhood or underbody connector that shows signs of contamination should be replaced in its entirety, terminals, seals and connector body.
3. Using an equivalent male terminal from the Terminal Repair Kit J 38125-2, check the retention force of the female terminal in question by inserting and removing the male terminal to the female terminal in the connector body. Good terminal contact will require a certain amount of force to separate the terminals.
4. Using an equivalent female terminal from the Terminal Repair Kit J 38125-2, compare the retention force of this terminal to the female terminal in question by joining and separating the male terminal to the good female terminal, and then joining and separating the male terminal to the female terminal in question. If the retention force is significantly different between the two female terminals, replace the female terminal in question, refer to Terminal Repair Kit J 38125-2.

Technical Service Bulletin # **913967A**

Date: **910801**

## **A/T - Evaluating Peened Spacer Plates**

Number: 91-396-7A

Section: 7A

Date: AUGUST 1991

Corporate Bulletin No.: 177120

Subject: EVALUATING PEENED SPACER PLATES

Model and Year: 1982-91 ALL PASSENGER CARS AND TRUCKS WITH AUTOMATIC TRANSAXLES AND TRANSMISSIONS (EXCEPT GEO)

TRANSMISSIONS APPLICATIONS:

All HYDRA-MATIC Automatic Transmissions and Transaxles

SUBJECT:

Evaluating Peened Spacer Plates (Service Information)

TRANSMISSION MODELS:

All

VEHICLE APPLICATIONS:

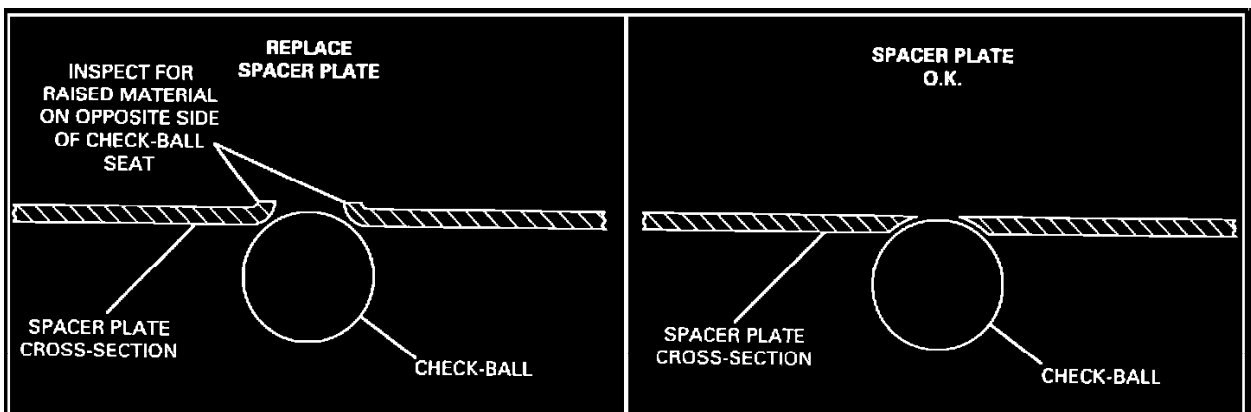
All Vehicles Using HYDRA-MATIC Automatic Transmissions and Transaxles

Bulletin Covers:

Some spacer plate peening is considered acceptable and preferred because it can help seat the check ball. This bulletin will help you decide if a spacer plate needs to be replaced due to a peening condition.

Service Procedure:

The following two procedures can help determine if the spacer plate can be reused. The following must be performed at all check-ball locations.



**Figure 1**

1. The spacer plate must be inspected 100% for raised material on the opposite side of the check-ball seat (see Figure 1). If the material on the opposite side is raised, the peening is too severe and the spacer plate must be replaced.

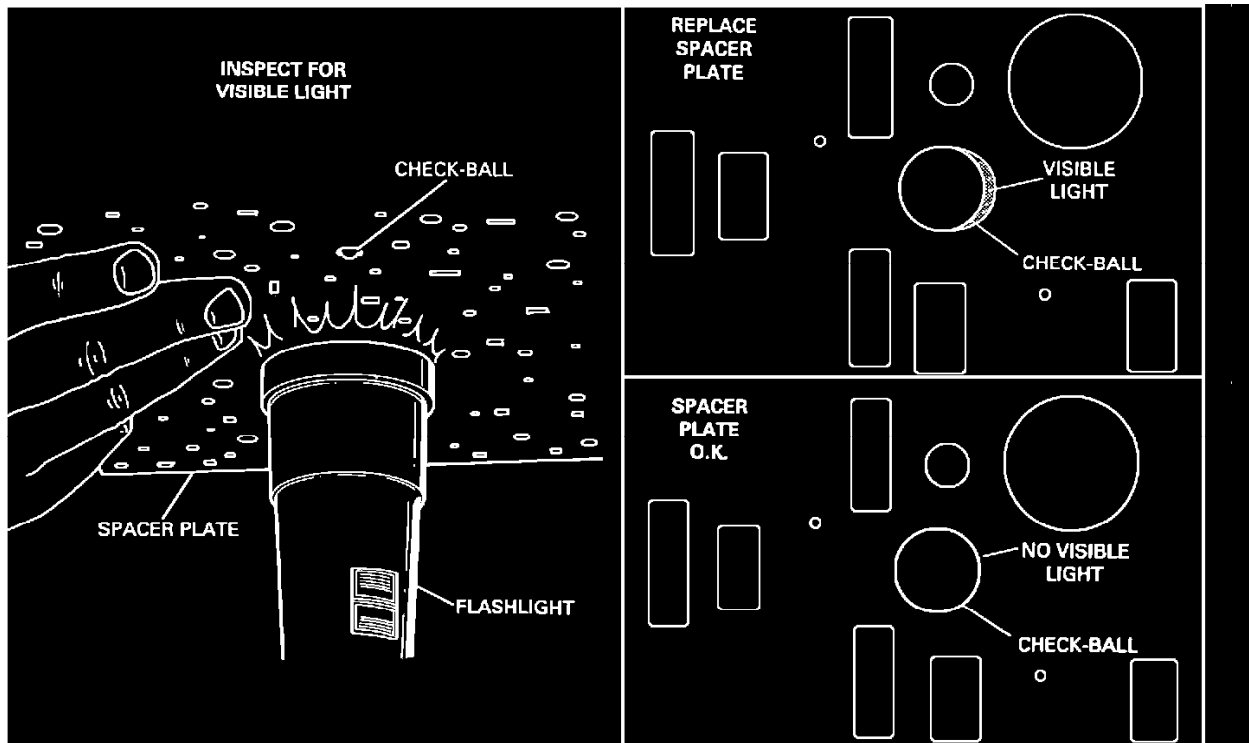


Figure 2

2. To verify that the spacer plate is peening evenly and the ball is sealing correctly, seat the check-ball on the spacer plate. Shine a beam of light on the opposite side and inspect for light between the spacer plate and check-ball (see Figure 2). No trace of light should be present. If light can be seen, a proper seal does not exist, and the spacer plate must be replaced.

Service Manual Reference:

Refer to the HYDRA-MATIC Automatic Transaxle/Transmission Diagnosis or Unit Repair section of your service manual for proper check-ball locations and functions.

Technical Service Bulletin # **89967A7B**

Date: **890301**

## Drivetrain - New Seal Protector for Drive Axle R&R

Number: 89-96-7A/7B

Section: 7A/7B

Date: MARCH, 1989

Subject: AXLE SEAL PROTECTOR TO PREVENT RIGHT SIDE AXLE  
SEAL DAMAGE DURING DRIVE AXLE INSTALLATION

Model and Year: 1980-89 CHEVROLET FWD MODELS

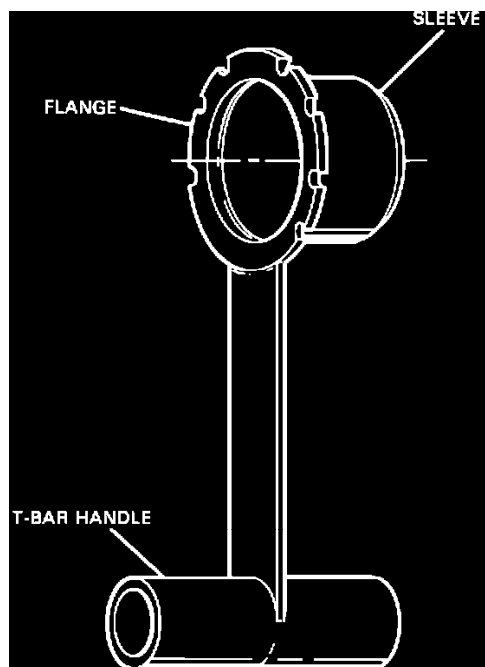


FIGURE 1 - AXLE SEAL PROTECTOR

TO: ALL CHEVROLET DEALERS

This bulletin covers a new low cost disposable Axle Seal Protector (Figure 1) now available for 1989 and prior models on A, J, L, and X cars equipped with a THM 125/HYDRA-MATIC 3T40, THM A1/HYDRA-MATIC 3T40-A, THM 440-T4/HYDRA-MATIC 4T60, THM F-7, HM-282/HYDRA-MATIC 5TM40, FX-125 OR FX-170. The advantage of this Axle Seal Protector is to prevent axle seal damage during installation of the right side Drive Axle. The right side (both sides for some manual transaxles) Drive Axle has male splines and a snap ring groove that can potentially nick or cut the seal when the Axle Seal Protector is not used.

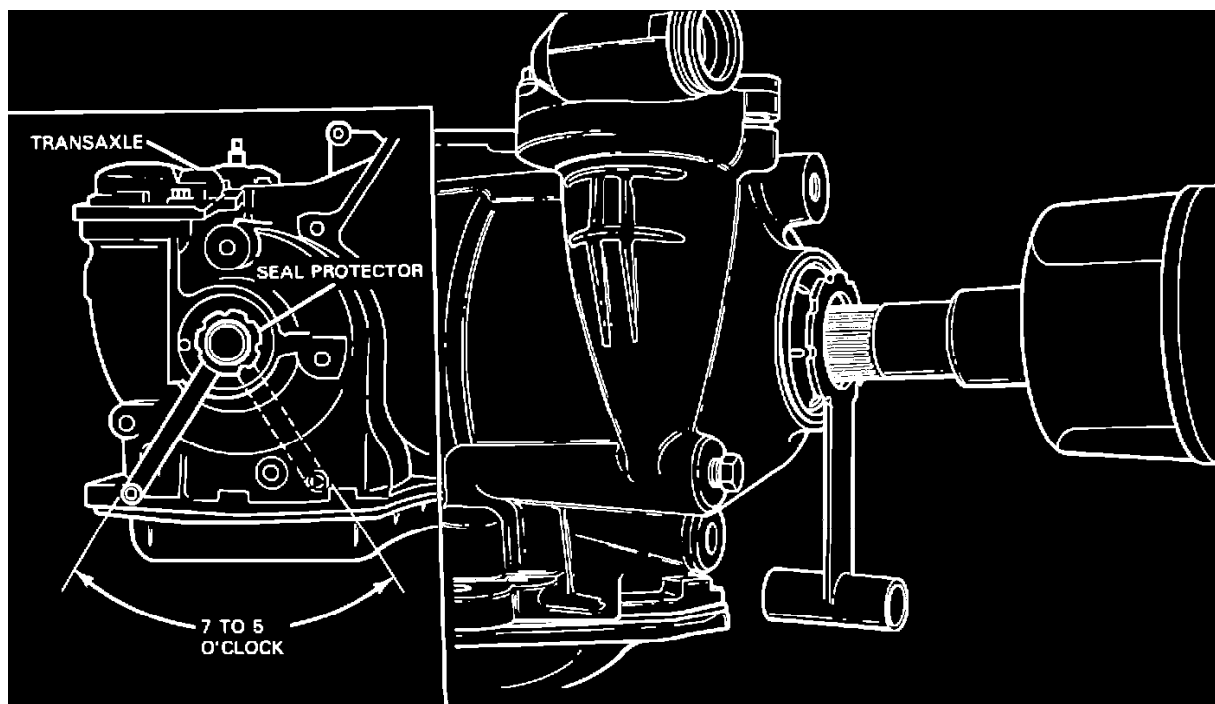


FIGURE 2 - RECOMMENDED INSTALLATION POSITION

#### SERVICE ACTION:

Once the transaxle is installed in the car and before the right side Drive Axle is installed, insert sleeve portion of Axle Seal Protector into the Axle Seal (Figure 2). Install with the "T-bar handle" in such a position so that it can be pulled out easily after the Drive Axle is installed. This will be between the 5 to 7 o'clock position, depending on the transaxle and carline. To remove the Axle Seal Protector after the Drive Axle is installed, pull in line with the "T-bar handle". Once removed, ensure that the Axle Seal Protector is intact (no pieces left inside the transaxle). Dispose of the protector, it is not reusable. Note - the Axle Seal should be replaced every time the Drive Axle is removed because the seal can be damaged during removal as well as installation.

**NOTICE:** The seal protector must be removed before the car is driven to prevent the protector from deteriorating inside the transaxle causing a leak and requiring Drive Axle removal to correct.

#### SERVICE TOOL INFORMATION:



The Axle Seal Protectors are available from Kent-Moore for \$8.95 per package (price does not include shipping) and can be obtained through Kent-Moore's order department (313) 574-2332 or 1-800-345-2233.

Tool No.	Description Package Contents
J 37292-A	Package - Seal Protectors (Seal Protectors - 50 in a package)

Technical Service Bulletin # **922501A**

Date: **920801**

## A/C - Use of Alternate Refrigerants In CFC 12

Number: 92-250-1A

Section: 0A

Date: AUGUST 1992

Corporate Bulletin No.: 231205

ASE No.: A7

Subject:  
USE OF ALTERNATE REFRIGERANTS IN CFC 12 REFRIGERANT MOBILE AIR CONDITIONERS

Model and Year:  
GALL MODEL YEARS - ALL PASSENGER CARS AND TRUCKS INCLUDING GEO

A number of inquiries have been received concerning the use of "alternate refrigerants" as a replacement for R-12 refrigerant in General Motors air conditioning systems.

Regardless of any advertised claims, there are currently no substitutes for refrigerant R-12 approved by General Motors. At the present time, only new or recycled R-12 is approved for use in General Motors R-12 air conditioning systems.

Based on studies performed to date, the use of "alternate refrigerants" in General Motors R-12 air conditioning systems may result in higher system pressures, higher leak rates or incompatibility with drying and sealing materials. System performance and reliability may also be affected.

Service equipment manufacturers have indicated that cross-contaminating R-12 recovery/recycling equipment with "alternate refrigerants" may damage the equipment. General Motors supports the Society of Automotive Engineers recommended service procedures for recovery and recycling of R-12. The use of known "alternate refrigerants" without proper service practices for identifying vehicle systems containing these "alternate refrigerants" and dedicated recovery equipment to service those vehicles will contaminate the recycled supply of R-12 refrigerant. Contamination of the recycled R-12 refrigerant makes the refrigerant unusable for recharging air conditioning systems and could jeopardize the recycling program.

At the present time, General Motors has not approved any "alternate refrigerant" for R-12 in R-12 air conditioning systems. Therefore, R-12 systems should continue to be serviced with new or recycled R-12 only.

Technical Service Bulletin # **531205**

Date: **950501**

## Contaminated R12 Refrigerant - Testing & Handling

FILE IN SECTION: 1 - HVAC

BULLETIN NO.: 53-12-05

DATE: May, 1995

SUBJECT:  
Contaminated R12 Refrigerant Testing and Handling

MODELS:  
1994 and Prior Passenger Cars and Trucks with R12 A/C Systems

The J 39851 "PureGuard" R12 refrigerant monitor was recently shipped to all GM dealers as an essential tool to test R12 refrigerant. Dealers are strongly urged to install this protective device on their ACR3 or other R12 recovery equipment immediately. The PureGuard is easily installed on any recovery cart (20 minutes), requires no recovery cart modifications, is fully automatic (no training required) and does not increase the time required to perform normal A/C service procedures. Proper use of this tool can:

- ^ Prevent damage to your R12 recovery/recycling equipment.
- ^ Prevent contamination of previously recovered R12 in the recovery tank.

^ Prevent loss of your recovered R12 as contaminated refrigerant will activate automatic air purge system.

^ Prevent the spread of contaminated R12 to other vehicles you service.

If your dealership has multiple R12 recovery stations which are not protected, use the PureGuard to check the refrigerant in these recovery tanks for contamination at least once each week. Simply connect the PureGuard blue service hose (that would normally be connected to the vehicle low side service port) to the red or vapor side of any recovery cart tank and run the test. It is also important to check a tank containing recovered/recycled material for purity before installation on your charging equipment. Even new R12 refrigerant purchased from sources other than GM should be tested for contamination prior to use.

#### Sources of Contaminated R12 Refrigerant

Since refrigerant testing has not been a standard practice in the mobile A/C repair industry, the amount of R12 refrigerant contamination is unknown. As R12 prices rise and supplies are depleted, it is anticipated that contaminated R12 refrigerant may become more prevalent from the following as well as other sources:

^ The use of R12 refrigerant substitutes without installation of unique service fittings and proper identification labeling.

^ Improper use of R12 substitutes, such as topping off R12 systems with R134a or other refrigerants available to "do-it-yourselfers".

^ Poor quality or contaminated new or reprocessed R12 refrigerant.

R12 can and should continue to be used to service vehicles built with R12 as long as it is available. Combining any refrigerant with R12 results in a refrigerant mixture which cannot be used in an A/C system.

R134a is the only substitute refrigerant approved by GM and should only be used when the appropriate retrofit service bulletin procedures are explicitly followed. Use of any other substitute refrigerant requires the purchase of additional dedicated recovery, recycling (if applicable) and charging equipment to service each substitute refrigerant used.

However, you should know that the Environmental Protection Agency (EPA) has listed several products as acceptable replacements for R12 mobile A/C systems under the Significant New Alternatives Policy (SNAP). Some of these products are: R134a, R401c (a DuPont refrigerant blend) and FRIGC (another refrigerant blend). It is important to understand that the SNAP program only considers the health, safety and environmental characteristics of a chemical. It does not test for A/C system cooling performance or durability. That judgment is deferred to the vehicle manufacturer. Use of any R12 refrigerant substitute without dedicated service equipment, unique fittings, labels and refrigerant testing prior to recovery, could result in contamination of the R12 supply and the loss of the R12 recycling program.

#### What To Do When Contamination is Detected

Repeat the test to verify contaminated refrigerant is present. Clear the PureGuard following the instructions listed on the face panel, then perform a second test to verify that the vehicle A/C system contains contaminated or mixed refrigerant.

Contact the vehicle owner to advise that previous A/C system repairs were apparently performed with an R12 refrigerant substitute. Suggest the owner contact or return to the previous repair facility. Explain that environmental regulations prohibit repair facilities from discharging ozone depleting A/C refrigerants into the atmosphere. Explain that recovery of this unknown refrigerant could damage your service equipment.

If the customer wishes to pursue repairs through your facility, it is recommended that the proper A/C service equipment be purchased. General Motors recommends the Kent-Moore J 41428 "Scavenger", an air operated refrigerant recovery station, be used to remove unknown refrigerants. The air operated feature reduces the hazard of recovering potentially flammable refrigerants. Dealers should evaluate the need to purchase the equipment based on the number of contaminated vehicles they encounter.

As an alternative to the initial purchase of a recovery only station, dealers should check locally for A/C specialty shops which may have the equipment to service substitute or contaminated refrigerants. They may be able to provide contaminated refrigerant recovery service to the dealer.

The GM Service Technology Group has tested a recovery procedure where a 15 or 30 pound DOT approved refillable tank is fully evacuated then connected to a vehicle A/C system to recover the charge. Testing has shown that even when the recovery tank is cooled down in dry ice, the procedure does not guarantee the entire charge will be recovered. Since EPA regulations require full recovery of ozone depleting substances, GM does not recommend this procedure.

#### Contaminated Refrigerant Disposal

Although A/C refrigerant testing and disposal have not been a service practice in the mobile A/C industry, It has been common in the stationary A/C service industry for many years. Listed at the end of this bulletin are companies that provide refrigerant disposal service for the stationary A/C industry. Please be advised that GM has not independently evaluated these companies and is not in any way endorsing or promoting the use of these companies. Each of these companies has expressed an interest in providing refrigerant disposal service to GM dealers.

In working with the stationary A/C industry, these companies typically receive large volumes of different refrigerants that have been mixed together. Unfortunately, because the volume of material returned by the mobile A/C industry will be in much smaller quantities, the cost of handling will be greater.

To arrange for return of the refrigerant, simply call the company nearest you using the phone number listed below. The company will advise you on billing and shipping procedures. Disposal cost will vary between \$3.00 and \$5.00 per pound plus freight and handling. Shipping charges will vary by distance and location. In general, a 7 to 10 day turn-around time on the tank can be expected. The tank can be shipped via common carrier. Documents that your refrigerant has been properly disposed of will be sent to you with the return of your tank.

As an alternative, many dealerships already have contracts in place with a disposal company who manages their hazardous wastes. In these cases, the disposal service may agree to handle containers of mixed refrigerants. Initially, the local disposal companies may be surprised by this inquiry. They may want to evaluate how much material will be collected before deciding whether to provide this service.

As we move forward with the practice of testing R12 refrigerant, it will take time for all the questions to be answered. STG will provide additional information as soon as it is available.

#### Understanding The PureGuard

The PureGuard is a highly sensitive instrument capable of detecting R12 with 3% or less cross-contamination with other refrigerants. Any refrigerant mixture in excess of this amount poses a threat to both your refrigerant supply and recovery equipment. The PureGuard uses a pass/fail approach when monitoring the refrigerant and is precisely calibrated to cut power to the recovery machine if it encounters R12 mixed with any substitute refrigerants. The PureGuard ignores the presence of the air, dyes or oils in the refrigerant sampled.

At least 20 psi must be present in the vehicle's A/C system for the PureGuard to function. Otherwise, refrigerant cannot be introduced to the PureGuard's test chamber. If a vehicle's A/C system contains less than 20 psi, it is an indication that the vehicle's system is nearly depleted of refrigerant.

Occasionally, erratic PureGuard operation or service code 002 display will be encountered when A/C system pressure is exactly 20 psi. If this occurs, simply cycle the on/off switch to reset the PureGuard. After the 30 second PureGuard warm-up cycle, proceed immediately with vehicle recovery operation.

Feedback from the field has indicated PureGuard service code 002 will also be displayed if the oil drain port is not sealed. Make sure the "O" ring seal in the cap is in place and that the cap is tight.

If the PureGuard fails to clear or if you experience any other problems operating the PureGuard, contact Kent-Moore Technical Service at 1-800-345-2233. The unit should not be returned without first contacting Kent-Moore to obtain return authorization.

#### Refrigerant Disposal Locations:

United States Refrigerant Reclamation Inc.  
12420 North Green River Rd.  
Evansville, IN 47711  
800-207-5931, FAX - 812-867-1463

Omega Refrigerant Reclamation  
5263 North Fourth St.  
Irwindale, CA 91706  
310-698-0991, FAX - 310-696-1908

Refrigerant Management Svcs of Georgia  
216 F. Atlanta Hwy.  
Cumming, GA 30130  
Ph/FAX - 800-347-5872

Refrigerant Reclaim Inc.  
122 Old Stage Coach Rd.  
Dumfries, VA 22026  
800-238-5902, FAX - 703-441-0393

Gartech Refrigerant Reclamation Ctr.  
2002 Platinum  
Garland, TX 75042  
214-272-4070, FAX - 214-272-8548

National Refrigerants, Inc.  
11401 Roosevelt Blvd.  
Philadelphia, PA 19154  
215-698-6620, FAX - 215-602-8205

CFC Reclamation  
1321 Swift North  
Kansas City, MO 64116  
816-471-2511

Full Cycle-Global  
550 James Street  
Lakewood, NJ 08701  
908-370-3400, FAX - 908-370-3088

Refrigerant Reclaim Svcs, Inc.  
dba Full Cycle-Global  
121 S. Norwood Drive  
Ft. Worth, TX 76053-7807  
817-282-0022, FAX - 800-831-6182

Full Cycle-Global  
2055 Silber, Ste. 109  
Houston, TX 77055  
713-681-7370, FAX - 713-681-9947

Full Cycle-Global  
343 South Airline Hwy.  
Gonzales, LA 70737  
504-644-5303, FAX - 504-644-1809

Full Cycle-Global  
2966 Wireton  
Blue Island, IL 60406  
708-388-8551, FAX - 708-388-8550

Technical Service Bulletin # **631209**

Date: **960501**

## **A/C - R12 or R134a Service Recommendations**

File In Section: 1 - HVAC

Bulletin No.: 63-12-09

Date: May, 1996

### **INFORMATION**

Subject:  
Service Issues for Vehicles with R12 or R134a Air Conditioning Systems

Models:  
1988-96 Passenger Cars and Trucks

## **R12 Service Recommendations**

As you know, production of R12 refrigerant ceased on December 31, 1995. Although R12 will no longer be manufactured, there is a reserve supply of R12 available. This reserve, along with strict A/C repair service adherence to proper refrigerant recycling procedures, should assure continued availability to meet consumers' needs.

R12 can and should continue to be used to service vehicles built with R12 A/C systems as long as it is available. If R12 is no longer available or affordable, a system retrofit utilizing R134a is recommended. **R134a IS THE ONLY SUBSTITUTE REFRIGERANT RECOMMENDED BY GM FOR USE IN GM VEHICLE A/C SYSTEMS, AND THEN ONLY AFTER FOLLOWING THE PROPER RETROFIT PROCEDURES FOR THE SPECIFIC MODEL.** All new vehicle manufacturers have chosen R134a for retrofit. One of the key reasons is to protect both the service industry and consumers from the high costs that would result from purchasing equipment necessary to service multiple refrigerants. This position also reduces the threat of recycled refrigerant contamination.

GM currently offers a simple, low cost R12 to R134a retrofit on many of its late model, front wheel drive passenger cars. Dealers should discuss this capability with owners of these specific models, listed in Retrofit Corporate Bulletin # 43-12-07D, whenever a repair to the A/C refrigerant system is required. Early retrofit of these specific models will aid in prolonging availability of the R12 supply and provide dealer service technicians the opportunity to become more familiar with the proper procedures for performing a retrofit.

Remember - R12 and R134a refrigerant are not interchangeable! They cannot be mixed together. In fact, despite the claims of some refrigerant manufacturers, no proposed R12 refrigerant substitute can be added to, mixed with or used to "top off" an R12 system. Under provisions of law covering the service of refrigerants, mixing dissimilar refrigerant products during service is prohibited.

To Summarize GM R12 Service Policy

1. Service R12 vehicles with good quality new or recycled R12 as long as it is available.

2. Purchase R12 from a reliable supplier. GMSP0 has a supply of high quality R12 available. Dealers are requested to use only R12 supplied by GMSP0 for warranty repairs. This high quality refrigerant will insure system performance and avoid the possibility of introducing contaminated material into the customer's A/C system.
3. Carefully test recovered R12 using the PureGuard monitor. On recovery equipment not protected by the PureGuard, always test the recovery cylinder prior to recharging a vehicle A/C system.
4. Discuss the R12 to R134a retrofit option with owners of GM vehicles listed in Retrofit Corporate Bulletin # 43-12-07D. Provide owner with a copy of the pamphlet "Converting Your Auto Air Conditioning System to Use the New Refrigerant".
5. Become familiar with retrofit procedures and exercise care in the handling of dissimilar refrigerants to prevent contamination.

## R134A Service Recommendations

When servicing a previously retrofitted vehicle, there is concern that if all of the R12 is not completely removed prior to the retrofit procedure, it could contaminate your R134a equipment and recovery tank when a subsequent A/C repair is performed. Although the number of retrofits being performed today is minimal, the volume will increase as R12 prices rise.

GM Service Technology Group is in the process of field testing a new R134a refrigerant purity tester similar to the PureGuard R12 refrigerant tester you now use. This new tool will mount to your ACR4 R134a Recovery Recycle and Recharge cart and sample all R134a refrigerant prior to recovery. It is expected that testing of this tool will be completed this year.

This new tool, the Pureguard 2, will also test vehicles and your recycle tank for air contamination, which is threatening A/C system performance. High levels of air have been found in the recovery tanks on a number of R12 and R134a recovery carts. Air contamination is caused by improper recovery procedures and short-cutting refrigerant recycling times. Use the following procedure for testing and correcting air contamination in your A/C service equipment.

1. Make certain that the ACR4 equipment has not been used for at least 12 hours. It is recommended that the equipment be left in an area where the temperature will remain constant overnight to allow the temperature of the refrigerant in the tank to stabilize.
2. Record the surrounding air temperature next to the ACR4 refrigerant tank.

### Important:

A major assumption is that the ambient air temperature next to the tank represents the refrigerant temperature in the tank. Failure to take care in measuring the temperature could result in unnecessary work.

3. Close both liquid (blue) and vapor (red) valves on the ACR4 tank.
4. Disconnect low side (blue) service hose from the back of the ACR4.
5. Slowly disconnect the tank vapor hose (red) from the back of the ACR4 and connect it to the low side service port.
6. Open the vapor (red) valve on the tank and record the tank pressure on the low side gage.
7. Restore hoses to the original position.

Ambient Temperature	Desired Tank Pressure	Maximum Allowable Pressure
15.5 °C (60 °F)	393 kPa (57 psi)	476 kPa (69 psi)
18.3 °C (65 °F)	441 kPa (64 psi)	531 kPa (77 psi)
21.1 °C (70 °F)	490 kPa (71 psi)	593 kPa (86 psi)
23.8 °C (75 °F)	538 kPa (78 psi)	662 kPa (96 psi)
26.6 °C (80 °F)	593 kPa (86 psi)	724 kPa (105 psi)
29.4 °C (85 °F)	655 kPa (95 psi)	800 kPa (116 psi)
32.2 °C (90 °F)	717 kPa (104 psi)	876 kPa (127 psi)
35 °C (95 °F)	786 kPa (114 psi)	958 kPa (139 psi)
37.7 °C (100 °F)	855 kPa (124 psi)	1048 kPa (152 psi)

8. Referring to the Table, find the ambient temperature measured in Step 2. Compare the pressure reading from Step 6 to the "maximum allowable pressure". If the pressure reading from Step 6 is less than the "maximum allowable pressure", no further action is necessary.

**Important:**

The closer the tank pressure is to the desired tank pressure, the better the A/C system will perform.

9. If the pressure reading from Step 6 exceeds the maximum allowable pressure from the Table, open both tank valves and operate the ACR4 through 4 or 5 evacuation cycles. This will activate the automatic air purge to lower the tank pressure.

**Important:**

Station should not be connected to vehicle.

10. Repeat the tank pressure checking procedure the next day to determine if the pressure has been reduced to acceptable levels. If the tank pressure has been reduced but is not acceptable, cycle with ACR4 through more evacuation cycles and recheck the next day. Continue process until acceptable pressure is obtained. If the tank pressure is not reduced through the evacuation cycling, then Kent-Moore should be contacted at 1-800-345-2233.

Technical Service Bulletin # **331226**

Date: **940101**

## **A/C - Retrofitting R-12 Vehicles to R-134A**

Group Ref.: HVAC

Bulletin No.: 331226

Date: January, 1994

### **INFORMATION**

**SUBJECT:**

RETROFITTING R-12 VEHICLES TO R-134a

**MODELS:**

1994 AND PRIOR YEARS, PASSENGER CARS AND TRUCKS WITH R-12 A/C SYSTEMS

There has been a great deal of information presented by the media regarding the need to retrofit vehicles produced with R-12, to a substitute refrigerant. This bulletin will outline GM's position and future plans on this subject.

Most important, there is currently NO requirement to retrofit any R-12 vehicle. Vehicles built with R-12 can be serviced with R-12, as long as the refrigerant is available. At some point in time, R-12 may become either too scarce or too expensive to economically justify service on some vehicles with R-12. By that time, GM will provide you with instructions on retrofitting those vehicles from R-12 to R-134a.

GM vehicle divisions, platforms, and component suppliers have been actively working on the details of retrofitting R-12 vehicles. An enormous amount of work is required to determine how hundreds of vehicle models can be satisfactorily retrofitted. Additional information will be provided as it becomes available.

The following items contain important technical information that should answer many of the questions, and correct some misconceptions reported in the media.

### **SUBSTITUTE REFRIGERANTS**

R-134a is the only approved substitute refrigerant that GM recommends and it should only be used if a complete retrofit procedure has been performed. None of the other refrigerants currently being marketed as replacement or drop-in substitutes for R-12 are approved for use in GM vehicles.

R-12 and R-134a are not interchangeable. R-134a cannot be added to fill a low R-12 system. The combination of the two materials can cause high system pressures, which could cause damage to the system.

Retrofitting an R-12 vehicle to R-134a requires careful preparation to insure that neither the vehicle nor the A/C service equipment has become contaminated.

### **RESIDUAL MINERAL OIL**

The concern that mineral oil is chemically incompatible with R-134a and/or PAG lubricant has been proven to be untrue. A normal charge of mineral oil left in the A/C system after a retrofit to R-134a will not damage the system. Mineral oil, however, does not mix well with R-134a, and will not provide adequate lubrication. Tests on both the orifice tube and TXV systems show that the mineral oil parks in places such as the accumulator, and does not appreciably affect performance or damage the system. The retrofit service bulletin will specify the correct oil to be used. It is important that this oil recommendation be followed carefully.

### **RESIDUAL R-12**

Residual R-12 left in a system, due to improper retrofit service procedures, may result in system damage unless the residual R-12 is kept below the 2 percent limit specified by the Society of Automotive Engineers' Specification J-1661. New service methods are being developed to minimize the level of R-12 remaining in the A/C system after the retrofit procedure is completed. Following these new procedures will be critical to insure that the above limits are met.

#### SYSTEM FLUSHING

R-11, a material commonly used as an A/C system flushing solvent, has been found to be chemically incompatible with PAG lubricant. Technicians should be aware that residual R-11 remaining in an R-12 system will be very damaging if the vehicle is retrofitted to R-134a later in its life. For many years GM has recommended the use of in-line filters as an alternative to system flushing.

SYSTEM FLUSHING, USING EITHER R-11 OR ANY OTHER FLUSHING MATERIAL, IS NOT APPROVED BY GM FOR ANY A/C SYSTEM.

#### DESICCANT PROTECTION

It has been reported that the desiccant (moisture absorption material) used in 1992 and older R-12 A/C systems is incompatible with R-134a and PAG oil. The older desiccant was designed specifically for R-12 systems, but testing has shown that it is NOT necessary to replace the older desiccant just because the vehicle is being retrofitted to R-134a. 1993 and newer GM vehicles use desiccant designed to be compatible with both R-12 and R-134a systems.

The amount of desiccant used in most GM vehicles is designed to last for at least seven years. To help maintain adequate protection for vehicles that must be retrofitted, it is recommended that the accumulator/dryer, which contains the desiccant, be replaced if the vehicle is more than five years old.

#### "O" RINGS

While continuing to service with R-12, be sure to use "O" rings and seal materials which are compatible with R-134a and PAG oil. This practice will eliminate concern in case the vehicle requires retrofitting later in its life. All "O" rings and seal materials available from GMSPO are compatible with R-134a systems.

#### RETROFITTED SYSTEM PERFORMANCE

Currently, it appears that for most GM vehicles, the retrofit procedure will require minimal changes to the existing system. Some vehicles may need additional parts and/or procedures to provide acceptable performance and/or durability. Our testing has shown that vehicles that have undergone recommended retrofit procedures will, in most climatic conditions, be minimally affected in terms of A/C performance.

#### SERVICE POLICY

Basic service policy is as follows:

During Warranty - If an R-12 produced vehicle A/C system must be repaired or recharged under warranty, repairs will be completed using R-12. If R-12 is unavailable or unaffordable, GM will notify the dealer body and will pay for the warranty repair and the retrofit to R-134a.

#### NOTE:

If a customer requests that an in-warranty vehicle be converted to R-134a, and the R-12 system is functioning properly, the customer will be expected to pay for the retrofit.

Out of Warranty - The cost of the conversion will be the responsibility of the customer.

Technical Service Bulletin # **033206**

Date: **940301**

### **P/S - Reduced Assist When Cold**

Group Ref.: Steering/Suspension

Bulletin No.: 033206

Date: March 1994

#### SUBJECT:

REDUCED POWER STEERING ASSIST AT LOW AMBIENT TEMPERATURES (NEW POWER STEERING FLUID)

#### MODELS:

1994 AND PRIOR PASSENGER CARS AND LIGHT DUTY TRUCKS

**BULLETIN BEING REVISED TO ADD MODEL YEARS 1993-94, ADDED LIGHT TRUCKS  
AND REVISED "IMPORTANT" STATEMENT FOUND LISTED BELOW STEP 3.  
UNDER SUB-TITLE 'BLEEDING THE POWER STEERING SYSTEM'.  
PREVIOUS DIVISIONAL PUBLICATION NUMBERS WERE:**

DIVISION	BULLETIN NUMBER
BUICK	91-3-8
CADILLAC	T-91-83
CANADA	91-3-117
CHEVROLET	91-208-3B
OLDSMOBILE	91-3-117
PONTIAC	91-3-12

**Applications:**

Appropriate for all passenger vehicles, but particularly beneficial in 1980 and later FWD Models equipped with Power Rack and Pinion Steering.

**CONDITION:**

Comments of reduced power steering assist at low ambient temperatures (approximately 10°F and lower) may be noted by some vehicle operators when turning the steering wheel in BOTH the right and left direction during warm-up after cold start. All vehicles with power steering exhibit this condition to varying degrees, but condition may be more noticeable with power rack and pinion steering systems that typically have longer hoses and cooler lines.

DIVISION	BULLETIN NUMBER
BUICK	88-POL-4
CADILLAC	88-P-1
CHEVROLET	88-417-3B
OLDSMOBILE	88-T-139
PONTIAC	88-SM-10

**Note:**

This condition, which is related to power steering fluid viscosity, should not, however, be confused with conditions having similar symptoms such as that described divisional Special Policy numbers listed:

**CAUSE:**

In cold weather, power steering fluid thickens in the same manner as any other petroleum-based oil or fluid. Upon cold starting, the fluid resists movement through the system and the driver senses reduced power assist (sometimes referred to as "stiff steer"). As the vehicle operates and fluid circulates through the power steering system, the fluid warms and thins to its normal operating viscosity.

**CORRECTION:**

Saginaw Division has developed a new Low Temperature Climate Service Fluid for use in cold climates. Compared with conventional power steering fluid, this new fluid flows better at low temperatures and resists the thickening which contributes to reduced power assist upon start up.

**RACK AND PINION STEERING SYSTEMS**

Reduced power assist upon cold weather starting may be more noticeable in Power Rack and Pinion steering systems that may contain six or more feet of pressure and return hose along with long cooler lines. Such long systems contain greater volumes of fluid and vehicles so equipped tend to have longer periods of reduced power assist. The new fluid performs particularly well with current designed Rack and Pinion steering systems and special remanufactured Rack and Pinion Steering Assemblies.

**PARTS INFORMATION:**

Container Size	Part Number
16 ounce	12345866
32 ounce	12345867

Low Temperature Climate Service Fluid is available from GMSPO. Order as:

Parts are currently available from GMSPO.

**SERVICE PROCEDURE:**

The power steering fluid replacement procedure is a two-stage process: first, flushing the old fluid from the system with new fluid; and second, bleeding the system to remove any trapped air. The two sequences outline the steps in each procedure.



**FLUSHING THE POWER STEERING SYSTEM**

1. Raise the front end of the vehicle off the ground until the wheels are free to turn.
2. Remove the fluid return line at the pump reservoir inlet connector.
3. Plug the inlet connector port on the pump reservoir.
4. Position the fluid return line toward a large container in order to catch the draining fluid.
5. While a second person fills the reservoir with new Low Temperature Climate Service Fluid, start and run the engine at idle.
6. Turn the steering wheel from stop to stop.

**NOTICE:**

Do not hold the wheel against stops while flushing the system, Holding steering wheel against wheel stops will cause high system pressure, overheating, and damage to the pump and/or gear.

7. Continue draining until all of the old fluid is cleared from the power steering system. Addition of approximately 1 quart of new fluid will be required to flush system.
8. Unplug pump reservoir inlet and reconnect return line.
9. Turn engine off, and fill reservoir to the "Full Cold" mark.
10. Continue with following procedure "Bleeding the Power Steering System".

# Bleeding Air from Power Steering Systems

**Before bleeding:** Inspect steering system. Check, and correct as needed:



Hoses must not touch any other part of vehicle.

- Steering system noise could be caused by hose touching frame, body, or engine.



All hose connections must be tight.

- Loose connections might not leak but could allow air into system.

## When to bleed:

After any component replacement  
After disconnecting fluid line  
In case of steering system noise

## Why bleed?

To prevent pump damage  
To ensure proper system operation  
To stop steering system noise

## Power Steering Fluid

Use only clean, new power steering fluid. Fluid must be:

**Conventional Climate:**

GM #1052884 - 16 ounce

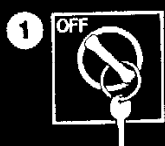
#1050017 - 32 ounce

**Cold Climate:**

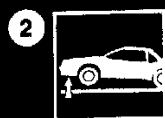
GM #12345866 - 16 ounce

#12345867 - 32 ounce

## How to bleed:



Switch ignition off.



Raise front wheels off ground.



Turn steering wheel full left.



Fill fluid reservoir to "FULL COLD" level. Leave cap off.



With assistant checking fluid level and condition, turn steering wheel lock-to-lock at least 20 times. Engine remains off.

- On systems with long return lines or fluid coolers, turn steering wheel lock-to-lock at least 40 times.
- Trapped air may cause fluid to overflow. Thoroughly clean any spilled fluid to allow for leak check.
- Keep fluid level at "FULL COLD."



While turning wheel, check fluid constantly.

- No bubbles are allowed.
- For any sign of bubbles, recheck connections. Repeat step 5.



Start engine. With engine idling, maintain fluid level. Reinstall cap.



Return wheels to center. Lower front wheels to ground.



Keep engine running for two minutes.



Turn steering wheel in both directions.

### Verify:

- ☒ Smooth power assist
- ☒ Noiseless operation
- ☒ Proper fluid level
- ☒ No system leaks
- ☒ Proper fluid condition
- No bubbles, no foam, no discoloration

**11** If all proper conditions apply, procedure is complete.

**12** If any problem remains, see "Special Conditions."

## Special Conditions:

### Fluid



- Foam or bubbles in fluid**  
Fluid must be completely free of bubbles. In step 5, be alert to periodic bubbles that could indicate a loose connection or leaky O-ring seal in either the return hose or pressure hose.
- Discolored fluid**  
(milky, opaque, or light tan color)

Switch ignition off. Wait two minutes. Recheck hose connections. Repeat steps 7-10. If condition still exists, replace and check a possible cause:

- ☒ Return hose clamps
- ☒ Return hose O-ring
- ☒ Pressure hose O-rings
- ☒ Gear cylinder line O-rings

Fill system and repeat bleed procedure for each possible cause. Repeat steps 7-10 to verify whether noise has been eliminated.

### Noise



- Pump whine or groan**

With engine running, recheck hoses for possible contact with frame body or engine. If no contact is found, follow either method below to cool down fluid and repressurize system.

### Method 1: Normal Cool Down

Switch engine off.  
Wait for system to cool.  
Install reservoir cap.

### Method 2: Partial Fluid Replacement

Switch engine off.  
Use a suction device to remove fluid from reservoir.  
Refill with cool, clean fluid.  
Install reservoir cap.

After either method of cooling, start engine and allow engine to come up to operating temperature. If noise persists, remove and replace power steering pump. Repeat bleed procedure following pump replacement.

## BLEEDING THE POWER STEERING SYSTEM

After replacing the fluid or servicing the power steering hydraulic system, you must bleed air from the system. Air in the system prevents an accurate fluid level reading, causes pump cavitation noise and over time could damage the pump. To bleed the power steering system proceed as follows:

- Begin with the engine off, front wheels off the ground, and wheels turned all the way to the left.
- Add Low Temperature Climate Service Fluid to the "FULL COLD" mark on the fluid level indicator.
- Bleed the system by turning the wheels from side to side without hitting stops.

### Important:

This may require turning the wheels from side to side twenty times. On systems with long return lines or fluid coolers, turning steering wheel lock-to-lock forty times may be required. Keep the fluid level at the "FULL COLD" mark. Fluid with air in it has a light tan appearance. This air must be eliminated from the fluid before normal steering action can be obtained.

4. Start the engine. With the engine idling, recheck the fluid level. If necessary, add fluid to bring the level to the "FULL COLD" mark.
5. Return the wheels to the center position. Lower front wheels to the ground. Continue running the engine for two or three minutes.
6. Test the vehicle to be sure the steering functions normally and is free from noise.

**Important:**

Inspect for fluid leakage at connection points along the power steering system.

7. Recheck the fluid level as described in Steps 3 and 4 except that the fluid level should now be up to the "FULL HOT" mark after the system has stabilized at its normal operating temperature.

Technical Service Bulletin # **912083B**

Date: **910201**

## **Power Steering - Reduced Assist At Low Temperatures**

Number: 91-208-3B

Section: 3B

FEBRUARY 1991 Date:

Corporate Bulletin No.: 033206R

Subject: REDUCED POWER STEERING ASSIST AT LOW AMBIENT TEMPERATURES

Model and Year: ALL 1980-91 PASSENGER CARS

### **Applications**

Appropriate for all passenger vehicles, but particularly beneficial in 1980 and later FWD Models equipped with Power Rack and Pinion Steering.

### **CONDITION**

Comments of reduced power steering assist at low ambient temperatures (approximately 10 degrees Fahrenheit and lower) may be noted by some vehicle operators when turning the steering wheel in BOTH the right and left direction during warm-up after cold start. All vehicles with power steering exhibit this condition to varying degrees, but condition may be more noticeable with power rack and pinion steering systems that typically have longer hoses and cooler lines.

Note: This condition, which is related to power steering fluid viscosity, should not, however, be confused with conditions having similar symptoms such as that described in divisional bulletins indicated below, related to internal steering gear fluid by-pass.

Chevrolet # 88-417-3B

### **CAUSE:**

In cold weather, power steering fluid thickens in the same manner as any other petroleum-based oil or fluid. Upon cold starting, the fluid resists movement through the system and the driver senses reduced power assist (sometimes referred to as "stiff steer"). As the vehicle operates and fluid circulates through the power steering system, the fluid warms and thins to its normal operating viscosity.

### **CORRECTION:**

Saginaw Division has developed a new Low Temperature Climate Service Fluid for use in cold climates. Compared with conventional power steering fluid, this new fluid flows better at low temperatures and resists the thickening which contributes to reduced power assist upon start up.

### **RACK AND PINION STEERING SYSTEMS**

Reduced power assist upon cold weather starting may be more noticeable in Power Rack and Pinion steering systems that may contain six or more feet of pressure and return hose along with long cooler lines. Such long systems contain greater volumes of fluid and vehicles so equipped tend to have longer periods of reduced power assist. The new fluid performs particularly well with current designed Rack and Pinion steering systems and special remanufactured Rack and Pinion Steering Assemblies.

### **PARTS INFORMATION:**

Low Temperature Climate Service Fluid is available from GMSPO. Order as:

Container Size	Part Number
16 ounce	12345866
32 ounce	12345867

Parts are currently available from GMSPO.

#### **SERVICE PROCEDURE:**

The power steering fluid replacement procedure is a two-stage process: first, flushing the old fluid from the system with new fluid; and second, bleeding the system to remove any trapped air. The following two sequences outline the steps in each procedure.

#### **FLUSHING THE POWER STEERING SYSTEM**

1. Raise the front end of the vehicle off the ground until the wheels are free to turn.
2. Remove the fluid return line at the pump reservoir inlet connector.
3. Plug the inlet connector port on the pump reservoir.
4. Position the fluid return line toward a large container in order to catch the draining fluid.
5. While a second person fills the reservoir with new Low Temperature Climate Service Fluid, start and run the engine at idle.
6. Turn the steering wheel from stop to stop.

**NOTICE:** Do not hold the wheel against stops while flushing the system. Holding steering wheel against wheel stops will cause high system pressure, overheating, and damage to the pump and/or gear.

7. Continue draining until all of the old fluid is cleared from the power steering system. Addition of approximately 1 quart of new fluid will be required to flush system.
8. Unplug pump reservoir inlet and reconnect return line.
9. Turn engine off, and fill reservoir to the "Full Cold" mark.
9. Continue with following procedure "Bleeding the Power Steering System".

#### **BLEEDING THE POWER STEERING SYSTEM**

After replacing the fluid or servicing the power steering hydraulic system, you must bleed air from the system. Air in the system prevents an accurate fluid level reading, causes pump cavitation noise and over time could damage the pump. To bleed the power steering system proceed as follows:

1. Begin with the engine off, front wheels off the ground, and wheels turned all the way to the left.
2. Add Low Temperature Climate Service Fluid to the "FULL COLD" mark on the fluid level indicator.
3. Bleed the system by turning the wheels from side to side without hitting stops.

**IMPORTANT:** This may require turning the wheels from side to side several times. Keep the fluid level at the "FULL COLD" mark. Fluid with air in it has a light tan appearance. This air must be eliminated from the fluid before normal steering action can be obtained.

4. Start the engine. With the engine idling, recheck the fluid level. If necessary, add fluid to bring the level to the "FULL COLD" mark.
5. Return the wheels to the center position. Lower front wheels to the ground. Continue running the engine for two or three minutes.
6. Test the vehicle to be sure the steering functions normally and is free from noise.

**IMPORTANT:** Inspect for fluid leakage at connection points along the power steering system.

7. Recheck the fluid level as described in Steps 3 and 4 except that the fluid level should now be up to the "FULL HOT" mark after the system has stabilized at its normal operating temperature.

Technical Service Bulletin # **538209**

Date: **951001**

### **Daytime Running Lamp - Retrofit Kits**

File In Section: 8 - Chassis/Body Electrical

Bulletin No: 53-82-09

Date: October, 1995

## INFORMATION

### Subject:

Daytime Running Lamps (DRL) Retrofit Kits

### Models:

1996 and Prior Passenger Cars (Except as noted below)

GMSPPO now has two kits available for retrofitting Daytime Running Lamps (DRL) on vehicles that were built without it. These kits are described in GMSPPO Information Bulletin # 95-162, issued May 19, 1995. This bulletin updates that information for model usage.

#### DRL Only, KIT # 12370131

The first kit, # 12370131, is for DRL only. It can be added for owners who desire only the DRL function without Twilight Sentinel, or for vehicles that already have factory installed Twilight Sentinel.

This kit WILL NOT WORK on the following vehicles:

- ^ Vehicles with covered headlamps (such as Buick Reatta, Pontiac Fiero and Firebird, Chevrolet Corvette, etc.).
- ^ GEO vehicles (but it DOES work on Pontiac LeMans).
- ^ Cadillac Allante.
- ^ 1995-96 Chevrolet Cavalier and Pontiac Sunfire.
- ^ Vehicles with electronic monitoring devices, including, but not limited to:
  - 1991-96 Buick Park Avenue, Oldsmobile Eighty-Eight and Ninety Eight, and Pontiac Bonneville with lamp monitor.
  - 1985-91 Pontiac Grand Am or Bonneville with Driver Information Center.

#### Twilight Sentinel/DRL, Kit # 12341366

This kit includes both Twilight Sentinel and DRL for vehicles without factory installed Twilight Sentinel.

This kit WILL NOT WORK on the following vehicles:

- ^ Vehicles with covered headlamps.
- ^ GEO vehicles (but it DOES work on Pontiac LeMans).
- ^ 1995-96 Sunfire.
- ^ 1992-96 Chevrolet Cavalier, Pontiac Grand Am, Buick Skylark, and Oldsmobile Achieva.
- ^ 1991-96 Buick Park Avenue with electronic bulb monitoring.

The following vehicles can use this kit for the Twilight Sentinel feature, but without the DRL feature:

- ^ Vehicles with electronic bulb monitoring devices, including, but not limited to:
  - 1991-96 Oldsmobile Eighty Eight and Ninety Eight, and Pontiac Bonneville with lamp monitor.
  - 1985-91 Pontiac Grand Am or Bonneville with Driver Information Center.

#### Information For Both Kits -

1. If the vehicle has an electronic digital dash, the DRL must be used together with automatic headlamp control/Twilight Sentinel. If the vehicle already has factory installed Twilight Sentinel, use kit # 12370131; if not, use kit # 12341366.
2. The following vehicles will also require a standard 5-pin SPDT relay (such as P/N 12077866). Call 1-800-995-1155 for installation details.
  - ^ Pontiac Grand Prix and Oldsmobile Cutlass Supreme with mini-quad headlamps (both kits).
  - ^ 1990-96 Buick Roadmaster, Chevrolet Caprice, or 1991-92 Oldsmobile Custom Cruiser, with RPO T82 Twilight Sentinel option (DRL kit, # 12370131 only).
3. Both kits have easy to follow installation and operation instructions. If additional help is needed, call the DRL Help Line at 1-800-995-1155.

#### Parts Information

Parts are currently available from GMSPPO.

Technical Service Bulletin # **435009**

Date: **941201**

## Brakes, Front - Pulsation Diagnosis, Correction, Repair

File In Section: 5 - Brakes

Bulletin No.: 43-50-09

Date: December, 1994

Subject:  
Front Brake Pulsation - "New" Diagnosis, Correction and Prevention

Models:  
1995 and Prior Year Passenger Cars

Preventing Brake Pulsation with Uniform Wheel Nut Torque and Unrestricted Pad Movement

Extensive testing has proven that the leading contributor to brake pulsation is non-uniform wheel nut torque. Because of the importance of this information, the following steps are being taken:

- ^ Issued service bulletin on front brake pulsation.
- ^ Video on diagnosing and fixing front brake. pulsation issued with bulletin.
- ^ Essential tools shipped to dealer.

Condition

Vehicle pulsates with light brake apply. (Refer to the following Pulsation Test Drive Procedure to properly diagnose customer concerns.)

**Important:**

A vibrating/pulsating brake pedal is normal with a stop where ABS is activated.

Cause

Front brake pulsation is caused by thickness variation of the rotor braking surfaces. The two leading causes of thickness variation are uneven wear and/or corrosion of the rotor.

Uneven wear accounts for 60% of all pulsation concerns. Rotor corrosion accounts for the rest of pulsation concerns. Rotor corrosion can be affected by the geographic area you live in and/or by the amount of time a vehicle sits without being driven.

The most significant contributors to thickness variation (uneven wear), which causes pulsation, are:

1. Non-uniform wheel nut torque (causes distortion of the braking surface).
2. Pad slide force restriction combined with # 1 (Non-uniform wheel torque).
  - a. Caliper to knuckle/shoe to knuckle interface
  - b. Slide bushing lube
  - c. Corroded slide bushing (pin binding)

**Important:**

Both rotor distortion and pad slide force restriction must be present to lead to thickness variation.

Correction

The only way to eliminate thickness variation is to replace or properly turn the rotor. Be sure to check the minimum thickness before attempting to turn a rotor. Refer to shop manual for proper rotor turning procedures.

Prevention

To prevent/minimize thickness variation/uneven wear from recurring, follow this procedure:

**Important:**

This should be done every time disc brakes are serviced.

1. Clean the caliper to knuckle or shoe to knuckle interface and lubricate with a thin film of silicone grease GM P/N 18010909 (or equivalent).
2. Clean the attaching/slide system and lubricate all moving surfaces with silicone grease. Do not use any abrasive cleaners on the pins. Remove the rubber bushings and clean the bores and bushings before lubricating.
3. Clean all rotor, bearing, and wheel mounting surfaces of any corrosion and/or dirt.

4. Use a torque stick on an impact wrench, or a torque wrench to consistently and uniformly fasten the wheel to the specified torque for the vehicle. The star pattern must be followed.

**Important:**

Torque sticks must be used any time an impact wrench is used to tighten wheel nuts.

**Summary**

Non-uniform wheel nut torque and improper tightening sequence are the leading causes of rotor distortion which leads directly to front brake pulsation when combined with pad slide force restriction.

**Pulsation Test Drive Procedures**

**Caution:**

Verify braking ability before test and obey laws while performing the road test, test the brakes at low speed to be sure the vehicle stops properly. Also, be sure to perform the road test in a safe area where traffic laws can be observed to protect both public and personal safety.

**Coast Down Vibration Test:**

1. Accelerate to approximately 40-50 mph (70-80 kph).
2. Place transmission in neutral.
3. Allow vehicle to coast down to 20 mph (35 kph) (do not use brakes).
4. Observe: Any tire/wheel imbalance or vehicle vibration, (other than road surface induced).
5. Correct or proceed to next section if none present.

**Rear Brake Pulsation Test:**

1. Accelerate to approximately 10-15 mph (16-25 kph).
2. Place transmission in neutral.
3. On vehicles equipped with a park brake release, hold release in return position and lightly apply the park brake to slow the vehicle.

**Notice:**

Failure to hold the release in the return position could result in rear brake lock up.

4. Observe: Does the park brake pedal pulsate or is there a noticeable vibration - other than road induced?
5. Correct or proceed to next section if OK.

**Vehicles with Push to Release Park Brake**

1. Accelerate to approximately 10-15 mph (16-25 kph).
2. Place transmission in neutral.
3. On vehicles so equipped, gently apply the park brake until you can feel the car slowing down due to the park brake action. Let vehicle come to a stop before pushing the park brake pedal to release it.
4. Observe: Does the park brake pedal pulsate or is there a noticeable vibration - other than road induced?
5. Correct or proceed to next section if OK.

**Front Brake Pulsation Test:**

1. Perform 20 mph (35 kph) brake test.
  - a. Accelerate to 20 mph (35 kph).
  - b. Place transmission in neutral.
  - c. Lightly apply brakes to stop the vehicle.
  - d. Optional - If pulsation is present, turn vehicle 180. and repeat stop. If pulsation is still present in the opposite direction, it is only on 1 (one) rotor. If pulsation is greatly reduced or gone, it is on both rotors (the thickness variation on each rotor will go in and out of phase

with each other after turning and reduce and/or cancel the effects on braking pulsation.

- e. Correct or proceed to Step 2 if OK.
2. Perform 45-50 mph (75-80 kph) brake test.
  - a. Accelerate to 50 mph (80 kph).
  - b. Place transmission in neutral.
  - c. Apply brakes using medium pressure.
  - d. Optional - If pulsates, do 180° turn test in 1-d above.
  - e. Correct or proceed to Step 3 if OK.
3. Heat up brake system by making 10 stops from 30 mph (50 kph) using medium pressure.
  - a. Repeat step 1 - 20 mph (35 kph) brake test.
  - b. Optional - If pulsates, do 180° turn test in 1-d above.
  - c. Correct or if no pulsation found, further diagnostics required to determine cause(s) of customer concern.

#### Parts Information

Parts are currently available from GMSPO.

#### Important:

Kent-Moore torque stick tool numbers and the divisions listed below completes the division torque stick essential tool requirement for servicing GM vehicles. All other divisions received torque stick tools in prior years essential tool packages. Additional torque sticks can be ordered through Kent-Moore Tools at 1-800-345-2233.

Division	Essential Stick Number	Stick Color
Chevrolet	J 39544-14	Brown
	J 39544-18	White
Cadillac	J 39544-14	Brown
	J 39544-15	Gray

#### Tool Information

Technical Service Bulletin # **570102**

Date: **950601**

## Fuel - Reformulated/Oxygenated Gasolines

FILE IN SECTION: 0 - General Information

BULLETIN NO.: 57-01-02

DATE: June, 1995

#### SUBJECT:

Reformulated Gasoline (RFG), Oxygenated Gasoline and California Phase 2 RFG

#### MODELS:

1995 and Prior Passenger Cars and Trucks

General Motors customers will be potentially exposed to a variety of different fuel types. Besides the conventional gasoline available, new types such as Reformulated Gasoline (RFG), oxygenated gasoline, and starting in 1996, California Phase 2 RFG. Reformulated Gasoline (RFG) is blended to burn more cleanly and not to evaporate as readily. RFG must contain a minimum of 2 percent oxygen, which is usually achieved with ethanol or EPA-approved ethers such as methyl tertiary-butyl ether (MTBE). This type of fuel is required by the Clean Air Act in the nine worst ozone non-attainment areas of the country, and may also be required in other areas designated ozone non-attainment, at the option of the states. RFG is intended to produce approximately 15 percent less pollution than conventional gasoline. Using RFG should reduce the total health risk to the public by reducing exposure to ozone and air toxins. General Motors supports the use of RFG as a cost effective means of providing air quality benefits.

Oxygenated gasolines are prevalent in the wintertime for Carbon Monoxide (CO) non-attainment areas. These fuels contain oxygen components similar to RFG. Approximately 50 percent of the fuel sold in the U.S. in the wintertime contains an oxygenate component.

Vehicle fuel economy may be slightly reduced, if at all, by the use of gasoline containing oxygenates. Fuel economy is most affected by engine and



vehicle type, driving habits, weather conditions, and vehicle maintenance.

Properly blended RFG, oxygenated gasoline, and California Phase 2 RFG will have no adverse effect on vehicle performance or to the durability of engine and fuel system components. In fact, the General Motors Owner's Manual fuel statements have consistently permitted the use of properly blended fuels containing up to 10 percent ethanol (since 1980) and up to 15 percent methyl tertiary-butyl ether (MTBE) for current and all past model year vehicles. These statements continue to be valid. The use of oxygenate-containing fuels will not invalidate the GM vehicle warranty.

Technical Service Bulletin # **892680B**

Date: **891001**

## **Fuel - Use of Gasoline Containing 15 Percent MTBE**

Number: 89-268-08

Section: 0B

Date: October 1989

Corporate Bulletin No.: 930108

Subject:  
USE OF GASOLINE CONTAINING 15 PERCENT MTBE

Model and Year:  
ALL 1980-89 PASSENGER CARS AND LIGHT DUTY TRUCKS

TO: ALL CHEVROLET DEALERS

In August of the U.S. Environmental Protection Agency approved the use of methyltertiary-butyl ether (MTBE) in gasolines at concentrations of 15 percent or Prior to that time, the legal limit was 11 percent; Generai Motors owners manuals stated that the use of gasolines containing 11 percent or less MTBE should not adversely affect the operation of the vehicle and would be covered by the New Vehicle and Emission Control Systems Warranties. The use of 15 percent MTBE in gasoline should also not adversely affect the operation of 1989 and earlier model vehicles and therefore, will not void any warranties covering those vehicles. In the interest of contributing to cleaner air, General Motors recommends that all model year vehicles use such fuels whenever available. The 1990 and future owners manuals will reflect this position.

Technical Service Bulletin # **89013A**

Date: **880901**

## **Alignment - The Importance of Four Wheel Alignment**

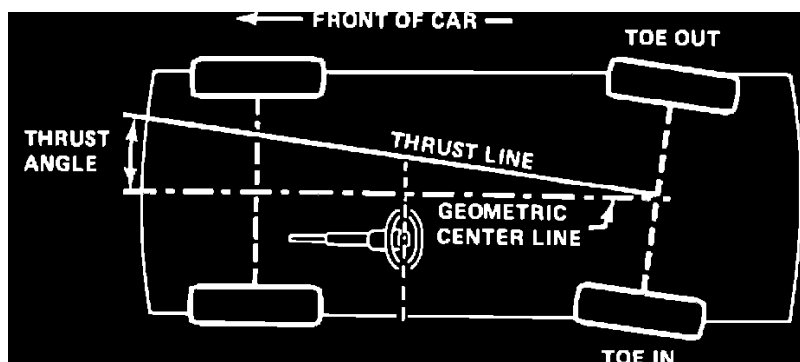
Number: 89-01-3A

Section: 3A

Date: SEPT., 1988

Subject: THE IMPORTANCE OF FOUR WHEEL ALIGNMENT

Model and Year: 1979-89 ALL CHEVROLET MODELS



TO: ALL CHEVROLET DEALERS

In which direction will the vehicle pictured below travel if the steering wheel is straight ahead?

The vehicle will track to the left because of the directional forces created by the rear wheels and tires. This directional force is called the "thrust angle". The front wheels aim or steer the vehicle but the rear wheels control tracking and assist in directing the car.

What might the driver comment about?

In the illustration, the driver may comment about the steering wheel being off center when going straight down the road. This would be true

because of the added input required at the steering wheel to offset the thrust angle force caused by the rear wheels not tracking the front wheels to the geometric center line of the vehicle.

The driver may also comment about unusual tire wear, not precise handling characteristics and even decreased fuel economy.

A four wheel alignment allows the technician to measure the toe of each rear wheel to determine if the rear wheels are tracking the geometric center line of the car. Ideally the geometric center line will be the same as the thrust line. In the example in Figure 1, the thrust line has shifted to the right because the rear wheel toe is not tracking the front wheels. This can occur on both or on one rear wheel.

On some vehicles the rear toe is adjustable; other models may require component straightening or replacement or shims. Once the rear toe is properly adjusted or set, the front wheel toe can be set so all four wheels are tracking the geometric center line of the vehicle. This will provide optimum tire wear, handling and fuel economy characteristics for the vehicle.

Technical Service Bulletin # **00-03-10-002D**

Date: **060801**

## **Wheels Chrome Wheel Chemical Staining/Pitting/Corrosion**

Bulletin No.: 00-03-10-002D

Date: August 01, 2006

### **INFORMATION**

Subject:

Chemical Staining, Pitting, Corrosion and/or Spotted Appearance of Chromed Aluminum Wheels

Models:

2007 and Prior GM Cars and Trucks (Including Saturn)

2003-2007 HUMMER H2

2006-2007 HUMMER H3

2005-2007 Saab 9-7X

Supercede:

This bulletin is being revised to add models and model years as well as update the information and subject. Please discard Corporate Bulletin Number 00-03-10-002C (Section 03 - Suspension).

### **Important:**

You may give a copy of this bulletin to the customer.

What is Chemical Staining of Chrome Wheels?

**Figure 1**



Chemical staining in most cases results from acid based cleaners (refer to Figure 1 for an example). These stains are frequently milky or greenish in appearance. They result from using cleaning solutions that contain hydrofluoric, oxalic and most other acids on chrome wheels (or any wheels).

Soap and water is usually sufficient to clean chrome wheels, but if a cleaner must be used on chrome wheels, GM Chrome and Wire Wheel Cleaner, P/N 1052929 (in Canada, use P/N 10953202), or equivalent, is recommended. Do not use cleaning solutions that contain hydrofluoric, oxalic and most other acids on chrome wheels (or any wheels).

**Note:**

Many wheel cleaner instructions advise to take care to avoid contact with painted surfaces. Most customers think of painted surfaces as the fenders, quarter panels and other exterior sheet metal. Many vehicles have painted brake calipers. Acidic wheel cleaners may craze, crack, or discolor the paint on the brake calipers. Damage from wheel cleaners is not covered under the vehicle new car warranty. Soap and water applied with a soft brush is usually all that is required to clean the calipers.

**Important:**

GM Chrome and Wire Wheel cleaner, P/N 1052929 (in Canada, P/N 10953202), has a mild phosphoric acid, which will not stain the chrome. However, do not use this product on clear-coated aluminum wheels.

Whenever any wheel cleaner is used, it must be THOROUGHLY rinsed off of the wheel with clean, clear water. Special care must be taken to rinse under the hub cap, balance weights, wheel nuts, lug nut caps, between the wheel cladding and off the back side of the wheel.

**Note:**

Do not use cleaning solutions that contain hydrofluoric, oxalic and most other acids on chrome wheels (or any wheels).

If the customer is unsure of the chemical make-up of a particular wheel cleaner, it should be avoided.

For wheels showing signs of milky staining from acidic cleaners, refer to Customer Assistance and Instructions below.

**Warranty of Stained Chrome Wheels**

Stained wheels are not warrantable. Most acid based cleaners will permanently stain chrome wheels. Follow-up with dealers has confirmed that such cleaners were used on wheels that were returned to the Warranty Parts Center (WPC). Any stained wheels received by the WPC will be charged back to the dealership. To assist the customer, refer to Customer Assistance and Instructions below.

**Pitting or Spotted Appearance of Chrome Wheels**



A second type or staining or finish disturbance may result from road chemicals, such as calcium chloride used for dust control of unpaved roads. The staining will look like small pitting (refer to Figure 2 shown). This staining will usually be on the leading edges of each wheel spoke, but may be uniformly distributed. If a vehicle must be operated under such conditions, the chrome wheels should be washed with mild soap and water and thoroughly rinsed as soon as conveniently possible.

**Important:**

Road chemicals, such as calcium chloride used for dust control of unpaved roads, can also stain chrome wheels. The staining will look like small pitting. This staining will usually be on the leading edges of each wheel spoke. This is explained by the vehicle traveling in the forward direction while being splashed by the road chemical. If a vehicle must be operated under such conditions, the chrome wheels should be washed with mild soap and water and thoroughly rinsed as soon as conveniently possible.

**Warranty of Pitted or Spotted Chrome Wheels**

Wheels returned with pitting or spotting as a result of road chemicals may be replaced one time. Damage resulting from contact with these applied road chemicals is corrosive to the wheels finish and may cause damage if the wheels are not kept clean.

**Important:**

Notify the customer that this is a one time replacement. Please stress to the customer the vital importance of keeping the wheels clean if they are operating the vehicle in an area that applies calcium chloride or other dust controlling chemicals! "GM of Canada" dealers require prior District Service Manager approval.

**Customer Assistance and Instructions**

GM has looked for ways customers may improve the appearance of wheels damaged by acidic cleaners. The following product and procedure has been found to dramatically improve the appearance of stained wheels. For wheels that have milky stains caused by acidic cleaners try the following:

**Note:**

THE 3M CHROME AND METAL POLISH REQUIRED FOR THIS PROCEDURE IS AN EXTREMELY AGGRESSIVE POLISH/CLEANER. THE WHEELS MUST BE CLEANED BEFORE APPLICATION TO AVOID SCRATCHING THE WHEEL SURFACE. THIS PRODUCT WILL REDUCE THE THICKNESS OF THE CHROME PLATING ON THE WHEEL AND IF USED INCORRECTLY OR EXCESSIVELY MAY REMOVE THE CHROME PLATING ALL TOGETHER, EXPOSING A LESS BRIGHT AND BRASSY COLORED SUB-LAYER. FOLLOW INSTRUCTIONS EXACTLY.

1. Wash the wheels with GM Chrome and Wire Wheel Cleaner, P/N 1052929 (in Canada, use P/N 10953202). Follow the instructions as indicated on the bottle for stubborn stains. This step will clean and may reduce wheel staining. Flood all areas of the wheel with water to rinse.
2. Dry the wheels completely.

**Note:**

Begin with a small section of the wheel and with light pressure buff off polish and examine results. ONLY apply and rub with sufficient force and time to remove enough staining that you are satisfied with the results. Some wheels may be stained to the extent that you may only achieve a 50% improvement while others may be able to be restored to the original lustre. IN ALL CASES, only apply until the results are satisfactory.

3. Apply \*3M Chrome and Metal Polish # 39527 with a clean terry cloth towel. As you apply the polish, the staining will be diminished.
4. When dry, buff off the polish with a clean portion of the towel.
5. Repeat application of the 3M Chrome and Metal Polish until satisfied with the results. If continued applications fail to improve the appearance further discontinue use.

This procedure will improve the appearance of the wheels and may, with repeated applications, restore the finish dramatically. For wheels that exhibit spotting from road chemicals the above procedure may marginally improve the condition but will not restore the finish or remove the pitting. In this type of staining the wheel finish has actually been removed in spots and no manner of cleaning will restore the finish.

\*We believe this source and their products to be reliable. There may be additional manufacturers of such products/materials. General Motors does not endorse, indicate any preference for or assume any responsibility for the products or material from this firm or for any such items that may be available from other sources.

Part Number	Description
1052929 (US)	*GM Chrome and Wire Wheel Cleaner
10953202 (Canada)	
39527	**3M Chrome and Metal Polish (10 oz)

\*Not available to Saturn Retailers. Saturn Retailers are to use soap and water.

\*\*This product is currently available from 3M. To obtain information for your local retail location please call 3M at 1-800-364-3577.

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Technical Service Bulletin # **06-03-10-010**

Date: **060907**

## **Wheels - Changing Procedures/Precautions**

Bulletin No.: 06-03-10-010

Date: September 07, 2006

### **INFORMATION**

Subject:

Information on Proper Wheel Changing Procedures and Cautions

Models:

2007 and Prior GM Passenger Cars and Trucks (including Saturn)

2007 and Prior HUMMER Models

2005-2007 Saab 9-7X

### **Attention:**

Complete wheel changing instructions for each vehicle line can be found under Tire and Wheel Removal and Installation in Service Information (SI). This bulletin is intended to quickly review and reinforce simple but vital procedures to reduce the possibility of achieving low torque during wheel installation. Always refer to SI for wheel lug nut torque specifications and complete jacking instructions for safe wheel changing.

### **Frequency of Wheel Changes - Marketplace Driven**

Just a few years ago, the increasing longevity of tires along with greater resistance to punctures had reduced the number of times wheels were removed to just required tire rotation intervals. Today with the booming business in accessory wheels/special application tires (such as winter tires), consumers are having tire/wheel assemblies removed - replaced - or installed more than ever. With this increased activity, it opens up more of a chance for error on the part of the technician. This bulletin will review a few of the common concerns and mistakes to make yourself aware of.

### **Proper Servicing Starts With the Right Tools**

The following tools have been made available to assist in proper wheel and tire removal and installation. J 39544-KIT Complete Torque Socket Set or equivalent.

J 41013 Rotor Resurfacing Kit or Equivalent

J 42450-A Wheel Hub Resurfacing Kit or Equivalent

### **Corroded Surfaces**

One area of concern is corrosion on the mating surfaces of the wheel to the hub on the vehicle. Excessive corrosion, dirt, rust or debris built up on these surfaces can mimic a properly tightened wheel in the service stall. Once the vehicle is driven, the debris may loosen, grind up or be washed away from water splash. This action may result in clearance at the mating surface of the wheel and an under-torqued condition.

Before installing a wheel, remove any buildup on the wheel mounting surface and brake drum or brake disc mounting surface. Installing wheels with poor metal-to-metal contact at the mounting surfaces can cause wheel nuts to loosen. This may cause a wheel to come off when the vehicle is moving, possibly resulting in a loss of control or personal injury.

Whenever you remove the tire/wheel assemblies, you must inspect the mating surfaces. If corrosion is found, you should remove the debris with a die grinder equipped with a fine sanding pad, wire brush or cleaning disc. Just remove enough material to assure a clean, smooth mating surface. The J 41013, or equivalent can be used to clean the following surfaces:

The hub mounting surface

The brake rotor mounting surface

The wheel mounting surface

Use the J 42450-A or equivalent, to clean around the base of the studs and the hub.

Lubricants, Grease and Fluids

Some customers may use penetrating oils, grease or other lubricants on wheel studs to aid in removal or installation. Always use a suitable cleaner/solvent to remove these lubricants prior to installing the wheel and tire assemblies. Lubricants left on the wheel studs may cause improper readings of wheel nut torque.

Always install wheels to clean, dry wheel studs ONLY.

Lubricants left on the wheel studs or vertical mounting surfaces between the wheel and the rotor or drum may cause the wheel to work itself loose after the vehicle is driven. Always install wheels to clean, dry wheel studs and surfaces ONLY.

#### Wheel Stud and Lug Nut Damage

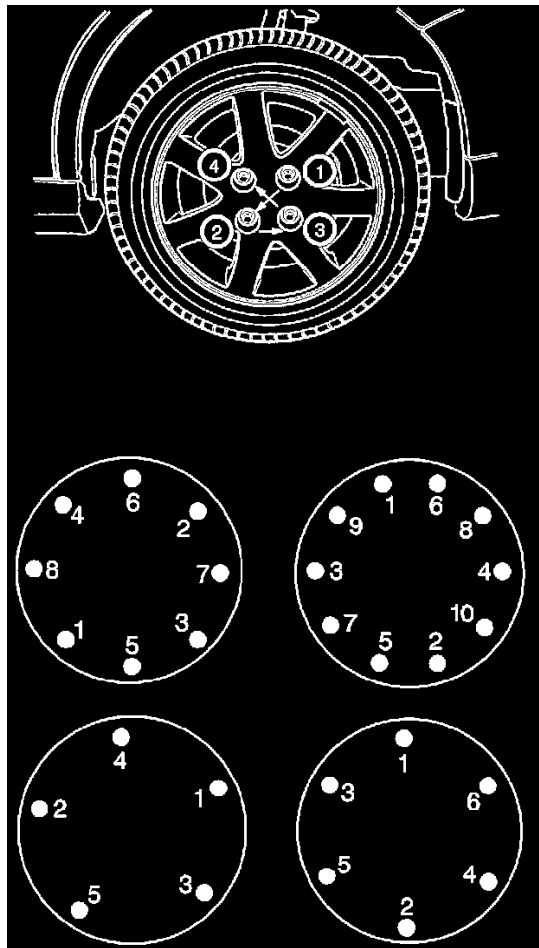
Always inspect the wheel studs and lug nuts for signs of damage from cross threading or abuse. You should never have to force wheel nuts down the stud. Lug nuts that are damaged may not retain properly, yet give the impression of fully tightening. Always inspect and replace any component suspected of damage.

#### Tip

Always start wheel nuts by hand! Be certain that all wheel nut threads have been engaged BEFORE tightening the nut.

If the vehicle has directional tread tires, verify the directional arrow on the outboard side of the tire is pointing in the direction of forward rotation.

#### Wheel Nut Tightening and Torque



Improper wheel nut tightening can lead to brake pulsation and rotor damage. In order to avoid additional brake repairs, evenly tighten the wheel nuts to the proper torque specification as shown for each vehicle in SI. Use the J 39544-KIT, or the equivalent torque stick, in order to tighten the nuts with an impact wrench. When running the nuts down the studs, run the impact wrench at a reasonable speed. Always observe the proper wheel nut tightening sequence as shown in order to avoid trapping the wheel on the wheel stud threads or clamping the wheel slightly off center resulting in vibration.

#### The Most Important Service You Provide

While the above information is well known, and wheel removal so common, technicians run the risk of becoming complacent on this very important service operation. A simple distraction or time constraint that rushes the job may result in personal injury if the greatest of care is not exercised. Make it a habit to double check your work and to always side with caution when installing wheels.

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Disclaimer Technical Service Bulletin # 02-08-98-001C

Date: 061009

## Body - Metal Panel Adhesive Bonding Information

Bulletin No.: 02-08-98-001C

Date: October 09, 2006

### INFORMATION

Subject:  
Metal Panel Bonding

Models:  
2007 and Prior GM Passenger Cars and Trucks (Including Saturn)  
2003-2007 HUMMER H2  
2006-2007 HUMMER H3  
2005-2007 Saab 9-7X  
2007 and Prior Isuzu Medium Duty Commercial Trucks

### Attention:

This bulletin applies to all models that have published panel bonding procedures in SI.

### Supercede:

This bulletin is being revised to update the applicable models and add information. Please discard Corporate Bulletin Number 02-08-98-001B (Section 08 - Body and Accessories).

This bulletin is intended to provide general information for adhesive bonding of Non-Structural exterior panels as an alternative to MIG welding. Panel bonding may be seen as an alternative to MIG welding to provide full panel replacement in regards to collision repair procedures. The benefits of panel bonding include the following:

No heat or burn damage when additional welding is not required

Corrosion protection

Can act as a sealant

Improved process for complicated shapes (wheelhouse area)

The General Motors specification for metal bonding adhesives is GM 6449G and provides test and standards information to adhesive manufacturers and suppliers. The scope of this specification is intended to provide the performance guidelines of structural adhesive systems used to repair (metallic) automotive bodies in the aftermarket. These types of adhesives are intended for use when bonding Non-Structural replacement body panels as an option to welding as the attachment means. Supplier guidelines outline the use of room temperature cure acrylic adhesives that contain glass bead technology.

Bonding procedures in general are applicable only to a factory seams type approach. Sectioning or partial paneling of full panels is not supported by General Motors unless specifically documented in a Service Bulletin or Manual.

Applicable components for this technology are NON-STRUCTURAL EXTERIOR PANELS ONLY, including door skins, tail panels, roof outer panels and quarter panels. While this bonding process has gained popularity, General Motors only supports this process for vehicles which it has published written repair procedures that are found in a Service Manual or Bulletin.

Manufacturer and Part Number	Description
GM P/N 12378566 (US)	Fast Set Bonding Adhesive
GM P/N 88901674 (Canada)	
Lord Fusor P/N 110B/111B	
GM P/N 12378567 (US)	Medium Set Panel Bonding Adhesive
GM P/N 88901675 (Canada)	
Lord Fusor P/N 108B/109B	
3M P/N 8116	Panel Bonding Adhesive
Ashland Plio Grip Panel 60	Panel Bonding Adhesive
The dispensing tool may be purchased locally. (Painters Supply Store)	

Adhesives currently meeting the performance requirements include General Motors materials, Lord Adhesives, Ashland Plio Grip, and products manufactured by 3M Corporation. At this time, ONLY the adhesive products shown meet this guideline.

Service information is also available on the web.

([www.acdelcotechconnect.com](http://www.acdelcotechconnect.com)) - This website includes service repair information for the total vehicle and is a subscription based site.

([www.techinfo.gmgoodwrench.com](http://www.techinfo.gmgoodwrench.com)) - This website includes select collision repair information only and is downloadable and free to the user.

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Disclaimer Technical Service Bulletin # 02-08-98-002B

Date: 070117

## Body - Hem Flange Repair

Bulletin No.: 02-08-98-002B

Date: January 17, 2007

### INFORMATION

Subject:  
Hem Flange Rust Repair

Models:  
2007 and Prior Passenger Cars and Trucks (Including Saturn)  
2007 and Prior HUMMER H2, H3  
2007 and Prior Saab 9-7X

Supercede:



This bulletin is being revised to add the 2007 model year and HUMMER, Saturn and Saab vehicles. Please discard Corporate Bulletin Number 02-08-98-002A (Section 08 - Body and Accessories).

In the event that hem flange corrosion becomes a concern, a new tool has been released by Kent Moore, J 46162, which allows for easier opening of the hem flange.

#### Repair Procedure

Remove the body panel from the vehicle.

Clean the hem flange area with wax and grease remover.

Using Kit J 46162, insert the tool into an air impact gun and open the hem flange up starting at one end.

Clean out the corrosion by "sand blasting" or by using \*3M(R) Strip Disc, P/N 07460.

If perforation is present, replace the affected panel.

Inspect the area for rust perforation or "micro pin holes".

Apply anticorrosion primer to the hem flange.

Apply a bead of \*LORD FUSOR, P/N 108B or 109B, adhesive to the hem flange. Follow the manufacturer,s recommendations for use.

Close the hem flange using the tool in the kit.

Clean off excessive adhesive from the repair area.

Refer to the 2007 GM Approved Refinish Materials booklet (GM 4901 MD-2007) for specific products.

To access the booklet, go to [www.gmgoodwrench.com](http://www.gmgoodwrench.com). Click on GM Collision Parts. Then click on GM Technical Repair Information. Finally, select Paint Shop.

Prime and refinish the area as required.

\*We believe these sources and their products to be reliable. There may be additional manufacturers of such material. General Motors does not endorse, indicate any preference for or assume any responsibility for the products from these firms or for any such items which may be available from other sources.

#### Parts Information

To order this tool (J 46162), call Kent Moore at 1-800-GMTOOLS.

LORD FUSOR and 3M(R) Strip Disc may be obtained from your local body shop supplier.

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DisclaimerTechnical Service Bulletin # **00-06-02-006D**

Date: **060815**

## Cooling System - Coolant Recycling Information

Bulletin No.: 00-06-02-006D

Date: August 15, 2006

#### INFORMATION

Subject:  
Engine Coolant Recycling and Warranty Information

Models:  
2007 and Prior GM Passenger Cars and Trucks (Including Saturn)  
2007 and Prior HUMMER Vehicles  
2005-2007 Saab 9-7X

**Attention:**

Please address this bulletin to the Warranty Claims Administrator and the Service Manager.

**Supercede:**

This bulletin is being revised to adjust the title and Include Warranty Information. Please discard Corporate Bulletin Number 00-06-02-006C (Section 06 - Engine/Propulsion System).

**Coolant Reimbursement Policy**

General Motors supports the use of recycled engine coolant for warranty repairs/service, providing a GM approved engine coolant recycling system is used. Recycled coolant will be reimbursed at the GMSPO dealer price for new coolant plus the appropriate mark-up. When coolant replacement is required during a warranty repair, it is crucial that only the relative amount of engine coolant concentrate be charged, not the total diluted volume. In other words: if you are using two gallons of pre-diluted (50:50) recycled engine coolant to service a vehicle, you may request reimbursement for one gallon of GM Goodwrench engine coolant concentrate at the dealer price plus the appropriate warranty parts handling allowance.

**Licensed Approved DEX-COOL(R) Providers****Important:**

USE OF NON-APPROVED VIRGIN OR RECYCLED DEX-COOL(R) OR DEVIATIONS IN THE FORM OF ALTERNATE CHEMICALS OR ALTERATION OF EQUIPMENT, WILL VOID THE GM ENDORSEMENT, MAY DEGRADE COOLANT SYSTEM INTEGRITY AND PLACE THE COOLING SYSTEM WARRANTY UNDER JEOPARDY.

Table 1 — Approved and Licensed Providers of DEX-COOL Products Meeting General Motors GM6277M Specifications	
License #	Provider
DC 001	Chevron
DC 002	Prestone
DC 003	Shell
DC 004	Valvoline
DC 005	Recycled Fluid Technologies (Bulk Service)
DC 011	GM Vehicle Care
DC 011	AC Delco

Shown in Table 1 are the only current licensed and approved providers of DEX-COOL(R). Products that are advertised as "COMPATIBLE" or "RECOMMENDED" for use with DEX-COOL(R) have not been tested or approved by General Motors. Non-approved coolants may degrade the coolant system integrity and will no longer be considered a 5 yr/150,000 mile (240,000 km) coolant.

**Coolant Removal Services/Recycling**

The tables include all coolant recycling processes currently approved by GM. Also included is a primary phone number and demographic information. Used DEX-COOL(R) can be combined with used conventional coolant (green) for recycling. Depending on the recycling service and/or equipment, it is then designated as a conventional 2 yr/30,000 mile (50,000 km) coolant or DEX-COOL(R) 5 yr/150,000 mile (240,000 km) coolant. Recycled coolants as designated in this bulletin may be used during the vehicle(s) warranty period.

**DEX-COOL(R) Recycling**

**Table 2 — Approved Engine Coolant Recycling Services – DEX-COOL®**

Recycler	Equipment/Service	Recycled Products	Demographics	Contact
Recycling Fluid Technologies	Service	DEX-COOL® Licensed Provider (50/50 pre-mix)	IN, IL, MI, OH	800-474-4947

The DEX-COOL(R) recycling service listed in Table 2 has been approved for recycling waste engine coolants (DEX-COOL) or conventional) to DEX-COOL(R) with 5 yr/150,000 mile (240,000 km) usability. Recycling Fluid Technologies is the only licensed provider of Recycled DEX-COOL(R) meeting GM6277M specifications and utilizes GM approved inhibitor packages. This is currently a limited program being monitored by GM Service Operations which will be expanded as demand increases.

#### Conventional (Green) Recycling

**Table 3 — Approved Engine Coolant Recycling Services and Equipment – Conventional Green**

Recycler	Equipment/Service	Recycled Products	Demographics	Contact
Antifreeze Technologies Systems	Service	Conventional Green (50/50 pre-mix)	IL, IN, MA, MD, MI, NH, NJ, PA, TX, VA	800-474-4947
Asbury Environmental Services/Demenno Kerdoon - Trinity Brand	Service	Conventional Green (50/50 pre-mix)	AZ, CA, NV, OR, WA	800-974-4495
Automotive Environmental Service	Service	Conventional Green (50/50 pre-mix)	AZ, CA, NV, OR, WA	650-325-2666
Kleentek	AF-250	Conventional Green (50/50 pre-mix)	US, Canada, Mexico	800-435-5336
Wynn Oil Company	Du-All Bulk 07400	Conventional Green (50/50 pre-mix)	US, Canada, Mexico	800-GMTools 800-989-8363
Clore Automotive	TechGuard	Conventional Green (50/50 pre-mix)	US, Canada, Mexico	800-328-2921

Processes shown in the Table 3 are capable of recycling waste engine coolants (DEX-COOL(R) or conventional) to a conventional (green) coolant. Recycling conventional coolant can be accomplished at your facility by a technician using approved EQUIPMENT (listed by model number in Table 3), or by an approved coolant recycling SERVICE which may recycle the coolant at your facility or at an offsite operation. Refer to the table for GM approved coolant recyclers in either of these two categories. Should you decide to recycle the coolant yourself, strict adherence to the operating procedures is imperative. Use ONLY the inhibitor chemicals supplied by the respective (GM approved) recycling equipment manufacturer.

#### Sealing Tablets

Cooling System Sealing Tablets (Seal Tabs) should not be used as a regular maintenance item after servicing an engine cooling system. Discoloration of coolant can occur if too many seal tabs have been inserted into the cooling system. This can occur if seal tabs are repeatedly used over the service life of a vehicle. Where appropriate, seal tabs may be used if diagnostics fail to repair a small leak in the cooling system. When a condition appears in which seal tabs may be recommended, a specific bulletin will be released describing their proper usage.

## Water Quality

The integrity of the coolant is dependent upon the quality of DEX-COOL(R) and water. DEX-COOL(R) is a product that has enhanced protection capability as well as an extended service interval. These enhanced properties may be jeopardized by combining DEX-COOL(R) with poor quality water. If you suspect the water in your area of being poor quality, it is recommended you use distilled or de-ionized water with DEX-COOL(R).

## "Pink" DEX-COOL(R)

DEX-COOL(R) is orange in color to distinguish it from other coolants. Due to inconsistencies in the mixing of the dyes used with DEX-COOL(R), some batches may appear pink after time. The color shift from orange to pink does not affect the integrity of the coolant, and still maintains the 5 yr/150,000 mile (240,000 km) service interval.

## Back Service

Only use DEX-COOL(R) if the vehicle was originally equipped with DEX-COOL(R).

## Contamination

Mixing conventional green coolant with DEX-COOL(R) will degrade the service interval from 5 yrs./150,000 miles (240,000 km) to 2 yrs./30,000 miles (50,000 km) if left in the contaminated condition. If contamination occurs, the cooling system must be flushed twice immediately and re-filled with a 50/50 mixture of DEX-COOL(R) and clean water in order to preserve the enhanced properties and extended service interval of DEX-COOL(R).

## After 5 years/150,000 miles (240,000 km)

After 5 yrs/150,000 miles (240,000 km), the coolant should be changed, preferably using a coolant exchanger. If the vehicle was originally equipped with DEX-COOL(R) and has not had problems with contamination from non-DEX-COOL(R) coolants, then the service interval remains the same, and the coolant does not need to be changed for another 5 yrs/150,000 miles (240,000 km)

## Equipment (Coolant Exchangers)

The preferred method of performing coolant replacement is to use a coolant exchanger. A coolant exchanger can replace virtually all of the old coolant with new coolant. Coolant exchangers can be used to perform coolant replacement without spillage, and facilitate easy waste collection. They can also be used to lower the coolant level in a vehicle to allow for less messy servicing of cooling system components. It is recommended that you use a coolant exchanger with a vacuum feature facilitates removing trapped air from the cooling system. This is a substantial time savings over repeatedly thermo cycling the vehicle and topping-off the radiator. The vacuum feature also allows venting of a hot system to relieve system pressure. Approved coolant exchangers are available through the GMDE (General Motors Dealer Equipment) program.

For refilling a cooling system that has been partially or fully drained for repairs other than coolant replacement, the Vac-N-Fill Coolant Refill Tool (GE-47716) is recommended to facilitate removal of trapped air from the cooling system during refill.

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Disclaimer Technical Service Bulletin # **01-07-31-002B**

Date: **061101**

## M/T - Hydraulic Clutch Bleeding Procedure Improvement

Bulletin No.: 01-07-31-002B

Date: November 01, 2006

## INFORMATION

### Subject:

Improved Bleeding Procedure for Hydraulic Clutch Release System

### Models:

2007 and Prior GM Passenger Cars and Light Duty Trucks (including Saturn)  
2007 and Prior Chevrolet and GMC 6-7F T-Series Medium Duty Tilt Cab Models  
2007 and Prior Isuzu F-Series Medium Duty Tilt Cab Models  
2006-2007 HUMMER H3

### Supercede:

This bulletin is being revised to add model years. Please discard Corporate Bulletin Number 01-07-31-002A (Section 07 - Transmission/Transaxle). This bulletin is being issued to inform dealers of an improved procedure to aid in the ease of bleeding the clutch hydraulic system for the above listed vehicles. This procedure can be used anytime air is introduced into the hydraulic system. Following this procedure may also reduce the number of unnecessary parts replaced for low clutch pedal reserve and high shift effort.

Verify that all the lines and fittings are dry and secure.

Clean the dirt and grease from the reservoir cap in order to ensure that no foreign substances enter the system.

Remove the reservoir cap.

Fill the reservoir to the proper level with the required fluid.

Attach the J 43485 (Adapter) to the J 35555 (Mity Vac), or equivalent.

Brake fluid will deteriorate the rubber on J 43485. Use a clean shop cloth to wipe away the fluid after each use.

Place and hold the adapter on the reservoir filler neck to ensure a tight fit. In some cases, the adapter will fit into the reservoir opening.

Apply a vacuum of 51-68 kPa (15-20 hg) and remove the adapter.

Refill the reservoir to the proper level.

Repeat Steps 6 and 7.

If needed, refill the reservoir and continue to pull a vacuum until no more bubbles can be seen in the reservoir or until the fluid level no longer drops.

The vehicle will move if started in gear before the Actuator Cylinder is refilled and operational. Start the vehicle the first time in neutral to help prevent personal injury from vehicle movement and see if the transmission will shift easily into gear.

Pump the clutch pedal until firm (to refill actuator cylinder).

Add additional fluid if needed.

Test drive vehicle to ensure proper operation.

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Technical Service Bulletin # **04-07-30-013B**

Date: **070201**

## **Engine, A/T - Shift/Driveability Concerns/MIL ON**

Bulletin No.: 04-07-30-013B

Date: February 01, 2007

### **INFORMATION**

Subject:

Automatic Transmission Shift, Engine Driveability Concerns or Service Engine Soon (SES) Light On as a Result of the Use of an Excessively/Over-Oiled Aftermarket, Reusable Air Filter

Models:

2007 and Prior GM Cars and Light Duty Trucks

2007 and Prior Saturn Models

2003-2007 HUMMER H2

2006-2007 HUMMER H3

2005-2007 Saab 9-7X

Supercede:

This bulletin is being revised to add models and model years. Please discard Corporate Bulletin Number 04-07-30-013A (Section 07 -

Transmission/Transaxle).

DO THIS	DON'T DO THIS
First, Inspect the vehicle for a reusable aftermarket excessively/over- oiled air filter	DO NOT repair MAF sensors under warranty if concerns result from the use of an excessively/over-oiled aftermarket, reusable air filter.

The use of an excessively/over-oiled aftermarket, reusable air filter may result in:

Service Engine Soon (SES) light on

Transmission shift concerns, slipping and damaged clutch(es) or band(s)

Engine driveability concerns, poor acceleration from a stop, limited engine RPM range

The oil that is used on these air filter elements may be transferred onto the Mass Air Flow (MAF) sensor causing contamination of the sensor. As a result, the Grams per Second (GPS) signal from the MAF may be low and any or all of the concerns listed above may occur.

When servicing a vehicle with any of these concerns, be sure to check for the presence of an aftermarket reusable, excessively/over-oiled air filter. The MAF, GPS reading should be compared to a like vehicle with an OEM air box and filter under the same driving conditions to verify the concern.

The use of an aftermarket reusable air filter DOES NOT void the vehicle's warranty.

If an aftermarket reusable air filter is used, technicians should inspect the MAF sensor element and the air induction hose for contamination of oil prior to making warranty repairs.

Transmission or engine driveability concerns (related to the MAF sensor being contaminated with oil) that are the result of the use of an aftermarket reusable, excessively/over-oiled air filter are not considered to be warrantable repair items.

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DisclaimerTechnical Service Bulletin # 06-00-89-051A

Date: 070124

# Locks - Key Code Securtiy Rules & Information

Bulletin No.: 06-00-89-051A

Date: January 24, 2007

## INFORMATION

Subject:  
KeyCode Security Rules and Information on GM KeyCode Look-Up Application

Models:  
2007 and Prior GM Passenger Cars and Light/Medium Duty Trucks (including Saturn)

2007 and Prior HUMMER H2, H3  
2005-2007 Saab 9-7X  
2007 and Prior Saab (Canada Only)  
2002 and Prior Isuzu (Canada Only)

## Attention:

This bulletin has been created to address potential issues and questions regarding KeyCode security. This bulletin should be read by all parties involved in KeyCode activity including dealer operator, partner security coordinator, sales, service and parts departments. A copy of this bulletin should be printed and maintained in the parts department for use as a reference.

Supercoded:

This bulletin is being revised to update/clarify the information. Please discard Corporate Bulletin Number 06-00-89-051 (Section 00 - General Information).

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## Key Code Information Part - 1

Where are Key Codes Located?

General Motors provides access to KeyCodes through three sources when a vehicle is delivered to a dealer. Vehicle KeyCodes are located on the original vehicle invoice to the dealership, but not on subsequent reprints. There is a small white bar coded tag sent with most new vehicles that also has the key code printed on it. Many dealers don't remove this and don't realize that as they are showing cars to customers they are also showing them the KeyCode to the vehicle. The third source for Key codes is through the GM KeyCode Look-Up application in GM DealerWorld (for U.S. dealers only) or the Keycode Look-Up feature within the Parts Locator and Information Services application on GM ACCESS (for Canadian dealers only). KeyCode Look-Up currently goes back 14 previous model years from the current model year (17 years in Canada).

When a vehicle is received by the dealership, care should be taken to safeguard the original vehicle invoice and KeyCode tag provided with the vehicle. Potential customers should not have access to the invoice or this KeyCode tag prior to the sale being completed. After a sale has been completed, the KeyCode information belongs to the customer and General Motors.

Tip

Only the original invoice contains key code information, a re-printed invoice does not.

GM KeyCode Look-Up Application for U.S. Dealers\*

\*Information for Canadian dealers and the Canadian Look-Up Application follows.

Recent KeyCode reviews have indicated that not all dealers are following the General Motors KeyCode Look-Up Policies and Procedures. GM has made several changes that will enhance the security of the KeyCode Look-Up system.

Please note that the KeyCode Access site is restricted. Only authorized users should be using this application. Please see your Partner Security Coordinator (PSC) for site authorized users. Keycode Look-Up currently goes back 14 previous model years from the current model year.

Recent changes include:

Users may not access the system from multiple computers simultaneously.

Users must accept the Keycode User Agreement for every request.

Users may only request one Keycode at a time.

Users must enter customer name, plate number and State/Province for every request.

Keycode information will only be available on the screen for 60 Seconds.

Detailed warnings have been added for printed Keycode requests.

Important notes about security:

Each user must maintain and protect their password to minimize the potential for abuse of the system within the dealership. Thus, authorized users should never share their password with others.

Processes must be in place for dealership management to review the dealership's Key code activity regularly through the Keycode Audit function available in GM DealerWorld.

The Partner Security Coordinator (PSC) must have processes in place to respond to changes within the dealership. Upon termination, an individual's access must be turned off immediately and access should be re-evaluated upon any position changes within the dealership.

If you think your password or ID security has been breached, contact your dealership Partner Security Coordinator for a new ID.

Contact GM Security via the Awareline at 1-800-244-3460 if you suspect your ID has been used by any other user.

Each user will be required to accept the following agreement each time the KeyCode application is used.

#### Key Code User Agreement

Key codes are proprietary information belonging to General Motors Corporation and to the vehicle owner.

Unauthorized access to, or use of, key code information is unlawful and may subject the user to criminal and civil penalties.

This information should be treated as strictly confidential and should not be disclosed to anyone unless authorized.

I will ensure that the following information is obtained prior to releasing any Key Code information:

Valid Picture ID

Vehicle Registration to verify owner name and VIN

The user must select I AGREE or I DO NOT AGREE on screen.

GM takes this agreement seriously. Each user must be certain of vehicle ownership before clicking on the "I agree" button.

When the ownership of the vehicle is in doubt, dealership personnel should not provide the information.

Key codes should never be sent via a fax or the internet.

Every Keycode Look-Up request or inquiry is retained indefinitely for GM review purposes.

GM will review KeyCode Look up on a monthly basis for compliance.

Do not put yourself, or your Dealership in the position of needing to "explain" a Keycode Look Up to either GM Security or law enforcement officials.

Create a file to document all Keycode Look Up transactions.

Dealership Partner Security Coordinator and/or assigned management has the ability to review all KeyCode Look-Up transactions.

Dealership management must review KeyCode Look-Up usage for compliance to the stated Policies and Procedures.

Dealership KeyCode documentation must be retained for a minimum of 2 years.

#### Frequently Asked Questions (FAQS) for U.S. Dealers\*

\*Information for Canadian dealers and the Canadian Look-Up Application follows.

FAQs are located in the KeyCode Help section of KeyCode look up. The FAQ section should be printed and located near the parts department should there be questions.

FAQs included the following information:

How do I document a Keycode request for a dealer owned vehicle?

The dealership name should be in the "Customer Name" field. "Stock Unit" should be entered in the "Plate Number" field. The dealership location should be used in the "State / Province Registered In" field. Dealership Management specified by the Dealer Operator should authorize any internal KeyCode Requests.

Any clarifying explanation should be entered into the comments field.

How do I request a KeyCode for customer owned vehicle that is not registered?

Scrapped, salvaged or stored vehicles that do not have a current registration should still have the ownership verified by requesting the vehicle title, current insurance policy and / or current lien holder information from the customers financing source. If you cannot determine if the customer is the owner of the vehicle, do not provide the key code information. In these cases, a short description of the vehicle (scrapped, salvaged, etc.) should be entered in the "Plate Number" field and the dealership location should be used in the "State / Province Registered In" field. Any clarifying explanation should be entered into the comments field.

How do I document a Keycode request for a vehicle that is being repossessed?

The reposessor must document ownership of the vehicle by providing a court ordered repossession order and lien-holder documents prior to



providing key code information. Copies of the repossession Drivers License and a business card should be retained by the dealership for documentation. Any clarifying explanation should be entered into the comments field.

What if I cannot obtain the "Plate Number" for the vehicle?

Every effort should be made to obtain complete information for each request. Dealership Management must be involved in any request without complete information. Place the name of the Dealership Manager approving the request in the Plate Number field. Any clarifying explanation should be entered into the comments field. Other forms of documentation include vehicle title, insurance policy, and or current lien information from the customers financing source. If you cannot determine if the customer is the owner of the vehicle, do not provide the key code information.

What do I do if the registration information is locked in the vehicle?

Every effort should be made to obtain complete information for each request. Each Dealership will have to decide on a case by case basis if enough information is available to verify the customer's ownership of the vehicle. Other forms of documentation include vehicle title, insurance policy, and or current lien information from the customers financing source. Dealership Management must be involved in any request without complete information. Place the name of the Dealership Manager approving the request in the Plate Number field. Any clarifying explanation should be entered into the comments field. If you cannot determine if the customer is the owner of the vehicle, do not provide the key code information.

Can I get a print out of the information on the screen?

It is important to note that the Key Code Look Up Search Results contain sensitive and/or proprietary information. For this reason GM recommends against printing it. If the Search Results must be printed, store and/or dispose of the printed copy properly to minimize the risk of improper or illegal use.

Who in the dealership has access to the KeyCode application?

Dealership Partner Security Coordinator will determine, and control, who is authorized to access the KeyCode Look Up application. However, we anticipate that dealership parts and service management will be the primary users of the application. The KeyCode Look Up application automatically tracks each user activity session. Information tracked by the system includes: User name, User ID, all other entered data and the date/time of access.

Do I have to go through the KeyCode Orientation each time I need to get a KeyCode?

The KeyCode Orientation session is required for all first time users on the KeyCode Look Up application. Returning users who have completed the orientation session on the application will only have to accept the KeyCode User Agreement for each request.

What if I input the VIN incorrectly?

If an incorrect VIN is entered into the system (meaning that the system does not recognize the VIN or that the VIN has been entered incorrectly) the system will return an error message highlighting the incorrect information.

If I am an authorized user for the KeyCode Audit application, can I access the application from home?

If you are authorized user for the application, you will be able to access it as you can other DealerWorld applications.

How will users be trained on the new applications?

The "Help" button on the application provides access to the Frequently Asked Questions (FAQs), Security Guidelines, System Usage Agreement and KeyCode Orientation. Additionally, the application features a "mouse-over" function that provides users with instructions for completing each required/optional data field.

Who in the dealership has access to the KeyCode Audit application?

Access to the KeyCode Audit application will be determined, and controlled, by the Partner Security Coordinator in the dealership. The KeyCode Audit function will allow the authorized user to view VIN's, user name, date and time of requests by your dealership.

What if I suspect key code misuse?

Your dealership should communicate the proper procedures for requesting key codes. Any suspicious activity either within the dealership or externally should be reported to GM via the GM Security tip line. The Awareline toll free number in the US and Canada is 1-800-244-3460, the number for Mexico is 011-800-244-7434.

## **Key Code Information Part - 2**

Whose key codes can I access through the system?

At this time the following US vehicle codes are available through the system: Chevrolet, Cadillac, Buick, Pontiac, GMC, HUMMER (H2 and H3 only), Oldsmobile and Saturn for the current model year and the 14 previous model years.

What should I do if I enter a valid VIN and the system does not produce any key code information?

Occasionally, the Keycode Look Up application may not produce a Key code for a valid VIN. This may be the result of new vehicle information not yet available. In addition, older vehicle information may no longer be available. If you do not receive a Key code returned for valid VIN, current model year or 14 previous model years back, you should contact the DealerWorld Help Desk at 1-888-337-1010. The help desk will escalate your request to the application owner for review. After the application owner has reviewed the key code information, you will be contacted. Please do not contact the DealerWorld Help Desk for future updates on your case.

How do I document a Keycode request for an Engineering Analysis Associate (EAA) Investigator?

The EAA investigator must provide a letter on GM letterhead stating the customer's name, VIN, Product Allegation Resolution (PAR) case number and investigators name. The investigation should be verified by contacting the GM Business Resource Groups PAR Staff during normal business hours M-F 8:00 - 5:00 EST at 800-231-1831 Prompts # 3, # 1, # 4. A copy of this letter, business card and Drivers License of the investigator should be retained by the dealership for documentation.

How do I access Keycodes if the Keycode Look-up system is down?

If the KeyCode Look-up system is temporarily unavailable you can contact the original selling dealer who may have it on file. If the customer is dealing with an emergency lock-out situation you need to have the customer contact Roadside assistance or OnStar, if subscribed. Roadside assistance no longer provides KeyCodes to dealers. At this time, there are no other options for obtaining KeyCodes.

What should I do if the Keycode from the look-up system does not work on the vehicle?

On occasion a dealer may encounter a Key code that will not work on the vehicle in question. In cases where the Key code won't work, you will need to verify with the manufacturer of the cutting equipment that the key has been cut correctly. If the key has been cut correctly, you may be able to verify the proper Key code was given through the original selling dealer. When unable to verify the Key code through the original selling dealer, GM DealerWorld Help Desk may be contacted and your case will be escalated to the application owner for review.

After the application owner has reviewed the key code information, you will be contacted. Please do not contact the DealerWorld Help Desk for future updates on your case. The application owner will verify the Key code provided matches the Key code listed on the vehicle invoice. If the key has been cut correctly and the code given does not work, the lock cylinder may have been changed. In these situations, following the proper SI document for recoding a key or replacing the lock cylinder may be necessary.

How do I document a Keycode request for an ESIS Investigator?

The ESIS investigator must provide a letter on ESIS GM Central Claims Unit letterhead stating the customer's name, VIN, claim number and investigators name.

The investigation should be verified by contacting the ESIS/GM Claims Unit during normal business hours M-F 8:00 - 5:00 EST at 1-800-888-0164. A copy of this letter, business card and Drivers License of the investigator should be retained by the dealership for documentation.

How long do I have to keep Keycode Records?

Dealership KeyCode documentation should be retained for a minimum of 2 years.

Can I get a KeyCode changed in the Look-Up system?

No. Currently, KeyCodes can not be changed in the Look-Up system if a lock cylinder has been changed.

Whose Name do I put in the "Customer's Name" field of KeyCode Look-Up?

Whenever a KeyCode is requested, the actual person (not the company name) you are giving the KeyCode information to must be put in this field. This would be the same person for which you have verified identification. Detailed comments should be included in the comments section and file if necessary.

What information do I need before I can provide a driver of a company fleet vehicle Keys or Keycode information?

The dealership should have a copy of the individual's driver's license, proof of employment and registration. If there is any question as to the customer's employment by the fleet company, the dealer should attempt to contact the fleet company for verification. If there is not enough information to determine ownership and employment, this information should not be provided.

How do I document a request from an Independent Repair facility for a Keycode or Key?

The independent must provide a copy of their driver's license, proof of employment and signed copy of the repair order for that repair facility. The repair order must include customer's name, address, VIN, city, state and license plate number. Copies of this information must be included in your dealer KeyCode file.

GM Keycode Look-Up Application for GM of Canada Dealers\*

\* Information for U.S. dealers and U.S. Look-Up Application above.

All dealers should review the General Motors of Canada KeyCode Look-Up Policies and Procedures (Service Policy & Procedures Manual Section 3.1.6 "Replacement of VIN plates & keys").

Please note that the KeyCode Access site is restricted. Only authorized users should be using this application. Please see your Parts Manager for site authorized users. KeyCode Look-Up currently goes back 17 years from current model year.

Important notes about security:

Users may not access the system from multiple computers simultaneously.

Users may only request one KeyCode at a time.

KeyCode information will only be available on the screen for 2 minutes.

Each user is personally responsible for maintaining and protecting their password.

Never share your password with others.

User ID's are suspended after 6 consecutive failed attempts.

User ID's are disabled if not used for 90 days.

Processes must be in place for regular dealership reviews.

The Parts Manager (or assigned management) must have processes in place for employee termination or life change events. Upon termination individuals access must be turned off immediately and access should be re-evaluated upon any position changes within the dealership.

If you think your password or ID security has been breached, contact the GMACCESS Help Desk at 1-800-265-0573 or GM of Canada Dealer Technology at 905-644-1829.

Each user will be required to accept the following agreement each time the KeyCode application is used.

Key Code User Agreement

Key codes are proprietary information belonging to General Motors Corporation and to the vehicle owner.

Unauthorized access to, or use of, key code information is unlawful and may subject the user to criminal and civil penalties.

This information should be treated as strictly confidential and should not be disclosed to anyone unless authorized.

I will ensure that the following information is obtained prior to releasing any Key Code information:

Government issued picture ID (Drivers License)

Registration or other proof of ownership. Registration should have normal markings from the Province that issued the registration and possibly the receipt for payment recorded as well.

GM takes this agreement seriously. Each user must be certain of vehicle ownership before giving out key codes.

When the ownership of the vehicle is in doubt, dealership personnel should not provide the information.

Key codes should NEVER be sent via a fax or the internet.

Each Dealership should create a permanent file to document all Keycode Look Up transactions. Requests should be filed by VIN and in each folder retain copies of the following:

Government issued picture ID (Drivers License)

Registration or other proof of ownership.

Copy of the paid customer receipt which has the name of the employee who cut and sold the key to the customer.

Do not put yourself or your Dealership in the position of needing to "explain" a KeyCode Look Up to either GM Security or law enforcement officials.

Dealership Management has the ability to review all KeyCode Look-Up transactions.

Dealership KeyCode documentation must be retained indefinitely.

## Frequently Asked Questions (FAQs) for GM of Canada Dealers\*

\* Information for U.S. dealers and U.S. Look-Up Application above.

How do I request a KeyCode for customer owned vehicle that is not registered?

Scrapped, salvaged or stored vehicles that do not have a current registration should still have the ownership verified by requesting the vehicle title, current insurance policy and/or current lien holder information from the customers financing source. If you cannot determine if the customer is the owner of the vehicle, do not provide the key code information. In these cases, a short description of the vehicle (scrapped, salvaged, etc.) and the dealership location should be kept on file. Any clarifying explanation should be entered into the comments field.

How do I document a KeyCode request for a vehicle that is being repossessed?

The reposessor must document ownership of the vehicle by providing a court ordered repossession order and lien-holder documents prior to providing key code information. Copies of the reposseors Drivers License and a business card should be retained by the dealership for documentation.

What do I do if the registration information is locked in the vehicle?

Every effort should be made to obtain complete information for each request. Each Dealership will have to decide on a case by case basis if enough information is available to verify the customer's ownership of the vehicle. Other forms of documentation include vehicle title, insurance policy, and or current lien information from the customers financing source. Dealership Management must be involved in any request without complete information. If you cannot determine if the customer is the owner of the vehicle, do not provide the key code information.

Can I get a print out of the information on the screen?

It is important to note that the Key Code Look Up Search Results contain sensitive and/or proprietary information. For this reason GM recommends against printing it. If the Search Results must be printed, store and/or dispose of the printed copy properly to minimize the risk of improper or illegal use.

Who in the dealership has access to the KeyCode application?

Dealership Parts Manager (or assigned management) will determine, and control, who is authorized to access the KeyCode Look Up application. However, we anticipate that dealership parts and service management will be the primary users of the application. The KeyCode Look Up application automatically tracks each user activity session. Information tracked by the system includes: User name, User ID, all other entered data and the date/time of access.

What if I input the VIN incorrectly?

If an incorrect VIN is entered into the system (meaning that the system does not recognize the VIN or that the VIN has been entered incorrectly) the system will return an error message.

If I am an authorized user for the KeyCode application, can I access the application from home?

The GM Parts Locator and Information Services application resides on the GMACCESS Server. Even if you are an authorized user for the application, you will NOT be able to access it outside of the dealership.

What if I suspect key code misuse?

Your dealership should communicate the proper procedures for requesting key codes. Any suspicious activity either within the dealership or externally should be reported to the GMACCESS Help Desk or GM of Canada Dealer Technology at 905-644-1829.

Whose key codes can I access through the system?

At this time the following Canadian vehicle codes are available through the system: Chevrolet, Cadillac, Buick, Pontiac, GMC, HUMMER (H2 and H3 only), Oldsmobile, Saturn, Saab and Isuzu (up to 2002 model year) for a maximum of 17 model years.

What should I do if I enter a valid VIN and the system does not produce any key code information?

Occasionally, the KeyCode Look Up application may not produce a key code for a valid VIN. This may be the result of new vehicle information not yet available.

In addition, older vehicle information may have been sent to an archive status. If you do not receive a key code returned for valid VIN, you should contact GM of Canada Dealer Technology at 905-644-1829.

How do I access Keycodes if the Keycode Look-up system is down?

If the KeyCode Look-up system is temporarily unavailable, you can contact the original selling dealer who may have it on file or contact GM of Canada Dealer Technology at 905-644-1829. If the customer is dealing with an emergency lock-out situation, you need to have the customer

contact Roadside assistance, OnStar if subscribed, or 911.

What should I do if the KeyCode from the look-up system does not work on the vehicle?

On occasion a dealer may encounter a KeyCode that will not work on the vehicle in question. In cases where the KeyCode won't work you will need to verify with the manufacturer of the cutting equipment that the key has been cut correctly. If the key has been cut correctly you may be able to verify the proper Keycode was given through the original selling dealer. When unable to verify the Keycode through the original selling dealer contact GM of Canada Dealer Technology at 905-644-1829. If the key has been cut correctly and the code given does not work, the lock cylinder may have been changed. In these situations following the proper SI document for recoding a key or replacing the lock cylinder may be necessary.

How long do I have to keep KeyCode Records?

Dealership Keycode documentation should be retained indefinitely.

Can I get a KeyCode changed in the Look-Up system?

Yes, Keycodes can be changed in the Look-Up system if a lock cylinder has been changed. Contact GM of Canada Dealer Technology at 905-644-1829.

What information do I need before I can provide a driver of a company fleet vehicle Keys or Keycode information?

The dealership should have a copy of the individual's driver's license, proof of employment and registration. If there is any question as to the customer's employment by the fleet company, the dealer should attempt to contact the fleet company for verification. If there is not enough information to determine ownership and employment, this information should not be provided.

How do I document a request from an Independent Repair facility for a Keycode or Key?

The independent must provide a copy of their driver's license, proof of employment and signed copy of the repair order for that repair facility. The repair order must include customer's name, address, VIN, city, province and license plate number. Copies of this information must be included in your dealer KeyCode file.

Technical Service Bulletin # **02-08-42-004A**

Date: **070330**

## **Instruments - Reduced PRNDL Display Visibility**

Bulletin No.: 02-08-42-004A

Date: March 30, 2007

### **INFORMATION**

Subject:

PRNDL Display Reduced Visibility For Approximately One Minute

Models:

2007 and Prior Passenger Cars and Trucks (Including Saturn)

2007 and Prior HUMMER H2, H3

2005-2007 Saab 9-7X

with Automatic Headlamp Control and Vacuum Fluorescent PRNDL Indicator Instrument Panel Cluster

Supercede:

This bulletin is being revised to include additional models and model years. Please discard Corporate Bulletin Number 02-08-42-0004 (Section 08 - Body and Accessories).

After backing the vehicle out of a garage or dark environment into a daylight environment, the PRNDL display has reduced visibility for approximately one minute.

While the vehicle is parked in a dark environment, the sensor for the automatic headlamp/driving lamps senses that it is dark. When the key is turned to the run/start position, the automatic headlamp module will turn all driving lamps, the instrument panel cluster and PRNDL display ON in the night-time mode. The night-time mode intensity of the instrument panel lamps and PRNDL display is controlled by the automatic headlamp module and can be dimmed further by the customer using the dimming control of the headlamp switch.

When the customer then moves the vehicle from the dark environment into the bright sunlight, it will take approximately one minute before the headlamp control module recognizes this as true daylight and not just a bright overhead street lamp shining on the sensor. The headlamp control module will then turn the headlamps off and restore the instrument panel and PRNDL display to full brilliance.

Without the time delay, the automatic headlamp control module would switch to the night mode (turn on all driving lamps, instrument panel lamps and PRNDL display would dim) each time the vehicle was driven under an overpass or other darkened environment.

This is a normal condition and no repair should be attempted.

Ensure the instrument panel backlighting control is in the full bright position. This will help alleviate the condition. You may demonstrate to the customer what happens by placing a repair order over the automatic headlamp control light sensor, which will cause the automatic headlamp control module to switch to the night mode in approximately one minute. All driving lamps will come ON, the instrument panel backlight will be dim, and the PRNDL display will also dim to the night setting in conjunction with the position of the headlamp switch dimming control. Demonstrate to the customer the variance in the instrument panel backlighting and PRNDL display while adjusting the headlamp switch dimming control to both ends of its allowable range. Advise the customer to keep the headlight switch dimming control in the highest position to allow viewing of the PRNDL display in a bright environment.

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



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Disclaimer Technical Service Bulletin # **07-08-63-001**

Date: **070417**

## **Body - Polypropylene Energy Absorber Replacement**

Bulletin No.: 07-08-63-001

Date: April 17, 2007

### **INFORMATION**

Subject:

Information on Repair of Polypropylene Energy Absorbers

Models:

2007 and Prior GM Passenger Cars and Trucks (including Saturn)

2007 and Prior HUMMER H2, H3

2005-2007 Saab 9-7X

Supercede:

This bulletin is being revised to change the repair information. Please discard Corporate Bulletin Number 63-20-02 (Section 8 - Body and Accessories).

Because the energy absorbers are relatively low in cost to replace, it is now more cost efficient to replace the energy absorbers whenever they are damaged.

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



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Disclaimer Technical Service Bulletin # **00-06-01-026B**

Date: **070621**

## **Intake Manifold - Inspect/Replace After Engine Damage**

Bulletin No.: 00-06-01-026B

Date: June 21, 2007

### **INFORMATION**

Subject:

Intake Manifold Inspection/Replacement After Severe Internal Engine Damage

Models:

2008 and Prior Passenger Cars and Trucks (Including Saturn)

2008 and Prior HUMMER H2, H3

2008 and Prior Saab 9-7X

Supercede:

This bulletin is being revised to include additional models and model years. Please discard Corporate Bulletin Number 00-06-01-026A (Section 06 - Engine).

When replacing an engine due to internal damage, extreme care should be taken when transferring the intake manifold to the new Goodwrench service engine long block. Internal damage may result in the potential discharge of internal engine component debris in the intake manifold via bent, broken, or missing intake valves. After removing the intake manifold from the engine, the technician should carefully inspect all of the cylinder head intake ports to see if the valve heads are still present and not bent. Usually when the valve heads are missing or sufficiently bent, internal engine component debris will be present to varying degrees in the intake port of the cylinder head. If this debris is present in any of the cylinder head intake ports, the intake manifold should be replaced. This replacement is required due to the complex inlet runner and plenum configuration of most of the intake manifolds, making thorough and complete component cleaning difficult and nearly impossible to verify complete removal of debris. Re-installation of an intake manifold removed from an engine with deposits of internal engine component debris may result in the ingestion of any remaining debris into the new Goodwrench service engine. This may cause damage or potential failure of the new service engine.

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



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DisclaimerTechnical Service Bulletin # 99-08-64-016B

Date: 070622

## Body - Use of Silicone for Weatherstrip Maintenance

Bulletin No.: 99-08-64-016B

Date: June 22, 2007

### INFORMATION

Subject:  
Use of Silicone for Weatherstrip Maintenance

Models:  
2008 and Prior GM Passenger Cars and Trucks (including Saturn)  
2008 and Prior HUMMER H2, H3  
2005-2008 Saab 9-7X

Supercede:

This bulletin is being revised to add model years. Please discard Corporate Bulletin Number 99-08-64-016A (Section 08 - Body and Accessories).

In the past, questions have been raised regarding the proper care and maintenance of weatherstrips. The purpose of this bulletin is to clarify which materials are recommended for use when required.

Periodically, a thin coating of silicone grease can prolong the life of the weatherstrip. The silicone will reduce wear in the contact areas as well as reduce squeaking and sticking conditions. During very cold or damp weather, more frequent applications may be necessary.

Be careful in areas where clothing may come in contact with the weatherstrip, as silicone or dirt may be transferred to clothing.

Part Number	Description
12345579 (U.S.) 10953481 (Canada)	Goodwrench Dielectric Silicone Grease (or equivalent) Lubricant Silicone Grease
3634770 (U.S.) 10953518 (Canada)	Goodwrench Weatherstrip Lubricant (Krytox*) (or equivalent) Lubricant

\*The use of KRYTOX for coating weatherstrips is allowed, but not required.

Parts Information

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



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Technical Service Bulletin # **06-08-43-003A**

Date: **070608**

## **Wipers - Performance/Cleaning Instructions/Maintenance**

Bulletin No.: 06-08-43-003A

Date: June 08, 2007

### **INFORMATION**

Subject:

Windshield Wiper Performance, Cleaning Instructions and Maintenance

Models:

2008 and Prior GM Passenger Cars and Trucks (including Saturn)

2008 and Prior HUMMER H2, H3

2008 and Prior Isuzu Medium Duty Trucks

2005-2008 Saab 9-7X

Supercede:

This bulletin is being revised to add the 2008 model year. Please discard Corporate Bulletin Number 06-08-43-003 (Section 08 - Body and Accessories).

### **Wiper Concerns**

Most concerns about windshield wiper performance are the result of dirty wiper blades, damaged wiper blades, or worn out blades that are continuing to be used beyond their useful life. Depending on environmental conditions, wiper blades can have dramatic differences in lifespan. Here are some tips and guidelines to maximize wiper performance to avoid damage to the blades, and to avoid unnecessary replacements.

Many wiper blades are being replaced under warranty with reviews showing there is nothing wrong with the returned blades other than a build-up of dirt. Additionally, advise the customer to review the information in their Owner Manual.

### **Inspection and Cleaning**

#### **Scheduled Maintenance**

Inspect your wipers rubber blades every 4-6 months or 12,000 km (7,500 mi) for wear, cracking or contamination.

Clean the windshield and the rubber wiper blades (using the procedure below) if the blades are not clearing the glass satisfactorily. If this does not correct the problem, then replace the rubber elements.

### **Cleaning Procedure**

Avoid getting windshield washer fluid on your hands. Wear rubber gloves or avoid direct contact with washer fluid.

Do not use gasoline, kerosene, or petroleum based products to clean wiper blades.

Clean the rubber blades using a lint free cloth or paper towel soaked with windshield washer fluid or a mild detergent. You should see significant amounts of dirt being removed on the cloth.

Be sure to wash the windshield thoroughly when you clean the blades. Bugs, road grime, sap and a buildup of car wash/wax treatments may additionally cause wiper streaking.

### **Tip**

For a larger scale buildup on the windshield, use a non-abrasive cleaner such as Bon-Ami\* ([www.faultless.com](http://www.faultless.com)) cleanser with a wet sponge, being sure to use plenty of water to avoid scratching the glass. Flush the surface and body panels completely.

### **Tip**

For day-to-day exterior glass cleaning and to maintain a streak free appearance, suggest Vehicle Care Glass Cleaner, P/N 89021822 (in Canada,



992727). This product is an easy to use foaming cleaner that quickly removes dirt and grime from glass surfaces.

#### Tip

Interior glass should be cleaned with plain, clean water to eliminate any film or haze on the window and help prevent fogging, a major customer dissatisfier. Refer to Corporate Bulletin Number 03-00-89-006D for more information. The New Vehicle Pre-Delivery Inspection form also recommends using plain water to clean interior glass.

\*We believe this material to be reliable. There may be additional manufacturers of such material. General Motors does not endorse, indicate any preference for or assume any responsibility for the products or equipment from these firms or any such items which may be available from other sources.

#### Avoiding Wiper Damage

The following are major contributors to wiper damage. Some of these you can control and others are environmental concerns.

Extremely dusty areas (such as driving on dirt roads) may cause the wipers rubber edge to wear quickly and unevenly.

Sand and salt used on roads for increasing winter traction and ice control will cause the wiper blades to wear quicker. Areas with significant snowfall require more frequent blade replacements.

Heat and time may cause the rubber blades to take a "permanent set" resulting in the rubber not flexing and turning over uniformly. This condition may result in streaking and/or unwiped areas.

Rubber blades are easily cut or torn when using ice scrapers. Likewise pulling blades up off a frozen windshield can tear the rubber. Exercise caution when clearing ice and snow.

Using your wipers to "wear through" frost and ice, instead of allowing the defrosters to melt the ice, can dull, nick or tear the rubber blades.

Banging wipers on the glass to remove ice and snow may cause the blade to bend, dislodging the rubber and causing potential scratching of the windshield.

Ice can form in the pin joints of the wipers, which can cause streaking and unwiped areas. To remove ice from pin joints, compress the blade and rubber edge with your hand to loosen the frozen joints. Consider using Winter Blades that have a rubber cover to avoid this condition.

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Technical Service Bulletin # **07-06-01-016A**

Date: **070917**

## Engine - Internal Noise/Damage After Oil Filter Change

Bulletin No.: 07-06-01-016A

Date: September 17, 2007

#### INFORMATION

Subject:  
Information on Internal Engine Noise or Damage After Oil Filter Replacement

Models:  
2008 and Prior Passenger Cars and Trucks (Including Saturn and Saab)  
2008 and Prior HUMMER H2, H3

#### Supercede:

This bulletin is being updated to include additional information on incorrect or improperly installed engine oil filters.

Please discard Corporate Bulletin Number 07-06-01-016 (Section 06 - Engine/Propulsion System).

Engine damage that is the result of an incorrect or improperly installed engine oil filter is not a warrantable claim. The best way to avoid oil filter quality concerns is to purchase ACDelco(R) oil filters directly from GMSPO.

Oil filter misapplication may cause abnormal engine noise or internal damage. Always utilize the most recent parts information to ensure the correct

part number filter is installed when replacing oil filters. Do not rely on physical dimensions alone. Counterfeit copies of name brand parts have been discovered in some aftermarket parts systems. Always ensure the parts you install are from a trusted source. Improper oil filter installation may result in catastrophic engine damage.

Refer to the appropriate Service Information (SI) installation instructions when replacing any oil filter and pay particular attention to procedures for proper cartridge filter element alignment. If the diagnostics in SI (Engine Mechanical) lead to the oil filter as the cause of the internal engine noise or damage, dealers should submit a field product report. Refer to Corporate Bulletin Number 02-00-89-002F (Information for Dealers on How to Submit a Field Product Report).

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Disclaimer Technical Service Bulletin # **05-06-01-010B**

Date: **070928**

## **Engine - Sealant Usage/Procedures**

Bulletin No.: 05-06-01-010B

Date: September 28, 2007

### **INFORMATION**

#### **Subject:**

Service Information Update on Consolidating Use of GM Liquid Gasket/Engine Sealants and New Sealant Dispenser GE-48326 Essential Tool

#### **Models:**

2008 and Prior GM Passenger Cars and Trucks (including Saturn)

2003-2008 HUMMER H2

2006-2008 HUMMER H3

2005-2008 Saab 9-7X

with Gasoline or Diesel Engines

#### **Supersede:**

This bulletin is being updated to add additional information about the use by date code printed on the crimp of the sealant tube. Please discard Corporate Bulletin Number 05-06-01-010A (Section 06 - Engine/Propulsion System).

In 2005 General Motors consolidated the use of all liquid gaskets/engine sealants. At that time, two sealants replaced all previous sealants referred to in Service Information (SI) and/or the Service Manual.

In 2007, GM has consolidated to one engine sealant already available in a 150 g cartridge and now in a 75 g aluminum tube. As a result, P/N 12346141, 54 g tube, has been deleted from service.

One of these, engine sealant P/N 12378521 (U.S.) and P/N 88901148 (Canada), was released in a cartridge to be used in a conventional caulking gun. The cartridge and conventional caulking gun proved to be too large and cumbersome in certain instances when used in on-vehicle service.

To address this concern, GM Powertrain Engineering released the engine sealant in a 0.075 kg (75 gram) squeeze tube (packaged six to the carton, with nozzles) along with a new essential service tool, Sealant Dispenser GE-48326, which has been shipped to all GM dealerships.

#### **Sealant Guidelines**

The GM Powertrain engineering specification for applying this sealant is an even bead, 3 mm (0.118 in) in diameter. Due to the high viscosity of the sealant, a dispenser is required to meet this specification. The GE-48326 Sealant Dispenser provides the ability to apply the sealant to specification using one hand, even in areas not accessible using the P/N 12378521 Engine Sealant cartridge and caulking gun.

This solitary engine sealant available in tubes and small cartridge is compatible with all synthetic, synthetic blends and mineral oils, as well as all engine coolants including DEX-COOL(R). The maximum working time of this sealant is 20 minutes. The sealant will be fully cured in 24 hours. The assembly may be filled with oil or coolant immediately after applying the sealant and tightening the bolts.

88861417 (U.S.)	Engine Sealant 0.075 kg (75 gram) Squeeze Tube
88861418 (Canada)	
12378521 (U.S.)	Engine Sealant 0.15 kg (150 gram) Cartridge
88901148 (Canada)	

Engine Sealant Part Numbers



Use By Date Code

The 0.075 kg (75 gram) Squeeze Tube is not available for 2008 and prior Saturn models (only in 150 g cartridges).

The "use by" date on the 0.15 kg (150 gram) cartridge currently is not available.

The use by date of the 0.075 kg (75 gram) tube is twelve months from the manufacture date printed on the crimp month (1), date (2), year (3).  
GMSPO recommends that dealers use the first-in first out (FIFO) system of stock rotation on chemicals. Use the oldest stock first by rotating the oldest to the front of a stock location.



Special Service Tool GE-48326 Sealant Dispenser



New Engine Sealant 0.075 kg (75 gram) Squeeze Tube (also available in Vehicle Care label for US dealers)

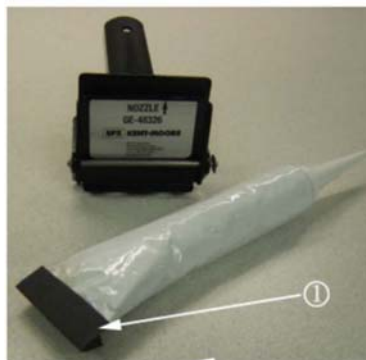
New Sealant and Sealant Dispenser GE-48326

Engine Sealant 0.075 kg (75 gram) Squeeze Tube is not available for 2008 and prior Saturn models (only in 150 g cartridges).

The following service procedures will assist technicians in the proper use of the new sealant dispenser GE-48326 in applying an even bead of sealant 3 mm (0.118 in) in diameter using one hand, even in areas not accessible using engine sealant cartridge and caulking gun.



To use the sealant dispenser correctly, install the two white tabs on the rear handle (1) over the front handle. The white paint marks are for demonstration purposes only. Now your dispenser is ready to install engine sealant 0.075 kg (75 gram) squeeze tube.



Before installing engine sealant 0.075 kg (75 gram) squeeze tube into the dispenser, install a small piece of medium grit sandpaper, or equivalent, by folding it over the bottom of the squeeze tube (1). This will help hold the squeeze tube firmly in place while using the sealant dispenser.



Install engine sealant 0.075 kg (75 gram) squeeze tube with a small piece of medium grit sandpaper into the dispenser (see above graphic

illustration). Remember to open the squeeze tube with a sharp knife or equivalent and cut the sealant nozzle to the correct diameter to apply a 3 mm (0.118 in) even bead of sealant.



The sealant dispenser with the engine sealant is now ready to be used (see above graphic illustration).

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Disclaimer Technical Service Bulletin # 07-08-45-002

Date: 070905

## Electrical - Aftermarket Fuse Warning

Bulletin No.: 07-08-45-002

Date: September 05, 2007

### ADVANCED SERVICE INFORMATION

Subject:

Service Alert: Concerns With Aftermarket Fuses in GM Vehicles

Models:

2008 and Prior GM Passenger Cars and Light Duty Trucks (including Saturn)

2008 and Prior HUMMER H2, H3

2008 and Prior Saab 9-7X

Concerns with Harbor Freight Tools "Storehouse" Branded Blade Type Fuses

General Motors has become aware of a fuse recall by Harbor Freight Tools/Storehouse for a variety of aftermarket fuses. In two cases, these fuses have not provided protection for the wiring system of the vehicles they were customer installed in.

Upon testing the 15 amp version, it was found that the fuse still would not "open" when shorted directly across the battery terminals.

How to Identify These Fuses



Packed in a 120 piece set, the fuse has a translucent, hard plastic, blue body with the amperage stamped into the top. There are no white painted numbers on the fuse to indicate amperage. There are no identifying marks on the fuse to tell who is making it. The fuses are known to be distributed by Harbor Freight Tools but there may be other marketers, and packaging of this style of fuse. It would be prudent to replace these fuses if found in a customers vehicle. Likewise, if wiring overheating is found you should check the fuse panel for the presence of this style of fuse.

All GM dealers should use genuine GM fuses on the vehicles they service. You should also encourage the use of GM fuses to your customers to assure they are getting the required electrical system protection. GM has no knowledge of any concerns with other aftermarket fuses. If additional information becomes available, this bulletin will be updated.

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Technical Service Bulletin # **03-03-10-007C**

Date: **070921**

## **Tires/Wheels - Vibration/Balance/Shake/Flat Spotting**

Bulletin No.: 03-03-10-007C

Date: September 21, 2007

### **INFORMATION**

Subject:  
Info - Tire/Wheel Characteristics (Vibration, Balance, Shake, Flat Spotting) of GM Original Equipment Tires

Models:  
2008 and Prior Cars and Light Duty Trucks (Including Saturn)  
2008 and Prior HUMMER H2, H3  
2005-2008 Saab 9-7X

Supersede:

This bulletin is being revised to include additional information and model years. Please discard Corporate Bulletin Number 03-03-10-007B (Section 03 - Suspension).

The purpose of this bulletin is to help explain that, under certain circumstances, a customer may notice a slight tire shake within the first few miles/kilometers of vehicle operation.

Tires may be designed with a nylon overlay configuration engineered to enhance the tire's integrity at high speeds. This allows the tires to be driven at higher speeds without excessive heat buildup.

Before measuring tires on equipment such as the Hunter GSP 9700, the vehicle **MUST** be driven a minimum of 16 km (10 mi) to ensure removal of any flat spotting. (The tendency to "flat spot" is less likely as the tire accumulates mileage.)

When parked overnight, or for a period of time, the tires may set (flat spot) and require a few miles/kilometers before heating up to their normal operating temperature. Until the tires warm up, a slight tire shake may be felt but should subside quickly.

**DEALERS SHOULD REFRAIN FROM ATTEMPTING REPAIRS OR REPLACING COMPONENTS.**

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Technical Service Bulletin # **00-00-90-002I**

Date: **071023**

## **Tires/Wheels - Tire Inflation Pressure Information**

Bulletin No.: 00-00-90-002I

Date: October 23, 2007

### **INFORMATION**

Subject:  
Information on Proper Tire Pressure

**Models:**

2008 and Prior GM Passenger Cars and Light Duty Trucks (including Saturn)

2008 and Prior HUMMER H2, H3

2005-2008 Saab 9-7X

**Supercede:**

This bulletin is being revised to add information about the 2008 HUMMER H2. Please discard Corporate Bulletin Number 00-00-90-002H (Section 00 - General Information).

ALL tires (including the spare tire) MUST be set to the recommended inflation pressure stated on the vehicle's tire placard (on driver's door) during the PRE-DELIVERY INSPECTION (PDI). Recommended inflation pressure is not the pressure printed on tire sidewall.

Tires may be over-inflated from the assembly plant due to the mounting process.

Generally a 5.6°C (10°F) temperature change will result in (is equivalent to) a 6.9 kPa (1 psi) tire pressure change.

2008 HUMMER H2 Only - The H2 comes standard with Light Truck "D" Load Range tires with a recommended cold inflation pressure of 289 kPa (42 psi). These tires will alert the driver to a low pressure situation at roughly 262 kPa (38 psi), due to a requirement in FMVSS 138, which specifies a Minimum Activation Pressure for each tire type. This creates a relatively narrow window of "usable" pressure values, and the warning will be more sensitive to outside temperature changes during the colder months.

As with other cold temperature / Tire pressure issues, there is nothing wrong with the system itself. If a vehicle is brought in with this concern, check for tire damage and set all tires to the Recommended Cold Inflation Pressure shown on the vehicle placard.

Accurate tire pressures ensure the safe handling and appropriate ride characteristics of GM cars and trucks. It is critical that the tire pressure be adjusted to the specifications on the vehicle's tire placard during PDI.

Ride, handling and road noise concerns may be caused by improperly adjusted tire pressure.

The first step in the diagnosis of these concerns is to verify that the tires are inflated to the correct pressures. The recommended tire inflation pressure is listed on the vehicle's tire placard. The tire placard is located on the driver's side front or rear door edge, center pillar, or the rear compartment lid.

**Tip**

Generally a 5.6°C (10°F) temperature increase will result in (is equivalent to) a 6.9 kPa (1 psi) tire pressure increase.

The definition of a "cold" tire is one that has been sitting for at least 3 hours, or driven no more than 1.6 km (1 mi).

On extremely cold days, if the vehicle has been indoors, it may be necessary to compensate for the low external temperature by adding additional air to the tire during PDI.

During cold weather, the TPM indicator light (a yellow horseshoe with an exclamation point) may illuminate. If this indicator turns off after the tires warm up (reach operating temperature), the tire pressure should be reset to placard pressure at the cold temperature.

System will work with nitrogen in tires.

System will work with the GM Tire Sealant but may not with other commercially available sealants.

Do not use the tire pressure indicated on the tire itself as a guide.

Always inspect and adjust the pressure when the tires are cold. Vehicles that have different pressures for the front and the rear need to be adjusted after tire rotation.

Improper tire inflation may result in any or all of the following conditions:

Premature tire wear

Harsh ride

Excessive road noise

Poor handling

Reduced fuel economy

Low Tire Pressure Monitor (TPM) Light ON

**Low Tire Pressure Message on the Drivers Information Center (DIC)**

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**Technical Service Bulletin # 00-03-10-006C**

**Date: 080109**

**Tires - (RFV) Radial Force Variation Information**

Bulletin No.: 00-03-10-006C

Date: January 09, 2008

**INFORMATION**

**Subject:**

Information on Tire Radial Force Variation (RFV)

**Models:**

2008 and Prior GM Passenger Cars and Light Duty Trucks

2008 and Prior HUMMER H2, H3

2005-2008 Saab 9-7X

2000-2005 Saturn L Series

2003-2007 Saturn ION

**Supercede:**

This bulletin is being revised to add the 2008 model year and to adjust the allowable force variation chart. Please discard Corporate Bulletin Number 00-03-10-006B (Section 03 - Suspension).

Before measuring tires on equipment such as the Hunter GSP9700, the vehicle **MUST** be driven a minimum of 16 km (10 mi) to ensure removal of any flatspotting. Refer to Corporate Bulletin Number 03-03-10-007C or newer - Tire Characteristics of GM Original Equipment Tires (SI Document ID # 1414757).

Equipment such as the Hunter GSP9700 **MUST** be calibrated prior to measuring tire/wheel assemblies for each vehicle.

The purpose of this bulletin is to provide guidance to GM dealers when using tire force variation measurement equipment, such as the Hunter GSP9700. This type of equipment can be a valuable tool in diagnosing vehicle ride concerns. The most common ride concern involving tire radial force variation is highway speed shake on smooth roads.

Tire related smooth road highway speed shake can be caused by three things: imbalance, out of round and tire force variation. These three conditions are not necessarily related. All three conditions must be addressed.

Imbalance is normally addressed first, because it is the simpler of the three to correct. Off-vehicle, two plane dynamic wheel balancers are readily available and can accurately correct any imbalance. Balancer calibration and maintenance, proper attachment of the wheel to the balancer, and proper balance weights, are all factors required for a quality balance. However, a perfectly balanced tire/wheel assembly can still be "oval shaped" and cause a vibration.

If a vibration or shake still exists after balancing, any out of round conditions, of the wheel, and force variation conditions of the tire, must be addressed. Equipment such as the Hunter GSP9700 can address both (it is also a wheel balancer).

Tire radial force vibration (RFV) can be defined as the amount of stiffness variation the tire will produce in one revolution under a constant load. Radial force variation is what the vehicle feels because the load (weight) of the vehicle is always on the tires. Although free runout of tires (not under load) is not always a good indicator of a smooth ride, it is critical that total tire/wheel assembly runout be within specification.

Equipment such as the Hunter GSP9700 loads the tire, similar to on the vehicle, and measures radial force variation of the tire/wheel assembly. Note that the wheel is affecting the tire's RFV measurement at this point. To isolate the wheel, its runout must be measured. This can be easily done on the Hunter, without the need to set up dial indicators. If the wheel meets the runout specification, the tires RFV can then be addressed.

After measuring the tire/wheel assembly under load, and the wheel alone, the machine then calculates (predicts) the radial force variation of the tire. However, because this is a prediction that can include mounting inaccuracies, and the load wheel is much smaller in diameter than used in tire production, this type of service equipment should **NOT** be used to audit new tires. Rather, it should be used as a service diagnostic tool to minimize radial force variation of the tire/wheel assembly.



Equipment such as the Hunter GSP9700 does an excellent job of measuring wheel runout, and of finding the low point of the wheel (for runout) and the high point of the tire (for radial force variation). This allows the tire to be matched mounted to the wheel for lowest tire/wheel assembly force variation.

The machine will simplify this process into easy steps.

LT-tires on light trucks	35 lbs or less
P-Metric tires of passenger cars	18 lbs or less
P-Metric tires on light trucks	24 lbs or less

The assembly radial force variation numbers shown should be used as a guide.

If match mounting tires to in-spec wheels produces assembly values higher than these tire replacement may be necessary. Replacing tires at lower values will probably mean good tires are being condemned. Because tires can sometimes become temporarily flat-spotted which will affect force variation it is important that the vehicle be driven at least 16 km (10 mi) prior to measuring. Tire pressure must also be adjusted to the usage pressure on the vehicle's tire placard prior to measuring.

Most GM vehicles will tolerate radial force variation up to these levels. However some vehicles are more sensitive and may require lower levels. Also there are other tire parameters that equipment such as the Hunter GSP9700 cannot measure that may be a factor. In such cases TAC should be contacted for further instructions.

When mounting a GM wheel to a wheel balancer/force variation machine, always use the wheel's center pilot hole. This is the primary centering mechanism on all GM wheels; the bolt holes are secondary. Usually a back cone method to the machine should be used. For added accuracy and repeatability, a flange plate should be used to clamp the wheel onto the cone and machine. This system is offered by all balancer manufacturers in GM's dealer program.

Any type of service equipment that removes tread rubber by grinding, buffing, or truing is NOT recommended, and may void the tire warranty. However, tires may have been ground by the tire company as part of their tire manufacturing process. This is a legitimate procedure.

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Technical Service Bulletin # **04-03-10-001D**

Date: **080107**

## **Tires - Tire Puncture Repair Procedures**

Bulletin No.: 04-03-10-001D

Date: January 07, 2008

### **INFORMATION**

Subject:

Tire Puncture Repair Procedures For All Cars and Light Duty Trucks

Models:

2008 and Prior GM Passenger Cars and Light Duty Trucks (including Saturn)

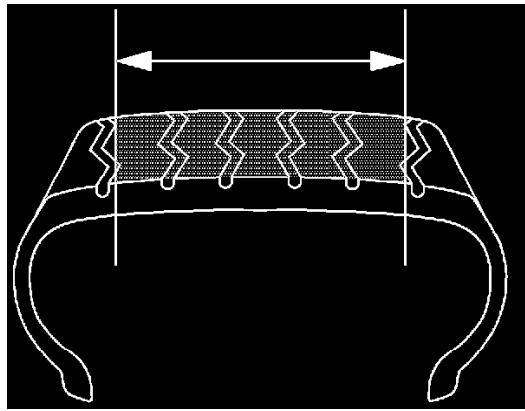
2008 and Prior HUMMER H2 H3

2008 and Prior Saab 9-7X

Supercede:

This bulletin is being revised to add the 2008 model year. Please discard Corporate Bulletin Number 04-03-10-001C (Section 03 - Suspension).

This bulletin covers puncture repair procedures for passenger car and light duty truck radial tires in the tread area only. The tire manufacturer must be contacted for its individual repair policy and whether or not the speed rating is retained after repair.



Repairable area on a radial tire.

NEVER repair tires worn to the tread indicators 1.59 mm (2/32") remaining depth).

NEVER repair tires with a tread puncture larger than 6.35 mm (1/4").

NEVER substitute an inner tube for a permissible or non-permissible repair.

NEVER perform an outside-in tire repair (plug only, on the wheel).

Every tire must be removed from the wheel for proper inspection and repair.

Regardless of the type of repair used, the repair must seal the innerliner and fill the injury.

Consult with repair material supplier/manufacturer for repair unit application procedures and repair tools/repair material recommendations.

Three basic steps for tire puncture repair:

Remove the tire from the wheel for inspection and repair.

Fill the injury (puncture) to keep moisture out.

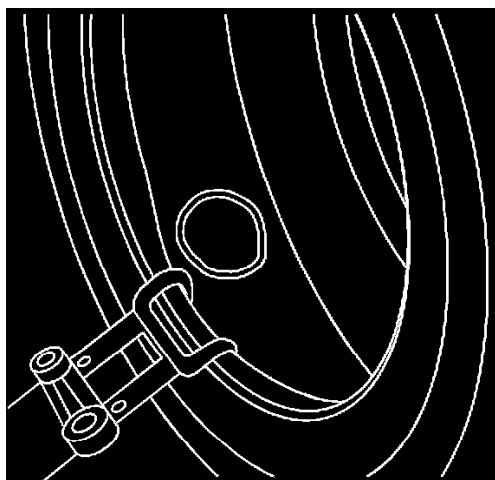
Seal the innerliner with a repair unit to prevent air loss.

#### External Inspection

Prior to demounting inspect the tire surface the valve and the wheel for the source of the leak by using a water and soap solution. Mark the injured area and totally deflate the tire by removing the valve core.

Demount the tire from the wheel and place the tire on a well-lighted spreader.

#### Internal Inspection



Spread the beads and mark the puncture with a tire crayon.

Inspect the inner tire for any signs of internal damage.

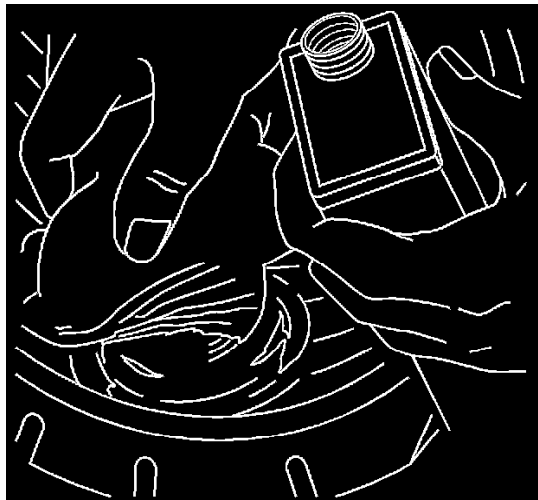
Remove the puncturing object noting the direction of the penetration.

Probe the injury with a blunt awl in order to determine the extent and direction of the injury.

Remove any loose foreign material from the injury.

Punctures exceeding 6.35 mm (1/4") should not be repaired.

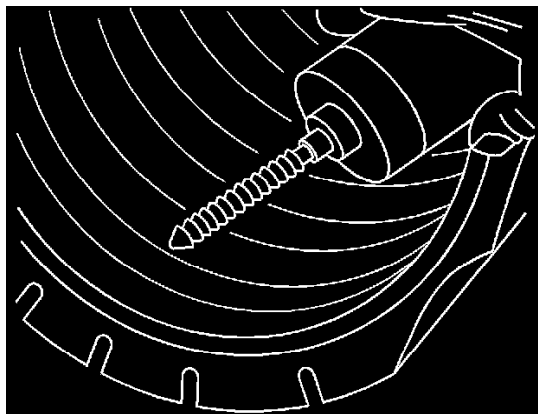
Cleaning



Clean the area around the puncture thoroughly with a proper liner cleaner clean cloth and a scraper. This step serves to remove dirt and mold lubricants to insure proper adhesion and non-contamination of the buffing tool.

Refer to information on the product or manufacturers Material Safety Data Sheet and follow guidelines for handling and disposal.

Clean the Injury Channel

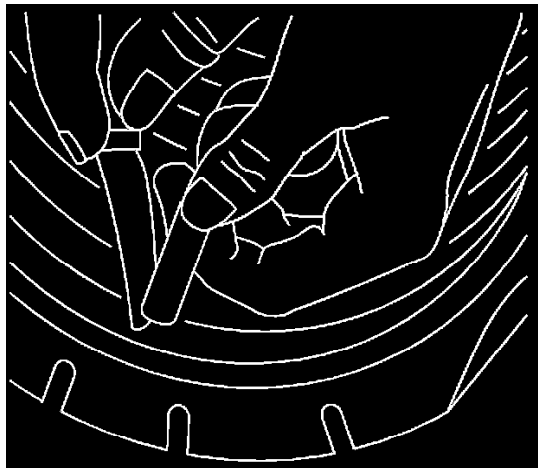


Use a proper hand reamer carbide cutter or drill bit to ream the puncture channel from the inside of the tire in order to clean the injury.

Remove steel wires protruding above the liner surface to prevent damage to the repair unit.

Consult your repair material supplier for recommended reaming tool(s).

Fill the Injury

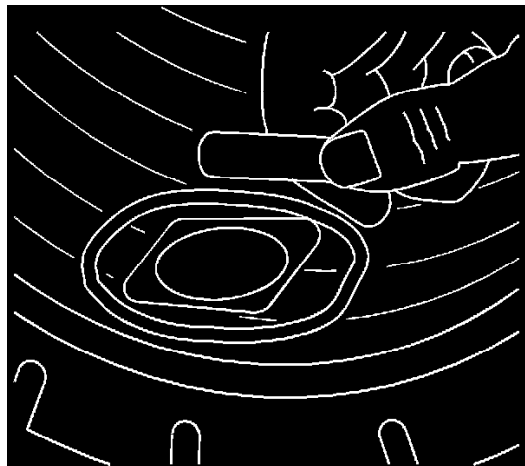


It is necessary to fill the injury channel to provide back up for the repair unit and to prevent moisture from entering the tire fabric and steel wires.

(For combination repair/plug units skip this step.) Cement the injured channel and fill the injury from the inside of the tire with the repair plug per repair material manufacturers recommendations. Without stretching the plug cut the plug off just above the inside tire surface.

Consult your repair material supplier for proper repair material selection.

#### Repair Unit Selection



Do not install the repair unit in this step.

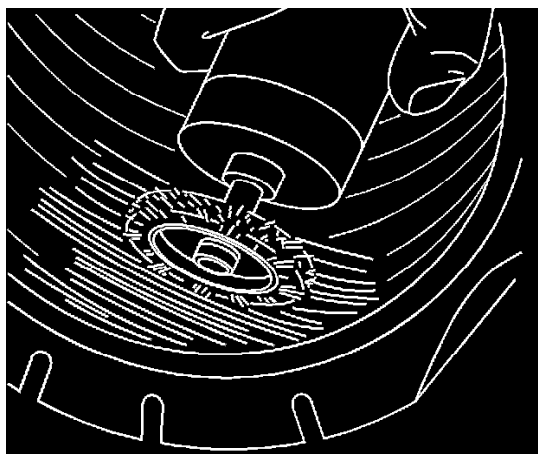
Center the repair unit over the injury as a reference and outline an area larger than the unit so that buffing will not remove the crayon marks.

Remove the repair unit.

DO NOT overlap previous or multiple repair units.

Consult your repair material supplier for proper repair unit selection.

#### Buffing



To prevent contamination and preserve the outline buff within the marked area thoroughly and evenly with a low speed buffing tool using a fine wire brush or gritted rasp.

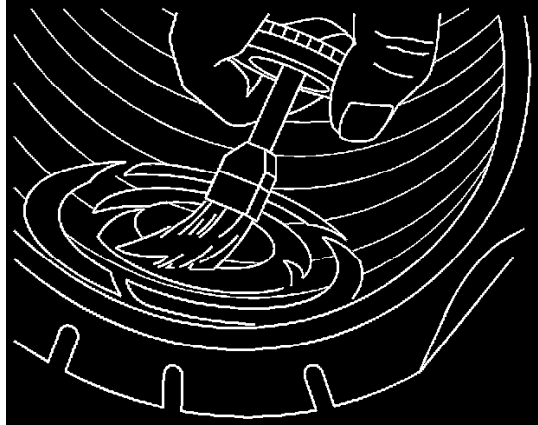
Buff to a smooth velvet surface (RMA # 1 or # 2 buffed texture).

Use caution not to gouge the innerliner or expose casing fabric.

Remove any buffing dust with a vacuum cleaner.

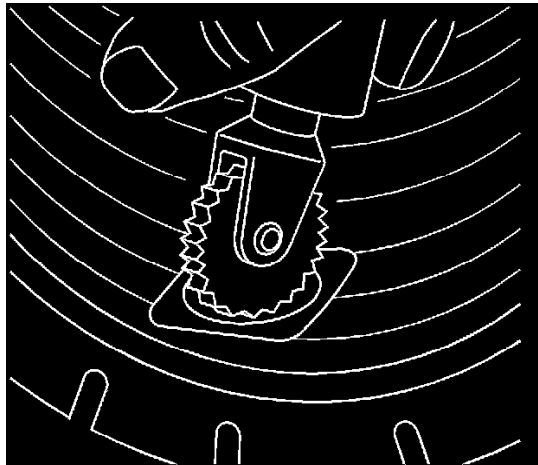
Consult your repair material supplier for a proper buffing tool.

Cementing



Apply chemical cement according to the repair material manufacturers procedures.

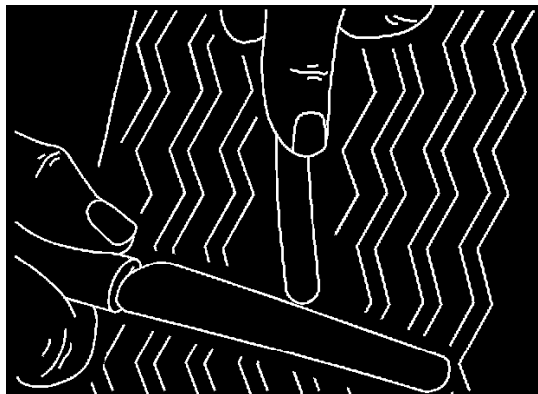
Repair Unit Application



The tire must be in the relaxed position when the repair unit is installed (Do not spread the beads excessively).

Two-Piece Plug and Repair Units

If applicable install the repair unit so that the alignment is correct.



Center the repair unit over the injury and stitch down thoroughly with the stitching tool working from the center out.

Being careful not to stretch the plug material cut the plug flush with the outer tread.

#### Combination Repair/Plug Units

Pull the plug through the injury until the repair just reaches the liner. Stitch down thoroughly.

Follow the repair material manufacturers recommendations for further installation instructions.

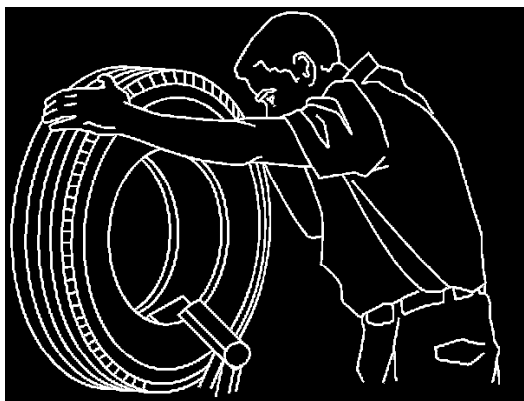
Consult your repair material supplier for the proper stitching tool.

#### Safety Cage



Some run flat tires such as the Goodyear Extended Mobility Tire (EMT) used on the Corvette may require more than 275 kPa (40 psi) to seat the bead. In such a case a tire safety cage must be used. Consult the tire manufacturer for its individual repair policy.

#### Final Inspection



After remounting and inflating the tire check both beads the repair and the valve with a water and soap solution in order to detect leaks.

If the tire continues to lose air the tire must be demounted and reinspected.

Balance the tire and wheel assembly. Refer to Tire and wheel Assembly Balancing - OFF Vehicle.

For additional tire puncture repair information, contact:

Rubber Manufacturers Association (RMA)  
1400 K Street N.W. Suite 900  
Washington DC 20005-2403  
Telephone: 202-682-4800  
E-mail: [info@rma.org](mailto:info@rma.org)  
Website: [www.rma.org](http://www.rma.org)

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Technical Service Bulletin # **05-03-10-020A**

Date: **080103**

## **Tires - Nitrogen Gas Usage**

Bulletin No.: 05-03-10-020A

Date: January 03, 2008

### **INFORMATION**

Subject:

Use of Nitrogen Gas in Tires

Models:

2008 and Prior GM Passenger Cars and Trucks (including Saturn)

2008 and Prior HUMMER H2 H3

2008 and Prior Saab 9-7X

Supercede:

This bulletin is being revised to add the 2007-2008 model years. Please discard Corporate Bulletin Number 05-03-10-020 (Section 03 - Suspension).

### **GM's Position on the Use of Nitrogen Gas in Tires**

General Motors does not oppose the use of purified nitrogen as an inflation gas for tires. We expect the theoretical benefits to be reduced in practical use due to the lack of an existing infrastructure to continuously facilitate inflating tires with nearly pure nitrogen. Even occasional inflation with compressed atmospheric air will negate many of the theoretical benefits. Given those theoretical benefits practical limitations and the robust design of GM original equipment TPC tires the realized benefits to our customer of inflating their tires with purified nitrogen are expected to be minimal.

### **The Promise of Nitrogen: Under Controlled Conditions**

Recently nitrogen gas (for use in inflating tires) has become available to the general consumer through some retailers. The use of nitrogen gas to inflate tires is a technology used in automobile racing. The following benefits under controlled conditions are attributed to nitrogen gas and its unique properties:

A reduction in the expected loss of Tire Pressure over time.

A reduction in the variance of Tire Pressures with temperature changes due to reduction of water vapor concentration.

A reduction of long term rubber degradation due to a decrease in oxygen concentrations.

These are obtainable performance improvements when relatively pure nitrogen gas is used to inflate tires under controlled conditions.

### **The Promise of Nitrogen: Real World Use**

Nitrogen inflation can provide some benefit by reducing gas migration (pressure loss) at the molecular level through the tire structure.

NHTSA (National Highway Traffic Safety Administration) has stated that the inflation pressure loss of tires can be up to 5% a month.

Nitrogen molecules are larger than oxygen molecules and therefore are less prone to "seeping" through the tire casing. The actual obtainable benefits of nitrogen vary, based on the physical construction and the materials used in the manufacturing of the tire being inflated.

Another potential benefit of nitrogen is the reduced oxidation of tire components. Research has demonstrated that oxygen consumed in the oxidation process of the tire primarily comes from the inflation media. Therefore, it is reasonable to assume that oxidation of tire components can be reduced if the tire is inflated with pure nitrogen. However, only very small amounts of oxygen are required to begin the normal oxidation process. Even slight contamination of the tire inflation gas with compressed atmospheric air during normal inflation pressure maintenance, may negate the benefits of using nitrogen.

### **GM Tire Quality, Technology and Focus of Importance**

Since 1972, General Motors has designed tires under the TPC (Tire Performance Criteria) specification system, which includes specific requirements that ensure robust tire performance under normal usage. General Motors works with tire suppliers to design and manufacture original equipment tires for GM vehicles. The GM TPC addresses required performance with respect to both inflation pressure retention, and endurance properties for original equipment tires. The inflation pressure retention requirements address availability of oxygen and oxidation concerns, while endurance requirements ensure the mechanical structure of the tire has sufficient strength. This combination has provided our customers with tires that maintain their structural integrity throughout their useful treadlife under normal operating conditions.

Regardless of the inflation media for tires (atmospheric air or nitrogen), inflation pressure maintenance of tires is critical for overall tire, and ultimately, vehicle performance. Maintaining the correct inflation pressure allows the tire to perform as intended by the vehicle manufacturer in many areas including comfort, fuel economy, stopping distance, cornering, traction, treadwear and noise. Since the load carrying capability of a tire is related to inflation pressure proper inflation pressure maintenance is necessary for the tire to support the load imposed by the vehicle without excessive structural degradation.

Regardless of the inflation media for tires (atmospheric air or nitrogen), inflation pressure maintenance of tires is critical for overall tire, and ultimately, vehicle performance.

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Disclaimer Technical Service Bulletin # **99-09-40-005E**

Date: **080109**

## **Seat Belts - Seat Belt Extender Availability**

Bulletin No.: 99-09-40-005E

Date: January 09, 2008

### **INFORMATION**

Subject:  
Seat Belt Extender Availability

Models:  
2008 and Prior GM Passenger Cars and Trucks (Including Saturn)  
2008 and Prior HUMMER H2, H3  
2005-2008 Saab 9-7X

Supercede:

This bulletin is being revised to add the 2008 model year. Please discard Corporate Bulletin Number 99-09-40-0050 (Section 09 - Restraints).

**DO NOT** use belt extenders when securing a child restraint.

The seat and shoulder belt restraint systems used in all General Motors vehicles have sufficient belt length to accommodate most drivers and passengers. Consequently, requests for belt extensions (extenders) should be minimal.

Seat belt extenders are available **ONLY IN BLACK** for most GM passenger cars and trucks produced in recent years. They are available in two different lengths, 23cm (9 in) and 38cm (15 in). They are designed to be coupled with the existing belts in each vehicle. When in use, the extender makes the belt arrangement a "custom fit" and use by anyone else or in another vehicle will lessen or nullify the protection offered by the vehicle's restraint system. For this reason, it is extremely important that the correct length extender be used for the vehicle and occupant intended.

Do not use an extender just to make it easier to buckle the safety belt. Use an extender only when you cannot buckle the safety belt without using an extender.

### **Parts Information**

For part numbers, usage and availability of extenders, see Extension Kit in Group 14.875 (cars) or Group 16.714 (trucks) of the appropriate parts catalog. Saturn retailers should refer to the appropriate model year Parts & Illustration catalog for the vehicle. U.S. Saab dealers should contact the Parts Help line. Canadian Saab dealers should fax requests to Partech Canada.

### **Warranty Information**

Seat belt extenders are a **NO CHARGE** item to all GM customers who request them for their specific vehicles.



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Disclaimer Technical Service Bulletin # 03-00-89-008D

Date: 071102

## Body - Metal Body Panel Corrosion Protection

Bulletin No.: 03-00-89-008D

Date: November 02, 2007

### INFORMATION

#### Subject:

Corrosion Protection For Metal Panels With Dealer Installed Accessories Fastened by Drilled Holes

#### Models:

2008 and Prior GM Passenger Cars and Trucks (Including Saturn)

2003-2008 HUMMER H2

2006-2008 HUMMER H3

#### Supercede:

This bulletin is being revised to update the information. Please discard Corporate Bulletin Number 03-00-89-008C (Section 00 - General Information).

### Corrosion Concerns

Frequently, dealer installed accessories, whether aftermarket or GM-approved, may require drilling holes into the body panels or supports to complete installation. Whenever you drill into a metal surface, the corrosion resistance of that panel is compromised. Testing was conducted to determine the best method used to protect the fastener-to-panel mounting holes from future corrosion. Several commercially available sealers and coatings were evaluated.

### Recommendations



In all cases, GM Vehicle Care Super Lube(R) with PTFE performed the best at preventing corrosion in fastener to panel interface holes and is now the official GM recommended product as shown in the above illustration. It is recommended to apply the GM Vehicle Care Super Lube(R) with PTFE, to any hole and fastener before installing the fastener into the drilled attaching hole or inside the metal panel.

GM Vehicle Care Super Lube(R) with PTFE is the only product recommended and required by GM for the corrosion protection of metal panels where fasteners will be added to metal panels.

Part Number	Description
12371287 (U.S.) 10953437 (Canada)	GM Vehicle Care Super Lube® with PTFE

## Parts Information

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## Disclaimer

Technical Service Bulletin # **04-07-30-037D**

Date: **071121**

**A/T - DEXRON(R)-VI Fluid Information**

Bulletin No.: 04-07-30-037D

Date: November 21, 2007

## INFORMATION

## Subject:

Release of DEXRON(R)-VI Automatic Transmission Fluid (ATF)

**2008 and Prior GM Passenger Cars and Light Duty Trucks**

2003–2008 HUMMER H2

2006–2008 HUMMER H3

2005–2007 Saturn Relay

2005 and Prior Saturn L-Series

2005–2007 Saturn ION

2005–2008 Saturn VUE with 4T45-E

2005–2008 Saab 9-7X

Except 2008 and Prior Chevrolet Aveo, Equinox

Except 2006 and Prior Chevrolet Epica

Except 2007 and Prior Chevrolet Optra

Except 2008 and Prior Pontiac Torrent, Vibe, Wave

Except 2003–2005 Saturn ION with CVT or AF23 Only

Except 1991–2002 Saturn S-Series

Except 2008 and Prior Saturn VUE with CVT, AF33 or 5AT (MJ7/MJ8) Transmission Only

Except 2008 Saturn Astra

## Models

**Attention:**

DEXRON(R)-VI Automatic Transmission Fluid (ATF) is the only approved fluid for warranty repairs for General Motors transmissions/transaxles requiring DEXRON(R)-III and/or prior DEXRON(R) transmission fluids.

## Supercede:

This bulletin is being revised to update model/model year information. Please discard Corporate Bulletin Number 04-07-30-037C (Section 07 - Transmission/Transaxle).

## MANUAL TRANSMISSIONS/TRANSFER CASES and POWER STEERING

The content of this bulletin does not apply to manual transmissions or transfer cases. Any vehicle that previously required DEXRON(R)-III for a manual transmission or transfer case should now use P/N 88861800. This fluid is labeled Manual Transmission and Transfer Case Fluid. Power Steering Systems should now use P/N 9985010 labeled Power Steering Fluid.

Consult the Owner's Manual or Service Information (SI) for fluid recommendations.

Some of our customers and/or General Motors dealerships/Saturn Retailers may have some concerns with DEXRON(R)-VI and DEXRON(R)-III Automatic Transmission Fluid (ATF) and transmission warranty claims. DEXRON(R)-VI is the only approved fluid for warranty repairs for General Motors transmissions/transaxles requiring DEXRON(R)-III and/or prior DEXRON(R) transmission fluids. Please remember that the clean oil reservoirs of the J 45096 - Flushing and Flow Tester machine should be purged of DEXRON(R)-III and filled with DEXRON(R)-VI for testing, flushing or filling General Motors transmissions/transaxles.

DEXRON(R)-VI can be used in any proportion in past model vehicles equipped with an automatic transmission/transaxle in place of DEXRON(R)-III (i.e. topping off the fluid in the event of a repair or fluid change). DEXRON(R)-VI is also compatible with any former version of DEXRON(R) for use in automatic transmissions/transaxles.

## DEXRON(R)-VI ATF

General Motors Powertrain has upgraded to DEXRON(R)-VI ATF with the start of 2006 vehicle production.

Current and prior automatic transmission models that had used DEXRON(R)-III must now only use DEXRON(R)-VI.

All 2006 and future model transmissions that use DEXRON(R)-VI are to be serviced ONLY with DEXRON(R)-VI fluid.

DEXRON®-VI	
Fluid Service Change Interval	160,000 km (100,000 mi) For Cars and Light Duty Trucks* 80,000 km (50,000 mi) (Severe Use) For Cars and Light Duty Trucks*
Clutch Friction Stability	Improved 100%
Clutch Durability Due To Fluid	Improved 120%
Oil Film Thickness	Increased 20%
Fluid Oxidation	Improved 100%
Foam/Aeration	Improved 150%
Shear Stability	Improved 200%
* These ATF change intervals remain the same as DEXRON®-III for the time being.	

DEXRON(R)-VI is an improvement over DEXRON(R)-III in the areas shown.

## 2006-2008 Transmission Fill and Cooler Flushing

Some new applications of the 6L80 six speed transmission will require the use of the J 45096 - Flushing and Flow Tester to accomplish transmission fluid fill. It is highly recommended that the clean oil reservoir of the machine be purged of DEXRON(R)-III and filled with DEXRON(R)-VI.

Part Number	Description
88861003 (US)	DEXRON®-VI Auto Trans Fluid (1 qt bottle)
88861045 (US)	DEXRON®-VI Auto Trans Fluid (1 gal bottle)
88861046 (US)	DEXRON®-VI Auto Trans Fluid (55 gal drum)
88861004 (Canada)	DEXRON®-VI Auto Trans Fluid (1L bottle)
88861043 (Canada)	DEXRON®-VI Auto Trans Fluid (4L bottle)
88861044 (Canada)	DEXRON®-VI Auto Trans Fluid (205L drum)

## Parts Information

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## Disclaimer

Technical Service Bulletin # **05-03-10-003C**

Date: **080115**

## Wheels/Tires - Low Tire Pressure

Bulletin No.: 05-03-10-003C

Date: January 15, 2008

### TECHNICAL

Subject:  
Low Tire Pressure Leaking Cast Aluminum wheels (Repair with Adhesive Sealant)

Models:  
2008 and Prior GM Passenger Cars and Light Duty Trucks (including Saturn)  
2008 and Prior HUMMER H2, H3  
2008 and Prior Saab 9-7X

with Cast Aluminum wheels

Supercede:

This bulletin is being revised to add the 2008 model year and update the Warranty Information section. Please discard Corporate Bulletin Number 05-03-10-003B (Section 03 - Suspension).

### Condition

Some customers may comment on a low tire pressure condition.

Diagnosis of the low tire pressure condition indicates an air leak through the cast aluminum wheel.

### Cause

Porosity in the cast aluminum wheel may be the cause.

Correction

Remove the tire and wheel assembly from the vehicle. Refer to the appropriate service procedure in SI.

Locate the leaking area by inflating the tire to 276 kPa (40 psi) and dipping the tire/wheel assembly in a water bath or use a spray bottle with soap and water to locate the specific leak location.

If the porosity leak is located in the bead area of the aluminum rim (where the tire meets the rim), the wheel should be replaced.

If two or more leaks are located on one wheel, the wheel should be replaced.

If air bubbles are observed mark the location.

If the leak location is on the tire/rubber area refer to Corporate Bulletin Number 04-03-10-001D or newer - Tire Puncture Repair Procedures for All Cars and Light Duty Trucks.

If the leak is located on the aluminum wheel area continue with the next step.

Inscribe a mark on the tire at the valve stem in order to indicate the orientation of the tire to the wheel.

Dismount the tire from the wheel. Refer to Tire Mounting and Dismounting.

Remove the tire pressure sensor. Refer to Corporate Bulletin Number 04-03-16-002 regarding tire pressure sensor grommet replacement and the appropriate Tire Pressure Sensor removal procedure in SI.

Scuff the INSIDE rim surface at the leak area with # 80 grit paper and clean the area with general purpose cleaner such as 3M(R) General Purpose Adhesive Cleaner P/N 08984 or equivalent.

Apply a 3 mm (0.12 in) thick layer of Silicone - Adhesive/Sealant P/N 12378478 (in Canada use 88900041) or equivalent to the leak area. Allow for the adhesive/sealant to dry.

Caution must be used when mounting the tire so as not to damage the sealer. Damaging the repair area may result in an air leak.

Align the inscribed mark on the tire with the valve stem on the wheel.

Reinstall the Tire Pressure Sensor. Refer to Corporate Bulletin Number 04-03-16-002 regarding tire pressure sensor grommet replacement and the appropriate Tire Pressure Sensor installation procedure in SI.

Mount the tire on the wheel. Refer to Tire Mounting and Dismounting.

Pressurize the tire to 276 kPa (40 psi) and inspect for leaks.

Adjust tire pressure to meet the placard specification.

Balance the tire/wheel assembly. Refer to Tire and wheel Assembly Balancing - Off-Vehicle.

Install the tire and wheel assembly onto the vehicle. Refer to the appropriate service procedure in SI.

Part Number	Description
12378478 (in Canada, use 88900041)	Silicone – Adhesive/Sealant
3M® 08984	3M® General Purpose Adhesive Cleaner

Parts Information

Warranty Information (excluding Saab U.S. Models)

The Silicone - Adhesive/Sealant comes in a case quantity of six. ONLY charge warranty one tube of adhesive/sealant per wheel repair.

One leak repair per wheel.

Labor Operation	Description	Labor Time
E0420	Wheel - One – R&R Or Replace	Use Published Labor operation Time
Add:	To Repair Porosity On Aluminum Wheel	Use Published Labor operation Time
Add:	To Repair Each Additional Wheel	Use Published Labor operation Time

For vehicles repaired under warranty use, the table.

Warranty Information (Saab U.S. Models)

Labor Operation	Description	Failed Object	Fault/Reason	Location Code	Warranty Type	Repair/Action Code	Labor Time
7711001	Wheel - One – R&R Or Replace	77110	55	3-left 4-right 5-all	01	05	Use Published Labor Operation Time
add 7711003	To Repair Porosity On Aluminum Wheel	—	—	—	—	—	0.1 hr
add 7711002	To Repair Each Additional Wheel	—	—	—	—	—	Use Published Labor Operation Time

For vehicles repaired under warranty, use the table.

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Disclaimer Technical Service Bulletin # 04-06-01-029B

Date: 080205

## Engine - Crankcase Flushing Information

Bulletin No.: 04-06-01-029B

Date: February 05, 2008

### INFORMATION

Subject:

Unnecessary Engine Crankcase and Subsystems Flushing Services Additive Recommendations and Proper Utilization of GM Simplified Maintenance Schedule to Enhance Customer Service Experience

**Models:**

2008 and Prior GM Passenger Cars and Trucks (including Saturn)

2008 and Prior HUMMER H2, H3

2005-2008 Saab 9-7X

**Supercede:**

This bulletin is being revised to add model years. Please discard Corporate Bulletin Number 04-06-01-029A (Section 06 - Engine/Propulsion System).

**An Overview of Proper Vehicle Service**

General Motors is aware that some companies are marketing tools and equipment to support a myriad of engine crankcase and subsystem flushing procedures. These dedicated machines are in addition to many engine oil cooling system fuel system A/C and steering system additives available to the consumer. GM Vehicles under normal usage do not require any additional procedures or additives beyond what is advised under the former Vehicle Maintenance Schedules or the current Simplified Maintenance Schedules. Do not confuse machines available from Kent-Moore/SPX that are designed to aid and accelerate the process of fluid changing with these flushing machines.

**Engine Crankcase Flushing**

General Motors Corporation does not endorse or recommend engine crankcase flushing for any of its gasoline engines. Analysis of some of the aftermarket materials used for crankcase flushing indicate incompatibility with GM engine components and the potential for damage to some engine seals and bearings. Damage to engine components resulting from crankcase flushing IS NOT COVERED under the terms of the New Vehicle Warranty.

**GM Authorized Service Information: Detailed, Descriptive, and Complete**

If a specific model vehicle or powertrain need is identified GM will issue an Authorized Service Document containing a procedure and if required provide make available or require the specific use of a machine tool or chemical to accomplish proper vehicle servicing. An example of this is fuel injector cleaning. Due to variation in fuel quality in different areas of the country GM has recognized the need for fuel injector cleaning methods on some engines though under normal circumstances this service is not part of the maintenance requirements.

GM has published several gasoline fuel injector cleaning bulletins that fully outline the methods to be used in conjunction with GM Part Numbered solutions to accomplish proper and safe cleaning of the fuel injectors with preventative maintenance suggestions to maintain optimum performance. You may refer to Corporate Bulletin Numbers 03-06-04-030 and 04-06-04-051 for additional information on this subject.

**Subsystem Flushing**

Flushing of A/C lines radiators transmission coolers and power steering systems are recognized practices to be performed after catastrophic failures or extreme corrosion when encountered in radiators. For acceptable A/C flushing concerns refer to Corporate Bulletin Number 01-01-38-006.

Flushing will remove metal fragments and safeguard new components. This practice is NOT required or recommended for normal service operations.

**Service Is Important to You and Your Customer**

General Motors takes great pride in offering our dealerships and customers high quality vehicles that require extremely low maintenance over the life of the vehicle. This low cost of ownership builds repeat sales and offers our customers measurable economy of operation against competing vehicles. Providing responsible services at the proper intervals will greatly aid your dealership with repeat business and additional services when required. Most customers appreciate and gain trust in the dealership that informs and offers them just what they need for continued trouble-free operation. Examine your service department's practices and verify that all Service Consultants and Technicians focus on customer satisfaction vehicle inspections and other products at time of service. Use this opportunity to upgrade the services you provide to your customers. Here are a few suggestions:

Take the time required to align your dealership service practices with the new GM Simplified Maintenance Schedule launched with the 2004 models (in Canada, the GM Merchandising Maintenance Process launched with the 2003 models). Use the new vehicle Owners Manual Maintenance I and II schedules (in Canada, use the "Warranty, Maintenance and Owner Assistance information" booklet and the vehicle's "Owner Manual" Maintenance Schedule) to create a "mirror image" in your advertising and dealer service pricing that is easily understandable to your customer. Taking advantage of this new service strategy may greatly increase your dealership service sales and customer retention while decreasing the frequency of visits and inconvenience to your customer.

Review your program to ensure that all vehicles coming in are evaluated for safety and wear items. Examine all vehicles for tire condition, signs of misalignment, brake wear, exterior lamp functionality, exhaust condition, A/C cooling performance, SRS or Air Bag MIL, along with Service Engine Soon or Check Engine indicators. If the Service Engine Soon or Check Engine MIL is illuminated, it is vital that you inform the customer of the concerns with ignoring the indicator and what the required repair would cost. In addition to the possibility of increased emissions and driveability concerns, many customers are unaware that lower gas mileage may also result, with additional cost to the customer.

Be complete in your service recommendations. Some sales opportunities are not being fully pursued nationally. Focus on overlooked but required maintenance that has real benefits to the customer. Many vehicles are equipped with cabin air filters. If these filters are used beyond replacement time, they may impede airflow decreasing A/C and heating performance. Make sure these filters are part of your recommended service. Note that

some of our vehicles may not have been factory equipped but will accept the filters as an accessory.

Express the value in maintaining the finish quality of the customers vehicle at the Maintenance I and II visits (in Canada, Semi-Annual and Annual Service inspections). More fully utilize the vehicle prep personnel you already have in place. In todays world, many people simply ignore the finish of their vehicle, at best infrequently using an automatic car wash for exterior cleaning. Offer vehicle detailing services in stages from just a wash and wax to a complete interior cleaning. when paired with the Simplified Maintenance (in Canada, the Semi-Annual and Annual Service) visit, this will increase customer satisfaction. On return, the customer gets a visibly improved vehicle that will be a source of pride of ownership along with a vehicle that is now fully maintained. Also, reinforce the improved resale value of a completely maintained vehicle.

For customers who clean and maintain the appearance of their vehicles themselves encourage the use of GM Vehicle Care products. Many customers may have never used GM Car Wash/Wax Concentrate, GM Cleaner Wax or a longtime product, GM Glass Cleaner, which is a favorite of many customers who try it just once. If your dealership give samples of these products with new car purchases, customers may already be sold on the product but not willing to make a special trip to the dealership. Capitalize on sales at this time. Stock shelves right at the Service counter with these products and consider instituting compensation programs for Service Consultants who suggest these products. Many consumers faced with an intimidating wall full of car care products sold at local auto parts stores may find it comforting to purchase a fully tested product sold by GM that they know will not harm the finish of their vehicle.

**In USA:**

#12378401 GM Vehicle Care Wash/Wax Concentrate 16 fl. oz. (0.473L)

#89021822 GM Vehicle Care Glass Cleaner Aerosol 18 oz. (510 g)

#12377966 GM Vehicle Care Cleaner Wax 16 fl. oz. (0.473L)

#1052929 GM Vehicle Care Chrome and Wire Wheel Cleaner 16 fl. oz. (0.473L)

#12378554 GM Vehicle Care Odor Eliminator 16 fl. oz. (0.473L)

**In Canada:**

#10953203 GM Vehicle Care Wash &amp; Wax Concentrate 473 mL

#992727 GM Glass Cleaner Aerosol 500 g

#10952905 GM Vehicle Care Liquid Cleaner/Wax 473 mL

#10953013 GM Vehicle Care Chrome Cleaner and Polish 454 mL

#10953202 GM Vehicle Care Wheel Brite 473 mL

#88901678 GM Vehicle Care Odor Eliminator 473 mL

We suggest the competitively priced basic vehicle care products shown to emphasize.

Display signboards with the installed price for popular GM Accessories such as running boards and Tonneau Covers. Customers may not think to ask about these desirable items at the time of a service visit.

Finally, take advantage of the GM Goodwrench initiatives (Tire Program, Goodwrench Credit Card, etc. / Dealer Marketing Association (DMA) Promotions in Canada) to provide the customer with more reasons to identify your dealership as the best place to go for parts and service. Remember to utilize ALL of the service aspects you possess in your dealership to satisfy and provide value to your customer. Many businesses exist profitably as an oil change location a vehicle repair facility or a detailing shop alone. You already have the capabilities of all three and provide these services with the inherent trust of your customer under the GM Mark of Excellence.

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Disclaimer Technical Service Bulletin # 00-06-01-012C

Date: 080414

## Engine - Use of 'Surface Conditioning Disks' INFORMATION

Bulletin No.: 00-06-01-012C

Date: April 14, 2008

Subject:

Use of "Surface Conditioning Disks" When Cleaning Engine Gasket Sealing Surfaces and/or Reused Engine Parts

Models:

2009 and Prior GM Passenger Cars and Trucks (including Saturn)

2009 and Prior HUMMER H2 Models, H3



2009 and Prior Saab 9-7X

Supercede:

This bulletin is being revised to add the 2008 and 2009 model years. Please discard Corporate Bulletin Number 00-06-01-012B (Section 06 - Engine/Propulsion System).

The Use of "Surface Conditioning Disks"

**Notice:**

Do not use abrasive pad/bristle devices to clean the gasket surfaces of engine components. Abrasive pads should not be used for the following reasons:

- ^ Abrasive pads will produce fine grit that the oil filter will not be able to remove from the oil. **THIS GRIT IS ABRASIVE AND HAS BEEN KNOWN TO CAUSE INTERNAL ENGINE DAMAGE.** Abrasive pads can easily remove enough material to round cylinder head surfaces. This has been known to affect the gaskets ability to seal especially in the narrow seal areas between the combustion chambers and coolant jackets.
- ^ Abrasive pads can also remove enough metal to affect cylinder head block oil pan rail and intake manifold runner flatness which can cause coolant and oil leaks. It takes about 15 seconds to remove 0.203 mm (0.008 in) of metal with an abrasive pad.

When cleaning engine gasket sealing surfaces and/or cleaning parts from an engine that are to be reused surface conditioning disks (typically constructed of woven fiber or molded bristles) that contain abrasives such as a high amount of Aluminum Oxide should NOT be used.

The use of such surface conditioning disks dislodges Aluminum Oxide (from the disk) and metal particles which can lead to premature engine bearing failure.

The presence of Aluminum Oxide in engine oil has been shown to cause premature engine bearing failure. In some cases this failure occurs in as little as 2,200 km (1,000 mi) or less after the repair has been made.

Surface conditioning disks may grind the component material and imbed it into the disk. This can result when more aggressive grinding of the gasket surface takes place.

**Recommended Cleaning Procedure**

General Motors recommends the use of a razor blade or plastic gasket scraper to clean the gasket surface on engine components that are to be reused. When cleaning gasket surfaces please note the following:

- ^ When using a razor blade type gasket scraper use a new razor blade for each cylinder head and corresponding block surface. Hold the blade as parallel to the gasket surface as possible. This will ensure that the razor blade does not gouge or scratch the gasket surfaces.
- ^ Do not gouge or scrape the combustion chamber surfaces.
- ^ Do not gouge or scratch any engine-sealing surface during the cleaning process.

**Important:**

The appearance of the gasket surface is not critical - the feel is. There will be indentations from the gasket left in the cylinder head after all the gasket material is removed. The new gasket will fill these small indentations when it is installed.

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DisclaimerTechnical Service Bulletin # **04-03-10-012B**

Date: **080201**

**Wheels - Chrome Wheel Brake Dust Accumulation/Pitting**

Bulletin No.: 04-03-10-012B

Date: February 01, 2008

**INFORMATION**

Subject:  
Pitting and Brake Dust on Chrome wheels

Models:

2008 and Prior GM Passenger Cars and Trucks (including Saturn)

2008 and Prior HUMMER H2, H3

2005-2008 Saab 9-7X

Supercede:

This bulletin is being revised to add model years. Please discard Corporate Bulletin Number 04-03-10-012A (Section 03 - Suspension).

## Analysis of Returned Wheels

Chrome wheels returned under the New Vehicle Limited Warranty for pitting concerns have recently been evaluated. This condition is usually most severe in the vent (or window) area of the front wheels. This "pitting" may actually be brake dust that has been allowed to accumulate on the wheel. The longer this accumulation builds up, the more difficult it is to remove.

## Cleaning the Wheels

In all cases, the returned wheels could be cleaned to their original condition using GM Vehicle Care Cleaner Wax, P/N 12377966 (in Canada, P/N 10952905). When using this product, you should confine your treatment to the areas of the wheel that show evidence of the brake dust build-up. This product is only for use on chromed steel or chromed aluminum wheels.

Part Number	Description
12377966 (in Canada, 10952905)	GM Vehicle Care Cleaner Wax 16 fl oz (.473 L)

## Parts Information

## Warranty Information

Wheel replacement for this condition is NOT applicable under the terms of the New Vehicle Limited Warranty.

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DisclaimerTechnical Service Bulletin # **02-07-30-052E**

Date: **080222**

# Automatic Transmission - Fluid Cooler Flushing INFORMATION

Bulletin No.: 02-07-30-052E

Date: February 22, 2008

Subject:  
Automatic Transmission Oil Cooler Flush and Flow Test Essential Tool J 45096 TransFlow(R)

Models:  
2008 and Prior Passenger Cars and Light Duty Trucks (Excluding Saturn)  
2003-2008 HUMMER H2  
2006-2008 HUMMER H3

with Automatic Transmission/Transaxle including Allison(R) Transmissions

Supercede:

This bulletin is being revised to update the models to 2008. Please discard Corporate Bulletin Numbers 03-07-30-002B and 02-07-30-052D (Section 07 - Transmission/Transaxle).

## Important:

All labor operations that include removal of the transmission from the vehicle include labor time to flush the transmission oil cooler system.

The J 45096 transmission oil cooling system flush and flow test tool replaces current tool J 35944-A. J 45096 is a self-contained unit utilizing a 12-volt flow meter shop air supply and DEXRON(R) VI automatic transmission fluid (ATF). In the flush mode transmission fluid is cycled through

the transmission oil cooling system. High-pressure air is automatically injected into the fluid stream adding agitation to the ATF oil to enhance the removal of contaminated ATF oil and debris. In the flow mode an electronic flow meter is used to measure the flow capability of the ATF oil cooling system. A digital display indicates the ATF oil flow rate in gallons per minute (GPM) along with the amount of ATF oil in the supply vessel supply vessel ATF oil temperature machine cycles and the operating mode. The supply oil vessel has 30 L (32 qt) capacity and the waste oil vessel has 32 L (34 qt) capacity. The waste oil vessel is constructed of a translucent composite material that allows the user to easily identify the oil level. The waste oil vessel can accommodate vacuum evacuation and gravity draining. In the code mode a random encrypted code is generated that can be used for verification of flow test results.

Current essential cooler line adapters are used to connect the J 45096 to the automatic transmission oil cooler lines that allows J 45096 to adapt to General Motors passenger cars and light duty trucks current and past models (except the Pontiac Vibe, Wave and Chevrolet Aveo).

The tool may be adapted for use on the Pontiac Vibe, Wave and Chevrolet Aveo by dealership personnel with a barbed hose connector and rubber hose obtained locally. The Vibe's/Wave's/Aveo's transmission has a transmission oil requirement which is slightly different than DEXRON(R) VI ATF. However flushing the cooler with DEXRON(R) VI automatic transmission fluid is an acceptable service procedure. Very little fluid remains in the cooler after the flush procedure and the residual DEXRON(R) VI ATF in the cooler is compatible with the Vibe's/Wave's/Aveo's transmission fluid.

Transmission	Oil Cooler Feed (Exiting Transmission)	Oil Cooler Return (Entering Transmission)
200-4R	top connector	bottom connector
3L30 (180)	front connector	rear connector
3L80 (400)	bottom connector	top connector
4L30-E	front connector	rear connector
4L60 (700-R4)	bottom connector	top connector
4L60-E	bottom connector (may require J 35944-200)	top connector (may require J 35944-200)
4L80-E	front connector (may require J 35944-200)	rear connector (may require J 35944-200)
3T40	bottom connector	top connector
4T40-E	top connector (requires J 35944-440)	bottom connector (requires J 35944-440)
4T60 (440-T4/F7)	vertical (top) connector	horizontal (bottom) connector
4T60-E	vertical (top) connector	horizontal (bottom) connector
4T65-E	vertical (top) connector	horizontal (bottom) connector
4T80-E	front connector (case cover)	rear connector (case)
Allison (M74)	top (rear) connector	lower (forward) connector
Aisin (AF33-5)	top connector	bottom connector (requires J 35944-440)
Aisin (AF17)	top connector	bottom connector
MU4/MU5	top connector	bottom connector
5L50E	bottom connector	top connector
6T70/75	top/front connector	top/rear connector
6T40/45	top/front connector	rear connector
6L50/80/90	bottom connector	top connector

#### Notice:

Insufficient oil flow through the ATF oil cooling system will cause premature transmission failure. The required minimum ATF oil flow rate reading is directly related to the supply oil temperature. Refer to the flow rate reference chart for the oil flow rate specification based on the temperature of the ATF in the supply vessel.

Helpful Hints for Maintaining the Temperature at or above 18°C (65°F)

#### Important:

- ^ The temperature of the supply vessel oil must be 18°C (65°F) or greater for J 45096 to operate. It is recommended to store the J 45096 in an area of the dealership where the room temperature remains at or above 18°C (65°F) when not in use.
- ^ Do not attempt to increase the fluid temperature in the Transflow(R) machine with an engine oil dipstick, or any other immersion type heater. The Transflow(R) machine has a check valve in the supply reservoir. Inserting a heater will damage the check valve and the subsequent repair expense would be the dealer's responsibility.
- ^ A heater blanket is available for the Tranflow(R) transmission cooling system flushing tool P/N J 45096. This heater fastens around the Transflow(R) internal supply vessel and runs on 110 volts AC. The heater will warm the ATF in the supply vessel to at least 18°C (65°F) and has a thermostat to hold a constant temperature.

Store the Transmission Cooling System Service Tool J 45096 Transflow(R) machine in a room where the temperature is maintained at or above 18°C (65°F).

Keep the ATF level in the reservoir low when the Transmission Cooling System Service Tool J 45096 Transflow(R) is not in use. Store several gallons of oil in an area where the temperature is maintained at or above 18°C (65°F). Fill the reservoir of the J 45096 as needed before using the machine on each repair.

With the ATF in a tightly sealed container place the container in a tub of hot water for a period of time. Then pour the ATF into the reservoir. This method works best with a low fluid level in the reservoir.

Place the Transflow(R) machine in the direct sunlight with the cabinet door open to expose the reservoir to the rays of the warm sun.

#### Flush/Flow Test Procedure

**Important:**

All labor operations that include removal of the transmission from the vehicle include labor time to flush the transmission oil cooler system.

Refer to SI for Automatic Transmission Oil Cooler Flushing and Flow Test J 45096 for the appropriate procedure.

**Important:**

The J 45096 can be used to flush the transmission oil cooler system on an Allison equipped vehicle, but the flow meter should not be utilized.

Refer to SI for Automatic Transmission Oil Cooler Flushing and Flow Test J 45096 for the appropriate flow check procedure.

#### Machine Displays

After completion of the flush and flow test the following information is to be recorded on the repair order. This information is displayed on the Transmission Cooling System Service Tool J 45096 Transflow(R) machine when the dial is in the code position.

^ Tested flow rate (displayed in Gallons Per Minute (GPM))

^ Temperature (displayed is degrees Fahrenheit)

^ Cycle number (a number)

^ Seven digit Alpha/Numeric flow code (i.e. A10DFB2)

#### Warranty Information

**Important:**

All labor operations that include removal of the transmission from the vehicle include labor time to flush the transmission oil cooler system.

Performing a transmission oil cooling system flush and flow test will use between 4.7-7.5 L (5-8 qts) of DEXRON(R)VI transmission fluid. The amount of transmission fluid (ATF) (DEXRON(R)VI) (fluid) that is to be charged for the flush portion of the repair should not exceed the allowable charge for 7.5 L (2 gal) of fluid. This expense should be shown in the net item column of the warranty claim document.

The Seven digit Alpha/Numeric flow code i.e. A10DFB2 "MUST" be written on the repair order and placed in the comments section of the warranty claim. Any repair that requires the technician to contact the Product Quality Center (PQC) must also include the seven digit flow code. The agent will request the seven digit flow code and add the information to the PQC case prior to providing authorization for the warranty claim.

In Canada the Seven digit Alpha/Numeric flow code i.e. A10DFB2 MUST be written on the repair order. Any repair that requires the technician to contact the Product Quality Center (PQC) must also include the seven digit flow code. The agent will request the seven digit flow code and add the information to the PQC case prior to providing authorization for the warranty claim.

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DisclaimerTechnical Service Bulletin # **01-05-23-001B**

Date: **080131**

## Brakes - Rotor Lateral Runout Correction Information

Bulletin No.: 01-05-23-001B

Date: January 31, 2008

#### INFORMATION

Subject:

Brake Align(R) System for Brake Rotor Lateral Runout Correction

Models:

2008 and Prior Passenger Cars

Supercede:

This bulletin is being revised to add model years. Please discard Corporate Bulletin Number 01-05-23-001A (Section 05 - Brakes).

This bulletin is being issued to update General Motors position on correcting brake rotor lateral runout (Refer to Corporate Bulletin Number 00-05-22-002B for additional brake rotor service procedures).

Certain conditions may apply to individual vehicles regarding specific repairs. Refer to those specific repairs in applicable service bulletins. Make sure other possible sources of brake pulsation, such as ABS pedal feedback, have been addressed before checking rotor runout.

Anytime a new or refinished rotor is installed on a vehicle, the rotor must have .050 mm (.002 in) or less of lateral runout. This specification is important to prevent comebacks for brake pulsation. Until now, the only acceptable methods to correct brake rotor runout were to index or replace the rotor or to refinish the rotor using an on-vehicle brake lathe.

GM has approved a new technology for the correction of lateral runout on new or refinished rotors. This new method is called Brake align(R)\*. It will allow the technician to meet the .050 mm (.002 in) or less requirement for lateral runout by installing a specially selected, tapered correction plate between the rotor and the hub. The Brake Align(R) Correction system does NOT require the use of an on-vehicle brake lathe to correct for lateral runout.

\*We believe this source and their products to be reliable. There may be additional manufacturers of such products. General Motors does not endorse, indicate any preference for or assume any responsibility for the products from this firm or for any such items which may be available from other sources.

The Brake Align(R) Starter Kit will include an ample supply of Correction Plates, in various correction sizes, that will cover most current GM passenger car applications. It will also include a Brake Align(R) tool kit containing a dial indicator and retaining washers along with other useful tools.

#### Service Procedure

Follow all the procedures referred to in Corporate Bulletin Number 00-05-22-002B. Dealers who have purchased the Brake Align(R) Starter Kit may use the following simplified runout correction procedure:

The existing rotors must first be machined on an approved, well-maintained bench lathe to guarantee smooth, flat, and parallel surfaces. Should the rotors require replacement, please note that it is not necessary to machine new rotors.

Make sure all the mating surfaces of the rotor and the hub are clean, using the J 42450-A wheel Hub Cleaning Kit. Mount the new or refinished rotor onto the vehicle hub using the retaining washers provided in the kit. Do not reinstall the caliper or wheel at this time.

Tighten all the wheel nuts to the proper specification, using J 39544 Torque Socket or the equivalent.

Fasten the dial indicator to the steering knuckle so that the indicator needle contacts the rotor friction surface approximately 12.7 mm (1/2 in) from the rotors outer edge.

Rotate the rotor and observe the total lateral runout.

Index the rotor on the hub to achieve the lowest amount of lateral runout. This will require removal and reassembly of the rotor until the lowest total lateral runout reading is obtained. If this reading is .050 mm (.002 in) or less, the assembled rotor is within specification. The brake system may be reassembled.

If total lateral runout is greater than .050 mm (.002 in), proceed with determining the correct Brake Align(R) Correction as follows:

Rotate the rotor to locate the lowest dial indicator reading and set the dial to zero. Rotate the rotor to determine and locate the highest amount of lateral runout.

Note the AMOUNT and LOCATION of the "high spot" on the rotor and mark the closest wheel stud relative to this location.

Remove the rotor.

Select the appropriate Brake Align(R) Runout Correction Plate for this vehicle using the Application Chart. Make sure the selection corrects the amount of runout that was diagnosed.

Never attempt to stack two or more Correction Plates together on one hub.

Never attempt to re-use a previously installed Correction Plate.

Following the Brake Align(R) procedures and diagram, install the Correction Plate onto the vehicle between the hub and the rotor. The V-notch in the Correction Plate is to be installed and aligned with the noted location of the "high spot" on the vehicle hub and marked wheel stud.

Install the rotor onto the vehicle with the Correction Plate placed between the hub and the rotor. Be sure to install the rotor onto the hub in the same

Location as identified in Step 7.

The rotor should then be secured onto the hub and tightened to the proper specification. The rotor should be dial indicated once more to assure that the rotor is now within specification.

The brake system is now ready for the remaining service and assembly. Once the caliper has been installed, check to ensure that the rotor rotates freely.

#### Parts Information

Dealer Equipment and Services
Brake Align® LLC

Brake Align(R) Runout Correction Plates are available through the suppliers shown.

To Order Call 1.800.GM.TOOLS or Fax To 1.866.259.1241											
Bill To:						Ship To:					
Dealership:						Dealership:					
Attention:						Attention:					
Street Address:						Street Address:					
City:			State:		Zip:	City:			State:		Zip:
Phone:						Phone:					
Dealer Code:						PO Number:					
Correction Plates — 5 Packs				Correction Plates — Single Plates				Accessories:			
Qty.	Part #	Price/Ea.	Ext Price	Qty.	Part #	Price/Ea.	Ext Price	Qty.	Part #	Price/Ea.	Ext Price
	411-801-03-05	\$46.00			411-801-03-01	\$11.00			411-951000 Complete Tool Kit	\$265.00	
	411-801-06-05	\$46.00			411-801-06-01	\$11.00					

## Chevrolet Sprint L3-61 1.0L

	411-8 01-09 -05	\$46.00			411-80 1-09-01	\$11.00			411-95 1020Vi ce Grip Dial Ind	\$196.00	
	411-8 02-03 -05	\$46.00			411-80 2-03-01	\$11.00					
	411-8 02-06 -05	\$46.00			411-80 2-06-01	\$11.00			411-95 1021R eplac ement Guage	\$64.00	
	411-8 02-09 -05	\$46.00			411-80 2-09-01	\$11.00					
	411-8 03-03 -05	\$46.00			411-80 3-03-01	\$11.00			411-95 012010 Conical Washe rs	\$21.00	
	411-8 03-06 -05	\$46.00			411-80 3-06-01	\$11.00					
	411-8 03-09 -05	\$46.00			411-80 3-09-01	\$11.00			411-95 0600A pplicat ion Chart	\$9.00	
	411-8 04-03 -05	\$46.00			411-80 4-03-01	\$11.00					
	411-8 04-06 -05	\$46.00			411-80 4-06-01	\$11.00			411-95 0300C ar Hub Cleaner w/Pads	\$44.00	
	411-8 04-09 -05	\$46.00			411-80 4-09-01	\$11.00					
	411-8 05-03 -05	\$46.00			411-80 5-03-01	\$11.00			411-95 0400C	\$26.00	

## Chevrolet Sprint L3-61 1.0L

	411-8 05-06 -05	\$46.00			411-80 5-06-01	\$11.00			ar Pads (10 Pack)		
	411-8 05-09 -05	\$46.00			411-80 5-09-01	\$11.00			411-95 0500M arker	\$4.00	
	411-8 06-03 -05	\$72.00			411-80 6-03-01	\$16.00					
	411-8 06-06 -05	\$72.00			411-80 6-06-01	\$16.00			411-95 1350In structi onal DVD	\$13.00	
	411-8 06-09 -05	\$72.00			411-80 6-09-01	\$16.00					
	411-8 07-03 -05	\$72.00			411-80 7-03-01	\$16.00			411-95 1400T ruck Hub Cleaner w/Pads	\$87.00	
	411-8 07-06 -05	\$72.00			411-80 7-06-01	\$16.00					
	411-8 07-09 -05	\$72.00			411-80 7-09-01	\$16.00			411-95 1375T ruck Pads (10-Pa ck)	\$31.00	
	411-8 08-03 -05	\$72.00			411-80 8-03-01	\$16.00					
	411-8 08-06 -05	\$72.00			411-80 8-06-01	\$16.00			411-95 1260C ustomer Brochu re (20)	\$9.00	
	411-8 08-09 -05	\$72.00			411-80 8-09-01	\$16.00					



Chevrolet Sprint L3-61 1.0L

	411-8 09-03 -05	\$72.00			411-80 9-03-01	\$16.00			411-95 0250H oning Stone	\$36.00	
	411-8 09-06 -05	\$72.00			411-80 9-06-01	\$16.00					
	411-8 09-09 -05	\$72.00			411-80 9-09-01	\$16.00		Other Items			
	411-8 10-03 -05	\$86.00			411-81 0-03-01	\$19.00					
	411-8 10-06 -05	\$86.00			411-81 0-06-01	\$19.00					
	411-8 10-09 -05	\$86.00			411-81 0-09-01	\$19.00					
	411-8 11-03 -05	\$72.00			411-81 1-03-01	\$16.00					
	411-8 11-06 -05	\$72.00			411-81 1-06-01	\$16.00					
	411-8 11-09 -05	\$72.00			411-81 1-09-01	\$16.00					
	411-8 12-03 -05	\$46.00			411-81 2-03-01	\$11.00					
	411-8 12-06 -05	\$46.00			411-81 2-06-01	\$11.00					

	411-8 12-09 -05	\$46.00			411-81 2-09-01	\$11.00					
	411-8 13-03 -05	\$46.00			411-81 3-03-01	\$11.00					
	411-8 13-06 -05	\$46.00			411-81 3-06-01	\$11.00					
	411-8 13-09 -05	\$46.00			411-81 3-09-01	\$11.00					
	411-8 14-03 -05	\$46.00			411-81 4-03-01	\$11.00					
	411-8 14-06 -05	\$46.00			411-81 4-06-01	\$11.00					
	411-8 14-09 -05	\$46.00			411-81 4-09-01	\$11.00					
	411-8 15-03 -05	\$46.00			411-81 5-03-01	\$11.00					
(\$40.00 Minimum Order)								Grand Total:			
Notes and/or Comments:											
Signature:								Date:			
Disclosures: Taxes, Freight Charges, Installation Charges will be billed when applicable By signing above, Dealer accepts all terms and conditions sale which are contained within the GM Dealer Equipment Program Catalog											

Brake Align Order Form

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Technical Service Bulletin # 08-09-41-003

Date: 080225

## Restraints - Usage of Used/Salvaged/Imitation Components

### INFORMATION

Bulletin No.: 08-09-41-003

Date: February 25, 2008

Subject:

## General Motors Position Statement on Installation of Used Salvaged or Imitation Air Bag System Components

### Models:

2008 and Prior GM Cars and Light Duty Trucks (Including Saturn and Saab)

2008 and Prior HUMMER H2, H3

Due to the critical nature of the design of Supplemental Inflatable Restraint Systems (SIR) (also known as air bag systems) GM does not support the use of any used salvage or imitation parts for repair. Only new genuine GM warranted parts should be used in repair.

Proper operation of the air bag system requires that any repairs to the vehicle be made with new GM warranted parts. Never use air bag parts from another vehicle or source. The reasons for this policy and practice within GM include the following:

### Occupant Protection

Air bag system components are carefully developed and specifically tuned for the specific vehicle environment. Corresponding air bag system components from other models or other model years may appear similar from the outside and may even fit the vehicle but different internal elements or calibrations may result in degraded restraint performance.

### Regulatory Compliance

All new GM vehicles are designed and built to meet or exceed all applicable Canadian and U.S. Federal Motor Vehicle Safety Standards. Use of air bag system components other than those specified could result in degraded restraint performance and under some circumstances could render the system inoperative. A repair establishment that knowingly makes a regulated safety system inoperative violates the Safety Act and becomes liable accordingly. The repair establishment also risks liability for losses or damage resulting from the repair.

### Reliability

Reuse of used or salvaged components brings into question the conditions under which the components were obtained and stored prior to use.

Components could have been damaged or stored under unfavorable conditions that could compromise performance and reliability.

### Warranty

The use of new parts is consistent with the vehicle factory warranty and extended warranty programs.

In summary new GM parts remain General Motors recommendation for repairs involving air bags systems and components. Air bag systems can best be returned to appropriate levels of performance when new GM parts are used.

(This information is also available online at: [www.techinfo.gmgoodwrench.com](http://www.techinfo.gmgoodwrench.com).)

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Technical Service Bulletin # **00-08-48-005C**

Date: **080201**

## Body - Vehicle Glass Distortion Information

Bulletin No.: 00-08-48-005C

Date: February 01, 2008

### INFORMATION

#### Subject:

Distortion in Outer Surface of Vehicle Glass

#### Models:

2008 and Prior GM Passenger Cars and Trucks (including Saturn)

2008 and Prior HUMMER H2 H3

2005-2008 Saab 9-7X

#### Supersede:

This bulletin is being revised to add model years. Please discard Corporate Bulletin Number 00-08-48-005B (Section 08 - Body and Accessories).

Distortion in the outer surface of the windshield glass door glass or backlite glass may appear after the vehicle has:

accumulated some mileage

been frequently washed in automatic car washes (particularly "touchless" car washes)

This distortion may look like a subtle orange peel pattern, or may look like a drip or sag etched into the surface of the glass.

Some car wash solutions contain a buffered solution of hydrofluoric acid which is used to clean the glass. This should not cause a problem if used in the correct concentration. However, if not used correctly, hydrofluoric acid will attack the glass, and over time, will cause visual distortion in the outer surface of the glass which cannot be removed by scraping or polishing.

If this condition is suspected, look at the area of the windshield under the wipers or below the belt seal on the side glass. The area of the glass below the wipers or belt seal will not be affected and what looks like a drip or sag may be apparent at the edge of the wiper or belt seal. You may also see a line on the glass where the wiper blade or the belt seal contacts the glass.

The repair will require replacing the affected glass and is not a result of a defect in material or workmanship. Therefore, is not covered by New Vehicle Warranty.

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Technical Service Bulletin # **08-06-01-008**

Date: **080327**

## **Engine - Accessory Drive Belt Noise Diagnostics/Tool** INFORMATION

Bulletin No.: 08-06-01-008

Date: March 27, 2008

Subject:

Diagnosing Accessory Drive Belt/Serpentine Belt Noise and Availability and Use of Kent-Moore EN-49228 Laser Alignment Tool - Drive Belt

Models:

2009 and Prior GM Passenger Cars and Trucks (Including Saturn)

2009 and Prior HUMMER H2, H3 Vehicles

2009 and Prior Saab 9-7X

### Background

Several aftermarket companies offer laser alignment tools for accessory drive systems that can be very helpful in eliminating drive belt noise as a result of misaligned pulleys. Typically pricing ranges from \$160 - \$200.

### EN49228 Laser Alignment Tool - Drive Belt

The GM Tool program has now made available a competitive, simple to use and time-saving laser tool to assist in achieving precise alignment of the drive belt pulleys. This optional tool removes the guesswork from proper pulley alignment and may serve to reduce comebacks from:

^ Drive Belt Noise

^ Accelerated Drive Belt Wear

^ Drive Belt Slippage

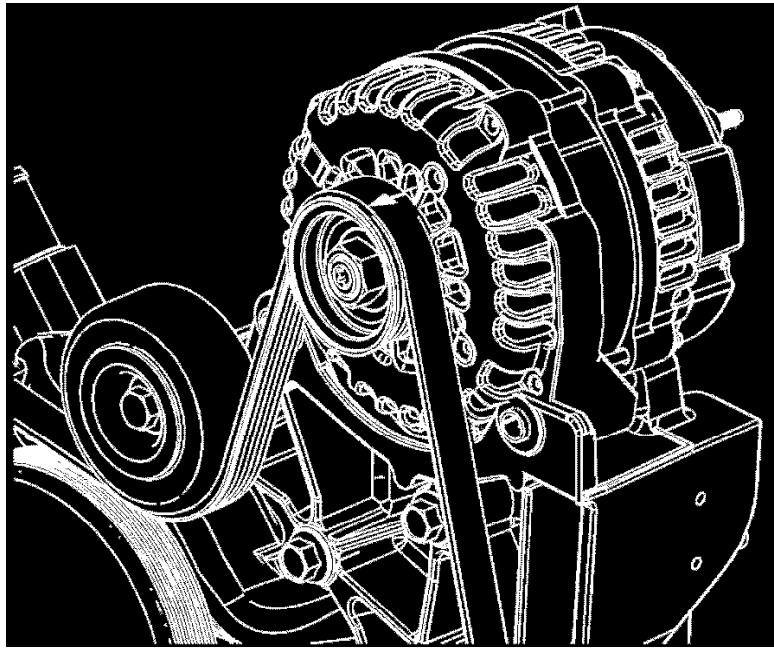
### Instructions

The instructions below are specific only to the truck Gen IV V-8 family of engines. These instructions are only for illustrative purposes to show how the tool may be used. Universal instructions are included in the box with the Laser Alignment Tool - Drive Belt.

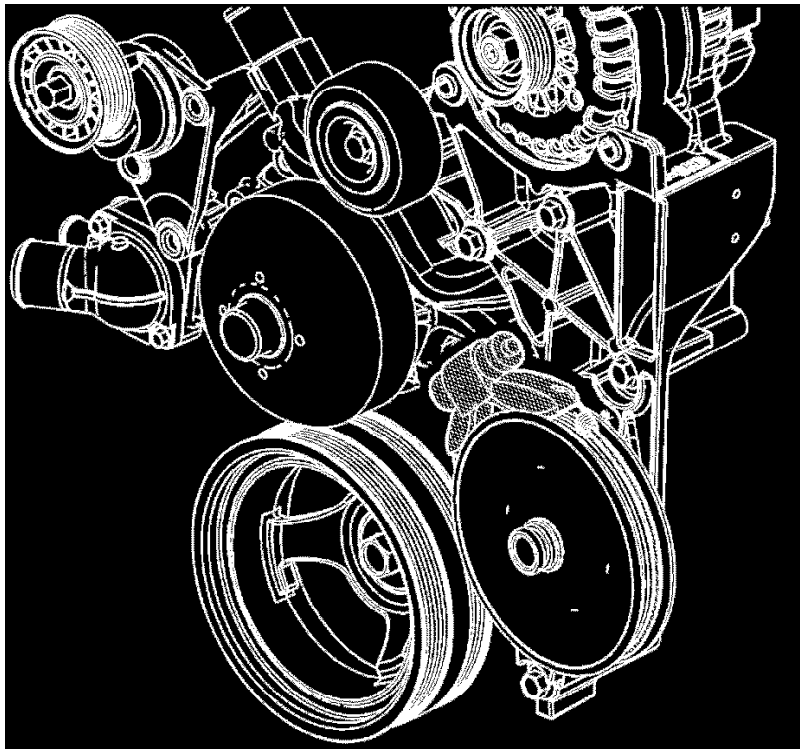
#### **Caution:**

^ Do not look directly into the beam projected from the laser.

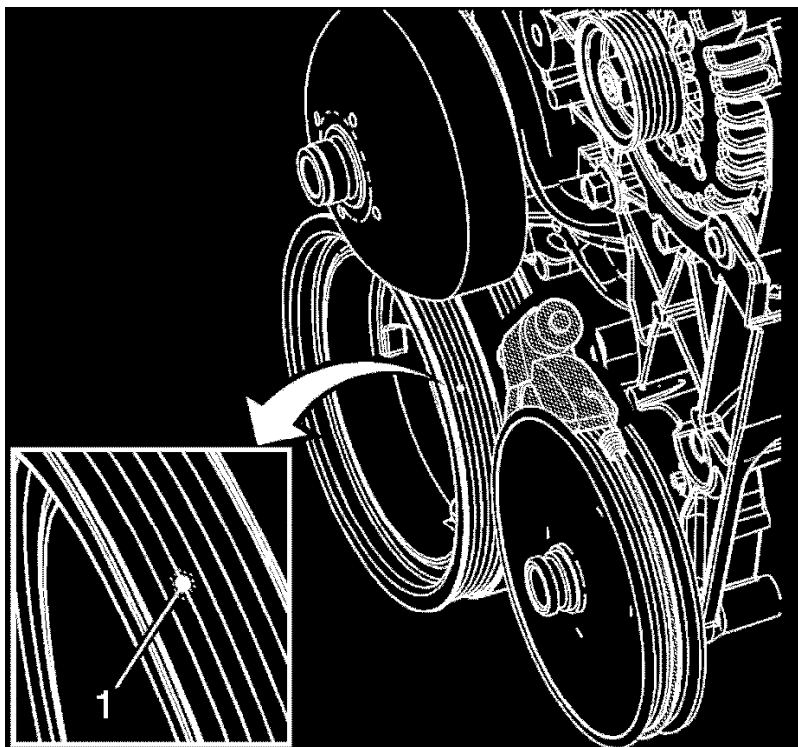
- ^ Use caution when shining the laser on highly polished or reflective surfaces. Laser safety glasses help reduce laser beam glare in many circumstances.
- ^ Always use laser safety glasses when using the laser. Laser safety glasses are not designed to protect eyes from direct laser exposure.



1. Observe and mark the serpentine belt orientation.
2. Remove the serpentine belt from the accessory drive system.



3. Install the tool onto the power steering pulley. Position the legs of the tool into the outer grooves of the pulley, farthest from the front of the engine.
4. Install the retaining cord around the pulley and to the legs of the tool.



5. Put on the laser safety glasses provided with the tool.
6. Depress the switch on the rear of the tool to activate the light beam.
7. Rotate the power steering pulley as required to project the light beam onto the crankshaft balancer pulley grooves.
8. Inspect for proper power steering pulley alignment.
  - ^ If the laser beam projects onto the second rib or raised area (1) the pulleys are aligned properly.
  - ^ If the laser beam projects more than one-quarter rib 0.9 mm (0.035 in) mis-alignment, adjust the position of the power steering pulley as required.
  - ^ Refer to SI for Power Steering Pulley Removal and Installation procedures.
9. Install the serpentine belt to the accessory drive system in the original orientation.
10. Operate the vehicle and verify that the belt noise concern is no longer present.

GM Tool Number	Description
EN-49228	Laser Alignment Tool – Drive Belt

#### Parts Information

Please contact 1-800-GM-TOOLS or visit the GM service tool website at <https://gmspecialservicetools.spx.com/> for pricing information or to place your order for this tool.

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Disclaimer Technical Service Bulletin # **05-00-89-078B**

Date: **080206**

## Fuel System - GM Fuel System Treatment PLUS(R) Info.

Bulletin No.: 05-00-89-078B

Date: February 06, 2008

INFORMATION

Subject:  
GM Fuel System Treatment PLUS Fuel Sending Unit Corrosion and Fuel System Deposits

Models:  
2008 and Prior GM Passenger Cars and Trucks (including Saturn)  
2008 and Prior HUMMER H2, H3  
2005-2008 Saab 9-7X

Supercede:

This bulletin is being revised to add model years. Please discard Corporate Bulletin Number 05-00-89-078A (Section 00 - General Information).

The GM Fuel System Treatment PLUS is not recommended for use with diesel fuel. The GM Fuel System Treatment PLUS is specially formulated for use in gasoline and/or E85 fuels.

GM Fuel System Treatment PLUS

GM Fuel System Treatment PLUS P/N 88861011 (for U.S. ACDelco(R) use 88861013) (in Canada 88861012) is now available for use in gasoline engines.

Added Benefits and Uses

The PLUS portion of GM Fuel System Treatment PLUS is the addition of a filmer additive that when used regularly can protect fuel system sending units from the corrosive effects of certain sulfur contaminants found in some of todays gasoline.

Sulfur contamination can disrupt electrical continuity of certain fuel sending units and lead to erratic or false fuel gauge readings. With scheduled usage GM Fuel System Treatment PLUS protects against the effects of harmful sulfurs in gasoline.

The Four Benefits

Just pour in one bottle of the GM Fuel System Treatment PLUS into the fuel tank when refueling around each oil change interval:

Cleans - Sulfur corrosion from fuel gauge sending units.

Prevents - Harmful sulfur components from attacking sensitive fuel system electronics.

Protects - By coating metallic surfaces of the fuel system.

Removes - Engine deposits left from use of poor quality fuels.

Part Number	Description
88861011 (for U.S. ACDelco, use 88861013) (in Canada, 88861012)	GM Fuel System Treatment PLUS

Parts Information

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Technical Service Bulletin # **06-06-04-035A**

Date: **080205**

## Fuel System - E85 Fuel Usage Precaution

Bulletin No.: 06-06-04-035A

Date: February 05, 2008

INFORMATION

**Subject:**

Use of E85 Fuels in Vehicles Not Certified by GM as being FlexFuel Compatible / Aftermarket Conversion of Vehicles to Operate on E85 Fuels

**Models:**

2008 and Prior GM Passenger Cars and Trucks NOT FlexFuel (E85) Compatible (including Saturn)

2008 and Prior HUMMER H2, H3

2005-2008 Saab 9-7X

**Supersede:**

This bulletin is being revised to add model years. Please discard Corporate Bulletin Number 06-06-04-035 (Section 06 - Engine/Propulsion System).

**Aftermarket Conversions of Vehicles to Use E85 Fuels**

General Motors has become aware of several companies that claim to be able to convert vehicles equipped with gasoline engines to be compatible with E85 Fuels.

Vehicles certified by GM as being FlexFuel (E85) compatible contain numerous calibration and component differences that are not conducive to an aftermarket retrofit.

General Motors DOES NOT support or endorse conversions that may alter the emissions and related emissions components of its vehicles.

Repairs that may result from changes to GM built components and repairs that result from the use of improper fuel such as the use of gasoline containing more than 10% Ethanol in a non-FlexFuel certified vehicle are not covered under the terms of the New Vehicle Warranty.

**E85 Compatible Vehicles**

2000–2002 S-Series pickups with 2.2L (VIN 5— RPO L43)  
2002–2005 full-size pickups and utilities with 5.3L (VIN Z — L59)  
2006 Chevrolet Avalanche, Silverado, Suburban, Tahoe with 5.3L (VIN Z — RPO L59)  
2006 Chevrolet Impala, Monte Carlo with 3.5L (VIN K — RPO LZE)  
2006 GMC Sierra, Yukon, Yukon XL with 5.3L (VIN Z — RPO L59)  
2007 Chevrolet Express with 5.3L (VIN Z — RPO L59)  
2007 Chevrolet Avalanche, Silverado, Suburban, Tahoe with 5.3L (VINs 0, 3 — RPOs LMG, LC9)  
2007 GMC Savana with 5.3L (VIN Z — RPO L59)  
2007 GMC Sierra, Yukon, Yukon XL with 5.3L (VINs 0, 3 — RPOs LMG, LC9)  
2007 Chevrolet Impala, Monte Carlo with 3.5L (VIN K — RPO LZE)  
2007 Saturn Relay, Buick Terraza, Chevrolet Uplander, Pontiac Montana SV6 (Canada Only) with 3.9L (VIN W — RPO LGD)  
2008 Chevrolet Impala with 3.5L (VIN K — RPO LZE) and 3.9L (VIN 1— RPO LZG)  
2008 Pontiac Montana SV6, Chevrolet Uplander 3.9L (VIN W — RPO LGD)  
2008 Chevrolet Express, GMC Savana with 5.3L (VIN 4 — RPO LMF)  
2008 Chevrolet Avalanche, Suburban, Silverado, GMC Yukon, Sierra with 5.3L (VIN 3 — RPO LC9)  
2008 Chevrolet Avalanche, Suburban, Silverado, Tahoe, GMC Yukon, Yukon XL, Sierra with 5.3L (VIN 0 — RPO LMG)

The only E85 compatible vehicles produced by General Motors are shown above.

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Technical Service Bulletin # **08-03-10-004**

Date: **080325**

**Wheels/Tires - Accessory Wheel/Tire Mounting/Balancing  
INFORMATION**

Bulletin No.: 08-03-10-004

Date: March 25, 2008



**Subject:**

**Mounting, Balancing and Installation of Accessory Wheels and Tires Available Through GM Accessories**

**Models:**

2009 and Prior GM Passenger Cars and Light Duty Trucks (Including Saturn)

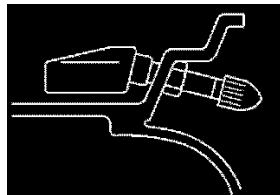
2003-2009 HUMMER H2

2006-2009 HUMMER H3

This bulletin is intended to offer comprehensive instructions to GM Dealers and authorized GM Accessory Distributor/Installers as to the proper methods for mounting, balancing and installing accessory wheels and tires. Adherence to these methods will ensure that the vehicle delivered to the customer is of the highest quality.

**Tire Pressure Monitor (TPM) Sensor Installation**

1. Clean any dirt or debris from the grommet sealing area.



2. Insert the sensor in the wheel hole with the air passage facing away from the wheel.
3. Install the sensor nut and position the sensor body parallel to the inside wheel surface while tightening the nut.

**Tighten**

Tighten the sensor nut to 7 N.m (62 lb in).

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## **Tire Mounting**

**Tire Mounting**

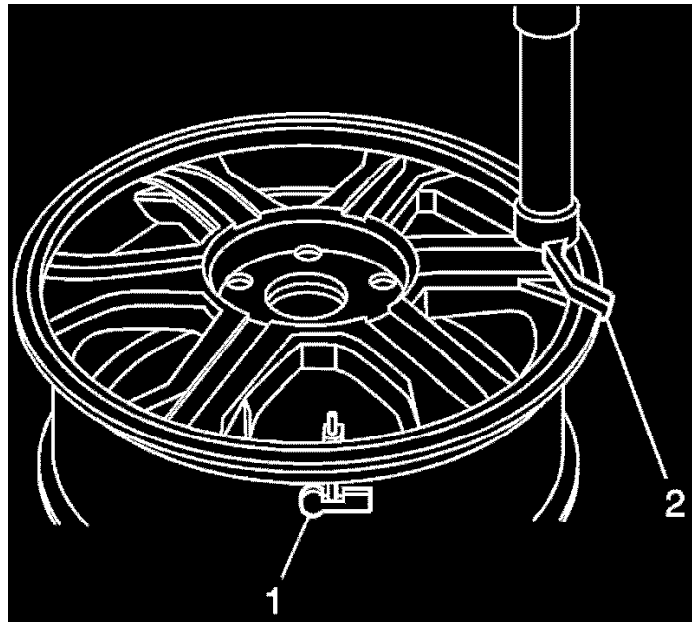
**Important:**

When mounting the tires, use the approved tire mounting lubricant. DO NOT use silicon or corrosive base compounds to lubricate the tire bead and the wheel rim. A silicon base compound can allow the tire to slip on the rim resulting in imbalance or braking failure. A corrosive type compound can cause tire or rim deterioration.

1. Verify that the tire is at least 15°C (60°F) prior to mounting and inflating.
2. Apply GM Vehicle Care Rubber Lubricant, P/N 12345884 (Canadian P/N 5728223), to both of the tire beads and both of the wheel bead hump areas for full circumference.

**Important:**

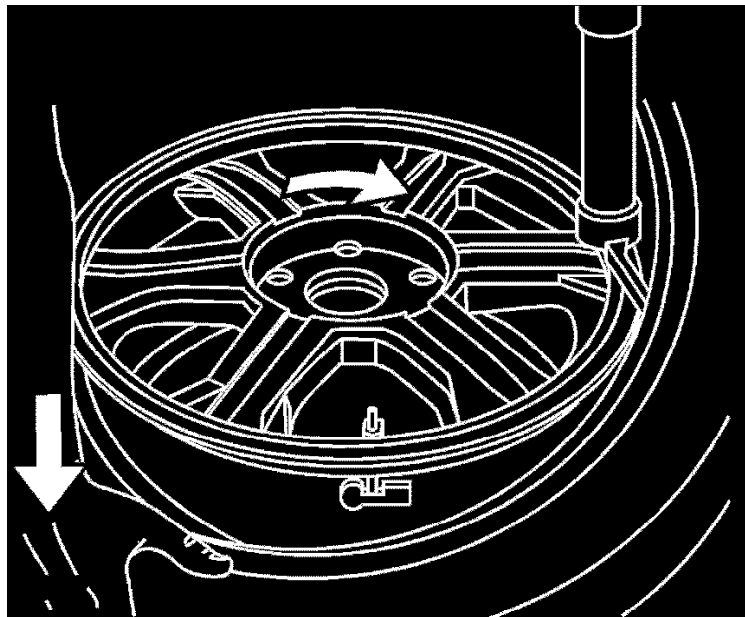
Mounting operation and wheel assembly must be completed within 15 minutes of applying lubricant to ensure proper assembly and inflation. Excess lubricant (drips and runs) in the tire must be avoided as it affects balance and may cause tire slippage on wheels during vehicle operation.



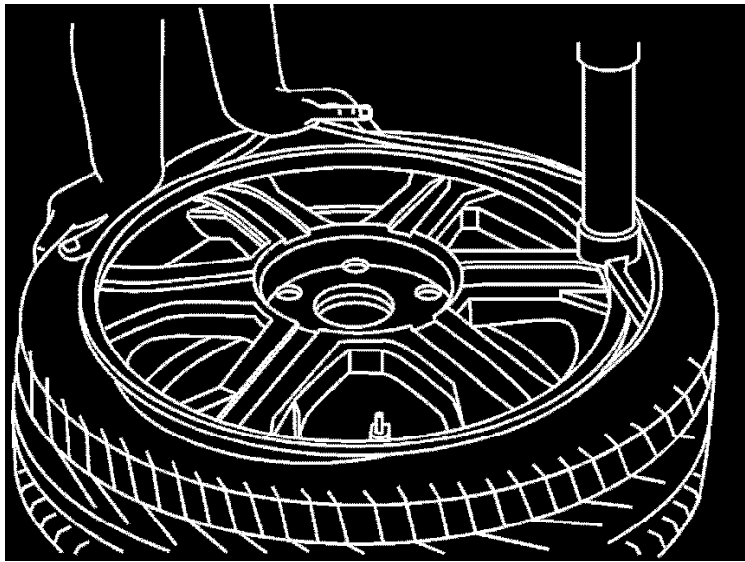
3. Position the rim so the TPM valve stem (1) is situated at the 3 o'clock position relative to the head (2). This will protect the TPM sensor body by ensuring that the bead is under the least amount of tension when it passes over it.

**Important:**

Some GM Accessory wheels have a "reverse-rim" design and will be marked as such. "Reverse-rim" wheels should be positioned face-down for tire mounting, taking care not to damage the face of the wheel.



4. Using the tire changer, rotate the tire/wheel assembly clockwise when transferring the tire bead to the inside of the wheel rim.
5. After the bottom bead is on the wheel, reposition the wheel and tire so that the TPM valve stem is again situated at the 3 o'clock position relative to the head. This will protect the sensor while mounting the tire bead to the outside of the wheel.



6. Using the tire changer, rotate the tire/wheel assembly clockwise when transferring the tire bead to the inside of the wheel rim.

**Danger:**

To avoid serious personal injury, do not stand over the tire when inflating. The bead may break when the bead snaps over the safety hump. Do not exceed 40 psi (275 kPa) pressure when inflating any tire if beads are not seated. If 40 psi (275 kPa) pressure will not seat the beads, deflate, relubricate the beads and reinflate. If greater than 40 psi (275 kPa) is required to install the tire on the wheel, a safety cage must be used. Overinflation may cause the bead to break and cause serious personal injury.

7. Inflate the tire until it passes the bead humps. Be sure that the valve core is not installed at this time.
8. Install the valve core to the TPM's valve stem.
9. Set the inflation pressure to 40 psi (275 kPa). It will be readjusted to the proper placard pressure when it is installed on the vehicle. This higher pressure allows for losses due to temperature change or any leakage that may occur prior to installation on the vehicle.

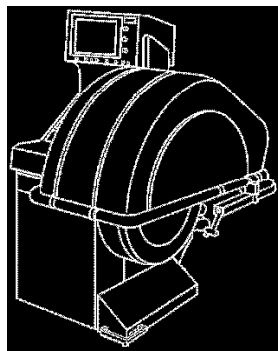
**Important:**

Aggressive accelerating and braking should be avoided for the first 24 hours after the tires have been mounted to avoid the tire slipping on the rim.

## Calibration of Tire/Wheel Balancer

### Calibration of Tire/Wheel Balancer

Tire/wheel balancing equipment should be checked for proper calibration every two weeks. Check the calibration of the tire and wheel assembly balancer according to the manufacturers recommendations or perform the following test:



**Important:**

If the balancer fails any of the steps in this calibration test, the balancer should be calibrated according to the manufacturer's instructions. If the balancer cannot be calibrated, contact the manufacturer for assistance.

1. Spin the balancer without a wheel or any of the adapters on the shaft.
2. Inspect the balancer readings.

**Specification**

Zero within 0.25 oz (7 g).

3. If the balancer is within the specification range, balance a tire and wheel assembly - that is within radial and lateral runout tolerances - to

ZERO, using the same balancer.

4. After the tire and wheel assembly has been balanced, add a 3 oz (85 g) test weight to the wheel at any location.
5. Spin the tire and wheel assembly again. Note the readings.
  - ^ In the static and dynamic modes, the balancer should call for 3 oz (85 g) of weight, 180 degrees opposite the test weight.
  - ^ In the dynamic mode, the weight should be called for on the flange of the wheel opposite the test weight.
6. With the assembly imbalanced to 3 oz (85 g), cycle the balancer five times.
7. Inspect the balancer readings:

Specification

Maximum variation: 0.25 oz (7 g).
8. Index the tire and wheel assembly on the balancer shaft 90 degrees from the previous location.
9. Cycle the balancer with the assembly at the new location.
10. Inspect the balancer readings:

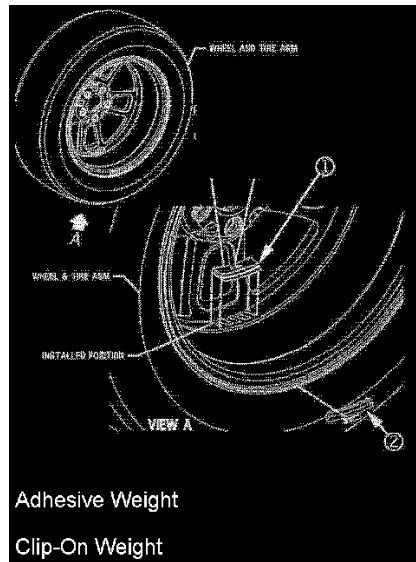
Specification

Maximum variation: 0.25 oz (7 g).
11. Repeat Steps 8 through 10 until the tire and wheel assembly has been cycled and checked at each of the 4 locations on the balancer shaft.

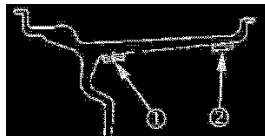
## **Tire and Wheel Balancing**

### **Tire and Wheel Balancing**

1. Follow the balancer manufacturers instructions to mount the wheel and tire assembly on the balancer.
2. Perform a dynamic balance on the tire and wheel per the manufacturers instructions (dynamic balance is sometimes referred to as "couple" balance). This will indicate the correct amount of balance weight to add at two positions on the wheel.



3. Install a clip-on balance weight on the inboard wheel flange per the weight indications on the balancer.
  - ^ Use only MC-series polyester-coated weights at this location. GM Accessory wheels have an MC-rim contour at the inboard location.
  - ^ Use only a nylon or plastic tipped hammer to avoid damaging the weight coating or the wheel finish.
  - ^ Never strike a wheel weight more than twice. If it doesn't seat properly after two hits, discard it and try a new weight.



### Wheel Rim Profile with Adhesive Weight Locations Shown

#### Important:

Some older GM Accessory wheels may be MC style rims both inboard and outboard and should, therefore, use clip-on MC weights in both positions. Some GM Accessory wheels may be flangeless on the inboard side. In this case, follow the instructions for applying adhesive balanced weights. Place the adhesive weight on the face of the rim inner surface, as far inboard as possible (2).

4. Install adhesive balance weights at the outboard location (1) on the wheel per the weight indications on the balancer.
  - ^ Both the wheel and the weights must be at least 15°C (60°F).
  - ^ The area where the weights will be applied must be clean and dry. Wipe the area with a 50/50 mixture, by volume, of isopropyl alcohol and clean water using a clean cloth. Allow to dry completely.
  - ^ Install adhesive weights just inboard of the wheel face on the rim inner surface.
  - ^ Apply a force of 21 lb (90 N) to the weights to achieve proper adhesion. This is very important to achieve proper adhesion.

### Balance Weight Limits

When dynamically balancing a wheel and tire assembly, the maximum amount of balance weight that should be used at any one location on a wheel is 5 oz (141 g). This means a maximum of 5 oz (141 g) on the outboard flange (or behind the wheel face, if adhesive weight is used), and maximum of 5 oz (141 g) on the inboard flange (or on the inner rim surface).

If the balancer calls for greater than 5 oz (141 g) in either position, perform the following steps to reduce the weight:

1. Mark the valve stem location on the tire.
2. Deflate the tire/wheel assembly.
3. Remove any existing balance weights.
4. Rotate tire 180 degrees on the wheel.
5. Re-inflate tire/wheel assembly and rebalance.
6. If the tire/wheel assembly still requires more than 5 oz (141 g) per plane, repeat Steps 1-4, rotating the tire 90 degrees from its original position.
7. If the tire/wheel assembly still requires more than 5 oz (141 g) per plane, repeat Steps 1-4, rotating the tire 270 degrees from its original position.
8. If tire/wheel assembly still requires more than 5 oz (141 g) per plane, remove the tire from the wheel, remove all wheel weights and TPM sensor, and check static balance of the wheel.

#### Important:

This is a static balance check only. The operating mode of the balancer must be changed from "dynamic or couple" to "static". The balancer should feed back only a single weight value when in static mode.

- ^ If static balance of wheel is 4 oz (113 g) or less, re-use wheel and reject the tire for excessive imbalance.
- ^ If static balance of the wheel is greater than 4 oz (113 g), re-use the tire and reject the wheel for excessive imbalance.

### Tire Pressure Monitor Sensor Learn (Excludes 2006-2009 Pontiac Vibe)

When installing GM Accessory wheels and tires on a vehicle that have new TPM sensors installed in them, it is necessary to learn the new sensor identification codes/locations into the RCDLR. If the relearn procedure is not performed properly, the RCDLR will continue to try to communicate with the original sensors that were removed from the vehicle. This will result in the vehicle displaying a TPM system malfunction message once the vehicle is removed from the proximity of the original sensors for an extended period of time.

### Sensor Functions Using J 46079

Each sensor has an internal low frequency coil. When the J 46079 Tire Pressure Monitor Diagnostic Tool is used in activate mode, it produces a low frequency transmission that activates the sensor. The sensor responds to a low frequency activation by transmitting in learn mode. When the RCDLR receives a learn mode transmission while in TPM learn mode, it will assign that sensor ID to the location on the

vehicle relative to the order in which it was learned.

### Sensor Functions Using Pressure Increase/Decrease Method

Each sensor takes a pressure measurement sample once every 30 seconds while in stationary mode. If the tire pressure increases, or decreases by more than 8.3 kPa (1.2 psi) from the last pressure measurement, another measurement will occur immediately to verify the change in pressure. If a pressure change has indeed occurred the sensor transmits in Learn mode. When the RCDLR receives a Learn mode transmission while in TPM learn mode it will assign that sensor ID to the location on the vehicle relative to the order in which it was learned.

### Learn Mode Cancellation

The learn mode will cancel if the ignition is cycled to OFF or if more than 2 minutes has elapsed for any sensor that has not been learned. If the learn mode is cancelled before the first sensor is learned, the original sensor IDs will be maintained. If the learn mode is canceled after the first sensor is learned the following will occur:

- ^ All stored sensor IDs will be invalidated in the RCDLR memory.
- ^ If equipped, the DIC will display dashes instead of tire pressures.
- ^ DTC C0775 will be set.

These conditions will now require the learn procedure to be repeated for the system to function properly.

### TPM Learn Procedure

#### **Important:**

Before proceeding, ensure that no other learn procedure is being performed simultaneously or that tire pressures are not being adjusted on another TPM equipped vehicle within close proximity. Stray signals from other TPM equipped vehicles just driving by can be inadvertently learned. If any random horn chirps are heard from the vehicle while performing the learn procedure, most likely a stray sensor has been learned and the procedure will need to be cancelled and repeated. Under these circumstances, performing the TPM Learn Procedure away from other vehicles would be highly recommended. In the event a particular sensor activation does not cause the horn to chirp, it may be necessary to rotate the wheel valve stem to a different position due to the sensor signal is being blocked by another component.

#### 1. Place the ignition switch in the proper position as follows:

- ^ With standard ignition switch, place the switch in the RUN position.
- ^ With electronic keyless ignition, place the switch in the ACCY position.

#### 2. Initiate the TPM Learn Mode using one of the following procedures:

- ^ Using a scan tool, initiate the TPM Learn Mode. A double horn chirp will sound indicating the Learn Mode has been enabled. The left front turn signal will also be illuminated.
- ^ On vehicles equipped with keyless entry, simultaneously press the keyless entry transmitters lock and unlock buttons until a double horn chirp sounds indicating the Learn Mode has been enabled. The left front turn signal will also be illuminated.
- ^ On vehicles not equipped with keyless entry, press and release the driver information center (DIC) INFO button until the RELEARN TIRE POSITIONS message appears on the DIC display. Press and hold the SET/RESET button until a double horn chirp sounds and the DIC displays a TIRE LEARNING ACTIVE message indicating the Learn Mode has been enabled. The left front turn signal will also be illuminated.
- ^ For HUMMER H3, GMC Canyon, Chevrolet Colorado ONLY: Turn the exterior lamp switch from OFF to Parking Lamps four times within four seconds. A double horn chirp will sound and the low tire pressure indicator will begin to flash, indicating the learn mode has been enabled.

#### 3. Starting with the left front tire, learn the tire pressure using one of the following methods:

- ^ Hold the antenna of the J 46079 aimed upward against the tire sidewall close to the wheel rim at the valve stem location. Press and release the activate button and wait for a horn chirp. Once the horn chirp has sounded, the turn signal in the next location to be learned will illuminate.
- ^ Increase/decrease the tire pressure for 8-10 seconds then wait for a horn chirp. The horn chirp may occur before or up to 30 seconds after the 8-10 second pressure increase/decrease time period has been reached. Once the horn chirp has sounded, the turn signal in the next location to be learned will illuminate.

#### 4. After the horn chirp has sounded and the right front turn signal is illuminated, repeat step 3 for the remaining 3 sensors in the following order:

1. Right Front
2. Right Rear
3. Left Rear
5. After the LR sensor has been learned, a double horn chirp will sound indicating all sensors have been learned.
6. Turn OFF the ignition to exit the learn mode.
7. After the learn mode has been exited, adjust all tires to the recommended pressures on the Tire Inflation Pressure Placard. Refer Tire Inflation Pressure and Placards.

For additional information on TPM refer to Corporate Bulletin Number 07-03-16-004.

#### Tire Inflation Pressure and Placards

#### Tire Placard

When installing GM Accessory wheels and tires on a vehicle, the new tire pressure placard (supplied with the GM Accessory wheel kit) must be installed over the existing placard inside the drivers side door frame. This is required when the size of the GM Accessory tires is different than those being removed from the vehicle.

The new tire placard should be located within the red box, over the top of the original tire label found on the doorjamb. To locate the placard within the red box use the upper left hand edge of the red line as a guide. When properly placed, the new tire placard will obscure the original tire information. Be sure that the surface is clean and dry, and the surface temperature is not less than 21°C (65°F).

#### Tire Inflation Pressure

Note the front, rear, and spare (where applicable) tire inflation pressures shown on the new tire placard. The inflation pressure of new tires on the vehicle must be adjusted to the values shown on the placard. Even if the tire size was not changed on the vehicle and the tire pressure placard was not replaced, all of the tires must have their inflation pressures adjusted to match those shown on tire pressure placard.

## Reprogramming (RCDLR) For Proper Tire Inflation Pressure

### Reprogramming Remote Control Door Lock Receiver (RCDLR) for Proper Tire Inflation Pressure

When GM Accessory wheels and tires are installed on a vehicle that requires a different tire inflation pressure according to the Tire Inflation Placard the RCDLR must be reprogrammed with the new pressure and tire type (P or LT). If this is not done the vehicle will incorrectly report low or high tire pressure conditions incorrectly. Follow the steps listed below to select the appropriate tire type/pressure:

1. Install the scan tool.
2. Turn ignition ON with the engine OFF.
3. Enter "Diagnostics" and build the vehicle according to model year, vehicle line, etc.
4. Select: "Body".
5. Select "RCDLR Module".
6. Select: "Module Setup".
7. Select: "Tire Type/Pressure Selection".
8. Select P-Metric Standard.
9. Select the front and rear tire pressure as noted on the new vehicle driver door placard sticker for the accessory wheels/tires.
10. Verify that the selections made are correct and press the enter key. The scan tool will flash "Procedure in Progress" then display "Procedure Complete".
11. Press the "exit" key to escape.

#### Other Electronic Module Reprogramming

For proper vehicle operation and to ensure coverage under the provisions of the new vehicle warranty, the vehicle may require that certain control modules be reprogrammed with the correct calibrations as soon as the GM Accessory wheels and tires are installed. Examples of the modules that may be affected are Electronic Brake Control Module (for proper anti-lock brake and stability control performance) and Engine Control Module (for proper speedometer/odometer function).

Please see the Corporate Bulletin specific to the vehicle and wheel/tire application for detailed information on module reprogramming.

Technical Service Bulletin # **06-08-44-015A**

Date: **080201**

## Audio System - Noise When Using Portable Playback Unit

Bulletin No.: 06-08-44-015A

Date: February 01, 2008

### INFORMATION

Subject:

Information on Eliminating Noise in Audio System when Using Portable Playback Device

Models:

2008 and Prior GM Passenger Cars and Trucks (Including Saturn)

2008 and Prior HUMMER H2, H3

2005-2008 Saab 9-7X

Supercede:

This bulletin is being revised to add model years. Please discard Corporate Bulletin Number 06-08-44-015 (Section 08 - Body and Accessories).

Some portable audio equipment may be susceptible to certain types of electronic noise present in the vehicle's 12V power outlet.

Here are two ways to eliminate this type of interference:

If the audio device is capable of being self-powered (battery) use it that way instead of plugging it into the vehicle's power outlet.

Have the customer purchase a Ground Loop Isolator such as \*Radio Shack Catalog # 270-054. This device plugs in between the radio and the customer's audio device. It is packed with one included Y-Adapter. If purchasing the \*Radio Shack product you will require an additional Y-Adapter (Catalog # 274-369). This device should be installed between the audio player and the AUX input of the vehicle radio. These catalog numbers are stocked nationally at \*Radio Shack Retail Stores in the U.S. and are currently available. Other similar products are available through other electronics or car stereo retailers defined as Ground Loop Isolators.

Parts are currently available nationally in the U.S. through \*Radio Shack retail locations or through the mail at Radio Shack direct ordering 1-800-843-7422. In Canada, parts are available nationally through \*The Source By Circuit City retail locations or at [www.thesourcecc.com](http://www.thesourcecc.com).

Part Number	Description	Qty
270-054 (U.S.) 2700054 (Canada)	Ground Loop Isolator	1
274-369 (U.S.) 2740883 (Canada)	Y-Adapter	1

\*We believe these sources and their products to be reliable. There may be additional manufacturers of such products/materials. General Motors does not endorse, indicate any preference for or assume any responsibility for the products or material from these firms or for any such items that may be available from other sources.

### Parts Information

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Technical Service Bulletin # **08-08-51-002**

Date: **080312**

## Body - TPO Fascia Cleaning Prior to Painting

### INFORMATION

Bulletin No.: 08-08-51-002

Date: March 12, 2008



Subject:  
New Primer For TPO Fascias and Affected Cleaning Process of Painting Operation

Models:  
2009 and Prior Passenger Cars and Trucks  
2009 and Prior HUMMER H2, H3

The purpose of this bulletin is to inform the technician that General Motors has made a change in the primer it uses for TPO plastic for service parts. This new primer comes in several different colors from five different suppliers. This change affects the cleaning process of the painting operation. The new process is as follows.

1. Wash with soap and water.
2. Clean with a 50% mix of isopropyl alcohol and water (or a waterborne cleaner). Check with your paint supplier for product recommendations.
3. Scuff sand per your paint suppliers recommendations.

**Note:**

The use of a solvent-type cleaner will soften, or begin to dissolve the primer. Base coats do not have any affect on this primer.

4. Reclean with a 50% mix of isopropyl alcohol and water (or a waterborne cleaner).

All fascias, with the exception of the Corvette, Camaro, and Cadillac XLR, are made of TPO. You may find other TPO parts with this primer. If the technician has a question as to the type of plastic they are painting, inspect the back of the part for the plastic symbol (TPO).

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Disclaimer Technical Service Bulletin # **04-08-50-006B**

Date: **080125**

## **Interior - Seat Cover Wrinkle/Crease/Crack/Burn Info.**

Bulletin No.: 04-08-50-006B

Date: January 25, 2008

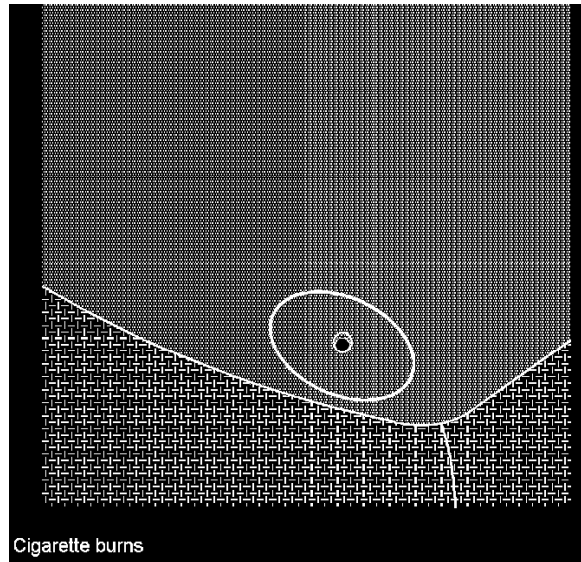
### **INFORMATION**

Subject:  
Minor Wrinkles/Creases, Discoloration, Cigarette Burns and Customer Induced Cuts and Stains on Front and Rear Driver and Passenger Seats with Leather, Vinyl or Cloth Seat Covers

Models:  
2009 and Prior GM Passenger Cars and Light Duty Trucks (Including Saturn)  
2009 and Prior HUMMER H2, H3  
2009 and Prior Saab 9-7X

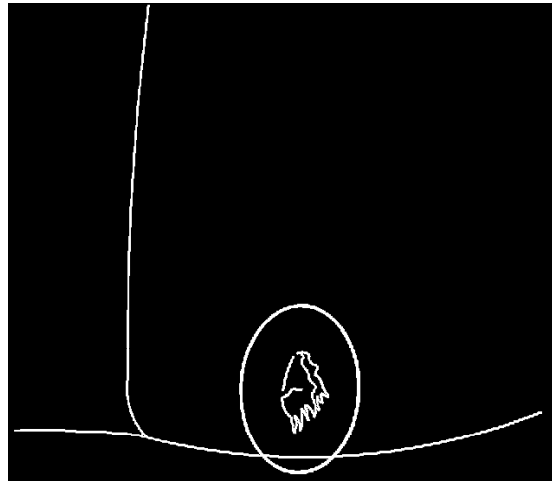
Supercede:

This bulletin is being revised to add model years. Please discard Corporate Bulletin Number 04-08-50-006A (Section 08 - Body and Accessories).



If a customer comes in to your dealership due to certain conditions of the seat covers (splits, wrinkles, loose stitching, etc.), you must examine the seat cover in order to determine the validity of the customer claim. Some components from the above listed vehicles have been returned to the Warranty Parts Center (WPC) and analysis of these parts showed "customer induced damage" or No Trouble Found (NTF).

The dealer should pay particular attention to the following conditions:



Customer induced cuts (knife cuts, cut by customer tools etc.)

Paint stains (customer should have cleaned paint stains while paint was still wet)

Coffee stains and other removable dirt

These should be cleaned as described in the Owners Manual under Appearance Care. Also refer to Corporate Bulletin Number 06-00-89-029A or later.

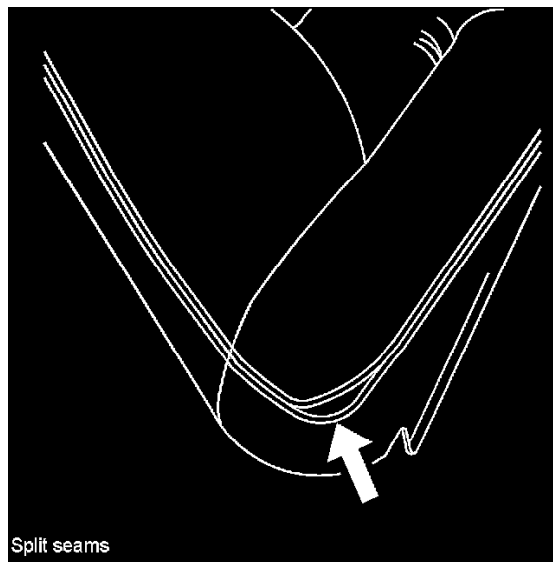
Evidence of chemicals used for cleaning other than those specified in the Owners Manual

Other chemical spills

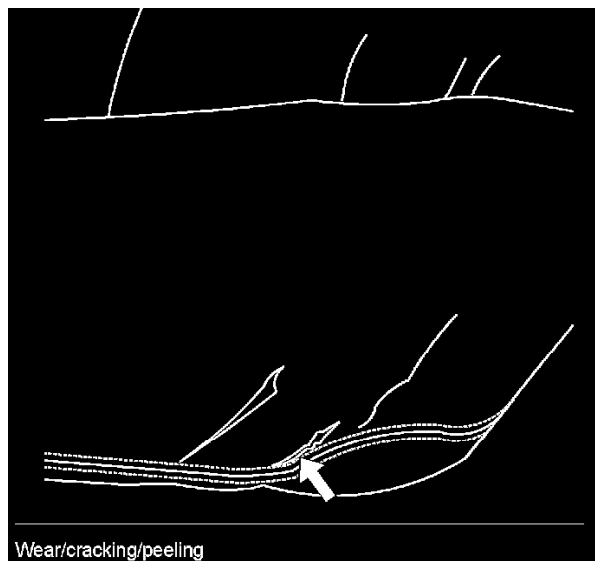
Minor and normal leather wrinkles as a result of use

Other defects to the seat cover not detected during the pre-delivery inspection (PDI).

Inform the customer that the above issues were not present when the vehicle was purchased and cannot be replaced under warranty. The covers, however, may be repaired or replaced at the customer's expense.



The following conditions are not caused by the customer and should be covered by warranty:



Discoloration/dye transfer from customer clothing (if discoloration/dye transfer is not removed after using GM Leather and Vinyl Plastic Cleaner P/N 88861401 (in Canada P/N 88861409) replace the covers.)

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Disclaimer Technical Service Bulletin # 99-04-20-002E

Date: 080606

## Drivetrain - Driveline Clunk Information

### INFORMATION

Bulletin No.: 99-04-20-002E

Date: June 06, 2008

Subject:  
Information on Driveline Clunk Noise When Shifting Between PARK and DRIVE, PARK and REVERSE or DRIVE and REVERSE

Models:  
2009 and Prior GM Passenger Cars and Light Duty Trucks (including Saturn)  
2009 and Prior HUMMER H2, H3  
2009 and Prior Saab 9-7X

Supercede:

This bulletin is being revised to add model years. Please discard Corporate Bulletin Number 99-04-20-002D (Section 04 - Driveline/Axle).

**Important:**

The condition described in this bulletin should not be confused with the following previous bulletins:

- ^ Info - Discontinue Flushing and Replacing Transfer Case Fluid Due to Bump/Clunk Concern (Corporate Bulletin Number 99-04-21-004A or newer).
- ^ Clunk, Bump or Squawk when Vehicle Comes to Complete Stop or Accelerating from Complete Stop (Replace Rear Drive Shaft Nickel-Plated Slip Yoke) (Corporate Bulletin Number 01-04-17-004B or newer).

Some owners of vehicles equipped with automatic transmissions may comment that the vehicle exhibits a clunk noise when shifting between Park and Drive, Park and Reverse, or Drive and Reverse. Similarly, owners of vehicles equipped with automatic or manual transmissions may comment that the vehicle exhibits a clunk noise while driving when the accelerator is quickly depressed and then released.

Whenever there are two or more gears interacting with one another, there must be a certain amount of clearance between those gears in order for the gears to operate properly. This clearance or freeplay (also known as lash) can translate into a clunk noise whenever the gear is loaded and unloaded quickly, or whenever the direction of rotation is reversed. The more gears you have in a system, the more freeplay the total system will have.

The clunk noise that owners sometimes hear may be the result of a buildup of freeplay (lash) between the components in the driveline.

For example, the potential for a driveline clunk would be greater in a 4-wheel drive or all-wheel drive vehicle than a 2-wheel drive vehicle. This is because in addition to the freeplay from the rear axle gears, the universal joints, and the transmission (common to both vehicles), the 4-wheel drive transfer case gears (and their associated clearances) add additional freeplay to the driveline.

In service, dealers are discouraged from attempting to repair driveline clunk conditions for the following reasons:

- ^ Comments of driveline clunk are almost never the result of one individual component with excessive lash, but rather the result of the added affect of freeplay (or lash) present in all of the driveline components.
- ^ Because all of the components in the driveline have a certain amount of lash by design, changing driveline components may not result in a satisfactory lash reduction.
- ^ While some owners may find the clunk noise objectionable, this will not adversely affect durability or performance.
- ^ For additional diagnostic information, refer to the appropriate Service Information.

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Disclaimer Technical Service Bulletin # **08-07-30-027**

Date: **080604**

**A/T - No Movement in Drive or 3rd Gear****TECHNICAL**

Bulletin No.: 08-07-30-027

Date: June 04, 2008

**Subject:**

No Movement When Transmission is Shifted to Drive or Third - Normal Operation When Shifted to Second, First or Reverse (Replace Forward Sprag Assembly)

**Models:**

1982 - 2005 GM Passenger Cars and Light Duty Trucks  
2006 - 2007 Buick Rainier  
2006 Cadillac Escalade, Escalade ESV, Escalade EXT  
2006 Chevrolet SSR  
2006 - 2008 Chevrolet Avalanche, Colorado, Express, Silverado Classic, Silverado, Suburban, Tahoe, TrailBlazer  
2006 GMC Yukon Denali, Yukon Denali XL  
2006 - 2008 GMC Canyon, Envoy, Savana, Sierra Classic, Sierra, Yukon, Yukon XL  
2006 Pontiac GTO  
2006 - 2007 HUMMER H2

2006 - 2008 HUMMER H3  
2006 - 2008 Saab 9-7X

with 4L60, 4L60E, 4L65E or 4L70E Automatic Transmission (RPOs MD8, M30, M32, M33 or M70)

## Condition

Some customers may comment that the vehicle has no movement when the transmission is shifted to DRIVE or THIRD position, but there is normal operation when it is shifted to SECOND, FIRST or REVERSE position.

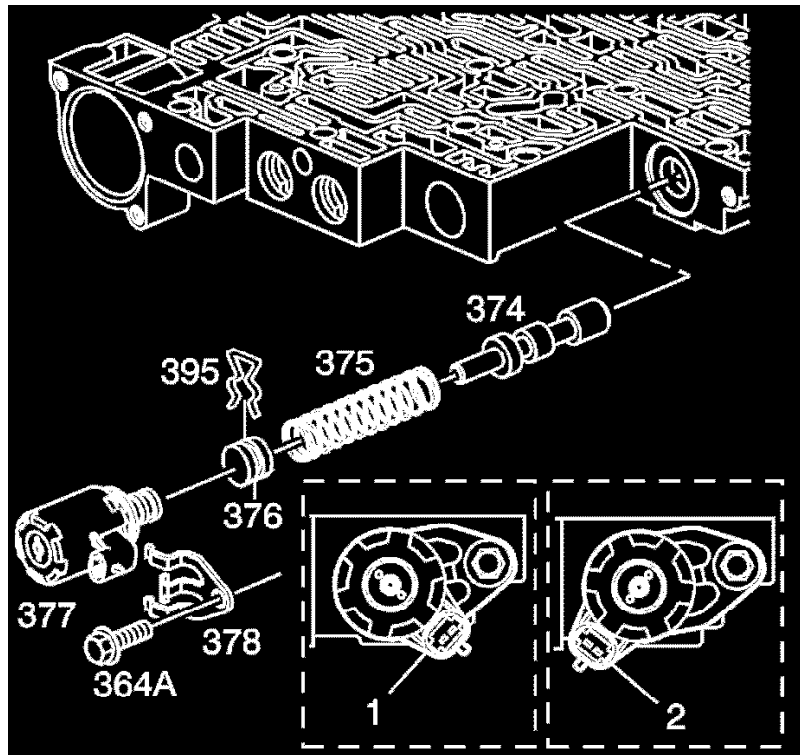
## Cause

This condition may be caused by a damaged forward sprag assembly (642).

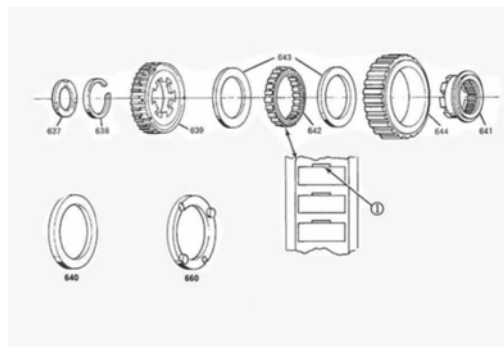
## Correction

When inspecting the sprag, it is important to test the sprag for proper operation by holding the outer race (644) with one hand while rotating the input sun gear (640) with the other hand. The sun gear should rotate only in the counterclockwise direction with the input sun gear facing upward. If the sprag rotates in both directions or will not rotate in either direction, the sprag elements should be inspected by removing one of the sprag assembly retaining rings (643). Refer to SI Unit Repair section for forward clutch sprag disassembly procedures.

If the sprag is found to be damaged, make repairs to the transmission as necessary. A new forward roller clutch sprag assembly is now available from GMSPO.



If clutch debris is found, it is also very important to inspect the Pressure Control (PC) solenoid valve (377) fluid screens. Clean or replace the PC solenoid (377) as necessary. It is also important to flush and flow check the transmission oil cooler using J45096. Refer to SI Automatic Transmission Oil Cooler Flushing and Flow Test for the procedure.



The notches above each sprag must point up as shown when assembled into the outer race.

Bearing Assembly, Input Sun Gear

Snap Ring, Overrun Clutch Hub Retaining

Hub, Overrun Clutch

Wear Plate, Sprag Assembly

Retainer and Race Assembly, Sprag

Forward Sprag Assembly

Retainer Rings, Sprag Assembly

Outer Race, Forward Clutch

Washer, Thrust (Input Carrier to Race)

The following information applies when this sprag is used in 1982-86 transmissions.

The new design sprag can be used on models 1982 through 1986, by replacing the entire assembly (637 - 644). Individual components are NOT interchangeable.

**Important:**

The wear plate (640) and input thrust washer (660) are not required with the new sprag. Use of the thrust washer and wear plate with the new sprag assembly will cause a misbuild (correct end play cannot be obtained).

Part Number	Description
24241477	Sprag, Forward Clutch

Parts Information

Warranty Information

Labor Operation	Description	Labor Time
K7253	Sprag, Forward Clutch — Replace	Use Published Labor Operation Time

For vehicles repaired under warranty, use the table.

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DisclaimerTechnical Service Bulletin # 03-07-29-004E

Date: 080502

## M/T - Operating Characteristics of Manual Transmissions

### INFORMATION

Bulletin No.: 03-07-29-004E

Date: May 02, 2008

Subject:

Manual Transmission Operating Characteristics

Models:

2009 and Prior Passenger Cars and Light Duty Trucks (Including Saturn)

2009 and Prior Chevrolet and GMC Medium Duty Trucks

2006-2009 HUMMER H3

2009 and Prior Isuzu Medium Duty Trucks

with Manual Transmission

Supercede:

This bulletin is being revised to add the 2009 model year. Please discard Corporate Bulletin Number 03-07-29-004D (Section 07 - Transmission/Transaxle).

**Important:**

Even though this bulletin attempts to cover operating characteristics of manual transmissions, it cannot be all inclusive. Be sure to compare any questionable concerns to a similar vehicle and if possible, with similar mileage. Even though many of the conditions are described as characteristics and may not be durability issues, GM may attempt to improve specific issues for customer satisfaction.

The purpose of this bulletin is to assist in identifying characteristics of manual transmissions that repair attempts will not change. The following are explanations and examples of conditions that will generally occur in all manual transmissions. All noises will vary between transmissions due to build variation, type of transmission (usually the more heavy duty, the more noise), type of flywheel and clutch, level of insulation, etc.

**Basic Information**

Many transmission noises are created by the firing pulses of the engine. Each firing pulse creates a sudden change in angular acceleration at the crankshaft. These changes in speed can be reduced with clutch damper springs and dual mass flywheels. However, some speed variation will make it through to the transmission. This can create noise as the various gears will accel and decel against each other because of required clearances.

**Gear Rattle**

Rattling or grinding (not to be confused with a missed shift type of grinding, also described as a combustion knock type of noise) type noises usually occur while operating the engine at low RPMs (lugging the engine). This can occur while accelerating from a stop (for example, a Corvette) or while operating at low RPMs while under a load (for example, Kodiak in a lower gear and at low engine speed). Vehicles equipped with a dual-mass flywheel (for example, a 3500 HD Sierra with the 6-speed manual and Duramax(R)) will have reduced noise levels as compared to vehicles without (for example a 4500 Kodiak with the 6-speed manual and Duramax(R)). However, dual-mass flywheels do not eliminate all noise.

**Neutral Rattle**

There are often concerns of rattle while idling in neutral with the clutch engaged. This is related to the changes in angular acceleration described earlier. This is a light rattle, and once again, vehicles with dual mass flywheels will have reduced noise. If the engine is shut off while idling in neutral with the clutch engaged, the sudden stop of the engine will create a rapid change in angular acceleration that even dual mass flywheels can not compensate. Because of the mass of all the components, this will create a noise. This type of noise should not be heard if the clutch is released (pedal pushed to the floor).

**Backlash**

Backlash noise is created when changing engine or driveline loading. This can occur when accelerating from a stop, coming to a stop, or applying and releasing the throttle (loading and unloading the driveline). This will vary based on vehicle type, build variations, driver input, vehicle loading, etc. and is created from the necessary clearance between all of the mating gears in the transmission, axle(s) and transfer case (if equipped).

**Shift Effort**

Shift effort will vary among different style transmissions and synchronizer designs. Usually the more heavy duty the transmission, the higher the shift effort because of the increased mass of the components. Shift effort can also be higher in cold weather because the fluid will be thicker. Medium duty transmissions will not shift as quickly as a Corvette transmission. To reduce shift effort, do not attempt to rush the shift - allow the synchronizers to work as designed. Shifting harder will only increase the chance of rushing past the synchronizer leading to grinding while shifting.

**Non-Synchronized Gears**

Some light duty truck transmissions in 1st gear (creeper-gear) and reverse gears in various transmissions, along with all gears in some medium duty transmissions, may be non-synchronized. This means there is not a mechanism to match input and output shaft speeds to allow for a smooth shift. This function is left up to the driver. This can be noticed if a shift into 1st or reverse is attempted while the vehicle is rolling or before the input shaft stops rotating leading to a gear grind. The grinding can be reduced by coming to a complete stop and pausing for a moment before shifting into the 1st or reverse gear. Some slight grinding can be expected. In medium duty non-synchronized transmissions, the driver must match input shaft (engine) speed to output shaft (driveshaft) speed with every shift. This can be accomplished by double clutching, or by using other methods. If the driver is not able to perform this function properly, there will be gear grinding with each improperly completed shift. Driver training may be required to correct this condition. Clutch brakes are used in medium duty non-synchronized transmissions to allow a shift into gear at a stop. The clutch brake is used to stop the input shaft from spinning, allowing a shift into gear at a stop without grinding. The clutch brake is activated by pressing the clutch pedal all the way to the floor. When the clutch brake is used, it is possible to have a blocked shift with the vehicle stationary. If this occurs, engage the clutch slightly to rotate the input gear to allow the shift. The clutch brake is intended to only be used while at a stop. Care must be taken to not activate the clutch brake while shifting between gears. This could lead to excessive grinding or a blocked or missed shift.

**Skip Shift**

Currently, the Cadillac CTS-V, GTO, and Corvette (other models may follow) equipped with the 6-speed manual transmission have a feature referred to as a "skip-shift". This feature only allows a shift from 1st to 4th gear when the indicator lamp is illuminated on the dash. Dealers cannot disable this feature as it was established to help meet fuel economy standards. The conditions for this feature are: engine coolant at normal operating temperature, vehicle speed of 24-31 km/h (15-19 mph) 21% or less throttle being used (refer to Service Information or the Owner Manual for more details.)

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Disclaimer Technical Service Bulletin # **05-00-89-072B**

Date: **080617**

## Engine/Fuel System - Oil/Fuel Additive Information INFORMATION

Bulletin No.: 05-00-89-072B

Date: June 17, 2008

Subject:

Fuel and Oil Additives - Facts and Myths/Maximizing Fuel Economy

Models:

2009 and Prior GM Passenger Cars and Trucks (including Saturn)

2009 and Prior HUMMER H2, H3

2009 and Prior Saab 9-7X

### Attention:

Please direct this bulletin to the Service Manager, the Service Consultants and the Sales Staff. A copy of this bulletin is encouraged to be given to your customer as it is written with the consumer in mind. You may also post this bulletin in your customer lounge or waiting area.

Supersede:

This bulletin is being revised to add the 2009 model year. Please discard Corporate Bulletin Number 05-00-89-072A (Section 00 - General information).

### A Statement About Fuel Economy

As gasoline prices have increased, the consumer has shifted priorities to become increasingly concerned with fuel consumption. GM is presently proud to offer over 30 cars in the U.S. with EPA highway estimates of at least 30 mpg. In Canada, vehicles are rated for fuel consumption in liters per 100 kilometers. GM offers over 20 vehicles in Canada that consume less than 7.0 L/100 km on the highway. The information below contains reasonable and prudent advice for your dealership and the consumer to get the most from every gallon or liter of gas.

The information below is presented in two easy to understand sections:

^ What Not To Do: Engine and Fuel Additives, Alternate Fuels, and "Miracle" Products

^ What to Do: Maximizing Fuel Economy/Minimizing Costs

### WHAT NOT TO DO: Engine and Fuel Additives, Alternate Fuels, and "Miracle" Products

Various unproven products with claims to improve vehicle fuel economy have been reported ranging from magnets that align molecules to chemical combustion improvers.

Most products claiming to provide benefits are based on unsubstantiated claims. Those that do present "scientific" results generally either have too little supporting data to be conclusive, have not conducted experiments in a controlled fashion, or cannot be substantiated by anyone else but the product's manufacturer.

The U.S. Federal Trade Commission summarizes results for products tested by the federal government at [www.ftc.gov/bcp/edu/pubs/consumer/autos/aut10.shtm](http://www.ftc.gov/bcp/edu/pubs/consumer/autos/aut10.shtm). A review of the list shows that the majority did not work, and for those that showed some effect, the benefit was too small to be cost effective.

### Harmful Ideas That May Damage Your Vehicle and Increase Emissions

One more recent poor idea to improve fuel economy that should not be attempted is to blend either kerosene or diesel fuel into gasoline. Why? Both kerosene and diesel fuel are distillate fuels meant for use in compression ignition engines, not spark ignition engines. They have very low octane and since they are heavier (higher density) than gasoline, they will cause heavy engine deposits and degradation of engine oil.

### Notice:

Never put Kerosene or Diesel Fuel in your Gasoline Engine vehicle. This may result in inconsistent performance and permanent damage to your vehicle that is not covered by your New Vehicle Warranty.



Chemicals that are normally used as solvents also should not be used. These include acetone, ketones, and methanol. These solvents can be incompatible with your vehicles rubber or sealing components, and may dissolve the vehicle's paint finish. In the case of methanol, corrosion of metal parts in the fuel system also may occur.

**Notice:**

Never use acetone, ketones, or methanol additives in your vehicle. Some of these solvents may damage or corrode your fuel system. They are also very damaging to the painted surfaces of the vehicle if spilled. Damage to vehicle components that result from non-approved or aftermarket additives and devices are not covered under the terms of the New Vehicle Warranty. The only fuel additive currently approved by GM is GM Fuel System Treatment Plus, P/N 88861011 (in Canada, # 88861012).

**WHAT TO DO: Maximizing Fuel Economy/Minimizing Costs**

The best fuel economy possible is the direct result of proper maintenance and good driving habits. Listed below are GM's recommendations to achieve the best mileage possible. The first group are things to consider for your vehicle, while the second are tips relating to your driving habits.

**Vehicle Considerations:**

- ^ Tire Pressure - One of the major contributors to poor fuel economy are under inflated tires. Tires low on pressure create drag that the vehicle's powertrain must overcome, wasting dollars in fuel. Always keep your tires inflated to the proper pressure as shown on the vehicle placard. This not only serves to increase gas mileage but cuts down on tire wear, further decreasing your costs per mile.
- ^ Air Filter - A vehicle that has a dirty air filter can't efficiently draw air into the engine. This restriction forces the engine to expend energy to "breathe" wasting fuel in the process. Change recommendations are found in your vehicle Owner's Manual.
- ^ Proper Viscosity "Starburst" Rated Oil - Always use the proper viscosity oil in your engine. Oil that has a higher than required viscosity will create more drag on the internal components of the engine, causing more work for it, especially when cold. Each Owner's Manual contains information on the proper type of oil for your vehicle. Look for the "starburst" symbol on the front of the bottle, and the SM rating on the API circle on the back label. If you are in doubt, stop by your dealer for an oil change, and any other services required. Most current GM vehicles are equipped with oil life monitors to further assist on the "when" to change your oil. (Aveo/Wave/Optra/Epica currently do not have oil life monitors).

**Notice:**

GM Vehicles DO NOT require additional engine oil additives. Some additives may cause harmful effects to the internal seals and additionally void the terms of your vehicles New Car Warranty.

- ^ Top Tier Fuels - Some fuel manufacturers provide gasoline advertised as TOP TIER DETERGENT GASOLINE (Chevron, Conoco, Phillips 66, Shell, Texaco, Entec Stations, MFA Oil Company, 76, Somerset Oil, Aloha Petroleum, Tri-Par Oil Company, QuikTrip, and Kwik Trip) in the U.S. and (Petro-Canada, Chevron, Shell, and Sunoco) in Canada. These fuels are preferable when and where available. They help to keep your fuel injectors and intake valves free of deposits. Clean engines provide optimal fuel economy, performance and reduced emissions. When Top Tier fuels are not available, consider a bottle of GM Fuel System treatment PLUS, P/N# 88861011 (in Canada, # 88861012), at oil change time which will remove intake system and injector deposits. GM does not recommend any other fuel system cleaner.

**Important:**

DO NOT confuse Top Tier Fuels with Higher Octane (Plus/Premium Grade Fuel) commonly sold at most all gas stations. Plus and Premium fuels are required in some high performance GM vehicles. However, they do not necessarily represent higher detergency present in TOP TIER Detergent Gasoline.

**Important:**

For additional information regarding Top Tier fuels and availability, please refer to Corporate Bulletin Number 04-06-04-047G for U.S. or 05-06-04-022D for Canada.

**Notice:**

E85 FUELS: Only vehicles designated for use with E85 should use E85 blended fuel. E85 compatibility is designated for vehicles that are certified to run on up to 85% ethanol and 15% gasoline. All other gasoline engines are designed to run on fuel that contains no more than 10% ethanol. Use of fuel containing greater than 10% ethanol in non-E85 designated vehicles can cause driveability issues, service engine soon indicators as well as increased fuel system corrosion. See Corporate Bulletin Number 05-06-04-035C for additional information.

- ^ Use the Recommended Grade (Octane) Fuel

Purchasing higher than required octane fuel is a waste of money. Using higher octane fuels in a vehicle that only required regular unleaded fuel will neither increase performance nor improve gas mileage. In all cases refer to your owners manual and ONLY use the octane rated fuel recommended for your vehicle.

**Important:**

In high performance GM vehicles that DO require Premium (91 octane or higher) fuel, you MUST use fuels of at least this octane. Use of lower octane fuel may result in reduced performance, knocking, and/or permanent engine damage not covered under the terms of the New Vehicle Warranty.

- ^ Check Engine/Service Engine Soon Light - Is the Check Engine/SES light on? When this light is on, the vehicles On-Board diagnostics

computer has noticed that something is wrong. GM vehicles have many sensors that the computer uses to both control and sense actual fuel usage. When the computer lights the Check Engine/SES light it has lost some ability to run efficiently. This may result in increased fuel consumption, increased emissions, and/or driveability concerns.

- ^ Spark Plugs - Even though most current GM vehicles have 160,000 km (100,000 mi) service intervals for spark plugs, if your vehicle is at that point in its life, have the spark plugs changed to assure proper running and continued efficient, trouble free operation. Refer to the applicable Maintenance Schedule for spark plugs service intervals on Chevrolet Aveo, Optra, Epica, Pontiac Vibe, Wave and Saturn Astra.

#### Changes In Driving Habits:

- ^ Slow Down, Drive Smoothly - Avoid quick/full throttle acceleration from a standstill in town and high cruising speeds on the interstates. While the optimum MPG for highway cruising speed varies from vehicle to vehicle, faster is almost always worse. If your vehicle is equipped with a Driver Information Center that displays Instant Fuel Economy, select that read out and vary your cruising speed while on the highway. The display will change continuously with uphill and downhill sections but you should quickly be able to identify on level ground the speed range that your vehicle does the best in.
- ^ Empty Your Trunk - Avoid leaving unnecessary items in your trunk. It takes power to move increased weight and that means more gasoline consumption and reduced performance. While the change may be slight, multiplied by thousands of miles, it all adds up.
- ^ Avoid Extended Idling - There is no need to idle your engine till it reaches operating temperature. Idling wastes fuel.
- ^ Combine Trips - Your vehicle uses much more fuel when the engine is cold. This is especially true in the winter months when the engine will take the longest to warm up. Combine errands or trips so that the vehicle only needs to warm up once to encompass many different stops.

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Disclaimer Technical Service Bulletin # **04-06-04-047H**

Date: **080624**

## Fuel System - 'TOP TIER' Detergent Gasoline Information

### INFORMATION

Bulletin No.: 04-06-04-047H

Date: June 24, 2008

#### Subject:

TOP TIER Detergent Gasoline (Deposits, Fuel Economy, No Start, Power, Performance, Stall Concerns) U.S. Only

#### Models:

2009 and Prior GM Passenger Cars and Trucks (including Saturn) (U.S. Only)

2003-2009 HUMMER H2 (U.S. Only)

2006-2009 HUMMER H3 (U.S. Only)

2005-2009 Saab 9-7X (U.S. Only)

#### Supercede:

This bulletin is being revised to add model years and additional sources to the Top Tier Fuel Retailers list. Please discard Corporate Bulletin Number 04-06-04-047G (Section 06 - Engine/Propulsion System). In Canada, refer to Corporate Bulletin Number 05-06-04-022D.

A new class of fuel called TOP TIER Detergent Gasoline is appearing at retail stations of some fuel marketers. This gasoline meets detergency standards developed by six automotive companies. All vehicles will benefit from using TOP TIER Detergent Gasoline over gasoline containing the "Lowest Additive Concentration" set by the EPA. Those vehicles that have experienced deposit related concerns may especially benefit from the use of TOP TIER Detergent Gasoline.



Intake valve: 10,000 miles with TOP TIER Detergent Gasoline

Intake valve: 10,000 miles with Legal Minimum additive

^ Intake valve: 10,000 miles with TOP TIER Detergent Gasoline

^ Intake valve: 10,000 miles with Legal Minimum additive

#### Gasoline Brands That Currently Meet TOP TIER Detergent Gasoline Standards

- **Chevron**
- **Chevron-Canada**
- **QuikTrip**
- **Conoco**
- **Phillips 66**
- **76**
- **Shell**
- **Shell-Canada**
- **Entec Stations** located in the greater Montgomery, Alabama area.
- **MFA Oil Company** located throughout Missouri.
- **Kwik Trip, Inc.** in Minnesota and Wisconsin and **Kwik Star** convenience stores in Iowa.
- **The Somerset Refinery, Inc.** at Somerset Oil stations in Kentucky.
- **Aloha Petroleum**
- **Tri-Par Oil Company**
- **Turkey Hill Minit Markets**
- **Texaco**
- **Petro-Canada**
- **Sunoco-Canada**

As of November 15, 2006, all grades of the gasoline brands shown above meet the TOP TIER Detergent Gasoline.

What is TOP TIER Detergent Gasoline?

TOP TIER Detergent Gasoline is a new class of gasoline with enhanced detergency. It meets new, voluntary deposit control standards developed by six automotive companies that exceed the detergent requirements imposed by the EPA.

Where Can TOP TIER Detergent Gasoline Be Purchased?

The TOP TIER program began on May 3, 2004 and many fuel marketers have joined the program and have introduced TOP TIER Detergent Gasoline. This is a voluntary program and not all fuel marketers will offer this product. Once fuel marketers make public announcements, they will appear on a list of brands that meet the TOP TIER standards.

Where Can I find the Latest Information on TOP TIER Fuel and Retailers?

On the web, please visit [www.toptiergas.com](http://www.toptiergas.com) for additional information and updated retailer lists.

Who developed TOP TIER Detergent Gasoline standards?

TOP TIER Detergent Gasoline standards were developed by six automotive companies: Audi, BMW, General Motors, Honda, Toyota and Volkswagen.

Why was TOP TIER Detergent Gasoline developed?

TOP TIER Detergent Gasoline was developed to increase the level of detergent additive in gasoline. The EPA requires that all gasoline sold in the U.S. contain a detergent additive. However, the requirement is minimal and in many cases, is not sufficient to keep engines clean. In order to meet TOP TIER Detergent Gasoline standards, a higher level of detergent is needed than what is required by the EPA. Also, TOP TIER was developed to give fuel marketers the opportunity to differentiate their product.

Why did the six automotive companies join together to develop TOP TIER?

All six corporations recognized the benefits to both the vehicle and the consumer. Also, joining together emphasized that low detergency is an issue of concern to several automotive companies.

What are the benefits of TOP TIER Detergent Gasoline?

TOP TIER Detergent Gasoline will help keep engines cleaner than gasoline containing the "Lowest Additive Concentration" set by the EPA. Clean engines help provide optimal fuel economy and performance and reduced emissions. Also, use of TOP TIER Detergent Gasoline will help reduce deposit related concerns.

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DisclaimerTechnical Service Bulletin # **08-03-10-005**

Date: **080501**

## **Wheels/Tires - Chrome or Chrome Plated Steel Valve Caps** INFORMATION

Bulletin No.: 08-03-10-005

Date: May 01, 2008

Subject:  
Use of Chrome or Chrome Plated Steel Valve Caps on Aluminum Valve Stems

Models:  
2009 and Prior GM Passenger Cars and Light Duty Trucks (including Saturn)  
2009 and Prior HUMMER H2, H3  
2009 and Prior Saab 9-7X

This bulletin is being issued to inform dealers about the use of chrome or chrome-plated steel valve caps on aluminum valve systems.

Dealers/customers cannot install a chrome or chrome-plated steel valve cap on an aluminum valve system. If this happens the contact between the different metals results in galvanic corrosion which will seize the cap to the stem and may fracture the stem when attempting to remove the cap.

Inform customers of corrosion issues when chrome or chrome-plated steel valve caps are used on aluminum valve stems. Use only plastic or aluminum caps with aluminum valve systems.

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DisclaimerTechnical Service Bulletin # **00-00-89-027E**

Date: **080929**

## **Interior - Elimination Of Unwanted Odors** INFORMATION

Bulletin No.: 00-00-89-027E

Date: September 29, 2008

Subject:  
Eliminating Unwanted Odors in Vehicles

Models:  
2009 and Prior GM Passenger Cars and Trucks (including Saturn)  
2009 and Prior HUMMER H2, H3 Vehicles  
2009 and Prior Saab 9-7X

Supersede:

This bulletin is being revised to add model years and refine the instructions. Please discard Corporate Bulletin Number 00-00-89-027D (Section 00 - General Information).

## Vehicle Odor Elimination

General Motors offers a product that may control or eliminate odors in the interior and luggage compartment areas of GM vehicles. GM Vehicle Care Odor Eliminator is a non-toxic, biodegradable odor remover. This odorless product has been shown to greatly reduce or remove objectionable smells of mold and mildew resulting from vehicle water leaks (as well as customer created odors, i.e. smoke). You may use GM Vehicle Care Odor Eliminator on fabrics, vinyl, leather, carpet and sound deadening materials. It may also be induced into HVAC modules and instrument panel ducts (for the control of non-bacterial related odors).

### **Important:**

This product leaves no residual scent and should not be sold as or considered an air freshener. Product action may result in the permanent elimination of an odor and may be preferable to customers with allergies who are sensitive to perfumes.

### How to Use This Product

GM Vehicle Care Odor Eliminator may be sprayed on in a ready-to-use formula or used in steam cleaners as an additive with carpet shampoo. This water-based, odorless product is safe for all vehicle interiors. Do not wet or soak any interior surface that plain water would cause to deteriorate, as this product will have the same effect. Also avoid letting this product come into contact with vinegar or any acidic substance. Acid-based products will hamper the effectiveness of, or render GM Vehicle Care Odor Eliminator inert.

### **Note:**

Complete eight page treatment sheets are enclosed within each case of GM Vehicle Care Odor Eliminator. These treatment instructions range from simple vehicle odor elimination to full step by step procedures for odor removal from water leaks. If lost, contact 800-977-4145 to get a replacement set faxed or e-mailed to your dealership.

Instructions and cautions are printed on the bottle, but additional help is available. If you encounter a difficult to eliminate or reoccurring odor, you may call 1-800-955-8591 (in Canada, 1-800-977-4145) to obtain additional information and usage suggestions.

### **Important:**

This product may effectively remove odors when directly contacting the odor source. It should be used in conjunction with diagnostic procedures (in cases such as a water leak) to first eliminate the root cause of the odor, and then the residual odor to permanently correct the vehicle condition.

## Vehicle Waterleak Odor Elimination

### STEP ONE:

Confirm that all water leaks have been repaired. Determine what areas of the vehicle were water soaked or wet. Components with visible mold/mildew staining should be replaced. Isolate the odor source inside the vehicle. Often an odor can be isolated to an area or component of the vehicle interior by careful evaluation. Odor evaluation may need to be performed by multiple persons. Another method of isolating an odor source is to remove and segregate interior trim and components. Plastic sheeting or drop cloths can be used to confine seats, headliners, etc. to assist in evaluation and diagnoses. If appropriate the vehicle and interior trim should be evaluated separately to determine if the odor stays with the vehicle or the interior components. Odors that stay with the vehicle may be isolated to insulating and sound deadening materials (i.e. water leak at the windshield or standing water in the front foot well area caused mold/mildew to form on the bulkhead or kick panel sound deadening pads. If the interior is removed the floor pan and primed/painted surfaces should be treated with bleach/soap solution, rinsed with clean water and dried. Interior surfaces should then be treated with GM Vehicle Care Odor Eliminator product before reinstalling carpet or reassembling.

The GM Vehicle Care Odor Eliminator product is an effective odor elimination product when used properly. It must come into direct contact with the odor source. It should be used in conjunction with diagnostic procedures to first eliminate the root cause of the odor. Some procedures for use after odor root cause correction are:

### STEP TWO:

- ^ Use the trigger spray head.
- ^ Put a drop of dish soap the size of a quarter in the bottom of a bottle.
- ^ Add 8 oz. of GM Vehicle Care Odor Eliminator (1 cup) to the dish soap and top off the bottle with tap water.
- ^ This formula should be used on hard surfaces (dash, interior plastic molding, and floor pan)

### STEP THREE:

The third step to neutralizing the vehicle is a light to medium treatment of all carpeting and upholstered seats with the GM Vehicle Care Odor Eliminator formula and a wide fan spray setting (at full strength) (i.e.: carpeting on the driver's side requires 4-5 triggers pulls for coverage). The headliner and trunk should be sprayed next. Lightly brushing the formula into the carpeting and upholstery is a recommended step for deep odor problems. The dash and all hard surfaces should be sprayed with dish soap/water mixture. Let stand for 1-2 minutes then wipe off the surface.

### STEP FOUR: (vehicle ventilation system treatment)

The ventilation system is generally the last step in the treatment of the vehicle.

- a. Spray the GM Vehicle Care Odor Eliminator formula into all dash vents. (1-2 trigger pulls per vent).
- b. Start the vehicle and turn the vehicle fan on high cool (not A/C setting).
- c. Spray the formula (10 trigger pulls) into the outside fresh air intake vent (cowl at base of windshield)
- d. Enter the vehicle after 1 minute and wipe off the excess formula spurting out of the dash vents.
- e. Smell the air coming from the dash vents. If odors are still present, spray another 5 triggers into the cowl, wait another minute and smell the results. Once you have obtained a fresh, clean smell coming from the vents, turn the system to the A/C re-circulation setting. Roll up the windows, spray 3-5 pumps into the right lower IP area and let the vehicle run with the fan set on high for 5-7 minutes.

Please follow this diagnosis process thoroughly and complete each step. If the condition exhibited is resolved without completing every step, the remaining steps do not need to be performed. If these steps do not resolve the condition, please contact GM TAC for further diagnostic assistance.

#### Additional Suggestions to Increase Customer Satisfaction

Here are some additional ideas to benefit your dealership and to generate greater customer enthusiasm for this product.

- ^ Keep this product on-hand for both the Service Department and the Used Car lot. Add value to your used car trades; treat loaner and demo cars during service and at final sale to eliminate smoke, pet, and other common odors offensive to customers. Make deodorizing a vehicle part of your normal vehicle detailing service.
- ^ Consider including GM Vehicle Care Odor Eliminator as a give-away item with new vehicle purchases. Many dealers give away as "gifts" various cleaning supplies at time of delivery. GM Odor Eliminator is one of a few products GM offers that has as many uses in the home as in the vehicle. Customers may find this product can be used for a host of recreational activities associated with their new vehicle, such as deodorizing a boat they tow, or a camper.
- ^ GM Odor Eliminator and many of the GM Vehicle Care products offer you the chance to increase dealership traffic as these superior quality products cannot be purchased in stores. Many Dealerships have product displays at the parts counter. Consider additional displays in the Customer Service Lounge, the Showroom and at the Service Desk or Cashier Window. Many customers who purchase vehicles and receive regular maintenance at your dealership may never visit the parts counter, and subsequently are not exposed to the variety and value that these products offer.

Part Number	Description
12378554 (U.S.)	GM Vehicle Care Odor Eliminator – 16 oz (0.473L) Non-Aerosol Bottles (Case of 12)
88901678 (Canada/Saturn)	

#### Parts Information

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Technical Service Bulletin # **05-06-02-001A**

Date: **080716**

## Cooling System, A/C - Aluminum Heater Cores/Radiators

### INFORMATION

Bulletin No.: 05-06-02-001A

Date: July 16, 2008

Subject:  
Information On Aluminum Heater Core and/or Radiator Replacement

Models:  
2005 and Prior GM Passenger Cars and Light Duty Trucks (including Saturn)  
2003-2005 HUMMER H2

Supercede:

This bulletin is being revised to update the Warranty Information. Please discard Corporate Bulletin Number 05-06-02-001 (Section 06 - Engine/Propulsion System).

**Important:**

2004-05 Chevrolet Aveo (Pontiac Wave, Canada Only) does not use DEX-COOL(R). Refer to the flushing procedure explained later in this bulletin.

The following information should be utilized when servicing aluminum heater core and/or radiators on repeat visits. A replacement may be necessary because erosion, corrosion, or insufficient inhibitor levels may cause damage to the heater core, radiator or water pump. A coolant check should be performed whenever a heater core, radiator, or water pump is replaced. The following procedures/ inspections should be done to verify proper coolant effectiveness.

**Caution:**

To avoid being burned, do not remove the radiator cap or surge tank cap while the engine is hot. The cooling system will release scalding fluid and steam under pressure if the radiator cap or surge tank cap is removed while the engine and radiator are still hot.

**Important:**

If the vehicle's coolant is low, drained out, or the customer has repeatedly added coolant or water to the system, then the system should be completely flushed using the procedure explained later in this bulletin.

**Technician Diagnosis**

^ Verify coolant concentration. A 50% coolant/water solution ensures proper freeze and corrosion protection. Inhibitor levels cannot be easily measured in the field, but can be indirectly done by the measurement of coolant concentration. This must be done by using a Refractometer J 23688 (Fahrenheit scale) or J 26568 (centigrade scale), or equivalent, coolant tester. The Refractometer uses a minimal amount of coolant that can be taken from the coolant recovery reservoir, radiator or the engine block. Inexpensive gravity float testers (floating balls) will not completely analyze the coolant concentration fully and should not be used. The concentration levels should be between 50% and 65% coolant concentrate. This mixture will have a freeze point protection of -34 degrees Fahrenheit (-37 degrees Celsius). If the concentration is below 50%, the cooling system must be flushed.

^ Inspect the coolant flow restrictor if the vehicle is equipped with one. Refer to Service Information (SI) and/or the appropriate Service Manual for component location and condition for operation.

^ Verify that no electrolysis is present in the cooling system. This electrolysis test can be performed before or after the system has been repaired. Use a digital voltmeter set to 12 volts. Attach one test lead to the negative battery post and insert the other test lead into the radiator coolant, making sure the lead does not touch the filler neck or core. Any voltage reading over 0.3 volts indicates that stray current is finding its way into the coolant. Electrolysis is often an intermittent condition that occurs when a device or accessory that is mounted to the radiator is energized. This type of current could be caused from a poorly grounded cooling fan or some other accessory and can be verified by watching the volt meter and turning on and off various accessories or engage the starter motor. Before using one of the following flush procedures, the coolant recovery reservoir must be removed, drained, cleaned and reinstalled before refilling the system.

**Notice:**

^ Using coolant other than DEX-COOL(R) may cause premature engine, heater core or radiator corrosion. In addition, the engine coolant may require changing sooner, at 30,000 miles (50,000 km) or 24 months, whichever occurs first. Any repairs would not be covered by your warranty. Always use DEX-COOL(R) (silicate free) coolant in your vehicle.

^ If you use an improper coolant mixture, your engine could overheat and be badly damaged. The repair cost would not be covered by your warranty. Too much water in the mixture can freeze and crack the engine, radiator, heater core and other parts.

**Flushing Procedures using DEX-COOL(R)**

**Important:**

The following procedure recommends refilling the system with DEX-COOL(R), P/N 12346290 (in Canada, use P/N 10953464), GM specification 6277M. This coolant is orange in color and has a service interval of 5 years or 240,000 km (150,000 mi). However, when used on vehicles built prior to the introduction of DEX-COOL(R), maintenance intervals will remain the same as specified in the Owner's Manual.

^ If available, use the approved cooling system flush and fill machine (available through the GM Dealer Equipment Program) following the manufacturer's operating instructions.

^ If approved cooling system flush and fill machine is not available, drain the coolant and dispose of properly following the draining procedures in the appropriate Service Manual. Refill the system using clear, drinkable water and run the vehicle until the thermostat opens. Repeat and run the vehicle three (3) times to totally remove the old coolant or until the drained coolant is almost clear. Once the system is completely flushed, refill the cooling system to a 50%-60% concentration with DEX-COOL(R), P/N 12346290 (in Canada, use P/N 10953464), GM specification 6277M, following the refill procedures in the appropriate Service Manual.

If a Service Manual is not available, fill half the capacity of the system with 100% DEX-COOL(R), P/N 12346290 (in Canada, use P/N 10953464), GM specification 6277M. Then slowly add clear, drinkable water (preferably distilled) to the system until the level of the coolant mixture has

reached the base of the radiator neck. Wait two (2) minutes and reverify the coolant level. If necessary, add clean water to restore the coolant to the appropriate level.

Once the system is refilled, reverify the coolant concentration using a Refractometer J 23688 (Fahrenheit scale) or J 26568 (centigrade scale) coolant tester, or equivalent. The concentration levels should be between 50% and 65%.

#### Flushing Procedures using Conventional Silicated (Green Colored) Coolant

##### Important:

2004-2005 Chevrolet Aveo (Pontiac Wave, Canada Only) does not use DEX-COOL(R). The Aveo and Wave are filled with conventional, silicated engine coolant that is blue in color. Silicated coolants are typically green in color and are required to be drained, flushed and refilled every 30,000 miles (48,000 km). The Aveo and Wave are to be serviced with conventional, silicated coolant. Use P/N 12378560 (1 gal) (in Canada, use P/N 88862159 (1 L). Refer to the Owner's Manual or Service Information (SI) for further information on OEM coolant.

##### Important:

Do not mix the OEM orange colored DEX-COOL(R) coolant with green colored coolant when adding coolant to the system or when servicing the vehicle's cooling system. Mixing the orange and green colored coolants will produce a brown coolant which may be a customer dissatisfier and will not extend the service interval to that of DEX-COOL(R). Conventional silicated coolants offered by GM Service and Parts Operations are green in color.

^ If available, use the approved cooling system flush and fill machine (available through the GM Dealer Equipment Program) following the manufacturer's operating instructions.

^ If approved cooling systems flush and fill machine is not available, drain coolant and dispose of properly following the draining procedures in appropriate Service Manual. Refill the system using clear, drinkable water and run vehicle until thermostat opens. Repeat and run vehicle three (3) times to totally remove old coolant or until drained coolant is almost clear. Once the system is completely flushed, refill the cooling system to a 50%-60% concentration with a good quality ethylene glycol base engine coolant, P/N 12378560, 1 gal (in Canada, use P/N 88862159 1 L), conforming to GM specification 1825M, or recycled coolant conforming to GM specification 1825M, following the refill procedures in the appropriate Service Manual.

If a Service Manual is not available, fill half the capacity of the system with 100% good quality ethylene glycol base (green colored) engine coolant, P/N 12378560 1 gal., (in Canada, use P/N 88862159 1 L) conforming to GM specification 1825M. Then slowly add clear, drinkable water (preferably distilled) to system until the level of the coolant mixture has reached the base of the radiator neck. Wait two (2) minutes and recheck coolant level. If necessary, add clean water to restore coolant to the appropriate level.

Once the system is refilled, recheck the coolant concentration using a Refractometer J 23688 (Fahrenheit scale) or J 26568 (centigrade scale) coolant tester, or equivalent. Concentration levels should be between 50% and 65%.

Part Number	Description
12346290 (in Canada, 10953464)	Coolant, Extended Life (DEX-COOL®)
12378560 (in Canada, 88862159)	Coolant, Conventional (Green Colored) 1 gal. (in Canada 1 L)

#### Parts Information

#### Warranty Information

Labor Operation	Description	Labor Time
J 3100	Radiator Assembly – Replace	Use Published Labor Operation Time
J 3250	Radiator Surge Tank – Replace	Use Published Labor Operation Time
J 3523	Cord, Engine Coolant Heater – Replace	Use Published Labor Operation Time
J 3524	Heater, Engine Coolant – Replace	Use Published Labor Operation Time
J 3540	Cooling System – Flush	Use Published Labor Operation Time

For vehicles repaired under warranty, use the table.

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Bulletin No.: 05-03-07-009B

Date: June 27, 2008

Subject:  
Wheel Alignment Specifications, Requirements and Recommendations for GM Vehicles

Models:  
2009 and Prior GM Passenger Cars and Light Duty Trucks (Including Saturn)  
2009 and Prior HUMMER H2, H3  
2009 and Prior Saab 9-7X

Supercede:

This bulletin is being revised to add 2008 & 2009 model years. Please discard Corporate Bulletin Number 05-03-07-009A (Section 03 - Suspension).

The purpose of this bulletin is to provide retail and wholesale personnel with General Motors specifications, requirements and recommendations for wheel alignment equipment and alignment procedures.

#### Wheel Alignment Specifications

Technicians must refer to SI for the correct wheel alignment specifications for each vehicle. SI is the only source of GM wheel alignment specifications that is up-to-date throughout the year. The wheel alignment specifications loaded in any wheel alignment machine by the equipment manufacturer may be incorrect and/or outdated, even if the dealership subscribes to the manufacturer's update service. GM used to send certain manufacturers an annual update of the wheel alignment specifications for the new model year in early summer. Certain equipment manufacturers now subscribe to GM's SI service to obtain updates for GM alignment specifications, however, because changes to the wheel alignment specifications may occur during the model year, dealership alignment machines may or may not be up to date with the current specifications. Therefore, it is required that the technicians refer directly to SI for the latest updates and any changes to the wheel alignment specifications.

Using incorrect and/or outdated specifications may result in unnecessary adjustments, irregular and/or premature tire wear and repeat customer concerns.

#### Conditions Possibly Requiring a Wheel Alignment

- ^ Lead/pull defined as "at a constant highway speed on a typical straight road, the amount of effort required at the steering wheel to maintain the vehicle's straight path."
- ^ Steering wheel off-center (clockwise or counterclockwise)
- ^ Unusual tire wear (slight to very slight "feathering" or "edge" wear on the shoulders of tires is NOT considered unusual and should even up with a tire rotation at or before the next scheduled maintenance interval)
- ^ Other repairs that affect wheel alignment

#### Alignment Equipment

Alignments must be performed with a quality alignment machine that will give accurate results when performing alignment checks. "External Reference" (image-based camera technology) is preferred.

#### Requirements

- ^ Computerized four wheel alignment system
- ^ Computer capable of printing before and after alignment reports
- ^ Computer capable of time and date stamp printout
- ^ Racking system must have jacking capability
- ^ Racking system must be capable of level to 1.6 mm (1/16 in)
- ^ Appropriate wheel stops and safety certification
- ^ Built-in turn plates and slip plates
- ^ Wheel clamps capable of attaching to 20" or larger wheels
- ^ Racking capable of accepting any GM passenger car or light duty truck

^ Operator properly trained and ASE-certified (U.S. only) in wheel alignment

## Recommendations

Racking should have front and rear jacking capability.

## Equipment Maintenance and Calibration

Alignment machines must be regularly calibrated in order to give correct information. Most manufacturers recommend the following:

^ Alignment machines with "internal reference" sensors should be checked (and calibrated, if necessary) every six months.

^ Alignment machines with "external reference" (image-based camera technology) should be checked (and calibrated, if necessary) once a year.

^ Racks must be kept level to within 1.6 mm (1/16 in).

^ If any instrument that is part of the alignment machine is dropped or damaged in some way, check the calibration immediately.

Check with the manufacturer of your specific equipment for their recommended service/calibration schedule.

## Warranty Claim Documentation

### **Important:**

Failure to have proper documentation of the repair order may result in denial or chargeback of the warranty claim.

In order to properly document a warranty claim for alignment, the following must be completed:

^ Details of the customer's concern or complaint are to be noted at the time of repair order write-up by recording the description of the customer's problem.

^ The technician's description of the cause of the concern and the repairs performed must be written on all copies of the repair order.

^ "Before" and "After" alignment settings are to be recorded on the repair order. An alignment machine printout of "Before" AND "After" settings with date/time stamp is to be attached to the repair order by dealers who have printout capable equipment.

^ Documentation of alignment machine calibration within the last 12 months must be available for AVM (in Canada, DSM, for Saturn, DSSM) review upon request.

^ Prior wholesale approval required for vehicles under 800 km (500 mi) or over 12,000 km (7,500 mi) (will now apply to Saturn retailers also). Refer to the GM Service Policies and Procedures Manual for complete warranty policy information.

## Alignment Process

When performing wheel alignment measurement and/or adjustment, the following steps should be taken:

### Preliminary Steps

1. Verify that the vehicle has a full tank of fuel (compensate as necessary).
2. Inspect the wheels and the tires for damage.
3. Inspect the tires for the proper inflation and irregular tire wear.
4. Inspect the wheel bearings for excessive play.
5. Inspect all suspension and steering parts for looseness, wear, or damage.
6. Inspect the steering wheel for excessive drag or poor return due to stiff or rusted linkage or suspension components.
7. Inspect the vehicle trim height.
8. Compensate for frame angle on targeted vehicles (refer to Wheel Alignment Specifications in SI).

Satisfactory vehicle operation may occur over a wide range of alignment angles. However, if the wheel alignment angles are not within the range of specifications, adjust the wheel alignment to the specifications. Refer to Wheel Alignment Specifications in SI. Give consideration to excess loads, such as tool boxes, sample cases, etc. Follow the alignment equipment manufacturer's instructions.

## Measure/Adjust

**Notice:**

Prior to making any adjustments to wheel alignment on a vehicle, technicians must verify that the wheel alignment specifications loaded into the wheel alignment machine are up-to-date by comparing these to the wheel alignment specifications for the appropriate model and model year in SI. Using incorrect and/or outdated specifications may result in unnecessary adjustments, irregular and/or premature tire wear and repeat customer concerns.

**Important:**

When performing adjustments to vehicles requiring a 4-wheel alignment, set the rear wheel alignment angles first in order to obtain proper front wheel alignment angles.

Perform the following steps in order to measure the front and rear alignment angles:

1. Install the alignment equipment according to the manufacturer's instructions.
2. Jounce the front and the rear bumpers 3 times prior to checking the wheel alignment.
3. Measure the alignment angles and record the readings.

Adjust alignment angles to vehicle specification, if necessary. Refer to Wheel Alignment Specifications in SI.

Test drive the vehicle to ensure proper repair.

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Disclaimer Technical Service Bulletin # **05-06-04-022E**

Date: **080806**

## **Fuel System - TOP TIER Detergent Gasoline (Canada)**

### **INFORMATION**

Bulletin No.: 05-06-04-022E

Date: August 06, 2008

**Subject:**

TOP TIER Detergent Gasoline (Deposits, Fuel Economy, No Start, Power, Performance, Stall Concerns) - Canada ONLY

**Models:**

2009 and Prior GM Passenger Cars and Trucks (Canada Only)

2009 and Prior Saab Vehicles (Canada Only)

2009 and Prior Saturn Vehicles (Canada Only)

2003-2009 HUMMER H2 (Canada Only)

2006-2009 HUMMER H3 (Canada Only)

**Supersede:**

This bulletin is being revised to update the model years. Please discard Corporate Bulletin Number 05-06-04-022D (Section 06 - Engine/Propulsion System). In the U.S., refer to Corporate Bulletin Number 04-06-04-047H.



Intake valve: 16,093 km (10,000 mi) with TOP TIER Detergent Gasoline

Intake valve: 16,093 km (10,000 mi) with Minimum Additive recommended by the CGSB

A new class of fuel called TOP TIER Detergent Gasoline is appearing at retail stations of some fuel marketers. This gasoline meets detergency standards developed by six automotive companies. All vehicles will benefit from using TOP TIER Detergent Gasoline over gasoline containing the

"Lowest Additive Concentration" recommended by the Canadian General Standards Board (CGSB). Those vehicles that have experienced deposit related concerns may especially benefit from use of TOP TIER Detergent Gasoline.

#### Top Tier Fuel Availability

Chevron was the first to offer TOP TIER Detergent Gasoline in Canada. Shell became the first national gasoline retailer to offer TOP TIER Detergent Gasoline across Canada. Petro-Canada began offering TOP TIER Detergent Gasoline nationally as of October 1, 2006. Sunoco began offering TOP TIER Detergent Gasoline in March of 2007.

#### Gasoline Brands That Currently Meet TOP TIER Detergent Gasoline Standards

The following gasoline brands meet the TOP TIER Detergent Gasoline Standards in all octane grades:

- ^ Chevron Canada (markets in British Columbia and western Alberta)
- ^ Shell Canada (nationally)
- ^ Petro-Canada (nationally)
- ^ Sunoco-Canada (Ontario)

#### What is TOP TIER Detergent Gasoline?

TOP TIER Detergent Gasoline is a new class of gasoline with enhanced detergency and no metallic additives. It meets new, voluntary deposit control standards developed by six automotive companies that exceed the detergent recommendations of Canadian standards and does not contain metallic additives, which can damage vehicle emission control components.

#### Where Can TOP TIER Detergent Gasoline Be Purchased? Detergent Gasoline Be Purchased?

The TOP TIER program began in the U.S. and Canada on May 3, 2004. Some fuel marketers have already joined and introduced TOP TIER Detergent Gasoline. This is a voluntary program and not all fuel marketers will offer this product. Once fuel marketers make public announcements, they will appear on a list of brands that meet the TOP TIER standards.

#### Who developed TOP TIER Detergent Gasoline standards?

TOP TIER Detergent Gasoline standards were developed by six automotive companies: BMW, General Motors, Honda, Toyota, Volkswagen and Audi.

#### Why was TOP TIER Detergent Gasoline developed?

TOP TIER Detergent Gasoline was developed to increase the level of detergent additive in gasoline. In the U.S., government regulations require that all gasoline sold in the U.S. contain a detergent additive. However, the requirement is minimal and in many cases, is not sufficient to keep engines clean. In Canada, gasoline standards recommend adherence to U.S. detergency requirements but do not require it. In fact, many brands of gasoline in Canada do not contain any detergent additive. In order to meet TOP TIER Detergent Gasoline standards, a higher level of detergent is needed than what is required or recommended, and no metallic additives are allowed. Also, TOP TIER was developed to give fuel marketers the opportunity to differentiate their product.

#### Why did the six automotive companies join together to develop TOP TIER?

All six corporations recognized the benefits to both the vehicle and the consumer. Also, joining together emphasized that low detergency and the intentional addition of metallic additives is an issue of concern to several automotive companies.

#### What are the benefits of TOP TIER Detergent Gasoline?

TOP TIER Detergent Gasoline will help keep engines cleaner than gasoline containing the "Lowest Additive Concentration" recommended by Canadian standards. Clean engines help provide optimal fuel economy and engine performance, and also provide reduced emissions. Also, the use of TOP TIER Detergent Gasoline will help reduce deposit related concerns.

#### Who should use TOP TIER Detergent Gasoline?

All vehicles will benefit from using TOP TIER Detergent Gasoline over gasoline containing the "Lowest Additive Concentration" recommended by Canadian standards. Those vehicles that have experienced deposit related concerns may especially benefit from use of TOP TIER Detergent Gasoline. More information on TOP TIER Detergent Gasoline can be found at <http://www.toptiergas.com/>.

***SATURN* bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer." They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your *SATURN* Retailer for information on whether your vehicle may benefit from the information.**

Disclaimer Technical Service Bulletin # 05-03-10-005D

Date: 080911

## Wheels/Tires - Upsized Wheel/Tire Characteristics INFORMATION

Bulletin No.: 05-03-10-005D

Date: September 11, 2008

Subject:  
Performance Characteristics of Vehicles with Accessory Wheel/Tire Assemblies Installed as "Upsized" to Original Equipment

Models:  
2009 and Prior GM Passenger Cars and Light Duty Trucks (including Saturn)  
20062009 HUMMER H3

Supercede:

This bulletin is being revised to add the 2009 model year. Please discard Corporate Bulletin Number 05-03-10-005C (Section 03 - Suspension).

When GM Accessories wheel/tire assemblies are installed on a vehicle, customers may notice a change in the driving characteristics of the vehicle. The purpose of this document is to review the different performance characteristics of a vehicle with accessory wheel/tire assemblies installed.

### Vehicle Performance:

Use of larger "upsized" tire/wheel assemblies, in lieu of the standard factory installed tire/wheel assemblies, can change the vehicle's overall performance characteristics. Depending on road surface and driving conditions, the driver may note changes or differences in the following:

- ^ Tire/road noise
- ^ Ride stiffness
- ^ Tire tread wear rate
- ^ Steering effort
- ^ Fuel economy
- ^ Braking performance
- ^ Tire traction (wet/dry/snow/ice) Also, generally, tire chains cannot be used due to lack of clearance to the wheelhouse. Trucks equipped with accessory will not be compatible for use with snowplow equipment.

### Turning Information:

#### Important:

This section ONLY applies to the following vehicles:

- ^ 1999-2007 Silverado and Sierra (Classic)
- ^ 2000-2006 Fullsize Utilities

In a reverse turn, the tire may contact the plastic inner liner toward the rear and may also contact the sway bar. In a bounce/jounce condition, the tire may contact the top of the wheel house (the metal part inside the fender lip). These are all considered friendly surface contacts, meaning they will not damage the tire/wheel and are a characteristic of the upgrade.

### Warranty Information

All GM accessories sold and permanently installed on a GM vehicle prior to delivery will be covered under the provisions of the New Vehicle Limited Warranty.

The changes in ride handling listed above are considered normal conditions when upgrading to larger wheels/tires and are not covered by the New Vehicle Limited Warranty.

#### Wheels

For the U.S., in the event GM Accessories are installed AFTER new vehicle delivery, or are replaced under the new vehicle warranty, they will be covered (parts and labor) for the balance of the vehicle warranty, but in no event less than 12 months/12,000 miles. This coverage is only effective for GM Accessories permanently installed by a GM dealer or a GM approved ADI (Accessory Distributor / Installer).

For Canada, in the event GM Accessories are installed AFTER new vehicle delivery, they will be covered (parts and labor) for the balance of the vehicle warranty, or up to 12 months/unlimited kilometers depending on month installed. For replacement after the new vehicle warranty expires, but within the 12 months/unlimited kilometers coverage, refer to claim type "B" guidelines.

GM Accessories sold over-the-counter, or those not requiring installation, will continue to receive the standard GM Dealer Parts Warranty of 12 months from the date of purchase (parts only).

#### Tires:

Any approved tire installed on a GM Vehicle PRIOR to delivery will be covered under the provisions of the New Vehicle Limited Warranty. Tires are covered against defects in material and workmanship. Tires are warranted for defects "without" prorated charge for tread mileage. Subsequent replacements under this warranty will continue to be covered for the remainder of the New Vehicle Limited Warranty.

Any approved tire installed on a GM Vehicle PRIOR to delivery, may continue to be warranted on a prorated basis by the tire manufacturer once the New Vehicle Limited Warranty expires.

Any approved tire installed AFTER delivery will be covered under the provisions of the tire manufacturer warranty. U.S. dealers should refer to GM Warranty Administration Bulletin 00-03-10-003M and GM Parts Process/Policy Bulletin 1B03001 for more information.

Canadian dealers should refer to GM Warranty Administration Bulletin 01-03-10-003E.

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Technical Service Bulletin # **08-08-44-026**

Date: **080811**

## Audio System - Refurbishing Radio Faceplates/Knobs INFORMATION

Bulletin No.: 08-08-44-026

Date: August 11, 2008

#### Subject:

Information on Refurbish Instead of Replace Out of Warranty Radios with Worn Graphics on Faceplate, Knobs or Buttons

#### Models:

2009 and Prior GM Passenger Cars and Trucks (Including Saturn)

2009 and Prior HUMMER H2, H3

2009 and Prior Saab 9-7X

#### Attention:

This bulletin applies to vehicles out of warranty and sold in the United States only.

Some customers may have concerns about the wear on the radio faceplate, knobs or buttons and their vehicle is out of warranty requiring a customer pay repair.

ESC Name	Location	Telephone
AER Technologies (AEL)	Brea, CA	(714) 871-7357 or (800) 321-6970
AJR International, Inc (AJC)	Elmhurst, IL	(630) 832-0222 or (800) 232-3965
Autocraft Electronics (AED)	Carrollton, TX	(972) 466-6200 or (800) 336-3998
Instrument Sales & Service, Inc (ISS)	Kent, WA	(253) 796-5400 or (800) 666-5469
Model Electronics, Inc (MES)	Ramsey, NJ	(201) 961-6200 or (800) 433-9657
Specmo Enterprises (SED)	Madison Heights, MI	(248) 307-2570 or (800) 545-7910
Techni-Car, Inc (TCT)	Oldsmar, FL	(813) 855-0022 or (800) 886-0022

GM authorized Electronic Service Centers may have the ability to refurbish out of warranty radios instead of replacing it. To determine if refurbishment is available, please contact an authorized GM Electronic Service Center (ESC). This may result in a considerable cost savings to the customer.

For vehicles in warranty, follow the normal procedure of exchanging the radio at an authorized Electronic Service Center Service Center.

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Disclaimer Technical Service Bulletin # 06-08-111-004A

Date: 080915

## Body - Exterior Emblem Discoloration/Blistering/Peeling INFORMATION

Bulletin No.: 06-08-111-004A

Date: September 15, 2008

Subject:  
Information on Discoloration, Blistering, Peeling or Erosion of Various Exterior Emblems Including the Chevy Bowtie

Models:  
2009 and Prior GM Passenger Cars and Trucks (including Saturn)  
2003-2009 HUMMER H2  
2006-2009 HUMMER H3  
2005-2009 Saab 9-7X

Supercede:

This bulletin is being revised to add model years. Please discard Corporate Bulletin Number 06-08-111-004 (Section 08 - Body and Accessories).

### Chemical Discoloration of Badges

Through warranty reviews and visits to dealership storage lots, it has been determined that certain chemicals may discolor exterior badging. The badges most likely to be affected are referred to as Second Surface Acrylic Emblems. These emblems have a clear lens over the painted portion that lends depth to the badge. Several aggressive cleaners have been identified that when allowed to soak the emblem may migrate under the lens and discolor it.

#### Butyl Cellusolve

This chemical is one of the most likely to harm badges. This chemical is found in several cleaning products such as Simple Green, RainX, Orange Blast Wheel Cleaner, Purple Power Engine Degreaser and many others. Most of these products have warnings about contact with plastics. Further, these products generally are not intended for use as a cleaner of painted surfaces. The exception is RainX which if added to the washer reservoir may be dispersed into emblems from rear wiper/washers. Avoid the use of Butyl Cellusolve altogether.

#### Important:

Always use mild soap and water as a first step whenever cleaning a vehicle.

#### Other Chemical Concerns

The following three chemicals may also harm plastic emblems:

^ Oxalic Acid

^ Dihydrate Techorganic Acid

^ Hydroflorides

Contact with these chemicals is sometimes associated with products intended to clean bug marks off vehicles, as well as in diluted form in some commercial car washes.

When using any cleaners on exterior emblems, DO NOT soak the application rag. In some cases the cleaner may not harm the badge if used sparingly and not allowed to seep into the lens of the emblem. Always use mild soap and water as a first step whenever cleaning a vehicle.

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