AUTOMATIC TRANSAXLE

Return To Main Table of Contents

GENERAL 2
TRANSAXLE CONTROL 46
SHIFT LEVER ASSEMBLY 51
AUTOMATIC TRANSAXLE 53
AUTOMATIC TRANSAXLE ASSEMBLY 57
OIL PUMP ASSEMBLY 88
FRONT CLUTCH ASSEMBLY 91
REAR CLUTCH ASSEMBLY 94
END CLUTCH ASSEMBLY 97
PLANETARY GEAR SET 100
INTERNAL GEAR AND TRANSFER DRIVE GEAR SET ASSEMBLY 104
DIFFERENTIAL 106
VALVE BODY 109
KICKDOWN SERVO 124
SPEEDOMETER SLEEVE 125
TRANSAXLE CASE 126
AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT 127

GENERAL

SPECIFICATIONS

Type	Automatic four speed with torque converter and internal differential KM 175
Torque converter	
Type	Spring type damper clutch
Engine stall speed	2000±200 rpm
Stall torque ratio	**2.17**
Transaxle	
Type	Electronically controlled 4-speed full-automatic
Gear ratio	
First	2.646
Second	1.661
Third	1.000
Fourth	0.665
Reverse	2.176
Final gear ratio	4.360
Speedometer gear ratio	Drive 36/Driven 32

TIGHTENING TORQUE

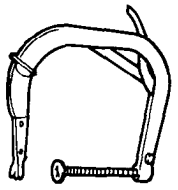
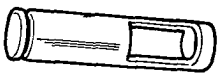
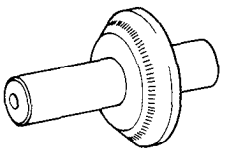
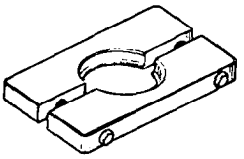
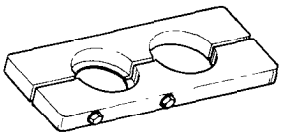
Items	Nm	kg.cm	lb.ft
Oil pan bolts	10-12	100-120	7-9
Tie rod end to knuckle	24-35	240-350	17-25
Lower arm ball joint to knuckle	60-72	600-720	43-52
Transaxle mounting bracket to transaxle	60-80	600-800	43-58
Special bolts	46-53	460-530	33-38
Selector lever assembly mounting bolts	9-14	90-140	7-10
Starter motor mounting bolt	27-34	270-340	20-24
Oil cooler hose clamp	4-6	40-60	3-4
Hose bracket	3-5	30-50	2-4
Cover to selector knob	2.0 or more	20 or more	1.4 or more
Selector knob to lever assembly	2.0 or more	20 or more	1.4 or more
Bell housing cover to engine	10-12	100-120	7-9
Transaxle mounting bolt [10 mm (0.40 in.) diameter bolt]	43-55	430-550	31-40
Transaxle mounting bolt [8 mm (0.31 in.) diameter bolt]	30-35	300-350	22-25
Torque converter to drive plate	73-77	730-770	53-55
Control cable to body	9-14	90-140	7-10
Indicator panel	1.5 or more	15 or more	1.1 or more
Lever assembly to bracket assembly	14-20	140-220	10-14
Drive plate-to-converter tightening bolt	46-53	460-530	34-38
Drain plug	30-35	300-350	22-25
Pressure check plug	8-10	80-100	6-7
Pulse generator mounting bolt	10-12	100-120	7-9
Bearing retainer screw	17-22	170-220	12-15
Lock plate bolt	48-60	480-600	35-43
Converter housing bolt	19-23	190-230	14-16
One-way clutch outer race bolt	25-35	250-350	18-25
Differential drive gear bolt	130-140	1300-1400	94-101
Manual control lever nut	17-21	170-210	13-15
Manual control shaft set screw	8-10	80-100	6-7
Transaxle range switch	10-12	100-120	7-9
Sprag rod support bolt	20-27	200-270	15-19
Pump housing-to-reaction shaft support bolt	10-12	100-120	7-9
Oil pump assembly mounting bolt	15-22	150-220	11-15
Valve body bolt	4-6	40-60	3-4
Valve body assembly mounting bolt	10-12	100-120	7-9
Oil filter bolt	5-7	50-70	4-5
Speedometer sleeve locking plate bolt	3-5	30-50	2-4
End clutch cover	6-8	60-80	5-6
Kickdown lock nut	25-32	250-320	18-23

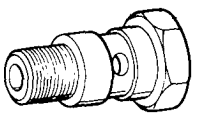
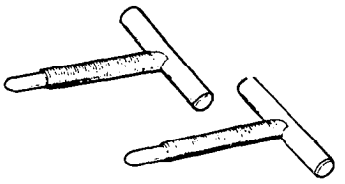
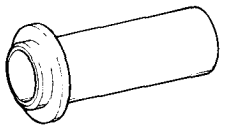
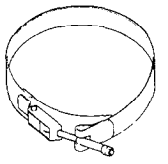
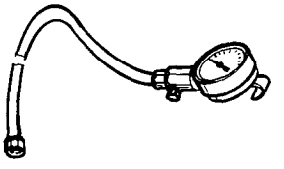
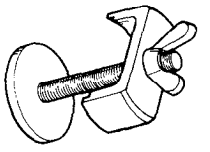
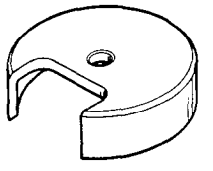
LUBRICANTS

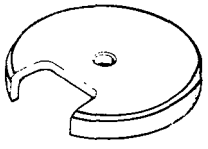
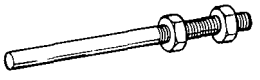
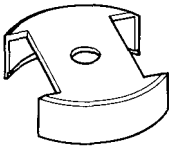
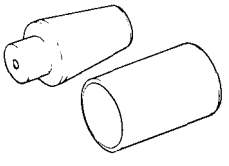
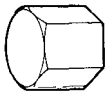
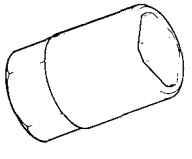
Items	Specified lubricant	Quantity
Transaxle fluid lit. (U.S. qts., Imp.qts.)	GENUINE HYUNDAI ATF AUTOMATIC TRANSAXLE FLUID OR *MOPAR ATF PLUS TYPE 7176, OR EQUIVALENT DIAMOND ATF SP.	6.1 (6.4, 5.4)
Drive shaft oil seal lip	Automatic transaxle fluid	As required
Sliding part of bushing	Chassis grease SAE J310, NLGI No.0	As required
Selector lever sliding portion	Multipurpose grease SAE J310, NLGI No.2	As required

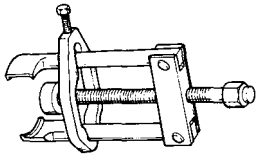
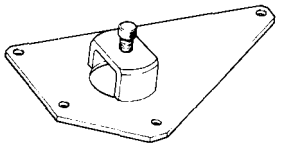
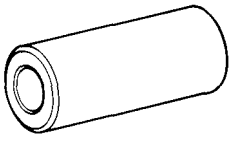
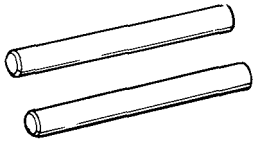
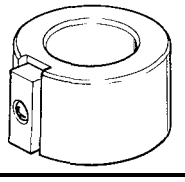
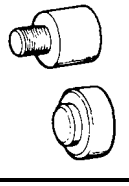
* : Mopar ATF PLUS TYPE 7176 is the recommended lubricant.

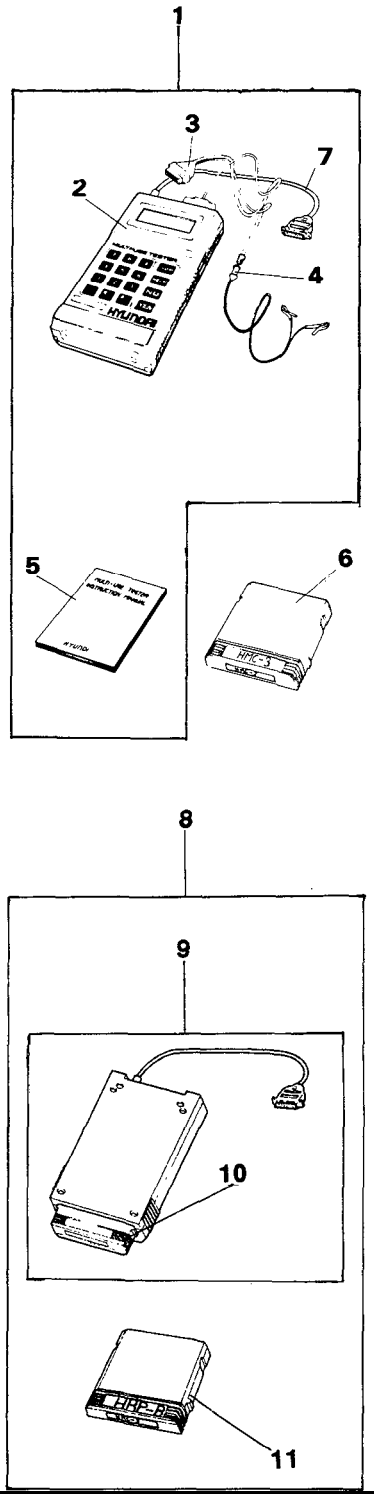
SPECIAL TOOLS

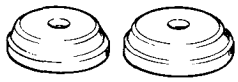
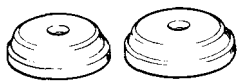
Tool (Number and name)	Illustration	Use
09222-28000 Valve spring compressor		Removal and installation of the kickdown servo. (use with 09222-28100)
09222-28100 Valve spring compressor holder		Removal and installation of the kick down servo (use with 09222-28000)
09431-21200 Oil seal installer		Installation of differential oil seal.
09433-21000 Removing plate		1) Removal of transfer driven gear taper bearing .(use with 09432-33800). 2) Removal of differential ball bearing.
09432-33200 Removing plate		Removal of transfer shaft bearing.
09432-33800 Bearing installer		Installation of transfer shaft bearing
09452-21001 Oil pressure gauge adapter		Measurement of the oil pressure. (use with 09452-21500 and 09452-21002)

Tool (Number and name)	Illustration	Use
09453-21102 Oil pressure gauge adapter		Measurement of the oil pressure. (use with 09452-21500 and 09452-21001)
09452-21100 Oil pump remover		Removal of the oil pump.
09452-21200 Oil pump oil seal installer		Installation of the oil pump oil seal.
09452-21301 Oil pump band		Assembling the oil pump. (use with 09452-21401)
09452-21401 Guide pin		Installation of the oil pump. (use with 09452-21301)
09452-21500 Oil pressure gauge		Measurement of the oil pressure. (use with 09452-21001 and 09452-21002)
09453-21000 Spring compressor		Removal and installation of the snap ring and return spring of the front clutch.
09453-21100 Spring compressor		Removal and installation of the rear clutch (use with 09453-21000)

Tool (Number and name)	Illustration	Use
09453-21200 Spring compressor		Removal and installation of snap ring of low-reverse brake. (use with 09454-33000)
09453-21310 Center support remover and installer		Removal and installation of the center sup-
09453-21400 Dial gauge support		Measurement of the input shaft and transfer shaft end play. (use with dial gauge)
09453-24000 Spring compressor		Removal and installation of snap ring and return spring of front clutch. (use with 09453-21000)
09453-33000 Snap ring installer		Installation of end clutch snap ring.
09453-33100 Dial gauge extension		Measurement of the low and reverse brake end play (use with dial gauge)
09454-21100 Wrench adapter		Loosening and tightening of the transfer idler shaft.
09454-33101A Kickdown servo socket wrench-A		Adjustment of kickdown servo. (use with 09454-33101B)

Tool (Number and name)	Illustration	Use
09454-33101B Kickdown servo socket wrench-B		Adjustment of kickdown. (use with 09454-33101A)
09455-21000 Bearing and gear puller		Removal of ball bearing and transfer drive gear.
09455-21100 Bearing installer		1) Installation of differential ball bearing. 2) Installation of ball bearing and transfer drive gear.
09455-21301 Transfer shaft retainer		Supporting the transfer shaft.
09455-33200 Bearing installer		1) Installation of ball bearing and transfer drive gear 2) Installation of the transfer shaft rear side bearing
09456-21000 Guide pin		Assembling of the valve body and transfer plate.
09458-33001 Wrench adapter		Preload measurement of transfer idler shaft.
09456-21100 Adapter set		Removal and installation of kickdown servo. (use with 09222-28000, 09222-28100)

Tool (Number and name)	Illustration	Use
09391-33002 Scan tool assy		Scan tool for MFI, automatic transaxle and cruise control system.
09391-33100 1. Scan tool sub assy		
09391-33200 2. Scan tool main body		
09391-33300 3. Test harness		
09391-33500 4. Battery harness		
09391-33600 5. Instruction manual		
09391-33402 6. ROM Pack		
09391-33700 7. Connector RS 232C		
09391-33902 8. Adapter assembly		
09391-33802 9. Adapter sub assembly		
09391-33822 10. Adapter system pack-B		
09391-33452 11. ROM pack (HRP-B)		For connection to the external communication device such as personal computer etc. in using Scan tool.

Tool (Number and name)	Illustration	Use
09500-11000 Bar		Installation of differential bearing outer race and output shaft bearing outer race. (use with 09532-11500)
09500-21000 Bar		Installation of transfer shaft bearing outer race. (use with 09532-32000)
09352-11500 Pinion bearing outer race installer		1) Installation of transfer shaft front bearing outer race. (use with 09500-11000). 2) Installation of differential bearing outer race and output shaft bearing oute race. (use with 09500-11000)
09532-32000 Bearing installer		Installtion of transfer shaft bearing outer race. (use with 09500-21000)

TROUBLESHOOTING

Malfunctions of the auto transaxle can lead to other problems, such as those described below:

1. Improper maintenance and/or adjustments
2. Electronic control malfunctions
3. Mechanical functions
4. Hydraulic control
5. Engine performance malfunctions

etc.

In order to properly troubleshoot the source of these malfunctions, it is first essential to methodically question the owner concerning the problem. The driver should also be asked whether or not the problem has occurred more than once.

Tests should be conducted troubleshooting, as described at the right.

Based upon the use of the troubleshooting guide, the probable location of the problem should be determined.

↓

Checks should be make of the ATF fluid level and the condition as well as the adjustment condition of the manual control cables.

↓

If a presumption has been made that there is an abnormal condition somewhere in the electronic-control system, the scan tool should be used to estimate the probable location by checking the malfunction-indication pattern.

↓

When the abnormal system is discovered during the road test, check each element (sensors, etc.) one by one, and make repairs as necessary.

↓

When the abnormal condition is presumed to be in the oil-pressure-control system, check by making an oil-pressure test.

↓

When the result of the oil-pressure test does not satisfy the specified pressure, check each system at places related to the valve body, check the oil-pressure passages for leakage, etc.

↓

If the problem is unusually dirty ATF, abnormal noises, oil leakage, or slippage of the clutch or brakes, or an abnormal condition of the transaxle itself, disassemble and repair the transaxle.

TROUBLESHOOTING GUIDE

		Problem / Presumed cause	Driving impossible or abnormal (before start-off)											
			Starter motor won't function	Forward/backward movement impossible	Forward movement impossible	Backward movement impossible	Engine stalls when N-D or R	Clutch slips at D (stall rpm too high)	Clutch slips at R (stall rpm too high)	Stall rpm too low	Vehicle moves at P or N	Engine starts, or vehicle moves, between NR ro ND	Parking doesn't hold	Abnormal vibration-shock when shift to D-2-L-R
	1	Abnormal idle rpm					X							X
	2	Poor performance					X			X				
	3	Improper adjustment of manual linkage	X	X	X	X		X	X		X	X	X	X
	4	Malfunction of torque converter (including damper clutch)		X	X	X				X				
	5	Operation malfunction of oil pump		X	X	X		X	X					
	6	Malfunction of one-way clutch			X			X						
	7	Damaged or worn gear or other rotating part, or improper adjustment of the preload			X									
	8	Malfunction of parking mechanism									X		X	
	9	Cracked drive plate, or loose bolt		X										
	10	Worn inside diameter of front clutch retainer				X			X					
	11	Low fluid level		X	X	X		X	X					
	12	Line pressure too low (seal damaged, leakage, looseness, etc.)		X	X	X		X	X					
	13	Malfunction of valve body (sticking valve, working cavity, adjustment, etc.)		X	X	X	X	X	X		X	X		X
	14	Malfunction of front clutch or piston				X			X					X
	15	Malfunction of rear clutch or piston			X			X						X
	16	Malfunction of kickdown band or piston												
	17	Improper adjustment of kickdown servo												
	18	Malfunction of low-reverse brake or piston		X		X			X					X
	19	O-ring of low-reverse brake circuit between valve body and case not installed				X			X					
	20	Malfunction of end clutch or piston (check ball hole, other)												
	21	Malfunction of inhibitors switch, damaged or disconnected wiring, or improper adjustment	X								X	X		X
	22	Malfunction of TPS, or improper adjustment												X
	23	Pulse generator (A) damaged or disconnected wiring, or short-circuit												
	24	Pulse generator (B) damaged or disconnected wiring, or short-circuit				X								
	25	Malfunction of kickdown servo switch												
	26	SCSV-A or B damaged or disconnected wiring, or short-circuit or sticking (valve open)												
	27	Malfunction of ignition signal system												
	28	Incorrectly grounded ground strap												
	29	PCSV damaged or disconnected wiring, or short-circuit												
	30	PCSV damaged or disconnected wiring (valve open)		X	X	X		X	X					
	31	DCCSV damaged or disconnected wiring (valve closed)												
	32	DCCSV short-circuit or sticking (valve open)					X							
	33	Malfunction of OD switch												
	34	Malfunction of accelerator switch, or improper adjustment (Untill 1993 model)												X
	35	Malfunction of oil-temperature sensor												
	36	Malfunction of reed switch												
	37	Poor contact of ignition switch												
	38	Malfunction of transaxle control module												X

NOTE: X indicates items of high priority during inspection.
Abbreviations: TPS = Throttle Position Sensor SCSV = Shift Control Solenoid Valve

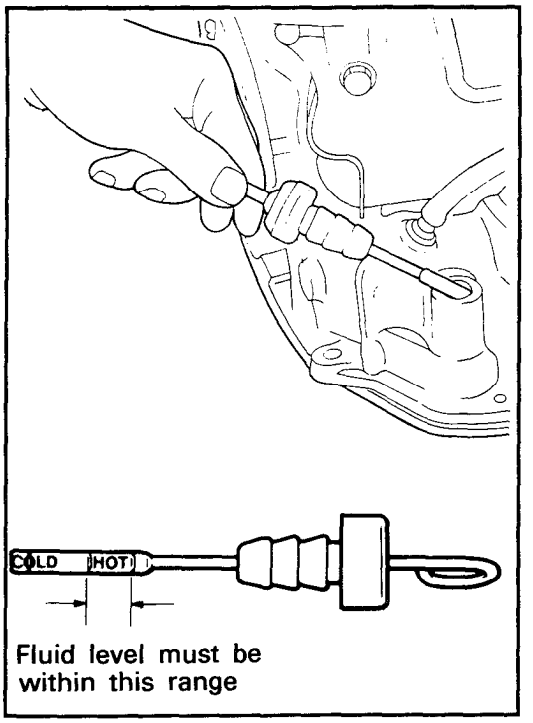
	Transaxle malfunction of shift-shock (after start-off)																Abnormal noise, other			
	Won't shift from 2nd to 3rd	Won't shift to 4th	OD switch doesn't function	Doesn't shift according to shift pattern (shifting is possible)	Improper start-off (starts off from 2nd, etc.)	Excessive creeping or idling vibration	Excessive vibration-shock when shift 1-2 or 3-4	Excessive vibration-shock when shift 2-3 or 4-3	Excessive vibration-shock during upshift	Excessive vibration-shock during D-2 downshift	Sudden engine rpm increase during upshift	Sudden engine rpm increase during 3-2 shift excessive vibration	Excessive vibration-shock (other than already described)	Excessive vibration shock only when cold	Damper clutch won't function	Abnormal vibration in high-load region in low gear (japprox. 1 Hz)	Abnormal noise from convertor housing together with engine rpm	Mechanical noise (clatter noise)from convertor housing	Abnormal noise inside transaxle case	Locked in 3rd gear
1						X														
2					X		X	X	X	X			X	X		X				
3		X			X															X
4					X										X	X				
5												X					X			
6																				
7																			X	
8																			X	
9																				
10	X	X									X	X						X		X
11												X								X
12											X	X		X						X
13	X			X	X		X	X	X	X	X	X	X	X	X	X				X
14	X							X	X		X									X
15																				X
16							X				X	X								X
17							X				X	X		X						X
18										X										X
19																				X
20		X					X				X									X
21		X			X															X
22				X			X	X	X	X	X	X		X	X	X				
23							X	X	X	X	X	X		X	X	X				X
24				X											X	X				X
25							X					X								X
26																				X
27							X	X	X	X	X	X		X	X					
28																				X
29																				X
30	X	X									X	X								X
31			X												X					
32																X				X
33		X																		
34					X	X									X					
35														X	X	X				
36			X																	X
37				X																X
38	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X			X

PCSV = Pressure control selenoid valve
DCCSV = Damper clutch control solenoid valve

DIAGNOSIS AND TEST

FLUID LEVEL AND CONDITION

1. Place the vehicle on level floor.
2. Before removing the dipstick, wipe all dirt from the area around the dipstick.
3. With the selector lever in “P” (Park), and the parking brakes applied, start the engine.
4. The engine should be running at idle speed. Fluid should be at normal operating temperature [70-80°C (160-180°F)].
5. Move the selector lever sequentially to every position to fill the torque converter and hydraulic system with fluid, then place the selector lever in “N” (Neutral) position. This operation is necessary to be sure that the fluid level check is accurate.
6. Check to see if the fluid level is in “HOT” range on dipstick. If fluid is low, add automatic transaxle fluid until level reaches the “HOT” range.
   Low fluid level can cause a variety of conditions because it allows the pump to take in air along with fluid. Air trapped in the hydraulic system forms bubbles, which are compressable. Therefore, the pressure will be erratic.
   Improper filling can also cause the fluid level to be too high. When transaxle has too much fluid, gears churn up foam and cause the same conditions which occur with low fluid level. This results in accelerated deterioration of the automatic transaxle fluid. In either case, air bubbles can cause overheating, fluid oxidation, and varnshing, which can interfere with normal valve, clutch, and servo operation.
   Foaming can also result in fluid escaping from the transaxle vent, where it may be mistaken for a leak.



MANUAL CONTROL CABLE

Proper manual control linkage adjustment can be determined by checking whether inhibitor switch is performing correctly.

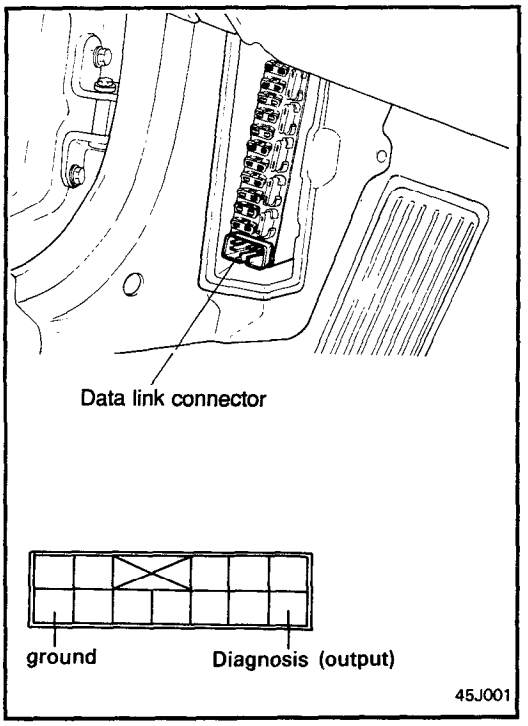
1. Apply parking and service brakes securely.
2. Place the selector lever in “R” range.
3. Set the ignition key to “ST” position.
4. Slowly move the selector lever upward until it clicks as it fits in the notch of the “P” range. If the starter motor operates when the lever makes a click, “P” range. If the starter motor operates when the lever makes a click, “P” position is correct.
5. Then slowly move the selector lever to the “N” range by the same procedure as in the foregoing paragraph. If the starter motor operates when the selector lever is in “N”, the “N” position is correct and the control cable is correctly adjusted.
6. Also check to be sure that the vehicle doesn’t begin to move and the lever doesn’t stop between P-R-N-D.
7. The manual-control cable is properly adjusted if (as described above) the starter motor will crank in both the “P” range and “N” range.

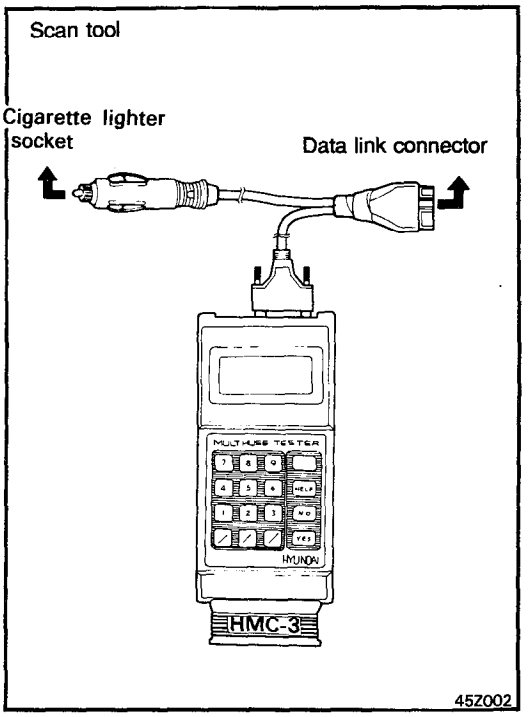
OBTAINING DIAGNOSTIC TROUBLE CODES

1. Connect the voltmeter or scan tool to the connector for diagnosis.
2. Read the output diagnostic trouble codes.
   Then follow the remedy procedures according to the "DIAGNOSTIC TROUBLE CODE DESCRIPTION" on the following page.

   NOTE
   - **As many a maximum of ten diagnostic trouble codes (in the sequence of occurrence) can be stored in the Random Access Memory (RAM) incorporated within the control model.**
   - **The same diagnostic trouble code can be stored as many as three times.**
   - **If the number of stored diagnostic trouble codes or diagnostic trouble patterns exceeds ten, already stored diagnostic trouble codes will be erased, in sequence beginning with the oldest.**
   - **Do not disconnect the battery until all diagnostic trouble codes or diagnostic trouble patterns have been read out, because all stored diagnostic trouble codes or diagnostic trouble patterns will be canceled when the battery is disconnected.**

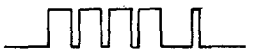
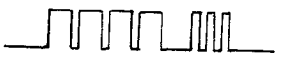
3. If the fail-safe system is activated and the transaxle is locked in third gear, the diagnostic trouble code in the Fail-Safe Code Description will be stored in the RAM.
   Three of these diagnostic trouble codes can be stored.
4. The cancelation will occur if, with the transaxle locked in third gear, the ignition key is turned to the OFF position, but the diagnostic trouble code is stored in the RAM.

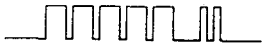




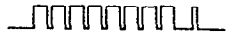
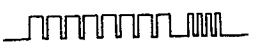
DIAGNOSTIC TROUBLE CODE DESCRIPTION

code	Diagnostic trouble code (for voltmeter)	Cause	Remedy
11		Excessively high throttle position sensor output	o Check the throttle position sensor connector. o Check the throttle position sensor itself. o Adjust the throttle position sensor. o Check the accelerator switch (No.24 : output or not).
12		Excessively low throttle position sensor output	
13		Throttle position sensor malfunction	
14		Improperly adjusted throttle position sensor system	
15		Open in the low-temperature side of the oil temperature sensor circuit.	o Oil temperature sensor connector inspection o Oil temperature sensor inspection
16		Short in the high-temperature side of the oil temperature sensor circuit.	
17		Open in the high-temperature side of the oil temperature sensor circuit or short in the low-temperature side circuit	
21		Open kickdown servo switch circuit	o Check the kickdown servo switch connector. o Check the kickdown servo switch.
22		Shorted kickdown servo switch circuit	
23		Open ignition pulse pickup cable circuit	o Check the ignition pulse signal line.

code	Diagnostic trouble code (for voltmeter)	Cause	Remedy
24		Open-circuited or improperly adjusted accelerator switch	o Check the accelerator switch connector o Check the accelerator switch itself o Adjust the accelerator switch.
31		Open pulse generator A circuit	o Check the pulse generator A and pulse generator B. o Check the vehicle speed reed switch (for chattering)
32		Open pulse generator B circuit	
41		Open shift control solenoid valve A circuit	o Check the solenoid valve connector. o Check shift control solenoid valve A.
42		Shorted shift control solenoid valve A circuit	
43		Open shift control solenoid valve B circuit	o Check the solenoid valve connector. o Check shift control solenoid valve B
44		Shorted shift control solenoid valve B circuit	
45		Open pressure control solenoid valve circuit	o Check the solenoid valve connector. o Check the pressure control solenoid valve.
46		Shorted pressure control solenoid valve circuit	

code	Diagnostic trouble code (for voltmeter)	Cause	Remedy
47		Open circuit in damper clutch control solenoid valve	o Inspection of solenoid valve connector. o Individual inspection of damper clutch control solenoid valve
48		Short circuit in damper clutch control solenoid valve	
49		Defect in the damper clutch system	o Inspection of damper clutch hydraulic system o Individual inspection of damper clutch control solenoid valve o Replacement of control module
51		Shifting to first gear does not match the engine speed.	o Check the pulse generator A and pulse generator B. o Check pulse generator A and pulse generator B. o Rear clutch slippage.
52		Shifting to second gear does not match the engine speed.	o Check the pulse generator A connector o Check pulse generator A o Kickdown brake slippage.
53		Shifting to third gear does not match the engine speed.	o Check the pulse generator A and pulse generator B connector o Check pulse generator A and pulse generator B. o Front clutch slippage. o Rear clutch slippage.
54		Shifting to fourth gear does not match the engine speed.	o Check the pulse generator A connector. o Check pulse generator A. o Kickdown brake slippage.
-	(Continue)	Normal	-
-	Constant output (or 0V)	Defective transaxle control module (TCM)	o TCM power supply inspection o TCM earth inspection o TCM replacement

FAIL-SAFE ITEM

Output code		Description	Fail-safe	Note (relation to diagnostic trouble code)
Code No.	Output pattern (for voltmeter)			
81		Open-circuited pulse generator A	Locked in third (D) or second	When code No. 31 is generated fourth time
82		Open-circuited pulse generator B	Locked in third (D) or second (2, L) gear	When code No. 32 is generated fourth time
83		Open-circuited or shorted shift control solenoid valve A	Lock in third	When code No. 41 or 42 is generated fourth time
84		Open-circuited or shorted shift control solenoid valve B	Lock in third gear	When code No. 43 or 44 is generated fourth time
85		Open-circuited or shorted pressure control solenoid valve	Locked in third (D) or second (2, L)	When code No. 45 or 46 is generated fourth time.
86		Gear shifting does not match the engine speed	Locked in third (D) or second (2, L)	When either code No. 51, 52, 53 or 54 is generated fourth time.
-	Constant output (or 0V)	Defective transaxle control module (TCM)	Fixed for third speed	-

CHECKING THE CONTROL SYSTEM (WHEN A SCAN TOOL IS USED)

Check items	Check procedures		Probalbe cause (or remedy) if a malfunction is found
	Check conditions	Normal value	
Throttle position sensor (TP Sensor) o Data list o Item No. 11	Accelerator pedal fully released	0.5-0.6 V	o TP Sensor adjusted improperly if voltage is high when accelerator fully released or pressed to floor o TP Sensor or circuit harness is fault if no change occurs o Falulty TP Sensor or accelerator pedal cable is faulty if gradual change is not noted
	Press accelerator pedal slowly	Varies with accelerator opening	
	Accelerator pedal pressed to floor	4.5-5.0 V	
Oil temperature sensor o Data list o Item No. 15	Cold engine (before starting)	Equivalent to outside air temperature	o Faulty oil temperature sensor or circuit harness
	While warming up engine	Gradual increase	
	After warming up engine	80-110°C	
Kickdown servo switch o Data list o Item No. 21	L range : Idling	ON	o Kickdown servo maladjusted o Faulty kickdown servo switch or circuit harness o Faulty kickdown servo
	D range : first or third gear	ON	
	D range : second or fourth gear	OFF	
Ignition signal wire o Data lit o Item No.23	N range : Idling	650-900 rpm	o Faulty ignition system o Faulty ignition signal pick-up circuit harness
	N range : 2,500 rpm (tachometer reading)	2,400-2,600 rpm	
Idle switch o Data list o Item No. 25	Accelerator pedal fully released	ON	o Idle position switch (fixed SAS) mal-adjusted. o Faulty idle position switch or circuit harness
	Accelerator pedal pressed very slightly	OFF	
Air conditioning relay signals o Data list o Item No. 26	D range : air conditioning idle up	ON	o Air conditioning power relay ON signal detection circuit harness faulty
	D range : air conditioning switch OFF	OFF	
Transaxle gear position o Data list o Item No. 27	D range : idling	C	o Faulty TCM o Faulty accelerator pedal switch system o Faulty transaxle range switch system o Faulty TP Sensor system
	L range : idling	First	
	2 range : second gear	Second	
	D range : overdrive-OFF : third gear	Third	
	D range : overdrive-ON : fourth gear	Fourth	
Pulse generator A o Data list o Item No.31	D range : driving at 30 km/h (19 mph) in second gear	0 rpm	o Pulse generator A or circuit harness faulty o Faulty pulse generator A shielded wire o Incoming noise from outside o Slipping kickdown brake
	D range : driving at 50 km/h (31 mph) in third gear	1,600-2,000 rpm	
	D range : driving at 50 km/h (31 mph) in fourth gear	0 rpm	

Check items	Check procedures		Probalbe cause (or remedy) if a malfunction is found
	Check conditions	Normal value	
Pulse generator B o Data list o Item No. 32	D range : stopped	0 rpm	o Pulse generator B or circuit harness faulty o Faulty pulse generator B shielded wire o Incoming noise from outside
	D range : driving at 50 km/h (31 mph) in third gear	1,600-2,000 rpm	
	D range : driving at 50 km/h (31 mph) in fourth gear	1,600-2,000 rpm	
Overdrive switch o Data list o Item No. 35	Overdrive switch is turned ON	OD-ON	o Overdrive switch or circuit harness faulty
	Overdrive switch is turned OFF	OD-OFF	
Normal/Economy select switch o Data reading o Item No. 36	Selection of the normal pattern (including during E pattern control when oil temperature is low)	Normal	o Normal/Economy select switch or circuit harness malfunction
	Selection of the Economy pattern	Economy	
Transaxle range switch o Data list o Item No. 37	Shift selector lever to P range	P	o Transaxle range switch maladjusted o Transaxle range switch or circuit harness faulty o Faulty manual control cable o If selector lever is inoperative, check shift lock mechanism
	Shift selector lever to R range	R	
	Shift selector lever to N range	N	
	Shift selector lever to D range	D	
	Shift selector lever to 2 range	2	
	Shift selector lever to L range	L	
Vehicle speed reed switch o Data list o Item No. 38	Keep vehicle stopped	0 km/h	o Vehicle speed reed switch is faulty if high speed signal is delivered while vehicle is stopping o In other cases, vehicle speed reed switch or circuit harness is faulty
	Driving at 30 km/h (19 mph)	30 km/h (19 mph)	
	Driving at 50 km/h (31 mph)	50 km/h (31 mph)	
PCSV duty o Data list o Item No. 45	D range : idling	50-70%	o When accelerator pedal is slightly pressed while idling in D range, duty should become 100 % o Faulty TCM o Faulty TP Sensor system o Faulty accelerator pedal switch system
	D range : first gear	100 %	
	D range : during shift	Varies with condition	
Damper clutch slippage amount o Data list o Item No. 47	D range ; third gear 1,500 rpm (tachometer reading)	200-300 rpm	o Faulty damper clutch o Ignition signal wire or pulse generator B system faulty o Inappropriate transaxle fluid pressure o Faulty DCCSV
	D range ; third gear 3,500 rpm (tachometer reading)	0 rpm	
DCCSV duty o Data list o Item No. 49	D range ; third gear 1,500 rpm (tachometer reading)	0%	o Faulty TCM o Faulty TP Sensor system o Pulse generator B system faulty
	D range ; third gear 3,500 rpm (tachometer reading)	Varies with load	

ELEMENT IN USE AT EACH POSITION OF SELECTOR LEVER

Selector lever position	Overdrive control switch	Shifting gear	Gear ratio	Engine start	Parking Mechanism	Clutch				Brake	
						C1	C2	C3	OWC	B1	B2
P	-	Neutral	-	Possible	O						
R	-	Reverse	2.176			O					O
N	-	Neutral	-	Possible							
D	ON	1st	2.846				O		O		
		2nd	1.581				O			O	
		3rd	1.000			O	O	O			
		OD	0.685					O		O	
D	OFF	1st	2.846				O		O		
		2nd	1.581				O			O	
		3rd	1.000			O	O	O			
2	-	1st	2.846				O		O		
		2nd	1.581				O			O	
L	-	1st	2.846				O				O

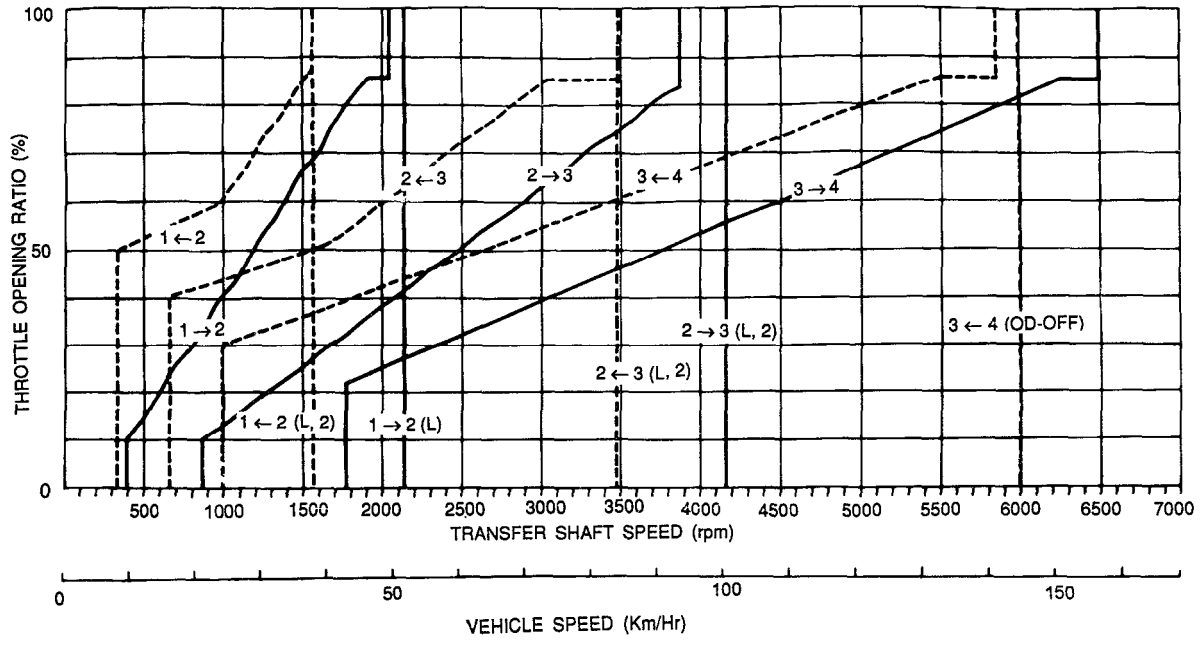
C1 : Front clutch
C2 : Rear clutch
C3 : End clutch
OWC : One way clutch
B1 : Kickdown brake
B2 : Low & reverse brake

SHIFT PATTERNS

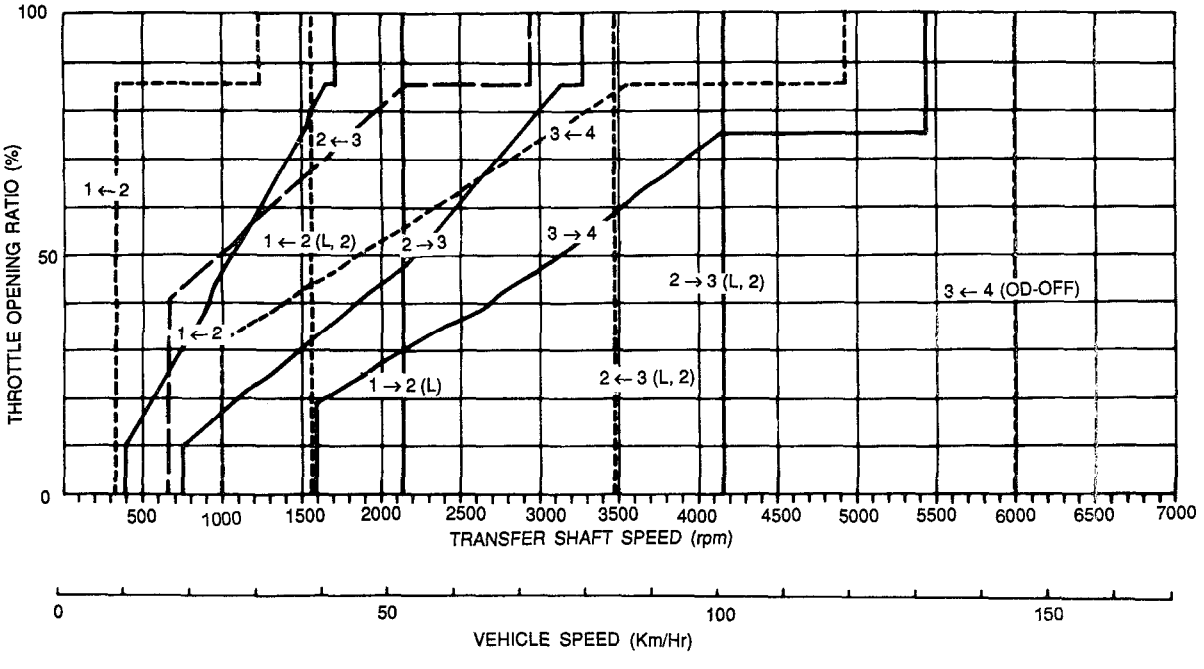
Two shift patterns are stored in the control module of this transaxle. One is the Normal pattern (for more powerful performance), and the other is the Economy pattern (for improved fuel consumption and quieter operation) (Refer to the diagram next page).
The driver can switch to the desired pattern by using the Normal/ Economy select switch on the center console.
The solid lines shown on these shift patterns graphs indicate up-shifts, and the broken lines indicate down-shifts. The difference between the shift points for up-shifts and for down-shifts is because up-shiftsanddown-shifts will not occur when driving at a speed close to that of the shift point.
When the vehicle is stopped, the transaxle is shifted into second gear in order to prevent vehicle creep “creeping”. Then when the accelerator pedal is depressed, the vehicle starts off in first gear.

SHIFT PATTERN

NORMAL RANGE



ECONOMY RANGE



INSPECTION OF ELECTRONIC CONTROL SYSTEM COMPONENTS

1. Wiring

→ Based on the wiring diagram, check whether the continuity and grounding of each harness is OK.

→ No continuity → Improper connection of connector, damaged or disconnected harness, or incorrect wiring connection.

→ Reconnect the connector; repair or replace the harness.

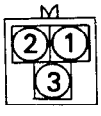
Based on the wiring diagram, check whether the continuity and grounding of each harness is OK.

→ Continuity

→ Normal

2. Oil-temperature sensor

Sensor side connector terminal



1 : Low temperature side
2 : Ground
3 : High temperature side

→ Vary the thermo-sensitive part from low temperature to high temperature and check the resistance between the 1 and 2 or 2 and 3.

→ No continuity (resistance: ∞) → Damaged or disconnected wiring

→ Replace the oil-temperature sensor.

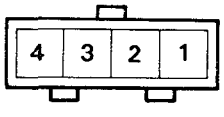
Vary the thermo-sensitive part from low temperature to high temperature and check the resistance between the 1 and 2 or 2 and 3.

→ Changes of the resistance continuous and smooth.

→ Normal

3. Throttle-position sensor (TPS)

Sensor side connector terminal



1: ground
3: output
4: power supply

→ Check the resistance between terminals 1 and 4 of the TPS.

→ Resistance: high or infinite → Damaged or disconnected wiring

→ Replace the TPS.

Check the resistance between terminals 1 and 4 of the TPS.

→ 3.5-6.5 KΩ/20°C (68°F)

→ Check the resistance between terminals 3 and 1 with the engine idling after throttle-valve opening warm-up.

→ Resistance: more or less than 0.4 KΩ/20°C (68°F) → Improper adjustment

→ Readjust the TPS installation

Check the resistance between terminals 3 and 1 with the engine idling after throttle-valve opening warm-up.

→ Resistance (actual measurement) between terminals 1-3: approx. 0.4 KΩ/20°C (68°F)

→ Check for changes of the resistance between terminals 1 and 3.

→ Changes of the resistance are not continuous. → Poor contact

→ Replace the TPS.

Check for changes of the resistance between terminals 1 and 3.

→ Changes of the resistance continuous and smooth.

→ Normal

4. Pulse generator A or B

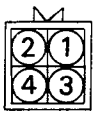
Check the resistance between terminals 1 and 2, 3 and 4.

Resistance: very low or very high → Short-circuit, damaged or disconnected wiring. → Replace the pulse generator.

215-275Ω/20°C (68°F) → Normal

Pulse generator side connector terminals

1-2: pulse generator A
3-4: pulse generator B



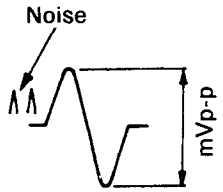
5. Pulse generator A or B (check by using an oscilloscope)

Connect the pulse generator and body harness, and connect an oscilloscope. Check on a chassis dynamotor or with the front wheels raised.

With the selector lever at the "L" position and the engine running at 1,000 rpm, check the voltage waveform between terminals 1 and 2.

Oscilloscope waveform

Oscilloscope waveform

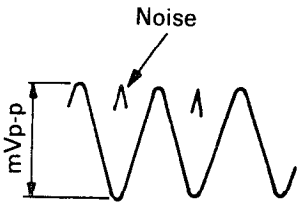


Very low voltage → Incorrect installation, or malfunction of the pulse generator. → Correct the installation condition, or replace the pulse generator.

1,000 mVp-p or higher

Noise in the waveform → Improper grounding of the pulse generator circuit's shielded wiring. → Replace the pulse generator.

With the selector lever at the "L" position and the engine running at 1,000 rpm, check the voltage waveform between terminals 3 and 4.



Very low voltage → Incorrect installation of the pulse generator, or malfunction of the pulse generator. → Correct the installation condition, or replace the pulse generator.

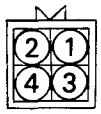
500 mVp-p or higher

Noise in the waveform → Improper grounding of the pulse generator circuit's shielded wiring. → Replace the pulse generator.

Normal

6. Pressure-control solenoid valve (PCSV)

Solenoid valve side connector terminals



1: DCCSV
2: PCSV
3: SCSV-B
4: SCSV-A

Check the resistance between terminal 2 of the solenoid valve connector and the transaxle case.

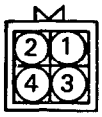
- Resistance; too low or too high → Short-circuit, damaged or disconnected wiring → Replace the PCSV.
- 2.9±0.3Ω/20°C (68°F)

Connect 12V between the transaxle case and terminal 2; switch ON and OFF and check for operation noise.

- No operation noise. (stroke: 0.3 mm (0.012 in. or less) → Foreign material caught between the valve and guide → Replace the PCSV.
- Noise exists
- Normal

7. Shift-control solenoid valve (SCSV) A or B

Solenoid valve side connector terminals



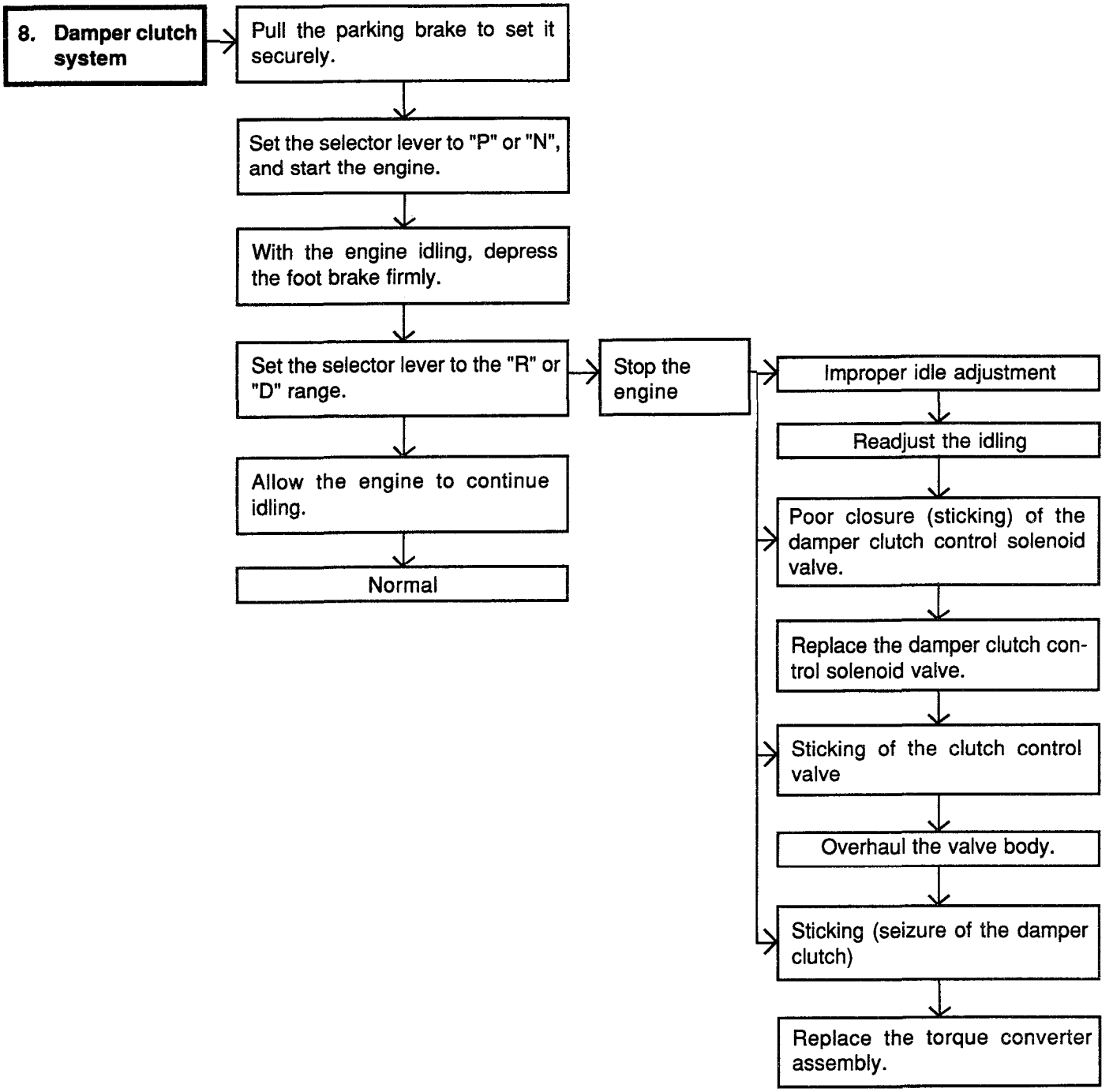
1: DCCSV
2: PCSV
3: SCSV-B
4: SCSV-A

Check the resistance between terminal 3 and 4 of the solenoid valve connector and the transaxle case.

- Resistance: too low or too high → Short-circuit, or damaged or disconnected wiring → Replace the SCSV.
- 22.3±1.5Ω/20°C (68°F)

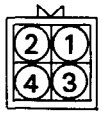
Connect 12V between the transaxle case and terminal 3 and 4; switch ON and OFF and check for operation noise of the solenoid valve, and check the valve stroke.

- No operation noise. (stroke: 0.25 mm (0.010 in. or less) → Residue accumulated in valve and core. → Replace the SCSV.
- Noise exists.
- Normal


8. Damper clutch system
Pull the parking brake to set it securely.
Set the selector lever to "P" or "N", and start the engine.
With the engine idling, depress the foot brake firmly.
Set the selector lever to the "R" or "D" range.
Allow the engine to continue idling.
Normal
Stop the engine
Improper idle adjustment
Readjust the idling
Poor closure (sticking) of the damper clutch control solenoid valve.
Replace the damper clutch control solenoid valve.
Sticking of the clutch control valve
Overhaul the valve body.
Sticking (seizure of the damper clutch)
Replace the torque converter assembly.

9. Damper clutch control solenoid valve (DCCSV)

Solenoid valve side connector terminals



1: DCCSV
2: PCSV
3: SCSV-B
4: SCSV-A

Check the resistance between terminal 1 of the solenoid valve connector and the transaxle case.

→ Resistance: too low or too high → Short-circuit, damaged or disconnected wiring. → Replace the DCCSV.

Standard value: 3Ω/20°C

Connect 12V between the transaxle case and terminal 1; switch ON and OFF and check for operation noise.

→ No operation noise. Check for sticking. * (Valve stroke: 0.3 mm (0.012 in.) or less) → Foreign material caught between the valve and guide → Replace the DCCSV.

Noise exists.

Normal

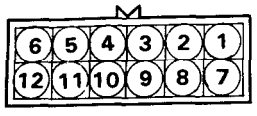
* Sticking is usually at the release side.

10. Idle switch

→ Refer to 31 Group (MFI COMPONENTS INSPECTION

11.Transaxle range switch

Switch side connector terminal



In the "P" range, check for continuity between terminals 3 and 4, and terminals 10 and 11.

↓

Continuity exists

↓

In the "R" range, check for continuity between terminals 3 and 12, and terminals 8 and 9.

↓

Continuity exists

↓

In the "N" range, check for continuity between terminals 3 and 5, and terminals 10 and 11.

↓

Continuity exists

→ No continuity → Poor contact, or damaged or disconnected wiring.

↓

Replace the transaxle range switch.

↓

In the "D" range, check for continuity between terminals 1 and 3.

↓

Continuity exists

↓

In the "2" range, check for continuity between terminals 3 and 6.

↓

Continuity exists

↓

In the "L" range, check for continuity between terminals 2 and 3.

↓

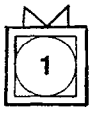
Continuity exists

↓

Normal

12.Kickdown (K/D) servo switch

Switch side connector terminal



Check for continuity between the kickdown servo switch terminal 1 and the transaxle case.

- No continuity → Poor contact, or damaged or disconnected wiring. → Replace the K/D servo switch.
- Continuity exists → Start the engine, set to the "L" range, and let the engine idle; check for continuity between the kickdown servo switch terminal and the transaxle case.
  NOTE: Be sure the brakes are applied during this check.
  - Continuity exists → Poor contact (sticking) → Replace the K/D servo switch
  - No continuity → Normal

13.Transaxle control moduel(TCM)

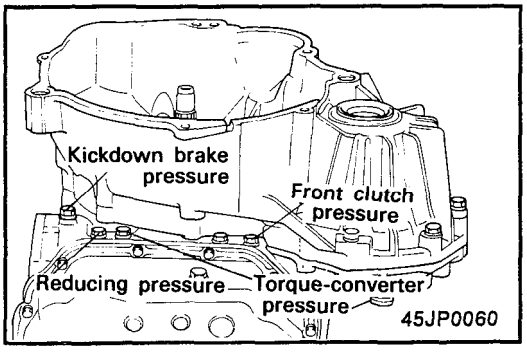
Disconnect the harness (both A and B connectors) from the vehicle's TCM. Then connect, (via an intermediate harness for checking), a new TCM to this harness and make a road test.

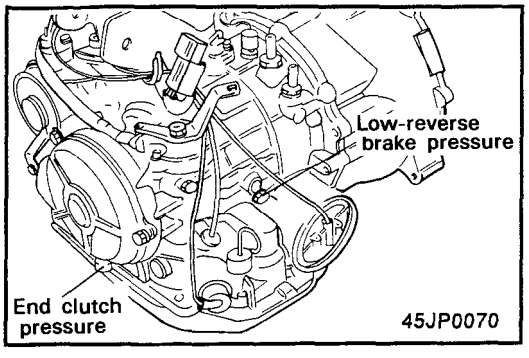
- The problem does not occur. → Malfunction of the original TCM. → Install a new TCM.
- Consider the original TCM to be normal, and again check the sensors, wiring, etc.

OIL PRESSURE TESTS

1. Completely warm up the transaxle.
2. Raise the front of the vehicle so that the front wheels can be rotated.
3. Connect an engine tachometer and place it in a position where it's easy to see.
4. Attach the special oil-pressure gauge (09452-21500) and the adapter (09452-21001, 09452-21002) to each oil-pressure outlet port.
   When the reverse pressure is to be tested, the 3,000 kPa (400 psi) type of gauge should be used.

5. Measure the oil pressure under various conditions. Check to be sure that the measured results are within the standard value range shown in the "Standard oil pressure table" below.
   If the oil pressure is not within the specified range, check and repair as described in the section "Preliminary Steps If Oil Pressure Is Not Normal" on the next page.





Standard Oil Pressure Table

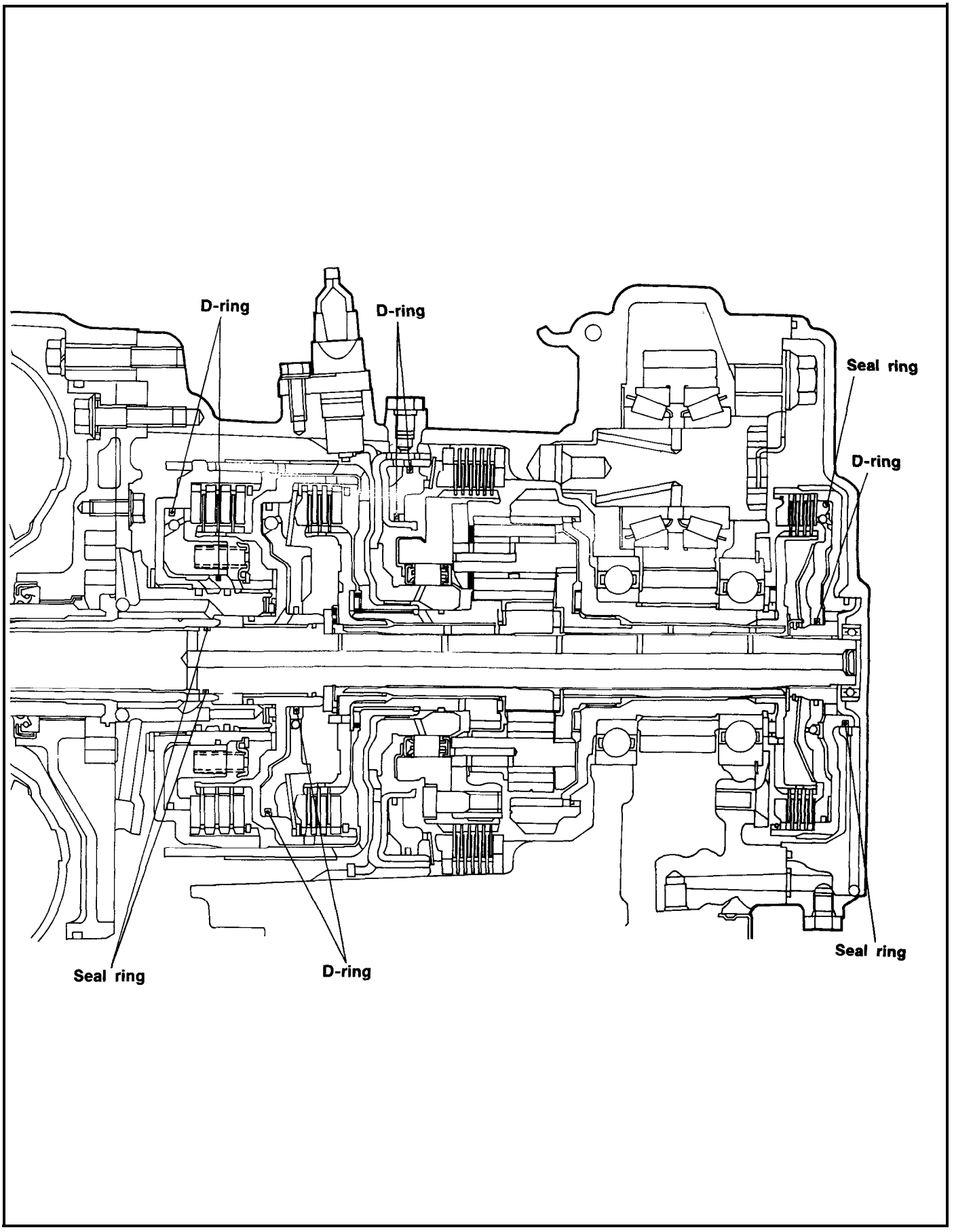
No.	Conditions				Standard oil pressure KPa (psi)					
	Selector lever position	(Reference) vehicle speed km/h (mph)	Engine speed rpm	Shift position	1 Reducing pressure	2 Kickdown brake pressure	3 Front clutch pressure	4 End clutch pressure	5 Low-reverse brake pressure	6 Torque-converter pressure
1	N	0 (0)	Idle	Neutral	353-470 (51-68)	-	-	-	-	*
2	D	0 (0)	Idle	second gear	353-470 (51-68)	100-210 (14-30)	-	-	-	*
3	D (SW-ON)	110 (68)	Approx. 2,500	fourth gear	353-470 (51-68)	830-900 (120-130)	-	830-900 (120-130)	-	450-650 (65-94)
4	D (SW-OFF)	75 (47)	Approx. 2,500	third gear	353-470 (51-68)	830-900 (120-130)	830-900 (120-130)	830-900 (120-130)	-	450-650 (65-94)
5	2	50 (31)	Approx. 2,500	second gear	353-470 (51-68)	830-900 (120-130)	-	-	-	450-650 (65-94)
6	L	0 (0)	Approx. 1,000	first gear	353-470 (51-68)	-	-	-	300-450 (44-60)	*
7	R	35 (22)	Approx. 2,500	Reverse	353-470 (51-68)	-	1,640-2,240 (238-325)	-	1,640-2,240 (233-328)	450-650 (65-94)
		0 (0)	Approx. 1,000				1,000 (145) or more		1,000 (145) or more	

NOTE:
- must be 9.9 kPa (1.4 psi) or less.
SW-ON : Switch ON the overdrive control switch.
SW-OFF : Switch OFF the overdrive control switch.
*** : Hydraulic pressure is generated, but not the standard value.**

Preliminary Steps if Oil Pressure Is Not Normal

Trouble symptom	Probable cause	Remedy
1. * Line pressures are all low (or high). NOTE "Line pressures" refers to oil pressures 2, 3, 4, 5, 6 and 7 in the "Standard oil pressure table" on the previous page.	a. Clogging on oil filter	a. Visually inspect the oil filter; replace the oil filter if it is clogged.
	b. Improper adjustment of oil pressure (line pressure) regulator valve	b. Measure line pressure 2 (kickdown brake pressure); if the pressure is not the standard value, readjust the line pressure, or if necessary, replace the valve body assembly.
	c. Sticking of regulator valve	c. Check the operation of the regulator valve; repair if necessary, or replace the valve body assembly.
	d. Looseness of valve body tightening part	d. Tighten the valve body tightening bolt and installation bolt.
	e. Improper oil pump discharge pressure	e. Check the side clearance of the oil pump gear; replace the oil pump assembly if necessary.
2. Improper reducing pressure	a. Improper line pressure	a. Check the 2 kickdown brake pressure (line pressure); if the line pressure is not the standard value, check as described in item 1 above.
	b. Clogging of the filter (L-shaped type) of the reducing-pressure circuit	b. Disassemble the valve body assembly and check the filter; replace the filter if it is restricted.
	c. Improper adjustment of the reducing pressure	c. Measure the 1 reducing pressure; if it is not the standard value, readjust, or replace the valve body assembly.
	d. Sticking of the reducing valve	d. Check the operation of the reducing valve; if necessary, repair it, or replace the valve body assembly.
	e. Looseness of valve body tightening part	e. Tighten the valve body tightening bolt and installation bolt.
3. Improper kickdown brake pressure	a. Malfunction of the D-ring or seal ring of the sleeve or kickdown servo piston.	a. Disassemble the kickdown servo and check whether the seal ring or D-ring is damaged. If it is cut or has scratches, replace the seal ring or D-ring.
	b. Looseness of valve body tightening part	b. Tighten the valve body tightening bolt and installation bolt.
	c. Functional malfunction of the valve body assembly.	c. Replace the valve body assembly.

Trouble symptom	Probable cause	Remedy
4. Improper front clutch pressure	a. Malfunction of the D-ring or seal ring of the sleeve or kickdown servo piston.	a. Disassemble the kickdown servo and check whether the seal ring or D-ring is damaged. If it is cut or has scratches, replace the seal ring or D-ring.
	b. Looseness of valve body tightening part	b. Tighten the valve body tightening bolt and installation bolt.
	c. Malfunction of the valve body assembly.	c. Replace the valve body assembly.
	d. Wear of the front clutch piston or retainer, or malfunction of the D-ring. (Refer to the figure on the next page.)	d. Disassemble the transaxle itself and check whether or not there is wear of the front clutch piston and retainer inner circumference, or damage of the D-ring. If there is any wear or damage, replace the piston, retainer, D-ring and/or seal ring.
5. Improper end clutch pressure	a. Malfunction of a D-ring, seal ring of the end clutch or O-ring of the pipe (Refer to the following figure.)	a. Disassemble the end clutch and check the seal ring, D-ring of the piston, seal ring of the retainer, etc.; replace if there are cuts, scars, scratches or damage.
	b. Looseness of valve body tightening part.	b. Tighten the valve body tightening bolt and installation bolt.
	c. Malfunction of the valve body assembly	c. Replace the valve body assembly.
6. Improper low-reverse brake pressure	a. O-ring between valve body and transaxle damaged or missing	a. Remove the valve body assembly and check to be sure that the O-ring at the upper surface of the upper valve body is not missing or damaged; install or replace the O-ring if necessary.
	b. Looseness of valve body tightening part	b. Tighten the valve body tightening bolt and installation bolt.
	c. Malfunction of the valve body assembly	c. Replace the valve body assembly.
	d. Malfunction of the O-ring of the low-reverse brake piston or the O-ring of the retainer (Refer to the following figure.)	d. Disassemble the transaxle itself and check the O-ring for damage; replace if there are cuts, scars, scratches or damage.
7. Improper torque converter pressure	a. Sticking of the damper clutch control solenoid valve (DCCSV) or the damper clutch control valve.	a. Check the operation of the damper clutch system and the DCCSV.
	b. Clogging or leaking of the oil cooler and/or lines.	b. Repair or replace, as necessary, the cooler and/or lines.
	c. Damaged seal ring of the input shaft (Refer to the following the figure)	c. Disassemble the transaxle itself and check for damage of the seal ring; replace the seal ring if there is damage.
	d. Malfunction of the torque converter	d. Replace the torque converter.


D-ring
D-ring
Seal ring
D-ring
Seal ring
D-ring
Seal ring

CONVERTER STALL TEST

Stall test consist of determining maximum engine speed obtained at full throttle in 'ID" and "R" positions. This test checks torque converter stator overrunning clutch operation, and holding ability of transaxle clutches and low-reverse brake.

Warning:
During this test, make sure that no one stand in front of or behind vehicle.

1. Check transaxle fluid level. Fluid should be at normal operating temperature [70-80^{o} (758-176°F). Engine coolant should also be at normal operating temperature] 80-90°C (176-205°F).
2. Apply chocks to both rear wheels.
3. Attach an engine tachometer.
4. Apply the parking and service brakes fully.
5. Start the engine.
6. With the selector lever in the "D" position, depress the accelerator pedal fully to read maximum engine rpm. Do not hold the throttle wide open any longer than is necessary to obtain maximum engine rpm reading, and never longer than 5 seconds at a time. If more than one stall test is required, operate the engine at approximately 1,000 rpm in neutral for 2 minutes to cool the transaxle fluid between tests.

   Stall speed : 1,800-2200 rpm

7. Place the selector lever in the "R" position and perform the stall test by the same procedure as previously described.

Stall Speed Above Specification in "D"

If stall speed is higher than specification, rear clutch or overrunning clutch of transaxle is slipping. In this case, perform hydraulic test to locate cause of slippage.

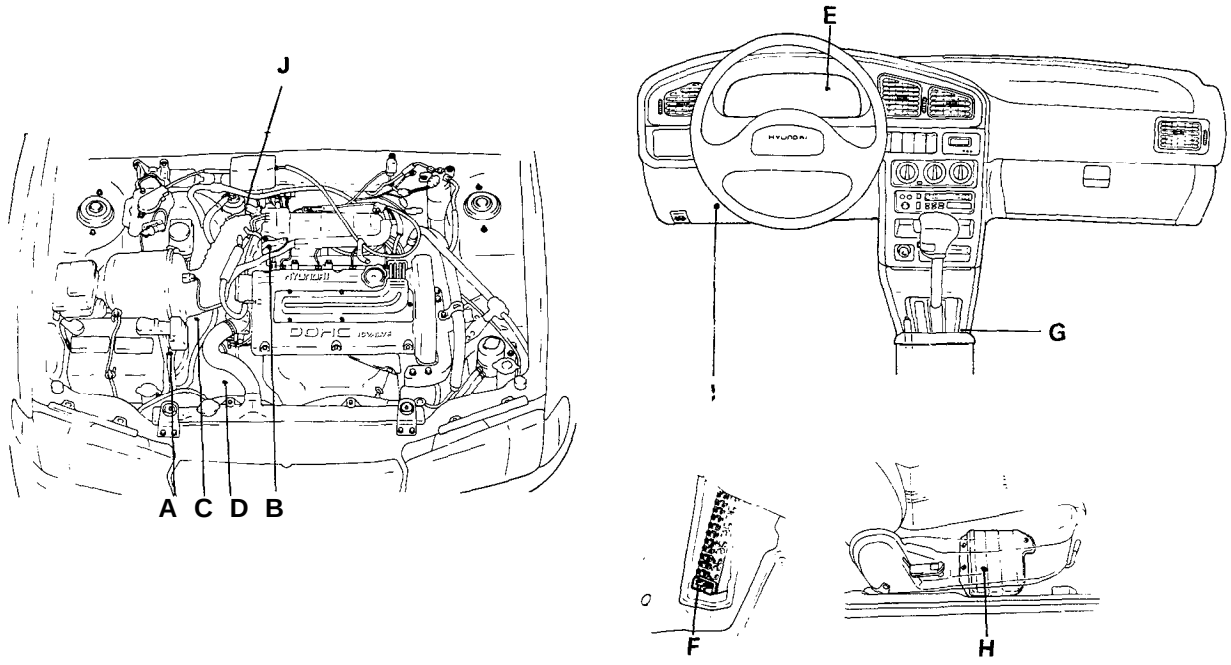
Stall Speed Above Specification in "R"

If the stall speed is higher than specification, the front clutch of the transaxle or low-reverse brake is slipping. In this case, perform the hydraulic test to locate the cause of slippage.

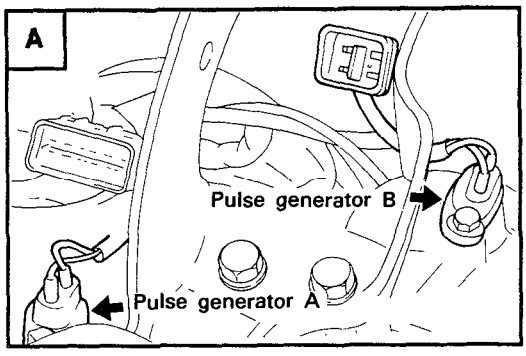
Stall Speed Below Specification in "D" and "R"

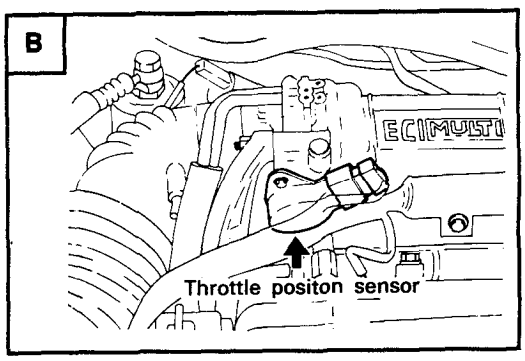
If the stall speed is lower than specification, insufficient engine output or a faulty torque converter is suspected. Check for engine misfiring, improper ignition timing, or valve clearance etc. If these are good, the torque converter is faulty.

E.L.C. 4-SPEED AUTOMATIC TRANSAXLE CONTROL COMPONENTS

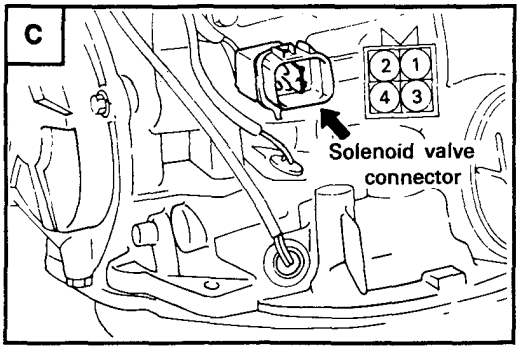


Name	Symbol	Name	Symbol
Pulse generator A, B	A	Data link connector	F
Throttle position sensor	B	Normal/Economy switch	G
Solenoid valve connector	C	4 A/T control module	H
Oil temperature sensor	D	M.F.I control module	I
Vehicle speed sensor	E	Idle switch	J

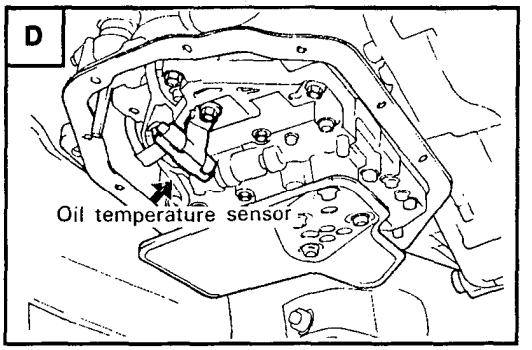




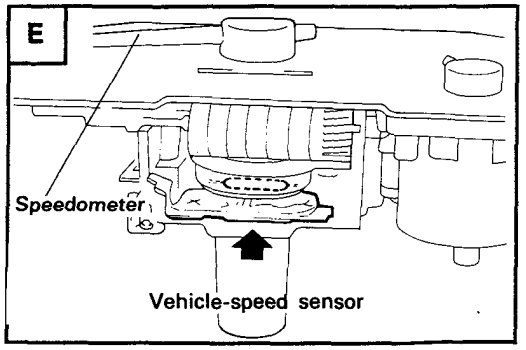
C


2 1
4 3
Solenoid valve connector

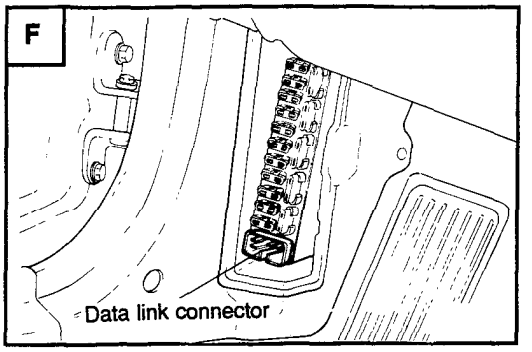
D


Oil temperature sensor

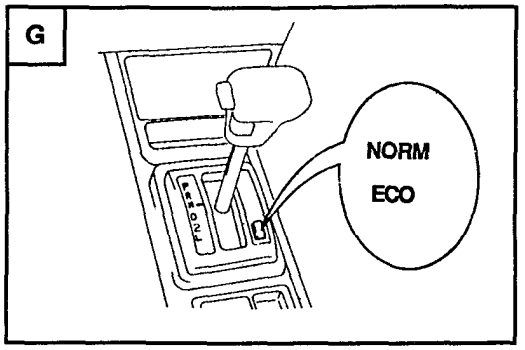
E


Speedometer
Vehicle-speed sensor

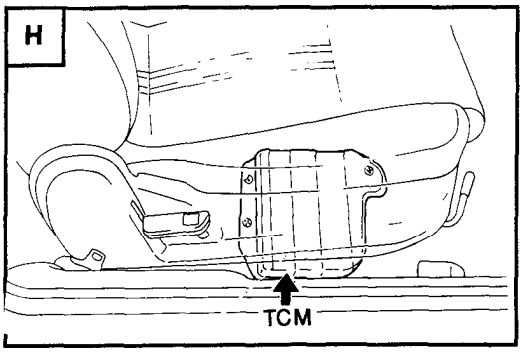
F


Data link connector

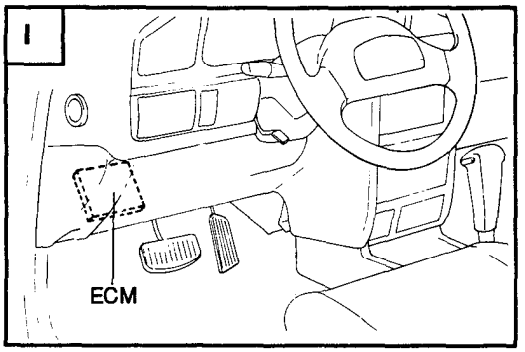
G


NORM
ECO

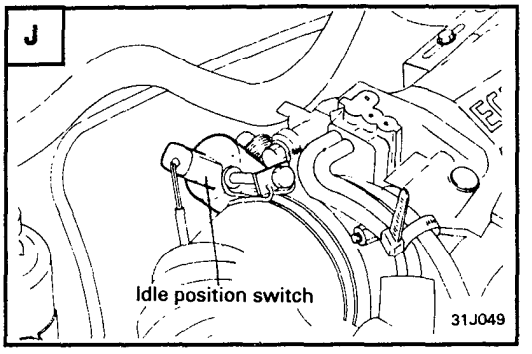
H


TCM

I

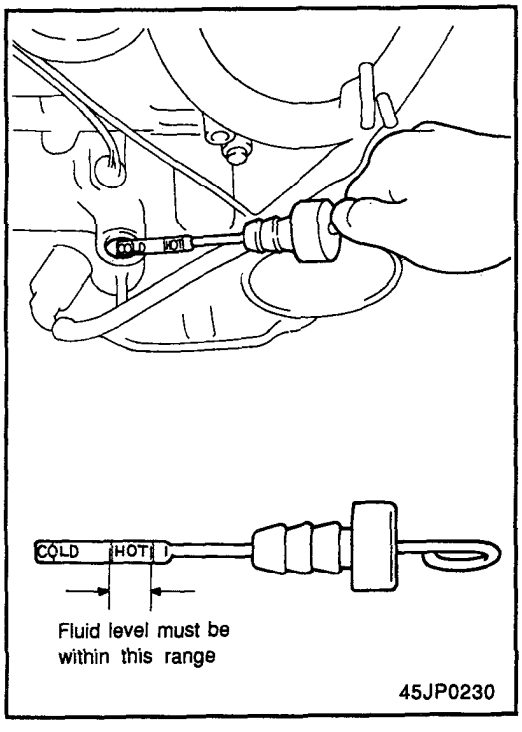

ECM

J


Idle position switch
31J049

SERVICE ADJUSTMENT PROCEDURES

TRANSAXLE FLUID LEVEL INSPECTION



1. Drive the vehicle until the fluid temperature reaches normal operating temperature [70-80°C (158-176°F)].
2. Place the vehicle on a level floor.
3. Move the selector lever sequentially to every position. This will fill the torque converter and hydraulic system with fluid, then place lever in "N" (Neutral) position.
4. Before removing the dipstick, wipe all contaminante from area around the dipstick, Then take out the dipstick and check the condition of the fluid.
5. Check to see if the fluid level is in the "HOT" range on dipstick. If fluid level is low, add automatic transaxle fluid until the level reaches the "HOT" range.

   Transaxle fluid :
   GENUINE HYUNDAI ATF AUTOMATIC TRANSAXLE FLUID OR MOPAR ATF PLUS TYPE 7176, DIAMOND ATF SP OR EQUIVALENT.

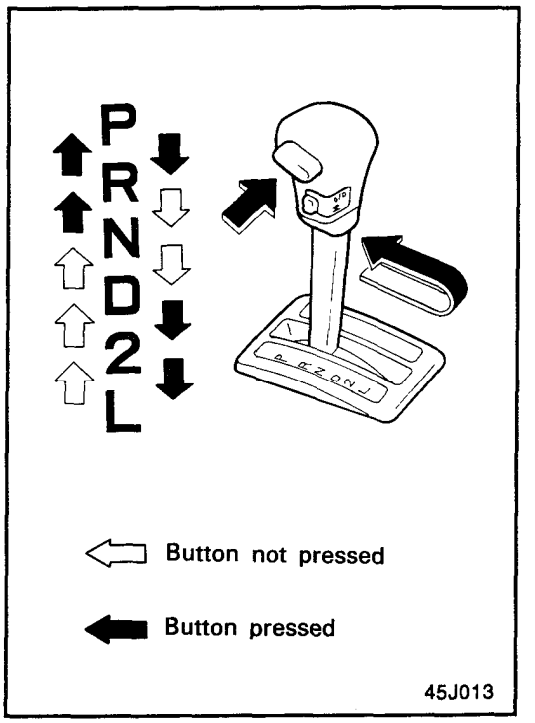
   Low fluid level can cause a variety of abnormal conditions because it allows the pump to take in air along with fluid. Air trapped in the hydraulic system forms bubbles which are compressable. Therefore, pressures will be erratic, causing delayed shifting, sliping clutch and brakes, etc.
   Improper filling can also raise fluid level too high. When the transaxle has too much fluid, gears churn up foam and cause the same conditions which occur with low fluid level, resulting in accelerated deterioration of automatic transaxle fluid.
   In either case, air bubbles can cause overheating, and fluid oxidation, which can interfere with normal valve, clutch, and servo operation. Foaming can also result in fluid escaping from the transaxle vent where it may be mistaken for a leak.
6. Be sure to examine the fluid on the dipstick closely.

TRANSAXLE FLUID REPLACEMENT

Refer to GROUP 10-Lubrication and Maintenance.

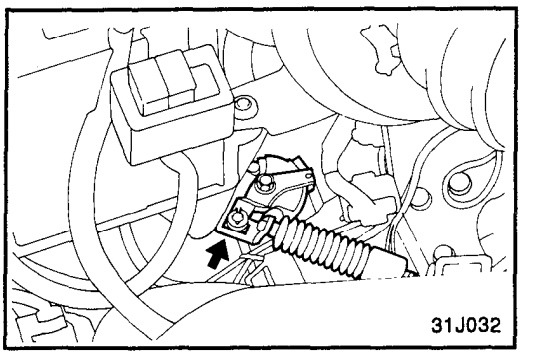
SELECTOR LEVER OPERATION CHECK

1. Shift the selector lever to each range and check to see that the lever moves smoothly and is controlled. Check to see that the position indicator is correct.
2. Check to be sure that the selector lever can be shifted to each position (by button operation as shown in the illustration).
3. Start the engine and check to see if the vehicle moves forward when the selector lever is shifted from "N" to "D", and moves backward when shifted to "R".
4. When the shift lever malfunctions, adjust the control cable and the selector lever sleeve. Check for worn shift lever assembly sliding parts.



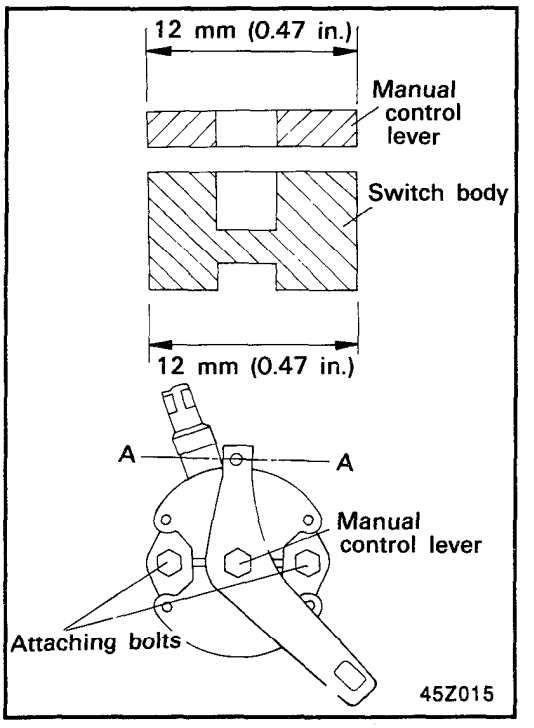
TRANSAXLE RANGE SWITCH ADJUSTMENT

1. Place selector lever in "N" (Neutral) position.
2 Loosen the manual control lever flange nut to separate the cable and lever.

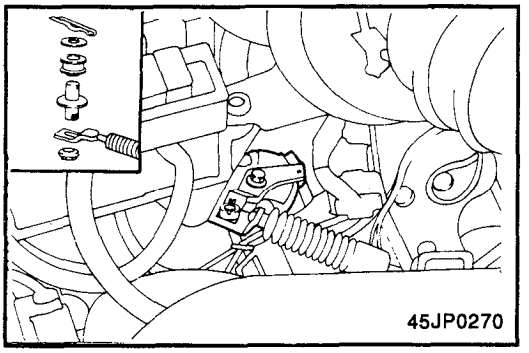


3. Place the manual control lever in the "N" (Neutral) position.
4. Turn the transaxle range switch body until the 12 mm (.47 in.) wide end of the manual control lever aligns with the switch body flange [12 mm (0.472 in.) wide portion].
5. Tighten the attaching bolts (2 pcs.) to the specified torque.
   Transaxle range switch attaching Bolt:
   10-12 Nm (100-120 kg.cm, 7-9 lb.ft)

NOTE
When setting up the switch body, be careful not to drop the O-ring from switch body.
Tighten the attaching bolts carefully.

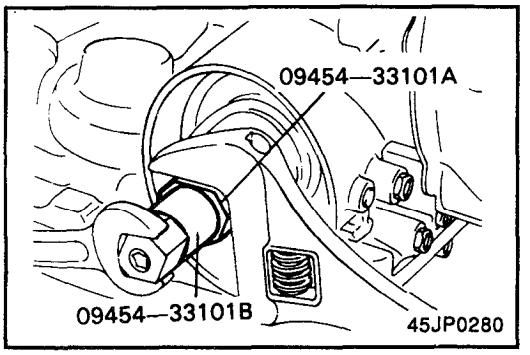


6. Make sure that the selector lever is in the "N" (Neutral) position.
7. Adjust the flange nut so that there is no slack in the control cable and make sure that the selector lever operates smoothly.
8. Run the vehicle and confirm that the transaxle is set in each range when the selector lever is shifted to each position.



KICKDOWN SERVO ADJUSTMENT

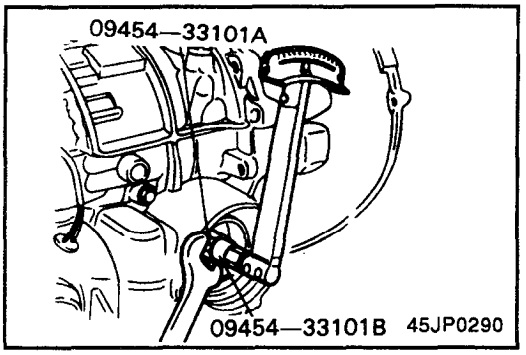
1. Completely remove all dirt and other contaminating materials adhered around the kickdown servo switch.
2. Remove the snap ring.
3. Remove the kickdown servo switch.
4. Loosen the lock nut.

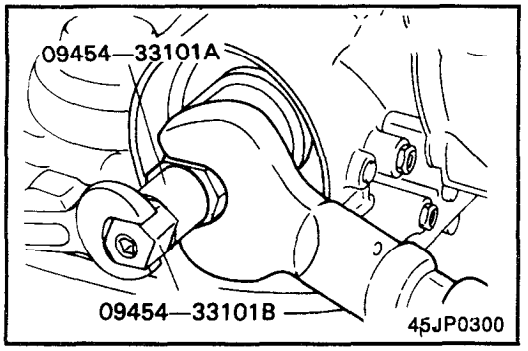


5. While holding with the special tool (09454-33101A) so that the kickdown servo piston won't turn, use a kickdown servo socket wrench-B (09454-33101B) to "tighten", the adjustment screw at 10 Nm (7.2 lb.ft). Loosen and tighten the adjustment screw two turns, and then finish tighten at a torque of 5 Nm (3.6 lb.ft). Again loosen the adjustment screw 2 to 2-1/4 turns.
6. While holding with special tool (09454-33101B) so that the kickdown servo piston won't turn, tighten the lock nut to the specified torque use special tool (09454-33101A).

   Lock nut: 25-32 Nm (250-320 kg.cm, 18-23 lb.ft)

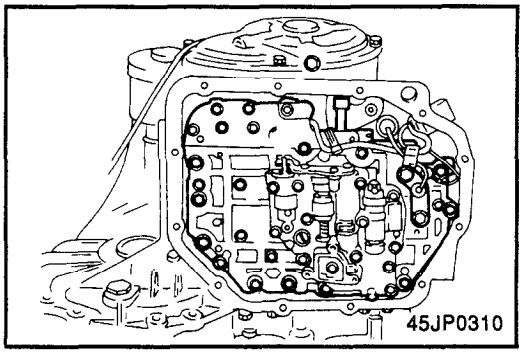
7. After installing a new O-ring in the groove surrounding the kickdown servo switch, arrange the O-ring so that it is not twisted. Install the kickdown servo switch into the case, and then install the snap ring.



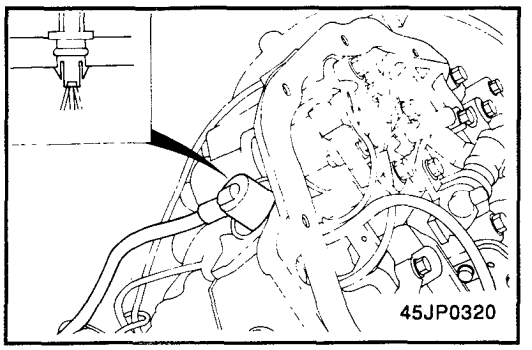


LINE PRESSURE ADJUSTMENT

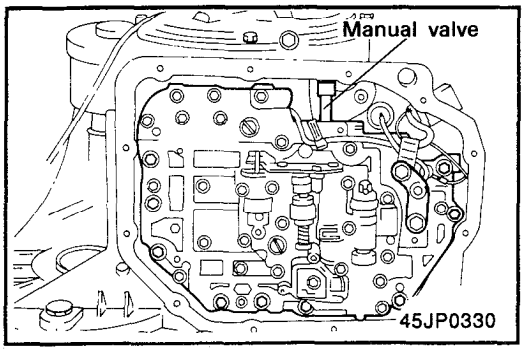
1. Drain the automatic transaxle fluid.
2. Remove the oil pan.
3. Remove the oil filter.
4. Remove the oil-temperature sensor.



5. Press the tab of the solenoid valve harness grommet and push in.

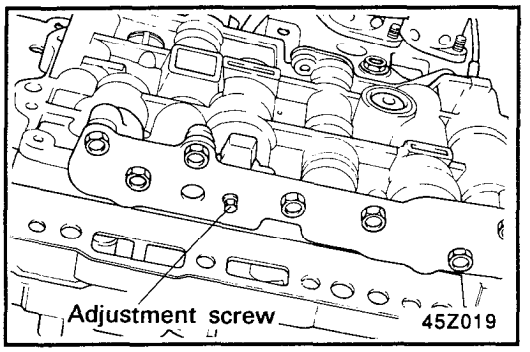


6. Remove the valve body assembly.
   Be careful not to drop the manual valve.

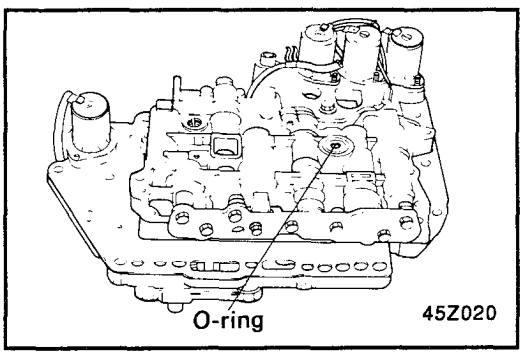


7. If the line pressure needs adjustment, then turning the screw clockwise, will lower to pressure, while turning the screw counter-clockwise, increase the pressure.

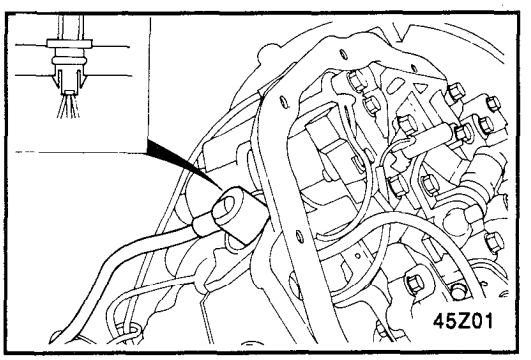
   Standard value :
   870-890 kPa (124-127 psi, 8.87-9.08 kg/cm^2)
   Oil pressure change for each turn of adjustment screw :
   38 kPa (54 psi, 0.39 kg/cm^2)



8. Check to be sure that the O-ring is installed on the upper surface of the valve body at the place shown in the figure.
9. Replace the O-ring of the solenoid valve connector with a new one.



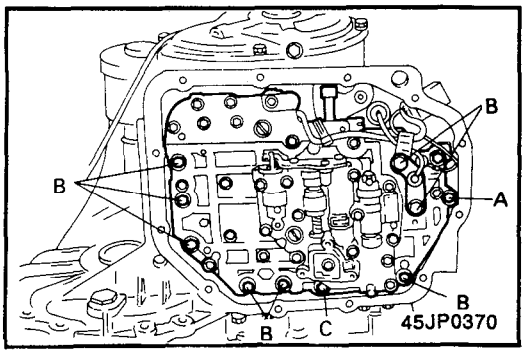
10. Install the valve body assembly to the case and then insert the solenoid valve connector into the case. Be sure, at this time, that the notched part of the connector faces as shown in the figure.
    Also be careful that the lead wiring isn't caught.



11. Tighten the ten(10) valve body assembly mounting bolts to 10-12Nm (100-120kg.cm, 7-9lb.ft).

    A : 18 mm (0.709 in.) long
    B : 25 mm (0.984 in.) long
    C : 40 mm (1.575 in.) long

12. Install the oil filter.
13. Install a new oil pan gasket with the oil pan.
14. Pour in the specified amount of Automatic transaxle fluid.
15. Make the oil pressure test. Readjust if necessary.



REDUCING PRESSURE ADJUSTMENT

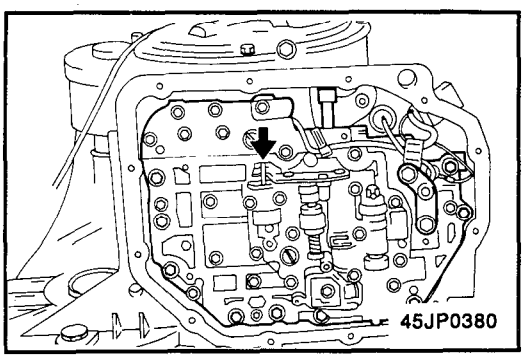
(If the Scan Tool is not available)

1. Remove parts up to the oil filter in the same way as for adjustment of the line pressure. The valve body need not be removed.
2. Turn the adjustment screw of the lower valve body and adjust so that the reducing pressure is the standard value.
   When the adjustment screw is turned clock wise, the reducing pressure becomes lower; when it is turned to the counter clock wise, it becomes higher.

   NOTE:
   When adjusting the reducing pressure, aim for the center value (425 kPa, 60 psi) of the standard value allowance.

   Standard value :
   425 ± 10 kPa (80 ± 1 psi, 4.3 ± 1 kg/cm^2)
   Oil pressure change for each turn of the adjustment screw:
   30 kPa (4.3 psi, 0.3 kg/cm^2)

3. Install the oil filter and oil pan in the same way as for adjustment of the line pressure.
4. Make the oil pressure test. Readjust if necessary.



(If the Scan Tool is used)

1. Adjust to obtain the specified kick down brake pressure when the pressure continued solenoid is activated at 50% duty ratio with the multi-use tester.

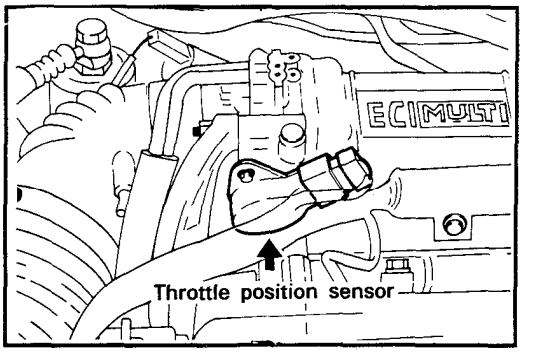
   Standard value :
   275 ± 10 kPa (39 ± 1 psi, 2.8 ± 1 kg/cm^2)
   Oil pressure change for each turn of the adjustment screw:
   20 kPa (3 psi, 0.2 kg/cm^2)

2. Check to be sure that the reducing pressure (after the adjustment is completed) is within the range of 370-490 kPa (53-70 psi, 3.8-5.0 kg/cm^2)

NOTE:
This adjustment should be made at an oil temperature of 70-60°C(166-176°F).
If the adjustment is made at a temperature that is too high, the line pressure will drop during idling, with the result that it might not be possible to make the correct adjustment.

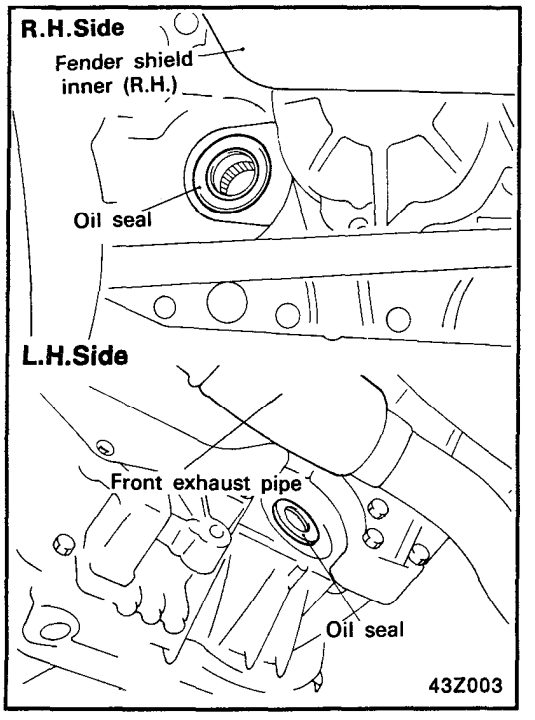
THROTTLE-POSITION SENSOR ADJUSTMENT

Refer to GROUP 31 -FUEL SYSTEM.

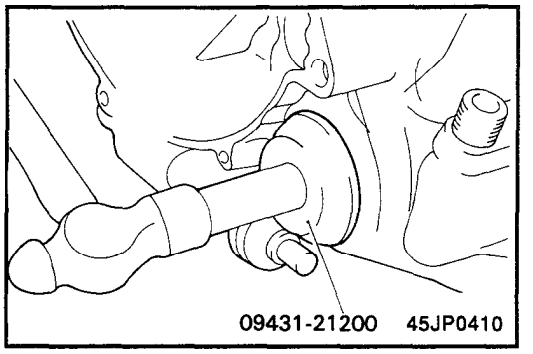


DRIVE SHAFT OIL SEALS REPLACEMENT

1. Disconnect the drive shaft from the transaxle. (Refer to FRONT SUSPENSION-Drive Shaft)
2. Using a flat-tip (-) screwdriver, remove the oil seal.

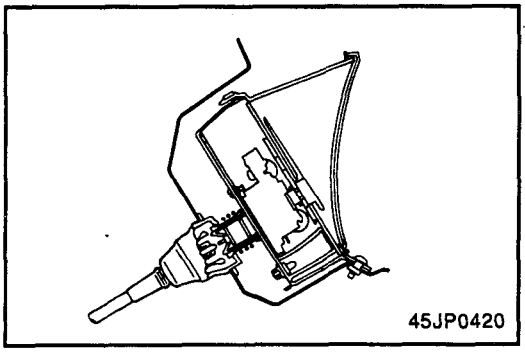


3. Using the special tool (09431-21200), tap the drive shaft oil seal into the transaxle.
4. Apply a coating of the transaxle fluid to the lip of the oil seal.



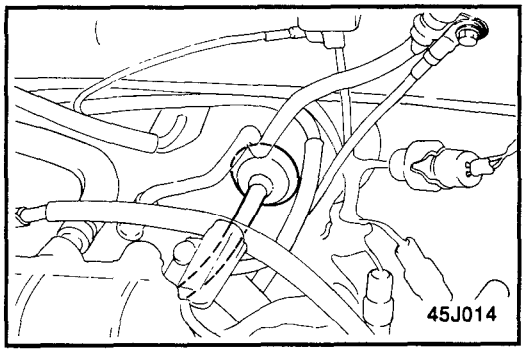
SPEEDOMETER CABLE REPLACEMENT

1. Correctly insert the adapter into the instrument panel, and fasten the new speedometer cable.



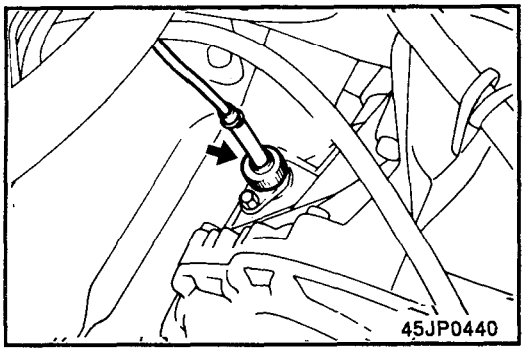
2. Install the grommet so that, as shown in the illustration, the cable attachment part and the projection part are horizontal.

   NOTE:
   The cable arrangement should be made so that the radius of the cable bends is 150 mm (5.9 in.) or more.

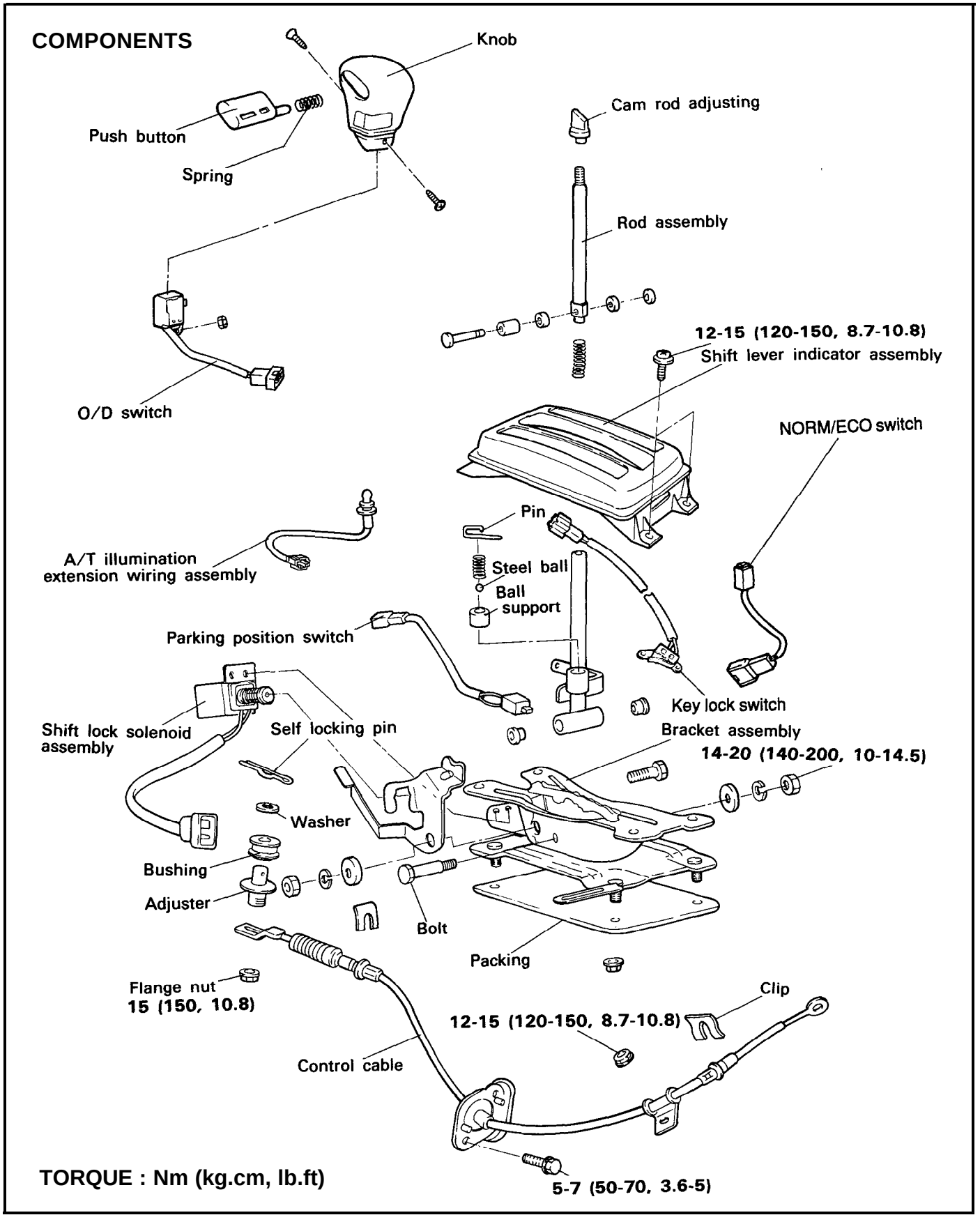


3. At the transaxle end of the speedometer cable, the key joint should be inserted into the transaxle, and the nut should be securely tightened.

   NOTE:
   If the cable is not correctly and securely connected, it may cause an incorrect reading on the speedometer, or abnormal noise. Be sure to connect it correctly.

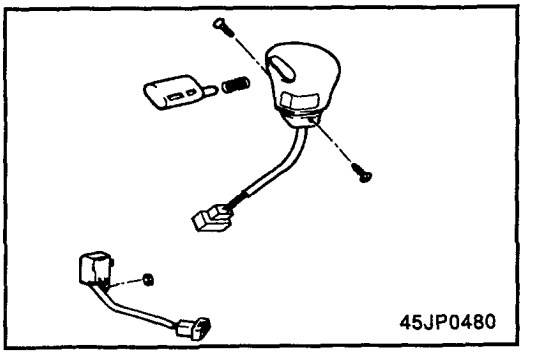


TRANSAXLE CONTROL

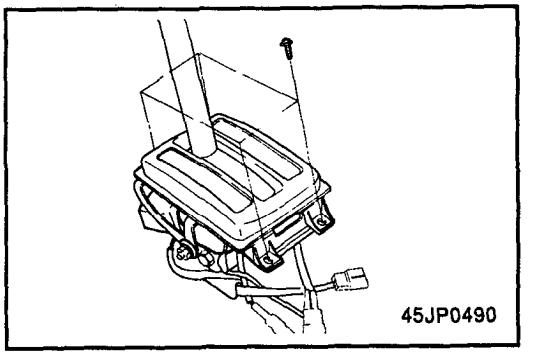


REMOVAL

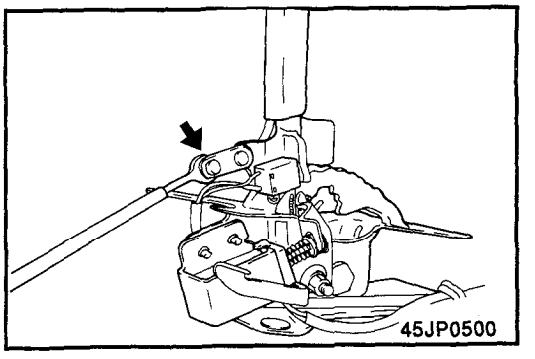
1. Remove the console box assembly. (Refer to Body Group).
2. Remove the knob installation screws.
3. Disconnect the overdrive switch connector and then remove the knob.



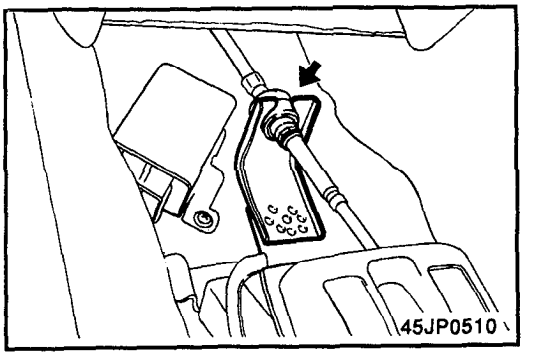
4. Remove the shift lever indicator assembly.
5. Disconnect the position indicator light connector and normal/ economy select switch connector.



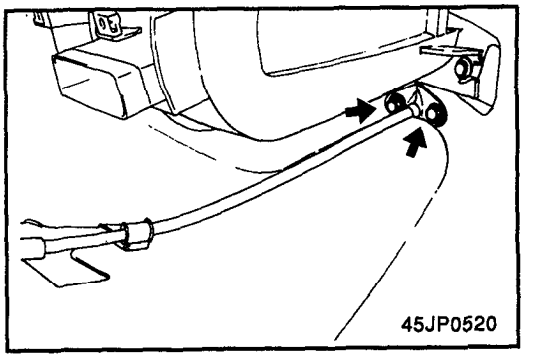
6. Remove the pin, self lock pin from the link.



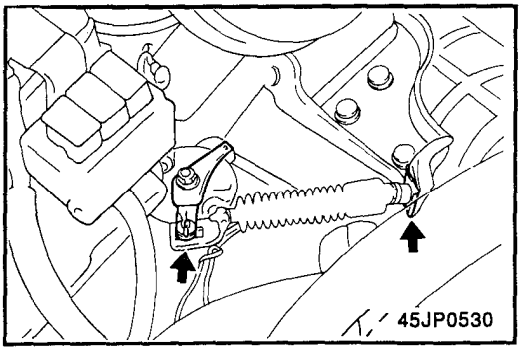
7. Remove the clip, nut from the shift lever side.



8. Remove the bolt-washer assembly located on dash panel.

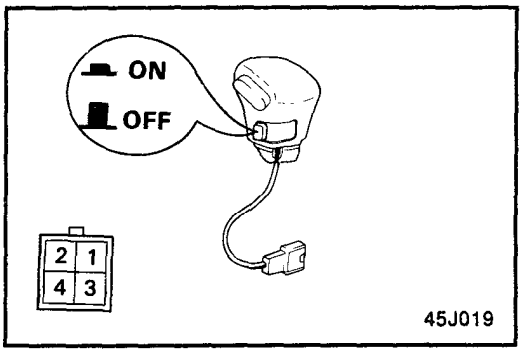


9. Remove the clip, flange nut from the transaxle side.
10. Remove the transaxle control cable assembly.



INSPECTION

1. Check the control cable for function and for damage.
2. Check the bushing for wear or damage.
3. Check the spring for damage or deterioration.
4. Check the overdrive switch for continuity.



○—○ Continuity

Terminal / Switch position	1 (0.3-RW)*	2 (0.3-LR)*	3 (0.3-BW)*
Overdrive activation	○	○	
Overdrive non-activation	○		○

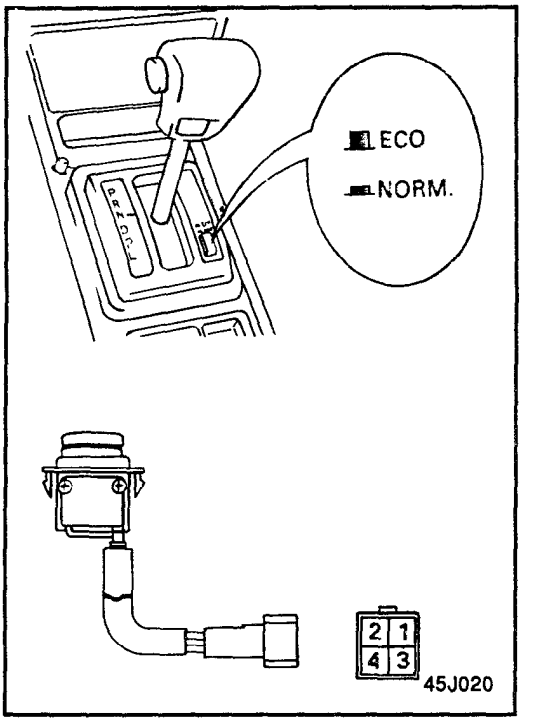
NOTE

*Color code	Color of wire	*Color code	Color of wire
R	Red	B	Black
W	White	L	Blue

5. Check the P/N switch for continuity.

○—○ : Continuity

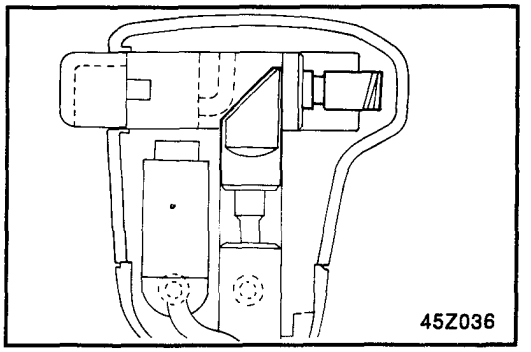
Terminal / Position	1	2	4
ECO (Free)	○		○
NORM (Push)	○	○	



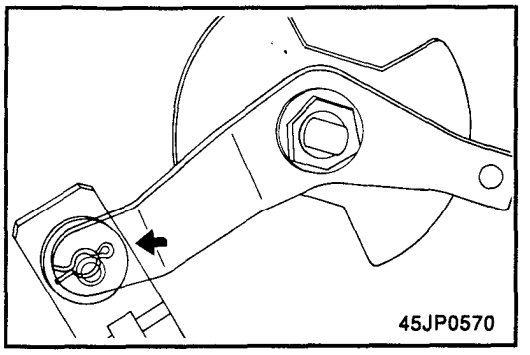
INSTALLATION

1. Apply a coating of the specified grease to the interior of the bushing.

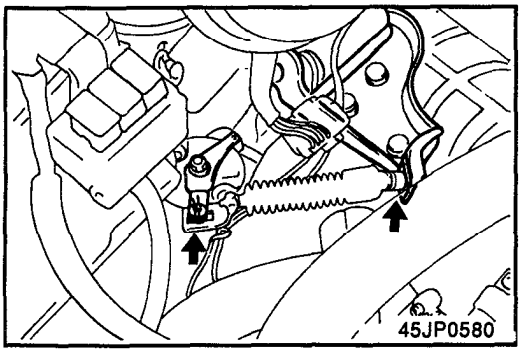
   Specified grease : Chassis grease SAE J310, NLGI No.2



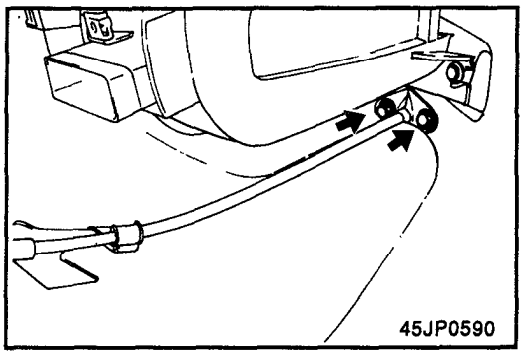
2. Move the shift lever and the transaxle range switch to the "N" position, and install the control cable.



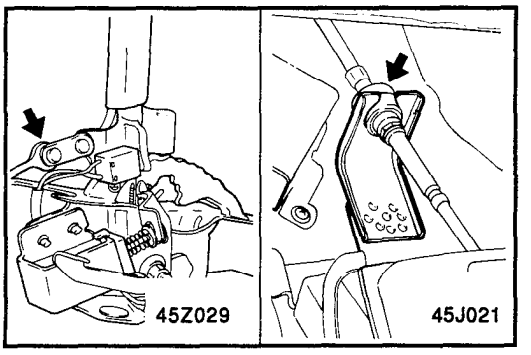
3. When connecting the control cable to the transaxle mounting bracket, install the clip until it contacts the control cable, in position switch in the figure.



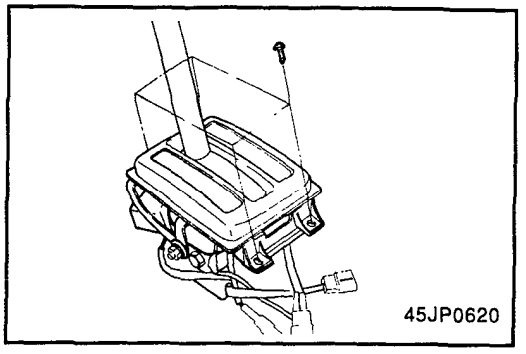
4. Install the bolt-washer assembly, nut.



5. Install the clip pin, self lock pin. (shift lever side).

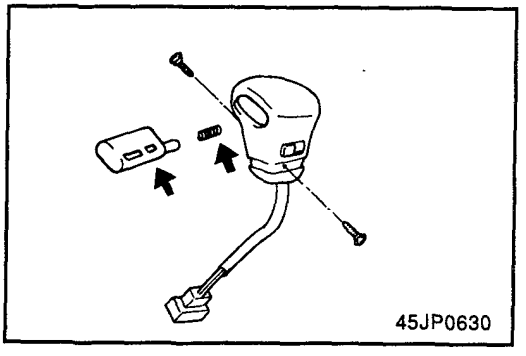


6. Connect the position indicator light connector, the O/D switch connector, the parking position switch connector, power/ normal select switch connector, and the shift lock solenoid connector.
7. Install the shift lever indicator assembly.



8. Apply the specified grease at the place shown in the figure.

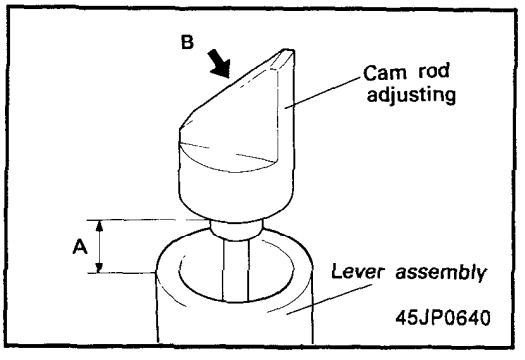
   Specified grease : Multipurpose grease SAE J310, NLGI No.2



9. Place the shift lever in the "N" position, and then turn the cam adjusting so that the clearance between the cam adjusting and the lever assembly end in within the standard value.

   Standard value (A) : 15.2-15.9 mm (0.596-0.625 in.)

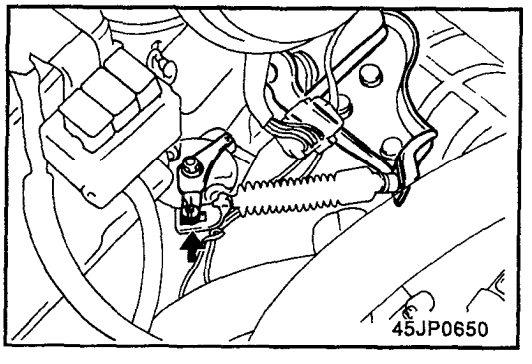
   NOTE
   Be sure to face B of the adjusting cam to the push button (driver's side).



10. install the selector knob.
11. Install the console box. (Refer to BODY GROUP).

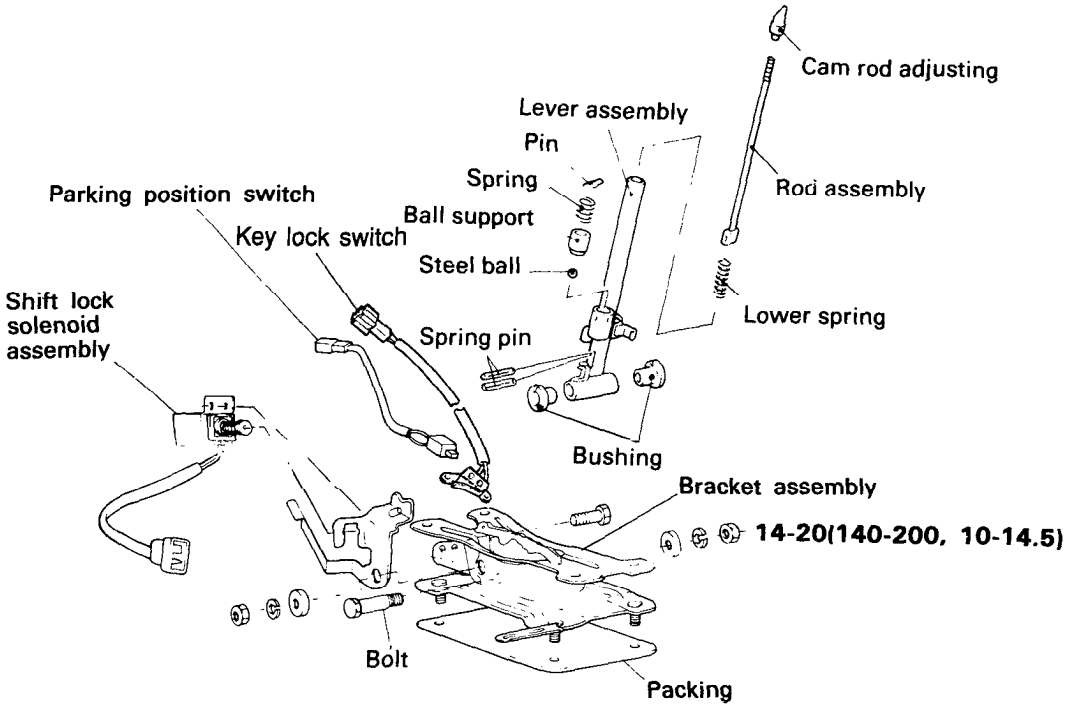
ADJUSTMENT OF CONTROL CABLE

1. Eliminate slack from the control cable with the adjusting flange nut and check that the select lever operates smoothly.
2 Driving the car, check that the transaxle is set in the proper range when the select lever is shifted to each position.



SHIR LEVER ASSEMBLY

COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

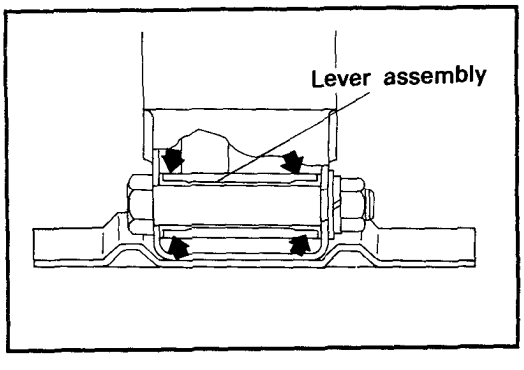
INSPECTION

- Check the detent place for wear.
- Check the bushing for wear or damage.
- Check the spring for damage or deterioration.
- Check the pin at the end of rod assembly for wear.

ASSEMBLY

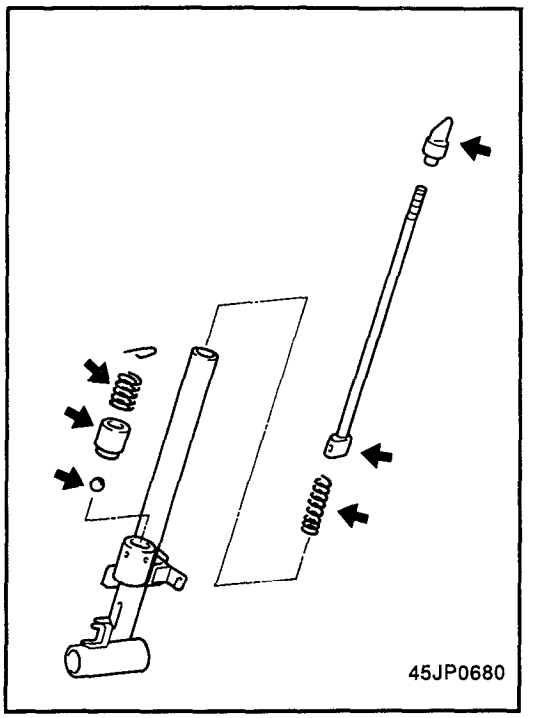
1. Apply a coating of grease to the sliding part of the bushing.

   Specified grease : Chassis grease SAE J310, NLGI No.2



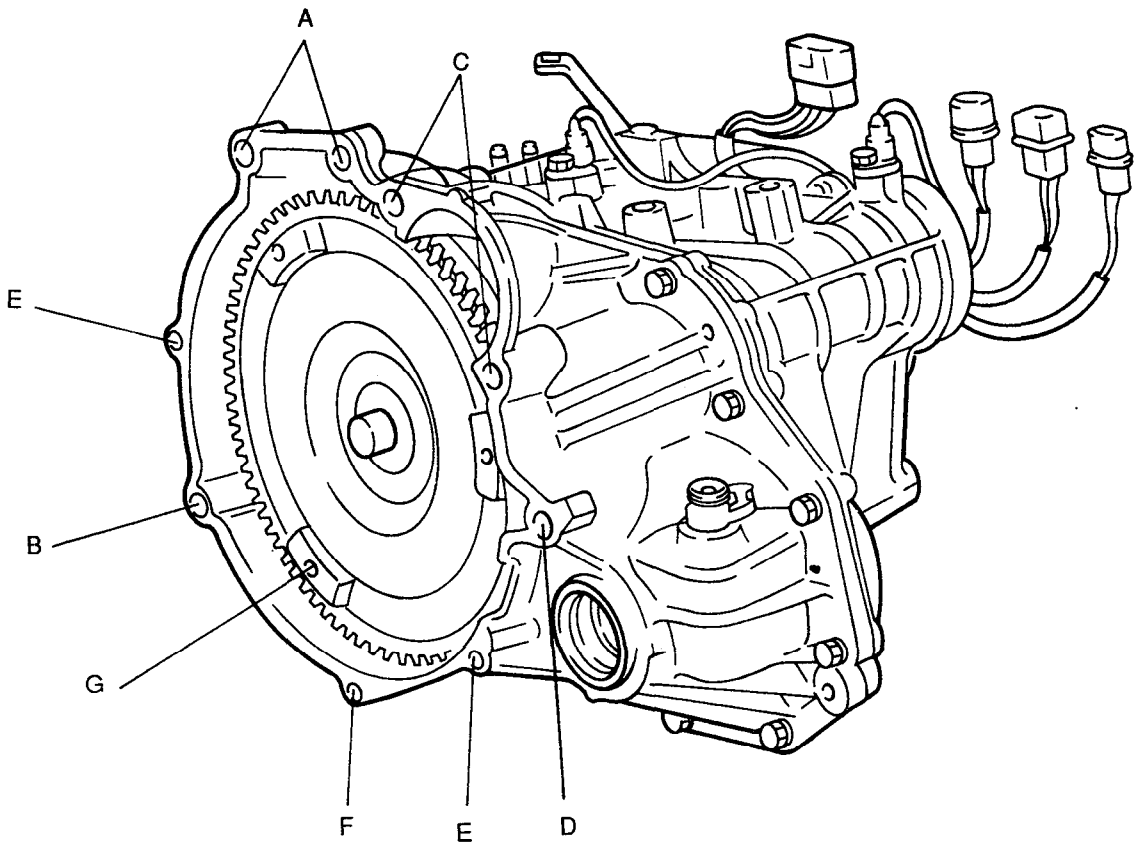
2 Apply the specified grease at the places shown in the figure.

Specified grease : Multipurpose grease SAE J310, NLGI No.2



AUTOMATIC TRANSAXLE

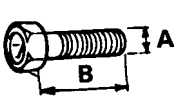
COMPONENTS



	Nm	Kg.cm	lb.ft	O.D. x Length mm (in.)
A	43-55	430-550	31-40	7 10x40(1.6)
B	43-55	430-550	31-40	7 10x65(2.6)
C	27-34	270-340	20-24	7 10x55(2.2)
D	30-35	300-350	22-25	10 8x60(2.4)
E	10-12	100-120	7-9	7 6x12(0.5)
F	30-35	300-350	22-25	7 8x12(0.5)
G	46-53	460-530	34-38	

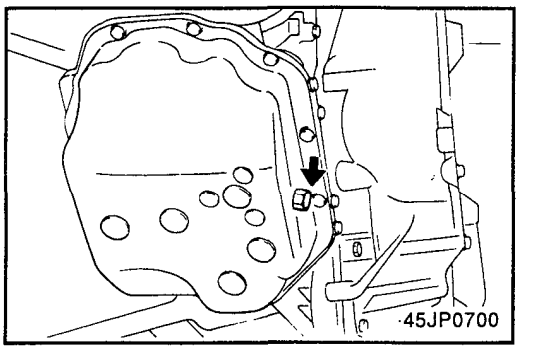
Bolt identification

7 A x B



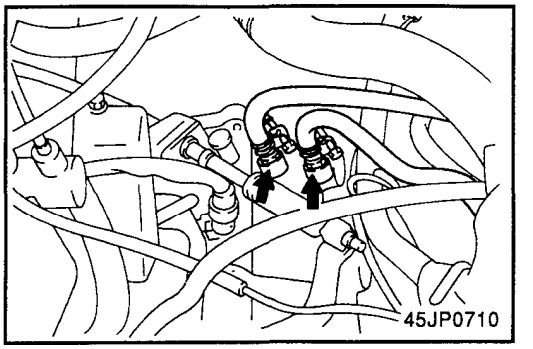
REMOVAL AND INSTALLATION

1. Remove the drain plug and drain the transaxle fluid.
2. Disconnect and remove the air cleaner assembly.

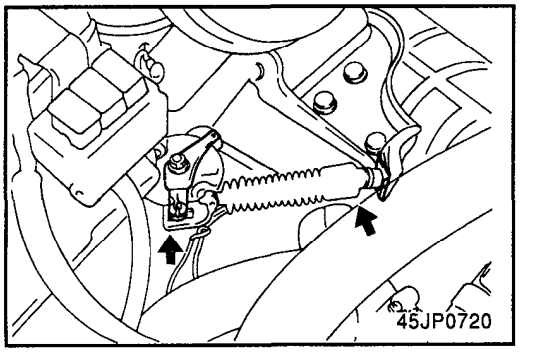


3. Loosen the mounting clamps and disconnect the return and supply hose.

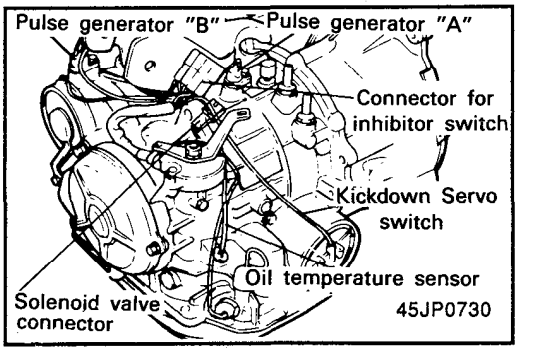
NOTE
To prevent to entry of dust and foreign matter, plug the disconnected hoses and the transaxle fitting part.



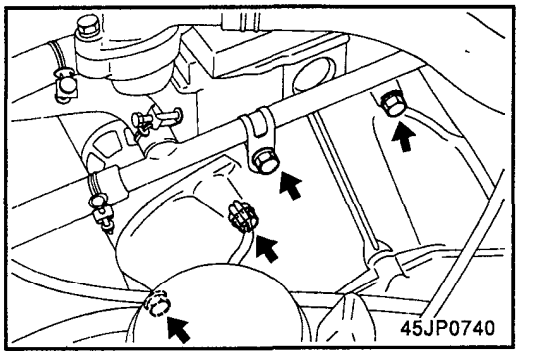
4. Remove the control cable.
5. Remove the speedometer cable.



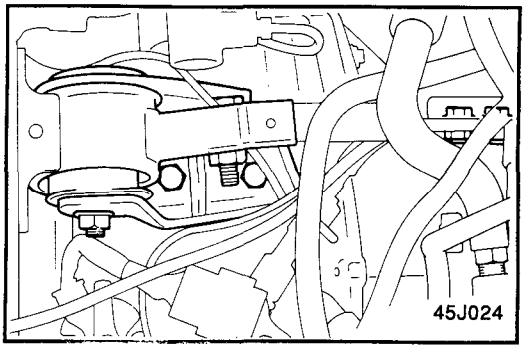
6. Separate the pulse generator connector, transaxle range switch connector, kickdown servo switch connector, solenoid valve connector, and the oil temperature sensor connector.



7. Remove the transaxle-to-engine bolt from the upper portion of the transaxle.

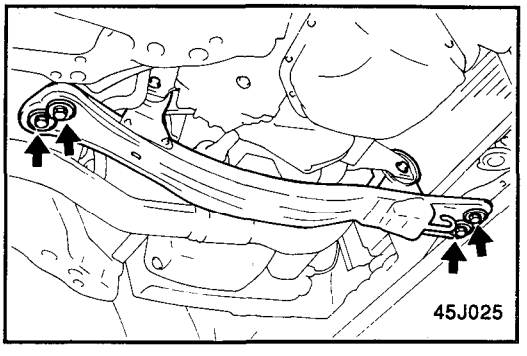


8. Remove the transaxle mounting bracket.



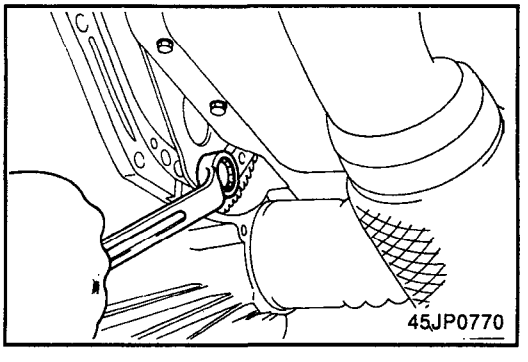
9. While supporting the lower part of the transaxle by using a jack, remove the center member mounting bolts.

CAUTION:
Support a wide area of the transaxle so that an excessive amount of pressure is not applied to the oil pan.

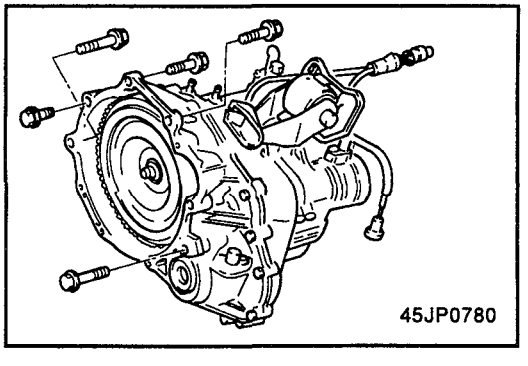


10. Remove the bell housing cover.
11. Remove the three special bolts connecting the converter to the drive plate.

NOTE
To remove the special bolts of torque converter, turn engine crankshaft with a box wrench to bring one of the bolts to the position appropriate for removal.
After removing the bolt, turn the crankshaft in the-same manner as above and remove all remaining bolts one after another.
Bring the transaxle shift lever into the "N" (Neutral) position.

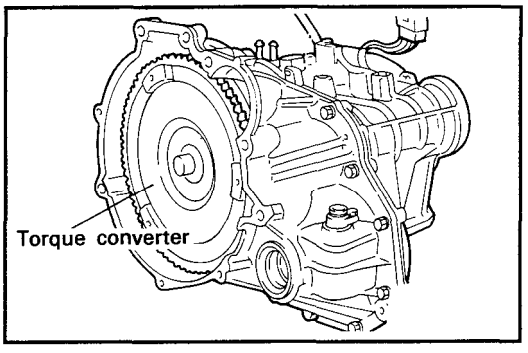


12. After removing the special bolts, re-install the center member assembly.
13. Remove the lower arm ball joint (Refer to DRIVE SHAFT GROUP)
14. Remove the remaining engine connecting bolts while at the same time supporting the transaxle with a floor jack.



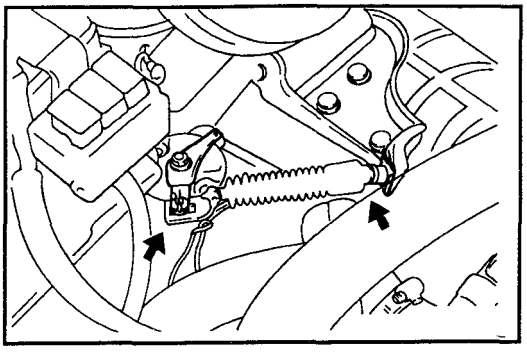
INSTALLATION

1. Attach the torque converter on the transaxle side and mount the transaxle assembly onto the engine.



CAUTION
If the torque converter is mounted first on the engine, the oil seal on the transaxle side may be damaged. Therefore, be sure to first assemble the torque converter to the transaxle.

2. Install the transaxle control cable and adjust as follows.
   1) Move the shift lever and the inhibitor switch to the "N" position, and install the control cable.
   2) When connecting the control cable to the transaxle mounting bracket, install the clip until it contacts the control cable. (as shown in the illustration)
   3) Remove any free-play in the control cable by adjusting nut and then check to see that the selector lever moves smoothly.
   4) Check to see that the control cable has been adjusted correctly.

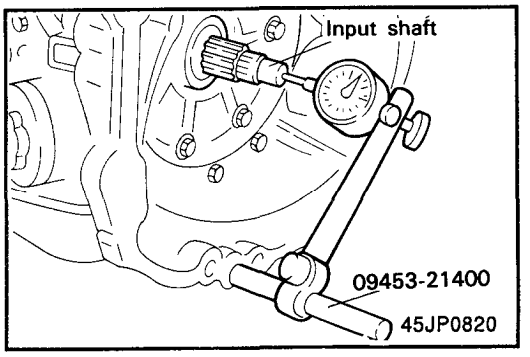


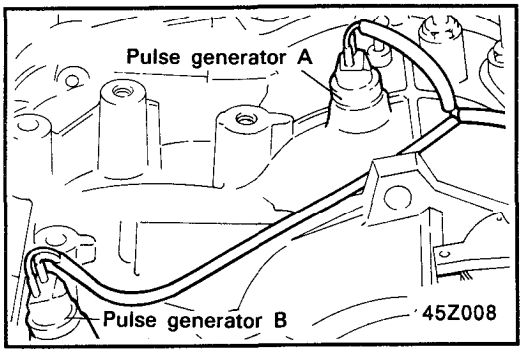
DISASSEMBLY

NOTE

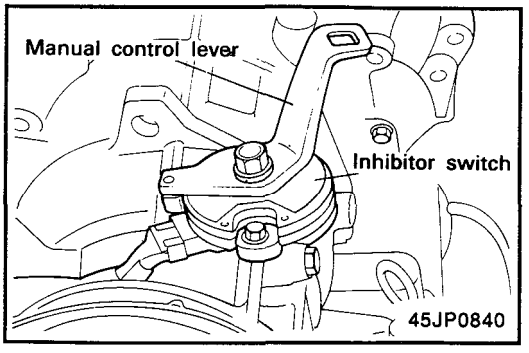
The automatic transaxle is composed of precision component parts, these parts should be very carefully handled during disassembly and assembly, to prevent and damage.
During disassembly, cloth gloves or rags should not not be used.
If such items must be used, use nylon, or use paper towels.
All disassembled parts must be thoroughly cleaned. Metal parts may be cleaned with ordinary detergents, but must be thoroughly air dried.
Clean the clutch disc, resin thrust plate and rubber parts by using ATF (automatic transaxle fluid), being careful that dust, dirt, etc. do not adhere.
If the transaxle pan has excessive metal residue, flush the radiator transaxle cooler system.

1. Clean away any sand, mud, etc. adhered around the transaxle.
2. Place the transaxle assembly on the workbench with the oil pan down.
3. Remove the torque converter.
4. Measuring input shaft end play before disassembly will usually indicate when a thrust washer change is required (except when major parts are replaced).
   Thrust washer are located between the reaction shaft support and rear clutch retainer, and between the reaction shaft support and front clutch retainer.
   Mount a dial indicator to the converter housing with the dial indicator support.
   Make sure that the indicator plunger is seated against the end of the input shaft.
   When checking end play, pull out or push in the input shaft with pliers. Be careful not to scratch the input shaft. Record indicator reading for reference when reassembling the transaxle.
5. Remove the pulse generators “A” and “B”.

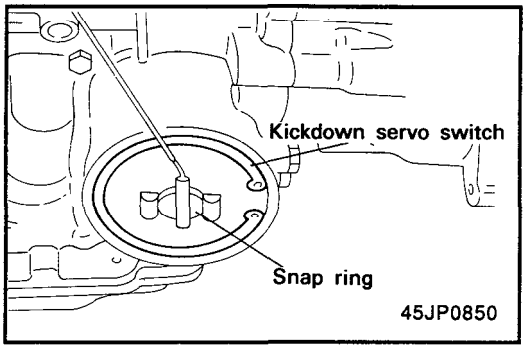




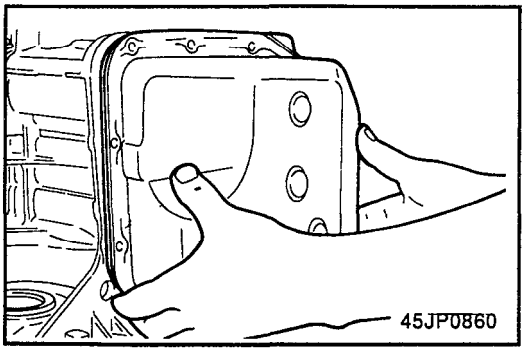
6. Remove manual control lever, then remove the transaxle range switch.



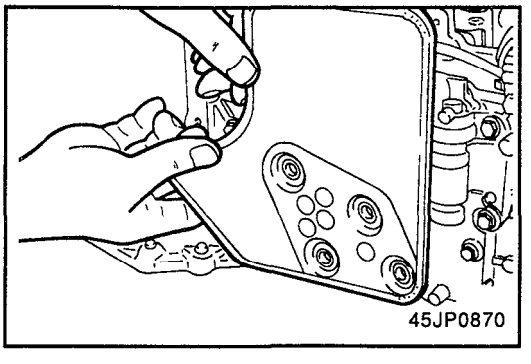
7. Remove the snap ring and kickdown servo switch.



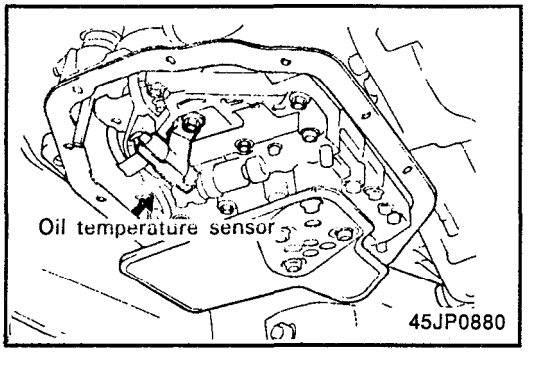
8. Remove the oil pan and gasket.



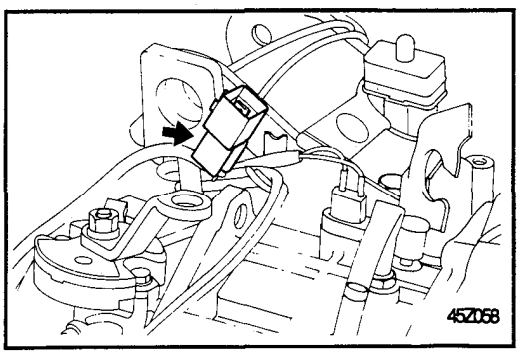
9. Remove the oil filter from the valve body.



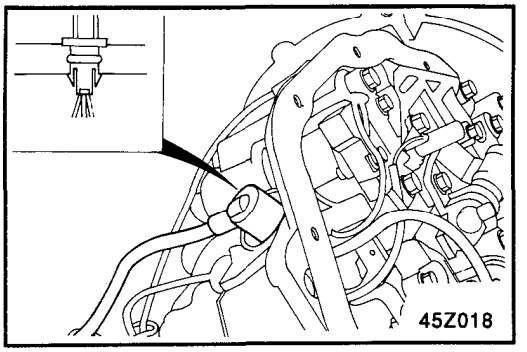
10. Remove the oil-temperature sensor installation bolt; then, after removal from the bracket, pull out from the connector side.



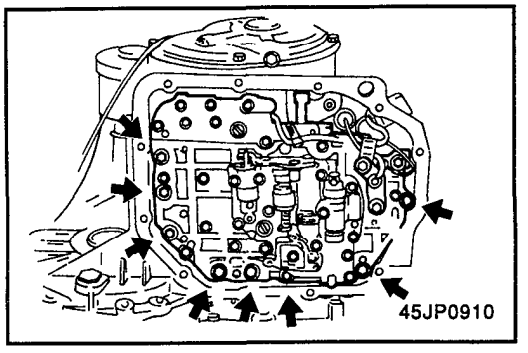
11. Pull up the solenoid valve connector.



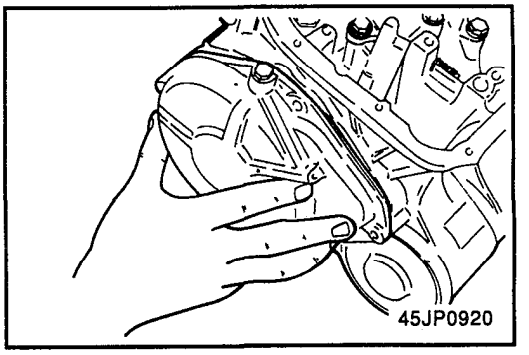
12. Press the tab of the solenoid valve harness grommet and push in.



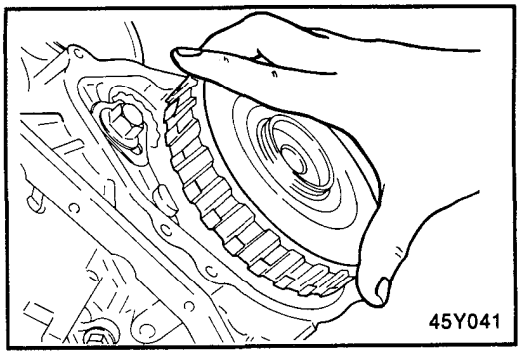
13. Remove the 8 valve body bolts. Remove the valve body.



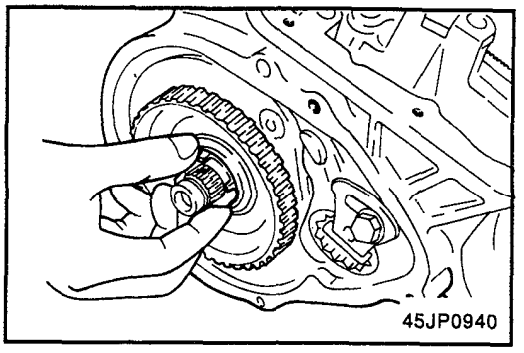
14. Remove the end clutch cover mounting bolts, the cover holder, and the end clutch cover.



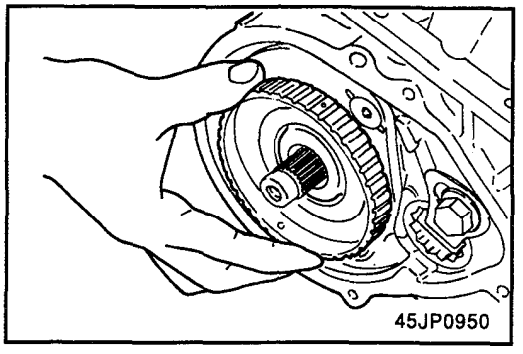
15. Remove the end clutch assembly.



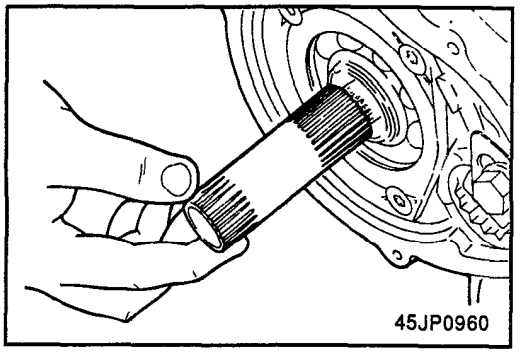
16. Remove the thrust plate.



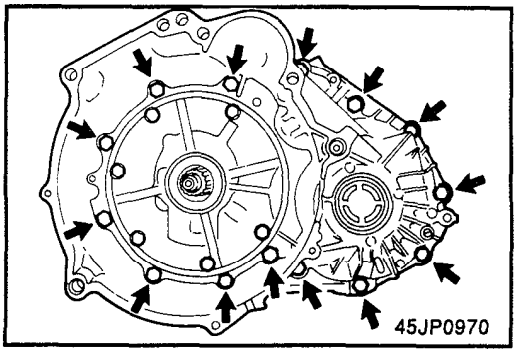
17. Remove the end clutch hub and thrust bearing.



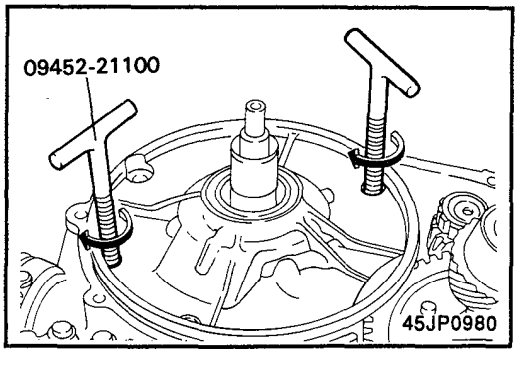
18. Pull out the end clutch shaft.



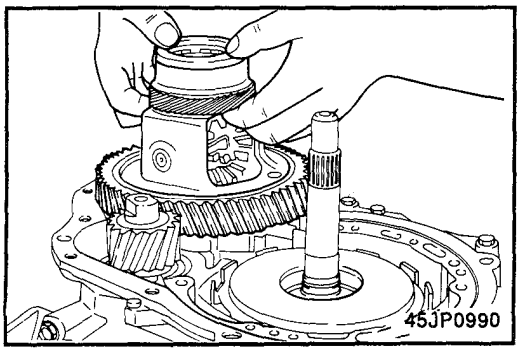
19. Remove the 14 converter bolts. Remove the converter housing.



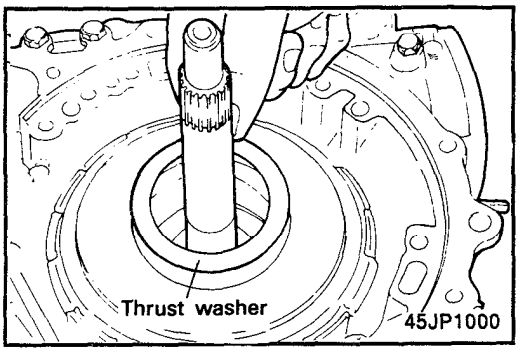
20. Using the special tool (09452-21100) remove the 6 oil pump assembly bolts. Remove the oil pump assembly.



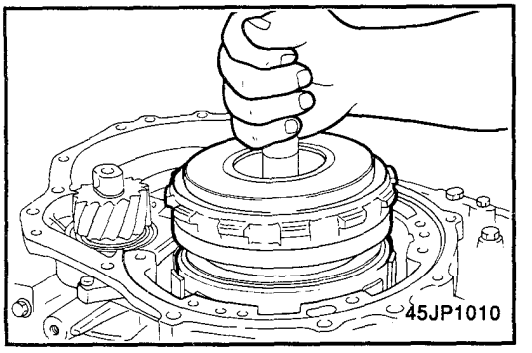
21. Remove the spacer and the differential assembly.



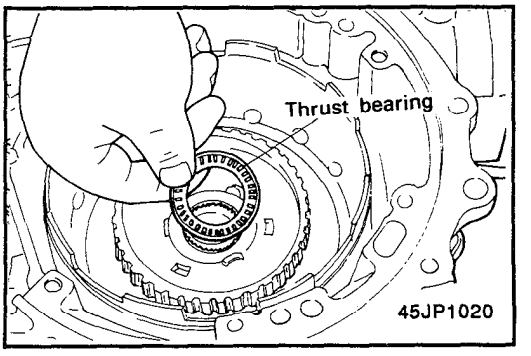
22. Remove the fiber thrust washer.



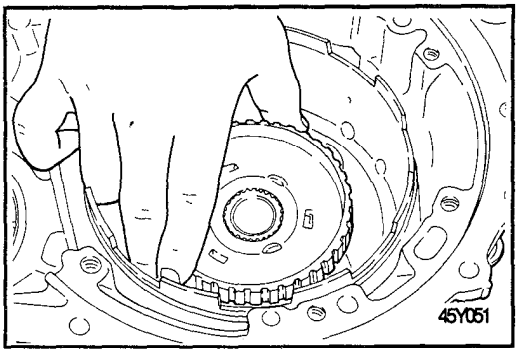
23. Pull up the input shaft, and remove the front clutch assembly and the rear clutch assembly together.



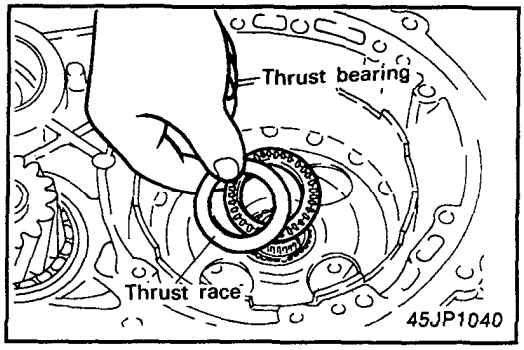
24. Remove the thrust bearing.



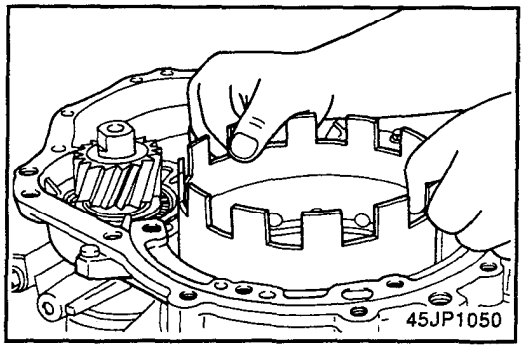
25. Remove the clutch hub.



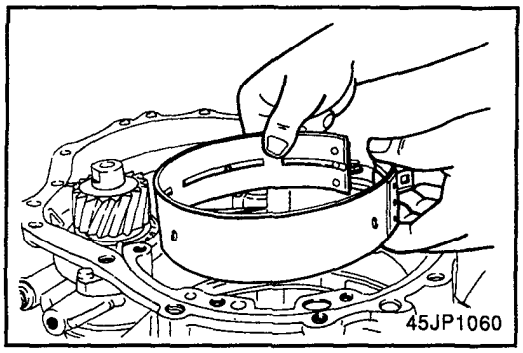
26. Remove the thrust race and bearing.



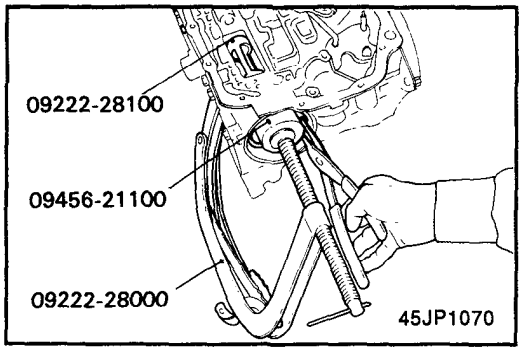
27. Remove the kickdown drum.



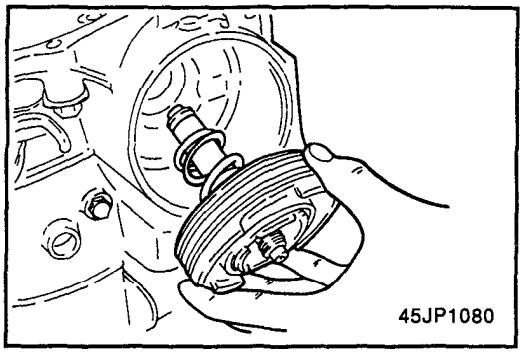
28. Remove the kickdown band,



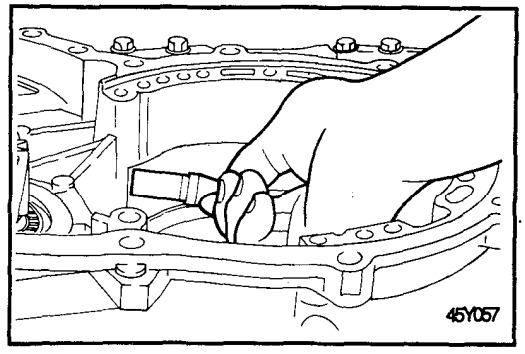
29. Using the special tools (09222-28000, 09222-28100, 09456-21100), push in the kickdown servo and remove the snap ring.



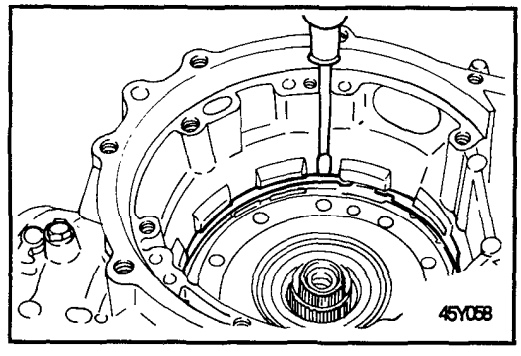
30. Remove the kickdown servo piston and spring.



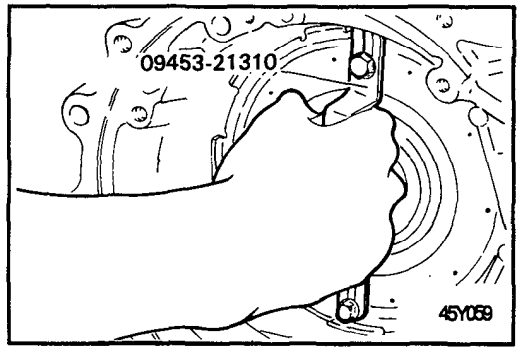
31. Remove the anchor rod.



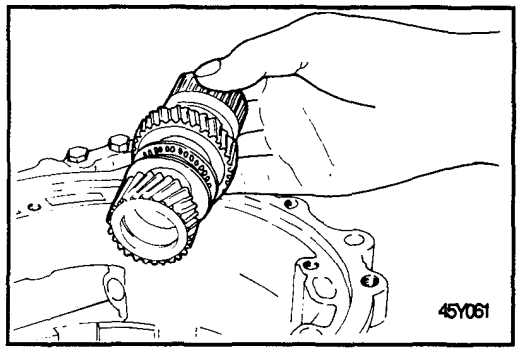
32. Remove the snap ring.



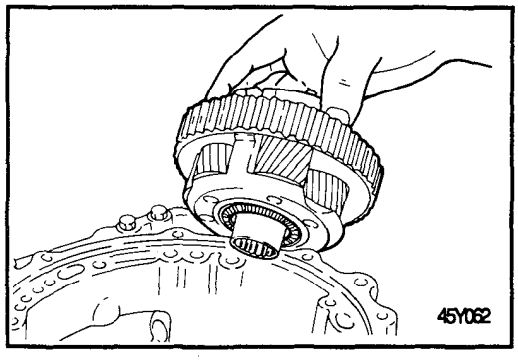
33. Attach the special tool (09453-21310) on the center support. Holding the handle of the tool, pull the center support straight upward.



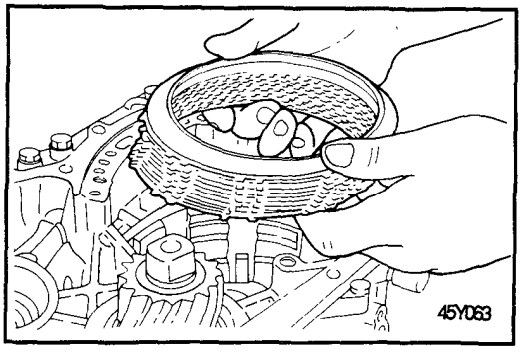
34. Remove the reverse sun gear and the forward sun gear together.



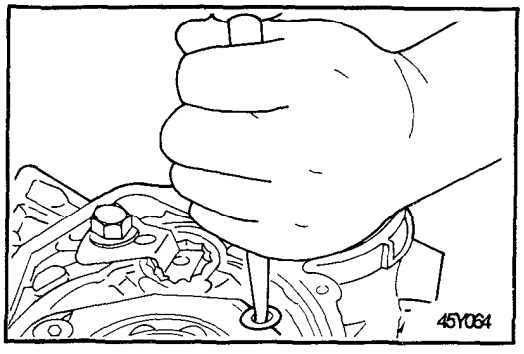
35. Remove the planet carrier assembly and thrust bearing.



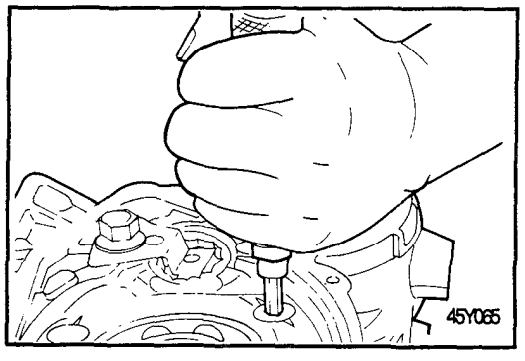
36. Remove the wave spring, return spring, reaction plate, brake disc, and brake plate.



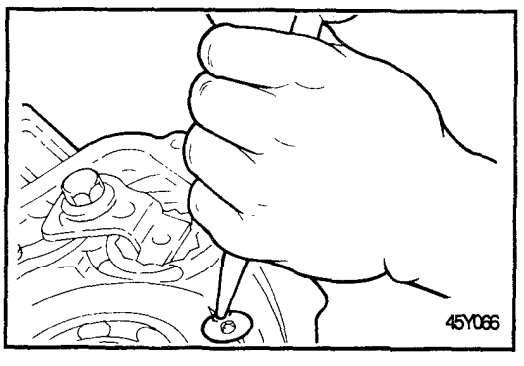
37. Since a thread locking compound is applied to the bolt threads, tap the bolt head for easier removal.



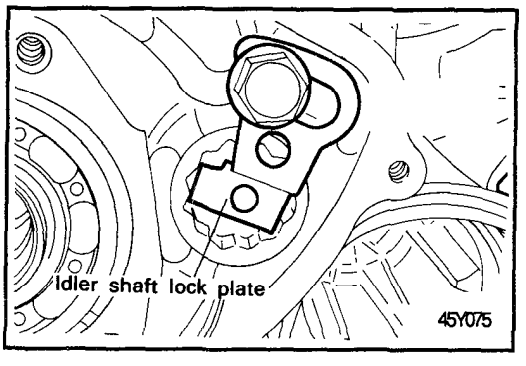
38. Using an impact driver, loosen the bolt.



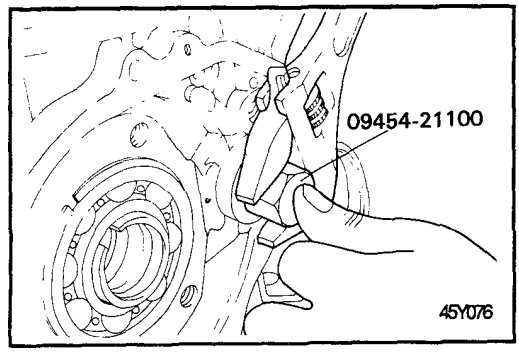
If an impact driver is not available, use a punch or something similar.



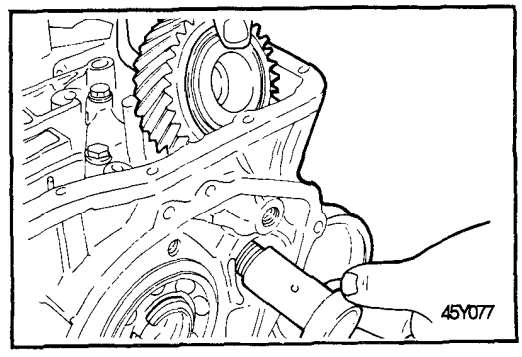
39. Remove the idler shaft lock plate.



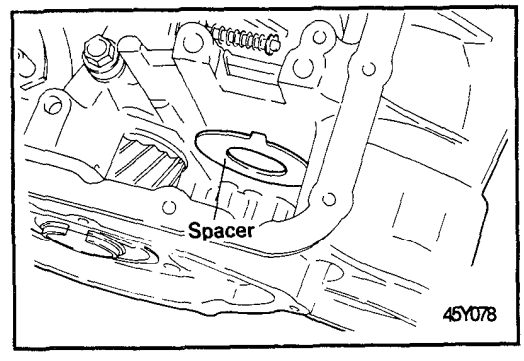
40. Loosen the transfer idler shaft with the special tool (09454-21100).



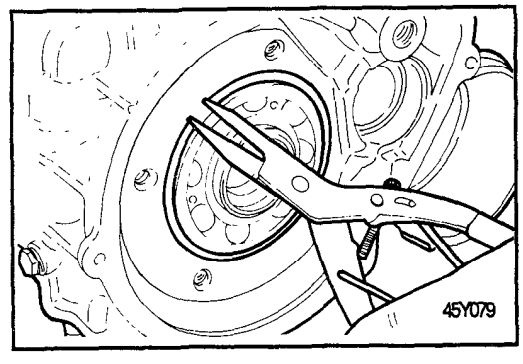
41. Remove the transfer idler shaft. Remove the transfer idle gear bearing inner races (2 pieces) from inside the case.



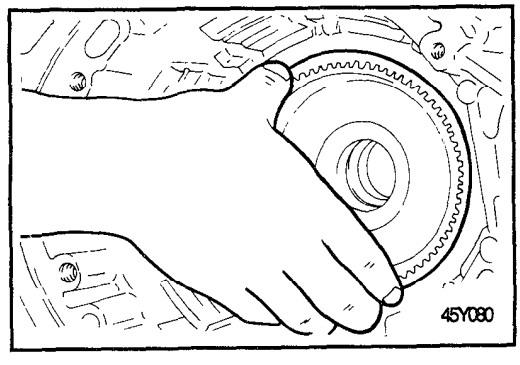
42: Remove the spacer.



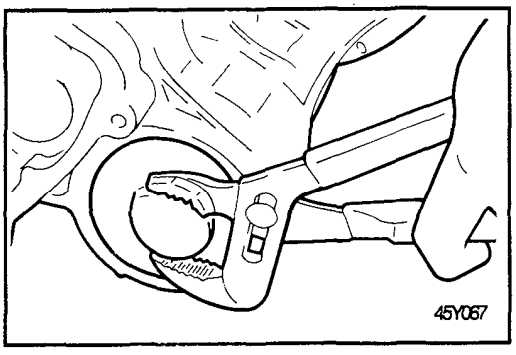
43. Remove the snap ring from the bearing.



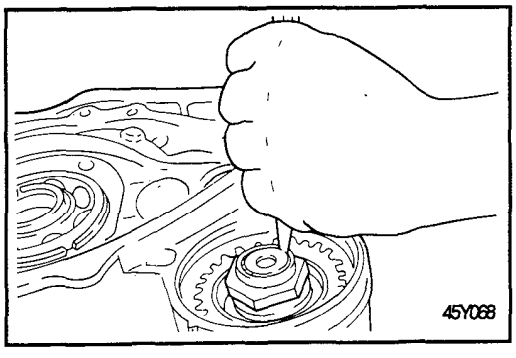
44. Remove the internal gear, output flange, transfer drive gear and bearing as an assembly from the case.



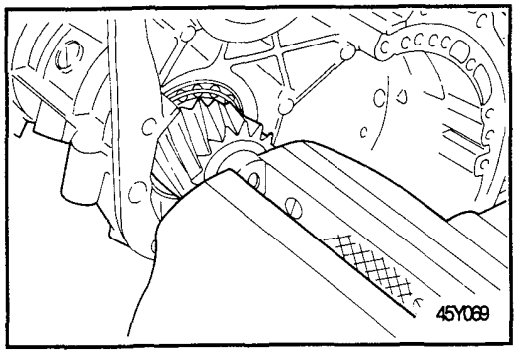
45. Remove the transfer shaft cover.



46, Unstake the transfer shaft lock nut.

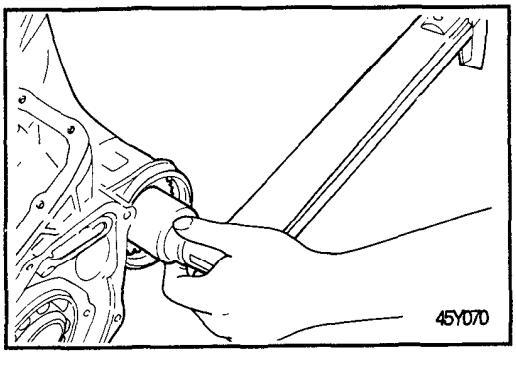


47. Fix the transfer shaft converter housing side.

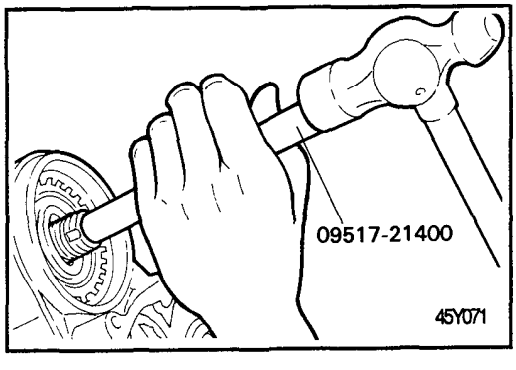


48. Remove the locking nut.

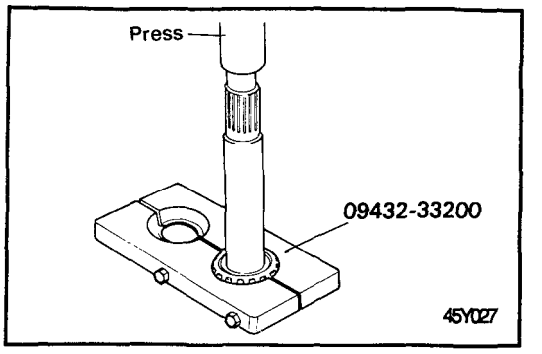
NOTE:
The lock nut has left-hand threads.



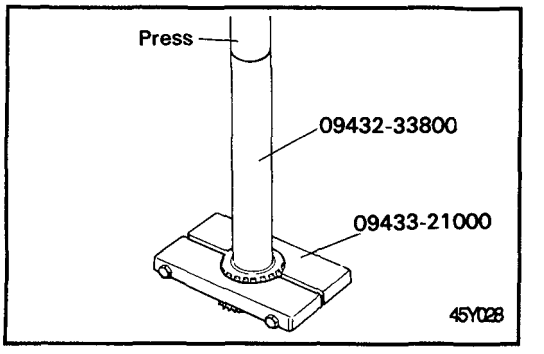
49. Knock off the transfer shaft to the converter housing side.



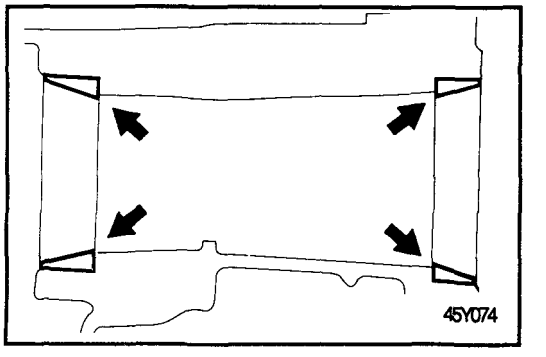
50. Using the special tool (09432-33200), pull the bearing from the transfer shaft.



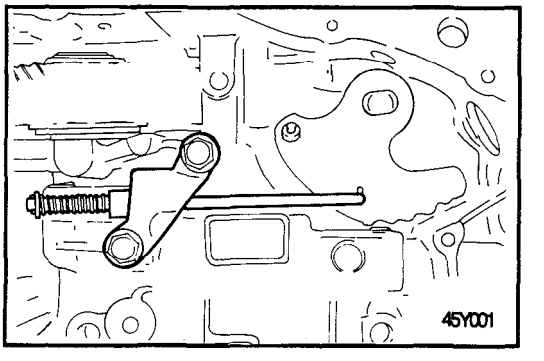
51. Using the special tools (09432-33800, 09433-21000), pull the bearing from the transfer driven gear.



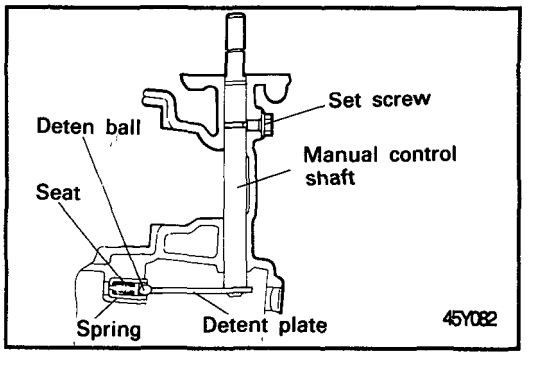
52. Using a screwdriver, remove the outer race.



53. Remove two bolts and the parking sprag rod.



54. Remove the set screw and the manual control shaft assembly. Remove the steel ball, the seat and the spring together at this time.



ASSEMBLY

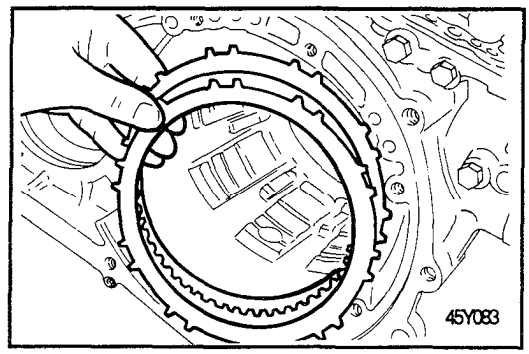
NOTE:
Do not reuse gaskets, oil seals and rubber parts. Replace them with new ones. The O-ring of the oil level dipstick need not be replaced.
Do not use grease other than petrolatum or industrial Vaseline. Apply automatic transaxle fluid to friction elements, rotating parts, and sliding parts before installation. Refer to page 45-4 concerning automatic transaxle fluid. New clutch discs should be immersed in automatic transaxle fluid for a minimum of two hours before installation.
Do not apply sealer or adhesive to gaskets.
When bushings must be replaced, replace their complete assembly which.
Do not use shop towels during disassembly and reassembly operation.
The oil in the cooler should also be replaced.

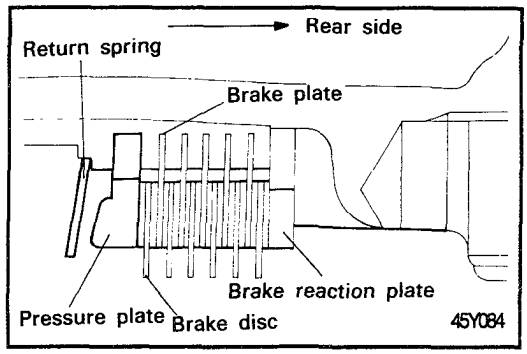
1. Before assembly of the transaxle, measure the end play of the low-reverse brake, and select a pressure plate to be used so that the end play will be the standard value.
   1) Install the brake reaction plate, brake plate and brake disc to the transaxle case.

      NOTE :
      If new brake discs are used, be sure to immerse them in ATF for a minimum of two hours.

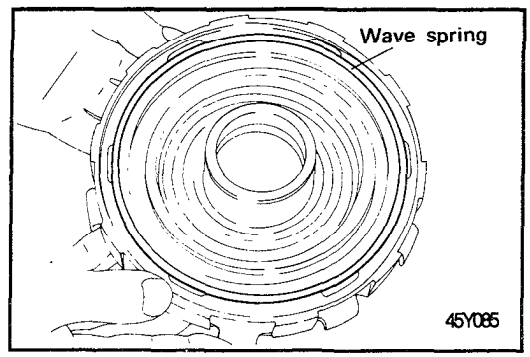
   2) Install the appropriate pressure plate and then install the return spring.

      NOTE :
      Be sure that the return spring is installed so that it faces in the correct direction.

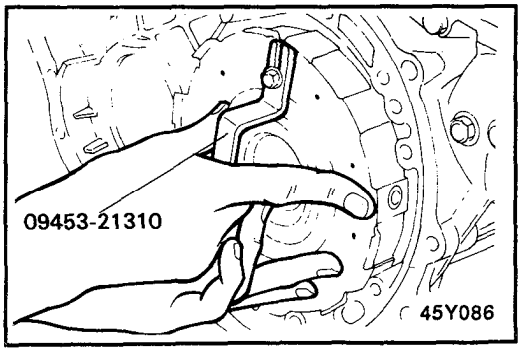




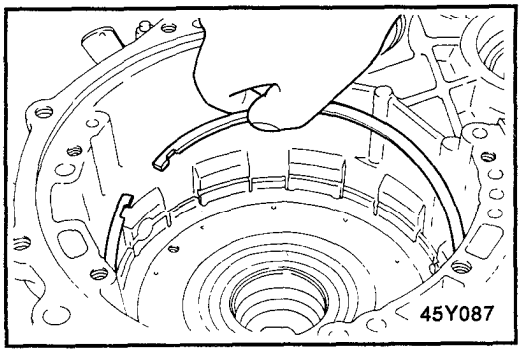
   3) Apply a coating of petroleum jelly to the wave spring and attach it to the center support.



4) Install the special tool (09453-21310) to the center support.

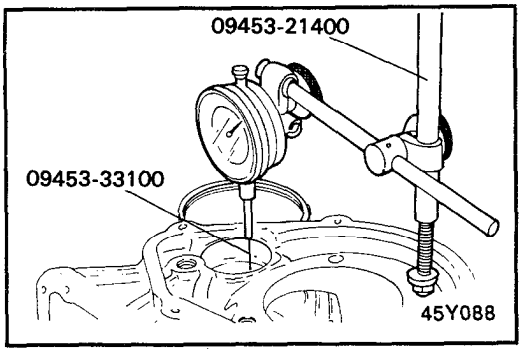


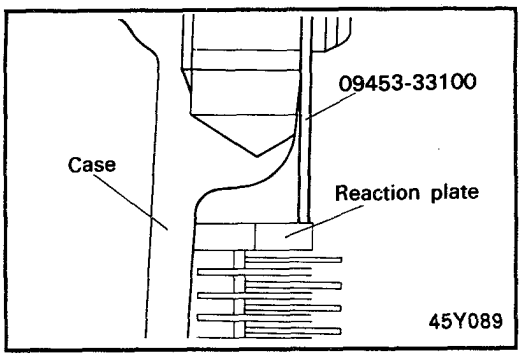
5) Install the snap ring.



6) Install the special tools (09453-21400, 09453-33100) and a dial gauge at the rear side of the transaxle case.

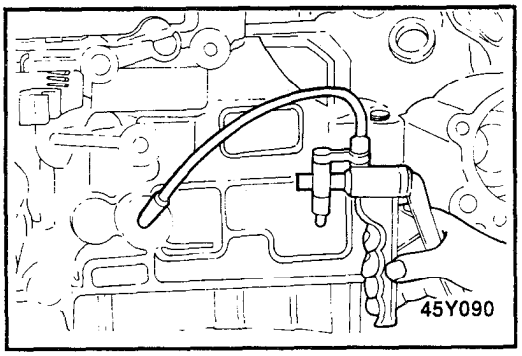
NOTE :
Install the dial gauge so that it contacts the brake reaction plate at a right angle from the transfer idler shaft hole.



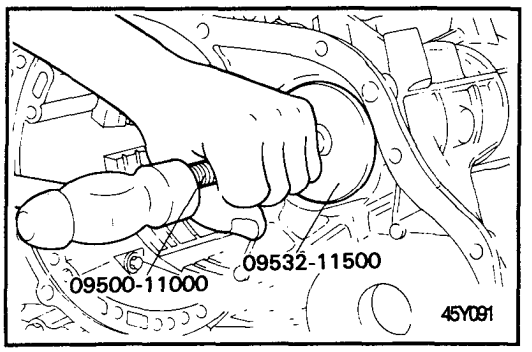


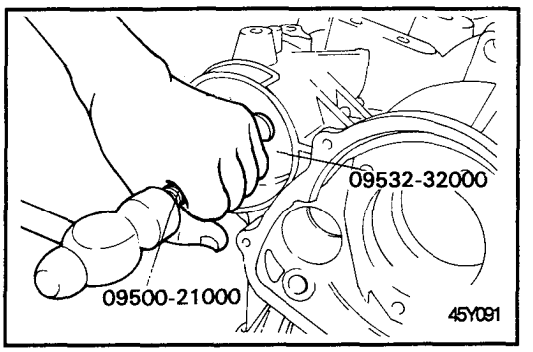
7) Using a manual pump, pump air in from the position shown in the illustration. Read the dial indicator gauge, and select the pressure plate that will provide the standard value.

Standard value: 0.78-1.09 mm (0.0307-0.043 in.)



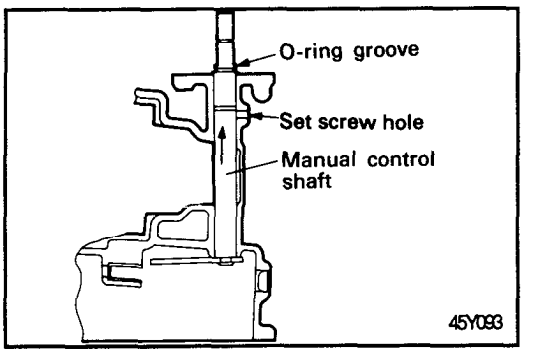
2. Using the special tools (09500-11000, 09500-21000,09532-11500, 09532-32000) tap in the bearing outer race.



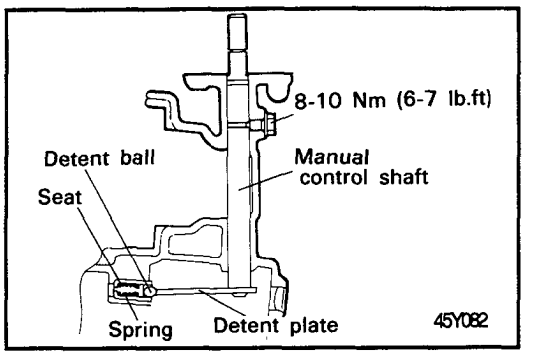


3. Insert manual control shaft into the transaxle case and push it toward the manual control lever.
   At this time, do not install the larger one of the two O-rings on the manual control shaft.

   'NOTE
   If installed before inserting the shaft, the O-ring will interfere with shaft set screw hole.

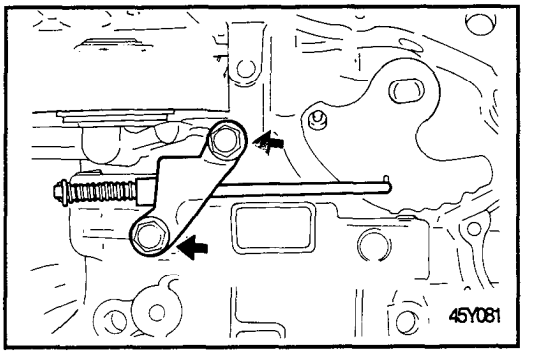


4. After installing the new O-ring on manual control shaft, draw shaft back into case. Install the set screw and gasket. Install the detent steel ball, seat and spring at the same time.

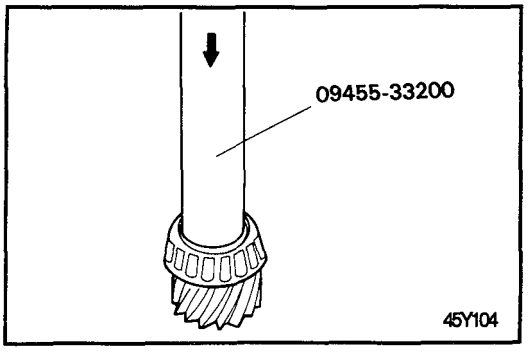


5. Install the parking sprag rod to the detent plate (manual control shaft).
   Install the sprag rod support and tighten the two bolts.

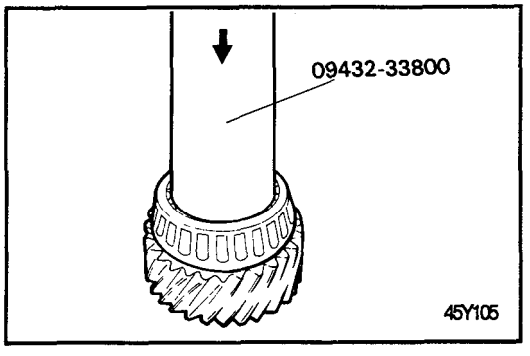
   Sprag rod support bolts:
   20-27 Nm (200-270 kg.cm, 15-19 lb.ft)



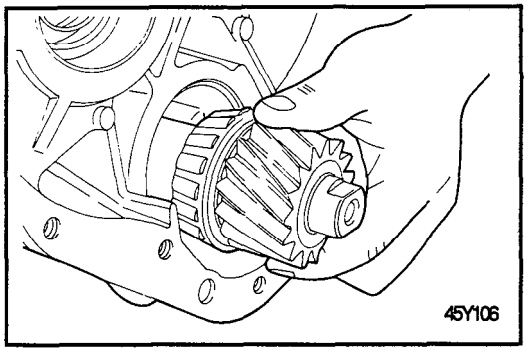
6. Press-fit the bearing inner race to the transfer driven gear, then press-fit the bearing outer race to the transaxle end clutch side.



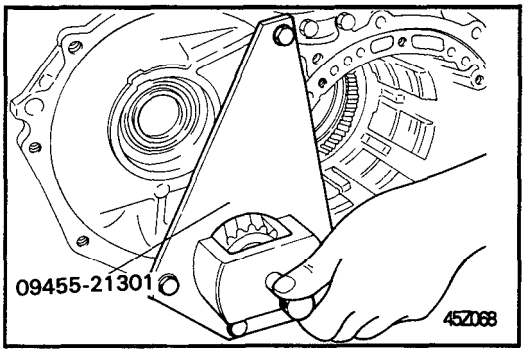
7. Press-fit the bearing inner race to the transfer shaft, then press-fit the bearing outer race to the transaxle case converter housing side.



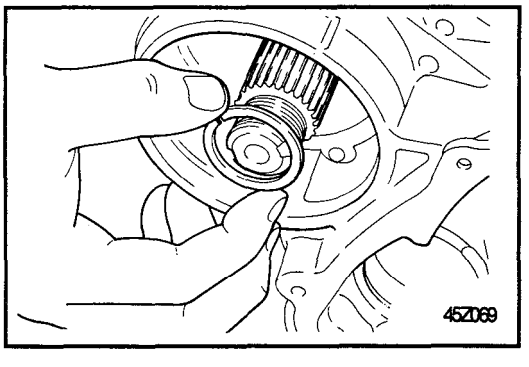
8. Attach the transfer shaft to the transaxle case.



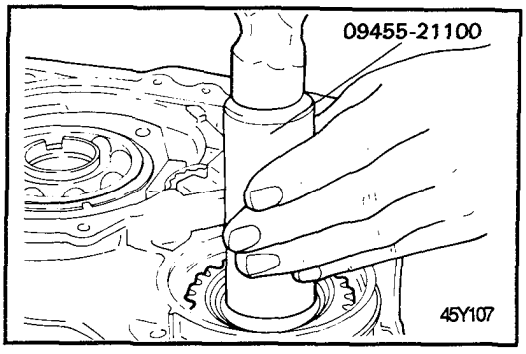
9. Install the special tool (09455-21301) to the transaxle case to support the transfer shaft.



10. Insert the thickest spacer 1.80 mm (0.0709 in.).



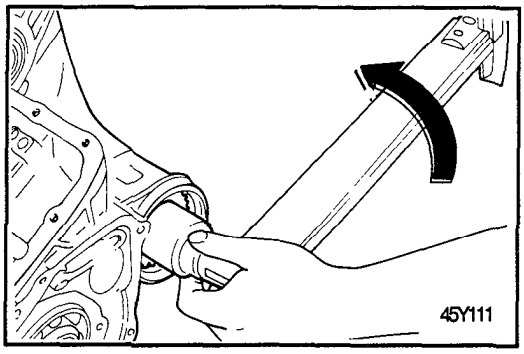
11. Attach the transfer driven gear.



12. After removing the special tool, place the converter housing side of the transfer shaft in a vise.

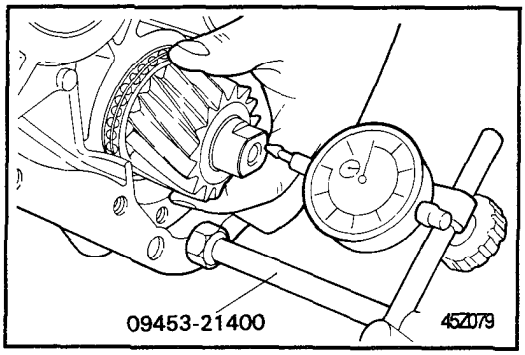
13. Tighten the lock nut to the specified torque.

Transfer lock nut:
200-230 Nm (2000-2300 kg.cm, 145-166 lb.ft)

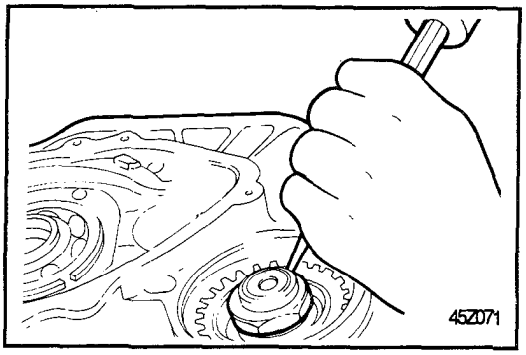


14. After installing the special tool (09453-21400), measure the end play of the transfer shaft; then select the spacer(s) needed to obtain the standard value, and refit.

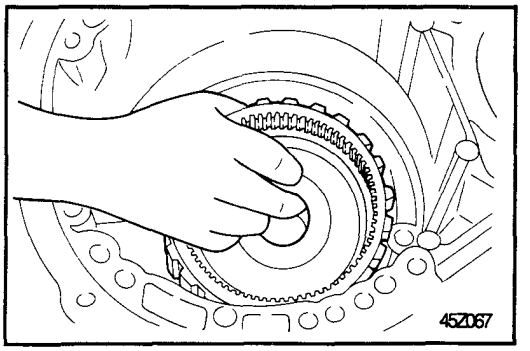
Transfer shaft end play: 0-0.025 mm (0-.0010 in.)



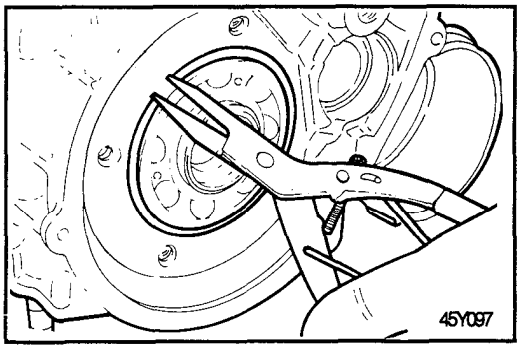
15. Using a punch, lock the lock nut to prevent rotation.
16. Attach the transfer cover.



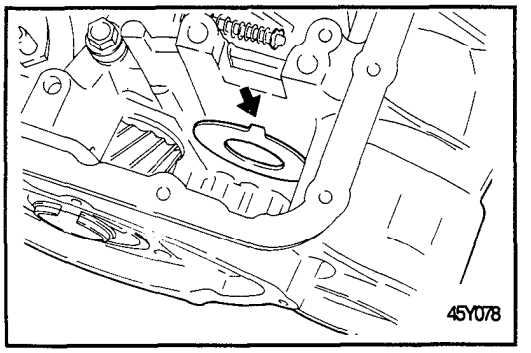
17. Insert the internal gear, output flange transfer drive gear and bearing assembly into the case.



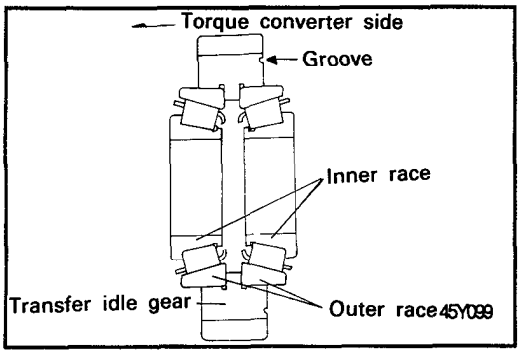
18. Install the snap ring on the output flange rear bearing.



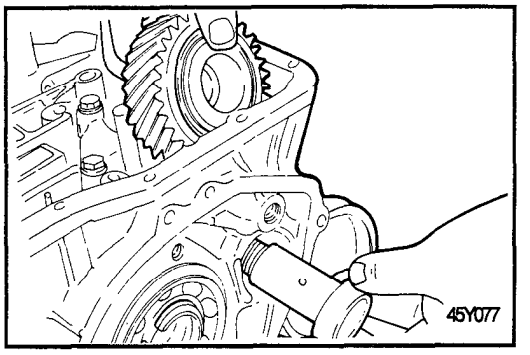
19. Coat petroleum jelly on the spacer and attach it to the transaxle case.



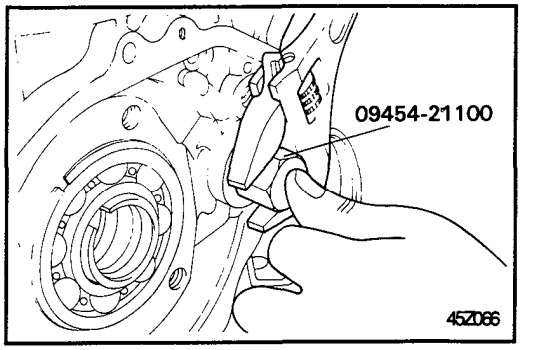
20. Install the two taper roller bearings and spacer onto the transfer idler gear.



21. Place the transfer idler gear (assembled in the preceding section) into the case, and then insert the idler shaft from the outer side of the case and screw it in.

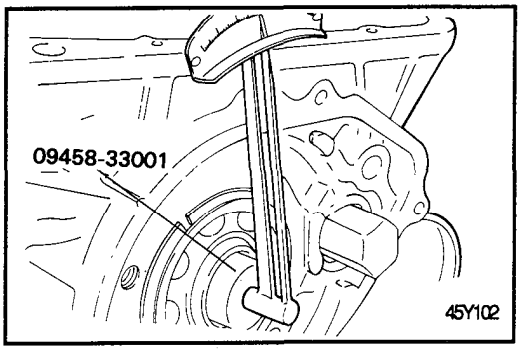


22. Tighten the idler shaft by using the special tool (09454-21100).



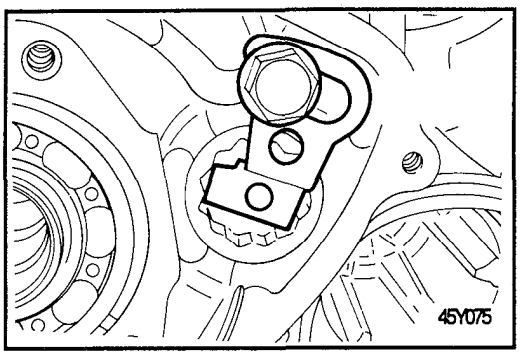
23. Insert the special tool (09458-33001) into the output flange and measure the preload using a torque wrench.
Adjust preload by tightening or loosening the transfer idler shaft.

Preload: 1.5 Nm (15 kg.cm, 1.0 lb.ft)



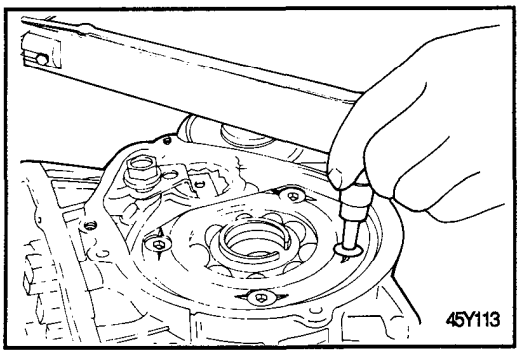
24. After the preload adjustment is completed, eliminate the back lash between the idler shaft and the lock plate by moving the idler shaft in the loosening direction. Attach the lock plate and tighten the lock plate bolt.

Lock plate bolt:
48-60 Nm (460-600 kg.cm, 35-43 lb.ft)

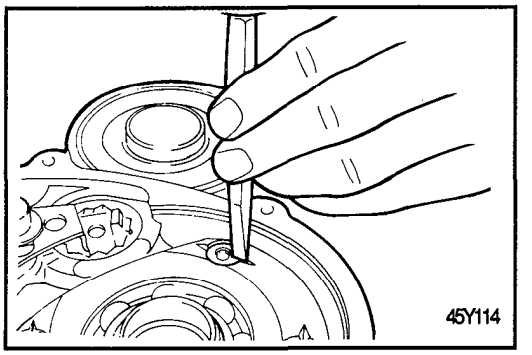


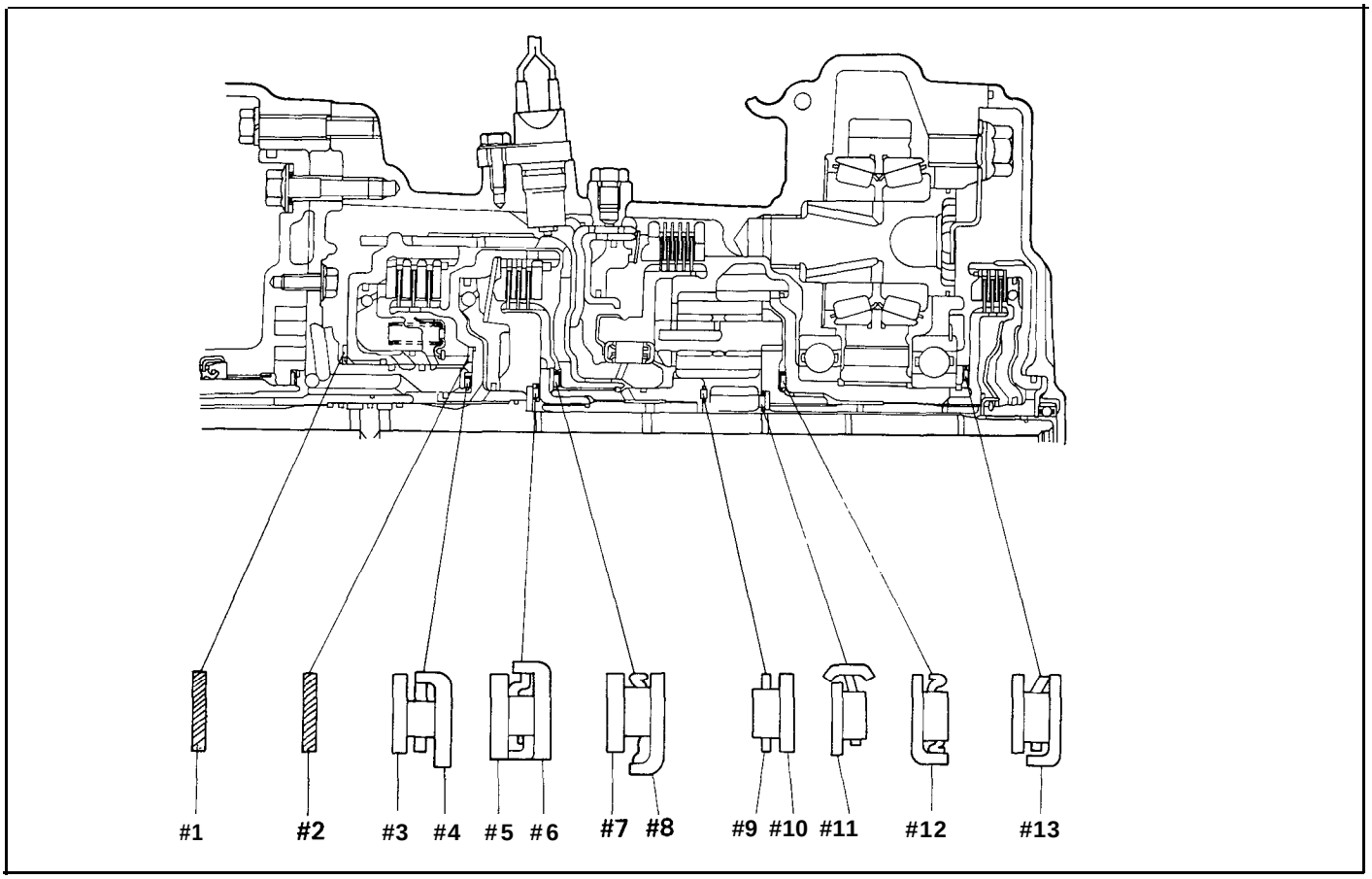
25. Install the bearing retainer. Tighten the screws to the specified torque. Apply a 5 mm (0.2 in.) width of sealant (3M Stud Locking No. 4176). Sealant should not stick out of screw head.

Screw: 17-22 Nm (170-220 kg.cm, 13-15 lb.ft)



26. Using a punch, lock the flush head screw to prevent rotation.



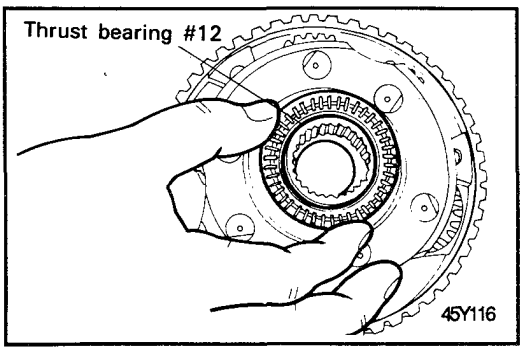


Identification of thrust bearings, thrust races and thrust washers

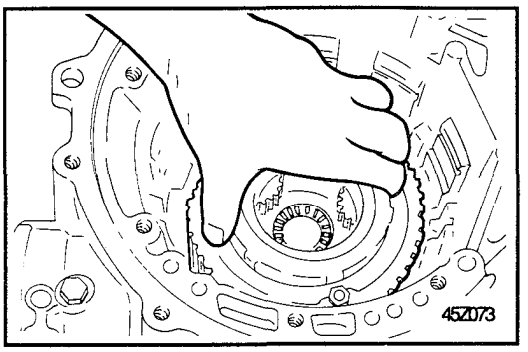
Unit: mm (in.)

Outer diameter	Inner diameter	Thickness	Code No.	Outer diameter	Inner diameter	Thickness	Code No.
70 (2.756)	55.7 (2.193)	1.4 (0.055)	#1	48.1 (1.894)	34.4 (1.354)	-	#4
70 (2.756)	55.7 (2.193)	1.8 (0.071)		40 (1.575)	21 (0.827)	2.4 (0.094)	#5
70 (2.756)	55.7 (2.193)	2.2 (0.087)		42.6 (1.677)	28 (1.102)	-	#6
70 (2.756)	55.7 (2.193)	2.6 (0.103)		54 (2.126)	38.7 (1.524)	1.6 (0.063)	#7
70 (2.756)	55.7 (2.193)	1.8 (0.071)	#2	52 (2.047)	36.4 (1.433)	-	#8
48.9 (1.925)	37 (1.457)	1.0 (0.040)	#3	41 (1.614)	28 (1.102)	-	#9
48.9 (1.925)	37 (1.457)	1.2 (0.047)		39 (1.535)	28 (1.102)	1.2 (0.047)	#10
48.9 (1.925)	37 (1.457)	1.4 (0.055)		38 (1.496)	22.2 (0.874)	-	#11
48.9 (1.925)	37 (1.457)	1.6 (0.063)		52 (2.047)	36.4 (1.433)	-	#12
48.9 (1.925)	37 (1.457)	1.8 (0.071)		58 (2.283)	44 (1.732)	-	#13
48.9 (1.925)	37 (1.457)	2.0 (0.079)					
48.9 (1.925)	37 (1.457)	2.2 (0.087)					
48.9 (1.925)	37 (1.457)	2.4 (0.094)					

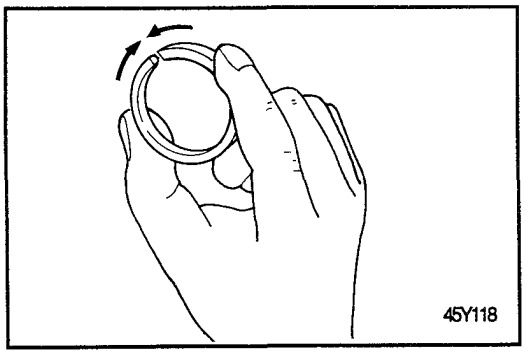
27. Apply a coating of petroleum jelly to thrust bearing #12 and attach to the planetary carrier.



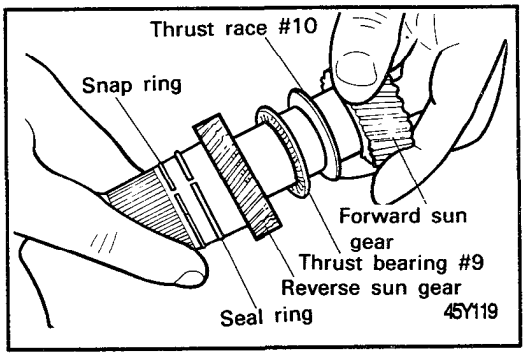
28. Install the planetary carrier to the case.



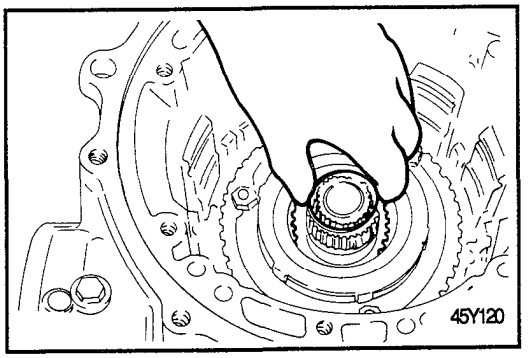
29. Assemble the reverse sun gear and the forward sun gear in the following order:
    1) Attach the seal ring and the snap ring to the reverse sun gear. When attaching, squeeze the seal ring as shown in the figure.
    2) Attach thrust bearing #9 to the forward sun gear.
    3) Attach thrust race #10 to the forward sun gear.



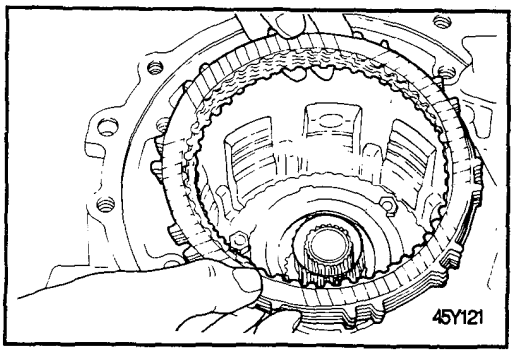
    4) Assemble the reverse sun gear, and then the forward sun gear.



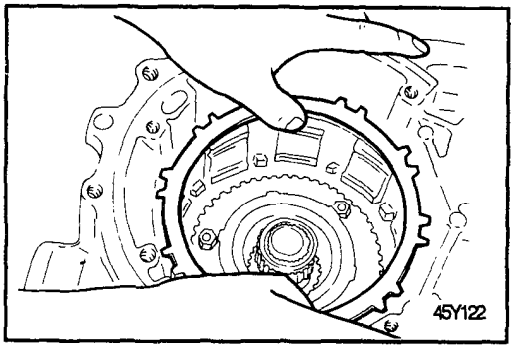
30. Install both of the previously assembled sun gears inside the planetary carrier.



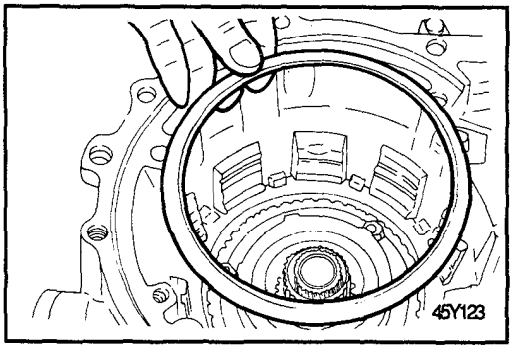
31. Install the brake disc and brake plate.



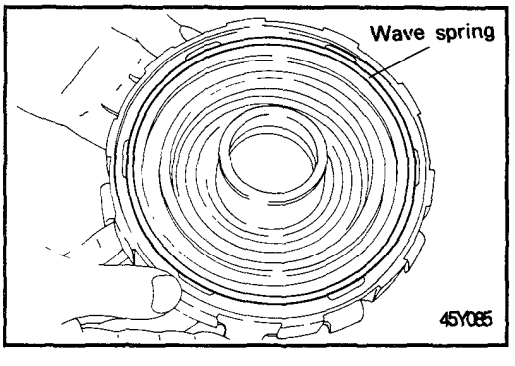
32. Install the selected brake pressure plate.



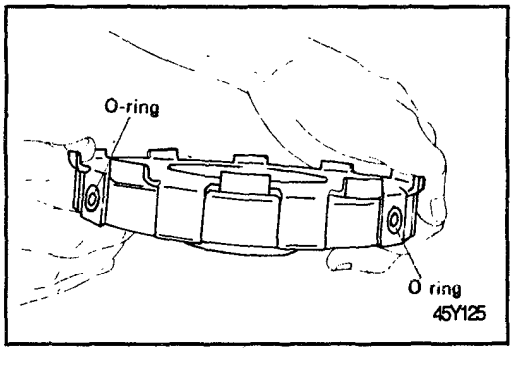
33. Install the return spring.



34. Apply a coating of petroleum jelly to the wave spring and attach it to the center support.

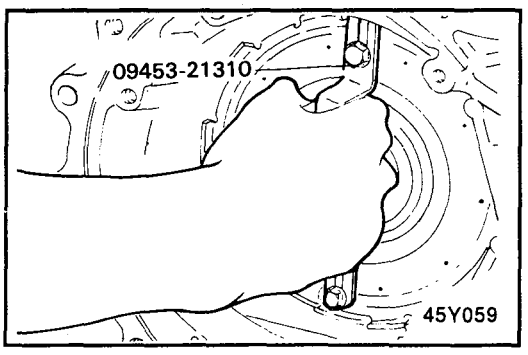


35. Install the two new O-rings to the center support.



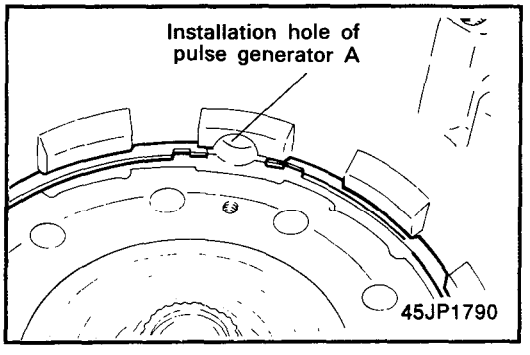
36. After applying a coating of ATF to the O-rings, install the special tool (09453-21310) to the center support, and install into the case.

Caution:
Be sure that the wave spring is not out of position.

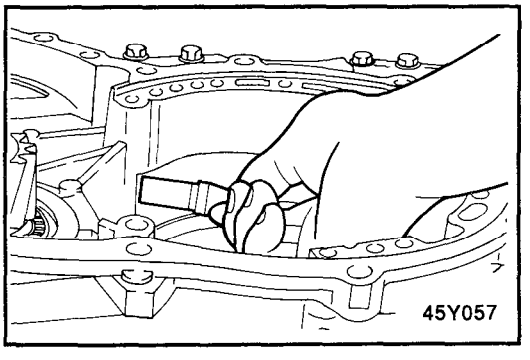


37. Install the snap ring.

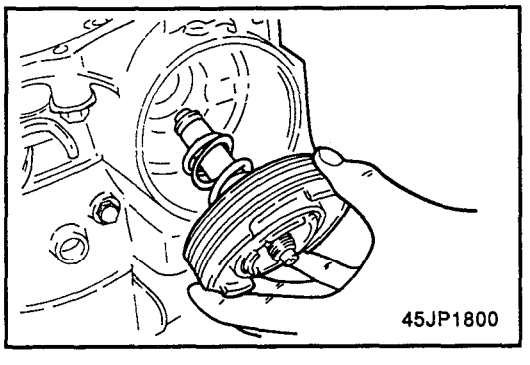
Caution:
The mating hole of the snap ring must be aligned with the installation hole of pulse generator A.



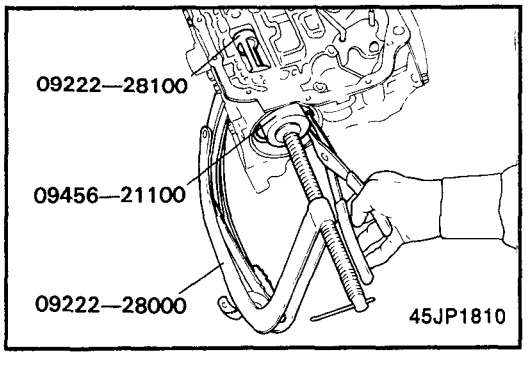
38. Install the anchor rod.



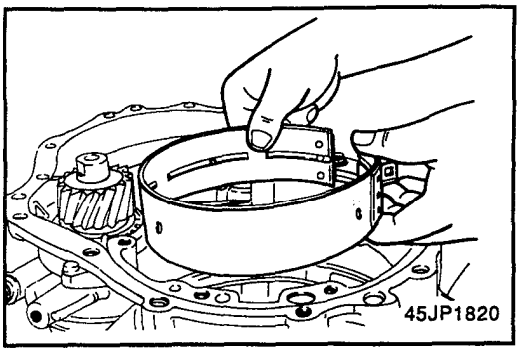
39. Assemble a new seal ring (large diameter) and D-ring (small diameter) to the kickdown servo piston, and install a new O-ring in the groove around the sleeve; then assemble the kickdown servo spring, piston and sleeve in the transaxle case.



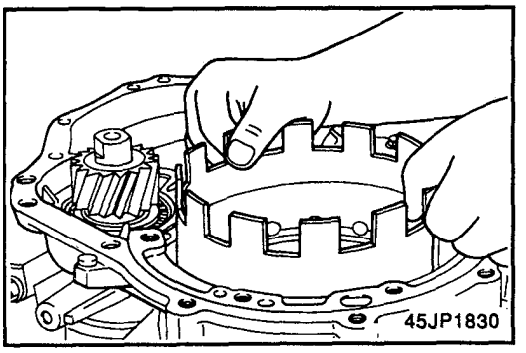
40. Press the kickdown servo and sleeve in by using the valve spring compressor and special tools (09456-21100,09222-28000,09222-28100), install the snap ring.



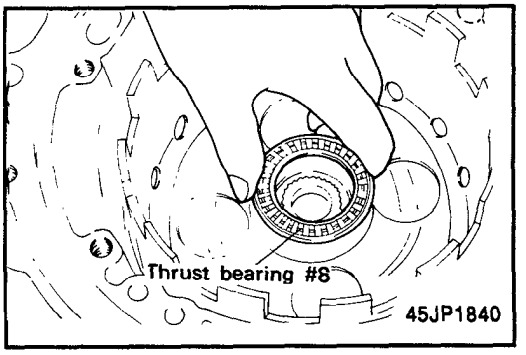
41. Install the kickdown band; attach the ends of band to the end of the anchor rod and servo piston rod.



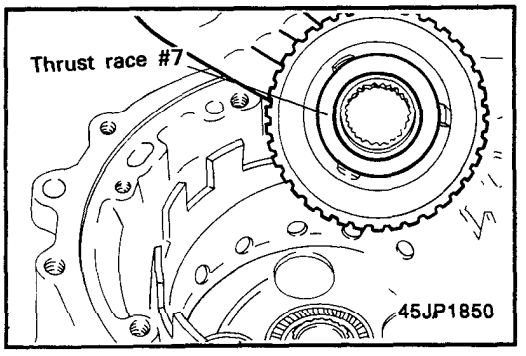
42. Install kickdown drum with its splines in mesh with the sun gear. Place the kickdown band on the kickdown drum and tighten the kickdown servo adjusting screw to keep the band in position.



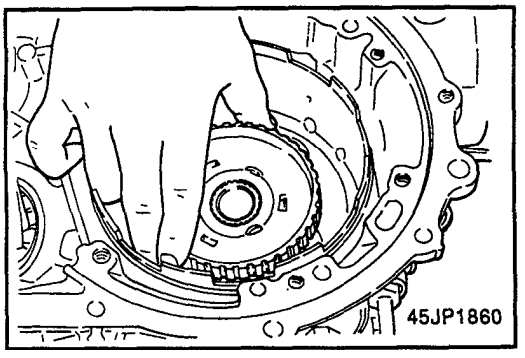
43. Apply a coating of petroleum jelly to thrust bearing #8, and then attach to the kickdown drum.



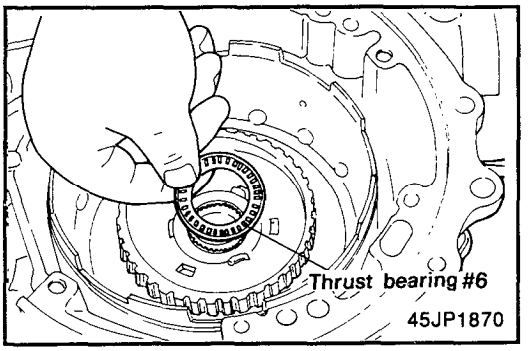
44. Apply a coating of petroleum jelly to thrust race #7, and then attach to the rear clutch hub.



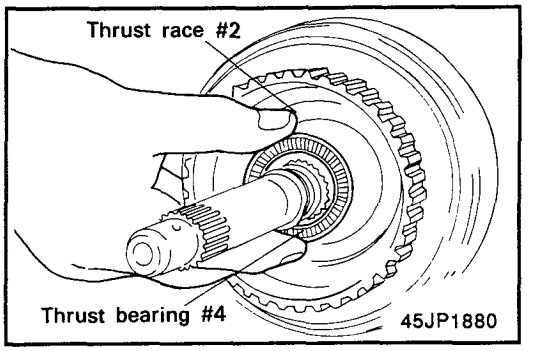
45. Install the clutch hub to the sun gear splines.



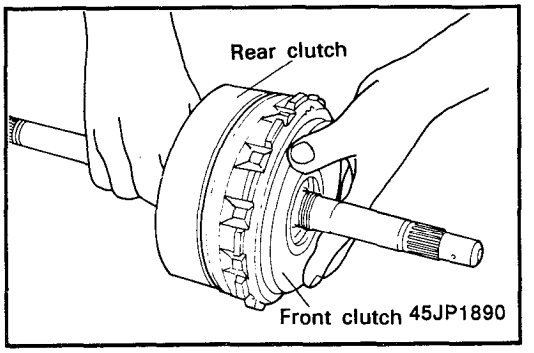
46. Attach thrust bearing #6 onto the hub using petroleum jelly.



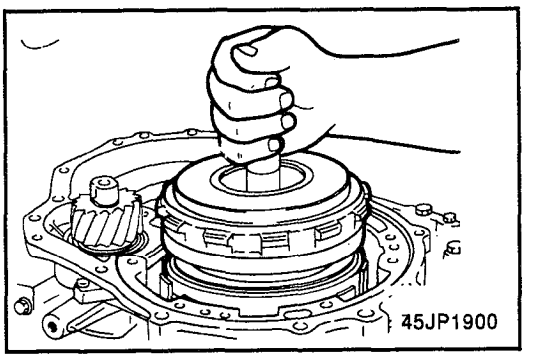
47. Apply a coating of petroleum jelly to thrust race #2 and thrust bearing #4. Attach to the rear clutch assembly.



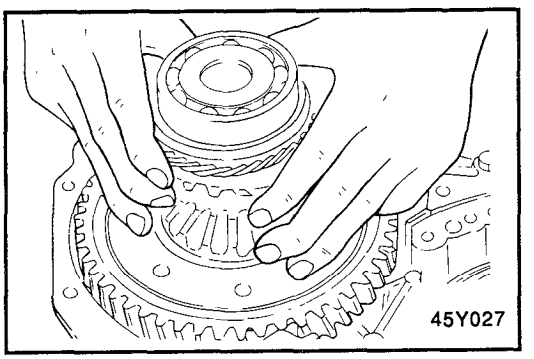
46. Combine the rear clutch and the front clutch assemblies.



49. Install the clutch assembly.



50. Install the differential assembly.



51. If end play which was measured and recorded at disassembly is not within standard value, adjust to specification by selecting thrust race #3.

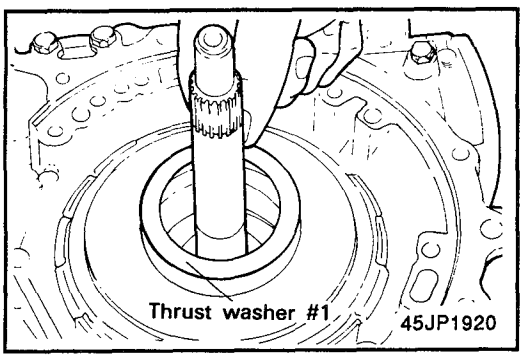
Standard value: 0.3-1.0 mm (0.012-0.040 in.)

When the thrust race is replaced with that of a different thickness, also replace thrust washer #1 located between the oil pump and front clutch. Use a washer of proper corresponding thickness corresponding to thrust race.
Find correct pair of thrust races (metal) and thrust washers (fiber) from following table.

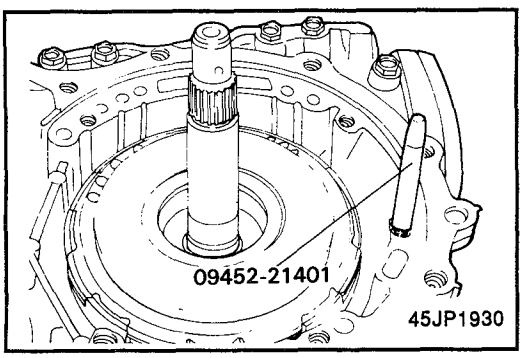
Thrust washer #1 (fiber)	Thrust race #3 (metal)
Thickness mm (in.)	Thickness mm (in.)
1.4 (0.055)	1.0 (0.039)
1.4 (0.055)	1.2 (0.047)
1.8 (0.071)	1.4 (0.055)
1.8 (0.071)	1.6 (0.063)
2.2 (0.087)	1.8 (0.071)
2.2 (0.087)	2.0 (0.079)
2.6 (0.102)	2.2 (0.087)
2.6 (0.102)	2.4 (0.095)

Note:
When a different thickness thick thrust race is selected, a corresponding thrust washer must be paired with it.

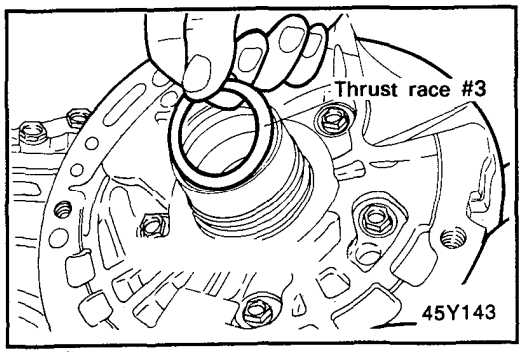
52. Attach the reused thrust washer #1, or the one selected in step 51, to the front clutch by using petroleum jelly.



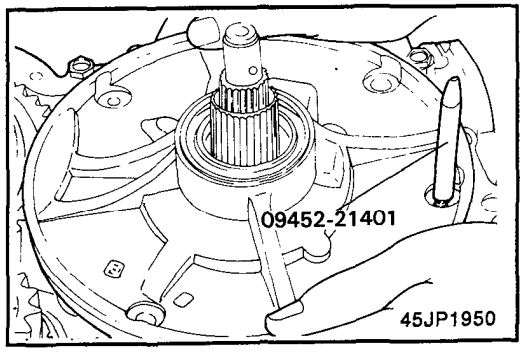
53. Install the special tool (09452-21401) to the case.



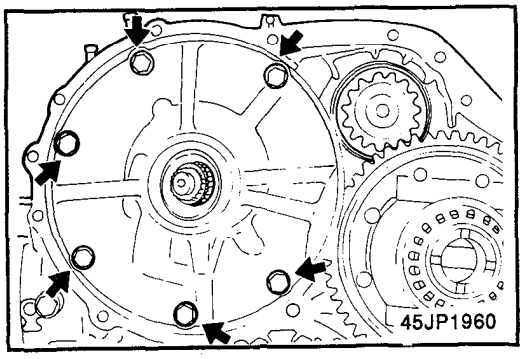
54. Attach the reused thrust race #3 or the one selected in step 51, to the oil pump by using petroleum jelly.



55. Install a new oil pump gasket and the oil pump assembly.

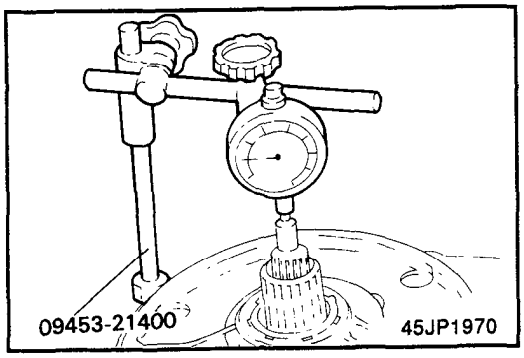


56. Install a new O-ring in the groove of the oil pump housing and lightly apply automatic transaxle fluid to the outside surface of the O-ring.
57. install the oil pump assembly by tightening the six bolts evenly. When installing this oil pump assembly, be careful that the thrust washer remains in place.

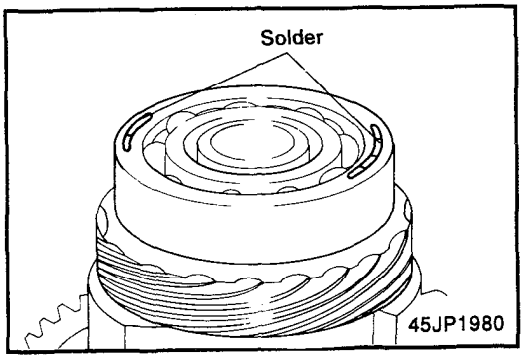


58. Check the input shaft end play. Readjust if necessary (see step 51).

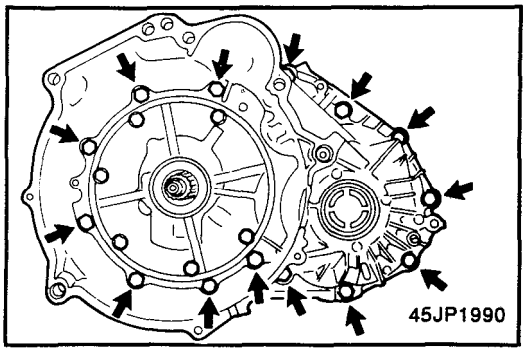
Standard value: 0.3-1.0 mm (0.012-0.040 in.)



59. Apply solder [10 mm (0.40 in.) in length and 3 mm (0.118 in.) in diameter] to the locations shown in the illustration.

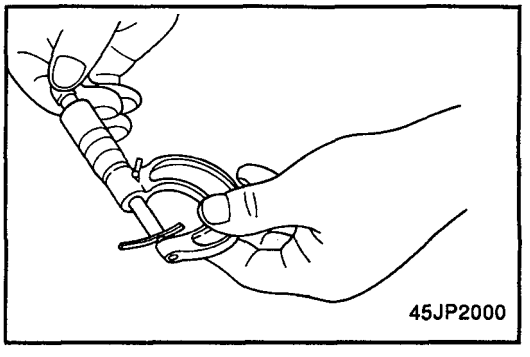


60. Install a new case gasket to the transaxle case.
61. Install the converter housing and tightening the 14 bolts to 19-**23** Nm (190-230 kg.cm, 14-16 lb.ft).

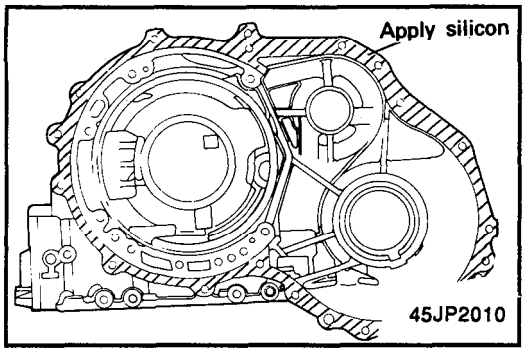


62. Remove the converter housing and gasket.
63. Remove the crushed solder from the outer race of the differential bearing.
64. Measure the thickness of the crushed solder using an outside micrometer and select and install a spacer that produces a standard preload.

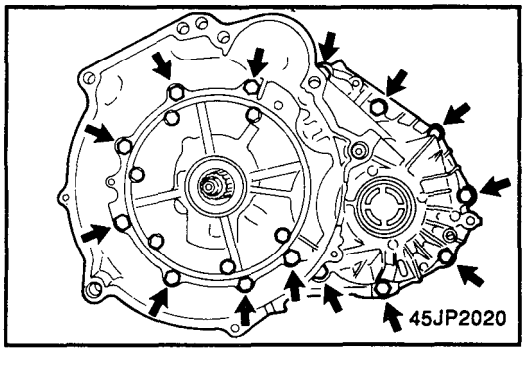
Standard value: 0.080-0.130 mm (0.003-0.005 in.)



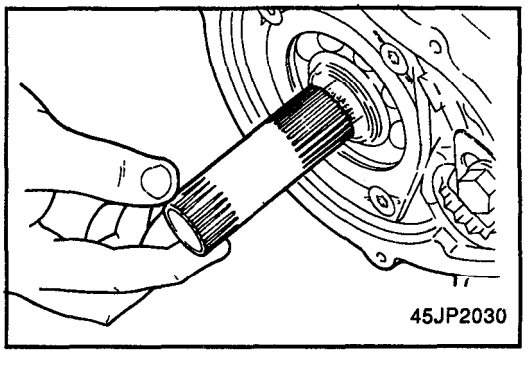
65. Apply silicone to the mating surface hatched area of the transaxle case.
66. Install a new case gasket on the transaxle case.



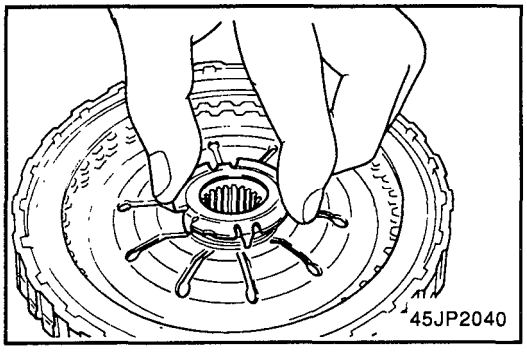
67. Install the converter housing and tighten the 14 bolts to 19-23 Nm (190-230 kg.cm, 14-16 lb.ft)



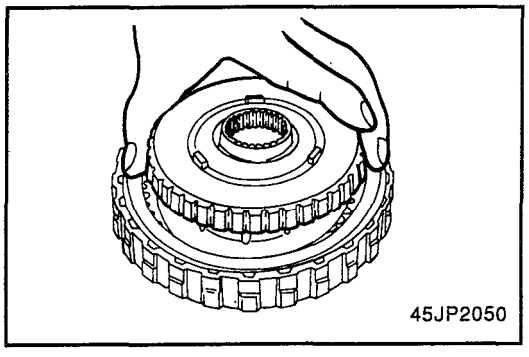
66. Install the end clutch shaft. Be sure to install the longer spline toward the front as shown.



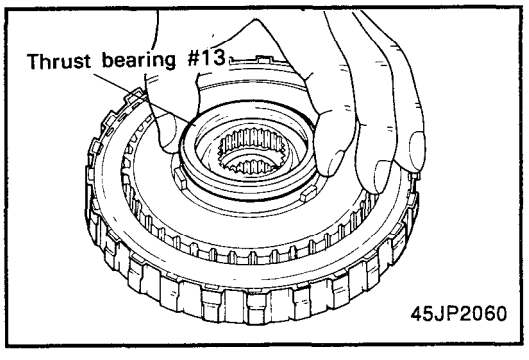
69. Fit the thrust washer toward the return spring at the end clutch side.



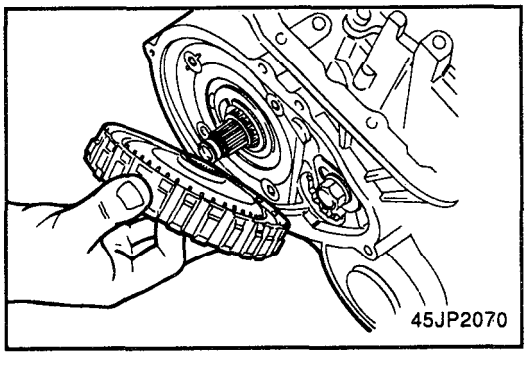
70. Install the end clutch hub to end clutch.



71. Attach, using petroleum jelly, thrust bearing #13 to the end clutch hub.

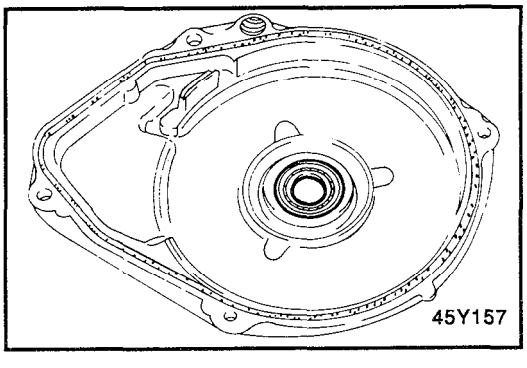


72. Install end clutch assembly.



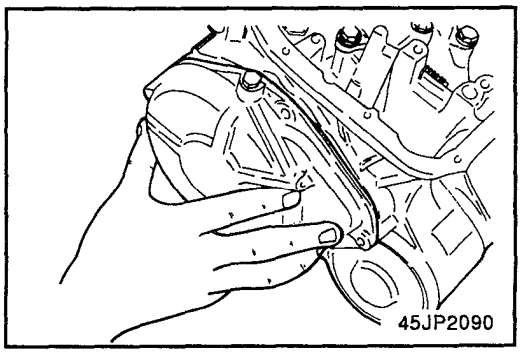
73. Attach a new O-ring and D-ring to the end clutch cover.

NOTE :
Install so that the D-ring is not twisted.
Apply a sufficient amount of automatic transaxle fluid to the bearing.

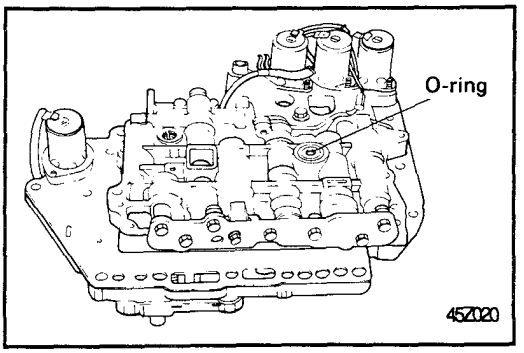


74. Attach the end cover and fasten it with four bolts.

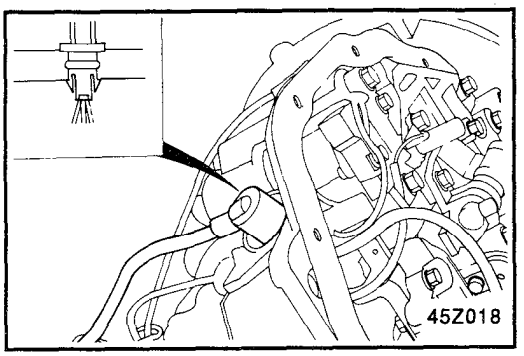
NOTE :
When installing the end cover, be sure the screw hole is correctly aligned. If the end cover is turned (after it is installed) in order to align with the screw hole, the O-ring and/or the D-ring may be twisted as a result.



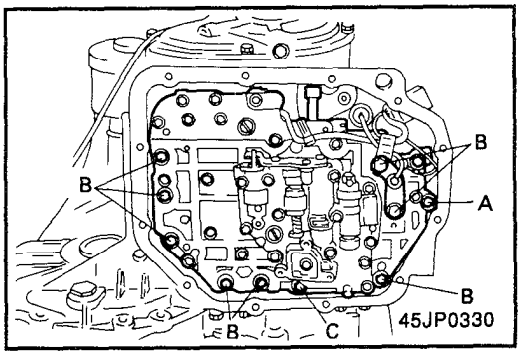
75. Install the O-ring at the center of the top of the valve body assembly (brake oil pressure passage).
76. Install the valve body assembly to the case, fitting the detent plate (manual control shaft) pin in the slot of the manual valve.



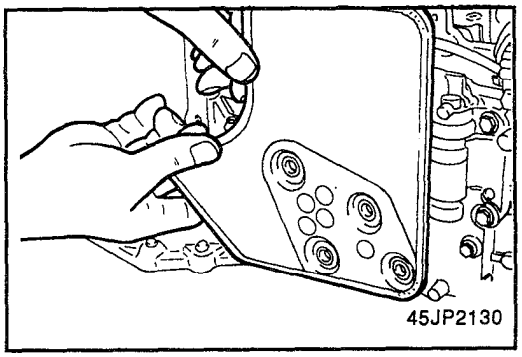
77. Replace the O-ring of the solenoid valve connector with a new one.
78. Insert the solenoid valve connector into the case. Be sure that the notched part of the connector faces as shown in the illustration.



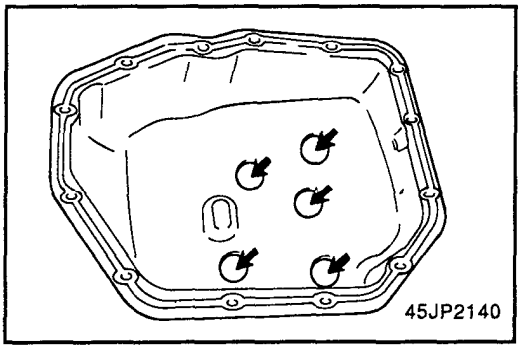
79. Install the oil-temperature sensor, and then tighten the ten(10) valve body assembly mounting bolts to 10-12 Nm (100-120 kg.cm, 7-9 lb.ft)
A : 18 mm (0.709 in.) long
B : 25 mm (0.984 in.) long
C : 40 mm (1.575 in.) long



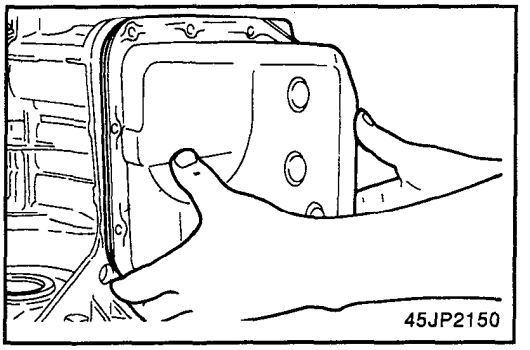
80. Install the oil filter. Tighten the four oil filter mounting bolts to 5-7 Nm (50-70 kg.cm, 4-5 lb.ft)



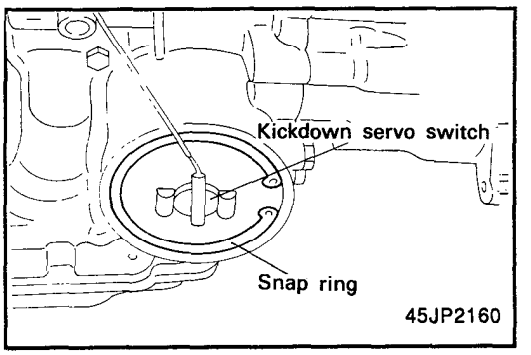
81. Install five magnets into the five depressions provided in the oil pan.



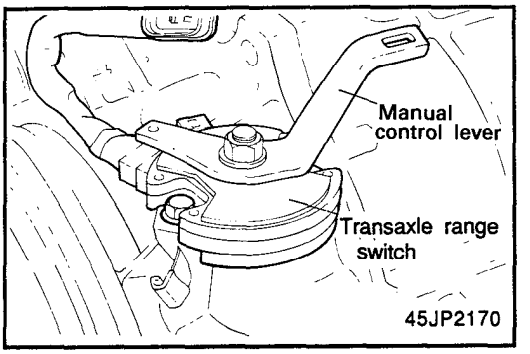
82. Install a new oil pan gasket and oil pan. Tightening 12 bolts to 10-12 Nm (100-120 kg-cm, 7-9 Ib.ft).



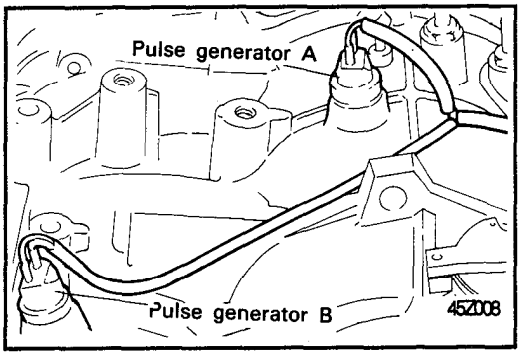
83. Install a new D-ring to the kickdown servo switch. Press into the case and secure using the proper snap ring.



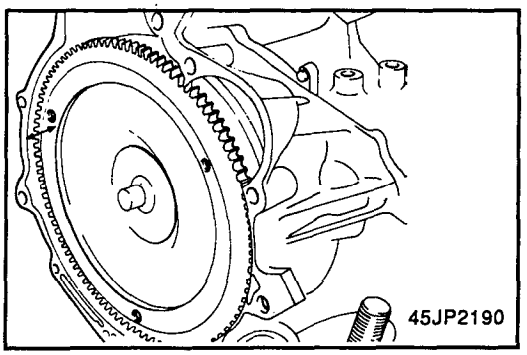
84. Install the inhibitor switch and manual lever. Adjust the inhibitor switch.



85. Install the pulse generator A and B.

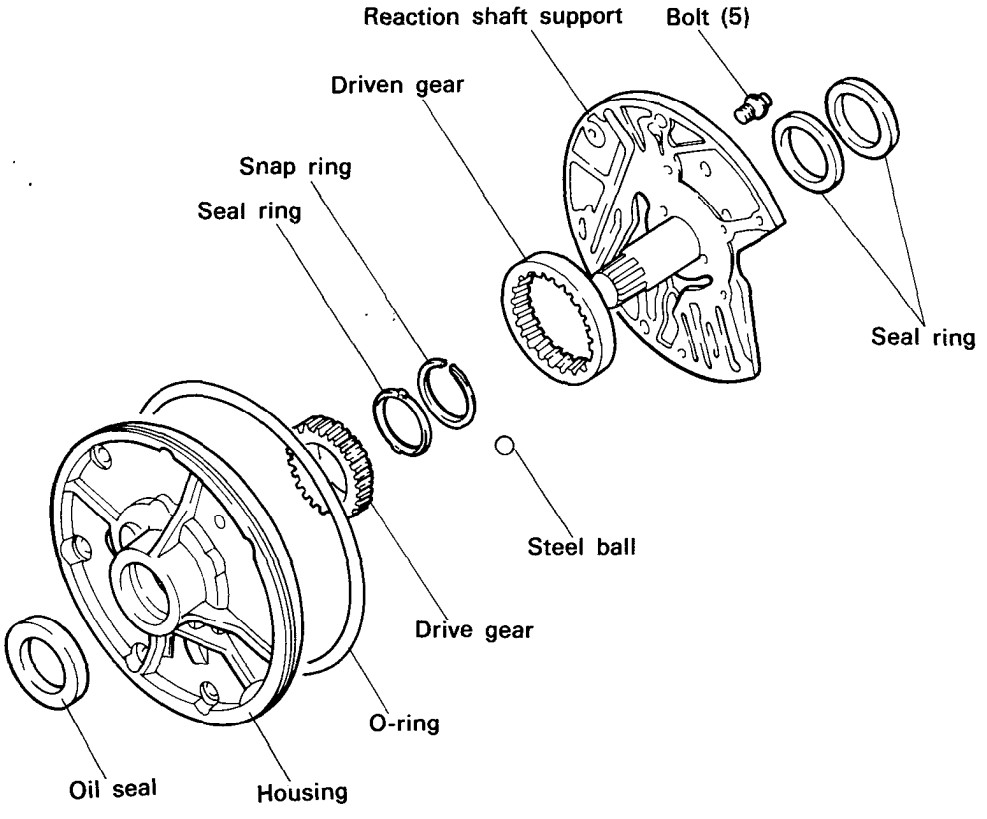


86. After applying automatic transaxle fluid to the outside surface of the oil pump-side cylindrical portion of the torque converter, install the torque converter carefully so as not to damage the seal lip. Make certain that the torque converter is in mesh with oil pump drive gear.
    Measure the distance between the ring gear end and the converter housing end. The torque converter has been properly installed when measurement is approximately 12 mm (0.47 in.).



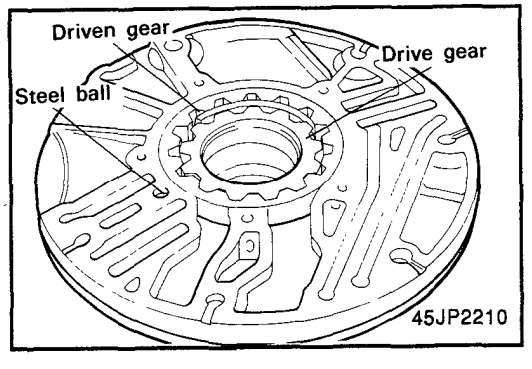
OIL PUMP ASSEMBLY

COMPONENTS

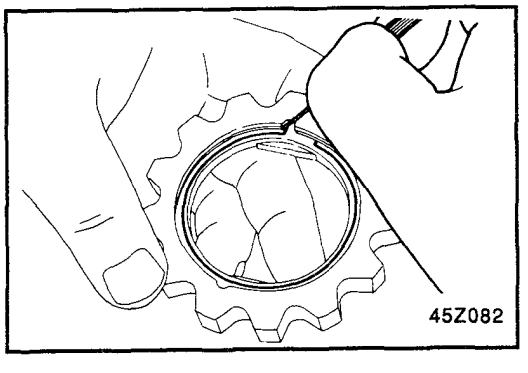


DISASSEMBLY

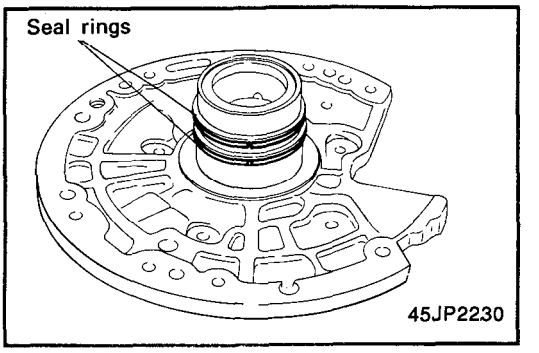
1. Remove the O-ring from oil pump housing.
2. Remove the five bolts and reaction shaft support from the housing.
3. Remove the oil **pump** drive and driven gears from the pump housing.
4. Make reassembly alignment marks on the drive and driven gears.
5. Remove the steel ball from the housing.



6. Remove the snap ring and oil seal from the oil pump drive gear.



7. Remove the two seal rings from the reaction shaft support.

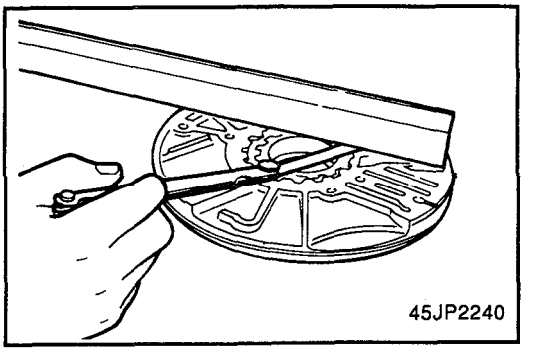


INSPECTION

1. Measure the side clearance of the oil pump gear. If the clearance exceeds the standard value, or if an inspection of the surface area (of the oil pump housing) that contacts the oil pump gear reveals indications of interference, replace the entire oil pump assembly.

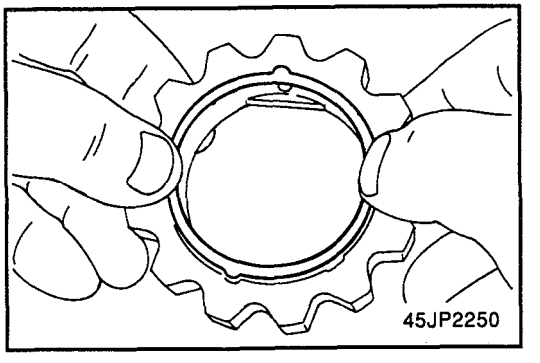
   Standard value: 0.03-0.05 mm (0.0012-0.0020 in.)

2. Check the surface of the reaction shaft support that contacts the oil pump gear. If there are indications of interference, replace the entire oil pump assembly.

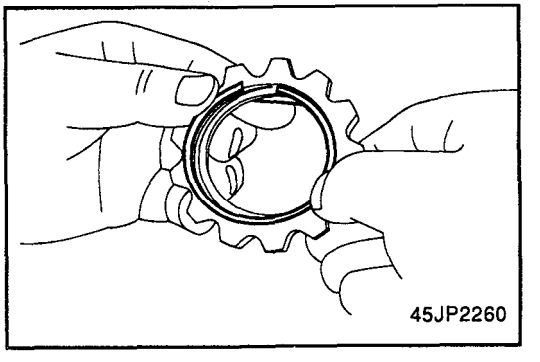


ASSEMBLY

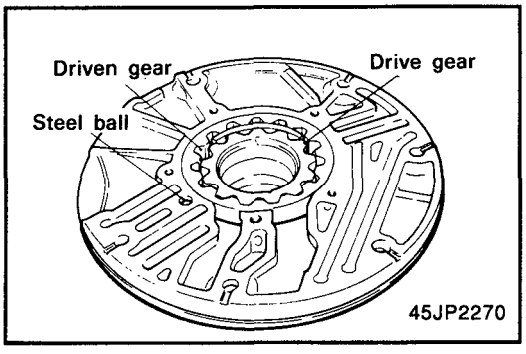
1. Install the oil seal to the oil pump drive gear.



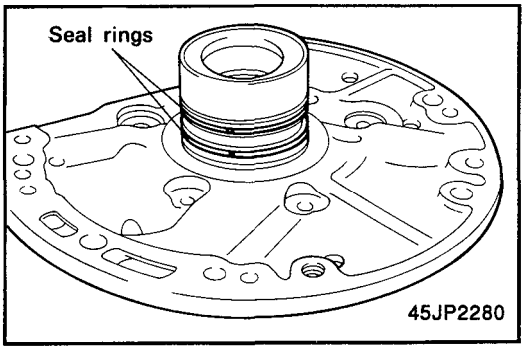
2. Install the snap ring.



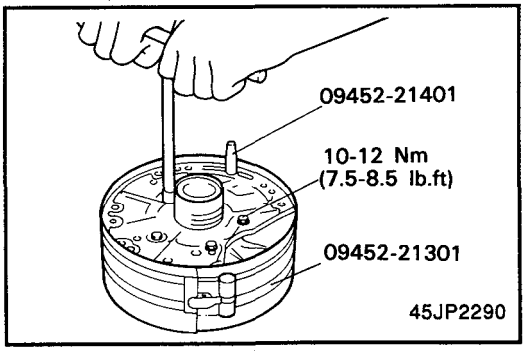
3. After immersing the drive and driven gears in automatic transaxle fluid, install them into pump housing. When reusing gears, install with mating marks properly aligned.
4. Fit a new O-ring into the groove at the inner circumference of the drive gear.
5. Install the steel ball in the hole as shown in the illustration.



6. Install the two seal rings, coated with automatic transaxle fluid, to the reaction shaft support.

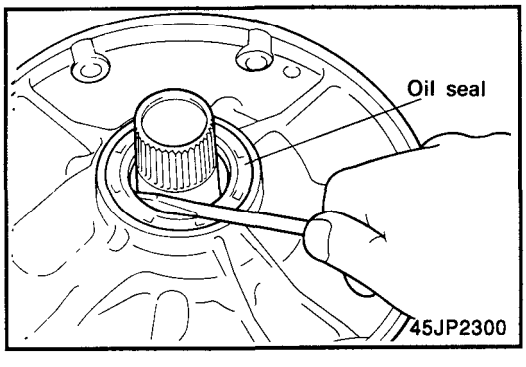


7. Make sure that oil pump gear turns freely.
8. Install a new O-ring in the groove provided in the circumference of the pump housing and apply petroleum jelly to the circumference of the O-ring.
9. Loosely install the reaction shaft support on the pump housing. Tighten the five bolts fingertight.
10. With the reaction shaft support properly positioned on the pump housing, using special tools (09452-21401, 09452-21301) tighten the five bolts to 10-12 Nm (100-120 kg.cm, 7.5-8.5 lbft).

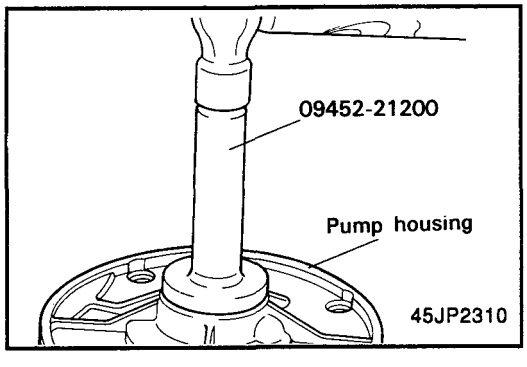


OIL SEAL REPLACEMENT

1. Pry off the pump housing oil seal using a screwdriver.

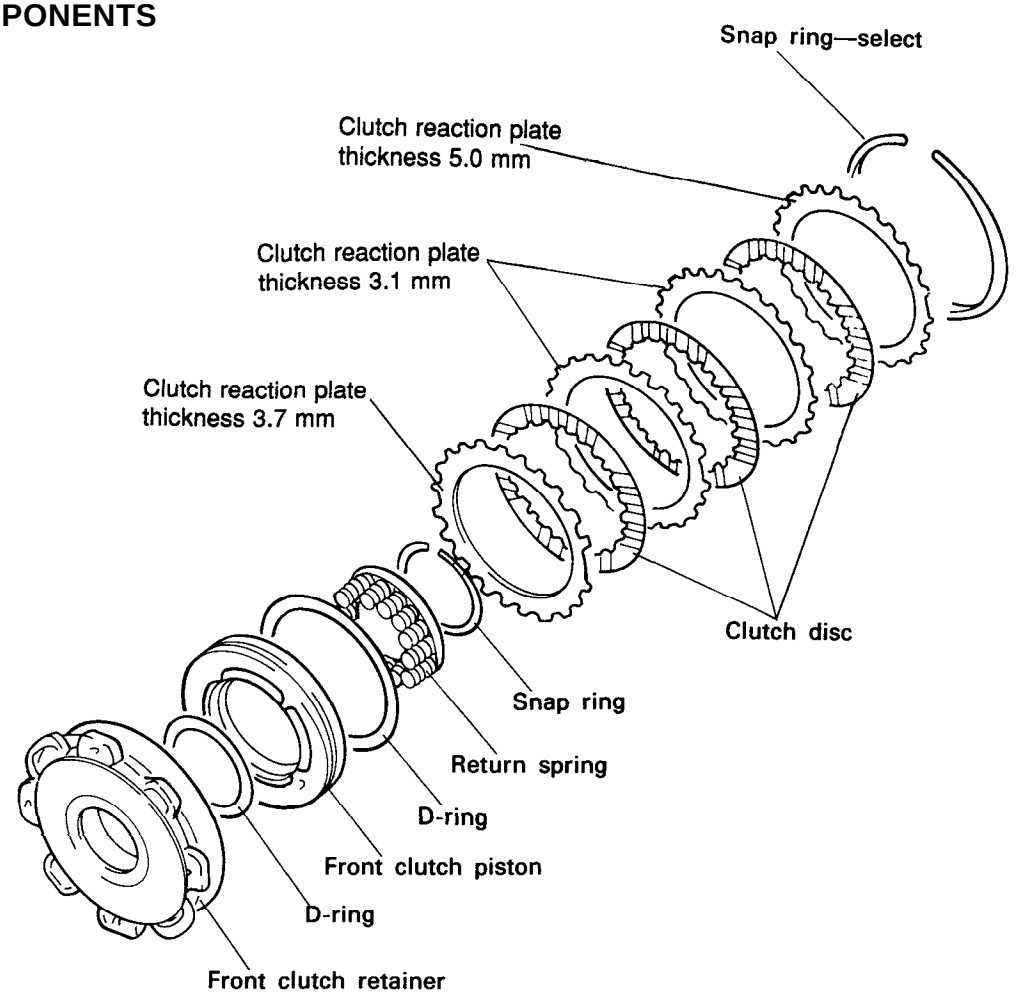


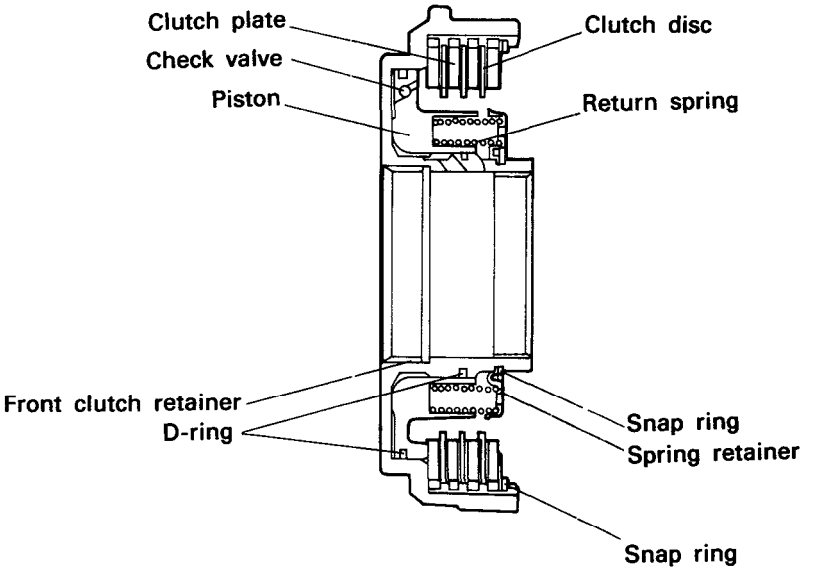
2 Using the special tool (09452-21200), install the oil seal to the pump housing. Apply a thin coat of automatic transaxle fluid to the lip of the oil seal before installation.



FRONT CLUTCH ASSEMBLY

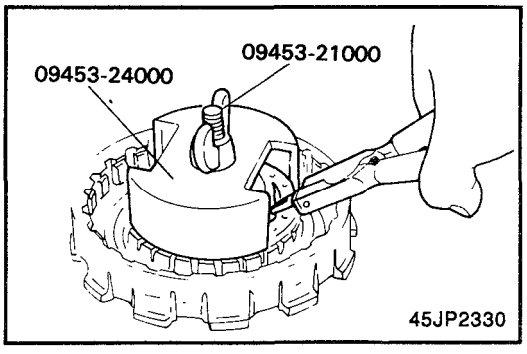
COMPONENTS





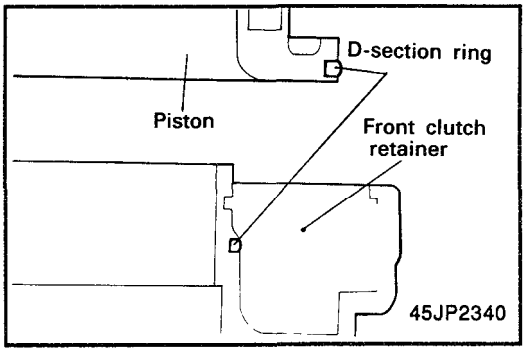
DISASSEMBLY

1. Remove the snap ring from the clutch retainer.
2. Take out the three clutch reaction plates and two clutch discs. If the clutch reaction plates and the clutch discs are to be reused, be sure not to change the installation order or direction.
3. With return spring compressed with the special tool (09453-21000, 09453-24000), Spring Compressor, remove snap ring, then spring retainer and return spring.
4. Remove the piston from the retainer.
5. Remove the D-section rings from the inner and outer circumferences of the piston.

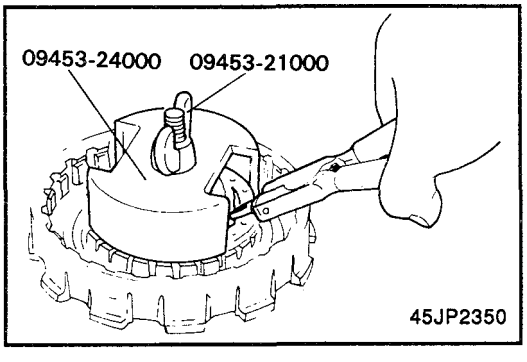


ASSEMBLY

1. Install the D-section ring in the groove on the outside surface of the piston with its round side out. Install another D-section ring to the front clutch retainer.
2. Apply automatic transaxle fluid to the outside surface of the D-section rings. Then push the piston into front clutch retainer by hand.

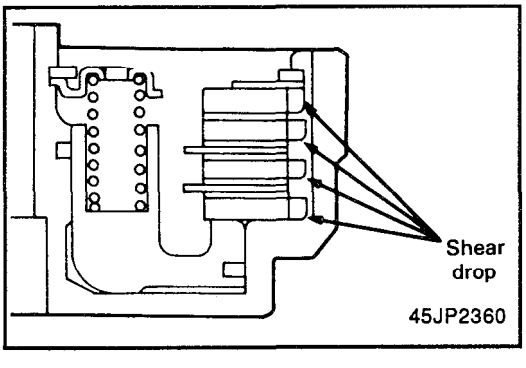


3. Install the return spring and spring retainer.
4. Compress the return spring with the special tool (09453-21000, 09453-24000) and install the snap ring.

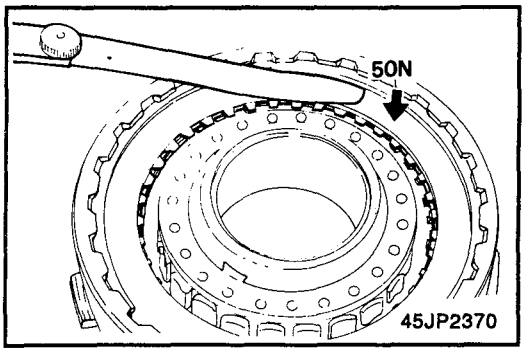


5. Install the three clutch reaction plates and two clutch discs. Prior to installation, apply automatic transaxle fluid to them.

NOTE:
When new clutch discs are used, they should be immersed in automatic transaxle fluid a minimum of two hours prior to installation.

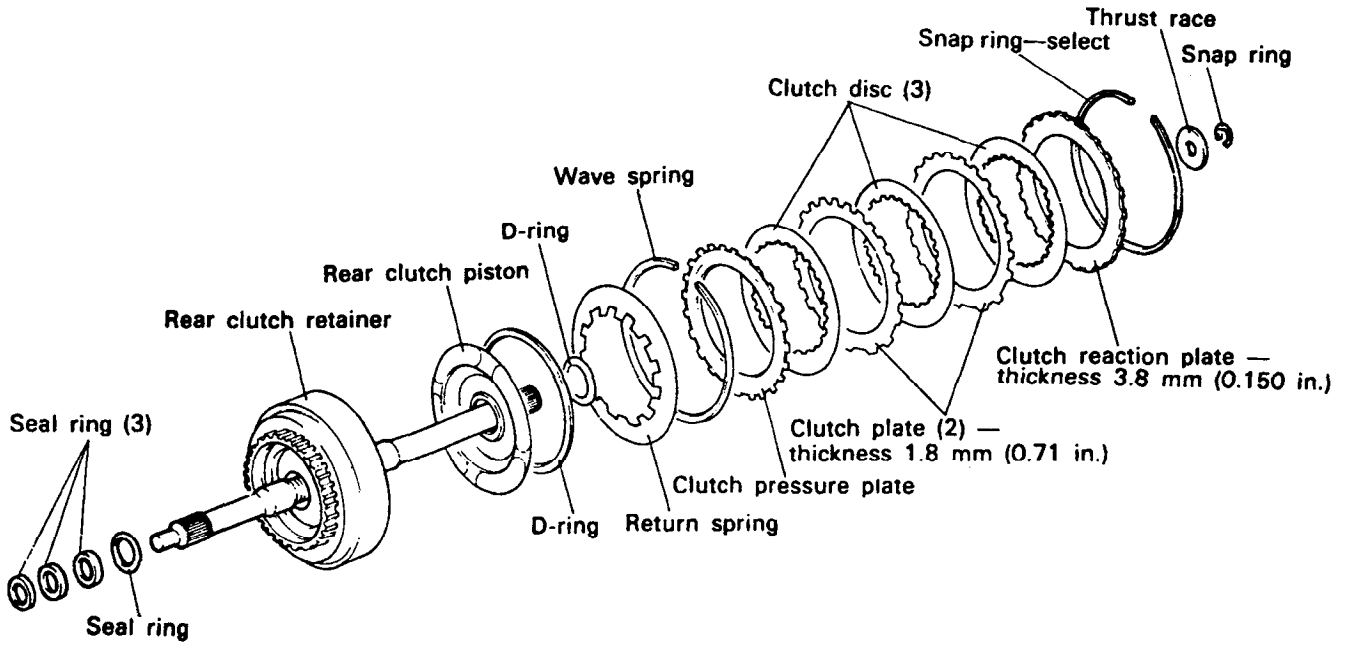


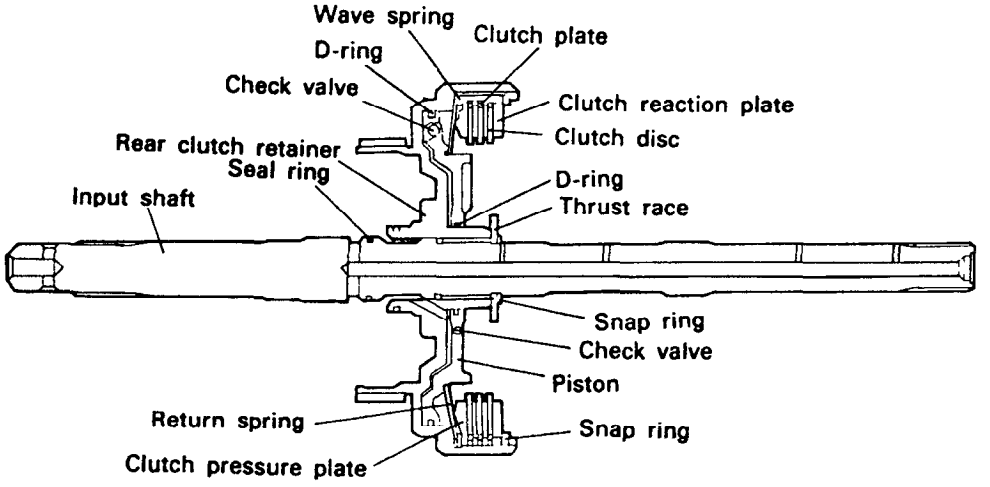
6. After installing the snap ring, check to see if there is a 0.4-0.6 mm (0.0157-0.0236 in.) clearance between the snap ring and the clutch reaction plate.
   To check clearance, hold the entire circumference of the clutch reaction plate down with 50 N (11 lb.) force. If clearance is out of specification, adjust the clearance by selecting the proper snap ring.



REAR CLUTCH ASSEMBLY

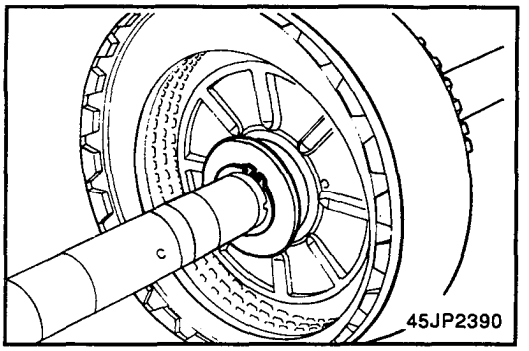
COMPONENTS



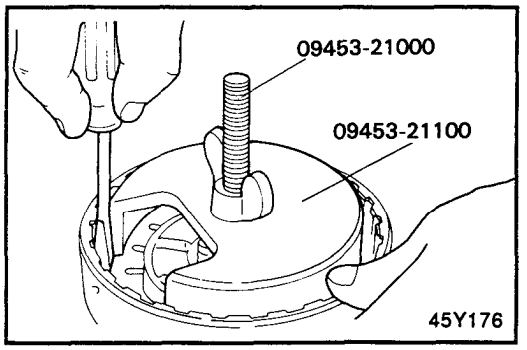


DISASSEMBLY

1. Remove the snap ring and thrust race.
2. Remove the input shaft from the rear clutch retainer.
3. Remove the snap ring from the clutch retainer.
4. Remove the clutch reaction plate, one clutch plates, two clutch discs and clutch pressure plate from the retainer.

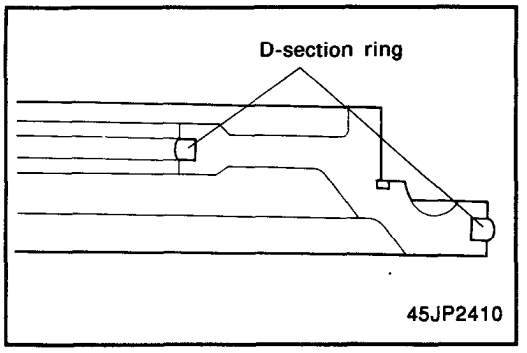


5. Compress the return spring by using the spring compressor.
6. Using a screwdriver, remove the wave spring.
7. Remove the return spring and piston.
8. Remove the two D-section rings from the piston.



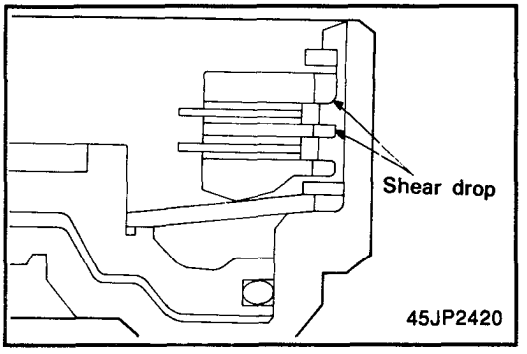
ASSEMBLY

1. Install the D-section rings in the grooves in the outside and inside surfaces of the piston.
2. After applying automatic transaxle fluid to the outside surface of the D-section rings, push the piston into the rear clutch retainer by hand.
3. Install the return spring on the piston.
4. Compress the return spring with the snap ring, by pushing down with a screwdriver and setting the snap ring in its groove.

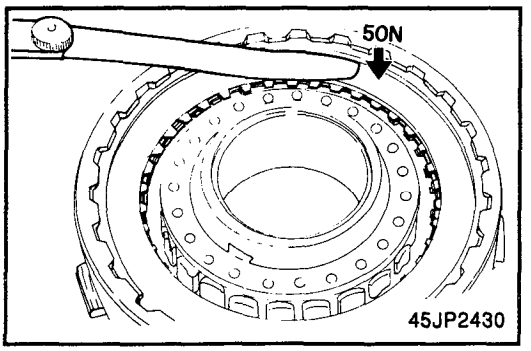


5. Install clutch pressure plate, two clutch discs, clutch plate and clutch reaction plate into the rear clutch retainer.
   When the reaction plate, clutch plate and clutch disc are removed, reinstall them by reversing the order of disassembly. Prior to installing, apply automatic transaxle fluid to the plates and discs.

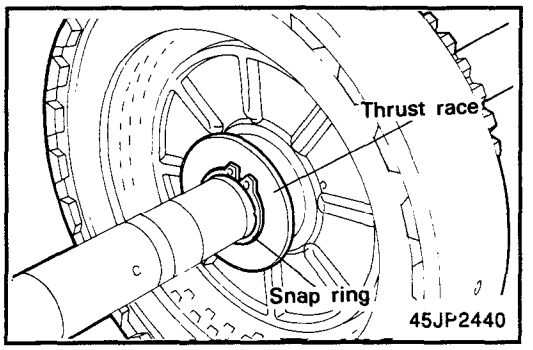
   NOTE :
   When new clutch discs are used, immerse them in automatic transaxle fluid for a minimum of two hours prior to installation



6. Install the snap ring. Check to see that the clearance between the snap ring and clutch reaction plate is 0.3-0.5 mm (0.012-0.020 in.). To check clearance, hold the entire circumference of the clutch reaction plate down with 50N (11 lbs.) force. If clearance is out of specification, adjust by selecting the proper snap ring. Snap rings are the same as those used for the front clutch.
7. Insert the input shaft into the clutch retainer.

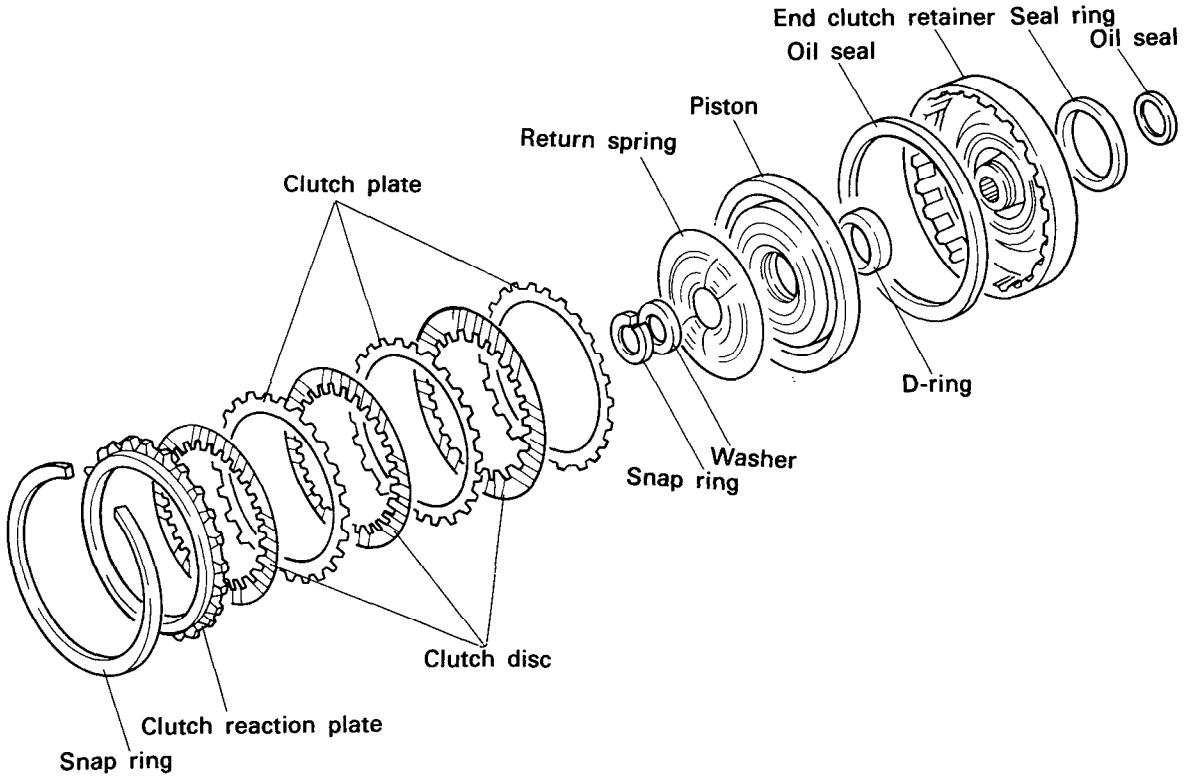


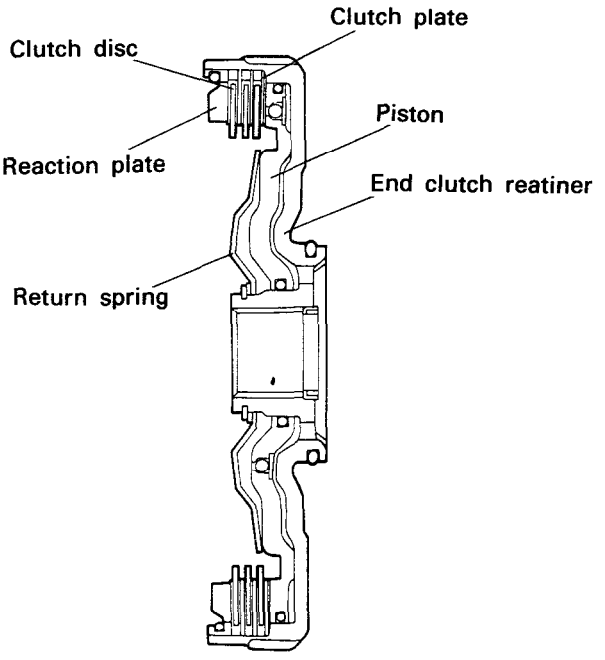
8. Install the thrust race, and snap ring.
9. Install the three seal rings to the grooves in the input shaft.



END CLUTCH ASSEMBLY

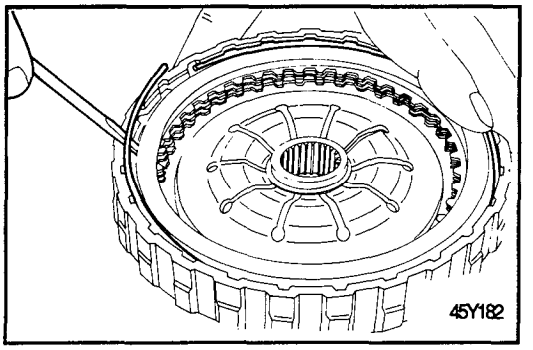
COMPONENTS



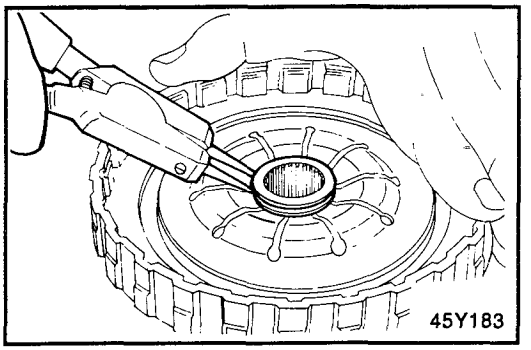


DISASSEMBLY

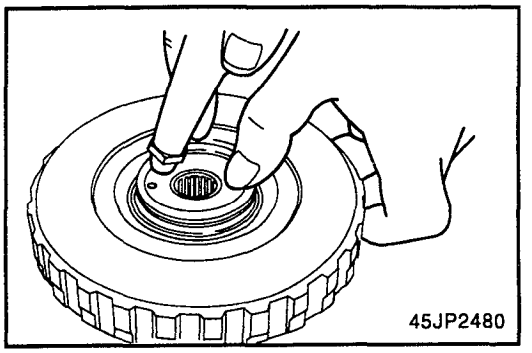
1. Remove the snap ring, clutch reaction plate, clutch disc, and the clutch plate. If the disc and plate are reused, note the installation order and direction when they are disassembled.



2. Remove the snap ring with snap-ring pliers, and then remove the washer and return spring.

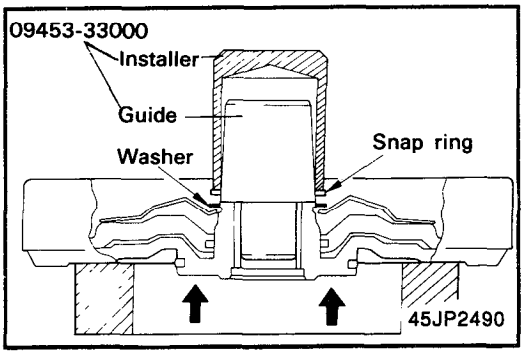


3. Remove the piston. If it is difficult to remove, face the piston side downward, and, with the retainer on a base, blow air in through the oil passage on the **rear surface.**
4. Remove the seal ring from the retainer.
5. Remove the two D-section rings and oil seal from the piston.



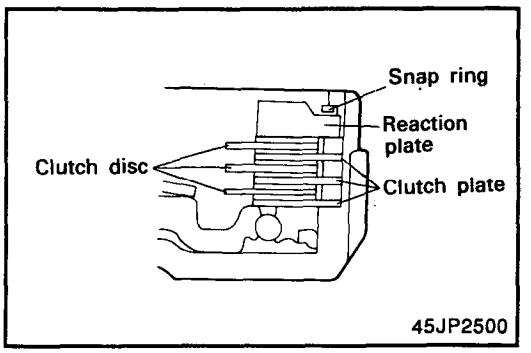
ASSEMBLY

1. Install the D-section rings and oil seal in the piston inner and outer grooves.
2. After applying a coating of automatic transaxle fluid to the D-section rings outer circumference, manually press the piston into the end clutch retainer.
3. Install the return spring and washer.
4. After fitting a new snap ring into the guide of the special tool (09453-33000), install the retainer. Push the snap ring as far down on the guide as possible.
   Attach the installer and press until the snap ring enters the groove. Do not press more than necessary. The places indicated by arrows in the illustration (center projections) are not to be supported.

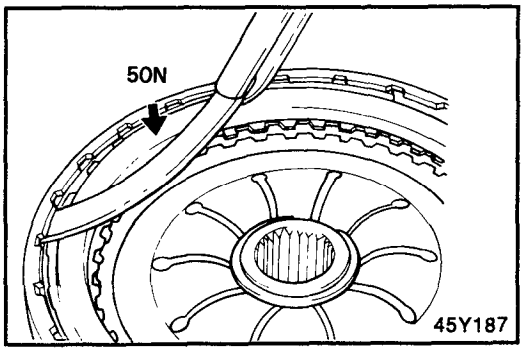


5. Install the clutch plate, clutch disc and reaction plate to the end clutch retainer.
   If the reaction plate, clutch plate and clutch disc are reused, install them in the same order they were disassembled. Apply a coating of automatic transaxle fluid.

   NOTE :
   When a new clutch disc is used, soak it in automatic transaxle fluid for 2 hours before using it.

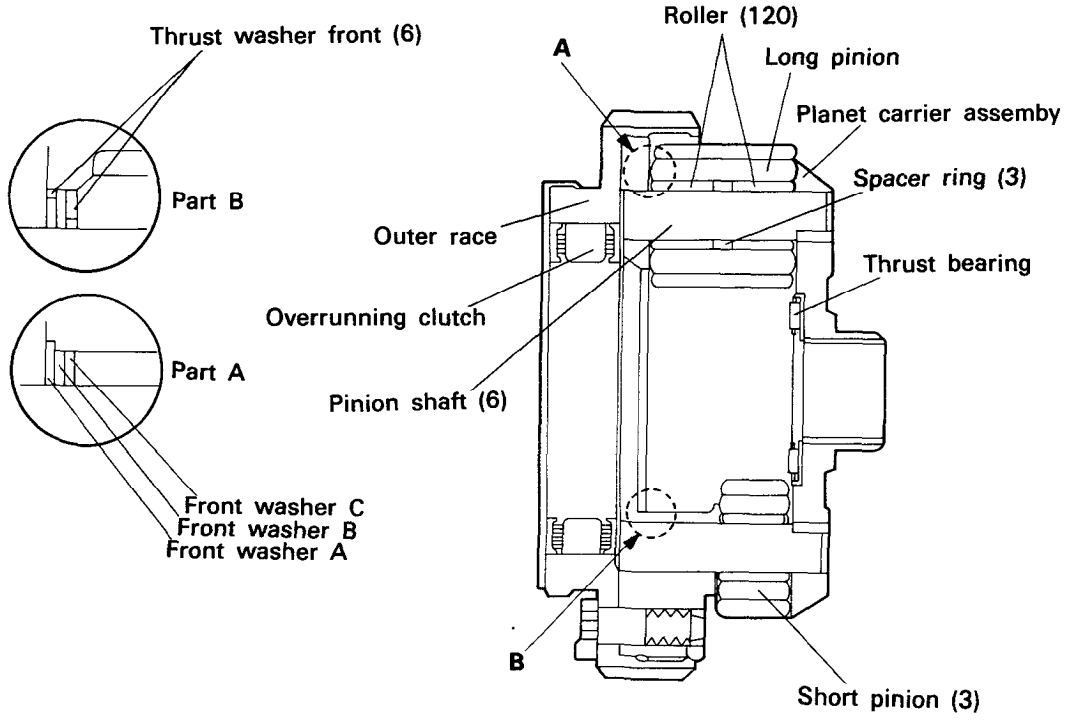


6. Install the snap ring. Check that the clearance between the snap ring and the clutch reaction plate is 0.4-0.65 mm (0.016-**0.026** in.).
   To check the clearance, hold the circumference of the clutch reaction plate down with 50N (11 lb.) force.
   If clearance is out of specifications, adjust the clearance by selecting the proper snap ring.



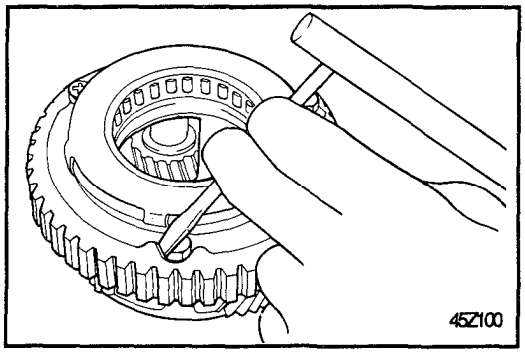
PLANETARY GEAR SET

COMPONENTS

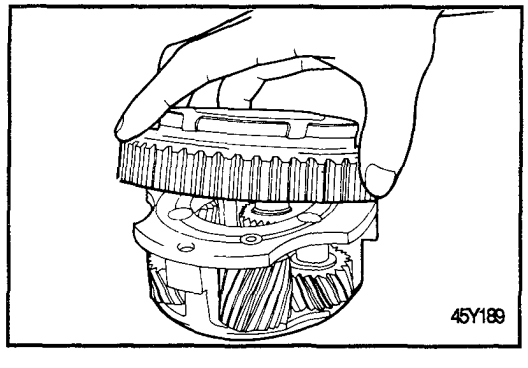


DISASSEMBLY

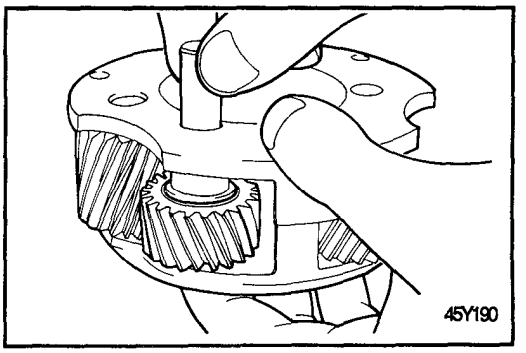
1. Remove three bolts.



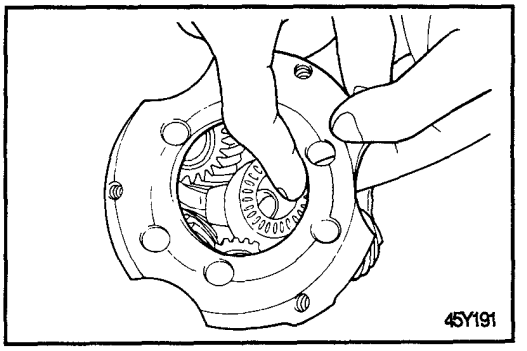
2. Remove the overrunning clutch outer race assembly. Remove the overrunning clutch end plate.



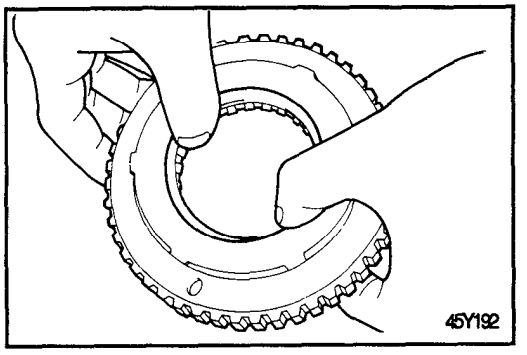
3. Remove the shaft of only one short pinion.
4. Remove the spacer bushing and two front thrust washers.
5. Remove the pinion. Do not drop the 17 roller bearings in the pinion.



6. Remove the thrust bearing.

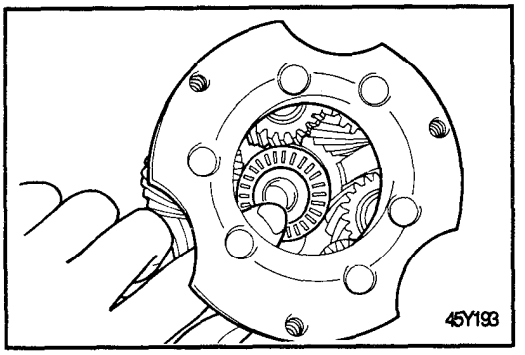


7. Push the overrunning clutch out of the outer race by hand.

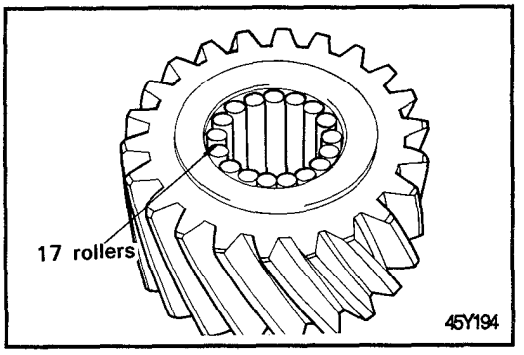


ASSEMBLY

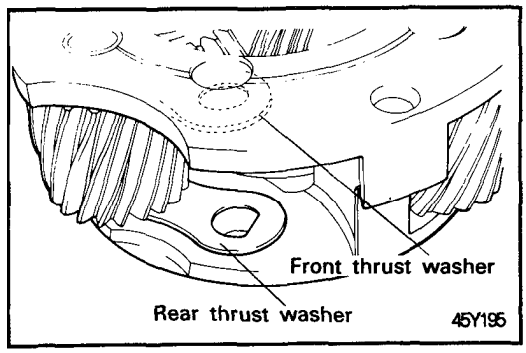
1. Install the thrust bearing in the carrier. Be sure that it fits correctly in the carrier.



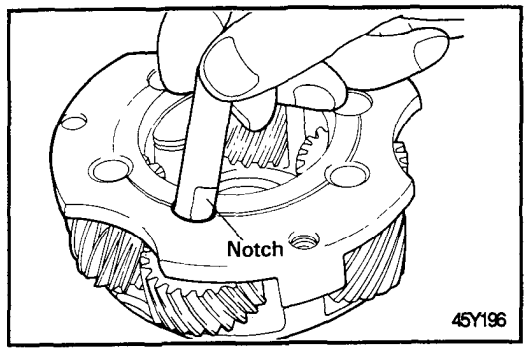
2. Apply a generous amount of petroleum jelly to the inside of the short pinion to hold the 17 rollers bearings in place.



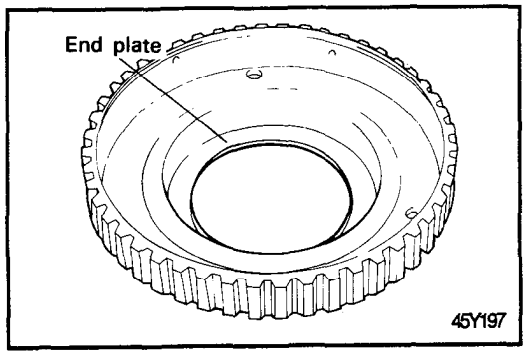
3. Line up the holes in the rear thrust washer and front thrust washer with the shaft of the carrier.
4. Install the short pinion, spacer bushing and two front thrust washers and align the holes. Use care not to allow the rollers to move out of position.



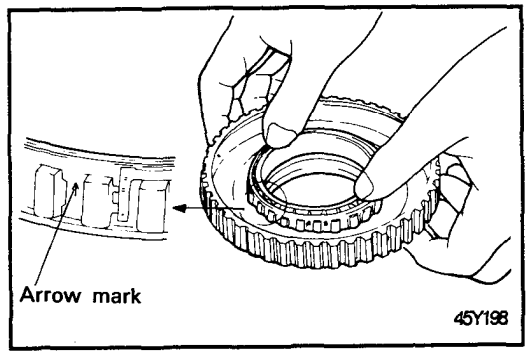
5. Insert the pinion shaft. Be sure that the flattened end of the pinion shaft fits properly into the hole in the rear thrust plate when the pinion shaft is inserted.



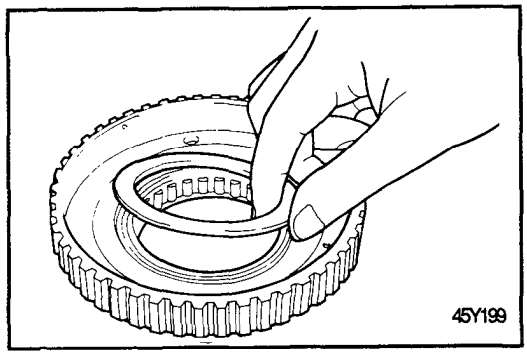
6. Install the end plate in the outer race.



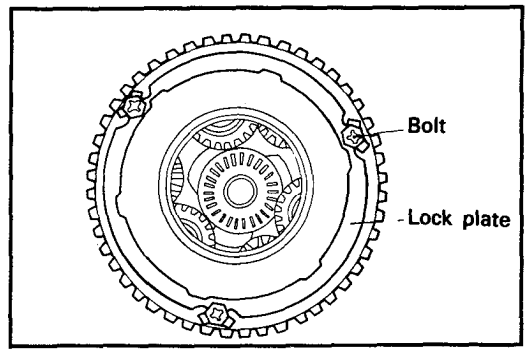
7. Press the overrunning clutch into the outer race. Be sure that the arrow on the outside circumference of the cage is pointing upward as shown in the illustration when the overrunning clutch is installed.



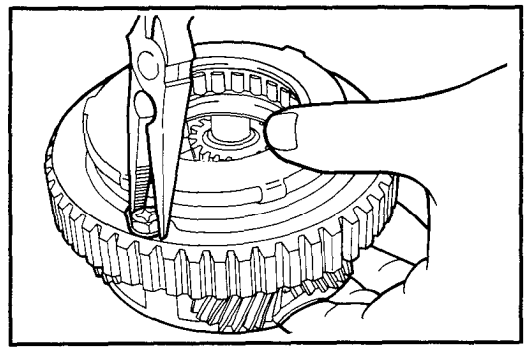
8. Apply petroleum jelly to the overrunning clutch end plate to retain it inside the overrunning clutch. Install the end plate in the clutch.



9. Install overrunning clutch assembly to carrier and align bolt holes.
10. Install three bolts and tighten three bolts to 25-35 Nm (18-25 ft.lbs.)

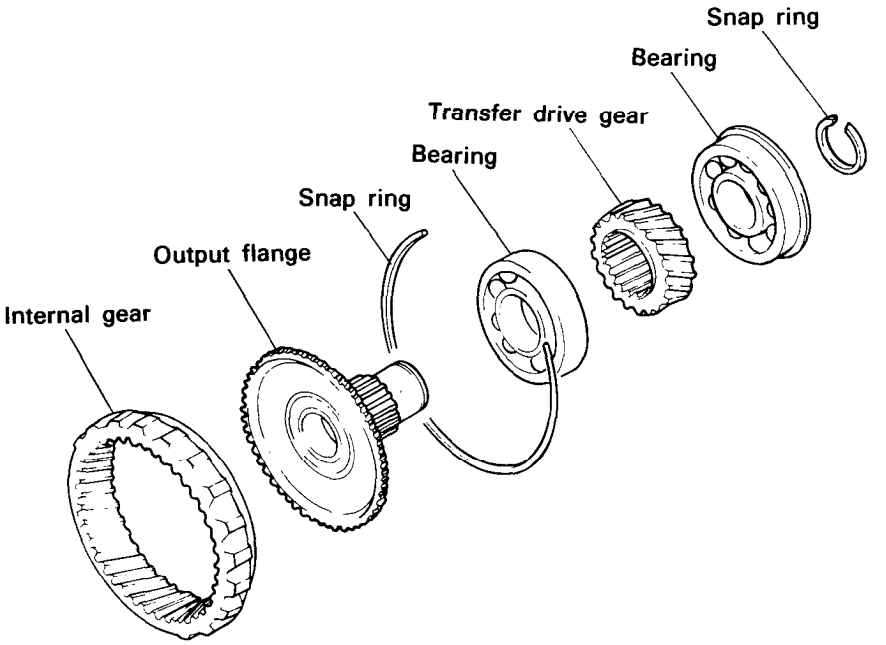


11. Bend the lock plate over the bolt head.



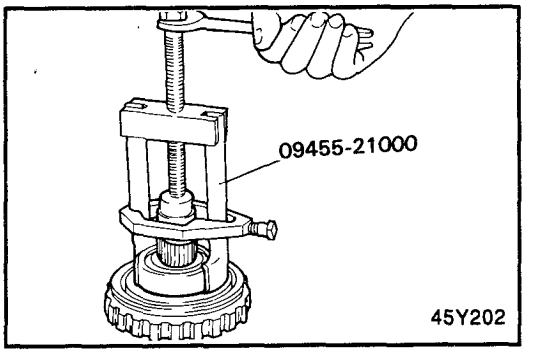
INTERNAL GEAR AND TRANSFER DRIVE GEAR SET ASSEMBLY

COMPONENTS

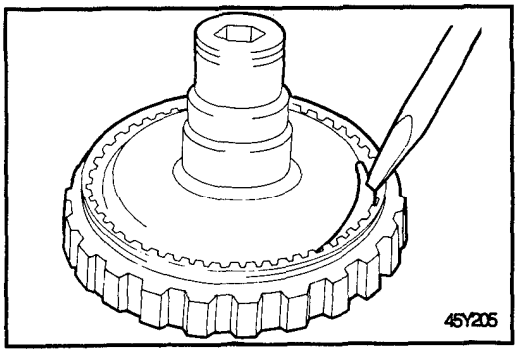


DISASSEMBLY

1. **Remove** the **snap ring** from the rear of the output flange.
2. Using the special tool (09455-21000) remove the bearing from the output flange.



3. Remove the snap ring, and separate the internal gear from the output flange.

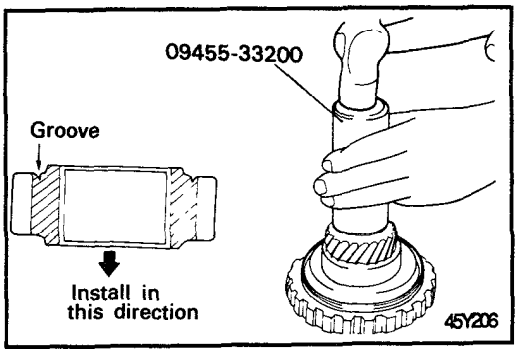


ASSEMBLY

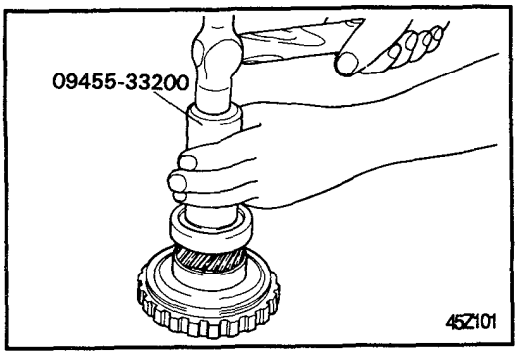
1. Using the special tool (09455-33200) press the bearing and transfer drive gear onto output flange.

   CAUTION
   Replace the output flange and transfer drive gear as a set.

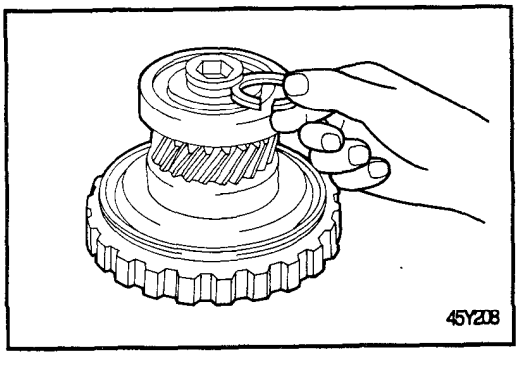
2. Install the transfer drive gear in the proper direction as shown in the illustration.



3. Install the ball bearing.

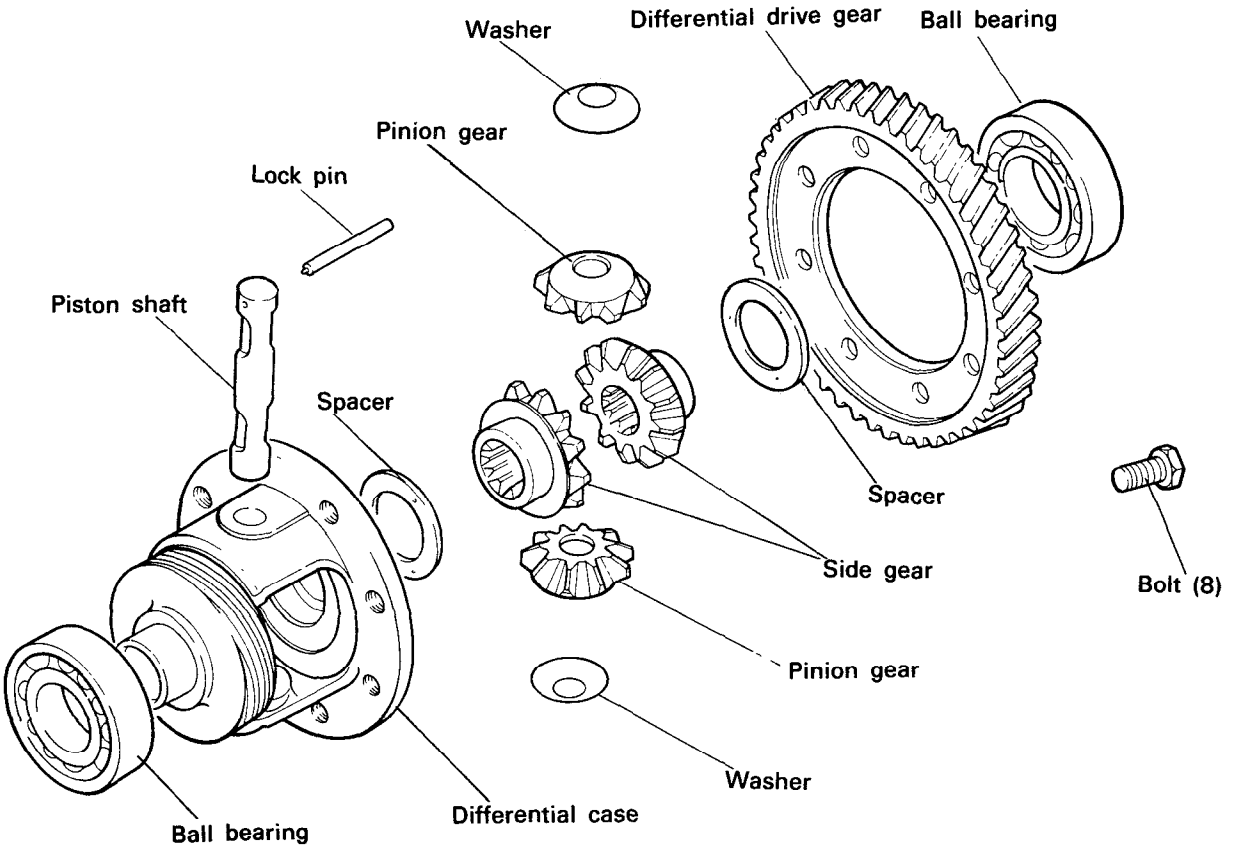


4. Select the thickest snap ring that can be installed in groove.



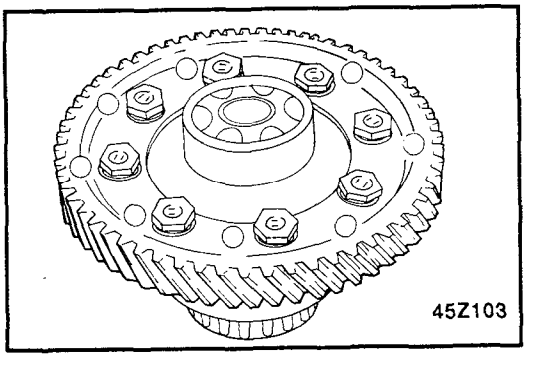
DIFFERENTIAL

COMPONENTS

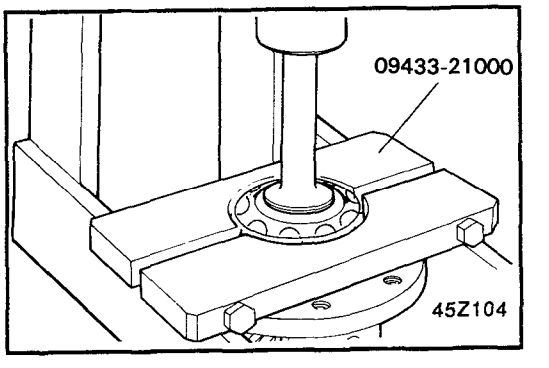


DISASSEMBLY

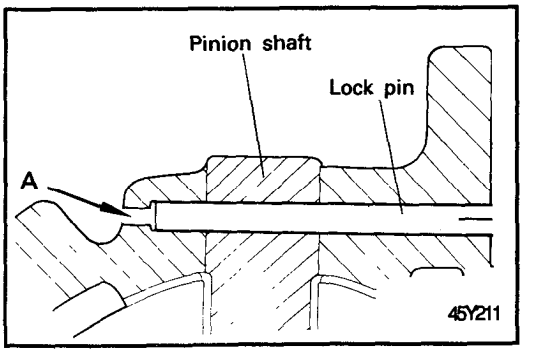
1. Remove the drive gear retaining bolts and drive gear from the differential case.



2. Remove the ball bearing with the special tool (09433-21000).



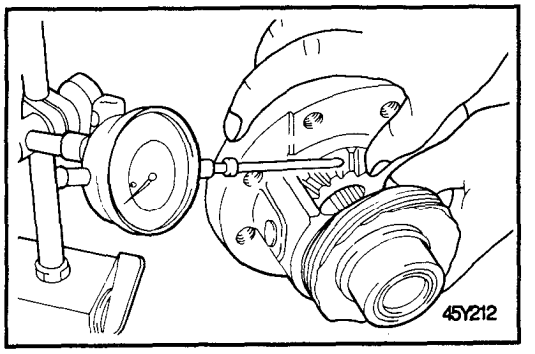
3. Drive out the lock pin with a punch inserted in hole “A”.
4. Remove the pinion shaft, pinion gears and washers.
5. Remove the side gears and spacers.
   Do not mix the gears and spacers between the left and right sides.



ASSEMBLY

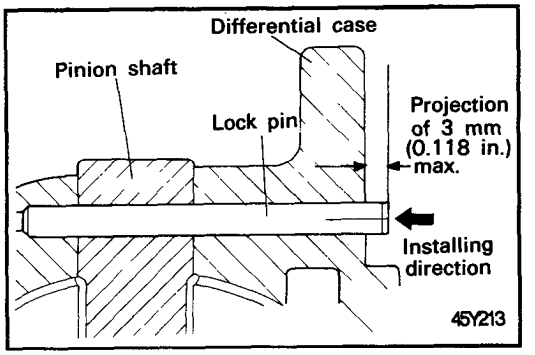
1. With the spacers installed on the back of the differential side gears, install the gears into the differential case. If reusing parts, install them in their original positions noted during disassembly.
   If using new differential side gears, install medium thickness spacers 1.0mm (0.039in.).
2. Install the washers on the back of the pinion gears. Install gears into the differential case, then insert the pinion shaft.
3. Measure the backlash between the side gear and the pinion gear.
   Backlash should be 0.025-0.150 mm (.0010-.0059 in.) and the right and left hand gear pairs should have equal backlash. If the backlash is out of specification, disassemble and reassemble using different spacers for the correct backlash.-

   Standard value: 0.025-0.150 mm (.0010-.0059 in.)

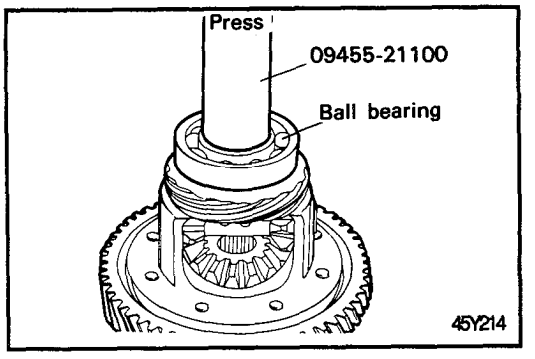


4. Install the pinion shaft lock pin in the direction specified in the illustration. After installation, check that the projection is less than 3 mm (.118 in.).-

   NOTE :
   The lock pin must not be reused.

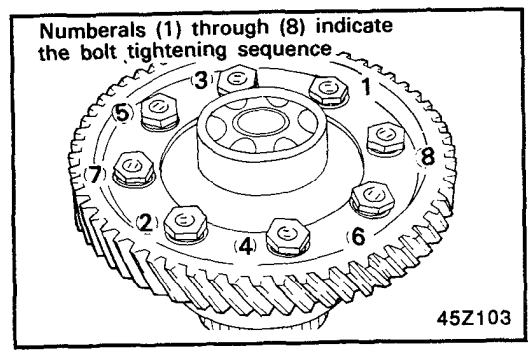


5. Press the bearings onto both ends of differential case. Press on the inner race when installing the bearings. Do not apply load to outer race.
6. Install the differential drive gear onto the case.



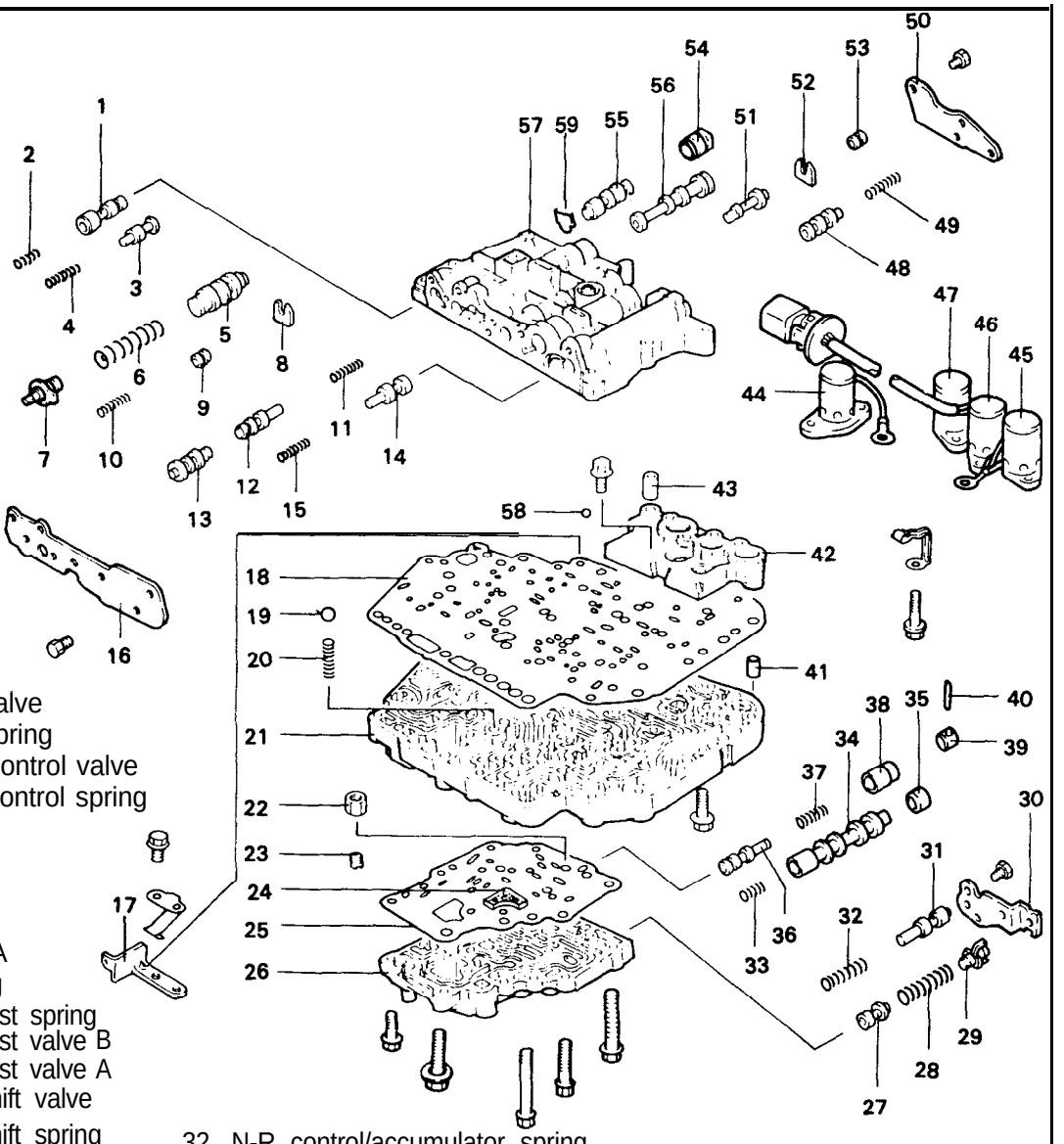
7. Apply ATF to the bolts and tighten the bolts to the specified torque in the sequence shown in the illustration.-

Tightening torque:
130-140 Nm (1300-1400 kg.cm, 94-101 lb.ft)



VALVE BODY

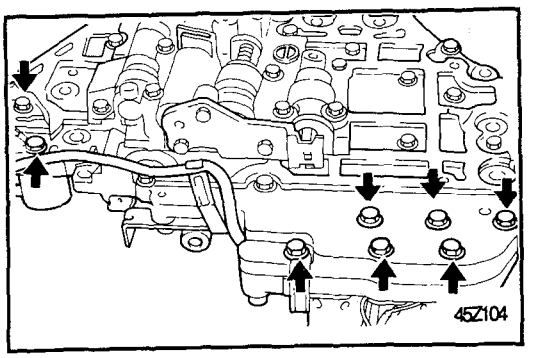
COMPONENTS



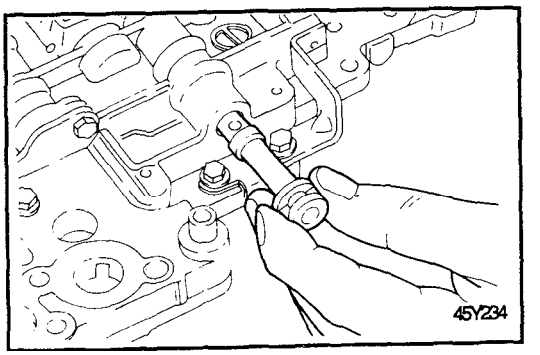
1. Pressure control valve
2. Pressure control spring
3. Torque converter control valve
4. Torque converter control spring
5. Regulator valve
6. Regulator spring
7. Adjusting screw
8. Stopper plate
9. Shift control plug A
10. Shift control spring
11. Rear clutch exhaust spring
12. Rear clutch exhaust valve B
13. Rear clutch exhaust valve A
14. 2nd-3rd/4th-3rd shift valve
15. 2nd-3rd/4th-3rd shift spring
16. Front end cover
17. Valve stopper
18. Upper separating plate
19. Steel ball
20. Relief spring
21. Intermediate plate
22. Nut
23. Jet
24. Oil filter
25. Lower separating plate
26. Lower valve body
27. Reducing valve
28. Reducing spring
29. Adjusting screw
30. End cover
31. N-R control/accumulator valve
32. N-R control/accumulator spring
33. Damper clutch control spring
34. Damper clutch control valve
35. Damper clutch control sleeve
36. End clutch valve
37. End clutch spring
38. End clutch plug
39. Stopper
40. Pin
41. Dowel bushing
42. Block
43. Pipe
44. Pressure control solenoid valve (PCSV)
45. Shift control solenoid valve B (SCSV-B)
46. Shift control solenoid valve A (SCSV-A)
47. Damper clutch control solenoid valve (DCCSV)
48. 1-2 shift valve
49. 1-2 shift spring
50. Rear end cover
51. Shift control cover
52. Stopper plate
53. Shift control plug B
54. N-D control sleeve
55. N-D control valve
56. Manual valve
57. Upper valve body
58. Teflon ball
59. N-D plate

DISASSEMBLY

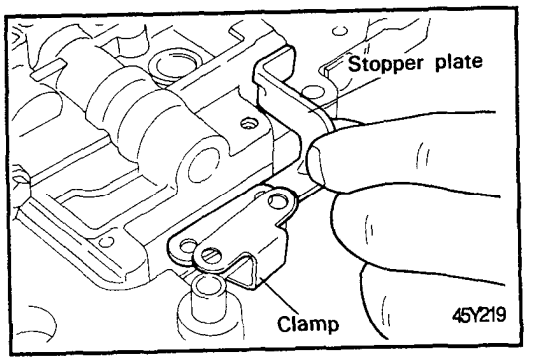
1. Remove the 4 solenoid valves.



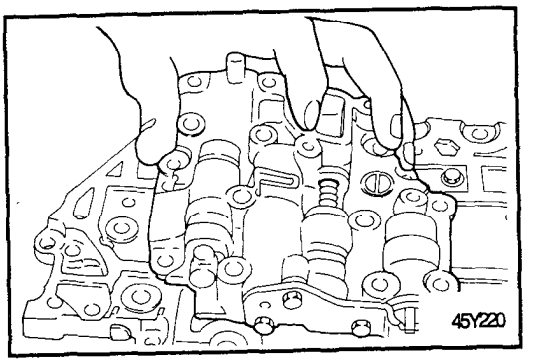
2. Remove the manual valve.



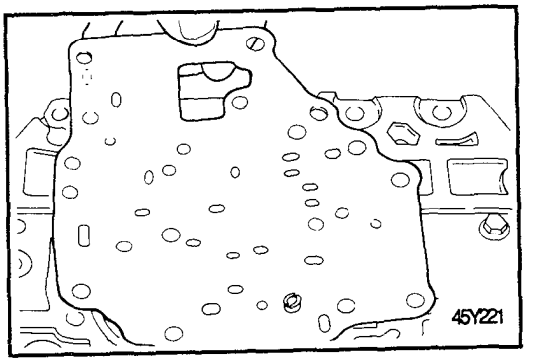
3. Remove the valve stopper and clamp.



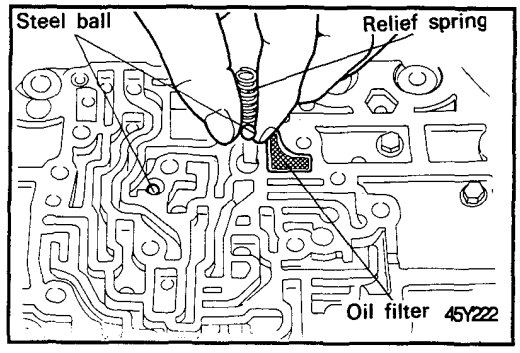
4. Remove the bolts (13), and then remove the lower valve body.



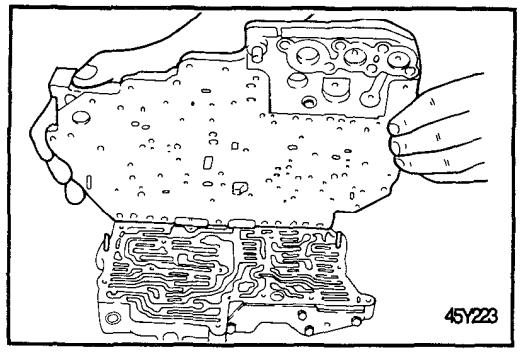
5. Remove the separating plate.



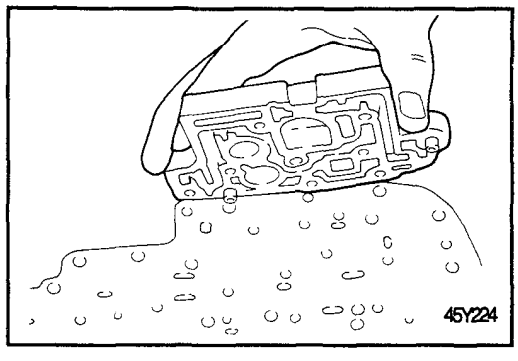
6. Remove the relief spring, two steel balls and oil filter from the intermediate plate,



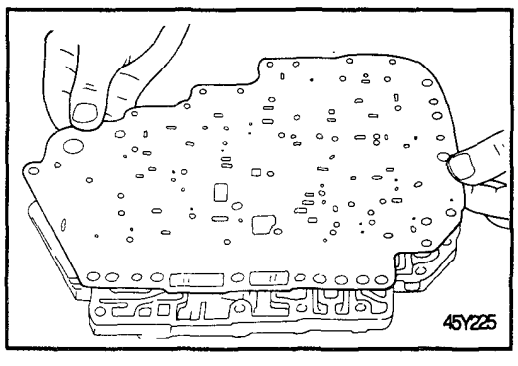
7. Remove the bolts (8) and then remove the intermediate and upper separation plates.



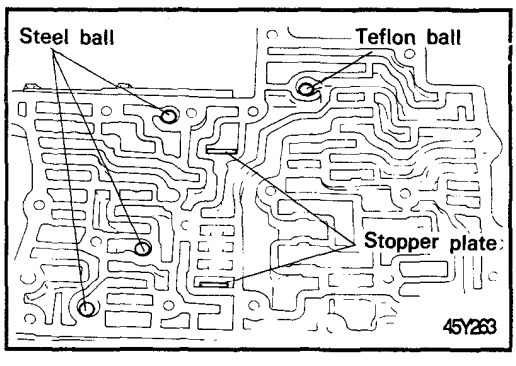
8. Remove the block.



9. Remove the upper separating plate.

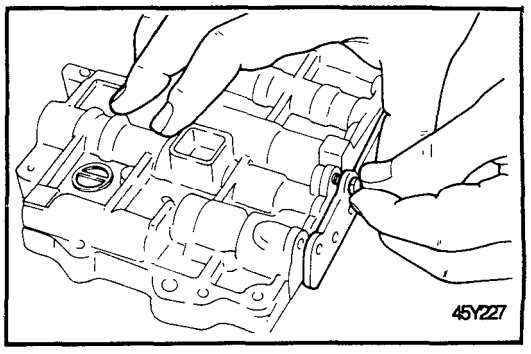


10. Remove, from the upper valve body, the three steel balls, the teflon ball, and the two stopper plates.

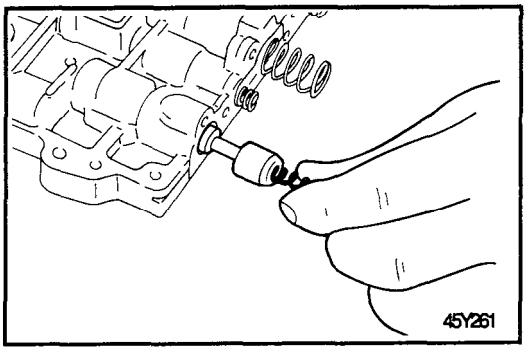


11. Remove from the upper valve body, the seven bolts. Then remove the front end cover and the adjustment screw.-

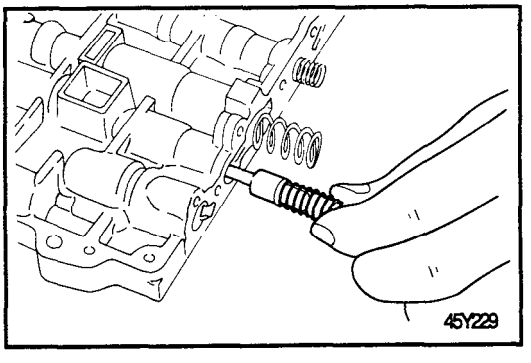
NOTE :
When removing the bolts, be sure to hold the front end cover (as shown in the illustration) to prevent the spring from causing the adjustment screw to fall out.



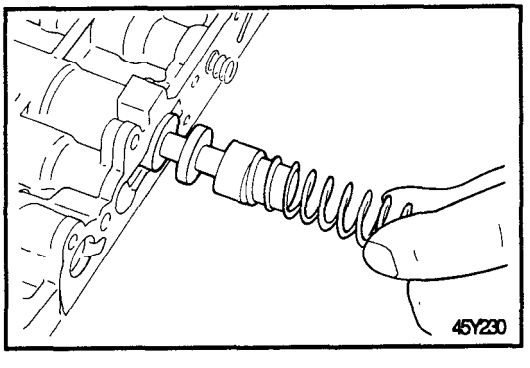
12. Remove the pressure control spring and the pressure control valve.



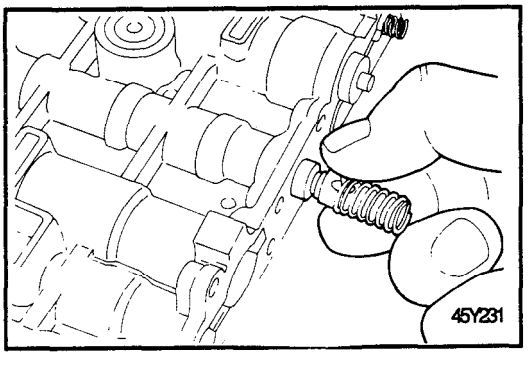
13. Remove the torque converter control spring and the torque converter control valve.



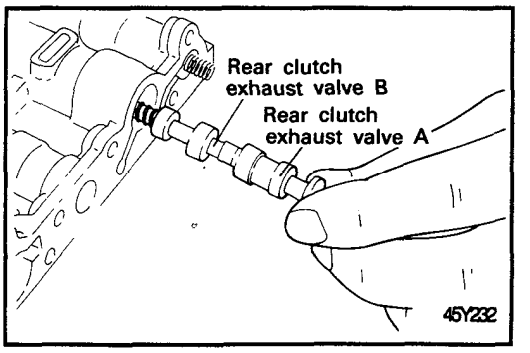
14. Remove the regulator spring and the regulator valve.



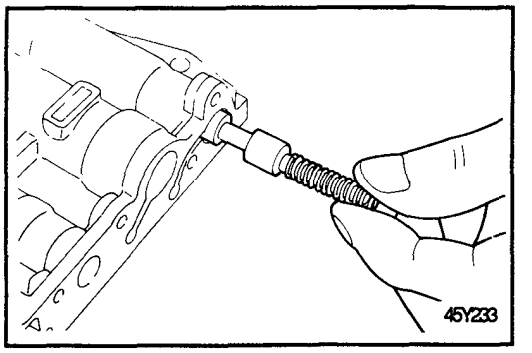
15. Remove the shift-control spring and shift-control plug A.



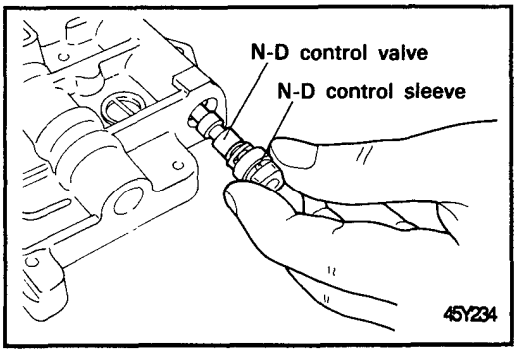
16. Remove the rear clutch exhaust valves A and B as well as the rear clutch exhaust spring.



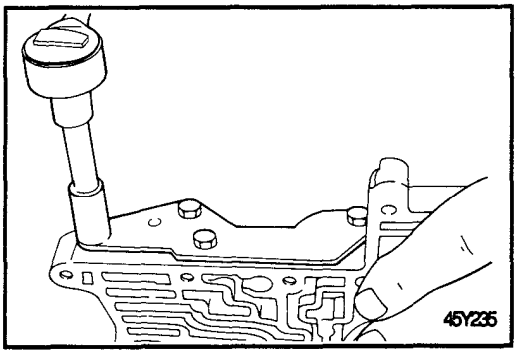
17. Remove the 2-3/4-3 shift spring and the shift valve.



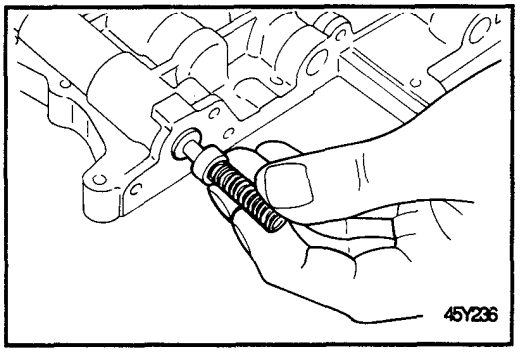
18. Remove, from the rear side of the upper valve body, the N-D plate, the N-D control sleeve and the N-D control valve.



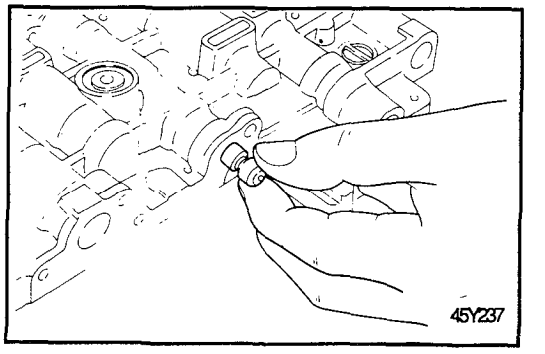
19. Remove the four bolts, and then remove the rear end cover.



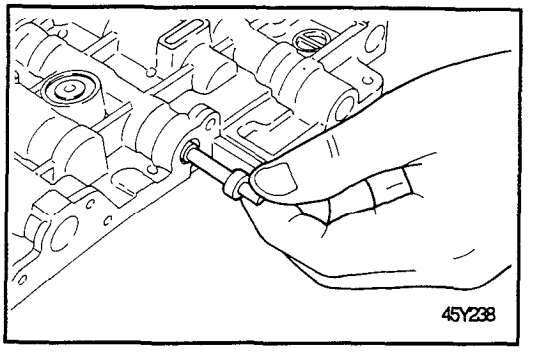
20. Remove the 1-2 shift spring and the 1-2 shift valve.



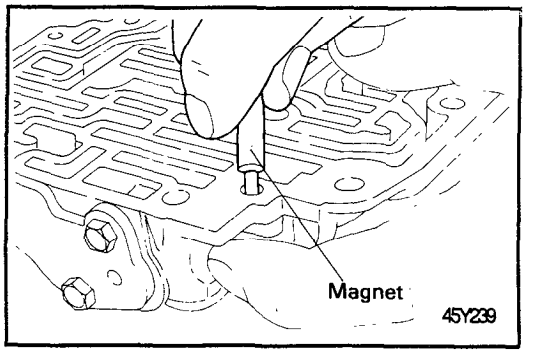
21. Remove shift-control plug B.



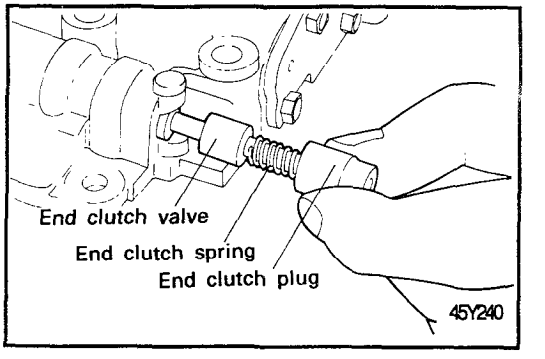
22. Remove the shift-control valve.



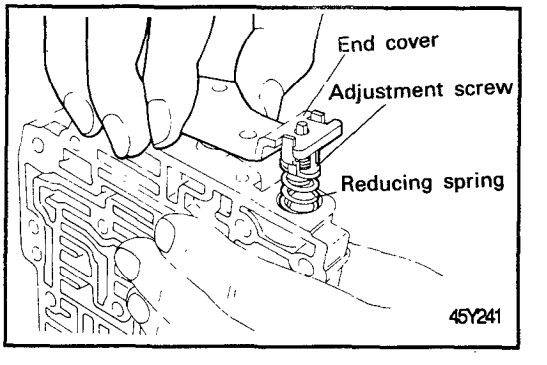
23. Using a magnet, extract the pin from the lower valve body, and then remove the stopper.



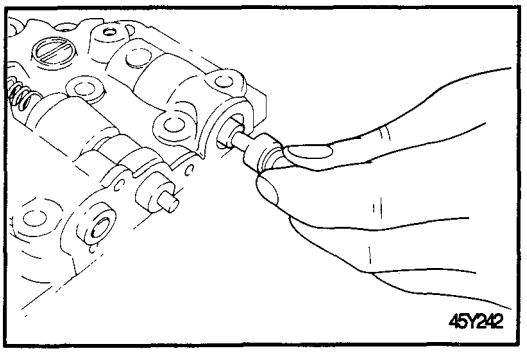
24. Remove the end clutch valve plug, end clutch spring, and end clutch valve.



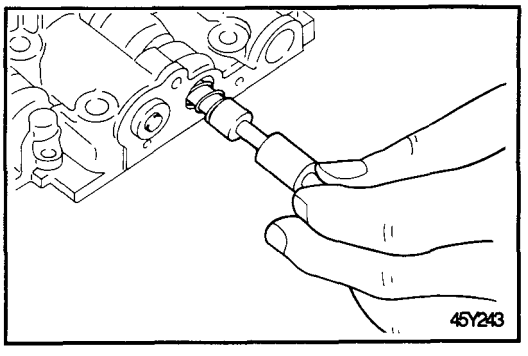
25. Remove the three bolts from the lower valve body, and then remove the end cover, adjustment screw, and reducing spring.



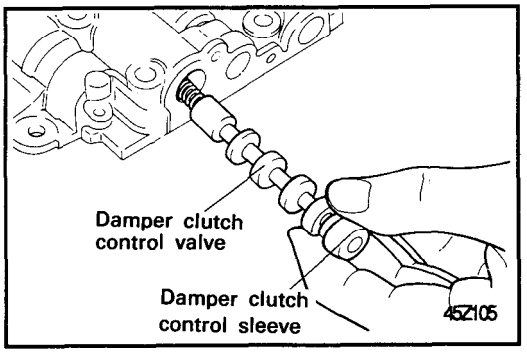
26. Remove the reducing valve.



27. Remove the N-R control/accumulator valve and the N-R control/accumulator spring.

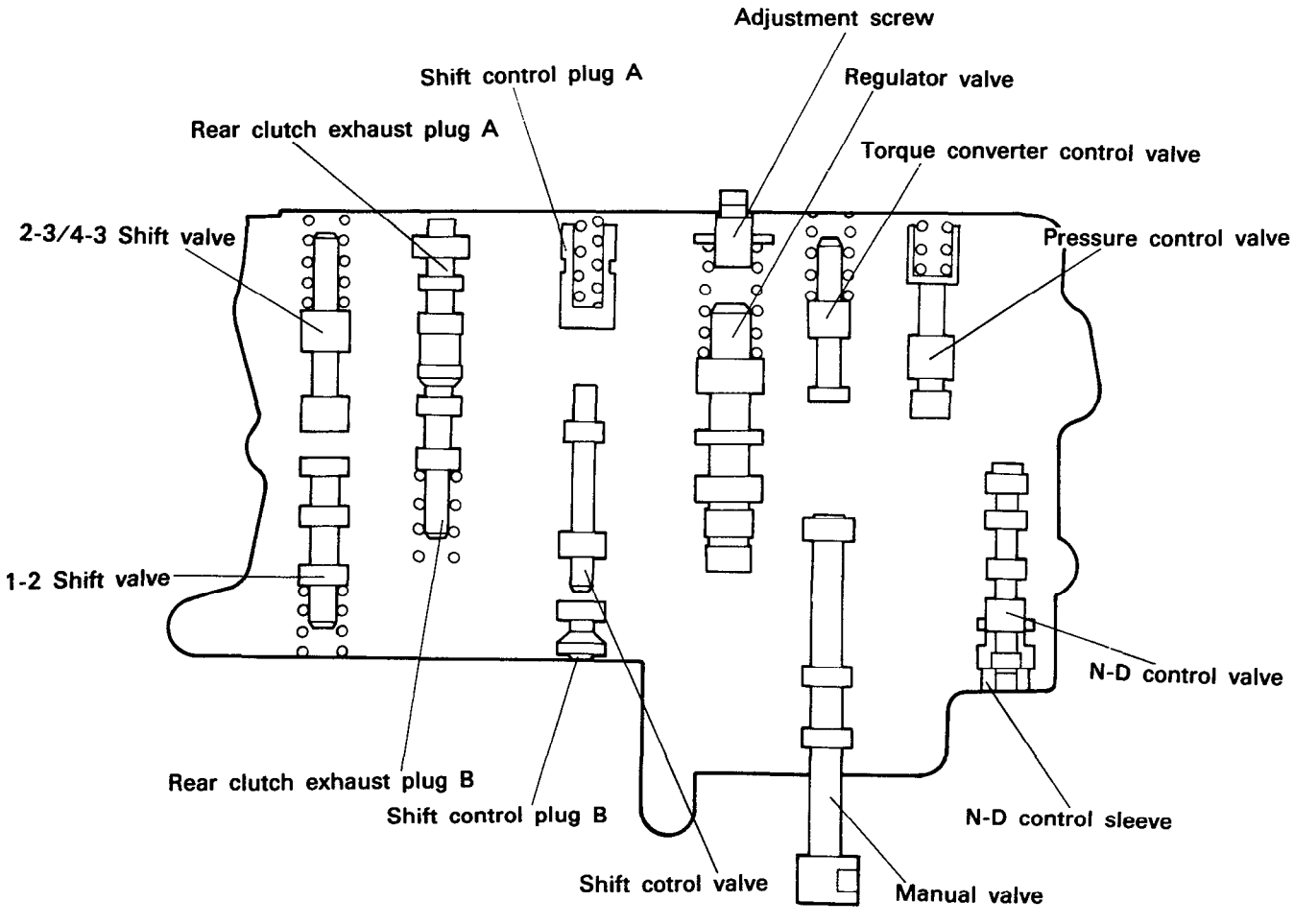


28. Remove the damper clutch control sleeve, damper clutch control valve, and the damper clutch control spring.

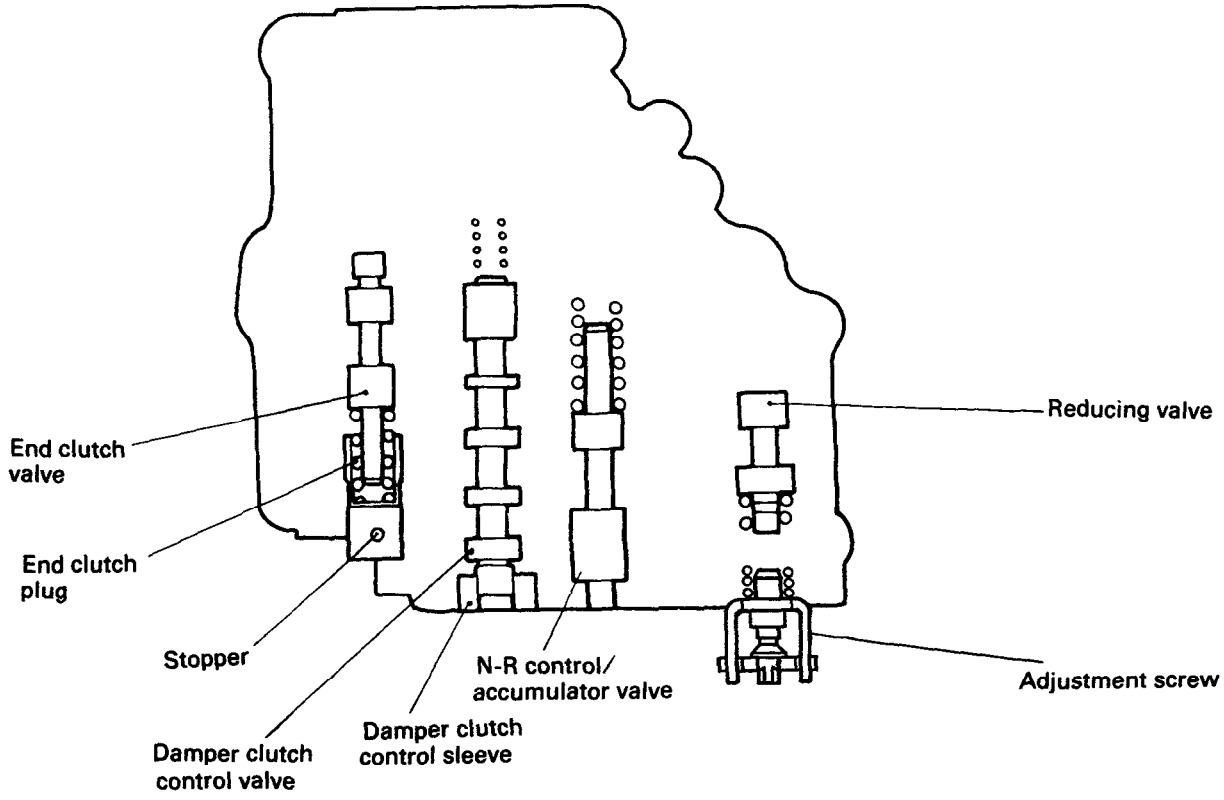


VALVE INSTALLATION POSITIONS

Upper Valve Body

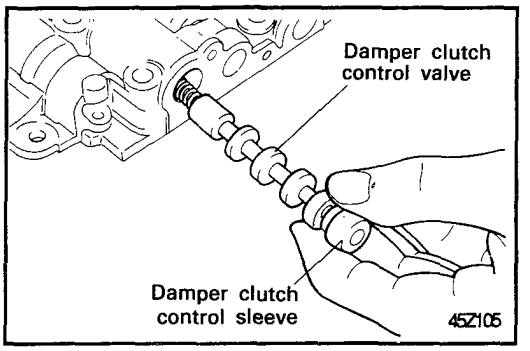


Lower Valve Body

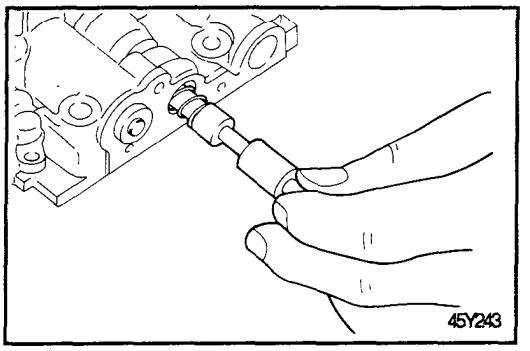


ASSEMBLY

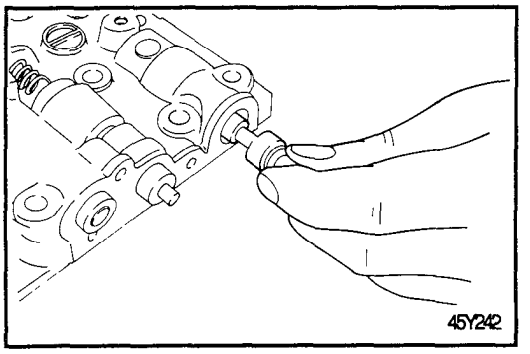
1. install in the lower valve body, the damper clutch control spring, damper clutch control valve, and the damper clutch control sleeve.



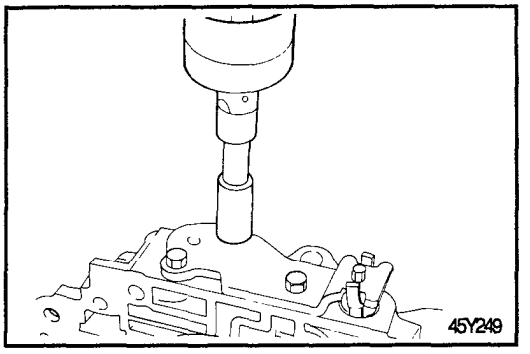
2. Install the N-R control/accumulator spring and the N-R control/ accumulator valve.



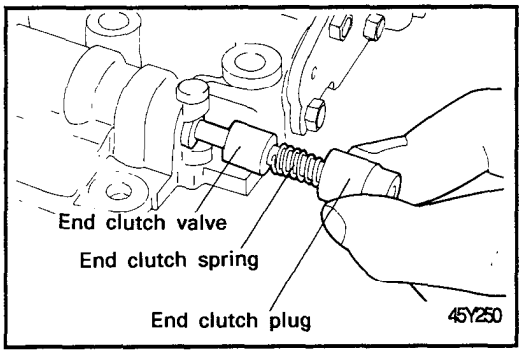
3. Install the reducing valve.



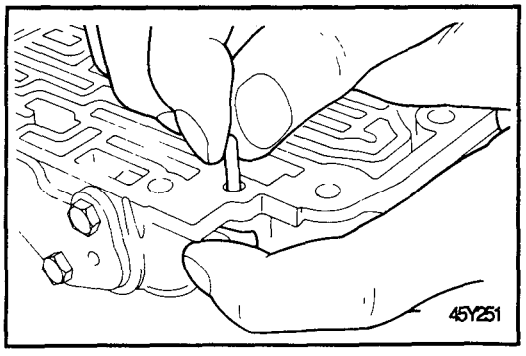
4. Install the reducing spring, adjustment screw, and end cover. Tighten the bolts to the specified torque.



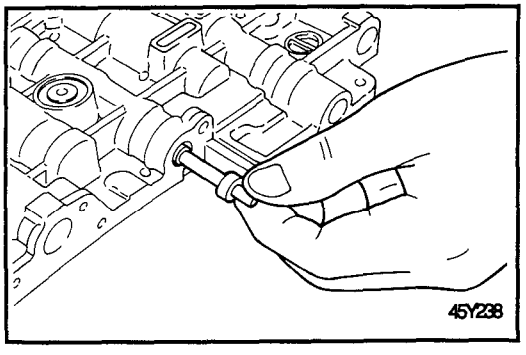
5. Install the end clutch valve, end clutch spring, and end clutch plug.



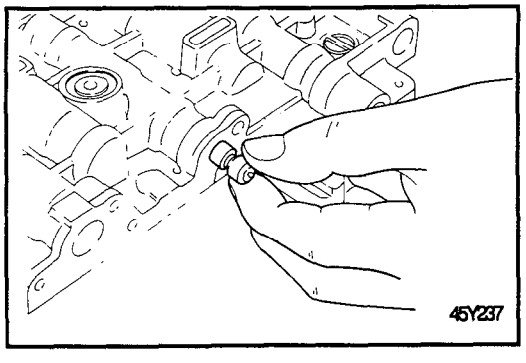
6. Install the stopper and secure it with the pin.



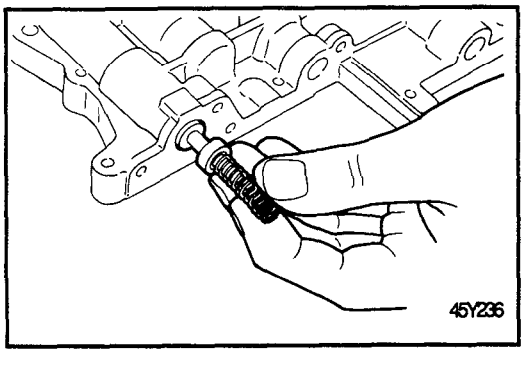
7. Install the 1-2 shift-control valve to the upper valve body.



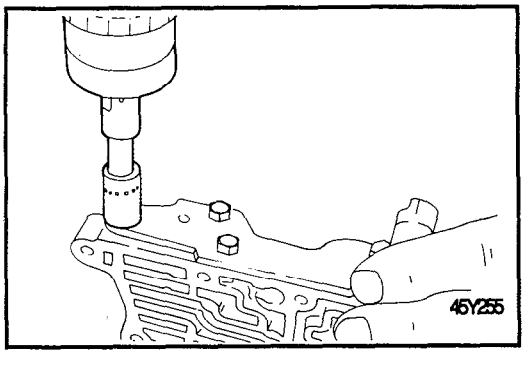
8. Install the 1-2 shift-control plug.



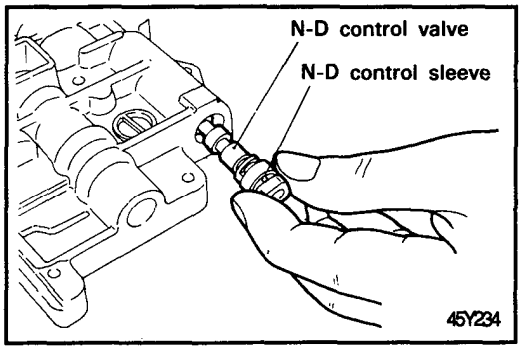
9. Install the 1-2 shift valve and 1-2 shift spring.



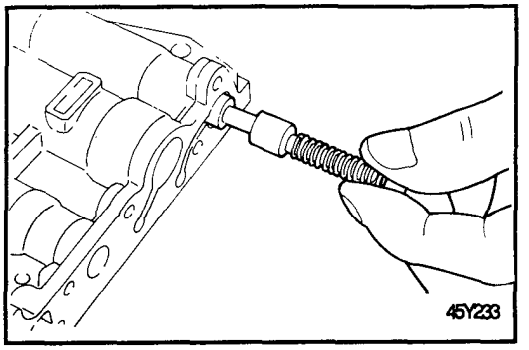
10. Install the rear and cover.



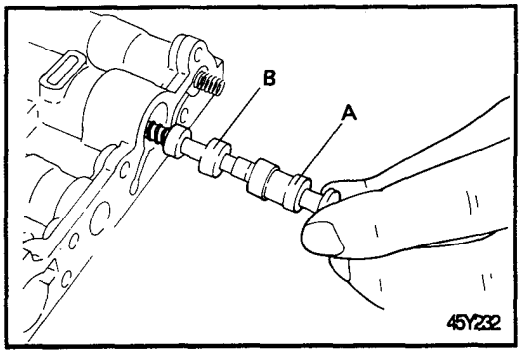
11. Install the N-D control valve, N-D control sleeve, and N-D plate.



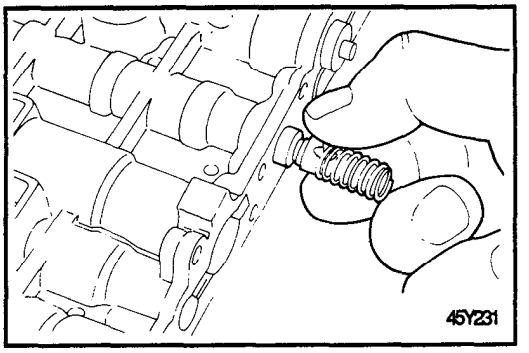
12. Install the 2-3/4-3 shift valve and the 2-3/4-3 shift spring.



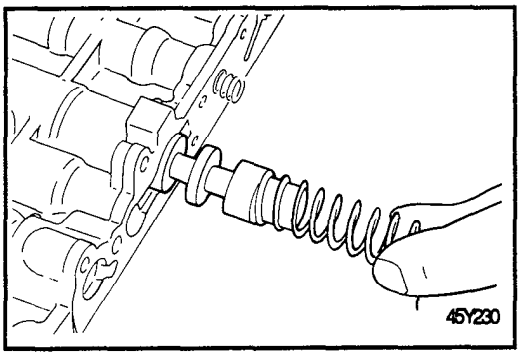
13. Install the rear clutch exhaust spring and rear clutch exhaust valves A and B.



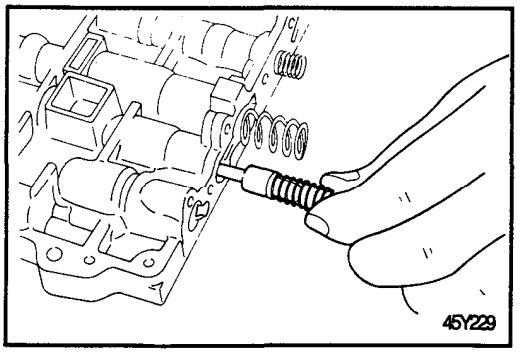
14. Install the shift-control valve and shift control spring.



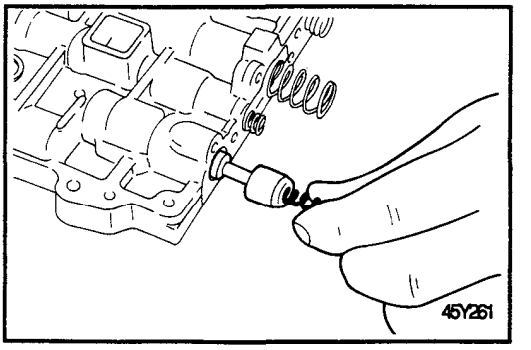
15. Install the regulator valve and regulator spring.



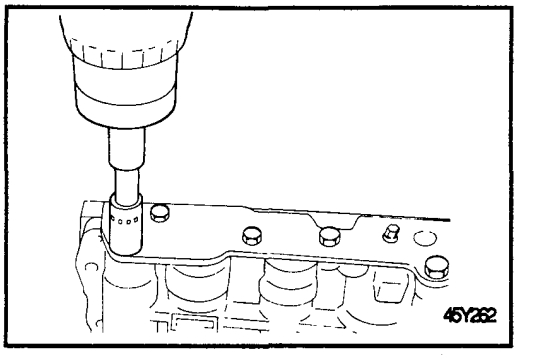
16. Install the torque converter control valve and torque converter control spring.



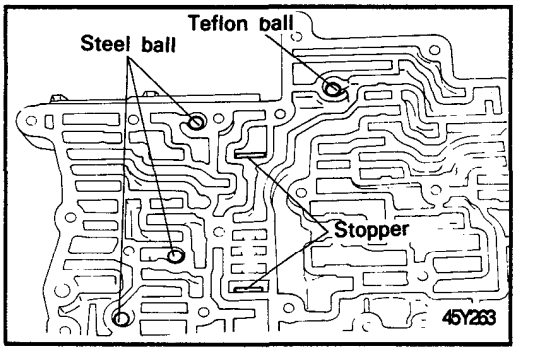
17. Install the pressure control valve and pressure control spring.



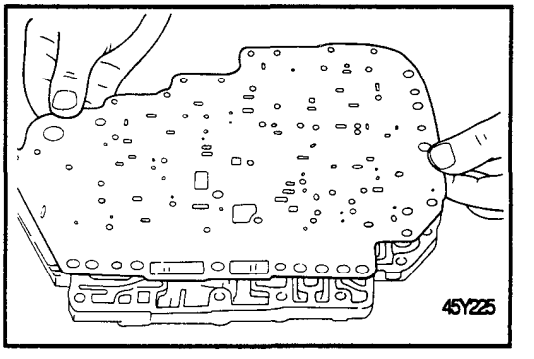
18. Install the adjustment screw and front end cover. Tighten the bolts to the specified torque.



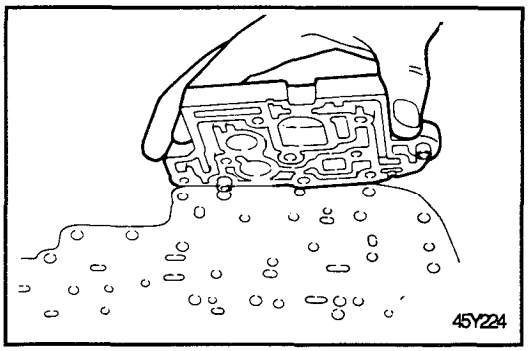
19. Install, in the upper valve body, the three steel balls, the teflon ball, and the stopper plate.



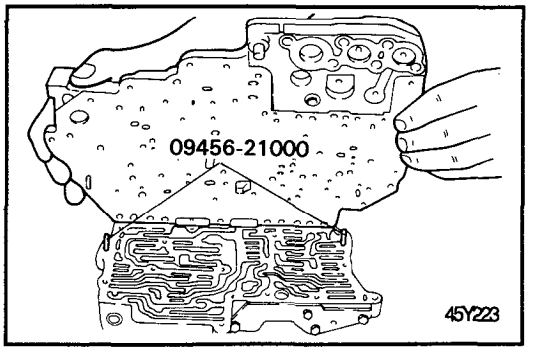
20. Install the upper separating plate.



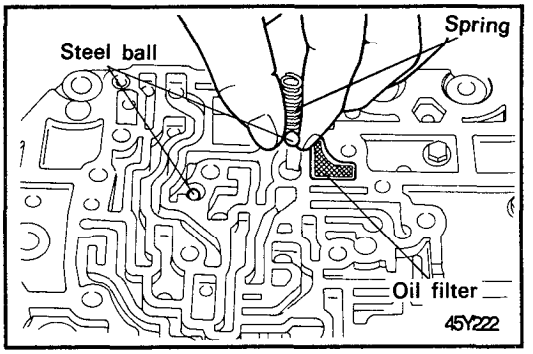
21. Install the block.



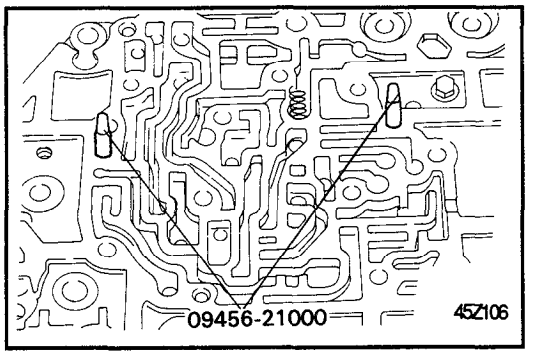
22. Install the special tool (09456-21000). Then, after securing the upper separating plate and the intermediate plate with the eight installation bolts, remove the special tool.



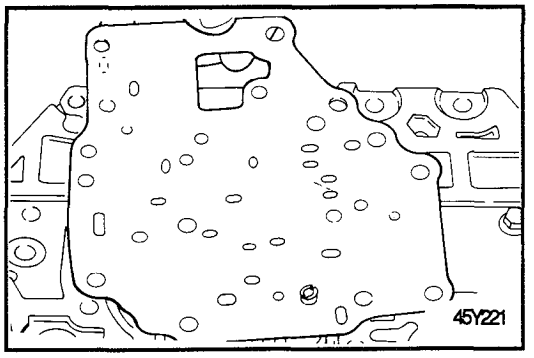
23. Install to the intermediate plate, the oil filter, the two steel balls, and the spring.



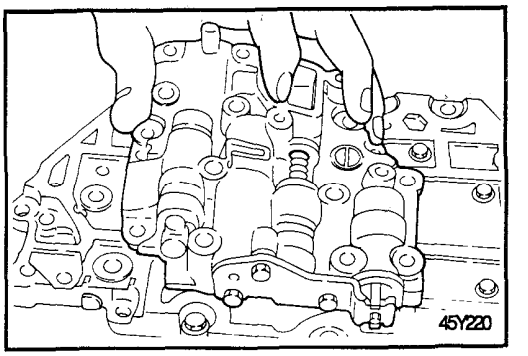
24. Install the special tool (09456-21000) to the intermediate plate.



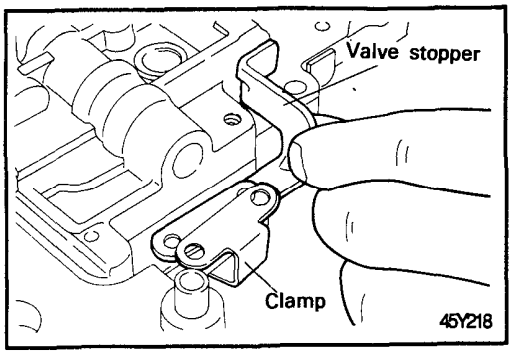
25. Install the separating plate.



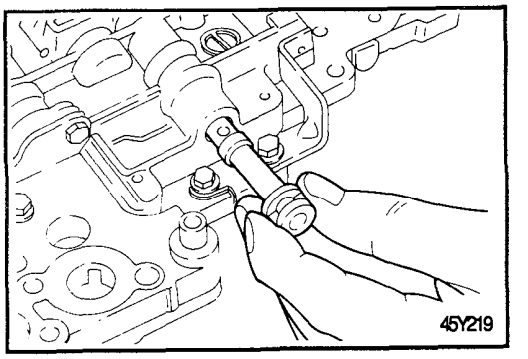
26. After securing the lower valve body using the 13 installation bolts, remove the special tool.



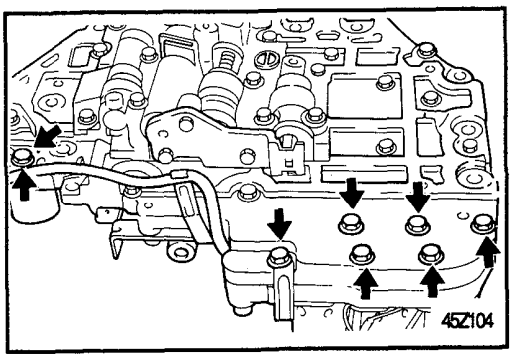
27. Install the valve stopper and clamp.



28. Install the manual valve.

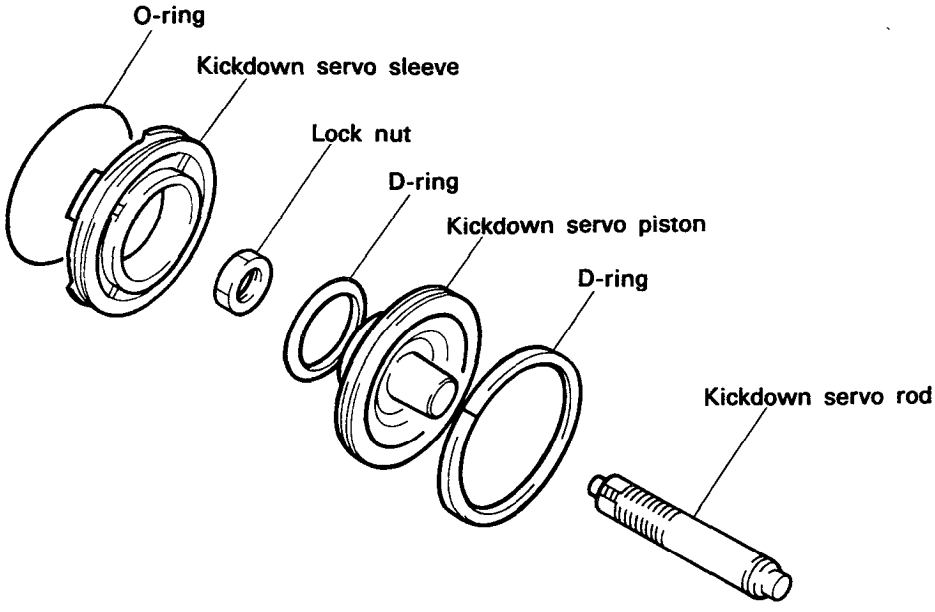


29. Secure the four solenoid valves using the installation bolts.



KICKDOWN SERVO

COMPONENTS

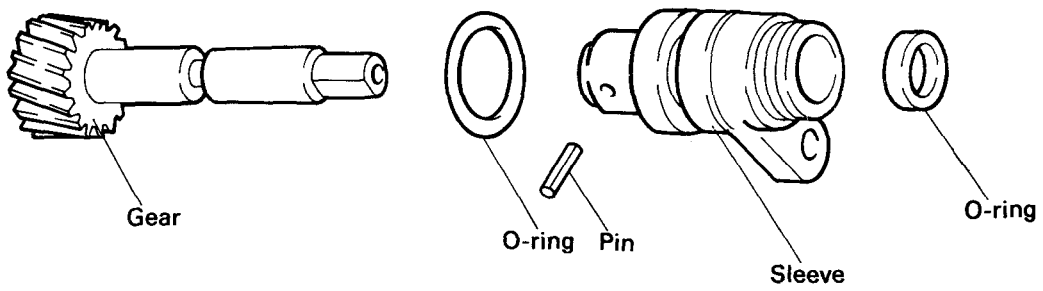


ASSEMBLY

1. Install the rod and nut to the kickdown servo piston.
2. Install two new D-rings (one large and one small) around the circumference of the piston, and then apply a coating of ATF to the D-rings.
3. Install the kickdown servo piston in the sleeve.
4. Install a new O-ring around the circumference of the sleeve, and apply a coating of ATF to the O-ring.

SPEEDOMETER SLEEVE

COMPONENTS



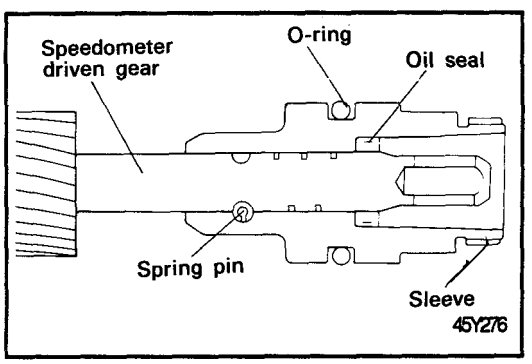
DISASSEMBLY

Drive the spring pin out, and disassemble the gear and sleeve.

NOTE :
Do not reuse the O-rings and spring pin.

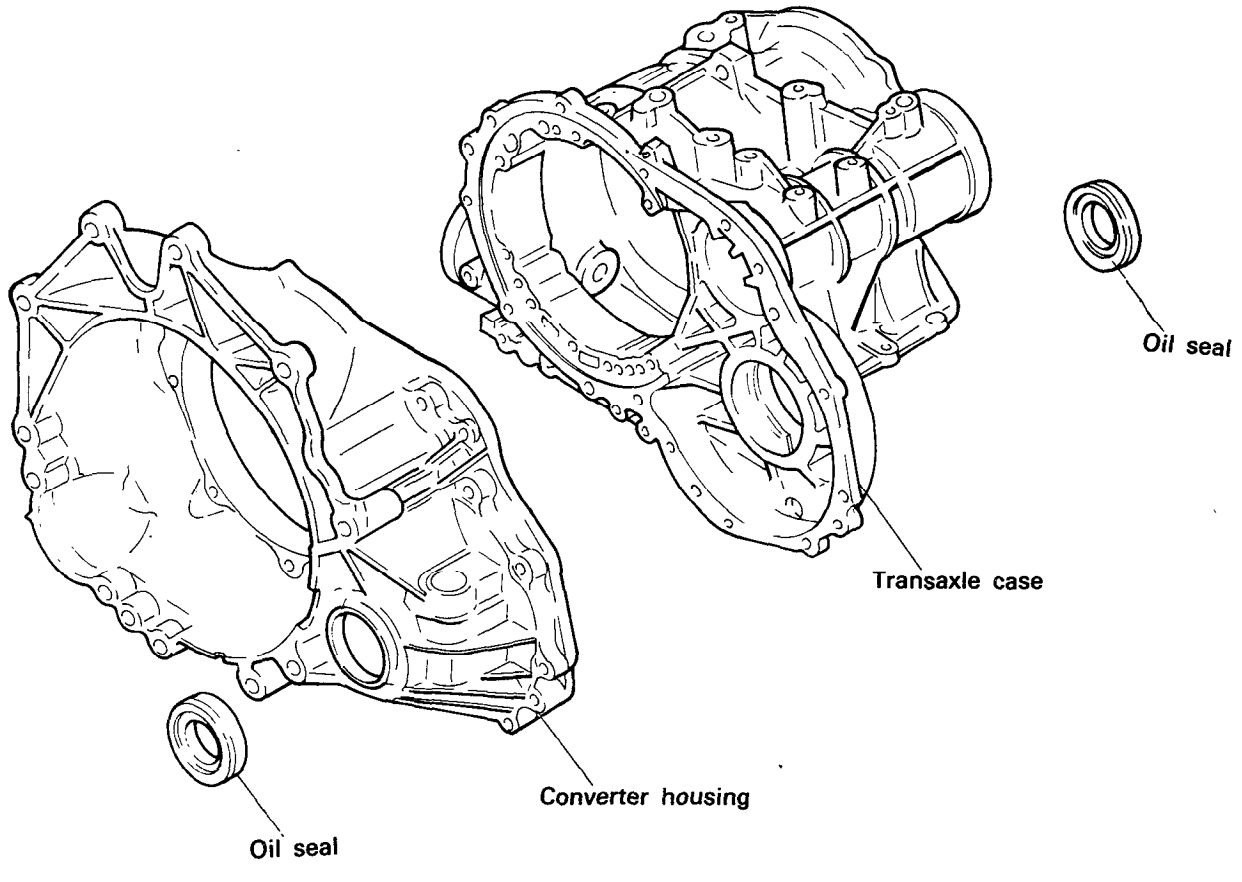
ASSEMBLY

1. Install a new O-ring to the shaft part of the gear, and apply ATF to the O-ring.
2. Insert the gear into the sleeve, and align the pin hole and the groove of the gear's shaft.
3. Tap-a new spring pin into the sleeve. When tapping it in, be sure that the slit is not at the gear side.
4. Install a new O-ring into the outer groove of the sleeve, and apply a coating of ATF to the outer circumference of the O-ring.



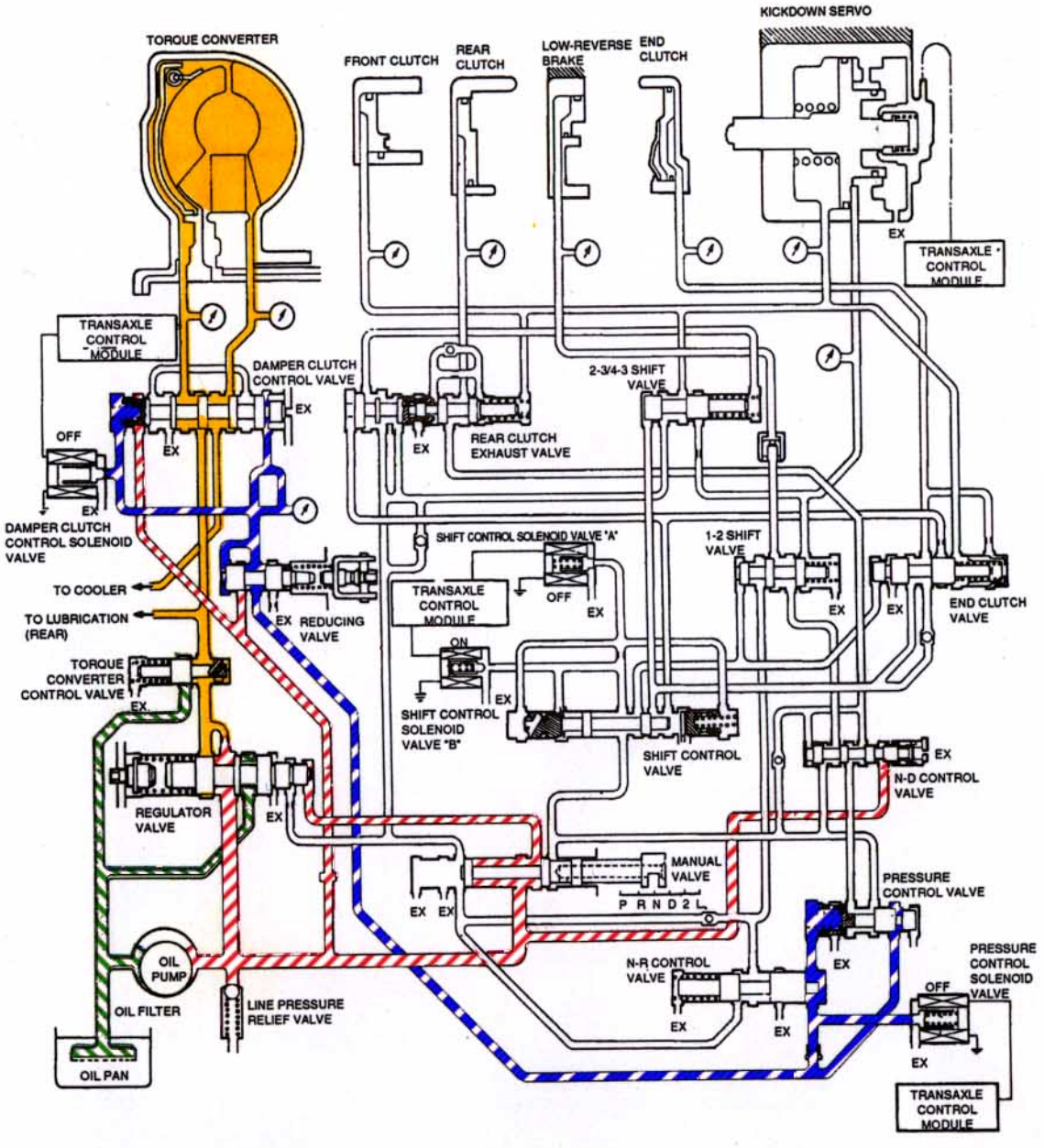
TRANSAXLE CASE

COMPONENTS



ASSEMBLY

1. Using the special tool (09431-21200), drive the shaft oil seal into the transaxle case.

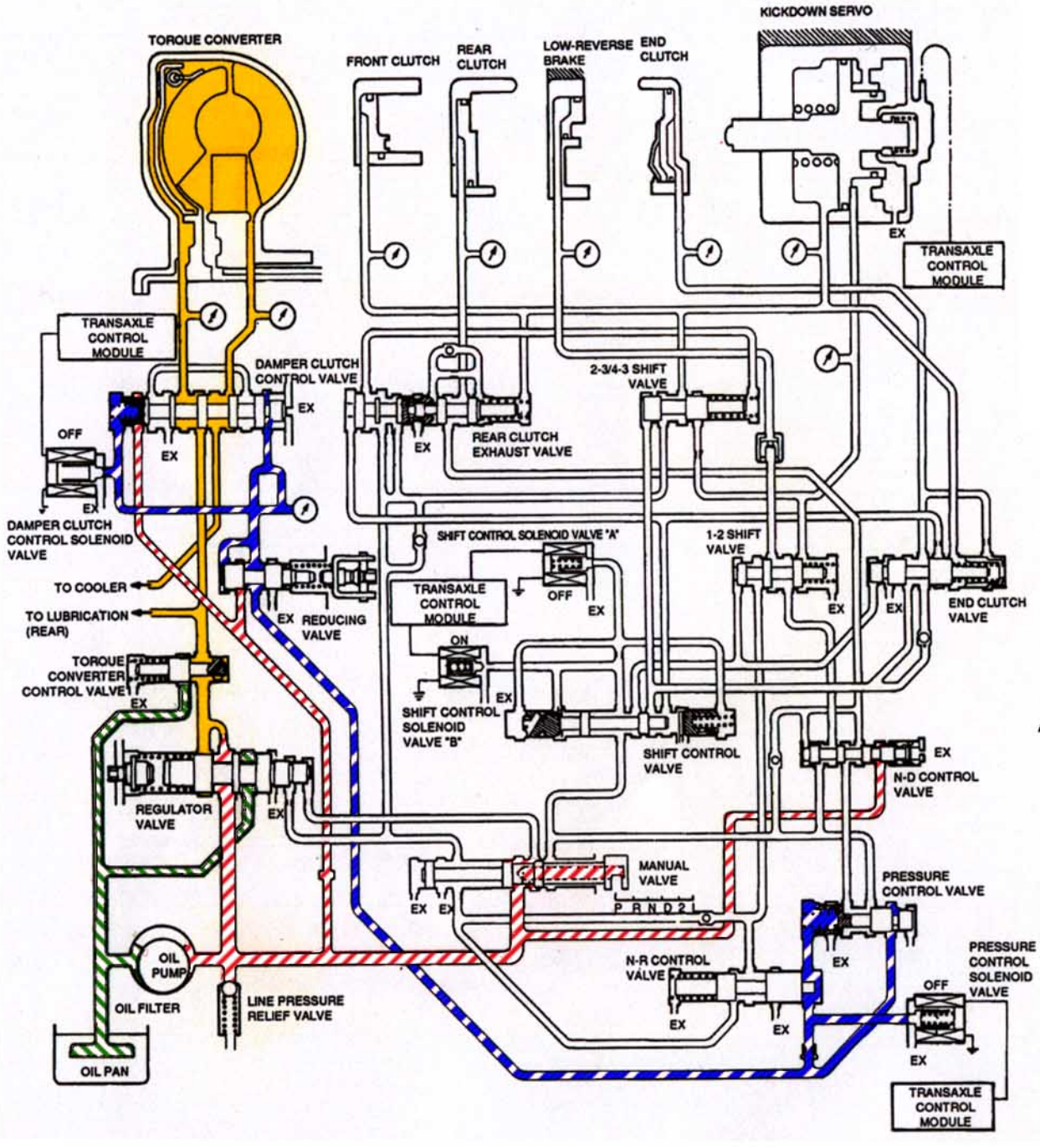


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE

NEUTRAL

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

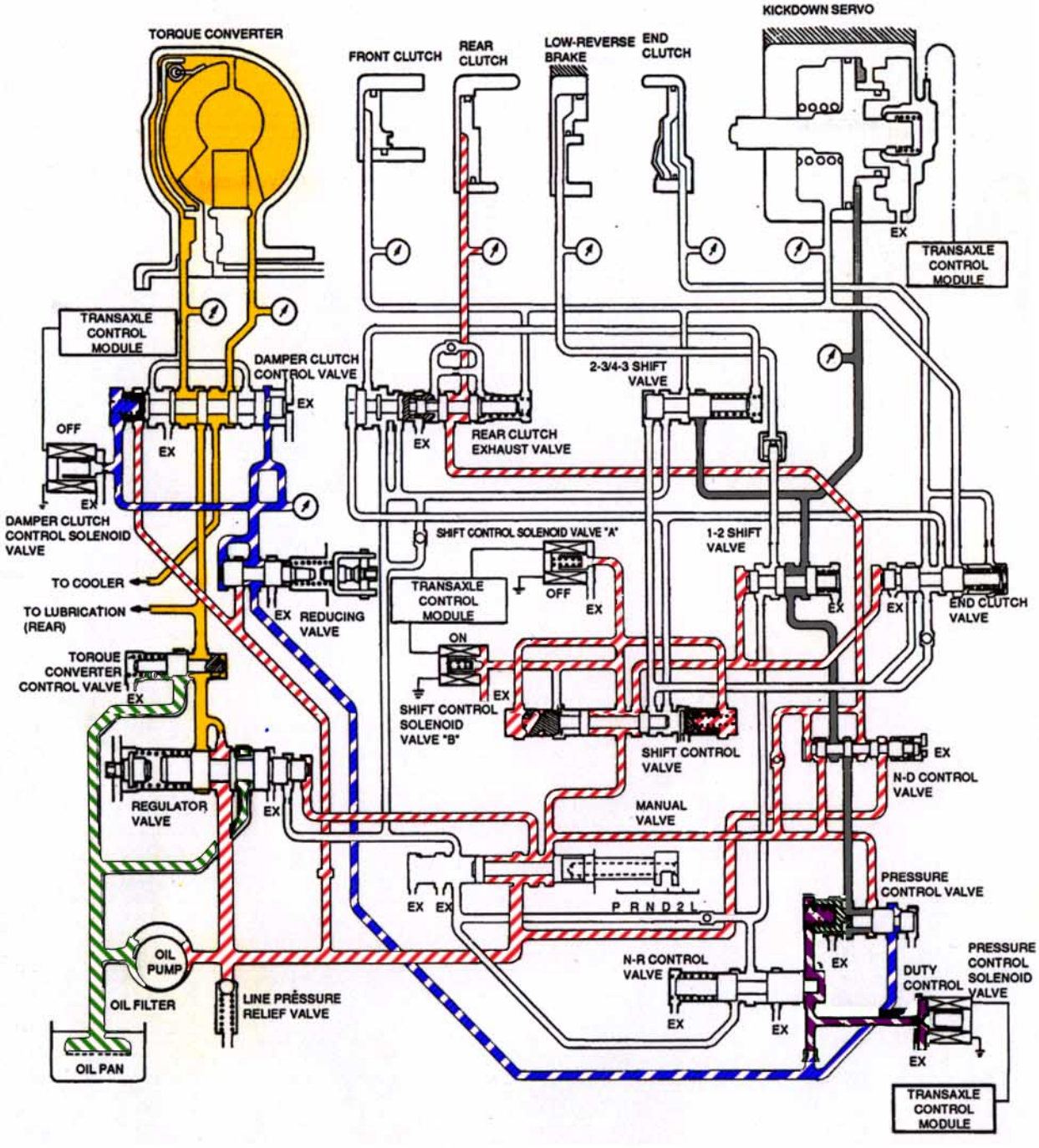


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE

PARKING

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

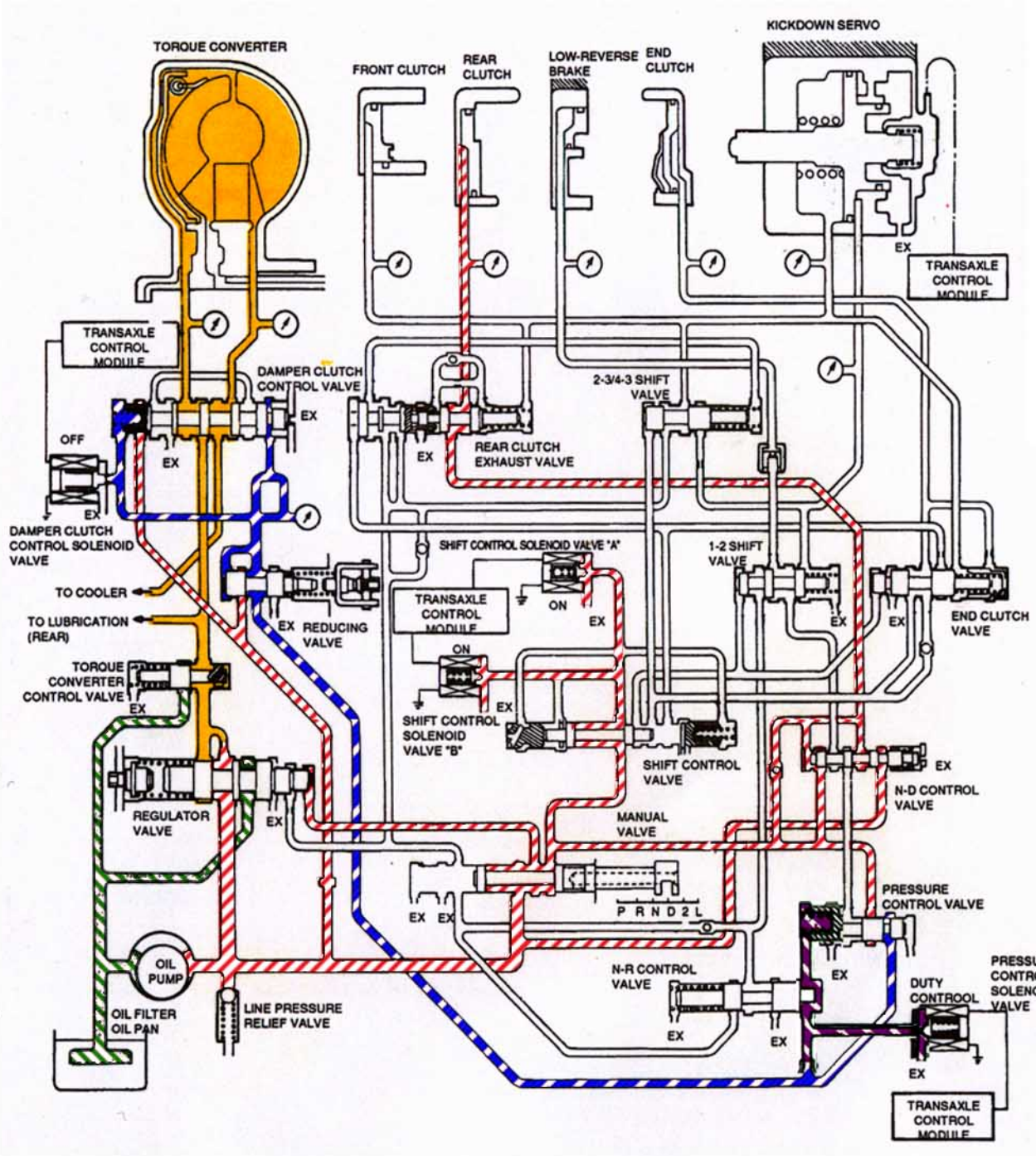


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE
- LINE PRESSURE (SECOND HOLD PRESSURE)
- CONTROL PRESSURE

DRIVE (STOPPING)

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

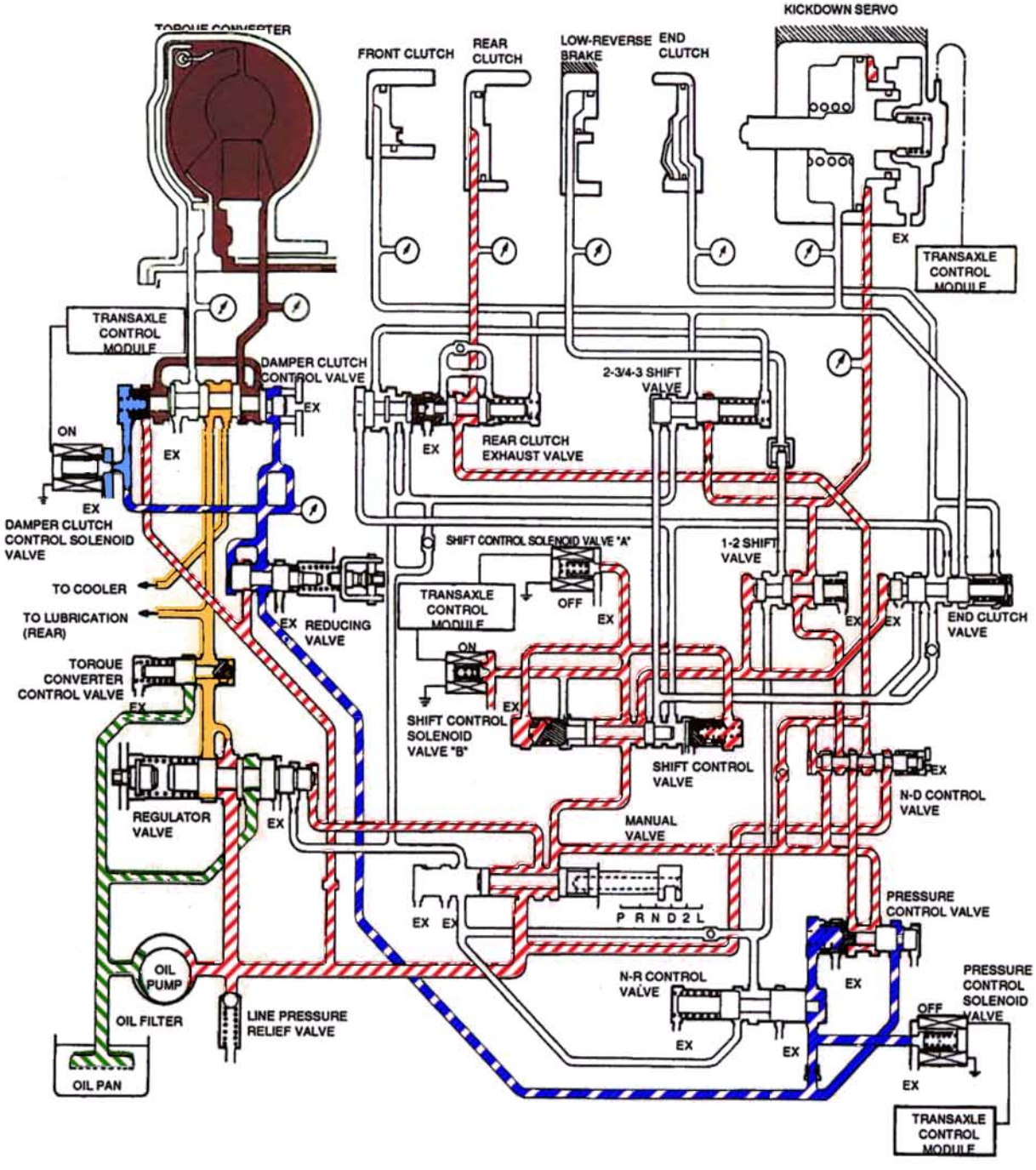


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE
- CONTROL PRESSURE

DRIVE (FIRST)

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

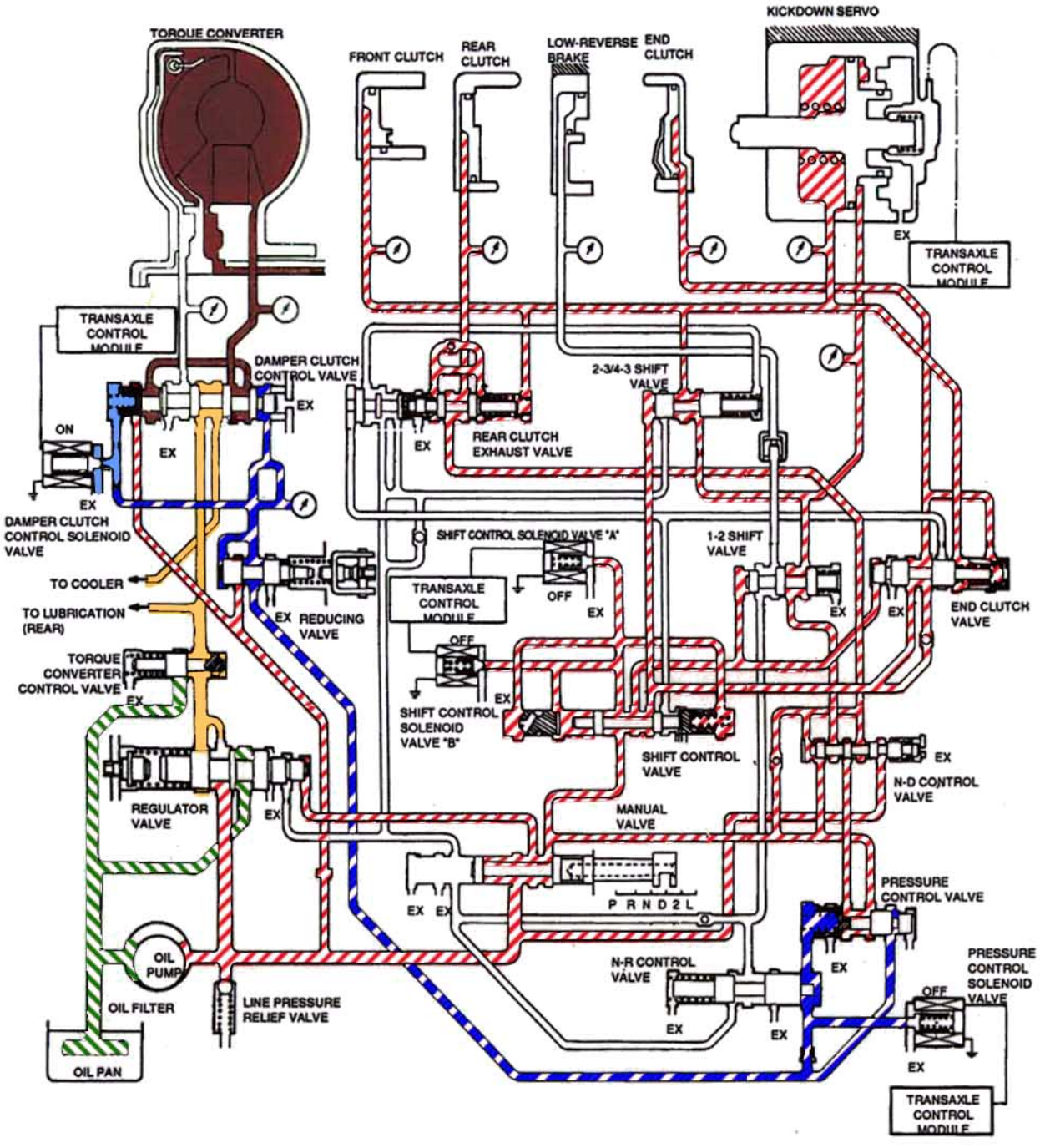


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE
- DAMPER CLUTCH PRESSURE
- DAMPER CLUTCH CONTROL SOLENOID VALVE PRESSURE

DRIVE (SECOND)

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

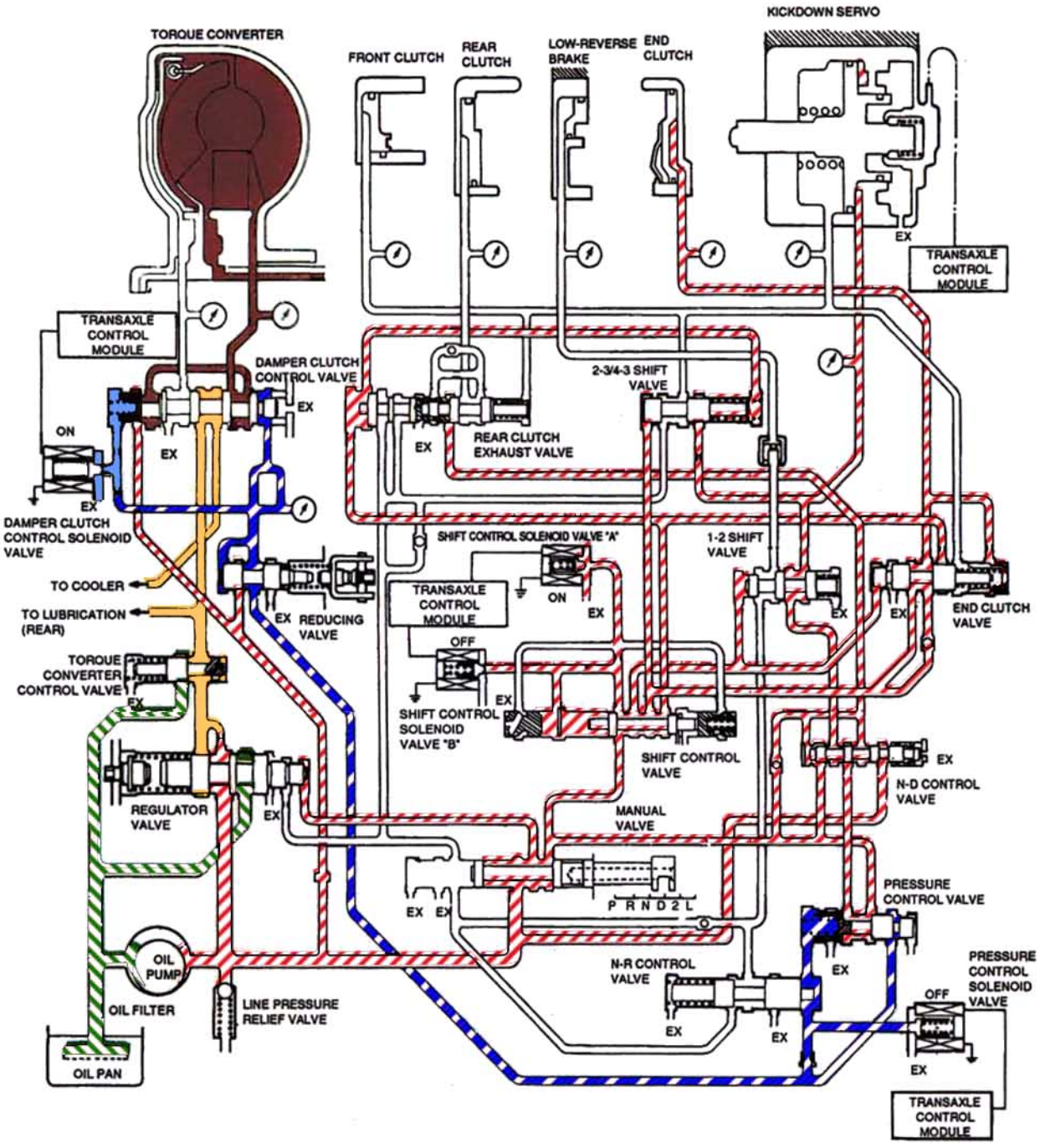


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE
- DAMPER CLUTCH PRESSURE
- DAMPER CLUTCH CONTROL SOLENOID VALVE PRESSURE

DRIVE (THIRD)

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

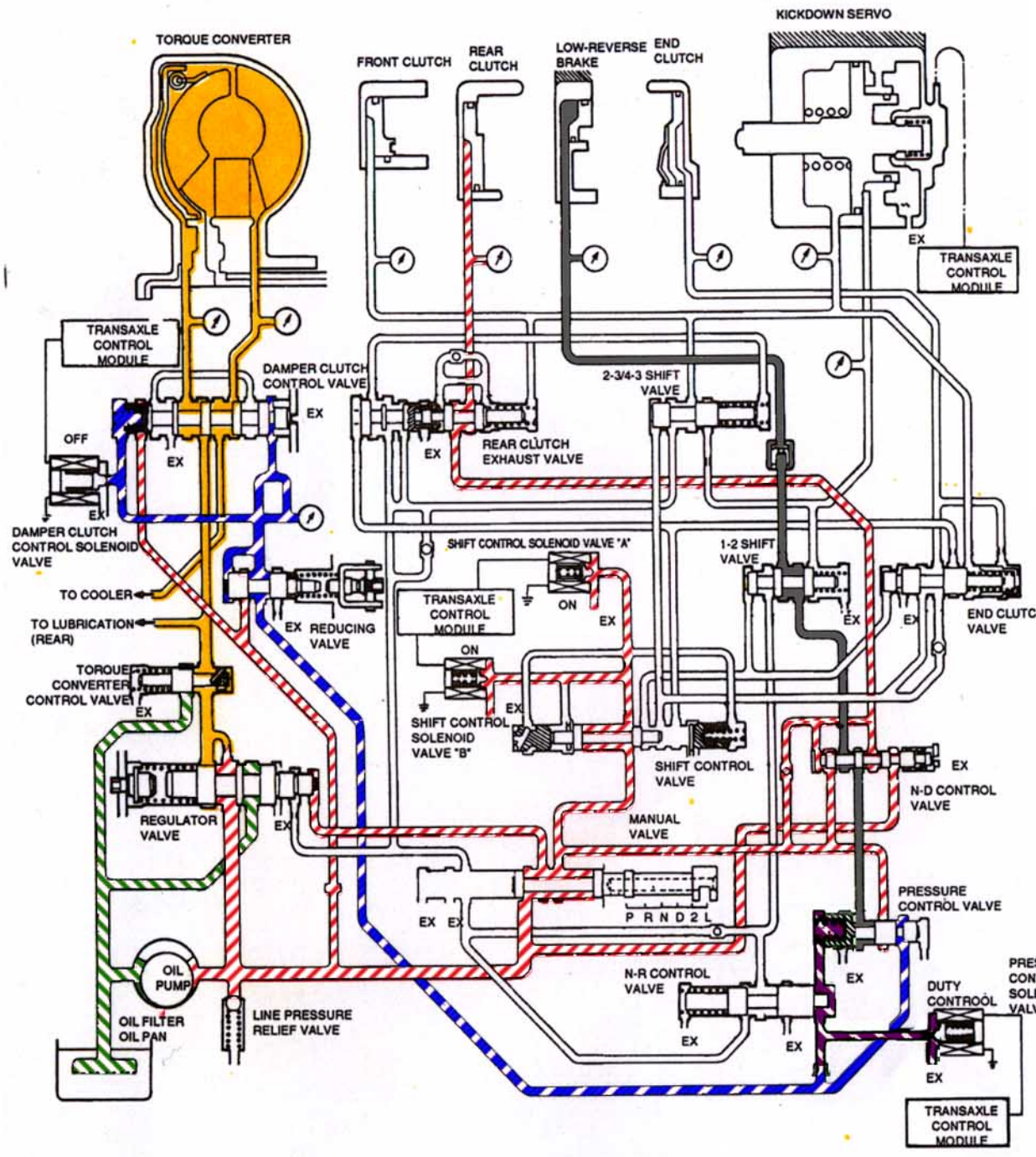


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE
- DAMPER CLUTCH PRESSURE
- DAMPER CLUTCH CONTROL SOLENOID VALVE PRESSURE

DRIVE (FOURTH)

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

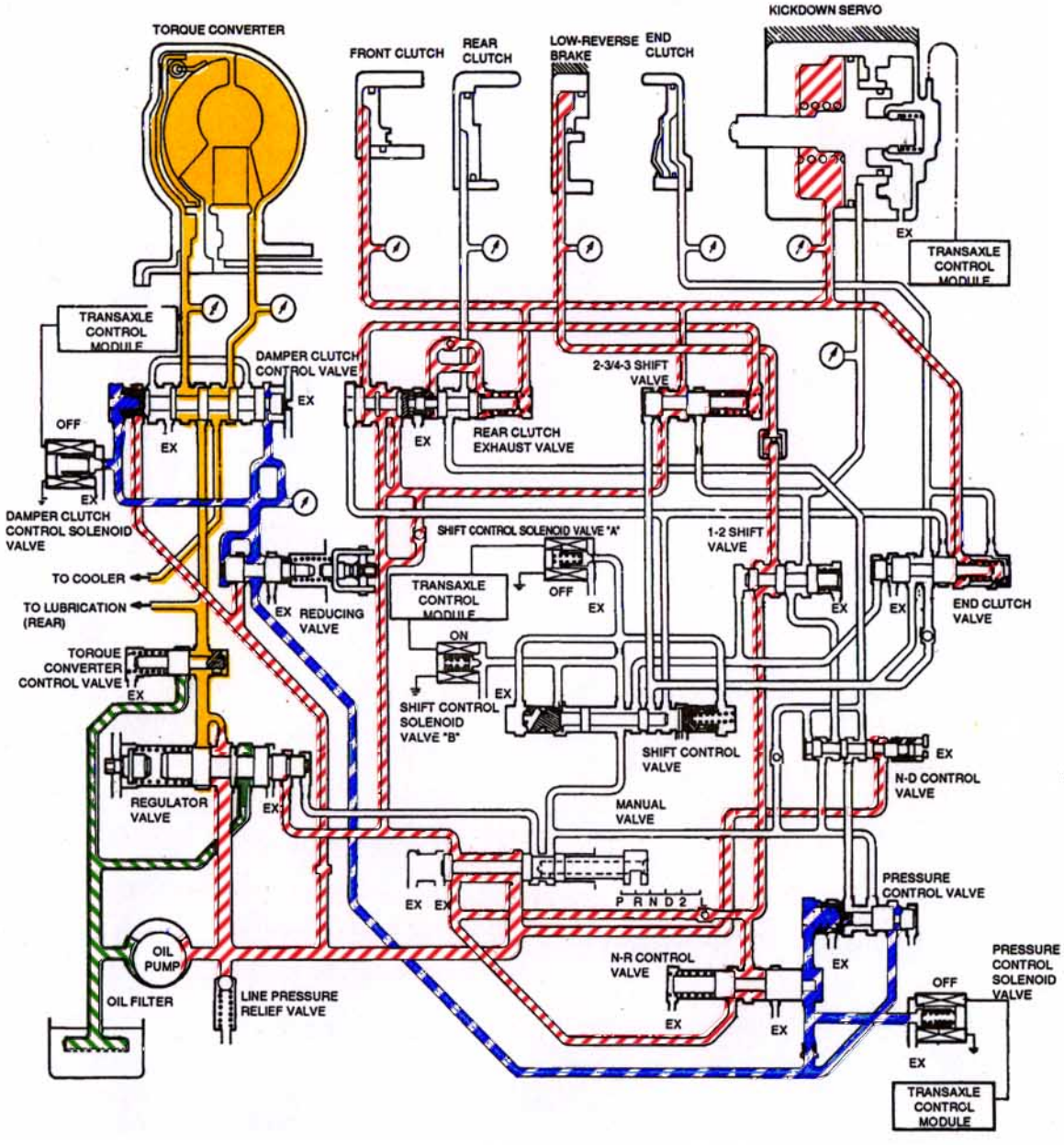


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE
- LINE PRESSURE "L" RANGE
- CONTROL PRESSURE

LOCK UP

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT



LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE

REVERSE

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

MANUAL TRANSAXLE

Return To Main Table of Contents

GENERAL 2
MANUAL TRANSAXLE CONTROL 12
SHIFT LEVER ASSEMBLY 14
MANUAL TRANSAXLE 15
MANUAL TRANSAXLE ASSEMBLY 17
FIFTH SPEED SYNCHRONIZER ASSEMBLY.. 31
INPUT SHAFT 33
INTERMEDIATE SHAFT 39
OUTPUT SHAFT 44
SHIFT FORK 45
DIFFERENTIAL 46
CLUTCH HOUSING 49
SPEEDOMETER DRIVEN GEAR ASSEMBLY 53

GENERAL

SPECIFICATIONS

Model	
Type	S-speed floor shift
Gear ratio First	3.083
Second	1.947
Third	1.285
Fourth	0.939
Fifth	0.756
Reverse	3.083
Final gear ratio	4.592
Speedometer gear ratio (driven/drive)	32/36

SERVICE STANDARD

Standard value	
Input shaft front bearing end play	0.01-0.12 mm (0.0004-0.0047 in.)
Input shaft rear bearing end play	0.01-0.09 mm (0.0004-0.0035 in.)
Intermediate shaft front bearing end play	0.01-0.14 mm (0.0004-0.0055 in.)
Intermediate shaft rear bearing end play	0.05-0.10 mm (0.002-0.0039 in.)
Output shaft bearing end play	0.05-0.10 mm (0.002-0.0039 in.)
Differential case end play	0.05-0.10 mm (0.002-0.0039 in.)
Differential side gear and pinion backlash	0.025-0.15 mm (0.001-0.006 in.)
Limit	
Synchronizer ring and clutch gear clearance	0.5 mm (0.02 in.)

LUBRICANTS

	Recommended lubricant	Quantity
Transaxle oil lit (U.S. gts., Imp.qts.)	Hypoid gear oil, SAE 75W-85W, AP1-GL4	1.8 (1.9, 1.6)
Return spring and bracket sliding part	Multipurpose grease SAE J310, NLG1 NO.2	As required
Drive shaft oil seal lip	Hypoid gear oil, SAE 75W-85W, AP1-GL4	As required
Shift lever bushing	Multipurpose grease SAE J310, NLG1 NO.2	As required

SEALANTS AND ADHESIVES

	Recommended sealants and adhesives	Quantity
Transaxle case and clutch housing alignment surface	THREE BOND 1216	As required
Transaxle case and rear cover alignment surface	THREE BOND 1216	As required
Differential drive gear bolt	THREE BOND 1303 or LOCTITE 648	As required
Bearing retainer bolt (flush bolt only)	THREE BOND 1303	As required

SNAP RING FOR ADJUSTMENT AND SPACER

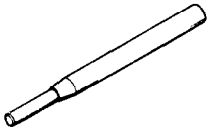
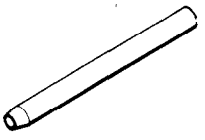
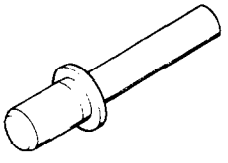
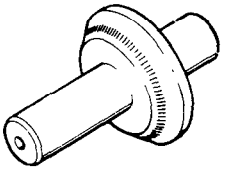
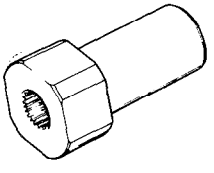
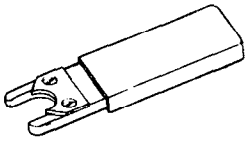
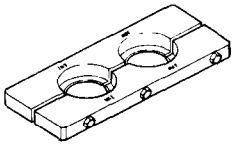
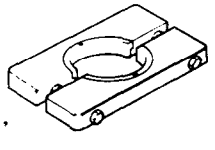
Part name	Thickness mm. (in.)	Identification symbol
Snap ring (For adjustment of input shaft front bearing end play)	2.24 (0.0882) 2.31 (0.0909) 2.38 (0.0937)	None Blue Brown
Snap ring (For adjustment of input shaft rear bearing end play)	1.80 (0.0709) 1.87 (0.0736) 1.94 (0.0764) 2.01 (0.0791) 2.08 (0.0819) 2.15 (0.0846)	Blue White None Green Yellow Brown
Snap ring (For adjustment of intermediate shaft bearing end play)	1.4 (0.0551) 1.5 (0.0591) 1.6 (0.0630) 1.7 (0.0669) 1.8 (0.0708)	Brown None Blue Red White
Spacer: (For adjustment of intermediate shaft end play)	0.62 (0.0244) 0.65 (0.0255) 0.68 (0.0268) 0.71 (0.0280) 0.74 (0.0291) 0.77 (0.0303)	62 65 68 71 74 77
	0.80 (0.0315) 0.83 (0.0327) 0.86 (0.0338) 0.89 (0.0350) 0.92 (0.0362) 0.95 (0.0374) 0.98 (0.0386) 1.01 (0.0394) 1.04 (0.0409) 1.07 (0.0421) 1.10 (0.0433) 1.13 (0.0445) 1.16 (0.0457) 1.19 (0.0468) 1.22 (0.0480) 1.25 (0.0492) 1.28 (0.0504) 1.31 (0.0516) 1.34 (0.0527) 1.37 (0.0539)	80 83 86 89 92 95 98 01 04 07 10 13 16 19 22 25 28 31 34 37

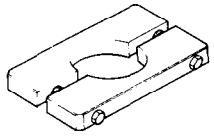
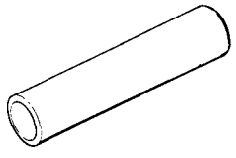
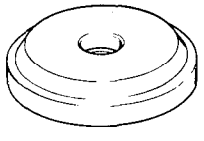
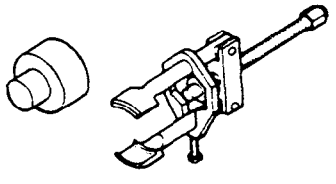
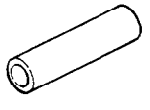
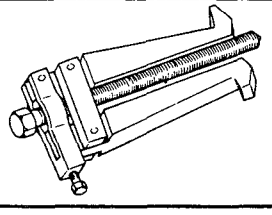
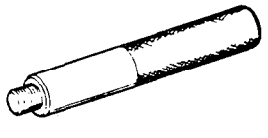
Part name	Thickness mm. (in.)	Identification symbol
Spacer (For adjustment of output shaft end play)	0.74 (0.0291) 0.77(0.0303) 0.80(0.0315) 0.83(0.0327) 0.86(0.0338) 0.89(0.0350) 0.92(0.0362) 0.95(0.0374) 0.98(0.0386) 1.01(0.0398) 1.04(0.0409) 1.07(0.0421) 1.10(0.0433) 1.13(0.0445) 1.16(0.0457) 1.19(0.0468) 1.22(0.0480) 1.25(0.0492) 1.28(0.0504) 1.31(0.0516) 1.34(0.0527)	74 77 80 83 86 89 92 95 98 01 04 07 10 13 16 19 22 25 28 31 34
Spacer (For adjustment of differential case end play)	0.80(0.0315) 0.83(0.0327) 0.86(0.0338) 0.89(0.0350) 0.92(0.0362) 0.95(0.0374) 0.98(0.0386) 1.01(0.0398) 1.04(0.0409) 1.07(0.0421) 1.10(0.0421) 1.13(0.0445) 1.16(0.0457) 1.19(0.0469) 1.22(0.0480)	80 83 86 89 92 95 98 01 04 07 10 13 16 19 22
Spacer (For adjustment of differential pinion backlash)	0.75-0.82(0.0295-0.0323) 0.83-0.92(0.0327-0.0362) 0.93-1.00(0.0366-0.0394) 1.01-1.08(0.0398-0.0425) 1.09-1.16(0.0429-0.0457)	- - - - -

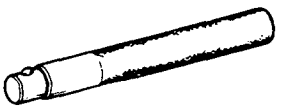
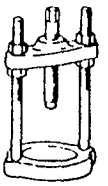
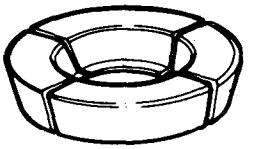
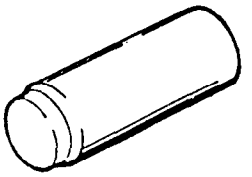
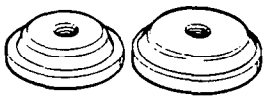
TIGHTENING TORQUE

	Nm	Kg.cm	lb.ft
Shift cable and select cable to body	12-15	120-150	9-1
Shift lever assembly to body	9-14	90-140	17-10
Shift lever (A) to bracket assembly	19-28	190-280	13-20
Clutch release cylinder mounting bolts	20-27	200-270	15-19
Clutch tube flare nut	13-17	130-170	9-12
Clutch tube to transaxle assembly	15-22	150-220	11-16
Starter motor mounting bolts	27-34	270-340	20-25
Transaxle mount bracket to transaxle	60-80	600-800	43-58
Transaxle mount bracket to body	90-110	900-1100	65-80
Transaxle mount bracket to tension rod	75-95	750-950	54-69
Tension rod to tension rod bracket	35-55	350-550	25-40
Bell housing cover mounting bolts	8-10	80-100	6-7
Transaxle mounting bolt [12 mm (0.47 in.) diameter bolt]	43-55	430-550	32-39
Transaxle mounting bolt [10 mm (0.39 in.) diameter bolt]	30-35	300-350	22-25
Transaxle mounting bolt [8 mm (0.31 in.) diameter bolt]	8-10	80-100	6-7
Rear cover bolt	15-22	150-220	11-15
Backup lamp switch	30-35	300-350	22-25
Poppet plug	30-42	300-420	22-30
Filler plug	30-35	300-350	22-25
Drain plug	30-35	300-350	22-25
Speedometer sleeve bolt	3-5	30-50	2-4
Input shaft lock nut	140-160	1400-1600	102-115
Intermediate shaft lock nut	140-160	1400-1600	102-115
Reverse idler gear shaft bolt	43-55	430-550	32-39
Transaxle case tightening bolt	35-42	350420	26-30
Stopper bracket bolt	15-22	150-220	11-15
Restriction ball assembly	30-35	300-350	22-25
Reverse shift lever assembly installation bolt	15-22	150-220	11-15
Bearing retainer bolt	15-22	150-220	11-15
Differential drive gear bolt	130-140	1300-1400	94-10
Interlock plate bolt	20-27	200-270	115-191
Select lever assembly mounting bolt	15-22	150-220	1-15
Reverse brake cone mounting bolts	4.0-5.5	40-55	3-4

SPECIAL TOOLS

Tool (Number and Name)	Illustration	Use
09414-11000 Lock pin extractor		1) Driving out the spring pin of the clutch shaft 2) Driving out the spring pin of the shift fork
09414-11100 Lock pin installer		Driving in the spring pin of the shift fork
09431-21000 Front oil seal installer		Installation of the input shaft front oil seal
09431-21200 Oil seal installer		Installation of differential oil seal
09432-21101 Input shaft holder		Holding the input shaft when loosening input shaft nut
09432-21201 Snap ring remover		Removal of input shaft snap ring
09432-21300 Removing plate		Removal of input shaft front and rear bearing
09432-33100 Removing plate		1) Removal of intermediate shaft first gear and taper roller bearing 2) Removal of intermediate shaft second gear

Tool (Number and Name)	Illustration	Use
09432-33200 Removing plate		1) Removal of taper roller bearing of output shaft. 2) Removal of input shaft third, fourth gear and bearing.
09432-33300 Bearing installer		1) Installation of input shaft bearing sleeve. 2) Installation of output shaft taper roller bearing. 3) Installation of the intermediate shaft front and rear bearing. 4) Installation of the input shaft third, fourth gear and bearing.
09432-33400 Bearing race installer		Installation of intermediate shaft bearing outer race (use with 09500-21000)
09455-21000 Bearing and gear puller		1) Removal of intermediate gear and needle bearing. 2) Removal of input shaft fifth speed gear sleeve.
09455-21100 Bearing installer		Installation of differential bearing
09455-32200 Oil seal puller		Removal of output shaft bearing outer race and intermediate shaft bearing outer race
09500-11000 Bar		Installation of differential bearing outer race and output shaft bearing outer race (use with 09532-11500)

Tool (Number and Name)	Illustration	Use
09500-21000 Bar		Installation of intermediate shaft bearing outer race (use with 09432-33400)
09532-11000 Taper roller bearing puller		Removal of the differential case side bearing (use with 09532-11100 and 09532-11301)
09532-11100 Side bearing remove adaptor		Removal of the differential case side bearing (use with 09532-11000 and 09532-11301)
09532-11301 Puller cup		Removal of the differential case side bearing (use with 09532-11000 and 09532-11100)
09532-11500 Pinion bearing outer race installer		1) Installation of differential bearing outer race and output shaft bearing outer race (use with 09500-11000) 2) Installation of output shaft bearing outer race (use with 09500-11000)

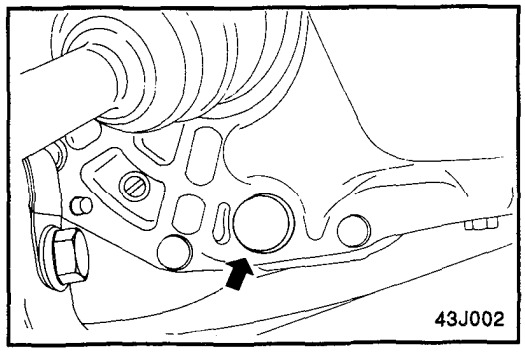
TROUBLESHOOTING

Symptom	Probable cause	Remedy
Vibration, noise	Loose or damaged transaxle and engine-mounts	Tighten or replace mounts
	Inadequate shaft end play	Correct end play
	Worn or damaged gears	Replace gears
	Use of inadequate grade of oil	Replace with specified oil
	Low oil level	Replenish
	Inadequate engine idle speed	Adjust idle speed
Oil leakage	Broken or damaged, oil seal or O-ring	Replace oil seal or O-ring
Hard shift	Faulty control cable	Replace control cable
	Poor contact or wear of synchronizer ring and gear cone	Correct or replace
	Weakened synchronizer spring	Replace synchronizer spring
	Use of inadequate grade of oil	Replace with specified oil
Jumps out of gear	Worn gear shift fork or broken poppet spring	Replace shift fork or poppet spring
	Synchronizer hub to sleeve spline clearance too large	Replace synchronizer hub and sleeve

SERVICE ADJUSTMENT PROCEDURES

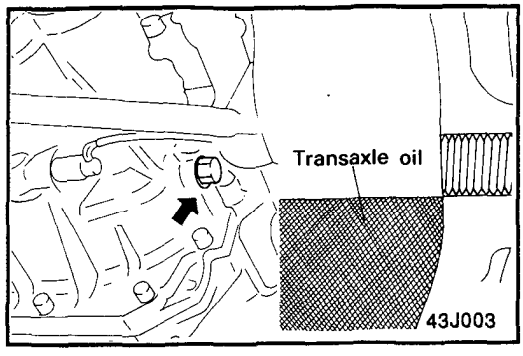
REPLACEMENT OF TRANSAXLE OIL

1. With the vehicle on a flat and level surface, remove the drain plug and drain out the transaxle oil.



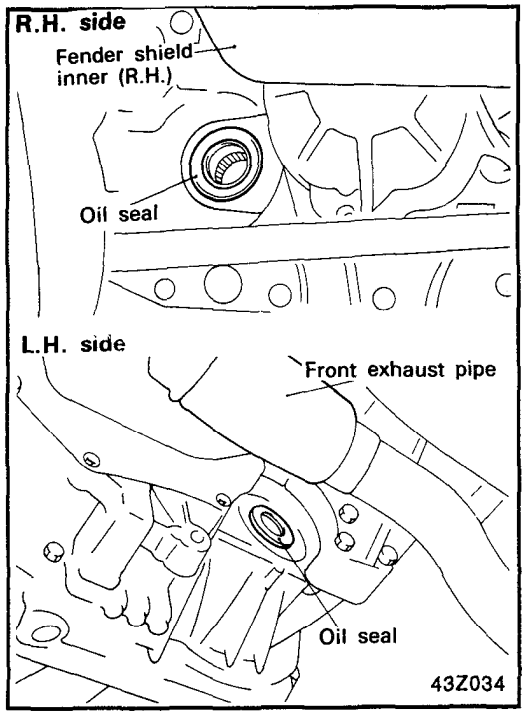
2. Fill transaxle oil (through the filler plug pat) until the oil level is the same level as the **plug hole.**

   Transaxle oil : Hypoid gear oil, SAE 75W-85W, API-GL4 [1.8 LIT. (1.9 U.S.qts., 1.6 Imp.qts.)]

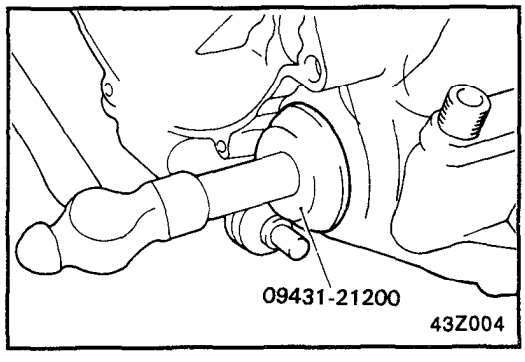


REPLACEMENT OF DRIVE SHAFT OIL SEALS

1. Disconnect the drive shaft from the transaxle (Refer to drive shaft).
2. Using a flat-tip (-) screwdriver, remove the oil seal.

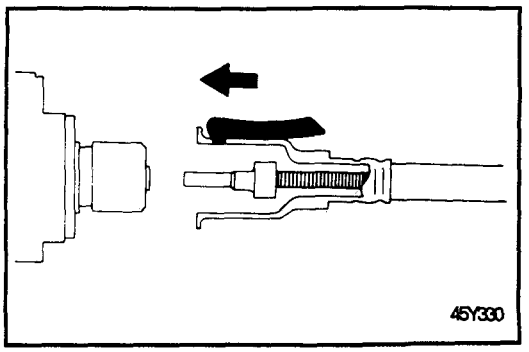


3. Using the special tool (09431-21200), tap the drive shaft oil seal into the transaxle.
4. Apply a coating of the transaxle oil to the lip of the oil seal.



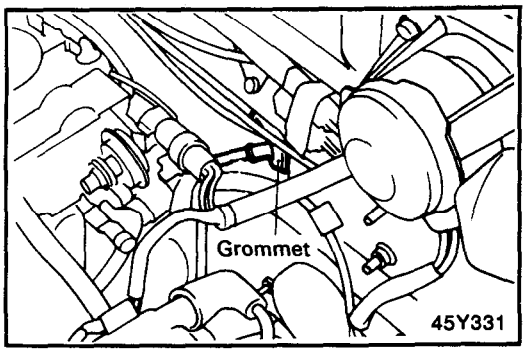
REPLACEMENT OF SPEEDOMETER CABLE

1. Remove the old cable.
2. When connecting the cable to the speedometer, insert the cable until its stopper properly fits to the meter side groove.



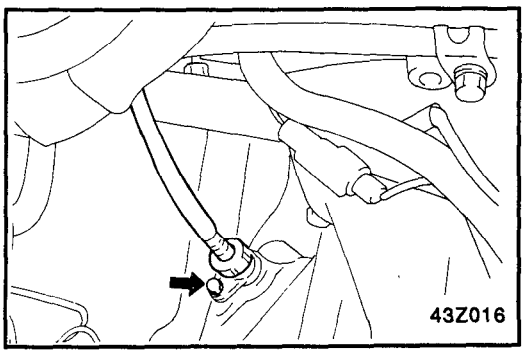
3. Install the grommet so that, as shown in the illustration, the cable attachment part and the projecting part are horizontal.

   Caution
   The cable arrangement should be made so that the radius of the cable bend is 150 mm (5.9 in.) or more.



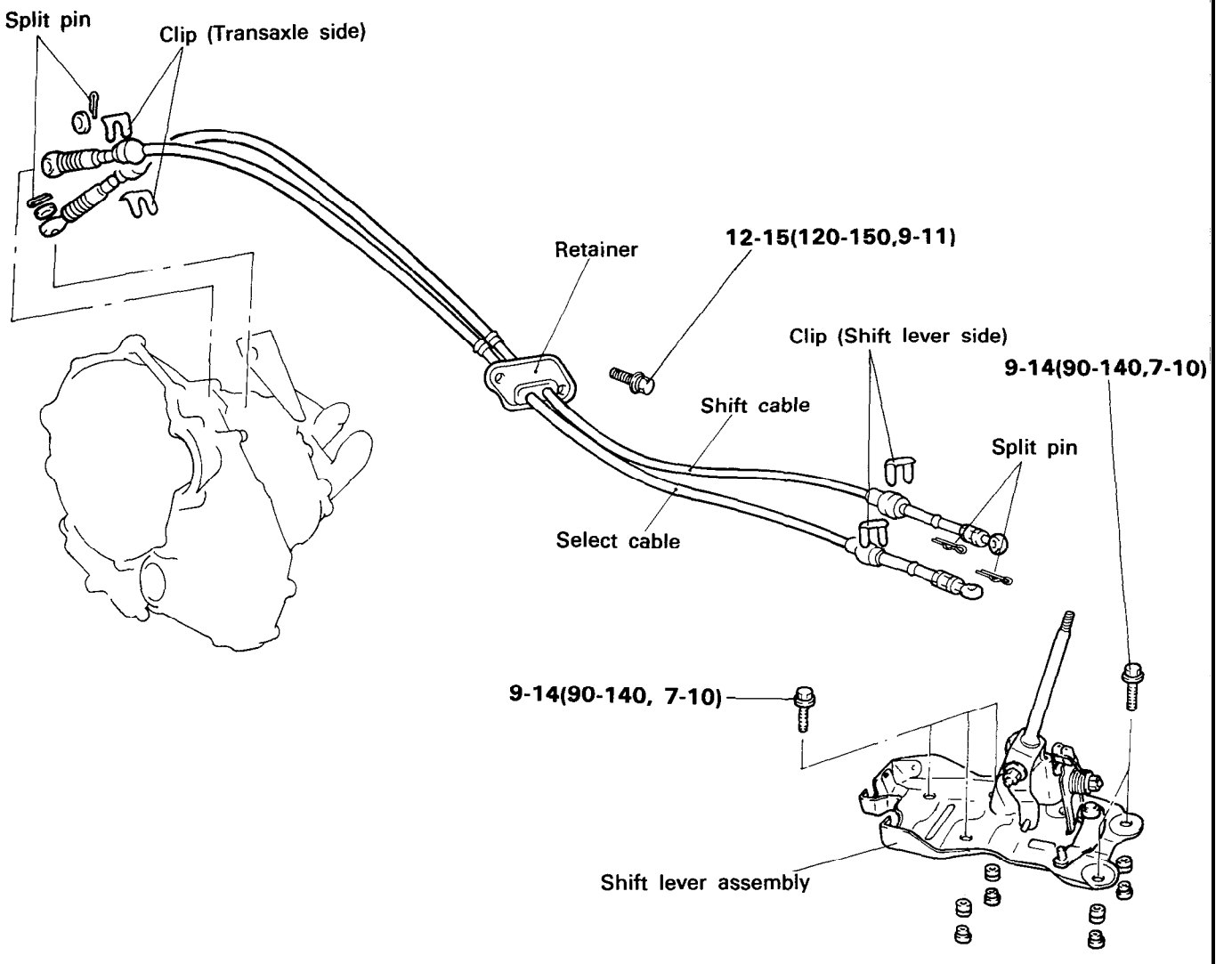
4. At the transaxle end of the speedometer cable, the key joint should be inserted into the transaxle, and the nut tightened.

   Caution
   If the cable is not correctly and securely connected, it may cause incorrect reading by the speedometer or abnormal noise.



MANUAL TRANSAXLE CONTROL

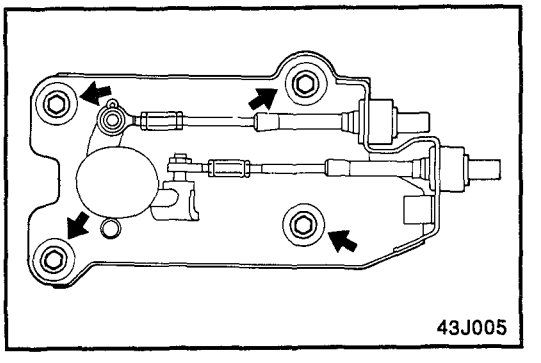
COMPONENTS



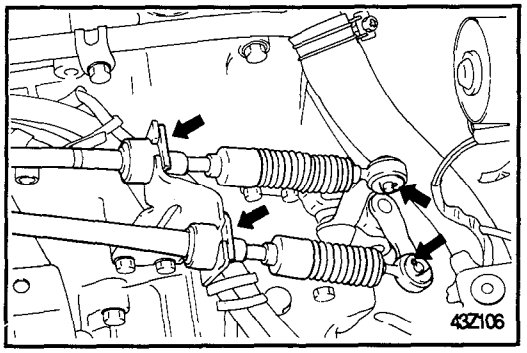
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Remove the console assembly (Refer to CONSOLE).
2. Remove the split pins and clips (shift lever side).
3. Remove the shift lever assembly.



4. Remove the retainer and bolts.
5. Remove the air cleaner assembly.
6. Remove the split pins and clips (Transaxle side).
7. Remove the shift cable and select cable.

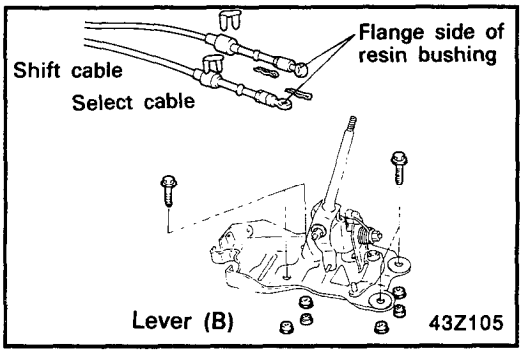


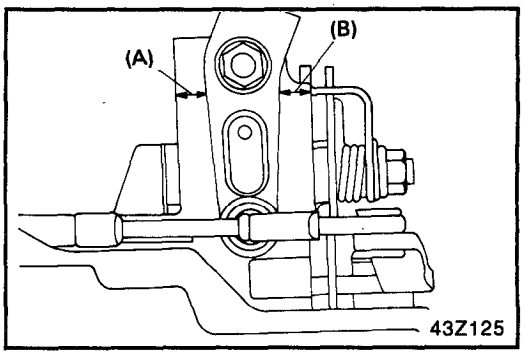
INSPECTION

1. Check the select cable for operation and for damage.
2. Check the shift cable for proper operation and for damage.
3. Check the boot for damage.
4. Check each bushing for wear, abrasion, sticking, restricted movement or damage.
5. Check for a weak or damaged spring.

INSTALLATION

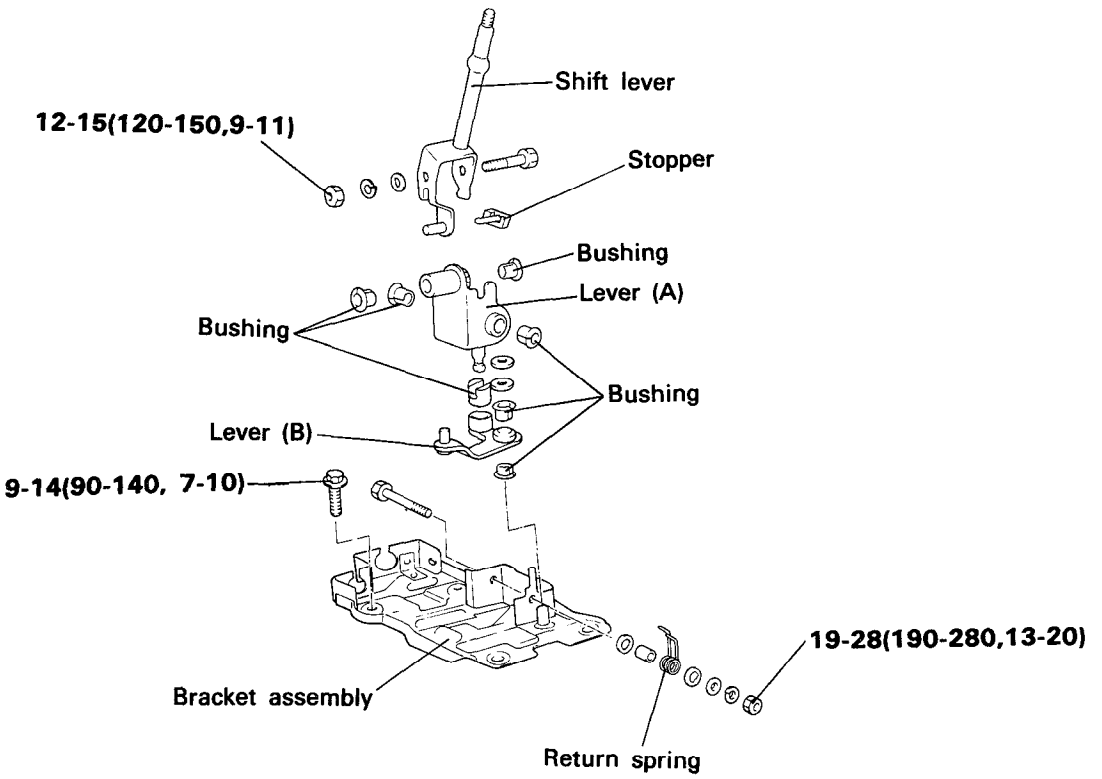
1. Install the shift lever assembly.
2. Installation of shift lever and select cable.
   1) Move the transaxle select lever and shift lever to the neutral position.
   2) When connecting the select cable to lever(B), adjust the select cable's length so that lever (B) is at the neutral position.
   3) The flange side of the resin bushing at the select cable end should be at the lever (B) end surface.
   4) The flange side of the resin bushing at the shift cable end should be at the shift lever's cotter pin hole.
   5) After connecting the shift cable, check that the dimensions (A) and (B) shown in the illustration are equal.
   6) Move the shift lever to each position and verify that the shifting is smooth.
3. Install the retainer and bolts.
4. Install the air cleaner assembly





SHIFT- LEVER ASSEMBLY

COMPONENTS



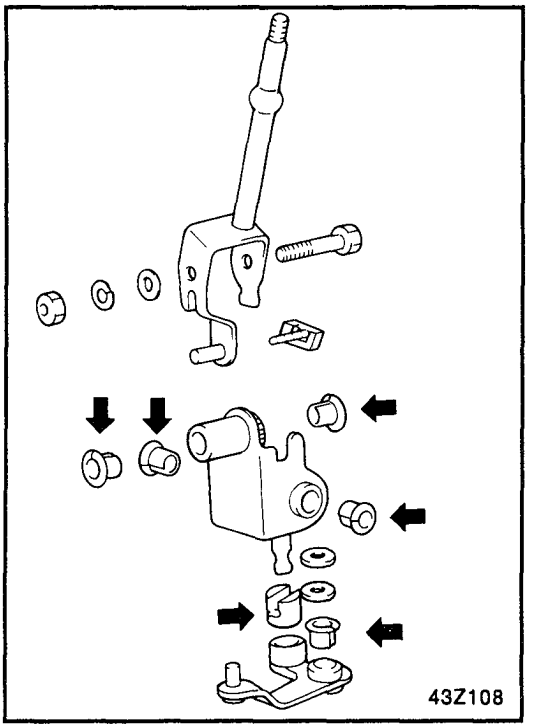
TORQUE : Nm (kg.cm, lb.ft)

INSPECTION

1. Inspect the bushing for wear or damage.
2. Inspect the return spring for damage or deterioration.

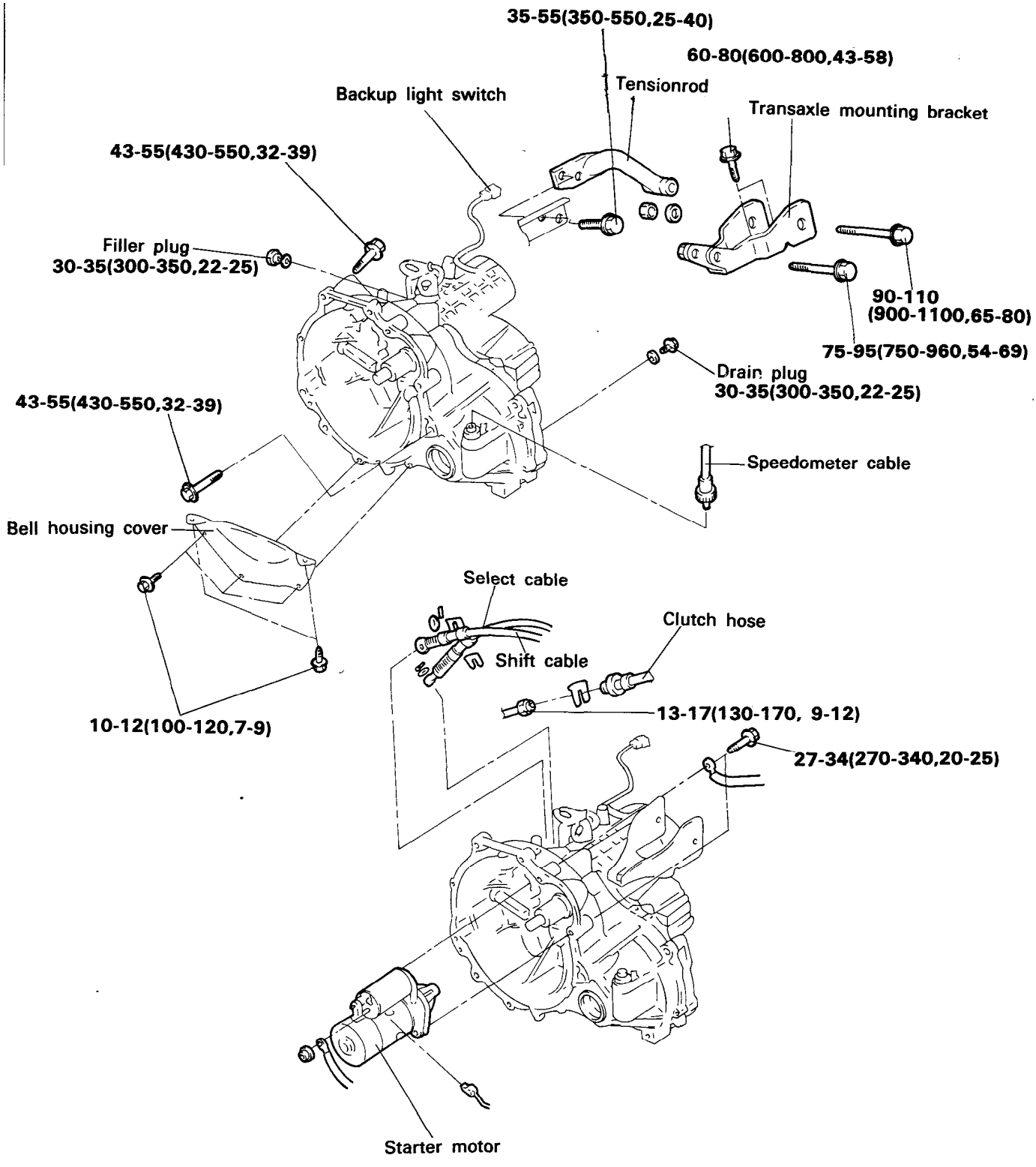
ASSEMBLY

1. Apply multi-purpose grease to the sliding part of the bushings.
2. Assembly is the reverse of disassembly.



MANUAL TRANSAXLE

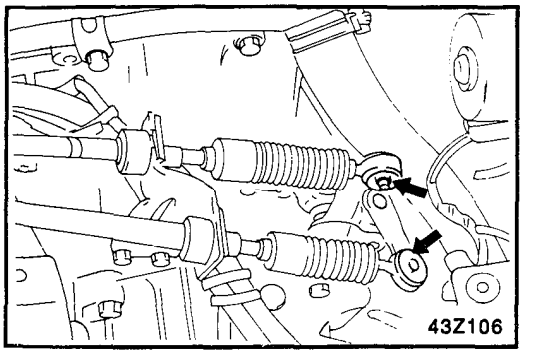
COMPONENTS



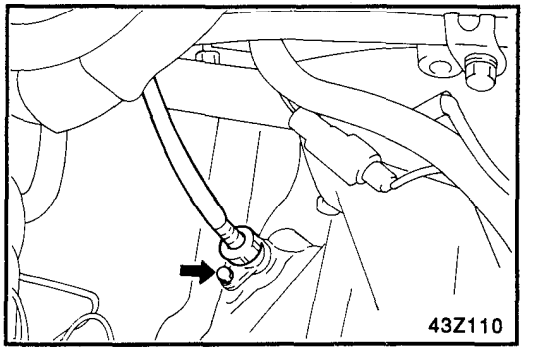
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

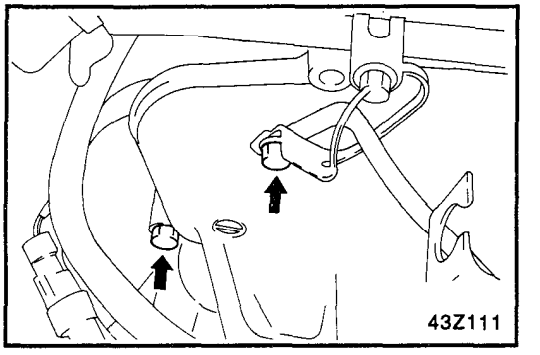
1. Remove the clutch release cylinder (Refer to clutch part.)
2. Remove the drain plug and drain the transaxle oil.
3. Remove the air cleaner assembly.
4. Remove the select cable and shift cable (Refer to MANUAL TRANSAXLE CONTROL SECTION)



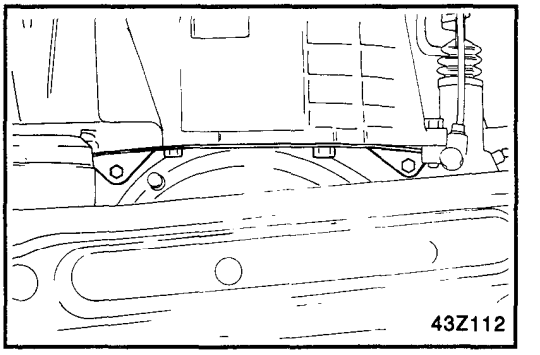
5. Separate the backup light switch connector.
6. Disconnect the speedometer cable.



7. Remove the starter motor mounting bolts.
   Remove the transaxle assembly upper connecting bolts and transaxle mounting bracket bolt.

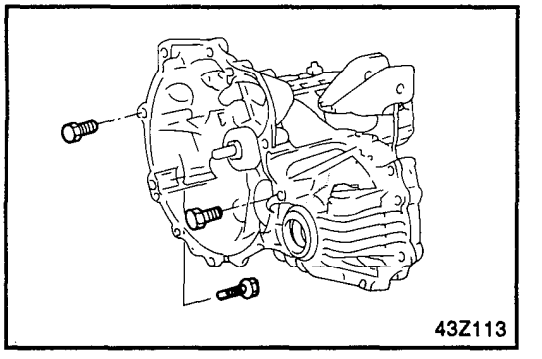


8. Remove the splash shield.
9. Disconnect the tie rod end, lower the arm ball joint and drive shaft (Refer to DRIVE SHAFT AND FRONT AXLE SECTION)
10. Remove the bell housing cover.

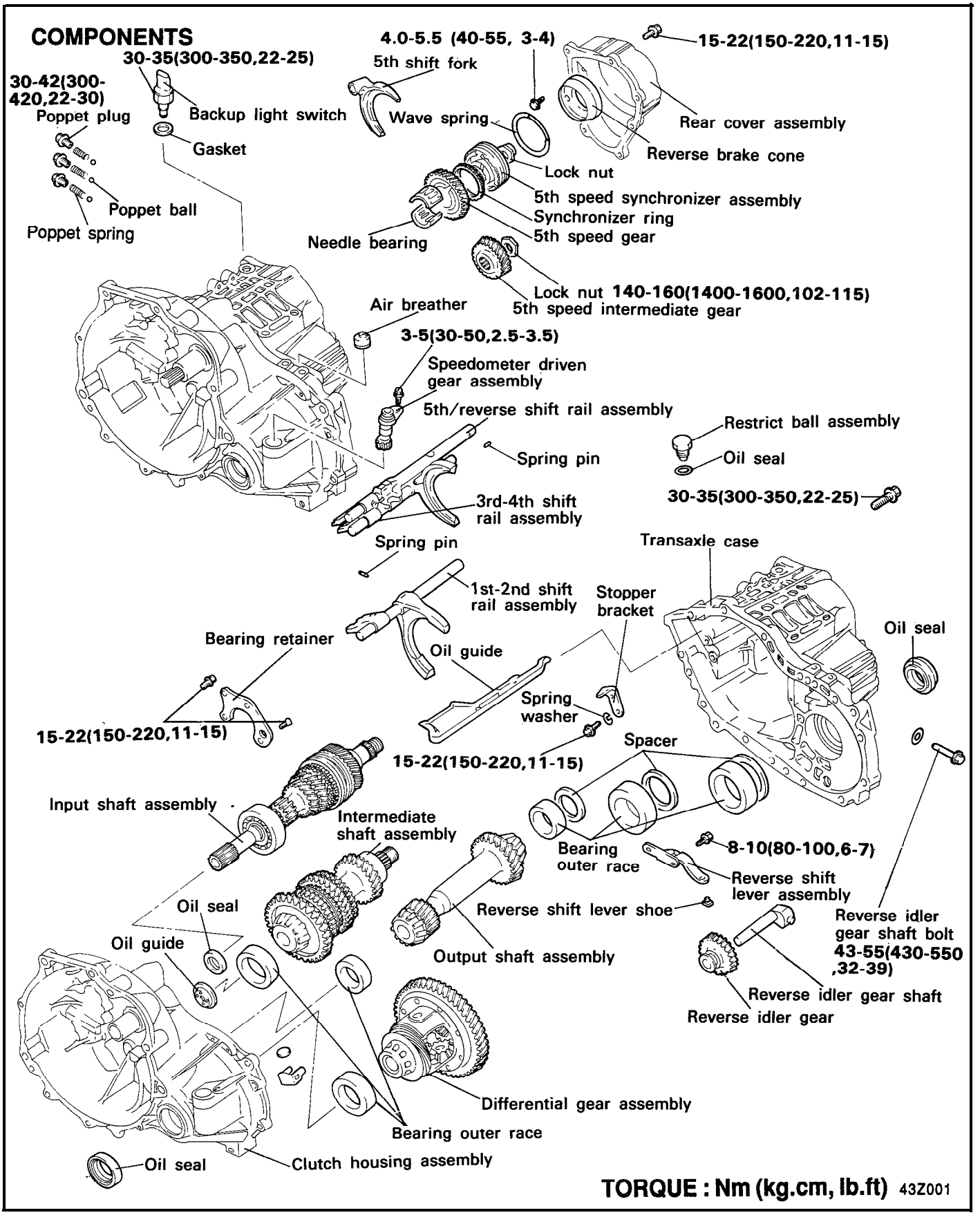


11. Remove the transaxle assembly lower mounting bolts with the transaxle assembly supported by a jack.
12. Remove the transaxle assembly.

NOTE
When supporting the transaxle assembly, make sure that the lifting force is applied to a wide area, not to a small localized area.

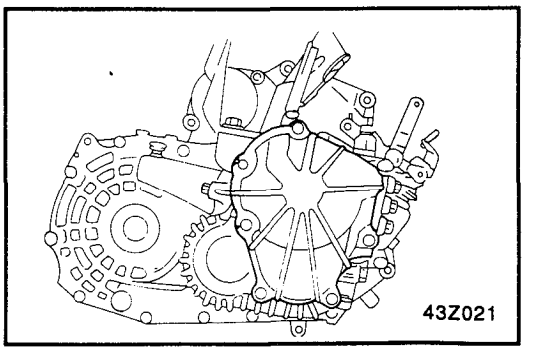


MANUAL TRANSAXLE ASSEMBLY

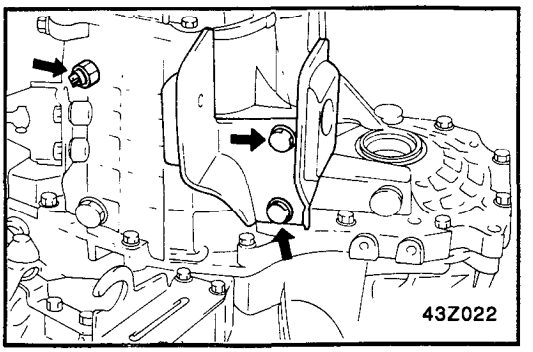


DISASSEMBLY

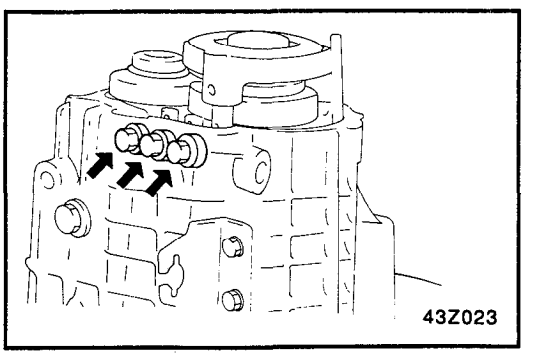
1. Remove the rear cover bolt and rear cover.



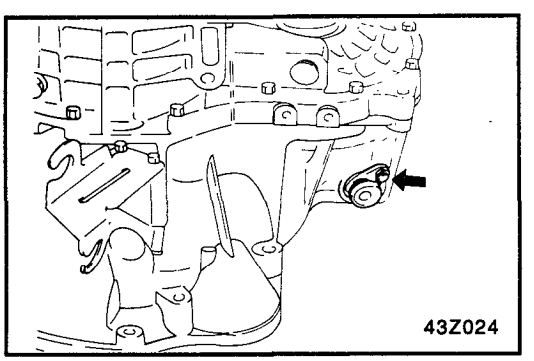
2. Remove the backup light switch, gasket and mounting bracket.



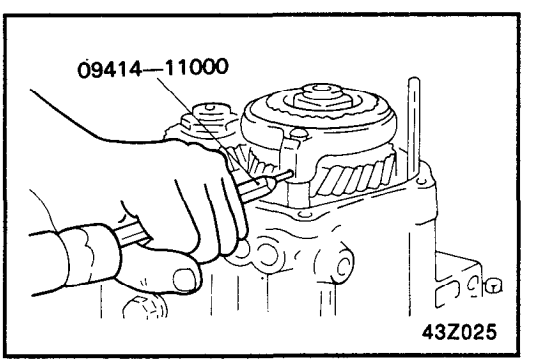
3. Remove the poppet plugs, poppet springs and poppet balls.



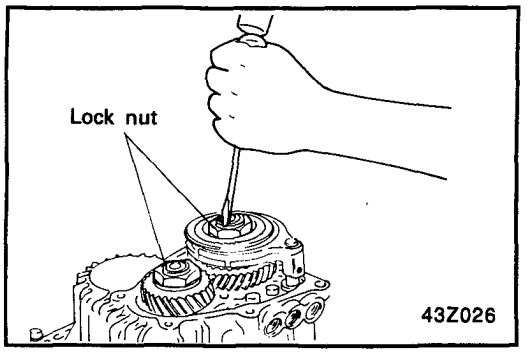
4. Remove the speedometer driven gear assembly.



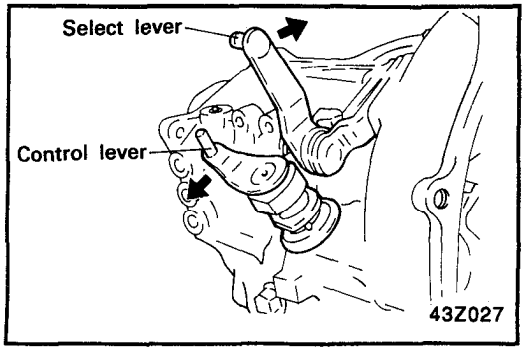
5. Remove the spring pin using the special tool (09414-11000).



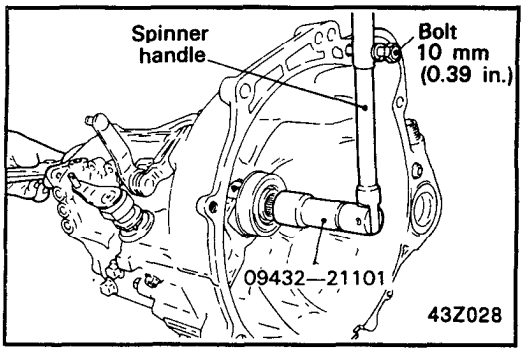
6. Removal of the lock nuts
   1) Unstake lock nuts of the input shaft and intermediate shaft.



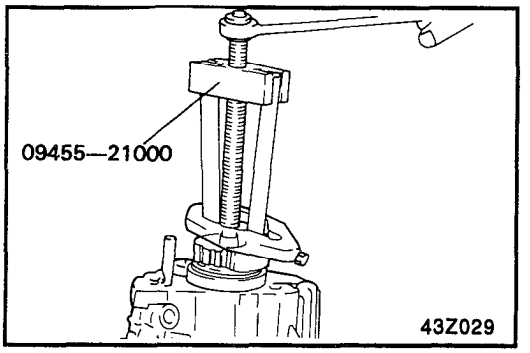
   2) Shift the transaxle in reverse using the control lever and select lever.



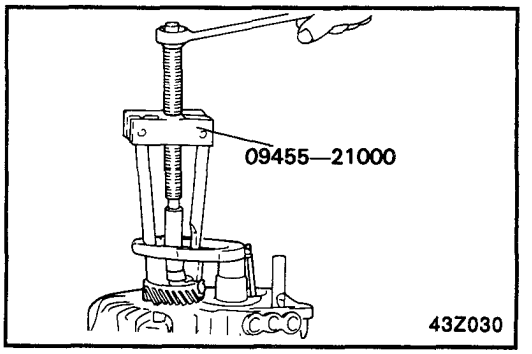
   3) Install the special tool (09432-21101) onto the input shaft.
   4) Screw a bolt 10 mm (0.39 in.) into the hole on the periphery of clutch housing and attach a spinner handle to the special tool.
   5) Remove the lock nut, while using the bolt as a spinner handle stopper.



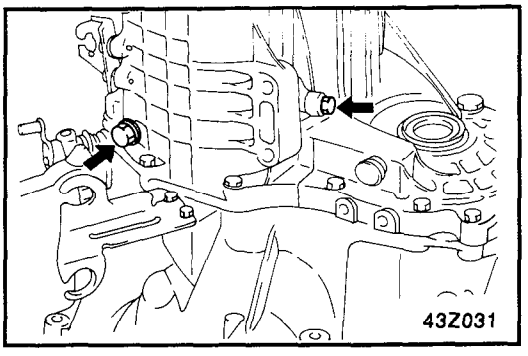
7. Remove the fifth speed synchronizer sleeve and fifth speed shift fork.
8. Remove the fifth speed synchronizer hub, synchronizer ring, fifth speed gear and needle bearing.



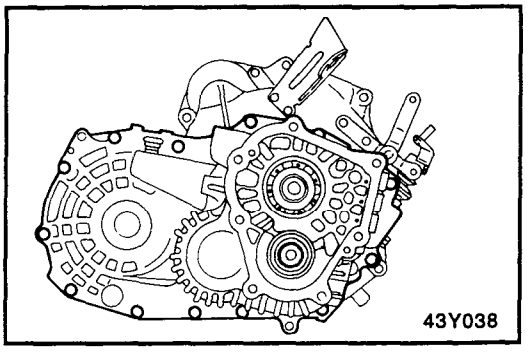
9. Remove the intermediate gear using the special tool (09455 21000).



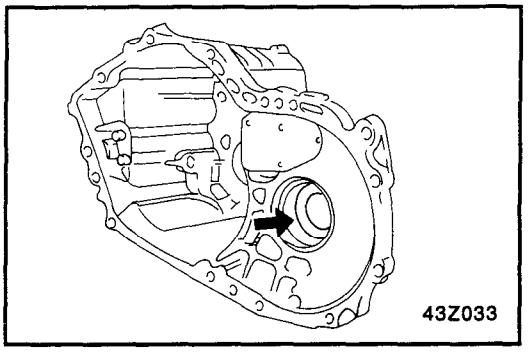
10. Remove the reverse idler gear shaft bolt and restriction ball assembly.



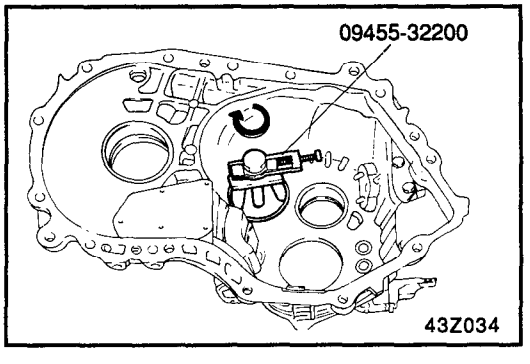
11. Remove the transaxle cover bolts (13 EA) and transaxle cover.



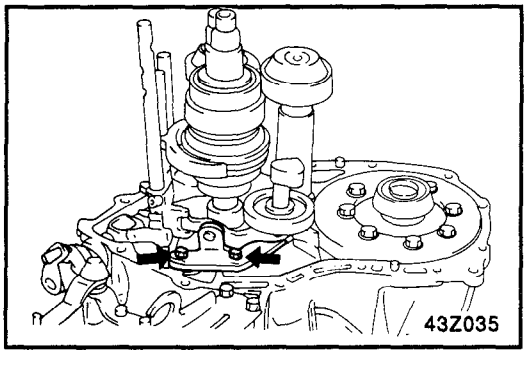
12. Remove the differential oil seal and oil guide.



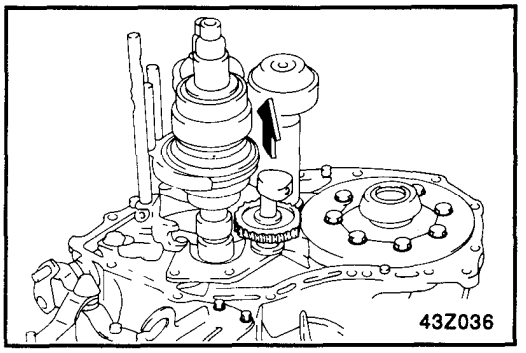
13. Remove the output shaft bearing outer race and spacer using the special tool (09455-32200).
14. Remove the intermediate shaft bearing outer race and spacer.
15. Remove the differential bearing outer race and spacer.



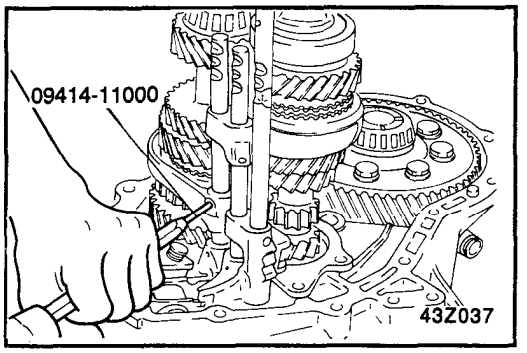
16. Remove the reverse shift lever and the reverse shift shoe.



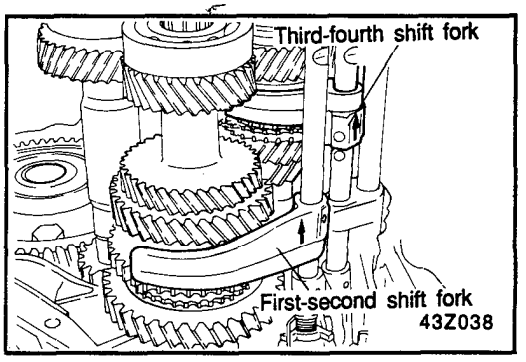
17. Remove the reverse gear shaft and reverse gear.



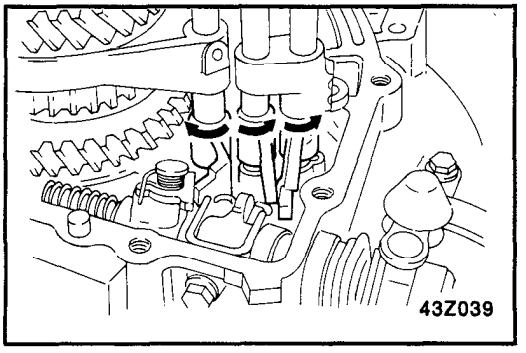
18. Remove the spring pins using the special tool ,(09414-11000).



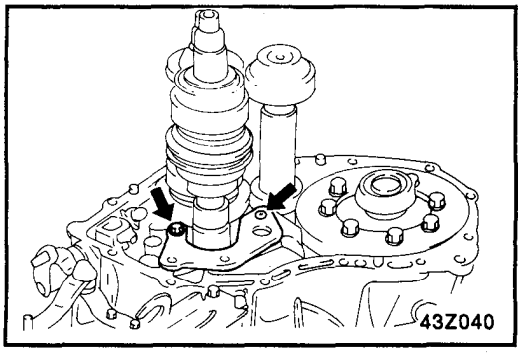
19. Disassembly of shift rail assembly.
    1) Shift the first-second speed shift fork to the second speed.
    2) Shift the third-fourth speed shift fork to the fourth speed.



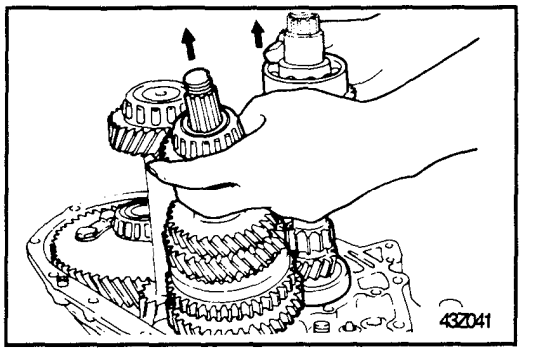
    3) Remove the shift rail assembly.



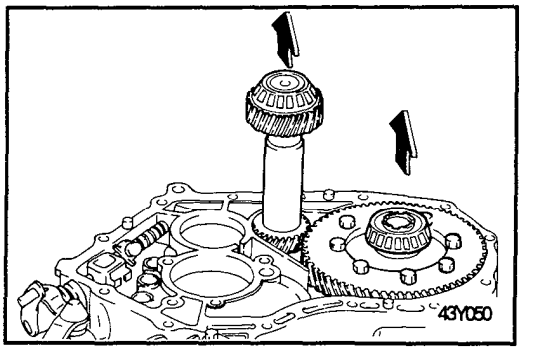
20. Remove the bearing retainer.



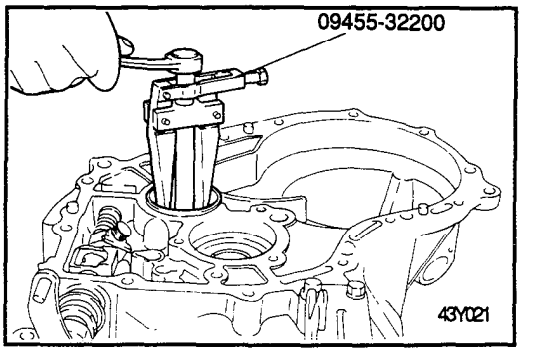
21. Lift up the input shaft assembly and remove the intermediate shaft assembly.



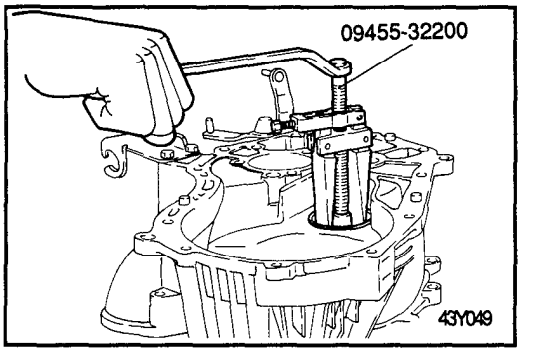
22. Remove the output shaft assembly and differential gear assembly.



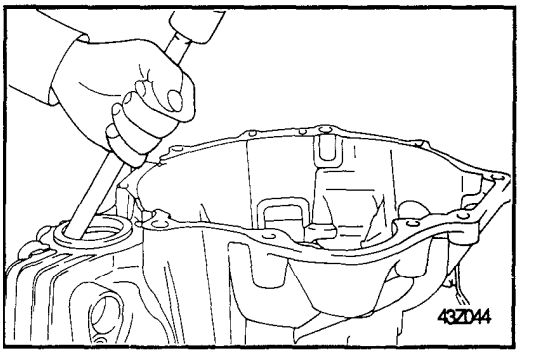
23. Remove the intermediate shaft bearing outer race and spacer and oil guide using the special tool (09455-32200).



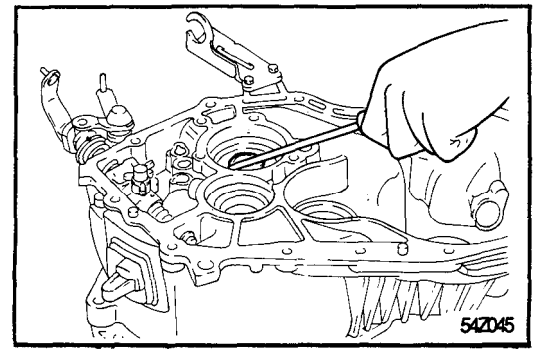
24. Remove the output shaft bearing outer race and spacer using the special tool (09455-32200).



25. Remove the differential bearing oil seal and the differential bearing outer race.

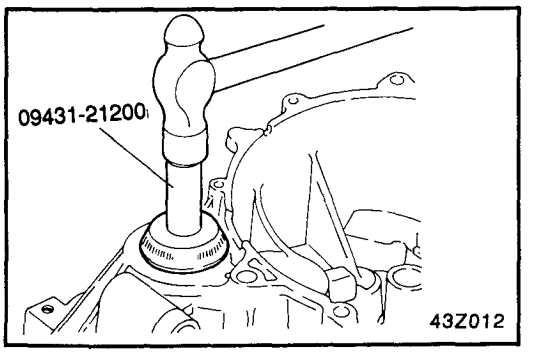


26. Remove the input shaft oil seal.

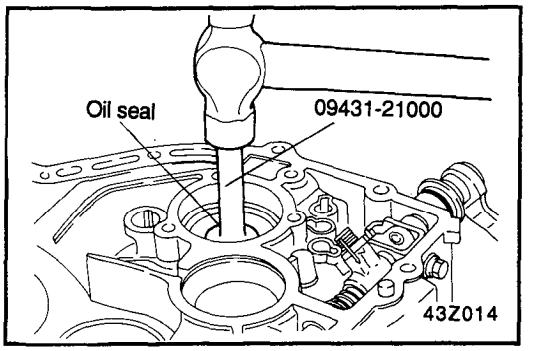


INSTALLATION

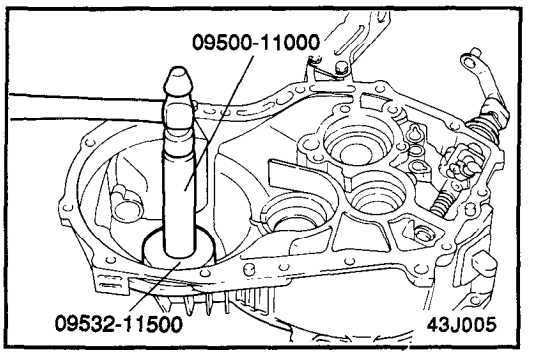
1. Install the drive shaft oil seal using the special tool (09431-21200).



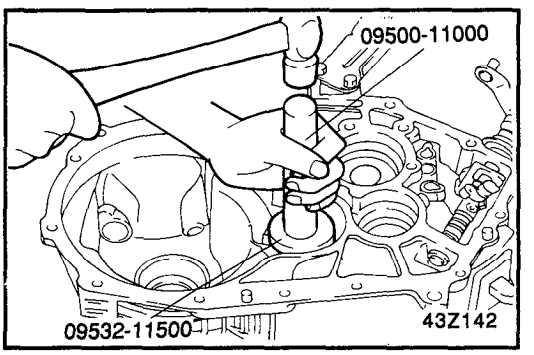
2. Install the input shaft front oil seal using the special tool (09431-21000).



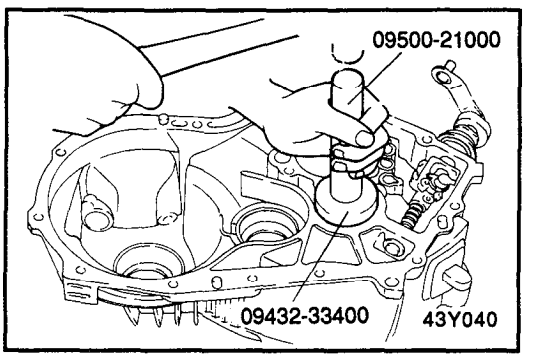
3. Install the differential gear bearing outer race and spacer using the special tool (09532-11500, 09500-11000).



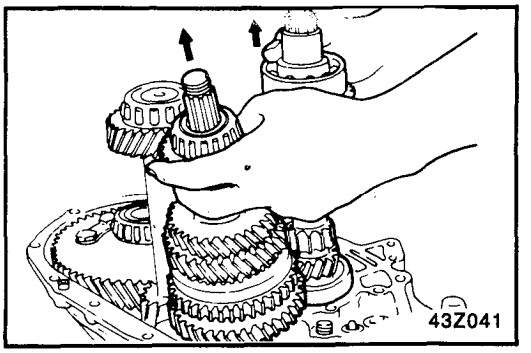
4. Install the output shaft bearing outer race and spacer using the special tool (09500-11000, 09532-11500).



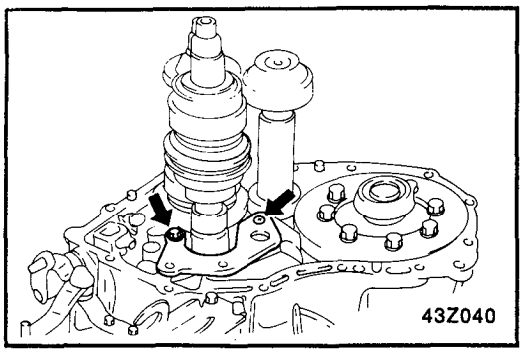
5. Install the oil guide and intermediate shaft bearing outer race and spacer using the special tools (09500-21000, 09432-33400).



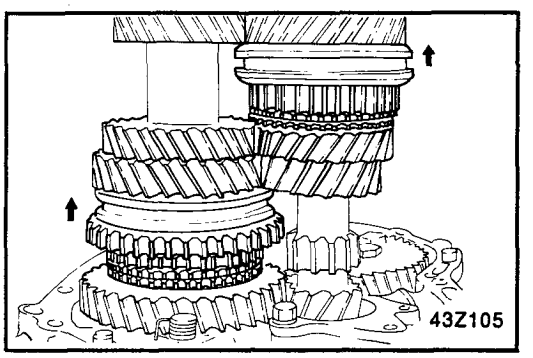
6. Install the differential gear assembly and output shaft assembly.
7. While lifting up the input shaft assembly, install it simultaneously with the intermediate shaft assembly.



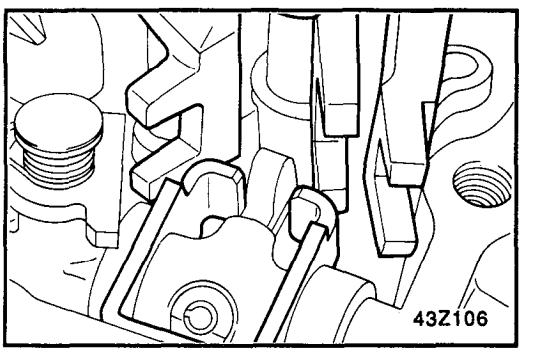
8. Install the retainer.



9. Reassembly of shift rail assembly.
   1) Set the first-second speed shift sleeve at second speed.
   2) Set the third-fourth speed shift sleeve at fourth speed.
   3) Install the first-second shift rail and fork assembly with the select lever pulled to fifth-reverse shift rail side.

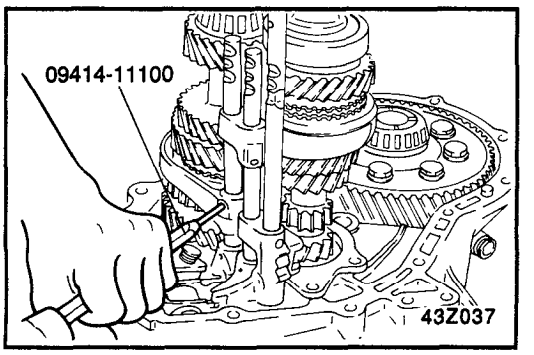


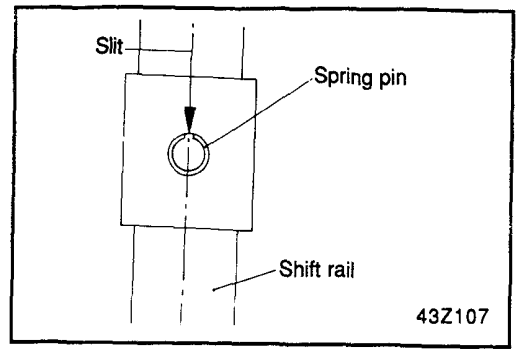
   4) Install the third-fourth/fifth-reverse shift rail and fork assembly together with the select lever fully pushed to first-second rail side.
   5) Install the third-fourth/reverse shift rail and fork assembly each other with the select lever fully pushed to first-second rail side.
   6) Turn the shift rail to engine shift lug.



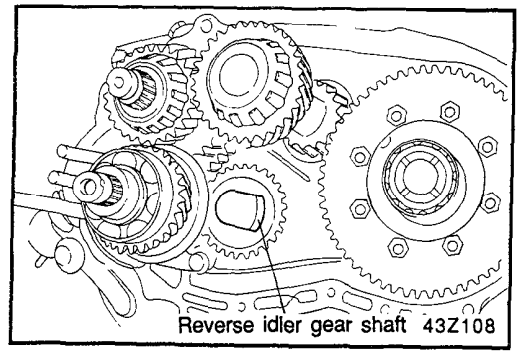
10. Reassembly of spring pin.
    1) Install the spring pins using the special tool (09414-11100).
    2) When installing, make sure that the slit of the spring pin is aligned with the shift rail center line.

Caution
Do not reuse the spring pins.

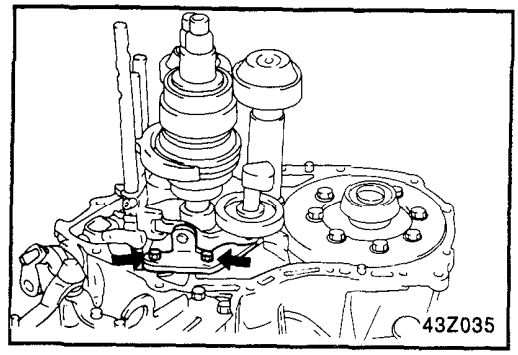




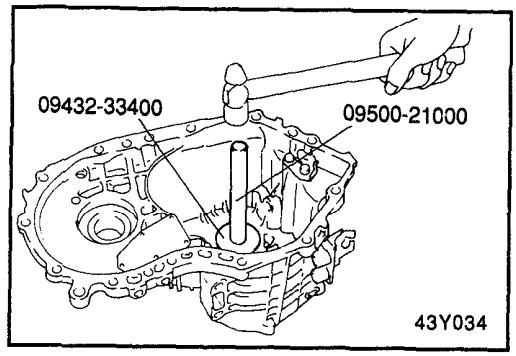
11. Install the reverse gear lever assembly.
12. install the reverse gear shaft and reverse gear in the direction illustrated.



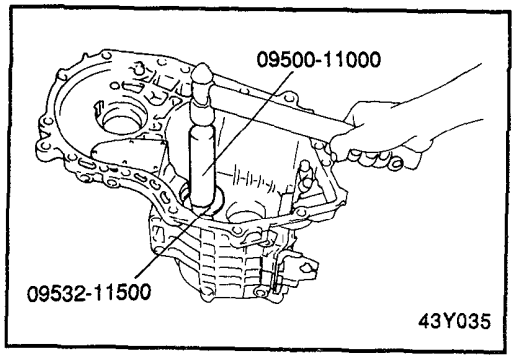
13. Install the reverse shift lever and shoe.



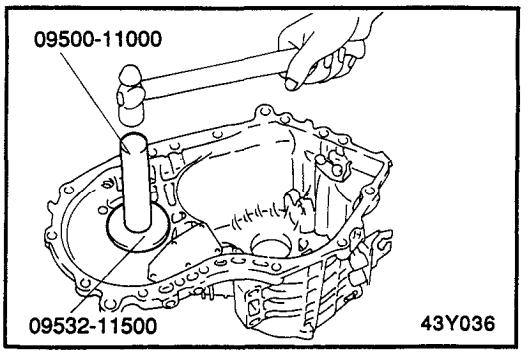
14. Install the intermediate shaft bearing outer race and spacer to the transaxle case using the special tools (09500-21000, 09432-33400).



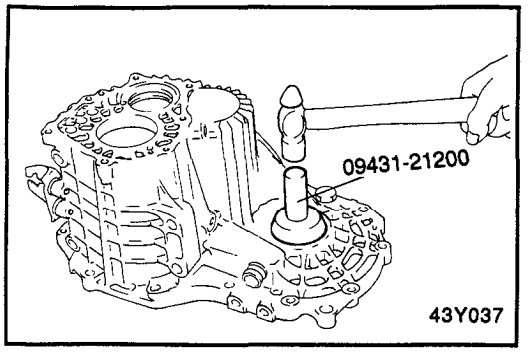
15. Install the output shaft bearing outer race and spacer to the transaxle case using the special tools (09500-11000, 09532-11500).



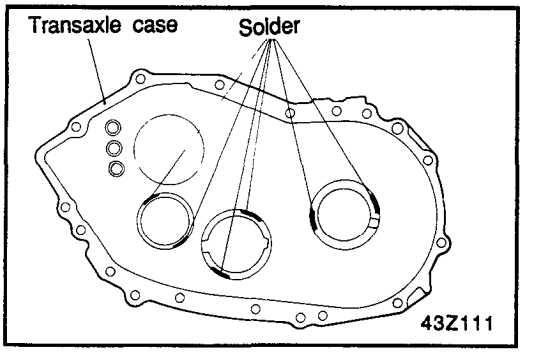
16. Install the differential bearing outer race and spacer to the transaxle case using the special tools (09500-11000, 09532-11500).



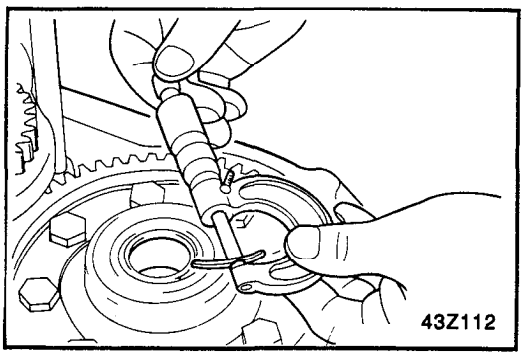
17. install the drive shaft oil seal to the transaxle case using the special tool (09431-21200).



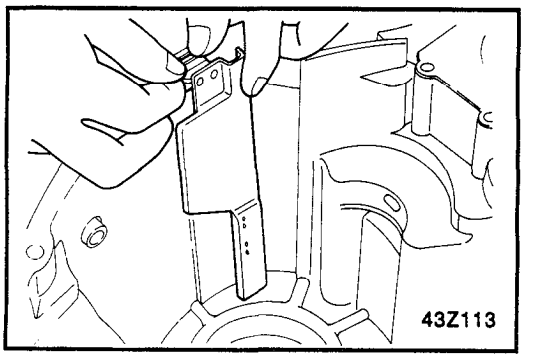
18. Reassembly of spacers (adjustment of end play).
    1) Place two pieces of solder measuring about 10 mm (0.4 in.) in length and 3 mm (0.12 in.) in diameter on the bearing outer race as shown in the illustration, and install the outer race.
    2) Install the transaxle case and tighten the bolts to the specified torque.
    3) Remove the transaxle case.
    4) Remove the outer races and remove the solder.



    5) Measure the thickness of the crushed solder with a micrometer and select and install spacer of tickness that gives standard end play.
    Standard value:
    intermediate shaft end play:
    0.05-0.10 mm (0.002-0.004 in.)
    Output shaft end play:
    0.05-0.10 mm (0.002-0.004 in.)
    Differential case end play:
    0.05-0.10 mm (0.002-0.004 in.)

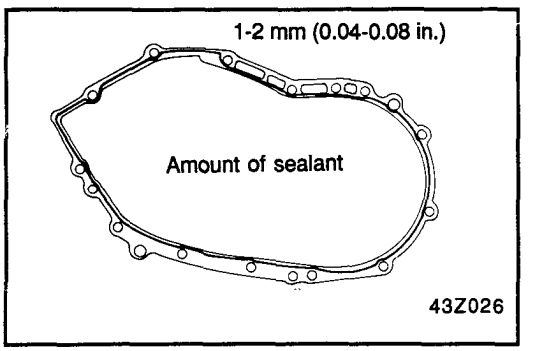


19. Install the oil guide to the transaxle case.

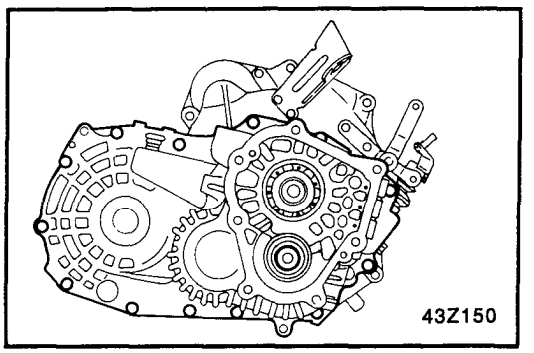


20. Apply specified sealant to the clutch housing side of the transaxle case.

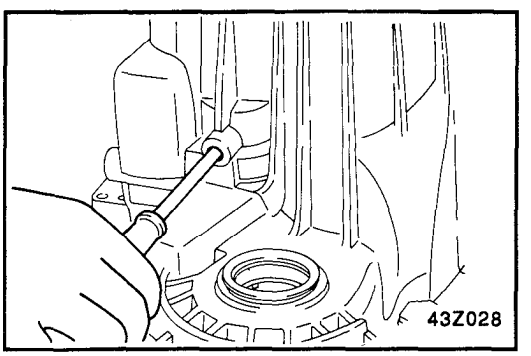
    Specified sealant : THREE BOND 1216



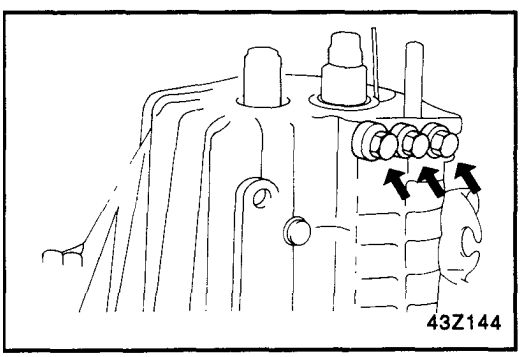
21. install the transaxle case to the clutch housing assembly and tighten the (13) bolts.



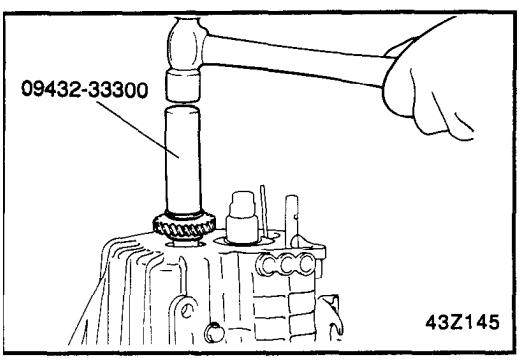
22. Install the restriction ball and gasket.
23. Center the shaft with a phillips screwdriver.
24. Tighten the reverse idler gear shaft bolt to the specified torque.



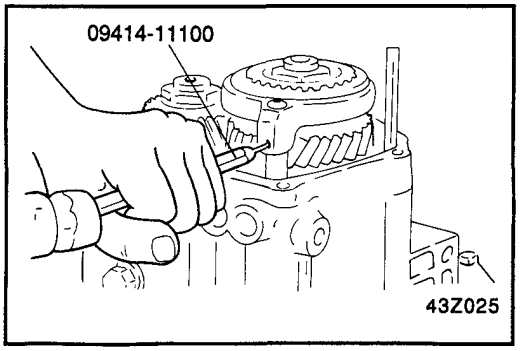
25. Install the poppet balls, poppet springs and poppet plugs.
26. Install the backup light assembly.



27. Install the intermediate gear using the special tool (09432-33300).
28. Install the fifth speed gear and needle roller bearing synchronizer ring, synchronizer hub.
29. Install the fifth speed shift fork and the fifth speed synchronizer sleeve at the same time.

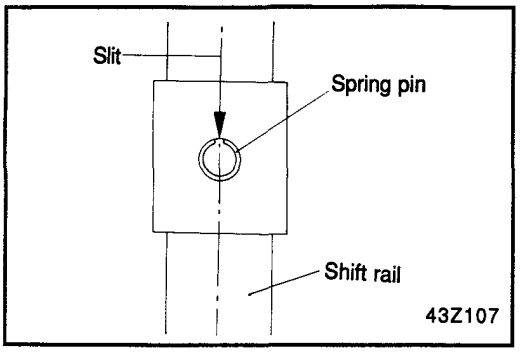


30. Install the spring pin using the special tool (09414-11100).

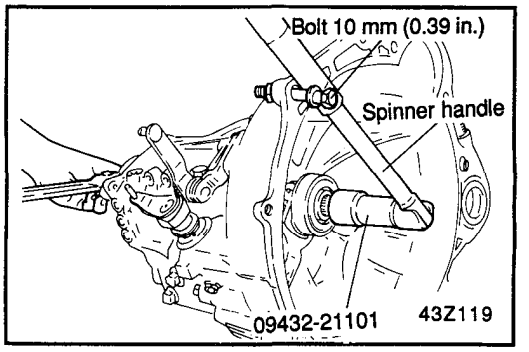


31. When installing, make sure that the slit of the spring pin is aligned with the shift railcenter line.

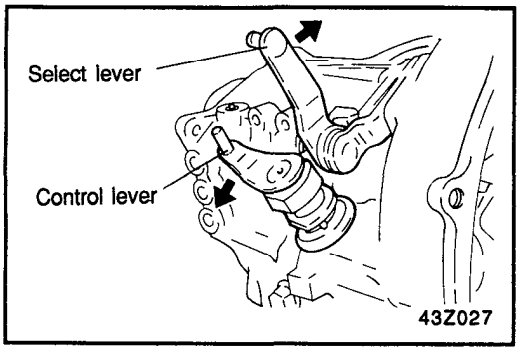
Caution
Do not reuse the spring pin.



32. Reassembly of lock nuts.
    1) Install the special tool (09432-21101) onto the input shat.
    2) Screw a bolt [10 mm (0.39 in.)] into the hole on the surface of clutch housing and attach a spinner handle to the special tool (09432-21101).

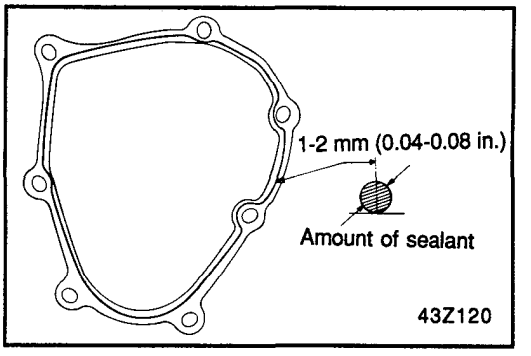


    3) Shift the transaxle in reverse using control lever and select lever.
    4) Tighten the lock nut to the specified torque.
    5) Stake the lock nut.

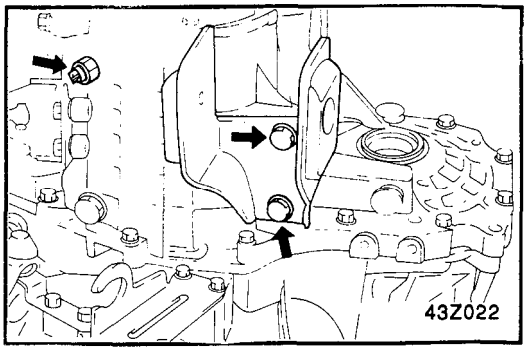


33. Apply the specified sealant to the rear cover and install the rear cover.

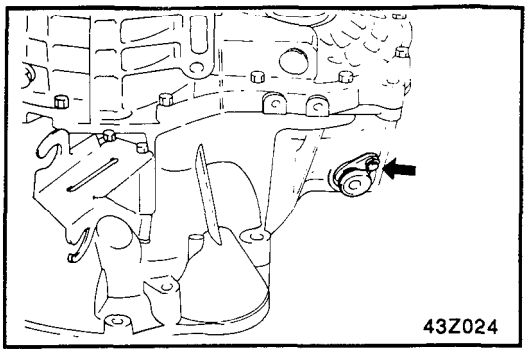
Specified sealant : THREE BOND 1216



34. Install the mounting bracket.

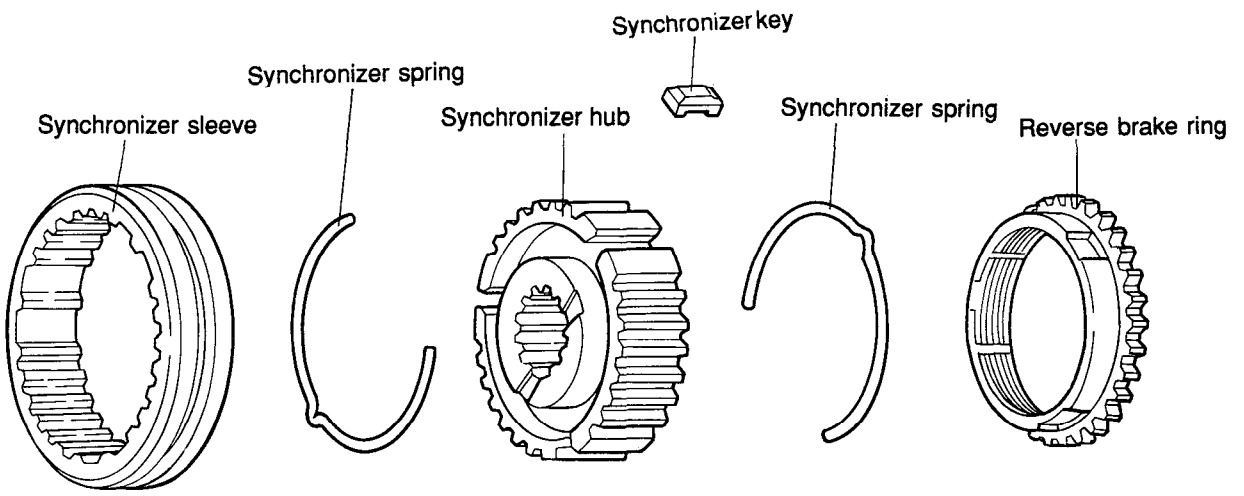


35. Install the speedometer driven gear assembly.



FIFTH SPEED SYNCHRONIZER ASSEMBLY

COMPONENTS

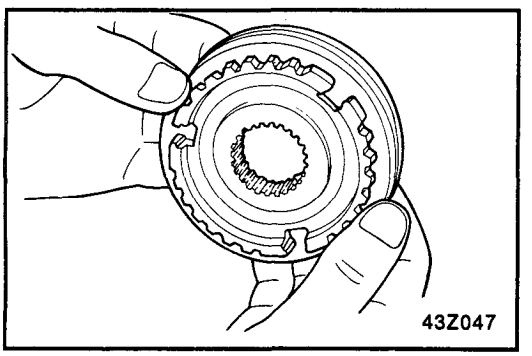


INSPECTION

SYNCHRONIZER SLEEVE AND HUB

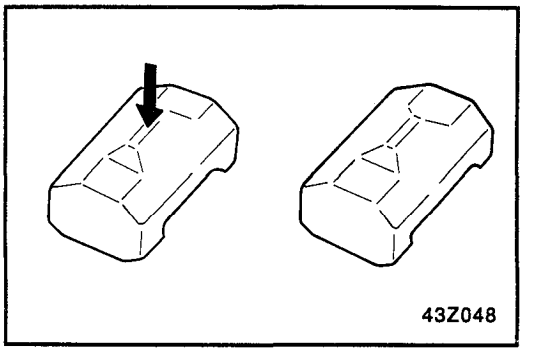
1. Combine the synchronizer sleeve and hub and check that they slide smoothly.
2. Check that the sleeve is free from-damage at its inside front and rear ends.
3. Check for wear of the hub front end (surface in contact with the fifth speed gear).

Caution
Replace the synchronizer hub and sleeve as a set.



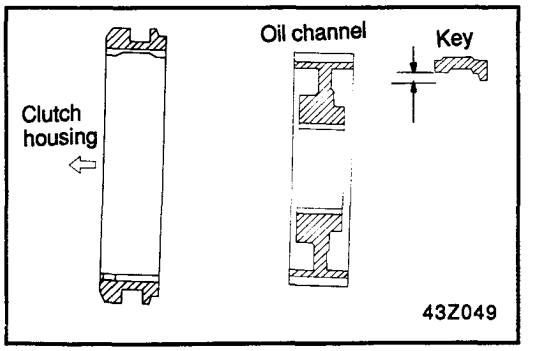
SYNCHRONIZER KEY AND SPRING

1. Check for wear of the synchronizer key center protrusion.
2. Check the spring for weakness, deformation and breakage.

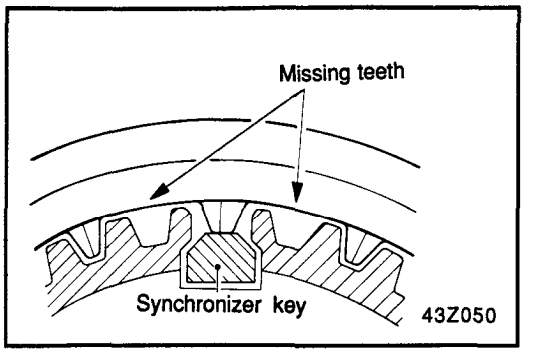


ASSEMBLY

1. Assemble the synchronizer hub, sleeve and key noting their direction.

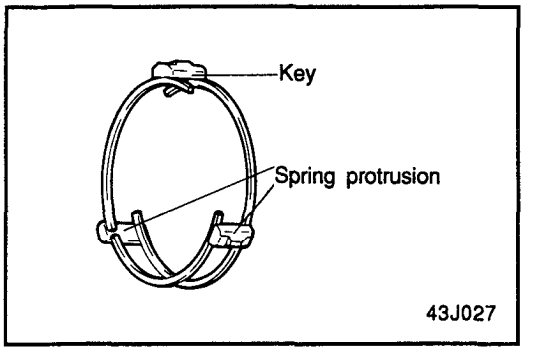


2. The synchronizer sleeve has teeth missing at six portions. Assemble the hub to the sleeve so that the center tooth between the two missing teeth will touch the synchronizer key.



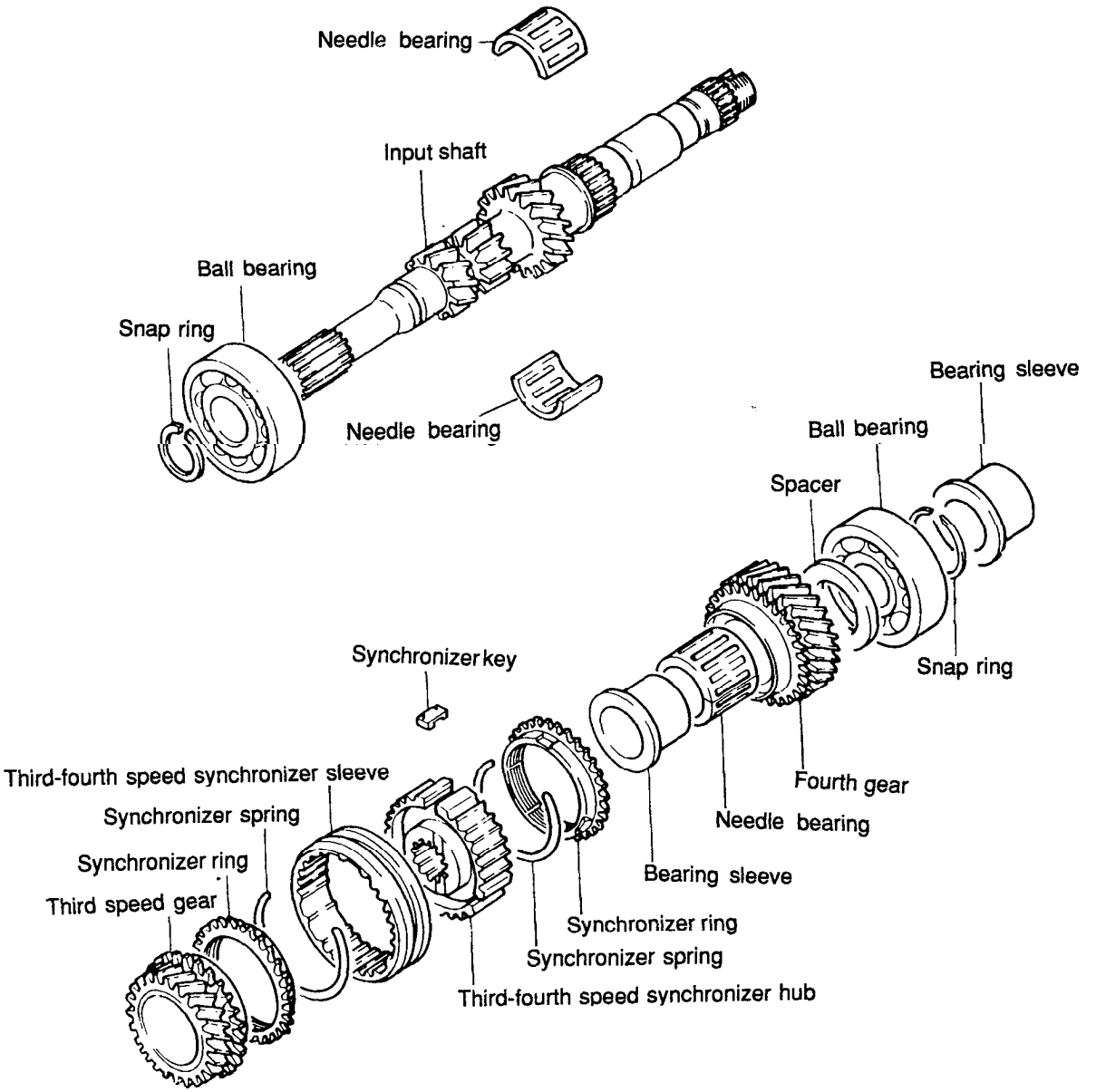
3. Install the synchronizer spring so that the its protrusion may be engaged in the groove of the synchronizer key.

Caution
When installing the synchronizer springs, make sure that the front and rear ones are not faced in same direction.



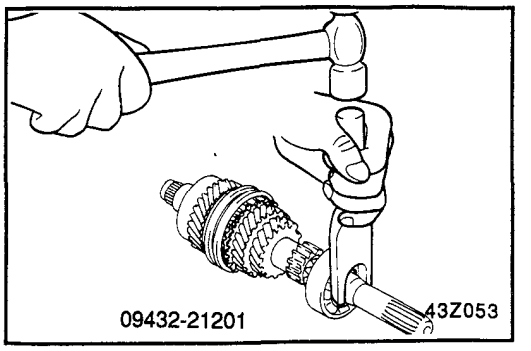
INPUT SHAFT

COMPONENTS

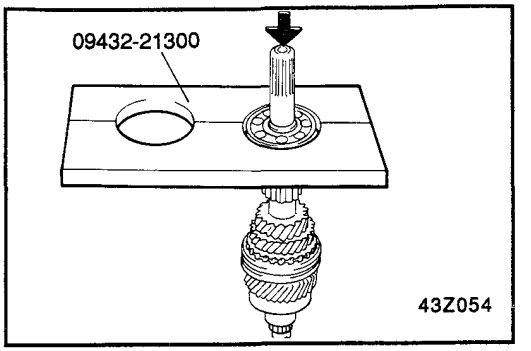


DISASSEMBLY

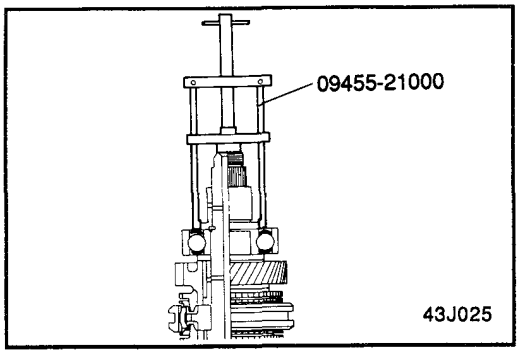
1. Remove the snap ring using the special tool (09432-21201).



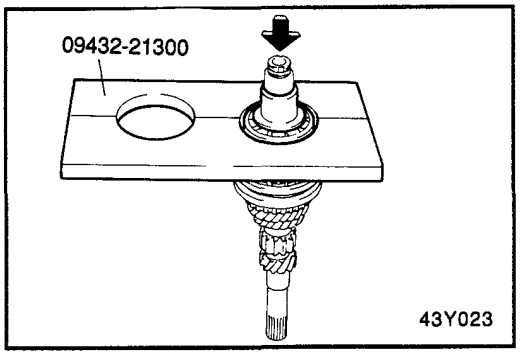
2. Remove the front bearing using the special tool (09432-21300).



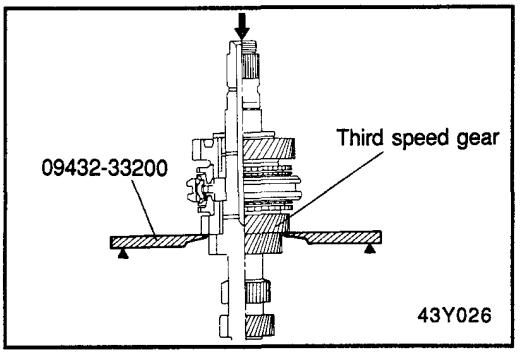
3. Remove the bearing sleeve using the special tool (09455 21000).
4. Remove the snap ring.



5. Remove the rear bearing using the special tool (09432-21300).



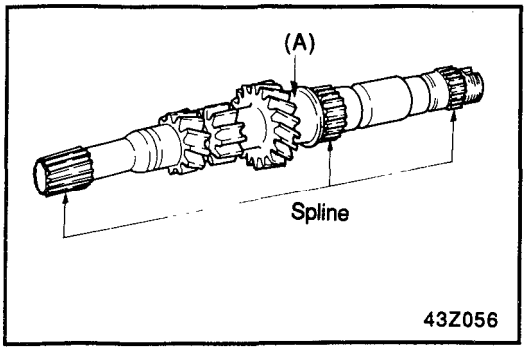
6. Remove the fourth speed gear and needle roller bearing, synchronizer ring, third-fourth speed synchronizer sleeve.
7. Remove the needle roller bearing sleeve, third-fourth synchronizer hub, synchronizer ring, third speed gear, needle roller bearing using the special tool (09432-33200).



INSPECTION

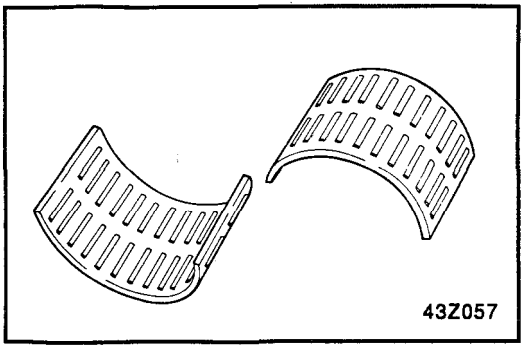
INPUT SHAFT

1. Check the outer surface of the input shaft where the needle bearing is mounted for damage or abnormal wear [portion (A)].
2. Check the splines for damage or wear.



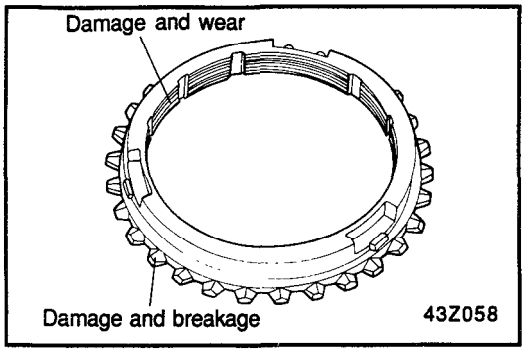
NEEDLE BEARING

1. Combine the needle bearing with the shaft or bearing sleeve and gear and check that it rotates smoothly without abnormal noise or play.
2. Check the needle bearing cage for deformation,



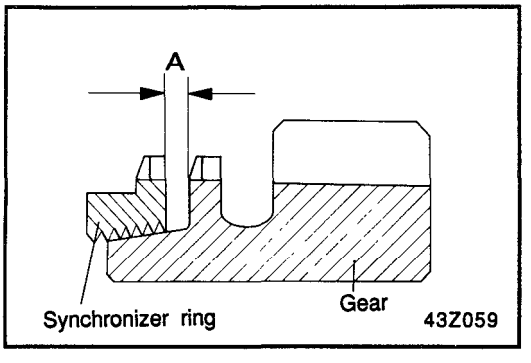
SYNCHRONIZER RING

1. Check the clutch gear teeth for damage and breakage.
2. Check the internal surface for damage, wear and broken threads.



3. Force the synchronizer ring toward the clutch gear and check clearance “A”. Replace if it is out of specification.

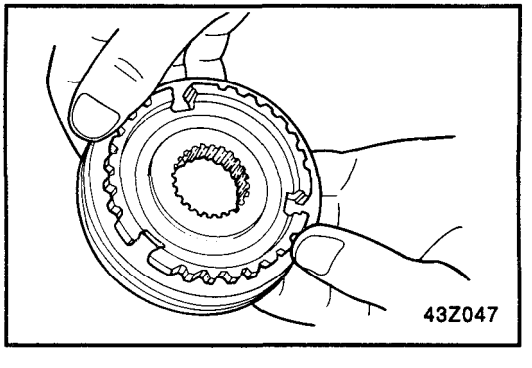
   Limit : 0.5 mm (0.02 in.)



SYNCHRONIZER SLEEVE AND HUB

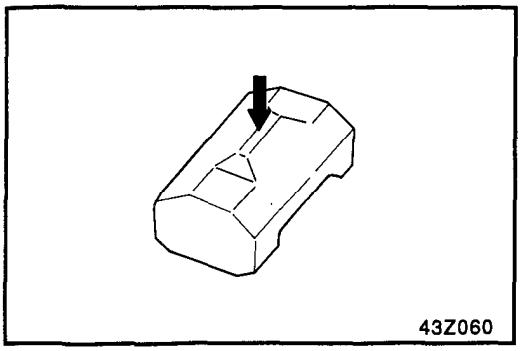
1. Combine the synchronizer sleeve and hub and check that they slide smoothly.
2. Check that the sleeve is free from damage at its inside front and rear ends.
3. Check for wear of the hub end surfaces (in contact with each speed gear).

   Caution
   Replace the synchronizer hub and sleeve as a set.



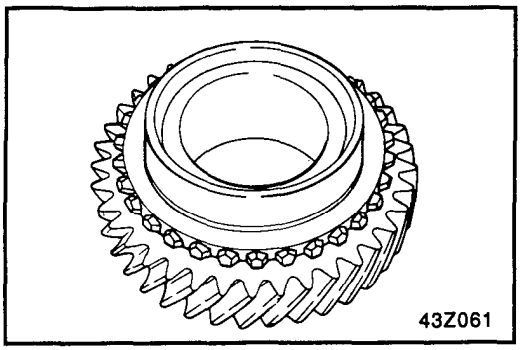
SYNCHRONIZER KEY AND SPRING

1. Check for wear of the synchronizer key center protrusion.
2. Check the spring for weakness, deformation and breakage.



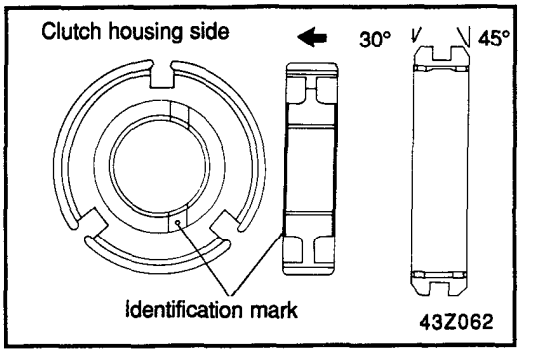
SPEED GEARS

1. Check the bevel gear and clutch gear teeth for damage and wear.
2. Check the synchronizer cone for rough surface, damage and, wear.
3. Check the gear bore and front and rear ends for damage and wear.

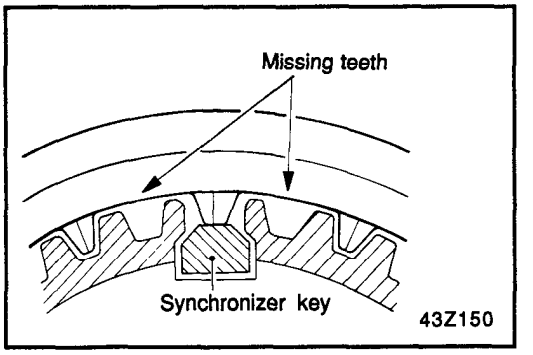


ASSEMBLY

1. Install the synchronizer hub and sleeve so that they are positioned as shown in the figure.

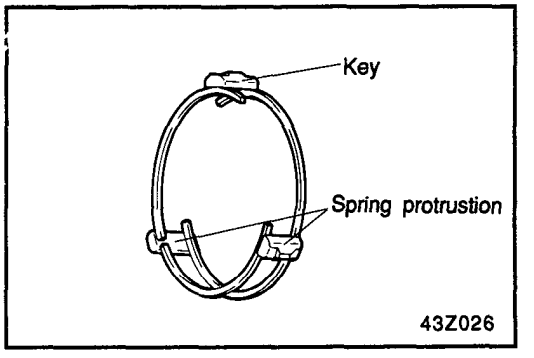


2. The synchronize sleeve has teeth missing at six portions. Assemble the hub to the sleeve so that the center tooth between the two missing teeth will touch the synchronizer key.



3. Install the synchronizer spring so that its protrusion fits into the groove in the synchronizer key.

Caution
When installing the synchronizer springs, make sure that the front and rear ones are not faced in same direction.

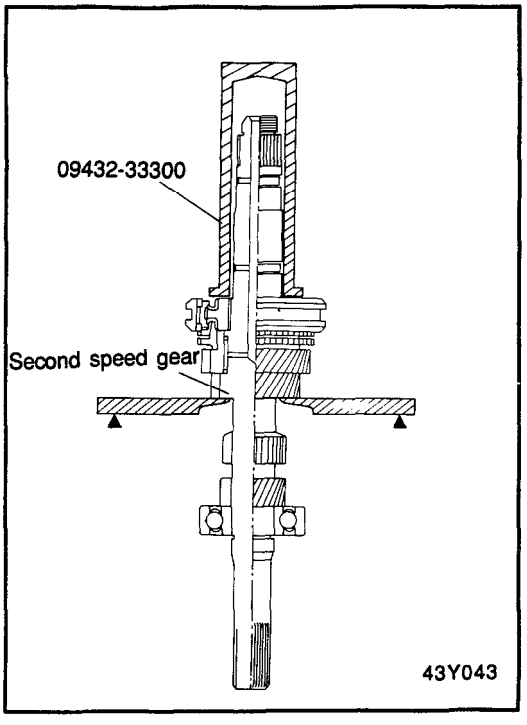


4. Install the needle roller bearing and third speed gear to the input Shaft.
5. Install the third-fourth speed synchronizer assembly over the input shaft using the special tool (09432-33300).

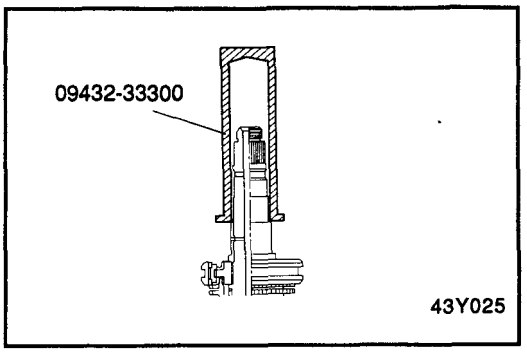
Caution

1. When installing the synchronizer assembly, make sure that three synchronizer keys are seated correctly in respective grooves of the synchronizer ring.

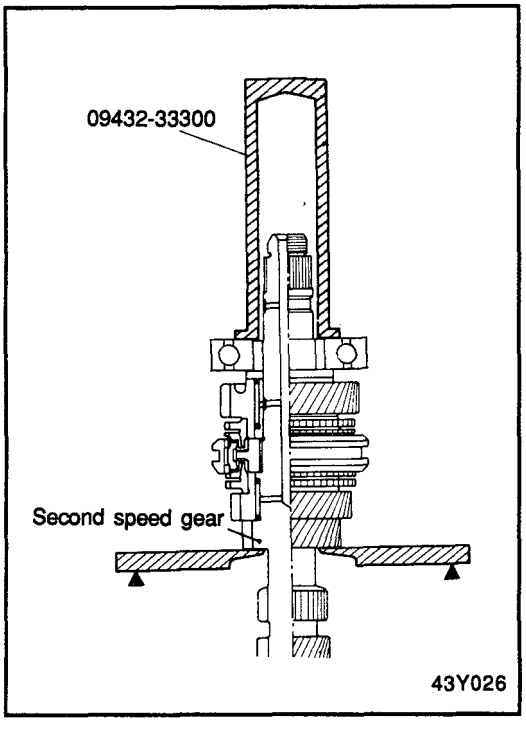
2. After installing of the synchronizer assembly, check that the third speed gear rotates smoothly.



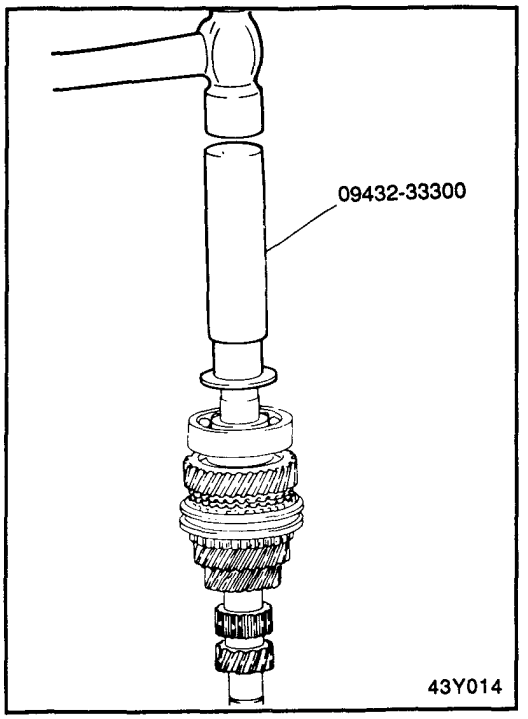
6. Install the needle roller bearing sleeve using the special tool (09432-33300).
7. Install the synchronizer ring, needle roller bearing, fourth gear and spacer.



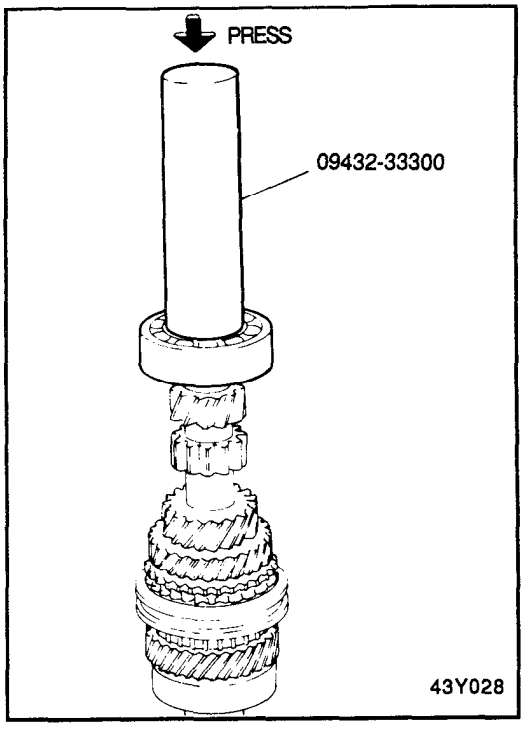
8. Install the rear bearing using the special tool (09432-33300).
9. Install the snap ring.



10. Install the rear bearing sleeve using the special tool (09432-**33300).**

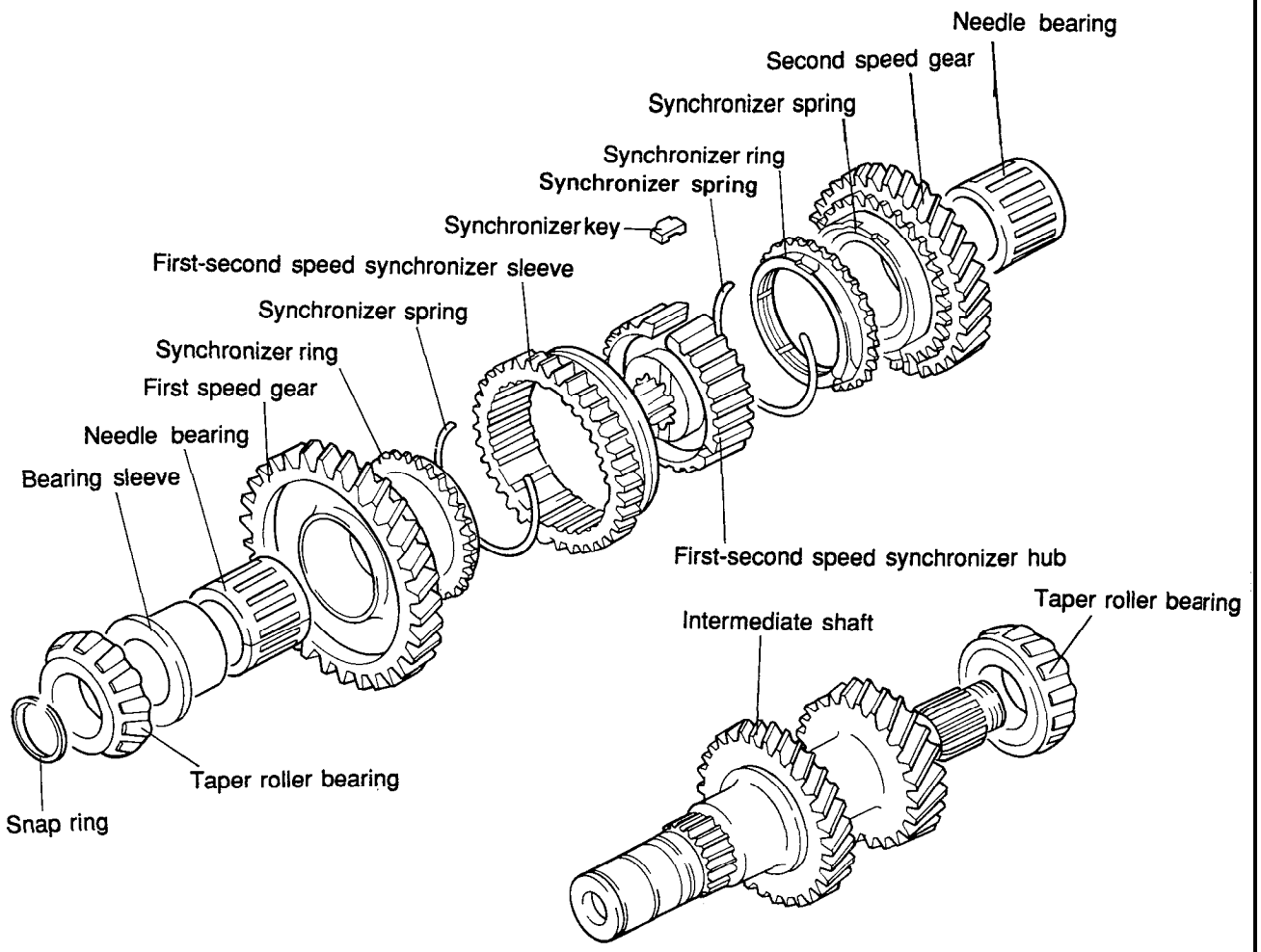


11. Install the front bearing using the special tool (09432-33300).
12. Install the snap ring.



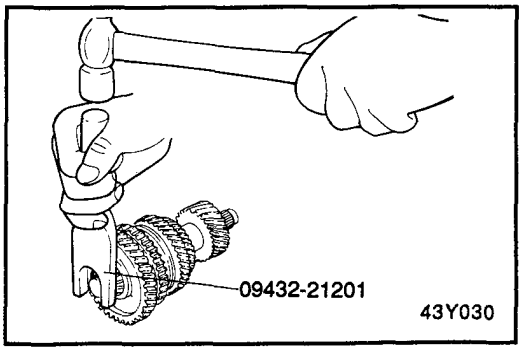
INTERMEDIATE SHAFT

COMPONENTS



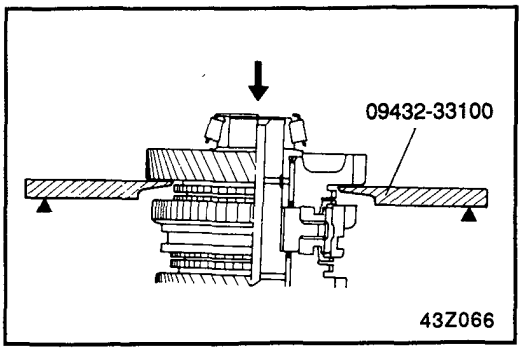
DISASSEMBLY

1. Remove the snap ring using the special tool (09432-21201).

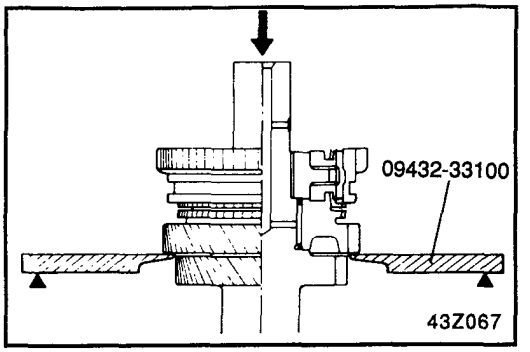


2. Remove the taper roller bearing, first speed gear and bearing sleeve and needle roller bearing using the special tool (09432-33100).

CAUTION
1. Do not reuse the bearing removed from the shaft.
2. Replace the inner and outer races of the tapered roller bearing as a set.

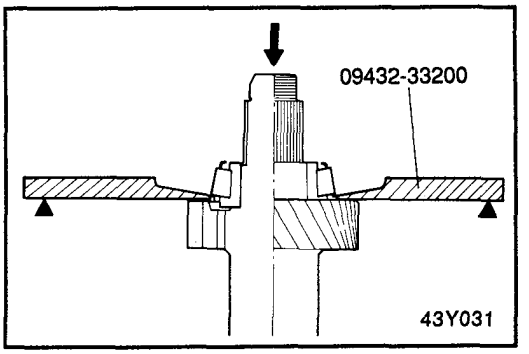


3. Remove the first-second speed synchronizer assembly and second speed gear, needle roller bearing together using the special tool (09432-33100).



4. Remove the taper roller bearing using the special tool (09432-33200).

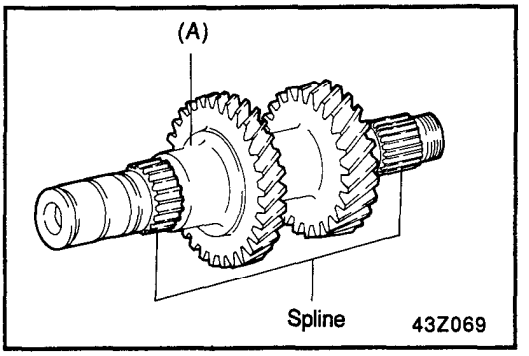
CAUTION
1. Do not reuse the bearing removed from the shaft.
2. Replace the inner and outer races of the tapered roller bearing as a set.



INSPECTION

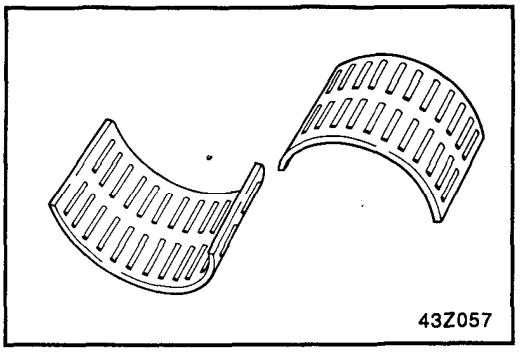
INTERMEDIATE SHAFT

1. Check the outer surface of the intermediate shaft where the needle bearing is mounted for damage or abnormal wear [portion (A)]
2. Check the splines for damage and wear.



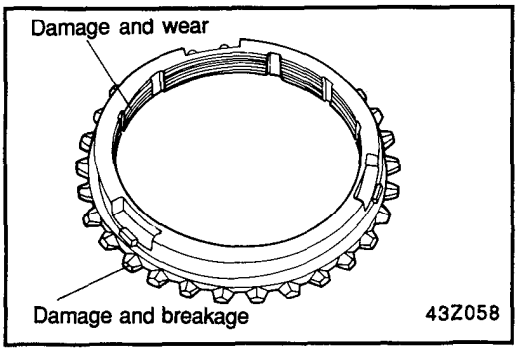
NEEDLE BEARING

1. Combine the needle bearing with the shaft or bearing sleeve and gear and check that it rotates smoothly without abnormal noise or play.
2. Check the needle bearing cage for deformation.



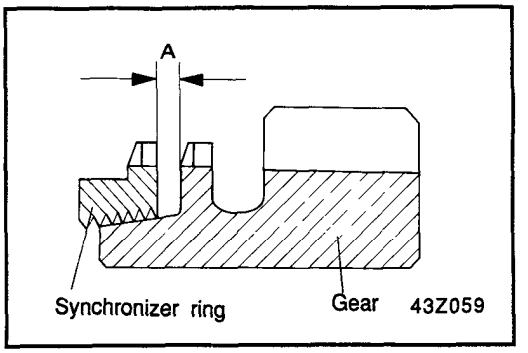
SYNCHRONIZER RING

1. Check the clutch gear teeth for damage and breakage.
2. Check the internal surface for damage, wear and broken threads.



3. Force the synchronizer ring toward the clutch gear and check clearance "A". Replace if it is out of specification.

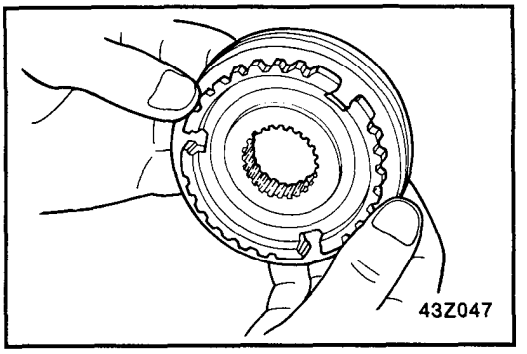
   Limit : 0.5 mm (0.02 in.)



SYNCHRONIZER SLEEVE AND HUB

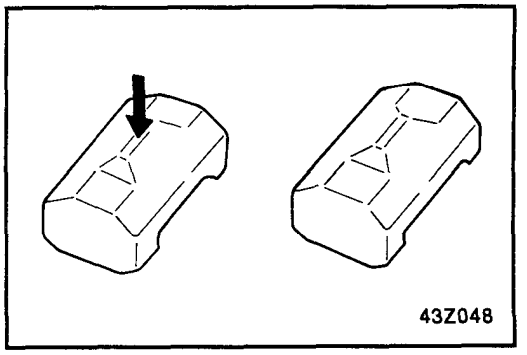
1. Combine the synchronizer sleeve and hub and check that they slide smoothly.
2. Check that the sleeve is free from damage at its inside front and rear ends.
3. Check for wear of the hub end surfaces (in contact with each speed gear).

   Caution
   Replace the synchronizer hub and sleeve as a set.



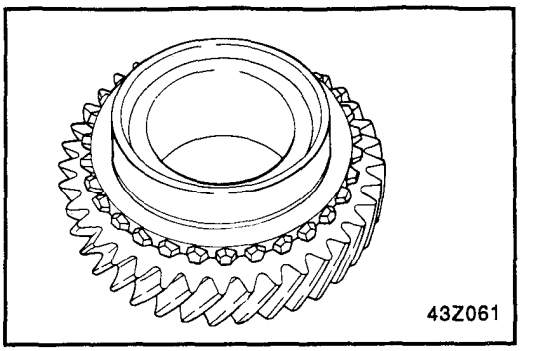
SYNCHRONIZER KEY AND SPRING

1. Check for wear of the synchronizer key center protrusion.
2. Check the spring for weakness, deformation or breakage.



SPEED GEARS

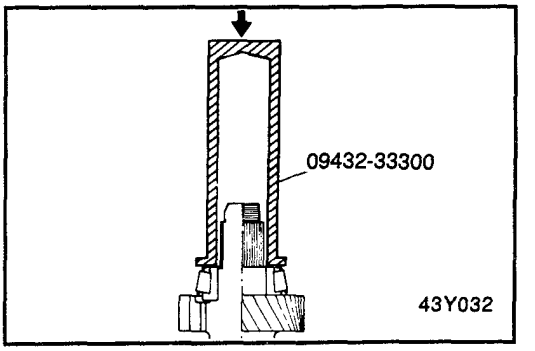
1. Check the bevel gear and clutch gear teeth for damage and wear.
2. Check the synchronizer cone for a rough surface, damage or wear.
3. Check the gear bore and front and rear ends for damage or wear.



ASSEMBLY

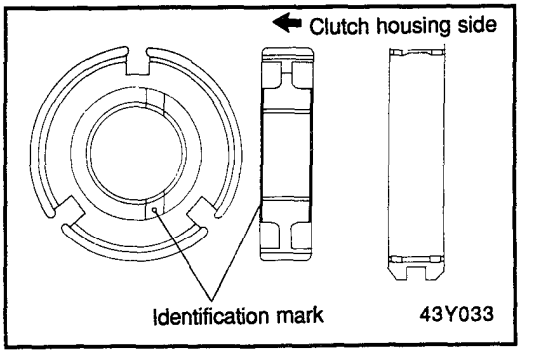
1. Install the taper roller bearing over the intermediate shaft using the special tool (09432-33300).

   CAUTION
   When installing the bearing, push on the inner race only.

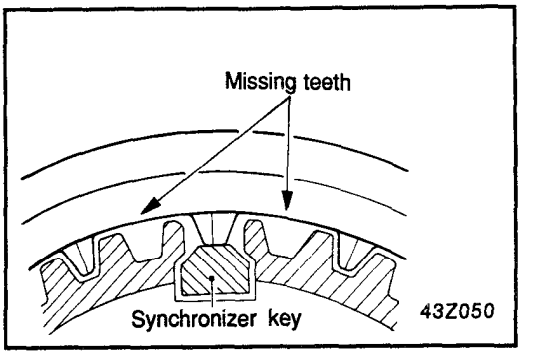


2. Install the first gear synchronizer ring noting its identification mark.

3. Combine the first-second speed synchronizer hub and sleeve.

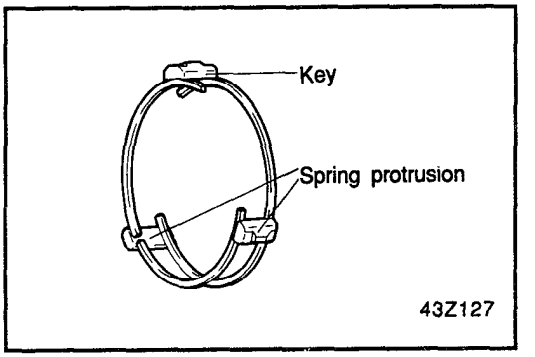


4. The synchronizer sleeve has teeth missing at six portions. Assemble the hub to the sleeve so that the center tooth between the two missing teeth will touch the synchronizer key.



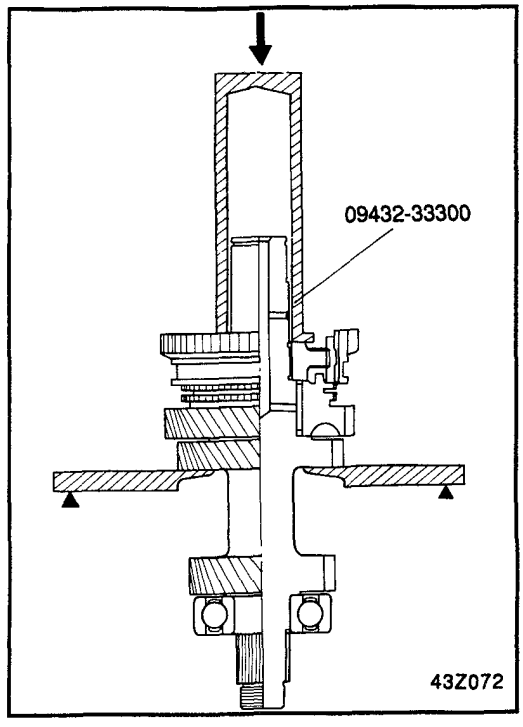
5. Install the synchronizer spring so that its portions fits into the groove in the synchronizer key.

   CAUTION
   When installing the synchronizer springs, make sure that the front and rear ones are not faced in same direction.

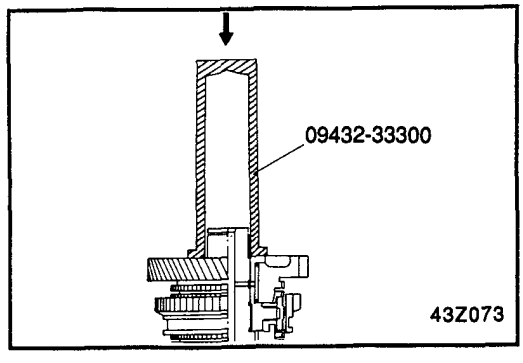


6. Install the needle roller bearing, second gear, first-second speed synchronizer assembly over the intermediate shaft using the special tool (09432-33300).

CAUTION
1. When installing the synchronizer assembly, make sure that the three synchronizer keys are seated correctly in their respective grooves of the synchronizer ring.
2. After installation of the synchronizer assembly, check that third gear rotates smoothly.



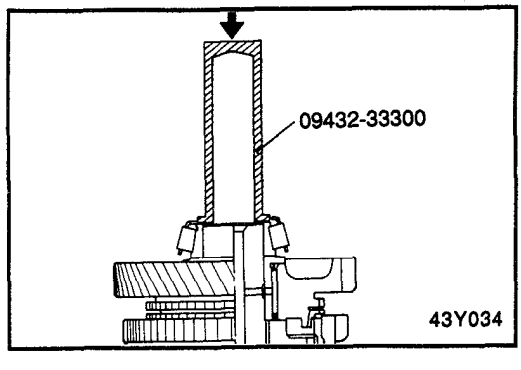
7. Install the needle roller bearing, first speed gear, bearing sleeve together using the special tool (09432-33300).



8. Install the taper bearing using the special tool (09432-33300).

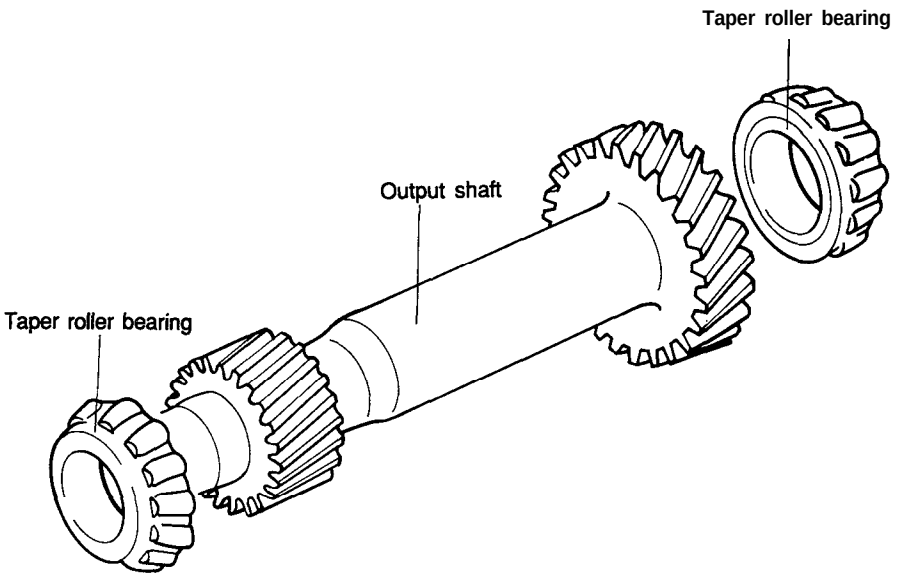
CAUTION
When installing the bearing, push on the inner race only.

9. Install the snap ring.



OUTPUT SHAFT

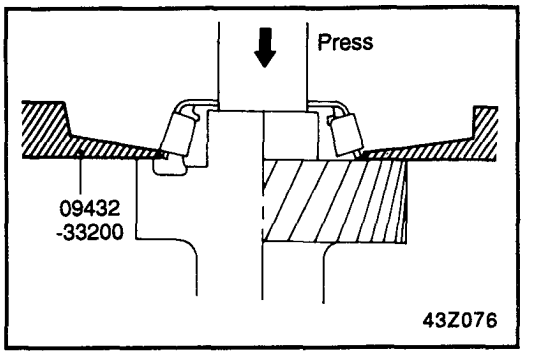
COMPONENTS



DISASSEMBLY

1. Remove the tapered roller bearing using the special tool (09432-33200).

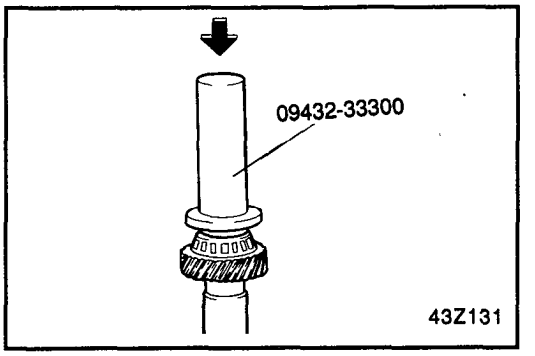
CAUTION
Do not reuse the bearing removed from the shaft.



ASSEMBLY

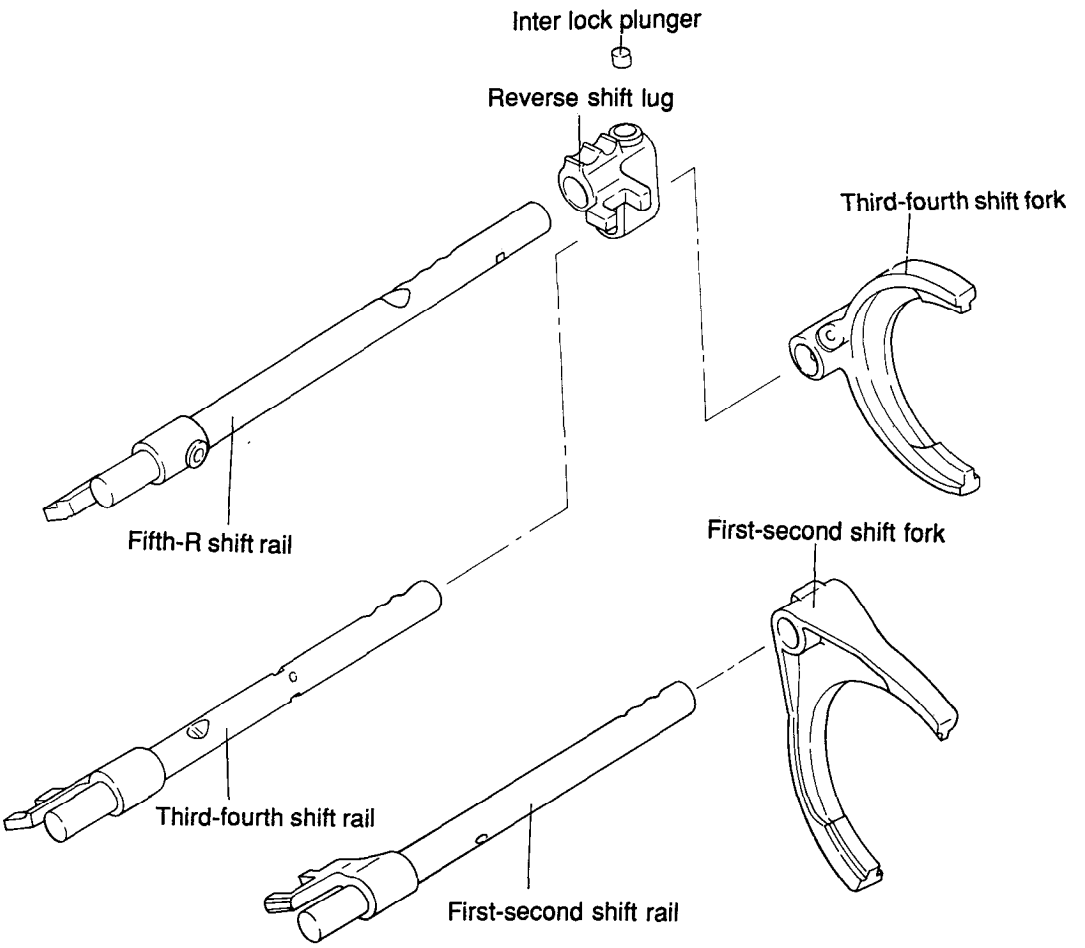
1. Install the tapered roller bearing using the special tool (09432-33300)

CAUTION
When installing the bearing, push on the inner race only.



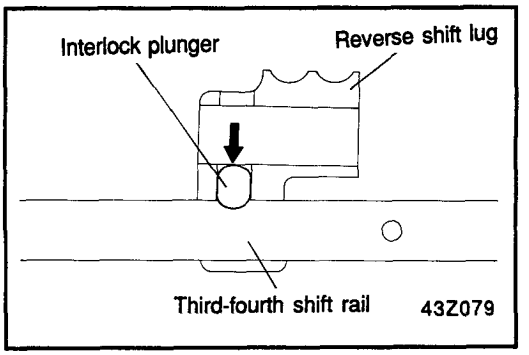
SHIFT FORK

COMPONENTS



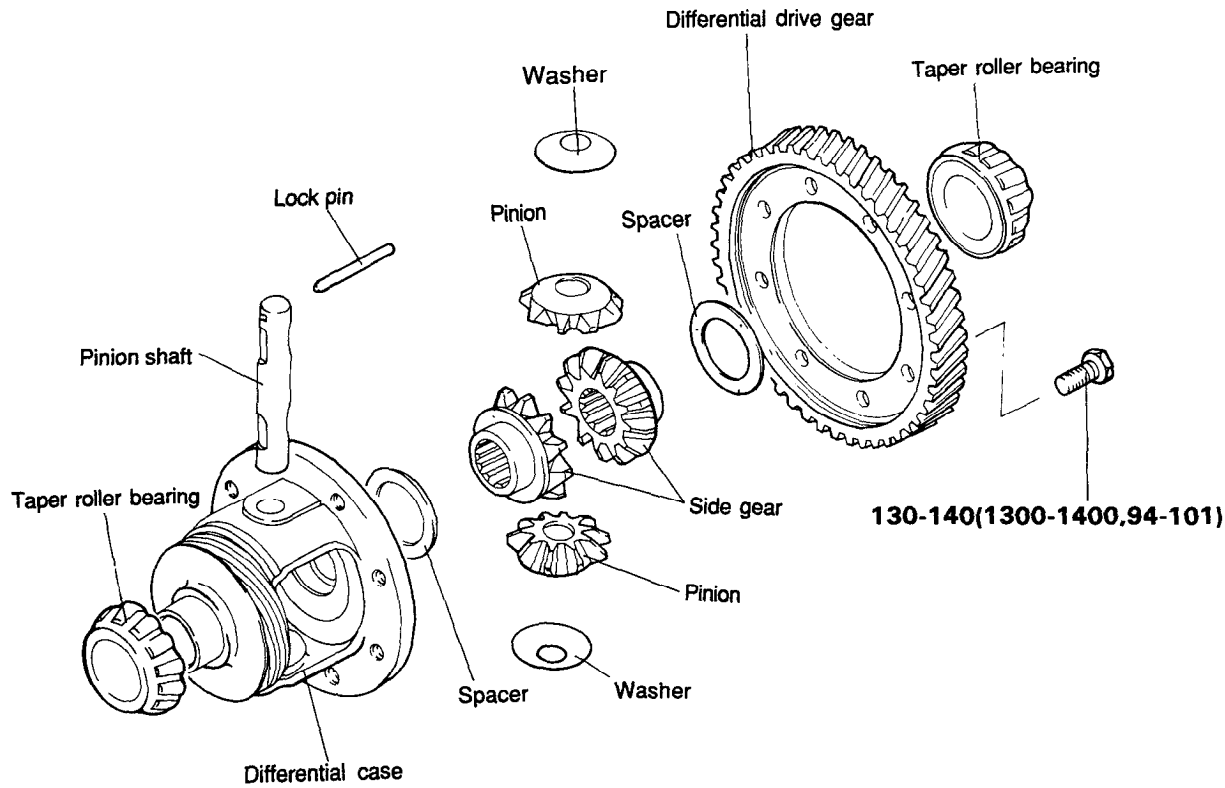
ASSEMBLY

1. Insert the interlock plunger as illustrated on the third-fourth speed shift rail.



DIFFERENTIAL

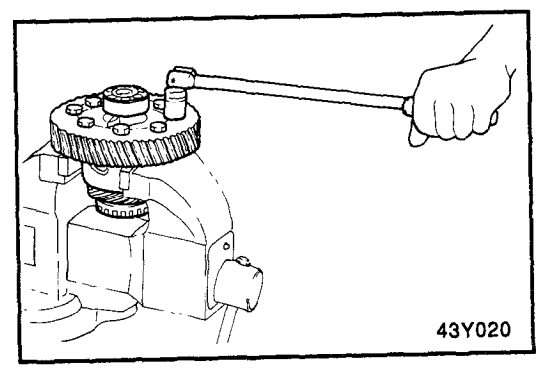
COMPONENTS



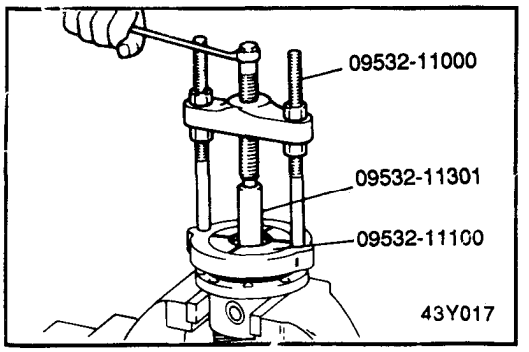
TORQUE : Nm (kg.cm, lb.ft)

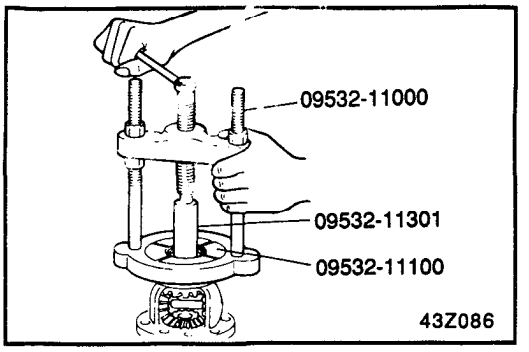
DISASSEMBLY

1. Clamp the differential case in a vise.
2. Remove the differential drive gear retaining bolts and remove the differential drive gear from differential case.

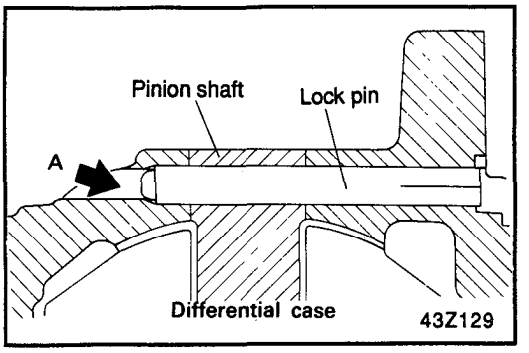


3. Remove the taper roller bearings using the special tool (09532-11000, 09532-11100, 09532-11301).





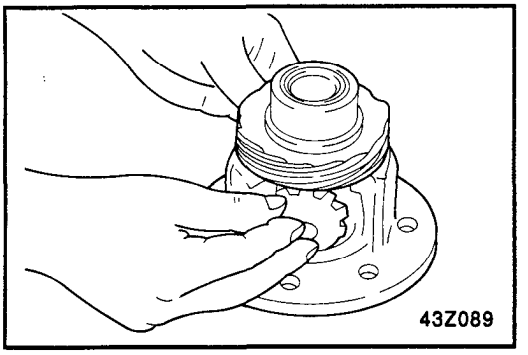
4. Drive out the lock pin from the hole A using a punch.
5. Drive out the pinion shaft.
6. Remove the pinion gears, washers, side gears and spacers.



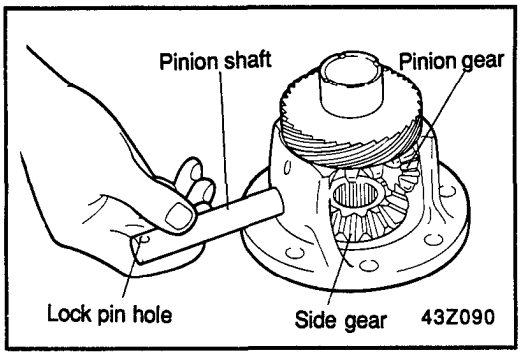
ASSEMBLY

1. Install the spacer on the back of the side gear and then install the gear in the differential case.

CAUTION
1. When installing a new side gear, use a spacer of medium thickness [0.93-1.00 mm (0.036-0.04 in.)]
2. Do not reuse the lock pin.
3. The lock pin head must be sunk below the flange surface of the differential case.

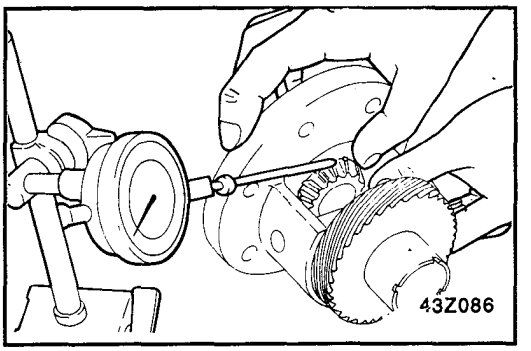


2. Set the washer on the back of each pinion and insert the two pinions to the specified position while engaging them with the side gears by turning them.
3. Insert the pinion shaft.



4. Measure the backlash between the side gears and pinions.

   Standard value : 0.025-0.150 mm (0.001-0.006 in.)

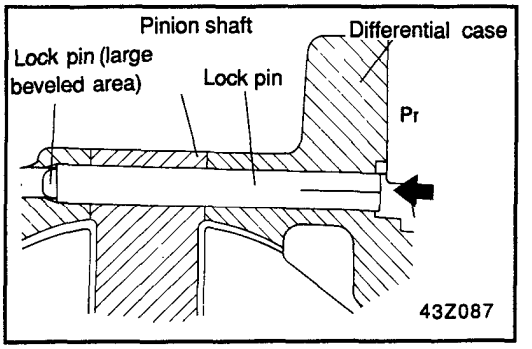


5. If the backlash is out of specification, disassemble and use the correct spacer, reassemble and remeasure.

   CAUTION
   Adjust the backlash of both side gears to the same specification.

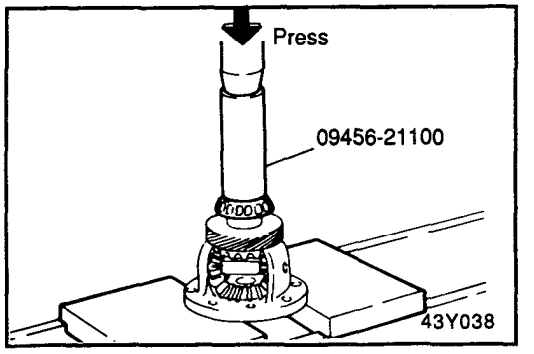
6. Align the pinion shaft lock pin hole with the case lock pin hole and insert the lock pin,

   CAUTION
   1. Do not reuse the lock pin.
   2. The lock pin head must be below the flange surface of the differential case.



7. Install the taper roller bearings on both sides of the differential case using the special tool (09455-21100).

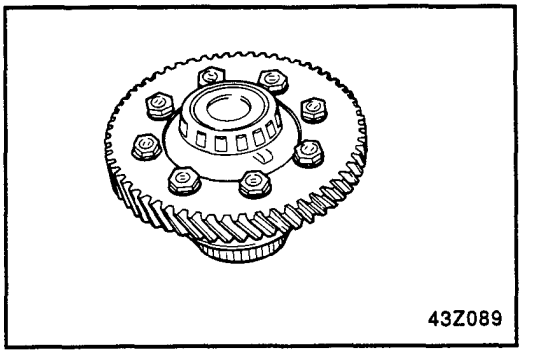
   CAUTION
   When press-fitting the bearings, push the inner race only.



8. Apply specified sealant to the entire threads of the bolt and tighten in the order shown in figure to the specified torque with the differential case clamped in a vise.

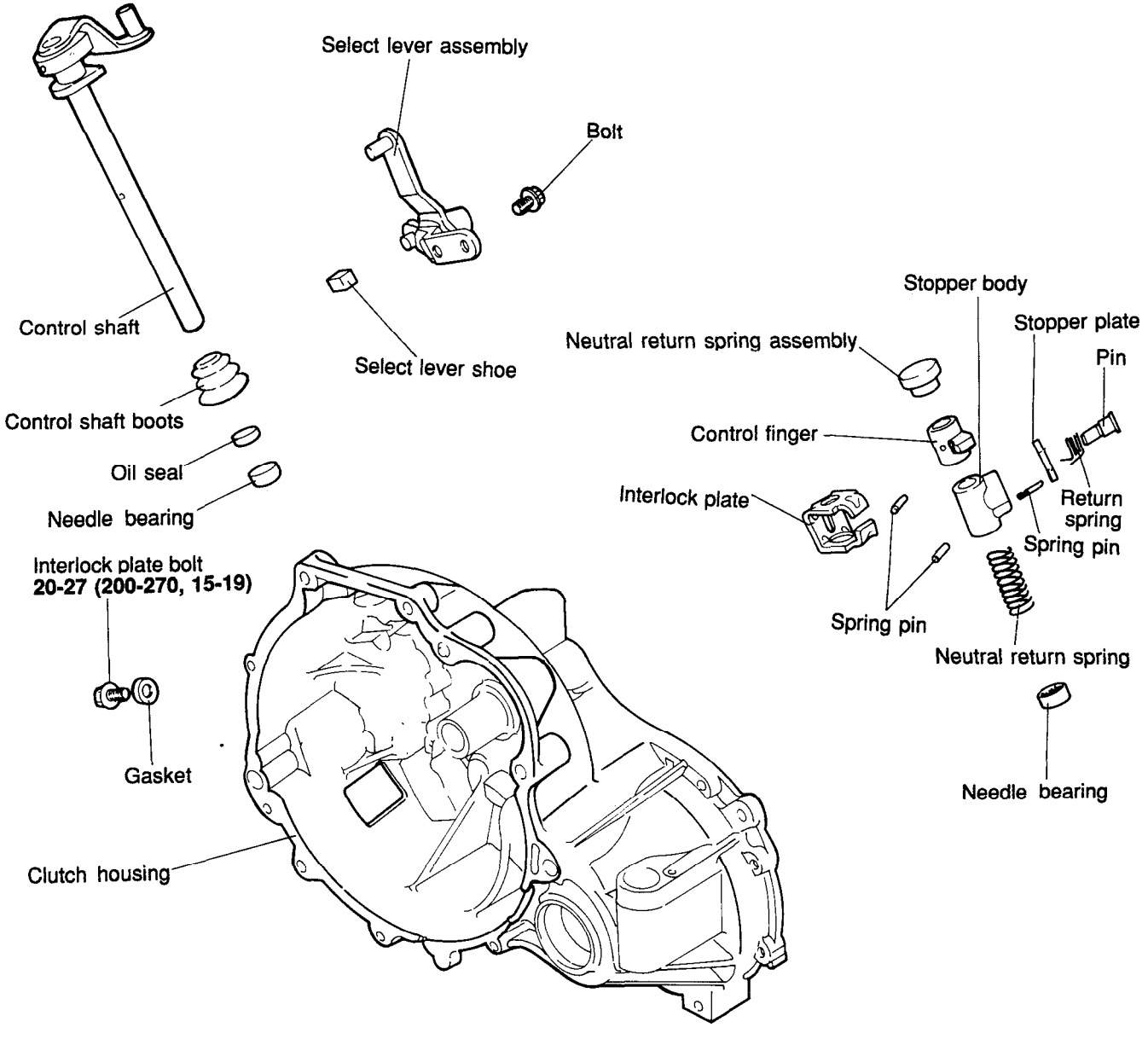
   Specified sealant : 3M Stud Locking No.4170

   CAUTION
   If a bolt is reused, remove the old sealant from the threads.



CLUTCH HOUSING

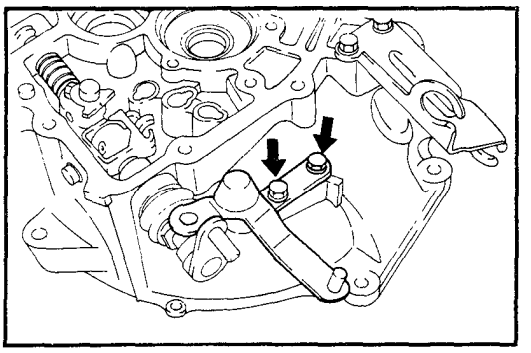
COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

DISASSEMBLY

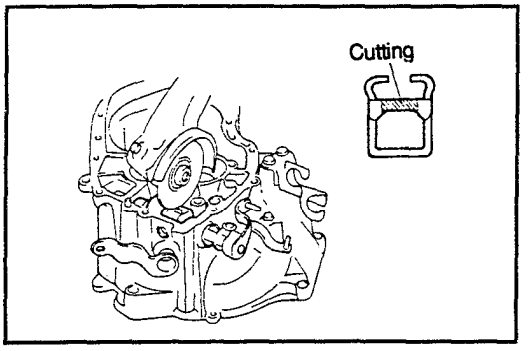
1. Remove the select lever assembly and the select lever shoe.
2. Remove the interlock plate bolt and gasket.



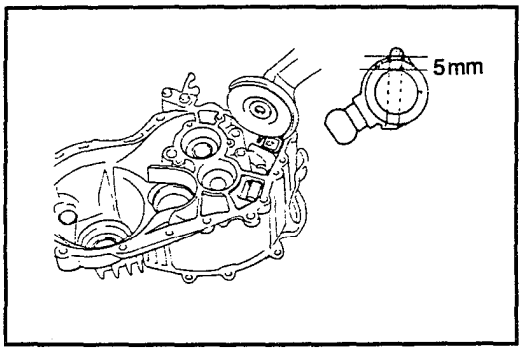
FIRST METHOD

If using following procedure, you should replace the shifting control shaft ass'y as new one.
This method is recommended as removal procedures in case that the clutch housing is normal and shifting control shaft is abnormal

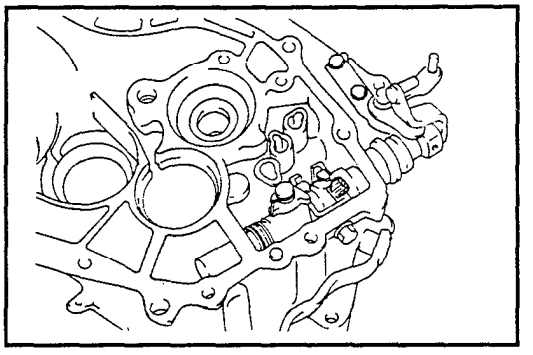
3. Cut the interlock plate which prevent the shifting control shafts turning, as shown in figure.



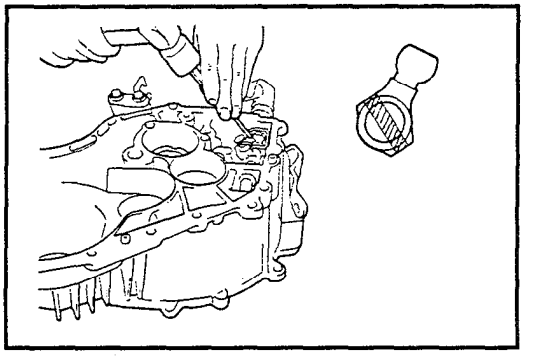
4. Grind the head of lock pin and shifting control shaft over 5mm.



5. Turn the shfiting control shaft to the opposite side.



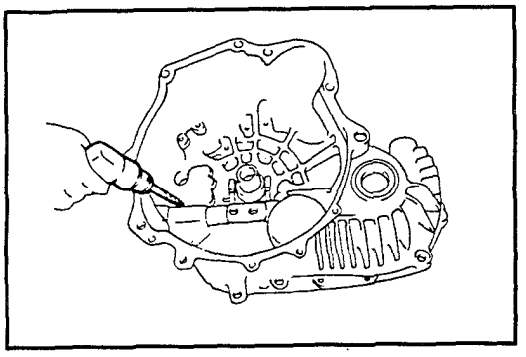
6. Remove the lock pin from the shifting control shift by punching the bottom of the lock pin using the special tool (09414-11000).



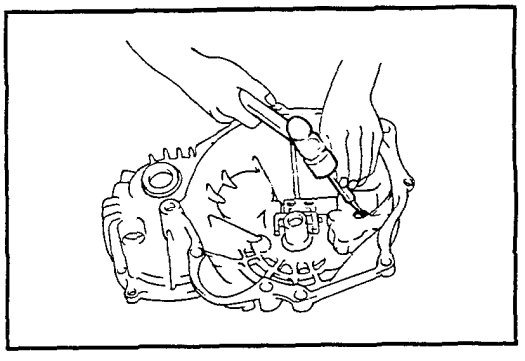
SECOND METHOD

If using following method, you should replace the clutch housing as new one.
This method is recomended in case that the clutch housing is abnormal such as crack, oil leaking, etc.

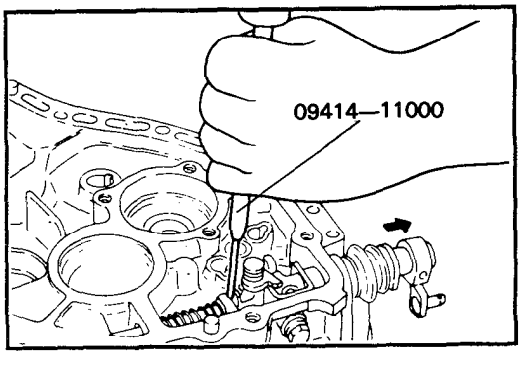
7. Drill the clutch housing to the inside as shown in figure.



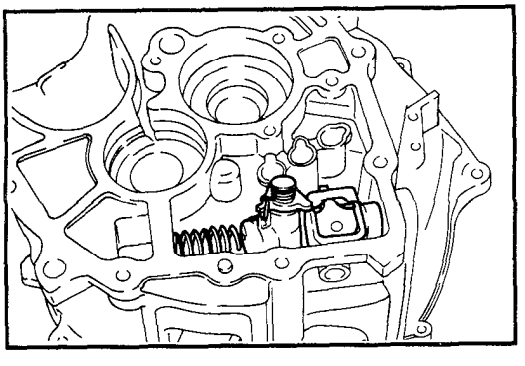
8. Punch and remove the lock pin, inserting the punch through its hole.



9. Drive out the spring pin from the stopper body using the special tool (09414-11000).
10. Pull out the control shaft and remove the control shaft boots and oil seal.

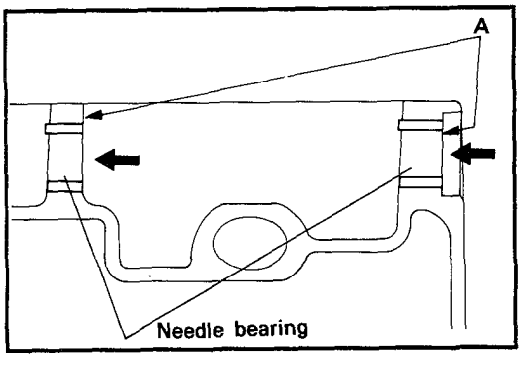


11. Remove the neutral return spring assembly, control finger, interlock plate, stopper body, neutral return spring.
12. Remove the control shaft oil seal the needle bearings.

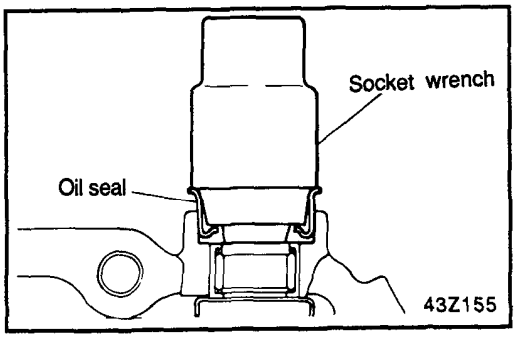


ASSEMBLY

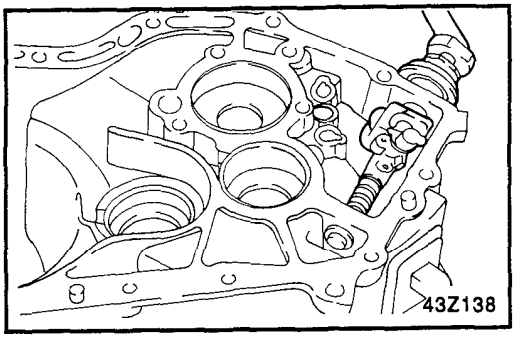
1. Install the needle bearing flush with the surface A of the clutch housing.



2 Install the control shaft oil seal using a socket wrench.



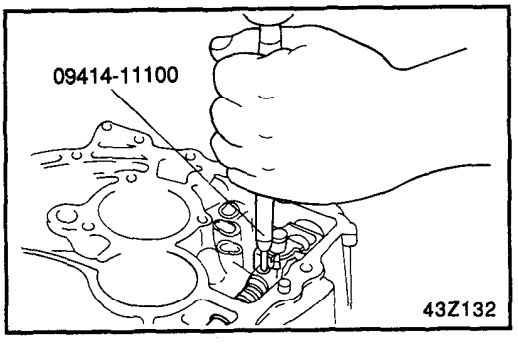
3. Install the neutral return spring assembly, control finger, interlock plate, stopper body, neutral return spring with the control shaft.

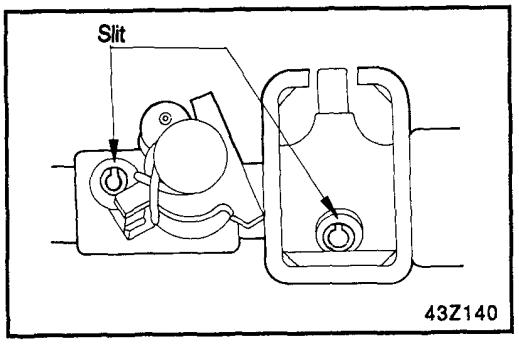


4. Install new spring pins using the special tool (09414-11100).

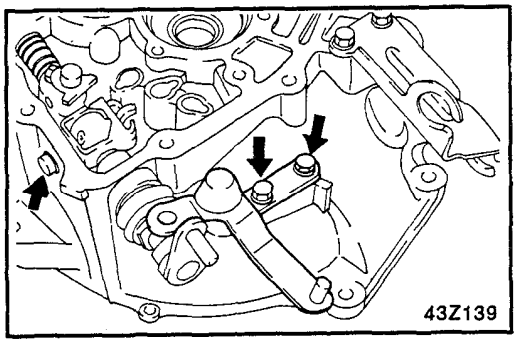
Caution

1. **Do not reuse the spring pins.**
2. **Install the spring pins with their slit at right angle to the control shaft center.**



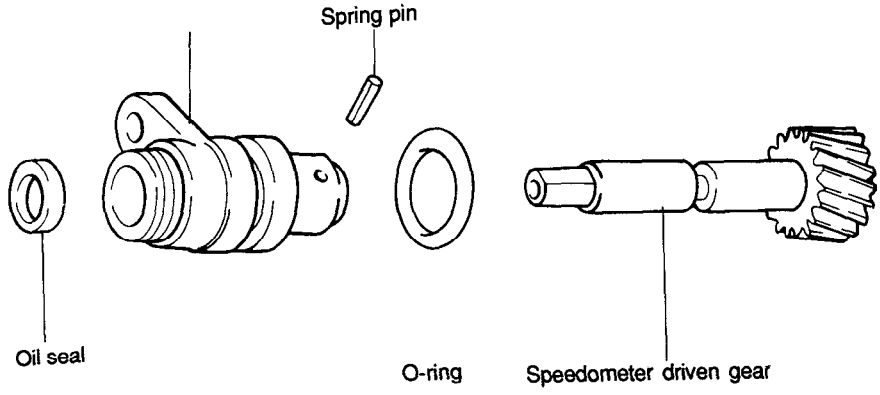


5. Install the interlock plate bolt and gasket.
6. Install the select lever assembly and select shoe.



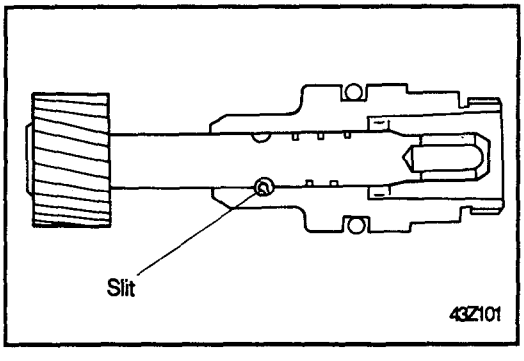
SPEEDOMETER DRIVEN GEAR ASSEMBLY

COMPONENTS



ASSEMBLY

1. Apply gear oil sparingly to the speedometer driven gear shaft and insert the shaft
2. Install the spring pin in such a way that it slit does not face the gear shaft.



BODY (INTERIOR AND EXTERIOR)

Return To Main Table of Contents

GENERAL 2
BODY PANELING 7
BODY DIMENSIONS 12
HOOD 17
GRILLE AND MOULDINGS 19
BUMPER 21
FENDER 24
WINDSHIELD 26
REAR WINDOW GLASS 30
FRONT DOOR 33
REAR DOOR 39
TRUNK LID 44
CRASH PAD 46
CONSOLE 51
INTERIOR TRIM AND HEAD LINING 53
FRONT SEAT 58
REAR SEAT 60
SEAT BELT 62
SUNROOF. 65
PASSIVE SEAT BELT (U.S.A. ONLY) 70

GENERAL

SPECIFICATIONS

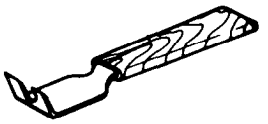
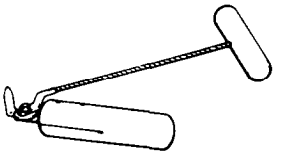
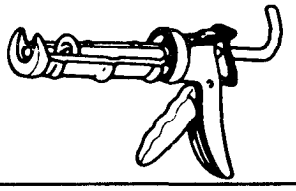
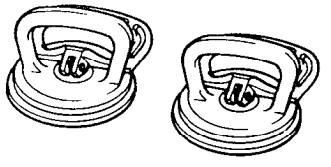
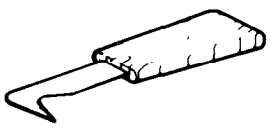
Hood		
Type		Rear hinged, front opening type
Front door		
Construction		Front hinged, full door construction
Regulator system		Wire drum type
Rear door		
Construction		Front hinged, full door construction
Regulator system		Wire drum type
Trunk lid		
Type		Torsion bar type
Glass thickness	mm (in.)	
Windshield glass		Laminated clear, tinted 5 (0.20) Laminated tinted shade band 5(0.20)
Door glass		3.2(0.13)
Rear fixed glass		3.2(0.13)
Rear window glass		4(0.16)
Distance between door upper hinge and lower hinge		Front door 325 mm (12.80 in.) Rear door 320 mm (12.6 in.)
Seat		
Front seat travel	mm (in.)	225 mm (8.9 in.)
Seat belt		
Front		W.L.R. 3 point type Passive type Adjustable type
Front seat belt anchor		
Rear		E.L.R. 3 point type with 2 point static

W.L.R. : Webbing Clamp Locking Retractor
E.L.R. : Emergency Locking Retractor

TIGHTENING TORQUE

	Nm	Kg.cm	lb.ft
Front and rear doors			
Door hinge to body	36-42	360-420	26-30
Door hinge to door	36-42	360-420	26-30
Trunk lid			
Trunk lid hinge to body	7-9	70-90	5-6.5
Trunk lid hinge to trunk lid	7-9	70-90	5-6.5
Trunk lid latch to trunk lid	7-9	70-90	5-6.5
Trunk lid striker to body	7-9	70-90	5-6.5
Hood			
Hood hinge to body	22-27	220-270	16-19.5
Hood hinge to hood	22-27	220-270	16-19.5
Hood latch to body	7-9	70-90	5-6.5
Hood striker to hood	7-9	70-90	5-6.5
Seat			
Front seat to floor, Nut	24-36	240-360	17-26
Bolt	35-55	350-550	25-40
Rear seat back to floor, Bolt	17-26	170-260	12-19
Rear seat back tilting bracket	17-26	170-260	12-19
Seat belt			
Front seat belt upper anchorage body	40-55	400-550	29-40
Front seat belt buckle	40-55	400-550	29-40
Front seat belt shoulder anchor mounting nut (Passive)	24-32	240-320	17-23
Should belt retractor mounting bolt (Passive)	9-11	90-110	5-8
Lap belt retractor mounting bolt (Passive)	23-34	230-340	17-25
Rear seat belt anchor mounting bolt	40-55	400-550	29-40

SPECIAL TOOLS

Tool (Number and Name)	Illustration	Use
09793-21000 Door hinge adjusting wrench		Adjustment, removal and installation of the door hinge
09800-21000 Ornament remover		Trim removal
09853-31000 Head lining clip remover		Removal of the head lining clip
09861-31100 Sealant cut-out tool		Cutting the sealant for the windshield glass (use with 09861-31200)
09861-31200 Sealant cutting blade		Cutting the sealant for the windshield glass (use with 09861-31100)
09861-31300 Sealant gun		Application of the sealant to the windshield glass 09861-31400
Glass holder Removal and installation of		the windshield glass
09861-31000 Windshield glass moulding remover		Removal of windshield glass moulding

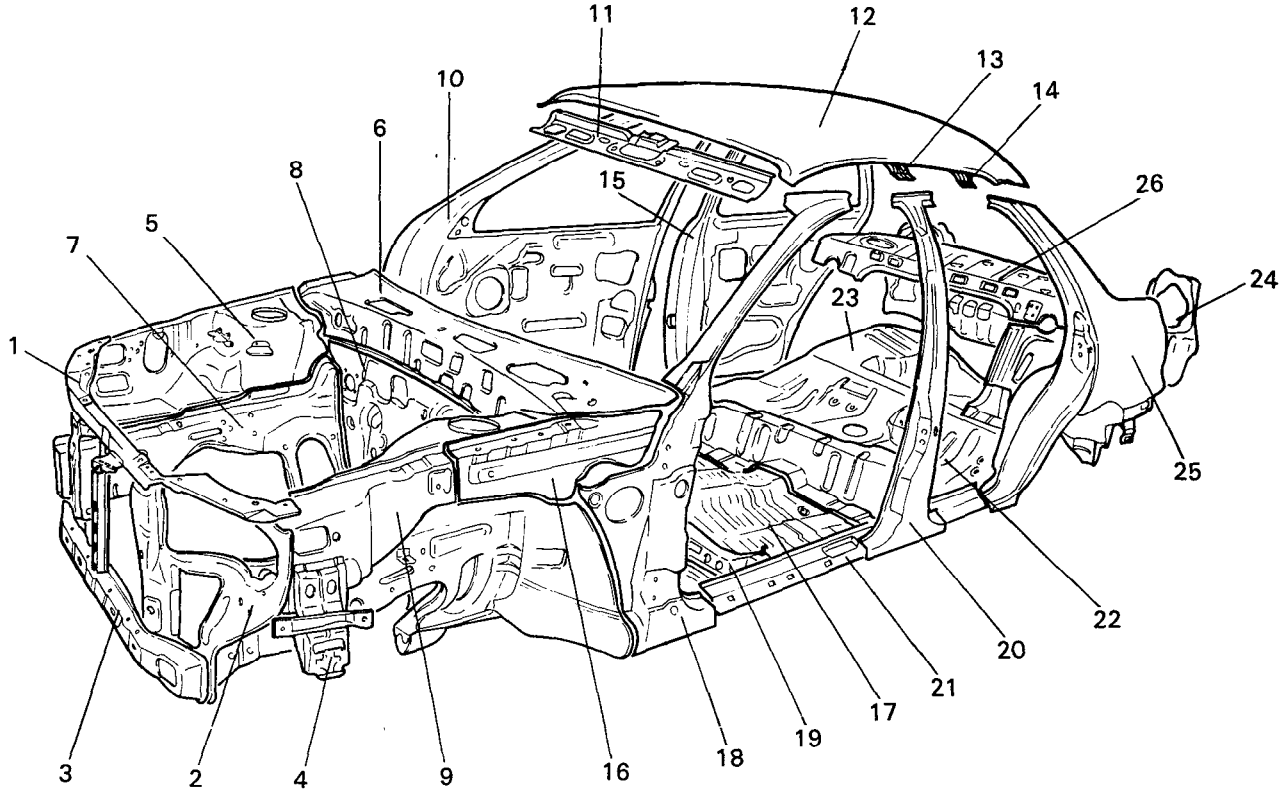
TROUBLESHOOTING

Symptom	Probable cause	Remedy
Sunroof Water leaks	Dust accumulated in drainage of housing assembly Clogged drain pipe Broken or dislocated drain pipe, defective or cracked clip Deteriorated roof lid weatherstrip Excessive roof lid-to-body clearance and improperly fitted weatherstrip	Clear dust from inside of drain pipe Blow air into drain pipe to remove dust Check pipe installation and flange contact Replace Adjust
Wind noise	Loose or deformed deflector	Retighten or replace
Roof lid makes noise when moved	Foreign matter lodged in guide rail Loose guide rails and lid	Check drive cable and guide rails for foreign matter Retighten
Motor runs but lid does not move or moves only halfway	Foreign matter lodged in guide rail Incorrect engagement of motor pinion with drive cable Decrease in clutch slipping force of motor Increased lid sliding resistance or interference of lid with drive cables, weatherstrip, etc. due to maladjustment of lid	Check drive cable and guide rails for foreign matter Check for loose motor installation and damaged pinion Adjust Adjust or replace
Noise in motor (Clutch slipping noise made in motor when lid is fully opened or closed is not unusual noise.)	Incorrect engagement of motor pinion with drive cable Worn or damaged motor pinion bearing Worn or deformed drive cable	Check pinion installation and retighten motor Replace motor assembly Replace
Door glass fails to operate up and down	Incorrect window glass installation Damaged or faulty regulator arm or regulator	Adjust position Correct or replace
Door does not open or close completely	Incorrect door installation Defective door check Door hinge required grease	Adjust position Correct or replace Apply grease
Hood does not open or close completely	Striker and latch not properly aligned Incorrectly installed hood Incorrect hood bumper height	Adjust Adjust Adjust
Door hard to open	Incorrect latch or striker adjustment	Adjust
Water leak through windshield and rear window	Defective seal Defective body flange	Fill sealant Correct

Symptom	Probable cause	Remedy
Wind noise around door	Weatherstrip not holding firmly	Adjust fit of door
	Improperly installed weatherstrip or setting of weatherstrip	Repair or replace
	Improperly closed door	Adjust
	Improperly fit door	Adjust
	Improper clearance between door glass and division channel	Adjust
	Deformed door	Repair or replace

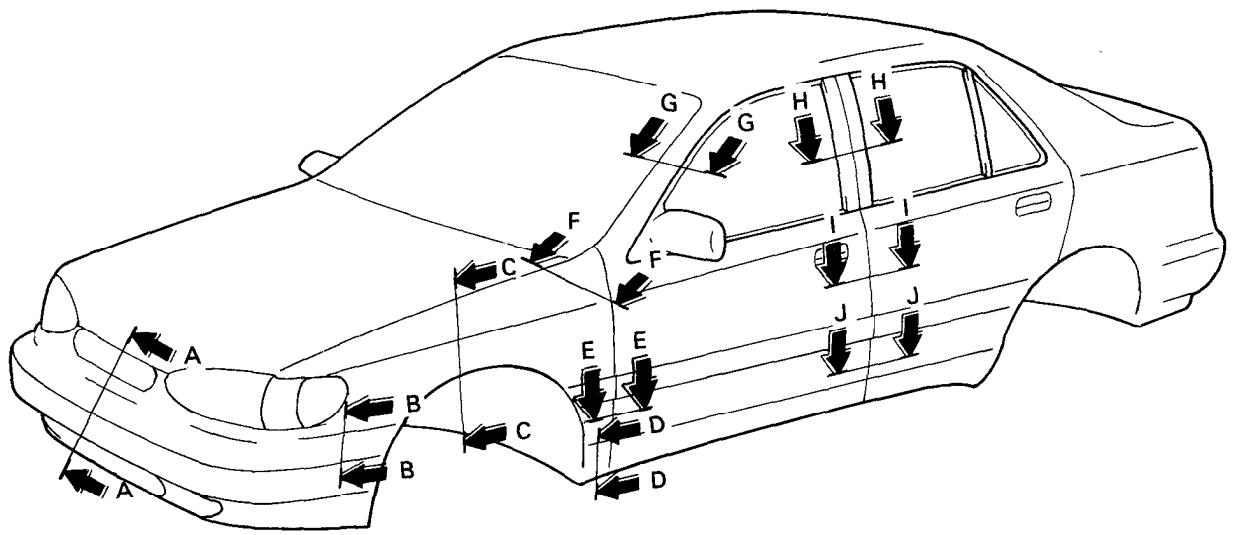
BODY PANELING

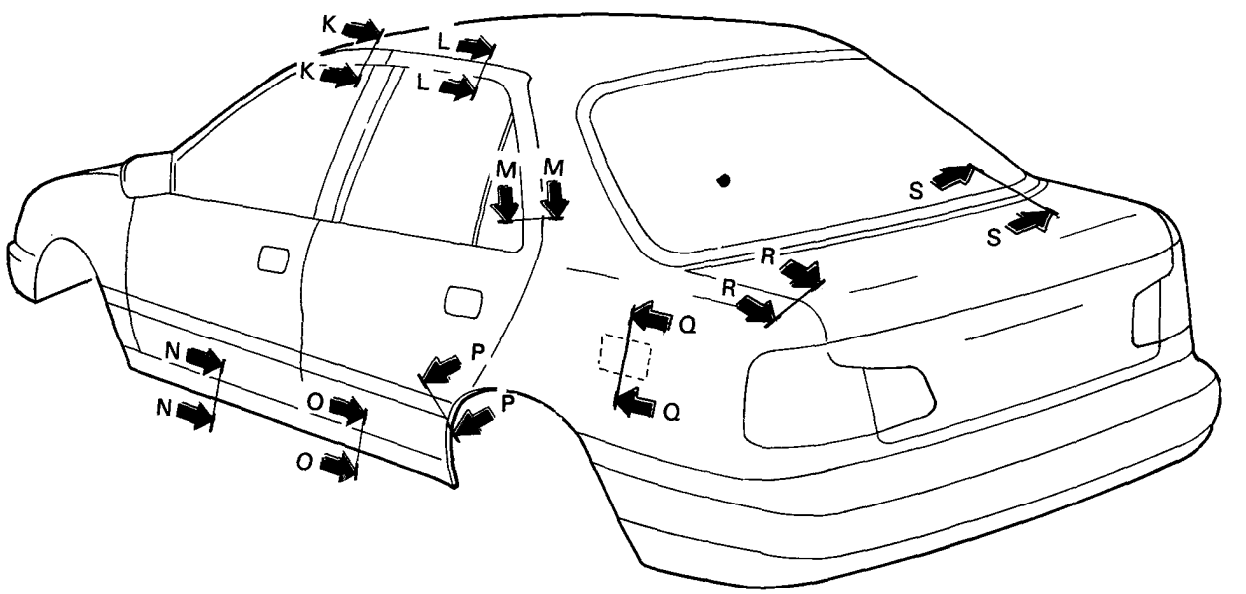
COMPONENTS

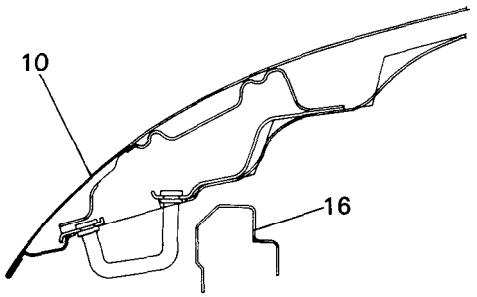


1. Member assy, radiator support upper
2. Panel assy, radiator support
3. Member assy, radiator support lower
4. Bracket assy, front bumper mounting
5. Panel assy, shock absorber housing
6. Panel assy, cowl top
7. Member assy, front side
8. Panel assy, dash
9. Panel assy, fender apron upper outer
10. Panel assy, front door
11. Rail assy, roof front
12. Panel assy, roof
13. Rail assy, roof center
14. Rail assy, roof rear
15. Panel assy, rear door
16. Panel assy, cowl side outer upper
17. Panel assy, center floor
18. Panel assy, front filler
19. Member assy, front seat cross
20. Panel assy, center filler
21. Panel assy, side sill outer
22. Panel assy, interm floor
23. Panel assy, rear floor
24. Panel assy, back
25. Panel assy, quarter outer
26. Panel assy, rear packagetray

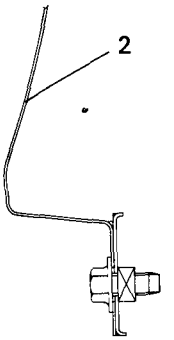
CROSS SECTIONAL VIEWS







SECTION A-A



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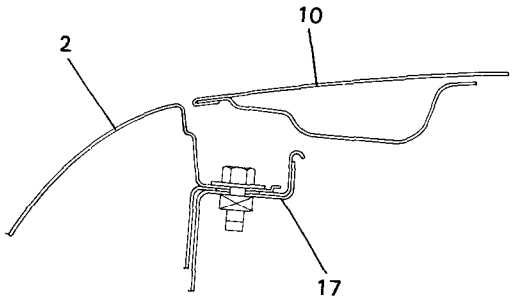
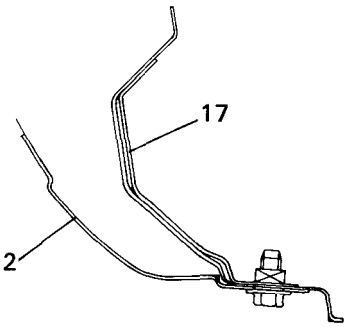


SECTION C-C



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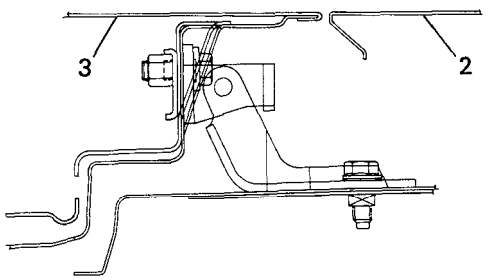
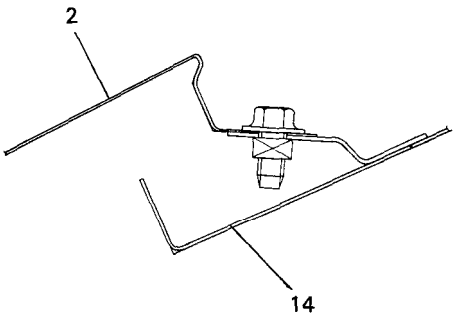
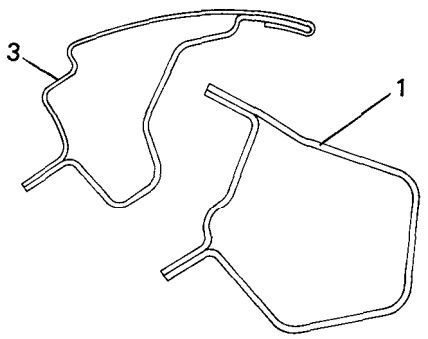


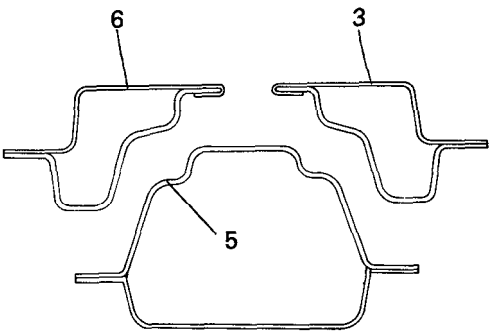
SECTION E-E



SECTION F-F



SECTION G-G



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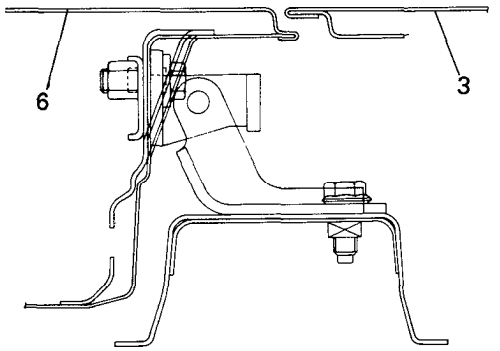
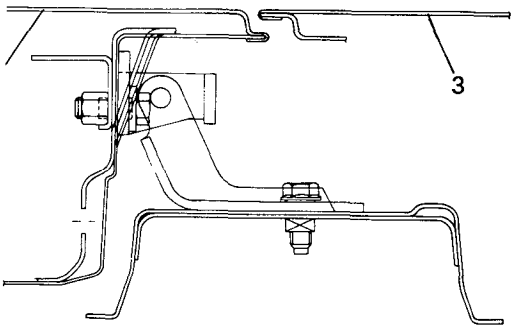


SECTION I-I



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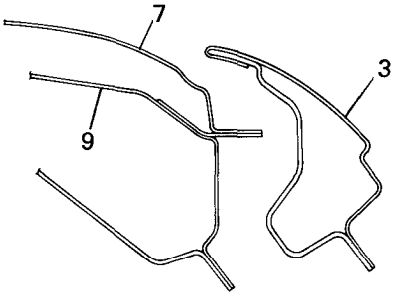
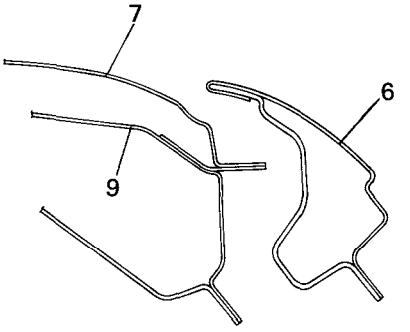
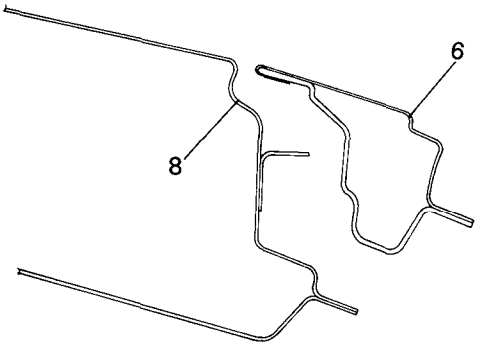


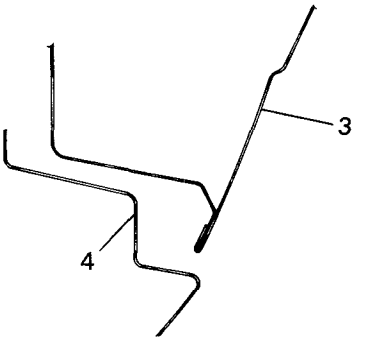
SECTION K-K



SECTION L-L



SECTION M-M



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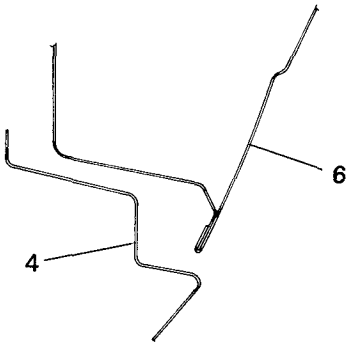
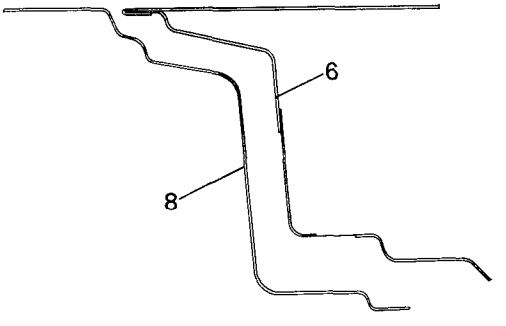
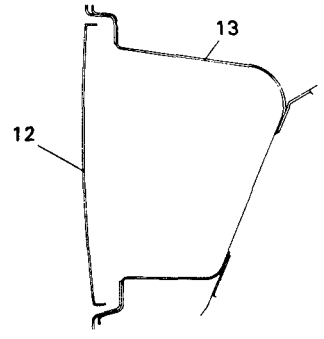


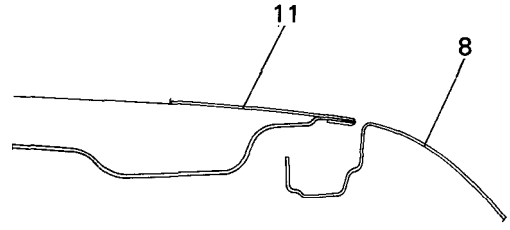
SECTION O-O



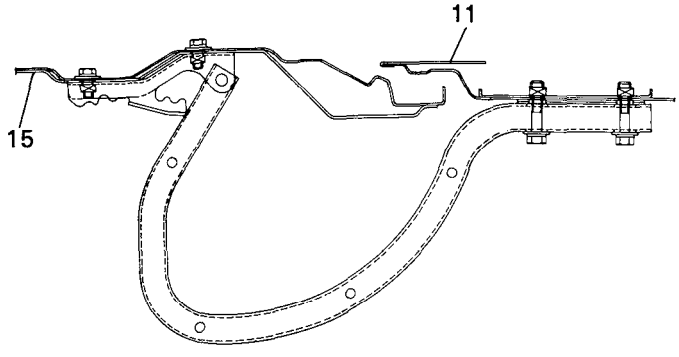
SECTION P-P



SECTION Q-Q



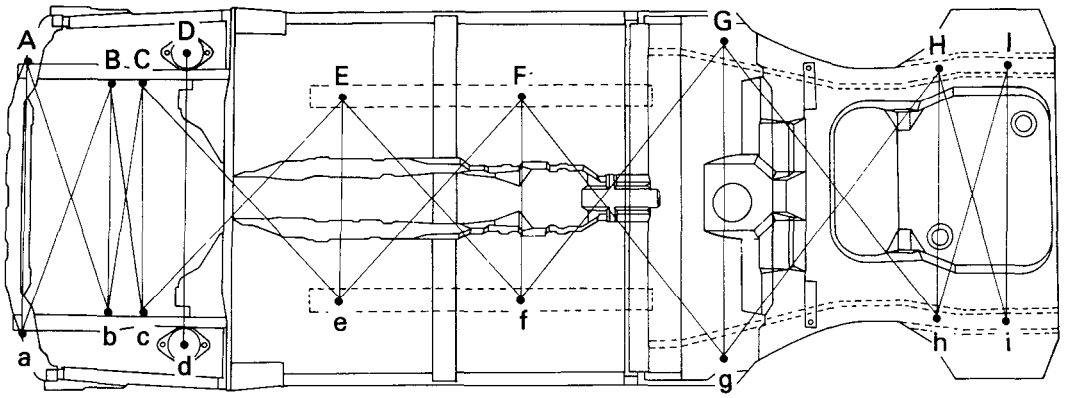
SECTION R-R



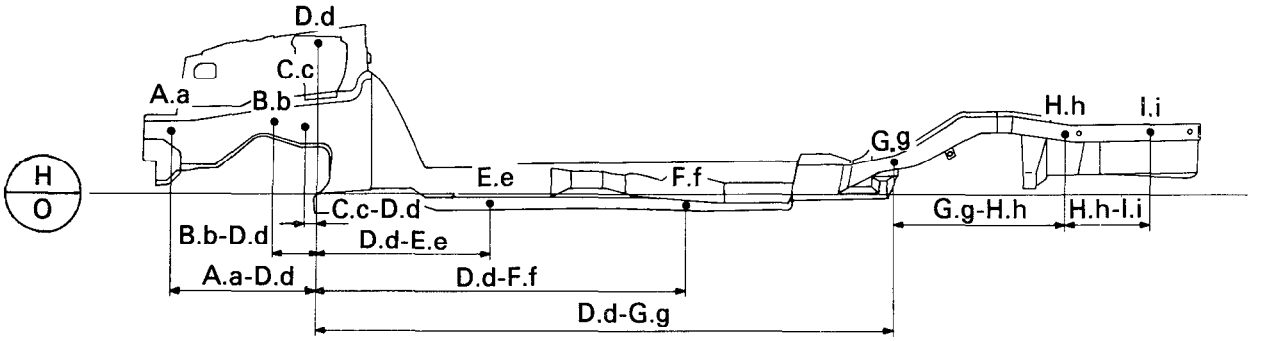
SECTION S-S

1. Front pillar
2 Fender panel
3. Front door panel
4. Side sill outer panel
5. Center pillar
6. Rear door panel
7. Roof panel
8. Quarter outer panel
9. Roof side outer upper rail
10. Hood panel
11. Trunk lid
12. Fuel filler door
13. Fuel filler housing
14. Cowl inner lower panel
15. Package tray panel
16. Radiator upper support member
17. Fender apron panel

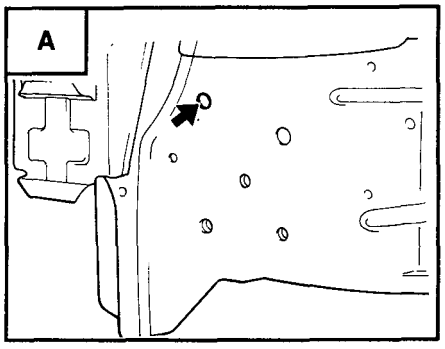
UNDER BODY



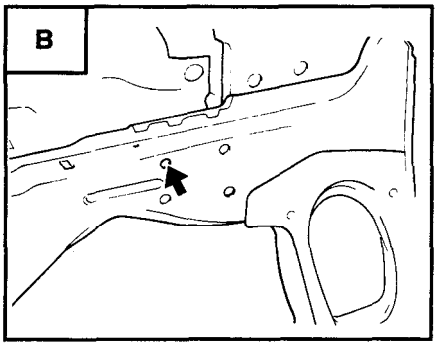
SIDE BODY



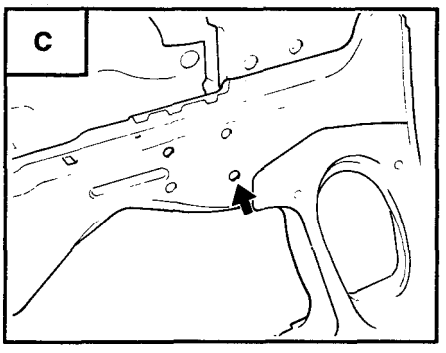
Point Symbol	A-a	B-b	C-c	D-d	E-e	F-f	G-g	H-h
Length (mm)	1001.8	889.6	878	1084	754	754	1080	858
Point Symbol	I-i	A-b	B-a	G-e	E-f	F-g	G-h	H-i
Length (mm)	1020	939.75	1060	1098.66	1264.46	1063.28	1162.16	994.05
Point Symbol	A-a	B,b	C,c	D,d	E,e	F,f	G,g	H,h
Length (mm)	231	296	270	572	-55	-67	142	210
Point Symbol	I,i	A,a-D,d	B,B-D,d	C,c-D,d	D,d-E,e	D,d-F,f	D,d-G,g	G,g-H,h
Length (mm)	198	661.5	186.5	36.5	623.5	1638.5	2134.5	2772.5
Point Symbol	H,h-I,i							
Length (mm)	3098.5							



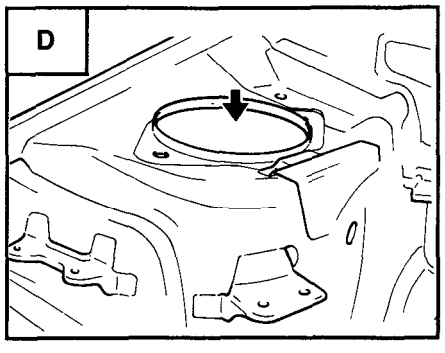
Front bumper mounting hole
(Ø14)



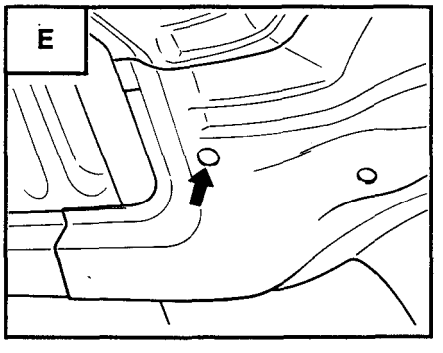
T/M mounting hole
(Ø12)



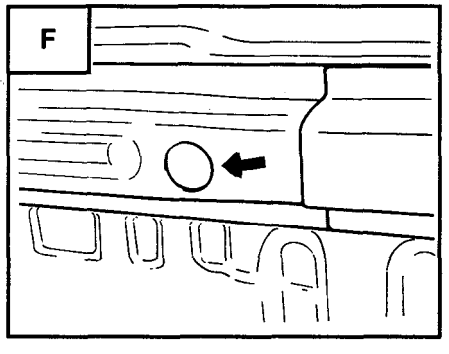
Point drain hole
(Ø15)



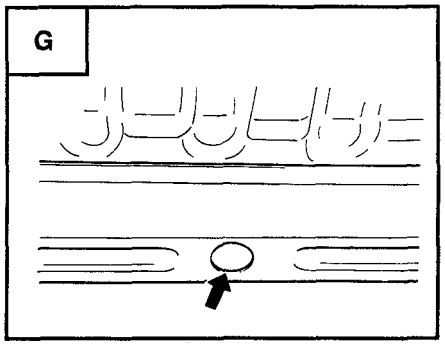
Front strut hole
(R 57)



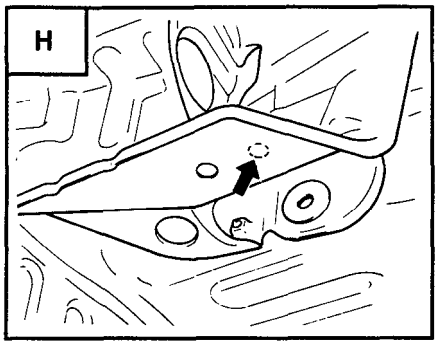
Toolg mounting
(Ø30)



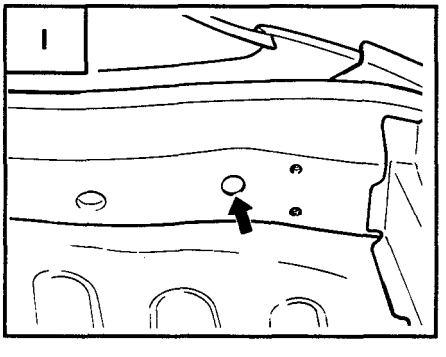
Paint drain hole
(Ø12)



Paint drain hole
(Ø20)

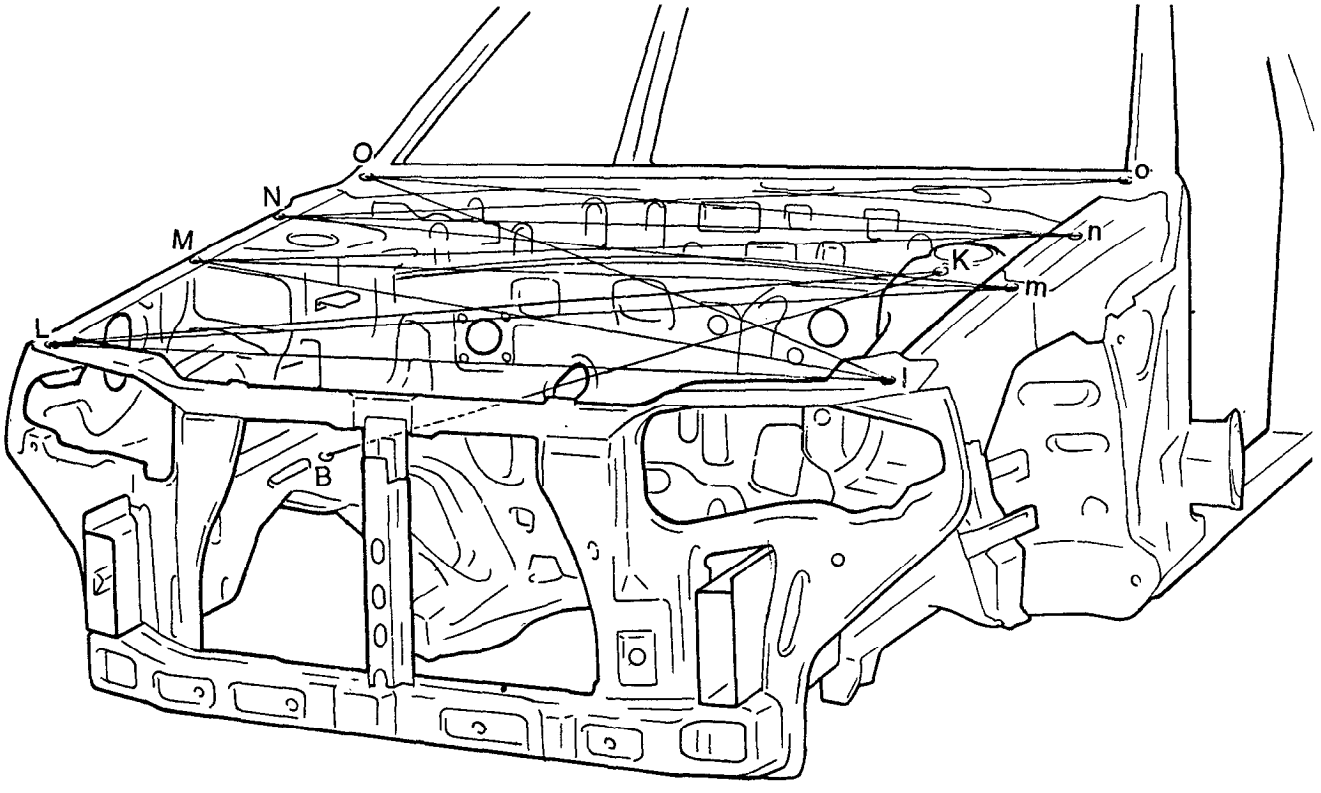


Muffler hanger mounting hole
(Ø12)

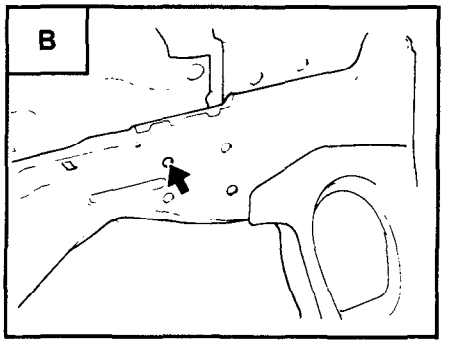


Rear bumber mounting hole
(Ø16)

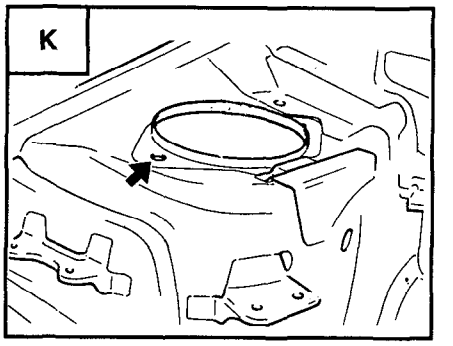
ENGINE COMPARTMENT



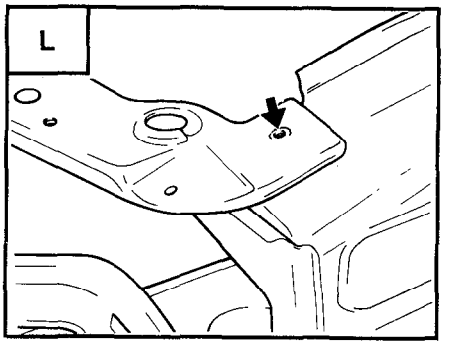
Point Symbol	L-l	M-m	N-n	O-o	L-m	M-n
Length (mm)	1288	1327	1362	1320	1349.25	1380.34
Point Symbol	N-o	O-l	K-B			
Length (mm)	1356.26	1564.4	675.40			



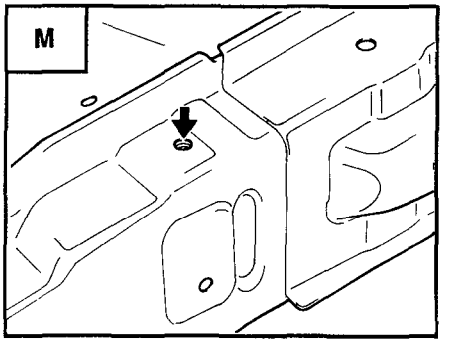
T/M mounting hole
(0 14)



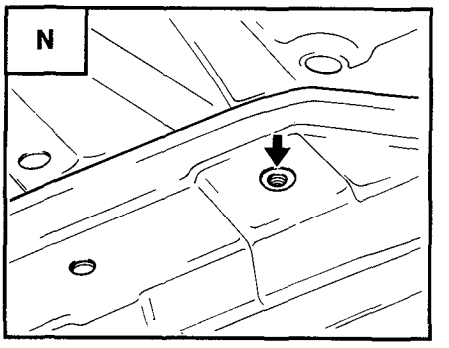
Shock absorber mounting hole
(Ø11)



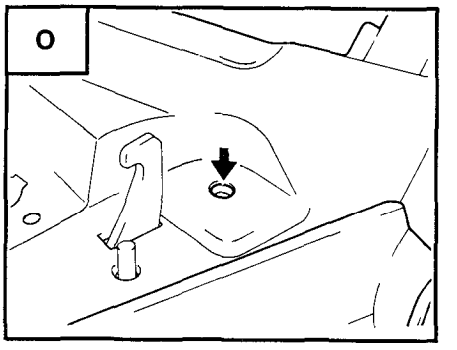
Fender mounting hole
(Ø10)



Fender mounting hole
(Ø6.6)

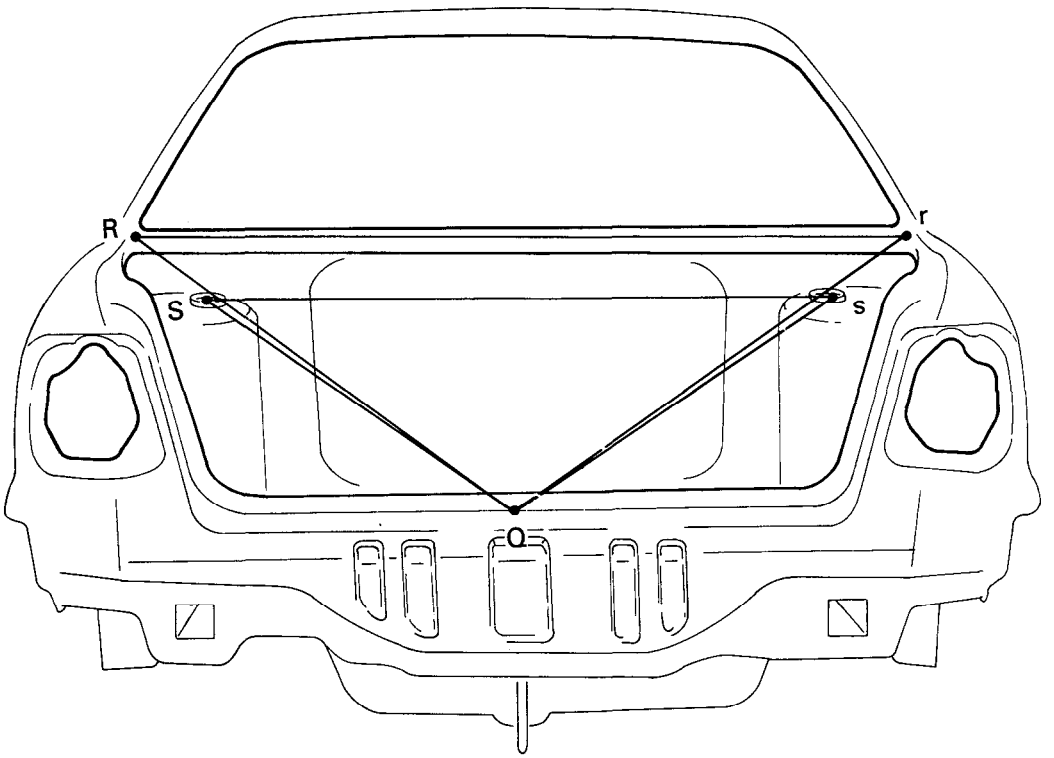


Fender mounting hole
(Ø9)

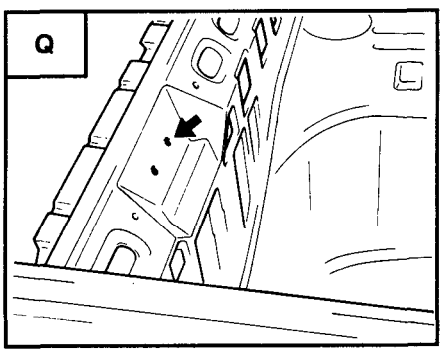


Hood hinge mounting hole
(Ø12)

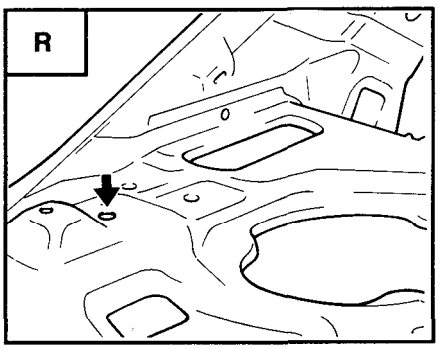
LUGGAGE COMPARTMENT



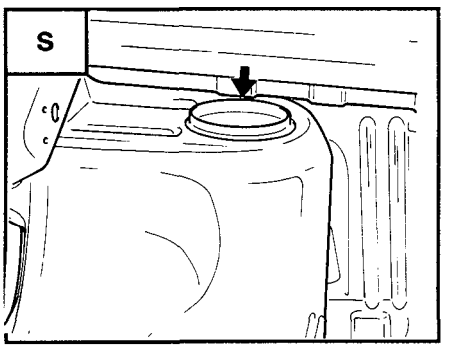
Point Symbol	R-r	s-s	Q-r	Q-S	Q-r	Q-S
Length (mm)	1138	1086	743.68	896.04	775.-15	926.11



Trunk lid striker mounting hole
(Ø9)



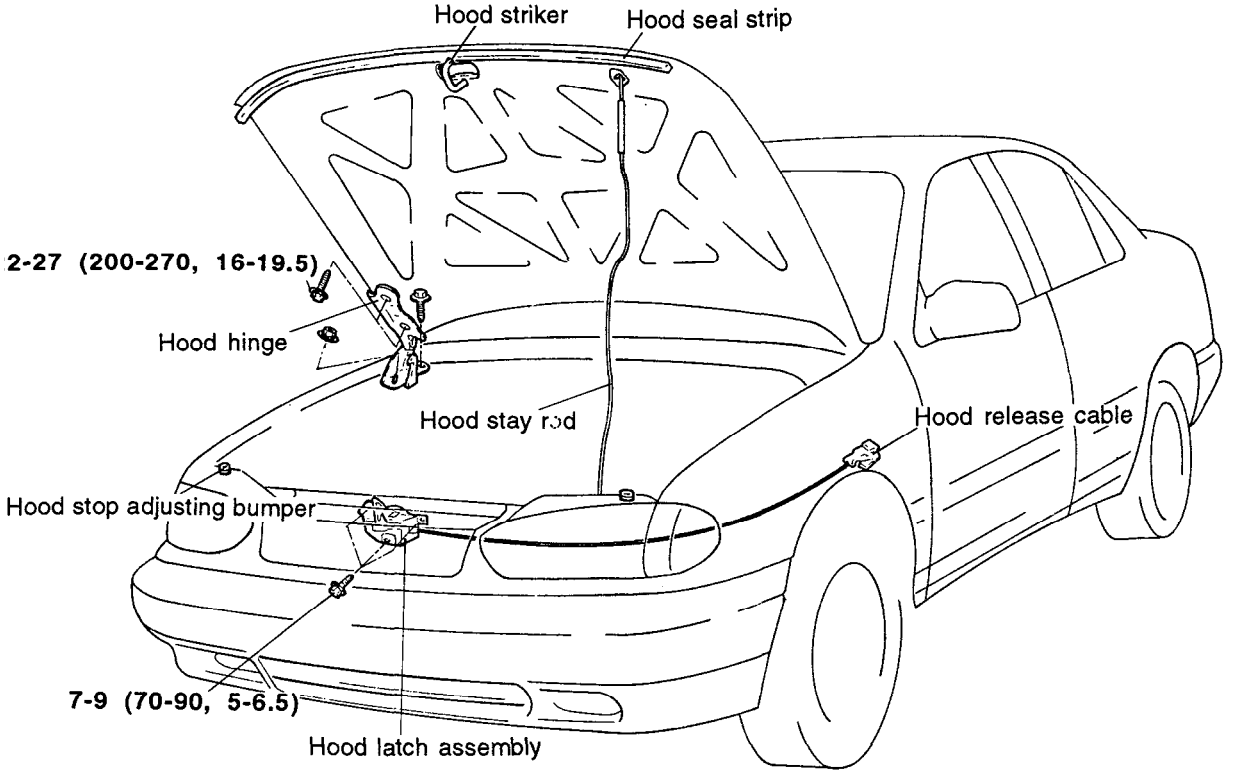
Trunk lid hinge mounting hole
(Ø9)



Rear strut mounting hole
(Ø84)

HOOD

COMPONENTS

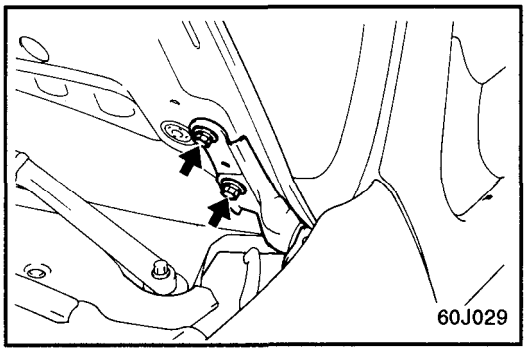


TORQUE : Nm (kg.cm, lb.ft)

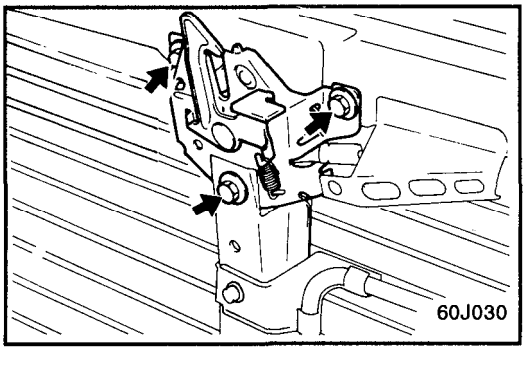
REMOVAL

1. Remove the hood mounting bolts, and then remove the hood.

CAUTION
Protect the front body area with a cloth so as not to cause damage with the hood.



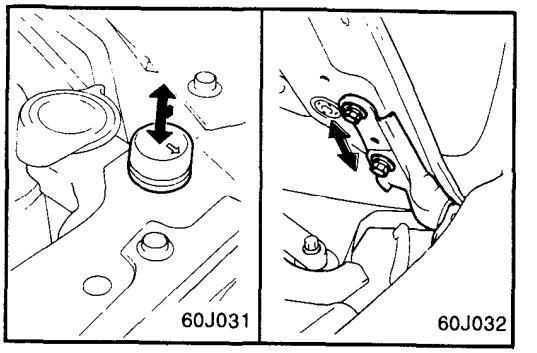
2. Remove the hood lock.
3. Remove the hood cable by opening the clip.
4. Loosen the cable holder screws.
5. Pull the cable nut to the cab side.



ADJUSTMENT

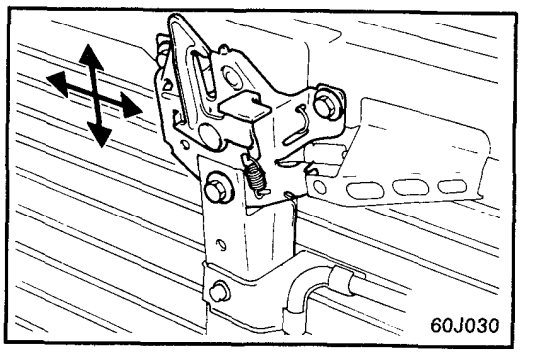
Hood Hinge

1. Loosen the hood hinge mounting bolt.
2. Adjust the longitudinal and lateral positions of the hood by utilizing the oblong holes in the hinge.
3. Adjust front edge of hood in vertical direction by adjusting the hood stop adjusting bumpers.



Hood Latch

1. Loosen the hood lock mounting bolts.
2. Adjust the alignment of the hood latch by adjusting the longitudinal and lateral position of the lock, and by adjusting the height of the hood.

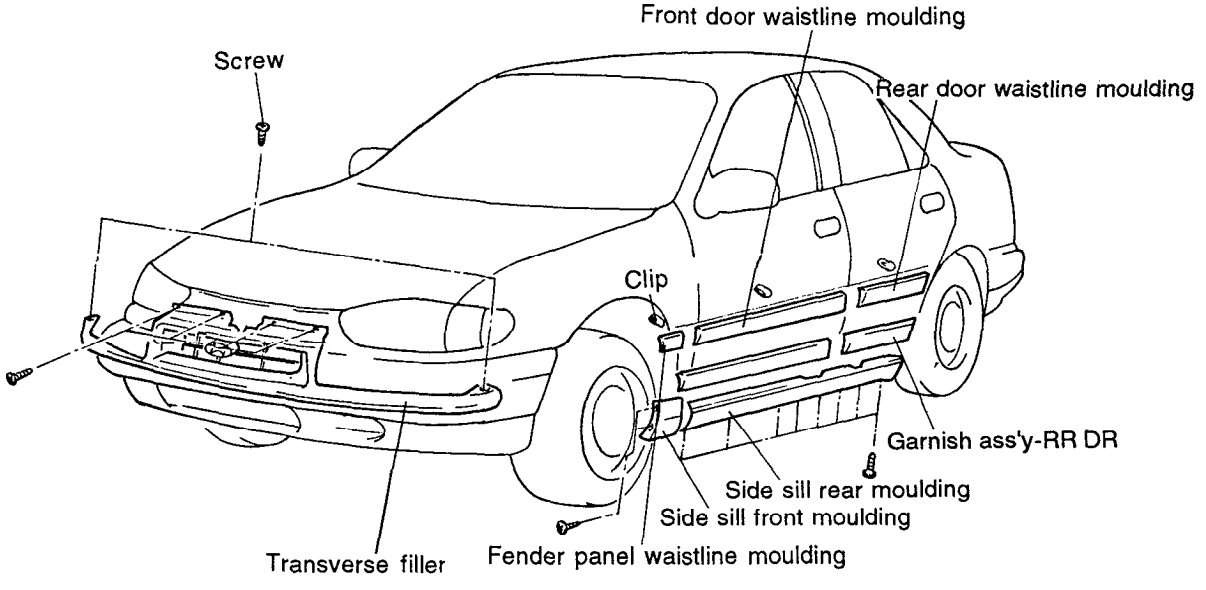


INSTALLATION

1. Installation is the reverse of the removal procedure.

GRILLE AND MOULDING

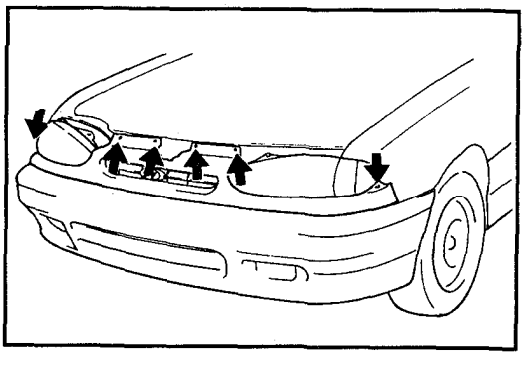
COMPONENTS



REMOVAL

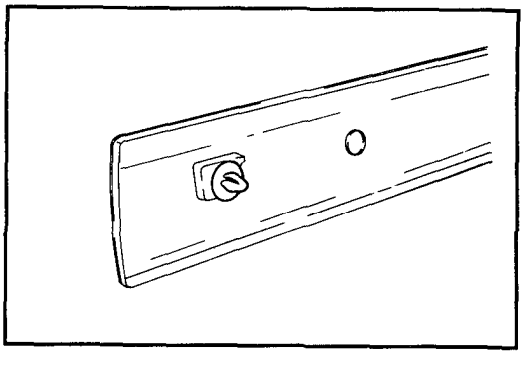
Transverse filler

1. Remove the turn signal lamp
2. Unscrew tapping screws and remove the transverse filler.



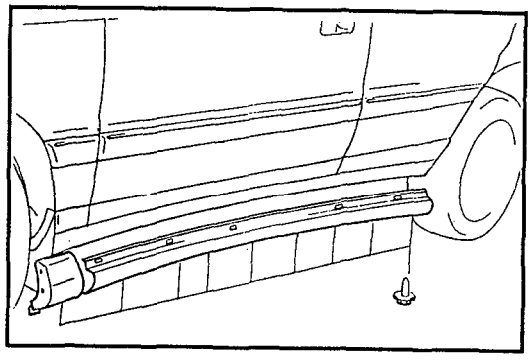
Waistline Moulding

1. Beginning from either end, remove the waistline moulding from fender panel, front and rear doors.



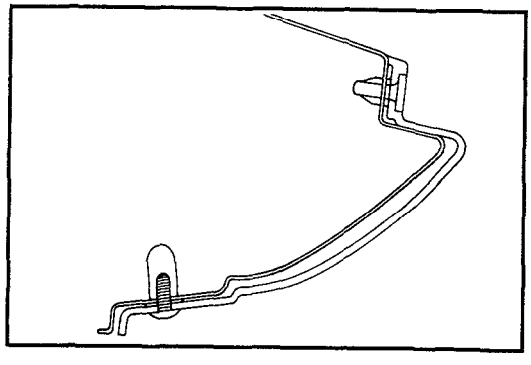
Side Sill Moulding

After removal of the mud guard, remove the side sill moulding.



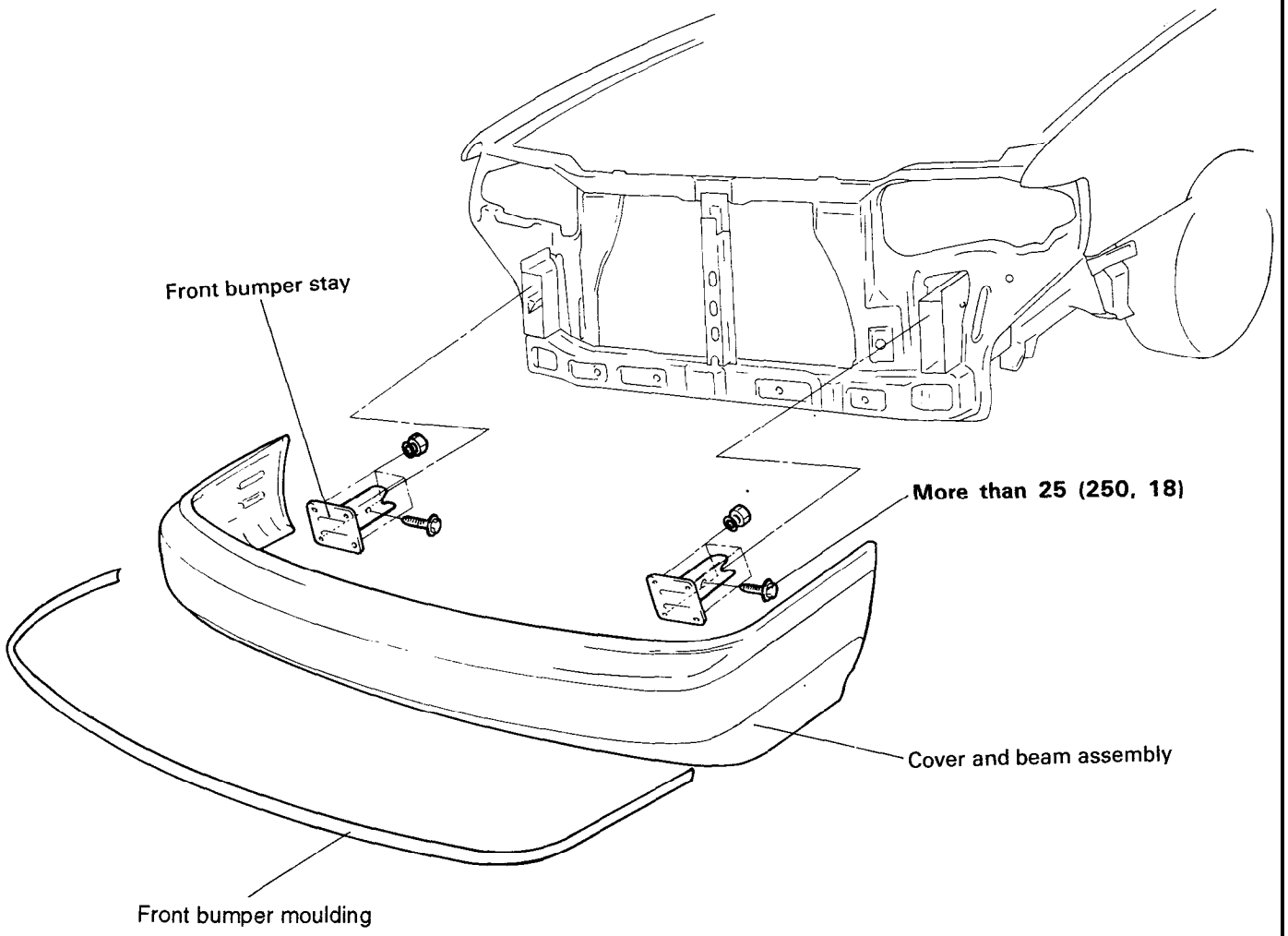
INSTALLATION

Clean the surfaces of the body to which adhesive will be applied by using a wax and grease remover.



FRONT BUMPER

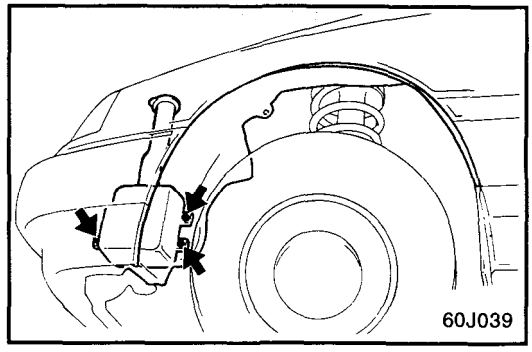
COMPONENTS



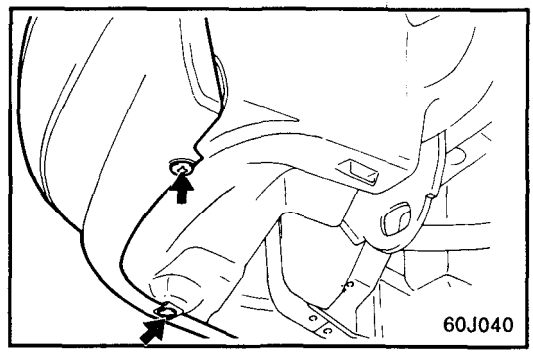
TORQUE : Nm (kg-cm, lb.ft)

REMOVAL

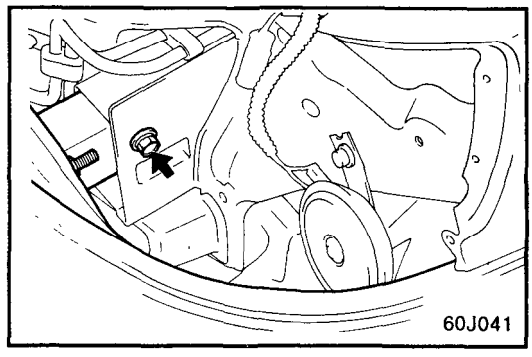
1. Remove the front wheel guard and reservoir tank.



2. Remove the mounting bolts from the lower side of front bumper cover.



3. Remove the bumper stay-to-body bolts and remove the front bumper.

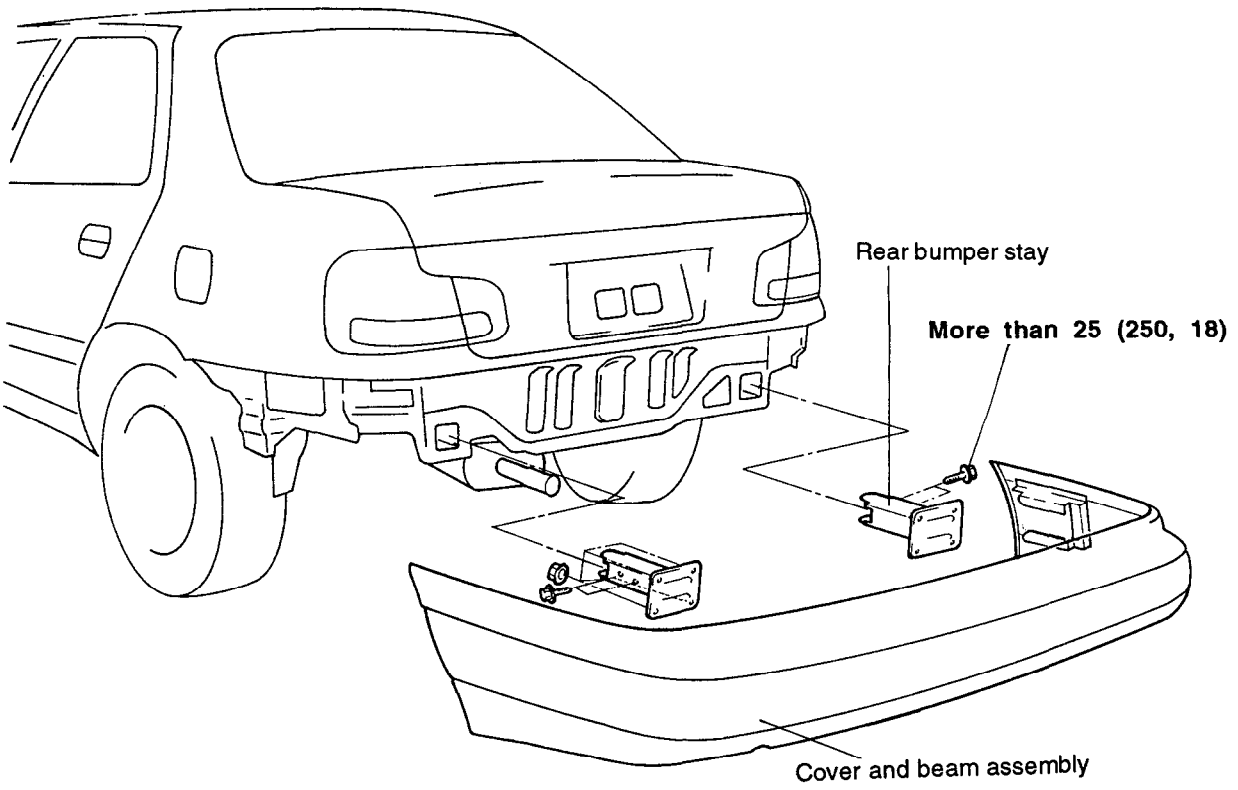


INSTALLATION

1. Installation is the reverse of the removal procedure.

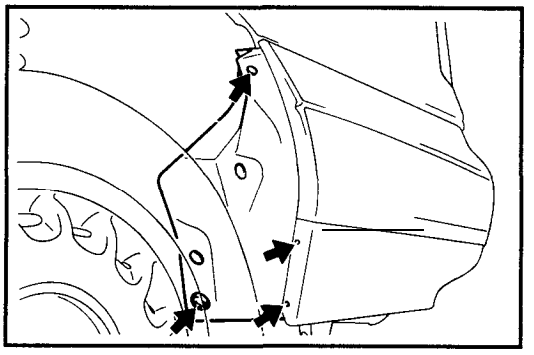
REAR BUMPER

COMPONENTS

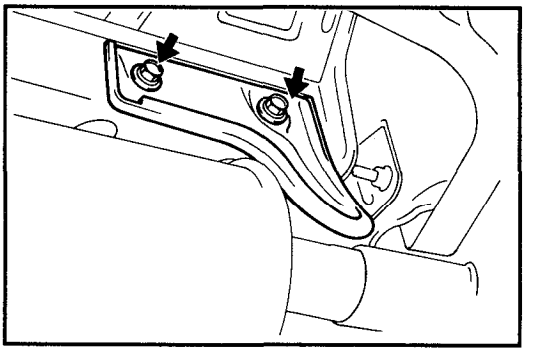


REMOVAL

1. Remove the mud guard and the wheel guard.

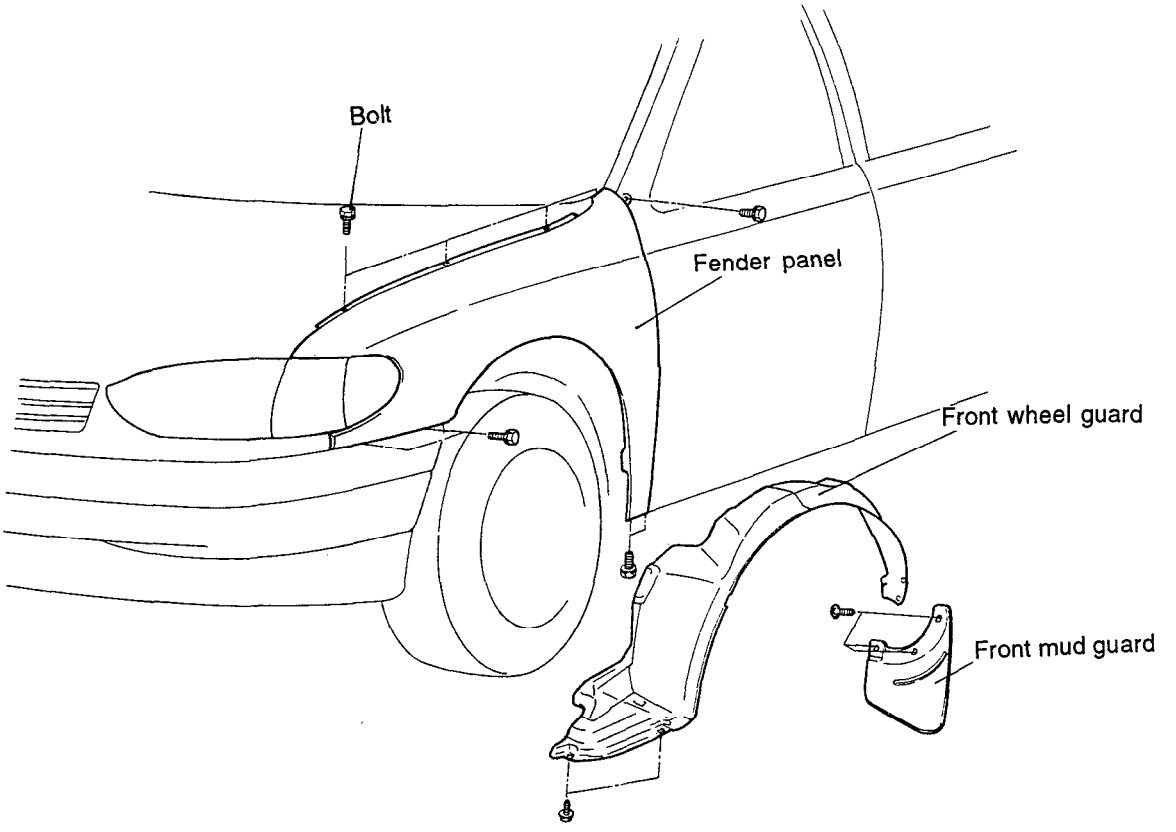


2 Remove the bumper stay-to-body bolts.



FENDER

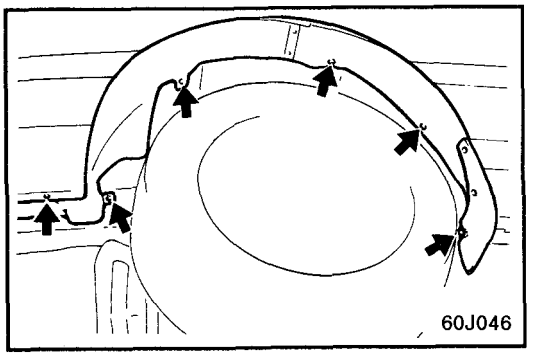
COMPONENTS



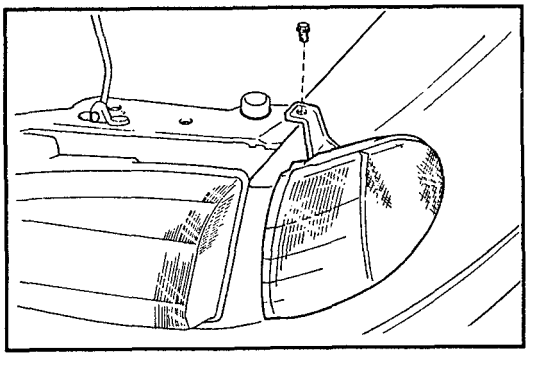
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Remove the mud guard and wheel guard by loosening the screws.

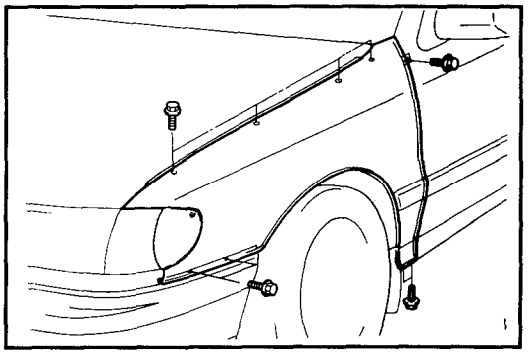


2 Disconnect the front turn signal lamp connector.
3. Remove the front turn signal lamp.



4. Remove the fender mounting bolts.

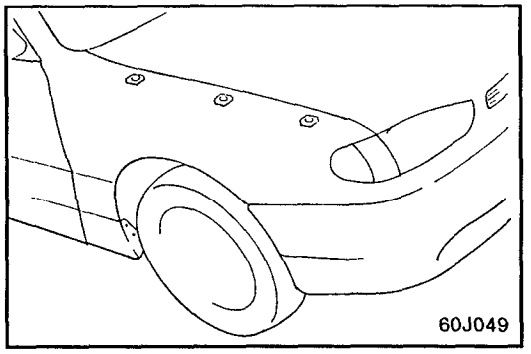
CAUTION
Use care to avoid damaging the paint.



INSTALLATION

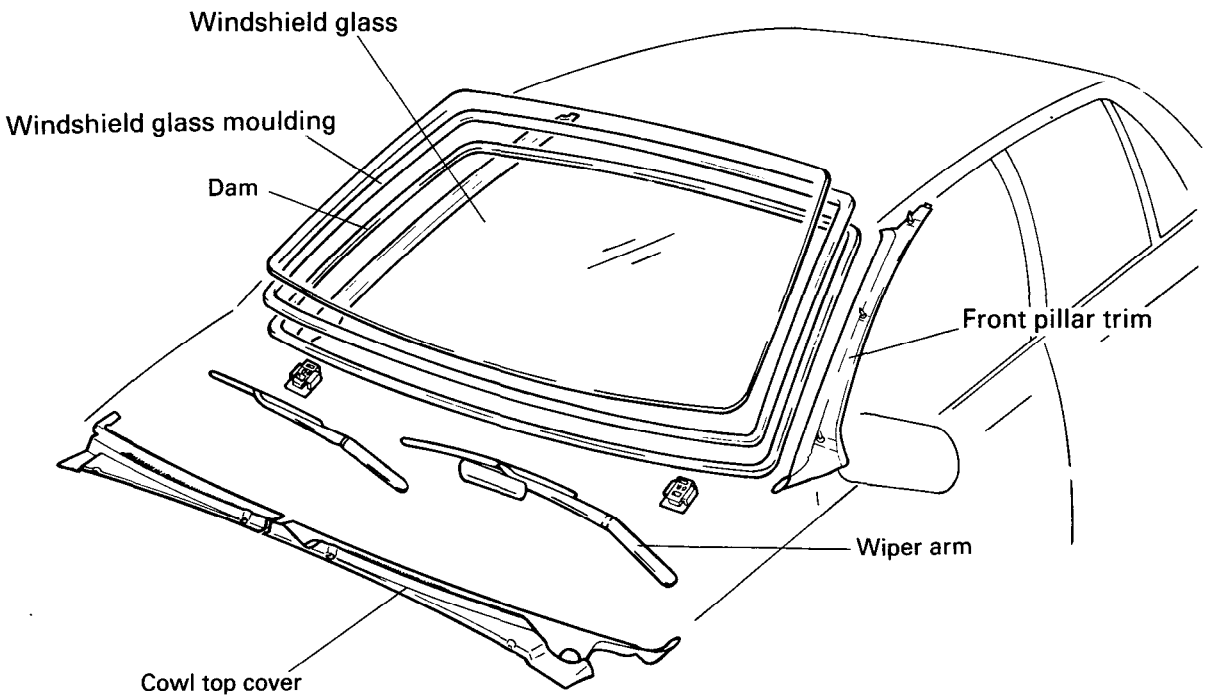
1. Installation is the reverse of the removal procedure.

NOTE
In order to prevent the fender mounting bolt area from forming rust, apply tape sealer between the fender and the body panel.



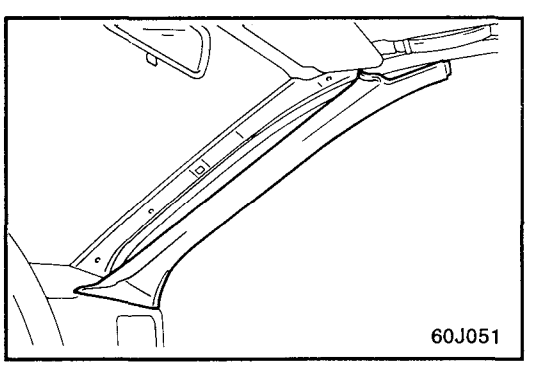
WINDSHIELD

COMPONENTS



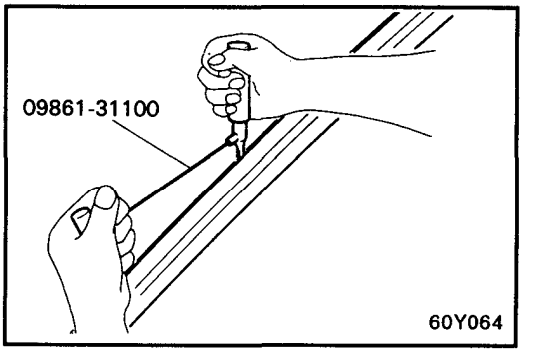
REMOVAL

1. Pry out the clips by your hand.
2 Remove the front pillar garnish.



3. To remove the windshield, first remove the following parts:
   1) Inside rear view mirror and piller trims.
   2) Wiper arms.
   3) Cowl top cover.

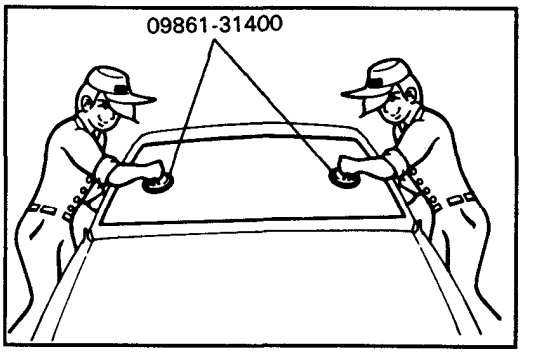
4. Use the special tool (09861-31100) to cut throught the wind shield sealant.



5. Make mating marks on the glass and body if the glass is to be reinstalled.

NOTE
Use chalk or equivalent to make mating marks on the glass and body.

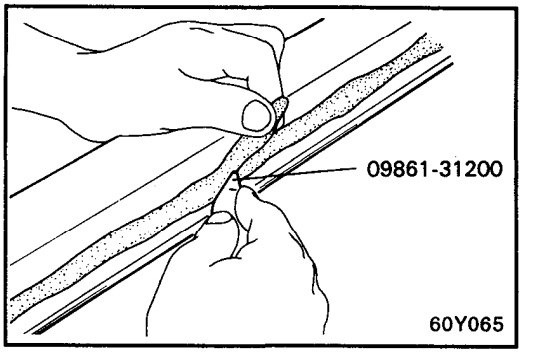
6. Take out the windshield glass with special tool, Glass Holder.



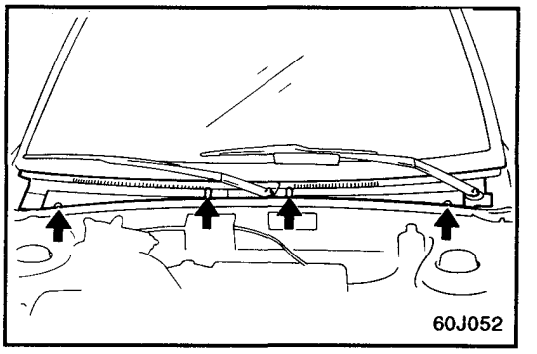
INSTALLATION

1. Using a cutter knife or the special tool, scrape the old sealant smoothly to a thickness of about 2 mm on the bonding surface around the entire windshield flange.

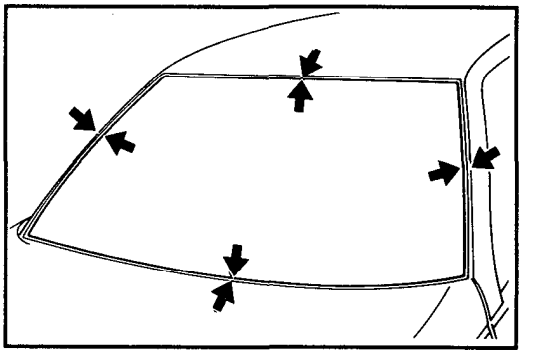
CAUTION
Be careful not to remove more adhesive than necessary, and also not to damage the paintwork on the body surface with the knife. If the paintwork is damaged, repair the damaged area with touch-up paint.



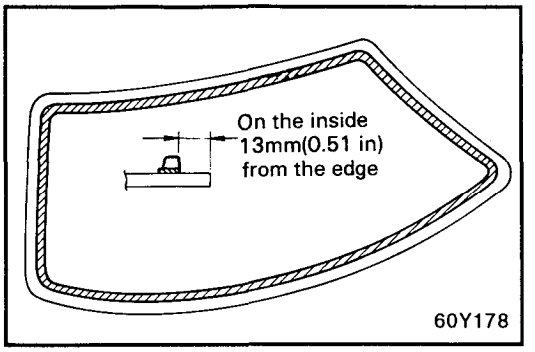
2. Clean the body bonding surface with a sponge dampened in alcohol or wax and grease remover.
3. Install the cowl top cover mounting retainers at the locations as shown in illustration.



4. Center a new windshield in the opening.
Mark the location by scribing lines across the glass and body with a grease pencil at the four points as shown.

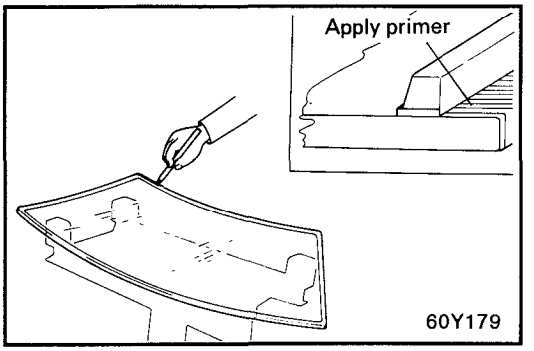


5. Glue the rubber dam to the inside surface of the windshield around the entire edge as shown, to contain the sealant during installation.

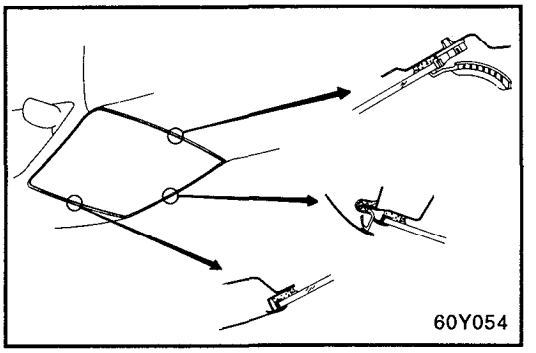


6. Apply a light coat of glass primer to the outside of the dam.

NOTE
1) Do not apply body primer to the glass.
2) Never touch the primed surfaces with your hand. If you do, the adhesive may not bond to the glass properly, causing a leak after the windshield is installed.
3) Keep water, dust, and abrasive materials away from the primed surface.

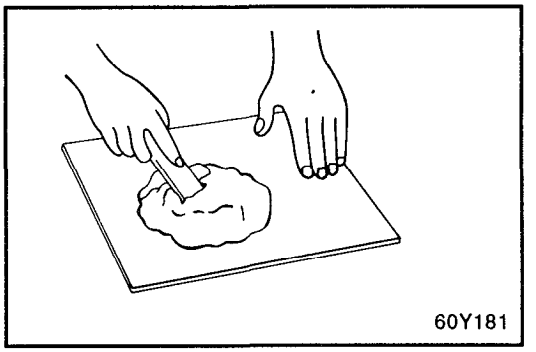


7. Apply a light coat of body primer to the original sealant remaining around the window opening flange. The glass should be installed 10 minutes after you apply the primer.



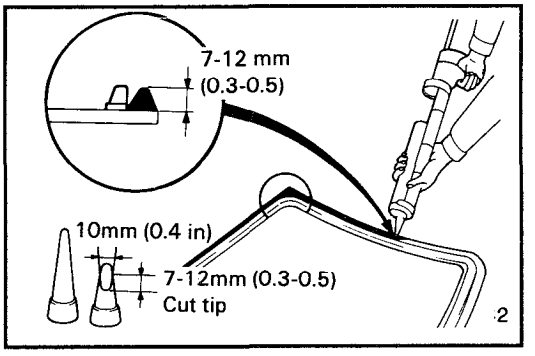
8. Thoroughly mix all the sealant and hardener together on a glass or metal plate with a putty knife.

NOTE
1. Clean the plate with a sponge and alcohol before mixing.
2. Follow the instructions that come with the sealant.

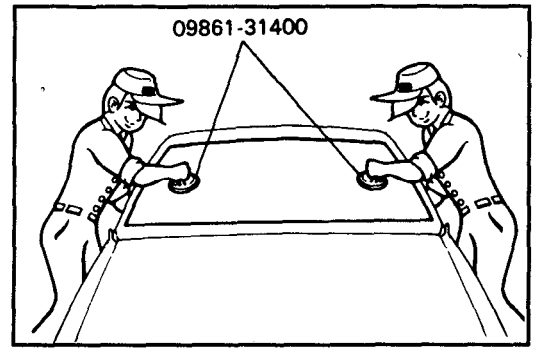


9. Pack adhesive into the cartridge aroiding air pockets, to ensure continuous delivery. Put the cartridge in a caulking gun or Sealant gun, and run a bead of adhesive around the edge of the glass as shown.

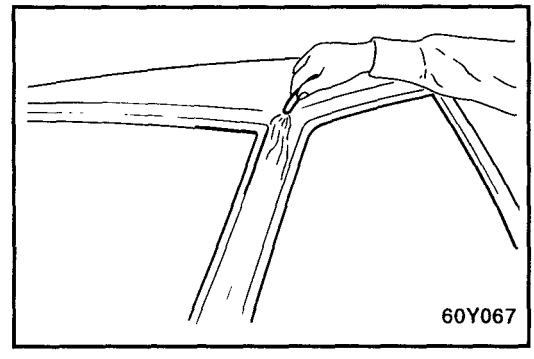
NOTE
Apply the adhesive within 5 minutes after applying the glass primer.



10. Use suction cups or special tool (09861-31300) lower the glass over the opening align it with the marks made in step 4 and set it down on the sealant, insert two lower spacers to prevent the windshield from moving downward.
11. Scrape or wipe excess adhesive off with putty knife or gauze. Full all cavities around the windshield.



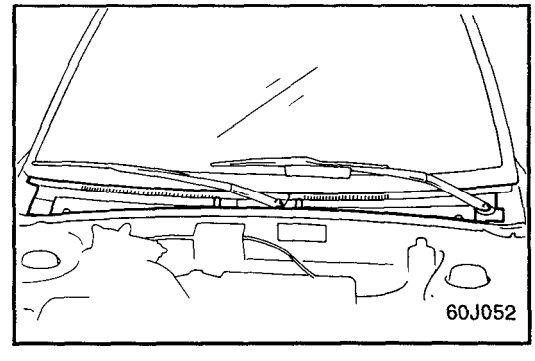
12. Perform the water-test for the windshield.
    Use a cold water spray, being careful not to direct a powerful stream of water on the new adhesive material. Allow water to spill over the edges of the glass.
13. If there are leaks, apply sealant at the leak points.



14. Install the cowl top cover.
    Reinstall the front pillar trims and wiper arms.

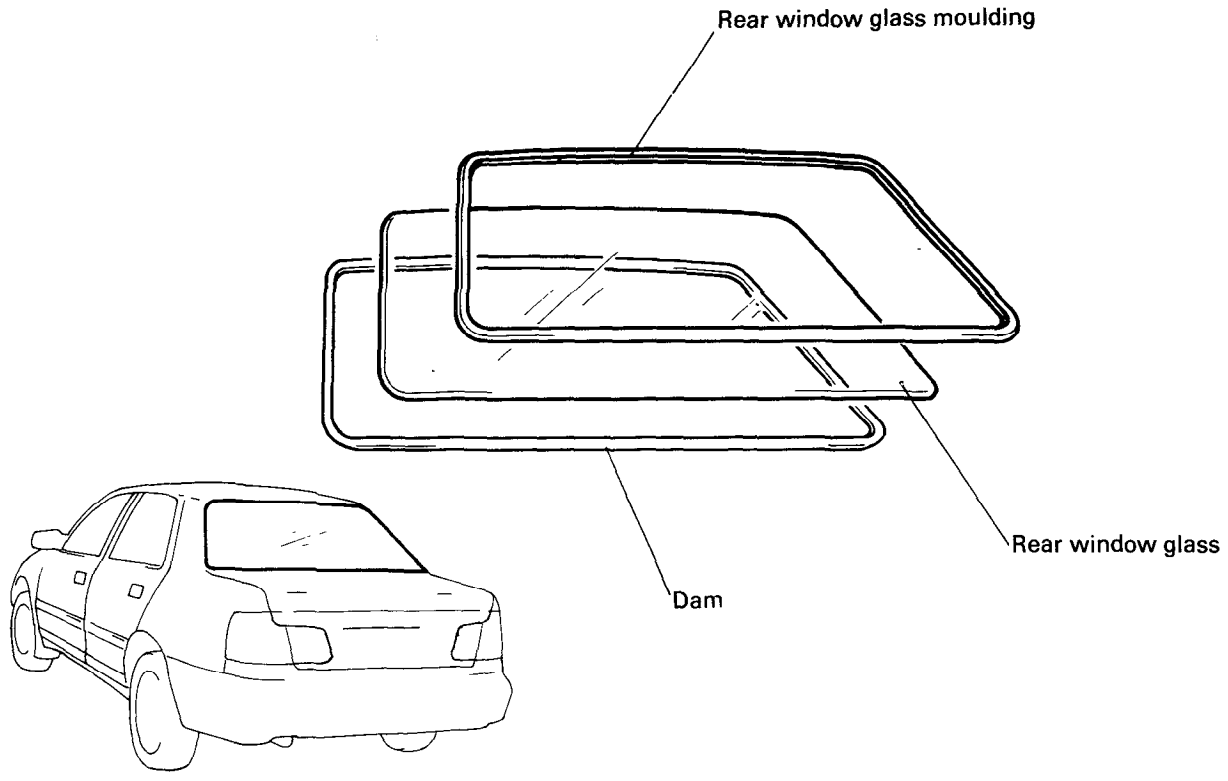
CAUTION

Make sure the sealant has set sufficiently before putting the vehicle back into operation.



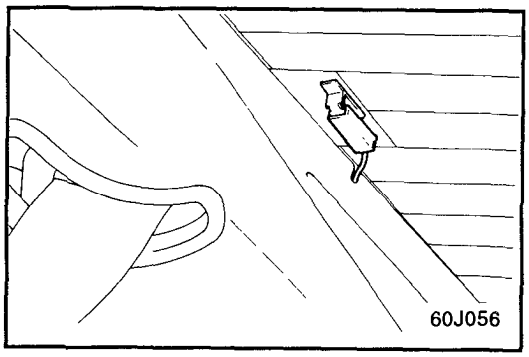
REAR WINDOW GLASS

COMPONENTS

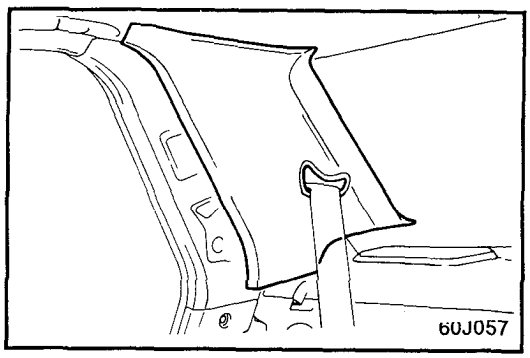


REMOVAL

1. Remove the defogger wire connector.

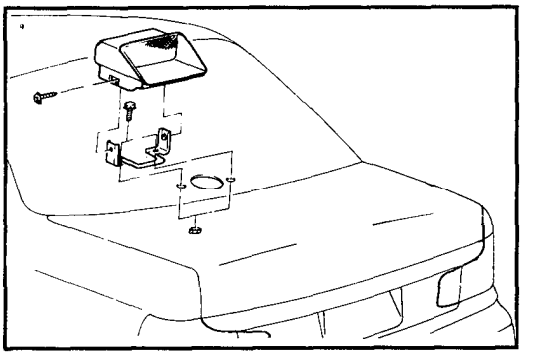


2. To remove the rear window glass, first remove the following pats;
   1) Rear pillar garnish
   2) Rear seat belt anchor bolt.



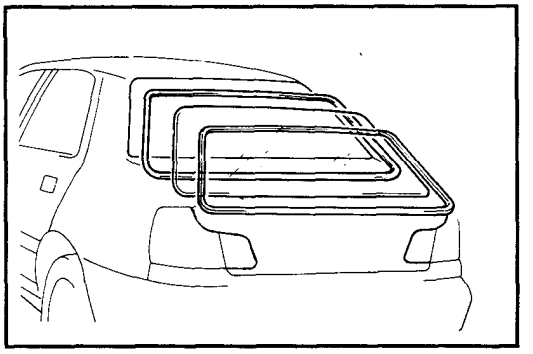
3) High mounted stop lamp.
4) Package tray trim.

3. Remove the rear window glass assembly.



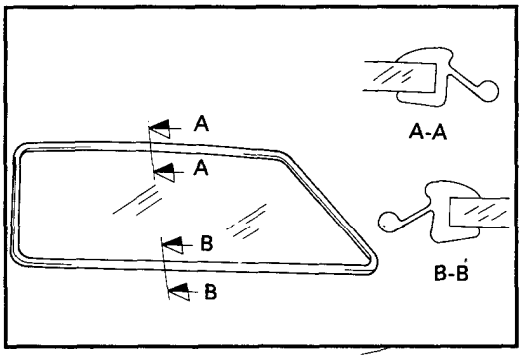
INSTALLATION

1. Install the rear window glass moulding to the rear window glass.

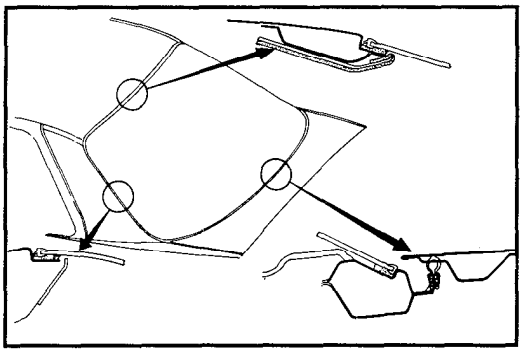


2. Apply a light coat of glass primer to the outside of the dam.

NOTE
1) Do not apply body primer to the glass.
2) Never touch the primed surfaces with your hand. If you do, the adhesive may not bond to the glass properly, causing a leak after the windshield is installed.
3) Keep water, dust, and abrasive materials away from the primed surface.

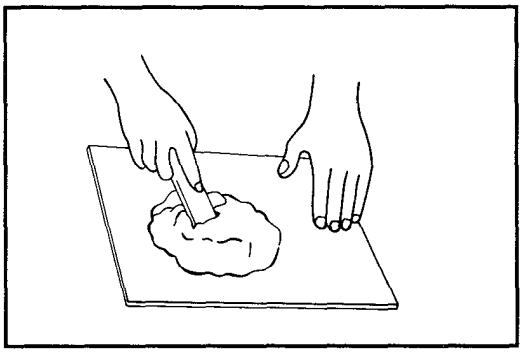


3. Apply a light coat of body primer to the original sealant remaining around the window opening flange. The glass should be installed 10 minutes after you apply the primer.

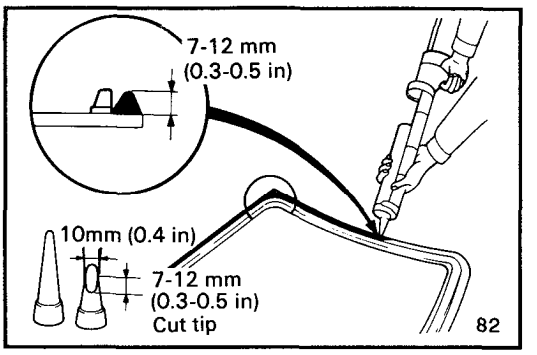


4. Thoroughly mix all the sealant and hardener together on a glass or metal plate with a putty knife.

NOTE
1) Clean the plate with a sponge and alcohol or wax or grease remover before mixing.
2) Follow the instructions that come with the sealant.

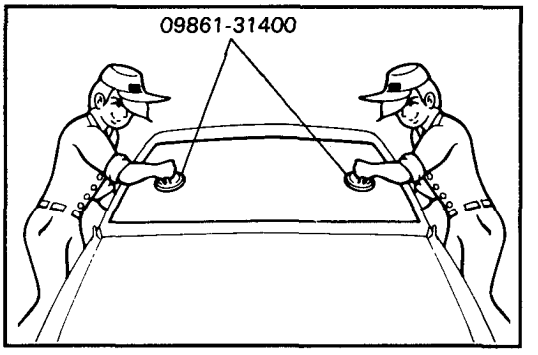


5. Pack adhesive into the cartridge (avoid air pockets), to ensure continuous delivery. Put the cartridge in a caulking gun or Sealant Gun, and run a bead of adhesive around the edge of the glass as shown.



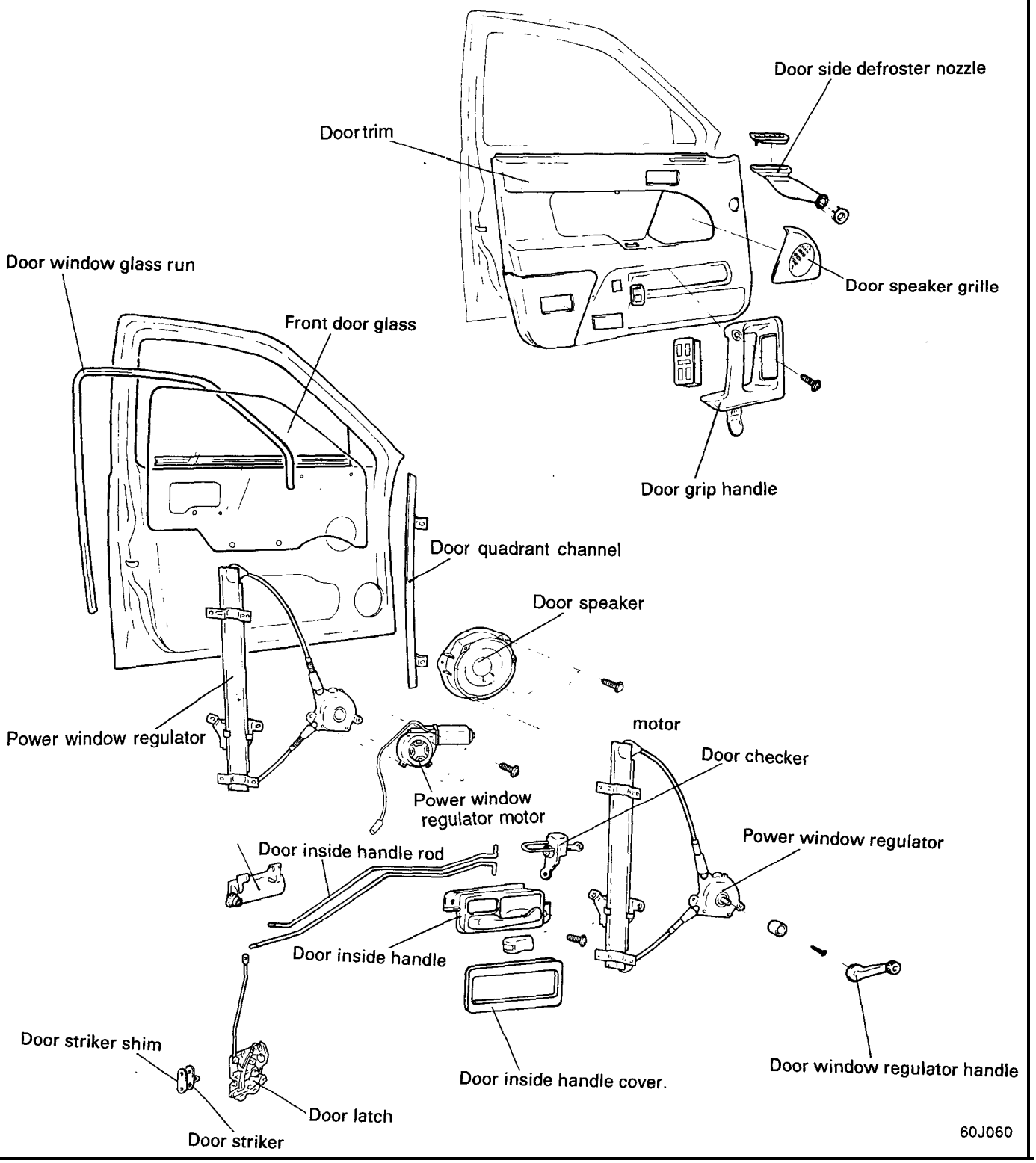
NOTE
Apply the adhesive within 5 minutes after applying the glass primer.

6. Using the special tool, install the rear window glass.



FRONT DOOR

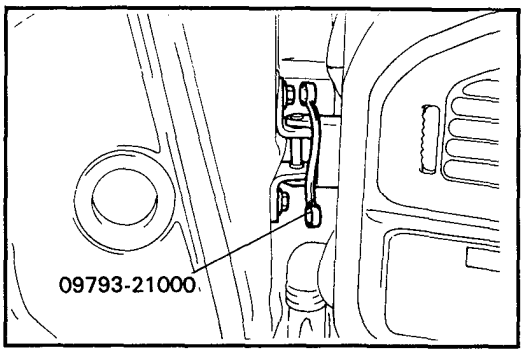
COMPONENTS



DOOR POSITION ADJUSTMENT

Check for flush fit with the body, then check for equal gap between the front and rear, top and bottom door edges and the body.
The door and body edges should also be parallel. Adjust at the hinge with the Special Tool (09793-21000).

CAUTION
Attach protective tape to the fender edges near the place where the hinge is installed.

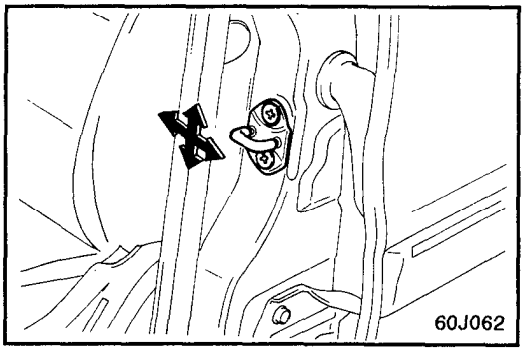


DOOR STRIKER ADJUSTMENT

Make sure the door is not loose, and latches securely without slamming. If it needs adjustment;

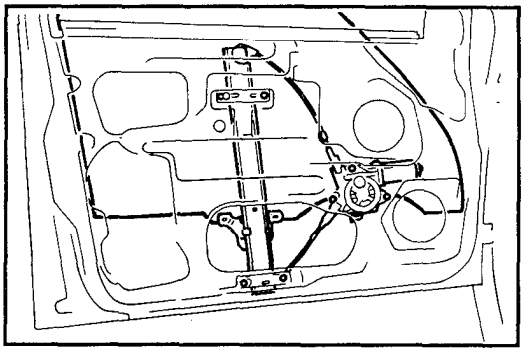
1. Draw a line around the striker plate for reference.
2. Loosen the striker screws, and move the striker IN or OUT to make the latch fit tighter or looser. Move the stiker UP or DOWN to align it with the latch opening. Then lightly tighten the screws and recheck.

   NOTE
   Hold the outside handle out and push the door against the body to be sure the striker allows a flush fit.



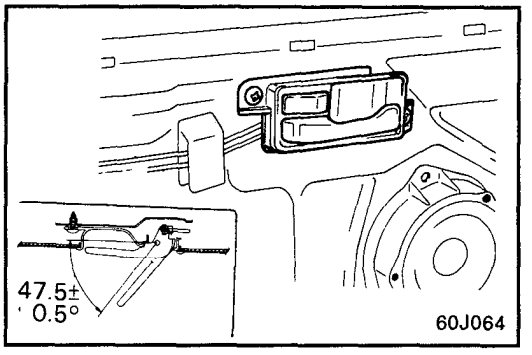
GLASS ADJUSTMENT

If the glass does not fit evenly when closed, adjust the slant of the glass in the front-to-back direction.



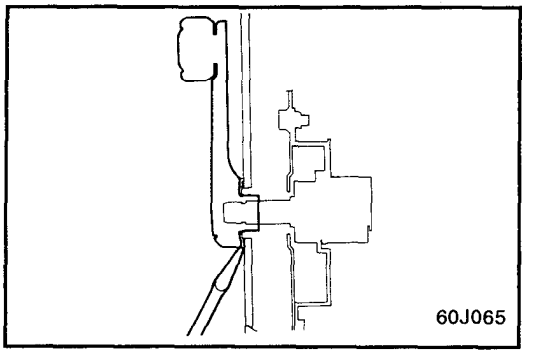
INSIDE DOOR HANDLE ADJUSTMENT

Adjust the inside handle play by adjusting the mounting position in the IN-to-OUT direction.
Full stroke [A] ..... 47.5 ± 0.5°

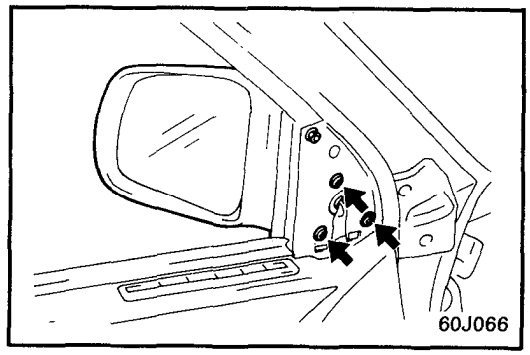


REMOVAL

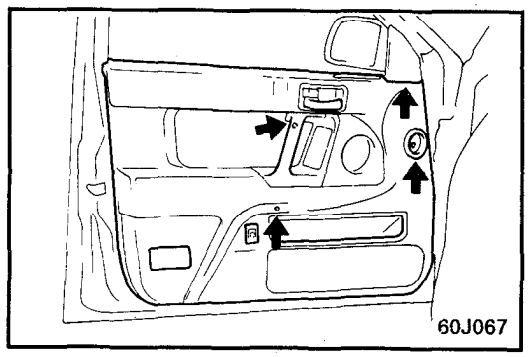
1. Using a screwdriver, remove the clip shown in the illustration to remove the regulator handle. (Manual type only)



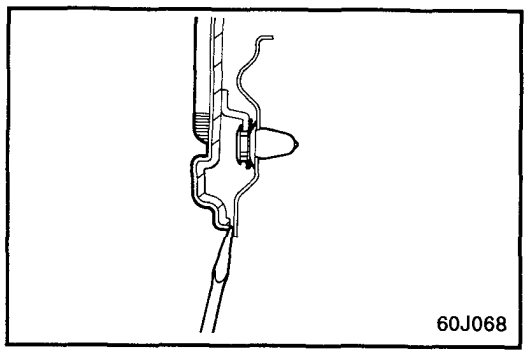
2. Remove the quadrant inner cover.
3. Remove the rear view mirror mounting screws and then remove the rear view mirror.
Disconnect the remote control connector. (Electric type only)



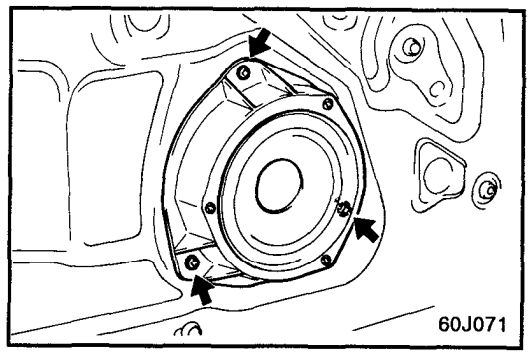
4. Remove the screws from the door trim and bezel side cover.



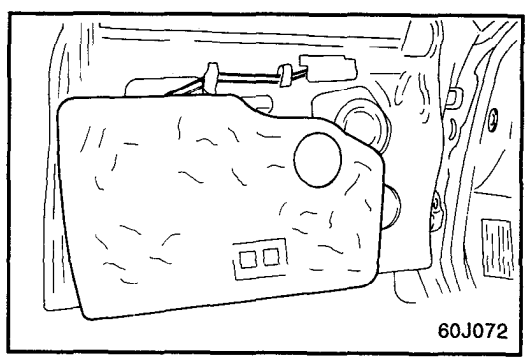
5. Insert a screwdriver between the trim fasteners and door panel to pry it loose.
Disconnect the connectors (Power window, motor, Power window main switch, Door lock actuator).



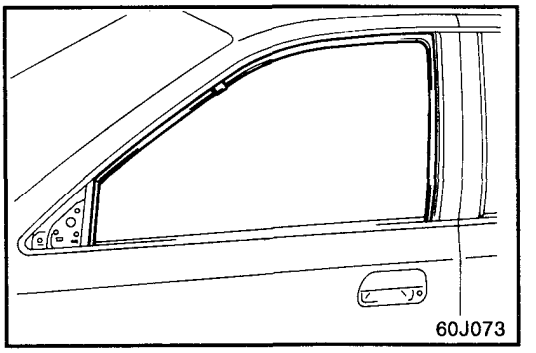
6. Remove the door speaker and speaker mounting bracket.



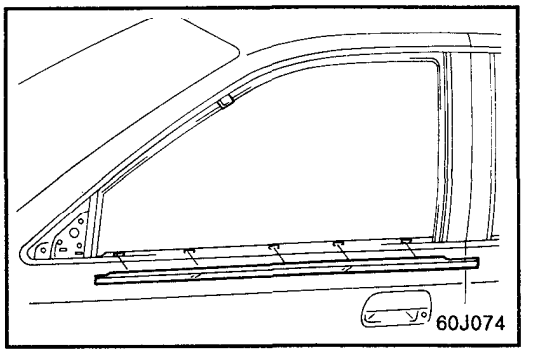
7. Remove the door trim seal.



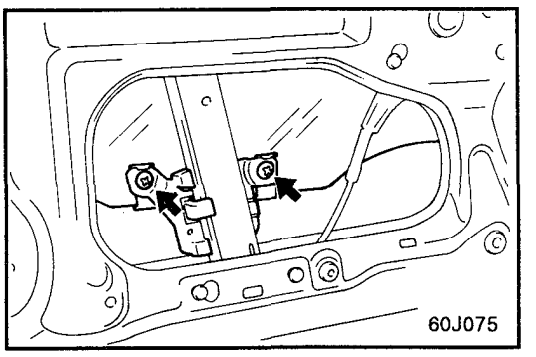
8. Remove the front door frame, rear moulding and the upper moulding.



9. Remove the front door belt outside weatherstrip.

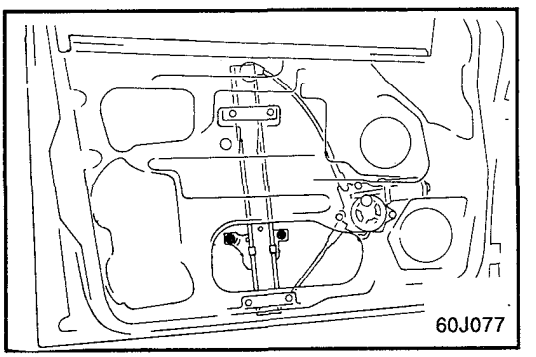


10. Remove the carrier plate bolts from the regulator channel.

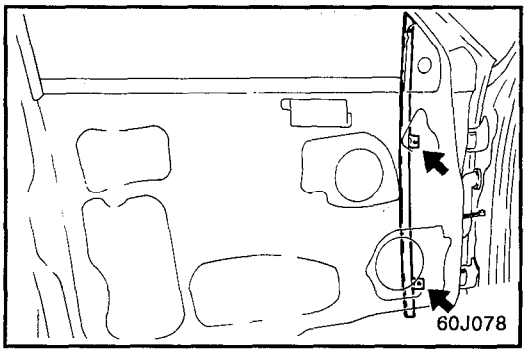


Il. Pull the door glass out through the window slot.

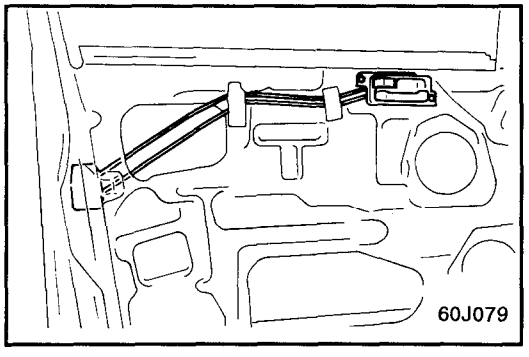
12. Remove the door regulator channel mounting bolts and then remove the door regulator assembly.



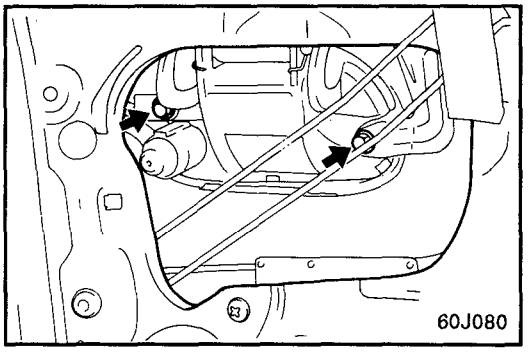
13. Remove the front door quadrant channel.



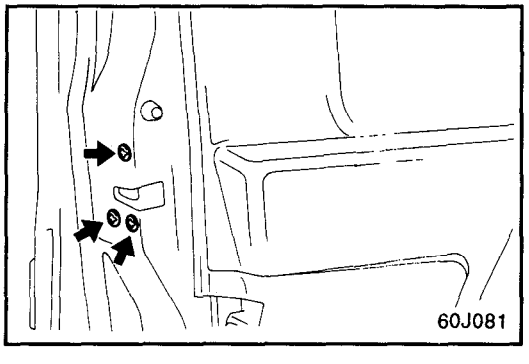
14. Remove the inside handle mounting screws.
Turn the rod holding clip and then remove the rod from the latch assembly.



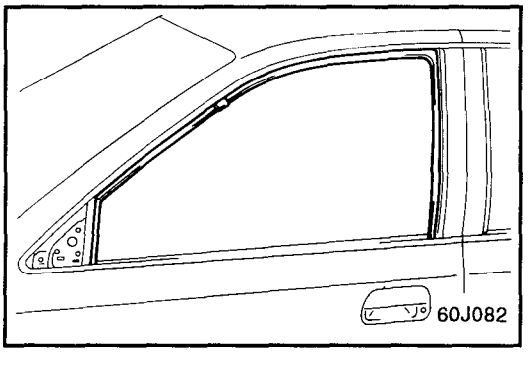
15. Remove the outside door handle mounting bolts.
Disconnect the outside door handle rod from the outside door handle at the position shown.



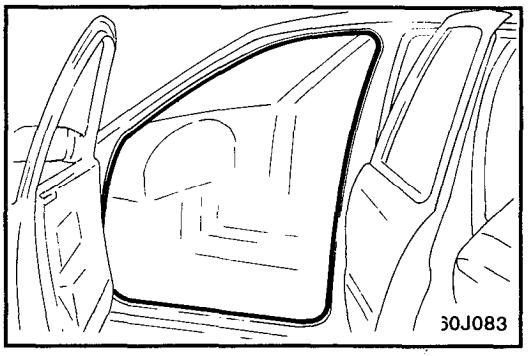
16. Remove the door latch and door lock actuator.



17. Remove the door frame moulding.



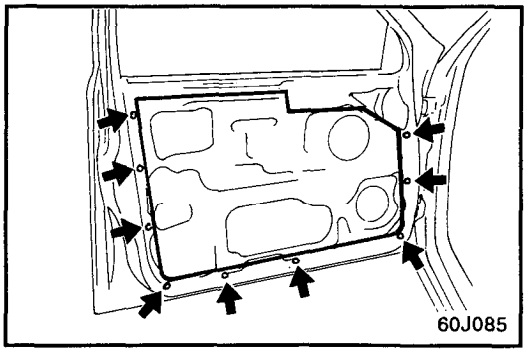
18. Remove the door glass run.



INSTALLATION

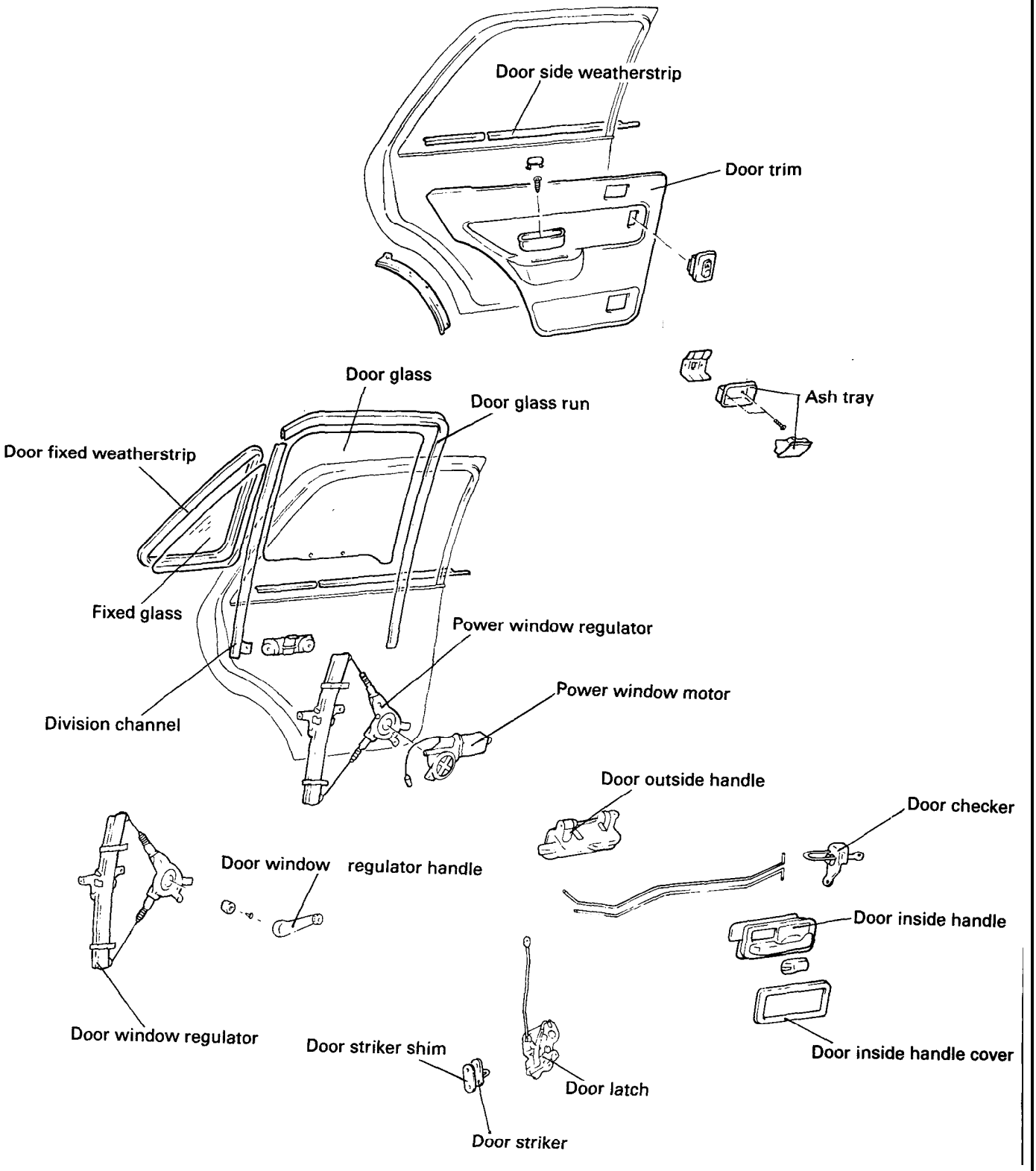
1. Installation is the reverse of removal procedure.
2 If the door glass has been removed from the glass grip, be sure to install it in the correct position.

CAUTION
When installing the door trim seal, butyl tape should not be placed over door trim fastener mounting area.



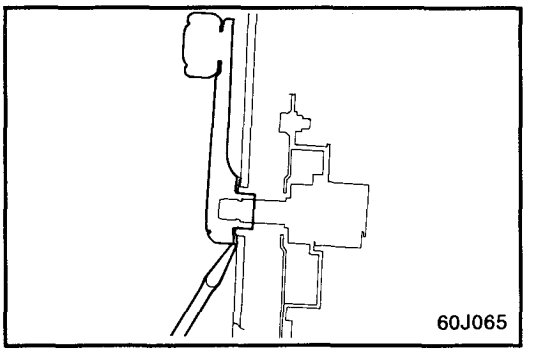
REAR DOOR

COMPONENTS

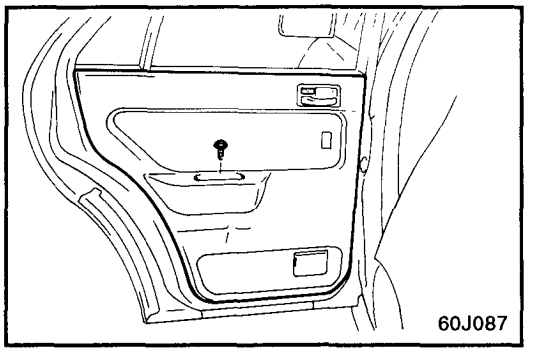


REMOVAL

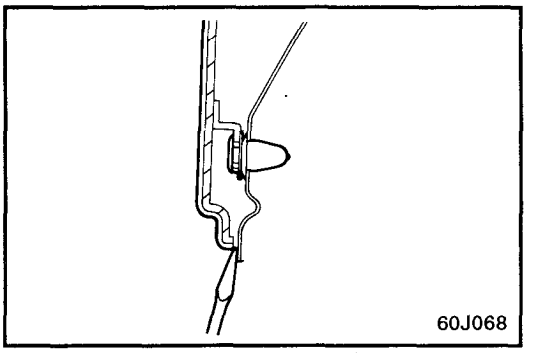
1. Using a screwdriver, remove the clip located in the illustration to remove the regulator handle. Be careful to avoid damaging the door trim panel. (Manual type only)



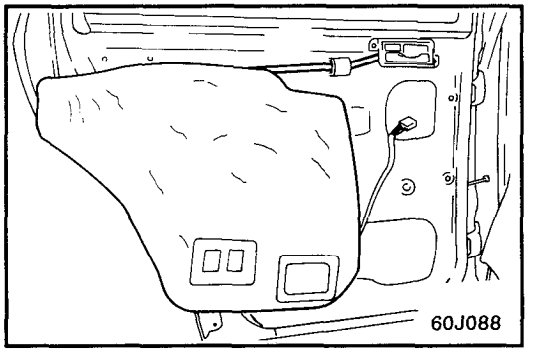
2. Remove the screw from the door trim, and bezel side cover.



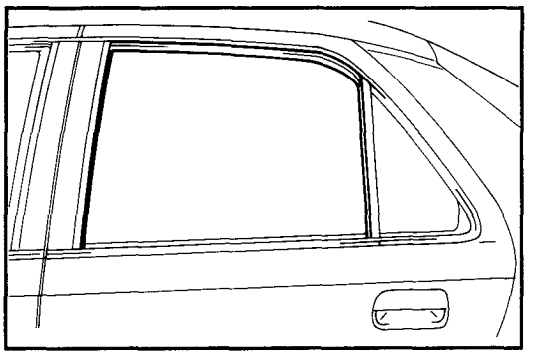
3. Insert a screwdriver between the trim fasteners and the door panel to pry it loose.
   Disconnect the electrical connectors.



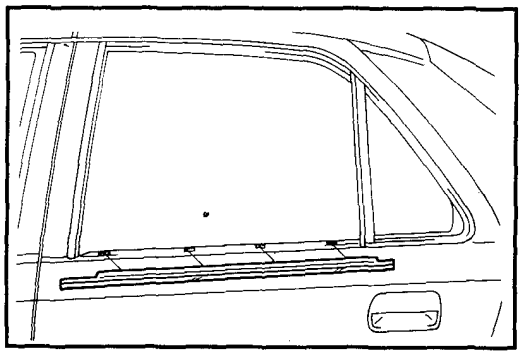
4. Remove the door trim seal.



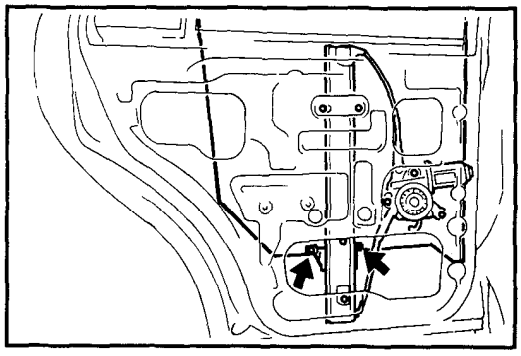
5. Remove the rear door frame front moulding.



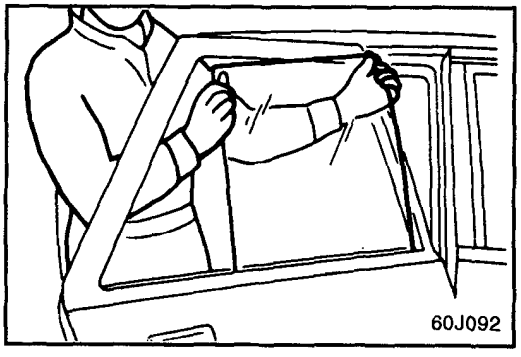
6. Remove the rear door outside belt weatherstrip,



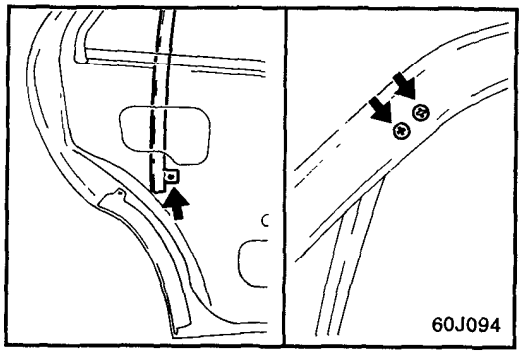
7. Remove the carrier plate bolts from the regulator channel.



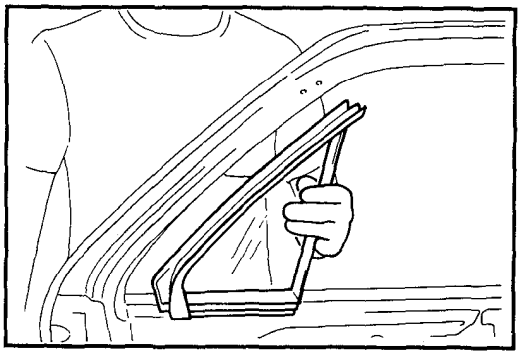
8. Remove the door glass.



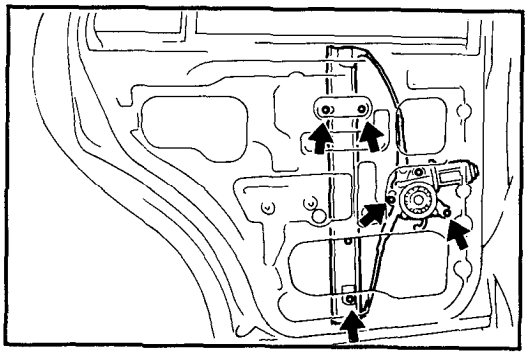
9. Remove the fixing screw and the bolts of the division channel. Remove the division channel.



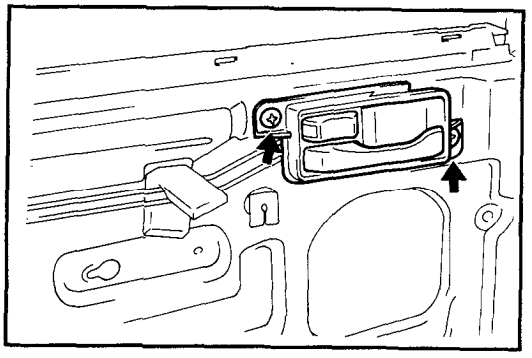
10. Remove the fixed glass.



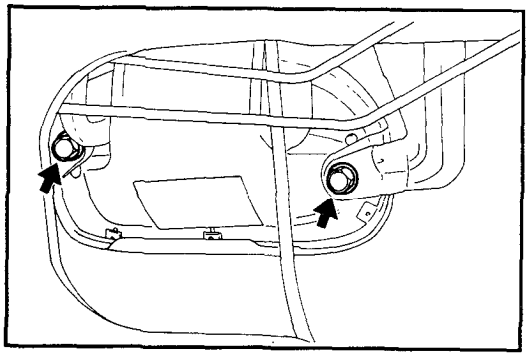
11. Remove the door regulator channel mounting bolts and then remove the door regulator assembly.



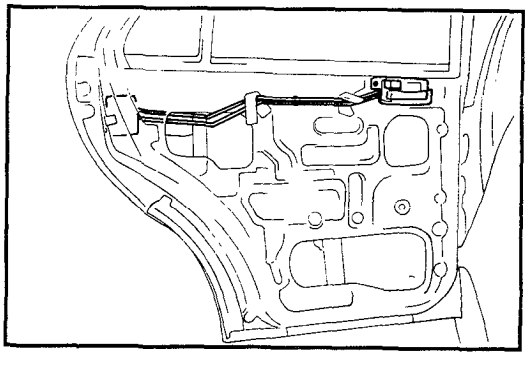
12. Remove the inside handle mounting screws.
Turn the rod holding clip and then remove the rod from the latch assembly.



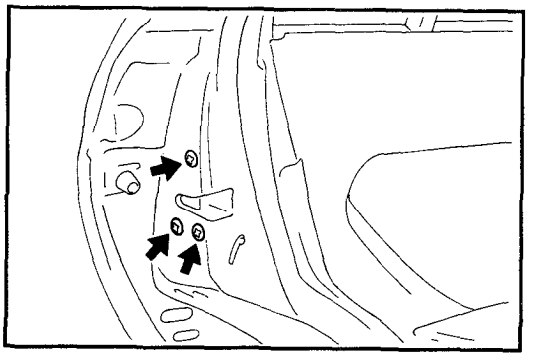
13. Remove the outside door handle mounting bolts.
Disconnect the outside handle rod from the outside door handle at the position shown.



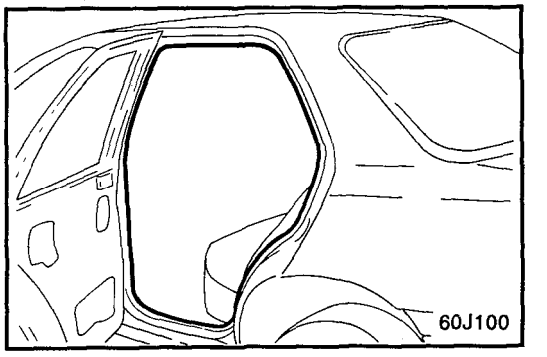
14. Remove the safety lock rod mounting screw and then remove the rod from the latch assembly.



15. Remove the door latch and door lock actuator.



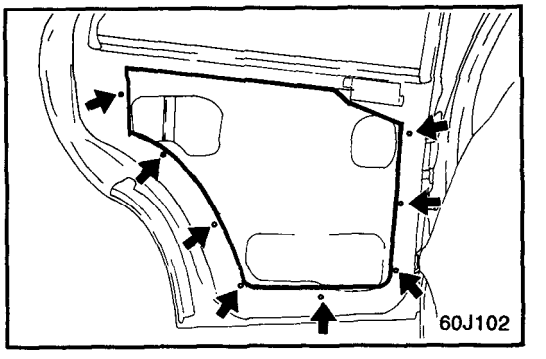
16. Remove the door side weatherstrip and door glass run.



INSTALLATION

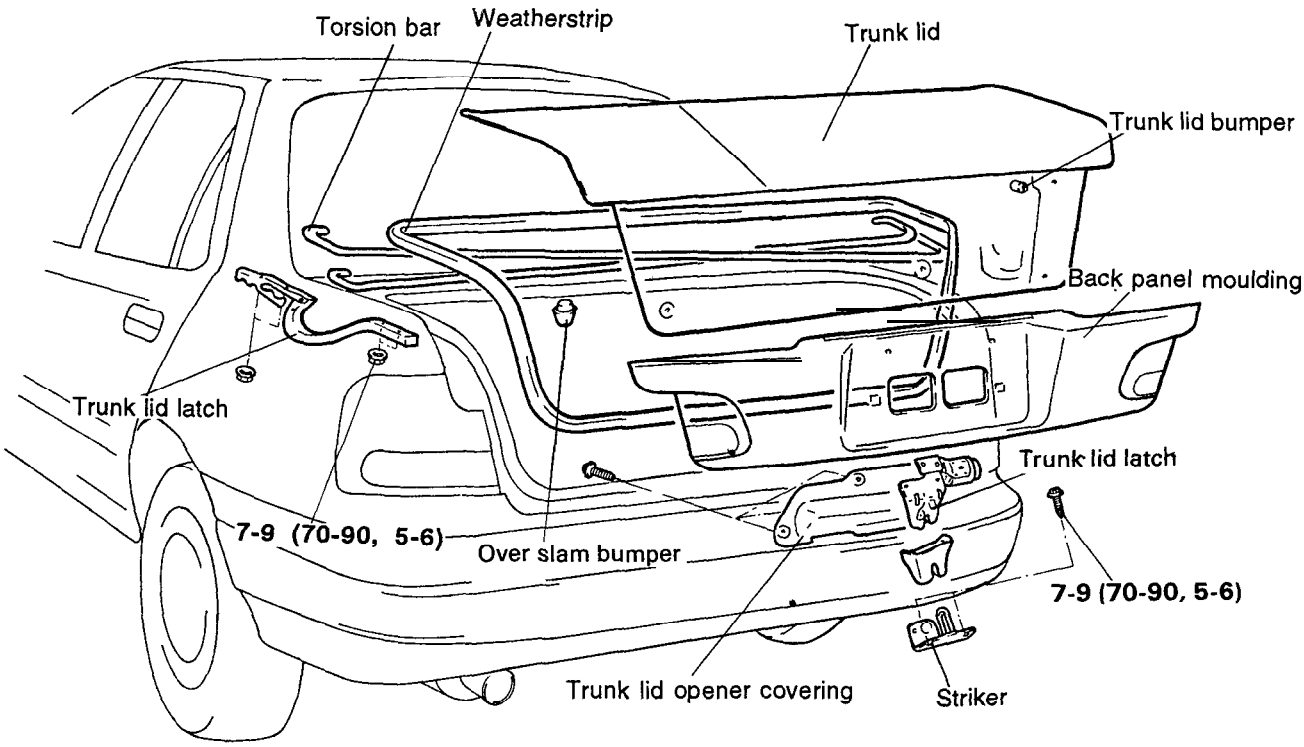
1. Installation is the reverse of removal procedure.
2. If the door glass has been removed from the glass grip, be sure to install it in the correct position

CATUION
When installing the door trim seal, butyl tape should not be placed over door trim fastener mounting area.



TRUNK LID

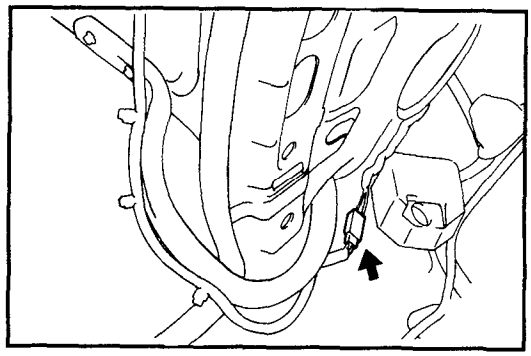
COMPONENTS



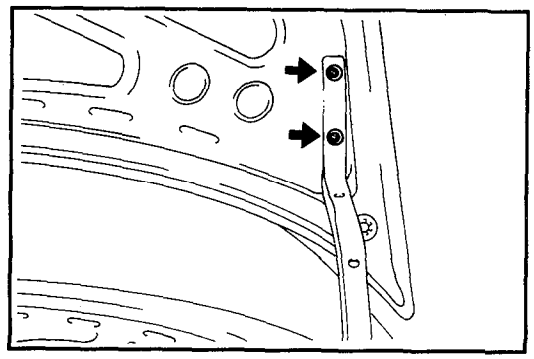
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Disconnect the trunk lid main wiring.

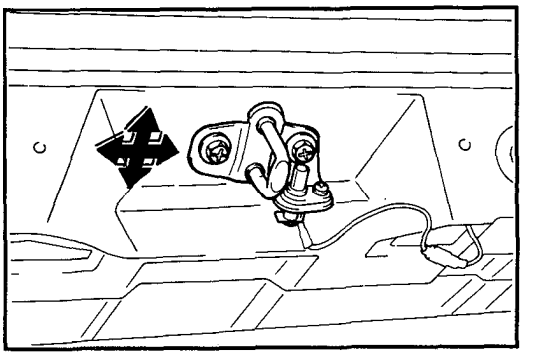


2. Remove the trunk lid hinge mounting bolts and then remove trunk lid.
3. Remove the torsion bar.

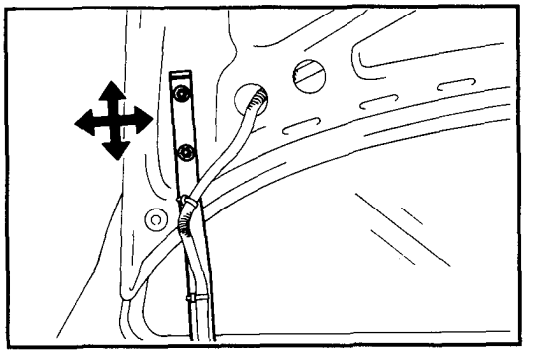


ADJUSTMENT

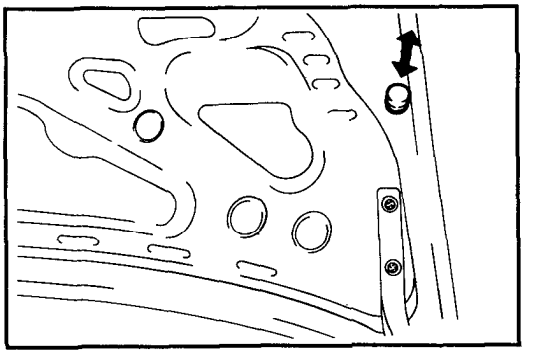
1, Adjust the striker up and down, and right or left until the trunk lid is flush with the rear edge of the body.



2. Adjust the trunk hinges up or down and right or left as necessary to equalizer the gap between the lid and the body.



3, Turn the trunk lid bumpers either left or right to adjust the height of the trunk lid.

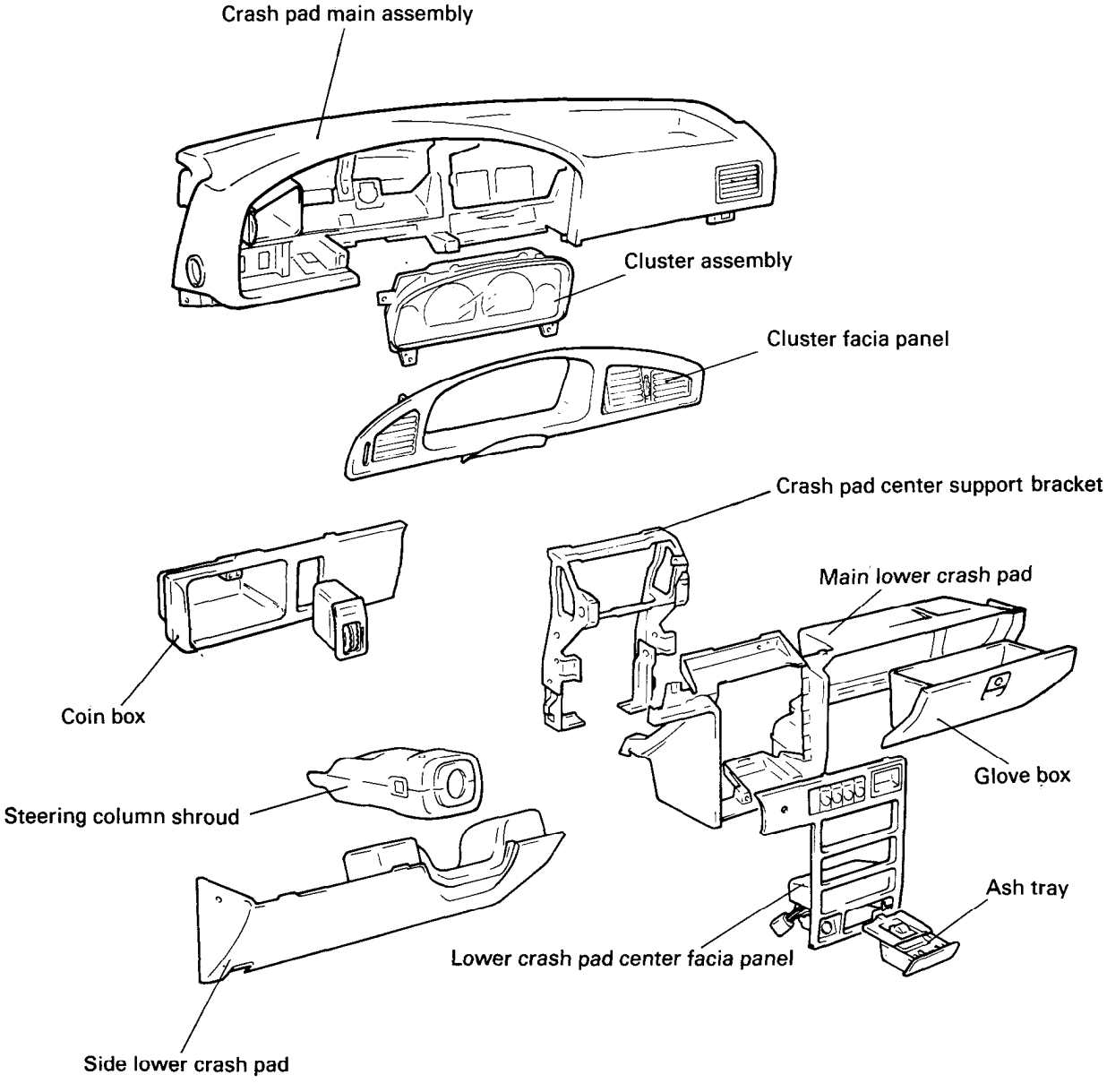


INSTALLATION

1. Installation is the reverse of removal procedure.

CRASH PAD

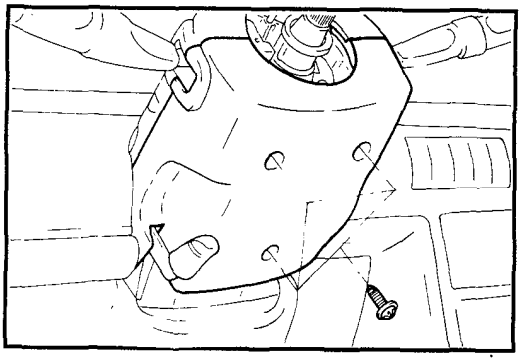
COMPONENTS



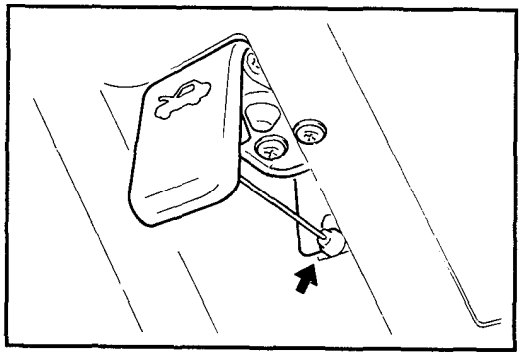
REMOVAL

1. Remove the horn pad assembly.
2. Remove the steering wheel, the steering column lower and upper shroud.

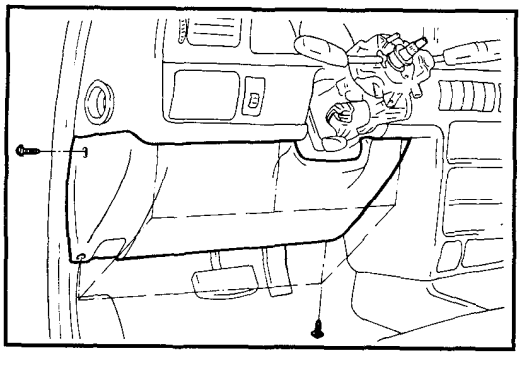
CAUTION
Before doing these procedures, see the SRS section (56A GROUP) for further information (SRS equipped vehicle only)



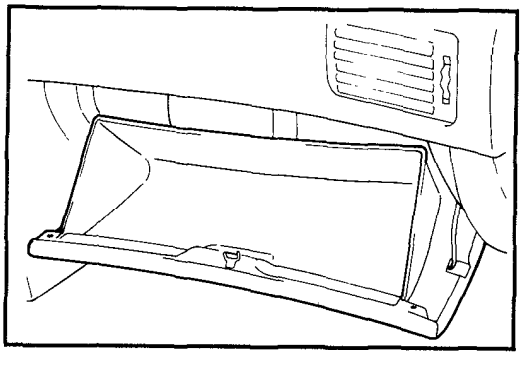
3. Remove the hood release handle mounting screws.



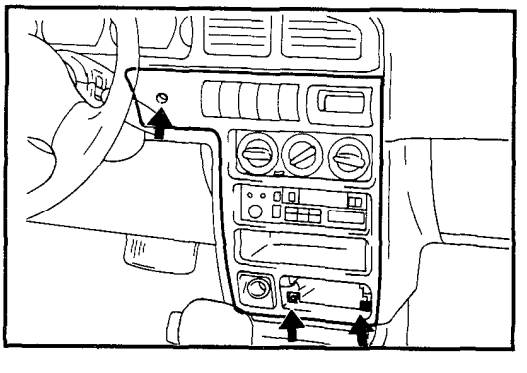
4. Remove the side lower crash pad.



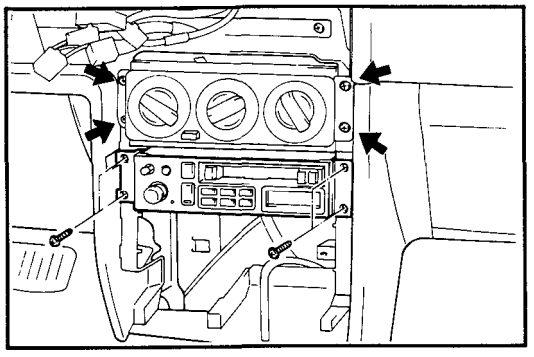
5. Remove the glove box.



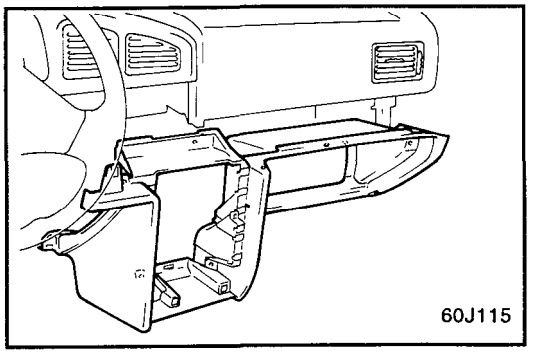
6. Remove the lower crash pad center facia panel and disconnect the connectors.



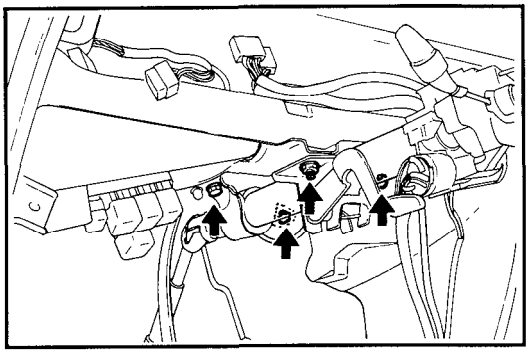
7. Remove the radio and disconnect the connectors, then remove the air conditioner control mounting screws to be detach the main lower crash pad.



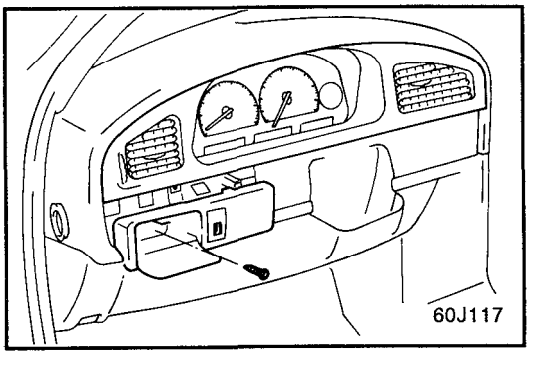
8. Remove the main lower crash pad.



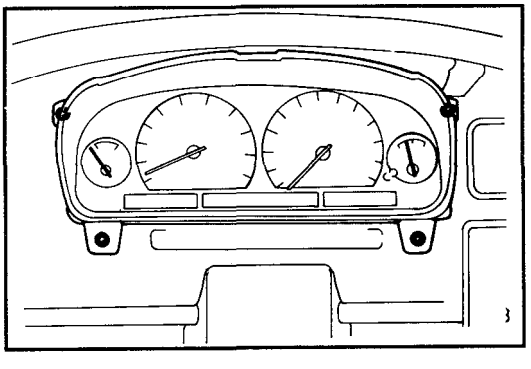
9. Remove the steering column mounting bolts and lower the steering column.



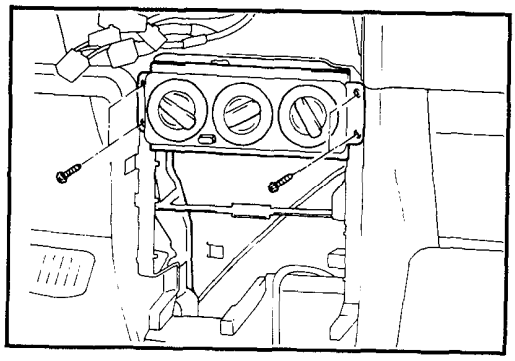
10. Detach the blanking cover from the cluster facia panel.
11, Remove the cluster facia panel and crash pad side plate.



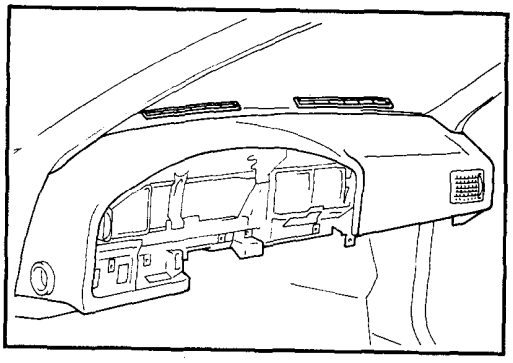
12. Remove the cluster assembly and disconnect the connectors.



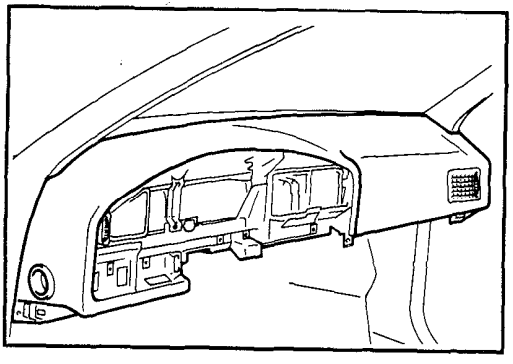
13. Remove the air conditioner control assembly.



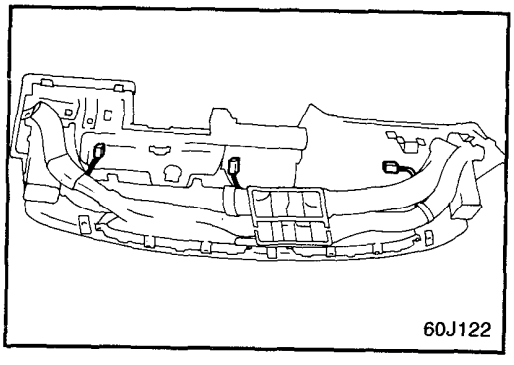
14. Detach the defroster nozzle upper center *cover* from the main crash pad.



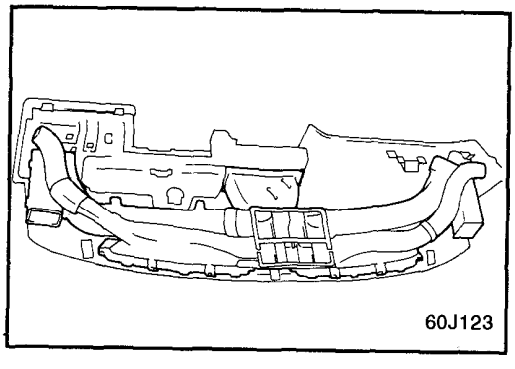
15. Remove the main crash pad.



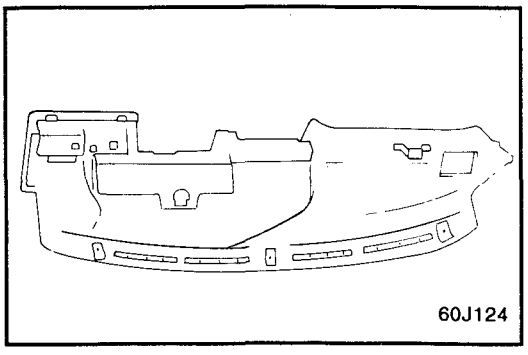
16. Remove the connectors from the air conditioner control assembly.



17. Remove the ventilators from the main crash pad.

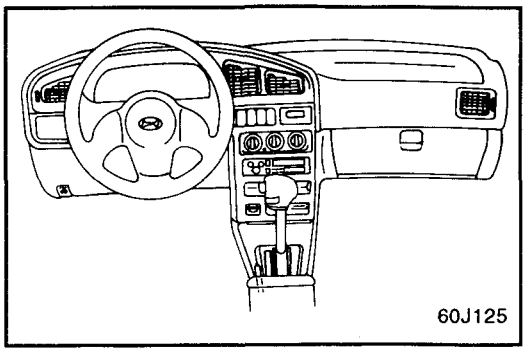


18. Remove the mounting brackets.



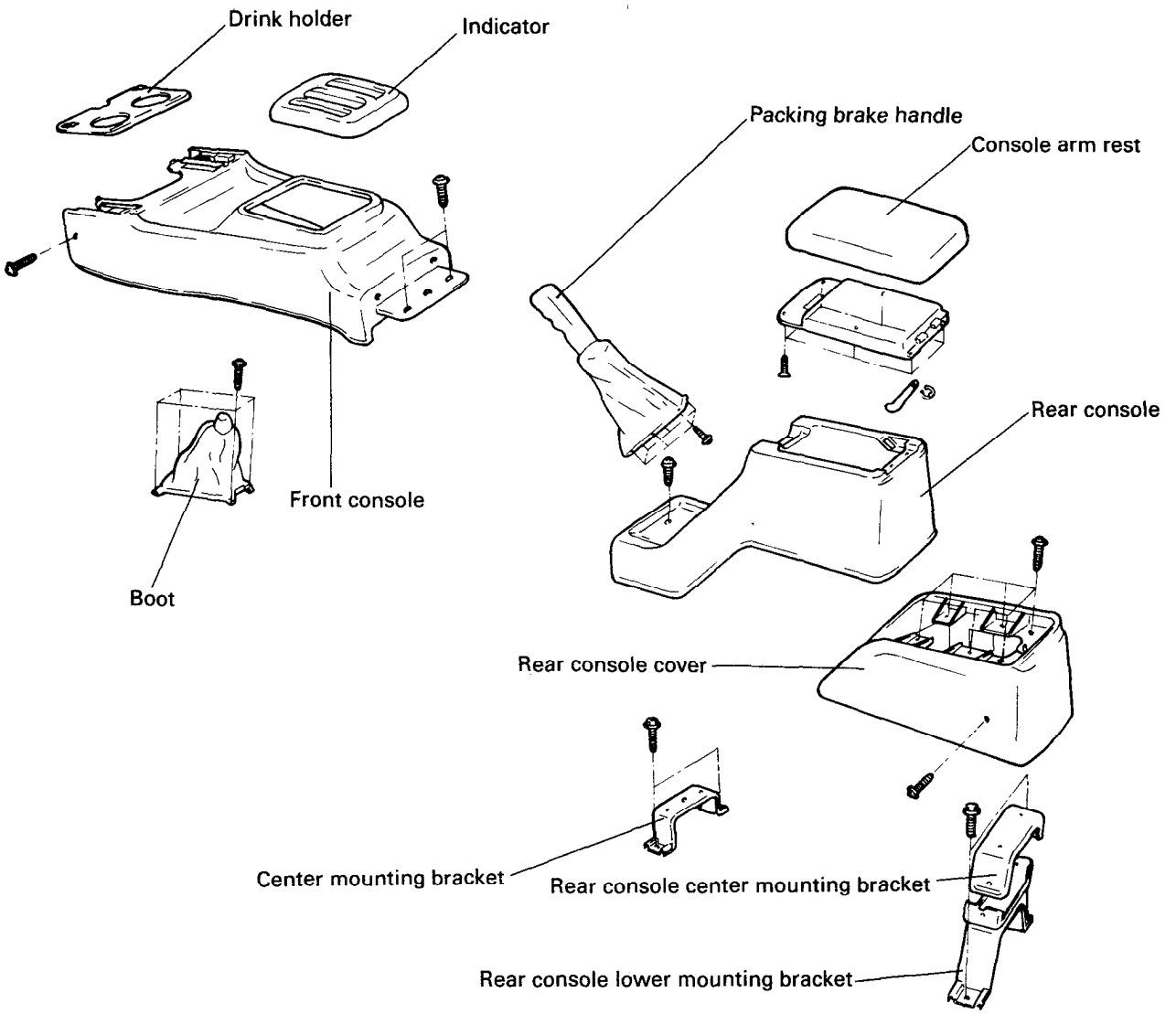
INSTALLATION

1. Installation is the reverse of removal procedure.
2. Connect all of the conectors securely.



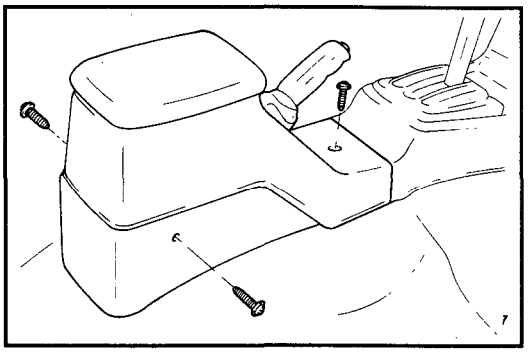
CONSOLE

COMPONENTS

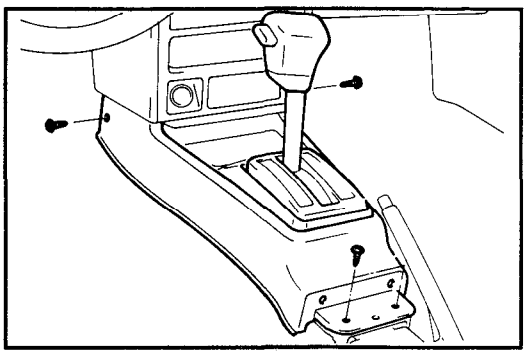


REMOVAL

1. Pull out the console plate and then loosen one screw. Disconnect the outside mirror control switch connector.
2. Remove the screws from the rear console.

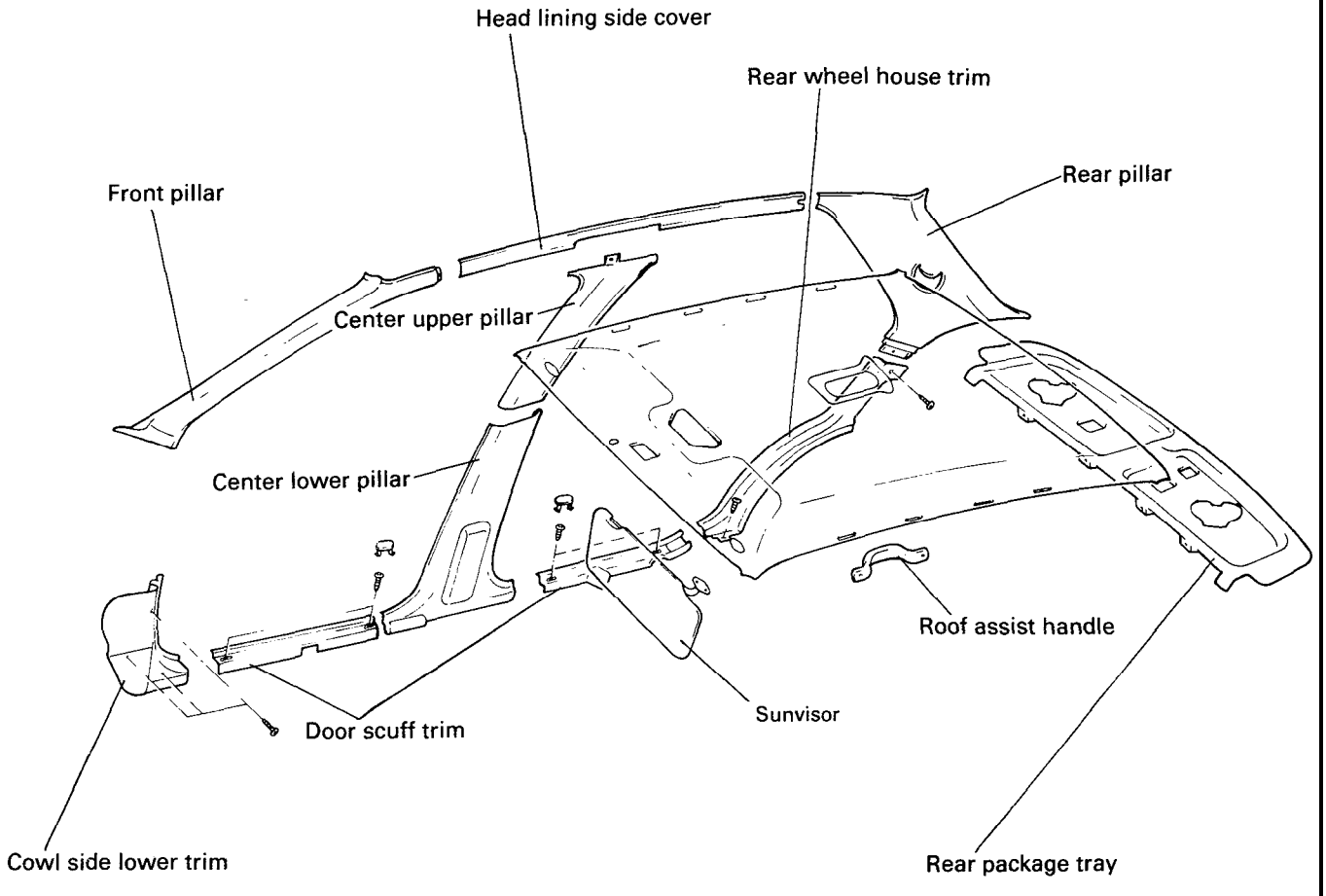


3. Remove the transmission control lever knob.
4. Remove the four screws securing front console to the front and center mounting brackets.
5. Remove the front console assembly.



INTERIOR TRIM AND HEAD LINING

COMPONENTS



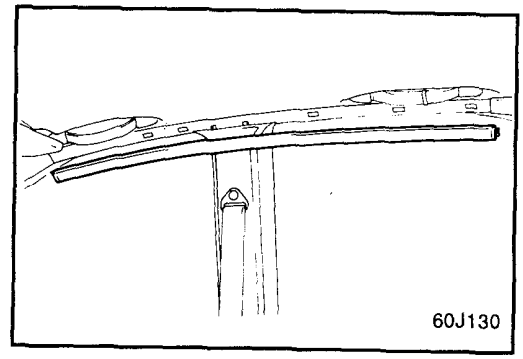
REMOVAL

Front Pillar Trim

1. Using a screwdriver, remove the front pillar trim.

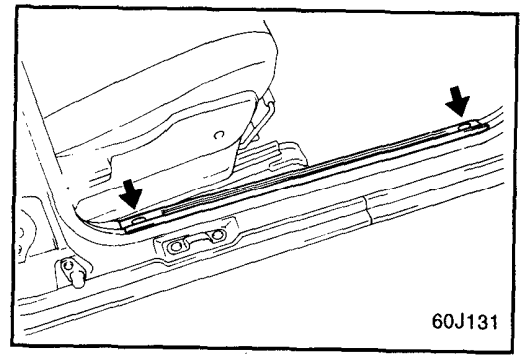
Head Lining Side Cover Trim

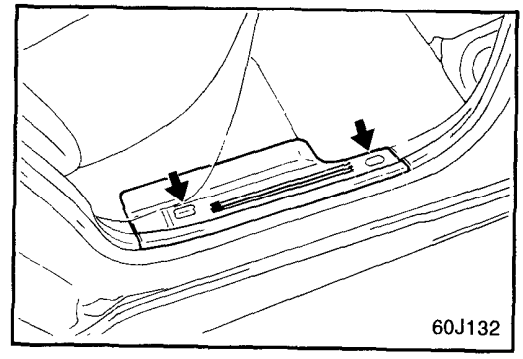
1. Remove the head lining side cover trim with a screwdriver.



Door Scuff Trim

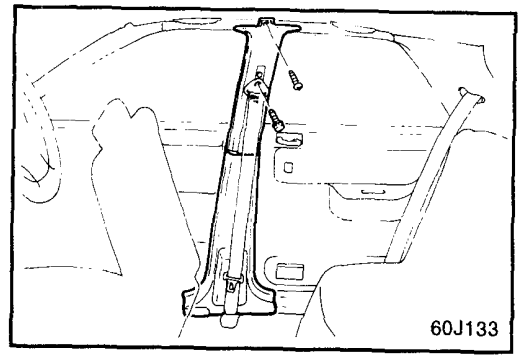
1. Remove the screws from the door scuff trim.
2. Remove the door scuff trim.





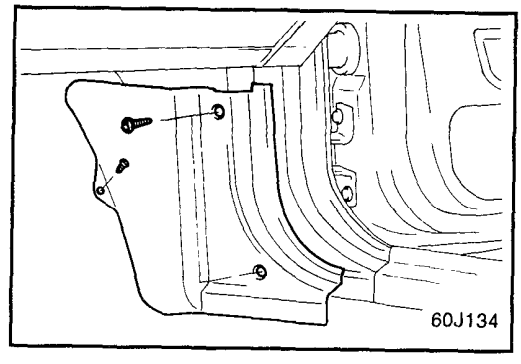
Center Pillar Trim

1. Loosen the screw from the center pillar
2. Remove the front seat belt upper anchor mounting bolt.
3. Pry out the clips and remove the center pillar trim.



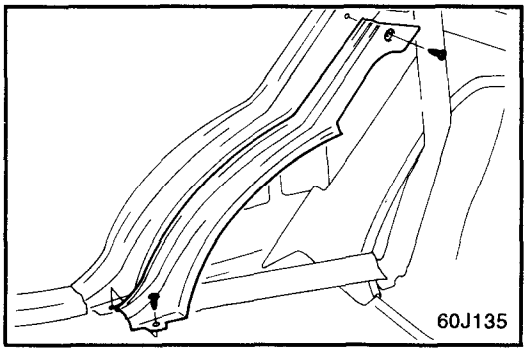
Cowl Side Lower Trim

1. Remove the two screws and one fastener from the cowl side lower trim



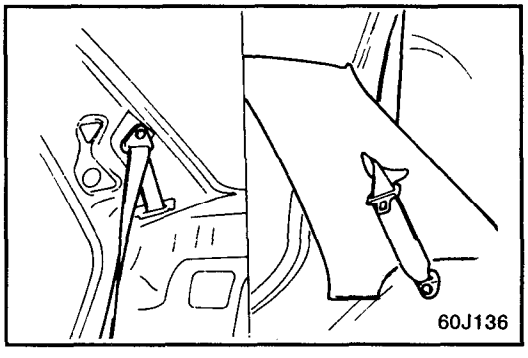
Rear wheel House Trim

1. Remove the rear seat assembly.
2. Remove the screws from the rear wheel house trim.



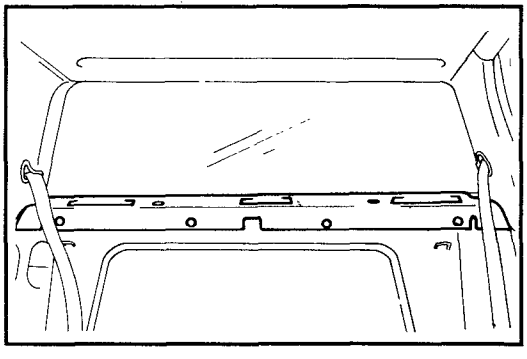
Rear Pillar Trim

1. Remove the bolt from the rear seat belt lower anchor.
2. Using a screwdriver, remove the rear pillar trim.



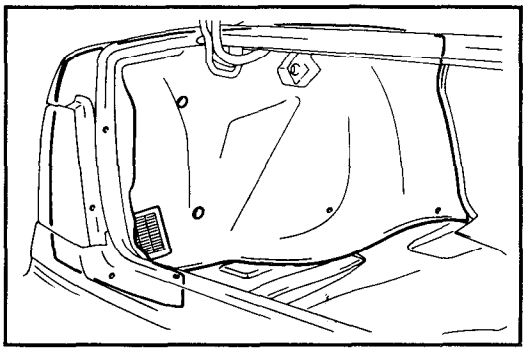
Rear Package Tray Trim

1. Remove the rear package tray trim mounting plugs and the rear speaker mounting nuts.
2. Remove the rear package tray trim.



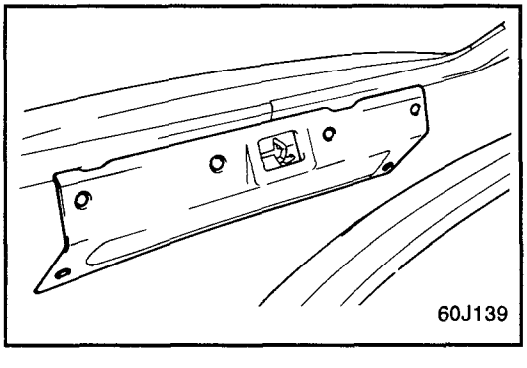
Luggage Side Trim

1. Remove the screws and plugs from the front and rear luggage side trim.



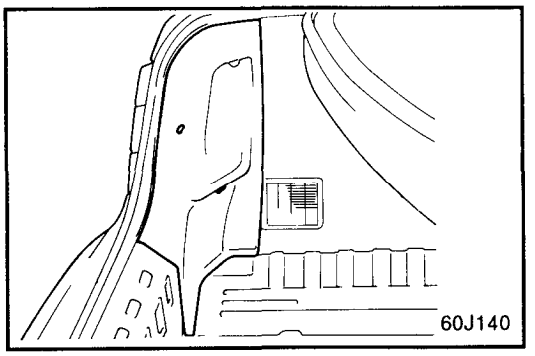
Rear Transverse Trim

1. Remove the transverse trim mounting fasteners and the rear transverse trim.



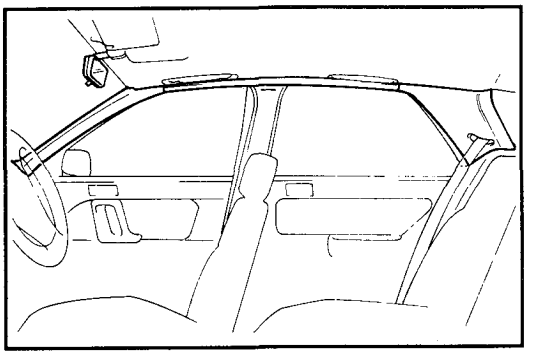
Luggage Rear Trim

1. Remove the luggage rear trim.

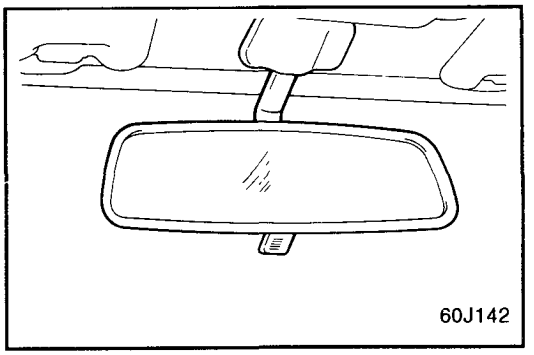


Head Lining

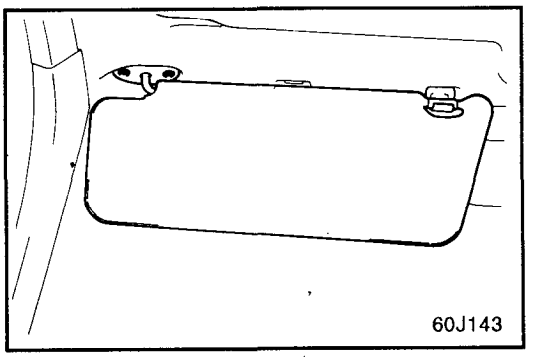
1. To remove the head lining, first remove the following parts:
   1) Inside rear view mirror.
   2) Head lining side cover trim.
   3) Front pillar trim.
   4) Rear pillar trim.



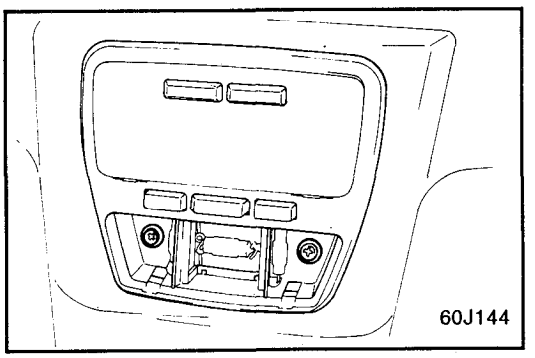
2. Remove the rear view mirror.



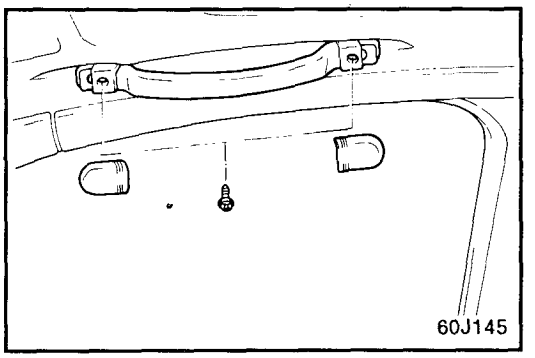
3. Remove the sunvisor and retainer.



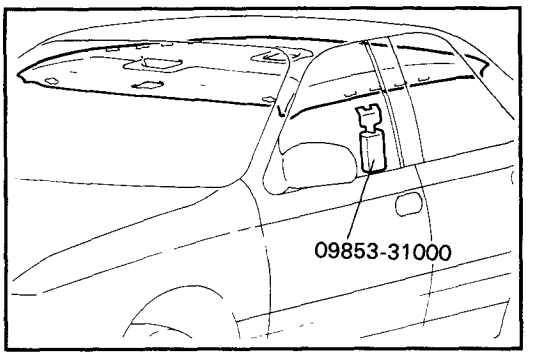
4. Detach the lens from room.
5. Remove the room lamp.



6. Remove the roof assist handle.



7. Using the special tool (09853-31000), remove the head lining.

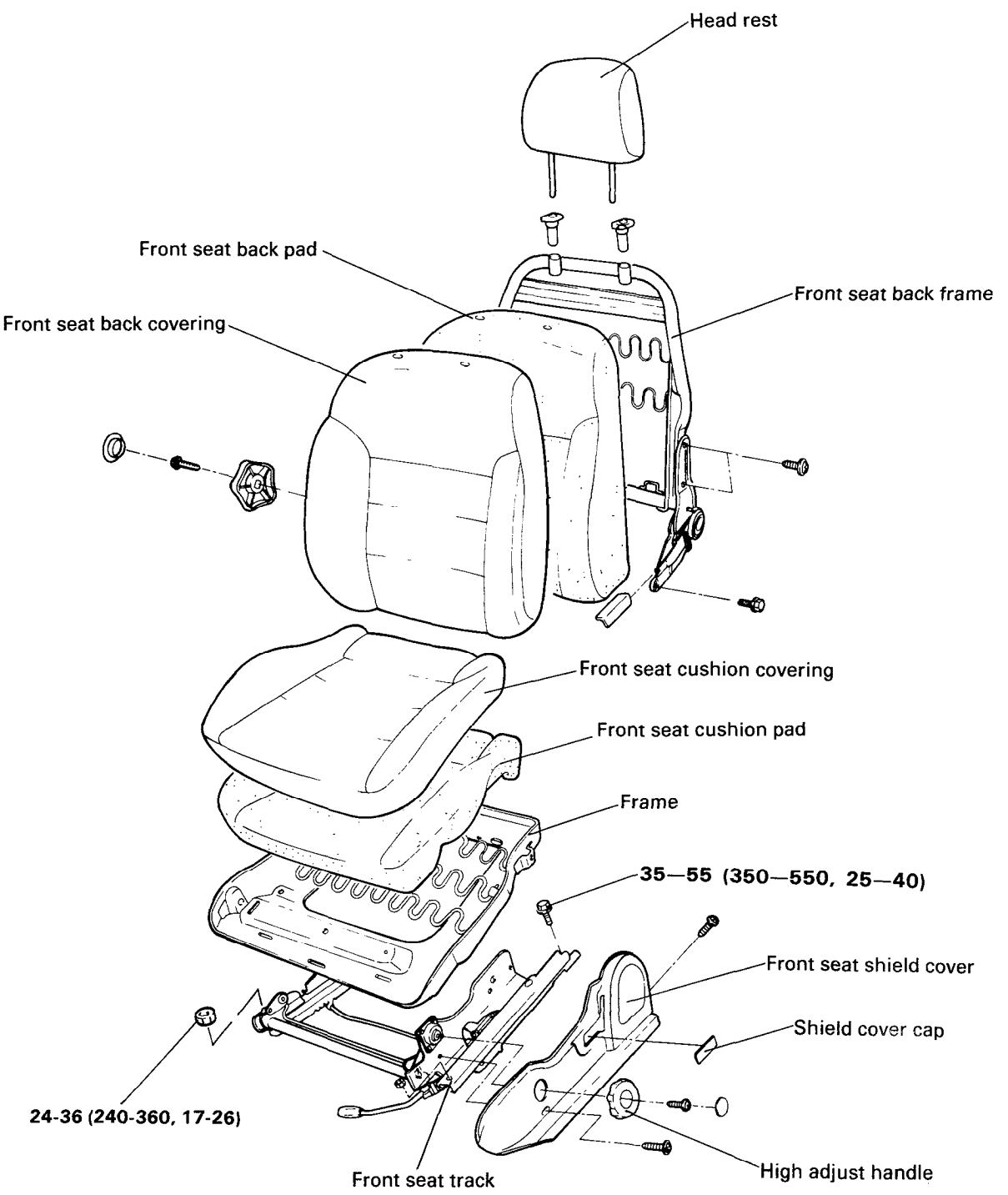


INSTALLATION

1. Installation is the reverse of the removal procedure.

FRONT SEAT

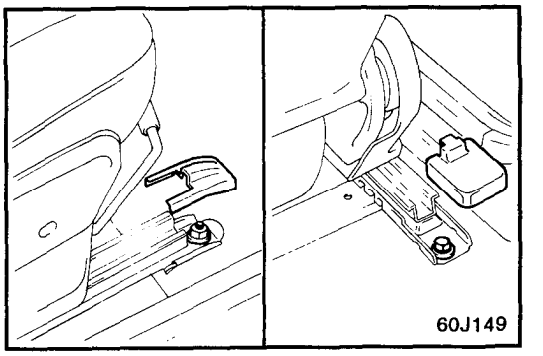
COMPONENTS



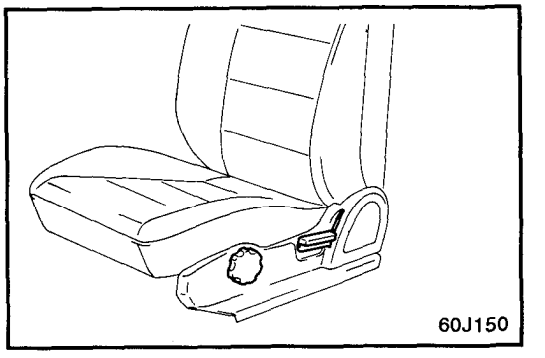
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

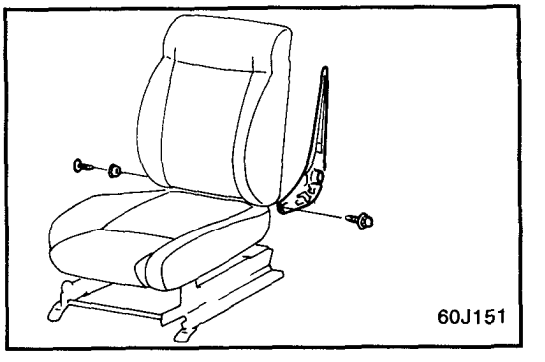
1. Pull out the front seat mounting cover and remove the bolts.
2. Remove the front seat assembly.



3. Pull out the seat tilt adjust handle cover and recliner handle cover.
4. Remove the seat shield cover.

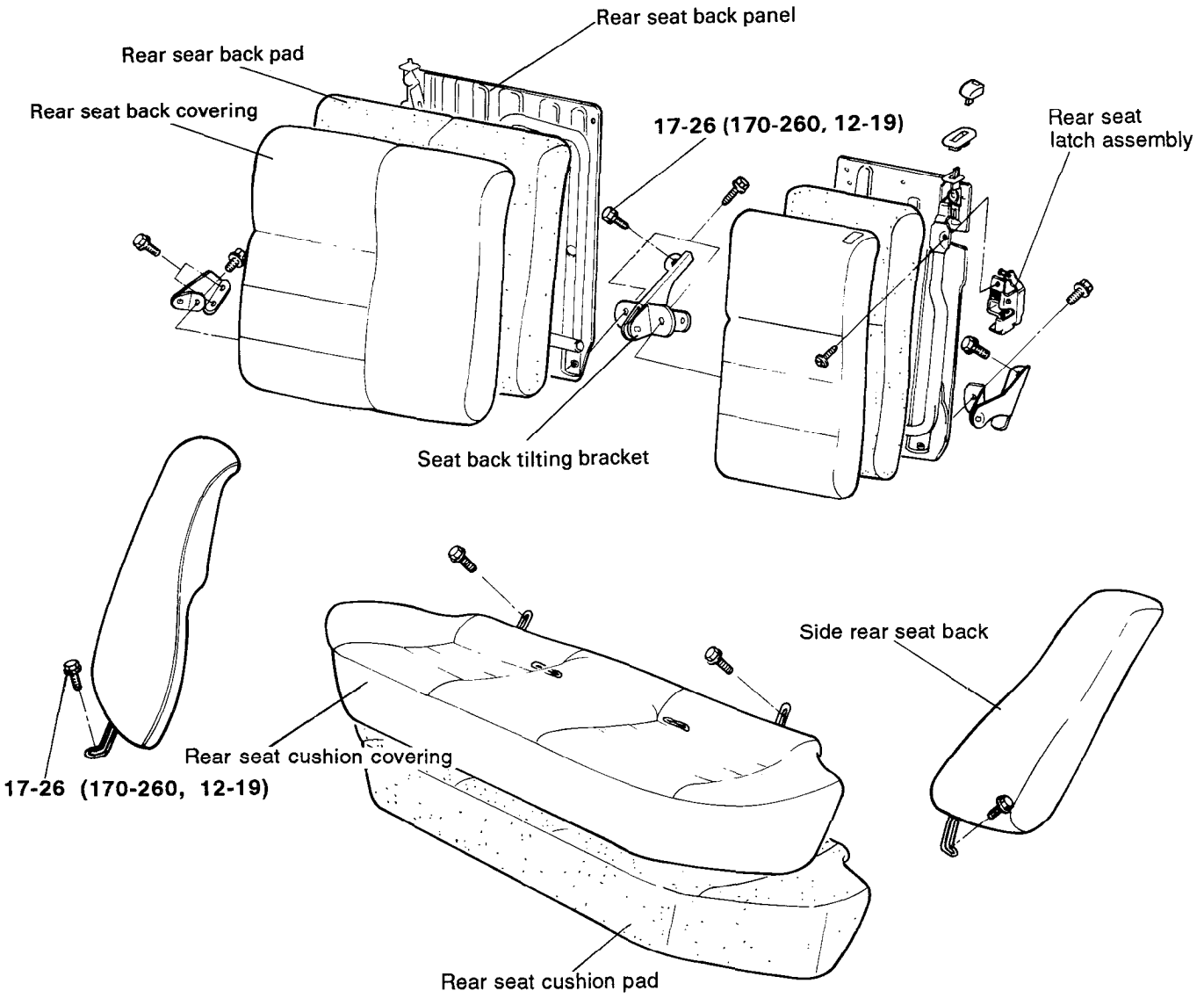


5. Remove the recliner mounting bolt and separate the seat back from the seat assembly.



REAR SEAT

COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

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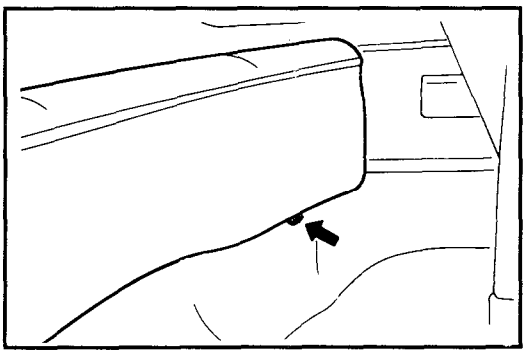
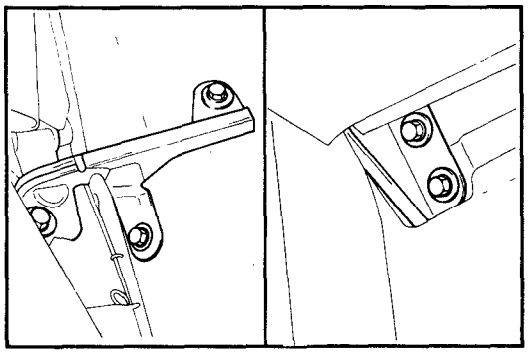
REMOVAL

1. Pull the rear seat mounting clip.
2. Remove the rear seat cushion.

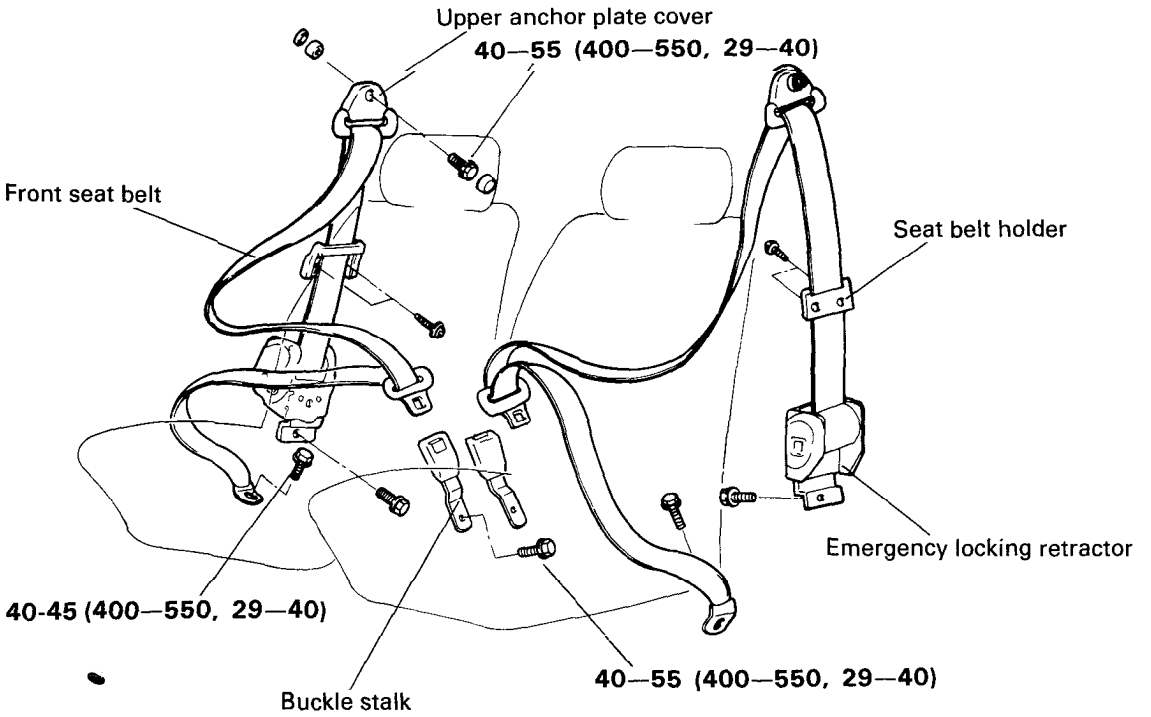


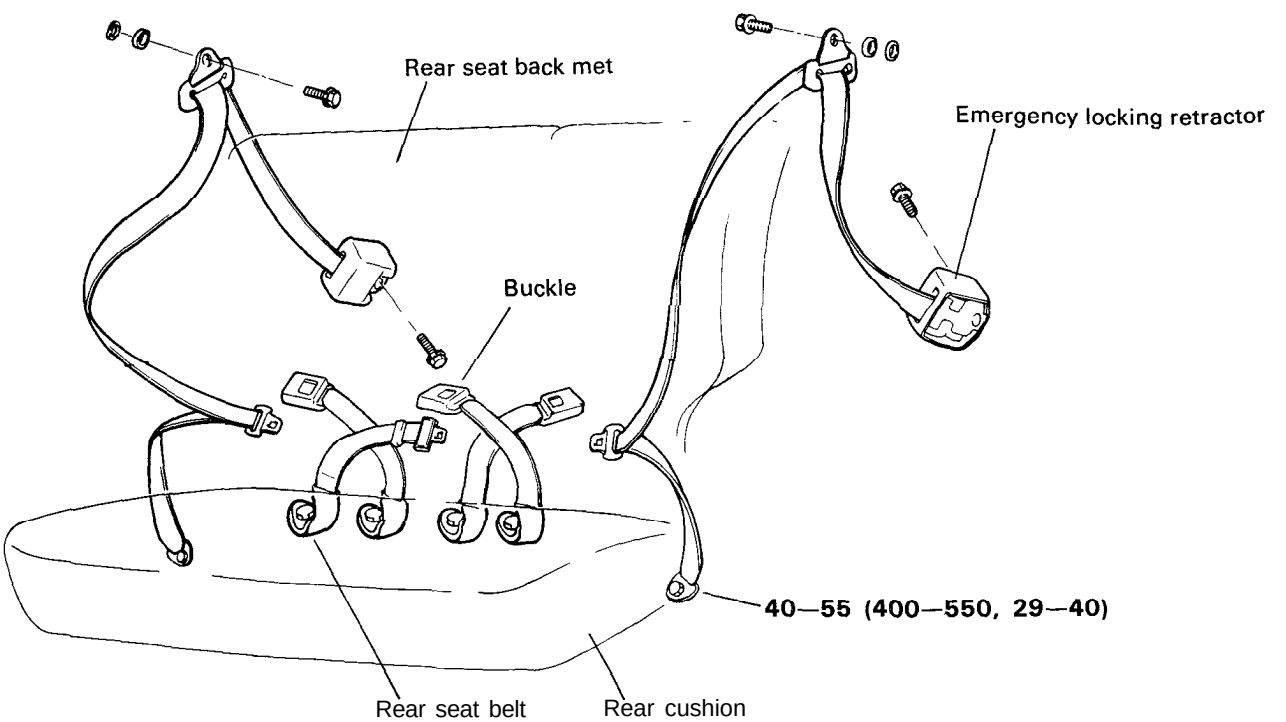
3. Remove the seat back mounting bolts.



SEAT BELT

COMPONENTS



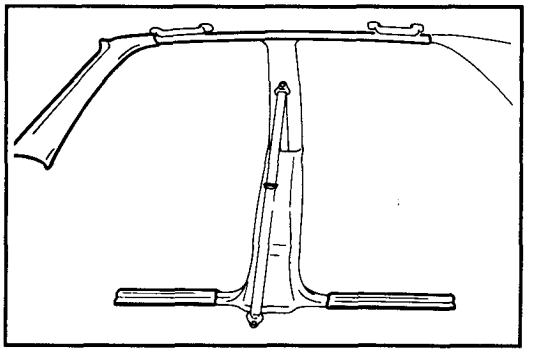


TORQUE : Nm (kg.cm, lb.ft)

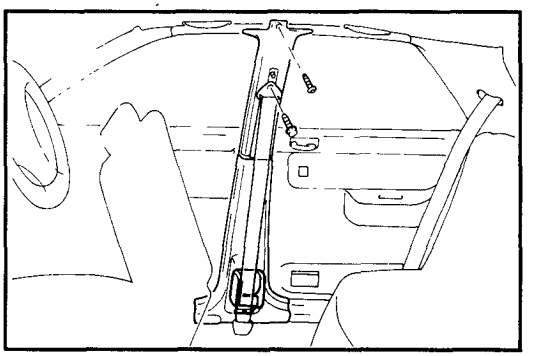
REMOVAL

Front Seat Belt

1. Remove the door scuff trim.
2. Remove the head lining side cover trim and the front pillar trim.

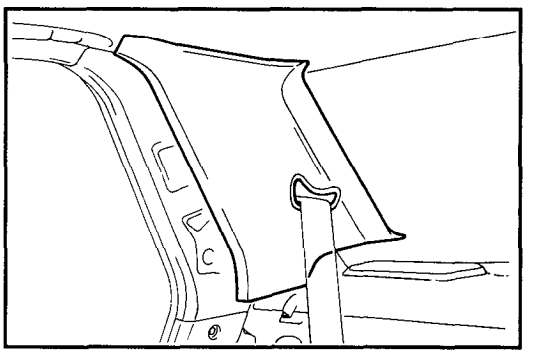


3. Remove the upper anchor plate cover and the upper anchor plate.
4. Remove the center pillar trim.
5. Remove the front seat belt assembly.

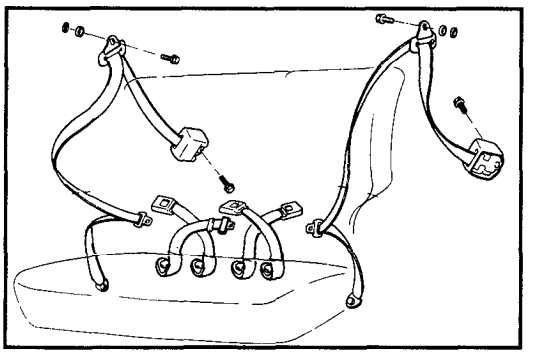


Rear Seat Belt

1. Remove the rear seat assembly.
2. Remove the rear pillar trim.



3. Remove the rear seat belt assembly.



INSTALLATION

Front Seat Belt

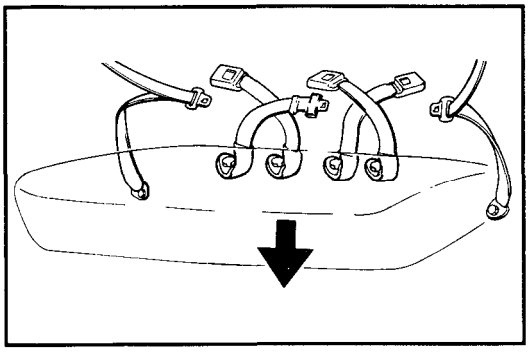
1. Installation is the reverse of the removal procedure.

Rear Seat Belt

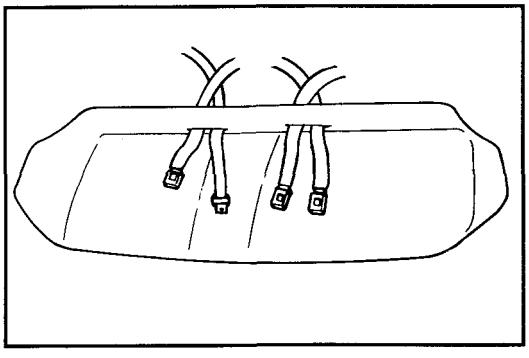
1. Installation is the reverse of the removal procedure.

CAUTION

1. When installing the rear seat belt assembly, be careful that the lower anchor plate must be placed in direction of front of the vehicle as illustration.

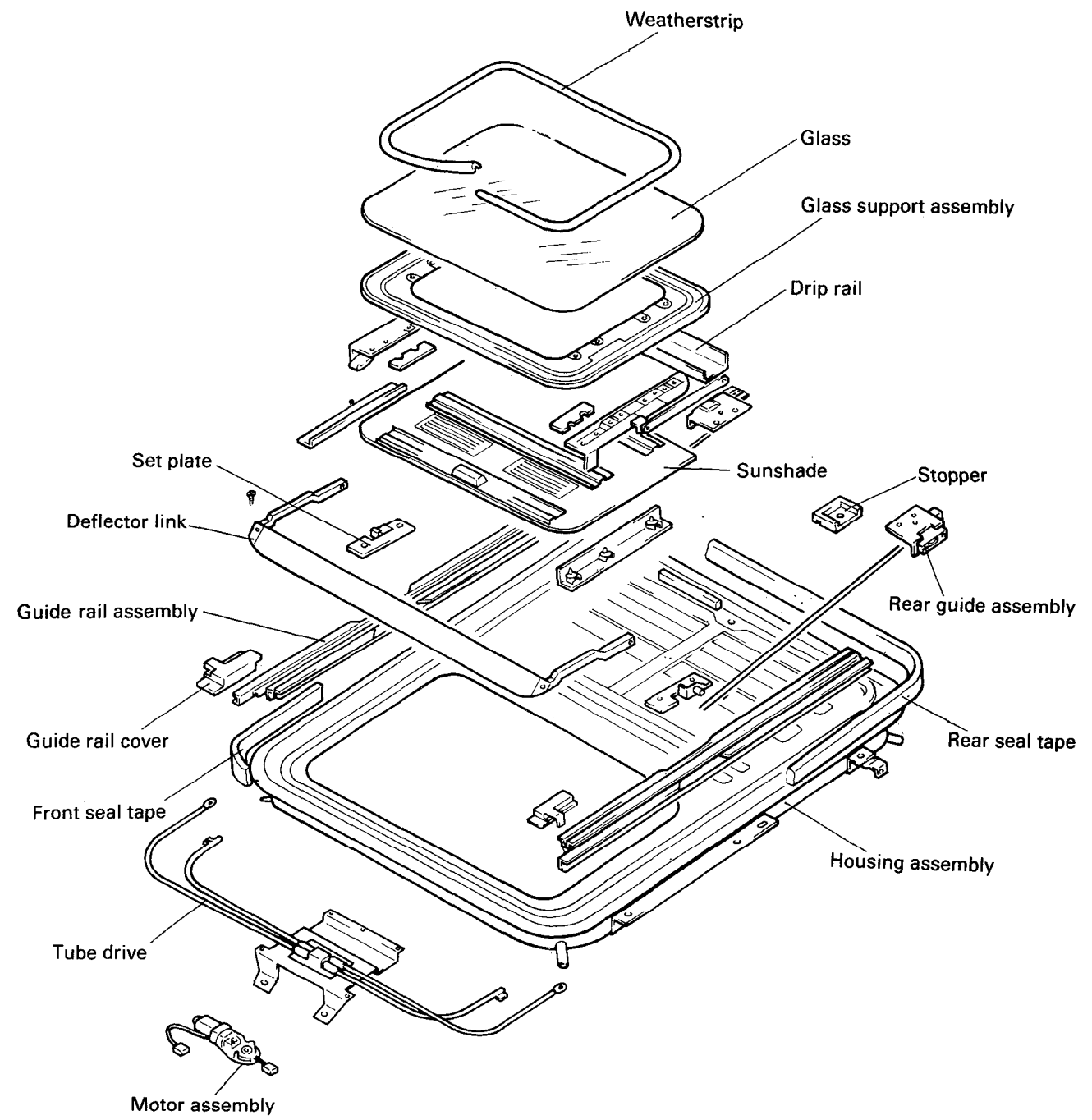


2. When installing the rear seat assembly, the seat 'belt must be passed through the rear seat cushion hole with untwisted state, as shown in the illustration.



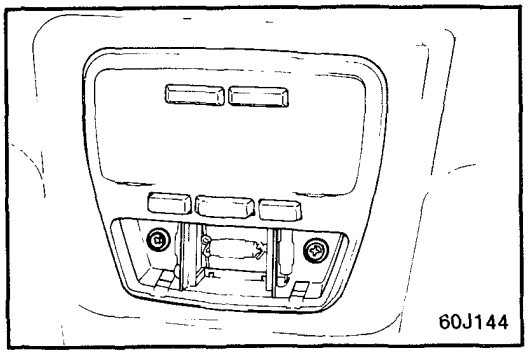
SUNROOF

COMPONENTS

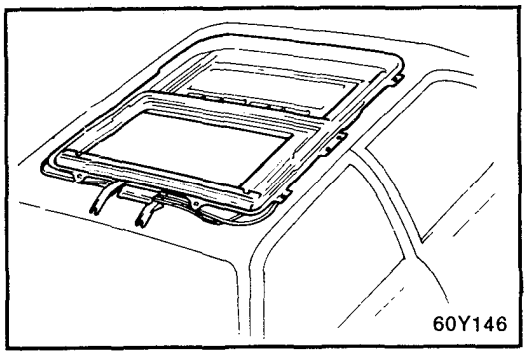


REMOVAL

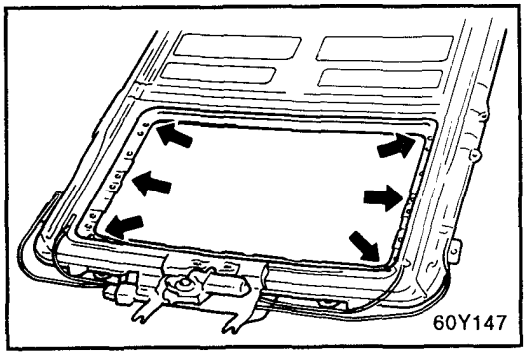
1. Remove the over head console lamp.
2. Remove the headlining.



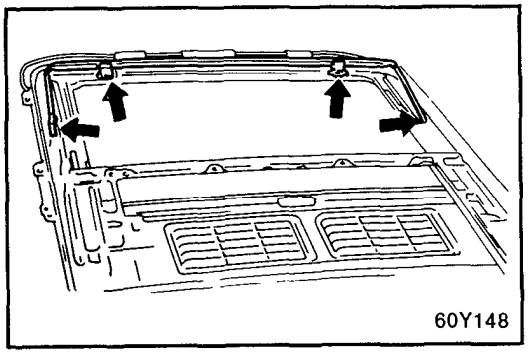
3. Remove the sunroof assembly.



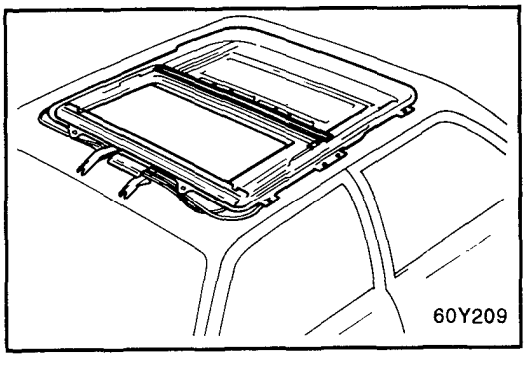
4. Remove the decoration side cover and the glass panel.



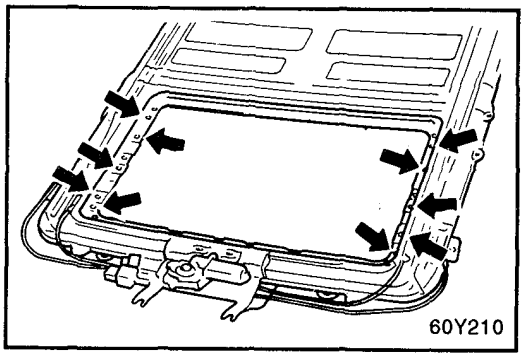
5. Using a handle, fully open the lid lower panel.
6. Remove the deflector assembly.



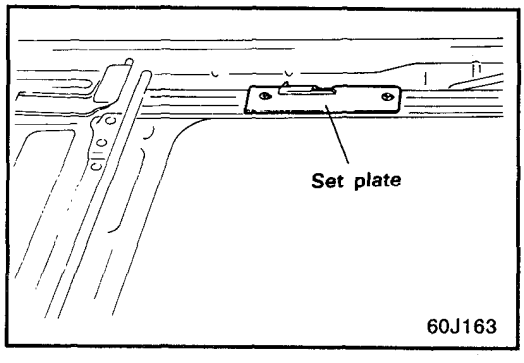
7. Close the lid lower panel.
8. Remove the stopper and the drip rail assembly.



9. Completely close the lid lower panel and remove the lid lower panel.

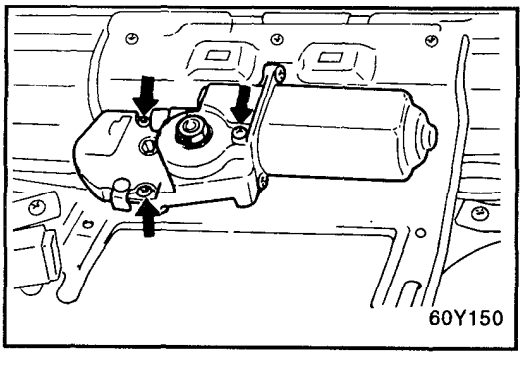


10. Remove the guide rail cover and set plate.

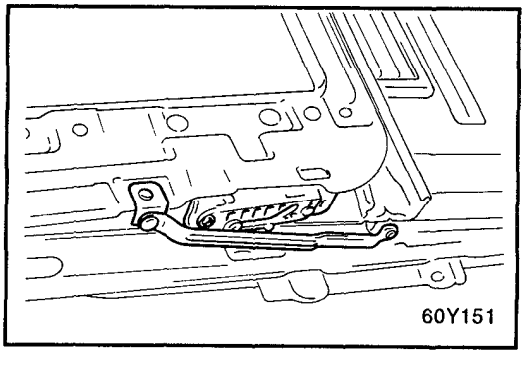


11. Remove the motor assembly.

NOTE
There are two types of mounting screws, long and short. Be sure to install them in the correct position.

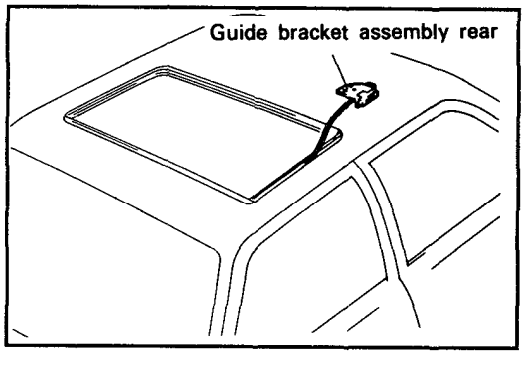


12. Pull the guide bracket assembly out while lifting from the rear.

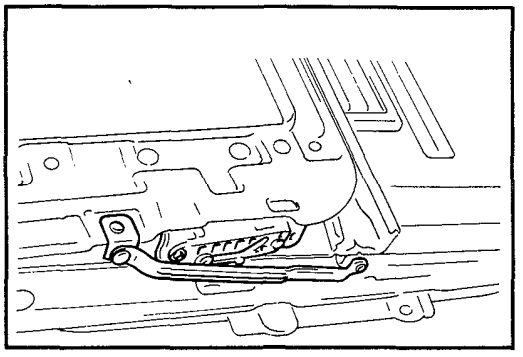


INSTALLATION

1. Insert the drive cable into the tube.

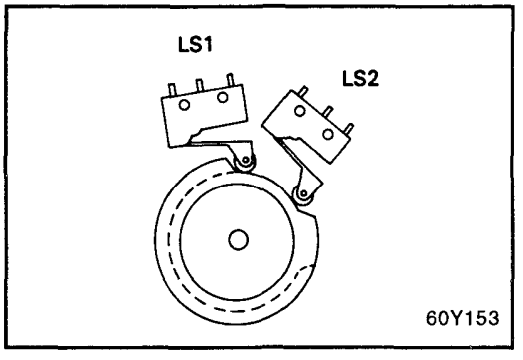


2. Align the projection of the cam with the pushing shaft in the tilting cam.



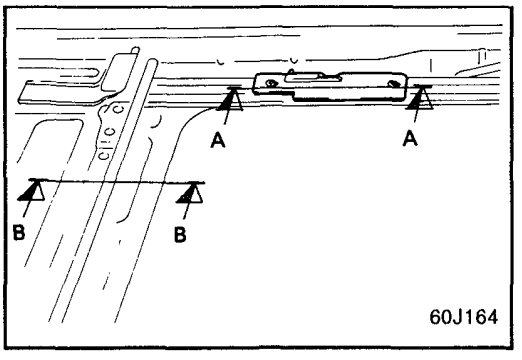
3. Install the motor assembly.

NOTE
Check that the limit switches (LS1 and LS2) of the motor are at the fully closed position.

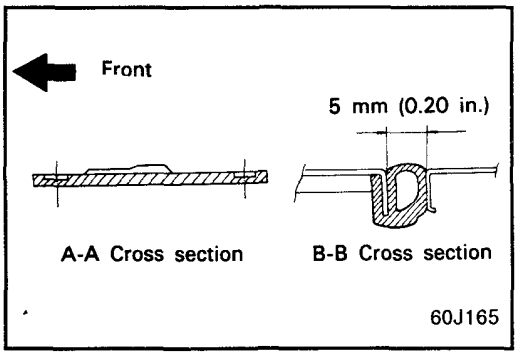


CHECK OPERATING CONDITION AFTER INSTALLATION

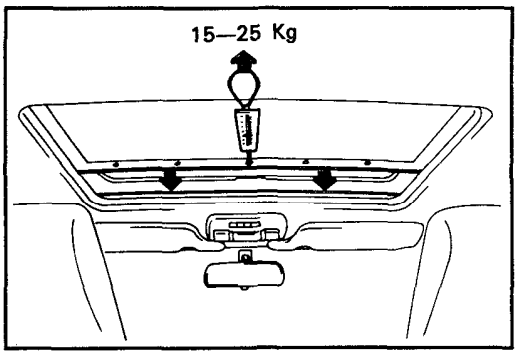
1. If the panel movement is difficult, check and adjust.
   1) Make sure the battery voltage is normal.
   2) Make sure that the sunroof sliding unit is free of foreign material.
   3) Make sure that, when the glass panel opens, the rear position of panel does not interfere excessively with the roof panel. If interference occurs, fully open the glass panel and move the stopper forward.



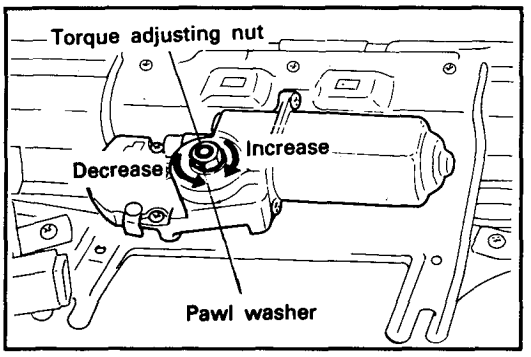
NOTE
If the stopper is moved forward too far, it may cause malfunction or leaks. Make sure the gap between the glass panel and roof panel is not more then 5.8 mm (0.28 in.).



   4) Measure the driving force of the motor, and adjust it to 15-25 kg (33.1-55.7 lb) with the torque adjustment nut on the motor.
   5) To measure, use the deep hole in the center of the lid lower panel.

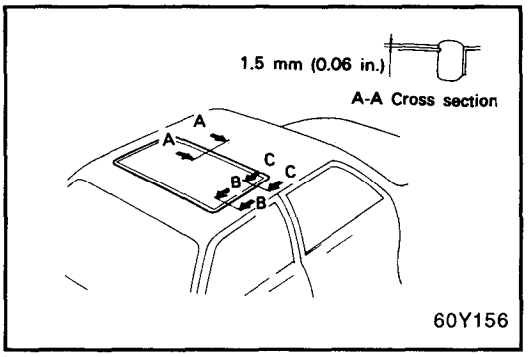


6) After adjustment, be sure to lock the nut with the pawl washer.

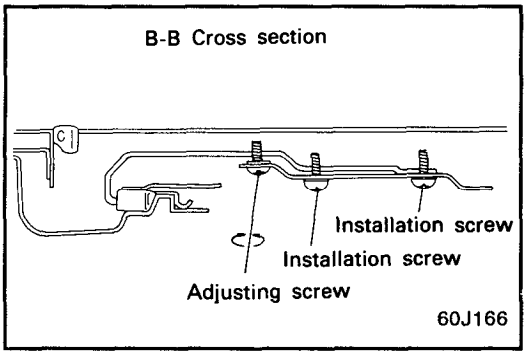


ADJUSTMENT

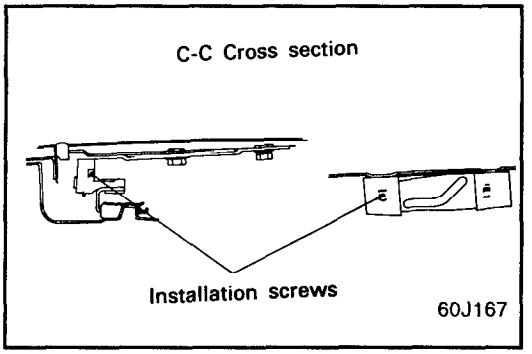
1. Adjust the height of the glass panel.
(A-A cross section)
Adjust the difference in height between the glass panel and the roof panel to no more than 5.8 mm (0.23 in.)



(Procedures to adjust B-B cross section)
1) Loose mounting screws 1 and 2.
When adjusting no more than 2 mm (0.08 in.), it may be better not to move screw 1.
2) Adjust by turning the adjust screw.
clockwise ..... Up
counterclockwise ..... Down
3) Tighten mounting screws 1 and 2.

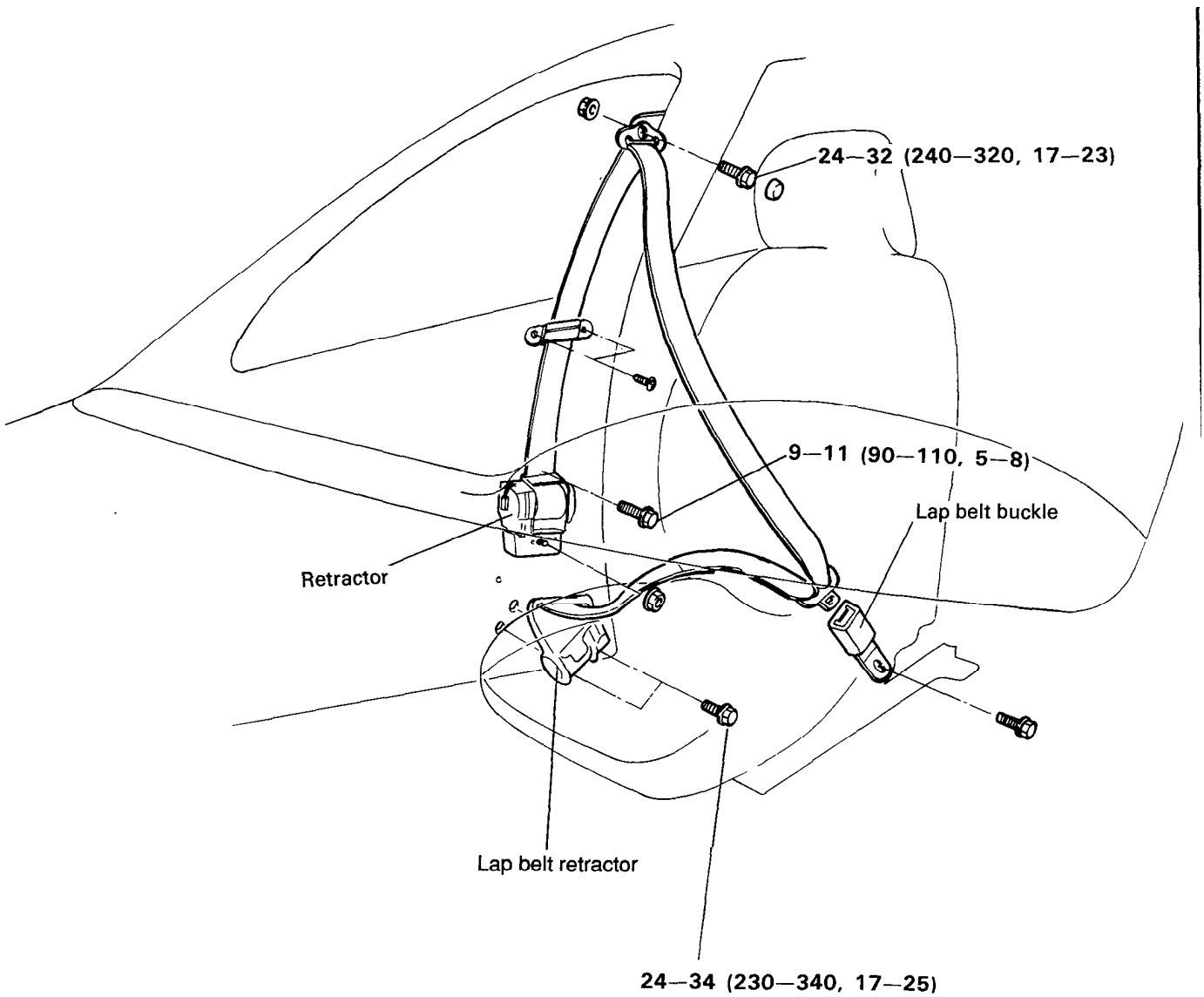


(Procedures to adjust C-C cross section)
Loose the mounting and adjusting screws. For easy adjustment, do not loosen the mounting screws too much. Adjust by moving the glass panel from inside or outside.
Tighten the adjusting screw and the mounting screws in that order.



PASSIVE SEAT BELT

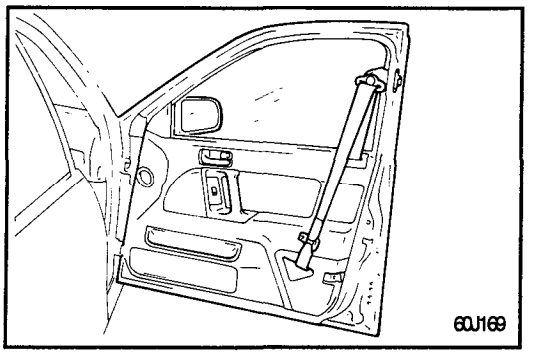
COMPONENTS



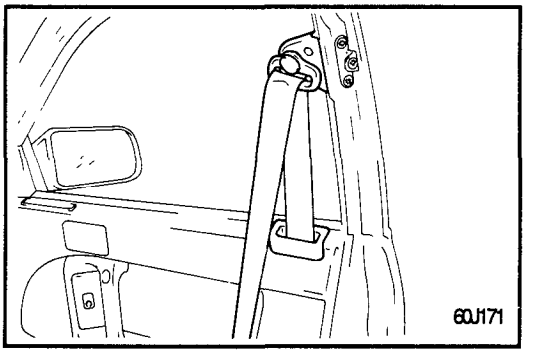
REMOVAL

Passive Seat Belt

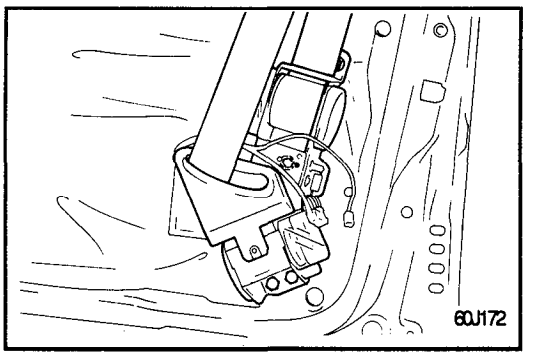
1. To remove the passive seat belt, first remove the following parts.
   1) Front door edge warning lamp.
   2) Front door trim retractor cover.
   3) Front door trim



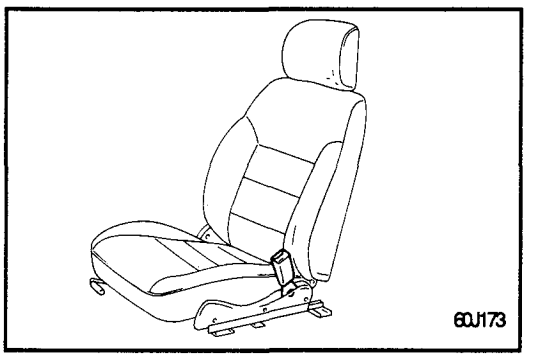
2. Remove the shoulder anchor and webbing guide.



3. Remove the lamp belt retractor and shoulder belt retractor.

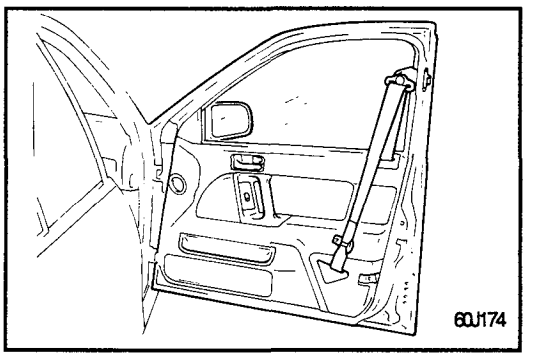


4. Remove the buckle assembly.



INSTALLATION

1. Installation is the reverse of the removal procedure.



APPENDIX

Return To Main Table of Contents

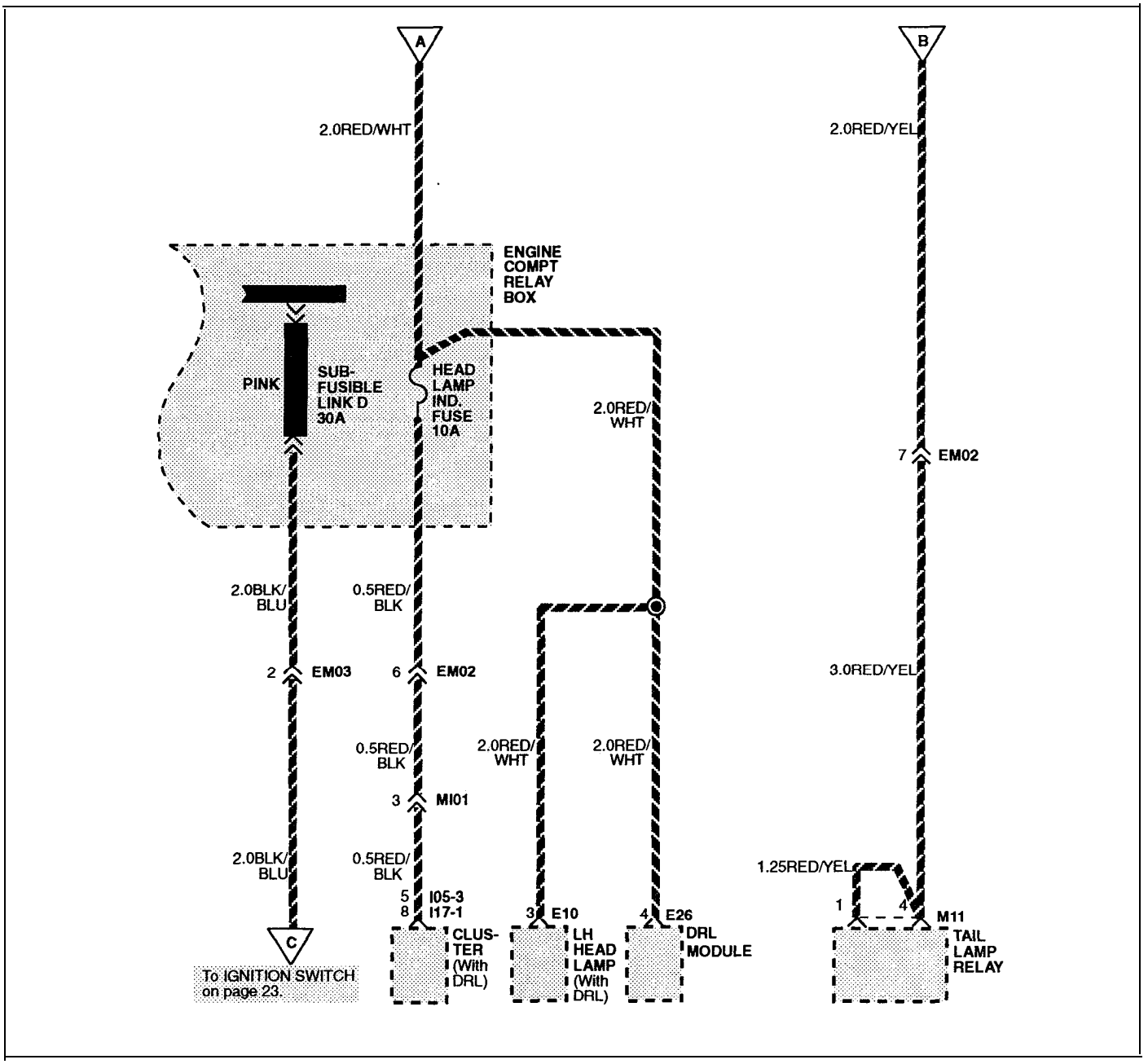
INTRODUCTION 2
SYMBOLS 6
TROUBLESHOOTING INSTRUCTIONS 10
FUSE AND RELAY INFORMATION 15
POWER DISTRIBUTION 18
DASH FUSE BOX DETAILS 22
GROUND DISTRIBUTION 32
JOINT DISTRIBUTION 44
AIR BAG 166
ANTI-LOCK BRAKE SYSTEM 162
A/C COMPRESSOR CONTROLS 142
A/T AND IGNITION KEY LOCK CONTROLS 146
BACKUP LAMPS 116
BLOWER CONTROLS 140
BRAKE AND CHARGE WARNING SYSTEM 98
CHARGING SYSTEM 56
CIGARETTE LIGHTER 90
COOLING SYSTEM 58
COURTESY LAMPS 118
CRUISE CONTROL SYSTEM 80
DASH, CONSOLE AND SWITCH LAMPS 122
DAYTIME RUNNING LIGHTS (DRL) 102
DIGITAL CLOCK 134
DOHC SYSTEM 62/70
ELECTRONIC LOCK UP CONTROL SYSTEM 84
EXTERIOR LAMPS 106
HEADLAMPS 100
HORNS 88
IGNITION SYSTEM 52
INDICATORS/GAUGES 92/ 96
PASSIVE SEAT BELT SYSTEM 158
POWER DOOR LOCKS 152
POWER DOOR MIRRORS 154
POWER WINDOWS 148
SOUND SYSTEM/POWER ANTENNA 130/132
STARTING SYSTEM 54
STOP LAMPS 110
SUNROOF 156
TAC SYSTEM 136
TRUNK LID OPENER 128
TURN/HAZARD LAMPS 112
VEHICLE SPEED SENSOR 78
CONFIGURATION OF CONNECTORS 168
COMPONENT LOCATION 182
HARNESS LAYOUT 206

INTRODUCTION

This Group consists of five major diagnostic sections for electrical problem troubleshooting.

- Schematic diagrams
- Component location indexes
- Harness layouts
- Component location
- Connector configurations

The starting point of each system section is the schematic diagram, these diagrams show how all the components work together, such as electrical current paths from power source to ground (via electrical load), switch connections at each positions, and other related circuit functions.
It is important to fully understand how a circuit work prior to troubleshooting and diagnosis.



An Example of Schematic Diagram

COMPONENT LOCATION INDEXES

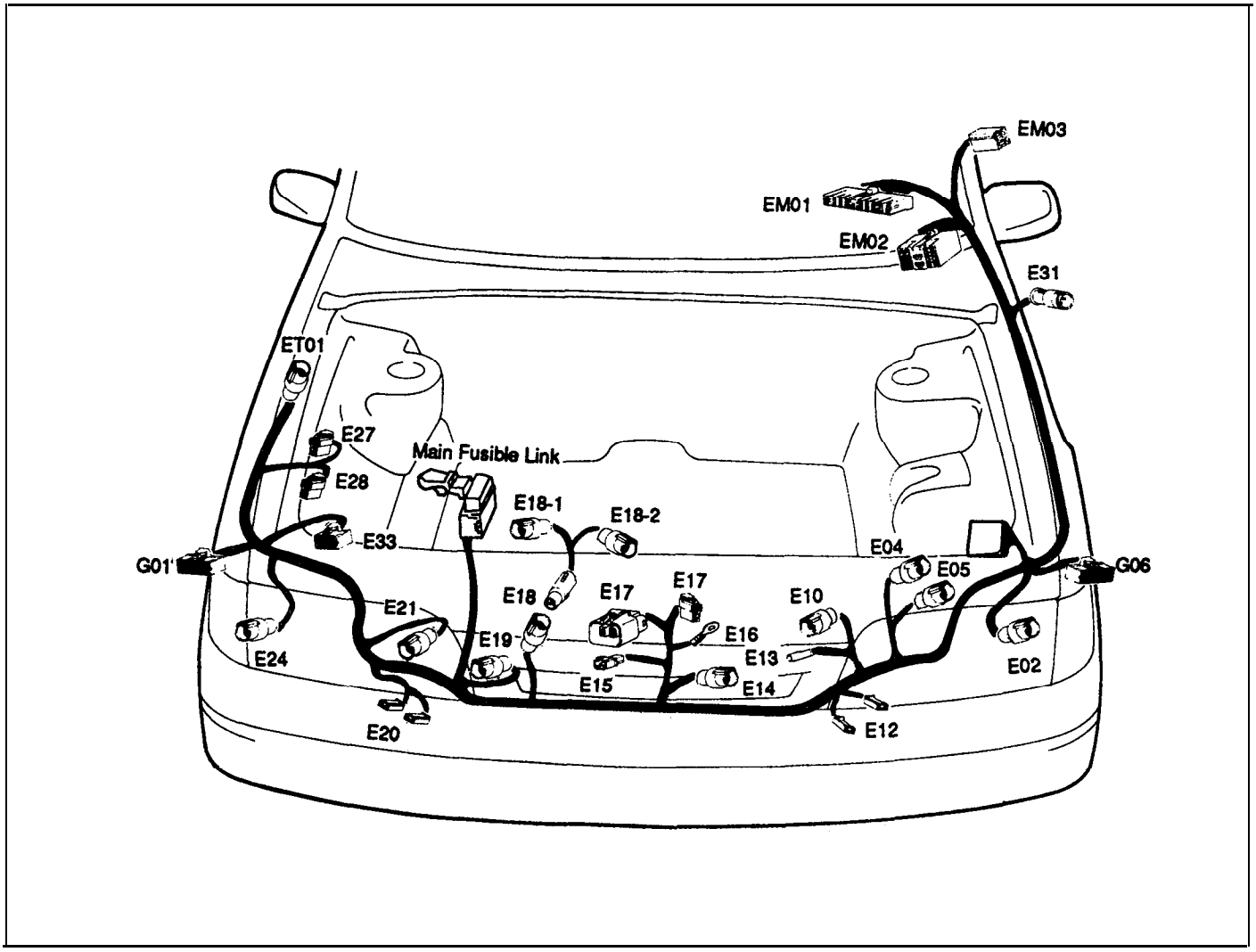
When you want to locate the schematic components on the vehicle, use the Component Location Index which follows each schematic. A Component Location Index lists major components, connectors, grounds and their physical location and page figure reference.

	Location reference-page
Components	
Relay with diode (C40)	WS-181
Generator (E17/E18)	WS-184
Instrument cluster (I05-1/I17-1)	WS-186
Connectors	
EM02	WS-185
MC02	WS-189
MI01	WS-190
Joint	
MO1-1	WS-17

Where connectors are listed, the number of cavities are provided. This figure indicates the total number of cavities in the connector, regardless of how many are actually used. This information along with housing color will be useful for you to identify connectors on the vehicle. Almost all components, connectors, grounds or splices shown on a schematic can be pinpointed visually by using the Component Location Illustrations.

HARNESS LAYOUTS

Harness layouts show the routing of the major wiring harnesses and the in-line connectors between the major harnesses. These layouts will make electrical troubleshooting easier.



An example of Harness Layouts-Engine Harness

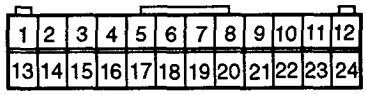
COMPONENT LOCATIONS

Component Locations give easy access to find the schematic components on the vehicle shown in the Component Location Index. Where connectors are listed, the total number of cavities, how many are actually used, is provided to help identify connectors on the vehicle.

CONNECTOR CONFIGURATIONS

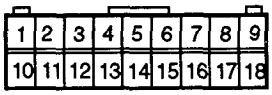
This section shows the cavitiy or terminal locations in all the multi-pin connectors shown in the schematic diagrams. It is helpful for you to locate check points, together with the wire colors and terminal numbers in the schematic. The configuration drawings show the connector views as seen from a component after the harness connector has been disconnected. When more than on connector is connected to a component, the connectors are all shown together. Both halves of in line connectors are shown together.

C01-1



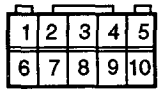
CC24-001F

C01-2



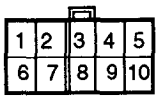
CC18-002F

C01-3



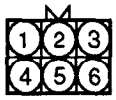
CC10-003F

C02



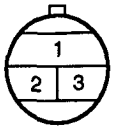
CC10-001F

C03



CC06-003F

C04



CC03-001F

C05

CC02-003F

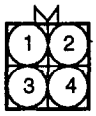
C06

CC02-003F

C07

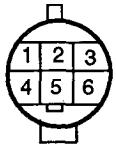
CC02-010F

C08



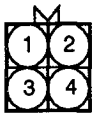
CC04-002F

C09



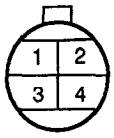
CC06-001F

C10



CC04-002F

C11

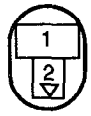


CC04-003F

C12

CC01-004F

C13



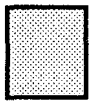
CC02-004F

SYMBOLS

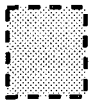
The symbols and the abbreviations explained in this section are used throughout the manual.

SYMBOLS IN SCHEMATIC

Components



A solid line means the entire component is shown.

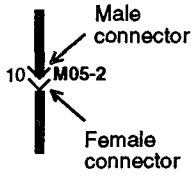


A broken line indicates only part of the component is shown.

The name of the component appears next to its upper right corner.

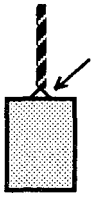
Notes about component function follow its name.

Connectors

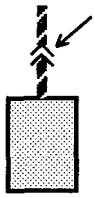


Each connector is numbered for reference in the component location index.

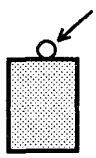
The index also lists the total number of cavities and the color the connector. Wires may not be used in all cavities.



This means the connector connects directly to the component.

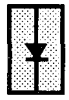


This indicates the connector connects to a lead (pigtail), wired directly to the component.



This indicates a screw terminal on the component.

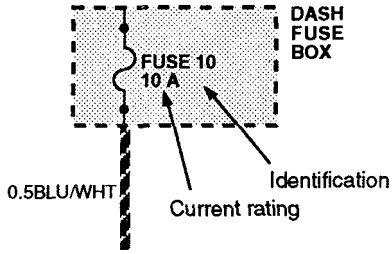
Diode

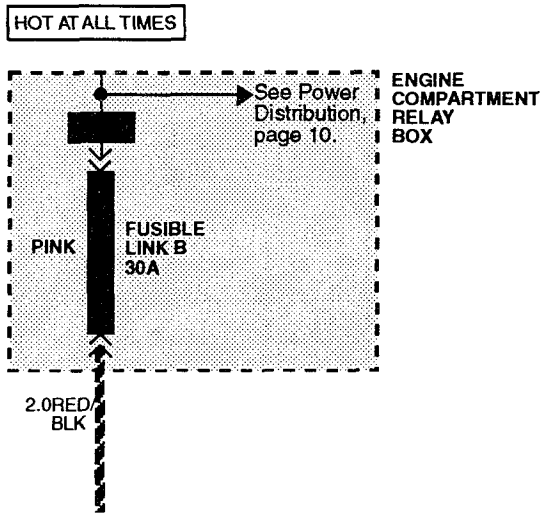


This diode allows current to flow only in the direction of the arrow.

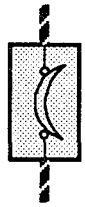
Fuse and Fusible link

This means power is supplied with the ignition in RUN.



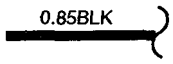


Circuit breaker



Basically a reusable fuse, a circuit breaker will heat and open if too much current flows through it. Some units automatically reset when cool, others must be manually reset.

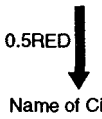
Wires



A wavy line means the wire is broken but is to be continued.

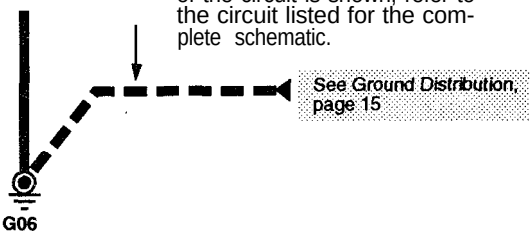
Wire insulation is yellow with a red strip

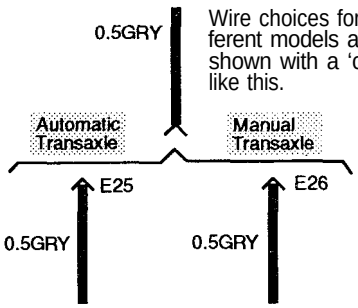
Current path is continued another page. The arrow shows the direction of current flow. You should look for the "P" in the Power Distribution schematic to follow the white wire in left example.



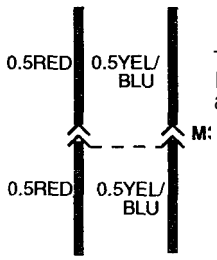
A wire connects to another circuit. The wire is shown again on that circuit which the arrow is pointing.

A broken line means only some of the circuit is shown; refer to the circuit listed for the complete schematic.

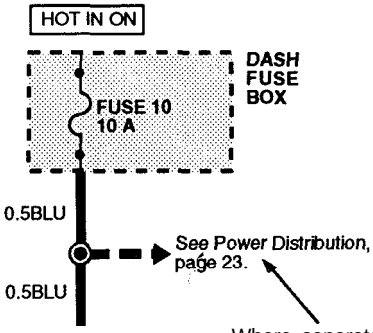




Wire choices for options or different models are labeled and shown with a 'choice' bracket like this.

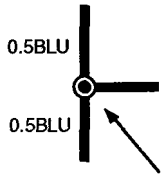


This dashed line means the RED and YEI/BLU wires are both in connector M35.



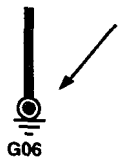
Where separate wires join, only the splice is shown: for details on the additional wiring, refer to the circuit listed.

Splices



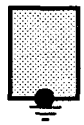
Splices are numbered and shown as a dot with circle. The exact location and connection of these splices may vary among vehicles.

Ground-"G"



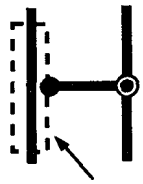
This symbol means the end of the wire is attached to a metal part of the vehicle.

Each wire ground (G) is numbered for reference in the component location index.



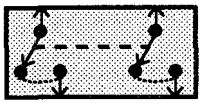
This ground symbol (dot and 3 lines overlapping the component) means the housing of the component is attached to a metal part of the vehicle.

Shield Wire



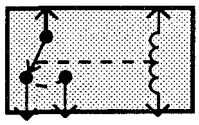
This represents RFI (Radio Frequency Interference) Shielding around a wire. the shielding is always connected to ground.

Switches

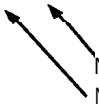


These switches move together: a dashed line shows a mechanical connection between them.

Relays

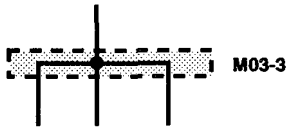


This is a relay shown with no current flowing through its coil. When a current flows through coil, contact will toggle.



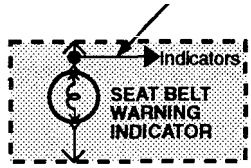
Normally open contact
Normally closed contact

Joint Connectors



Indicator

This indicates seat belt warning indicator continues to other indicators within instrument cluster.



This is an indicator which displays the lighted symbol.

WIRE COLOR ABBREVIATIONS

The following abbreviations are used to identify wire colors in the circuit schematics:

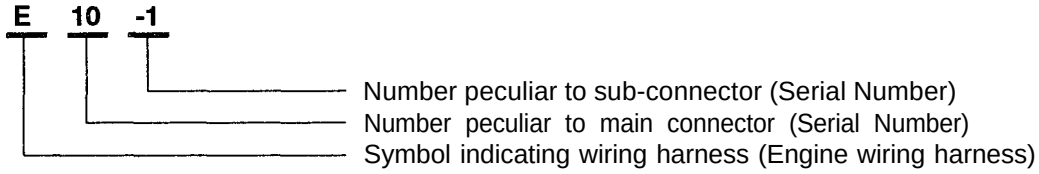
Symbol	Color of wire	Symbol	Color of wire
BLK	Black	LT GRN	Light Green
BLU	Blue	ORN	Orange
BRN	Brown	PNK	Pink
GRN	Green	RED	Red
GRY	Gray	WHT	White
LT BLU	Light Blue	YEL	Yellow

CONNECTOR CLASSIFICATION SYMBOLS

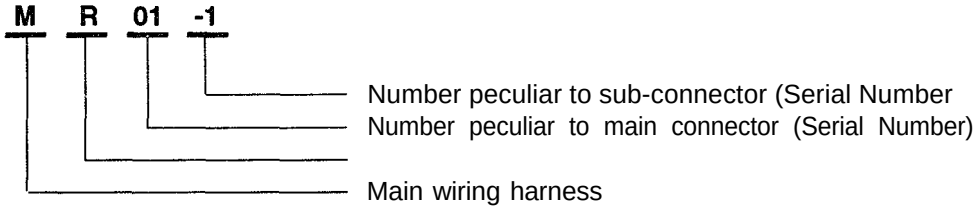
Electrical wiring connectors are classified according to the wiring parts in the Harness Layout.

Harness name	Location	Symbol
Engine and its extension harness	Engine compartment	E
Main and its extension harness	Passenger compartment	M
Control (ECM) harness	Engine compartment	C
T/A (TCM) and its extension harness	Engine compartment	T
Floor and Rear floor, Trunk lid (Tail gate), Rear and their extension harnesses	Passenger compartment/ Luggage compartment	R
Crash pad, Instrument and their extension harnesses	Under crash pad	I
Door and its extension harness	Door	D

A connector identification symbol consists of a wiring harness location classification symbol corresponding to each other wiring harness location and number peculiar to the connector.
These connector locations can be found in the WIRING HARNESS LAYOUT.



NOTE
Connectors which connect each wiring harness are represented by the following symbols.
For example:



TROUBLESHOOTING INSTRUCTIONS

TROUBLESHOOTING PROCEDURES

The following five-step troubleshooting procedure is recommended.

Step 1. Verify the customer complaints

Turn on all the components in the problem circuit to check the accuracy of the customer complaints. Note the symptoms. Do not begin disassembly or testing until you have narrowed down the probable causes.

Step 2. Read and analyze the schematic diagram

Locate the schematic for the problem circuit. Determine how the circuit is supposed to work by tracing the current paths from the power source through the system components to ground. If you do not understand how the circuit should work, read the circuit operation text. Also check other circuits that share with the problem circuit. The name of circuits that share the same fuse, ground, or switch, for example, are referred to on each diagrams. Try to operate any shared circuits you did not check in step 1. If the shared circuit works, the shared wiring is okay, and the cause must be within the wiring used only by the problem circuit. If several circuit fails at the same time, the fuse or ground is a likely cause.

Step 3. Inspect the circuit/component with the problem isolated

Make a circuit test to check the diagnosis you made in step 2. Remember that a logical, simple procedure is the key to efficient troubleshooting. Narrow down the probable causes using the Troubleshooting Hints, System Diagnosis Charts. Test for the most likely cause of failure first. try to make tests at points that are easily accessible.

Step 4. Repair the problem

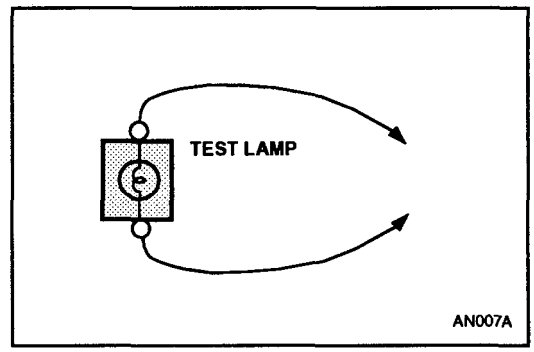
Once the problem is found, make the necessary repairs.

Step 5. Make sure the circuit works

Repeat the system check to be sure you have repaired the problem. If the problem was a blown fuse, be sure to test all of the circuits on that fuse.

TROUBLESHOOTING EQUIPMENTS

Voltmeter And Test Lamp

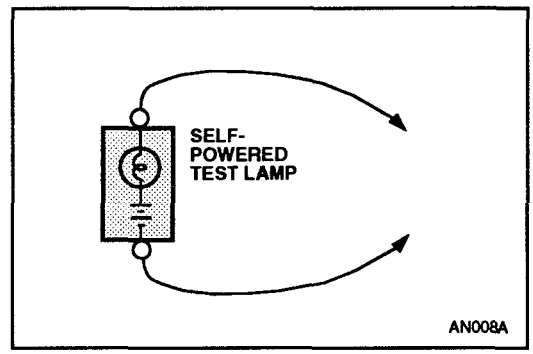


Use a test lamp or a voltmeter on circuits without solid-state units, use a test lamp to check for voltage. A test lamp is made up of 12-volt bulb with a pair of leads attached. After grounding one lead to various points along the circuit where voltage should be present. When the bulb goes on, there is voltage at the point being tested.

CAUTION:
A number of circuits include solid-state modules such as **Engine Control Module (EM) used with computer command control injection. Voltage in these circuits should be tested only with a 10-megohm or higher impedance digital voltmeter. Never use a test lamp on circuits that contain solid-state units. Damage to the units may result.**

A voltmeter can be used in place of a test lamp. While a test lamp shows whether the voltage is present or not, a voltmeter indicates how much voltage there is.

Self-Powered Test Lamp And Ohmmeter

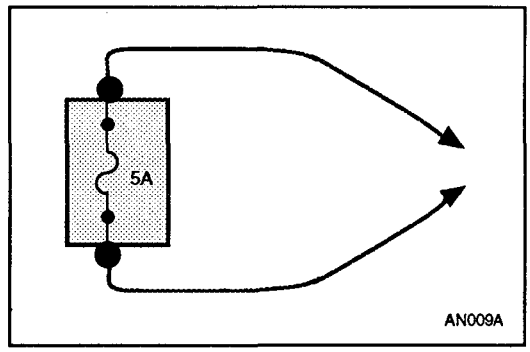


Use a self-powered test lamp or a ohmmeter to check for continuity. Self-powered test lamp is made of a bulb, battery and two leads and is used only on an unpowered circuit. If the leads are touched together, the lamp will go on. Prior to checking the points, first disconnect the battery ground cable or remove the fuse which feeds the circuit you are working on.

CAUTION:
Never use a self-powered test lamp on circuits that contain solid state units. Damage to these units may result.

An ohmmeter can be used in place of a self-powered test lamp. The ohmmeter shows how much resistance there is between two points along a circuit. Low resistance means good continuity. Circuits which include any solid-state devices should be tested only with a 10-megohm or higher impedance digital multimeter. When measuring resistance with a digital multimeter, battery negative terminal should be disconnected. Otherwise, there may incorrect readings. Diodes and solid-state devices in a circuit can make an ohmmeter give a false reading. To find out if a component is affecting a measurement, take one reading, reverse the leads and take a second reading. If the readings differ, the solid-state device is affecting the measurement.

Jumper Wire With Fuse



Use a jumper wire with fuse to by pass an open circuit.
A jumper wire is made up of an in-line fuse holder connected to a set of test leads. This tool is available with small clamp connectors providing adaption to most connectors without damage.

CAUTION:
Do not use a fuse with a higher rating then the specified fuse that protests the circuit being tested. Do not use this tool in any situation to substitute for input or output at the solid-state control module, such as ECM, TCM, etc.

Short Finder

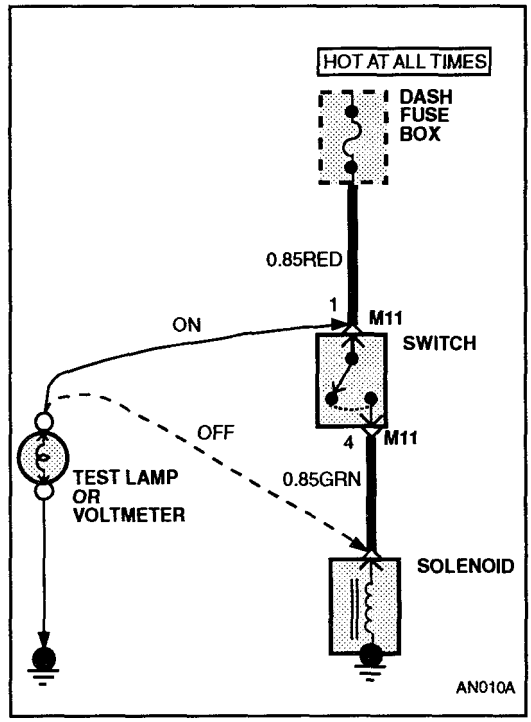
Short finder is available to locate short to ground. The short finder creates a pulsing magnetic field in the shorted circuit and shows you the location of the short through body trim or sheet metal.

TROUBLESHOOTING TEST

Testing For Voltage

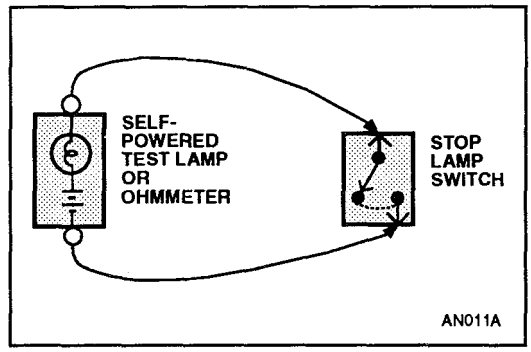
This test measures voltage in a circuit. When testing for voltage at a connector, you do not have to separate the two halves of the connector. Instead, probe the connector from the back. Always check both sides of the connector because dirt and corrosion between its contact surfaces can cause electrical problems.

1. Connect one lead of a test lamp or voltmeter to a ground. If you are using a voltmeter, be sure it is the voltmeter's negative lead test you have connected to ground.
2. Connect the other lead of the test lamp or voltmeter to a selected test point (connector or terminal).
3. If the test lamp glows, there is voltage present. If you are using a voltmeter, note the voltage reading.
   A loss of more than 1 volt from specifications indicates a problem.



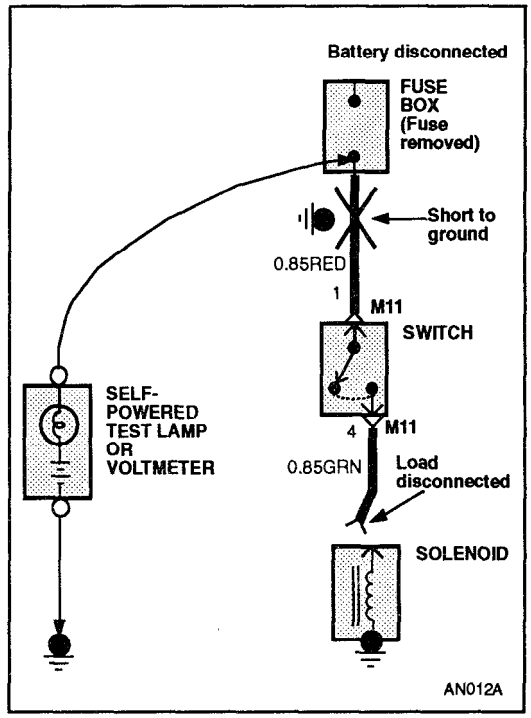
Testing For Continuity

1. Disconnect the battery negative terminal.
2. Connect one lead of a self-powered test lamp or ohmmeter to one end of the part of the circuit you wish to test. If you are using an ohmmeter, hold the leads together and adjust the ohmmeter to read zero ohms.
3. Connect the other lead to the other end.
4. If the self-powered test lamp glows, there is continuity. If you are using an ohmmeter, low or zero resistance means good continuity.



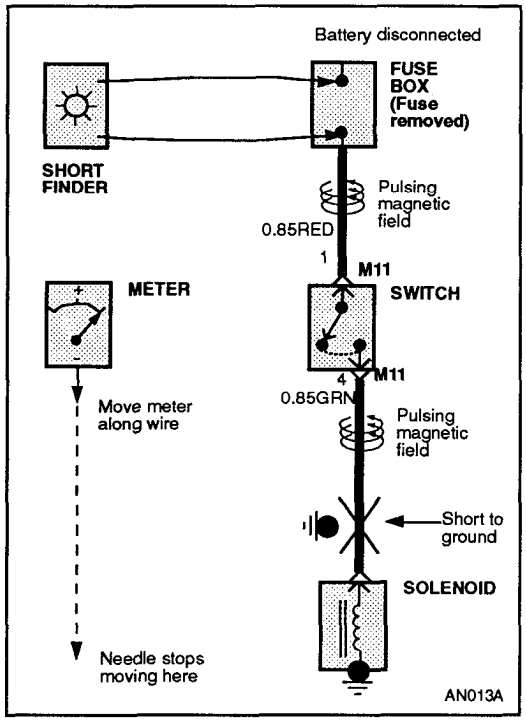
Testing For Short To Ground

1. Remove the blown fuse and disconnect the battery and load.
3. Connect one lead of a self-powered test lamp or an ohmmeter to the fuse terminal on the load side.
3. Connect the other lead to a ground.
4. Beginning near the fuse block move the harness from side to side. Continue this point (about six inches apart) while watching the selfpowered test lamp or ohmmeter.
5. When the self-powered test lamp glows, or ohmmeter registers, there is a short to ground in the wiring near that point.



Testing For A Short With A Short Finder

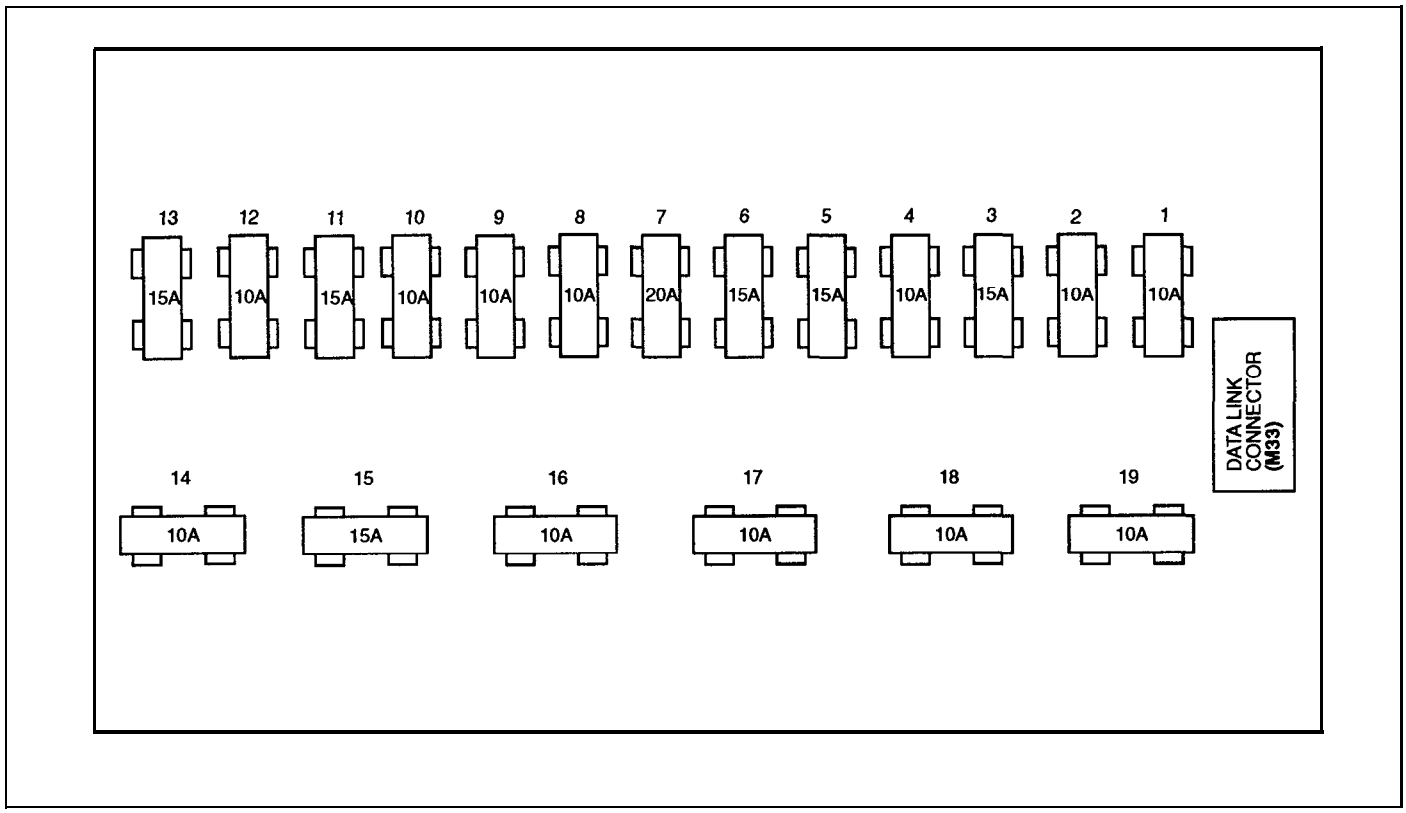
1. Remove the blown fuse. Leave the battery connected.
2. Connect the short finder across the fuse terminals.
3. Close all switches in series in the circuit you're testing.
4. Turn on the short circuit locator. It sends pulses of current to the short.
   This creates a pulsing magnetic field around the wiring between the fuse box and the short.
5. Beginning at the fuse box, slowly move the short finder along the circuit wiring. The meter will show current pulses through sheet metal and body trim. As long as the meter is between the fuse and the short, the needle with move with each current pulse. One you move the meter past the point of the short, the needle will stop moving. Check around this area to locate the cause of the short circuit.



FUSE AND RELAY INFORMATION

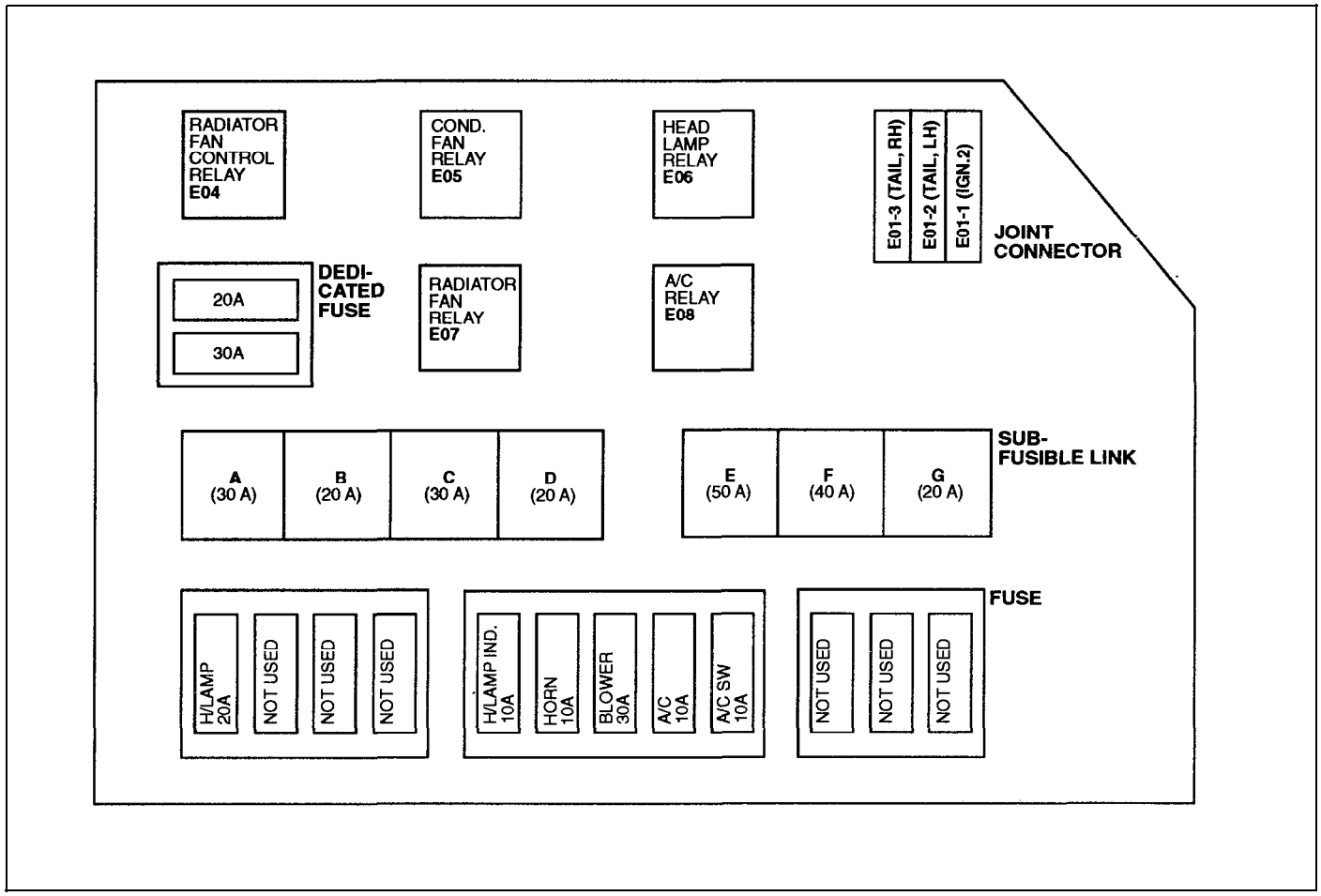
DASH FUSE BOX

Layout



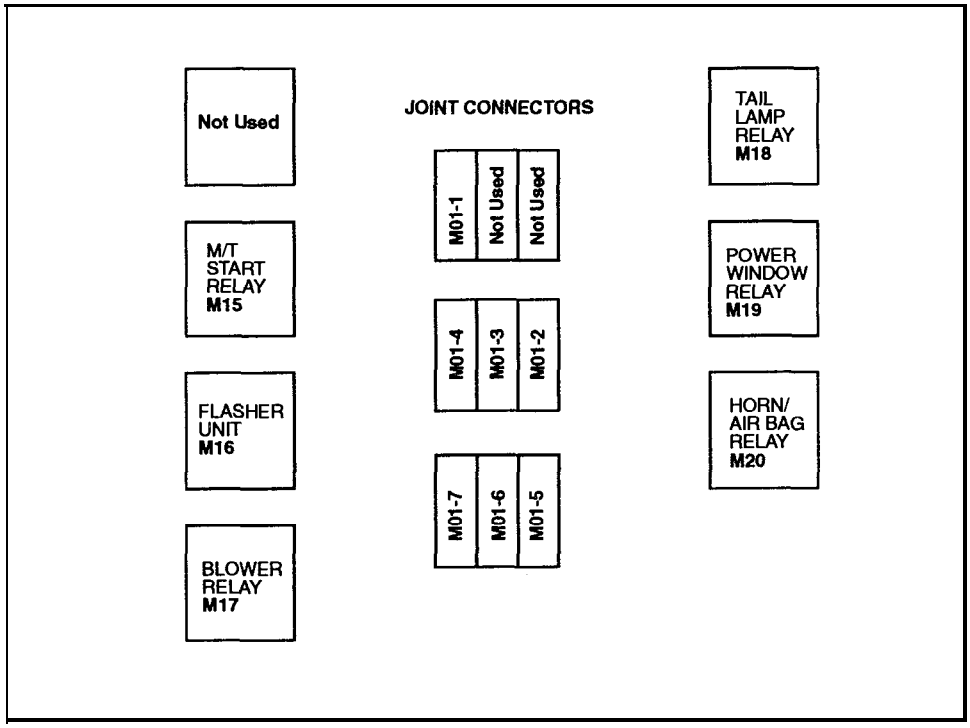
Fuse	Amperages	Circuits
1	10A	A/C compressor controls
2	10A	Hazard warning
3	15A	Cruise controls, stop lamps
4	10A	TCM, audio power antenna
5	15A	Power door lock, trunk lid opener
6	15A	Sunroof, courtesy lamps
7	20A	Rear defogger
8	10A	Cluster, interior lamps, clock
9	10A	Back up lamps, turn signal lamps
10	10A	Cluster, clock, seat belt
11	15A	Wiper and washer controls
12	10A	Power windows, blower, head lamps, sunroof
13	15A	Cruise, TCM
14	10A	Audio, power door mirror
15	15A	Cigarette lighter
16	10A	LH tail lamps
17	10A	RH tail lamps
18	10A	SRS (Air bag) controls
19	10A	Passive seat belt

ENGINE COMPARTMENT RELAY BOX
Layout

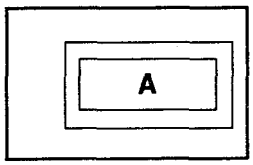


Description	Amperages	Circuit protected	Remark
Sub-fusible link			
A(Pink)	30A	Ignition power source	
B(Blue)	20A	MFI system controls	
C(Pink)	30A	Power windows	
D(Blue)	20A	Condenser fan controls	
E(Red)	50A	Battery power source	
F(Pink)	30A	Headlamps	
G(Blue)	20A	Radiator fan controls	
Fuse			
H/LAMP	20A	Headlamps	
A/C SWITCH	10A	Air conditioning controls	
A/C	10A	Air conditioning controls	
H/LAMP IND	10A	Headlamp indicator	
HORN	10A	Horns	
BLOWER	30A	Blower	

PASSENGER COMPARTMENT RELAY BOX
Layout



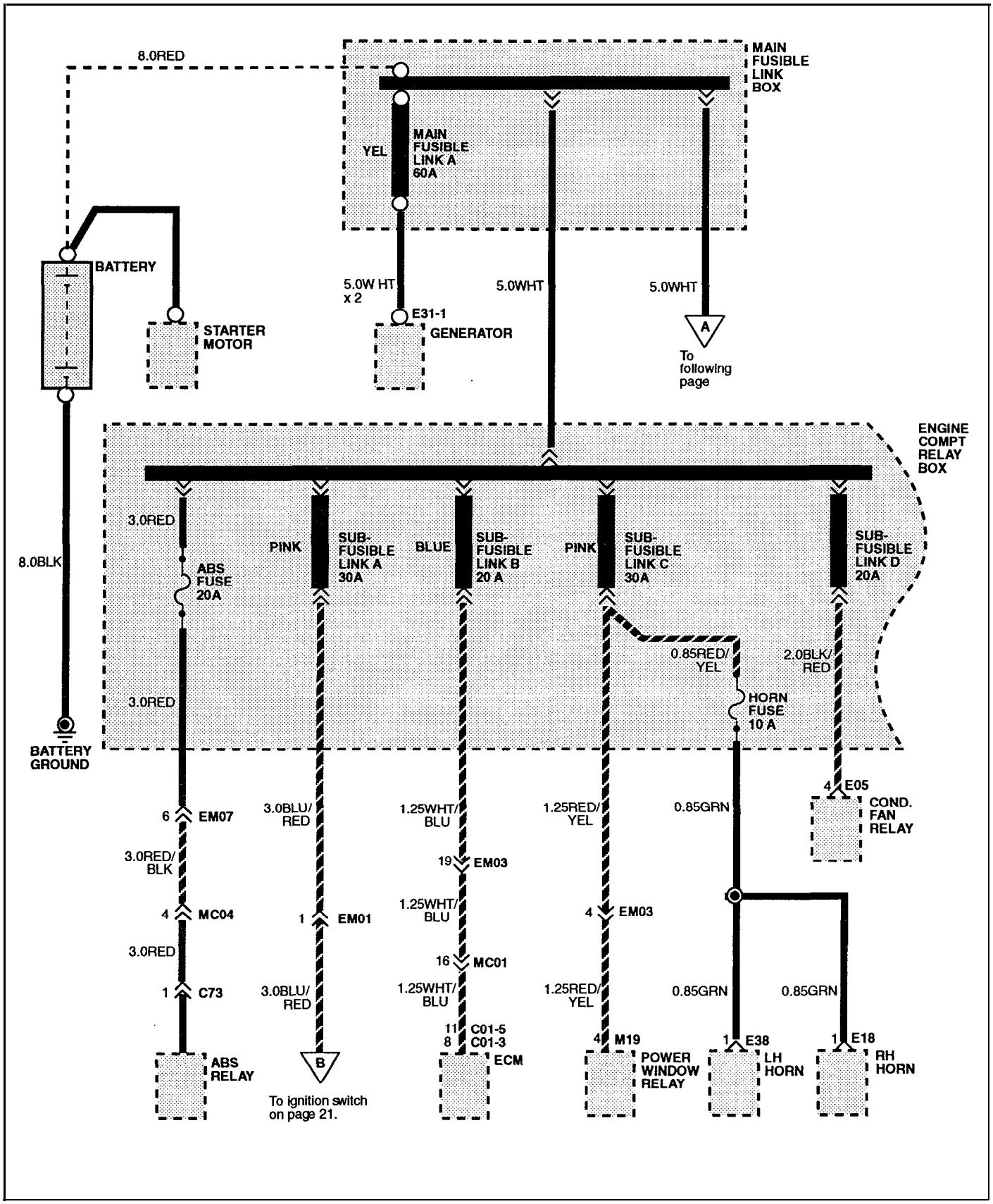
FUSIBLE LINK BOX
Layout/circuit



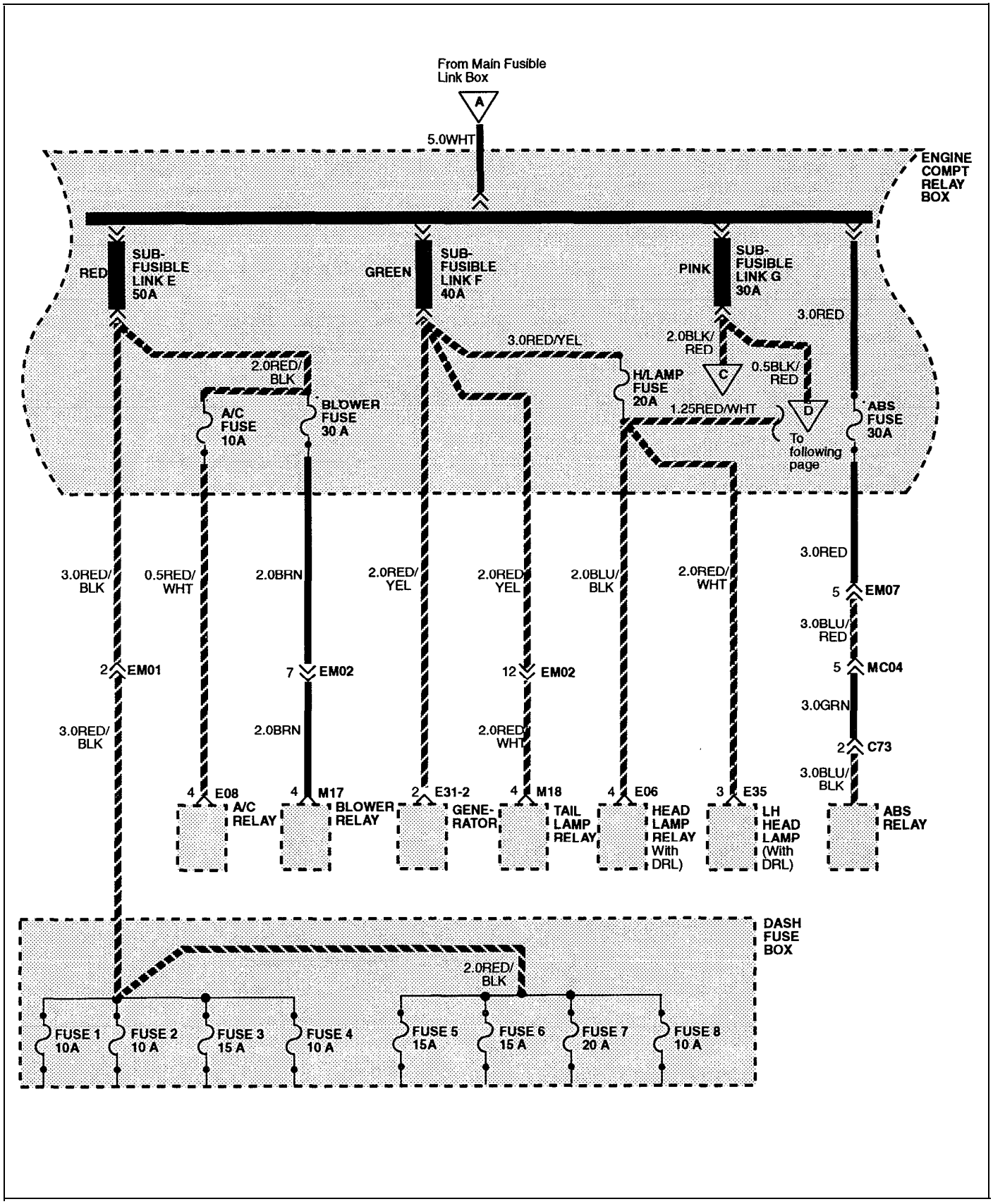
Main-fusible link	Amperage	Circuit
A (Yellow)	60A	Generator

POWER DISTRIBUTION

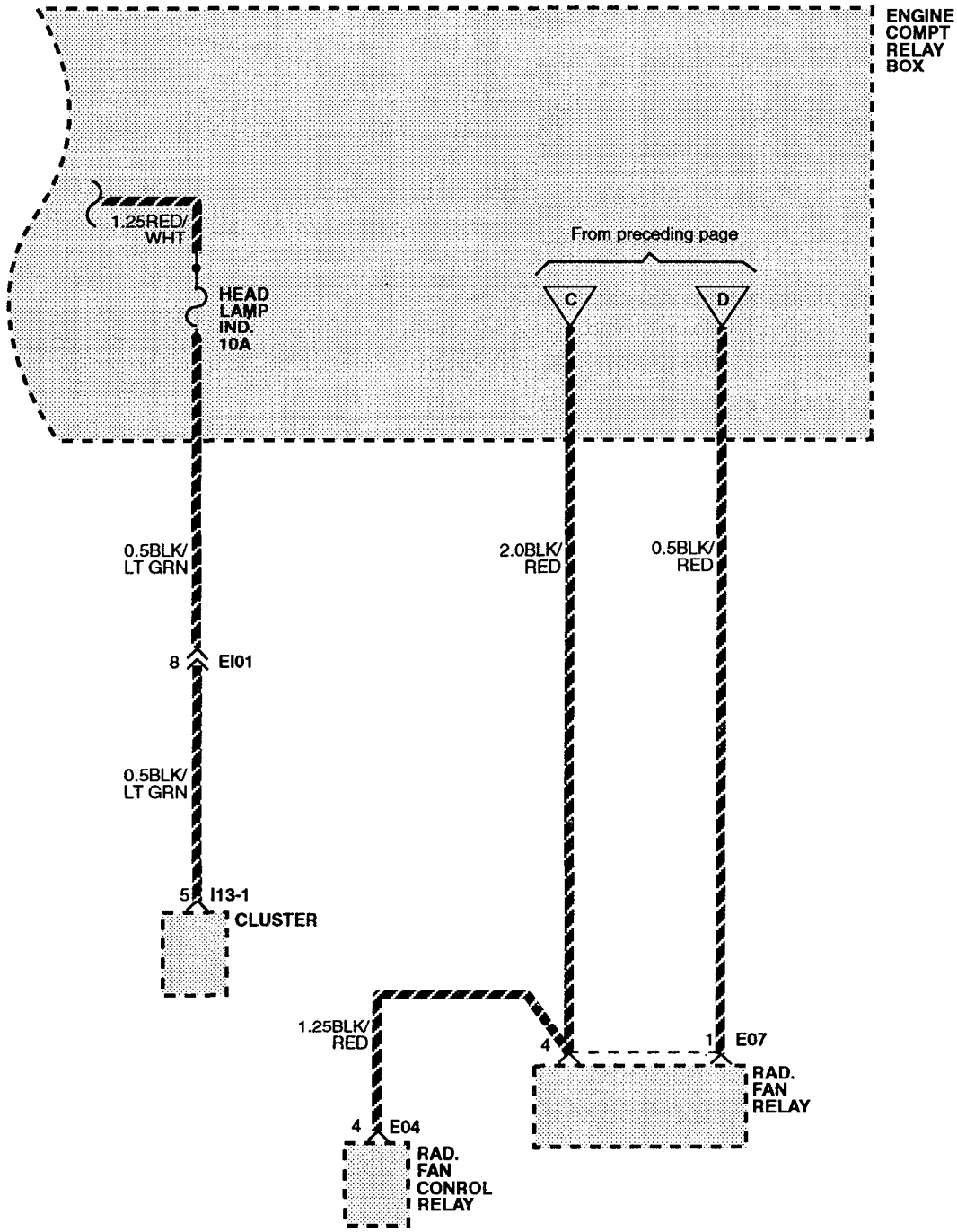
SCHEMATIC DIAGRAM (1)



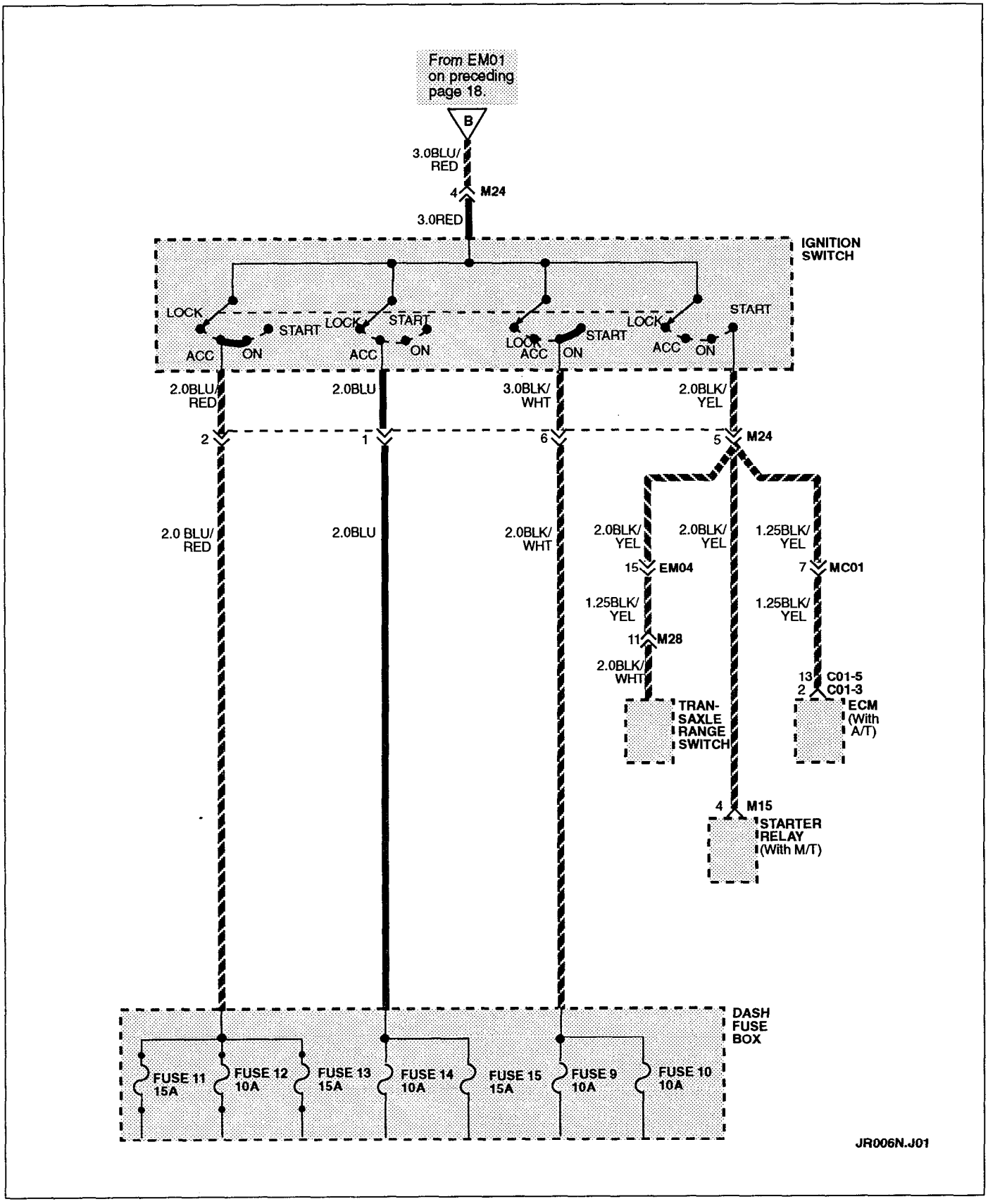
SCHEMATIC DIAGRAM (2)



SCHEMATIC DIAGRAM (3)

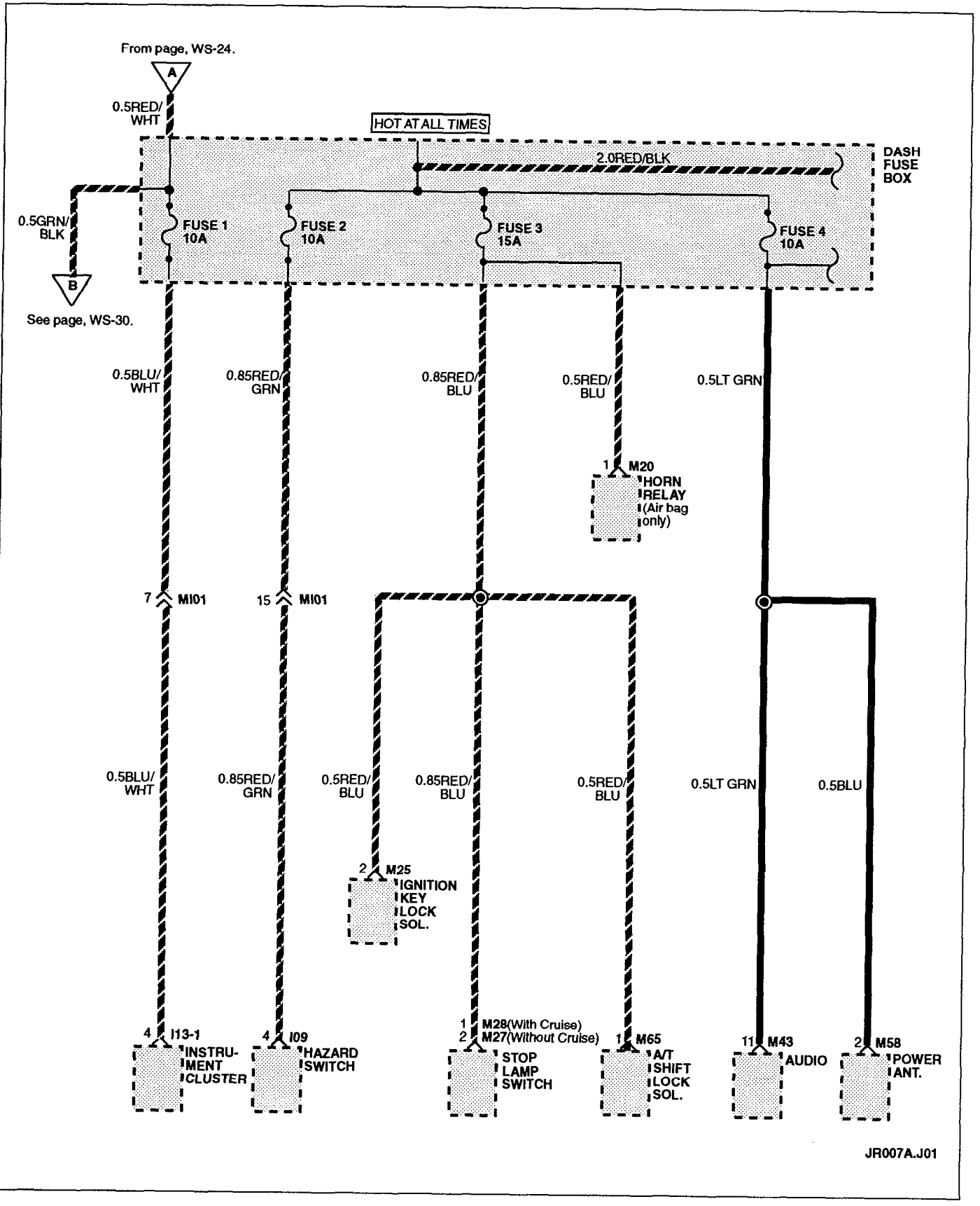


SCHEMATIC DIAGRAM (4)

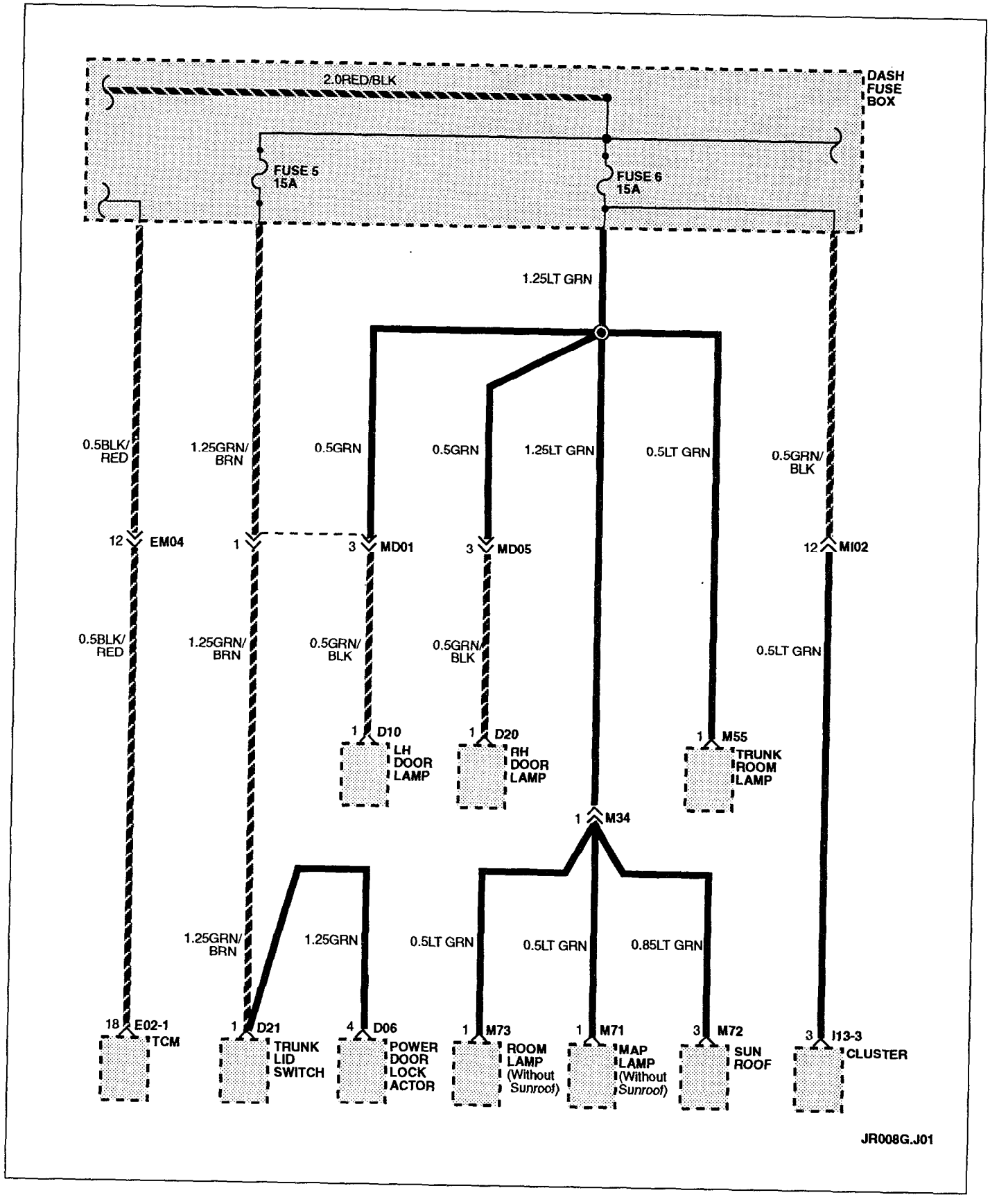


DASH FUSE BOX DETAILS

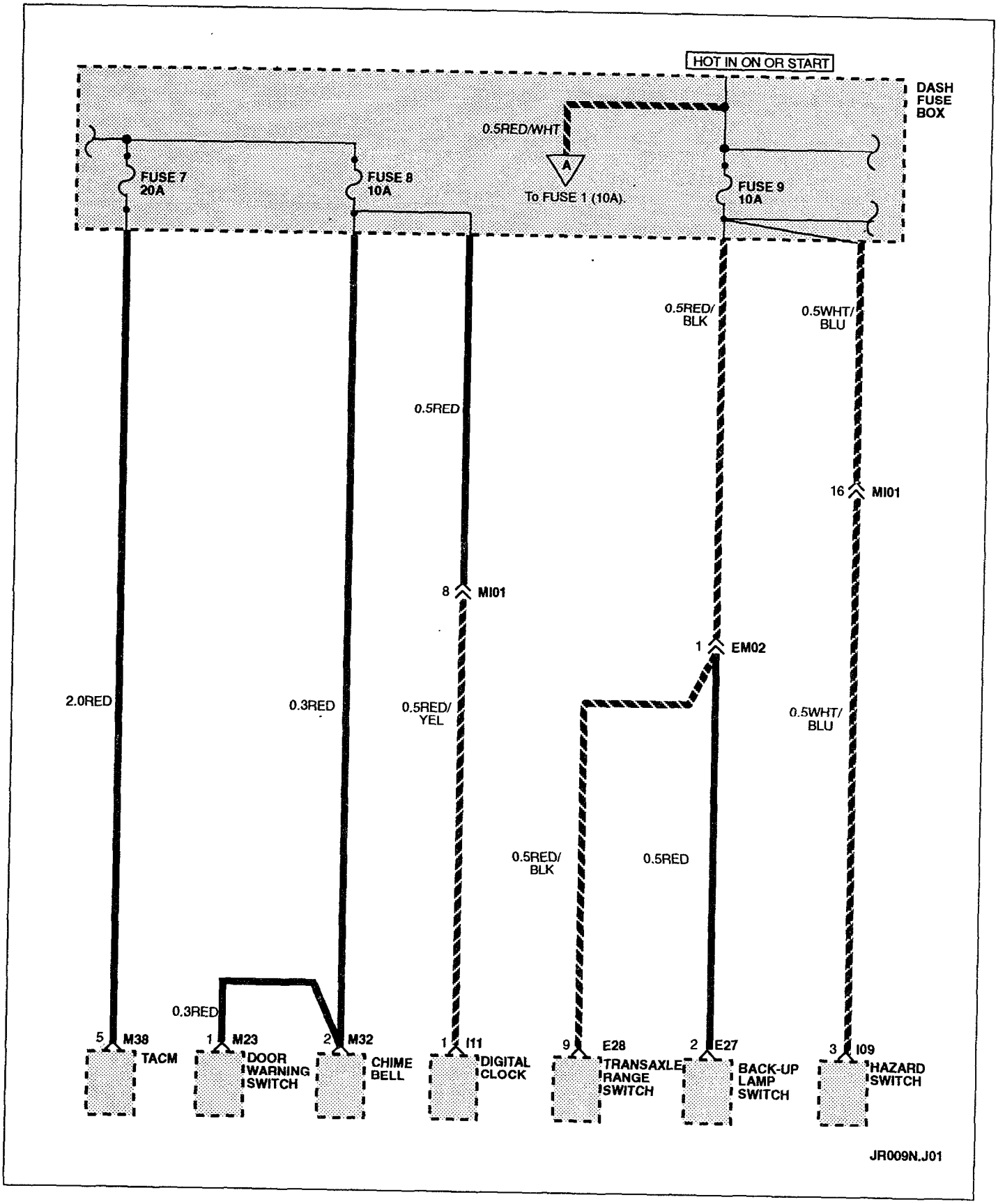
SCHEMATIC DIAGRAM (1)



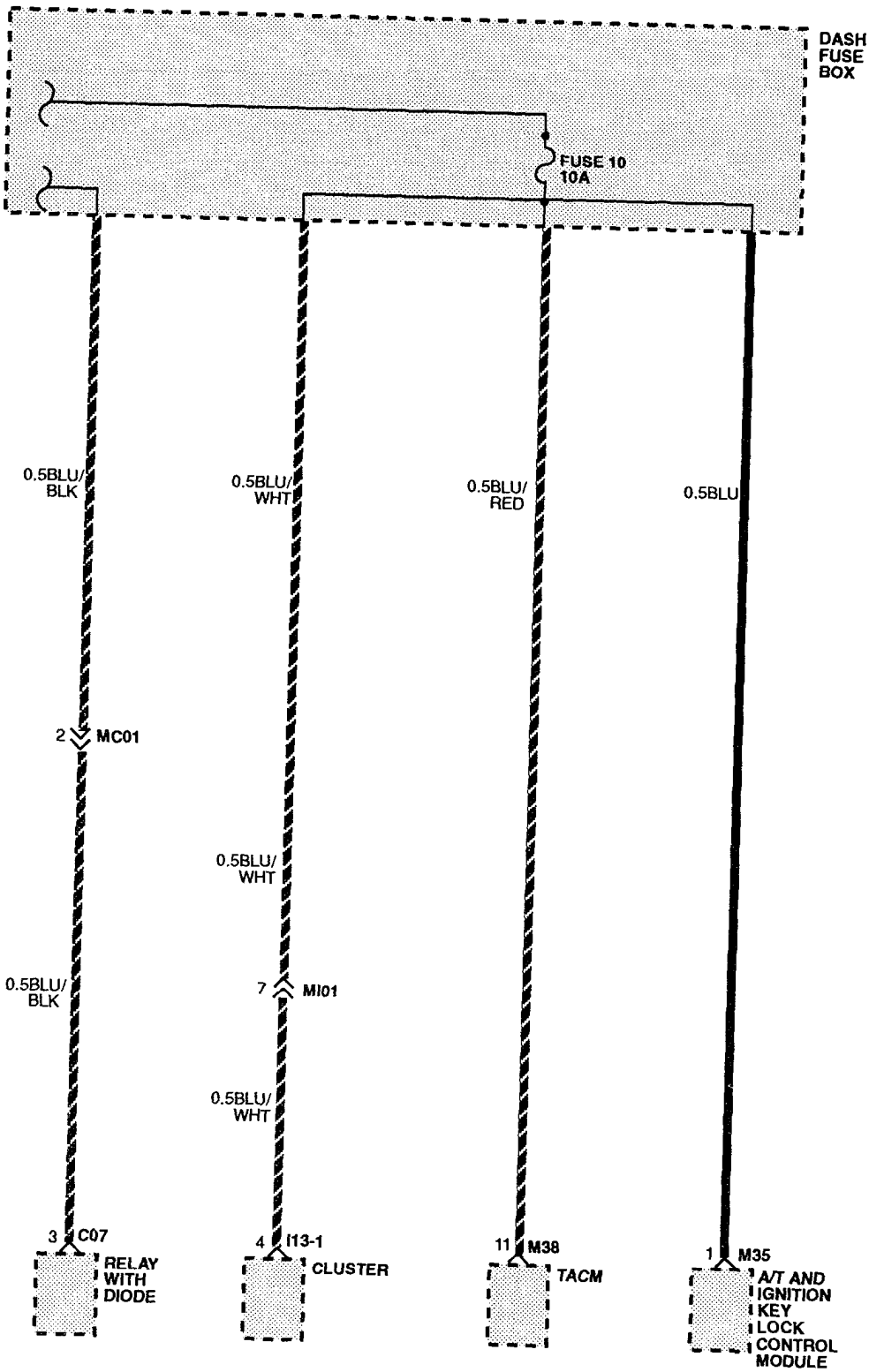
SCHEMATIC DIAGRAM (2)



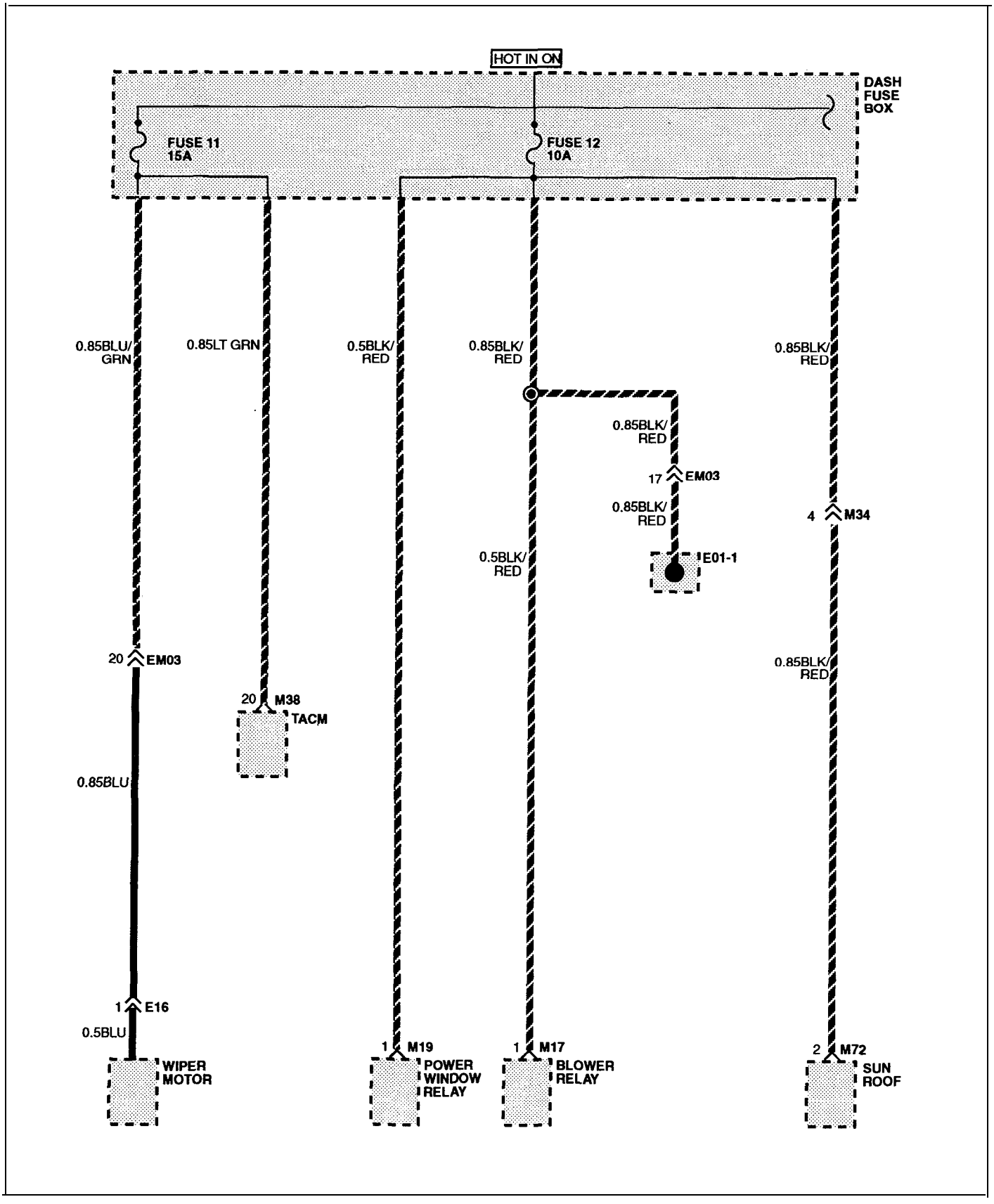
SCHEMATIC DIAGRAM (3)



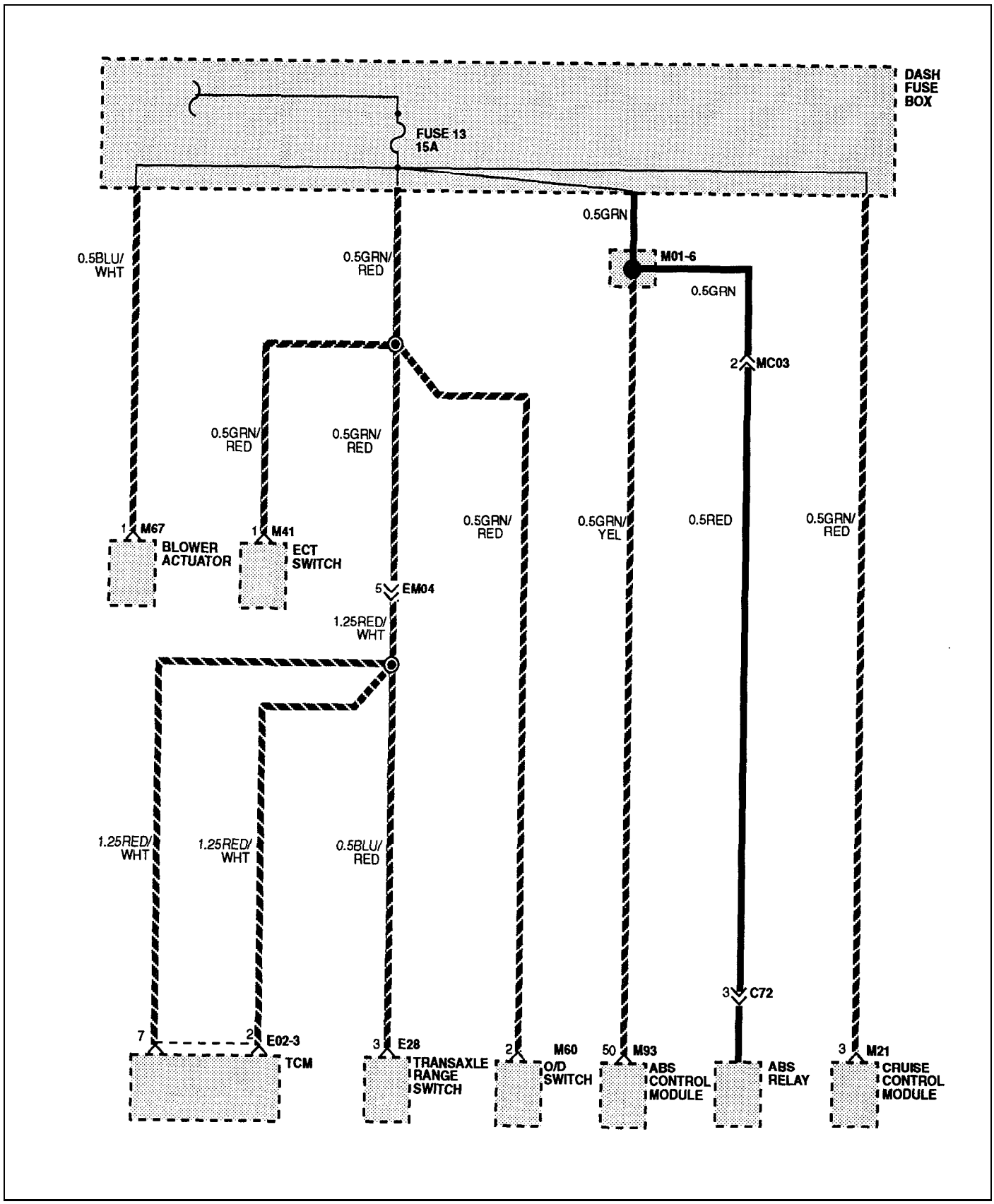
SCHEMATIC DIAGRAM (4)



SCHEMATIC DIAGRAM (5)

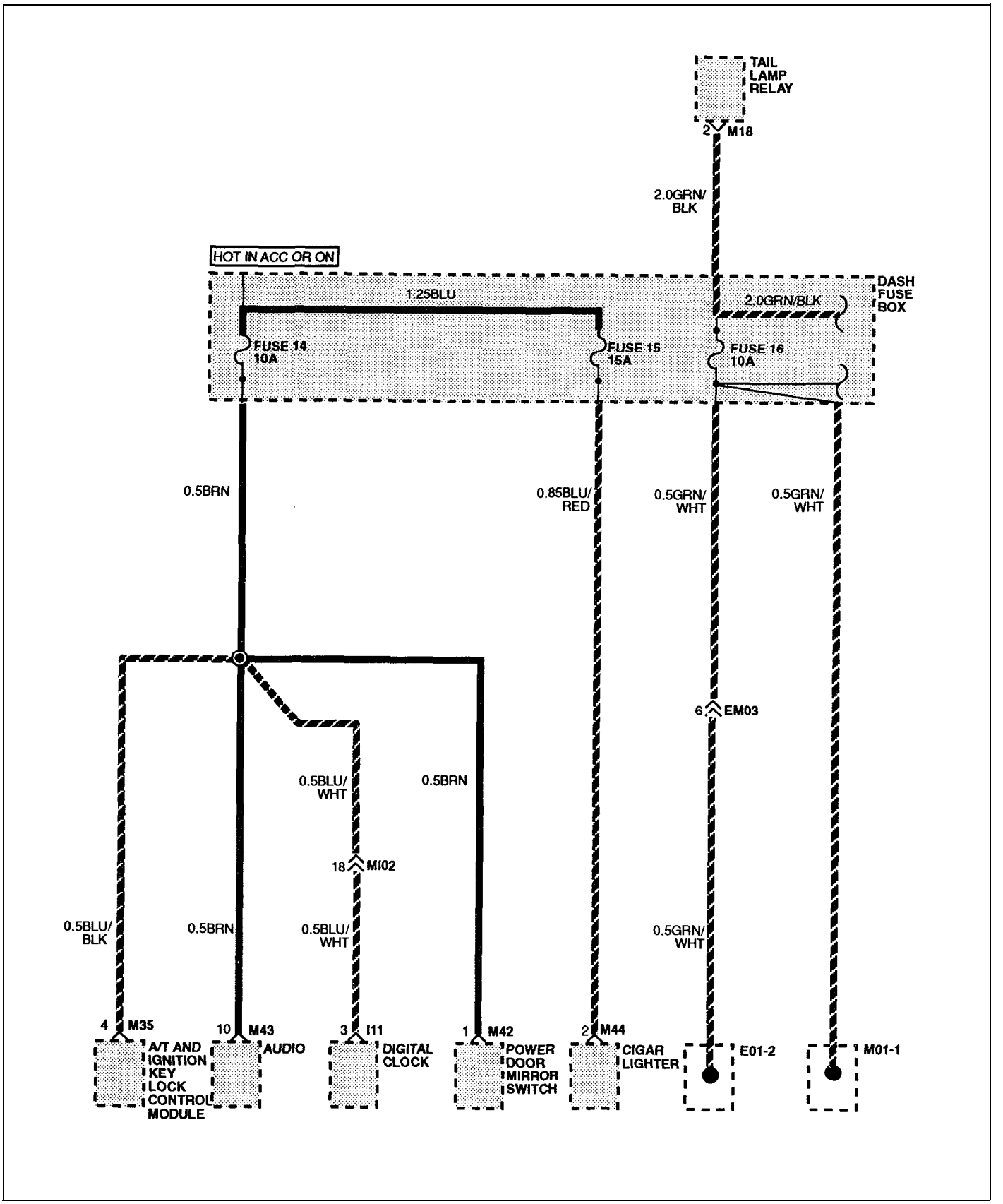


SCHEMATIC DIAGRAM (6)

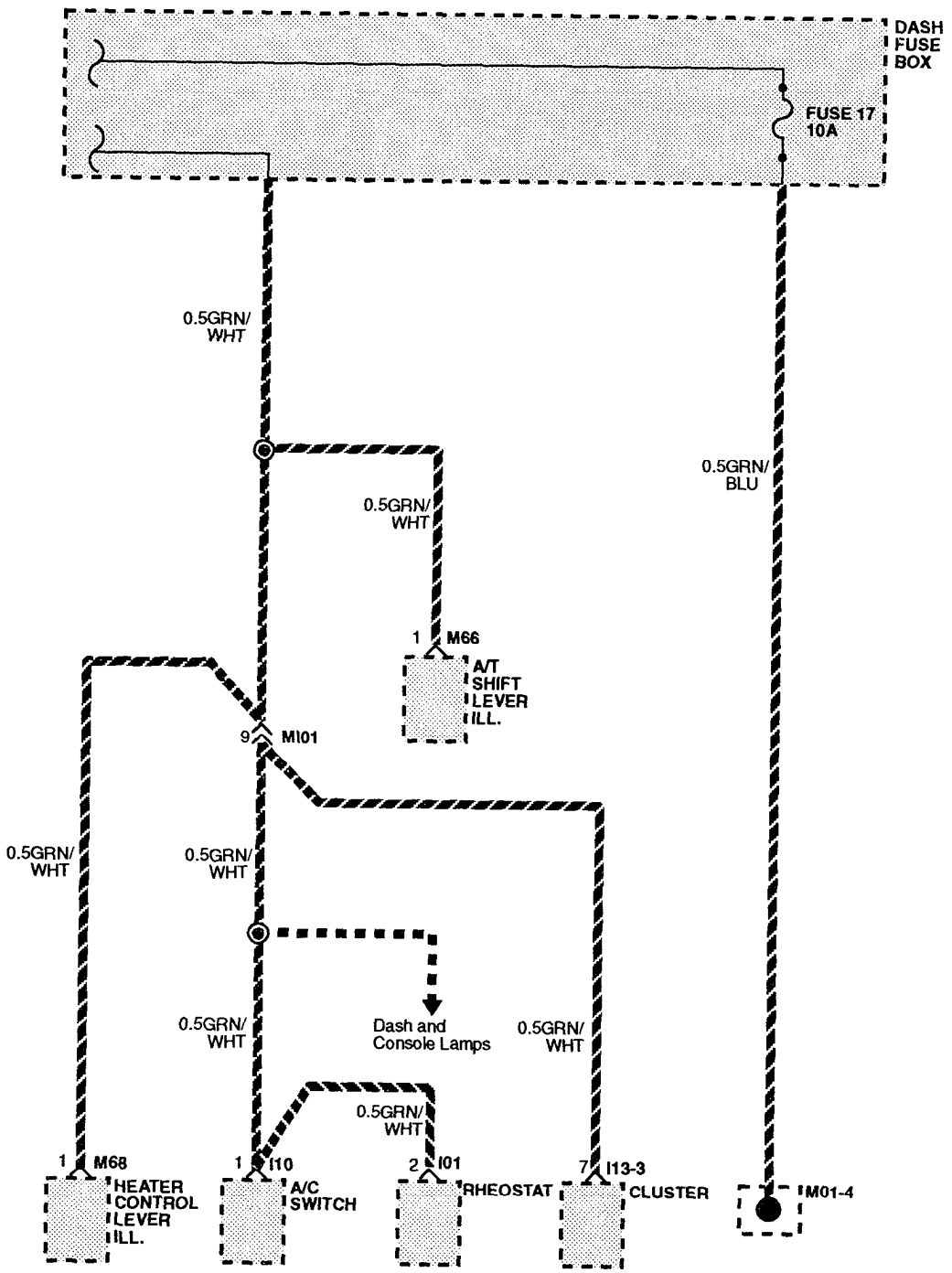


DASH FUSE BOX DETAILS

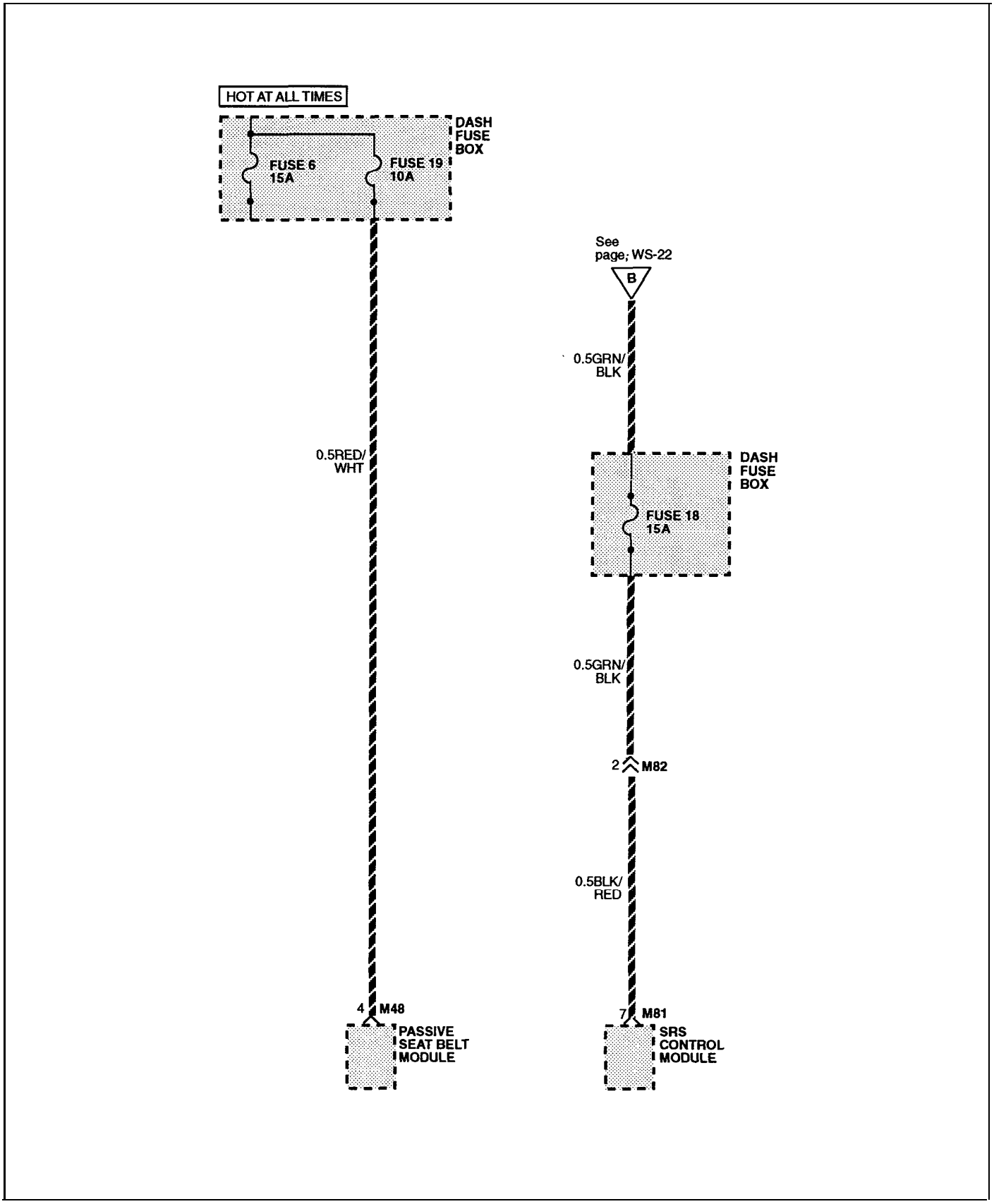
SCHEMATIC DIAGRAM (7)



SCHEMATIC DIAGRAM (8)



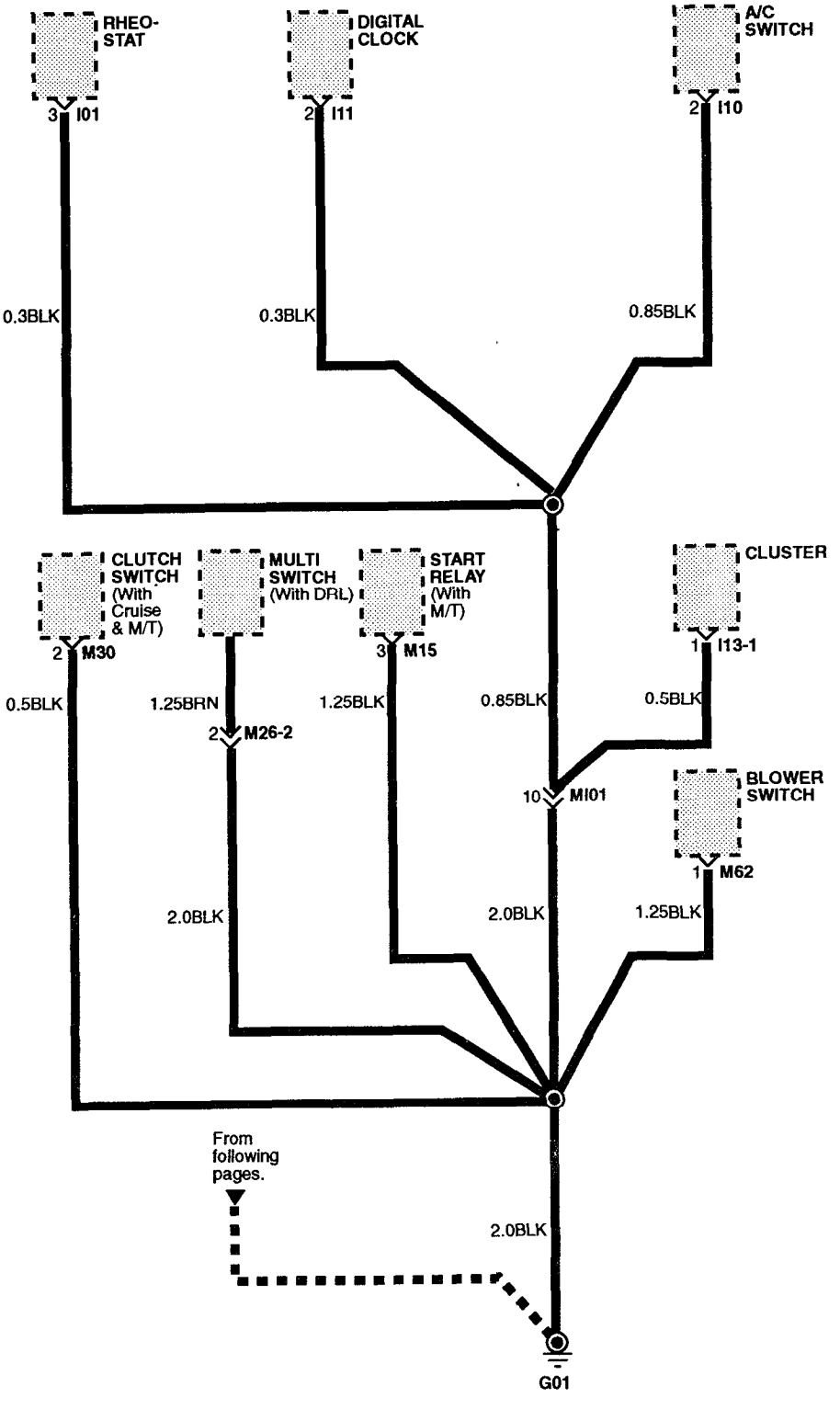
SCHEMATIC DIAGRAM (9)



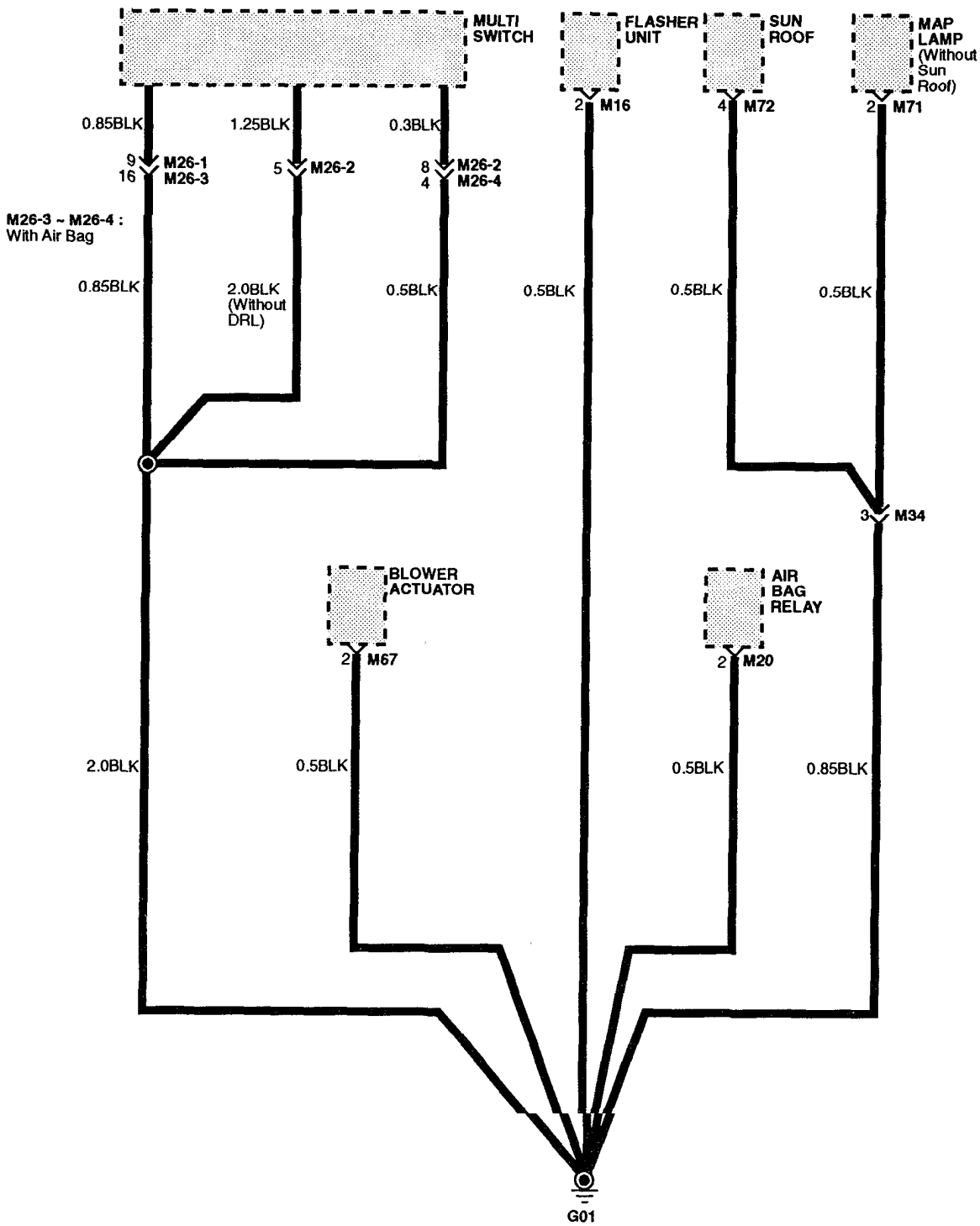
MEMO

GROUND DISTRIBUTION

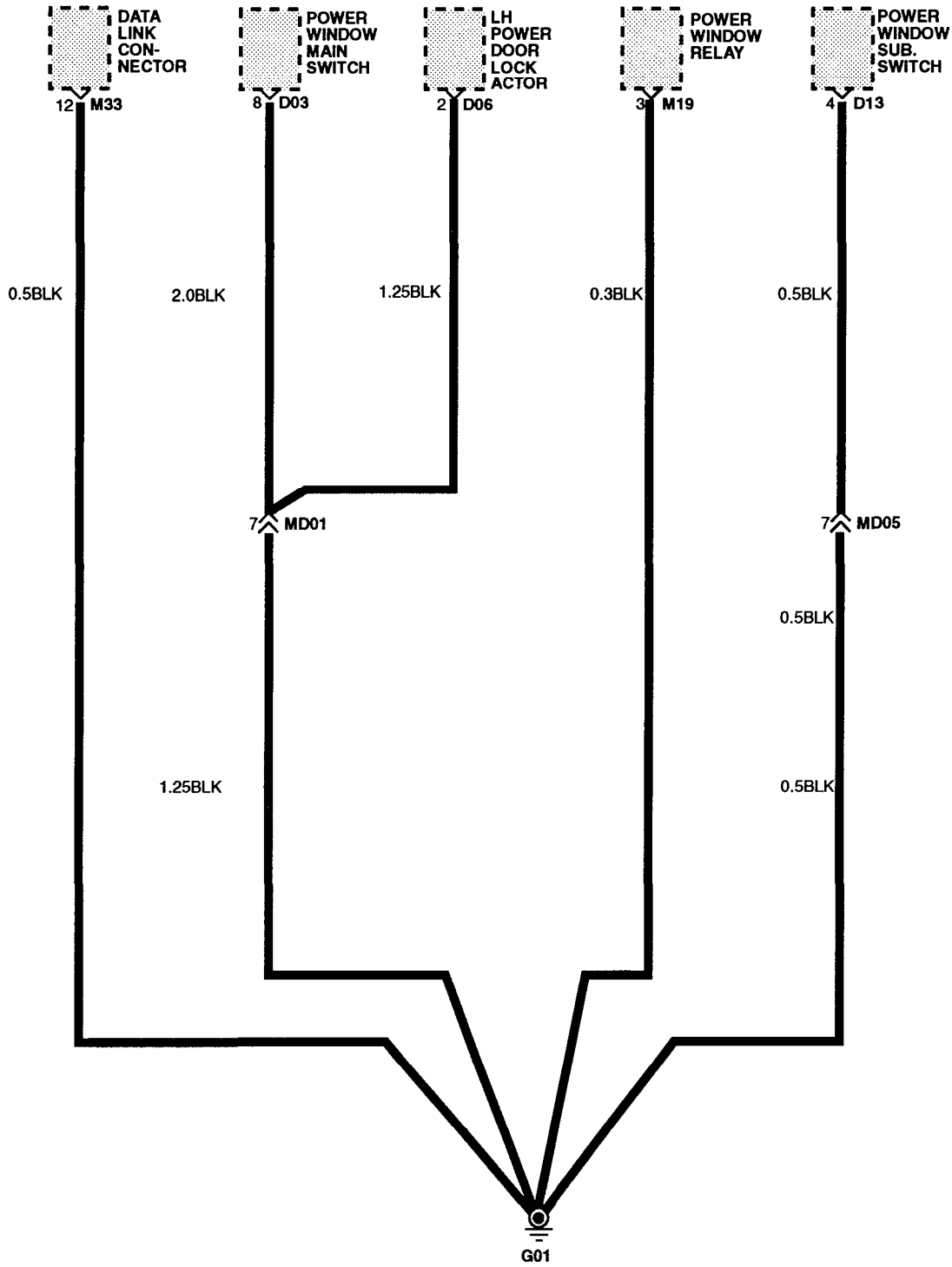
SCHEMATIC DIAGRAM (G01)-1



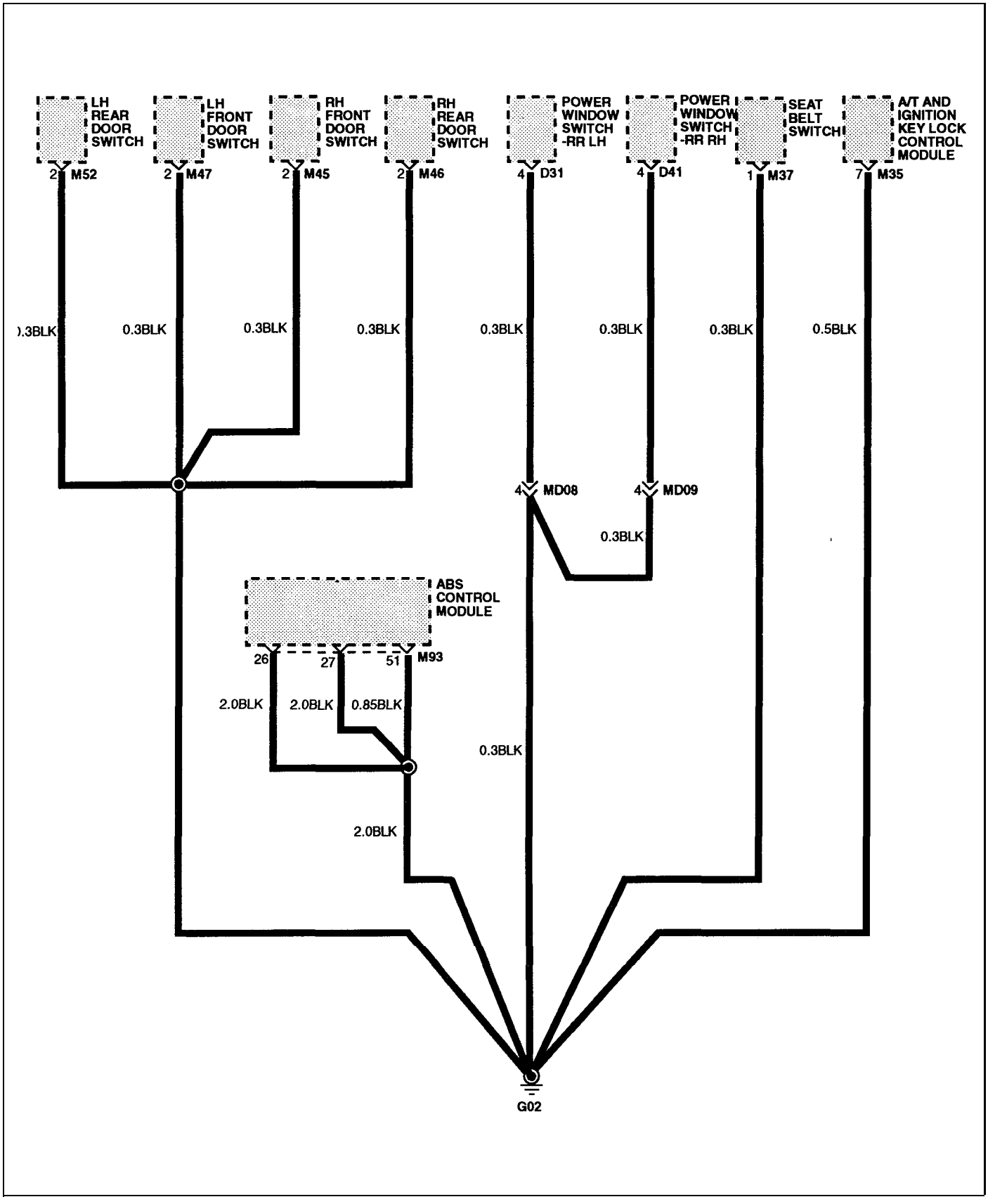
SCHEMATIC DIAGRAM (G01)-2



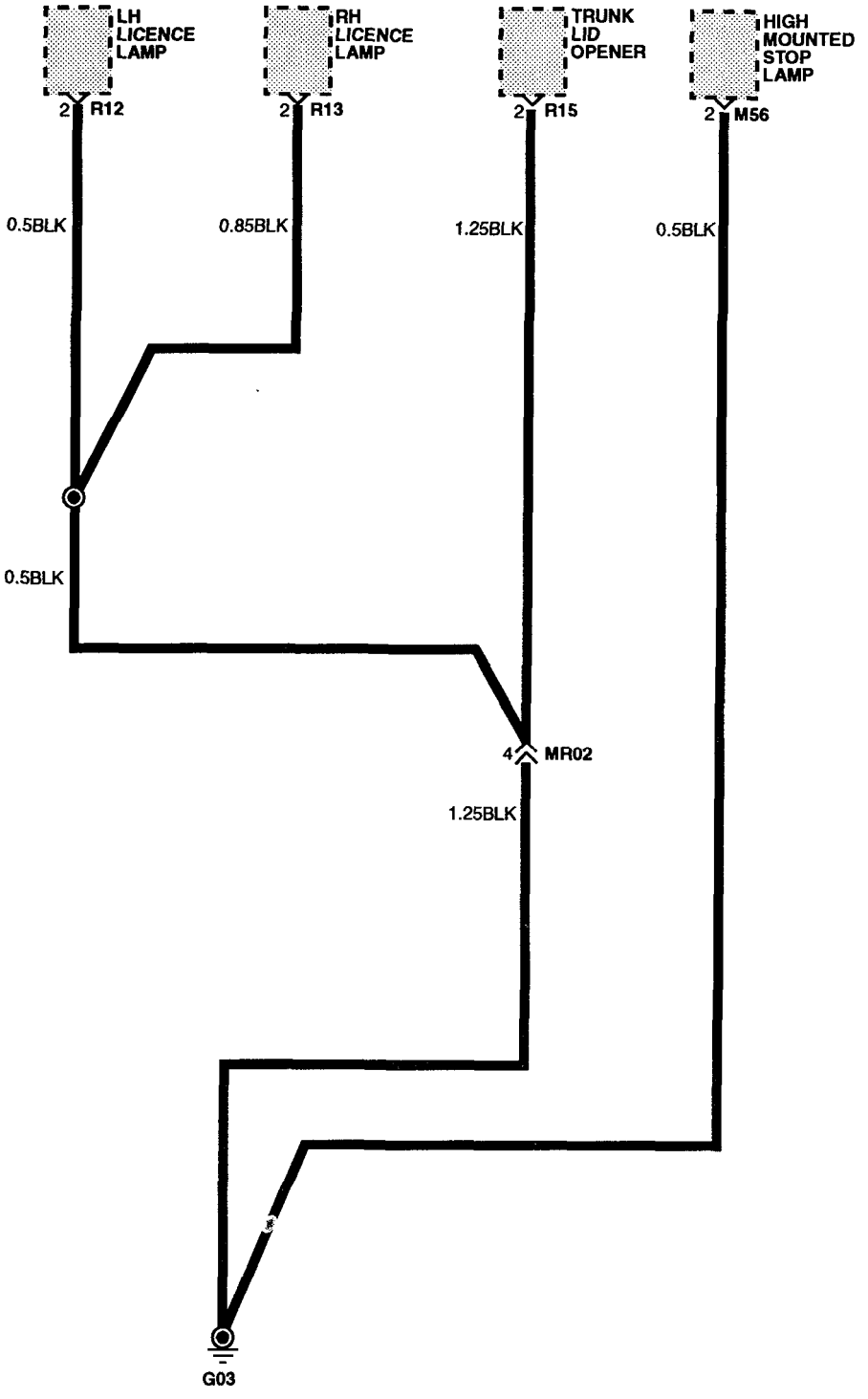
SCHEMATIC DIAGRAM (G01)-3



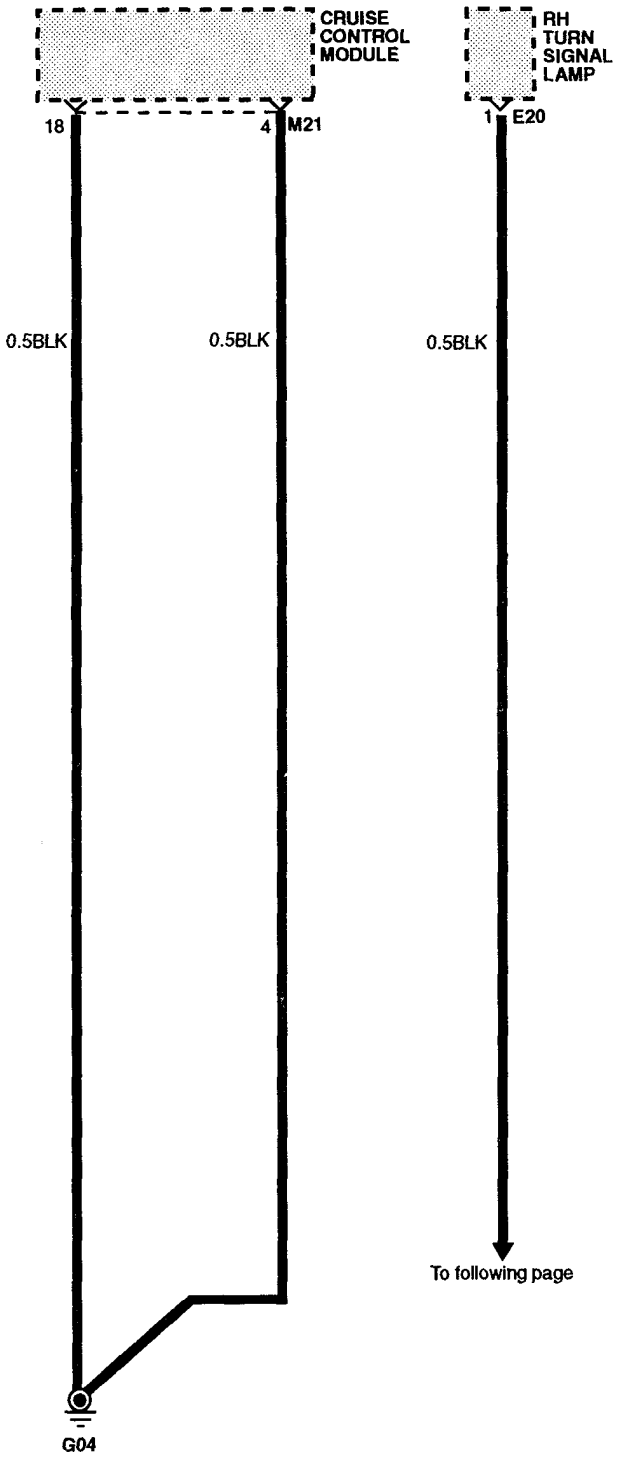
SCHEMATIC DIAGRAM (G02-1)



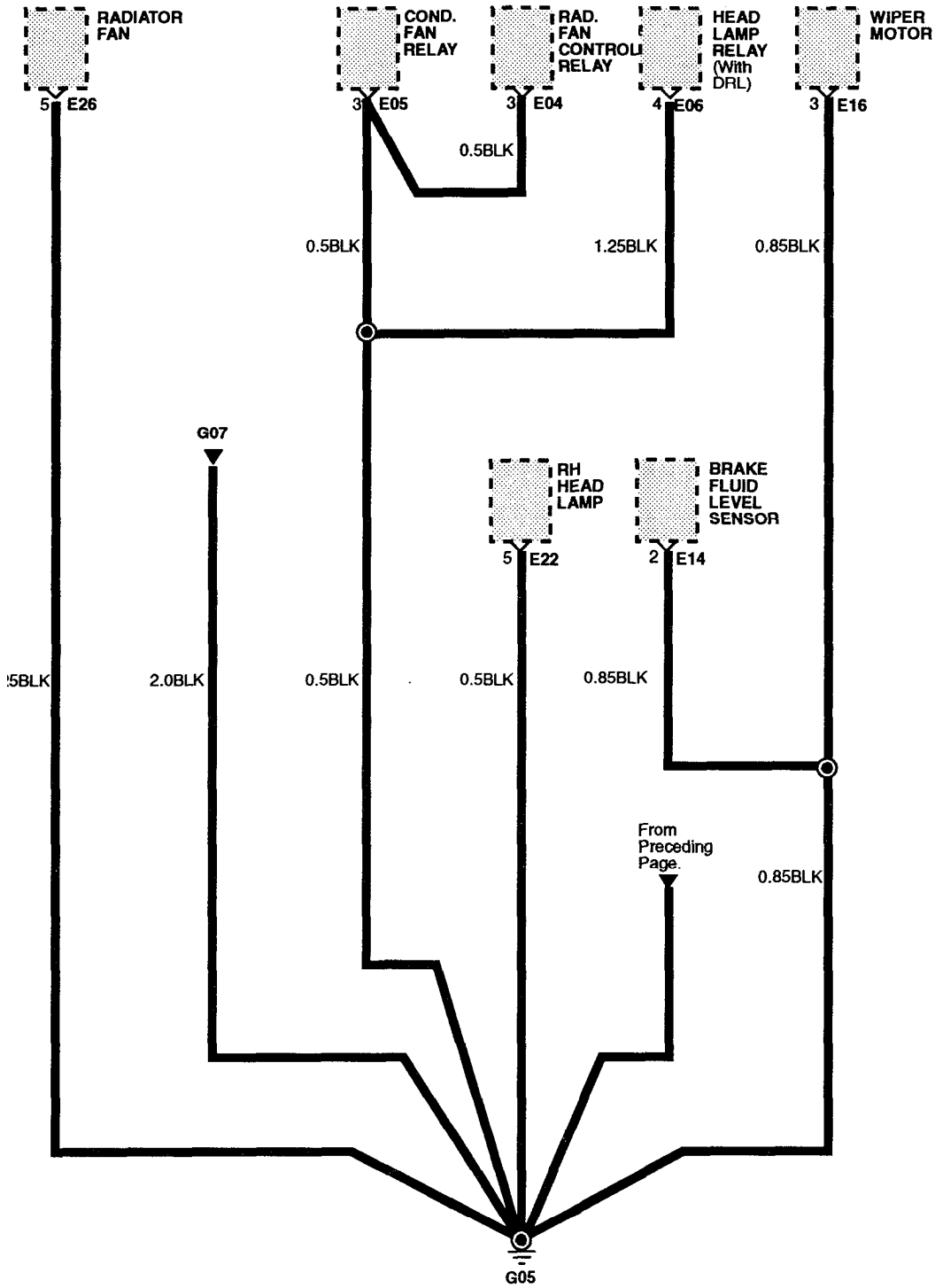
SCHEMATIC DIAGRAM (G03)



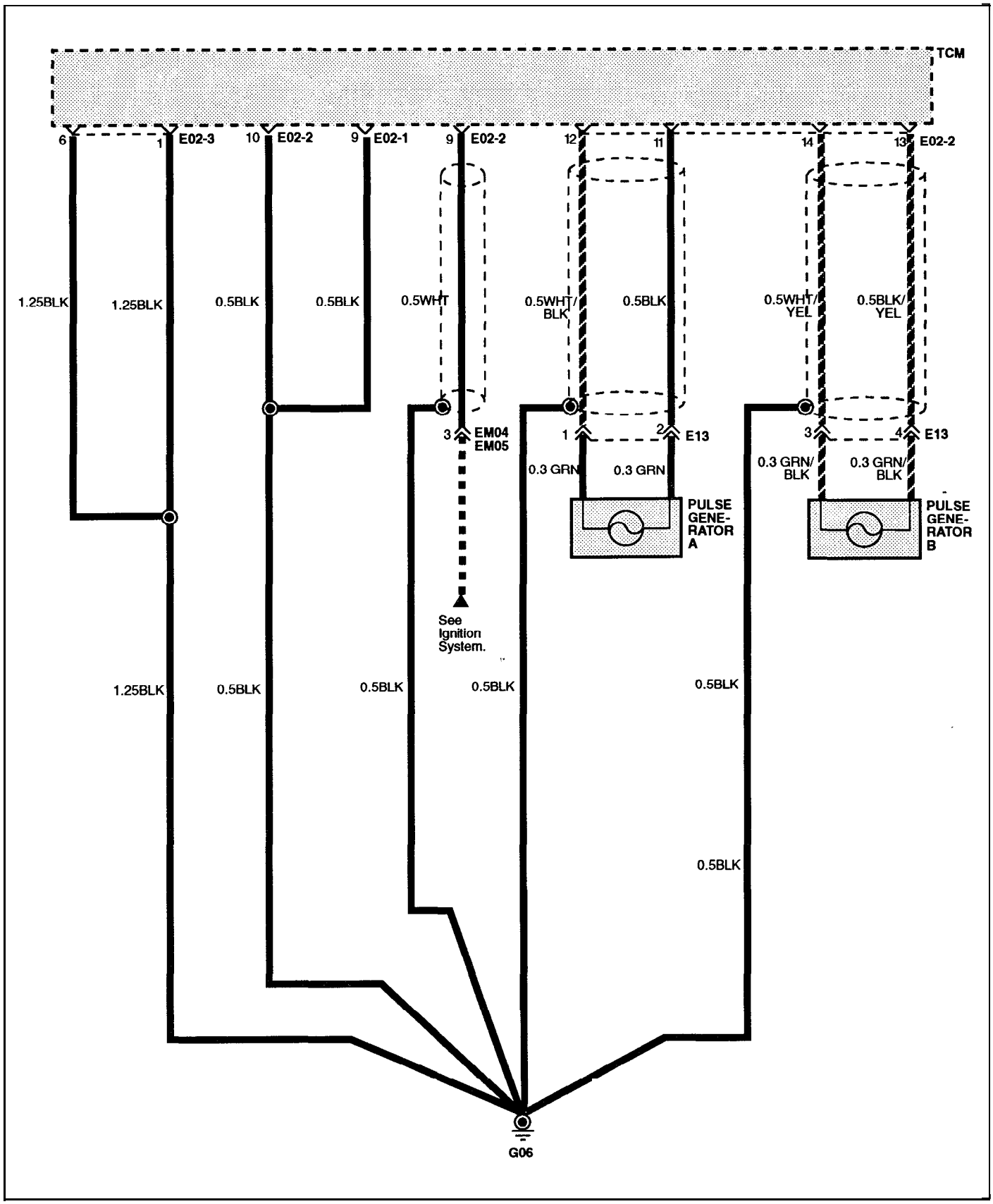
SCHEMATIC DIAGRAM (G04/G05)



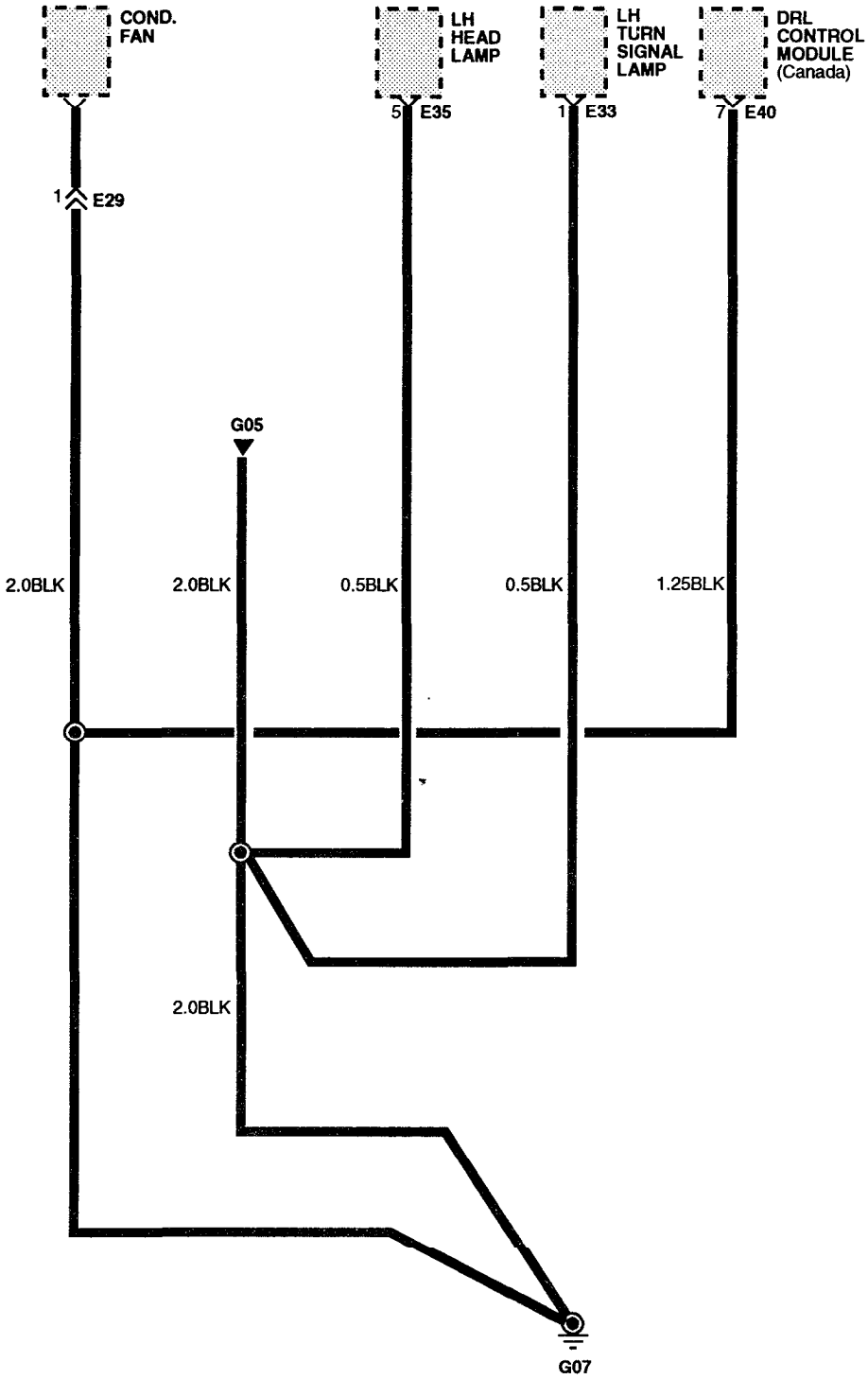
SCHEMATIC DIAGRAM (G05)



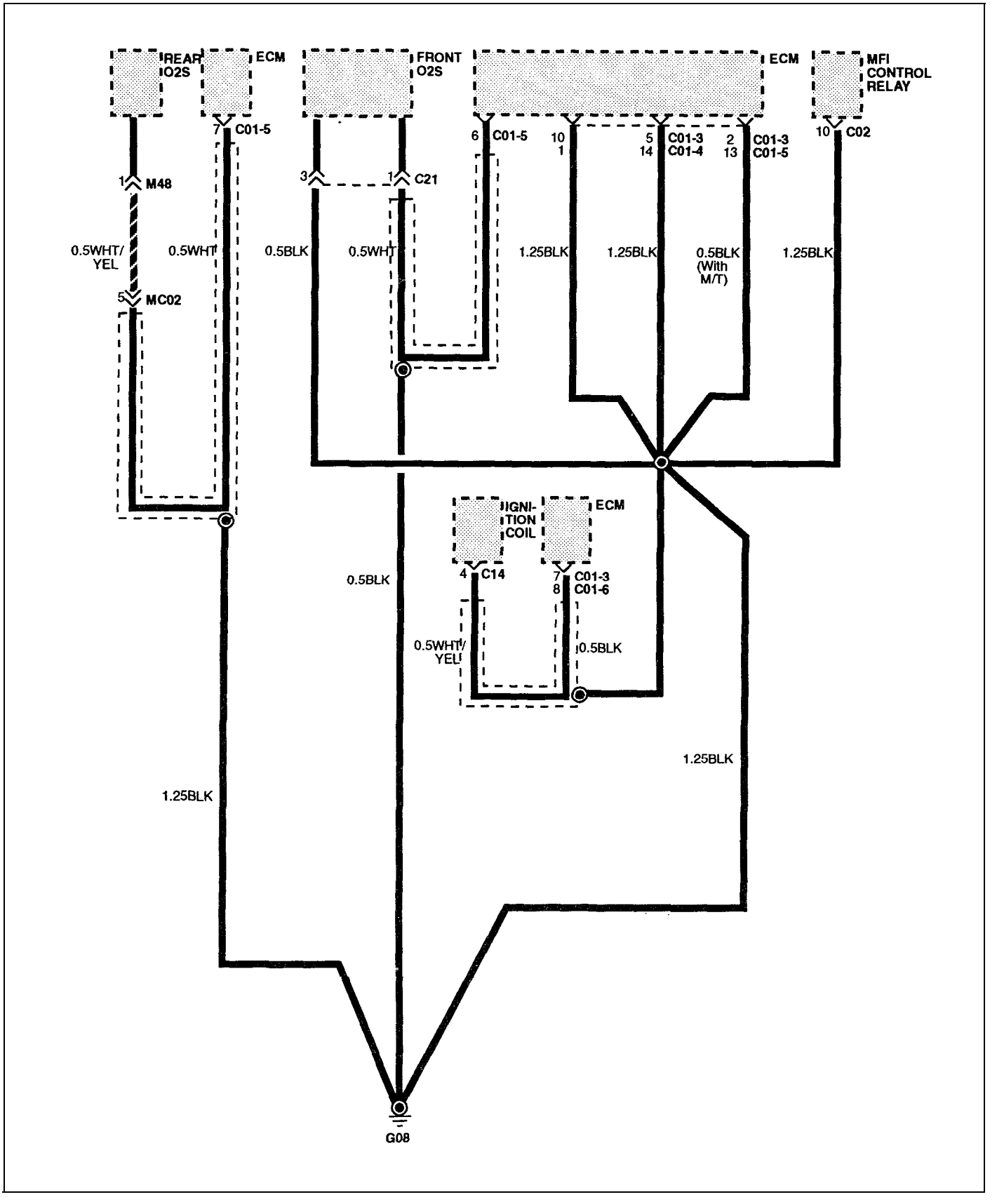
SCHEMATIC DIAGRAM (G06)



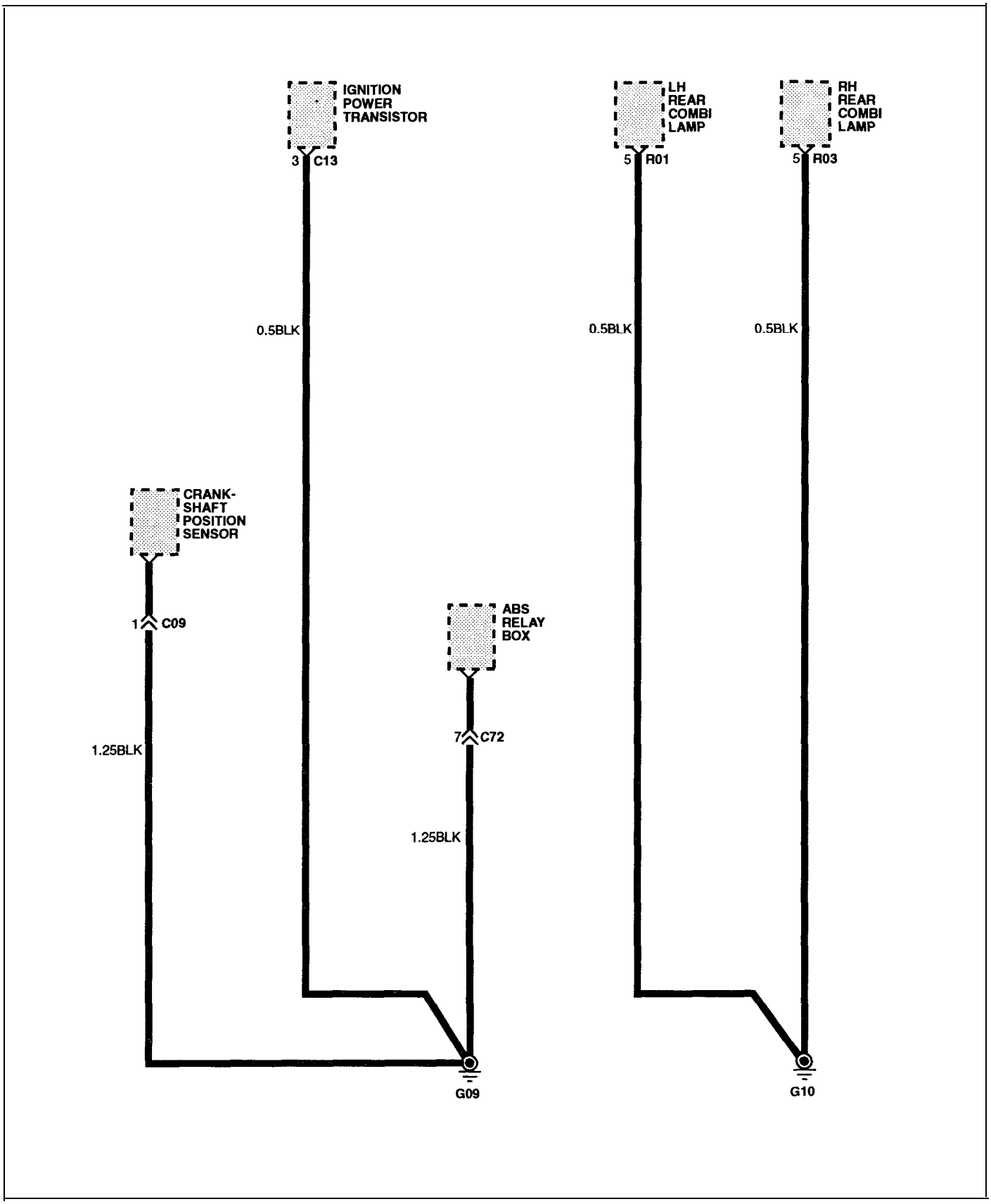
SCHEMATIC DIAGRAM (G07)



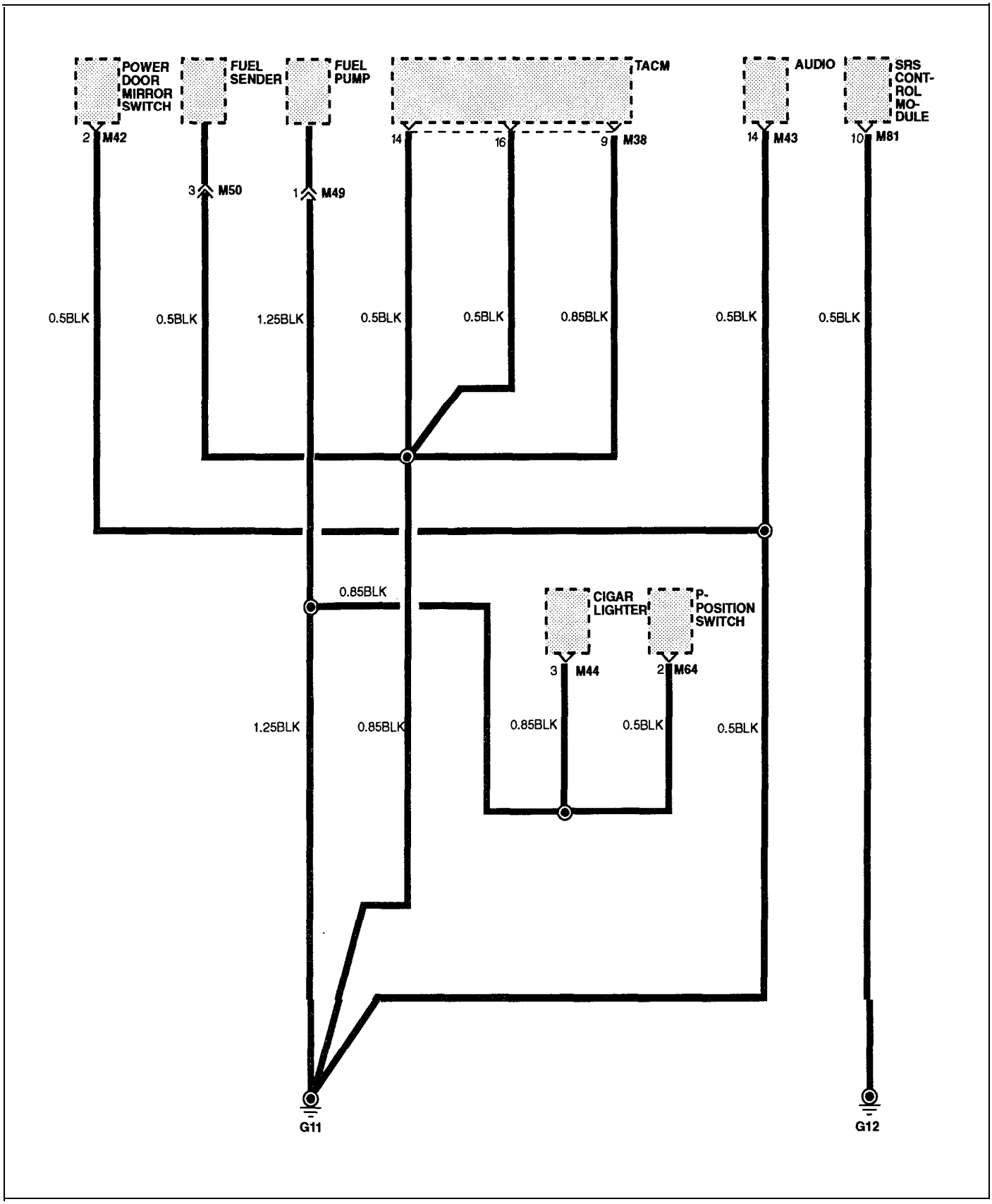
SCHEMATIC DIAGRAM (G08)



SCHEMATIC DIAGRAM (G09/G10)

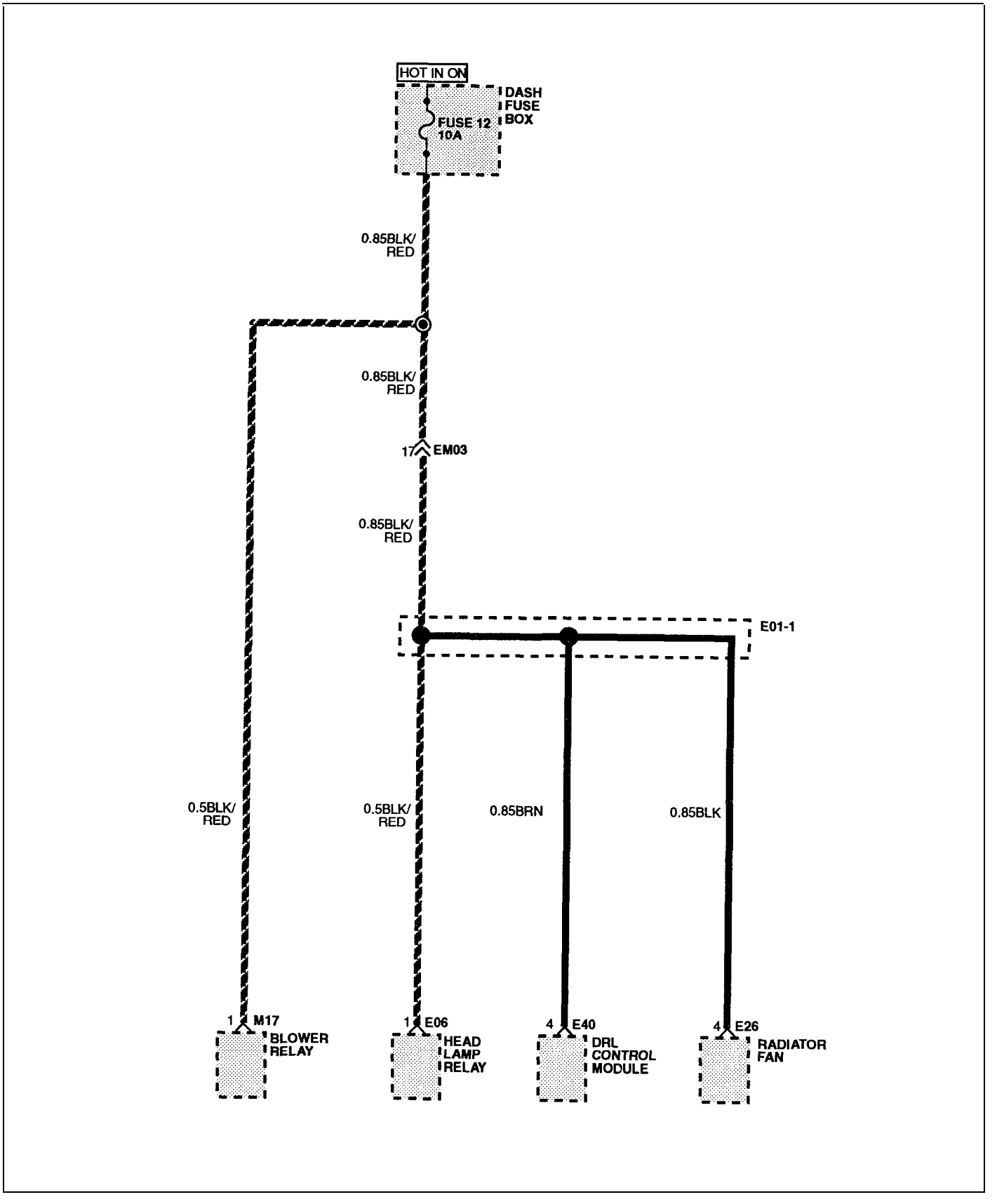


SCHEMATIC DIAGRAM (G11/G12)

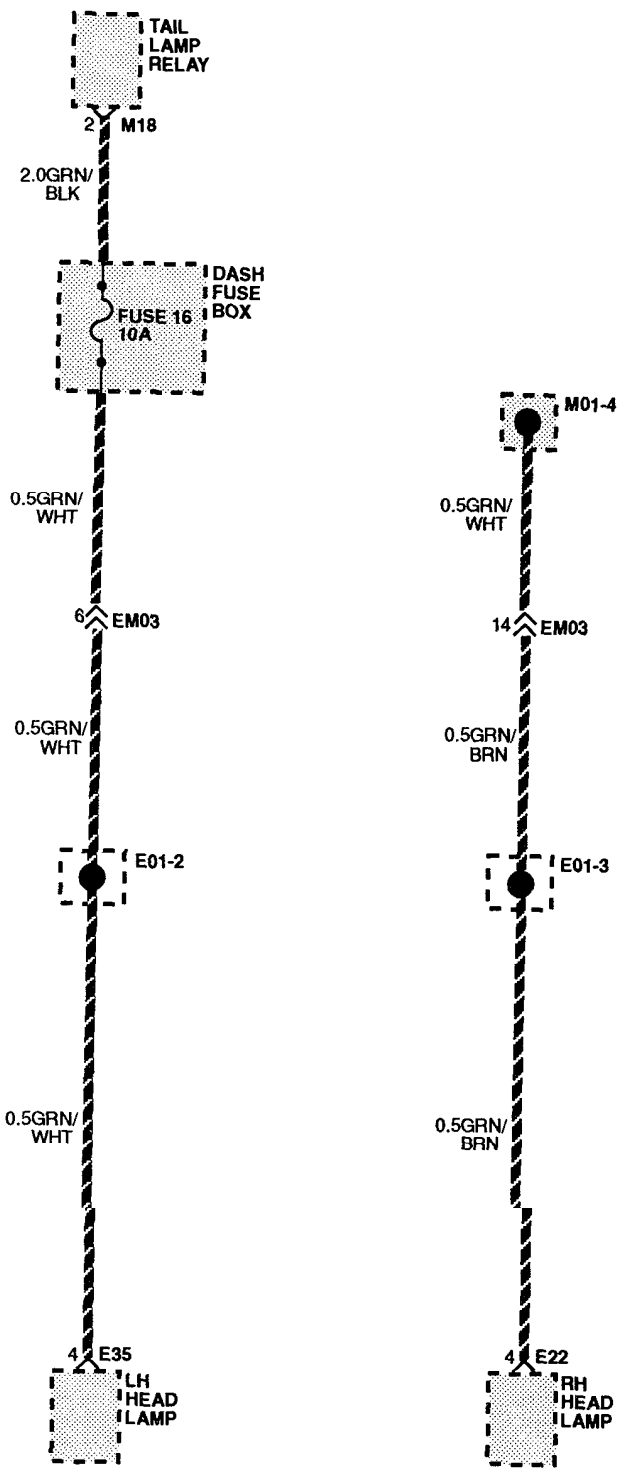


JOINT DISTRIBUTION

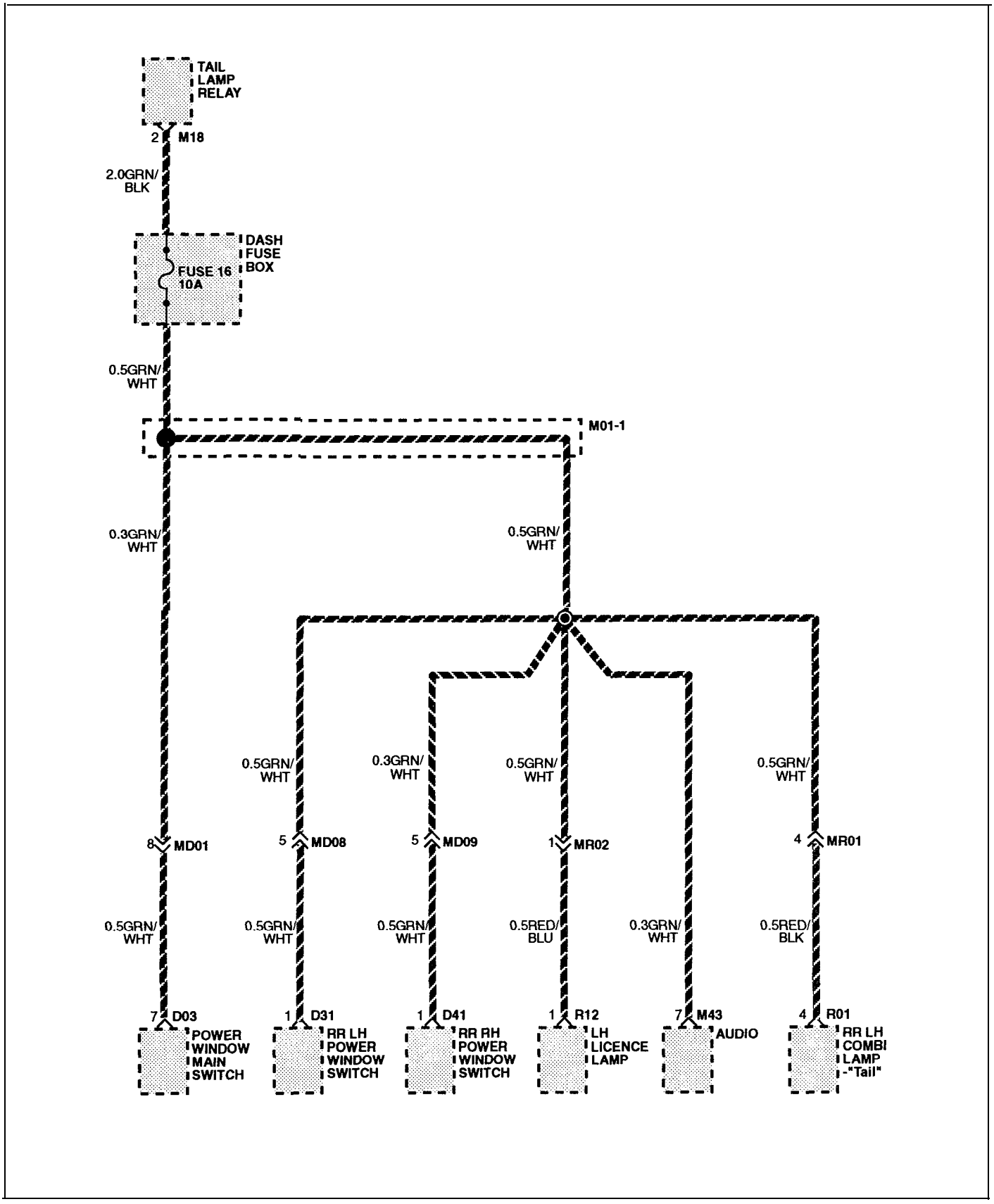
SCHEMATIC DIAGRAM (E01-1)



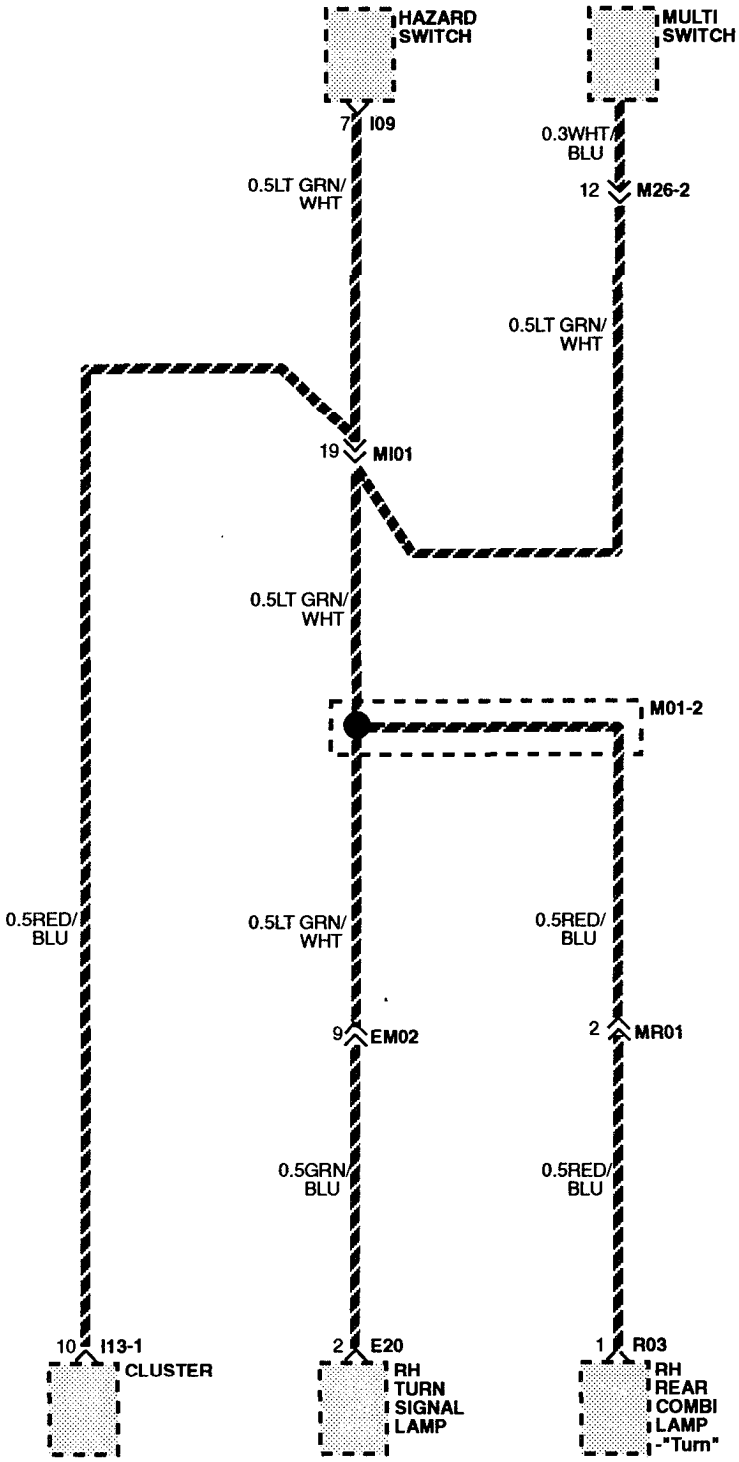
SCHEMATIC DIAGRAM (E0143)



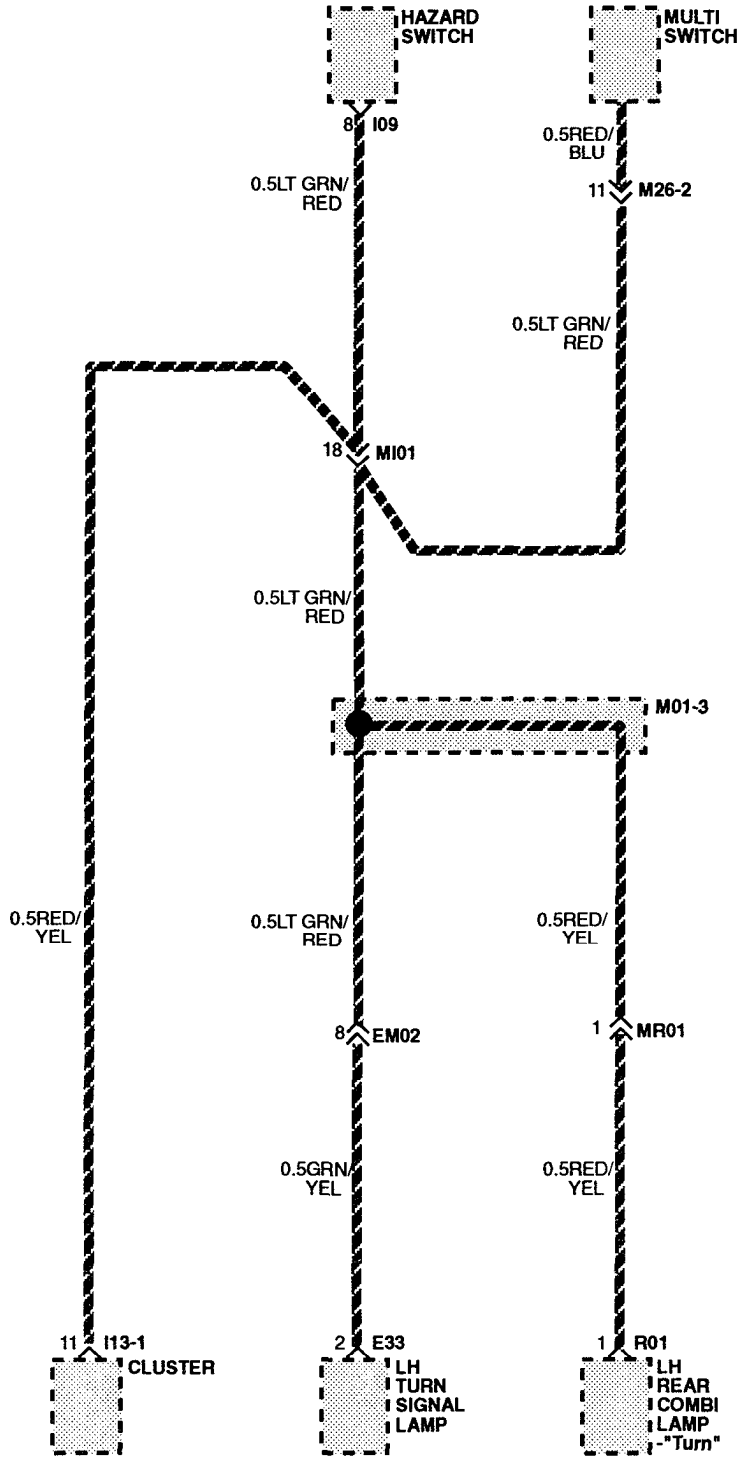
SCHEMATIC DIAGRAM (M01-1)



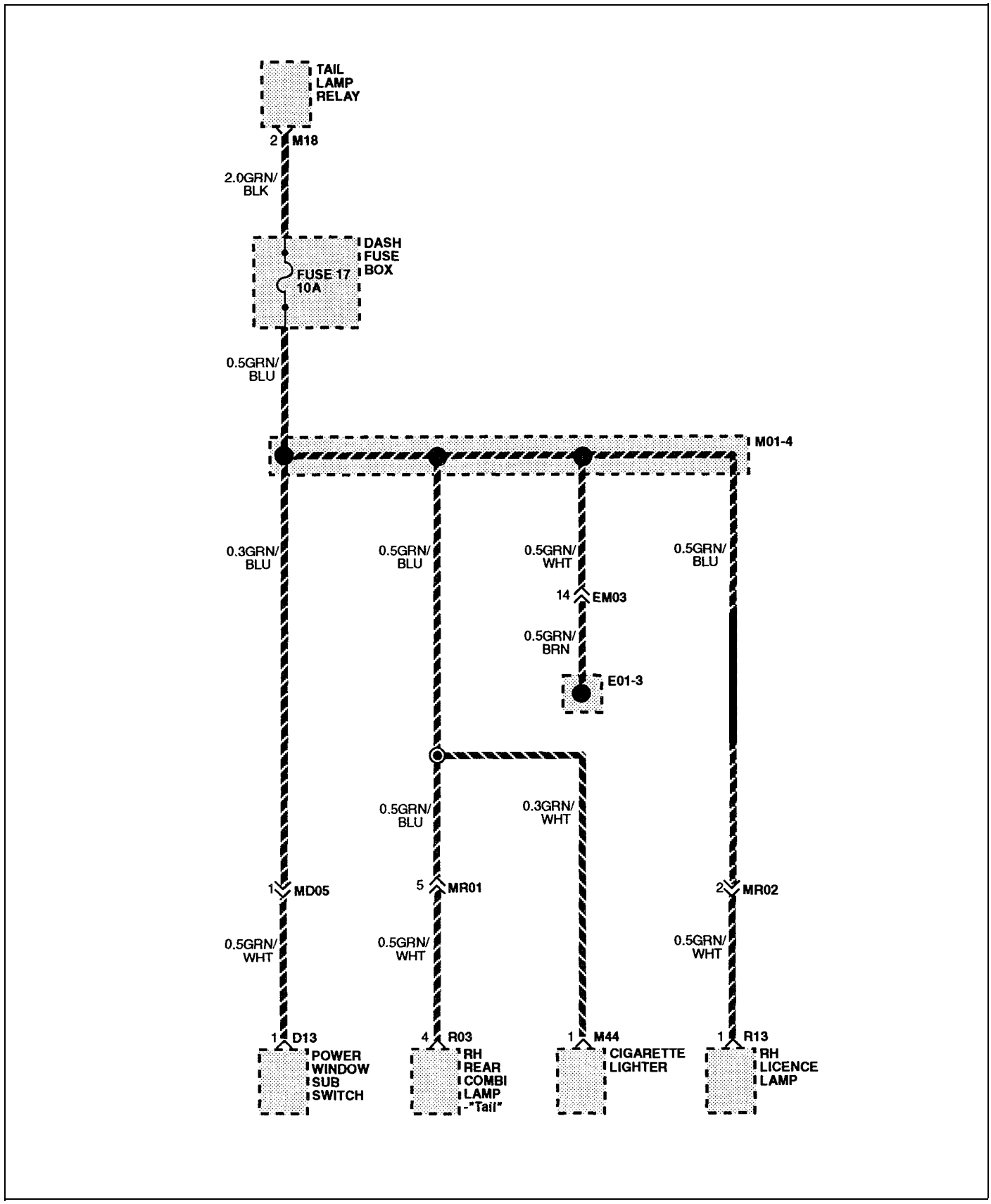
SCHEMATIC DIAGRAM (M01-2)



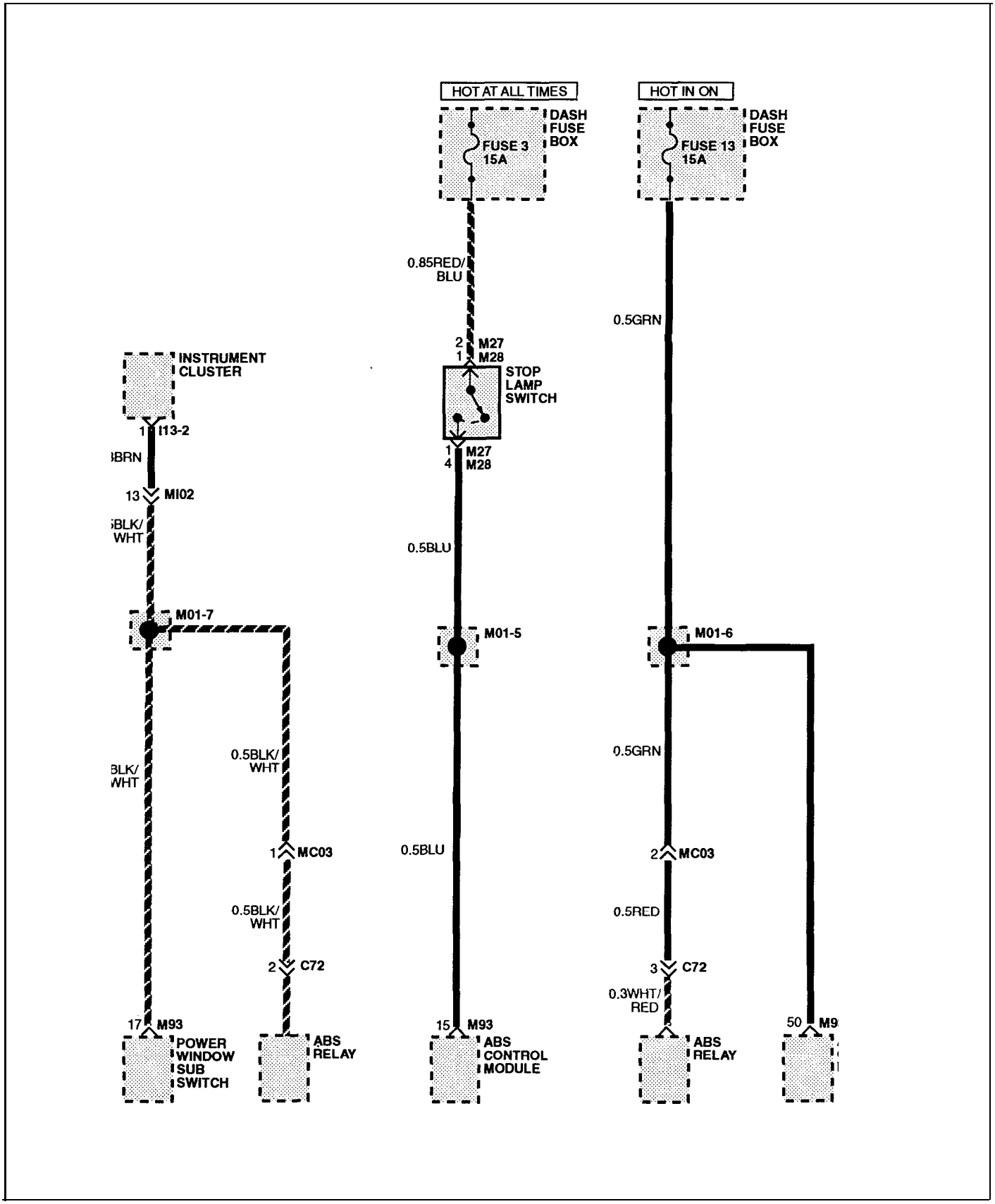
SCHEMATIC DIAGRAM (M01-3)



SCHEMATIC DIAGRAM (M01-4)



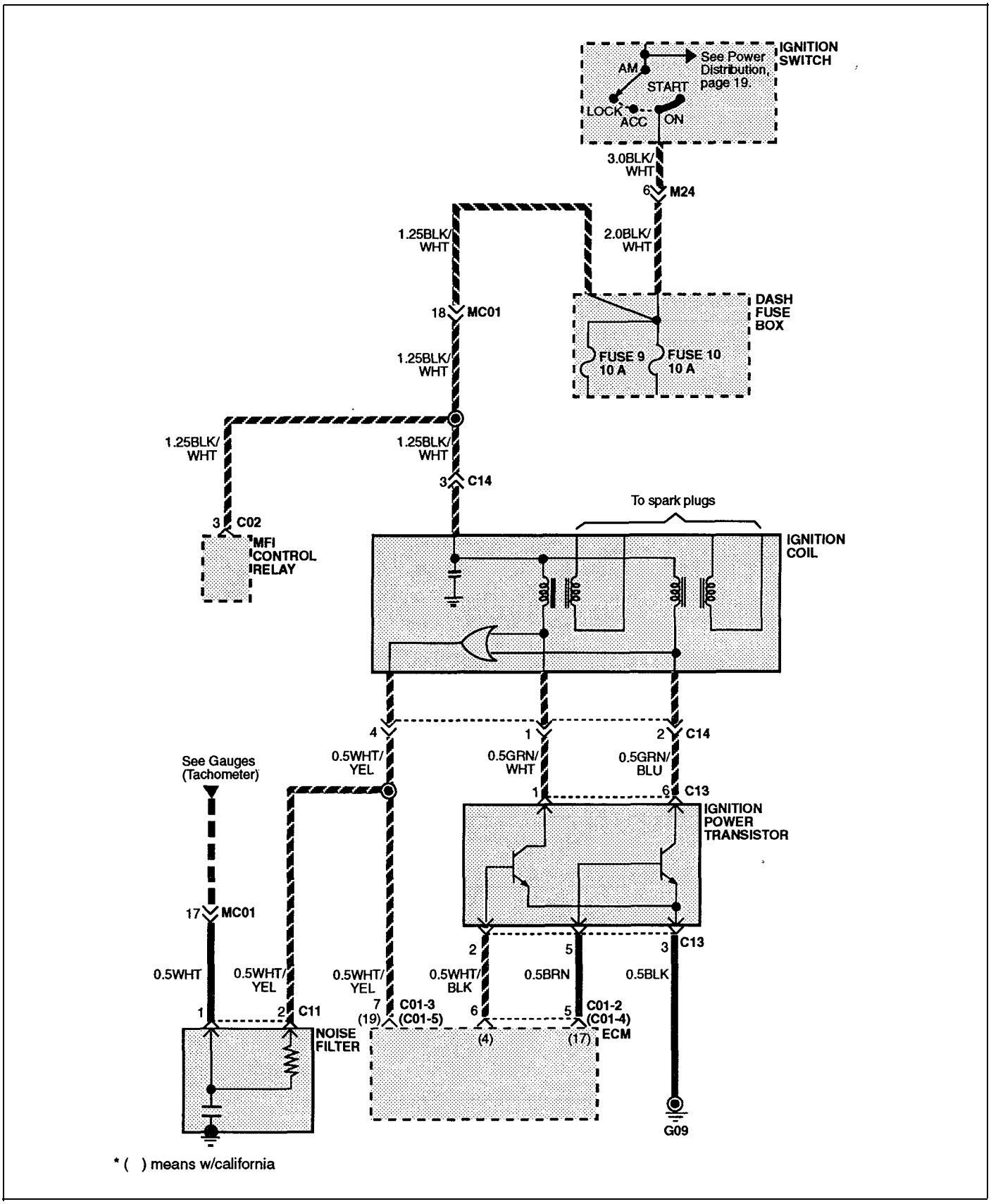
SCHEMATIC DIAGRAM (M01-5)



MEMO

IGNITION SYSTEM

SCHEMATIC DIAGRAM

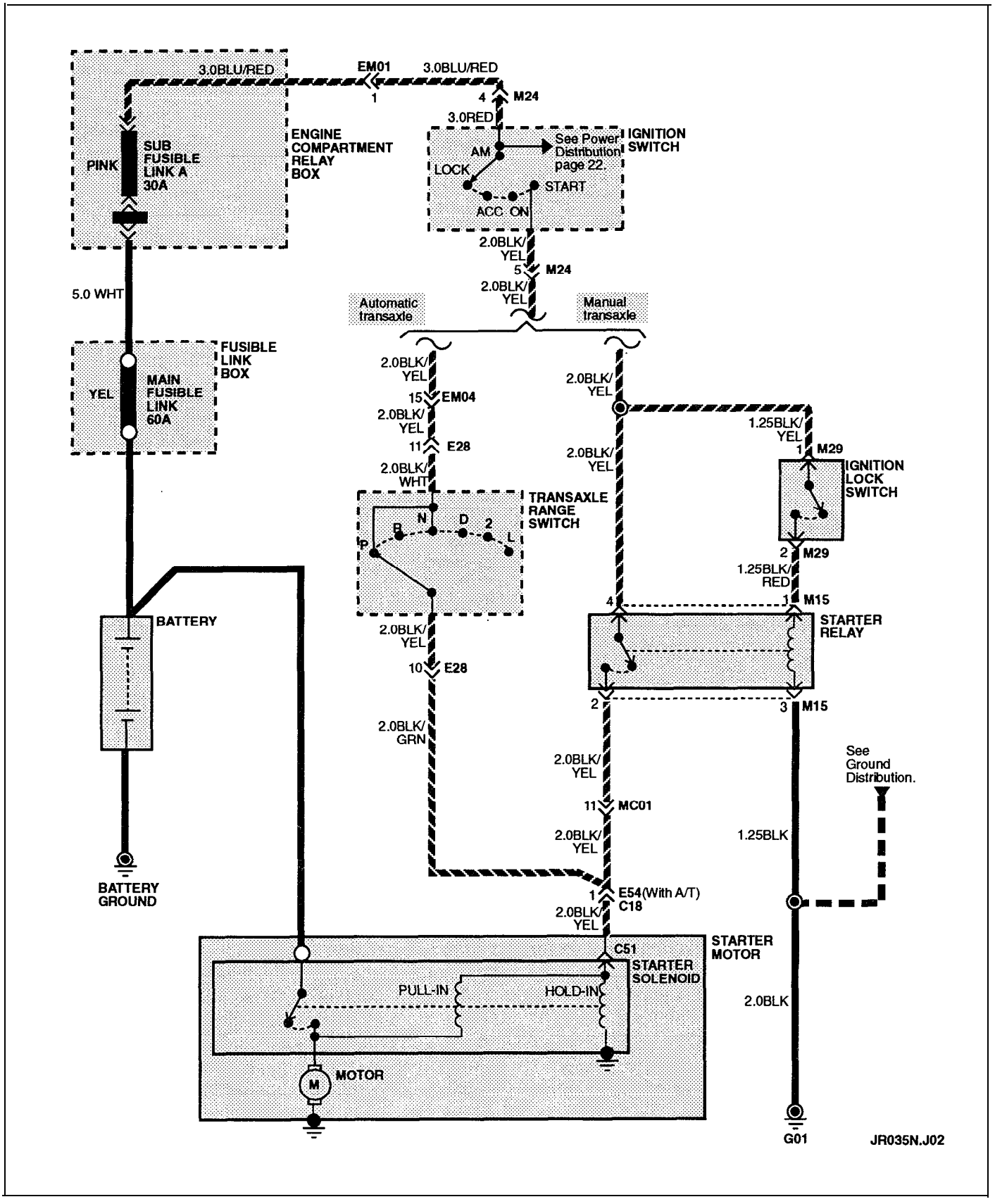


COMPONENT LOCATION INDEX

	Location reference-page
Components	
ECM (C01-2 ~ C01-3)	WS-182
ECM control relay (C02)	WS-182
Ignition coil (C14)	WS-183
Ignition switch (M24)	WS-189
Noise filter (Cl 1)	WS-182
Power transistor (C13)	WS-183
Connector	
MC01	WS-201
Ground	
G09	WS-204

STARTING SYSTEM

SCHEMATIC DIAGRAM

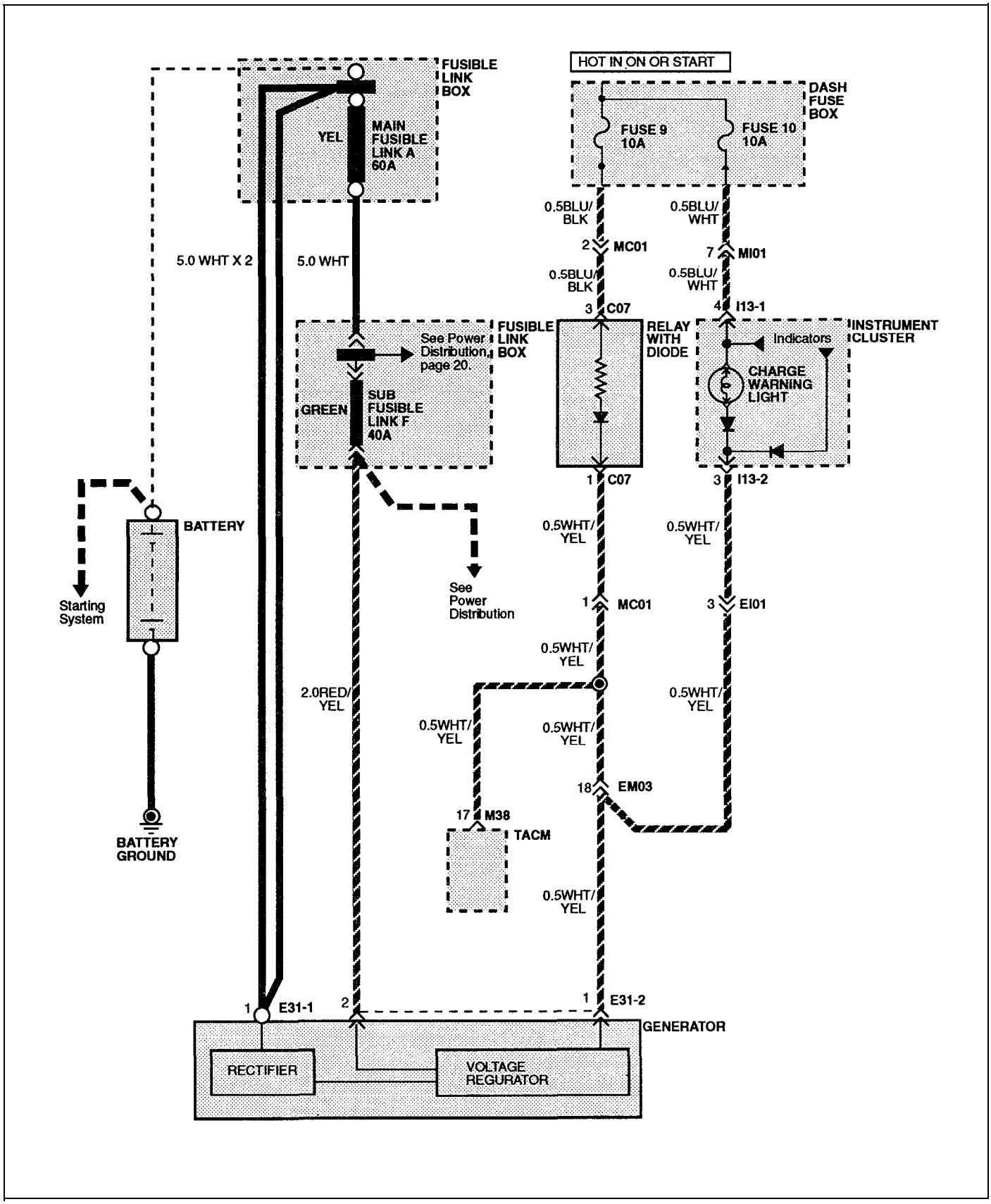


COMPONENT LOCATION INDEX

	Location reference-page
Components	
Ignition lock switch (M29)	WS-195
Starter motor (C18)	WS-183
Starter relay (M15)	WS-194
Transaxle range switch (E28)	WS-189
Connectors	
EM04/EM05	WS-191
MC01	WS-201
Ground	
G01	WS-203

CHARGING SYSTEM

SCHEMATIC DIAGRAM

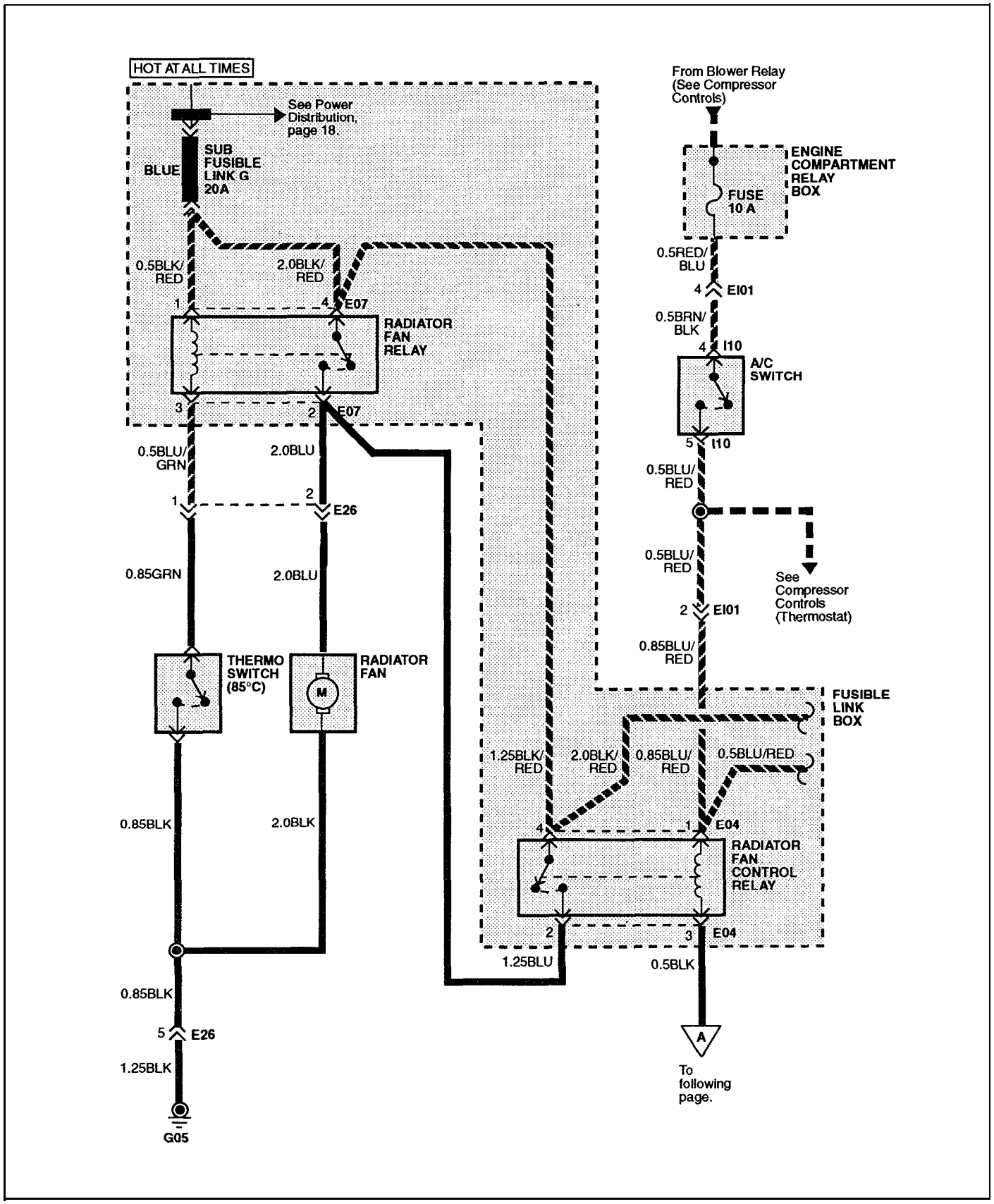


COMPONENT LOCATION INDEX

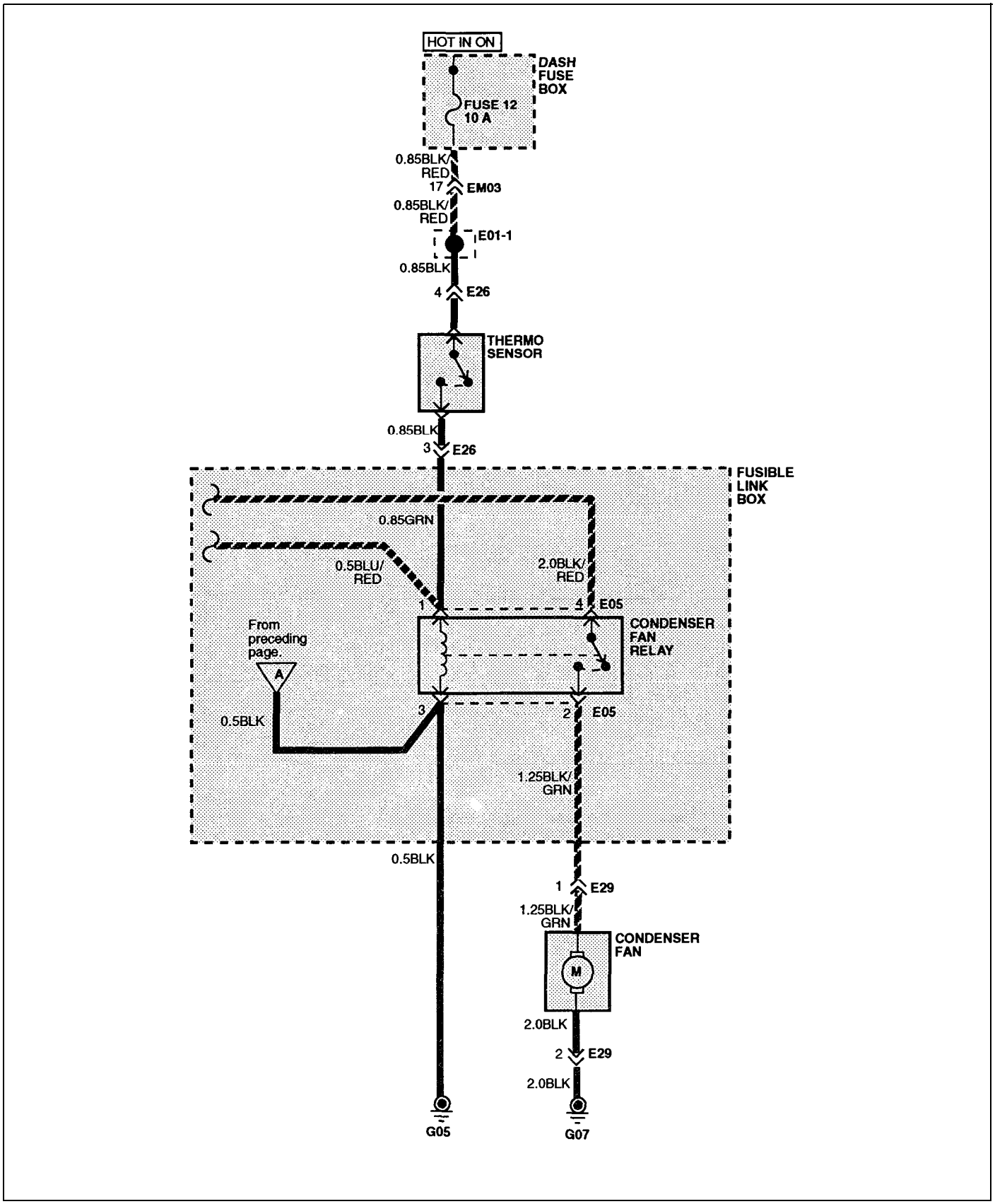
	Location reference-page
Components	
Generator (E31-1 ~ E31-2)	WS-189
Instrument cluster (I13-1)	WS-193
Relay with diode (C07)	WS-182
Connectors	
El01	WS-192
EM03	WS-191
MC01	WS-201

COOLING SYSTEM

SCHEMATIC DIAGRAM (1)



SCHEMATIC DIAGRAM (2)



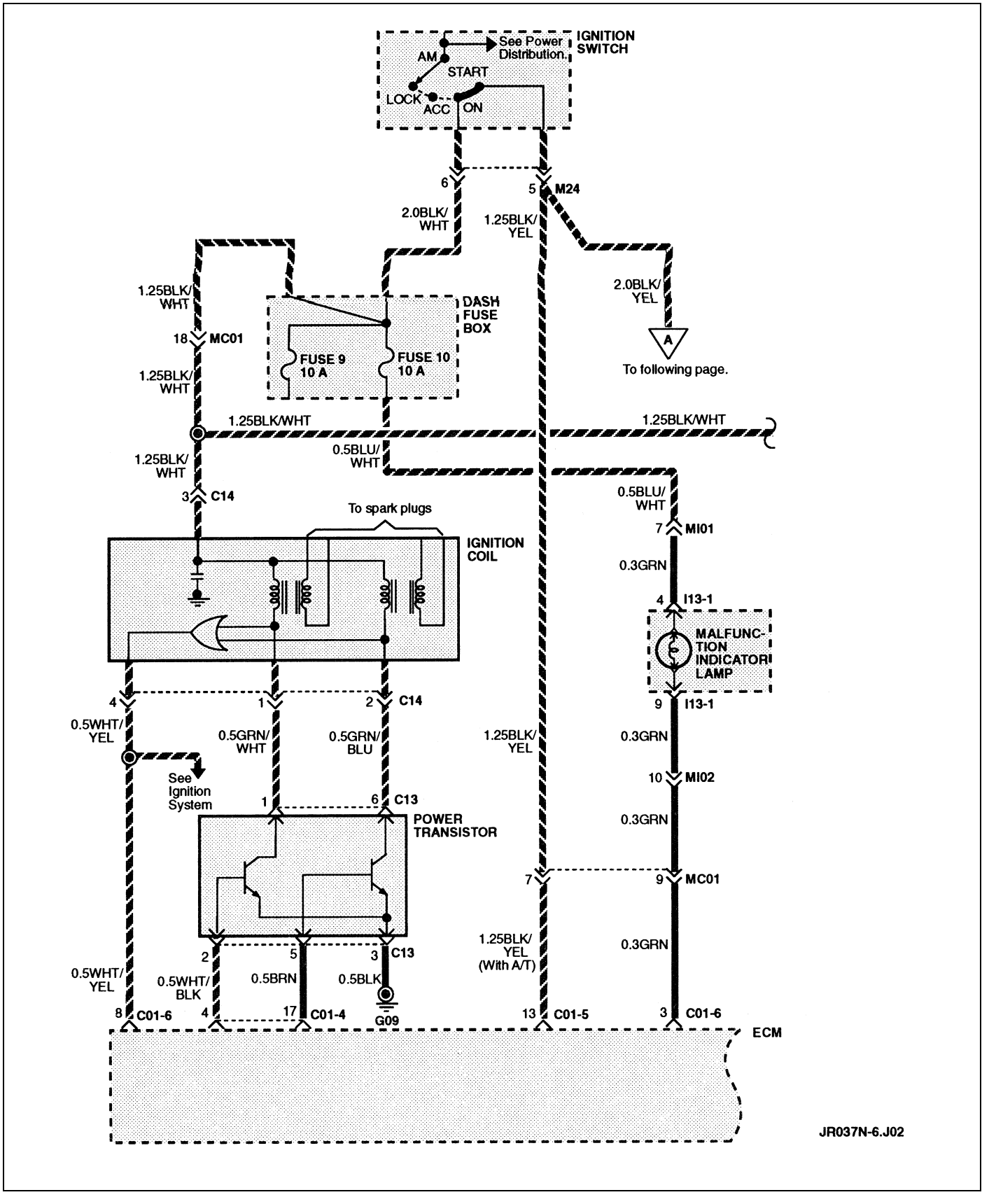
COMPONENT LOCATION INDEX

	Location reference-page
Components	
A/C switch (I10)	WS-193
Condenser fan (E29)	WS-189
Condenser fan control relay (E04)	WS-188
Condenser fan relay (E05)	WS-188
Radiator fan (E26)	WS-189
Radiator fan relay (E07)	WS-188
Thermo switch (E26-2)	WS-189
Therrno sensor (E44)	WS-190
Connectors	
El01	WS-192
EM03	WS-191
Ml01	WS-201
Ground	
G05	WS-203
G07	WS-203

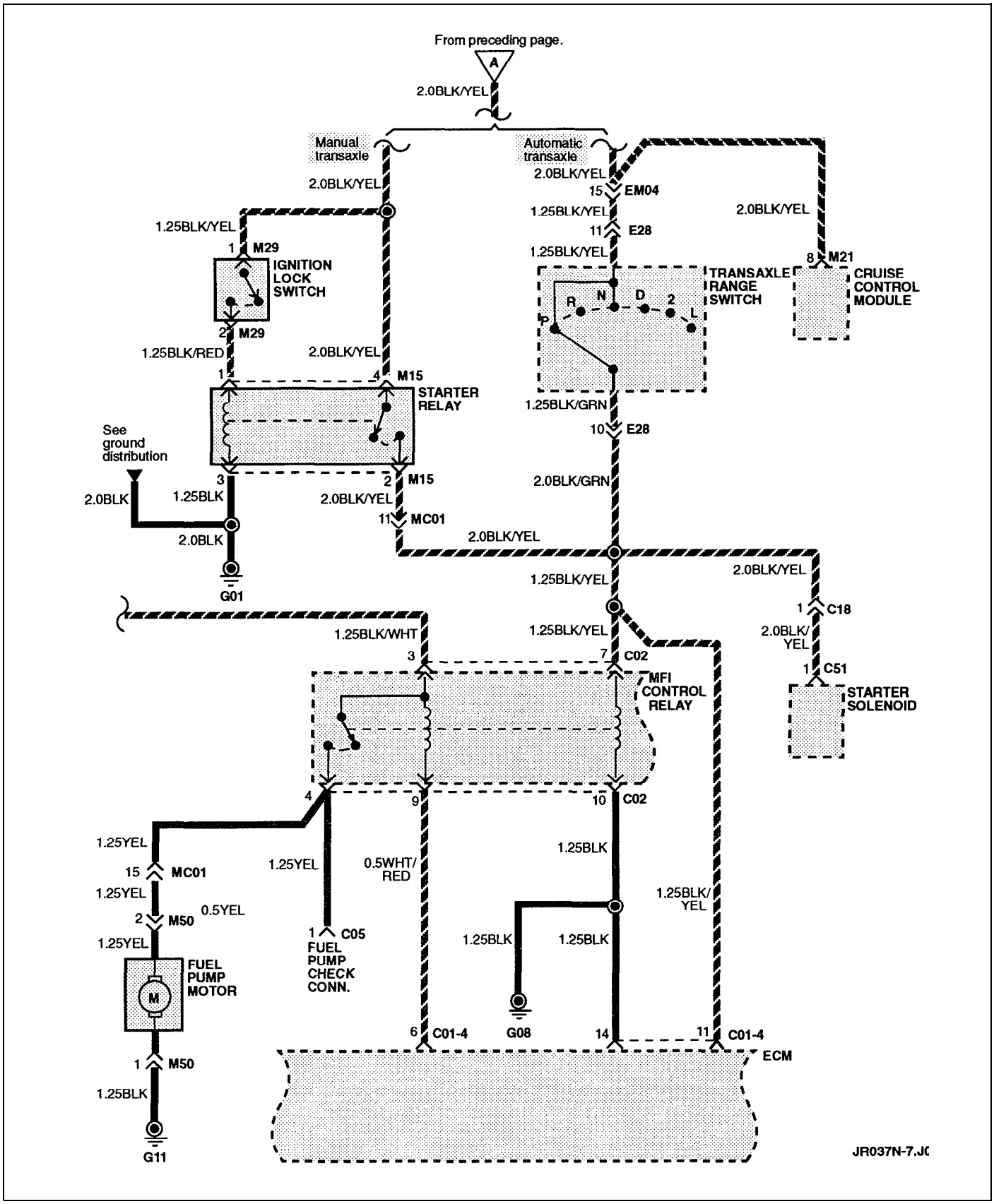
MEMO

DOHC SYSTEM (For California)

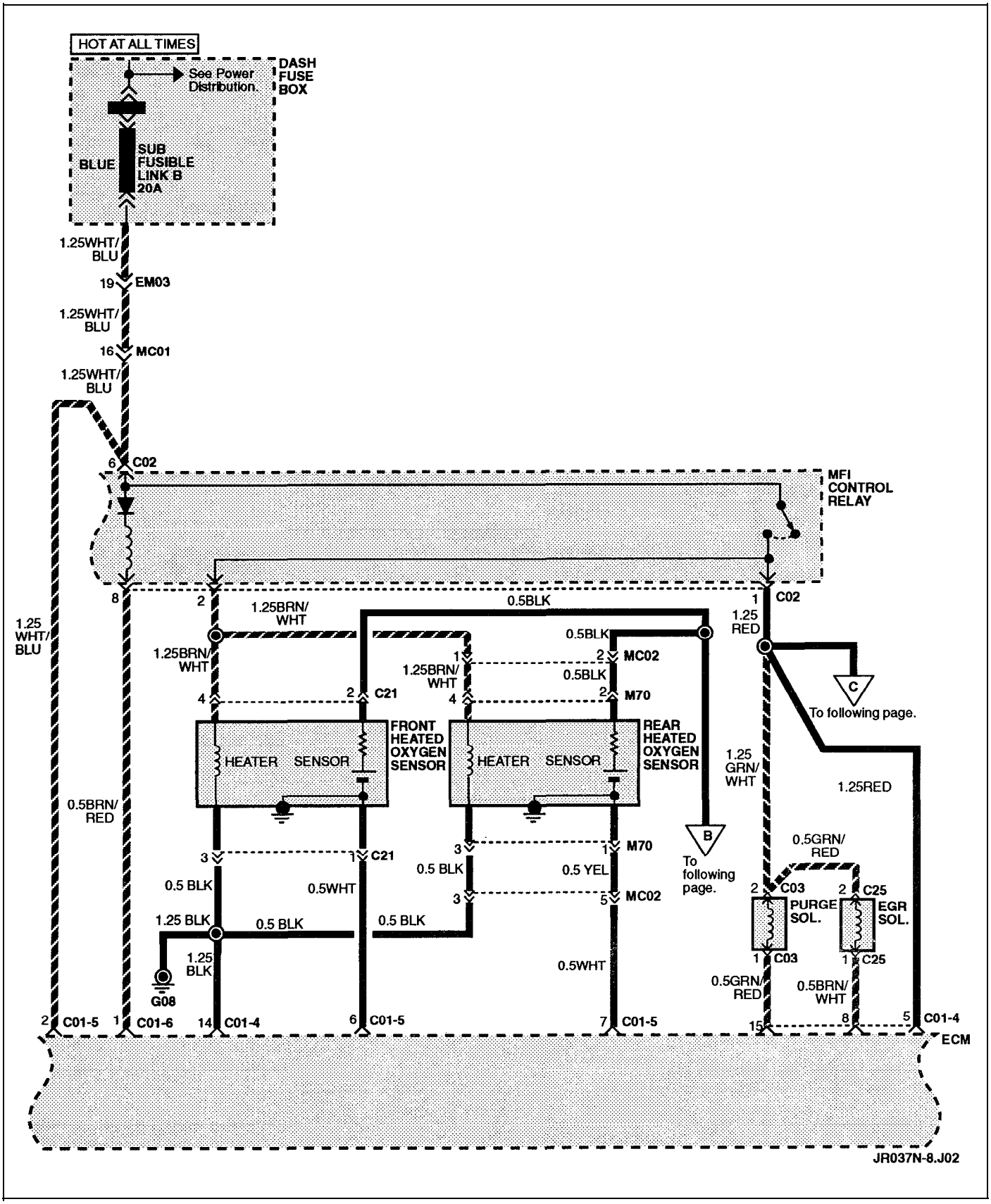
SCHEMATIC DIAGRAM (1)



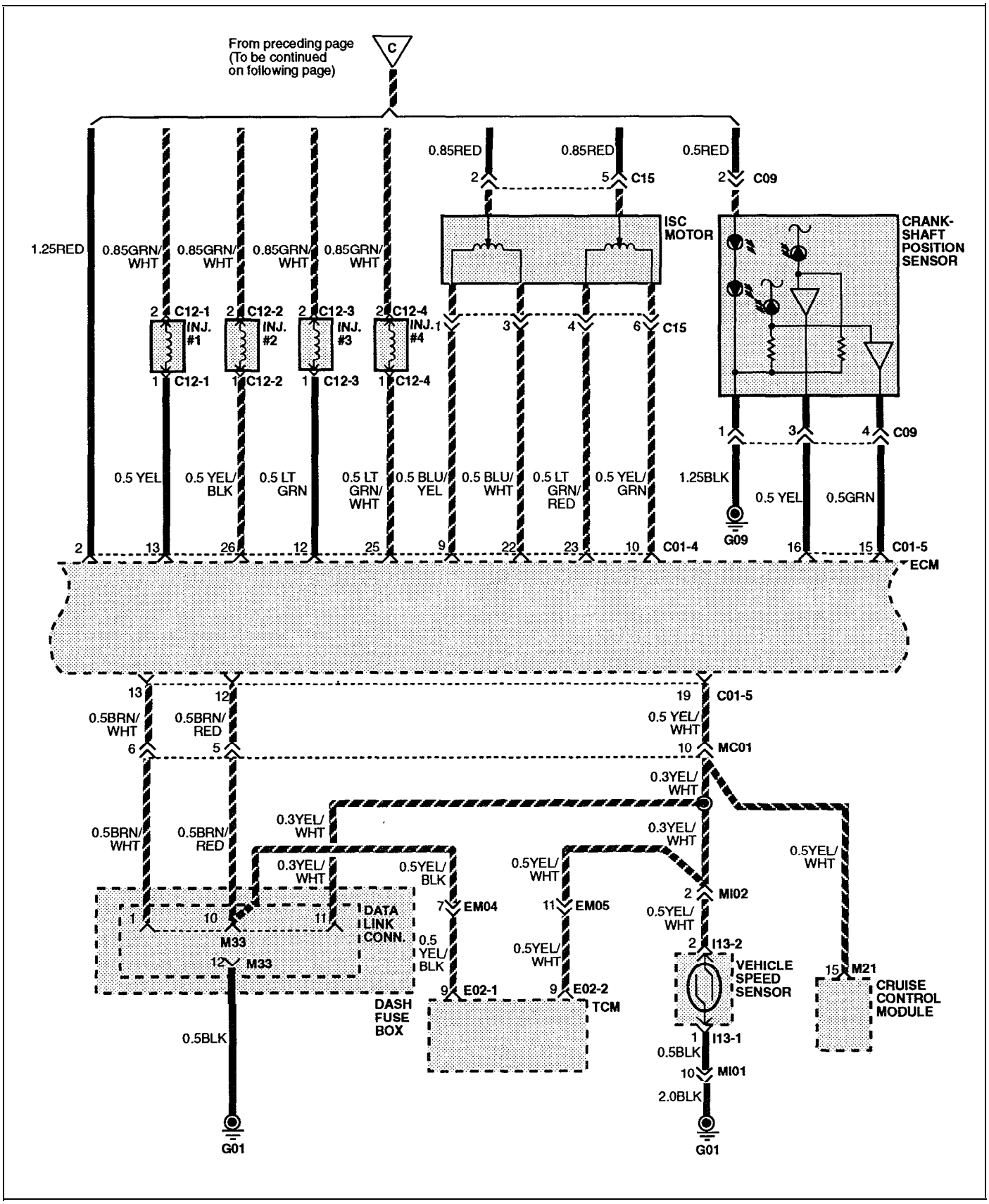
SCHEMATIC DIAGRAM (2)



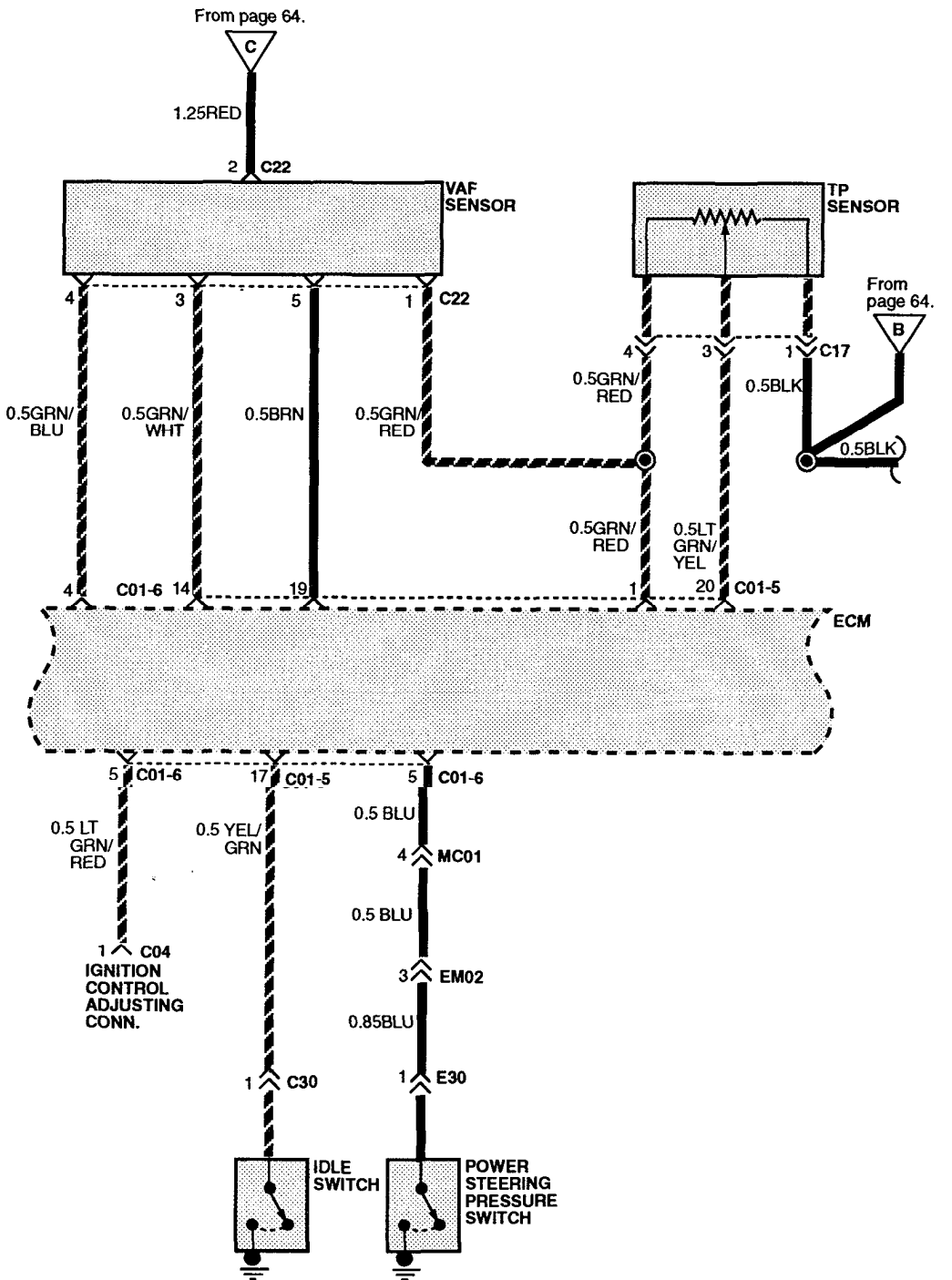
SCHEMATIC DIAGRAM (3)



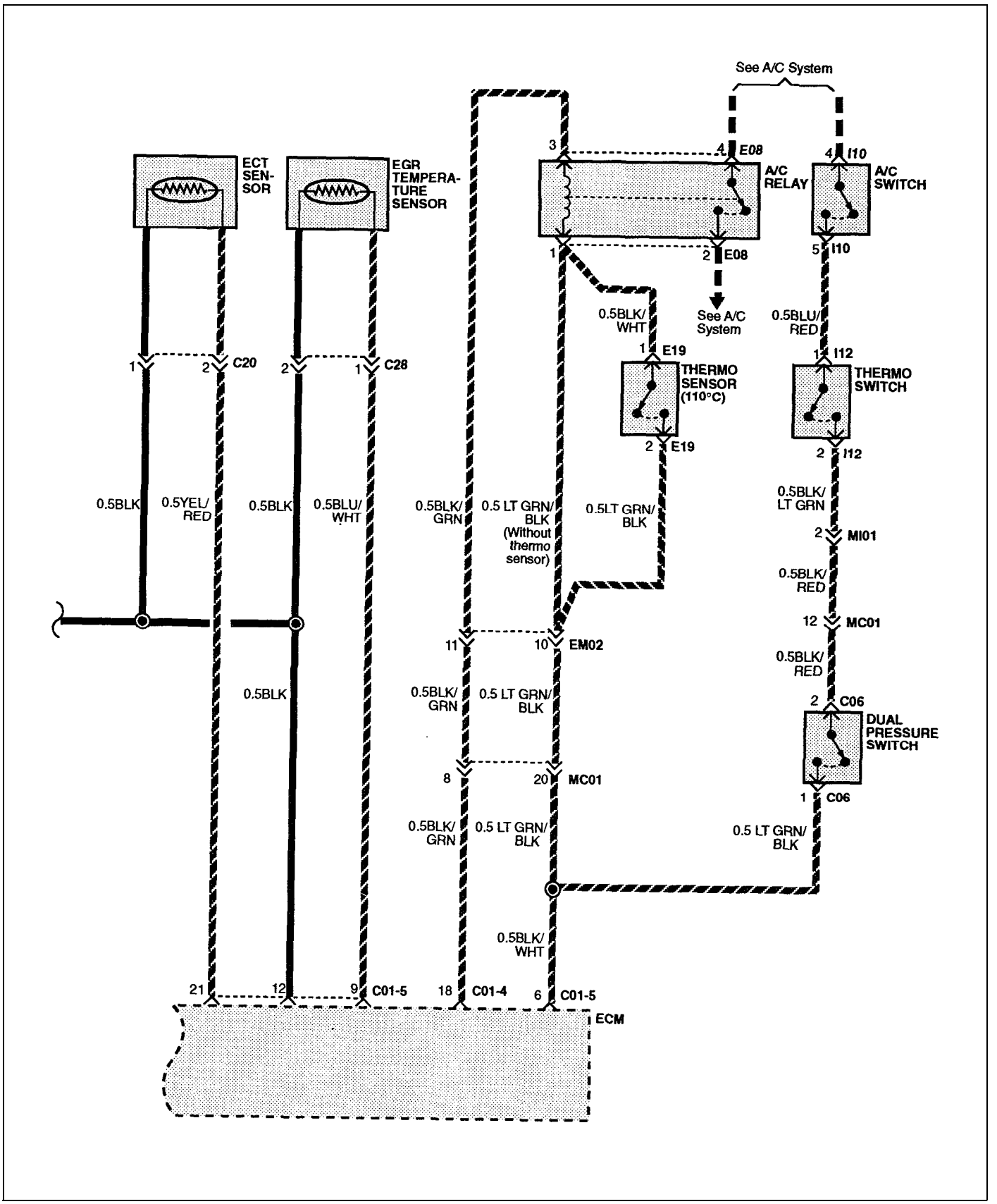
SCHEMATIC DIAGRAM (4)



SCHEMATIC DIAGRAM (5)



SCHEMATIC DIAGRAM (6)



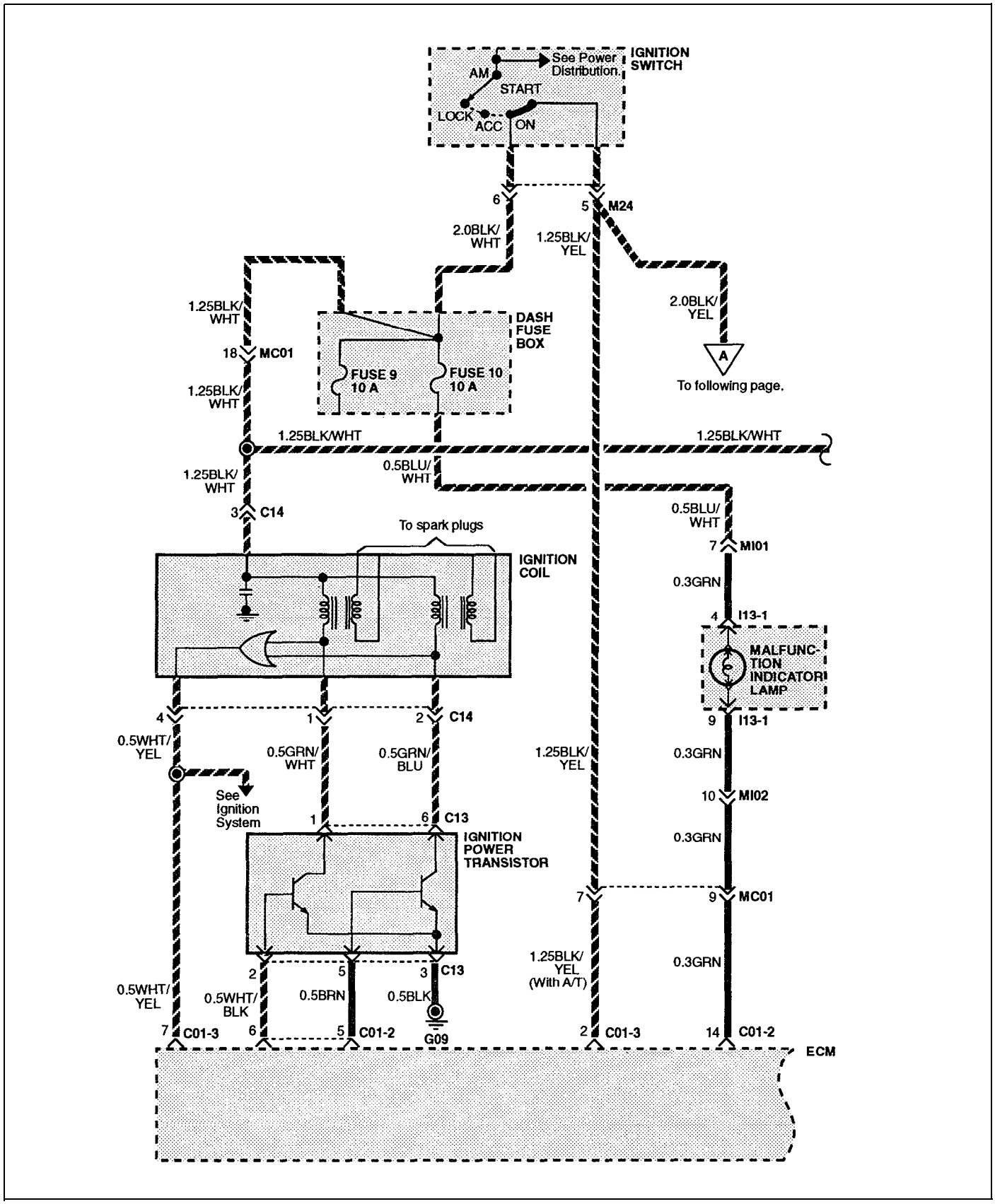
COMPONENT LOCATION INDEX

	Location reference-page
Components	
A/C relay (E08)	WS-188
A/C switch (I10)	WS-193
Auto cruise module (M21)	WS-194
Crankshaft position sensor (C09)	WS-182
Data link conn. (M33)	WS-196
ECM control relay (C02)	WS-182
ECM (C01 -1 ~. C01 -3)	WS-182
ELC module (E02-2)	WS-188
ECTS (C20)	WS-183
Fuel pump motor (M50)	WS-197
Idle switch (C30)	WS-184
Ignition switch (M24)	WS-195
Ignition coil (C14)	WS-183
Ignition lock switch (M29)	WS-195
Injectors (C12-1 ~ C12-4)	WS-182
Instrument cluster (I13-1)	WS-193
ISC motor (C15)	WS-183
Ignition control adjusting conn. (C19)	WS-183
Low pressure switch (C06)	WS-182
Oxygen sensor (C21)	WS-183
Power steering switch (E30)	WS-189
Power transistor (C13)	WS-183
Starter relay (M15)	WS-194
Transaxle range switch (E28)	WS-189
Thermo sensor (El 9)	WS-188
Thermo switch (I12)	WS-193
TPS (C17)	WS-183
VAFS (C22)	WS-183
Connectors	
EM02	WS-191
EM03	WS-191
EM04	WS-191
EM05	WS-191
MC01	WS-201
Ml01	WS-201
Ml02	WS-201
Ground	
G01	WS-203
G08	WS-203
G09	WS-204
G11	WS-204

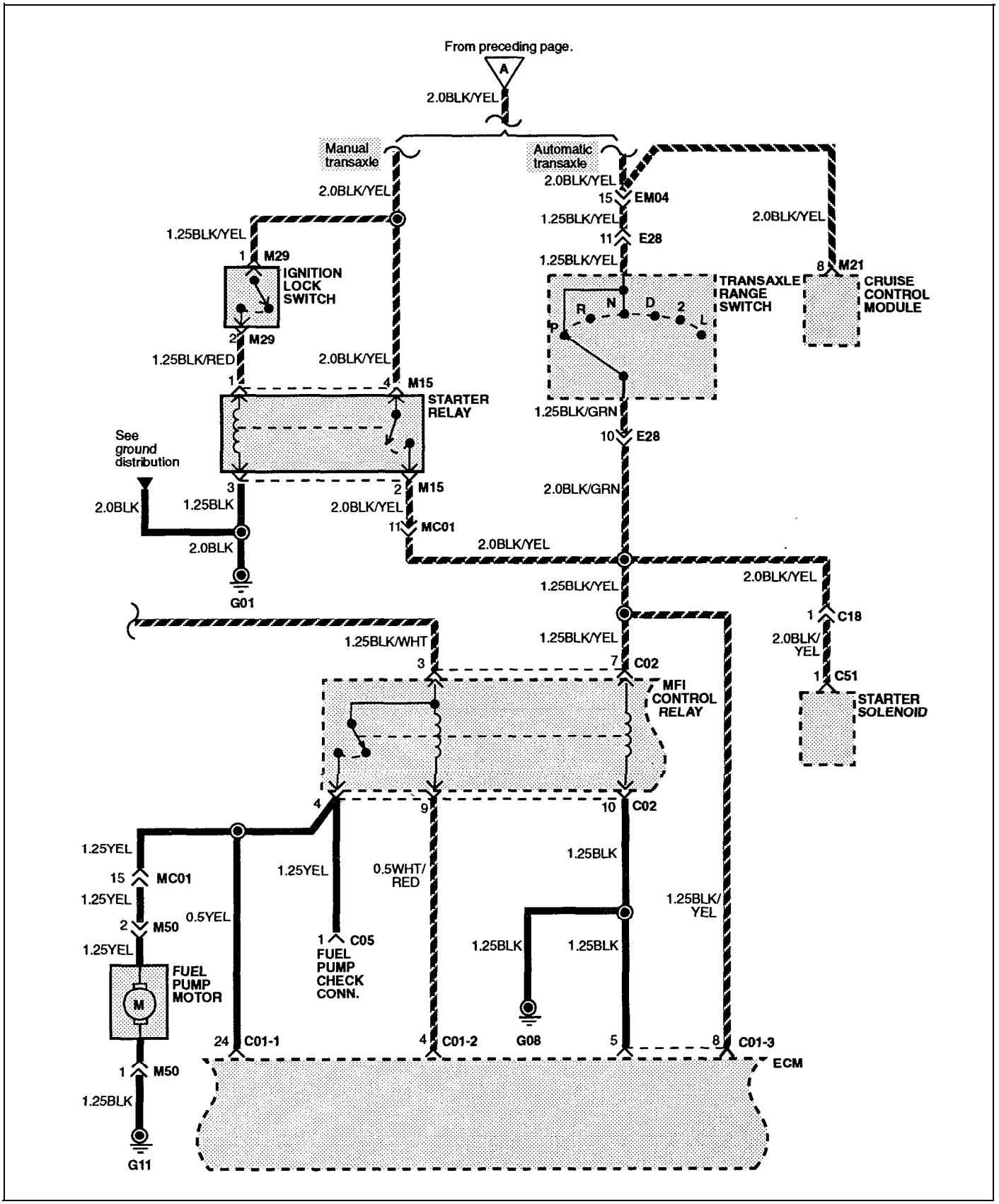
MEMO

DOHC SYSTEM (Except California)

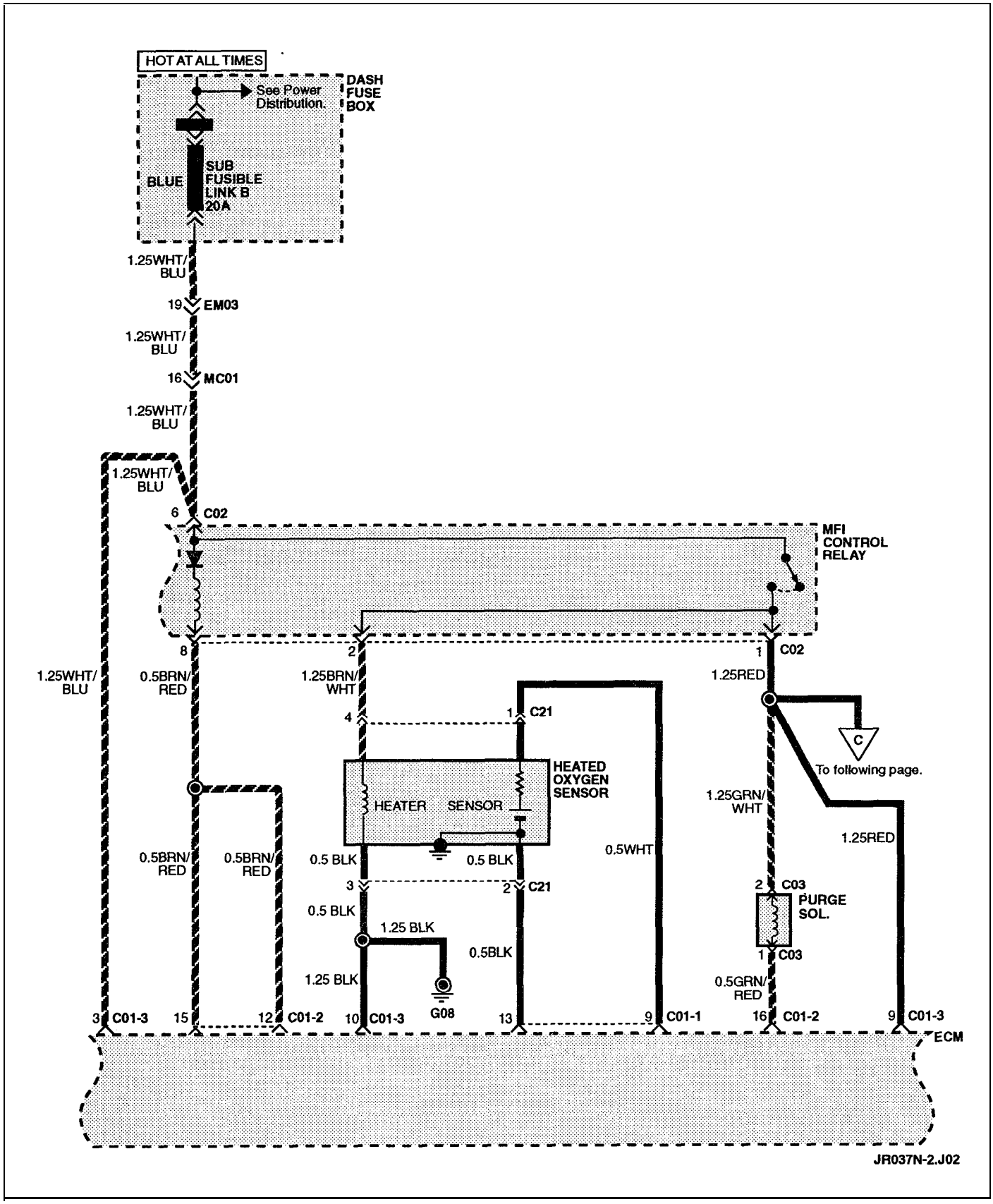
SCHEMATIC DIAGRAM (1)



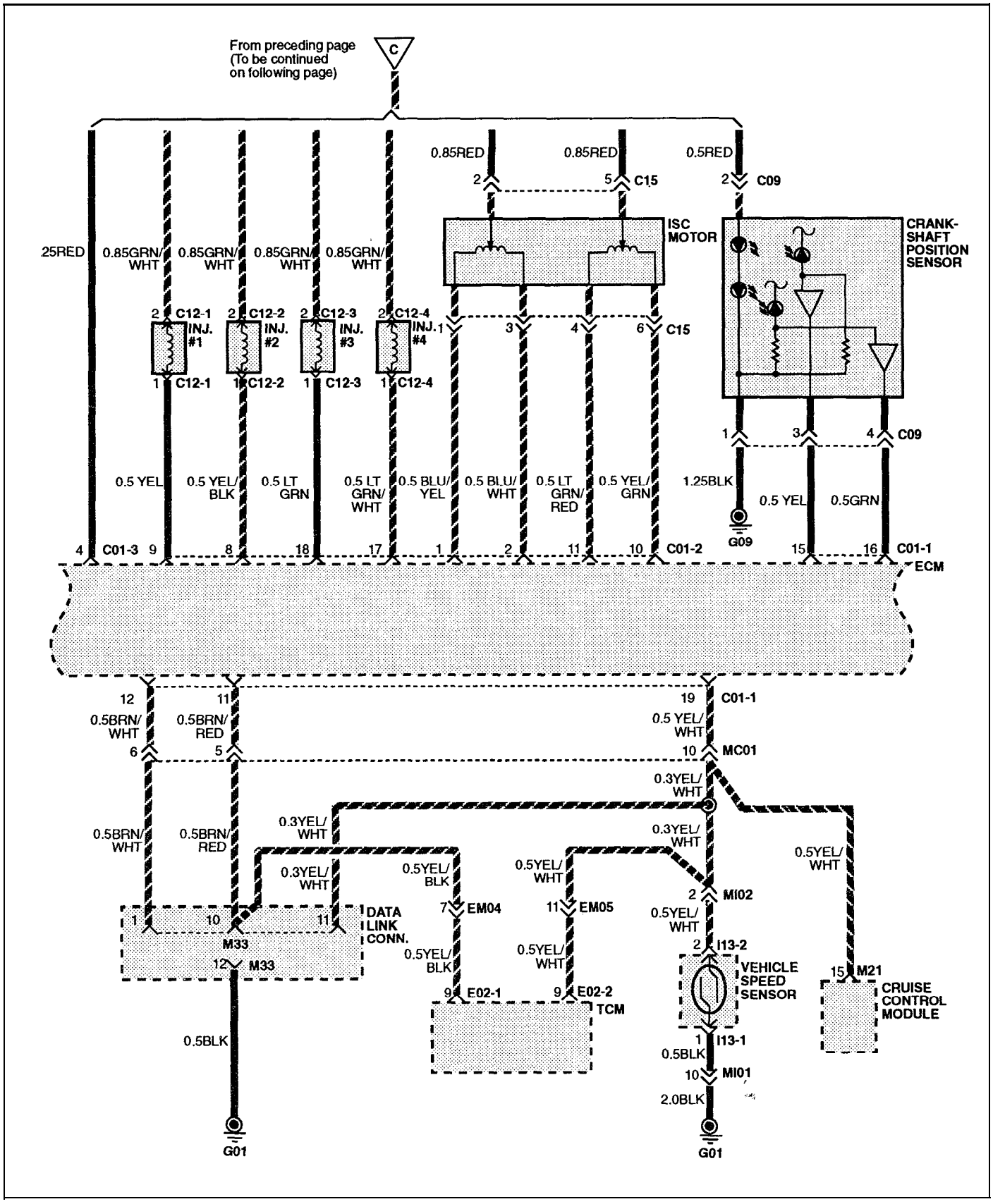
SCHEMATIC DIAGRAM (2)



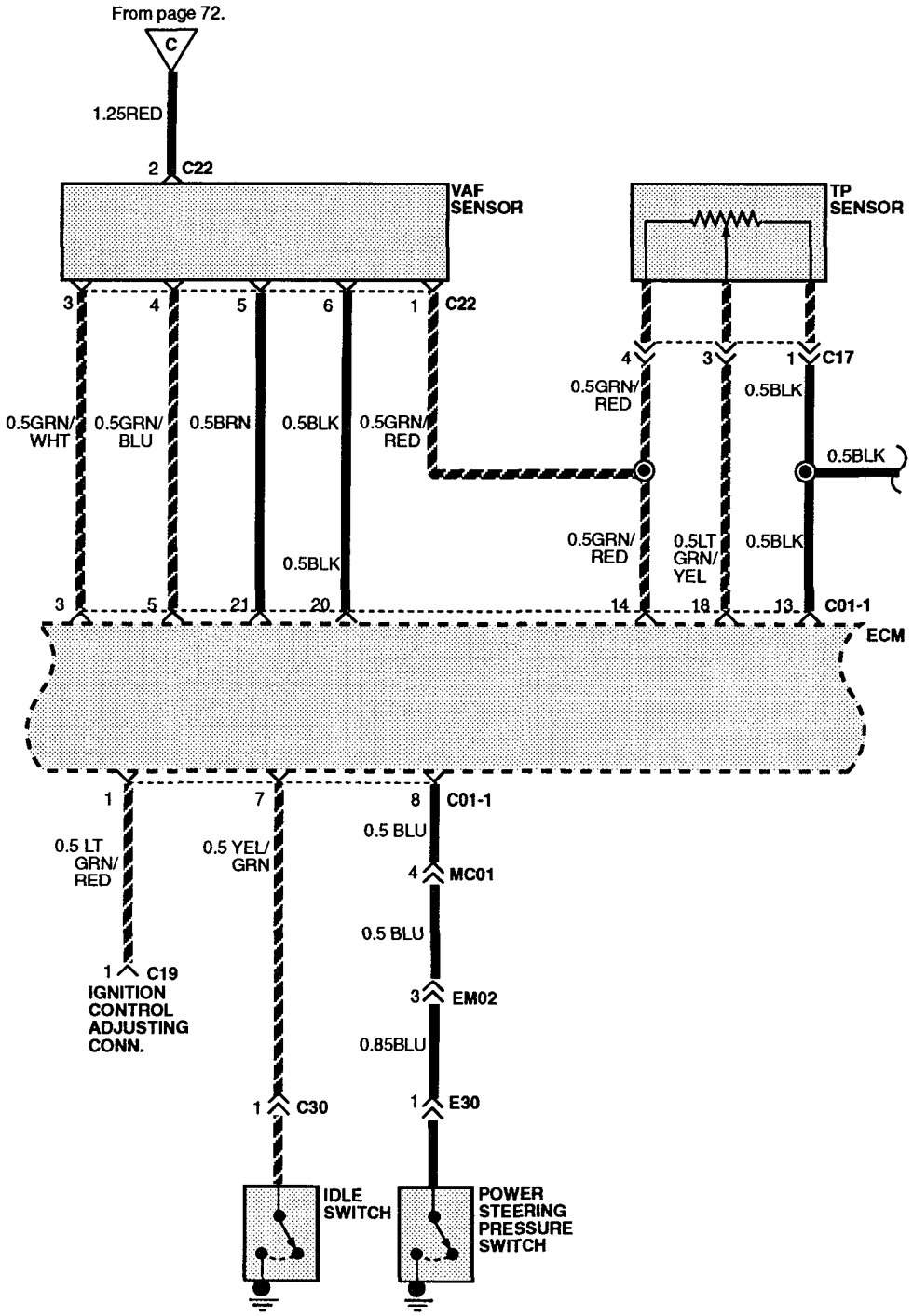
SCHEMATIC DIAGRAM (3)



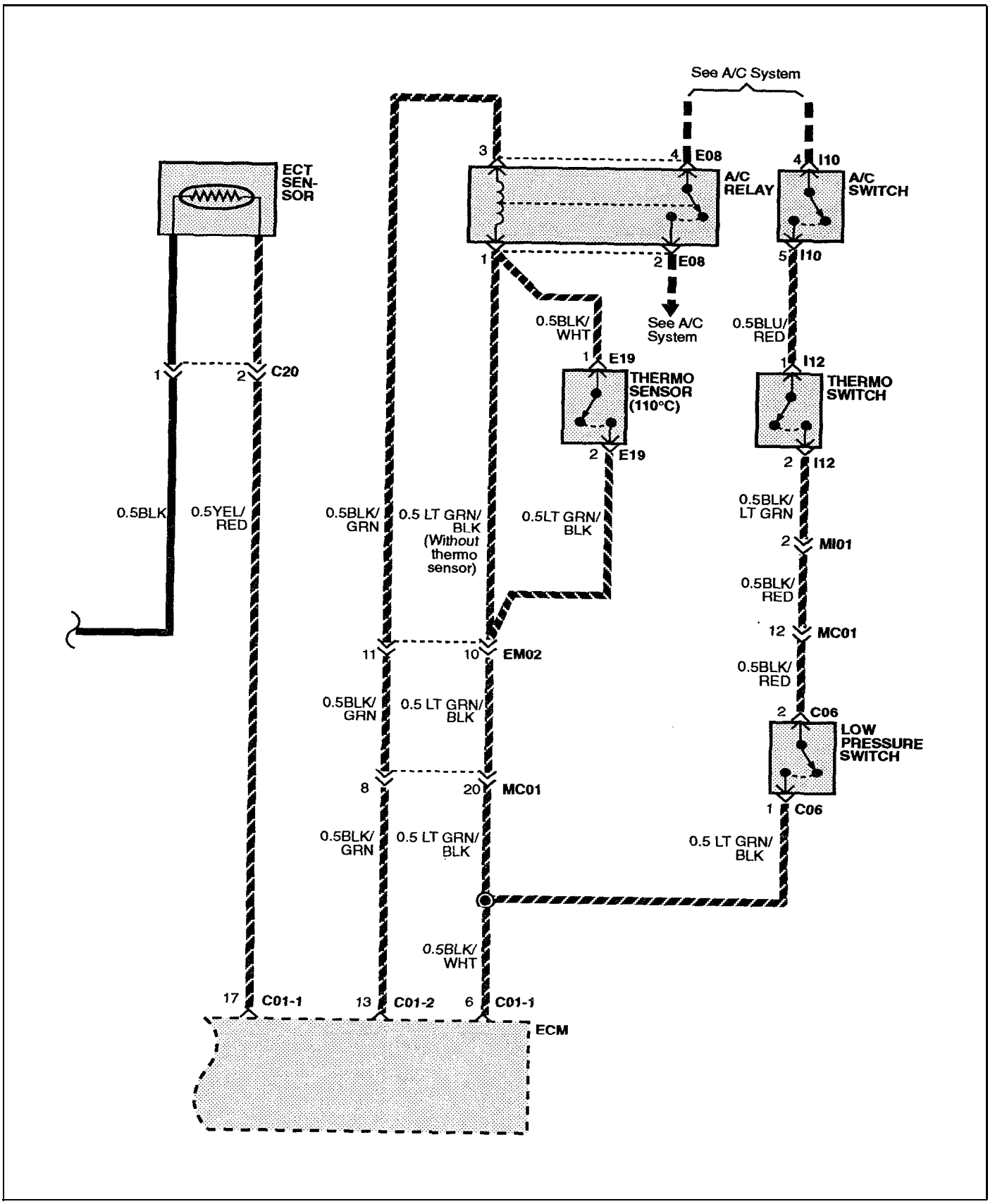
SCHEMATIC DIAGRAM (4)



SCHEMATIC DIAGRAM (5)



SCHEMATIC DIAGRAM (6)



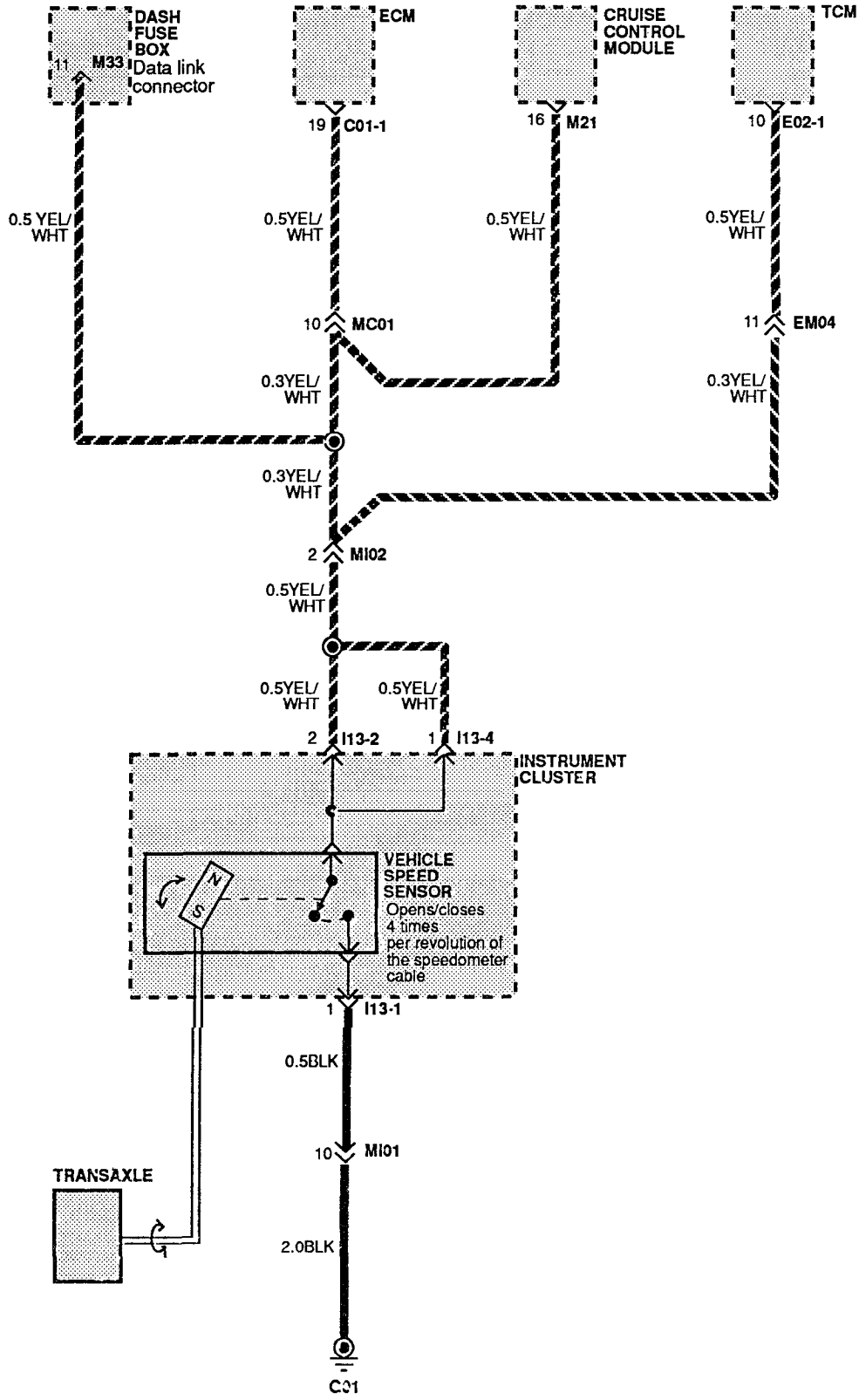
COMPONENT LOCATION INDEX

	Location reference-page
Components	
A/C relay (E08)	WS-188
A/C switch (I10)	WS-193
Auto cruise module (M21)	WS-194
Crankshaft position sensor (C09)	WS-182
Data link conn. (M33)	WS-196
ECM control relay (C02)	WS-182
ECM (C01 -1 ~ C01 -3)	WS-182
ELC module (E02-2)	WS-188
ECTS (C20)	WS-183
Fuel pump motor (M50)	WS-197
Idle switch (C30)	WS-184
Ignition switch (M24)	WS-195
Ignition coil (C14)	WS-183
Ignition lock switch (M29)	WS-195
Injectors (C12-1 ~ Cl 2-4)	WS-182
Instrument cluster (I13-1)	WS-193
ISC motor (Cl 5)	WS-183
Ignition control adjusting conn. (Cl 9)	WS-183
Low pressure switch (C06)	WS-182
Oxygen sensor (C21)	WS-183
Power steering switch (E30)	WS-189
Power transistor (C13)	WS-183
Starter relay (M15)	WS-194
Transaxle range switch (E28)	WS-189
Thermo sensor (El 9)	WS-188
Thermo switch (I12)	WS-193
TPS (Cl 7)	WS-183
VAFS (C22)	WS-183
Connectors	
EM02	WS-191
EM03	WS-191
EM04	WS-191
EM05	WS-191
MC01	WS-201
Ml01	WS-201
Ml02	WS-201
Ground	
G01	WS-203
G08	WS-203
G09	WS-204
G11	WS-204

MEMO

VEHICLE SPEED SENSOR

SCHEMATIC DIAGRAM

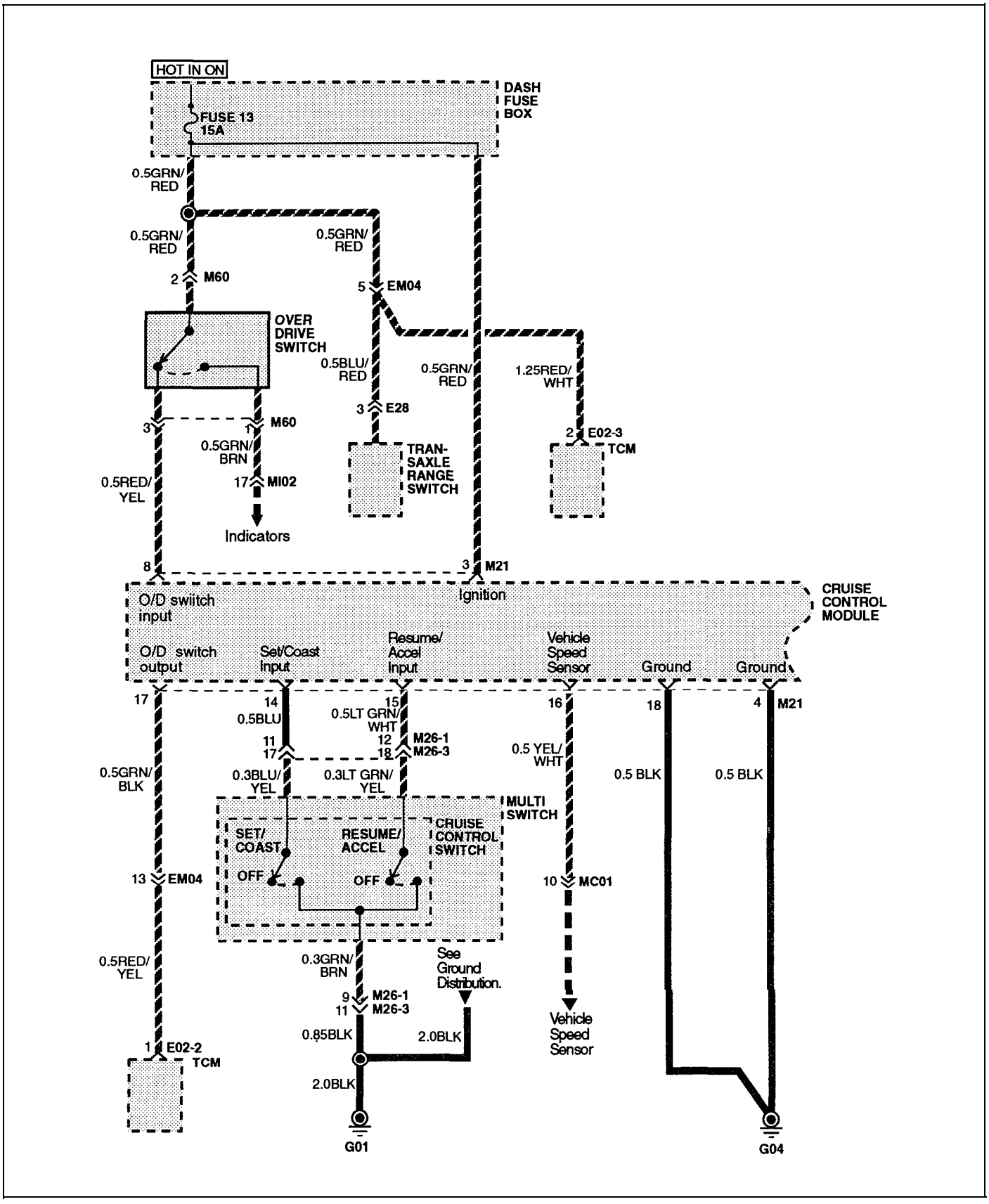


COMPONENT LOCATION INDEX

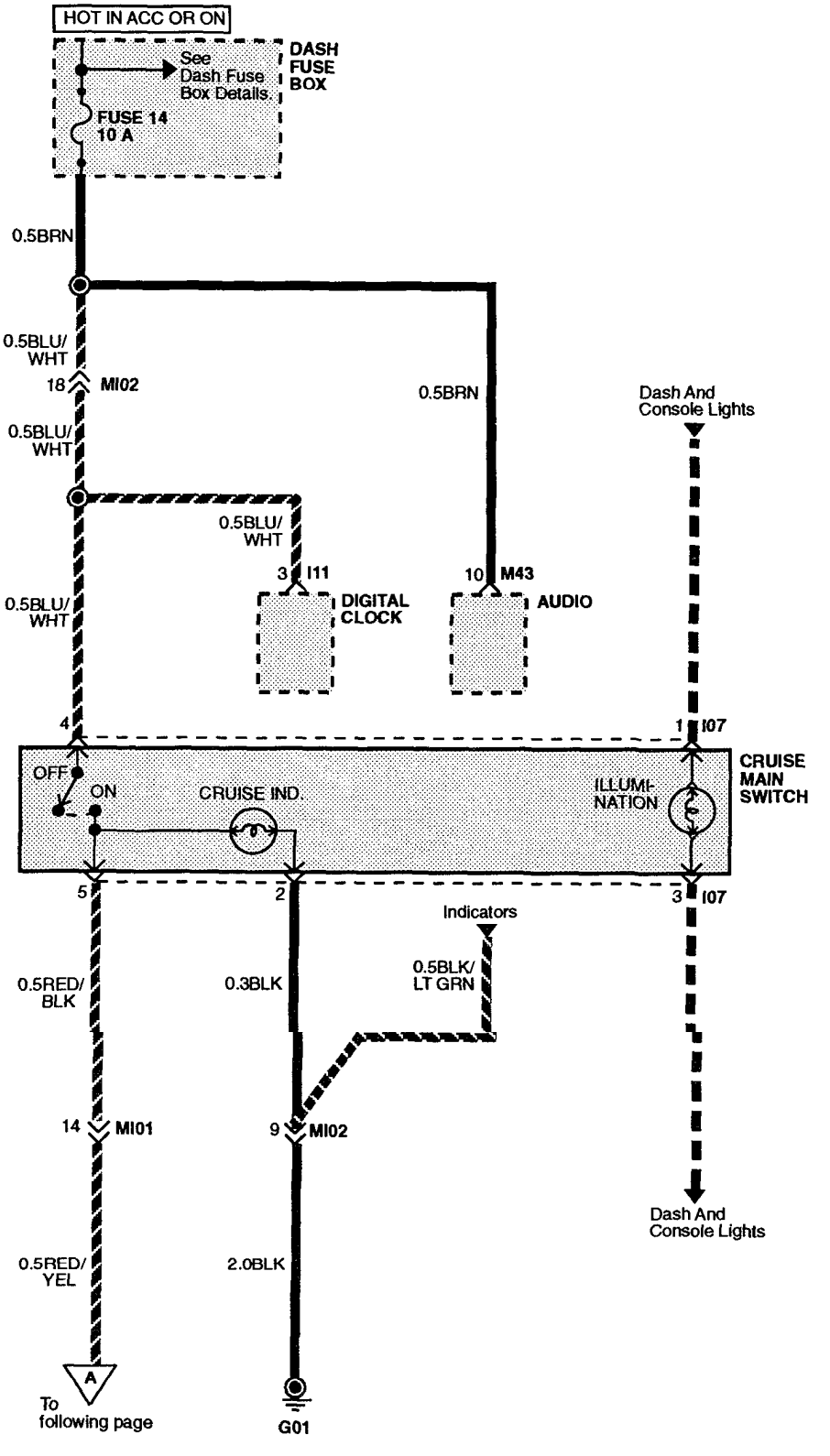
	Location reference-page
Components	
A/C switch (I10)	WS-193
Cruise control module (M21)	WS-194
Data link connector (M33)	WS-196
ECM (C01 -1)	WS-182
Instrument cluster (I13-1 ~ I13-4)	WS-193
TCM (E02-2)	WS-188
Connectors	
EM04	WS-191
MC01	WS-201
Ml01	WS-201
Ml02	WS-201
Ground	
G01	WS-203

CRUISE CONTROL SYSTEM

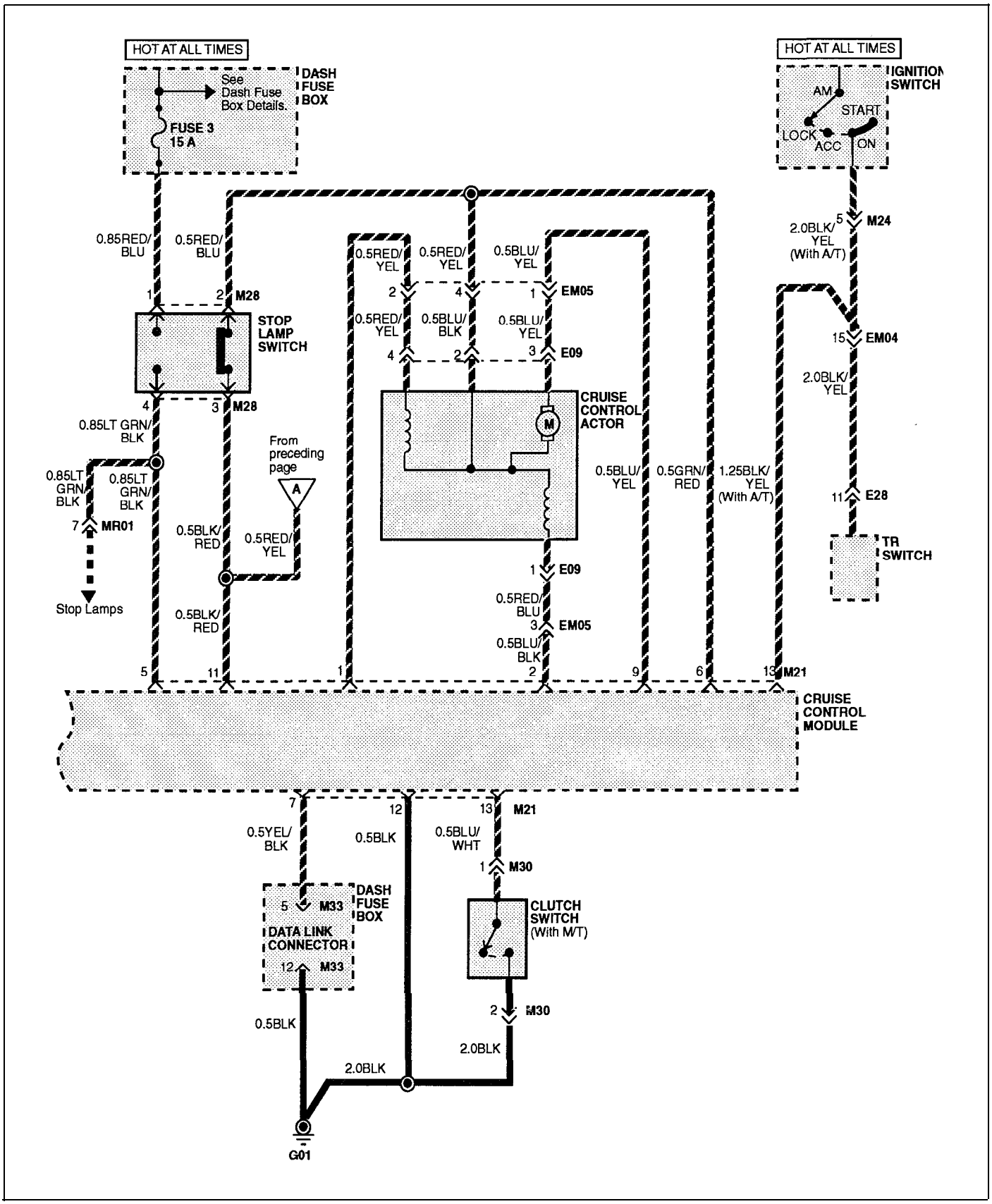
SCHEMATIC DIAGRAM (1)



SCHEMATIC DIAGRAM (2)



SCHEMATIC DIAGRAM (3)

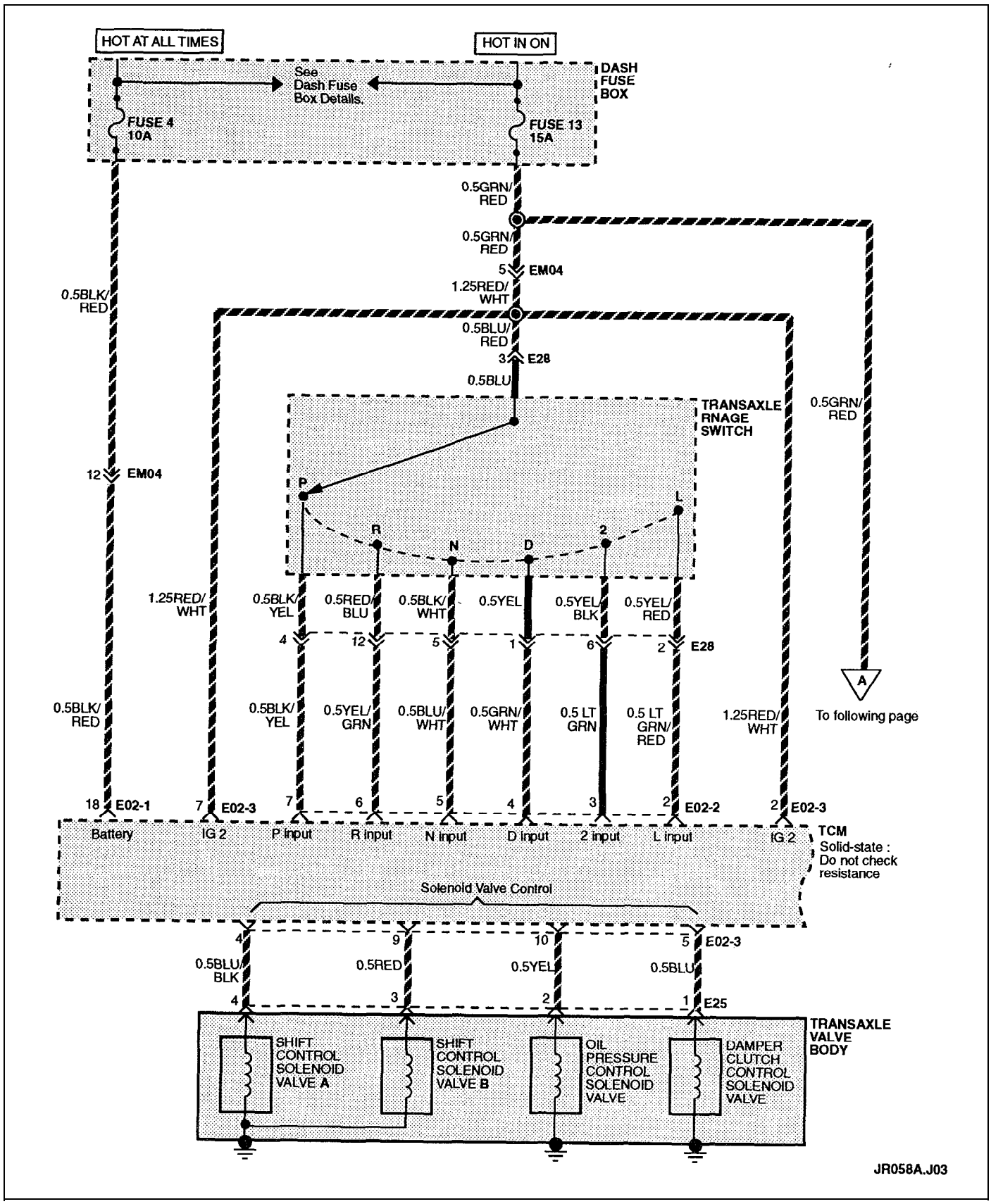


COMPONENT LOCATION INDEX

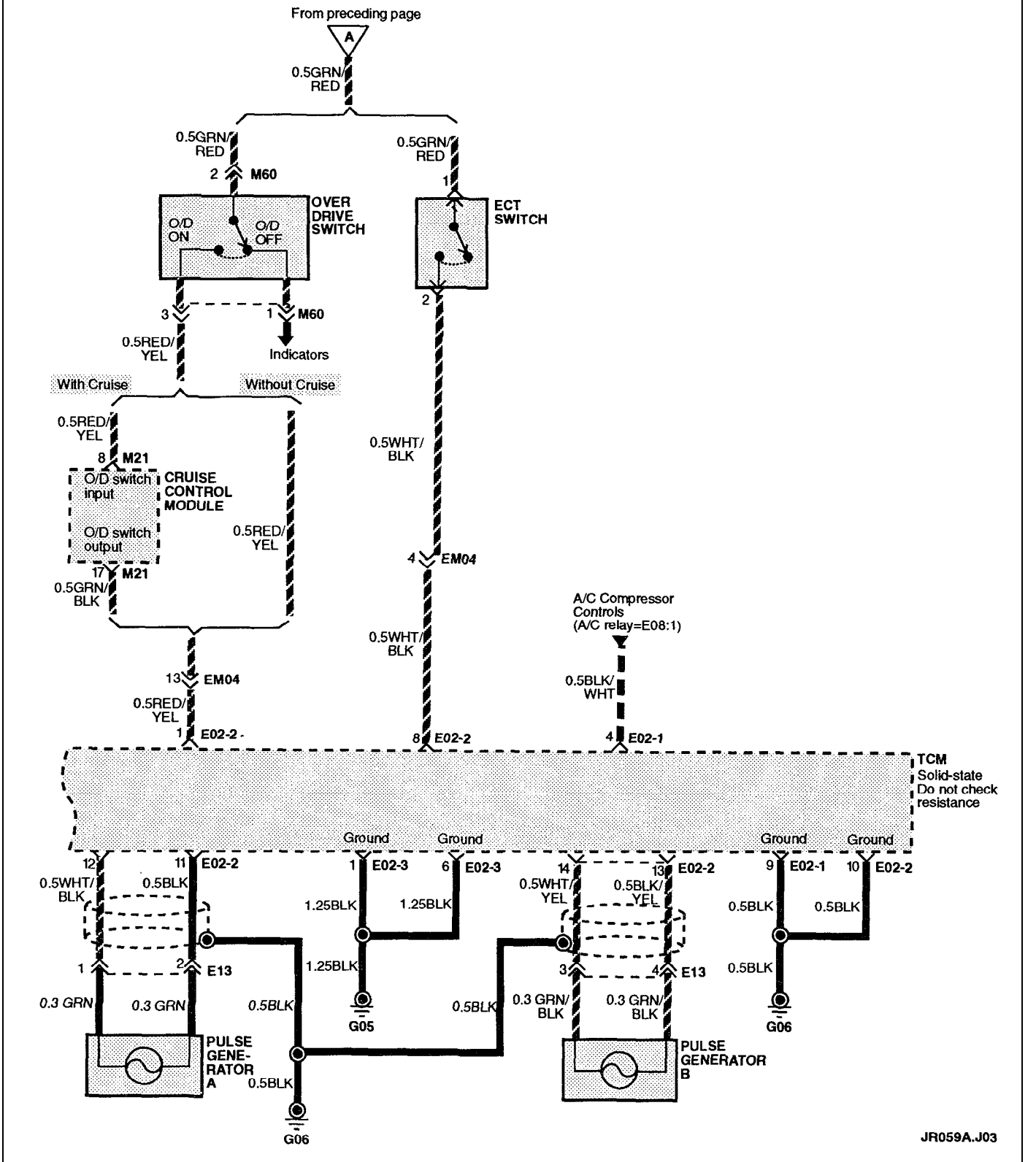
	Location reference-page
Components	
Audio (M43)	WS-196
Clutch switch (M30)	WS-195
Cruise control actuator (E09)	WS-188
Cruise control module (M21)	WS-194
Cruise main switch (I07)	WS-193
Data link connector (M33)	WS-196
Digital clock (I11)	WS-193
Ignition switch (M24)	WS-195
Multi switch (M26-1/M26-3)	WS-195
Overdrive switch (M60)	WS-198
Stop lamp switch (M28)	WS-195
Transaxle range switch (E28)	WS-189
TCM (E20-2~E20-3)	WS-188
Connectors	
EM04	WS-191
EM05 (NT)	WS-191
MC01	WS-201
MI02	WS-201
MI01	WS-201
MR01	WS-201
Ground	
G01	WS-203
G04	WS-203

ELECTRONIC LOCK UP CONTROLS

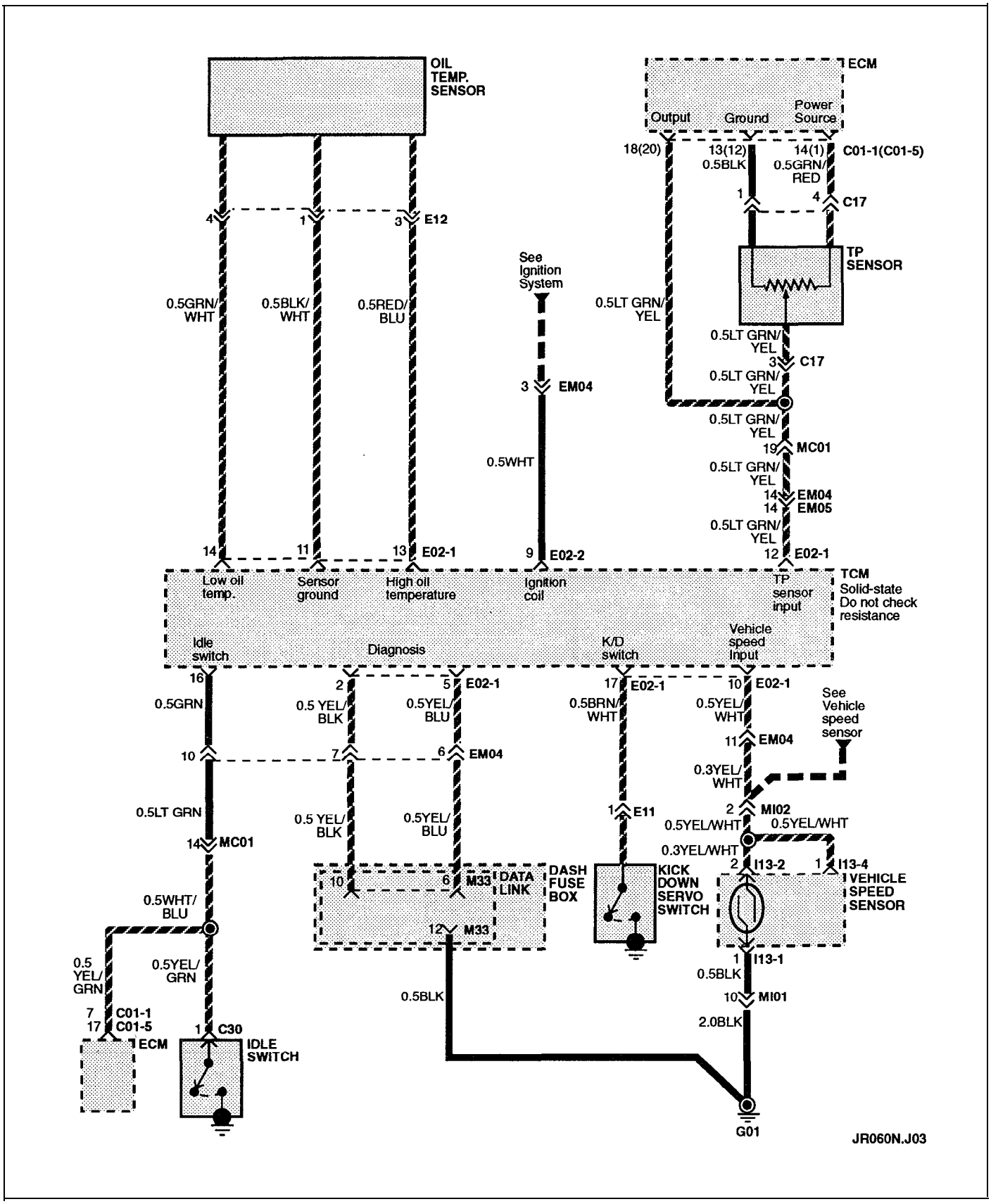
SCHEMATIC DIAGRAM (1)



SCHEMATIC DIAGRAM (2)



SCHEMATIC DIAGRAM (3)

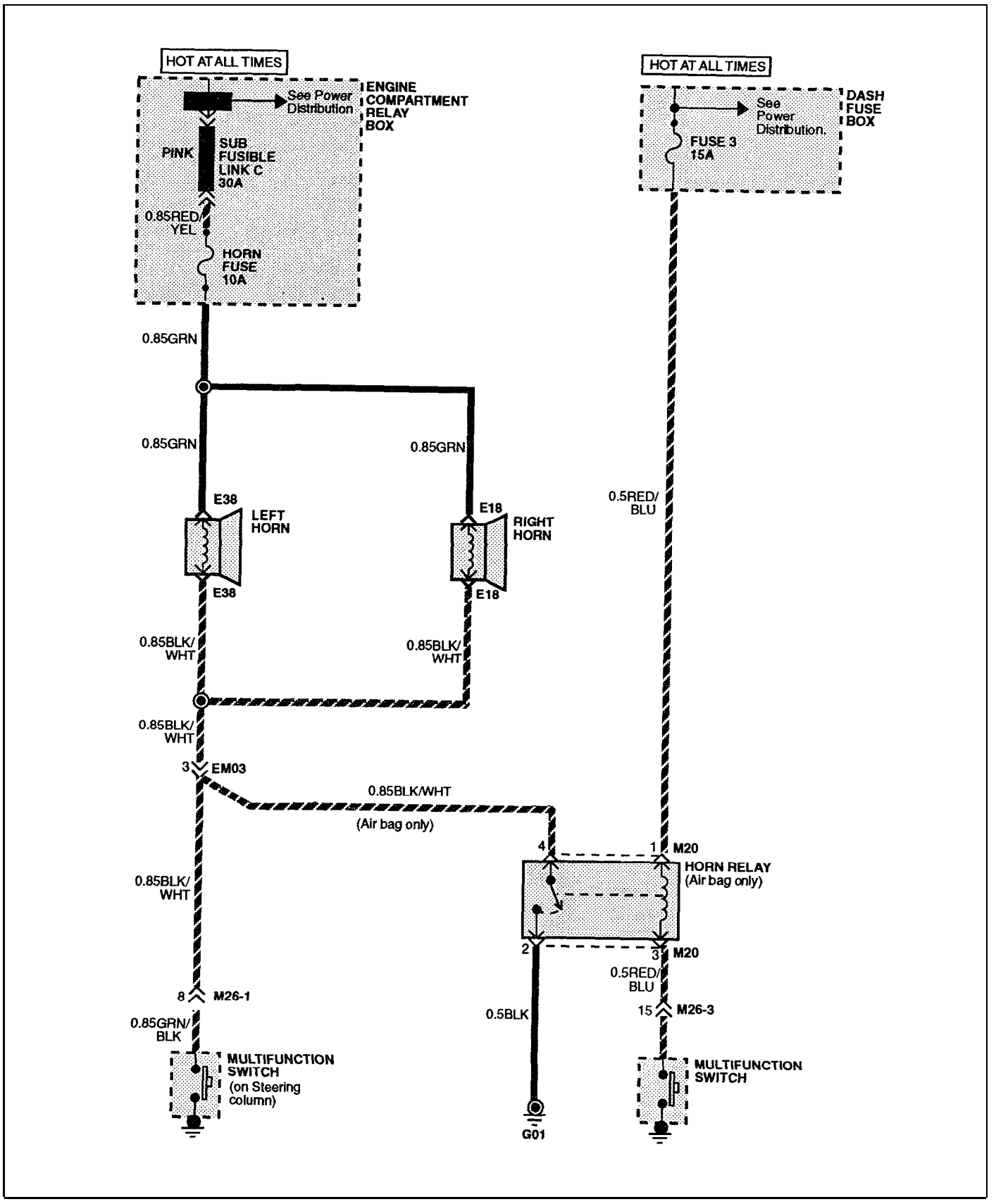


COMPONENT LOCATION INDEX

	Location reference-page
Components	
Accelerator pedal switch (M22)	WS-194
Cruise control module (M21)	WS-194
Data link connector (M33)	WS-196
ECT switch (M41)	WS-196
ECM (CO1 -1)	WS-182
Kick down servo switch (El 1)	WS-188
Oil Temperature sensor (El 2)	WS-188
Over drive switch (M60)	WS-188
Pulse generator (El 3)	WS-188
Transaxle range switch (E28)	WS-189
TCM (E02-1 ~ E02-2)	WS-188
TP sensor (Cl 7)	WS-183
Transaxle valve body (E25)	WS-189
Vehicle speed sensor (I13-2)	WS-193
Connectors	
EM04	WS-191
MC01	WS-201
Ml02	WS-201
Grounds	
G01	WS-203
G06	WS-203

HORNS

SCHEMATIC DIAGRAM

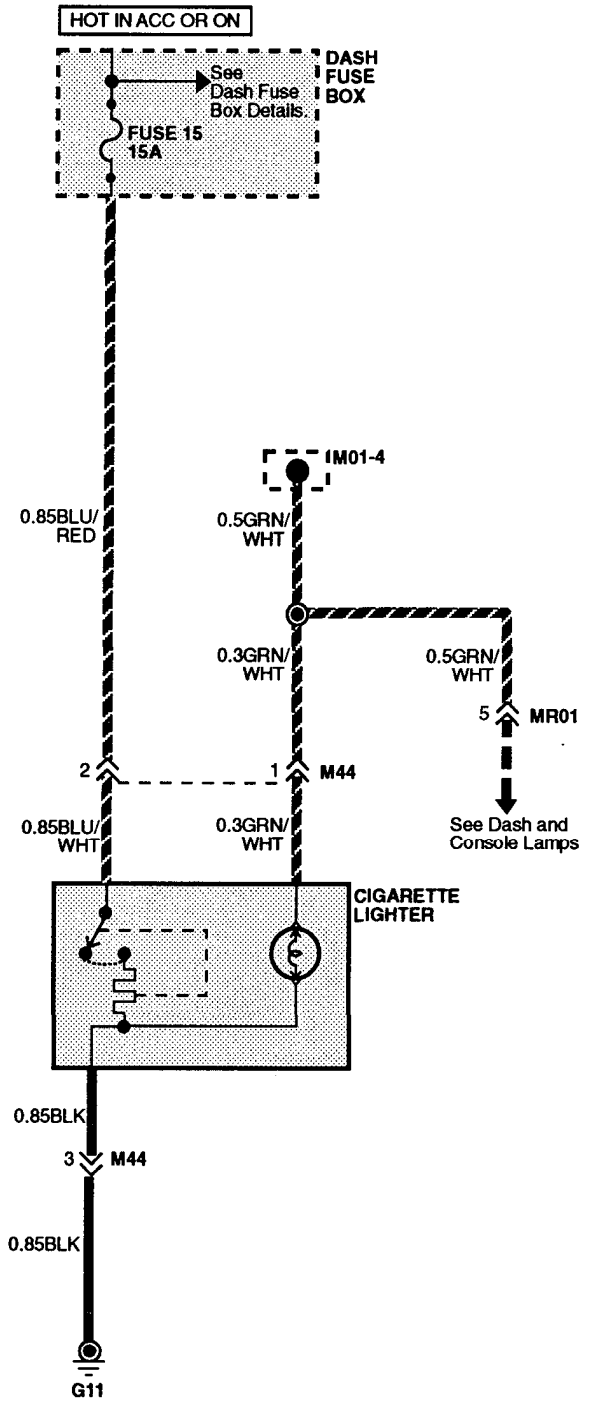


COMPONENT LOCATION INDEX

	Location reference-page
Components	
Horn relay (M20)	WS-194
Left horn (E38)	WS-190
Multifunction switch (M26-1/M26-3)	WS-195
Right horn (El 8)	WS-188
Connector	
EM03	WS-191

CIGARETTE LIGHTER

SCHEMATIC DIAGRAM

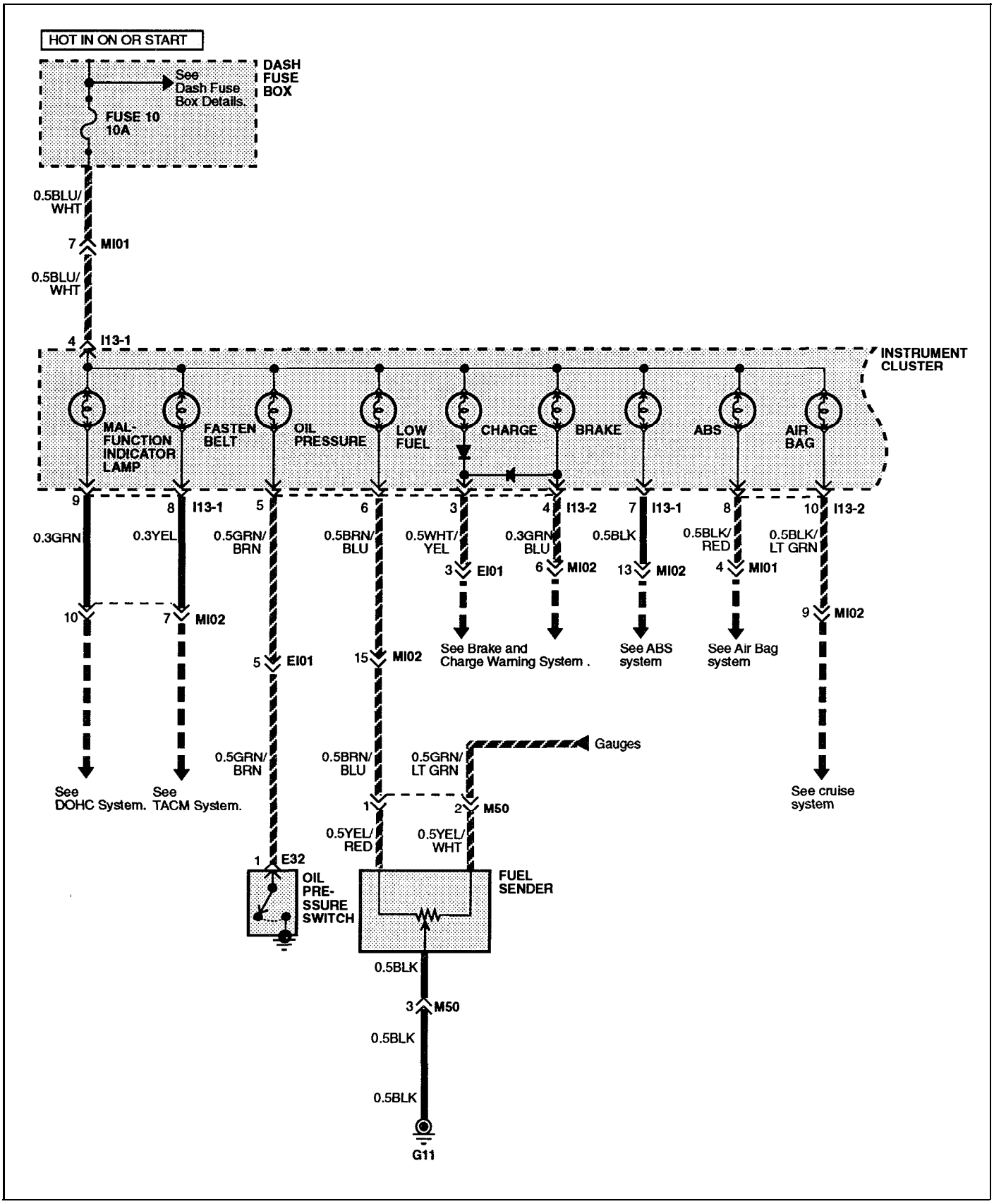


COMPONENT LOCATION INDEX

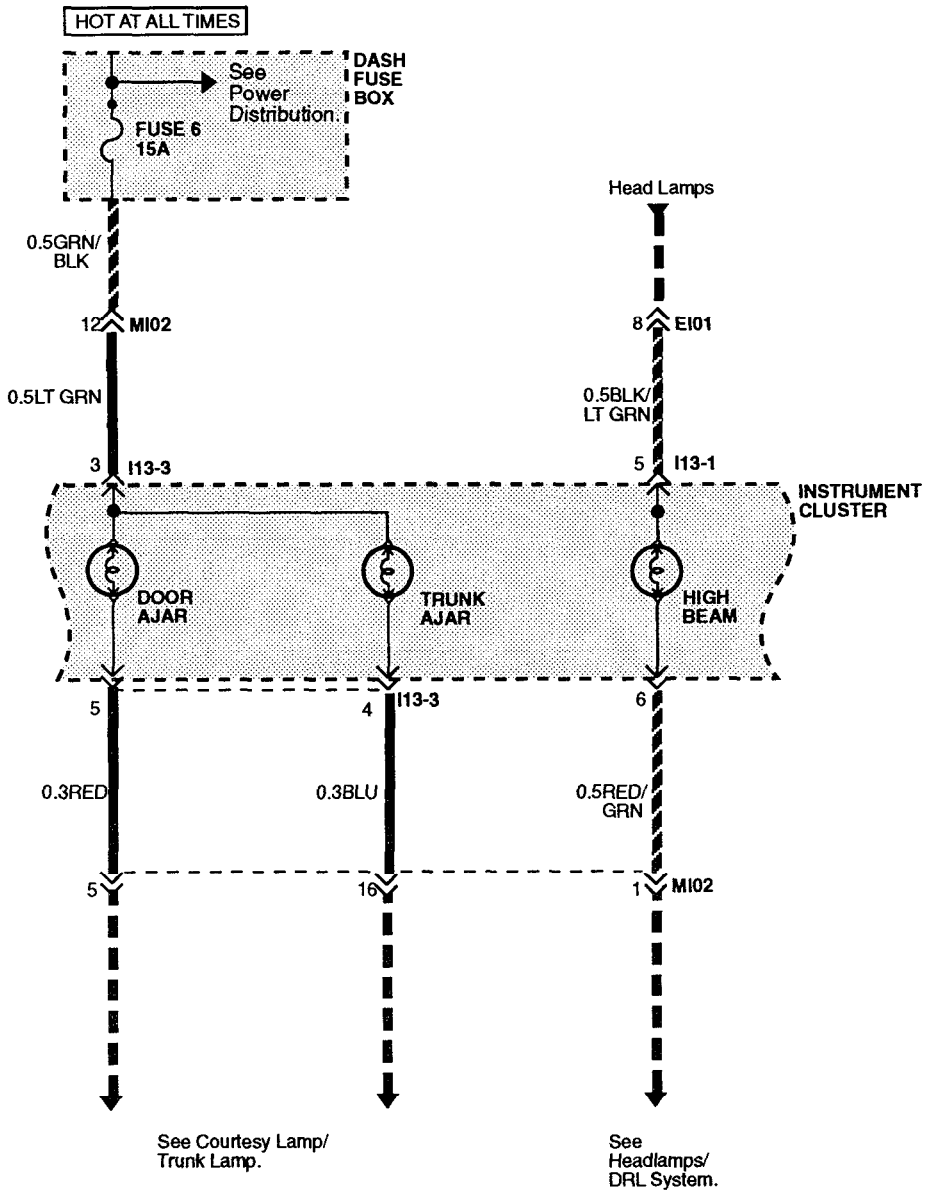
	Location reference-page
Components	
Cigarette lighter (M44)	WS-197
Ground	
G11	WS-204

INDICATORS

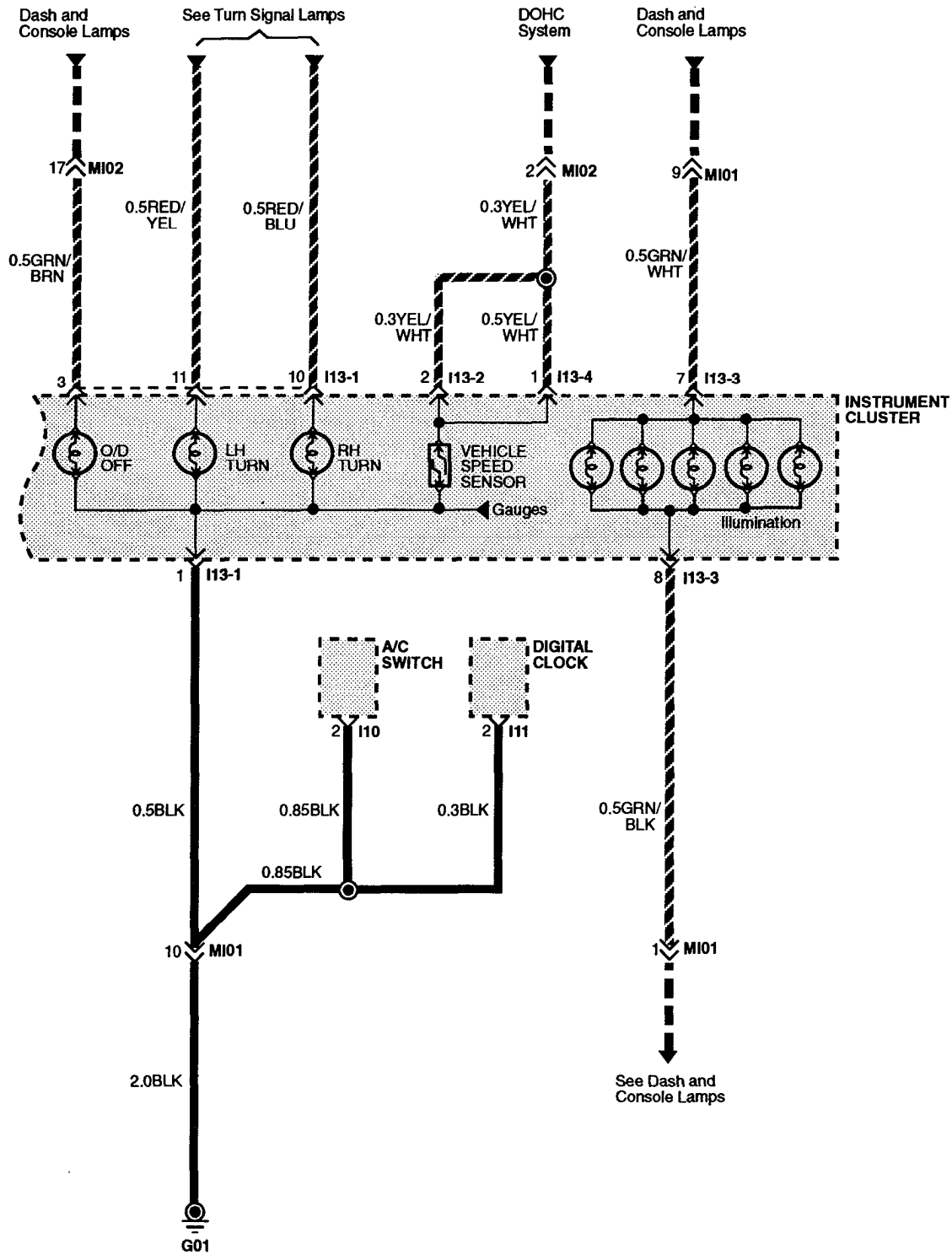
SCHEMATIC DIAGRAM (1)



SCHEMATIC DIAGRAM (2)



SCHEMATIC DIAGRAM (3)

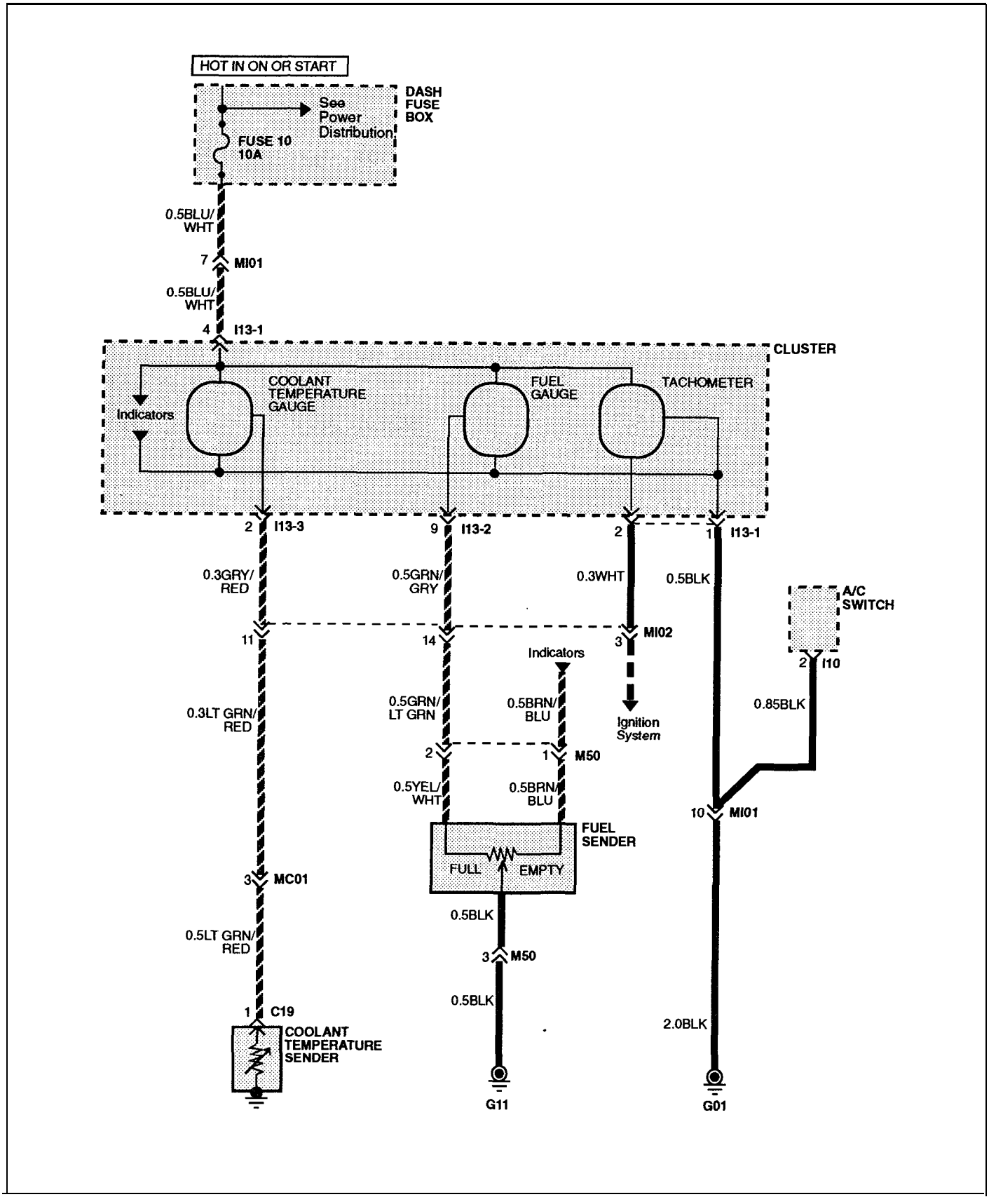


COMPONENT LOCATION INDEX

	Location reference-page
Components	
A/C switch (I10)	WS-193
Digital clock (I11)	WS-193
Fuel sender (M50)	WS-197
Instrument cluster (I13-1 ~ I13-4)	WS-193
Oil pressure switch (E32)	WS-195
Rheostat (I01)	WS-193
TACM (M38)	WS-196
Connectors	
El01	WS-192
MC01	WS-201
Ml01	WS-201
Ml02	WS-201
Ground	
G01	WS-203
G11	WS-204

GAUGES

SCHEMATIC DIAGRAM

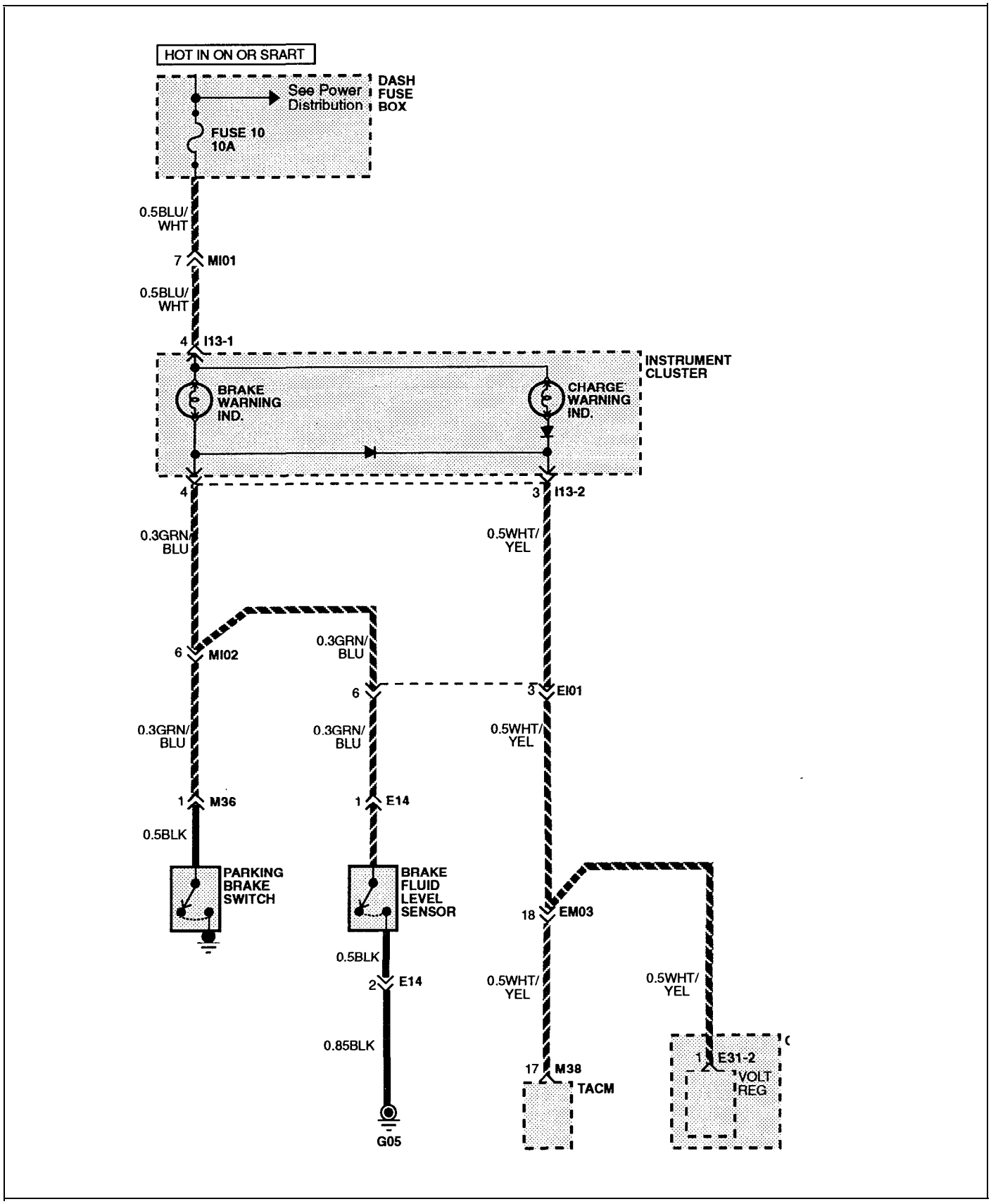


COMPONENT LOCATION INDEX

	Location reference-page
Components	
A/C switch (I10)	WS-193
Cluster (I13-1)	WS-193
Coolant temperature sender (Cl 9)	WS-183
Fuel sender (M50)	WS-197
Connectors	
MC01	WS-201
Ml02	WS-201
Ml01	WS-201
Grounds	
G01	WS-203
G11	WS-204

BRAKE AND CHARGE WARNING SYSTEM

SCHEMATIC DIAGRAM

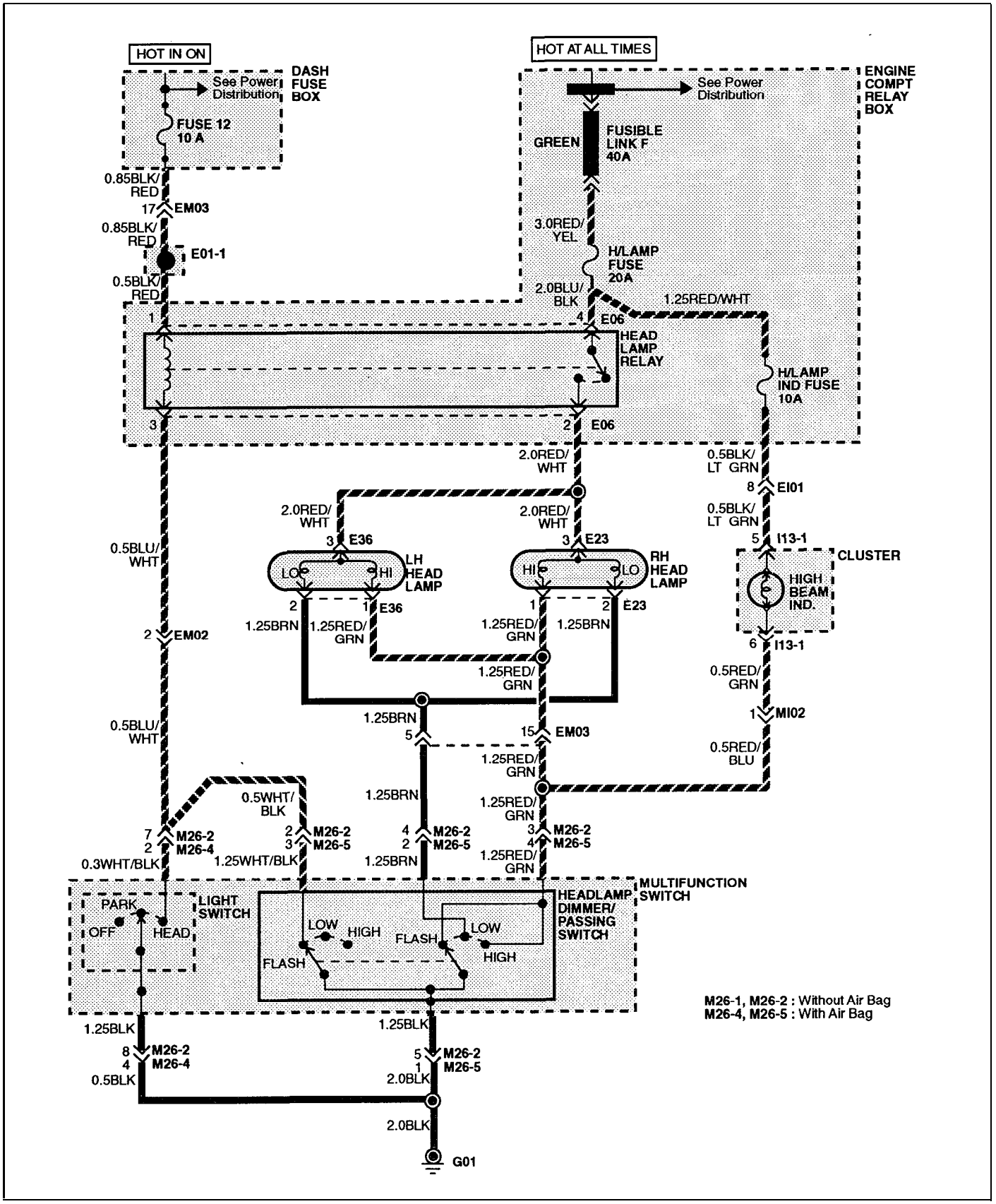


COMPONENT LOCATION INDEX

	Location reference-page
Components	
Generator (E31-2)	WS-189
Brake fluid level sensor (E14)	WS-188
Instrument cluster (I13-2)	WS-193
Parking brake switch (M36)	WS-196
TACM unit (M38)	WS-196
Relay with diode (C07)	WS-182
Connectors	
El01	WS-192
EM03	WS-191
Ml01/Ml02	WS-201
Ground	
G05	WS-203

HEAD LAMPS

SCHEMATIC DIAGRAM

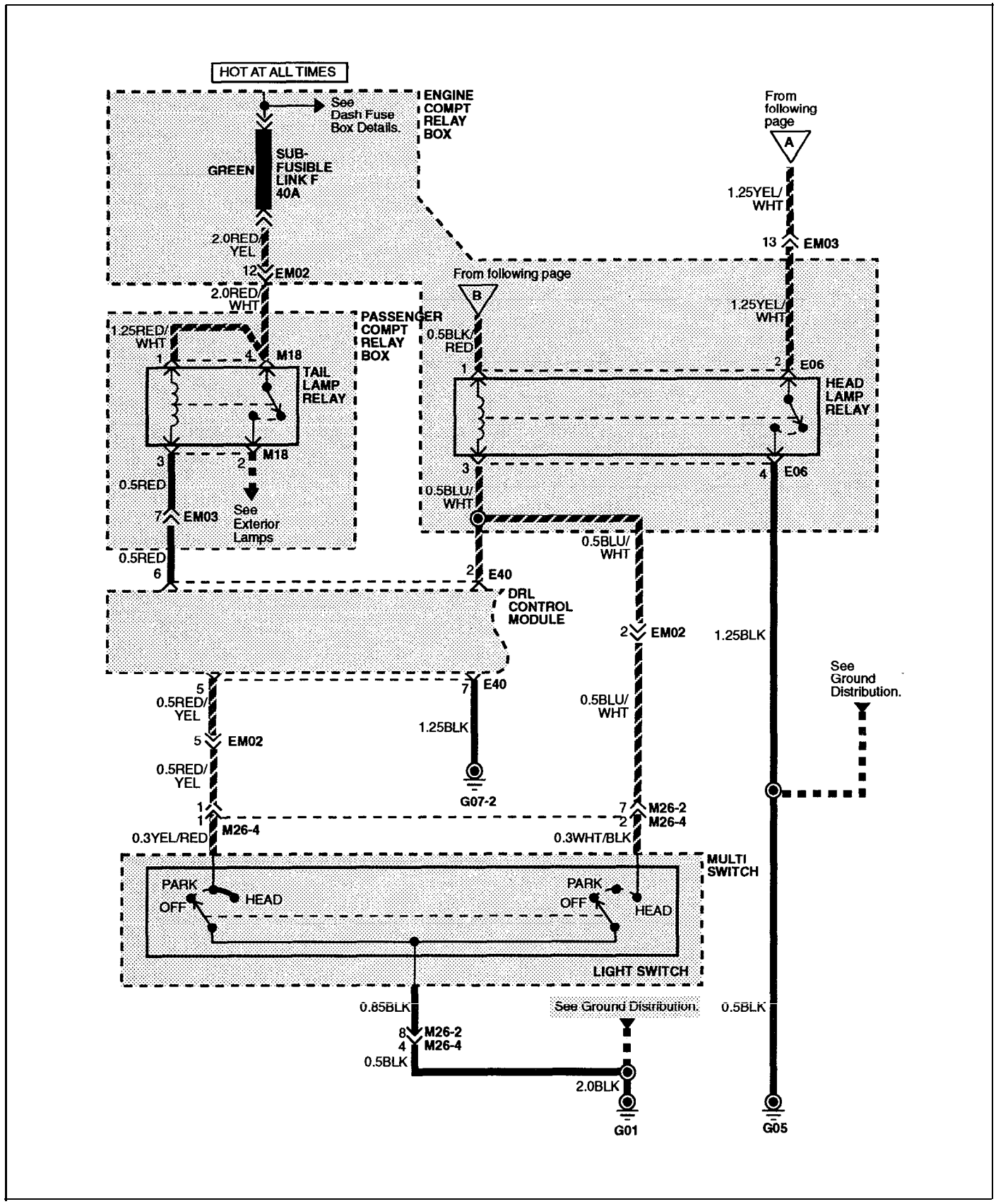


COMPONENT LOCATION INDEX

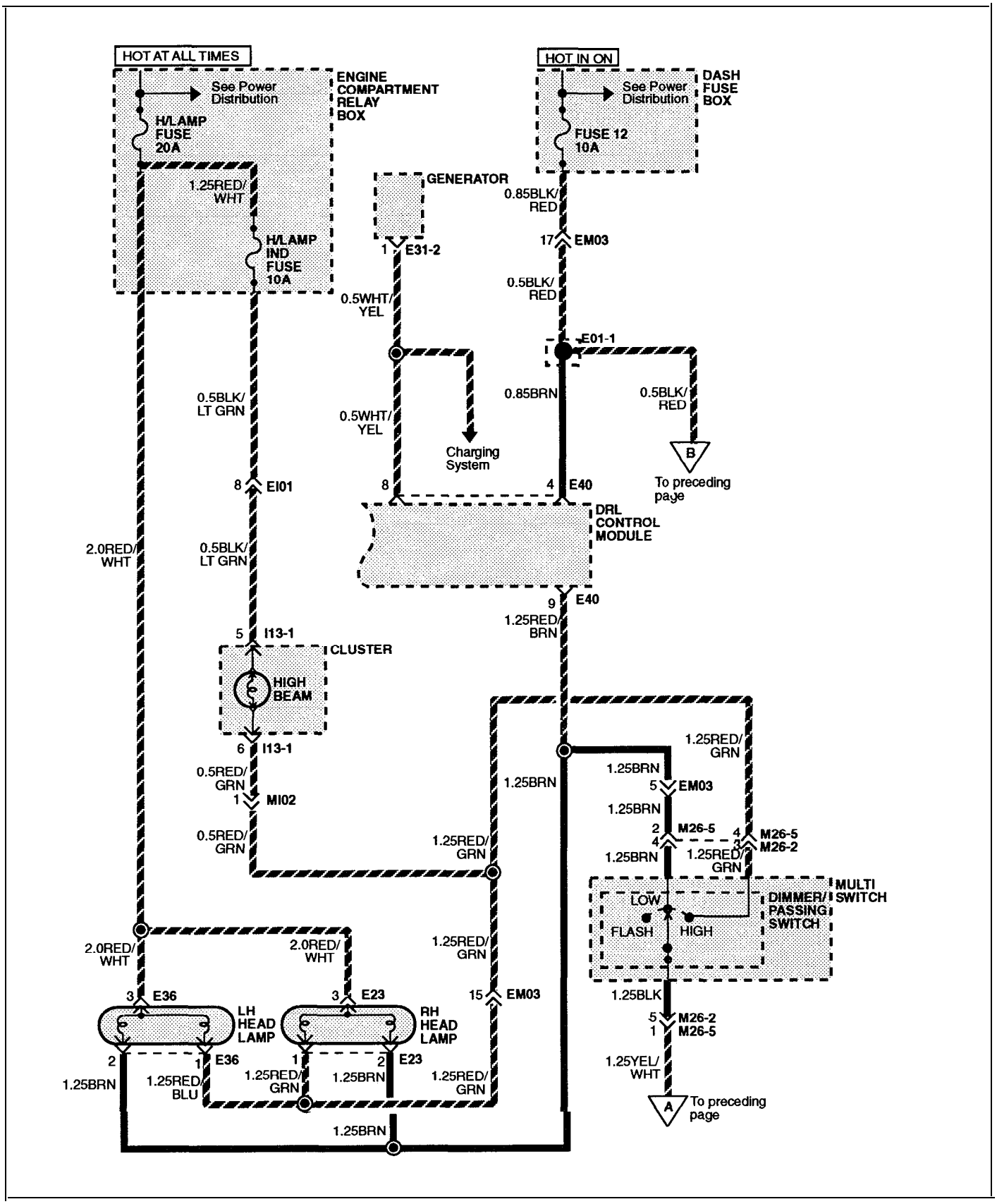
	Location reference-page
Components	
Cluster (I13-1)	WS-193
Head lamp relay (E06)	WS-188
LH head lamp (E36)	WS-190
Multifunction switch (M26-2)	WS-195
RH head lamp (E23)	WS-188
Connectors	
El01	WS-192
EM02	WS-191
EM03	WS-191
Ml02	WS-201
Ground	
GO1	WS-203

DAYTIME RUNNING LIGHTS (DRL)

SCHEMATIC DIAGRAM (1)



SCHEMATIC DIAGRAM (2)



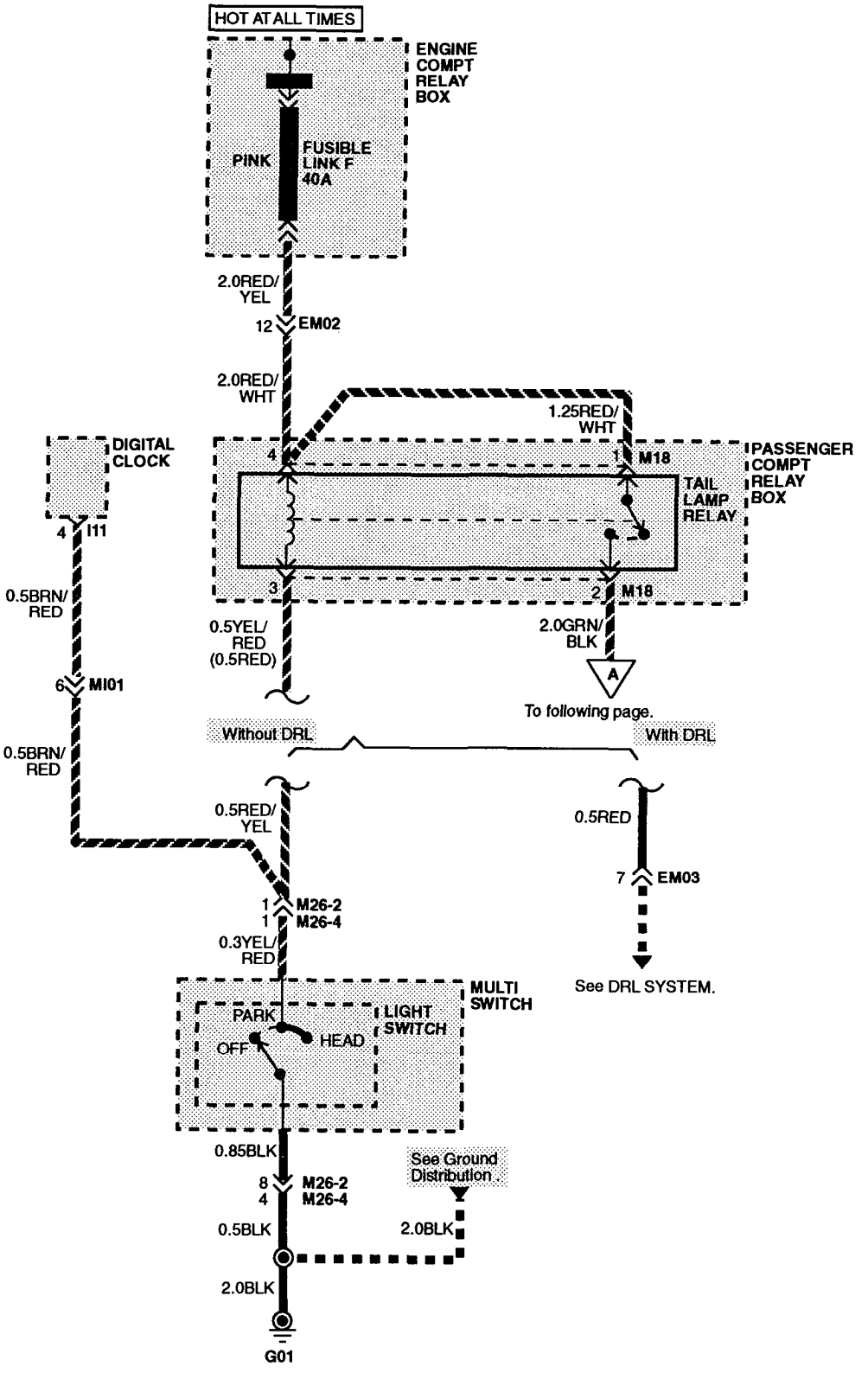
COMPONENT LOCATION INDEX

	Location reference-page
Components	
Generator (E31-2)	WS-189
Brake fluid level sensor (E14)	WS-188
CON D. fan motor (E29)	WS-189
COND. fan relay (E05)	WS-188
DRL module (E40)	WS-190
Instrument cluster (I13-2)	WS-193
LH head lamp (E36)	WS-190
Multi switch (M26-2)	WS-195
RH head lamp (E22)	WS-188
Tail lamp relay (M18)	WS-194
Connectors	
El01	WS-192
EM02/EM03	WS-191
Ml02	WS-201
Ground	
G01/G05/G07	WS-203

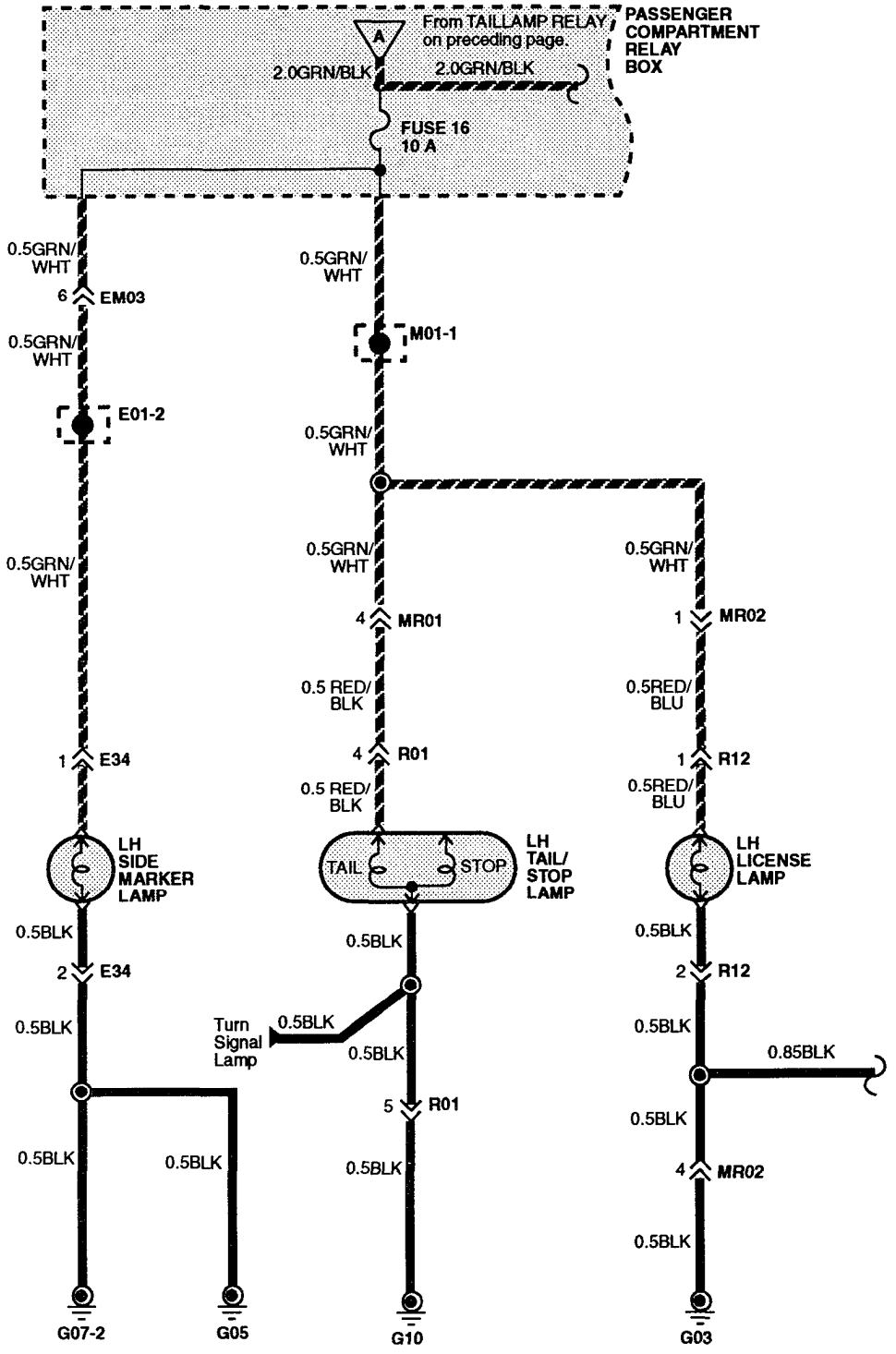
MEMO

EXTERIOR LAMPS

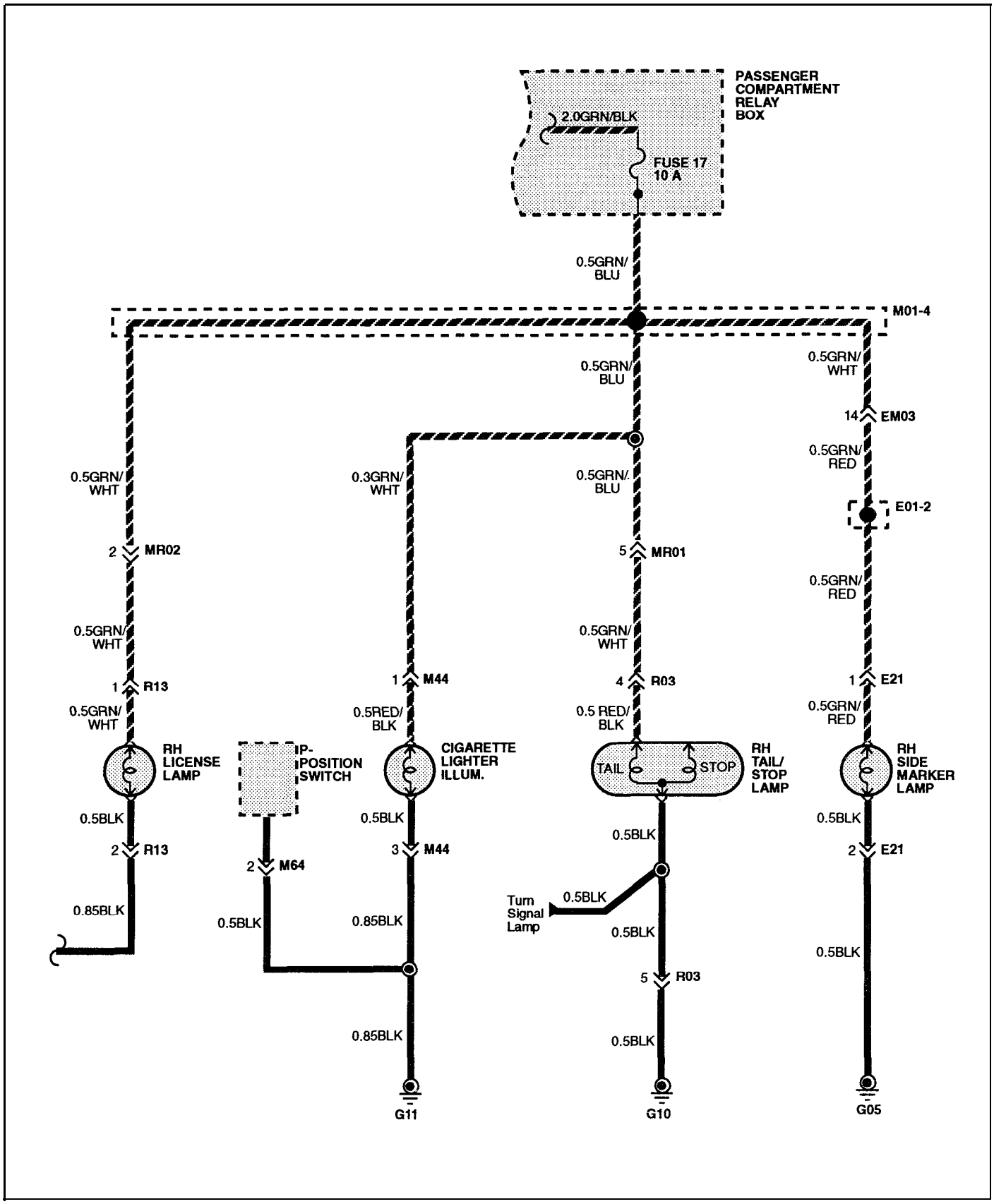
SCHEMATIC DIAGRAM (1)



SCHEMATIC DIAGRAM (2)



SCHEMATIC DIAGRAM (3)

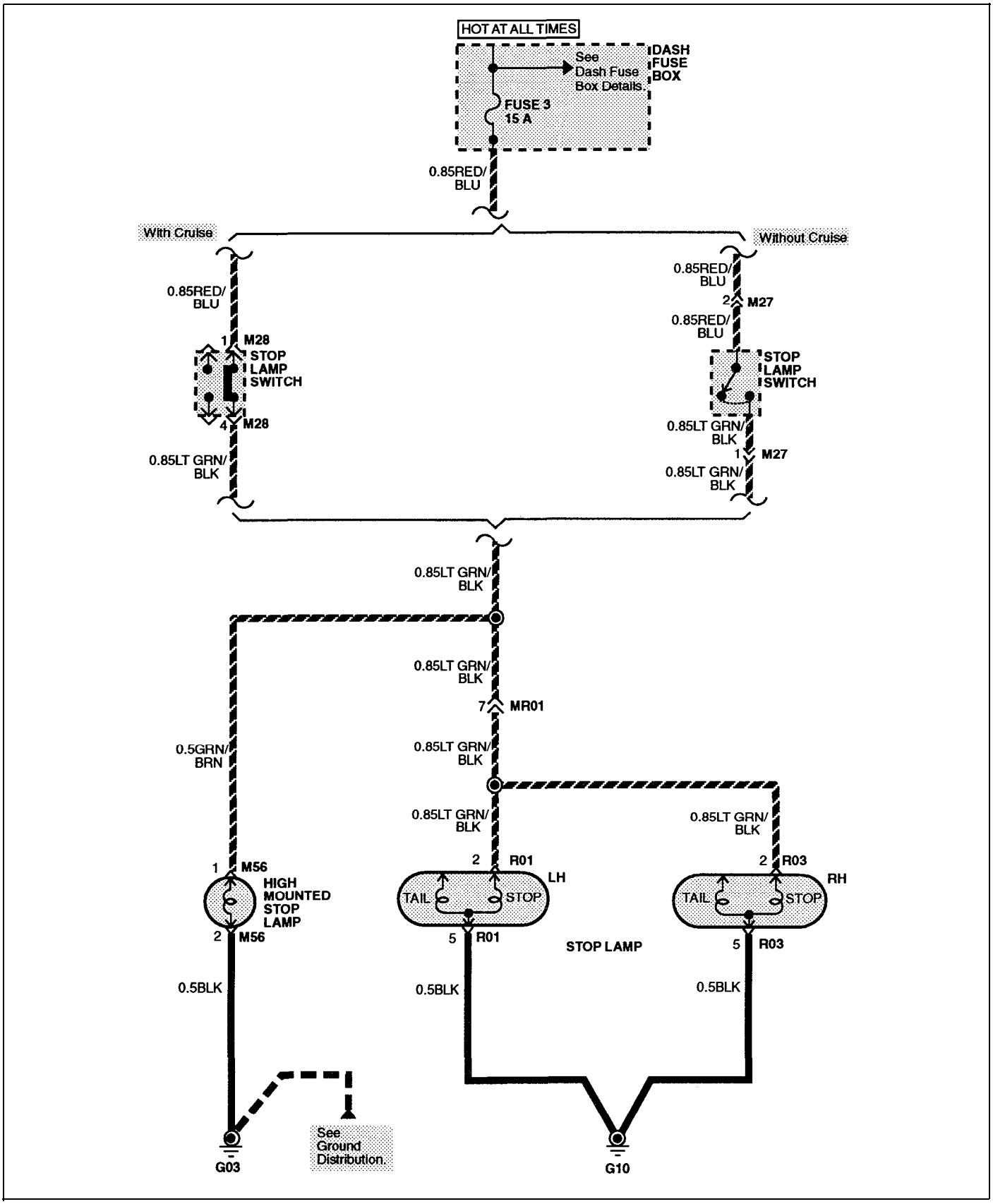


COMPONENT LOCATION INDEX

	Location reference-page
Components	
Tail lamp relay (M18)	WS-194
Multi switch (M26-2)	WS-195
Digital clock (I11)	WS-193
LH side marker lamp (E34)	WS-190
LH tail/stop lamp (R01)	WS-202
LH license lamp (R12)	WS-202
Trunk lid opener (R15)	WS-202
RH license lamp (R13)	WS-202
Fuel pump (M49)	WS-197
Cigarette lighter illum. (M44)	WS-197
RH tail/stop lamp (R03)	WS-202
RH side marker lamp (E21)	WS-188
Connectors	
EM02/EM03	WS-191
MI01/MR01/MR02	WS-201
Ground	
G01/G03	WS-203
G10/G11	WS-204

STOP LAMPS

SCHEMATIC DIAGRAM

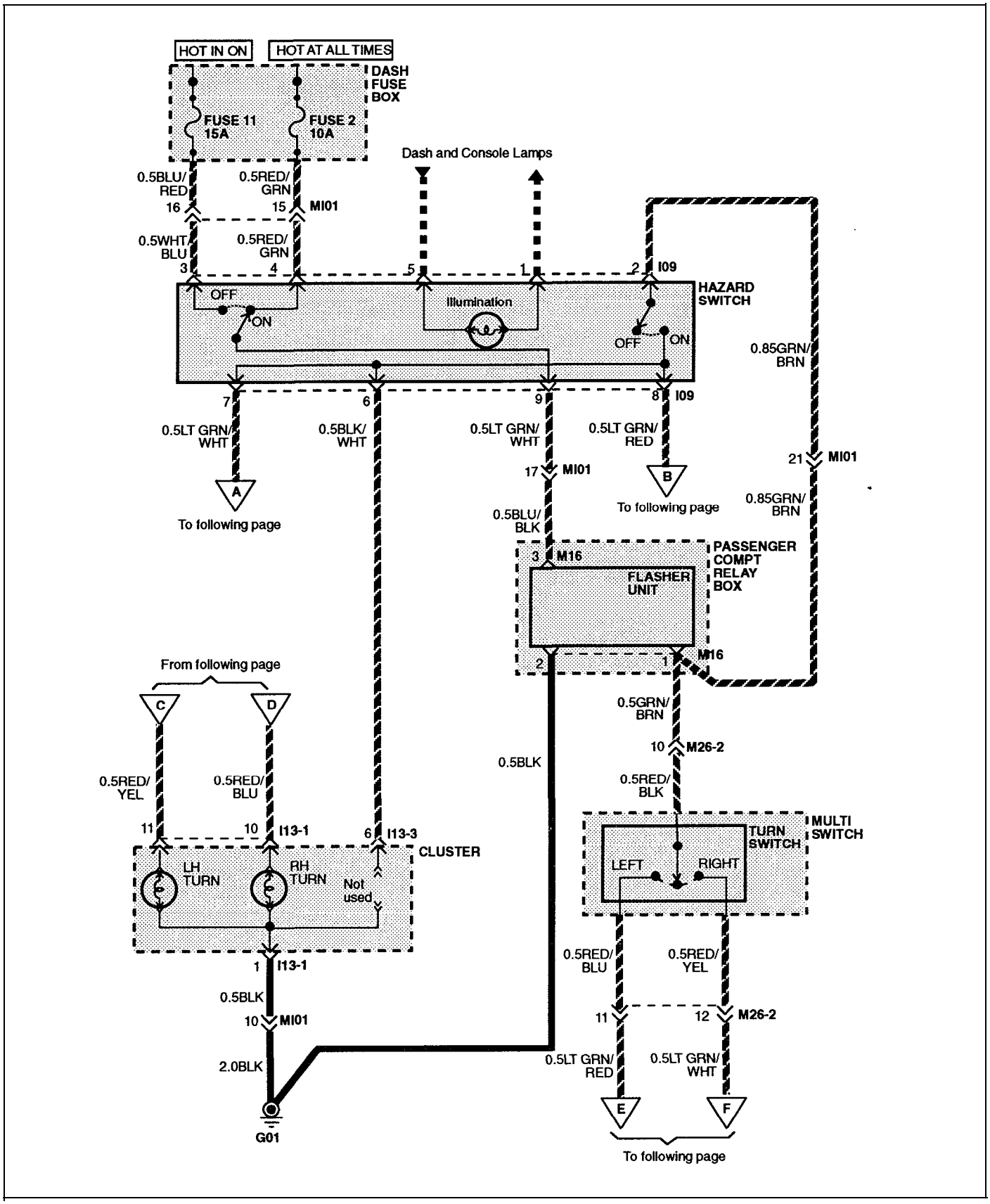


COMPONENT LOCATION INDEX

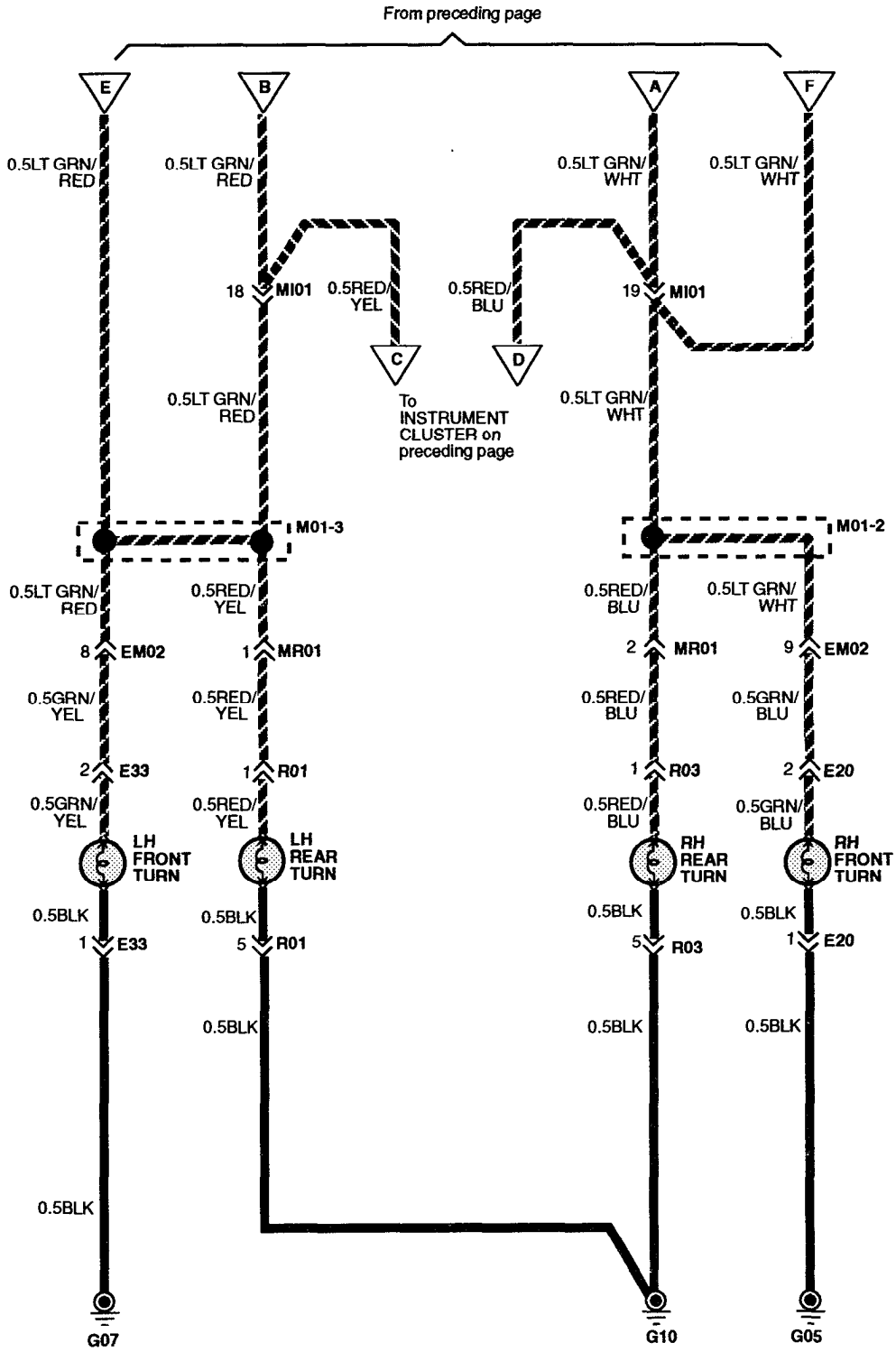
	Location reference-page
Components	
High mounted stop lamp (M56)	WS-198
LH stop lamp (R01)	WS-202
RH stop lamp (R03)	WS-202
Stop lamp switch (M28)	WS-195
Stop lamp switch (M27)	WS-195
Connector	
MR01	WS-201
Grounds	
G03	WS-203
G10	WS-204

TURN/HAZARD LAMPS

SCHEMATIC DIAGRAM (1)



SCHEMATIC DIAGRAM (2)



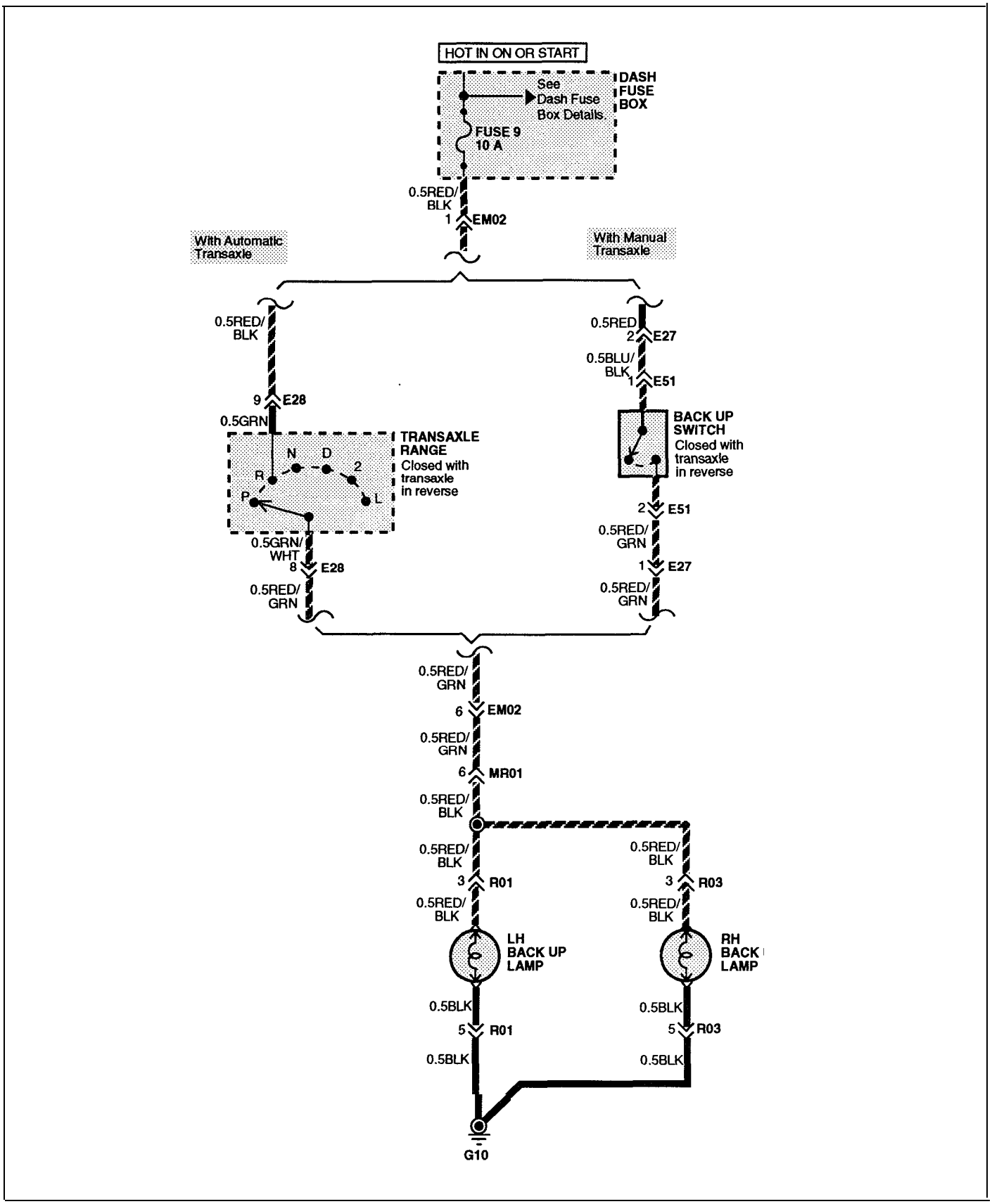
COMPONENT LOCATION INDEX

	Location reference-page
Components	
Cluster (I13-1, I13-2)	WS-193
Flasher unit (M16)	WS-194
Hazard switch (109)	WS-193
LH front turn (E33)	WS-190
LH rear turn (R01)	WS-202
Multi switch (M26-2)	WS-195
RH front turn (E20)	WS-188
RH rear turn (R03)	WS-202
Connectors	
EM02	WS-191
Ml01	WS-201
MR01	WS-201
Ground	
G01/G05	WS-203
G10	WS-204

MEMO

BACK UP LAMPS

SCHEMATIC DIAGRAM

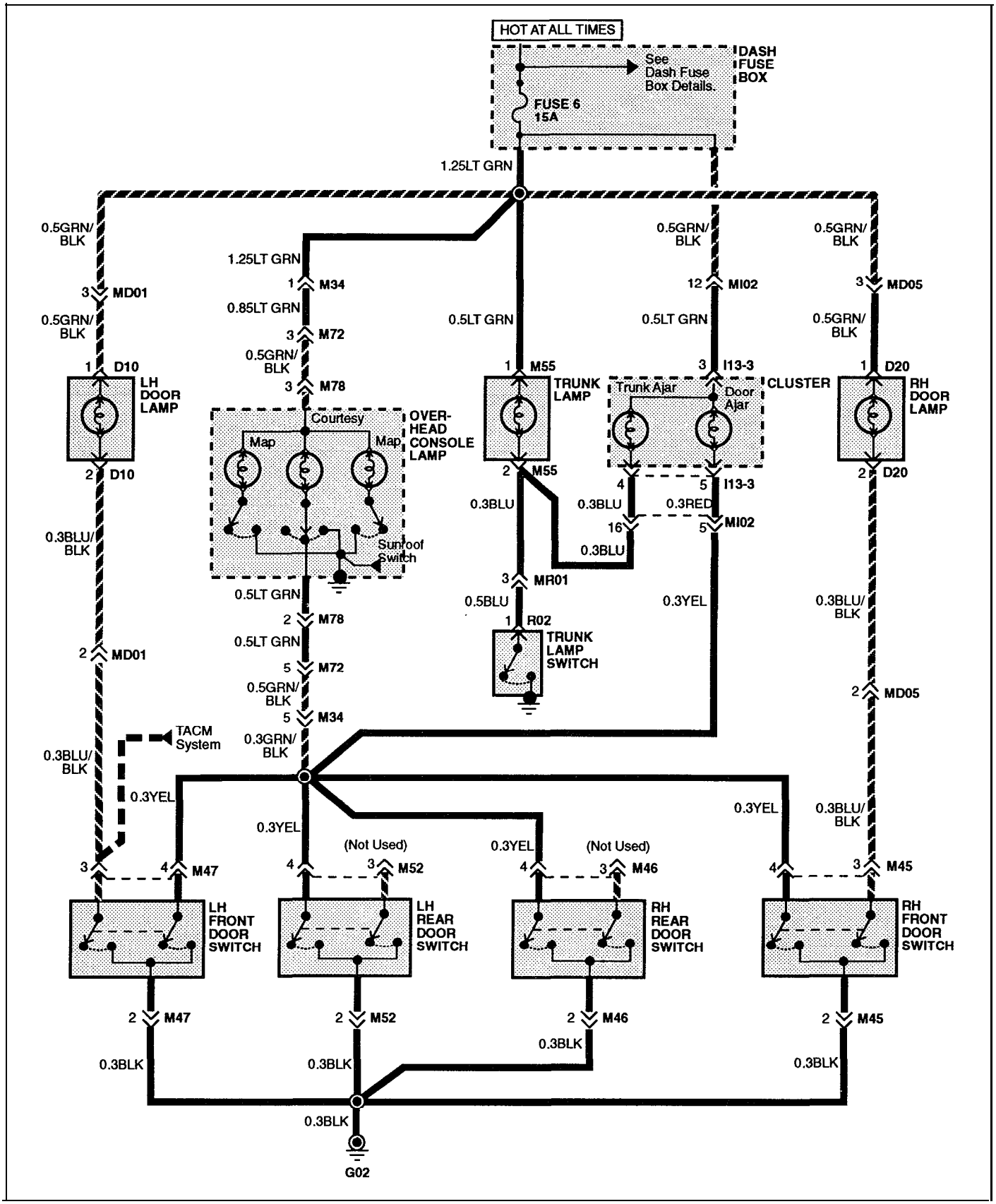


COMPONENT LOCATION INDEX

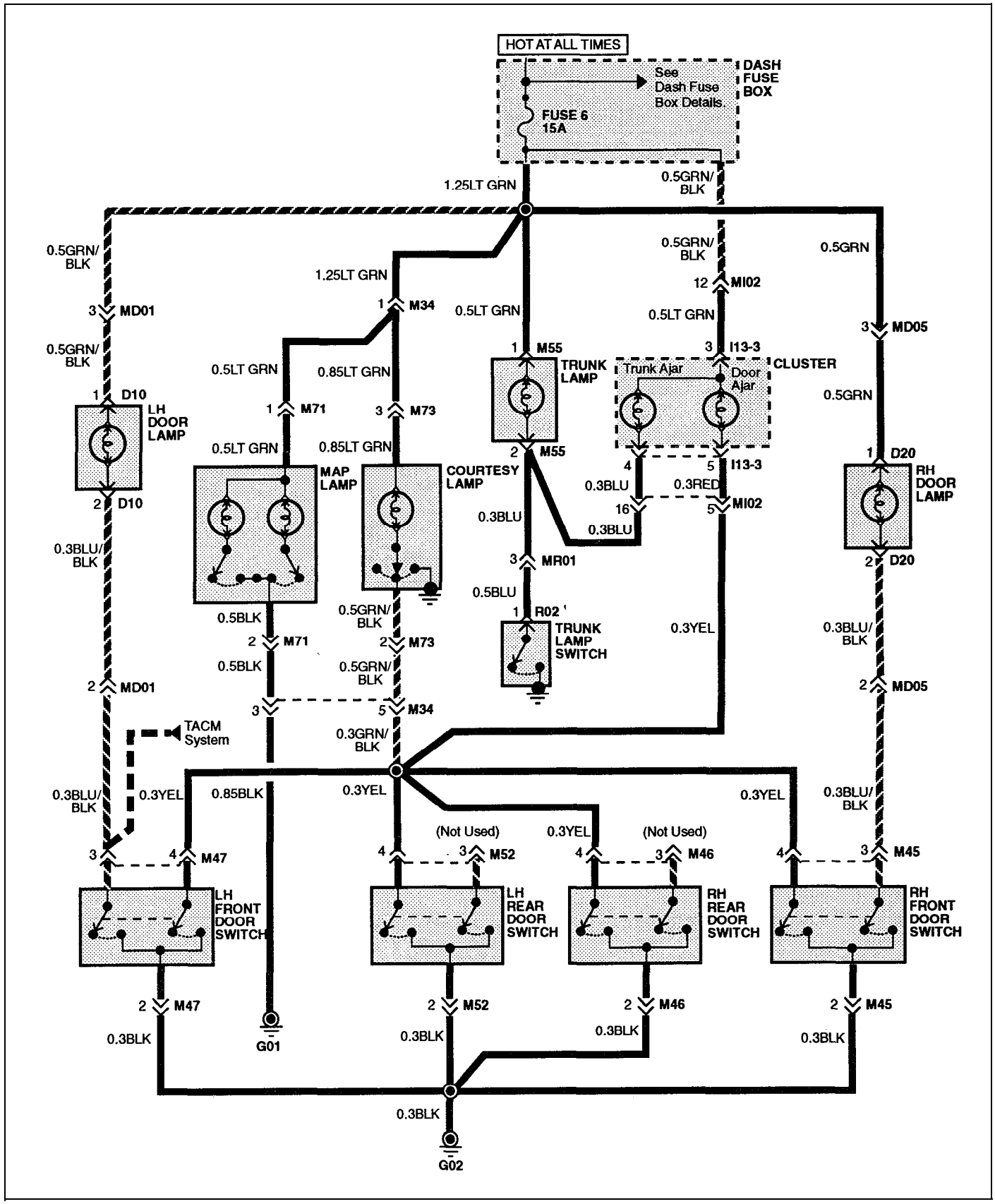
	Location reference-page
Components	
Transaxle range switch (E28)	WS-189
LH back up lamp (R01)	WS-202
RH back up lamp (R03)	WS-202
Connectors	
EM02	WS-191
MR01	WS-201
Ground	
G10	WS-204

COURTESY LAMPS

SCHEMATIC DIAGRAM (1)-With Sunroof



SCHEMATIC DIAGRAM (P)-Without Sunroof



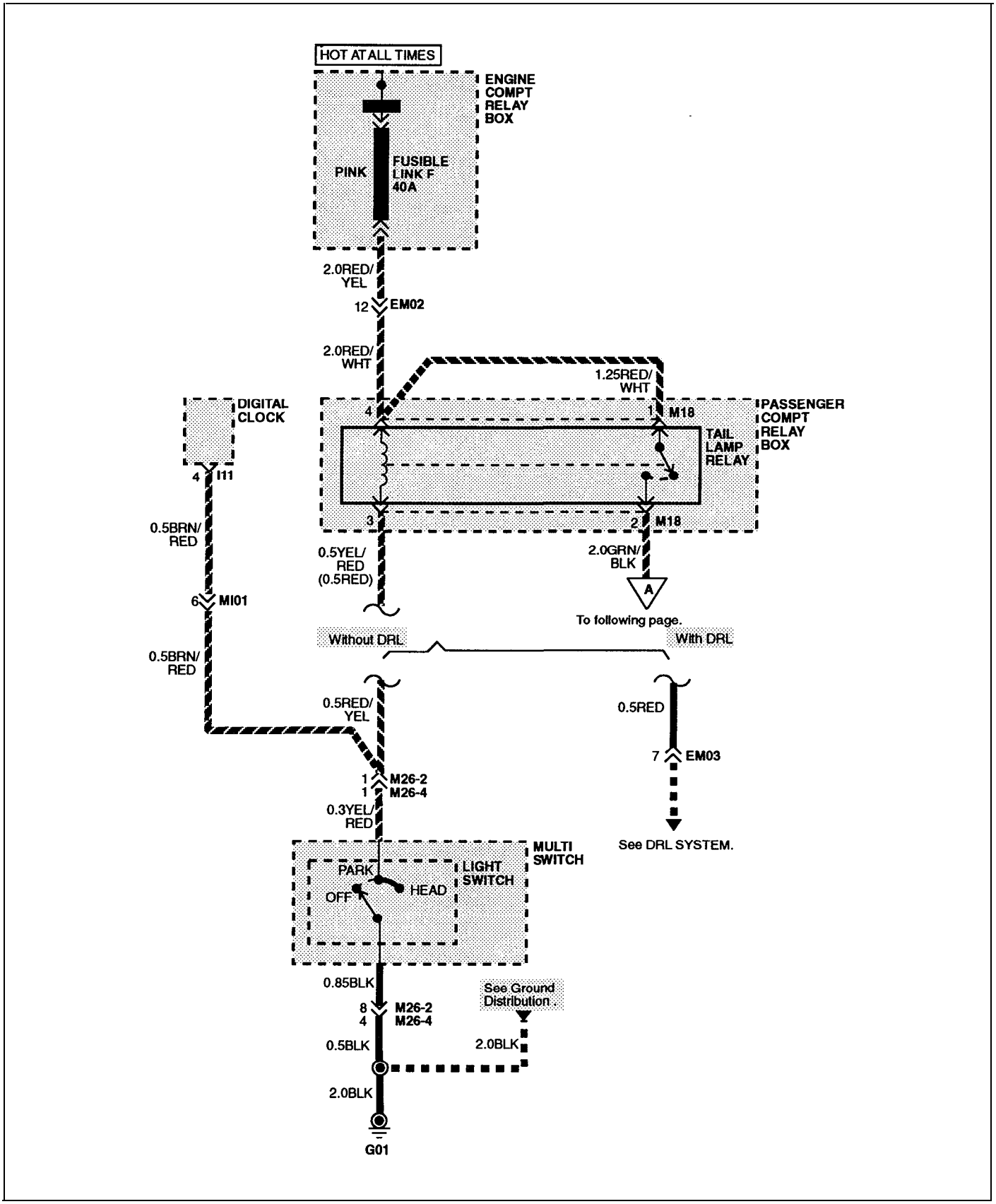
COMPONENT LOCATION INDEX

	Location reference-page
Components	
Cluster (I13-3)	WS-193
Courtesy lamp (M73)	WS-199
LH door lamp (D10)	WS-186
LH front door switch (M47)	WS-197
LH rear door switch (M52)	WS-197
Map lamp (M71)	WS-199
Overhead console lamp (M78)	WS-199
RH door lamp (D20)	WS-187
RH front door switch (M45)	WS-197
RH rear door switch (M46)	WS-197
Trunk lamp (M55)	WS-198
Trunk lamp switch (R02)	WS-202
Connectors	
MD01/MD05	WS-201
Ml02/MR01	WS-201
Ground	
G02	WS-203

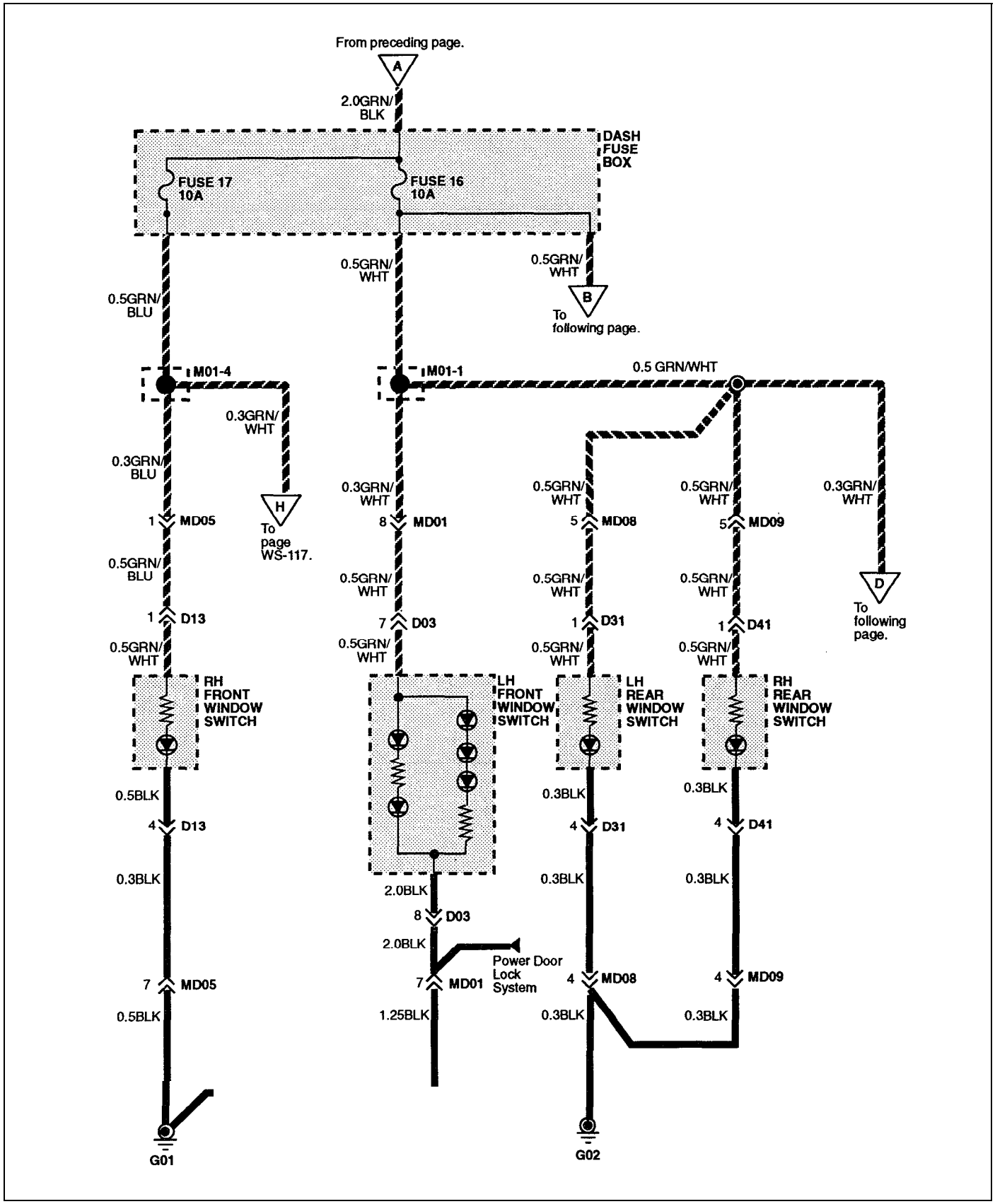
MEMO

DASH, CONSOLE AND SWITCH LAMPS

SCHEMATIC DIAGRAM (1)



SCHEMATIC DIAGRAM (2)



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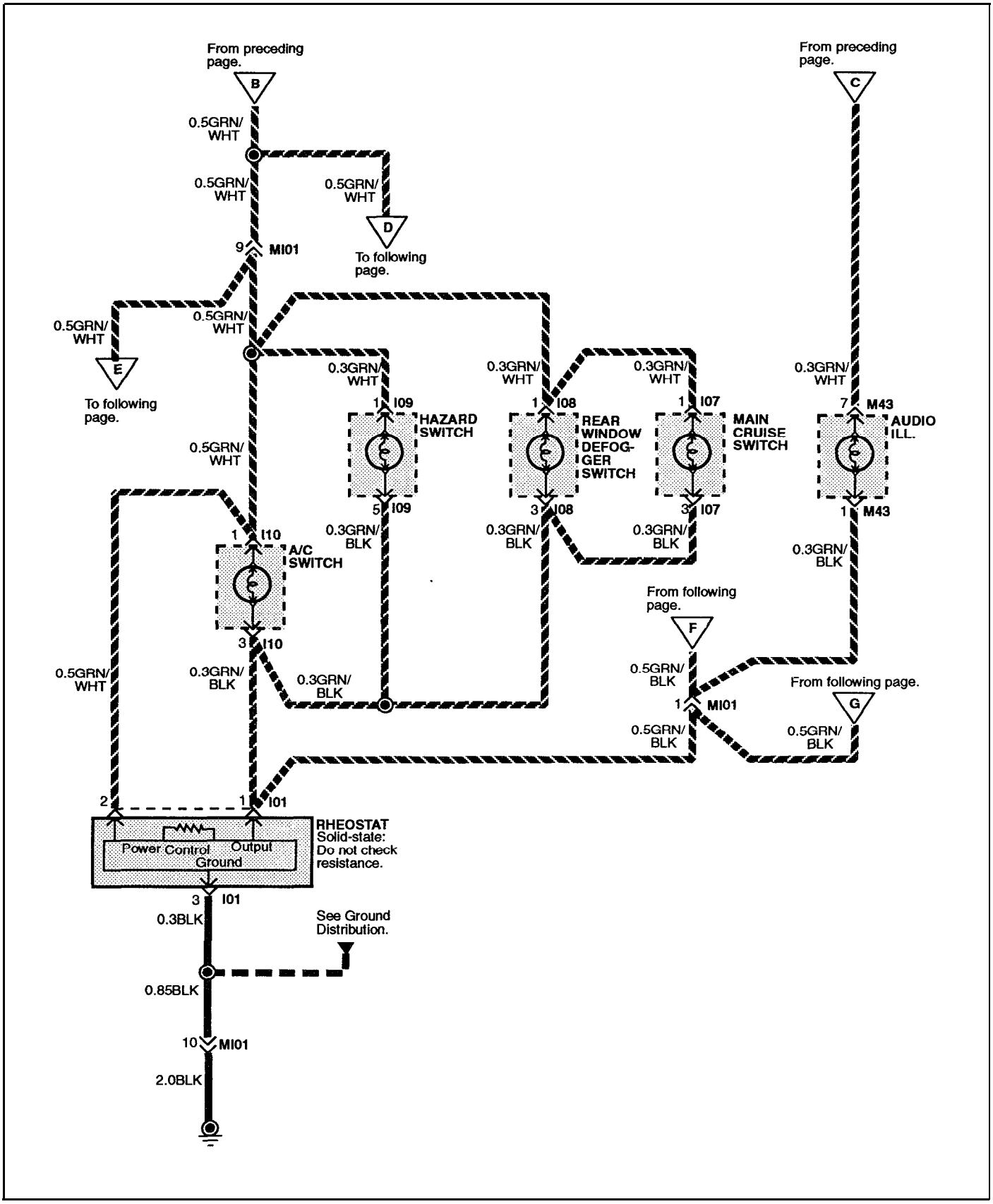

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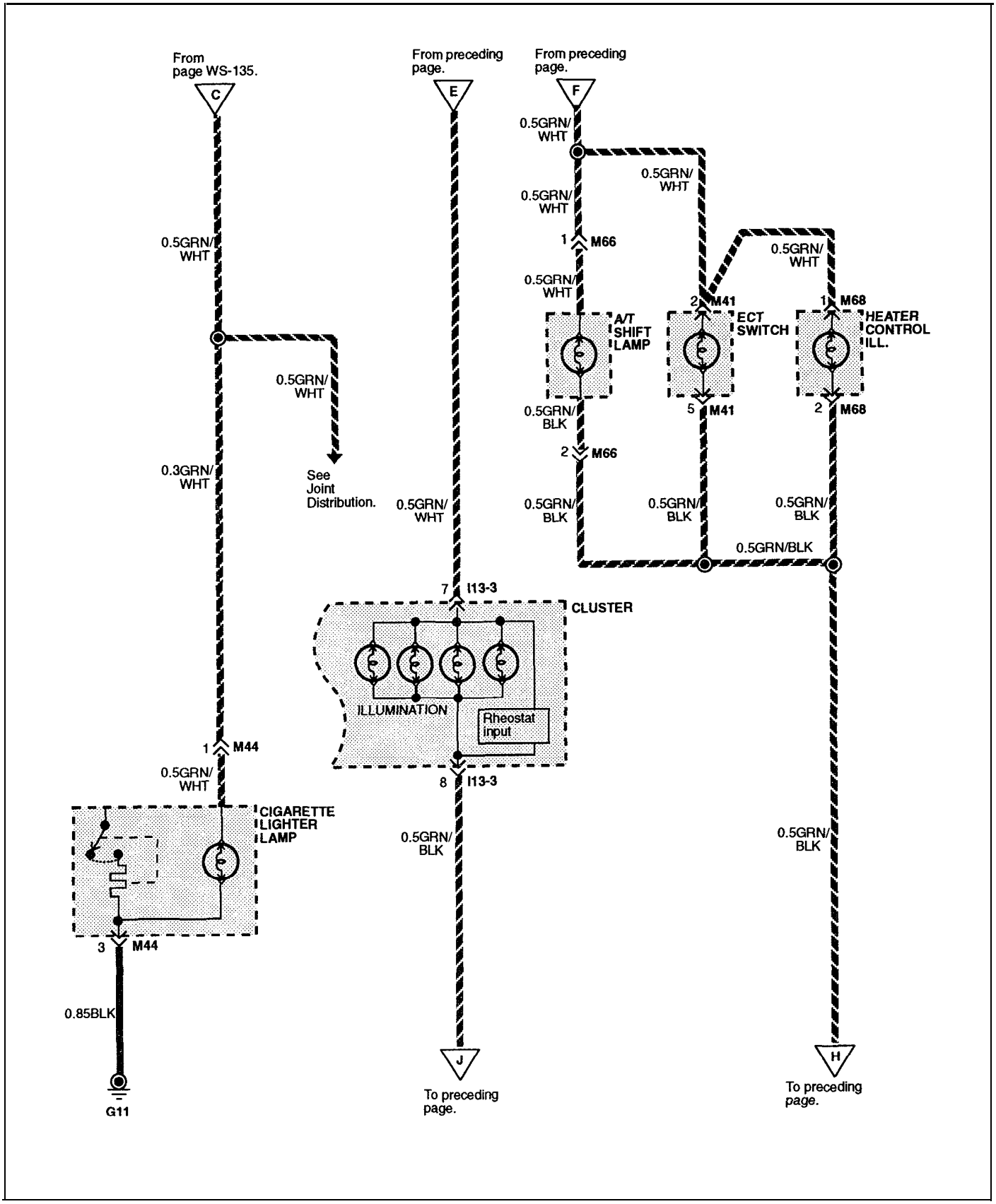


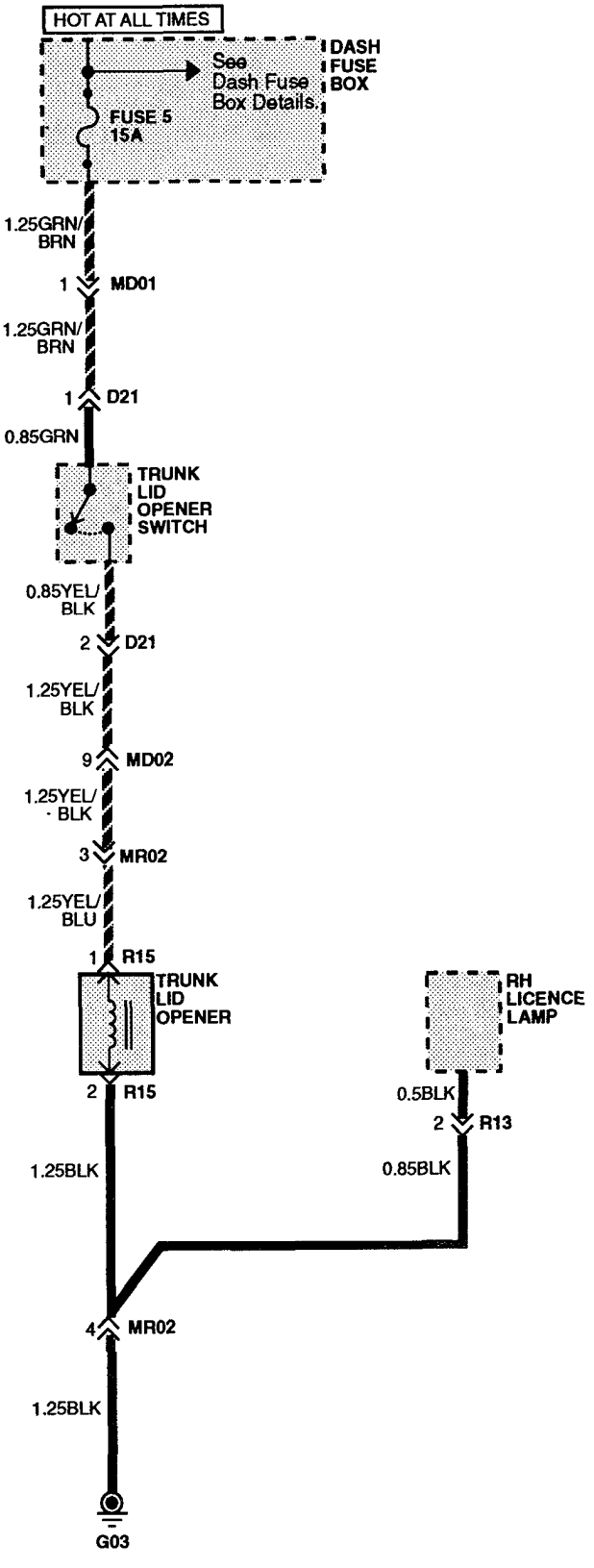
COMPONENT LOCATION INDEX

	Location reference-page
Components	
Audio ILL. (M43)	WS-196
A/T shift lamp (M66)	WS-198
Cigarette lighter lamp (M44)	WS-197
Cluster (I13-3)	WS-193
Digital clock (I11)	WS-193
ECT switch (M41)	WS-196
Fuel pump (M49)	WS-196
Hazard switch (I09)	WS-193
Heater control ILL. (M68)	WS-198
LH front window switch (D03)	WS-186
LH rear window switch (D31)	WS-187
Main cruise switch (I07)	WSs-193
Multi switch (M26-2)	WS-195
Rear window defogger switch (I08)	WS-193
Rheostat (I01)	WS-193
RH front window switch (D13)	WS-187
RH rear window switch (D41)	WS-187
Connectors	
EM02	WS-191
EM03	WS-191
MD01	WS-201
MD05	WS-201
MD08	WS-201
MD09	WS-201
Ml01	WS-201
Ground	
GO1	WS-203
G02	WS-203
G11	WS-204

MEMO

TRUNK LID OPENER

SCHEMATIC DIAGRAM

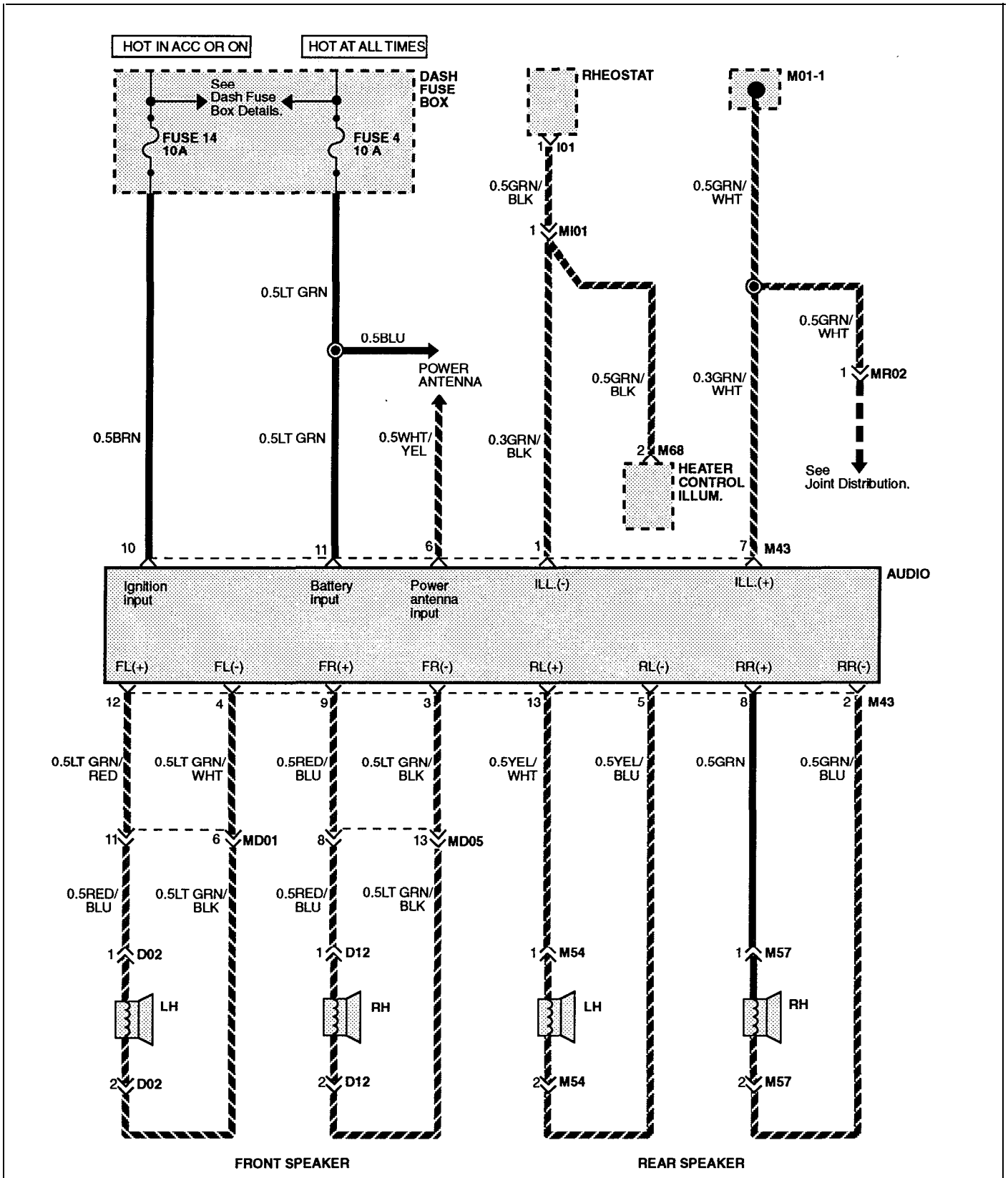


COMPONENT LOCATION INDEX

	Location reference-page
Components	
LH licence lamp (R12)	WS-202
Trunk lid opener (R15)	WS-202
Trunk lid opener switch (D21)	WS-187
Connectors	
MD01	WS-201
MD02	WS-201
MR02	WS-201
Ground	
G03	WS-203

SOUND SYSTEM

SCHEMATIC DIAGRAM

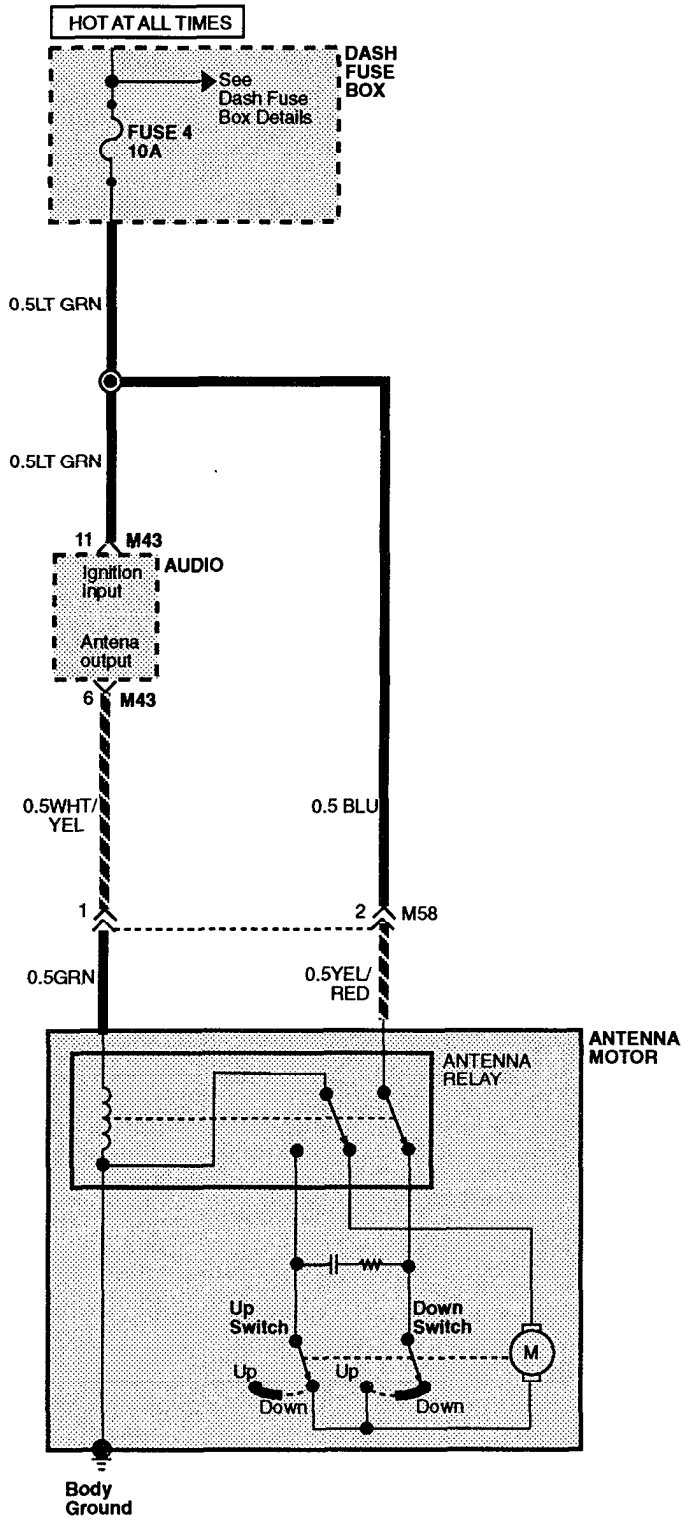


COMPONENT LOCATION INDEX

	Location reference-page
Components	
Audio (M43)	WS-196
Heater control ilium (M66)	WS-198
LH front speaker (D02)	WS-186
LH rear speaker (M54)	WS-198
Rheostat (101)	WS-193
RH front speaker (D12)	WS-186
RH rear speaker (M57)	WS-198
Connectors	
MD01	WS-201
MD05	WS-201
Ml01	WS-201
MR02	WS-201

POWER ANTENNA

SCHEMATIC DIAGRAM

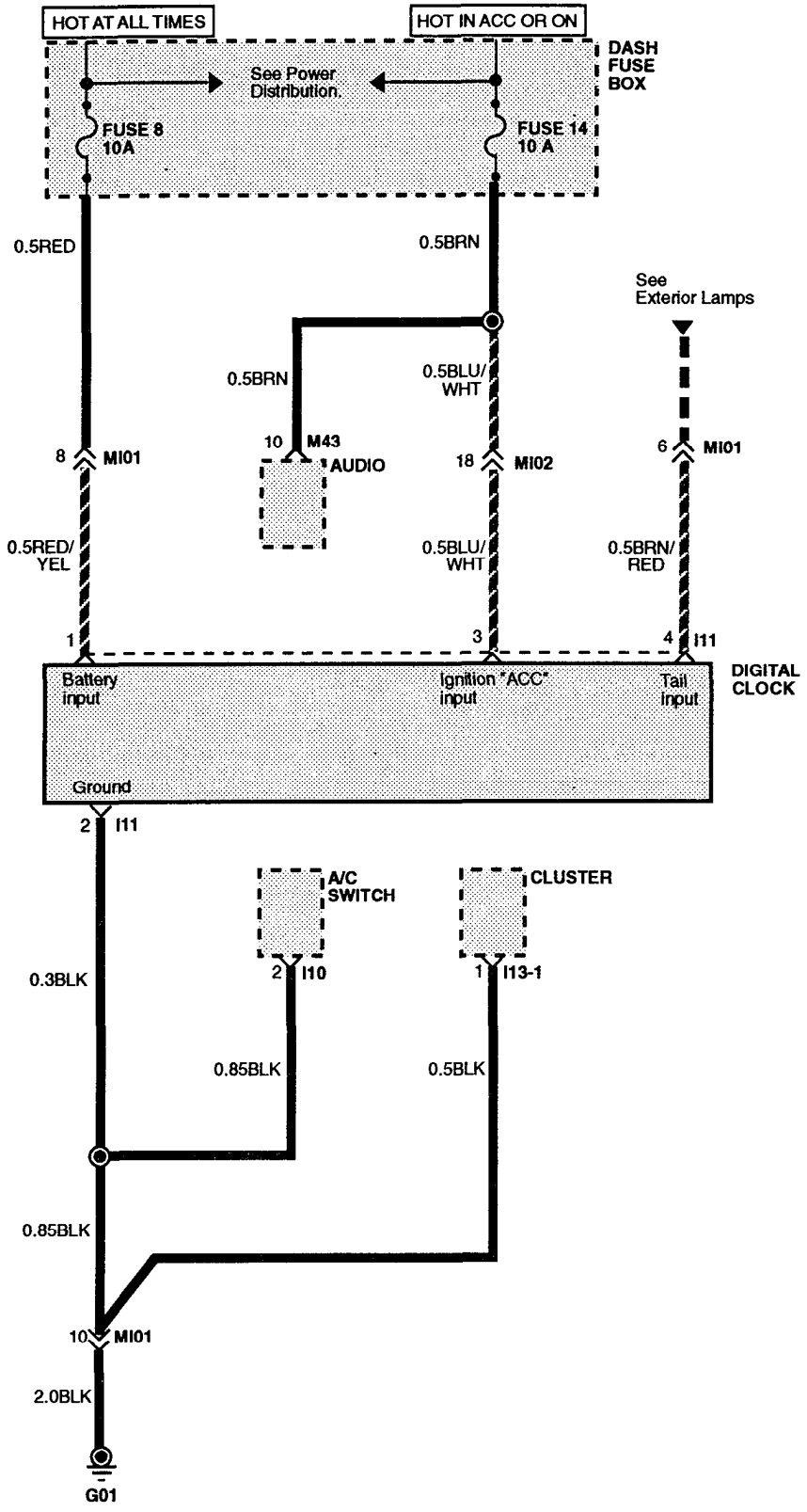


COMPONENT LOCATION INDEX

	Location reference-page
Components	
Antenna motor (M58)	WS-198
Audio (M43)	WS-196

DIGITAL CLOCK

SCHEMATIC DIAGRAM

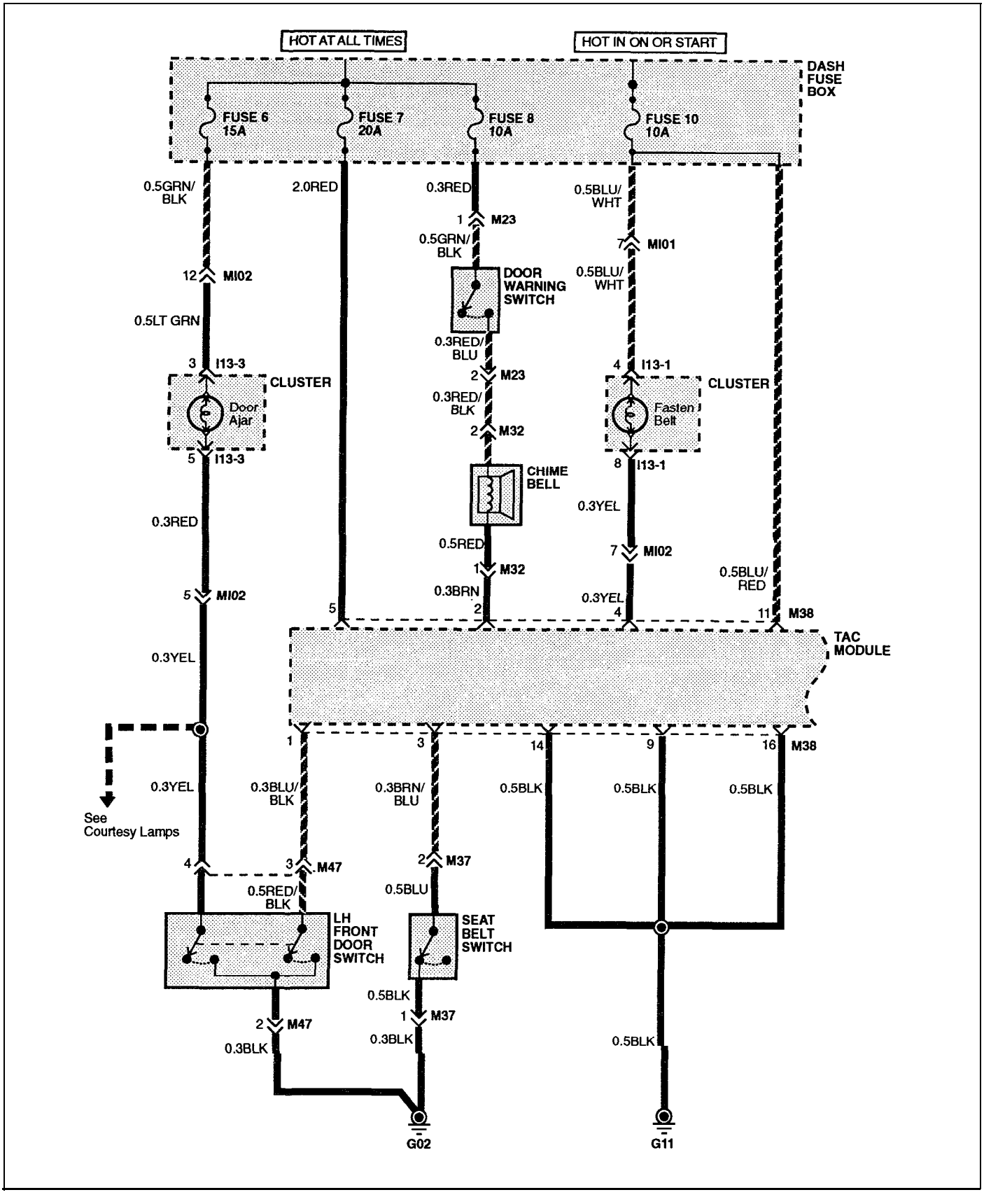


COMPONENT LOCATION INDEX

	Location reference-page
Components	
A/C switch (I10)	WS-193
Audio (M43)	WS-196
Cluster (I13-1)	WS-193
Digital clock (I11)	WS-193
Connectors	
Ml01	WS-201
Ml02	WS-201
Ground	
G01	WS-203

TIME AND ALARM CONTROL (TAC) SYSTEM

SCHEMATIC DIAGRAM (1)



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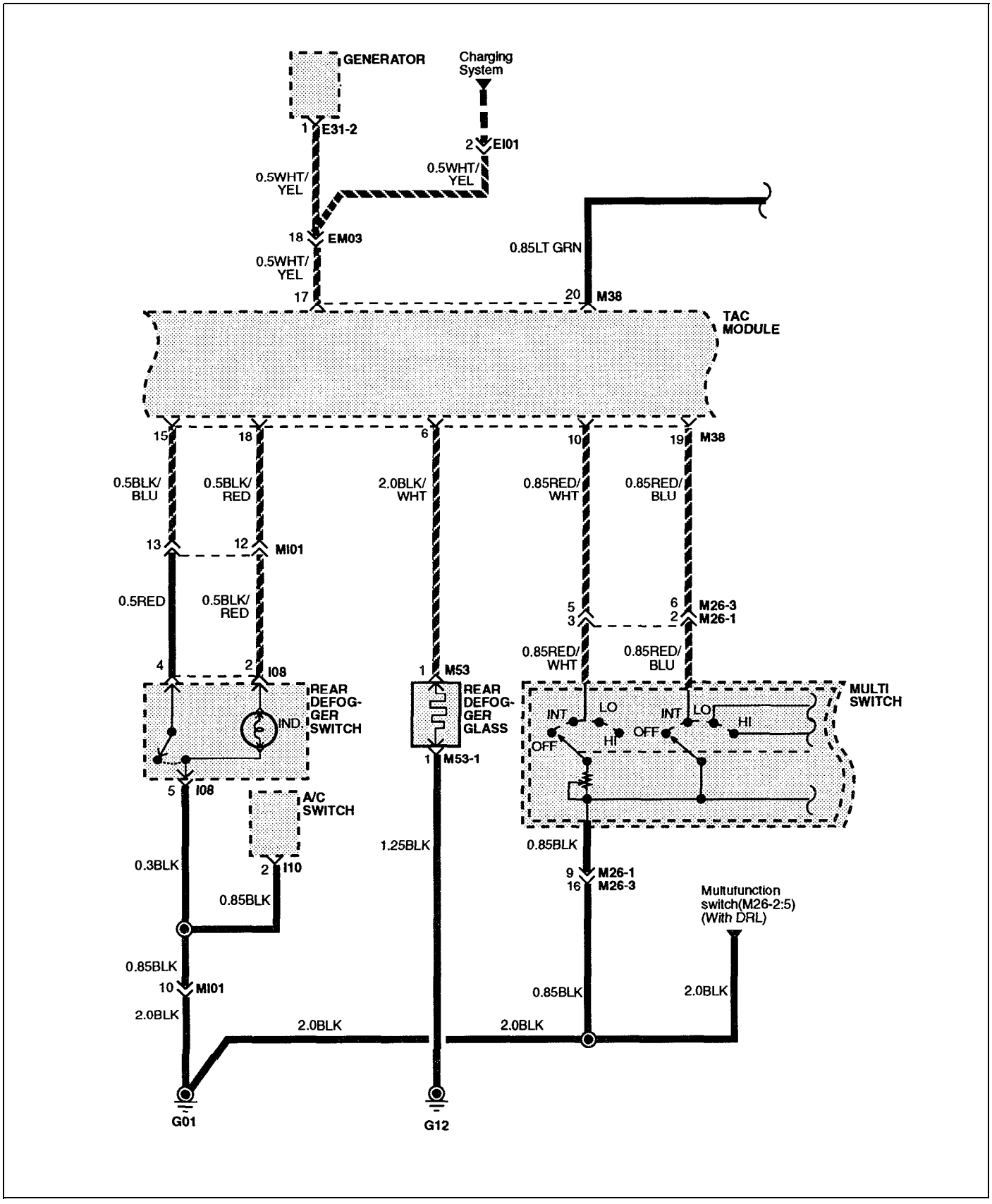

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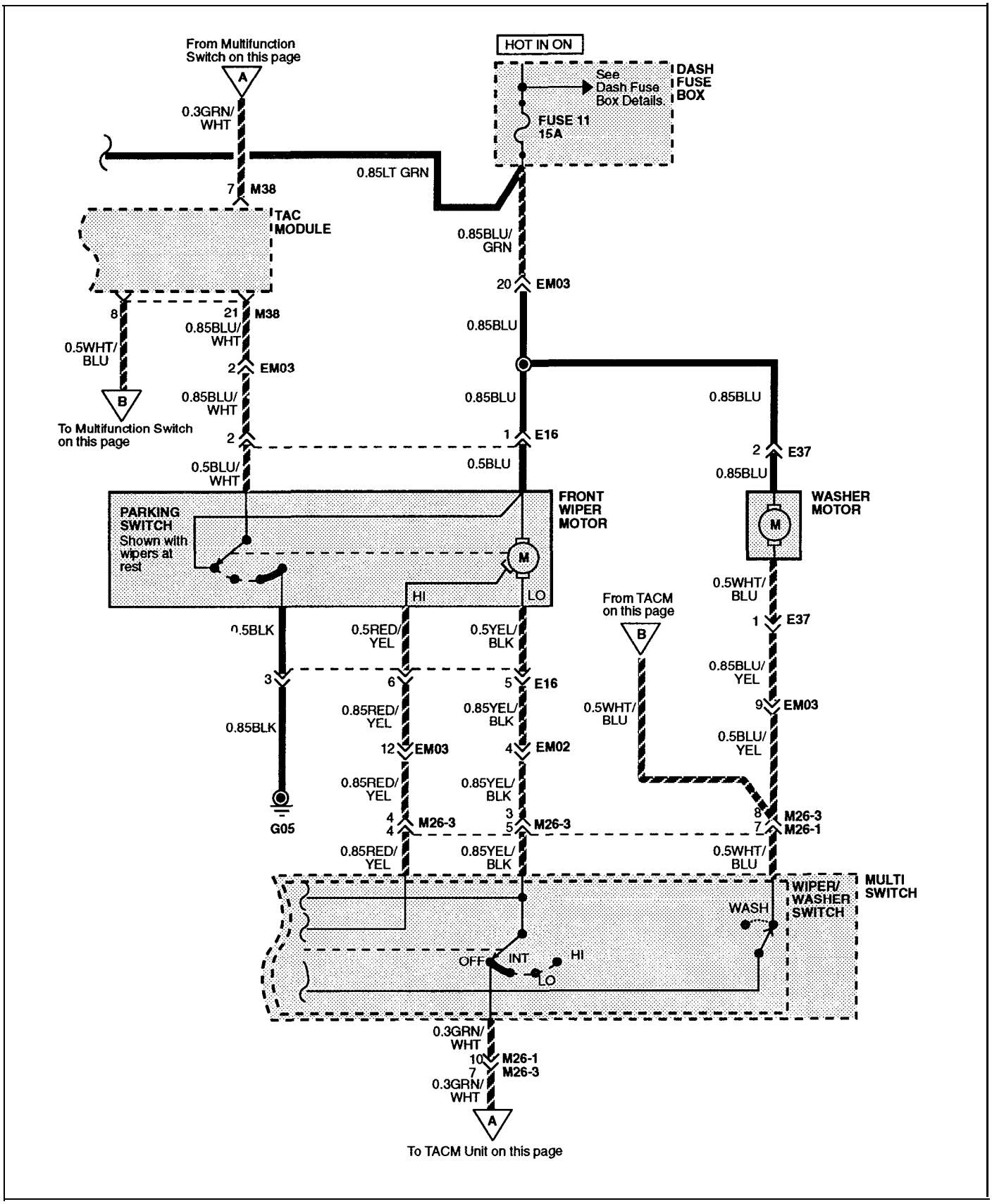
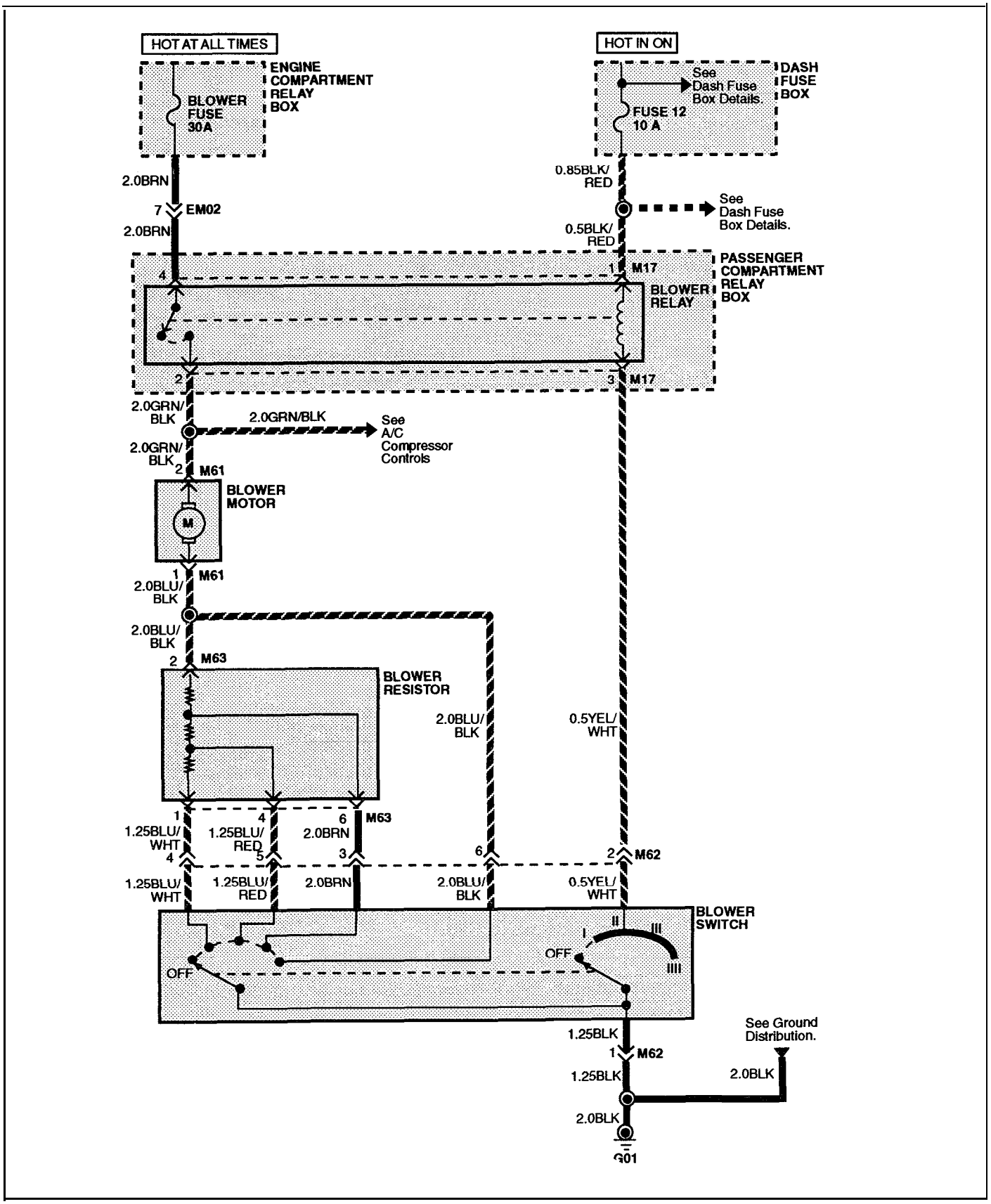


COMPONENT LOCATION IN

	Location reference-page
Components	
A/C switch (I10)	WS-193
Generator (E31-2)	WS-189
Chime bell (M32)	WS-195
Cluster (I13-1)	WS-193
Cluster (I13-3)	WS-193
Door warning switch (M23)	WS-195
Front wiper motor (E16)	WS-188
LH front door switch (M47)	WS-197
Multi switch (M26-1)	WS-195
Rear defogger glass (M53)	WS-197
Rear defogger switch (I08)	WS-196
Seat belt switch (M37)	WS-193
TACM (M38)	WS-196
Washer motor (E37)	WS-190
Connectors	
EM02	WS-191
EM03	WS-191
MI01	WS-201
MI02	WS-201
Ground	
G01	WS-203
G02	WS-203
G05	WS-203
G11	WS-204
G12	WS-204

BLOWER CONTROLS

SCHEMATIC DIAGRAM

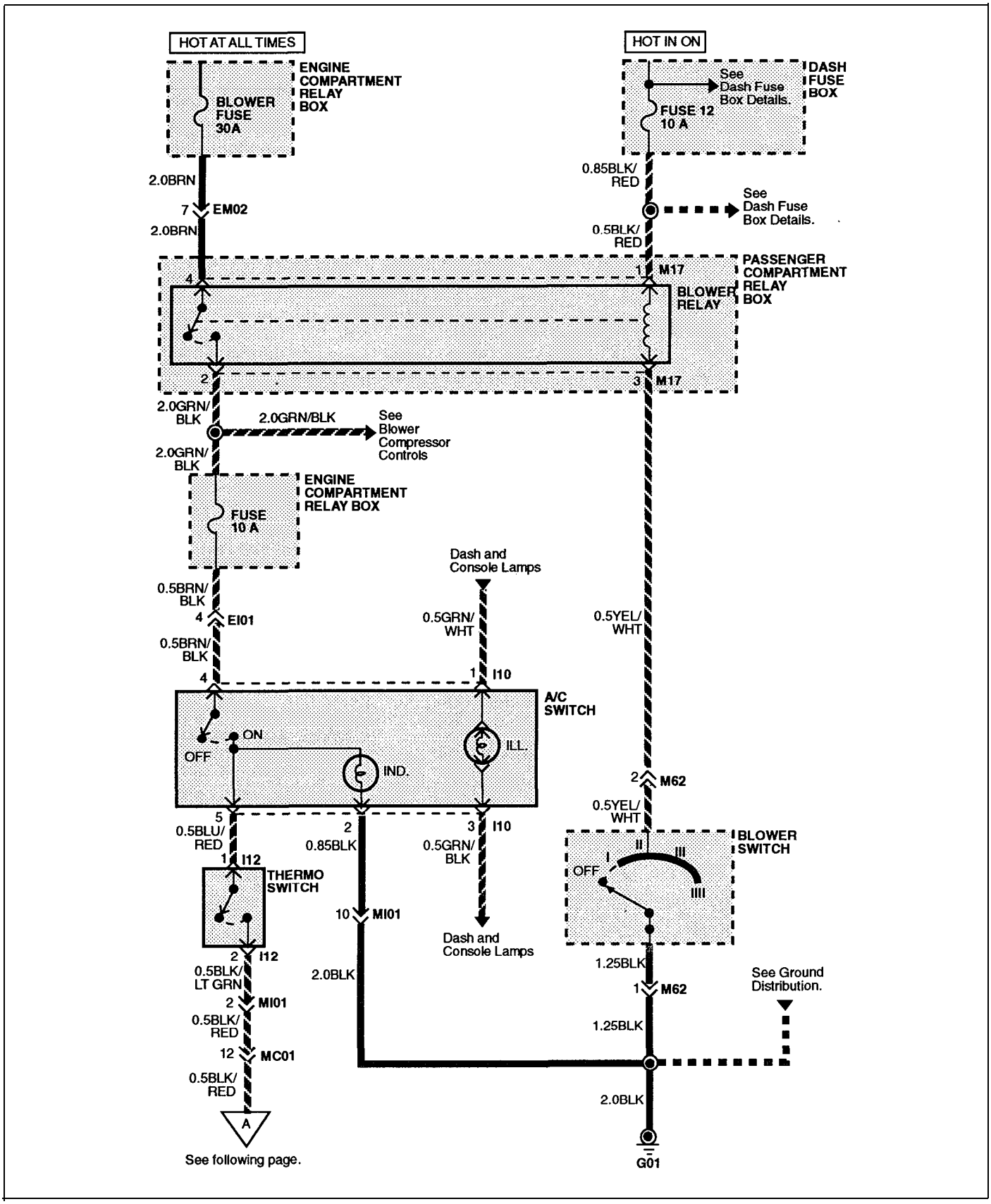


COMPONENT LOCATION INDEX

	Location reference-page
Components	
Blower motor (M61)	WS-198
Blower relay (Ml 7)	WS-194
Blower resistor (M63)	WS-198
Blower switch (M62)	WS-198
Connectors	
EM02	WS-191
EM03	WS-191
Ground	
GO1	WS-203

A/C COMPRESSOR CONTROLS

SCHEMATIC DIAGRAM (1)



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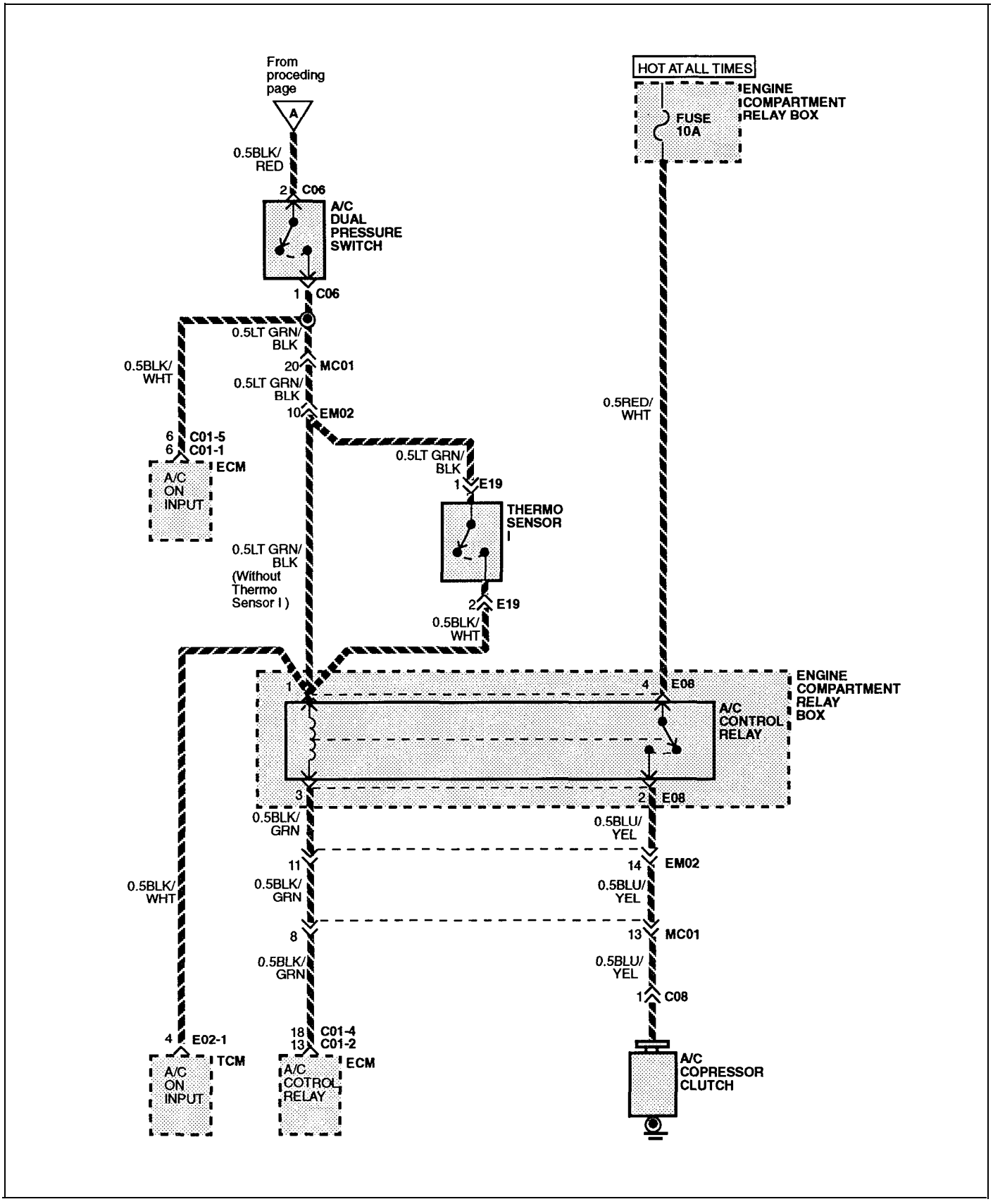


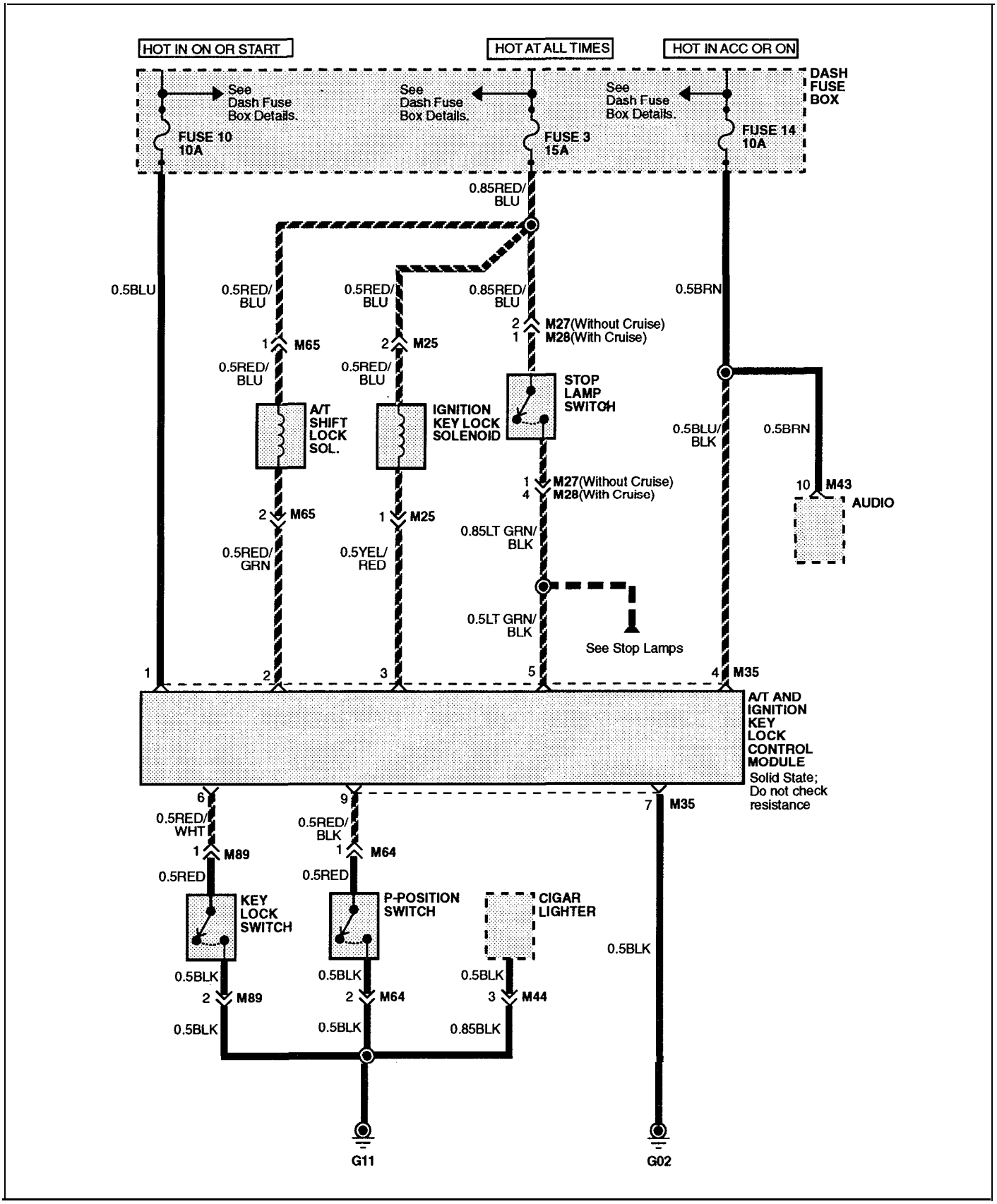
COMPONENT LOCATION INDEX

	Location reference-page
Components	
NC compressor (C08)	WS-182
A/C control relay (E08)	WS-188
A/C low pressure switch (C06)	WS-182
A/C switch (I10)	WS-193
Blower relay (M17)	WS-194
Blower switch (M62)	WS-198
ECM (C01 -1/C01 -2)	WS-182
TCM (E02-1)	WS-188
Thermo sensor-l (El 9)	WS-188
Thermo switch (I12)	WS-193
Connectors	
El01	WS-192
EM02	WS-191
MC01	WS-201
Ml01	WS-201
Ground	
GO1	WS-203

MEMO

A/T AND IGNITION KEY LOCK CONTROLS

SCHEMATIC DIAGRAM

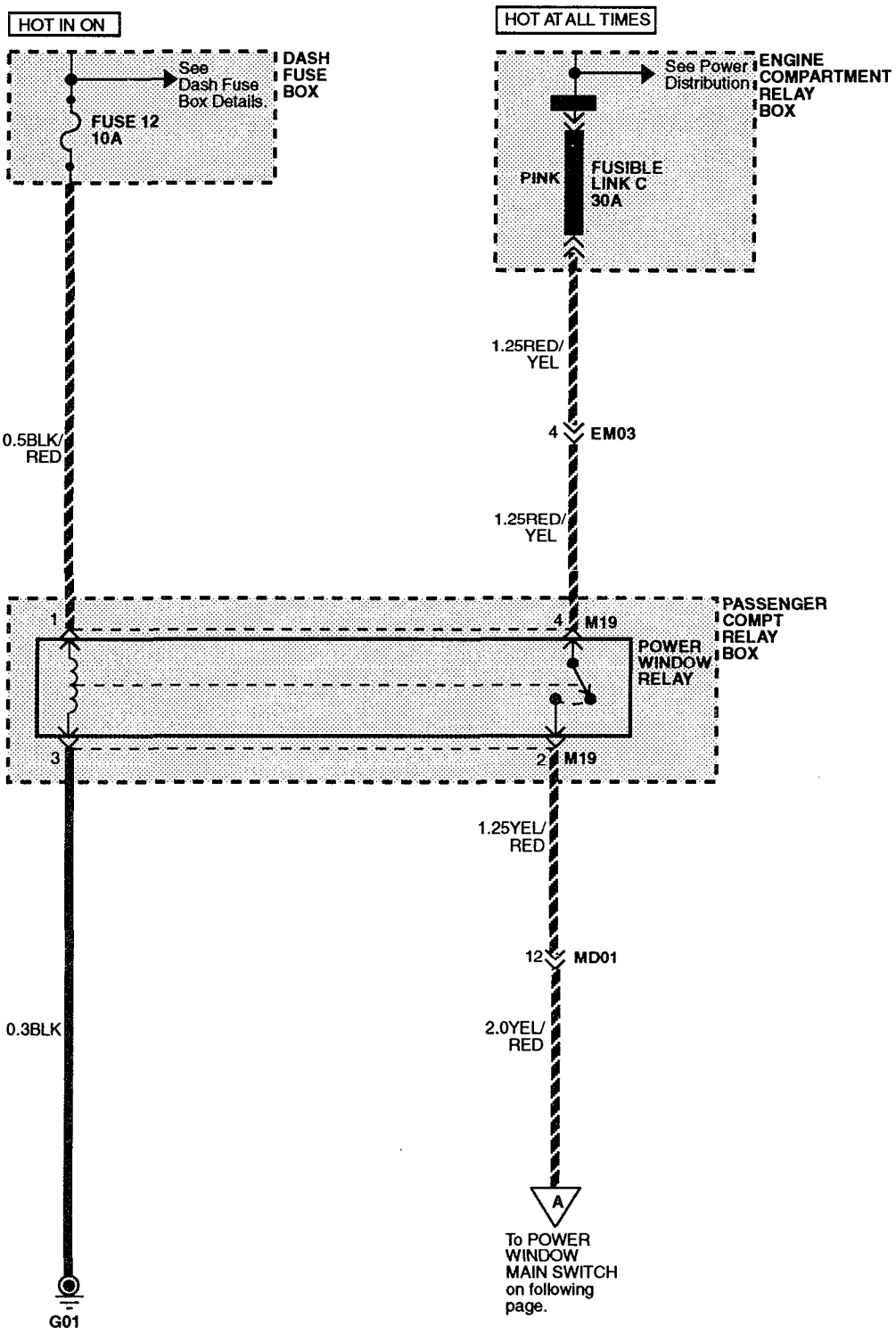


COMPONENT LOCATION INDEX

	Location reference-page
Components	
A/T and ignition key lock control module (M35)	WS-196
A/T shift lock sol. (M65)	WS-198
Audio (M43)	WS-196
Cigar lighter (M44)	WS-197
Ignition key lock solenoid (M25)	WS-195
P-position switch (M64)	WS-198
Stop lamp switch (M27/M28)	WS-195
Ground	
G02	WS-203
G11	WS-204

POWER WINDOWS

SCHEMATIC DIAGRAM (1)



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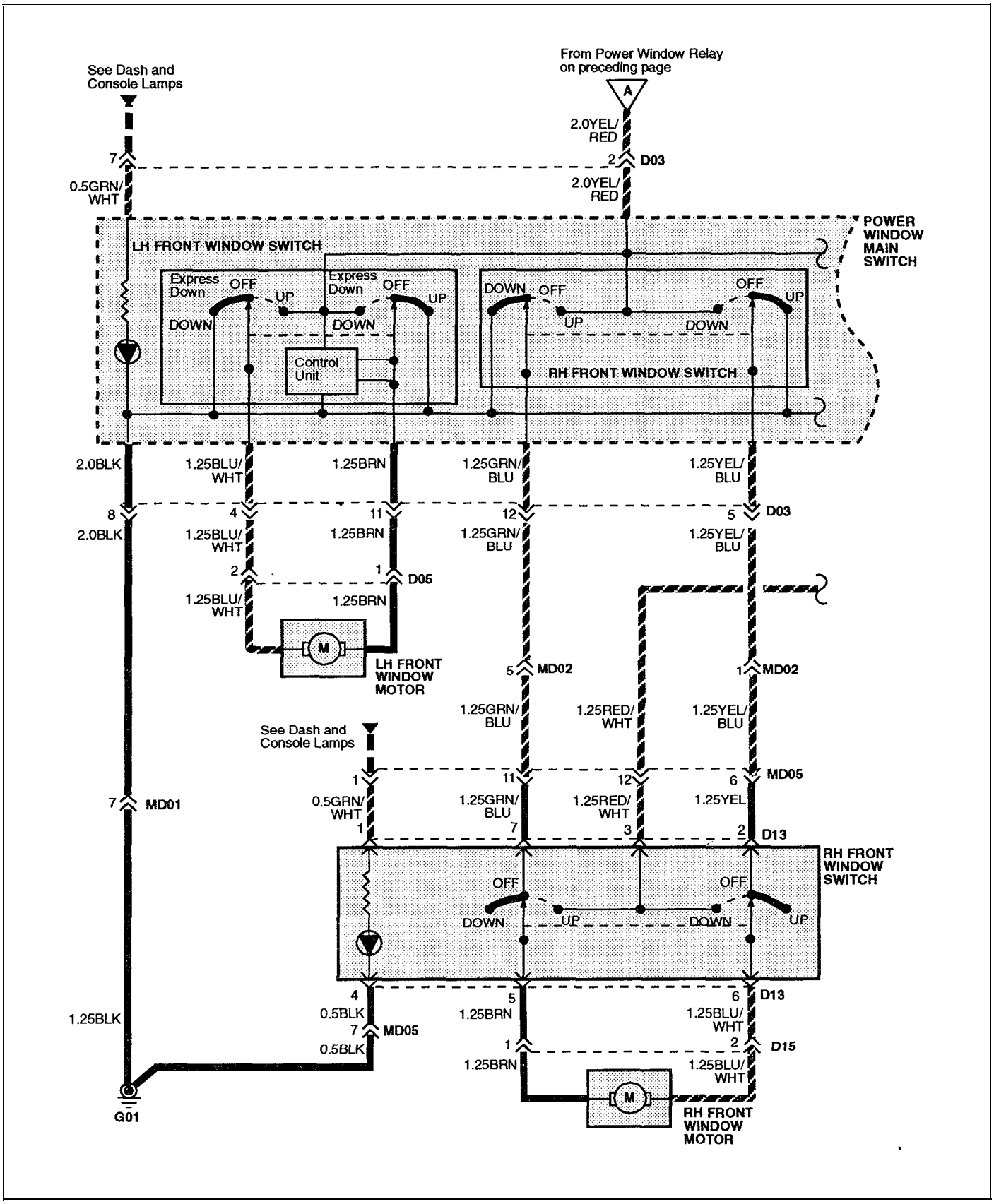

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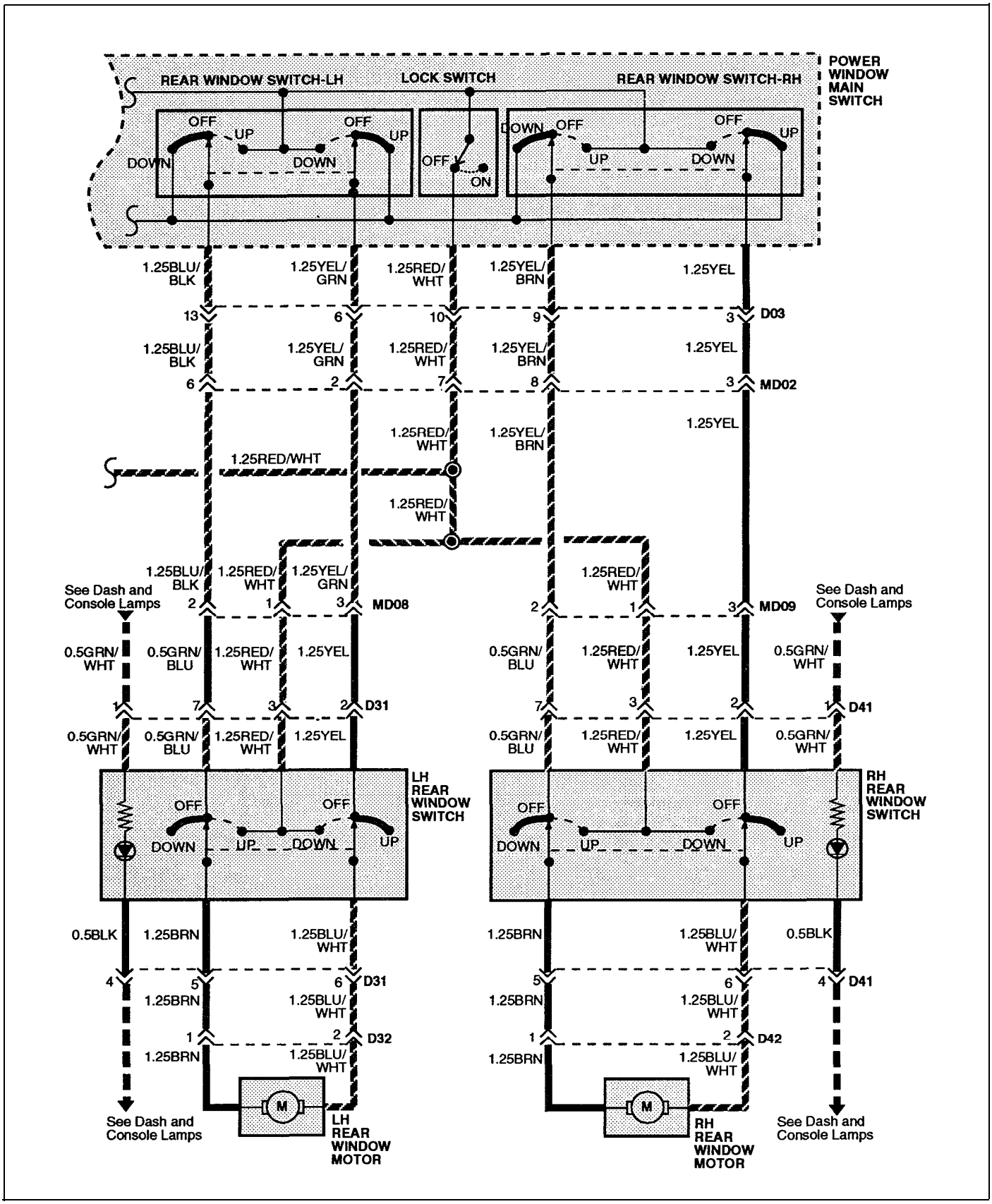
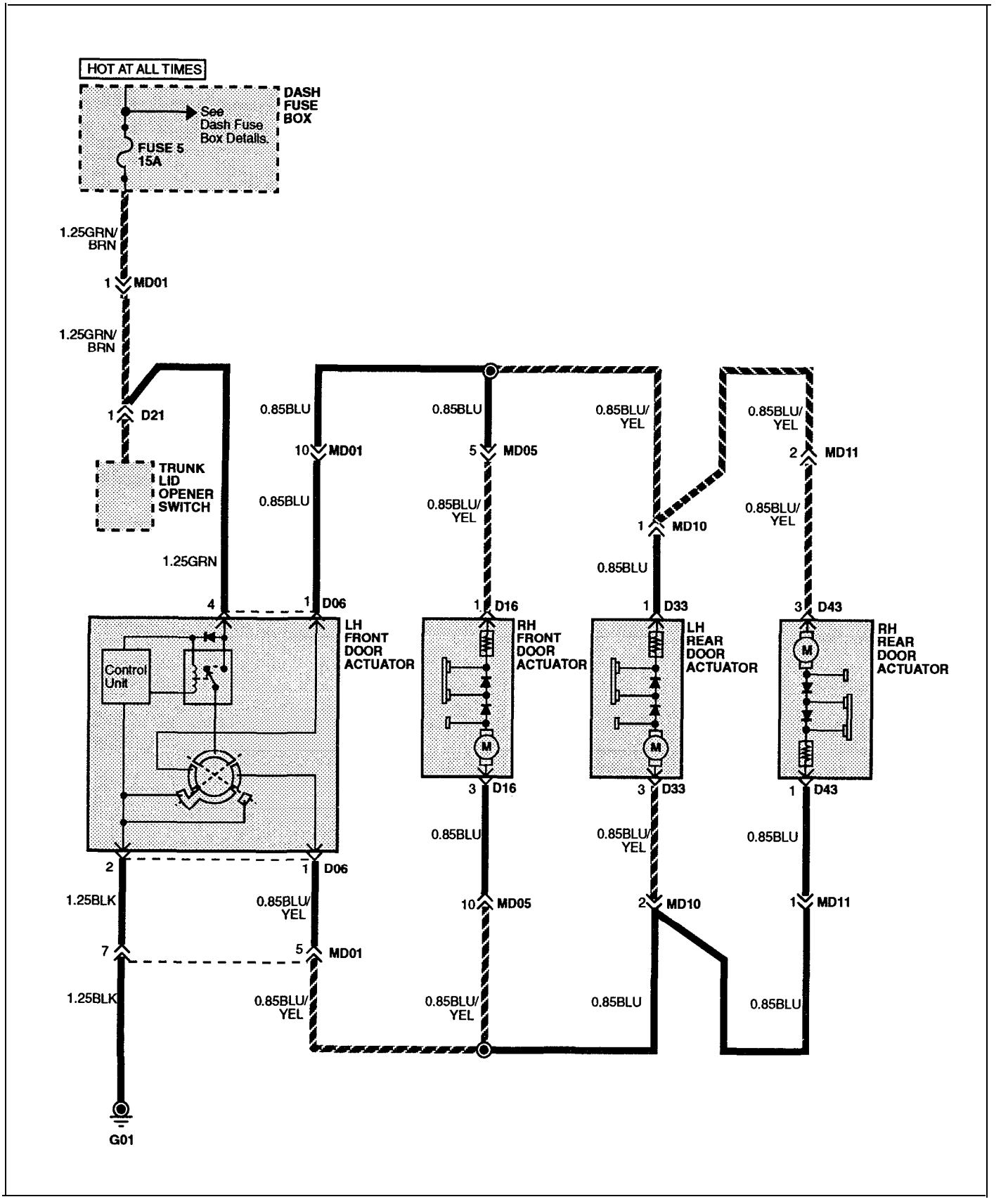


COMPONENT LOCATION INDEX

	Location reference-page
Components	
LH front window motor (D05)	WS-186
LH rear window motor (D32)	WS-187
LH rear window switch (D31)	WS-187
Power window main switch (D03)	WS-186
RH front window motor (D15)	WS-187
RH front window switch (D13)	WS-187
RH rear window motor (D42)	WS-187
RH rear window switch (D41)	WS-187
Connectors	
EM03	WS-191
MD01	WS-201
MD02	WS-201
MD05	WS-201
MD08	WS-201
MD09	WS-201
Ground	
G01	WS-203

POWER DOOR LOCK

SCHEMATIC DIAGRAM (1)

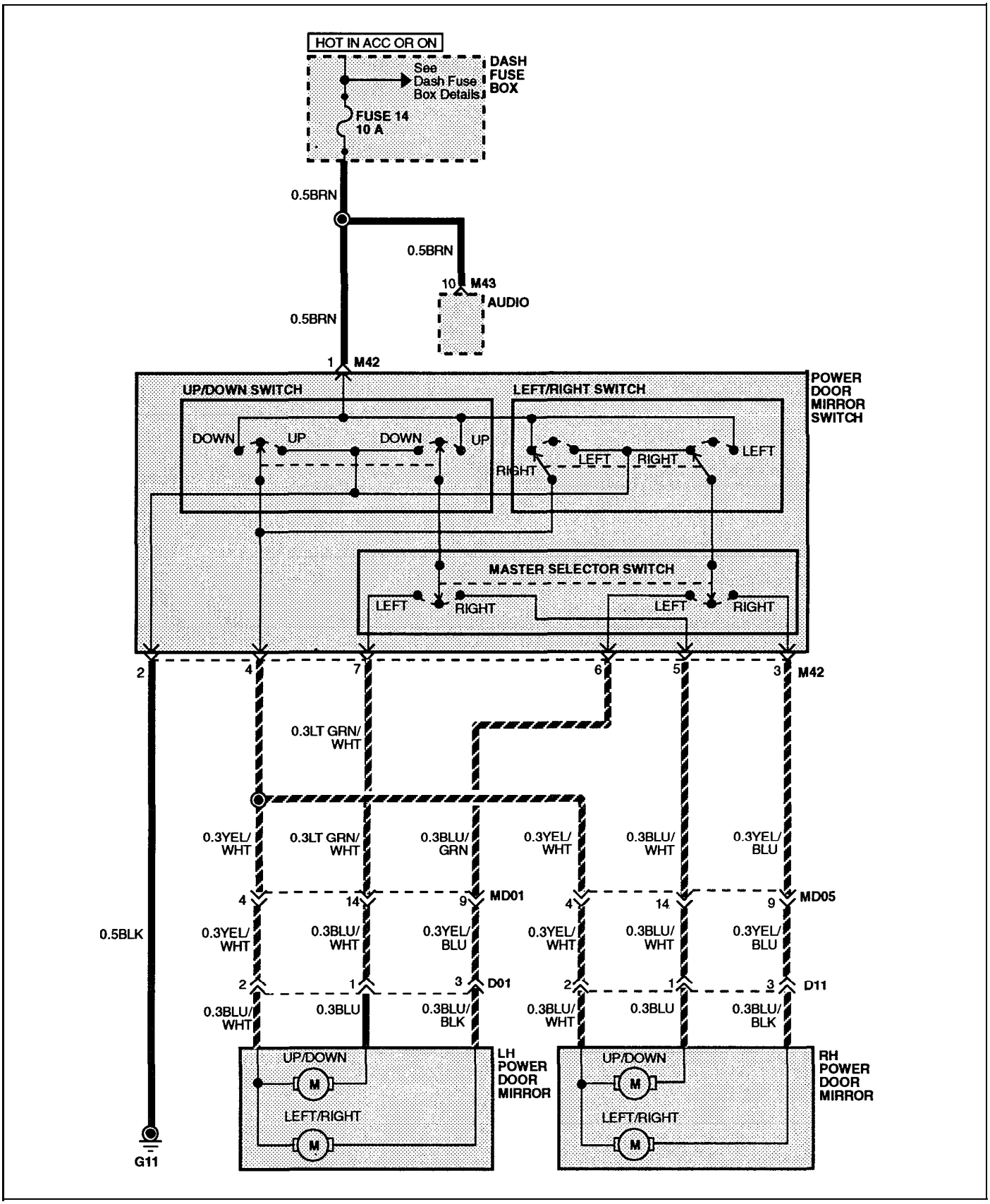


COMPONENT LOCATION INDEX

	Location reference-page
Components	
LH front door actor (D06).	WS-186
LH rear door actor (D33)	WS-187
RH front door actor (D16)	WS-187
RH rear door actor (D43)	WS-187
Trunk lid opener switch (D21)	WS-187
Connectors	
MD01	WS-201
MD05	WS-201
Ground	
G01	WS-203

POWER DOOR MIRROR

SCHEMATIC DIAGRAM

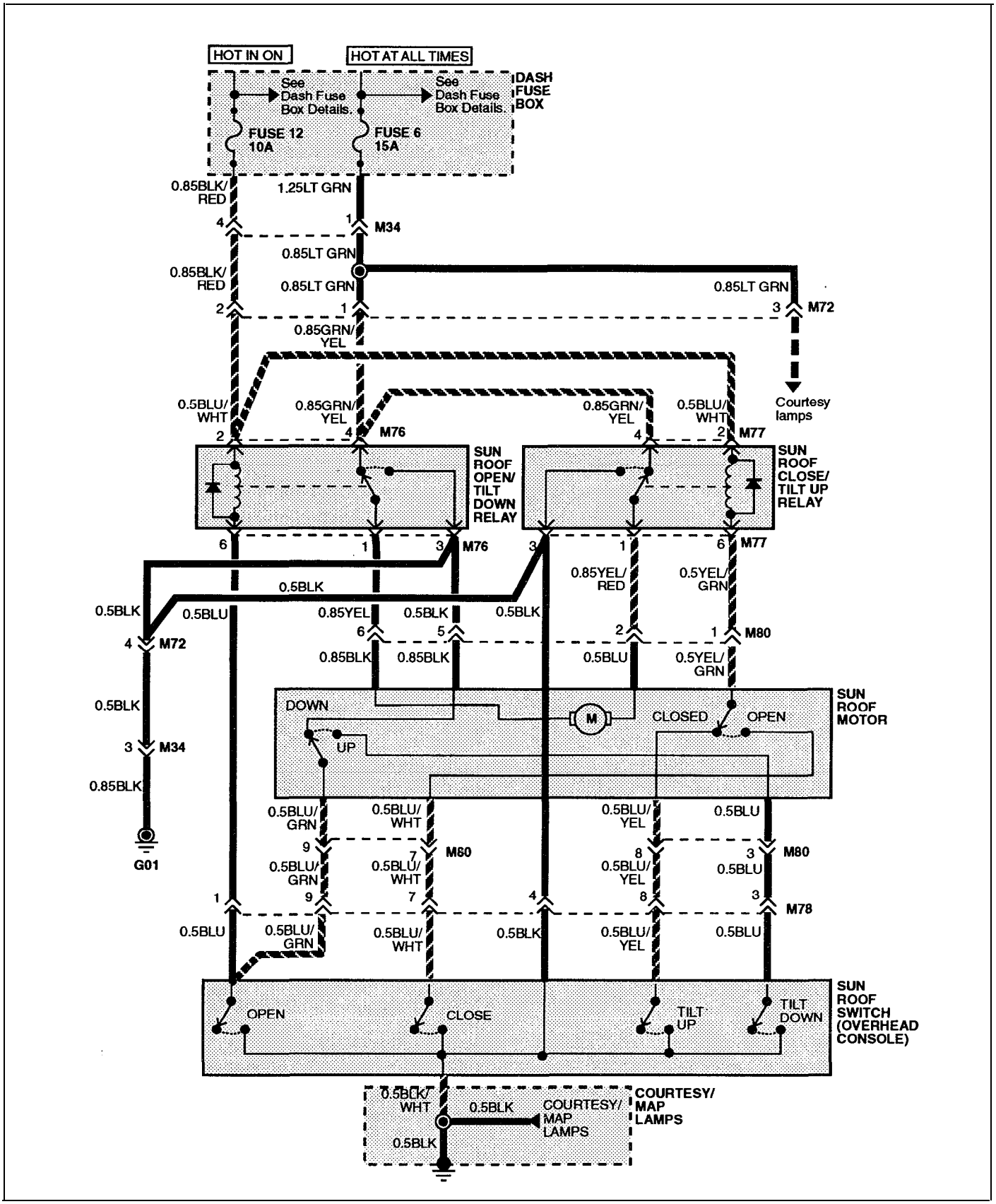


COMPONENT LOCATION INDEX

	Location reference-page
Components	
Audio (M43)	WS-196
LH power door mirror (D01)	WS-186
Power door mirror switch (M42)	WS-196
RH power door mirror (D11)	WS-187
Connectors	
MD01	WS-201
MD05	WS-201
Ground	
G11	WS-204

SUNROOF

SCHEMATIC DIAGRAM

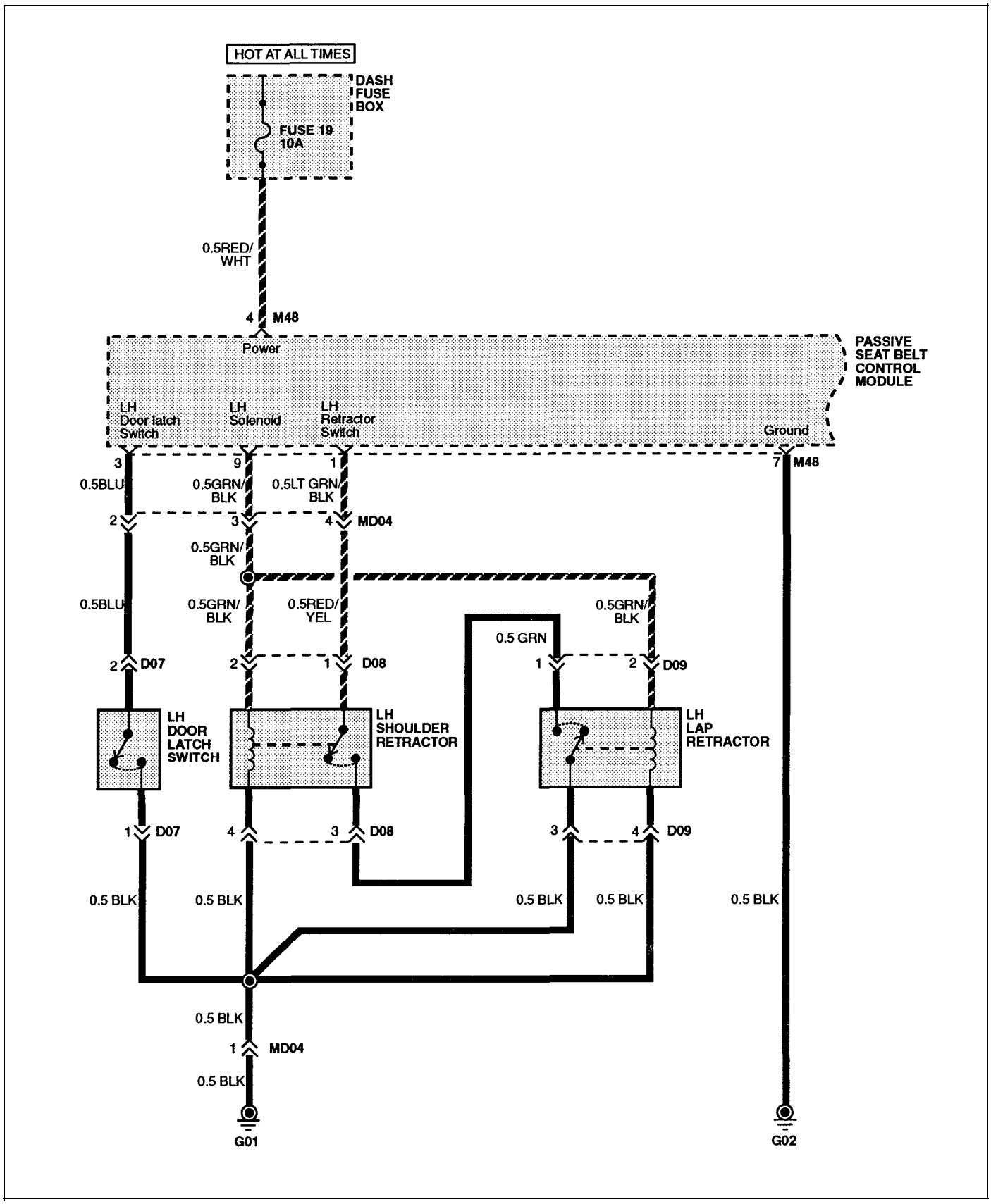


COMPONENT LOCATION INDEX

	Location reference-page
Components	
Sun roof close/tilt up relay (M77)	WS-199
Sun roof motor (M80)	WS-199
Sun roof open/tilt down relay (M76)	WS-199
Sun roof switch (overhead console) (M78)	WS-199
Connectors	
M34	WS-196
M72	WS-199
Ground	
G01	WS-203

PASSIVE SEAT BELTS

SCHEMATIC DIAGRAM (1)



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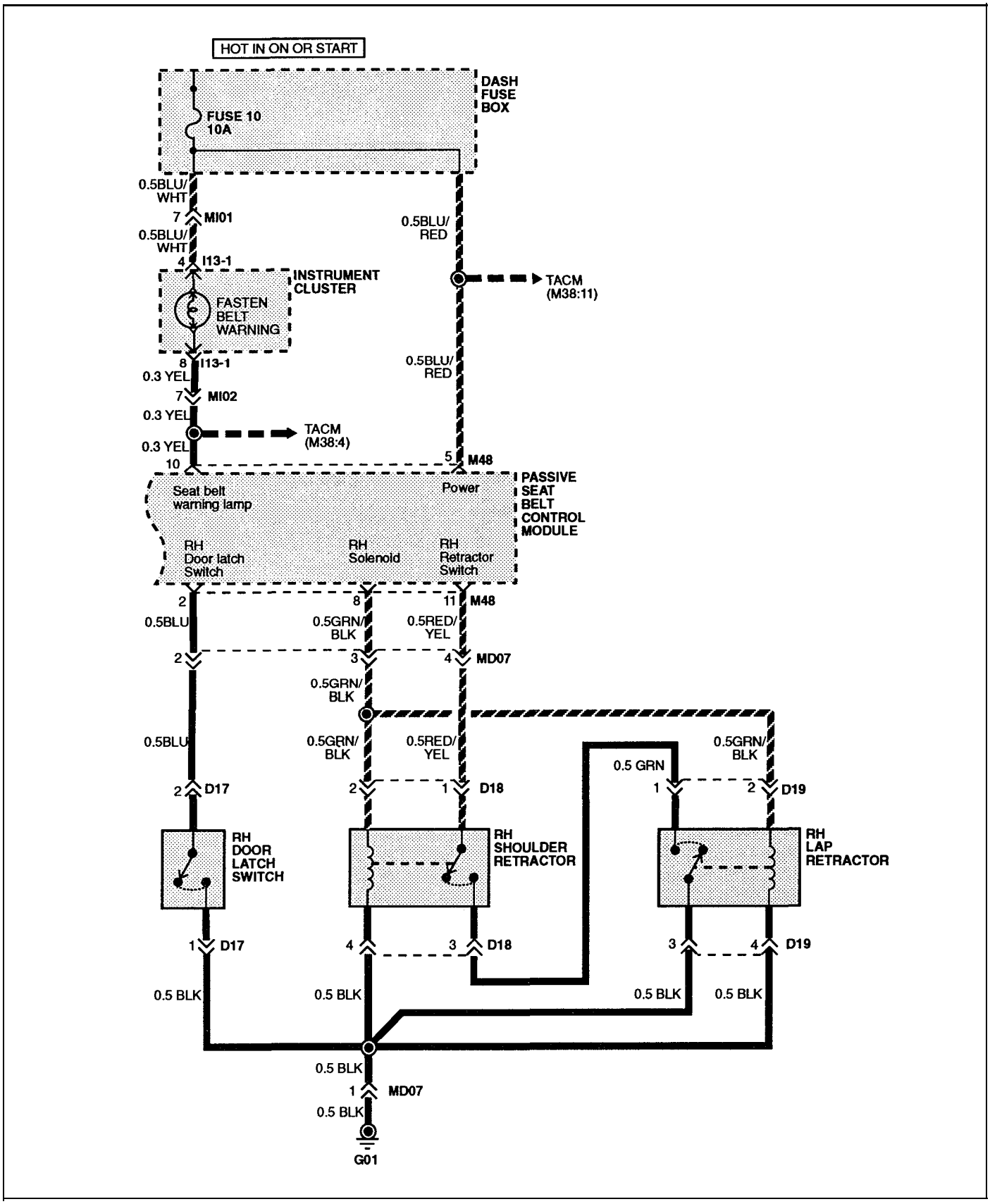


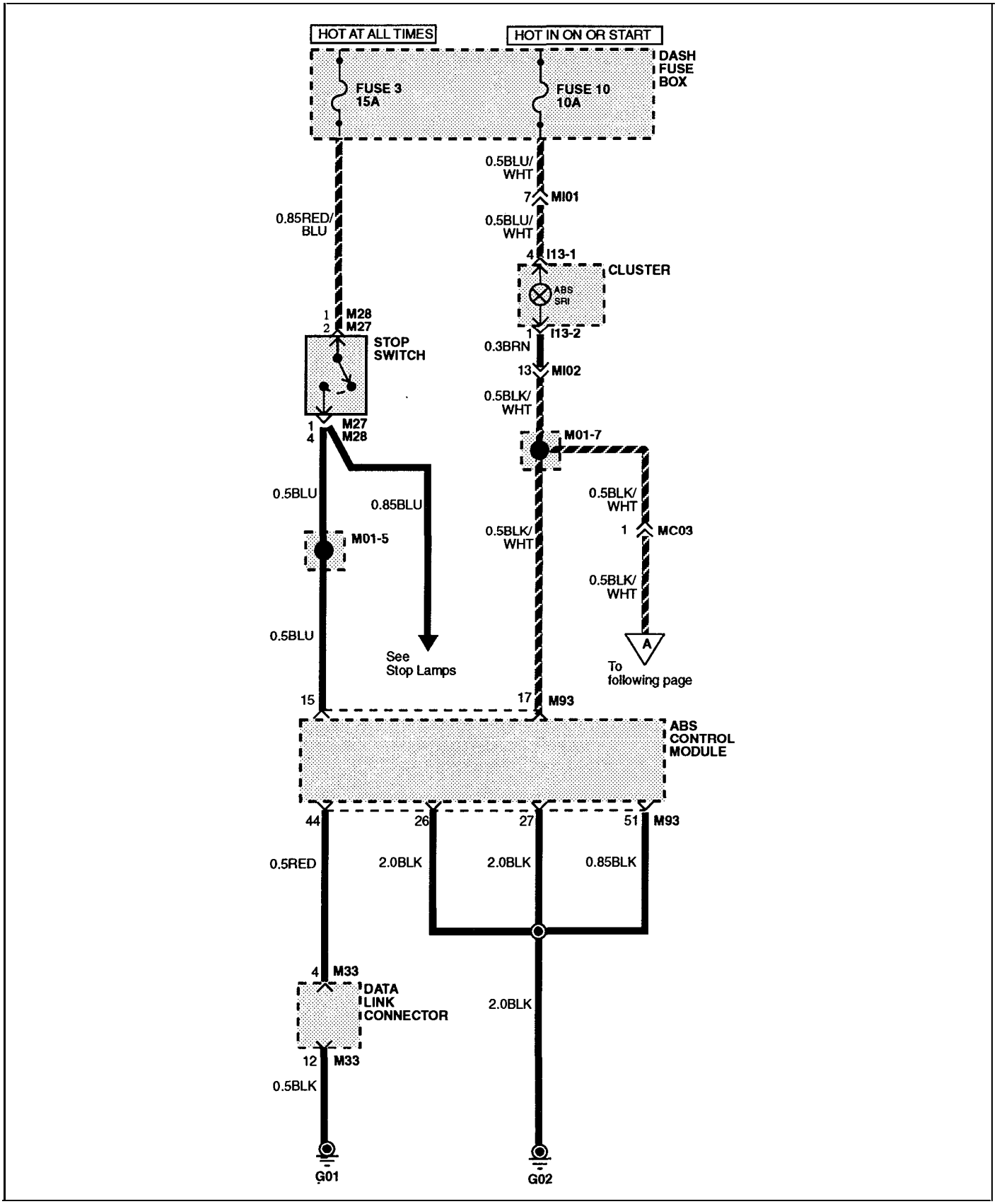
COMPONENT LOCATION INDEX

	Location reference-page
Components	
Instrument cluster (I13-1)	WS-193
LH door latch switch (D07)	WS-186
LH lap retractor (D09)	WS-186
LH shoulder retractor (D08)	WS-186
Passive seat belt unit (M48)	WS-197
RH door latch switch (D17)	WS-187
RH lap retractor (D19)	WS-187
RH shoulder retractor (D18)	WS-187
Connectors	
MD04	WS-201
MD07	WS-201
Ml01	WS-201
Ml02	WS-201
Grounds	
G01	WS-203
G02	WS-203

MEMO

ANTI-LOCK BRAKE SYSTEM

SCHEMATIC DIAGRAM (1)



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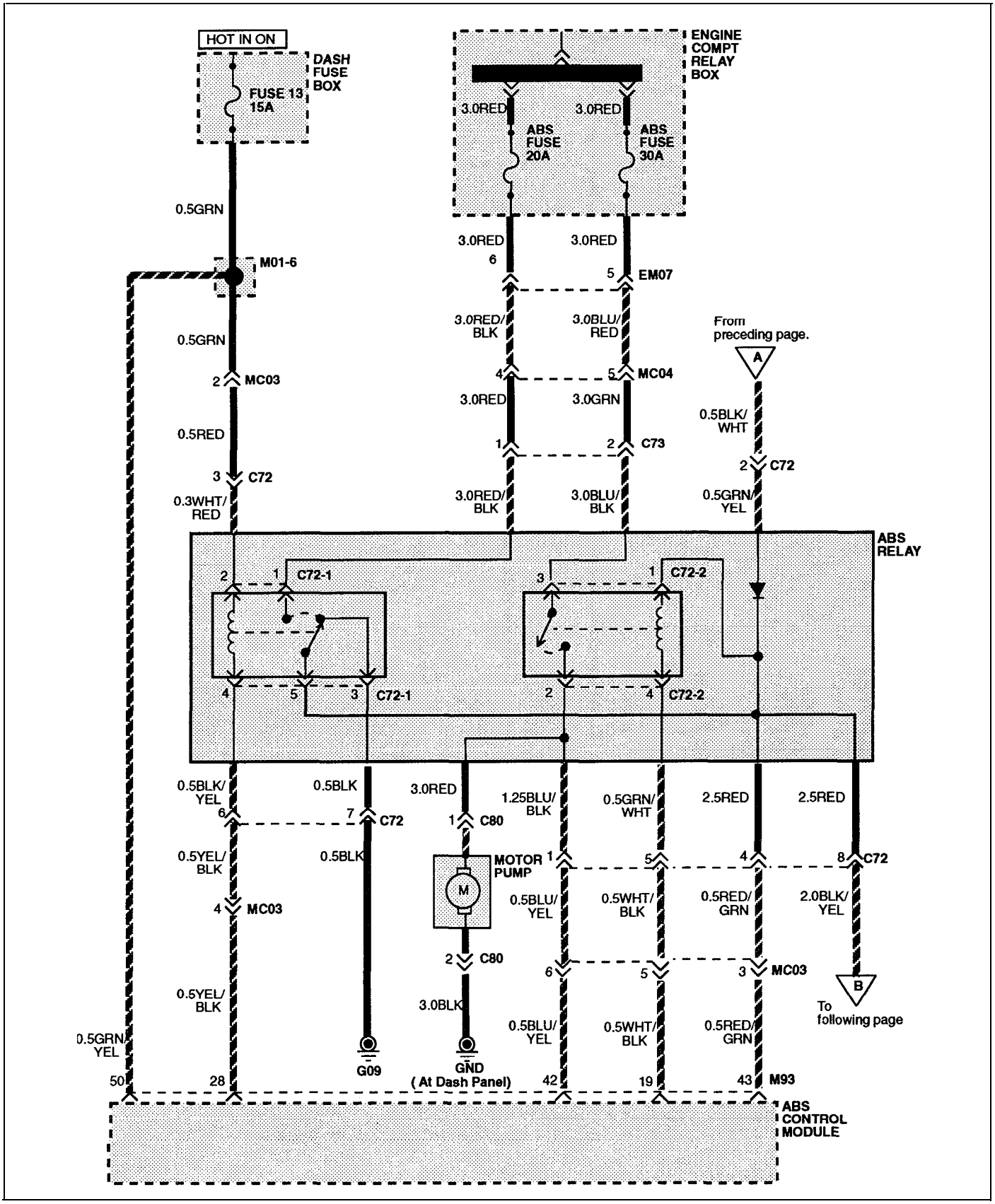

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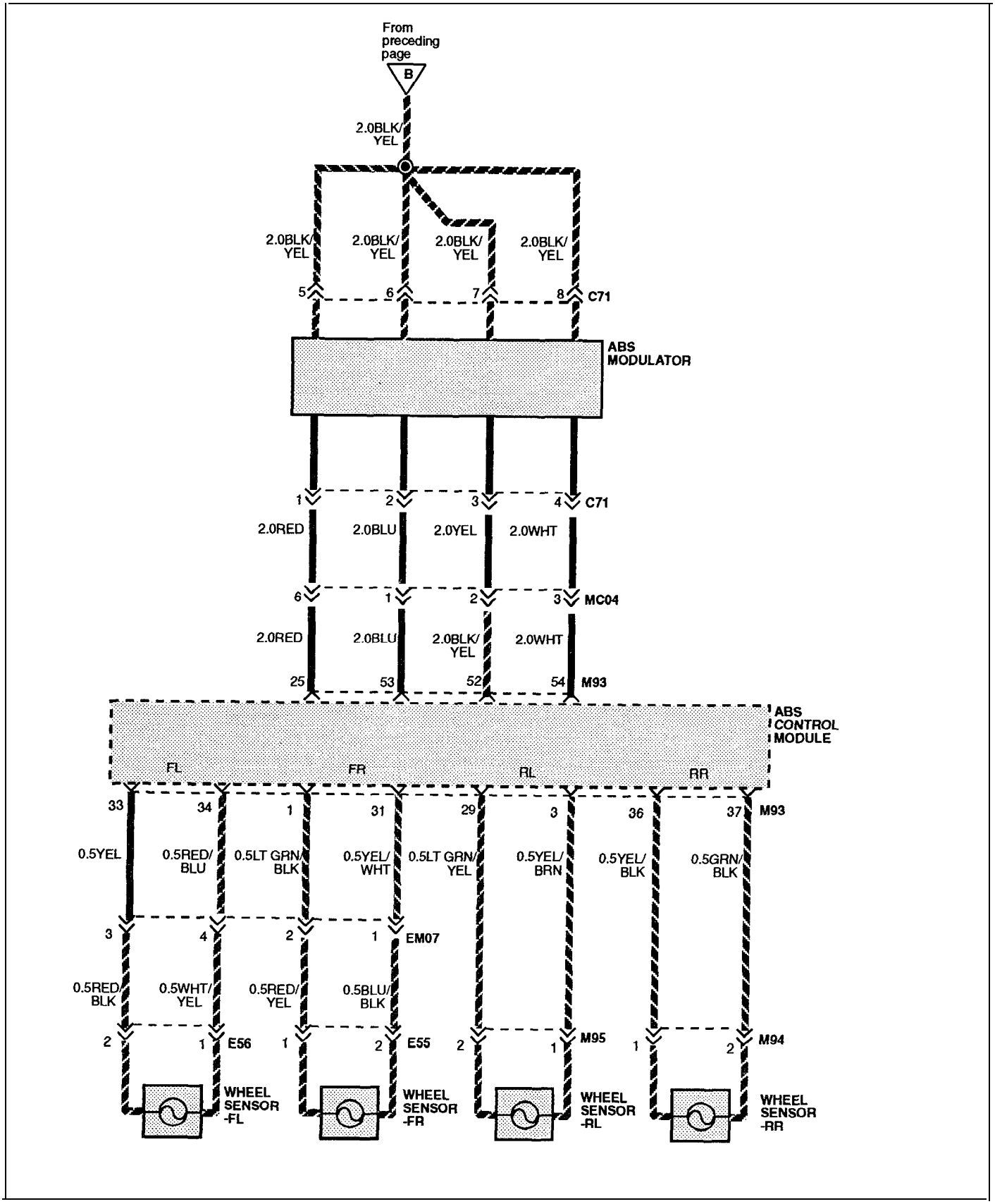
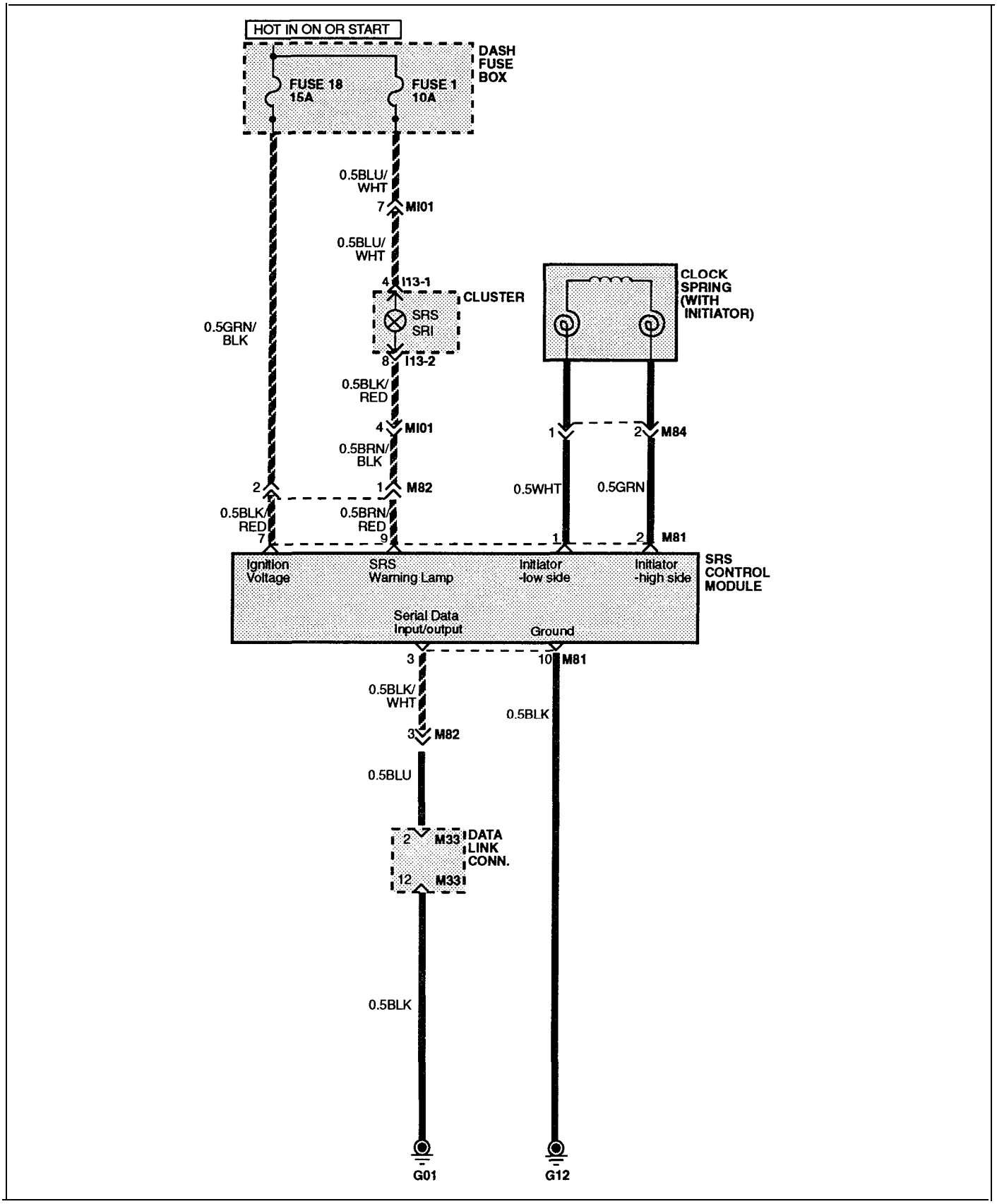


COMPONENT LOCATION INDEX

	Location reference-page
Components	
ABS control module (M93)	WS-200
ABS modulator (C71)	WS-185
ABS relay (C72/C73)	WS-185
Cluster (I13-1/I13-2)	WS-193
Motor pump (C80)	WS-185
Data link connector (M33)	WS-190
Stop lamp switch (M27/M28)	WS-189
Wheel sensor (E55/E56/M94/M95)	WS-191/200
Connectors	
MC03	WS-201
EM07	WS-192
MC04	WS-201
Grounds	
GO1	WS-203
G02	WS-203

AIR BAG

SCHEMATIC DIAGRAM



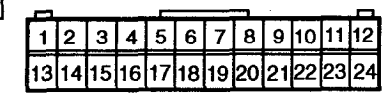
COMPONENT LOCATION INDEX

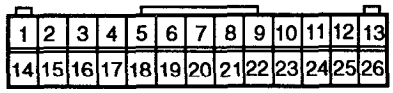
	Location reference-page
Components	
Clock spring (Initiator) (M84)	WS-200
SRS control module (M81)	WS-200
Data link connector (M33)	WS-196
Cluster (I13-1~I13-2)	WS-193
Connectors	
Ml01	WS-201
M82	WS-200
Grounds	
GO1	WS-203
G02	WS-203

CONFIGURATION OF CONNECTORS

CO1-1 ~ C20

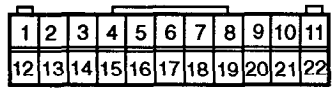
C01-1/C01-4





CC24-001F/CC26-001F

C01-2/C01-5



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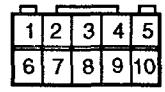
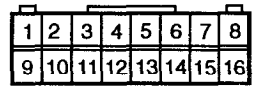
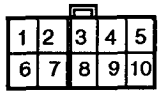
C01-3/C01-6





CC10-003F/CC16-003F

C02



CC10-001F

C03

CC02-005F

C04

CC01-013F

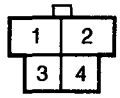
C05

CC01-013F

C06

CC02-003F

C07

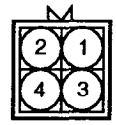


CC04-004F

C08

CC01-008F

C09

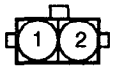


CC04-002M

C11

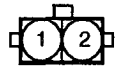
CC02-005F

C12-1



CC02-009F

C12-2



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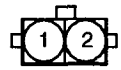

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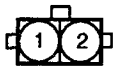
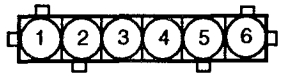
C12-4



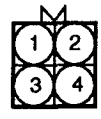
CC02-009F

C13



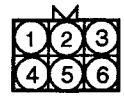
CC06-007F

C14



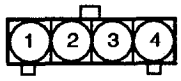
CC04-002F

C15



CC06-003F

C17



CC04-005F

C18

CC01-015F

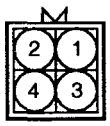
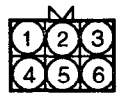
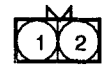
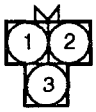
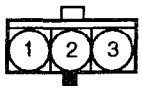
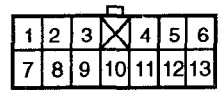
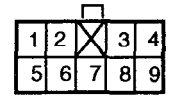
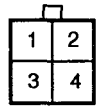
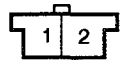
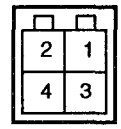
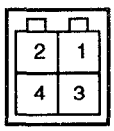
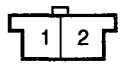
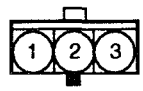
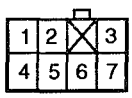
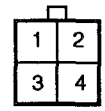
C19

CC01-003F

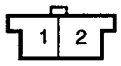
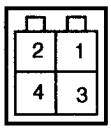
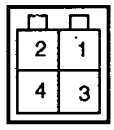
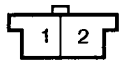
C20

CC02-004F

C21 ~ D16

C21  CC04-003F	C22  CC06-003F	C25 CC02-005F	C28  CC02-013F
C29  CC03-004F	C30 CC01-004F/004M	BLANK	C51
D01  CC03-008F	D02 CC02-004F	D03  CC13-001F	D04  CC09-004F
D05 CC02-003F	D06  CC04-006F	D07  CC01-002F	D08  CC04-007M
D09  CC04-007M	D10  CC01-002F	D11  CC03-008F	D12 CC02-004F
D13  CC07-003F	D14 BLANK	D15 CC02-003F	D16  CC04-006F

D17 ~ E05

D17  CC01-002F	D18  CC04-007M	D19  CC04-007M	D20  CC01-002F
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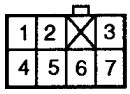
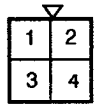
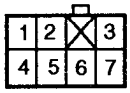
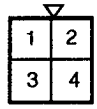
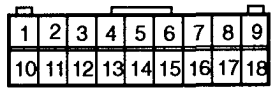
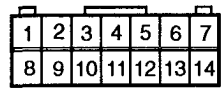
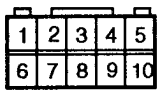
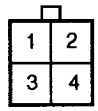
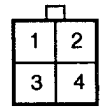
D31  CC07-003F	D32 CC02-003F	D33  CC04-002F	D34 BLANK
D41  CC07-003F	D42 CC02-003F	D43  CC04-013F	D44 BLANK
E01 BLANK	E02-1  CC20-001F	E02-2  CC13-001F	
E02-3  CC13-001F	E03 CC02-007M	E04  CC04-006F	E05  CC04-006F

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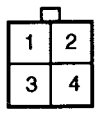
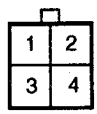
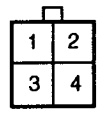
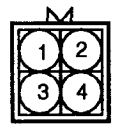
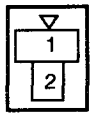
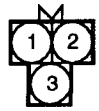
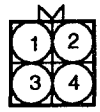
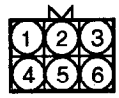
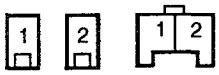
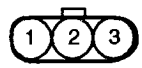
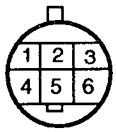
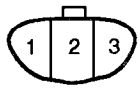
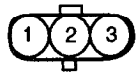
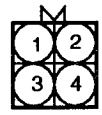
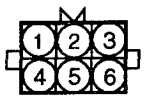
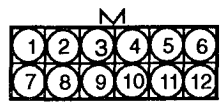
E06  CC04-006F	E07  CC04-006F	E08  CC04-006F	E09  CC04-003F
E10  CC02-006M	E11 CC03-004F	E12  CC02-007F	E13  CC04-002F
E14 CC02-003F	E15 BLANK	E16  CC06-003F	E17 BLANK
E18  CC01-003F	E19 CC02-003M	E20 CC02-007F	E21  CC02-007F
E22  CC06-001F	E23  CC03-015F	E24  CC03-002F	E25  CC04-002F
E26  CC04-002M	E27 CC02-007F	E28  CC12-011F	E29 CC02-003F

E30 ~ EI01

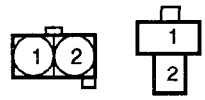
E30

CC01-008F

E31-1

CC01-014F

E31-2



CC02-008F

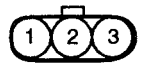
E32

CC01-003F

E33

CC02-013F

E34



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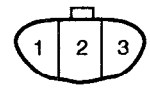
E35

CC06-001F

E36



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E37

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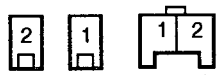
E38



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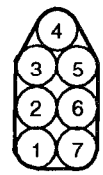

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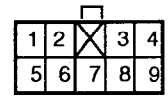

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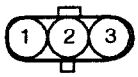

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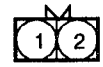

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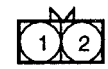

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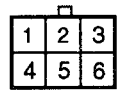

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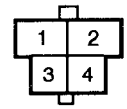

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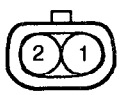

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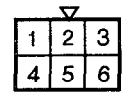

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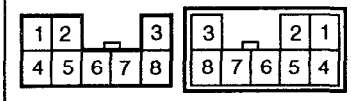

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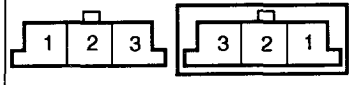
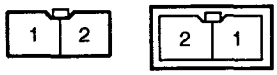
EI02 ~ I13-3

EI02



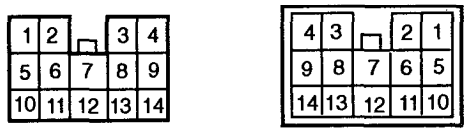
CC03-007F/CC03-007M

EM01



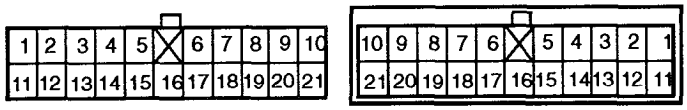
CC02-011F/CC02-001M

EM02



CC14-001F/CC14-001M

EM03



CC17-002F/CC17-002M

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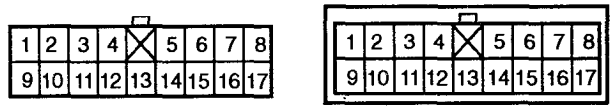

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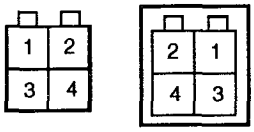

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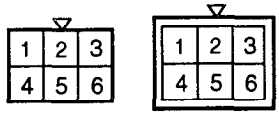

CC06-002M

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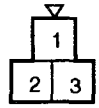

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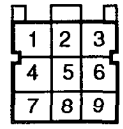

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I03

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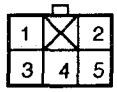

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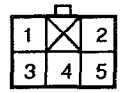

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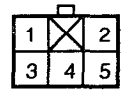

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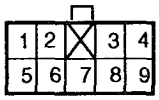

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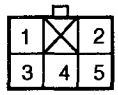

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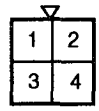
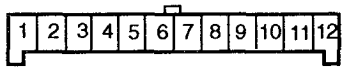


CC04-013F

I12

CC02-005F

I13-1



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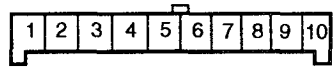
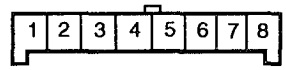


CC10-007F

I13-3



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I13-4 ~ M12

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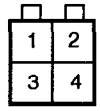
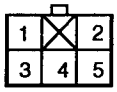
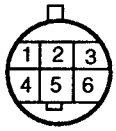
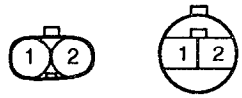
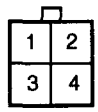
I17 BLANK	I18 BLANK	I19 BLANK	I20  CC04-007M
I20-1  CC05-003F	M01-1 BLANK	M01-2 BLANK	M01-3 BLANK
M01-4 BLANK	M02 CC01-003F	M03 BLANK	M04 CC01-015F
M05  CC06-001F	M06 CC02-003F	M07 CC01-014F	M08  CC02-003F
M09 CC01-008F	M10 CC02-005F	M11 BLANK	M12 BLANK

M13 ~ M32

M13

CC02-004F

M14



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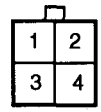

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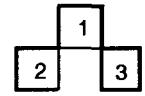
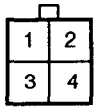


CC03-012F

M17



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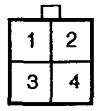

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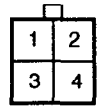

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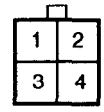

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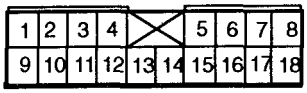
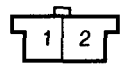


CC18-001F

M22

CC02-005F

M23



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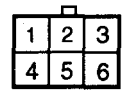
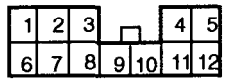


CC06-004F

M25

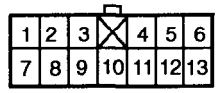
CC02-005F

M26-1



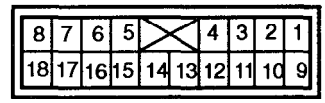
CC12-003F

M26-2



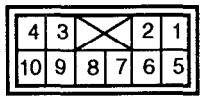
CC13-001F

M26-3



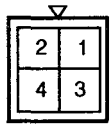
CC18-001F

M26-4



CC10-001F

M26-5



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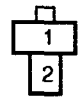
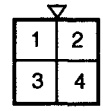


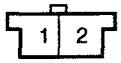
CC02-005F

M28



CC04-013F

M29



CC01-002F

M30

CC02-006F

M31

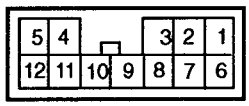
CC02-007M

M32

CC02-005F

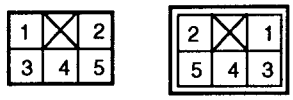
M33 ~ M57

M33



CC12-003M

M34



CC05-001F/CC05-001M

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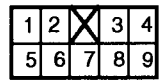


CC09-002F

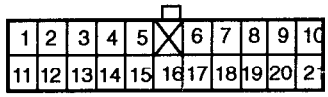
M36

CC01-001F

M37

CC02-005F

M38



CC21-001F

M39

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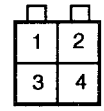
M41



CC04-007F

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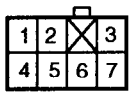
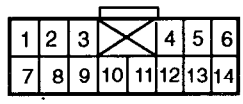


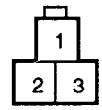
CC06-004F

M43



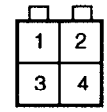
CC14-004F

M44



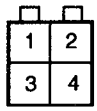
CC03-006F

M45



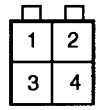
CC04-007F

M46



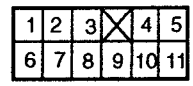
CC04-007F

M47



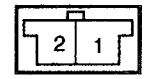
CC04-007F

M48



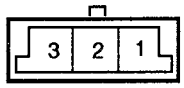
CC11-002F

M49



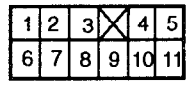
CC01-002M

M50



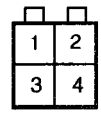
CC03-007M

M51



CC11-002F

M52



CC04-007F

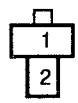
M53

CC01-003F

M54

CC02-004F

M55



CC02-005F

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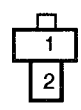

CC02-005F

M57

CC02-004F

M58 ~ M81

M58

CC02-005F

M59

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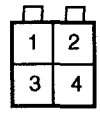
M60

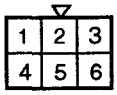


CC04-007F

M61

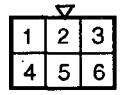
CC02-005F

M62



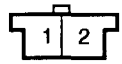
CC06-009F

M63



CC06-009F

M64

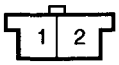


CC01-002F

M65

CC02-005F

M66

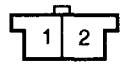


CC01-002F

M67

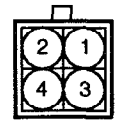
CC02-012F

M68



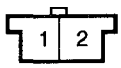
CC01-002F

M70



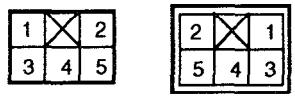
CC04-002F

M71



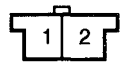
CC01-002F

M72



CC05-001F/CC05-001M

M73



CC01-002F

M74

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M75

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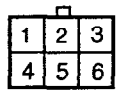
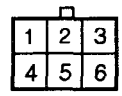
M76



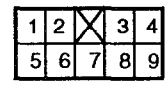
CC06-004F

M77



CC06-004F

M78

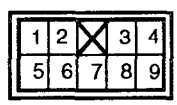


CC09-002F

M79

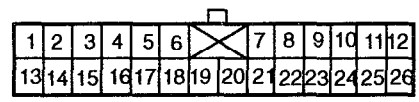
CC08-006F

M80



CC09-002M

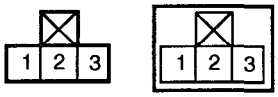
M81



CC26-002M

M82 ~ MD05

M82



CC03-001F

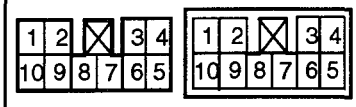
M83

CC02-001F

M84

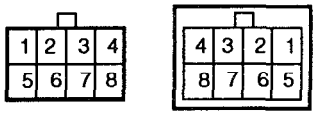
CC02-012F

M91



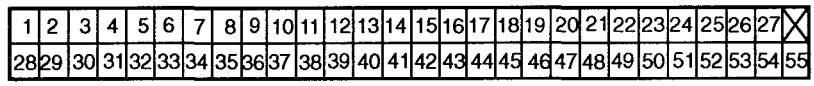
CC10-001F

M92



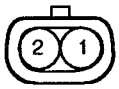
CC08-001F

M93



CC55-001F

M94

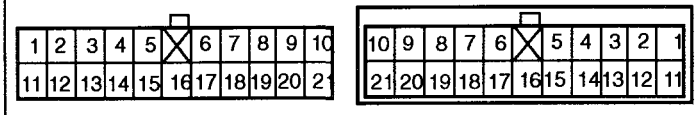


CC02-023F

M95

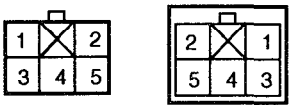
CC02-023F

MC01



CC21-001F/CC21-001M

MC02

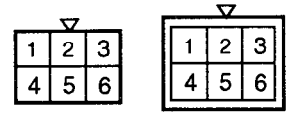


CC05-001F/CC05-001M

MC03

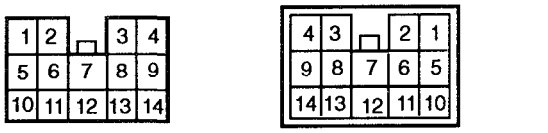
CC01-002F/CC01-002M

MC04



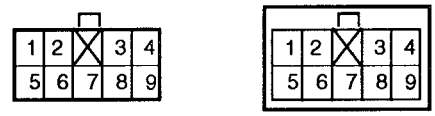
CC07-002F/CC07-002M

MD01



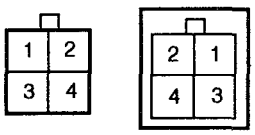
CC14-001F/001M

MD02



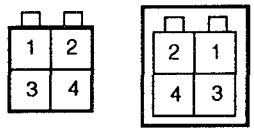
CC09-004F/CC09-004M

MD03



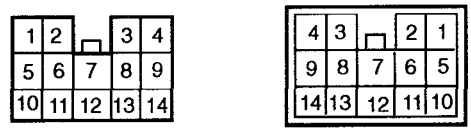
CC04-006F/CC04-006M

MD04



CC04-007F/007M

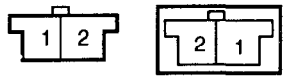
MD05



CC14-001F/001M

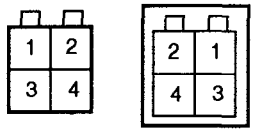
MD06 ~ R10

MD06



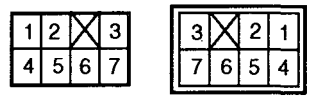
CC01-002F/CC01-002M

MD07



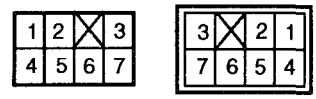
CC04-007F/007M

MD08



CC07-001F/CC07-001M

MD09



CC07-001F/CC07-001M

MD10

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MD11

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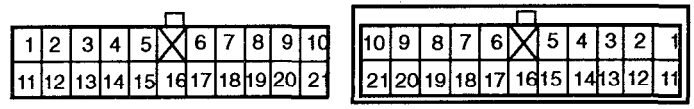
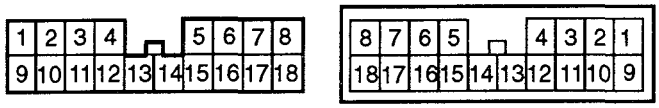
MI01



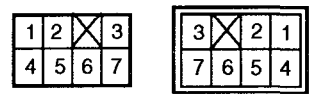
CC21-001F/CC21-001M

MI02



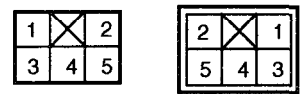
CC18-001F/CC18-001M

MR01



CC07-002F/CC07-002M

MR02



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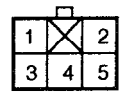
R01



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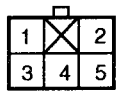
R02

CC01-008F

R03



CC05-003F

R04

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R05

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R06

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R07

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R08

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R09

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R10

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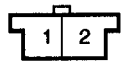
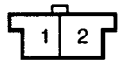
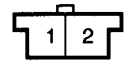
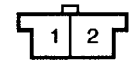
R11 ~ R16

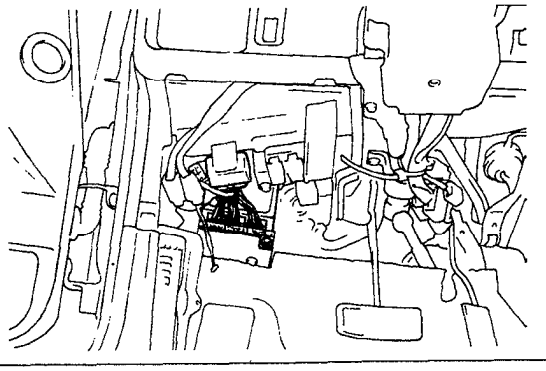
R11  CC01-002F	R12  CC01-002F	R13  CC01-002F	R14  CC01-002F
R15 CC02-005F	R16 BLANK	BLANK	BLANK

MEMO

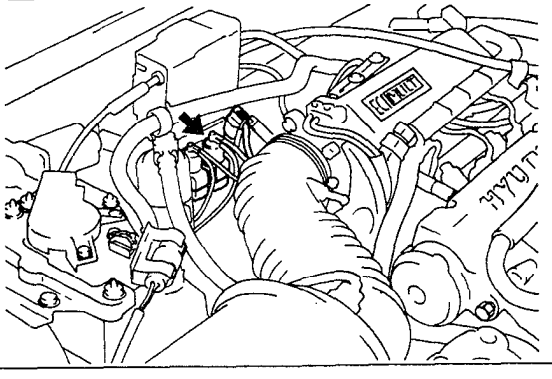
MEMO

COMPONENTS (CO1-1 ~ C12-4)

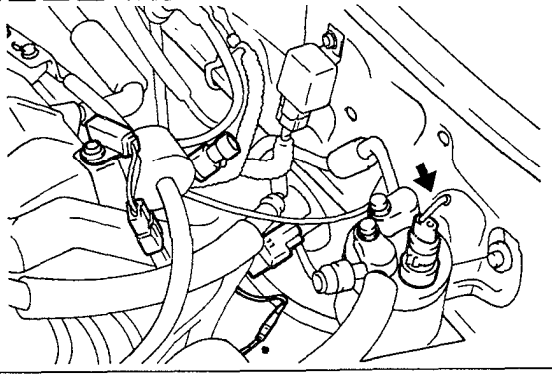
C01-1 ~ C01-3, C01-4 ~ C01-6



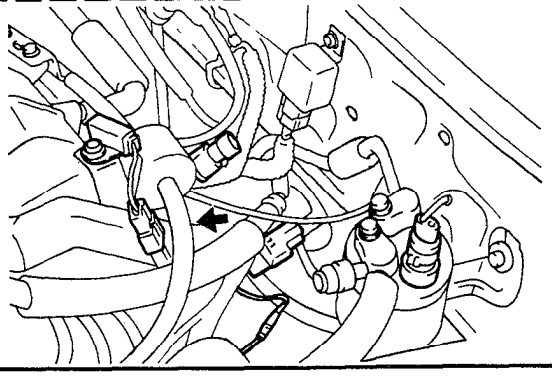
C03



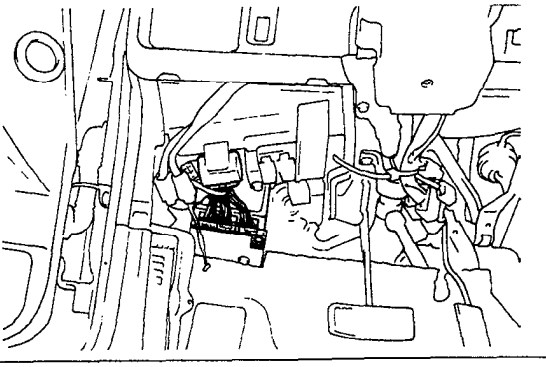
C06



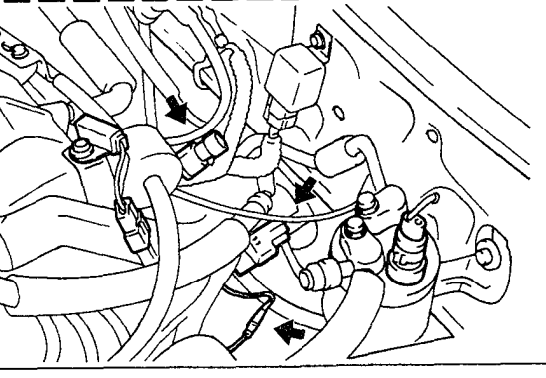
C11



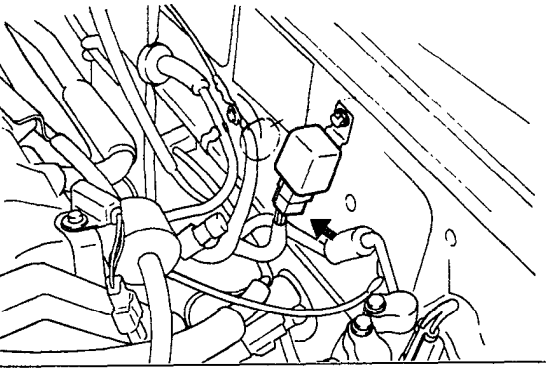
C02



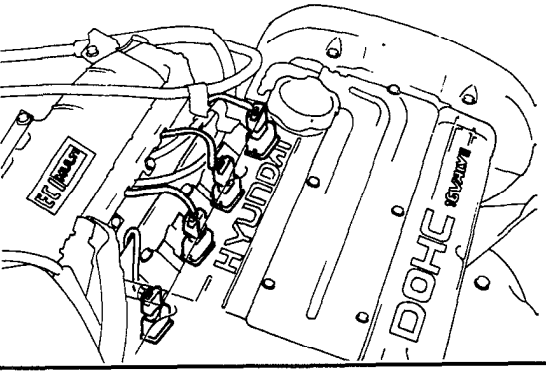
C04, C05, C08



C07

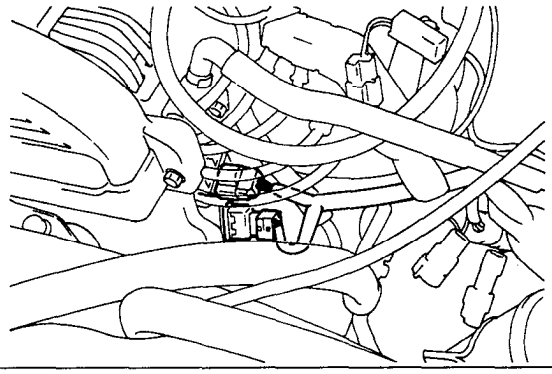


C12-1 ~ C12-4

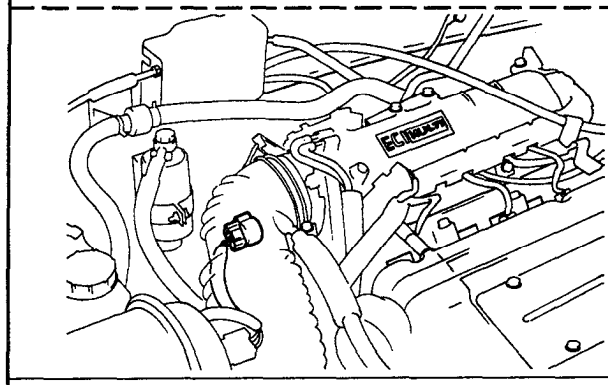


COMPONENTS (CI3 ~ C25)

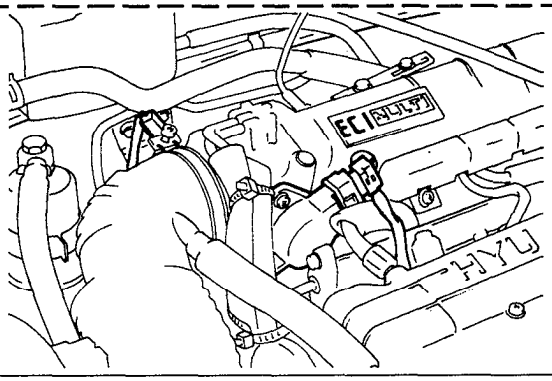
C13, C14



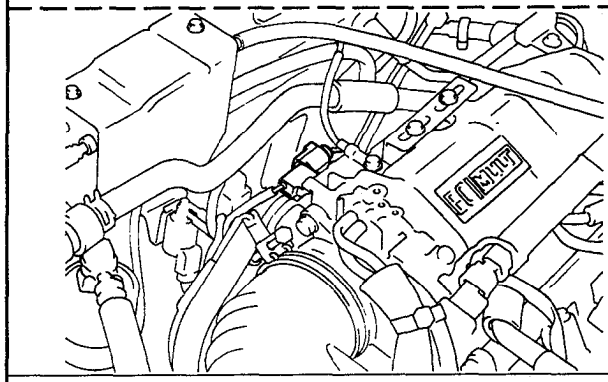
C15



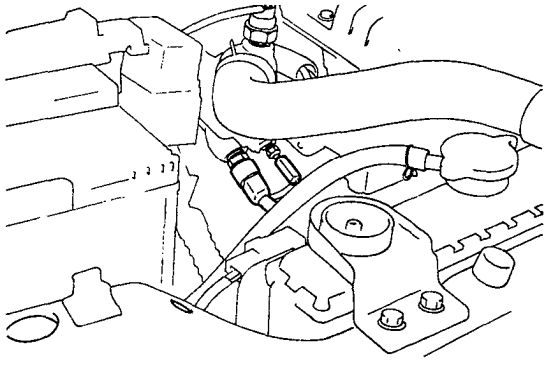
C17



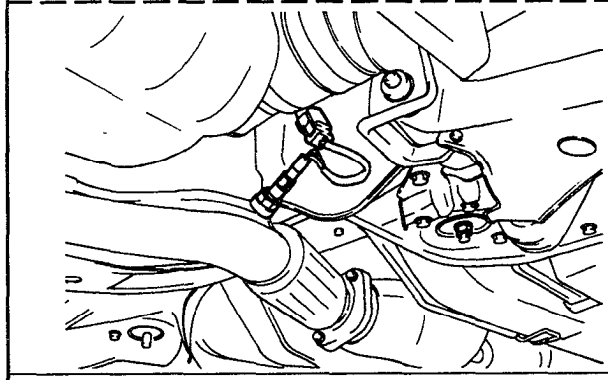
C18



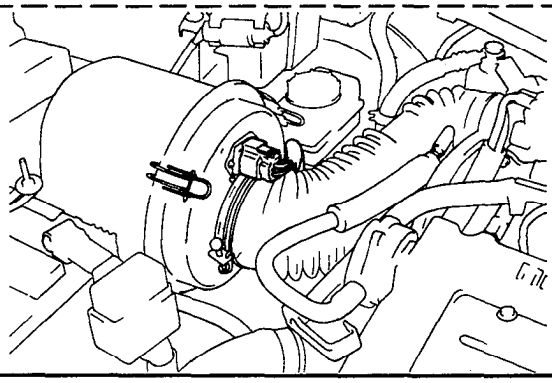
C19, C20



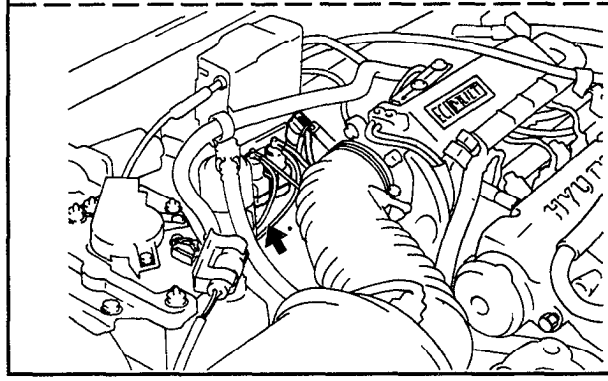
C21



C22

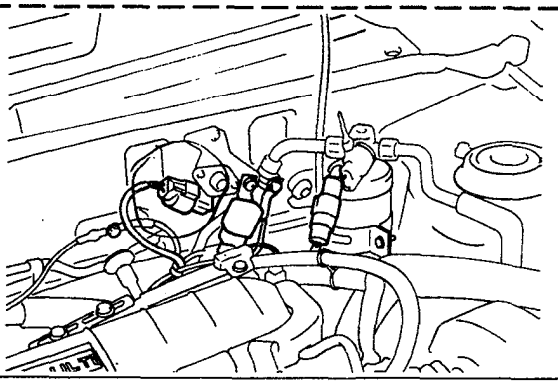


C25

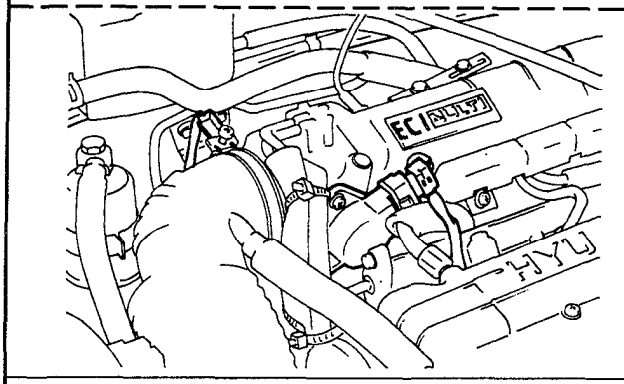


COMPONENTS (C28 ~ C47)

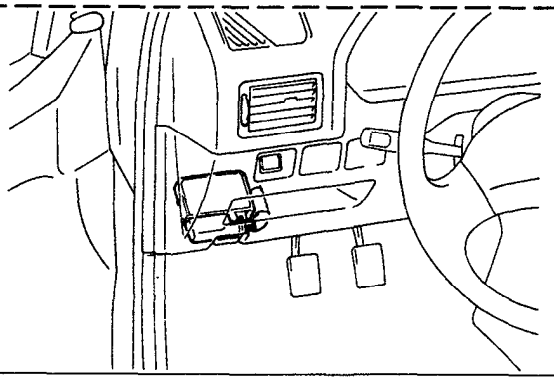
C28



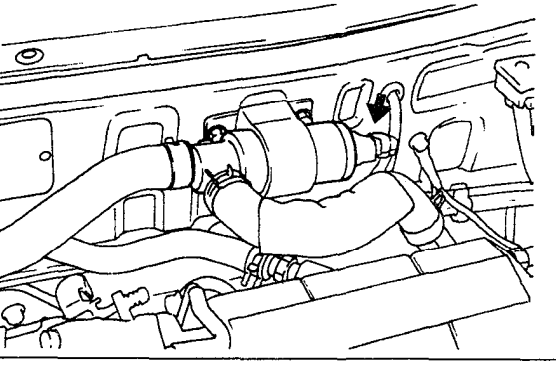
C30



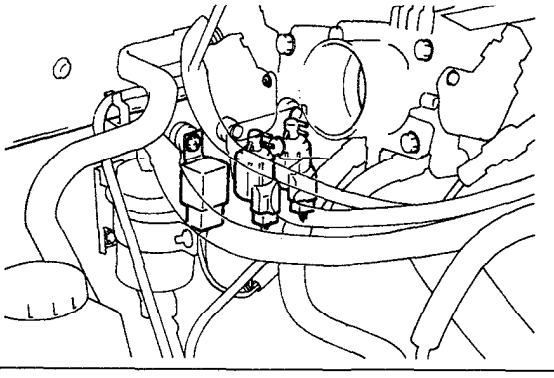
C40



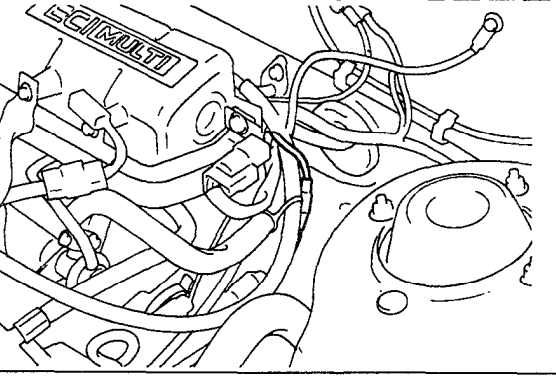
C42, C83



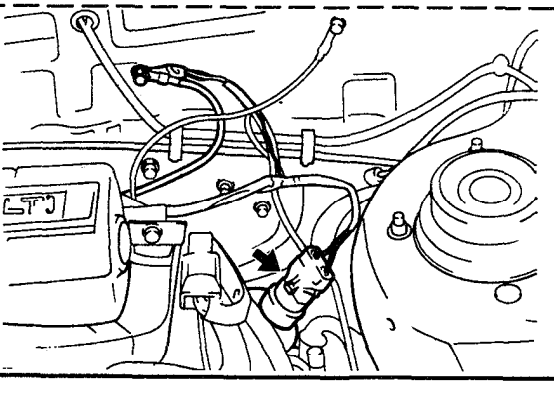
C43, C44, C85



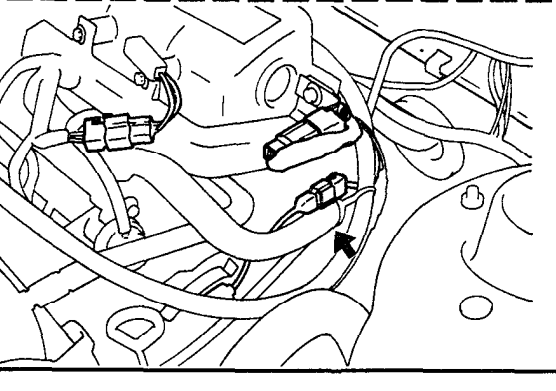
C45, C51, C91



C46, C87

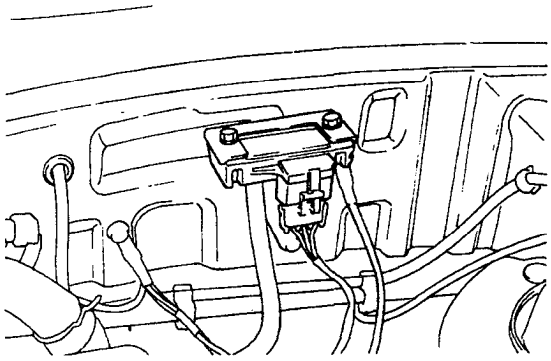


C47, C90

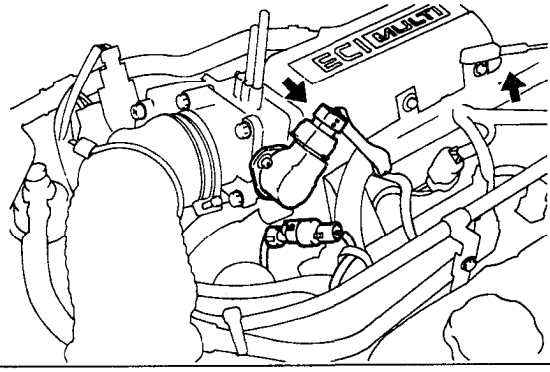


COMPONENTS (C48 ~ C80)

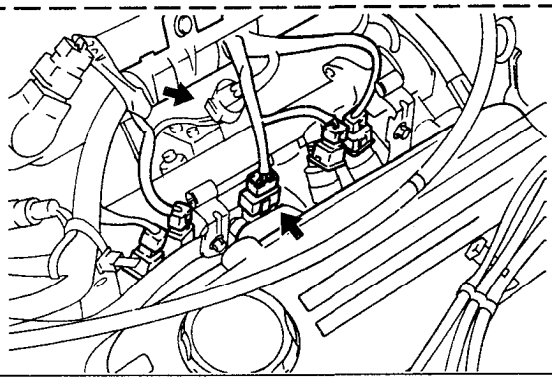
C48



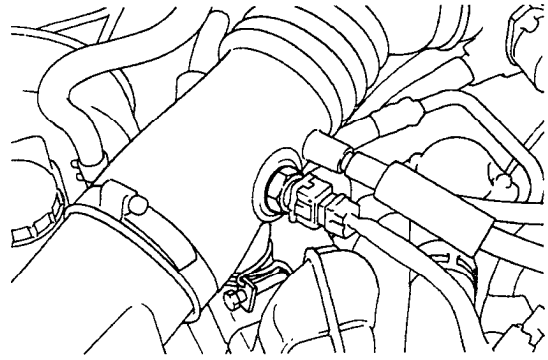
C52, C55, C92, C96



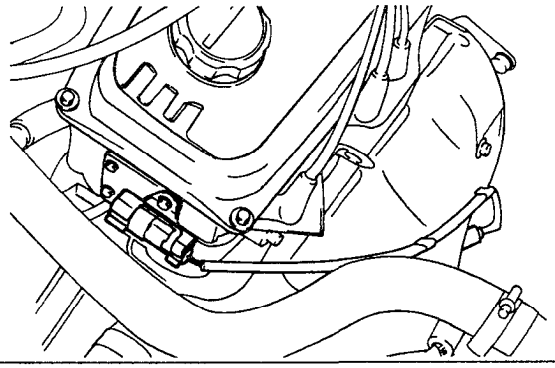
C54, C56, C94, C95



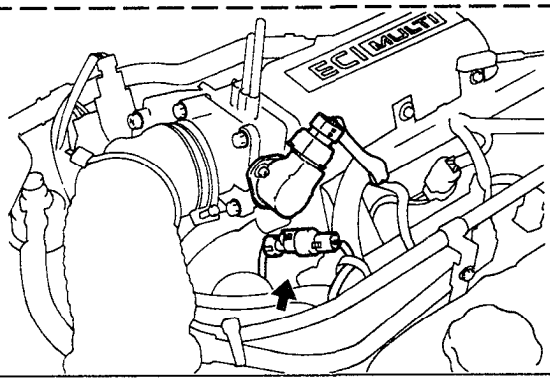
C59, C99



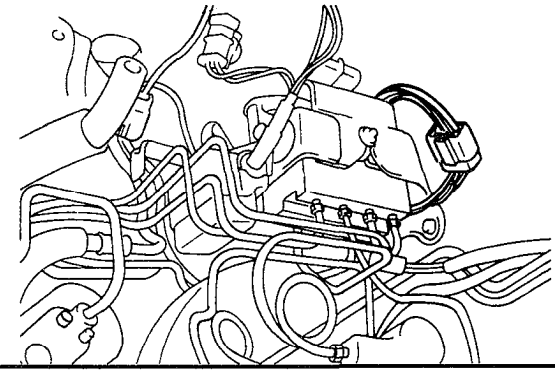
C60, C100



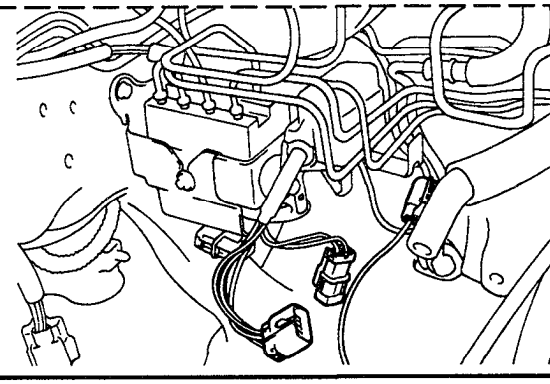
C61, C101



C71

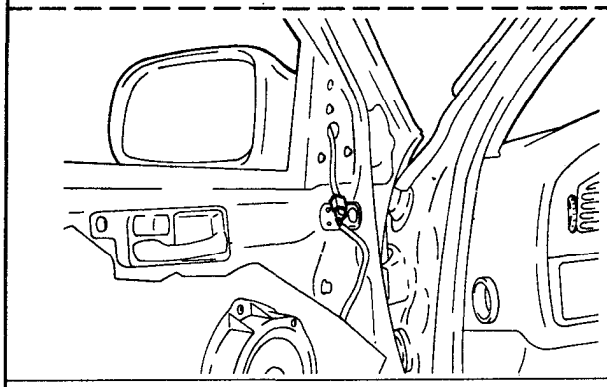


C72, C73, C80

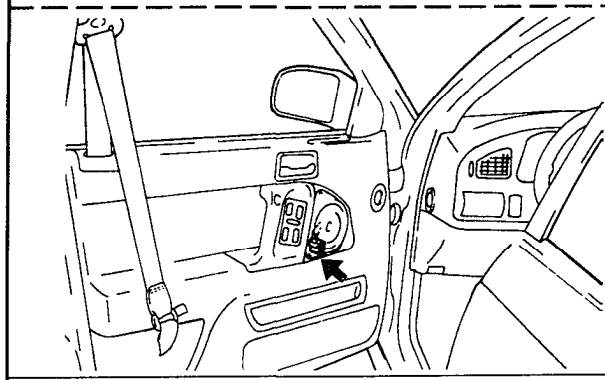


COMPONENTS (DO1 ~ D10)

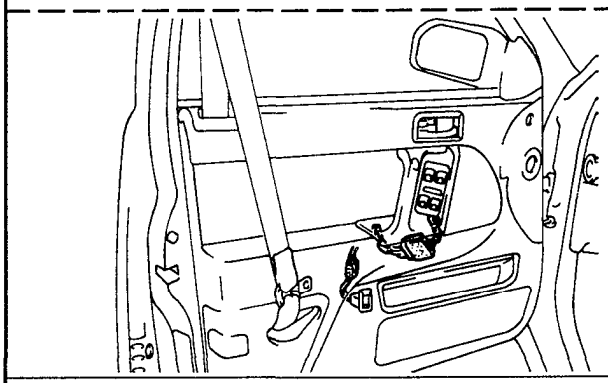
D01 (D11)



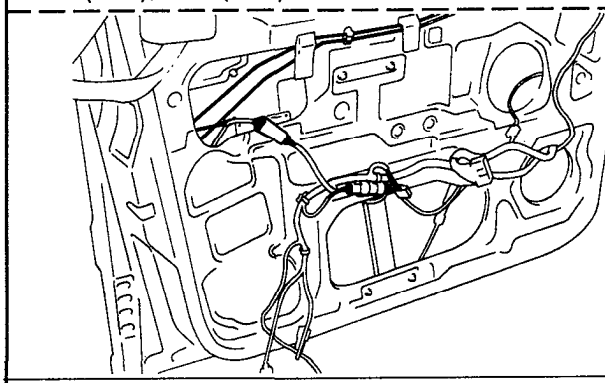
D02 (D12)



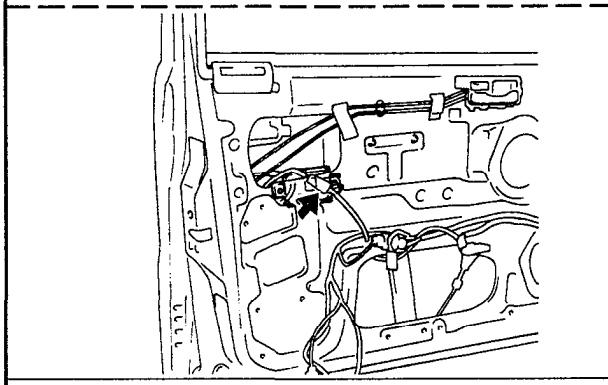
D03



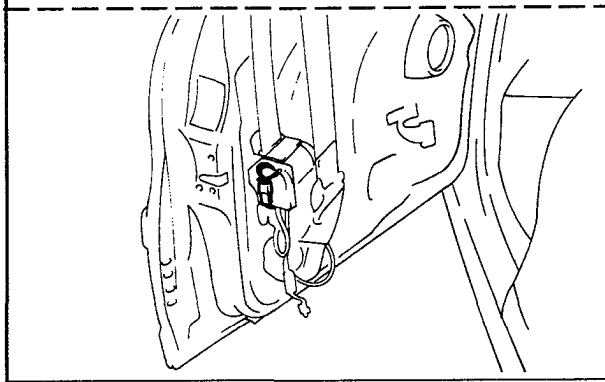
D05 (D15), D07 (D17)



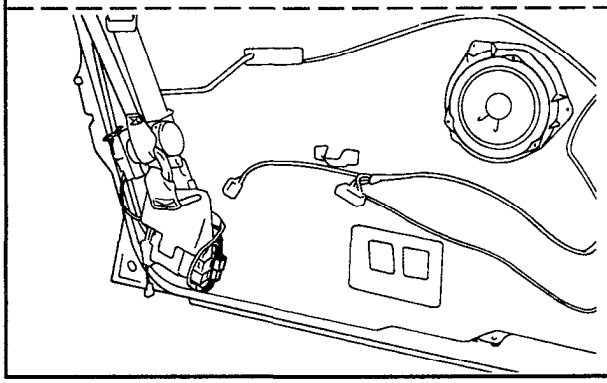
D06 (D16)



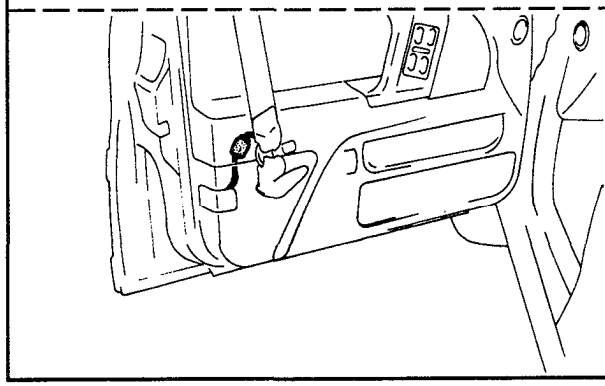
D08 (D18)



D09 (D19)

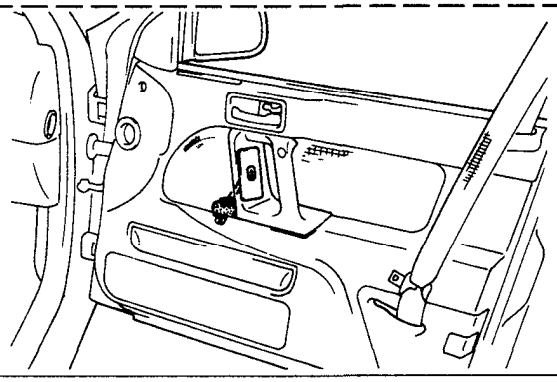


D10 (D20)

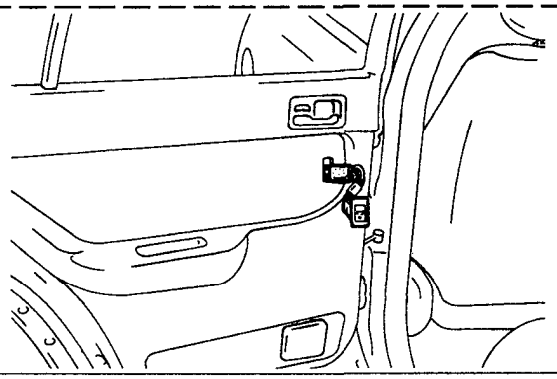


COMPONENTS (D13 ~ D33)

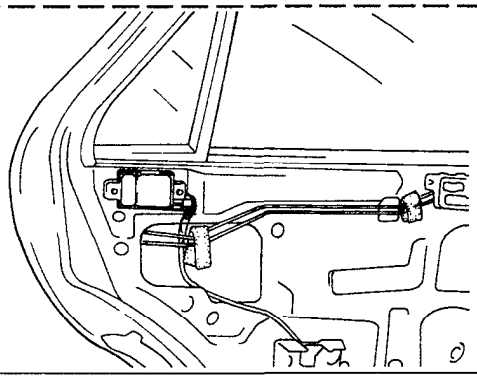
D13



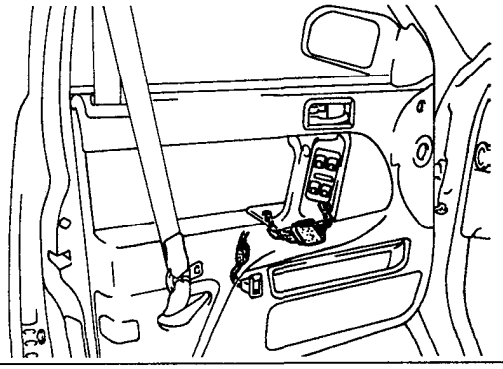
D31 (D41)



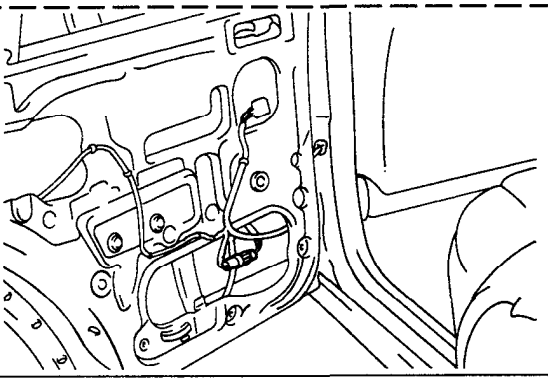
D33 (D43)



D21

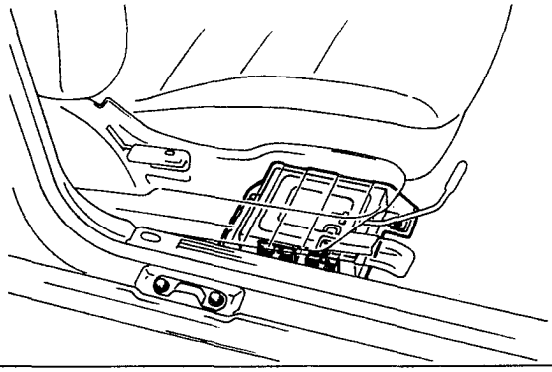


D32 (D42)

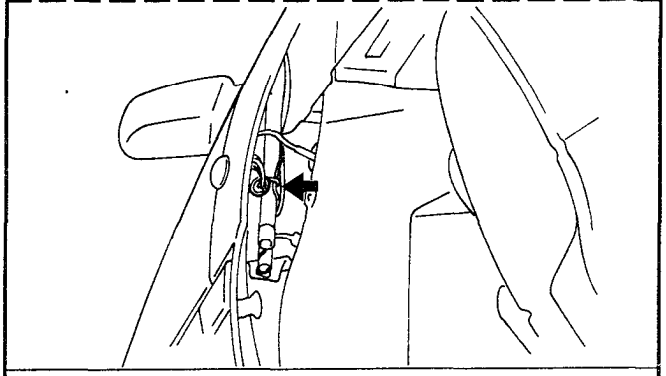


COMPONENTS (E02-1 ~ E23)

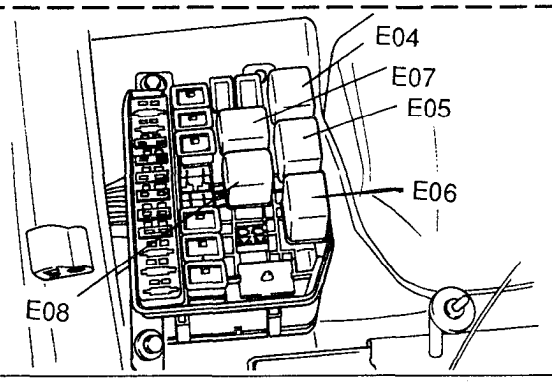
E02-1 ~ E02-2



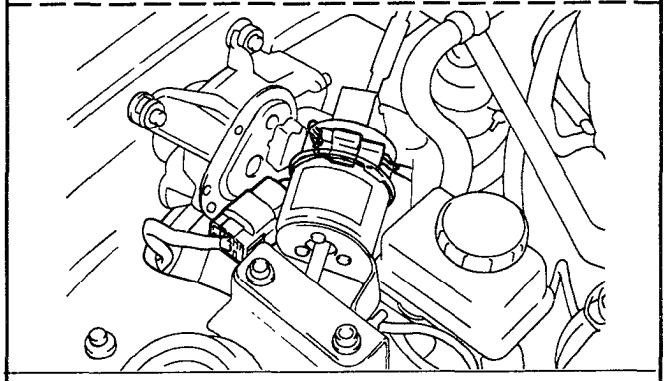
E03



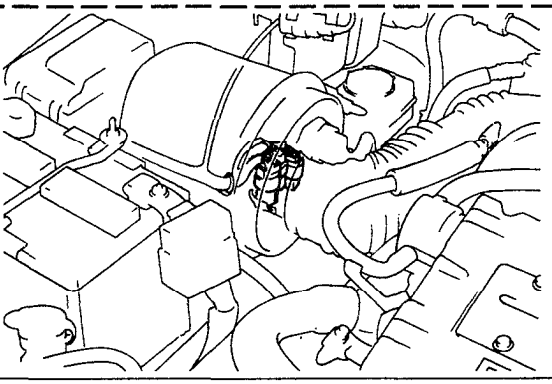
E04, E05, E06, E07, E08



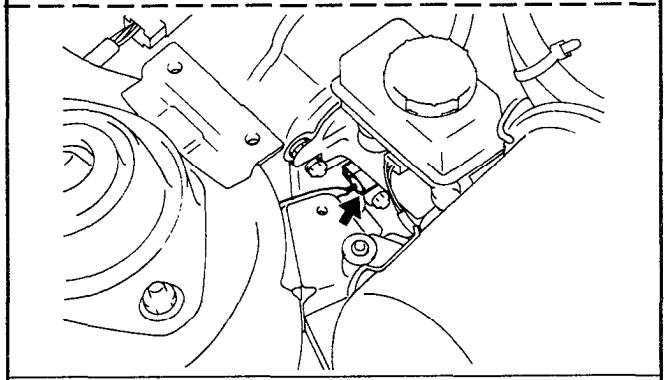
E09, E16



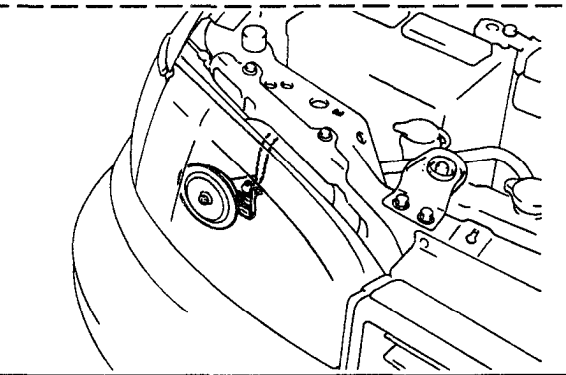
E11, E12, E13



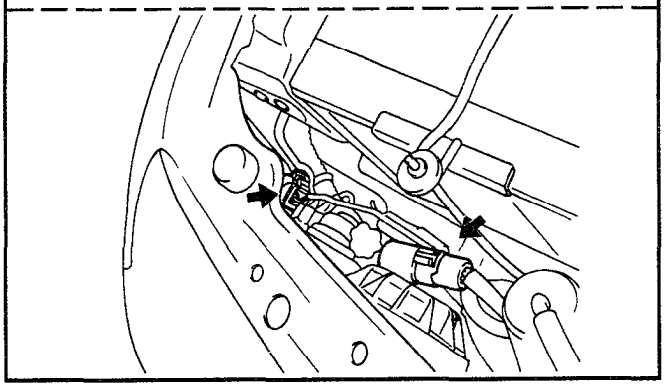
E14



E18

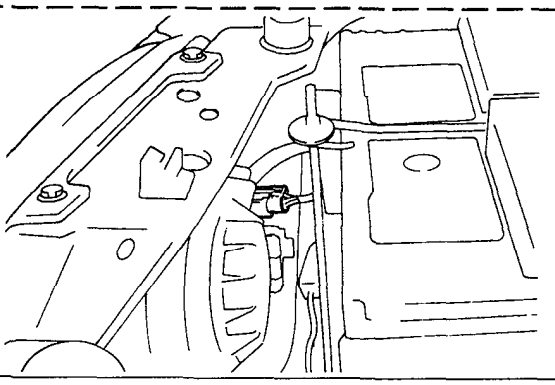


E20, E23

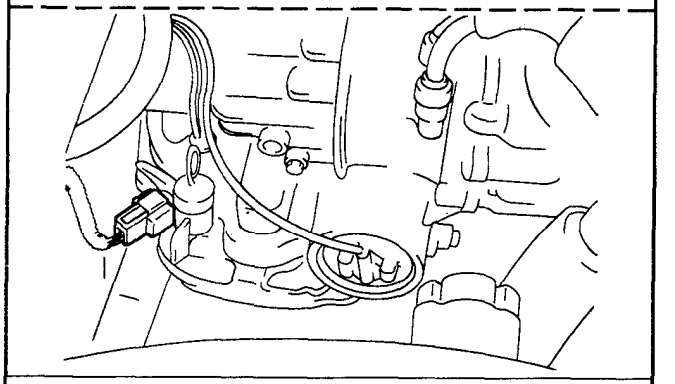


COMPONENTS (E24 ~ E31-2)

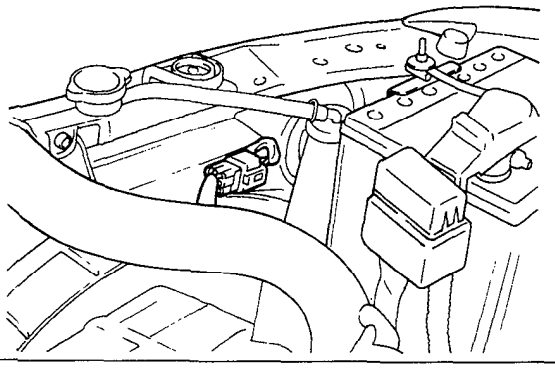
E24



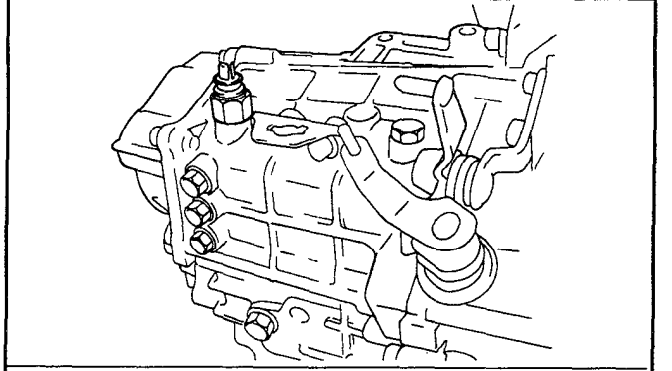
E25



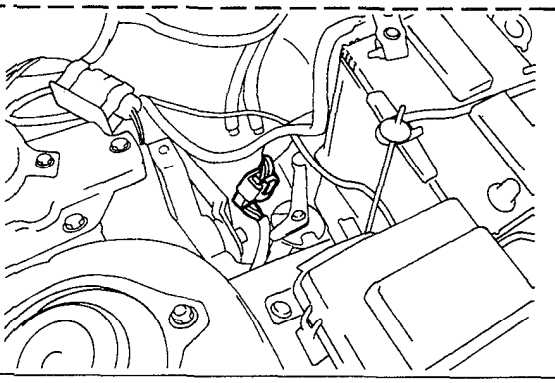
E26



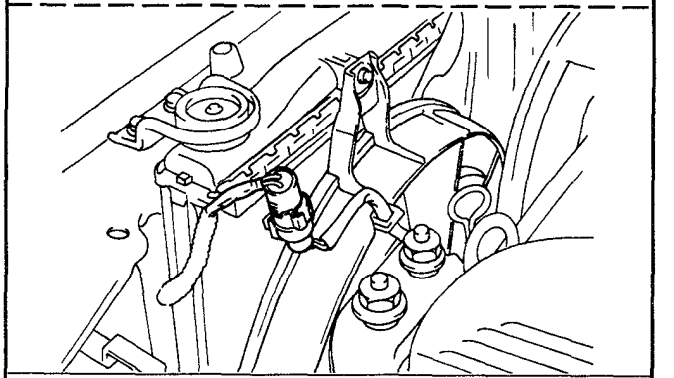
E27



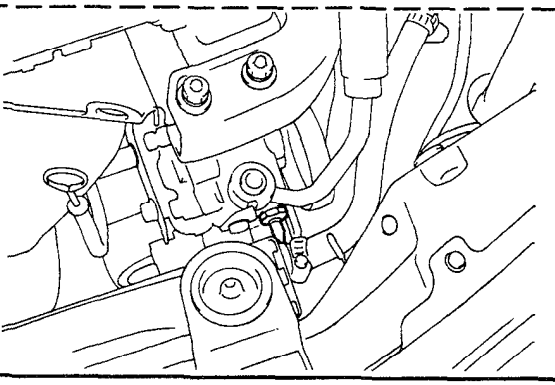
E28



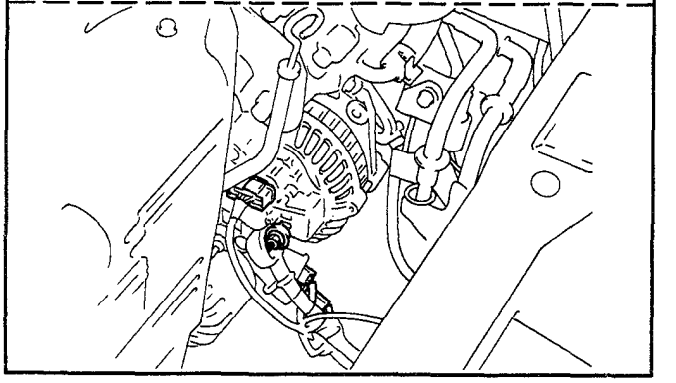
E29



E30

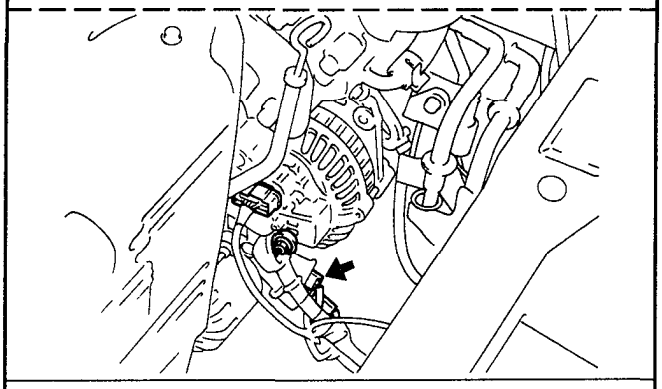


E31-1, E31-2

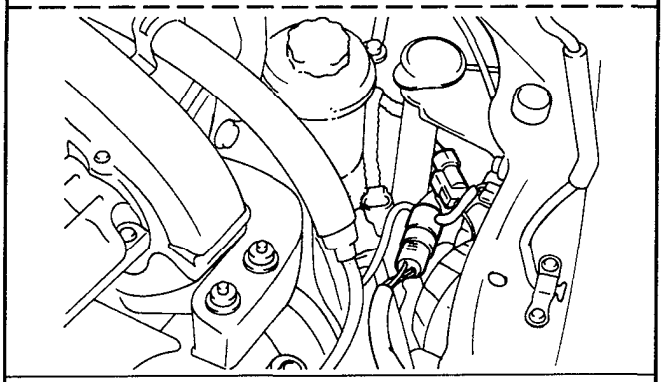


COMPONENTS (E32 ~ E44)

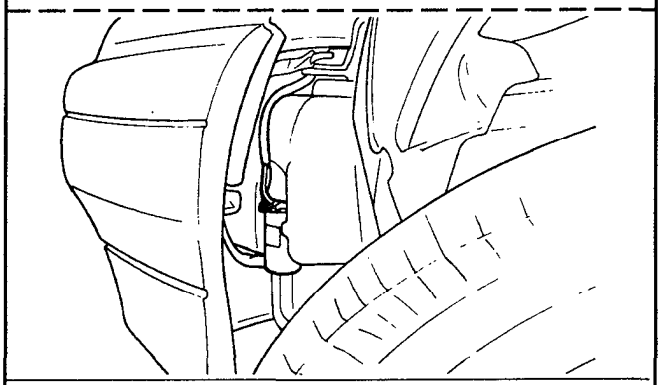
E32



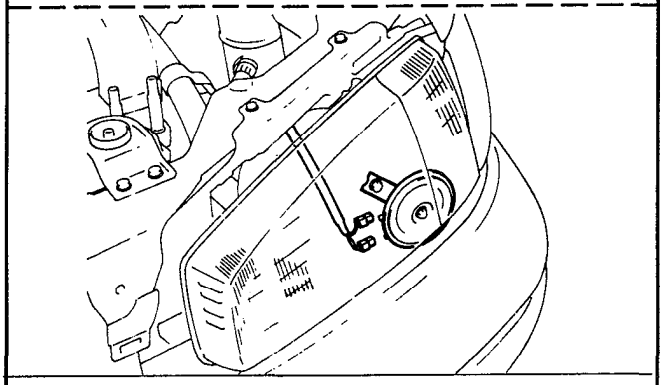
E33, E36



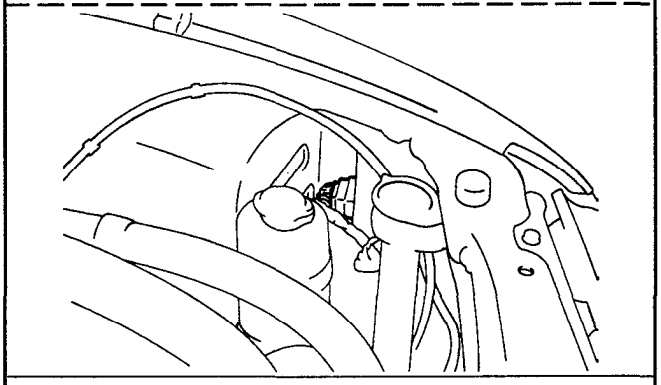
E37



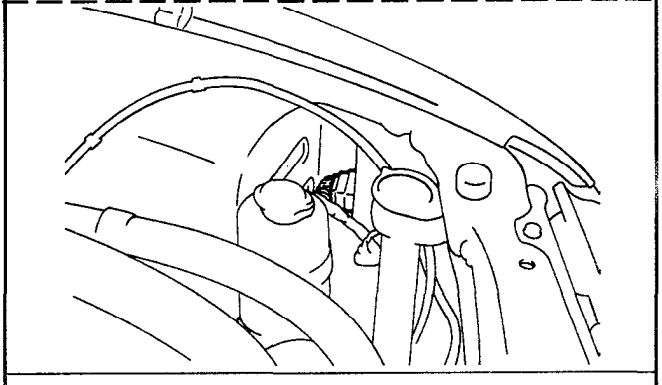
E38



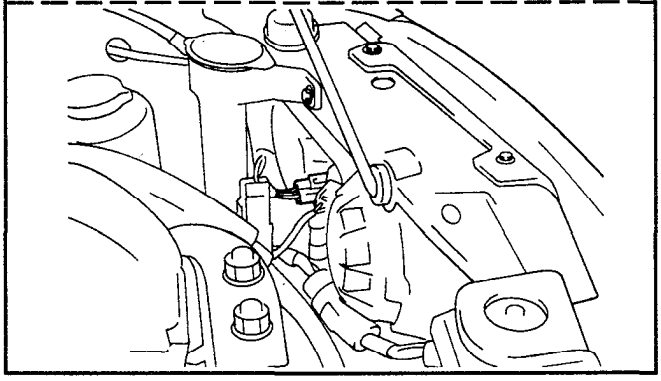
E39



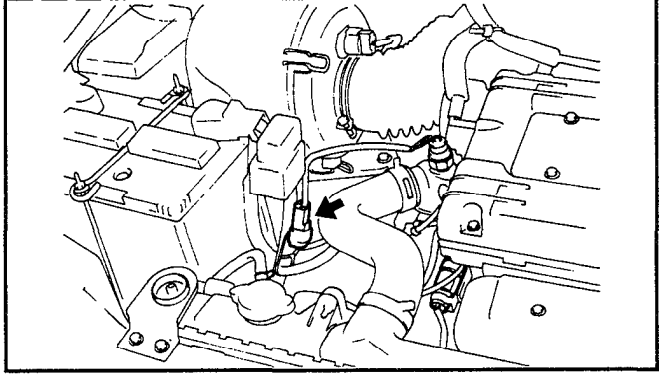
E40



E41

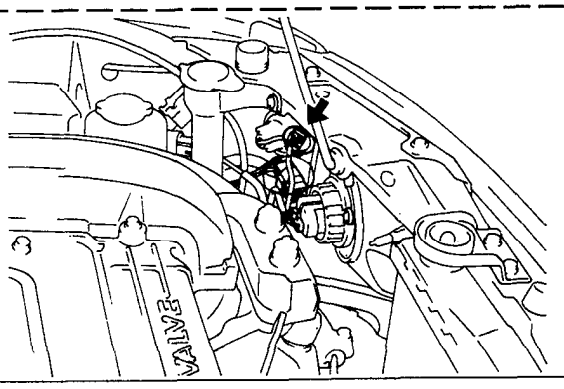


E44

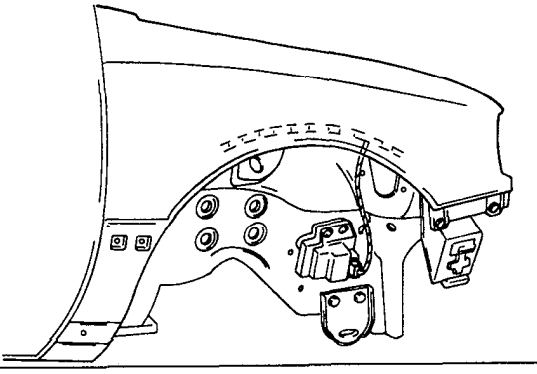


COMPONENTS (E50 ~ EM06)

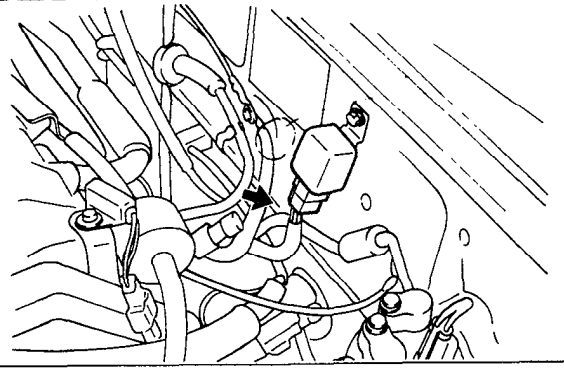
E50



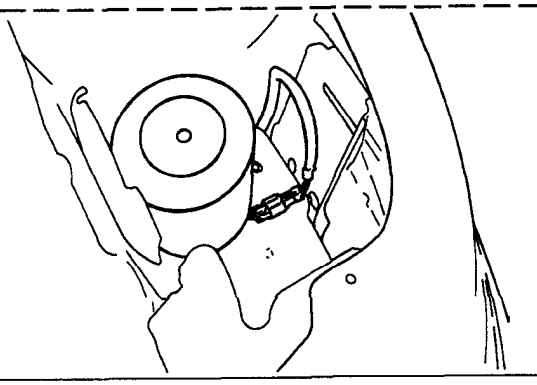
E51



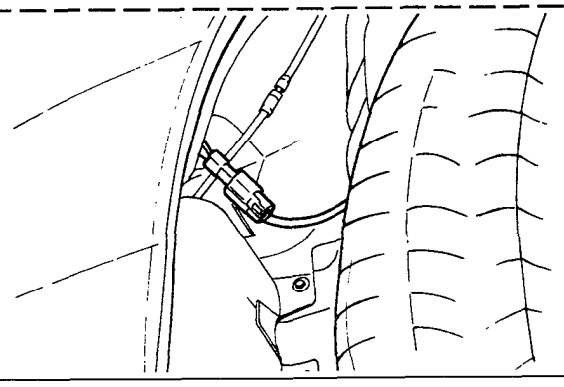
E53



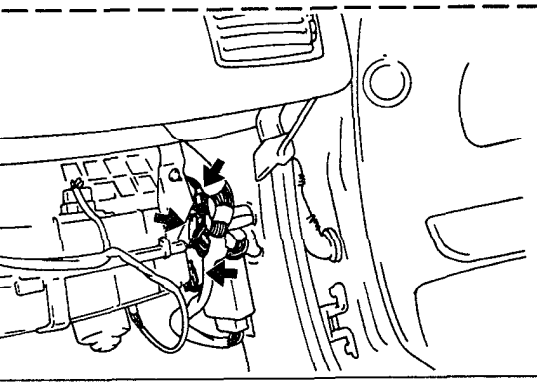
E55



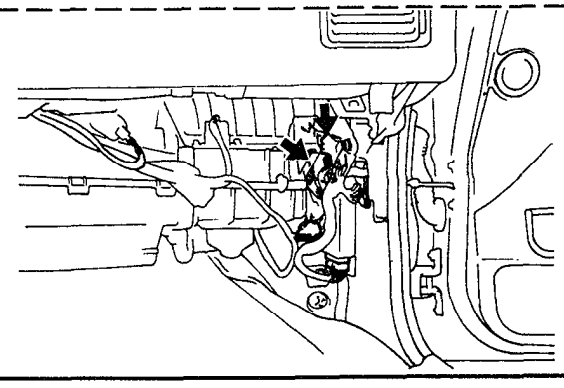
E56



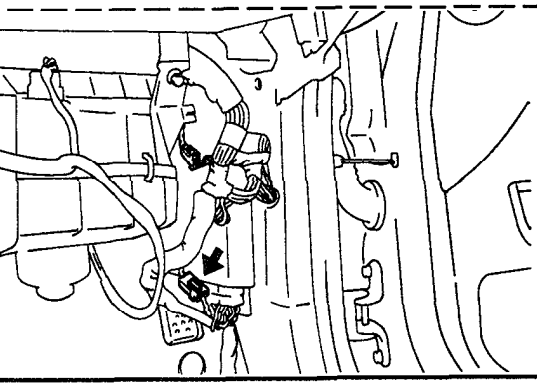
EM01 ~ EM03



EM04, EM05

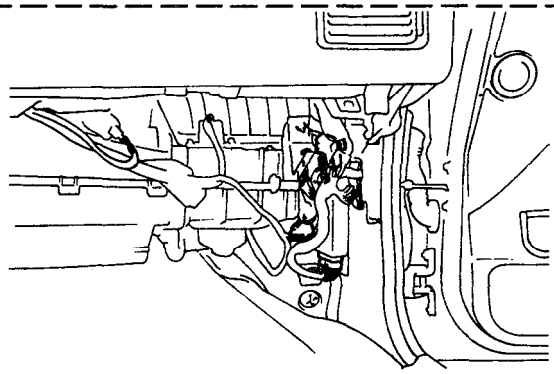


EM06

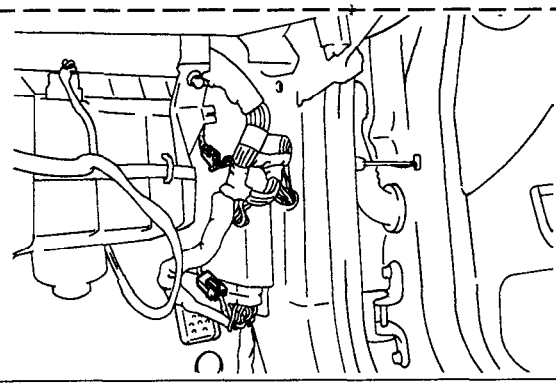


COMPONENTS (EM07 ~ EI02)

EM07

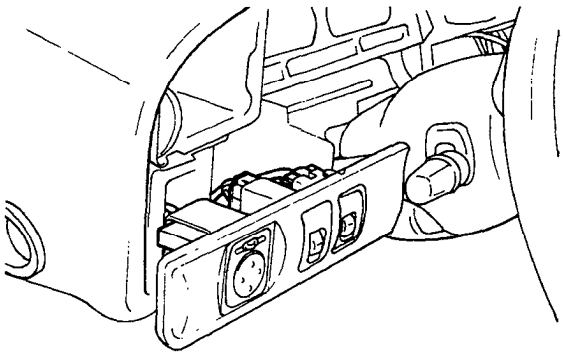


EI01, EI02

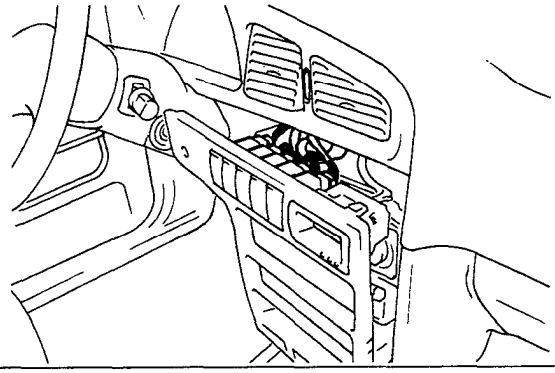


COMPONENTS (I01 ~ I20)

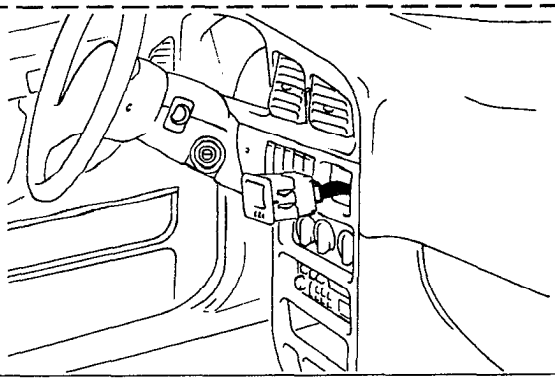
I01, I02



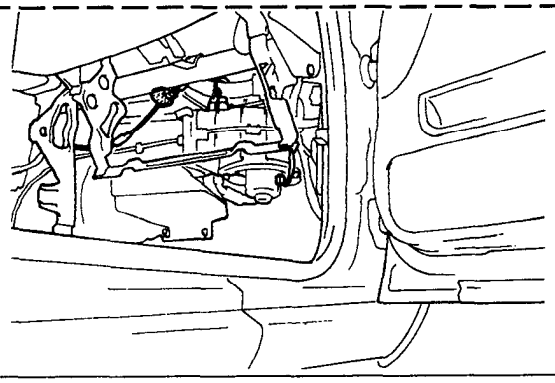
I06 ~ I10



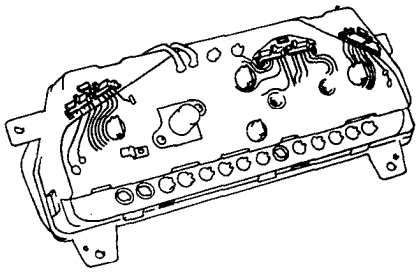
I11



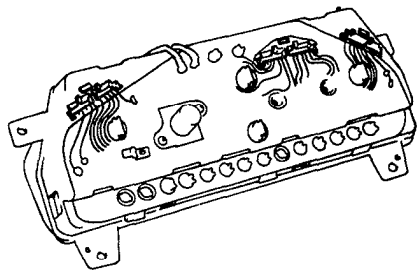
I12



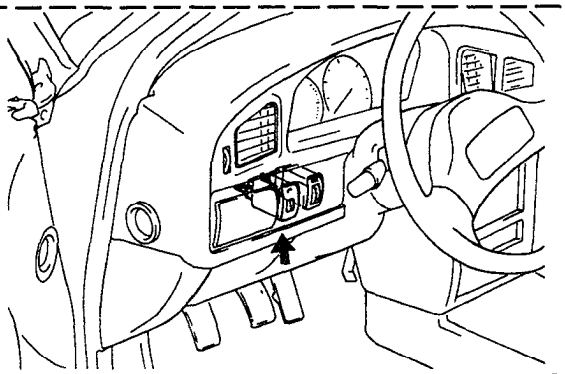
I13-1 ~ I13-3



I13-4

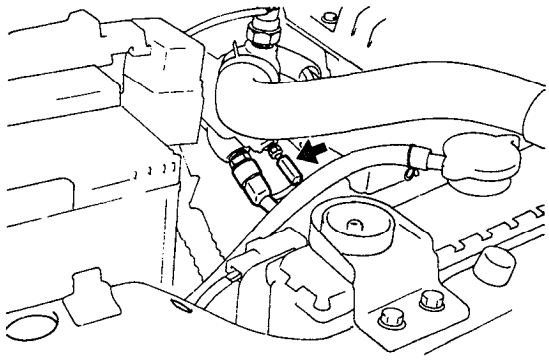


I20

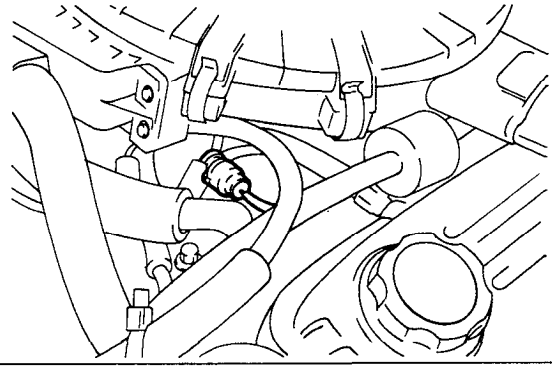


COMPONENTS (M02 ~ M22)

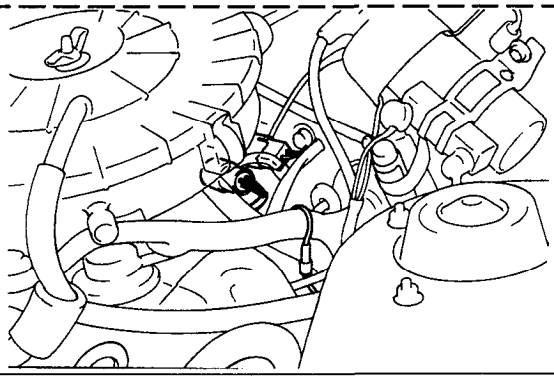
M02



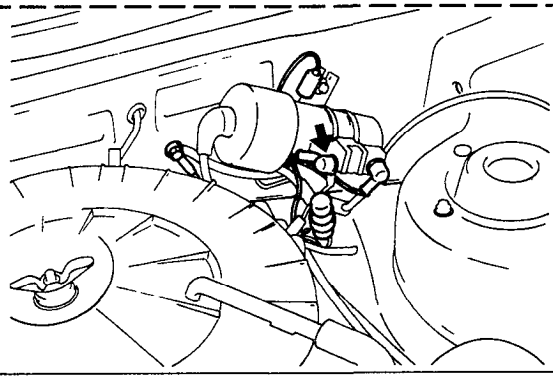
M04



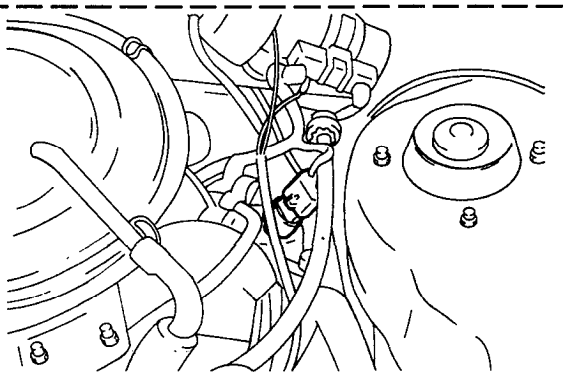
M05, M06, M09



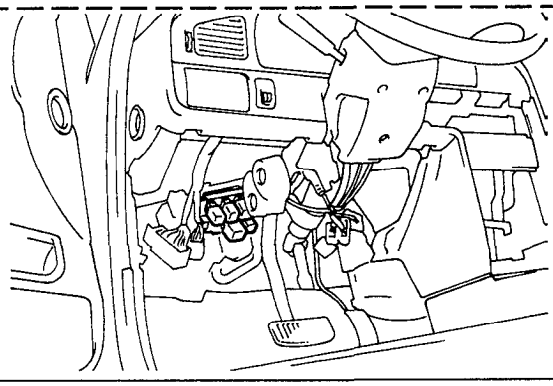
M07



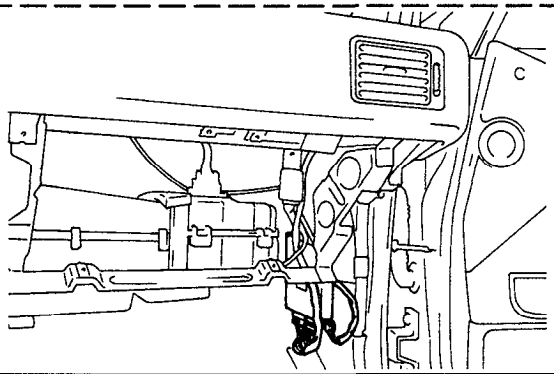
M10



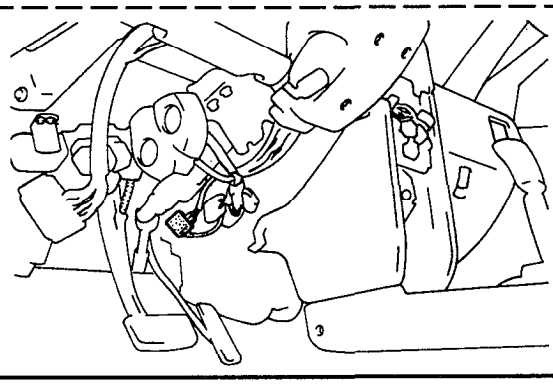
M14 ~ M20



M21

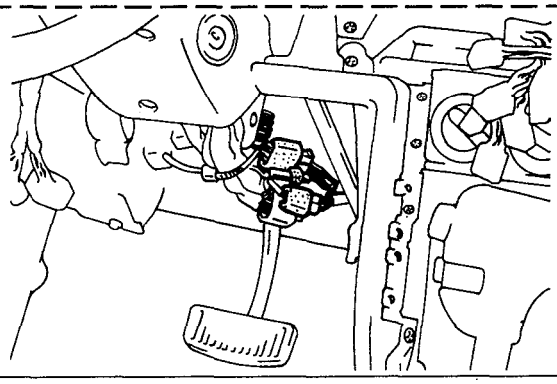


M22

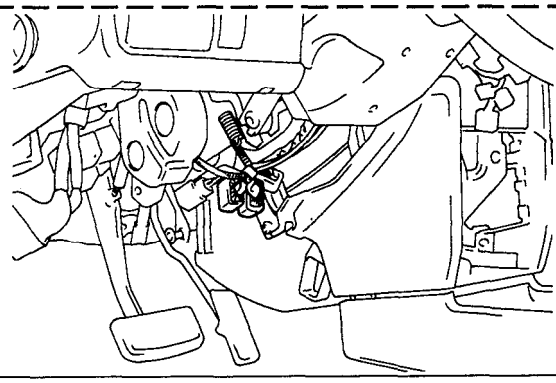


COMPONENTS (M23 ~ M32)

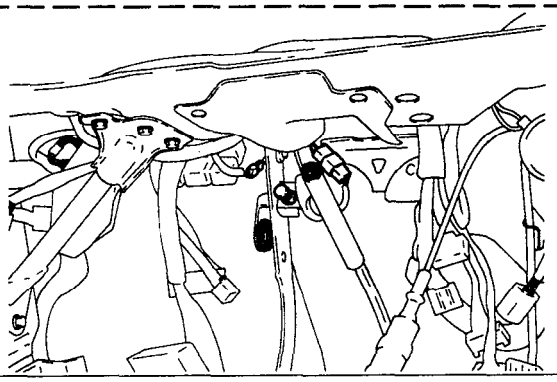
M23, M24, M25



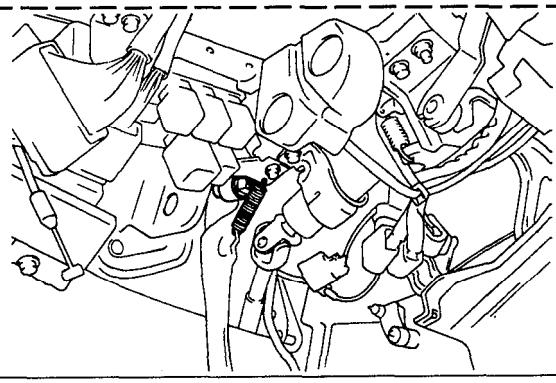
M26-1, M26-2



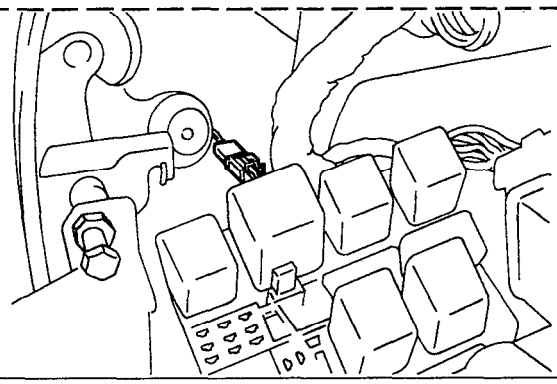
M27



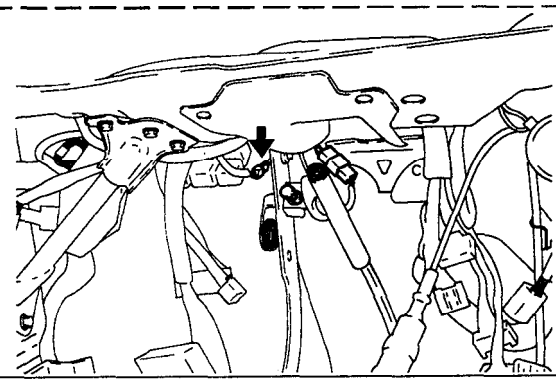
M28



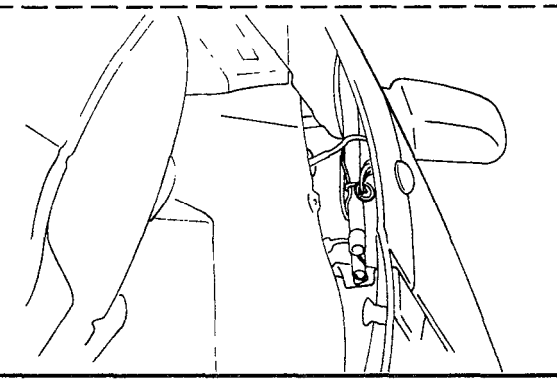
M29



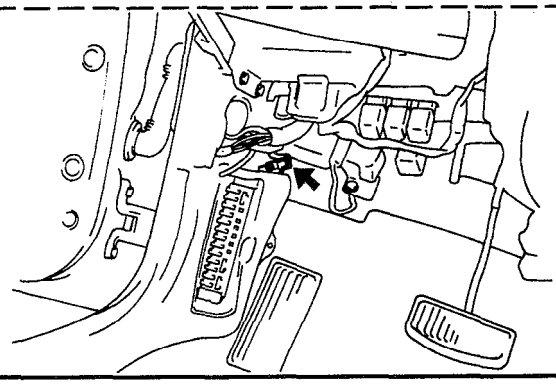
M30



M31

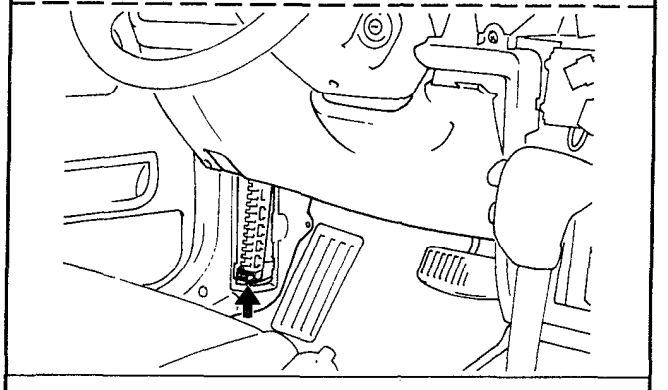


M32

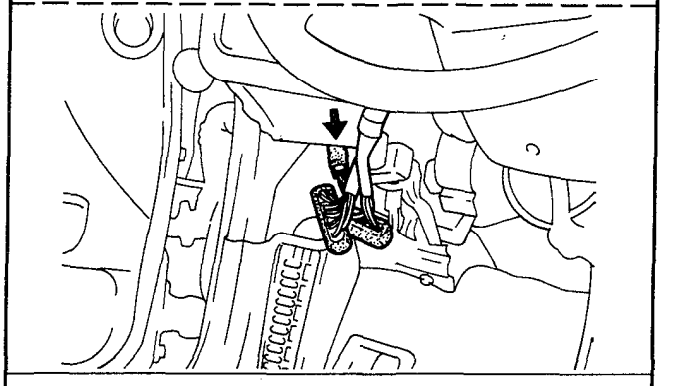


COMPONENTS (M33 ~ M43)

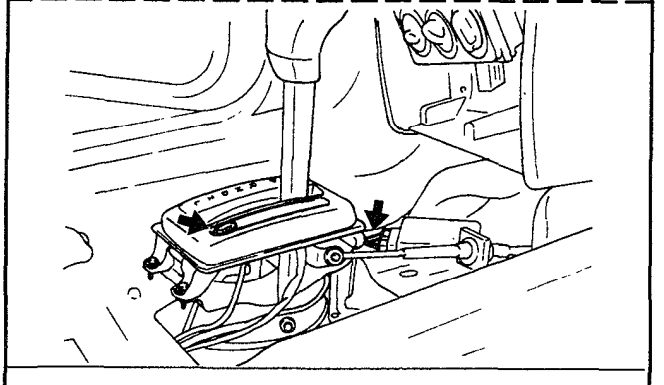
M33



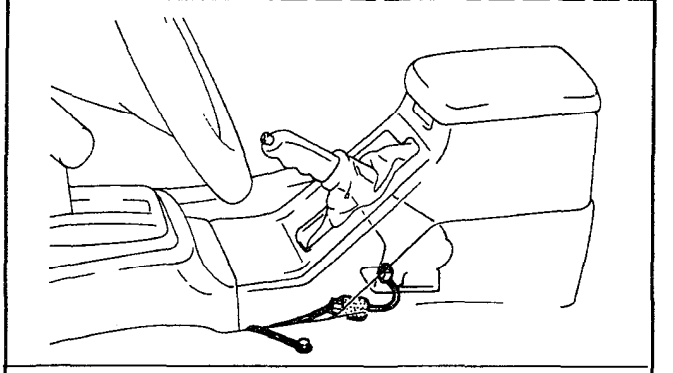
M34



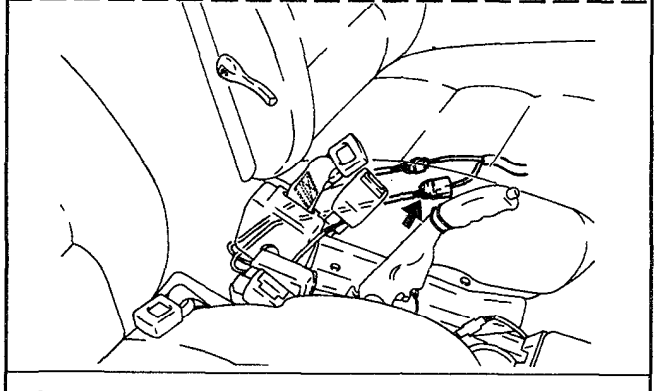
M35, M41



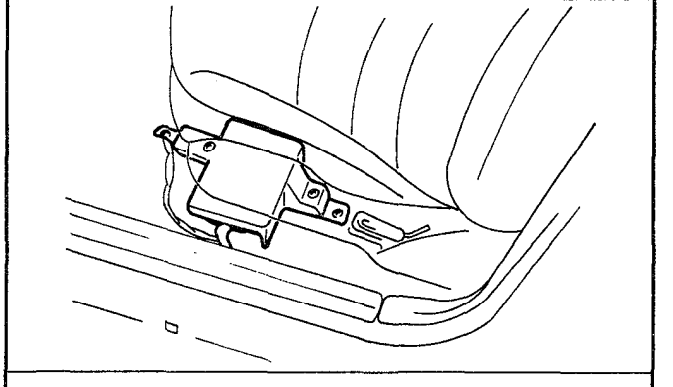
M36



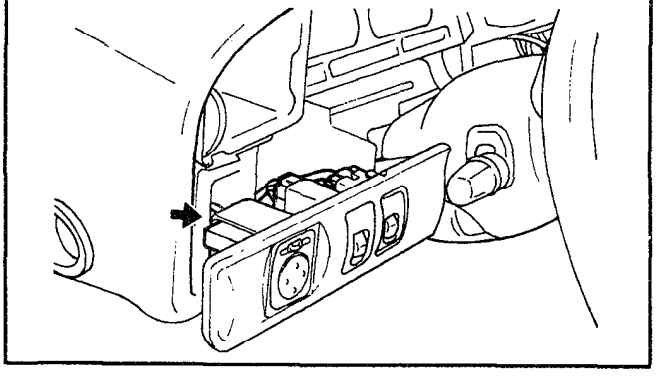
M37



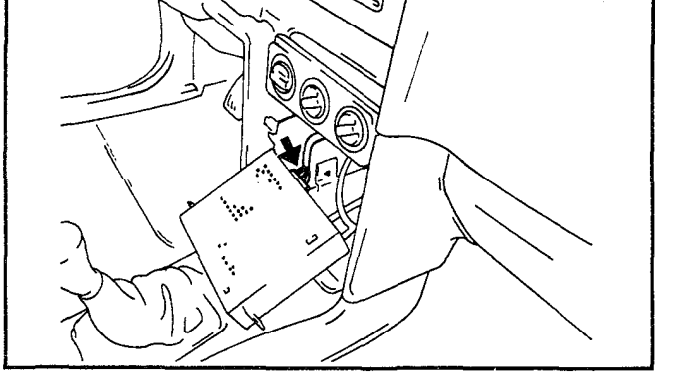
M38



M42

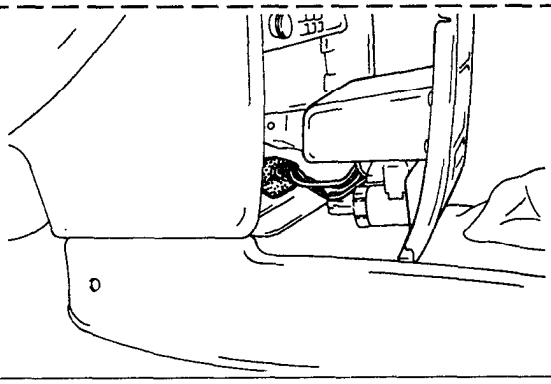


M43

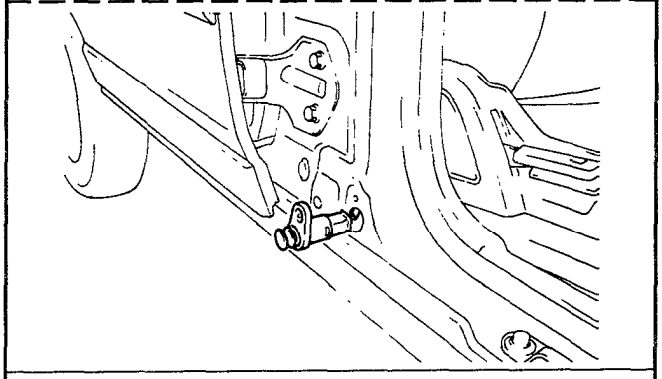


COMPONENTS (M44 ~ M53)

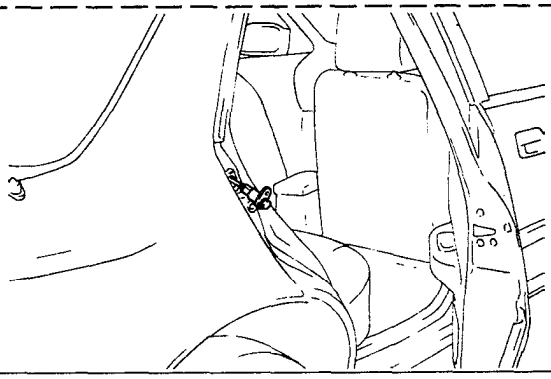
M44



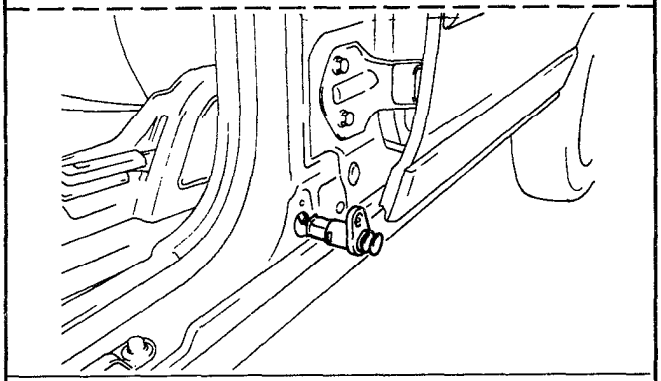
M45



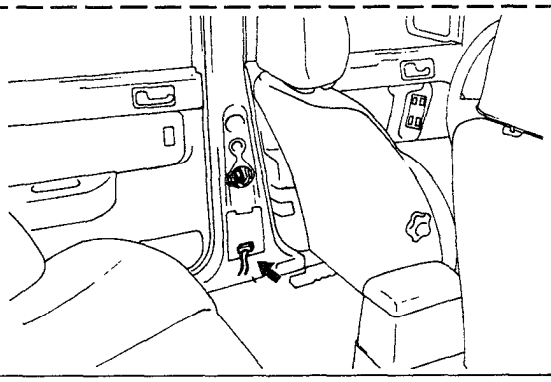
M46



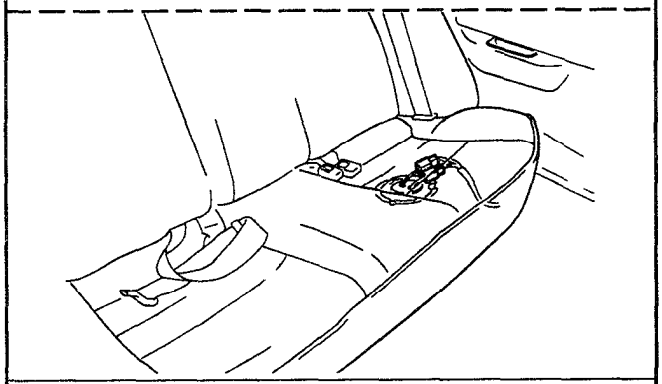
M47



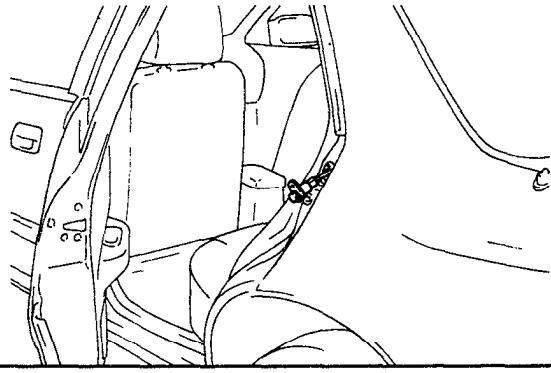
M48



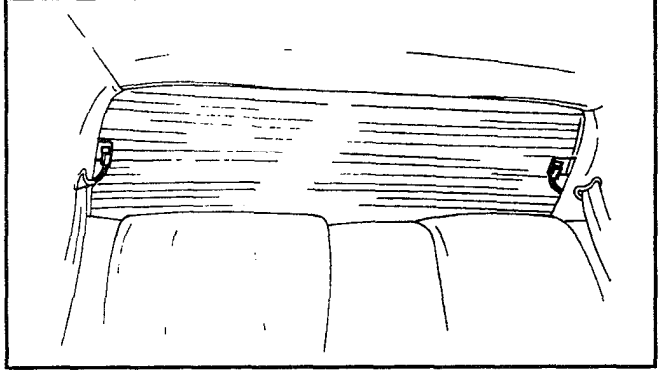
M49, M50



M52

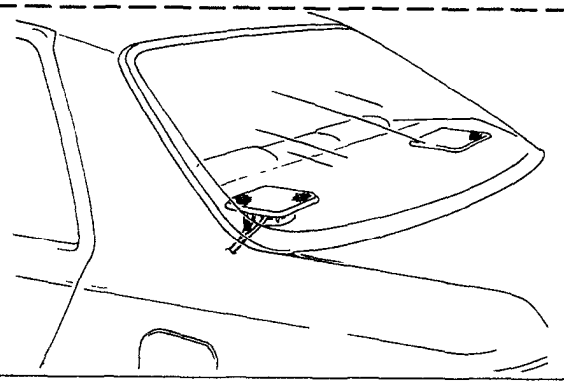


M53

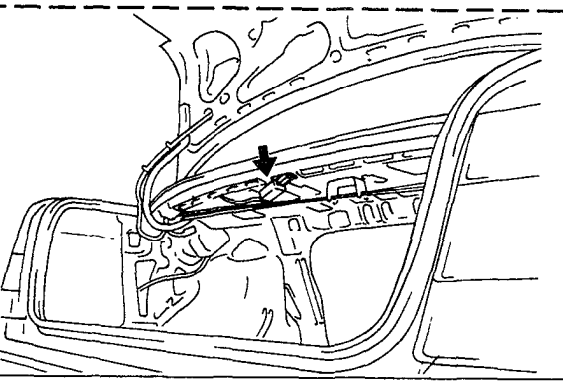


COMPONENTS (M54 ~ M68)

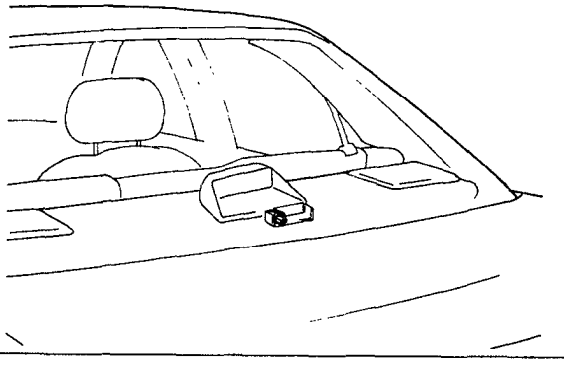
M54



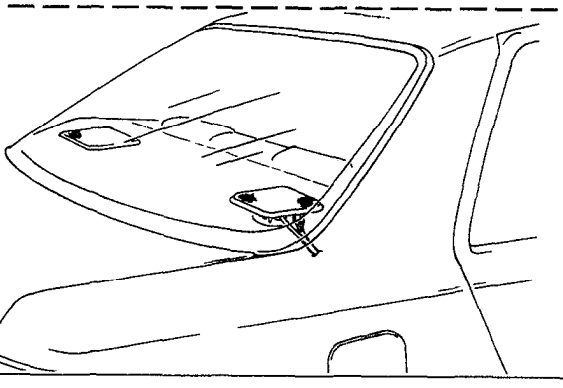
M55



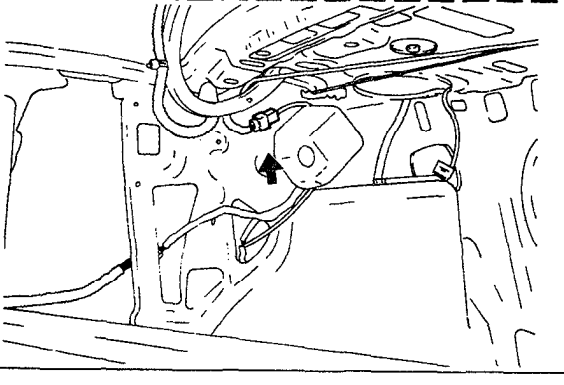
M56



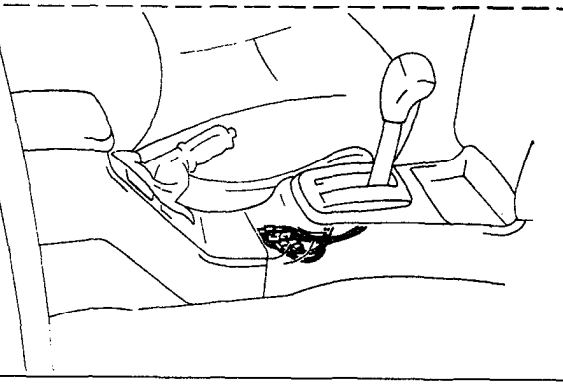
M57



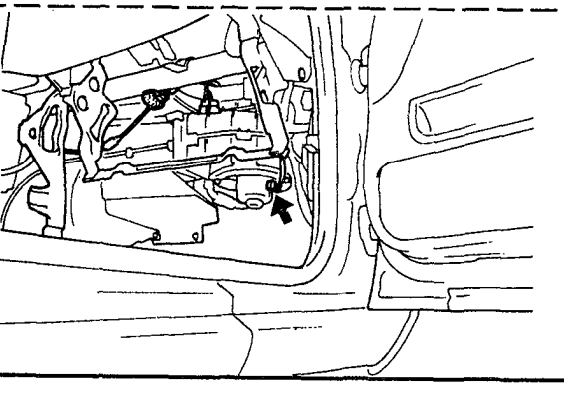
M58



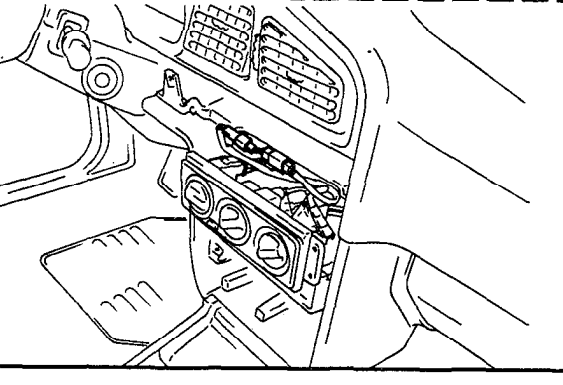
M60, M64, M65, M66



M61, M63

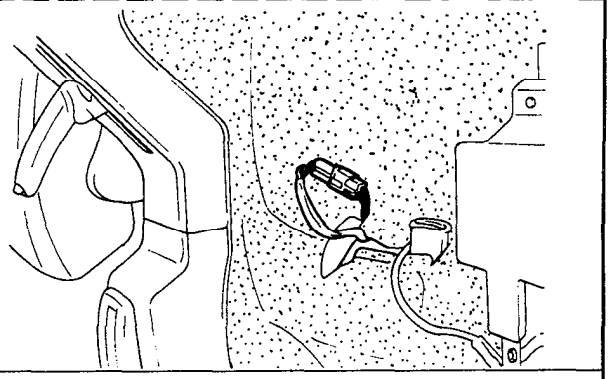


M62, M67, M68

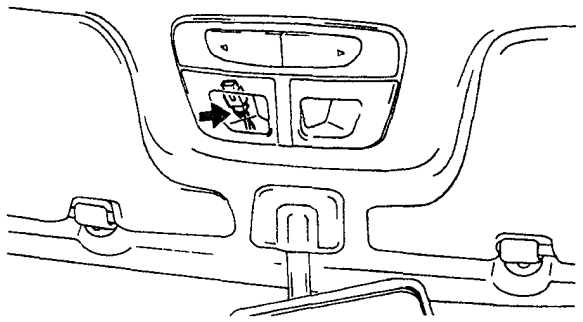


COMPONENTS (M70 ~ M80)

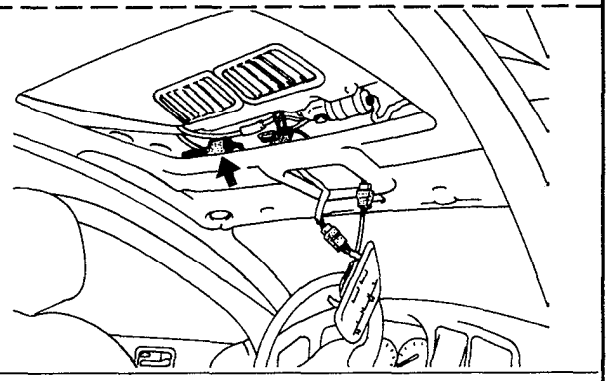
M70



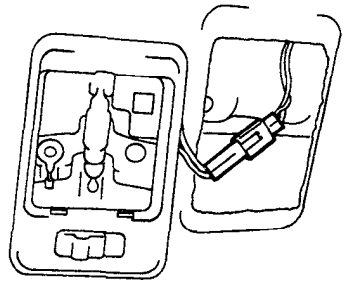
M71



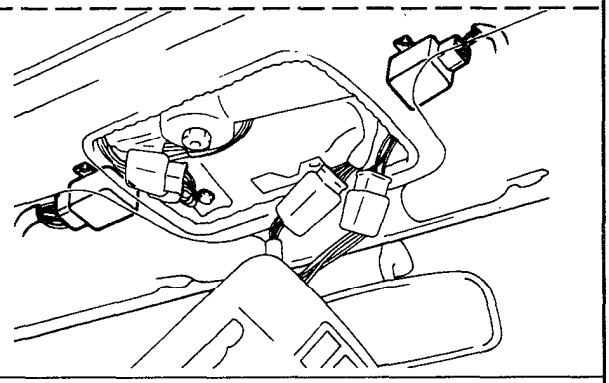
M72



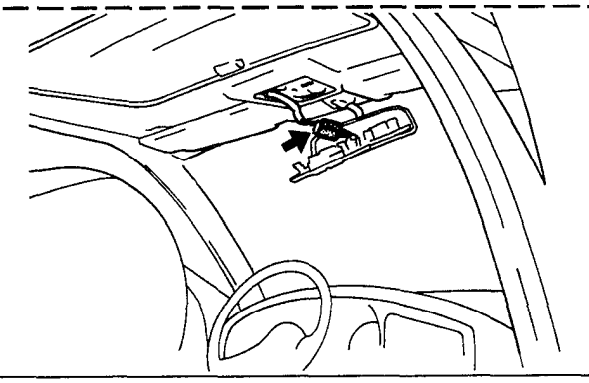
M73



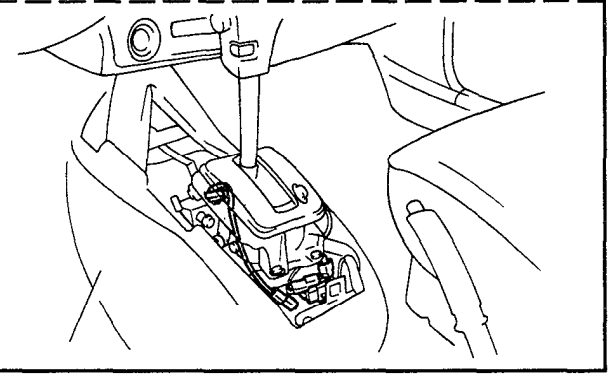
M76, M77



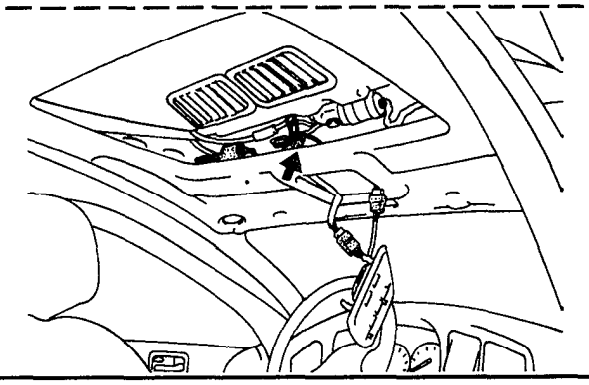
M78



M79

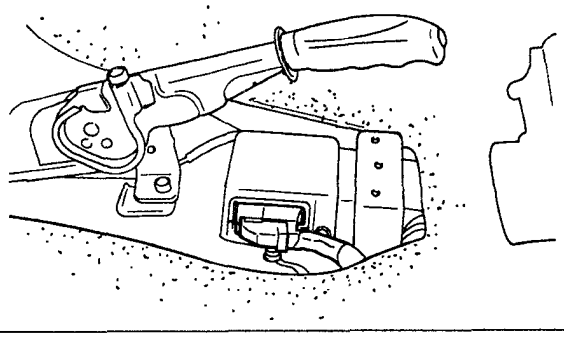


M80

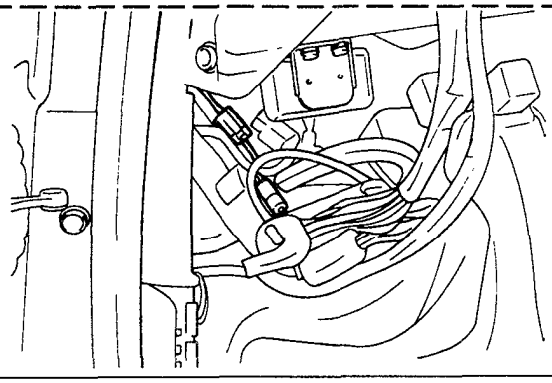


COMPONENTS (M81 ~ M95)

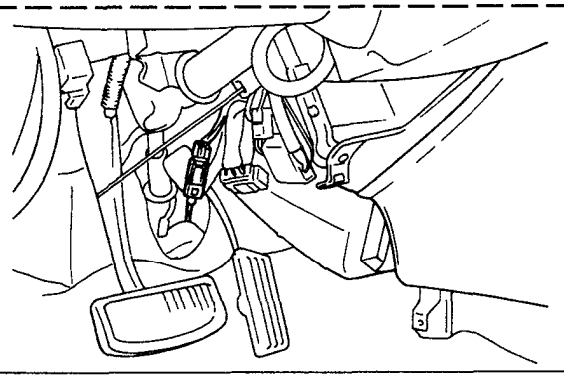
M81



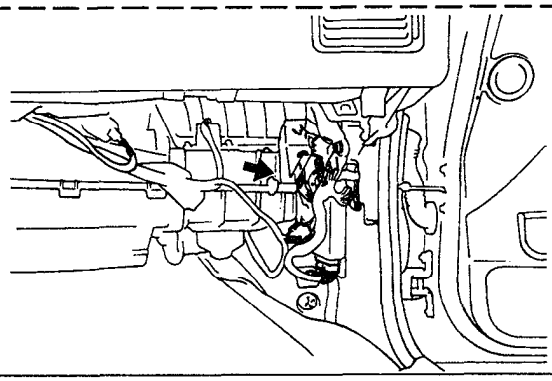
M82, M83



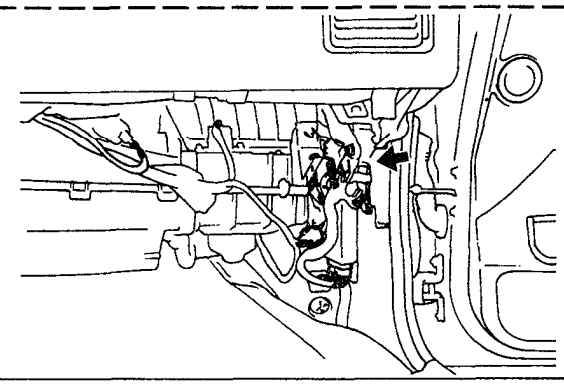
M84



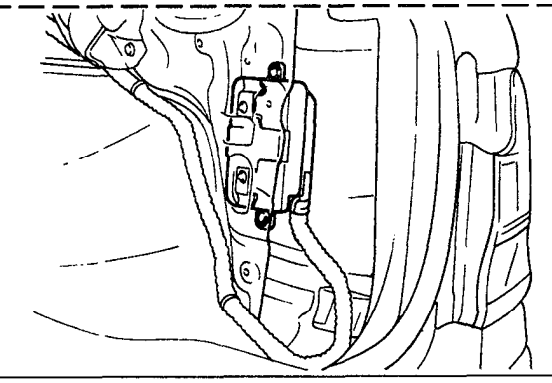
M91



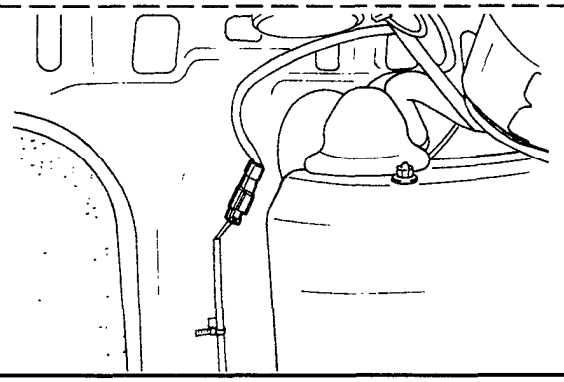
M92



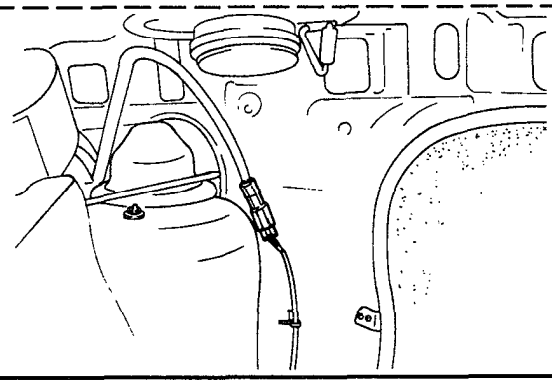
M93



M94

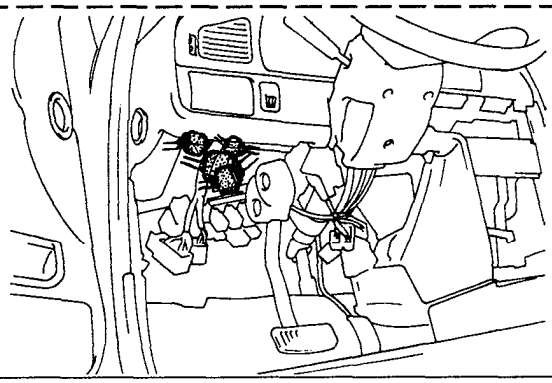


M95

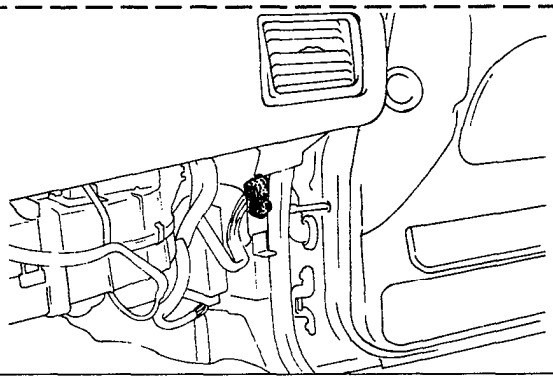


COMPONENTS (MC01 ~ MR02)

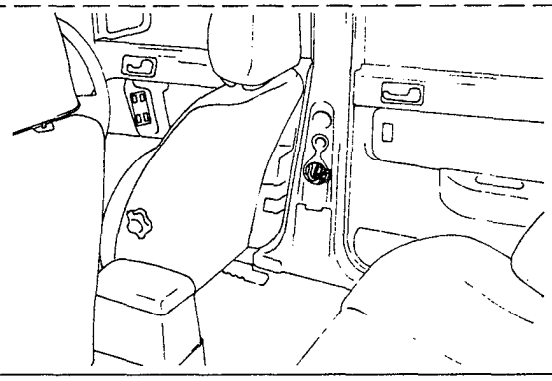
MC01 ~ MC04



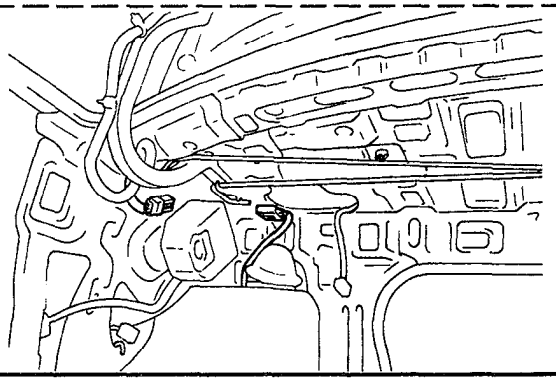
MD05, MD06



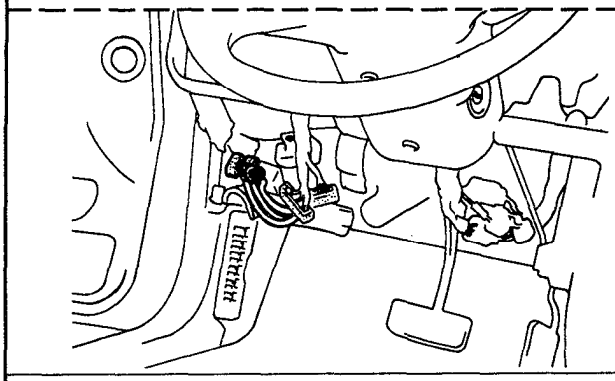
MD09, MD11



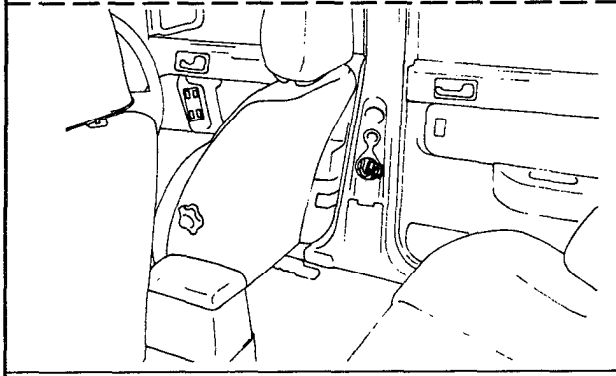
MR01, MR02



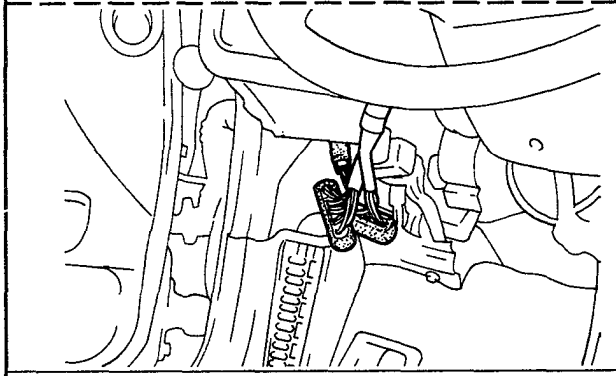
MD01 ~ MD03



MD08

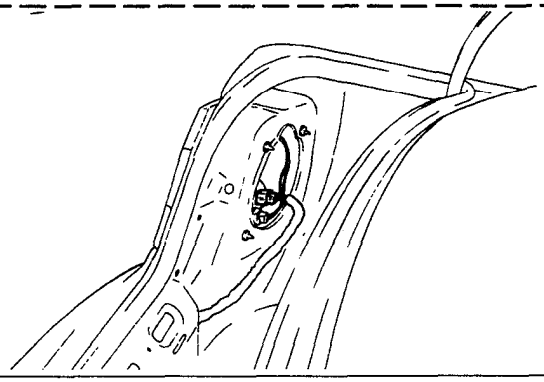


MI01, MI02

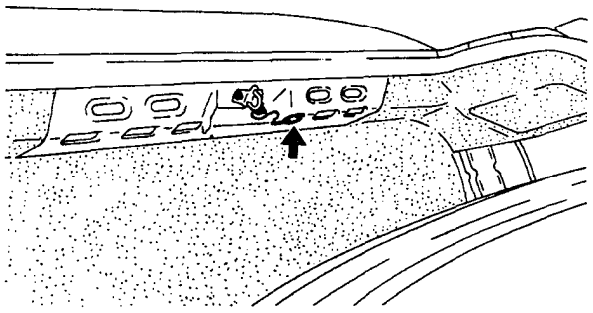


COMPONENTS (R01 ~ R15)

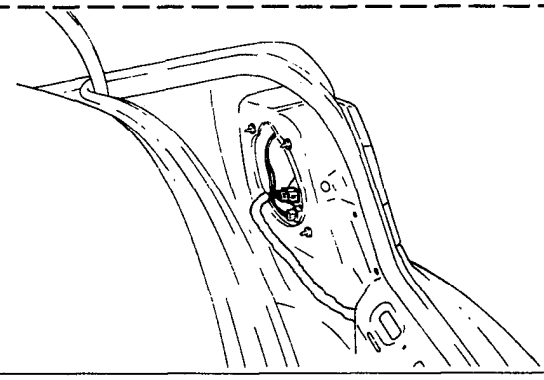
R01



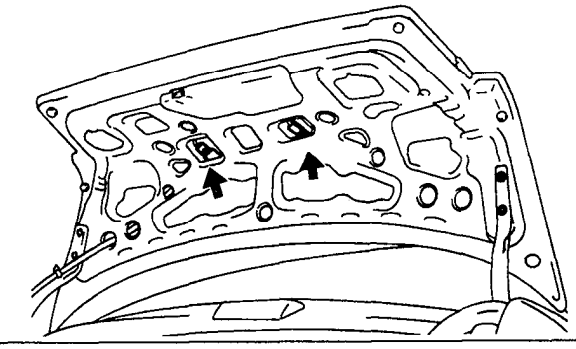
R02



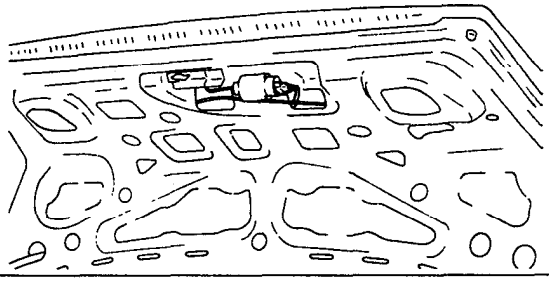
R03



R12, R13

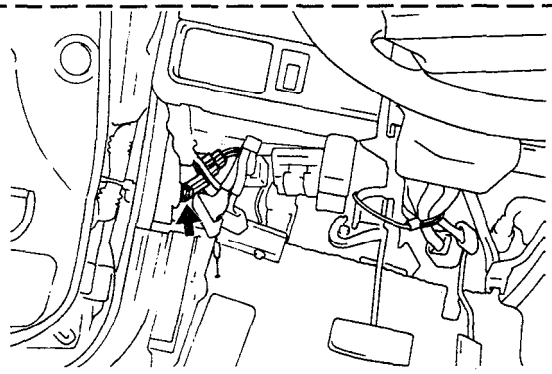


R15

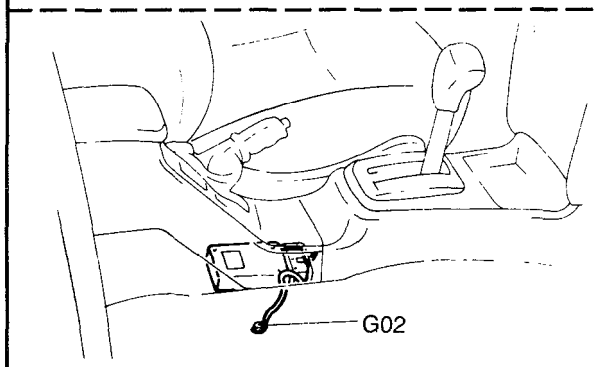


COMPONENTS (G01 ~ G08)

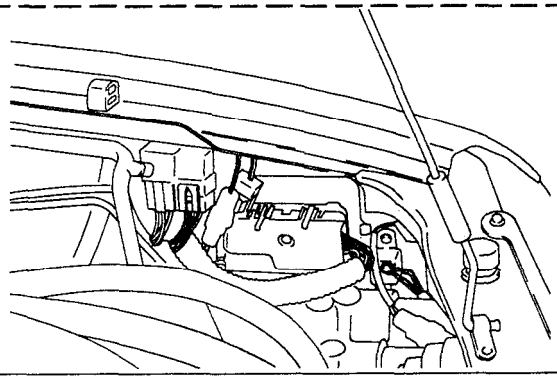
G01



G02



G03



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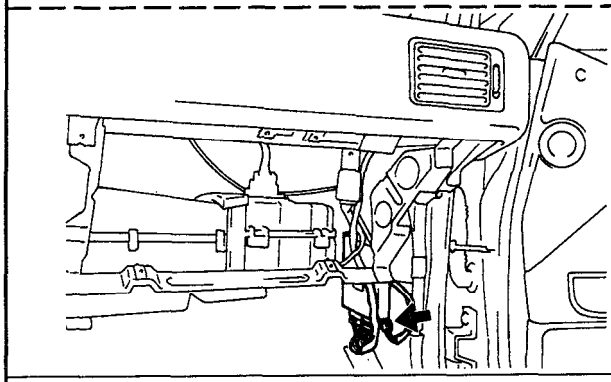

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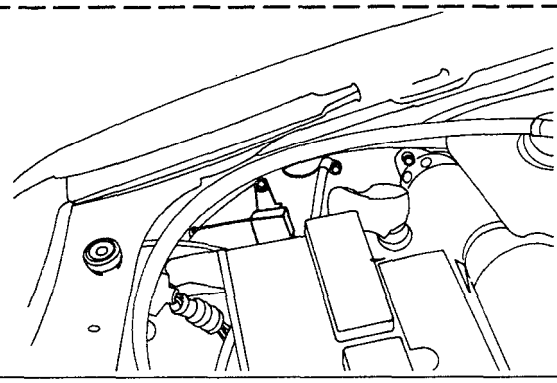
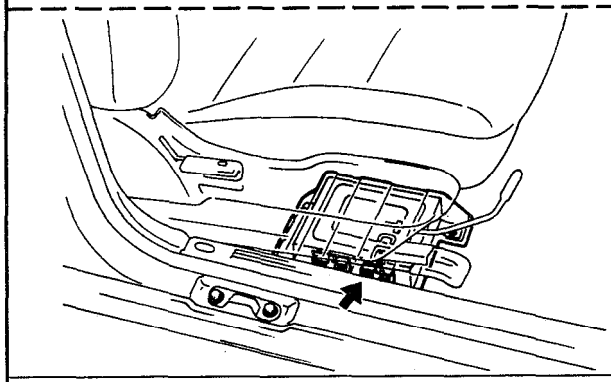
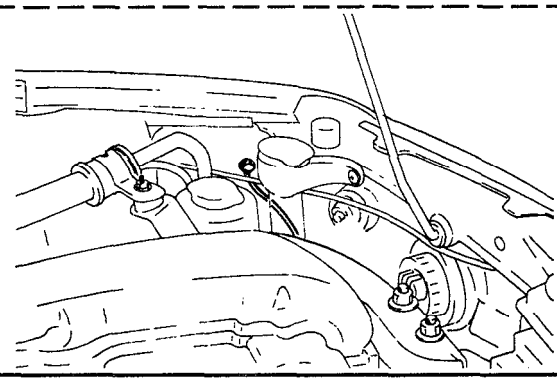


G06



G07



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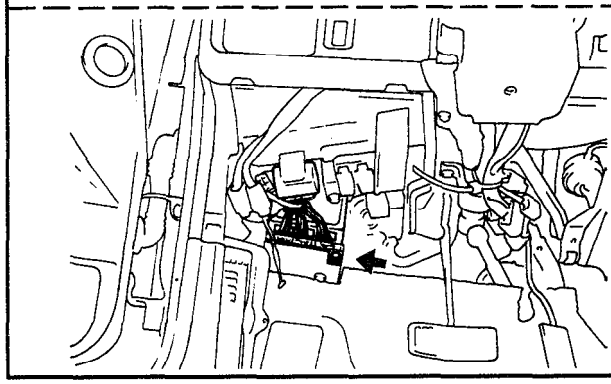
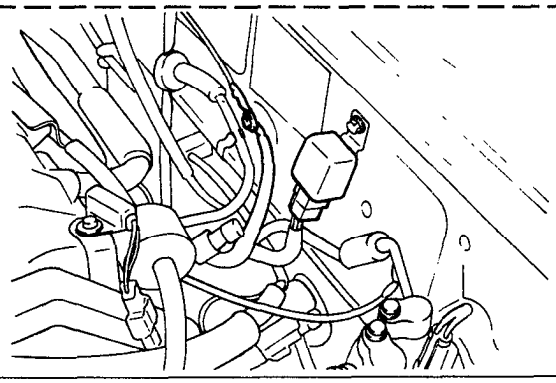
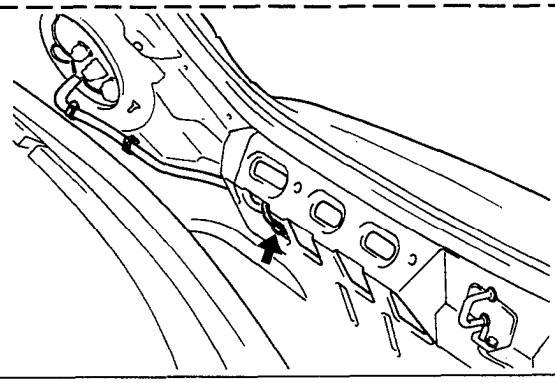


COMPONENTS (G09 ~ G12)

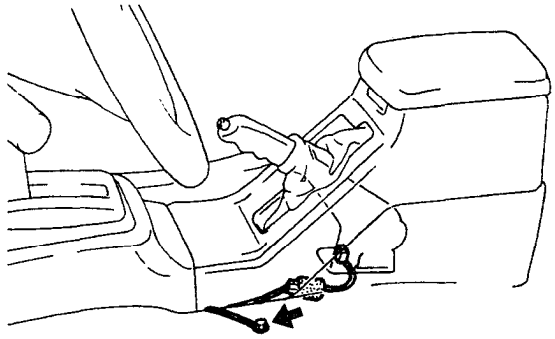
G09



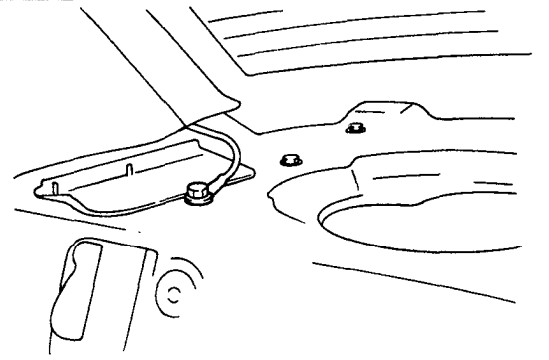
G10



G11

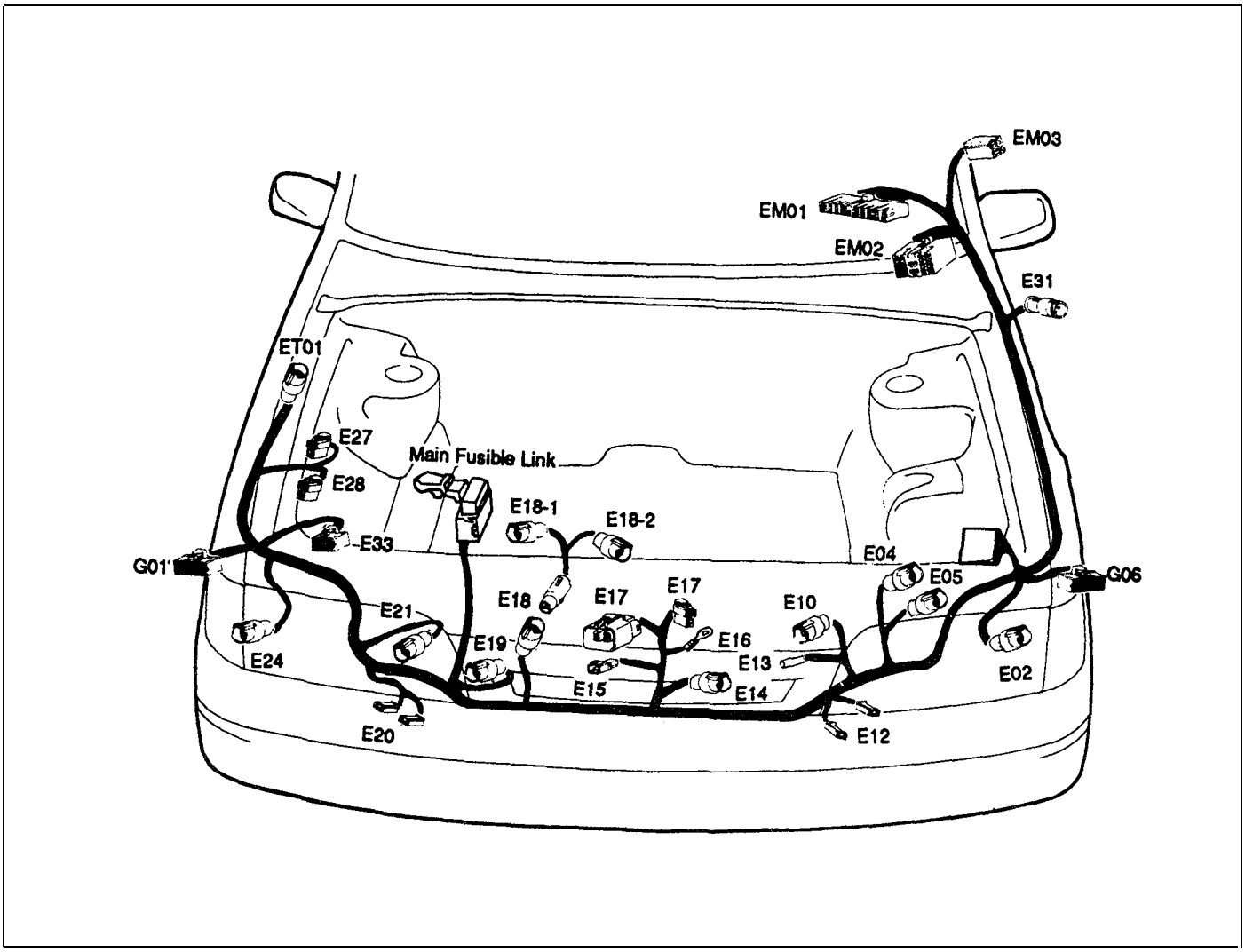


G12



HARNESS LAYOUTS

Harness layouts show the routing of the major wiring harnesses and the in-line connectors between the **major harnesses.** These layouts will make electrical troubleshooting easier.



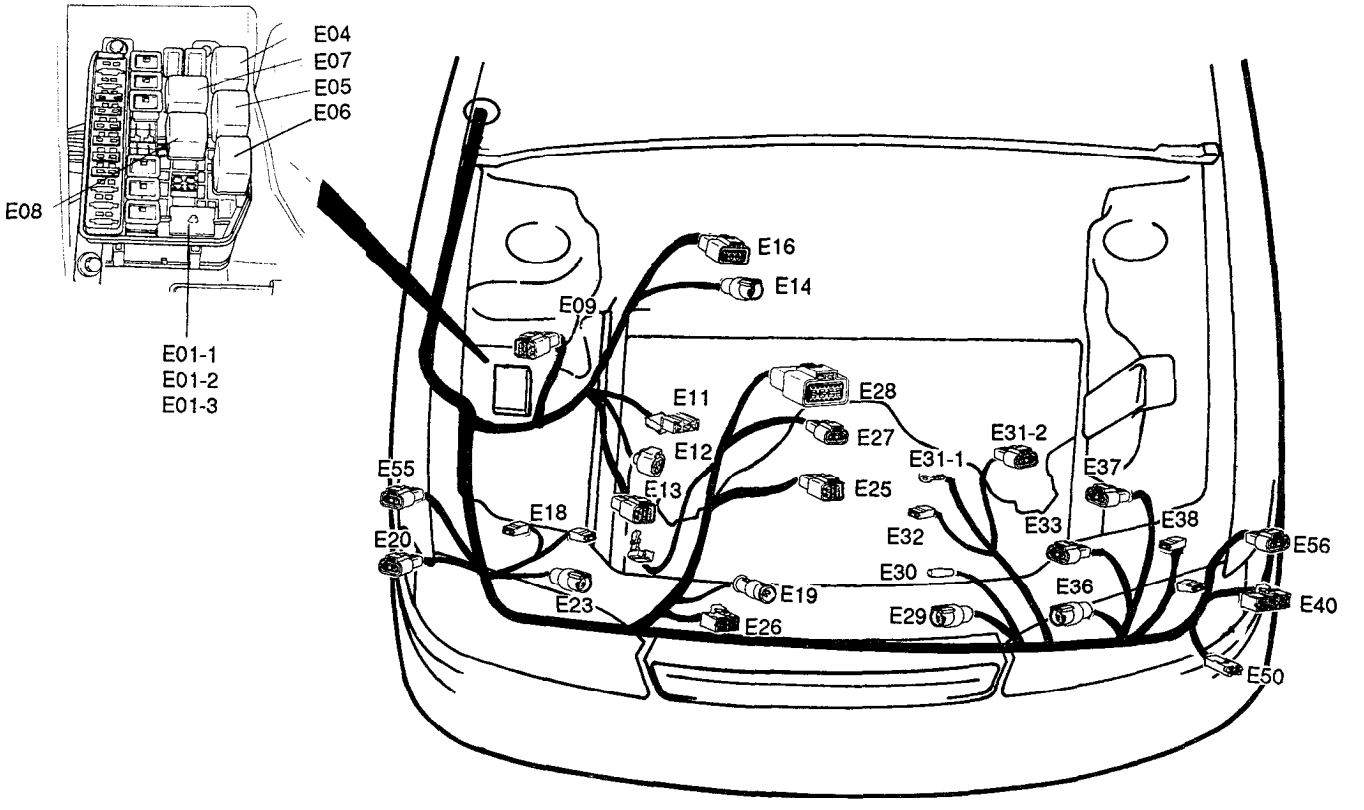
An example of Harness Layouts-Engine Harness

COMPONENT LOCATIONS

Component Locations give easy access to find the schematic components on the vehicle shown in the Component Location Index. Where connectors are listed, the total number of cavities, how many are actually used, is provided to help identify connectors on the vehicle.

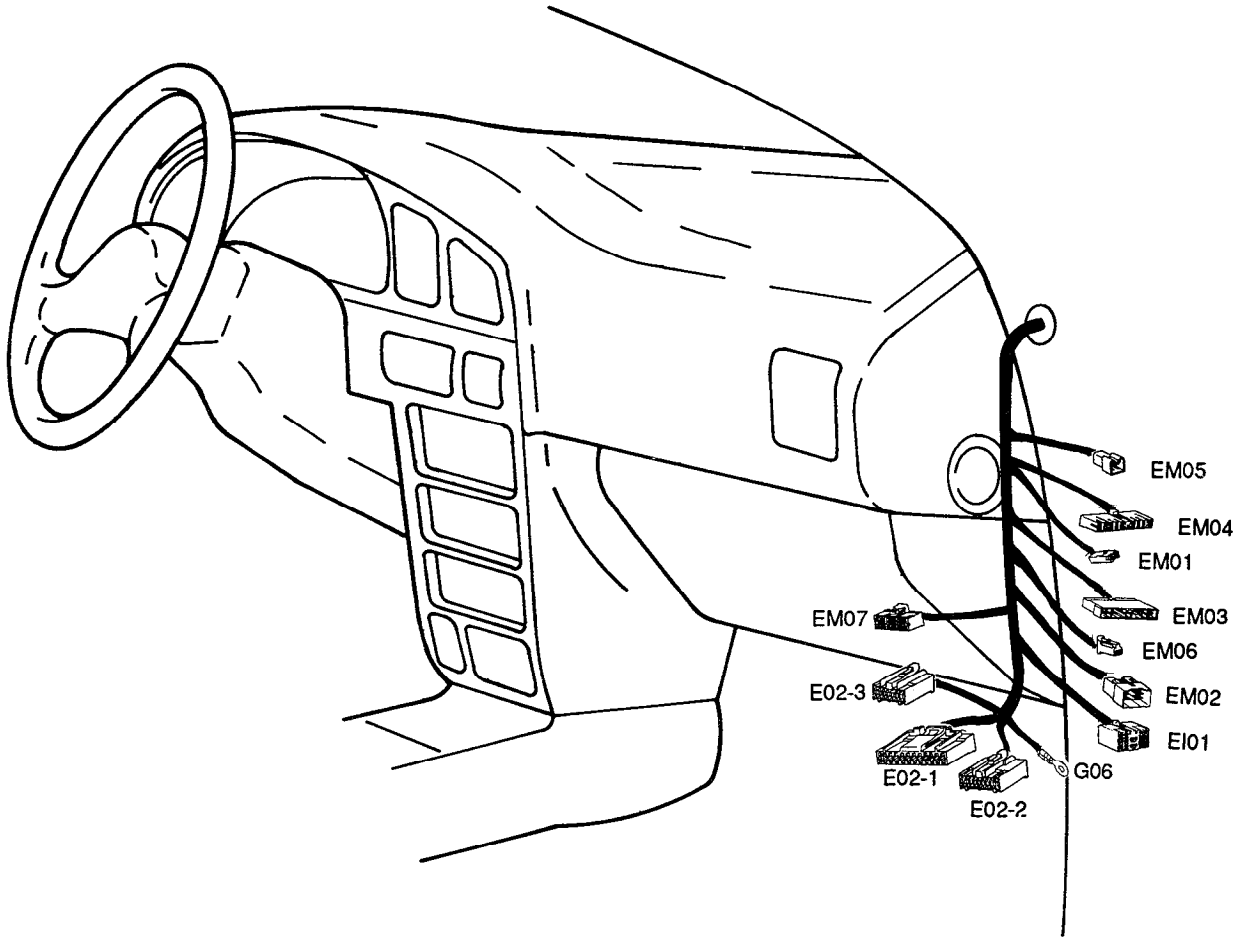
H A R N E S S L A Y O U T

ENGINE HARNESS (1)



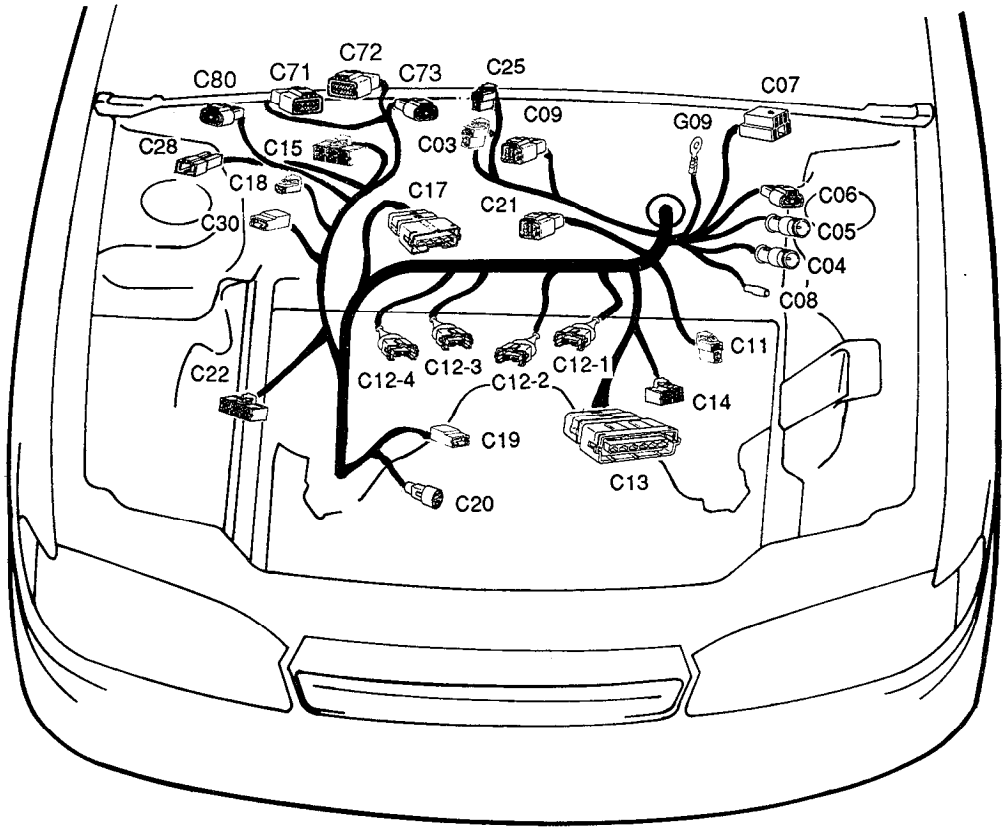
E01-1 Joint connector (IGN)
E01-2 Joint connector (TAIL, LH)
E01-3 Joint connector (TAIL, RH)
E04 Radiator fan control relay
E05 Condense fan relay
E06 Head lamp relay
E07 Radiator fan relay
E08 Air conditioner relay
E09 Cruise control actuator
E11 Kick down switch (A/T)
E12 Oil temperature sensor (A/T)
E13 Pulse generator (A/T)
E14 Brake fluid sensor
E16 Wiper motor
E18 Horn (RH)
E19 Thermo sensor (U.S.A)
E20 Front turn signal lamp (RH)
E23 Head lamp
E25 T/A control solenoid (AT)
E26 Radiator fan
E27 Back up lamp switch (M/T)
E28 Transaxle range switch (A/T)
E29 Condenser fan
E30 Power steering switch
E31-1 Generator (B+)
E31-2 Generator (S.L)
E32 Oil pressure switch
E33 Front turn signal lamp (LH)
E36 Head lamp (LH)
E37 Washer motor
E38 Horn (LH)
E40 DRL module
E55 Front sensor RH (ABS)
E56 Front sensor LH (ABS)

ENGINE HARNESS (2)



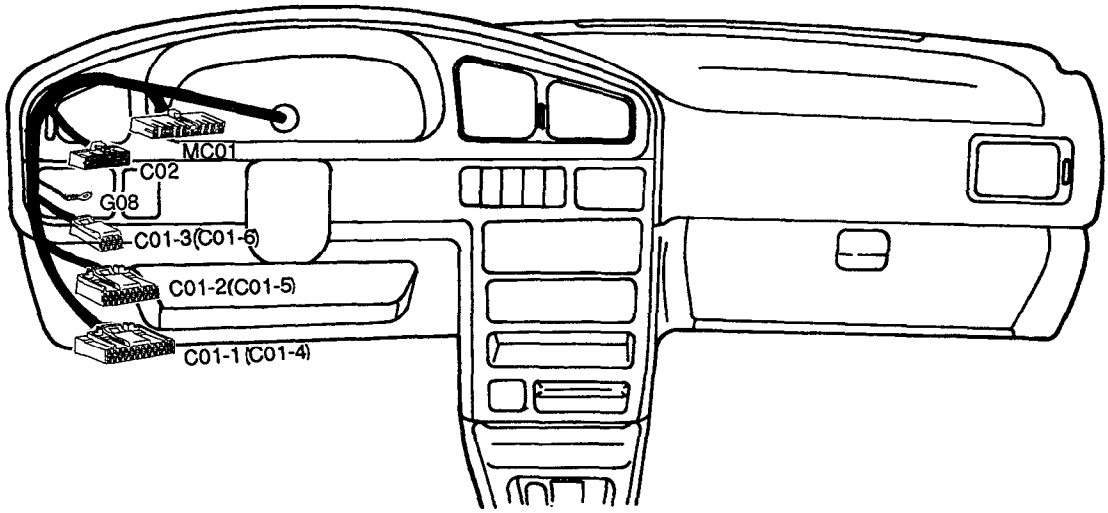
E02-1 TCM
E02-2 TCM
E02-3 TCM
EM01 Connection with MAIN wiring harness
EM02 Connection with MAIN wiring harness
EM03 Connection with MAIN wiring harness
EM04 Connection with MAIN wiring harness (A/T)
EM05 Connection with MAIN wiring harness (A/T, Cruise)
EM06 Connection with MAIN wiring harness (M/T, Cruise)
EM07 Connection with ABS wiring harness
EI01 Connection with CRASH PAD wiring harness

CONTROL HARNESS



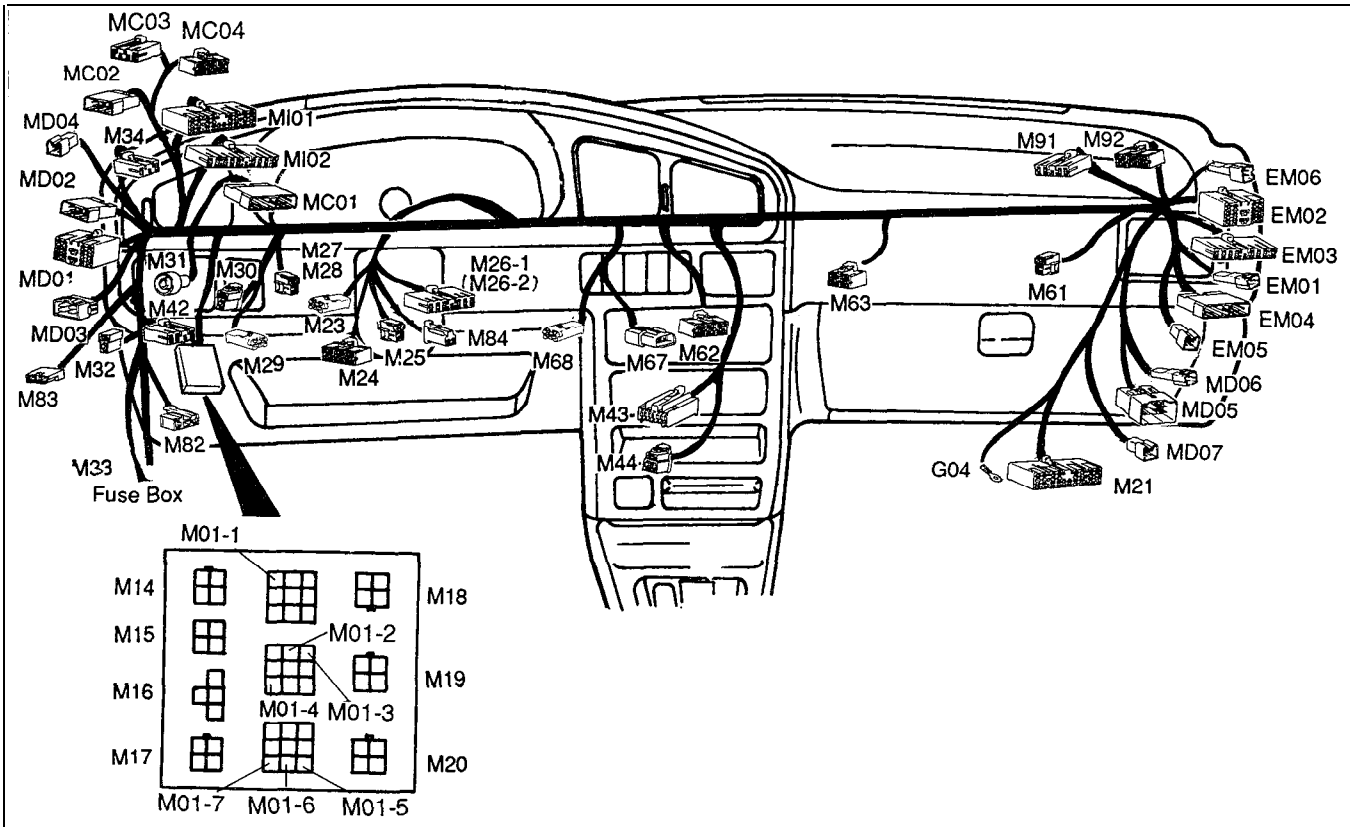
C03	Purge solenoid
C04	Ignition timing adjuster
C05	Fuel pump checker
CO6	Dual pressure switch (A/C)
C07	Relay with diode
C08	A/C compressor
C09	Crankshaft position sensor
C11	Noise filter
C12-1	Injector #1
C12-2	Injector #2
C12-3	Injector #3
C12-4	Injector #4
C13	Power transistor
C14	Ignition coil
C15	ISC motor
C17	Trottle position sensor
C18	Starter solenoid extension
C19	Coolant temp gauge
C20	Coolant temp sensor
C21	Front oxygen sensor
C22	Volume air flow sensor
C25	EGR solenoid
C28	EGR temp sensor
C30	Idle switch
C71	ABS modulator connector (1.8L)
C72	ABS relay box connector 2 (1.8L)
C73	ABS relay box connector 1 (1.8L)
C80	ABS motor pump (1.8L)

CONTROL HARNESS



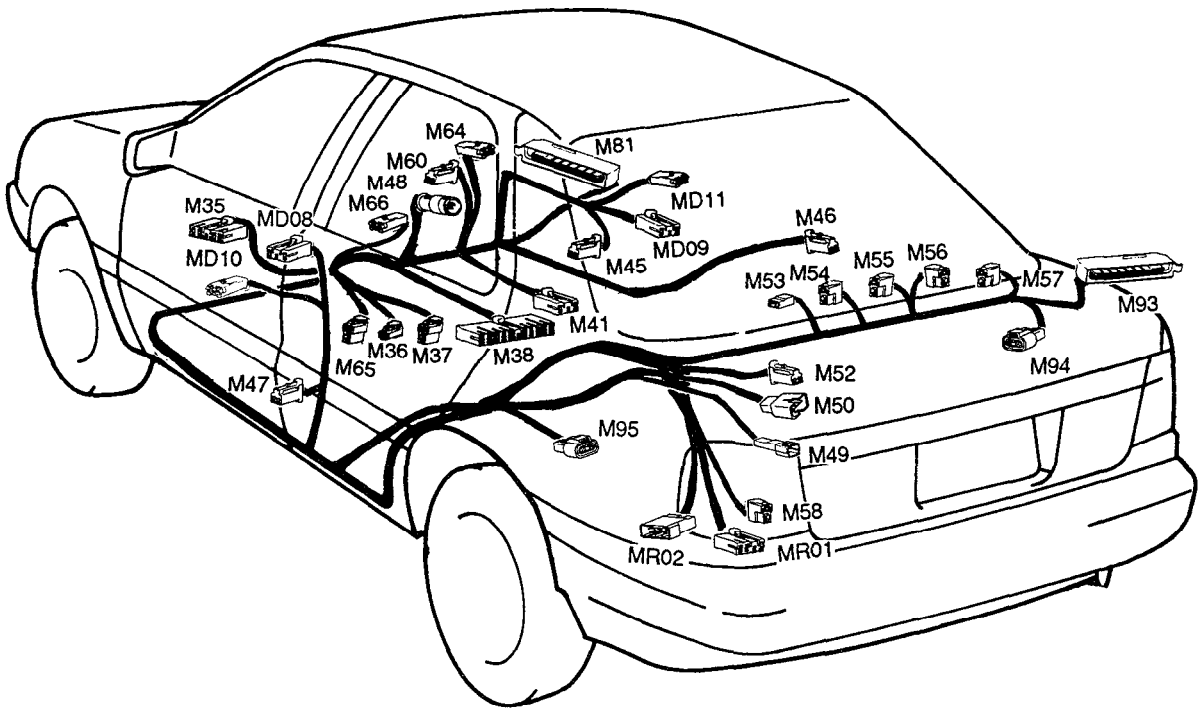
C01-1 ECM
C01-2 ECM
C01-3 ECM
C02 Control relay
MC01 Connection with MAIN wiring harness

MAIN HARNESS (1)



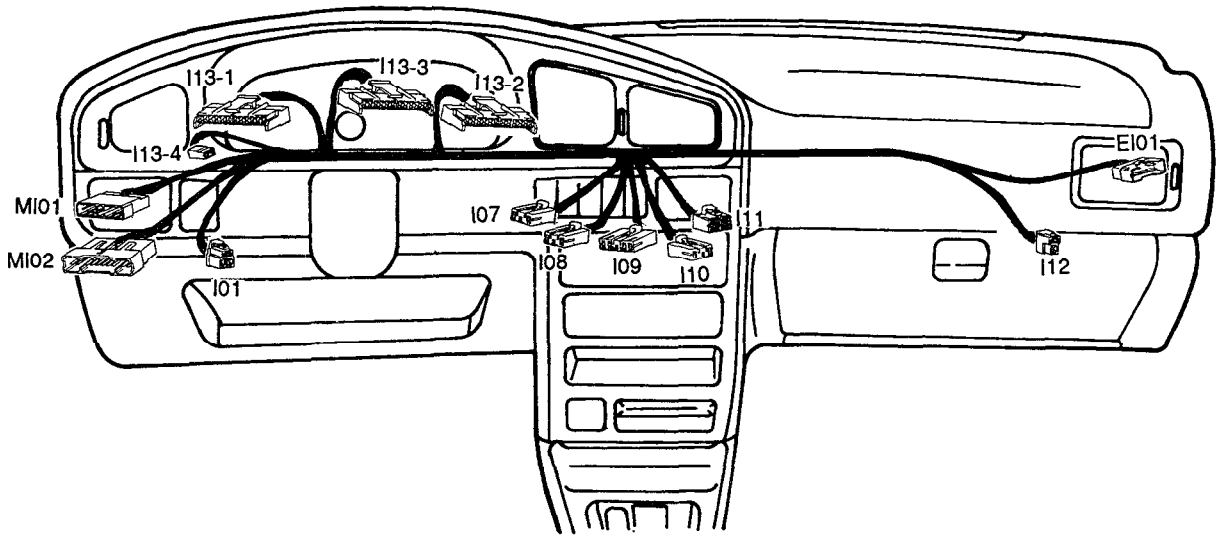
M01-1 Joint connector (TAIL, LH)
M01 -2 Joint connector (T/SIG, RH)
M01-3 Joint connector (T/SIG, LH)
M01 -4 Joint connector (TAIL, RH)
M15 Starter relay
M16 Flasher unit
M17 Blower relay
M18 Tail lamp relay
M19 Power window relay
M21 Cruise control unit
M23 Door warning switch
M24 Ignition switch
M25 Key lock solenoid (A/T)
M26-1 Multifunction switch
W26-2 Multifunction switch
M27 Stop lamp switch (W/O CRUISE)
M28 Stop lamp switch (W/CRUISE)
M29 Ignition lock switch
M30 Clutch switch
M32 Chime
M33 Data link connector
M34 Connection with ROOF wiring harness
M42 Outside mirror switch
M43 Audio
M44 Cigarette lighter
M61 Blower motor
M62 Blower switch
M63 Resister
M67 Blower actuator
M68 Heat control illumination
M82 Connection with A/BAG wiring connector
M83 Service connector (A/BAG)
M91 Connection with ABS wiring
M92 Connection with ABS wiring connector
EM01 Connection with MAIN wiring harness
EM02 Connection with MAIN wiring harness
EM03 Connection with MAIN wiring harness
EM04 Connection with MAIN wiring harness (A/T)
EM05 Connection with MAIN wiring harness (A/T, CRUISE)
EM06 Connection with MAIN wiring harness (M/T, CRUISE)
MC01 Connection with CONTROL wiring harness
MC02 Connection with CONTROL wiring harness
MC03 Connection with CONTROL wiring harness (1.8L)
MC04 Connection with CONTROL wiring harness (1.8L)
MI01 Connection with CRASH PAD wiring harness
MI02 Connection with CRASH PAD wiring harness
MD01 Connection with DOOR wiring harness (FRT, LH)
MD02 Connection with DOOR wiring harness (FRT, LH)
MD03 Connection with DOOR wiring harness (FRT, LH)
MD04 Connection with DOOR wiring harness (FRT, LH)
MD05 Connection with DOOR wiring harness (FRT, RH)
MD06 Connection with DOOR wiring harness (FRT, RH)
MD07 Connection with DOOR wiring harness (FRT, RH)

MAIN HARNESS (2)



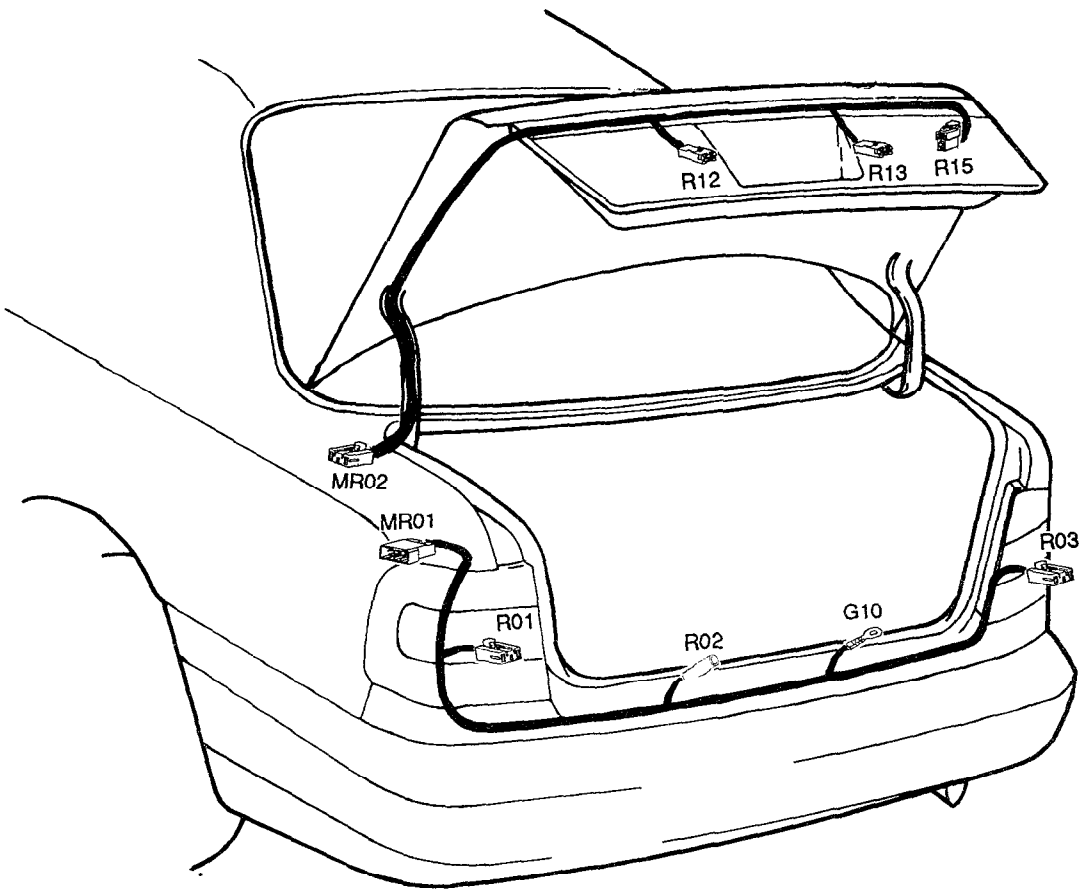
M35	A/T & key lock control unit	M58	Power antenna
M36	Parking brake switch	M60	Over drive (O/D) switch
M37	Seat belt switch	M64	P/Position switch
M38	TACM	M65	A/T Solenoid
M41	ECT switch	M66	A/T Illumination
M45	Door switch (FRT, RH)	M70	Rear oxygen sensor
M46	Door switch (RR, RH)	M81	A/Bag control module (ESPS)
M47	Door switch (FRT, LH)	M93	ABS control module
M48	Passive s/belt module	M94	Rear sensor RH (ABS)
M49	Fuel pump	M95	Rear sensor LH (ABS)
M50	Fuel sender	MR01	Connection with REAR wiring harness
M52	Door switch (RR, LH)	MR02	Connection with TRUNK LID wiring harness
M53	Rear heated glass (+)	MD08	Connection with DOOR wiring harness (RR, LH)
M54	Speaker (RR, RH)	MD09	Connection with DOOR wiring harness (RR, RH)
M55	Trunk room lamp	MD10	Connection with DOOR wiring harness (RR, LH)
M56	High mounted stop lamp	MD11	Connection with DOOR wiring harness (RR, RH)
M57	Speaker (RR, LH)		

CRASH PAD HARNESS



I01	Rheostat
I07	Cruise switch
I08	Rear defogger switch
I09	Hazard switch
I10	NC switch
I11	Digital clock
I12	Thermo switch
I13-1	Cluster
I13-2	Cluster
I13-3	Cluster
I13-4	Reed switch
MI01	Connection with Main harness
MI02	Connection with Main harness
EI01	Connection with Engine harness

REAR/TRUNK LID HARNESS



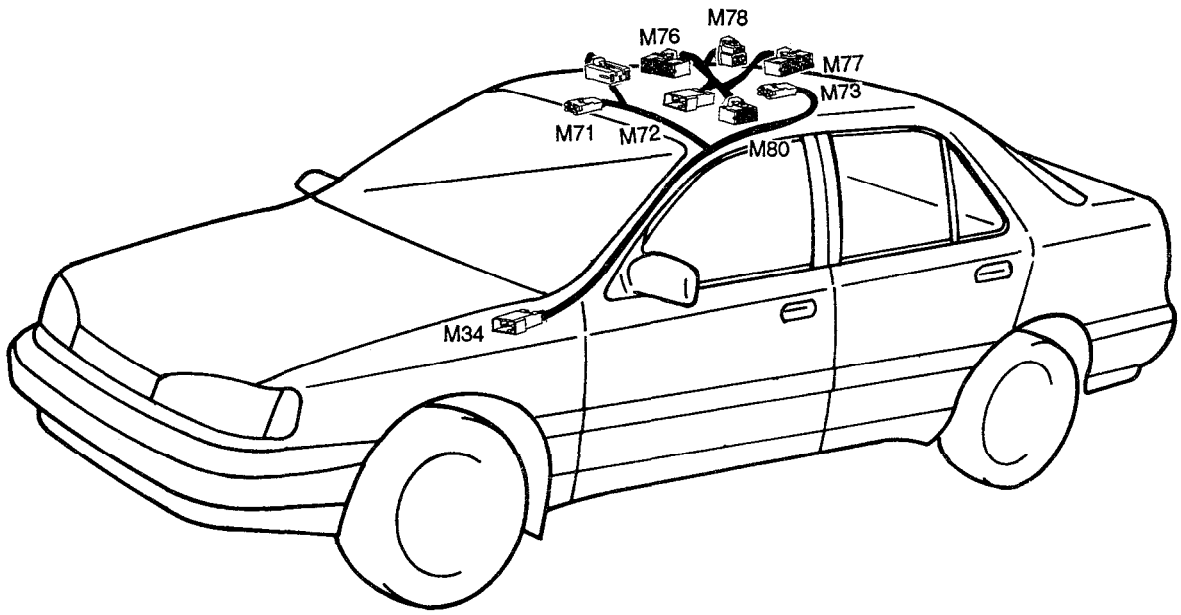
Rear wiring harness

R01 Combination lamp (LH)
R02 Trunk room lamp switch
R03 Combination lamp (RH)
MR01 Connection with MAIN harness

Trunk lid wiring harness

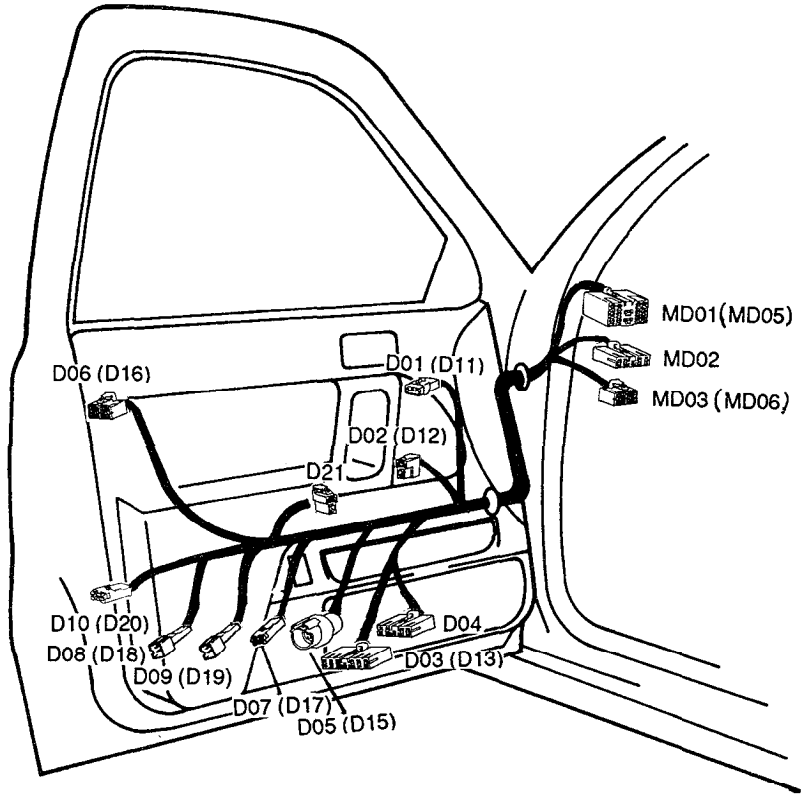
R12 License lamp (LH)
R13 License lamp (RH)
R15 Trunk lid opener
MR02 Connection with MAIN harness

ROOF HARNESS



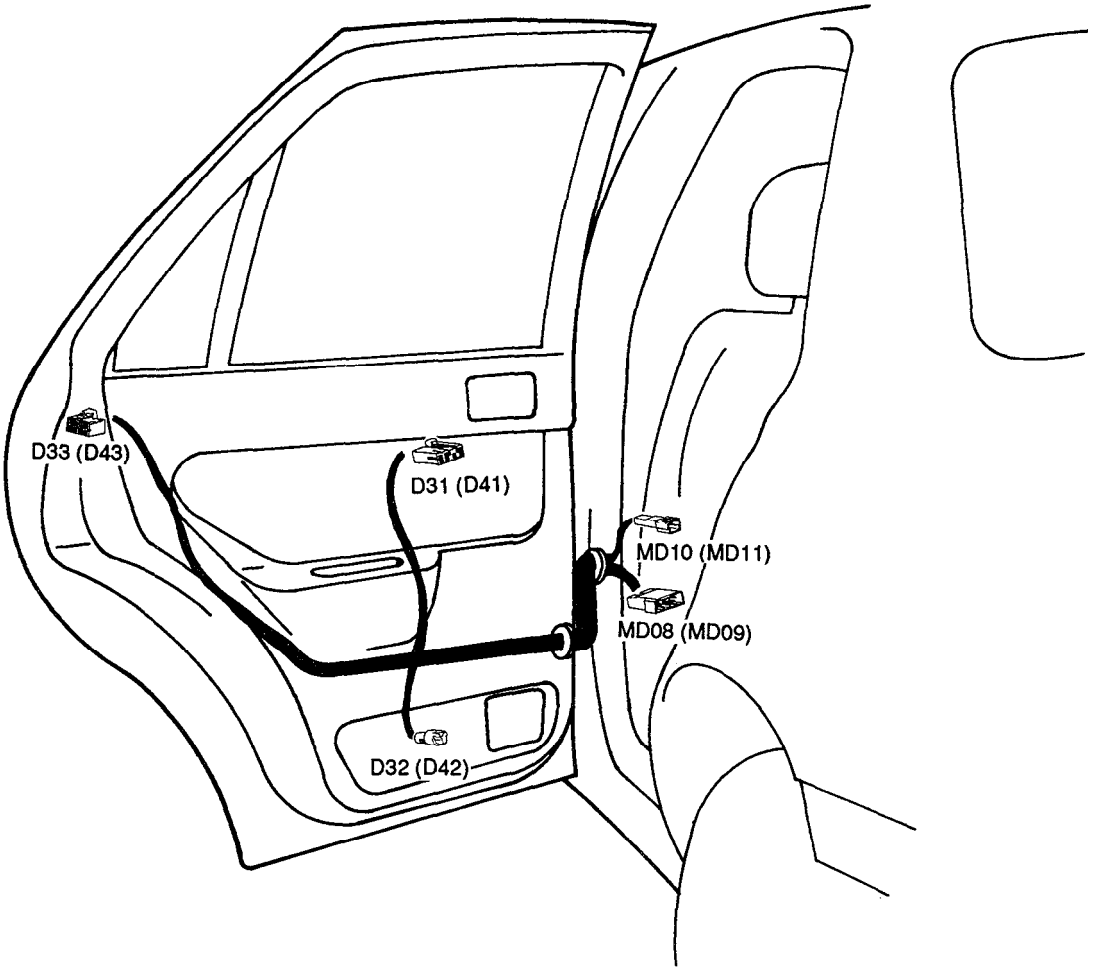
M34 Connection with MAIN wiring harness
M71 Map lamp
M72 Sunroof extension wiring harness
M73 Room lamp (W/O sunroof)
M76 Sunroof relay (LH)
M77 Sunroof relay (RH)
M78 Over head console lamp (W/Sunroof)
M80 Sunroof motor

FRONT DOOR HARNESS



D01 (D11)	Outside mirror
D02 (D12)	Speaker (FRT, LH)
D03 (D13)	Power window switch
D04	Power window switch
D05 (D15)	Power window motor
D06 (D16)	Central door locking actuator
D07 (D17)	Door latch switch
D08 (D18)	Shoulder retractor
D09 (D19)	Lap retractor
D10 (D20)	Door lamp
D21	Trunk lid switch
MD01	Connection with MAIN wiring harness (FRT, LH)
MD02	Connection with MAIN wiring harness (FRT, LH)
MD03	Connection with MAIN wiring harness (FRT, LH)
MD05	Connection with MAIN wiring harness (FRT, RH)
MD06	Connection with MAIN wiring harness (FRT, RH)

REAR DOOR HARNESS



D31 (D41)	Power window switch
D32 (D42)	Power window motor
D33 (D43)	Central door locking actuator
MD08 (MD09)	Connection with MAIN wiring harness
MD10 (md11)	Connection with MAIN wiring harness

BODY ELECTRICAL SYSTEM

Return To Main Table of Contents

GENERAL 2

FUSIBLE LINK AND FUSE 5

IGNITION SWITCH 7

MULTIFUNCTION SWITCH 8

INSTRUMENT AND WARNING SYSTEM 17

LIGHTING SYSTEM 28

AUDIO SYSTEM 36

WINDSHIELD WIPER AND WASHER 49

CLOCK 55

CIGARETTE LIGHTER 56

SUN ROOF 58

HORN 60

POWER DOOR LOCK SYSTEM 62

POWER WINDOW 64

POWER DOOR MIRROR 70

TRUNK LID OPENER 73

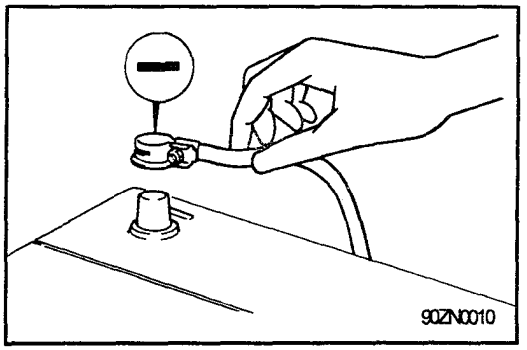
TAC CONTROL SYSTEM 75

AUTOMATIC TRANSAXLE AND KEY LOCK CONTROL SYSTEM 81

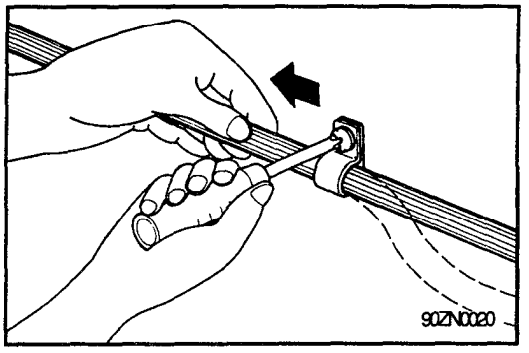
PASSIVE SEAT BELT SYSTEM 85

GENERAL
SERVICING THE ELECTRICAL SYSTEM

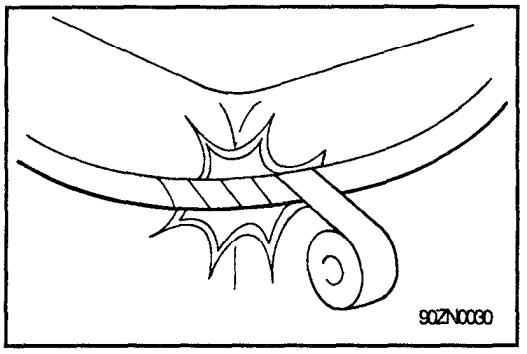
1. Prior to servicing the electrical system, be sure to turn off the ignition switch and disconnect the battery ground cable.
   NOTE:
   In the course of MFI or ELC system diagnosis, when the battery cable is removed, any diagnostic code retained by the computer will be cleared.
   Therefore, if necessary, read the diagnostic codes before removing the battery cable.



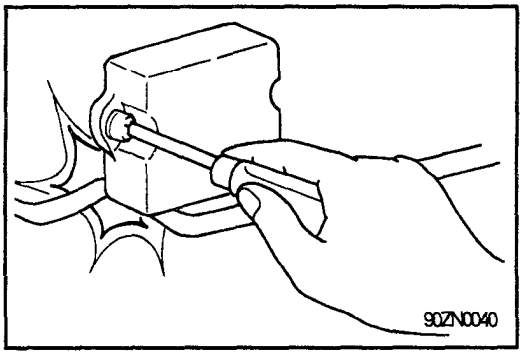
2. Secure the wiring harnesses by using clamps so that there is no slack. However, for any harness which passes to the engine or other vibrating parts of the vehicle, allow some slack within a range that does not allow the engine vibrations to cause the harness to come into contact with any of the surrounding parts, and then secure the harness by using a clamp.



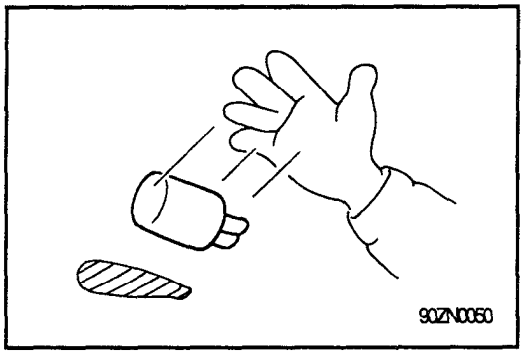
3. If any section of a wiring harness interferes with the edge of a part, or a corner, wrap the section of the harness with tape or something similar in order to protect it from damage.



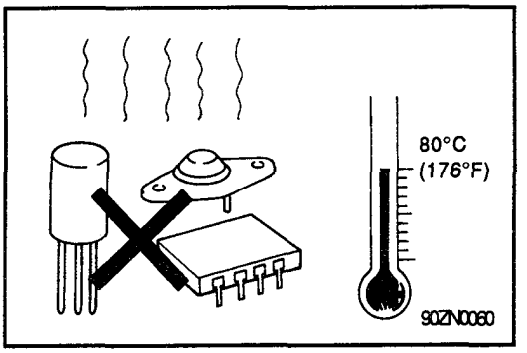
4. When installing any of the vehicle parts, be careful not to pinch or damage any of the wiring harnesses.



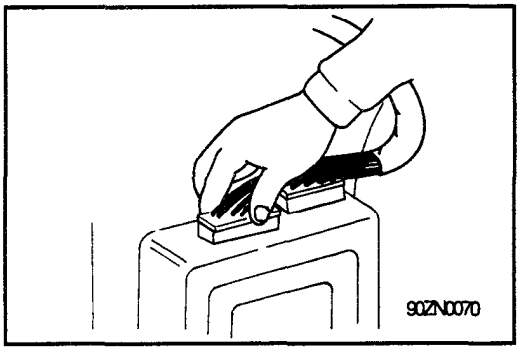
5. The sensors, relays, and electrical parts, must never be subjected to strong shocks. Do not allow them to fall when handling.



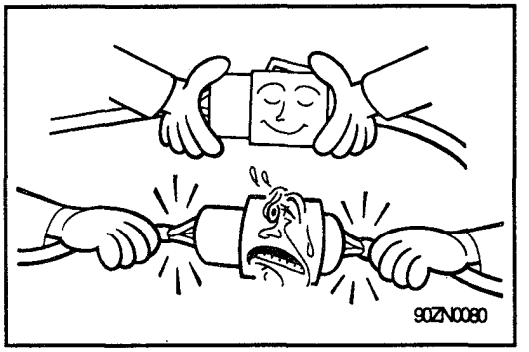
6. The electronic parts used in the computer, relays, etc. are readily damaged by heat. If there is a need for service operations that may cause the temperature to exceed 80°C (176°F), remove the electronic parts beforehand.



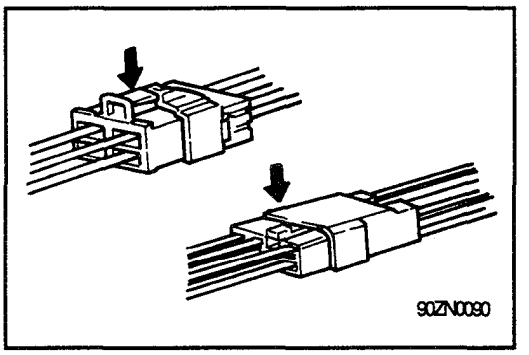
7. Loose connectors could be troubled. Make sure that connectors are connected securely.



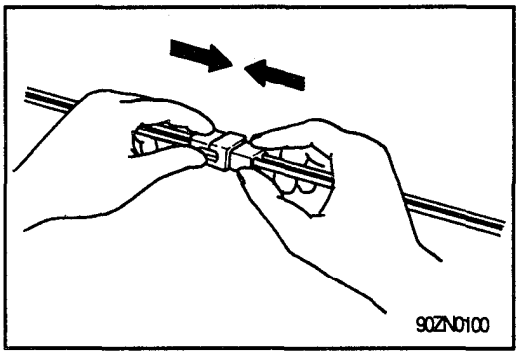
8. When removing a connector, be sure to pull only the connector, not the harness.



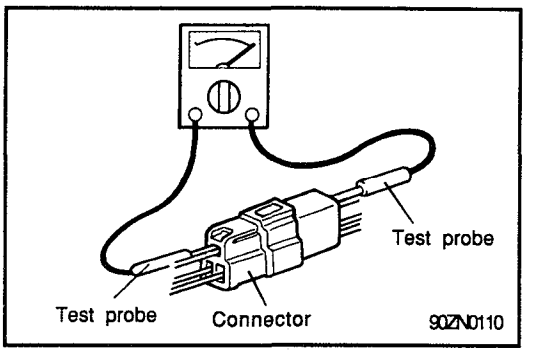
9. Remove connectors which have catches by pressing in the direction indicated by the arrows in the illustration.



10. Connect connectors which have catches by inserting the connectors until a “snap” sound is heard.



11. When using a circuit tester to perform continuity or voltage checks on connector terminals, insert the test probe from the harness side.
    If the connector is a scales connector, insert the test probe in through the hole in the rubber cap for the electrical wires, being careful not to damage the insulation of the wires; continue to insert the test probe until it contacts the terminal.

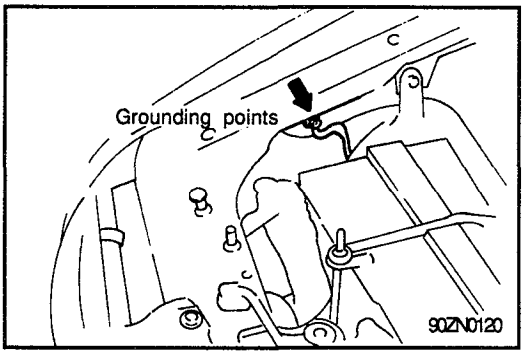


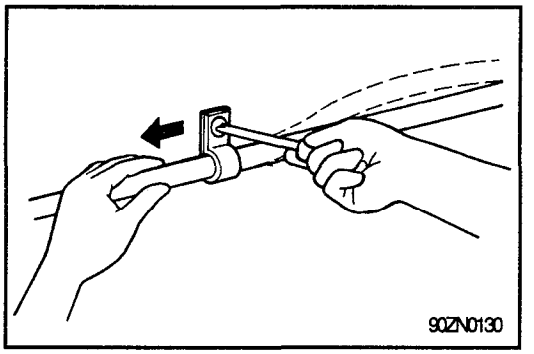
12. In order to avoid overloading the wiring, take the electrical current load of the optional equipment into consideration, and determine the appropriate wire size.

Nominal size	SAE gauge No.	Permissibe current	
		In engine compartment	Other areas
0.3 mm²	AWG 22	-	5A
0.5 mm²	AWG 20	7A	13A
0.85 mm²	AWG 18	9A	17A
1.25 mm²	AWG 16	12A	22A
2.0 mm²	AWG 14	16A	30A
3.0 mm²	AWG 12	21A	40A
5.0 mm²	AWG 10	31A	54A

CHECKING CABLES AND WIRES

1. Checking the terminal for tightness.
2. Check terminals and wires for corrosion by battery electrolyte, etc.
3. Check terminals and wires for open circuit or impending open circuit.
4. Check wire insulation and coating for damage, cracks and degrading.
5. Check conductive parts of terminals for contact with other metallic parts (vehicle body and other parts).
6. Check grounding parts to verify that there is continuity between attaching bolt(s) and vehicle body.
7. Check for incorrect wiring.
8. Check that wirings are so clamped as to prevent contact with sharp corners of the vehicle body, etc. or hot parts (exhaust manifold, pipe, etc.).
9. Check that wirings are clamped firmly to secure enough clearance from the fan pulley, fan belt and other rotating or moving parts.
10. Check that the wirings between the fixed parts such as the vehicle body and the vibrating parts such as the engine are made with adequate allowance for vibrations.





FUSIBLE LINK & FUSE

FUSIBLE LINK

SPECIFICATIONS

<table>
<tr><th>Item</th><th>Specifications</th></tr>
<tr><td>Main fusible link
Type
Ampere rating
Housing color
Location

Sub-fusible link
Type
Ampere rating & housing
Color

Location</td><td>
Screw-up type
60 A
Yellow
Engine compartment
(Connected with Battery (+) terminal)

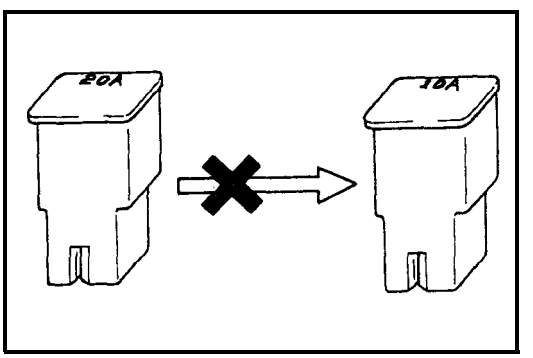
Connector type
<table>
<tr><th>Item \ Circuit</th><th>IGN</th><th>MPI</th><th>P/WDW</th><th>CON</th><th>BATT</th><th>LAMP</th><th>RAD</th></tr>
<tr><td>Ampere rating</td><td>30 A</td><td>20 A</td><td>30A</td><td>20 A</td><td>50 A</td><td>40 A</td><td>30 A</td></tr>
<tr><td>Housing Color</td><td>Pink</td><td>Blue</td><td>Pink</td><td>Blue</td><td>Red</td><td>Green</td><td>Pink</td></tr>
</table>
Engine compartment (in the relay & fuse box)</td></tr>
</table>

INSPECTION

1. Check for a burnt fusible link with an ohmmeter (fusible link must be removed from holder prior to testing).
2. If a fusible link burns out, there is a short or some other problem in the circuit. Carefully determine the cause and correct it before replacing the fusible link.

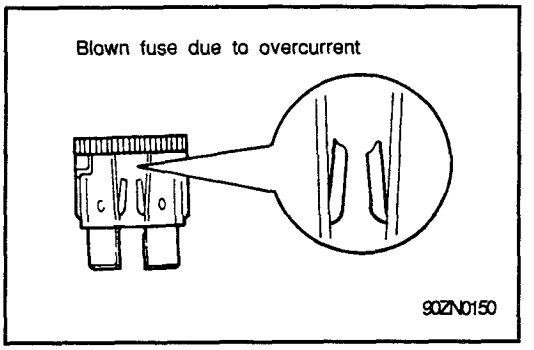
NOTE:

The fusible link will burn out within 15 seconds if a higher current than specified flows through the circuit.



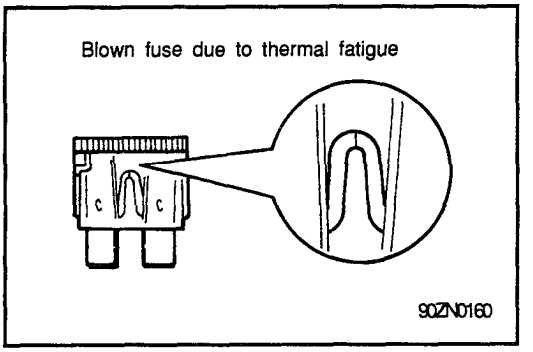
FUSE
INSPECTION

When a fuse is blown, there are two probable causes as follows. Which of the two causes is responsible can be easily determined by visual check after removing the fuses.



1. Fuse blown due to over-current.

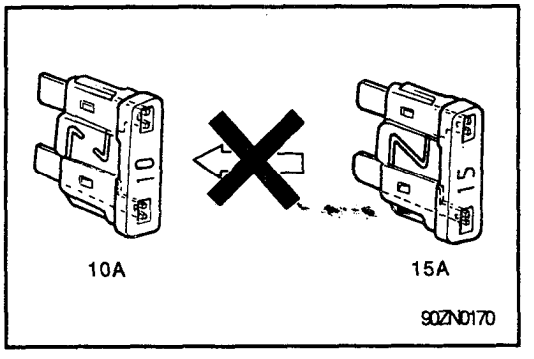
Prior to replacing the fuse with a new one, check the circuit for **a** short and the related parts for abnormal condition.
Only after the correction of a short or replacement of abnormal parts, should a fuse with same ampere rating be installed.



2. Fuse blown due to repeated current on-off.

Normally, this type of problem occurs after fairly long period of use and hence is less frequent than the above type.
In this case, you may simply replace with a new fuse of the same capacity.

CAUTION:
A blade type fuse is identified by the numbered value in amperes.
If the fuse is burnt-out, be sure to replace a fuse with the same ampere rating. If a fuse of higher capacity than specified is used, parts may be damaged and the danger of fire also exists.
When removing or inserting a fuse, please use a fuse puller in the fuse box.



IGNITION SWITCH (WITH DOOR WARNING SWITCH)

INSPECTION

1. Remove the connector located under the steering column.
2. Check for continuity between terminals.

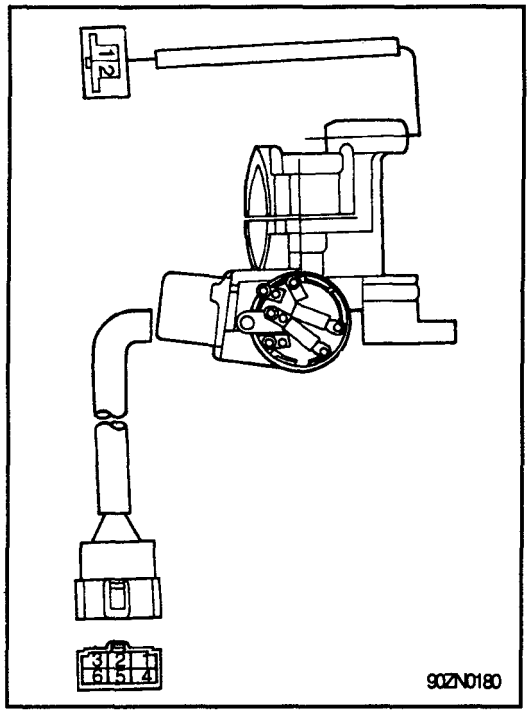
Switch / Terminal / Position / Key		Ignition switch					Door warning switch		Lock	
		1	2	4	5	6	1	2	RO	RE
LOCK	R								L	L
	I						O	O	L	F
ACC		O	O						F	F
ON		O	O	O		O			F	F
START				O	O	O			F	F

NOTE:

O - O : indicates that there is a continuity between terminals.

RO : Round the locking bar, RE : Return the locking bar,

R : Removed, I : Inserted, L : Lock, F : Free

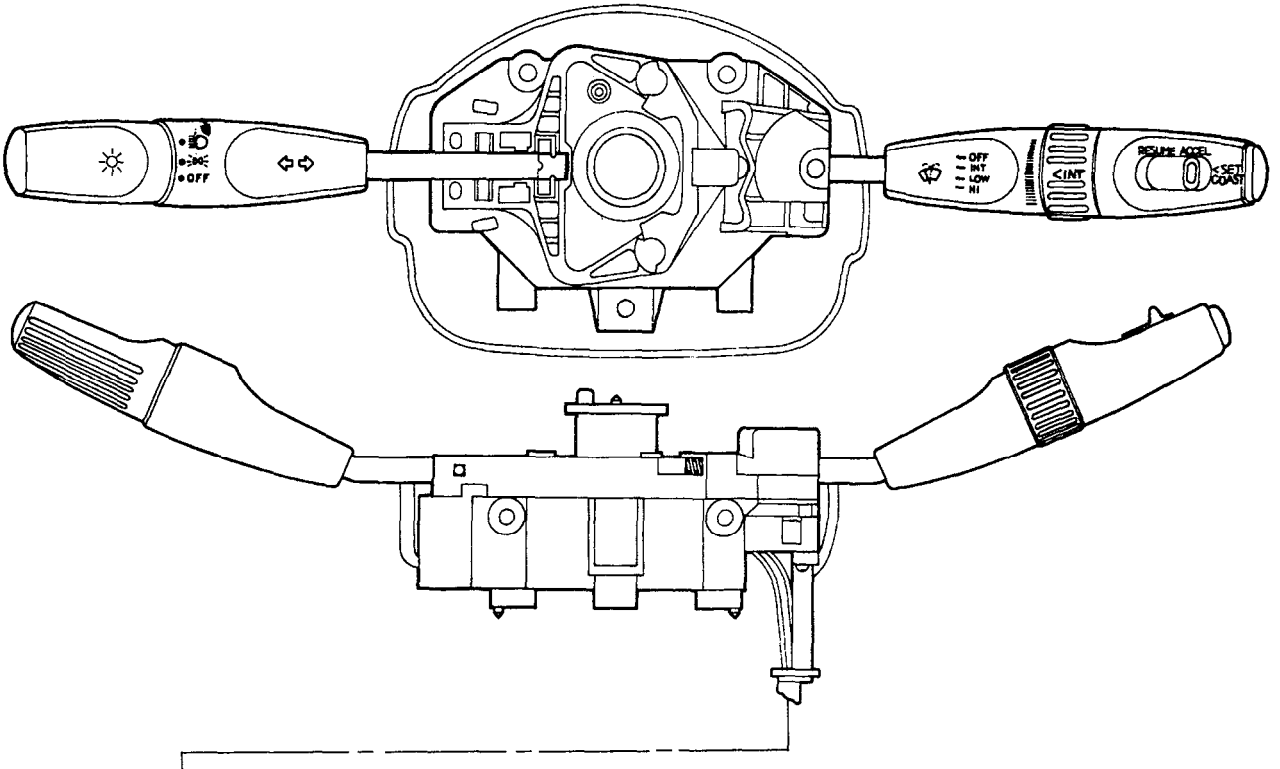


MULTIFUNCTION SWITCH

SPECIFICATIONS

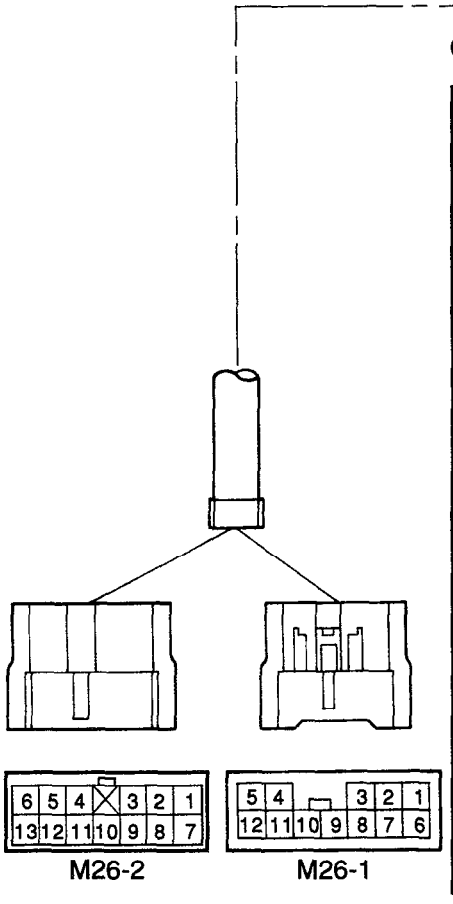
Items	Specifications
Rated Voltage	DC 12 V
Operating temperature range	-30° ~ +80°C (-22 ~ +176°F)
Rated load	
Dimmer & Passing switch	High : 15 A (Lamp load) Low : 10 A (Lamp load) Passing : 15 A (Lamp load)
Lighting & tail switch	Lighting : 1 A (Relay load) Tail : 0.7 A (Relay load)
Turn signal switch	5 A (Lamp load)
Wiper switch	Low, Hi : 4 A (Motor load) Int. : 0.22 ± 0.05 A (Relay load) Lock : MAX. 23 A (Motor load)
Washer switch	4 A (Motor load)
Cruise control switch	0.2 ± 0.1 A
Horn switch	7 A (Relay load)
Variable int. volume switch	MAX. 10 mA

COMPONENT (WITHOUT AIR BAG)



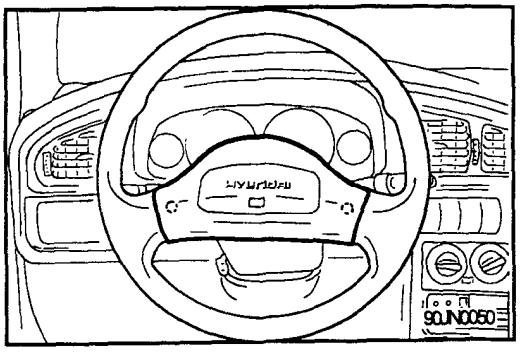
Circuit connection

Connector No.	Terminal No.	Wire size & color	Circuit	Description
M26-1	1	No Connection		
	2	0.85RL	INT	Intermittent wiper
	3	0.85RW	S	Wiper parking
	4	0.85RY	HI	Wiper high speed
	5	0.85YB	LOW	Wiper low speed
	6	No Connection		
	7	0.5WL	W	Washer switch
	8	0.85GB	HO	Horn
	9	0.85B	EW, EA	Wiper & washer, cruise ground
	10	0.3GW	INT(T)	Intermittent wiper
	11	0.3L	SET	Speed set coast
	12	0.3LgW	RES	Resume accel
M26-2	1	0.3YR	TS	Tail lamp switch
	2	1.25WB	HS(2)	Head lamp switch passing
	3	1.25RG	HU	Head lamp upper beam power
	4	1.25Br	HL	Head lamp lower beam power
	5	1.25B	EB	Dimmer & passing switch ground
	6	No Connection		
	7	0.3WL	HS(1)	Head lamp switch
	8	0.3B	EL	Lighting switch ground
	9	0.3G	F	Rear fog lamp
	10	0.5RW	TB	Flasher unit power
	11	0.5RL	TL	Turn signal lamp (LH) switch
	12	0.5RY	TR	Turn signal lamp (RH) switch
	13	No Connection		

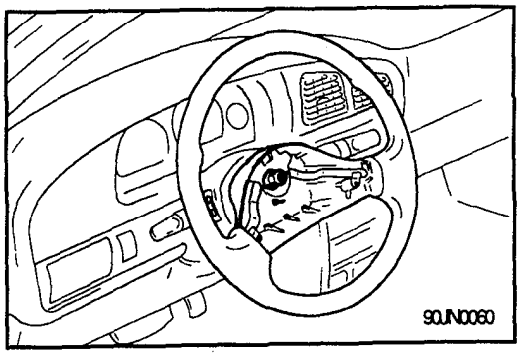


REMOVAL AND INSTALLATION (WITHOUT A/BAG)

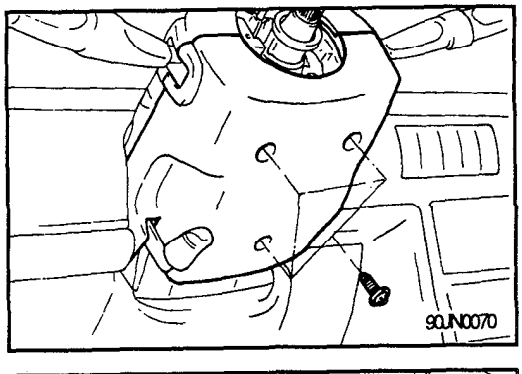
1. Remove the horn pad by loosening 2 screws and the horn switch connector.



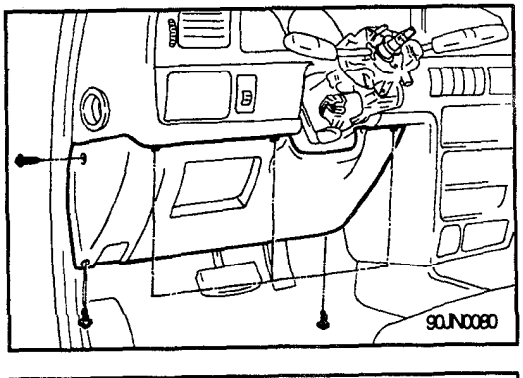
2. Remove the steering wheel by loosening the steering wheel mounting nut.



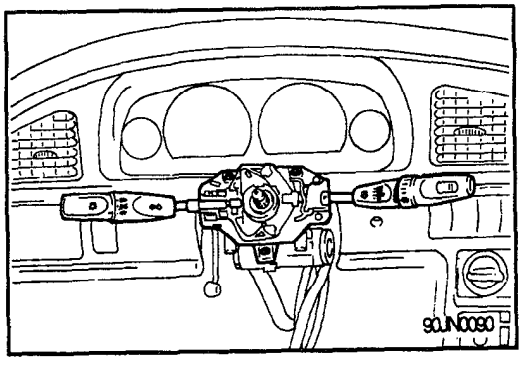
3. Remove the steering column shroud. (3 screws)



4. Remove the lower crash pad. (6 screws)
5. Remove the cable band and harness connectors.



6. Remove the multifunction switch assembly by loosening the 3 screws shown in the illustration.
7. Installation is the reverse order of the removal procedure.



INSPECTION (WITHOUT A/BAG)

With the multifunction switch in each position, make sure that continuity exists between terminals below. If continuity is not as specified, replace the multifunction switch.

Lighting switch (Connector No.: M26-2)

Position \ Terminal	1	7	8	9
OFF				
I	○		○	
II	○	○	○	○

Dimmer and passing switch (Connector No.: M26-2)

Position \ Terminal	5	4	3	2
HU	○		○	
HL	○	○		
P	○		○	○

Turn signal switch (Connector No.: M26-2)

Hazard switch	Turn signal switch \ Terminal	10	11	12
OFF	L	○	○	
	N			
	R	○		○

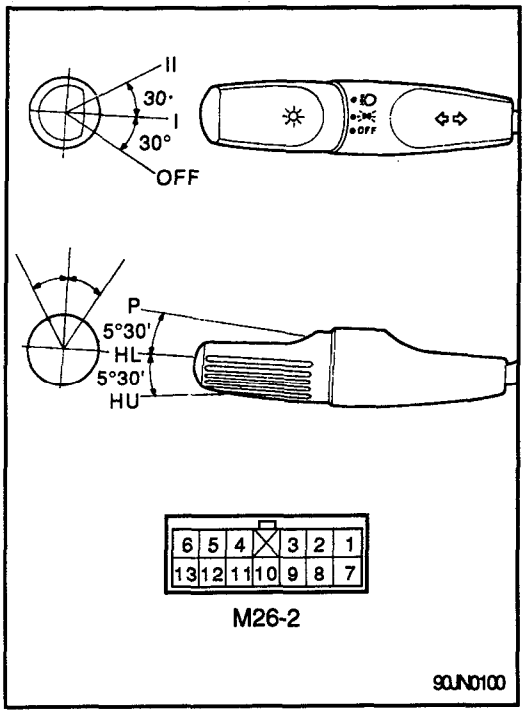
L : Left position
N : Neutral position
R : Right position

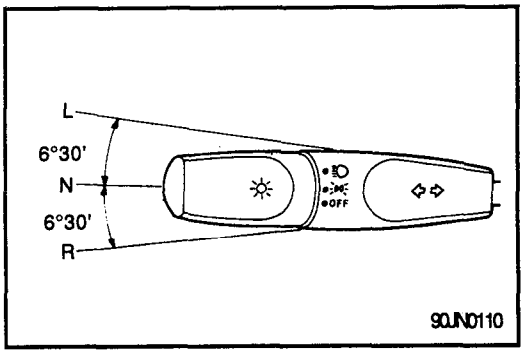
Wiper switch (Connector No.: M26-1)

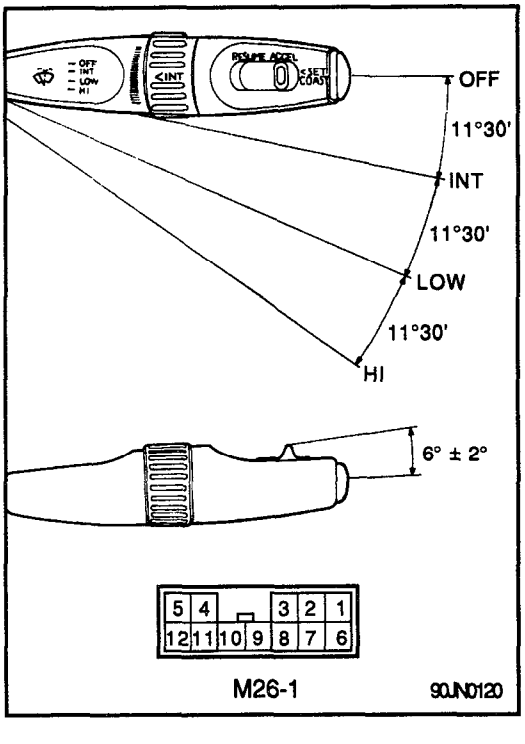
Position \ Terminal	5	4	3	2	9	10
OFF	○		○			
INT	○		○	○	○	○
LOW	○				○	
HI		○			○	

Washer switch (Connector No.: M26-1)

Position \ Terminal	7	9
OFF		
ON	○	○

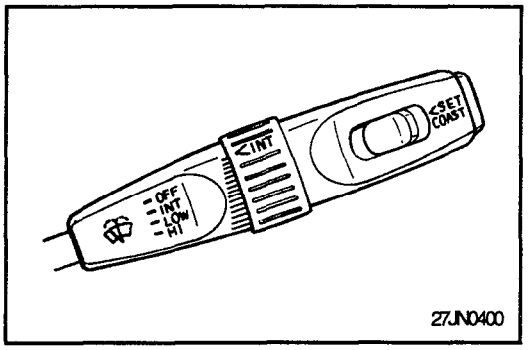






Cruise control switch (Connector No.: M26-1)

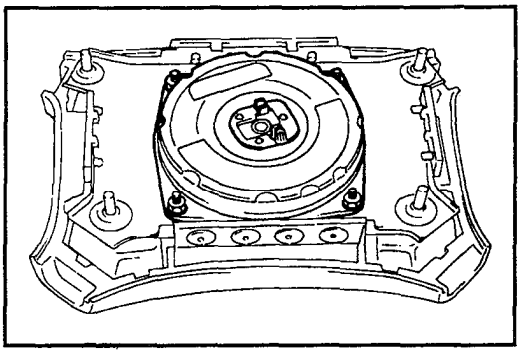
Terminal / Position	12	11	9
RESUME	O		O
OFF			
SET		O	O



REMOVAL AND INSTALLATION (WITH AIR BAG)

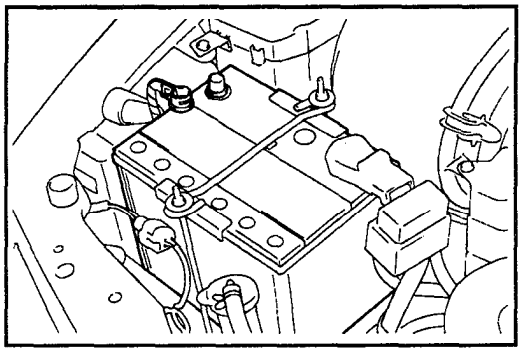
CAUTION

1. **Never attempt to disassemble or repair the air bag module or clock spring.**
   If faulty, replace it.
2. **Do not drop the air bag module or clock spring or allow contact with water, grease or oil.**
   Replace it if a dent, crack, deformation or rust are detected.
3. **The air bag module should be stored on a flat surface and placed so that the pad surface is facing upward.**
   Do not place anything on top of it.
4. **Do not expose the air bag module to temperature over 93°C (200°F).**
5. **After deployment of an air bag, replace the clock spring with a new one.**
6. **Wear gloves and safety glasses when handling an air bag that has already deployed.**
7. **An undeployed air bag module should only be disposed of in accordance with the procedures.**

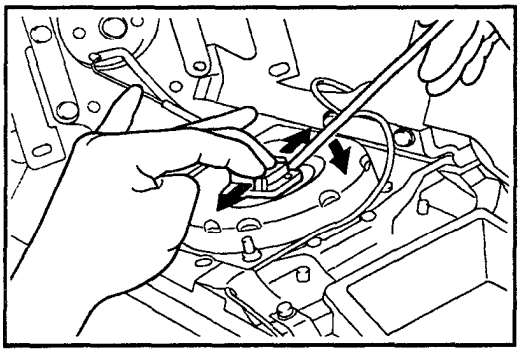


1. Disconnect the negative battery cable and keep secure from battery.

   CAUTION
   Wait at least 30 seconds after disconnecting the battery cable before doint any further work.

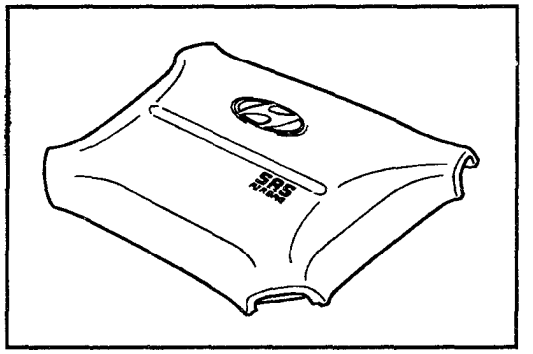


2. Remove the air bag module mounting nut using a socket wrench from the back side.
3. When disconnecting the connector of the clock spring from the air bag module, press the air bag's lock toward the outer side to spread it open. Use a screwdriver, as shown in the figure at the left, to pry so as to remove the connector gently.



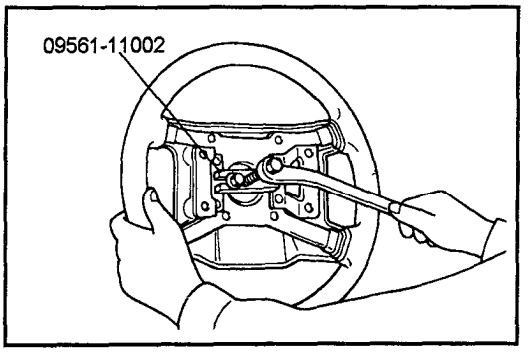
CAUTION

- **When disconnecting the air bag module-clock spring connector, take care not to apply excessive force to it.**
- **The removed air bag module should be stored in a clean, dry place with the pa cover face up.**

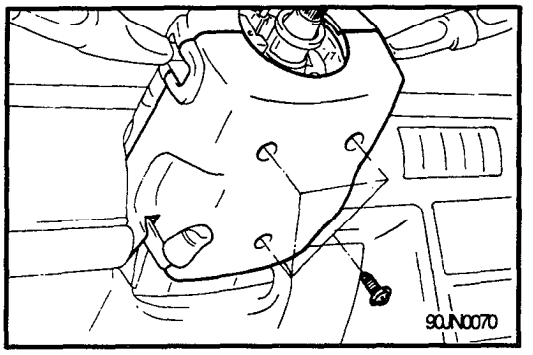


4. Remove the steering wheel by using a special too (09561-**11002).**

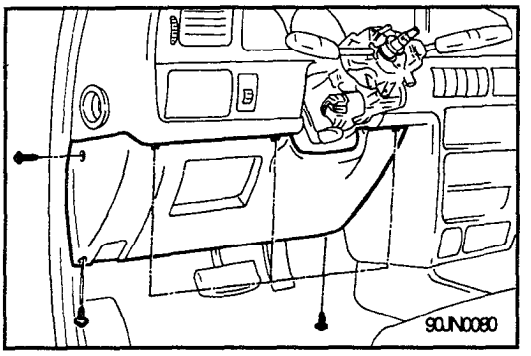
CAUTION
Do not hammer on the steering wheel. Doing so may damage the collapsible column mechanism.



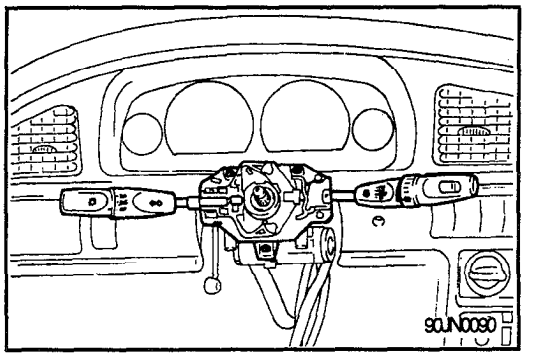
5. Remove the steering column shroud. (3 screws)



6. Remove the lower crash pad. (6 screws)
7. Remove the cable band and harness connectors.



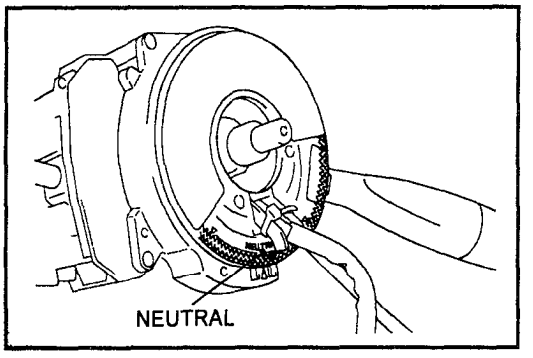
8. Remove the multifunction switch assembly by loosening the 3 screws shown in the illustration.
9. Installation is the reverse order of the removal procedure.



INSTALLATION FOR CLOCK SPRING

Align the mating mark and "NEUTRAL" position indicator of the clock spring, and, after turning the front wheels to the straight-ahead position, install the clock spring to the column switch.

CAUTION
If the clock spring's mating mark is not properly aligned, the steering wheel may not be completely rotational during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading serious injury to the vehicle's driver.
To inspect clock spring, refer to air bag group.



INSPECTION (WITH A/BAG)

With the multifunction switch in each position, make sure that continuity exists between terminals below. If continuity is not as specified, replace the multifunction switch.

Lighting switch (Connector No.: M26-4)

Position \ Terminal	1	2	4	3
OFF				
I	○		○	
II	○	○	○	○

Dimmer and passing switch (Connector No.: M26-5)

Position \ Terminal	1	2	4	3
HU	○		○	
HL	○	○		
P	○		○	○

Turn signal switch (Connector No.: M26-4)

Hazard switch \ Turn signal switch \ Terminal		10	9	8
OFF	L	○	○	
	N			
	R	○		○

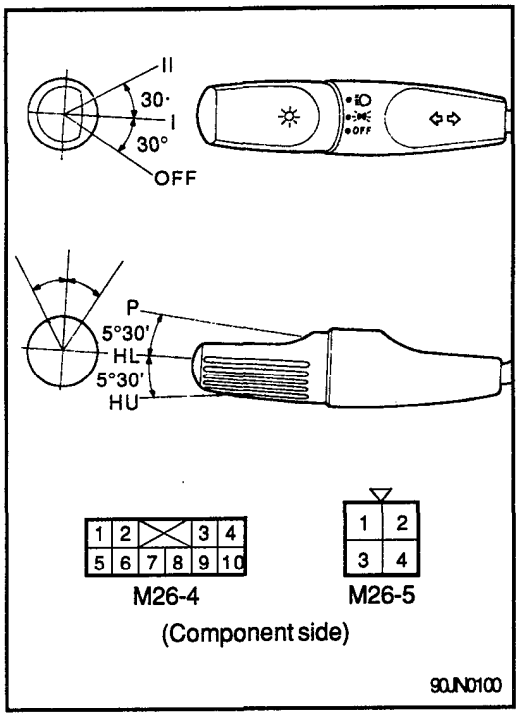
L : Left position
N : Neutral position
R : Right position

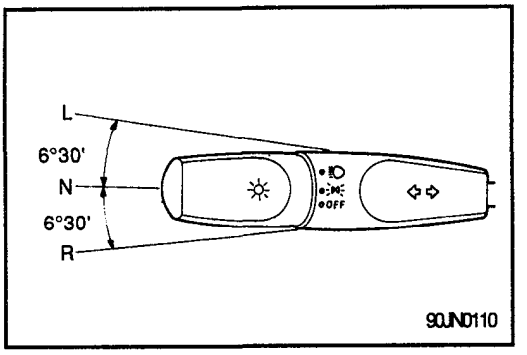
Wiper switch (Connector No.: M26-3)

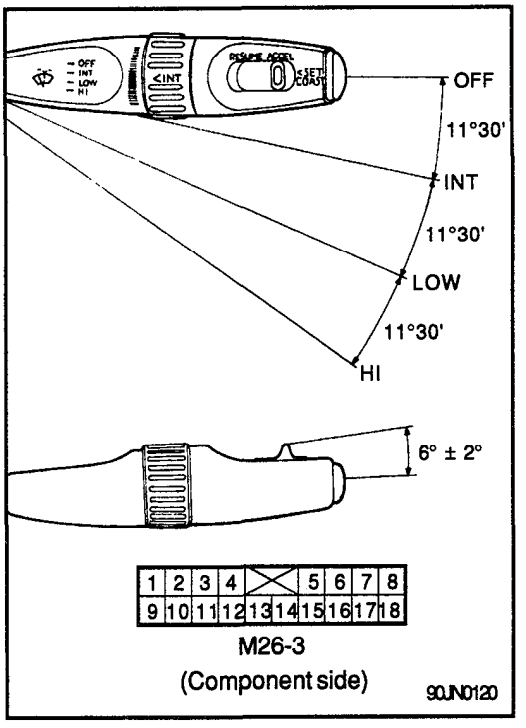
Position \ Terminal	2	4	5	6	16	7
OFF	○		○			
INT	○		○	○	○	○
LOW	○				○	
HI		○			○	

Washer switch (Connector No.: M26-3)

Position \ Terminal	8	16
OFF		
ON	○	○

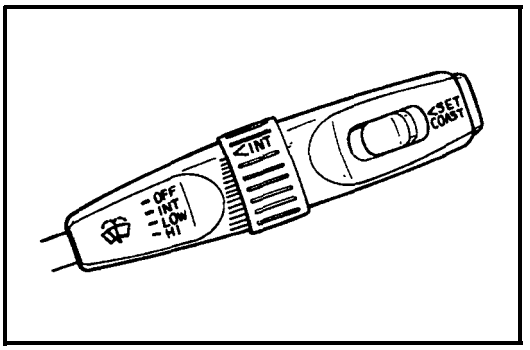






Cruise control switch (Connector No. : M26-3)

Position \ Terminal	18	17	16
RESUME	O		O
OFF			
SET		O	O



INSTRUMENTS AND WARNING SYSTEM
SPECIFICATIONS

Instrument cluster		
Type	Package type (flexible P.C.B. with push connection)	
Illumination lamps	Transparent illumination - 3.4W x 3 Indirect illumination - 1.2W x 2	
Indicator and warning lamps	Bulb wattage (W)	Illumination color
Battery charge	1.2	Red
Oil pressure	1.2	Red
Door ajar	1.2	Amber
Check engine	1.2	Amber
Brake failure	1.2	Red
Over-drive OFF	1.2	Amber
High beam	3.0	Blue
Seat belt	1.2	Red
Hazard	1.2	Red
Low fuel	3.0	Amber
Trunk lid open	1.2	Amber
Direction indicator (LH, RH)	1.2	Green
Air bag	1.2	Green
ABS	1.2	Green
Cruise	1.2	Green

SERVICE SPECIFICATIONS

Speedometer

Type: Eddy current push connection type

Indication tolerance:

Speed (MPH)	10	20	40	60	80	100	120
Tolerance (MPH)	±1.5	±1.5	±1.5	±1.5	±1.5	±1.5	±1.5

Speed (km/h)	20	40	60	80	100	120	140	160
Tolerance (km/h)	+4 0	+3 0	+4 0	+5 0	+5 0	+5.5 +0.5	+5.5 +0.5	+5.5 +0.5

Tachometer

Type: Electronic type

Indication tolerance:

Standard (RPM)	1,000	2,000	3,000	4,000	5,000	6,000	7,000
Tolerance (RPM)	±100	±125	±150	±150	±150	±180	±210

Red zone: 7500 - 9000 RPM

Fuel gauge

Type: Air cored type (pointer remaining type)

Standard & tolerance:

Fuel level	E (Empty)	1/2	F (Full)
Scale angle	-30°	0°	+30°
Tolerance	±2.4°	±5°	±2.4°
Tolerance when assembled with fuel sender	+0° -5°	±7°	+7° -0°
Resistance (Ω)	95	32.5	7

Temperature gauge

Type: Air cored type (pointer-zero-position returning type)

Standard & tolerance:

Temperature (°C)	60	85	110	Red zone	125
Scale angle	-30°	-7°	-7°	26.5°	30°
Tolerance		+2° -3°	+2° -3°		±5°
Tolerance when assembled with temp. sender			+3° -2°		-4° +7°

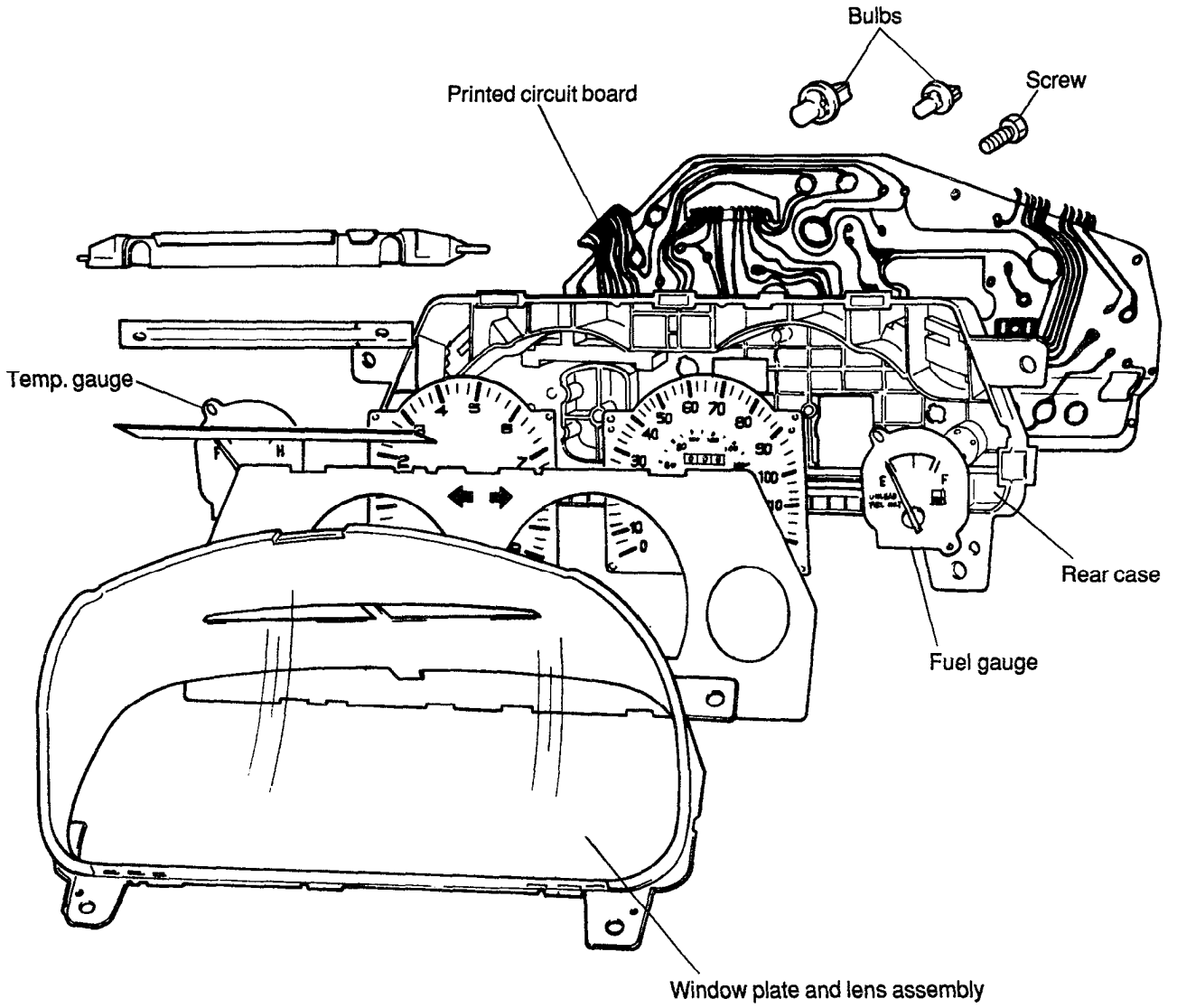
TROUBLESHOOTING

Problem	Probable cause	Remedy
Tachometer does not operate	No.10 fuse (10A) blown Tachometer faulty Wiring faulty	Check for short and replace fuse Check tachometer Repair if necessary
Fuel gauge does not operate	No.10 fuse (10A) blown Fuel gauge faulty Fuel sender faulty Wiring faulty	Check for short and replace fuse Check gauge Check fuel sender Repair if necessary
Low fuel warning lamp does not light	No.10 fuse (10A) blown Bulb burned out Fuel level sensor faulty Wiring or ground faulty	Check for short and replace fuse Replace bulb Check sensor Repair as necessary
ECT gauge does not operate	No. 10 (10A) fuse blown ECT sender faulty Water temperature sender faulty Wiring or ground faulty	Check for short and replace fuse Check gauge Check sender Repair if necessary
Oil pressure warning lamp does not light	NO. 10 (10A) fuse blown Bulb burned out Oil pressure sender faulty Wiring or ground faulty	Check for short and replace fuse Replace bulb Check sender Repair if necessary
Low brake fluid warning lamp does not light	NO. 10 (10A) fuse blown Bulb burned out Brake fluid level warning switch faulty Parking brake switch faulty Wiring or ground faulty	Check for short and replace fuse Replace bulb Check switch Check switch Repair if necessary
Open door warning lamp does not light	NO. 6 (15A) fuse blown Bulb burned out Door switch faulty Wiring or ground faulty	Check for short and replace fuse Replace bulb Check switch Repair if necessary
Seat belt warning lamp does not light	No.10 (10A) fuse blown Bulb burned out Buckle switch faulty Wiring or ground faulty	Check for short and replace fuse Replace bulb Check switch Repair if necessary

ECT : Engine Coolant Temperature

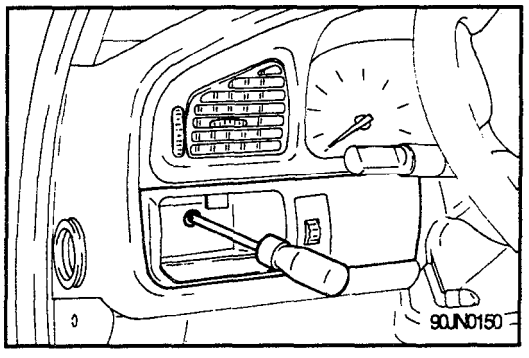
INSTRUMENT CLUSTER

COMPONENTS

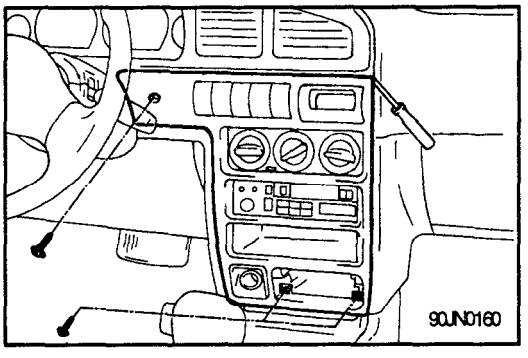


REMOVAL AND INSTALLATION

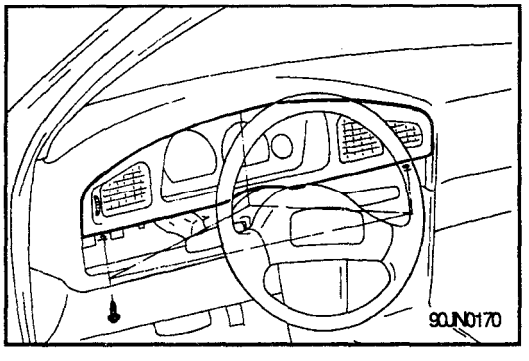
1. Disconnect the battery ground cable.
2. Remove the coin box. (Screw 1 EA)



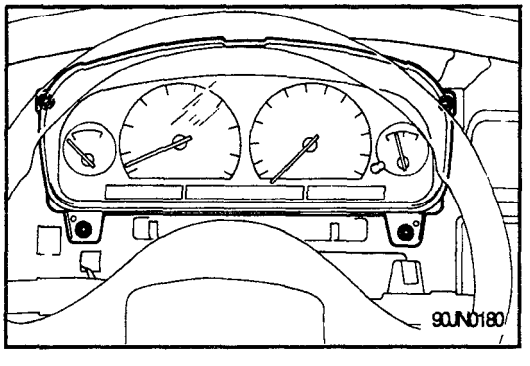
3. Remove the ashtray and lower crash pad center facia panel. (Screw 3 EA)
4. Separate connectors. (Digital clock, Hazard switch, A/C switch, Rear defogger switch, cruise switch)



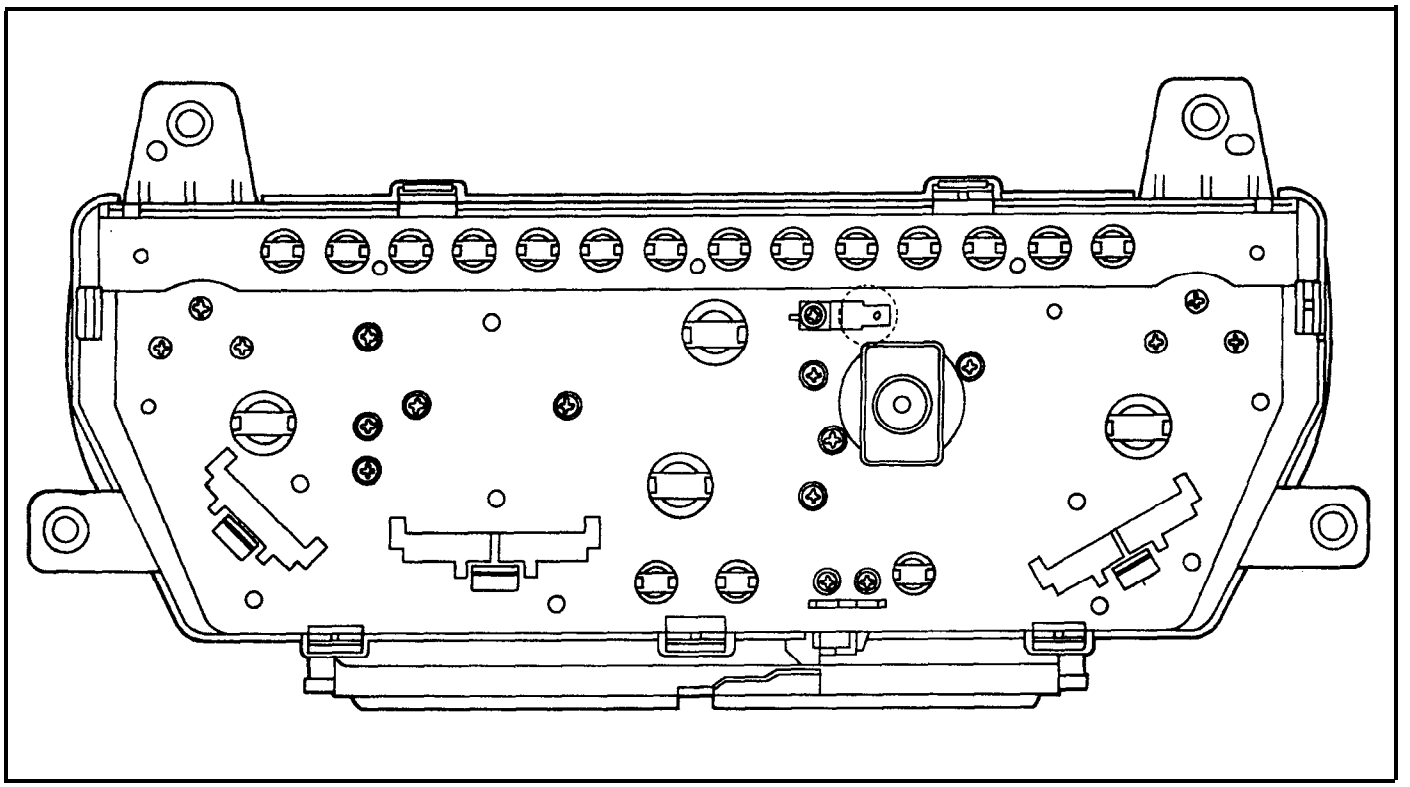
5. Remove three screws at the cluster facia panel.



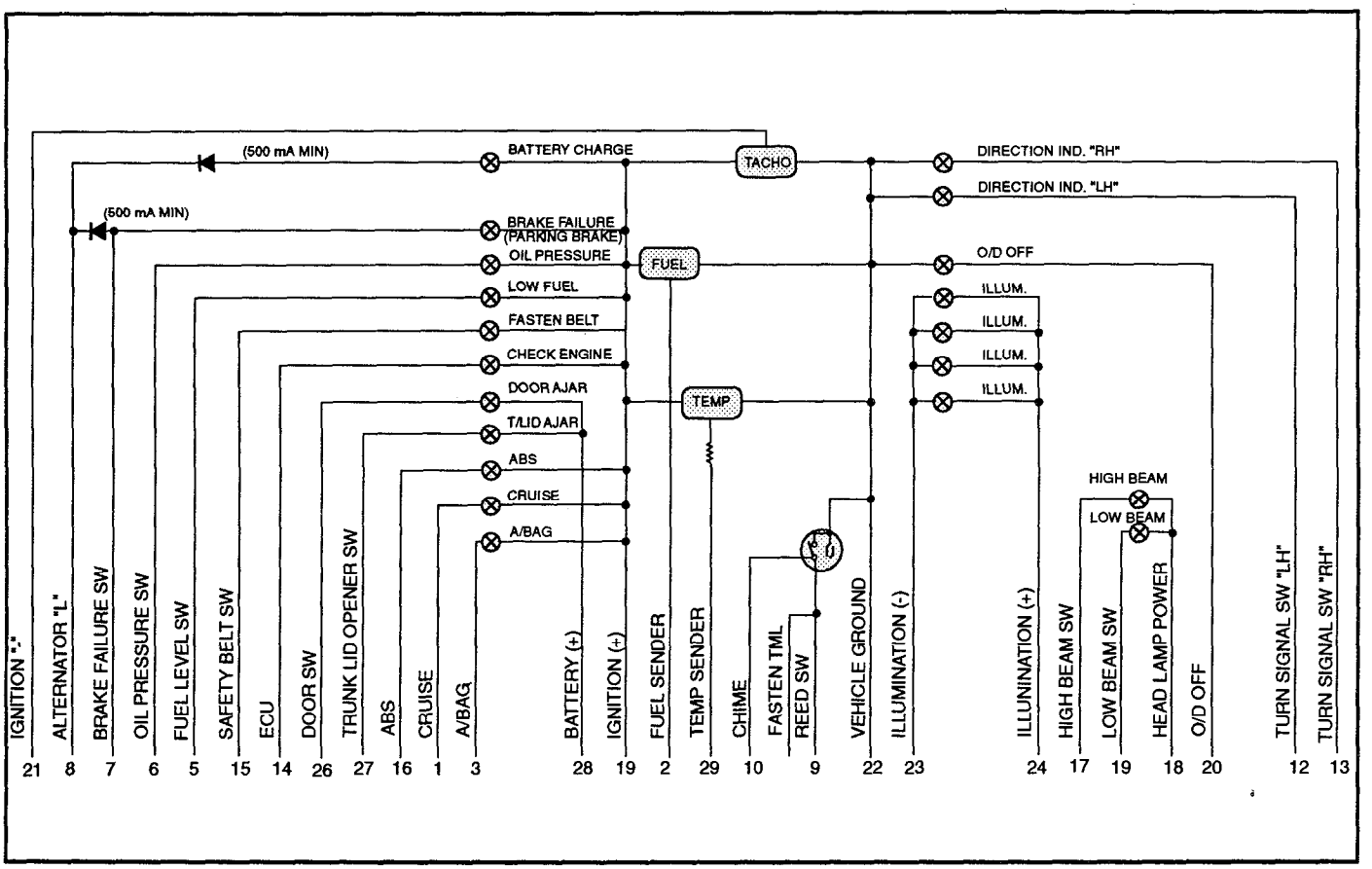
6. Remove four screws retaining cluster and connectors.
7. Installation is the reverse order of removal.



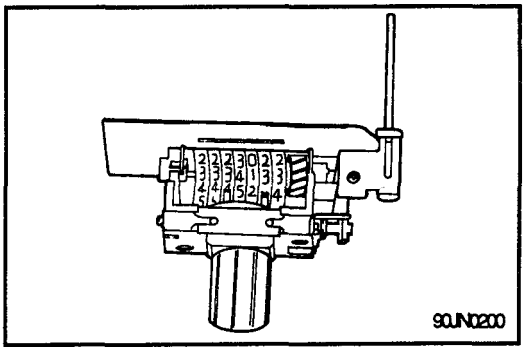
PRINTED CIRCUIT BOARD



CIRCUIT DIAGRAM



SPEEDOMETER AND SPEEDOMETER CABLE



Speedometer inspection (on-vehicle)

1. Using a speedometer tester, ensure that any indication error is within tolerance limits.

   NOTE

   It should be noted that the excessive tire wear and tire over or under-inflation will cause indication errors.

Speed (MPH)	10	20	40	60	80	100	120
Tolerance (MPH)	±1.5	±1.5	±1.5	±1.5	±1.5	±1.5	±1.5

Speed (km/h)	20	40	60	80	100	120	140	160
Tolerance (km/h)	+4 0	+3 0	+4 0	+5 0	+5 0	+5.5 +0.5	+5.5 +0.5	+5.5 +0.5

2. Check the speedometer for pointer fluctuation and abnormal noise.

   NOTE

   Pointer fluctuations can be caused by a faulty speedometer cable.

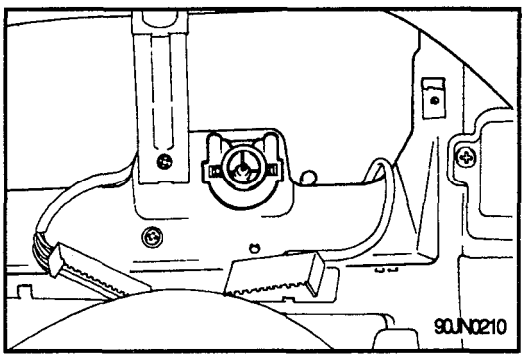
3. Check to see if the odometer is functioning properly.

Speedometer cable inspection

1. Check the cable for kinks, bents or damages in routing. If the conditions are severe, replace cable.
2. After disconnecting cable, check the core for kinks, burrs or bent tips.

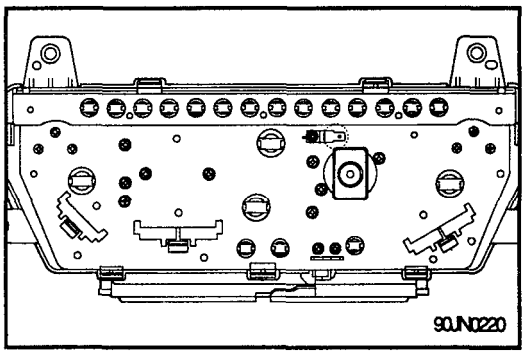
   NOTE

   When installing a cable, it is necessary that extra care should be taken to verify that the stopper of the cable is fitted properly into the speedometer groove and the cable is routed properly to eliminate any kinks.

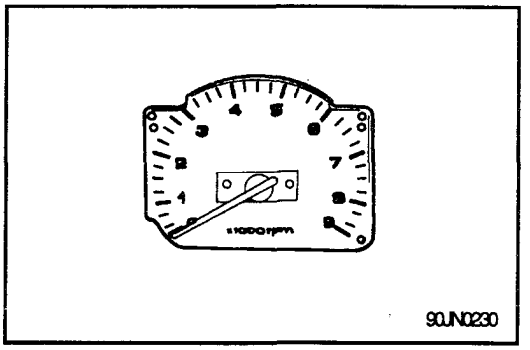


Reed switch inspection

1. Remove the instrument cluster.
2. Use an ohmmeter to check for continuity, or no continuity between the test points as the speedometer cable is rotated.



TACHOMETER

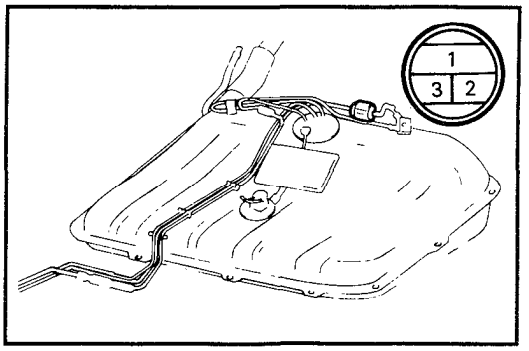


On-vehicle inspection

1. Connect the multi-use tester to the diagnosis connector in the fuse box, or install a tachometer.
2. With engine started, compare the readings of the tester with that of the tachometer.
   Replace tachometer if tolerance is excessive.

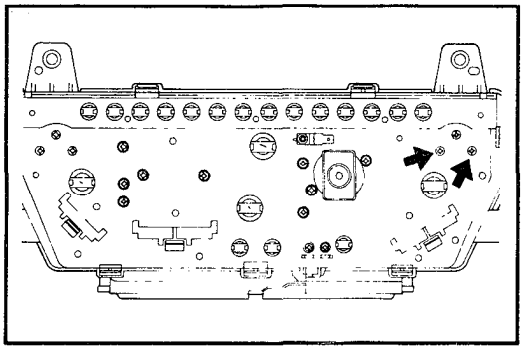
Standard (RPM)	1,000	2,000	3,000	4,000	5,000	6,000	7,000
Tolerance (RPM)	±100	±125	±150	±150	±150	±180	±210

FUEL GAUGE AND FUEL SENDER



Fuel gauge operation check (in-vehicle)

1. Raise the vehicle and disconnect the fuel sender connector
2. Ground the harness side connector (terminal 2) via 12V, 3.4 W bulb.
3. Turn the ignition switch to the ON position.
4. Check to be sure that the test bulb flashes and that the indicator moves gradually to the "F" position.

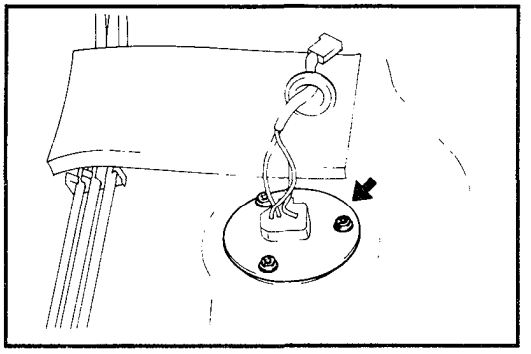


Fuel gauge inspection

1. Remove the instrument cluster.
2. Measure the resistance between terminals.

Standard resistance : 55Ω

NOTE :
If the resistance value is extremely low, there may be a short in the coil; if it is extremely high, there may a broken wire or some other problems in the coil.



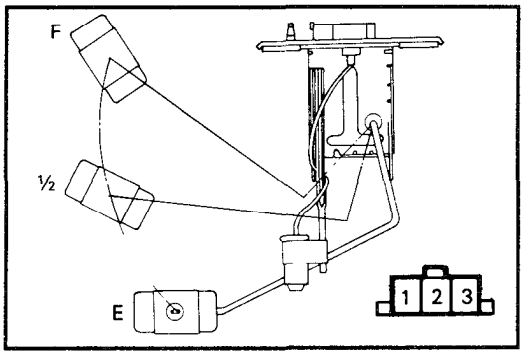
Fuel sender inspection

1. Remove the rear seat assembly,
2. Remove the fuel sender assembly.

3. Using an ohmmeter, measure the resistance between terminals 2 and 3 at each float level.

Float position	E	1/2	F
Resistance Ω	95	32.5	7

4. Check that resistance changes smoothly when the float is moved to "E" or "F".



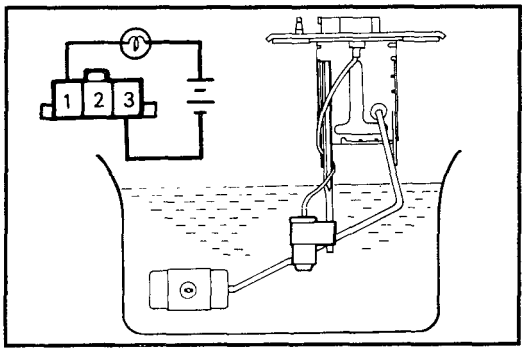
Low fuel level sensor inspection

1. Connect the sender with a test lamp (12V, 3.4W) to the battery and immerse it in the water.
2. The lamp should be off while thermistor is submerged in the water, and should illuminate when the sender is taken out of the water.

NOTE :

If there is a malfunction, replace the fuel sender as an assembly.

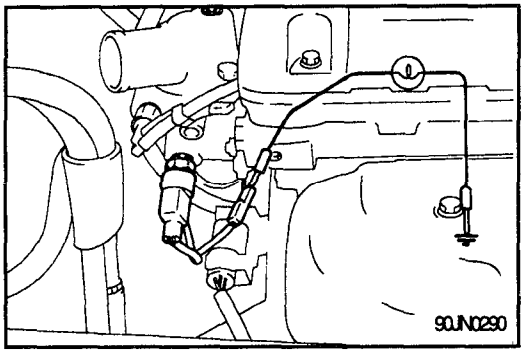
After completing this test, wipe the sender dry and install it in the fuel tank.



WATER TEMPERATURE GAUGE AND SENDER

Water temperature gauge operation check (in-vehicle)

1. Remove the harness connector from water temperature sender located in engine compartment.
2. Ground the harness side connector via 12V, 3.4W bulb.
3. Turn the ignition switch to ON position.
4. Check to be sure that the test bulb flashes and that the indicator moves.

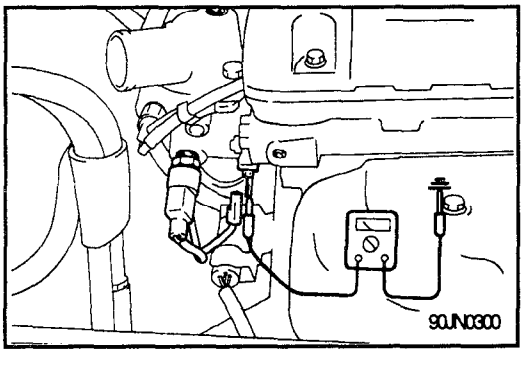


Water temperature sender inspection

Using an ohmmeter, measure the resistance between terminal and ground.

If the resistance is out of specification, replace the sender.

Temperature °C (°F)	60 (140)	80 (176)	110 (230)	125 (257)
Resistance Ω	125	48.4	24	15.2

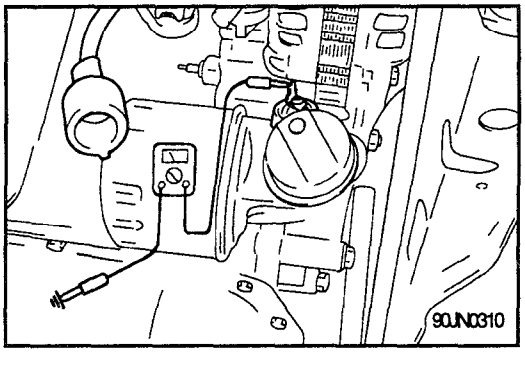


OIL PRESSURE SWITCH AND WARNING LAMP

Oil pressure switch inspection

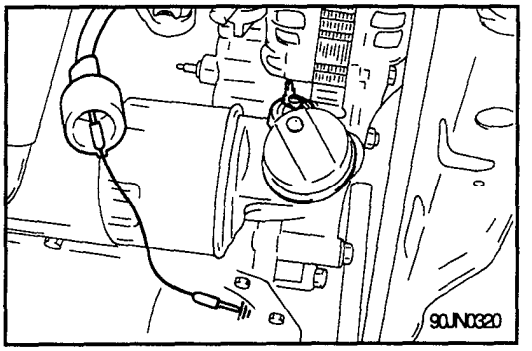
1. Pull out the connector from the oil pressure switch located at the cylinder block.
2. Check for continuity between the switch terminal and ground under condition of pressure below.

Switch ON pressure .....
0.3 ± 0.1 kg/cm^2 (29.4 ± 9.8 kPa, 4.3 ± 1.4 psi)



Oil pressure warning lamp inspection

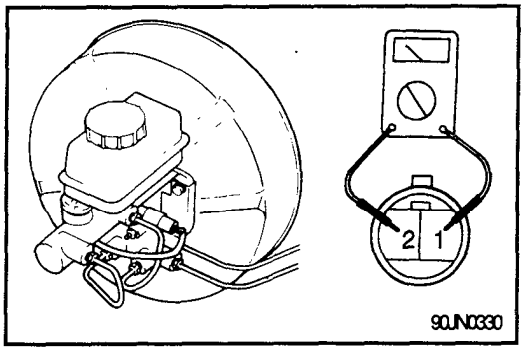
1. Pull out the connector from the oil pressure switch.
2. Ground the harness side connector.
3. Ensure that the oil pressure warning lamp lights when the ignition switch is turned ON.



BRAKE FLUID LEVEL WARNING SWITCH AND LAMP

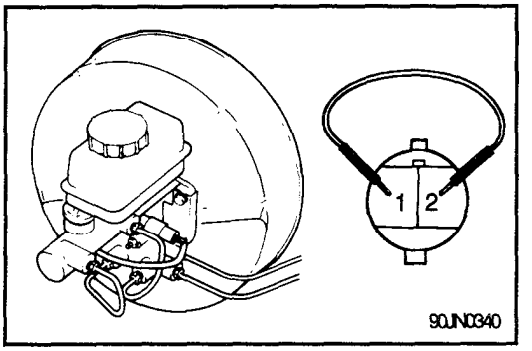
Brake fluid level warning switch inspection

1. Remove the connector from the switch located at brake fluid reservoir.
2. Ensure that the continuity exists between switch terminals 1 and 2 while pressing down the switch (float) with a rod.



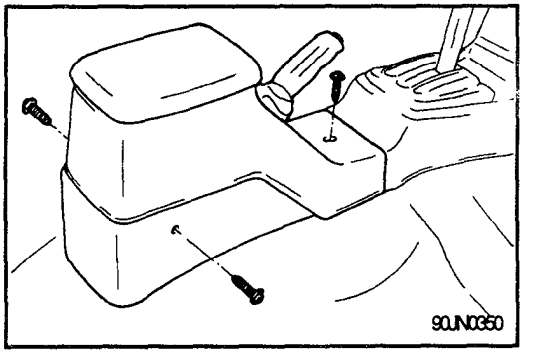
Brake fluid level warning lamp inspection

1. Start the engine.
2. Release the parking brake.
3. Release the connector form the brake fluid level warning switch.
4. Ground the connector at the harness side.
5. Ensure that the warning lamp lights.



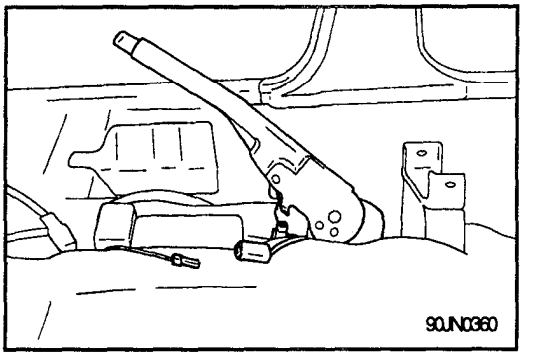
Parking brake switch inspection

1. Remove the rear console assembly.

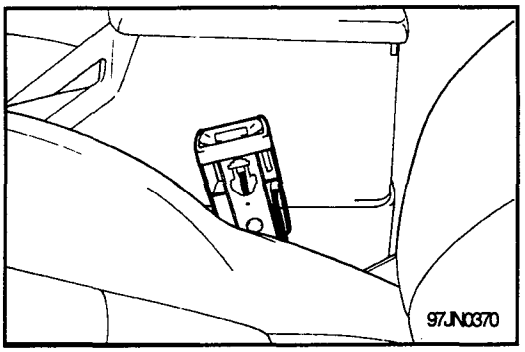


2. Disconnect the connector of parking brake switch.
3. Check continuity between terminal and body ground.

Parking lever position	Continuity
Pulled ON	Conductive (0Ω)
Released OFF	Non-conductive (∞Ω)



SEAT BELT WARNING SWITCH AND LAMP



Seat belt switch inspection

1. Remove the connector from the switch.
2. Check for continuity between terminals.

Seat belt condition	Continuity
Fastened	Non-conductive (∞Ω)
Not fastened	Conductive (0Ω)

Seat belt warning lamp inspection

With the ignition switch turned ON, ensure that the lamp glows.

Seat belt condition	Warning lamp
Fastened	Off
Not fastened	Glows for about six seconds

LIGHTING SYSTEM
SPECIFICATION

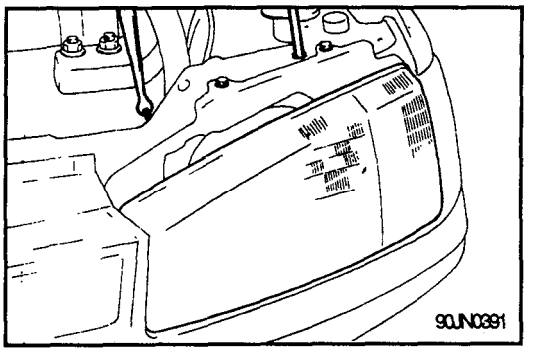
Front combination lamp		
Headlamp	W	60/45
Position lamp	W	4
Turn signal lamp	W	28/8
Front side marker lamp	W	5
Rear combination lamp		
Tail and stop lamp	W	8/27
Turn signal lamp	W	27
Sack up lamp	W	27
Side marker lamp	W	5
Interior lamp		
Luggage compartment lamp	W	5
Door lamp	W	5
High mounted stop lamp	W	17
Room lamp	W	10
Map lamp	W	5
Overhead console lamp (Vehicles only with soonroof)	W	10
Licence plate lamp	W	8
Flasher unit		
Turn signal blinking frequency	C/M	85 ± 10 at 12.8V
Hazard warning blinking frequency	C/M	80 ± 12 at 12.8V

TROUBLESHOOTING

Problem	Possible cause	Remedy
Only one lamp does not light (all exterior)	Bulb burnt out Socket, wire or ground faulty	Replace bulb Repair as necessary
Headlamps do not light	Bulb burned out Fusible link blown Headlamp relay faulty Lighting switch faulty Wiring or ground faulty	Replace bulb Replace fusible link Check relay Check switch Repair as necessary
Tail, and licence lamp do not light	Tail fuse blown Fusible link blown Taillamp relay faulty Lighting switch faulty Wiring or ground faulty	Replace fuse and check for short Replace fusible link Check relay Check switch Repair as necessary
Stop lamps do not light	Circuit fuse blown Stop lamp switch faulty Wiring or ground faulty	Replace fuse and check for short Adjust or replace switch Repair as necessary
Stop lamps stay on	Bulb burned out Stop lamp switch faulty	Replace bulb Adjust or replace switch
Instrument lamps do not light (taillamps light)	Lamp control rheostat faulty Wiring or ground faulty	Check rheostat Repair as necessary
Turn signal does not flash on one side	Bulb burned out Turn signal switch faulty Wiring or ground faulty	Replace bulb Check switch Repair as necessary
Turn signal does not operate	Turn signal fuse blown Turn signal flasher faulty Turn signal switch faulty Wiring or ground faulty	Replace fuse and check for short Check flasher Check switch Repair as necessary
Hazard warning lamp does not operate	Hazard fuse blown Hazard warning flasher faulty Hazard switch faulty Wiring or ground faulty	Replace fuse and check for short Check flasher Check switch Repair as necessary

HEADLAMP AIMING

PRE-AIMING INSTRUCTIONS



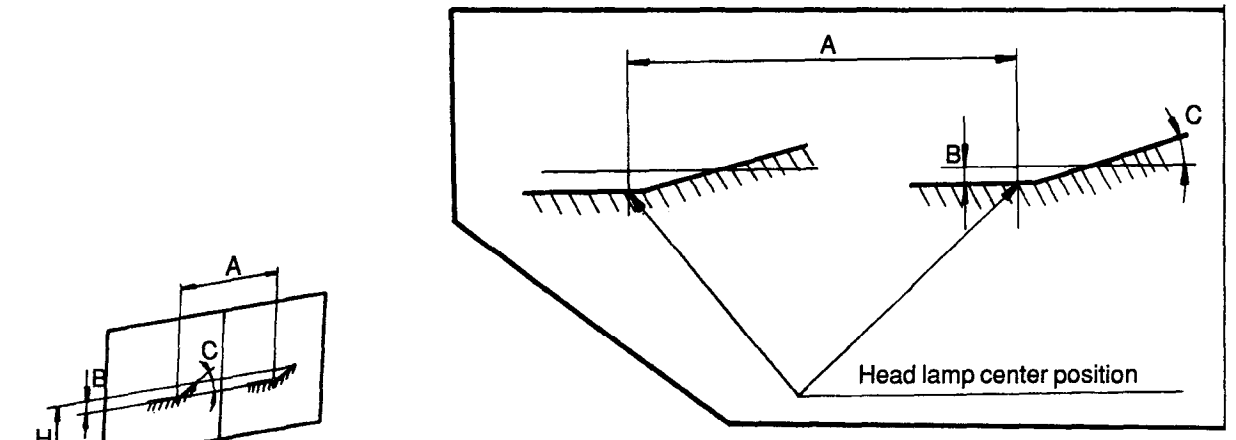
The headlamps should be aimed with the proper beam-setting equipment, and in accordance with the equipment manufacturer's instructions.

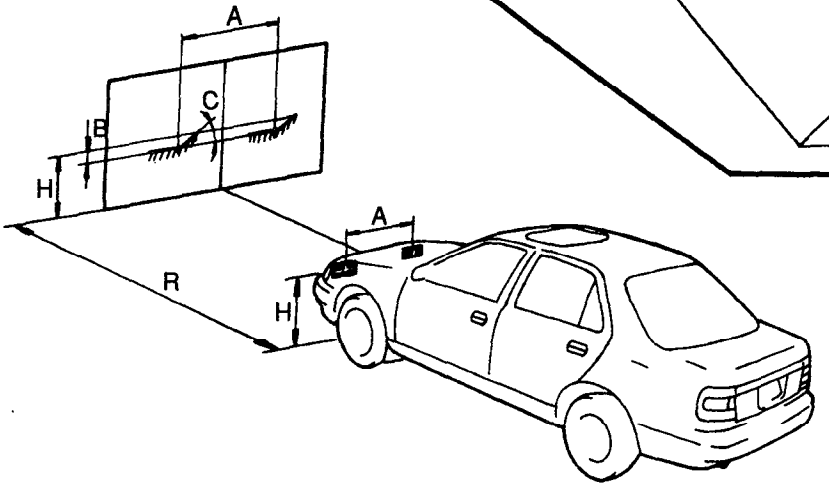
NOTE:

If there are any regulations pertinent to the aiming of headlamps in the area where the vehicle is to be used, adjust so as to meet those requirements.

Alternately turn the adjusting bolts to adjust the headlamp aiming. If beam-setting equipment is not available, proceed as follows:

1. Inflate the tires to the specified pressure and remove the load from the vehicle except a driver, spare tire, tool.
2. The vehicle should be placed on the flat floor.
3. Draw vertical lines (vertical lines passing through respective headlamp centers) and a horizontal line (horizontal line passing through center of headlamps) on the screen.
4. With the headlamp and battery normal condition, aim the headlamps.
   Make the vertical and horizontal adjustment of the lower beam to the standard values by using the adjusting knobs.



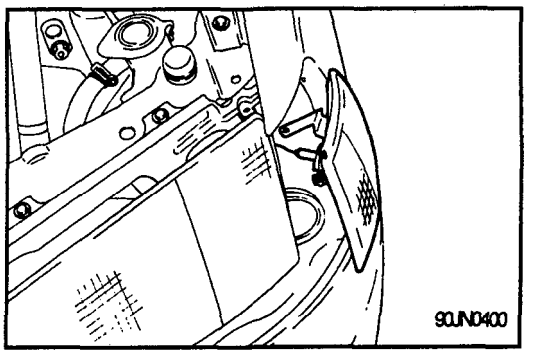


A : 1,000 mm
B : 30 mm
C : 15°
H : 627 (without driver)
626 (with driver)
R : 3,000 mm

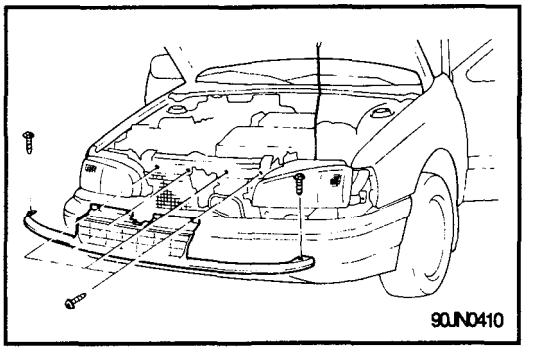
REPLACEMENT OF LAMPS

Headlamp (Position lamp incorporated)/ Turn Signal Lamp

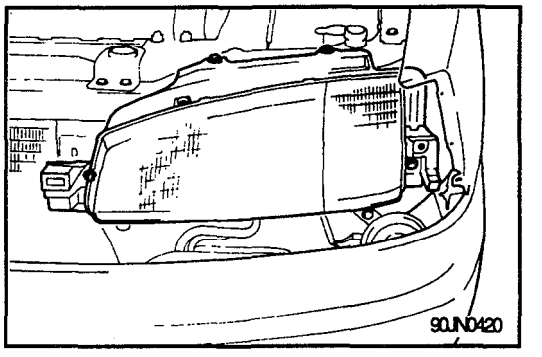
1. Disconnect the battery negative terminal.
2. After loosening the screw, pull out the turn signal lamp.



3. Remove the radiator grille.

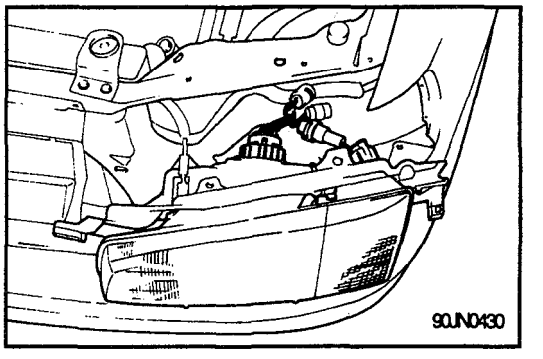


4. Remove the headlamp assembly.



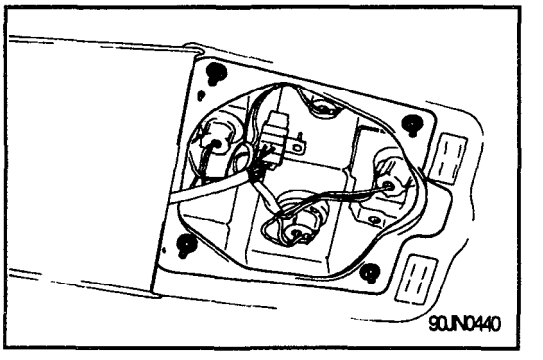
5. Disconnect the headlamp connector.
6. Installation is the reverse order of removal.

Tightening torque	N.m (kg.cm, lb.ft)
Turn signal lamp	3-5 (30-50, 2.2-3.6)
Headlamp	3-5 (30-50, 2.2-3.6)
Radiator grille	0.5-1.0 (5-10, 0.4-0.7)



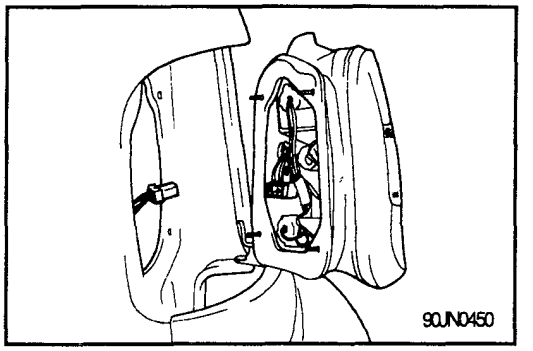
Rear Combination Lamp

1. Disconnect the negative terminal from the battery.
2. Open the trunk lid.
3. With rear luggage cover opened, loosen the 4 mounting nuts.



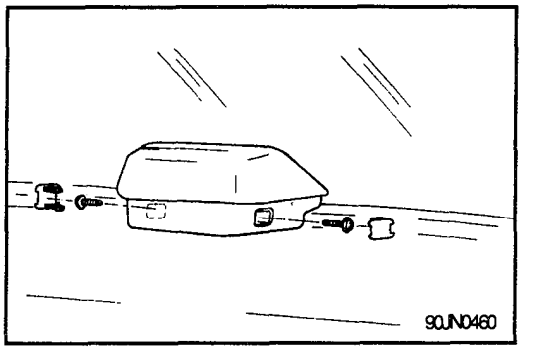
4. After disconnecting the connector, remove the lamp assembly.
5. Installation is the reverse order of removal.

Tightening torque of rear combination lamp .....
2-2.5 N.m (20-25 kg.cm, 1.4-1.8 lb.ft)

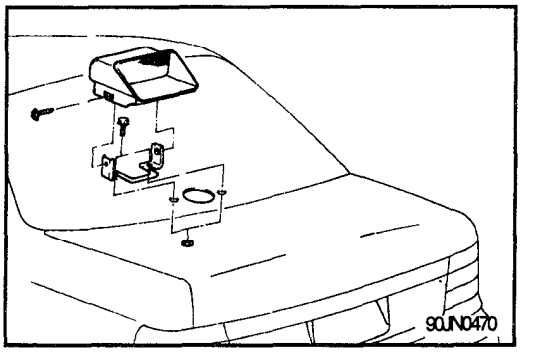


High Mounted Stop Lamp

1. Disconnect the battery negative terminal.
2. Using a screw driver, detach 2 blanking covers on both sides of the lamp.
3. Loosen the mounting screws.

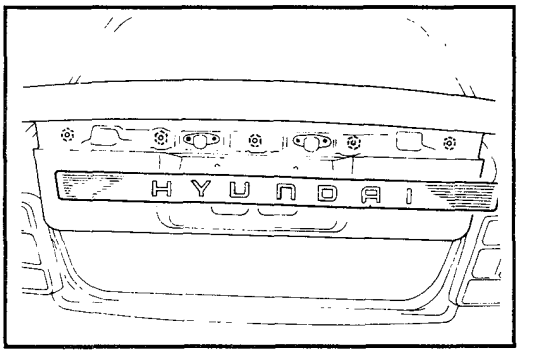


4. Remove the lamp assembly from the rear package trim.
5. Disconnect the connector from main harness.
6. Installation is the reverse order of removal.



Licence Plate Lamp

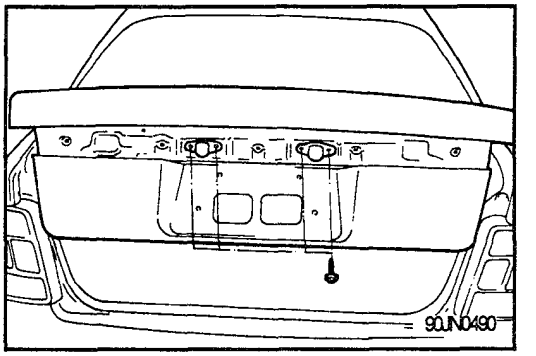
1. Disconnect the battery negative terminal.
2. Remove the back panel upper garnish by loosening 5 nuts.



3. Remove the licence plate lamp assembly.
4. Disconnect the connector from the harness.
5. Installation is the reverse order of removal.

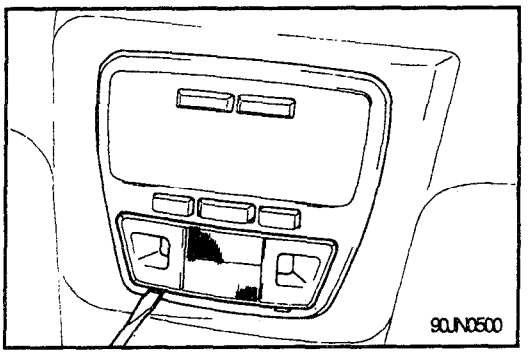
Tightening torque

Backpanel upper garnish mounting nut .....
2.0-2.5 N.m (20-25 kg.cm, 1.4-1.8 lb.ft)
Licence plate lamp mounting screw .....
0.5-1.0 N.m (5-10 kg.cm, 0.4-0.7 lb.ft)

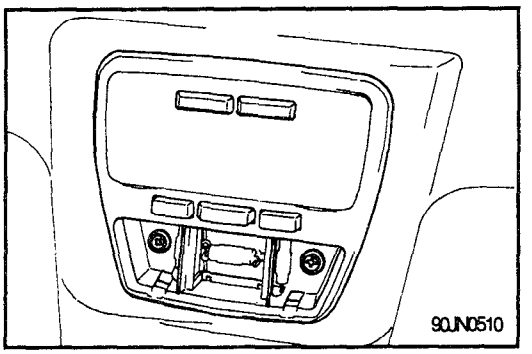


Overhead Console Lamp (Vehicles with sunroof)

1. Disconnect the battery negative terminal.
2. Using a screw driver, detach the overhead console lamp lens.

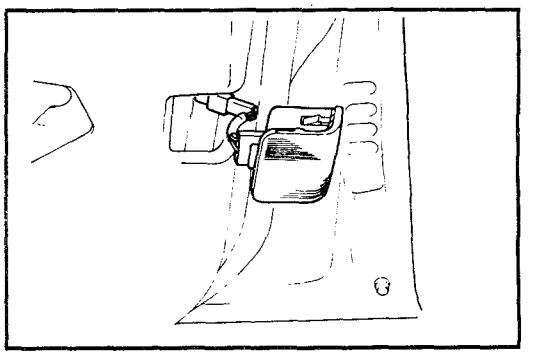


3. Remove the lamp assembly from the head lining by loosening 2 screws.
4. Disconnect the connector from the roof harness.
5. Installation is the reverse order of removal.



Door Lamp

1. Disconnect the battery negative terminal.
2. Remove the door lamp while inserting the screw driver as shown.
3. Disconnect the connector from door harness.
4. Installation is the reverse order of removal.

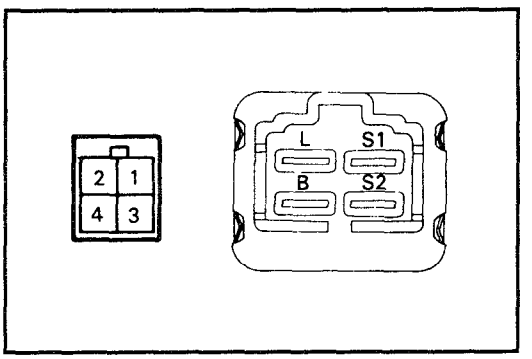


INSPECTION OF COMPONENTS

Relay (Headlamp & Taillamp)

1. Pull out the headlamp relay from the relay box in engine compartment.
2. Check for continuity between terminals.

Terminal / Position	1	2	3	4
When de-energized	O		O	
When energized	⊕	O	⊖	O

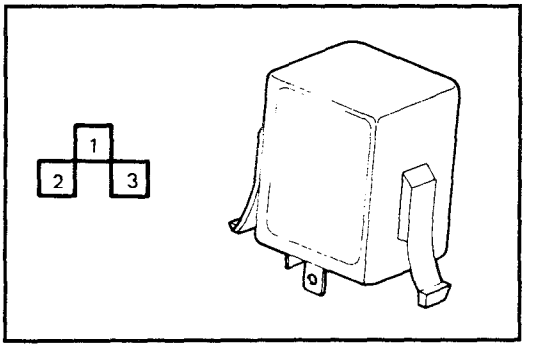


NOTE:

1. O—O indicates that there is continuity between the terminals.

2. ⊕—⊖ indicates power supply connection.

Flasher Unit



1. Remove the flasher unit from the relay box in passenger compartment.
2. Connect the positive (+) lead from the battery to terminal 3 and the negative (-) lead to terminal 2.
3. Connect the two turn signal lamps parallel to each other to terminal 1 and 2, check that the bulbs turn on and off.

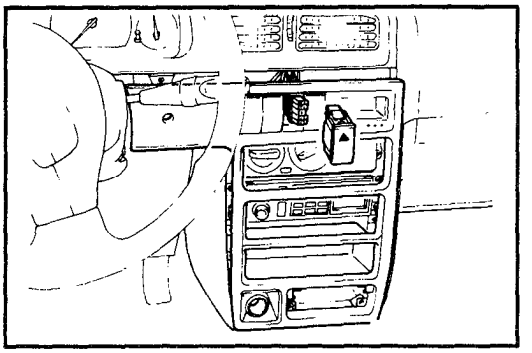
NOTE

The turn signal lamps should flash 75 to 95 times per minute.

If one of the front or rear turn signal lamps has an open circuit, the number of flashes will be more than 120 per minute.

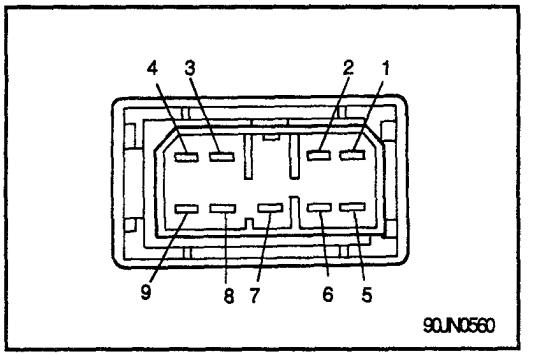
If operation is not as specifed, replace the flasher unit.

Hazard Switch



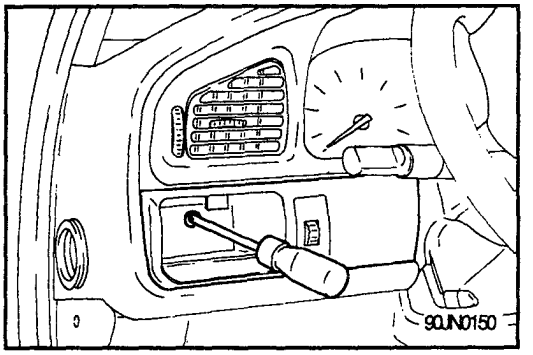
1. Disconnect the battery negative terminal.
2. Remove the hazard switch from the lower crash pad center facia panel.
3. Disconnect the connector from crash pad harness.

4. Operate the switch and check for continuity between terminals by using an ohmmeter.



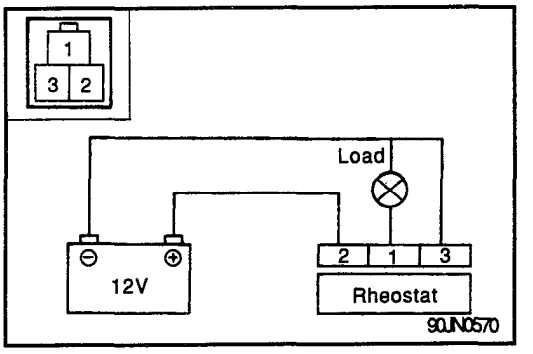
Terminal / Position	3	4	9	2	6	7	8	1	5
OFF	O		O					O	O
ON		O	O	O	O	O	O		

Rheostat



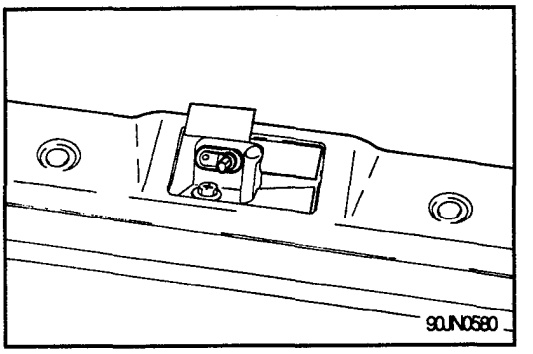
1. Disconnect the battery negative terminal.
2. Open coin box cover and remove the coin box assembly, with rheostat.
3. Disconnect the rheostat from crash pad harness.
4. Remove the rheostat from the coin box.

5. Check for intensity of lamp load.
   If the light intensity of the lamps changes smoothly without any flickering when the rheostat is turned, it can be assumed that the rheostat is functioning properly.



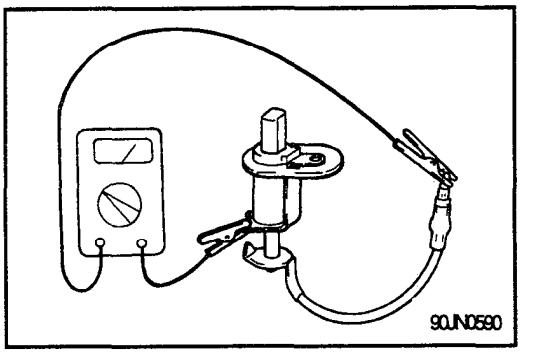
Luggage Compartment Lamp Switch

1. Disconnect the battery negative terminal.
2. Remove the luggage compartment lamp switch from the trunk lid striker.
3. Disconnect the connector from rear harness.



4. Check for continuity between terminal and body while pushing the rod.

Switch rod condition	Continuity
Pushed (OFF)	Non-conductive (∞Ω)
Released (ON)	Conductive (0Ω)



AUDIO

SPECIFICATIONS

AM/FM RADIO WITH CASSETTE

Item	H810 (Base)	H820 (Mid)	H565 (Deluxe)
Radio			
Receiving band	AM/FM1/FM2	←	←
Tuning type	E.T.R	←	←
Memory (AM/FM)	6/12	←	←
Frequency range			
AM	530-1,710 KHz	530-1,710 KHz	
FM	87.9-l 08	←	←
Tape player			
Deck type	Mechanical	Full logic	←
Eject type	Key off release	←	←
Reproducing type	Auto reverse	←	←
Amplifier			
Output power	Max. 20W x 2CH	Max. 25W x 4CH	Max. 25W x 4CH
Volume type	Rotary	←	←
Compact disc player			
Frequency response			20KHz to 20KHz ± 3dB
Signal to noise ratio			NOM. 80dB (with IHF-A)

ANTENNA

Items	Specifications
Manual antenna	
Type	Telescopic rod
Insulating resistance	MIN. 100 MΩ (at DC 500 V megger)
Electrostatic capacity	80 ± 8 PF, 75Ω
Power antenna	
Rated Voltage	DC 12V
Operating amperage	Max. 6A (Lock Current Max 15A)
Insulating resistance	MIN. 100 MΩ (at DC 500V megger)
Electrostatic capacity	80 ± 8 PF, 75Ω

COMPACT DISC PLAYER TROUBLESHOOTING

Symptoms	Cause	Solution
o Skips o Stuck on one track o Disc ejects during play	o Scratches o Fingerprint marks or dust (Unclean surfaces)	o Handle disc by edge only. o Keep disc clean by using a cleaning kit specifically designed for compact discs.
	o Pin holes	o Check for pin holes by holding disc up to a light aspect and observing it. o Defective disc should not be used in player.
o Disc loads but ejects after a few seconds	o Disc is not centered on clamping mechanism.	o Disc center hole can be defective during manufacturing process. o Defective disc should not be used in player.
	o Rough edges	o Rough edges may touch mechanism parts and can be corrected by lightly sanding disc edges.
o Disc loads but function switch won't operate and display is erratic. o Error indication	o Battery voltage drop or a momentary loss of B+.	o When replacing or charging vehicle battery, reset button should be depressed to restore normal function.
	o Laser diode protection circuit is being activated due to excessive scratches or environmental heat.	o An excessive scratched disc may cause the tracking servo to move more than necessary, resulting in internal heat build up. o Remove disc and allow CD. player to return to a safe operating temperature before re-inserting.

TROUBLESHOOTING

There are 5 areas where a problem can occur: the wiring harness, radio, cassette tape deck, speaker, and the antenna.
Your job in troubleshooting is to isolate the problem to a particular area.

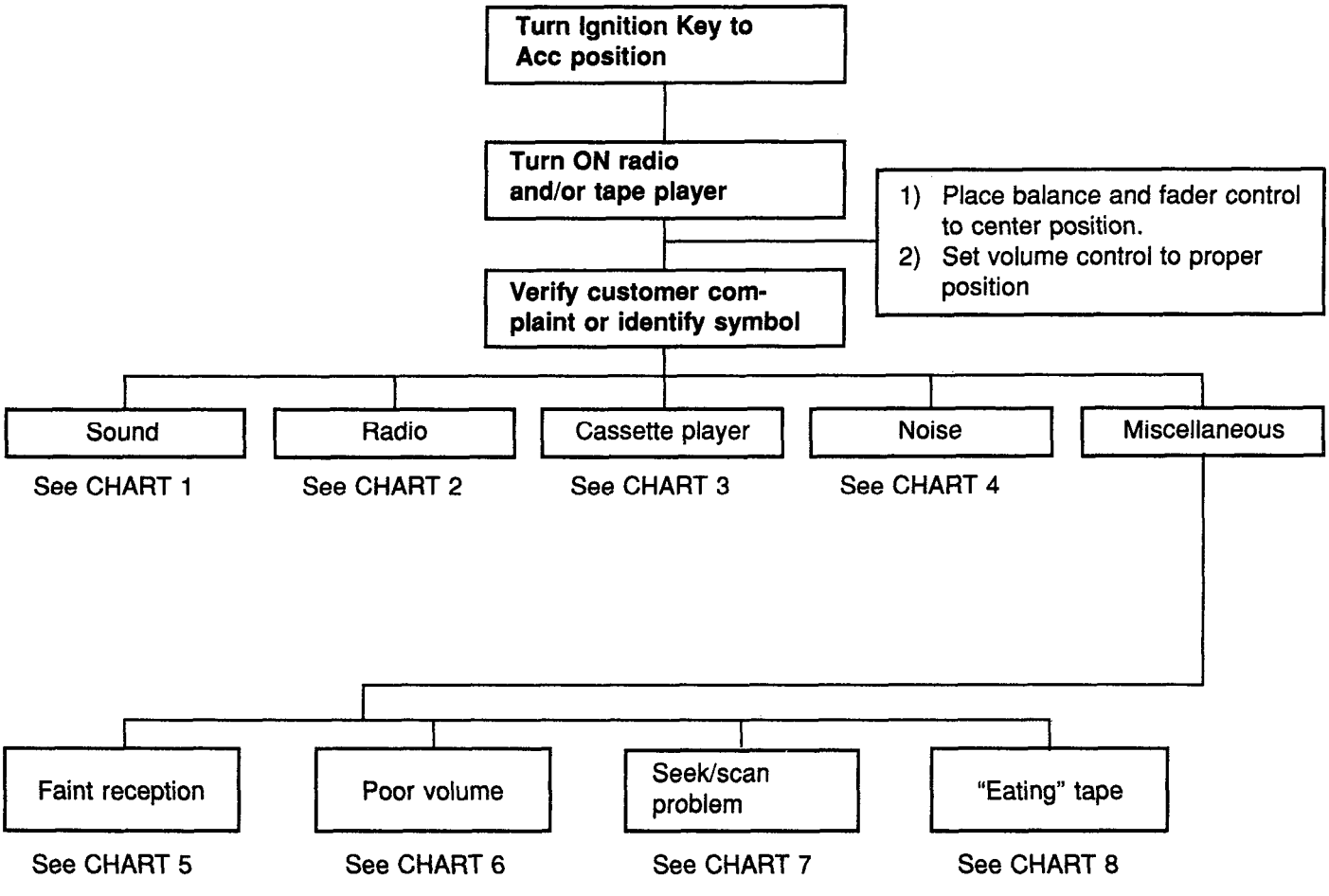
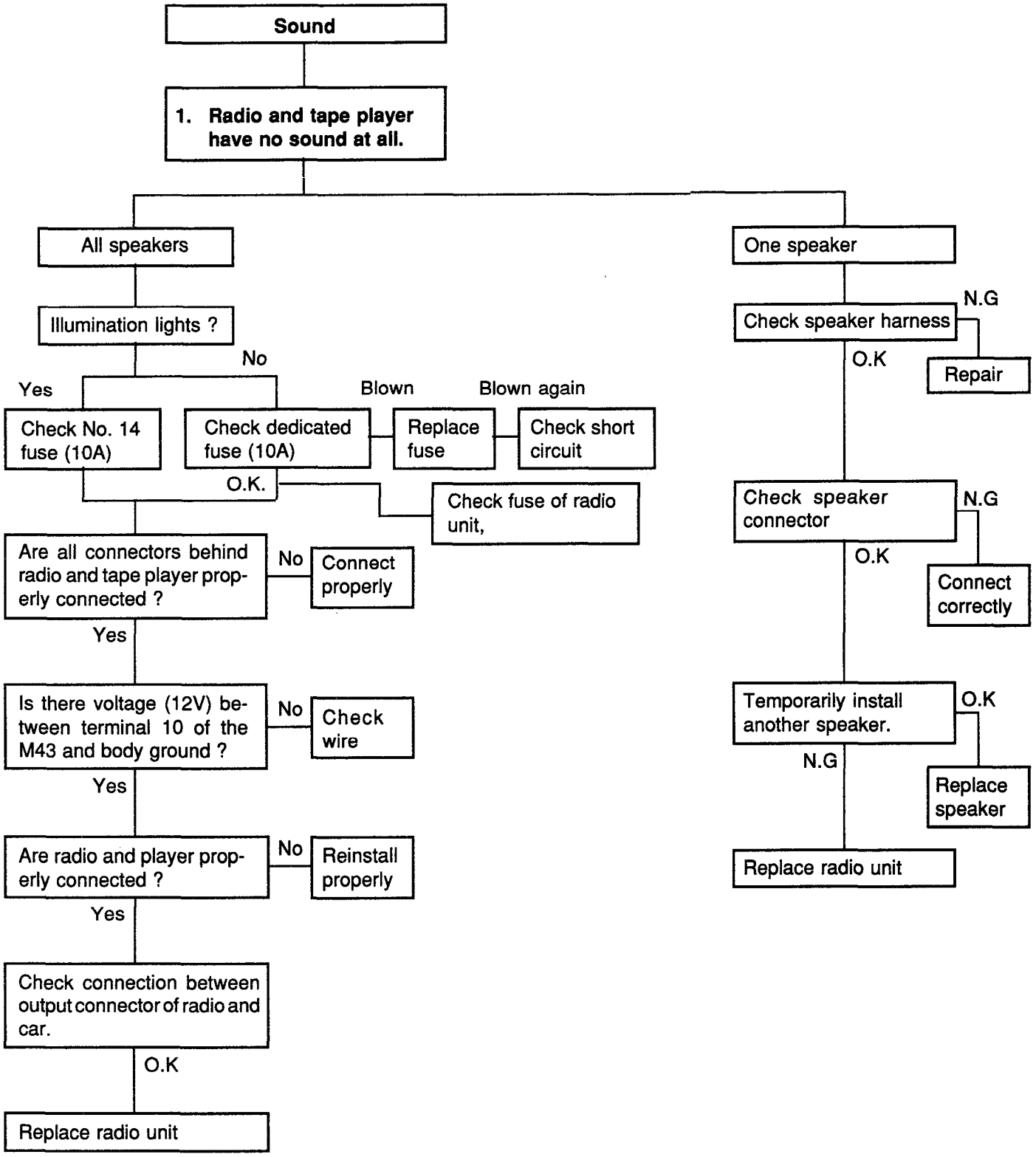


CHART 1


Sound
1. Radio and tape player have no sound at all.
All speakers
Illumination lights ?
No
Yes
Blown
Blown again
Check No. 14 fuse (10A)
Check dedicated fuse (10A)
Replace fuse
Check short circuit
O.K.
Check fuse of radio unit,
Are all connectors behind radio and tape player properly connected ?
No
Connect properly
Yes
Is there voltage (12V) between terminal 10 of the M43 and body ground ?
No
Check wire
Yes
Are radio and player properly connected ?
No
Reinstall properly
Yes
Check connection between output connector of radio and car.
O.K
Replace radio unit
One speaker
Check speaker harness
N.G
O.K
Repair
Check speaker connector
N.G
O.K
Connect correctly
Temporarily install another speaker.
O.K
N.G
Replace speaker
Replace radio unit

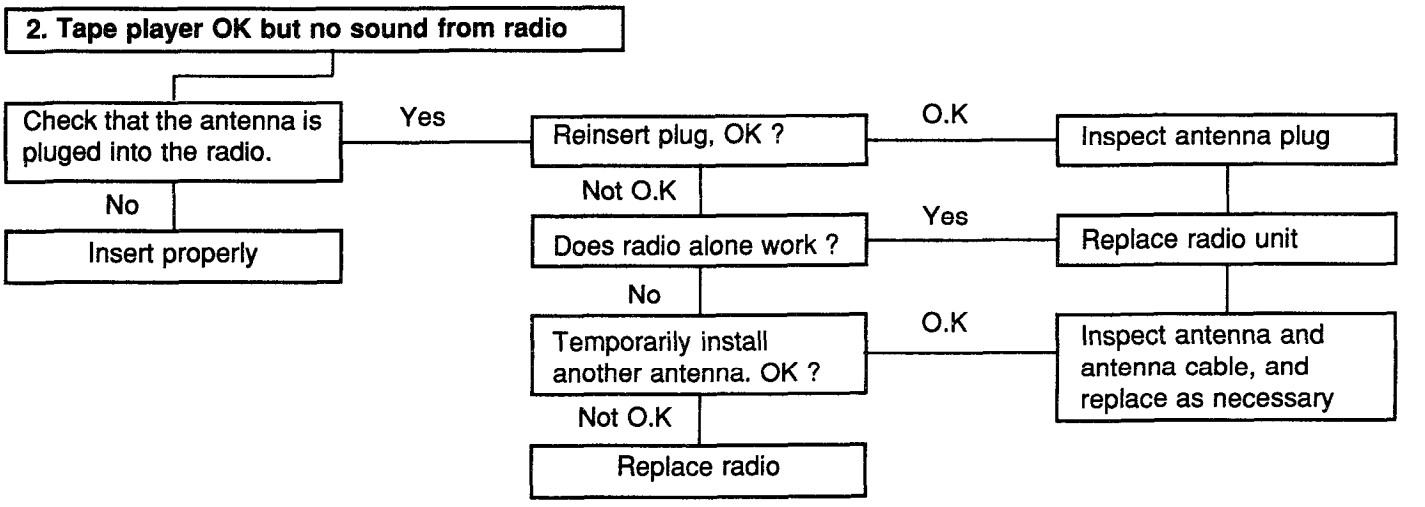
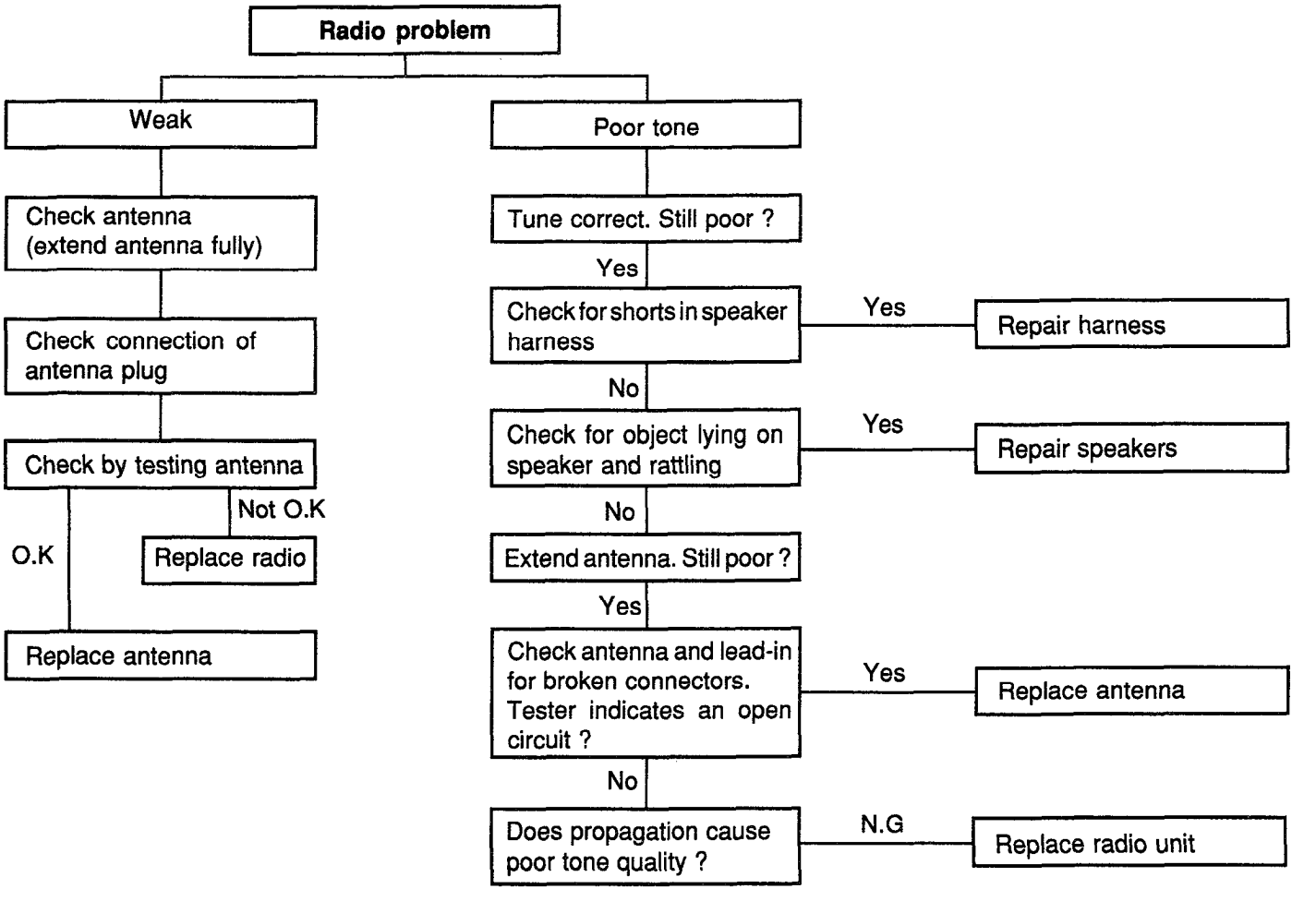

2. Tape player OK but no sound from radio
Check that the antenna is pluged into the radio.
Yes
Reinsert plug, OK ?
O.K
Inspect antenna plug
No
Insert properly
Not O.K
Does radio alone work ?
Yes
Replace radio unit
No
Temporarily install another antenna. OK ?
O.K
Inspect antenna and antenna cable, and replace as necessary
Not O.K
Replace radio

CHART 2


Radio problem
Weak
Check antenna (extend antenna fully)
Check connection of antenna plug
Check by testing antenna
Not O.K
O.K
Replace radio
Replace antenna
Poor tone
Tune correct. Still poor ?
Yes
Check for shorts in speaker harness
Yes
Repair harness
No
Check for object lying on speaker and rattling
Yes
Repair speakers
No
Extend antenna. Still poor ?
Yes
Check antenna and lead-in for broken connectors. Tester indicates an open circuit ?
Yes
Replace antenna
No
Does propagation cause poor tone quality ?
N.G
Replace radio unit

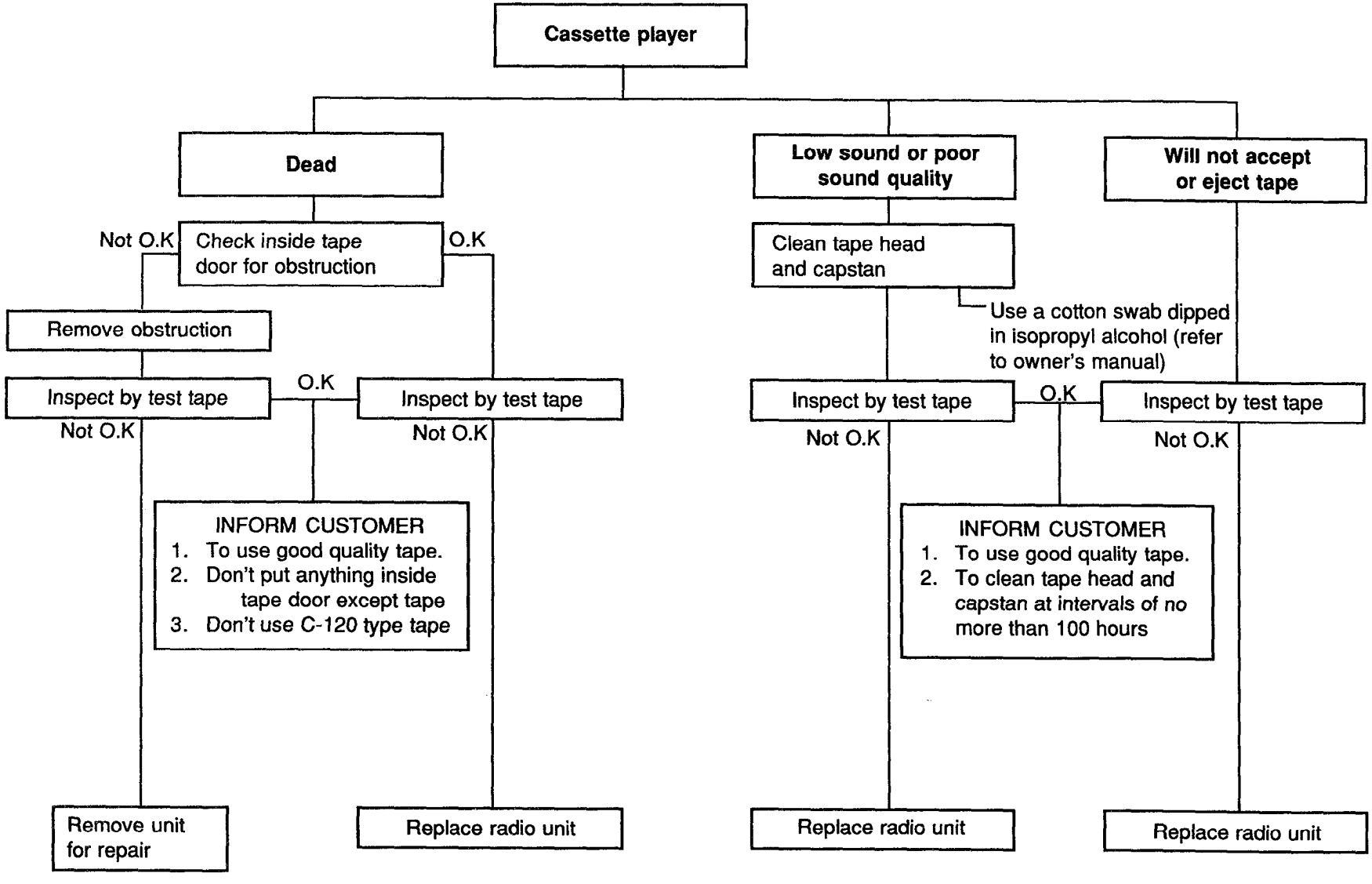

Cassette player
Dead
Low sound or poor sound quality
Will not accept or eject tape
Not O.K
Check inside tape door for obstruction
O.K
Clean tape head and capstan
Use a cotton swab dipped in isopropyl alcohol (refer to owner's manual)
Remove obstruction
Inspect by test tape
O.K
Inspect by test tape
Inspect by test tape
O.K
Inspect by test tape
Not O.K
Not O.K
Not O.K
Not O.K
INFORM CUSTOMER
1. To use good quality tape.
2. Don't put anything inside tape door except tape
3. Don't use C-120 type tape
INFORM CUSTOMER
1. To use good quality tape.
2. To clean tape head and capstan at intervals of no more than 100 hours
Remove unit for repair
Replace radio unit
Replace radio unit
Replace radio unit

CHART 4

1. RADIO

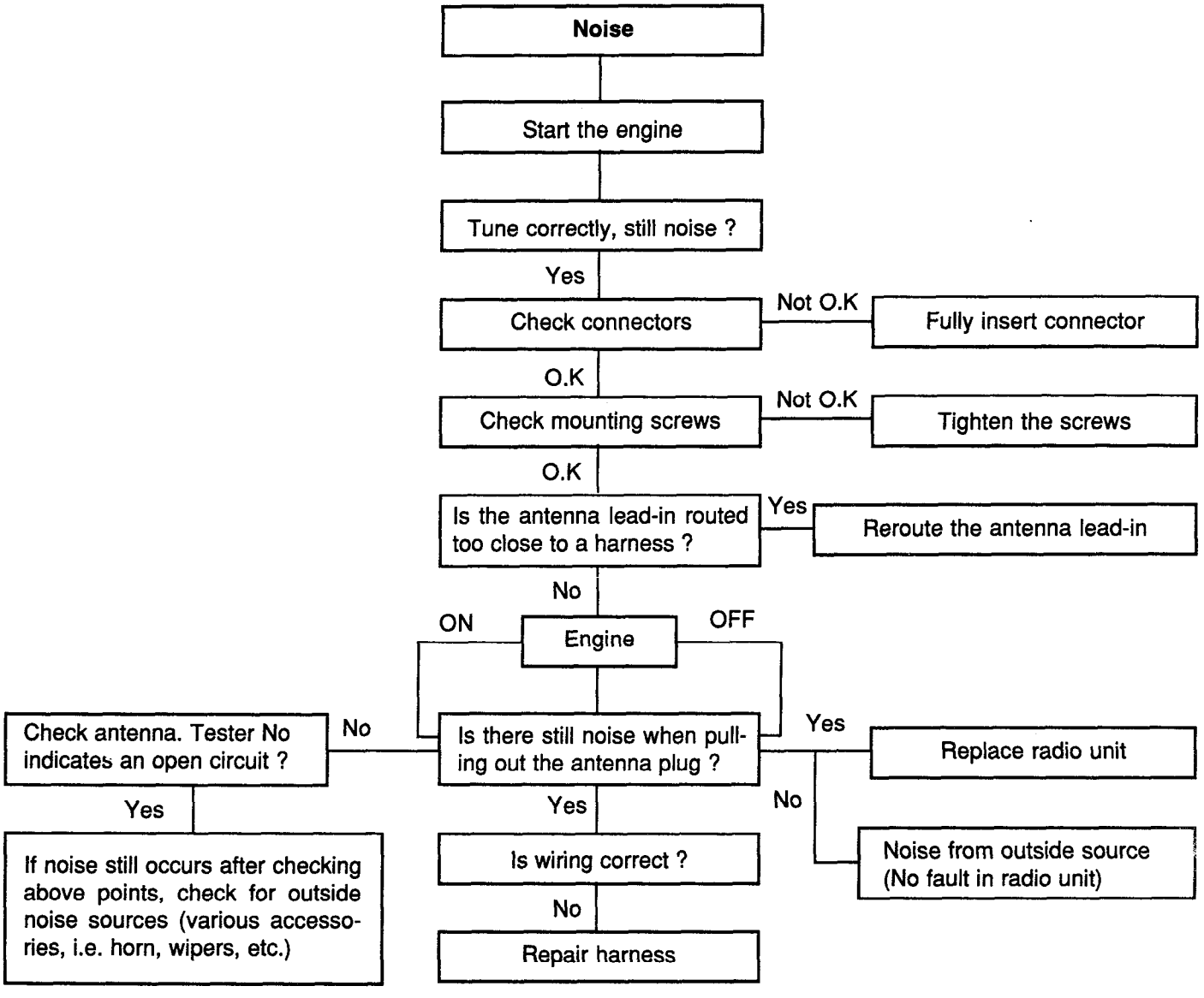


CHART 4 (Continued)

2. TAPE

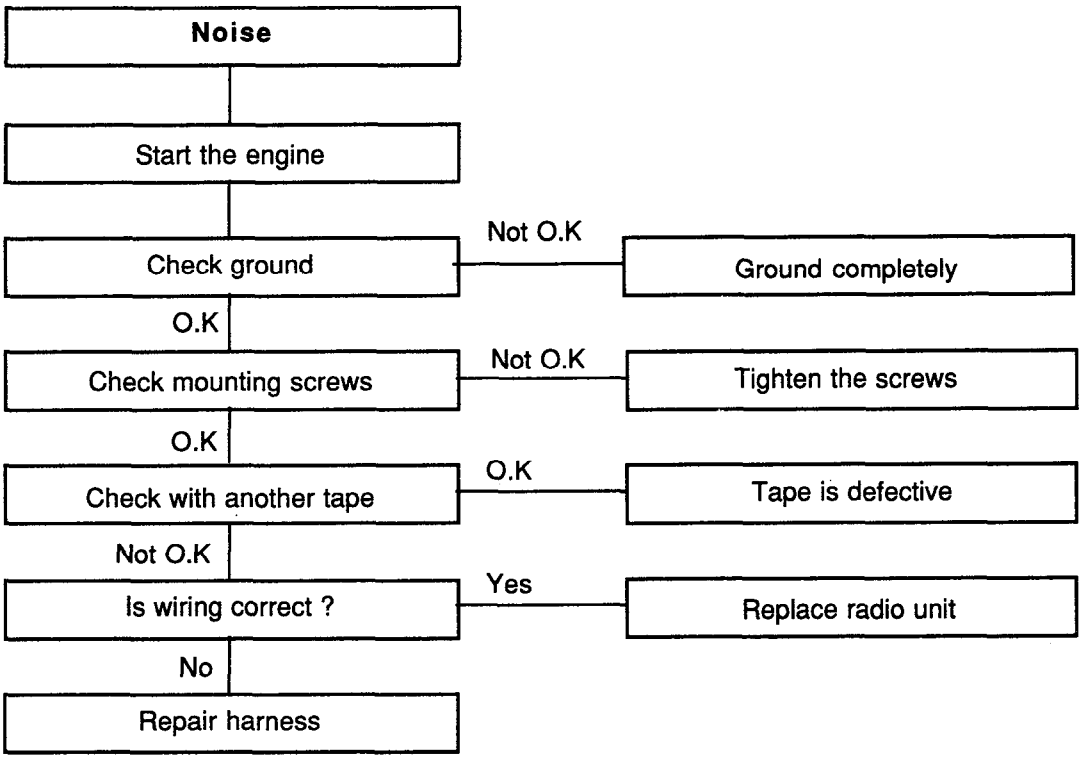


CHART 5

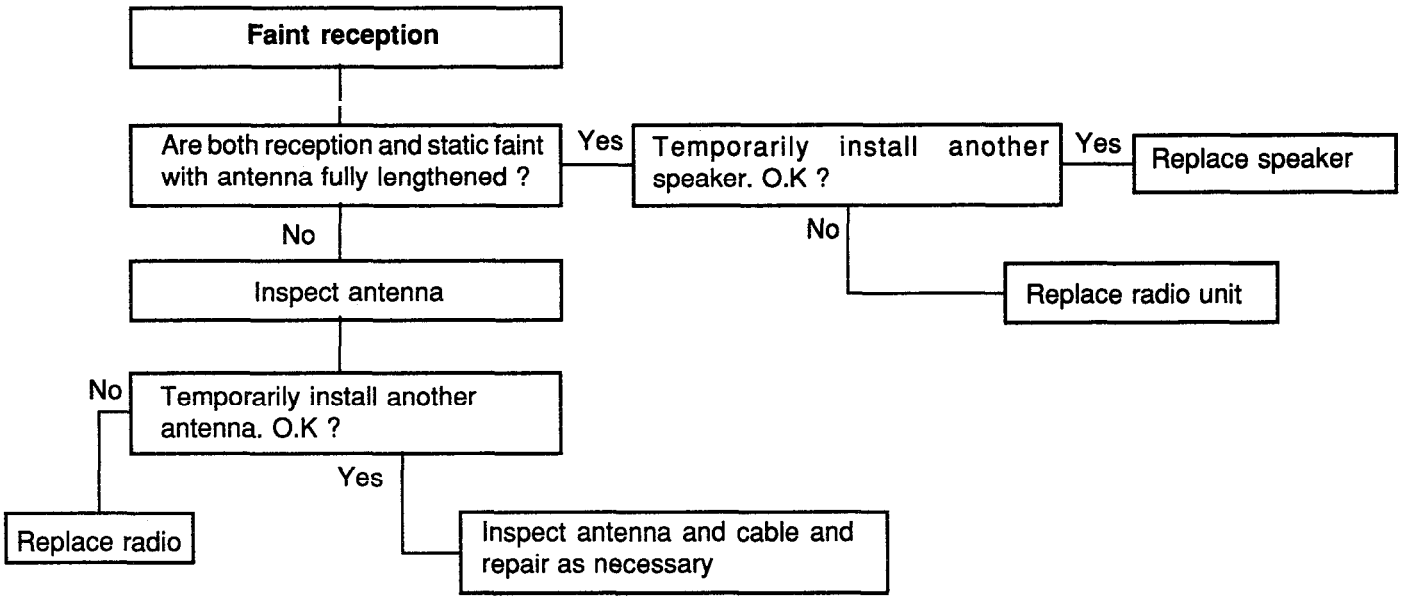


CHART 6

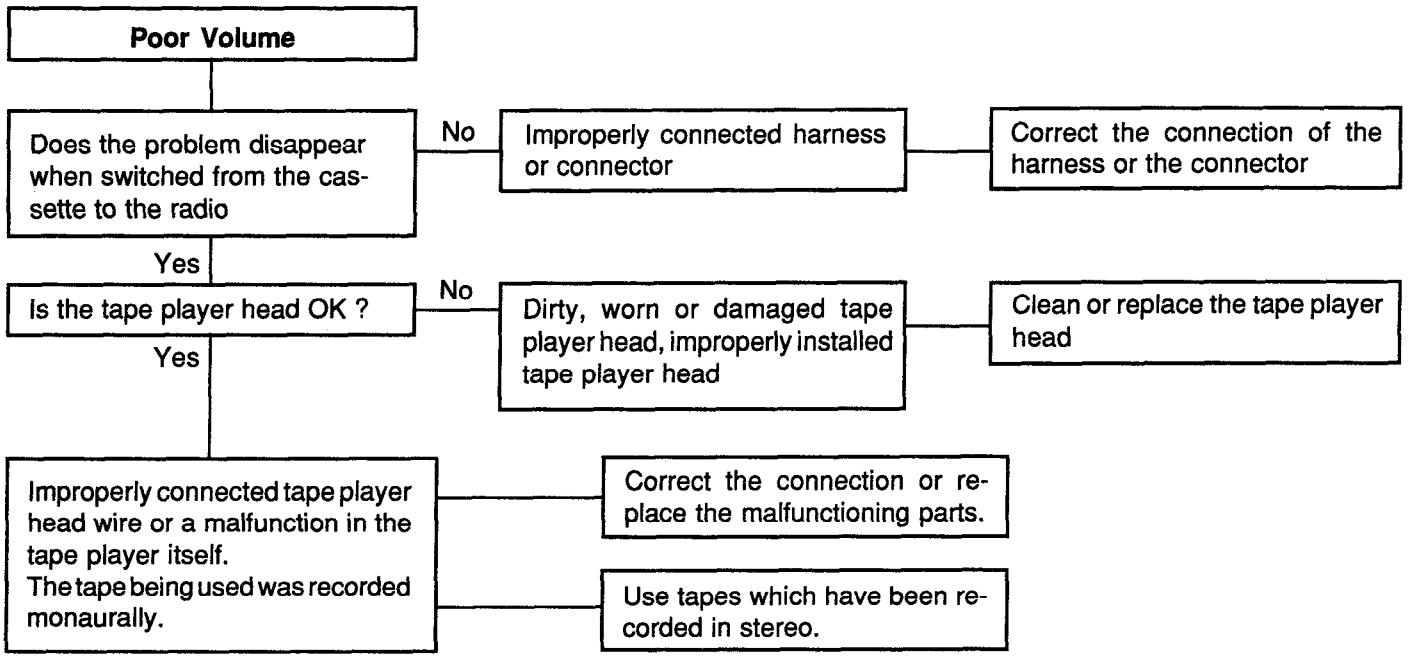


CHART 7

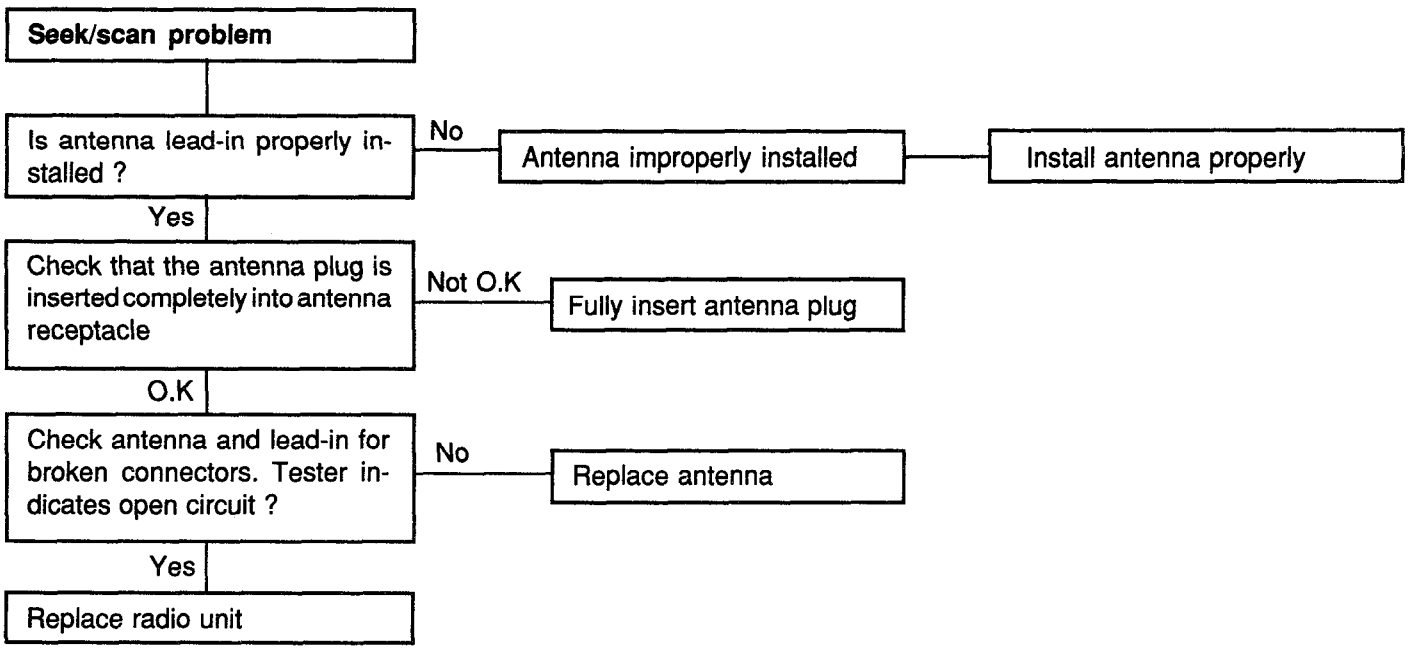
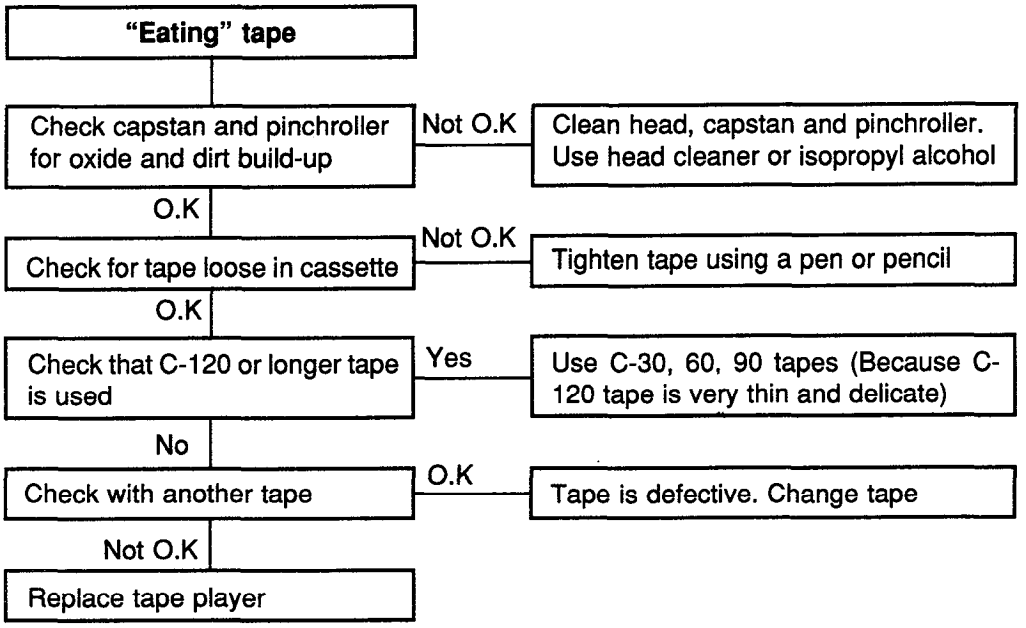


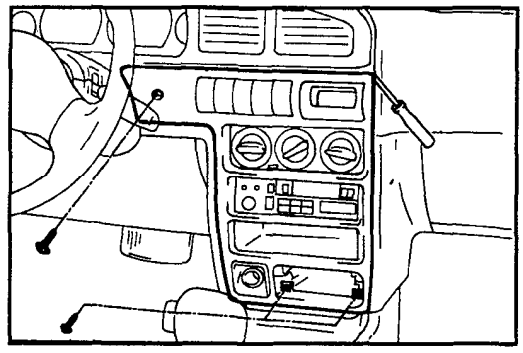
CHART 8


"Eating" tape
Check capstan and pinchroller for oxide and dirt build-up
Not O.K
Clean head, capstan and pinchroller. Use head cleaner or isopropyl alcohol
O.K
Check for tape loose in cassette
Not O.K
Tighten tape using a pen or pencil
O.K
Check that C-120 or longer tape is used
Yes
Use C-30, 60, 90 tapes (Because C-120 tape is very thin and delicate)
No
Check with another tape
O.K
Tape is defective. Change tape
Not O.K
Replace tape player

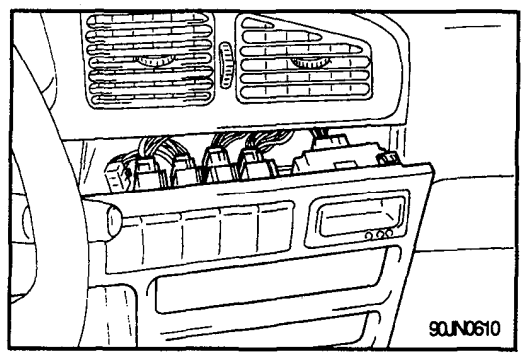
REMOVAL AND INSTALLATION

Radio Unit

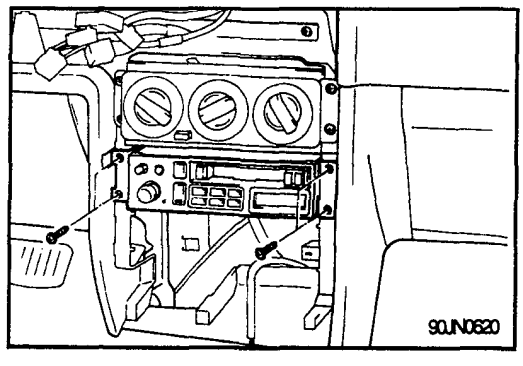
1. Remove the facia panel mounting screws.



2. Disconnect the 5 connectors as shown.

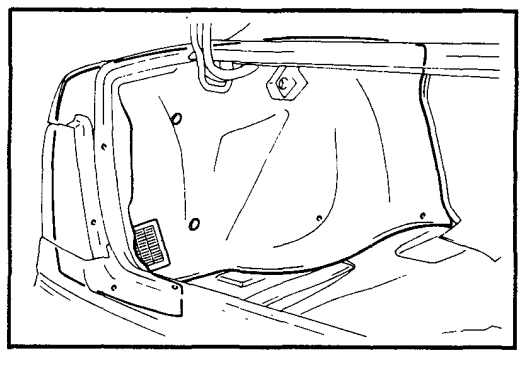


3. Unscrew the radio mounting screws and remove the radio unit from the mounting bracket.
4. Installation is the reverse order of preceding steps.

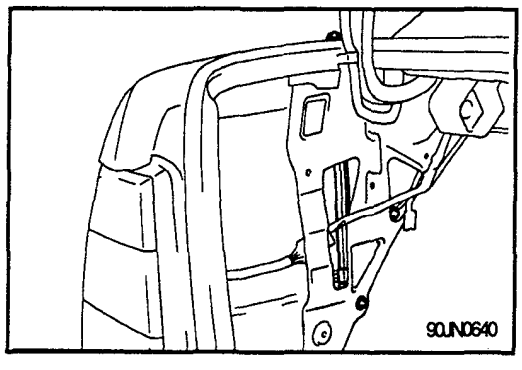


ANTENNA (AUTOMATIC)

1. Remove the luggage side trim.



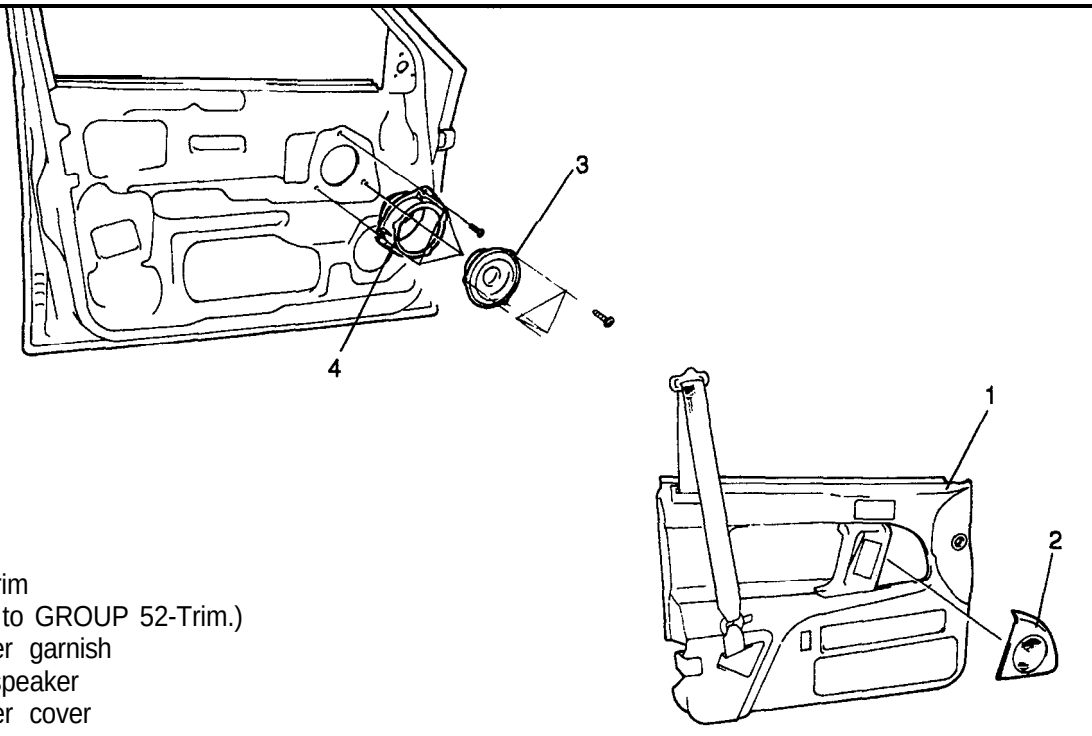
2. Remove the antenna mounting nuts and tapping screw for ground.
3. Disconnect the wiring connector and antenna cable.
3. Remove the antenna assembly.
4. Installation is the reverse order of preceding steps.



SPEAKER

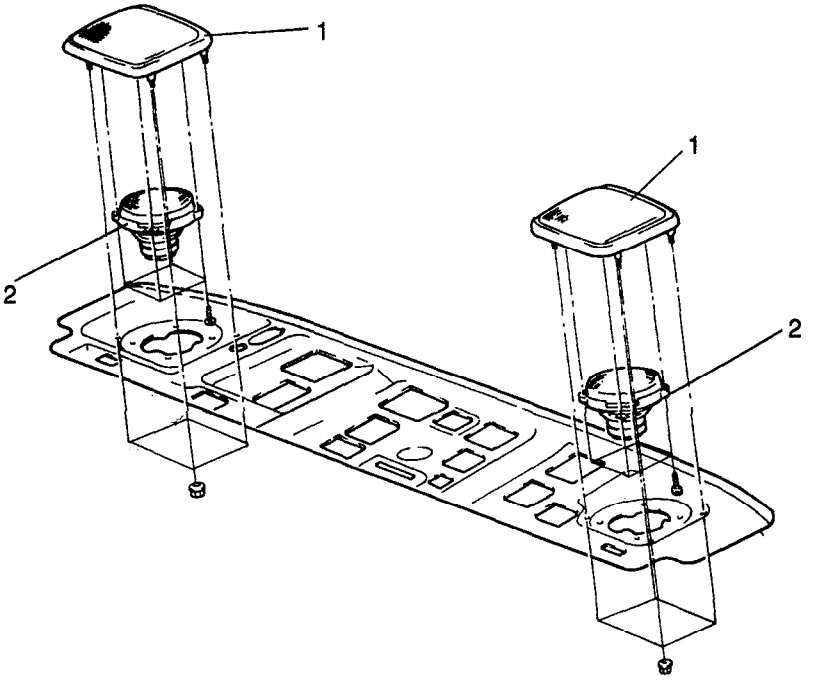
REMOVAL AND INSTALLATION

Front door Speaker



1. Door trim
   (Refer to GROUP 52-Trim.)
2. Speaker garnish
3. Door speaker
4. Speaker cover

Rear Speaker



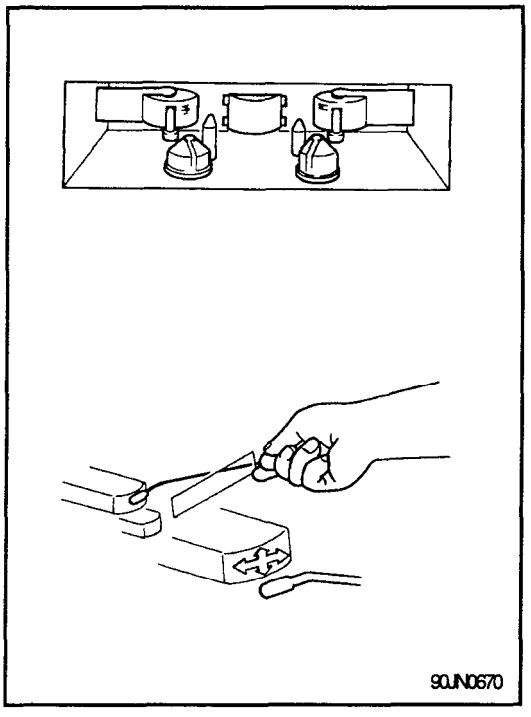
1. Speaker garnish
2. Rear speaker

NOTE :
Remove the speaker mounting nuts from the luggage compartment side.

SERVICE ADJUSTMENT PROCEDURES

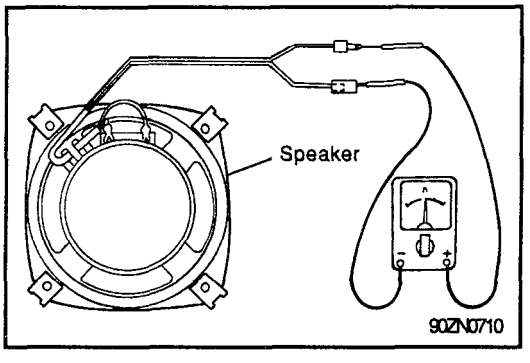
TAPE HEAD AND CAPSTAN CLEANING

1. To obtain optimum performance, clean the head and capstan as often as necessary, depending upon frequency of use and tape cleanliness.
2. To clean the tape head and capstan, use a cotton swab dipped in ordinary rubbing alcohol.
   Wipe the head and capstan.



SPEAKER CHECKING

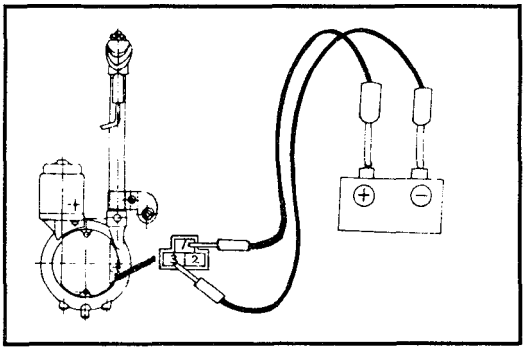
1. Check the speaker by using an ohmmeter.
   If an ohmmeter indicates the impedance of the speaker when checking between the speaker (+) and speaker (-) of the same channel, the speaker is ok.
2. If clicking sound is emitted from the speaker when the ohmmeter plugs touch the speaker terminals, the speaker is okay.



ANTENNA (AUTOMATIC)

INSPECTION

Connect the motor terminals directly to the battery and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction.



WINDSHIELD WIPER AND WASHER

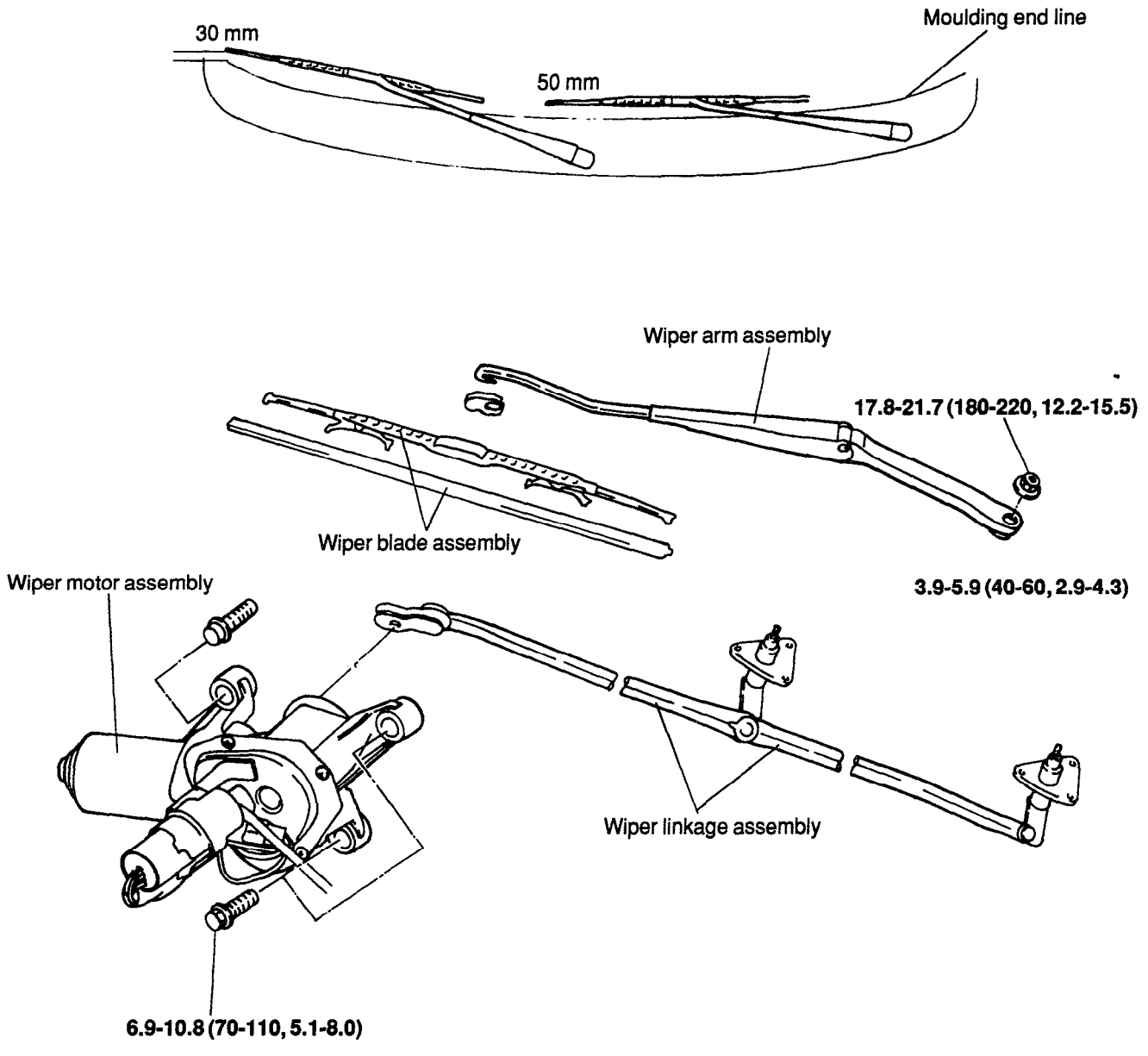
SPECIFICATIONS

Items	Specification
Wiper motor	
Speed/current at 10 kg.cm load test (1.0 Nm, 0.7 lb.ft)	Low : 48-56 rpm/3.5A or less High : 64-78 rpm/4.5A or less
Speed/current at 40 kg.cm load test (3.9 Nm, 2.9 lb.ft)	Low : 40-48 rpm/5.5A or less High : 56-68 rpm/7A or less
Current when locking	Low : 20A or less High : 22A or less
Wiper arm and blade	
Arm spring type	Tension type
Arm pressure	
Driver side	800 ± 50 g or less
Passenger side	650 ± 50 g ro less
Blade rubber length	
Driver side	500 mm
Passenger side	480 mm
Wiping angle	
Driver side	81° ± 1°
Passenger side	96° ± $^{2}_{1}$
Windshield washer	
Motor type	DC ferrite magnet type
Pump type	Centrifugal type
Current	3.8A or less
Discharge pressure	1.2 kg/cm^2 or more
Flow rate	1,320 cc/min. or more
Overload capacity (Continuous operation)	
With water	60 sec. or less
Without water	20 sec. or less

TROUBLESHOOTING

Problem	Possible cause	Remedy
Wipers do not operate or return to off position.	Wiper fuse (No.11; 15A) blown Wiper motor faulty Wiper switch faulty Wiring or ground faulty	Check for short and replace fuse Check motor Check switch Repair as necessary
Wipers do not operate in INT position	TACU faulty Wiper switch faulty Wiper motor faulty Wiring or ground faulty	Check TACU Check switch Check motor Repair as necessary

COMPONENTS



TIGHTENING TORQUE : Nm (kg.cm, lb.ft)

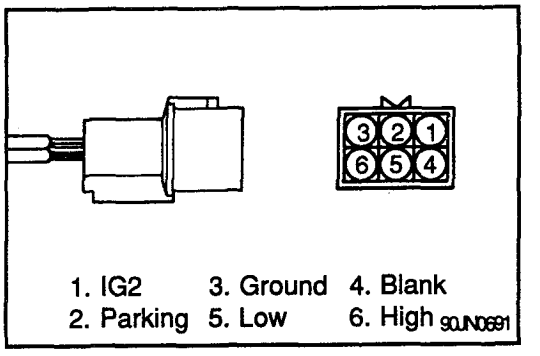
90JN0690

SERVICE ADJUSTMENT PROCEDURES

WIPER MOTOR

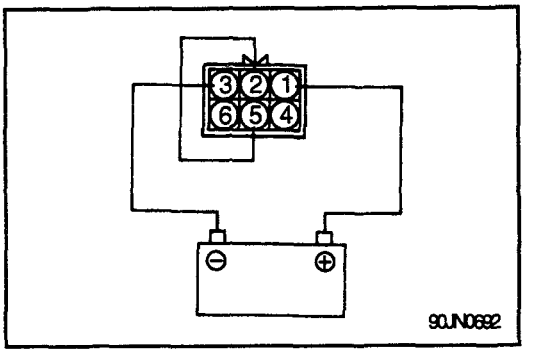
Speed operation check

1. Remove the connector from the wiper motor.
2. Attach the positive (+) lead from the battery to terminal 5 and the negative (-) lead to terminal 3.
3. Check that the motor operates at low speed.
4. Connect the positive (+) lead from the battery to terminal 6 and the negative (-) lead to terminal 3.
5. Check that the motor operates at high speed.



Automatic stop operation check

1. Operate the motor at low speed.
2. Stop the motor operation anywhere except at the off position by disconnecting terminal 5.
3. Connect terminals 5 and 2.
4. Attach the positive (+) lead from the battery to terminal 1.
5. Check that the motor stops running at the off position.



WINDSHIELD WIPER AND WASHER SWITCH

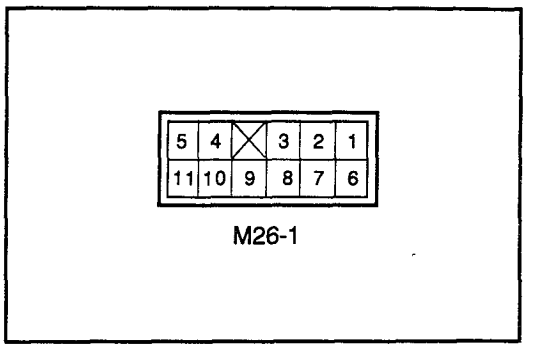
INSPECTION

Check the switch for continuity between the terminals.

Position \ Terminal	5	4	3	2	9	10
OFF	O		O			
INT	O		O	O	O	O
LO	O				O	
HI		O			O	

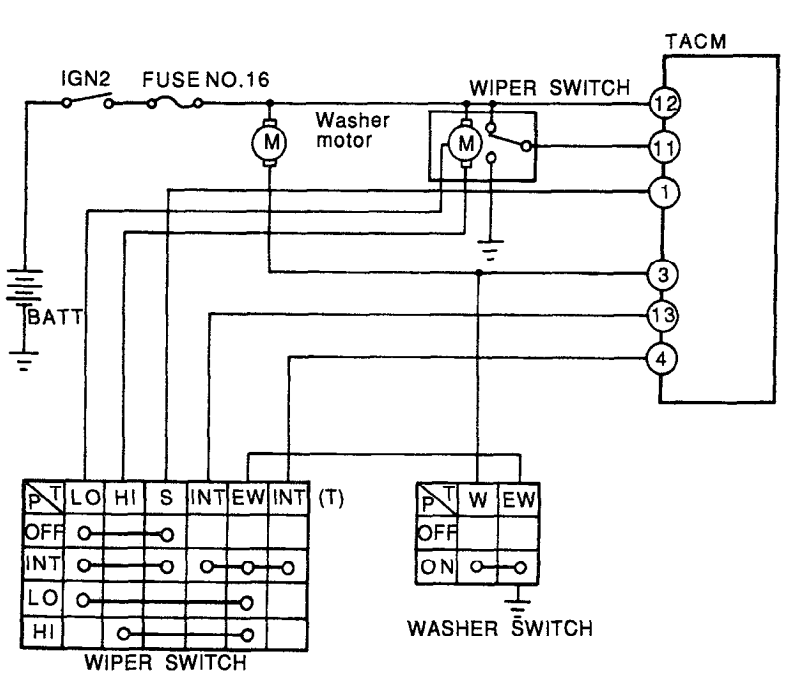
Position \ Terminal	7	9
OFF		
ON	O	O

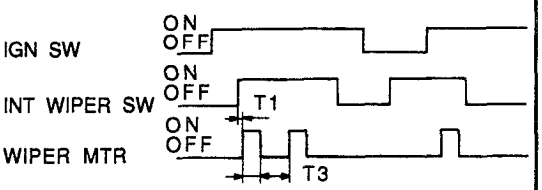
If continuity is not as specified, replace the switch.



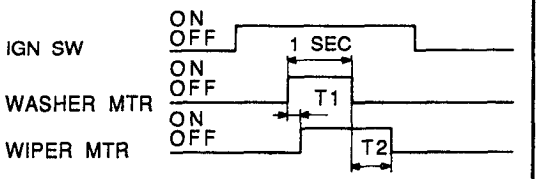
TACM (For Windshield Wiper/Washer)

CIRCUIT DIAGRAM





T1 = Within 0.5 sec
T3 = 1.5 ± 0.7 sec (at VR=0 kΩ)
~ 10.5 ± 3 sec (at VR=50 KΩ)

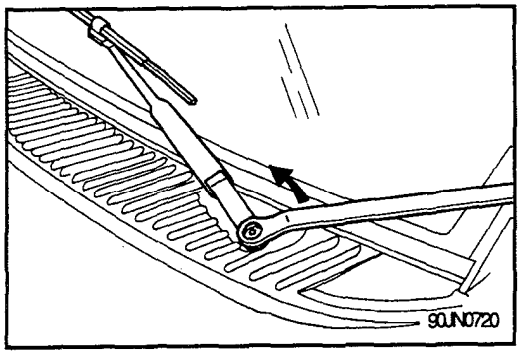


T1 = 0.4-1.2 sec.
T2 = 2.0-4.7 sec.

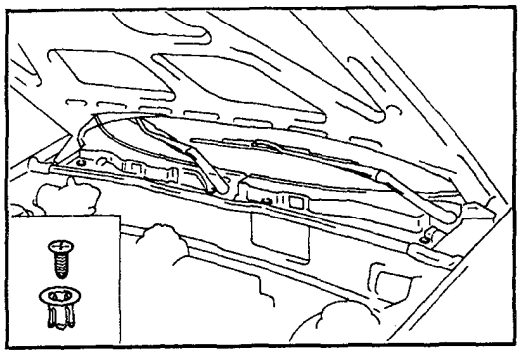
REMOVAL AND INSTALLATION

Removal

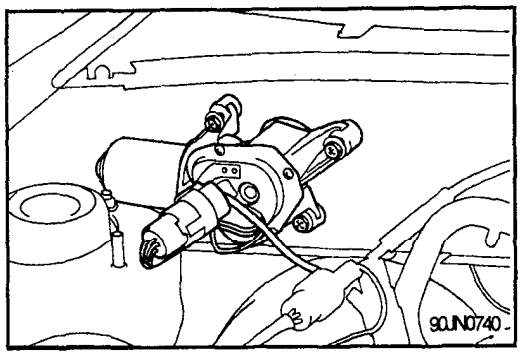
1. Remove the wiper arm mounting nut.
   NOTE'
   Care must be taken not to scratch in the engine hood.
2. Remove wiper arm and blade assembly.



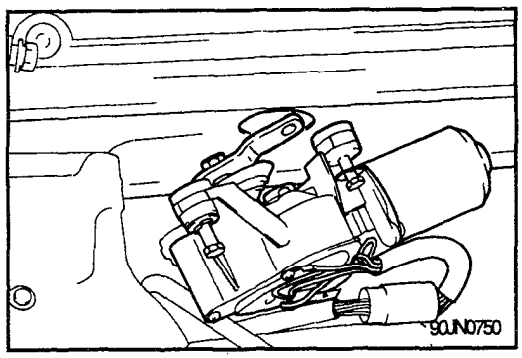
3. Remove the cowl top sealing cap.
4. Remove the cowl top cover.



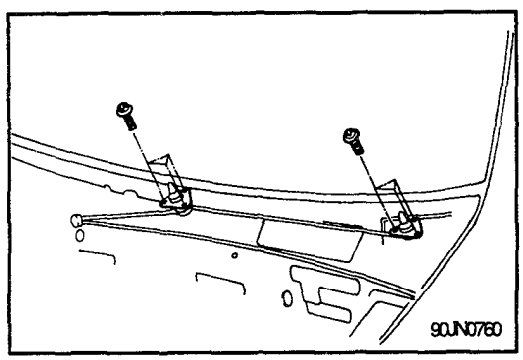
5. Remove the wiper motor connector.
6. Remove the wiper motor mounting bolt.



7. Disconnect the motor from the fink, then remove the motor assembly.
   NOTE
   When removing the wiper motor only, it can be done by steps 5 to 7.

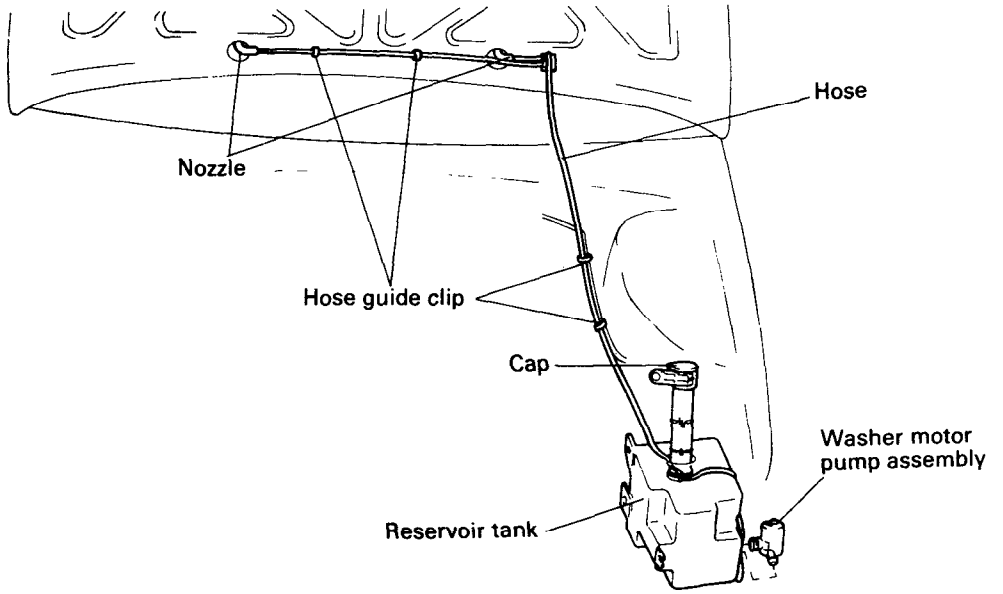


8. Remove the wiper link mounting bolt.
9. Take out wiper link assembly from the cowl top panel.



WINDSHIELD WASHER

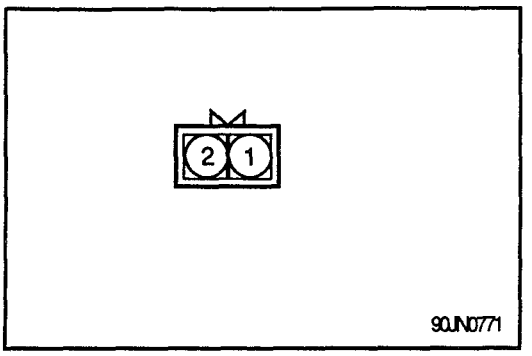
COMPONENTS



INSPECTION

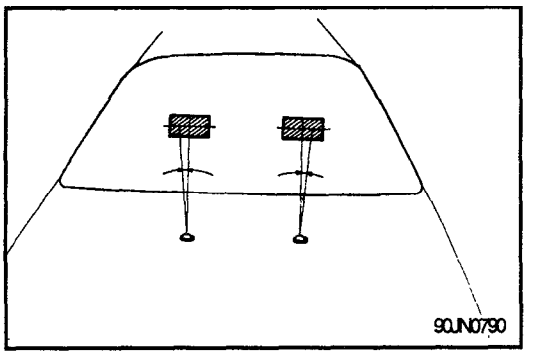
Washer Motor

1. With the washer motor connected to the washer tank, fill the washer tank with water.
2. Connect battery positive (+) and negative (-) cables to terminals 2 and 1 respectively to see that the washer motor runs and water is pumped.



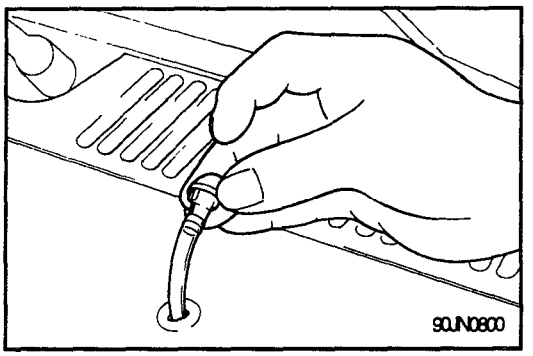
Washer Nozzle

1. Disconnect washer hose from the nozzle and then pressing the pawls to the back side of engine hood, detach washer nozzle.
2. After installation, place a wire in the injection port of nozzle and adjust the direction of washer fluid by moving the wire.



Nozzle Bracket

1. Check the washer fluid contact point.
2. Adjust the washer fluid contact point by using a metal wire to move the washer nozzle ball.
3. If the amount of washer fluid sprayed is too small, check for clogged, bent or crushed washer tube.



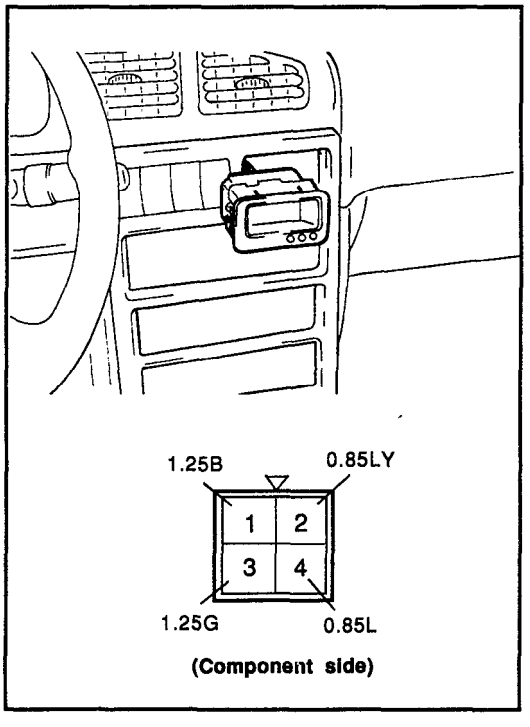
CLOCK
SPECIFICATIONS

Items	Specifications
Display method	Vaccum Fluroescent display
Operating voltage range	DC 6V ~ DC 16V
Operating temperature range	-40°C ~ +90°C (-104°F ~ +194°F)
Current comsumption (with DC 13V)	Max. 5 mA (With display illuminated) Max. 150 mA (Without display illuminated)

TROUBLESHOOTING

Inspect each terminal for applicable table.

Terminal	Condition	indiction
1	Constant	Battery voltage
2	Constant	Continuity
3	Turn ignition switch ON	Battery voltage
4	Turn Taillamp switch ON	



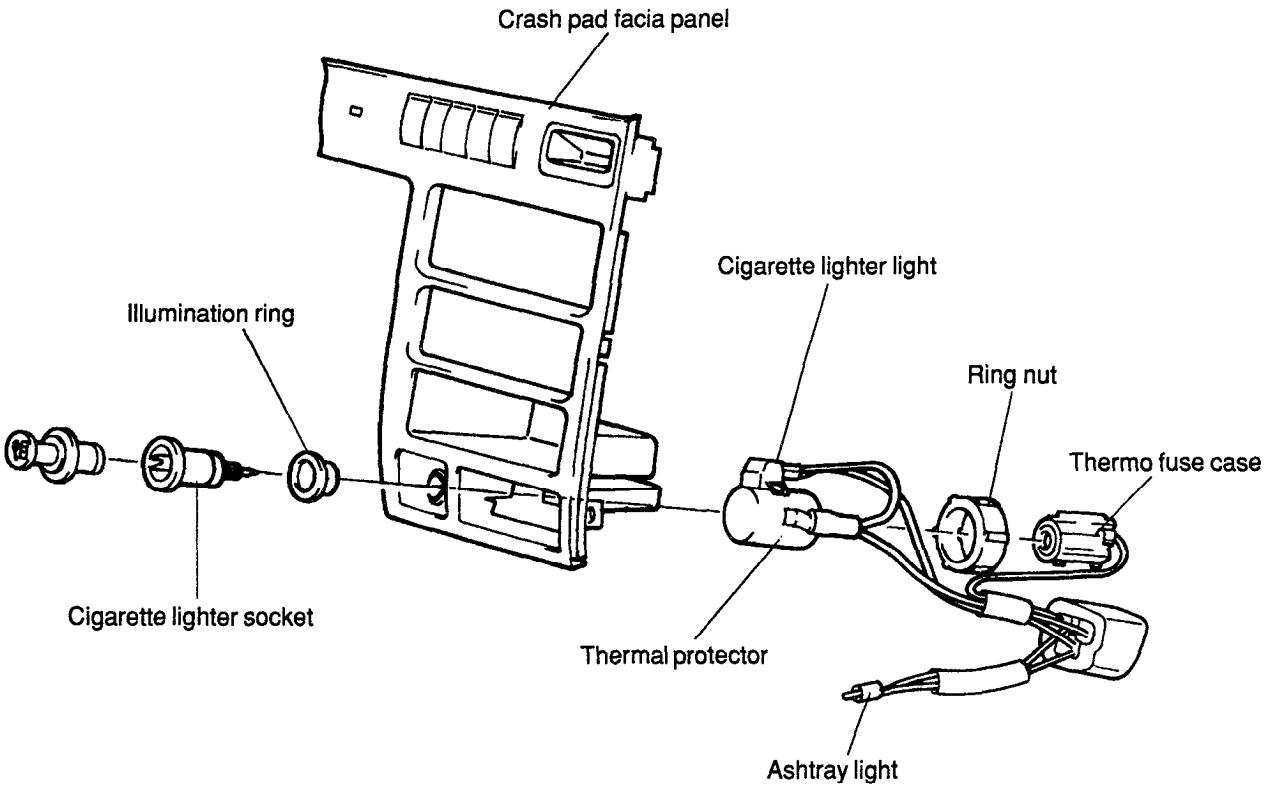
CIGARETTE LIGHTER

SPECIFICATIONS

items	Specification
Maximum power consumption	120 W
insulation resistance	MIN. 5MΩ (at the 500V megger)
Return time	13 ± 5 sec. (after pushing the lighter in)
Break temperature of fuse °C (°F)	138 ~ 151 °C (278.4 ~ 303.4°F)

REMOVAL AND INSTALLATION

1. After removing the ashtray, remove the facia panel mounting 3 screws.
2. Then disconnect the 3-p connector from the cigarette lighter.
3. Disconnect the thermal fuse case from the socket end.
4. Remove the ring nut and separate the cigarette lighter socket from the thermal protector.



NOTE:
When installing the cigarette lighter, align each lug on the illumination ring and cigarette lighter socket with the groove of the hole, then position the bulb case on the thermal protector between the stoppers of the center panel.

INSPECTION

1. Take out the plug.
2. Examine the element spot connection for remnants of tobacco and other meterials.
3. Using an ohmmeter, check for the continuity of the element.

Cautions for use of the cigarette lighter socket as auxiliary power

1. When using a 'plug-in" type of accessory, do not use anything with a load of more than 120W.
2. It is recommended that only the lighter be inserted into the holder.

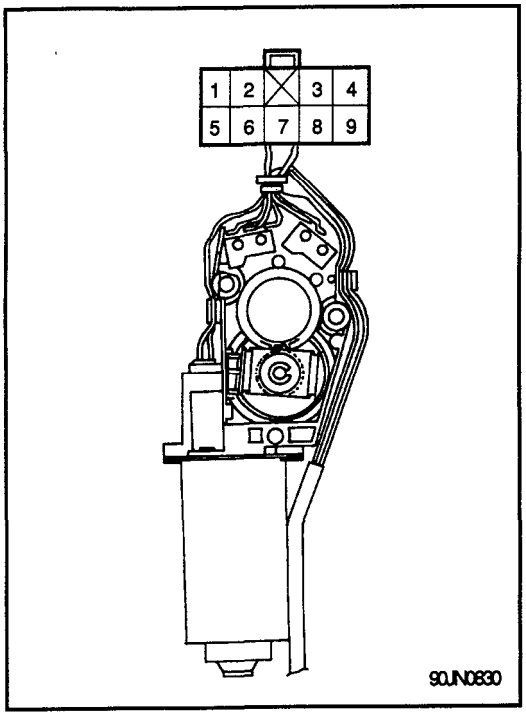
SUNROOF
SPECIFICATIONS

Items	Specifications
Sun roof motor	
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 15V
Testing voltage	DC 13±0.2V
No load rotation and electric current	MAX. 180 rpm, MAX. 6 A
insulating resistance	MIN. 1 (with 200 V megger)
Sun roof relay	
Rated voltage	**DC 12V**
Rated load	Motor 6 A Lock 15 A
Operating voltage	DC 9 ~ 15V
Excitation current	MAX. 250 mA
Voltage drop (between both terminals)	MAX. 0.15 V
Sun roof motor switch	
Rated load	DC 12 V, 0.2 A (relay load)
Type of operation	Push ON and self return
Operating force	0.3 ~ 0.75 kg

INSPECTION

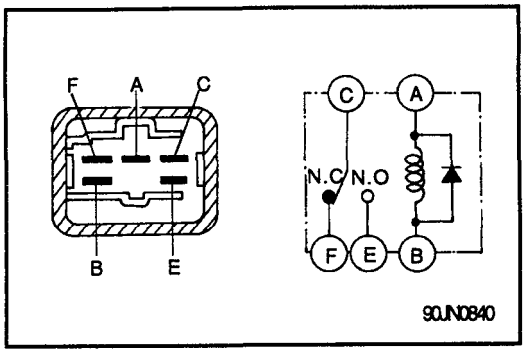
Motor

1. Disconnect the motor connector.
2 Apply DC 12V to the 0.85L wire and ground the 0.858 wire.
3. Check that the motor turns in the direction to tilt up and closed position.
4. Reverse the connections and check that the motor turns from open, to closed, to tilt up position.



Relay

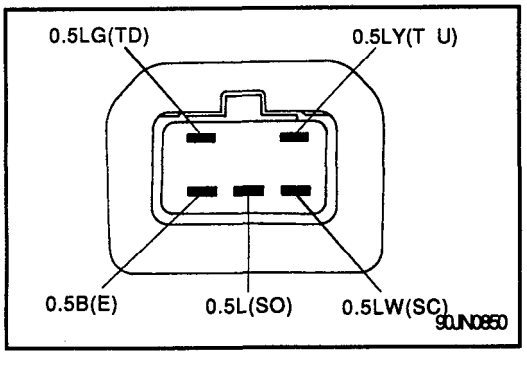
1. Check the continuity between the terminals “A” and “B”, "C" and "F" by using an ohmmeter.
2. Apply DC 12 to the terminal “A”.
3. Ground the terminal “B”.
4. Check for continuity between the terminals “C” and “E”.



Switch

Use an ohmmeter to check the continuity of the switch.
If the continuity is not as specified, replace the switch.

Terminal / Position		SO	SC	TU	TD	E
OFF						
Slide switch	Open	O				O
	Close		O			O
Tilt switch	Up			O		O
	Down				O	O



NOTE :

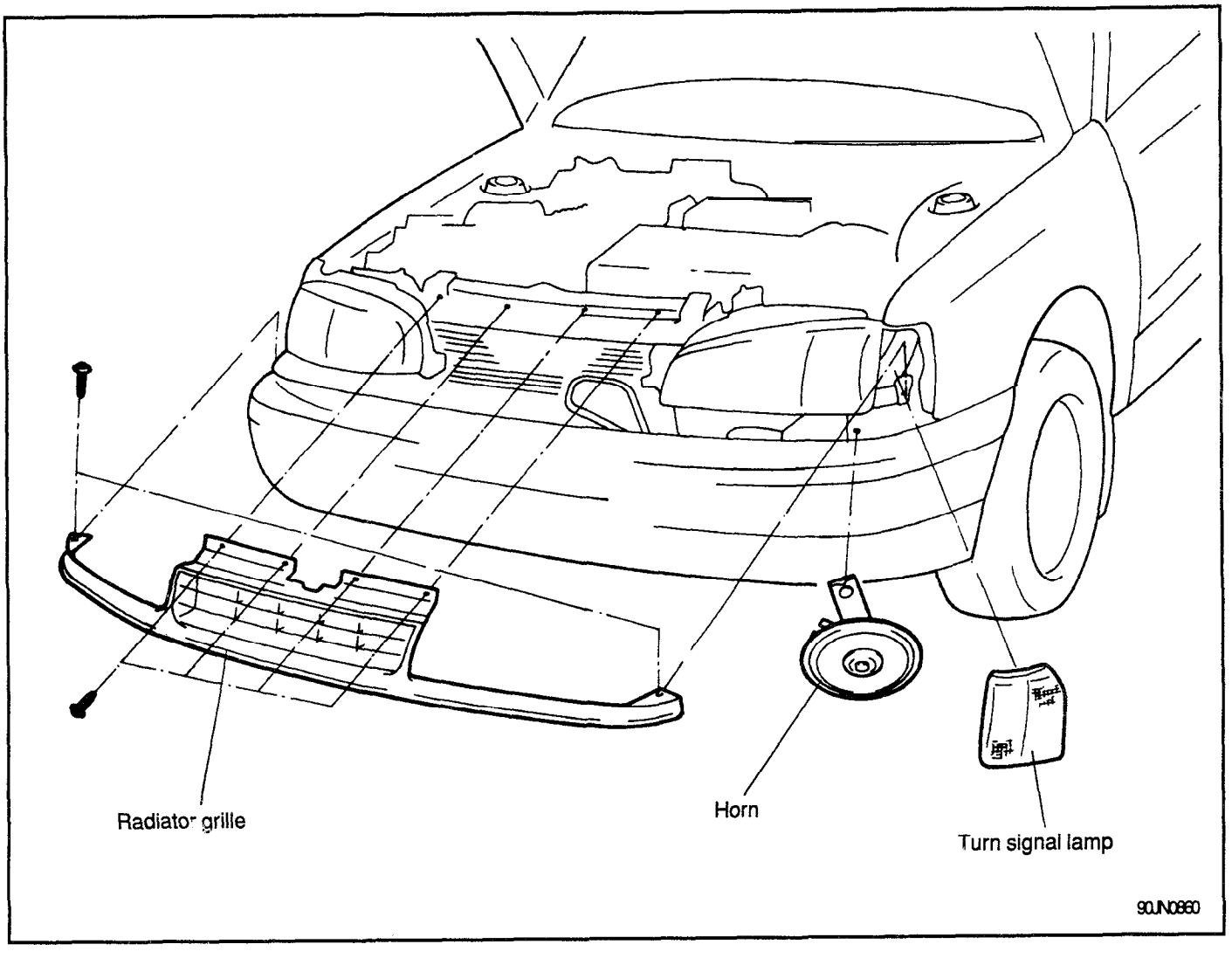
SO : Slide open **SC : Slide close**
TU : Tilt up **TD : Tilt down**

HORN

SPECIFICATIONS

Items	Specifications
Type	Plate
Rated voltage	DC 12V
Power comsumption	Max. 3.5A (at DC 12V)
Sound level	110 ± 5 dB (atDC12V)
Horn effective voltage	DC 10V ~ DC 14.5V
Operating temperature range	-40°C ~ +8O°C (-104°F ~ +176°F)
Fundmental frequency	
Low pitch	350 ± 20 Hz
High pitch	415 ± 20 Hz

REMOVAL AND INSTALLATION

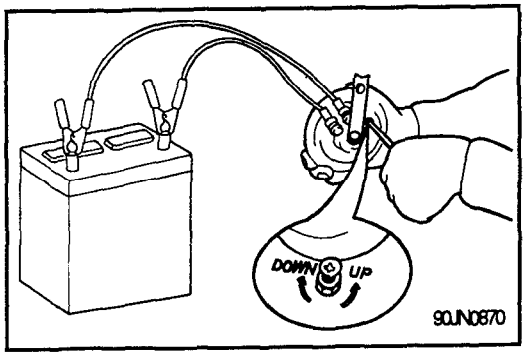


ADJUSTMENT

Operate the horn, and adjust the tone to a suitable level (by turning the adjusting screw).

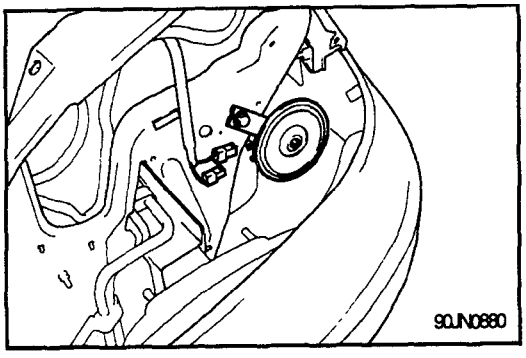
CAUTION

After the adjustment, apply a small amount of paint around the screw head to keep it from loosening.



INSPECTION

1. Test the horn by connecting battery voltage to the A and B terminals.
2, The horn should sound, if the horn fails to sound, replace it.

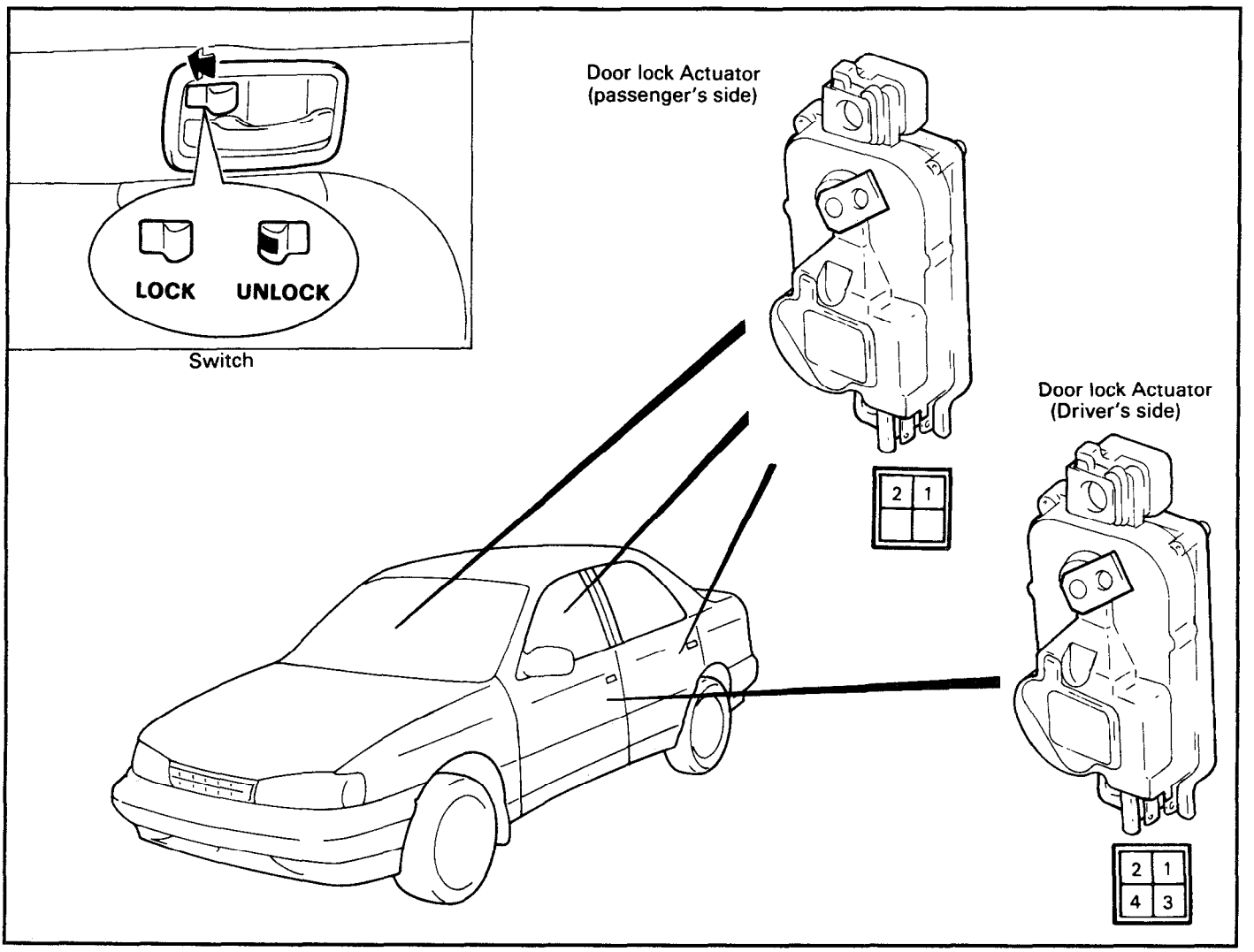


POWER DOOR LOCK SYSTEM

SPECIFICATIONS

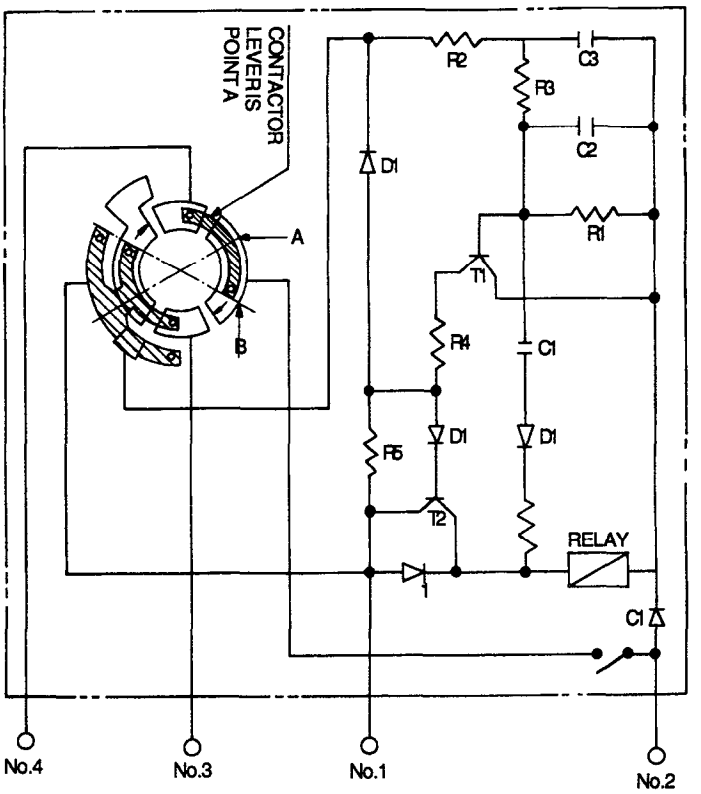
Items	Specifications
Rated voltage	DC 12V
Operating voltage range	DC 9V ~ 15V
Lock current	Max. 5A
Manual operating force	3.2 kg.cm (at DC 9 V)
Operating temperature	-30°C ~ +8O°C
Stroke	21.8

COMPONENTS



DOOR LOCK CONTROL SWITCH

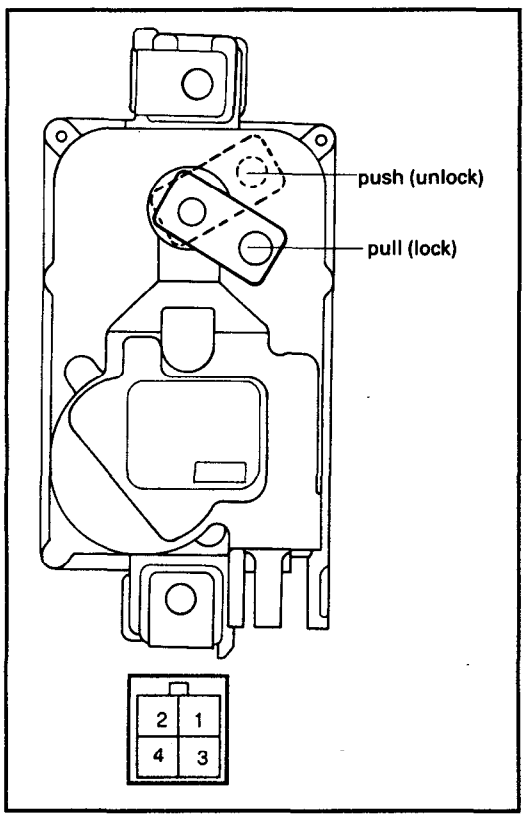
Circuit Diagram



INSPECTION

1. Disconnect the 4 pin connector from the front door wiring harness.
2. Test door lock control switch operation.

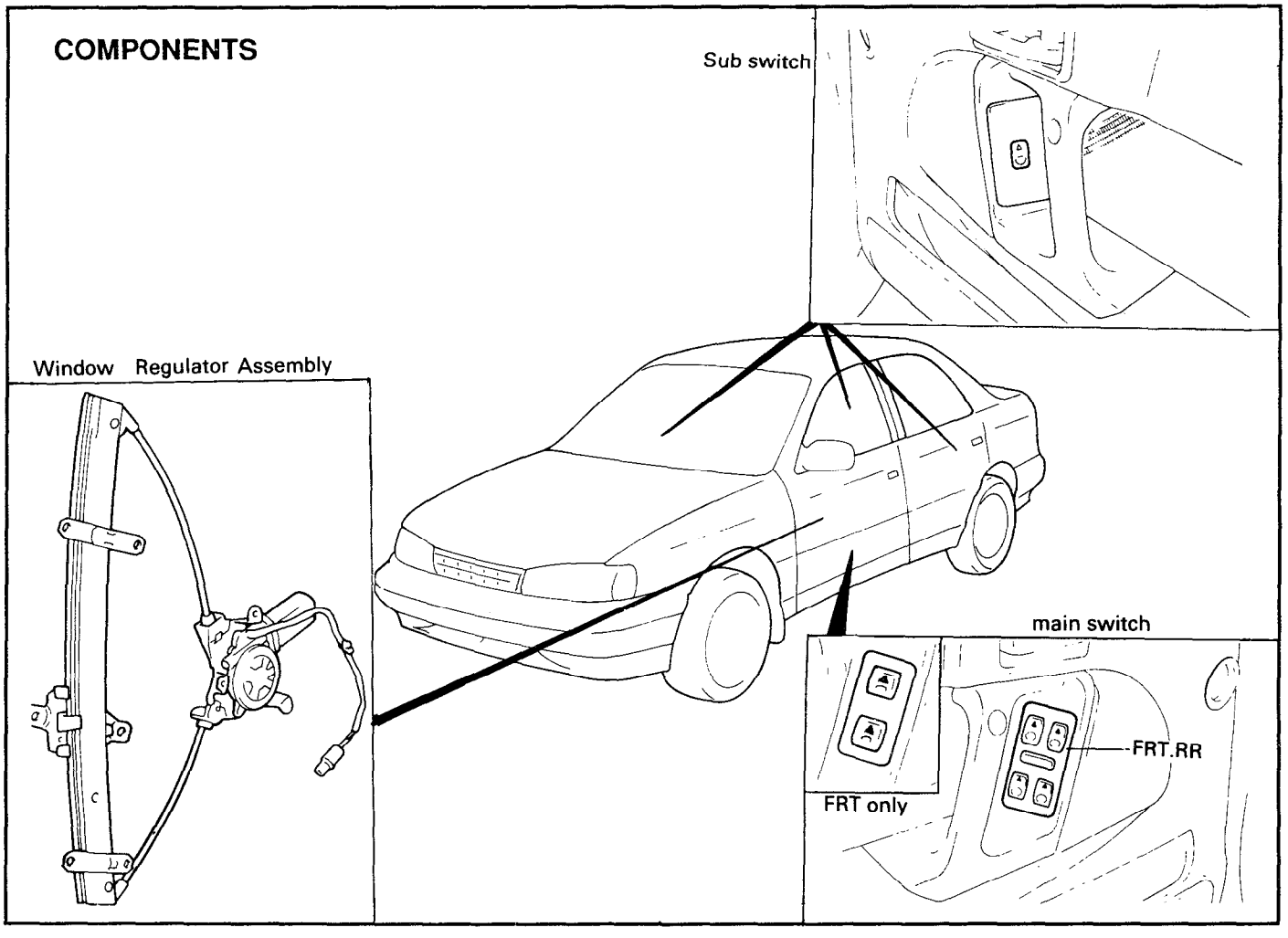
Direction / Terminal	1	2	3	4
A-D	○		○	
		○		○
C-B	○			○
		○	○	



POWER WINDOW

SPECIFICATIONS

Items	Specifications
Power window motor	
Rated voltage	DC 13.5 V
Rated current	6 A or less
Temperature	-40 ~ 80°C (-40 ~ +176°F)
Electrical source (Motor terminal voltage)	DC 11 ~ 15V
Power window relay	
Rated voltage	DC 12V
Range of voltage used	DC 10 ~ 15 V
Rated load current	20A
Exciting coil rated current	MAX. 150 mA (at 24°C)
Voltage drop between terminal	0.3 V or less
Power window switch (Main)	
Rated voltage	DC 12V
Range of voltage used	DC 10 l 16V
Operating temperature	-30 ~ +8O°C (-22 ~ +176°F)
Rated load current	10A
Voltage drop	0.4 V or less
Insulating resistance	1 Mý or more (by DC 500 V megger)
Consumption current	0.35 A or less (DC 12V, AT 20°C ± 10%)
Power window switch (Sub.)	
Rated voltage	DC 13V
Rated current	10 A
Voltage drop	0.3 V or less
Operating temperature	-30 ~ +80°C (-22 ~ +176°F)



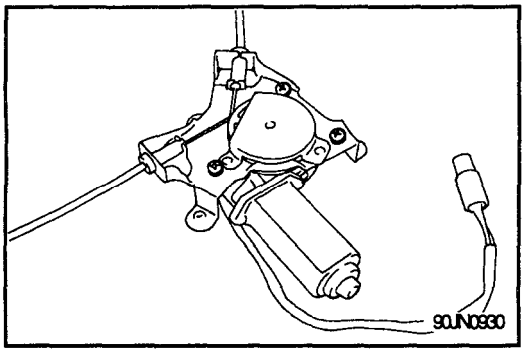
POWER WINDOW MOTOR

Removal

1. Detach the regulator assembly.
2. Disconnect the power window motor from the regulator assembly.

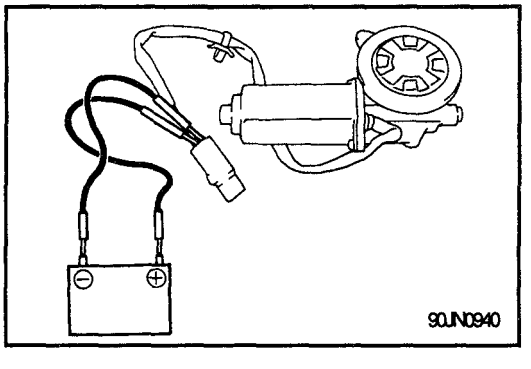
CAUTION

When loosening the connecting screws of the regulator and the motor assembly, the compressed force of the regulator spring may cause the regulator arm to spring up.



Inspecction

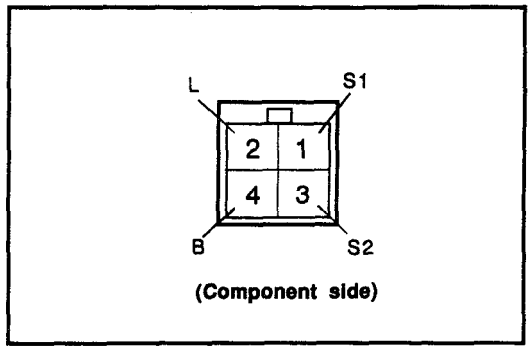
Connect the mother terminals directly to the battery and check that the motor operates smoothly. Next reverse the polarity and check that the motor operates smoothly in the reverse direction.
The operation is abnormal, replace the motor.



POWER WINDOW RELAY

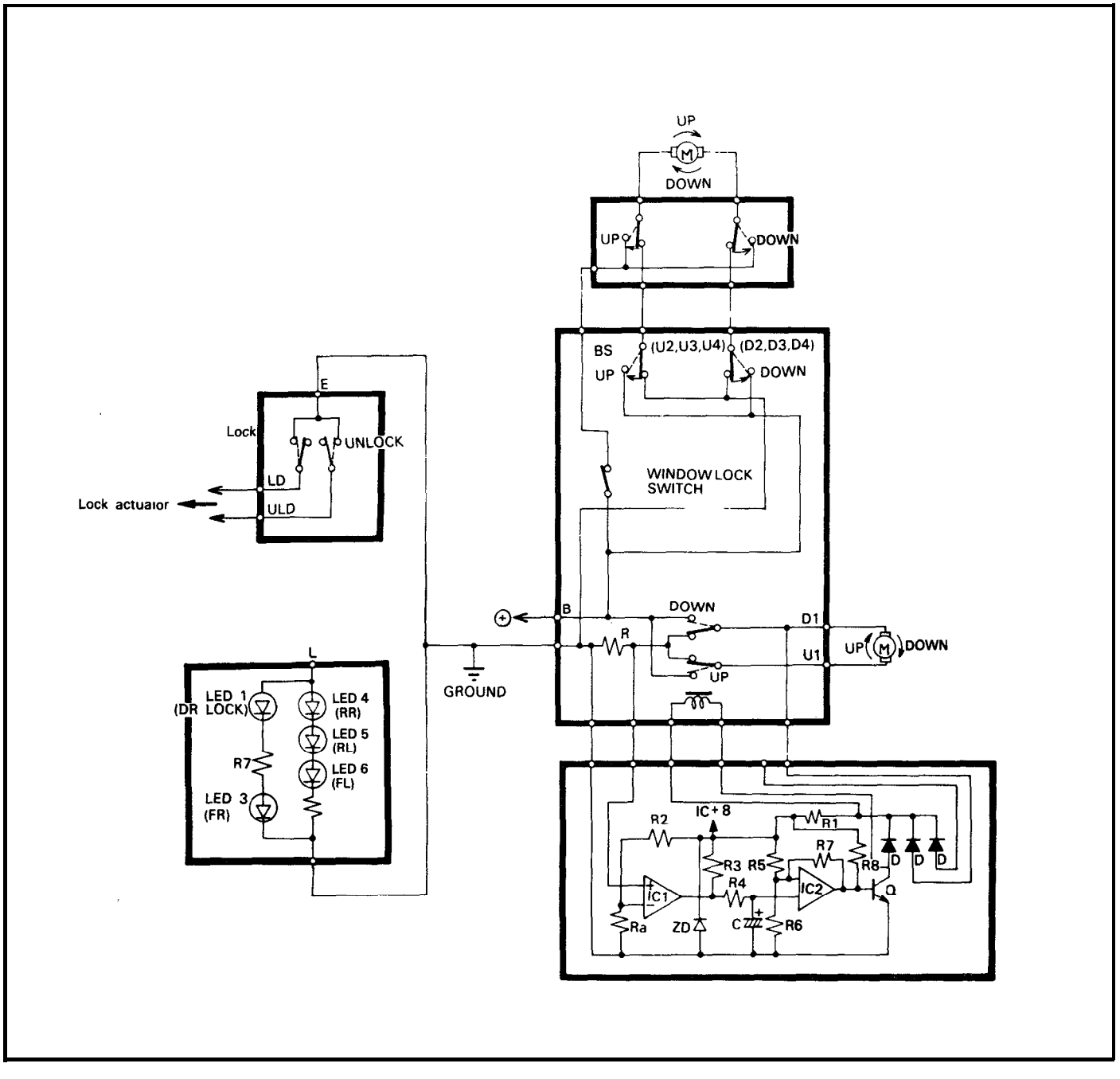
Inspection

1. Remove the power window relay from the relay box.
2. The relay should be operated, if the relay fails to operate, replace it.



POWER WINDOW MAIN SWITCH

Circuit



Inspection

1. Disconnect the power window main switch.
2. Operate the switch, and check for continuity between the terminals.
3. If continuity is not as specified, replace the switch.

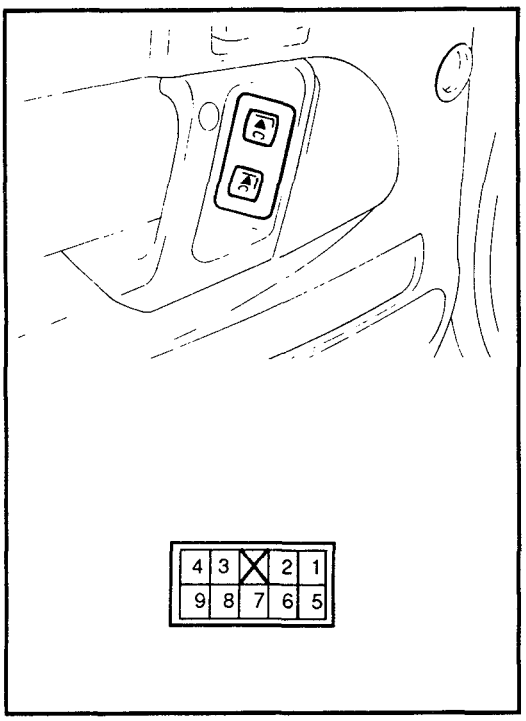
For front door control only

T / P	Front (LH)				Front (RH)			
	B	U1	D1	E	B	U2	D2	E
UP	O—O		O—O		O—O		O—O	
OFF	O—O	O				O—O	O	
DOWN	O	O—O		O	O	O	O—O	

[Connection Diagram]

NO	CIRCUIT	WIRE SIZE & COLOR
1	D1	AV 1.25 Br
2	U2	AV 1.25 YL
3	U1	AV 1.25 LW
4	BS	AV 1.25 RW
5	N.C	-
6	L	AV 0.5 GW
7	E	AV 2.0 B
8	B	AV 2.0 YR
9	D2	AV 1.25 GL

*** N.C. : No-Connection**



[FRT, RR]

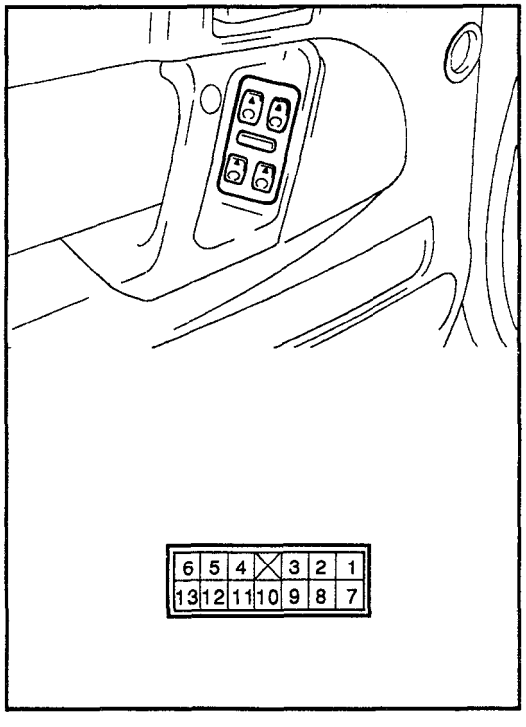
TERMINAL / POSITION	FRT, LH (RH)				FRT, RH (LH)				RR, LH				RR, RH			
	B	U1	D1	E	B	U	2D	2E	B	U3	D3	E	B	U4	D4	E
UP	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
OFF		○	○	○		○	○	○		○	○	○		○	○	○
DOWN	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

[Connection Diagram]

P / T	B	BS
NORMAL	○	○
LOCK		

Window Lock Switch

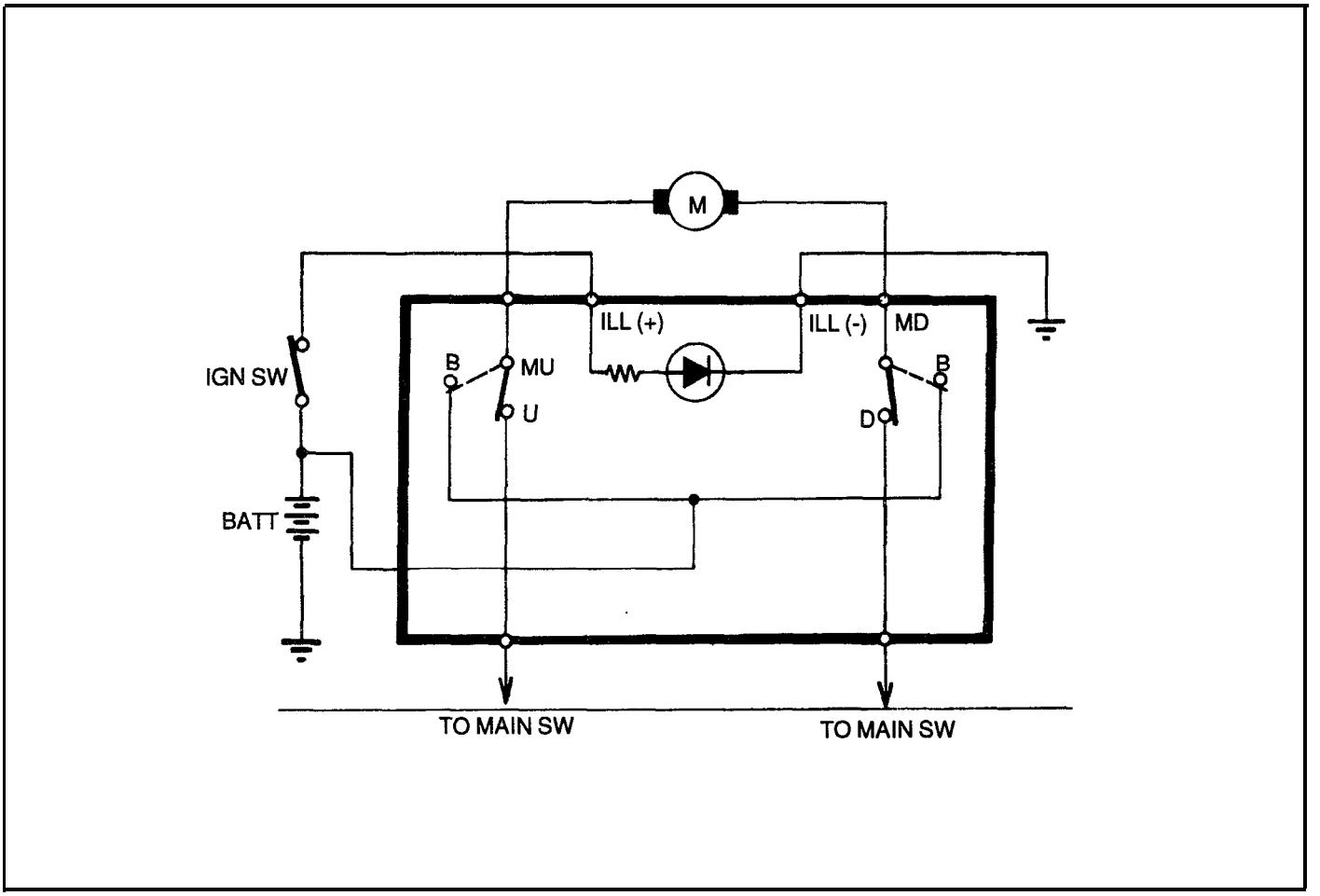
No.	CIRCUIT	WIRE SIZE COLOR
1	N.C	-
2	B	AV 2.0 YR
3	U4	AV 1.25 Y
4	U1	AV 1.25 LW
5	U2	AV 1.25 YL
6	U3	AV 1.25 YG
7	L	AV 0.5 GW
8	E	AV 2.0 B
9	D4	AV 1.25 YBr
10	BS	AV 1.25 RW
11	D1	AV 1.25 Br
12	D2	AV 1.25 GL
13	D3	AV 1.25 LB



* N.C : No-Connection

POWER WINDOW SUB SWITCH

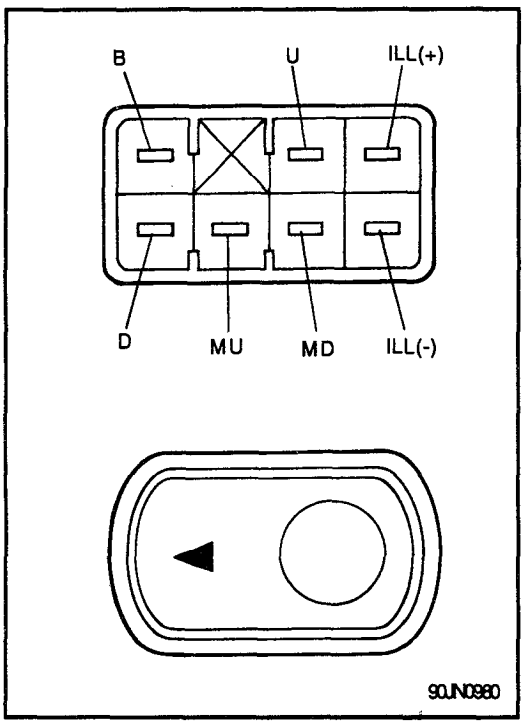
Circuit



Inspection

Operate the switch, and check for the continuity between the terminals.
If continuity is not as specified, replace the switch.

Terminal name / Switch position	B	D	U	MD	MU	ILL(+)	ILL(-)
UP	○				○		
		○		○			
OFF		○		○		○	○
			○		○		
DOWN	○			○			
			○		○		



POWER DOOR MIRROR

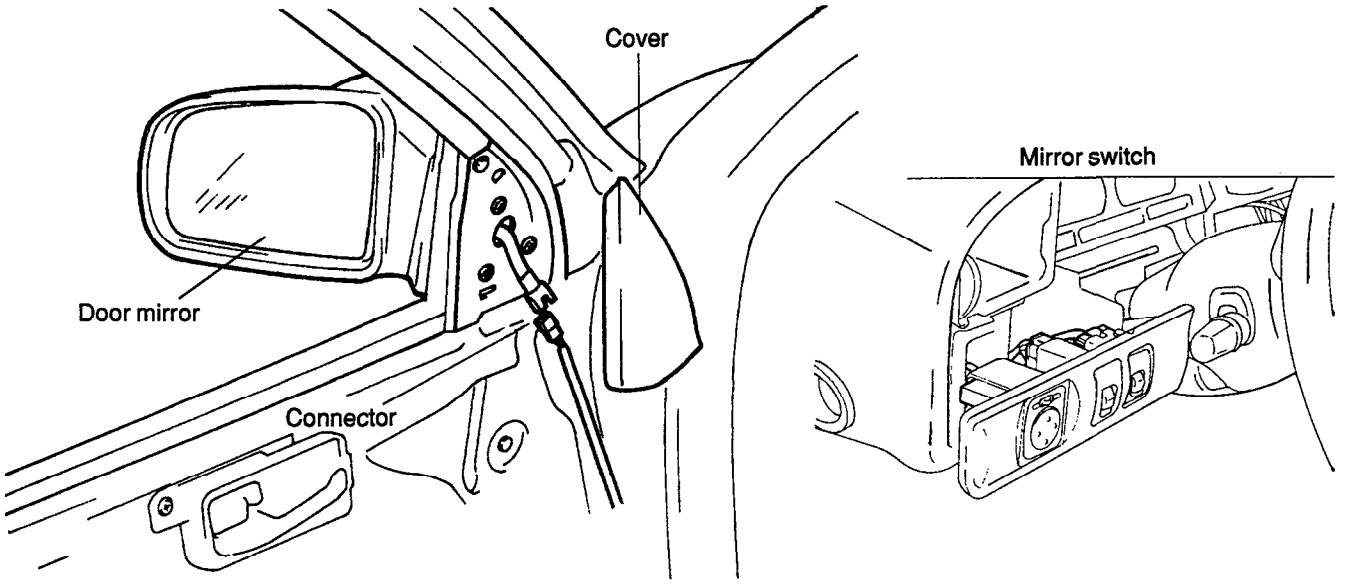
SPECIFICATIONS

Items	Specifications
Remote control mirror actuator	
Rated voltage	DC 12V
Rated current	60 mA
Travel speed	$3^{o} \pm 1^{o}$ /sec at DC 12V
Current consumption	Max. 150 mA
Adjustment angle	9^{o} (up. down. right. left)
Remote control mirror switch	
Rated voltage	DC 12V
Rated current	0.2 A (MAX. 0.5 A)

TROUBLESHOOTING

Problem	Possible cause	Remedy
Door lock system does not operate at all	POWER fuse blown Door lock actuator faulty Wiring or ground faulty	Replace fuses and check for short Check actuator Repair as necessary
Door lock system does not operate by manual switch	Door lock manual switch faulty Wiring faulty	Check switch Repair as necessary
Door lock system does not operate by door key	Door key lock and unlock switch faulty Wiring faulty Door lock link disconnected	Check switch Repair as necessary Connect link

COMPONENTS

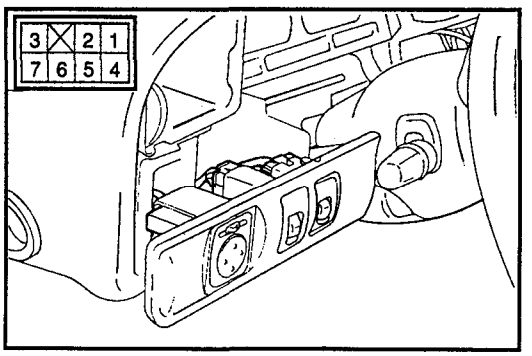


INSPECTION

Mirror Switch

1. Remove the remote control mirror switch from rear console box.
2. Check for continuity between the terminals in each switch position according to the table.

Class	Terminal No.	1	2	3	4	5	6	7
	Direction	B(+)	E(-)	HR	C	VR	HL	VL
LH	UP	○			○			○
	DOWN	○	○		○			○
	LEFT	○		○	○		○	
	RIGHT	○	○		○		○	
RH	UP	○	○		○	○		
	DOWN	○			○	○		
	LEFT	○		○	○			
	RIGHT	○	○	○	○			

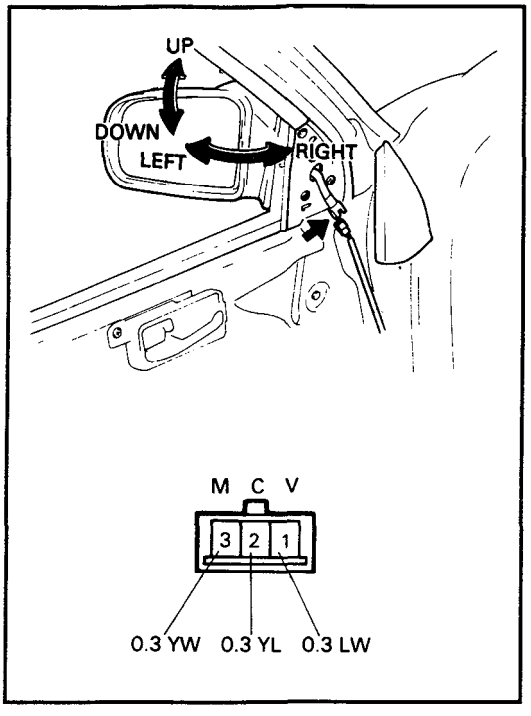


NOTE
VL : Vertical left
VR : Vertical right
HL : Horizontal left
HR : Horizontal right

Mirror Actuator

1. Disconnect the 3-p Connector from the mirror
2. Test actuator operation

Terminal / Direction	Power Supply	Ground	1	2	3
UP	○	○	○	○	
DOWN	○	○	○	○	
LIFT	○	○		○	○
RIGHT	○	○		○	○

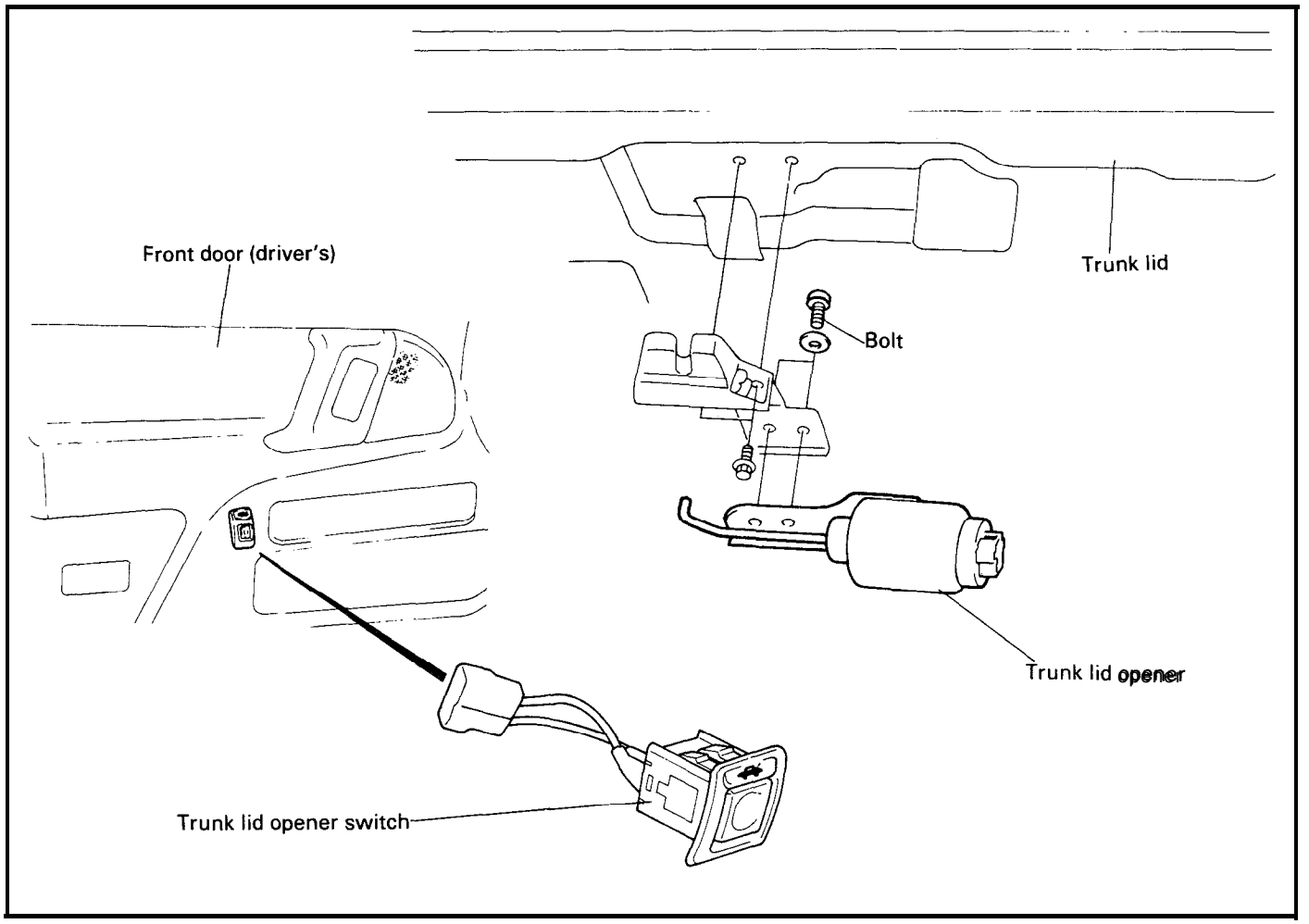


TRUNK LID OPENER

SPECIFICATIONS

items	Specifications
Trunk lid opener	
Rated voltage	DC 12V
Rated current	Max. 12A
Initial pulling torque	Min. 3.6 kg
Circuit breaker (at 7.5 A)	
Trip time	4 ~ 9 sec.
Recovery time	5 sec.
Trunk lid opener switch	
Rated voltage	DC 12V
Current consumption	21A
Operating force	0.5 ~ 1.1 kg

COMPONENTS

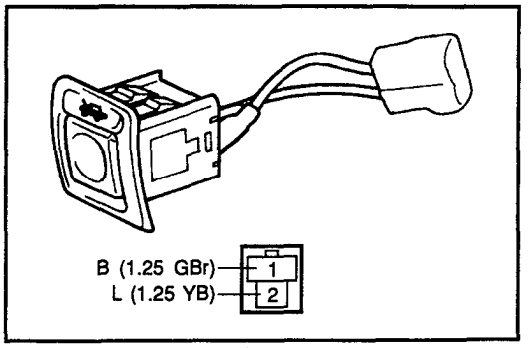


INSPECTION

Trunk Lid Opener Switch

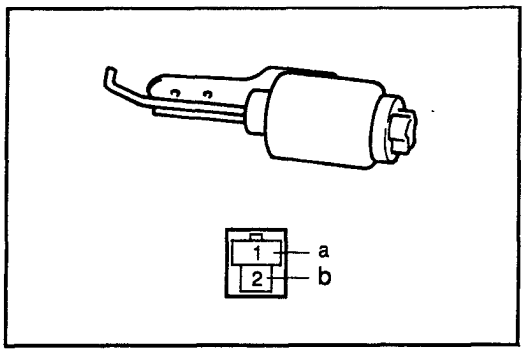
Remove the trunk lid opener switch and check continuity between the terminals

T / P	B	L
OFF		
ON	O———	———O



Trunk Lid Opener

Remove the trunk lid opener and check continuity between the terminal “a” and "b".
If there is no continuity, replace it.



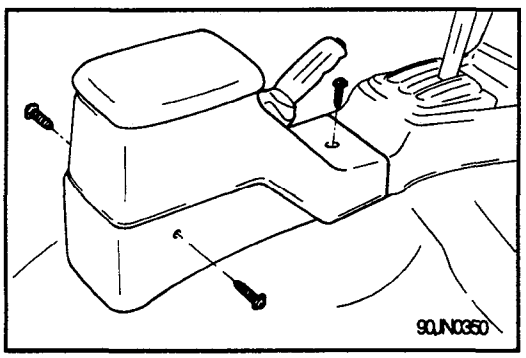
TIME AND ALARM CONTROL SYSTEM (TAC SYSTEM)

SPECIFICATIONS

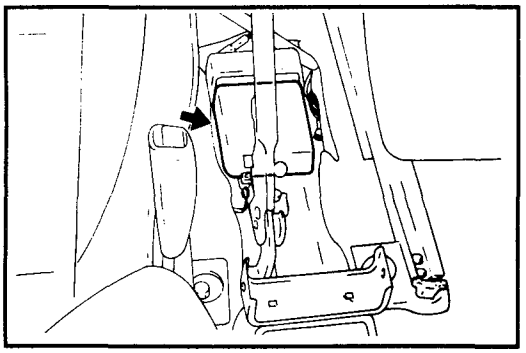
Items	Specifications
Rated voltage	DC. 12 V
Operating voltage range	DC. 9 I 16 V
Operating temperature range	-30° ~ +80°C (-22°F ~ +176°F)
Rated load	
Variable intermittent wiper	MAX. 5 A (Inductance load)
Rear defogger (heated) timer	DC. 14.3 V, 200 W (Resistance load)
Seat belt warning	DC. 12 V, 1.2 W (Lamp load)
	DC. 13.5 V, 350 mA (Inductance load)
Door warning	DC. 13.5 V, 350 mA (Inductance load)

REMOVAL

1. Remove the rear console. (3 Screws)
2. Separate connectors. (E.C.T switch, Remote control mirror switch)



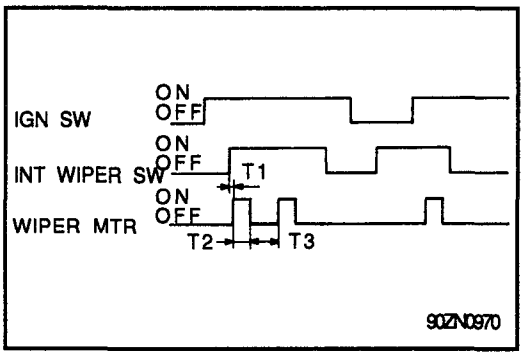
3. Remove 2 screws retaining TACM bracket.
4. Installation is the reverse order of the removal step.



INSPECTION

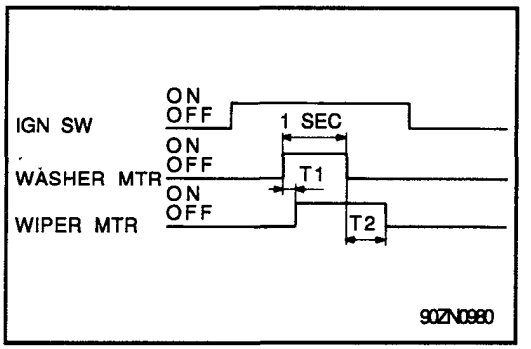
Intermittent Wiper

1. Operating characteristic :
2. T_1 : MAX. 0.5 sec.
   T_2 : Time of wiper motor 1 rotation.
   T_3 : 1.5 ± 0.7 sec. (VR=0 kΩ) I 10.5 ± 3 sec. (VR=50 kΩ)
3. Variable resistance (VR) : 50 ± 10 kΩ



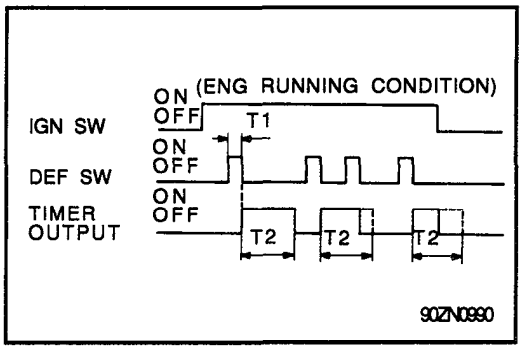
Washer

1. Operating characteristic :
2. T_1 : 0.4 ~ 1.2 sec.
   T_2 : 2.0 ~ 4.7 sec.
3. This function should be operated preferentially even though the variable intermittent wiper is operating.



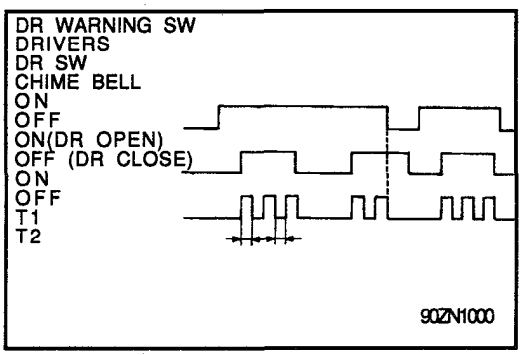
Rear Defogger Timer

1. Operating characteristic :
2. T_1 : 0.5 sec.
   T_2 : 10 ± 3 min.



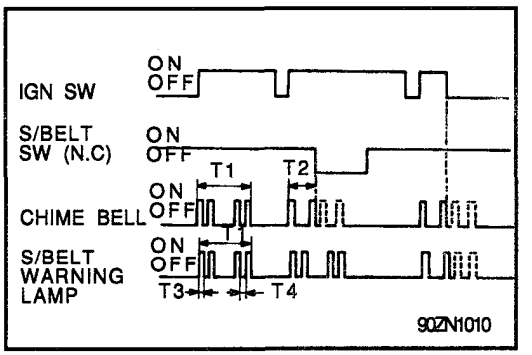
Door Warning

1. Operating characteristic :
2. T_1, T_2 : 0.3 ± 0.1 sec.



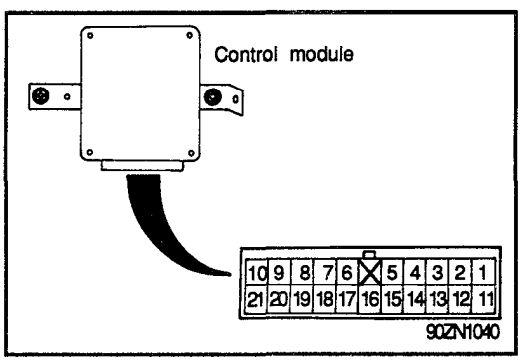
Seat Belt Warning

1. Operating characteristic :
2. T_1 :6 ± 1 sec.
   T_2 : MAX. 6 ± 1 sec.
   T_3, T_4 : 0.3 ± 0.1 sec.



CONTROL MODULE

1. After tracing the problem to the control module, replace it with a new one. Check for proper operation.
2. If system operates properly, the original control module is faulty.



REAR WINDOW DEFOGGER (HEATED GLASS) SPECIFICATIONS

Items	Specifications
Rear window defogger (heated) switch	
Rated voltage	DC 12V
Operating force	0.3 ~ 1.0 kg
Insulating resistance	MIN. 5MΩ (DC 500 V megger)
Indicator lamp	1.2 W
Rear window heated glass	
Rated voltage	DC 12V
Power comsumption	185 ± 10 W (per sheet)

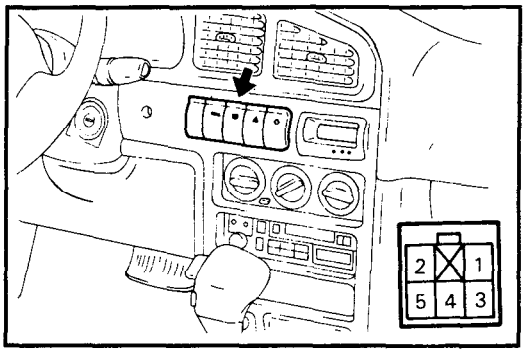
REAR WINDOW DEFOGGER SWITCH

INSPECTION

Disconnect the defogger switch connector from the wiring harness. Operate the switch, and check the continuity between the terminals.

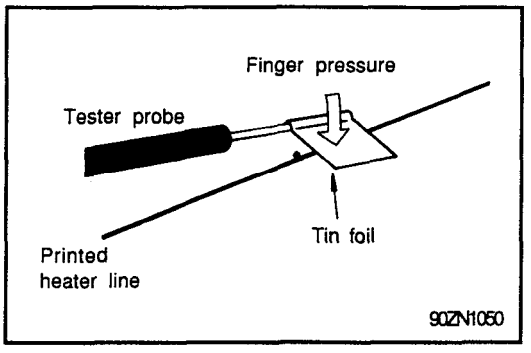
Position \ Terminal	4	5	2	1	3
OFF				O—O	
ON	O—O		O		

If continuity is not as specified, replace the switch.

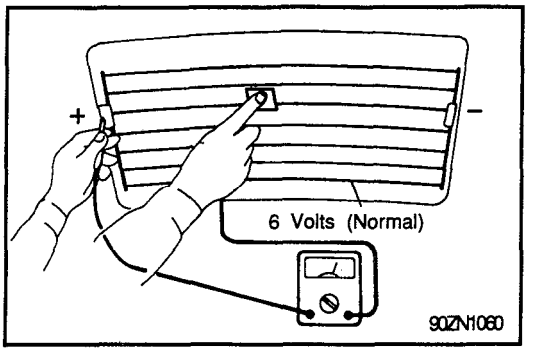


REAR HEATED (DEFOGGER) GLASS PRINTED HEATER LINK CHECK

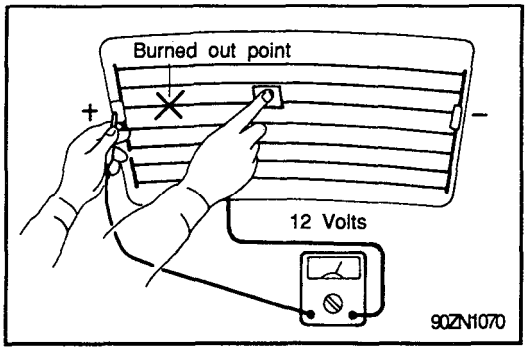
NOTE :
Wrap tin foil around the end of the voltmeter test lead to prevent damaging the heater line. Apply finger pressure on the tin foil, moving the tin foil along the grid line to check for open circuits.



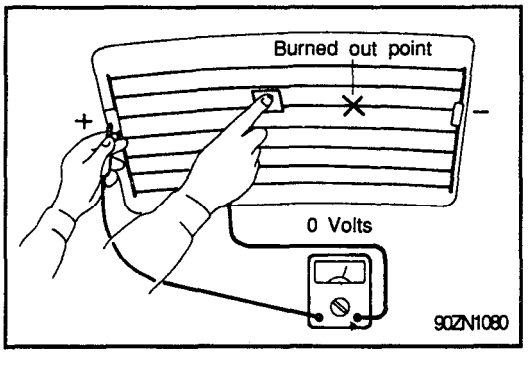
1. Turn on the defogger switch and use a voltmeter to measure the voltage of each heater line at the glass center point. If a voltage of approximately 6V is indicated by the voltmeter, the heater line of the rear window is considered satisfactory.



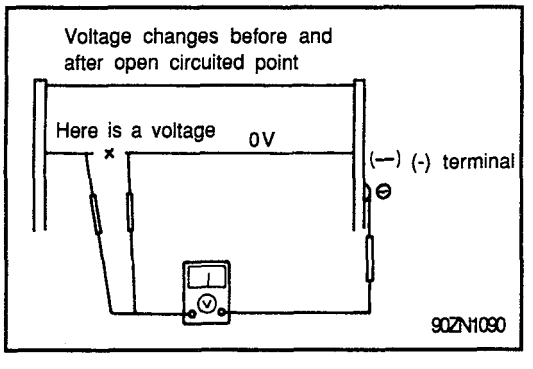
2. If a heater line is burned out between the center point and (+) terminal, voltmeter will indicate 12 volts.



3. If a heater line is burned out between the center point and (-) terminal, the voltmeter will indicate 0 volt.

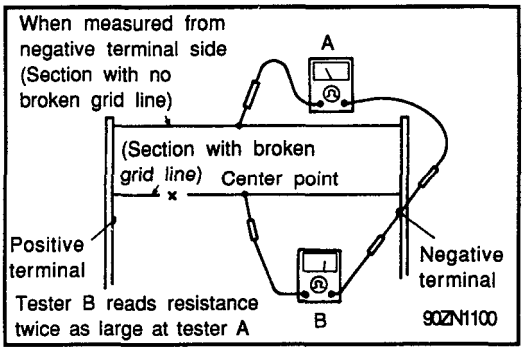


4. To check for open circuits, slowly move the test lead in the direction that the open circuit seems to exist. Try to find a point where a voltage is generated or changes to 0V. The point where the voltage has changed is the open-circuited point.



Defogger OFF

5. Use an ohmmeter to measure the resistance of each heater line. The section with a broken heater line will indicate a resistance twice that of other section. In the affected section, move the test to a position where resistance sharply changes.



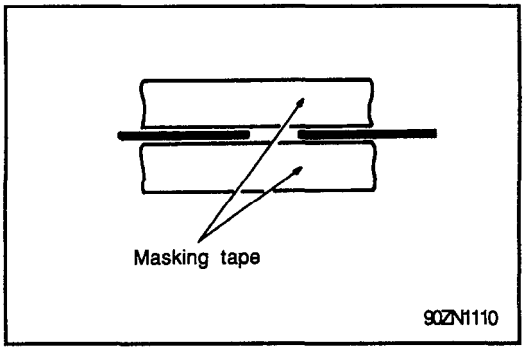
Repair

Provide the following items:
1. Conductive paint
2. Paint thinner
3. Masking tape
4. Silicone remover
5. Thin brush

Wipe the glass adjacent to the broken heater line, clean with silicone remover and attach the masking tape as shown. Shake the conductive paint container well, and apply three coats with a brush at intervals of about 15 minutes apart. Remove the tape and allow sufficient time for drying before applying power. For a better finish, scrape away excess deposits with a knife after completely dried. (allow 24 hours)

NOTE :

After repairing, clean the glass with a soft dry cloth or wipe along the grid line with a slightly moistened cloth.

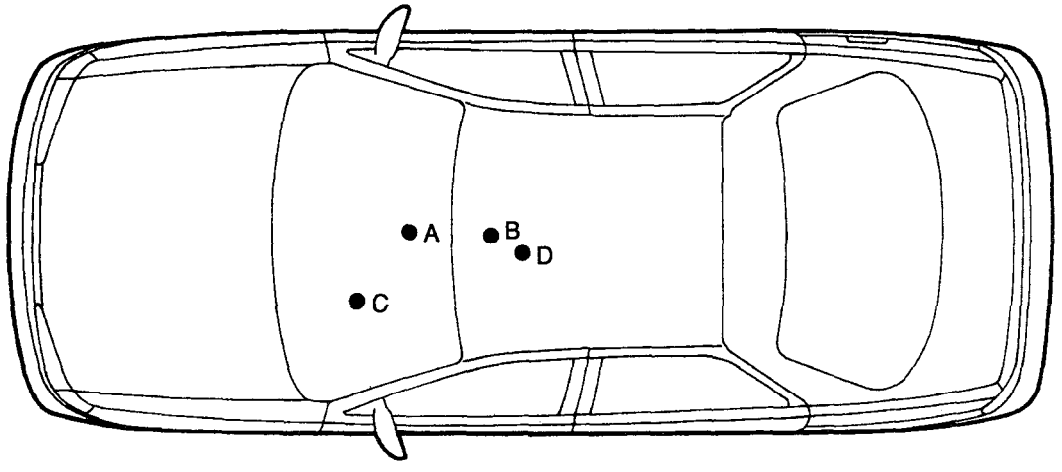


AUTOMATIC TRANSAXLE AND KEY LOCK CONTROL SYSTEM

SPECIFICATION

Items	Specifications
Control unit	
Rated voltage	DC 12V
Operating voltage range	DC 9 ~ 16V
Operating temperature range	-30°C ~ +80°C (22°F ~ +176°F)
Rated load	MAX. 1A (A/T solenoid) MAX. 0.8A (Key lock solenoid)
A/T solenoid	
Rated voltage	DC 12V
Rated current	1 A (MAX. 2A)
Operating voltage range	DC9 ~ 16V
Operating temperature range	-30°C ~ +80°C (22°F ~ +176°F)
Operating force	
Initial pull in force	0.4 kg.cm (at 12V, 20°C)
Spring force	0.2 kg.cm (at 12V, 20°C)
Holding force	1.5 kg.cm (at 12V, 20°C)
Key lock solenoid	
Operating voltage range	DC 9 I 16V
Operating temperature range	30°C ~ +80°C (22°F ~ +176°F)
Exciting current	MAX. 0.9A
Operating force	
Pull in force	MIN. 0.17 kg.cm (at DC 7.5 ± 0.1V)
Holding force	MIN. 0.25 kg.cm (at DC 6 ± 0.1V)
Parking position switch	
Rated load	1A (resistance load, at DC 12V)
Operating force	0.8 ± 0.2 kgf
Operating temperature range	30°C ~ +80°C (22°F ~+176°F)

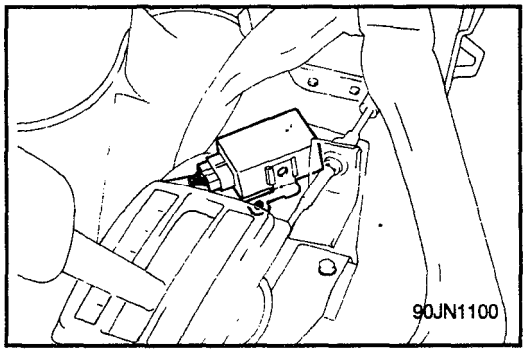
COMPONENTS LAYOUT



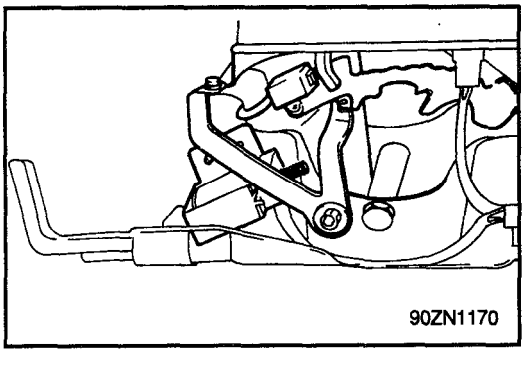
A. Under parking brake lever
B. Shift lever assembly
C. Ignition key
D. Shift lever assembly

90JN1090

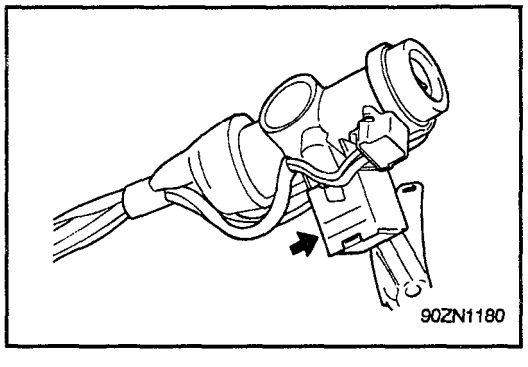
A. Control unit



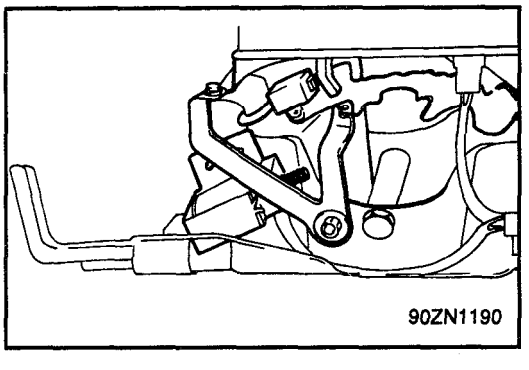
B. A/T solenoid



C. Key lock solenoid



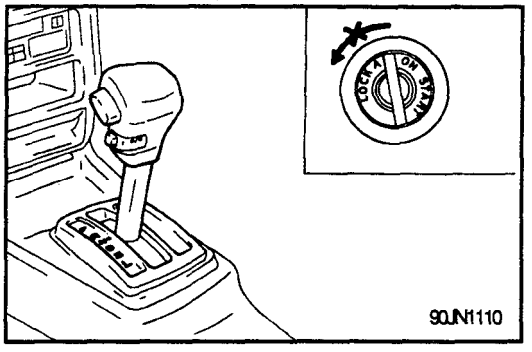
D. P/position switch/Key lock switch



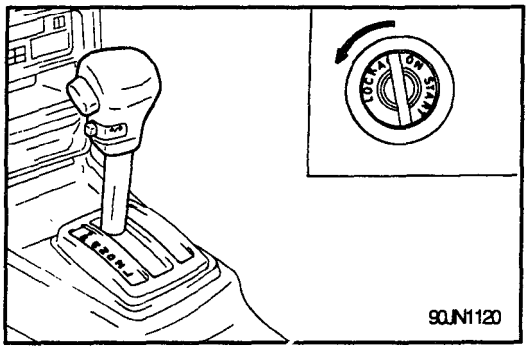
SYSTEM CHECK

KEY LOCK SYSTEM

1. Check that the ignition key cannot be turned to “LOCK (OFF)” position, when the position of the shift lever is not in “P” position.



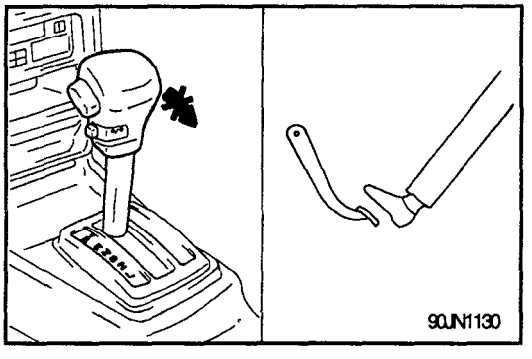
2. Check that the ignition key turns to the “LOCK (OFF)” position, when the shift lever is set to the “P” position.



SHIFT’ LOCK SYSTEM

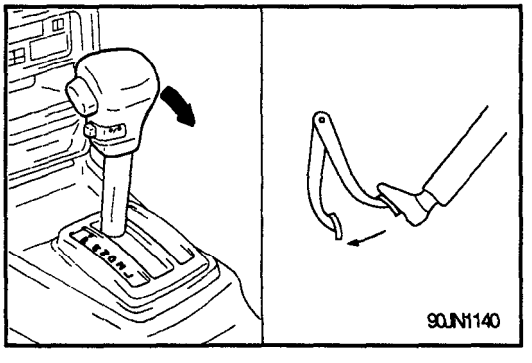
1. Check that under the following conditions, the shift lever cannot be moved from the “P” position to any other position.

   IGNITION KEY POSITION : “ON”
   BRAKE PEDAL: NOT DEPRESSED
   BUTTON : PRESSED

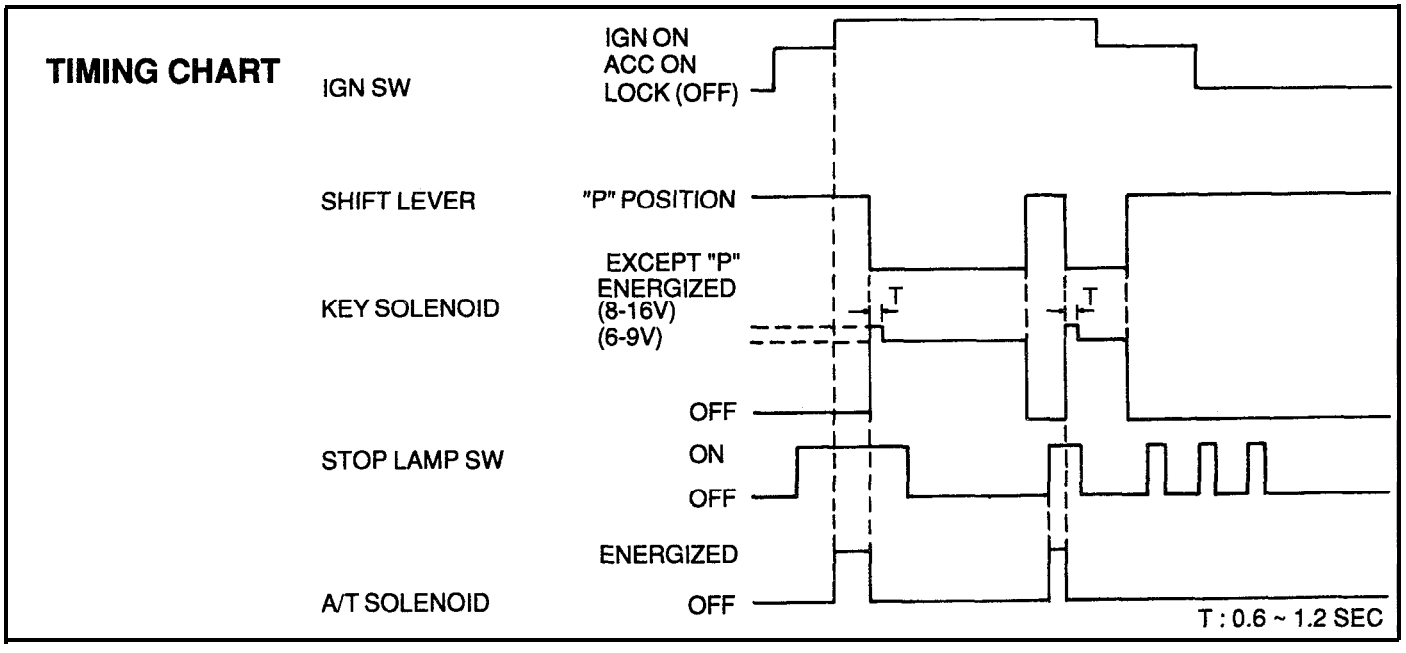


2. Check that under the following conditions, the shift lever can be moved from the “P” position to other position.

   IGNITION KEY POSITION : “ON”
   BRAKE PEDAL: DEPRESSED
   BUTTON : PRESSED



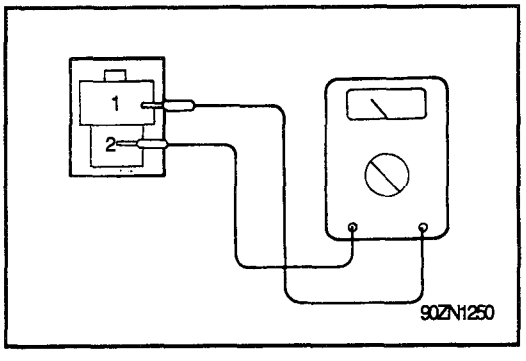
INSPECTION



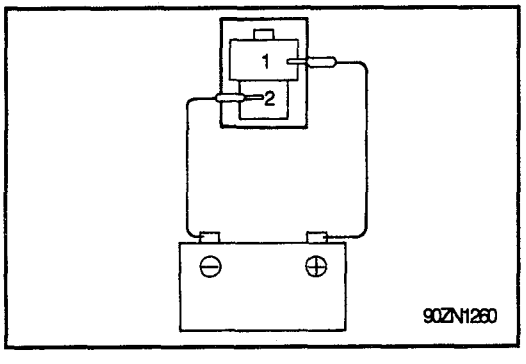
AUTOMATIC TRANSAXLE SOLENOID

1. Remove the solenoid connector.
2. Using an ohmmeter, measure the resistance between terminals.

Standard resistance : 12 - 16Ω



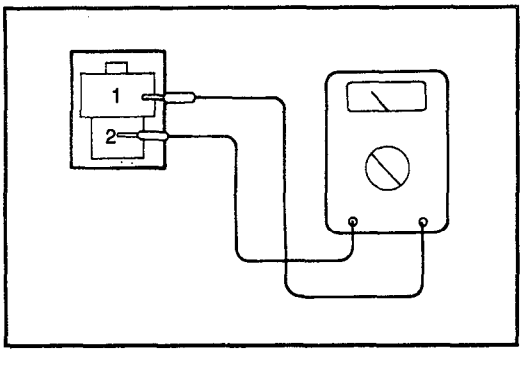
3. Attach the positive (+) lead from the battery to terminal #1. and the negative () lead to terminal #2.
4. Check that an operation noise can be heard from the solenoid.



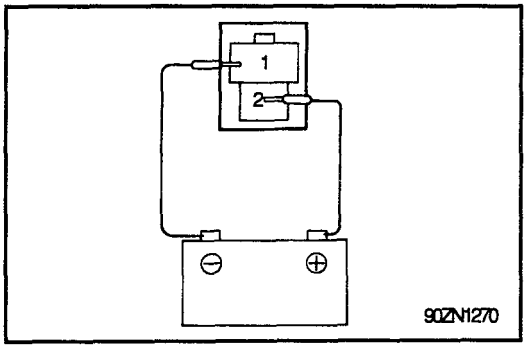
KEY LOCK SELENOID

1. Remove the solenoid connector.
2. Using an ohmmeter, measure the resistance between terminals.

Standard resistance : 12.5 - 16.5Ω



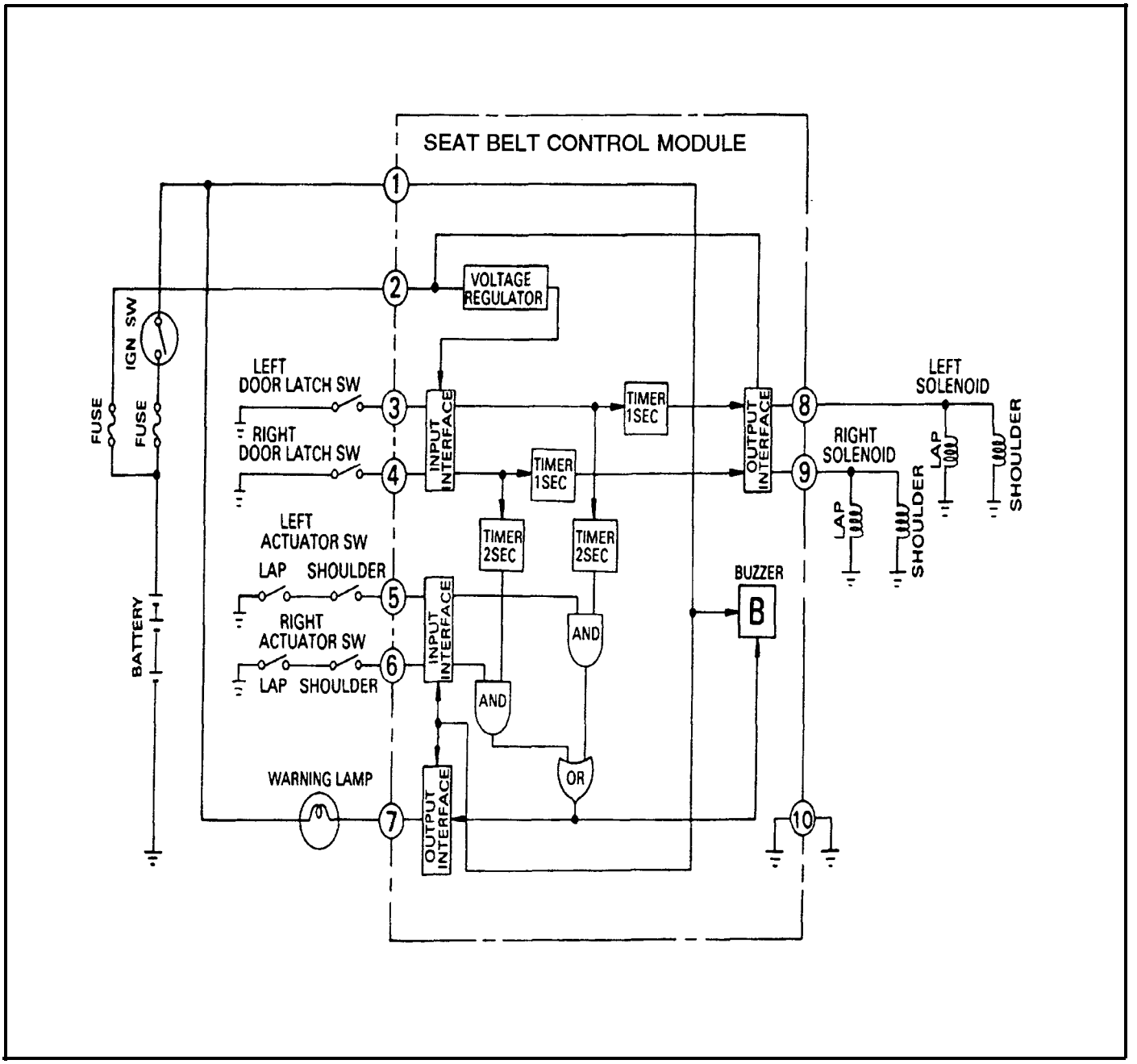
3. Attach the positive (+) lead from the battery to terminal #2. and the negative (-) lead to terminal #1.
4. Check that an operating noise can be heard from the solenoid.



PASSIVE SEAT BELT
SPECIFICATIONS OF CONTROL UNIT

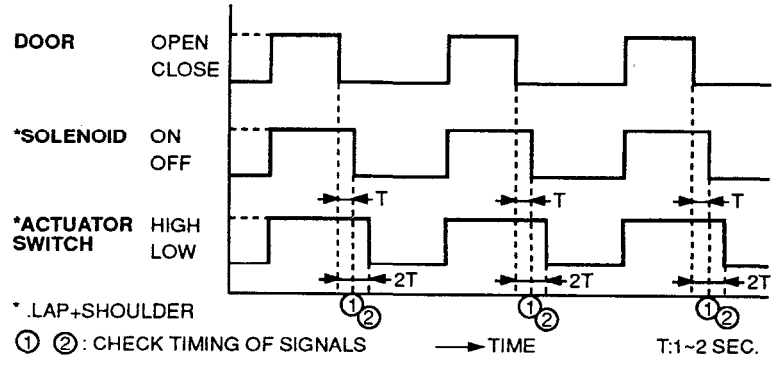
Items	Specification
Rated voltage	DC 12V
Operation voltage range	DC 8.OV - 16.OV
Rated load	
Solenoid	35Ω x 2 (parrallel)/seat belt
Warning lamp	1.2W (at DC 12V)
Buzzer	70 - 72 dB (between 1 Meter)
Actuator switch	DC 8V 6mA or more
Door latch switch	DC 5V 4mA or more
Voltage drop	
Solenoid circuit	1.5V or less
Warning lamp circuit	1.5V or less
Static current	2mA or less
Conditions : Door closed Ignition switch OFF Actuator switch closed Solenoid OFF Lamp and Buzzer OFF	

BLOCK DIAGRAM



TIMING CHART/OPERATION MODE

Normal operation mode



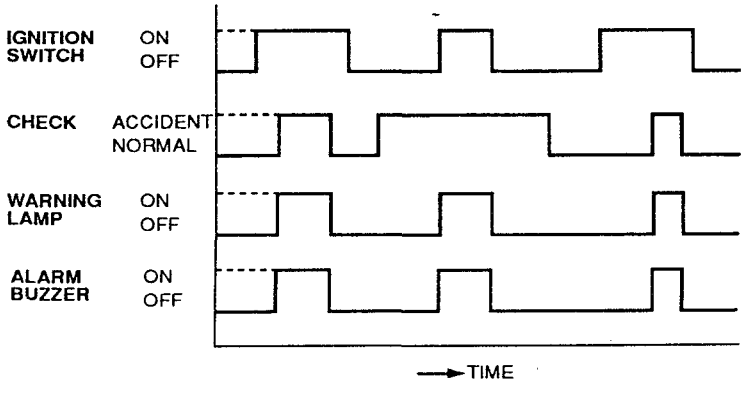
1. When door is opened

According to door open signal (by door latch switch) control unit actuates solenoid mounted in seat belt retractor, and makes VSI sensor inoperative state.

2. When door is closed

According to door close signal, control unit deactuates solenoid 1.0^{+1}_{-0} seconds after door close signal, and then VSI sensor becomes operating state.

Alarm operation



Control unit outputs alarm signal when the following conditions are met simulataneously.

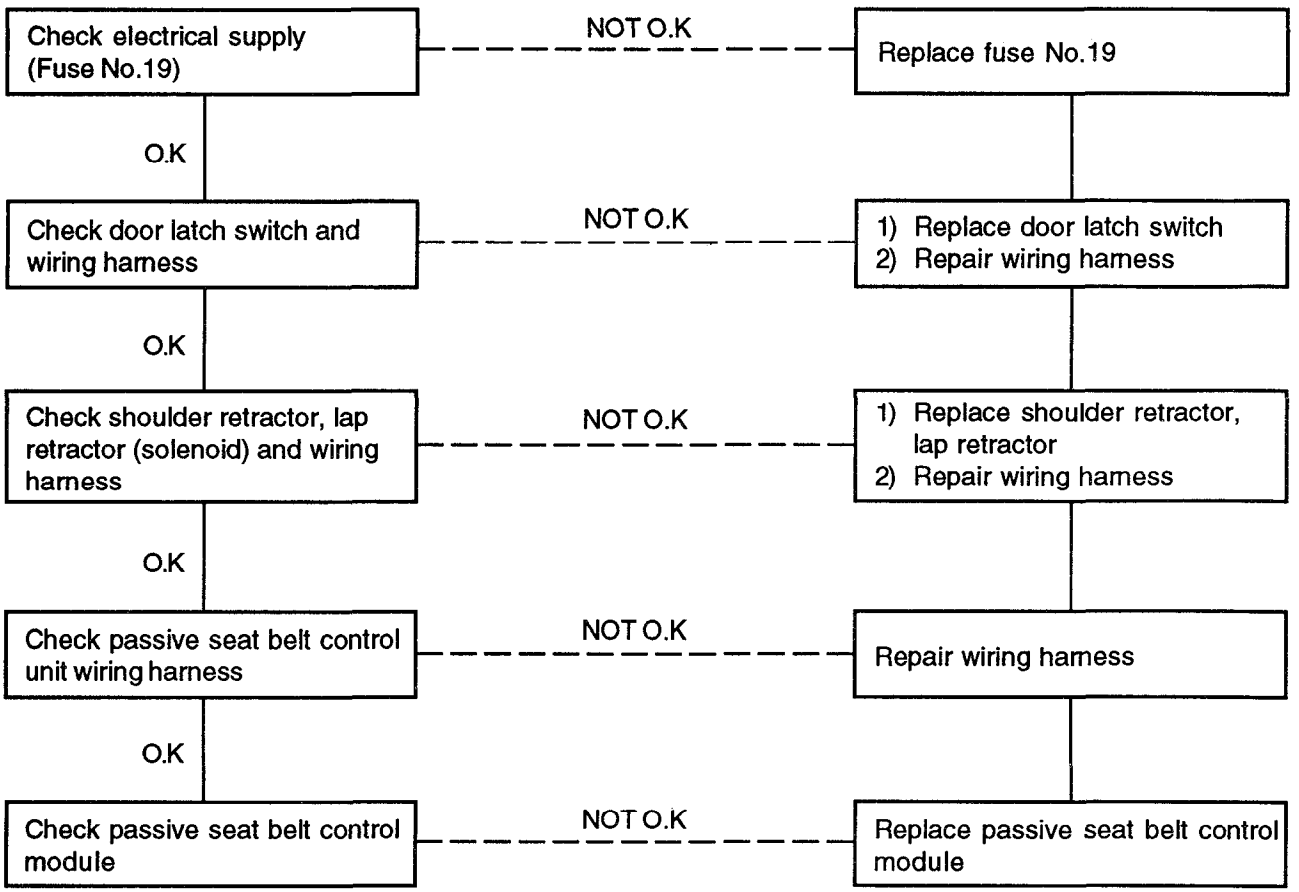
- o Ignition switch is ON.
- o Solenoid signal is OFF.
- o Actuator switch is HIGH for 1.0^{+2}_{-0} seconds after solenoid operation.

NOTE

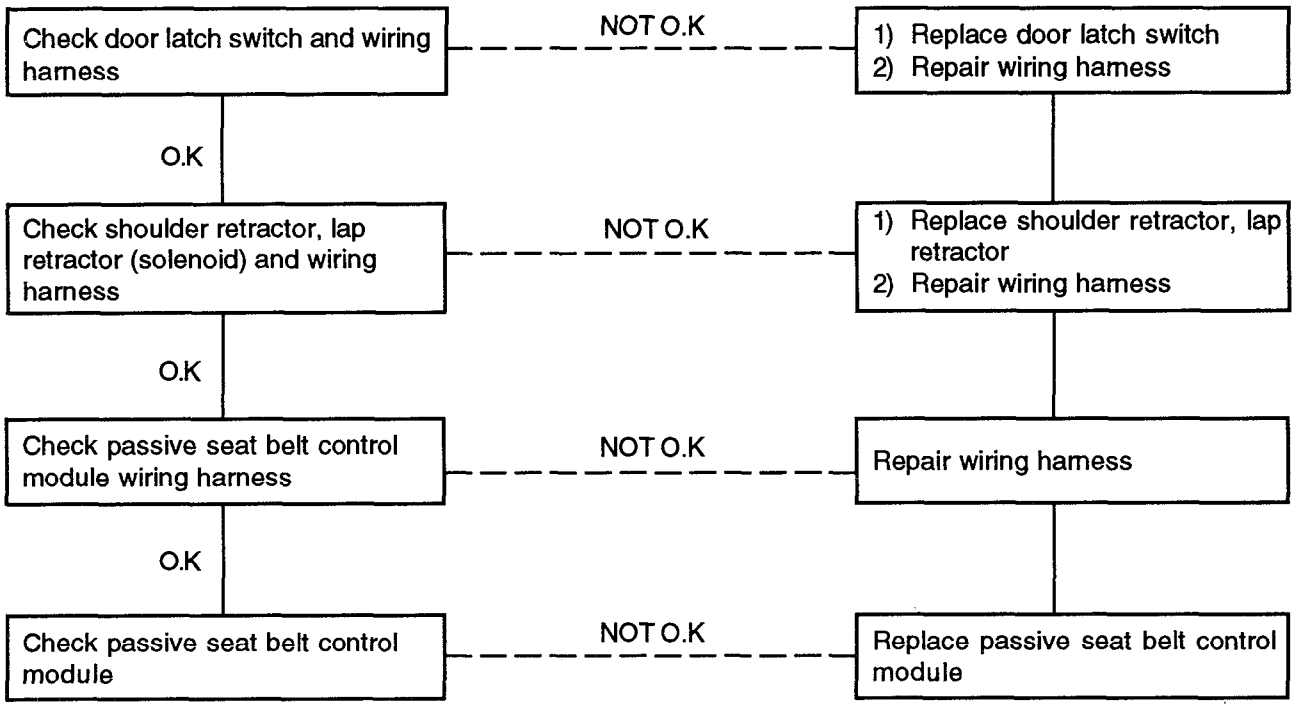
Actuator switch high means that plunger is pulled in solenoid.

TROUBLESHOOTING

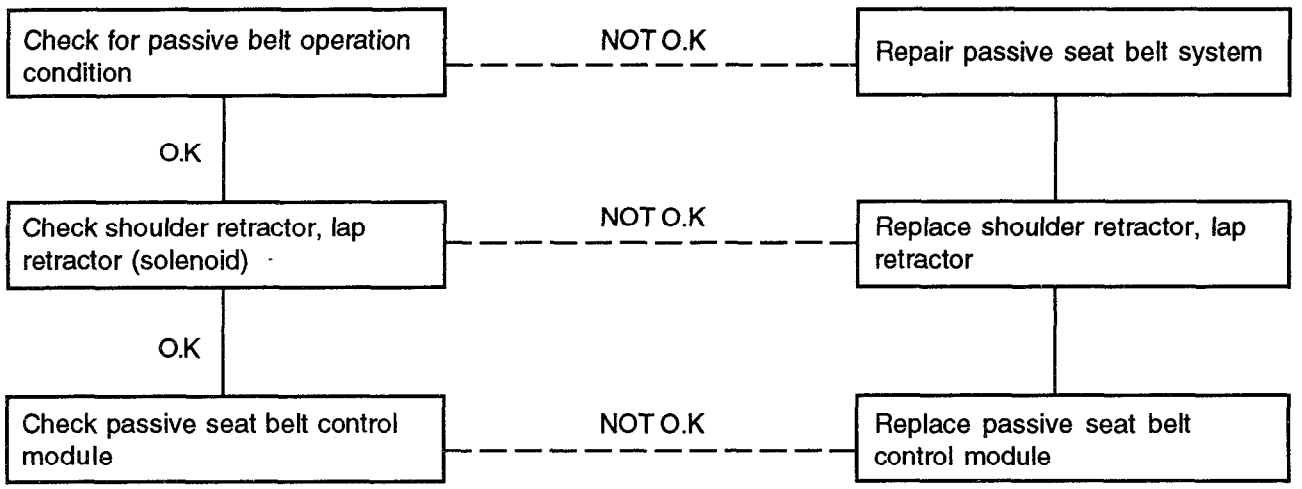
Symptom 1. Seat belt locking (with door opened)



Symptom 2. Seat belt unlocking (when door is closed)



Symptom 3. Buzzer alarm warning (when ignition switch is ON)



ANTI-LOCK BRAKE SYSTEM

Return To Main Table of Contents

GENERAL 2
ABS MODULATOR AND ABS RELAY 8
ABSCM (ABS Control Module) 10
WHEEL SPEED SENSOR 11
BLEEDING OF BRAKE SYSTEM 13
TROUBLESHOOTING 14

GENERAL

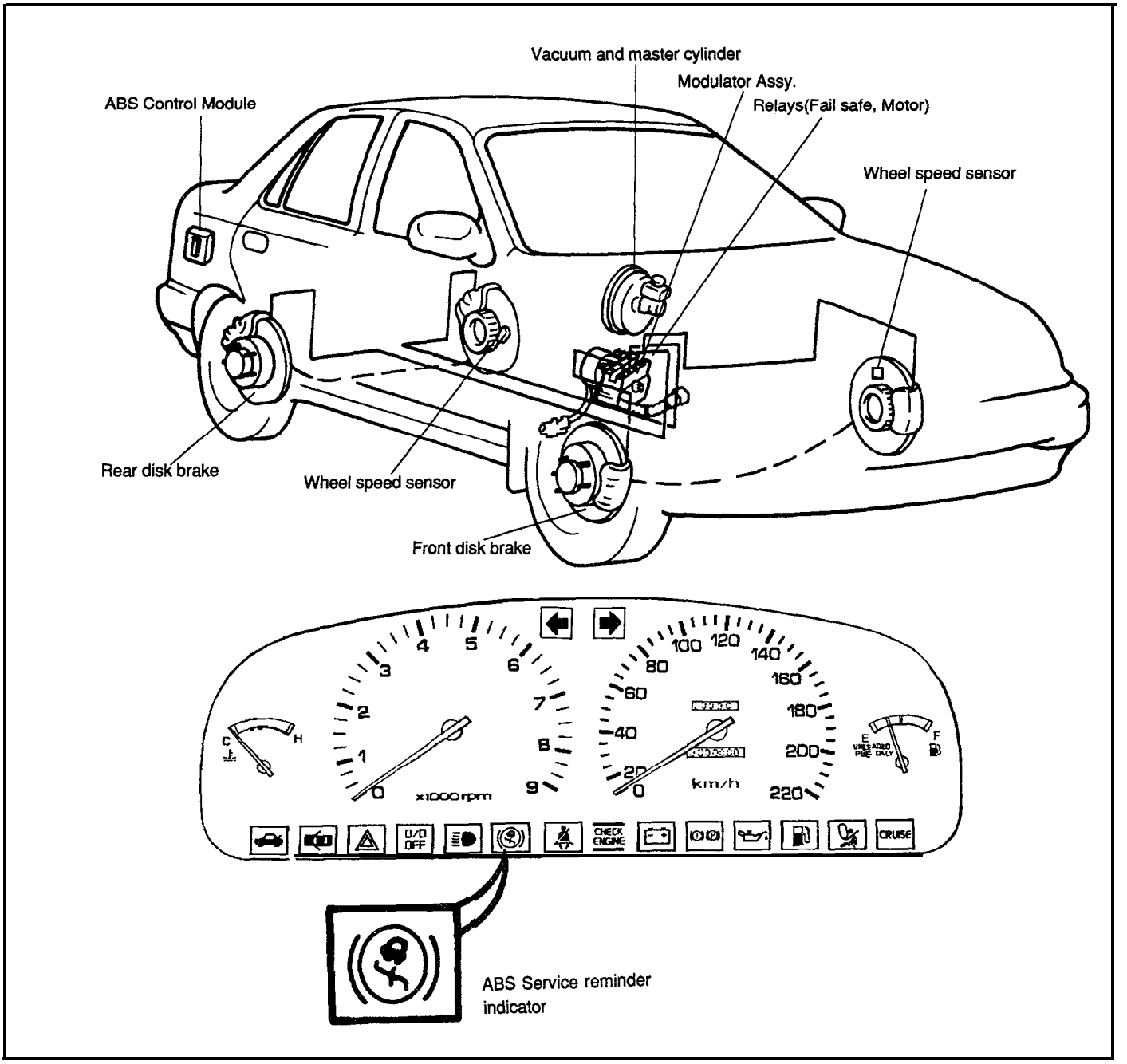
SPECIFICATIONS

ABSCM (Anti-Lock Brake System Control Module)	
Operating voltage range	9.0-16.2V
Power consumption	150 mA or below
Controller fuse	10A
Operating temperature range	**-40°** to +80°C
ABS Service Reminder Indicator	
Power consumption	1.2W
Service Reminder Indicator fuse	10A
Modulator	
Operating voltage range	9.0-16.2V
Rated voltage	12v
Pump Motor fuse	30A
Solenoid fuse	20A
Operating temperature range	**-40°C** to **120°C**

TIGHTENING TORQUE

	N.m	kg.cm	lb.ft
Sensor mounting bolt on the brake plate			
Front	7-11	70-110	5-8
Rear	17-26	170-260	12-19
Hydraulic unit mounting bolt	17-26	170-260	12-19
Hydraulic unit mounting bracket bolt	17-26	170-260	12-19
Six brake tubes on the Hydraulic Unit	13-17	130-170	9-12

SYSTEM COMPONENT

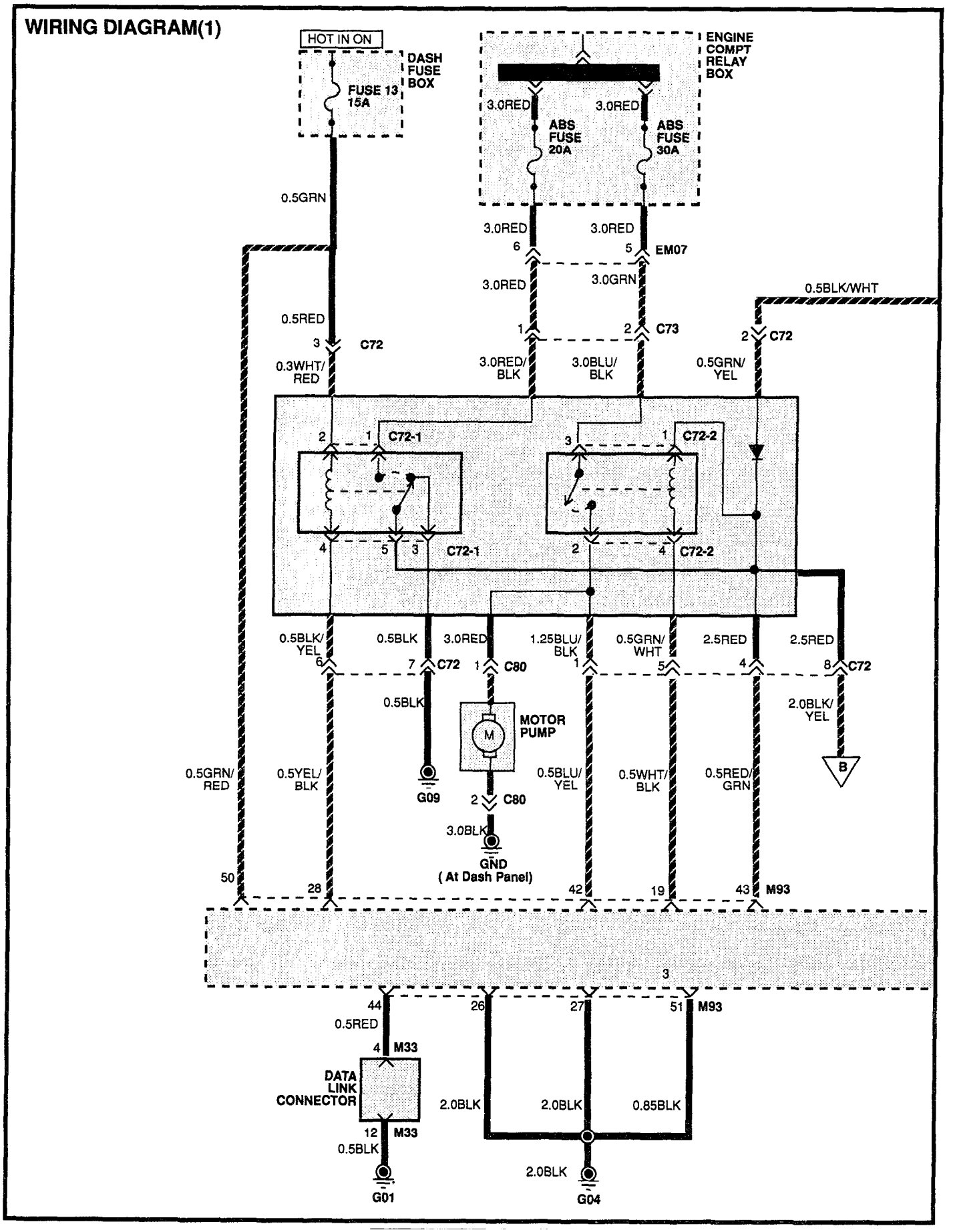


The Anti-Lock Brake System (ABS) controls the hydraulic brake pressure of all four wheels during sudden braking and braking on hazardous road surfaces, preventing the wheels from locking. The ABS provides the following benefits:

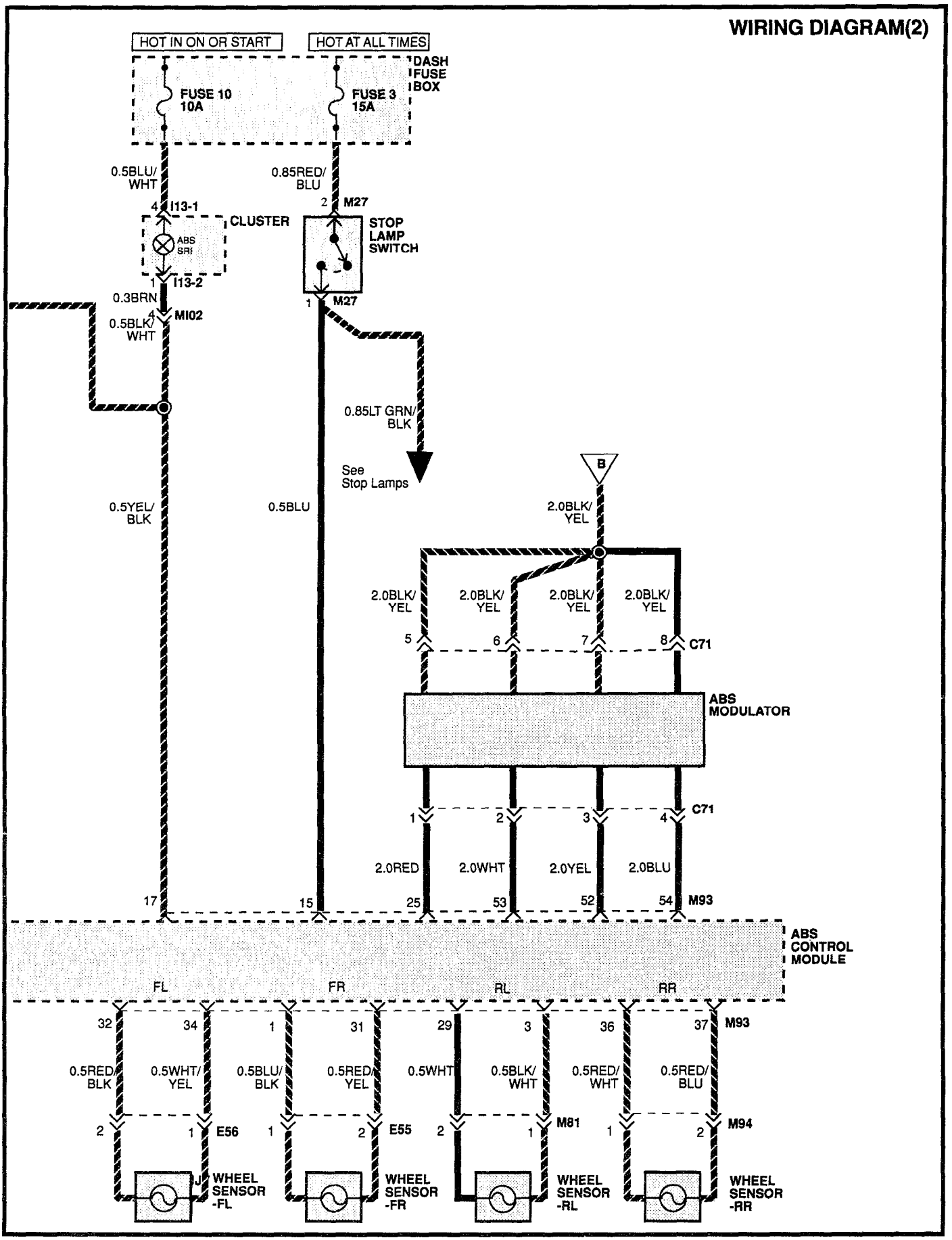
(1) Enables steering around obstacles with a greater degree of certainty even during panic braking
(2) Enables stopping during panic braking while allowing stability and steerability to a minimum, even on curves.

In case a malfunction occurs, a diagnosis function and fail-safe system have been included for serviceability.

WIRING DIAGRAM(1)

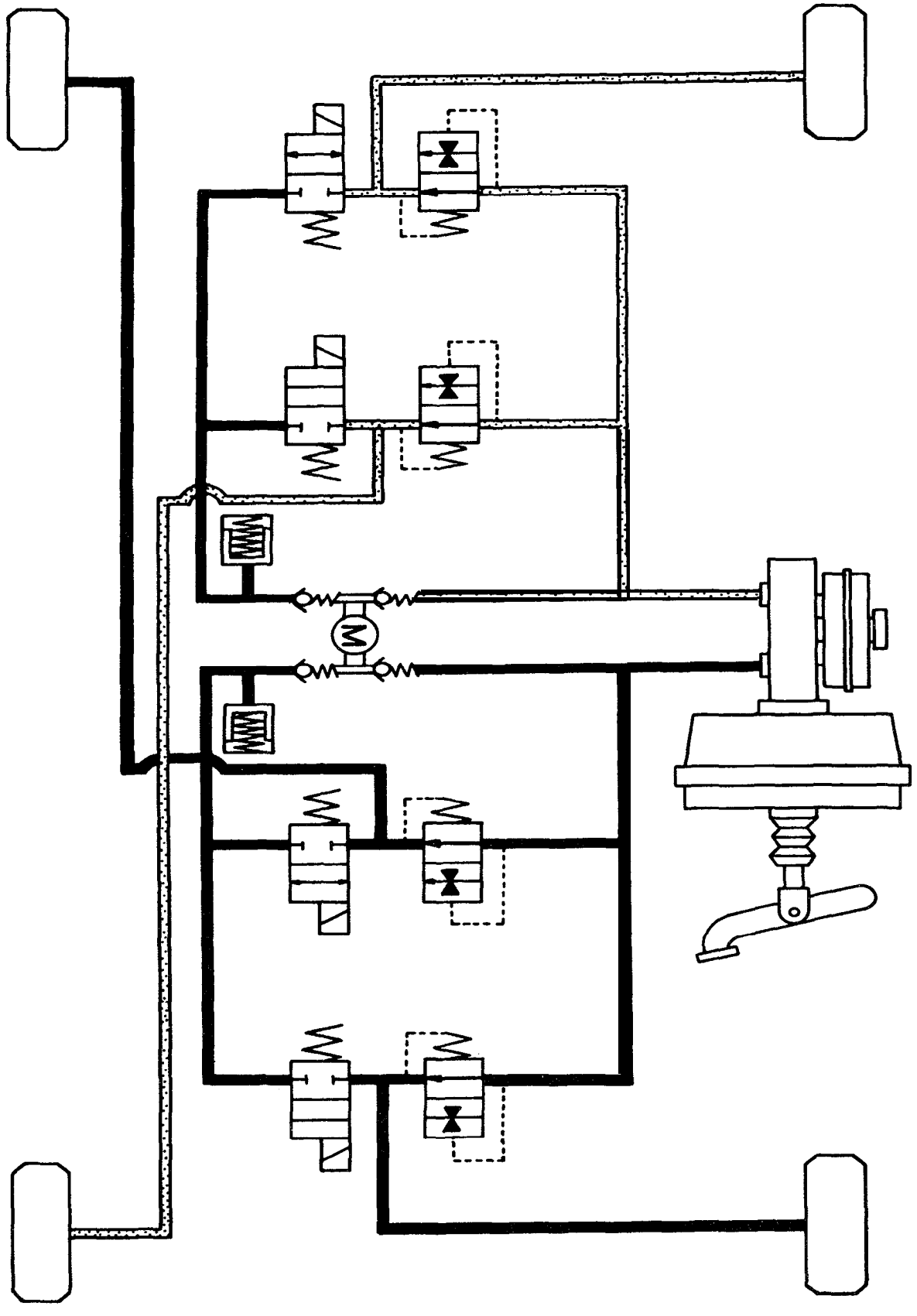


WIRING DIAGRAM(2)



HYDRAULIC SYSTEM

DIAGRAM

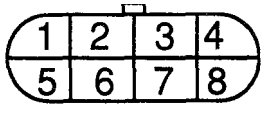


ABSCM CONNECTOR

PIN NO.	PLUG ASSIGNMENT	I/O	PIN NO.	PLUG ASSIGNMENT	I/O
1	SENSOR RIGHT FRONT	I	34	SENSOR LEFT FRONT GND	I
3	SENSOR LEFT REAR GROUND	I	36	SENSOR RIGHT REAR	I
15	BRAKE LIGHT SWITCH	I	37	SENSOR RIGHT REAR GND	I
17	ABS SRI	O	42	MOTOR MONITOR LINE	I
19	MOTOR RELAY DRIVE	O	43	F/SF RELAY MONITOR	I
25	SOLENOID REAR RIGHT	O	44	DLC INPUT/OUTPUT	I/O
26	GROUND FOR SOLENOIDS	I	50	IGNITION SIGNAL	I
27	GROUND FOR SOLENOIDS	I	51	CONTROLLER GROUND	I
28	F/SF RELAY DRIVE	O	52	SOLENOID RIGHT FRONT	O
29	SENSOR LEFT REAR	I	53	SOLENOID LEFT REAR	O
31	SENSOR RIGHT FRONT GND	I	54	SOLENOID LEFT FRONT	O
32	SENSOR LEFT FRONT	I			

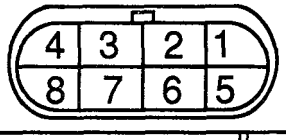
I : INPUT
O : OUTPUT F/SF : Fail safe
SRI : Service Reminder Indicator DLC : Data Link Connector

Modulator connector(C71)



PIN NO.	PLUG ASSIGNMENT	PIN NO.	PLUG ASSIGNMENT
1	RIGHT REAR SOLENOID GND	5	RIGHT REAR SOLENOID
2	LEFT REAR SOLENOID GND	6	LEFT REAR SOLENOID
3	RIGHT FRONT SOLENOID GND	7	RIGHT FRONT SOLENOID
4	LEFT FRONT SOLENOID GND	8	LEFT FRONT SOLENOID

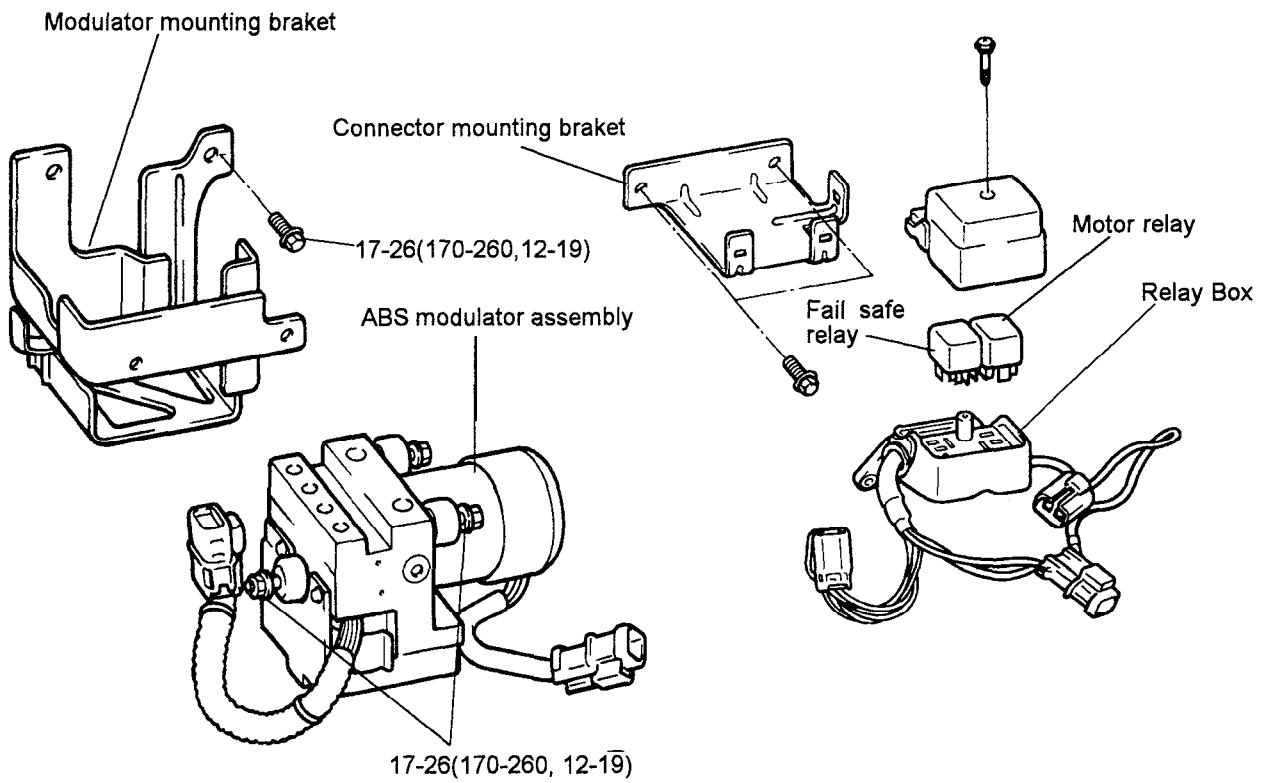
Relay Box connector(C72)



PIN NO.	PLUG ASSIGNMENT	PIN NO.	PLUG ASSIGNMENT
1	MOTOR MONITOR LINE	5	MOTOR RELAY DRIVE LINE
2	SRI DRIVE LINE	6	F/SF RELAY DRIVE LINE
3	F/SF RELAY POWER SUPPLY	7	RELAY GND
4	F/SF RELAY MONITOR LINE	8	MODULATOR POWER SUPPLY

ABS MODULATOR AND ABS RELAY

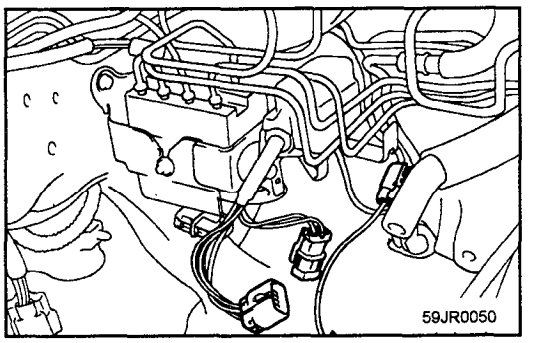
COMPONENTS



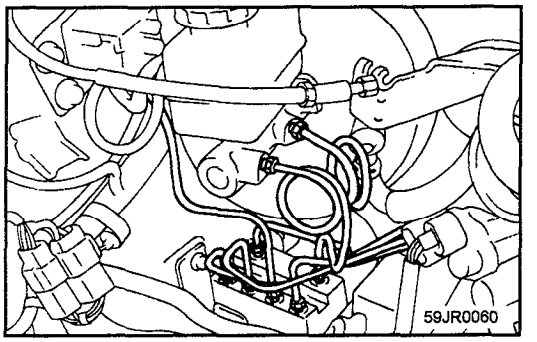
TIGHTENING TORQUE : N.m(kg.cm, lb.ft)

REMOVAL

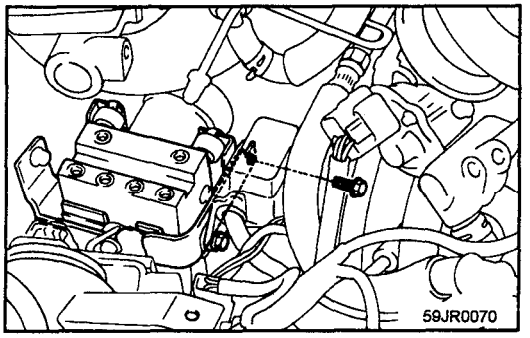
1. Remove the Air cleaner assembly.
2. Disconnect the ABS Relay box harness, Motor Pump harness and modulator harness



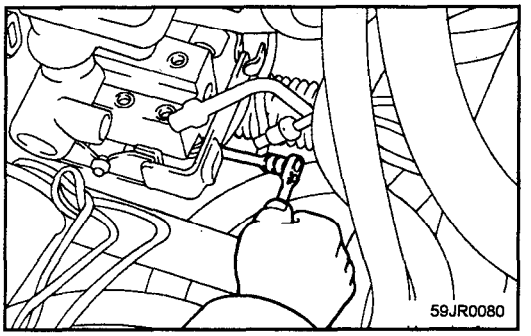
3. Disconnect the brake tubes from the ABS modulator to the brake master cylinder and proportioning valve.



4. Remove the Relay box from modulator mounting bracket.



5. Remove the Modulator mounting Bracket and remove the modulator.



CAUTION
1. **Never attempt to disassemble the ABS modulator**
2. **The modulator must be transported and stored in upright position and with sealed ports.**
   The modulator must not be drained.

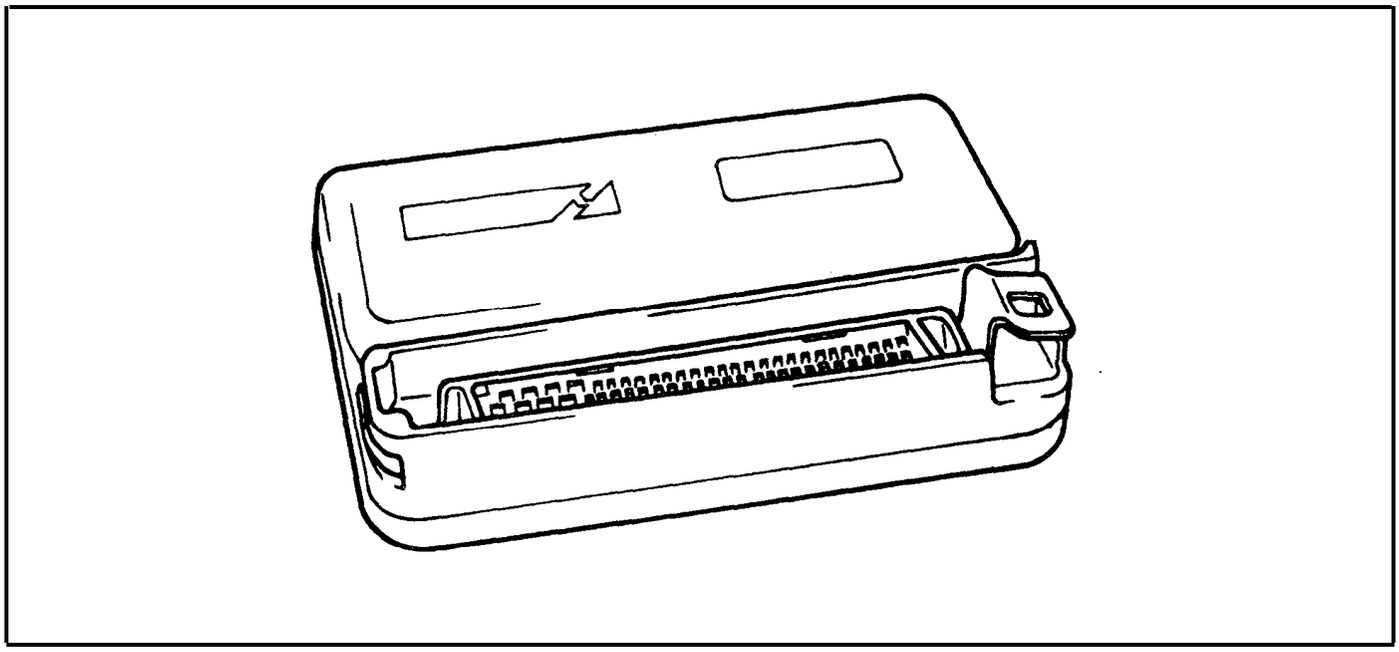
INSTALLATION

1, Follow the reverse order of Removal.

2. Tighten the modulator mounting bolts and brake tube nuts to the specified torque.

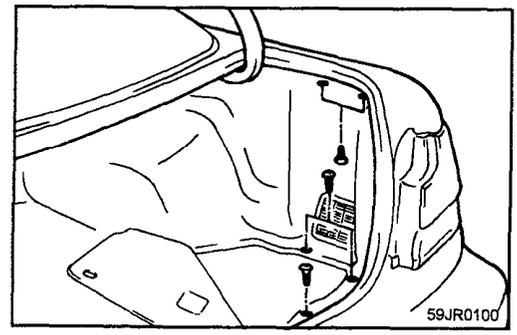
Tightening torque
Modulator mounting bolt .. 1 7-26 N.m(170-260 kg.cm, 12-19 lb)
Brake tube nut..... 13-17 N.m(130-170 kg.cm, 9-12 lb)

ABSCM (ABS Control Module)

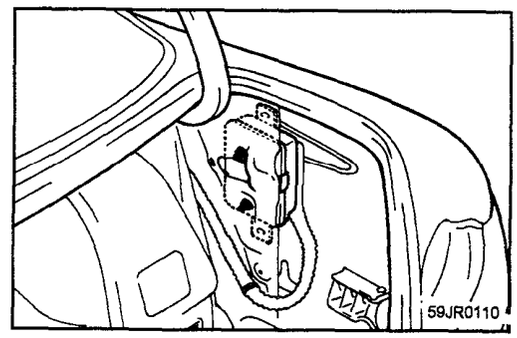


REMOVAL

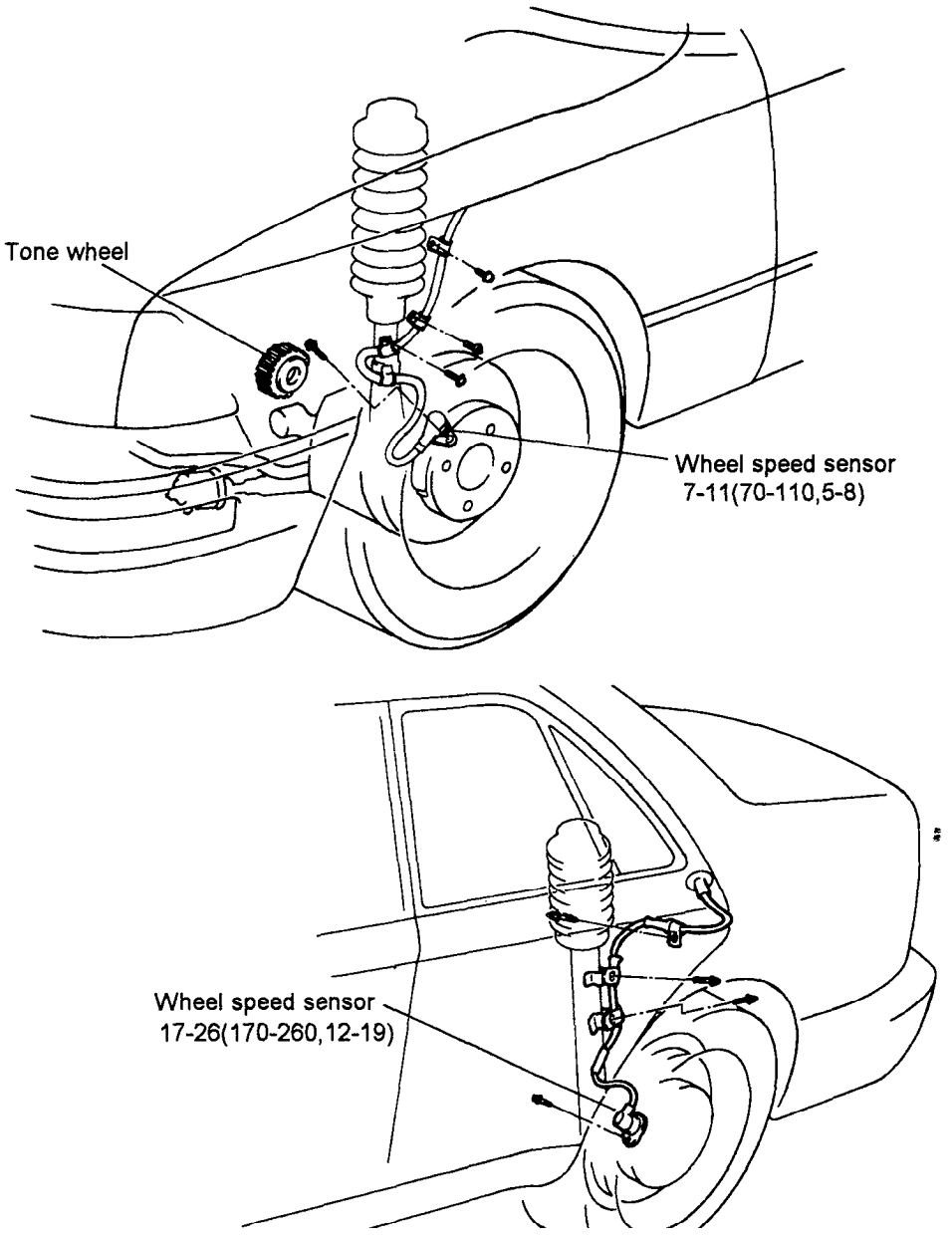
1. Remove the luggage side trim



2. Remove the ABSCM.



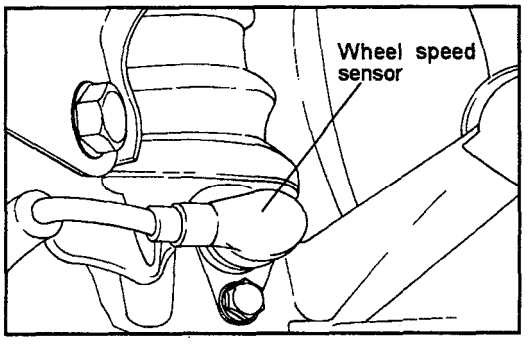
WHEEL SPEED SENSOR



TIGHTENING TORQUE

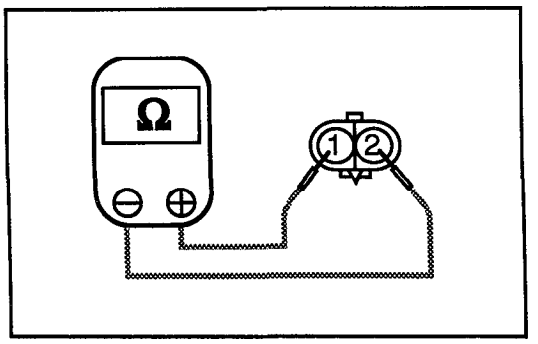
REMOVAL

1. Disconnect the wheel speed sensor connector and mounting bolts.



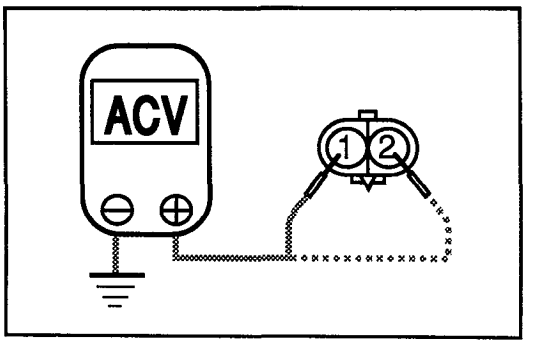
INSPECTION

1. Connect an ohmmeter between the wheel speed sensor terminals and measure the resistance.



Service standard : Front : 1275-1495 Ω
Rear : 1260-1540 Ω

2. Connect a voltmeter between the wheel speed sensor terminals, and measure the voltage by turning the wheel.



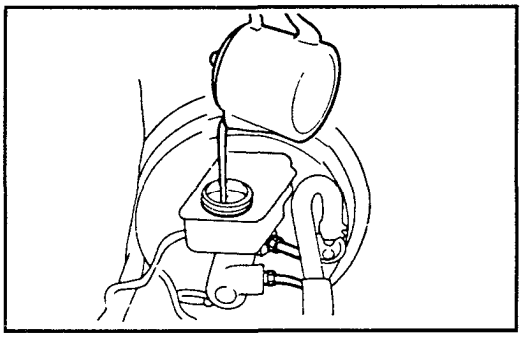
NOTE
Set the voltmeter to measure AC voltage.

Service standard : AC voltage detected.

BLEEDING OF BRAKE SYSTEM

NOTE
There are no special bleeding procedure for the ABS SYSTEM. For bleeding please use the standard rules as described for the conventional brake system as follows.

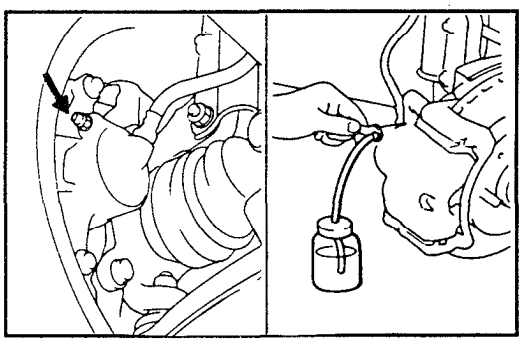
BLEEDING OF BRAKE SYSTEM



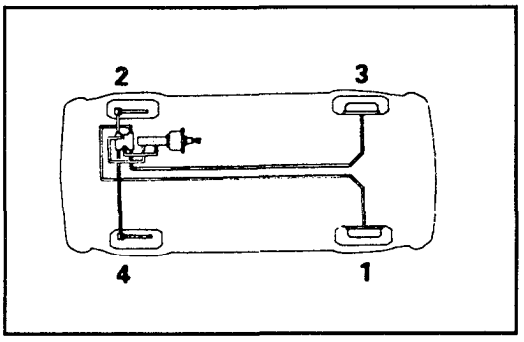
1. Remove the reservoir cap and fill the brake reservoir with brake fluid.

   CAUTION
   Do not allow brake fluid remain on a painted surface. Wash it off immediately.

   NOTE
   When bleeding by pressurized fluid, do not depress the brake pedal.



2. Connect the vinyl tube to the wheel cylinder bleeder screw, and insert the other end of tube in a half full container of brake fluid.
3. Slowly pump the brake pedal several times.
4. While depressing the brake pedal fully, loosen the bleeder screwuntil fluid starts to run out. Then close the bleeder screw.
5. Repeat the 3 and 4 until there are no more bubbles in the fluid.
6. Tighten the bleeder plug screw.



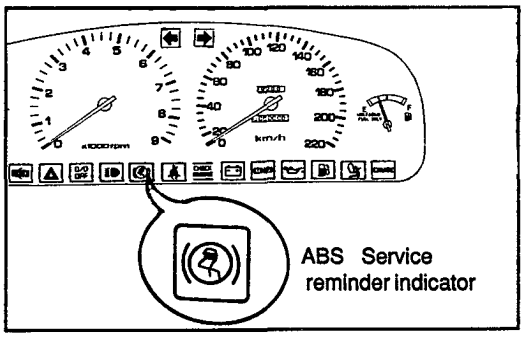
Bleeder screw tightening torque	
Front :	7-13 Nm (70-130 kg.cm, 5-10 lbft)
Rear :	8-20 Nm (80-200 kg.cm, 6-15 lb.ft)

7. Repeat the above procedure for each wheel in the sequence shown in the illustration.

SYSTEM DIAGNOSIS STEP

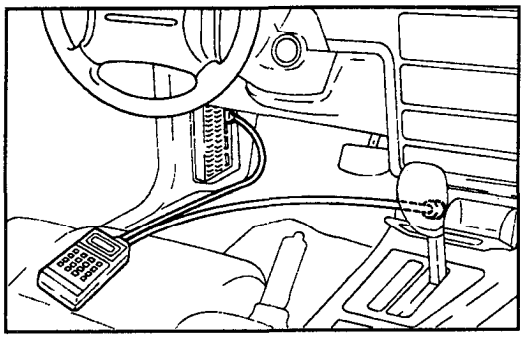
INDICATOR CHECK

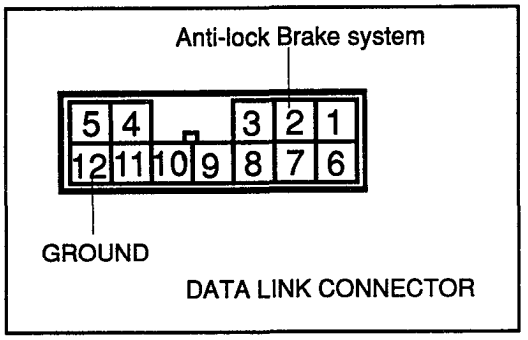
When the ignition switch is turned on, check that the ABS SRI goes ON for 6 seconds.
If the SRI is not illuminated immediately after ignition on, the ABS fail safe relay may be at fault.



SCAN TOOL CHECK

1. Turn the ignition OFF.
2. Connect the scan tool to the data link connector in the fuse box.
3. Connect the power-source terminal of the scan tool to the cigarette lighter socket.
4. Turn the ignition ON.
5. Use the scan tool to check the self-diagnosis codes.
6. After completion of the repair or correction of the problems, turn OFF the ignition switch; then erase the stored diagnostic trouble codes using the scan tool.
7. Disconnect the scan tool.

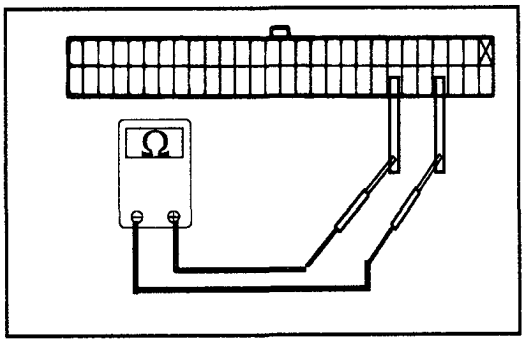




CONNECTOR CHECK

1. Remove the battery negative (-) terminal.
2. Disconnect the connectors and check the terminals following the troubleshooting procedure.

NOTE
When performing the test procedures, be careful not to damage the connector terminals.



Diagnostic trouble code chart

Diagnostic trouble code No.	Scan tool Display	Diagnosis item	Description
19	TONE WHEEL	CHECK THE TONE WHEELS	Check for a defective tone wheel on a wheel.
21	SOL. LF-SHRT	LEFT FRONT SOLENOID	Detection for short circuit to +12 Volt for the left front solenoid.
22	SOL. LF-OPEN	LEFT FRONT SOLENOID	Detection for open circuit or short circuit to GND for the left front solenoid.
23	SOL. RF-SHRT	RIGHT RIGHT SOLENOID	Detection for short circuit to +12 Volt for the right front solenoid.
24	SOL. RF-OPEN	RIGHT FRONT SOLENOID	Detection for open circuit or short circuit to GND for the right front solenoid.
25	SOL. LR-SHRT	LEFT REAR SOLENOID	Detection for short circuit to +12 Volt for the left rear solenoid.
26	SOL. LR-OPEN	LEFT REAR SOLENOID	Detection for open circuit or short circuit to GND for the left rear solenoid.
27	SOL. RR-SHRT	RIGHT REAR SOLENOID	Detection for short circuit to +12 Volt for the right rear solenoid.
28	SOL. RR-OPEN	RIGHT REAR SOLENOID	Detection for open circuit or short circuit to GND for the right rear solenoid.
31	SNSR. LF-GAP	LEFT FRONT SENSOR	Detection for the air gap of the tone wheel. This detection will be activated if all wheel speeds are zero and the ABS-function is not active.
32	SNSR. RF-GAP	RIGHT FRONT SENSOR	Detection for the air gap of the tone wheel. This detection will be activated if all wheel speeds are zero and the ABS-function is not active.
33	SNSR. LR-GAP	LEFT REAR SENSOR	Detection for the air gap of the tone wheel. This detection will be activated if all wheel speeds are zero and the ABS-function is not active.
34	SNSR. RR-GAP	RIGHT REAR SENSOR	Detection for the air gap of the tone wheel. This detection will be activated if all wheel speeds are zero and the ABS-function is not active.
35	MOTOR PUMP	MOTOR PUMP	Faulty or seized up motor pump.

Diagnostic trouble code No.	Scan tool Display	Diagnosis item	Description
36	MP RLY-OPEN	MOTOR RELAY CIRCUIT	Detection for a open circuit or a short circuit to GND from the motor pump relay.
37	MP RLY-SHRT	MOTOR RELAY CIRCUIT	Detection for a short circuit to +12 Volt from the motor pump relay.
38	MP BATT-SHRT	PUMP MOTOR	Detection for a short circuit at the motor pump
39	MP GND-SHRT	PUMP MOTOR	Detection for a short circuit to GND at the motor pump
41	FAIL RLY-SHRT	FAIL SAFE RELAY	Fail safe relay contacts are short circuit.
42	FAIL RLY-OPEN	FAIL SAFE RELAY	Fail safe relay contacts are open circuit
43	FAIL COIL	FAIL SAFE RELAY COIL	The current from the fail safe relay is too high or too low
44	ABS SRI-GND	SERVICE REMINDER INDICATOR	Detection of a short circuit of the Service Reminder Indicator (Permanently on)
45	ABS SRI-DIODE	SERVICE REMINDER INDICATOR DIODE	Detection for a open circuit of the diode for the Service Reminder Indicator ABS.
54	ABS SRI-BATT	SERVICE REMINDER INDICATOR	Detection for a short circuit to +12V of the Service Reminder Indicator
55	ABS SRI-OPEN	SERVICE REMINDER INDICATOR	Detection for a open circuit of the Service Reminder Indicator ABS.
56	BATT. VOLT-LO	BATTERY VOLTAGE	Battery voltage out of the function range (Under voltage) for the system.
57	BATT.VOLT-HI	BATTERY VOLTAGE	Battery voltage out of the function range (Over voltage) for the system.
62	SNSR. LF-OPEN	LEFT FRONT SENSOR CIRCUIT	Sensor open circuit or short to 12 Volt detection for the left front wheel
63	SNSR. RF-OPEN	RIGHT FRONT SENSOR CIRCUIT	Sensor open circuit or short to 12 Volt detection for the right front wheel.
64	SNSR. LR-OPEN	LEFT REAR SENSOR CIRCUIT	Sensor open circuit or short to 12 Volt detection for the left rear wheel.
65	SNSR. RR-OPEN	RIGHT REAR SENSOR CIRCUIT	Sensor open circuit or short to 12 Volt detection for the right rear wheel.
66	SNSR. LF-SHRT	LEFT FRONT SENSOR CIRCUIT	Sensor short to GND detection for the left front wheel

Diagnostic trouble code No.	Scan tool Display	Diagnosis item	Description
67	SNSR. RF-SHRT	RIGHT FRONT SENSOR CIRCUIT	Sensor short to GND detection for the right front wheel.
68	SNSR. LR-SHRT	LEFT REAR SENSOR CIRCUIT	Sensor short to GND detection for the left rear wheel.
69	SNSR. RR-SHRT	RIGHT REAR SENSOR CIRCUIT	Sensor short to GND detection for the right rear wheel.
71	SNSR. LF-S. JMP	LEFT FRONT TONE WHEEL	Detection for missing teeth on the tone wheel or speed jumps over-100g on the left front wheel.
72	SNSR. RF-S.JMP	RIGHT FRONT TONE WHEEL	Detection for missing teeth on the tone wheel or speed jumps over-100g on the right front wheel.
73	SNSR. LR-S.JMP	LEFT REAR TONE WHEEL	Detection for missing teeth on the tone wheel or speed jumps over-100g on the left rear wheel.
74	SNSR. RR-S.JMP	RIGHT REAR TONE WHEEL	Detection for missing teeth on the tone wheel or speed jumps over -100g on the right rear wheel.
77	ABSCM-FAIL	ABSCM ERROR	Detection of a ABSCM (ABS Control module) error.

SERVICE DATA

SCAN TOOL (MUT) DISPLAY	DESCRIPTION	REMARKS
21. SOLENOID VALVES FL ON or OFF. FR ON or OFF RL ON or OFF. RR ON or OFF	Solenoid valves operation status	
31. WHEEL SPEED SENSORS (KPH) LF ***/RF *** LR ***/RR ***	Wheel speed sensors sensing speed	Minimum level is 2 kph
36. MP. RLY ON or OFF	Motor pump relay	
38. MOTOR PUMP ON or OFF	Motor pump monitor	
41. FAILSAFE RLY ON or OFF	Failsafe relay	
44. ABS SRI ON or OFF	ABS service reminder indicator	
56. BATTERY VOLT *** V	Battery voltage	Operating condition of ABS : 10.0-16.2 V
81. STOP LAMP SW ON or OFF	Stop lamp switch	

ACTUATOR TEST

- Test condition : Ignition "ON"-

SCAN TOOL (MUT) DISPLAY	RECOGNITION	REMARKS
21. SOLENOID - LF	Front left solenoid valve operation (Click sounds)	Actuation time is limited to MAX. 20 seconds
23. SOLENOID - RF	Front right solenoid valve operation (Click sounds)	
25. SOLENOID - LR	Rear left solenoid valve operation (Click sounds)	
27. SOLENOID - RR	Rear right solenoid valve operation (Click sounds)	
36. MP. RLY	Motor pump relay operation (Click sounds)	

DIAGNOSTIC TROUBLE CHART

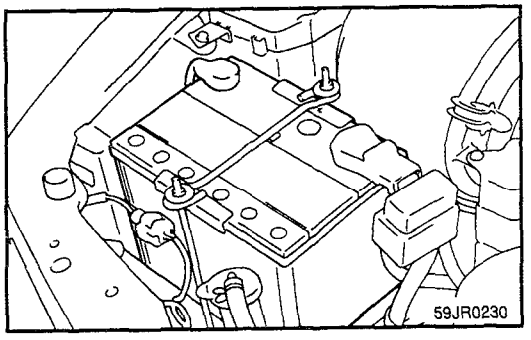
If a diagnostic trouble code is displayed during MUT checking.
Check the circuit listied for that code in the table below and proceed to the page given.

Code No.	Inspection circuit or parts	See page
56, 57	Power supply	58A-20
44, 45, 54, 55	Service Reminder Indicator Circuit	58A-23
41, 42, 43	Fault/shutdown Relay	58A-28
37, 35, 38	Motor Pump Relay Motor Pump (Short B+)	58A-32
36, 39	Motor Pump (Short Ground)	58A-36
21, 23, 25, 27	Modulator (Solenoid valve) (Short to battery)	58A-40
22, 24, 26, 28	Modulator (Solenoid valve) (Short to ground)	58A-43
62, 63, 64, 65,	Speed sensor (Short to battery)	58A-46
66, 67, 68, 69,	Speed sensor (Short to ground))	58A-48
31, 32, 33, 34,	Speed sensor (Air gap)	58A-50
71, 72, 73, 74,19	Speed sensor (speed jump)	58A-53
	Stop Light Switch Circuit	58A-56
	Data link connector Circuit	58A-57
77	ABSCM (ABS Control Module)	58A-59

CIRCUIT INSPECTION

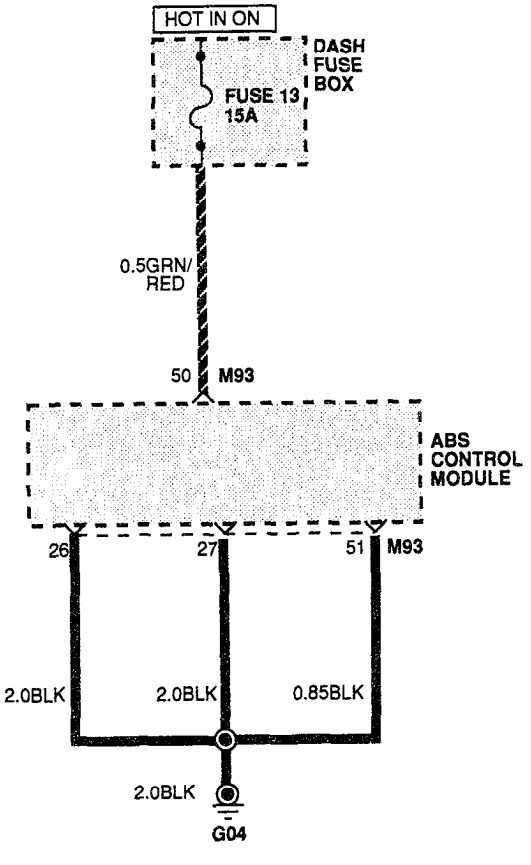
POWER SOURCE VOLTAGE

Detection of battery voltage out of the function range for the system.



Error Code	Scan tool Display	Symptom	Possible Cause
56	BATT. VOLT-LO	ABSCM power supply voltage is 8.9V or below	o Battery o Charging circuit o Harness connector between battery and ABSCM, ABSCM and body ground.
57	BATT. VOLT-HI	ABSCM power supply voltage is 16.2V or higher	

WIRING DIAGRAM

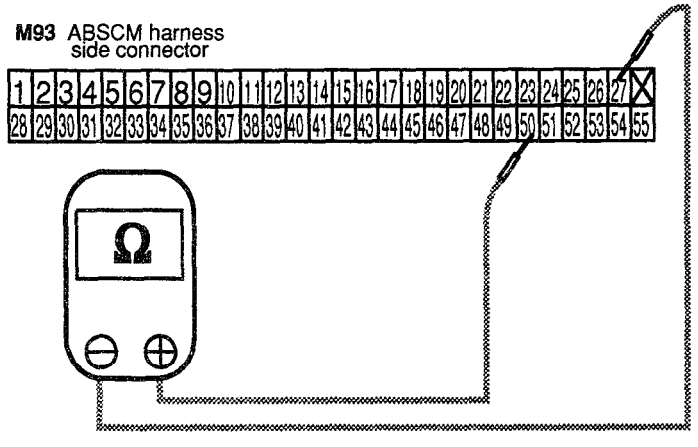


INSPECTION PROCEDURE

1. Check the ABSCM fuse

	1. Remove the FUSE 18 and Inspect in the DASH FUSE BOX. LIMIT Continuity
OK → 2	NG → Replace Fuse 18 then recheck with MUT procedure.

2. Check Voltage between Battery (+) and GND of ABSCM connector



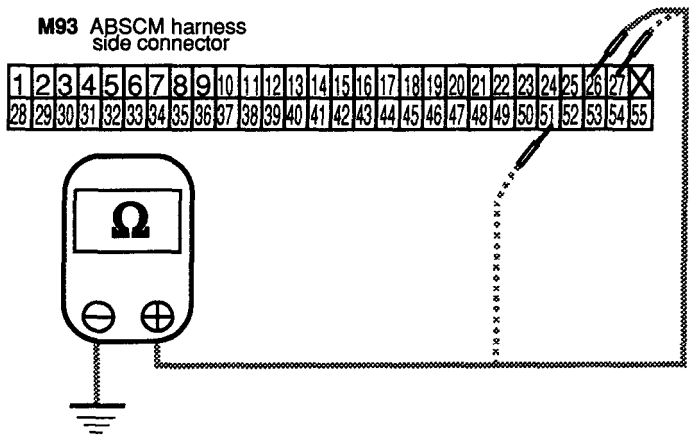
1. Remove battery negative(-) terminal.
2. Remove the ABSCM and disconnect the connector
3. Connect battery negative(-) terminal
4. Turn ignition switch to ON position
5. Measure the supply voltage between terminals 50 and 27.

LIMIT

9.5V ~ 14.2V

OK → Connect the ABSCM and re-check the diagnostic code, if code 56, 57 displayed, check and re-connect the ABSCM.	NG → 3

3. Check Continuity between the ABSCM connector GND and Body GND



1. Turn the ignition switch to the LOCK position.
2. Disconnect ABSCM connector.
3. Measure the ground connection between terminal 27 and body ground, terminal 26 and body ground, terminals 51 and body ground.

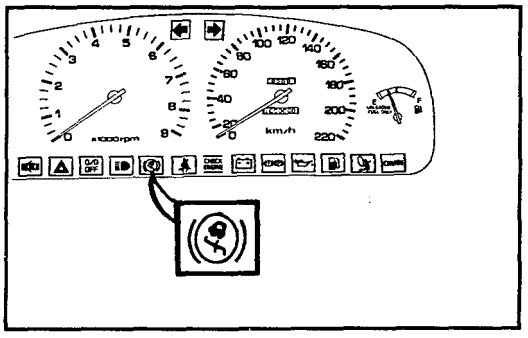
LIMIT

0.5 2 or below

Check for an open between the harness and the connector between the ABSCM and the battery	NG → 1. Check ground connection for corrosion and loosing 2. Repair harness or connector.

ABS SRI (Service Reminder Indicator) Circuit.

If the trouble occurs, ABSCM lights the ABS-SRI while at the same time terminating ABS operation. At this time, the ABSCM records a diagnostic code in memory.
If the ABSCM detects a fault in the Anti-Lock Brake System, the ABSCM turns the ABS SRI on and disasbles the ABS. At the same time a trouble code is stored in the ABSCM memory.

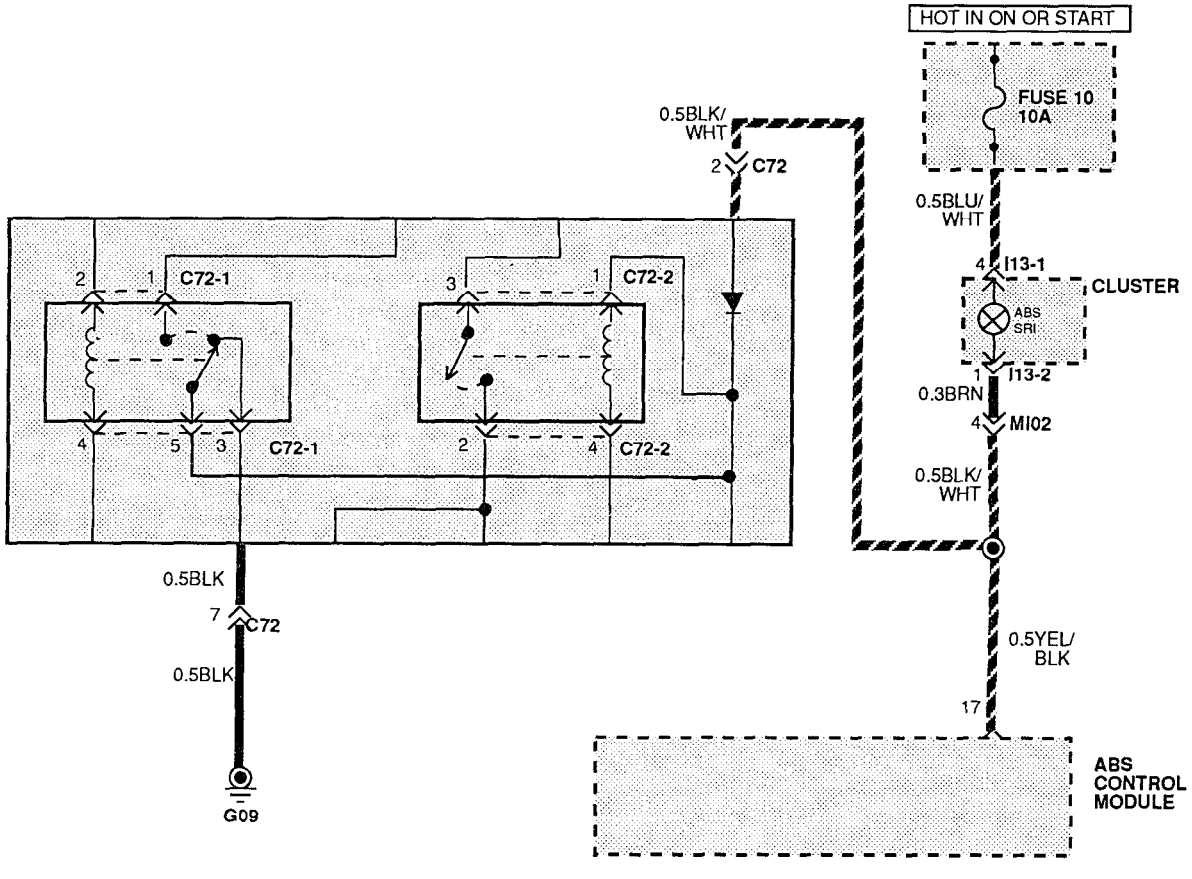


Code No.	Scan tool Display	Symptom	Possible Cause
44	ABS SRI-GND	Service Reminder Indicator short to ground	Service Reminder Indicator Box (Fail safe Relay) Fuse
45	ABS SRI-DIODE	Service Reminder Indicator diode not OK	
54	ABS SRI-BATT	Service Reminder Indicator short to 12V	
55	ABS SRI-OPEN	Service Reminder Indicator open circuit	

Trouble shooting

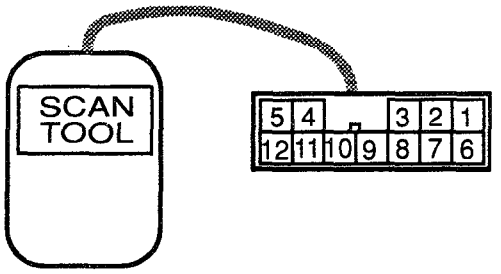
ABS Service Reminder Indicator ON	Go to procedure 1
ABS Service Reminder Indicator OFF	Go to procedure 6

WIRING DIAGRAM

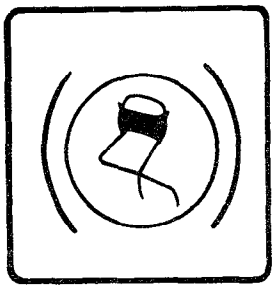


INSPECTION PROCEDURE

1. Check the diagnostic code

	1. Perform the MUT diagnostic check 2. Only display diagnostic code about SRI(Service Reminder Indicator) circuit.
OK→ 2	**NG→** Repair system indicated by the Scan tool trouble.

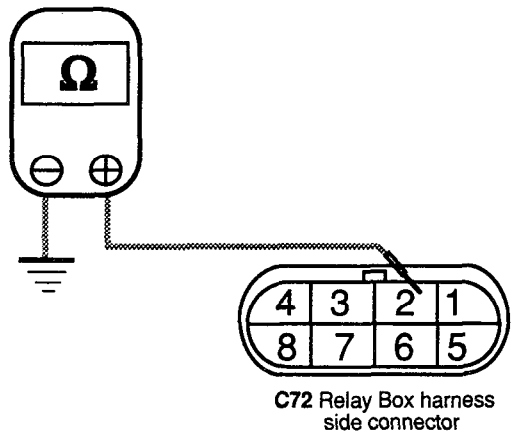
2. Check the ABS Service Reminder Indicator circuit without Relay-Box

 LAMP OFF	1. Disconnect the battery negative terminal 2. Disconnect the ABSCM connector 3. Remove the ABS Relay-Box connector, while ignition switch "LOCK". 4. Connect the battery negative (-) terminal 5. Turn ignition switch to ON position 6. Check the SRI condition. LIMIT Lamp OFF
OK→ 3	**NG→** Goto step 4

3. Check the ABS Relay-Box

	Refer to page 26-Procedure 8
OK→ 5	**NG→** Replace the Fail safe Relay

4. Check the ABS Relay-Box harness



C72 Relay Box harness side connector

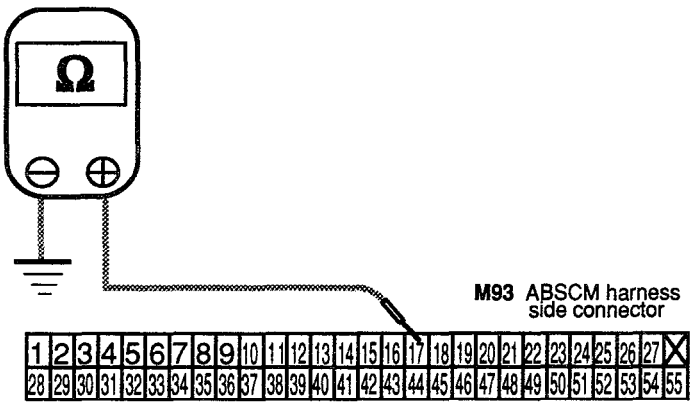
1. Turn ignition switch to "LOCK" position.
2. Disconnect the Relay Box connector.
3. Check the continuity between the Relay-Box harness terminal 3 and body ground.

LIMIT No continuity

OK → 5

NG → Repair the harness

5. Check the ABSCM connector harness



M93 ABSCM harness side connector

1. Disconnect the battery negative terminal.
2. Disconnect the ABSCM connector.
3. Check the continuity between ABSCM. connector harness pin No.17 and body ground.

LIMIT No continuity

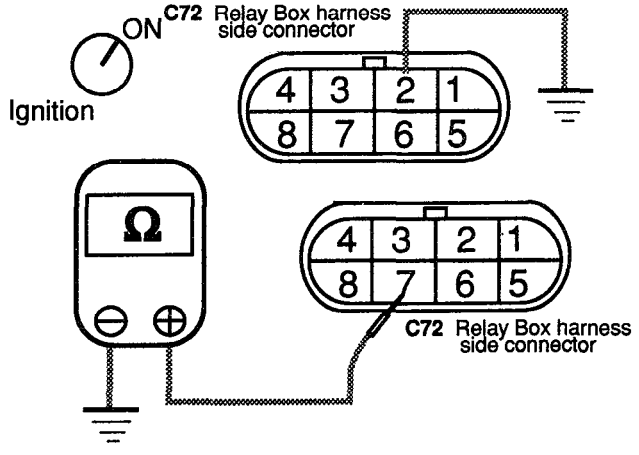
OK → Re-connect the ABSCM and recheck

NG → Repair the harness

6: Check the fuse

Inspect the fuse No.16 located in the Dash Fuse Box	
OK→ 7	**NG→** Replace the fuse.

7. Check the ABS SRI Circuit



1. Turn ignition switch to "LOCK" position.
2. Remove the ABS Relay box connector and the ABSCM connector.
3. Ground Relay box terminal 2 and turn the ignition ON.

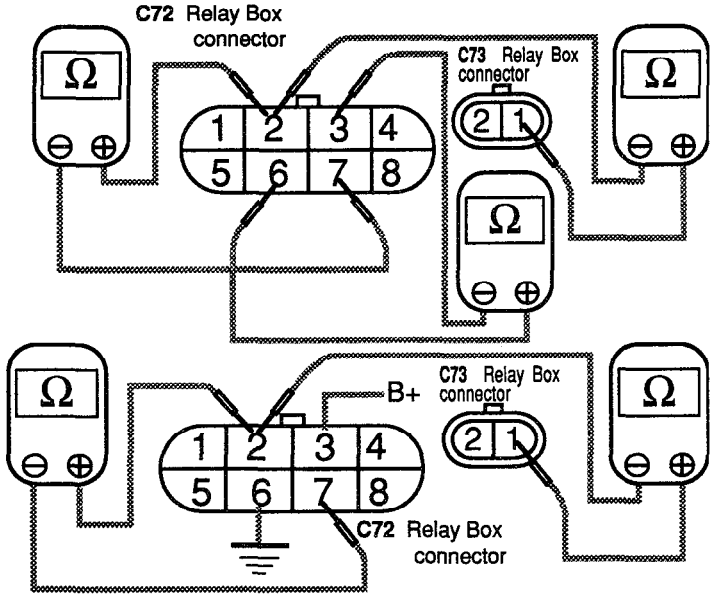
LIMIT SRI ON

4. Turn ignition switch to "LOCK" position
5. Check the continuity between terminal 7 and body ground.

LIMIT Continuity

OK→ 8	**NG→** Repair the harness

6. Check the ABS-Relay Box(Fail safe relay)



1. Turn ignition switch to "LOCK" position.
2. Remove the ABS Relay Box connector.
3. Check continuity between each terminal of the Relay box.

LIMIT

Terminals 3, 6	Continuity
Terminals 2, 7	Continuity
Terminals C72-2, C73-1	No continuity

3. Apply battery voltage between terminals 3 and 6.

Caution
Never attempt to continue 2 sec. or more

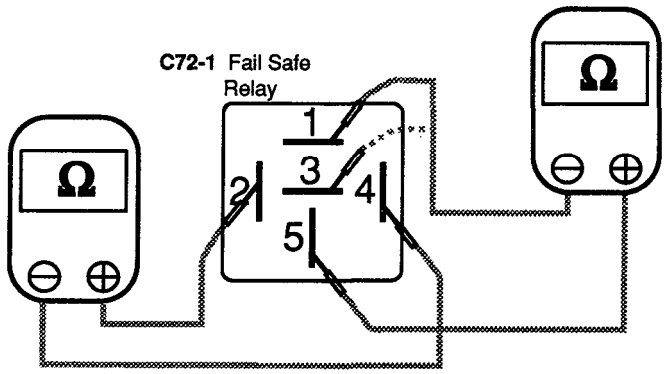
4. Check for continuity.

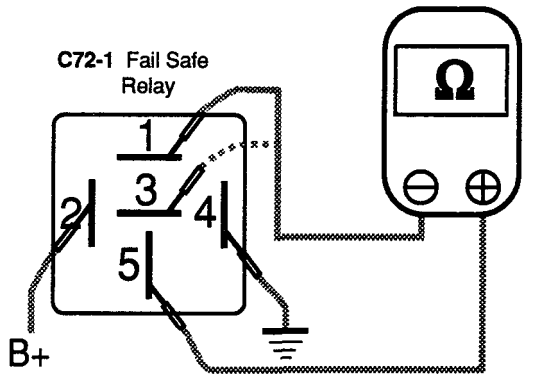
LIMIT

Terminals 2, 7	No continuity
Terminals C72-2, C73-1	Continuity

OK→ Re-connect the ABSCM	**NG→** 9

9. Check the Fail safe relay





1. Turn ignition switch to "LOCK" position.
2. Remove the Relay-box cover.
3. Remove the Fail-safe relay.
4. Check continuity between terminals as follows.

LIMIT

Terminals 2 and 4	Continuity
Terminals 1 and 5	No continuity
Terminals 3 and 5	Continuity

5. Apply battery voltage between terminals 2 and 4.

Caution
Never attempt to continue 2 sec. or more

5. Check continuity between terminals as follows.

LIMIT

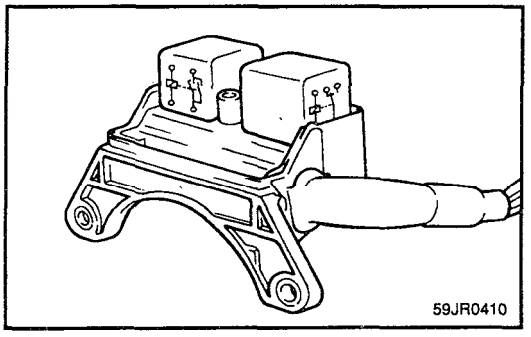
Terminals 1 and 5	Continuity
Terminals 3 and 5	No continuity

OK → Re-connect the ABS-Relay

NG → Replace the Fail safe relay

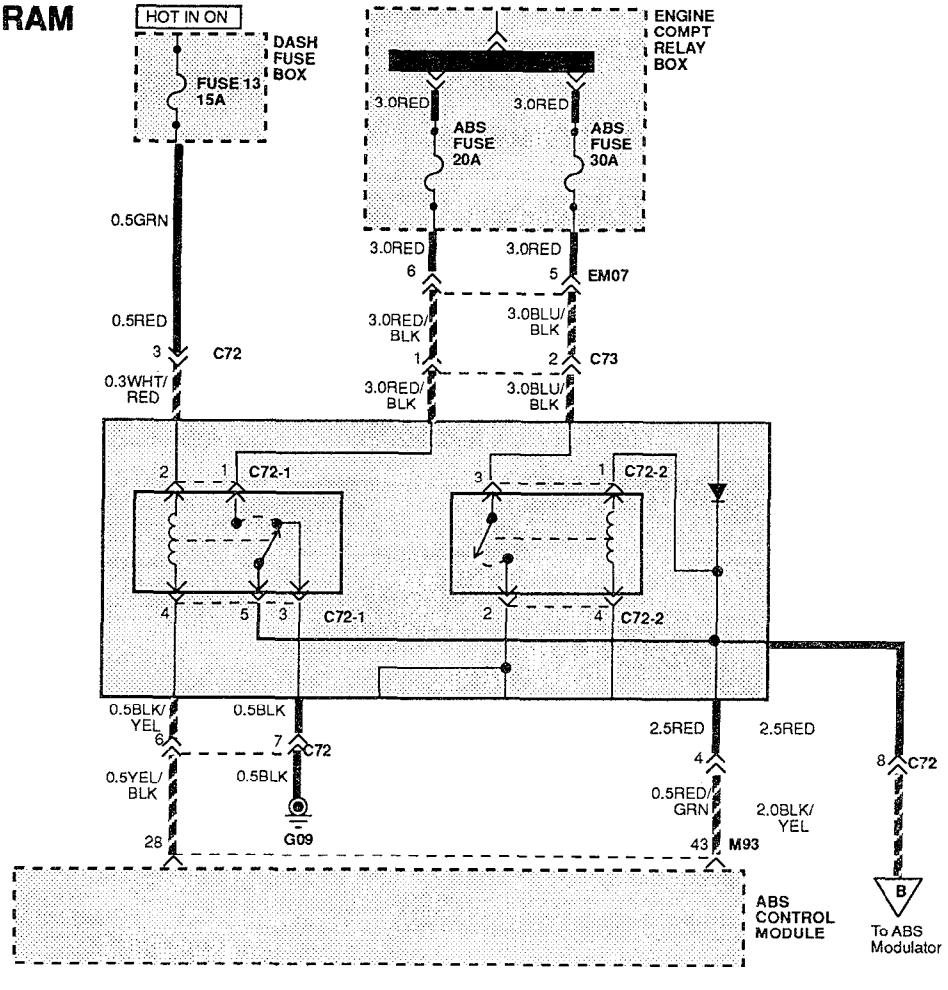
ABS RELAY BOX CIRCUIT (FAIL SAFE RELAY)

Fail safe relay supplies battery voltage to the modulator. After the ignition switch is turned ON position, the relay goes on, if the initial check is good.
If a problem occurs in the ABS system, the ABSCM disables the relay and the ABS is disabled.



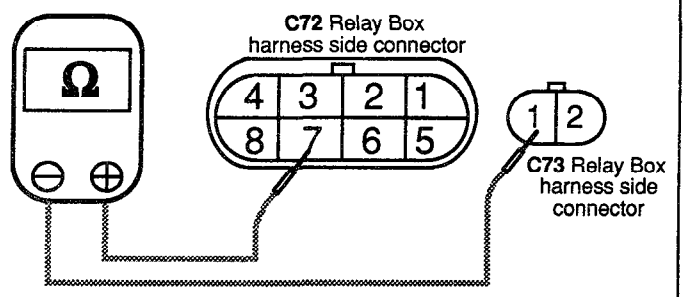
Code No.	Scan tool Display	Symptom	Possible Cause
41	FAIL RLY-SHRT	Fail safe relay not set active contact signal stay close	o Fail safe relay o Harness between Relay box and ABSCM o ABSCM
42	FAIL RLY-OPEN	Fail safe relay set active contact signal stay not closed	o Fail safe Relay o Harness between Relay box and Power source o Harness between Relay box and ABSCM o ABSCM
43	FAIL COIL	Fail safe relay coil not OK	

WIRING DIAGRAM



INSPECTION PROCEDURE

1. Check ABS power supply.



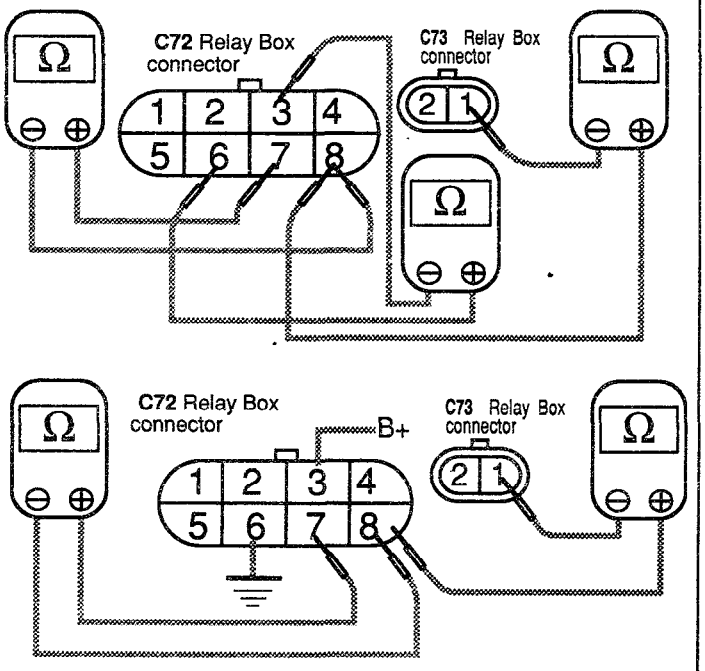
1. Turn ignition switch to "LOCK" position.
2. Disconnect the ABS Relay Box connector
3. Measure the voltage between terminal C72-6 and C73-1 at harness side connector

LIMIT Between 9.5-14.2V

OK→ 1

NG→ Repair the harness and connector from Battery Voltage, Relay box and body ground

2. Check the ABS Relay Box (Fail safe Relay)



1. Turn ignition switch to "LOCK" position.
2. Disconnect the ABS Relay Box connector.
3. Check for continuity between as follows.

LIMIT

Terminal 7, 8	Continuity
Terminal C72-8, C73-1	No continuity
Terminal 3, 6	Continuity

4. Apply battery voltage between terminal 3 and 6.

Caution
Never attempt to continue 2 sec. or more

5. Check for continuity as follows.

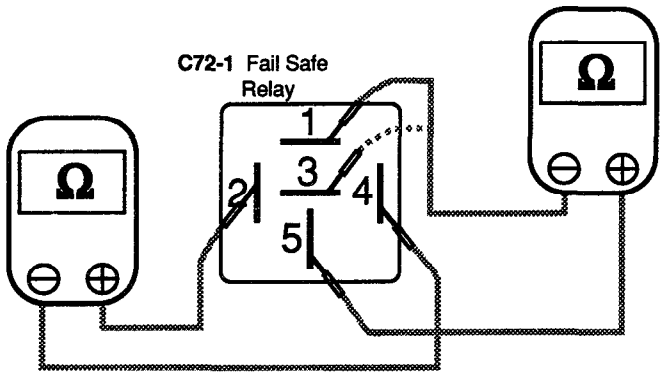
LIMIT

Terminal 7, 8	No continuity
Terminal C72-8, C73-1	Continuity

OK→ 4

NG→ 3

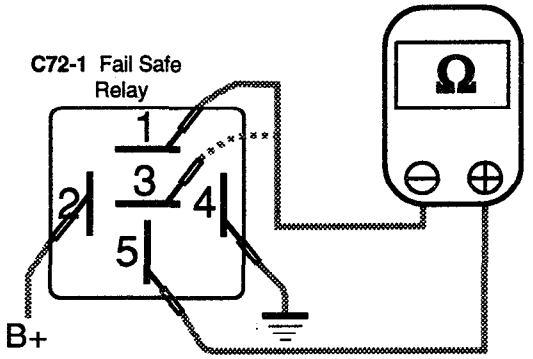
3. Check the Fail safe relay



1. Turn ignition switch to "LOCK" position.
2. Remove the Relay-box cover.
3. Remove the Fail-safe relay.
4. Check for continuity between terminals as follows.

LIMIT

Terminals 2 and 4	Continuity
Terminals 1 and 5	Noncontinuity
Terminals 3 and 5	Continuity



5. Apply battery voltage between terminals 2 and 4.

Caution
Never attempt to continue 2 sec. or more.

6. Check for continuity between terminals as follows.

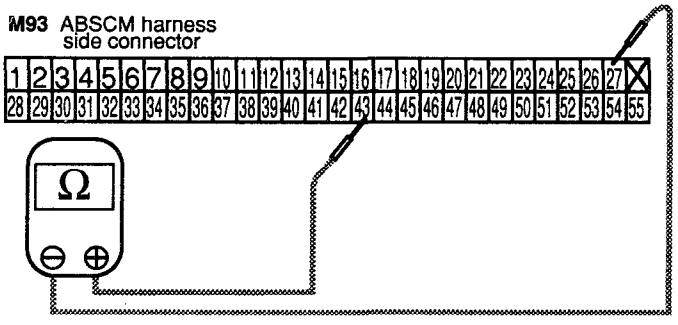
LIMIT

Terminals 1 and 5	Continuity
Terminals 3 and 5	No continuity

OK→ Re-connect fail-safe relay

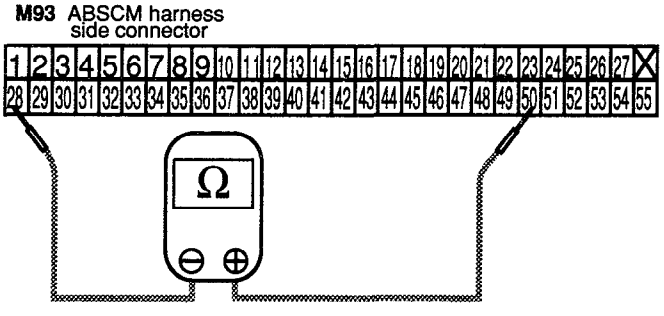
NG→ Replace the Fail safe relay

4. Check the ABSCM harness



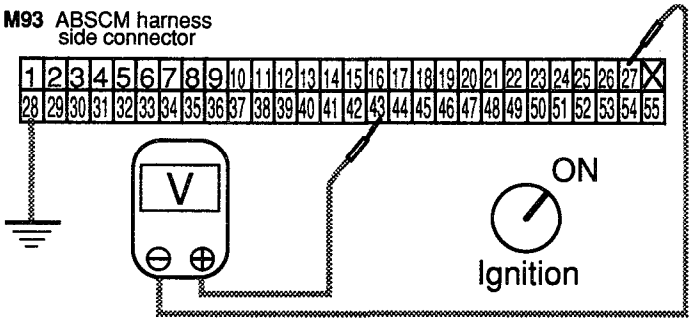
1. Turn ignition switch to "LOCK" position.
2. Connect the fail safe relay.
3. Disconnect the ABSCM connector.
4. Measure the resistance between terminals 43 and 27.

LIMIT 1.0 Ω or below



5. Measure the resistance between terminals 28 and 50.

LIMIT 20-28 Ω



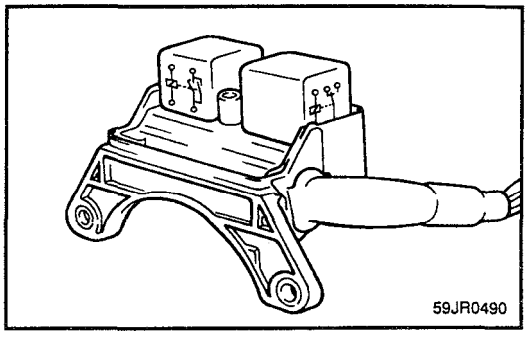
6. Ground terminal 28.
7. Turn ignition switch to "ON" position.
   Caution
   Never attempt to continue 2 sec. or more.
8. Measure the voltage between terminal 43 and 27.

LIMIT 9.0-14.2V

OK→ Re-connect the ABSCM	**NG→** Repair the harness

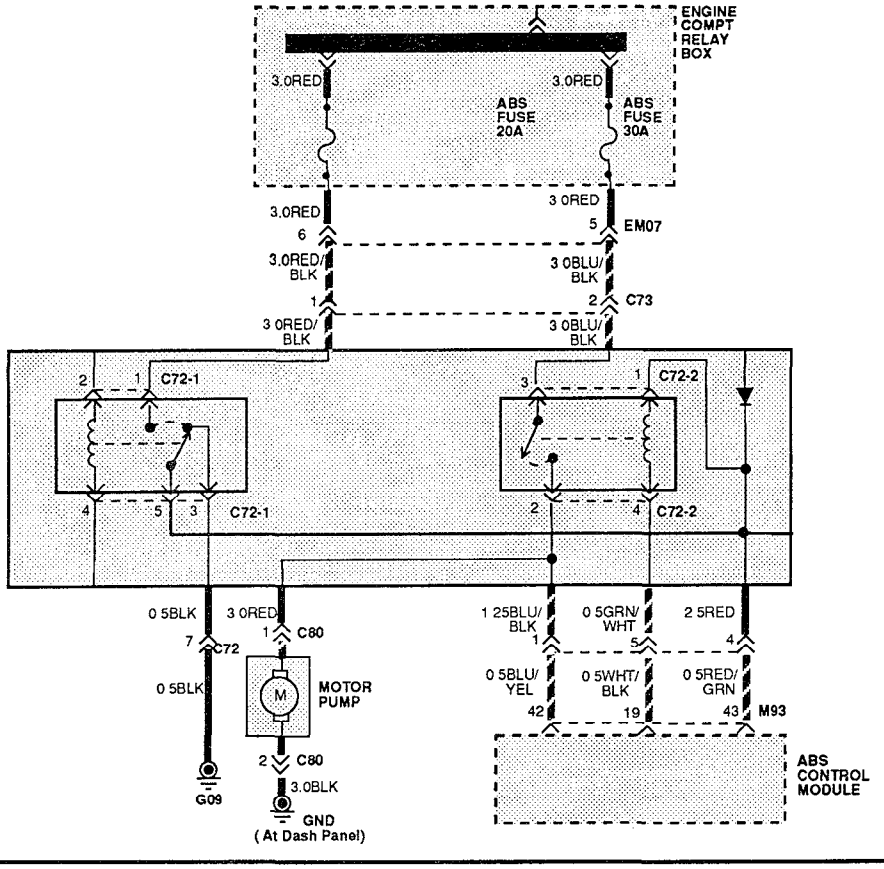
ABS RELAY BOX CIRCUIT (MOTOR PUMP RELAY, SHORT B+)

Motor pump relay supplies battery voltage to the motor pump. The ABSCM switches the motor relay ON and operates the ABS motor pump.
If a problem occurs in the ABS system, the ABSCM disables the motor pump relay.



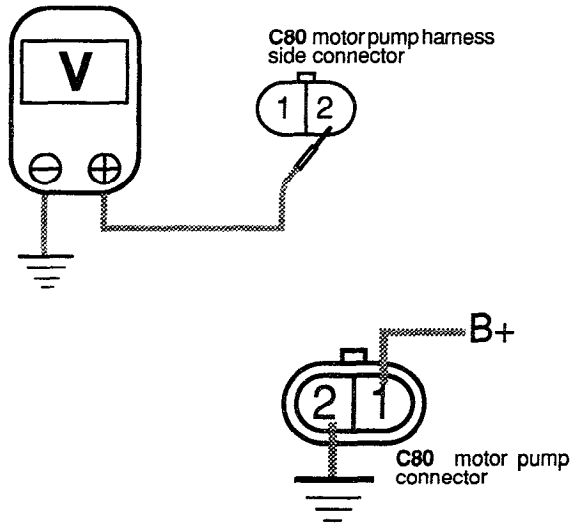
Code No.	Scan tool Display	Symptom	Possible Cause
35	MOTOR PUMP	Motor pump does not operate.	o Motor pump o Motor pump relay o Harness between the ABS modulator and Relay Box o Harness between power supply
37	MP RLY-SHRT	Motor pump relay circuit short to battery	o Motor pump relay o ABSCM o Harness between the Relay Box and the ABSCM
38	MP BATT-SHRT	Motor pump short to 12Volt or circuit open	o Motor pump relay o Harness between the ABS modulator and the Relay Box. o Harness between the power supply and Relay Box. o Motor pump

WIRING DIAGRAM



INSPECTION PROCEDURE

1. Check for voltage between the Relay Box terminal C80 and BODY GND. Check motor pump.



1. Turn ignition switch to "LOCK" position.
2. Disconnect the Relay Box connector.
3. Measure for voltage between terminals 2 and body ground.

LIMIT 9.0-14.2V

4. Disconnect the motor pump connector.
5. Apply battery voltage between terminals 1 and 2.

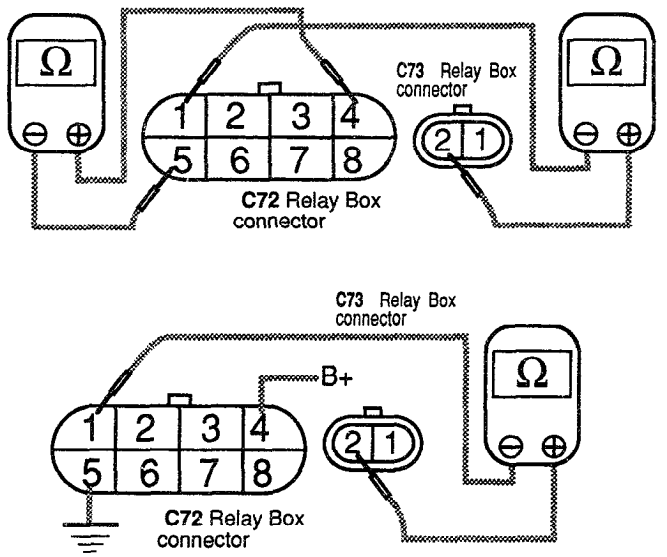
Note: Do not apply power for more than 2 seconds.

LIMIT Motor running

OK→ 2

NG→
1. Check ground connection for corrosion and loosing.
2. Replace the ABS Modulator.

2. Check ABS-Relay Box (Motor pump relay)



1. Turn ignition switch to "LOCK" position.
2. Disconnect the Relay Box connector
3. Check for continuity between the terminals as follows.

Terminal 4 and 5	Continuity
Terminal C72-1 and C73-2	No continuity

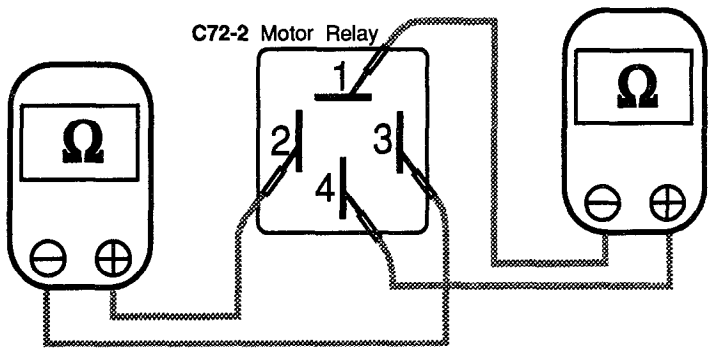
4. Apply battery voltage between terminals 4 and 5.
5. Check for continuity between terminals C72-1 and C73-2.

LIMIT Continuity

OK→ 4

NG→ 3

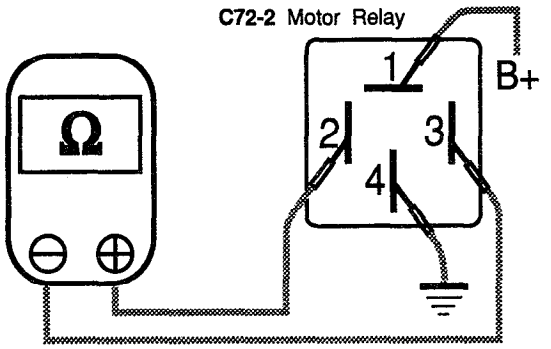
3. Check Motor pump relay



1. Turn ignition switch to "LOCK" position.
2. Remove the Relay-box cover.
3. Remove the Motor pump relay.
4. Check for continuity terminals between as follows.

LIMIT

Terminals 1 and 4	Continuity
Terminals 2 and 3	No continuity



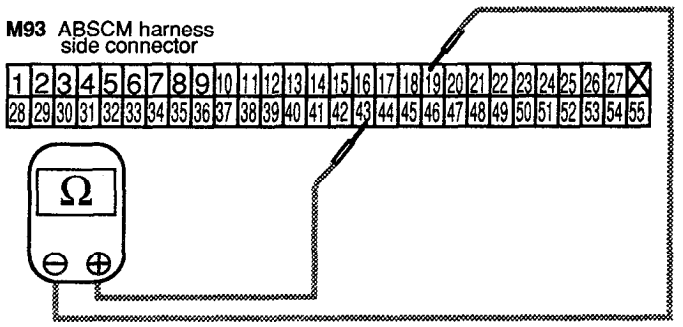
5. Apply battery voltage between terminals 1 and 4.
6. Check for continuity between terminals 2 and 3.

LIMIT Continutiy

OK→ Reconnect motor pump relay

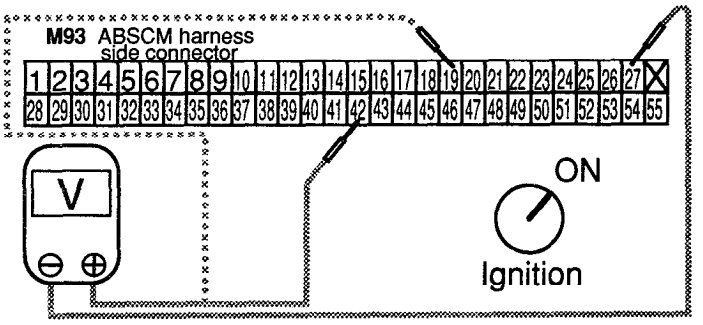
NG→ Replace the Motor pump relay

4. Check resistance between each terminal of ABSCM connector



1. Turn ignition switch to "LOCK" position.
2. Disconnect the ABSCM connector.
3. Check for resistance between terminals 19 and 43.

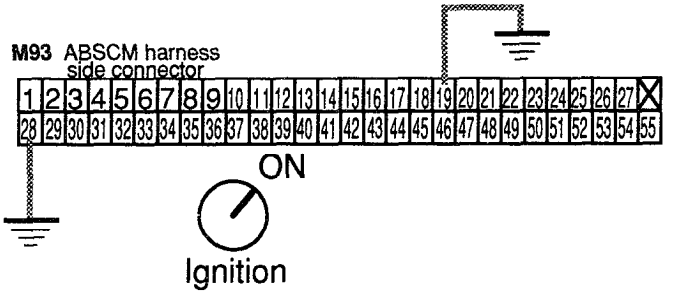
LIMIT 50-60 Ω



4. Turn ignition switch to "ON" position.
5. Measure the voltage between terminals as follows.

LIMIT

Terminals 42 and 27	0V
Terminals 19 and 27	0V



6. Turn ignition switch "LOCK" position.
7. Ground terminal 19 and 28.
8. Turn ignition switch "ON" position.

LIMIT Motor running

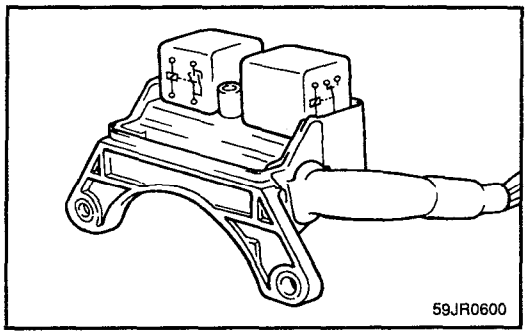
NOTE
Do not apply power for more than 2 seconds.

OK→ Reconnect the ABSCM

NG→ Repair the Harness

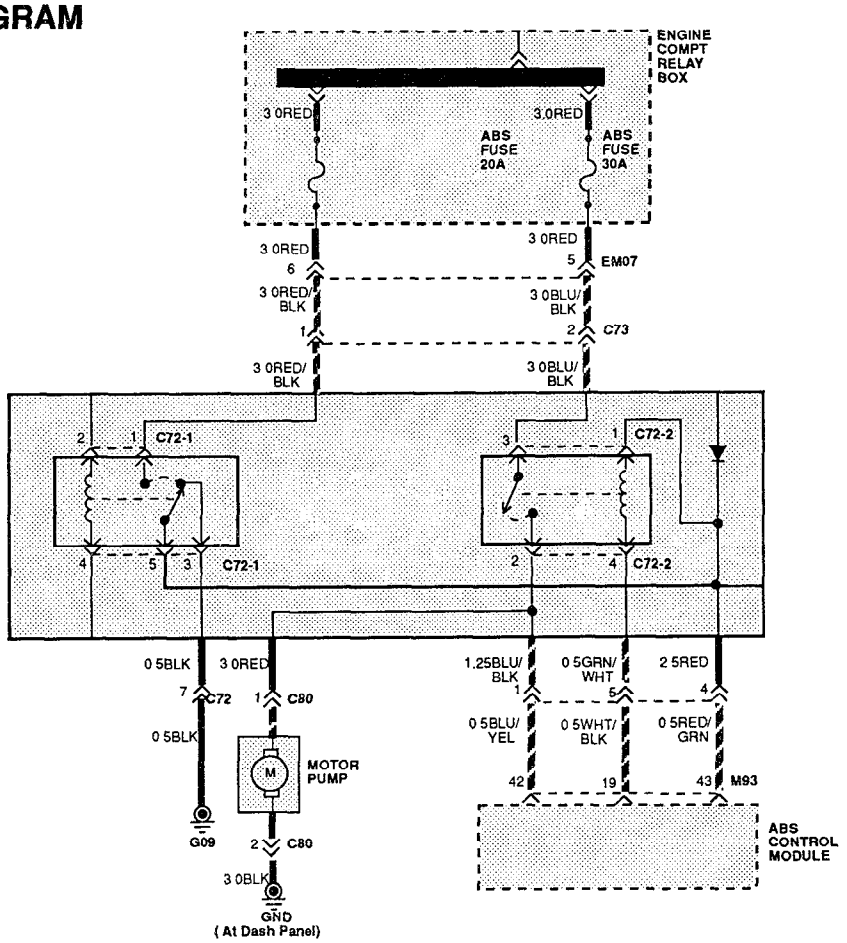
ABS RELAY BOX CIRCUIT (MOTOR PUMP RELAY, SHORT GND)

Motor pump relay supplies battery voltage to the motor pump. The ABSCM switches the motor relay ON and operates the ABS motor pump.
If a problem occurs in the ABS system, the ABSCM disables the motor pump relay.



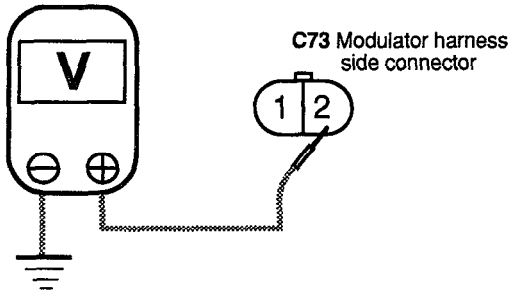
Code No.	Scan tool Display	Symptom	Possible Cause
36	MP RLY-OPEN	Motor pump relay circuit open or short to ground	o Motor pump relay o ABSCM o Harness between the Relay Box and the ABSCM o Harness between the power supply and the relay box
39	MP GND-SHRT	Motor pump short to ground	o Motor pump relay o Harness between the ABS modulator and Relay Box. o Harness between the power supply and Relay Box. o Motor pump

WIRING DIAGRAM



INSPECTION PROCEDURE

1. Check for voltage between the Relay Box terminal C73 and BODY GND.



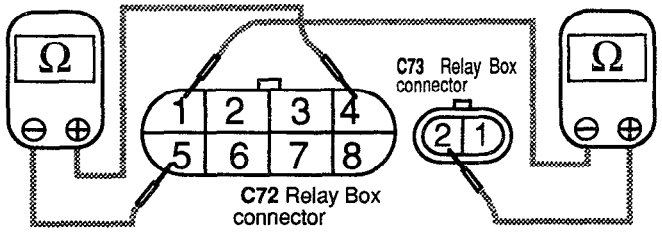
1. Turn ignition switch to "LOCK" position.
2. Disconnect the Relay Box connector.
3. Measure the voltage between terminals 2 and body ground.

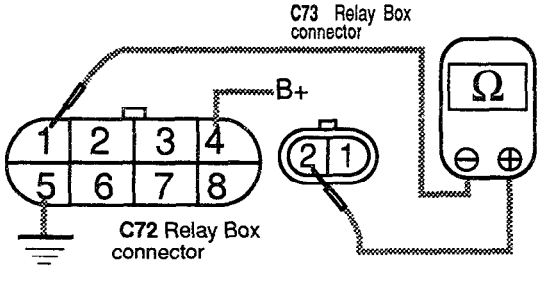
LIMIT 9.0-14.2V

OK→ 2

NG→ Repair the Motor harness

2. Check the ABS Relay Box (Motor pump relay).





1. Turn ignition switch to "LOCK" position.
2. Disconnect the Relay Box connector.
3. Check for continuity between the terminals as follows.

LIMIT

Terminal 4 and 5	Continuity
Terminal C72-1 and C73-2	No continuity

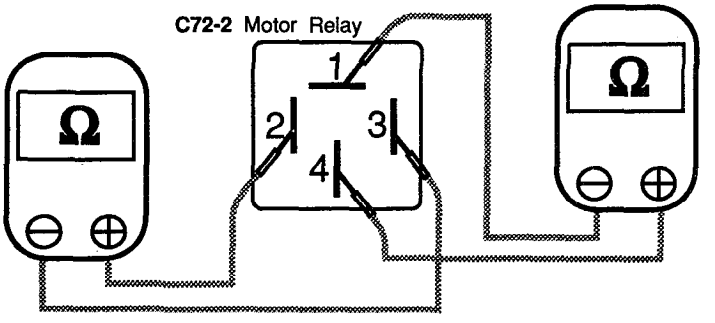
4. Apply battery voltage between terminals 4 and 5.
5. Check for continuity between terminals C72-1 and C73-2.

LIMIT Continuity

OK→ 4

NG→ 3

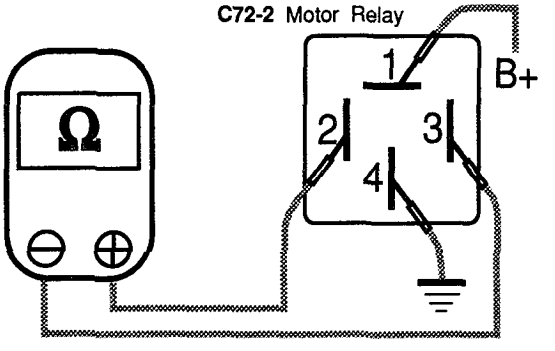
3. Check the Motor pump relay



1. Turn ignition switch to "LOCK" position.
2. Remove the Relay-box cover.
3. Remove the Motor pump relay.
4. Check for continuity terminals between as *follows.*

LIMIT

Terminals 1 and 4	Continuity
Terminals 2 and 3	No continuity



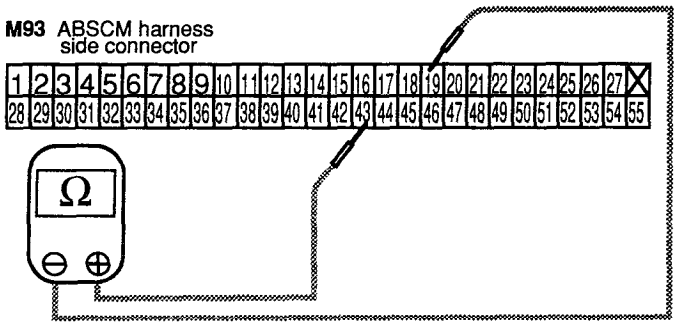
5. Apply battery voltage between terminals 1 and 4.
6. Check for continuity between terminals 2 and 3.

LIMIT Continutiy

OK→ Reconnect motor relay.

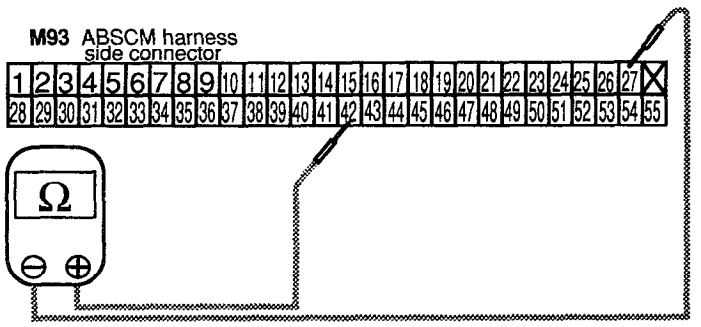
NG→ Replace the Motor pump relay

3. Check for resistance between each terminal of the ABSCM connector



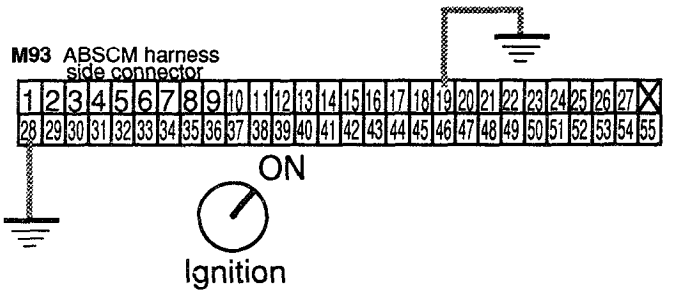
1. Turn ignition switch to "LOCK" position.
2. Disconnect the ABSCM connector.
3. Check for resistance between terminals 19 and 42.

LIMIT 50-60 Ω



4. Turn ignition switch to "LOCK" position.
5. Check the continuity between terminals 42 and 27.

LIMIT 0.9Ω or below



6. Turn ignition switch to "LOCK" position..
7. Ground terminal 19 and 28.
8. Turn ignition switch to "ON" position.

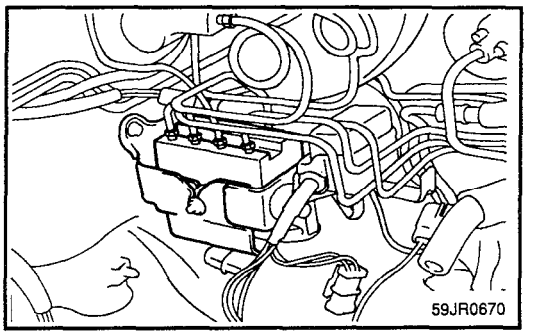
LIMIT Motor running

NOTE
Do not apply power for more than 2 seconds

OK → Reconnect the ABSCM.	**NG** → Repair the Harness.

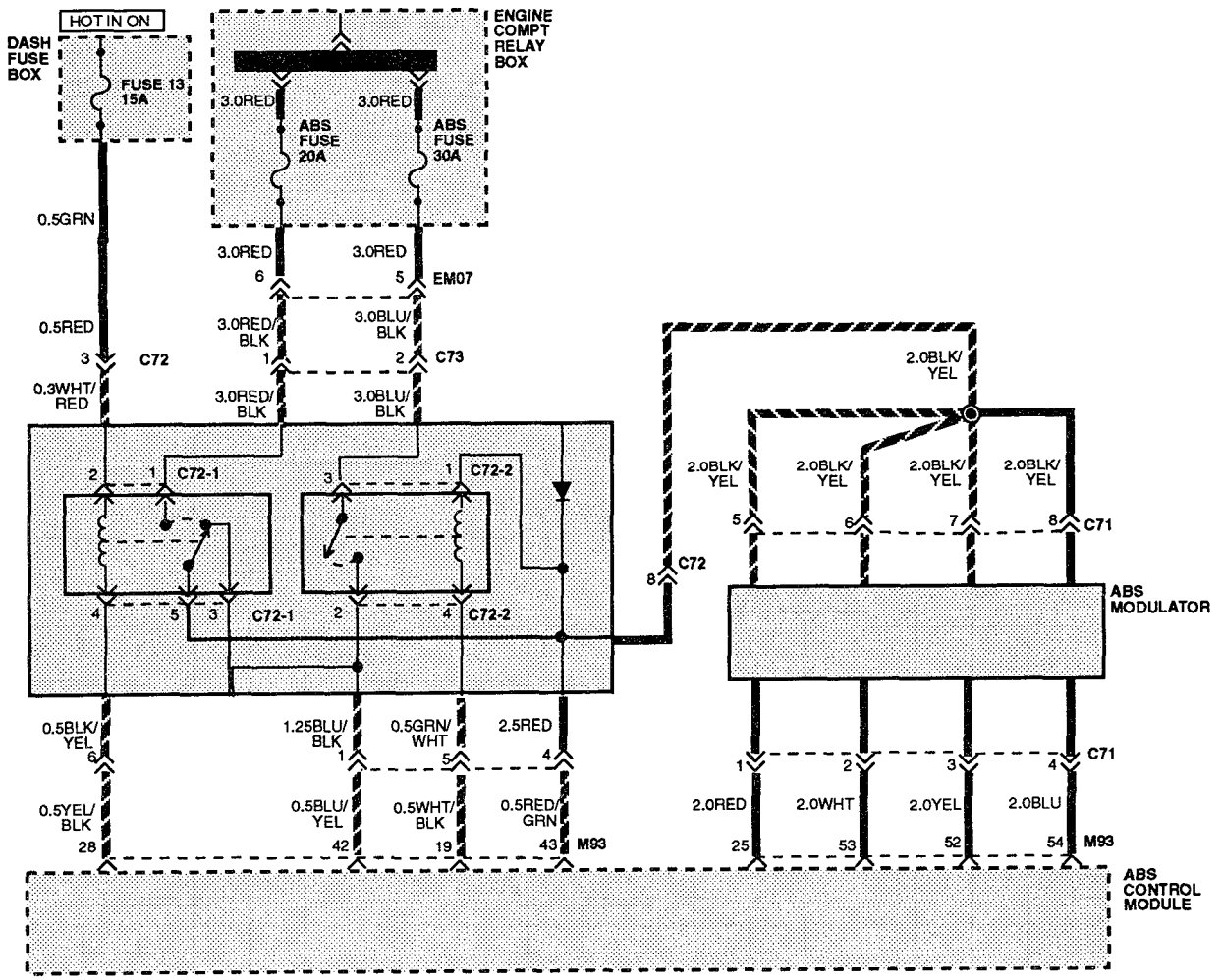
ABS MODULATOR CIRCUIT (SHORT B+)

The modulator consists of four solenoid valves, one expander chamber per brake circuit and a hydraulic pump.
The ABSCM activates the solenoid vavles and controls the pressure to the wheel calipers.



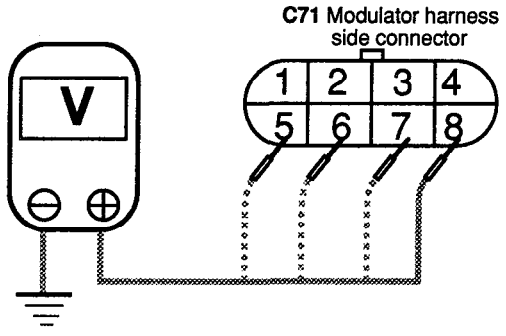
Code No.	Scan tool Display	Symptom	Possible cause
21	SOL. LF-SHRT	LF solenoid valve short-circuit to 12V	o ABS Modulator o ABS Relay-Box o Harness or connector between ABSCM and modulator
23	SOL. RF-SHRT	RF solenoid valve short-circuit to 12V	
25	SOL. LR-SHRT	LR solenoid valve short-circuit to 12V	
27	SOL. RR-SHRT	RR solenoid valve short-circuit to 12V	

WIRING DIAGRAM



INSPECTION PROCEDURE

1. Check for voltage between each terminal of the ABS modulator harness



1. Disconnect the battery negative (-) terminal.
2. Disconnect the ABS modulator connector and ABSCM connector.
3. Connect the battery negative terminal and ignition ON.
4. Measure the voltage between terminals and body ground as follows:

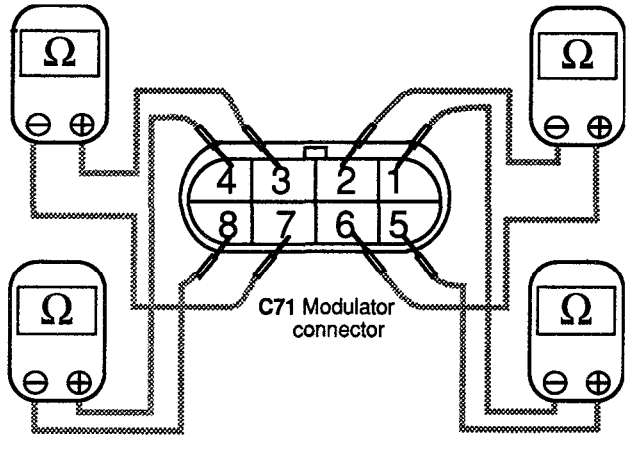
LIMIT

SOL. RR	Terminal 5 and ground	0V
SOL. LR	Terminal 6 and ground	0V
SOL. RF	Terminal 7 and ground	0V
SOL. LF	Terminal 8 and ground	0V

OK→ 2

NG→ Check and repair harness between terminal 5, 6, 7, 8 and relay box ground.

2. Check the ABS-Modulator



1. Turn ignition switch to "LOCK" position.
2. Disconnect the ABS modulator connector.
3. Check the resistance between terminals as follows.

LIMIT

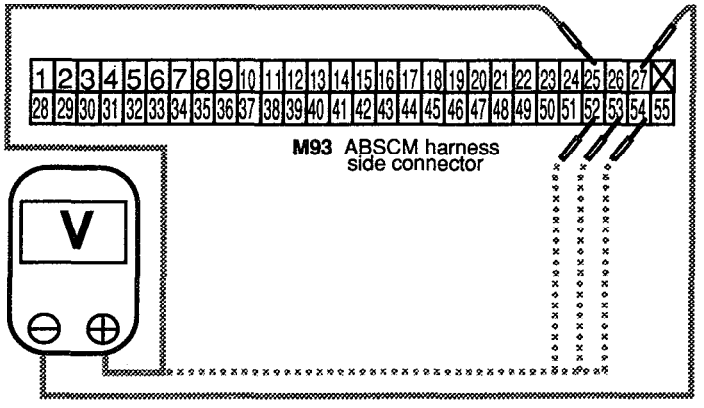
SOL. RR	Terminal 1 and 5	3.10-3.34 Ω
SOL. LR	Terminal 2 and 6	3.10-3.34 Ω
SOL. RF	Terminal 3 and 7	3.10-3.34 Ω
SOL. LF	Terminal 4 and 8	3.10-3.34 Ω

OK→ 3

NG→ Replace the ABS modulator.

SOL. : Solenoid

3. Check the ABSCM harness



1. Disconnect the battery negative (-) terminal.
2. Disconnect ABSCM connector.
3. Connect the battery negative (-) terminal.
4. Turn ignition switch to "ON" position
5. Measure the voltage between terminals and ground as follows.

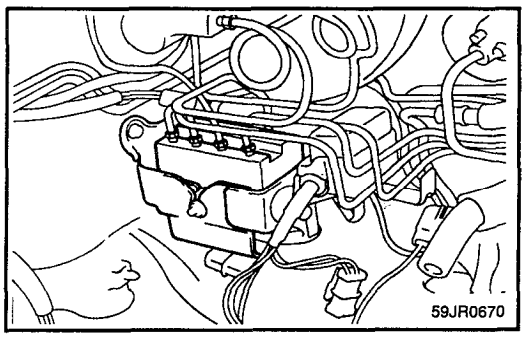
SOL. RR	Terminal 25 and 27	0 V
SOL. LF	Terminal 54 and 27	0 V
SOL. LR	Terminal 53 and 27	0 V
SOL. RF	Terminal 52 and 27	0 V

OK → Reconnect the ABSCM

NG → Repair the harness

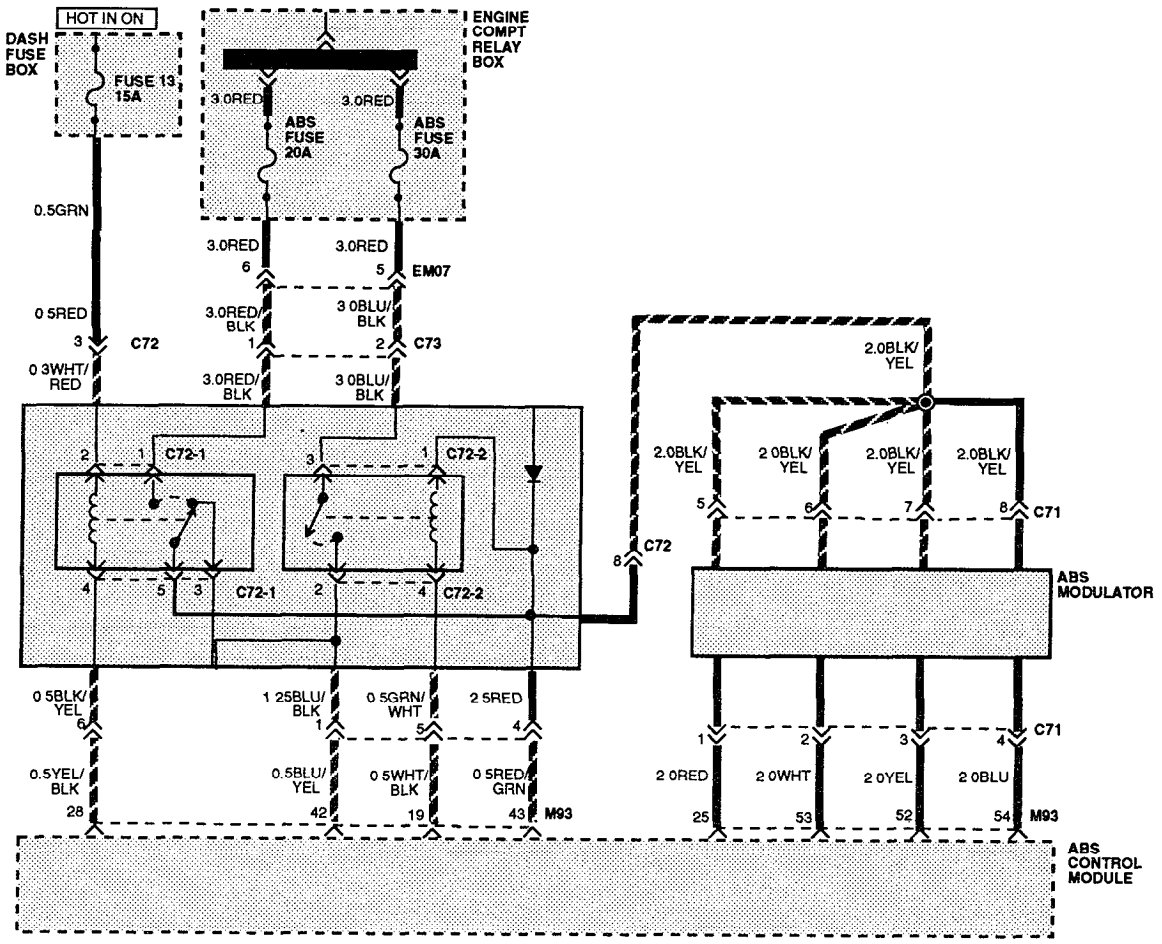
ABS MODULATOR CIRCUIT (SHORT GND)

The modulator consists of four solenoid valves, one expander chamber per brake circuit and a hydraulic pump.
The ABSCM activates the solenoid valves and controls the pressure to the wheel calipers.



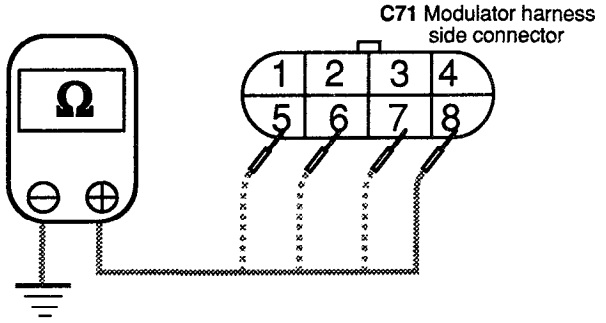
Code No.	Scan tool Display	Symptom	Possible cause
22	SOL. LF-OPEN	LF solenoid valve open or short-circuit to ground	o ABS Modulator o ABS Relay-Box o Harness or connector between the ABSCM and modulator
24	SOL. RF-OPEN	RF solenoid valve open or short-circuit to ground	
26	SOL. LR-OPEN	LR solenoid valve open or short-circuit to ground	
28	SOL. RR-OPEN	RR solenoid valve open or short-circuit to ground	

WIRING DIAGRAM



INSPECTION PROCEDURE

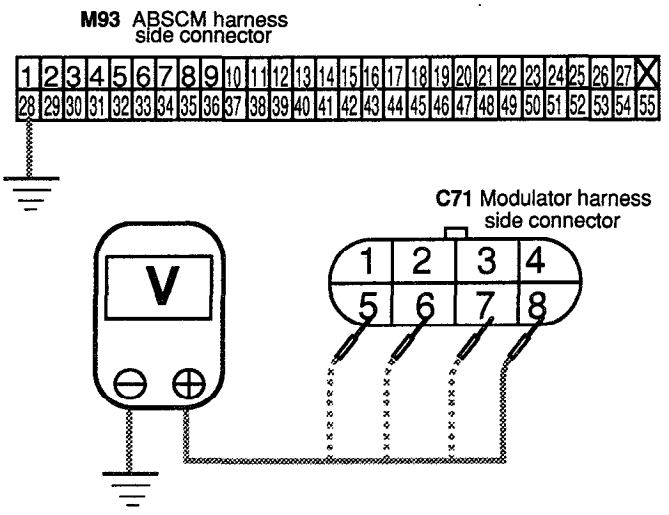
1. Check for continuity between each terminal of the ABS modulator harness



1. Disconnect the battery negative (-) terminal.
2. Disconnect the ABS modulator connector and ABSCM connector.
3. Check for continuity between the terminals and body ground as follows.

LIMIT

SOL. RR	Terminal 5 and ground	Continuity
SOL. RL	Terminal 6 and ground	Continuity
SOL. FR	Terminal 7 and ground	Continuity
SOL. FL	Terminal 8 and ground	Continuity



4. Disconnect the ABSCM connector.
5. Ground ABSCM connector terminal 28.
6. Connect the battery negative terminal
7. Turn ignition switch to "ON" position.
8. Measure voltage between terminals and body ground as follows.

LIMIT

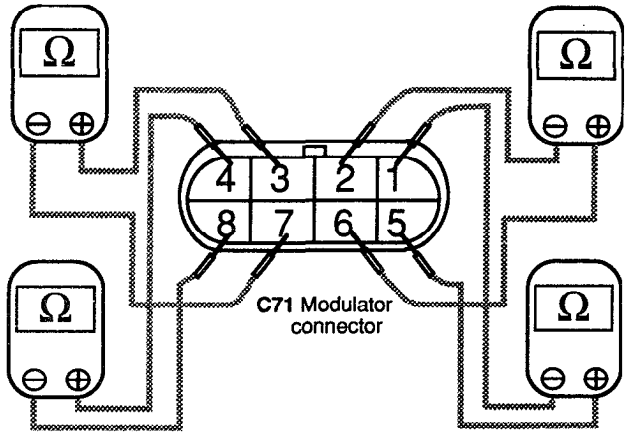
SOL. RR	Terminal 5 and ground	9.0-14.2 V
SOL. RL	Terminal 6 and ground	9.0-14.2 V
SOL. FR	Terminal 7 and ground	9.0-14.2 V
SOL. FL	Terminal 8 and ground	9.0-14.2 V

OK→ 2

NG→ Check and repair the harness between terminal 5, 6, 7, 8 and relay box ground.

SOL. : SOLENOID

2. Check ABS-Modulator



1. Turn ignition switch to "LOCK" position.
2. Disconnect the ABS modulator connector.
3. Check the resistance between the terminals as follows.

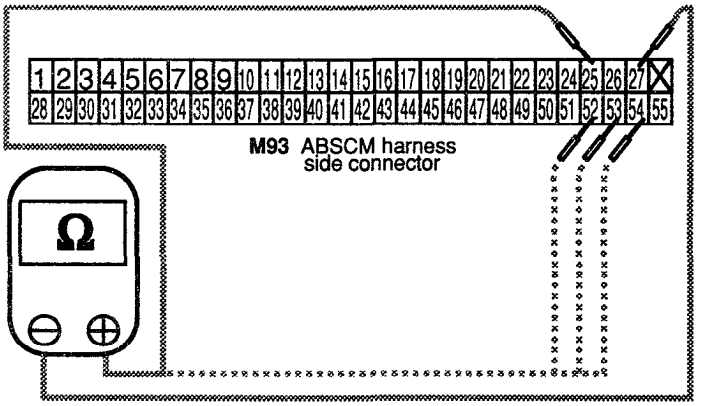
LIMIT

SOL. RR	Terminal 1 and 5	3.10-3.34 Ω
SOL. RL	Terminal 2 and 6	3.10-3.34 Ω
SOL. FR	Terminal 3 and 7	3.10-3.34 Ω
SOL. FL	Terminal 4 and 8	3.10-3.34 Ω

OK→ 3

NG→ Replace ABS modulator.

3. Check ABSCM harness



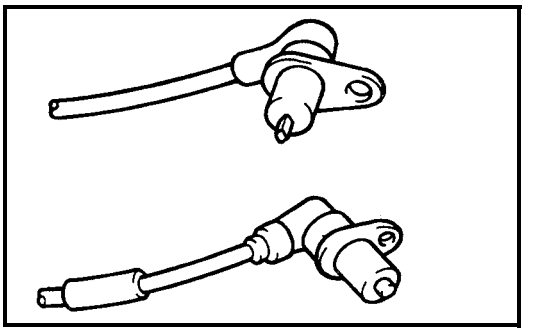
1. Disconnect the battery negative (-) terminal.
2. Disconnect the ABSCM connector.
3. Connect the modulator connector.
4. Measure the voltage between terminals and ground as follows.

SOL. RR	Terminal 25 and 27	3.0-3.8 Ω
SOL. FL	Terminal 54 and 27	3.0-3.8 Ω
SOL. RL	Terminal 53 and 27	3.0-3.8 Ω
SOL. FR	Terminal 52 and 27	3.0-3.8 Ω

OK→ Reconnect the ABSCM.

NG→ Repair harness

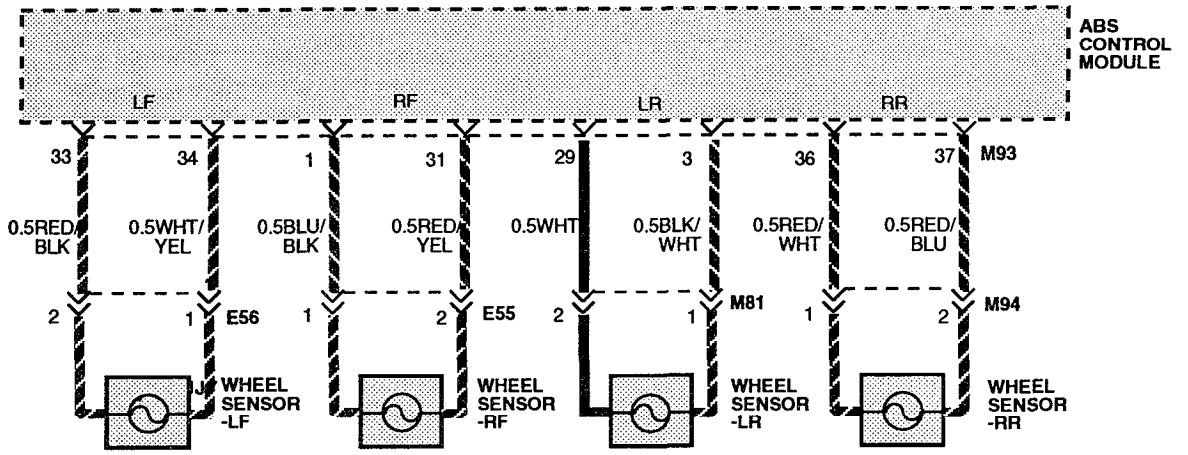
SPEED SENSOR CIRCUIT (Short to B+)



At each wheel hub there is a tone wheel and an inductive sensor which supplies wheel speed information to the ABSCM The sensor comprises a magnet and a pole piece surrounded by a coil. When the tone wheel rotates adjacent to the sensor pole piece an alternating current signal is generated in the coil with a frequency proportioned to wheel speed.
A special integrated circuit in the ABSCM translates the generated AC signal to a square wave.
This square wave is used by the microprocessor to operate the ABS.

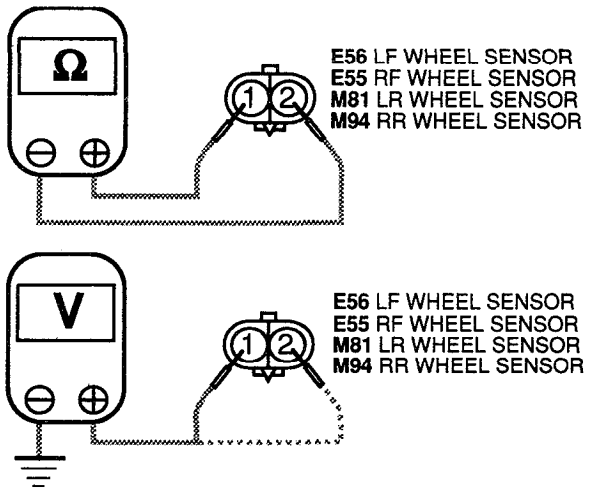
Code No.	Scan tool Display	Symptom	Possible cause
62	SNSR. LF-OPEN	Sensor LF circuit open or short to 12Volt	o Wheel speed sensor o Harness or connector between the wheel speed sensor and ABSCM o ABSCM
63	SNSR. RF-OPEN	Sensor RF circuit open or short to 1.2Volt	
64	SNSR. LR-OPEN	Sensor LR circuit open or short to 12Volt	
65	SNSR. RR-OPEN	Sensor RR circuit open or short to 12Volt	

WIRING DIAGRAM



INSPECTION PROCEDURE

1. Check Wheel Speed Sensor



1. Disconnect the wheel speed sensor.
2. Measure the resistance between terminals 1 and 2 the of wheel speed sensor connector.

LIMIT Front : 1275-1495 Ω
Rear : 1260-1540 Ω

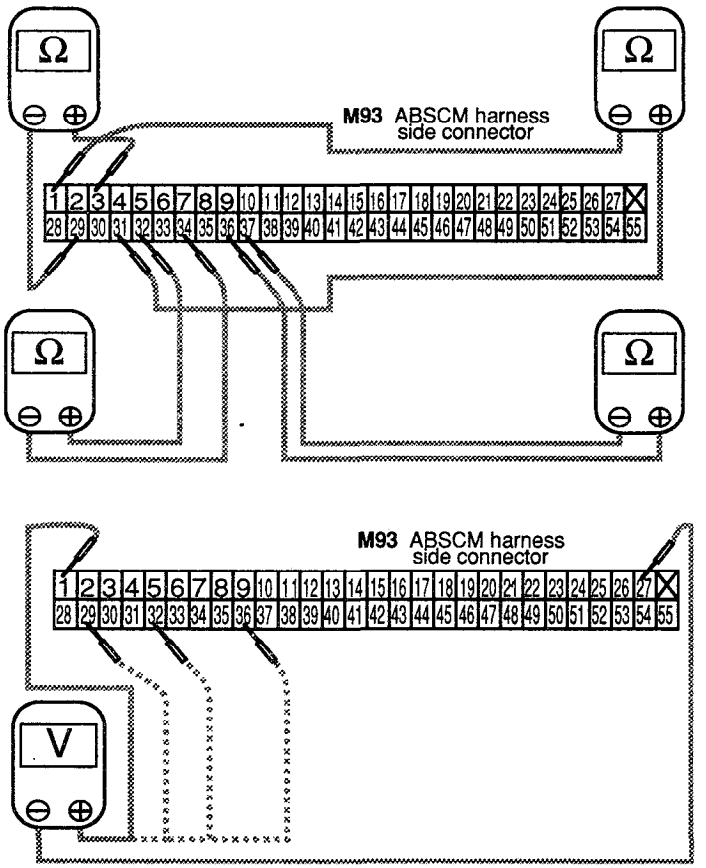
3. Measure voltage between wheel speed sensor connector terminals 1, 2 and body ground.

LIMIT 0 V

OK→ 2

NG→ Replace wheel speed sensor

2. Check the harness and to connector between the ABSCM and each wheel speed sensor



1. Turn ignition switch to "LOCK" position
2. Disconnect the ABSCM connector harness
3. Turn ignition switch to "ON" position.
4. Measure the resistance between the terminals as follows.

LIMIT

SNSR.LF	Terminals 32 and 34	1275-1495 Ω
SNSR.RF	Terminals 1 and 31	1275-1495 Ω
SNSR.LR	Terminals 29 and 3	1260-1540 Ω
SNSR.RR	Terminals 36 and 37	1260-1540 Ω

5. Measure the voltage between sensor terminals and body ground terminals as follows.

LIMIT

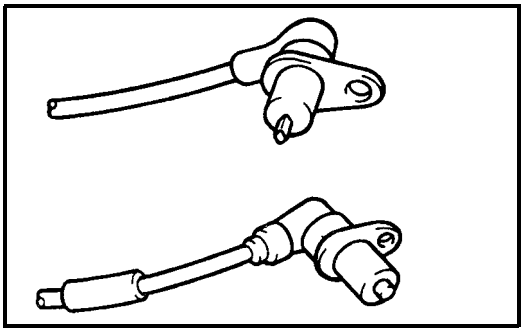
SNSR.FL	Terminals 32 and 27	0 V
SNSR.FR	Terminals 1 and 27	0 V
SNSR.RL	Terminals 29 and 27	0 V
SNSR.RR	Terminals 36 and 27	0 V

OK→ Re-connect the ABSCM and re-check

NG→ Repair the harness

SNSR.: SENSOR

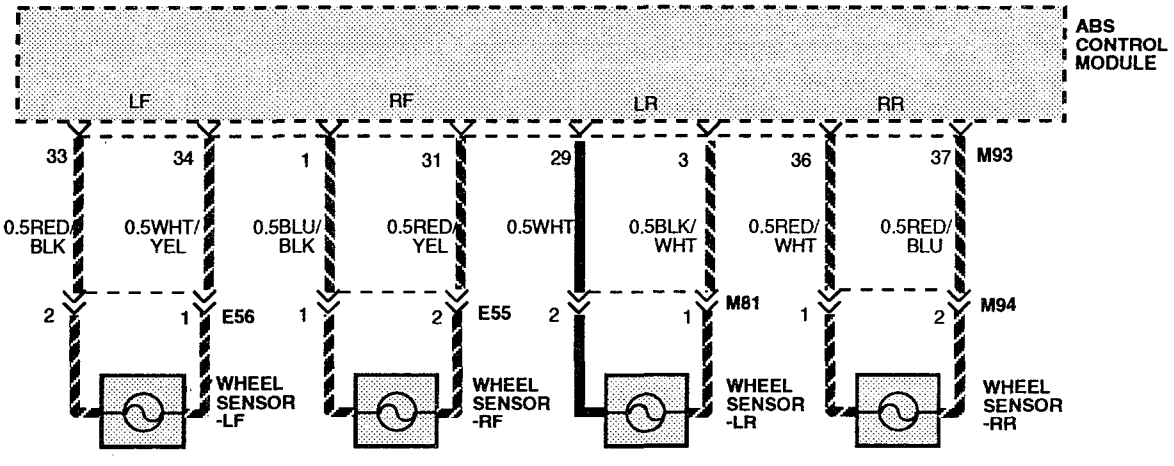
SPEED SENSOR CIRCUIT (SHORT GND)



At each wheel hub there is a tone wheel and an inductive sensor which supplies the wheel speed information to the ABSCM The sensor comprises a magnet and a pole piece surrounded by a coil. When the tone wheel rotates adjacent to the sensor pole piece an alternating current signal is generated in the coil with a frequency proportioned to wheel speed.
A special integrated circuit in the ABSCM translates the generated AC signal to a square wave.
This square wave is used by the microprocessor to operate the ABS.

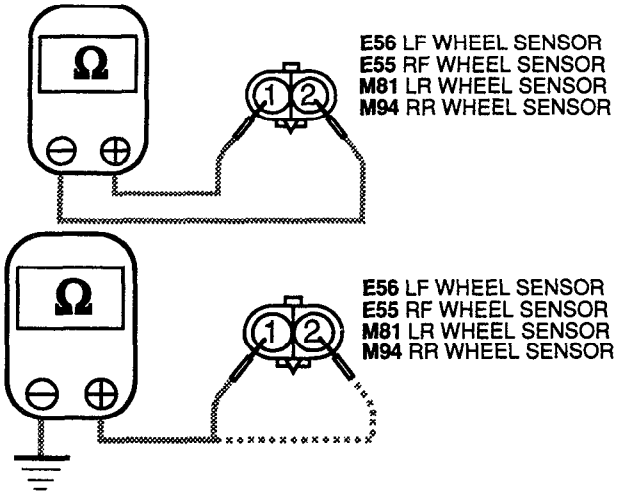
Code No.	Scan tool Display	Symptom	
66	SNSR. LF-SHRT	Sensor LF circuit short to ground	o Wheel speed sensor o Harness or connector between the wheel speed sensor and the ABSCM o ABSCM
67	SNSR. RF-SHRT	Sensor RF circuit short to ground	
68	SNSR. LR-SHRT	Sensor LR circuit short to ground	
69	SNSR. RR-SHRT	Sensor RR circuit short to ground	

WIRING DIAGRAM



INSPECTION PROCEDURE

1. Check Wheel Speed Sensor



1. Disconnect the wheel speed sensor.
2. Measure the resistance between terminals 1 and 2 of wheel speed sensor connector.

LIMIT: Front : 1275-1495 Ω
Rear : 1260-1540 Ω

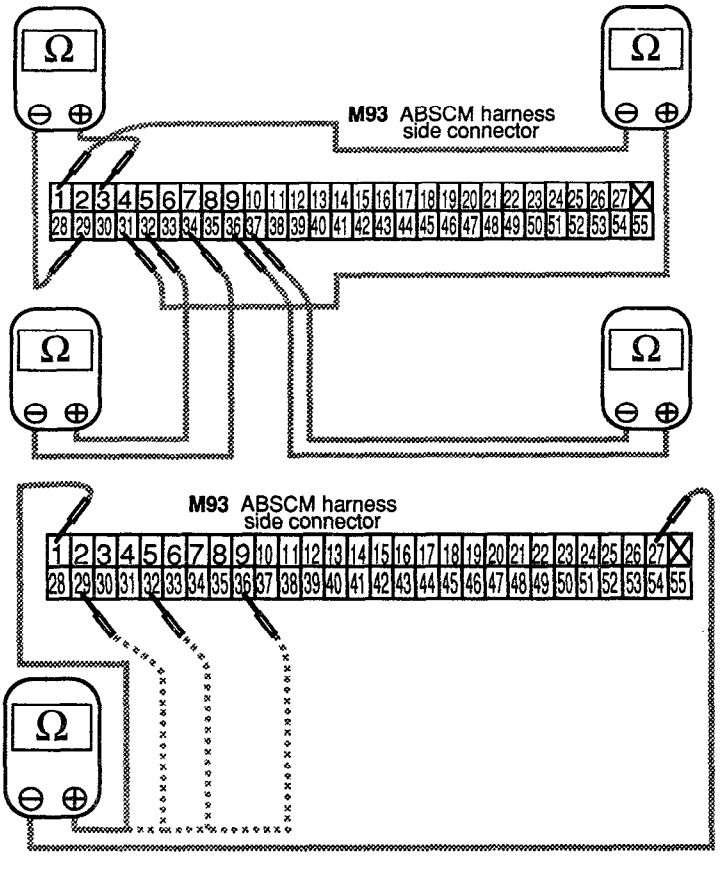
3. Check the continuity between wheel speed sensor connector terminals 1, 2 and body ground.

LIMIT: No continuity

OK→ 2

NG→ Replace the wheel speed sensor

2. Check the harness and the connector between the ABSCM and each wheel speed sensor



1. Disconnect the battery negative terminal.
2. Disconnect the ABSCM connector harness.
3. Measure the resistance between terminals as follows.

LIMIT

SNSR.LF	Terminals 32 and 34	1275-1495 Ω
SNSR.RF	Terminals 1 and 31	1275-1495 Ω
SNSR.LR	Terminals 29 and 3	1260-1540 Ω
SNSR.RR	Terminals 36 and 37	1260-1540 Ω

4. Check the continuity between sensor terminals and body ground terminals as follows.

LIMIT

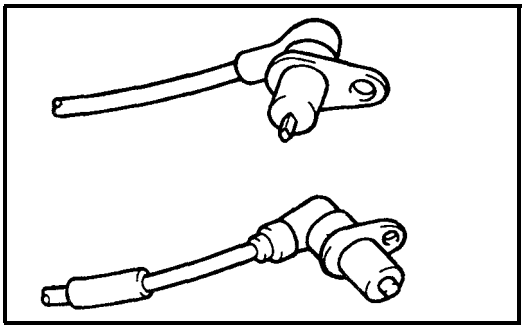
SNSR.LF	Terminal 32 and 27	No continuity
SNSR.RF	Terminal 1 and 27	No continuity
SNSR.LR	Terminal 29 and 27	No continuity
SNSR.RR	Terminal 36 and 27	No continuity

SNSR.: SENSOR

OK→ Re-connect the ABSCM and re-check

NG→ Repair the harness

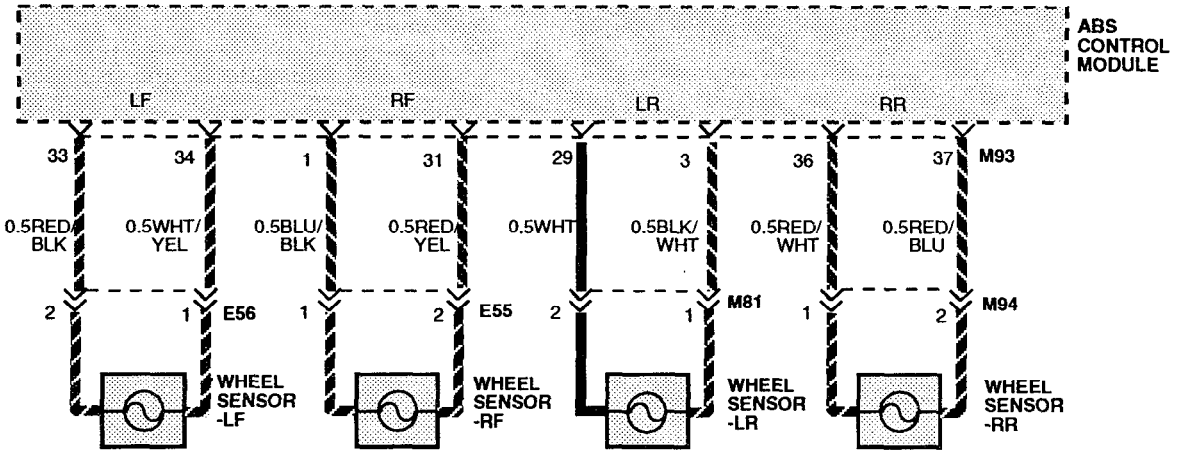
SPEED SENSOR CIRCUIT



At each wheel hub there is a tone wheel and an inductive sensor which supplies the wheel speed information to the ABSCM The sensor comprises a magnet and a pole piece surrounded by a coil. When the tone wheel rotates adjacent to the sensor pole piece an alternating current signal is generated in the coil with a frequency proportioned to wheel speed.
A special integrated circuit in the ABSCM translates the generated AC signal to a square wave.
This square wave is used by the microprocessor to operate the ABS.

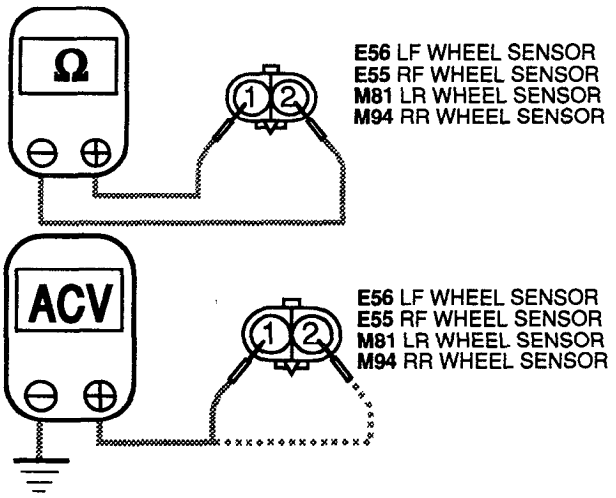
Code No.	Scan tool Display	Symptom	Possible cause
31	SNSR. LF-GAP	Air gap ON sensor LF incorrect	o Wheel speed sensor air gap o Wheel speed sensor o Harness or connector between the wheel speed sensor and ABSCM o ABSCM
32	SNSR. RF-GAP	Air gap ON sensor RF incorrect	
33	SNSR. LR-GAP	Air gap ON sensor LR incorrect	
34	SNSR. RR-GAP	Air gap ON sensor RR incorrect	

WIRING DIAGRAM



INSPECTION PROCEDURE

1. Check Wheel Speed Sensor



1. Disconnect the wheel speed sensor.
2. Measure the resistance between terminals 1 and 2 of wheel speed sensor connector.

LIMIT Front : 1275-1495 Ω
Rear : 1260-1540 Ω

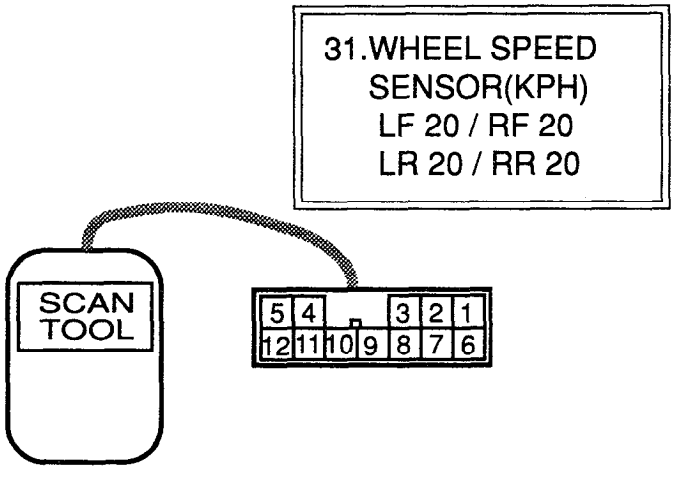
3. Check the continuity between wheel speed sensor connector terminals 1, 2 and body ground.

LIMIT No continuity

OK→ 2

NG→ Replace the wheel speed sensor

2. Check wheel speed sensor with scan tool



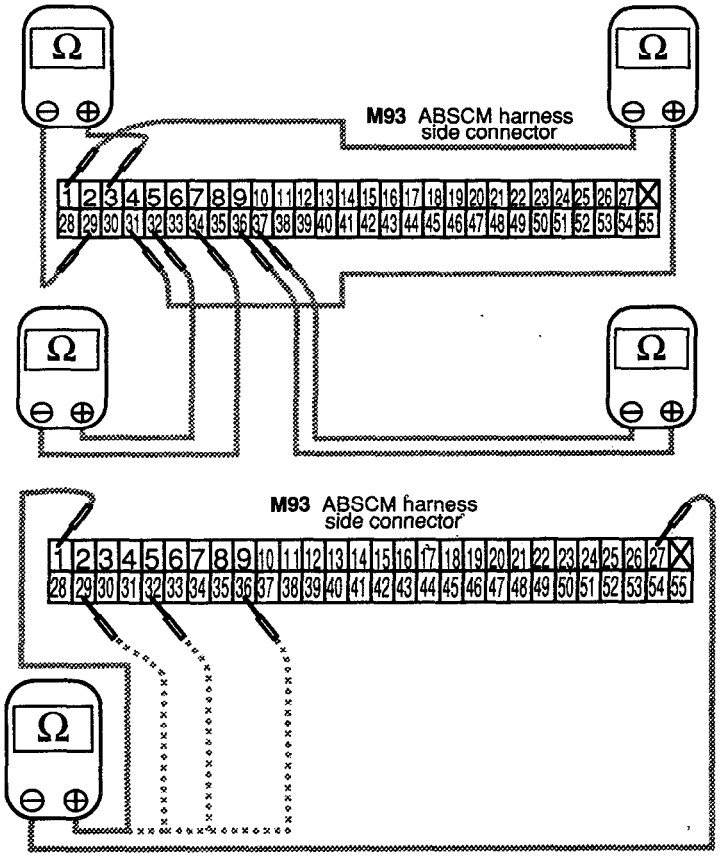
1. Connect scan tool carry out service data 31 WHEEL SPEED SENSOR test by using scan tool.
2. Drive the car about 20 kPh (12.5 mph)

LIMIT 18 kPh (11.25 mph) or more.

OK→ 3

NG→ 3

3. Check the harness and the connector between the ABSCM and each wheel speed sensor



1. Ignition off.
2. Disconnect the ABSCM connector harness.
3. Ignition ON.
4. Measure the resistance between terminals as follows.

LIMIT

SNSR.LF	Terminals 32 and 34	1275-1495 Ω
SNSR.RF	Terminals 1 and 31	1275-1495 Ω
SNSR.LR	Terminals 29 and 3	1260-1540 Ω
SNSR.RR	Terminals 36 and 37	1260-1540 Ω

5. Measure the voltage between sensor terminals and body ground terminals as follows.

LIMIT

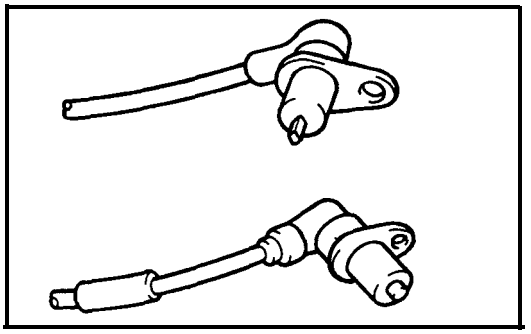
SNSR.LF	Terminal 32 and 27	No continuity
SNSR.RF	Terminal 1 and 27	No continuity
SNSR.LR	Terminal 29 and 27	No continuity
SNSR.RR	Terminal 36 and 27	No continuity

SNSR.: SENSOR

OK→ Re-connect the ABSCM and re-check

NG→ Repair the harness

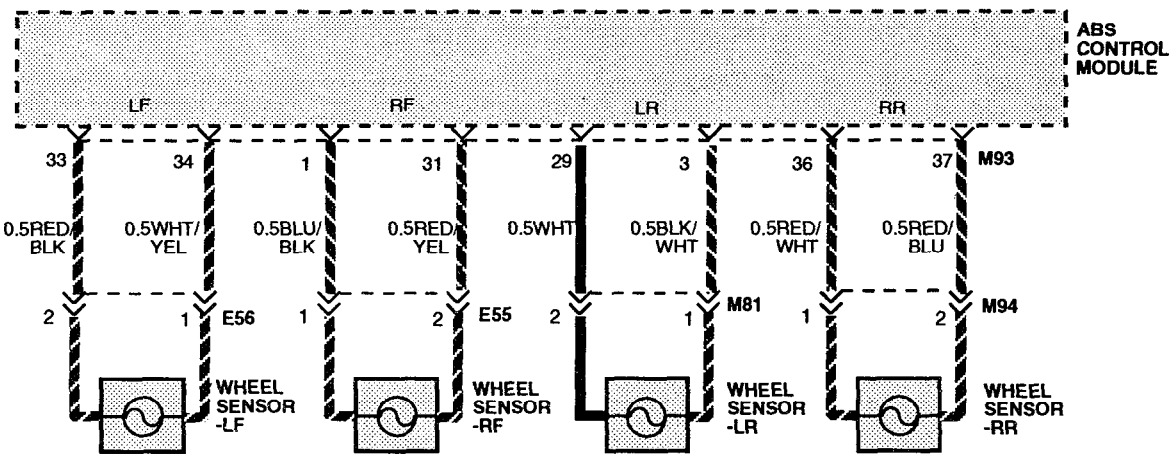
SPEED SENSOR CIRCUIT



At each wheel hub there is a tone wheel and an inductive sensor which supplies the wheel speed information to the ABSCM The sensor comprises a magnet and a pole piece surrounded by a coil. When the tone wheel rotates adjacent to the sensor pole piece an alternating current signal is generated in the coil with a frequency proportioned to wheel speed.
A special integrated circuit in the ABSCM translates the generated AC signal to a square wave.
This square wave is used by the microprocessor to operate the ABS.

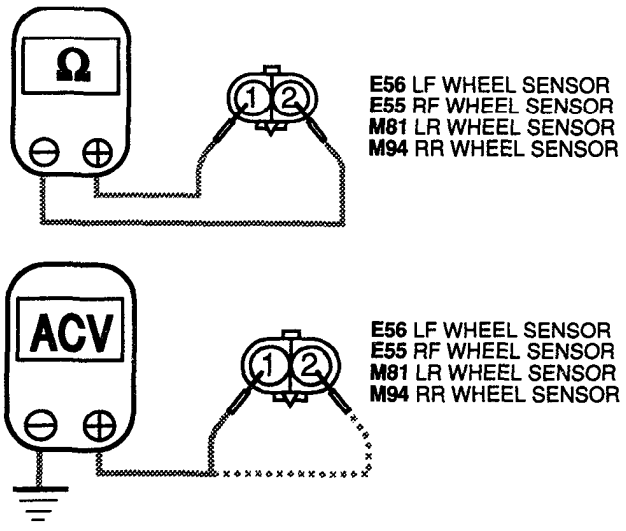
Code No.	Scan tool Display	Symptom	Possible cause
71	SNSR. LF-S.JMP	Speed jump on the exciter wheel FL	o Tone wheel o Wheel speed sensor o Harness or connector between the wheel speed sensor and the ABSCM o ABSCM
72	SNSR. RF-S.JMP	Speed jump on the exciter wheel FR	
73	SNSR. LR-S.JMP	Speed jump on the exciter wheel RL	
74	SNSR. RR-S.JMP	Speed jump on the exciter wheel RR	
19	TONE WHEEL	Check the tone wheels	o Tone wheel o Wheel speed sensor and harness

WIRING DIAGRAM



INSPECTION PROCEDURE

1. Check Wheel Speed Sensor



1. Disconnect the wheel speed sensor
2. Measure the resistance between terminals 1 and 2 of wheel speed sensor connector

LIMIT Front : 1275-1495 Ω
Rear : 1260-1540 Ω

3. Connect a voltmeter between the wheel speed sensor terminals, and measure the voltmeter by turning the wheel.

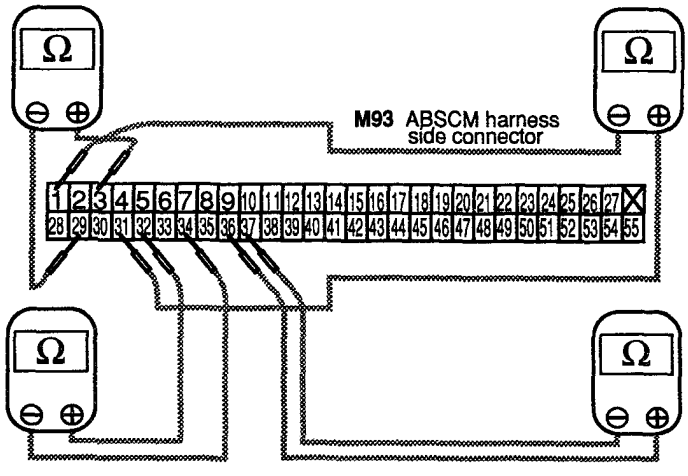
NOTE
Set the voltmeter to measure AC voltage.

LIMIT AC Voltage detected

OK→ 2

NG→ Replace wheel speed sensor

2. Check the harness and the connector between the ABSCM and each wheel speed sensor



1. Disconnect the battery negative terminal.
2. Disconnect the ABSCM connector harness
3. Measure the resistance between the terminals as follows :

LIMIT

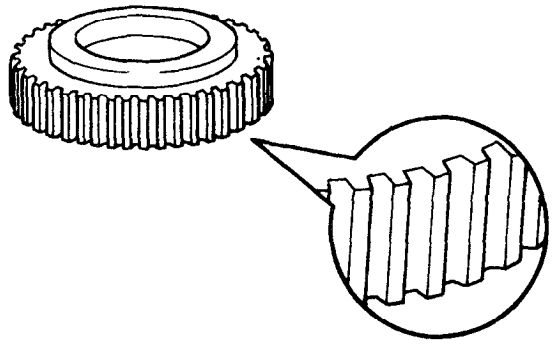
SNSR.LF	Terminals 32 and 34	1275-1495 Ω
SNSR.RF	Terminals 1 and 31	1275-1495 Ω
SNSR.LR	Terminals 29 and 3	1260-1540 Ω
SNSR.RR	Terminals 36 and 37	1260-1540 Ω

OK→ Re-connect the ABSCM and re-check

NG→ Replace wheel speed sensor

SNSR. : SENSOR

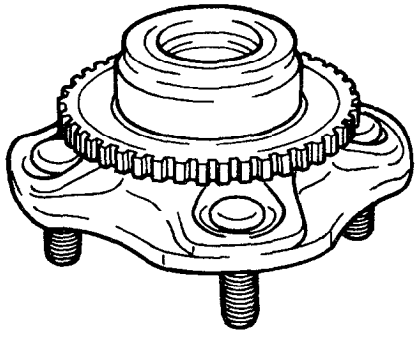
3. Check tone wheel and sensor installation



Front

- o Remove the front tone wheel
- o Check the tone wheel teeth for missing or scratches.

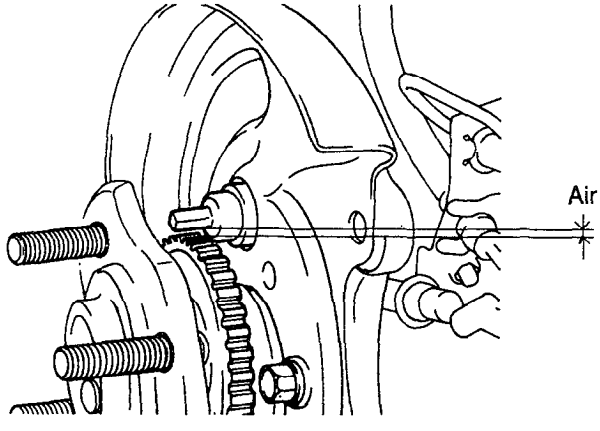
LIMIT *Tone wheel OK*



Rear

- o Check the tone wheel teeth for missing or scratches.

LIMIT Tone wheel OK



ALL

- o Check the air gap between the wheel speed sensors and the tone wheel teeth.

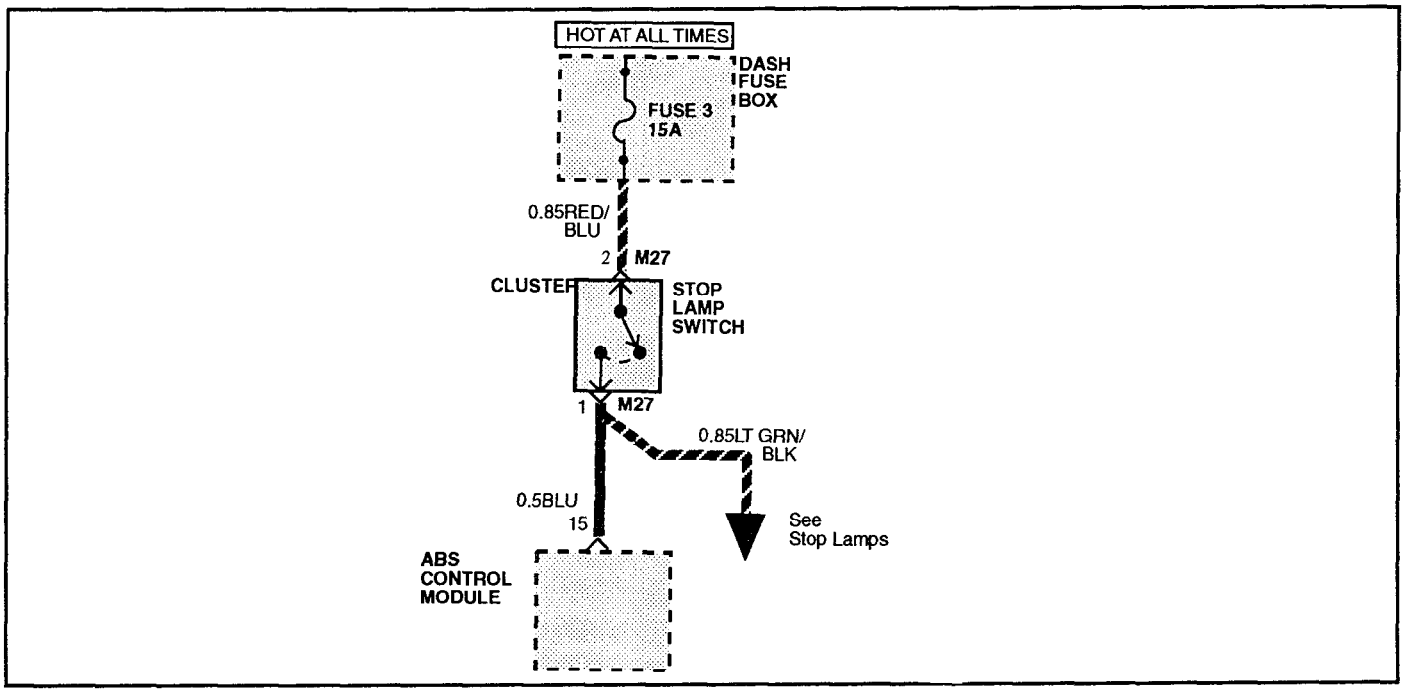
LIMIT FRONT : 0.2-1.1 mm(0.008-0.043in.)
REAR : 0.2-1.0 mm(0.008-0.039in.)

OK→ Re-connect the ABSCM and re-check

NG→ Replace the components.

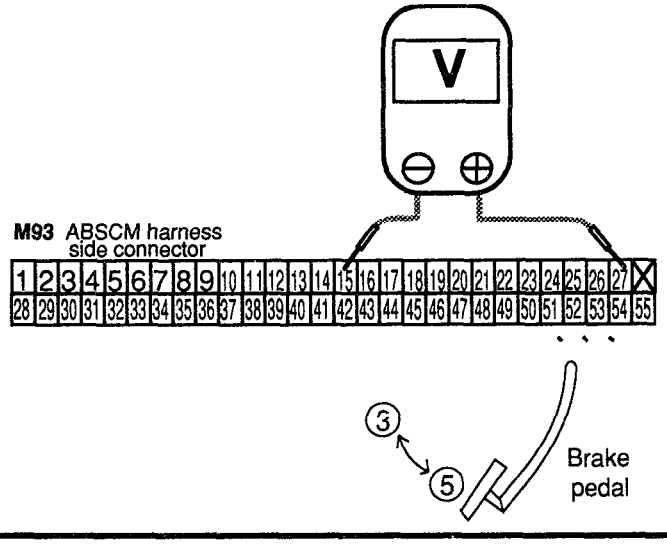
STOP LAMP SWITCH CIRCUIT

The stop lamp switch senses whether the brake pedal is depressed or released, and sends the signal to the ABSCM



INSPECTION PROCEDURE

1. Check the stop light switch circuit



1. Disconnect the ABSCM connector.
2. Turn ignition switch to "ON" position.
3. Measure the voltage between terminals 15 and 27.

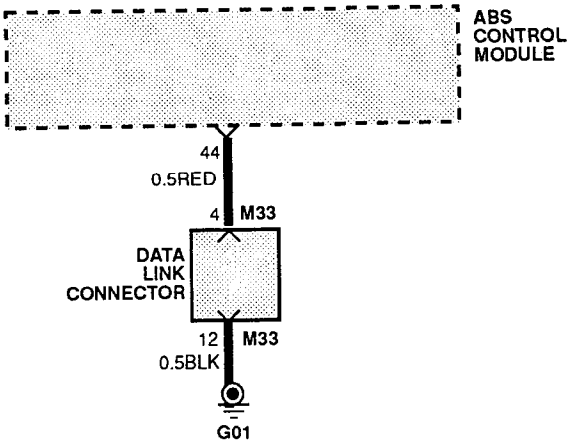
LIMIT 9.5-14.2 V

OK → Re-connect the ABSCM and re-check

NG → Repair the harness

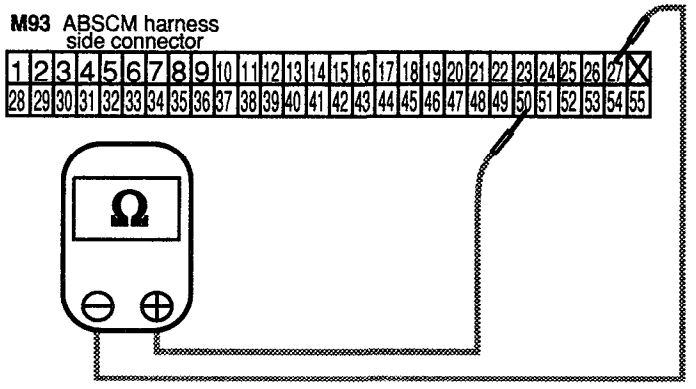
DATA-LINK CIRCUIT

When a fault is detected by the ABSCM, a code is stored in the ABSCM memory. The MUT can be used to read the codes in the ABSCM memory.



INSPECTION PROCEDURE

1. Check for voltage supply of ABSCM



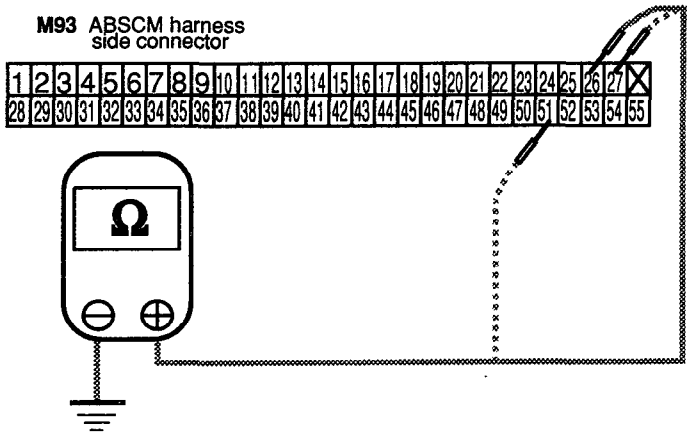
1. Turn ignition switch to "LOCK" position.
2. Disconnect the ABSCM connector.
3. Turn ignition switch to "ON" position
4. Check for voltage between terminal 5 and body ground

LIMIT 9.5 -14.2V

OK→ 2

NG→ Refer to page 58A-20 Power source voltage

2. Check continuity between the ABSCM connector GND and Body GND



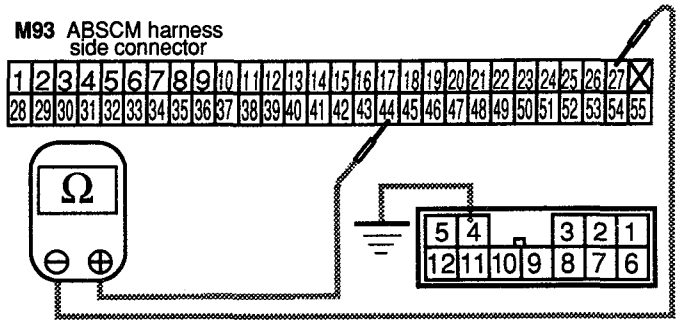
1. Turn the ignition switch to the "LOCK" position.
2. Measure the ground connection between terminal 27 and body ground, terminal 26 and body ground, terminals 51 and body ground.

LIMIT 0.5Ω or below

OK→ Check for an open between the harness and the connector between the ABSCM and the battery

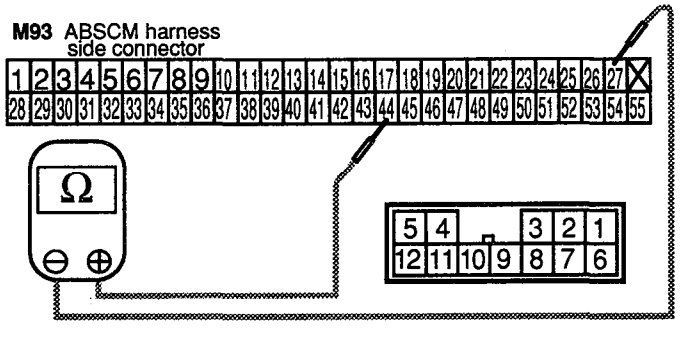
NG→
1. Check ground connection for corrosion and loosing
2. Repair harness or connector.

3. Check for continuity between the data-link connector and the ABSCM connector



1. Turn ignition switch to "LOCK" position.
2. Disconnect the ABSCM connector.
3. Ground the data link connector terminal 4.
4. Check for continuity between terminal 44 and body ground.

LIMIT Continuity



4. Isolate the data link connector terminal 4 from body ground.
5. Check for continuity between terminal 44 and 27.

LIMIT No continuity

OK→ Re-connect the ABSCM and re-check

NG→ Repair the harness

ABSCM (ABS Control Module)

If a diagnostic trouble code is 77, replace the ABSCM.

Code No.	Scan tool display	Symptom	Possible cause
77	ABSCM-FAIL		o ABSCM

Inspection Procedure

1. Replace the ABSCM (ABS Control Module)

BRAKE SYSTEM

Return To Main Table of Contents

GENERAL 2
BRAKE PEDAL 10
MASTER CYLINDER 13
BRAKE BOOSTER 16
BRAKE LINE 18
PROPORTIONING VALVE 19
FRONT DISC BRAKE 20
REAR DRUM BRAKE 25
REAR DISK BRAKE 28
PARKING BRAKE 32

GENERAL

SPECIFICATIONS

Master cylinder	
Type	Tandem
I:D.	22.22 mm (0.875 in.)
Fluid level warning sensor	Provided
Brake booster	
Type	Vacuum
Effective dia.	233.1 mm (9.177 in.)
Boosting ratio	4.0 : 1
Proportioning valve	
Cut-in pressure (Split point)	3.92 MPa (40 kg/cm^2, 569 Psi)
Decompression ratio	3.7 : 1
Front brake	
Type	Floating type with ventilated disc
Disc O.D.	257 mm (10.118 in.)
Disc thickness	22 mm (0.866 in.)
Pad thickness	11 mm (0.433 in.)
Cylinder I.D.	54 mm (2.126 in.)
Rear brake	
Type	Leading-trailing drum
Drum I.D.	203.2 mm (8 in.)
Brake lining thickness	4.05 mm (0.159 in.)
Cylinder I.D.	19.05 mm (0.75 in.)
Clearance adjustment	Automatic
Parking brake	
Type	Mechanical brake acting on rear wheels
Braking type	Lever type (Cam shape)
Cable arrangement	V type

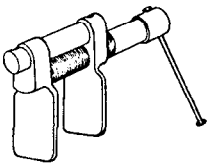
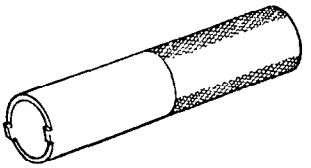
SERVICE STANDARD

Standard value	
Brake pedal height	178 mm (7.008 in.)
Brake pedal stroke	145 mm (5.709 in.)
Stop light switch outer case to pedal arm clearance	0.5-1.0 mm (0.02-0.04 in.)
Brake pedal free play	3-8 mm (0.118-0.315 in.)
Brake pedal to floorboard clearance	65 mm (2.56 in.) or more
Booster push rod to master cylinder piston clearance	0 (at 500 mmHg vacuum)
Parking brake lever stroke (When lever assembly is pulled with 196 N (20 Kg, 44 lb) force)	7-8 clicks
Service limit	
Front disc brake pad thickness	2.0 mm (0.079 in.)
Front disc thickness (minimum)	20 mm (0.787 in.)
Front disc runout	0.15 mm (0.006 in.)
Drum brake lining thickness	1.5 mm (0.059 in.)
Brake drum I.D. (maximum)	205.2 mm (8.079 in.)
Wheel cylinder to piston clearance	0.15 mm (0.006 in.)

TIGHTENING TORQUE

	Nm	kg.cm	lb.ft
Master cylinder to booster mounting nut	8-12	80-120	6-9
Brake booster mounting nut	8-12	80-120	6-9
Brake booster hose fitting to manifold	8-12	80-120	6-9
Bleeder screw	7-13	70-130	5-9.5
Brake tube flare nut, brake hose	13-17	130-170	9-12
Proportioning valve mounting nut	8-12	80-120	6-9
Caliper guide rod bolt	22-32	220-320	16-24
Caliper pin bolt	35-45	350-450	26-33
Caliper assembly to knuckle	69-85	690-850	44-63
Brake hose to front caliper	25-30	250-300	18-22
Backing plate mounting bolt	50-60	500-600	37-44

SPECIAL TOOL

Tool (Number and name)	Illustration	Use
09581-11000 Piston expander		Retraction of the front disc brake piston
09580-34000 Rear brake piston adjuster		Removal and installation of rear brake piston

TROUBLESHOOTING

Symptom	Probable cause	Remedy
Noise or vibration when brakes are applied	Backing plate or caliper improperly mounted	Correct
	Loose backing plate or caliper mounting bolts	Retighten
	Unevenly worn or cracked brake drum or brake disc	Replace
	Foreign material in brake drum	Clean
	Seized pad or lining contact surface	Replace
	Excessive caliper to pad assembly clearance	Correct
	Uneven pad contact	Correct
	Lack of lubrication in sliding parts	Lubricate
	Loose suspension parts	Retighten
Vehicle pulls to one side when brakes are applied	Difference in left and right tire inflation pressure	Adjust
	Improper front wheel alignment	Adjust
	Inadequate contact of pad or lining	Correct
	Grease or oil on pad or lining surface	Replace
	Drum eccentricity or uneven wear	Replace
	Incorrect wheel cylinder installation	Correct
	Auto adjuster malfunction	Correct
Insufficient braking power	Low or contaminated brake fluid	Replenish or change
	Air in brake system	Bleed the system
	Brake booster malfunction	Correct
	Inadequate contact of pad or lining	Correct
	Grease or oil on pad or lining surface	Replace
	Auto adjuster malfunction	Correct
	Overheated brake rotor due to dragging of pad or lining	Correct
	Restricted brake line	Correct
	Proportioning valve malfunction	Replace
Increased pedal stroke (Reduced pedal to floorboard clearance)	Air in brake system	Bleed the system
	Brake fluid leaks	Correct
	Auto adjuster malfunction	Correct
	Excessive push rod to master cylinder clearance	Adjust

Symptom	Probable cause	Remedy
Brake drag	Incomplete release of parking brake	Correct
	Incorrect parking brake adjustment	Adjust
	Weak brake pedal return spring	Replace
	Restricted master cylinder return port	Correct
	Broken rear drum brake shoe return spring	Replace
	Lack of lubrication in sliding parts	Lubricate
	Defective master cylinder check valve or piston return spring	Replace
	Insufficient push rod to master cylinder clearance	Adjust
Insufficient parking brake function	Worn brake lining	Replace
	Grease or oil on lining surface	Replace
	Parking brake cable sticking	Replace
	Auto adjuster malfunction	Correct
	Excessive parking brake lever stroke	Adjust the parking brake lever stroke or check the parking brake cable routing

SERVICE ADJUSTMENT PROCEDURE

BRAKE PEDAL INSPECTION AND ADJUSTMENT

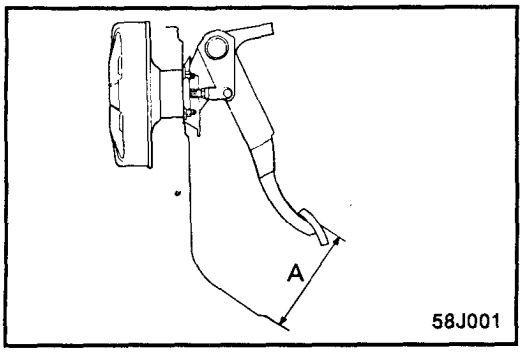
1. Pedal height

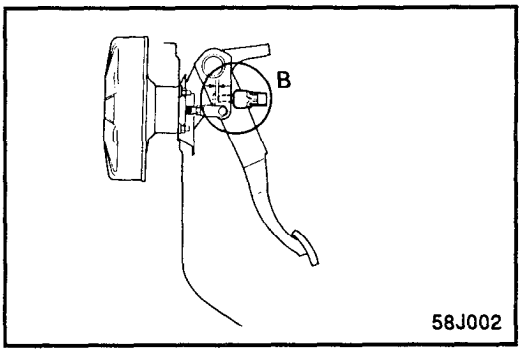
Pedal height (from top of pedal to toeboard) A .....
178 mm (7.008 in.)

If the pedal height is out of specification, adjust by the following procedure.

1) Back off the stop lamp switch to a position where it does not contact the pedal arm.
2) Turn the stop lamp switch until the clearance between the stop lamp switch outer case and the pedal arm is within the standard value, and tighten the lock nut.

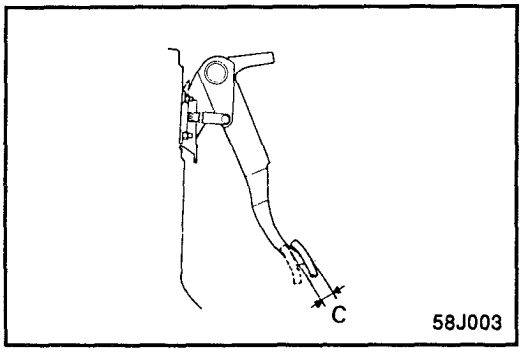
Clearance between pedal and stop lamp switch B .....
0.5 to 1.0 mm (0.02 to 0.04 in.)





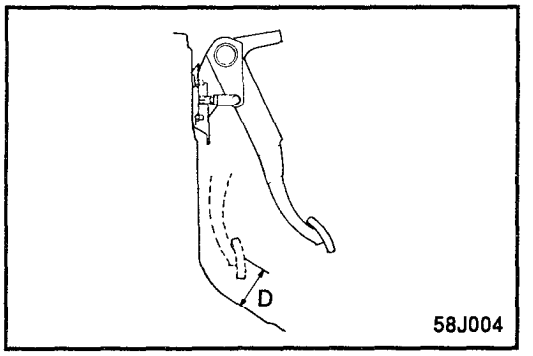
2. Brake pedal free play.

Brake pedal free play C .....
3-8 mm (0.118-0.315 in.)



3. Start the engine, apply the brake pedal with approximately 50 kg (110 Ibs.) of force, and measure the clearance between the brake pedal and the floor board.

Pedal to floor board clearance D
when pedal is depressed 50 kg (110lbs.)force .....
90 mm (3.543 in.) or more
when pedal is fully depressed without brake fluid .....
60 mm (2.362 in.) or more

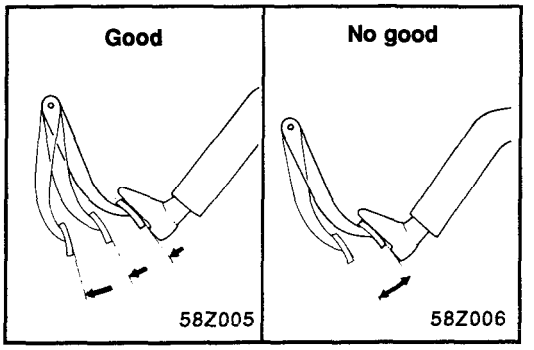


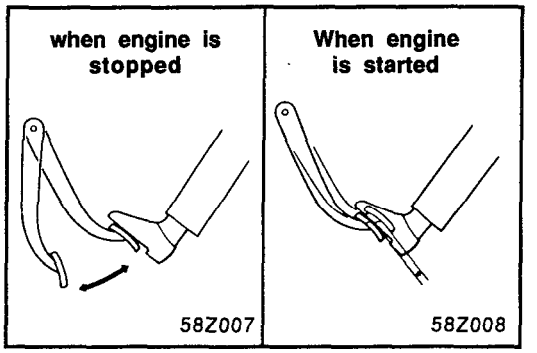
BRAKE BOOSTER OPERATION TEST

For a simple check of the brake booster operation, use the following tests.

1. Run the engine for one or two minutes, then stop it. Depress the brake pedal several times using normal foot pressure. If the pedal goes down further the first time, but gradually rises after the second or third time, the brake booster is functioning properly. Go to step 2.
2. With the engine stopped, depress the brake pedal several times.
   Depress the brake pedal and start the engine.
   If the pedal goes down slightly, the booster is in good condition. Go to step 3.
3. With the engine running, depress the brake pedal and then stop the engine.
   Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition.

If one of the above three tests is not okay, check the vacuum hoses, the check valve and the brake booster. Make any necessary corrections. If all the tests are OK, the unit is good.





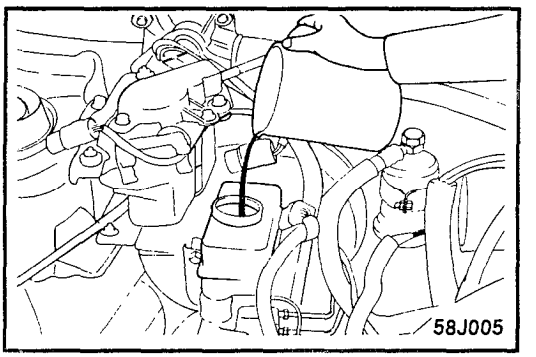
BLEEDING OF BRAKE SYSTEM

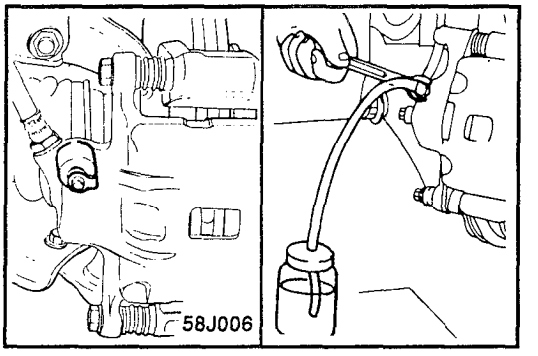
1. Remove the reservoir cap and fill the brake fluid reservoir.

   CAUTION
   Do not allow brake fluid to remain on a painted surface. Wash it off immediately.

   NOTE
   When bleeding by pressured fluid, do not depress the brake pedal.

2. Connect a vinyl tube to the wheel cylinder bleeder screw and insert the other end of tube in a half full container of brake fluid.
3. Slowly pump the brake pedal several times.
4. While depressing the brake pedal fully, loosen the bleeder screw until fluid starts to run out. Then close the bleeder screw.

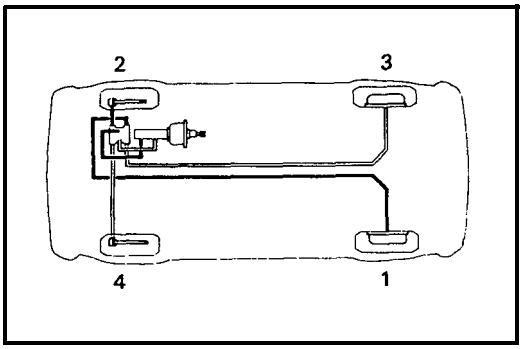




5. Repeat steps 3 and 4 until there are no more bubbles in the fluid.
4. Tighten the bleeder screw.

Bleeder screw tightening torque	7-9 Nm (70-90 kg.cm, 5.1-6.6 lb.ft)

7. Repeat the above procedure for each wheel in the sequence shown in the illustration.

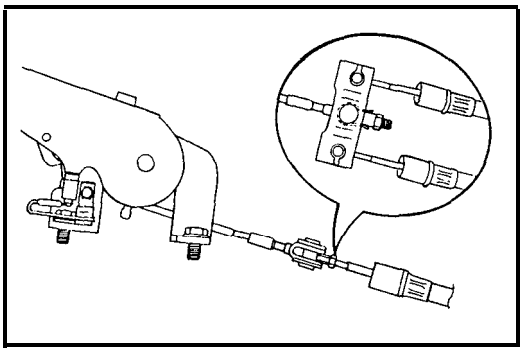


PARKING BRAKE STROKE ADJUSTMENT

1. Pull the brake lever with a force of approximately 20 kg (44 lbs.), and count the number of clicks.

Parking brake lever stroke [Standard value]	7-8 clicks

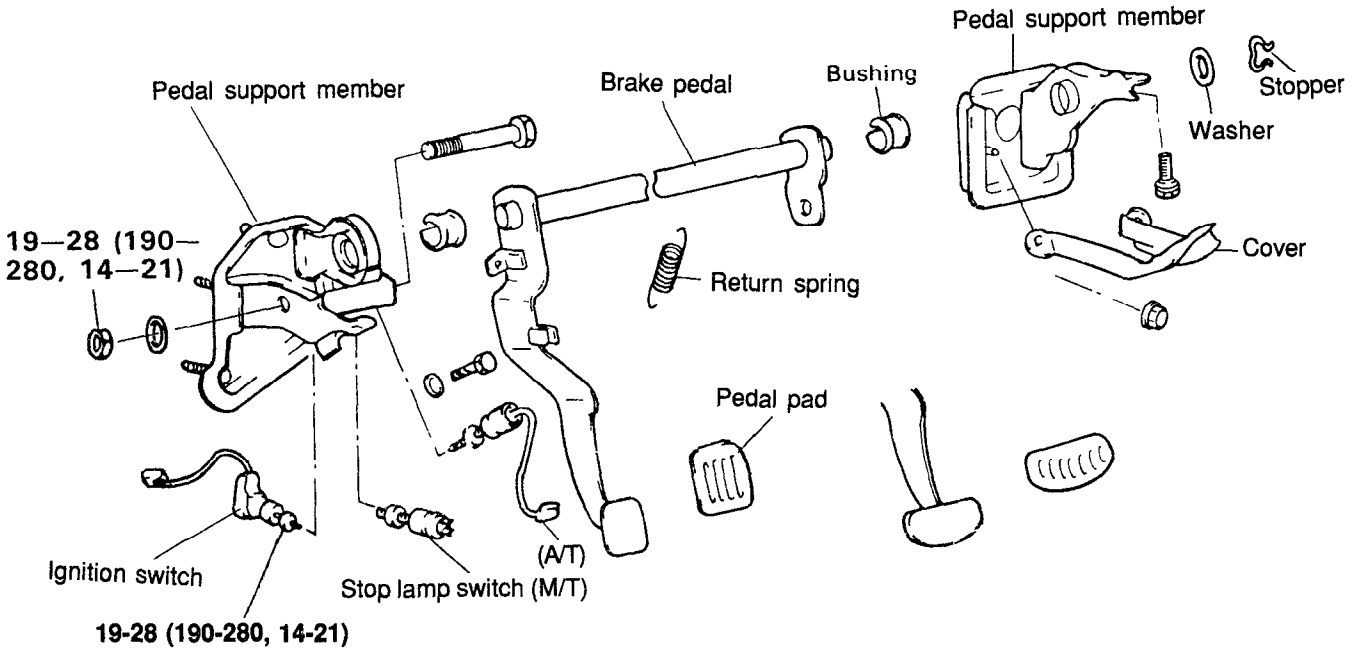
2. If the number of notches is not within the standard value, adjust the cable length with the adjusting nut of the equalizer.



3. The indicator light will go out when the brake lever is fully released, and will light with the lever is pulled up one notch. If it does not operate, check the bulb and/or switch.
4. After the adjustment, check that the rear brakes do not drag with the parking brake lever released.

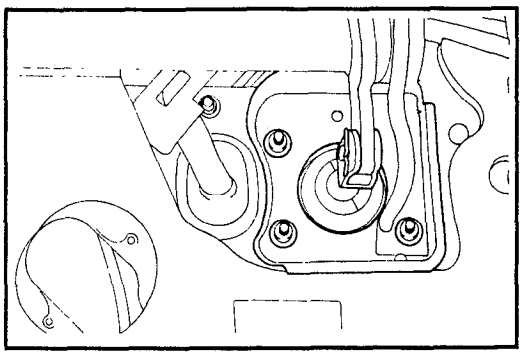
BRAKE PEDAL

COMPONENTS

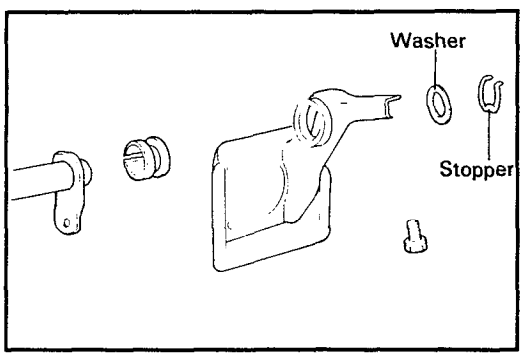


REMOVAL

1. Remove the lower crash pad assembly.
2. Remove the steering column shaft mounting bolts (Refer to Steering Group).
3. Remove the clutch pedal assembly.
4. Remove the console assembly (Refer to Body Group)
5. Remove the glove box housing cover and RH side lower crash pad.
6. Remove the blower switch and air duct control assembly.
7. Drain the coolant, disconnect the heater hose and remove the heater unit assembly (Refer to Air Conditioning Group).
8. Remove the stop lamp switch connector.
9. Remove the return spring.
10. Disconnect the operating rod and brake pedal from each other.



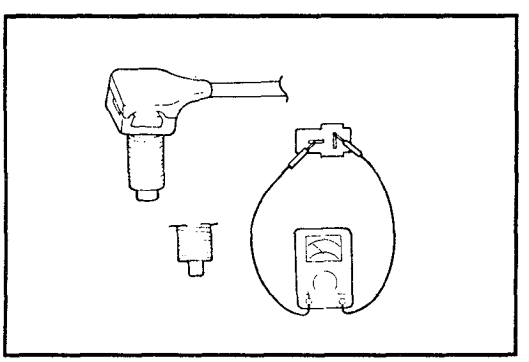
11. Remove the stopper and the washer.



12. Loosen the booster mounting nut and remove the right side pedal support member.
13. Remove the pedal support (left) and remove the pedal from the left.

INSPECTION

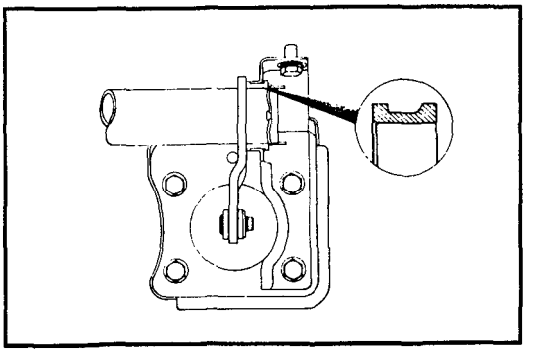
1. Check the bushing for wear.
2. Check the brake pedal for distortion.
3. Check the brake pedal return spring for damage.
4. Check the stop lamp switch.
   1) With an ohmmeter connected to the stop lamp switch terminals, check for continuity.
   2) If there is no continuity when the plunger is depressed and there is continuity when the plunger is released, the stop lamp switch is normal.



INSTALLATION

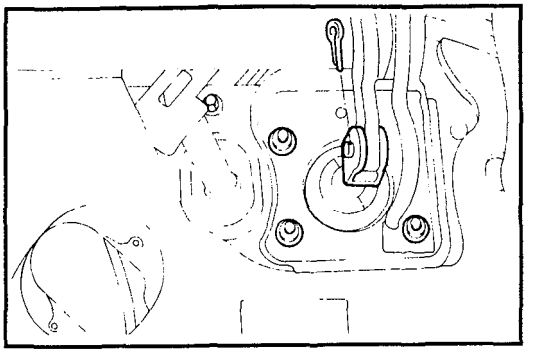
1. Apply chassis grease to the bushing bore and flanges.

   NOTE
   install the bushing in the correct position as shown in the illustration.



2. Apply chassis grease to the sliding surface of the brake pedal and operating rod clevis pin.

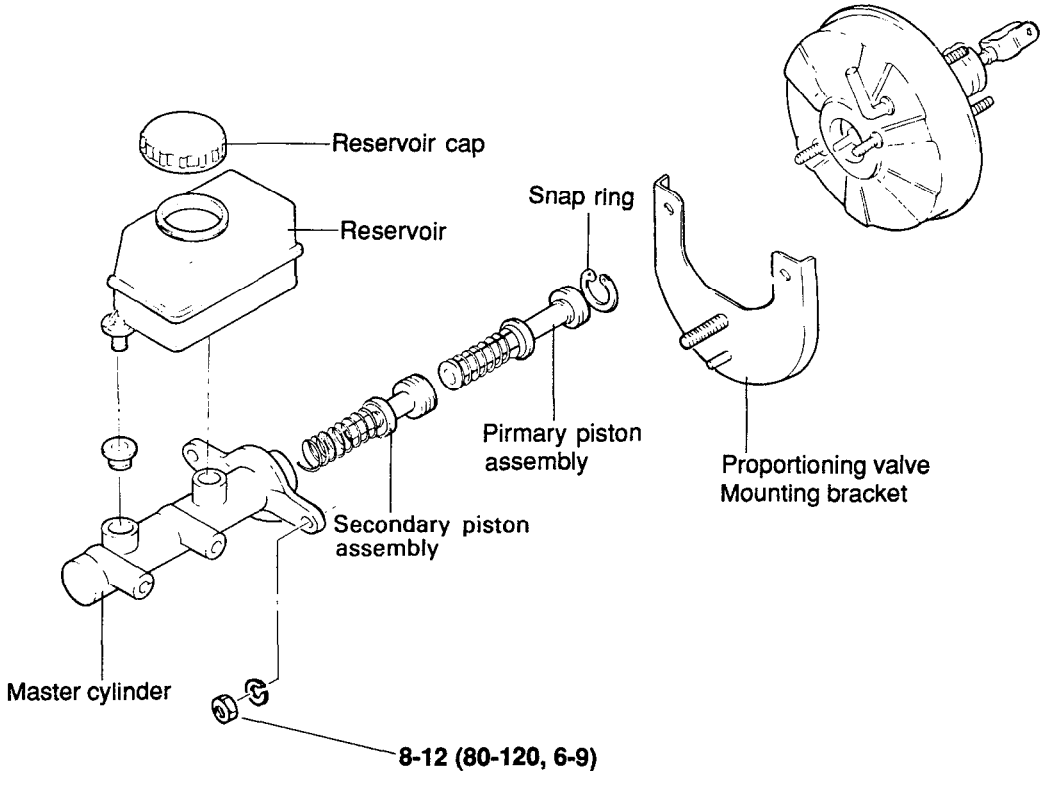
   CAUTION
   Be sure to install the split pin on the operating rod clevis pin.



3. Adjust the brake pedal height and free play.
4. Adjust the clutch pedal stroke and free play.
5. Install the steering shaft.

MASTER CYLINDER

COMPONENTS



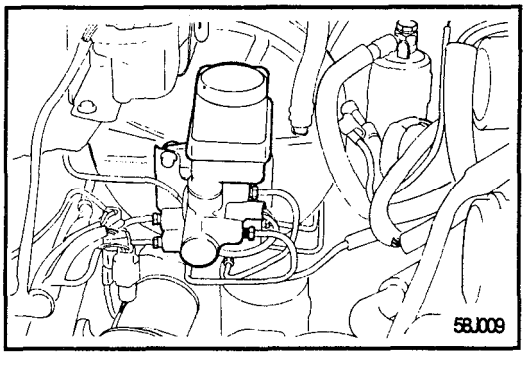
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Remove the fluid level warning device connector.
2. Disconnect the brake lines from the master cylinder, and plug the open ports.

   CAUTION
   Do not allow brake fluid to remain on a painted surface. Wash it off immediately.

3. Remove the master cylinder mounting nuts. Disconnect the proportioning valve mounting bracket, then lift out the master cylinder.

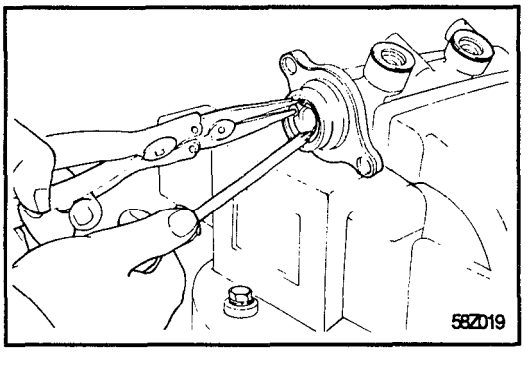


DISASSEMBLY

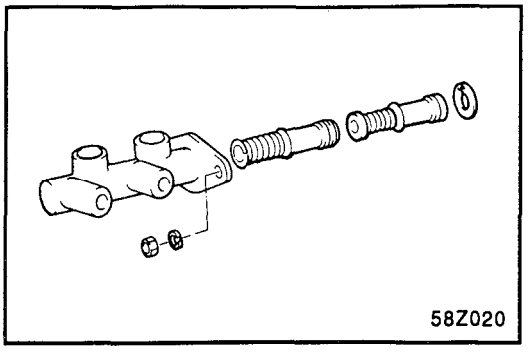
1. Remove the reservoir cap and drain the brake fluid into a suitable container.
2. Remove the reservoir from the master cylinder.

   NOTE
   If necessary, support the master cylinder in a vise at its flange not at its bore.

3. While depressing the piston, remove the snap ring.



4. Remove the primary and secondary pistons from the master cylinder body.



NOTE
1) Be careful not to damage the cylinder bore.
2) Do not disassemble the primary and secondary piston assemblies.

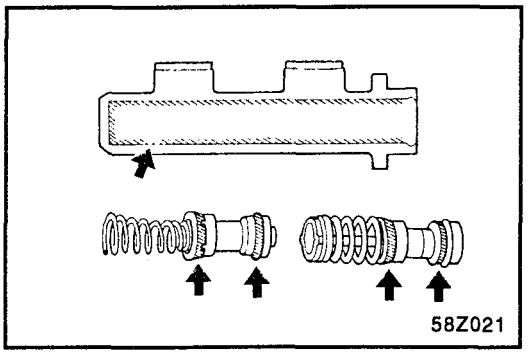
INSPECTION

1. Check the master cylinder bore for rust or scoring.
2. Check the primary and secondary pistons for rust, scoring, wear, damage or deterioration.
3. Check the primary and secondary piston springs for deterioration.

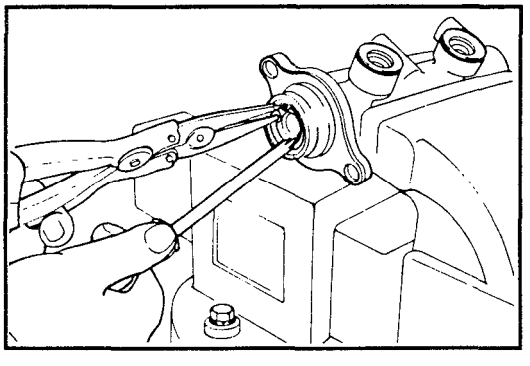
ASSEMBLY

1. Apply the specified brake fluid to the inner surface of the master cylinder body and to the outside of the secondary and primary pistons.

Recommended brake fluid	DOT 3 or equivalent

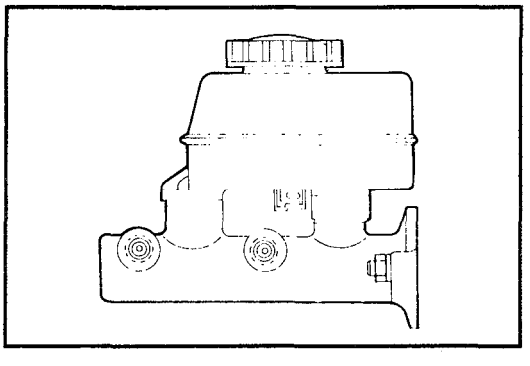


2. Carefully insert the spring and secondary piston assembly in the master cylinder bore.
3. Carefully insert the primary piston assembly in the master cylinder bore.
4. Depress the primary piston and install the snap ring in the cylinder bore groove as illustrated.



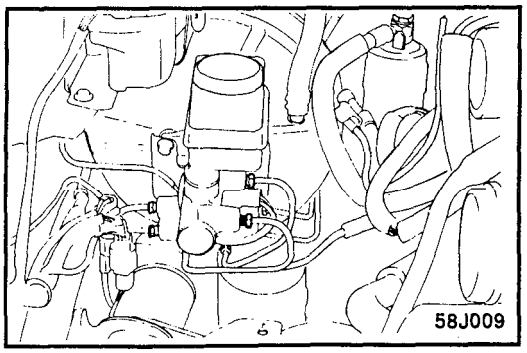
5. Install the reservoir cap on the reservoir.
6. Lubricate the two grommets at both inside and outside with genuine brake fluid and then insert them into the master cylinder body.

NOTE
Whenever the reservoir is replaced, the grommets must also be replaced.



7. Press the reservoir into the master cylinder body with the fluid level indicator socket facing inboard. The reservoir should snap in place indicating that it is secure as illustrated.
8. Connect the fluid level warning connector in the socket on the reservoir.

INSTALLATION



1. Install the master cylinder on the brake booster with two nuts.

Nut	8-12 Nm (80-120 kg.cm, 6-9 lb.ft)

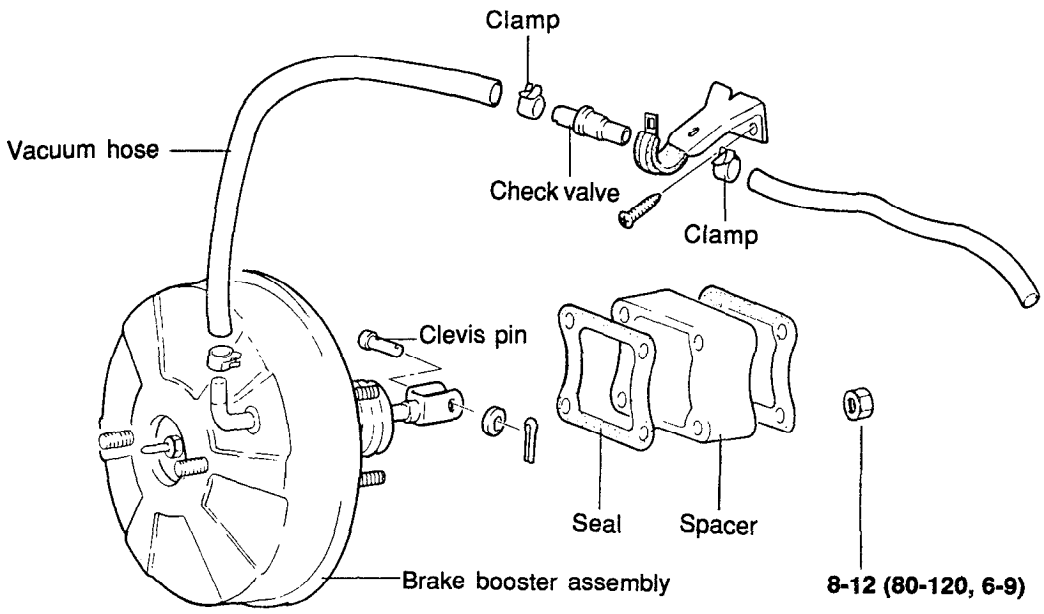
2. Connect two brake tubes and fluid level warning connector.

Brake tube flare nut	13-17 Nm (130-170 kg.cm, 9-12 lb.ft)

3. Fill the master cylinder reservoir with brake fluid and bleed the system.

BRAKE BOOSTER

COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

58J010

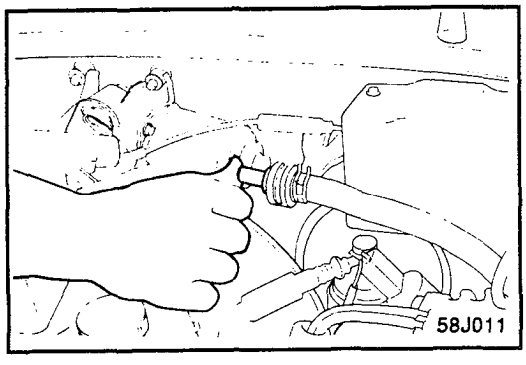
CHECK VALVE OPERATION TEST

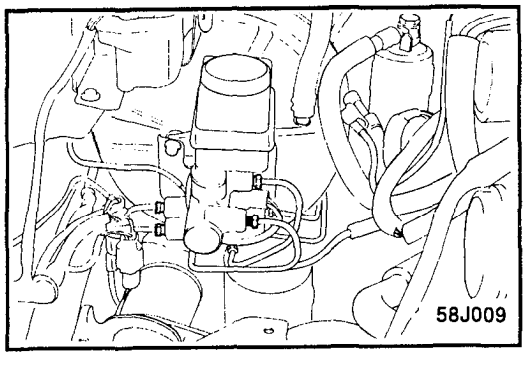
Remove the booster hose from the check valve.

Start the engine.

Plug the check valve hole with a finger.

Check that vacuum is present



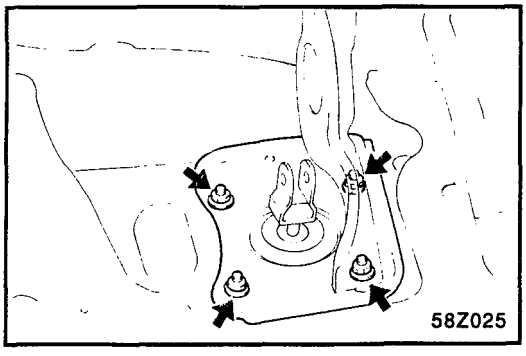


REMOVAL

1. Remove the master cylinder.
   (Refer to page 58-13)

CAUTION
Do not allow brake fluid to remain on a painted surface. Wash it off immediately

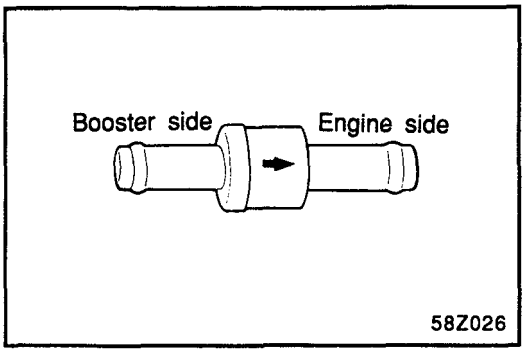
2. Disconnect the vacuum hose from the booster.
3. Remove the operating rod from the brake pedal.
4. Loosen the booster mounting nuts.
5. Lift out the booster assembly.



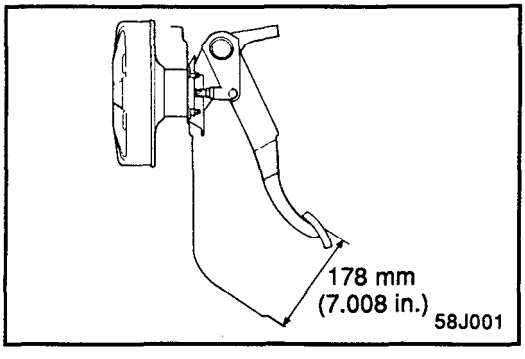
INSTALLATION

1. When the booster assembly is installed, replace the packing at each end of the booster mounting holder, if necessary.
2. Install brake booster and tighten the mounting nuts.

Tightening torque .....
8-12 Nm (80-120 kg.cm, 6-9 lb.ft)

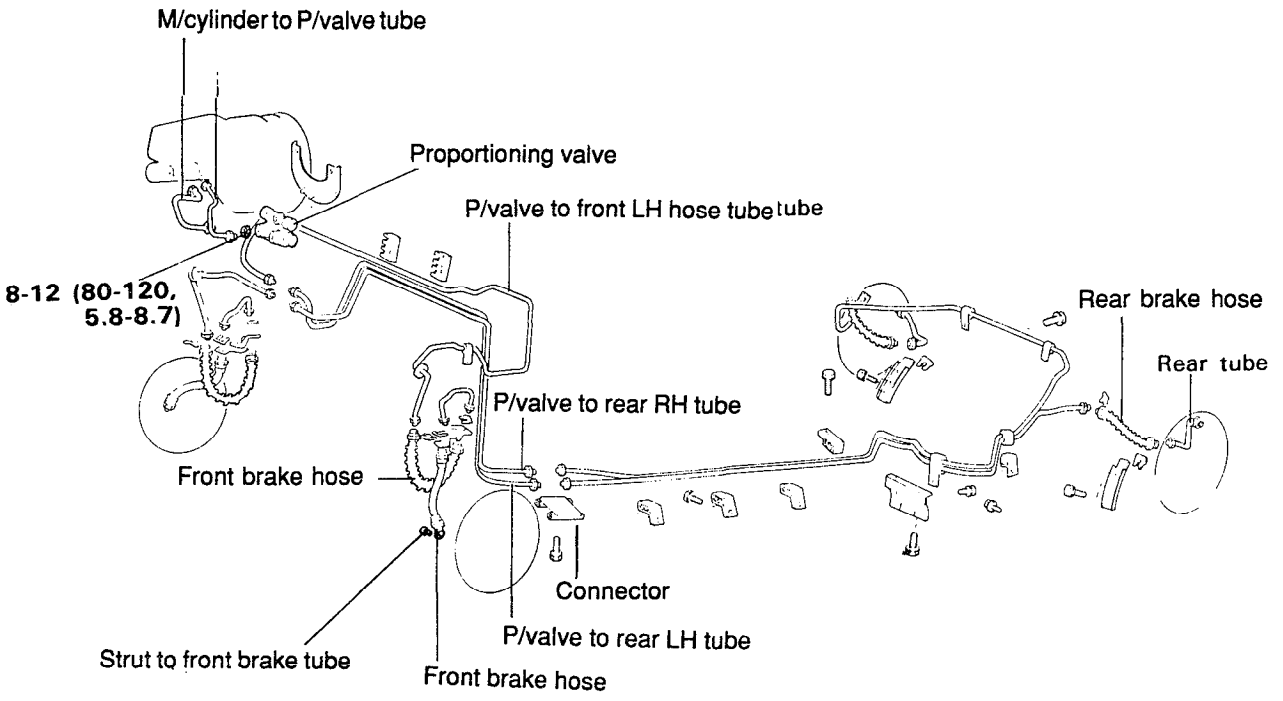


3. Connect clevis to brake pedal with clevis pin and install the split pin to the clevis pin.
4. Install master cylinder.
5. Connect vacuum hose to brake booster.
6. Pay attention to the direction of the check valve when installing.
7. Fill brake reservoir with brake fluid and bleed the system.
8. Check for fluid leakage.
9. Check and adjust the brake pedal (Refer to page 58-7).
10. After installation, apply sufficient grease to the clevis and brake pedal contacting points.



BRAKE LINE

COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

58J012

INSPECTION

1. Check the brake lines for cracks, crimps and corrosion.
2. Check the brake hoses for cracks, damage and leakage.
3. Check the brake line flare nuts for damage and leakage.

INSTALLATION

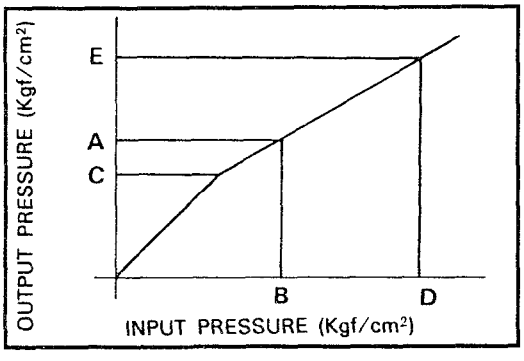
1. Install the brake hoses without twisting them.
2. The brake lines should be installed away from sharp edges, weld beads or moving parts.
3. Tighten the connections to the specified torque.

Flare nuts ..... 13-17 Nm (130-170 kg.cm, 9-12 lb.ft)
Brake hose to front caliper .....
25-30 Nm (250-300 kg.cm, 18-22 lb.ft)

PROPORTIONING VALVE

Do not disassemble the proportioning valve. The proportioning valve regulates the distribution of fluid pressure to the front and rear brakes to prevent skidding in the event of rear wheel lock, and to obtain greater braking efficiency.

PROPORTIONING VALVE FUNCTION TEST



1. Connect two pressure gauges, one the input side and one to the output side of the proportioning valve.

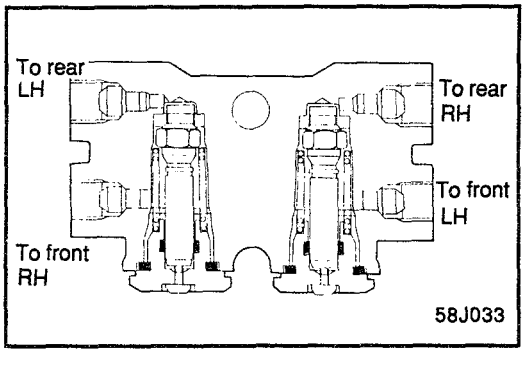
   NOTE
   Be sure to bleed the system after you connect the pressure gauges.

2. With the brakes applied, measure the input pressure and the output pressure. If the measured pressures are within the ranges as illustrated, the proportioning valve is good.
3. Reconnect the brake lines in their original positions and bleed the system.

   NOTE
   This figure shows characteristics of the proportioning valve during pressure increase.

A	B	C	D	E
51 ± 3.5	80	40^{+6}_{-2}	140	67 ± 4

PROPORTIONING VALVE INSTALLATION

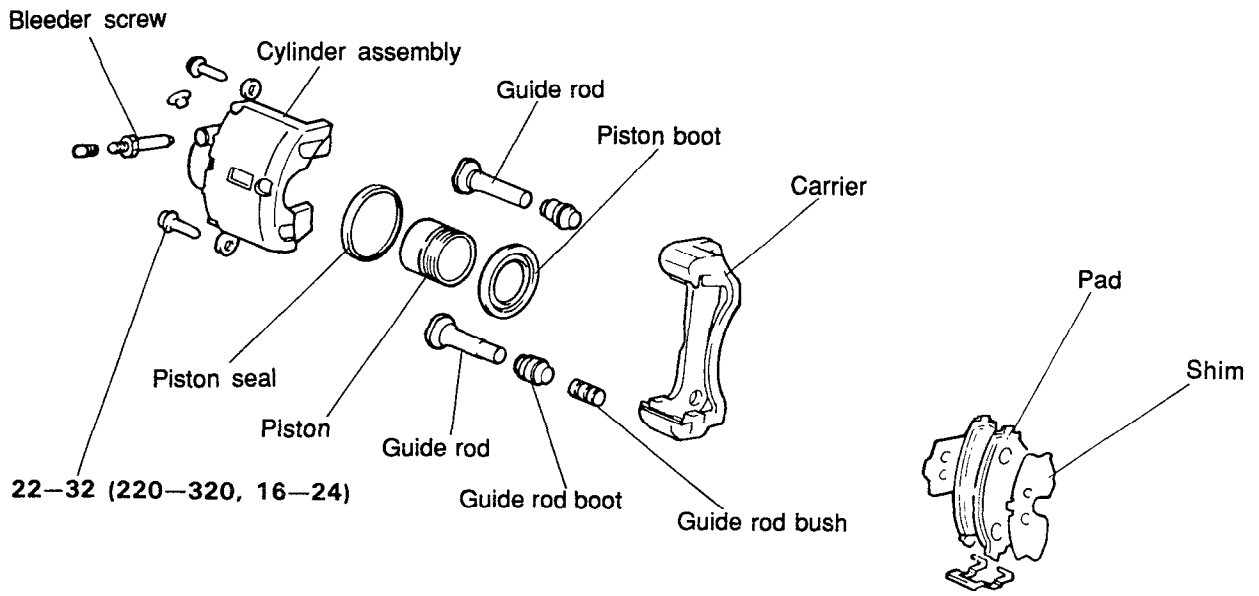


1. Install the brake lines according to the illustration.
2. Tighten the flare nuts and bleed the system.

Tightening torque
- Brake tube flare nut ..... 13-17Nm (130-170 kgcm, 9-12 lb.ft)
- Proportioning valve mounting nut ..... 8-12 Nm (80-120 kg.cm, 6-9 lb.ft)

FRONT DISC BRAKE

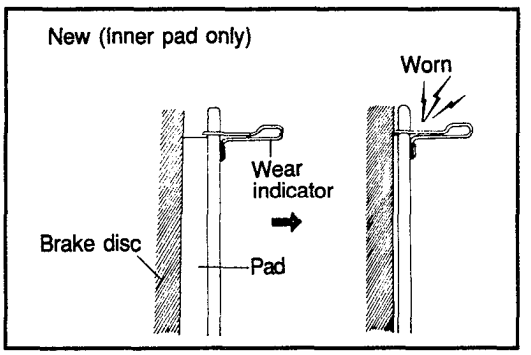
COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

REPLACEMENT OF BRAKE PADS

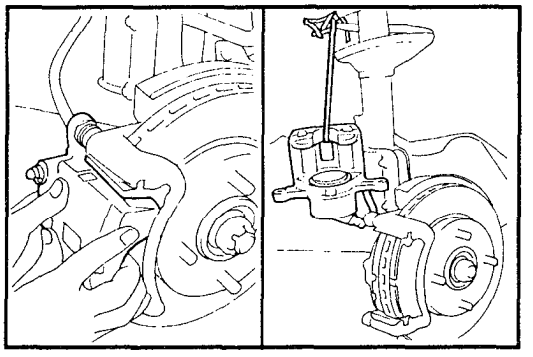
The brake pads have wear indicators that contact the brake disc when the brake pad thickness becomes 2 mm (0.08 in.). The wear indicators will generate a squealing sound to warn the driver.



Removal

1. Remove the lower bolt and lift the caliper assembly up **and** out of the way. Secure it with wire or some other retaining method.
2. Remove the pads.

CAUTION
Do not depress the brake pedal while disassembling the pads.



Inspection

1. Check the pads for wear or oil contamination and replace, if necessary.

NOTE
The pads for the right and left wheels should be replaced at the same time. Never "split" or intermix brake pad sets. All four pads must be replaced as a complete set.

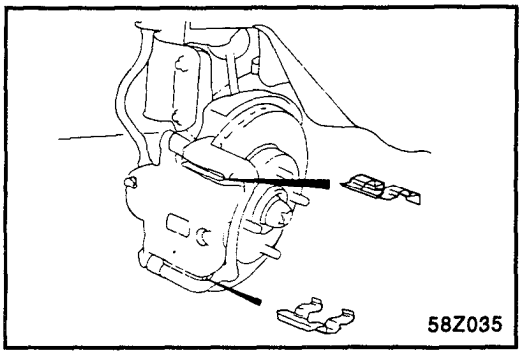
	Standard value	Service limit
Pad thickness mm (in.)	11(0.433)	2.0 (0.079)

2. Check the shims for damage or deformation.

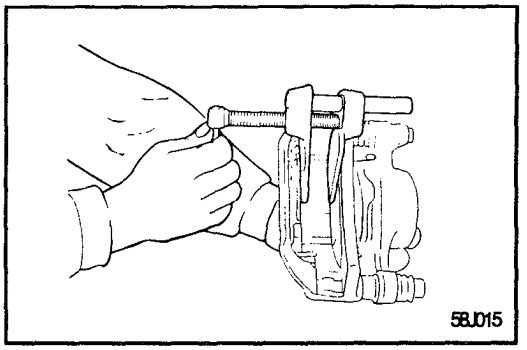
Installation

1. Install the pad clips.
2. Install the pads onto each pad clip.

NOTE
Position the pad with its wear indicator toward the disc side and facing upward.

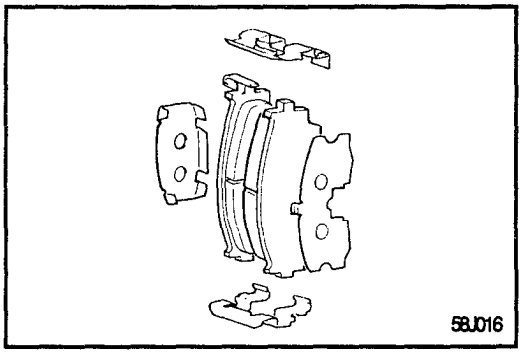


3. Seat the piston in the cylinder using special tool.



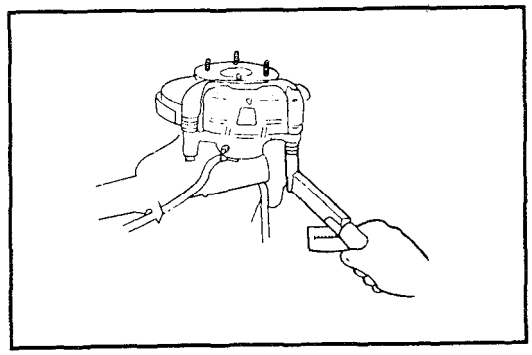
4. Install the new pads. The shims are attached to the each pad as illustrated.

NOTE
Never apply grease to the disc or pads.



5. Install the bolt and tighten to the specified value.

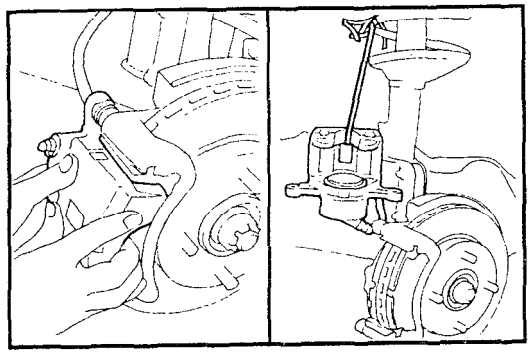
Tightening torque .....
22-32 Nm (220-320 kg.cm, 16-24 lb.ft)



CALIPER ASSEMBLY

Removal

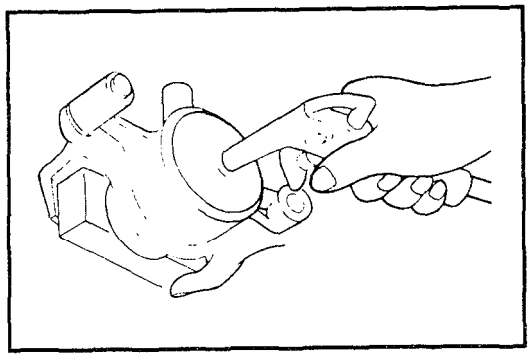
1. Remove the wheel and tire.
2. Disconnect the brake hose.
3. Remove the pads.
4. Remove the sleeve.
5. Remove the pin boot and sleeve boot.
6. Remove the caliper assembly.



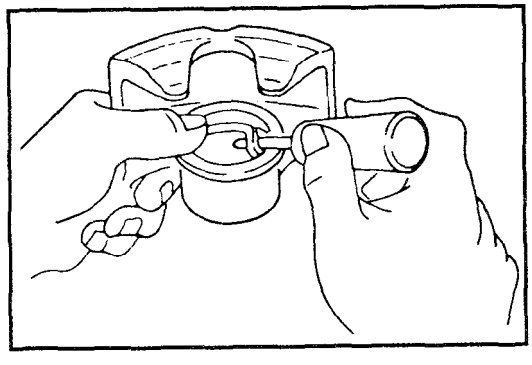
Disassembly

1. Remove the piston boot.
2. Remove the piston using compressed air.

CAUTION
1) Do not place fingers in front of the piston when using compressed air.
2) Be careful not to splatter the brake fluid.



3. Remove the piston seal from the caliper using a screw driver.



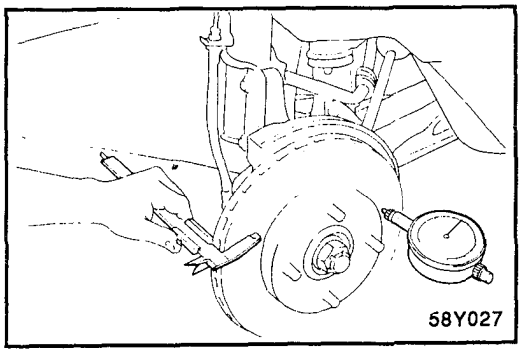
Inspection

1. Check the caliper for wear, damage, cracks and rust.
2. Check the piston for rust, damage, cracks and wear on the outer surface.
3. Check the sleeve and pin for damage and rust.
4. Check the pad spring and boots for damage.
5. Check the carrier for damage, rust, wear and cracks.

NOTE
1) Do not use sand paper on the piston surface.
2) All rubber parts must be replaced with new ones.

6. Inspect the disc using a caliper and dial gauge.

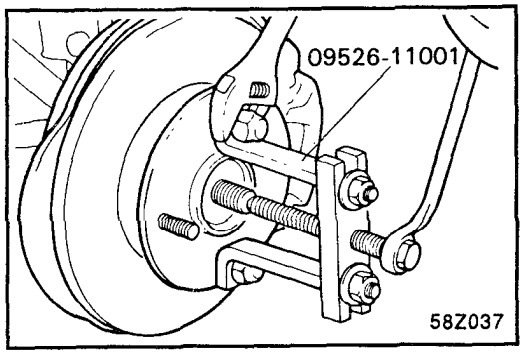
	Standard value	Service limit
Thickness of disc mm (in.)	22 (0.876)	20 (0.797)
Runout of disc mm (in.)		0.15 (0.006)



7. If necessary, replace the brake disc.
   1) Remove the torque plate from the knuckle and suspend it with a wire.
   2) Using special tool, disconnect the driveshaft from the hub, and remove the brake disc and hub.
   3) Install the brake disc and hub assembly to the axle shaft.
   4) Install the axle nut and washer, then tighten the axle nut.

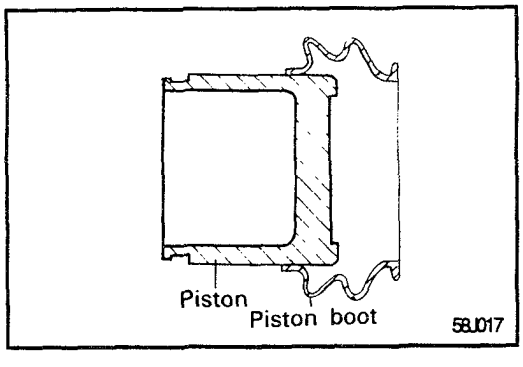
   Tightening torque .....
   200-260 Nm (2000-2600 kg.cm, 145-188 lb.ft)

   5) Install the torque plate onto the knuckle.

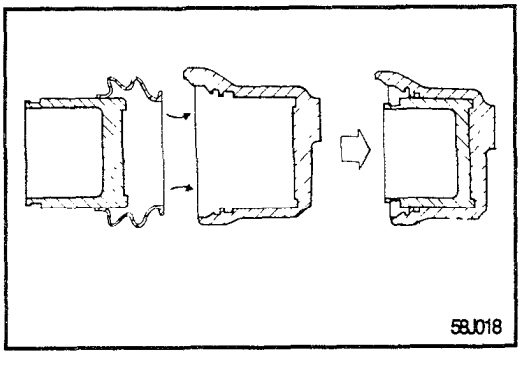


Assembly

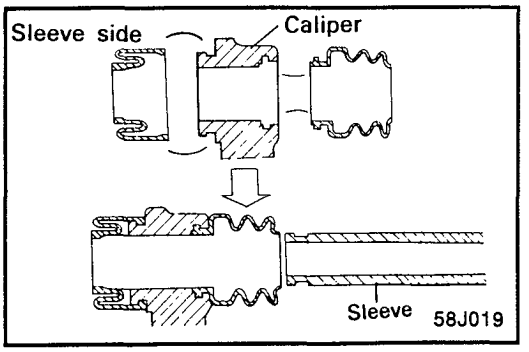
1. Clean all components with isopropyl alcohol except the pads and shim.
2. Apply rubber grease to the piston seal and install the piston seal in the cylinder.

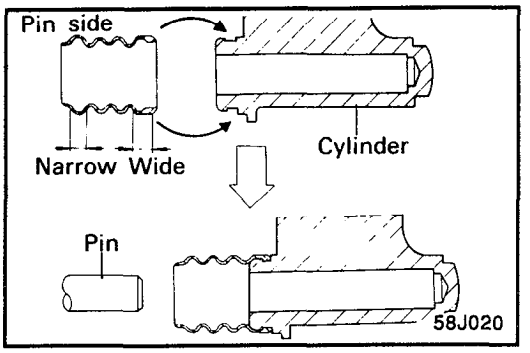


3. Assemble the piston and piston boots according to the following procedure.
   1) Apply rubber grease to the caliper bore, outside surface of the piston and piston boot.
   2) Install the piston boot on the piston as illustrated.
   3) Insert the piston boot in the inner groove of caliper and slide the piston into the caliper.



4. Assemble the sliding parts according to the following procedure.
   1) Apply rubber grease to the outside surface of the sleeve and pin, pin and sleeve bore of the caliper, pin boot and sleeve boot.
   2) Insert the boots into the groove of the caliper.





5. Install the pads.

NOTE
Do not apply grease to the disc or pads.

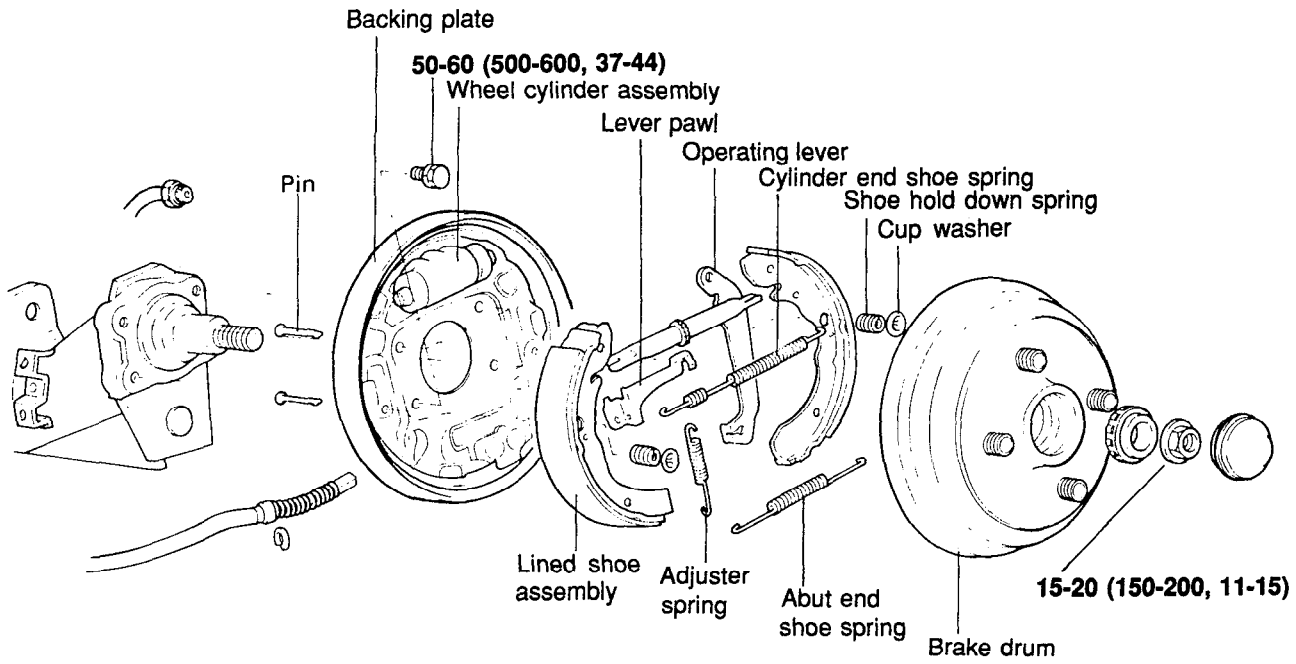
6. Tighten the brake hose connecting bolt.

Tightening torque	Nm (kg.cm, lb.ft)
Sliding pin	35-45 (350-450, 26-33)
Sliding bolt	22-32 (220-320, 16-24)
Carrier mounting bolt	69-85 (690-850, 44-63)
Brake hose mounting oil bolt	25-30 (250-300, 18-22)

NOTE
1) Check that the surfaces of the pin and bolts are not damaged before tightening.
2) Bleed the system.
Depress the pedal several times and check for fluid leakage from all connecting parts.

REAR DRUM BRAKE

COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Removing the wheel and tire, then remove brake drum.
2. After removing the nut, remove the rear hub with the brake drum.

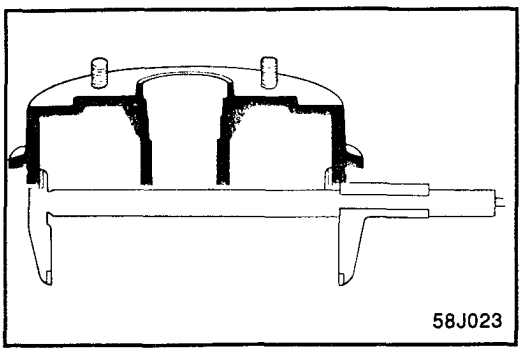
3. Remove the abut end shoe spring, shoe hold down spring.
4. Remove the shoes and adjuster as an assembly.

INSPECTION

1. Measure the brake drum inside diameter.
   Check the runout of the brake drum using a dial indicator.

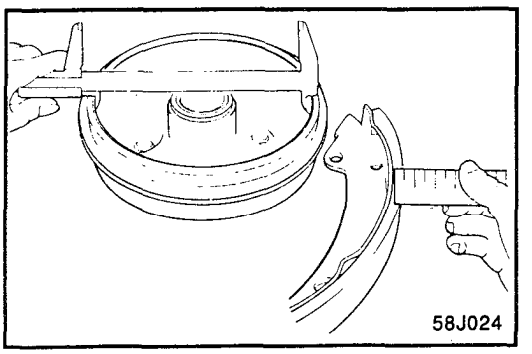
mm (in.)

	Standard value	Service limit
Inside diameter	203.2 (8)	205.2 (8.079)
Out-of-rounded of brake drum		0.015 (0.0006)

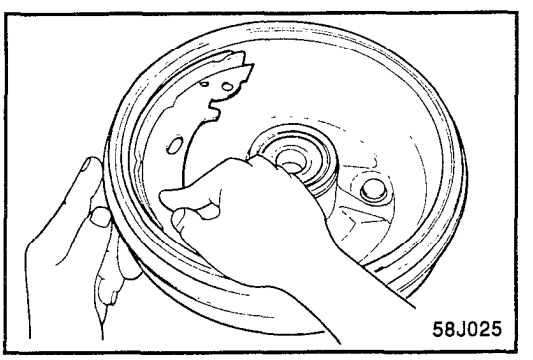


2. Measure the brake shoe lining thickness.

	Standard value	Service limit
Lining thickness mm (in.)	4.05 mm (0.159 in.)	1.5 (0.059)



3. Inspect the brake lining and drum for proper contact.
4. Inspect the wheel cylinder outside for excessive corrosion and damage.
5. Inspect the backing plate for wear or damage.

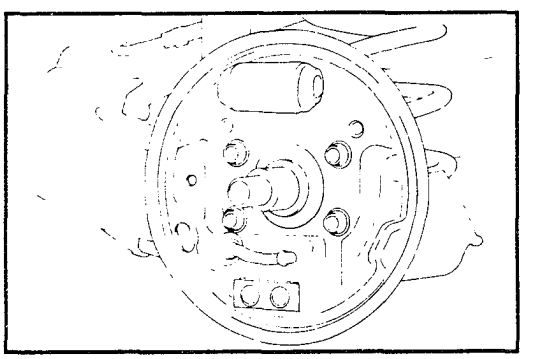


INSTALLATION

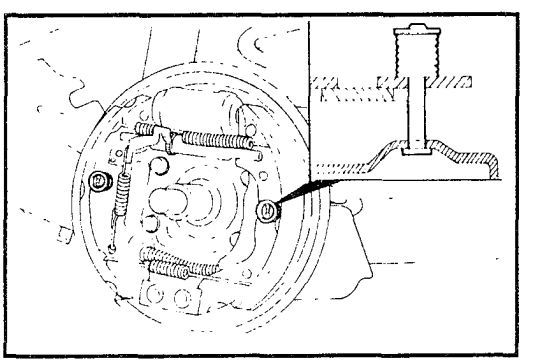
1. Apply a specified grease to the locations indicated in the illustration and to each component.

   o Shoe and backing plate contact surfaces
   o Shoe and anchor plate contact surfaces

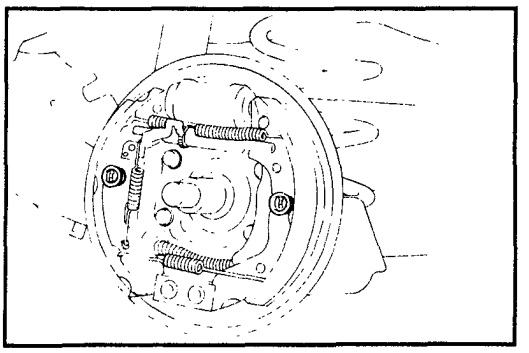
Recommended grease .....
Multipurpose grease SAE 3310, NLGI No.2



2. Install the shoe hold down pin.

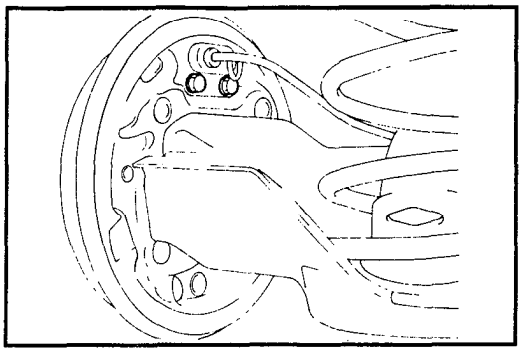


3. Assemble the return spring with the push rod shortened.
4. After assembling the drum components, pull the parking brake lever all the way up several times.

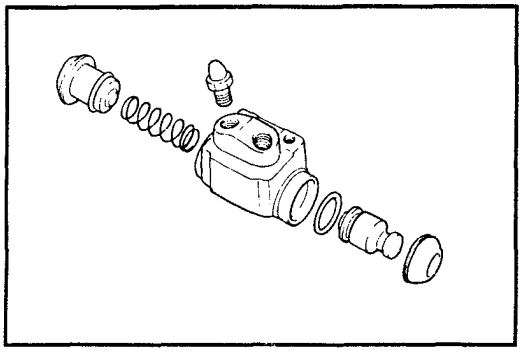


WHEEL CYLINDER REPLACEMENT

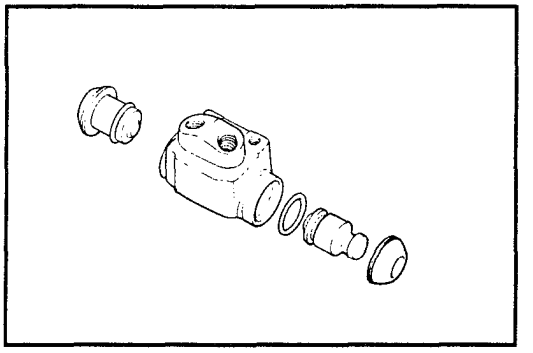
1. Remove the brake shoe.
2. Disconnect the brake tube.
3. Remove the wheel cylinder assembly.



4. Remove the duct boot.
5. Remove the piston and piston cup.
6. Drive out the return spring.



7. Before assembling the wheel cylinder, inspect the following points.
   1) Check the cylinder and piston for wear, damage and rust.
   2) Check the cylinder body for damage and cracks.
   3) Check the contact surface of the piston and shoes for wear.
   4) Check the piston spring for looseness.
8. Assembly is the reverse of the removal procedure.



NOTE

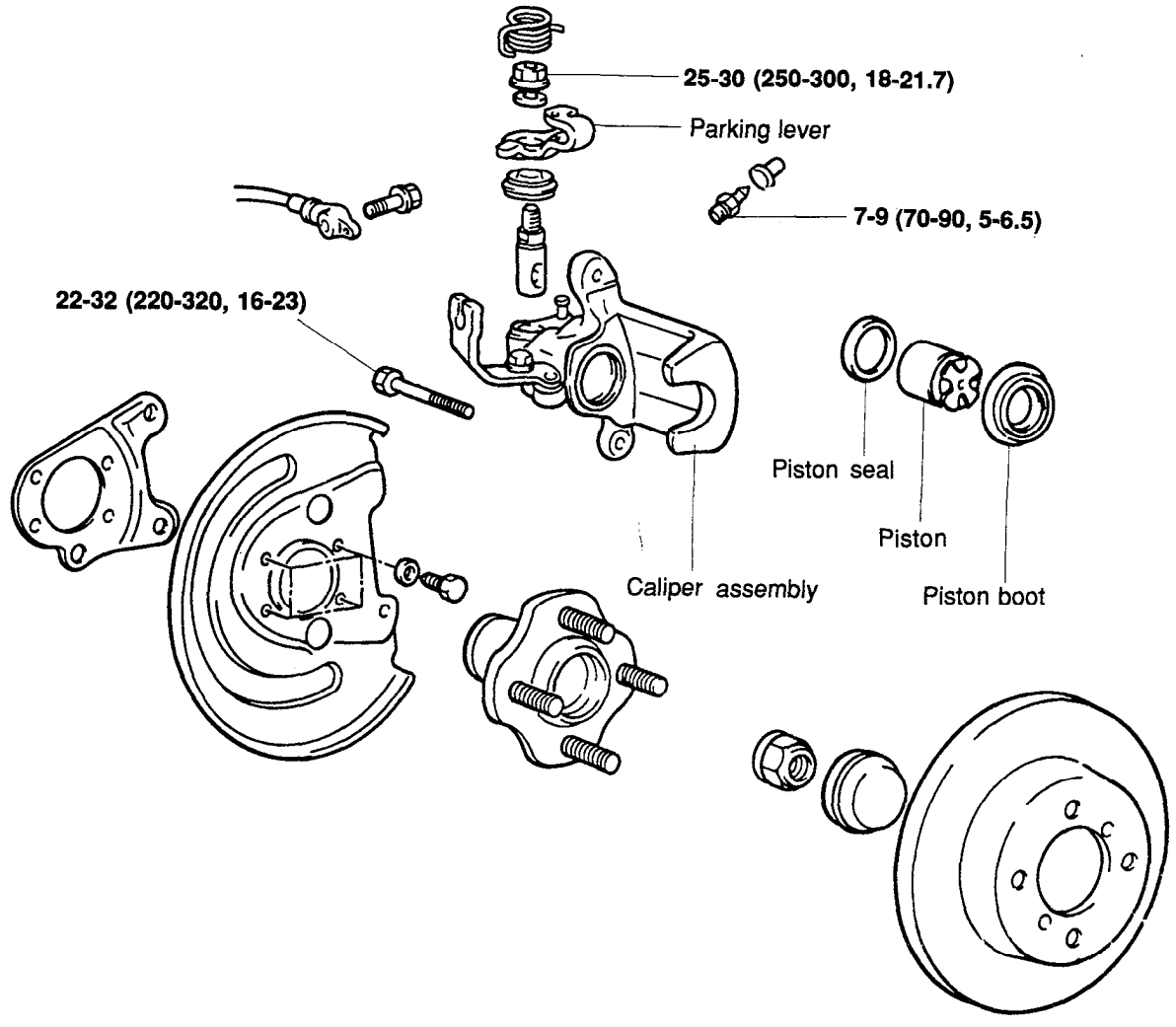
1) Clean the cylinder and inner part with isopropyl alcohol before assembly.
2) Apply enough brake fluid to piston cups and cylinder.
3) Be sure to use new piston cups and dust boots.

NOTE

Be careful not to lose the steel ball in the bleeder.

REAR DISC BRAKE

COMPONENTS



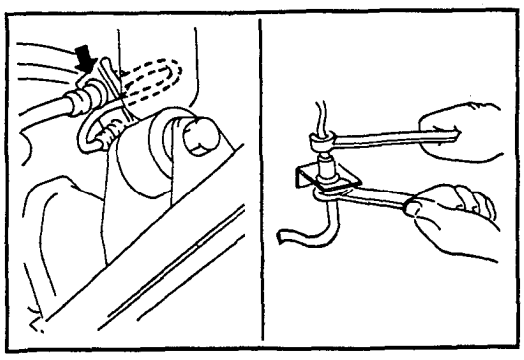
DISC BRAKE PAD

REMOVAL

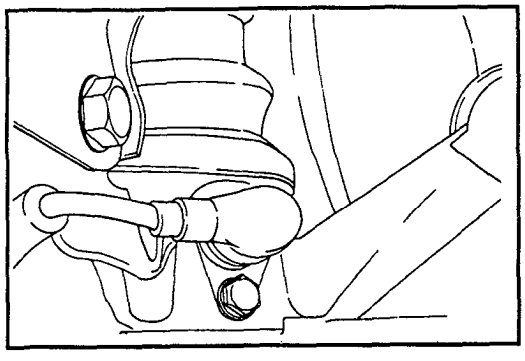
1. Remove the wheel
2. Remove the screw which holds the trailing shoe key onto the anchor plate.
3. Release the parking cable adjusting nut.
4. Remove the parking cable.

5. Remove the brake fluid hose.
6. Remove the caliper assembly

NOTE
Support the caliper with a wire or some other means to prevent damage to the brake hose.



7. Remove the ABS wheel speed sensor.



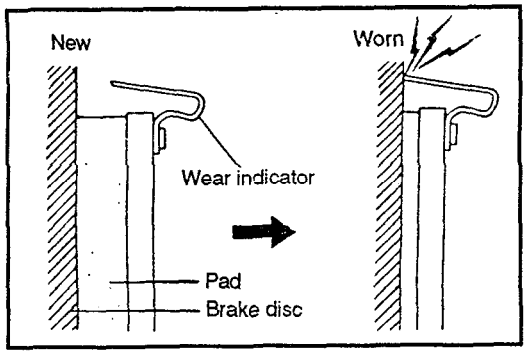
8. Remove the wheel bearing nut
9. Remove the wheel hub and dust cover.

INSPECTION

1. Check the pads for wear or oil contamination and replace if necessary.

NOTE
The pads for the right and left wheels should be replaced at the same time

Pad thickness wear limit 0.8 mm



2. Check the leading and trailing shoe keys and retaining screw for damage, or wear. Replace the keys and retaining screw at the same time the pads are replaced.
3. Check for worn or damaged dust boots if dust or mud has entered the caliper assembly through this seal, the caliper assembly must be replaced or rebuilt.

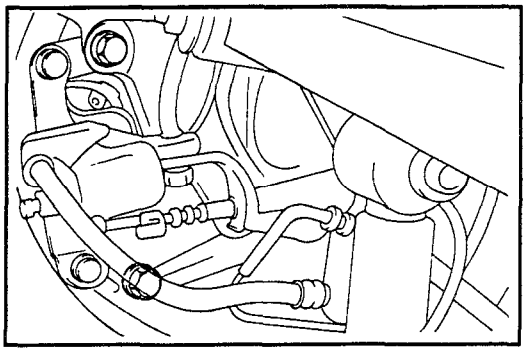
INSTALLATION

1. Before replacing the brake pads, *remove* brake fluid from the master cylinder reservoir until it is half full.

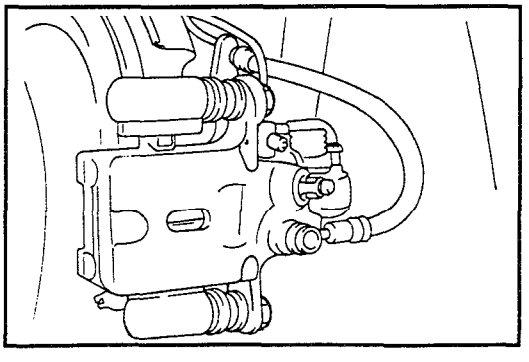
CALIPER

Disassembly

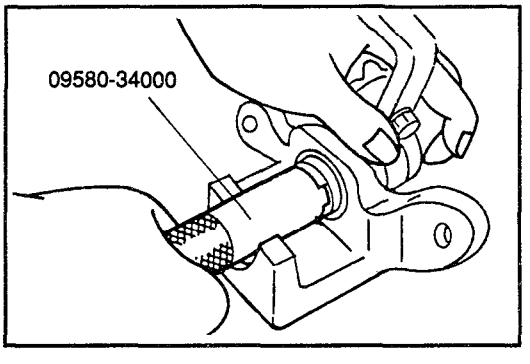
1. Remove the caliper mounting bolts, and remove the caliper assy.



2. Remove the carrier bolt, and remove the carrier with brake pad.

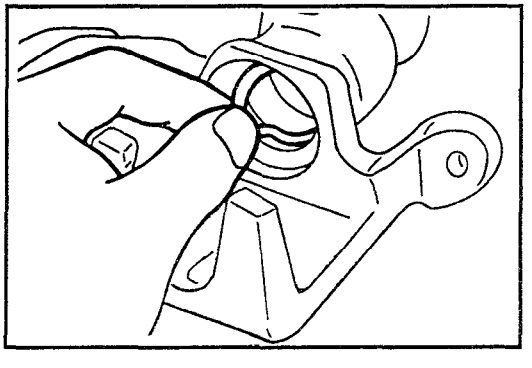


3. Remove the piston boot.
4. Remove the piston assy with special tool to twist the piston out of the caliper body.



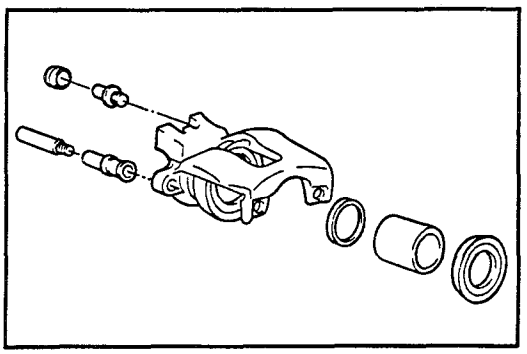
5. Remove piston seal with finger tip.

CAUTION
Do not use sharpened tools to prevent damage to inner cylinder.



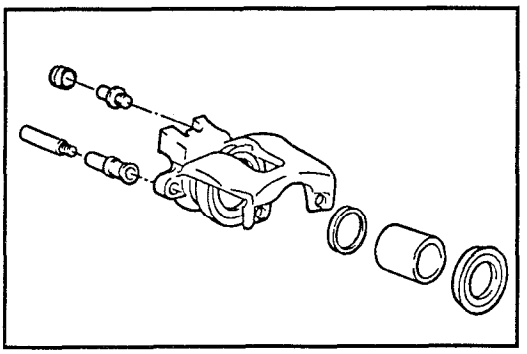
Assembly

1. Check for worn, damaged, or rusted piston bore and piston. Replace the damaged parts if necessary.
2. Check for damaged piston seal, boot, and pin insulators.

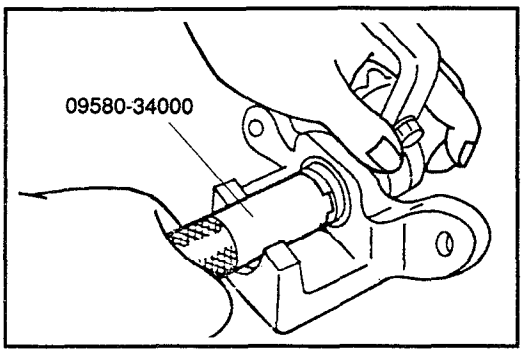


3. Apply a recommended lubricant to the fallowing parts

Parts	Recommended lubricant	Quantity
Piston seal	Brake fluid (Dot 3)	As required
Cylinder inner side	Brake fluid (Dot 3)	As required
Piston boot	Brake fluid (Dot 3)	As required
Piston outer surface	Brake fluid (Dot 3)	As required
Guide-rod insulators	Rubber grease	As required

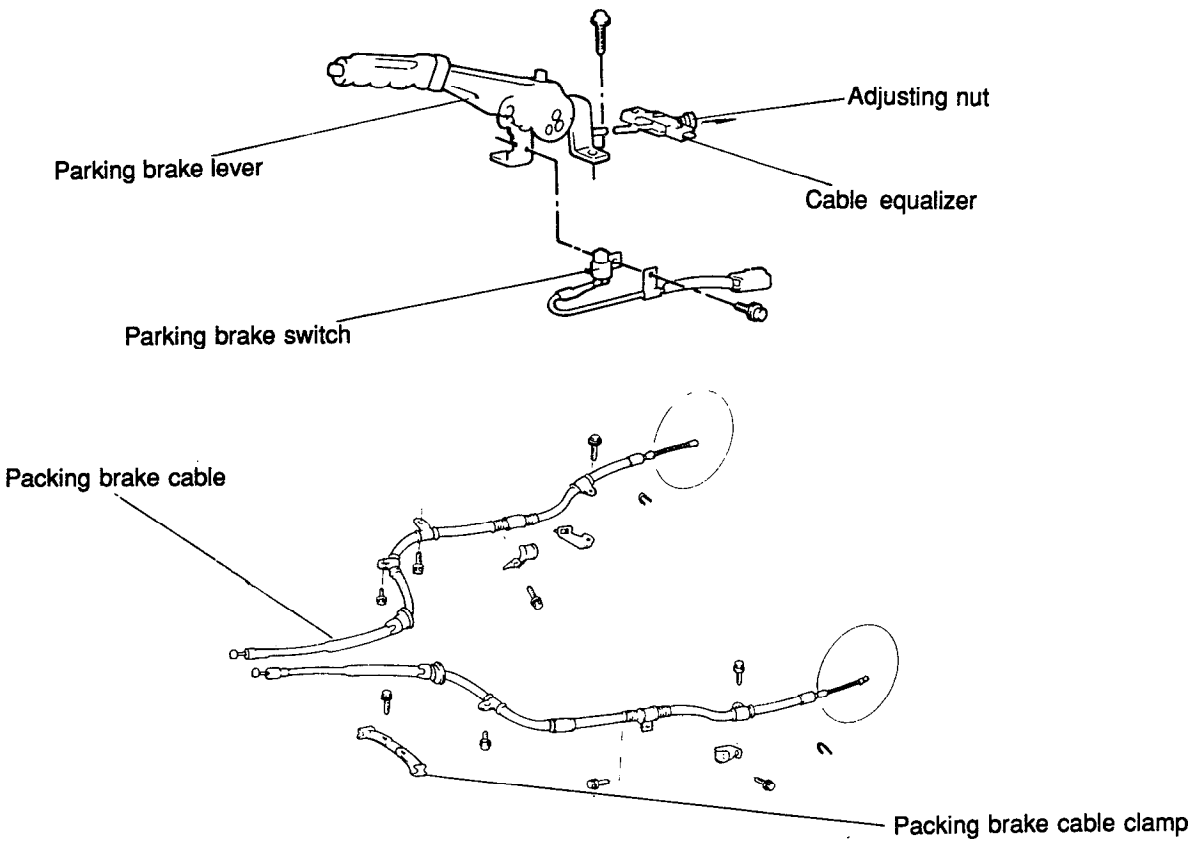


4. Push the piston into the caliper with special tool.



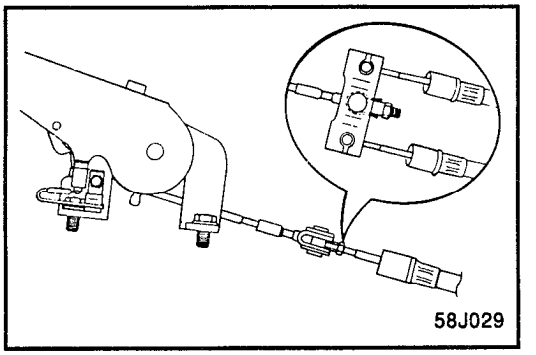
PARKING BRAKE

COMPONENTS

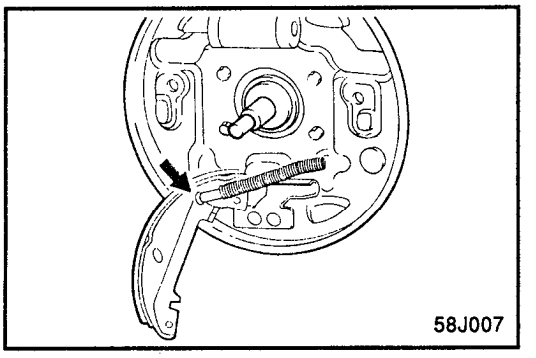


REMOVAL

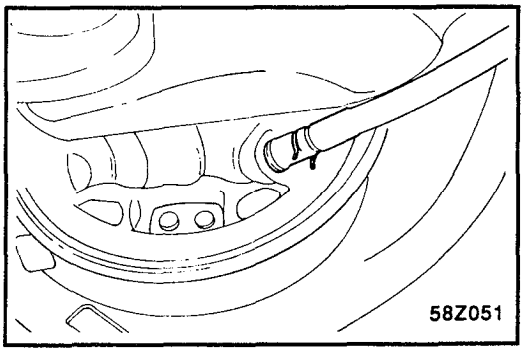
1. Remove the rear console.
2. Loosen the adjusting nut and detach the parking brake cable.
3. Detach the parking brake switch assembly.
4. Remove the parking brake lever assembly.



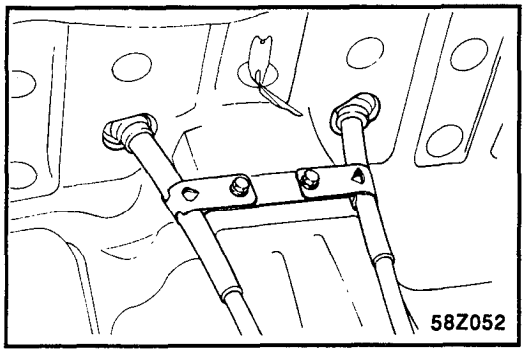
5. Remove the wheel and tire.
6. Remove the brake drum.
7. Remove the brake shoes as outlined before.
8. Detach the parking brake cable from the parking lever.



7. Remove the parking brake cable retaining ring in the rear of the backing plate.



8. Remove the rear seat cushion assembly and roll up the carpet.
9. Loosen the parking brake cable clamp and remove the parking brake cable assembly.

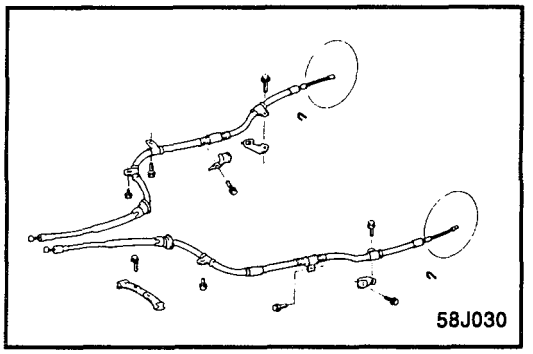


INSPECTION

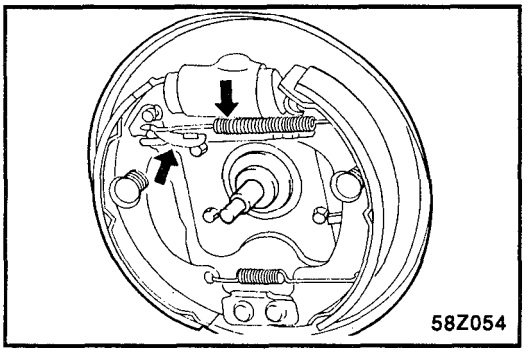
1. Check the parking brake switch operation.
2. Check the parking brake lever ratchet for wear.
3. Check the parking brake cable for fraying or damage.

INSTALLATION

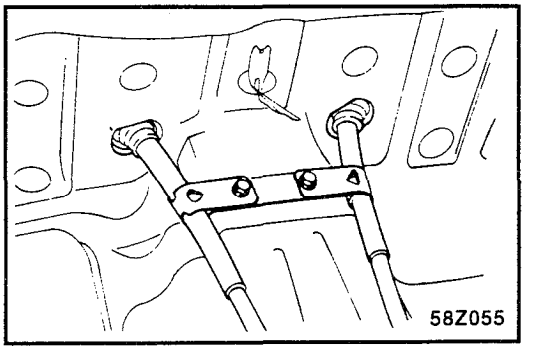
1. Check the parking brake cables for left and right identification marks and install accordingly.



2. Move the adjuster lever all the way back when installing the shoe-to-shoe spring.



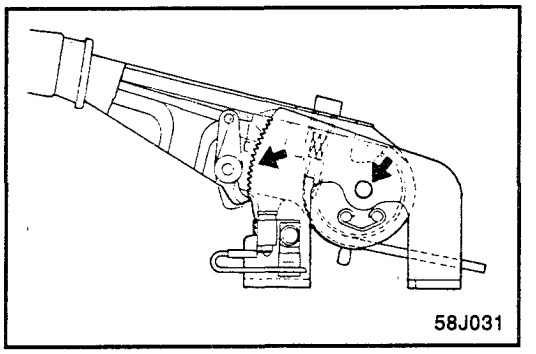
3. Install the grommets in the direction shown in the illustration.



4. Apply a coating of the specified grease to the sliding parts of the ratchet plate and ratchet pawl.

Specified grease	Multipurpose grease SAE J310, NLGI No. 2

5. After installing the cable adjuster, adjust the parking brake lever stroke.



CLUTCH SYSTEM

Return To Main Table of Contents

CLUTCH 2
CLUTCH PEDAL 8
CLUTCH CONTROL 10
CLUTCH MASTER CYLINDER 13
CLUTCH RELEASE CYLINDER 15
CLUTCH COVER AND DISC 17

GENERAL

SPECIFICATIONS

Clutch operating method	Hydraulic type
Clutch disc	
Type	Single dry with diaphragm.
Facing diameter (Outside x Inside)mm (in.)	215x140(8.5x5.9)
Clutch cover assembly	
Type	Diaphragm spring strap
Setting load N (lb)	36804320 (827-971)
Clutch release cylinder	
I.D.mm (in.)	20.64(0.81)
Clutch master cylinder	
I.D.mm (in)	15.87(0.62)

* I.D. : Inside Diameter

SERVICE STANDARD

Standard value	
Clutch disc thickness	8.6±0.5mm (0.33±0.1 in.)
Clutch pedal height	182 mm (7.0 in.) : For 1.6 DOHC 189 mm (7.4 in.) : For 1.8 DOHC
Clutch pedal free play	6-13 mm (0.24-0.51 in.)
Clutch pedal to floorboard clearance (when the clutch is disengaged)	70 mm (2.8 in.)
Clutch pedal stroke	145 mm (5.7 in.) : For 1.6 DOHC 155 mm (6.1 in.) : For 1.8 DOHC
Limit	
Clutch disc rivet sink	0.3 mm (0.012in.)
Diaphragm spring end height difference	0.5 mm (0.02 in.)

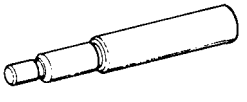
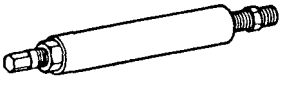
TIGHTENING TORQUE

	Nm	kg.cm	lb.ft
Clutch pedal to pedal support member (clutch pedal bracket)	1428	190-280	14-20
Clutch pedal support member	17-21	170-210	12-15
Ignition lock switch	19-28	190-280	14-20
Clutch master cylinder to firewall	9-14	90-140	7-10
Clutch tube flare nut	13-17	130-170	9-12
Clutch tube bracket	4-6	40-60	3-4
Reservoir band	5-7	50-70	4-5
Clutch release cylinder mounting bolt	20-27	200-270	14-20
Clutch release cylinder to union bolt	20-25	200-250	14-18
Clutch cover assembly	15-22	150-220	11-16
Clutch master cylinder push rod lock nut	10-15	100-150	7-11

LUBRICANTS

Items	Specified lubricants	Quantity
Contact surface of release bearing and fulcrum of clutch release fork	MOLYWHITE TA NO.2	As required
Inner surface of clutch release bearing	MOLYWHITE TA NO.2	As required
Inner surface of clutch release cylinder and outer circumference of piston and cup	Brake fluid DOT3	As required
Inner surface of clutch disc spline	MOLYWHITE TA NO.2	As required
Inner surface of clutch master cylinder and outer circumference of piston assembly	Brake fluid DOT3	As required
Clutch master cylinder push rod, clevis pin and washer	Wheel bearing grease SAE J310a, NLGI No.2	As required
Clutch pedal shaft and bushings	SAE J310a, Chassis grease (NLGI-0)	As required
Contact portion of release fork to release cylinder push rod	MOLYWHITE TA No.2	As required
Input shaft spline	MOLYWHITE TA No.2	As required

SPECIAL TOOLS

Tool (Number and name)	Illustration	Use
09411-11000 Clutch disc guide		Centering flywheel and clutch disc
09414-24000 Lock pin remover		Removal of lock pin

TROUBLESHOOTING

Symptom		Probable cause	Remedy
Clutch slipping o Car will not respond to engine speed during acceleration. o Insufficient car speed o Lack of power during Uphill driving		Insufficient pedal free play	Adjust
		Clogged hydraulic system	Correct or replace parts
		Excessive wear of clutch disc facing	Replace
		Hardened clutch disc facing, or oil on surface	Replace
		Damaged pressure plate or flywheel	Replace
Difficult gear shifting (gear noise during shifting)		Weak or broken pressure spring	Replace
		Excessive pedal free play	Adjust
		Hydraulic system fluid leaks, air trapping or clogging	Repair or replace parts
		Unusual wear or corrosion of clutch disc spling	Replace
		Excessive vibration (distortion) of clutch disc	Replace
Clutch noisy	When clutch is not used	Insufficient play of clutch pedal	Adjust
		Excessive wear of clutch disc facing	Replace
	A noise is heard after clutch is disengaged	Unusual wear and/or damage of release bearing	Replace
	A noise is heard when clutch is disengaged	Insufficient grease on the sliding surface of bearing sleeve	Repair
		Improperly installed clutch assembly or bearing	Repair
	A noise is heard when car is suddenly rolled of with clutch partially engaged	Damaged pilot bushing	Replace
Hard pedal effort		Insufficient lubrication of clutch pedal	Repair
		Insufficient lubrication of spline part of clutch disc	Repair
		Insufficient lubrication of clutch release lever shaft	Repair
		Insufficient lubrication of front bearing retainer	Repair

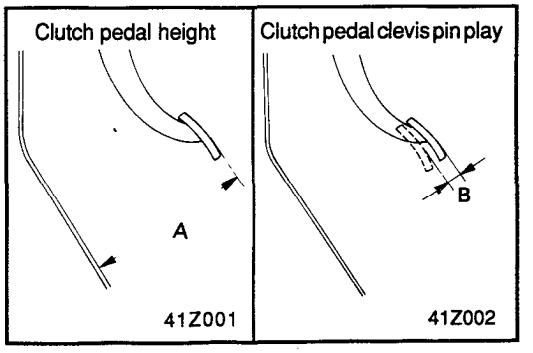
Symptom	Probable cause	Remedy
Hard to shift or will not shift	Clutch pedal free play excessive	Adjust pedal free play
	Clutch release cylinder faulty	Repair release cylinder
	Clutch disc out of true, runout is excessive or lining broken	Inspect clutch disc
	Spline on input shaft or clutch disc dirty or burred	Repair as necessary
	Clutch pressure plate faulty	Replace clutch cover
Clutch slips	Clutch pedal free play insufficient	Adjust pedal free play
	Clogged hydraulic system	Repair or replace pats
	Clutch disc lining oily or worn out	Inspect clutch disc
	Pressure plate faulty	Replace clutch cover
	Release fork binding	Inspect release fork
Clutch grabs/chatters	Clutch disc lining oily or worn out	Inspect clutch disc
	Pressure plate faulty	Replace clutch cover
	Clutch diaphragm spring bent	Replace clutch cover
	Worn or broken torsion spring	Replace clutch disc
	Engine mounts loose	Repair as necessary
Clutch noisy	Damaged clutch pedal bushing	Replace clutch pedal bushing
	Loose part inside housing	Repair as necessary
	Release bearing worn or dirty	Replace release bearing
	Release fork or linkage sticks	Repair as necessary

SERVICE ADJUSTMENT PROCEDURE

CLUTCH PEDAL INSPECTION AND ADJUSTMENT

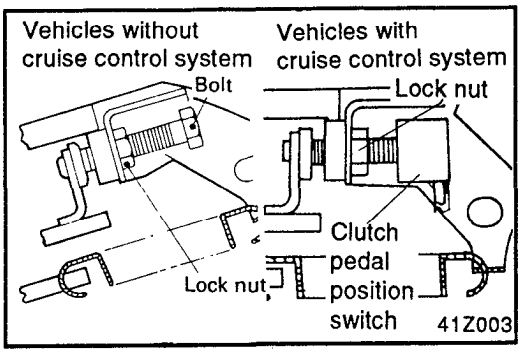
1. Measure the clutch pedal height (from the face of the pedal pad to the floorboard) and the clutch pedal clevis pin play (measured at the face of the pedal pad.)

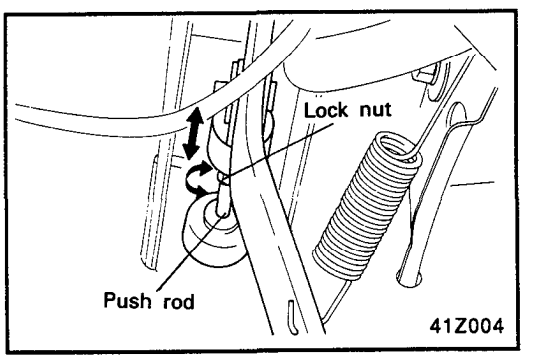
   Standard value : (A) 189 mm (7.4 in.) : For 1.8 DOHC
   182 mm (7.0 in.) : For 1.6 DOHC
   (6) 1-3 mm (0.04-0.12 in.)



2. If either the clutch pedal height or the clutch pedal clevis pin play are not within the standard value range, adjust as follows:
   1) For vehicles without cruise control system, turn and adjust the bolt so that the pedal height is the standard value, and then secure by tightening the lock nut.
   Vehicles with cruise control system, disconnect the clutch pedal position switch connector and turn the switch for standard clutch pedal height. Then lock with the lock nut.

   NOTE
   When the pedal height is lower than the standard value, loosen the bolt or clutch pedal position switch, and then turn the push rod to make the adjustment. After the adjustment, tighten the bolt or clutch pedal position switch until it reaches the pedal stopper, and then lock with the lock nut.



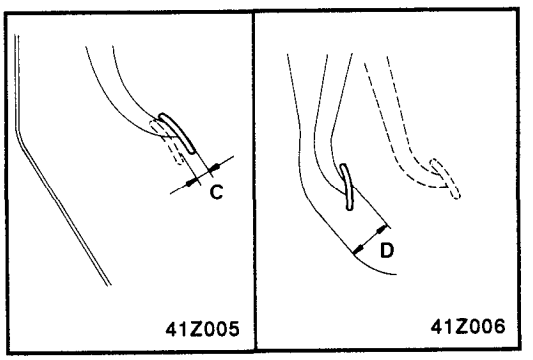


   2) Turn the push rod to adjust the clutch pedal clevis pin play to agree with the standard value and then secure the push rod with the lock nut.

   CAUTION
   When adjusting the clutch pedal height or the clutch pedal clevis pin play, be careful not to push the push rod toward the master cylinder.

3. After completing the adjustments, confirm that the clutch pedal free play (measured at the face of the pedal pad) and the distance between the clutch pedal (the face of the pedal pad) and the firewall when the clutch is disengaged are within the standard value ranges.

   Standard value : (C) 6-13 mm (0.2-0.5 in.)
   (D) 70 mm (2.8 in.)



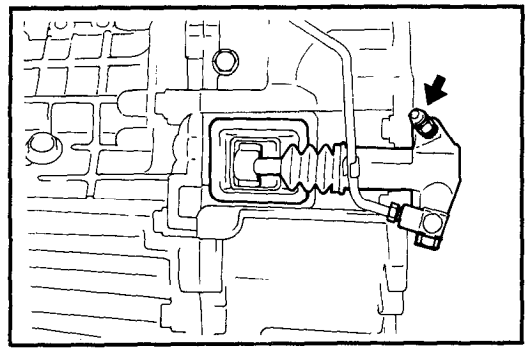
4. If the clutch pedal free play and the distance between the clutch pedal and the firewall when the cluch is disengaged do not agree with the standard values, after adjusting it is probably the result of either air in the hydraulic system or a faulty master cylinder or clutch. Bleed the air, or disassemble and inspect the master cylinder or clutch.

BLEEDING

Whenever the clutch tube, the clutch hose, and/or the clutch master cylinder have been removed, or if the clutch pedal is spongy, bleed the system.

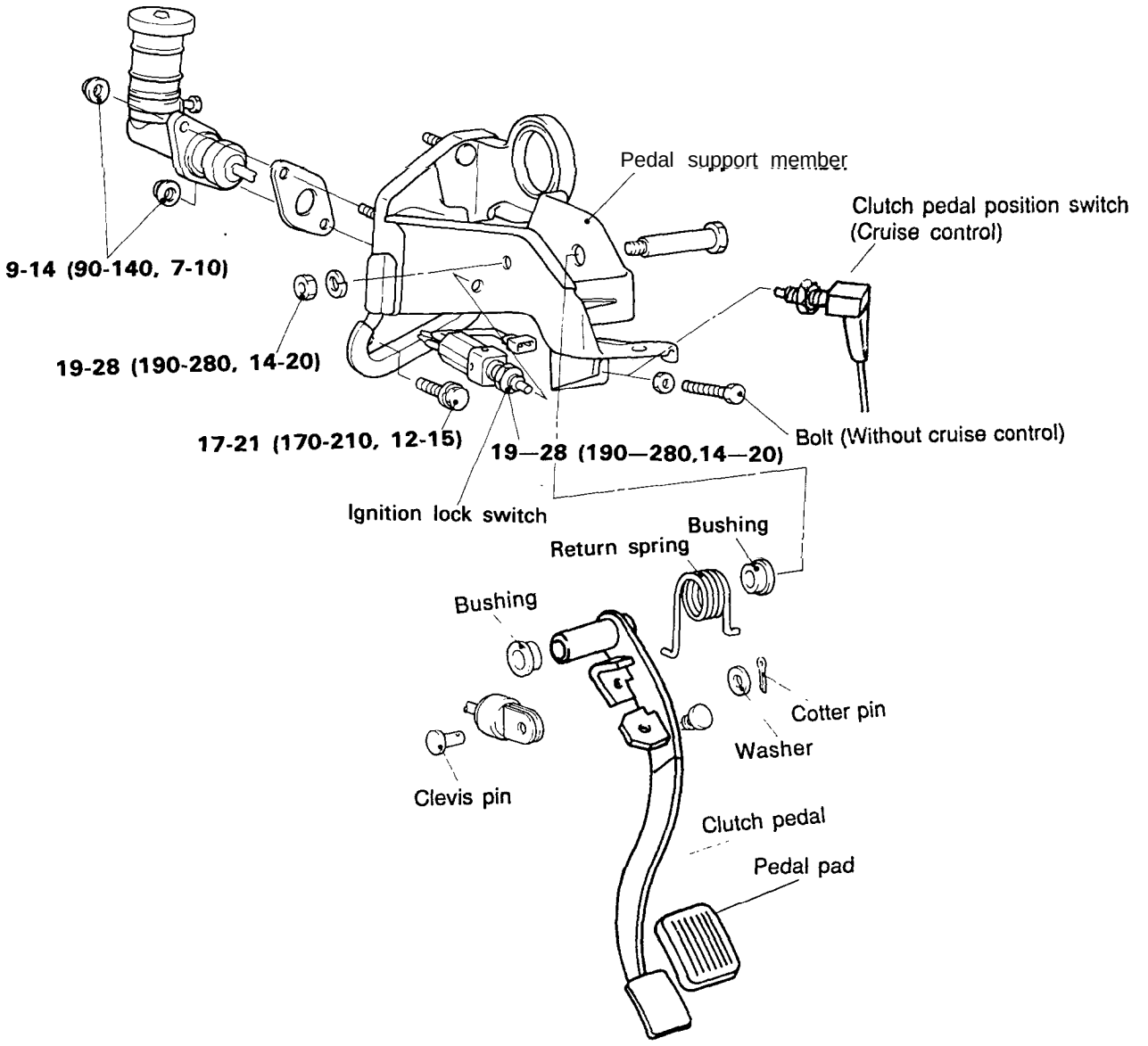
CAUTION
Use the specified brake fluid.

Specified brake fluid : DOT3



CLUTCH PEDAL

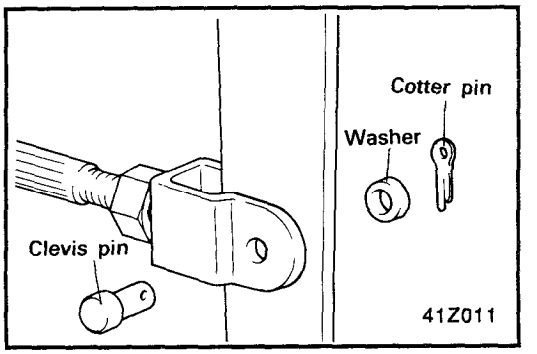
COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

Removal

1. Remove the cotter pin, washer and clevis pin.
2. Remove the clutch pedal mounting bolt.

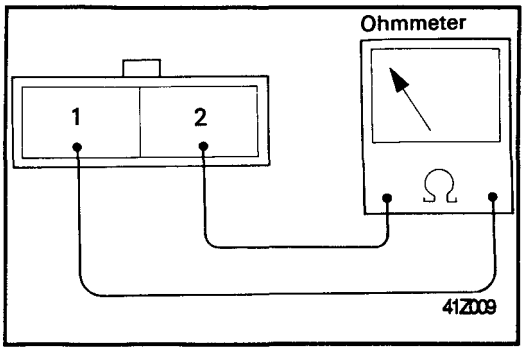


INSPECTION

1. Check the pedal shaft and bushing for wear.
2. Check the clutch pedal for bending or twisting.
3. Check the return spring for damage or deterioration.
4. Check the pedal pad for damage or wear.

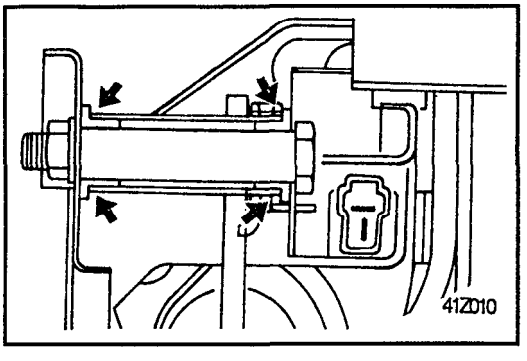
IGNITION LOCK SWITCH INSPECTION

1. Disconnect the connector
2. Check to be sure that there is continuity between connector terminals. (Refer to 27 GROUP Igition Lock system)

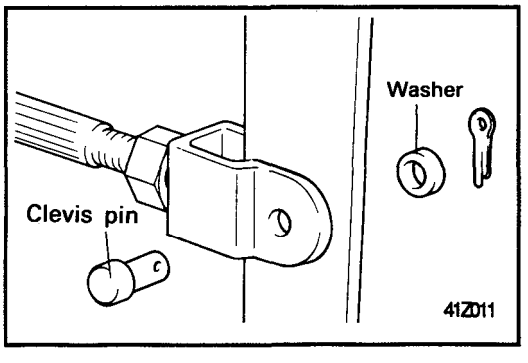


INSTALLATION

1. Installation is reverse of removal.
2. Apply multi-purpose grease to the bushings.

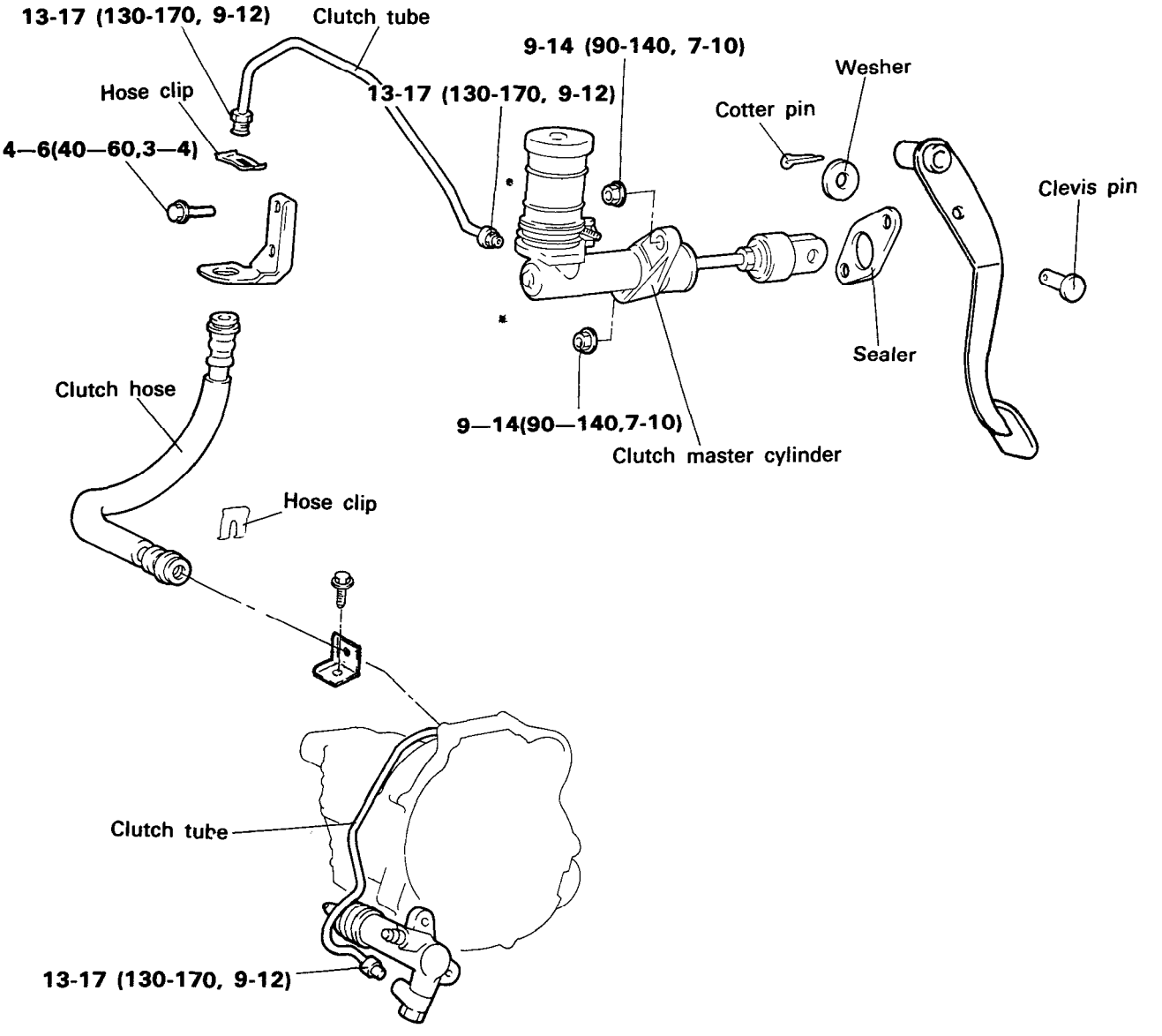


3. Apply multi-purpose grease to the clevis pin and washer.



CLUTCH CONTROL

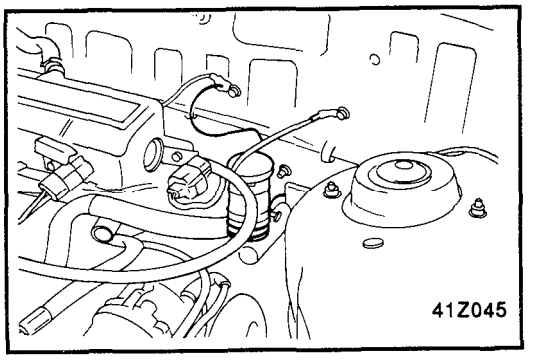
COMPONENTS



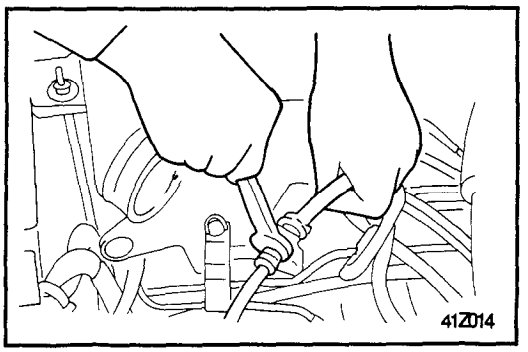
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

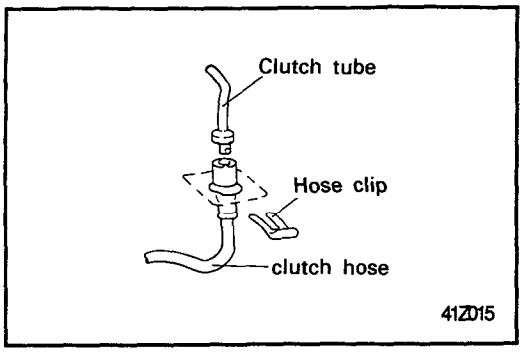
1. Drain the clutch fluid through the bleed plug.
2. Remove the clevis pin, washer and cotter pin.
3. Disconnect the clutch line (master cylinder side).
4. Remove the master cylinder mounting bolt.



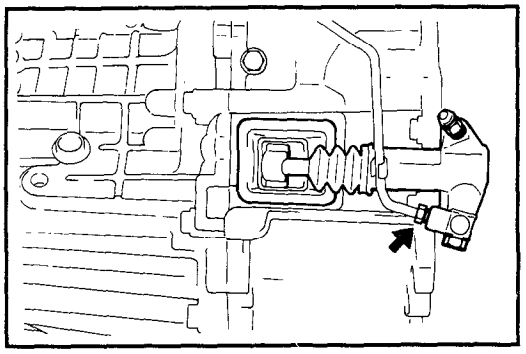
5. Remove the clutch line clips.
6. Hold the nut on the clutch hose and loosen the flare nut on the clutch line.



7. Remove the clip from the clutch hose and remove the hose from the bracket.
8. Remove the clutch line.



9. Disconnect the clutch line (release cylinder side).

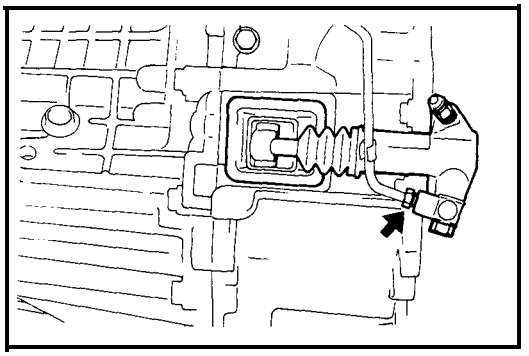


INSPECTION

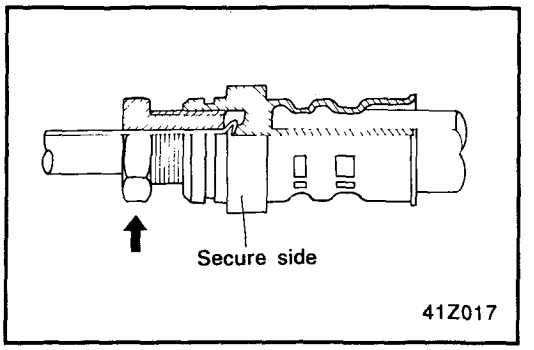
1. Check the clutch hose or lines for cracks or restrictions.

INSTALLATION

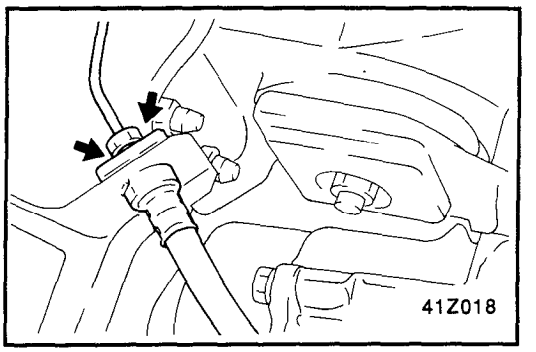
1. Connect the clutch line (release cylinder side).



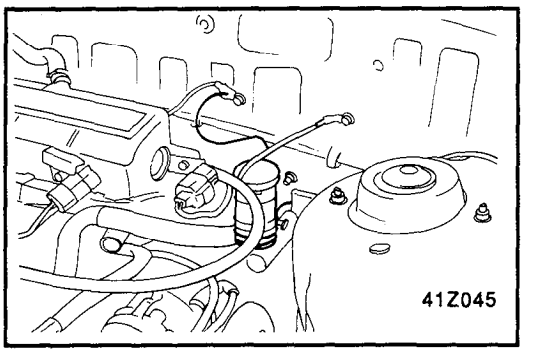
2. Temporarily tighten the flare nut by hand, then tighten it to the specified torque, being careful that the clutch hose does not become twisted.



3. Install the clutch line and clips.



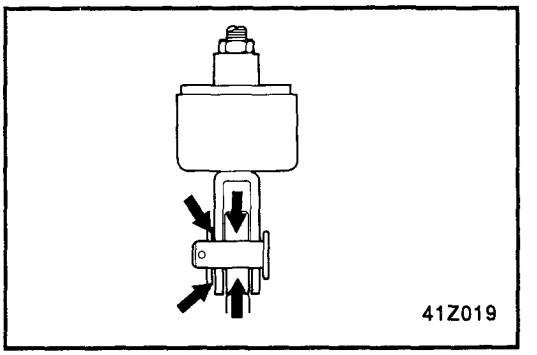
4. Install the master cylinder.



5. Apply the specified grease to the clevis pin and washer.

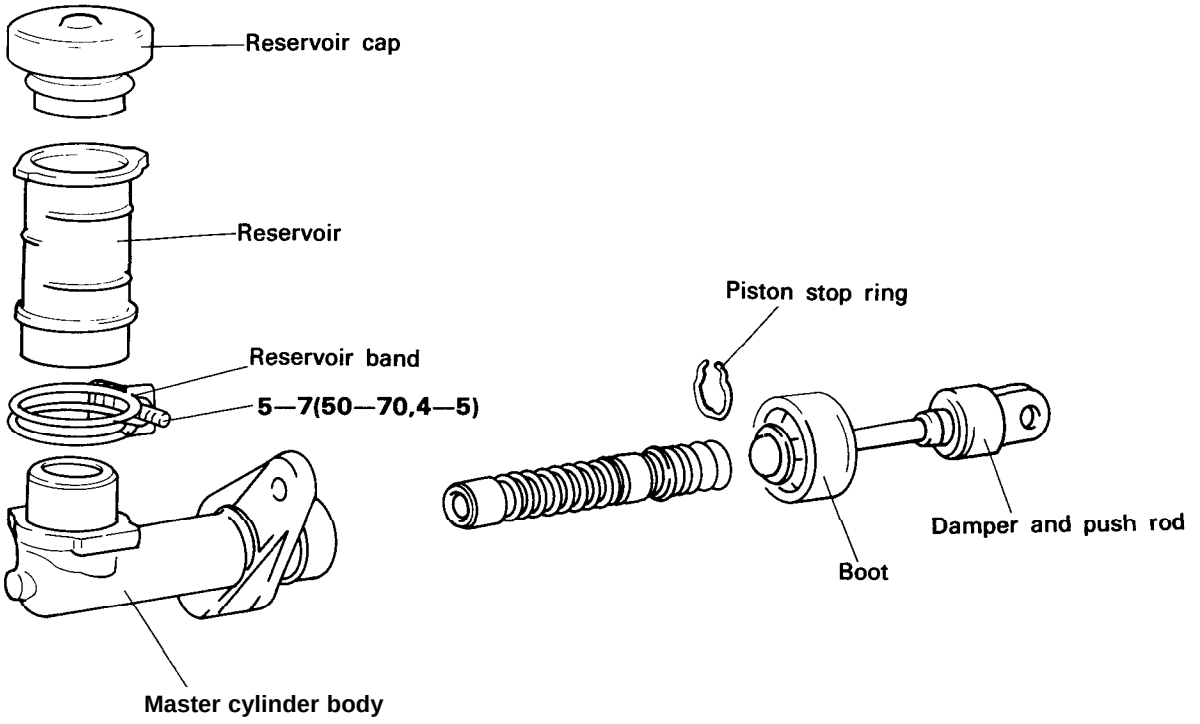
Specified grease : Wheel bearing grease SAE J310a, NLGI No.2

6. Install the push rod to the clutch pedal.
7. Refill the clutch master cylinder with fluid.
8. Bleed the system.



CLUTCH MASTER CYLINDER

COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

DISASSEMBLY

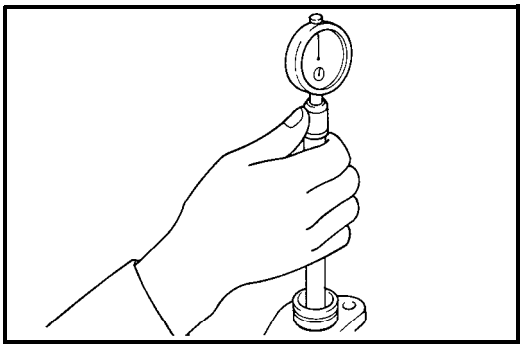
1. Remove the piston stop ring,
2. Pull out the push rod and piston.
3. Remove the reservoir band, reservoir cap and reservoir.

NOTE

1) Use care not to damage the master cylinder body and piston assembly.

2) Do not disassemble the piston assembly.

INSPECTION



1. Check the inside of cylinder body for rust pitting or scoring.
2. Check the piston cup for wear or deformation.
3. Check the piston for rust, pitting or scoring.
4. Measure the master cylinder inside diameter with a cylinder gauge and the piston outside diameter with a micrometer.

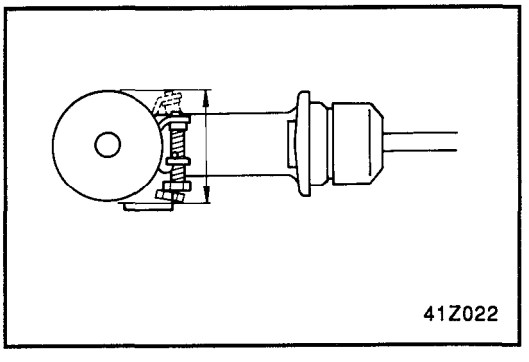
   NOTE
   Measure the inside diameter of the master cylinder at three places (bottom, middle, and top), in perpendicular directions.

5. If the master cylinder-to-piston clearance exceeds the limit, replace the master cylinder and/or piston assembly.

   Limit : 0.15 mm (0.006 in.)

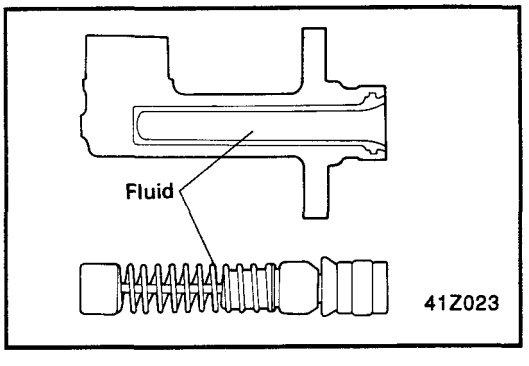
REASSEMBLY

1. After installing the reservoir to the master cylinder body, install the reservoir clamp within the range shown by the arrow in the illustration.



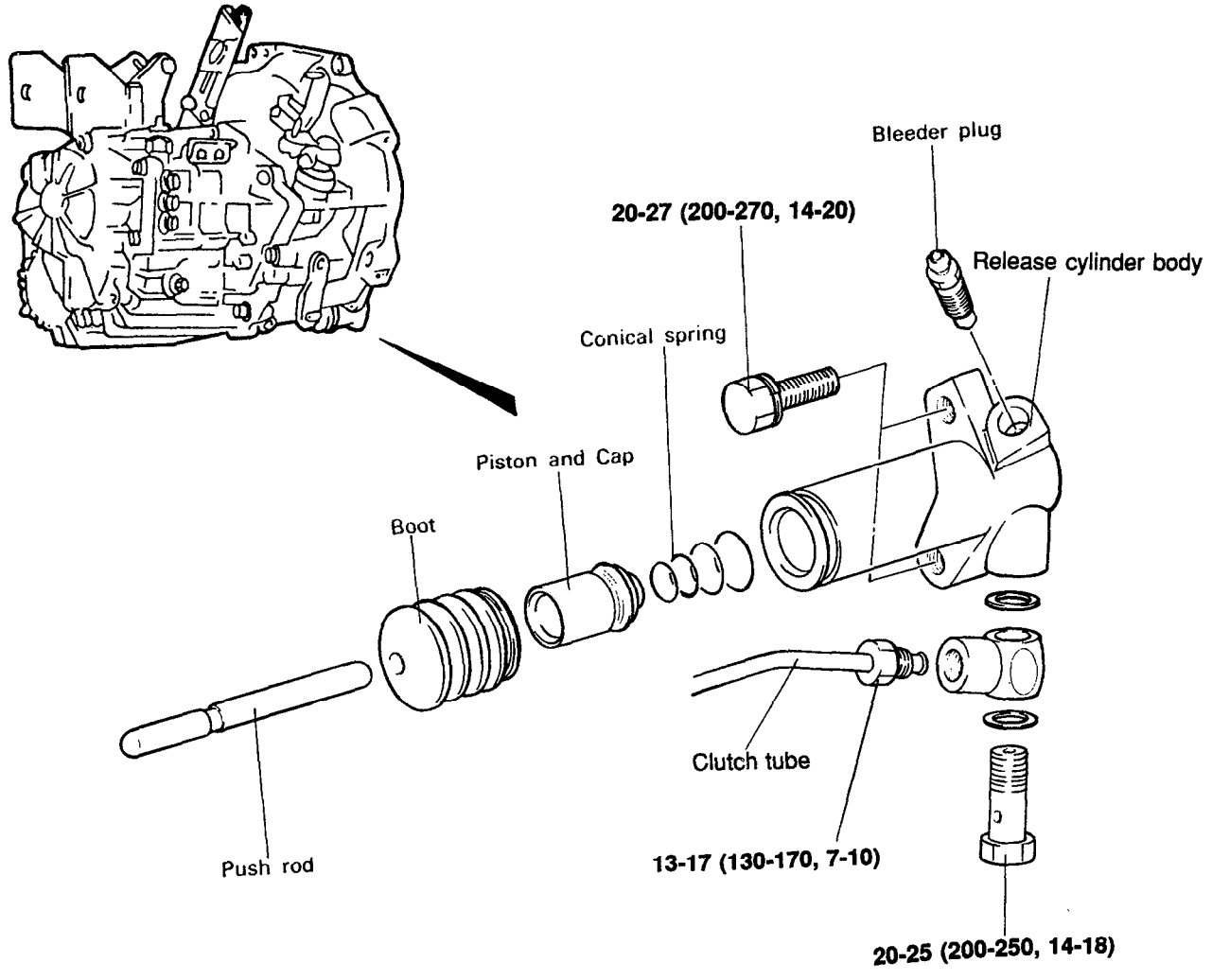
2 Apply the specified fluid to the inner surface of the cylinder body and to the outside of the piston assembly.

   Specified fluid : BRAKE FLUID DOT 3



CLUTCH RELEASE CYLINDER

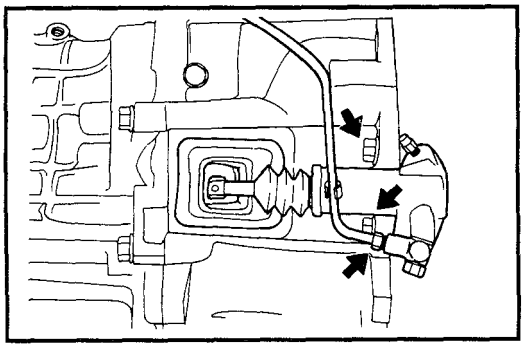
COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Disconnect the clutch line.
2. Remove the release cylinder mounting bolt.



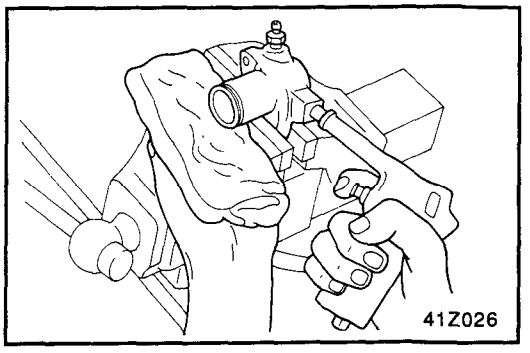
INSPECTION

1. Check the clutch release cylinder for fluid leakage.
2. Check the clutch release cylinder boots for damage.

DISASSEMBLY

1. Remove the valve plate, spring, push rod. boots.
2. Remove the piston from the release cylinder using compressed air.

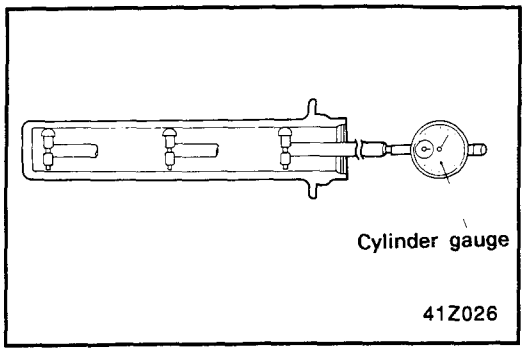
CAUTION
1) Cover with rags to prevent the piston from popping out.
2) Apply compressed air slowly to prevent brake fluid from splashing.



INSPECTION

1. Check the release cylinder bore for rust and damage.
2. Measure the release cylinder bore at three locations (bottom, middle and top) with a cylinder gauge and replace the release cylinder assembly if the clearance to the piston outside exceeds the limit.

Limit : 0.15 mm (0.006 in.)

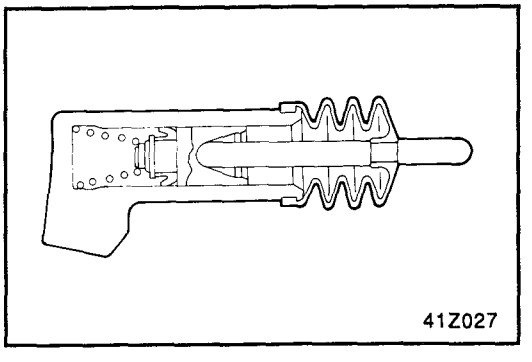


REASSEMBLY

1. Apply specified brake fluid to the release cylinder body inside and outer surface of the piston and piston cup and push the piston cup assembly in the cylinder.

Specified fluid : BRAKE FLUID DOT 3

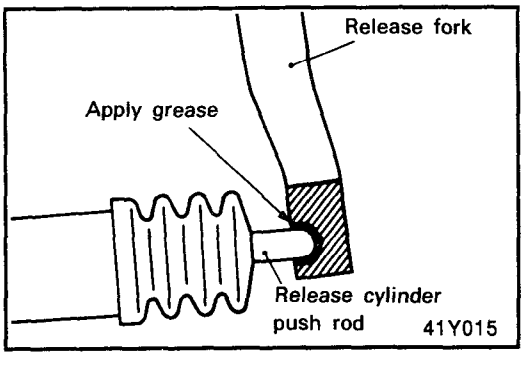
2. Install the valve plate, spring, union.



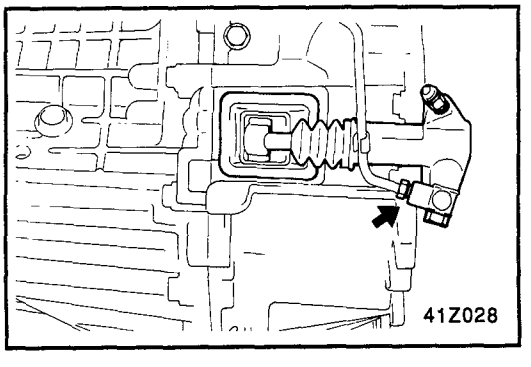
INSTALLATION

1. Apply a coating of the specified grease to the contact parts of the release fork and release cylinder push rod. (DOHC)

Specified grease : MOLYWHITE TA NO.2

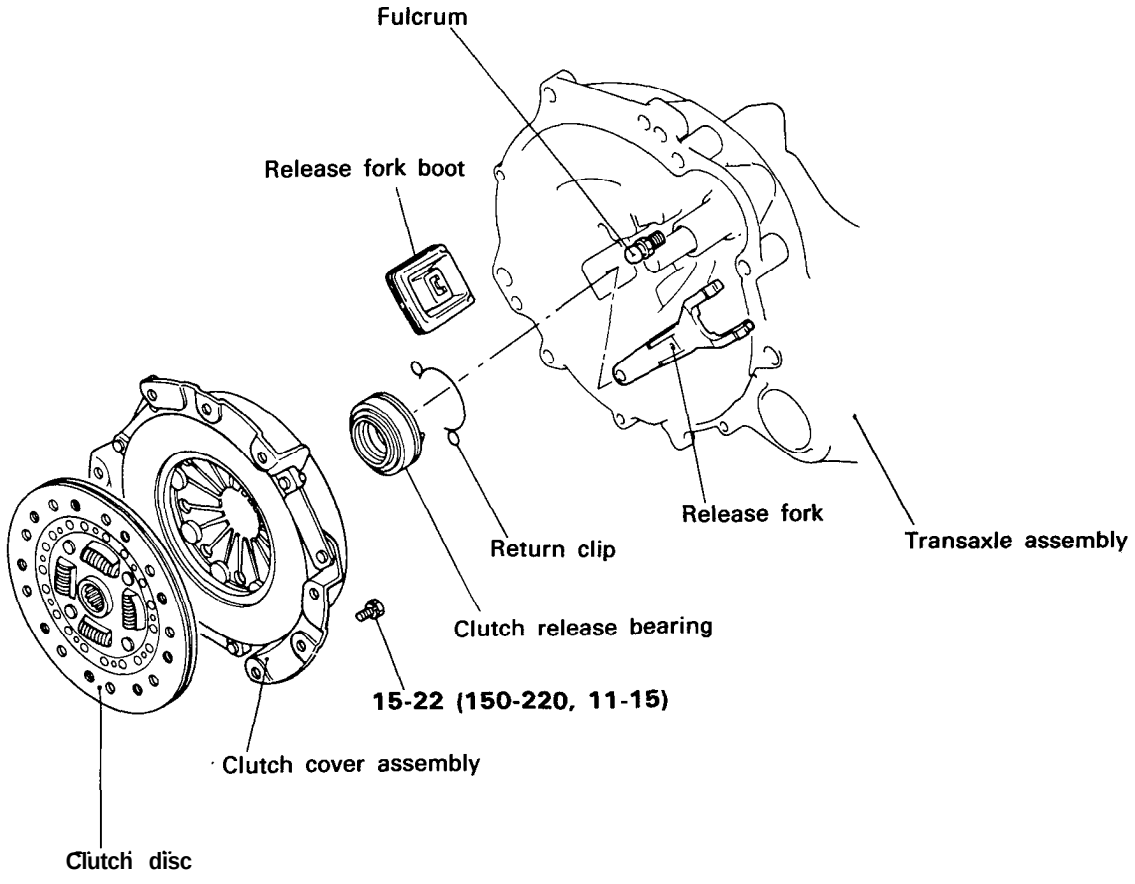


2. Install the clutch release cylinder, and the clutch tube.



CLUTCH COVER AND DISC

COMPONENTS

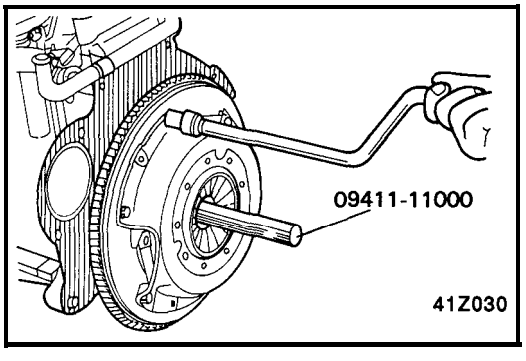


TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1, Remove the transaxle.
2. insert the special tool (0941 l-l 1000) at the center spline (in order to prevent the clutch disc from falling).
3. Diagonally loosen bolts which attach clutch cover to flywheel. Back off bolts in succession, one or two turns at a time, to avoid bending cover flange.

NOTE:
DO NOT clean the clutch disc or release bearing with cleaning solvent.



INSPECTION

CLUTCH COVER ASSEMBLY

1. Check the diaphragm spring end for wear and uneven height.
2. Replace if wear is evident or height difference exceeds the limit.

   Limit : 0.5 mm (0.02 in.)

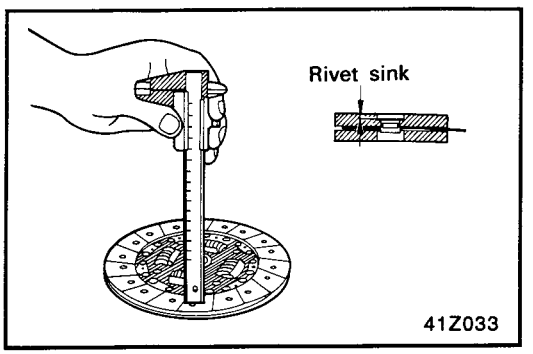
3. Check the pressure plate surface for wear, cracks and color change.
4. Check the cover plate rivets for looseness and replace the clutch cover assembly if loose.

CLUTCH DISC

1. Check the facing for loose rivets, uneven contact, deterioration due to seizure, adhesion of oil or grease and replace the clutch disc if defective.
2. Measure the rivet sink and replace the clutch disc if it is out of specification.

   Limit : 0.3 mm (0.012 in.)

3. Check for torsion spring play and damage and if defective, replace the clutch disc.
4. Combine the clutch disc with the input shaft and check sliding condition and check for play in the rotating direction. If it does not slide smoothly, check after cleaning and reassembling. If the play is excessive, replace the clutch disc and/or the input shaft.



CLUTCH RELEASE BEARING

1. The release bearing is packed with grease, so don't use cleaning oil, etc. to clean it.
2. Check the bearing for heat damage, abnormal noise and/or improper rotation. Also check whether or not there is wear at the point of contact with the diaphragm spring.
3. If there is abnormal wear at the point of contact with the release fork, replace the bearing.

RELEASE FORK

1. If there is abnormal wear at the point of contact with the bearing, replace the release fork.

INSTALLATION

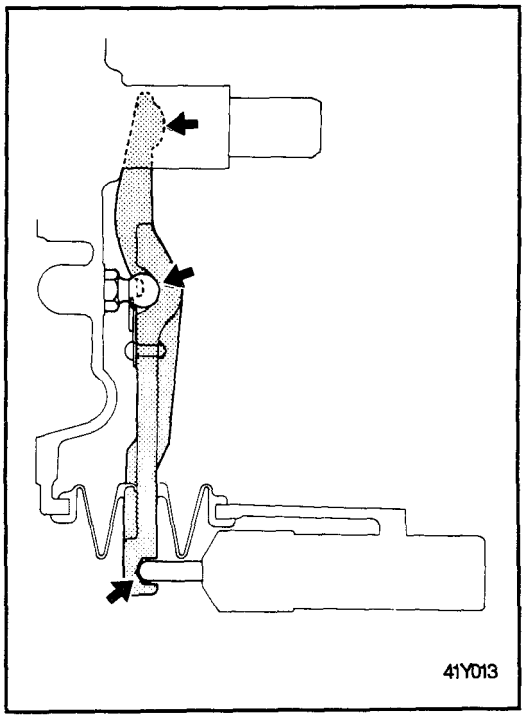
1. Apply a coating of the specified grease to the point of contact with the fulcrum and the point of contact with the release bearing.

   Specified grease : MOLYWHITE TA No.2

   NOTE
   When installing the clutch, apply grease to each part, but be careful not to apply excessive grease; excessive grease will cause clutch slippage and shudder.

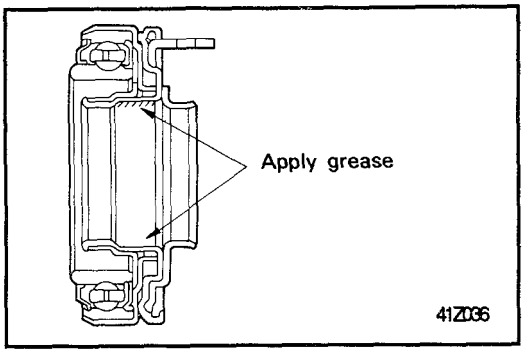
2. Apply a coating of the specified grease to the end of the release cylinder's push rod and to the push rod hole in the release fork.

   Specified grease : MOLYWHITE TA NO. 2



3. Pack the inner surface of the clutch release bearing and the groove with the specified grease.

   Specified grease : MOLYWHITE TA NO. 2

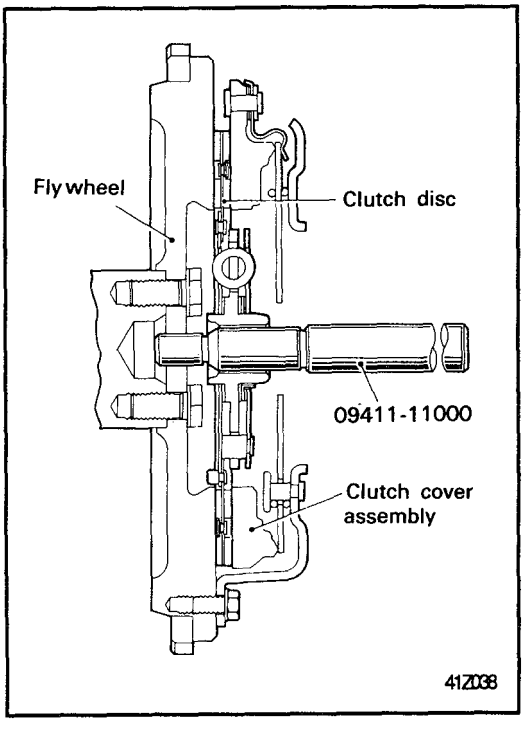


4. Apply multipurpose grease to the release bearing contact surfaces of the clutch release fork.

   Specified grease : MOLYWHITE TA No.2

5. Using the special tool (clutch disc guide), position the clutch disc to the flywheel.
6. Install the clutch cover assembly. Tighten the bolts a little at a time, working in a diagonal sequence, finally tightening them to the specified torque.
7. Before installing the transaxle assembly, apply a coating of the specified grease to the input shaft spline, and then rub in by using a brush.

   Specified grease : MOLYWHITE TA No.2



DRIVE SHAFT & FRONT AXLE

Return To Main Table of Contents

GENERAL 2
DRIVE SHAFT 6
HUB AND KNUCKLE 17

GENERAL

SPECIFICATIONS

Drive shaft			
Joint type	1.6 M/T	1.6 A/T	1.8 M/T, A/T
Outer	B.J.	B.J.	B.J.
Inner	D.O.J. (R.H) T.J. (L.H)	T.J.	D.O.J.
Length (Joint to joint)mm (in.)			
Right	366(14.40)	377.5 (14.86)	366(14.40)
Left	694.5 (27.34)	694.5 (27.34)	698 (27.48)
Maximum permissible joint angle			
B.J.	45° or more	45° or more	46° or more
D.O.J.	22° or more (R.H)		22° or more
T.J.	22.5° or more (L-H)	22.5° or more	

B.J. : Birfield joint D.O.J. : Double offset joint T.J. : Tripod joint

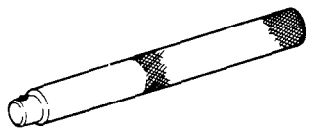
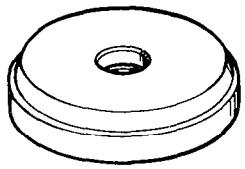
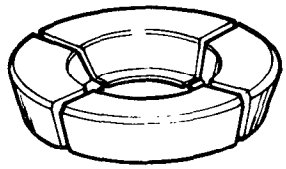
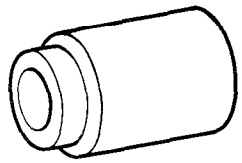
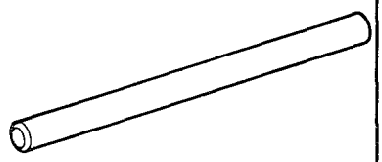
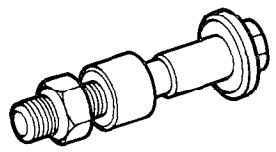
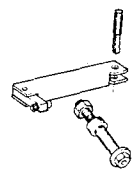
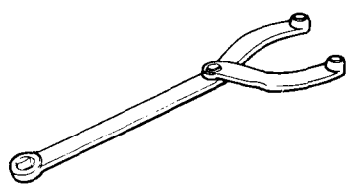
TIGHTENING TORQUE

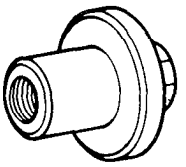
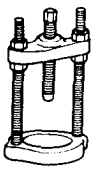
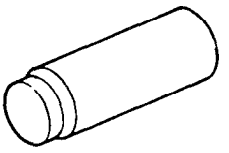
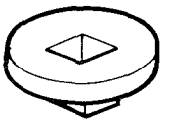
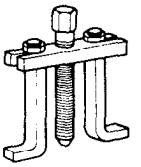
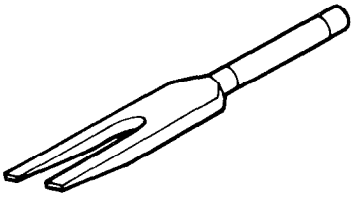
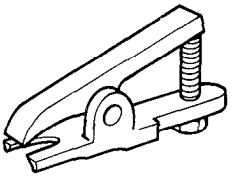
	Nm	kg.cm	lb.ft
Drive shaft nut	200-260	2000-2600	148-192
Knuckle to strut assembly	110-130	1100-1300	81-96
Lower arm ball joint to knuckle	60-72	600-720	44-53
Tie rod end to knuckle	15-34	150-340	11-25

LUBRICANTS

	Recommended lubricant	Quantity
T.J.-B.J. type drive shaft (For 1.6 A/T, M/T L.H)		
B.J. boot grease	SUNLIGHT SW-2	95±6gr. (Joint : 45 ± 3 gr., Boot : 50 ± 3 gr.)
T.J. boot grease	ONE-LÜBER MK	105±6gr. (Joint : 65 ± 3 gr., Boot : 40 ± 3 gr.)
D.O.J.-B.J. type drive shaft (For 1.6 M/T RH)		
B.J. boot grease	SUNLIGHT SW-2	95±6gr. (Jonit : 45 ± 3 gr., Boot : 50 ± 3 gr.)
D.O.J boot grease	SUNLIGHT SD-2	95±6gr. (Jonit : 60 ± 3 gr., Boot : 35 ± 3 gr.)
D.O.J.-B.J. type drive shaft (For 1.8 A/T, M/T)		
B.J. boot grease	SUNLIGHT SW-2	115±6gr. (Joint : 60 ± 3 gr., Boot : 55 ± 3 gr.)
D.O.J. boot grease	VALIANT SD-R2	100±6gr. (Joint : 60 ± 3 gr., Boot : 40 ± 3 gr.)

SPECIAL TOOLS

Tool (Number and Name)	Illustration	Use
09500-21000 Bar		Installation of oil seal and bearing.
09517-21000 Oil seal installer		1) Press fit for the front wheel bearing oil seal. (use with 09500-21000). 2) Press fit for the front wheel bearing outer race. (use with 09500-21000).
09517-21100 Hub bearing remover		Removal of front wheel bearing. (ues with 09532-11000, 09532-11301).
09517-21200 Front axle base		Installation of the front wheel bearing outer race. (use with 09517-21000, 09500-21000).
09517-21400 Drift		Removal of front hub bearing outer race.
09517-21500 Front hub remover and installer		Removal & installation of the front hub. (use with 09517-21600)
09517-21600 Knuckle arm bridge		Removal of the front hub. (use with 09517-21500)
09517-21700 End yoke holder		Holding of the front wheel when installing and removing the front axle shaft.

Tool (Number and Name)	Illustration	Use
09529-21000 wheel alignment gauge attachment		Front wheel alignment for aluminum wheel.
09532-11000 Tapered roller bearing puller		Removal of front wheel bearing. (use with 09532-11301, 09517-21100)
09532-11301 Puller cup		Removal of front wheel bearing. (use with 09517-21100, 09532-11000)
09532-11600 Pre-load socket		Measuring of front wheel bearing preload. (use with 09517-21500, 30 mm socket and torque wrench)
09526-11001 Axle shaft puller		Removal of the drive shaft from the front hub.
09545-21000 Ball joint remover		Removal of the front lower arm ball joint.
09568-31000 Tie rod end puller		Separation of the tie rod end ball joint.

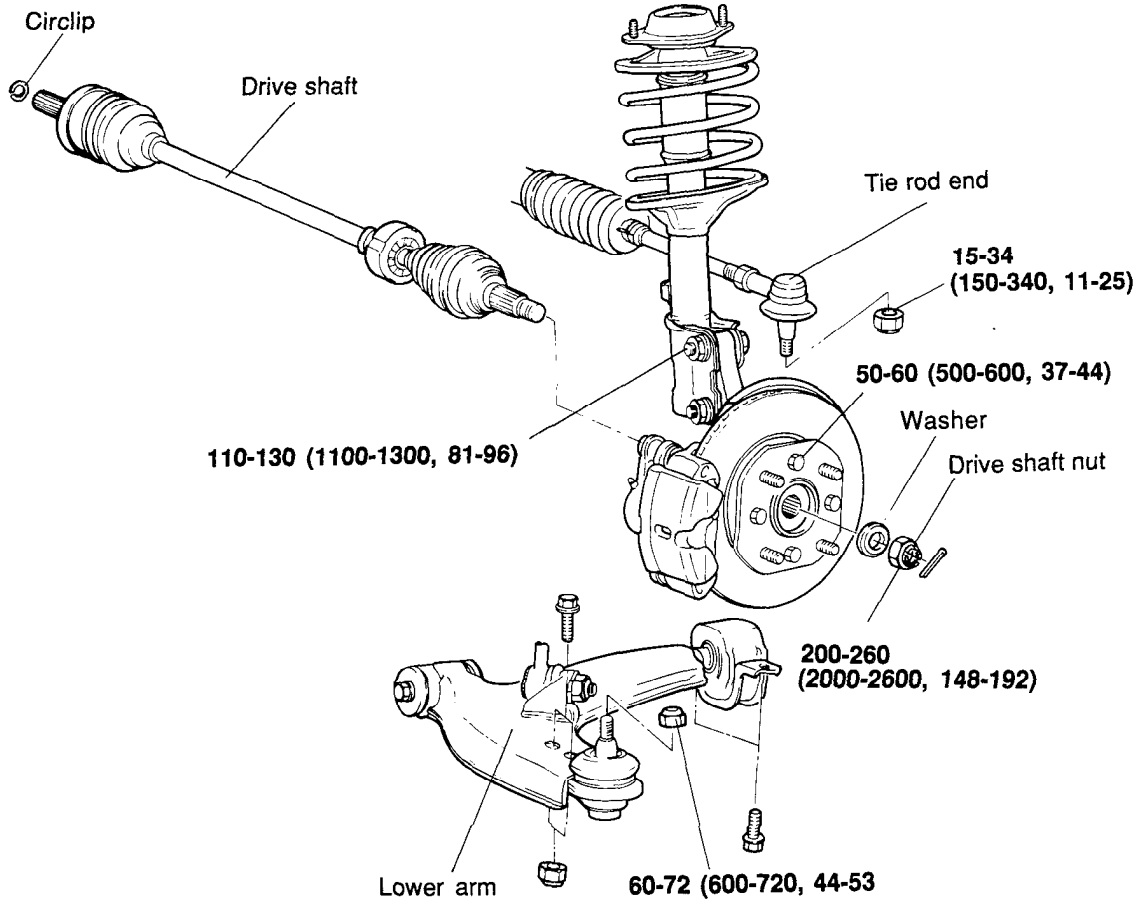
TROUBLESHOOTING

Symptom	Probable cause	Remedy
Vehicle pulls to one side	Galling of drive shaft ball joint Wear, rattle or galling of wheel bearing Defective front suspension and steering	Replace Replace Adjust or replace
Vibration	Wear, damage or bending of drive shaft Drive shaft rattle and hub serration Wear, rattle or sintering of wheel bearing	Replace Replace Replace
Shimmy	Improper wheel balance Defective front suspension and steering	Adjust or replace Adjust or replace
Excessive noise	Wear, damage or bending of drive shaft Drive shaft rattle and hub serrration Drive shaft rattle and side gear serration Wear, rattle or galling of wheel bearing Loose hub nut Defective front suspension and steering	Replace Replace Replace Replace Adjust or replace Adjust or replace

WHEEL BEARING TROUBLESHOOTING

Symptom	Probable cause	Remedy
Bent cage	Cage damage due to improper handling or tool usage.	Replace bearing
Galling	Metal smears on roller end due to overheating, lubricant problem or overloading.	Replace bearing Check seals, check for proper lubrication
Cracked inner race	Race cracked due to improper fit, cocking or poor bearing seats.	Replace bearing
Etching	Bearing surfaces appear gray or grayish black in color with etching of material usually at roller spacing.	Replace bearing Check seals, check for proper lubrication
Brinelling	Surface indentations, on race surface caused by roolers either under impact loading or vibration while the bearing is not rotating.	Replace bearing
Heat discoloration	Heat discoloration is dark blue resulting from overload or no lubricant (Yellow or brown color is normal).	Replace bearing Check seals and other parts
Fatigue spalling	Flaking of surface metal resulting from fatigue.	Replace bearing Clean all related parts.

COMPONENTS

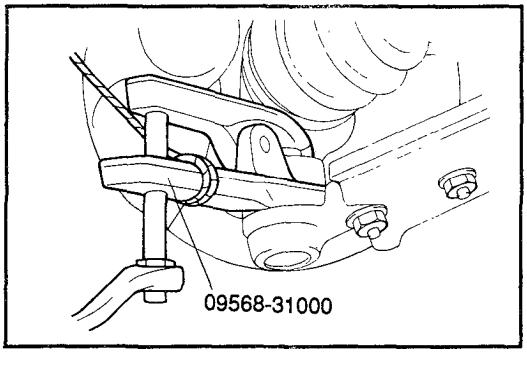


TORQUE : Nm (kg.cm, lb.ft)

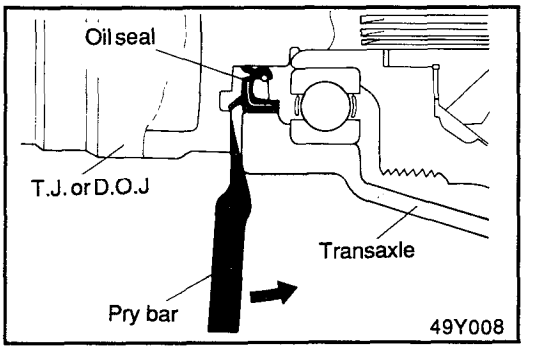
49J001

REMOVAL

1. Remove the hub caps, and loosen the drive shaft nut.
2. Lift up the vehicle and remove the tires.
3. Remove the lower arm ball joint or its mounting bolts from the lower arm.



4. Detach the tie rod end ball joint connection.
5. Remove the stabilizer bar self locking nut.
6. Drain the transaxle fluid.
7. Insert a pry bar between the transaxle case and joint case (T.J. or D.O.J.), and pry the drive shaft from the transaxle case.

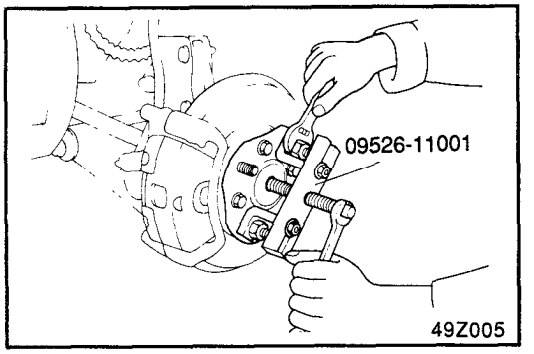


NOTE
1) Be sure to apply the pry bar to the rib of the transaxle case.
2) Do not insert the pry too deep, as this may cause damage to the oil seal. [max. depth : 7 mm (0.28 in.)].

8. Pull out the drive shaft from the transaxle case.

NOTE
1) Place a shop towel in the hole of the transaxle case to prevent contamination.
2) Support the drive shaft properly.
3) Replace the retainer ring each time the drive shaft is removed from the transaxle case.

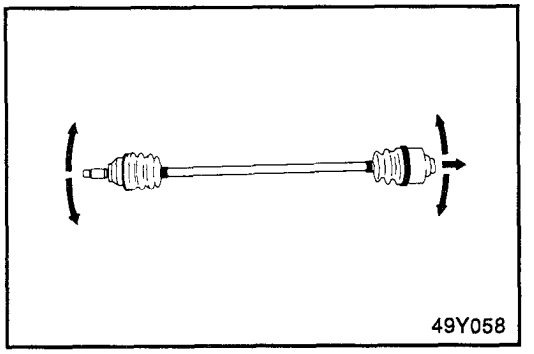
9. Using special tool, force the drive shaft out of the hub.



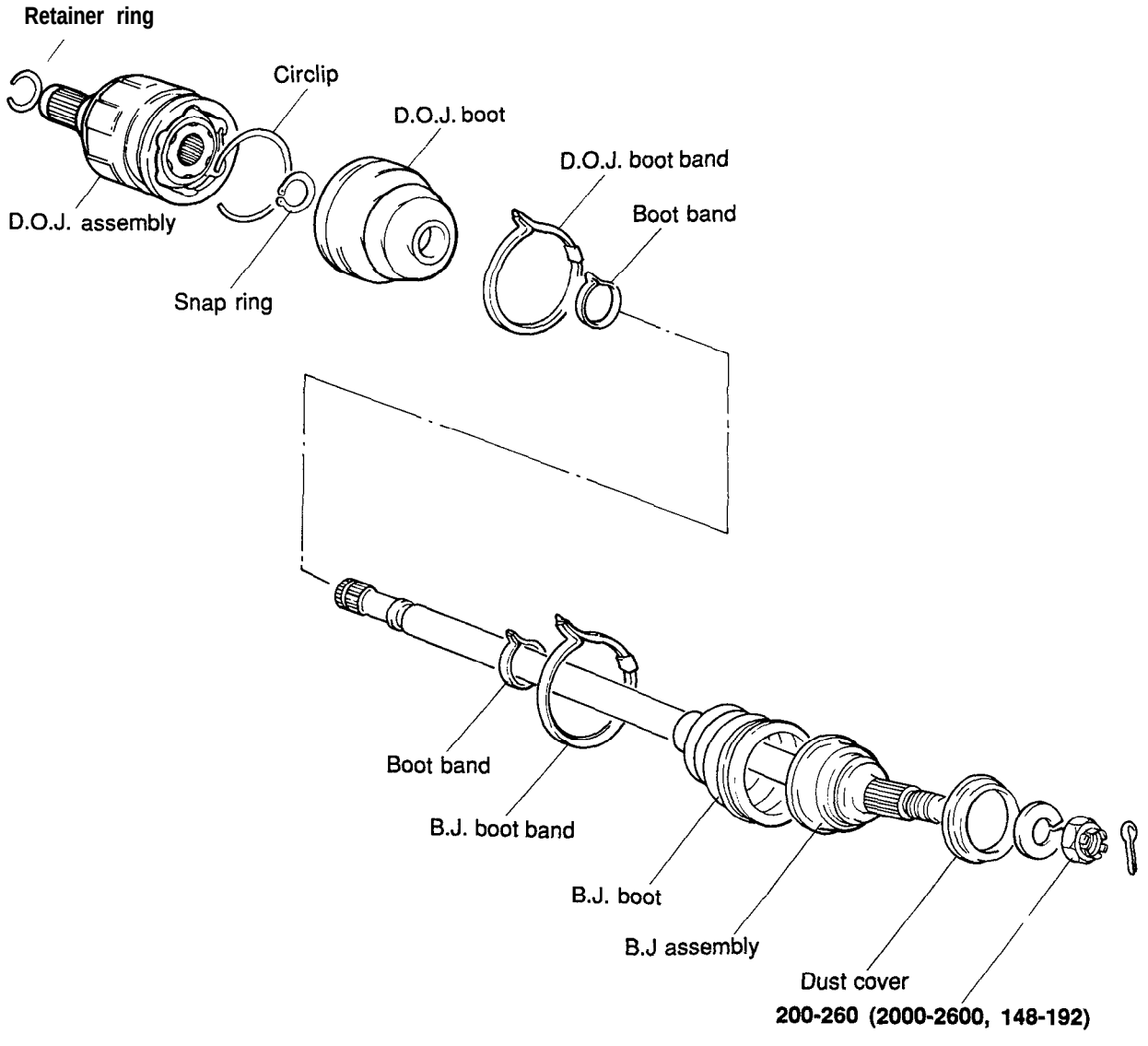
NOTE
When the drive shaft is forced out, keep the spacer from falling out of place.

INSPECTION

1. Check the drive shaft boot for damage and deterioration.
2. Check the ball joints for wear and operating condition.
3. Check the splines for wear and damage.

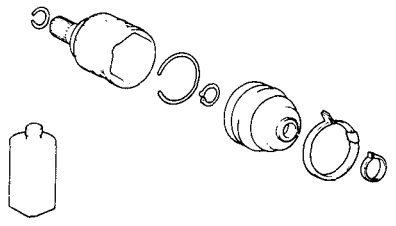
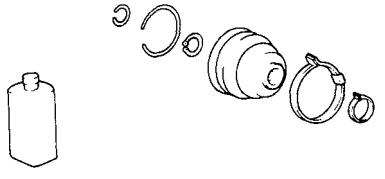
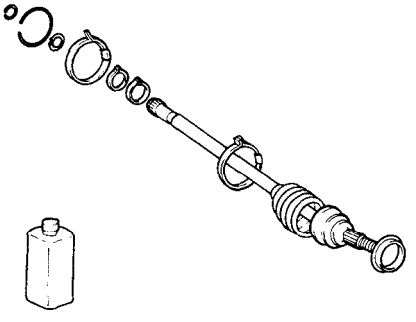
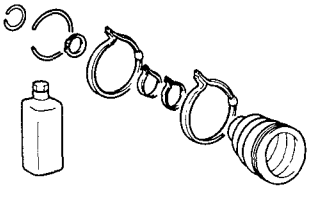


DISASSEMBLY AND ASSEMBLY (D.O.J.-B.J. TYPE)

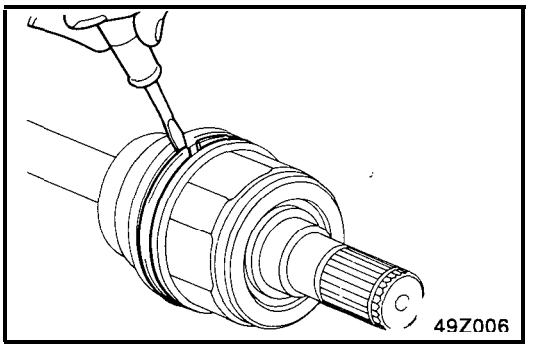


TORQUE : Nm (kg.cm, lb.ft)

REPAIR KITS

Kit name	Illustration	Contents
Double offset joint kit		o Clip (Retainer ring) o D.0.J assy o Circlip o Snap ring o D.O.J boot o D.0.J boot band o Boot band o Grease
Double offset joint boot kit		o Clip (Retainer ring) o Circlip o Snap ring o D.0.J boot o D.0.J boot band o Boot band o Grease
Birfield joint and shaft kit		o Clip (Retainer ring) o Circlip o Snap ring o D.0.J boot band o Boot bands o B.J boot band o B.J boot o B.J assy o Dust cover o Grease
Birfield joint boot kit		o Clip (Retainer ring) o Circlip o Snap ring o D.0.J boot band o Boot bands o B.J boot band o B.J boot o Grease

DISASSEMBLY

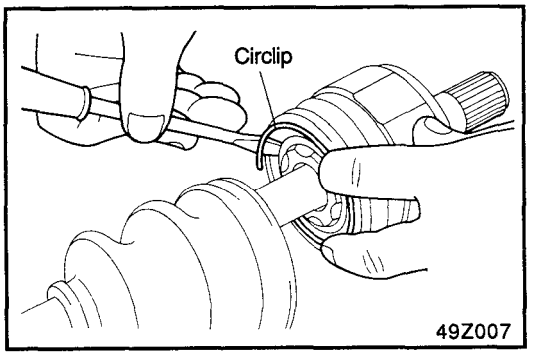


NOTE
1) Do not disassemble the B.J. assembly.
2) The drive shaft joint uses special grease. Do not substitute with another type of grease.
3) The boot band should be replaced with a new one.

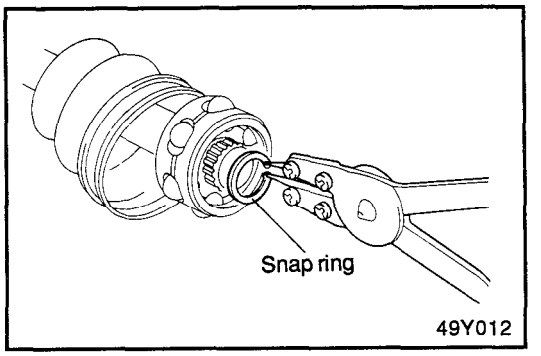
1. Remove the D.O.J. boot bands and pull the D.O.J. boot from the D.O.J. outer race.

   NOTE
   Be careful not to damage the boot.

2. Remove the circlip with a flat-blade screwdriver.

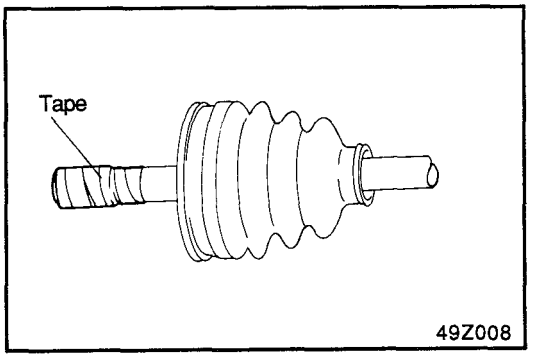


3. Pull out the drive shaft from the D.O.J. outer race.
4. Remove the snap ring and take out the inner race, cage and balls as an assembly.



5. Clean the inner race, cage and balls without disassembling.
6. Remove the B.J. boot bands and pull out the D.O.J. boot and B.J. boot.

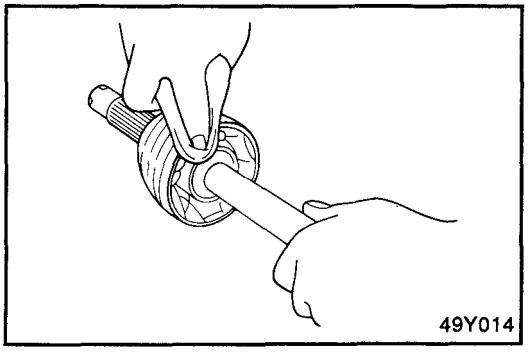
   NOTE
   If the boot is to be reused, wrap tape around the drive shaft splines to protect the boot.



Inspection after Disassembly

1. Rusted or damaged D.O.J. outer race, inner race, cage and balls.
2. Worn splines.
3. Water, foreign matter or rust in B.J. boot.

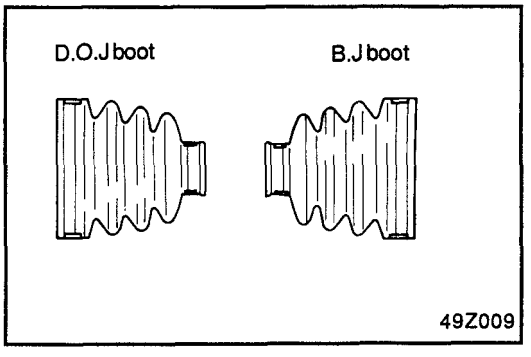
NOTE
When the B.J. assembly is to be reused, do not wipe away the grease. Check for foreign substances in the grease. If necessary, clean the B.J. assembly and replace grease.


49Y014

ASSEMBLY

1. Wrap tape around the drive shaft splines (D.O.J. side) to prevent damage to the boots.
2. Apply grease to the drive shaft and instail the boots.

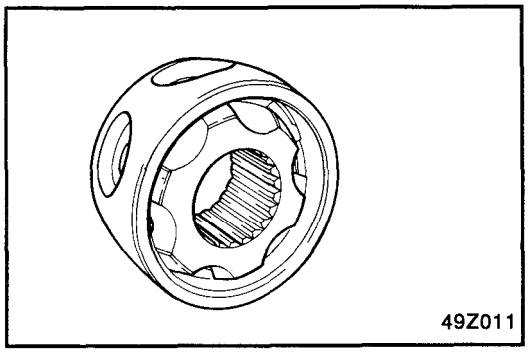
Recommended lubricant
B.J. Boot grease ..... Sunlight SW-2
D.O.J. Boot grease ..... [For 1.6 M/T R.H] Sunlight BD-2
[For 1.8 A/T, M/T] Valiant SD-R2



49Z009

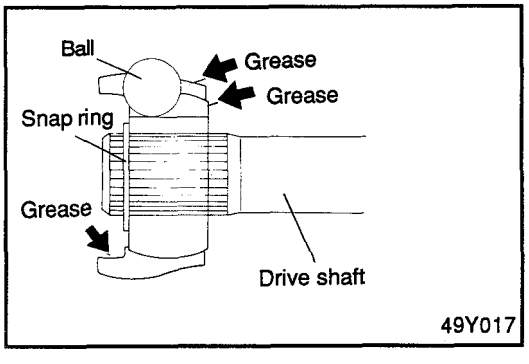
3. Apply the specified grease to the inner race and cage. Install the cage so that it is offset on the race as shawn.

NOTE
Use the grease included in the repair kit.


49Z011

4. Apply the specified grease to the cage and fit the balls into the cage.
5. Install the chamfered side as shown, and then install the inner race onto the drive shaft, and install the snap ring.
6. Apply 60±3gr.(2.1 ± 0.1 oz.) of specified grease to the outer race and install the outer race onto the drive shaft.
7. Apply 35 ± 3 gr. (4.2 ± 0.1 oz.) of specified grease into the D.0.J boot and install the boot.

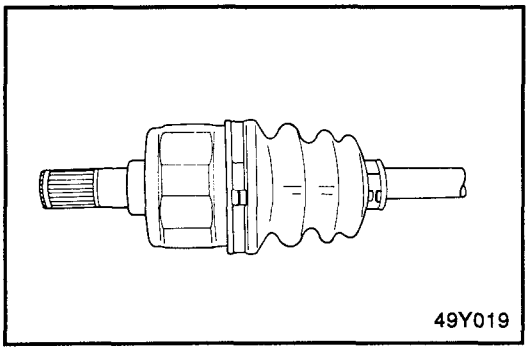
D.O.J. boot grease gr. (oz)
[1.6 M/T- R.H]
Total 95 ± 6 (3.4 ± 0.2)
In the joint ..... 60±3(2.1 ± 0.1)
In the boot ..... 35±3(1.2±0.1)
[1.8 A/T, M/T]
Total ..... 100±6(3.5±0.2)
In the joint ..... 60±3(2.1 ±0.1)
In the boot ..... 40±3(1.4±0.1)



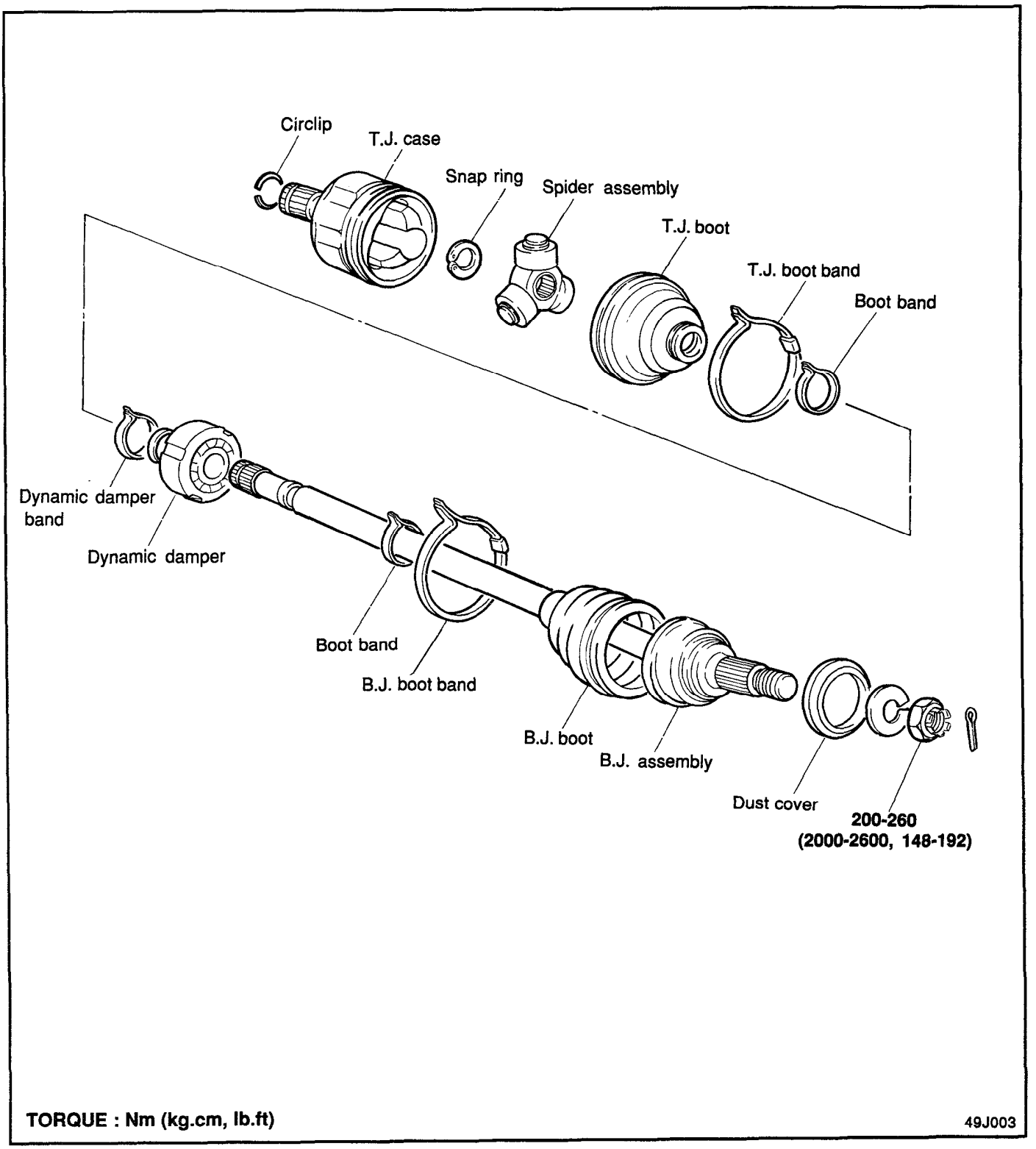
49Y017

8. Tighten the D.O.J. boot bands.
9. Add to the B.J. as much specified grease as was wiped away at the time of inspection.

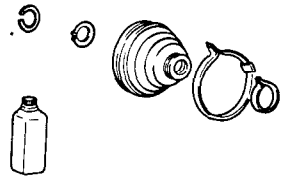
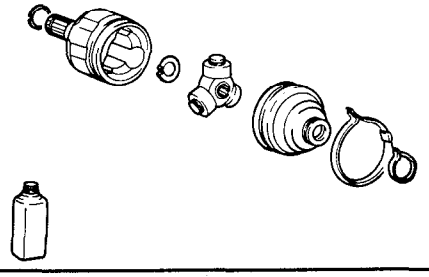
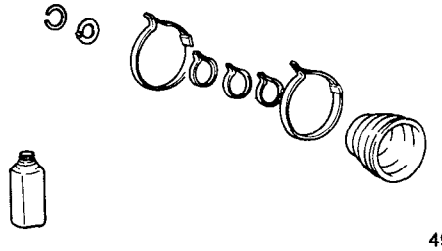
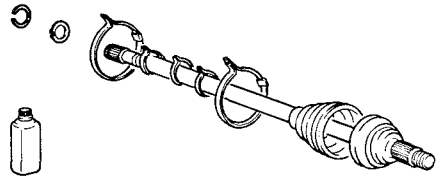
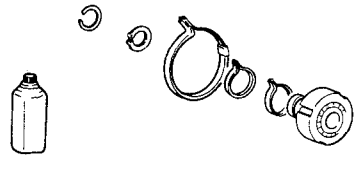
10. Install the boots.
11. Tighten the B.J. boot bands.
12. To control the air in the D.O.J. boot, keep the proper distance between the boot bands when they are tightened:



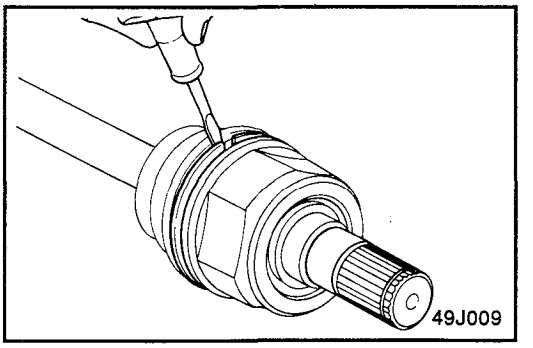
DISASSEMBLY AND ASSEMBLY (T.J.-B.J. TYPE)



REPAIR KITS

Kit name	Illustration	Contents
T.J. boot kit	 49J004	o Circlip o Snap ring o T.J. boot o T.J. boot band o Boot band o Grease
T.J. joint kit	 49J005	o Circlip o T.J. case o Snap ring o Spider assembly o T.J. boot o T.J. boot band o Boot band o Grease
B.J. boot kit	 49J006	o Circlip o Snap ring o T.J. boot band o Boot band o Dynamic damper band o Boot band o B.J. boot o Grease
B.J. joint and shaft kit	 49J007	o Circlip o Snap ring o T.J. boot band o Boot band o Dynamic damper band o Boot band o B.J. boot band o B.J. boot o B.J. assembly o Grease
Damper kit	 49J008	o Circlip o Snap ring o T.J. boot band o Boot band o Dynamic damper band o Dynamic damper o Grease

DISASSEMBLY

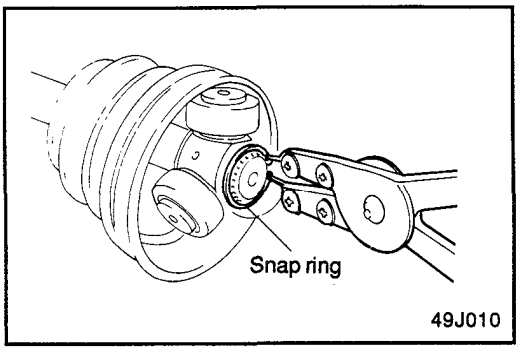


NOTE
1) Do not disassemble the spider assembly.
2) The drive shaft joint uses special grease. Do not substitute with another type of grease.
3) The boot band should be replaced with a new one.

1. Remove the T.J. boot bands and pull the T.J. boot from the T.J. case.

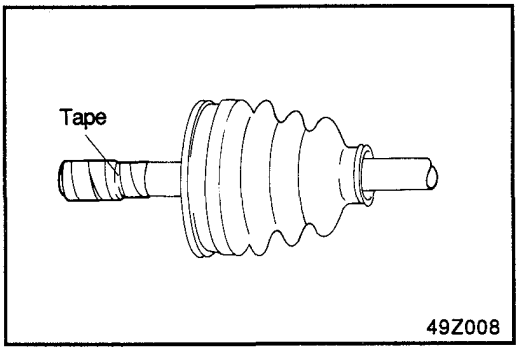
   NOTE
   Be careful not to damage the boot.

2. Remove the snap ring and spider asembly from the drive shaft.
3. Clean the spider assembly.



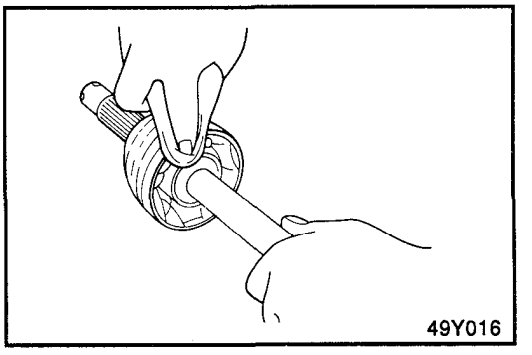
4. Remove the B.J. boot bands and pull out the T.J. boot and B.J. boot.

   NOTE
   If the boot is to be reused, wrap tape around the drive shaft splines to protect the boot.



Inspection after Disassembly

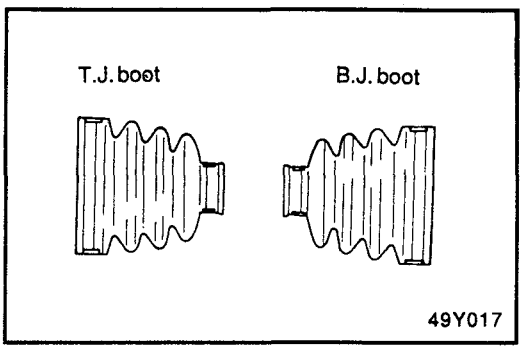
1. Check the drive shaft spline part for wear or damage.
2. Check for entry of water and/or foreign material into B.J.
3. Check the spider assembly for roller rotation, wear or corrosion.
4. Check the groove inside T.J. case for wear or corrosion.
5. Check the dynamic damper for damage or cracking.



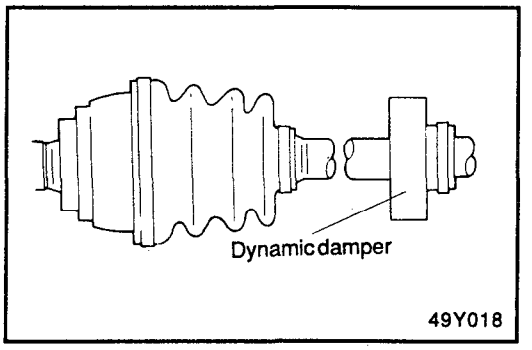
ASSEMBLY

1. Wrap tape around the drive shaft splines (T.J. side) to prevent damage to the boots.
2. Apply grease to the drive shaft and install the boots.

Recommended lubricant	
B.J. Boot grease	Sunlight SW-2
T.J. Boot grease	ONE-LÜBER MK

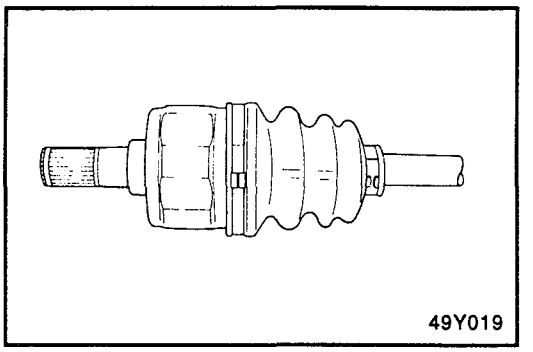


3. To install the dynamic damper, keep the B.J. and shaft in a straight line and secure the dynamic damper in the direction illustrated and install the small boot band.



4. Apply grease into the T.J. boot and install the boot.

T.J. boot grease gr. (oz) [1.6 A/T, M/T L.H]	
Total	105±6(3.7±0.2)
In the joint	65±3(2.3±0.1)
In the boot	40±3(1.4±0.1)



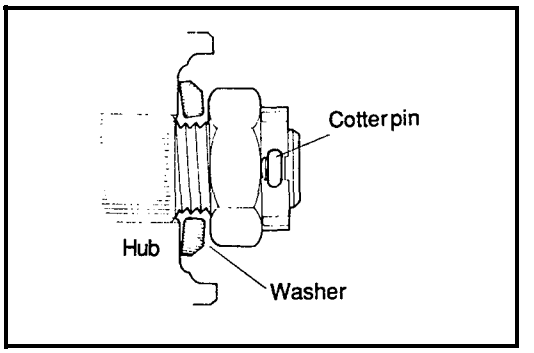
5. Tighten the T.J. boot bands.
6. Add to the B.J. as much specified grease as was wiped away at the time of inspection.
7. Install the boots.
8. Tighten the B.J. boot bands.
9. To control the air in the T.J. boot, keep the specified distance between the boot bands when they are tightened.

INSTALLATION

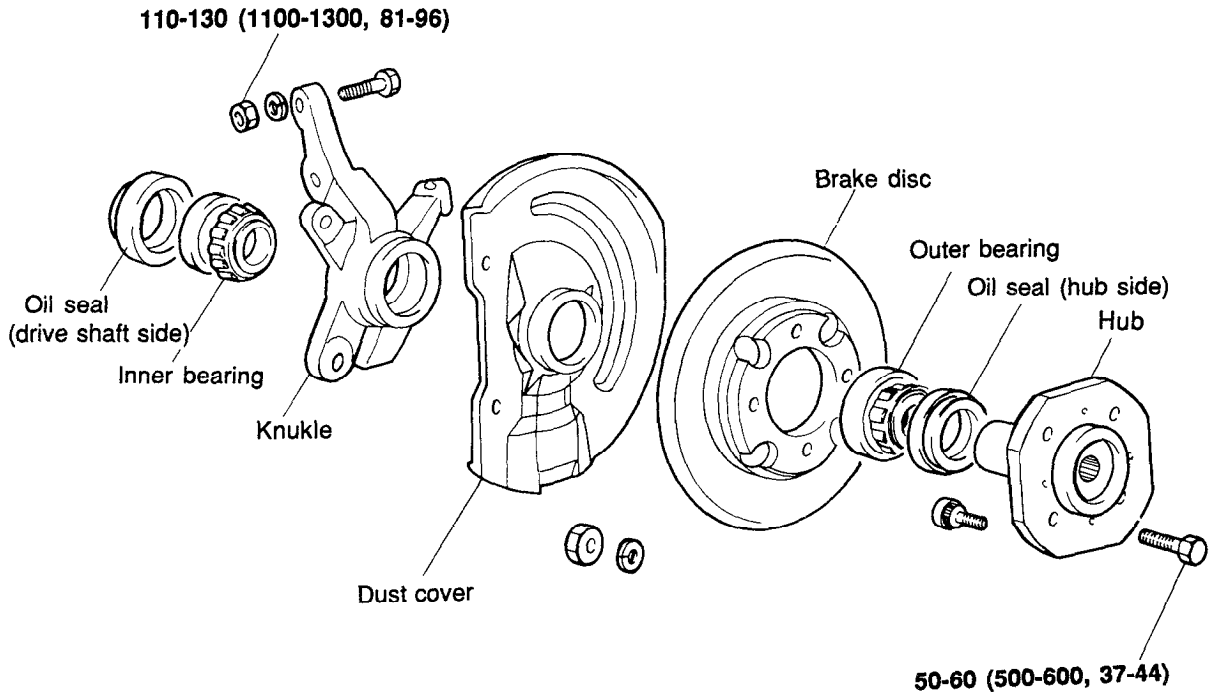
1. Tighten the following parts to the specified torque.

	Nm (kg.cm, lb.ft)
Drive shaft nut	200-260 (2000-2600, 148-192)
Knuckle to strut assembly	110-130(1100-1300,81-96)
Lower arm ball joint to knuckle	60-72 (600-720,44-53)

2. Install a new retainer ring each time the drive shaft is removed from the transaxle.
3. Install the washer under the drive shaft nut as shown in the illustration.



COMPONENTS

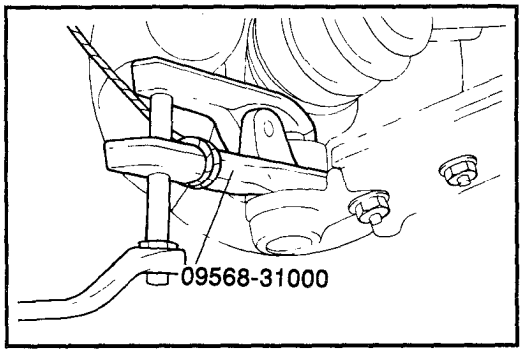


TORQUE : Nm (kg.cm, lb.ft)

49J011

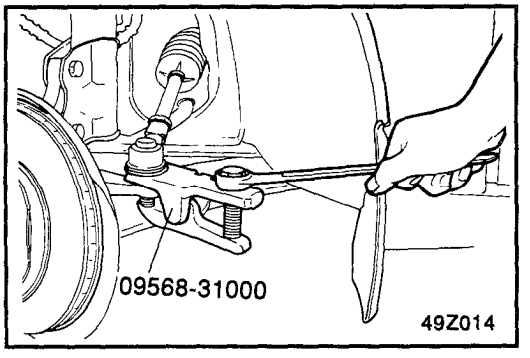
REMOVAL

1. Remove the hub caps.
2. Remove the drive shaft nut.
3. Jack up the vehicle and support it with jack stands.
4. Remove the wheel and tire.
5. Remove the front brake assembly from the knuckle and suspend it with a wire.
6. Disconnect the lower arm ball joint from the knuckle using the special tool.

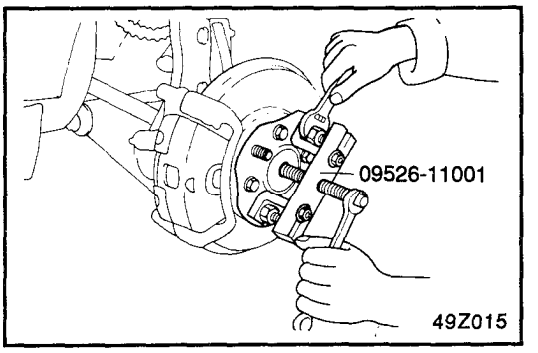


7. Disconnect the tie rod end ball joint from the knuckle using the special tool.

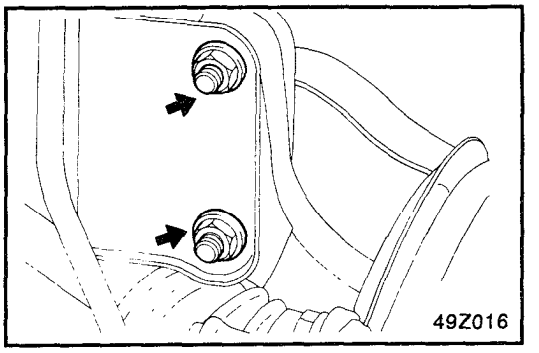
NOTE
1. **Be sure to the the cord of the special tool to the nearbly part.**
2. **Loose the nut, but do not remove it.**



8. Disconnect the drive shaft from the hub using the special tool.



9. Remove the hub and knuckle as an assembly from the strut.



INSPECTION

1. Check the hub for cracks and the splines for wear.
2. Check the oil seal for cracking or damage.
3. Check the brake disc for scoring and damage.
4. Check the steering knuckle for cracks.
5. Check for a defective bearing. (Refer to "Wheel bearing trouble shooting".)

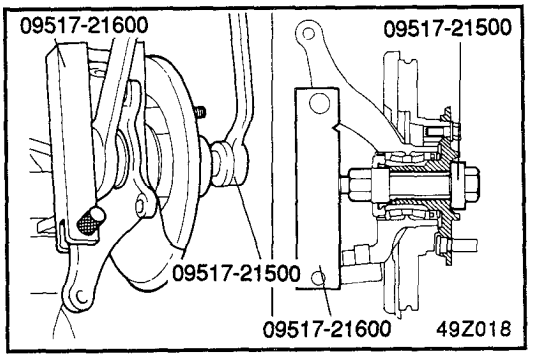
BEARING REPLACEMENT

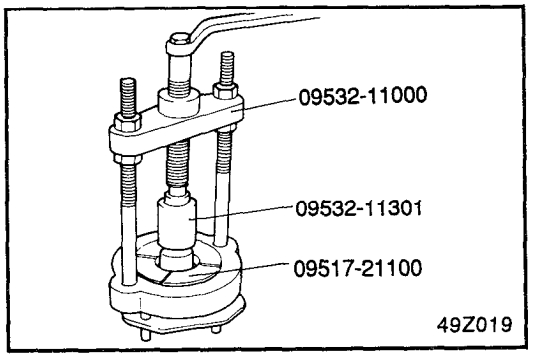
1. Install the special tools as illustrated.
2. Remove the hub from the knuckle by turning the special tool.

NOTE
1) Be sure to use the special tool.
2) If the hub and knuckle are disassembled by striking with a hammer, the bearing will be damaged.

3. Secure the knuckle in a vise.
4. Remove the brake disc from the hub.

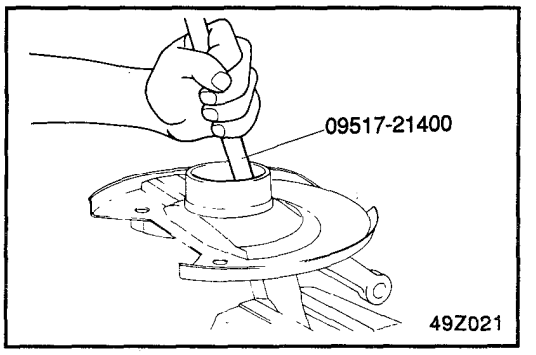
5. Remover the outer bearing inner race from the hub using special tools.





6. Remove the oil seal and inner bearing inner race from the knuckle.
7. Drive out the bearing outer races from the knuckle using the special tool.

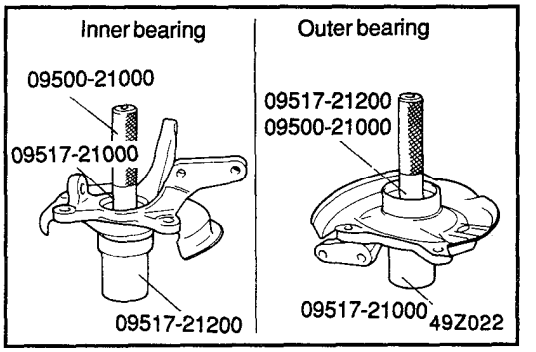
NOTE
If either the outer or inner race needs replacement, they must be replaced as a set.



8. Apply the specified multipurpose grease to the outside surface of the bearing outer race.

Recommended grease	SAE J310a, multipurpose grease NLGI No.2

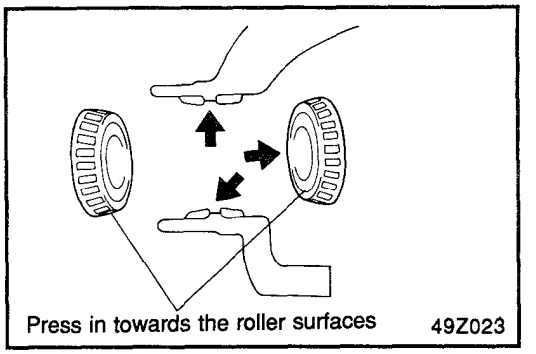
9. Install the bearing outer race into the knuckle with special tools.



10. Install the disc to the hub. and torque to specification.

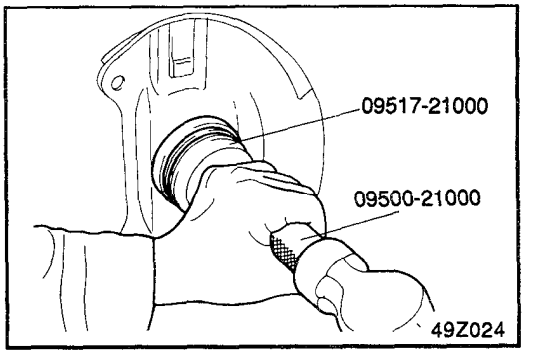
Tightening torque	50-60 Nm (500-600 kg.cm, 36-43 lb.ft)

11. Apply the specified multipurpose grease to the bearings and inside surface of the hub.

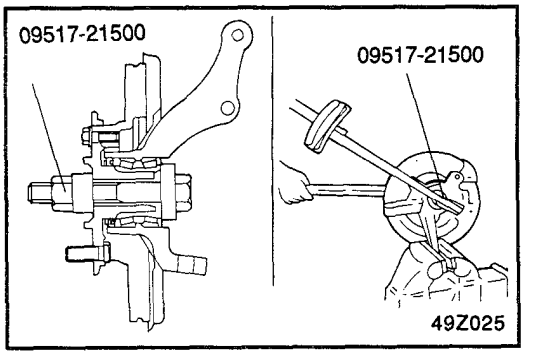


12. Place the outside bearing inner race into the knuckle.
13. Drive the oil seal (hub side) into the knuckle with the special tools.
14. Apply the specified multipurpose grease to the lip of the oil seal and to the surfaces of the oil seal which contact the hub.

Recommended grease	SAE J310a, multipurpose grease NLGI No.2



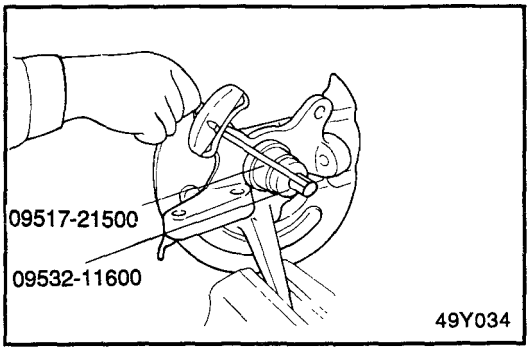
15. Place the inner bearing into the knuckle.
16. Tighten the hub to the knuckle to 235 Nm (2350 kg.cm, 167 lb.ft) with the special tool.
17. Rotate the hub to seat the bearing.



18. Measure the hub bearing starting torque.

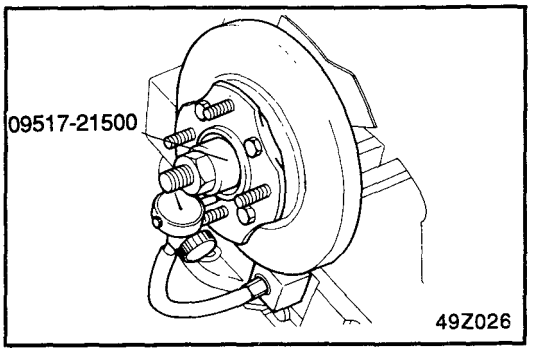
Hubbearing starting torque [Limit]	1.3 Nm (13 kg.cm, 11 lb.in) or less

19. If the starting torque is 0 Nm (0 lb.in), measure the hub bearing axial play.



20. If the hub axial play exceeds the limit while the nut is tightened to 235 Nm (2,350 Kg.cm, 167 lb.ft), the bearing, hub and knuckle have not been installed correctly. Repeat the disassembly and assembly procedure.

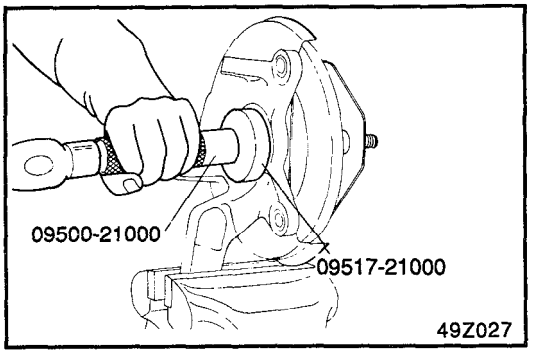
Hub bearing axial play [Limit]	0.11 mm (0.0043 in.)



21. Remove the special tool.
22. Apply the specified multipurpose grease to the bearing and to the inside of the knuckle.

Recommended grease	SAE J310a, multipurpose grease, NLGI No.2

23. Drive the oil seal (drive shaft side) into the knuckle until it contacts the bearing outer race using special tools.
24. Apply the specified multipurpose grease to the lip of the oil seal.
25. Install the parts to the torque specifications.



INSTALLATION

1. Lower the vehicle to the ground and tighten the knuckle to the lower arm ball joint connecting bolt.
2. Install parts to torque specifications.

EMISSION CONTROL SYSTEM

Return To Main Table of Contents

GENERAL 2
CRANKCASE EMISSION SYSTEM 9
EVAPORATIVE EMISSION SYSTEM 10
EXHAUST EMISSION SYSTEM 14

GENERAL

SPECIFICATIONS

Components	Function	Remarks
Crankcase Emission Control System Positive crankcase ventilation (PCV) valve	HC reduction	 Variable flow rate type
Evaporative Emission Control System EVAP Canister EVAP Canister Purge Solenoid Valve	HC reduction	 ON/OFF solenoid valve
Exhaust Emission Control System MFI system (air-fuel mixture control device) Three-way catalytic converter Exhaust gas recirculation system EGR valve EGR TVV (Except California)	CO, HC, NOx reduction CO, HC, NOx reduction NOx reduction	 Oxygen sensor feedback type Monolith type Single type Bimetal type

EGR TVV : Exhaust Gas Recirculation Thermal Vacuum Valve
EVAP : Evaporative Emission
MFI : Multiport Fuel Injection

SERVICE STANDARD

EVAP Canister Purge Solenoid Valve Coil resistance	 36-44 Ω [at 20°C (68°F)]
EGR TVV temperature Opening temperature Closing temperature	 MIN. 50°C (122°F) 61-69°C (142-156°F)
EGR temperature sensor (California only) Coil resistance	 60-83 kΩ [at 50°C (122°F)] 11-14 kΩ [at 100°C (212°F)]
EGR solenoid valve (California only) Coil resistance	 36-44 Ω [at 20°C (68°F)]

TIGHTENING TORQUE

	Nm	kg.cm	lb.ft
Positive crankcase ventilation valve	8-12	80-120	6-8
EGR valve installation bolt	15-22	150-220	11-16
EGR TVV	20-40	200-400	14-29
EGR temperature sensor	10-12	100-120	7-9

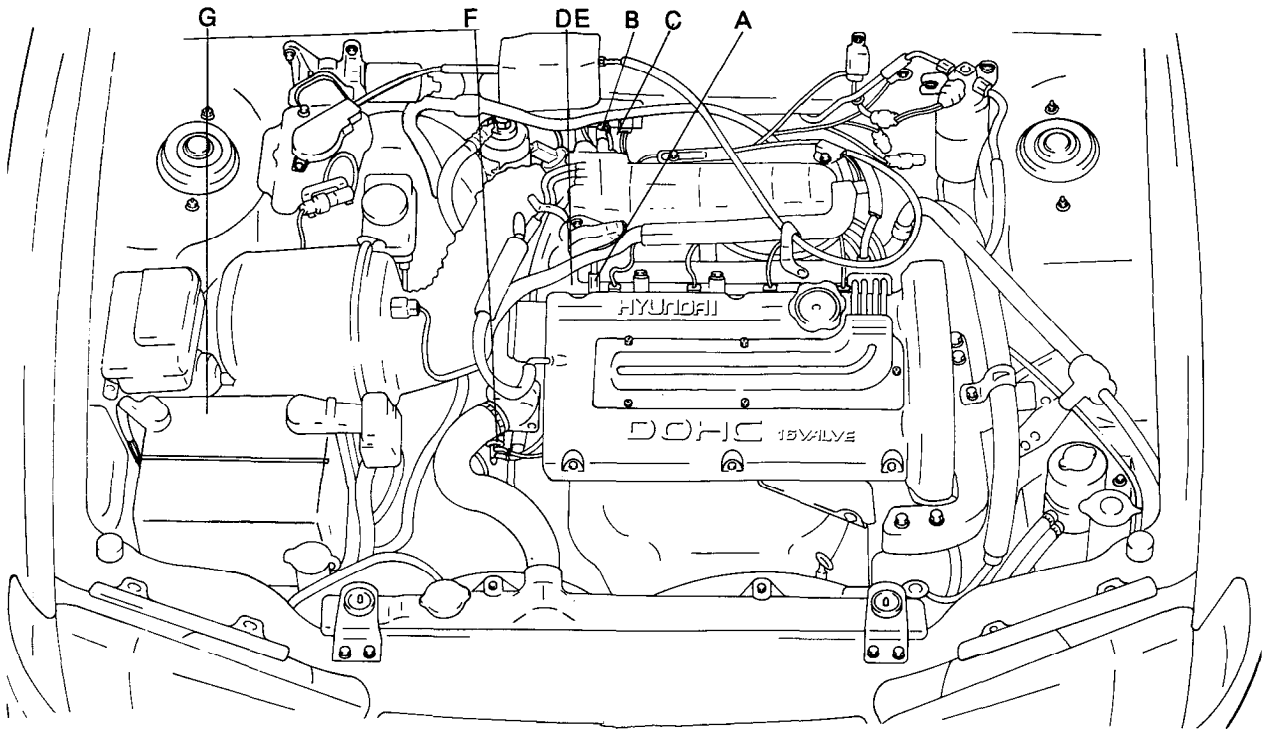
SEALANT

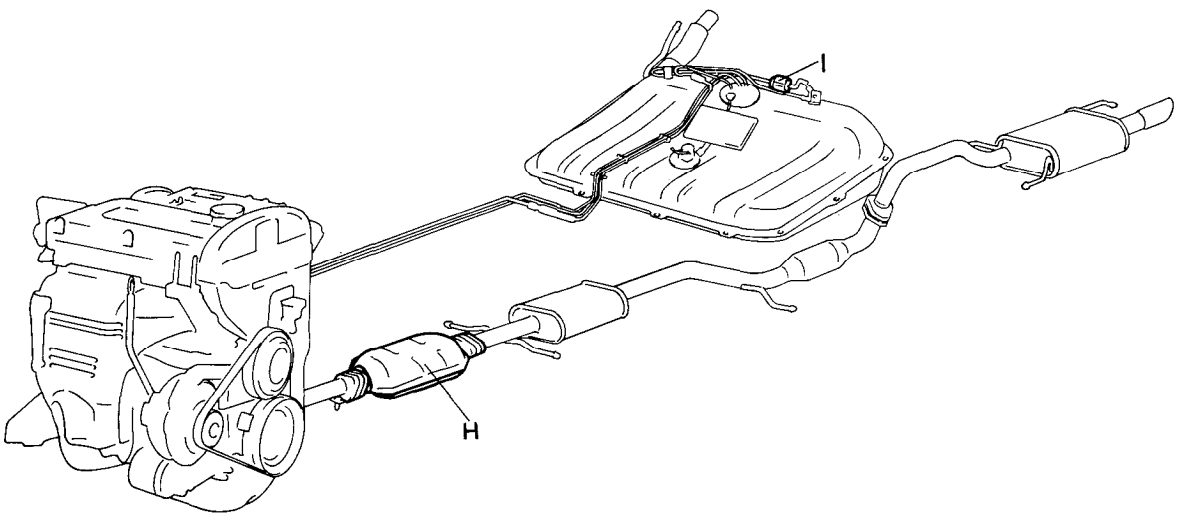
EGR TVV thread portion	Three bond 1104 or equivalent

TROUBLESHOOTING

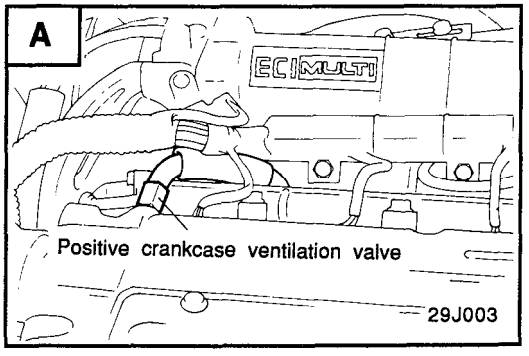
Symptom	Probable cause	Remedy
Engine will not start or hard to start	Vacuum hose disconnected or damaged The EGR valve is not closed Malfunction of the EVAP Canister Purge Solenoid Valve	Repair or replace Repair or replace Repair or replace
Rough idle or engine stalls	The EGR valve is not closed Vacuum hose disconnected or damaged Malfunction of the PCV valve Malfunction of the EVAP Canister Purge system	Repair or replace Repair or replace Replace Check the system; if there is a problem, check its component parts
Engine hesitates or poor acceleration	Malfunction of the exhaust gas recirculation system	Check the system; if there is a problem, check its component parts
Excessive oil consumption	Positive crankcase ventilation line clogged	Check positive crankcase ventilation system
Poor fuel mileage	Malfunction of the exhaust gas recirculation system	Check the system; if there is a problem, check its component parts

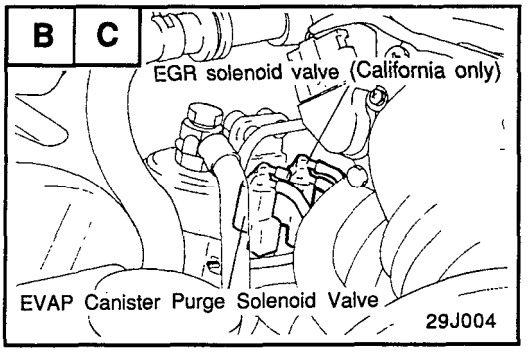
EMISSION CONTROLS LOCATION

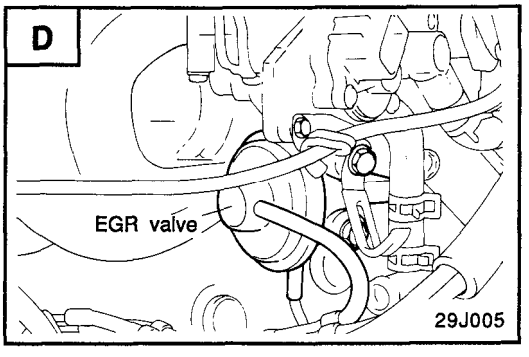


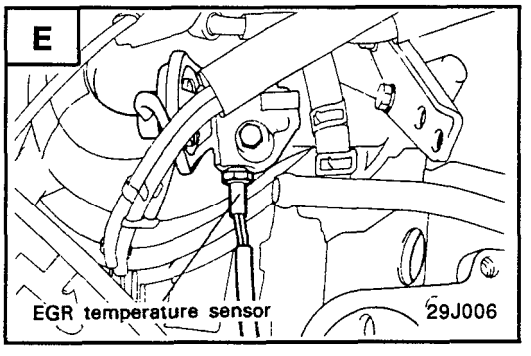


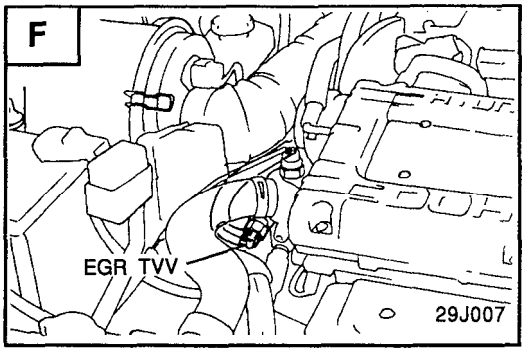
A. PCV valve
B. EVAP Canister Purge Selenoid Valve
C. EGR solenoid valve (California only)
D. EGR valve
E. EGR temperature sensor (California only)
F. EGR TVV
G. EVAP Canister
H. Catalytic converter
I. Two-way valve



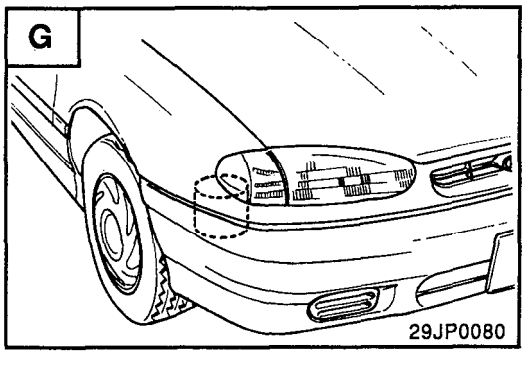


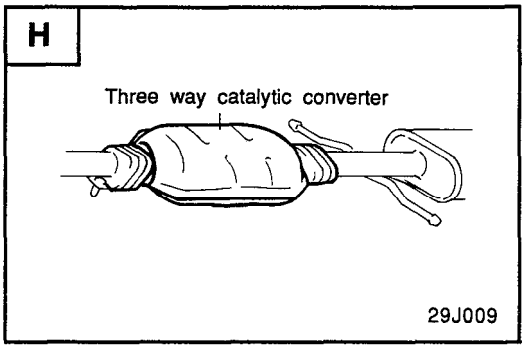


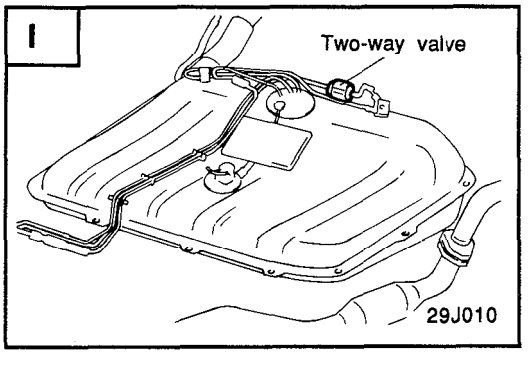




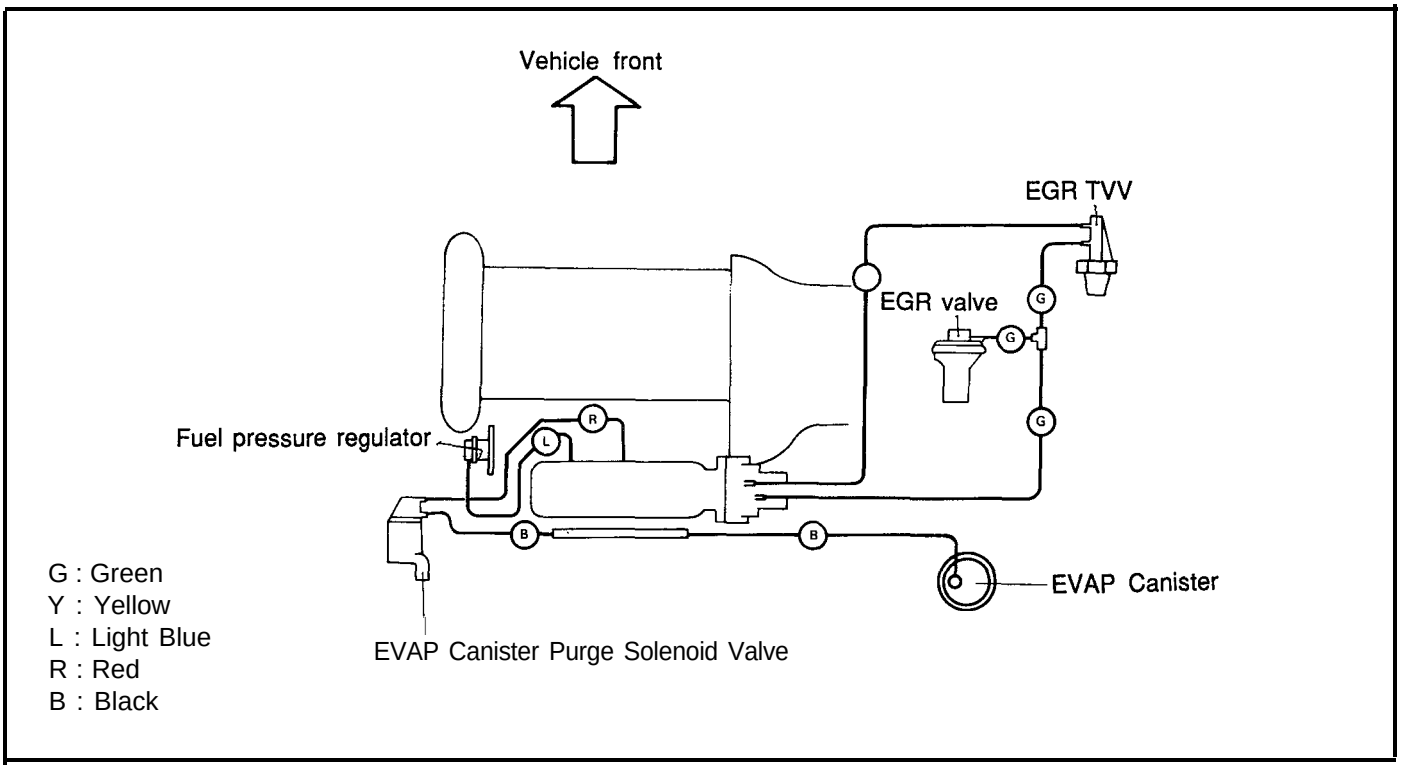
EVAP Canister



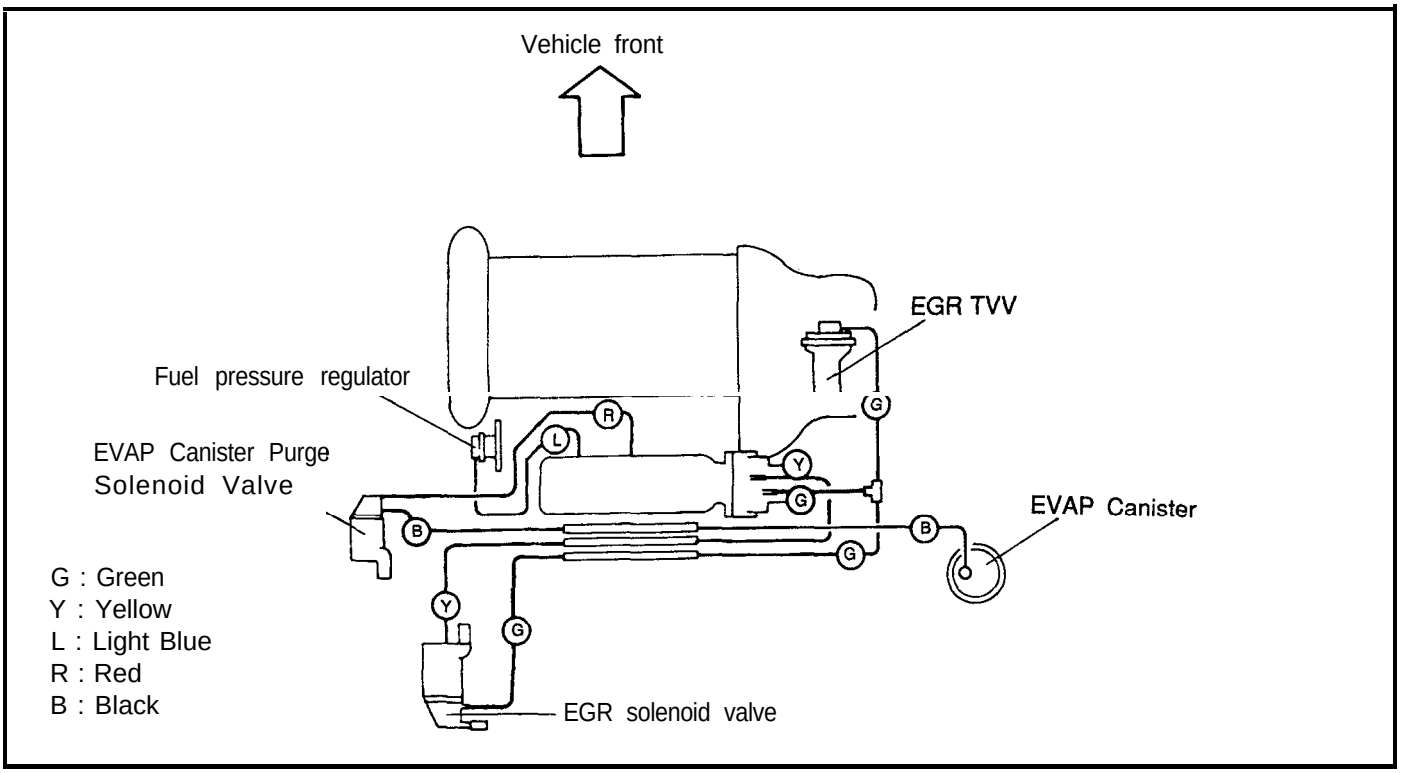




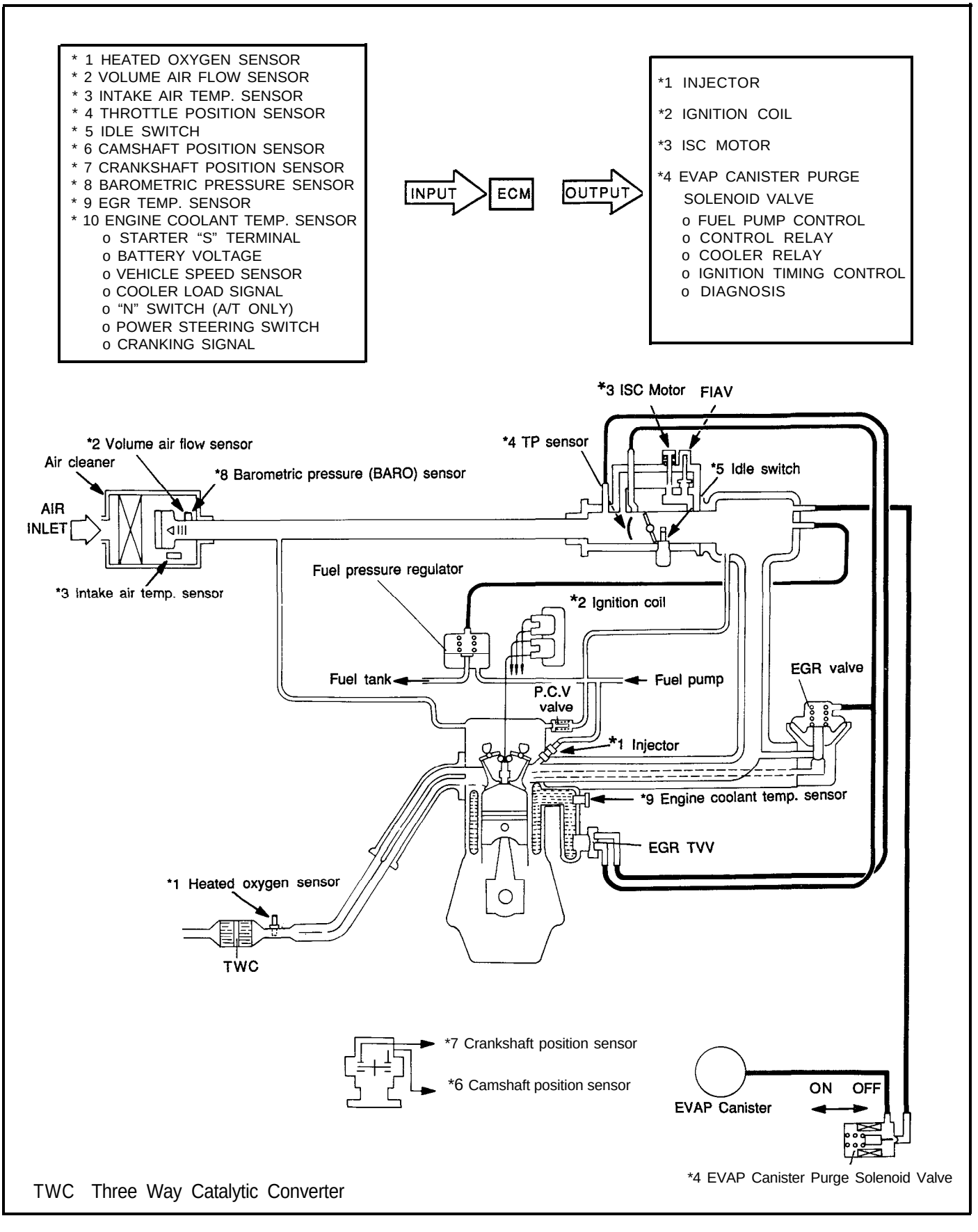
VACUUM HOSES LAYOUT
[Except California]



[California only]



SCHEMATIC DRAWING (Except California)



TWC Three Way Catalytic Converter

SCHEMATIC DRAWING (California only)

* 1 HEATED OXYGEN SENSOR (FR, RR)
* 2 VOLUME AIR FLOW SENSOR
* 3 INTAKE AIR TEMP. SENSOR
* 4 THROTTLE POSITION SENSOR
* 5 CAMSHAFT POSITION SENSOR
* 6 CRANKSHAFT POSITION SENSOR
* 7 BAROMETRIC PRESSURE SENSOR
* 8 EGR TEMP. SENSOR
* 9 ENGINE COOLANT TEMP. SENSOR
* 10 IDLE SWITCH
  - o STARTER "S" TERMINAL
  - o BATTERY VOLTAGE
  - o VEHICLE SPEED SENSOR
  - o COOLER LOAD SIGNAL
  - o "N" SWITCH (A/T ONLY)
  - o POWER STEERING SWITCH

INPUT → ECM → OUTPUT

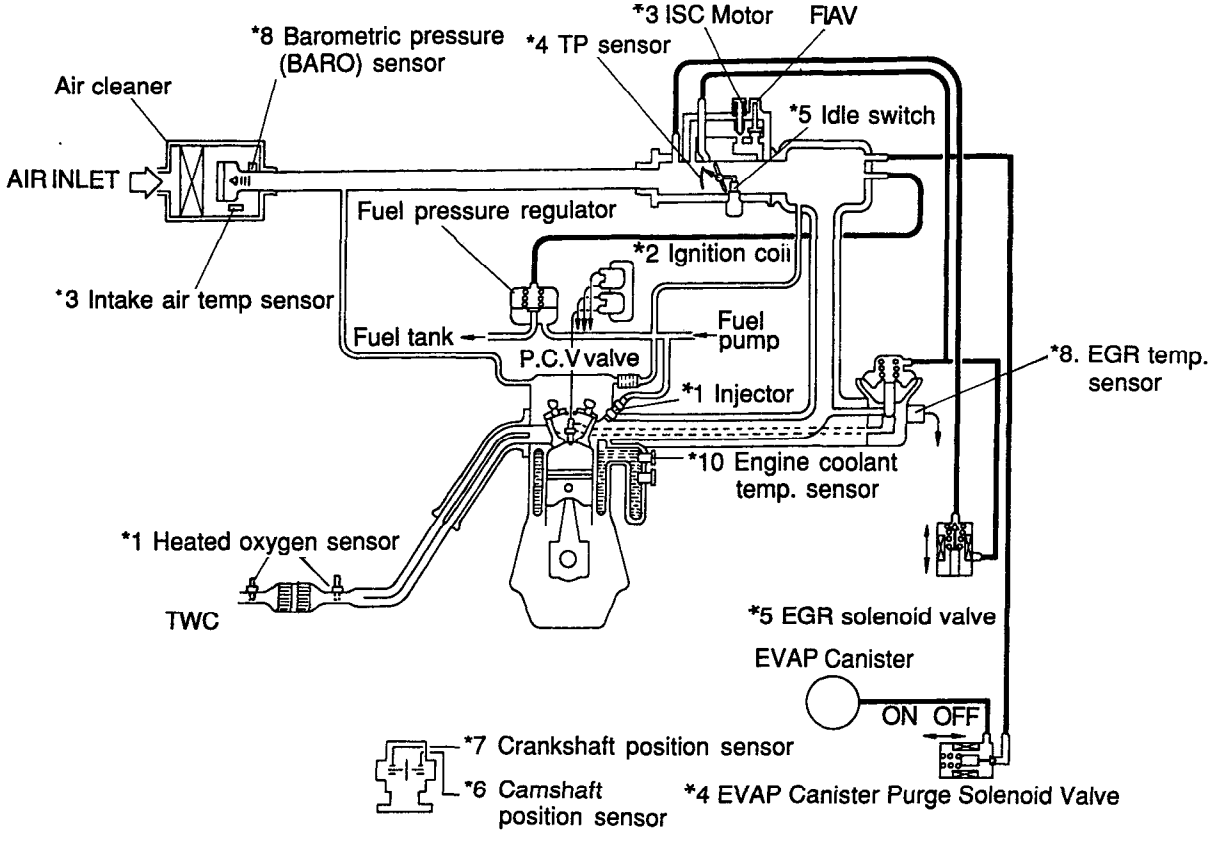
*1 INJECTOR

*2 IGNITION COIL

*3 ISC MOTOR

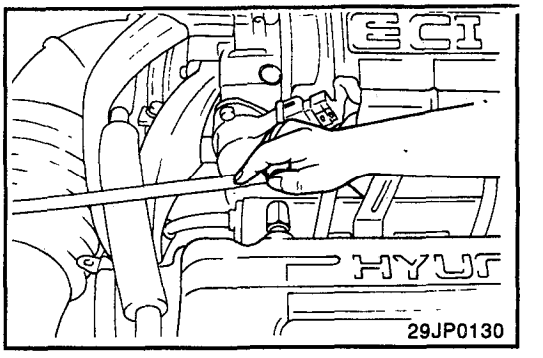
*4 EVAP CANISTER PURGE SOLENOID VALVE

*5 EGR SOLENOID VALVE
- o FUEL PUMP CONTROL (CONTROL RELAY)
- o COOLER RELAY
- o IGNITION TIMING CONTROL
- o DIAGNOSIS



TWC : Three Way Catalytic Converter

CRANKCASE EMISSION SYSTEM

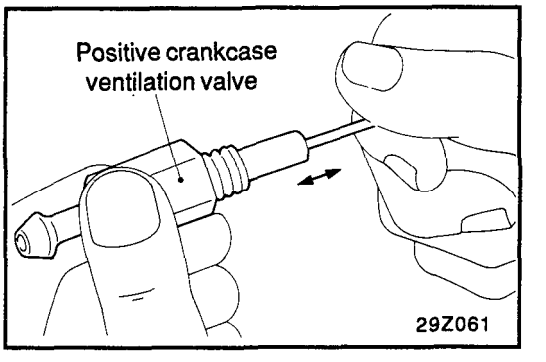


1. Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve. Remove the PCV valve from the rocker cover and reconnect it to the ventilation hose.
2. Run the engine at idle and put a finger on the open end of the PCV valve and make sure that intake manifold vacuum is felt.

NOTE
The plunger inside the PCV valve will move back and forth.

3. If vacuum is not felt, clean the PCV valve and ventilation hose in cleaning solvent or replace if necessary.

INSPECTION



1. Remove the positive crankcase ventilation valve.
2. Insert a thin stick into the positive crankcase ventilation valve from the threaded side to check that the plunger moves.
3. If the plunger does not move, the positive crankcase ventilation valve is clogged. Clean it or replace.

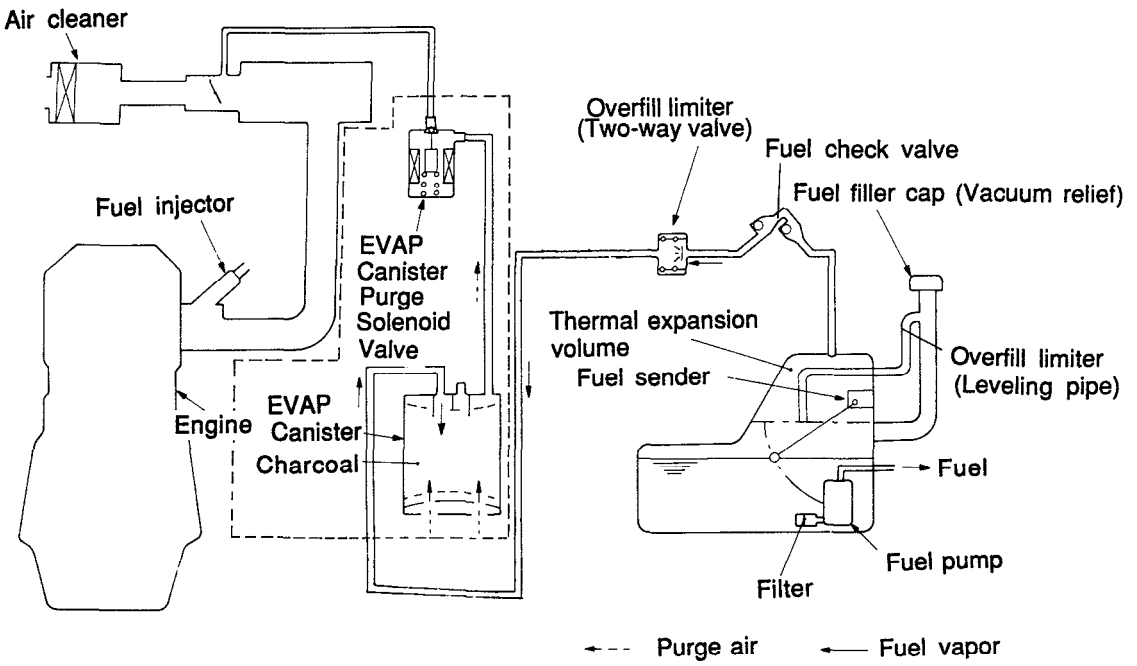
INSTALLATION

Install the positive crankcase ventilation valve and tighten to the specified torque.

PCV valve tightening torque	8-12 Nm (80-120 kg.cm, 6-8 lb.f-t)

EVAPORATIVE EMISSION SYSTEM

COMPONENTS

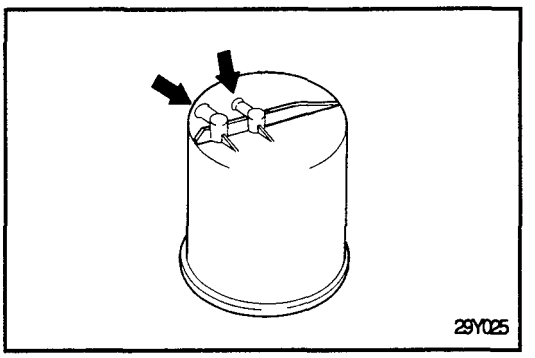


EVAP : Evaporative Emission

EVAP CANISTER

Inspection

1. Look for loose connections, sharp bends or damage to the fuel vapor lines.
2. Look for distortion, cracks or fuel leakage.
3. After removing the EVAP Canister, inspect for cracks or damage.



EVAP CANISTER PURGE SOLENOID VALVE

Inspection

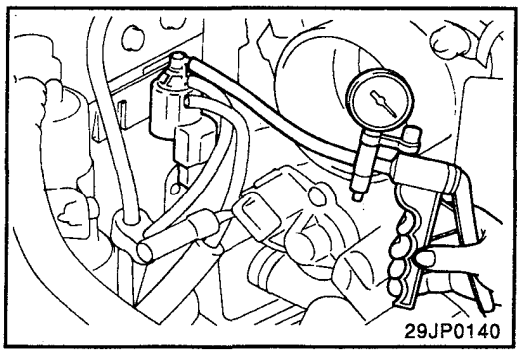
NOTE
When disconnecting the vacuum hose, make an identification mark on it so that it can be reconnected to its original position.

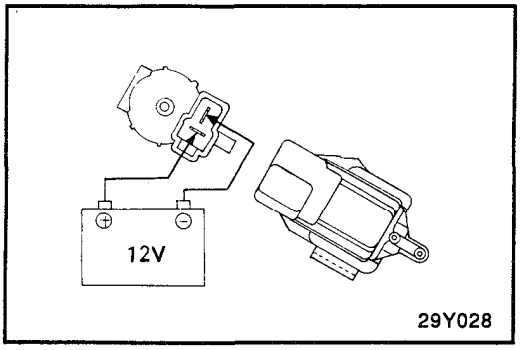
1. Disconnect the vacuum hose (black with red stripe) from the solenoid valve.
2. Detach the harness connector.
3. Connect a vacuum pump to the nipple to which the red-striped vacuum hose was connected.
4. Apply vacuum and check when voltage is applied to the purge-control solenoid valve and when the voltage is discontinued.

Battery voltage	Normal condition
When applied	Vacuum is released.
When discontinued	Vacuum is maintained

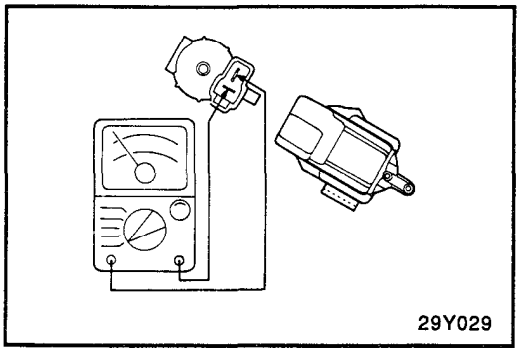
5. Measure the resistance between the terminals of the solenoid valve.

EVAP Canister Purge Solenoid Valve
Coil resistance ..... 36-44 Ω [at 20°C (68°F)]


29JP0140

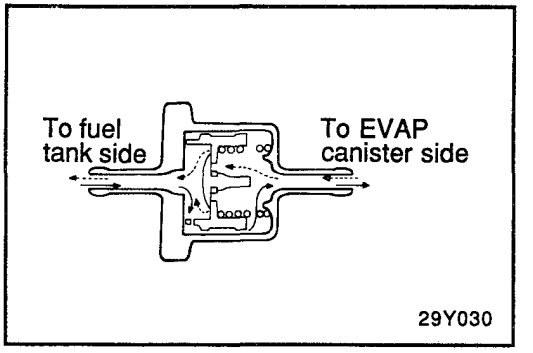


29Y028


29Y029

OVERFILL LIMITER (TWO-WAY VALVE)

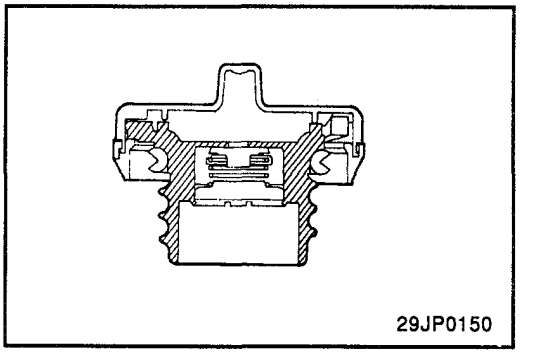
To inspect the overfill limiter (Two-way valve), refer to Group 31- Fuel tank.



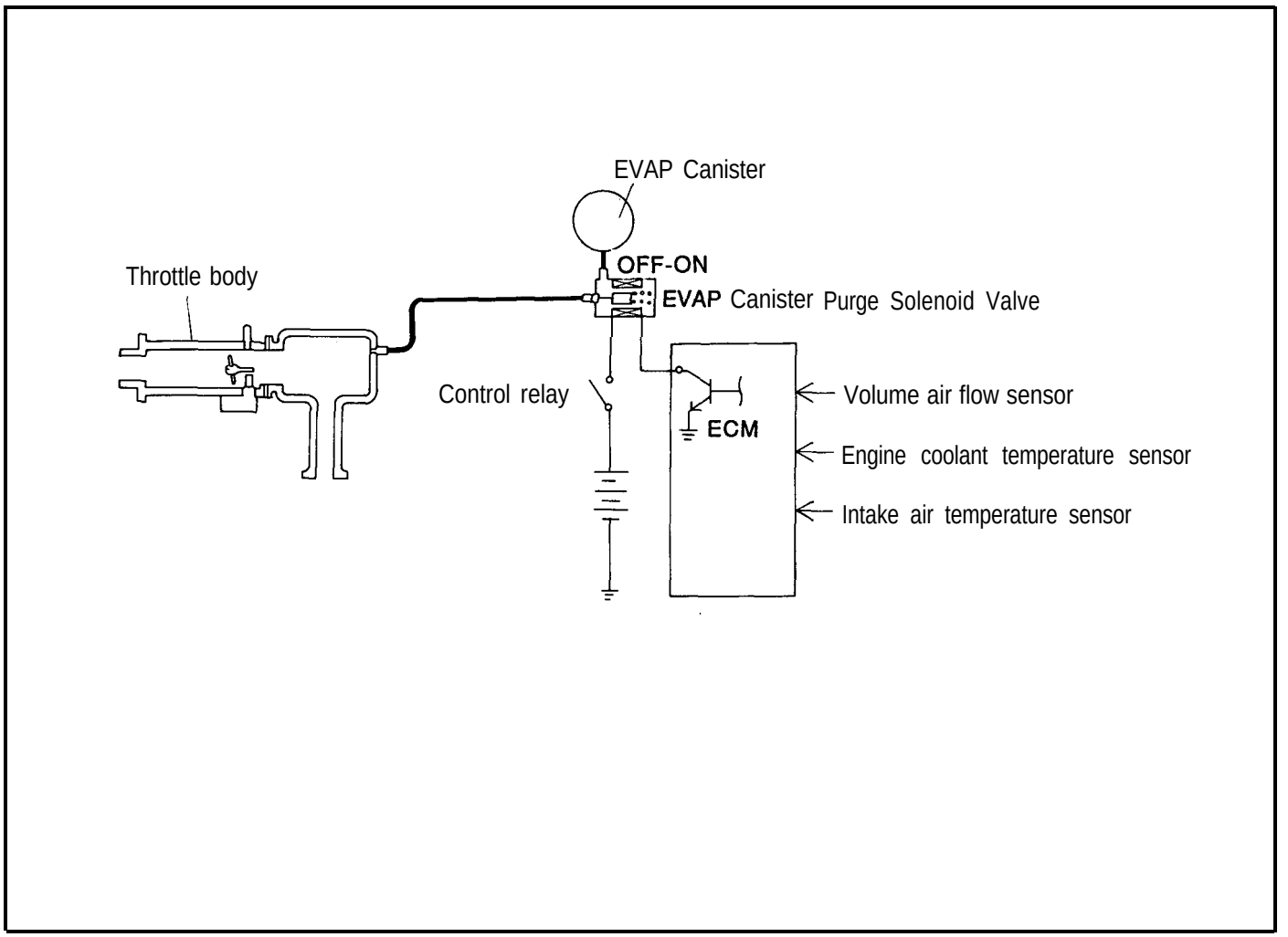
29Y030

FUEL FILLER CAP

Check the gasket of the fuel filler cap, and the filler cap itself, for damage or deformation; replace the cap if necessary.

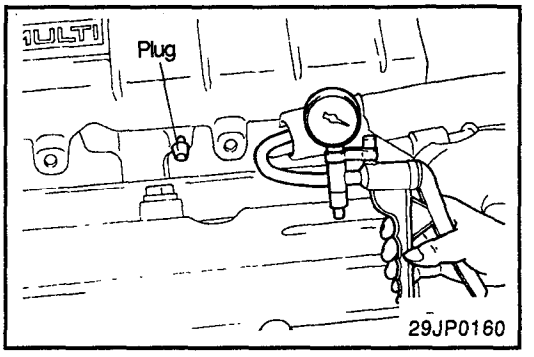

29JP0150

CHECKING PURGE SYSTEM



Checking

1. Disconnect the vacuum hose (red stripe) from the throttle body, and connect a vacuum pump to the vacuum hose.



2. Check the following points when the engine is cold [engine coolant temperature 60°C (140°F) or below] and when it is warm [engine coolant temperature 70°C (158°F) or higher].

When engine is cold

Engine operating condition	Applying vacuum	Result
Idling	50 kPa (7.3 psi)	Vacuum is held
3,000 rpm		

When engine is warm

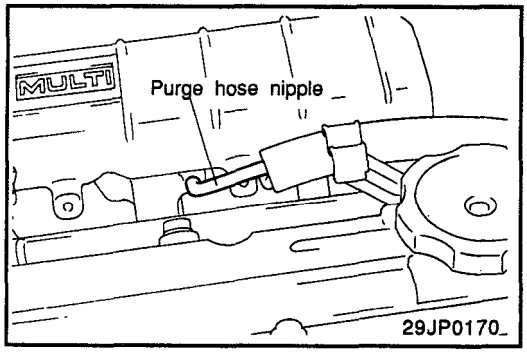
Engine operating condition	Aply vacuum	Result
idling	50 kPa (7.3 psi)	Vacuum is held
Within 3 minutes after engine start 3,000 rpm	Try to apply vacuum	Vacuum is released
After 3 minutes have passed after engine start 3,000 rpm	50 kPa (7.3 psi)	Vacuum will be held momentarily, after which, it will be released. **NOTE** **The vacuum will leak continuously if the altitude is 2,200 m (7,200 ft.) or higher, or the intake air temperature is 50°C (122°F) or lower.**

PURGE PORT VACUUM

Inspection

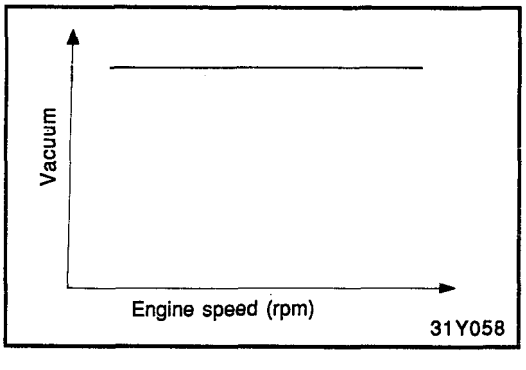
Engine coolant temperature: 80-95°C (176-205°F)

1. Disconnect the vacuum hose from the intake manifold purge hose nipple and connect a hand vacuum pump to the nipple.



2. Start the engine and check to see that, after raising the engine speed by racing the engine, vacuum remains fairly constant.

   NOTE
   If there is no vacuum created, it is possible that the intake manifold port may be clogged and require cleaning.



EXHAUST EMISSION SYSTEM

Exhaust emissions (CO, HC, NOx) are controlled by a combination of engine modifications and the addition of special control components.
Modifications to the combustion chamber, intake manifold, camshaft and ignition system form the basic control system. Additional control devices include an exhaust gas recirculation (EGR) system and catalytic converters.
These systems have been integrated into a highly effective system which controls exhaust emissions while maintaining good driveability and fuel economy.

AIR/FUEL MIXTURE RATIO CONTROL SYSTEM

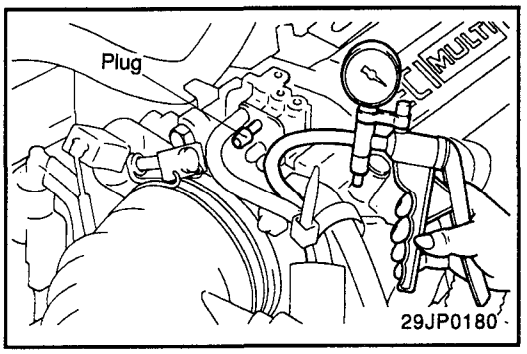
[Multiport Fuel Injection (MFI) System]

The MFI system is a system which employs the signals from the oxygen sensor to activate and control the injector installed in the manifold for each cylinder, thus precisely regulating the air/fuel mixture ratio and reducing emissions.
This in turn allows the engine to produce exhaust gases of the proper composition to permit the use of a three-way catalyst. The three-way catalyst is designed to convert the three pollutants (1) hydrocarbons (HC), (2) carbon monoxide (CO), and (3) oxides of nitrogen (NOx) into harmless substances. There are two operating modes in the MFI system.

1. Open-Loop air/fuel ratio is controlled by information programmed into the ECM.
2. Closed-Loop air/fuel ratio is varied by the ECM based on information supplied by the oxygen sensor.

EXHAUST GAS RECIRCULATION SYSTEM

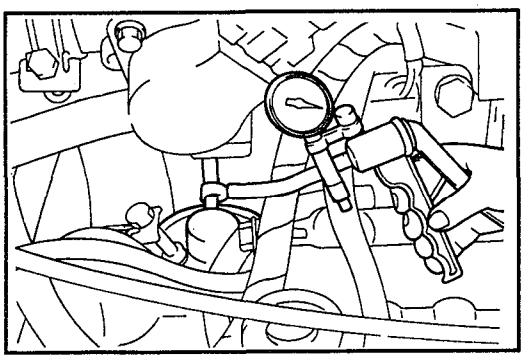
Inspection (Except California)



1. Disconnect the vacuum hose (green stripe) from the throttle body, and connect a vacuum pump to the vacuum hose.
2. Check the following points when the engine is both cold [engine coolant temperature 50°C (122°F) or below] and hot [engine coolant temperature 80-95°C (176-205°F) or higher].

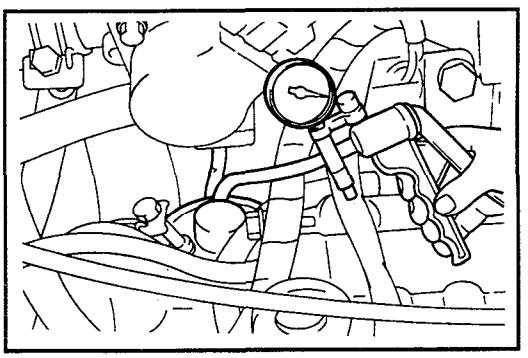
Engine coolant temperature	Vacuum	Engine condition	Normal condition
Cold	Apply	Idling	Vacuum is released
Hot	6 kPa (1.7 in.Hg)	Idling	Vacuum is held
	26 kPa (7.5 in.Hg)	Idle is unstable	Vacuum is held

Inspection (California Only)



1. Disconnect the vacuum hose (green stripe) from the EGR valve body, and connect a vacuum pump via the three way terminal.
2. Check the following points when the engine is both cold [engine coolant temperature 20°C (68°F) or below] and hot [engine coolant temperature 70°C (158°F) or higher].

[When the engine is cold]



Engine condition	Normal condition
Rev engine	No change in vacuum (atmospheric pressure)

[When the engine is warm]

Engine condition	Normal condition
Rev engine	Vacuum rises temporarily to 14 kPa (3.9 in.Hg) or more.

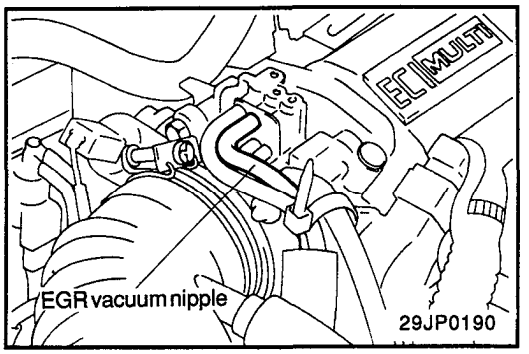
3. Disconnect the three-way terminal and connect the hand vacuum pump directly to the Exhaust Gas Recirculation (EGR) valve.
4. Check whether the engine stalls or the idling is unstable when a vacuum of 26 kPa (7.5 in.Hg) or higher is applied during idling.

EGR VALVE VACUUM

Inspection

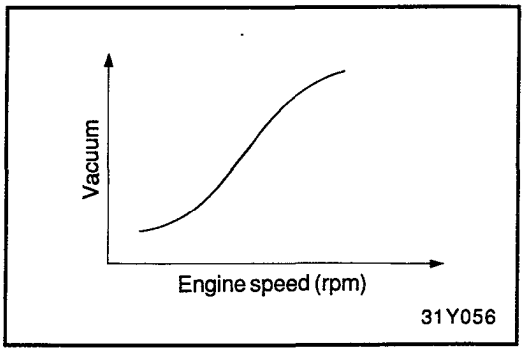
Engine coolant temperature: 80-95°C (176-205°F)

1. Disconnect the vacuum hose from the throttle body EGR vacuum nipple and connect a hand vacuum pump to the nipple.



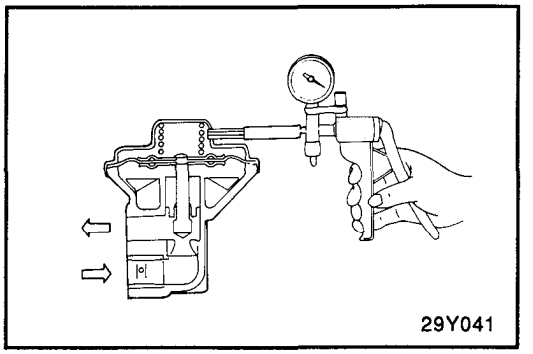
2. Start the engine and check to see that, after raising the engine speed by racing the engine, E vacuum rises proportionately with the rise in engine speed.

NOTE
If there is a problem with the change in vacuum, it is possible that the throttle body E port may be clogged and require cleaning.



EGR VALVE

1. Remove the EGR valve and check for sticking, carbon deposits, etc.
   If such conditions exist, clean with solvent to ensure tight valve seat contact.
2. Connect a manual vacuum pump to the EGR valve.
3. Apply a vacuum of 67 kPa (9.7 psi) and check air tightness.
4. Blow in air from one passage of the EGR to check condition as follows.



Vacuum	Normal conditin
7 kPa (1.0 psi) or less	Air does not blow through
23 kPa (3.3 psi) or more	Air blows through

CAUTION
When installing the EGR valve, use a new gasket and tighten to the specified torque.

Tightening torque
EGR valve ..... 15-22 Nm (150-220 kg.cm, 11-16 lb.ft)

Exhaust Gas Recirculation Thermal Vacuum Valve [(EGR TVV) Except California]

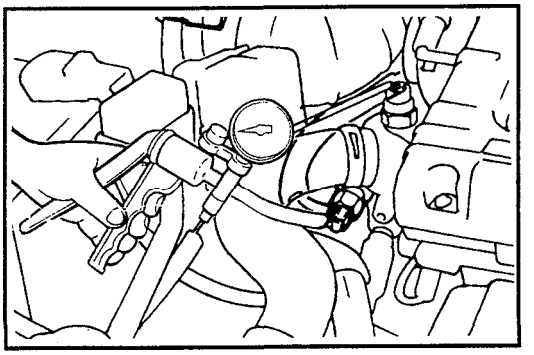
CAUTION
1. **Do not use a wrench on the plastic section when removing or installing the EGR TVV.**
2. **When installing, apply a coat of sealant to the threads, and tighten to the specified torque.**

Tightening torque
EGR TVV ..... 20-40 **Nm (200-400 kg.cm, 14-29 lb&)**

3. **When disconnecting the vacuum hose, make an identification mark on it so that it can be reconnected to the original position.**

1. Disconnect the vacuum hoses from the EGR TVV, and connect a manual vacuum pump to the EGR TVV.
2. Apply **a** vacuum and check the air passage through the EGR TVV.

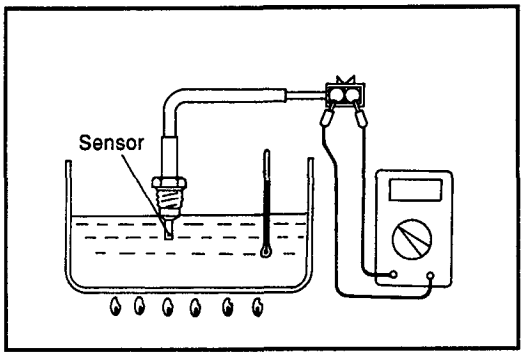
Engine coolant temperature	Normal condition
50°C (122°F) or less	Vacuum leaks
80°C (176°F) or more	Vacuum is maintained



EGR Temperature Sensor (California only)

1. Place the EGR temperature sensor in water, and then measure the resistance value between terminals 1 and 2 while increasing the water temperature.
   If out of specification, replace the EGR temperature sensor.

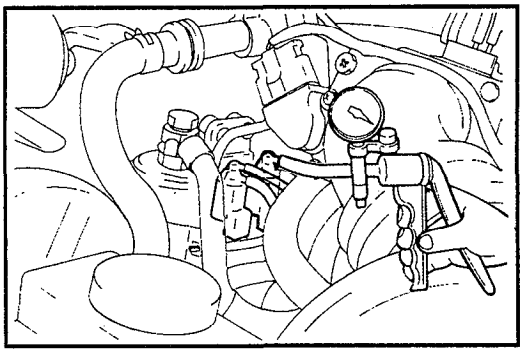
Temperature °C (°F)	Resistance (kΩ)
50 (122)	60-83
100 (212)	11-14



EGR Control Solenoid Valve (California only)

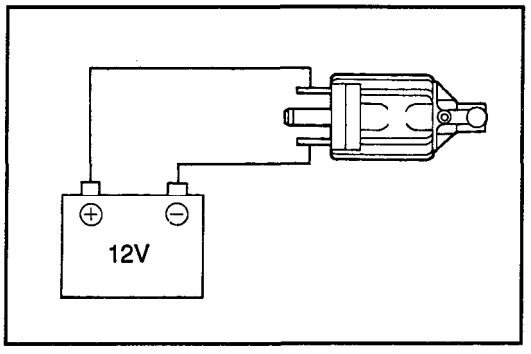
NOTE
When disconnecting the vacuum hose, make an identification mark on it so that it can be reconnected to its original position.

1. Disconnect the vacuum hose (green stripe) from the solenoid valve.
2. Disconnect the harness connector.
3. Connect a hand vacuum pump to the nipple to which the green-striped vacuum hose was connected.



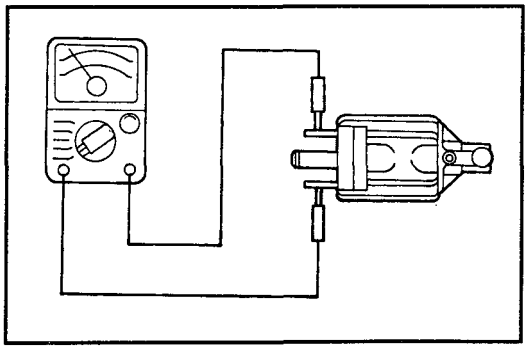
4. Apply a vacuum to check for a maintained vacuum when voltage applied directly to the EGR solenoid valve.
   When the voltage is discontinued, the vacuum is released.

Battery voltage	Result
When applied	Vacuum is held.
When discontinued	Vacuum is released



5. Measure the resistance between the terminals of the solenoid valve.

Standard value ..... 36-44 Ω [at 20°C (68°F)]



CATALYTIC CONVERTER

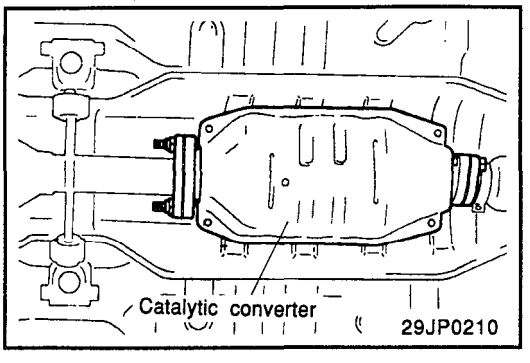
INSPECTION

Inspect for damage, cracking or deterioration. Replace if faulty.

CAUTION

The catalytic converters require the use of unleaded gasoline only. Leaded gasoline will destroy the effectiveness of the catalysts as an emission control device.

Under normal operating conditions, the catalytic converters will not require maintenance. However, it is important to keep the engine properly tuned. Engine misfiring may cause overheating of the catalysts. This may cause heat damage to the converters or vehicle components. The situation can also occur during diagnostic testing if any spark plug cables are removed and the engine is allowed to idle for a prolonged period of time.



ENGINE ELECTRICAL SYSTEM

Return To Main Table of Contents

GENERAL 2

IGNITION SYSTEM 4

CHARGING SYSTEM 13

STARTING SYSTEM 29

AUTOMATIC SPEED CONTROL (CRUISE) SYSTEM 38

GENERAL

SPECIFICATIONS

Distributor

Type	Contact pointless type
Advance mechanism	Controlled by engine control module
Ignition order	1-3-4-2

Ignition coil

Type	Mold dual-coil
Primary coil resistance	0.8 ± 0.09 Ω
Secondary coil resistance	12.1 ± 1.8 KΩ

Spark plug

Type	
NGK	BPR6ES-11
Champion	RN9YC4
Plug gap	1.0-1.1 mm (0.039-0.043 in.)

Starter motor

Type	Reduction drive (with planetary gear)
Voltage	12V
output	1.2KW
No-load characteristics	
Terminal voltage	11V
Amperage	90 A
Speed	3,000 RPM
Number of pinion teeth	8
Pinion gap	0.5-2.0 mm (0.0197-0.079 in.)

Generator

Type	Battery voltage sensing
Rated output	13.5 V
Voltage regulator type	Electronic built-in type
Regulator setting voltage	14.4 ± 0.3V
Temperature compensation	-10 ± 3 mV/°C

Battery

Type	**60AH-B**
Ampere hours (5HR)	**48 Ah or more**
(20HR)	**60 Ah or more**
Cold cranking [at -17.8°C(0°F)]	**420 A or more**
Reserve capacity	**92 min.**
Specific gravity [at 25°C(77°F)]	**1.270 ± 0.01**

NOTE

COLD CRANKING AMPERAGE is the amperage a battery can deliver for 30 seconds and maintain a terminal voltage of 7.2 or greater at a specified temperature.

RESERVE CAPACITY RATING is the amount of time a battery can deliver 25A and maintain a minimum terminal voltage of 10.5 at 26.7°C (80°F).

IGNITION SYSTEM

GENERAL INFORMATION

Ignition timing is controlled by the electronic control ignition timing system. The ignition timing data for the engine operation conditions are programmed in the memory of the engine control module (ECM).

The engine conditions (speed, load, warm-up condition, etc.) are detected by the various sensors. Based upon these sensor signals and the ignition timing data, signals to interrupt the primary current are sent to the power transistor. The ignition coil is activated, and timing is controlled at the optimum point.

TROUBLE SHOOTING

Trouble condition	Probable cause	Remedy
Engine will not start or is hard to start. (Cranks OK)	Incorrect ignition timing	Adjust ignition timing
	Ignition coil faulty	Inspect ignition coil
	Power transistor faulty	Inspect power transistor
	Crankshaft position sensor faulty	Replace crankshaft position sensor
	High tension cable faulty	Inspect high tension cable
	Spark plugs faulty	Replace plugs
	Ignition wiring disconnected or broken	Inspect wiring
Rough idle or stalls	Spark plugs faulty	Replace plugs
	Ignition wiring faulty	Inspect wiring
	Incorrect ignition timing	Adjust ignition timing
	Ignition coil faulty	Inspect ignition coil
	Power transistor faulty	Inspect power transistor
Engine hesitates/poor acceleration	Spark plugs faulty	Replace plugs
	Ignition wiring faulty	Inspect wiring
	Incorrect ignition timing	Adjust timing
Poor mileage	Spark plugs faulty	Replace plugs
	Incorrect ignition timing	Adjust ignition timing
Engine overheats	Incorrect ignition timing	Adjust ignition timing

IGNITION TIMING

Adjustment conditions:

Coolant temperature: 80-95°C (170-205°F)
Lamps, cooling fan, and all accessories: Off
Transaxle range : Neutral (N or P for A/T)
Parking brake : ON
Steering wheel : Neutral position

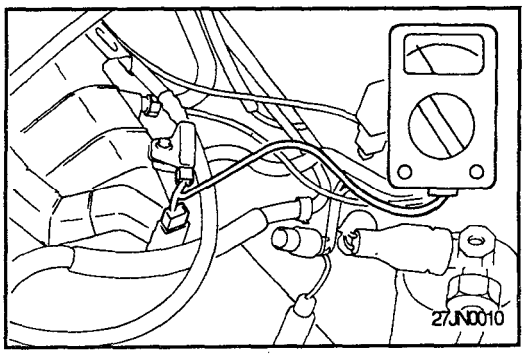
Adjustment Procedures

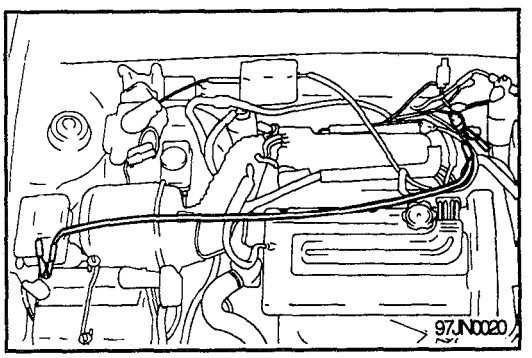
1. Install a tachometer and a timing light.
2. Run the engine for more than 5 seconds at an engine speed of 2,000 to 3,000 rpm.
   Run the engine at idle for 2 minutes.
3. Read the idling rpm. If it is not within the specified value, check the idle speed control system.

   Idle speed : 750 ± 100 rpm (For 1.6L)
   700 ± 100 rpm (For 1.8L)

   Refer to 31 GROUP - Idle speed adjustment section.

   NOTE
   1) Do not use the scan tool.
   If tested with the scan tool connected to the data link connector, the ignition timing will not be the basic timing, but be ordinary timing.
   2) The engine speed indicated is a second of actual speed. In other words, the reading of the tachometer times 2 is actual speed.



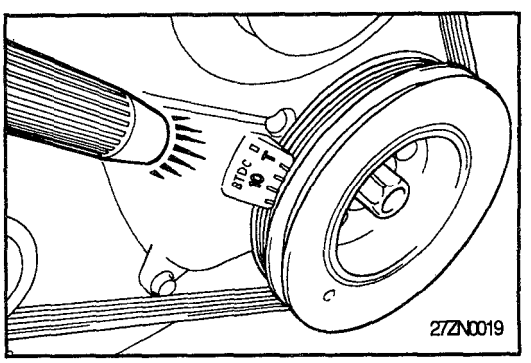


4. Ground the ignition timing adjustment terminal.
5. Check the basic ignition timing.

   Basic ignition timing : 5^{o} ± 2^{o} BTDC (at idle)

6. If the timing is incorrect, loosen the crankshaft position sensor mounting nut, and rotate the crankshaft position sensor until the timing is correct.

   NOTE
   The ignition timing will be retarded, if the crankshaft position sensor is turned to the left and advanced if it is turned to the right.



7. After adjustment, securely tighten the mounting nut.
   Tightening torque : 10-13Nm (100-130 kg.cm, 7-9 lb.ft)

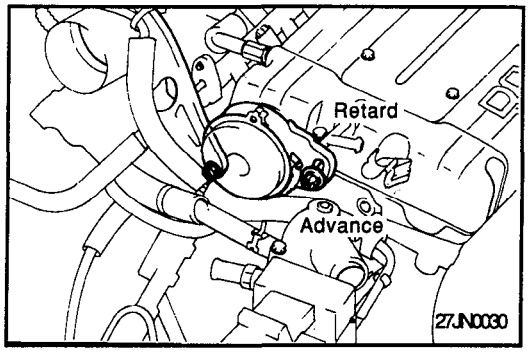
   NOTE

   Be careful, when tightening the nut, that the crankshaft position sensor does not move.
8. Stop the engine.
9. Disconnect the lead wire connected at step 4.
10. Start and run the engine at curb idle speed.
11. Check to be sure that the idling ignition timing is the correct timing.

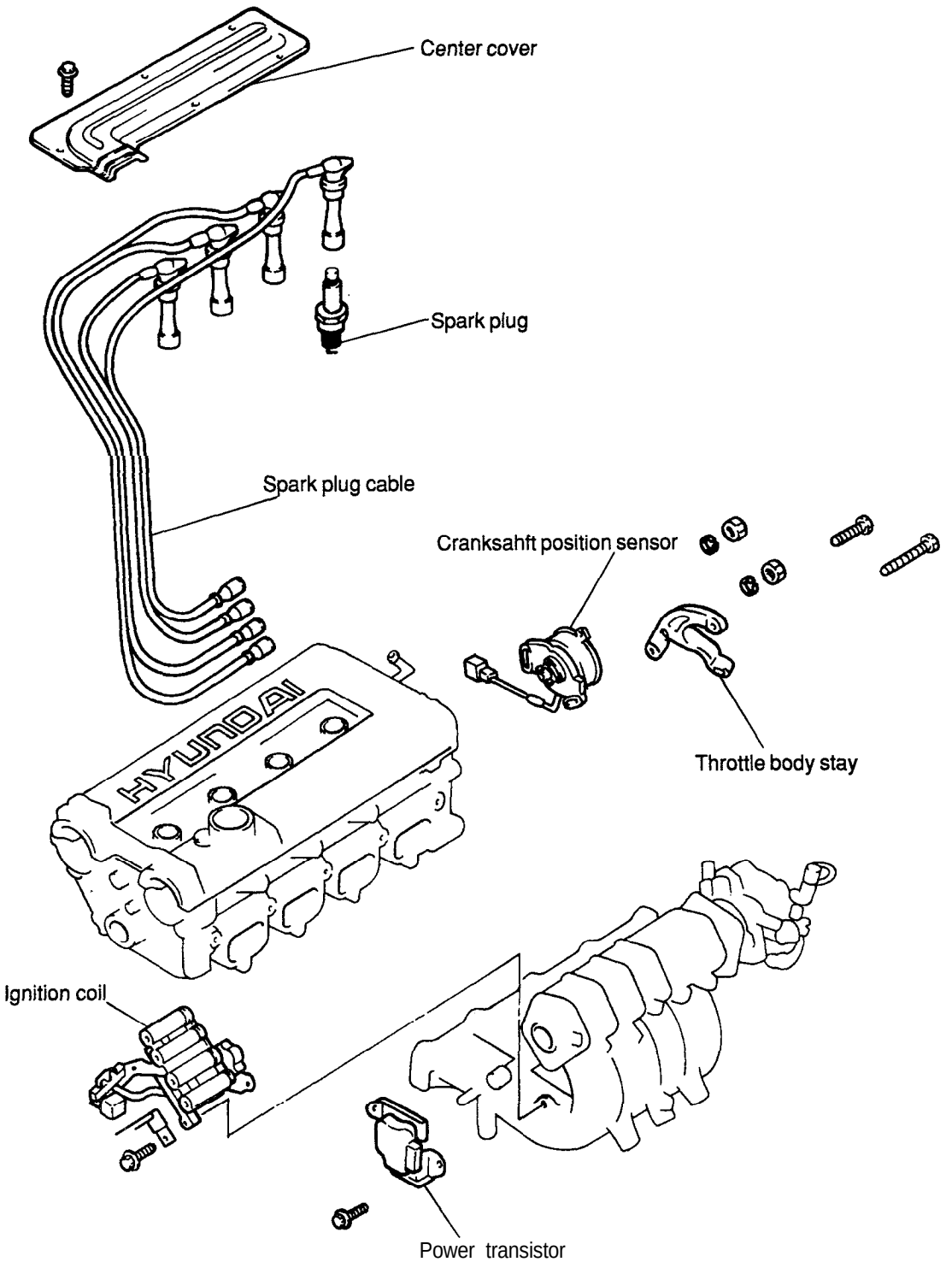
    Actual ignition timing : 8° BTDC (For 1.6L)
    14° BTDC (For 1.8L)

    NOTE

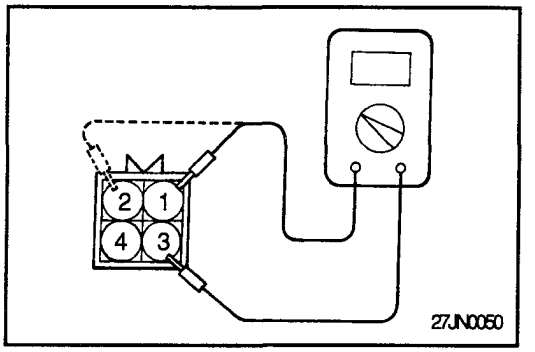
    1. Actual ignition timing may vary, depending on the control mode of the engine control module. In such a case, re-check the basic ignition timing. If there is no deviation, the ignition timing is functioning normally.
    2. At high altitudes more than approximately 700 m (2,300 ft.) above sea level, the actual ignition timing is farther advanced to ensure good combustion.



REMOVAL AND INSTALLATION



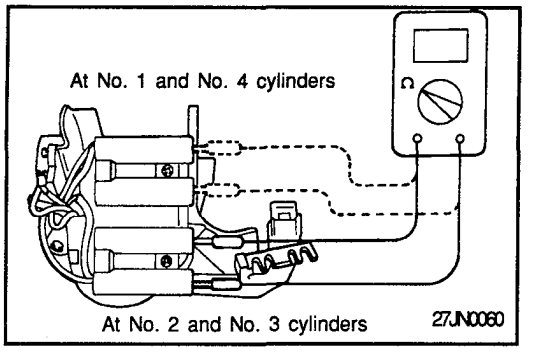
IGNITION COIL



Measurement of the primary coil resistance

1. Measure the resistance between connector terminals 3 and 1 (the coils at the No. 1 and No. 4 cylinder sides) of the ignition coil, and between terminals 3 and 2 (the coils at the No. 2 and No. 3 cylinder sides).

   Standard value: 0.77 - 0.95Ω



Measurement of the secondary coil resistance

1. Measure the resistance between the high-voltage terminal for the No. 1 and No. 4 cylinders, and between the high-voltage terminals for the No. 2 and No. 3 cylinders.

   Standard value: 10.3 - 13.9KΩ

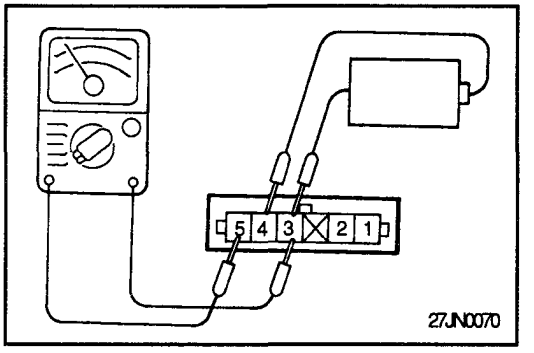
   CAUTION

   Be sure, when measuring the resistance of the secondary coil, to disconnect the connector of the ignition coil.

POWER TRANSISTOR

NOTE

An analog-type ammeter should be used.



Power transistor for coil No. 1 and No. 4 cylinders

1. Connect the negative (-) terminal of the 1.5V power supply to terminal No.3 of the power transistor; then check whether there is continuity between terminal No.5 and terminal No.3 when terminal No.4 and the positive (+) terminal are connected and disconnected.

   NOTE

   Connect the negative (-) probe of the ammeter to terminal No.5.

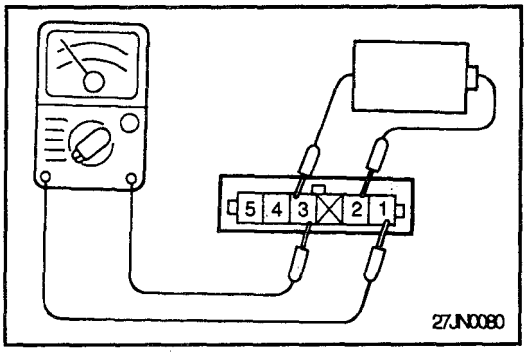
Terminal 4 and (+) terminal	Terminal 5 and terminal 3
Connected	Continuity
Disconnected	No continuity

Power transistor for coil No.2 and No.3 cylinders

1. Connect the negative (-) terminal of the 1.5V power supply to terminal No.3 of the power transistor; then check whether there is continuity between terminal No.1 and terminal No.3 when terminal No.2 and the positive (+) terminal are connected and disconnected.

   NOTE

   Connect the negative (-) probe of the ammeter to terminal No.1.



Terminal 2 and (+) terminal	Terminal 1 and terminal 3
Connected	Continuity
Disconnected	No continuity

If the problem is still evident after checking as described above, replace the power transistor.

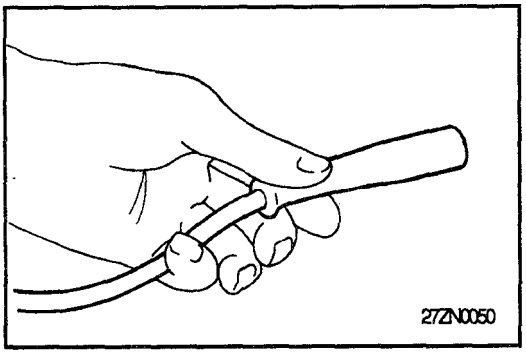
CHECKING SPARK PLUG

Inspection and Cleaning

1. Disconnect the spark plug cable from the spark plug.

   NOTE

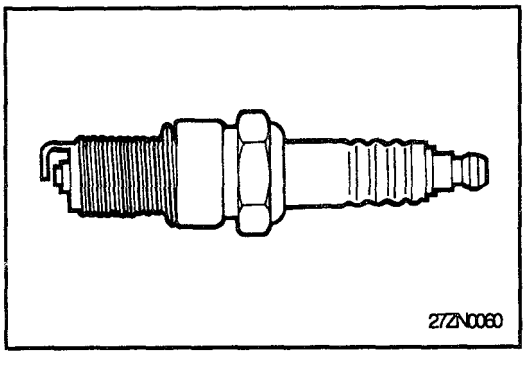
   Pull on the spark plug cable boot when removing the spark plug cable, not the cable, as it may be damaged.



2. Using spark plug wrench, remove all of the spark plugs from the cylinder head.

   NOTE

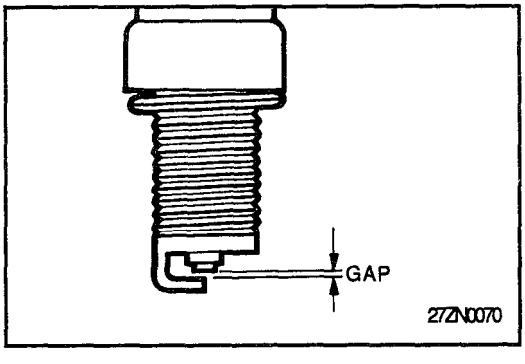
   Take care not to allow contaminants to enter through the spark plug holes.



3. Check the spark plugs for the following:
   1) Broken insulator
   2) Worn electrode
   3) Carbon deposits
   4) Damaged or broken gasket
   5) Condition of the porcelain insulator at the tip of the spark-plug

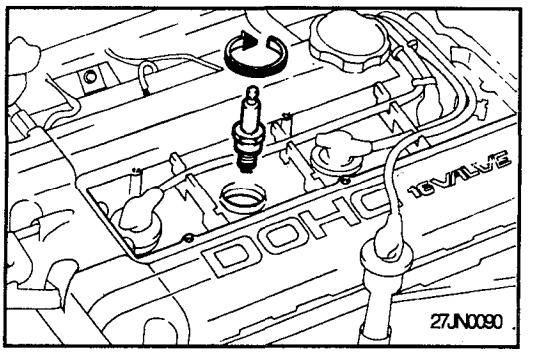
4. Check the spark plug gap using a wire gap gauge, and adjust if necessary.

   Standard value: 1.0-1.1 mm (0.039-0.043 in.)



5. Re-insert the spark plug and tighten to the specified torque. If it is over torqued, damage to the threaded portion of cylinder head might result.

   Spark plug: 20-30 Nm (204-309 kg.cm, 15-21 lb.ft)



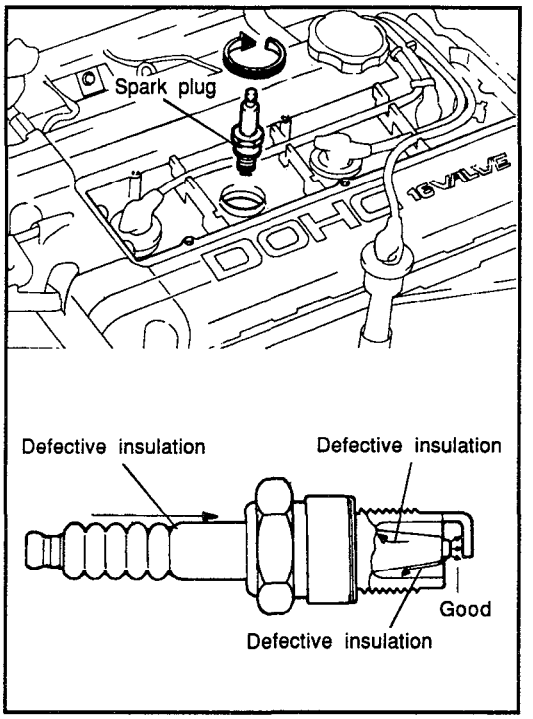
Analyzing Spark Plug

Engine conditions can be analyzed by the tip deposits near the electrode.

Condition	Dark deposits	White deposits
Description	o Too rich a fuel mixture o Low air intake	o Too lean a fuel mixture o Advanced ignition timing o Insufficient plug tightening

SPARK PLUG TEST

1. Remove the spark plug and connect to the spark plug cable.
2. Ground the spark plug outer electrode, and crank the engine.
3. Check to be sure that there is an electrical discharge between the electrodes at this time.



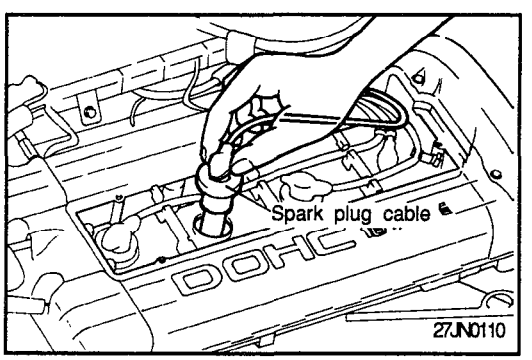
SPARK PLUG CABLES TEST

1. Disconnect, one at a time each of the spark plug cables while the engine is idling to check whether the engine's running performance changes or not.

   Caution

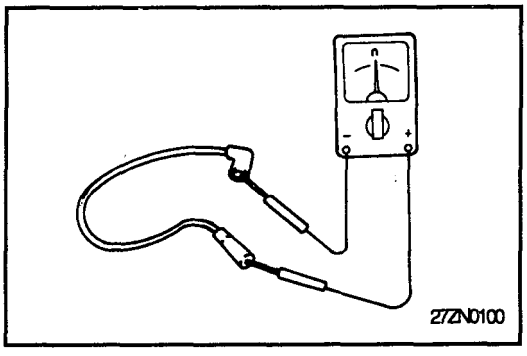
   Wear rubber gloves while doing so.

2. If the engine performance does not change, check the resistance of the spark plug, and check the spark plug itself.
3. Check the cap and outer shell for cracks.



4. Measure the resistance.

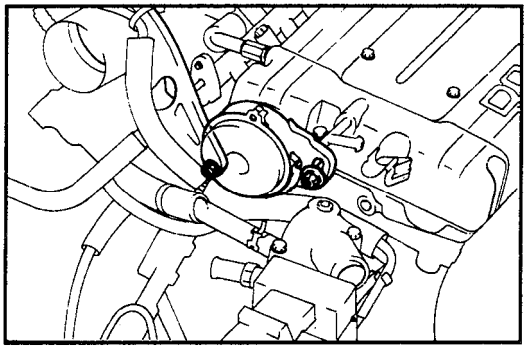
Spark plug cable			
No. 1	No. 2	No. 3	No. 4
5.8	8.4	10.6	9.7



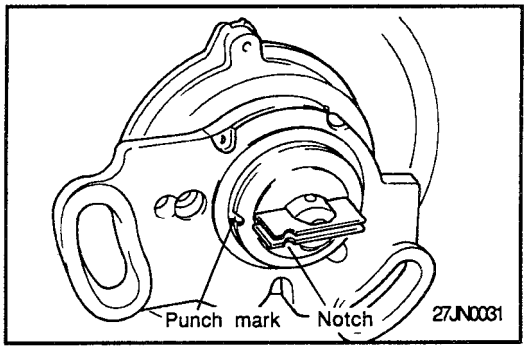
NOTE

Resistance should not be higher than 10,000 Ω per foot of cable. If resistance is higher, replace the cable.

CRANKSHAFT POSITION SENSOR



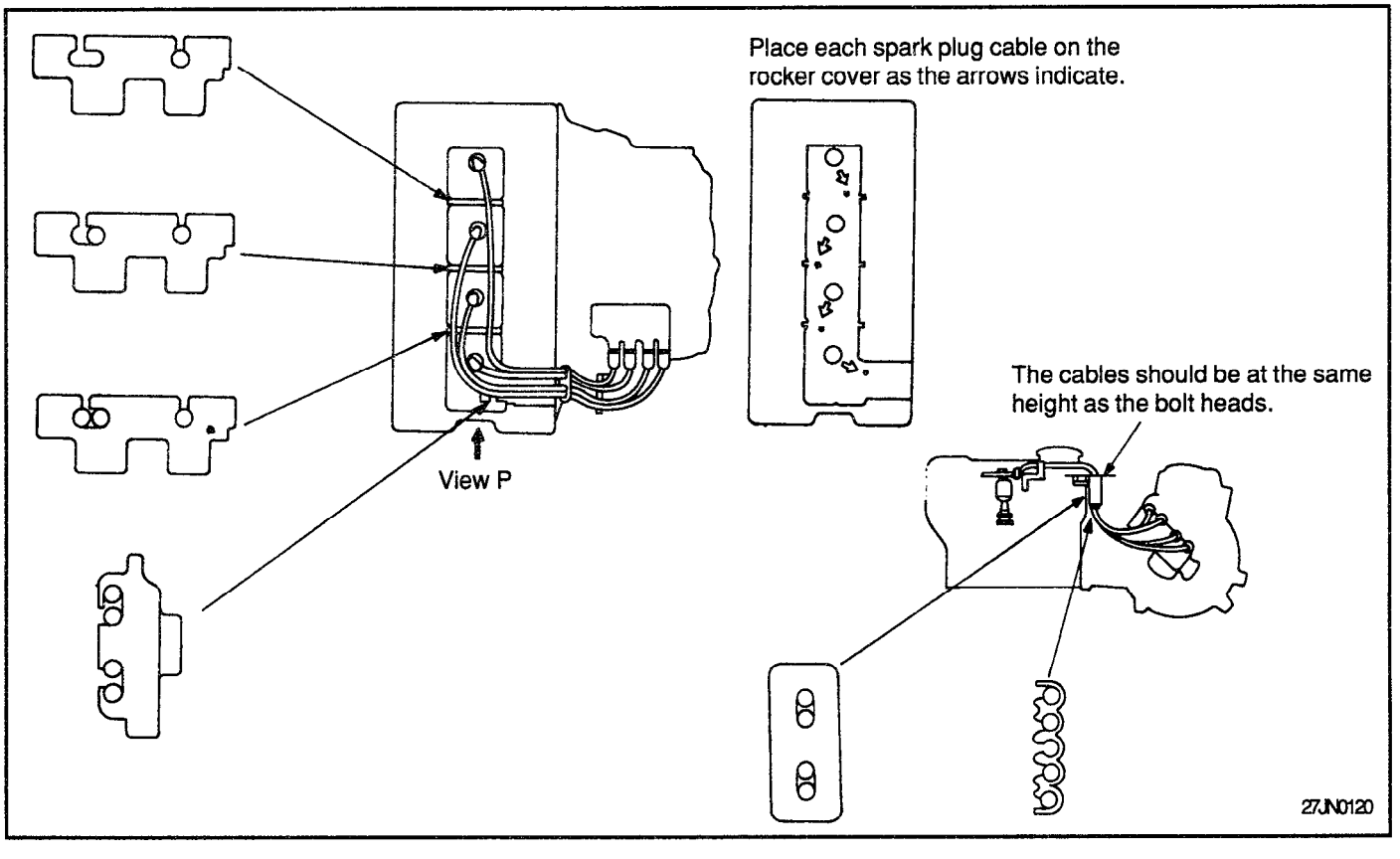
1. Remove the battery ground cable
2. Remove the crankshaft position sensor mounting bolt (2 EA).
3. Pull out the crankshaft position sensor from cylinder head.



4. Turn the crankshaft so that the No. 1 cylinder is at top dead center.
5. Align the punch mark on the crankshaft position sensor housing with the notch in plate.
6. install the crankshaft position sensor on the cylinder head.

INSTALLATION OF SPARK PLUG CABLE

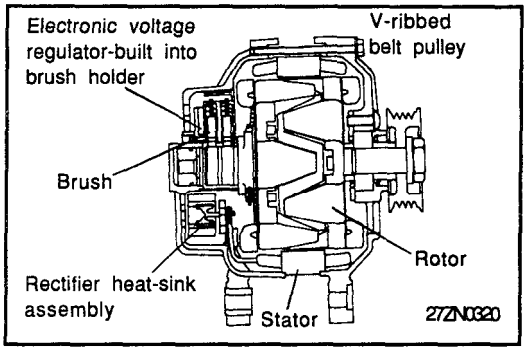
Improper arrangement of spark plug cables will induce voltage between the cables, causing miss firing and developing a surge at acceleration in high-speed operation.
Therefore, be careful to arrange the spark plug cables properly as shown in the illustration.



CHARGING SYSTEM

GENERAL INFORMATION

The charging system includes a battery, an generator with a built-in regulator, and the charging indicator light and wires. The generator has six built-in diodes (three positive and three negative), each rectifying AC current to DC current. Therefore, DC current appears at generator "B" terminal.
In addition, the charging voltage of this generator is regulated by the battery voltage detection system. The main components of the generator are the rotor, stator, rectifier, capacitor, brushes, bearings and V-ribbed belt pulley. The brush holder contains a built-in electronic voltage regulator.



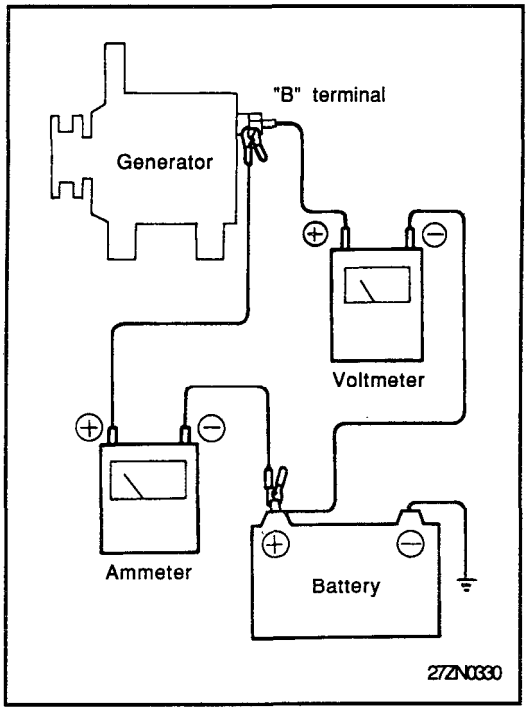
TROUBLESHOOTING

Symptom	Probable cause	Remedy
Charging warning indicator does not light with ignition switch "ON" and engine off.	Fuse blown.	Check fuses.
	Bulb burned out.	Replace bulb.
	Wiring connection loose.	Tighten loose connections.
	Electronic voltage regulator faulty.	Replace voltage regulator.
Charging warning indicator does not go out with engine running. (Battery requires frequent recharging).	Drive belt loose or worn.	Adjust tension or replace drive belt.
	Battery cables loose, corroded or worn.	Repair or replace cables.
	Fuse blown.	Check fuses.
	Fusible link blown.	Replace fusible link.
	Electronic voltage regulator or generator faulty.	Test generator.
	Wiring faulty.	Repair wiring.
Discharge battery.	Drive belt loose or worn.	Adjust tension or replace drive belt.
	Wiring connection loose or open circuit.	Tighten loose connection or repair wiring.
	Fusible link blown.	Replace fusible link.
	Poor grounding.	Repair.
	Electronic voltage regulator or generator faulty.	Test generator.
	Worn battery	Replace battery.
Overcharge	Electronic voltage regulator faulty	Replace voltage regulator.
	Voltage sensing wire faulty	Repair wire.

INSPECTION OF CHARGING SYSTEM

VOLTAGE DROP TEST OF GENERATOR OUTPUT WIRE

This test determines whether or not the wiring between the generator “B” terminal and the battery (+) terminal is good.



Preparation

1. Turn the ignition switch to “OFF”.
2. Disconnect the battery ground cable.
3. Disconnect the generator output lead from the generator "B" terminal.
4. Connect a DC ammeter (0 to 100A) in series to the “B” terminal and disconnected the output lead. Connect the (+) lead of the ammeter to the “B” terminal and the (-) lead to the disconnected output wire.

   NOTE

   Using a clamp type ammeter is the best method of measuring current. It will allow you to check the system with out disconnecting any of the terminals.
5. Connect a voltmeter between the generator “B” terminal and battery (+) terminal. Connect the (+) lead wire of the voltmeter to the “B” terminal and the (-) lead wire to the battery (+) terminal.
6. Connect the battery ground cable.
7. Leave the hood open.

Test

1. Start the engine.
2. Turn on the headlights and adjust the engine speed so that the ammeter reads 20A and then read the voltmeter.

Result

1. It is okay if the voltmeter indicates the standard value.

   Standard value: 0.2V Max.

2. If the voltmeter indicates a value that is larger than the standard value, poor wiring is suspected. In this case check the wiring from the generator “B” terminal to the fusible link to the battery (+) terminal. Check for loose connections, color change due to an overheated harness, etc. Correct them before testing again.

3. Upon completion of the test, set the engine speed at idle. Turn off the head lamps and the ignition switch.
4. Disconnect the battery ground cable.
5. Disconnect the ammeter and voltmeter that have been connected for testing.
6. Connect the generator output wire to the generator "B" terminal.
7. Connect the battery ground cable.

OUTPUT CURRENT TEST

This test judges whether or not the generator gives an output current that is equivalent to the nominal output.

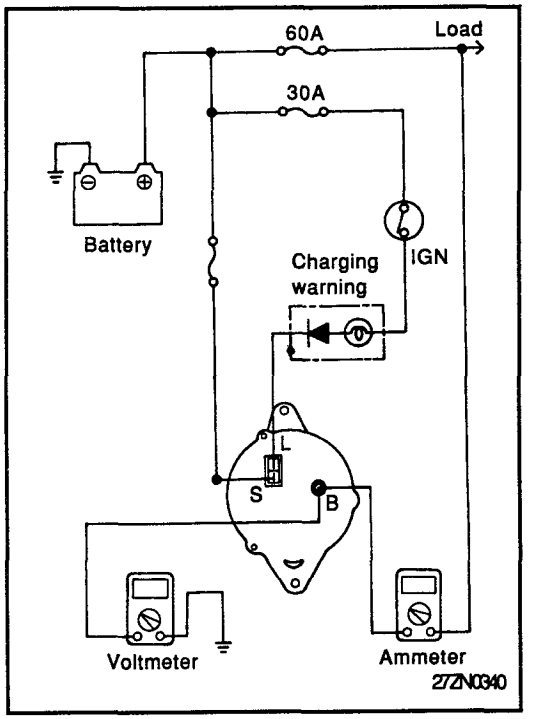
Preparation

1. Prior to the test, check the following items and correct as necessary.
   1) Check the battery installed in the vehicle to ensure that it is in good condition*. The battery checking method is described in "BATTERY".

      NOTE

      The battery that is used to test the output current should be one that has been partially discharged. With a fully charged battery, the test may not be conducted correctly due to an insufficient load.

   2) Check the tension of the generator drive belt. The belt tension check method is described in the section "COOLING".



2. Turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Disconnect the generator output wire from the generator "B" terminal.
5. Connect a DC ammeter (0 to 100A) in series between the "B" terminal and the disconnected output wire. Be sure to connect the (-) lead wire of the ammeter to the disconnected output wire.

   NOTE

   Tighten each connection securely, as a heavy current will flow. Do not rely on clips.

6. Connect a voltmeter (0 to 20V) between the "B" terminal and ground. Connect the (+) lead wire to the generator "B" terminal and (-) lead wire to a good ground.
7. Attach an engine tachometer and connect the battery ground cable.
8. Leave the engine hood open.

Test

1. Check to see that the voltmeter reads the same value as the battery voltage.
   If the voltmeter reads 0 V, and open circuit in the wire between the generator "B" terminal and battery (-) terminal, a blown fusible link or poor grounding is likey.
2. Start the engine and turn on the headlights.
3. Set the headlights to high beam and the heater blower switch to HIGH, quickly increase the engine speed to 2,500 rpm and read the maximum output current value indicated by the ammeter.

NOTE

After the engine start up, the charging current quickly drops, therefore, the above operation must be done quickly to read the maximum current value correctly.

Result

1. The ammeter reading must be higher than the limit value. If it is lower but the generator output wire is in good condition, remove the generator from the vehicle and test it.

   Limit value : 52.5A

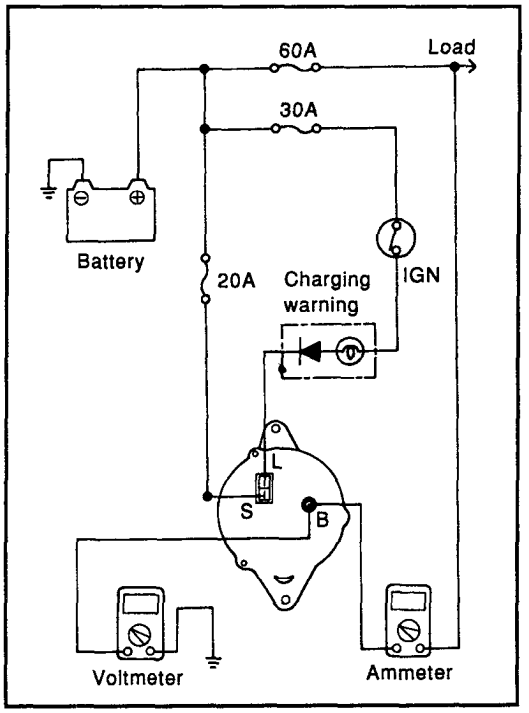
   NOTE

   1) The nominal output current value is shown on the nameplate affixed to the generator body.
   2) The output current value changes with the electrical load and the temperature of the generator itself. Therefore, the nominal output current may not be obtained. If such is the case, use a carbon pile to increase the load on the generator.
   The nominal output current may not be obtained if the temperature of the generator itself or ambient temperature is too high.

2 Upon completion of the output current test, lower the engine speed to idle and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the ammeter and voltmeter and the engine tachometer.
5. Connect the generator output wire to the generator "B" terminal.
6. Connect the battery ground cable.

REGULATED VOLTAGE TEST

The purpose of this test is to check that the electronic voltage regulator controls voltage correctly.



Preparation

1. Prior to the test, check the following items and correct if necessary.
   1) Check the battery installed on the vehicle to see that it is fully charged. For battery checking method, see “BATTERY”.
   2) Check the generator drive belt tension. For belt tension check, see section, “COOLING”.
2. Turn ignition switch to “OFF”.
3. Disconnect the battery ground cable.
4. Connect a digital voltmeter between the “S” terminal of the generator and ground. Connect the (+) lead of the voltmeter to the “S(L)” terminal of the generator. Connect the (-) lead to good ground or the battery (-) terminal.
5. Disconnect the generator output wire from the generator “B” terminal.
6. Connect a DC ammeter (0 to 100A) in series between the "B" terminal and the disconnected output wire. Connect the (-) lead wire of the ammeter to the disconnected output wire.
7. Attach the engine tachometer and connect the battery ground cable.

Test

1. Turn on the ignition switch and check to see that the voltmeter indicates the following value.

   Voltage: Battery voltage

   If it reads 0 V, there is an open circuit in the wire between the generator “S” terminal and the battery (+), or the fusible link is blown.
2. Start the engine. Keep all lights and accessories off.
3. Run the engine at a speed of about 2,500 rpm and read the voltmeter when the generator output current drops to 10 A or less.

Result

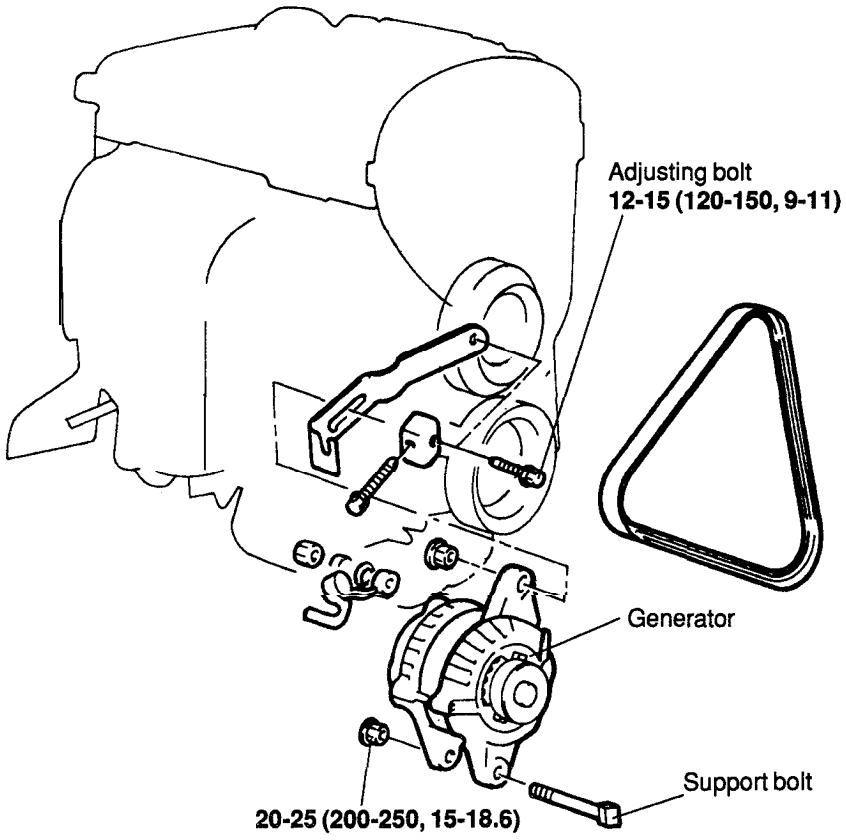
1. If the voltmeter reading agrees with the value listed in the Regulating Voltage Table below, the voltage regulator is functioning correctly. If the reading is other than the standard value, the voltage regulator or the generator is faulty.

Regulating Voltage Table

Voltage regulator ambient temperature °C(°F)	Regulating voltage V
-20 (-4)	14.2-15.4
20 (68)	13.9-14.9
60 (140)	13.4-14.6
80 (176)	13.1-14.5

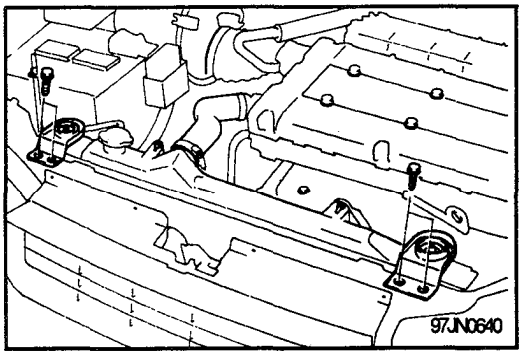
2. Upon completion of the test, reduce the engine speed to idle, and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the voltmeter and ammeter and the engine tachometer.
5. Connect the generator output wire to the generator “B” terminal.
6. Connect the battery ground cable.

GENERATOR
REMOVAL AND INSTALLATION

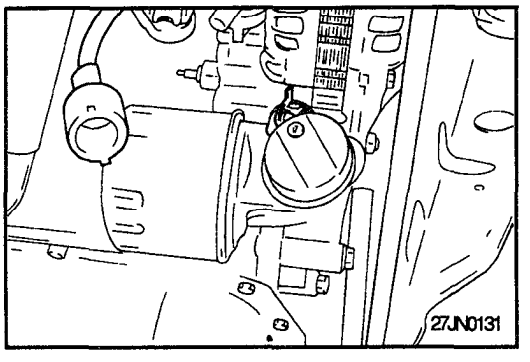


TORQUE : Nm (kg.cm, lb.ft)

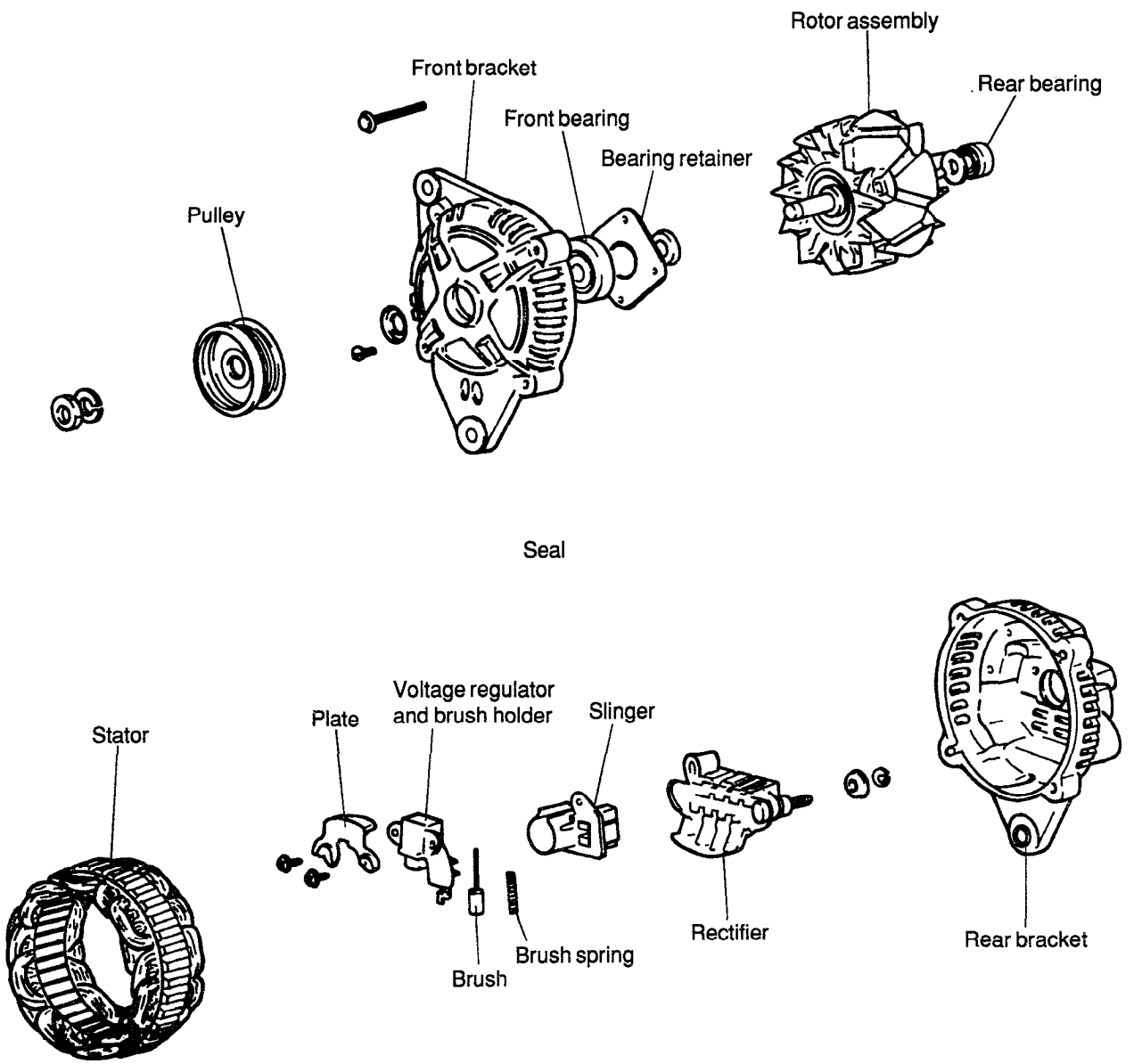
1. Disconnect the negative terminal from the battery.
2. Remove the radiator mounting bolt.
3. Disconnect the reservoir hose and fan motor connectors.
4. Raise the vehicle.
5. Remove the mud guard-LH.



6. Disconnect the connector pin of oil pressure switch.
7. Loosen the belt tension and remove the belt.
8. Remove the terminal nut and the wire from the B terminal.
9. With lifting up the radiator, remove the generator.
10. Installation is the reverse of the removal procedure.



COMPONENTS

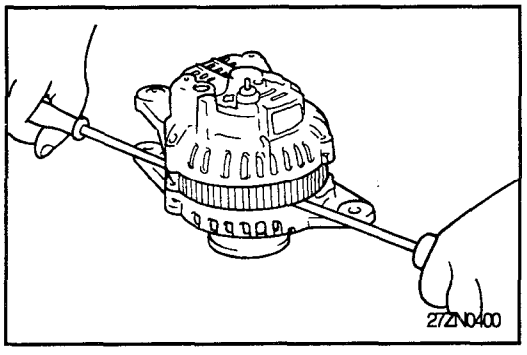

Rotor assembly
Front bracket
Rear bearing
Front bearing
Bearing retainer
Pulley
Seal
Stator
Plate
Voltage regulator and brush holder
Slinger
Rectifier
Rear bracket
Brush spring
Brush

DISASSEMBLY

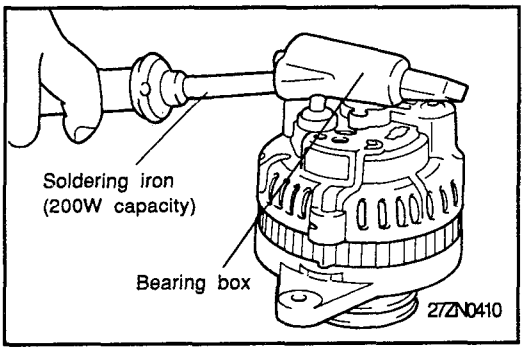
1. Remove the three through bolts.
2. Insert a fiat screwdriver between the front bracket and stator core, and pry downward.

   NOTE

   1) Do not insert the screwdriver too deeply, as there is a danger of damaging the stator coil.



   2) The rear cover may be hard to remove because a ring is used to lock the outer race of the rear bearing. To facilitate removal of rear cover, heat just the bearing box section with a 200-watt soldering iron. Do not use a heat gun, as it may damage the diode assembly.

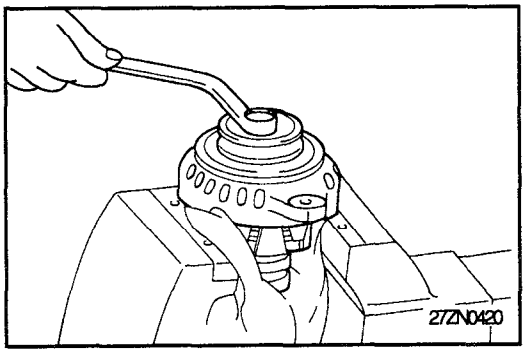


3. Secure the rotor in a vise with the pulley side up.

   NOTE

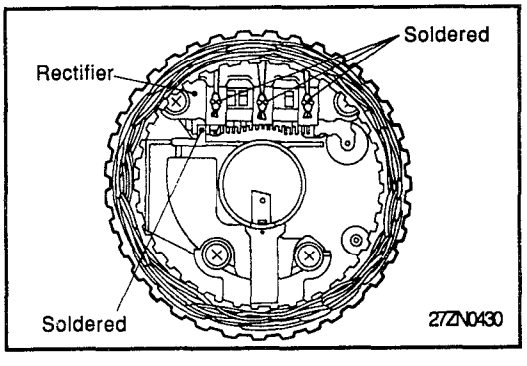
   Be careful that the vise jaws do not damage the rotor.

4. Remove the pulley nut, then remove the spring washer, then the pulley, and then the spacer.
5. Remove the front bracket and two seals.
6. Remove the rotor from the vise.
7. Remove the brush holder screws, the rectifier screws, and the nut from the "B" terminal.
8. Remove the stator assembly from the rear bracket.
9. Detach the slinger from the brush holder.
10. When the stator is to be removed, unsolder the three stator leads to the main diodes on the rectifier.



    NOTE

    1) When soldering or unsoldering, use care to make sure that heat of soldering iron is not transmitted to the diodes for a long period.
    2) Use care that excessive force is not exerted on the leads of the diodes.



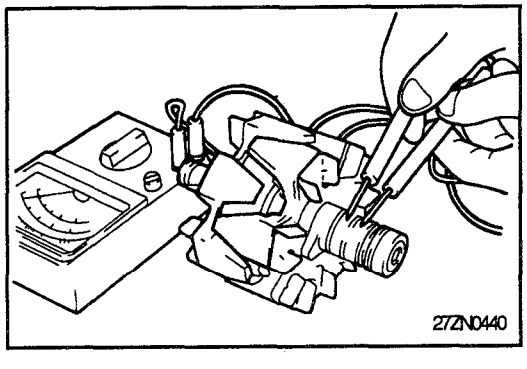
11. When separating the rectifier from the brush holder, unsolder the two plates soldered to the rectifier.

INSPECTION

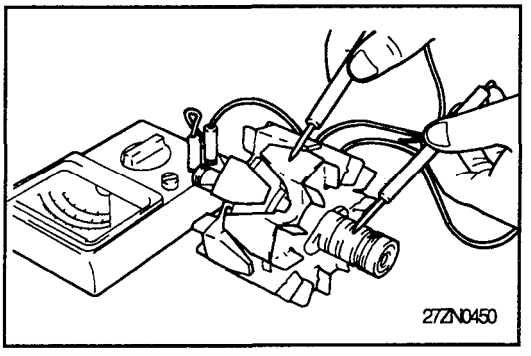
Rotor

1. Check the rotor coil for continuity. Check to make sure that there is continuity between the slip rings.
   If resistance is extremely low, it means that there is a short. If there is no continuity or if there is a short circuit, replace the rotor assembly.

   Resistance value: Approx. 3.1Ω

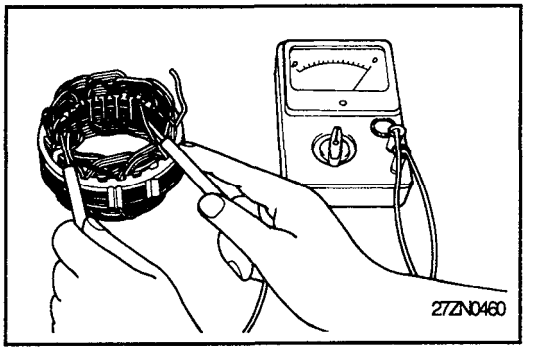


2. Check the rotor coil for a ground. Check to make sure that there is no continuity between slip the ring and the core.
   If there is continuity, replace rotor assembly.

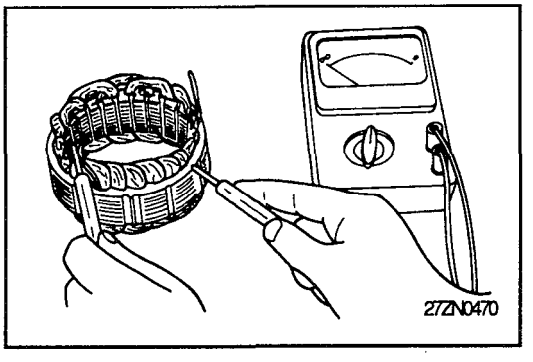


Stator

1. Make a continuity check on the stator coil. Check to make sure that there is continuity between the coil leads.
   If there is no continuity, replace stator assembly.



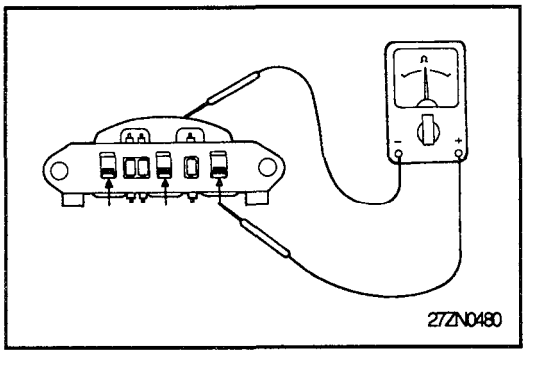
2. Check the coil for grounding. Check to make sure that there is no continuity between the coil and the core.
   If there is continuity, replace the stator assembly.



Rectifiers

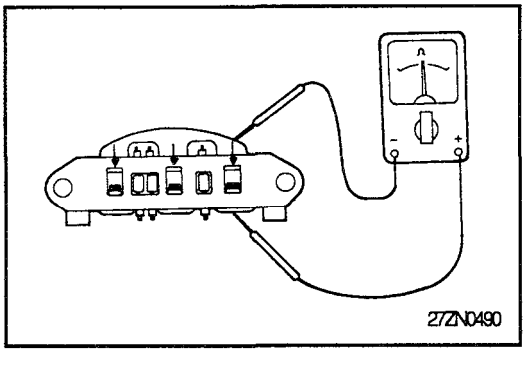
Positive rectifier test

Check for continuity between the positive rectifier and stator coil lead connection terminal with an ohmmeter. The ohmmeter should read continuity in only one direction. If there is continuity in both directions, a diode is shorted.
Replace the rectifier assembly.



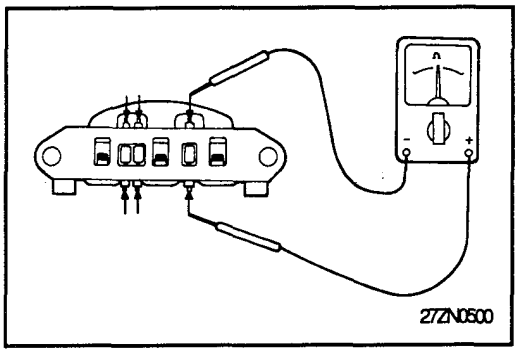
Negative rectifier test

Check for continuity between the negative rectifier and the stator coil lead connection terminal. The ohmmeter should read continuity in only one direction. If there is continuity in both directions, a diode is shorted, and the rectifier assembly must be replaced.



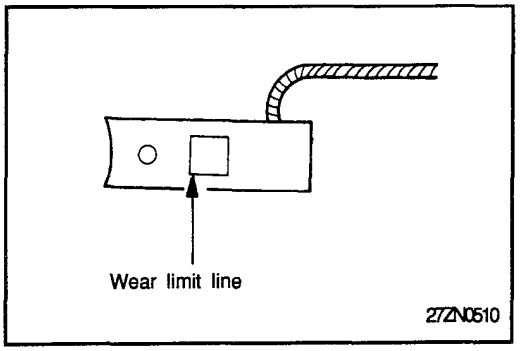
Diode trio test

Check the three diodes for continuity by connecting an ohmmeter to both ends of each diode. Each diode should have continuity in only one direction.
If continuity is present in both directions, a diode is defective and the heatsink assembly must be replaced.

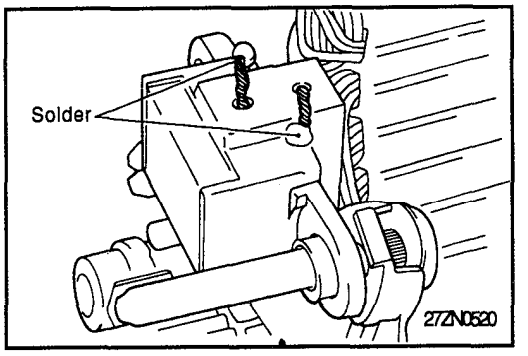


BRUSH REPLACEMENT

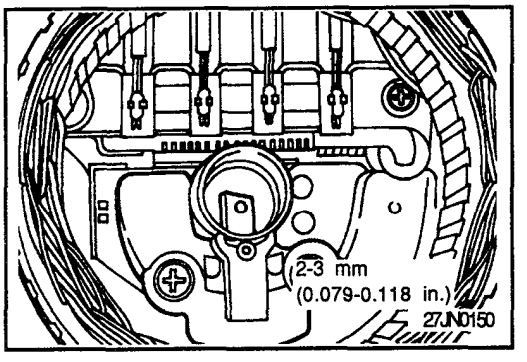
Replace the brushes if they are worn to limit line.



1. Unsolder the pigtail and remove the old brush and spring.

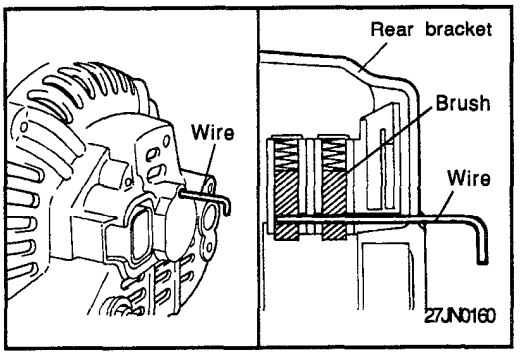


2. Install the brush spring and a new brush in the brush holder.
3. Insert the brush to where there is a space 2 to 3 mm (0.079 to 0.118 in.) between the limit line and the end of the brush holder.
4. Solder the pigtail to the brush holder.



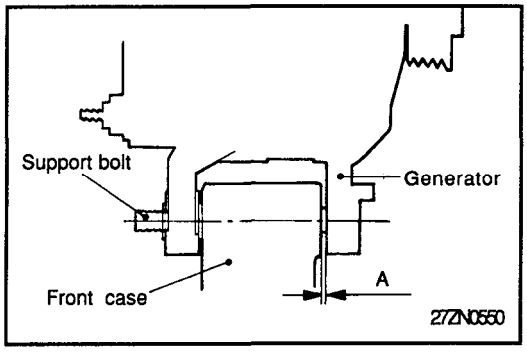
REASSEMBLY

Perform reassembly in the reverse procedure of disassembly. Pay attention to the following:
Before the rotor is attached to the rear bracket, insert a wire through the small hole in the rear bracket to lock the brush. After the rotor has been installed, the wire can be removed.



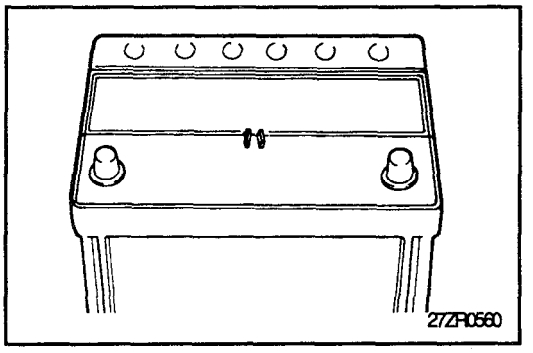
INSTALLATION

1. Position the generator and insert the support bolt. (Do not attach the nut.)
2. Push the generator forward and determine how many spacers (thickness: 0.198 mm) should be inserted between the front leg of the generator and the front case (space A in the illustration). (There should be enough spacers so that they do not fall out when you let go of them.)
3. Insert the spacers (space A in the illustration), attach the nut, and complete the installation.

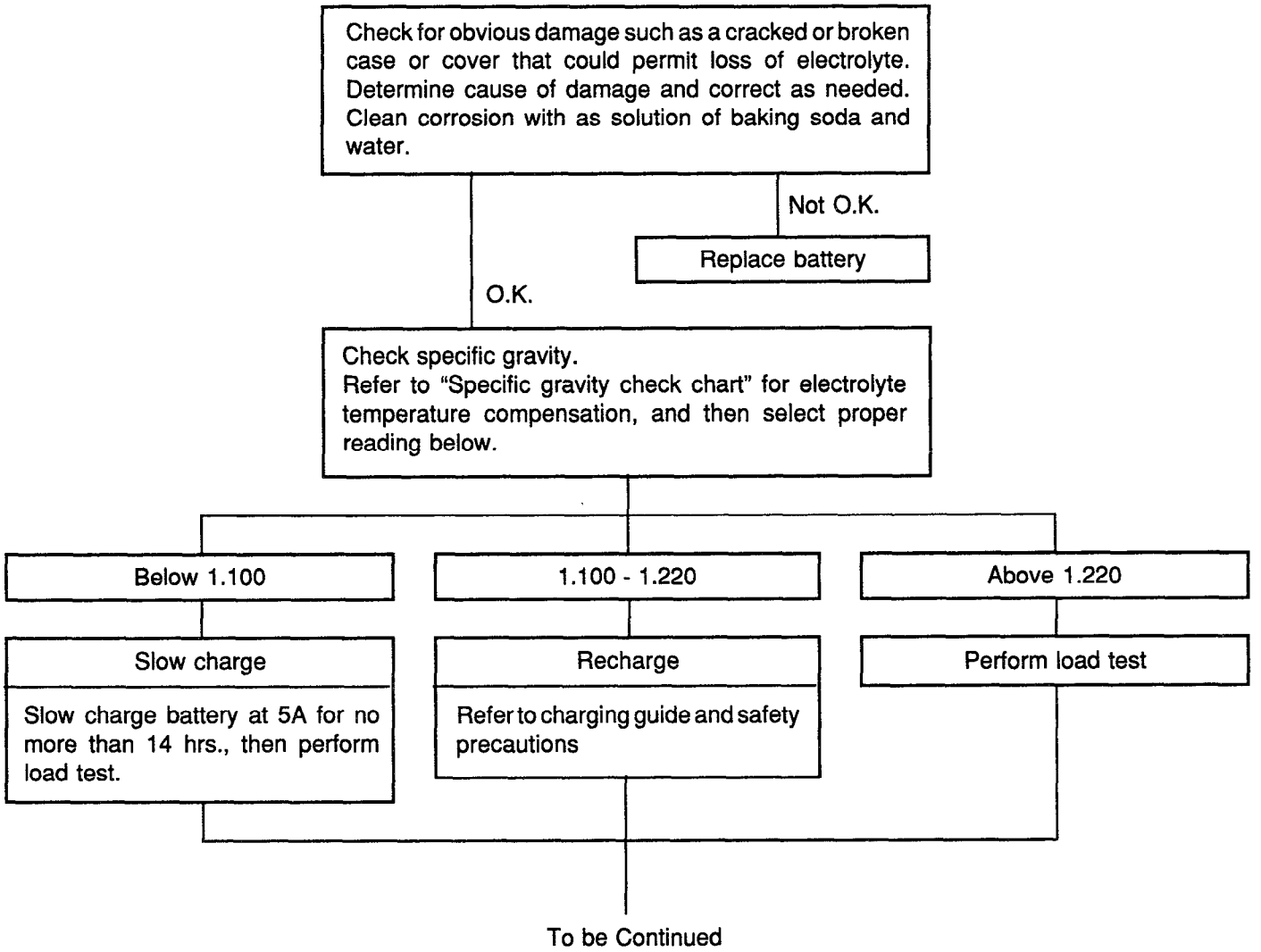


BATTERY

1. The maintenance-free battery is, as the name implies, totally maintenance free and has no removable battery cell caps.
2. Water never needs to be added to the maintenance-free battery.
3. The battery is completely sealed, except for small vent holes in the cover.



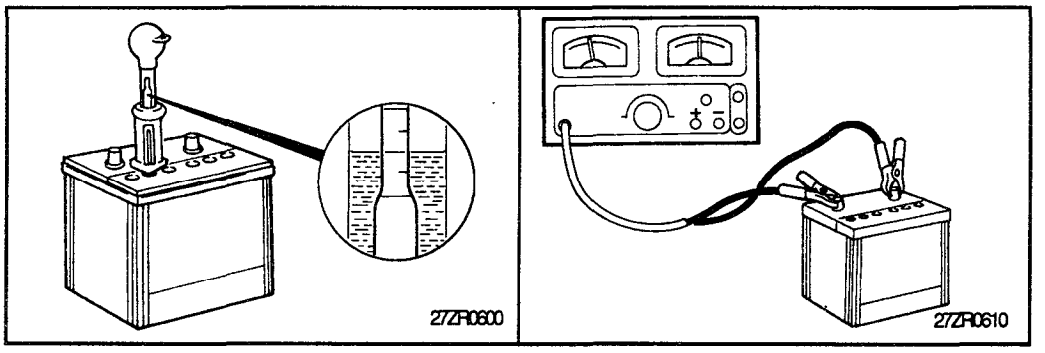
BATTERY VISUAL INSPECTION (1)



Load test battery

Apply 200A load for 15 sec., then check battery voltage and compare below

Above 9.6 volts	9.6 - 6.5 volts	Below 6.5 volts
Battery O.K./Reuse	Fast charge battery and then perform load test again. NOTE: If battery is still less than 9.6 volts after second fast charge and load test, then it should be replaced	Battery no good. Replace



SPECIFIC GRAVITY CHECK CHART

The specific gravity of battery electrolyte changes with temperature. Heat thins the solution and lowers the specific gravity. Cold thickens the solution and raises the specific gravity.

A fully charged battery should have a specific gravity between 1.260 and 1.280, with the electrolyte temperature at 80§F, the specific gravity reading must be corrected by adding 4 points (.004) for each 10^0 above 80°F or subtracting 4 points for every 10^0 below 80°F.

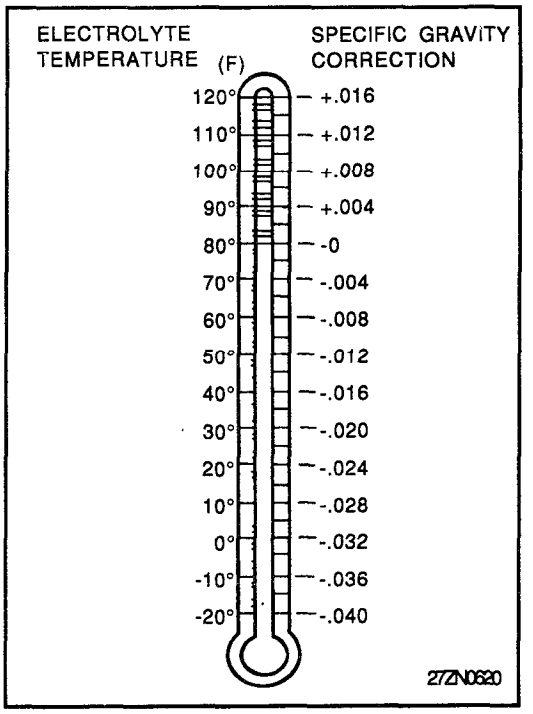
For example : The hydrometer reading is 1.280, and the electrolyte temperature reading is 10°F. By using the chart, the specific gravity must be lowered by 0.028 points. The true corrected reading is 1.252.

1.280 - 0.028 = 1.252

You should never take a hydrometer reading immediately after water has been added. The water and electrolyte must be mixed by either charging for a few minutes at a low rate or by allowing the battery to sit for an hour.

NOTE

A difference of 50 points (0.050) or more between one or more cells indicates a defective battery. It should be replaced.



BATTERY CHARGE RATE

Charge method / Specific gravity	Slow charge (5A)	Fast charge (20A)
Below 1.100	14 hours	4 hours
1.100 - 1.130	12 hours	3 hours
1.130 - 1.160	10 hours	2.5 hours
1.160 - 1.190	8 hours	2.0 hours
1.190 - 1.220	6 hours	1.5 hours
Above 1.220	4 hours	1.0 hours

BATTERY VISUAL INSPECTION (2)

1. Make sure ignition switch is in the Off position and all accessories are Off.
2. Disconnect the battery cables (negative first)
3. Remove the battery from the vehicle.

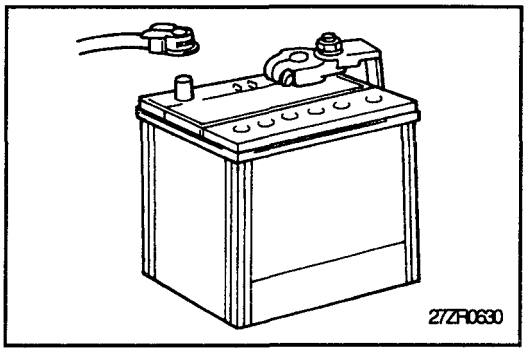
CAUTION

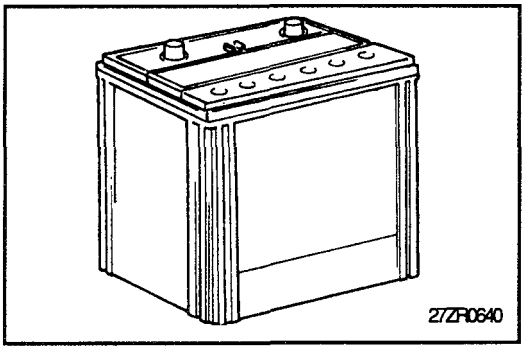
Care should be taken in the event the battery case is cracked or leaking, to protect your skin from the electrolyte. A suitable pair of rubber gloves (not household type) should be worn when removing the battery.

4. Inspect the battery carrier for damage caused by the loss of acid from the battery. If acid damage is present, it will be necessary to clean the area with a solution of clean warm, water and baking soda. Scrub the area with a stiff bristle brush and wipe off with a cloth moistened with baking soda and water.
5. Clean the top of the battery with the same solution as described in Step (4).
6. Inspect the battery case, and cover, for cracks. If cracks are present, the battery must be replaced.
7. Clean the battery posts with a suitable battery post cleaner.
8. Clean the inside surface of the terminal clamps with a suitable battery terminal cleaning tool. Replace damaged or frayed cables and broken terminal clamps.
9. Install the battery in the vehicle.
10. Connect the cable terminals to the battery post, making sure the top of the terminals are flush with the top of the post.
11. Tighten the terminal nut securely.
12. Coat all connections with light mineral grease after tightening.

CAUTION

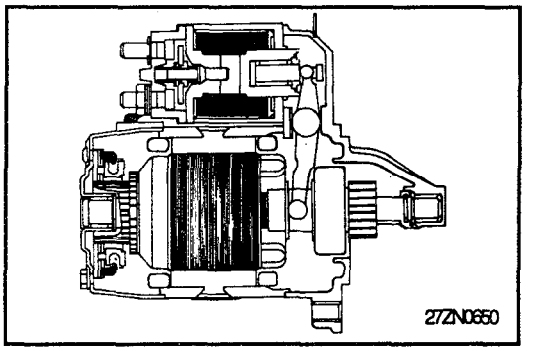
When batteries are being charged, an explosive gas forms beneath the cover of each cell. Do not smoke near batteries being charged or which have recently been charged.
Do not break live circuits at the terminals of the batteries being charged. A spark will occur where the circuit is broken.
Keep all oppen flames away from the battery.





GENERAL INFORMATION

The starting system includes the battery, starter motor, solenoid switch, ignition switch, transaxle range switch (A/T only), connection wires, and the battery cables.
When the ignition key is turned to the start position, current flows and energizes the coil of the starter motor's solenoid. When this happens, the solenoid plunger and the clutch shift lever are activated, and the clutch pinion engages the ring gear. The contacts close and the starter motor cranks.
In order to prevent damage caused by excessive rotation of the starter armature when the engine starts, the clutch pinion gear overruns.



TROUBLESHOOTING

Trouble condition	Probable cause	Remedy
Engine will not crank.	Battery charge low	Charge or replace battery.
	Battery cables loose, corroded or worn	Repair or replace cables.
	Transaxle range switch faulty (Vehicle with automatic transaxle only)	Adjust or replace switch.
	Fusible link blown	Replace fusible link.
	Starter motor faulty	Repair starter motor.
	Ignition switch faulty	Replace ignition switch.
Engine cranks slowly.	Battery charge low	Charge or replace battery.
	Battery cables loose, corroded or worn	Repair or replace cables.
	Starter motor faulty	Repair starter motor.
Starter keeps running.	Starter motor faulty	Repair starter motor.
	Ignition switch faulty	Replace ignition switch.
Starter spins but engine will not crank.	Short in wiring	Repair wiring.
	Pinion gear teeth broken or starter motor faulty	Repair starter motor.
	Ring gear teeth broken	Replace flywheel ring gear or torque converter.

SERVICE ADJUSTMENT PROCEDURES

PINION GAP ADJUSTMENT

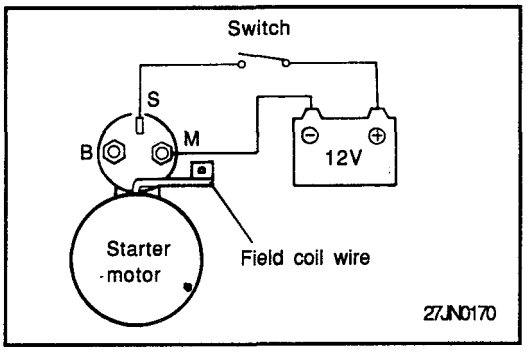
1. Disconnect the field coil wire from the M-terminal of the solenoid.
2. Connect a 12V battery the S-terminal and the M-terminal.
3. The pinion will move out.

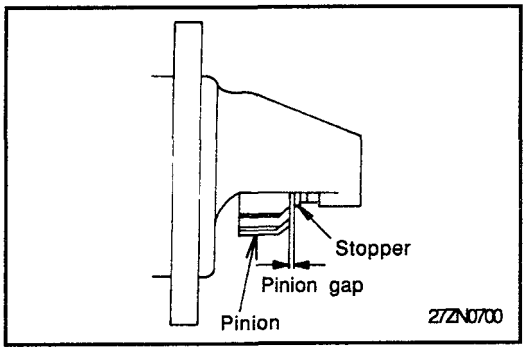
NOTE

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

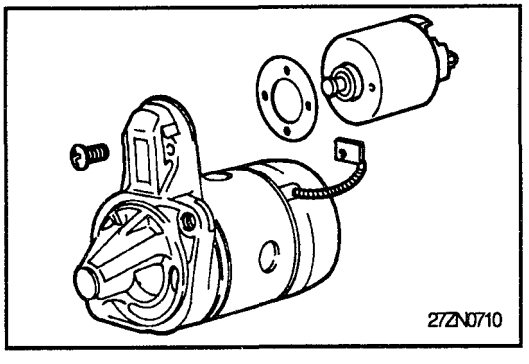
4. Check the pinion to stopper clearance (pinion gap) with a feeler gauge.

Pinion gap : 0.5-2.0 mm (0.02-0.079 in.)





5. If the pinion gap is out of specifcation, adjust by adding or removing gaskets between the solenoid and the front bracket.



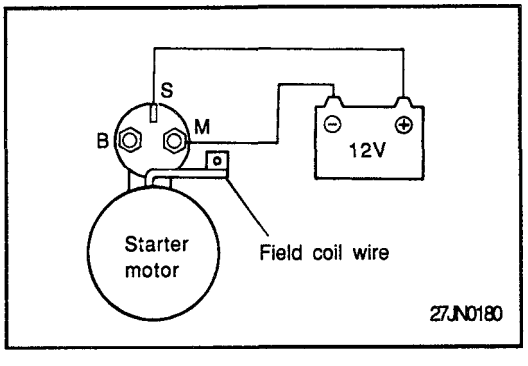
MAGNETIC SWITCH PULL-IN TEST

1. Disconnect the field coil wire from the M-terminal of the magnetic switch.
2. Connect a 12V battery between the S-terminal and the M-terminal.

NOTE

This teat must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

3. If the pinion moves out, then the pull-in coil is good. If it doesn't, replace the magnetic switch.



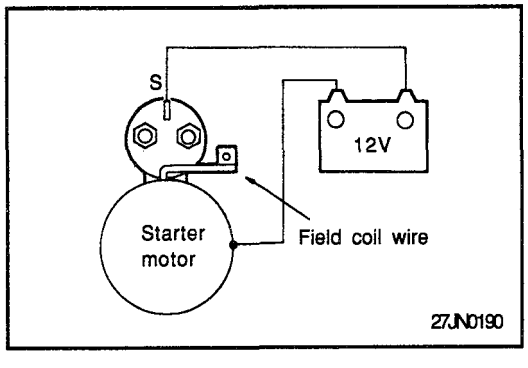
MAGNETIC SWITCH HOLD-IN TEST

1. Disconnect the field coil wire from the M-terminal of the magnetic switch.
2. Connect a 12V battery between the S-terminal and the body.

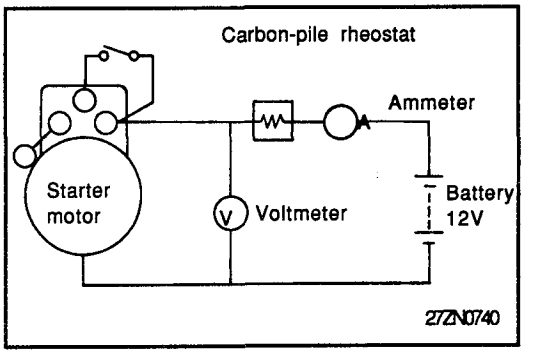
NOTE

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

3. If the pinion moves out, everything is in order. If the pinion moves, the hold-in circuit is open. Replace the magnetic switch.



FREE RUNNING TEST

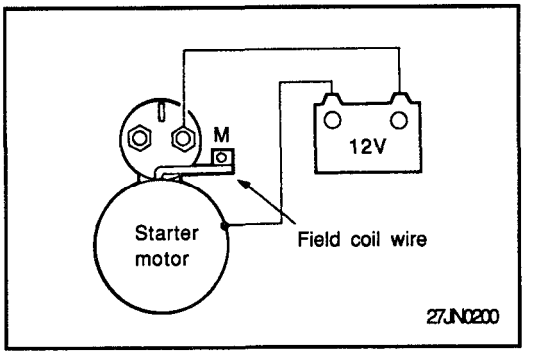


1. Place the starter motor in a vise equipped with soft jaws and connect a fully-charged 12-volt battery to starter motor as follows:
2. Connect a test ammeter (100-ampere scale) and carbon pile rheostat as shown is the illustration.
3. Connect a voltmeter (15-volt scale) across starter motor.
4. Rotate carbon pile to the off position.
5. Connect battery cable from battery negative post to starter motor body.
6. Adjust until battery voltage shown on the voltmeter reads 11 volts.
7. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

   Current: Max. 90 Amps (reduction drive type)

   Speed: Min. 3,000 rpm

MAGNETIC SWITCH RETURN TEST



1. Disconnect field coil wire from the M-terminal of the magnetic switch.
2. Connect a 12V battery between M-terminal and the body.

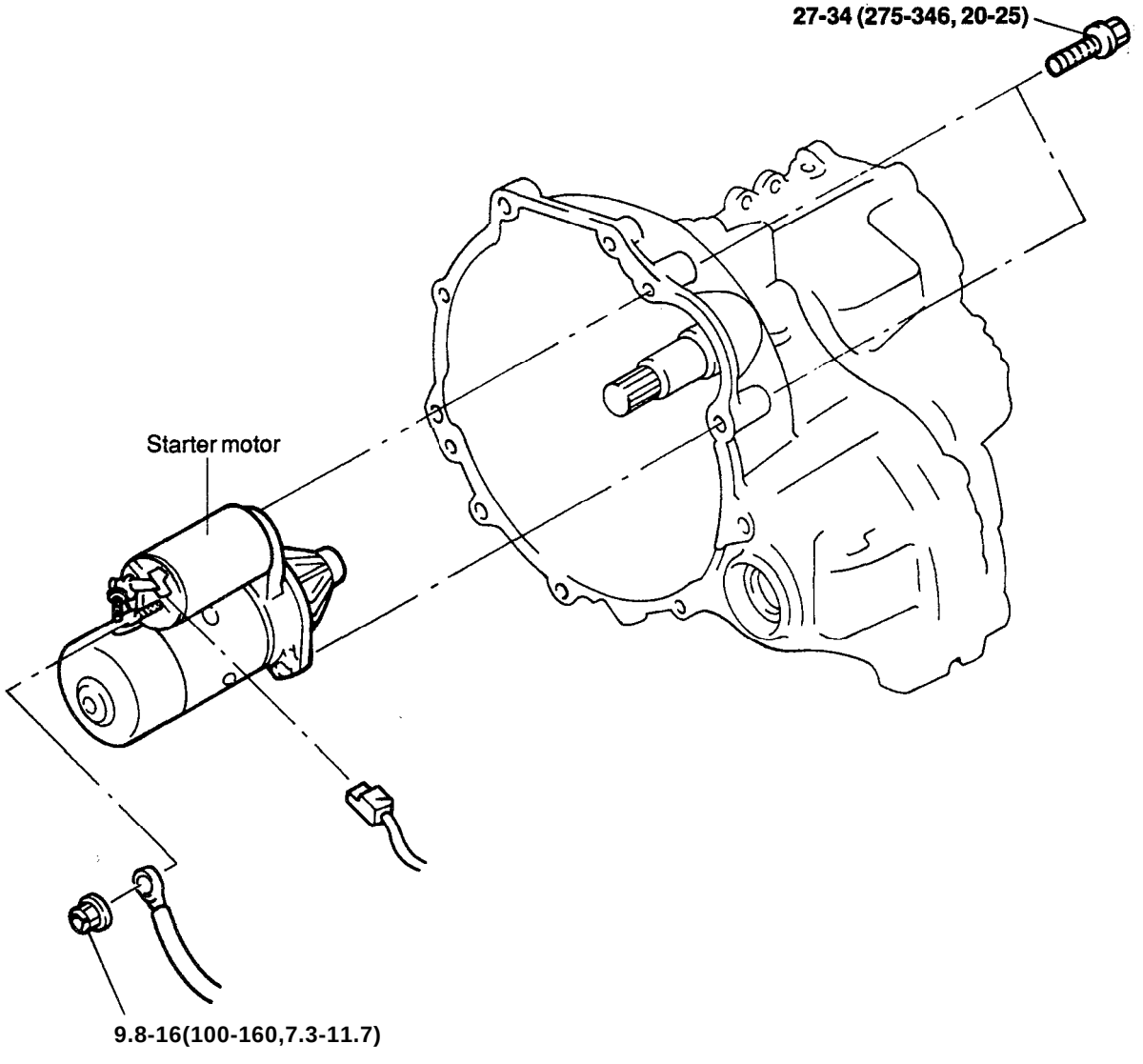
   NOTE

   This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

3. Pull pinion out and release. If pinion returns quickly to its original position, everything is in order. If it doesn't, replace the magnetic switch.

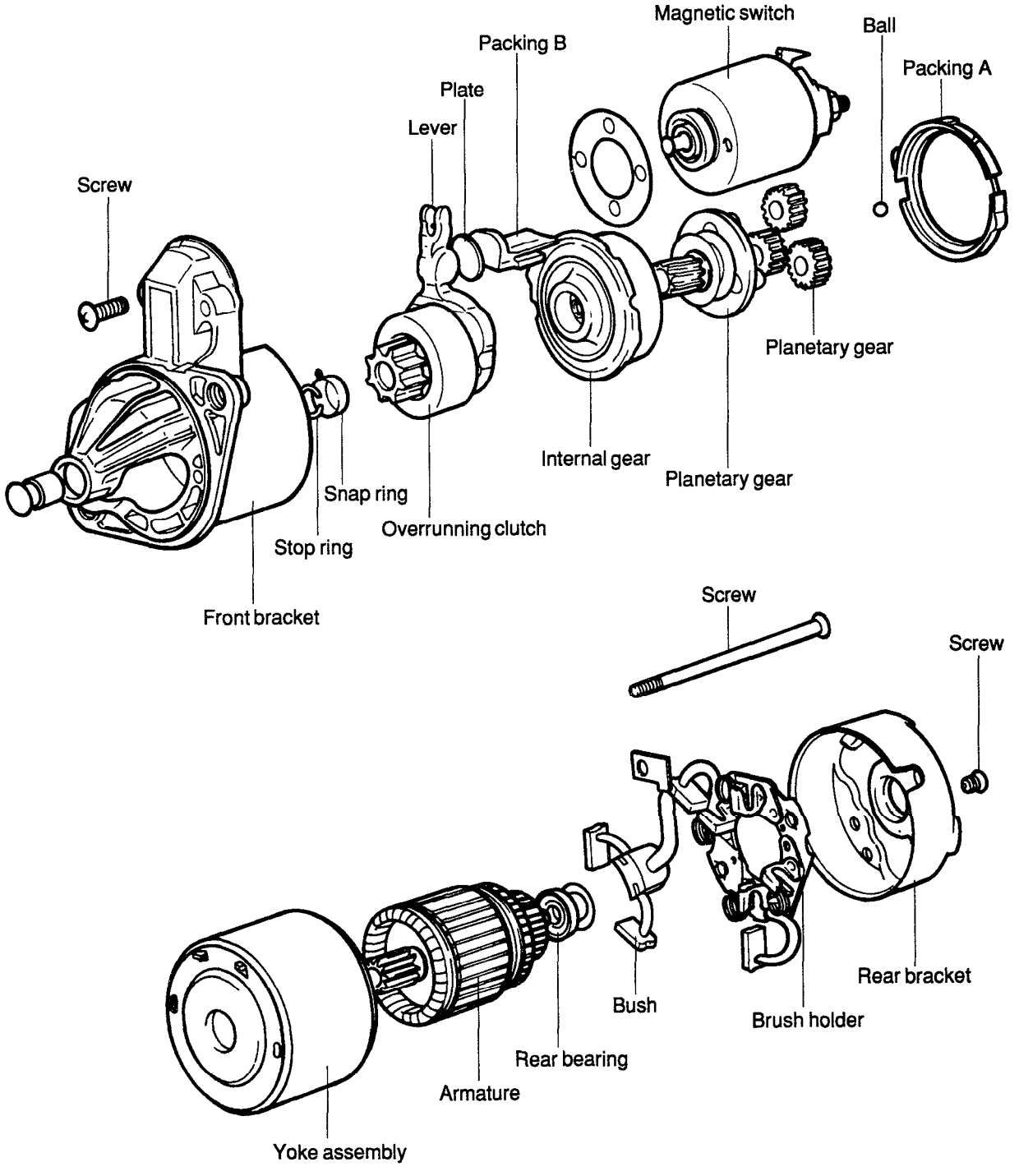
STARTER MOTOR

REMOVAL AND INSTALLATION



TORQUE : Nm (kg.cm, lb.ft)

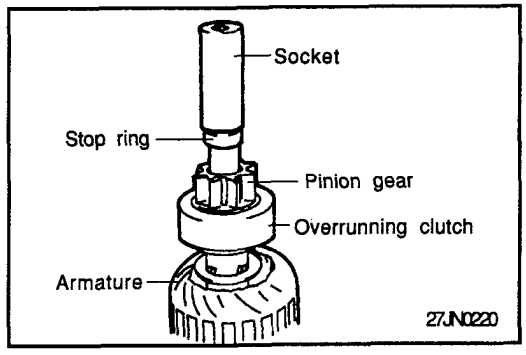
COMPONENTS


Magnetic switch
Ball
Packing B
Packing A
Plate
Lever
Screw
Planetary gear
Internal gear
Planetary gear
Snap ring
Overrunning clutch
Stop ring
Front bracket
Screw
Screw
Rear bracket
Bush
Brush holder
Rear bearing
Armature
Yoke assembly

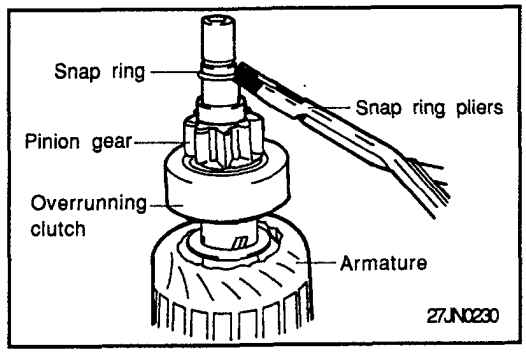
DISASSEMBLY

REMOVAL OF SNAP RING AND STOP RING

1. Press the stop ring, by using an appropriate socket wrench, to the snap ring side.



2. After removing the snap ring (by using snap-ring pliers), remove the stop ring and the overrunning clutch.



CLEANING STARTER MOTOR PARTS

1. Do not immerse parts in cleaning solvent. Immersing the yoke and field coil assembly and/or armature will damage insulation. Wipe these parts with a cloth only.
2. Do not immerse drive unit in cleaning solvent. Overrunning clutch is pre-lubricated at the factory and solvent will wash lubrication from clutch.
3. The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.

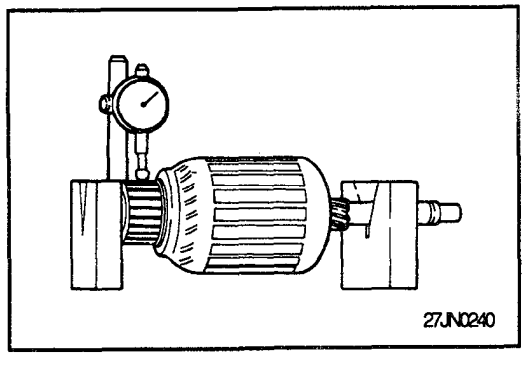
INSPECTION

CHECKING THE COMMUTATOR

1. Place the armature on a pair of V-blocks, and check the deflection by using a dial gage.

   Standard value: 0.05 mm (0.002 in.)

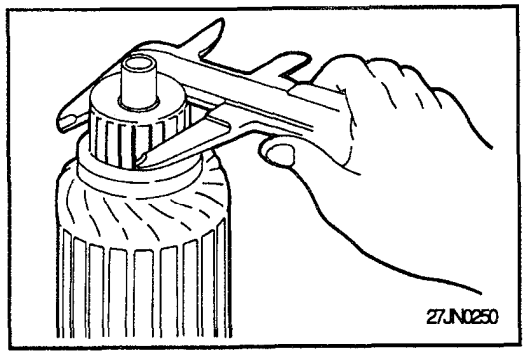
   Limit: 0.1 mm (0.0039 in.)



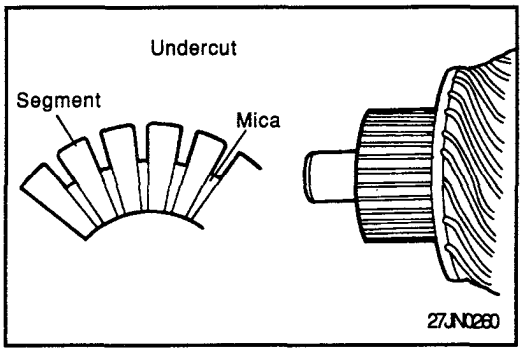
2. Check the outer diameter of the commutator.

   Standard value: 29.4 mm (1.157 in.)

   Limit: 29.4 mm (1.118 in.)

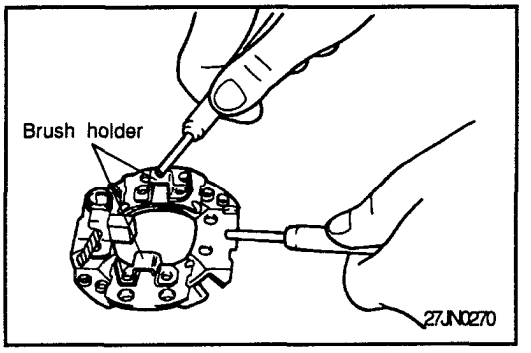


3. Check the depth of the undercut between segments.
   Standard value: 0.5 mm (0.020 in.)
   Limit: 0.2 mm (0.0079 in.)



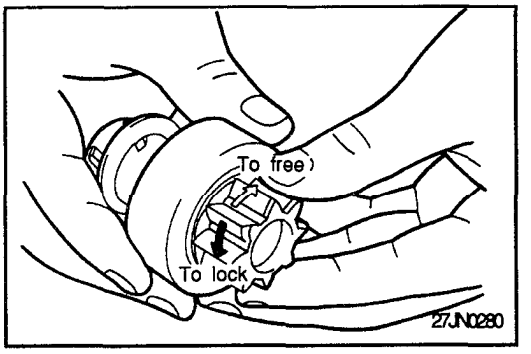
BRUSH HOLDER

Check for continuity between the brush holder plate and the brush holder.
The normal condition is no continuity.



OVERRUNNING CLUTCH

1. While holding clutch housing, rotate the pinion. Drive pinion should rotate smoothly in one direction, but should not rotate in opposite direction. If clutch does not function properly, replace overrunning clutch assembly.
2. Inspect pinion for wear or burrs. If pinion is worn or burred, replace overrunning clutch assembly. If pinion is damaged, also inspect ring gear for wear or burrs.

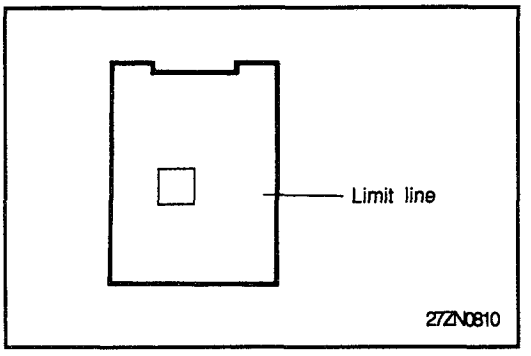


FRONT AND REAR BRACKET BUSHING

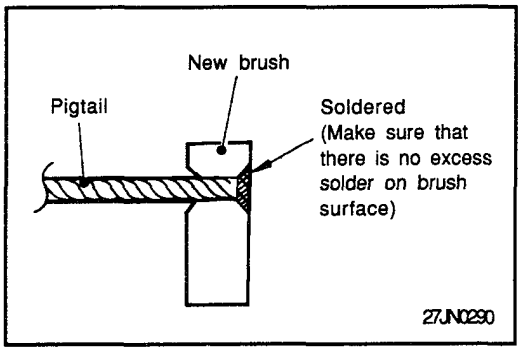
Inspect bushing for wear or burrs. If bushing is worn or burred, replace front bracket assembly or rear bracket assembly.

REPLACEMENT OF BRUSHES AND SPRINGS

1. Brushes that are worn beyond wear limit line, or oil-soaked, should be replaced.
2. When replacing field coil brushes, crush worn brush with pliers, taking care not to damage pigtail.



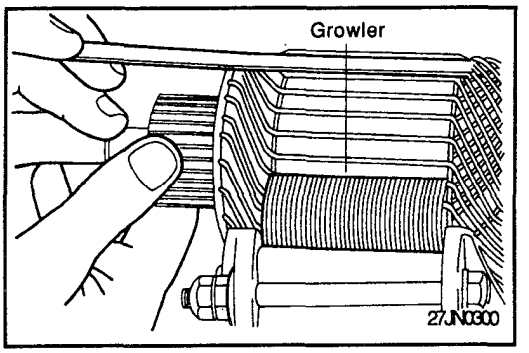
3. Sand pigtail end with sandpaper to ensure good soldering.
4. insert pigtail into hole provided in new brush and solder it. Make sure that pigtail and excess solder do not come out onto brush surface.
5. When replacing ground brush, slide the brush from brush holder by prying retaining spring back.



TESTING ARMATURE

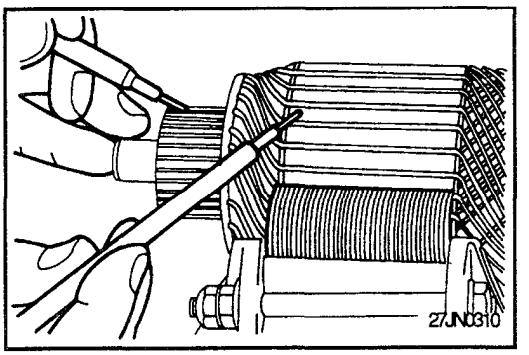
TESTING ARMATURE FOR SHORT-CIRCUIT

1. Place armature in a growler.
2. Hold a thin steel blade parallel and just above while rotating armature slowly in growler. A shorted armature will cause blade to vibrate and be attracted to the core. Replace shorted armature.



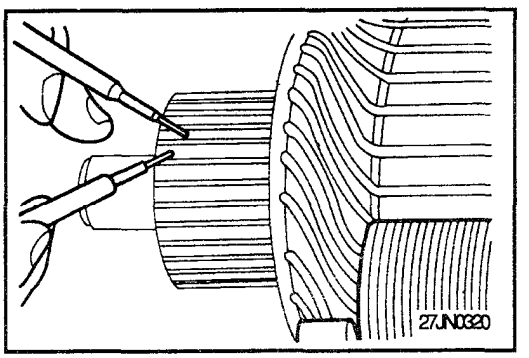
TESTING ARMATURE FOR GROUNDING

Check the insulation between the armature coil cores and the commutator segments. They are normal if there is no continuity.



CHECKING FOR ARMATURE COIL WIRING DAMAGE/DISCONNECTION

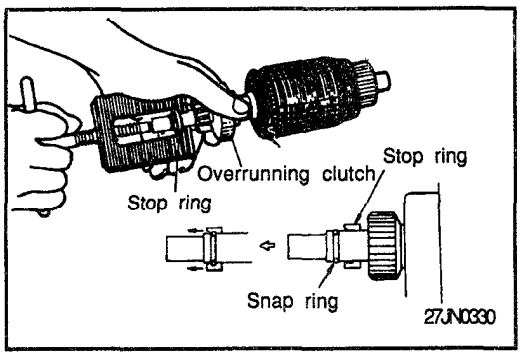
Check for continuity between segments. The condition is normal if there is continuity.



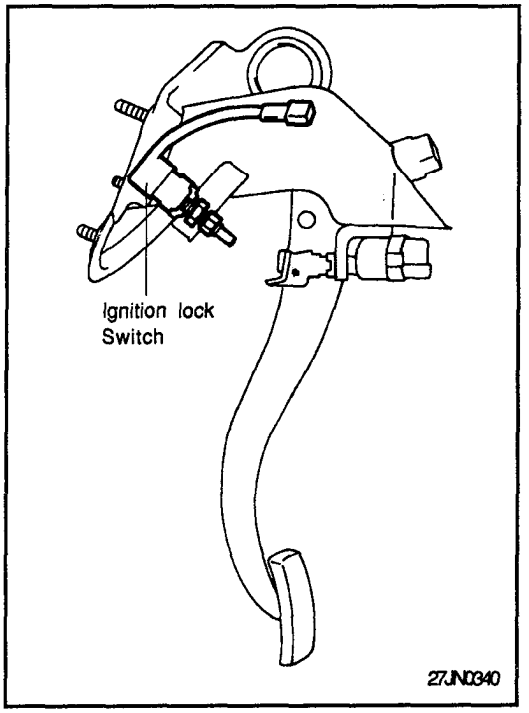
SERVICE POINTS OF ASSEMBLY

INSTALLATION OF THE STOP RING AND SNAP RING

Using a suitable pulling tool, pull overrunning clutch stop ring over snap ring.



INSPECTION OF CLUTCH START SYSTEM (IGNITION LOCK SYSTEM)



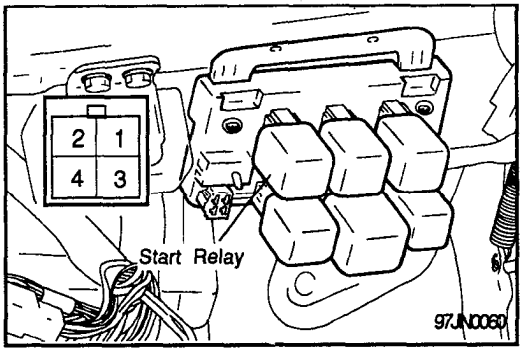
Check clutch pedal

Check that pedal height, pedal freeplay and clutch pedal clevis pin play are correct. (Refer to clutch group)

Check starter relay

Remove the starter relay and check continuity between the terminals. If the continuity is not as specified, replace the relay.

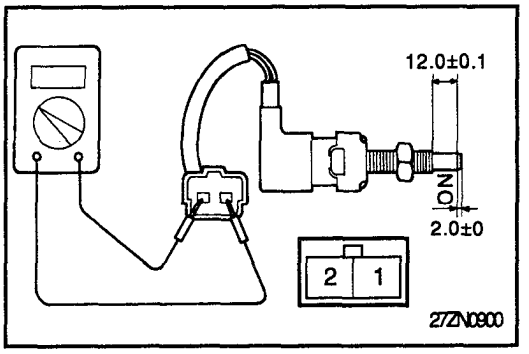
Terminal / Condition	S_1 (1)	S_2 (3)	L (2)	B (4)
When de-energized	O——	——O		
When energized	O——	——O	O——	——O



Check ignition lock switch

Remove the ignition lock switch and check continuity between terminals. If the continuity is not as specified, replace the switch.

Terminal / Condition	1	2
Free		
Push	O——	——O

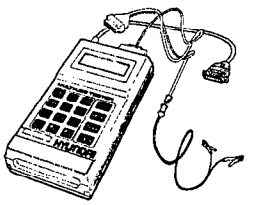
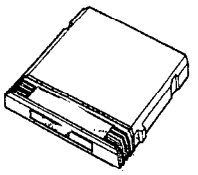


CRUISE CONTROL

SPECIFICATIONS

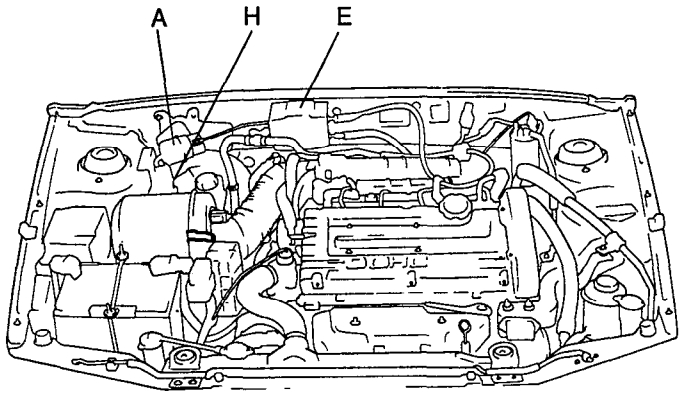
Items	Specifications
Speed control module	
Operating voltage range	DC 10 ~ 16V
Operating temperature	-30 ~ +100°C (-22 ~ +167°F)
Voltage drop between module and actuator	0.4 V
Operating speed range	Low speed limit : 40±3 km/h (25±2 mph) High speed limit : 160 ± 5 km/h (90 ± 3 mph)
Vacuum pump	
Type	Diaphragm type
Actuator	
Drive system	Vacuum type
Stroke mm (in.)	38-42 (1.5-1.7)
Cruise main switch	
Rated voltage	DC 12 V
Operating force	0.3 - 1.0 kg
Voltage drop	0.15 V or less
Stop lamp switch	
Rated voltage	DC 12 V
Rated load	
Stop lamp	21 x 5 W (lamp load)

SPECIAL SERVICE TOOL

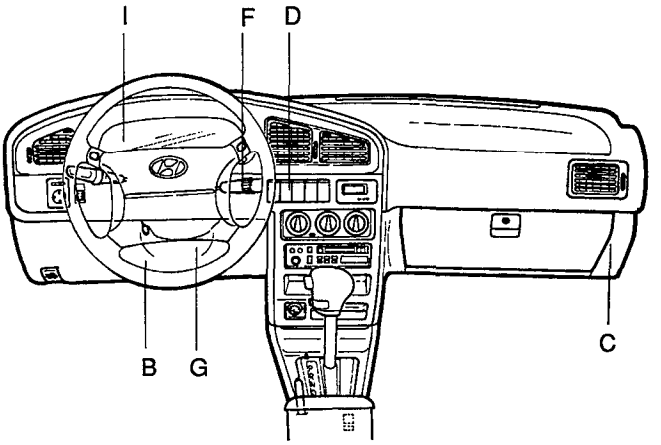
Tool (Number and name)	Illustration	Use
09391-33100 Scan tool		ROM PACK HRP-B
ROM PACK 09391-33452		Reading diagnosis code with scan tool

COMPONENTS LOCATION

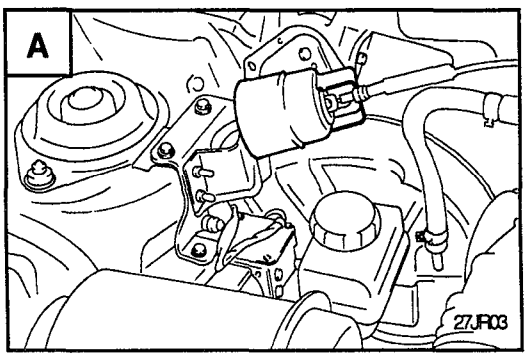
Engine compartment

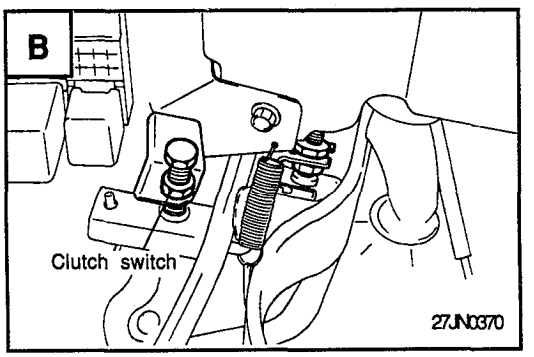


Interior

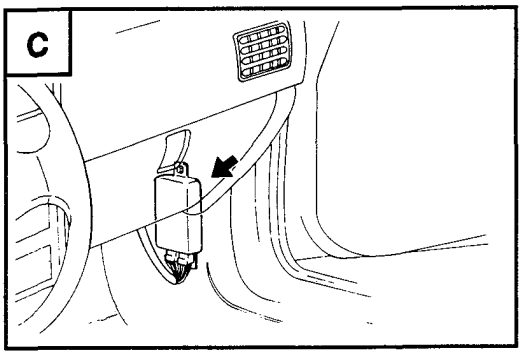


Name	Symbol	Name	Symbol
Actuator	A	Speed control switch (in multi function switch)	F
Clutch switch	B	Stop lamp switch	G
Cruise control module	C	Vacuum motor	H
Cruise main switch	D	Vehicle speed sensor	I
Pulley assembly	E		

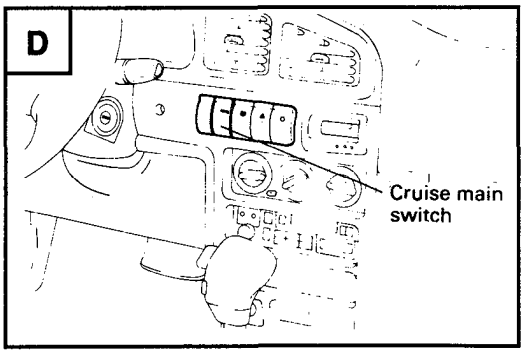




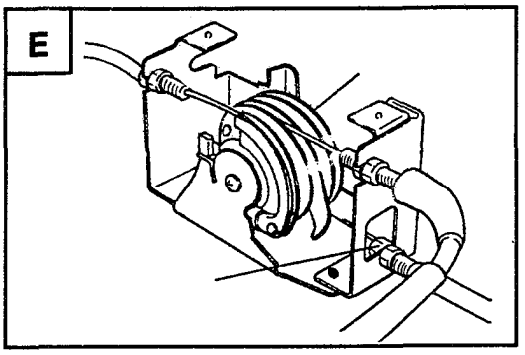
C



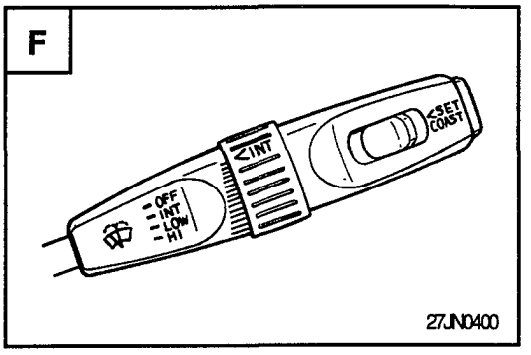
D


Cruise main switch

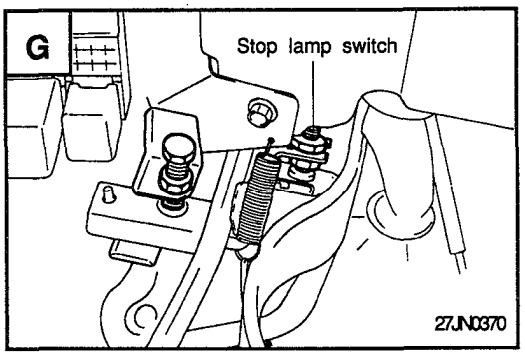
E



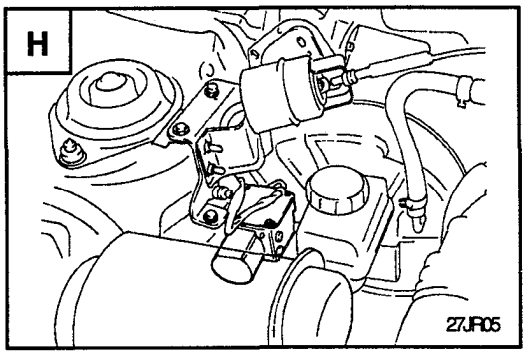
F


SET COAST
INT
OFF
INT
LOW
HI
27JN0400

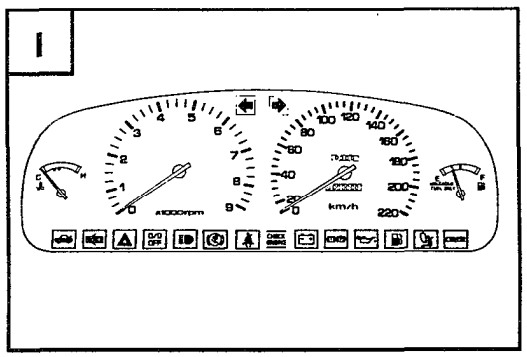
G


Stop lamp switch
27JN0370

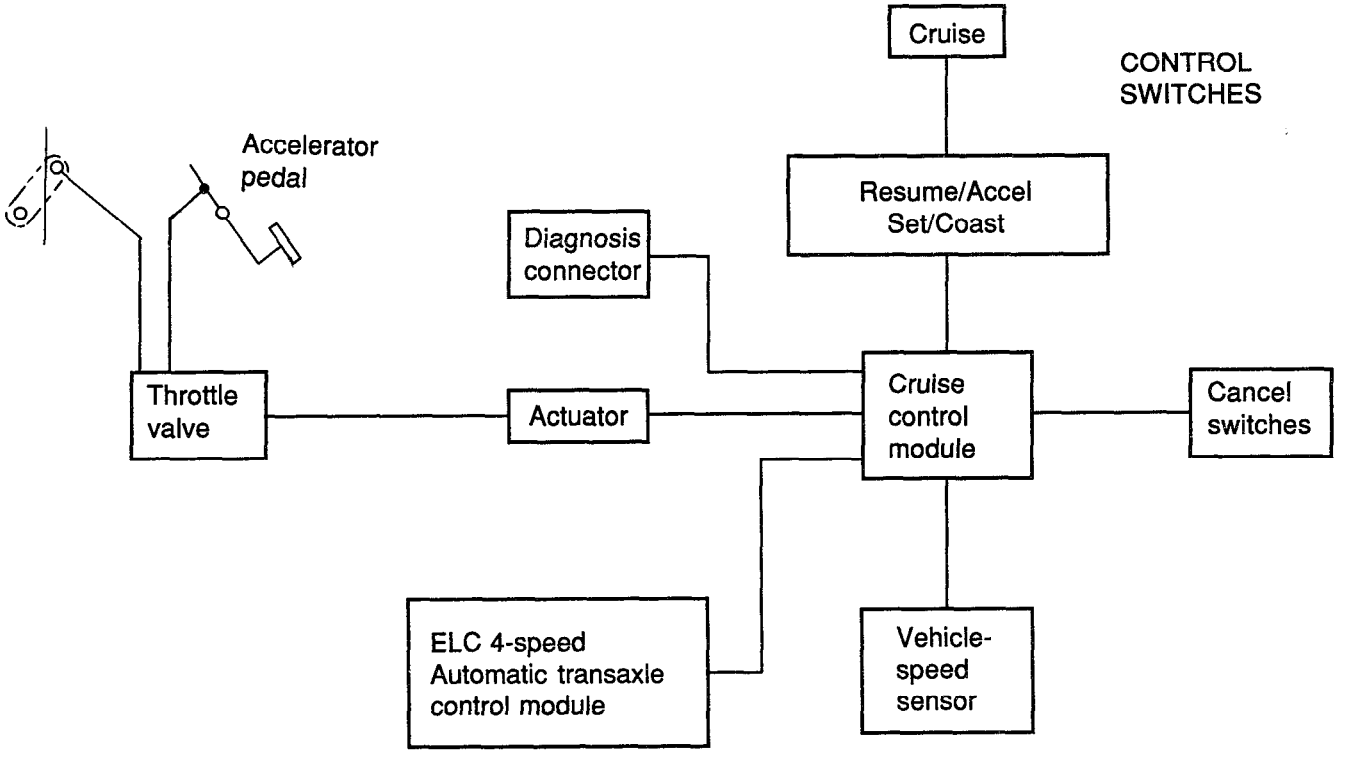
H


27JR05

I



System Block Diagram



Component parts and function outline

COMPONENT PART		FUNCTION
Vehicle-speed sensor		Converts vehicle speed to pulse.
Cruise control module (CCM)		Receives signals from sensor and control switches; CCM controls all automatic speed control functions.
Actuator		Regulates the throttle valve to the set opening by signals from the CCM.
Control switch	CRUISE main switch	Switch for automatic speed control power supply.
	SET switch RESUME switch	Controls automatic speed control functions by SET (COAST) and RESUME (ACCEL).
	CRUISE main switch indicator	Illuminates when CRUISE main switch is ON (Built into cluster).

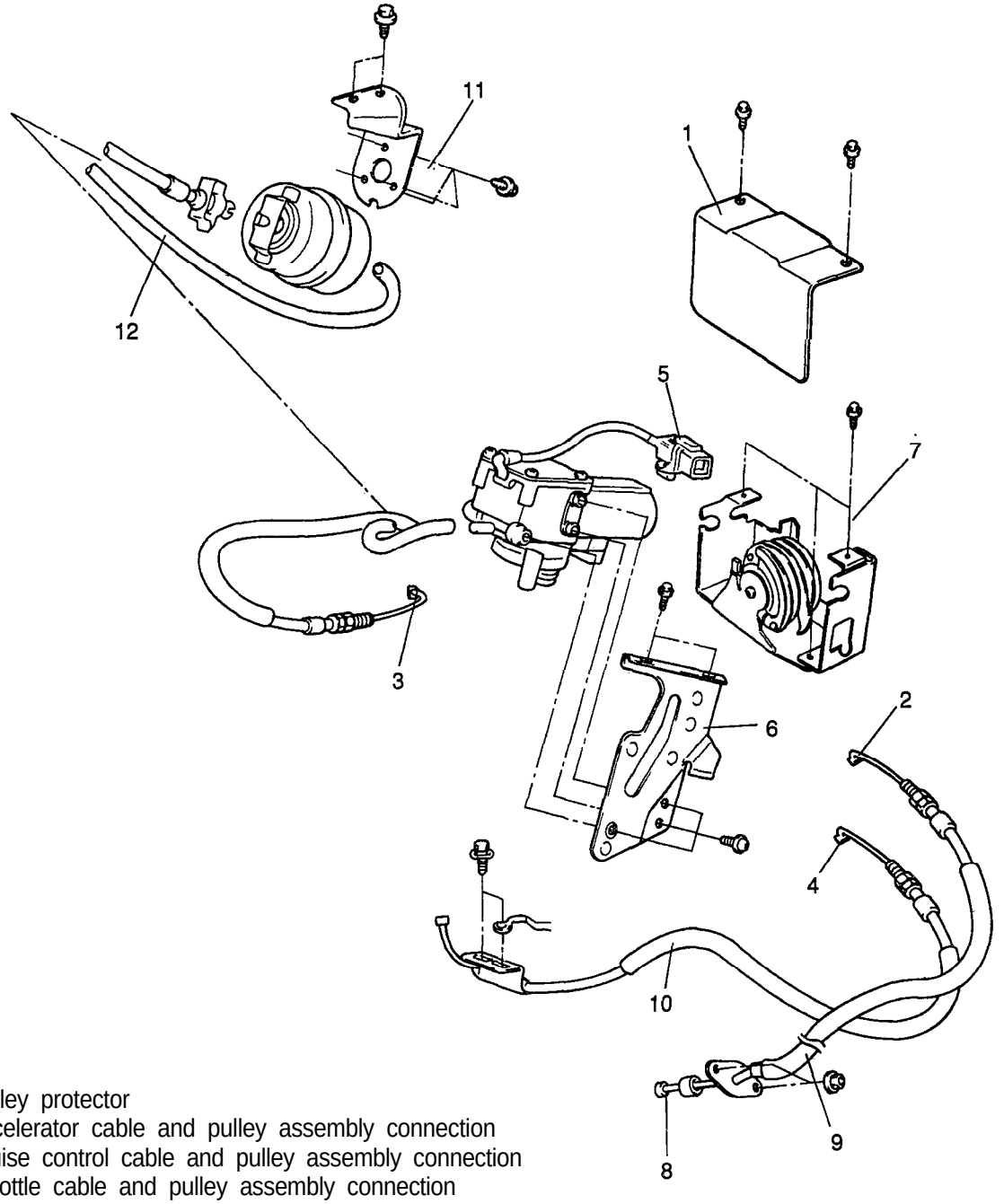
* CCM : Cruise Control Module

COMPONENT PART		FUNCTION
Cancel switch	Stop lamp switch/Clutch switch (M/T)	Sends cancel signals to the CCM.
	Inhibitor switch	
ELC 4-speed automatic transaxle control module		Controls the overdrive ON and OFF, based on signals from the CCM for the CC.
Data link connector		By connecting the check light or scan tool, control unit diagnostic codes can be read.

* CC : Cruise Control

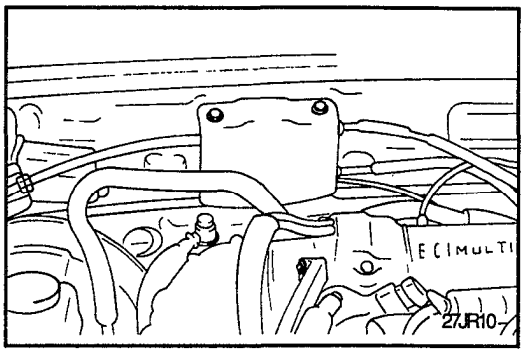
REMOVAL AND INSTALLATION

COMPONENTS

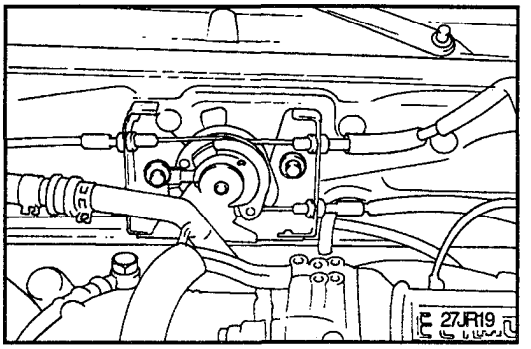


1. Pulley protector
2. Accelerator cable and pulley assembly connection
3. Cruise control cable and pulley assembly connection
4. Throttle cable and pulley assembly connection
5. Vacuum pump connector
6. Pump bracket and pump assembly
7. Pulley assembly
8. Accelerator cable and pedal connection
9. Accelerator cable
10. Throttle cable
11. Actuator
12. Vacuum hose

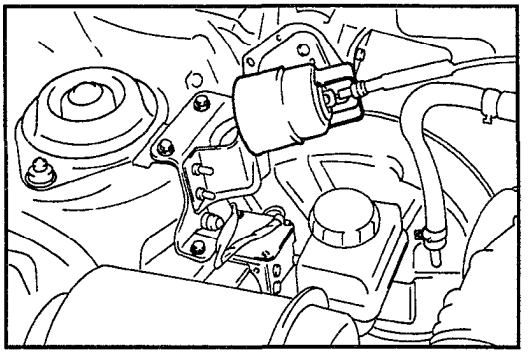
1. Remove the battery negative terminal.
2. Remove the pulley cover.
3. Disconnect the accelerator cable and pulley assembly connection.
4. Disconnect the cruise control cable and pulley assembly connection.



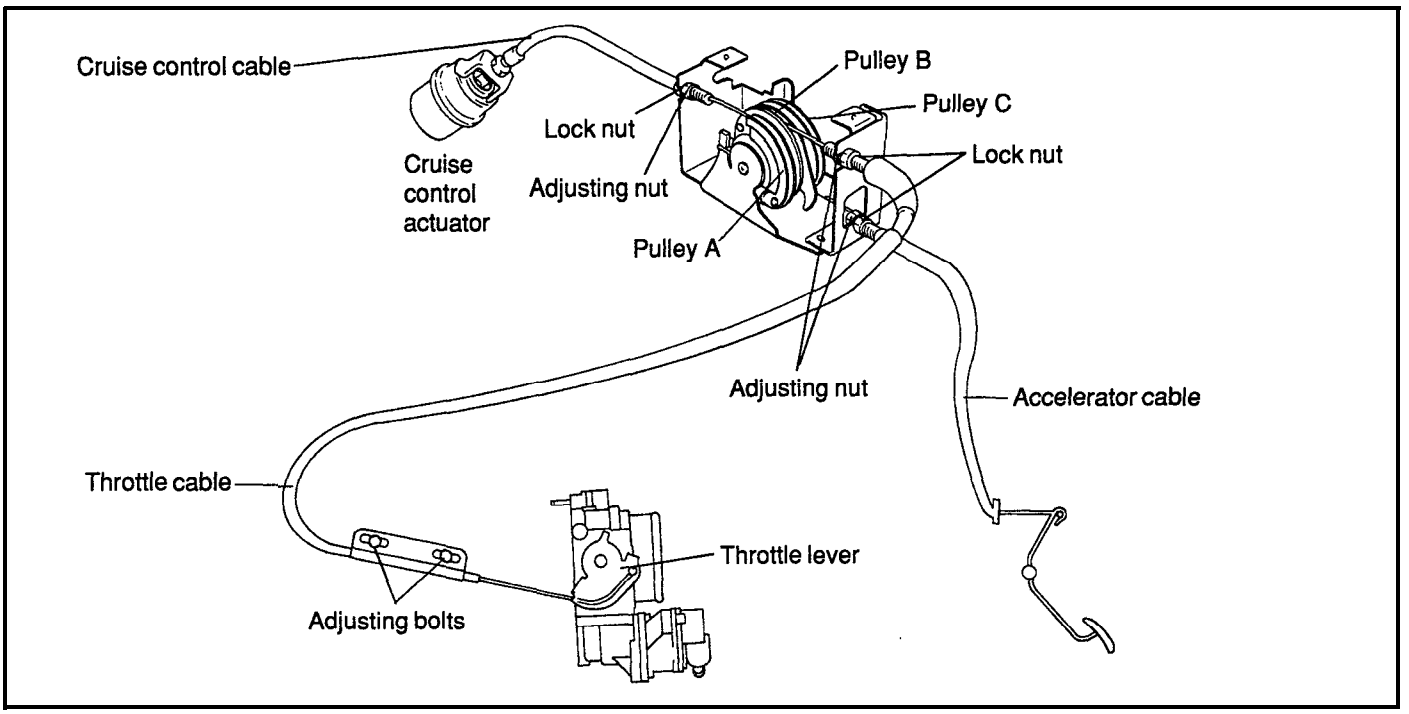
5. Disconnect the throttle body cable and pulley assembly connection with turning throttle lever to full open position.
6. Disconnect the vacuum pump connector and remove the vacuum pump assembly.



7. Remove the actuator bracket and disconnect vacuum hose.
8. Installation is the reverse order of removal.



CRUISE CONTROL CABLES INSPECTION AND ADJUSTMENT



Adjustment conditions

- o Turn A/C and all lights OFF.
  Inspect and adjust at no load.
- o Warm engine until stabilized at idle.
  Confirm idle speed is at specified RPM.
- o Then, ignition switch OFF.

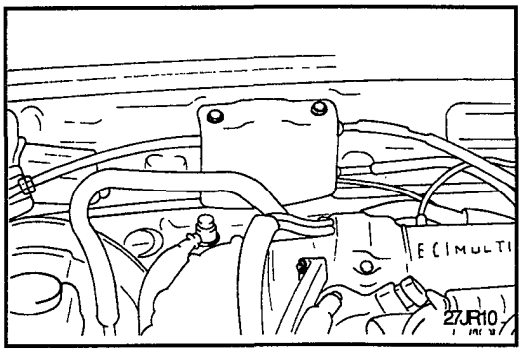
Inspection

1. Confirm there are no sharp bends in cables.
2. Depress the accelerator pedal and check if the throttle lever moves smoothly from fully closed to fully open.
3. Check inner cables for correct slack.
4. If there is too much slack or no slack, adjust play by the following procedures.

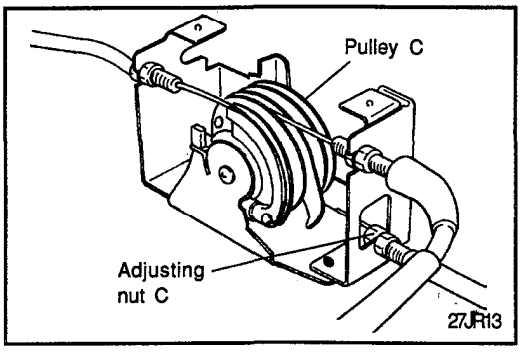
SERVICE HINT

1. If the cable is very loose, the loss of speed going uphill will be large.
2. If the cable is too tight, the idle RPM will become high.

ADJUSTMENT

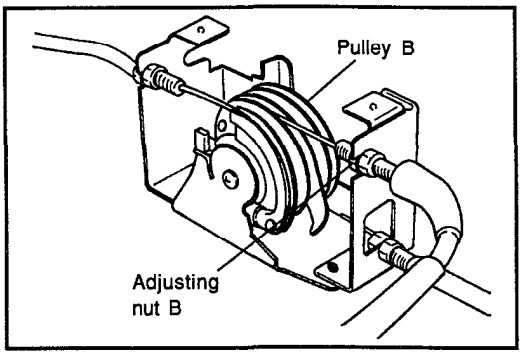


1. Remove the cover of actuator.
2. Loosen the adjusting nuts and lock nuts of the throttle lever and intermediate pulley A, B and C, so that the intermediate pulley A, B and C and the throttle lever can move freely.



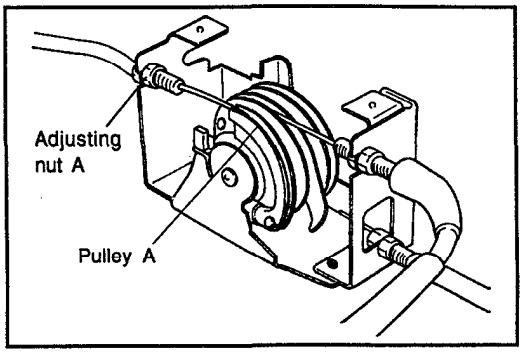
3. Turn the ignition switch to the ON position (without starting the engine).
4. Rotate the intermediate pulley C in the direction shown in the diagram, and while keeping it touching the stopper, tighten the adjusting nut C in the direction to lessen the inner cable play of the accelerator cable. Then unscrew the adjusting nut C the specified number of turns just before the intermediate pulley C begins to move.

   Amount to unscrew the adjusting nut C:
   <A/T> 2-3 mm (0.08-0.12 inch)
   Approx. li2 turns
   <M/T> 0-1 mm (0-0.04 inch)



5. Fix the accelerator cable with lock nut.
6. Tighten the adjusting nut B in the direction to lessen the inner cable play of the throttle cable. At the position where the intermediate pulley B lever touches the intermediate pulley C, unscrew the adjusting nut B the specified number of turns.

   Amount to unscrew the adjusting nut B:
   Approx. 1 turn [inner cable play 1-2 mm (.04-.08)]



7. Fix the throttle cable with the lock nut.
8. Tighten the adjusting nut A in the direction to lessen the inner cable play of the cruise control cable. At the position where the intermediate pulley A lever touches the intermediate pulley B, unscrew the adjusting nut A the specified number of turns.

   Amount to unscrew the adjusting nut A:
   Approx. 1 turn [inner cable play 1-2 mm (.04-.08 in.)]

9. Fix the cruise cable with the lock nut.
10. After adjusting, check if the end of the fixed SAS is touching the throttle lever stopper.

TROUBLESHOOTING
BEFORE TROUBLESHOOTING

Before commencing troubleshooting, inspect each of the following sections, and if there is an abnormality, carry out a repair.

(1) Check if the installation and connection routes of the cables and vacuum hoses of the cruise vacuum pump assembly, actuator and pulley assembly are all normal.
(2) Check if the pulley assembly and the movement of all cables are all working smoothly.
(3) Check if there is no excessive play or tension in each cable.

SELF-DIAGNOSIS CHECKING

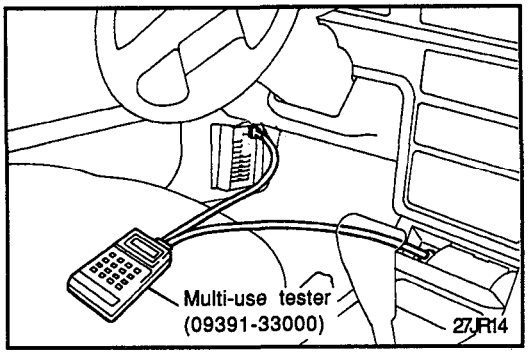
Self-diagnosis checking is performed when there has been an automatic cancellation, without cancel switch operation.

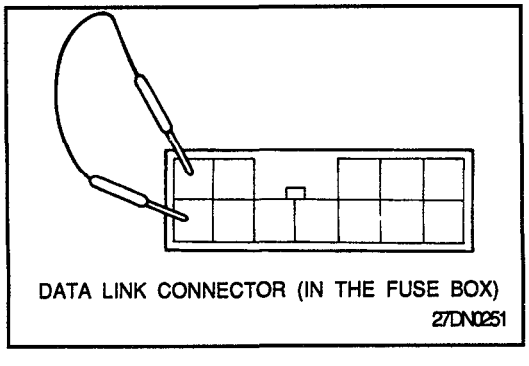
1. The following two methods can be used for checking the diagnosis. Note that the data link connector is located in the fuse box.
   1) If a multi-use tester is used.
      Connect the scan socket and connector to the cigarette lighter socket and the data link connector, and set the scan tool.
      Use the scan tool according to its operation instructions; display the diagnosis code number and then check.
   2) If a indicator lamp is used.
      Connect directly between the ground terminal and the terminal for CC of the data link connector.
      It is possible to discover which circuit is the cause of the cancellation by verifying the indication shown by the indicator lamp with the display patterns shown on the next page.

      CAUTION
      The ignition switch should be turned OFF when connecting and disconnecting the scan tool.

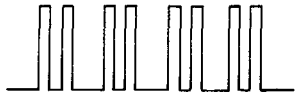
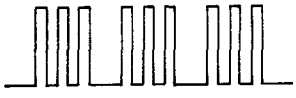
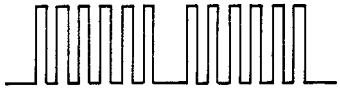
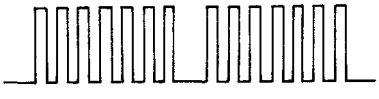
2. All diagnostic trouble codes are stored so that it is possible to check if a problem occurred in the past or not until disconnecting the battery terminals, even when the ignition key is turned to OFF.

CC : Cruise Control





3. Diagnosis display patterns and codes

CODE NO.	DISPLAY PATTERNS (Use with check light)	PROBABLE CAUSE	CHECK ITEMS
01 (Vacuum pump)		Abnormal condition of auto cruise vacuum pump drive system	1. Vacuum pump assembly 2. Cruise CCM 3. Relevant wiring
02 (Speed sensor)		Abnormal condition of vehicle speed signal system	1. Vehicle speed sensor 2. Relevant wiring
03 (Low speed limit)		Vehicle speed less than 40km/h	
04 (Redundant brake)		Vehicle speed less than memory speed by 15km/h	
05 (Control switch)		SET and RESUME switches on simultaneously	
06 (Control module)		Abnormal condition of cruise CCM	1. Cruise CCM 2. Relevant wiring
07 (Cancel signal)		Cancel switch ON	1. Brake switch 2. P/N position switch 3. Clutch switch 4. Relevant wiring

TROUBLESHOOTING PROCEDURES

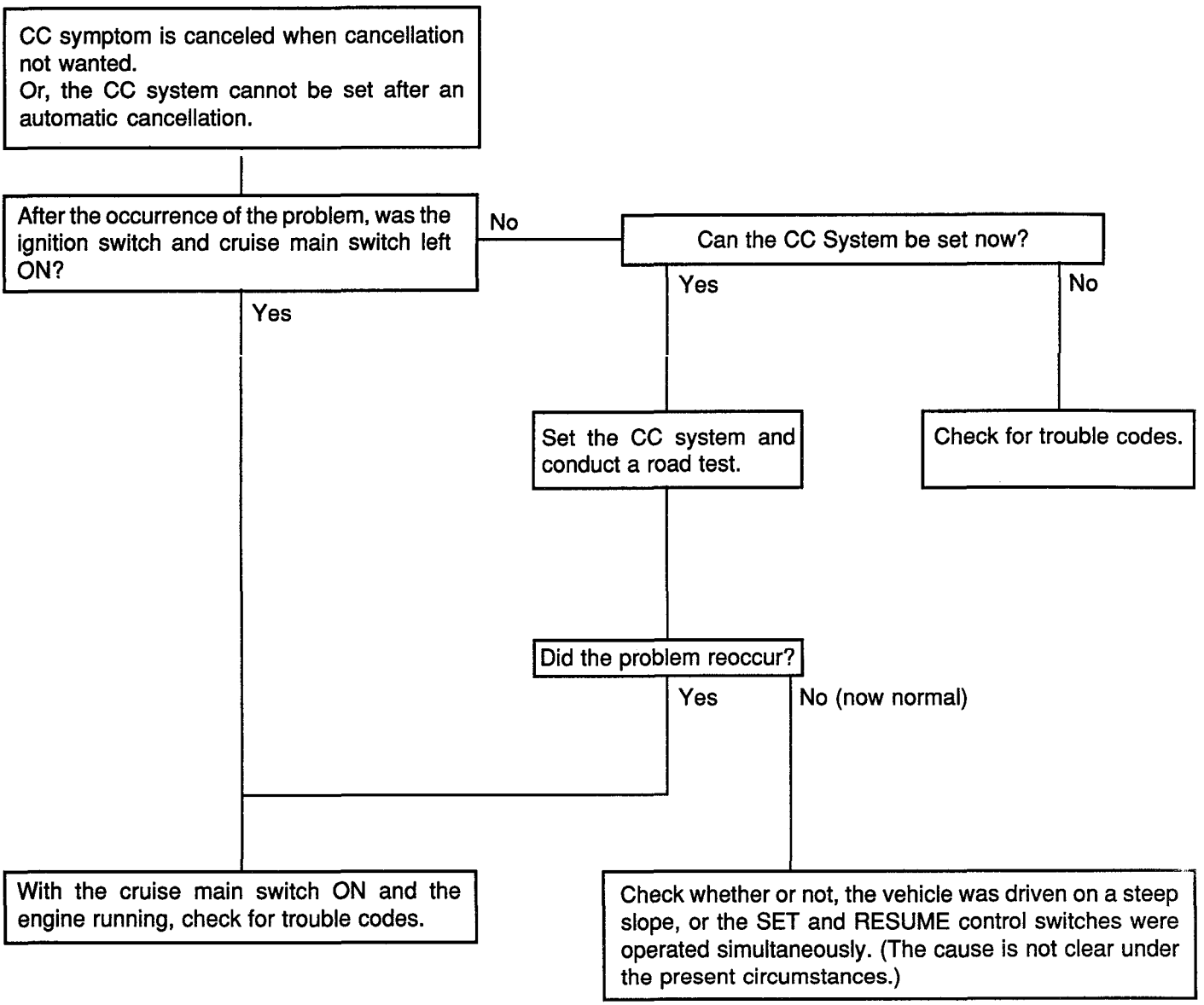
First, select the applicable malfunction symptom from the Trouble Symptom Charts. Conduct the self-diagnostic test following the directions on the charts.
Determine the condition of all function circuits.

CAUTION
Because the computer (self-diagnosis) memory data will be erased, when the system is unintentionally canceled during fixed-speed driving, the ignition switch and/or the cruise main switch of the ASC system should not be switched OFF, and the battery should not be disconnected.

1. Make the following preliminary inspections.
   1) Check that the installation of the actuator, accelerator cables are correct, and that the cables and links are securely connected.
   2) Check that the accelerator pedal moves smoothly.
   3) Adjust the cable so there is no excessive tension or excessive play on the accelerator cable.
   4) Check that the CCM, actuator, cruise main and control switch and the connector of each cancel switch are connected securely.
2. Check in the sequence indicated in the Trouble Symptom Chart.
3. If these checks indicate a normal condition, replace the cruise control unit.

TROUBLE SYMPTOM CHARTS

Trouble Symptom 1



CC : Cruise Control

Trouble Symptom 2

Trouble symptom	Probable cause	Remedy
o The set vehicle speed varies greatly upward or downward o "Surging" (repeated alternating acceleration and deceleration) occurs after setting	Malfunction of the vehicle speed sensor circuit	Repair the vehicle speed sensor system, or replace the part
	Malfunction of the speedometer cable or speedometer drive gear	
	Cruise vacuum pump circuit poor contact	Repair the actuator system, or replace the part
	Malfunction of the CCM	Replace the CCM

Trouble Symptom 3

Trouble symptom	Probable cause	Remedy
The CC system is not canceled when the brake pedal is depressed	Damaged or disconnected wiring of the stop lamp switch	Repair the harness or replace the stop lamp switch
	Cruise vacuum pump drive circuit short-circuit	Repair the harness or replace the vacuum pump
	Malfunction of the CCM	Replace the CCM

Trouble Symptom 4

Trouble symptom	Probable cause	Remedy
The CC system is not canceled when the shift lever is moved to the "N" position (It is canceled, however, when the brake pedal is depressed)	Damaged or disconnected wiring of inhibitor switch input circuit	Repair the harness or repair or replace the inhibitor switch
	Improper adjustment of inhibitor switch	
	Malfunction of the CCM	Replace the CCM

Trouble Symptom 5

Trouble symptom	Probable cause	Remedy
Cannot decelerate (coast) by using the SET switch	Temporary damaged or disconnected wiring of SET switch input circuit	Repair the harness or replace the SET switch
	Actuator circuit poor contact	Repair the harness or replace the actuator
	Malfunction of the actuator	
	Malfunction of the CCM	Replace the CCM

Trouble Symptom 6

Trouble symptom	Probable cause	Remedy
Cannot accelerate or resume speed by using the RESUME switch	Damaged or disconnected wiring, or short circuit, or RESUME switch input circuit	Repair the harness or replace the RESUME switch
	Actuator circuit poor contact	Repair the harness or replace the actuator
	Malfunction of the actuator	
	Malfunction of the CCM	Replace the CCM

Trouble Symptom 7

Trouble symptom	Probable cause	Remedy
CC system can be set while driving at a vehicle speed of less than 40 km/h (25 mph), or there is no automatic cancellation at that speed	Malfunction of the vehicle-speed sensor circuit	Repair the vehicle speed sensor system, or replace the part
	Malfunction of the speedometer cable or the speedometer drive gear	
	Malfunction of the CCM	Replace the CCM

Trouble Symptom 6

Trouble symptom	Probable cause	Remedy
The cruise main switch indicator lamp does not illuminate (But CC system is normal.)	Damaged or disconnected bulb of cruise main switch indicator lamp	Repair the harness or replace the part.
	Harness damaged or disconnected	

Trouble Symptom 9

Trouble symptom	Probable cause	Remedy
Malfunction of control function by ON/OFF switching of idle switch	Malfunction of circuit related to idle switch function	Repair the harness or replace the part
	Malfunction of the CCM	

Trouble Symptom 10

Trouble symptom	Probable cause	Remedy
Overdrive is not canceled during fixed speed driving.	Malfunction of circuit related to over-drive cancelation, or malfunction of CCM	Repair the harness or replace the part
No shift to overdrive during manual driving.		

PARTS INSPECTION
CRUISE CONTROL MAIN SWITCH

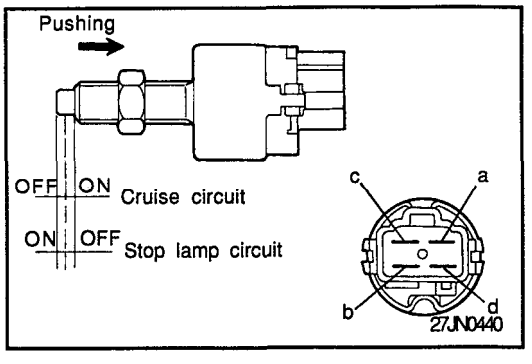
1. Operate the switch, and check for the continuity between the terminals.
2. If continuity is not as specified, replace the switch.

Termina / Position	1	2	3	4	5	6
ON	●	●		●	●	●
OFF	●			●		

STOP LAMP SWITCH

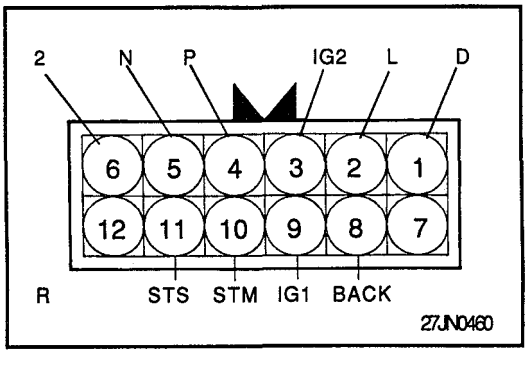
After operating the stop lamp switch, check for continuity between the terminals.

Terminal / Position	a	b	c	d
Pushing			●	●
Not pushing	●	●		



P/N POSITION SWITCH

1. Disconnect the connector.
2. Check that there is continuity between connector terminals 10 and 11 when the shift lever is moved to the “N” range.

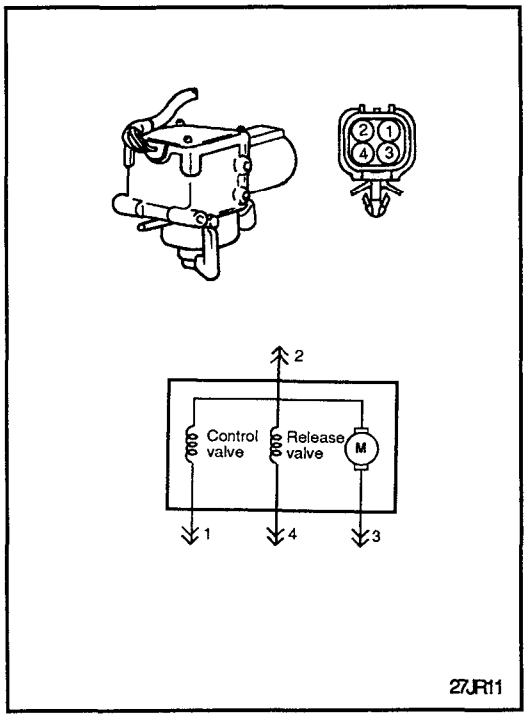


CRUISE VACUUM PUMP
INSPECTION OF SOLENOID VALVE (CONTROL VALVE, RELEASE VALVE)

1. Remove the auto-cruise vacuum pump connector.
2. Measure the resistance value between connector terminal 1 and 2, and connector terminals 2 and 4.

   Standard value : 50-60Ω

3. Check that the solenoid valve makes an operating noise when battery voltage is impressed between terminals 2 and 1, and connector terminals 2 and 4.
4. If there is a malfunction of the solenoid valve, replace the cruise vacuum pump assembly.

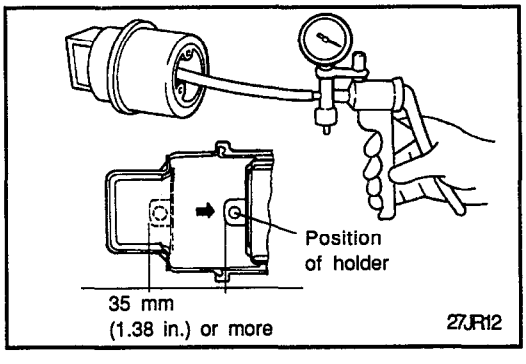


MOTOR INSPECTION

1. Remove the cruise vacuum pump connector.
2. Check that the motor revolves when battery voltage applyed between connector terminals 2 and 3.

ACTUATOR

1. Remove the actuator.
2. Apply negative pressure to the actuator with the vacuum pump and check that the holder moves more than 35 mm (1.38 in.). In addition, check that there is no change in the position of the holder when negative pressure is maintained in that condition.
3. First install the actuator and then inspect and adjust the cruise control cable.



COOLING SYSTEM

Return To Main Table of Contents

GENERAL 2
COOLING SYSTEM 7
RADIATOR 9
ENGINE COOLANT PUMP 12
THERMOSTAT 14
ENGINE COOLANT TEMPERATURE SENDER & SENSOR 15
ENGINE COOLANT HOSE AND PIPE 17

GENERAL

SPECIFICATIONS

Cooling method	Water-cooled, pressurized. Forced circulation with electrical fan	
Cooling system		
Quantity	6 lit (6.3 U.S.qts., 5.2 Imp.qts.)	
Radiator cap		
Main valve opening pressure	74-103 kPa (10.7-14.9 psi, 0.75-1.05 kg/cm^2)	
Vacuum valve opening pressure	-6.86 kPa (-1.00 psi, -0.07 kg/cm^2)or less	
Engine coolant pump	Centrifugal type impeller	
Thermostat		
Valve opening temperature	88^O (190°F)	
Full-opening temperature	100°C (212°F)	
Engine coolant temperature sender		
Resistance	90.5-117.54 at 70°C (158°F) 21.3-26.34 at 115°C (239°F)	
Thermo switch A (On radiator)		
Operating temperature	[1.6 Eng.]	[1.8 Eng.]
OFF → ON	85±3^{o}C (185±5.4^{o}F)	90±3^{o}C (194±5.4^{o}F)
ON → OFF	81±3^{o}C (177.8±5.4^{o}F)	83°C (191.4^{o}F) or more
Thermo switch A (On radiator)		
Operating temperature		
OFF → ON	103°C (217.4^{o}F)	
ON → OFF	110±3^{o}C (230±5.4^{o}F)	
Thermo switch [On engine coolant outlet fitting]		
Operating temperature		
OFF → ON	105±3^{o}C (221±5^{o}F)	
ON → OFF	98°C (208.4^{o}F) or more	
Engine coolant temperature sensor		
Resistance	2.21-2.69 kΩ at 20°C (68°F) 264-328 Ω at 80°C (176°F)	

SERVICE STANDARD

Standard value	
Coolant concentration	50% [Except tropical areas] 40% [Tropical areas]

SEALANT

Engine coolant temperature sender	Three bond No.2310 or equivalent
Engine coolant temperature sensor assy	LOCTITE 962T or equivalent

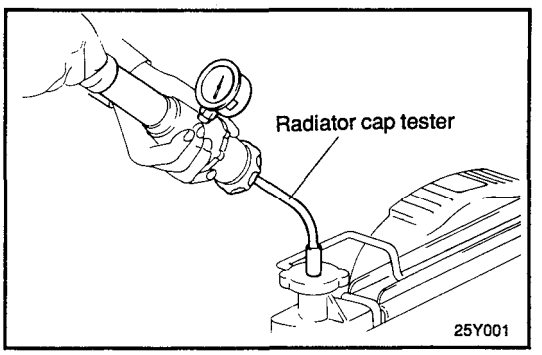
TIGHTENING TORQUE

	Nm	kg.cm	lb.ft
Generator support nut	20-25	200-250	14-18
Generator adjuster lock bolt	12-15	120-150	9-11
Engine coolant pump to cylinder block	12-15	120-150	9-11
Engine coolant pump to cylinder block (generator brace mounting)	20-27	200-270	14-20
Engine coolant pump pulley	8-10	80-100	6-7
Engine coolant temperature sender	10-12	100-120	7-9
Engine coolant temperature sensor	20-40	200-400	14-29
Engine coolant outlet fitting bolt	17-20	170-200	12-14

TROUBLESHOOTING

Symptom	Probable cause	Remedy
Low coolant level	Leakage of coolant Heater or radiator hose Faulty radiator cap Thermostat housing Radiator Engine coolant pump	 Repair or replace parts Tighten or replace clamps Replace gasket or housing Replace Replace parts
Clogged radiator	Foreign material in coolant	Replace coolant
Abnormally high coolant temperature	Faulty thermostat Faulty radiator cap Restricted to flow in cooling system Loosen or missing drive belt Faulty engine coolant pump Faulty temperature sender or wiring Faulty electric fan Faulty thermo-switch in radiator Insufficient coolant	Replace parts Clear restriction or replace parts Adjust or replace Replace Repair or replace Repair or replace Replace Refill coolant
Abnormally low coolant temperature	Faulty thermostat Faulty temperature sender or wiring	Replace Repair or replace
Leakage from oil cooling system	Loose connections Cracked or damaged Hoses Pipes Oil cooler	Tighten Replace
Inoperative electrical cooling fan	Damaged Thermo sensor Electrical motor Radiator fan relay Wiring	Repair or replace

COOLANT LEAK CHECK



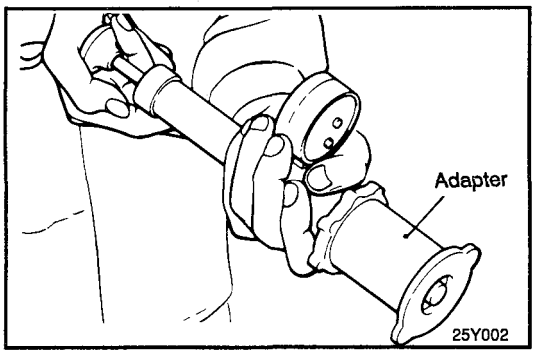
1. Loosen the radiator cap.
2. Confirm that the coolant level is up to the filler neck.
3. Install a radiator cap tester to the radiator filler neck and apply 150 kPa (21 psi, 1.53 kg/cm^2) pressure. Hold for two minutes, while checking for leakage from the radiator, hose or connections.

CAUTIONS

1) Radiator coolant may be extremely hot. Do not open the system while hot, or scalding water could spray out causing personal injury. Allow vehicle to cool before servicing this system.
2) Be sure to completely clean away any moisture from the places checked.
3) When the tester is removed, be careful not to spill any coolant from it.
4) Be careful, when installing and removing the tester and when testing, not to deform the filler neck of the radiator.

4. If there is leakage, repair or replace the appropriate part.

RADIATOR CAP PRESSURE TEST



1. Use an adapter to attach the cap to the tester.
2. Increase the pressure until the indicator of the gauge stops moving.

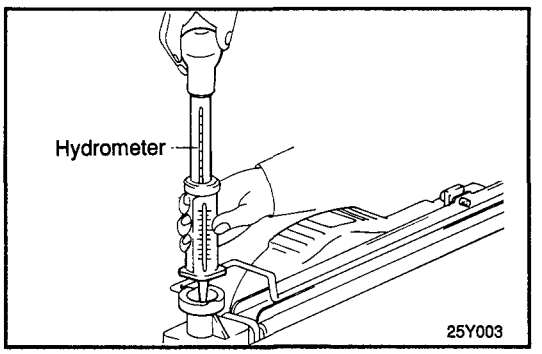
Main valve opening pressure	81-108 kPa (11.8-15.6 psi, 0.83-1.10 kg/cm^2)
Limit	65 kPa (9.2 psi, 0.66 kg/cm^2)

3. Check that the pressure level is maintained at or above the limit.
4. Replace the radiator cap if the reading does not remain at or above the limit.

NOTE

Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an improper indication.

SPECIFIC GRAVITY TEST



1. Measure the specific gravity of the coolant with a hydrometer.
2. Measure the coolant temperature, and calculate the concentration from the relation between the specific and temperature, using the following table for reference.

RELATION BETWEEN COOLANT CONCENTRATION AND SPECIFIC GRAVITY

Coolant temperature °C (°F) and specific gravity					Freezing temperature °C (°F)	Safe operating temperature °C (°F)	Coolant concentration (Specific volume)
10 (50)	20 (68)	30 (86)	40 (104)	50 (122)			
1.054	1.050	1.046	1.042	1.036	-16 (3.2)	-11 (12.2)	30%
1.063	1.058	1.054	1.049	1.044	-20 (-4)	-15 (5)	35%
1.071	1.067	1.062	1.057	1.052	-25 (-13)	-20 (-4)	40%
1.079	1.074	1.069	1.064	1.058	-30 (-22)	-25 (-13)	45%
1.087	1.082	1.076	1.070	1.064	-36 (-32.8)	-31 (-23.8)	50%
1.095	1.090	1.084	1.077	1.070	-42 (-44)	-37 (-35)	55%
1.103	1.098	1.092	1.084	1.076	-50 (-58)	-45 (-49)	60%

Example
The safe operating temperature is -15°C (5°F) when the measured specific gravity is 1.058 at coolant temperature of 20°C (68°F).

CAUTION
If the concentration of the coolant is below 30%, the anti-corrosion property will be adversely affected. In addition, if the concentration is above 60%, both the anti-freeze and engine cooling properties will decrease affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.
Do not use together with another brand.

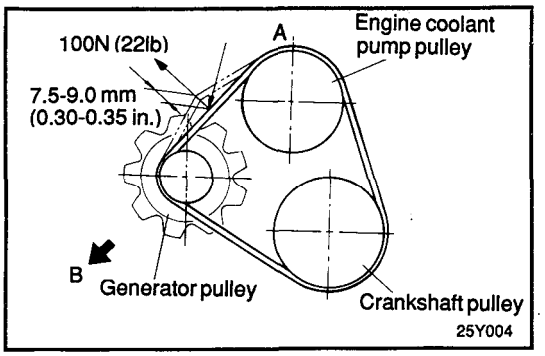
RECOMMENDED COOLANT

Antifreeze	Mixture ratio of anti-freeze in coolant	
ETHYLENE GLYCOL BASE FOR ALUMINUM	Tropical area	40%
	Other area	50%

DRIVE BELT TENSION ADJUSTMENT

The belt must be adjusted to the following specifications.
1. When 100 N (22 lb) (tension or compression) is given perpendicularly to belt at center “A”, sag is to be "L" mm.
2. Or, tension gauge must read “T” at center “A”.

	New belt installed	Used belt installed
Deflection	7.5 - 9.0 mm (0.30-0.35 in.)	10.0 mm (0.39 in.)
Tension (T)	50 - 70 kg (110-154 lb)	40 kg (88 lb)



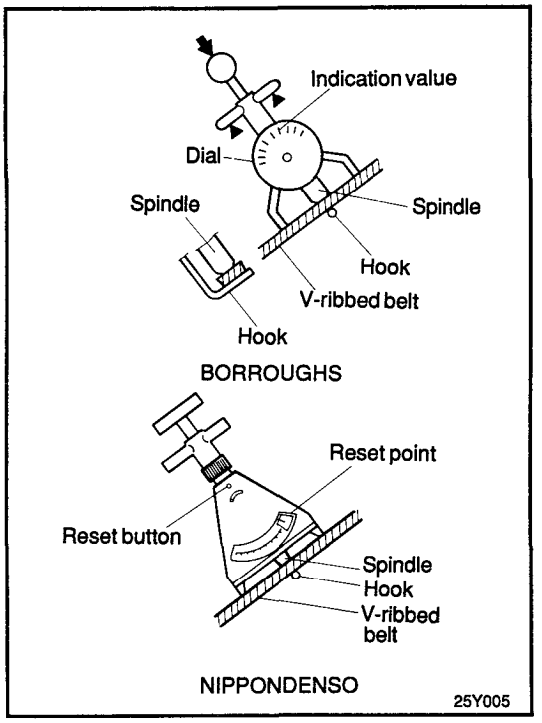
USAGE OF TENSION GAUGE

Using Tension Gauge

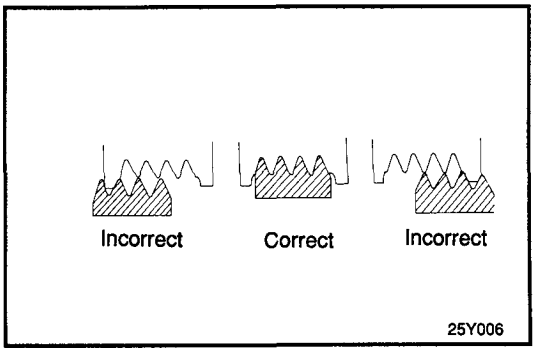
BORROUGHS BT-33-73F Type
NIPPONDENSO BTG-2 Type

Measuring Method

1. Press down on the tension gauge handle and insert the belt between the spindle and hook of the gauge.
2. Release the handle and read the measurement on the gauge.



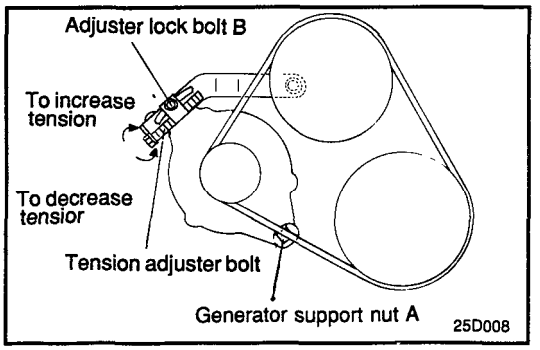
NOTE
1. Belt which had been in operation for 5 minutes or more, must be adjusted to the used belt specifications.
2. Ensure that the belt is installed correctly, as shown in the Illustration.
3. A loose belt will produce a high-pitched squealing noise.
4. A belt that is too is tight will damage the generator and engine coolant pump bearings.



DRIVE BELT AND PULLEY

Removal

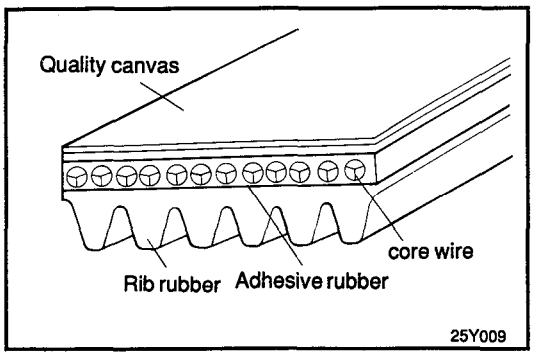
1. Loosen generator support nut “A” and the belt tension adjuster lock bolt "B".
2. Rotate the adjuster bolt counterclockwise to relieve belt tension, and remove the belt.
3. Remove the water pump pulley bolts and remove the engine coolant pump pulley.



Tightening torque
- Generator support nut A ..... 20-25 Nm (200-250 kg.cm, 14-18 Ib.ft)
- Adjuster lock bolt B ..... 12-15 Nm (120-150 kgcm, 9-11 Ib.ft)

Inspection

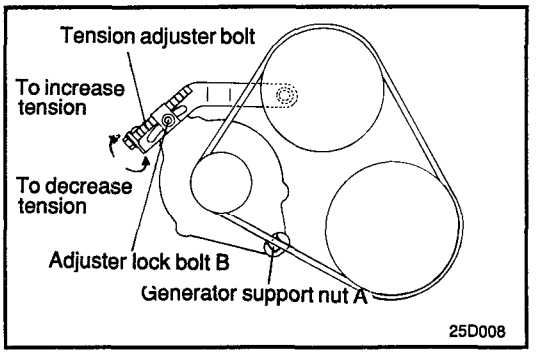
Check the following items and replace if defective.
1. Check the surface for damage, peeling or cracks.
2. Check the belt surface for oil or grease.
3. Check the rubber for worn or hardened areas.
4. Check the surface of the pulley for cracks or damage.



Installation

1. Install the engine coolant pump pulley to the engine coolant pump pulley bracket and tighten the bolts firmly.
2. After installing the belt, adjust the belt tension. See “DRIVE BELT TENSION DEFLECTION CHECK AND ADJUSTMENT”.

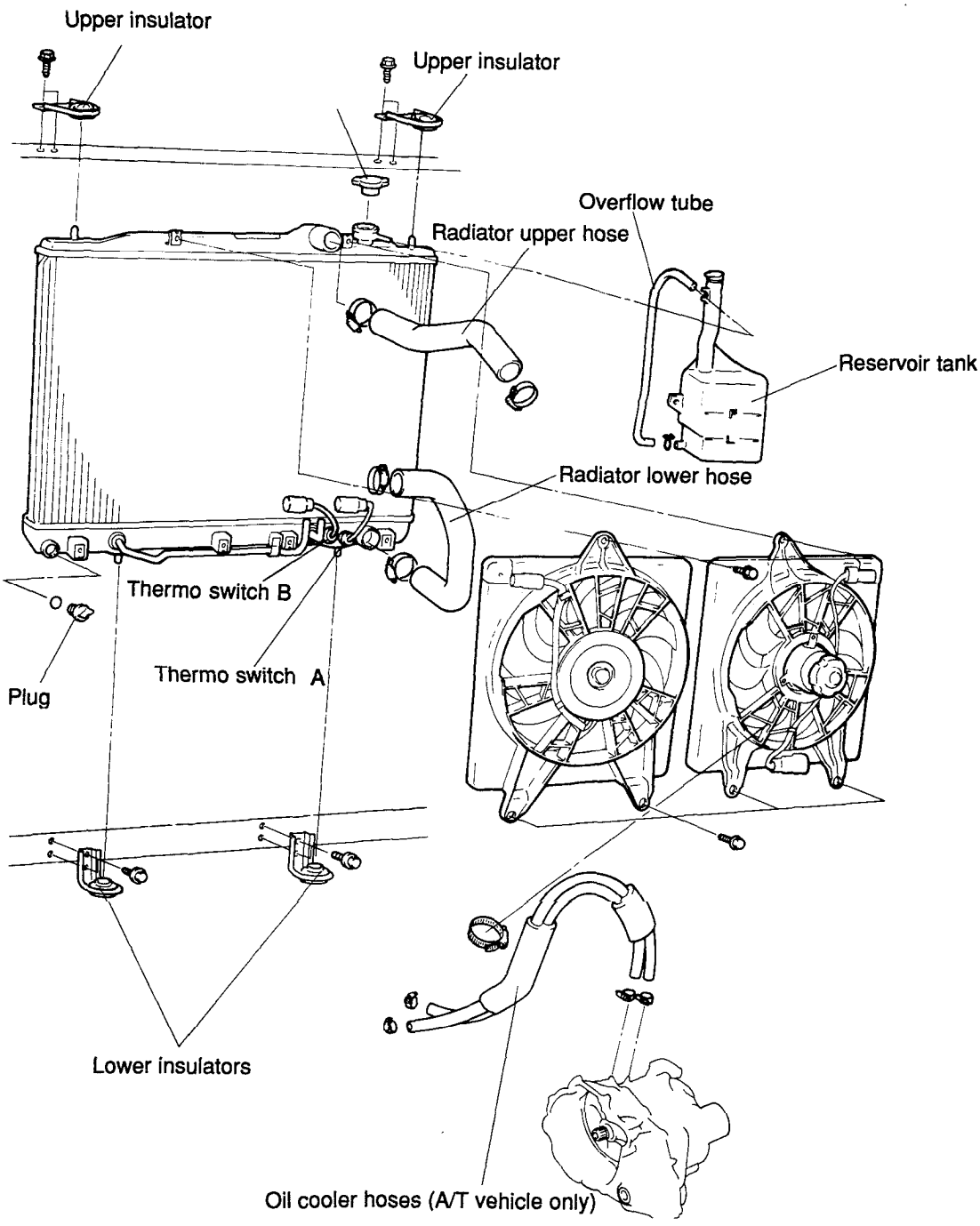
CAUTION
Note that 1.6L and 1.8L Engine V-ribbed velts are different in length.



Standard value
- **1.6L Engine ..... 980±5 mm**
- **1.8L Engine ..... 990±5 mm**

RADIATOR

COMPONENTS



REMOVAL

1. Disconnect the fan motor plug.
2. Set the warm engine coolant flow control knob of the heater control to the hot position.
3. Loosen the radiator drain plug to drain coolant.
4. Disconnect the upper and lower hose, and the overflow tube.
5. For vehicles with an automatic transaxle, disconnect the oil cooler hoses from the automatic transaxle.

CAUTION
Plug the ends of the oil cooler hoses and the automatic transaxle port to prevent the transaxle fluid from spilling out and foreign material from getting in.

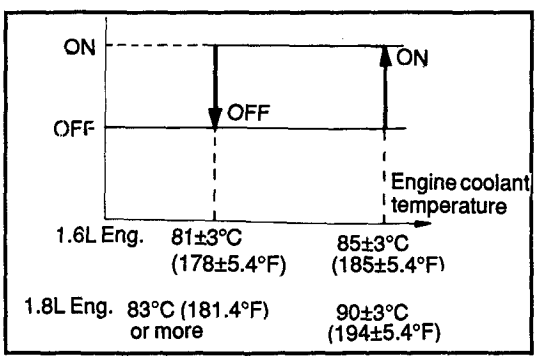
6. Remove the radiator mounting bolts.
7. Remove the radiator together with the fan motor.
8. Remove the fan motor from the radiator.

INSPECTION

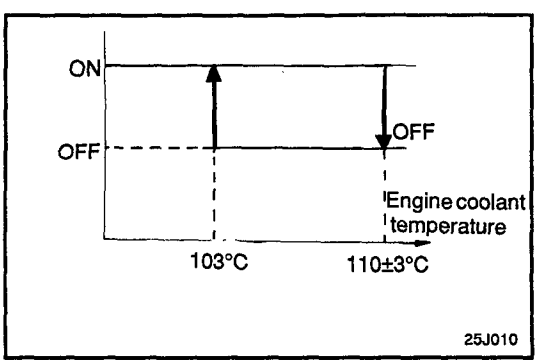
1. Check the radiator for bent, broken, or plugged fins.
2. Check the radiator for corrosion, damage, rust or scale.
3. Check the radiator hoses for cracks, damage or deterioration.
4. Check the reservoir tank for damage.
5. Check the radiator cap spring for damage. Pressure test the cap using a cooling system checker.
6. Check the radiator cap seal for cracks or damage.

7. Check for continuity with the thermo switch in hot water.
   Continuity at 85 ± 3°C (185 ± 5.4oF) [1.6L Eng.]
   90 ± 3°C (194 ± 5.4°F) [1.8L Eng.]
   No continuity at 81 ± 3°C (178 ± 54°F) [1.6L Eng.]
   83°C (181.4°F) or more [1.8L Eng.]

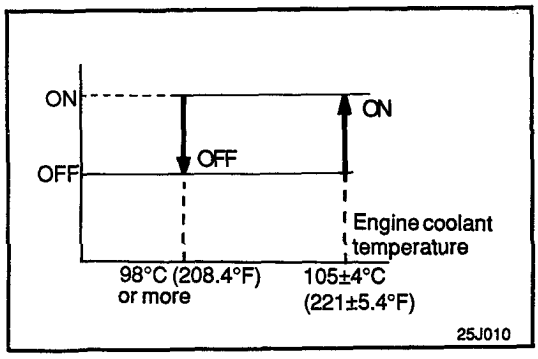
NOTE
Immerse the thermo switch in hot engine coolant up to the mounting threads to check for continuity.

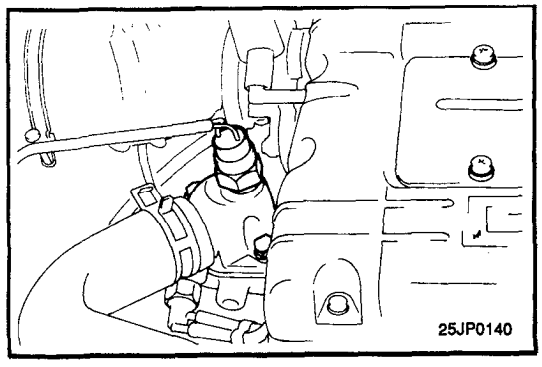


8. Check for continuity with thermo switch B in hot engine coolant
   Continuity at 103°C (217.4°F)
   No continuity at 110°C±3°C (230+5.4°F) or more



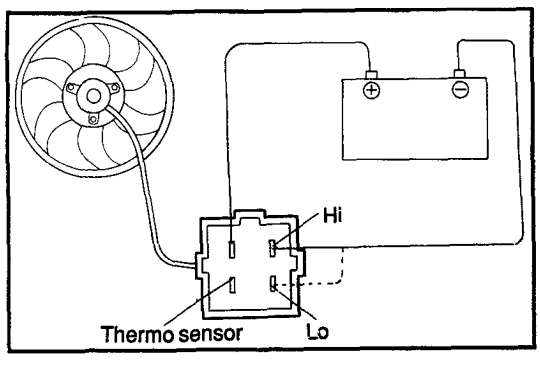
9. Check for continuity with thermo sensor on water outlet fitting in hot water.
   Continuity at 102-108°C (215.6-226.4°F)
   No continuity at 98°C (208.4°F) or more





Radiator Fan Motor

1. Check to be sure that the radiator fan rotates when battery voltage is applied between the terminals (as shown in the figure).
2. Check to see that abnormal noises are not produced while the motor is turning.

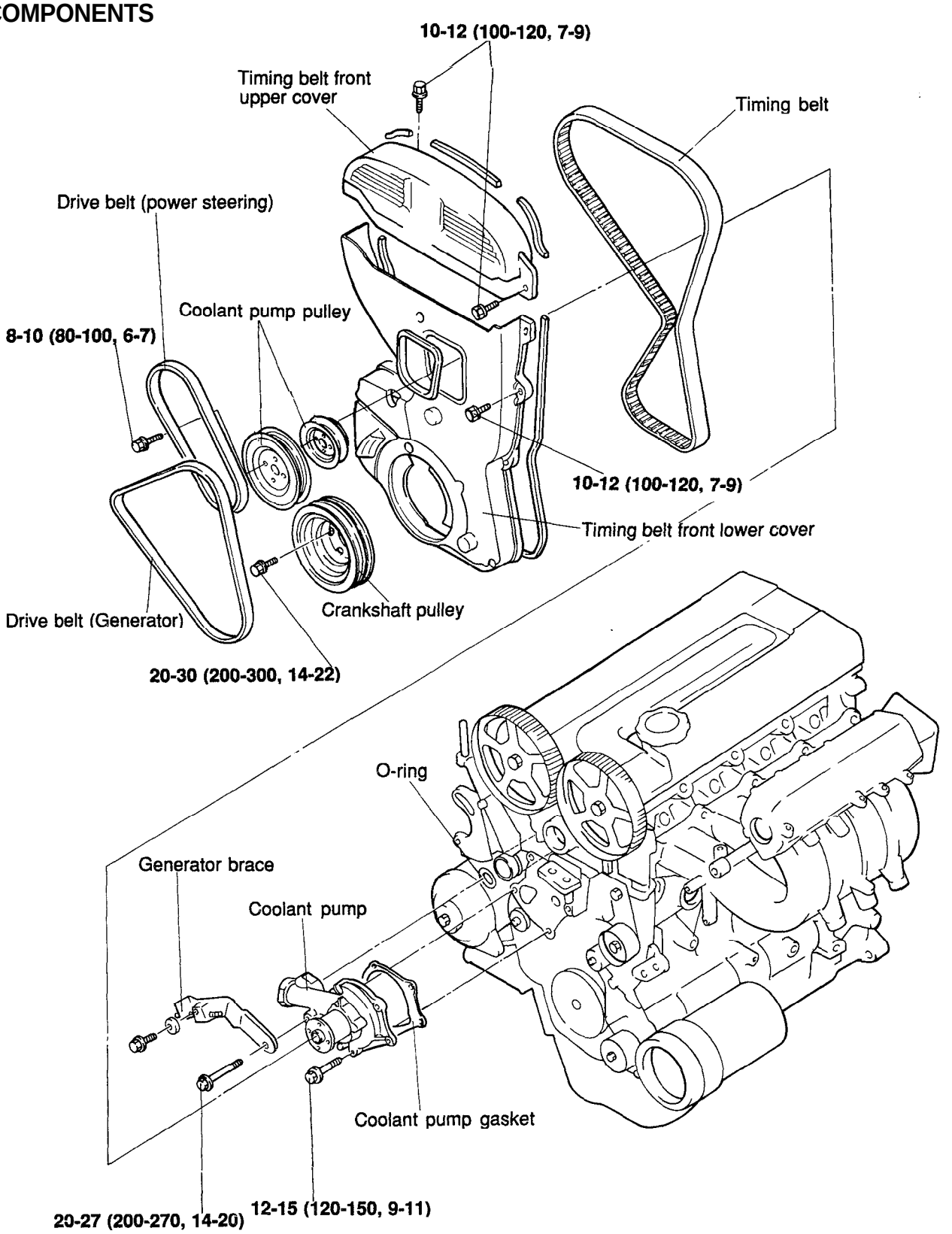


INSTALLATION

1. Fill the radiator and reservoir tank with a fresh coolant mixture.
2. Run the engine until the coolant has warmed up enough so that the thermostat valve opens, and then stop the engine.
3. Remove the radiator cap, pour in the coolant until it is up to the filler neck of the radiator, and then fill the reservoir tank to the upper level.
4. Check to be sure that there is no leakage from the radiator, hoses or connections.

ENGINE COOLANT PUMP

COMPONENTS



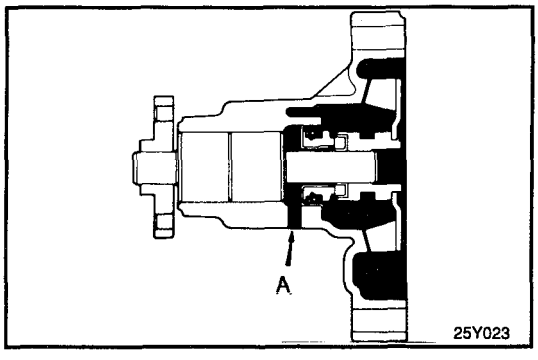
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Drain the coolant and disconnect the radiator outlet hose and engine coolant by-pass hose from the engine coolant pump.
2. Remove the drive belt and engine coolant pump pulley.
3. Remove the timing belt covers and the timing belt tensioner.
4. Remove the engine coolant pump mounting bolts and then remove the generator brace.
5. Remove the engine coolant pump assembly from the cylinder block.

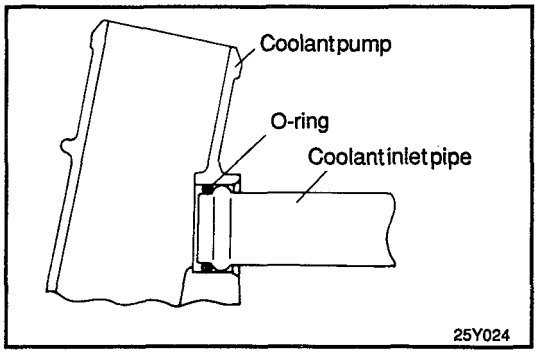
INSPECTION

1. Check the engine coolant pump for cracks, damage or wear, and replace the engine coolant pump assembly if necessary.
2. Check the bearing for damage, abnormal noise and sluggish rotation, and replace the engine coolant pump assembly if necessary.
3. Check the seal unit for leaks, and replace the engine coolant pump assembly if necessary.
4. Check for water leakage. If water leaks from hole "A", seal unit is defective. Replace engine coolant pump assembly.

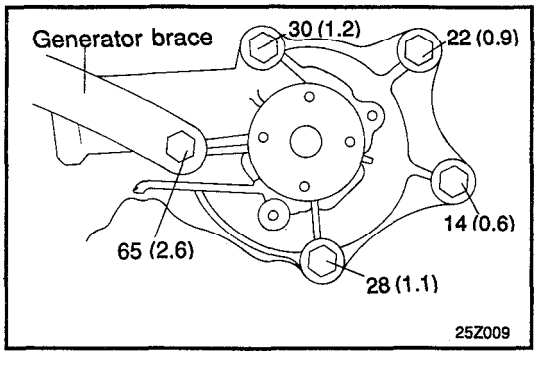


INSTALLATION

1. Clean the gasket surfaces of the engine coolant pump body and the cylinder block.
2. Install the new O-ring onto the groove on the front end of the engine coolant pipe, then wet the O-ring with water. Do not apply oil or grease.
3. Install a new engine coolant pump gasket and engine coolant pump assembly. Tighten the bolts to the specified torque.



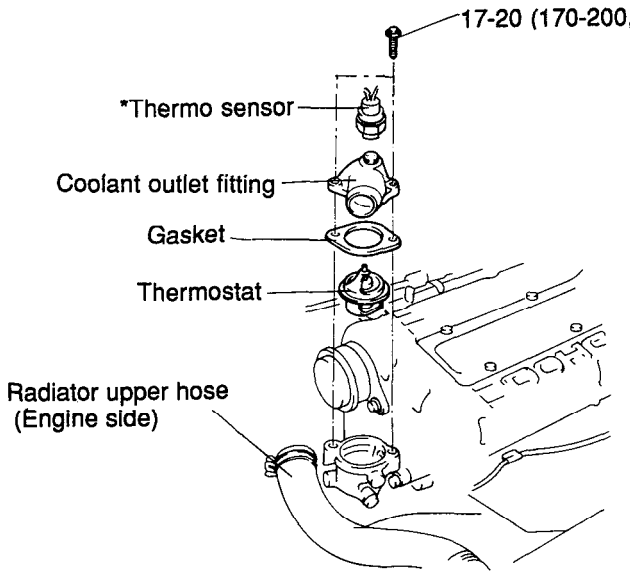
Tightening torque	
Engine coolant pump to cylinder block	
Head mark "4" bolt	12-15 Nm (120-150 kg.cm, 9-11 lb.ft)
Head mark "7" bolt	**20-27** Nm (200-270 kg.cm, 14-20 lb.ft)



4. Install the timing belt tensioner and timing belt. Adjust the timing belt tension, and then install the timing belt covers.
5. Install the engine coolant pump pulley and drive belt, and then adjust the belt tension.
6. Refill the coolant.
7. Run the engine and check for leaks.

THERMOSTAT

COMPONENTS



* Middle East, Austrialia only

TORQUE : Nm (kg.cm, lb.ft)

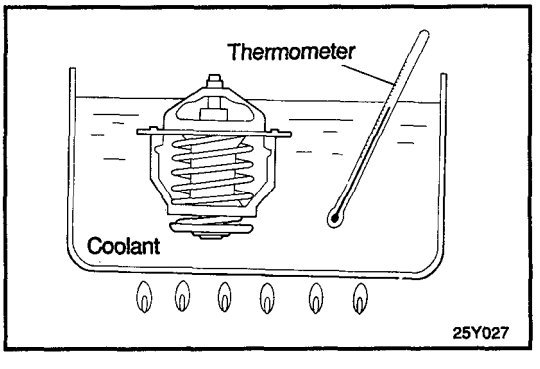
REMOVAL AND INSPECTION

1. Drain the coolant down to thermostat level or below.
2. Remove the water outlet fitting and gasket.
3. Remove the thermostat.
4. Heat the thermostat as shown in the illustration.
5. Check to see if the valve operates properly.
6. Check to determine the temperature at which the valve begins to open.

Valve opening temperature
88°C (190°F)

Full opening temperature
100°C (212°F)

Valve lift (at full open) ..... 8 mm (0.31 in.) or more

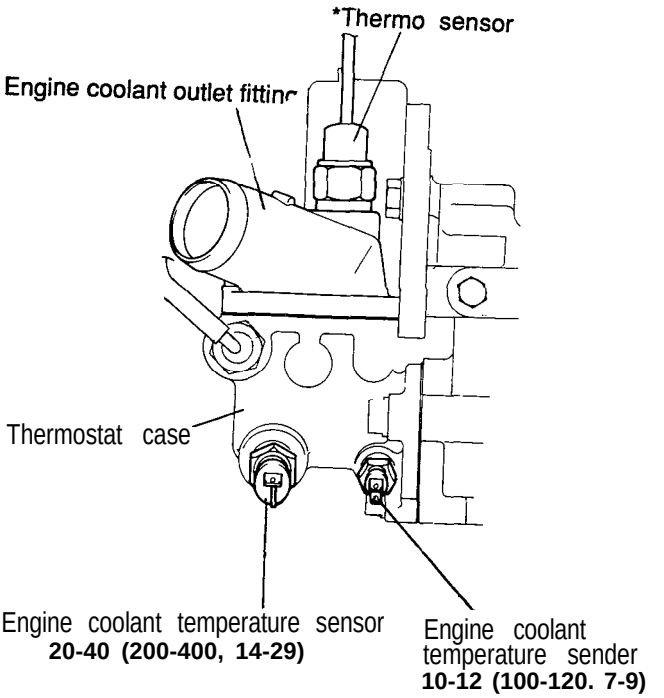


INSTALLATION

1. Check to ensure that the flange of the thermostat is correctly seated in the socket of the thermostat housing. If the thermostat is installed in the wrong direction, the bottom of the thermostat will touch the rib inside the intake manifold, making it impossible to seat the flange in position.
2. Install a new gasket and engine coolant outlet fitting.
3. Refill the coolant.

ENGINE COOLANT TEMPERATURE SENDER, SENSOR

COMPONENTS



* Middle East, Austrialia only

TORQUE : Nm (kg.cm, lb.ft)

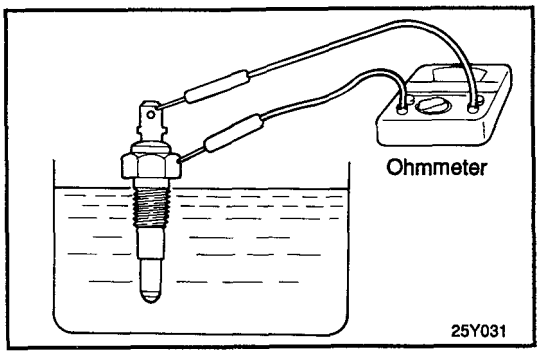
REMOVAL

1. Drain the coolant down to sender level or below.
2. Disconnect the battery ground cable and disconnect the engine harness.
3. Remove the engine coolant temperature sender and sensor.

INSPECTION

1. Heat the engine coolant temperature sender by submerging it in hot water.
2. Check that the resistance is within the specified range.

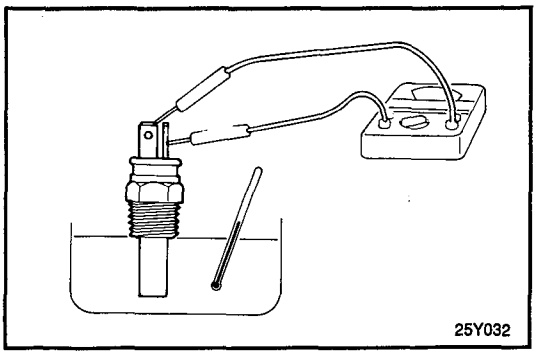
Resistance	90.5-117.5 Ω at 70°C (158°F) 21.3-26.3 Ω at 115°C (239°F)



Engine Coolant Temperature Sensor

1. Heat the sensor by submerging it in hot water.
2. Check that the resistance is within the specified range.

Resistance	2.21-2.69 KΩ at 20°C (68°F) 264-328 Ω at 80°C (176°F)

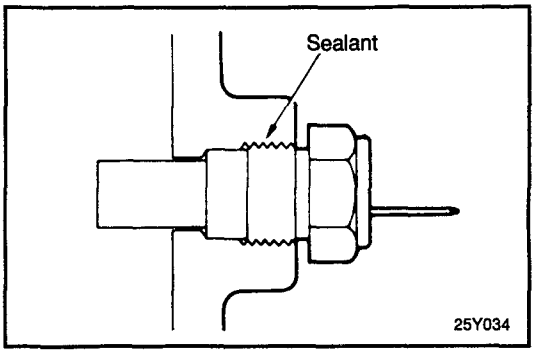


INSTALLATION

1. Apply sealant to the threaded portion and tighten to the specified torque.

Engine coolant temperature sender	Three bond No.2310 or equivalent
Engine coolant temperature sensor	LOCTITE 962T or equivalent

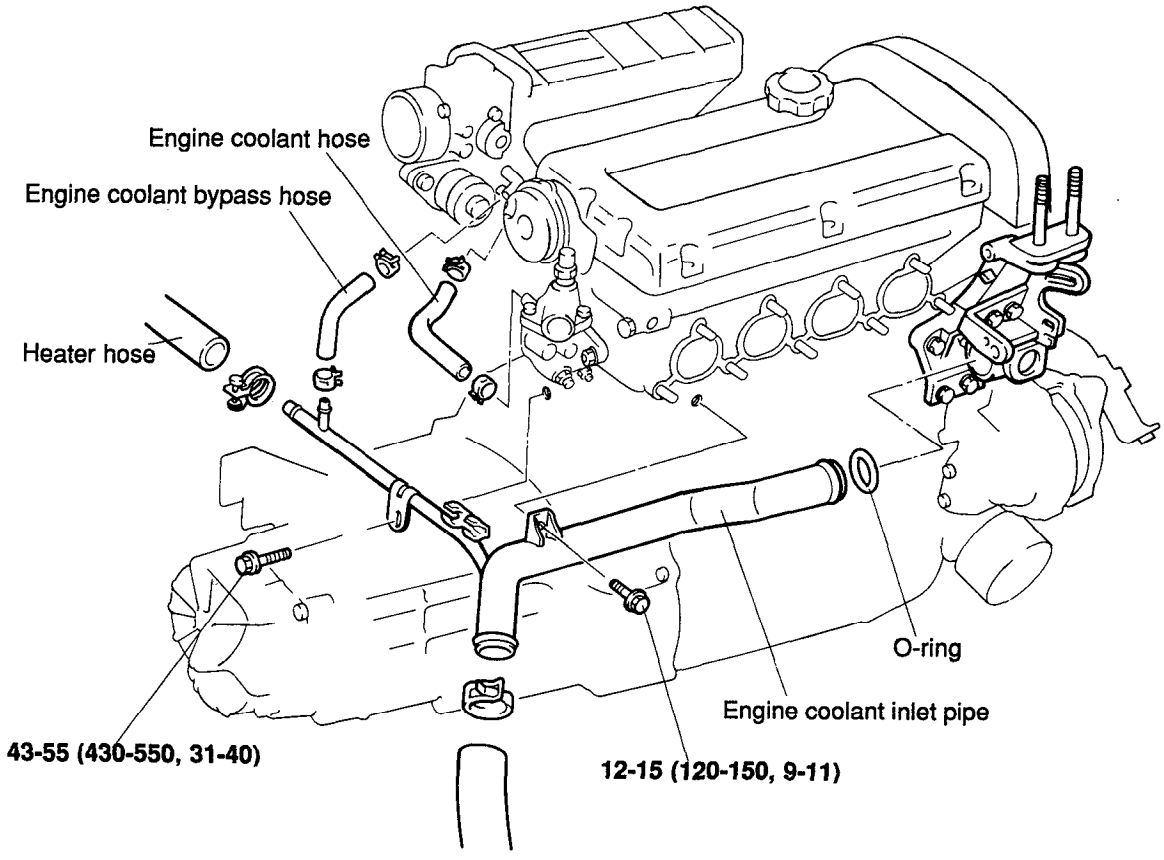
Tightening torque	
Engine coolant temperature sender	1O-12 Nm (100-120 kg.cm, 7-9 lb.ft)
Engine coolant temperature sensor	**20-40** Nm (200-400 kg.cm, 14-29 lb.ft)



2. Connect the harness to the engine coolant temperature sender, temperature sensor.
3. Connect the battery ground cable.
4. Refill with coolant.

ENGINE COOLANT HOSE AND PIPE

COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

INSPECTION

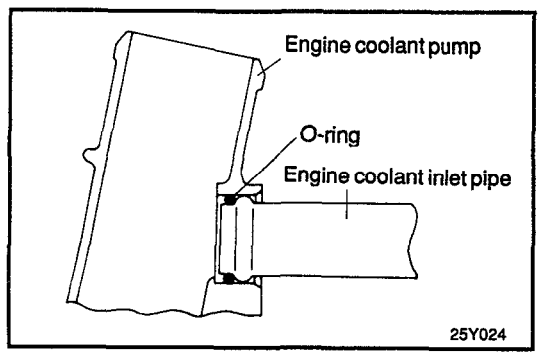
Check the engine coolant pipe and hose for cracks, damage, or restrictions. Replace if necessary.

INSTALLATION

Fit O-ring in the groove provided at engine coolant inlet pipe end, wet the periphery of O-ring and inset engine coolant inlet pipe.

NOTE

1. Do not apply oils or greases to water pipe O-ring.
2. Keep the engine coolant pipe connections free of sand, dust, etc.
3. Insert engine coolant pipe until its end bottoms.



ENGINE MECHANICAL

Return To Main Table of Contents

GENERAL 2
ENGINE MOUNTING 16
ENGINE AND TRANSAXLE ASSEMBLY 19
TIMING BELT 22
CAMSHAFTS AND ROCKER ARMS 34
CYLINDER HEAD AND VALVES 39
FRONT CASE, OIL PUMP
COUNTER BALANCE SHAFT 46
PISTON AND CONNECTING ROD 54
CRANKSHAFT, FLYWHEEL 59
CYLINDER BLOCK 64

GENERAL

SPECIFICATIONS

Description	Specification		Limit
General			
Type	In-line, Double Over Head Camshaft		
Number of cylinders	4		
	1.6L Eng.	1.8L Eng.	
Bore	82.3 mm (3.240 in.)	81.5 mm (3.209 in.)	
Stroke	75.0 mm (2.953 in.)	88 mm (3.465 in.)	
Total displacement	1595 cc (97.3 cu. in.)	1836 cc (112.04 cu. in.)	
Compression ratio	9.2	9.2	
Firing order	1-3-4-2	←	
Idle R.P.M	750 ± 100 rpm	700 ± 100 rpm	
Ignition timing at idling speed	BTDC $5^o \pm 2^o$	←	
Valve timing			
Intake valve	1.6L Eng.	1.8L Eng.	
Opens (BTDC)	16^o (For M/T), 26^o (For A/T)	26^o	
Closes (ABDC)	48^o (For M/T), 38^o (For A/T)	46^o	
Exhaust valve			
Opens (BBDC)	43^o (For M/T), 53^o (For A/T)	55^o	
Closes (ATDC)	17^o (For M/T), 7^o (For A/T)	9^o	
Cylinder head			
Flatness of gasket surface	Max. 0.05 mm (0.0020 in.)		0.1 mm (0.0039 in.)
Flatness of manifold mounting surface	0.15 mm (0.0059 in.)		0.2 mm (0.008 in.)
Oversize rework dimensions of valve seat hole			
Intake 0.3 mm (0.012 in.) O.S.	35.300-35.325 mm (1.3898-1.3907 in.)		
0.6 mm (0.024 in.) O.S	35.600-35.625 mm (1.4016-1.4026 in.)		
Exhaust 0.3 mm (0.012 in.) O.S.	33.300-33.325 mm (1.3110-1.3120 in.)		
0.6 mm (0.024) O.S.	33.600-33.625 mm (1.3228-1.3238 in.)		
Oversize rework dimensions of valve guide hole (both intake and exhaust)			
0.05 mm (0.002 in.) O.S.	12.050-12.068 mm (0.4744-0.4751 in.)		
0.25 mm (0.010 in.) O.S.	12.250-12.268 mm (0.4823-0.4830 in.)		
0.50 mm (0.020 in.) O.S.	12.500-12.518 mm (0.4921-0.4928 in.)		
Camshaft			
1.6L Eng.			
Cam height			
Intake	35.200 mm (1.3858 in.)		34.700 mm (1.3661 in.)
Exhaust	34.907 mm (1.3743 in.)		34.407 mm (1.3546 in.)
Journal O.D.	26 mm (1.02 in.)		
Bearing oil clearance	0.05-0.09 mm (0.0020-0.0035)		
End play	0.1-0.2 mm (0.004-0.008 in.)		
1.8L Eng.			
Cam height			
Intake	35.493 mm (1.3974 in.)		34.993 mm (1.3777 in.)
Exhaust	35.200 mm (1.3858 in.)		34.700 mm (1.3661 in.)
Journal O.D.	26 mm (1.02 in.)		
Bearing oil clearance	0.05-0.09 mm (0.0020-0.0035 in.)		
End play	0.1-0.2 mm (0.004-0.008 in.)		

Description	Specification	Limit
Valve		
Valve length		
Intake	109.5 mm (4.311 in.)	
Exhaust	109.7 mm (4.319 in.)	
Stem O.D.		
Intake	6.565-6.580 mm (0.2585-0.2591 in.)	
Exhaust	6.530-6.550 mm (0.2571-0.2579 in.)	
Face angle	45-45.5°	
Thickness of valve head (margin)		
Intake	1.0 mm (0.039 in.)	0.7 mm (0.028 in.)
Exhaust	1.5 mm (0.059 in.)	1.0 mm (0.039 in.)
Valve stem to valve guide clearance		
intake	0.020-0.047 mm (0.0008-0.0019 in.)	0.10 mm (0.0039 in.)
Exhaust	0.050-0.085 mm (0.0020-0.0033 in.)	0.15 mm (0.0059 in.)
Valve guide		
Length		
Intake	45.5 mm (1.791 in.)	
Exhaust	50.5 mm (1.988 in.)	
Service size	0.05, 0.25,0.50 mm (0.002,0.010,0.020 in.) oversize	
Valve seat		
Width of seat contact	0.9-1.3 mm (0.035-0.051 in.)	
Seat angle	44-44.5°	
Service size	0.3 mm (0.012 in.), 0.6 mm (0.024 in.) oversize	
Valve spring		
Free length	48.3 mm (1.902 in,)	47.3 mm (1.862 in.)
Load	300 N (66 lb)/40 mm (1.575 in.)	
Out of squareness	Less than 1.5°	4°
Cylinder block		
Cylinder bore	82.30-82.33 mm (3.2402-3.2413 in.)[1.6L Eng.] 81.50-81.53 mm (3.2087-3.2098 in) [1.8L Eng.]	
Out-of-roundness and taper of cylinder bore	Less than 0.01 mm (0.0004 in.)	
Flatness of gasket surface	Less than 0.05 mm (0.0020 in.)	0.1 mm (0.0039 in.)
Piston		
O.D.	82.27-82.30 mm (3.2390-3.2402 in.)[1.6L Eng.] 81.47-81.50 mm (3.2075-3.2087 in.)[1.8L Eng.]	
Piston-to-cylinder clearance	0.02-0.04 mm (0.0008-0.0016 in.)	
Ring groove width		
No. 1	1.22-1.24 mm (0.0480-0.0488 in.)	
No. 2	1.52-1.54 mm (0.0598-0.0606 in.)	
Oil	3.01-3.03 mm (0.1185-0.1193 in.)	
Service size	0.25, 0.50, 0.75, 1.00 mm (0.010, 0.020, 0.030, 0.039 in.) oversize	

Description	Specification	Limit
Piston ring		
Side clearance		
No. 1, No. 2	0.03-0.07 mm (0.0012-0.0028 in.)	0.1 mm (0.004 in.)
End gap		
1.6L Eng.		
No. 1	0.25-0.40 mm (0.0098-0.0157 in.)	0.8 mm (0.031 in.)
No. 2	0.35-0.50 mm (0.0138-0.0197 in.)	0.8 mm (0.031 in.)
Oil ring side rail	0.20-0.70 mm (0.0079-0.0276 in.)	1.0 mm (0.039 in.)
1.8L Eng.		
No.1	0.25-0.40 mm (0.098-0.0157 in.)	0.8 mm (0.031 in.)
No.2	0.45-0.60 mm (0.0177-0.0236 in.)	0.8 mm (0.031 in.)
Oil ring side rail	0.20-0.70 mm (0.0079-0.0276 in.)	1.0 mm (0.039 in.)
Service size	0.25,0.50,0.75, 1.00 mm (0.010, 0.020, 0.030, 0.039 in.) oversize	
Connecting rod		
Bend	0.05 mm (0.0020 in.)	
Twist	0.1 mm (0.004 in.)	
Connecting rod big end to crankshaft side clearance	0.10-0.25 mm (0.0039-0.0098 in.)	0.4 mm (0.0157 in.)
Piston pin press-in load	7,500-17,500 N (1,653-3,858 lb)	
Connecting rod bearing		
Oil clearance	0.022-0.05 mm (0.00086-0.0020 in.)	0.1 mm (0.004 in.)
Crankshaft main bearing		
Oil clearance	0.02-0.05 mm (0.0008-0.0020 in.)	0.1 mm (0.004 in.)
Crankshaft		
Pin O.D.	45 mm (1.77 in.)	
Journal O.D.	57 mm (2.24 in.)	
Out-of-roundness of journal and pin	Less than 0.015 mm (0.0006 in.)	
Taper of journal and pin	Less than 0.005 (0.0002)	
End play	0.05-0.18 mm (0.0020-0.0071 in.)	0.25 mm (0.0098 in.)
Flywheel		
Runout		0.13 mm (0.0051 in.)
Oil pressure at curb idle speed [Oil tempreature is 75 to 90°C (167 to 194°F)]	80 kPa (11.4 psi) or more	
Oil pump		
Tip clearance		
Drive gear	0.16-0.21 mm (0.0063-0.0083 in.)	0.25 mm (0.0098 in.)
Driven gear	0.13-0.18 mm (0.0051-0.0071 in.)	0.25 mm (0.0098 in.)
Side clearance		
Drive gear	0.08-0.14 mm (0.0031-0.0055 in.)	0.25 mm (0.0098 in.)
Driven gear	0.06-0.12 mm (0.0024-0.0047 in.)	0.25 mm (0.0098 in.)
Relief spring		
Free length	46.6 mm (1.835 in.)	
Load [61 N (13.5 lb)]	40.1 mm (1.579 in.)	

Description	Specification	Limit
Right counter balance shaft		
Front journal diameter	41.959-41.975 mm (1.6519-1.6526 in.)	
Rear journal diameter	40.951-40.967 mm (1.6122-1.6129 in.)	
Oil clearance		
Front	0.020-0.0061 mm (0.0008-0.0024 in.)	
Rear	0.050-0.091 mm (0.0020-0.0036 in.)	
Left counter balance shaft		
Front journal diameter	18.467-18.480 mm (0.7270-0.7276 in.)	
Rear journal diameter	40.959--40.975 mm (1.6126-1.6132 in.)	
Oil clearance		
Front	0.020-0.054 mm (0.0008-0.0021 in.)	
Rear	0.042-0.083 mm (0.0017-0.0033 in.)	

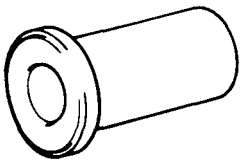
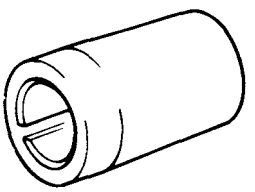
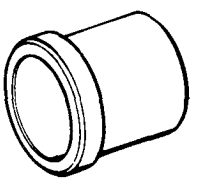
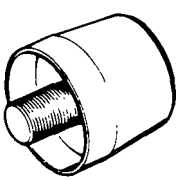
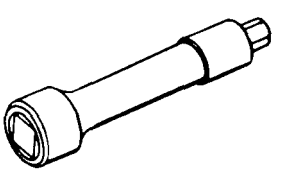
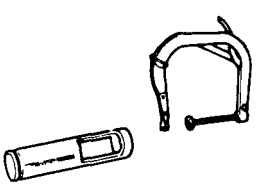
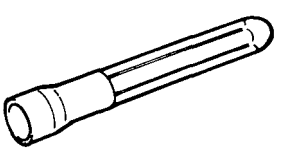
NOTE
O.D. = Outer Diameter
I.D. = Inner Diameter
O.S. = Oversize Diameter
U.S. = Undersize Diameter

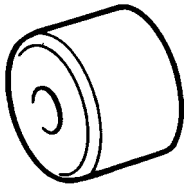
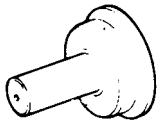
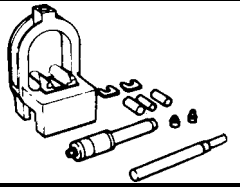
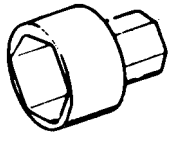
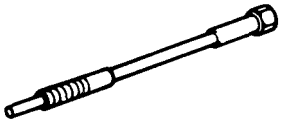
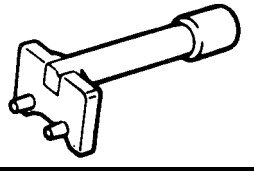
TIGHTENING TORQUE

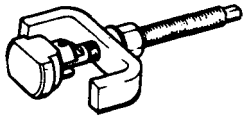
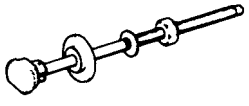
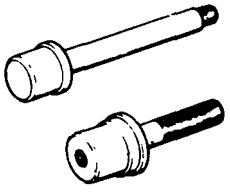
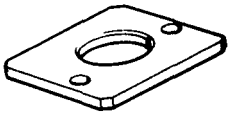
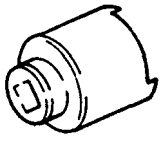
	Nm	kg.cm	lb.ft
Engine mount bracket nut and bolt	50-65	500-650	36-47
Engine mount insulator nut (large)	90-110	900-1100	65-80
Engine mount insulator nut (small)	45-60	450-600	33-43
Front roll stopper insulator nut	45-60	450-600	33-43
Rear roll stopper insulator nut	45-60	450-600	33-43
Fuel high pressure hose to delivery pipe	4-6	40-60	3-4
Accelerator cable adjusting bolt	4-6	40-60	3-4
Front engine support bracket bolt	50-70	500-700	36-51
Front exhaust pipe support bracket bolt	30-42	300-420	22-30
Left engine support bracket bolt	30-42	300-420	22-30
Front roll stopper bracket bolt	55-75	550-750	40-54
Rear roll stopper bracket bolt	110-130	1100-1300	80-94
Engine mount bracket to bracket	17-26	170-260	12-19
Front engine support bracket to bracket	17-26	170-260	12-19
Air conditioning compressor to bracket	23-27	230-270	17-20
Power steering oil pump to bracket	45-55	450-550	32.4-39.6
Front exhaust pipe to exhaust manifold	30-40	300-400	22-29
Rocker cover bolt	2.5-3.5	25-35	2-3
Center cover bolt	2.5-3.5	25-35	2-3
Camshaft sprocket bolt	80-100	800-1000	58-72
Camshaft bearing cap bolt	19-21	190-210	14-15
Crank angle sensor nut	10-13	100-130	7-9
Throttle body stay	15-22	150-220	11-16
Air cleaner body installation bolt	8-10	80-100	6-7
Crankshaft sprocket bolt	110-130	1100-1300	80-94
Crankshaft pulley to crankshaft sprocket	20-30	200-300	14-22
Cylinder head bolt (cold engine)	105-115	1050-1150	76-83
Intake manifold stay	25-30	250-300	18-22
Tension rod to bracket	35-55	350-550	25-40
Tension pulley bracket bolt	17-26	230-270	12-19
Auto tensioner bolt	20-27	200-270	14-20
Tensioner pulley bolt	43-55	430-550	31-40
Idle pulley bolt	30-42	300-420	22-30
Front exhaust pipe clamp bolt	20-30	200-300	14-22

	Nm	kg.cm	lb.ft
Oil pan	6-8	60-80	4-6
Oil pan drain plug	35-45	350-450	25-33
Oil screen	15-22	150-220	11-16
Oil pump sprocket bolt	50-60	500-600	36-43
Oil pressure switch	8-12	80-120	6-8
Oil filter bracket bolt	15-22	150-220	11-16
Oil pump cover bolt	15-18	150-180	11-13
Oil seal case bolt	10-12	100-120	7-9
Plug cap	20-27	200-270	14-20
Front case bolt			
M8 x 30	27-34	270-340	20-26
except M8 x 30	20-27	200-270	14-20
Drive gear bolt	34-40	340-400	25-29
Engine coolant pump pulley bolt	8-10	80-100	6-7
Timing belt upper cover	10-12	100-120	7-9
Timing belt lower cover	10-12	100-120	7-9
Relief plug	40-50	400-500	29-36
Flywheel	130-140	1300-1400	94-101
Drive plate	130-140	1300-1400	94-101
Timing belt rear right cover	10-12	100-120	7-9
Timing belt rear left cover (lower)			
-bolt also securing left engine support bracket	30-42	300-420	22-30
Timing belt rear left cover (upper)	10-12	100-120	7-9
Connecting rod cap bolt	50-53	500-530	36-38
Crankshaft bearing cap bolt	65-70	650-700	47-51
Engine hanger	12-15	120-150	9-11

SPECIAL TOOLS

Tool (Number and name)	Illustration	Use
09214-32000 Crankshaft front oil seal installer		Installation of the crankshaft front oil seal (use with 09214-32100)
09214-32100 Crankshaft front oil seal guide		Installation of the crankshaft front oil seal (use with 09214-32000)
09221-21000 Camshaft oil seal installer		Installation of the camshaft oil seal (use with 09221-21100)
09221-21100 Camshaft oil seal guide		Used as a guide when pressing in the camshaft oil seal (use with 09221-21000)
09221-32001 Cylinder head bolt wrench		Removal and tightening of the cylinder head bolt
09222-28000 Valve spring compressor 09222-28100 Valve spring compressor holder		Removal and installation of the inlet or exhaust valve
09222-28200 Valve stem oil seal installer		Installation of the valve stem oil seal

Tool (Number and name)	Illustration	Use
09222-21200A 09222-21200B Valve guide installer		Removal and installation of the valve guide
09222-28400 Valve guide installer adapter		Installation of the valve guide
09231-21000 Crankshaft rear oil seal installer		1. Installation of the engine rear oil seal 2. Installation of the crankshaft rear oil seal
09234-33001 Piston pin remover and installer kit		Removal and installation of the piston pin
09234-33002 Insert		Removal and installation of the piston pin (use with 09234-33001)
09260-11000 Oil pressure switch wrench		Removal and installation of the oil pressure switch
09244-28000 Auto tensioner set screw		Removal and installation of auto tensioner
09244-28100 Socket wrench		Adjustment of auto tensioner

Tool (Number and name)	Illustration	Use
09212-32000 Counter balance shaft bearing puller		Removal of front bearing of counter balance shaft
09212-32100 Counter balance shaft bearing puller		Removal of rear bearing of counter balance shaft (use with 09212-32300)
09212-32200 Counter balance shaft bearing installer		Installation of counter balance shaft bearing front and rear (use with 09212-32300)
09212-32300 Guide plate		Removal and installation of counter balance shaft rear bearing (use with 09212-32100, 09212-32200)
09213-33000 Plug cap wrench		Removal and installation of front case cap plug

TROUBLESHOOTING

Symptom	Probable cause	Remedy
Low compression	Blown cylinder head gasket Worn or damaged piston rings Worn piston or cylinder Worn or damaged valve seat	Replace gasket Replace rings Repair or replace piston and/or cylinder block Repair or replace valve and/or seat ring
Oil pressure drop	Low engine oil level Faulty oil pressure switch Clogged oil filter Worn oil pump gears or cover Thin or diluted engine oil Oil relief valve stuck (open) Excessive bearing clearance	Check engine oil level Replace Replace Replace Change and determine cause Repair Replace
High oil pressure	Oil relief valve stuck (closed)	Repair
Excessive engine rolling and vibration	Loose engine roll stopper (front, rear) Loose transaxle mount bracket Loose engine mount bracket Loose center member Broken transaxle mount insulator Broken engine mount insulator Broken engine roll stopper insulator	Re-tighten Re-tighten Re-tighten Re-tighten Replace Replace Replace
Noisy valves	Thin or diluted engine oil (low oil pressure) Worn or damaged valve stem or valve guide	Change Replace
Connecting rod and/main bearing noise	Insufficient oil supply Thin or diluted engine oil Excessive bearing clearance	Check engine oil level Change and determine cause Replace
Timing belt noise	Incorrect belt tension	Adjust belt tension

ENGINE

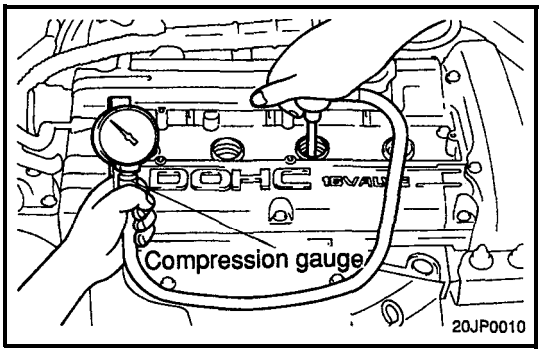
REPLACING OIL FILTER
Refer to the page 10-12

CHANGING ENGINE OIL
Refer to the page 10-11

CHECKING COMPRESSION PRESSURE

1. Before checking compression, check the engine oil level. Make sure the starter motor and battery are in normal operating condition.
2. Start the engine and wait until engine coolant temperature reaches 80-95°C (176-205°F)
3. Stop the engine and disconnect the spark plug cables.
4. Remove the spark plugs.
5. Crank the engine to remove any foreign objects in the cylinders.
6. Attach the compression gauge to the spark plug hole.
7. Depress the accelerator pedal to fully open the throttle.
8. Crank the engine and read the gauge.

Limit ..... 12.0 kg/cm^2 (1.18 MPa, 171 psi) 1250-400 rpm]



9. Repeat steps 6 through 8 on all cylinders, making sure that the pressure differential for each of the cylinders is within the specified limit.

Limit ... Max. 1.0 kg/cm^2 (100 kPa, 14 psi) between cylinders

10. If a cylinder's compression or pressure differential is below the specification, add a small amount of oil through the spark plug hole and repeat steps 6 through 9.
    1) If the addition of oil brings the compression up, it is possible that there is wear between the piston ring and cylinder wall.
    2) If compression remains the same, valve seizure, poor valve seating or a compression leak from the cylinder head gasket are all possible causes.

Tightening torque
Spark plug ..... 20-30 Nm (200-300 kg.cm, 15-21 lb.ft)

DRIVE BELTS TENSION ADJUSTMENT

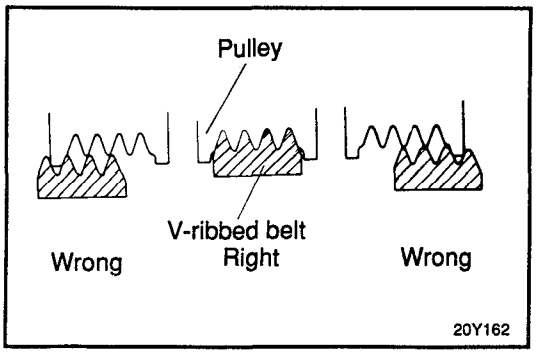
1. Check that the belts are not damaged and are properly fit into the pulley grooves.

CAUTION

1. When installing the V-ribbed belt, check that the V-ribs are properly in alignment.

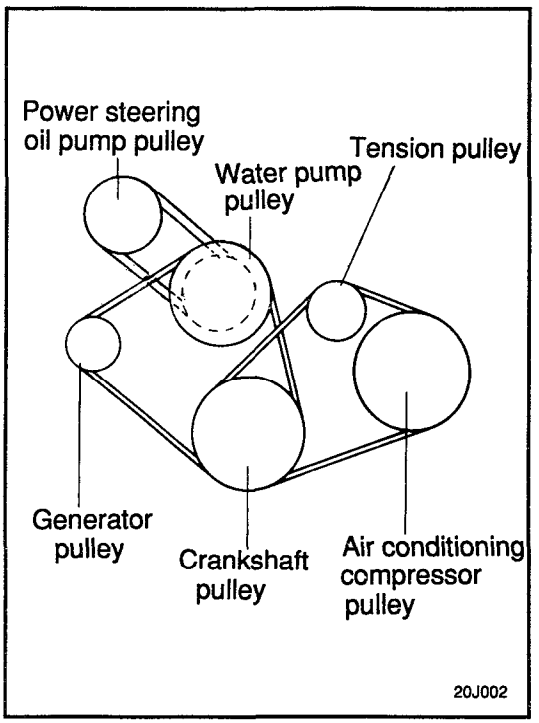
2. If noise or slippage is detected, check the belt for wear, damage, or breakage on the pulley contact surface, and check the pulley for scoring. Also check for the proper belt deflection measurement.

2. Apply 100 N (22 lbs.) force to the belt back midway between the pulleys as shown in the illustration, measure the amount of deflection with a tension gauge.



Standard value :

Items		Inspection	Adjustment	
			New	Used
For Generator	Deflection mm (in.)	9.0-10.4 (0.354-0.409)	7.5-9.0 (0.295-0.354)	10 (0.394)
	Tension N (lb)	350-500 (77-110)	500-700 (110-154)	400 (88)
For air conditioning compressor	Deflection mm (in.)	Approx. 8.0 (0.315)	5.0-5.5 (0.197-0.217)	6.0-7.0 (0.236-0.276)
For power steering oil pump	Deflection mm (in.)	6.0-9.0 (0.236-0.354)	–	–



NOTE

1. The belt tension must be measured between the specified pulleys.

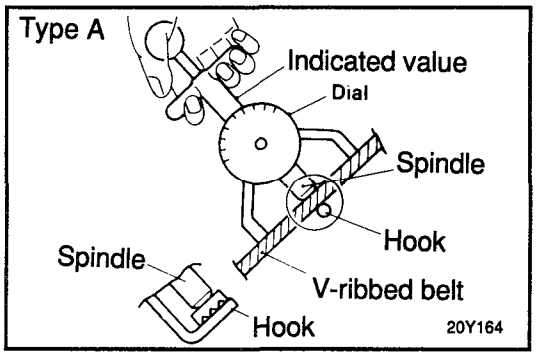
2. When a new belt is installed, adjust the tension to the center of the standard range indicated under "New". And then let the engine idle for 5 minutes or more, and check the standard value indicated under "Inspection".

3. When adjusting a belt which has been used or a belt newly installed after 5 minutes or more of operation, refer to the standard value indicated under "Used".

4. Refer to the standard value indicated under "Inspection" for periodic inspections.

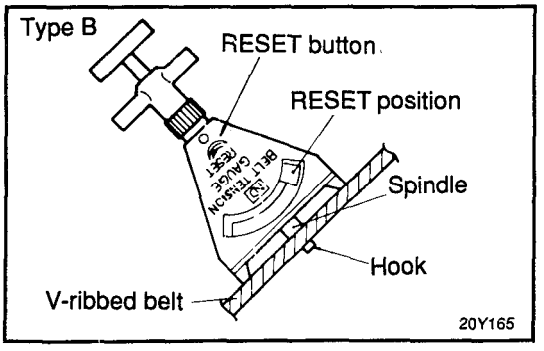
Type A tension gauge

Do not let the dial section of the tension gauge contact other objects during measurement.



Type B tension gauge

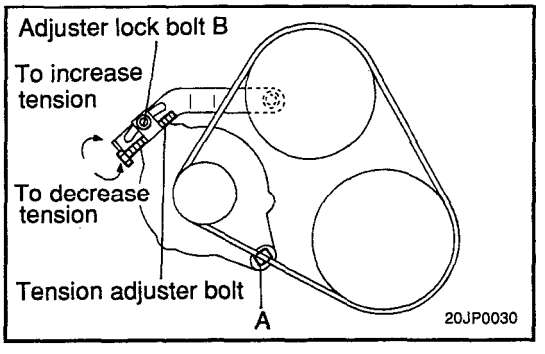
1. When measuring, be sure to turn reset button in the arrow direction to set the gauge needle to the RESET position.
2. If the tension gauge is removed from the belt, the needle will still indicate the tension. Read the tension after removing the gauge.



Generator Belt Adjustment

CAUTION
If the belt is too loose, there will cause noise or premature wear. If the belt is too tight, the water pump bearing or the generator will get damaged.

1. Loosen the generator nut "A" and the tension adjuster lock bolt "B".
2. Using the tension adjuster bolt, adjust the belt tension to specification.
3. Tighten the adjuster lock bolt "B".
4. Tighten the generator nut "A".
5. Check the tension or the deflection of belt, readjust if necessary.



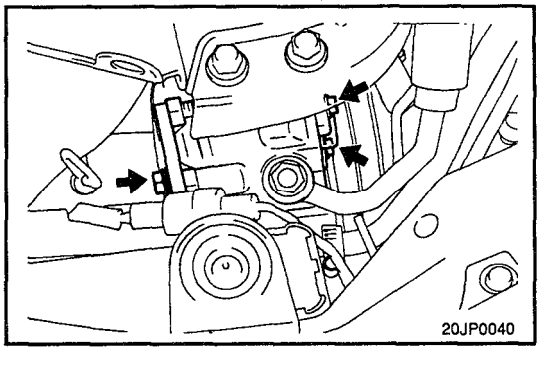
Tightening torque
Generator nut A .... **20-25** Nm (200-250 kg.cm, 14-18 lbft)
Adjuster lock bolt B ... 12-15 Nm (120-150 kg.cm, 9-11 lb.ft)
Tension adjuster bolt ..... 8-12 Nm (80-120 kg.cm, lb.ft)

CAUATION
Note that 1.6L and 1.6L Engine V-ribbed velts are different in length.

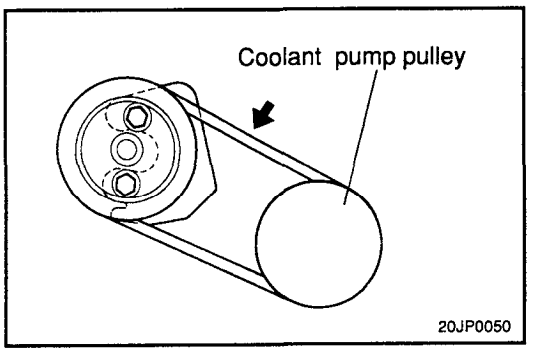
Standard Value
1.6L Eng. ..... 980±5 mm
1.8L Eng. ..... 990±5 mm

Power Steering Oil Pump Belt Adjustment

1. Loosen the adjustment bolt of the power steering oil pump.



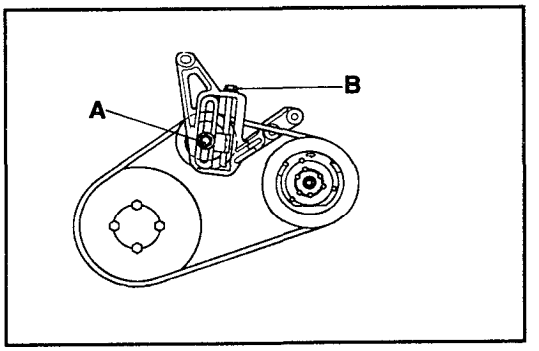
2. Adjust the deflection or the tension of the power steering pump to specification.
3. Tighten the adjustment bolt.
4. Crank the engine one or more revolutions.
5. Check the belt deflection, readjust if necessary.



Air Conditioning Compressor Belt Adjustment

l. Loosen the tension pulley adjustment bolt A.
2. Adjust the belt deflection with adjustment bolt B.
3. Tighten the fixing bolt A.
4. Re-check the belt deflection and re-adjust, if necessary.

NOTE
Before re-checking, crank the engine one or more revolutions.



Lash Adjusters Check

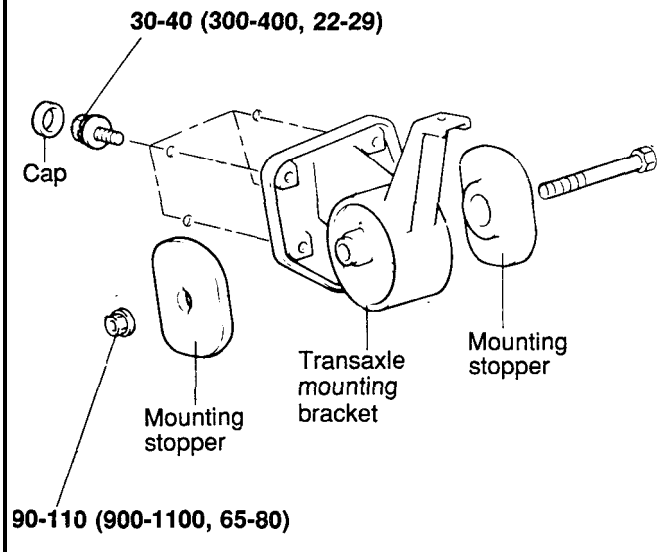
If an abnormal noise is heard from the lash adjusters (tappets), check as follows;

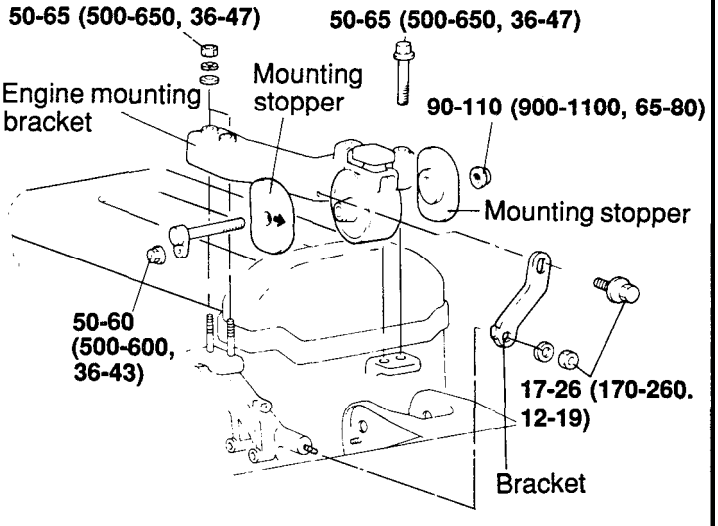
1. While installed to the cylinder head, press the part where the rocker arm contacts the lash adjuster at the very top. If the adjuster is normal, the part pressed will feel very hard.
2. If it easily moves all the way downward when pressed, there is a malfunction of the lash adjuster and it should be replaced with a new one.
3. If it feels spongy or elastic, probably oil with air mixed in it has entered the lash adjuster, so follow the steps below:
   - o Check whether the amount of oil is too much or is not enough.
   - o Check whether the cause of air becoming mixed into the oil is a damaged oil screen or oil screen gasket. After repairing the cause of the air leak, warm up the engine and then drive the vehicle at low speed for a while.
     Stop the engine and leave it off for a few minutes; then re-start the engine and drive at low speed. Repeat this procedure several times during the course of about one hour so as to remove the air from the oil.

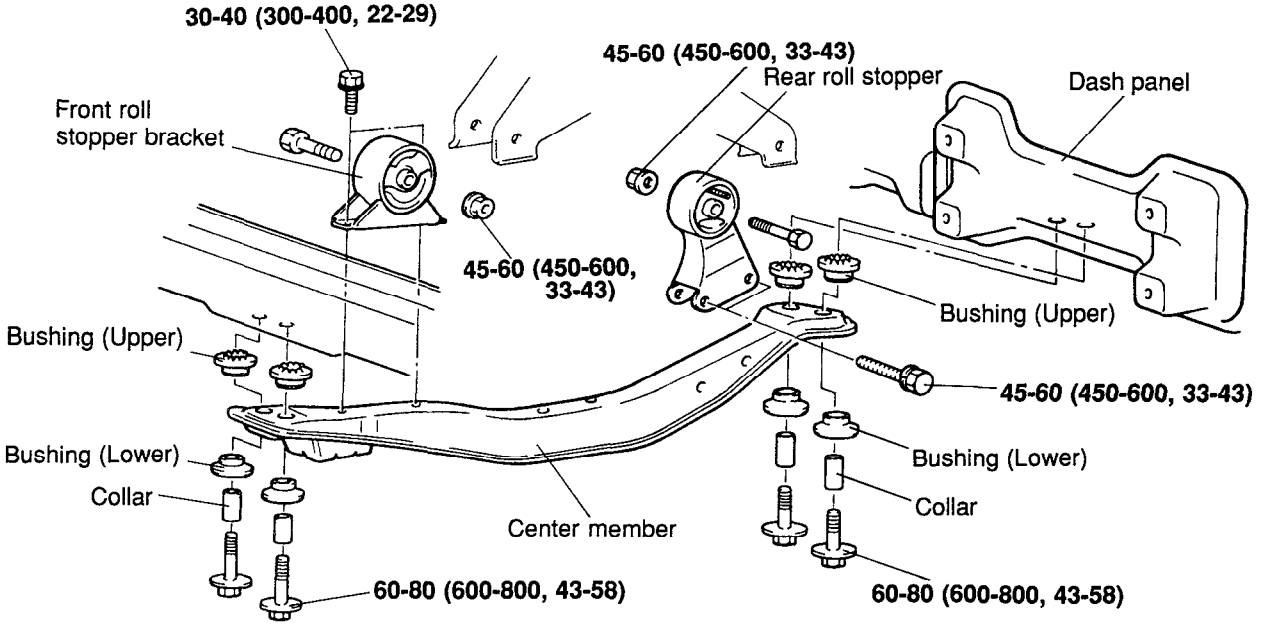
ENGINE MOUNTING

COMPONENTS

TRANSAXLE MOUNTING



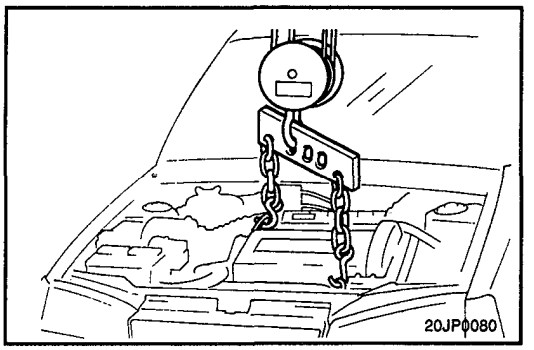




TORQUE : Nm (kg.cm, lb.ft)

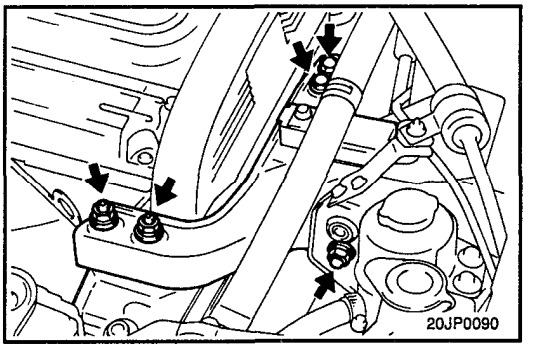
REMOVAL

Attach an engine hoist to the engine hooks, and raise just enough so that there is no pressure on the insulators.



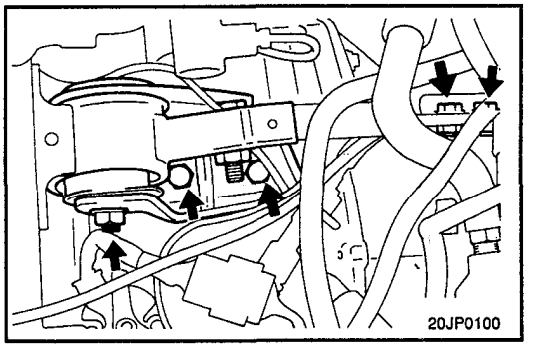
Engine Mounting

1. Remove the engine mount insulator bolts.
2. Remove the engine mount bracket from the engine.

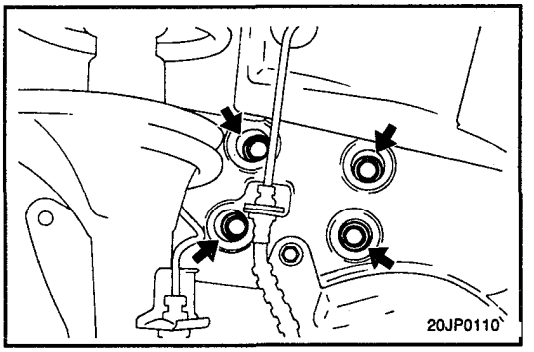


Transaxle Mounting

1. For vehicles with a 5-speed manual transaxle, remove the select control valve.
2. Remove the transaxle mount bolt.

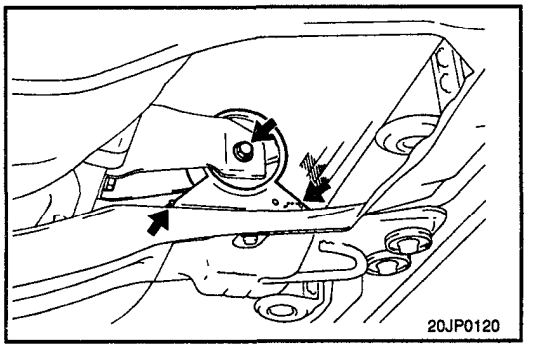


3. Detach the cap from the inside of the right fender shield, remove the transaxle mounting bolts.
4. Remove the transaxle bracket.



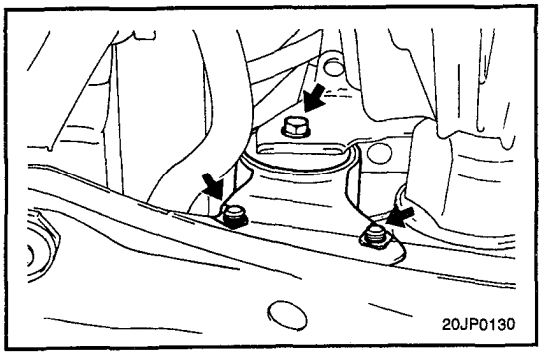
Front Roll Stopper

Remove the front bracket from the center member.



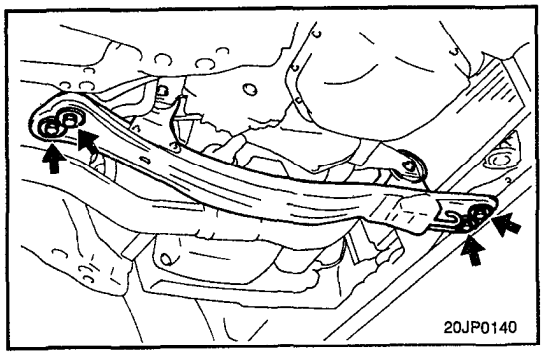
Rear Roll Stopper

Remove the rear roll stopper from the center member.

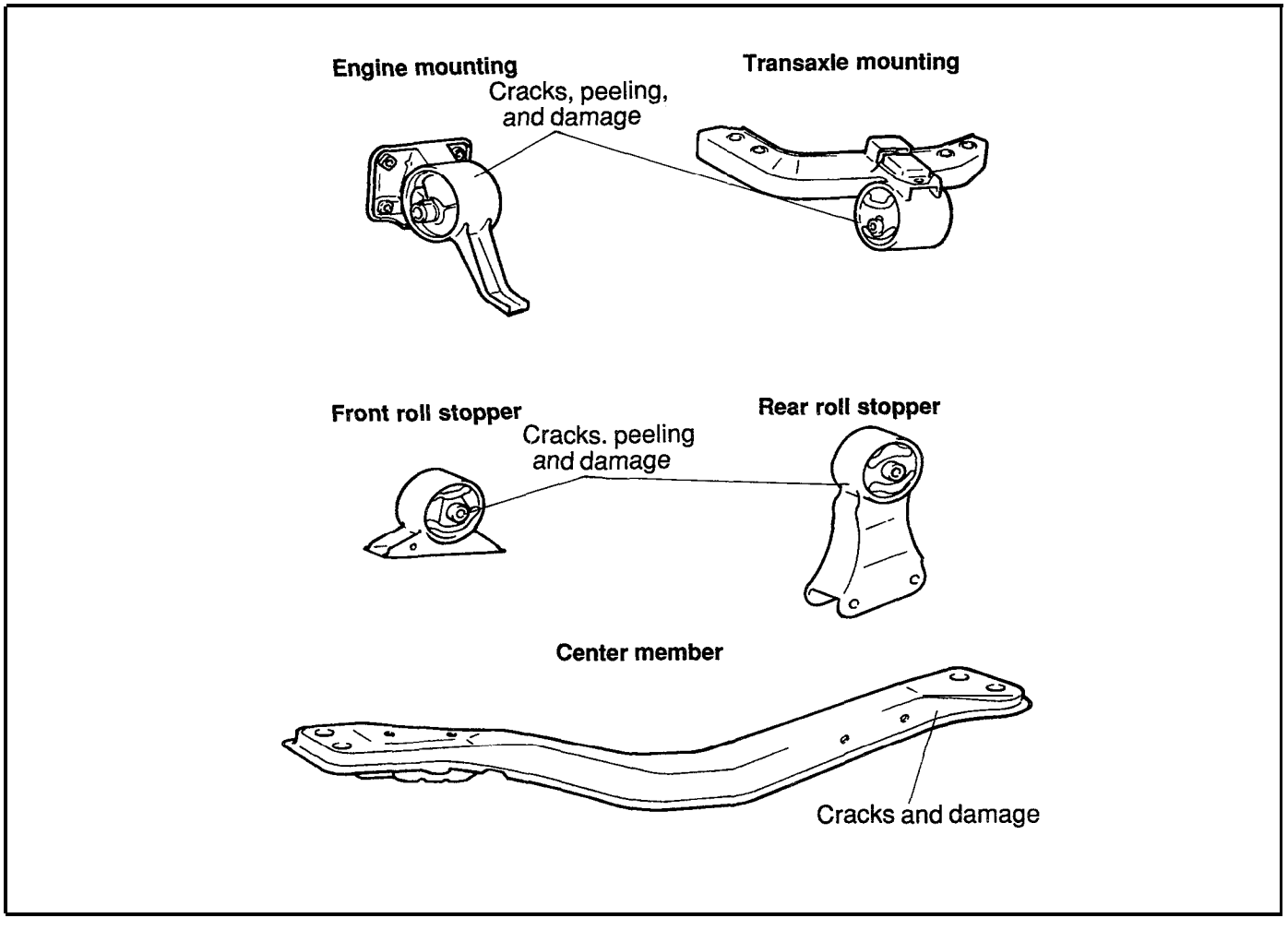


Center member

1. Remove the under cover (R.H.).
2. Remove the front roll stopper mounting bolts.
3. Remove the rear roll stopper mounting bolts.
4. Remove the center member from the body.



INSPECTION ITEMS



ENGINE AND TRANSAXLE ASSEMBLY

REMOVAL

1. Remove the battery.
2. Detach the air cleaner.
3. Disconnect the connectors for the backup lamp and engine harness.
4. For a vehicle with a 5-speed manual transaxle, disconnect the select control valve connector.

5. Disconnect the connectors for the generator harness and the oil pressure gauge wiring.
6. Drain the engine coolant.
7. For vehicles with an automatic transaxle, disconnect the transaxle oil cooler hoses.

NOTE
When disconnecting the hoses, make identification marks to avoid making any mistakes in reconnecting them.

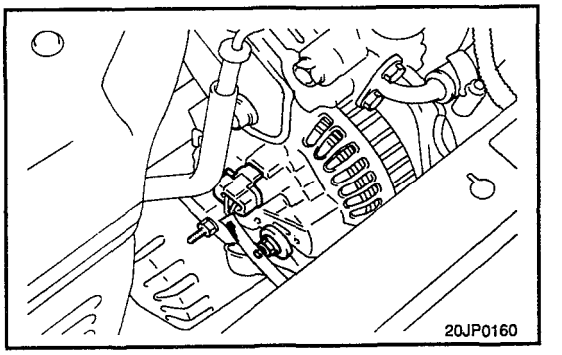
CAUTION
Be careful not to spill any of the oil or fluid out of the hoses, and plug the openings to prevent the entrance of foreign material.

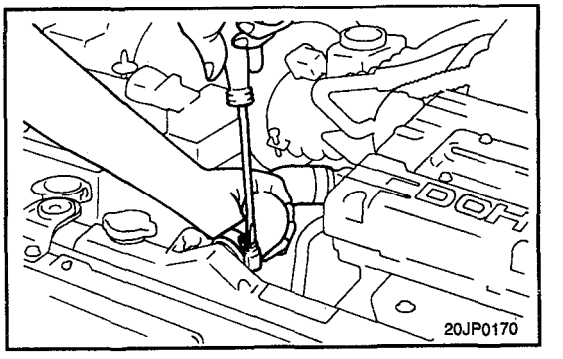
8. Disconnect the radiator upper and lower hoses on the engine side, and then remove the radiator assembly.
9. Disconnect the high tension cable from the ignition coil section.
10. Disconnect the engine ground.
11. Disconnect the brake booster vacuum hose.
12. Remove the main fuel line, and the return and vapor hoses from the engine side.

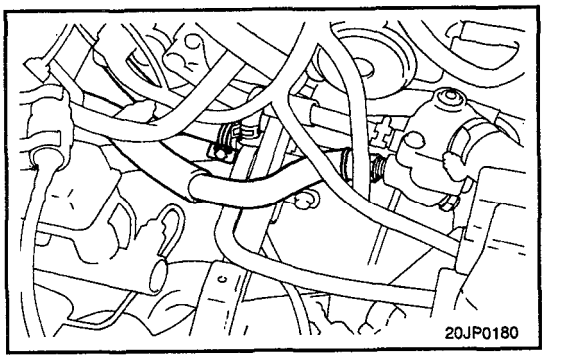
CAUTION
To reduce the residual pressure in the hoses, refer to Group Fuel System "Fuel filter replacement".

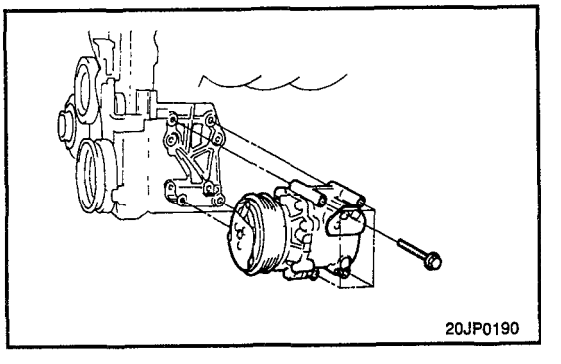
13. Disconnect the heater hoses (inlet and outlet) on the engine side.
14. Disconnect the accelerator cable at the engine side.
15. For vehicles with a manual transaxle, remove the clutch cable from the transaxle.
16. For vehicles with an automatic transaxle, remove the control cable from the transaxle.

17. Disconnect the speedometer cable from the transaxle.
18. Disconnect the air conditioning from the mounting bracket.









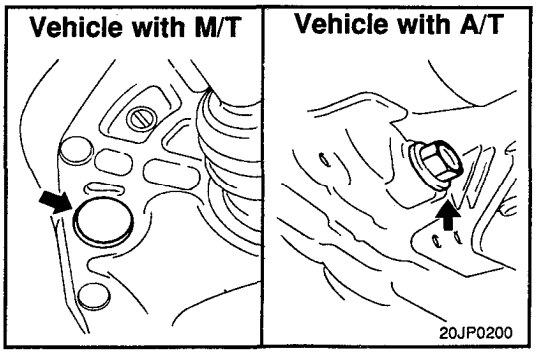
19. Jack up the vehicle.
20. Drain the transaxle oil (or fluid).
21. Disconnect the front exhaust pipe from the manifold.

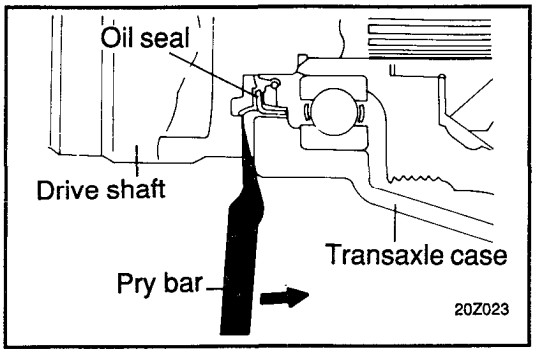
NOTE
Use wire to suspend the exhaust pipe from the bottom of the vehicle.

22. For vehicles with a manual transaxle, remove the shift control rod and extension rod.
23. Remove the lower arm ball joint bolts and the stabilizer bar at the point where it is mounted to the lower arm.
24. Remove the drive shafts from the transaxle case.

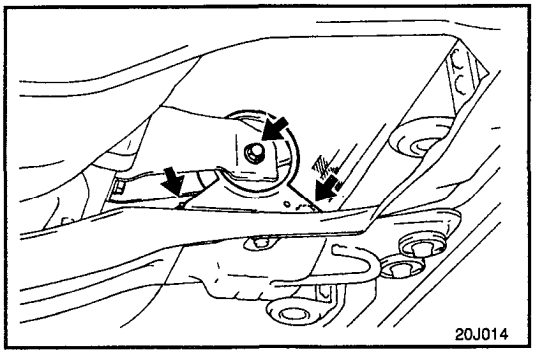
CAUTION
1) Plug the holes of the transaxle case to prevent entry of foreign material.
2) Install new circlips on the drive shafts when reassembling.

25. Hang the lower arm and drive shaft from the body with a string.
26. Attach a cable to the engine, and use a chain hoist to lift the engine only enough to pull cable tight.

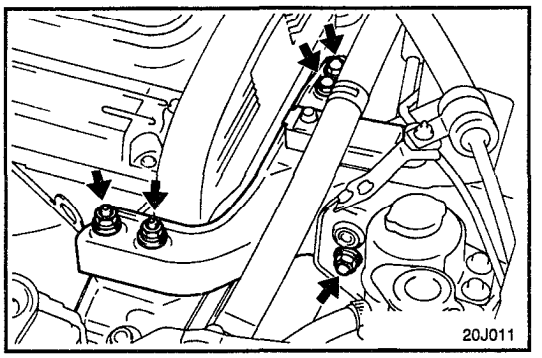




27. Remove the front roll stopper.
28. Separate the rear roll stopper.



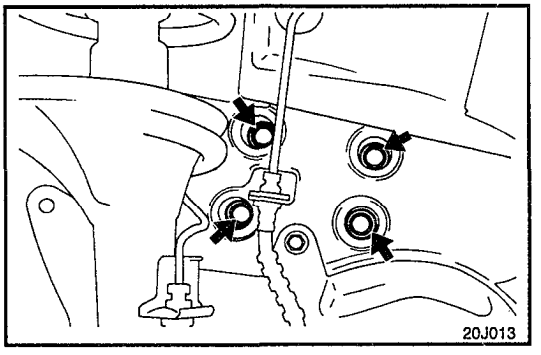
29. Remove the engine mounting insulator bolts.
30. Remove the engine mounting bracket from the engine.



31. Slowly raise the engine (to the extent that the engine and transaxle weights are not applied to the mounting portions) and temporarily hold it in the raised condition.

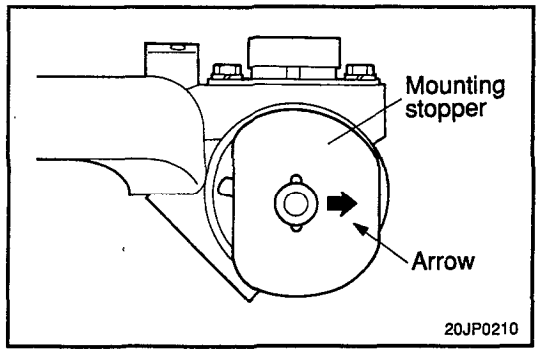
CAUTION
Check that all of the cables, hoses, harnesses, connectors etc. are disconnected from the engine.

32. Remove the caps from inside the right fender shield and remove the transaxle mount bracket bolts.
33. Remove the left mount insulator bolt.
34. While directing the transaxle side downward, lift the engine and transaxle assembly up and out of the vehicles.

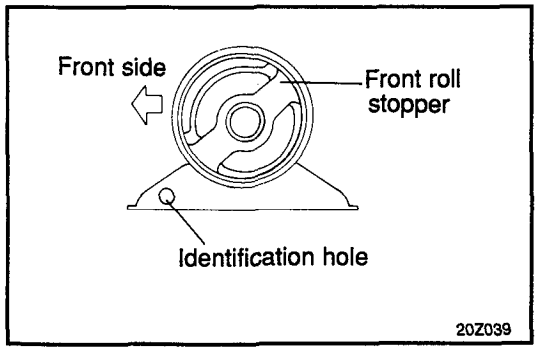


INSTALLATION

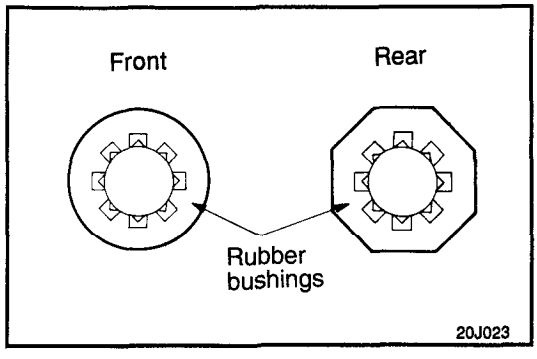
1. While checking the connections of the harnesses, pipes, hoses, etc., and making sure that none of them are being caught, damaged, etc., install the engine and transaxle assembly.
2. Install the mounting stoppers with the arrows on them pointing in the direction shown.



3. When the engine and transaxle assembly is in place temporarily tighten the front roll stopper.



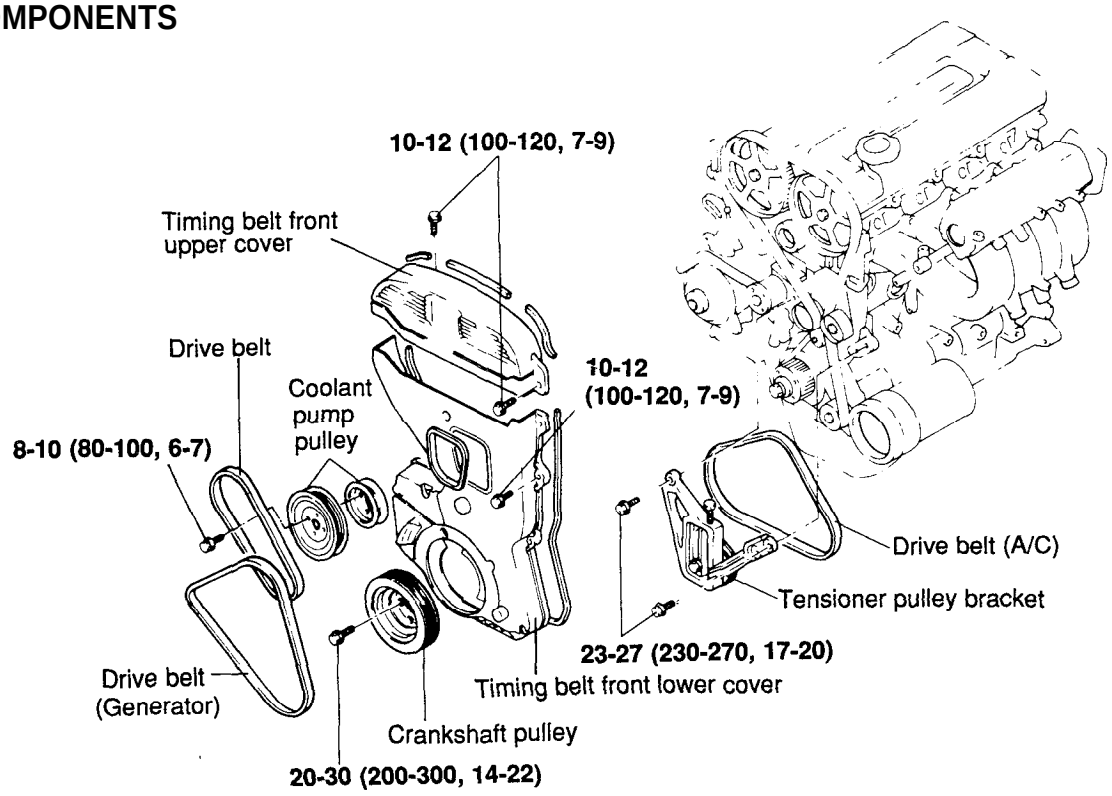
4. The front and rear center member rubber bushings and collars are different.

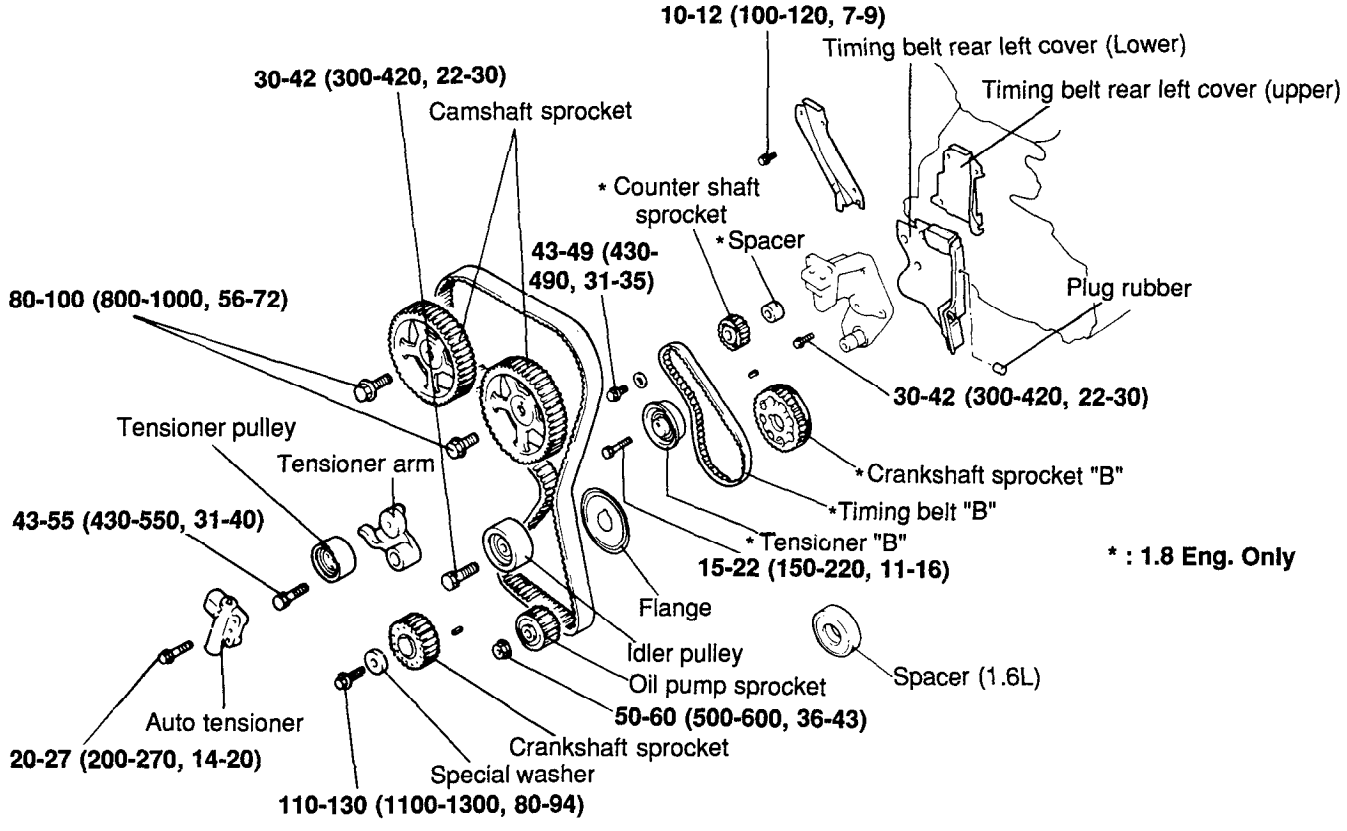


5. After the weight of the engine and transaxle assembly has been put on each insulator, tighten to specified torque.
6. Reassemble all of the components removed during disassembly. Be especially careful to properly secure all components, including fuel, electrical and fluid pipe connections.
7. Refill the coolant and check for leaks.
8. Refill the transaxle fluid, test its operation, and check for leaks.
9. Check the operation of the transaxle control cable and accelerator cable. Adjust as necessary.
10. Check for proper operation of each of the various gauges.

TIMING BELT

COMPONENTS





TORQUE : Nm (kg.cm, lb.ft).

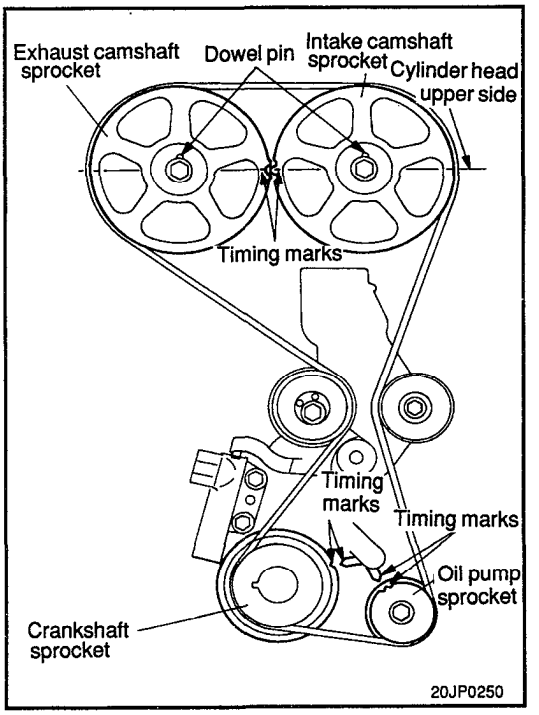
REMOVAL

[Step 6-10 for 1.8L Eng.]

1. Remove the crankshaft pulley, engine coolant pump pulley and drive belt.
2. Remove the timing belt cover.

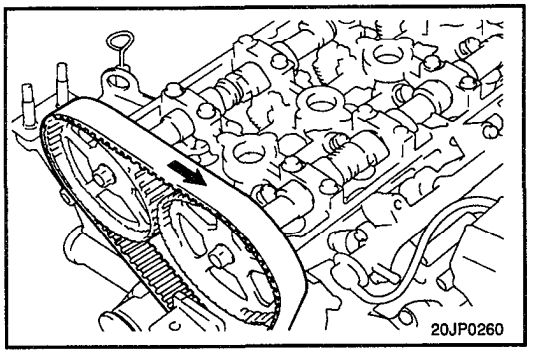
3. Turn the crankshaft clockwise and align the timing marks so as to bring the No. 1 cylinder to compression top-dead-center position.
   At this time the timing marks of the camshaft sprocket and the upper surface of the cylinder head should coincide, and the dowel pin of the camshaft sprocket should be at the upper side.
   Remove the auto tensioner.

   CAUTION
   Rotate the crankshaft clockwise.



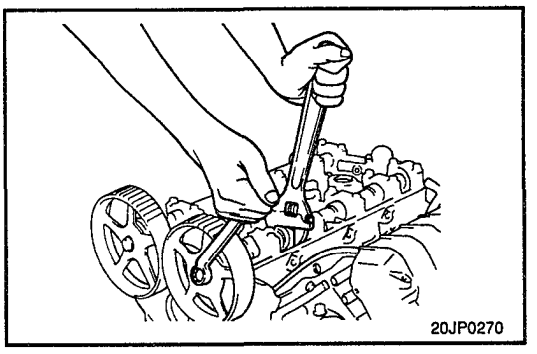
4. Remove the timing belt.

   NOTE
   If the timing belt is reused, make an arrow mark indicating the turning direction (or the front of the engine) to make sure that the belt is reinstalled in the same direction as before.

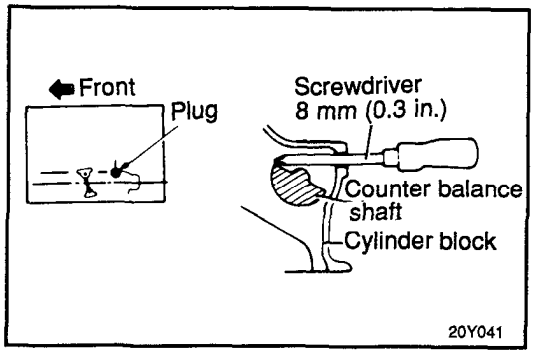


5. Remove the camshaft sprockets.

   NOTE
   Be careful not to damage the cylinder head with the wrench.



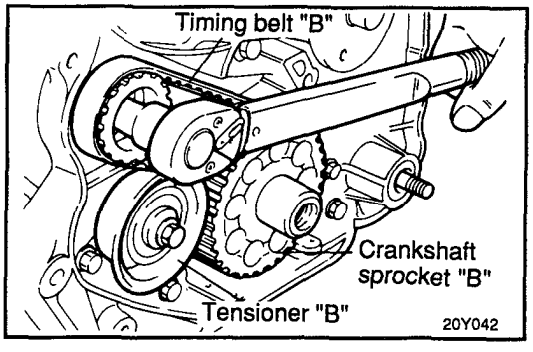
6. When the oil pump sprocket nut is removed, first remove the plug at left side of the cylinder block and insert a screwdriver to keep the left counter balance shaft in position.
   Screwdriver used for this purpose should have a shaft 8 mm (0.3 in.) in diameter which can be inserted more than 60 mm (2.36 in.)
7. Remove the oil pump sprocket retaining nut and remove the oil pump sprocket.



8. Loosen the right counter balance shaft sprocket mounting bolt until it can be loosened by hand.
9. Next, remove tensioner “B” and remove timing belt “B”.

CAUTION
After timing belt “B” has been removed, do not attempt loosening bolt, while holding sprocket with pliers, etc.

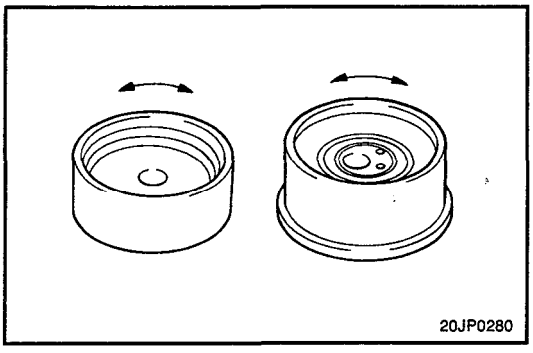
10. Remove the crankshaft sprocket “B” from crankshaft



INSPECTION

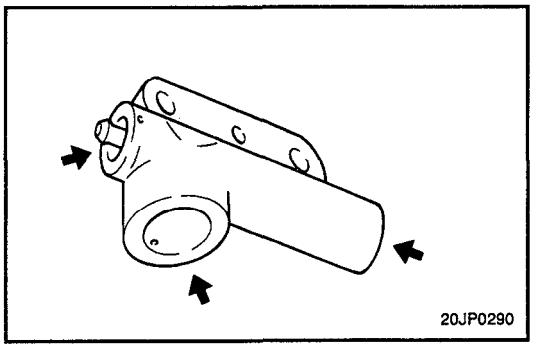
Sprockets, Tensioner Pulley, and Idler Pulley

1. Check the camshaft sprocket, crankshaft sprocket, tensioner pulley, and idler pulley for abnormal wear, cracks, or damage. Replace as necessary.
2. Inspect the tensioner pulley and the idler pulley for easy and smooth pulley rotation and check for play or noise. Replace as necessary.
3. Replace if there is a grease leak.



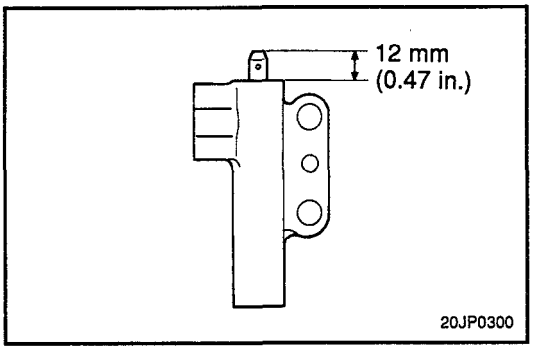
Auto Tensioner

1. Check the auto tensioner for leaks and replace as necessary.
2. Check the rod end for wear or damage and replace as necessary.



3. Measure the rod protrusion. If it is out of specification, replace the auto tensioner.

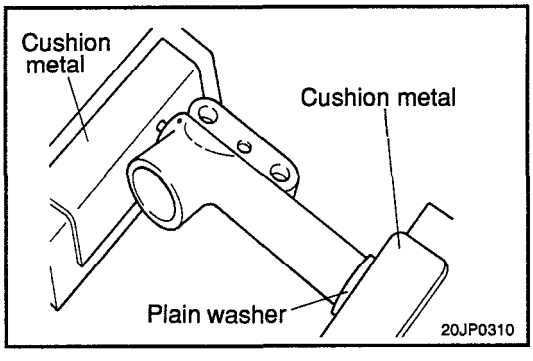
Standard value	12 mm (0.47 in.)



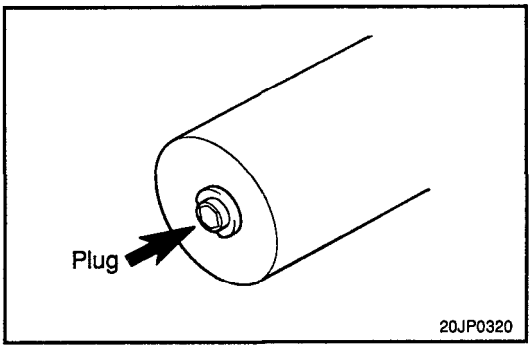
4. Using a vise soft jaws push in the auto tensioner rod. If the rod can be easily retracted, replace the auto tensioner. You should feel a fair amount of resistance when pushing the rod in.

CAUTION

1. Clamp the auto tensioner in the vise so that it is level. Use soft jaws in the vise to avoid damaging the auto tensioner.

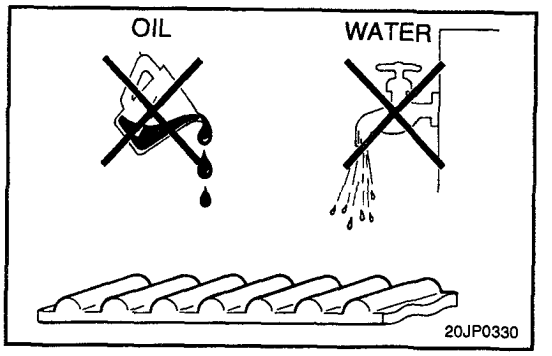


2. If the plug is at the bottom of the auto tensioner, insert a plain washer to prevent direct contact if the plug with the vise.

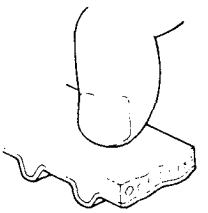


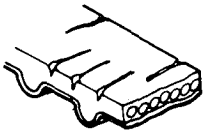
Timing Belt

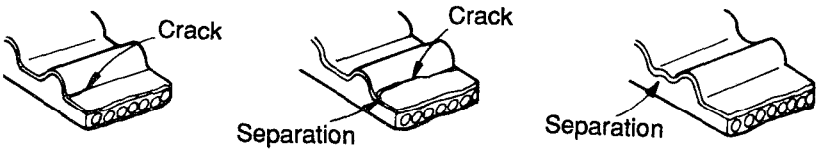
1. Check the belt for oil or dust deposits. Replace if necessary. Small deposits should be wiped away with a dry cloth or paper. Do not clean with solvent.
2. When the engine is overhauled or belt tension adjusted, check the belt in detail. If the following flaws are evident, replace the belt with a new one.

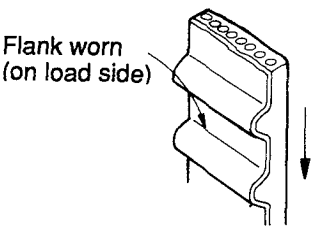


Description	Flaw conditions
1. Hardened back surface rubber	Back surface glossy. Non-elastic and so hard that when a finger nail is forced into it, no mark is produced.
2. Cracked back surface rubber	
3. Cracked or separating canvas	
4. Badly worn teeth (initial stage)	Canvas on load side tooth flank worn (Fluffy canvas fibers, rubber gone and color changed to white, and unclear canvas texture)

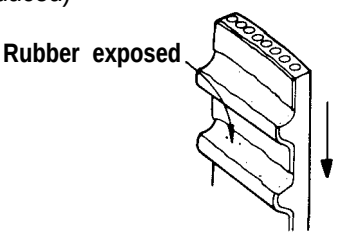


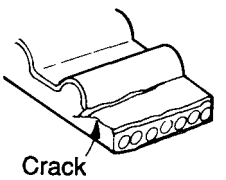


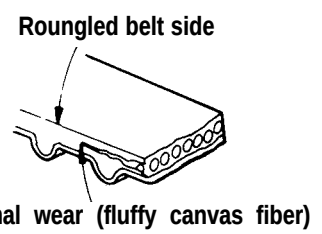


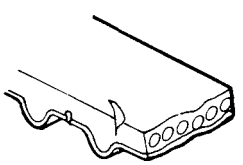


Description	Flaw conditions
5. Badly worn teeth (last stage)	Canvas on load side tooth flank worn down and rubber exposed (tooth width reduced)
6. Cracked tooth bottom	
7. Missing tooth	
8. Side of belt badly worn	
9. Side of belt cracked	**NOTE** **Normal belt should have precisely cut sides as if produced by a sharp knife.**







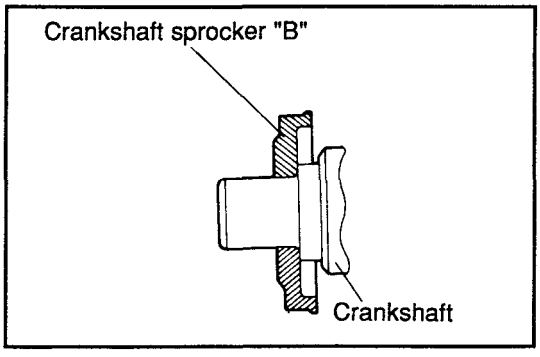


INSTALLATION

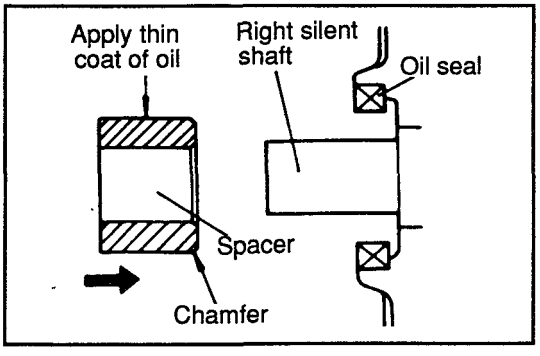
[Step 1-9, 11-12 for 1.8L Eng.]

1. Install crankshaft sprocket “B” into crankshaft.

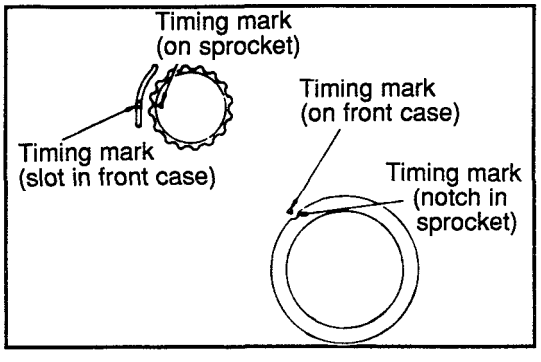
CAUTION
Pay special attention to the direction of the flange. If it is installed in the wrong direction, a broken belt could result.



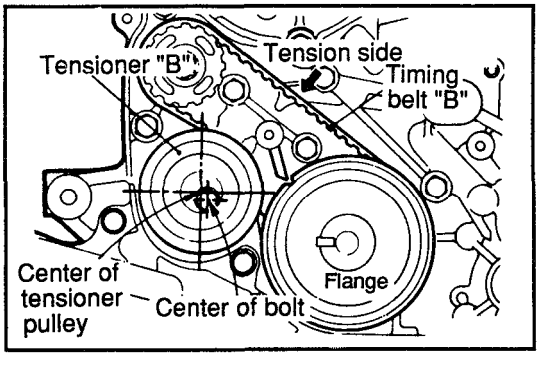
2. Lightly apply engine oil to the outer surface of spacer, and then install in the direction as shown in illustration.
3. install counter balance shaft sprocket onto right counter balance shaft, and then tighten flange bolt finger tight.



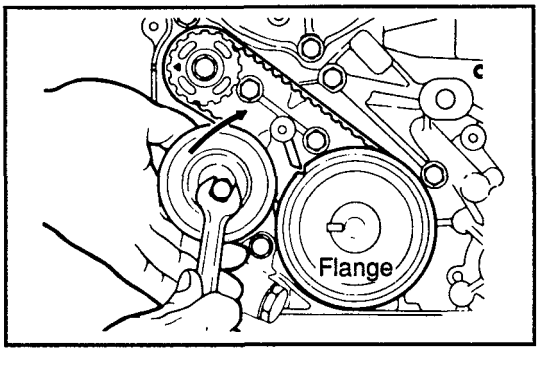
4. Align timing mark on each sprocket with corresponding timing mark on the front case.



5. When timing belt “B” is installed, make certain that tension side has no slack.
   Install tensioner “B” with center of pulley located on the left side of mounting bolt and with pulley flange directed toward front of engine.

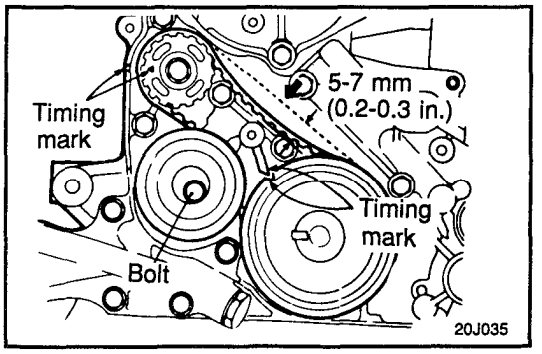


6. Lift tensioner ”B” to tighten timing belt “B” so that its tension side will be pulled tight. In this condition, tighten bolt to secure tensioner “B”. When bolt is tightened, use care to prevent shaft from turning together. If shaft is turned together, belt will be over-tightened.



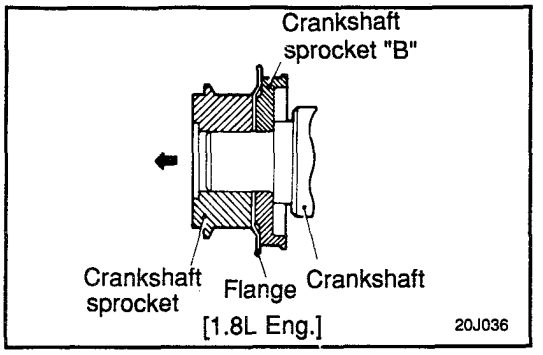
7. Check to ensure that timing marks are in alignment.
8. Check to ensure that when center of span on the tension side is depressed with index finger in direction of arrow, deflection of belt is within specification.

Belt deflection	5-7 mm (0.2-0.3 in.)



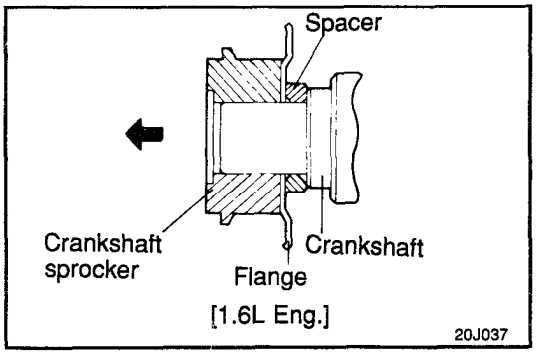
9. Install flange crankshaft sprocket onto crankshaft. Be sure to install in the direction as shown in illustration.

CAUTION
Pay attention to direction of flange. If it is installed in wrong direction, a broken belt could result.

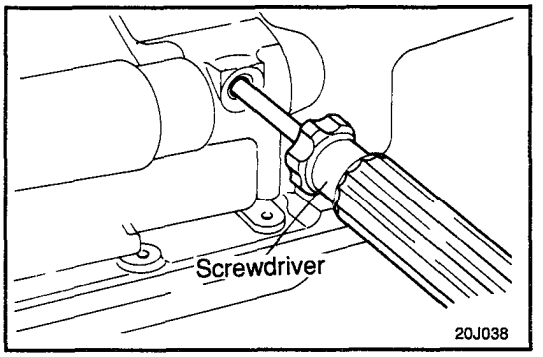


10. Install special washer and sprocket bolt to crankshaft, and then tighten the sprocket bolt. [for 1.6L Eng.]

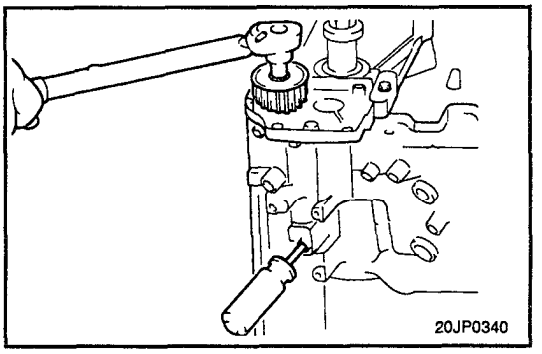
Tightening torque	
Crankshaft sprocket bolt	110-130 Nm (1100-1300 kg.cm, 80-94 lb.ft)



11. Insert screwdriver through plug hole in left side of cylinder block to keep shaft in position.

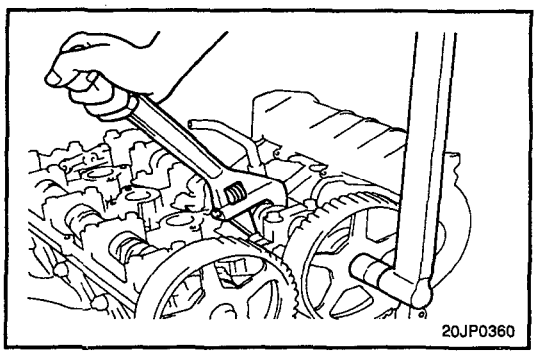


12. Install the oil pump sprocket, and tighten the nut to the specified torque.



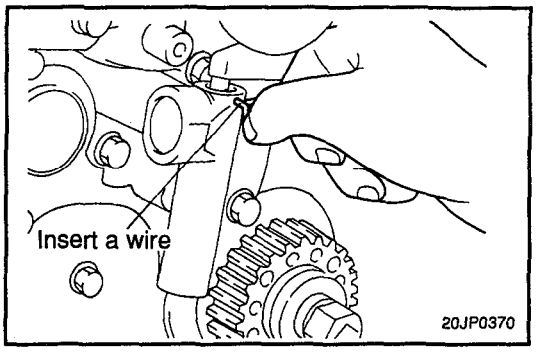
13. Install the camshaft sprocket and tighten the bolt to the specified torque.

Tightening torque	
Camshaft sprocket bolt	80-100 Nm (800-1000 kg.cm, 56-72 lb.ft)



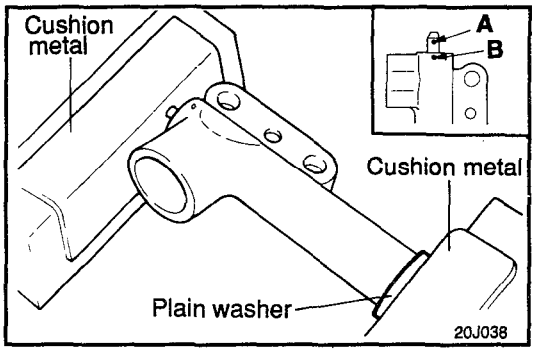
14. Install the auto tensioner.

CAUTION
Leave the wire installed in the auto tensioner



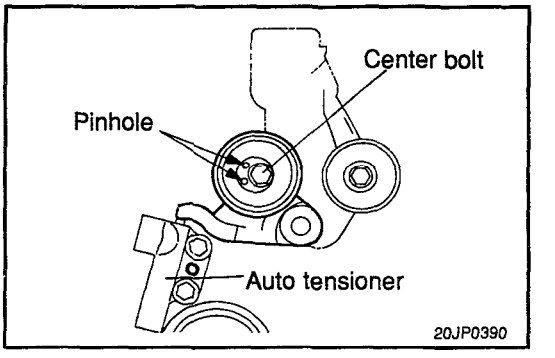
NOTE
If the auto tensioner rod is in its fully extended position, reset it as follows.

1. **Clamp it in the vise with soft jaws in a level position. Apply a plain washer if there is a plug at the bottom of the auto tensioner.**
2. **Push in the rod slowly with the vise until the set hole A in the rod is aligned with the set hole B in the cylinder.**

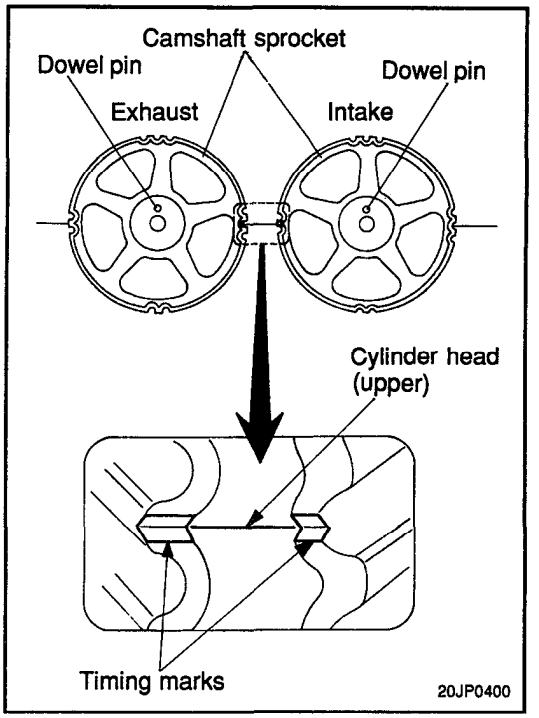


15. Install the tensioner pulley onto the tensioner arm. And locate the pinhole in the tensioner pulley shaft to the left of the center bolt and then tighten the center bolt finger-tight.

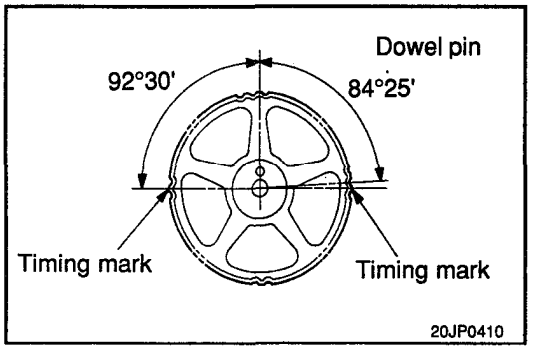
CAUTION
Leave the wire installed in the auto tensioner.



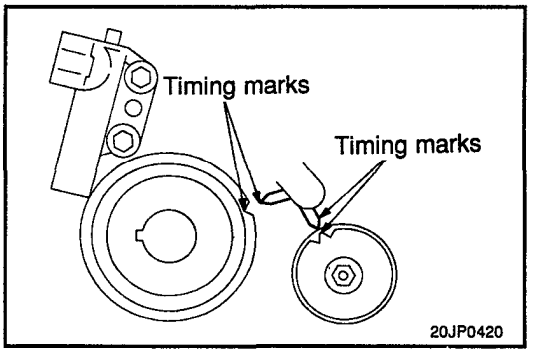
16. Turn the two sprockets so that their dowel pins are located on top. Then, align the timing marks facing each other with the top surface of the cylinder head.



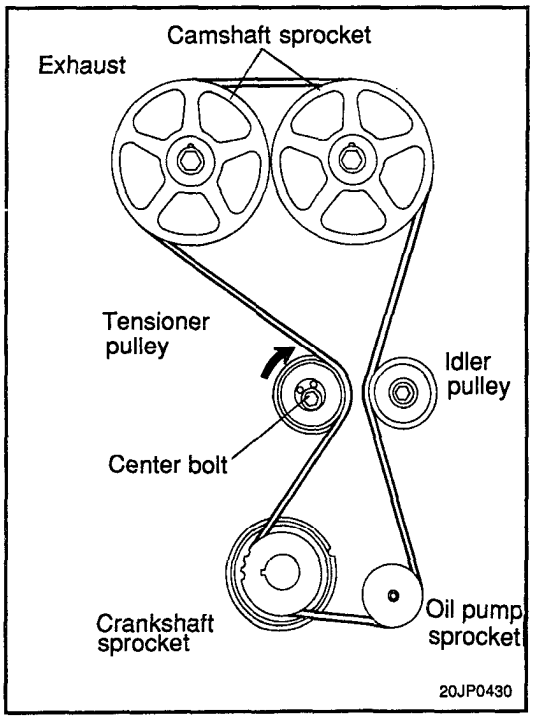
NOTE
The same camshaft sprocket is used for the intake and exhaust camshafts and is provided with two timing marks. When the sprocket is mounted on the exhaust camshaft, use the timing mark on the right with the dowel pin hole on top. For the intake camshaft sprocket, use the one on the left with the dowel pin hole on top.



17. Align the crankshaft sprocket timing marks.
18. Align the oil pump sprocket timing marks.

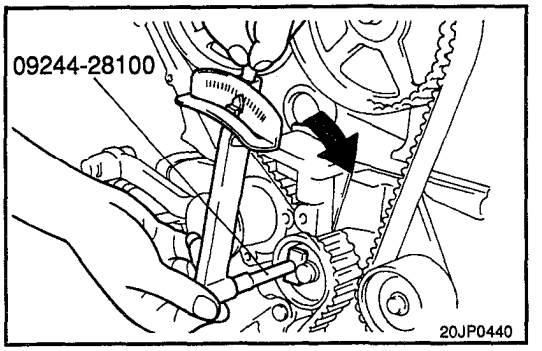


19. Install the timing belt around the tensioner pulley and crankshaft sprocket. Then secure the timing belt onto the tensioner pulley with your left hand.
20. Pulling the belt with your right hand, install it around the oil pump sprocket.
21. Install the belt around the idler pulley.
22. Install it around the intake camshaft sprocket.
23. Turn the exhaust camshaft sprocket one tooth clockwise to align its timing mark with the cylinder head top surface [see illustration in step 5]. Then, pulling the belt with both hands, install it around the exhaust camshaft sprocket.
24. Gently raise the tensioner pulley as shown by the arrow, so that the belt does not sag, and temporarily tighten the center bolt.

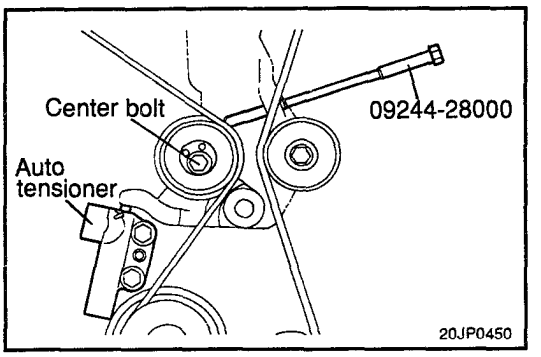


25. After turning the crankshaft 1/4 turn counterclockwise, turn it clockwise to move the No. 1 cylinder to top dead center.
26. Loosen the center bolt, and then, as shown in the illustration, attach the special tool and a torque wrench and apply a torque of 2.6-2.8 Nm (1.88-2.03 Ibft.).
    If the body interferes with the special tool and the torque wrench, use a jack to slightly raise the engine assembly.

    NOTE
    Use a torque wrench measuring within a range of 0-3 Nm (0-2.2 lb.ft.).



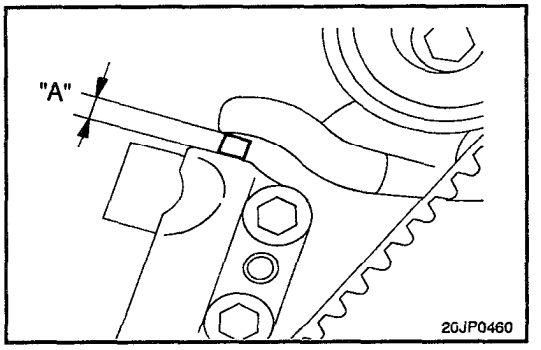
27. Holding the tensioner pulley with the special tool and torque wrench, tighten the center bolt to specification. Screw the special tool into the engine left support bracket until its end makes contact with the tensioner arm. At that point, screw the special tool some more and then remove the set wire attached to the auto tensioner.
28. Remove the special tool.



29. Rotate the crankshaft two complete turns clockwise and leave it as is for about 15 minutes. Then, measure the auto tensioner protrusion "A" (distance between the tensioner arm and auto tensioner body) to ensure that it is up to specification.

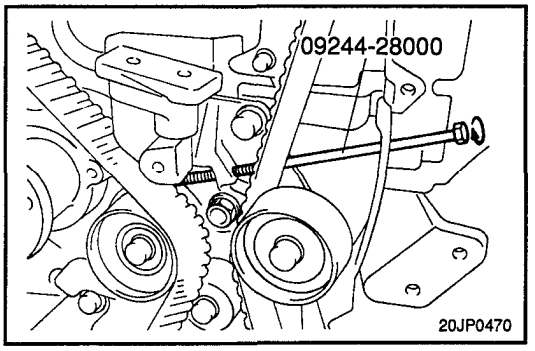
Standard value	3.8-4.5 mm (0.15-0.18 in.)

    If it is out of specification, repeat steps 25 through 29 until the specified value is obtained.



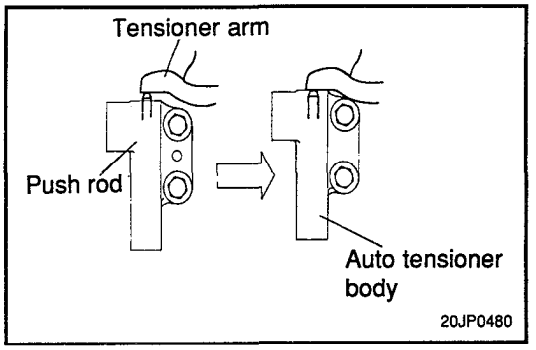
NOTE
If the clearance "A" between the tensioner arm and the auto tensioner body cannot be measured (When the engine is mounted on the vehicle, for example), the following alternative method may be used.

1. **Screw in the special tool until its end makes contact with the tensioner arm.**

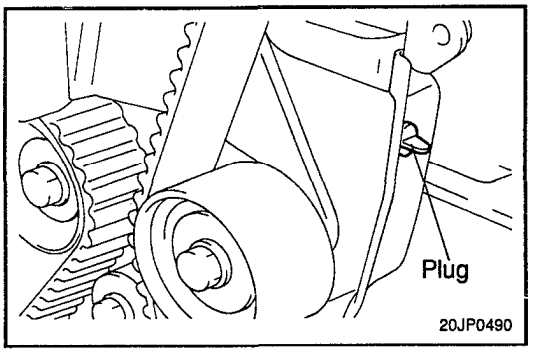


2. **Starting with that position, screw in the special tool some more to retract the auto tensioner push rod while counting the number of turns of the tool makes until the tensioner arm is brought into contact with the auto tensioner body.**
   Make sure that the number of turns the special tool makes conforms with the standard value.

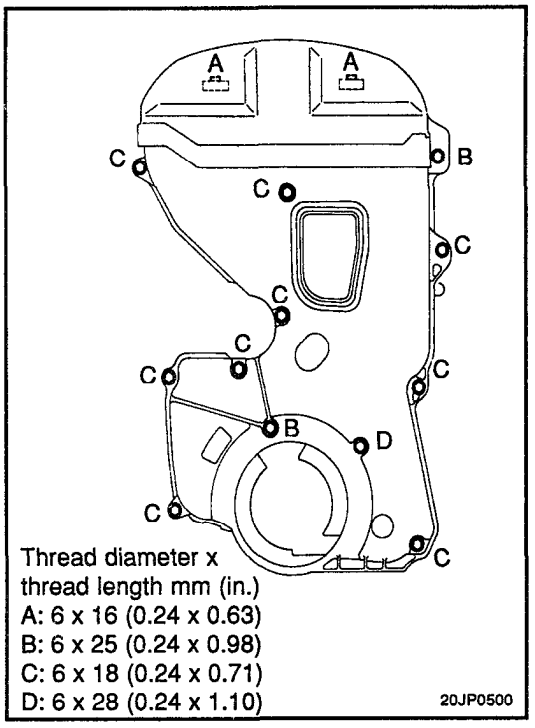
Standard value ..... 2.53 turns



30. Install the rubber plug to the timing belt rear cover.

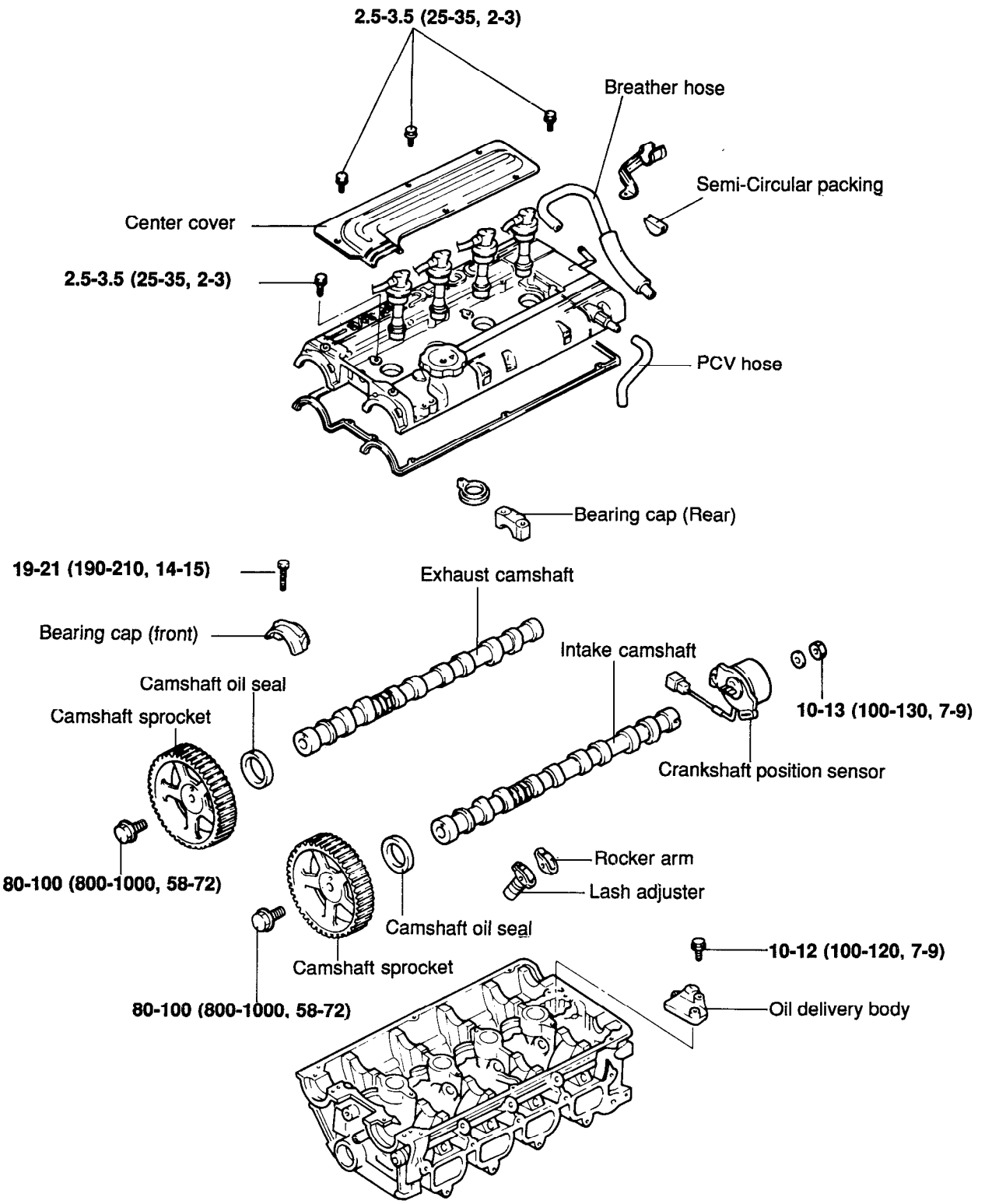


31. Install the timing belt lower cover and the timing belt upper cover.



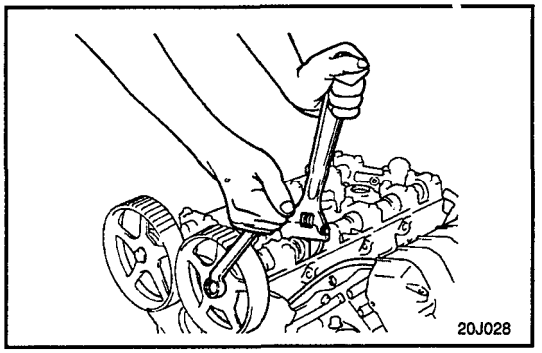
CAMSHAFTS AND ROCKER ARMS

COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

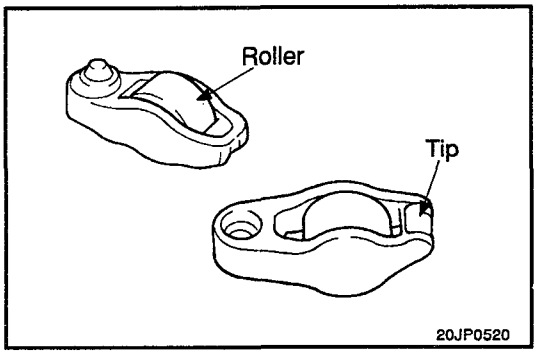
REMOVAL



1. Disconnect the negative terminal from battery.
2. Remove the breather hose between the air cleaner and the rocker cover.
3. Remove the air intake hose.
4. Remove the timing belt cover.
5. Remove the rocker cover, crank angle sensor.
6. Loosen the camshaft sprocket bolts and remove the camshaft sprockets.
7. Loosen the bearing cap bolts and remove the bearing caps, camshafts, rocker arms, lash adjusters.

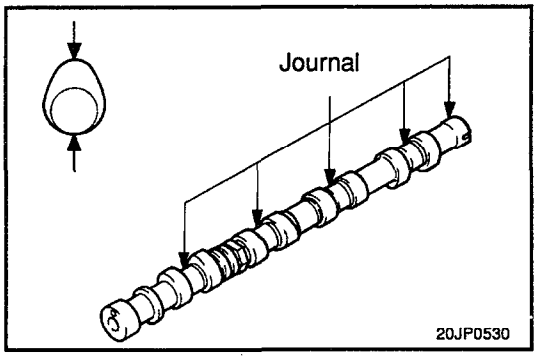
INSPECTION

Rocker Arms



1. Check rotation of the roller. If it does not rotate smoothly or if looseness is evident, replace it.
2. Check the roller. Replace there are any dents, damage or evidence of seizure.
3. Check the valve contact surface for possible damage or seizure and replace as necessary.

Camshafts



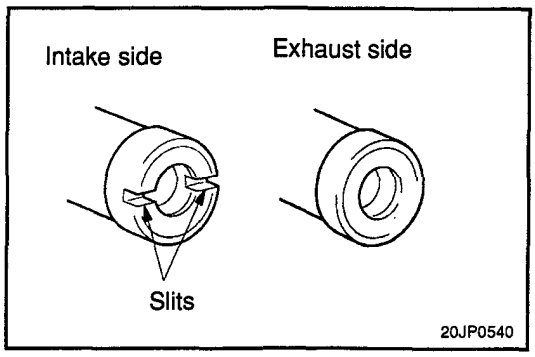
1. Check the camshaft journals for wear. If the journals are badly worn, replace the camshaft.
2. Check the cam lobes for damage. If the lobe is damaged or worn excessively, replace the camshaft.

Cam height	
[Standard]	
1.6L Eng.	
Intake	35.200 mm (1.3858 in.)
Exhaust	34.907 mm (1.3743 in.)
1.8L Eng.	
Intake	35.493 mm (1.3974 in.)
Exhaust	35.200 mm (1.3858 in.)
[Limit]	
1.6L Eng.	
Intake	34.700 mm (1.3661 in.)
Exhaust	34.407 mm (1.3546 in.)
1.8L Eng.	
Intake	34.993 mm (1 .3777in.)
Exhaust	34.700 mm (1.3661 in.)

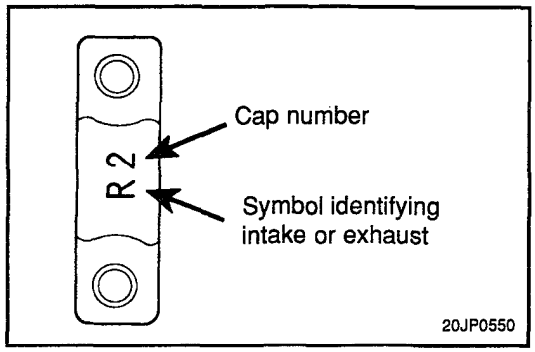
INSTALLATION

1. Install the camshafts on the cylinder head.

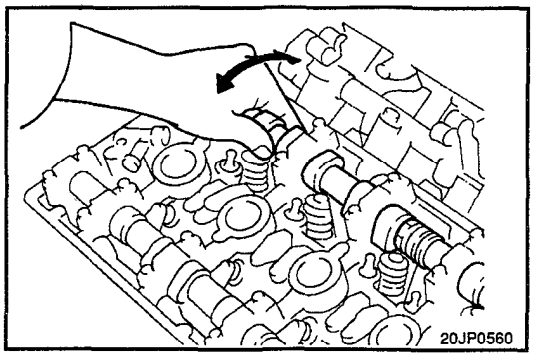
   NOTE
   1. Apply engine oil to journals and cams of the camshafts.
   2. The intake camshaft has a slit on its rear end for driving the crank angle sensor.



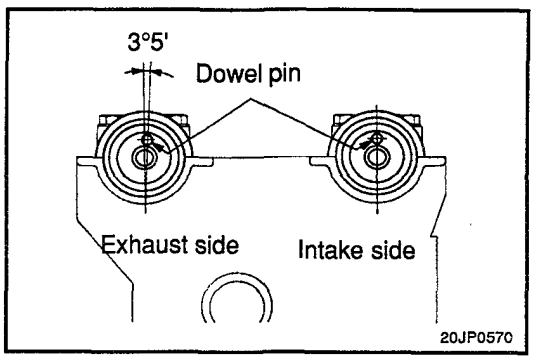
2. Install the bearing caps. Check the markings on the caps for intake/exhaust identification symbol.
   L : Intake camshaft
   R : Exhaust camshaft



3. Check that the camshaft can be easily turned by hand. After checking, remove the bearing caps and the camshafts, and then install the rocker arms.



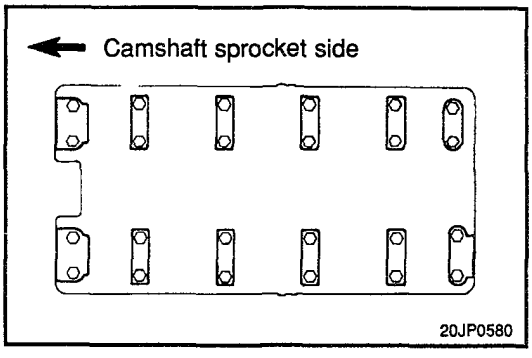
4. Make sure that the dowel pins on the camshaft sprocket end are located on the top.



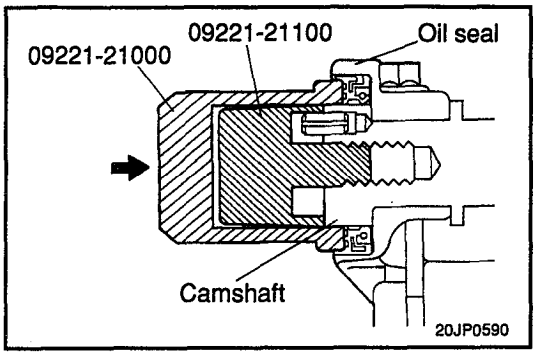
5. Tighten the bearing caps to the specified torque in two or three steps as shown.

   NOTE
   Tighten the rocker arms uniformly.

Tightening torque
Rocker arm bolts ..... 19-21 Nm (190-210 kg.cm, 14-15 lbft)

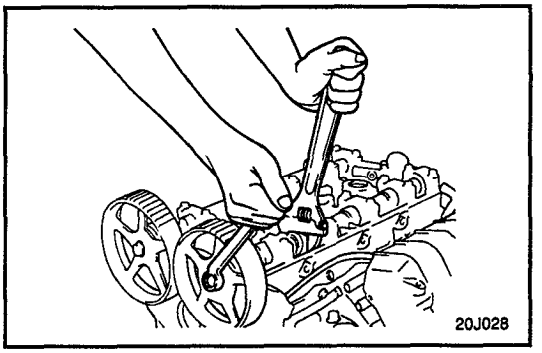


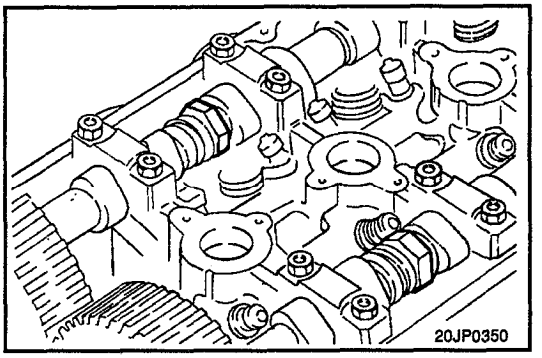
6. Using special tools, Camshaft Oil Seal Installer and guide (09221-21000, 09221-21100), press fit the camshaft oil seal. Be sure to apply engine oil to the external surface of the oil seal. Insert the oil seal along the camshaft front end and install by driving the installer with a hammer until the oil seal is fully seated.



7. Install the camshaft sprockets to the specified torque.

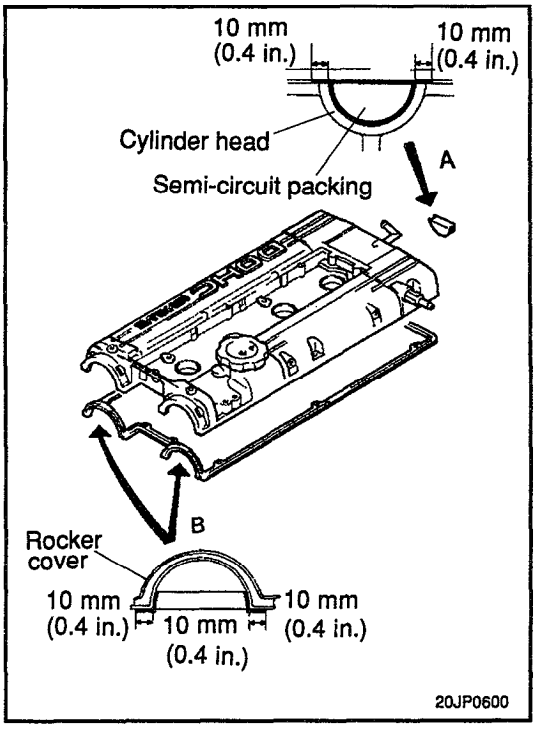
Tightening torque	
Camshaft sprocket bolts	80-100 Nm (800-1000 kg.cm, 58-72 lb.ft)



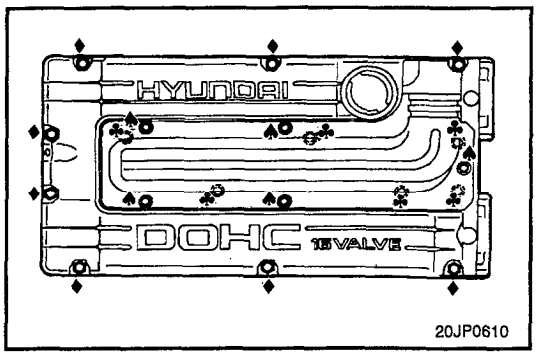


8. Install the rocker cover. Apply sealant as shown.

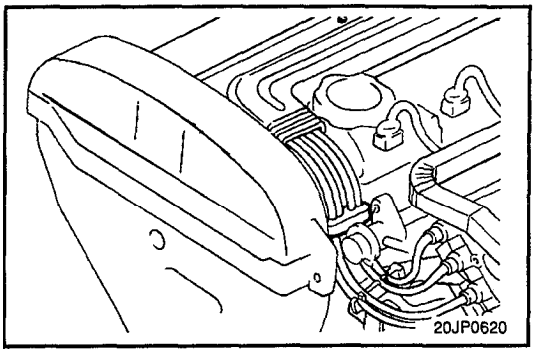
Tightening torque	
Rocker cover bolts	2.5-3.5 Nm (25-35 kg.cm, 2-3 lb.ft)
Sealant	
A Portion	Threebond No. 10 or equivalent
B Portion	Threebond No. 1212D or equivalent



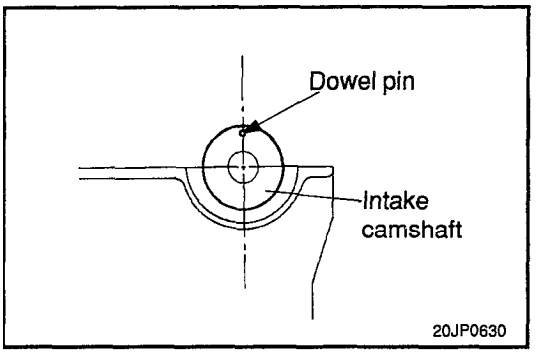
Bolt length x Diameter
♦ : 25 mm x 6 mm
♣ : 20 mm x 6 mm
♠ : 15 mm x 6 mm



9. Install the spark plugs, center cover and the rubber as shown in the illustration.

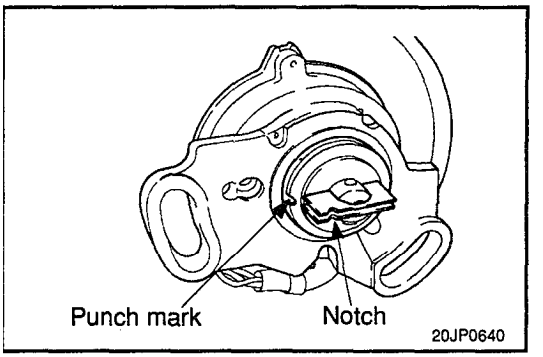


10. Locate the dowel pin on the sprocket side of the intake camshaft at the top.



11. Align the punch mark on the crankshaft position sensor housing with the notch in plate.

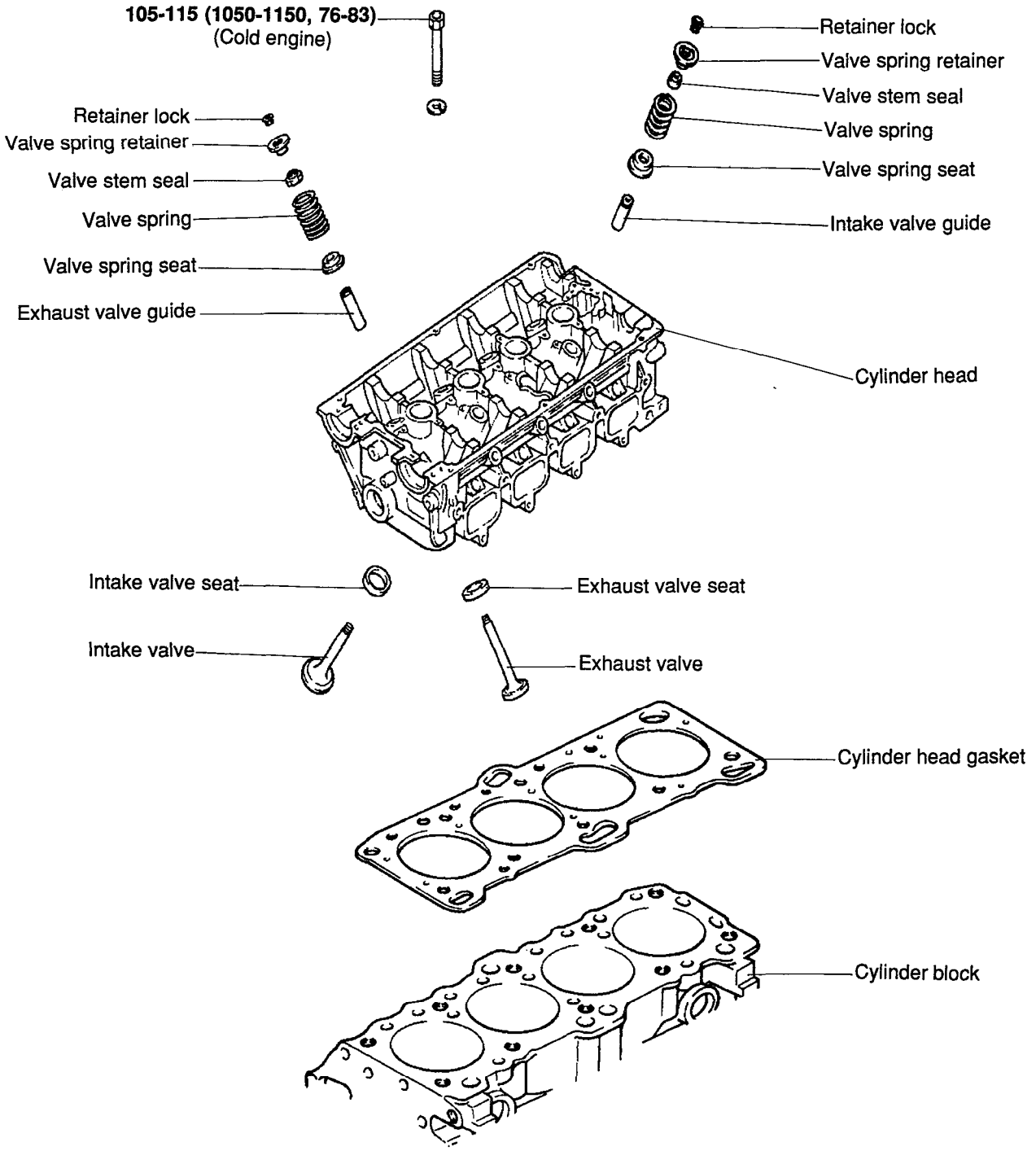
NOTE
The crankshaft position sensor can be installed even when the punch mark is positioned opposite the notch; however, the position results in incorrect fuel injection and ignition timings.



12. Install the crankshaft position sensor on the cylinder head.

CYLINDER HEAD AND VALVES

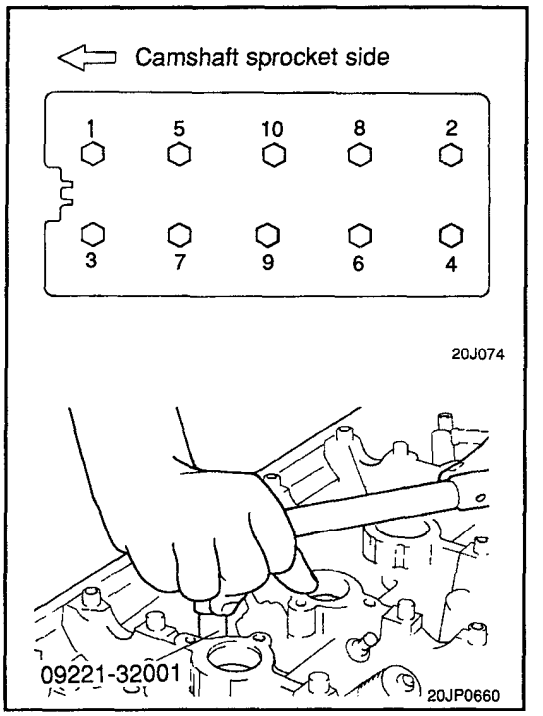
COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

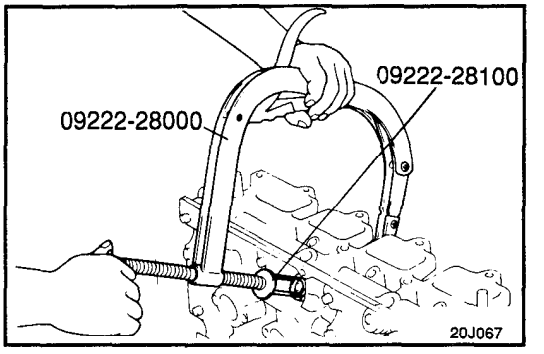
REMOVAL

1. Using the special tool, Cylinder Head Bolt Wrench (09221-32001), remove the cylinder head bolts as shown in the illustration.



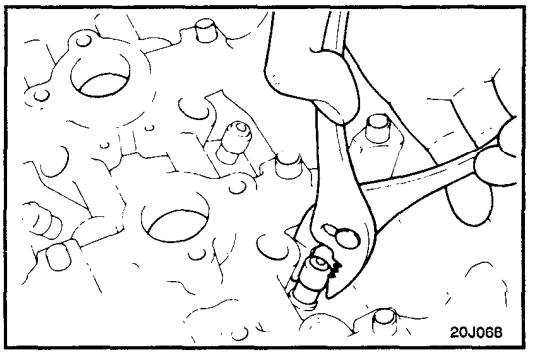
2. Using the special tool, Valve Spring Compressor (09222-28000, 09222-28100), remove the retainer lock. Next remove the spring retainer, valve spring, spring seat and valve.

NOTE
Keep these parts in order so that they can be reinstalled in their original positions.



3. Remove the valve stem seals with pliers, and discard.

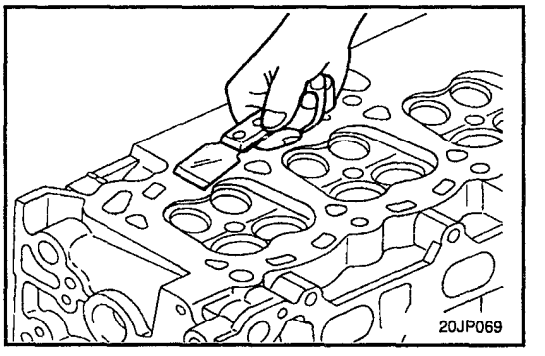
NOTE
Do not reuse the valve stem seals.



INSPECTION

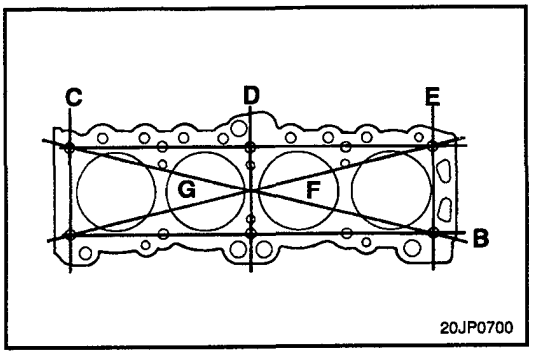
Cylinder head

1. Check the cylinder head for cracks, damage and coolant leakage. If cracked, replace the cylinder head.
2. Remove scale, sealing compound and carbon deposits completely. After cleaning oil passages, apply compressed air to make certain that the passages are not clogged.



3. Check the cylinder head gasket surface for flatness by using a straight edge in the direction of A, B, ... as shown.
   If flatness exceeds service limit in any direction, either replace the cylinder head, or lightly machine the cylinder head gasket surface.

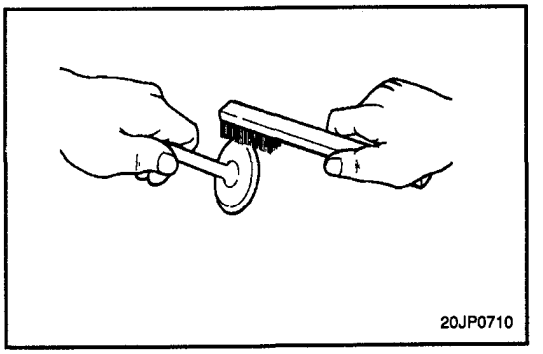
Flatness of cylinder head gasket surface	
[Standard dimension]	Less than 0.05 mm (0.002 in.)
[Limit]	0.1 mm (0.0039 in.)

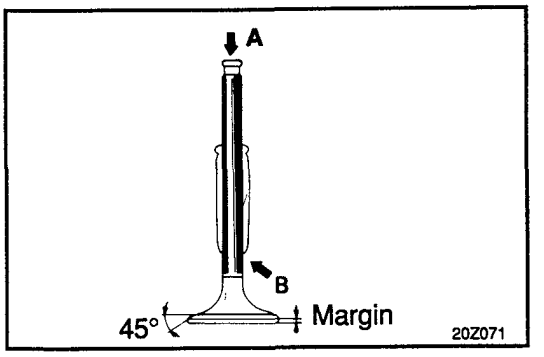


Valves

1. Using a wire brush, clean the valve thoroughly.
2. Check each valve for wear, damage and distortion of head and stem at B. Repair or correct if necessary.
   If stem end A is pitted or worn, resurface as necessary. This correction must be limited to a minimum. Also resurface the valve face.
   Replace the valve if the margin has decreased to less than the service limit.

Margin	
[Standard dimension]	
Intake	1.0 mm (0.039 in.)
Exhaust	1.5 mm (0.059 in.)
[Limit]	
Intake	0.7 mm (0.028 in.)
Exhaust	1.0 mm (0.039 in.)

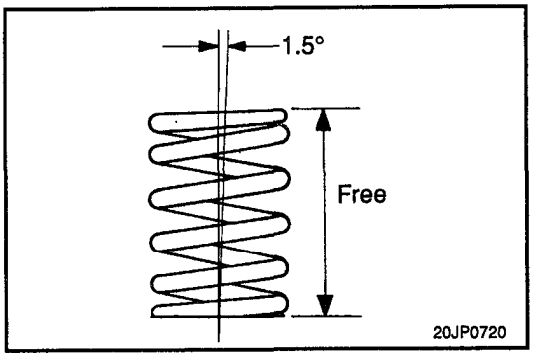




Valve Springs

1. Check the valve spring free length and tension. If they exceed the service limit, replace the spring.
2. Using a square, test the squareness of each spring. If the spring is excessively out of square, replace it.

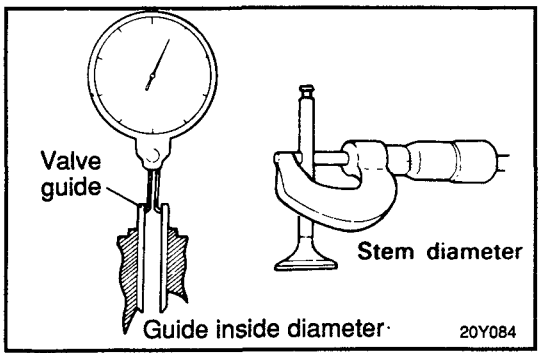
Valve spring	
[Standard Value]	
Free height	48.3 mm (1.902 in.)
Load	300 N (66 lb)/40 mm (1.575 in.)
Out of square	1.5^{o} or less
[Limit]	
Free hight	-1.0 mm (-0.039 in.)
Out of square	4^{o}



Valve Guides

Check the valve stem-to-guide clearance. if the clearance exceeds the service limit, replace the valve guide with the next oversize part.

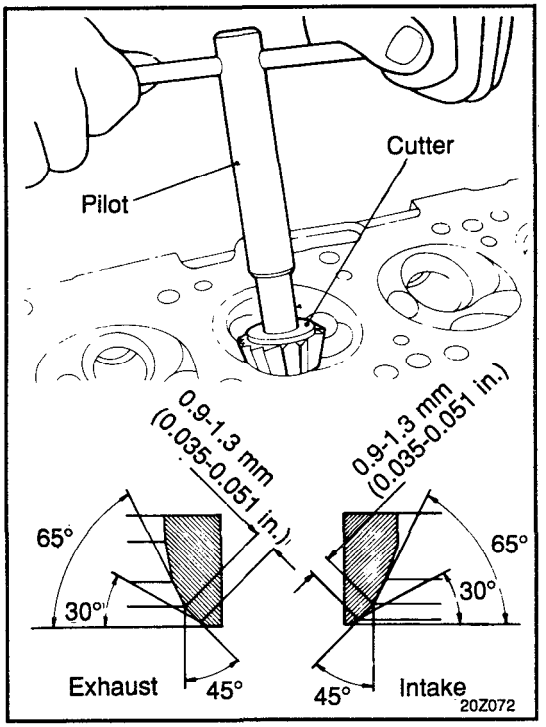
Valve stem-to-guide clearance
- [Standard dimension]
  - Intake . . . . . 0.020-0.047 mm (0.0008-0.0019 in.)
  - Exhaust . . . . . 0.050-0.085 mm (0.0020-0.0033 in.)
- [Limit]
  - Intake . . . . . 0.1 mm (0.0039 in.)
  - Exhaust ..... 0.15 mm (0.0059 in.)



Valve Seat Insert

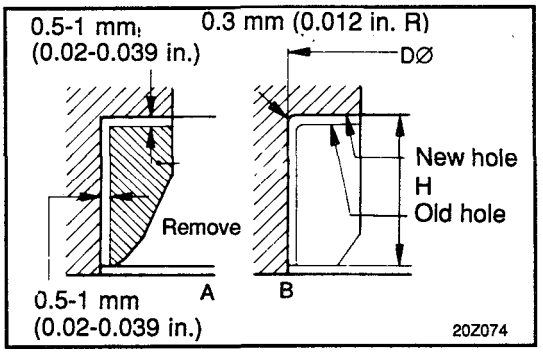
Check the valve seat for evidence of overheating and improper contact with the valve face. Recondition or replace the seat if necessary.

Before reconditioning the seat, check the valve guide for wear. If the valve guide is worn, replace it, then recondition the seat. Recondition the valve seat with a valve seat grinder or cutter. The valve seat contact width should be within specifications and centered on the valve face.



Valve Seat Insert Replacement Procedure

1. Any valve seat insert that has been worn over the service limit should be removed at normal temperature after cutting away most of the insert wall, using valve seat cutters, as shown in Fig. "A".



2. After removing the seat insert, machine the seat insert bore using a reamer or a cutter. Cut to the size shown in the table.
3. Heat the cylinder head to about 250°C (480°F) and press in the oversize seat insert. The oversize seat insert should be at normal room temperature for installation. After installation of a new valve seat insert, resurface the valve seat using the same procedure as in paragraph 1. in Valve Seat Insert.

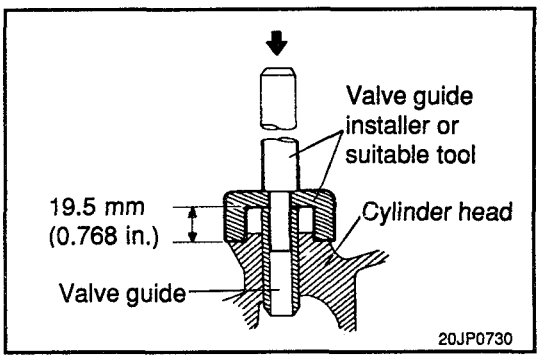
Valve Seat Insert Oversizes

Description	Size mm (in.)	Size mark	Seat insert height H mm (in.)	Cylinder head I.D. mm (in.)
Intake valve seat insert	0.3 (0.012) O.S. 0.6 (0.024) O.S.	30 60	7.9-8.1 (0.311-0.319) 8.2-8.4 (0.323-0.331)	35.300-35.325 (1.3898-1.3907) 35.600-35.625 (1.4016-1.4026)
Exhaust valve seat insert	0.3 (0.012) O.S. 0.6 (0.024) O.S.	30 60	7.9-8.1 (0.311-0.319) 8.2-8.4 (0.323-0.331)	33.300-33.325 (1.3110-1.3120) 33.600-33.625 (1.3228-1.3238)

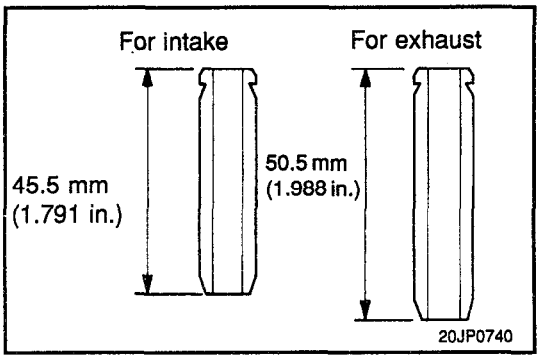
Valve Guide Replacement Procedures

The valve guide is installed using a press fit. Using a Valve Guide Installer (09222-21200A, 09222-212008) or suitable tool, replace the valve guide by the following procedure.

1. Using the push rod of the Valve Guide Installer, push the valve guide out toward the cylinder block with a press.
2. Machine the valve guide insert hole in the cylinder head to the specified oversize of the new valve guide.



3. Using the Valve Guide Installer or suitable tool, press fit the valve guide. The use of the valve guide installer makes it possible to press fit the valve guide to a predetermined height. The valve guide should be installed from the top of the cylinder head. Note that intake and exhaust valve guides are different in length [45.5 mm (1.791 in.) for intake and 50.5 mm (1.988 in.) for exhaust.]
4. After the valve guides have been installed, insert new valves and check the clearance.
5. Whenever valve guides are replaced, check for valve to seat contact and recondition the valve seats as necessary.

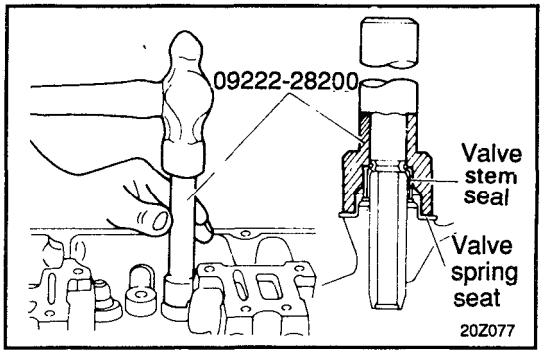


Valve Guide Oversizes

Size mm (in.)	Size mark	Cylinder head hole size mm (in.)
0.05 (0.002) O.S.	5	12.050-12.068 (0.4744-0.4751)
0.25 (0.010) O.S.	25	12.250-12.268 (0.4823-0.4830)
0.50 (0.020) O.S.	50	12.500-12.518 (0.4921-0.4928)

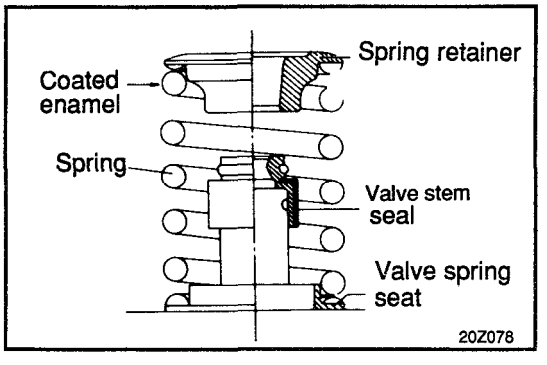
INSTALLATION

NOTE
1) Clean each part before assembly.
2) Apply engine oil to sliding and rotating parts.



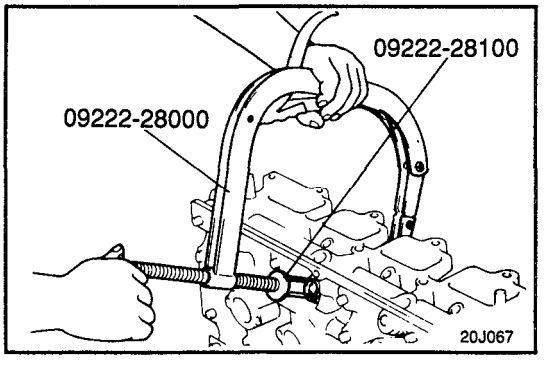
1. After installing the spring seat, fit the stem seal onto the valve guide.
   To install, fit the seal in by lightly tapping the Special Tool, Valve Stem Oil Seal Installer (09222-28200).
   The seal is installed in the specified position by means of the special tool. Incorrect installation of the seal will adversely affect the lip I.D. and eccentricity, resulting in oil leakage down the valve guides. When installing, therefore, be careful not to twist the seal. Do not reuse old stem seals.
2. Apply engine oil to each valve. Insert the valves into the valve guides. Avoid inserting the valve into the seal with force.
   After insertion, check to see if the valve moves smoothly.

3. Install springs and spring retainers.
   Valve springs should be installed with the enamel coated side toward the valve spring retainer.

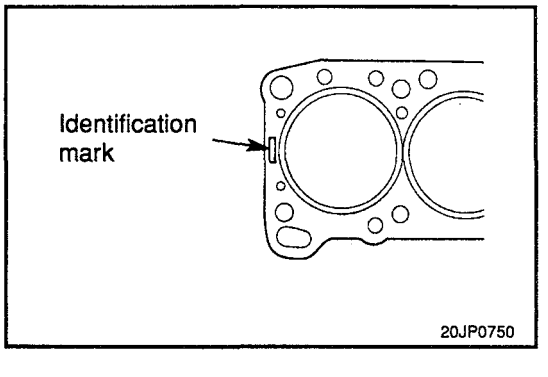


4. Using the special tool, Valve Spring Compressor (09222-28000, 09222-28100), remove the retainer lock. Next remove the spring retainer, valve spring, spring seat and valve.

   NOTE
   Keep these parts in order so that they can be reinstalled in their original positions.

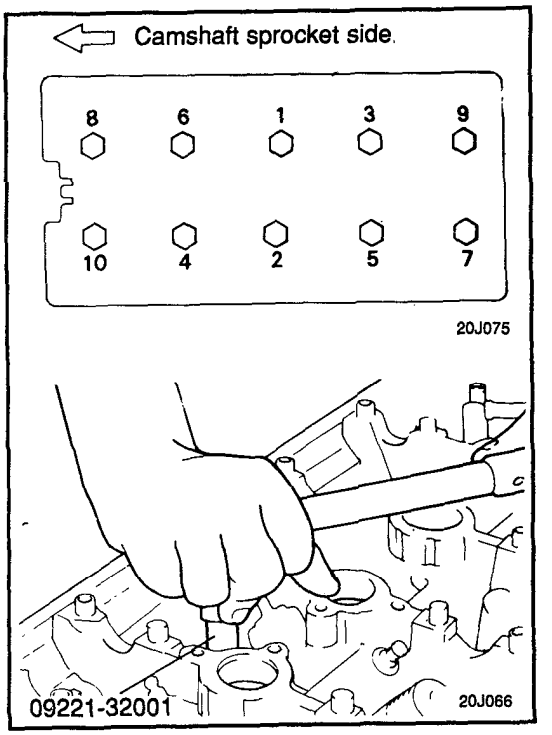


5. Clean all gasket surfaces of the cylinder block and cylinder head.
6. Install a new cylinder head gasket onto the cylinder head assembly. Do not apply sealant to the gasket and do not reuse the old cylinder head gasket.



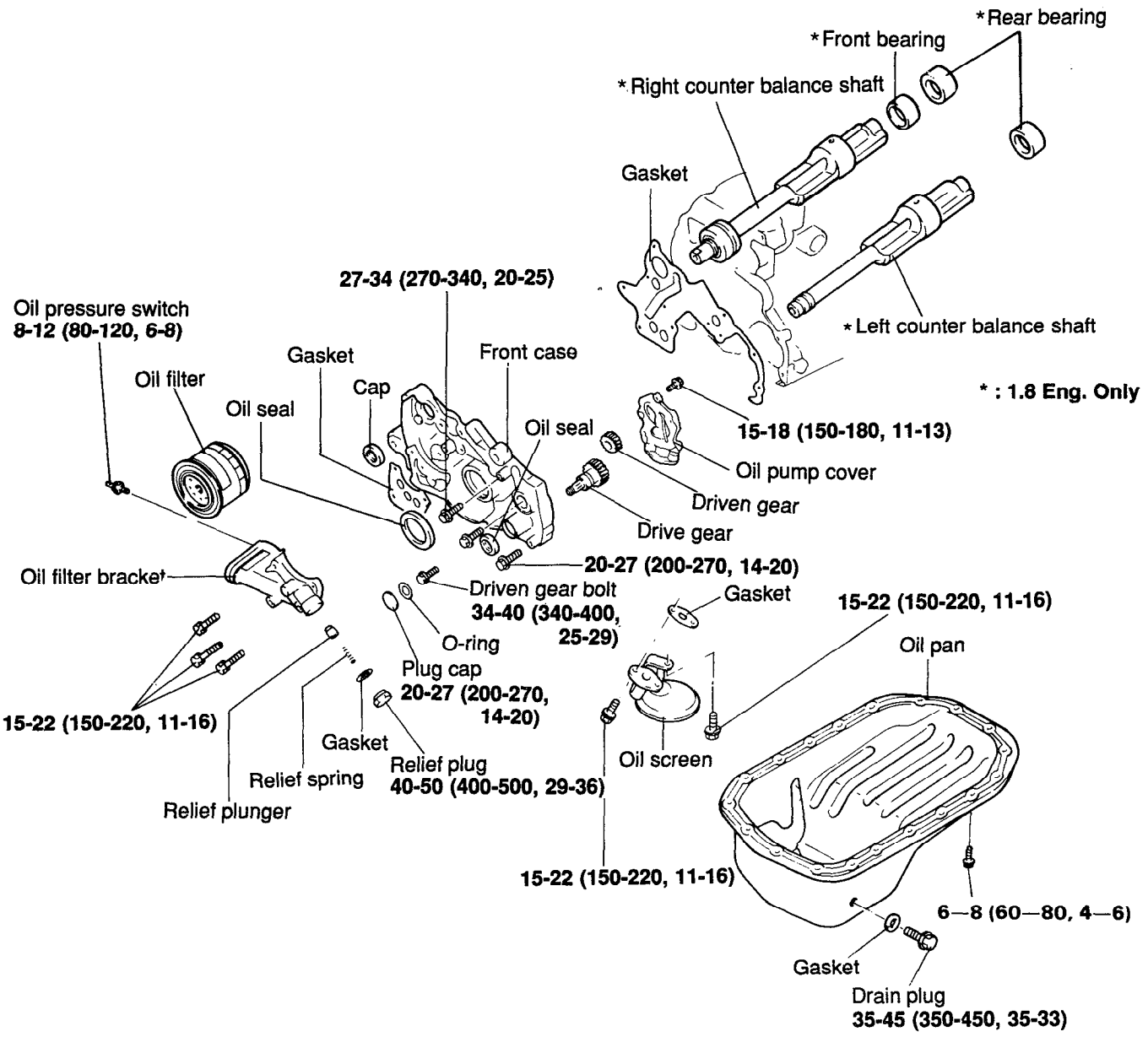
7. Using the special tool, Cylinder Head Bolt Wrench (09221-32001), install the cylinder head bolts as shown in the illustration.

Tightening torque	
Cylinder head bolt [cold engine]	105-115 Nm (1050-1150 kg.cm, 76-83 lb.ft)



FRONT CASE, OIL PUMP COUNTER BALANCE SHAFT

COMPONENTS

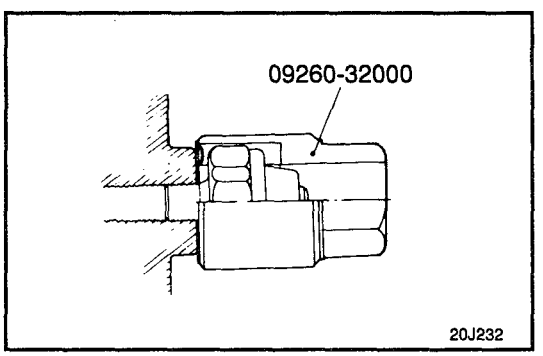


TORQUE : Nm (kg.cm, lb.ft)

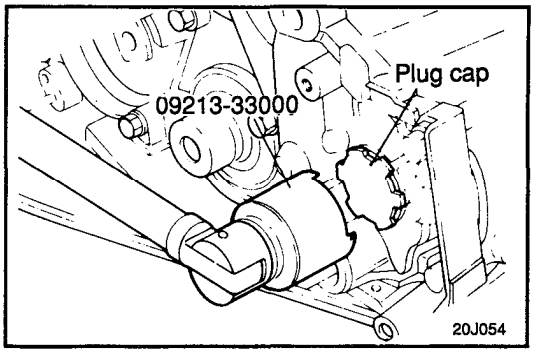
REMOVAL

[Step 8-10, 12 for 1.8L Eng.]

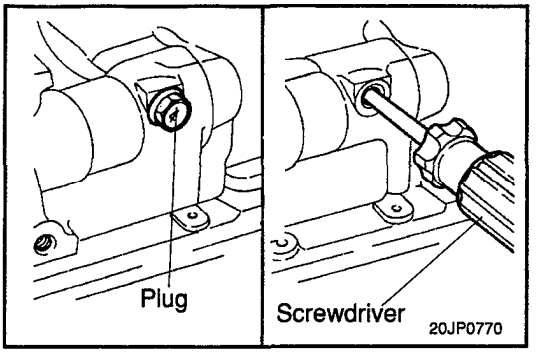
1. **Remove the timing** belt. Refer to "Timing Belt".
2. Remove all the oil pan bolts.
3. Remove the oil pan.
4. Remove the oil screen and gasket.
5. Remove the relief plunger and gasket, and then take off the relief spring and relief valve from the oil filter bracket.
6. Remove the oil pressure switch.



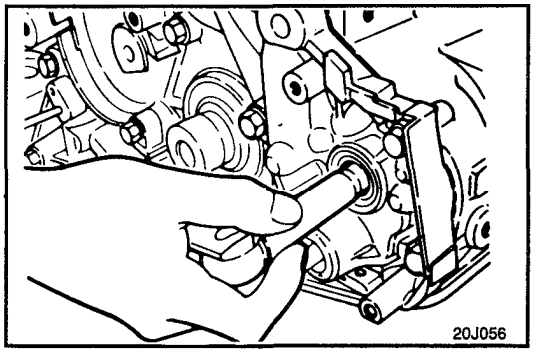
7. Remove the oil filter bracket and gasket.
8. Using the special tool, remove the plug cap from the oil pump portion of front case.



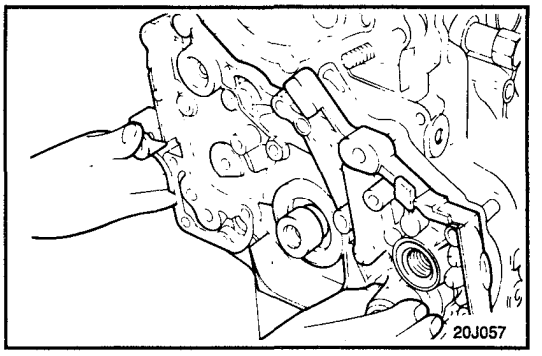
9. Remove the left side cylinder block plug and insert a screwdriver with an 8 mm (0.32 in.) diameter shaft into plug hole. Screwdriver shaft must be inserted more than 60 mm (2.4 in.)



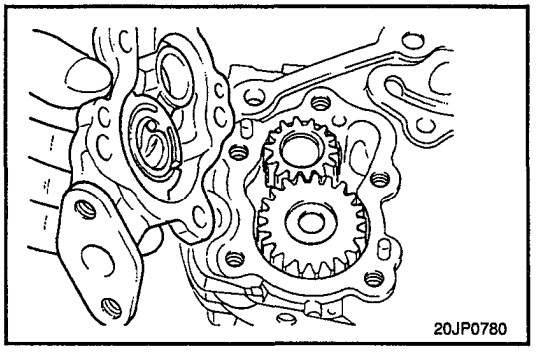
10. Remove the oil pump driven gear and left counter balance shaft retaining bolt.



11. Remove the front case mounting bolts and remove front case assembly and gasket.
12. Remove the two counter balance shafts from the cylinder block.



13. Remove the oil pump cover from the front case.
14. Remove the oil pump from front case.



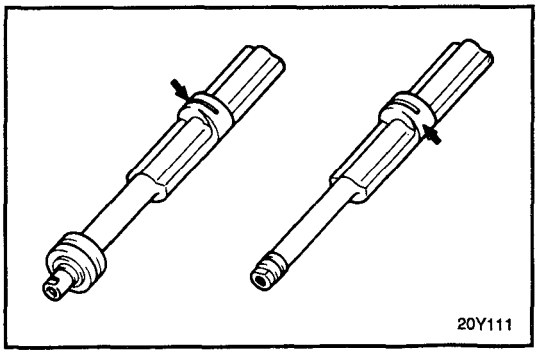
INSPECTION

Front Case

1. Check oil holes for clogging and clean if necessary.
2. Check counter balance shaft front bearing section for wear, damage and seizure. If there is anything wrong with the section, replace the front case. [for 1.8L Eng.]
3. Check the front case for cracks and other damage. Replace cracked or damaged front case.

Counter Balance Shaft [for 1.8L Eng.]

Check journals for wear or seizure.
If excessive wear or seizure is evident, check bearing as well.
If necessary, replace counter balance shaft bearing or both.

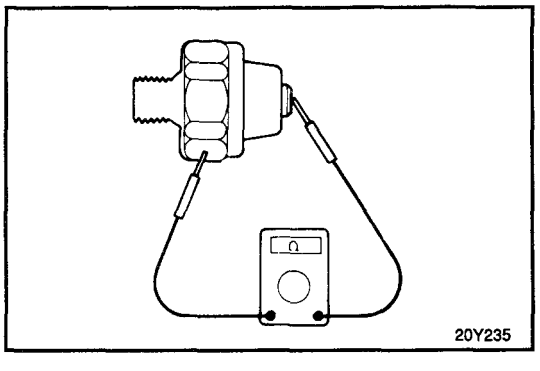


Oil Seal

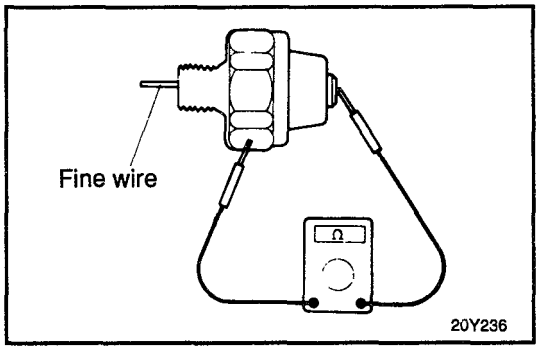
1. Check the oil seal lip for wear and damage. Replace oil seal if necessary.
2. Check the oil seal lip for deterioration. Replace oil seal if necessary.

Oil Pressure Switch

1. Check the continuity between the terminal and the body with an ohmmeter.
   If there is continuity, replace the oil pressure switch.



2. Check the continuity between the terminal and the body when the fine wire is pushed. If there is continuity even when the fine wire is pushed, replace it.
3. Or, if there is no continuity when a 50 kPa (7 psi) vacuum is applied through the oil hole, the switch is operating properly. Check to see that air doesn't leak. If air leaks, the diaphragm is broken. Replace the switch.

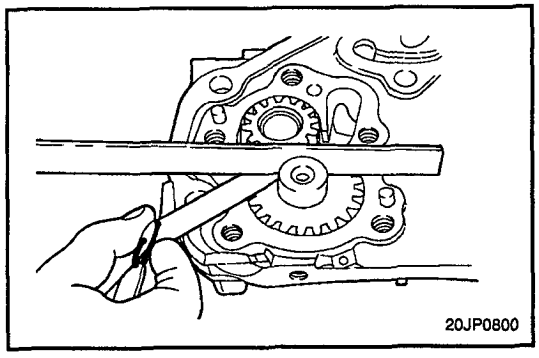


Oil Pump

1. Assemble the oil pump gear to the front case and rotate it to ensure smooth rotation with no looseness.
2. Ensure that there is no ridge wear on the contact surface between the front case and gear surface of the oil pump cover.

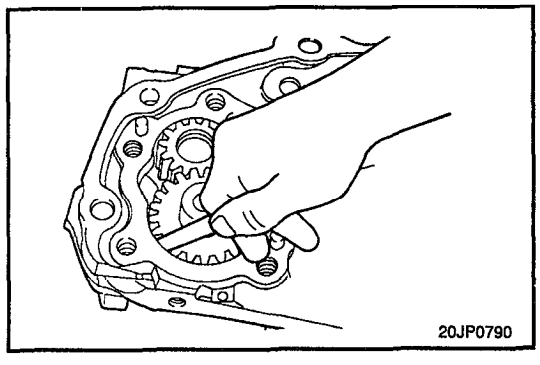
3. With the drive and driven gears installed into the front case, measure the tip clearance of the gears.

[Standard value]
Drive gear . . . . . 0.16-0.21 mm (0.0063-0.0083 in.)
Driven gear . . . . . 0.13-0.18 mm (0.0051-0.0071 in.)
[Limit]
Drive gear ..... 0.25 mm (0.0098 in.)
Driven gear. . . . . 0.25 mm (0.0098 in.)



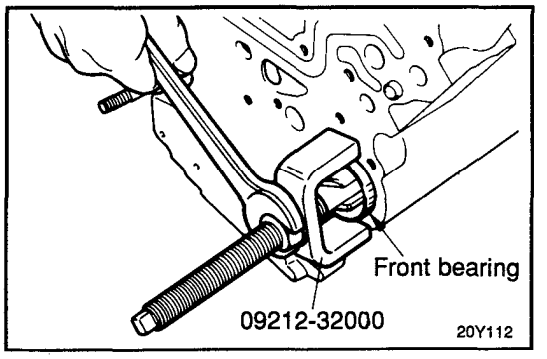
4. Check the side clearance.

[Standard value]
Drive gear . . . . . 0.08-0.14 mm (0.0031-0.0055 in.)
Driven gear . . . . . 0.06-0.12 mm (0.0024-0.0047 in.)
[Limit]
Drive gear ..... 0.25 mm (0.0098 in.)
Driven gear ..... 0.25 mm (0.0098 in.)

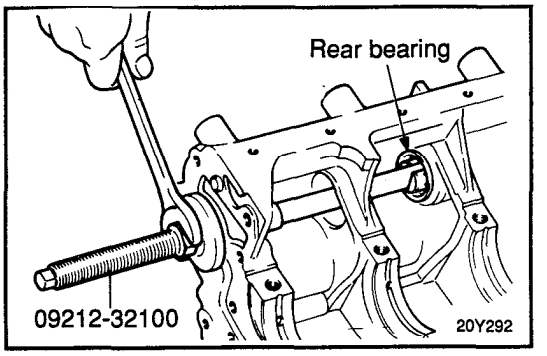


COUNTER BALANCE SHAFT BEARING REPLACEMENT [for 1.8L Eng.]

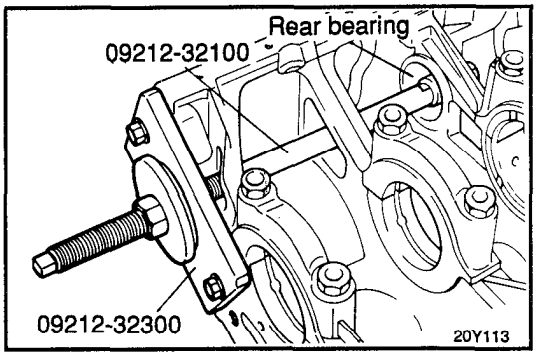
1. Using special tool, remove the right counter balance shaft front bearing from the cylinder block.



2. Using special tool, remove the right counter balance shaft rear bearing from the cylinder block.

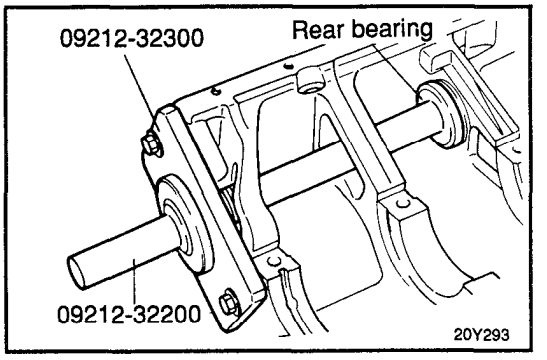


3. Using special tool, remove the left counter balance shaft rear bearing from cylinder block. At this time, install special tool on front surface of cylinder block to hold bearing puller.



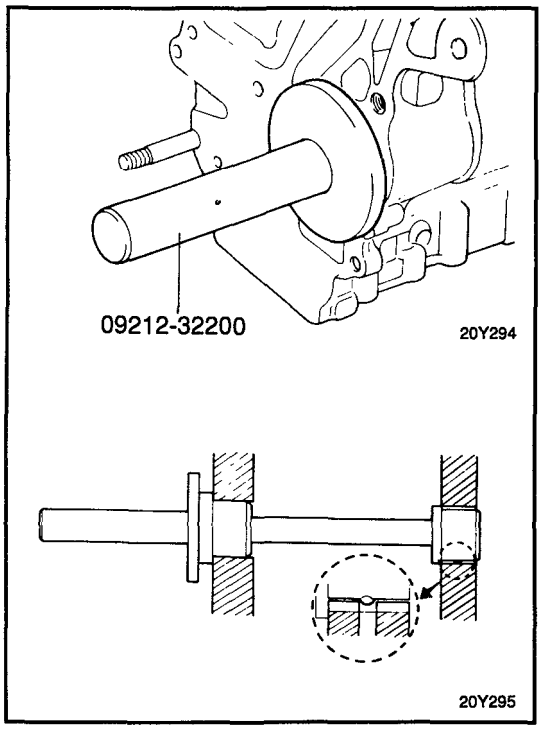
4. Using special tool, install the left counter balance shaft rear bearing to the cylinder block.

NOTE
1. Apply engine oil to the rear bearing outer circumference and bearing hole in cylinder block.
2. The left rear bearing has no oil holes.

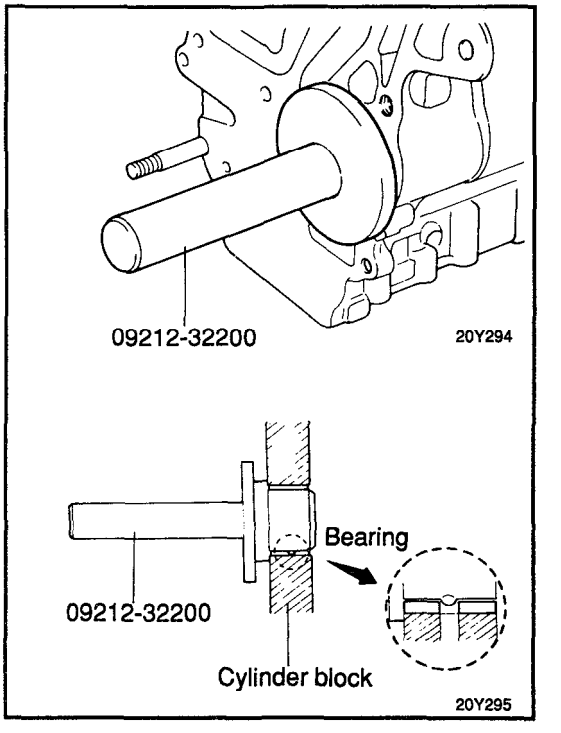


5. Using special tool, install the right counter balance shaft rear bearing to the cylinder block.

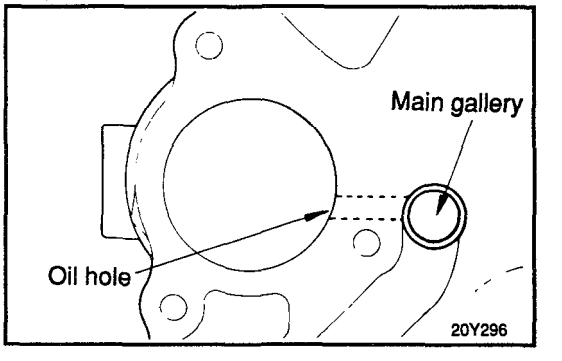
NOTE
1. Apply engine oil to outer surface of bearing.
2. Make sure that bearing oil hole is aligned with oil hole of cylinder block.



6. Using special tool, install the right counter balance shaft front bearing to the cylinder block.



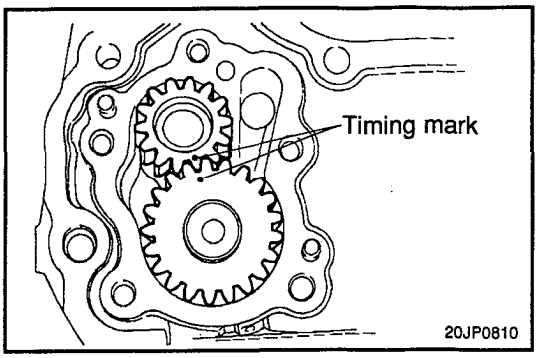
NOTE
Make sure that bearing oil hole is aligned with oil hole of cylinder block.



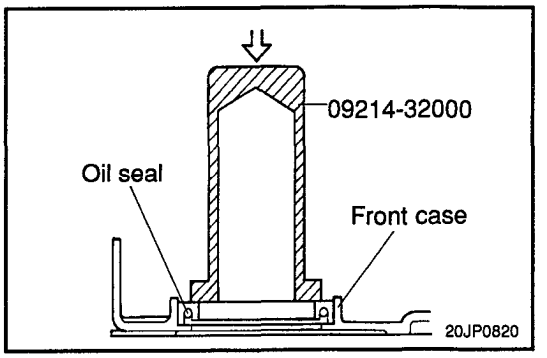
INSTALLATION

[Step 6-8 for 1.8L Eng.]

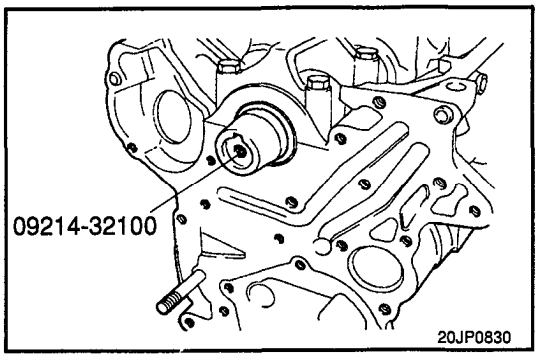
1. Apply engine oil to the gear and align the two timing marks.



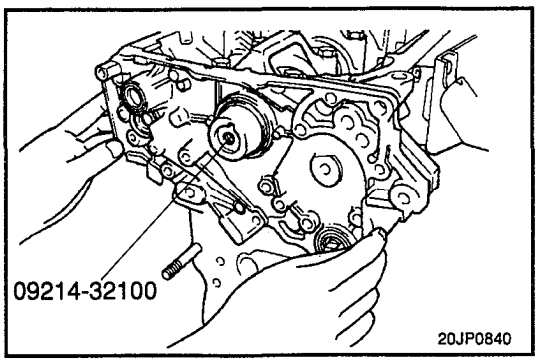
2. Using the special tool, Crankshaft Front Oil Seal Installer (09214-32000), install the crankshaft front oil seal into the front case.



3. Set the special tool (09214-32100) on the front end of crankshaft and apply a thin coat of engine oil to outer circumference of the special tool to install the front case.

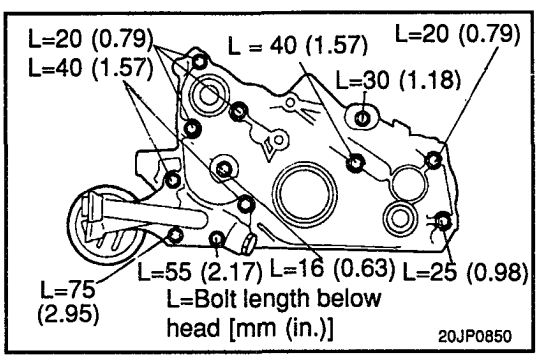


4. Install the front case assembly through a new front case gasket and temporarily tighten the flange bolts (other than those for tightening the filter bracket).

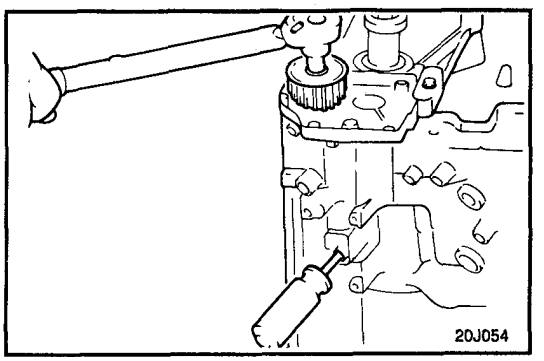


5. Install the front case assembly with a new gasket, and tighten the bolts to the specified torque.

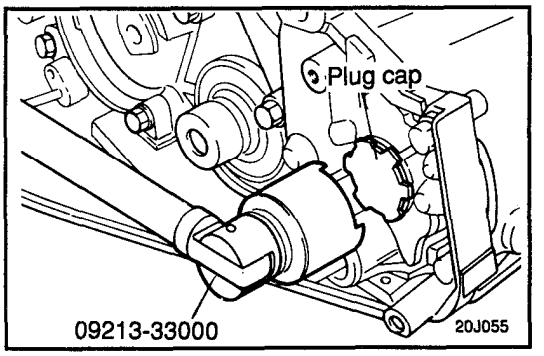
Front case assembly Tightening torque	
	*** : 27-34** Nm (270-340 kg.cm, 20-25 lb.ft)
	All except* : 20-27 Nm (200-270 kg.cm, 14-20 lb.ft)
Oil filter bracket bolts	
	15-22 Nm (150-220 kg.cm, 11-16 lb.ft)



6. Insert screwdriver through plug hole in left side of cylinder block to keep shaft in position, and then tighten.

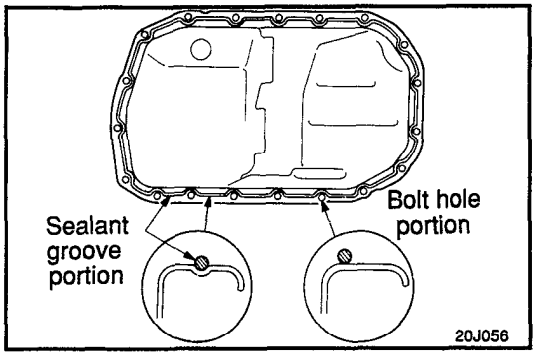


7. Install a new O-ring to the groove of front case.
8. Using special tool, install the plug case and tighten to specified torque.



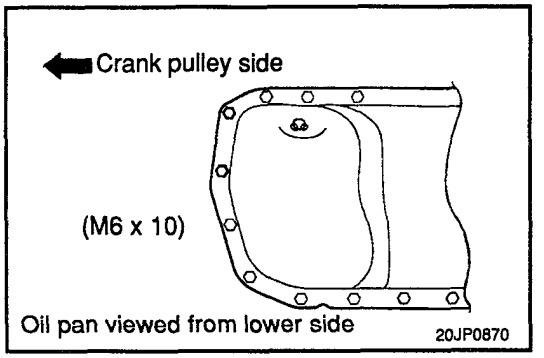
9. Apply sealant into the groove of the pan flange as shown.

NOTE
1) Apply sealant approx. 4 mm (0.16 in.) in thickness.
2) After application of sealant, do not exceed 15 minutes before installing the oil pan.
List what type of sealant to use.



10. Note the difference in bolt lengths at the location shown. Install the oil pan and tighten the bolts to the specified torque.

Tightening torque
Oil pan bolt . . . . . 6-8 Nm (60-80 kg.cm, 4-6 lb.ft)

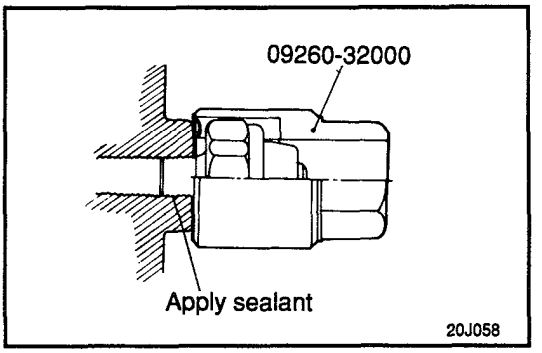


11. Using the special tool, install the oil pressure switch after applying sealant to the threaded area.

Sealant . . . . . Threebond 1104 or equivalent

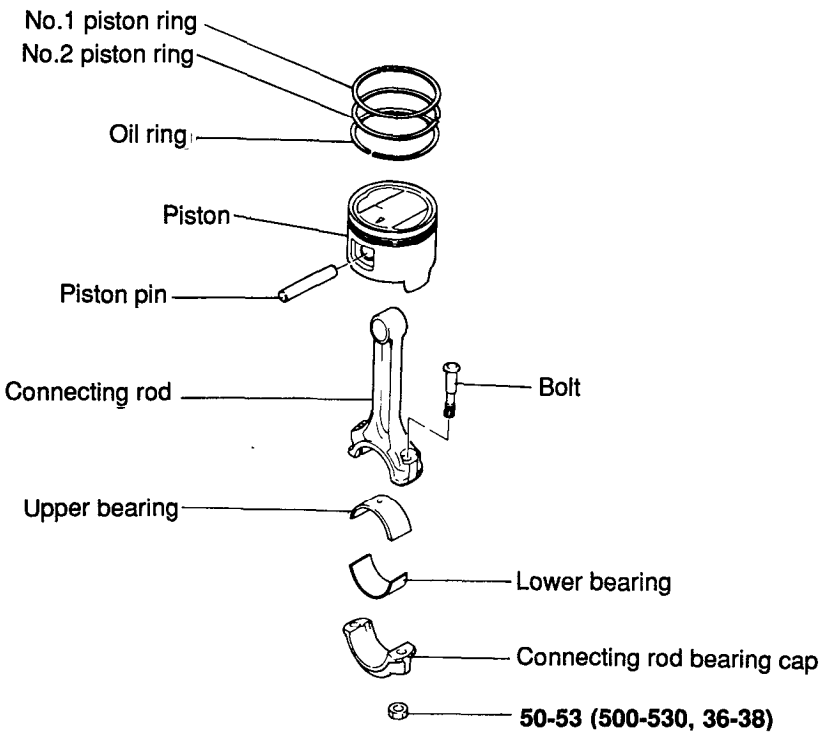
NOTE
Do not over torque the oil pressure switch.

Tightening torque
Oil pressure switch . . . . . 8-12 Nm (80-120 kg.cm, 6-8 lb.ft)



PISTON AND CONNECTING ROD

COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

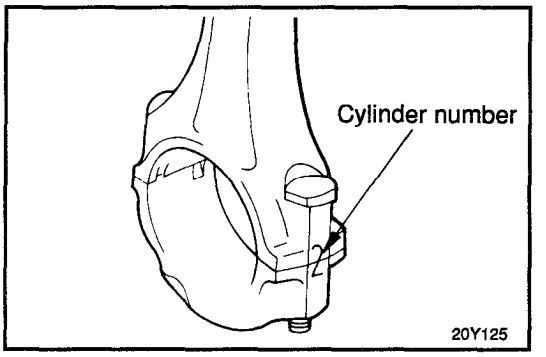
REMOVAL

Connecting Rod Cap

NOTE

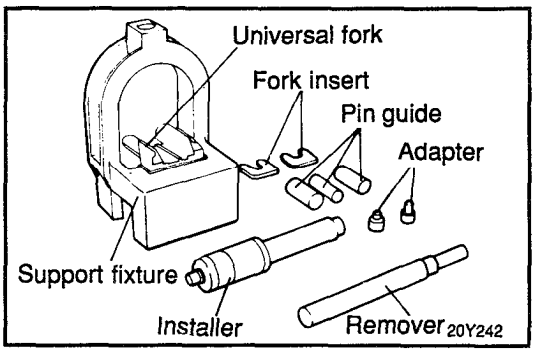
Keep the bearings in order with their corresponding connecting rods (according to cylinder numbers) for proper reassembly.

1. **Remove the connecting rod cap nuts** and then remove the caps and the big end lower bearing.
2. Push each piston-connecting rod assembly toward the top of the cylinder.



Piston Pin Removal and Installation Procedures

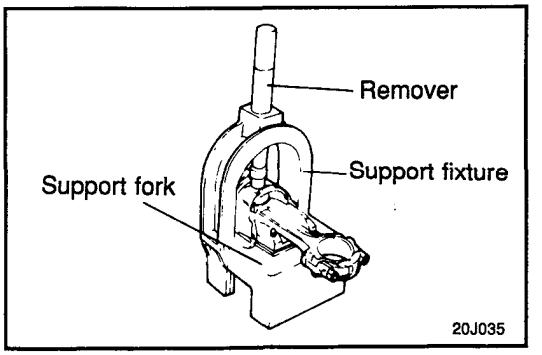
1. Use the special tools (09234-33001), to disassemble and reassemble the piston and connecting rod.
2. Place the proper insert in the fork of the tool. Position the insert between the connecting rod and the piston.



3. Insert the proper removal tool through the hole in the arch of the tool.

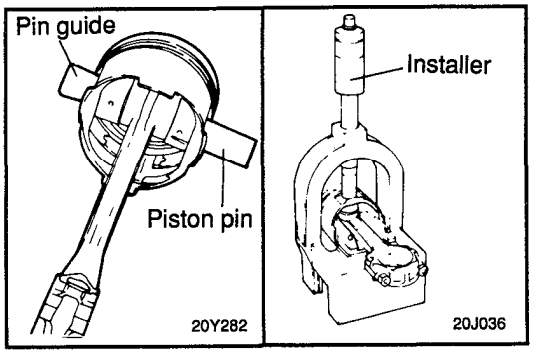
NOTE
Center the piston, rod and pin assembly with the removal arbor.

4. Press the piston pin out of the connecting rod.



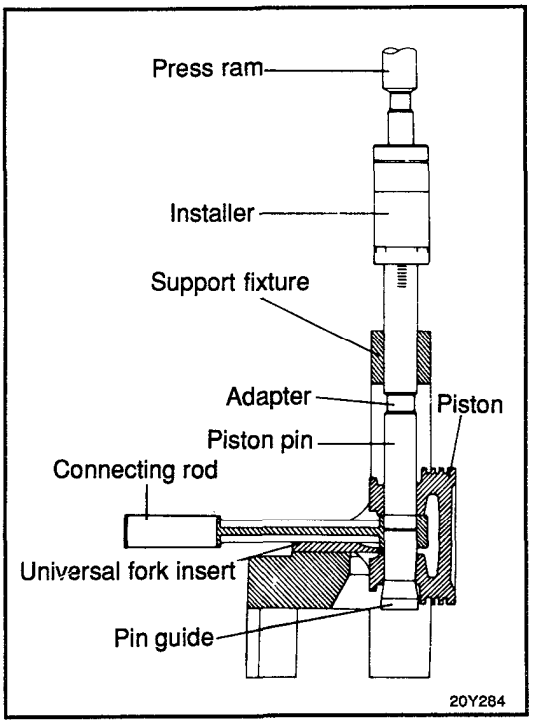
5. Install proper pin guide (refer to application chart) through piston and into connecting rod. Hand tap pin guide into piston for proper retention. Drop piston pin into the other side of the piston.

NOTE
The pin guide centers the conneting rod in the piston. When the piston, connecting rod, piston pin and pin guide assembly are positioned on the fork of the tool, the pin guide will also center this assembly in the tool. If a pin guide that is too small is used, the piston assembly will not be located centrally in the tool, and damage may occur to the fork and/or the insert of the tool.



6. Install piston assembly onto fork assembly of tool. Tool will support connecting rod at the piston pin. Be sure piston assembly is slid onto the fork until the pin guide contacts the fork insert.
7. Adjust the installing arbor to the proper length by turning the numbered sleeve on the lettered shaft until the specified alpha numeric setting from the application chart is obtained. Turn knurled nut to lock numbered sleeve on shaft.
8. Insert the installing arbor through the hole in the arch of the tool. Press piston pin into the connecting rod until the sleeve on the installing arbor contacts the top of the tool arch. The pin guide will fall out of the connecting rod as the piston pin is pressed in.

CAUTION
Do not exceed 5000 pounds of force when stopping the installing arbor sleeve against the arch.



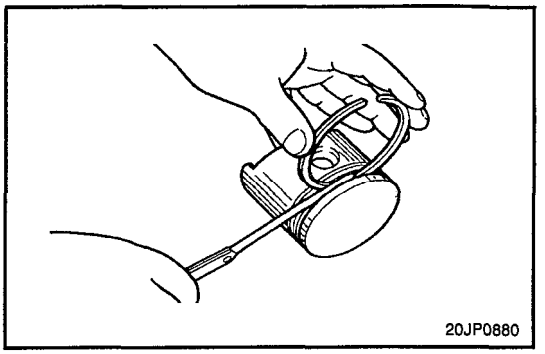
INSPECTION

Piston and Piston Pins

1. Check each piston for scuffing, scoring, wear and other defects. Replace any piston that is defective.
2. Check each piston ring for breakage, damage and abnormal wear. Replace the defective rings. When the piston requires replacement, its rings should also be replaced.
3. Check the piston pin fit in the piston pin hole. Replace any piston and pin assembly that is defective.
   The piston pin must be smoothly pressed by hand into the pin hole at room temperature.

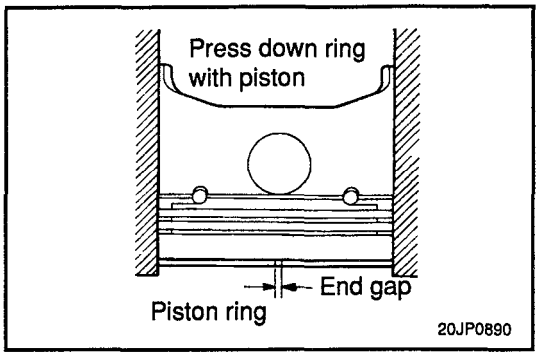
Piston Rings

1. Measure the piston ring side clearance. If the measured value exceeds the service limit, insert a new ring in a ring groove to measure the side clearance. If the clearance still exceeds the service limit, replace the piston and rings together. If it is less than the service limit, replace the piston rings only.



[Standard value]
Piston ring side clearance ..... 0.03-0.07 mm (0.0012-0.0028 in.)
[Limit] ..... 0.1 mm (0.004 in.)

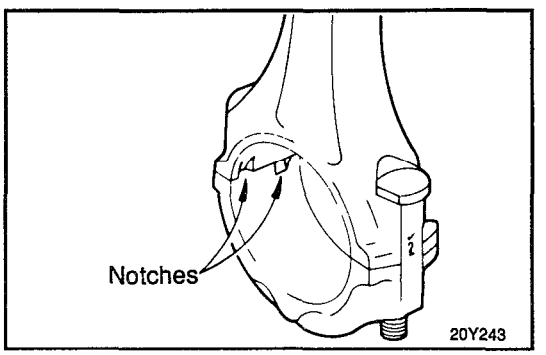
2. To measure the piston ring end gap, insert a piston ring into the cylinder bore. Position the ring at right angles to the cylinder wall by gently pressing it down with a piston. Measure the gap with a feeler gauge. If the gap exceeds the service limit, replace the piston ring.



Piston ring end gap
[Standard dimension]
1.6L Eng.
No.1 ..... 0.25-0.40 mm (0.0098-0.0157 in.)
No.2 ..... 0.35-0.50 mm (0.0138-0.0197 in.)
Oil ring side rail ..... 0.20-0.70 mm (0.0079-0.0276 in.)
1.8L Eng.
No.1 ..... 0.25-0.40 mm (0.0098-0.0157 in.)
No.2 ..... 0.45-0.60 mm (0.0177-0.0236 in.)
Oil ring side rail ..... 0.20-0.70 mm (0.0079-0.0276 in.)
[Limit]
No.1, No.2 ..... 0.8 mm (0.031 in.)
Oil ring side rail ..... 1.0 mm (0.039 in.)

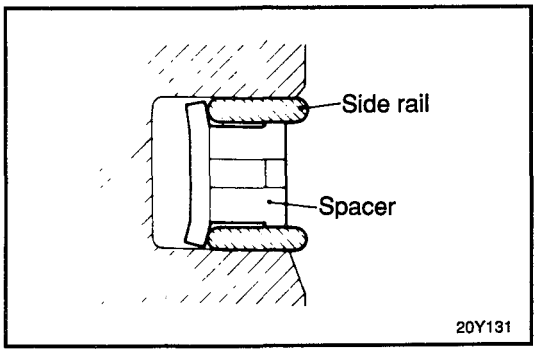
Connecting Rods

1. When the connecting rod cap is installed, make sure that cylinder numbers put on the rod end cap at disassembly match. When a new connecting rod is installed, make sure that the notches for holding the bearing in place are on the same side.
2. Replace the connecting rod if it is damaged on the thrust faces at either end, and also if it has a step wear in, or severely rough surface of, the inside diameter of the small end.



INSTALLATION

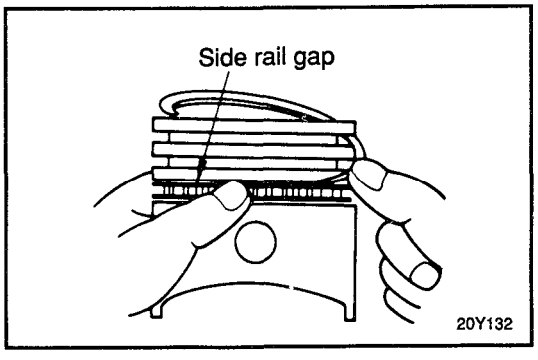
1. Install the spacer.



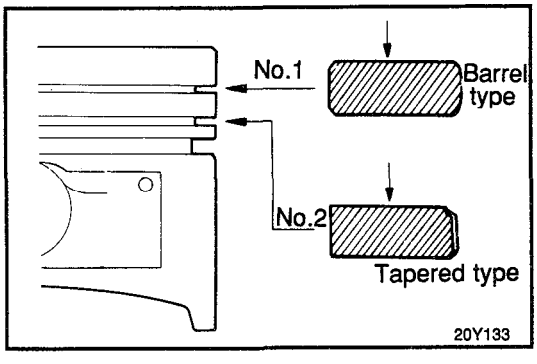
2. Install upper side rail. To install side rail, first put one end of side rail between piston ring groove and spacer, hole it down firmly, and then press down the portion which is to be inserted into groove with a finger as illustrated.

   NOTE
   Do not use piston ring expander when installing side rail.

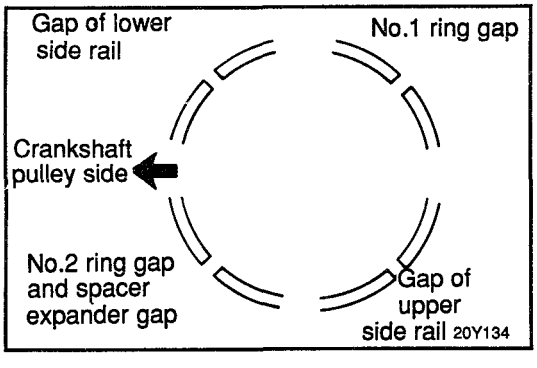
3. Install lower side rail by same procedure as Step 2.



4. Using piston ring expander, install No.2 piston ring.
5. Install No.1 piston ring.
6. Apply engine oil around piston and piston rings.



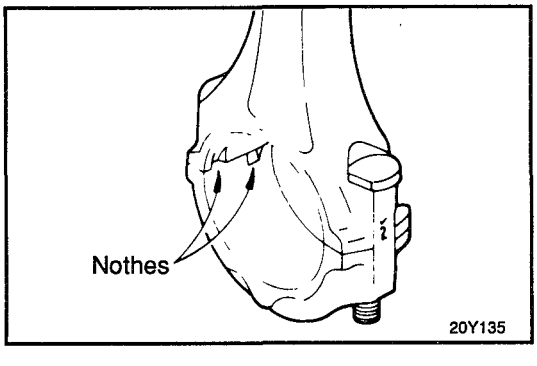
7. Position each piston ring end gap as for apart from neighboring gaps as possible. Make sure that gaps are not positioned in thrust and pin directions.
8. Hold piston rings firmly in a piston ring compressor as they are inserted into cylinder.



9. Make sure that front mark of piston and front mark (identification mark) of connecting rod are directed toward front of engine.
10. When connecting rod cap is installed, make sure that cylinder numbers put on rod and cap at disassembly match.
11. When new connecting rod is installed, make sure that notches for holding bearing in place are on same side.
12. Tighten the connecting rod cap nuts.

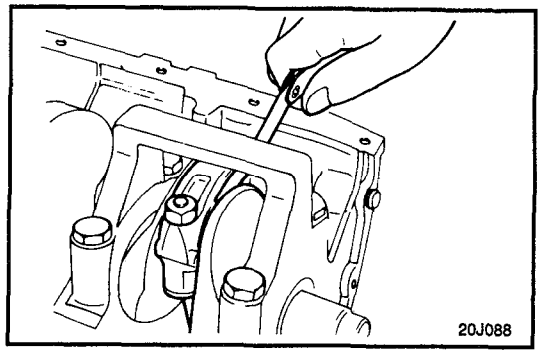
Notches

Tightening torque	
Connecting rod cap nuts	50-53 Nm (500530 kg.cm, 36-38 lb.ft)



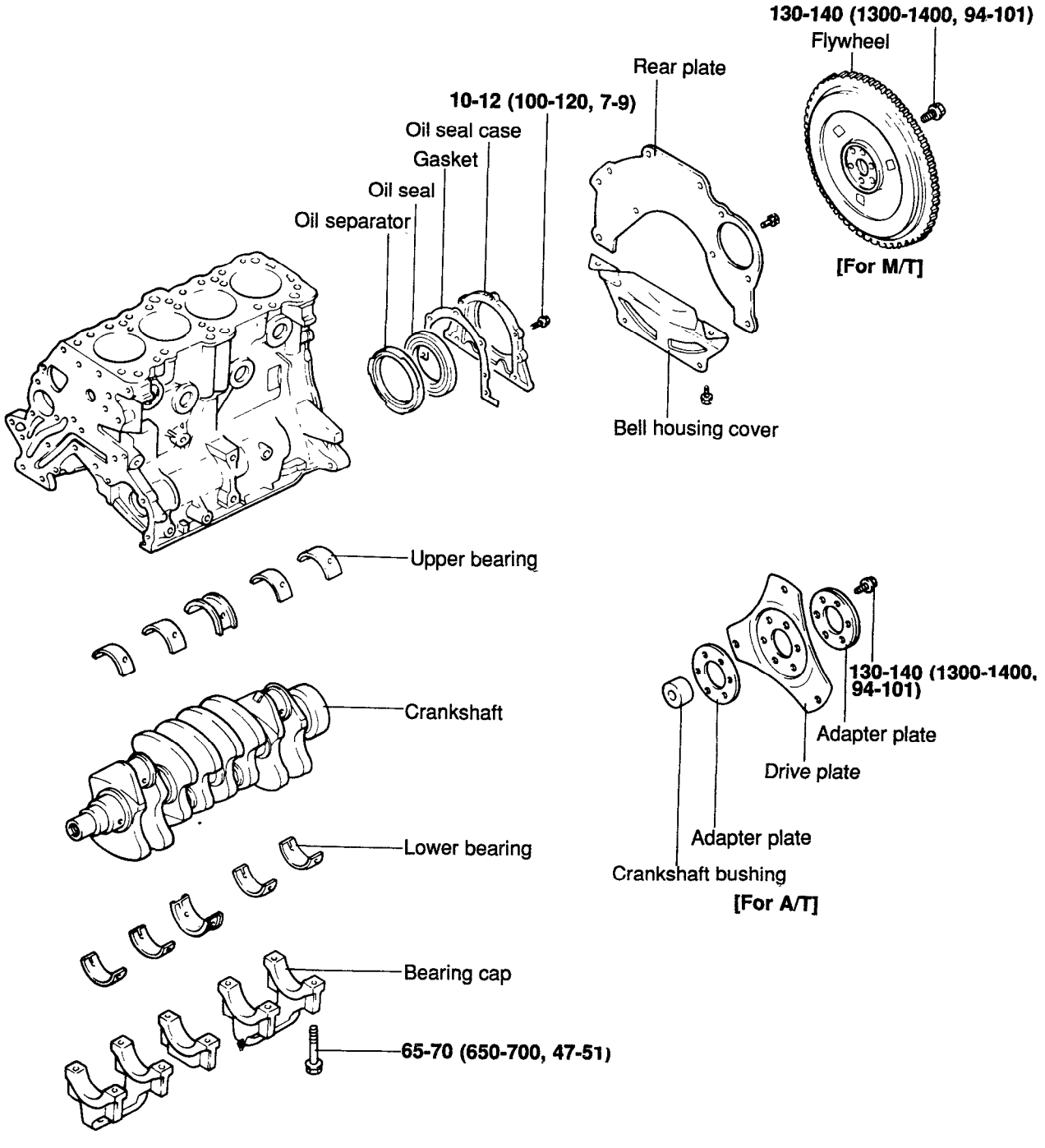
13. Check connecting rod side clearance.

Side clearance	0.10-0.25 mm (0.0039-0.0098 in.)
Limit	0.4 mm (0.0157 in.)



CRANKSHAFT, FLYWHEEL

COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Remove the timing belt train, front case, flywheel cylinder head assembly and oil pan. For details, refer to respective chapters.
2. Remove the rear plate and the rear oil seal.
3. Remove the connecting rod caps.

NOTE
Mark the main bearing caps to permit reassembly in the original position and direction.

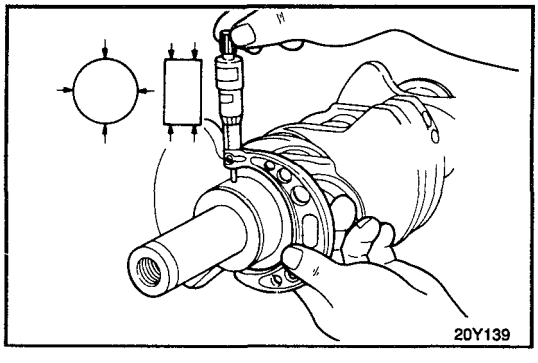
4. Remove the main bearing caps and remove the crankshaft. Keep the bearings in order by cap number.

INSPECTION

Crankshaft

1. Check the crankshaft journals and pins for damage, uneven wear and cracks. Also check oil holes for clogging. Correct or replace any defective part.
2. Inspect out-of-roundness and taper of crankshaft journal and pin.

Standard value	
Crankshaft journal O.D	**57** mm (2.24 in.)
Crankshaft pin O.D	**45** mm (1.77 in.)



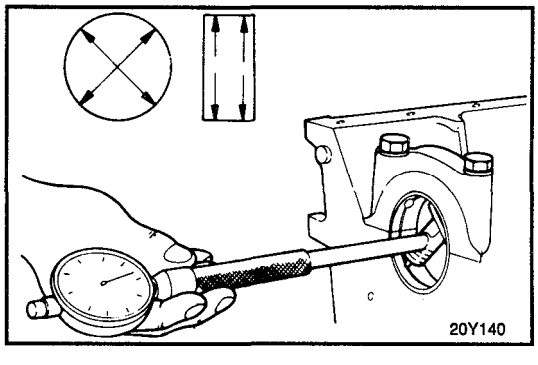
Main Bearings and Connecting Rod Bearings

Visually inspect each bearing for peeling, melt, seizure and improper contact. Replace the defective bearings.

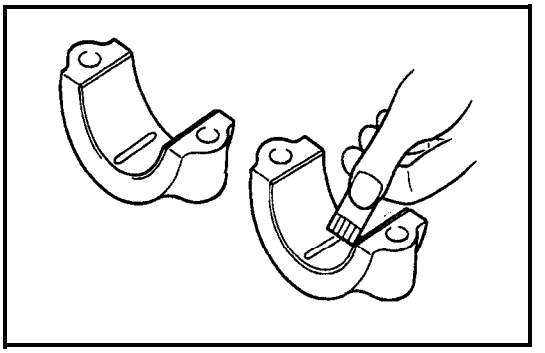
Oil Clearance Measurement

To check the oil clearance, measure the outside diameter of the crankshaft journal and the crank pin and the inside diameter of the bearing. The clearance can be obtained by calculating the difference between the measured outside and inside diameters.

Standard value	
Oil clearance	
Crankshaft main bearing	**0.02-0.05** mm (0.0008-0.0020 in.)
Connecting rod bearing	**0.02-0.05** mm (0.0008-0.0020 in.)
Limit	0.1 mm (0.004 in.)



Plastigauge Method



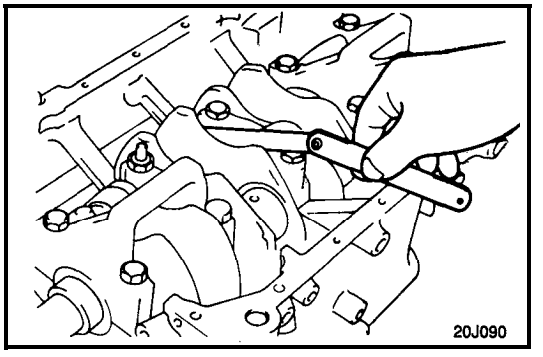
Plastigauge may be used to measure the clearance.

1. Remove oil and grease and any other dirt from bearings and journals.
2. Cut plastigauge to the same length as the width of the bearing and place it in parallel with the journal, off oil holes.
3. Install the crankshaft, bearings and caps and tighten them to the specified torques. During this operation, do not turn the crank shaft. Remove the caps. Measure the width of the plastigauge at the widest part by using a scale printed on the gauge package. if the clearance exceeds the repair limit, the bearing should be replaced.
   When installing a new crankshaft, be sure to use standard size bearings.

Oil Seal

Check front and rear oil seals for damage or worn lips. Replace any seat that is defective.

Bearing Caps



After installing the bearing caps, make sure that the crankshaft turns smoothly and the end play is correct. If the end play exceeds the limit, replace crankshaft bearings.

Standard value	0.05-0.18 mm (0.0020-0.0071 in.)
Limit	0.25 mm (0.0098 in.)

Drive Plate

Replace deformed, damaged, or cracked drive plates.

Flywheel

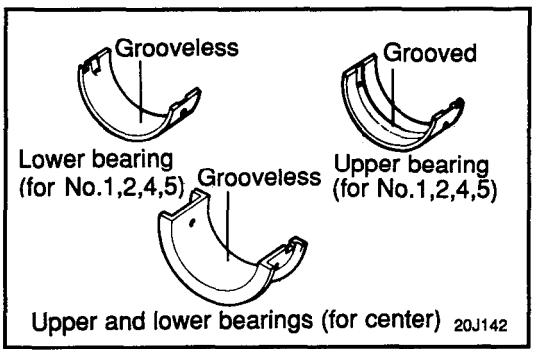
1. Check the clutch disc contacting surface of the flywheel for damage and wear. Replace the flywheel if excessively damaged or worn.
2. Check the clutch disc contacting surface of the flywheel for run-out.

Limit	
Flywheel run-out	0.13 mm (0.0051 in.)

3. Check the ring gear for damage, cracks and wear, and replace if necessary.

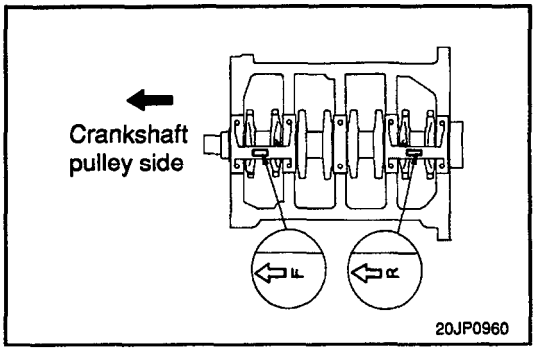
INSTALLATION

1. Install grooved main bearing (upper bearing) on cylinder block side.
2. Install grooveless main bearing (lower bearing) on main bearing cap side.
3. Both upper and lower bearings for center are grooveless.



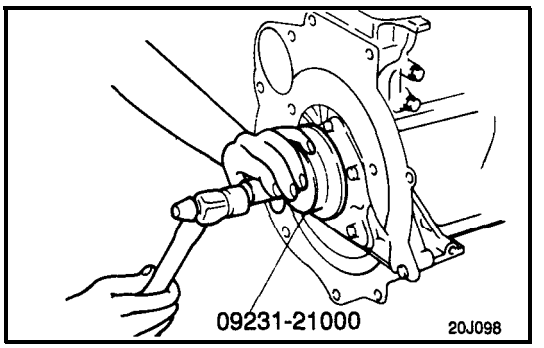
4. Install crankshaft. Apply engine oil to journal and pin.
5. Caps should be installed with arrow mark directed toward front of engine. Cap number must be correct.
6. Tighten cap bolts to specified torque in sequence of center No.2, No.4, front and rear caps.

Tightening torque	
Main bearing cap bolts	65-70 Nm (650-700 kg.cm, 47-51 lb.ft)

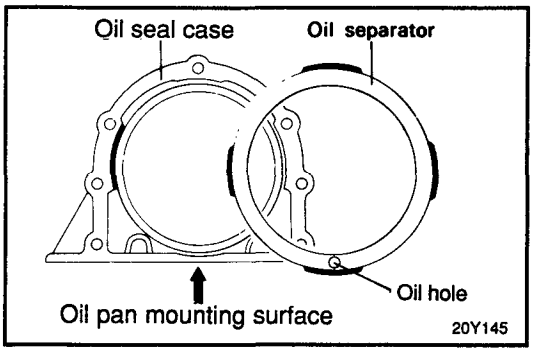


7. Cap bolts should be tightened evenly in 4 to 5 stages before they are tightened to specified torque.
6. Make certain that crankshaft turns freely and has proper end play.

9. Using special tool (09231-21000), install oil seal in oil seal case.



10. Install the oil separator into the oil seal so that the oil hole in the separator is directed downward (arrow in illustration).



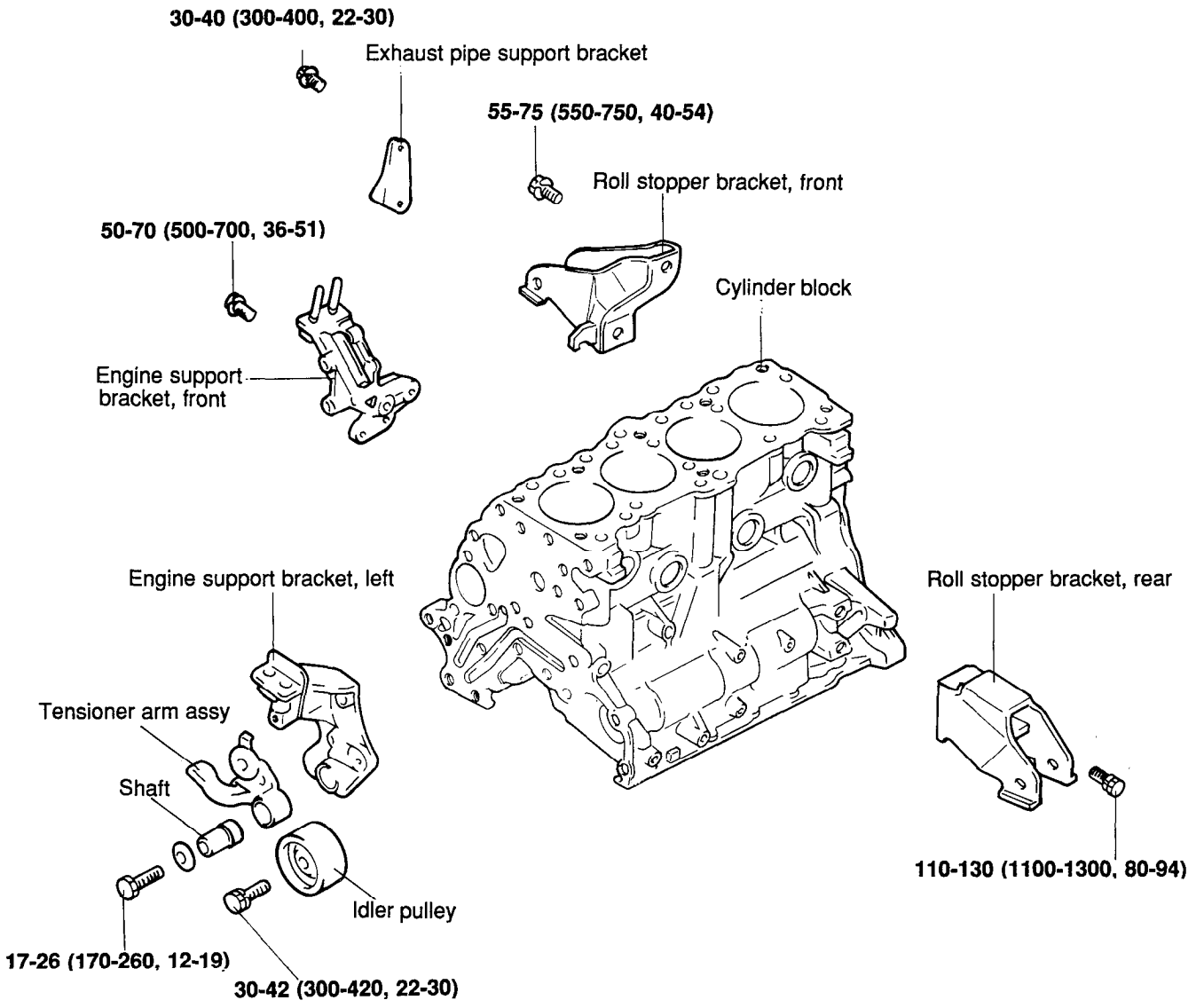
11. Install the new oil seal case gasket and oil seal case assembly.
12. Install the rear plate to the cylinder block.

13. Install the flywheel assembly and tighten the bolts to the specified torque.

Tightening torque	
Flywheel bolt	130-140 Nm (1,300-1,400 kg.cm, 94-101 lb.ft)

CYLINDER BLOCK

COMPONENTS



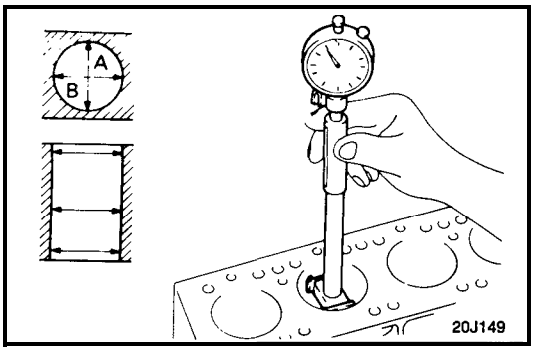
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

Remove the cylinder head, timing belt train, front case, flywheel, piston and crankshaft.
For further details, refer to the respective chapters.

INSPECTION

Cylinder Block



1. Visually check the cylinder block for scores, rust and corrosion. Also check for cracks or any other defects. Correct or replace the block if defective.
2. Measure cylinder bore with a cylinder gauge at three levels in directions of A and B.
   Level 1 : No.1 piston ring position with piston at TDC
   Level 2 : Center of cylinder
   Level 3 : Bottom of cylinder

3. If cylinder bores show more than specified out-of-round or taper, or if cylinder walls are badly scuffed or scored, cylinder block should be rebored and honed, and new oversize piston and rings are fitted.

Standard value	
Cylinder bore	
1.6L Eng.:	82.3-82.33 mm (3.2402-3.2413 in.)
1.8L Eng.:	81581.53 mm (3.2087-3.2098 in.)
Out-of-roundness and taper of cylinder bore	Max. 0.01 mm (0.0004 in.)

4. If cylinder top ridge is worn in stages, cut away with ridge reamer.
5. Oversize pistons are available in four sizes.

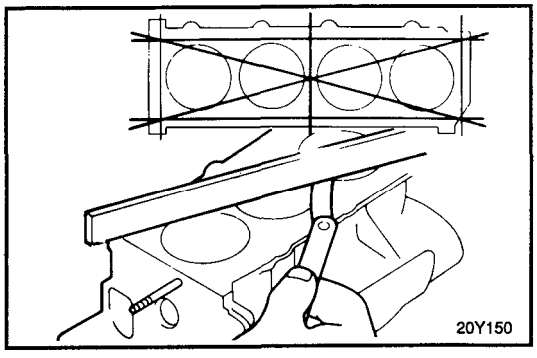
Piston service size and mark mm (in.)	
0.25 (0.010) O.S	0.25
0.50 (0.020) O.S.	0.50
0.75 (0.030) O.S.	0.75
1.00 (0.039) O.S.	1.00

6. To rebore the cylinder to oversize, keep the specified clearance between the oversize piston and the bore, and make sure that all pistons used are of the same oversize. The standard measurement of the piston outside diameter is taken at a level 2 mm (0.08 in.) above the bottom of the piston skirt and across the thrust faces.

Piston-to-cylinder wall clearance	0.02-0.04 mm (0.0008-0.0016 in.)

7. Check for damage and cracks.

8. Check top surface for flatness. If excessive flatness is evident, grind to minimum limit or replace.



Standard value	
Flatness of gasket surface	Max. 0.05 mm (0.0020 in.)
Cylinder block (New) height	275 mm (10.83 in.)[1.6L Eng.] 284 mm (11.18 in.)[1.8L Eng.]
Service limit	
Flatness of gasket surface	0.1 mm (0.0039 in.)
Overall height	-0.2 mm (-0.0079 in.)

NOTE
The cylinder block gasket surface should be ground to within -0.2 mm (-0.0079 in.) even with the grind of cylinder head gasket surface.

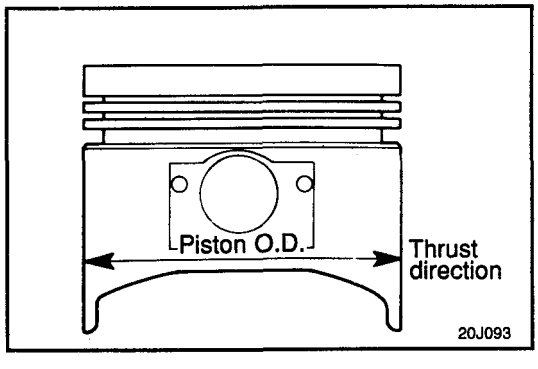
Boring Cylinder

1. Oversize pistons to be used should be determined on the basic of the largest bore cylinder.

Size	Identification mark
0.25 mm (0.010 in.) O.S	0.25
0.50 mm (0.020 in.) O.S	0.50
0.75 mm (0.030 in.) O.S	0.75
1.00 mm (0.039 in.) O.S	1.00

NOTE
Size mark is stamped on top of piston.

2. Measure outside diameter of piston to be used.
3. Based on measured piston O.D., calculate boring finish dimension.



Boring finish dimension = Piston O.D + 0.02-0.04 mm (0.0008-0.0016 in.) (clearance between O.D and cylinder)- 0.02 mm (0.008 in.) (honing margin.)

4. Bore each of the cylinders to the calculated size.

NOTE
To prevent distortion that may result from temperature rise during honing, bore cylinders, working from No.2 to No.4 **to No.1 to No.3.**

5. Hone the cylinders, finishing them to the proper dimension (piston outside diameter + gap with cylinder).
6. Check clearance between piston and cylinder.

NOTE
When boring cylinders, finish all of four cylinders to same oversize. Do not bore only one cylinder to an oversize.

INSTALLATION

1. Install the following parts by referring to the respective paragraphs.
   1) Crankshaft
   2) Flywheel
   3) Piston
   4) Cylinder head
   5) Timing belt train
   6) Front case

INTAKE & EXHAUST SYSTEM

Return To Main Table of Contents

GENERAL 2
AIR CLEANER 4
INTAKE MANIFOLD 6
EXHAUST MANIFOLD 8
MUFFLERS 9

GENERAL

SPECIFICATIONS

Air cleaner	
Type	Dry type
Filter	Unwoven cloth type
Exhaust pipe	
Muffler	Expansion resonance type
Suspension system	Rubber hangers

TIGHTENING TORQUE

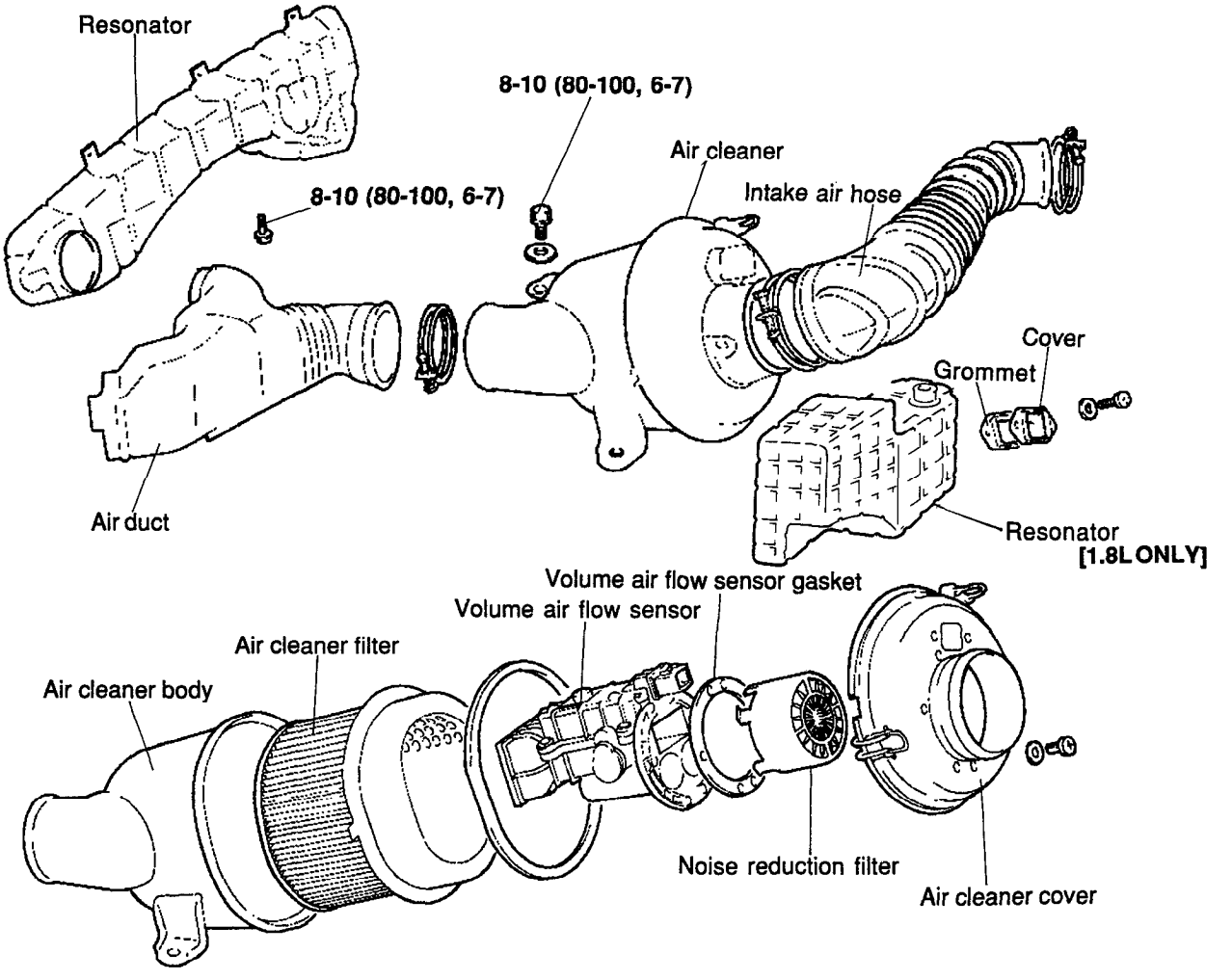
	Nm	kg.cm	lb.ft
Air cleaner mounting bolts	8-10	80-100	6-7
Resonator mounting bolt	8-10	80-160	6-7
Resonator mounting nut	4-6	40-60	3-4
Delivery pipe bolt to engine	10-13	100-130	7-9
Accelerator cable bolts to intake manifold	4-6	40-60	3-4
Throttle body to intake manifold	15-22	150-220	11-16
Intake manifold stay bolts	25-30	250-300	18-22
Intake manifold mounting bolt (M8)	15-20	150-200	11-14
Intake manifold mounting nut and bolt	30-42	300-420	22-30
Tension rod bracket bolt to tension rod	35-55	350-550	25-40
Ignition coil bolts	20-27	200-270	14-20
Power transistor bolts	10-12	100-120	7-9
EGR valve bolts	15-22	150-220	11-16
Front exhaust pipe nuts to exhaust manifold	30-40	300-400	22-29
Front exhaust pipe bolt to engine	20-30	200-300	14-22
Front exhaust pipe bolts to catalytic converter	40-60	400-600	29-43
Center exhaust pipe nuts to catalytic converter	30-40	300-400	22-29
Center exhaust pipe bolts to main muffler	30-40	300-400	22-29
Center exhaust pipe bolt to bracket	10-15	100-150	7-11
Hanger bolt to body	10-15	100-150	7-11
Hanger bolt to main muffler	10-15	100-150	7-11
Exhaust manifold nuts to engine	25-30	250-300	18-22
Heated oxygen sensor	40-50	400-500	29-36
Heat protector bolt to exhaust manifold	12-15	120-150	9-11

TROUBLESHOOTING

Symptom	Probable cause	Remedy
Exhaust gas leakage	Loose connections Broken pipe or muffler	Re-tighten Repair or replace
Abnormal noise	Detached baffle plate in muffler Broken rubber hanger Pipe or muffler contacting vehicle body Broken pipe or muffler	Replace Replace Correct Repair or replace

AIR CLEANER

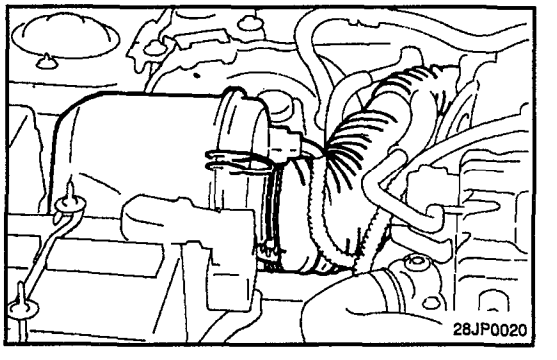
COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

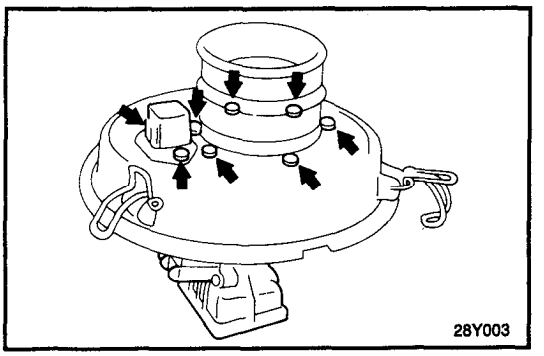
REMOVAL

1. Remove the intake air hose and air duct connected to the air cleaner, and the resonator.
2. Remove the three bolts attaching the air cleaner mounting brackets.
3. Detach the air cleaner.



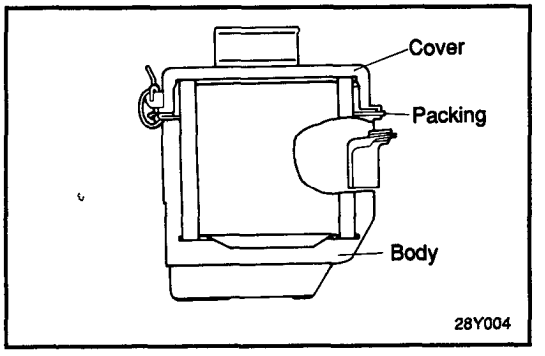
4. Remove the volume air flow sensor from the air cleaner case.

CAUTION
Do not pull on the volume airflow sensor harness, because the grommet is attached to the air cleaner case.

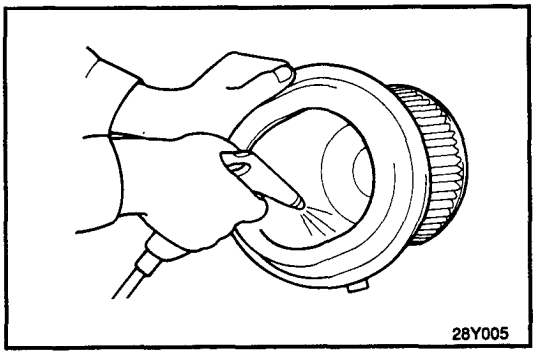


INSPECTION

1. Check the air cleaner body, cover, or packing for distortion, corrosion or damage.
2. Check the air duct for damage.



3. Check the air cleaner filter for restriction, contamination or damage.
   If the element is slightly restricted, remove the dust and other contaminants by blowing air from the inside through the filter.
4. Check the air cleaner housing for restrictions, contamination or damage.
5. Check the resonator for damage.

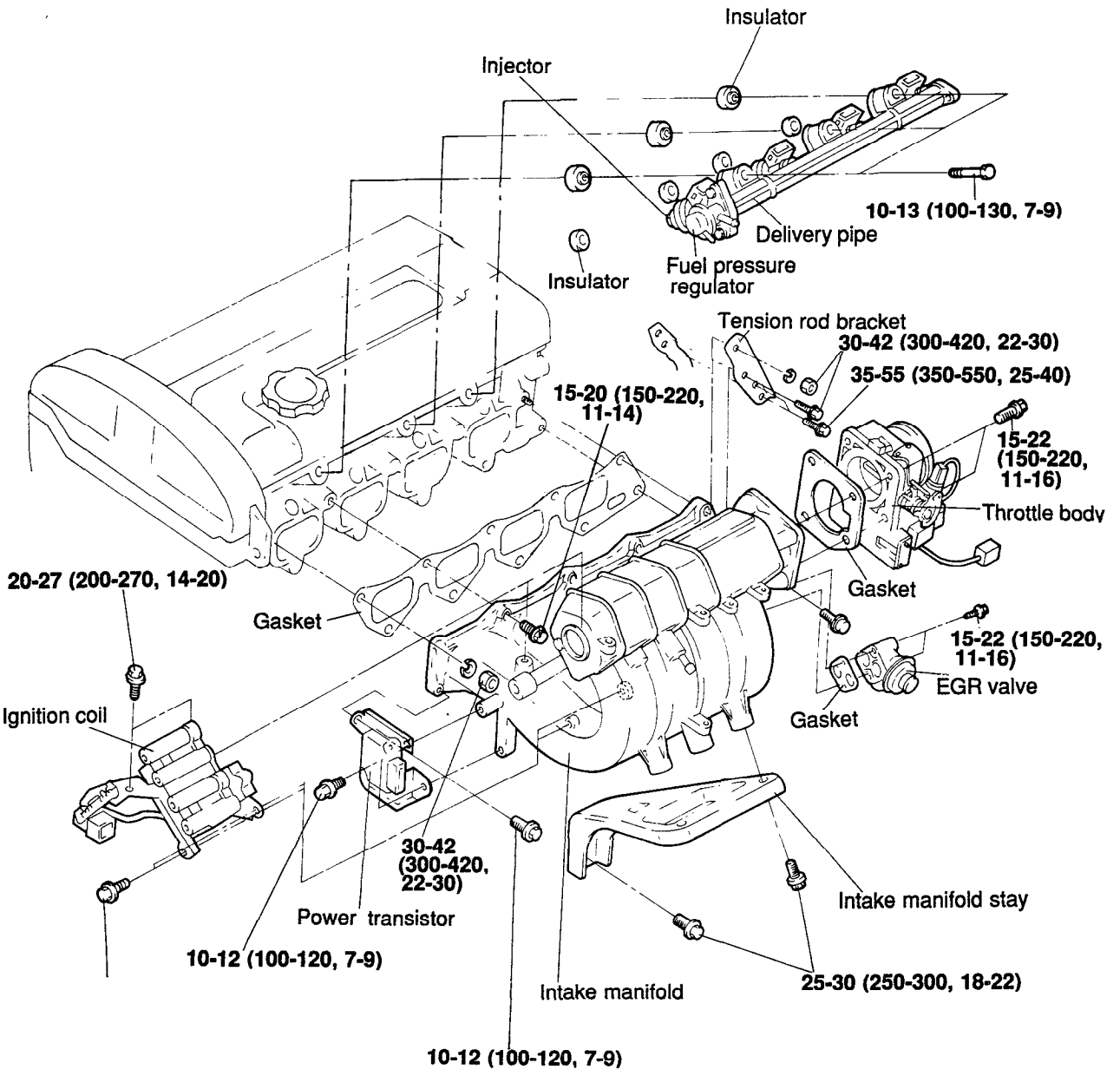


INSTALLATION

Install the air cleaner in the reverse order of removal.

INTAKE MANIFOLD

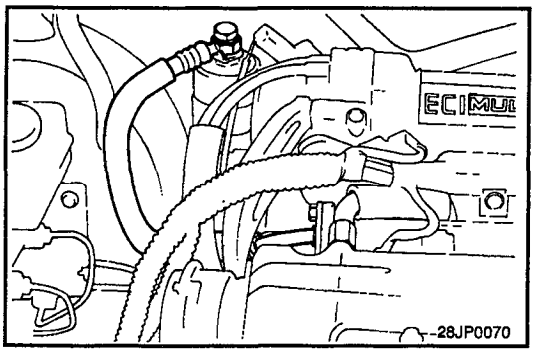
COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

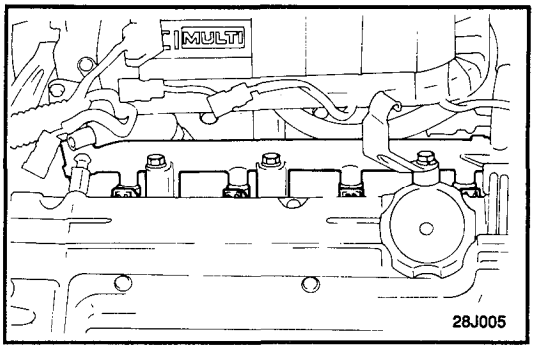
REMOVAL

1. Disconnect the high pressure fuel hose connection after relieving pressure in the fuel pipe line to prevent fuel overflow. (Refer to "Fuel system").



2. Remove the delivery pipe with the fuel injectors and pressure regulator attached.

CAUTION
Be careful not to drop the injectors when removing the delivery pipe.



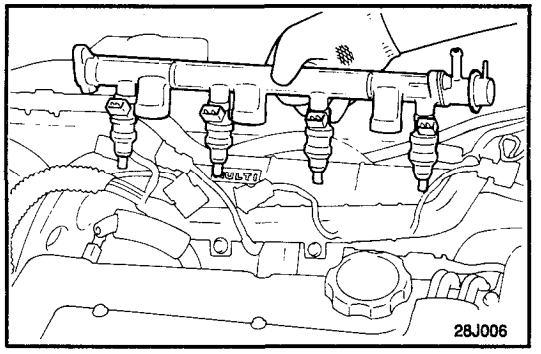
INSPECTION

Intake Manifold

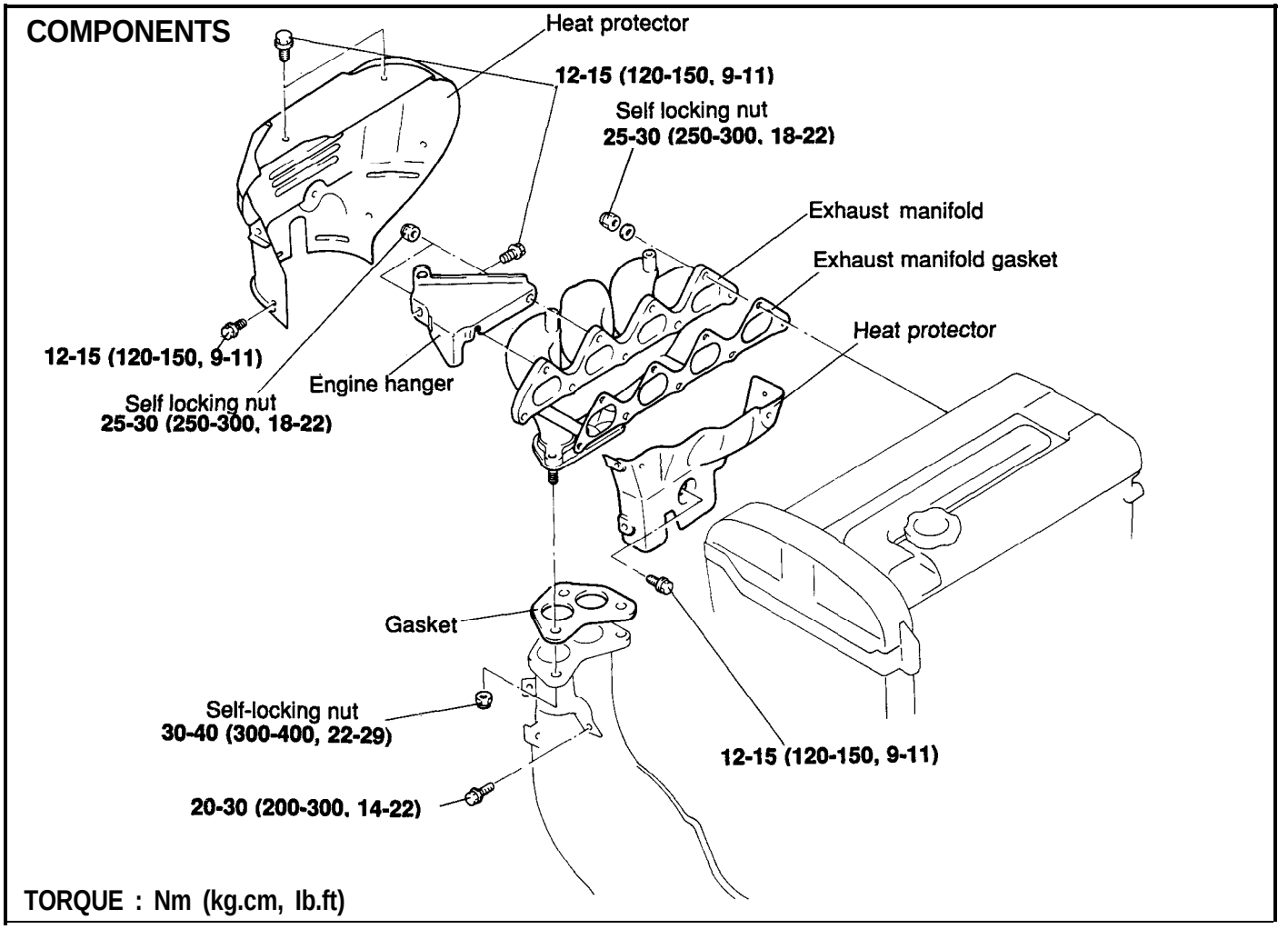
1. Check for damage or cracking of any part.
2. Check for obstruction of the vacuum outlet port, and for obstruction of the gas passage.

INSTALLATION

1. Make sure that the injector is not dropped, when installing the delivery pipe.



EXHAUST MANIFOLD



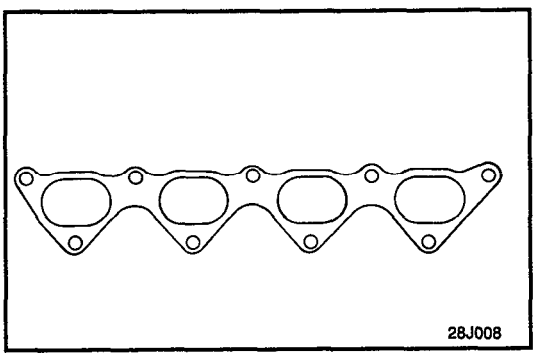
INSPECTION

Exhaust Manifold

Check for damage or cracking of any part.

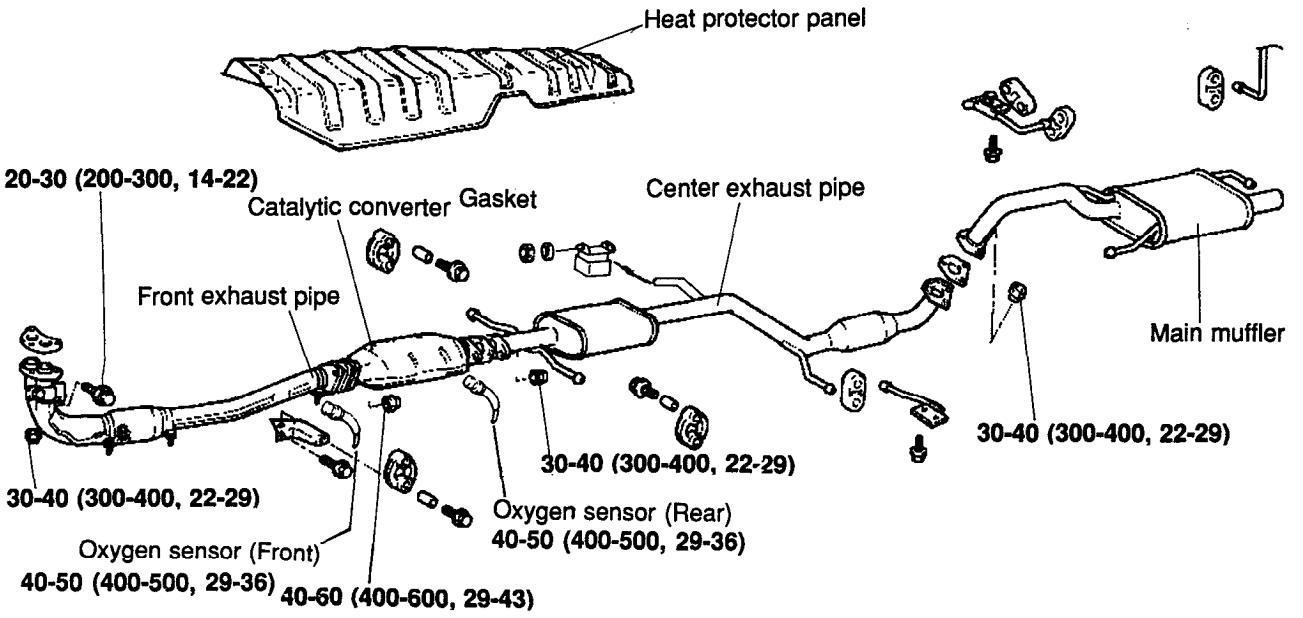
Exhaust Manifold Gasket

Check for flaking damage of the gasket.

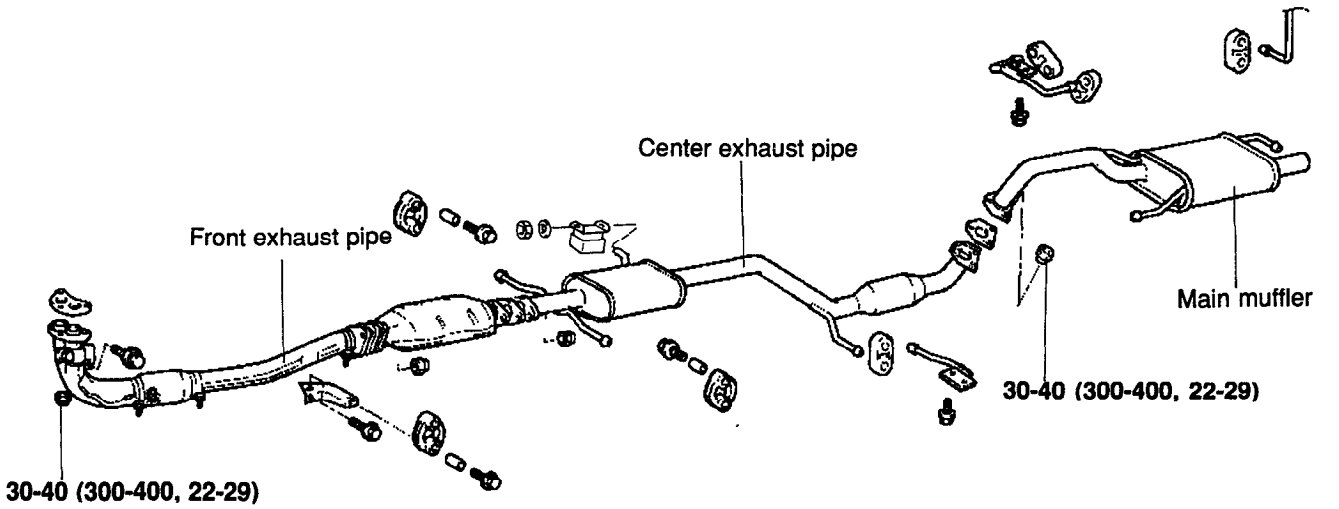


MUFFLERS

COMPONENTS



[UNLEAD Vehicles]



[LEAD Vehicles]

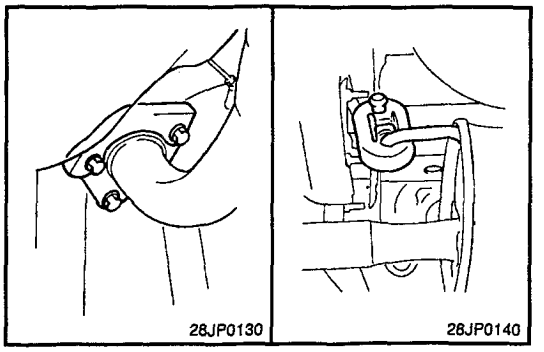
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

Main Muffler

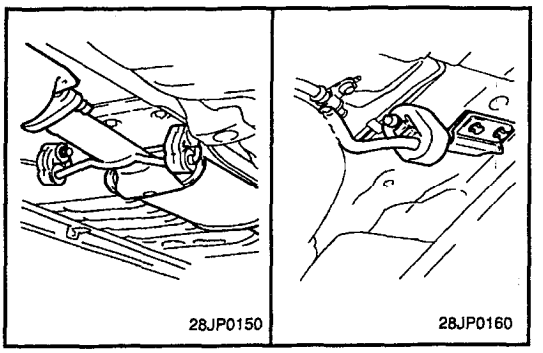
CAUTION
Before removing or inspecting the exhaust system, ensure that the exhaust system is cool enough.

1. Disconnect the main muffler from the center exhaust pipe.
2. Remove the rubber hangers and take out the main muffler.



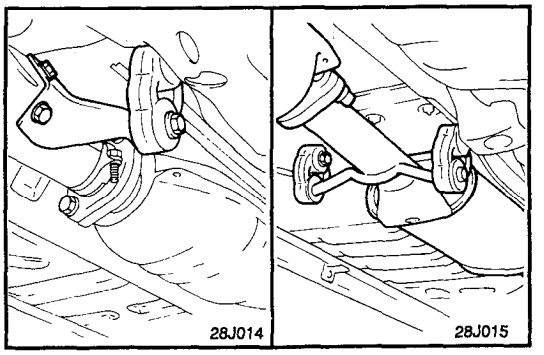
Center Exhaust Pipe

1. Disconnect the center exhaust pipe from the main muffler and the catalytic converter.
2. Remove the rubber hangers and take out the center exhaust pipe.



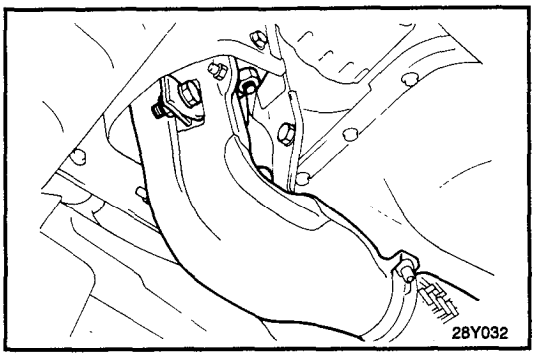
Catalytic Converter [For UNLEAD Vehicles]

1. Disconnect the center exhaust pipe from the center exhaust pipe and front exhaust pipe.
2. Remove the rubber hangers and take out the center exhaust pipe.

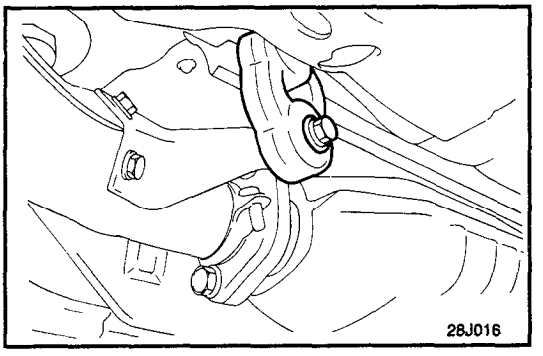


Front Exhaust Pipe

1. Remove the front exhaust pipe-to-catalytic converter mounting bolts.
2. Remove the front exhaust pipe clamp bolt and remove the exhaust manifold-to-front exhaust pipe mounting nuts.



3. Remove the front exhaust pipe from the rubber hanger.



INSPECTION

1. Check the mufflers and pipes for corrosion and damage.
2. Check the rubber hanger and hangers for deterioration and cracks.

INSTALLATION

1. Temporarily install the front exhaust pipe, the catalytic converter assembly, the center exhaust pipe, and the main muffler, in that order.
2. Install the rubber hangers so that they are identical (left and right) in length.
3. Tighten the parts securely, and then confirm that there is no interference with any body components.

LUBRICATION AND MAINTENANCE

Return To Main Table of Contents

SCHEDULED MAINTENANCE 2
RECOMMENDED LUBRICANTS AND CAPACITIES..... 4
MAINTENANCESERVICE 5

SCHEDULED MAINTENANCE

RECOMMENDED CUSTOMER MAINTENANCE

The following maintenance services must be performed to assure proper emission control and performance. Keep receipts for al vehicle emission service to keep your emission warranty in force.

Where both mileage and time are shown, the frequency of service is determined by whichever occurs first.

R : REPLACE
I : INSPECT AFTER INSPECTION, CLEAN, ADJUST, REPAIR OR REPLACE IF NECESSARY

NO.	DESCRIPTION	MILES x 1000	7.5	15	22.5	30	37.5	45	52.5	60
		KILOMETERS x 1000	12	24	36	48	60	72	84	96
		MONTHS	5	10	20	30	40	50	60	70
	EMISSION CONTROL ITEMS									
1	ENGINE OIL AND FILTER		R	R	R	R	R	R	R	R
2	FUEL FILTER								R	
3	FUEL LINES AND CONNECTIONS								I	
4	VACUUM, CRANKCASE VENTILATION HOSES								I	
5	FUEL HOSE, VAPOR HOSE & FUEL FILLER CAP								I	
6	AIR CLEANER FILTER					R				R
7	SPARK PLUGS					R				R

R : REPLACE
I : INSPECT AFTER INSPECTION, CLEAN, ADJUST, REPAIR OR REPLACE IF NECESSARY

NO.	DESCRIPTION	MILES x 1000	7.5	15	22.5	30	37.5	45	52.5	60
		KILOMETERS x 1000	12	24	36	48	60	72	84	96
		MONTHS	5	10	20	30	40	50	60	70
	GENERAL ITEMS									
1	DRIVE BELT (ENGINE COOLANT PUMP AND GENERATOR)					I				I
2	ENGINE COOLANT					R				R
3	TIMING BELT									R
4	MANUAL TRANSAXLE OIL					I				I
5	AUTO TRANSAXLE OIL			I		R		I		R
6	BRAKE FLUIE					R				R
7	BRAKE HOSES, LINES			I		I		I		I
8	REAR BRAKE DRUMS/LININGS/PARKING BRAKE					I				I
9	BRAKE PADS, CALIPERS, ROTORS			I		I		I		I
10	EXHAUST PIPE CONNECTIONS, MUFFLER & SUSPENSION BOOTS					I				I
11	STEERING GEAR RACK, LINKAGE & BOOTS					I				I
12	WHEEL BEARING GREASE					I				I
13	DRIVESHAFTS & BOOTS			I		I		I		I

MAINTENANCE UNDER SEVERE USAGE CONDITIONS

The following items must be serviced more frequently on cars normaly used under sever driving conditions. Refer to the chart below for the appropriate maintenance intervals.
(I = Inspect, correct or replace if necessary, R = Replace.)

MAINTENANCE ITEM	MAINTENANCE OPERATION	MAINTENANCE INTERVALS	DRIVING CONDITION
ENGINE OIL AND FILTER	R	EVERY 3,000 MILES (4,800 KM) OR 3 MONTHS	A, B, C, F, H
AIR CLEANER FILTER	R	MORE FREQUENTLY	C, E
SPARKPLUGS	R	EVERY 24,000 MILES (40,000 KM) OR 18 MONTHS	B, H
BRAKE PADS, CALIPERS, ROTORS	I	MORE FREQUENTLY	C, D, G, H
REAR BRAKE DRUMS/LININGS	I	MORE FREQUENTLY	C, D, G, H
STEERING GEAR RACK LINKAGE & BOOTS	I	EVERY 7,500 MILES (12,000 KM) OR 6 MONTHS	C, D, E, F, G
DRIVE SHAFTS & BOOTS	I	EVERY 7,500 MILES (12,000 KM) OR 6 MONTHS	C, E, F

SEVERE DRIVING CONDITIONS
A - Repeated short distance driving
B - Extensive idling
C - Driving in dusty conditions
D - Driving in areas using salt or other corrosive materials or in very cold weather
E - Driving in sandy areas
F - More than 50% driving in heavy city traftic during hot weather above 90°F (32°C)
G - Driving in mountainous areas
H - Towing a trailer

RECOMMENDED LUBRICANTS AND CAPACITIES

RECOMMENDED LUBRICANTS

Parts	Specifications	Remarks
Engine oil	API classification SG or SG/CD	For further details, refer to SAE viscosity number
Manual transaxle	API classification GL-4	SAE grade number: SAE 75W-85W
Automatic transaxle	GENUINE HYUNDAI AUTOMATIC TRANSMISSION FLUID, MOPAR ATF PLUS TYPE 7176 OR DIAMOND ATF SP.	MOPAR ATF PLUS TYPE 7176 is recommended lubricant
Brake	Conforming to DOT 3 or equivalent	
Rear wheel bearing	Multi-purpose grease NLGI Grade #2, EP	
Cooling system	High quality ethylene glycol	Concentration level 50%
Transaxle linkage, parking brake cable mechanism, hood lock and hook, door latch, seat adjuster, trunk latch, door hinges, trunk hinges	Multipurpose grease NLGI Grade #2	
Power steering	DEXRON or DEXRON®II type	

LUBRICANTS CAPACITIES

Description	Capacities	Remarks
Engine oil		
Oil pan	4.0 lit (4.2 U.S. qts., 3.5 Imp.qts.)	
Oil filter	0.4 lit (0.42 U.S. qts., 0.35 Imp.qts.)	
Total	4.4 lit (4.62 U.S. qts., 3.85 Imp.qts.)	
Cooling system	5.0 lit (5.4 U.S. qts., 4.8 Imp.qts.)	
Manual transaxle	1.8 lit (1.9 U.S. qts., 1.6 Imp.qts.)	
Automatic transaxle	6.1 lit (6.4 U.S. qts., 5.4 Imp.qts.)	
Power steering	0.9 lit (0.95 U.S. qts., 0.79 Imp.qts.)	

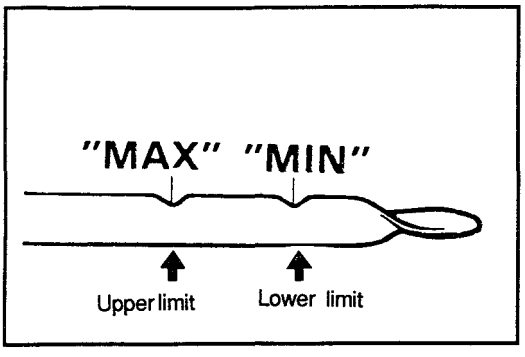
MAINTENANCE SERVICE

CHECKING ENGINE OIL

1. Position the vehicle on a level surface.
2. Warm up the engine.

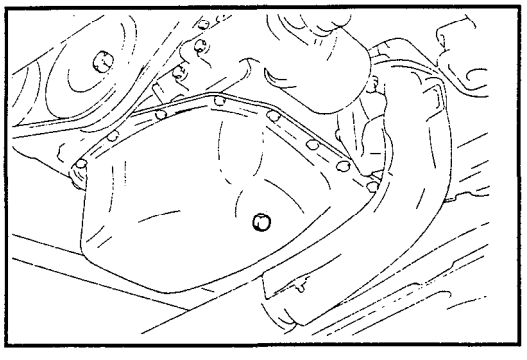
NOTE
If a vehicle that has been out of service for a prolonged period of time, warm up the engine for approximately 20 minutes.

3. Stop the engine, and wait 2 or 3 minutes, then check the oil level after engine oil drains to the oil pan.
4. Check that the engine oil level is within the level range indicated on the oil dipstick. If the oil level is found to have fallen to the lower limit (the MIN mark), refill to the "MAX" mark.



NOTE
When refilling, use the same type of engine oil as the one currently being used.

5. Check that the oil is not dirty or contaminated with coolant: or gasoline, and that it has the proper viscosity.



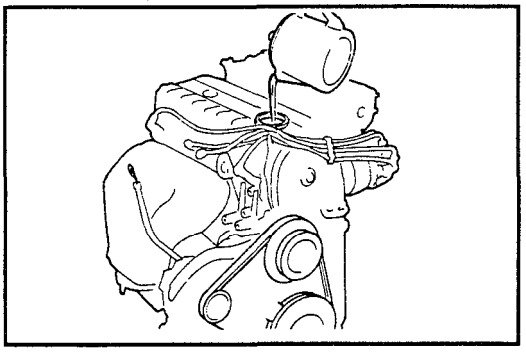
CHANGING THE ENGINE OIL

1. Warm up the engine.
2. With the engine off remove engine oil drain plug and drain oil.
3. Reinstall the drain plug and tighten.

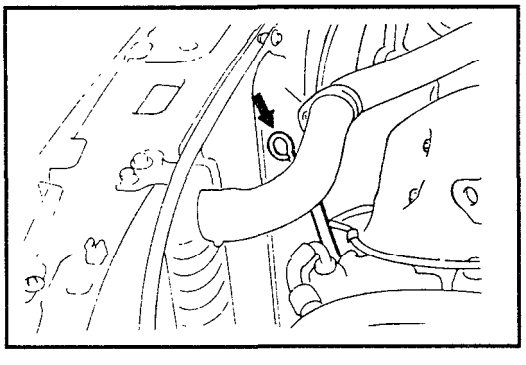
Tightening torque
Drain plug ..... **35-45** Nm (350-450 kg.cm, 25-33 lb.ft)

4. Fill the crankcase with fresh oil through the filler port.

Dry fill ..... 4.4 lit. (4.62 U.S.qts., 3.85 Imp.qts.)
Drain and refill
Without oil filter: 2.9 lit (3.06 U.S.qts., 2.55 Imp.qts.)
With oil filter: 3.3 lit (3.49 U.S.qts., 2.90 Imp.qts.)



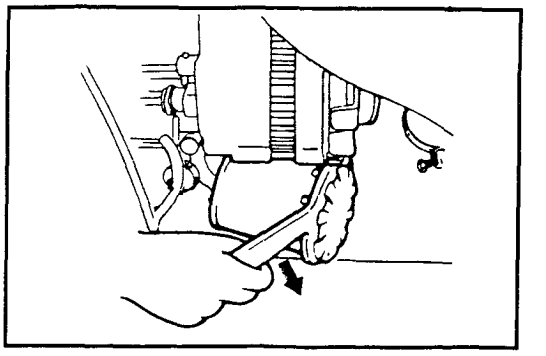
5. Check the oil level.
6. Install the filler cap.
7. After a road test, recheck the level of the engine oil.



Recommended engine oil

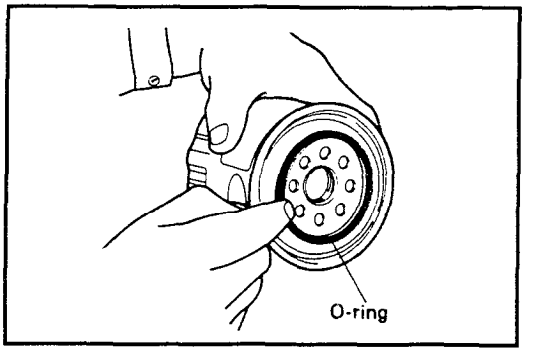
API SG or SG/CD
SAE 20W-40, 20W-50 (ABOVE 32°F OR 0°C)
10W-30, 10W-40, 10W-50 (ABOVE -10°F OR -23°C)
5W-30, 5W-40 (BELLOW 95°F OR 35°C)

REPLACEMENT OF THE ENGINE OIL FILTER



1. Replace the oil filter at every oil change.
2. Use a filter wrench to remove the oil filter.
3. Drain the oil in the filter.

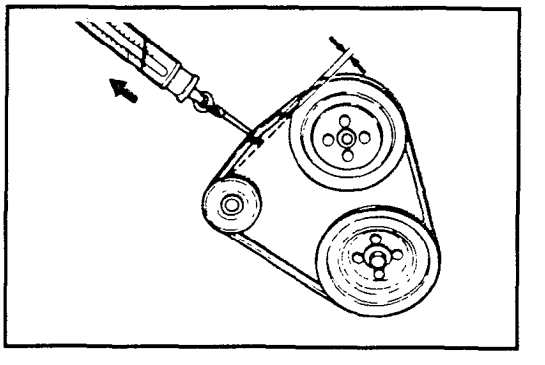
4. Lightly coat the O-ring (1) of the new oil filter with engine oil, and install the filter by turning it by hand.



CHECKING AND ADJUSTMENT OF V-BELT TENSION

Measure the deflection of the V-belt at the point shown in the illustration.

V-belt deflection [under a tension of 10 kg (22 lb)] ..... 9.0-11.5 mm (0.35-0.45 in.)



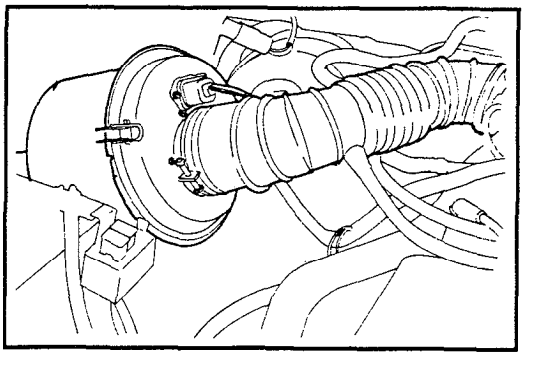
REPLACEMENT OF THE AIR CLEANER FILTER

The air cleaner filter will become dirty and loaded with dust during use and the filtering effect will be substantially reduced. Replace with a new one.

1. Remove the intake air hose and air duct.
2. Disconnect the connector for the volume air flow sensor from the air cleaner filter cover.
3. Disconnect the volume air cleaner filter cover clip.
4. Remove the air cleaner filter cover.

CAUTION
The air cleaner filter cover should be removed carefully because it includes volume the air flow sensor.

5. Remove the air cleaner filter.
6. Insert in a new air cleaner filter and clamp the air cleaner filter cover closed.



COOLING SYSTEM

Check the cooling system for damaged hoses. loose or leaking connections.

Antifreeze

The engine cooling system is provided with a mixture of 50% ethylene glycol anti-freeze and 50% water at the time of manufacture. (For the vehicles of tropical area, the engine cooling system is provided with a mixture of 40% ethylene glycol anti-freeze and 60% water at the time of manufacture.)
Since the cylinder head and engine coolant pump body are made of aluminum alloy casting, be sure to use a 30 to 60% ethylene glycol antifreeze coolant to provide corrosion protection and freezing prevention.

CAUTION
If the concentration of the antifreeze is below 30%, the anticorrosion property will be adversely affected. In addition, if the concentration is above 60%, both the antifreezing and engine cooling properties will decrease, adversely affecting the engine. For these reasons, be sure to maintain the concentration level within the specified range.

Measurement of Antifreeze Concentration

Run the engine until coolant is fully mixed. Drain some coolant (antifreeze), and measure temperature and specific gravity of the coolant. Determine concentration and safe working temperature. If the coolant is short of antifreeze, add antifreeze up to a concentration of 50%.

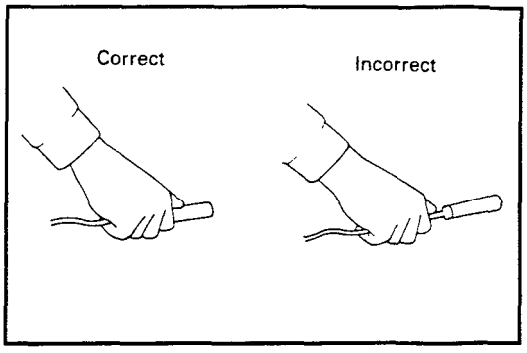
Replacement the Engine Coolant

1. Set the temperature control level to the hot position.
2. Remove the radiator cap.

   CAUTION
   Remove cap slowly as the system is pressurized and the coolant may be hot.

3. Loosen the drain plug to drain the coolant.
4. Drain the coolant from the reserve tank.
5. After draining the coolant, tighten the drain plug securely.
6. Supply the coolant into the radiator until it is filled up to its filler neck.
7. Fill into the reserve tank with coolant.
8. After warming the engine until the thermostat opens, remove the radiator cap and check the coolant level.
9. Fill the radiator with coolant up to the filler neck, and install the radiator cap securely.
10. Fill the reserve tank with coolant up to the “FULL” line.

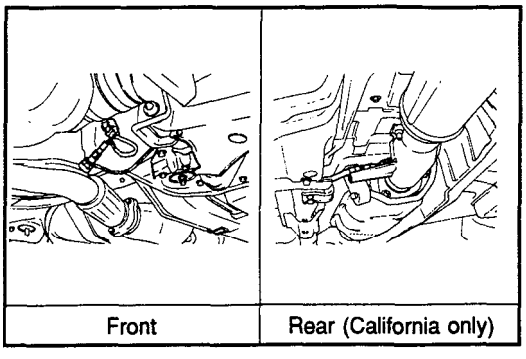
REPLACEMENT OF IGNITION CABLES



The ignition cables should be replaced periodically with new ones. After replacing, make sure that the ignition cables and terminals are properly connected and fully seated.

NOTE
When disconnecting an ignition cable be sure to hold cable cap. If the cable is disconnected by pulling on the cable alone an open circuit might result.

REPLACEMENT HEATED OXYGEN SENSOR



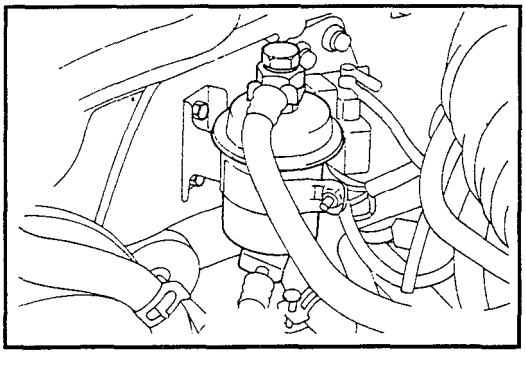
The heated oxygen sensor is a device which controls the fuel mixture. If the heated oxygen sensor is damaged, the exhaust-gas cleaning effect as well as driveability deteriorates. Therefore, it should be replaced periodically with a new one.

FUEL SYSTEM

Tank, Lines And Connections

1. Check for damage or leakage in the fuel lines and connections.
2. Inspect the surface of fuel hoses for heat and mechanical damage. Hard and brittle rubber, cranking, checking, tears, cuts, abrasions and excessive swelling indicate deterioration of the rubber.
3. If the fabric casing of the rubber hose is exposed by cracks and abrasions in the fuel system, the hoses should be changed.

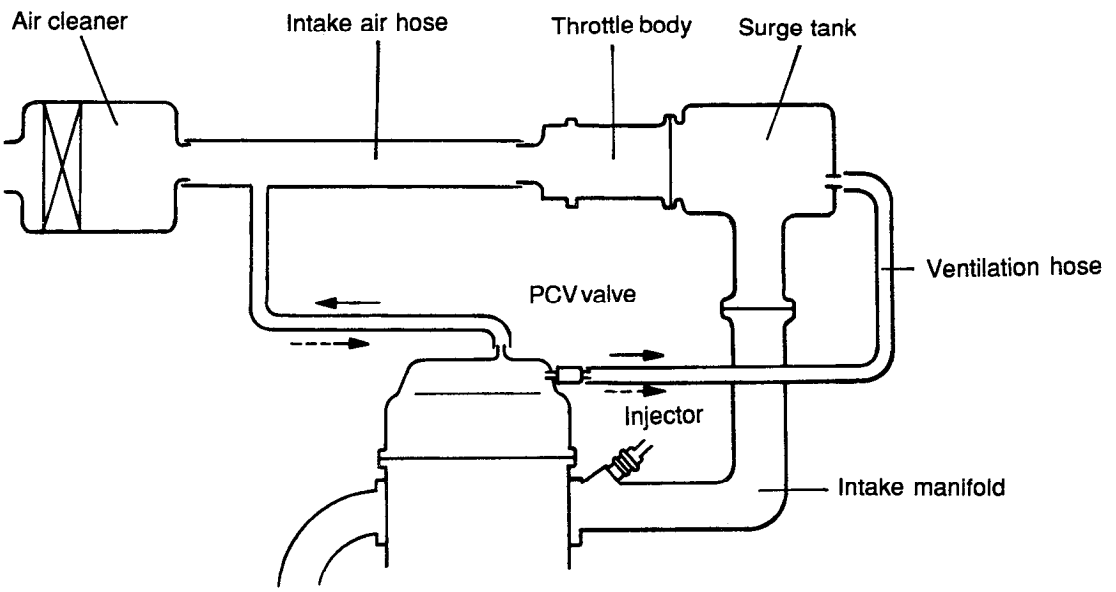
Fuel Filter



The fuel filter should be replaced regularly because its performance is reduced by dirt and water collected over an extended period of use. Replace as required.

CRANKCASE EMISSION SYSTEM (PCV valve)

The crankcase ventilation system must be kept clean to maintain good engine performance.
Periodic servicing is required to remove combustion By-products from the PCV valve.



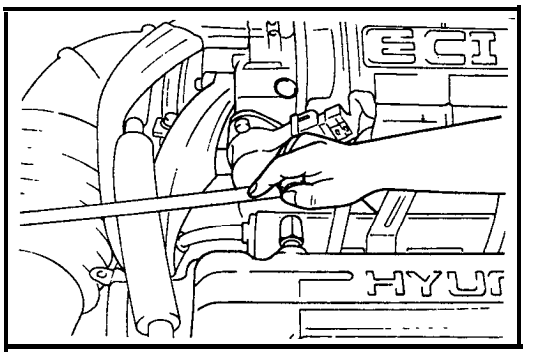
Blow-by gas →

Fresh air - - →

1. Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve. Then, remove PCV valve from the rocker cover and reconnect it to the ventilation hose.
2. Idle the engine and put a finger to the open end of PCV valve to make sure that intake manifold vacuum is felt on the finger.

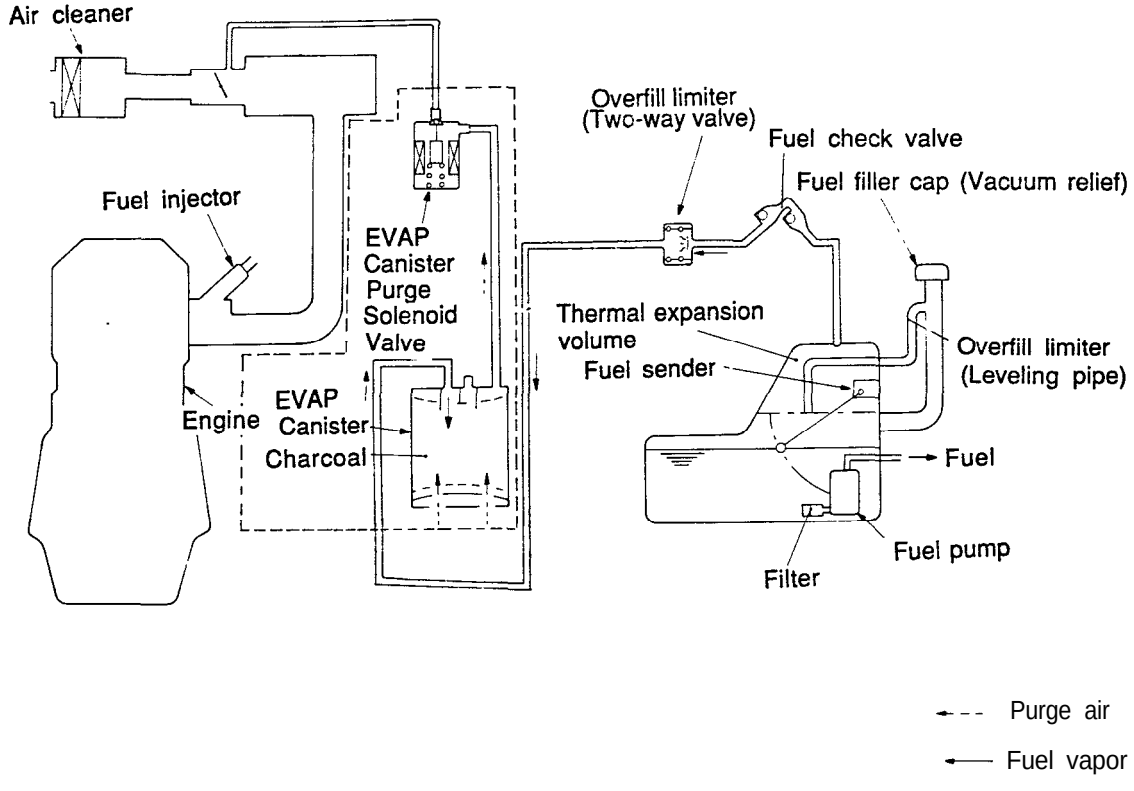
   NOTE
   At this time, the plunger inside the PCV valve should move back and forth.

3. If vacuum is felt, replace the PCV valve and clean the ventilation hose in cleaning solvent or replace if necessary.



EVAPORATIVE EMISSION SYSTEM

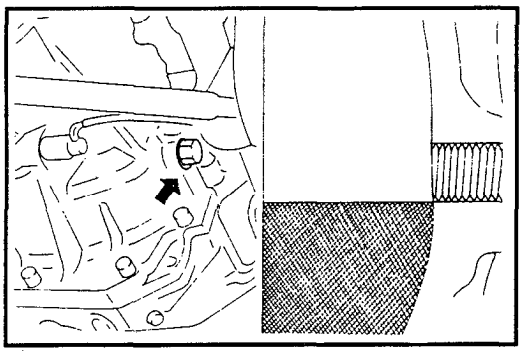
1. If the fuel-vapor vent line is clogged or damaged, a fuel-vapor mixture excapes into the atmosphere causing excessive emissions. Disconnect the line at both ends, and blow it clean with compressed air. Remove the filler cap from the filler pipe and check to see if there is evidence that the packing makes improper contact to the filler pipe.
2. The overfill limiter (Two-way valve) installed on the vapor line between the EVAP canister inlet and fuel tank outlet should be checked for correct operation.



EVAP CANISTER (Replacement)

If the EVAP canister filter becomes clogged, the purge air volume will decrease and the EVAP canister should be reduced.

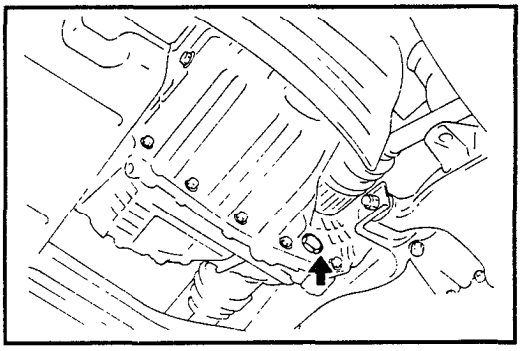
MANUAL TRANSAXLE (Inspect oil level)



Inspect each component for evidence of leakage, and check the oil level by removing the filler plug. If the oil is contaminated, it is necessary to replace it with new oil.

1. With the vehicle parked at a level place, remove the filler plug and make sure that oil level is at the same level as the plug hole.
2. Check to be sure that the transaxle oil is not dirty.

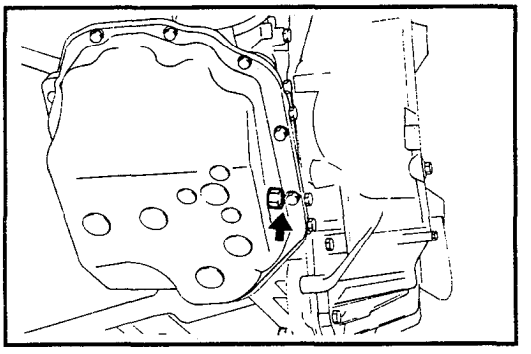
TRANSAXLE OIL (Replacement)



1. With the vehicle parked at a level place, remove the magnetic drain plug to drain transaxle oil.
2. Replace waswer with a new one and install the magnetic plug.
3. Pump transaxle oil (through the filler plug hole) until the oil level is at the same level as the plug hole.

Transaxle oil capacity :
1.8 liters (1.9 U.S. qts., 1.6 Imp. qts.)

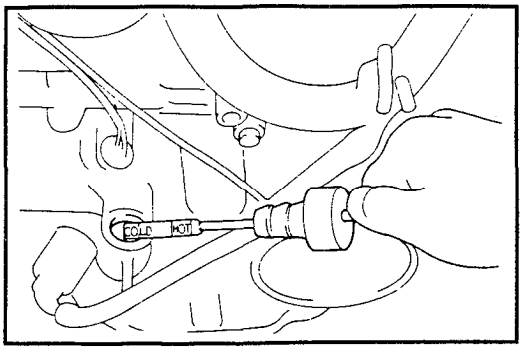
AUTOMATIC TRANSAXLE (Change fluid)



Drain the fluid and check whether there is any evidence of contamination.
Replenish with new fluid after the cause of any contamination has been corrected.

1. Remove drain plug at differential bottom to let fluid drain.
2. Place a drain container with large opening under the transaxle oil pan.
3. Loosen oil pan bolts and tap pan at one corner to break it loose allowing fluid to drain, then remove oil pan.
4. Check the oil filter for clogging and damage and replace if necessary.
5. Clean drain plug and tighten drain plug with gasket to 30-35 Nm (300-350 kg.cm, 22-25 lb.ft).
6. Clean both gasket surfaces of transaxle case and oil pan.
7. Install oil pan with new gasket and tighten oil pan bolts to 10-12 Nm (100-120 kg.cm, 7.5-8.5 lbft).
8. Pour 4 liters (4.2 U.S.qts., 3.5 Imp.qts.) of AFF into case through dipstick hole. [Total quantity of ATF required is approx. 6.1 liters (6.4 U.S.qts., 5.4 Imp.qts.). However, approx. 4.5 liters (4.8 U.S.qts., 4.0 Imp.qts.) of fluid can be replaced, the ballance of the fluid remains in the torque converter.]

9. Start engine and allow to idle for at least two minutes. Then, with parking brake on, move selector lever momentarily to each position., ending in “N” Neutral position.
10. Add sufficient ATF to bring fluid level to lower mark.
    Recheck fluid level after transmission is at normal operating temperature.
    Fluid level should be between upper and lower marks of “HOT” range. Insert dipstick fully to prevent dirt from entering transmission.

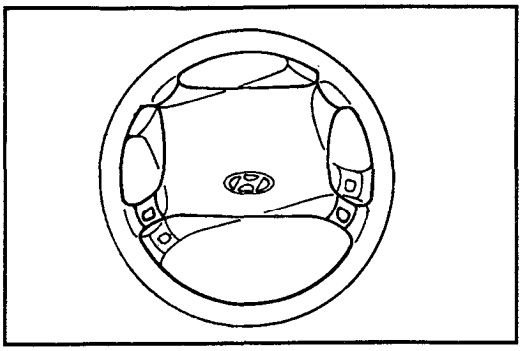


INSPECT STEERING LINKAGE

1. Check steering wheel freeplay.

Maximum steering wheel freeplay	30 mm (1.181 in.)

2. Check steering linkage for looseness and damage as follows.
   1) Tie rod ends do not have excessive play.
   2) Dust seals and boots are not damaged.
   3) Boot clamps are not loose.



POWER STEERING OIL PUMP BELT (Check and service as required)

1. Inspect the belt for evidence of cuts and cracks. Replace, if necessary.
2. Check belt for proper tension. If necessary, adjust the belt tension as follows.
   1) Push the belt with a force of 98 N (22 lb) at a point halfway between the power steering oil pump pulley and engine coolant pump pulley. The belt deflection should be 6 to 9 mm **(0.24-0.35** in.)
   2) If belt deflection is not within specified limits, loosen oil pump mounting bolt, and move the oil pump to obtain proper belt deflection at 98 N (22 lb) force.

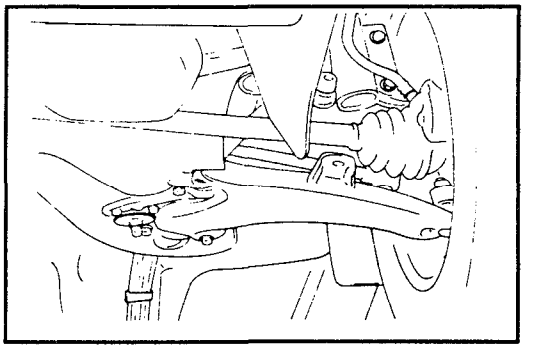
POWER STEERING FLUID LEVEL (Inspect fluid level)

1. Park the vehicle on a flat, level surface, start the engine, and then turn the steering wheel several times to raise the temperature of the fluid to approximately 50°C (122°F).
2. With the vehicle still idling, turn the wheel all the way to the left and right several times.
   Check the fluid in the oil reservoir for foaming, check the fluid level, and add fluid in the oil reservoir through the oil filler if necessary.

POWER STEERING HOSES (Check for deterioration or leaks)

1. Check the hose connections for fluid leaks.
2. The power steering hoses should be replaced if there are severe surface cracking, pulling, scuffing or worn steps. Deterioration of the hoses could cause premature failure.

BALL JOINT AND STEERING LINKAGE SEALS, STEERING AND DRIVE SHAFT BOOTS



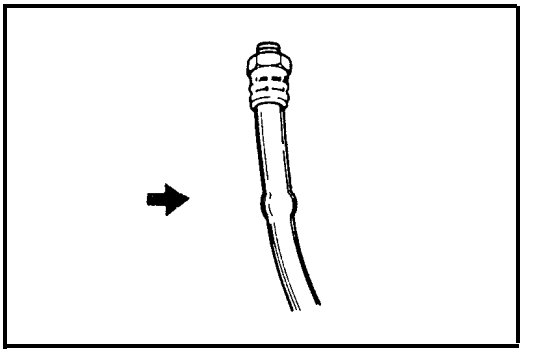
1. These components, which are permanently lubricated at the factory, do not require periodic lubrication. Damaged seals and boots should be replaced to prevent leakage or contamination of the grease.
2. Inspect the dust cover and boots for leakage and damage. Replace them if defective.

REAR WHEEL BEARINGS (Inspect for grease leaks)

Inspect for evidence of grease leakage around the hub cap and the back of the hub. If there is leakage of grease, remove the hub and inspect its oil seal for damage. Clean the grease off the hub and bearing and repack with specified new grease.

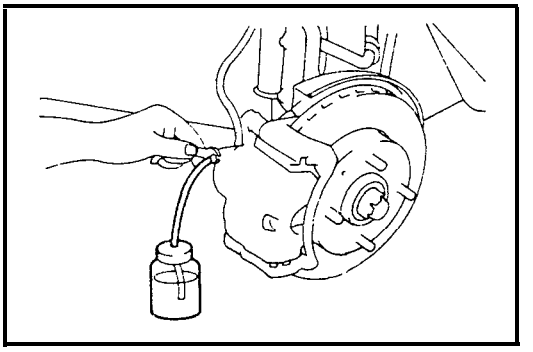
Specified grease :
Multipurpose grease SAE J310a, NLGI No. 2

INSPECT BRAKE LINE



1. Check all brake pipes and hoses for damage, wear, cracks, corrosion, leaks, bends, twists.
2. Check all clamps for tightness.
3. Check that the lines are clear of sharp edges, moving parts and the exhaust system.

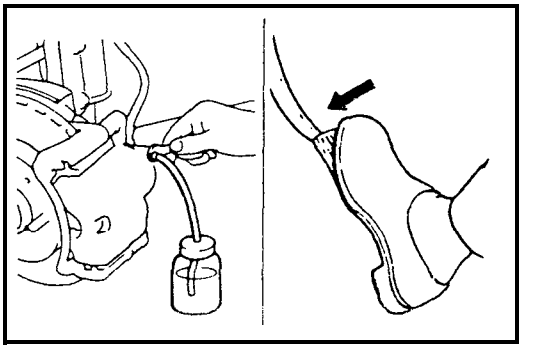
CHANGING OF THE BRAKE FLUID



1. Refer to page 58-5 for air-bleeding procedures.
2. Connect a vinyl tube to the bleeder screw of each wheel cylinder. Put the other end of the vinyl tube in a vessel for receiving the brake fluid.

3. Depress the brake pedal a few times. Then loosen the bleeder (with the brake pedal still depressed), and tighten it after the brake fluid stops flowing.
4. Repeat the above operation until no air bubbles are in the brake fluid.
5. Repeat these steps for the other cylinders.
6. Add fresh brake fluid up to the "MAX" level in the reserve tank.

Brake fluid . . . . . DOT 3 or equivalent



CHECKING TIRE INFLATION PRESSURE

Check the Tire inflation Pressures as Follows.

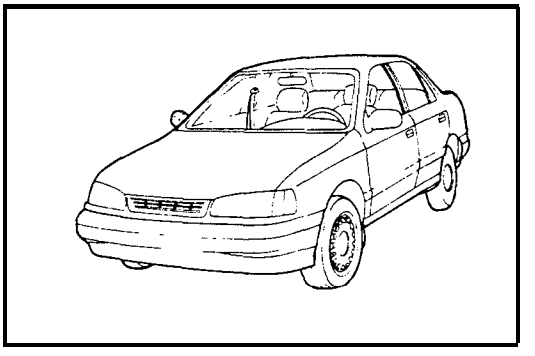
TIRE INFLATION PRESSURE (Check with Tires Cool)

Tire size	Front	Rear
P175/65 HR 14 P185/60 HR 14	200 kPa (29 psi)	200 kPa (29 psi)
T125/70 D 15 (Temporary)	414 kPa (60psi)	414 kPa (60 psi)

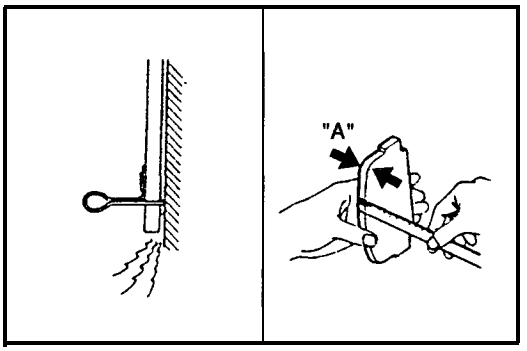
ROAD TEST

Drive the vehicle and check for abnormal conditions.

1. Check for oil, fluid, fuel, engine coolant and exhaust gas leaks.
2. Check free play of clutch pedal and brake pedal.
3. Check operation of brake booster.
4. Check operation of service brake and parking brake systems.
5. Check stroke of parking brake lever.
6. Check driveability of engine.
7. Check condition of instruments, gauges, indicators, exterior lamps, heater and ventilators.
8. Check abnormal noise.



FRONT AND REAR DISC BRAKE PADS



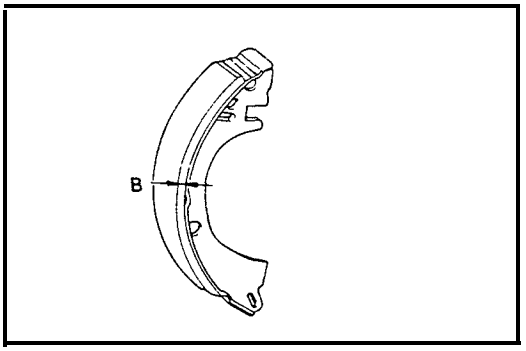
Check for fluid contamination and wear. Replace complete set of pads if defective.

NOTE:
If a squealing or scraping noise occurs from the brakes during driving, check rod pad wear indicator contacting the disc, the brake pad should be replaced.

CAUTION
The pads for the right and left wheels should be replaced at the same time. Never "split" or intermix brake pad sets.
All pads must be replaced as a complete set.

Thickness of pad lining "A" [Limit]	2.0 mm (0.079 in.)

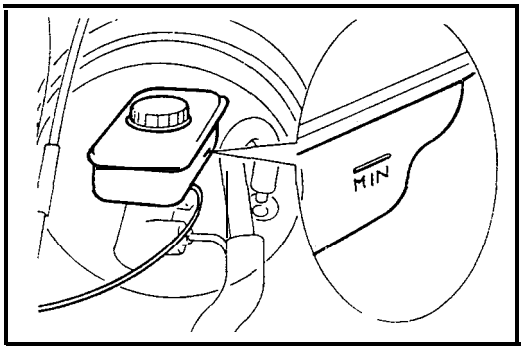
REAR DRUM BRAKE LININGS AND REAR WHEEL CYLINDERS



1. Remove the brake drum and check the thickness of brake shoe lining for wear. Check the automatic brake adjusting system by hand to see if it operates smoothly. Also see if the gears are in proper mesh with each other. To assure smooth functioning, apply a very thin coat of grease to the friction surface of adjuster and link shaft.
2. Inspect the wheel cylinder boots for evidence of a brake fluid leak. Visually check the boots for cuts, tears or heat cracks. (A slight amount of fluid on the boot may not be a leak, but may be preservative fluid used at assembly.)
   1) Check the brake shoes for wear.

Thickness of lining "B" [Limit]	1.5 mm (0.059 in.)

CHECKING THE BRAKE FLUID LEVEL



1. Visually check the level of the brake fluid in the reserve tank of the master cylinder.
2. The level should be between the "MAX" and "MIN" marks.
3. If the level is lower than the "MIN" marks, add fresh brake fluid up to the "MAX" mark.

FUEL SYSTEM

Return To Main Table of Contents

GENERAL 2
SERVICE ADJUSTMENT PROCEDURES 23
MFI COMPONENTS INSPECTION 33
INJECTOR 88
THROTTLE BODY 90
FUEL TANK 91
FUEL LINE AND VAPOR LINE 95
ENGINE CONTROL 97

GENERAL

SPECIFICATIONS

Fuel tank	
Capacity	52 lit. (13.8 US. gal., 11.4 Imp.gal.)
Fuel filter	
Type	High pressure type
Fuel pump	
Type	Electrical, in-tank type
Driven by	Electric motor
Throttle body	
Throttle position sensor (TP Sensor)	
Type	Variable resistor type
Resistance	3.5-6.5 kΩ
Output voltage at curb idle	0.48-0.52 V
Idle speed control (ISC) motor	
Type	Stepper motor
Resistance	28-33 Ω at 20°C (68°F)
Idle position switch	
Type	Contact type within ISC motor
Input sensor	
Voluem air flow sensor (VAF Sensor)	
Type	Karman vortex type
Intake air temperature (IAT) sensor	
Type	Thermistor type
Resistance	2.33-2.97 kΩ at 20°C (68°F)
Engine coolant temperature (ECT) sensor	
Type	Thermistor type
Resistance	2.5 kΩ at 20°C (68°F) 0.3 kΩ at 80°C (176°F)
Heated oxygen sensor (HO2S)	
Type	Zirconia sensor
Vehicle speed sensor	
Type	Reed switch type
Camshaft position (CMP) sensor	
Type	Photo diode sensor
Crankshaft position (CKP) sensor	
Type	Photo diode sensor
Output actuator	
Injector	
Type	Electromagnetic type
Number	4
Coil resistance	13-16 Ω at 20°C (68°F)
Fuel pressure regulator	
Regulated pressure	330 kPa (3.35 kg/cm^2, 48 psi)

SEALANT

Engine coolant temperature sensor assy	LOCTITE 962T or equivalent
Engine coolant temperature sender	Three bond No.2310 or equivalent

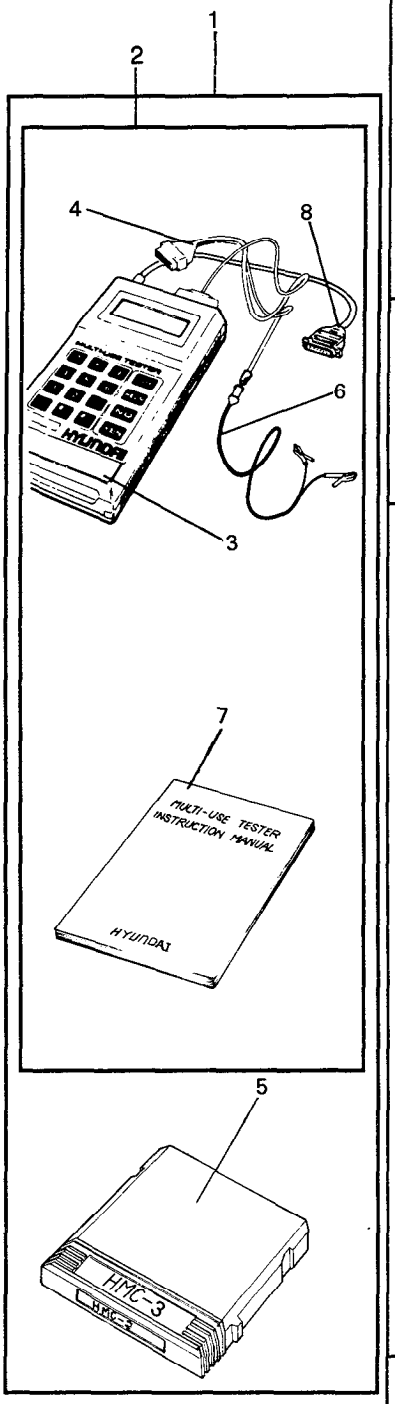
SERVICE STANDARD

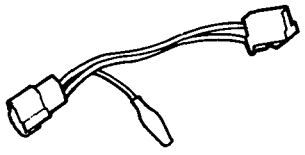
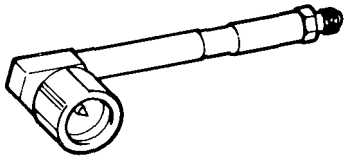
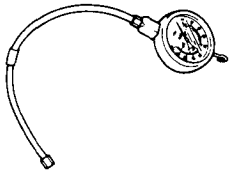
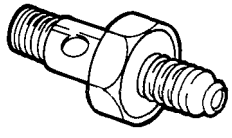
Basic ignition timing	BTDC $5^0 \pm 2^0$ at curb idle
Curb idle speed	750 ± 100 rpm [For 1.6L Engine] 700 ± 100 rpm [For 1.8L Engine]
Throttle position sensor (TP Sensor) adjustment voltage	0.48-0.52 V at curb idle

TIGHTENING TORQUE

	Nm	Kg.cm	lb.ft
Delivery pipe installation bolts	10-13	100-130	7-9
Engine coolant temperature sensor	20-40	200-400	14-29
Heated oxygen sensor (HO2S)	40-50	400-500	29-36
Throttle position sensor (TP Sensor) installation screw	1.5-2.5	15-25	1.1-1.8
Fuel pressure regulator bolts	8-10	80-100	6-7
High pressure hose and fuel filter	25-35	250-350	18-25
High pressure hose and fuel tank	30-40	300-400	22-29
Throttle body to surge tank bolts	15-22	150-220	11-16
Fuel tank drain plug	15-25	150-250	11-18
Fuel filter mounting bolts	9-14	90-140	7-10
Accelerator arm bracket bolts	9-14	90-140	7-10

SPECIAL TOOLS

Tool (Number and name)	Illustration	Use
09391-33002 1. Scan Tool (ST) ass'y (Without Adapter Ass'y)		
09391-33100 2. Scan Tool sub ass'y		
09391-33200 3. Scan Tool main body		Diagnostic tester for MFI, automatic transaxle and cruise control systems
09391-33300 4. Wiring harness		
09391-33402 5. Rom-pack (HRP-B)		
09391-33500 6. Battery harness		
09391-33600 7. Instruction manual		
09391-33700 8. P/C connector (RS-232C)		For connection to the external communication device such as personal computer etc. in using Scan Tool.

Tool (Number and name)	Illustration	Use
09273-24000 Test harness connector		Engine r.p.m. check
09353-24000 Fuel pressure gauge connector		Connection of fuel pressure gauge to delivery pipe for measurement of fuel pressure.
09353-24100 Fuel pressure gauge & hose		
09353-24200 Fuel pressure gauge adapter		
J-38228 Fuel pressure gauge kit Includes-l each 09353-24000 09353-24100 09353-24200		

TROUBLESHOOTING

When checking engine troubles, it is important to start with an inspection of the basic systems. If one of the following conditions exists, (A) engine start failure, (B) unstable idling or (C) poor acceleration, begin by checking the following basic systems.

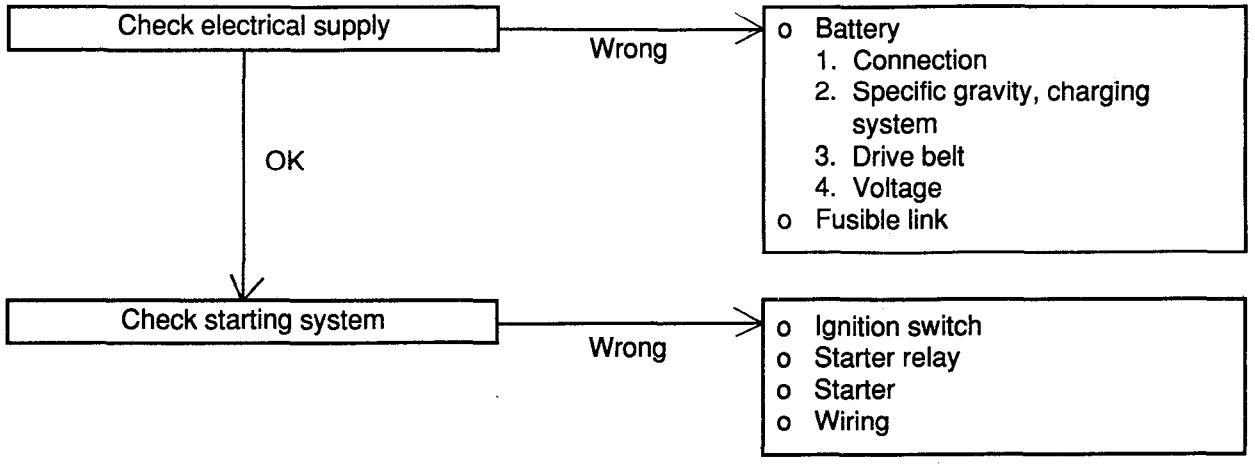
1. Power supply
   1) Battery
   2) Fusible link
   3) Fuse
2. Body ground
3. Fuel supply
   1) Fuel line
   2) Fuel filter
   3) Fuel pump
4. Ignition system
   1) Spark plug
   2) High-tension cable
   3) Ignition coil
5. Emission control system
   1) PCV system
   2) EGR system
   3) Vacuum leak
6. Others
   1) Ignition timing
   2) Idle speed

Troubles with the MFI system are often caused by poor contact of the harness connectors. It is important to check all harness connectors and verify that they are securely connected.

MFI TROUBLESHOOTING PROCEDURES

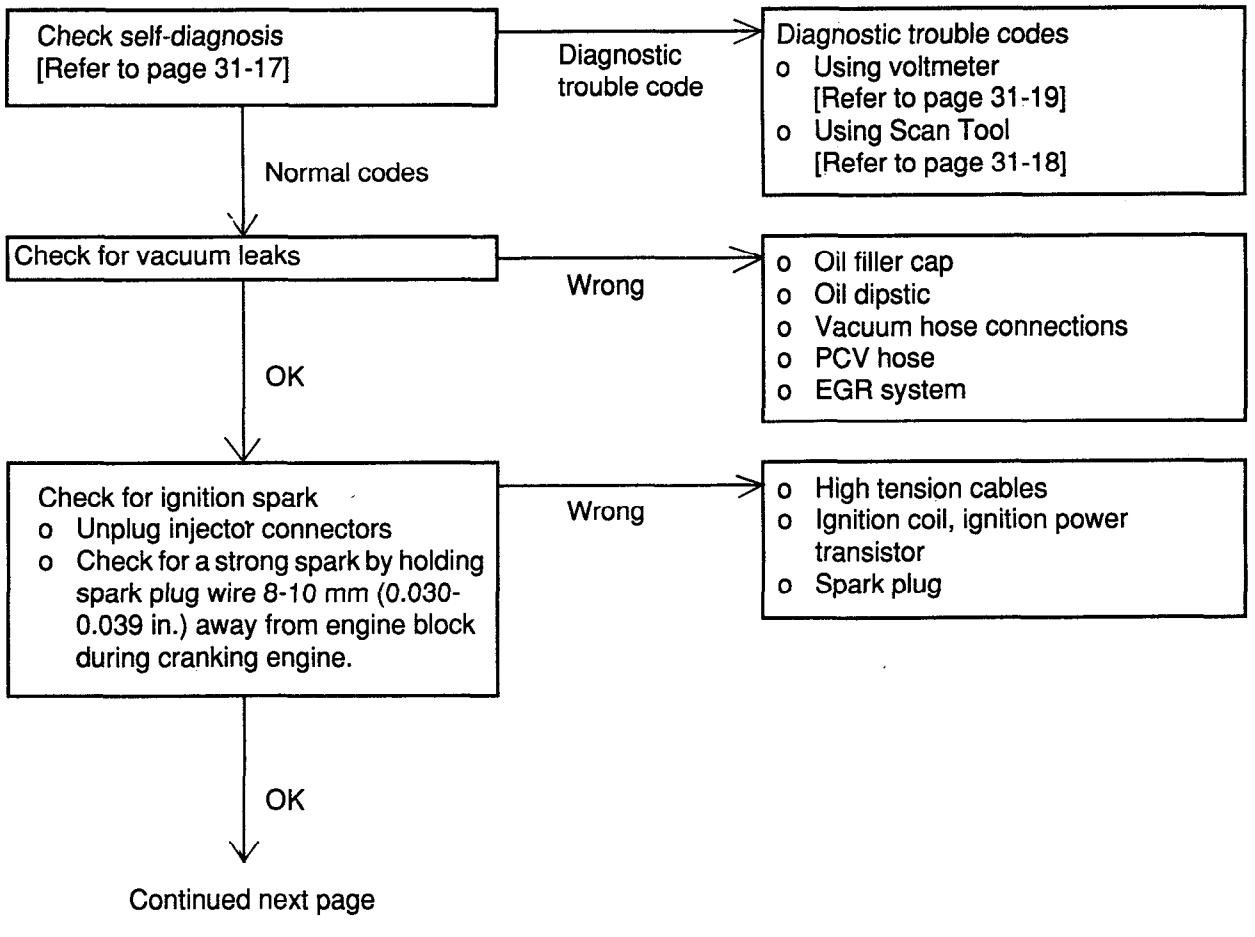
PROBLEM

Engine will not start



PROBLEM

Hard to start (Cranks OK)



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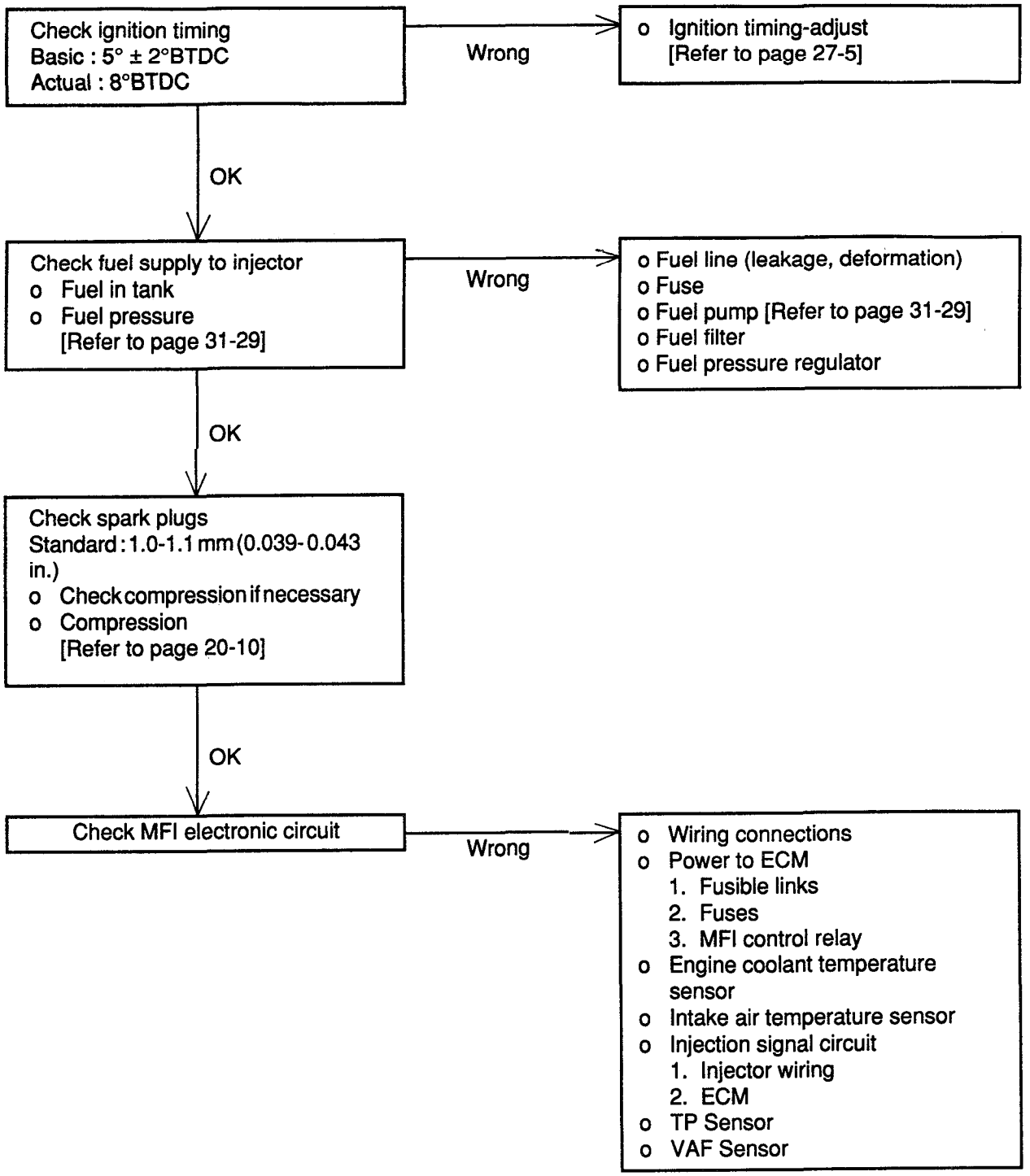
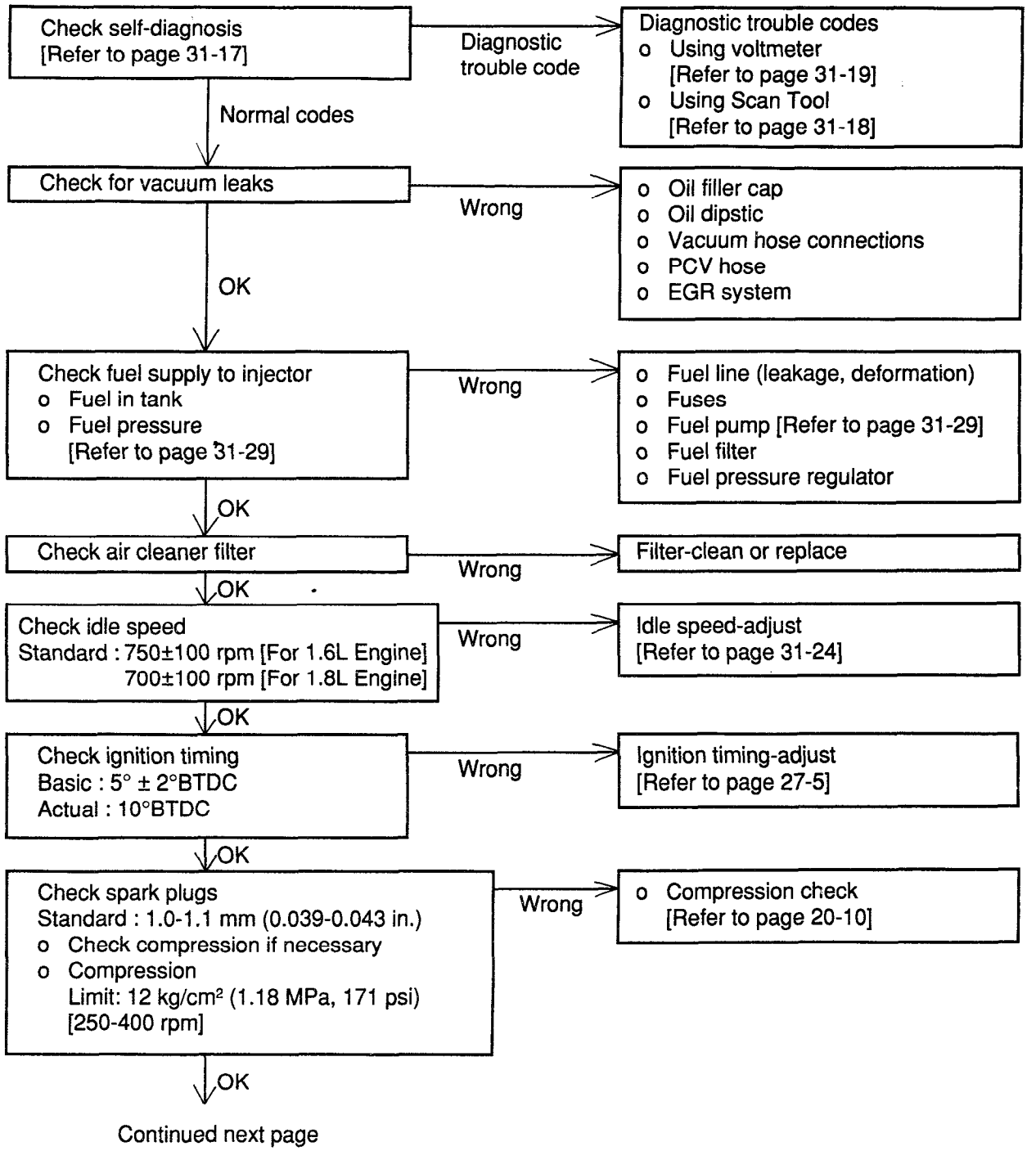

Check ignition timing
Basic : 5° ± 2°BTDC
Actual : 8°BTDC
Wrong
o Ignition timing-adjust
[Refer to page 27-5]
OK
Check fuel supply to injector
o Fuel in tank
o Fuel pressure
[Refer to page 31-29]
Wrong
o Fuel line (leakage, deformation)
o Fuse
o Fuel pump [Refer to page 31-29]
o Fuel filter
o Fuel pressure regulator
OK
Check spark plugs
Standard : 1.0-1.1 mm (0.039-0.043 in.)
o Check compression if necessary
o Compression
[Refer to page 20-10]
OK
Check MFI electronic circuit
Wrong
o Wiring connections
o Power to ECM
1. Fusible links
2. Fuses
3. MFI control relay
o Engine coolant temperature sensor
o Intake air temperature sensor
o Injection signal circuit
1. Injector wiring
2. ECM
o TP Sensor
o VAF Sensor

PROBLEM

Rough idle or engine stalls



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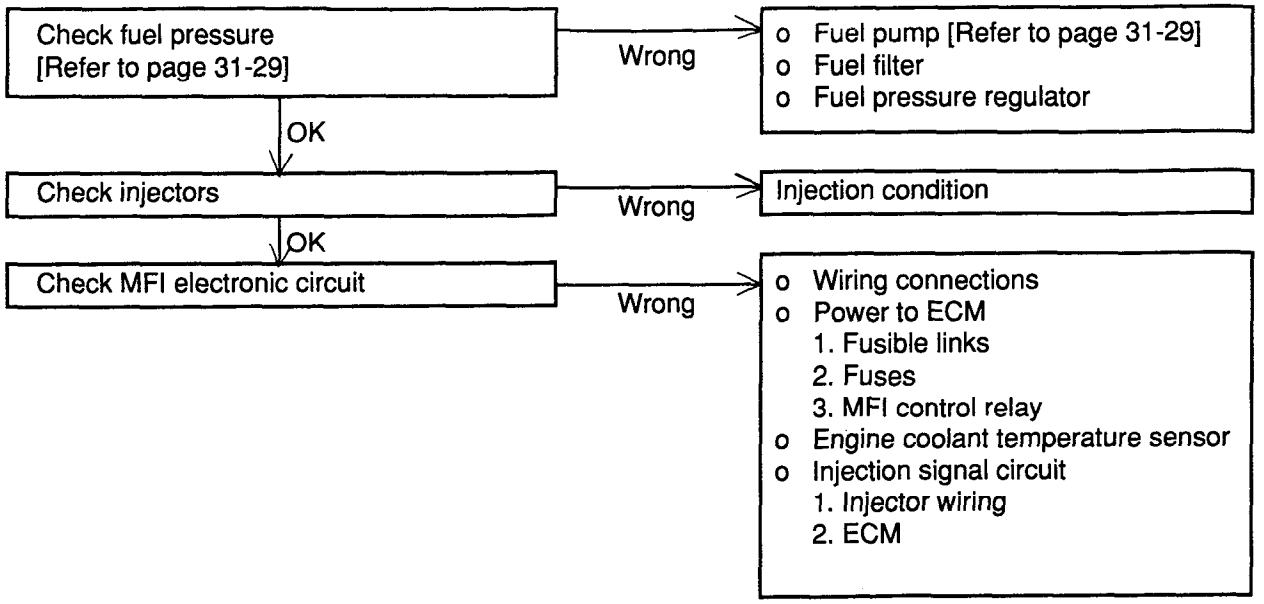
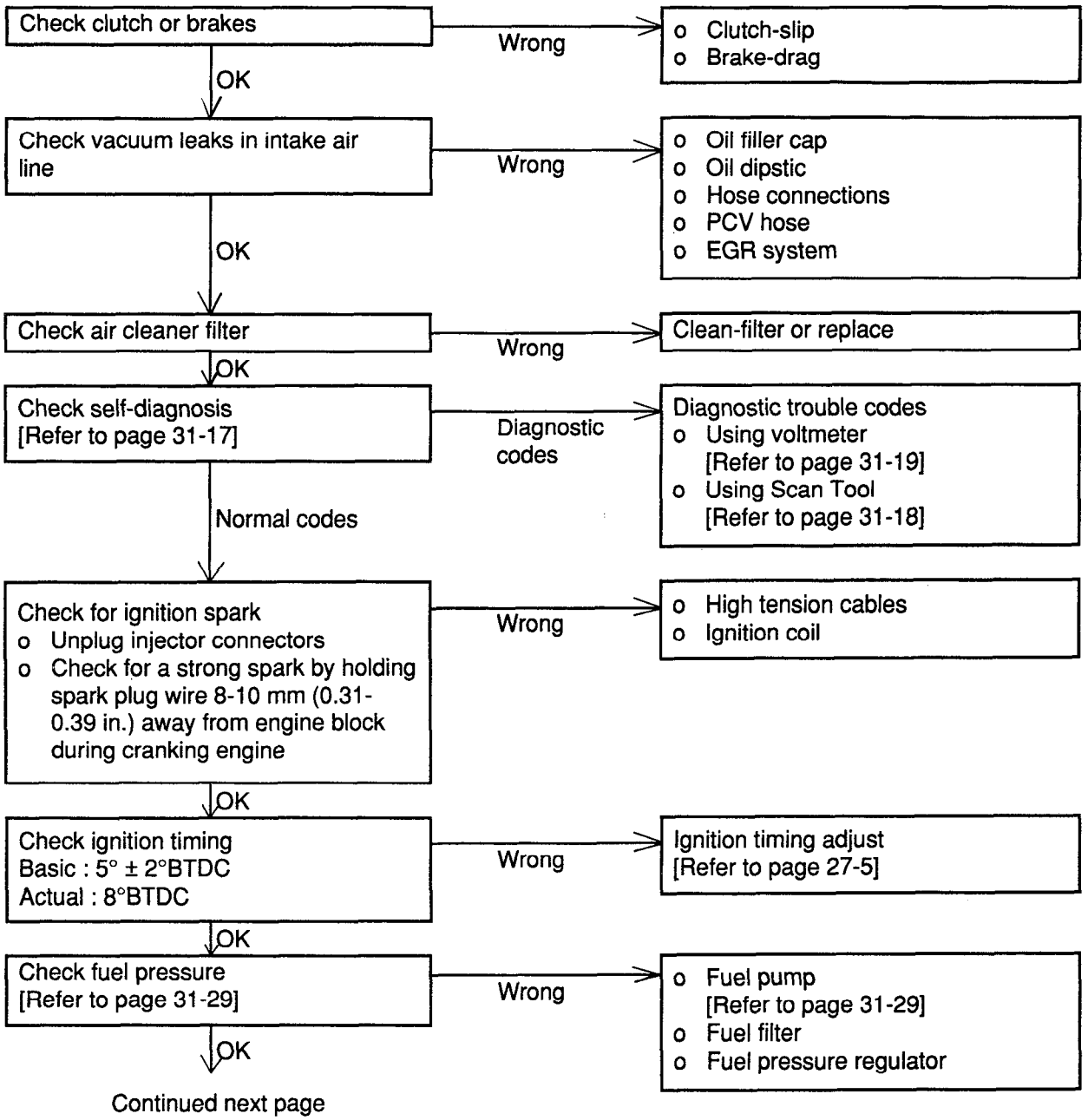

Check fuel pressure
[Refer to page 31-29]
Wrong
o Fuel pump [Refer to page 31-29]
o Fuel filter
o Fuel pressure regulator
OK
Check injectors
Wrong
Injection condition
OK
Check MFI electronic circuit
Wrong
o Wiring connections
o Power to ECM
1. Fusible links
2. Fuses
3. MFI control relay
o Engine coolant temperature sensor
o Injection signal circuit
1. Injector wiring
2. ECM

PROBLEM

Engine hesitates or accelerates poorly



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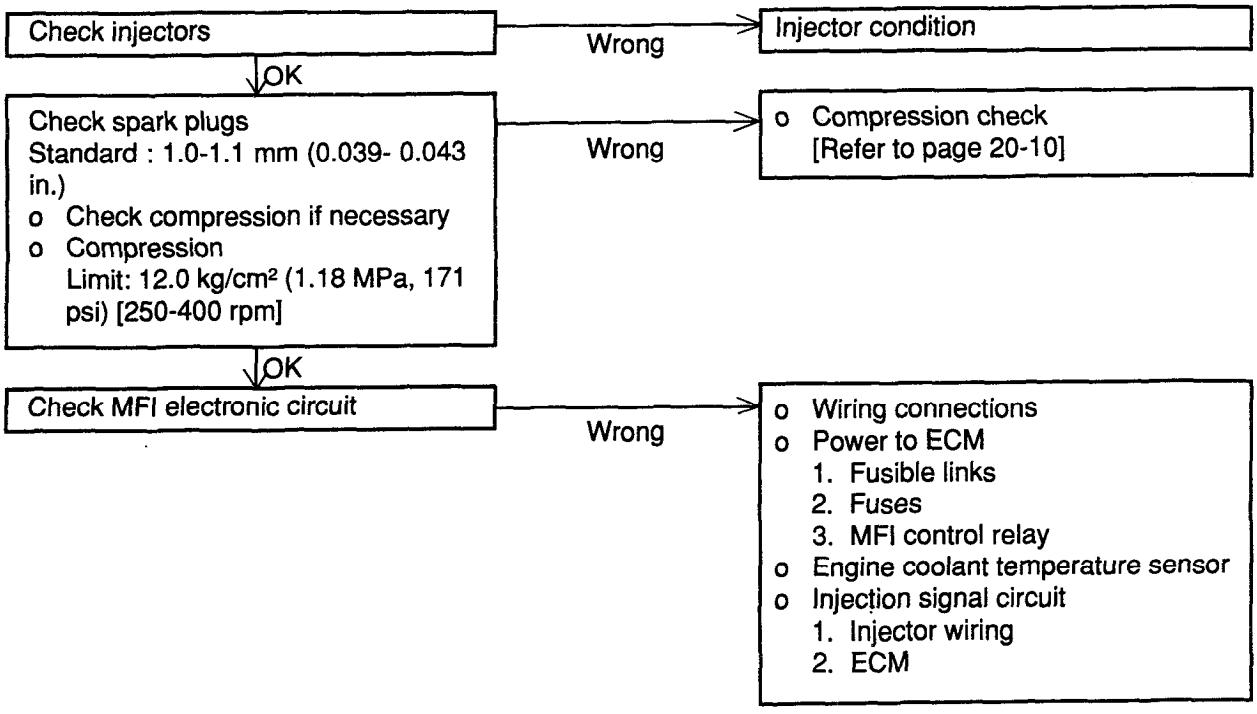

Check injectors
Wrong
Injector condition
OK
Check spark plugs
Standard : 1.0-1.1 mm (0.039- 0.043 in.)
o Check compression if necessary
o Compression
Limit: 12.0 kg/cm² (1.18 MPa, 171 psi) [250-400 rpm]
Wrong
o Compression check
[Refer to page 20-10]
OK
Check MFI electronic circuit
Wrong
o Wiring connections
o Power to ECM
1. Fusible links
2. Fuses
3. MFI control relay
o Engine coolant temperature sensor
o Injection signal circuit
1. Injector wiring
2. ECM

FUEL TANK AND FUEL LINE

Symptom	Probable cause	Remedy
Engine malfunctions due to insufficient fuel supply	Bent or kinked fuel pipe or hose Clogged fuel pipe or hose Clogged fuel filter of in-tank fuel filter Water in fuel filter Dirty or rusted fuel tank interior Malfunctioning fuel pump (Clogged filter in the pump)	Repair or replace Clean or replace Replace Replace the fuel filter or clean the fuel tank and fuel lines Clean or replace Replace
Evaporative emission system malfunctions (when fuel filler cap is removed, pressure is released)	Incorrect routing of a vapor line Disconnected vapor line Folded, bent, cracked or clogged vapor line Faulty fuel tank cap Malfunctioning overfill limiter (Two-way valve)	Correct Correct Replace Replace Replace

TROUBLESHOOTING GUIDE CHART

Main Symptoms / Sub-Symptoms / Check points	STARTING							Poor Idling					Poor Driving	
	Does not start			Hard to start										
	Does not crank	Starter runs but engine does not crank	Incomplete combustion	Cranks slowly	Usually	When cold engine	When hot engine	Incorrect fast idle	High idle speed	Low idle speed	Rough idling	Engine hesitates or accelerates poorly	Surging	Knocking
Starter relay	1													
Starter	2	1		1										
TR SW [A/T] or Clutch start SW [M/T]	3													
Flywheel [M/T] or Drive plate [A/T]		2												
Volume air flow sensor circuit			1							4	11	8		
Idle speed control motor			2		3	3	3	3	3	2	8			2
Fuel pressure regulator			3		6	5	5				5	12	1	
ECT sensor circuit			4		4	1	1	2	2	1	2	9	6	
Compression			5		9						9	6		
Piston ring			6		10						10			
Ignition timing			7		11						12	15		
Timing belt			8								13			
Injectors			9		14	8	8		7	5	14	16	4	
ECM			10		15	9	9	4	8	6	16	17	5	
A/C circuit				2					6					
Connecting rod bearing				3										
Crankshaft bearing				4										
Fuel quality					1	2	2				1	3	3	
Spark plug					2						4	5	2	
EGR system					5					3	3	4		
Fuel pump					7	6	6				6	13		
Fuel lines					8	7	7				7	14		
Ignition circuit					12						15			3
Intake air temp. sensor circuit					13	4	4		4			10		1
Accelerator pedal link								1	1					
TP Sensor circuit									5			7		
Cylinder head											17			
Cluch [M/T]												1		
Brakes drag when released												2		
Oxygen sensor circuit												11		

Main Symptoms / Sub-Symptoms' / Check points	Engine Stalls				Others		
	Soon after starting	After accelerator pedal depressed	After accelerator pedal released	During A/C ON	Excessive fuel	Engine overheats	Engine over cools
Fuel quality	1				2		
Fuel pressure regulator	2	5					
Fuel pump	3						
Fuel lines	4	6					
EGR system	5	2	2		6		
ISC motor	6		1	2			
VAF sensor circuit	7	1	3		14		
ECT sensor circuit	8				12		
Injectors	9	7			11		
ECM	10	8	4	3	18		
TP Sensor circuit		3			13		
Spark plug		4			7	8	
A/C circuit				1	15		
Fuel leakage					1		
Accelerator pedal link					3		
Clutch [M/T]					4		
Brakes drag when released					5		
Compression					8		
Piston ring					9		
Ignition timing					10		
Oxygen sensor circuit					16		
Intake air temp. sensor circuit					17		
Coolant leakage						1	
Cooling fan						2	1
Thermo switch						3	
Radiator and radiator cap						4	
Thermostat						5	2
Timing belt						6	
Engine coolant pump						7	
Oil pump						9	
Cylinder head						10	
Cylinder block						11	
ECT sender						12	3

NOTE

The number herein means the check order.

MFI SYSTEM INSPECTION

If the MFI system components (sensors, ECM, injector, etc.) fail, interruption or failure to supply the proper amount of fuel for various engine operating conditions will result. The following situations can be encountered.

1, Engine is hard to start or does not start at all.
2. Unstable idle
3. Poor driveability

If any of the above conditions is noted, first perform an inspection by self-diagnosis and subsequent basic engine checks (ignition system malfunction, incorrect engine adjustment, etc.), and then inspect the MFI system components with the Scan Tool (ST).

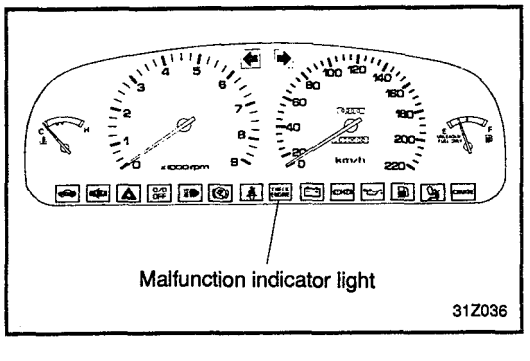
NOTES

1) Before removing or installing any part, read the diagnostic trouble code and then disconnect the battery negative (-) terminal.
2) Before disconnecting the cable from battery terminal, turn the ignition switch to OFF. Removal or connection of battery cable during engine operation or while the ignition switch is ON could cause damage to the ECM.
3) The control harnesses between the ECM and heated oxygen sensor are shielded wires with the shield grounded to the body in order to prevent the influence of ignition noises and radio interference. When the shielded wire is faulty the control harness must be replaced.

Malfunction Indicator Light (MIL)

A malfunction indicator light comes on to notify the driver of the emission control items when an irregularity is detected.
However, when an irregular signal returns to normal, the malfunction indicator light will go out.
Immediately after the ignition switch is turn on, the malfunction indicator light is lit for 5 seconds to indicate that the malfunction indicator light operates normally.
Item Indicated By The MIL

- Engine Control Module (ECM)
- Heated oxygen sensor (HO2S)
- Volume air flow sensor (VAF Sensor)
- Intake air temperature sensor (IAT Sensor)
- Throttle position sensor (TP Sensor)
- Engine coolant temperature sensor (ECT Sensor)



- Crankshaft position sensor (CKP Sensor)
- Camshaft position sensor (CMP Sensor)
- Injector
- Fuel pump
- EGR temperature sensor (Only California)
- Vehicle speed sensor
- Barometric pressure sensor
- Ignition coil

MIL (Malfunction Indicator Light) Inspection

1. Check that when the ignition switch is turned on the light illuminates for about 5 seconds and then goes out.
2. If the light does not illuminate, check for open circuit in harness, blown fuse and blown bulb.

SELF-DIAGNOSIS

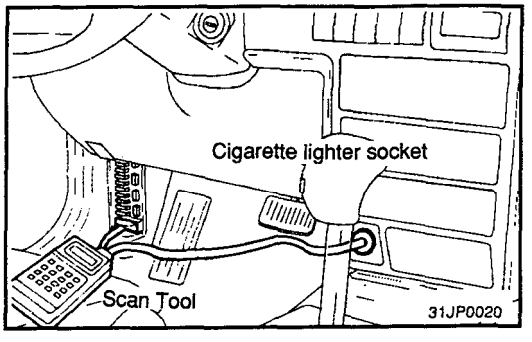
The ECM monitors the input/output signals (some signals at all times and the others under specified conditions).
When the ECM detects that an irregularity memorize the diagnostic trouble code, and outputs the signal to the self-diagnosis output terminal.
There are 14 diagnosis items, including the normal state, and the diagnosis results can be read out with voltmeter or Scan Tool.
Diagnostic trouble codes will remain in the ECM as long as battery power is maintained. The diagnostic trouble codes will, however, be erased when the battery terminal or the engine control module connector is disconnected.

NOTE
If the sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble code is memorized. In this case, disconnect the battery negative terminal (-) for 15 seconds or more, and the diagnosis memory will be erased.

CHECKING PROCEDURE (SELF-DIAGNOSIS)

NOTE
1) **When battery voltage is low, diagnostic trouble codes can not be read. Be sure to check the battery for voltage and other conditions before starting the test.**
2) **Diagnosis memory is erased if the battery or the ECM connector is disconnected. Do not disconnect the battery before the diagnostic trouble codes are completely read.**

Inspection Procedure (Using Scan Tool)

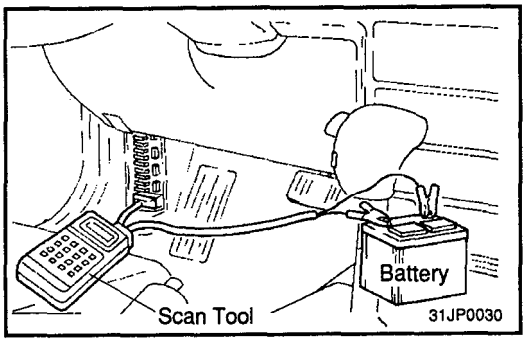


1. Turn OFF the ignition switch.
2. Connect the Scan Tool to the diagnosis connector in the fuse box.
3. Connect the power-source terminal of the Scan Tool to the cigarette lighter socket.
4. Turn ON the ignition switch.
5. Use the scan tool to check the diagnostic trouble codes.
6. Repair the faulty part from the diagnosis chart.
7. Erase the diagnostic trouble code.

NOTE
1) Select 4. "SPECIAL TEST" from the function selection menu of the Scan Tool.
2) Then select Item No.5 "ERASE DIAG".
3) Press the YES key when "ERASE DIAG. CODE?" is displayed.
4) Enter ID code "19".
5) Press the CLEAR key when "FINISHED ERASING DIAG. CODE" is displayed.
6) Read the self-diagnosis output and check output of correct code.

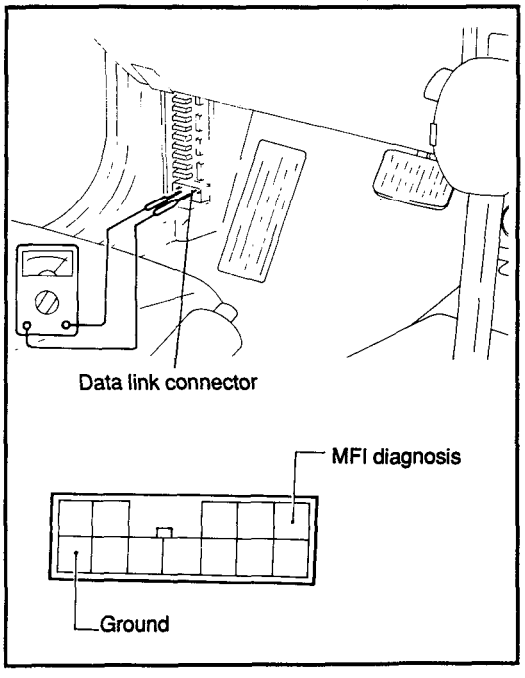
8. Disconnect the scan tool.

NOTE
When the ignition key is in the ST position, the cigarette lighter power is OFF. If a test needs to be made during cranking, use the battery clamp harness provided.



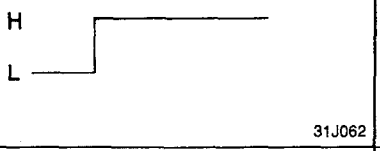
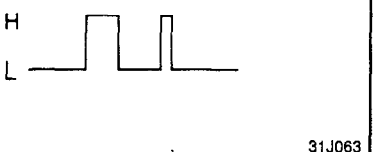
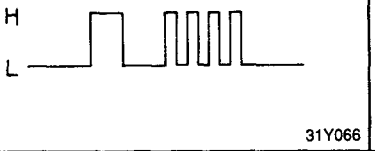
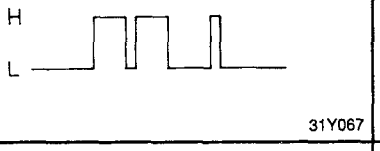
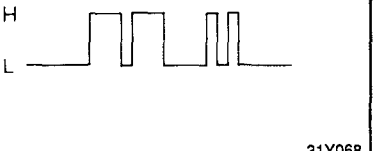
Inspection Procedure (Using Voltmeter)

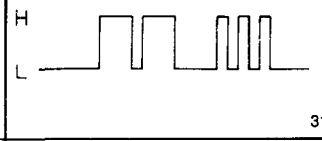
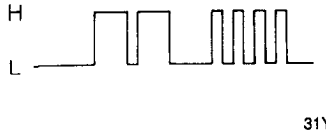
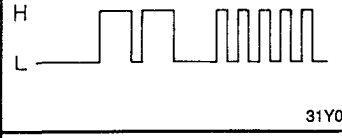
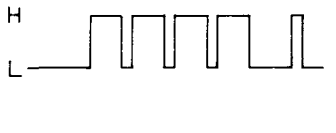
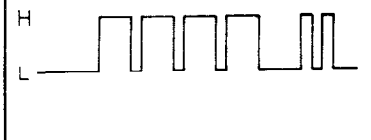
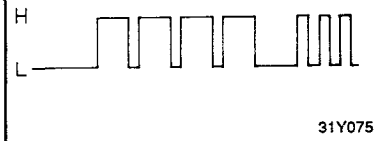
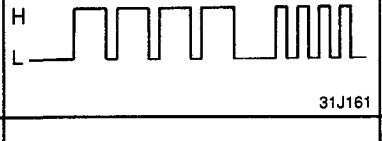
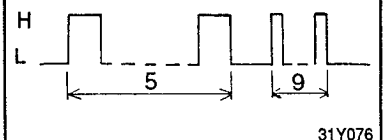
1. Connect the voltmeter to the data link connector.
2. Turn the ignition switch, and the engine control module (ECM) memory contents will immediately start.
   After recording the abnormal item, check and repair each part according to the check items in “Diagnosis Chart”.
3. When the defective parts have been repaired, disconnect the negative terminal of the battery cable for 15 seconds or more and connect it again to make sure that the diagnostic trouble code has been erased.

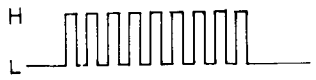


Diagnosis Chart

The 16 diagnosis items are provided as follows, and if plural items are activated, they are all indicated sequentially from the smallest code number.

Output preference order	Diagnosis item	Diagnostic trouble code			Check item (Remedy)
		Output signal pattern	No.	Memory	
1	Engine control module	 31J062	-	-	(Replace engine control module)
2	Heated oxygen sensor (Front)	 31J063	11	Retained	o Harness and connector o Fuel pressure o Injectors (Replace if defective.) o Intake air leaks o Oxygen sensor (Front)
3	Volume air flow sensor	31Y064	12	Retained	o Harness and connector (If harness and connector are normal, replace volume air flow sensor assembly.)
4	Intake air temperature sensor	31Y065	13	Retained	o Harness and connector o Intake air temperature sensor
5	Throttle position sensor	 31Y066	14	Retained	o Harness and connector o Throttle position sensor o Idle position switch
6	Engine coolant temperature sensor	 31Y067	21	Retained	o Harness and connector o Engine coolant temperature sensor
7	Crankshaft position sensor	 31Y068	22	Retained	o Harness and connector If harness and connector are normal, replace crankshaft position sensor assembly.)

Output preference order	Diagnosis item	Diagnostic trouble code			Check item (Remedy)
		Output signal pattern	No.	Memory	
8	Camshaft position sensor	 31Y070	23	Retained	o Harness and connector If harness and connector are normal, replace crankshaft position sensor.)
9	Vehiclespeed sensor (reed switch)	 31Y071	24	Retained	o Harness and connector o Vehicle-speed sensor (reed switch)
10	Barometric pressure sensor	 31Y072	25	Retained	o Harness and connector If harness and connector are normal, replace barometric pressure sensor assembly.)
11	Injector	 31Y073	41	Retained	o Harness and connector o Injector coil resistance
12	Fuel pump	 31Y074	42	Retained	o Harness and connector o Control relay
13	EGR*	 31Y075	43	Retained	o Harness and connector o EGR temperature sensor o EGR valve o EGR solenoid valve o EGR valve control vacuum
14	Ignition coil	 31J161	44	Retained	o Harness and connector o Ignition coil o Ignition power transistor
15	Heated * oxygen sensor (Rear)	 31Y076	59	Retained	o Harness and connector o Fuel pressure o Injectors o Intake air leaks o Heated oxygen sensor (Rear)

Output preference order	Diagnosis item	Trouble code			Check item (Remedy)
		Output signal pattern	No.	Memory	
16	Normal state		-	-	-

NOTE
1. Replace the engine control unit if a diagnostic trouble code is read although the inspection reveals that there are no problems with the diagnosis item.
2. The diagnostic item marked* is applicable to the California vehicles only.

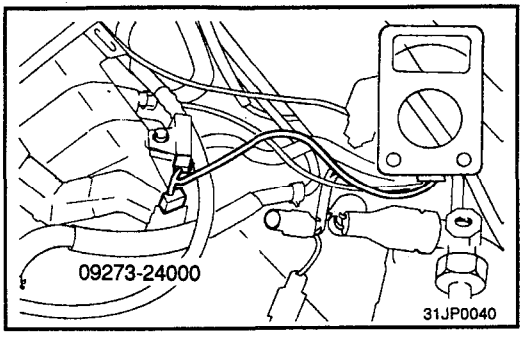
SERVICE ADJUSTMENT PROCEDURES

Idle Speed Check Procedures

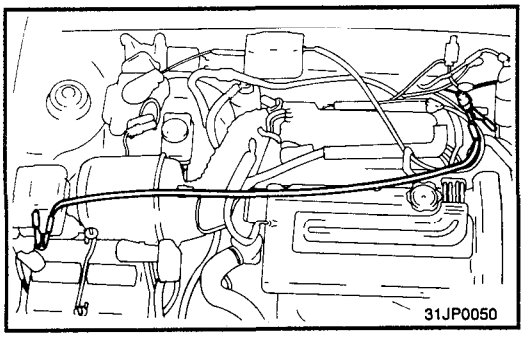
Checking conditions;

- Engine coolant temperature is 80 to 95°C (176 to 205°F).
- Lights, electric cooling fan and all accessories are off.
- Transaxle is in neutral ["P" or "N" range for A/T vehicles].
- Steering wheel is straight forward position (Vehicles with power steering).

1. Install a tachometer and a timing light.



2. Ground the ignition timing adjustment terminal.



3. Run the engine and let it idle.
4. Check the basic ignition timing and adjust if necessary.

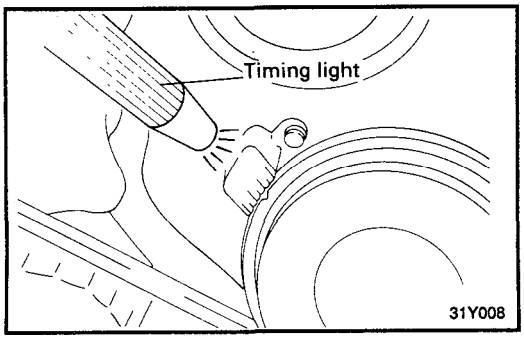
Basic ignition timing	$5^{o} \pm 2^{o}$BTDC (At idle)

Refer to 27 GROUP-Ignition Timing section.

5. Remove the lead wire connected at step 2.
6. Let the engine idle for 2 minutes.
7. Check the idle speed.

Idle speed	750 ± 100 rpm [For 1.6L Engine] 700 ± 100 rpm [For 1.8L Engine]

NOTE
Adjustment of the idling speed is usually unnecessary, because this system controls the idle speed.



Basic Idle Speed Adjustment

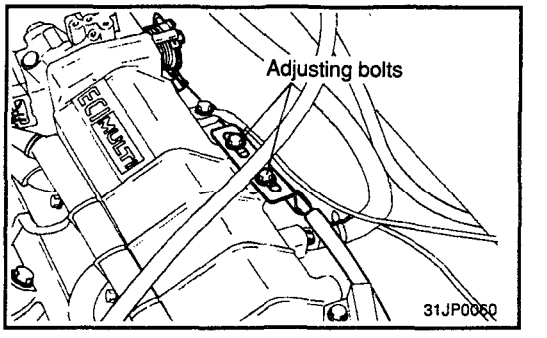
NOTE

1. **Before adjusting, check that the spark plugs, injectors, ISC motor, compression, etc. are normal.**
2. **Clean the throttle body area.**

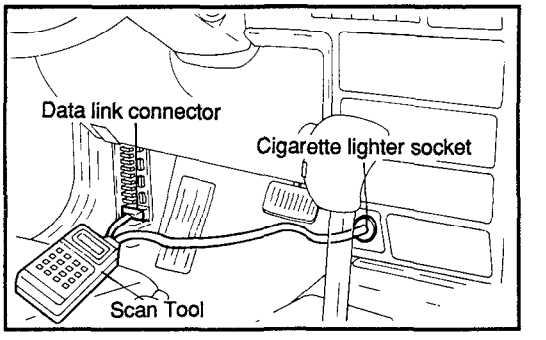
Adjustment conditions:

- Engine coolant temperature is 80 to 95°C (176 to 205°F).
- Lights, electric cooling fan and all accessories are off.
- Transaxle is in neutral ["P" or "N" range for A/T vehicles].
- Steering wheel is a straight forward position (Vehicles with power steering).

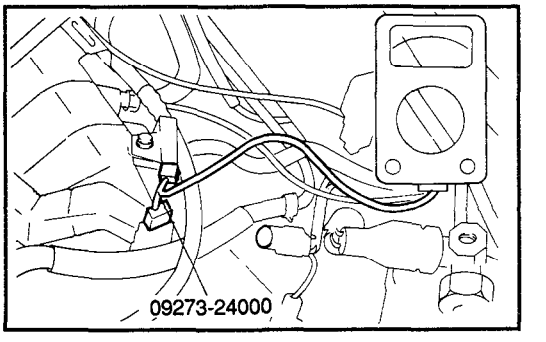
1. Loosen the accelerator cable.



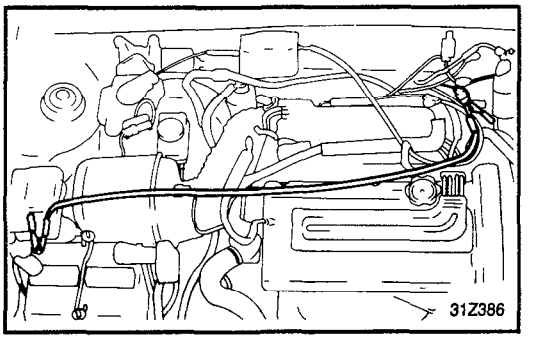
2. Connect the scan tool to the data link connector in the fuse box.



3. If the scan tool is not used, connect a tachometer. And ground the data link connector.



4. Ground the ignition timing adjustment terminal.



5. Run the engine for more than 5 seconds at an engine speed of 2,000 to 3,000 rpm.
6. Run the engine at idle for 2 minutes.
7. Check that the engine rpm is within the standard value.
   If the scan tool is used, press code No. 22 and read the engine rpm.

Basic idle speed	750±100 rpm [For 1.6L Engine]
	700±100 rpm [For 1.8L Engine]

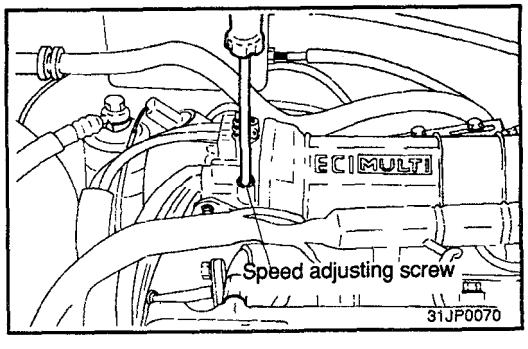
NOTE

1. **The engine speed on a new vehicle driven less than 500 Km (300 miles) may be 20 to 100 prkm lower than specification, but no adjustment is necessary.**
2. **If the engine stalls or the engine speed is low after the vehicle has been driven a distance of 500 km (300 miles) or more, a deposit on the throttle valve area is suspected.**

8. If the basic idle speed is out of specification, adjust by the speed adjusting screw (SAS) for the standard rpm. In adjusting use a tachometer.

   NOTE

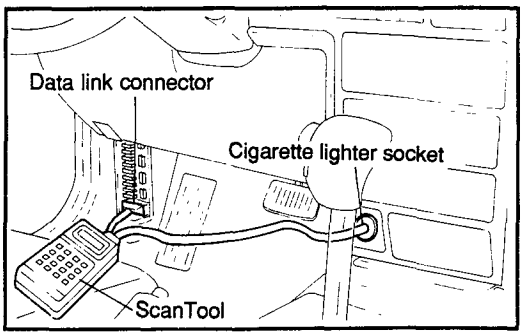
   If the idle speed is higher than specified, even with the speed adjusting screw (SAS) fully closed, check whether the idle switch (fixed SAS) moving mark exists or not. If it is found that the switch has moved, adjust the idle switch (fixed SAS) has been mis-adjusted.



9. Turn the ignition switch to the OFF position.
10. If the scan tool was not used, disconnect the data link connector
11. Disconnect the lead wire from the ignition timing adjusting terminals.
12. Run the engine again and let it idle for about 10 minutes.
    Check that the engine is in normal idling condition.

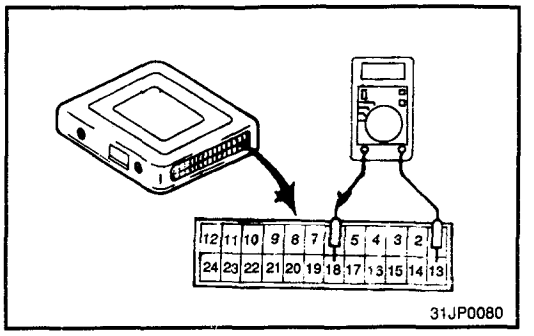
Throttle Position Sensor Adjustment

1. Connect a scan tool to the data link connector.



2. If a scan tool (ST) is not used, connect a digital-type voltmeter between terminal 13 and terminal 18 of the ECM.

   NOTE
   1. Do not disconnect the ECM connector from the ECM.
   2. Use a digital voltmeter.

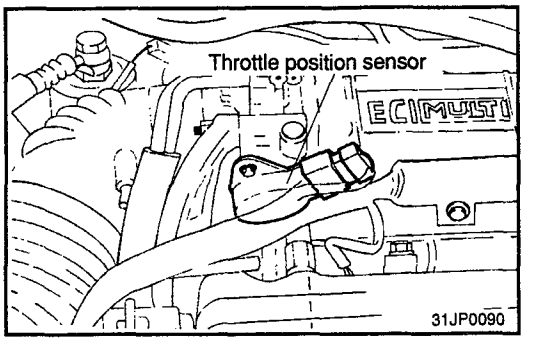


3. Turn the ignition switch to the ON position (do not start engine) and check that the TP Sensor output voltage is as specified. If a scan tool is used, press code No. 14 and read the voltage.

Standard value	480-520 mV

4. If it is out of specification, loosen TP Sensor mounting screws and adjust by turning the TP Sensor.

   NOTE
   1. Turning the TP Sensor clockwise increases the output voltage.
   2. Tighten the screws securely after adjustment.



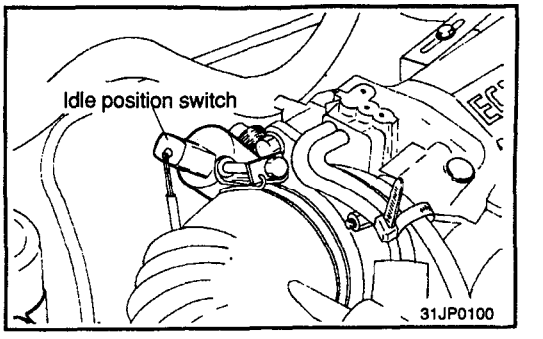
5. Turn the ignition switch to the OFF position.

Idle Position Switch (Fixed SAS) Adjustment

NOTE
Since the idle switch (Fixed SAS) is adjusted at the factory, it is not necessary to adjust the idle swtich in normal cases except during replacement.

1. Loosen the tension of the acceleration cable.
2. Disconnect the idle switch (fixed SAS) connector.
3. Loosen the idle switch (fixed SAS) lock nut.
4. Turn the idle switch (fixed SAS) counterclockwise until the throttle valve closes.
5. Connect an ohmmeter between the terminal of the switch and the body.
6. Screw in the idle switch (fixed SAS) until continuity is found between the switch terminal and the body, and screw in the idle switch 15/16 turn from that point.
   Tighten the lock nut and connect the idle switch connector.

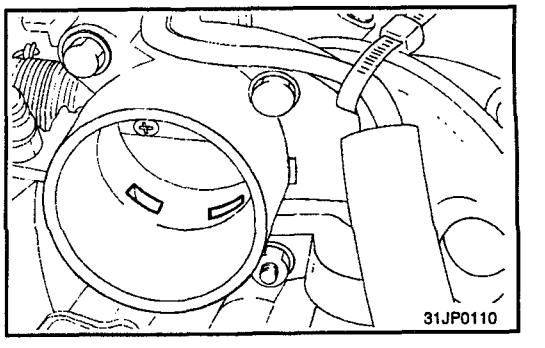
NOTE
Keep the idle switch (fixed SAS) from moving when tightening the lock nut.



7. Adjust the acceleration cable.
8. Adjust the curb idle speed.
9. Adjust the TP Sensor (Throttle position sensor).

Throttle Body (Throttle Valve Area) Cleaning

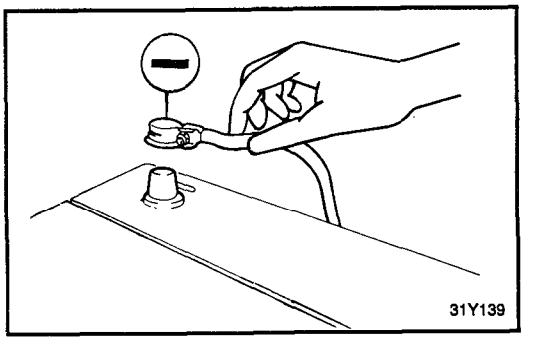
NOTE
Disconnect the intake air hose from the throttle body, and check the throttle valve surface for carbon deposits. Spray cleaning solvent on the valve to remove carbon deposits.



1. Warm up the engine, then stop it.
2. Remove the intake air hose from the throttle body.
3. Plug the bypass passage inlet of the throttle body.

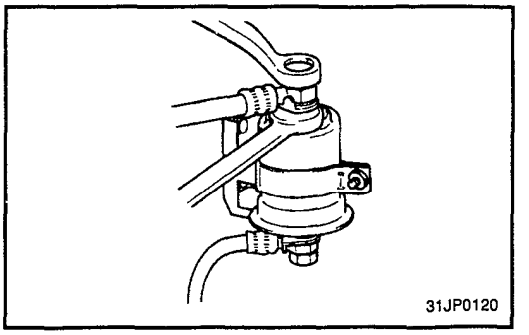
NOTE
Make sure the solvent does not enter the by-pass passage.

4. Spray cleaning solvent onto the valve through the throttle body intake port and let it soak for about 5 minutes.
5. Start the engine, race it several times and allow the engine to idle for 1 minute.
6. Repeat Steps 4 and 5.
7. Unplug the by-pass passage inlet.
8. Attach the intake air hose.
9. Disconnect the battery ground cable for more than 10 seconds.
10. Adjust the basic idle speed (Speed adjusting screw).



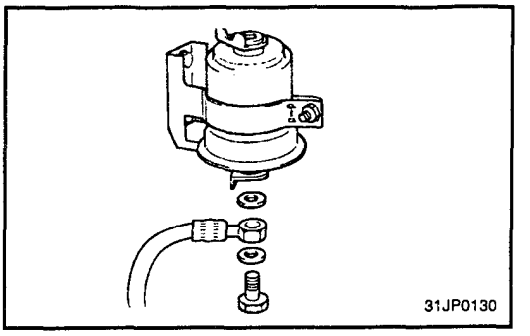
Fuel Filter Replacement

1. Remove the upper eye bolt while holding the fuel filter nut securely and remove the high pressure fuel hose.



CAUTION
1) Be sure to reduce the fuel pressure before disconnecting the fuel main pipe and hose, otherwise fuel will spill out.
2) Cover the hose connection with rags to prevent splashing of fuel that could be caused by residual pressure in the fuel line.

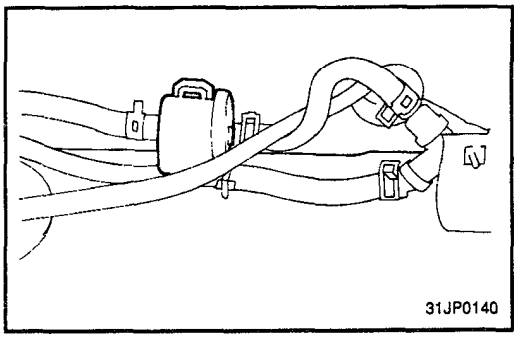
2. Remove the lower eye bolt while holding the fuel filter nut assembly.
3. Remove the fuel filter mounting bolts, and then remove the fuel filter from the bracket.



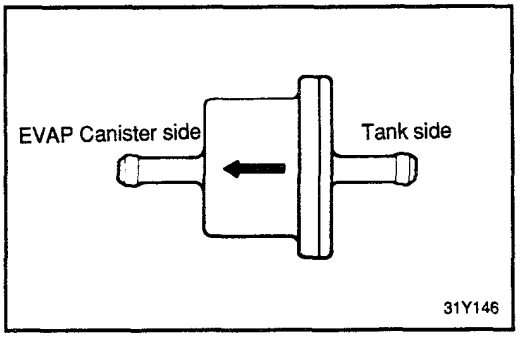
Tightening torque 25-35Nm (250-350 kgcm,18-25Ib.ft)

Overfill Limiter (Two-way Valve) Replacement

1. Disconnect the vapor hoses, and then remove the overfill limiter.

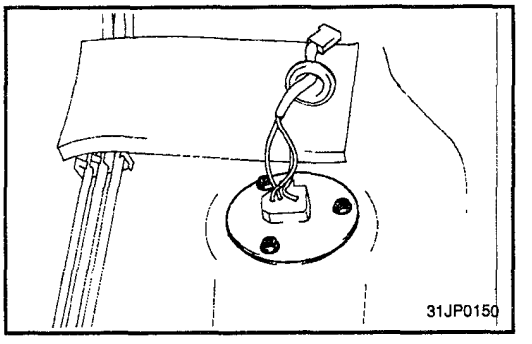


2. Connect the overfill limiter in the correct direction.



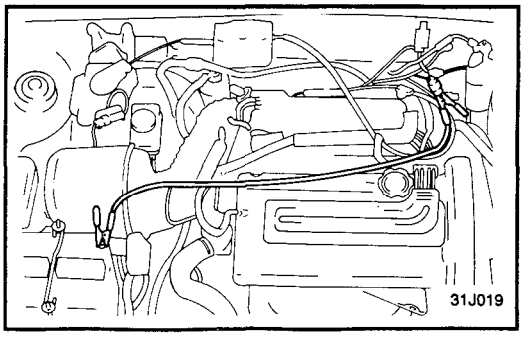
Fuel Sender Replacement

1. Remove the fuel tank cap to lower the fuel tanks internal pressure.
2. Remove the fuel sender installation screws, then remove the fuel sender from the fuel tank.



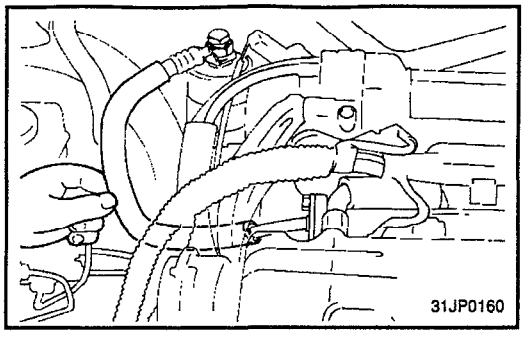
Fuel Pump Operation Check

1. Turn the ignition switch to the OFF position.
2. Apply battery voltage to the fuel pump drive connector to check that the pump operates.



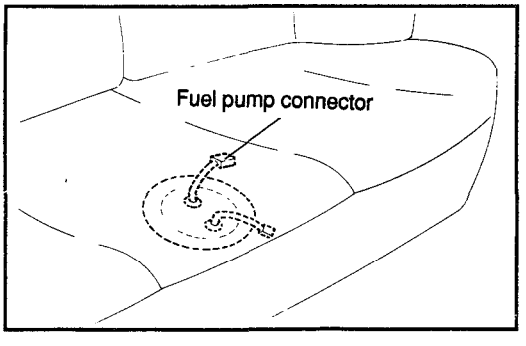
NOTE
The fuel pump is in-tank type and its operating sound is hard to hear without removing the fuel tank cap.

3. Pinch the hose to check that fuel pressure is felt.



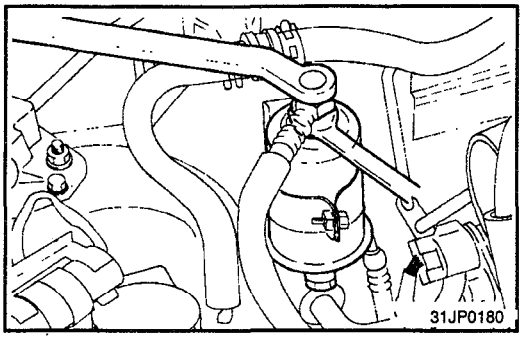
Fuel Pressure Test

1. Reduce the internal pressure of the fuel pipes and hoses by the following procedures.
   - o Disconnect the fuel pump harness connector in the rear seat side.
   - o Start the engine and after it stops by itself, turn the ignition switch to the OFF position.
   - o Disconnect the battery negative (-) terminal.
   - o Connect the fuel pump harness connector.



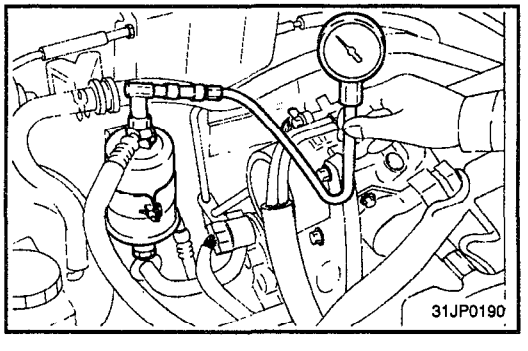
2. Remove the upper eye bolt while holding the fuel filter nut securely.

CAUTION
Cover the hose connection with a shop towel to prevent splashing of fuel caused by residual pressure in the fuel line.



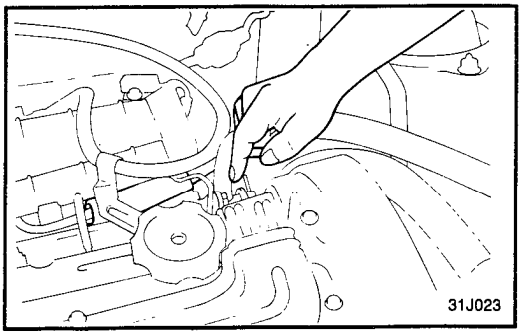
3. Using the fuel pressure gauge adapter (09353-24000, 09353-24100, 09353-24200), install the fuel-pressure gauge to the fuel filter. Tighten the bolt to the specified torque.

Tightening torque	
Fuel pressure gauge to fuel filter	**25-35** Nm (250-350 kg.cm, 18-25 lb.ft)



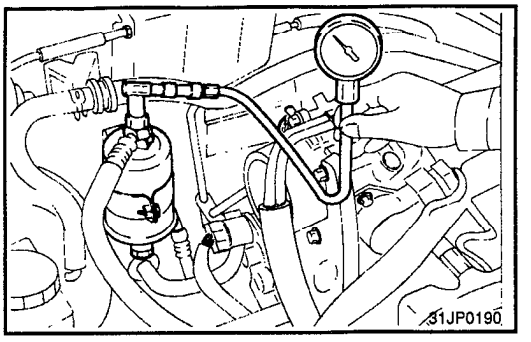
4. Connect the battery's negative (-) terminal.
5. Apply battery voltage to the terminal for the pump drive and activate the fuel pump; then, with fuel pressure applied, check that there is no fuel leakage from the pressure gauge or connection part.

6. Disconnect the vacuum hose from the pressure regulator, and plug the hose end. Measure the fuel pressure at idle.



Standard value	320-340 kPa (3.26-3.47 kg/cm^2, 46-49 psi)

7. Measure the fuel pressure when the vacuum hose is connected to the pressure regulator.



Standard value	Approx. 270 kPa (2.75 kg/cm^2, 39 psi)

8. If the results of the measurements made in steps (6) and (7) are not within the standard value, use the table next page to determine the probable cause, and make the necessary repairs.

Condition	Probable cause	Remedy
Fuel pressure too low	a. Clogged fuel filter. b. Fuel leakage to the return side, caused by poor seating of the fuel-pressure regulator c. Low discharge pressure of the fuel pump	a. Replace fuel filter b. Replace fuel pressure regulator. c. Check the in-tank fuel hose for leakage or replace the fuel pump.
Fuel pressure too high	a. Sticking fuel-pressure regulator b. Clogged or bent fuel return hose or pipe.	a. Replace fuel pressure regulator b. Repair or replace hose or pipe.
There is no difference in fuel pressure when the vacuum hose is connected and when it is not.	a Clogging, or damaged vacuum hose of the nipple. b. Sticking or poor seating of the fuel pressure regulator.	a. Repair or replace the vacuum hose or the nipple b. Repair or replace hose or pipe.

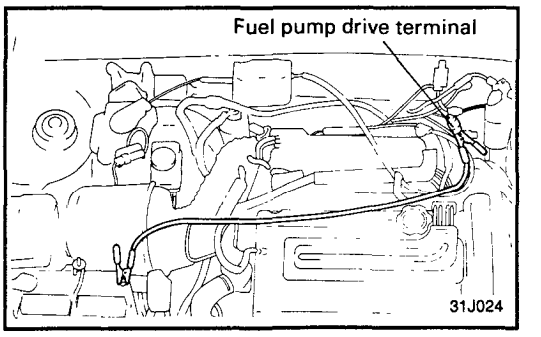
9. Stop the engine and check for a change in the fuel pressure gauge reading, which should hold for approximately 5 minutes. If the gauge indication drops, observe the rate of drop. Determine and remove the causes according to the following table.

Condition	Probable cause	Remedy
Fuel pressure drops slowly after engine is stopped	a. Injector leakage	a. Replace injector
Fuel pressure drops immediately after engine is stopped	a. The check valve within the fuel pump is open	a. Replace fuel pump

10. Reduce the fuel pressure in the fuel line.
11. Disconnect the high pressure hose and remove the fuel pressure gauge from the delivery pipe.

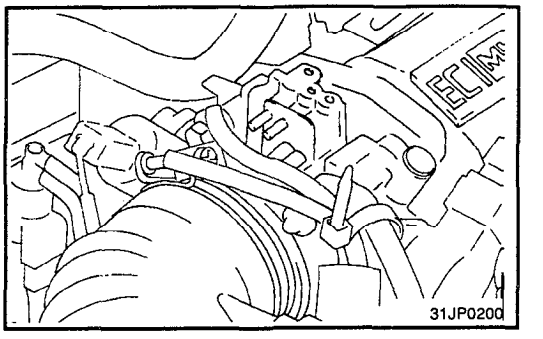
CAUTION
Cover the hose connection with a shop towel to prevent splashing of fuel caused by residual pressure in the fuel line.

12. Install a new O-ring in the groove at the end of the high-pressure hose.
13. Connect the high pressure fuel hose to the fuel filter, and tighten the screws to the specified torque..
14. Check for fuel leaks.
    - o Apply battery voltage to the fuel pump drive terminal to operate the fuel pump.
    - o With pressure, check the fuel line for leaks.



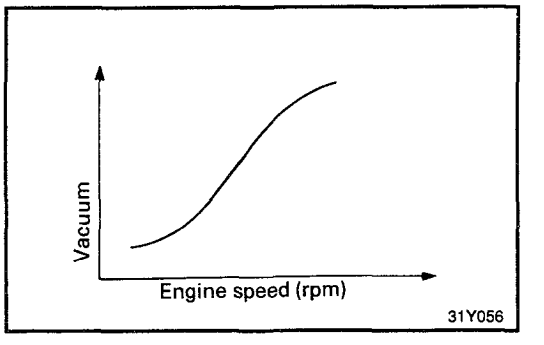
EGR Valve Control Vacuum Check

Checking Condition
Engine coolant temperature: 80-95°C (176-205°F)
1. Disconnect the vacuum hose from the throttle body EGR vacuum fitting and connect a hand vacuum pump to the fitting.



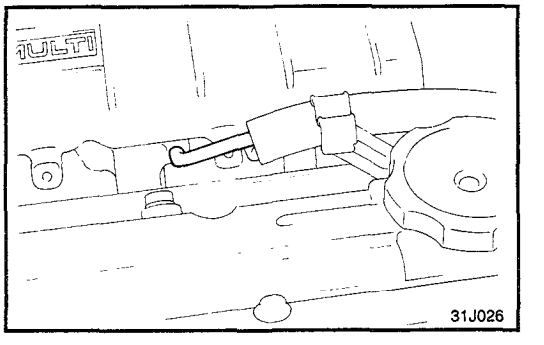
2. Start the engine and check to see that, after increasing the engine speed, vacuum raises proportionately to engine speed.

NOTE
If there is a problem with the change in vacuum, it is possible that the throttle body port may be restricted and require cleaning.



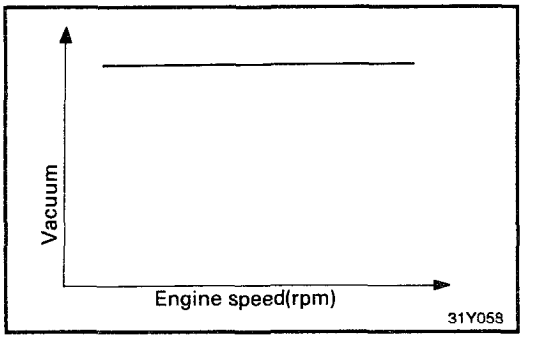
Purge Port Vacuum Check

Checking Condition
Engine coolant temperature: 80-95°C (176-205°F)
1. Disconnect the vacuum hose from the throttle body purge hose fitting and connect a vacuum pump.

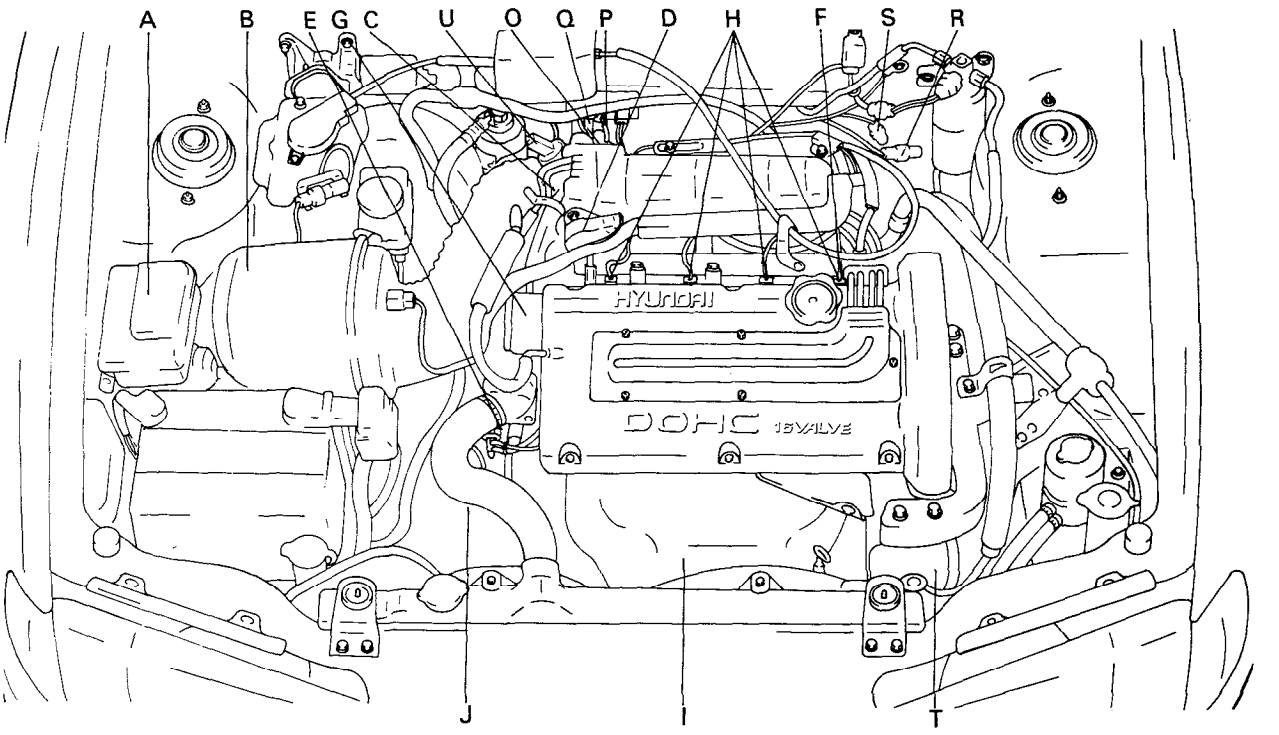


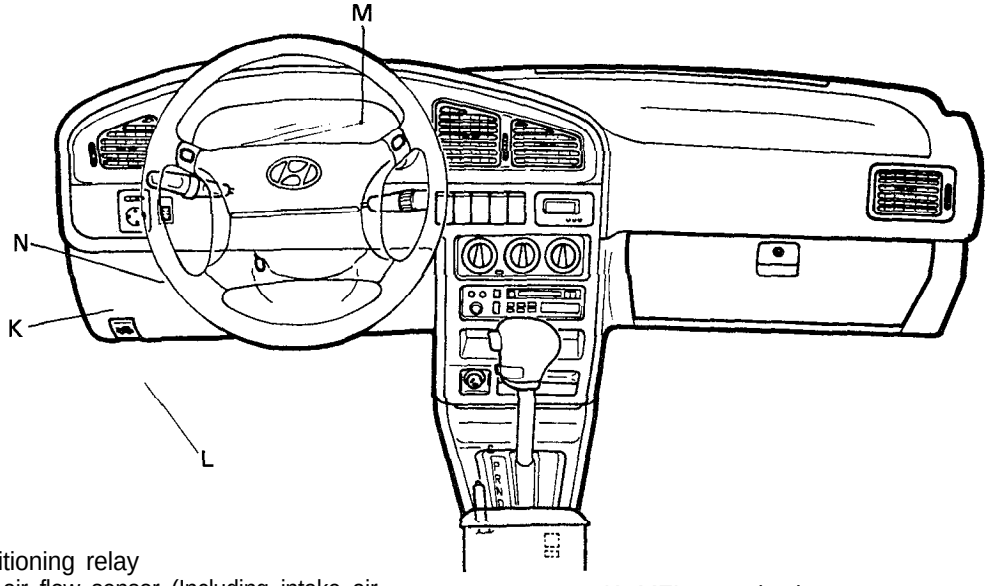
2. Start the engine and check to see that, after increasing the engine speed, vacuum remains fairly constant.

NOTE
If there is no vacuum created, it is possible that the throttle body port may be restricted and required cleaning.



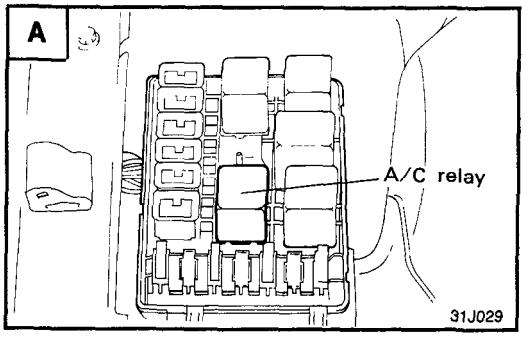
LOCATION OF MFI COMPONENTS



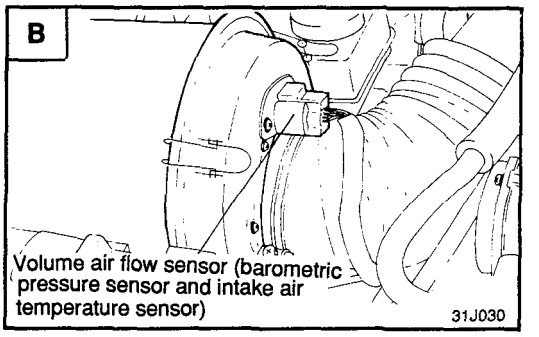


A. Air conditioning relay
B. Volume air flow sensor (Including intake air temp. sensor and barometric pressure sensor)
C. ISC motor (Stepper motor)
D. Throttle position sensor (TP Sensor)
E. Engine coolant temperature sensor
F. Ignition Power transistor
G. Crankshaft position (CKP) sensor and camshaft position (CMP) sensor
H. Injectors
I. Heated oxygen sensor (HO2S)
J. Transaxle range (TR) switch
K. MFI control relay
L. Data link connector
M. Vehicle speed sensor
N. Engine control module (ECM)
0. EGR temperature sensor (For California only)
P. EGR solenoid valve (For California only)
Q. EVAP Canister Purge Solenoid Valve
R. Fuel pump check terminal
S. Ignition timing adjustment terminal
T. Power steering oil pressure switch
U. Idle position switch

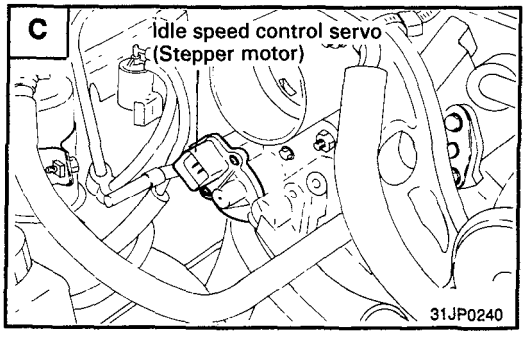
A


A/C relay
31J029

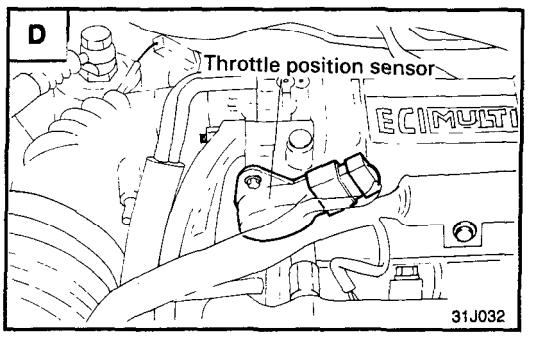
B


Volume air flow sensor (barometric pressure sensor and intake air temperature sensor)
31J030

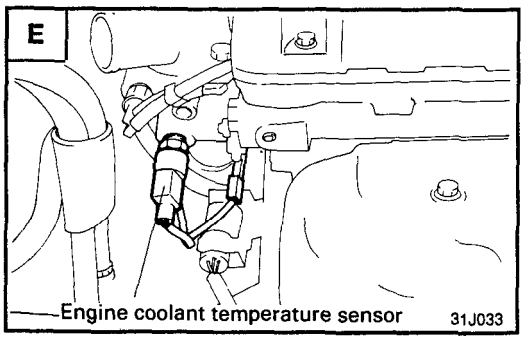
C


Idle speed control servo (Stepper motor)
31JP0240

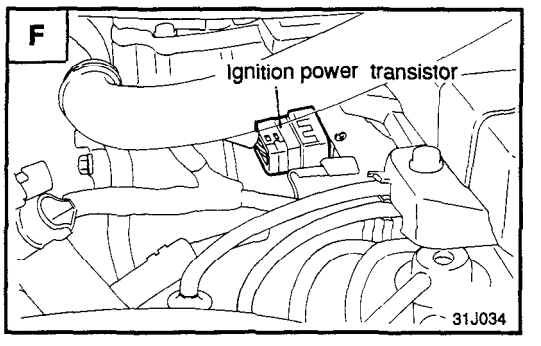
D


Throttle position sensor
31J032

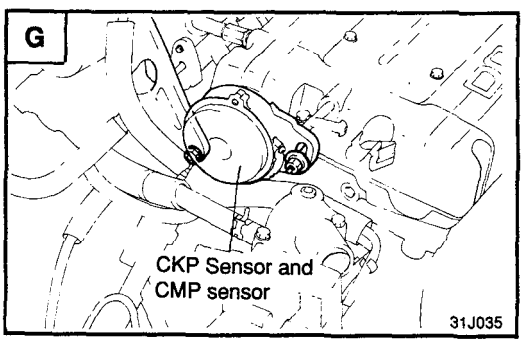
E


Engine coolant temperature sensor
31J033

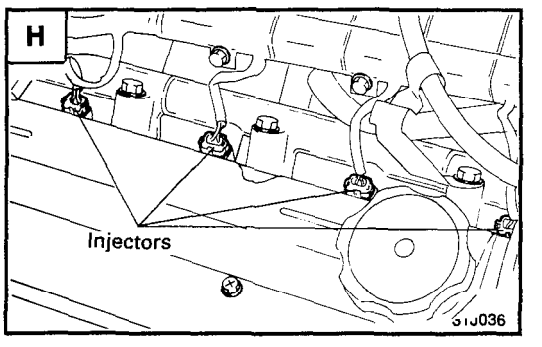
F


Ignition power transistor
31J034

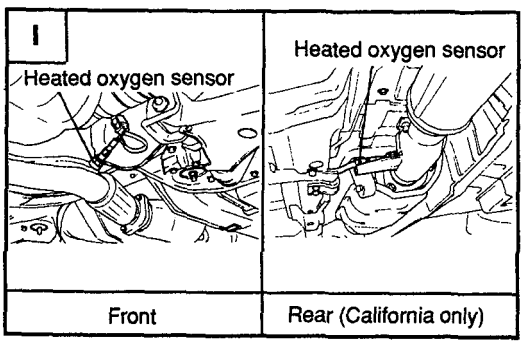
G


CKP Sensor and CMP sensor
31J035

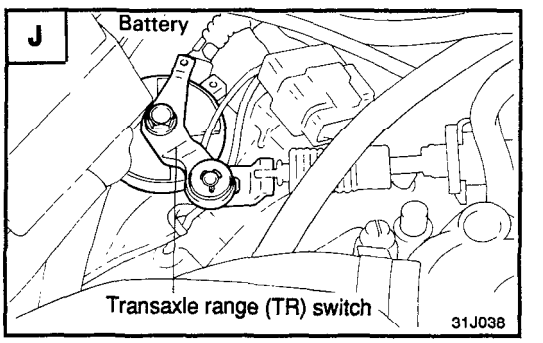
H


Injectors
31J036

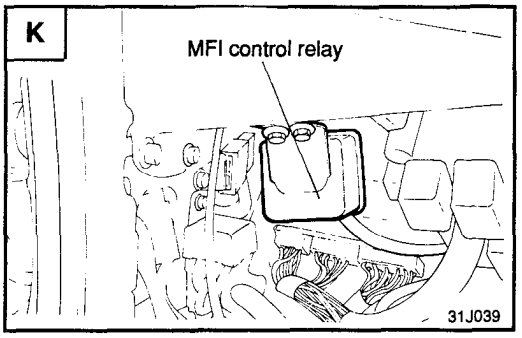
I


Heated oxygen sensor
Heated oxygen sensor
Front
Rear (California only)

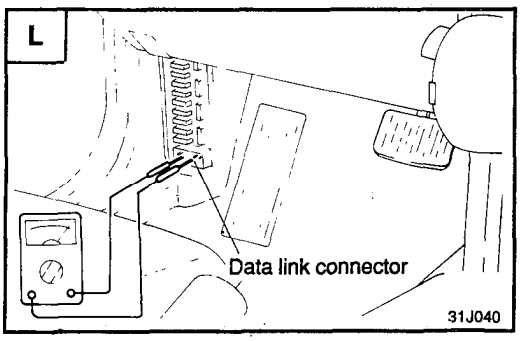
J


Battery
Transaxle range (TR) switch
31J038

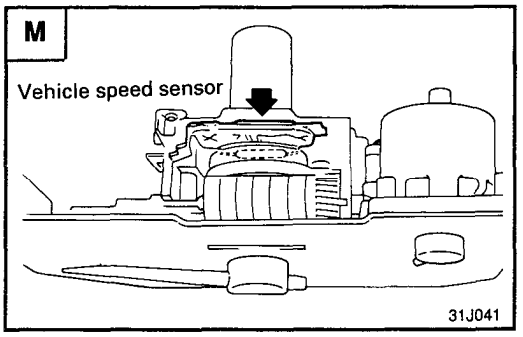
K


MFI control relay
31J039

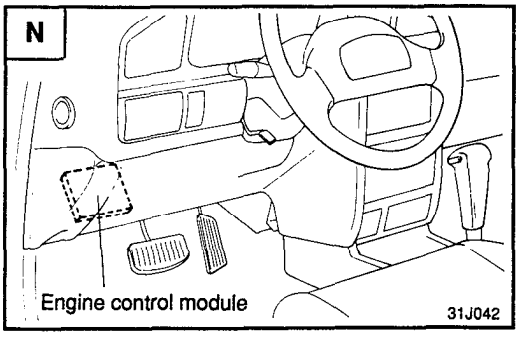
L


Data link connector
31J040

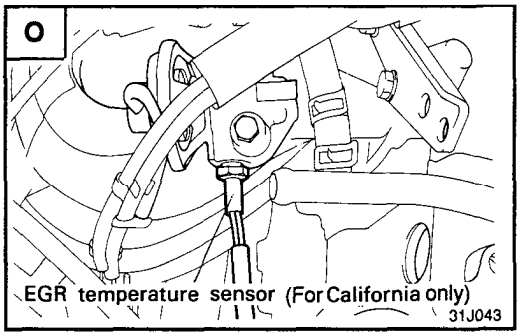
M


Vehicle speed sensor
31J041

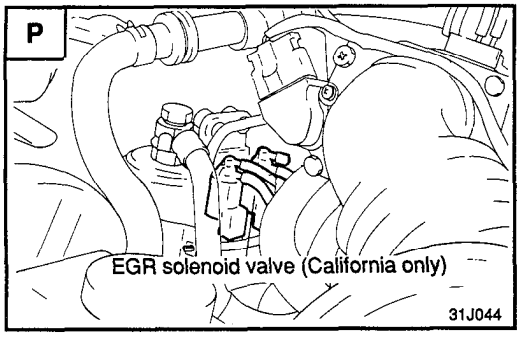
N


Engine control module
31J042

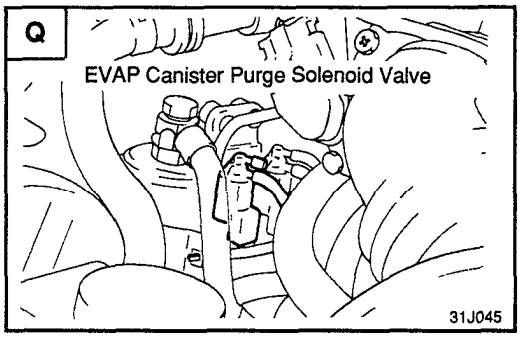
O


EGR temperature sensor (For California only)
31J043

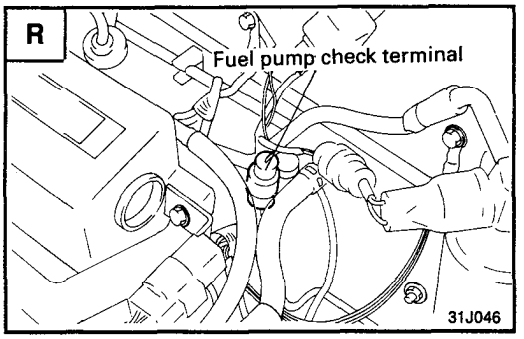
P


EGR solenoid valve (California only)
31J044

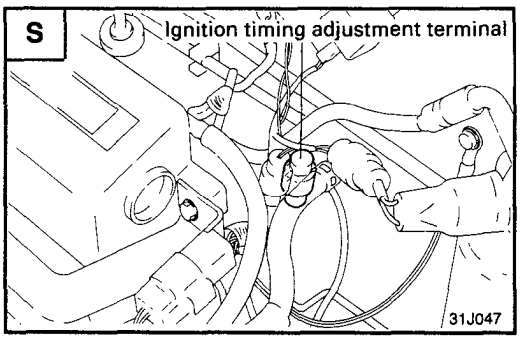
Q


EVAP Canister Purge Solenoid Valve
31J045

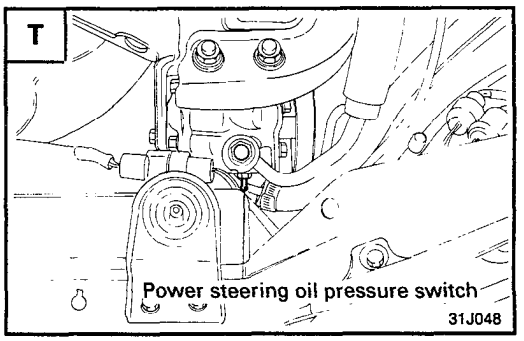
R

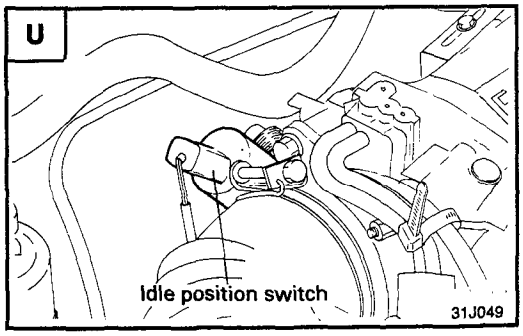

Fuel pump check terminal
31J046

S


Ignition timing adjustment terminal
31J047

T

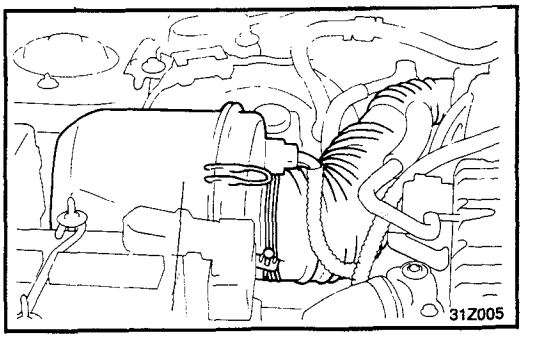

Power steering oil pressure switch
31J048


U
Idle position switch
31J049

MFI COMPONENTS INSPECTION

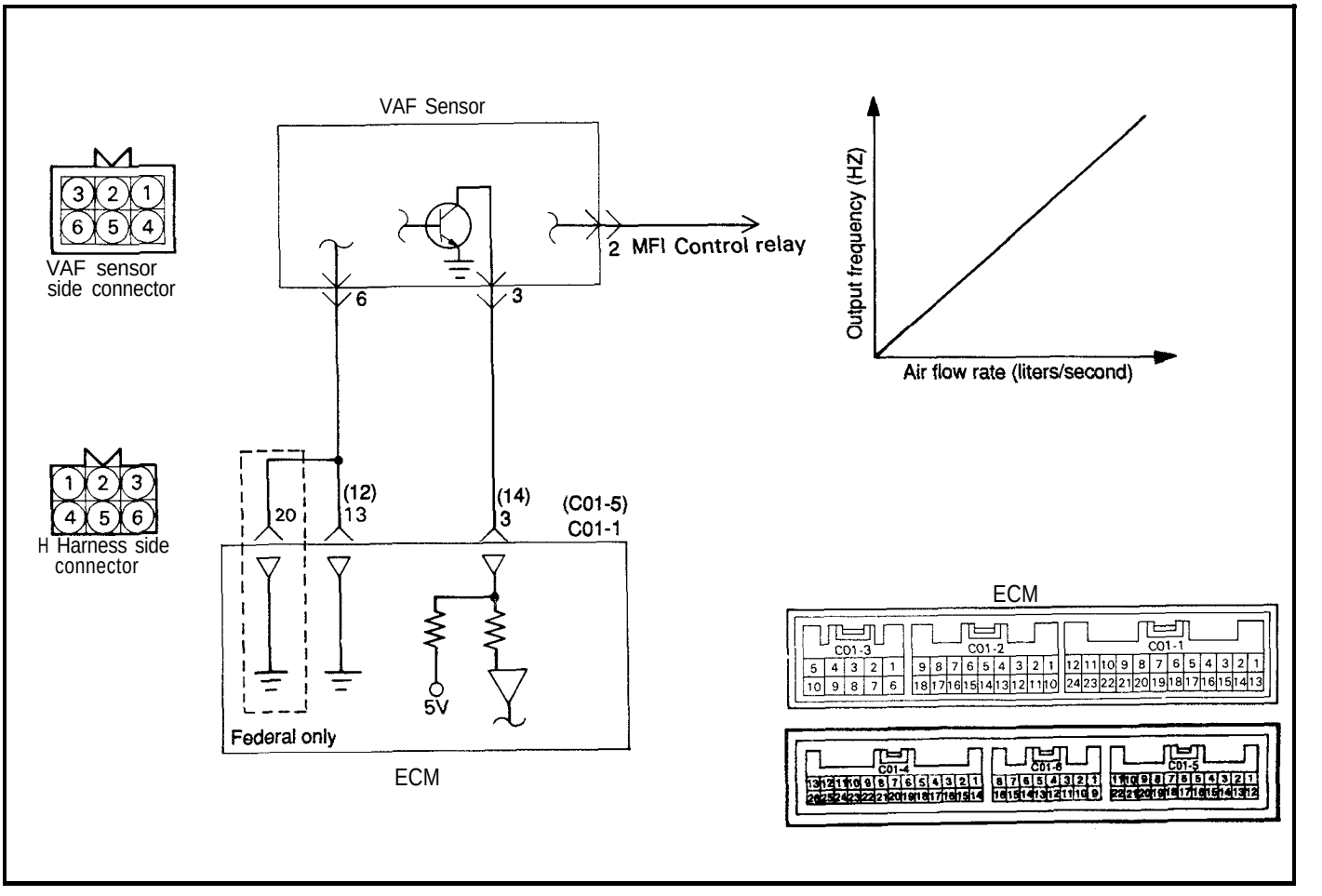
VOLUME AIR FLOW SENSOR (VAF Sensor)

The VAF Sensor measures the intake air volume. It makes use of a Karman vortex to detect the air flow rate and sends it to the ECM as the intake air volume signal.
The ECM uses this intake air volume signal to decide the basic fuel injection duration.



Circuit Diagram

( ) : California only



Troubleshooting Hints

1. If the engine stalls occasionally, crank the engine and shake the VAF Sensor harness. If the engine stalls, check for the poor contact of the VAF Sensor connector.
2. If the VAF Sensor output frequency is other than 0 when the ignition switch is turned on (do not start the engine), Check for the faulty VAF Sensor or ECM.
3. If the engine can be idle even if the VAF Sensor output frequency is out of specification, check for the following conditions:
   1) Disturbed air flow in the VAF Sensor.
      Disconnected air duct, clogged air cleaner filter.
   2) Poor combustion in the cylinder.
      Faulty ignition plug, ignition coil, injector, incorrect compression.
   3) Air leaks in the intake manifold.
   4) Loose EGR valve seat.

Using Scan Tool

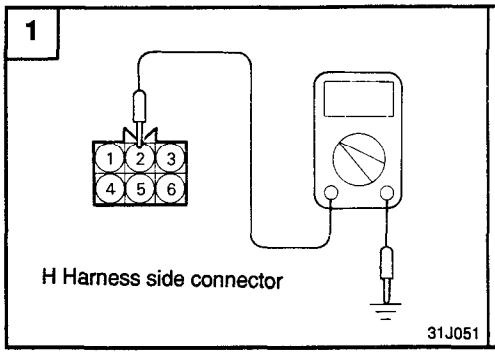
Check Item	Data display	Check conditions	Engine state	Test specification
Volume air flow sensor o Service data Item No. 12	Sensor air volume (frequency)	o Engine coolant temperature: 80 to 95°C (176 to 205°F) o Lamps, electric cooling fan, accessory units: All OFF o Transaxle: Neutral (P range for vehicle with A/T) o Steering wheel: Neutral	750 rpm (Idle)	27-33 Hz
			2,000 rpm	60-80 Hz
			Racing	Frequency increases with racing

NOTE
When the vehicle is new [within initial operation of about 500 km (300 miles)], the volume air flow sensor output frequency may be about 10% higher.

Harness Inspection Procedures

* : California only

1

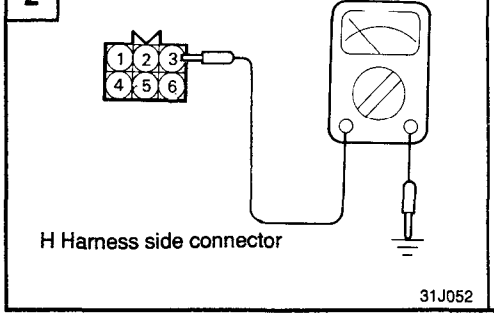


Measure the power supply voltage.
- o Connector: Disconnected
- o Ignition switch: ON
- o Voltage (V): System voltage

OK → **2**

NG → Repair the harness (H 2 - MFI control relay) or check the MFI control relay.

2

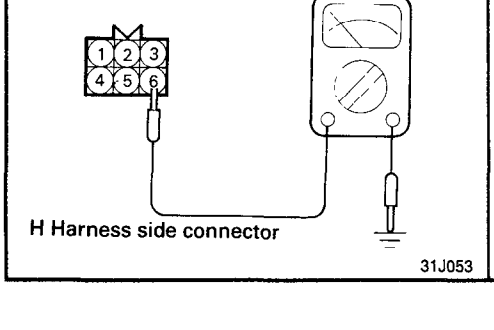


Measure the terminal voltage.
- o Connector: Disconnected
- o Ignition switch: ON
- o Voltage: 4.8-5.2V

OK → **3**

NG → Repair the harness.
(H 3 - C01-1 3)
* (H 3 - C01-5 14)

3



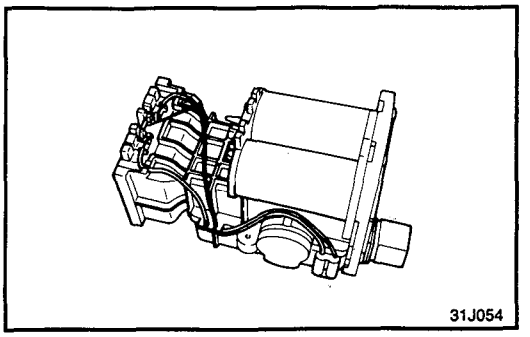
Check for continuity of the ground circuit.
- o Connector: Disconnected

OK → **END !**

NG → Repair the harness.
(H 6 - C01-1 20, 13)
* (H 6 -C01-5 12)

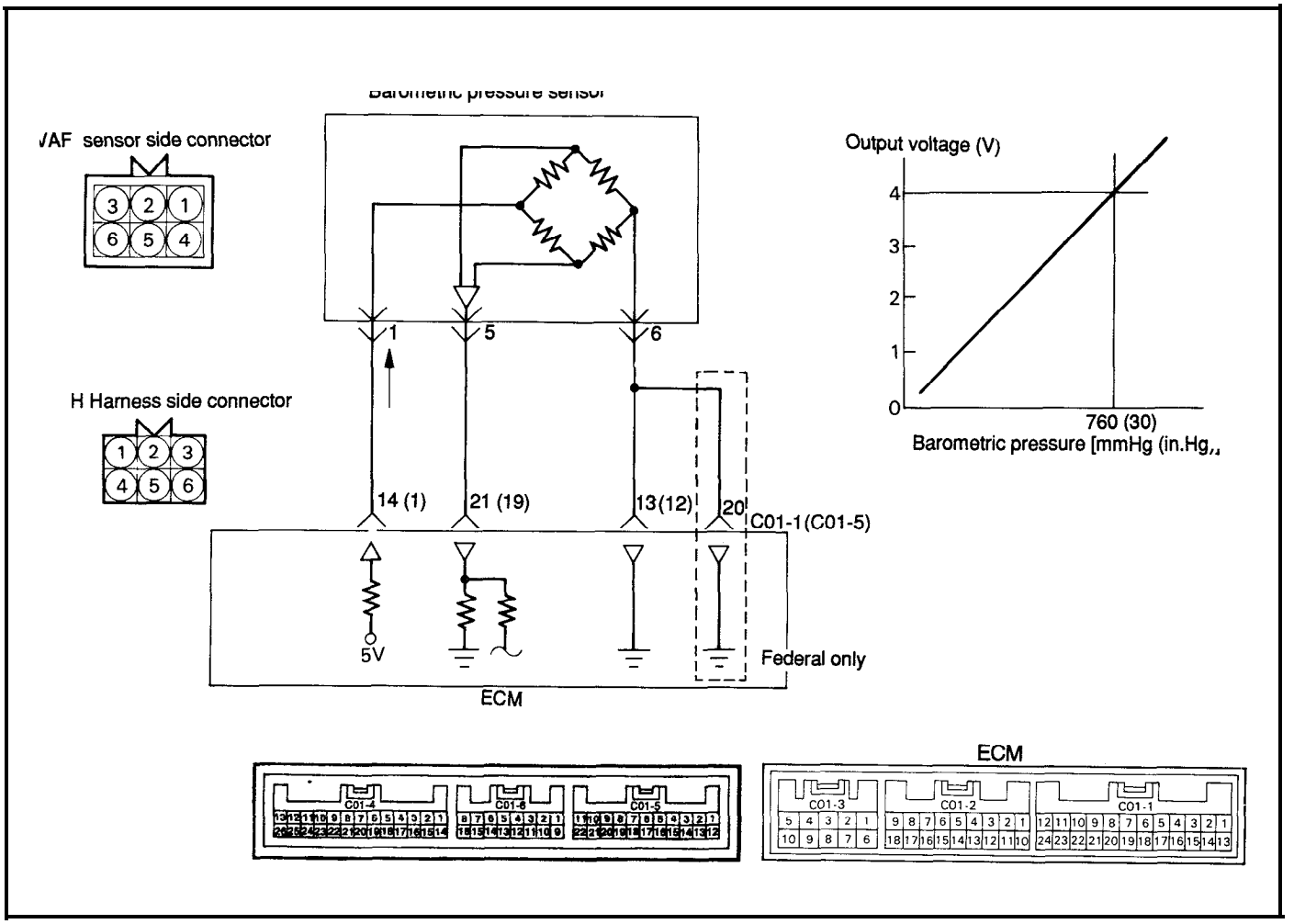
BAROMETRIC PRESSURE (BARO) SENSOR

The barometric pressure sensor installed on the VAF Sensor senses the barometric pressure and converts it into a voltage which is sent to the ECM.
The ECM uses this signal to compute the altitude at which the vehicle is running and corrects the air-fuel ratio and the ignition timing, thus improving driveability at high altitude.



Circuit Diagram

( ) : California only



Troubleshooting Hints

1. If the barometric pressure sensor is faulty, the vehicle will experience poor driveability.
2. If the pressure of the barometric pressure sensor drops greatly during high speed driving, check the air cleaner for clogging.

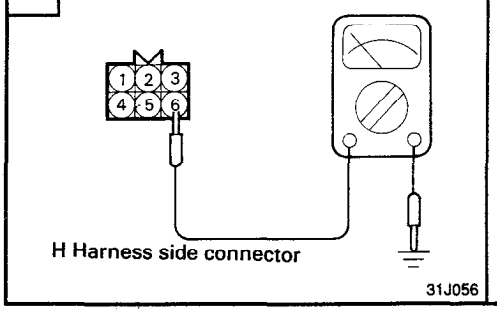
Using Scan Tool

Check item	Data display	Check conditions	Altitude	Test specification
Barometric pressure sensor o Service data Item No. 25	Sensor pressure	Ignition switch: ON	When 0 m (0 ft.)	760 mmHg
			When 600 m (1,969 ft.)	710 mmHg
			When 1,200 m (3,937 ft.)	660 mmHg
			When 1,800 m (5,906 ft.)	610 mmHg

Harness Inspection Procedures

* : California only

1

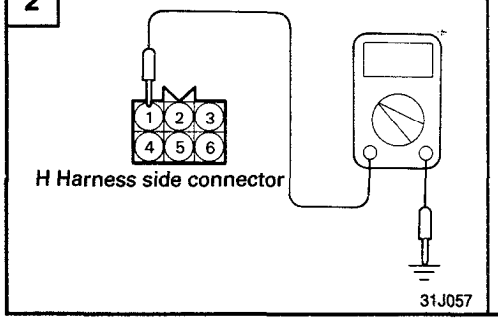


Check for continuity of the ground circuit.
- o Connector: Disconnected

OK → 2

NG → Repair the harness (H 6 - C01-1 20 , 13) * (H 6 - C01-5 12)

2

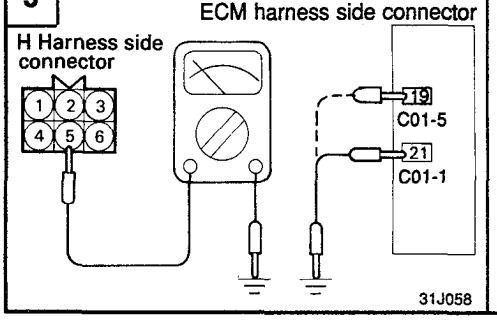


Measure the power supply voltage of the barometric pressure sensor.
- o Connector: Disconnected
- o Ignition switch: ON
- o Voltage: 4.8-5.2V

OK → 3

NG → Repair the harness. (H 1 - C01-1 14) * (H 1 - C01-5 1)

3



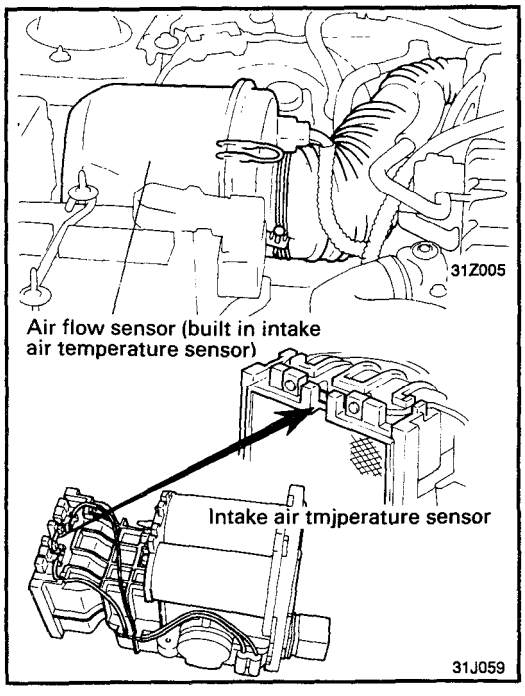
Check for an open-circuit, or a short-circuit to ground between the engine control module and the barometric pressure sensor.
- o VAF air flow sensor connector: Disconnected
- o Engine control module connector: Disconnected

OK → END !

NG → Repair the harness. (H 5 - C01-1 21) * (H 5 - C01-5 19)

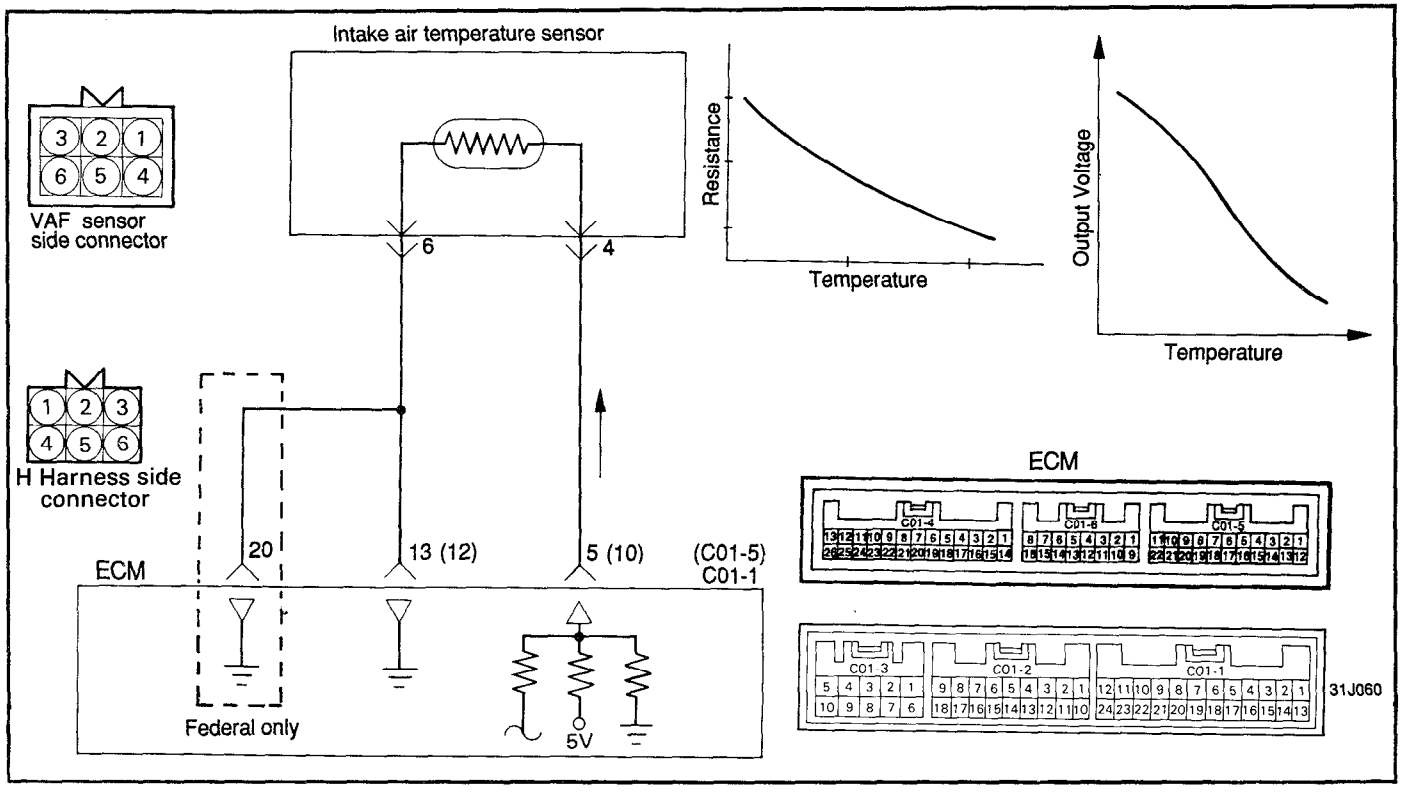
INTAKE AIR TEMPERATURE SENSOR

The intake air temperature sensor, located at the illustrated position on VAF Sensor, is a resistor-based sensor for detecting the intake air temperature.
According to the intake air temperature information from the sensor, the ECM provides necessary fuel injection amount control.



Circuit Diagram

( ) : California only



Troubleshooting Hints

The intake air temperature sensor senses the intake air temperature in the air cleaner to indicate a temperature different from outside temperature.

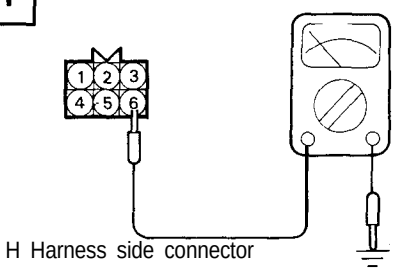
Using Scan Tool

Check Item	Data display	Check conditions	Intake air temperature	Test specification
Intake air temperature sensor o Service data Item No. 13	Sensor temperature	Ignition switch: ON or engine running	When -20°C (-4°F)	-20°C
			When 0°C (32°F)	0°C
			When 20°C (68°F)	20°C
			When 40°C (104°F)	40°C
			When 80°C (176°F)	80°C

Harness Inspection Procedures

* : California only

1

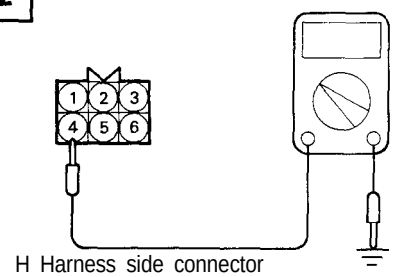


Check for continuity of the ground circuit.
o Connector: Disconnected

OK → 2

NG → Repair the harness (H 6 - C01-1 20, 13)
* (H 6 - C01-5 12)

2



Measure the power supply voltage.
o Connector: Disconnected
o Ignition switch: ON
o Voltage: 4.5-4.9V

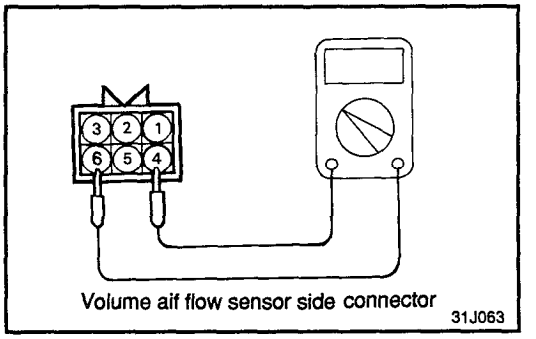
OK → **END !**

NG → Repair the harness. (H 4 - C01-1 15)
* (H 4 - C01-5 10)

Sensor Inspection

1. Disconnect the volume air flow sensor connectors.
2. Measure resistance between terminals 4 and 6.

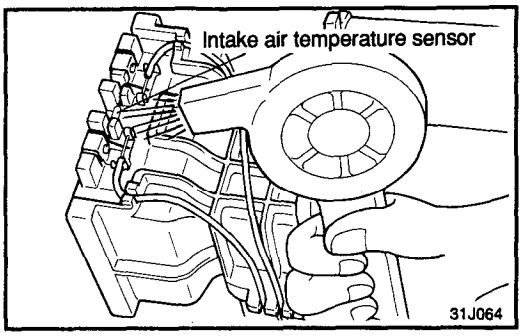
Temperature [°C (°F)]	Resistance (kΩ)
0 (32)	6.0
20 (68)	2.7
80 (176)	0.4



3. Measure resistance while heating the sensor using a hair drier.

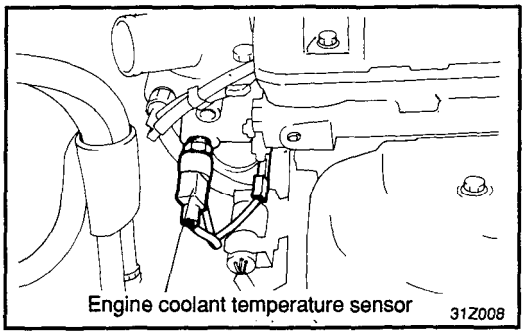
Temperature [°C (°F)]	Resistance (kΩ)
Higher	Smaller

4. If the value deviates from the standard value or the resistance remains unchanged, replace the volume air flow sensor assembly.



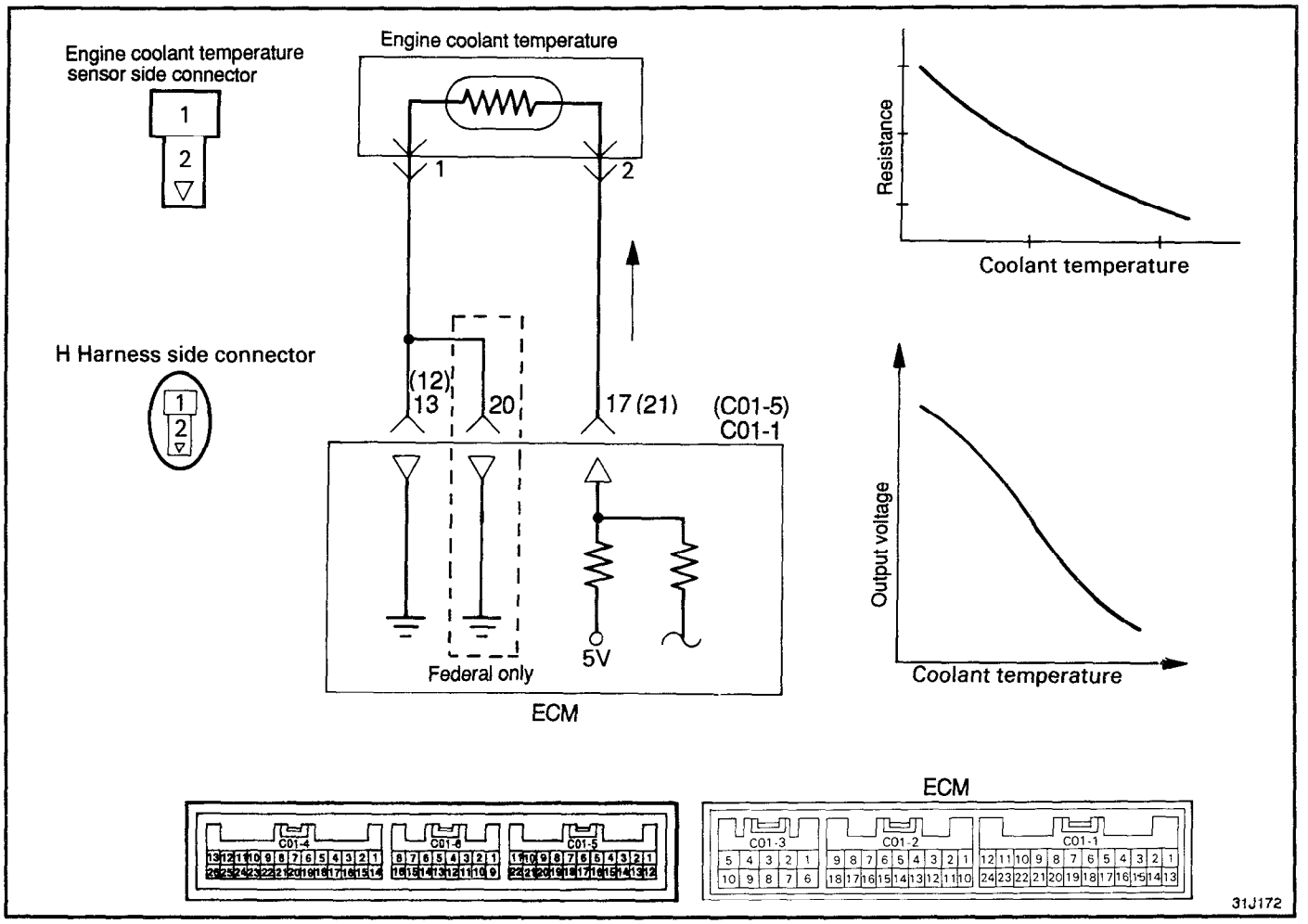
ENGINE COOLANT TEMPERATURE SENSOR

The engine coolant temperature sensor is installed in the engine coolant passage of the cylinder head. The ECM judges engine temperature by the sensor output voltage and provides optimum fuel enrichment when the engine is cold.



Circuit Diagram

( ) : California only



Troubleshooting Hints

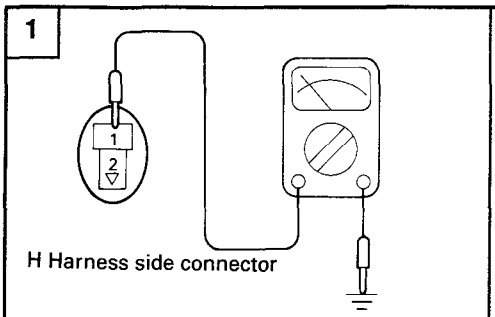
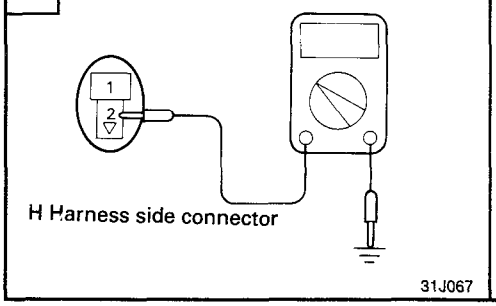
If the fast idle speed is not enough or the engine gives off dark smoke during the engine warm-up operation, the engine coolant temperature sensor might be the causes.

Using Scan Tool

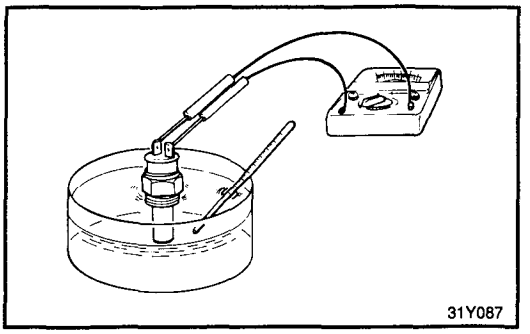
Check Item	Data display	Check conditions	Coolant temperature	Test specification
Engine coolant temperature sensor o Service data Item No. 21	Sensor temperature	Ignition switch: ON or engine running	When -20°C (-4°F)	-20°C
			When 0°C (32°F)	0°C
			When 20°C (68°F)	20°C
			When 40°C (104°F)	40°C
			When 80°C (176°F)	80°C

Harness Inspection Procedures

• : California only

1  31J066	Check for continuity of the ground circuit. o Connector: Disconnected	OK →	2
		NG →	Repair the harness (H 1 - C01-1 23 , 13) * (H 1 - C01-5 12)
2  31J067	Measure the power supply voltage. o Connector: Disconnected o Ignition switch: ON o Voltage: 4.5-4.9V	OK →	END !
		NG →	Repair the harness. (H 2 - C01-1 17) * (H 2 - C01-5 21)

Sensor Inspection



1. Remove engine coolant temperature sensor from the intake manifold.
2. With temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

Temperature °C (°F)	Resistance (KΩ)
0 (32)	5.9
20 (68)	2.5
40 (104)	1.1
80 (176)	0.3

3. If the resistance deviates from the standard value greatly, replace the sensor.

Installation

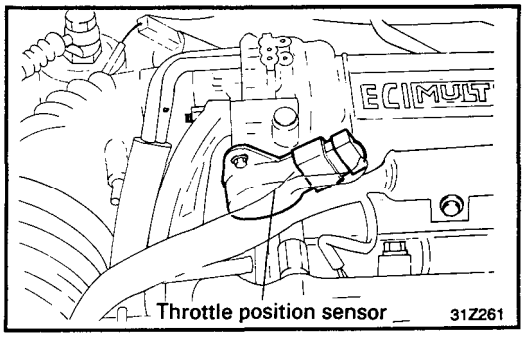
1. Apply sealant LOCTITE 962T or equivalent to threaded portion.
2. Install engine coolant temperature sensor and tighten it to specified torque.

Tightening torque ..... 20-40 Nm (200-400 kg.cm, 14-29 lb.ft)

3. Connect the harness connector securely.

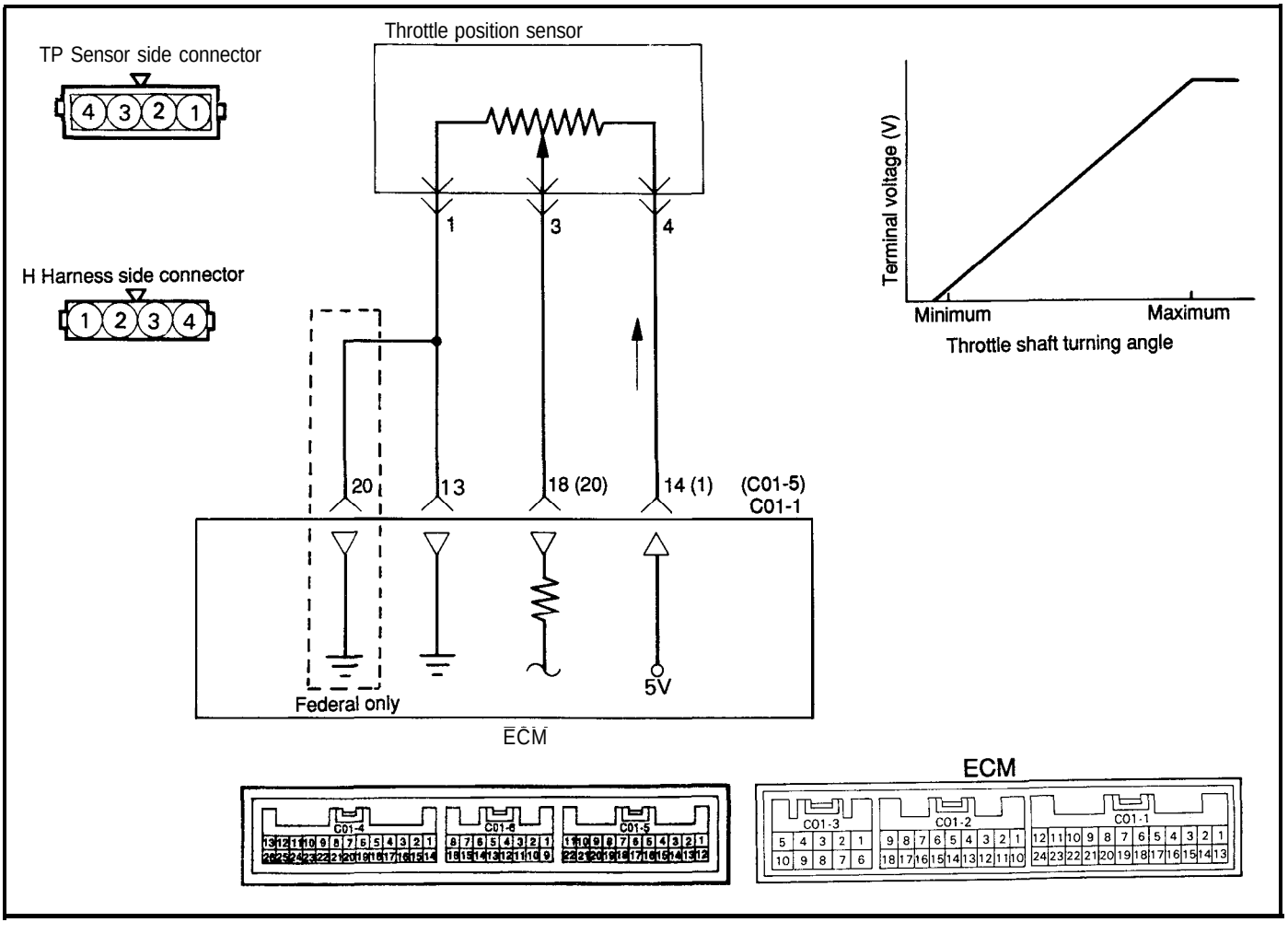
THROTTLE POSITION SENSOR (TP Sensor)

The TP Sensor is a rotating type variable resistor that rotates with the throttle body throttle shaft to sense the throttle valve angle. As the throttle shaft rotates, the output voltage of the TP Sensor changes and the ECM detects the throttle valve opening based on the change of the voltage.



Circuit Diagram

( ) : California only



Troubleshooting Hints

1. The TP Sensor signal is important in the control of automatic transaxle. Shift shock and other troubles will occure if the sensor is faulty.

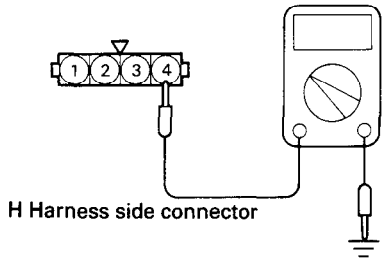
Using Scan Tool

Check Item	Data display	Check conditions	Throttle valve	Test specification
Throttle position sensor o Service data Item No. 14	Sensor voltage	Ignition switch: ON	At idle postion	450-550 mV
			Open slowly	Increases with valve opening
			Open widely	4,500-5,500 mV

Harness Inspection Procedures

* : California only

1

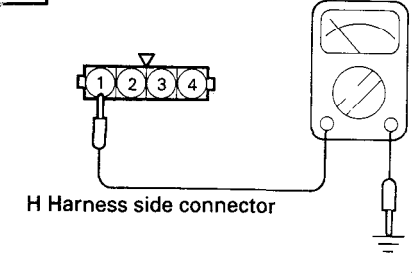


Measure the power supply voltage of the throttle position sensor.
- o Connector: Disconnected
- o Ignition switch: ON
- o Voltage: 4.8-5.2V

OK → 2

NG → Repair the harness (H 4 - C01-1 14)
* (H 4 -C01-5 1)

2

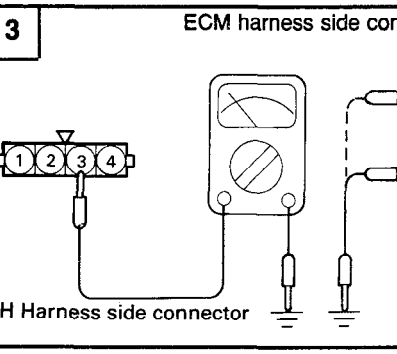


Check for continuity of the ground circuit.
- o Connector: Disconnected

OK → 3

NG → Repair the harness. (H 1 - C01-1 20 , 13)
* (H 1 - C01-5 12)

3

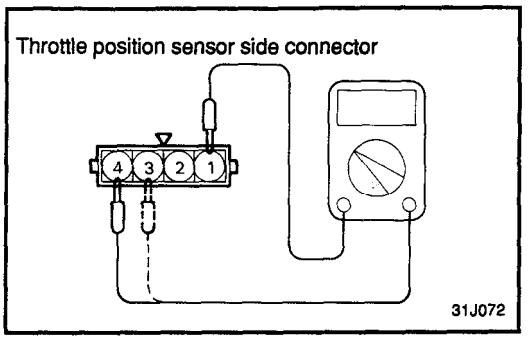


Check for an open-circuit, or a short-circuit to ground between the engine control module and the throttle position sensor.
- o Throttle position sensor connector: Disconnected
- o Engine control module connector: Disconnected

OK → **END !**

NG → Repair the harness. (H 3 - C01-1 18)
* (H 3 - C01-5 20)

Sensor Inspection



1. Disconnect the throttle position sensor connector.
2. Measure resistance between terminal 1 (sensor ground) and terminal 4 (sensor power).

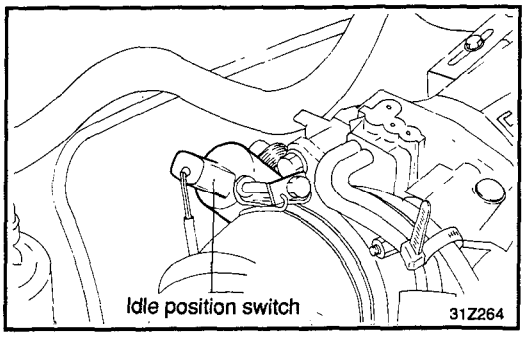
Standard value ..... 3.5-6.5 kΩ

3. Connect a pointer type ohmmeter between terminal 1 (sensor ground) and terminal 3 (sensor output).
4. Operate the throttle valve slowly from the idle position to the full open position and check that the resistance changes smoothly in proportion with the throttle valve opening angle.
5. If the resistance is out of specification, or fails to change smoothly, replace the throttle position sensor.

TP Sensor tightening torque .....
1.5-2.5 Nm (15-25 kg.cm, 1.1-1.8 lb.ft)

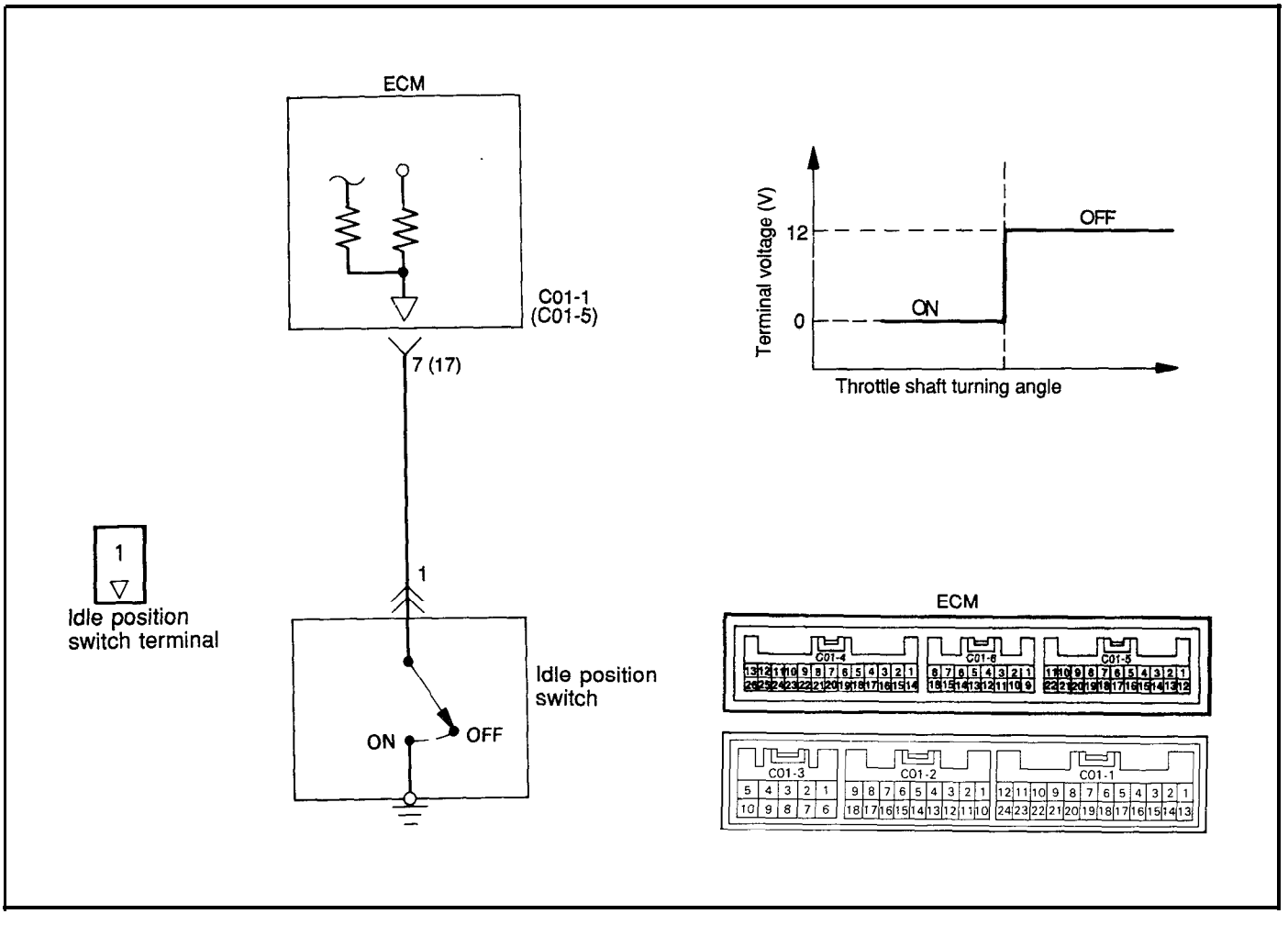
IDLE POSITION SWITCH

The idle switch, which is a contact type switch, senses accelerator operation.



Circuit Diagram

( ) : California only



Troubleshooting Hints

If the idle position switch harness is OK, but the idle position switch output is abnormal, check for the following items.

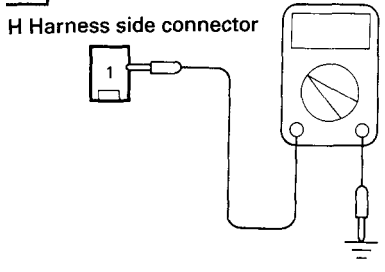
1. Poorly adjusted accelerator cable or auto-cruise control cable.
2. Poorly adjusted idle position switch (fixed SAS).

Using Scan Tool

Check Item	Data display	Check conditions	Throttle valve	Normal indication
Idle position switch o Service data Item No. 26	Switch state	Ignition switch: ON (check by operating accelerator pedal repeatedly)	At idle position	ON
			Open a little	OFF

Harness Inspection Procedures

* : California only

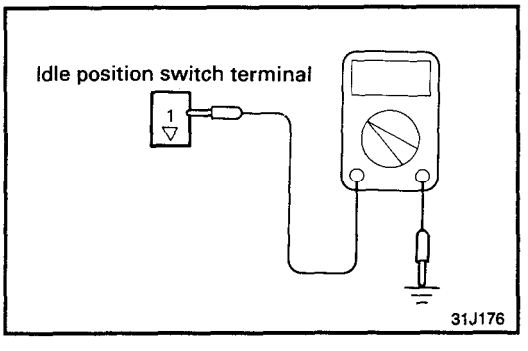
1 H Harness side connector 	Measure the power supply voltage of the idle position switch. o Connector: Disconnected o Ignition switch: ON o Voltage: 4V or more	OK → END ! NG → Repair the harness. (H 1 - C01-1 7) * (H 1 -C01-5 17)

Sensor Inspection

1. Disconnect the idle position switch connector.
2. Check the continuity between terminal 1 and sensor ground.

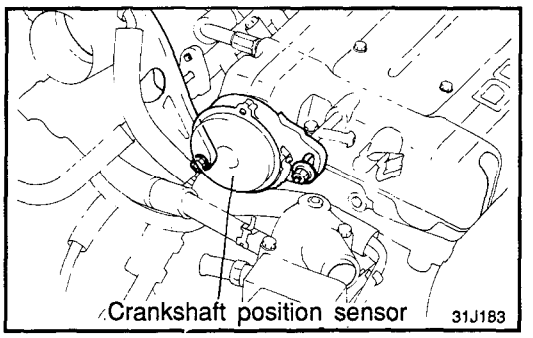
Accelerator pedal	Continuity
Depressed	Non-conductive (∞ Ω)
Released	Conductive (0 Ω)

3. If out of specification, replace the idle position switch.



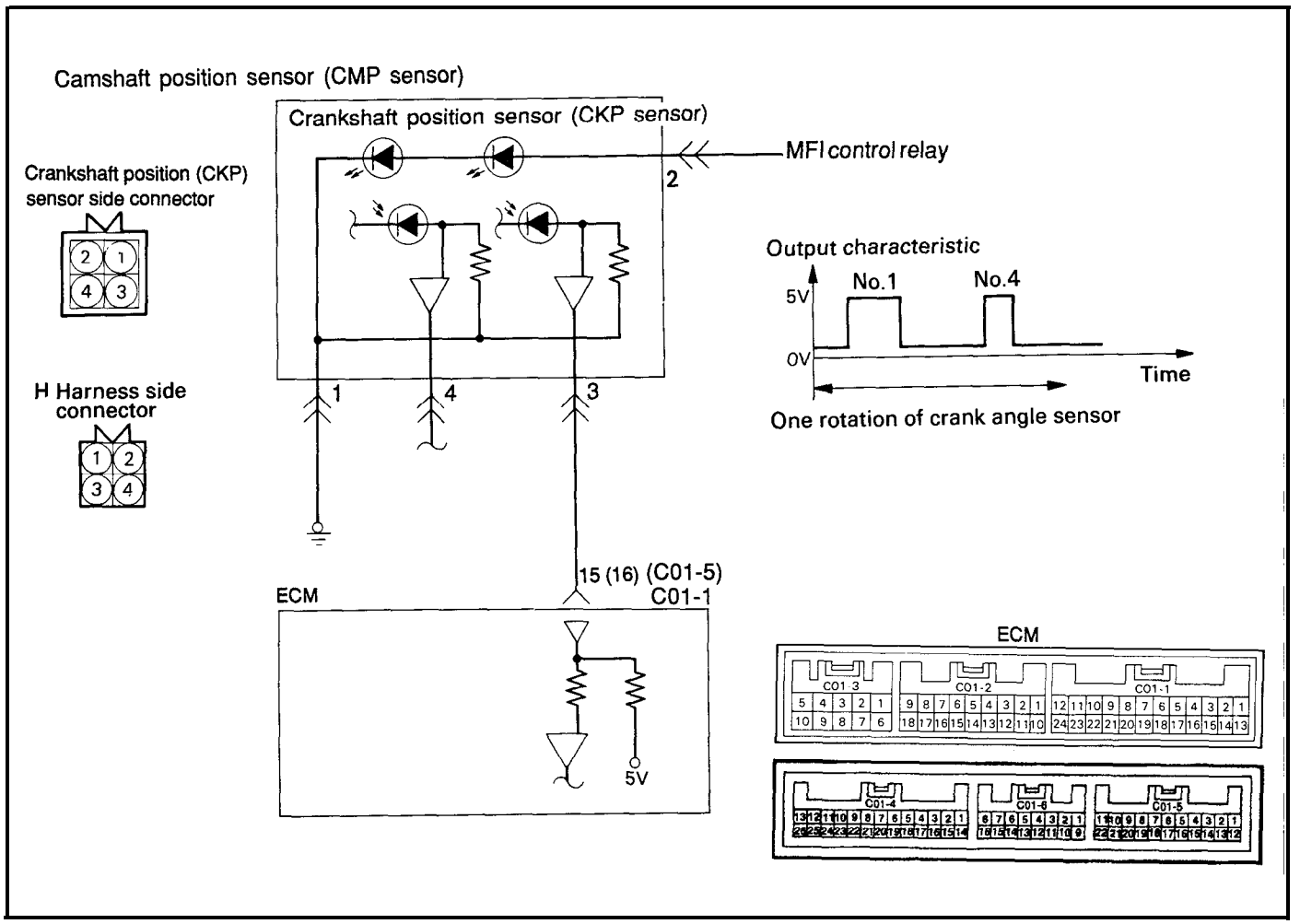
CAMSHAFT POSITION (CMP) SENSOR

The CMP sensor senses the camshaft position sensor on compression stroke of the No. 1 and No. 4 cylinders, converts it into a pulse signal and inputs it to the ECM. The ECM then computes the fuel injection sequence, etc. based on the input signal.



Circuit Diagram

( ) : California only

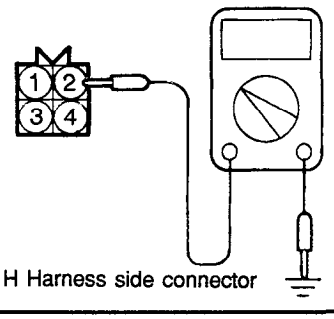
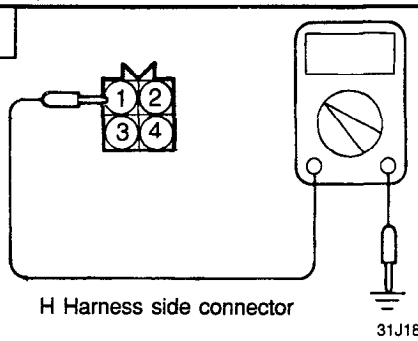
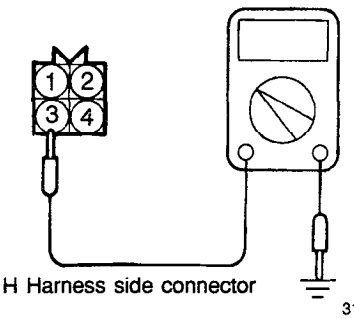


Troubleshooting Hints

If the CMP Sensor does not operate correctly, correct sequential injection is not made so that the engine may stall or run irregularly at idle or fail to accelerate normally.

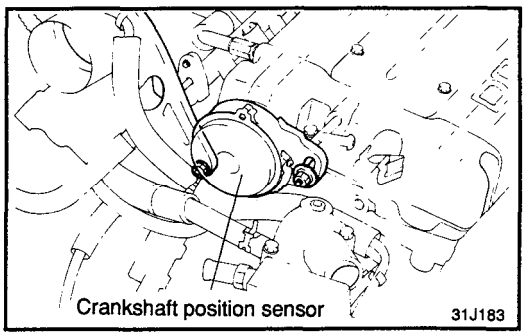
Harness Inspection Procedures

* : California only

1		Measure the power supply voltage. o Connector: Disconnected o Ignition switch: ON o Voltage (V): SV	OK → 2 NG → Repair the harness (H 2 - MFI control relay)
2		Check for continuity of the ground circuit. o Connector: Disconnected	OK → 3 NG → Repair the harness. (H 1 - Ground)
3		Check for continuity of the ground circuit. o Connector: Disconnected o Ignition switch: ON o Voltage: 4.8-5.2V	OK → END ! NG → Repair the harness. (H 3 - C01-1 15) * (H 3 - C01-5 16)

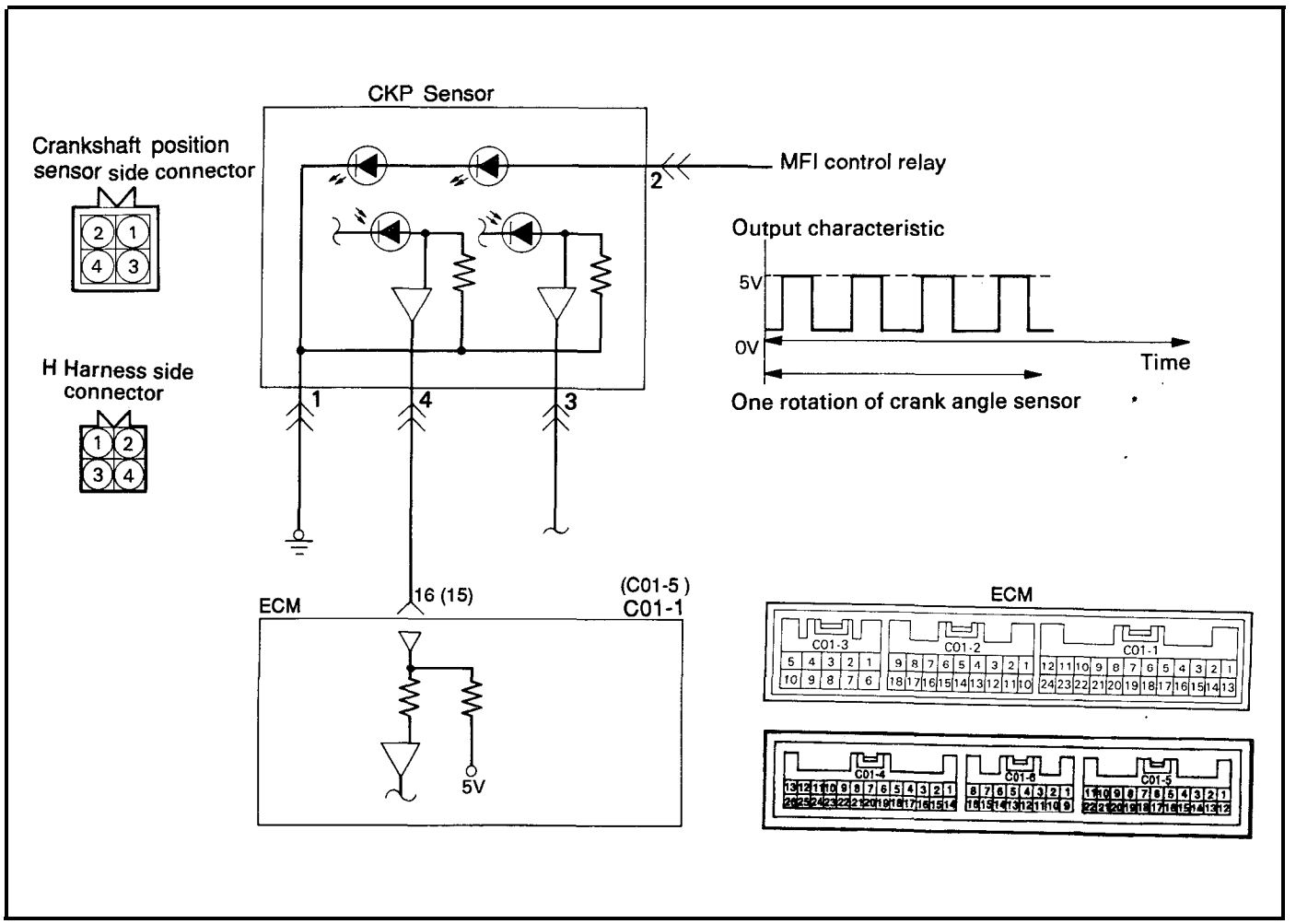
CRANKSHAFT POSITION (CKP) SENSOR

The crankshaft position sensor senses the crank angle (piston position) of each cylinder, converts it into a pulse signal.
The ECM computes the engine speed and controls the fuel injection timing and ignition timing based on the input signal.



Circuit Diagram

( ) : California only



Troubleshooting Hints

1. If unexpected shocks are felt during driving or the engine stalls suddenly, shake the crankshaft position sensor harness. If this causes the engine to stall, check for poor contact of the sensor connector.
2. If the tachometer reads 0 rpm when the engine is cranked, check for faulty crank angle sensor, broken timing belt or ignition system problems,
3. If the engine can be run at idle even if the crank angle sensor reading is out of specification, check the followings:
   1) Faulty engine coolant temperature sensor
   2) Faulty idle speed control motor
   3) Poorly adjusted reference idle speed

Using Scan Tool

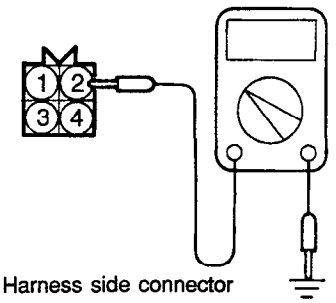
Check Item	Data display	Check conditions	Check content	Normal state
Crankshaft position sensor o Service data Item No. 22	Cranking speed	o Engine cranking o Tachometer connected (check on and off of primary current of ignition coil by tachometer)	Compare cranking speed and multi-tester reading	Indicated speed agrees

Check Item	Data display	Check conditions	Coolant temperature	Test specification
Crankshaft position sensor o Service data Item No.22	Idle speed	o Engine: Running at idle o Idle position switch: ON	When -20°C (-4°F)	1,500-1,700 rpm
			When 0°C (32°F)	1,350-1,550 rpm
			When 20°C (68°F)	1,200-1,400 rpm
			When 40°C (104°F)	1,000-1,200 rpm
			When 80°C (176°F)	650-850 rpm

Harness Inspection Procedures

* : California only

1

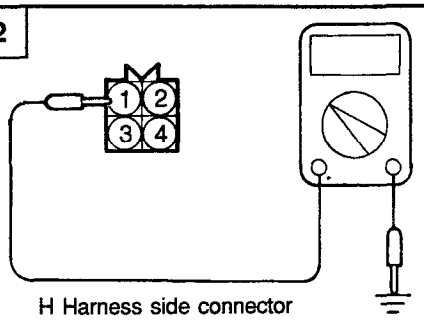


Measure the power supply voltage.
- o Connector: Disconnected
- o Ignition switch: ON
- o Voltage (V): SV

OK → 2

NG → Repair the harness (H 2-MFI control relay)

2

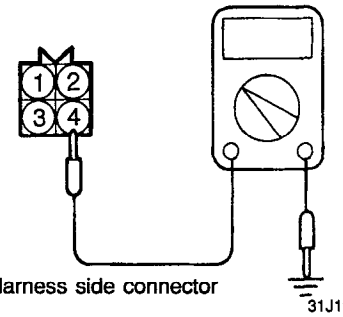


Check for continuity of the ground circuit.
- o Connector: Disconnected

OK → 3

NG → Repair the harness. (H 1 - Ground)

3



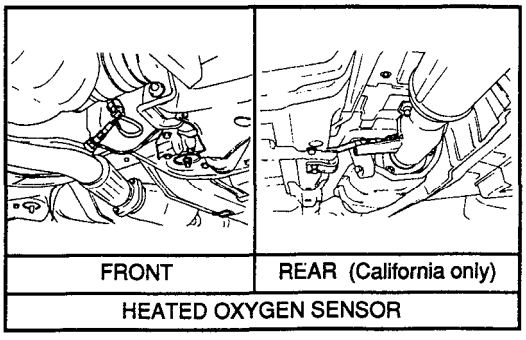
Check for continuity of the ground circuit.
- o Connector: Disconnected
- o Ignition switch: ON
- o Voltage: 4.8-5.2V

OK → **END !**

NG → Repair the harness. (H 2 - C01-1 16) * (H 4 - C01-5 15)

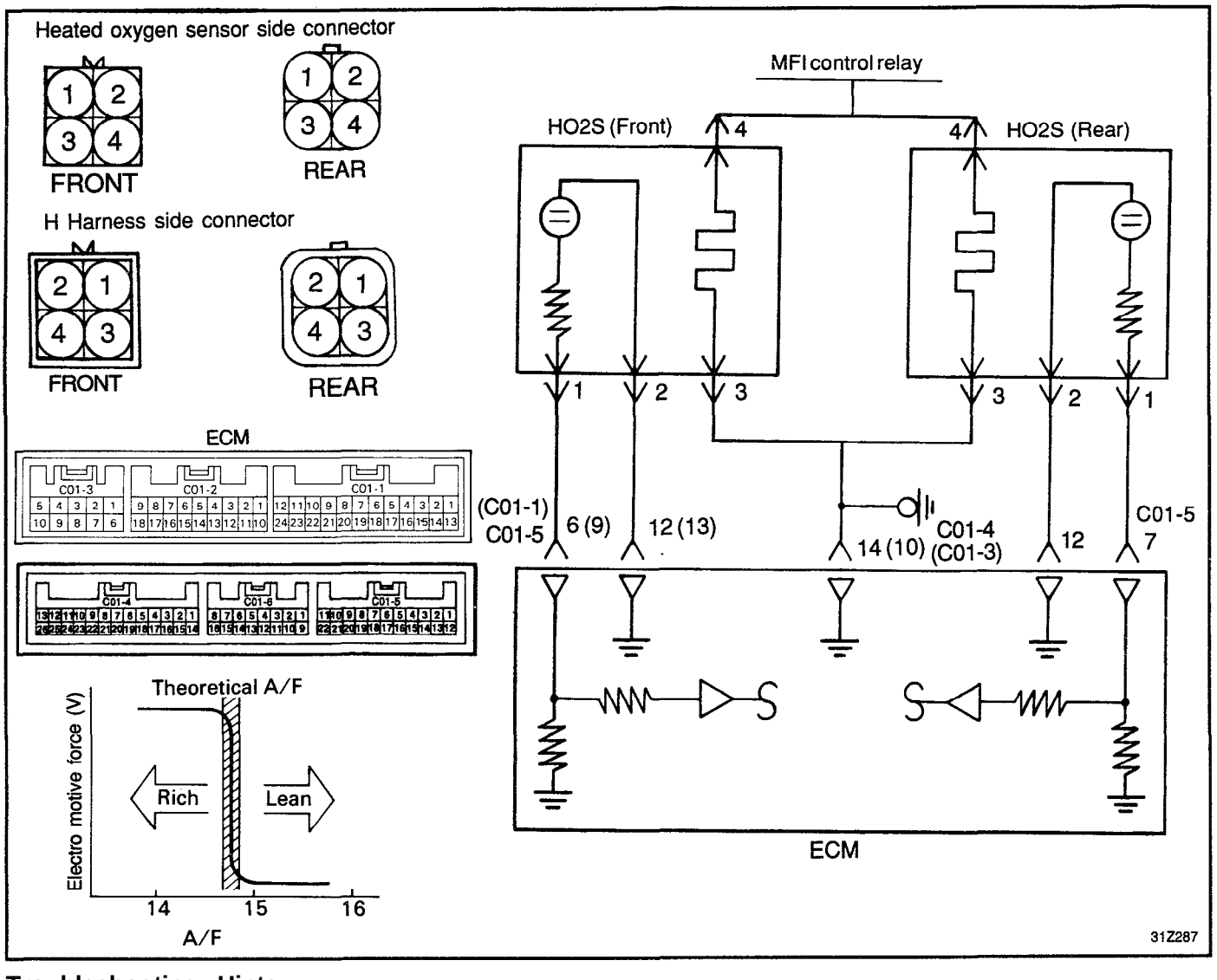
HEATED OXYGEN SENSOR (HO2S)

The heated oxygen sensor senses the oxygen concentration in exhaust gas, converts it into a voltage which is sent to the ECM. The oxygen sensor outputs about 1 V when the air fuel ratio is richer than the theoretical ratio and outputs about 0V when the ratio is leaner (higher oxygen concentration in exhaust gas.).
The ECM controls the fuel injection ratio based on this signal so that the air fuel ratio is maintained at the theoretical ratio. The oxygen sensor has a heater element which ensures the sensor performance during all driving conditions.



HEATED OXYGEN SENSOR

Circuit Diagram



Troubleshooting Hints

1. If the HO2S is defective abnormally high emissions may occure.
2. If the HO2S check has resulted normal but the sensor output voltage is out of specifications, check for the following items related to air fuel ratio control system.
   1) Faulty injector
   2) Air leaks in the intake manifold.
   3) Faulty volume air flow sensor, intake air temperature sensor, barometric pressure sensor, engine coolant temperature sensor.

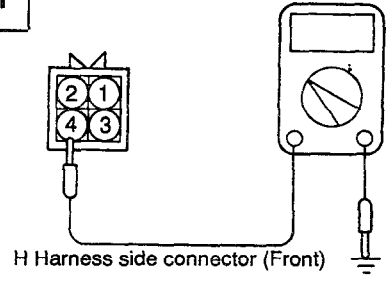
Using Scan Tool

Check Item	Data display	Check conditions	Engine state	Test specification
Heated oxygen sensor o Service data Item No. 11, 59	Sensor voltage	Engine: Warm-up (make the mixture lean by engine speed reduction, and rich by racing)	When sudden deceleration from 4,000 rpm	**200** mV or lower
			When engine is suddenly raced	600-1,000 mV
		Engine: Warm-up (using the heated oxygen sensor signal, check the air/fuel mixture ratio, and also check the condition of control by the ECU)	750 rpm (Idle)	**400** mV or lower - (changes) 600-1,000 mV
			2,000 rpm	

Harness Inspection Procedures

* : Federal only

1

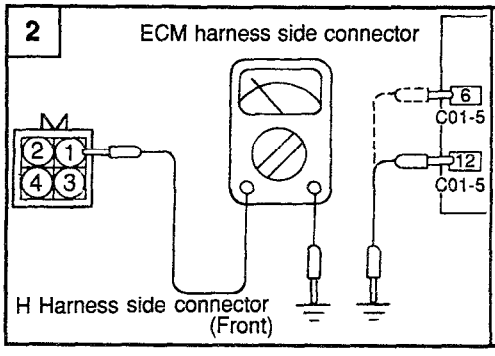


Measure the power supply voltage of the heated oxygen sensor.
- o Connector: Disconnected
- o Ignition switch: ON
- o Voltage (V): System voltage

OK → 2

NG → Repair the harness (H 4, - MFI control relay)

2

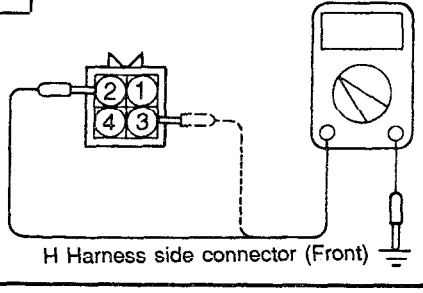


Check for an open-circuit, or a short-circuit of ground between the engine control module and the heated oxygen sensor.
- o Heated oxygen sensor connector: Disconnected
- o ECM connector: Disconnected

OK → 3

NG → Repair the harness.
(H 1 - C01-5 6)
(H 1 - C01-5 7)
* (H 1 - C01-1 9)

3



Check for continuity of the ground circuit.
- o Connector: Disconnected

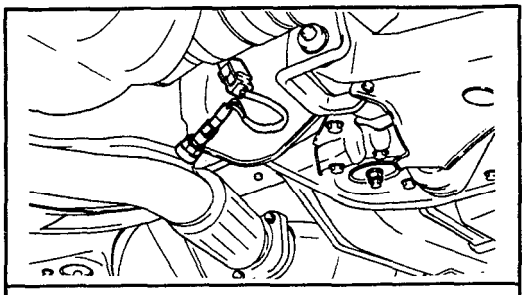
OK → **END !**
Repair the harness.
(H 2 - C01-5 12)
(H 3 - C01-4 14)

NG → *(H 2 - C01-1 13)
* (H 3 - C01-3 10)

Sensor Inspection

NOTE

1) **Before checking, warm up the engine until the engine coolant temperature reaches 80 to 95°C (176 to 205°F).**
2) **Use an accurate digital voltmeter.**



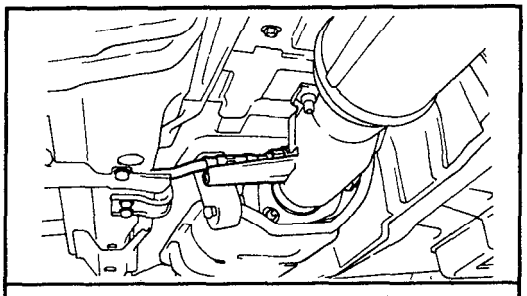
HO2S (Front)

1. Disconnect the oxygen sensor connector, and measure the resistance between terminal 3 and terminal 4.

   Standard value

Temperature °C (°F)	Resistance (Ω)
400 (752)	30 or more

2. Replace the oxygen sensor if there is malfunction.

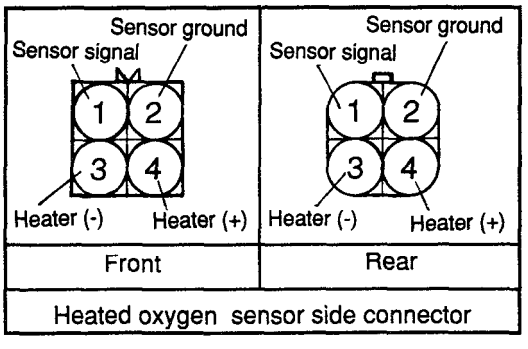


HO2S Rear (california only)

3. Apply battery voltage directly between terminal 3 and terminal 4.

   NOTE

   Take care when applying the voltage, because damage will result if the terminals are incorrect or are short-circuited.



Heated oxygen sensor side connector

4. Connect a digital-type voltmeter between terminal 1 and terminal 2.
5. While repeatedly racing the engine, measure the oxygen sensor output voltage.

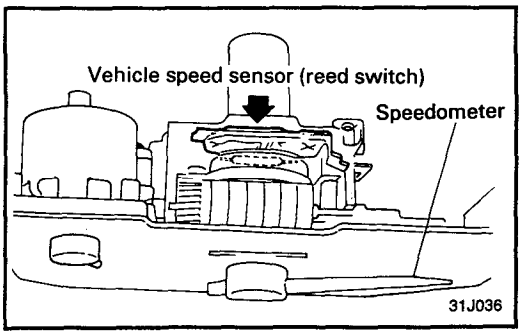
Engine	Oxygen sensor output voltage	Remarks
Race	Min. 0.6V	Makes the air/fuel mixture rich by increased engine speed

6. If there is a problem, it is probable that there is a malfunction of the oxygen sensor.

Tightening torque
Oxygen sensor ..... **40-50** Nm (400-500 kg.cm, 29-36 lb.ft)

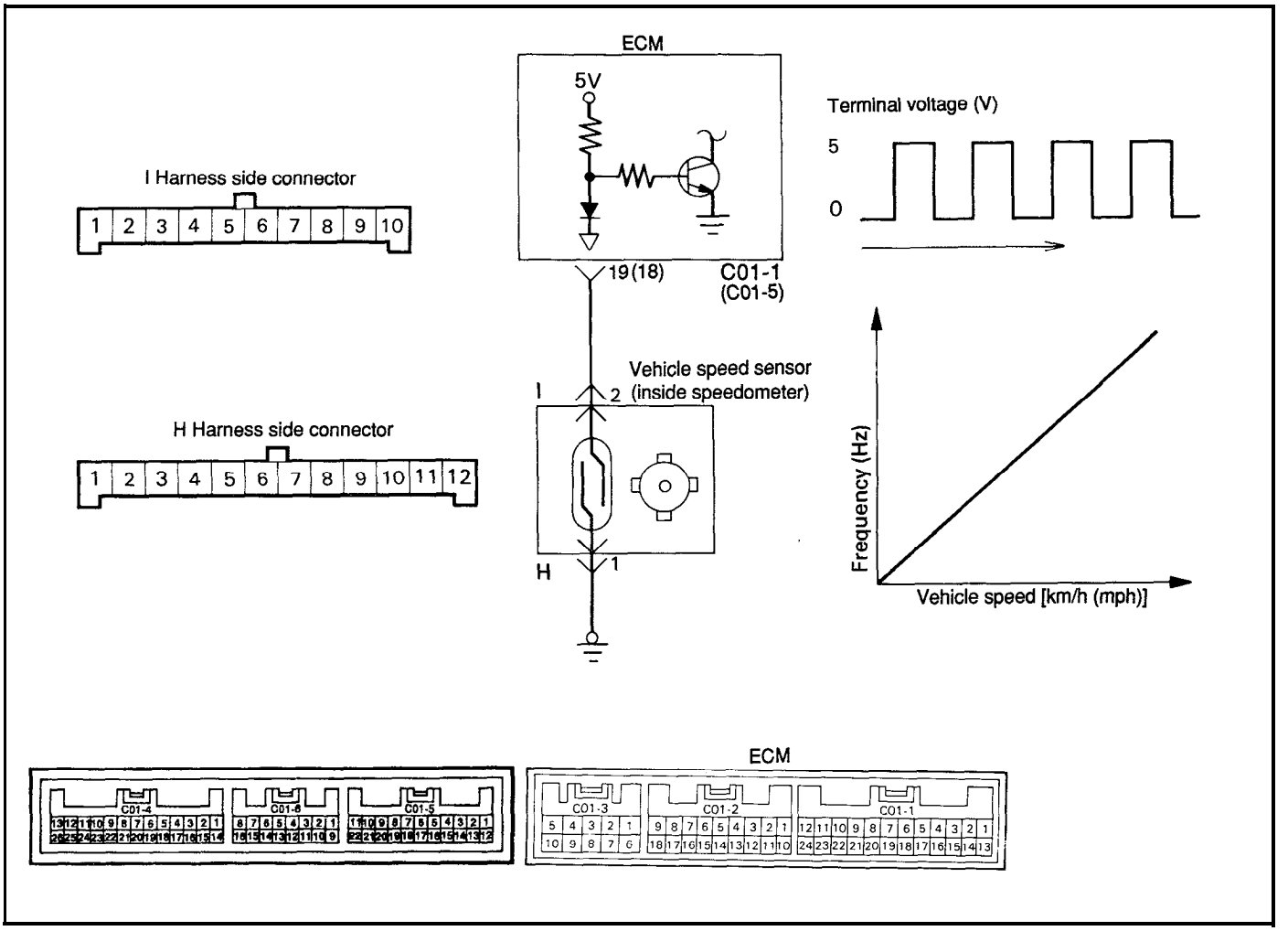
VEHICLE SPEED SENSOR

The vehicle speed sensor is a reed switch. The speed sensor is built into the speedometer and converts the transaxle gear revolutions into pulse signals, which are sent to the ECM.



Circuit Diagram

( ) : California only

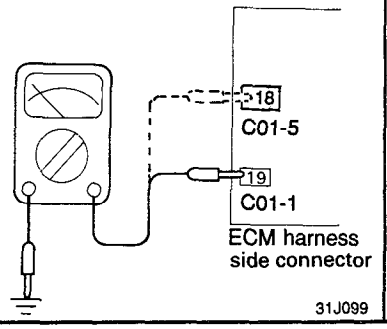
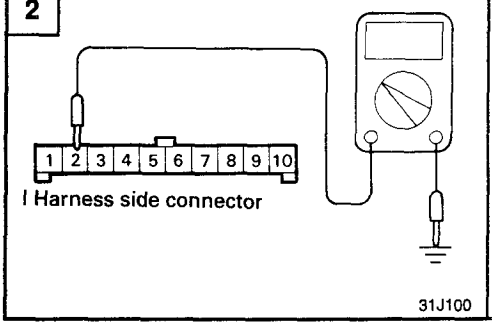
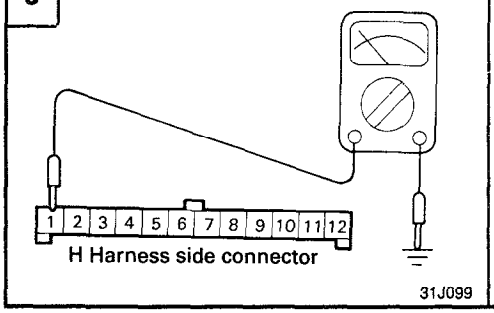


Troubleshooting Hints

If there is an open or short circuit in the vehicle speed sensor signal circuit, the engine may stall when the vehicle is decelerated to stop.

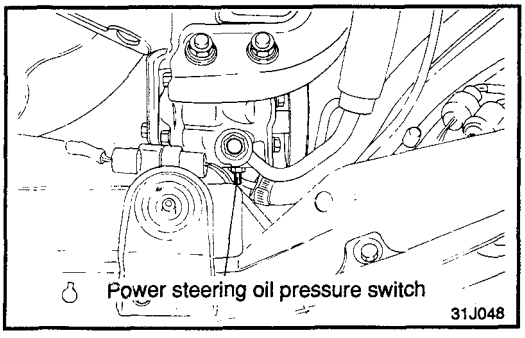
Harness Inspection Procedures

* : California only

1		Check the vehicle speed sensor output circuit for continuity. o Engine control module connector: Disconnected o Move the vehicle.	OK → END ! NG → 2
2		Measure the power supply voltage of the vehicle speed sensor. o Connector : Disconnected o Ignition switch : ON o Voltage : 4.5-4.9V	OK → 3 NG → Repair the harness. (H 2 - C01-1 19) * (H 2 - C01-5 18)
3		Check for continuity of the ground circuit. o Connector : Disconnected	OK → END ! NG → Repair the harness. (H 1- Ground)

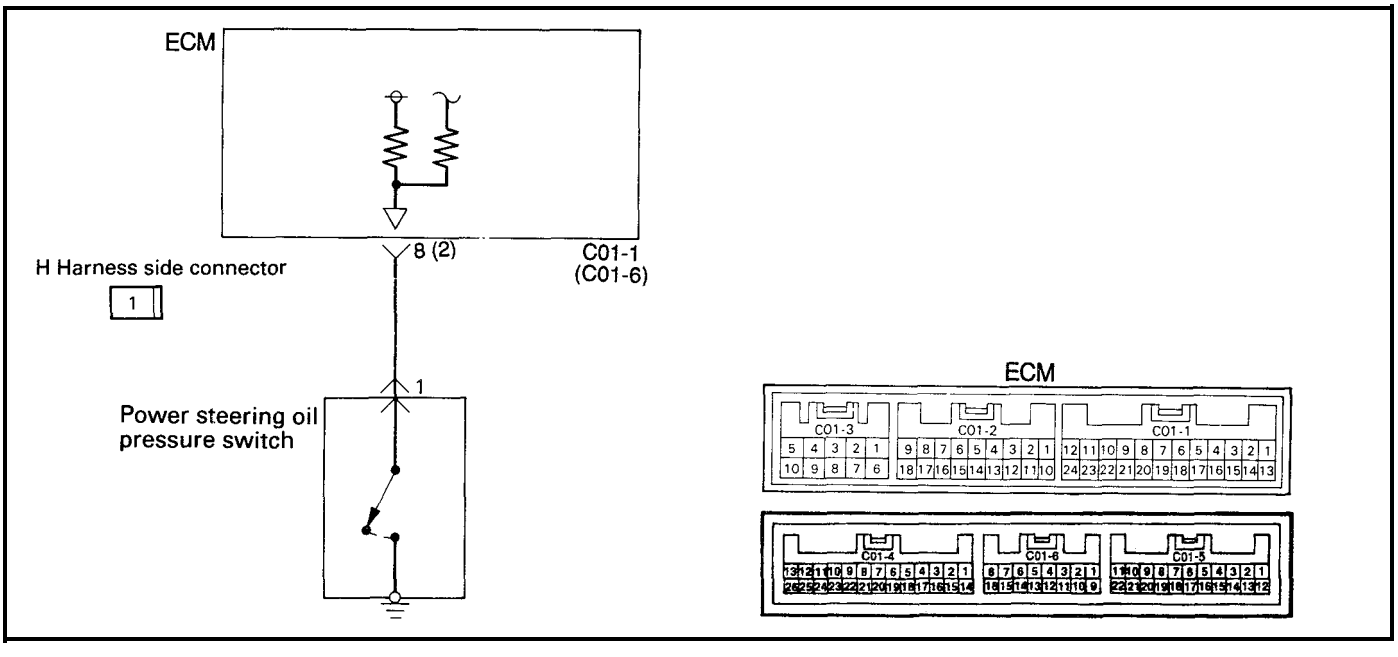
POWER STEERING OIL PRESSURE SWITCH

The power steering oil pressure switch senses the power steering load into low/high voltage and inputs it to ECM, which then controls the idle speed control motor based on this signal.



Circuit Diagram

( ) : California only

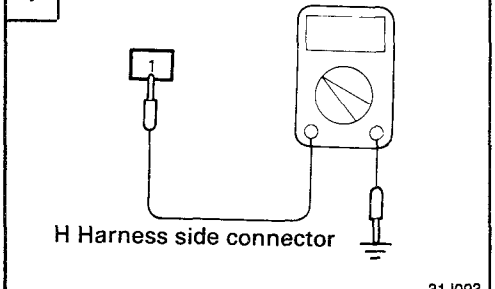


Using Scan Tool

Check Item	Data display	Check conditions	Steering wheel	Normal indication
Power steering oil pressure switch o Service data Item No.27	Switch state	Engine: Idling	Steering wheel neutral position (wheels straight-ahead direction)	OFF
			Steering wheel half turn	ON

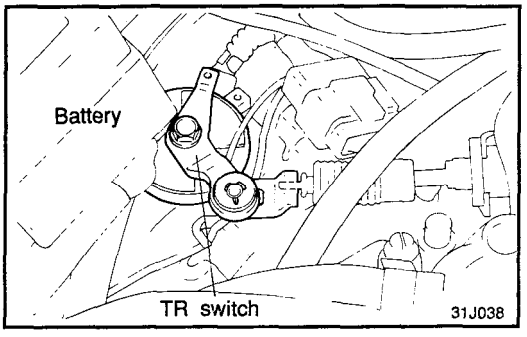
Harness Inspection Procedure

. : California only

1  	Measure the power supply voltage. o Connector: Disconnected o Ignition switch: ON o Voltage (V): System voltage	OK →	END !
		NG →	Repair the harness. (H 1- C01-1 8) * (H 1 - C01 - 6 2)

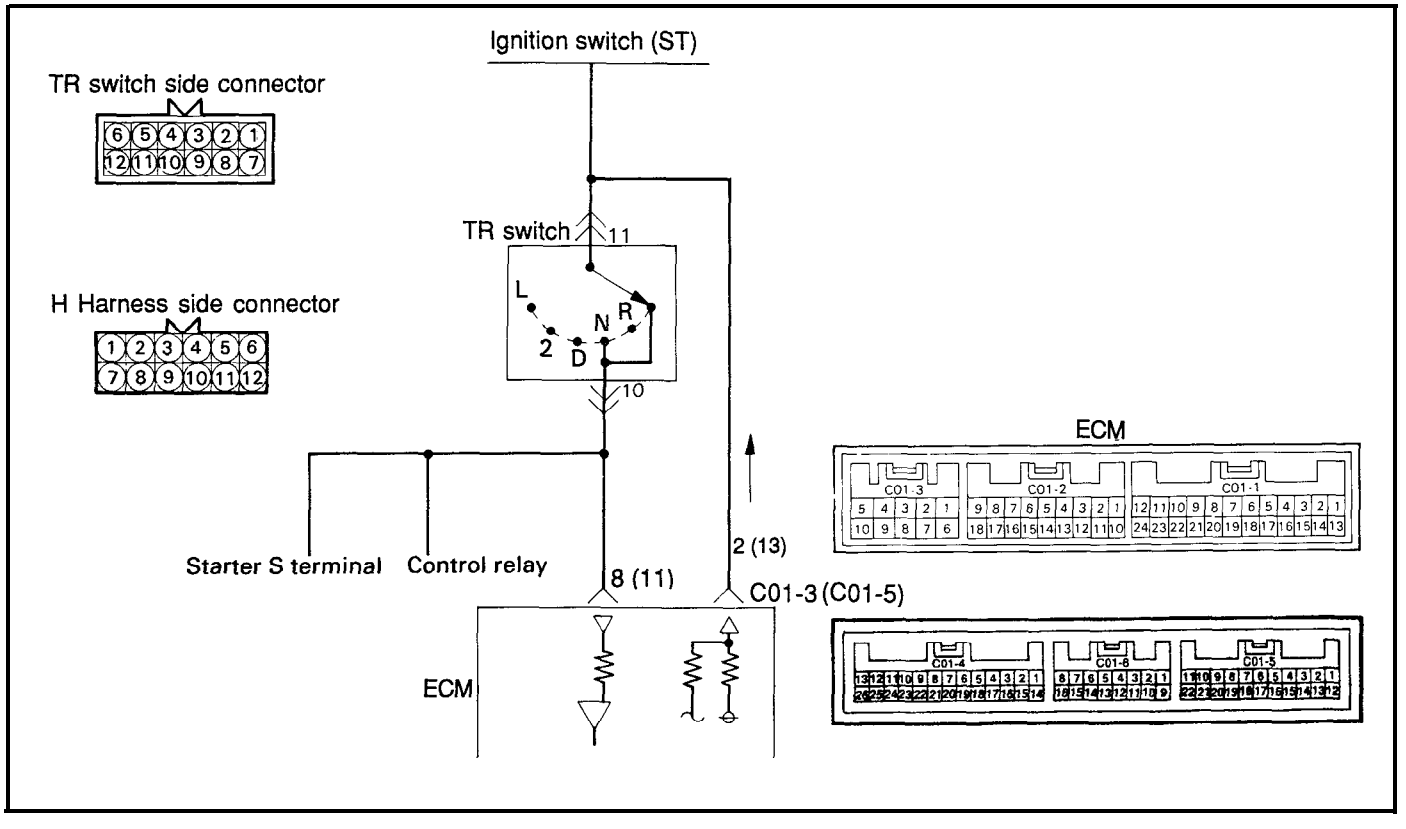
IGNITION SWITCH-ST AND TRANSAXLE RANGE (TR) SWITCH [A/T]

When the ignition switch is set ST position, the battery voltage is applied through the ignition switch and transaxle range switch to the ECM.
If the selector lever is not P or N position, the battery voltage will not reach to the ECM.
Based on this signal, the ECM determines the automatic transaxle load and drives the ISC motor to maintain optimum idle speed.



Circuit Diagram

( ) : California only



Troubleshooting Hints

If the TR switch harness check is normal but the TR switch output is abnormal, check for the control cable adjustment.

Using Scan Tool

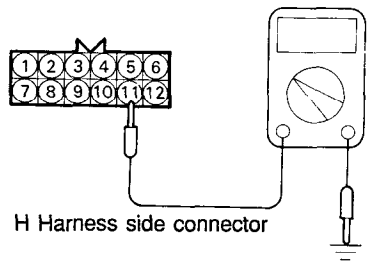
Check Item	Data display	Check conditions	Steering wheel	Normal indication
Crank signal o Service data Item No. 18	Switch state	Ignition switch: ON	stop	OFF
			Cranking	ON

Check Item	Data display	Check conditions	Steering wheel	Normal indication
TR switch o Service data Item No. 29	Switch state	Ignition switch: ON	P or N	P or N
			D, 2, L or R	D, 2, L or R

Harness Inspection

* : California only

1

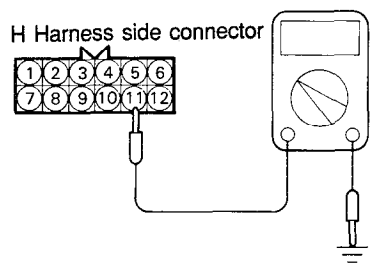


Measure the power supply voltage of the TR switch
- o ECM connector: Disconnected
- o TR switch connector: Disconnected
- o Ignition switch: START and ON
- o Voltage (V): System voltage

OK → 2

NG → Check the power supply circuit.

2

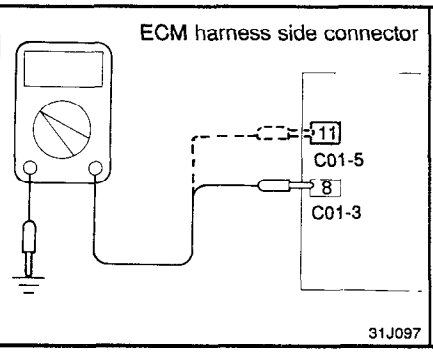


Measure the input voltage of engine control unit
- o ECM connector: Connected
- o TR switch connector: Disconnected
- o Ignition switch: ON
- o Voltage (V): System voltage

OK → 3

NG → Repair the harness (H 11 - C01-3 2)
* (H 11 - C01-5 13)

3



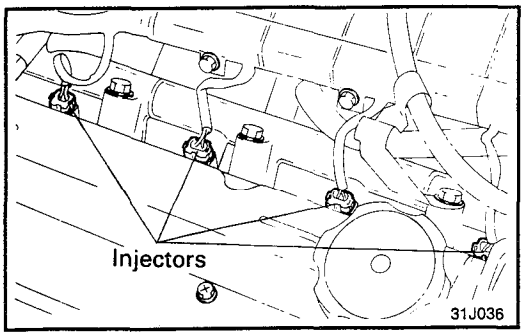
Measure the input voltage of engine control module
- o ECM connector: Disconnected
- o TR switch connector: Connected
- o Select lever: P range
- o Ignition switch: START
- o Voltage: 8V or more

OK → **END !**

NG → Repair the harness (H 10 - C01-3 8)
* (H 10 C01-5 11)

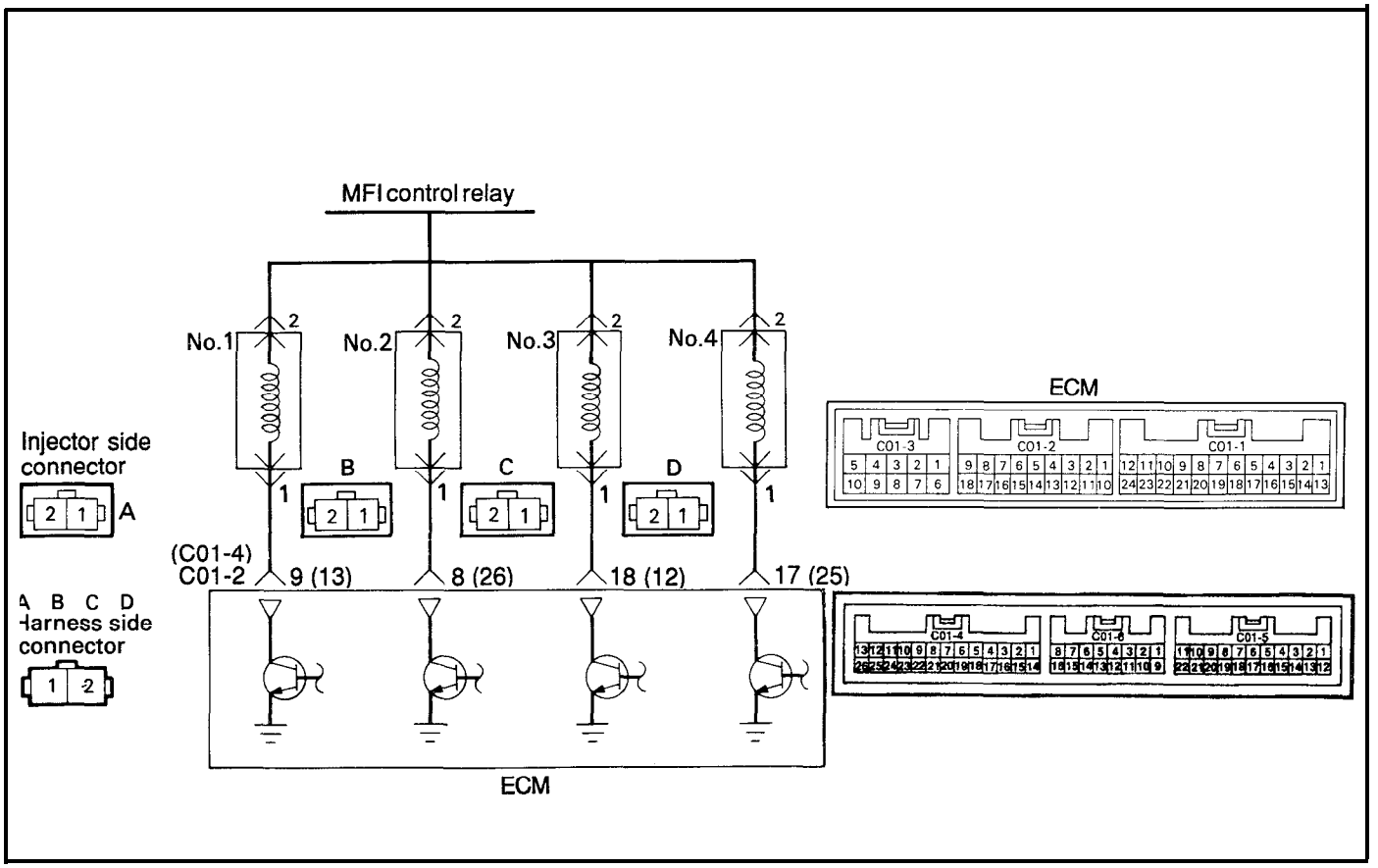
INJECTORS

The injectors inject fuel according to a signal coming from the ECM. The volume of fuel injected by the injector is determined by the time during which the solenoid valve is energized.



Circuit Diagram

( ) : California only



Troubleshooting Hints

1. If the engine is hard to start when hot, check for fuel pressure and injector leaks.
2. If the injector does not operate when the engine is cranked, then check the followings;
   1) Faulty power supply circuit to the ECM, faulty ground circuit
   2) Faulty control relay
   3) Faulty crankshaft position (CKP) sensor, camshaft position (CMP) sensor
3. If there is any cylinder whose idle state remains unchanged when the fuel injection of injectors is cut one after another during idling, check for the following items about such cylinder.
   1) Injector and harness
   2) Ignition plug and high tension cable
   3) Compression pressure

   If the injection system is ok but the injector drive time is out of specification, check for the following items.
   1) Poor combustion in the cylinder (faulty ignition plug, ignition coil, compression pressure, etc.)
   2) Loose EGR valve seating

Using Scan Tool

Check Item	Data display	Check conditions	Check content	Test specification
Injector o Service data Item No. 41	Drive time*1	Engine: Cranking	0°C (32°F)*2	Approx. 18 ms
			20°C (68°F)	Approx. 34 ms
			80°C (176°F)	Aporox. 6.1 ms

Check Item	Data display	Check conditions	Engine state	Test specification
Injector o Service data Item No. 41	Drive time	o Engine coolant temperature: 80 to 95°C (176 to 205°F) o Lamps, electric cooling fan, accessory units: All OFF o Transaxle: Neutral (P range for vehicle with A/T) o Steering wheel: Neutral	750 rpm (Idle)	2.5-3.1 ms
			2,000 rpm	2.2-2.8 ms
			Rapid racing	To increase

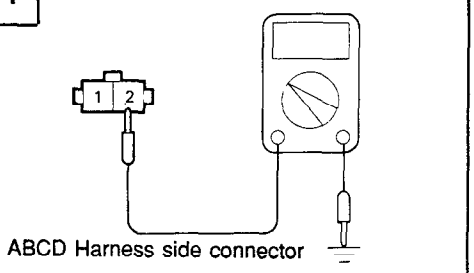
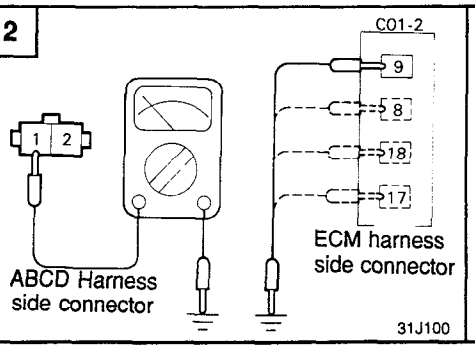
NOTE

***1 : The injector drive time refers to when the supply voltage is 11 V and the cranking speed is less than 250 rpm.**
***2: When engine coolant temperature is lower than 0°C (32°F), the ECM fires all four cylinders simultaneously.**
***3: When the vehicle is new [within initial operation of about 500 km (300 miles)], the injector drive time may be about 10% longer.**

Check Item	Item No.	Drive content	Check condition	Normal state
Injector o Actuator test	01	No. 1 injector shut off	Engine: Idling after warm-up (Shut off the injectors in sequence during after engine warm-up, check the idling condition)	Idle should become unstable as injector shut off.
	02	No. 2 injector shut off		
	03	No. 3 injector shut off		
	04	No. 4 injector shut off		

Harness Inspection Procedures

* : California only

1  	Measure the power supply voltage of the injector. o Connector: Disconnected o Ignition switch: ON o Voltage (V): System voltage	OK → NG →	2 Repair the harness. (A B C D 2 - MFI control relay) Check the power supply.
2  	Check for an open-circuit, or a short-circuit to ground between the engine control module and the injector. o ECM connector: Disconnected o Injector connector: Disconnected	OK → NG →	END ! Repair the harness. (A B C D 1 - C01-2 9 , 8, 18 , 17) * (A B C D 1 - C01-4 12, 13, 25, 26)

Actuator Inspection

Operation Check

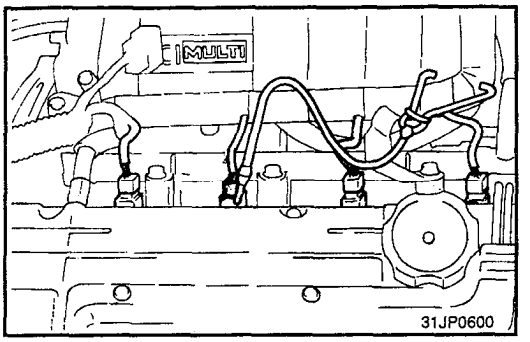
Using a scan tool, check as described below.

- o Cut off the fuel injectors in sequence.
- o Check the operation time of the injectors.

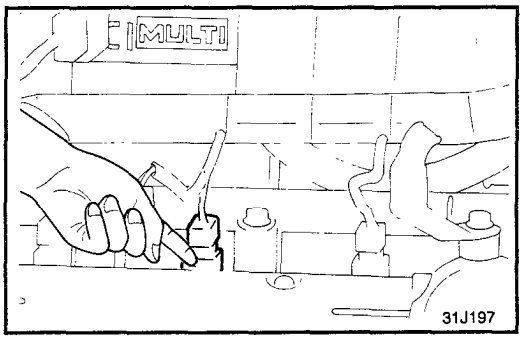
Operation Sound Check

1. Using a stethoscope, check the injectors for a clicking sound at idle. Check that the sound is produced at shorter intervals as the engine speed increases.

   NOTE
   Ensure that the sound from an adjacent injector is not being transmitted along the delivery pipe to an inoperative injector.



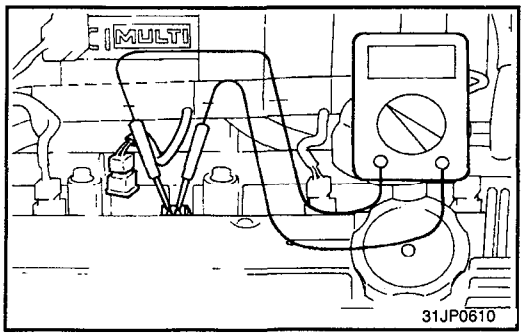
2. If a stethoscope is not available, check the injector operation with your finger.
   If no vibrations are felt, check the wiring connector, injector, or injection signal from ECM.



Resistance Measurement Between Terminals
1. Disconnect the connector at the injector.
2. Measure the resistance between terminals.

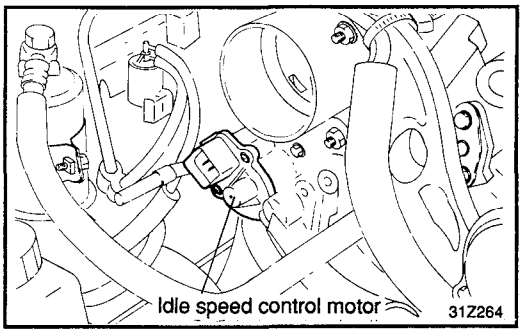
Standard value ..... 13-16 Ω [at 20°C (68°F)]

3. Connect the connector to the injector.



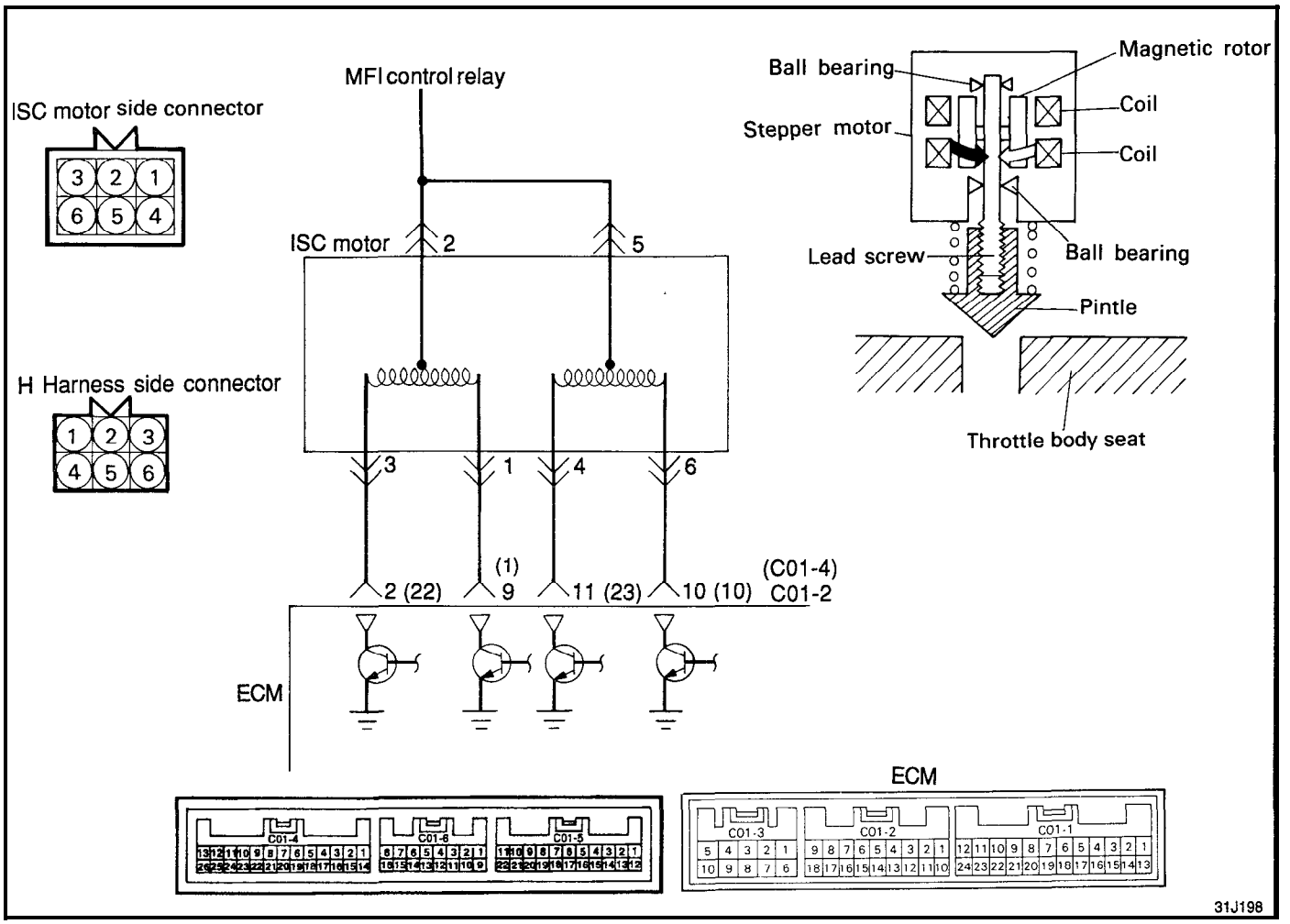
IDLE SPEED CONTROL MOTOR (STEPPER MOTOR TYPE)

The intake air volume at idle is controlled by opening or closing the motor valve provided in the air path that bypasses the throttle valve.



Circuit Diagram

( ) : California only



Troubleshooting Hints

1. If the stepper motor step increases to 100 to 120 steps or decreases to 0 step, check for faulty stepper motor or open circuit in the harness.
2. If the idle speed control motor is normal but the stepper motor steps are out of specification, check the following items;
   1) Poorly adjusted reference idle speed
   2) Deposit on the throttle valve
   3) Air leaking into the intake manifold through gasket gap
   4) Loose EGR valve seat
   5) Poor combustion in the cylinder (faulty ignition plug, ignition coil, injector, low compression pressure, etc.)

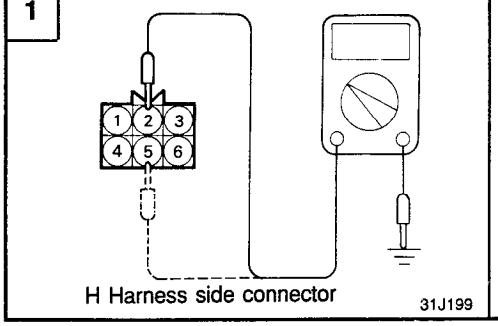
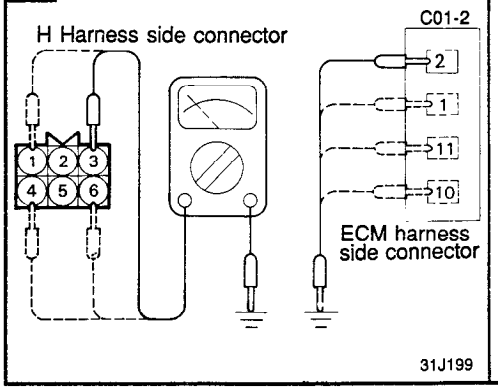
Using Scan Tool

Check Item	Data display	Check conditions	Engine state	Test specifications
Stepper motor o Service data Item No. 45	Stepper notor steps	o Engine coolant temperature: 80 to 95°C (176 to 205°F) o Lamps, electric cooling fan, accessory units: All OFF o Transaxle: Neutral (P range for vehicle with A/T) o Steering wheel: Neutral o Idle position switch : ON (compressor clutch to be ON if air conditioning switch is ON) o Engine : Idling	Air conditioning switch : OFF	4-14 step
			Air conditioning switch : ON	40-60 step
			o Air conditioning switch : ON o Selector lever: Shift to D range	48-68 step

NOTE
When the vehicle is new [within initial operation of about 500 km (300 miles)], the stepper motor steps may be about 30 steps more than standard.

Harness Inspection Procedures

* : California only

1		Measure the power supply voltage of idle speed control motor o Idle speed control motor connector: o Disconnected o Ignition switch : ON o Voltage (V) : System Voltage	OK → 2 NG → Repair the harness. (MFI control relay-H 2) (MFI control relay - H 5)
2		Check for an open-circuit, or a short-circuit to ground between the engine control module and the idle speed control motor o Engine control module connector: Disconnected o Idle speed control motor connector: Disconnected	OK → END ! NG → Repair the harness. (H 3-C01-2 2) (H 1-C01-2 1) (H 4-C01-2 11) (H 6-C01-2 10) * (H 3-C01-4 22) * (H 1-C01-4 9) * (H 4-C01-4 23) * (H 6-C01-4 10)

Actuator Inspection

Operation Sound Check

1. Check for the sound of the stepper motor after the ignition is switched ON (but without starting the motor).
2. If the operation sound cannot be heard, check the stepper motor's circuit.
3. If the circuit is normal, then the problem may be the stepper motor or the ECM

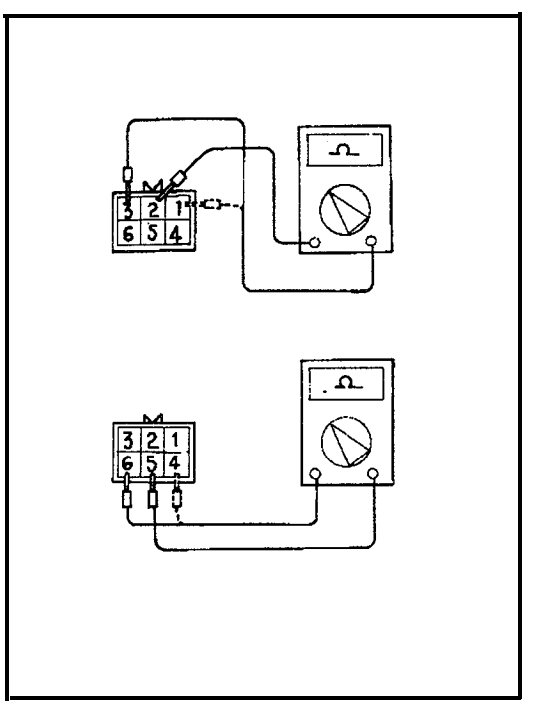
Resistance Measurement between terminals

Measure the resistance between the respective terminals.

Standard value:

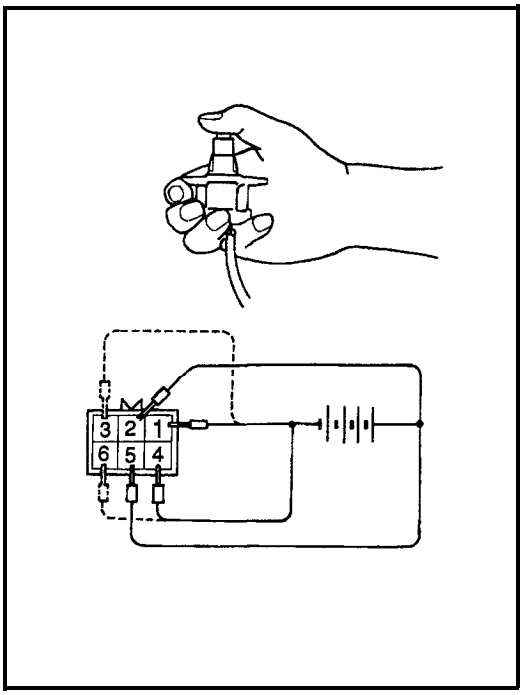
Terminals 2-3 and 1 . . . . . 28-33 Ω[at 20°C (68°F)]

Terminals 5-4 and 6 ..... 28-33Ω [at 20°C (68°F)]



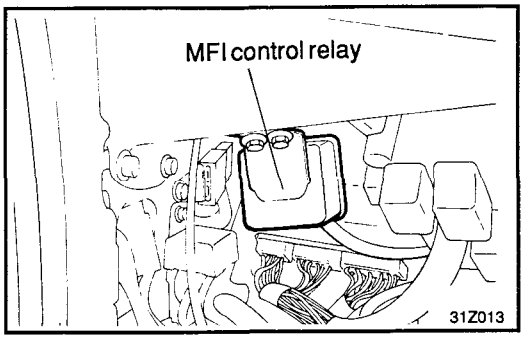
Operation check
Apply voltage as follows and check whether or not stepper motor movement occurs.

- Connect the power supply (approx. 6V) terminal (+) to terminals 2 and 5 of the connector.
- Connect the power supply (-) terminal to terminals 3 and 4
- Connect the power supply (-) terminal to terminals 3 and 4
- Connect the power supply (-) terminal to terminals 3 and 6
- Connect the power supply (-) terminal to terminals 1 and 6
- Connect the power supply (-) terminal to terminals 1 and 4.



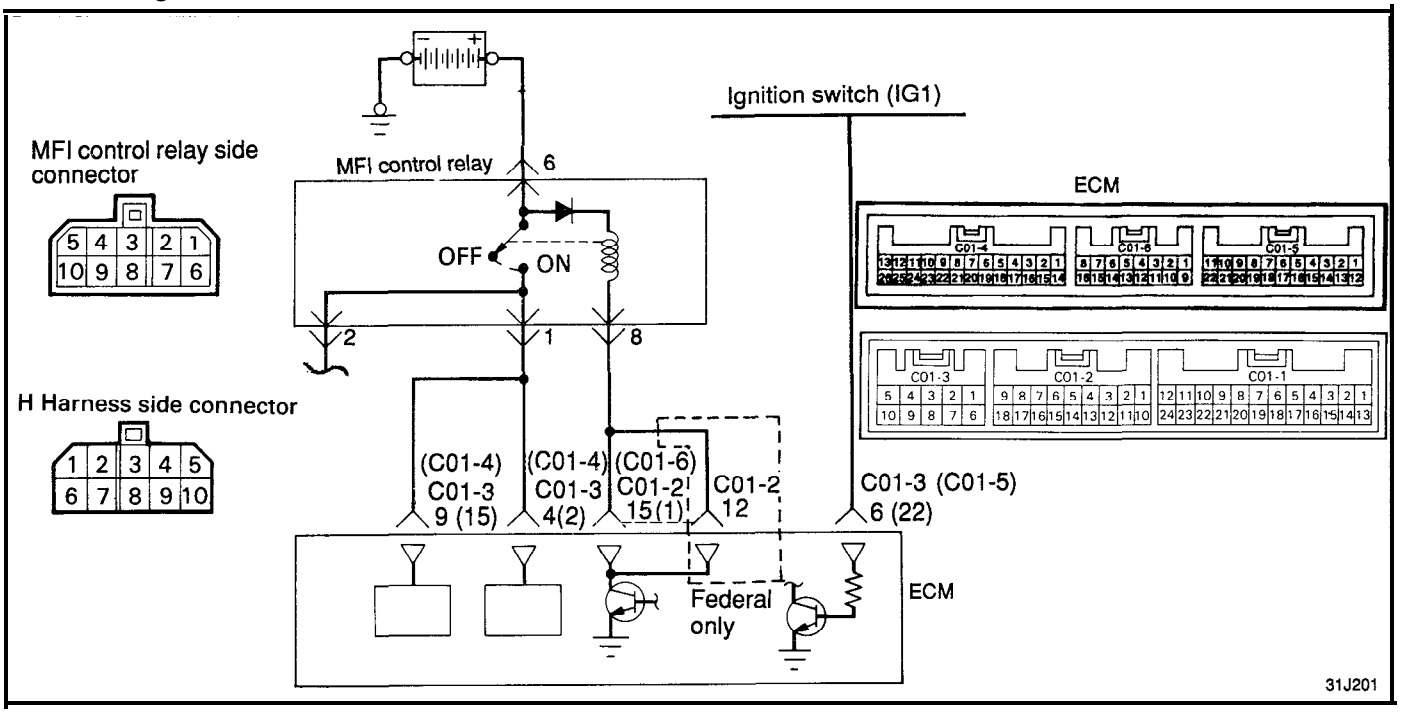
MFI CONTROL RELAY AND IGNITION SWITCH-IG

When the ignition switch is turned on, battery voltage is applied from the ignition switch to the ECM. This is turns ON the ignition power transistor and energizes the MFI control relay coil. This turns ON the MFI control relay switch and power is supplied from the battery to the ECM through the MFI control relay switch.



Circuit Diagram

( ) : California only



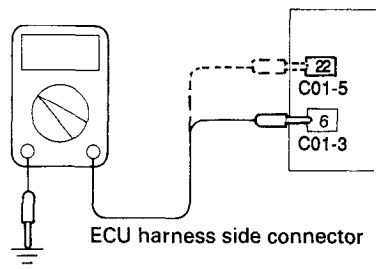
Using Scan Tool

Check Item	Data display	Check condition	Test specification
Battery voltage o Service data Item No. 16	Engine control module power voltage	Ignition switch: ON	11-13v

Harness Inspection

* : California only

1

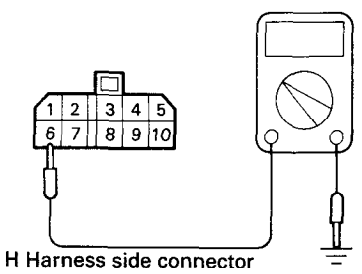


Measure the TR switch terminal input voltage.
- o ECM connector: Connected
- o Ignition switch : ON
- o Voltage (V) : System Voltage

OK → 2

NG → Repair the harness. (Ignition-switch C01-3 6) * (Ignition switch -C01-5 22)

2

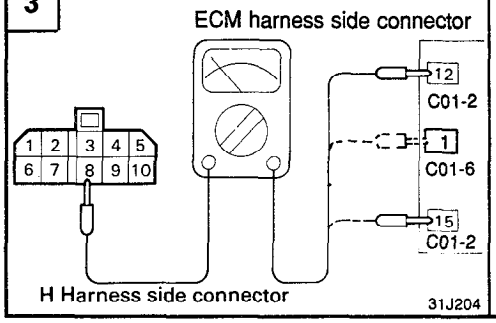


Measure the power supply votlage of the MFI control relay.
- o Connector : Disconnected
- o Voltage (V) : System Voltage

OK → 3

NG → Repair the harness. (Battery-H 6)

3

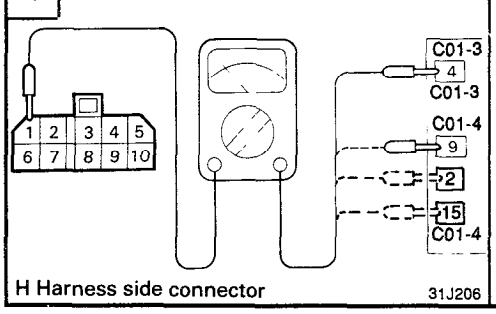


Check for an open-circuit, or a short-circuit to ground, between the ECM and the MFI control relay.
- o ECM connector: Disconnected
- o Control relay connnector: Disconnected

OK → 4

NG → Repair the harness. (H 8-C01-2 15) (H 8-C01-2 12) * (H 8-C01-6 1)

4

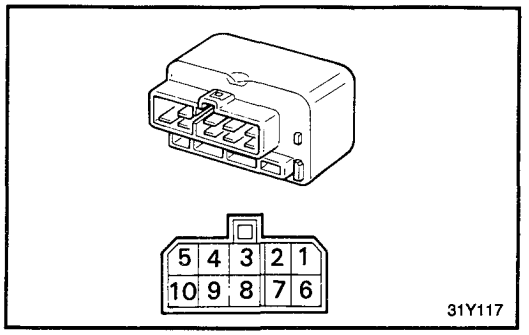


Check for open-circuit, or short-circuit to ground between the engine control module and the MFI control relay.
- o MFI control relay connector: Disconnected
- o ECM connector: Disconnected

OK → END !

NG → Repair the harness. (H 1-C01-3 4, 9) * (H 1-C01-4 2, 15)

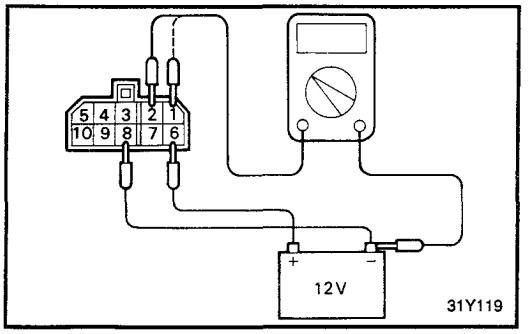
Control Relay Inspection



NOTE
When applying battery voltage directly, make sure that it is applied to correct terminal. Otherwise, the relay could be damaged.

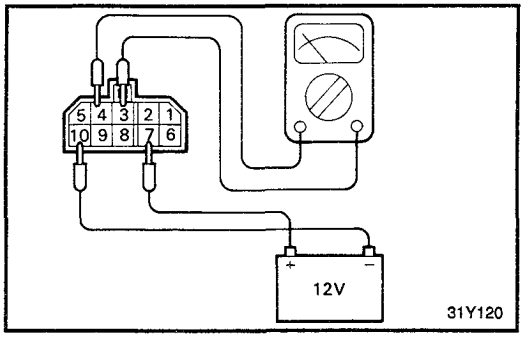
1. Connect a 12V power supply (+) terminal to the terminal 6 of the MFI control relay and measure the voltages at terminal 1 when the (-) terminal is connected to and disconnected from the terminal 8.

Terminal 8 and 12V power supply (-) terminal	Terminal 1
Connected	12V
Disconnected	0V



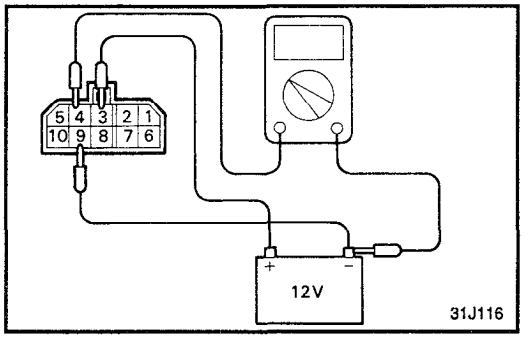
2. Connect a 12V power supply (-) terminal to the terminal 10 of the control relay and check the continuity between terminals 3 and 4 when the (+) terminal is connected to and disconnected from the terminal 7.

Terminal 7 and 12V power supply (+) terminal	Terminal 3 and terminal 4
Connected	Continuity
Disconnected	Discontinuity



3. Connect a 12V power supply (+) teminal to the terminal 3 of the MFI control relay and measure the voltages at the terminal 4 when the (-) terminal is connected to and disconnected from the terminal 9.

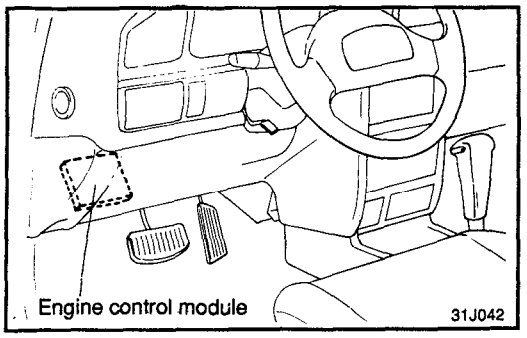
Terinal 9 and 12V power supply (-) terminal	Terminal 4
Connected	12V
Disconnected	0V



4. If one of the above is improper, replace the MFI control relay.

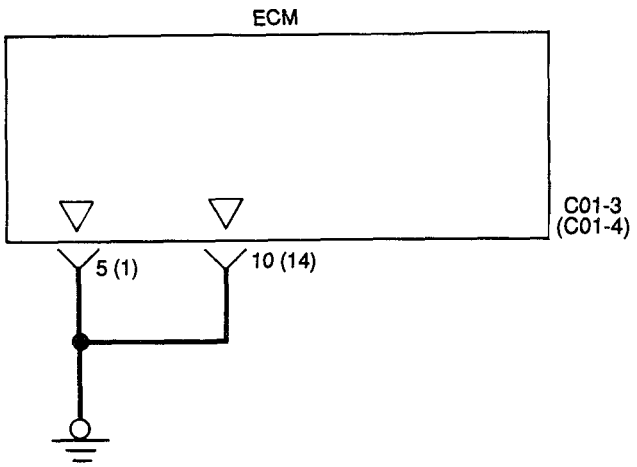
ENGINE CONTROL MODULE (ECM)- POWER GROUND

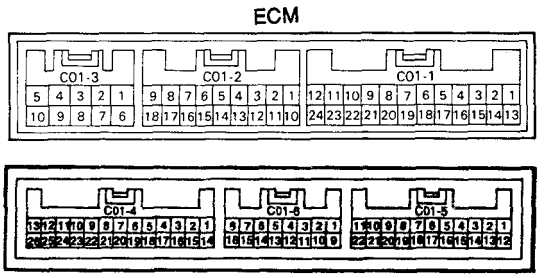
Grounds the engine control module (ECM).



Circuit Diagram

( ) : California only



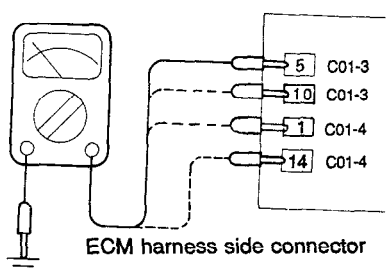


Troubleshooting Hints

If the ground wire of the ECM is not connected securely to ground, the unit will not operate correctly.

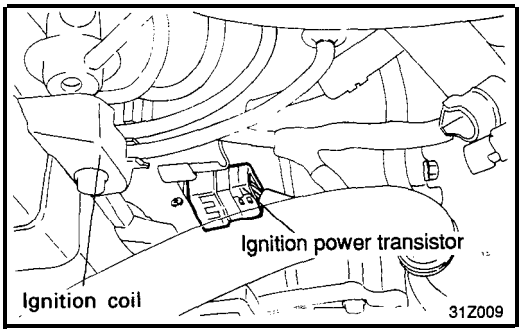
Harness Inspection

. : California only

1		Check for continuity of the ground circuit. o ECM connector: Disconnected	OK → END ! NG → Repair the harness (C01-3 5, 10 - Ground) * (C01-4 1, 14 - Ground)

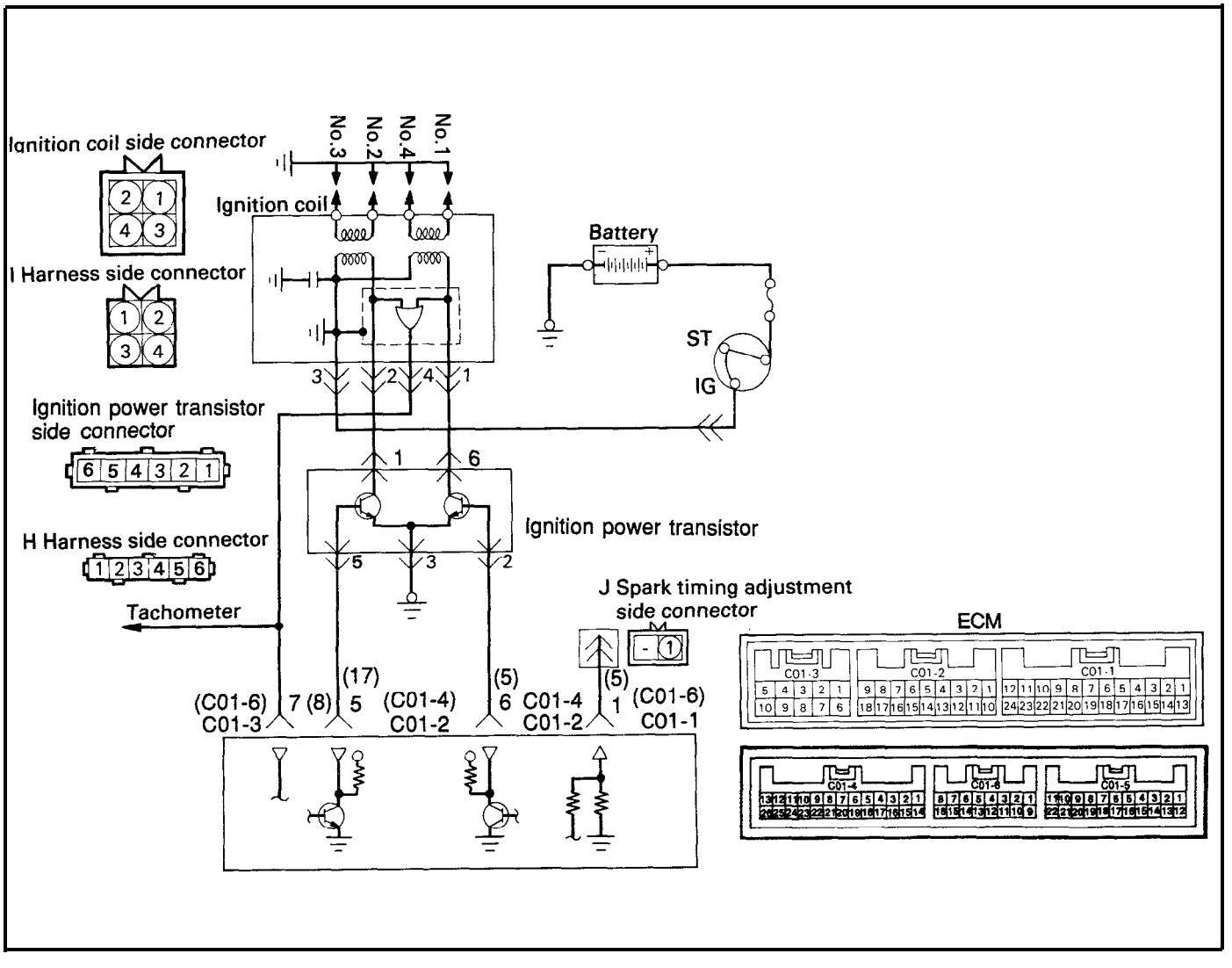
IGNITION COIL AND IGNITION POWER TRANSISTOR

The ignition power transistor functions to control the ignition timing by controlling the ignition coil primary current by signals from the ECM.



Circuit Diagram

( ) : California only

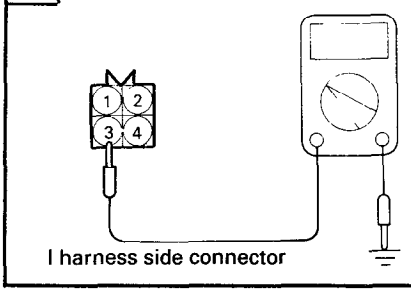
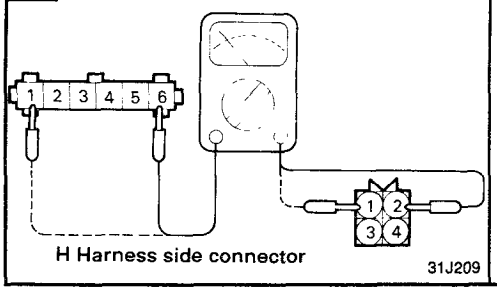
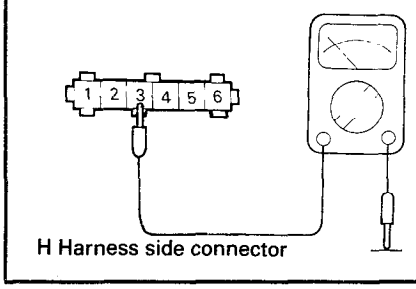
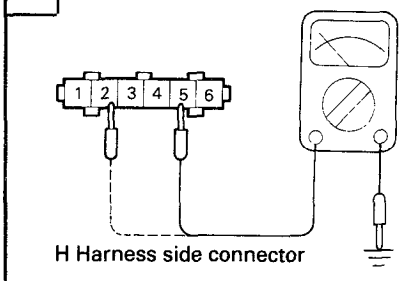
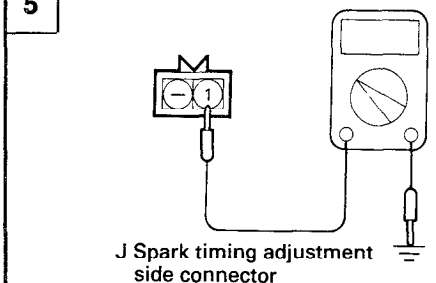


Using Scan Tool

Check Item	Check condition	Engine state	Standard value
Ignition advance o Service data Item No. 44	o Engine: Warmed up o Timing light: Set (set timing light to check actual ignition timing)	750 rpm (idle)	5-15°BTDC
		2,000 rpm	32-40°BTDC

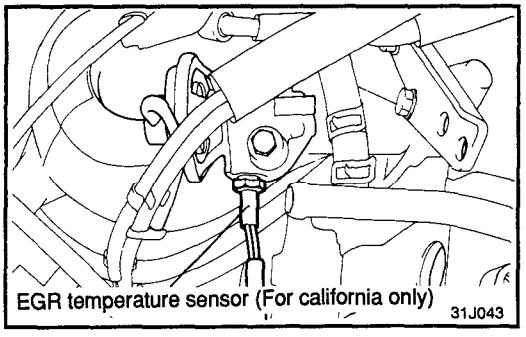
Harness Inspection

* : California only

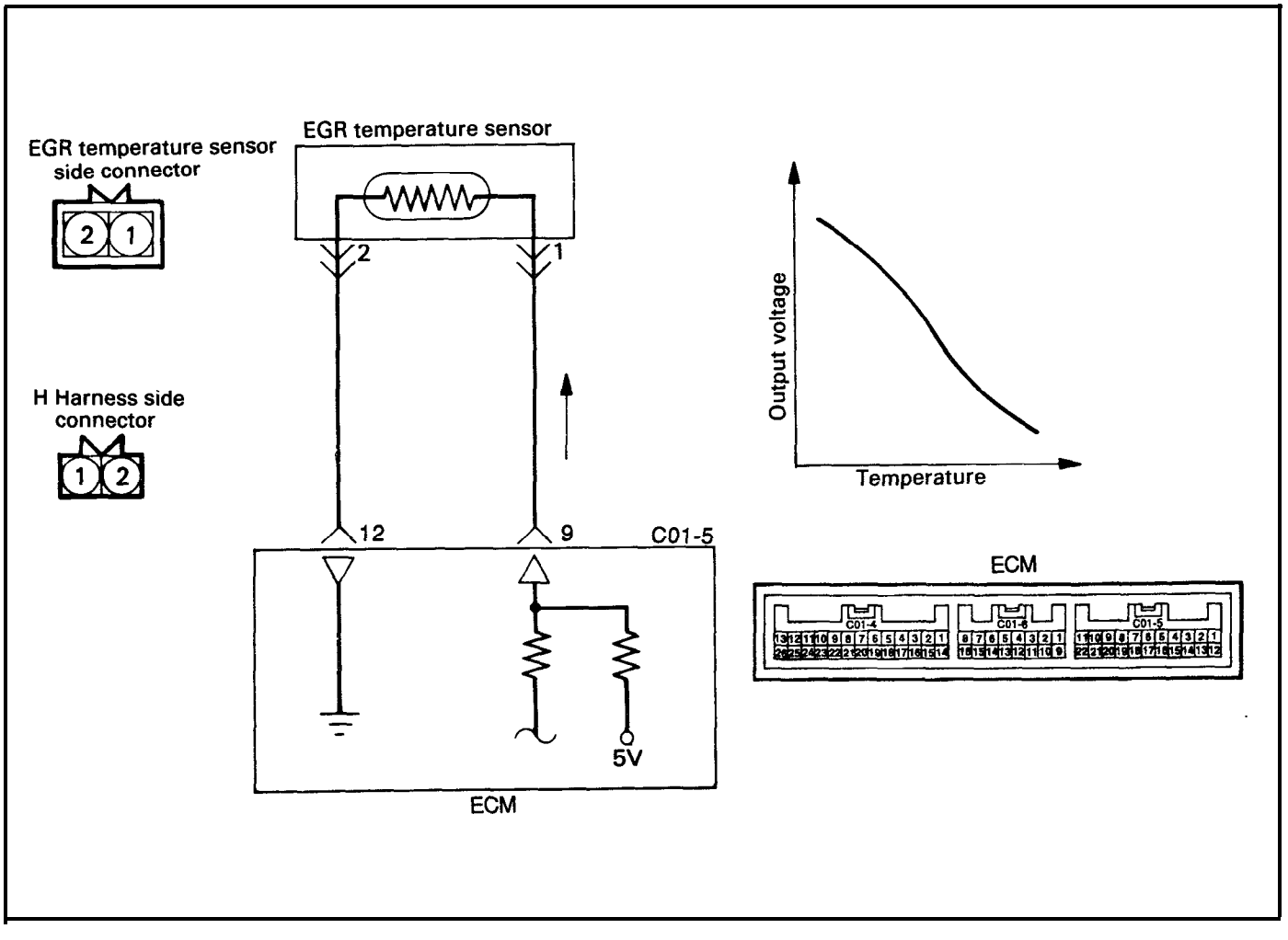
1  I harness side connector 31J208	Measure the power supply voltage of the ignition coil. o Connector: Disconnected o Ignition switch: ON o Voltage (V): System voltage	OK →	2
		NG →	Repair the harness. (I 3-Ignition switch)
2  H Harness side connector 31J209	Check for an open-circuit, or a short-circuit to ground between the ignition power transistor and the ignition coil. o Ignition coil connector: Disconnected o Ignition power transistor connector: Disconnected	OK →	3
		NG →	Repair the harness. (I 1 - H 1) (I 2 - H 6)
3  H Harness side connector 31J210	Check for continuity of the ground circuit. o Connector: Disconnected	OK →	4
		NG →	Repair the harness. (H 3-Ground)
4  H Harness side connector 31J211	Measure the voltage of the control signal circuit of the ignition power transistor. o Connector: Disconnected o Ignition switch: START o Voltage: 0.5 - 4.0 V	OK →	5
		NG →	Repair the harness. (H 5-C01-2 5) (H 2-C01-2 6) *(H 3-C01-4 17) *(H2-C01-4 4)
5  J Spark timing adjustment side connector 31J212	Measure the voltage of the ignition timing adjustment terminal. o Ignition switch: ON o Voltage: 4.0 - 5.2 V	OK →	END !
		NG →	Repair the harness. (J 1 -C01-1 1) * (J 1 - C01-6 5)

EGR TEMPERATURE SENSOR [For California]

The EGR temperature sensor converts the temperature of EGR gas downstream from the EGR valve to voltage and inputs it to the ECM. The ECM judges the condition of the EGR by this signal. If there is abnormal condition, the engine warning light is turned on to notify the driver.



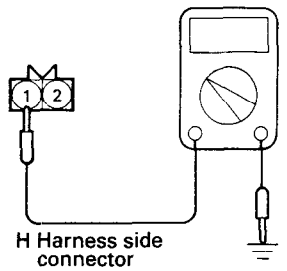
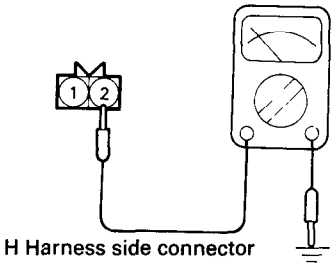
Circuit Diagram



Using Scan Tool

Check Item	Data display	Check condition	Engine state	Test specification
EGR temperature sensor o Service data Item No. 43	Sensor temperature	Engine: Warmed up Engine is maintained in a constant state for 2 minutes or more	750 rpm (Idle)	70°C (158°F) or less
			3,500 rpm	70°C (158°F) or more

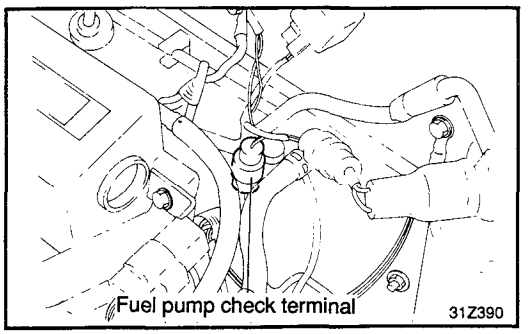
Harness Inspection

1  31J126	Measure the power supply voltage. o Connector: Disconnected o Ignition switch: ON o Voltage: 4.3-4.7V	OK →	2
		NG →	Repair the harness. (H 2 - C01-5 9)
2  31J127	Check for continuity of the ground circuit. o Connector: Disconnected	OK →	END !
		NG →	Repair the harness. (H 1 - C01-5 12)

Sensor Inspection

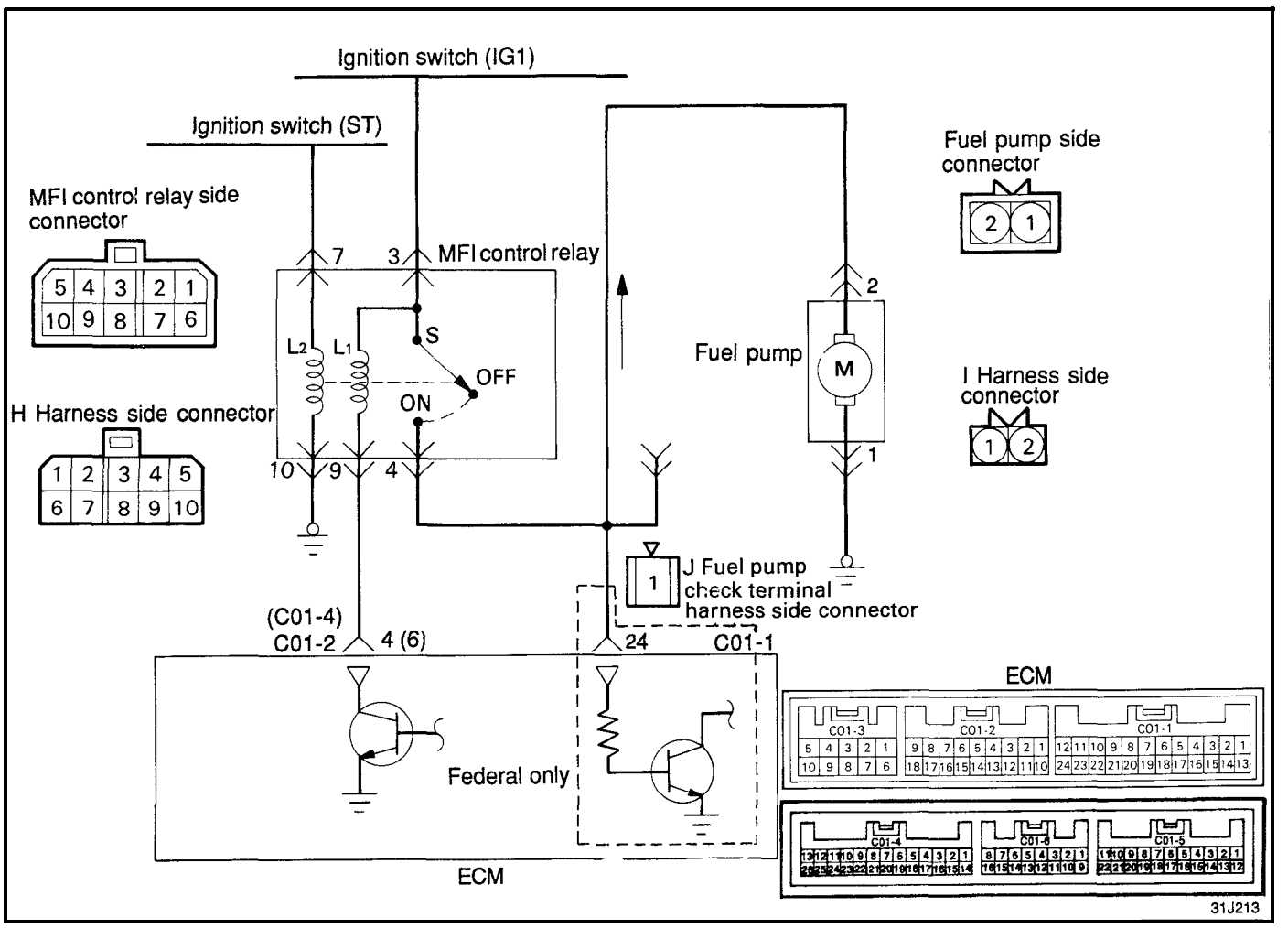
Refer to GROUP 29-Exhaust Gas Recirculation (EGR) System.

FUEL PUMP



Circuit Diagram

( ) : California only

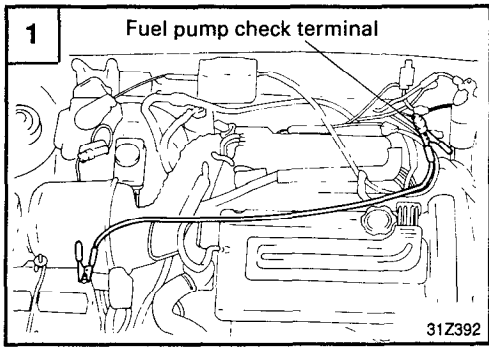
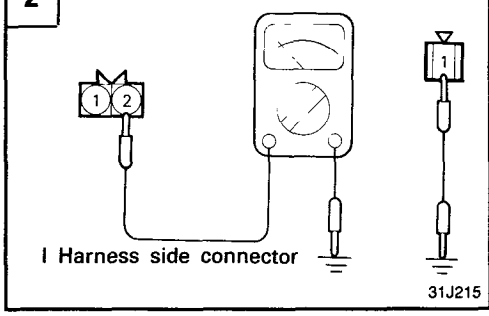
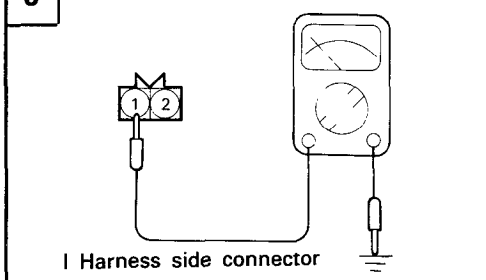


Using Scan Tool

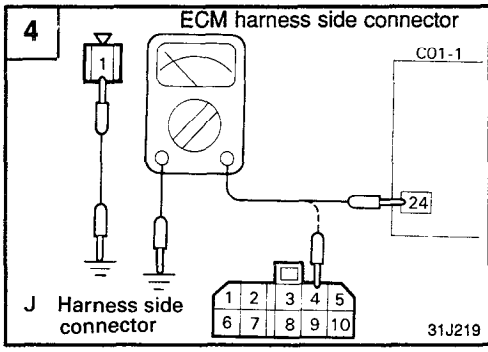
Check Item	Item No.	Drive	Check condition	Engine state	Normal state
Actuator test	07	Fuel pump is driven to circulate fuel	o Engine cranking o Forced drive of fuel pump Check is made for above two conditions	Hold return hose with fingers to feel pulsation indicating fuel flow	Pulsation is felt
				Listen to pump operating sound near fuel tank	Operating sound is heard

Harness Inspection

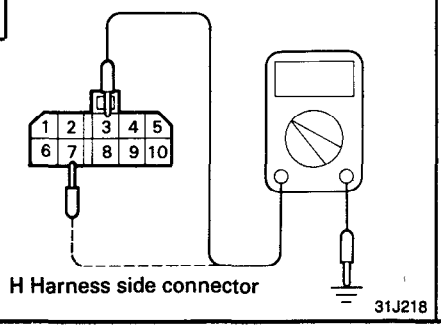
* : California only

1 	Check the fuel pump. o Apply battery voltage to the checking terminal and operate the pump	OK →	4
		NG →	2
2 	Check the ground circuit of the fuel pump. o Connector: Disconnected	OK →	3
		NG →	Repair the harness. (I 2-Ground)
3 	Check for continuity between the fuel pump and the checking terminal. o Connector: Disconnected	OK →	4
		NG →	Repair the harness. (I 1 - J 1)

Federal only

4 	Check for continuity between the checking terminal and the engine control module, and between the MFI control relay terminals. o MFI control relay connector: Disconnected o Engine control module connector: Disconnected o Fuel pump connector: Disconnected	OK →	5
		NG →	Repair the harness (J 1 -C01-1 24)

5

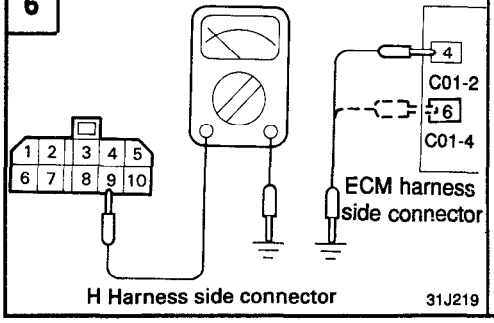


Measure the power supply voltage of the MFI control relay.
- Connector : Disconnected
- Ignition switch: START (when H 2 checked)
- Ignition switch : ON (when H 3 checked)
- Voltage : 8V or more

OK → 6

NG → Repair the harness.(Ignition switch-ON-H 3) (Ignition switch-ST-H 7)

6

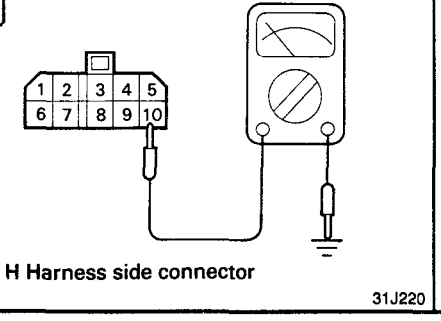


Check for an open-circuit, or a short-circuit to ground between the MFI control relay and the engine control moduel.
- MFI Control relay connector: Disconnected
- Engine control moduel connector: Disconnected

OK → 7

NG → Repair the harness. (H 9-C01-2 4) * (H 9-C01-4 6)

7

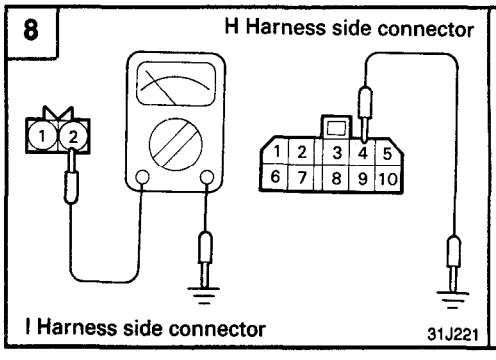


Check for continuity of the ground circuit.
- Control relay connector: Disconnected

OK → 8

NG → Repair the harness. (H 10 - Ground)

8



Check for an open-circuit, or a short-circuit to ground between the MFI control relay and the fuel pump.
- MFI control relay connector: Disconnected
- Fuel pump connector: Disconnected

OK → END !

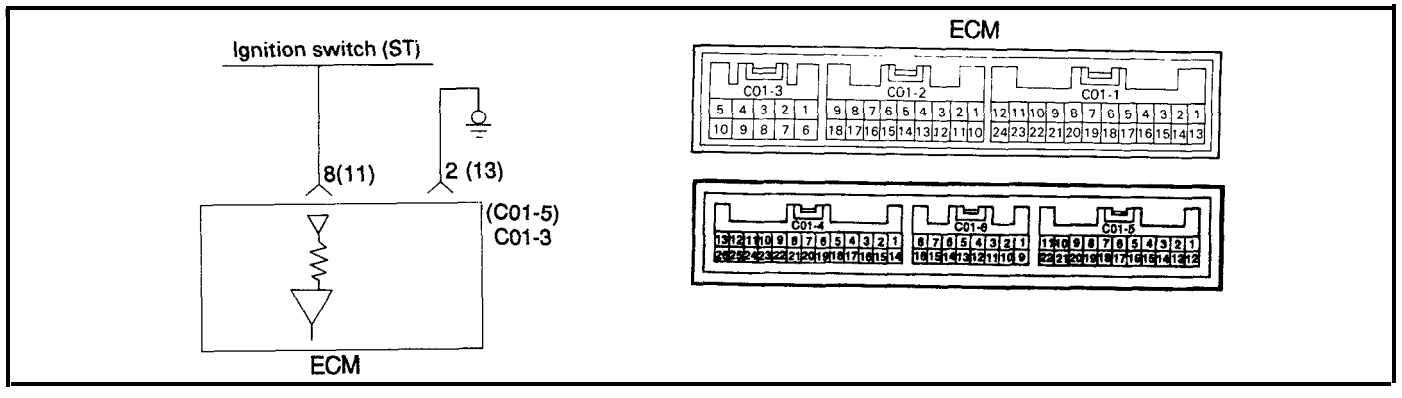
NG → Repair the harness. (H 4 - I 1)

IGNITION SWITCH-ST [M/T]

The ignition switch-ST inputs a high signal to the ECU while the engine is cranking.
The ECM provides fuel injection control, etc. at engine start-up based on this signal.

Circuit Diagram

( ) : California only

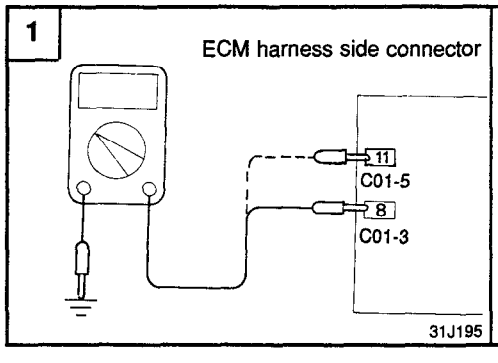
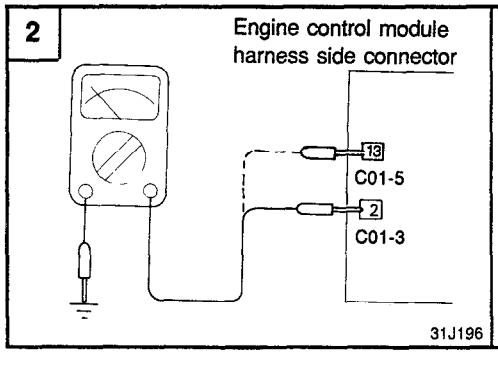


Using Scan Tool

Function	item No.	Data display	Check conditions	Engine	Normal indication
Data reading	18	Switch state	Ignition switch: ON	stop	OFF
				Cranking	ON

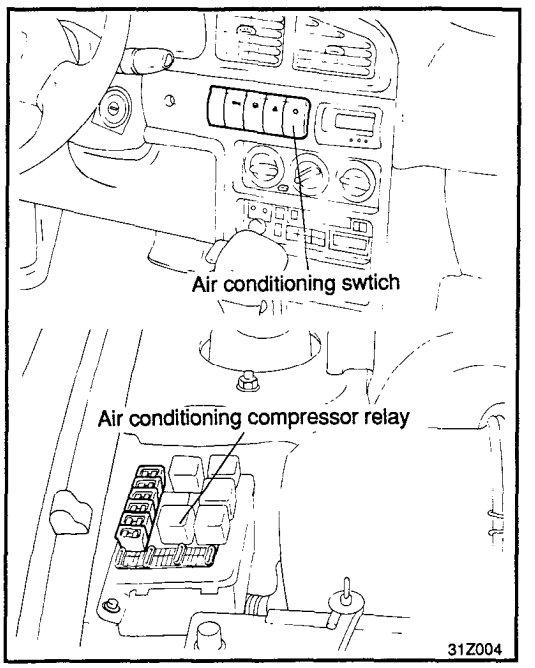
Harness Inspection

* : California only

1 	Measure the input voltage to the ECM o ECM connector: Disconnected o Ignition switch: START o Voltage: 8V or more	OK →	2
		NG →	Repair the harness (C01-3 8- Ignition switch) * (C01-5 11 - Ignition switch)
2 	Check for continuity of the ground circuit o ECM connector: Disconnected	OK →	END !
		NG →	Repair the harness (C01-3 2- Ground) * (C01-5 13 - Ground)

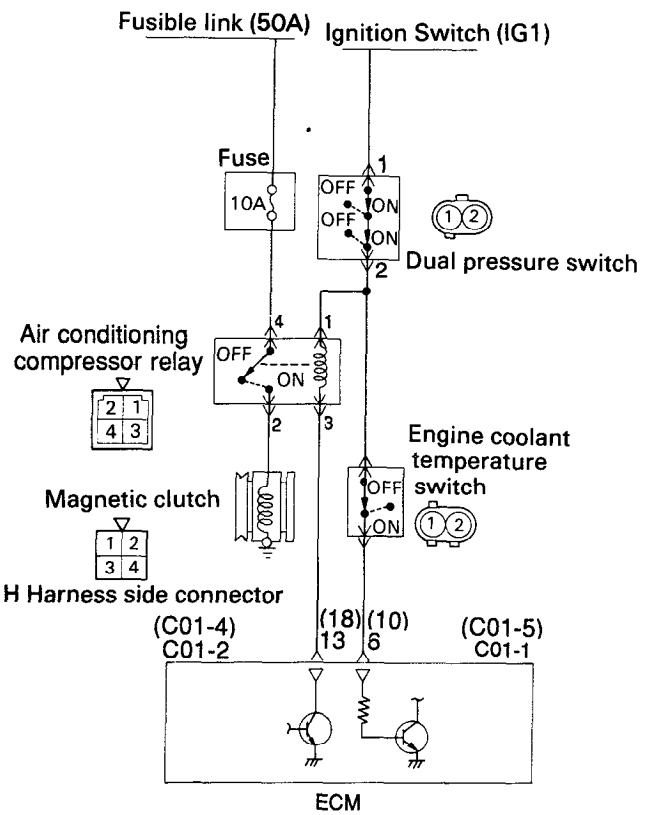
AIR CONDITIONING SWITCH AND AIR CONDITIONING RELAY

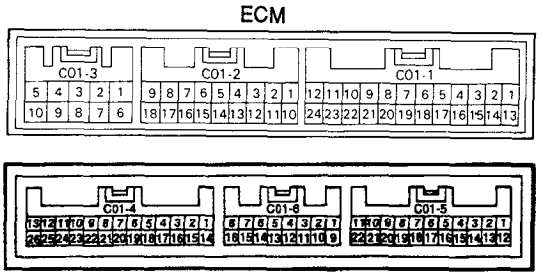
The air conditioning switch applies the battery voltage to the ECM when the air conditioner is turned on.
When the air conditioning ON signal is input, the ECM drives the ISC motor and turns ON the power transistor. And then the air conditioning power relay coil is energized to turn on the relay switch, which activates the air compressor magnetic clutch.



Circuit Diagram

( ) : California only





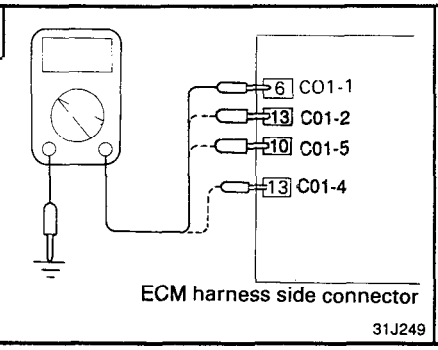
Troubleshooting Hints

If the air compressor magnet clutch is not activated when the air conditioning switch is turned on during idling, faulty air conditioning control system is suspected.

Using Scan Tool

Check Item	Data display	Check conditions	Air conditioning switch	Normal indication
Air conditioning switch o Service data o Item No.28	Switch state	Engine: Idling (air compressor to be running when air conditioning switch is ON)	OFF	OFF
			ON	ON
Air conditioning relay o Service data o Item No.49	Air conditioning relay state	Engine: Idling after warm-up	OFF	OFF (compressor clutch non-activation
				ON (compressor clutch activation)

Harness Inspection

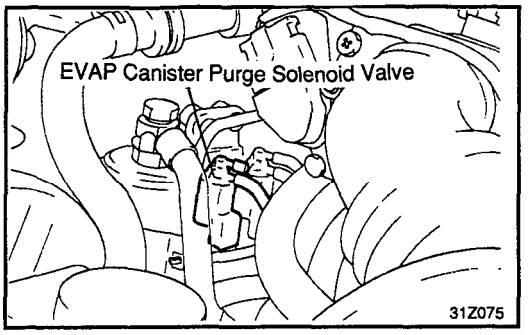
1	 ECM harness side connector 31J249	Measure the power supply voltage of the air conditioning circuit. o Air conditioning switch: ON o Engine control module connector: Disconnected o Ignition switch: ON o Voltage: System voltage	OK → END ! NG → Check the air conditioning circuit

Air Conditioning Inspection

Refer to GROUP 97-Service Adjustment Procedures.

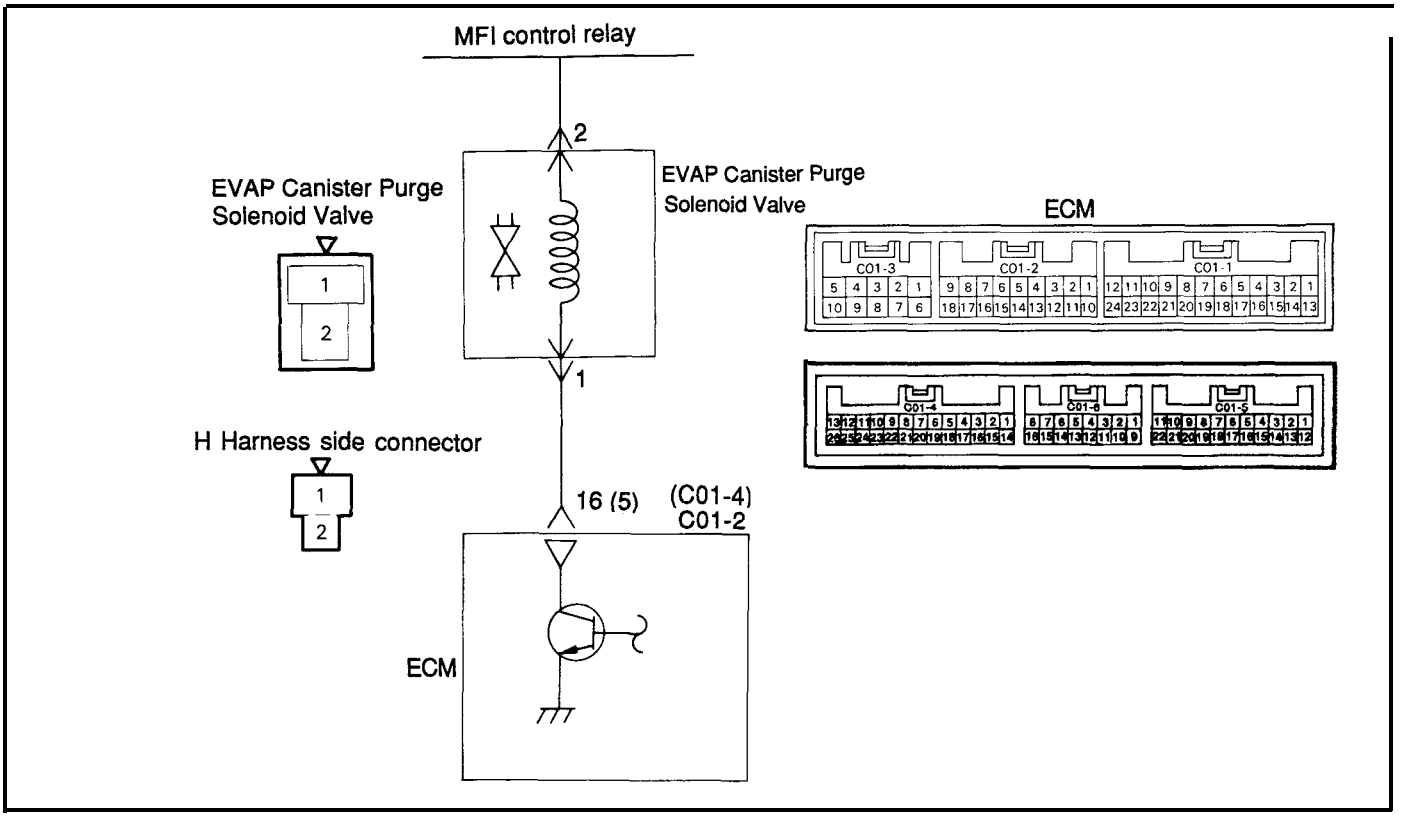
EVAP CANISTER PURGE SOLENOID VALVE

The EVAP Canister Purge Solenoid Valve solenoid valve is an ON-OFF type, which controls introduction of purge air from the EVAP canister.



Circuit Diagram

( ) : California only

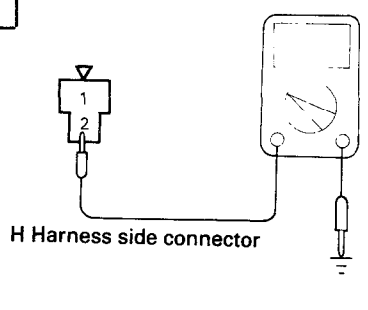
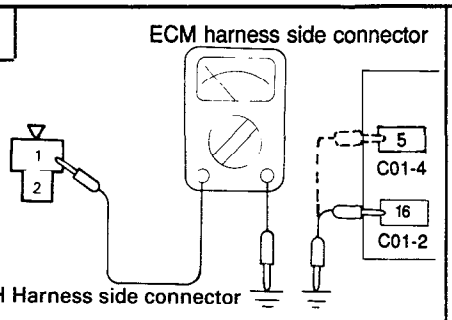


Using Scan Tool

Check Item	Drive content	Check condition	Normal state
EVAP Canister Purge Solenoid Valve o Service data Item No.8	Solenoid valve from OFF to ON	Ignition switch: ON	Operating sound is heard when driven

Harness Inspection

* : California only

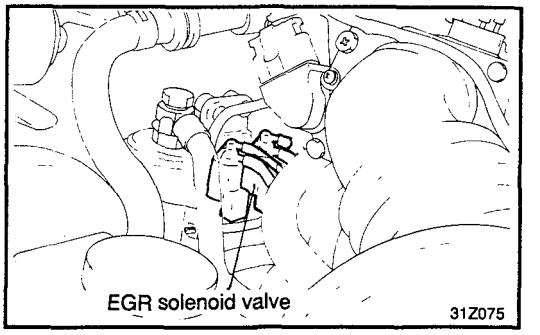
1  31J223	Measure the power supply voltage. o Connector: Disconnected o Ignition switch: ON o Voltage: System voltage	OK →	2
		NG →	Repair the harness. (MFI control relay - H 2)
2  31J224	Check for an open-circuit, or a short-circuit to ground between the EVAP Canister Purge Solenoid Valve and the engine control module. o Engine control module connector: Disconnected o EVAP Canister Purge Solenoid Valve connector: Disconnected	OK →	END !
		NG →	Repair the harness. (H 1 - C01-2 16) * (H 1 - C01-4 5)

Actuator Inspection

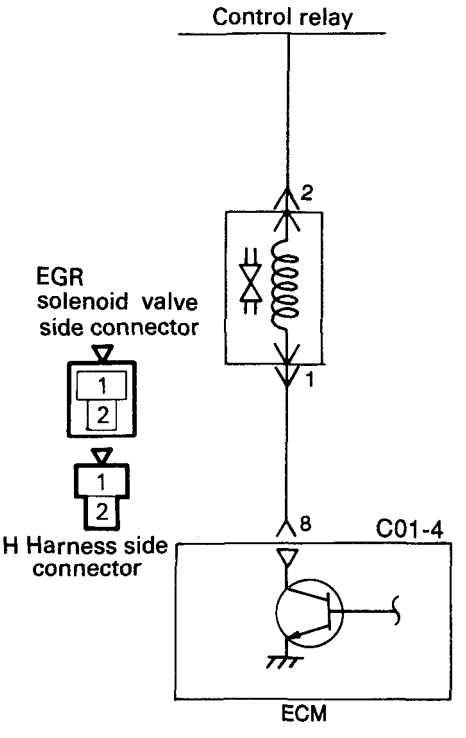
Refer to GROUP 29-Evaporative Emission System.

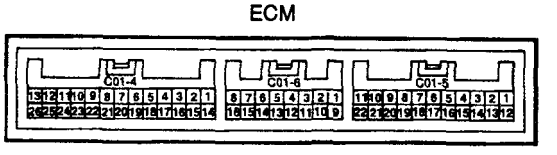
EGR SOLENOID VALVE (For California only)

The EGR solenoid valve is a duty control type solenoid valve, which makes control by leaking EGR valve operating negative pressure to the throttle body a port.



Circuit Diagram





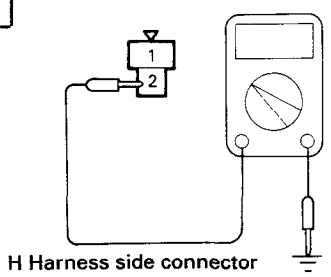
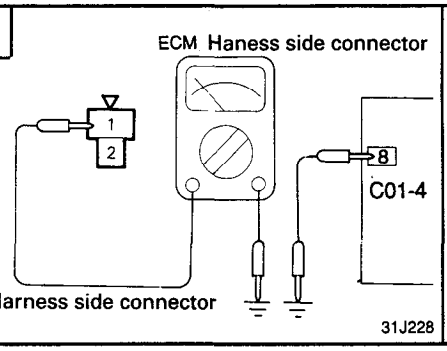
Troubleshooting Hint

If the results of EGR solenoid valve on-vehicle and off-vehicle inspections are normal but the diagnostic trouble code for EGR system failure is displayed, check the EGR valve, vacuum hose and EGR passage for blocking.

Using Scan Tool

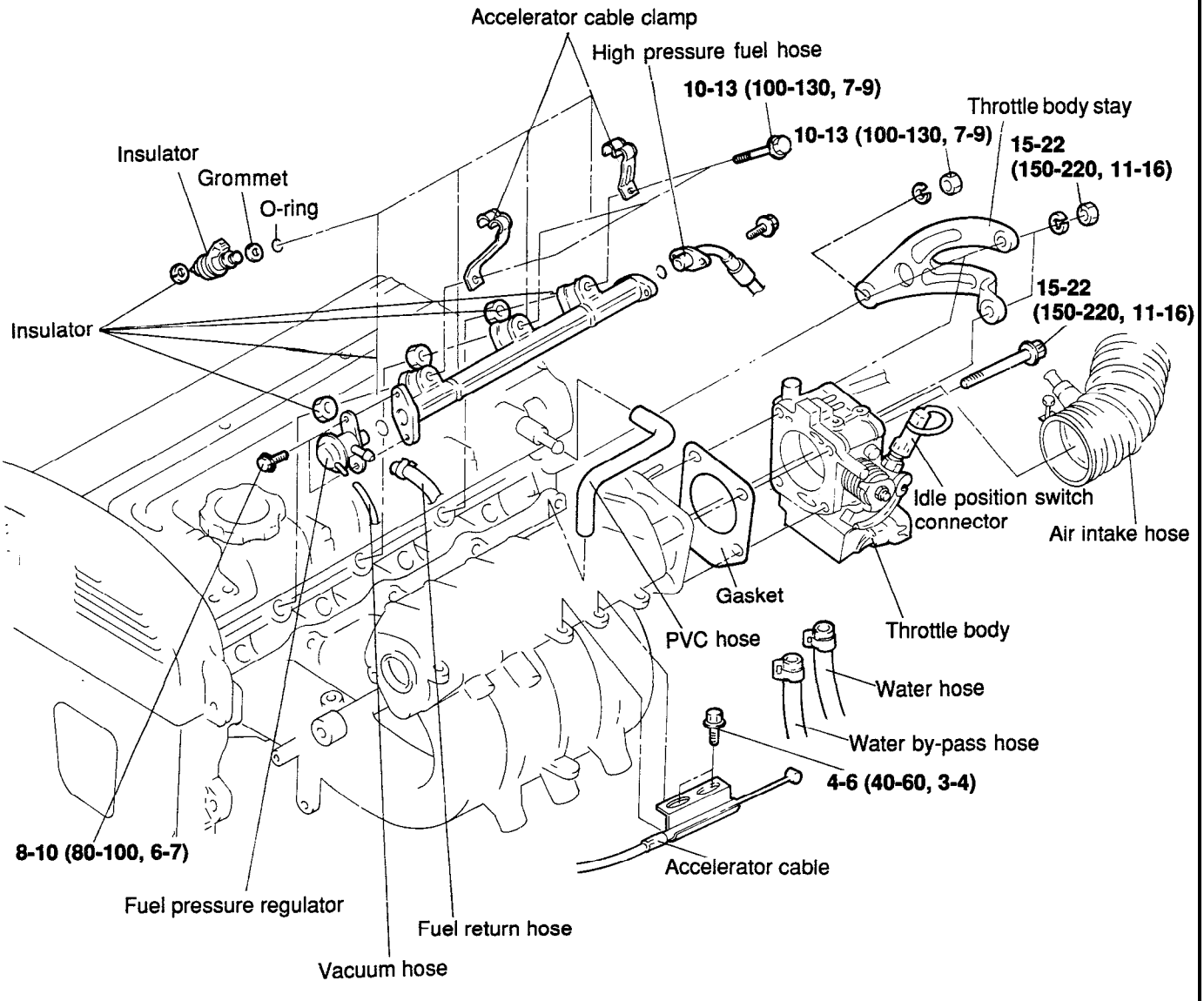
Check Item	Drive content	Check condition	Normal state
EGR solenoid valve o Service data Item No. 10	Change solenoid valve from OFF to ON state	Ignition switch: ON	Operating sound is heard when driven

Harness Inspection

1  	Measure the power supply voltage. o Connector: Disconnected o Ignition switch: ON o Voltage: System Voltage	OK → NG →	2 Repair the harness. (H 2 - Control relay)
2  	Check for an open-circuit, or a short-circuit to ground between the EGR solenoid valve and engine control module. o EGR solenoid valve connector: Disconnected o ECM connector: Disconnected	OK → NG →	END ! Repair the harness. (H 1 - C01-4 8)

INJECTOR

COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Release residual pressure from the fuel line to prevent fuel from spilling.

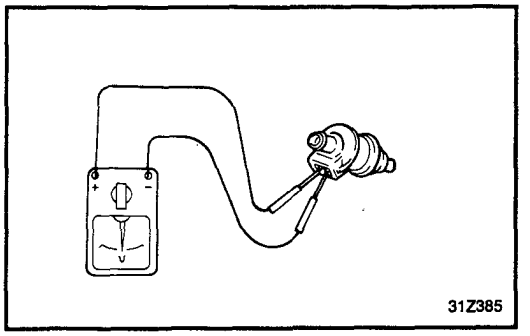
CAUTION
Cover the hose connection with rags to prevent splashing of fuel that could be caused by residual pressure in the fuel line.

INSPECTION

1. Measure the resistance of the injectors between the terminals using an ohmmeter.

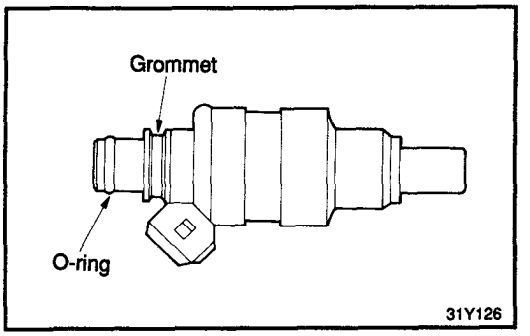
Resistance	13-16Ω [at 20°C (68°F)]

2. If the resistance is not within specifications, replace the injector.



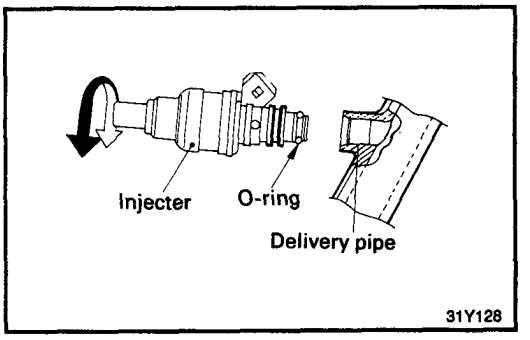
INSTALLATION

1. Install a new grommet and O-ring to the injector.
2. Apply a coating of solvent, spindle oil or gasoline to the O-ring of the injector.



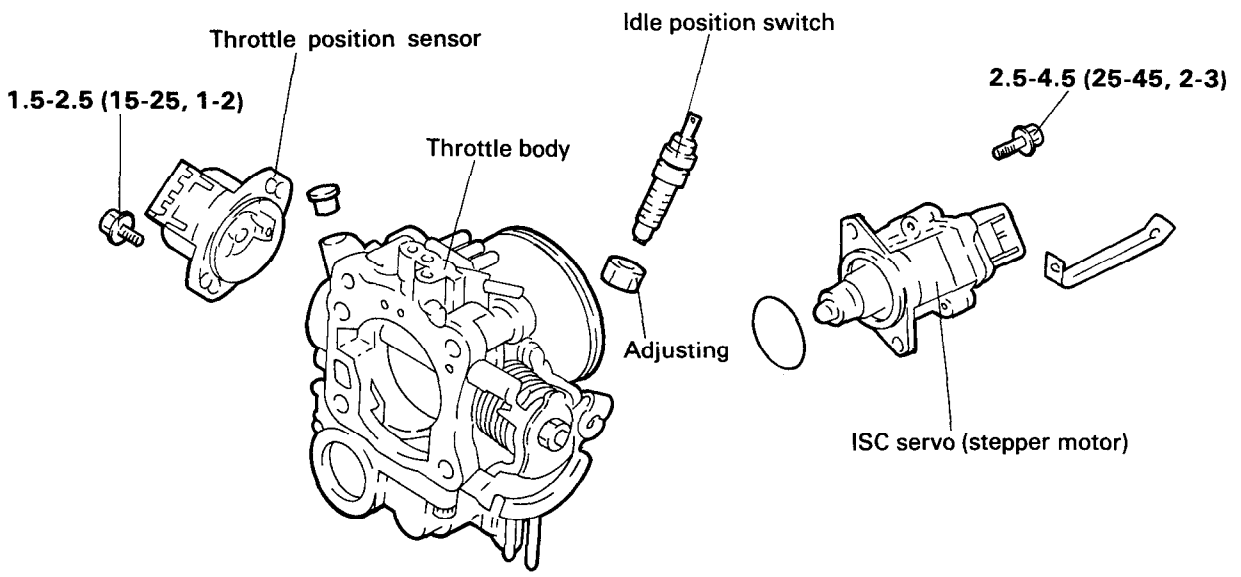
3. While turning the injector to the left and right, install it on to the delivery pipe.
4. Be sure the injector turns smoothly.

NOTE
If it does not turn smoothly, the O-ring may be jammed; remove the injector and re-insert it into the delivery pipe and re-check.



THROTTLE BODY

COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

CAUTION

1. **The throttle valve must not be removed.**
2. **When loosening a phillips screw firmly tightened, use an exact phillips screwdriver for the screw.**

INSPECTION

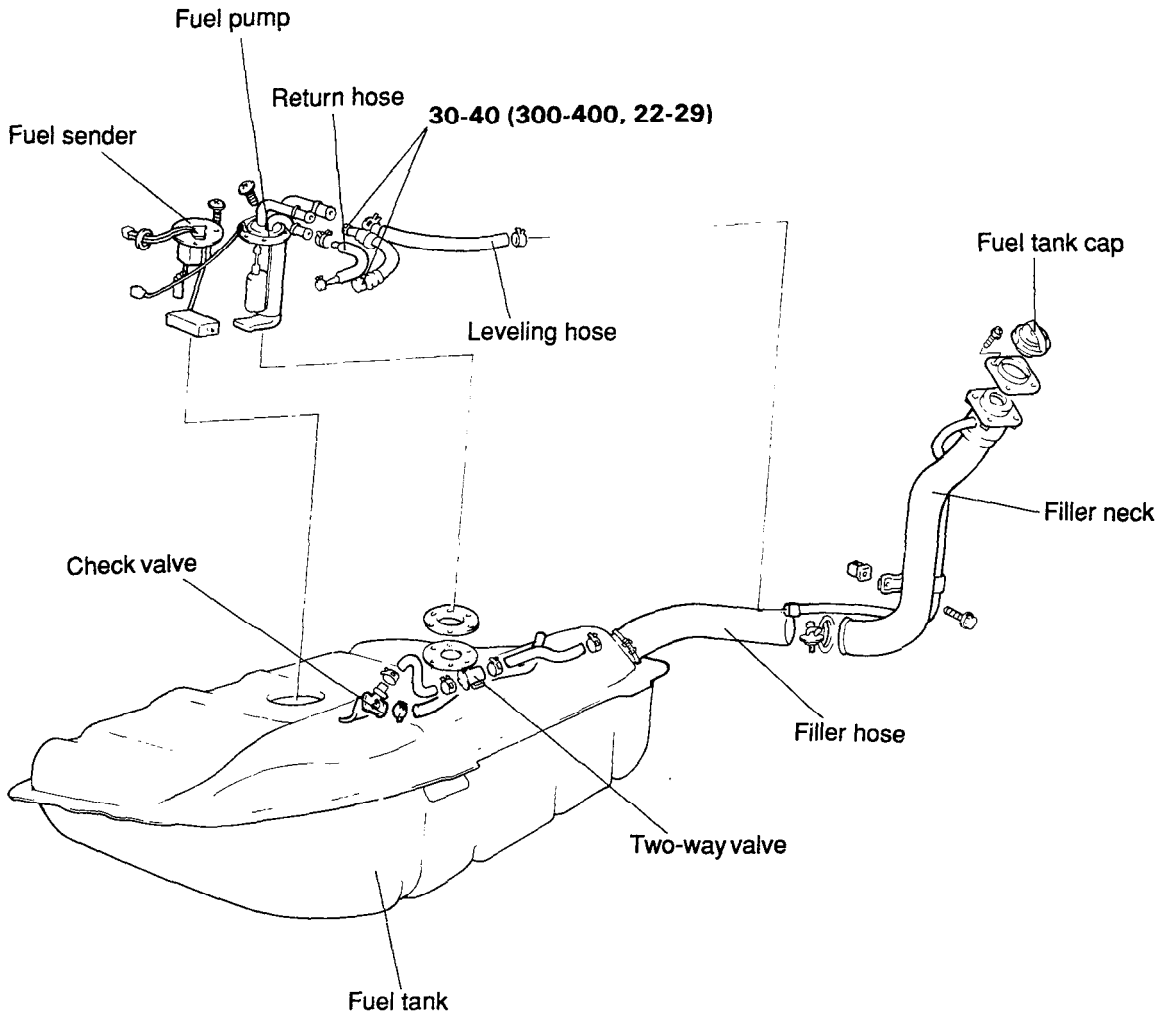
Cleaning Throttle Body Components

1. Clean all components. The following components must not be cleaned by immersion in cleaning solvents.
   - o Throttle position sensor
   - o ISC motor assembly
   - o Idle position switch

   The insulation of these components will be damaged if they are immersed in cleaning solvent. They should be cleaned by using a piece of cloth.
2. Check for restriction of the vacuum port or passage. Clean the vacuum passage by using compressed air.

FUEL TANK

COMPONENTS

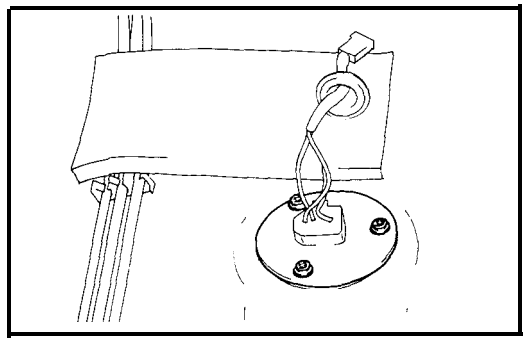


TORQUE : Nm (kg.cm, lb.ft)

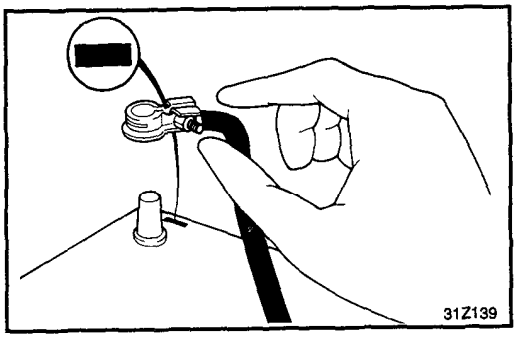
REMOVAL

1. To reduce the internal pressure of the fuel main pipes and hose, first start the engine and then disconnect the electrical fuel pump connector in the rear seat side.
   Disconnect the fuel sender connector.

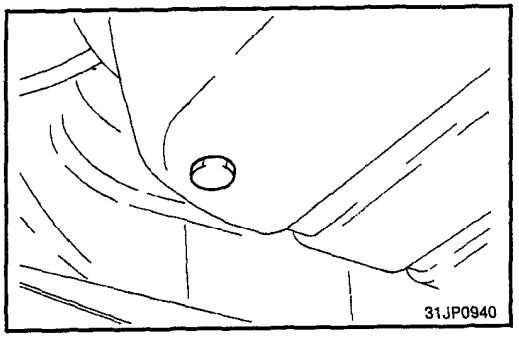
   C A U T I O N
   Be sure to reduce the fuel pressure before disconnecting the fuel main pipe and hose otherwise fuel will spill out.



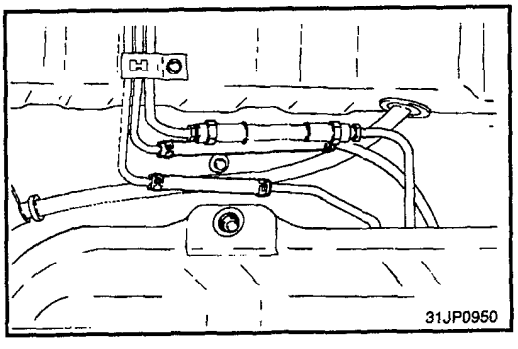
2. Disconnect the battery cable form the negative terminal of the battery.



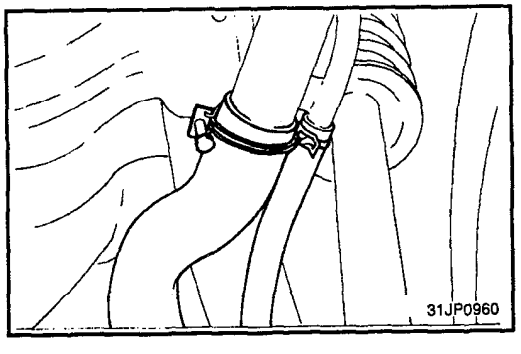
3. Remove the fuel tank cap.
4. Remove the drain plug and drain the fuel.



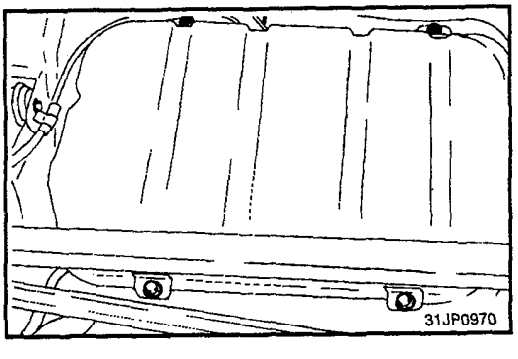
5. Disconnect the return hose and vapor hose.



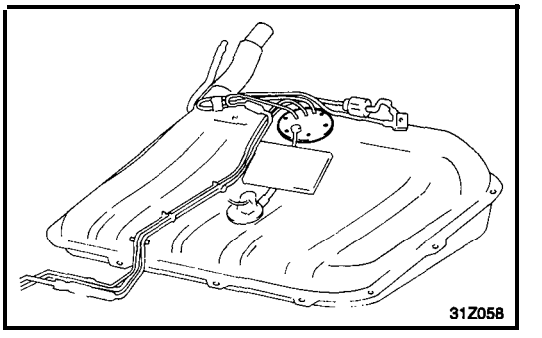
6. Detach the fuel filler hose and leveling hose.



7. Loosen the self locking nuts.



8. Disconnect the high pressure hose from the fuel tank.
9. Remove the fuel vapor hose and the fuel tank.

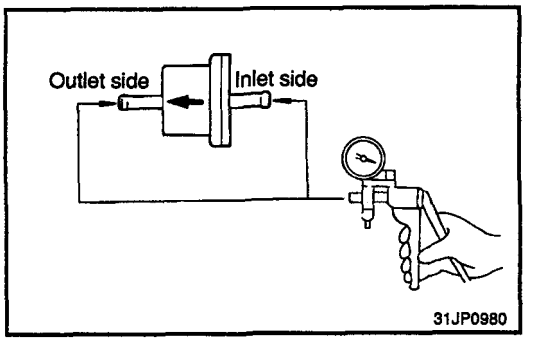


INSPECTION

1. Check the hoses and the pipes for cracks or damage.
2. Check the fuel tank cap for proper operation.
3. Check the fuel tank for deformation, corrosion or cracking.
4. Check the inside fuel tank for dirt or foreign material.
5. Check the in-tank fuel filter for damage or restriction.

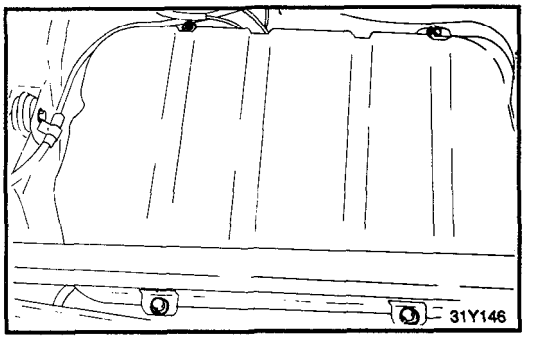
6. Test the two-way valve for proper operation.
7. Using a vacuum hand pump, check the operation of the two-way valve.

Vacuum pump	Guide lines for acceptance or rejection
When connected to inlet side	Negative pressure generated and vacuum maintained
When connected to outlet side	No negative pressure generated

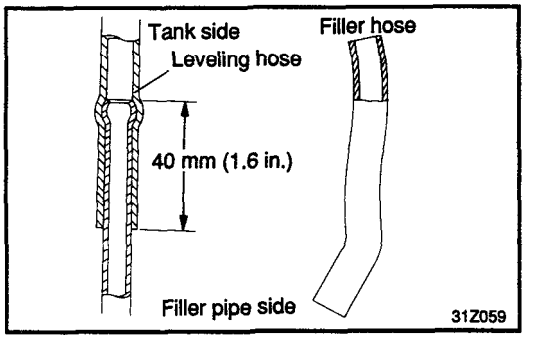


INSTALLATION

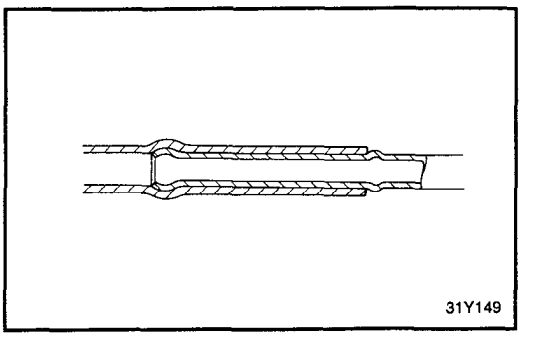
1. Install the fuel tank by tightening the self locking nuts.



2. Connect the leveling hose to the tank and approximately 40 mm (1.6 in.) at the filler neck.
3. When connecting the filler hose, the end with the shorter straight pipe should be connected to the tank side.

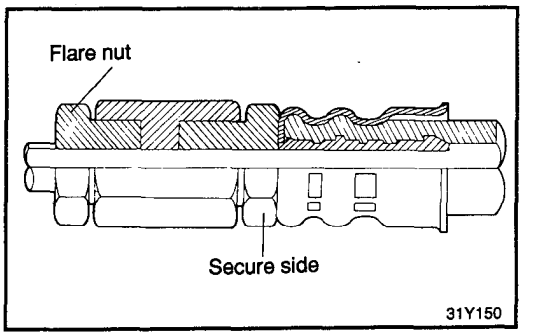


4. Connect the vapor hose and return hose.
   When attaching the fuel hose to the line, be sure that the hose is attached as shown in the illustration.



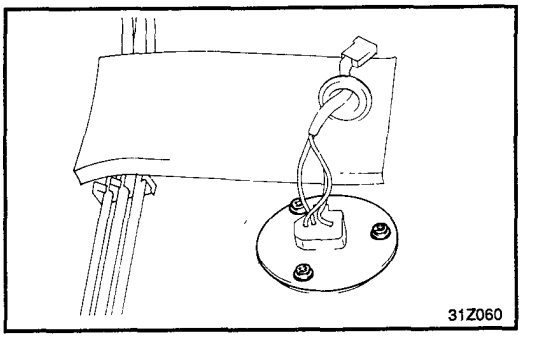
5. To connect the high pressure hose to the fuel pump, temporarily the flare nut by hand, and then tighten it to the specified torque. Be careful that the fuel hose does not twist.

Tightening torque
High pressure hose flare nut .....
30-40 Nm (300-400 kg.cm, 22-29 lb.ft)



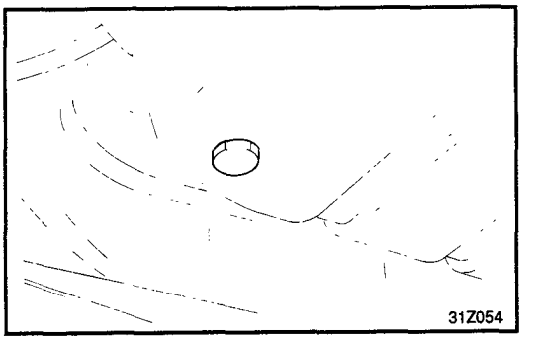
NOTE
When tightening the flare nut, be careful not to bend or twist the line to prevent damage to the fuel pump connection.

6. Connect the electrical fuel pump and fuel sender connector.



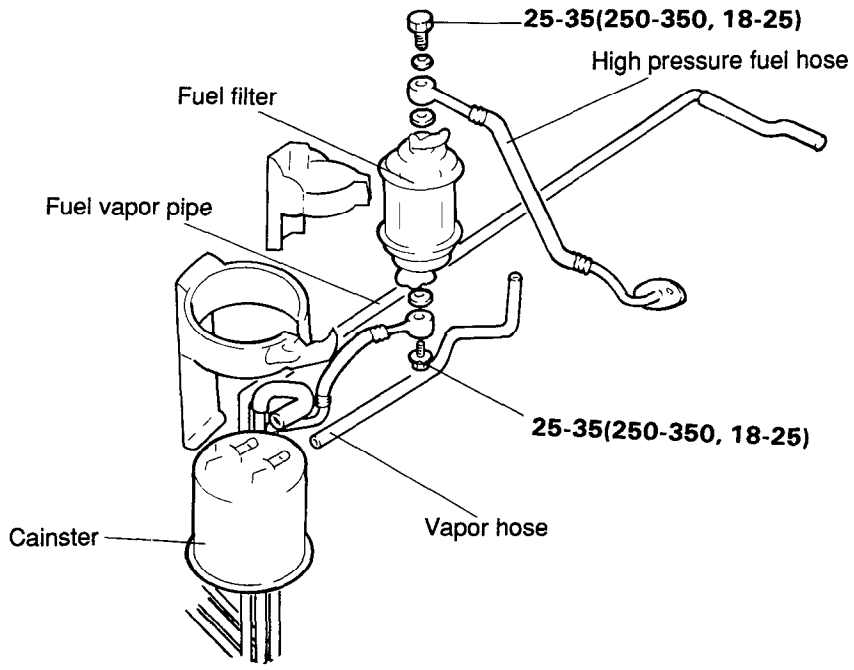
7. Tighten the drain plug to the specified torque.

Tightening torque
Drain plug ..... 15-25 Nm (150-250 kgcm, 11-18 lb.ft)



FUEL LINE AND VAPOR LINE

COMPONENTS

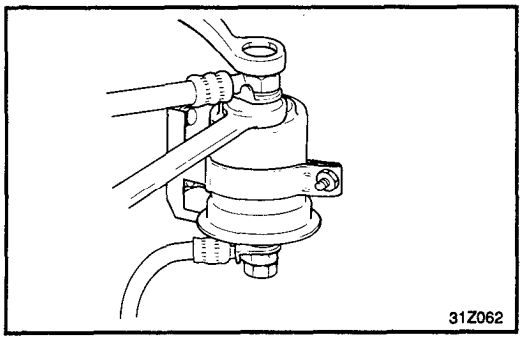


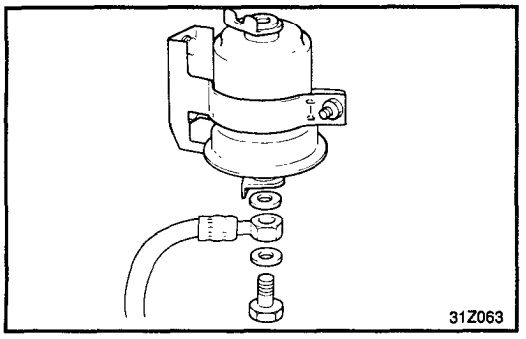
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Remove the upper eye bolt while holding the fuel filter nut securely and remove the high pressure fuel hose.

   CAUTION
   1) Be sure to reduce the fuel pressure before disconnecting the fuel line and hose, otherwise fuel will spill out.
   2) Cover the hose connection with a shop towel to prevent splashing of fuel that could be caused by residual pressure in the fuel line.
2. Remove the lower eye bolt while holding the fuel filter nut assembly.
3. Remove the fuel filter mounting bolts, then remove the fuel filter from the bracket.
4. Remove the fuel return hose and line.
5. Remove the fuel vapor hose and line.



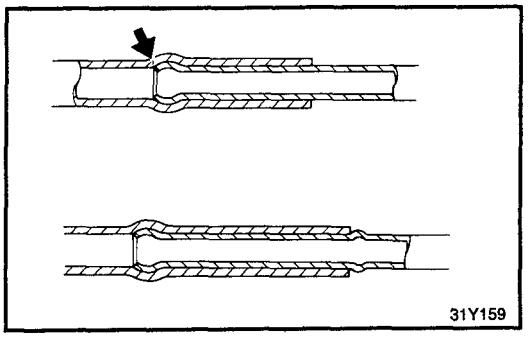


INSPECTION

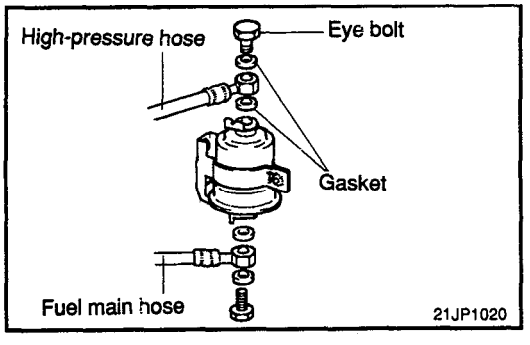
1. Check the hoses and pipes for cracking bending, deformation or restrictions.
2. Check the canister for restrictions.
3. Check the fuel filter for restrictions and damage.

INSTALLATION

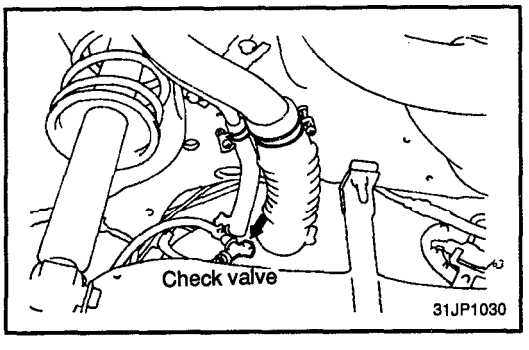
1. Install the fuel vapor hose and return hoses.
   - o If the fuel line has a stepped section, connect the fuel hose to the line securely, as shown in the illustration.
   - o If the fuel line does not have a stepped section, connect the fuel hose to the line securely.



2. Install the fuel filter, and tighten the fuel filter bracket.
3. Insert the main line on the filter and tighten the eye bolts while holding the fuel filter nuts.

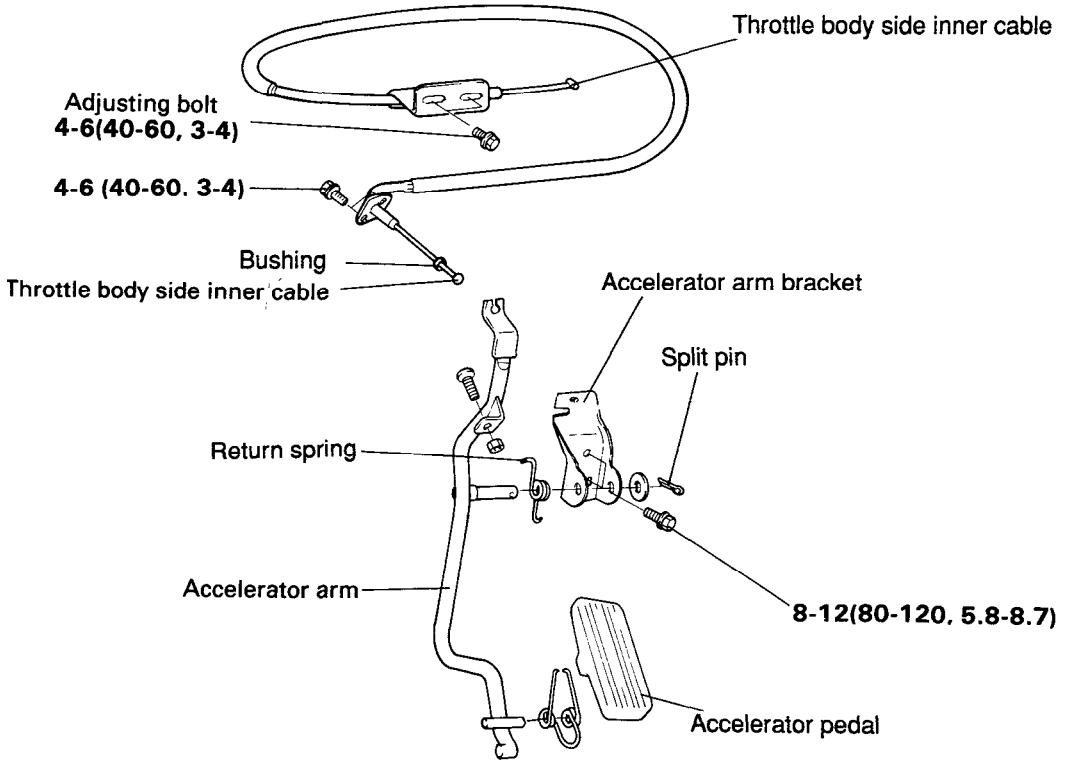


4. Install the clips and make sure that they do not interfere with other components.



ENGINE CONTROL

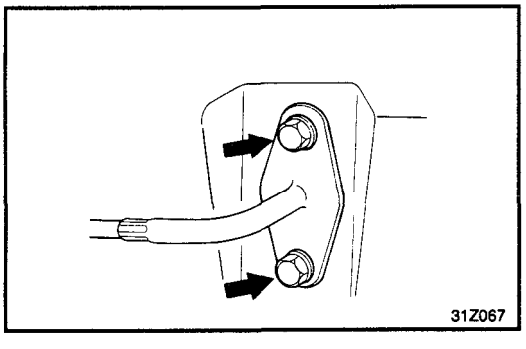
COMPONENTS



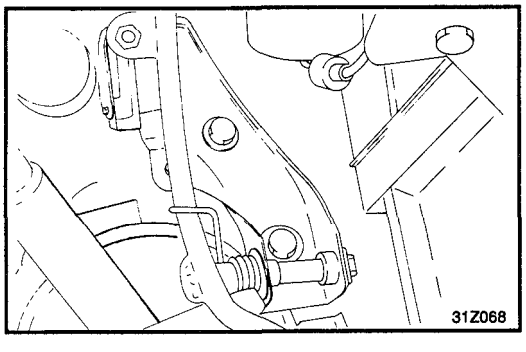
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Remove the bushing and inner cable of the accelerator arm side.



2. Loosen the bolts of the accelerator arm bracket and remove.

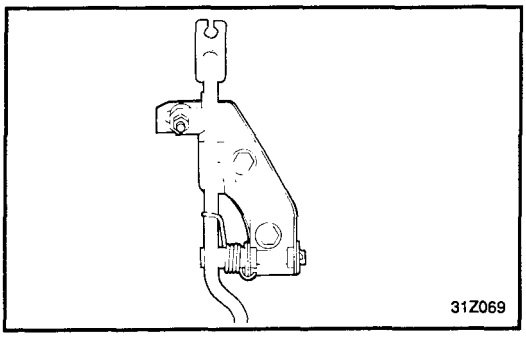


INSPECTION

1. Check the inner and outer cable for damage.
2. Check the cable for smooth movement.
3. Check the accelerator arm for deformation.
4. Check the return spring for deterioration.
5. Check the connection of the bushing to end metal fitting.

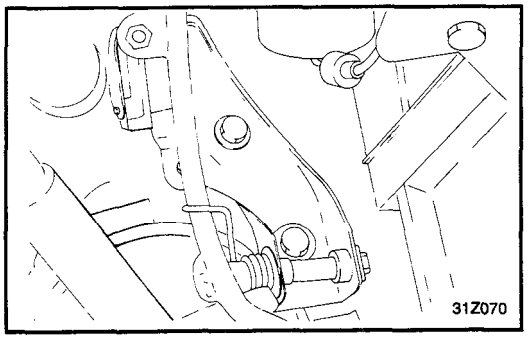
INSTALLATION

1. When installing the return spring and accelerator arm, apply multi-purpose grease around each moving point of the accelerator arm.

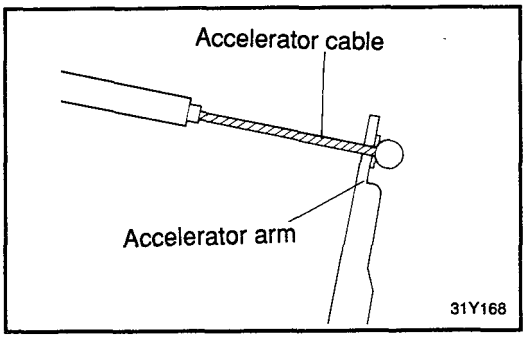


2. Apply sealant to the bolt mounting hole, and tighten the accelerator arm bracket.

Tightening torque
Accelerator arm bracket bolts ..... 8-12 Nm (80-120 kg.cm, 6-7 lb.ft)



3. Securely install the resin bushing of the accelerator cable on the end of the accelerator arm.



AIR CONDITIONING

Return To Main Table of Contents

GENERAL 2
HEATER 7
BLOWER 9
VENTILATOR 11
AIR CONDITIONING SYSTEM 13
AIR CONDITIONING SERVICE 15
COMPRESSOR 33
CONDENSER 42
RECEIVER DRIER 44
EVAPORATOR 46
REFRIGERANT LINE 50

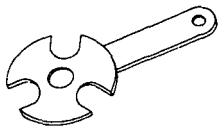
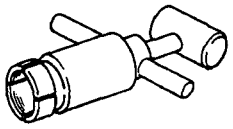
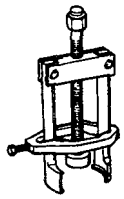
SPECIFICATION (R-134a)

Heater unit	
Type	Three-way-flow full-air-mix system
Heating Capacity	3800 Kcal/h
Heater control assembly	Rotary type (Vacuum Control System)
Air Conditioning	
Cooling capacity	3700 Kcal/h
Compressor	
Model	FX15 (Swash Plate Type)
Refrigerant unit lubricant, cc (cu. in)	PAG oil FD46XG or Equivalant, 140-160 (8.5-9.7)
No. of cylinders and displacement CC/Rev	5 cylinders, 154
Dual pressure switch	
High pressure switch	OFF 32±2 kg/cm (3,138 kPa, 455 psi) ON 26±2 kg/cm (2,550 kPa, 370 psi)
Low pressure switch	OFF 2.0 kg/cm (200 kPa, 28 psi) ON 2.25±0.2 kg/cm (220 kPa, 32 psi)
Freezer prevention (Built -in evaporator)	Air temperature thermostat OFF : 0^0 (32°F) ON : 4°C (39°F)
Pressure relief valve	
Working pressure	MIN. 35.0 kg/cm^2 (498 psi), MAX. 42.2 kg/cm^2 (600 psi)
Resealed pressure	MIN. 28.1 kg/cm^2 (400 psi)
Refrigerant and quantity	R-l 34a, Approx. 680 g (1.5 Ibs)

SERVICE STANDARDS

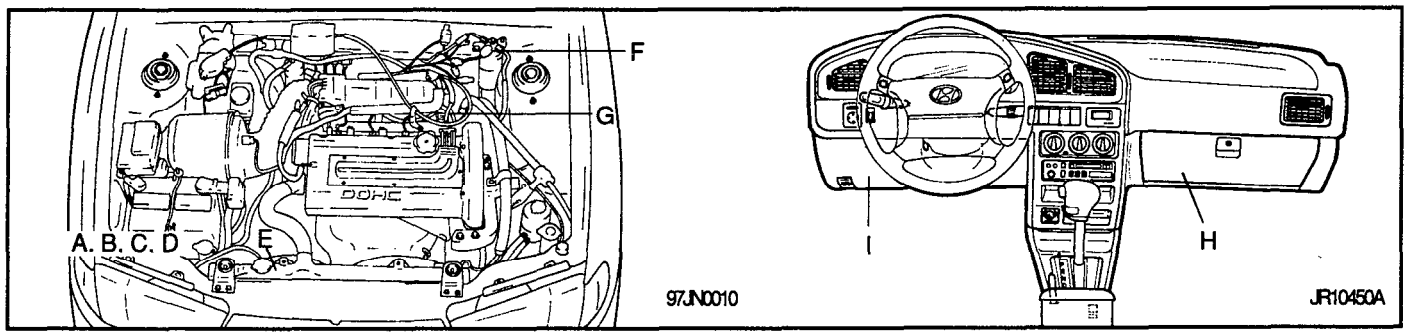
Amount of deflection of V belt	
New belt	5-5.5 mm (0.20-0.21 in.)
Used belt	6-7 mm (0.23-0-28 in.)
After driving	8 mm (0.31 in.)
Clutch clearance	0.35-0.75 mm (0.01-0.03 in.)
V belt size	
Type	4 PK
Length	910 mm (35.9 in.)

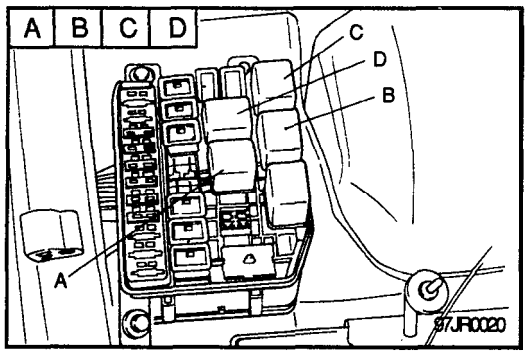
SPECIAL TOOLS

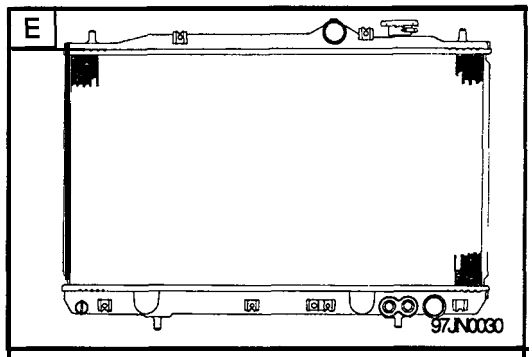
Tool (Number and name)	Illustration	Use
09977-34000 Pressure plate bolt remover		Removal and installation of pressure plate
09977-33700 Shaft seal remover and installer		Removal and installation of the shaft seal.
09977-33800 Snap ring remover		Removal of snap ring.
09455-34000 Bearing and gear puller		Removal of field coil.

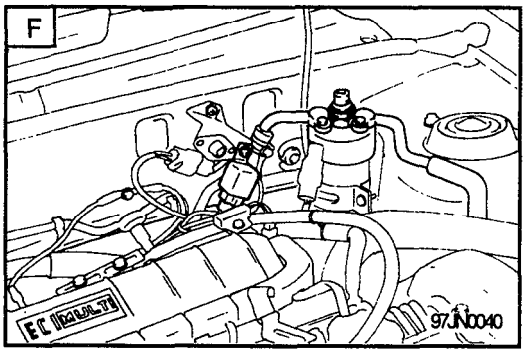
LOCATION OF COMPONENTS

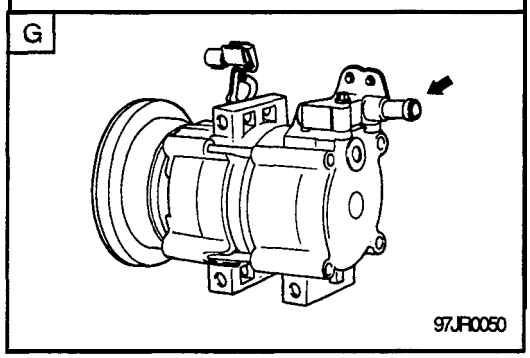
Name	Symbol	Name	Symbol
Air Conditioning relay	A	Dual pressure switch	F
Condenser fan relay	B	Pressure relief valve	G
Radiator fan control relay	C	Thermostat	H
Radiator fan relay	D	Blower relay	I
Thermo sensor	E		

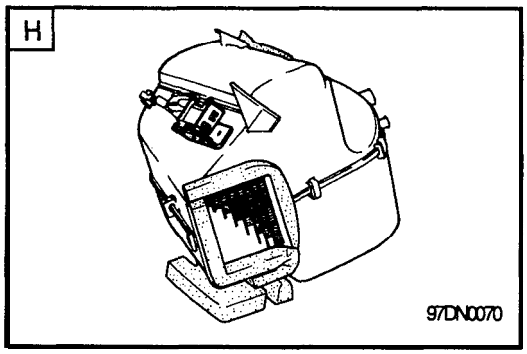


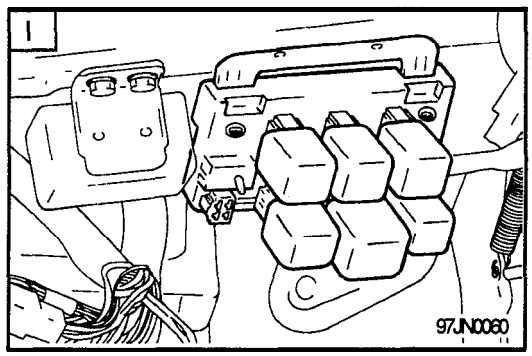




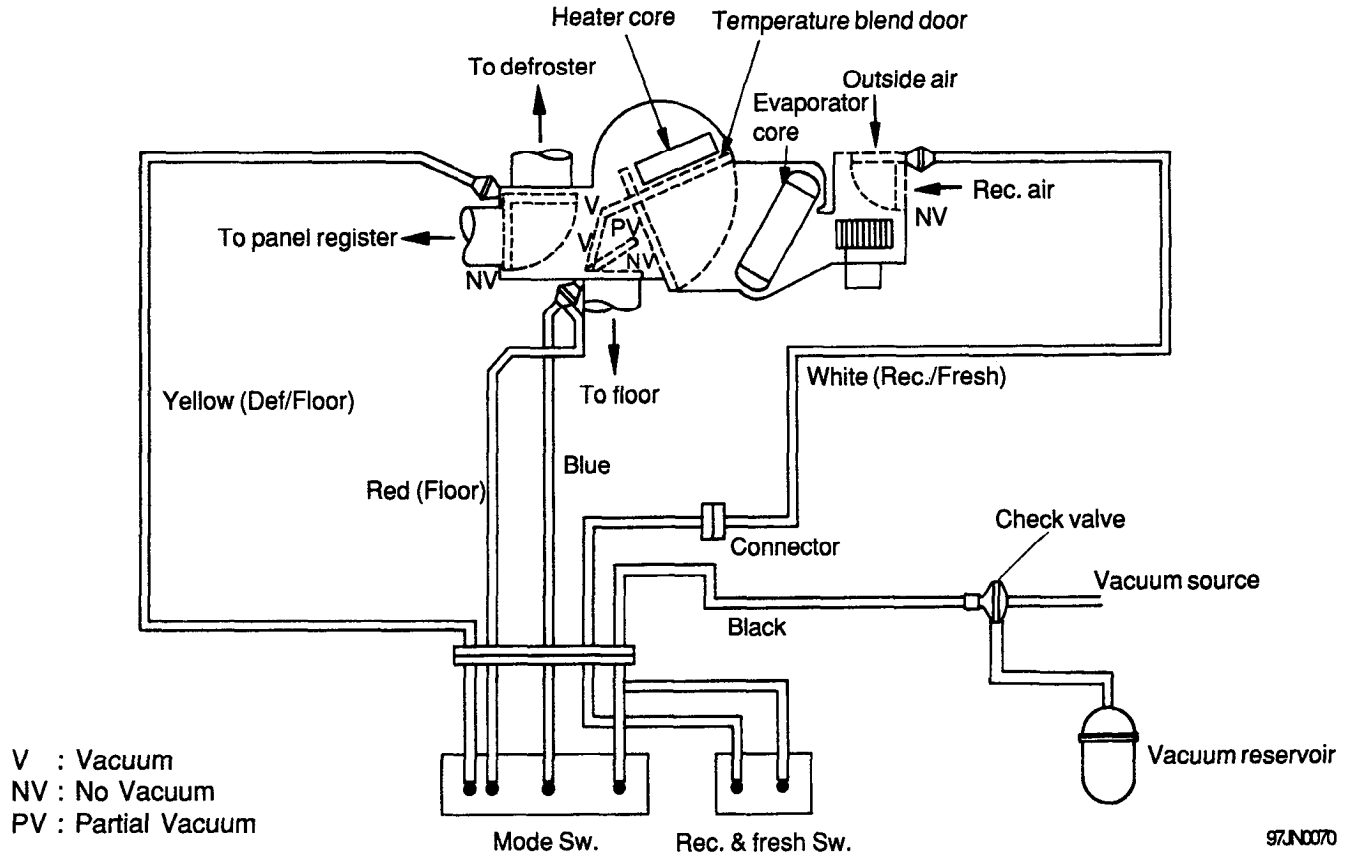


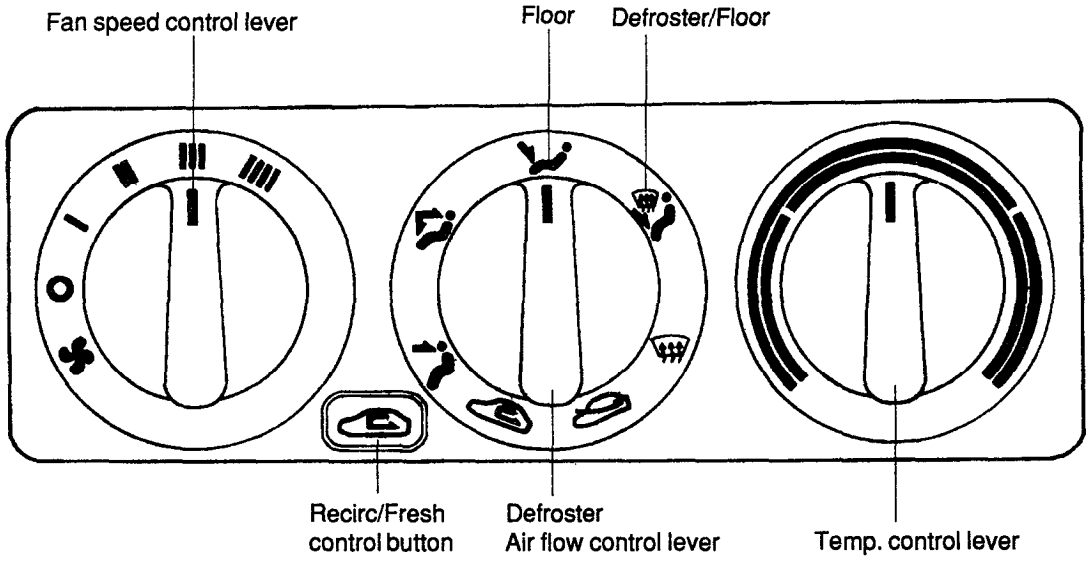






VACUUM SYSTEM SYMPTOM AND PROBABLE CAUSE

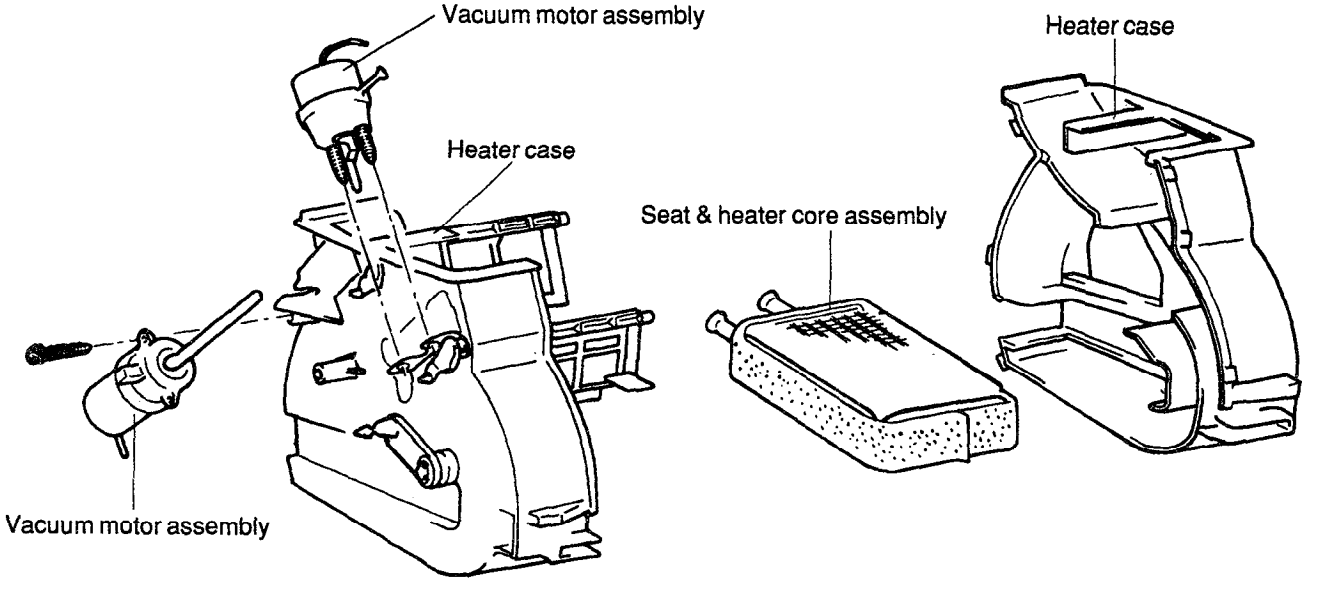




Symptom	Probable cause
On "FLOOR" position. All air through defroster or DEF/FLOOR.	o Blue and/or red vacuum hose pinched or disconnected at vacuum motor. o Black source hose pinched or disconnected at the connector. o Engine compartment vacuum source hose pinched or disconnected at the vacuum manifold. o Defective vacuum motor.
On "DEF/FLOOR" position. All air through defroster.	o Blue hose pinched or disconnected at vacuum motor. o Blue vacuum hoses installed improperly (reversed). o Black source hose pinched or disconnected at the connector. o Engine compartment vacuum source hose pinched or disconnected at the vacuum manifold. o Defective vacuum manifold.
On "PANEL VENTS" position. All air through defroster.	o Yellow vacuum hose pinched or disconnected at vacuum motor. o Black source hose pinched or disconnected at the connector. o Engine compartment vacuum source hose pinched or disconnected at the vacuum manifold. o Defective vacuum motor.
On "PANEL/FLOOR" position. All air through defroster or panel	o Yellow vacuum hose pinched or disconnected at vacuum motor. o Blue hose pinched or disconnected at vacuum motor. o Black source hose pinched or disconnected at the connector. o Engine compartment vacuum source hose pinched or disconnected at the vacuum manifold. o Defective vacuum motor.
On "DEF" position. (No vacuum) On "RECIRC" position. All air through fresh.	o White vacuum hose disconnected at the connector or recirc duct vacuum motor. o Black source hose pinched or disconnected at the connector. o Engine compartment vacuum source hose pinched or disconnected at the vacuum manifold. o Defective vacuum motor.

HEATER

COMPONENTS



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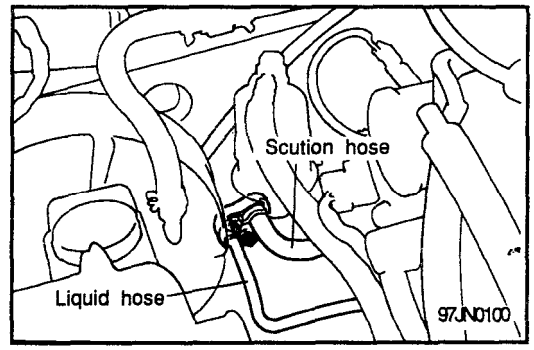
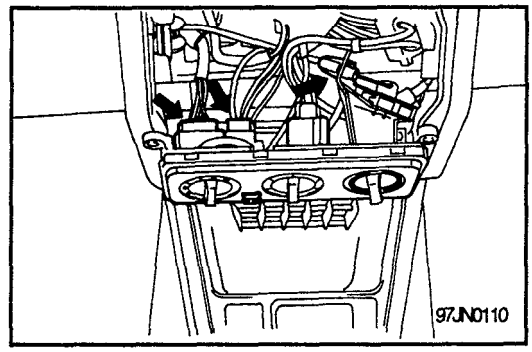
REMOVAL

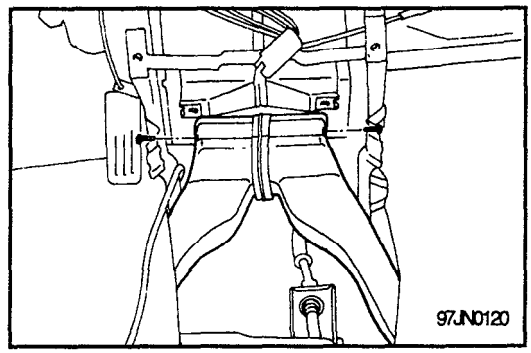
1. Disconnect the negative terminal at the battery.
2. Drain the coolant from the radiator.
3. Remove the heater hoses and the evaporator water drain hose.
4. Remove the suction line and the liquid line.



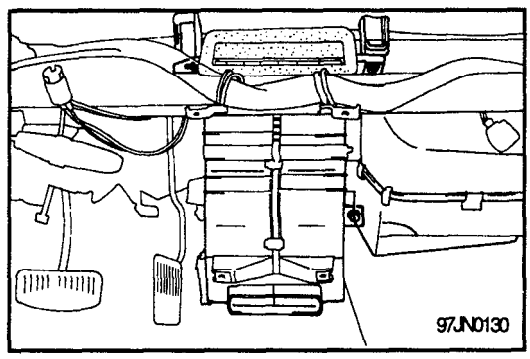
5. Remove the console assembly (Refer to BODY GROUP).
6. Remove the glove box assembly, main lower crash pad assembly and lower crash pad center facia panel assembly (Refer to BODY GROUP).
7. Remove the heater control assembly.



8. Remove the lower crash pad center skin assembly (Refer to BODY GROUP).
9. Remove the crash pad center support bracket assembly (Refer to BODY GROUP).
10. Remove the rear heating joint duct assembly.



11. Remove the heater unit assembly.

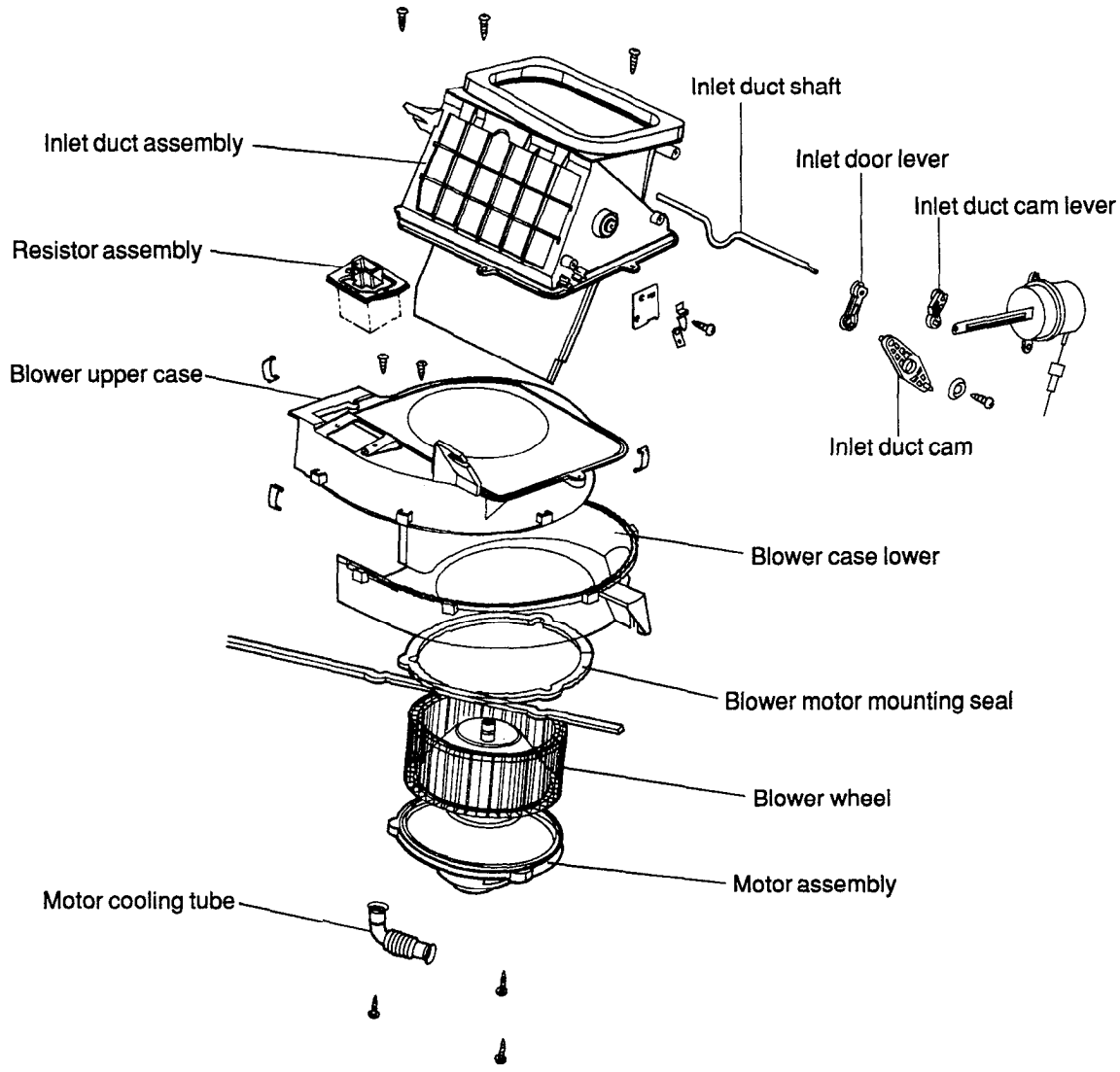


INSPECTION

1. Check the linkage mechanism for operation.
2. Check the heater core for restrictions or leakage.

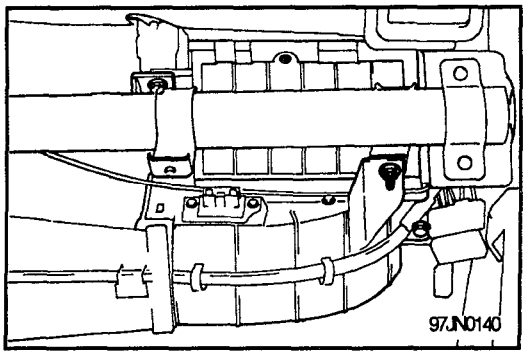
BLOWER ASSEMBLY

COMPONENTS



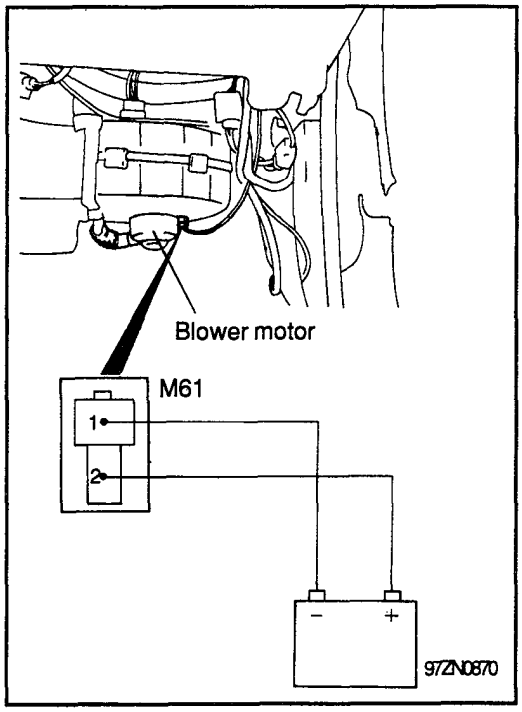
REMOVAL AND INSTALLATION

1. Remove the glove box housing cover assembly.
2. Remove the lower crash pad assembly.
3. Disconnect the resistor and blower motor connector.
4. Loosen the three mounting bolts for evaporator unit.
5. Remove the three nuts from the blower unit mounting bracket.
6. Pull out the blower unit and then disconnect the fresh/recirc vacuum connector.
7. Installation is the reverse of removal.

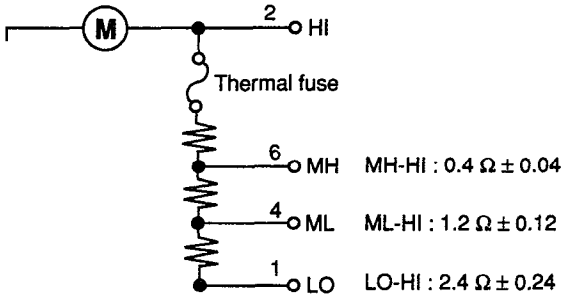


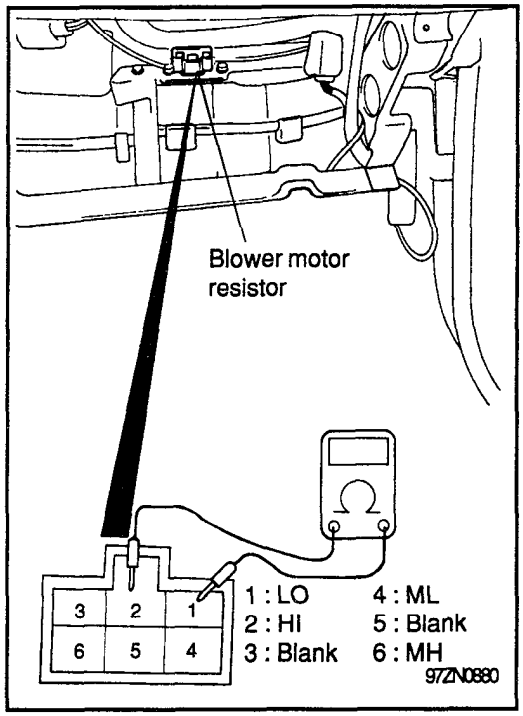
INSPECTION

1. Check for bending or abnormal deflection of the rotating shaft of the blower motor assembly.
2. Check for cracking or deterioration of the packing.
3. Check for damage to the fan.
4. Check for damage to the blower case.
5. Check the operation of the inside/outside selection damper, and for damage. 6
6. Connect the blower motor terminals directly to the battery and check that the blower motor operates smoothly.
7. Next, reverse the polarity and check that the blower motor operates smoothly in the reverse direction.



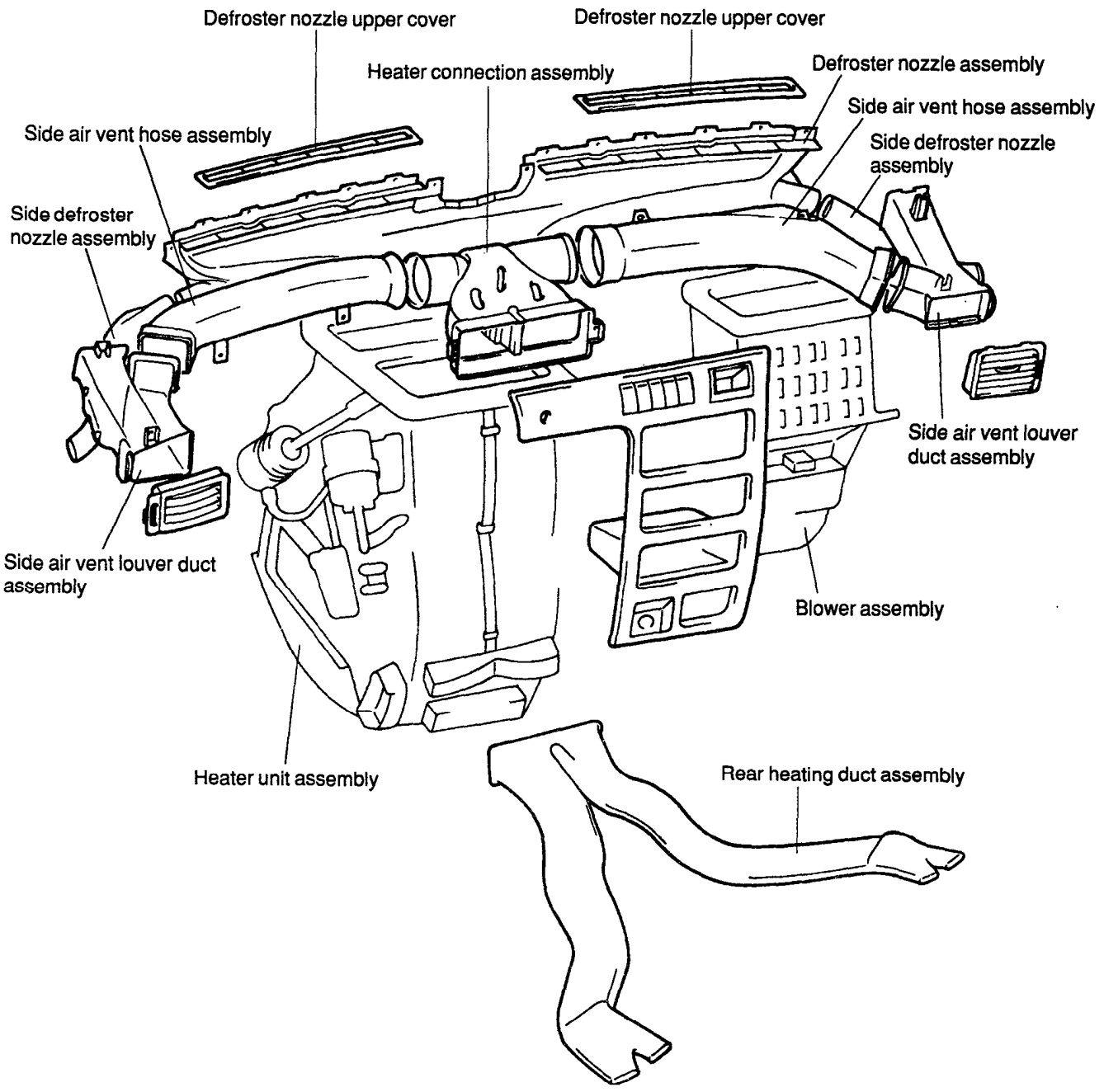
8. Using an ohmmeter, check that there is continuity between terminals 1 and 2.
   If there is no continuity, replace the resistor.





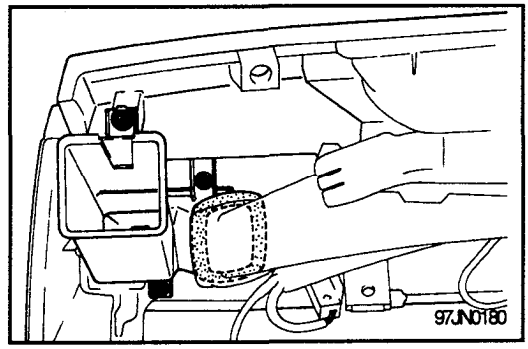
VENTILATOR

COMPONENTS

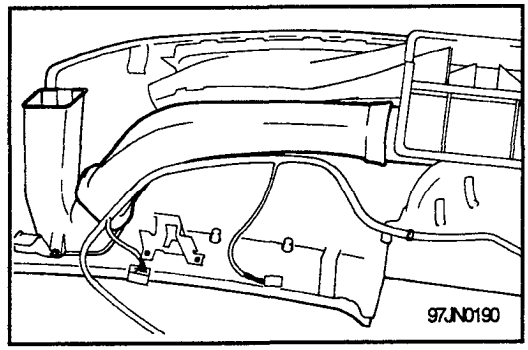


REMOVAL AND INSTALLATION

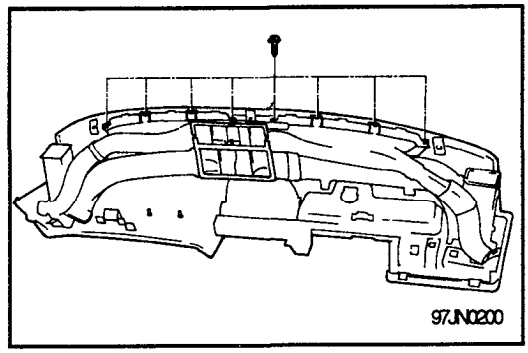
1. Remove the main crash pad assembly (Refer to BODY GROUP)
2. Remove the side air vent louver duct assembly (LH/RH).



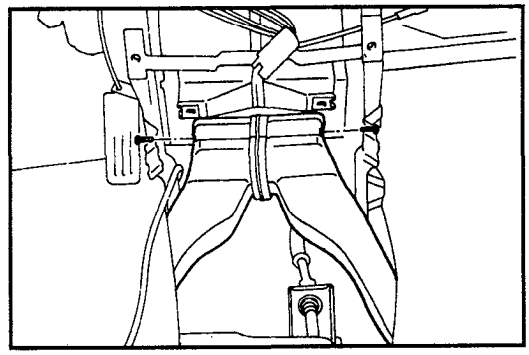
3. Remove the side air vent hose assembly (LH/RH).
4. Remove the side air vent louver assembly (LH/RH).



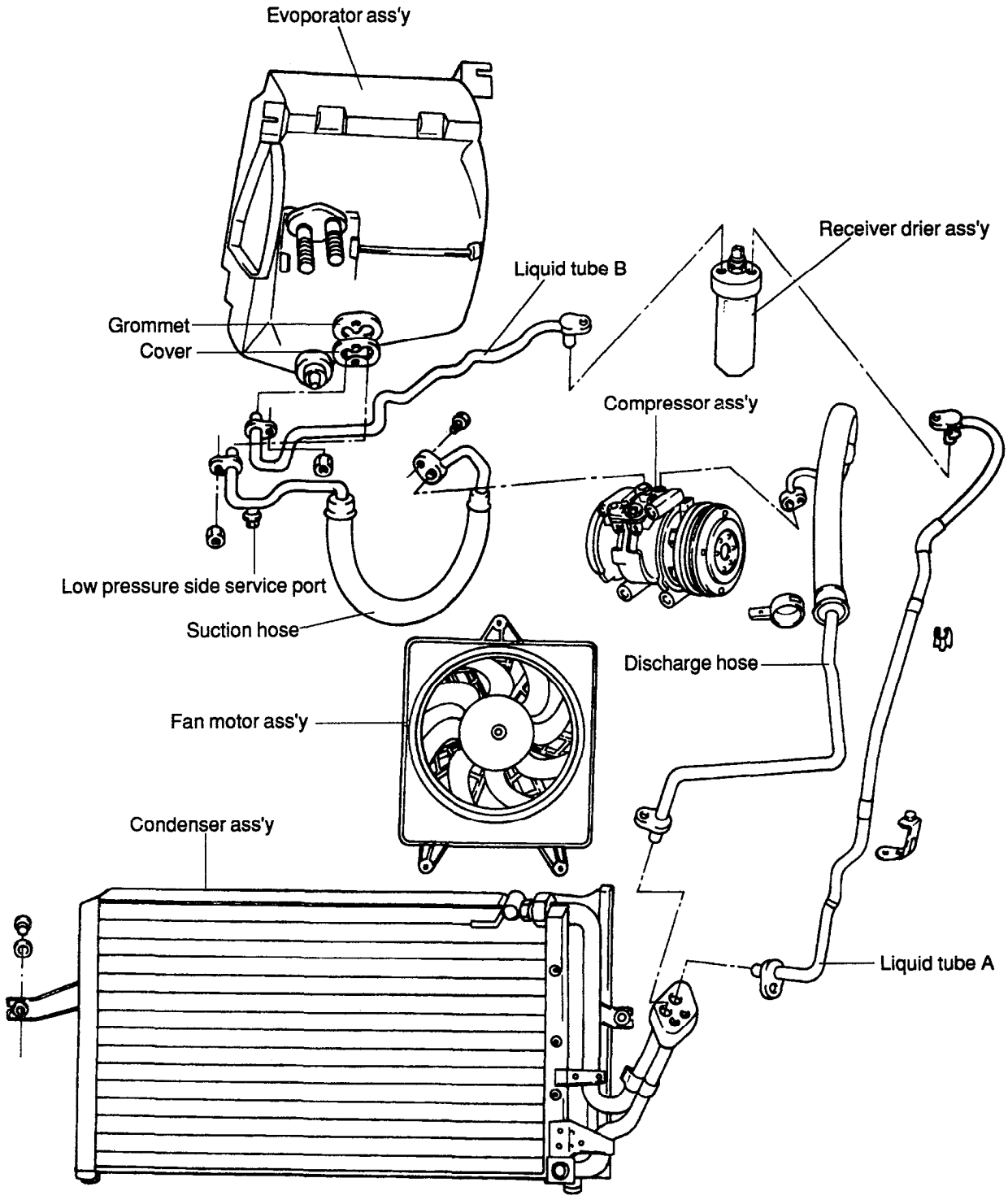
5. Remove the heater connection assembly.
6. Remove the defroster nozzle assembly.
7. Remove the side defroster nozzle assembly (LH/RH).
8. Remove the crash pad upper cover assembly.



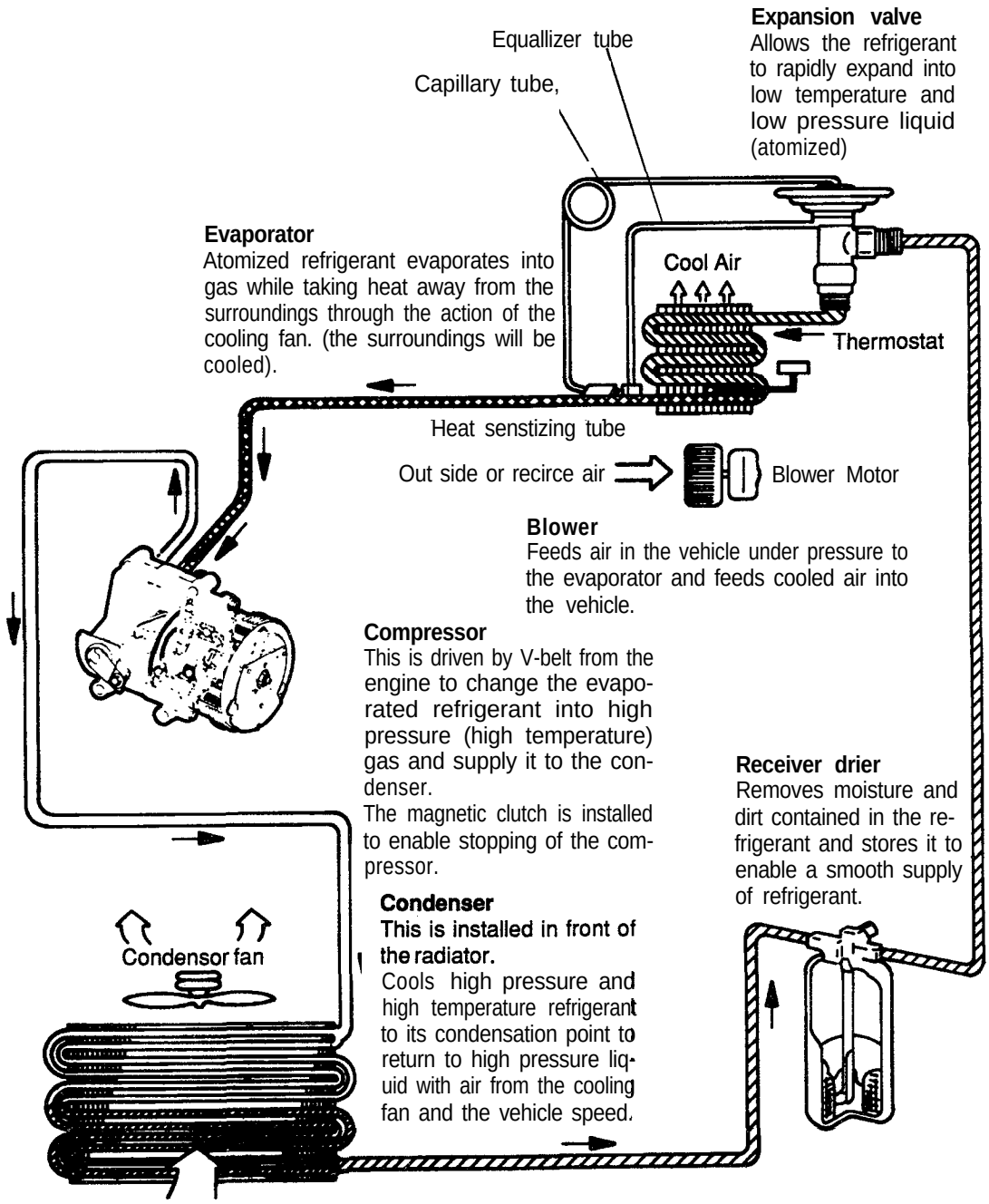
9. Remove the rear heating joint duct assembly and rear heating side duct assembly (LH/RH).
10. Installation is the reverse of removal procedures.



AIR CONDITIONING COMPONENTS

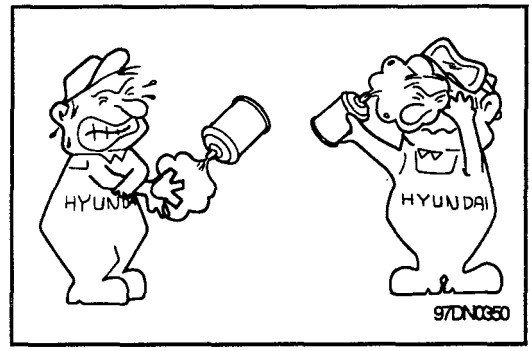


REFRIGERATION CYCLE



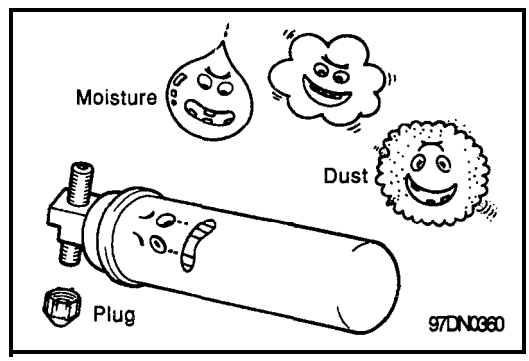
GENERAL SERVICE INSTRUCTIONS

SAFETY PRECAUTIONS



1. R-134a liquid refrigerant is highly volatile. A drop on the skin could result in localized frostbite. When handling the refrigerant, be sure to wear gloves.
2. If the refrigerant splashes into your eyes, wash them with clean water immediately. It is standard practice to wear goggles or glasses to protect your eyes, and gloves to protect your hands.
3. The R-134a container is highly pressurized, never leave it in a hot place, and check that the storage temperature is below 52°C (126°F).
4. A halide leak detector is often used to check the system for refrigerant leakage. Bear in mind that R-134a, upon coming into contact with flame (this detector burns propane to produce a small flame), produces phosgene, a toxic gas.
5. Use only recommended lubricant for R-134a A/C system components. If lubricants other than recommended one used, system failure may occur.
6. The PAG lubricant absorbs moisture from the atmosphere at a rapid rate, therefore the following precautions must be observed.
   -. When removing refrigerant components from a vehicle cap immediately the components to prevent A/C system from the entry of moisture.
   -. When installing refrigerant components to a vehicle, do not remove the cap until just before connecting the components.
   -. Complete the connection of all refrigerant tubes and hoses without delay to prevent the A/C system from entry of moisture.
   -. Use the recommended lubricant from a sealed container only.
7. If accidental system discharge occurs, ventilate the work area before resuming service.

WHEN REPLACEING PARTS ON A/C SYSTEM

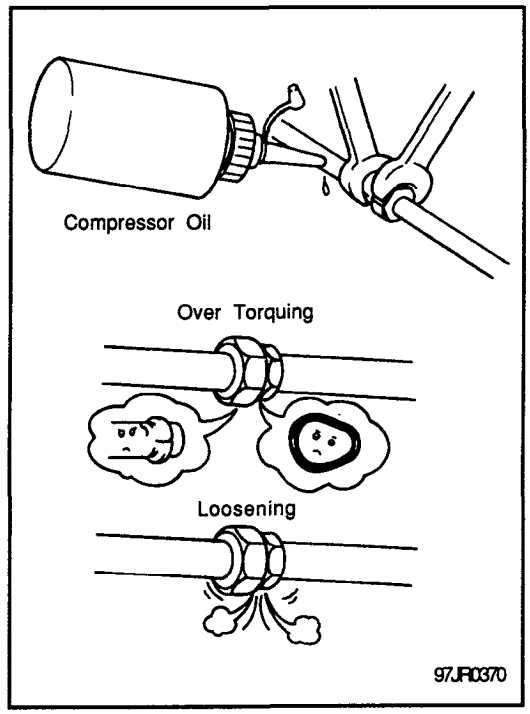


1. Never open or loosen a connection before discharging the system.
2. Seal the open fittings with a cap or plug immediately in disconnected parts to prevent intrusion of moisture and dust.
3. Do not remove the sealing caps from a replacement component until it is ready to be installed.
4. Before connecting an open fitting, always install a new sealing ring. Coat the fitting and seal with refrigerant oil before making the connection.

HOW TO INSTALL CONNECTING PARTS

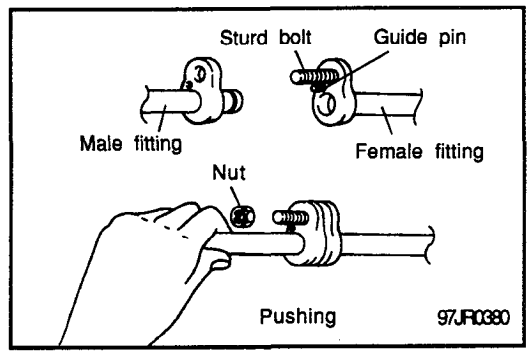
Bolt/nut coupling type

1. Lubricate O-ring fittings with compressor oil for easy tightening and to prevent leaking of refrigerant gas.
2. Tighten the nut using two wrenches to avoid twisting the tube.
3. Tighten the O-ring fittings to the specified torque.



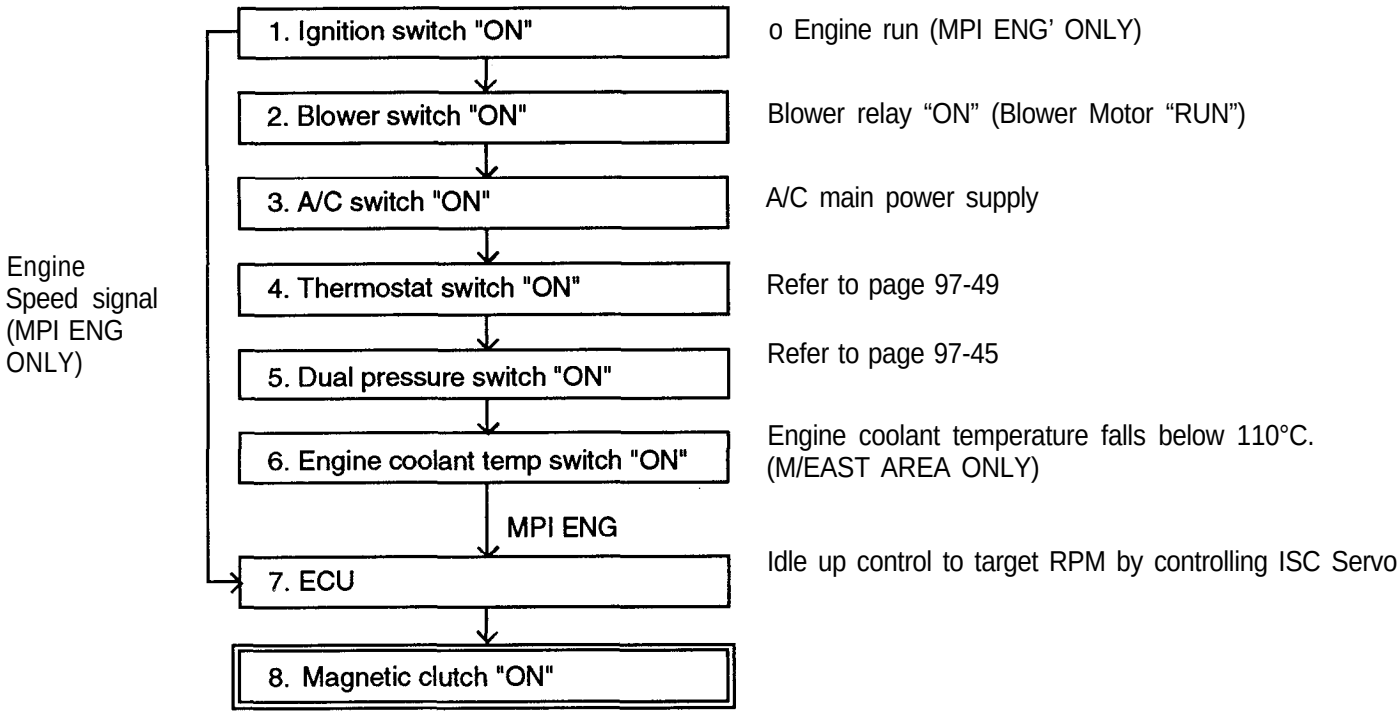
Flange With Guide Pin Type

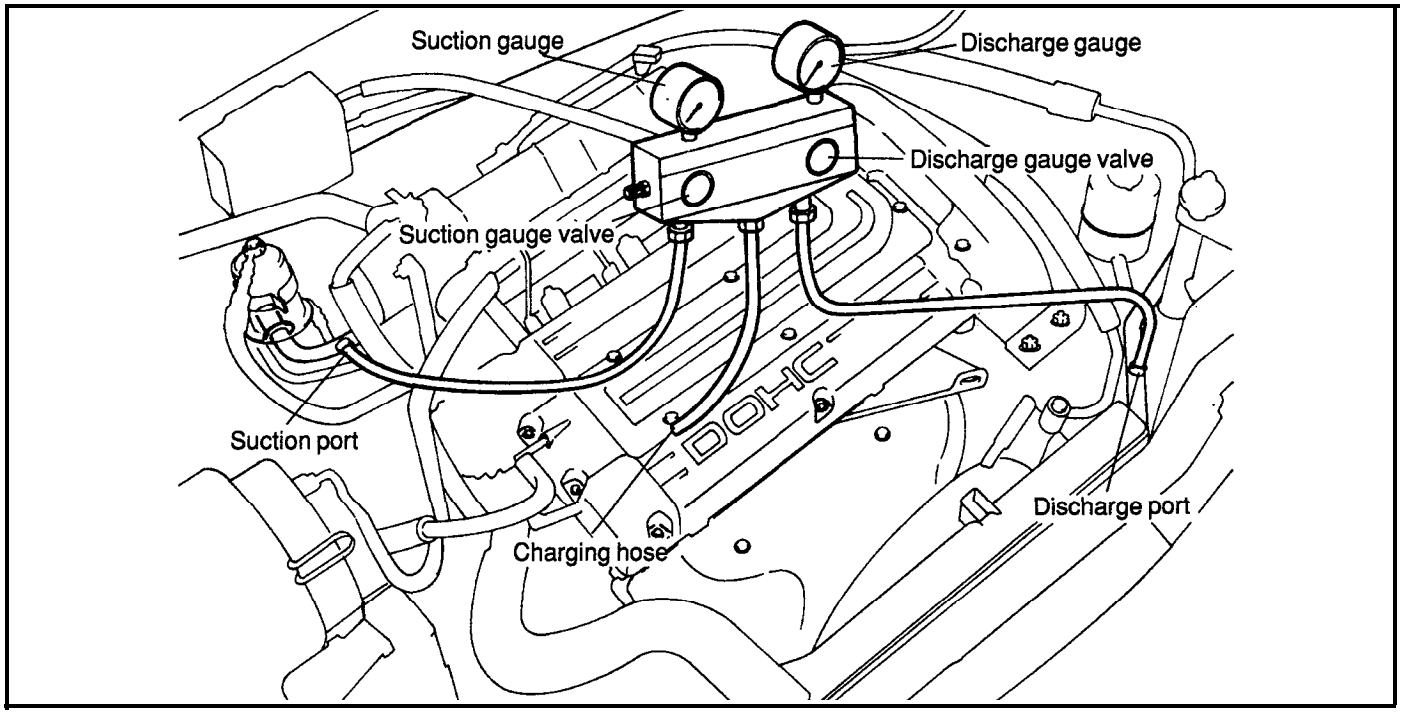
1. Check for missing or damaged the new O-ring (use only specified one) and lubricate with compressor oil.
2. Hand tighten the nut or bolt by pushing the one side pipe.
3. Tighten the nut or bolt to the specified torque.



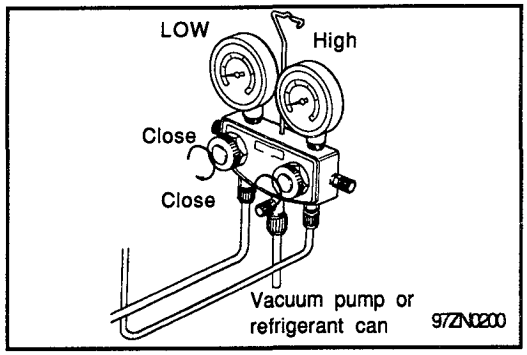
HOW IS THE MAGNETIC CLUTCH ENERGIZED ?

The general process until the magnetic clutch is energized as shown below.





1. Close both hand valves of manifold gauge set.
2. Install charging hoses of gauge set to service ports. Connect the low pressure hose to the low pressure service port in the suction pipe and the high pressure hose to the high pressure service port in the discharge hose.
3. Tighten the hose nuts by hand.

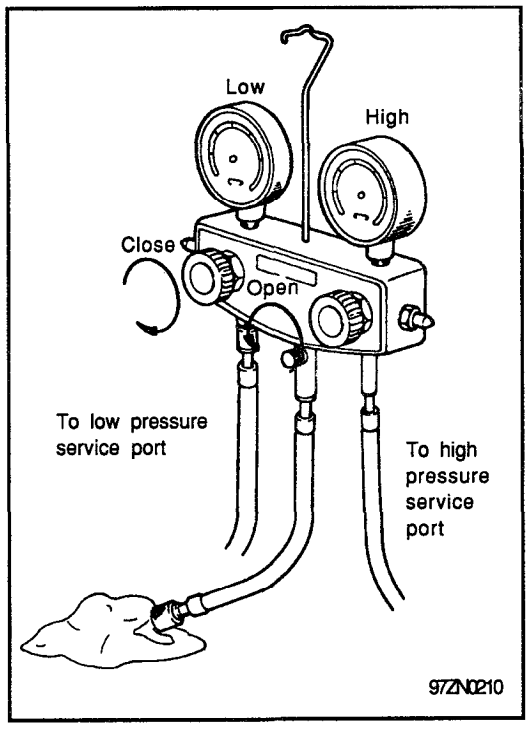


DISCHARGING THE REFRIGERANT SYSTEM

1. Connect the manifold gauge set to the system.
2. Place the free end of the center hose on a shop towel.
3. Slowly open the high-pressure hand valve to adjust the refrigerant flow. Open the valve slightly.

   NOTE:

   If refrigerant is allowed to escape too fast, compressor oil will be drawn out of the system.
4. Check the shop towel to make sure no oil is being discharged. If oil is present, partially close the hand valve.
5. After the manifold gauge reading drops below 434 kPa (3.5 kg/cm^2, 50 psi), slowly open the low-pressure hand valve.
6. As the system pressure drops, gradually open both the high and the low-pressure hand valves until both gauges read 1 kPa (0 kg/cm^2, 0 psi).



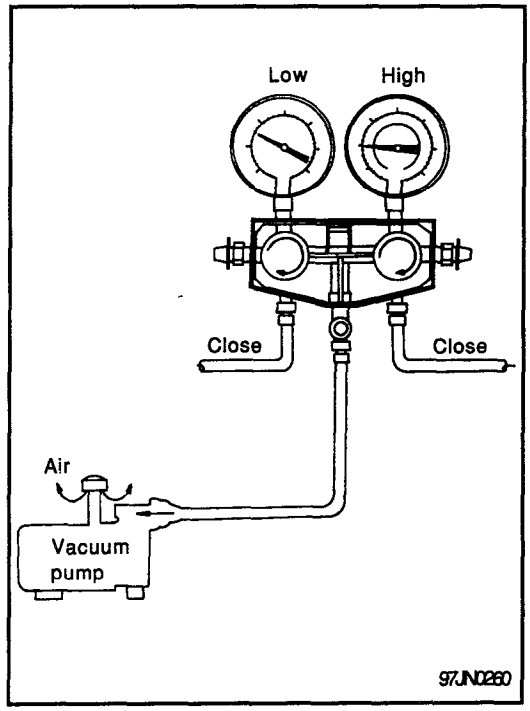
EVACUATING REFRIGERANT SYSTEM

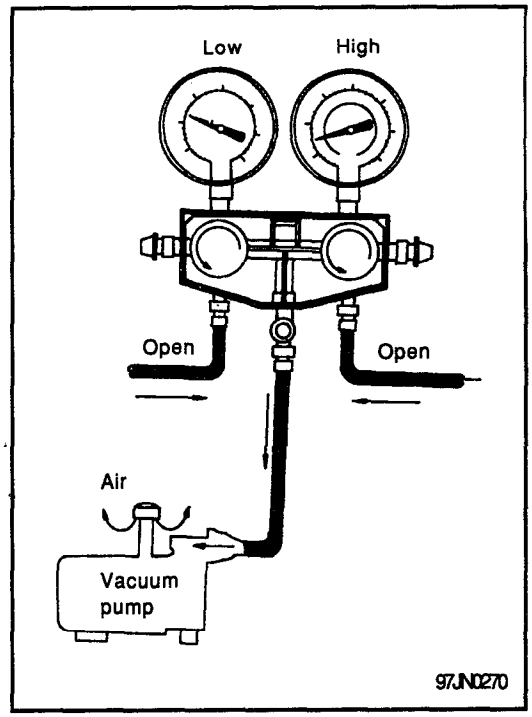
NOTE:

It is necessary to evacuate the air conditioning system any time the system has been opened. Evacuation is necessary to purge all of that air and moisture that may have entered the system.

After installation of a component, the system should be evacuated for approximately 15 minutes. A component in service that has been opened for repair should be evacuated for 30 minutes.

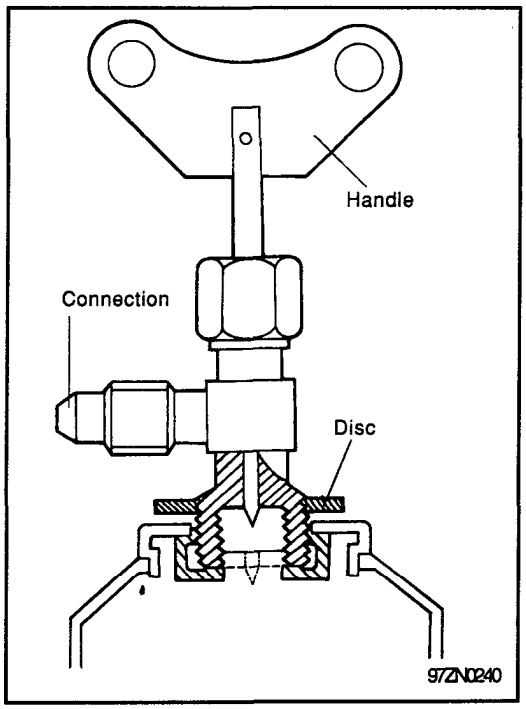
1. Engine should be off.
2. Connect a manifold gauge set to the service ports. Close both high and low pressure valves.
3. Make sure the refrigerant has been discharged from the system.
4. Connect the center hose of the gauge set to the vacuum pump inlet.
5. Start the vacuum pump and then open the high and low manifold pressure valves.
6. After about ten minutes, check that the low pressure gauge reads more than 94.39 kPa (0.96 kg/cm^2, 28" HG) vacuum. If negative pressure can not be obtained, there is a leak in the system. In this case, repair the leak as described in the following.
   1) Close both the manifold valves and stop the vacuum pump.
   2) Charge the system with a can of refrigerant [about 0.4 kg (0.9 lb)]. Refer to Charging Refrigerant.
   3) Check for refrigerant leakage with a leak detector.
   4) Repair any leakage found. Refer to Checking Refrigerant Leaks.
   5) Discharge the system again, and then evacuate the system.
7. Start the vacuum pump.
8. Open both manifold pressure valves to obtain 94.39 kPa (0.96 kg/cm^2, 28" HG) of vacuum.
9. After the low pressure manifold gauge indicates as close to 94.39 kPa (0.96 kg/cm^2, 28" HG) as possible, continue evacuating for 15 minutes.
10. After evacuating for 15 minutes, close both manifold pressure valves and stop the vacuum pump. Disconnect the hose from the vacuum pump. The system is now ready for charging.





HANDLING REFRIGERANT SERVICE TAP VALVE

1. Before connecting the valve to the refrigerant container, turn the handle fully counterclockwise.
2. Turn the adapter counterclockwise until it reaches its highest position.
3. Connect the center hose to the valve fitting. Turn the adapter fully clockwise by hand.
4. Turn the handle clockwise to make a hole in the sealed top.
5. Turn the handle fully counterclockwise to fill the center hose with air. Do not open the high and low-pressure hand valves.
6. Loosen the center hose nut connected to the center fitting of the manifold gauge.
7. Allow air to escape for a few seconds, and then tighten the nut.



CHARGING REFRIGERANT SYSTEM (VAPOR)

NOTE

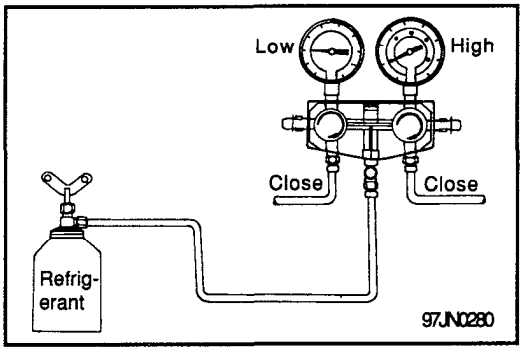
This step is to charge the system through the low pressure side with refrigerant in a vapor state. When the refrigernat container is placed rightside up, refrigerant will enter the system as a vapor.

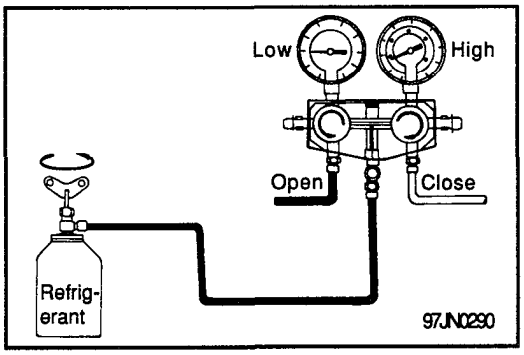
1. Install the refrigerant can tap valve as described in Handling the Refrigerant Service Tap Valve section.
2. Open the low pressure valve. Adjust the valve so that the low pressure gauge does not read over 412 kPa (4.2 kg/cm^2, 60 psi)
3. Put the refrigerant in a pan of warm water (maximum temperature 40°C or (104°F) to keep vapor pressure in the container slightly higher than vapor pressure in the system.
4. Run the engine at fast idle, and operate the air conditioner.

   NOTE:

   Be sure to keep the container upright to prevent liquid refrigerant from being charged into the system through the suction side, resulting in possible damage to the compressor.
5. Charge the system to the specified amount. Then, close the low pressure valve.

   Specified amount : 680 g (1.5 lbs)

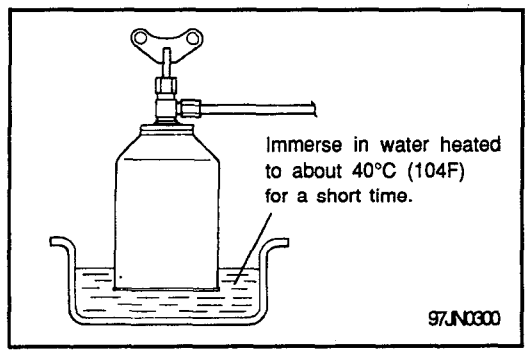




When refrigerant charging speed is slow, immerse the refrigerant can in water, heated to a temperature of about 40°C (104°F).

WARNING

- Under no circumstances should the refrigerant can be warmed in water heated to a temperature of over 52°C (126°F).
- A blow torch or stove must never be used to warm up the can.



CHARGING REFRIGERANT SYSTEM (LIQUID)

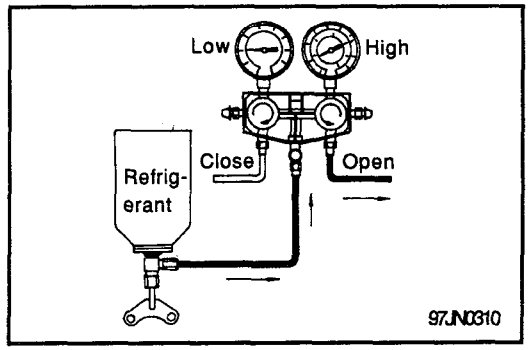
NOTE

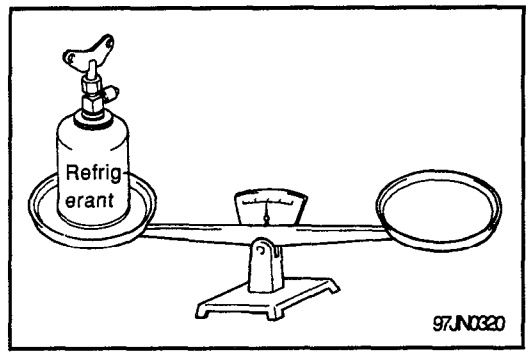
This step is to charge an empty system through the high pressure side with refrigerant in a liquid state. When the refrigerant container is held upside down, refrigerant will enter the system as a liquid.

CAUTION:

Never run the engine when charging the system through the high pressure side.

Do not open the low pressure valve when the system is being charged with liquid refrigerant.





1. Cloes both the high and low pressure valves completely after the system is evacuated.
2. Install the refrigerant tap valve as described in “Handling Refrigerant Service Tap Valve” section.
3. Open the high pressure valve fully, and keep the container upside down.
4. Charge the system to the specified amount by weighing the refrigerant with a scale. Overcharging will cause discharge pressure (high side) to rise. Then, close the high pressure valve.

   Specified amount : 680 g (1.5 lbs)

   NOTE:

   If the low pressure gauge does not show a reading, the system is restricted and must be repaired.

5. After the specified amount of refrigerant has been charged into the system, close the manifold gauge valve.
6. Check that there are no leaks in the system with a leak detector. Refer to Checking Refrigerant Leaks.

   NOTE:

   Conducting a preformance test prior to removing the manifold gauge is a good service operation.

COMPRESSOR OIL LEVEL CHECK

The oil used to lubricate the compressor circulates in the system while the compressor is operating. Whenever replacing any component of the system or when a large amount of gas leakage occurs, add oil to maintain the original total amount of oil.

Total amount of oil in the system: 140-160 cc (859.7 in.)

Adding Oil for Replacement Component Parts

When replacing the system's component parts, be sure to add the following amount of oil to the parts being replaced.

Component parts to be replaced	Amount of oil cc (in.)
Evaporator core	40 (2.4)
Condenser	25 (1.5)
Receiver drier	40 (2.4)
Compressor	30 (1.8)
Tube, hose	15 (0.9)

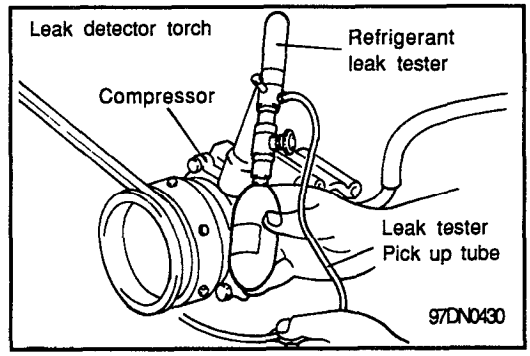
Electronic Leak Detector

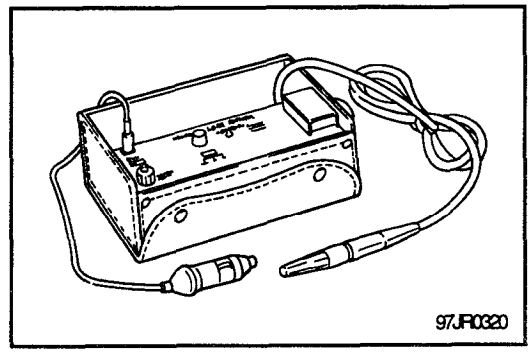
The leak detector is **a** delicate device that detects small amounts of halogen.

In order to use the device properly, read the manuals supplied by the manufacturer to perform the specified maintenance and inspections.

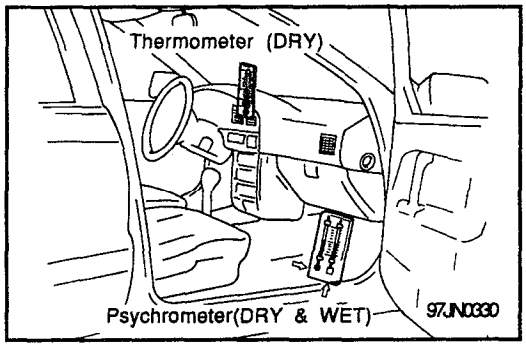
If a gas leak is detected, proceed as follows:

1. Check the torque on the connection fitting and, if necessary, tighten to the proper torque, Check for leakage with the leak detector.
2. If leakage continues even after the fitting has been retightened, discharge the refrigerant from the system, disconnect the fitting, and check the seat for damage. Replace fitting, even if the damage is slight.
3. Check compressor oil and add oil if required.
4. Charge the system and recheck for leaks. If no leaks are found, evacuate and charge the system.



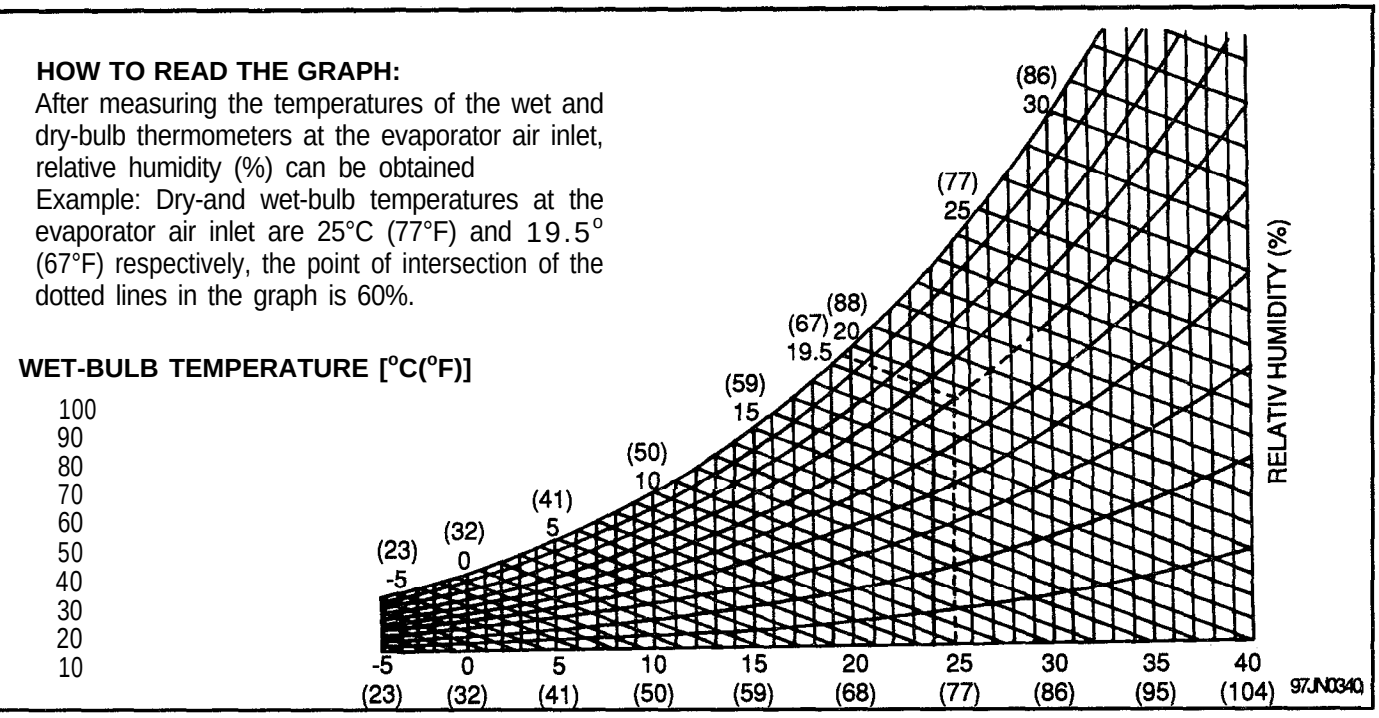


PERFORMANCE TEST

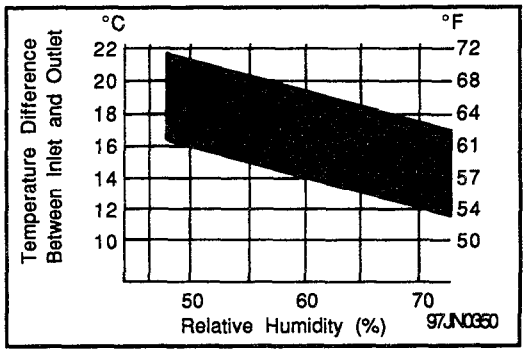


1. Install the manifold gauge set.
2. Run the engine at 2,000 rpm and set the controls for maximum cooling and high blower speed.
3. Keep all windows and doors open.
4. Place a dry-bulb thermometer in the cool air outlet.
5. Place a psychrometer close to the inlet of the cooling unit.
6. Check that the reading on the high pressure gauge is 1,373-1,575 kPa (14-16 kg/cm^2, 199-228 psi).
   If the reading is too high, pour water on the condenser.
   If the reading to too low, cover the front of the condenser.
7. Check that the reading on the dry-bulb thermometer at the air inlet at 25-35°C (77-95°F).
8. Calculate the relative humidity from the psychrometric graph by comparing the wet-and dry-bulb reading of the psychrometer at the air inlet.

HOW TO READ THE GRAPH:
After measuring the temperatures of the wet and dry-bulb thermometers at the evaporator air inlet, relative humidity (%) can be obtained
Example: Dry-and wet-bulb temperatures at the evaporator air inlet are 25°C (77°F) and 19.5° (67°F) respectively, the point of intersection of the dotted lines in the graph is 60%.

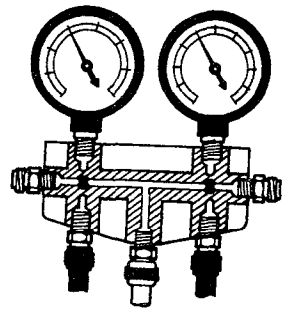
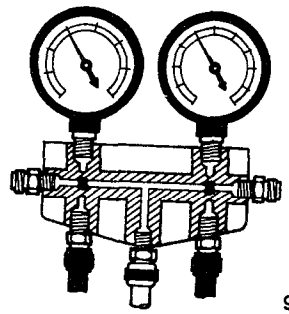
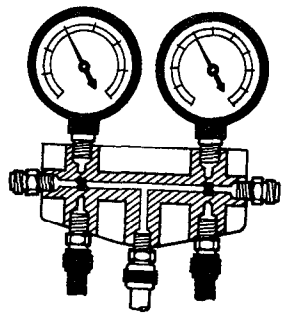


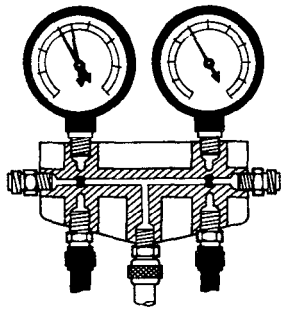
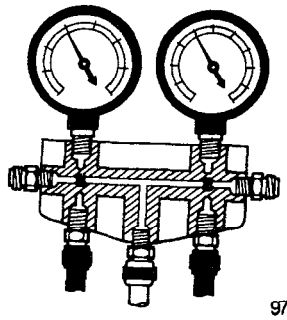
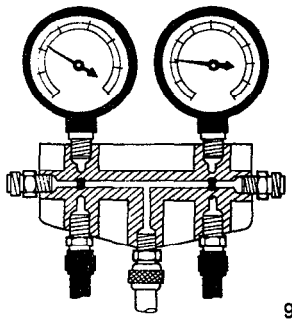
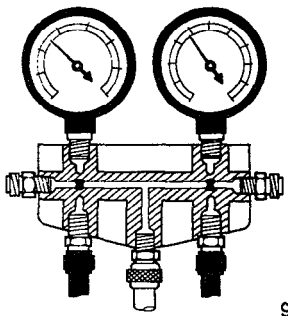
9. Measure the dry-bulb temperature at the cool air outlet, and calculate the difference between the inlet dry-bulb and outlet dry-bulb temperatures.
10. Check that the intersection of the relative humidity and temperature difference is between the two hatched lines. If the intersection is within the two lines, cooling performance is satisfactory.

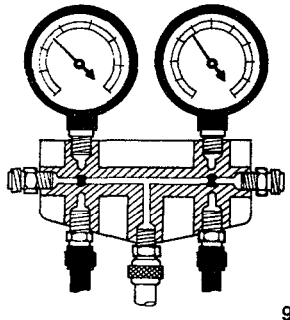
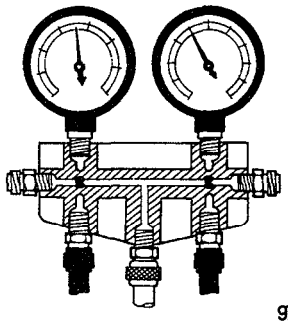
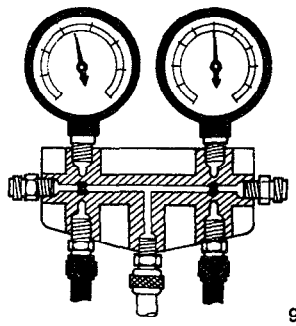
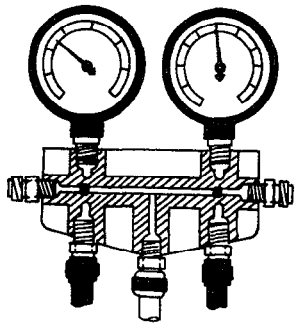


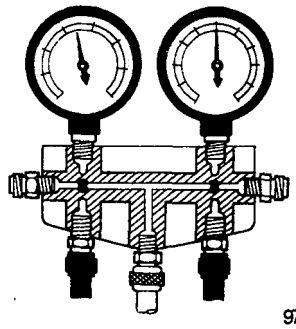
PERFORMANCE TEST DIAGNOSIS

The test gauge indicators shown on the following chapter are to be used as typical examples of common problems which you may need to diagnose.

GAUGE READINGS	OTHER SYMPTOMS	DIAGNOSIS	CORRECTION
1 Low side NORMAL High side NORMAL  97DN0440	o Sight glass: clear or few bubbles. o Discharge air: slightly cool. o Thermostatic switch: Low side gauge dosen't fluctuate with switch "ON" and "OFF" cycle.	Some air and moisture in system.	1. Leak test system. 2. Discharge refrigerant from system. 3. Repair leaks as located. 4. Replace receiver-drier The drier is probably saturated with moisture. 5. Evacuated the system for at least 30 minutes. 6. Charge system with refrigerant. 7. Operate system and check performance.
2 Low side NORMAL High side NORMAL  97DN0440	o Sight glass: Tiny bubbles. o Discharge air: Becomes warm as low side cycles into vacuum. o Discharge air: Becomes warm all the time during hot part of day.	Excessive moisture in system	1. Discharge refrigerant 2. Replace receiver-drier 3. Evacuate system with a vacuum pump. 4. Recharge system to proper capacity. 5. Operate system and check performance.
3 Low side NORMAL High side NORMAL  97DN0440	o Compressor: Cycles on and off too fast. o Low side gauge: Not enough range shown on low side gauge.	Defective thermostatic switch	1. Stop engine and turn air conditioner "OFF" 2. Replace thermostatic switch when installing new thermostic switch, make sure that capil lary tube is installed in the same position and to the same depth in evaporator core as old switch tube. 3. Operate system and check performance.

GAUGE READINGS	OTHER SYMPTOMS	DIAGNOSIS	CORRECTION
4 Low side NORMAL to HIGH High side NORMAL  97J030	o Compressor: low side pressure builds too high before compressor turns on (cycle "ON" point too high)	Faulty thermostatic switch	1. Stop engine and turn air condi tioner "OFF" 2. Repair or replace thermostatic switch (make sure that all wiring is positioned so that no short circuiting can occurred. 3. Operate system and check performance.
5 Low side LOW High side LOW  97DN0440	o Discharge air: Slightly cool. o Sight glass: Some bubbles.	o System slightly low on refrigerant	1. Check leaks. 2. Discharge refrigerant. 3. Repair leaks. 4. Check compressor oil level. 5. Evacuate system using a vacuum pump. 6. Charge system with refrigerant. 7. Operate system and check performance.
6 Low side LOW High side LOW  97DN0450	o Discharge air: Warm o Sight glass: Clear	o System very low on refriger-ant o Possible leak in system.	1. Check leaks. 2. Leak test compressor seal area very carefully. 3. Discharge refrigerant. 4. Check compressor oil level. 5. Evaporate system using a vacuum pump. 6. Charge system with refrigerant. 7. Operate system and check performance.
7 Low sid LOW High side LOW  97DN0470	o Discharge air: Slightly cool. o Expansion valve: Sweating or frost build up.	o Expansion valve stuck closed. o Screen plugged. o Sensing bulb mal-function.	1. Discharge system. 2. Disconnect inlet line at expansion valve and remove and inspect screen. 3. Clean and replace screen and reconnect inlet line. 4. Evacuate system using a vacuumpump. 5. Charge system with refrigerant.

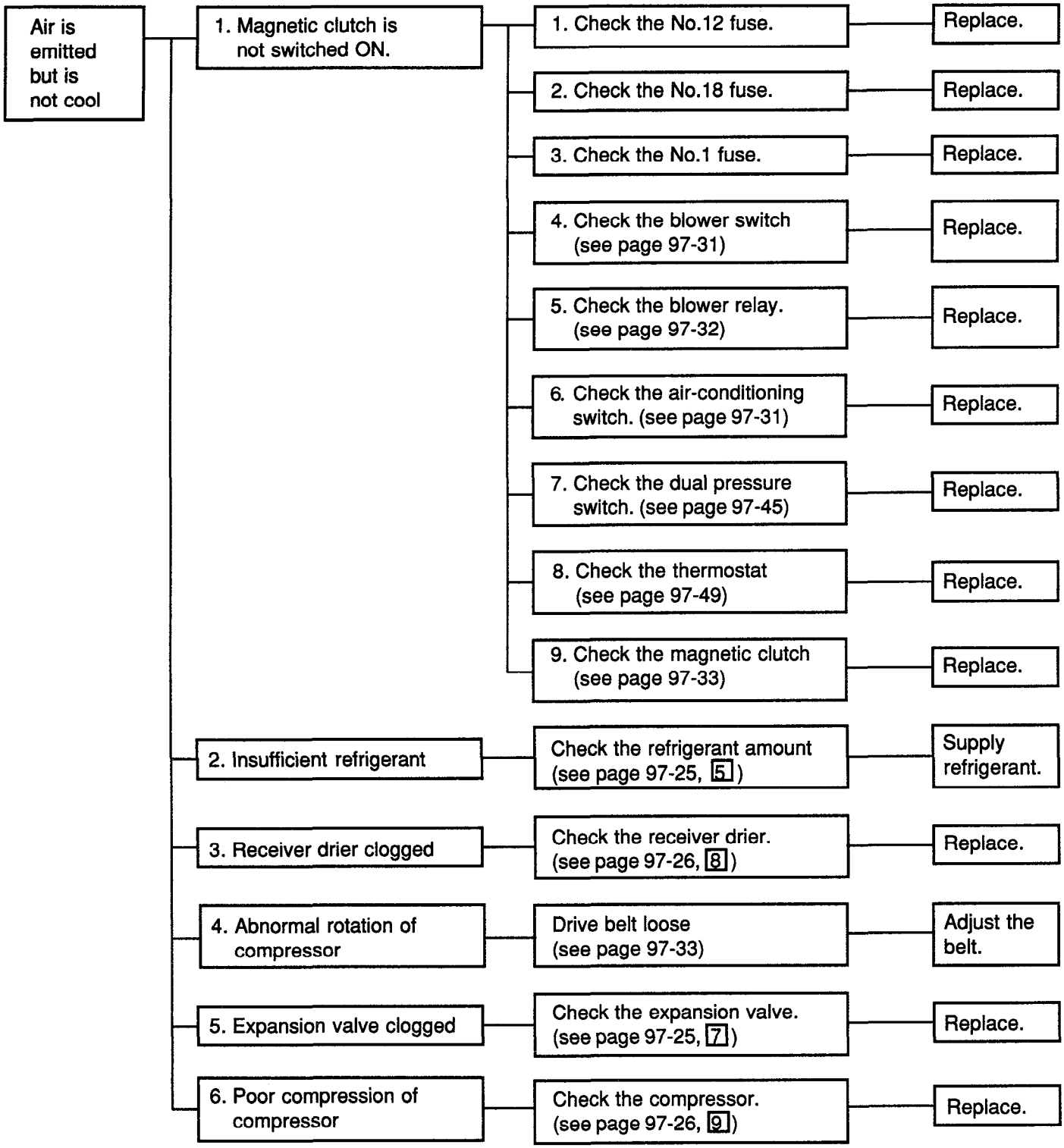
GAUGE READINGS	OTHER SYMPTOMS	DIAGNOSIS	CORRECTION
8 Low side LOW High side LOW  97DN0470	o Discharge air: slightly cool. o High side pipe: Cool and also shows sweating or frost.	o Restriction in high side of system or receiver drier Clogged	1. Discharge system. 2. Remove and replace receiver-drier, liquid pipes or other defective components. 3. Evacuate system using a vacuum pump. 4. Charge system with refrigerant. 5. Operate system and check performance.
9 Low side HIGH High side LOW  97DN0480	o Compressor: Noisy o Insufficient cooling	o Compressor malfunction	1. Isolate compressor. 2. Remove compressor cylinder head and inspect compressor. 3. Check compressor oil level. 4. Replace receiver-drier. 5. Operate system and check performance.
10 Low side HIGH High side HIGH  97DN0490	o Discharge air: Warm. o Sight glass: Bubbles. o High side pipe: Very hot	o Malfunctioning condenser or Overcharge.	1. Check for loose or worn fan belt. 2. Inspect condenser for clogged air passage. 3. Inspect condenser mounting for proper radiator clearance. 4. Check for refrigerant overcharge. 5. Operate system and check performance.
11 Low side HIGH High side HIGH  97J036	o Sight glass: Occasional bubbles o Discharge air: Slightly cool.	o Large amount of air and moisture	1. Discharge refrigerant from system. 2. Replace receiver-drier which may be saturated with moisture. 3. Evacuate system using vacuum pump. 4. Charge system with refrigerant. 5. Operate system and check performance.

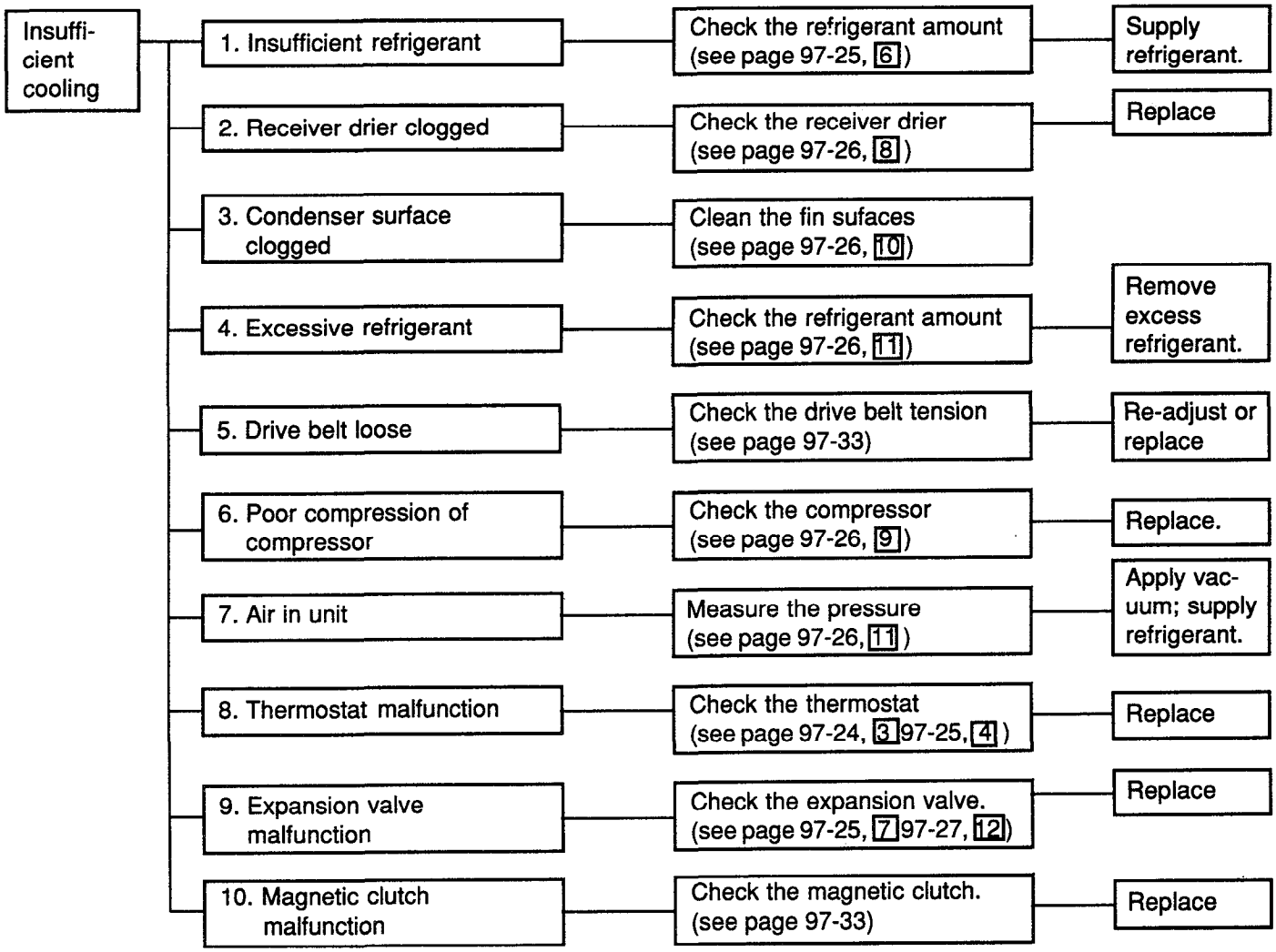
GAUGE READINGS	OTHER SYMPTOMS	DIAGNOSIS	CORRECTION
12 Low side HIGH High side HIGH  97DN0490	o Discharge air: Warm. o Evaporator: Sweating or frost.	o Expansion valve stuck open	1. Discharge system. 2. Replace expansion valve, making sure all contacts are clean and secure. 3. Evacuate system using vacuum pump, then recharge system with refrigerant. 4. Operate system and check performance.

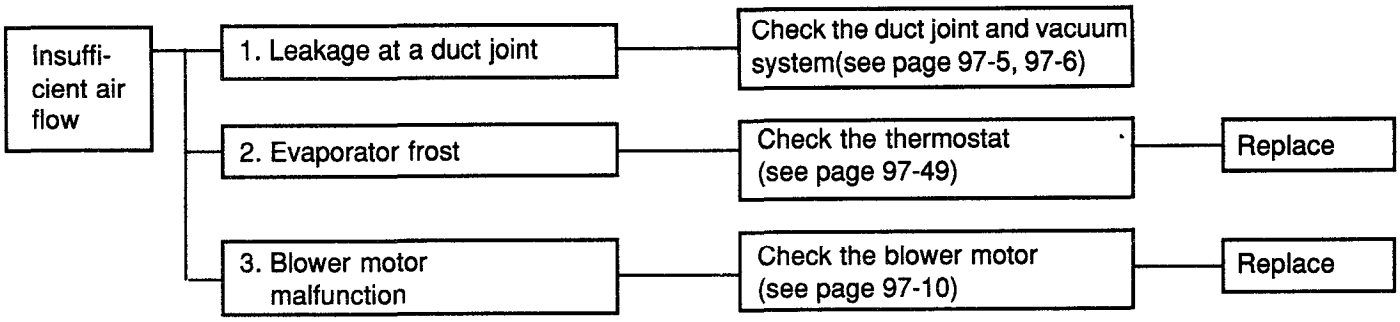
TROUBLESHOOTING-Malfunction Causes and Remedies.

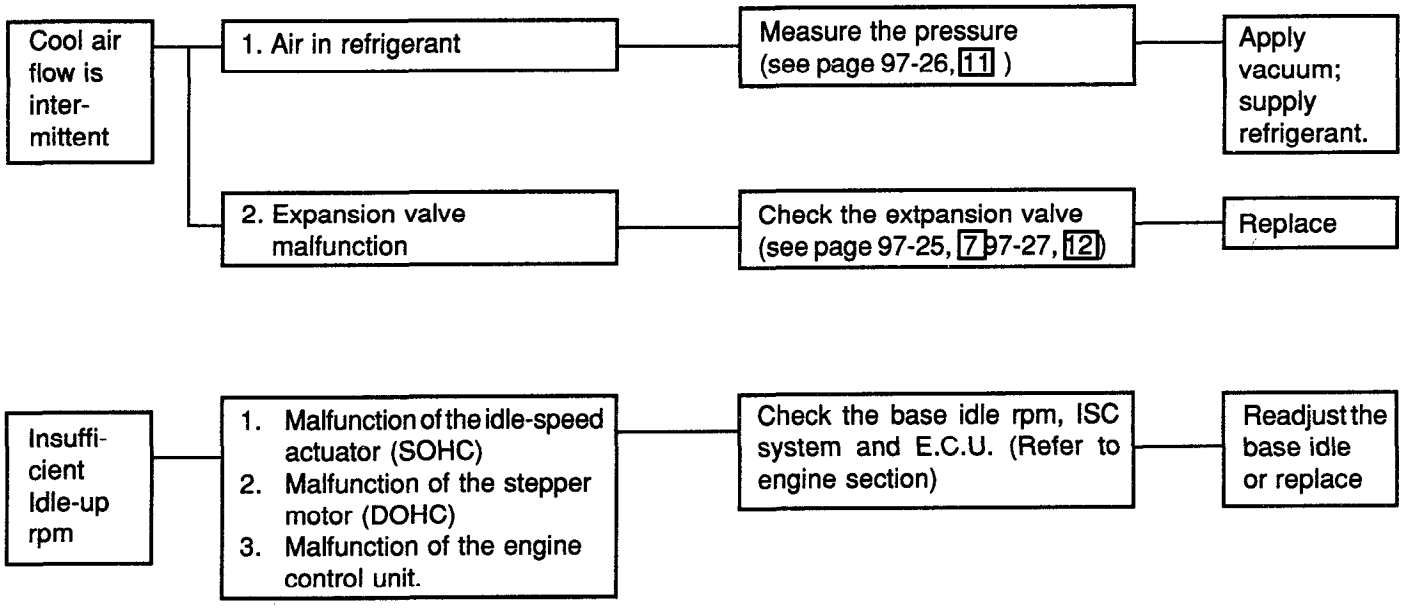
You will find the cause of the malfunction easily by using the following diagnostic chart. In this chart, the numbers indicate the order of priority of the cause of malfunction.

MALFUNCTION CAUSES AND REMEDIES (Numbers indicate checking/inspection order.)




Insuffi-cient cooling
1. Insufficient refrigerant
Check the refrigerant amount (see page 97-25, 6)
Supply refrigerant.
2. Receiver drier clogged
Check the receiver drier (see page 97-26, 8)
Replace
3. Condenser surface clogged
Clean the fin sufaces (see page 97-26, 10)
4. Excessive refrigerant
Check the refrigerant amount (see page 97-26, 11)
Remove excess refrigerant.
5. Drive belt loose
Check the drive belt tension (see page 97-33)
Re-adjust or replace
6. Poor compression of compressor
Check the compressor (see page 97-26, 9)
Replace.
7. Air in unit
Measure the pressure (see page 97-26, 11)
Apply vac-uum; supply refrigerant.
8. Thermostat malfunction
Check the thermostat (see page 97-24, 3 97-25, 4)
Replace
9. Expansion valve malfunction
Check the expansion valve. (see page 97-25, 7 97-27, 12)
Replace
10. Magnetic clutch malfunction
Check the magnetic clutch. (see page 97-33)
Replace


Insuffi-cient air flow
1. Leakage at a duct joint
Check the duct joint and vacuum system(see page 97-5, 97-6)
2. Evaporator frost
Check the thermostat (see page 97-49)
Replace
3. Blower motor malfunction
Check the blower motor (see page 97-10)
Replace


Cool air flow is inter-mittent
1. Air in refrigerant
Measure the pressure (see page 97-26, 11)
Apply vacuum; supply refrigerant.
2. Expansion valve malfunction
Check the extpansion valve (see page 97-25, 7 97-27, 12)
Replace
Insuffi-cient Idle-up rpm
1. Malfunction of the idle-speed actuator (SOHC)
2. Malfunction of the stepper motor (DOHC)
3. Malfunction of the engine control unit.
Check the base idle rpm, ISC system and E.C.U. (Refer to engine section)
Readjust the base idle or replace

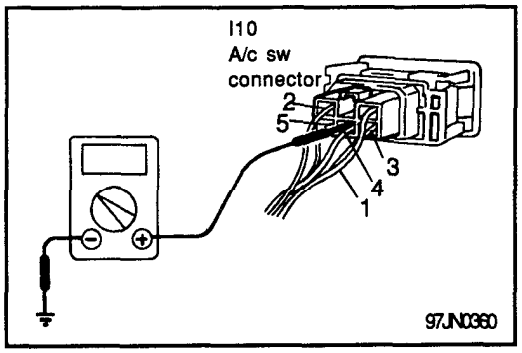
AIR CONDITIONING SWITCH CHECK

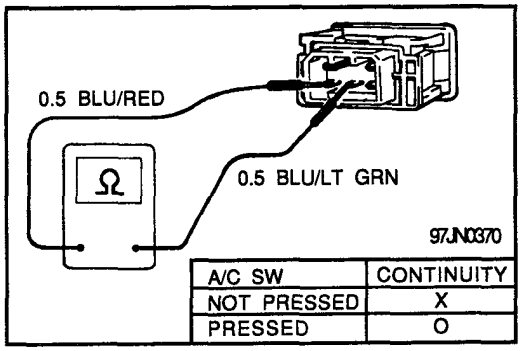
1. Remove the air conditioning switch with connector still connected.
2. Measure voltage between terminal 4 of A/C switch (I10) connector and body ground when blower switch is on and off.

IG SW	A/C sw	Blower sw	Voltage
ON (Do not start)	OFF	OFF	O V
		ON	Battery Voltage

If not ok, check fuse No. 18 and blower circuit.
If ok, perform next check 3.

3. Disconnect the I10 connector from the air conditioning switch.
4. Check continuity between terminal 4 and 5 of air conditioning switch.
If not ok, replace the air conditioning switch.



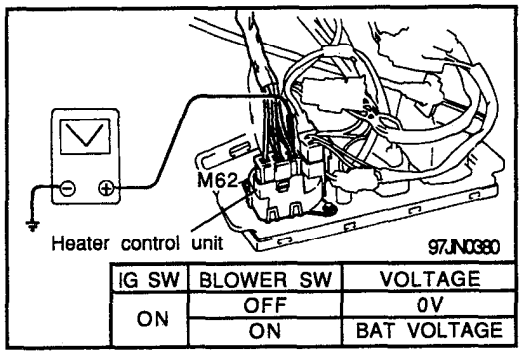


A/C SW	CONTINUITY
NOT PRESSED	X
PRESSED	O

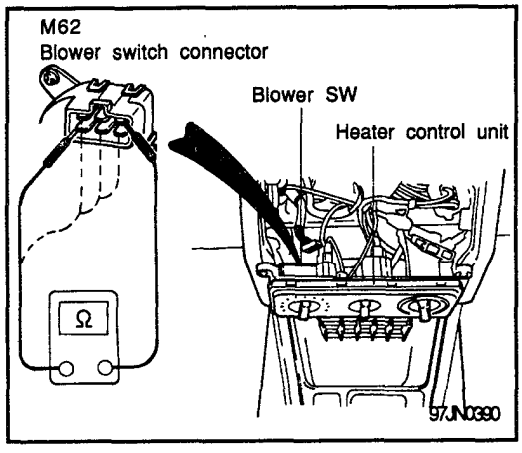
BLOWER SWITCH CHECK

1. Remove the heater control assembly with connector still connected.
2. Connect jumperwire between M62; 2 terminal and body ground.
3. Measure voltage between terminal 6 of blower switch (M62) connector and body ground when blower switch is and off.
If not ok, check fuse No. 12 and blower relay.
If ok, perform next check 3.
4. Disconnect the blower switch (M62) connector from the heater control unit assembly.
5. Check continuity between blower switch terminals.

Terminal \ SW position	OFF	1	2	3	4
1		O	O	O	O
2		O	O	O	O
3				O	
4		O			
5			O		
6					O



IG SW	BLOWER SW	VOLTAGE
ON	OFF	0V
	ON	BAT VOLTAGE



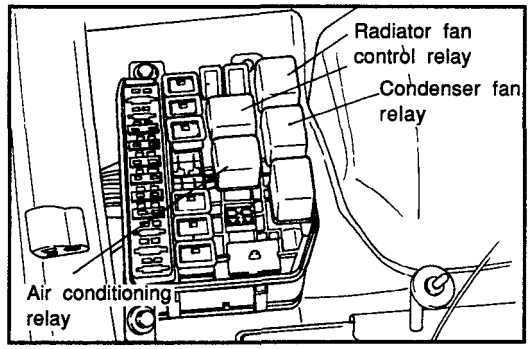
5. If not ok, replace the blower switch.

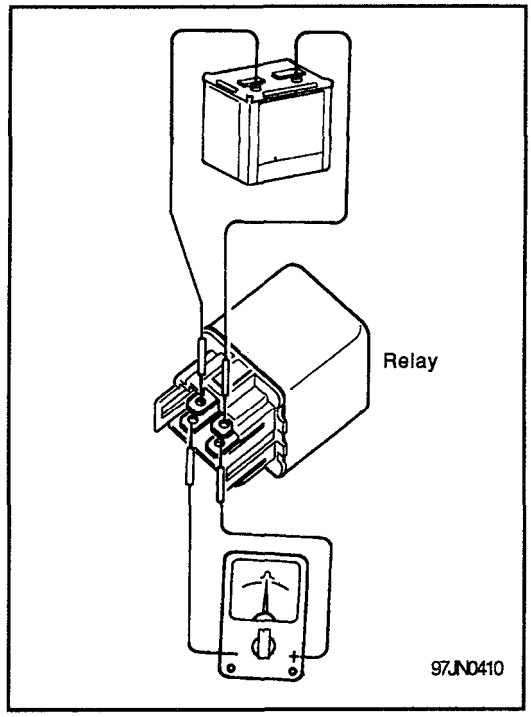
POWER RELAY CHECK

AIR CONDITIONING RELAY, RADIATOR FAN CONTROL RELAY AND CONDENSER FAN RELAY.

1. Remove the battery ground cable.
2. Remove the cover of relay box located in engine compartment.
3. Remove the relays from relay box.
4. Check for continuity between the terminals.

When power is supplied	Between terminals 2 - 4	Continuity
	Between terminals 1 - 3	
When power is not supplied	Between terminals 2 - 4	No Continuity
	Between terminals 1 - 3	Continuity

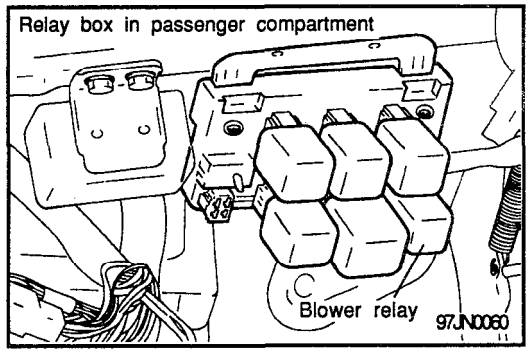




BLOWER FAN RELAY

1. Remove the battery ground cable.
2. Remove the of relay box located behind the crash pad.
3. Remove the relay and check for continuity between the terminals.

When power is supplied	Between terminals 2 - 4	Continuity
	Between terminals 1 - 3	
When power is not supplied	Between terminals 2 - 4	No Continuity
	Between terminals 1 - 3	Continuity



ON-VEHICLE INSPECTION

Magnetic clutch

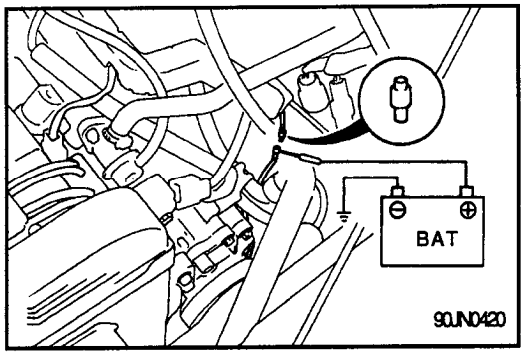
1. Check compressor drive belt tension.
2. Start engine.
3. Inspect clutch bearing for noise.
   1) Check for abnormal noise from the compressor when the A/con switch is off.
   3) If abnormal noise is being emitted, replace the compressor pulley bearing or magnetic clutch.

4. Stop engine.
5. Make the following visual checks.
   1) Leakage of grease from the clutch bearing.
   2) Signs of oil on the pressure plate or rotor.

   Repair or replace, as necessary.

6. Inspect operation
   1) Disconnect the connector from the compressor magnetic clutch.
   2) Connect the positive ⊕ lead from the battery to the terminal on the magnetic clutch connector and the negative - lead to the body ground.
   3) Check that the magnetic clutch is energized.

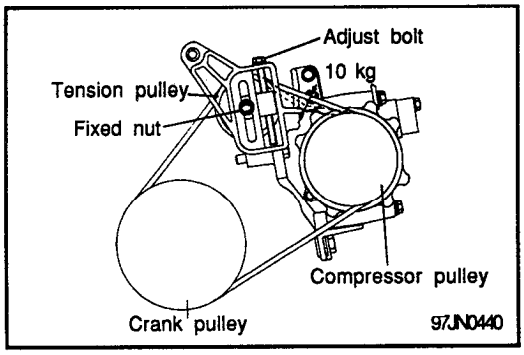
   If operation is not as specified, replace the magnetic clutch.



COMPRESSOR DRIVE BELT

Satisfactory performance of the air conditioning system is dependent upon drive belt condition and tension. If the proper tensions are not maintained, belt slippage will greatly reduce air conditioning performance and drive belt life. To avoid such adverse effects, the following service procedure should be followed.

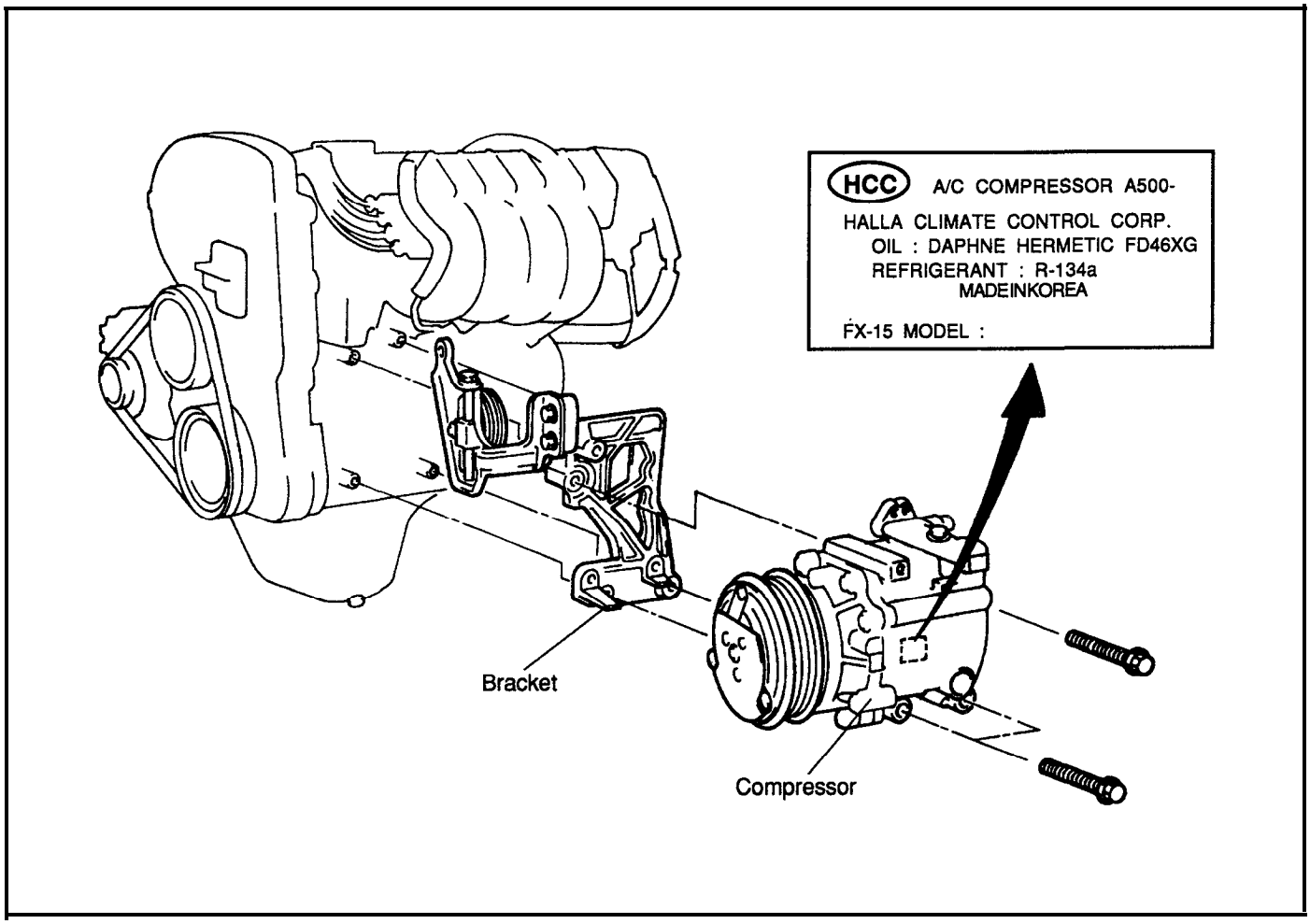
1) Any belt that has operated for a minimum of one half-hour is considered to be a "used" belt. Adjust air conditioning drive belt at the time of new-car preparation.
2) Check drive belt tension at regular service intervals and adjust as needed.



NEW BELT	5-5.5 mm (0.20-0.21 in.)
USED BELT	6-7 mm (0.23-0.28 in.)
AFTER DRIVING	8 mm (0.31 in.)

REMOVAL AND INSTALLATION

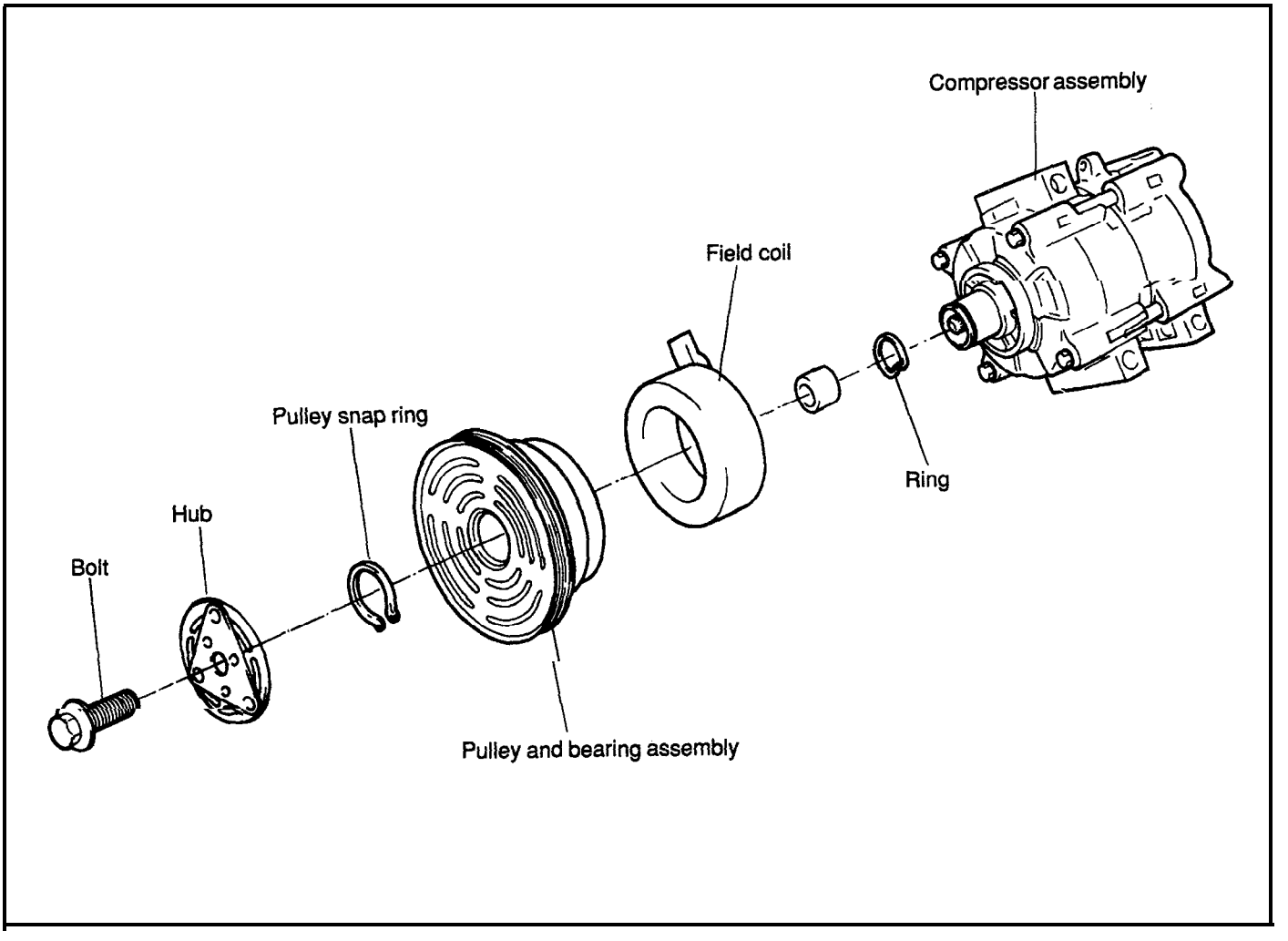
LOCATION



1. Loosen the tension pulley and then remove the V belt.
2. Discharge the refrigerant. (Refer to page to 97-18)
3. Disconnect the magnetic clutch.

4. Remove the discharge hose and suction hose.
5. Remove the compressor.
6. Installation is the reverse of removal.

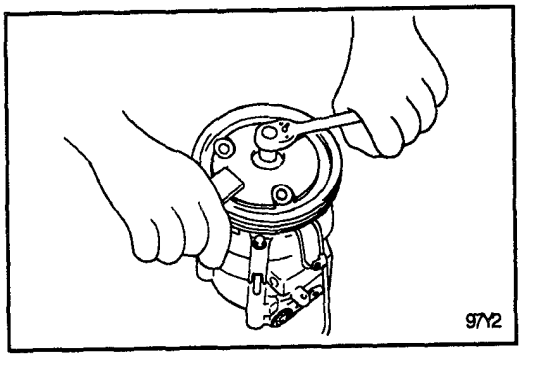
COMPONENTS



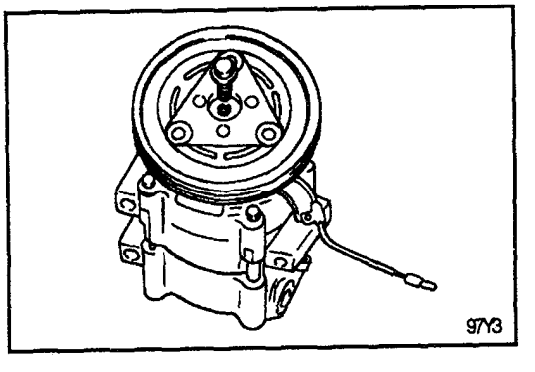
CLUTCH HUB AND PULLEY

Removal

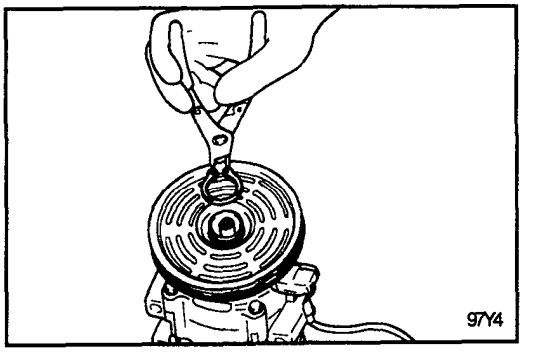
1. Remove the clutch hub retaining bolt with the aid of a spanner wrench.



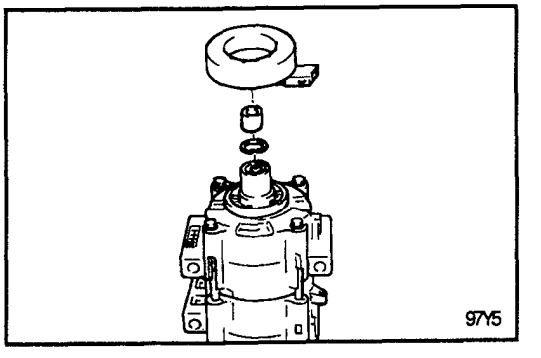
2. Pull the clutch hub and shims from the compressor shaft. If the hub cannot be pulled from the compressor shaft, screw an 8-mm bolt into the shaft hole of the clutch hub to force the hub from the shaft.



3. Remove the pulley retaining snap ring.

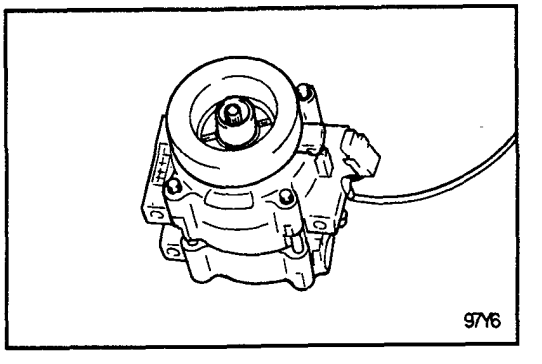


4. Pull the pulley and bearing assembly from the compressor.

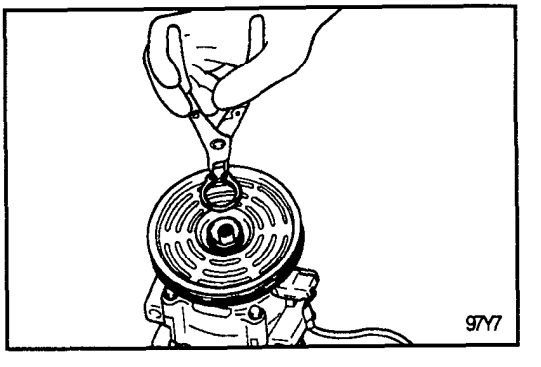


Installation

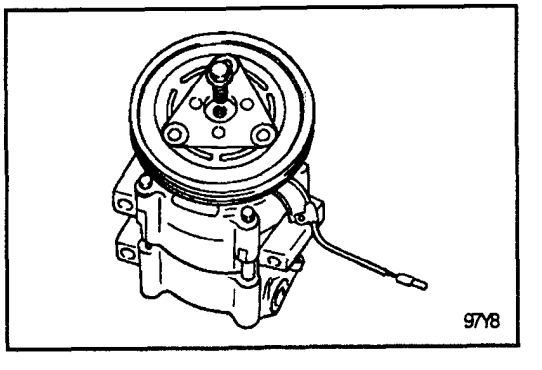
1. Clean the pulley bearing surface of the compressor head to remove any dirt or corrosion
2. Install the pulley and bearing assembly on the compressor. The bearing is a slip fit on the compressor head and, if properly aligned, should slip on the compressor head.



3. Install the pulley retaining snap ring with the bevel side of the snap ring out.



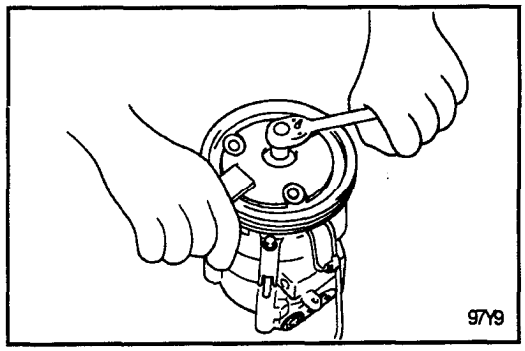
4. Place one nominal thickness spacer shim inside the hub spline opening and slide the hub on the end of the compressor shaft.



5. Thread a new hub retaining bolt into the end of the compressor shaft. Tighten the hub retaining bolt.

Tightening torque : 10-15 Nm (100-150 kn.cm, 7-11 lb.ft)

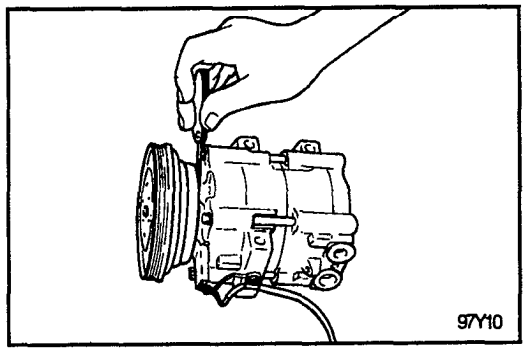
NOTE
Do not use air tools.



6. Check the clutch air gap between the clutch hub and the pulley mating surfaces with a feeler gauge. The air gap should be **as** follows:

Between 0.014 and 0.030 inches.

Check at three locations equally spaced around the pulley.



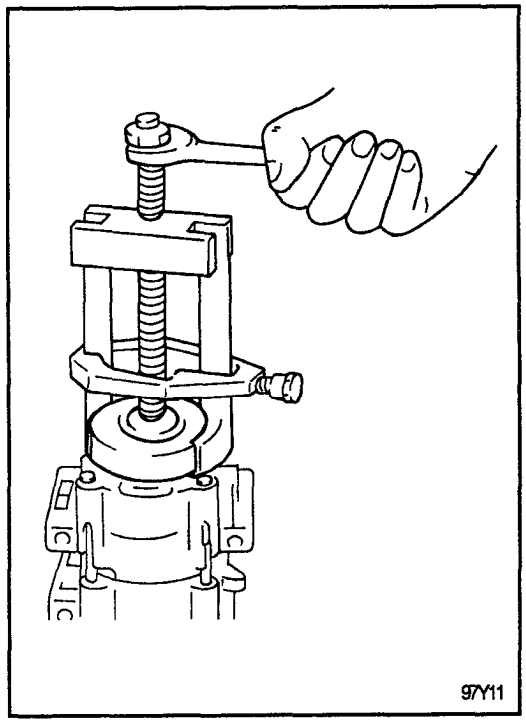
7. If the clutch air gap is not within the dimensions specified above, repeat steps 4 through 6 with the various thickness shims until the air gap is between the specified limits.

CLUTCH FIELD COIL

Removal

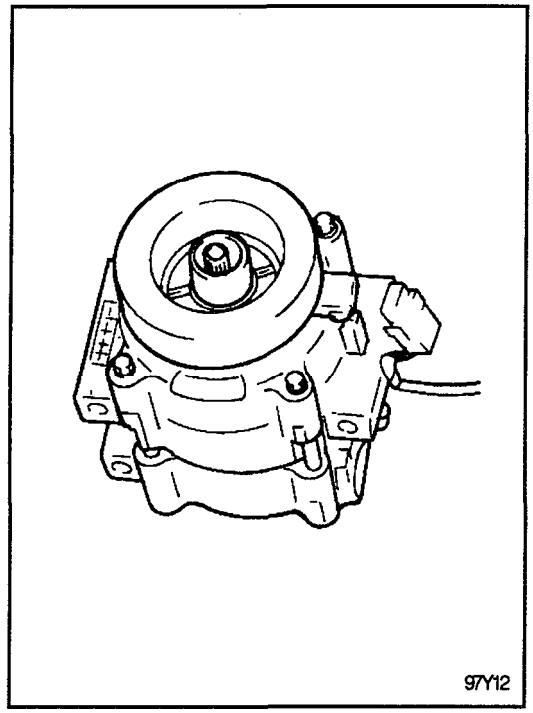
1. Remove the clutch hub and pulley following the procedure given.
2. Install shaft protector tool on the nose opening of the compressor.
3. Install the puller on the compressor as shown in the illustration. Place the tip of the puller forcing screw on the center dimple of the shaft protector and the jaws of the puller around the back side of the field coil.
4. Tighten the forcing screw with a wrench to pull the coil loose from the compressor front head.

NOTE
DO NOT USE AIR TOOLS.



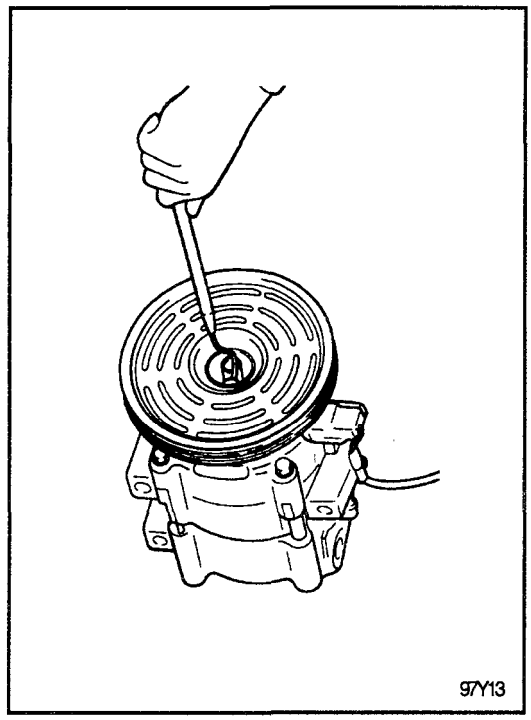
Installation

1. Clean the coil press diameter of the front head to remove any dirt or corrosion.
2. With the compressor in a vertical position (nose up), place the coil in position on the front head of the compressor. Assure that the clutch coil electrical connector is positioned correctly.
3. Place the coil pressing tool in position over the compressor nose and the inner radius of the field coil.
4. Position an eight (8) inch, two jaw puller to the compressor and pressing tool as shown in the illustration. The jaws of the puller should be firmly engaged with the rear side of the compressor front mounts and the forcing screw should be piloted on the center of the pressing tool.
5. Tighten the forcing screw with a wrench by hand untill the coil is pressed completely onto the compressor front head. Check to assure that the field coil bottoms against the front head at all points around the coil outer diameter.
6. Install the clutch pulley and hub on the compressor as outlined.



Shaft Seal

The refrigerant system must be discharged and the compressor must be removed from the vehicle prior to replacing the compressor shaft seal.

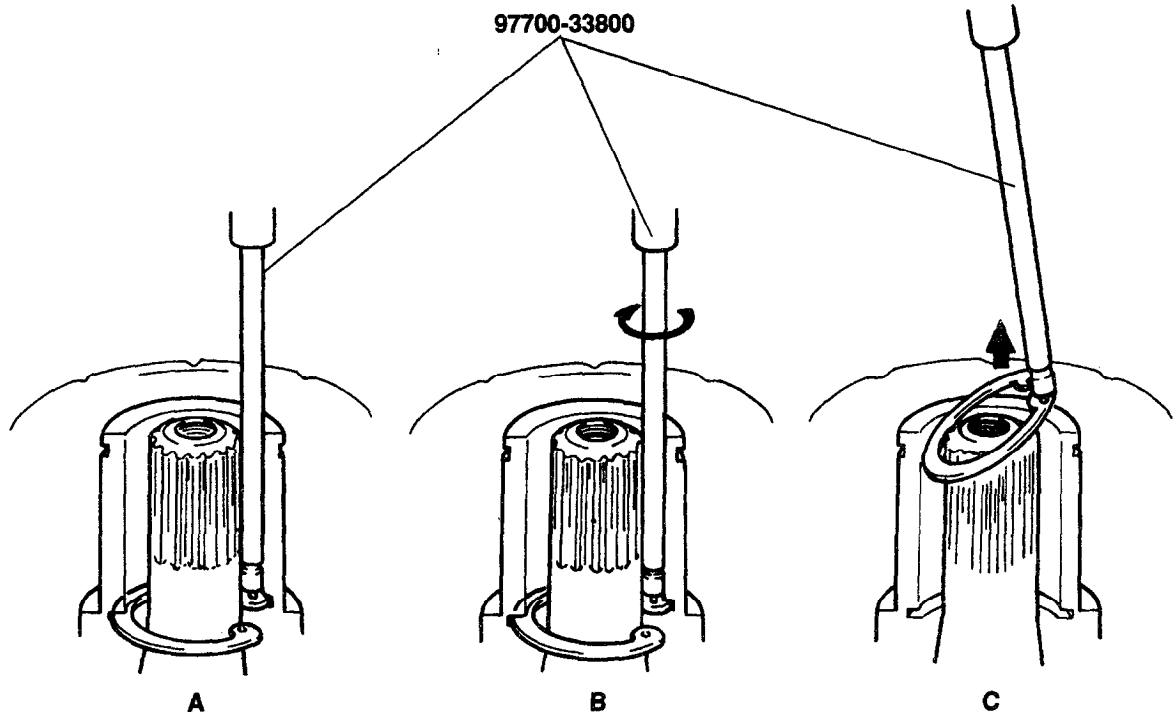


REMOVAL

1. Remove the clutch hub from the compressor.
2. Remove the shaft seal felt from the nose of the compressor with a pick type tool.
3. Blow any debris from inside the compressor nose with low pressure compressed air. Then, clean the inside and outside nose area of the compressor with a lint-free cloth to remove any oil and dirt.

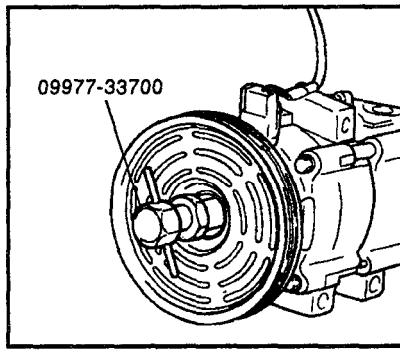
4. Remove the shaft seal retaining snap ring from inside the compressor nose with Snap Ring Remover as follows:

Removing FX15 Shaft Seal Retaining Snap Ring.



- o Insert tip of Snap Ring Remover into one of the snap ring eyes (View A).
- o Rotate the Snap Ring Remover to position the tool tip and snap ring eye closest to the compressor shaft (View B).
- o Pull the Snap Ring Remover tool up quickly while keeping the tool shaft against the side of the nose opening to remove the snap ring (View C).

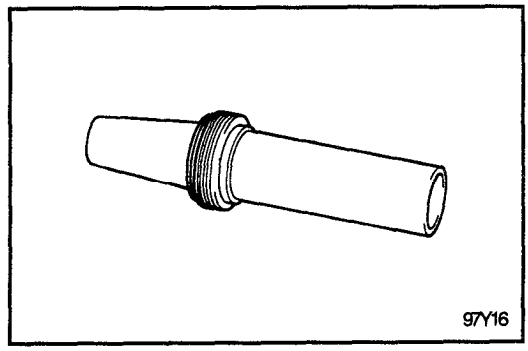
5. Position the Shaft Seal Remove Tool (09977-33700) over the compressor shaft and push the tool into the nose of the compressor and down against the shaft seal. Engage the end of the tool with the internal diameter of the shaft seal. While holding the hex part of the tool, turn the tool handle clockwise to expand the tool tip inside the seal inner radius. Then, pull the shaft seal from the compressor with the tool.



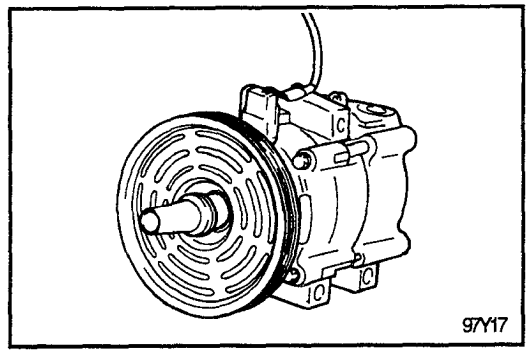
Installation

1. Obtain **a** new shaft seal kit. Carefully remove the contents from the package and locate the plastic shaft seal protector. Inspect the protector for any burrs or other damage. Do not use the protector if it is damaged. Obtain another shaft seal kit and use the protector from it.
3. Using a clean lint-free cloth, clean the shaft and the seal pocket inside the compressor nose.

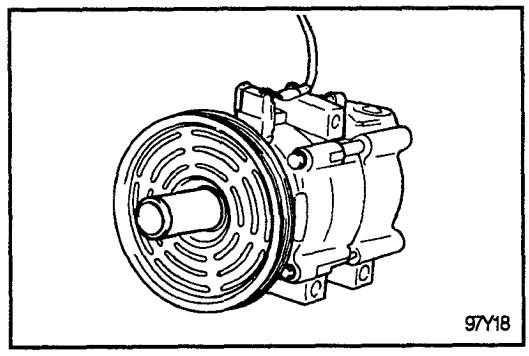
3. Dip the shaft seal protector and seal in clean refrigerant oil and position the seal on the protector with the lip of the seal pointing toward the large end of the protector.



4. Place the seal protector with shaft seal over the end of the compressor shaft.



5. Place the shaft seal installer tool over the end of the shaft seal protector. Then, slowly push the shaft seal down the protector until it is seated in the compressor.



6. Remove the seal installer and seat protector from the compressor.
7. Place a new seal retaining snap ring into the compressor nose opening and seat the snap ring into the groove with the remover tool.
8. Leak test the shaft seal installation after rotating the shaft about 10 revolutions with the clutch hub.
9. install a new felt into the compressor nose.
10. Install the clutch hub on the compressor as outlined in this section.

HEAD GASKETS AND/OR O-RING SEALS

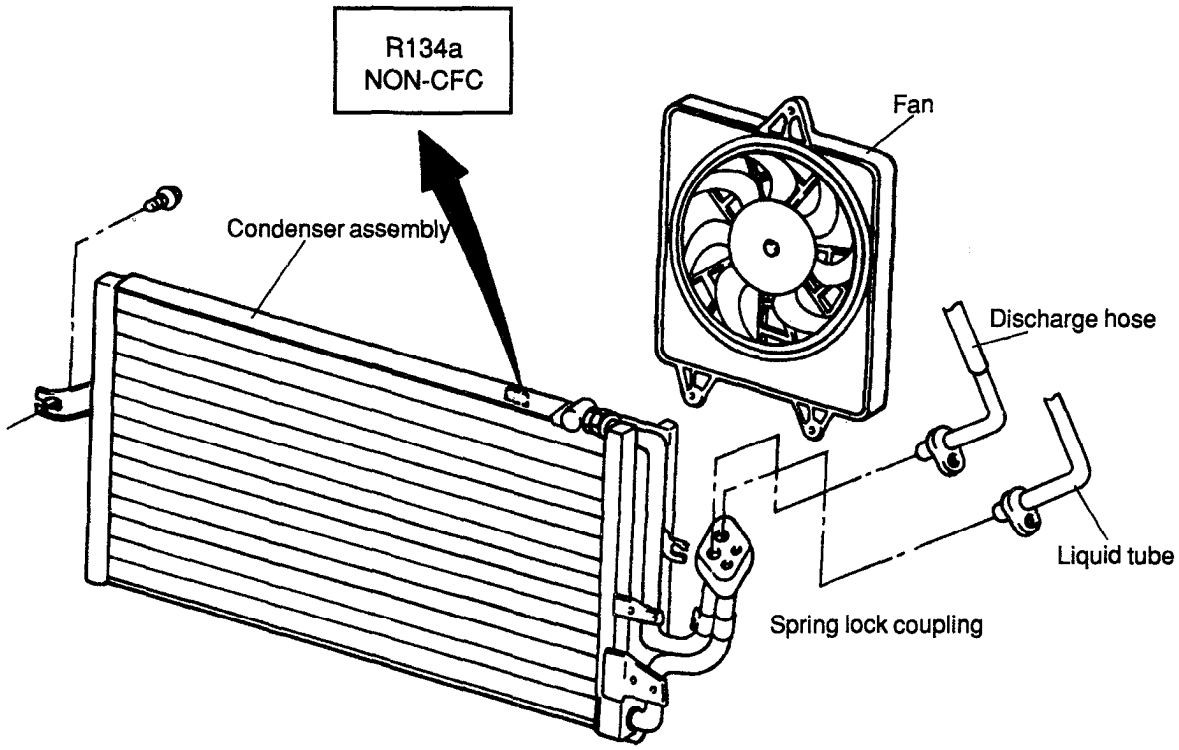
This service procedure was not approved for the FX-15 Compressor at the time this section was approved for printing.

HEAD REPLACEMENT

Head replacement on the FX-15 compressor is not an authorized service procedure at the time this section was approved for publication.

CONDENSER

COMPONENT



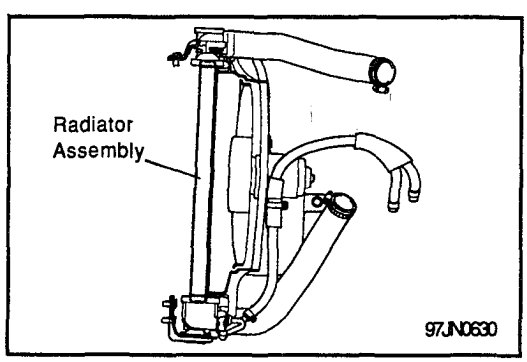
TORQUE : Nm (kg.cm, lb.ft)

ON-VEHICLE INSPECTION

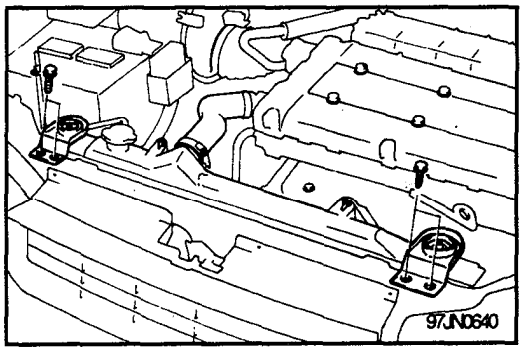
1. Check the condenser fins for blockages or damage. If the fins are clogged, clean them with compressed air. If the fins are bent, straighten them with a screwdriver or a pair of pliers.
2. Check the condenser fittings for leakage. Repair or replace if necessary.

REMOVAL AND INSTALLATION

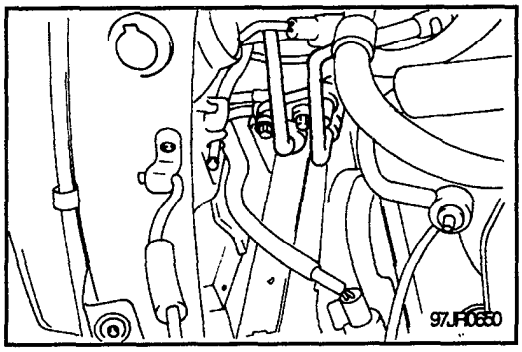
1. Discharge the refrigerant from the A/C system
2. Drain the radiator coolant.
3. Remove the radiator inlet and outlet hose.
4. For vehicles with an automatic transaxle, disconnect the oil cooler from the automatic transaxle.



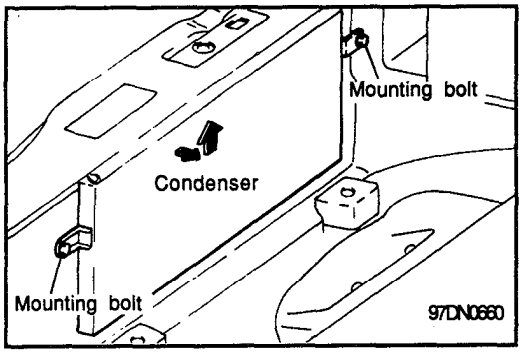
5. Remove the radiator assembly.
   a) Remove the radiator mounting bolt.
   b) Remove the radiator with the fan motor.



6. Disconnect the discharge hose and the liquid tube.



7. After removing the condenser mounting bolts (2EA), remove condenser assembly.



INSTALLATION

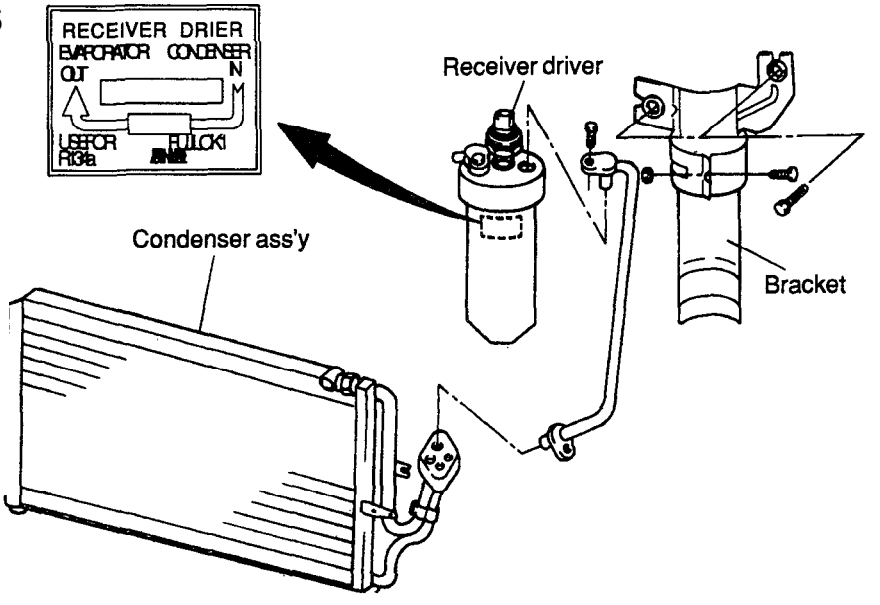
Installation is the reverse of removal.

NOTE

When a condenser is replaced, it will be necessary to replace the receiver-drier.

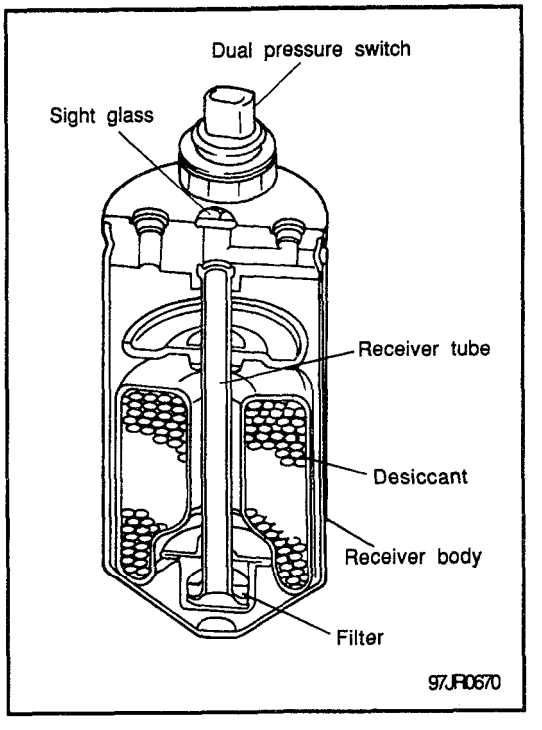
RECEIVER DRIER

COMPONENTS



ON-VEHICLE INSPECTION

1. Check the sight glass, fusible plug and the fittings for leakage, using a leak detector.
2. Check the receiver-drier for clogging.
   (a) Run the engine at fast idle with the air conditioner ON.
   (b) Check both the inlet and outlet temperatures. If difference in temperatures between the inlet and outlet is large, replace the receiver-drier.



REMOVAL

1. Discharge the air conditioner system.
2. Disconnect the two liquid line pipes from the receiver-drier.
3. Remove the receiver-drier from the bracket.

NOTE

Plug the all open fittings immediately to keep moisture out of the system.

INSTALLATION

1. Install the receiver-drier in the bracket.

NOTE

Do not remove the blind plugs until ready for connection.

2. Connect the two liquid line pipes to the receiver drier at specified torque.
3. If the receiver-drier is replaced with a new unit, add 40 cc's of compressor oil to the compressor.

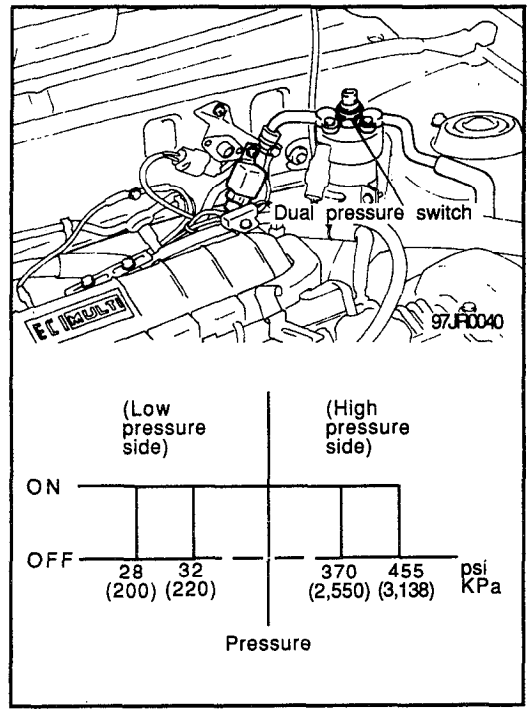
DUAL PRESSURE SWITCH

The dual pressure switch is a combination of the low pressure switch (for checking the quantity of refrigerant) and the high pressure switch (for prevention of overheating). It is installed in the receiver, and, when the pressure becomes approximately 200 KPa (28 psi) or lower, the compressor stops, thus preventing the compressor from being damaged by heat.
When the pressure reaches 3,138 KPa (455 psi) or higher, the compressor stops, thus preventing overheating. There is generally no necessity for inspection; if, however, an unusual condition, such as non-operation of the compressor is encountered, check by following the procedures below.

(1) Check for continuity of the dual pressure switch.

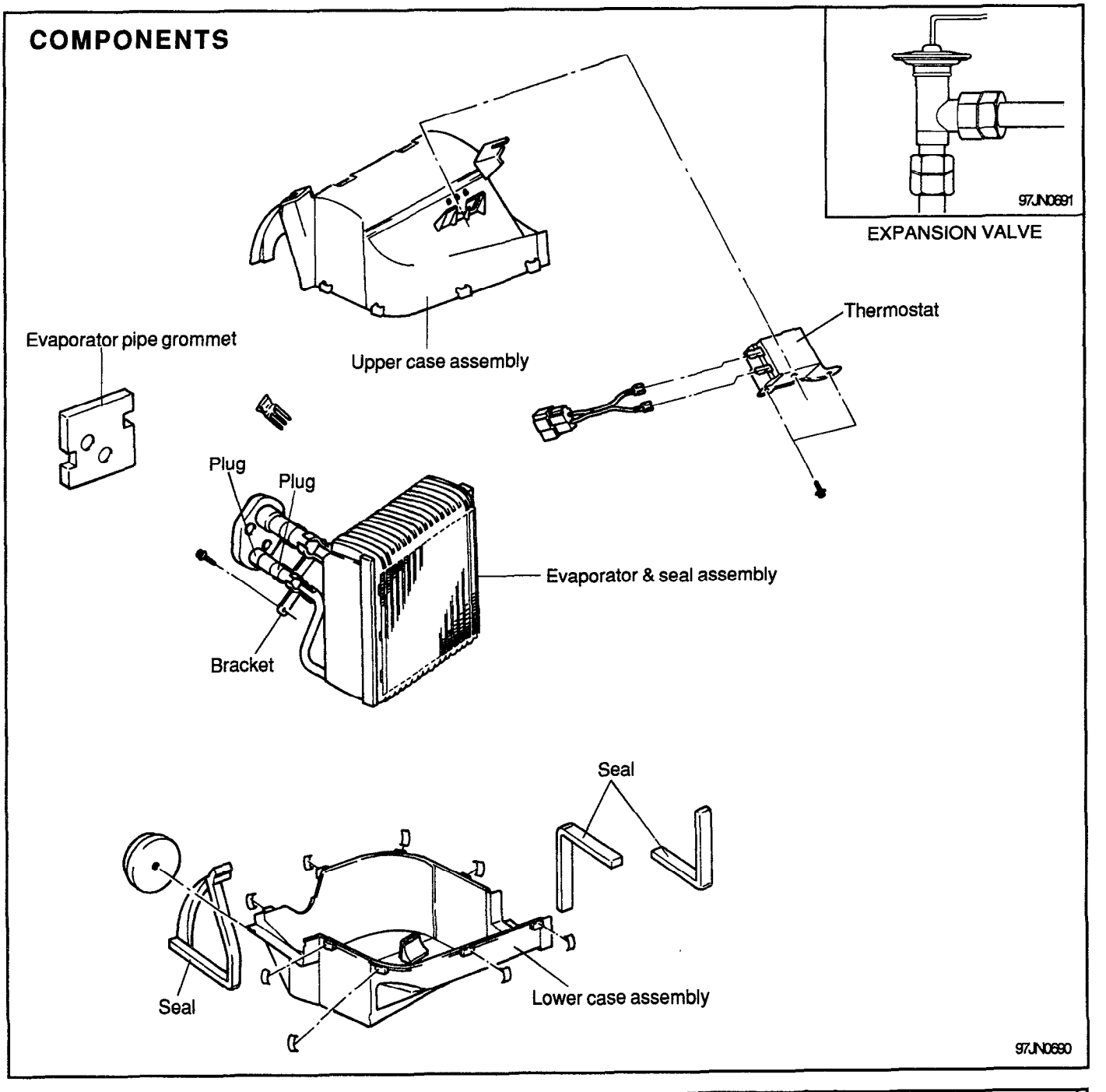
Usual condition	Continuity
Insufficient refrigerant	No continuity
Unusually high temperature	

(2) If there is an insufficient amount of refrigerant, check the refrigerant amount by looking through the sight glass of the receiver; supply refrigerant is necessary.
(3) Set the gauge manifold in pace and check whether or not the pressure at the high pressure side has become the dual pressure switch activation pressure.
(4) Replace the switch if, under ordinary conditions, there is no continuity.



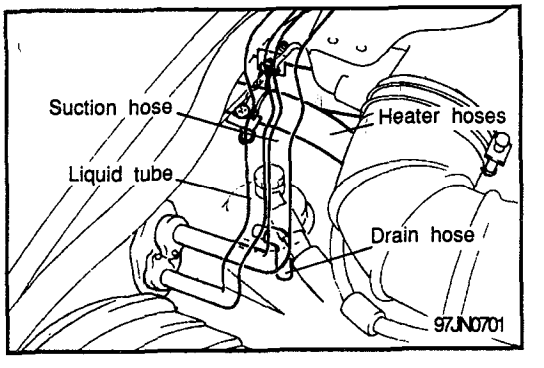
EVAPORATOR

COMPONENTS

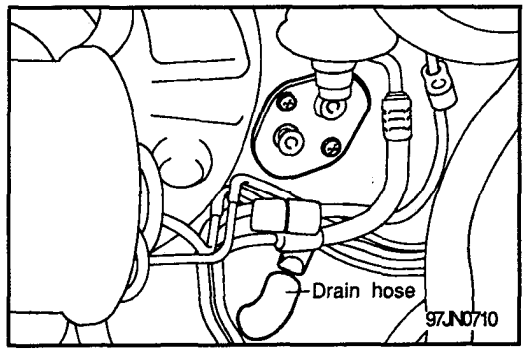


REMOVAL AND INSTALLATION

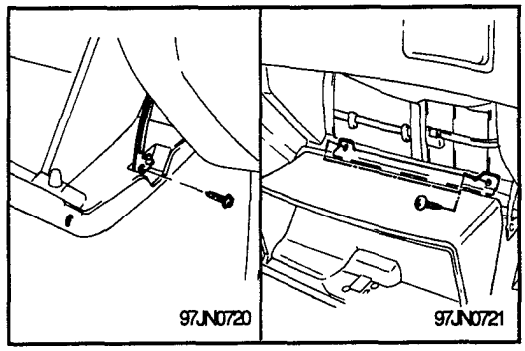
1. Disconnect the negative terminal from the battery.
2. Discharge the refrigerant from the system.
3. Remove the air intake hose.
4. Disconnect the suction and liquid lines.



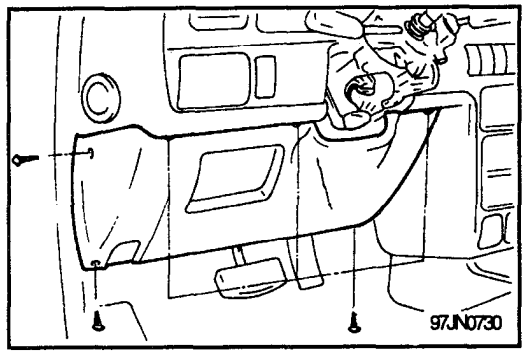
5. Remove the water drain hose from the evaporator.
6. Remove the grommet cover from the dash pannel. (2 screws)



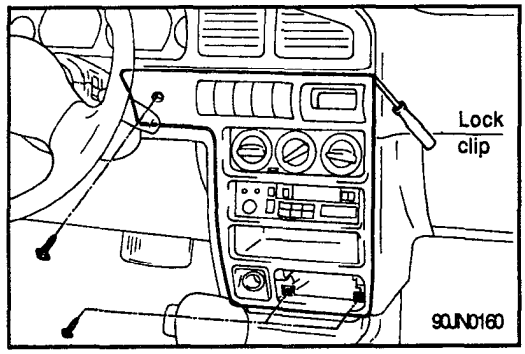
7. Remove the glove box assembly. (3 screws)



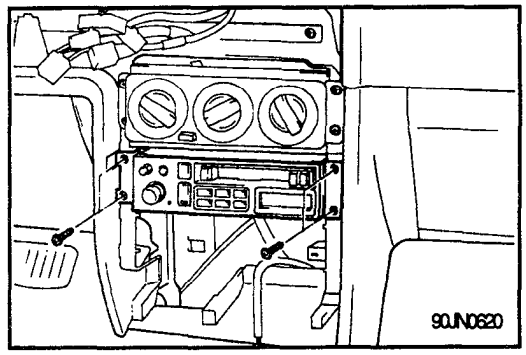
8. Remove the side lower crash pad. (6 screws)



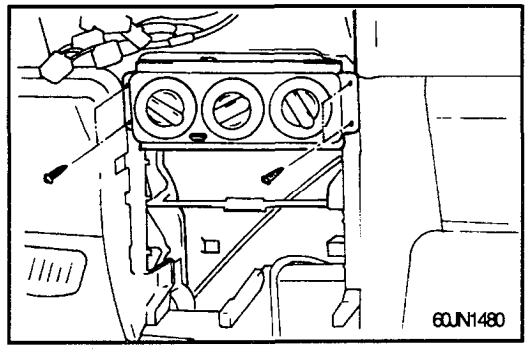
9. Remove the ash tray.
10. Remove the lower crash pad center facia panel and disconnect the connectors.
    NOTE : Using a screwdriver, pry loose one clip.
    * Tape the screwdriver tip before use.



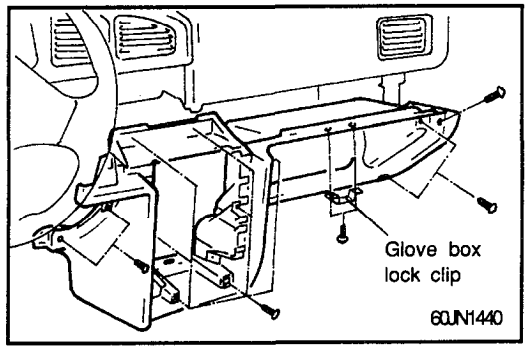
11. Remove the radio and disconnect the connectors.



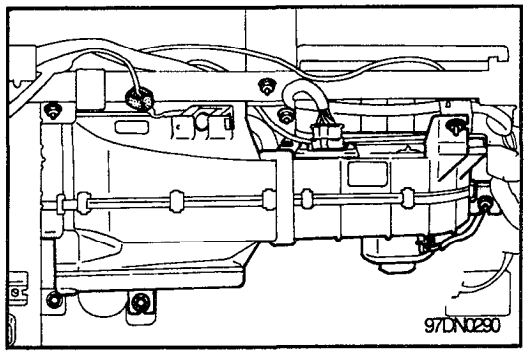
12. Remove 4 mounting bolts for heater control unit assembly.



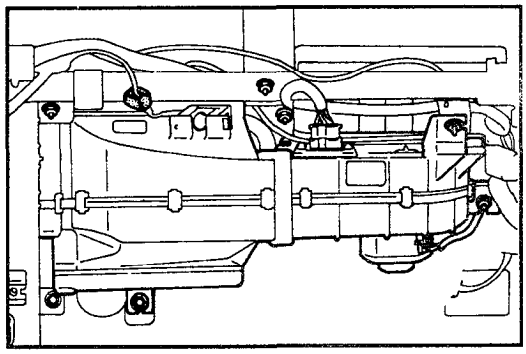
13. Remove the main lower crash pad. (14 screws)



14. Disconnect the connectors for blower resistor (M63), blower motor (M61), thermostat (I12), and the vacuum hose from the recirce/fresh vacuum motor.



15. Remove the blower motor and the evaporator assembly. (2 bolts and 3 nuts)
16. Installation is the reverse of removal.



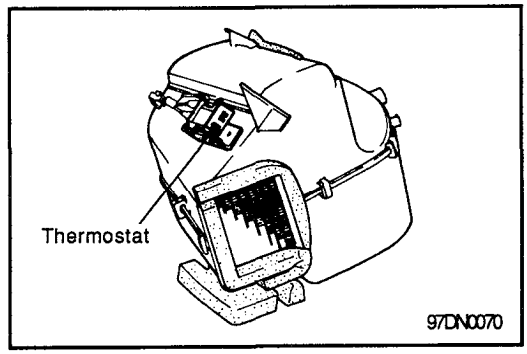
INSPECTION

o Check for damage of evaporator fin.
o Check for damage or collapse of drain hose.
o Check for peeling or cracking of the insulator.

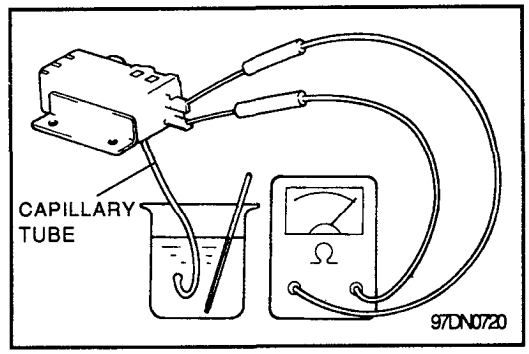
THERMOSTAT

1. Place the thermostat capillary tube in cold water and check for continuity.

   cut-off ..... 0 ± 1^{o}
   Cut-in ..... 4 ± 1^{o}

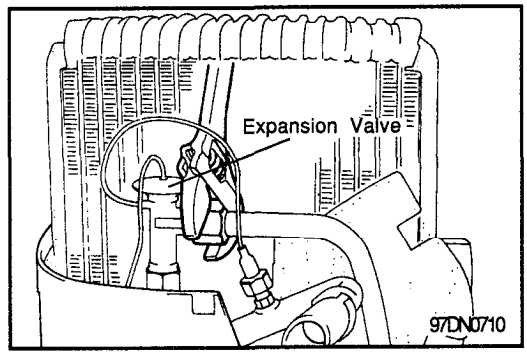


2. If cut-off or cut-in temperature is too low or too high, replace the thermostat.

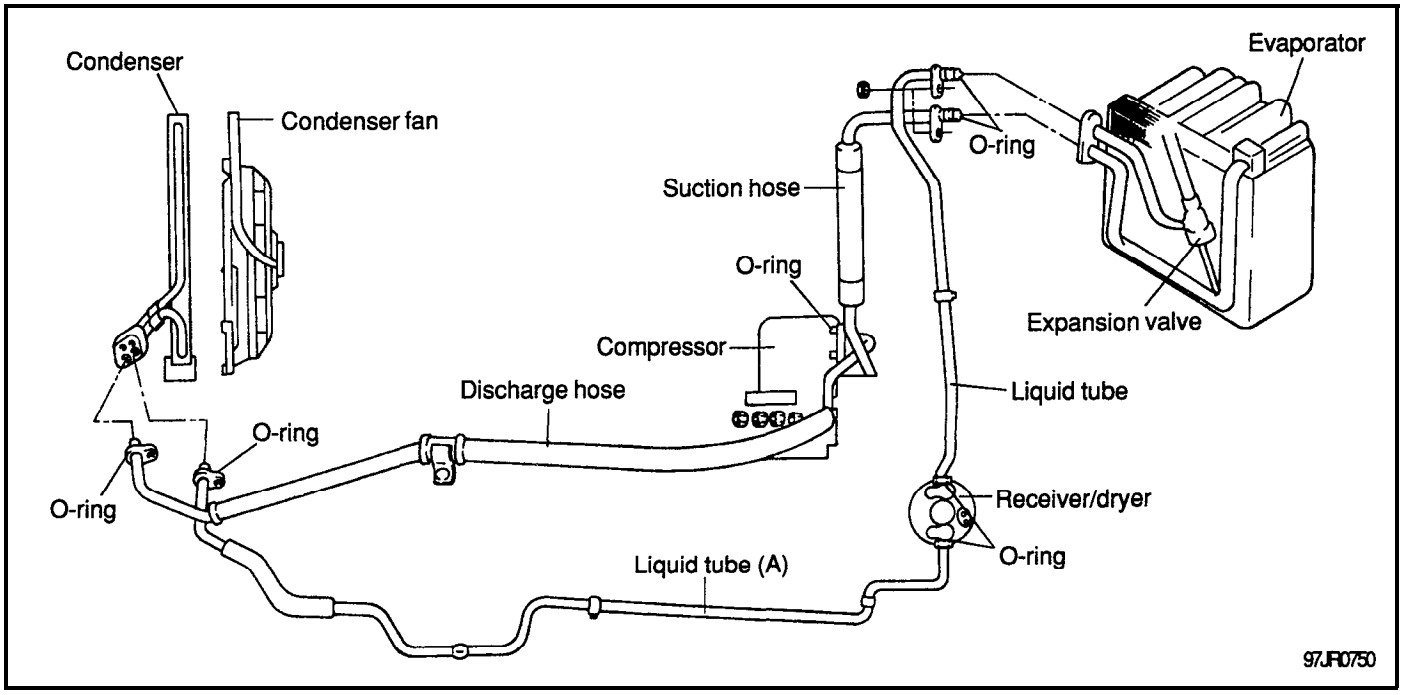


EXPANSION VALVE

1. Disconnect the liquid tube from the inlet fitting of the expansion valve.
2. Remove the packing and heat sensing tube from suction tube of evaporator.
3. Remove the expansion valve.



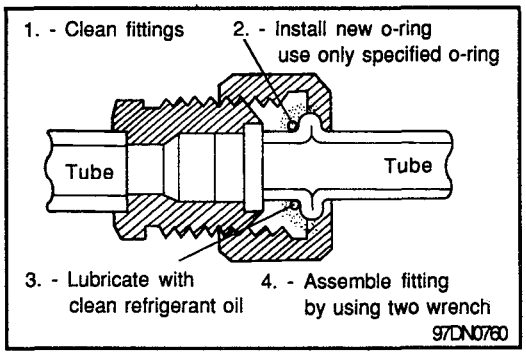
HANDLING TUBING AND FITTINGS



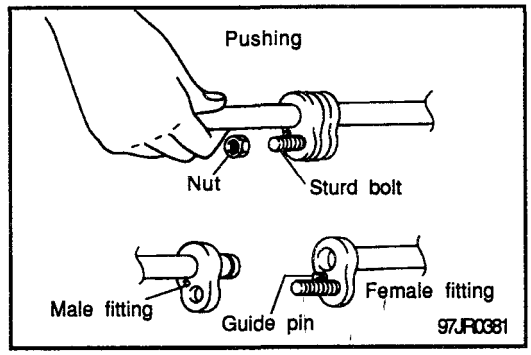
The internal parts of the refrigeration system will remain in a state of chemical stability as long as pure-moisture free refrigerant and refrigerant oil is used. Abnormal amounts of dirt, moisture or air can upset the chemical stability and cause troubles or even serious damage.

The following precautions must be observed

1. When it is necessary to open the refrigeration system, have everything you will need to service the system ready so the system will not be left open any longer than necessary.
2. Cap or plug all lines and fittings as soon as they are opened to prevent the entrance of dirt and moisture.
3. All lines and components in parts stock should be capped or sealed until they are ready to be used.
4. Never attempt to rebend formed lines to fit. Use the correct line for the installation you are servicing.
5. All tools, including the refrigerant dispensing manifold, the gage set manifold and test hoses should be kept clean and dry-



BOLT-NUT TYPE COUPLING



FLANGE WITH GUIDE PIN TYPE

SUPPLEMENTAL RESTRAINT SYSTEM (SRS AIR-BAG)

Return To Main Table of Contents

GENERAL 2
SRSCM(SRS Control Module) 9
AIRBAG MODULE(DRIVER) AND CLOCK SPRING 12
AIRBAG CONNECTORS 17
TROUBLESHOOTING 19
AIRBAG MODULE DISPOSAL 44

GENERAL

The supplemental restraint system (SRS) is designed to supplement the driver's seat belt to help reduce the risk or severity of injury to the driver by activating and deploying a drivers-side air bag in certain frontal collisions.
The SRS (Air-bag) consists of; a driver side air bag module located in the center of the steering wheel, which contains the folded air-bag and an inflator unit: SRSCM (SRS control module) located under the rear console assembly, which monitors the system, and an accelerometer which senses the vehicle deceleration an SRS SRI (Service reminder Indicator) located on the cluster, which indicates the operational status of the SRS; a clock spring interconnection located within the steering column; system wiring and wiring connector; and a knee bolster located under the steering column.
The impact sensing function of the SRSCM is carried out by electronic accelerometer that continuously measure the vehicle's longitudinal acceleration and delivers a corresponding signal through amplifying and filtering circuitry to the microprocessor.
That is designed to occur in frontal or near-frontal impacts of moderate to severe force.
Only authorized service personnel should do work on or around the SRS components. Those service personnel should read this manual carefully before starting any such work. Extreme care must be used when servicing the SRS, to avoid injury to the service personnel (by inadvertent deployment of the air bag) or the driver (by rendering the SRS inoperative)

CUSTOMER CAUTIONS

Failure to carry out service operations in the correct sequence could cause the airbag system to unexpectedly deploy during servicing, possibly leading to a serious accident.
Further, if a mistake is made in servicing the airbag system, it is possible the airbag may fail to operate when required.
Before performing servicing (including removal or installation of parts, inspection or replacement), be sure to read the following items carefully, then follow the correct procedure described in the repair manual.

1. Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the LOCK position and the negative (-) terminal cable is disconnected from the battery. (The airbag system is equipped with a back-up power source so that if work is started within 30 seconds of disconnecting the negative (-) terminal cable of the battery, the airbag may be deployed.)
   When the negative (-) terminal cable is disconnected from the battery, memory of the clock and audio systems will be cancelled. So before starting work, make a record of the contents memorized by the audio memory system. Then when work is finished, reset the audio system as before and adjust the clock.

2. Malfunction symptoms of the airbag system are difficult to confirm, so the diagnostic codes become the most important source of information when troubleshooting.
   When troubleshooting the airbag system, always inspect the diagnostic codes before disconnecting the battery.

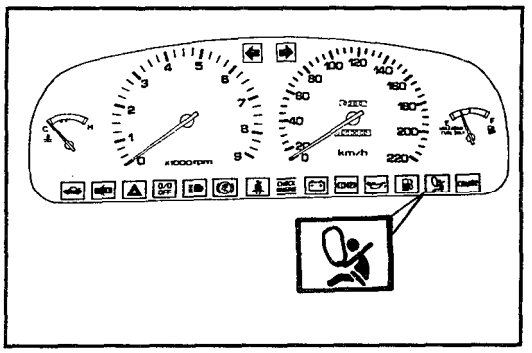
3. Never use airbag parts from another vehicle. When replacing parts, replace them with new parts.

4. Never attempt to disassemble and repair the airbag modules, SRSCM, Clock spring and Air-bag wiring harness in order to reuse it.

5. If the SRSCM or air-bag module have been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.

6. After work on the airbag system is completed, perform the SRS SRI check.

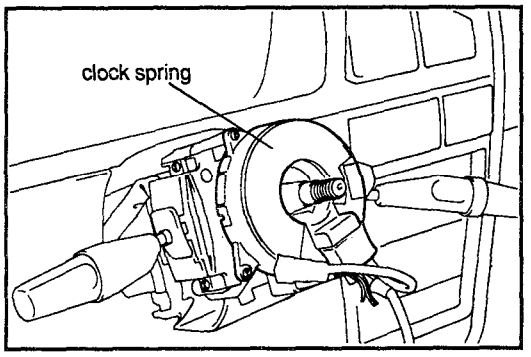
SRSCM INDEPENDENT LAMP ACTIVATION



There are certain fault conditions in which the SRSCM (SRS control module) cannot function and thus cannot control the operation of the lamp. In these cases, the lamp is directly activated by appropriate circuitry that operates independently of the SRSCM, as follows:

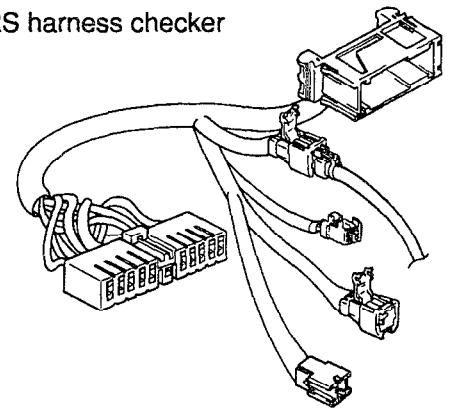
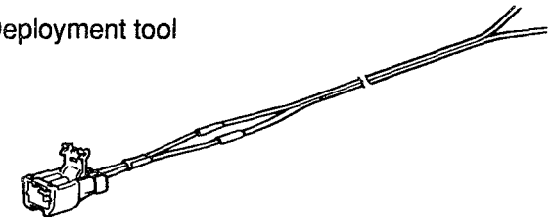
1. Loss of ignition voltage supply to the SRSCM: lamp turned on continuously.
2. Loss of internal operating voltage: lamp turned on continuously.
3. Loss of SRSCM operation: lamp turned on continuously.
4. SRSCM not connected: lamp turned on through shorting bar in wiring harness connector.

CLOCK SPRING (in MULTI-FUNCTION SWITCH)

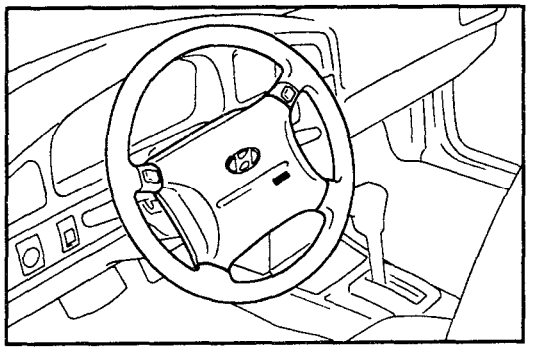


The steering wheel must be fitted correctly to the steering column with the clock spring at the neutral position, otherwise cable disconnection and other troubles may result. Refer to page 56A-13 of this manual concerning correct steering wheel installation.

SPECIAL SERVICE TOOL

Tool	Name and Description
SRS harness checker 	SRS harness checker (09574A-34000) - Harness inspection - SRSCM inspection with dummy terminals
Deployment tool 	Deployment tool(09574A-34100) - Deployment of undeployed Air-bag module

AIR-BAG MODULE (with AIRBAG)



1. When removing the air-bag module or handling a new air-bag module, it should be placed with the pad top surface facing up. In this case, the twin-lock type connector lock lever should be in the lock state and care should be taken to place it so the connector will not be damaged. And do not store a steering wheel pad on top of another one. (Storing the pad with its metallic surface up may lead to a serious accident if the airbag inflates for some reason.)

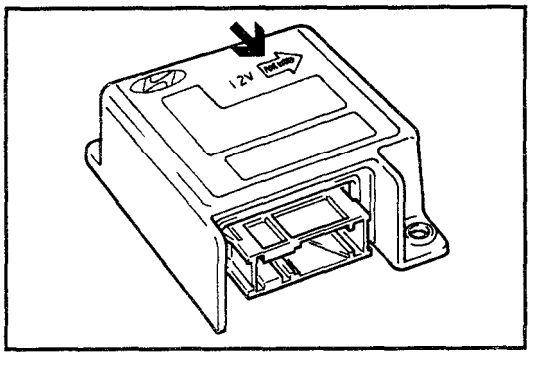
2. Never measure the resistance of the airbag squib. (This may cause the airbag to deploy, which is very dangerous.)

3. Store the air-bag module where the ambient temperature remains below 93°C (200°F), without high humidity and away from electrical noise.

4. When using electric welding, first disconnect the airbag connector (red color and 2 pins) under the steering column near the MULTI-FUNCTION SWITCH connector before starting work.

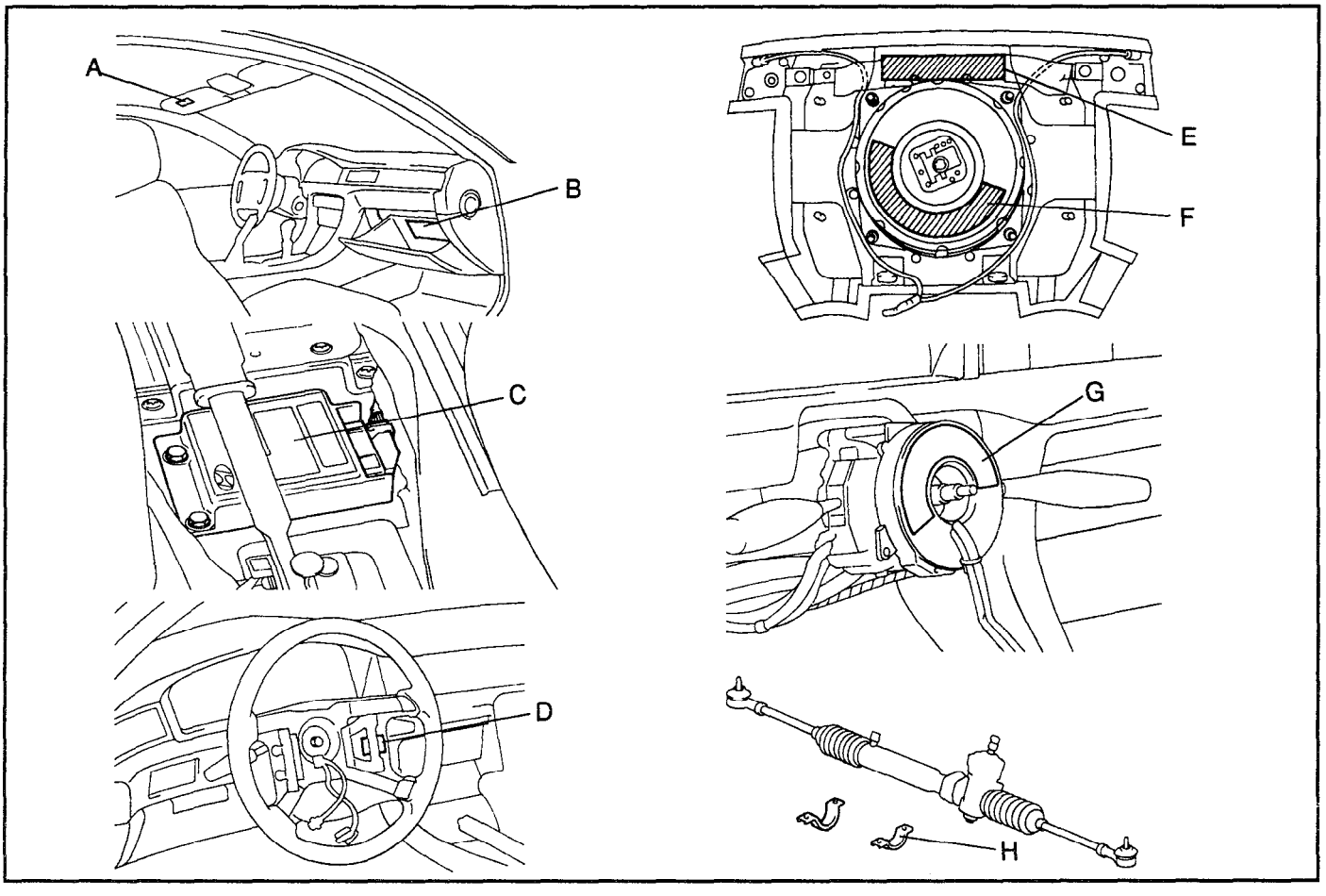
SRSCM(SRS Control Module)

Install the SRSCM with the arrow on the SRSCM facing toward the front of the vehicle.



WARNING/CAUTION LABELS

A number of caution labels relating to the SRS are found in the vehicle, as shown in the following illustration. Follow label instructions when servicing SRS.
If labels are dirty of damaged, replace them with new ones.



A :

SRS ALWAYS WEAR YOUR SEAT BELT
This car is equipped with A DIRIVER AIRBAG Supplemental Restraint System. (S.R.S)
It is designed to supplement the seat belt.
Before driving, read the label inside THE GOVE BOX.

B :

AIRBAG INFORMATION
Airbag system is nomal if "SRS" lamp, in cluster flashes approximaty 7 times and then goes out after ingnition key is turned on.
However, if any of the following conditions occur, the system must be serviced.
1. "SRS" lamp does not light when key is turned on.
2. "SRS" lamp flashes or stays lit continuosly.
3. The airbag has inflated.
Always fasten children in child-restraints placed in the rear seat since an inflating airbag may seriously injure a child. In addition, rear seating positions are safer for children.
WARNING! failure to follow above instruction can result in injure to your or other occupants and children in the vehicle.
See "SRS" section in Owners Manual for more information about airbag.

C. CAUTION: AIRBAG ESPS UNIT
Detach connector before unmounting. Assemble strictly according to manual instructions.

E. WARNING SRS
This air bag module cannot be repaired. Do not disassemble or tamper.
Do not perform diagnosis. Do not touch with electrical test equipment or probes. Refer to service manual for further instructions, and for special handing, storage and disposal procedures.
Tampering or mishandling can result in injury.

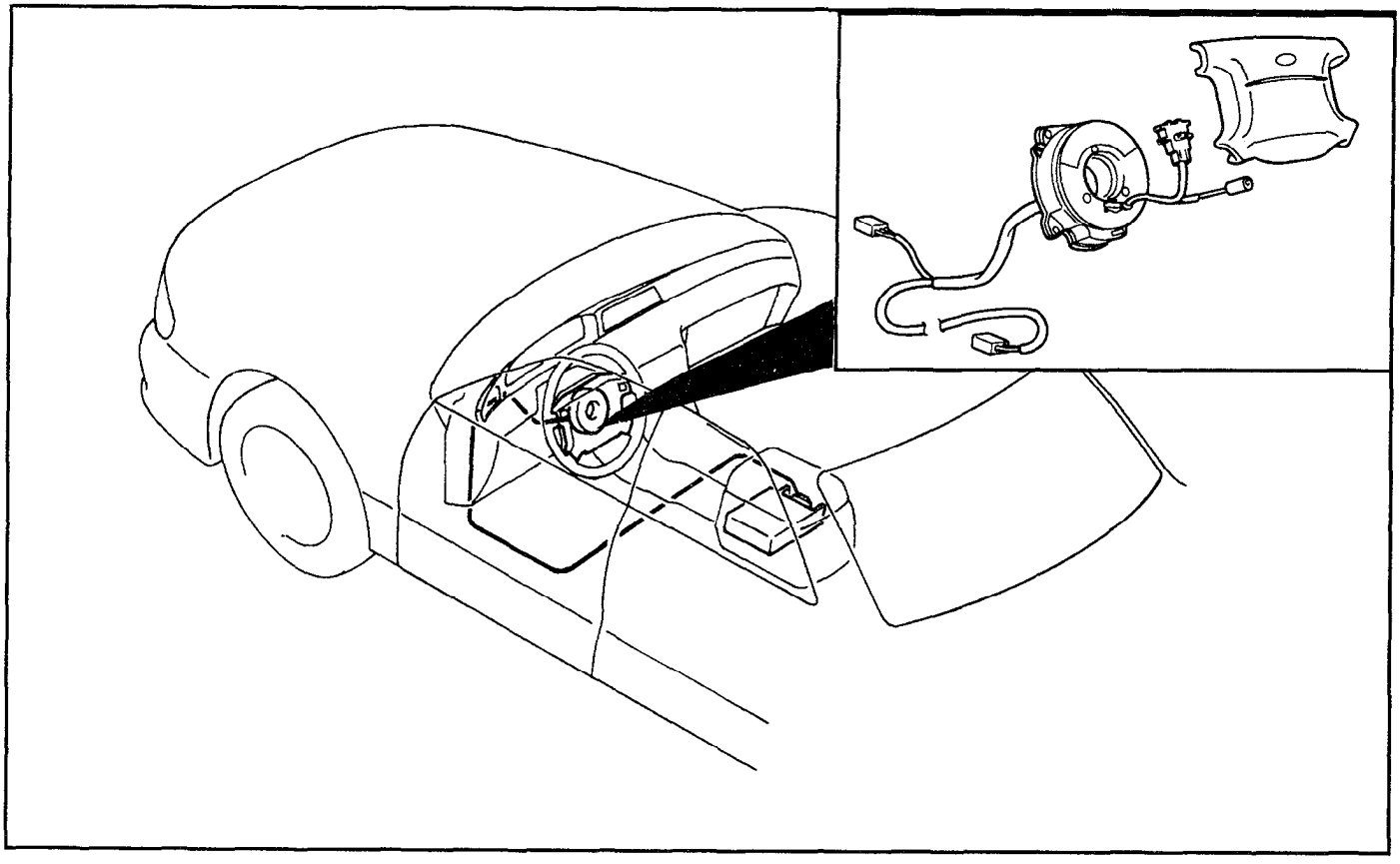
G. CAUTION: SRS clock spring
This is not a repairable part. Do not disassemble or tamper.
If defective, remove and replace entire unit per service manual instructions.
Before replacement, read service manual, center front wheels and align neutral marks.
Failure to follow instructions may render SRS system inoperative, risking serious driver injury.

H. CAUTION: SRS
Before removal of steering gearbox, read service manual, center front wheels and remove ignition key.
Failure to do so may damage SRS clock spring and render SRS system inoperative, risking serious driver injury.

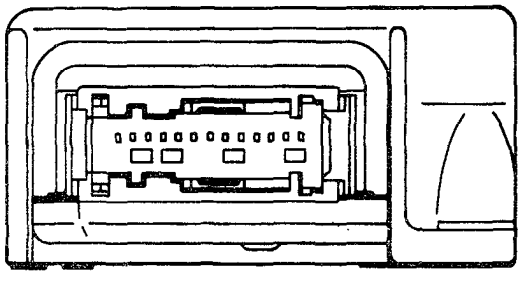
D. CAUTION: SRS
Before replacing steering wheel, read service manual, center front wheels and align SRS clock spring neutral marks.
Failure to do so may render SRS system inoperative, risking serious driver injury.

F. Danger! Poison. Keep out of the reach of children. Contains sodium azide and potassium nitrate contents are poisonous and extremely flammable. Contact with acid, water, or heavy metals may produce harmful and irritating gases or explosive compounds. Do not dismantle, incinerate, bring into contact with electricity of store at temperature exceeding (93.3%) 200°F.
First aid: If contents are swallowed induce vomiting. For eye contact flush eye with water for 15 minutes. If gases from acid or water contact are inhaled, seek fresh air. In every case, get prompt medical attention.
For additional information, see material safety data sheet (MSDS) for this product.

SYSTEM COMPONENT



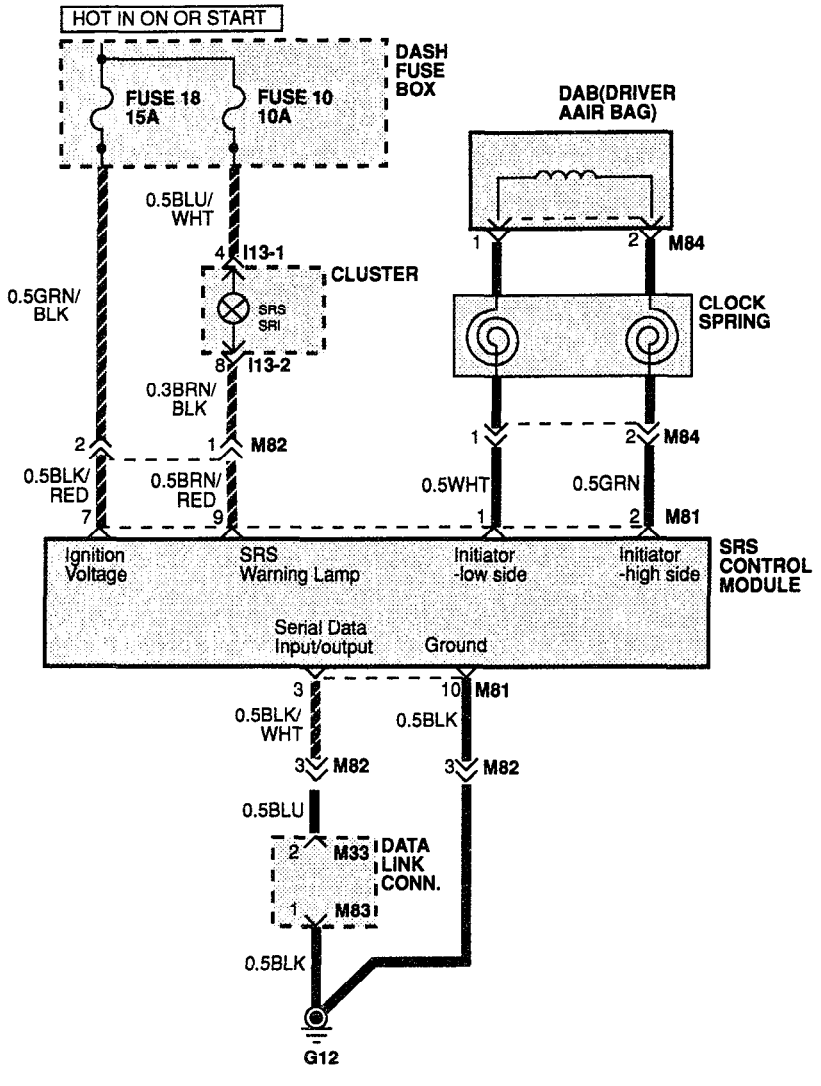
SRSCM CONNECTOR



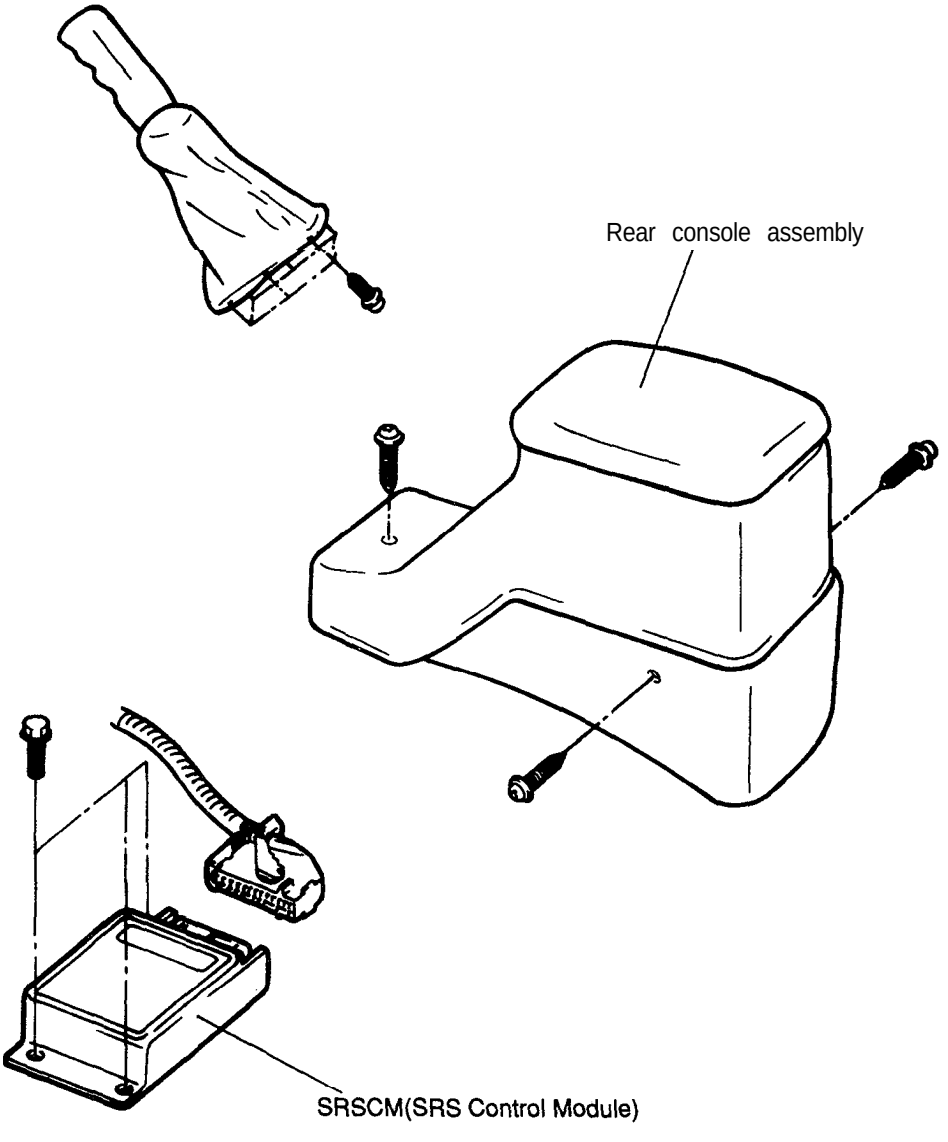
Connector pinout	
Pin 1	Driver inflator, low side
Pin 2	Driver inflator, high side
Pin 3	Serial data input, output
Pin 7	Ignition voltage
Pin 9	SRS SRI
Pin 10	Ground

Shorting bar removal tab (Open : Enable, Close: Disable)	
Pin 14,15	Driver side inflator
Pin 18,19	Not used
Pin 22, 23	SRS SRI
Pin 24, 25	Not used

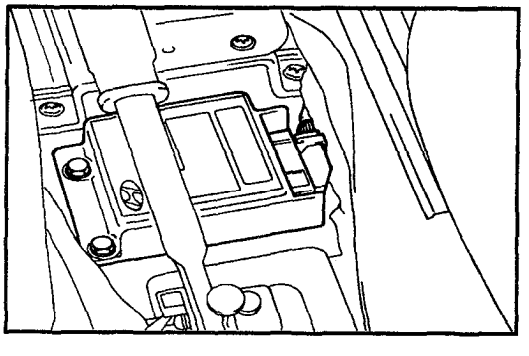
WIRING DIAGRAM



SRSCM (SRS CONTROL MODULE)



The SRSCM is mounted below rear console assy.
The electronic accelerometer which is located in the SRSCM sense the vehicle deceleration for determining the firing instant and discriminating between must-deploy and must-not-deploy impact conditions.

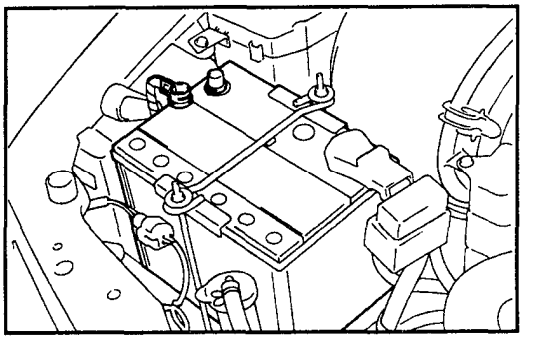


REMOVAL

CAUTION

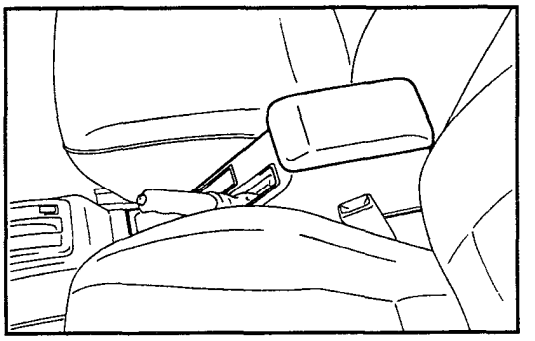
- **Never attempt to disassemble or repair the SRSCM. If faulty, replace it.**
- **Do not drop or subject the SRSCM to impact or vibration.**
  If denting, cracking, deformation, or rust are discovered in the SRSCM, replace it with a new SRSCM. Discard the old one.
- **After deployment of an air bag, replace the SRSCM with a new one.**
- **Never use an ohmmeter on or near the SRSCM and use only the scan tool.**

1. Disconnect the negative battery cable and keep it secure from battery

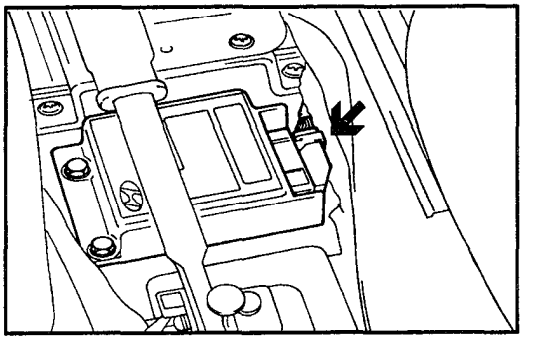


CAUTION
Wait at least 30 seconds after disconnecting the battery cable before doing any further work.

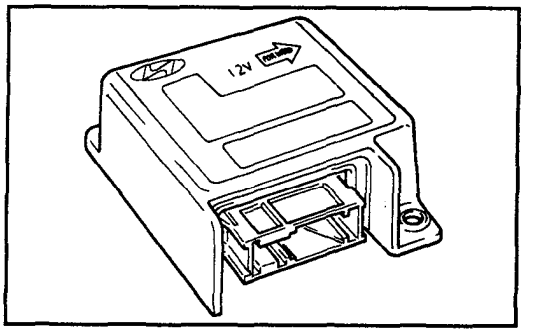
2. Remove the rear console assy.



3. Disconnect the SRSCM harness first before remove the Air-bag mounting bolt.
4. Remove the SRSCM.



INSPECTION

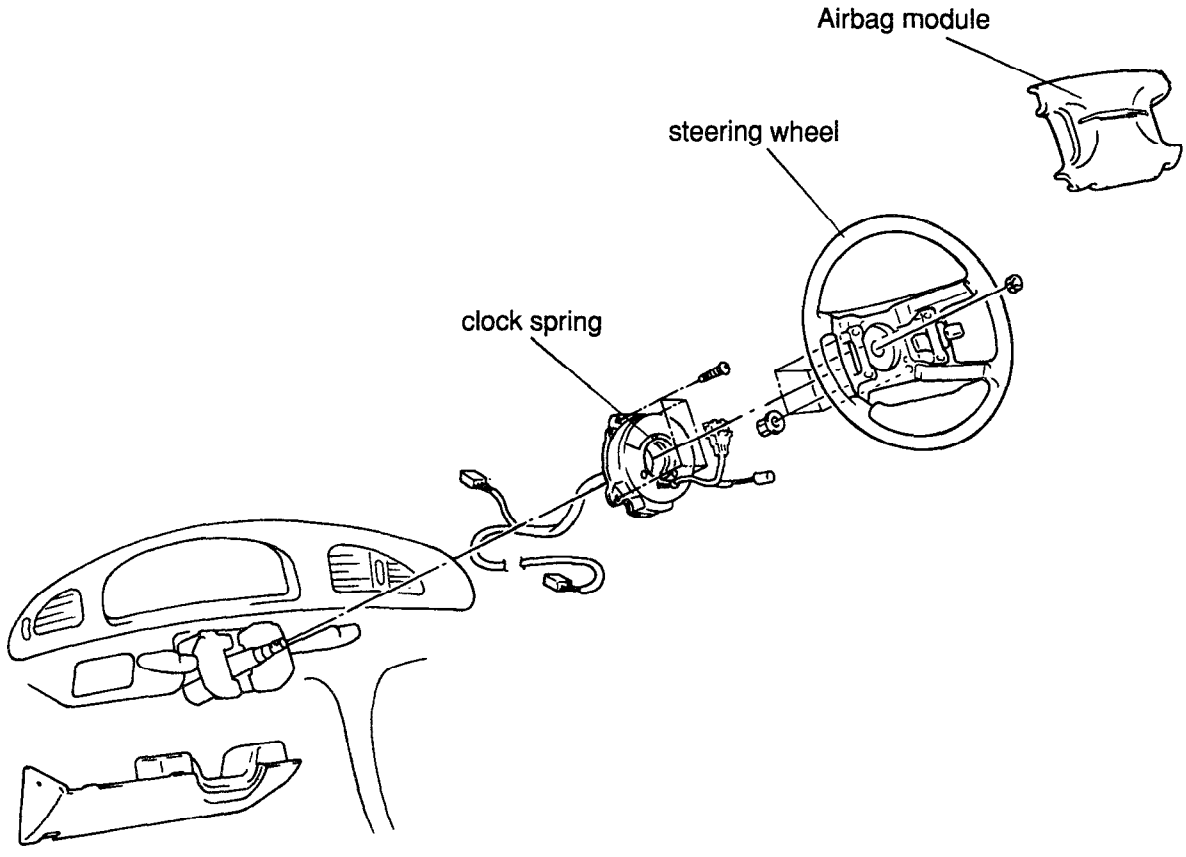


1. Check the SRSCM case and brackets for dents, cracks or deformities.
2. Check connectors and the lock lever for damage, and terminals for deformities.

CAUTION
If a dent, cracks, deformation or rust are discovered, replace the SRSCM with a new one.

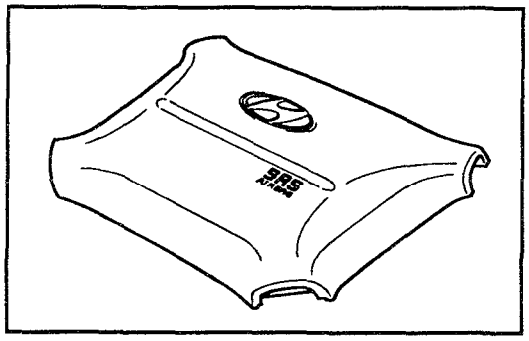
AIR BAG MODULE (DRIVER) AND CLOCK SPRING

COMPONENTS



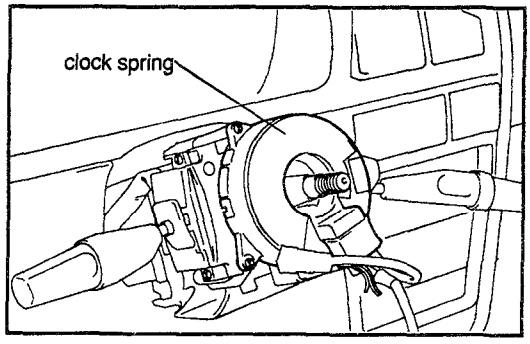
AIR-BAG MODULE (with AIRBAG)

The inflater and bag of the airbag system are stored in the air-bag module and cannot be disassembled.
The inflater contains a squib, igniter charge, gas generant, etc., and will inflate the bag in case of a frontal collision.



CLOCK SPRING (in MULTI-FUNCTION SWITCH)

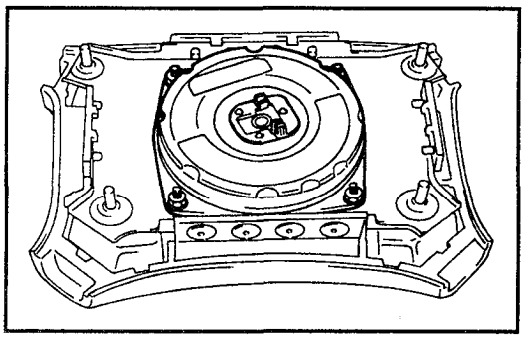
A clock spring is used as an electrical joint from the vehicle body side to the steering wheel.



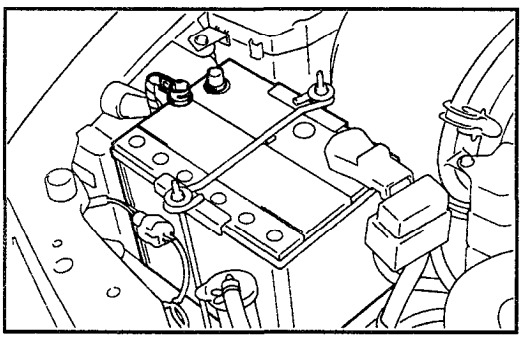
REMOVAL

CAUTION

1. **Never attempt to disassemble or repair the air bag module or clock spring. If faulty, replace it.**
2. **Do not drop the airbag module or clock spring or allow contact with water, grease or oil. Replace it if a dent, crack, deformation or rust are detected.**
3. **The air bag module should be stored on a flat surface and placed so that the pad surface is facing upward. Do not place anything on top of it.**
4. **Do not expose the air bag module to temperature over 93°C (200°F).**
5. **After deployment of an air bag, replace the clock spring with a new one.**
6. **Wear gloves and safety glasses when handling an air bag that has already deployed.**
7. **An undeployed air bag module should only be disposed of in accordance with the procedures**



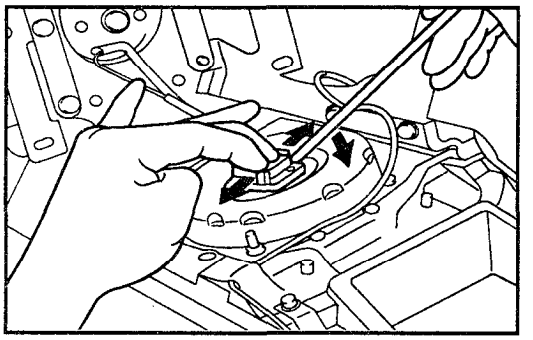
1. Disconnect the negative battery cable and keep secure from battery.



CAUTION

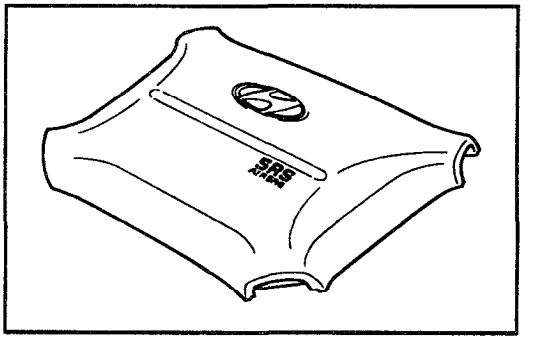
Wait at least 30 seconds after disconnecting the battery cable before doing any further work.

2. Remove the air bag module mounting nut using a socket wrench from the back side.
3. When disconnecting the connector of the clock spring from the air bag module, press the air bag's lock toward the outer side to spread it open. Use a screwdriver, as shown in the figure at the left, to pry so as to remove the connector gently.

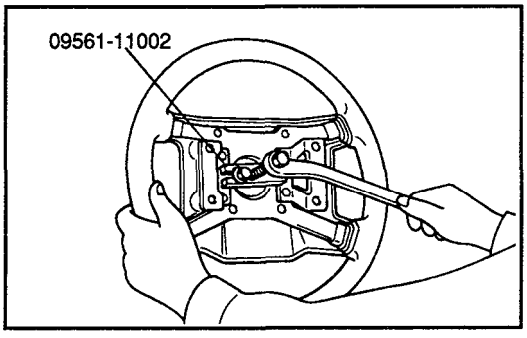


CAUTION

- **When disconnecting the air bag module-clock spring connector, take care not to apply excessive force to it.**
- **The removed air bag module should be stored in a clean, dry place with the pad cover face up.**



4. Remove the steering wheel by using a special tool (09561-11002).



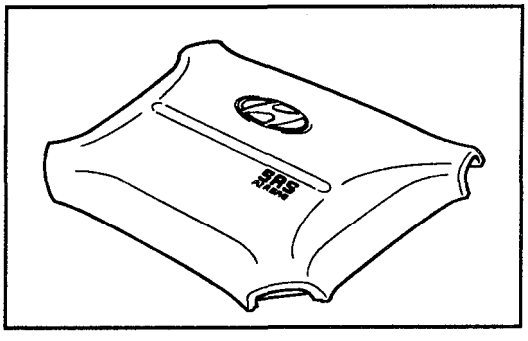
CAUTION
Do not hammer on the steering wheel. Doing so may damage the collapsible column mechanism.

INSPECTION
AIR BAG MODULE

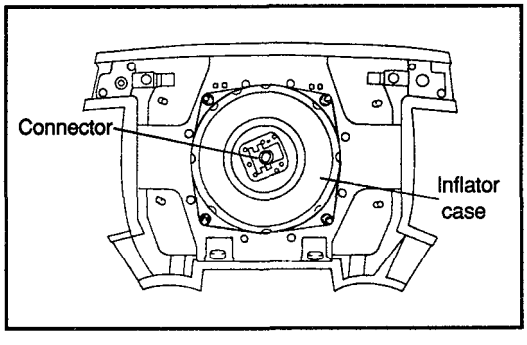
If any improper parts are found during the following inspection, replace the air bag module with a new one.
Dispose of the old one according to the specified procedure.

CAUTION
Never attempt to measure the circuit resistance of the air bag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental air bag deployment will result in serious personal injury.

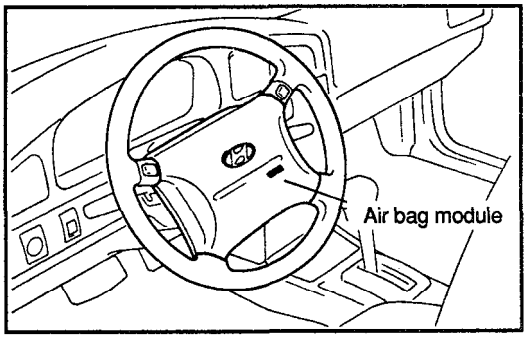
1. Check pad cover for dents, cracks or deformities.



2. Check the air bag module for denting, cracking or deformation.
3. Check connectors for damage, terminals for deformities, and harness for binds.
4. Check air bag inflator case for dents, cracks or deformities.



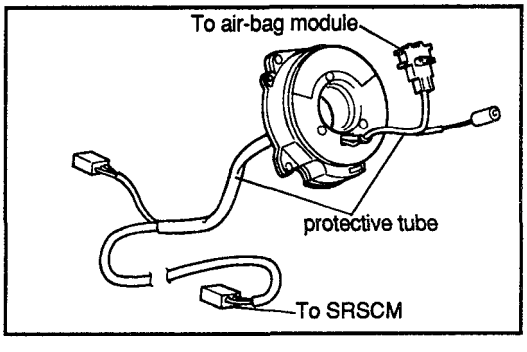
5. Install the air bag module to steering wheel to check fit or alignment with the wheel.



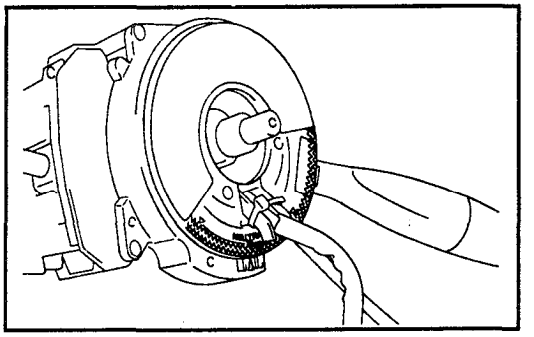
CLOCK SPRING

If, as a result of the following checks, even one abnormal point is discovered, replace the clock spring with a new one.

1. Check connectors and protective tube for damage, and terminals for deformities.

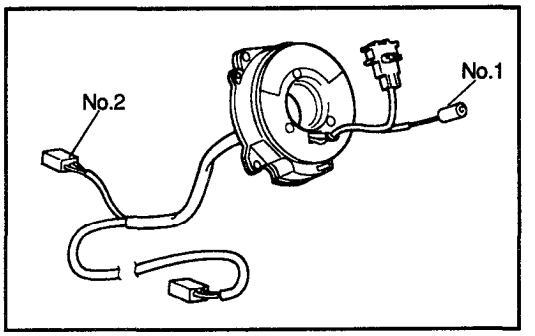


2. Visually check the case and the gears for damage.



3. Check for continuity between No.1 connector of the clock spring and connectors No.2.

   LIMIT : Continuity

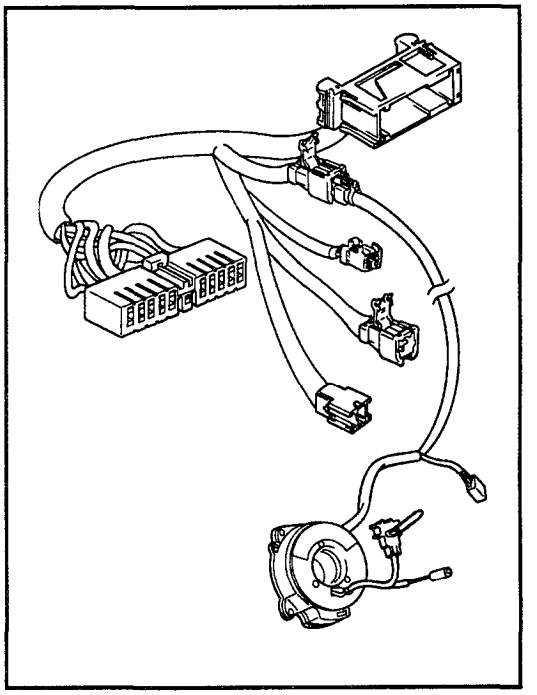


4. Check of resistance between the terminals.
   (1) Join the No.5 connector of the clock spring to the SRS harness checker.
   (2) Check continuity between terminals 1 and 2 of the SRS harness Checker..

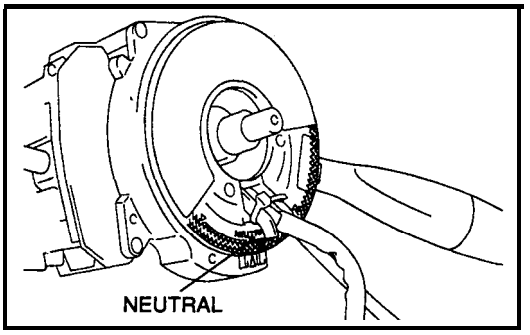
   Limit : Noncontinuity

   (3) Insert the clip edges into the inflator showing in figure, and check continuity between terminals 1 and 2.

   Limit : continuity



INSTALLATION



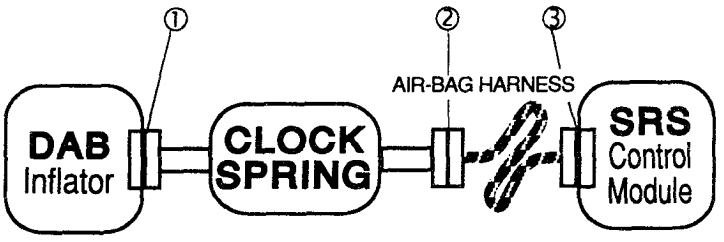
Align the mating mark and “NEUTRAL” position indicator of the clock spring, and, after turning the front wheels to the straight-ahead position, install the clock spring to the column switch.

CAUTION

If the clock spring’s mating mark is not properly aligned, the steering wheel may not be completely rotational during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle’s driver.

CONNECTORS

All wiring in the airbag system is wrapped in yellow type to distinguish it from others. For ensuring high reliability, air-bag connectors have special functions and specifically designed. The connectors use gold-plated terminals.



① Anti-deploy mechanism
Twin-lock Mechanism

②Anti-deploy mechanism
Twin-lock Mechanism

③Anti-deploy mechanism
Twin-lock Mechanism
Electrical connection check mechanism

1. SRS control Module
   - Twin-lock Mechanism
   - Anti-deploy Mechanism
   - Electrical Connection check Mechanism

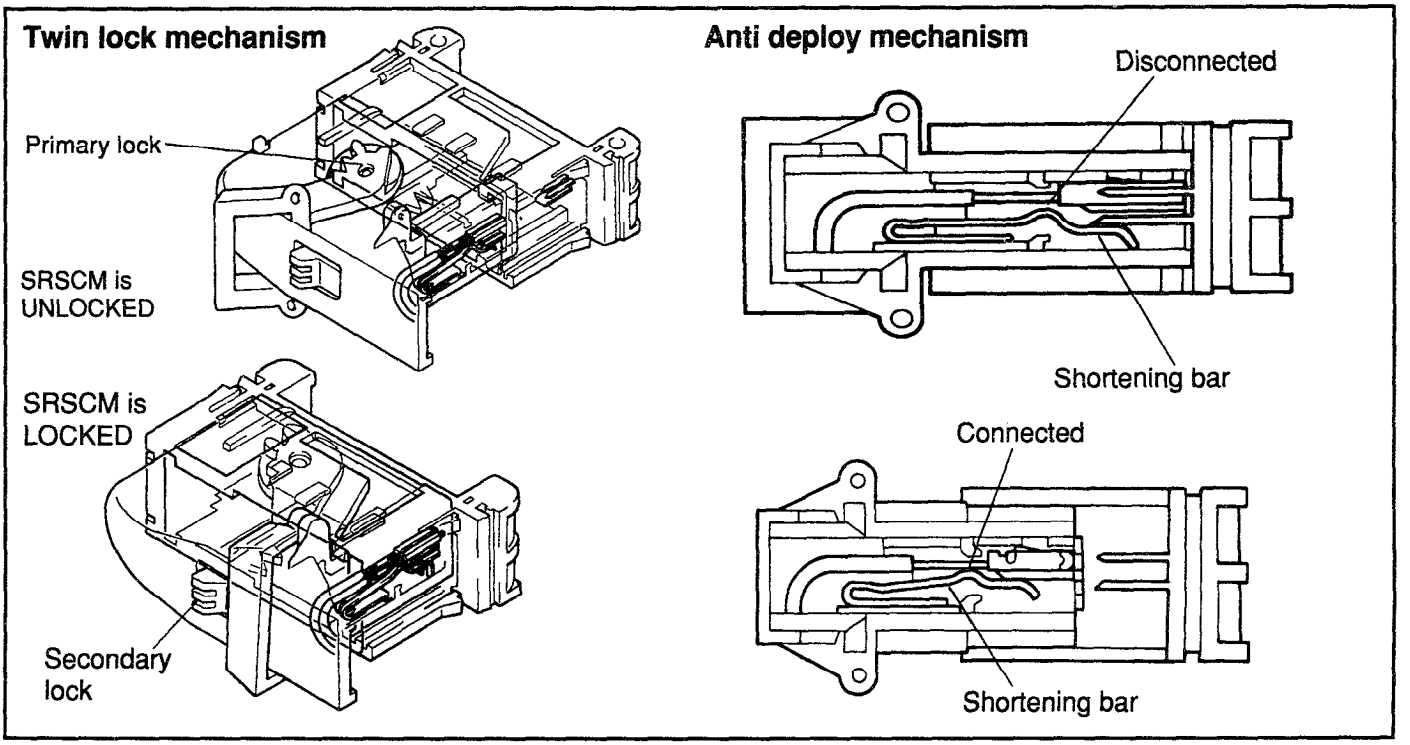
2. Driver Air-bag
   - Twin lock Mechanism
   - Anti-deploy Mechanism

SRS Control Module Connector (SRSCM Connector)

SRSCM Connector is designed with 3 security systems for preventing unexpected deployment, because of poor connections.

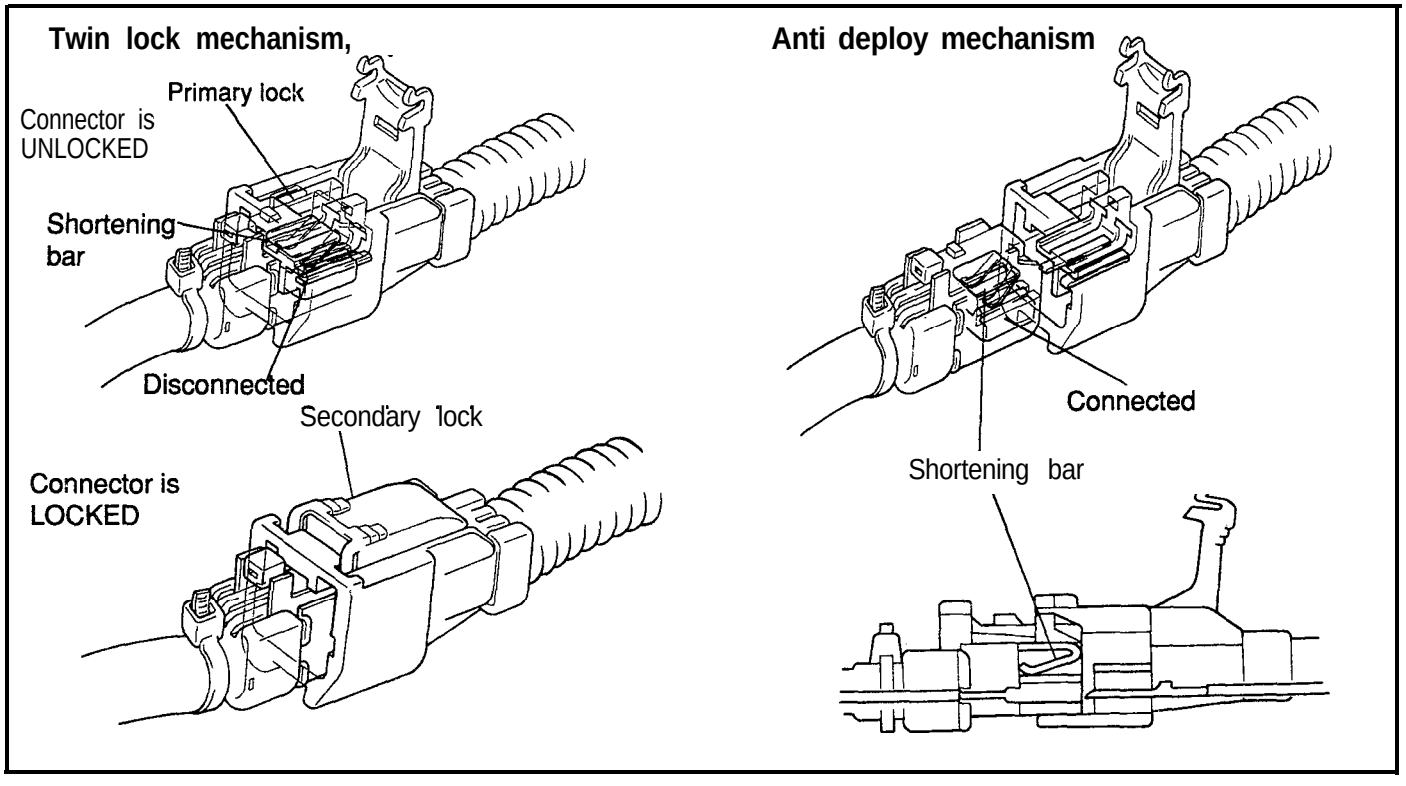
1. Twin Lock mechanism secures the locking of the terminal by locking device to prevent terminal from coming out.
2. Anti-deploy mechanism to prevent unexpected deployment by shortening of the two squib terminals.
3. Electrical Connection check mechanism is designed for finding poor connections at the SRSCM connector.

If it occures SRS SRI (Service Reminder Indicator) lights up permanently.



Driver Air-Bag Module (DAB)

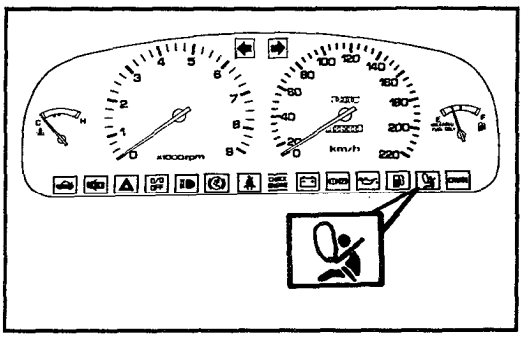
Two security mechanism of the DAB is twin-lock mechanism and anti-deploy mechanism. The anti-deploy mechanism prevents unexpected deployment by the shortening of the two squib terminals.
The twin-lock mechanism connectors (male and female) are fastened locked by two locking devices to increase connection reliability. If the primary lock is incomplete, ribs will prevent the secondary lock from coming apart.



DIAGNOSIS SYSTEM

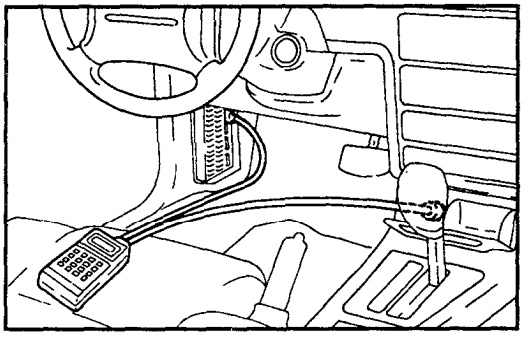
INDICATOR CHECK

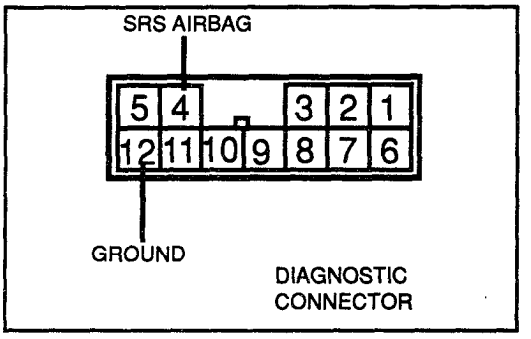
When the ignition switch is turned on, check that the SRS SRI (Service Reminder Indicator) flashes for 6 seconds, if the SRI is not illuminated immediately after the ignition is turned ON, a failure in the area of SRI circuit has occurred.



SCAN TOOL CHECK

1. Turn the ignition OFF.
2. Connect the Scan tool to the data link connector in the fuse box.
3. Connect the power-source terminal of the Scan tool to the cigarette lighter socket.
4. Turn the ignition ON.
5. Use the scan tool to check the diagnostic trouble codes.
6. After completion of the repair or correction of the problems, turn OFF the ignition switch; then erase the stored diagnostic trouble codes using the scan tool.
7. Disconnect the scan tool.





Diagnostic Trouble Code (DTC) Chart

DTC	Trouble status	Scan tool (MUT) display	See page	Description
1	A	INFLT SHRT GND	21	Driver inflator short circuit to ground
51	H			
2	A	INFLT SHRT BAT	25	Driver inflator short circuit to battery
52	H			
3	A	DRV INFLT-OPEN	29	Driver inflator circuit open (resistance too high)
53	H			
5	A	D/INFLT R-LOW	33	Driver inflator resistance low
54	H			
7	A	IG INPUT V-LOW	37	Ignition input voltage too low
57	H			
8	A	IG INPUT V-HI	37	Ignition input voltage too high
58	H			
13	A	SRS SRI FAIL	40	Supplemental restraint system(Air bag)service reminder indicator short to ground or to battery, open circuit
63	H			
14	A	SRSCM	43	Service restraint system (Air bag) control module internal fault.
64	H			
15	A	SRSCM CRASH	43	Crash recorded without being erased
65	H			

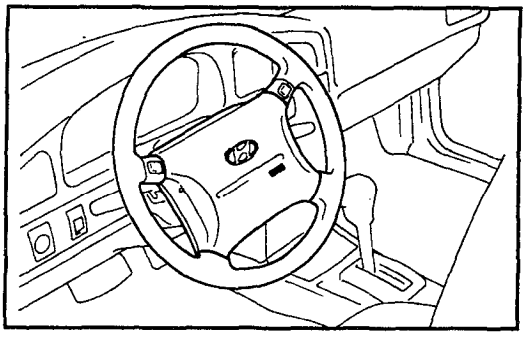
A : Active H : Histroy

SERVICE DATA

SCAN TOOL (SCAN TOOL) DISPLAY	DESCRIPTION OF TROUBLE CODE
01. CRASH NUMBERS **	Numbers of airbag activation (Inflation)
02. SRI STATUS ON or OFF	The ON-OFF status of service reminder indicator
03. SRI TIME • ** MIN.	The driving time after service reminder indicator “ON” is recorded for forty two hours by the minutes interval.
04.IG CYCLE ***	The engine starting numbers after service reminder indicator “ON” can be recorded 100 times.

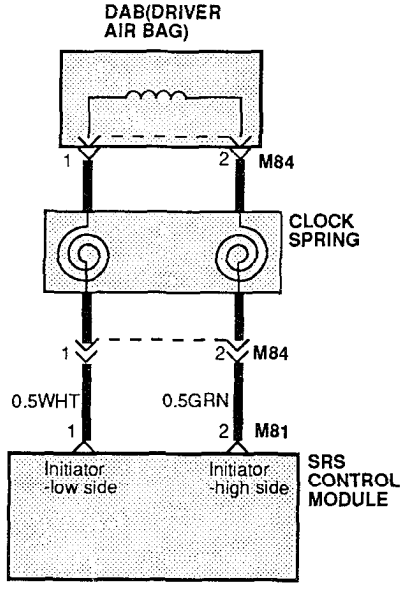
AIR-BAG MODULE CIRCUIT (Short to Ground)

The DAB circuit consists of SRSCM, spiral cable and the air-bag module.



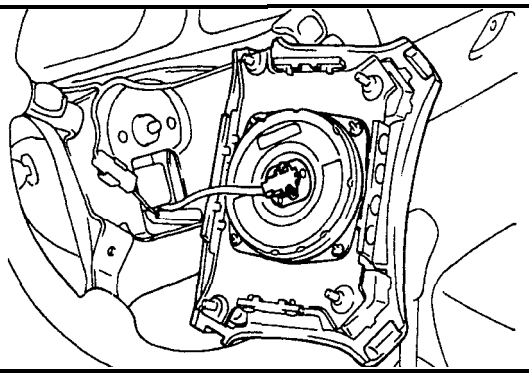
Code No.	Symptom	Trouble cause
1 (Active) 51 (History)	DAB (Driver side air-bag modulator) circuit short to ground.	o Short circuit in DAB wire harness o Air-bag modulator malfunction. o Clock spring cable malfunction o SRSCM.

WIRING-DIAGRAM



INSPECTION PROCEDURE

1. Before inspection



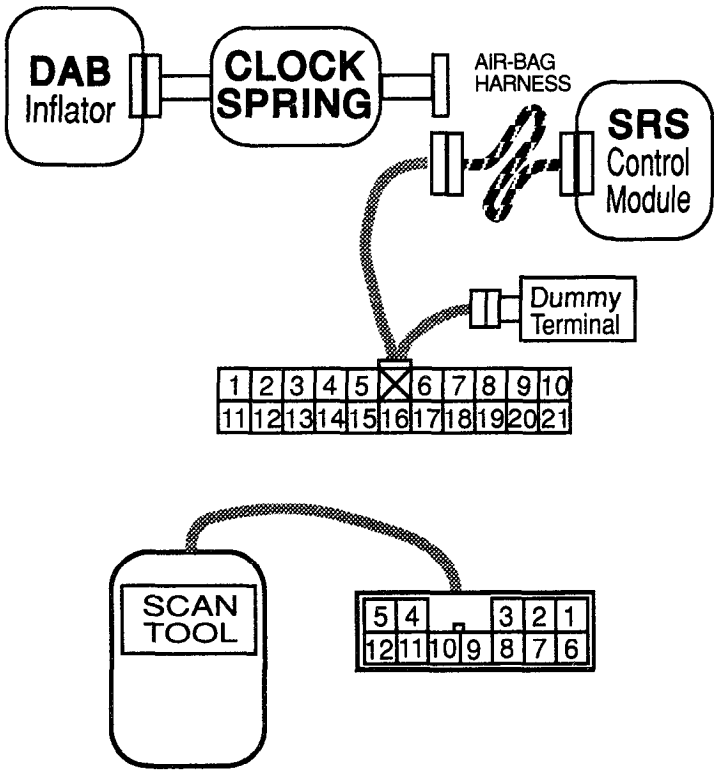
1. Disconnect battery negative (-) terminal cable

Caution !
Wait at least 30 seconds.

2. Remove the air-bag module.

Caution !
When storing air-bag module, keep the pad surface facing upward.

2. Check Air-bag SRSCM



1. Disconnect clock spring connector.
2. Connect dummy-terminal to harness side of the inflator connector with SRS harness checker.
3. Connect negative (-) terminal cable to battery, and wait at least 5 seconds.
4. Connect the SCAN TOOL terminal, and turn ignition switch ON.

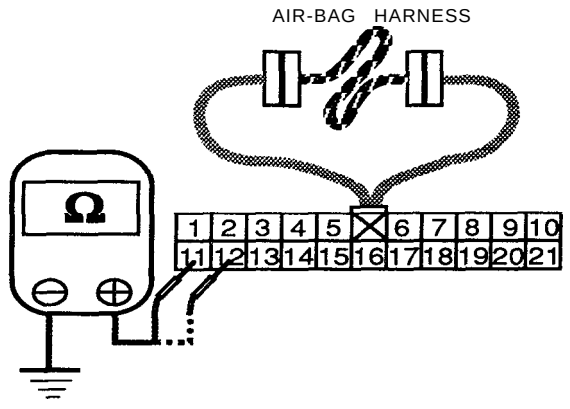
LIMIT

Diagnostic code 1 is not displayed.

NOTE
Code other than code 1 may be displayed at this time, but this is not relevant to this check.

OK→ 4	NG→ 3

3. Check inflator circuit (Driver)



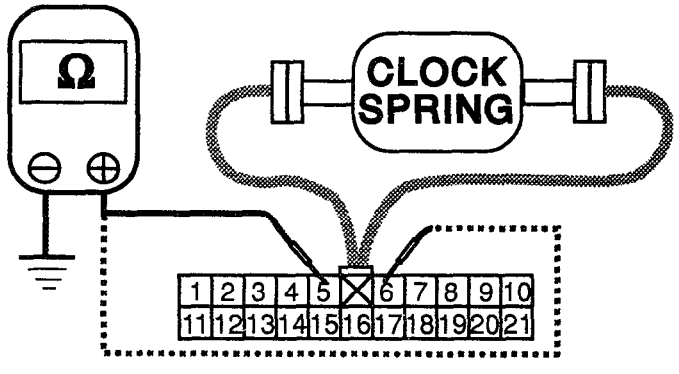
1. Disconnect SRSCM harness connector and clock spring connector.
2. Connect SRS harness checker to the SRSCM harness connector and clock spring harness side connector.
3. Check continuity between terminals 11, 12 and body ground.

LIMIT No continuity

OK → Replace SRSCM

NG → Replace Air-bag harness

4. Check clock spring



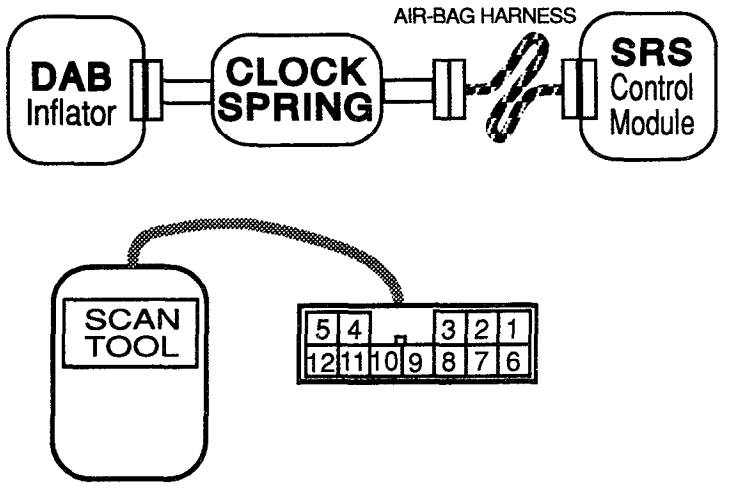
1. Disconnect DAB and clock spring connector.
2. Connect the SRS harness checker to clock spring connector.
3. Check continuity between terminals 5, 6 and body ground.

LIMIT No continuity

OK → 5

NG → Replace clock spring

5. Check Inflator



1. Turn ignition switch to lock, and disconnect the negative (-) terminal cable from battery and wait at least 30 seconds.
2. Connect inflator connector.
3. Connect negative (-) terminal cable to battery and wait at least 5 seconds.
4. Connect the SCAN TOOL terminal, and turn ignition switch ON.

LIMIT

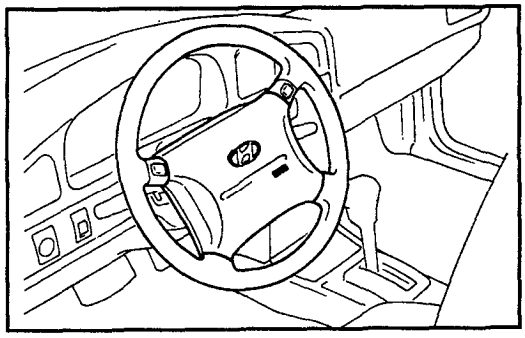
Diagnostic code 1 is not displayed.

NOTE
Code other than code 1 may be displayed at this time, but this is not relevant to this check

OK→ Connect all system and recheck	**NG→** Replace DAB

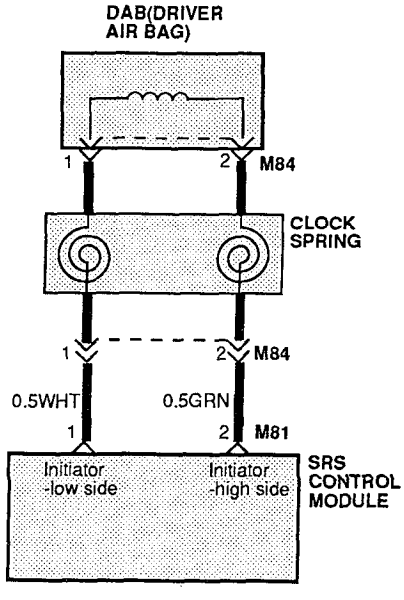
AIR-BAG MODULE CIRCUIT (Short to Battery +)

The DAB circuit consists of Air-bag SRSCM, clock spring and the Air-bag module.



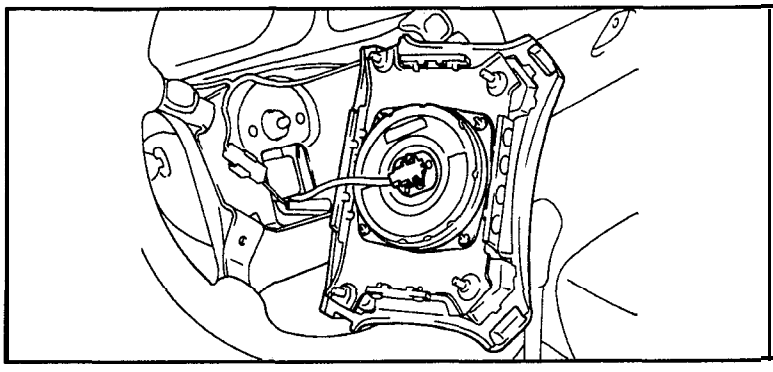
Code No.	Symptom	Trouble Area
2 (Active) 52 (History)	DAB (Driver side Air-bag modulator) circuit short to Battery + (12V)	o Short circuit in DAB wire harness (to battery + (12V)) o Air-bag modulator malfunction o Clock spring cable malfunction o SRSCM

WIRING DIAGRAM



INSPECTION PROCEDURE

1. Before inspection



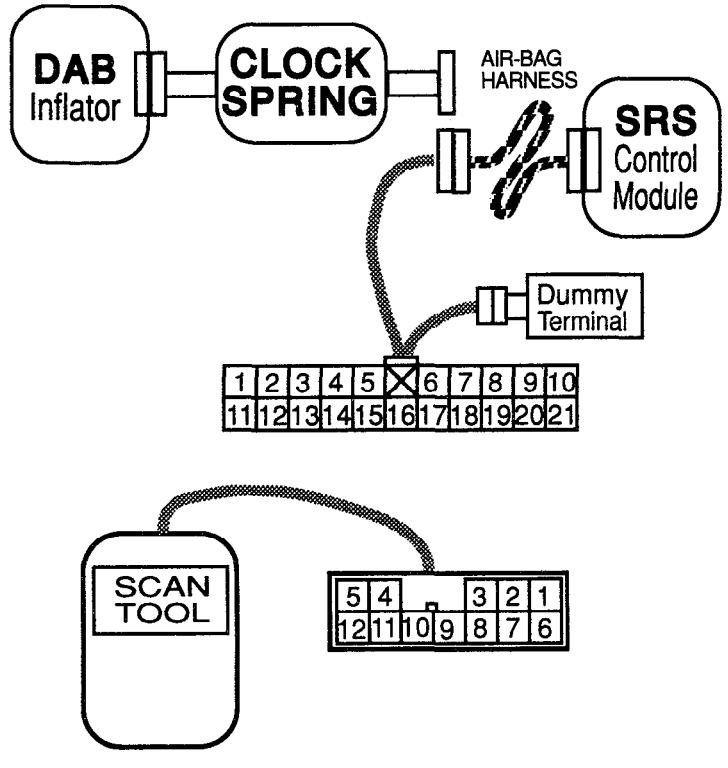
1. Disconnect battery negative (-) terminal cable

Caution !
Wait at least 30 seconds.

2. Remove the air-bag module.

Caution !
When storing air-bag module, keep the pad surface facing upward.

2. Check Air-bag SRSCM



1. Remove clock spring connector.
2. Connect dummy-terminal to harness side of the inflator connector with SRS harness checker.
3. Connect negative (-) terminal cable to battery, and wait at least 5 seconds.
4. Connect the SCAN TOOL terminal, and turn ignition switch ON

LIMIT

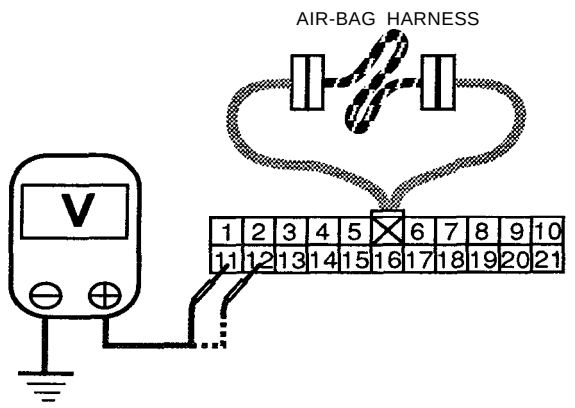
Diagnostic code 2 is not displayed

NOTE
Code other than code 2 may be displayed at this time, but this is not relevant to this check.

OK→ 4

NG→ 3

3. Check inflator circuit



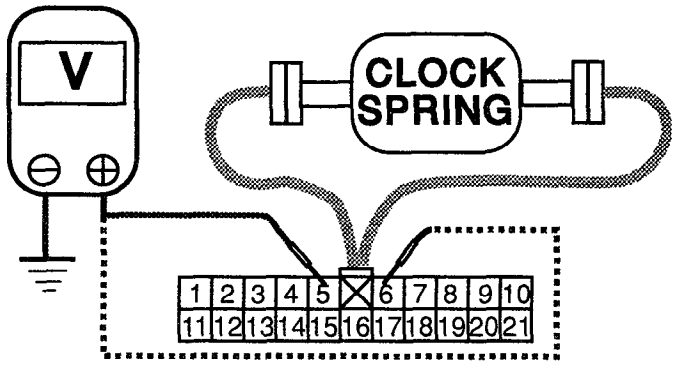
1. Turn ignition switch to lock, and disconnect the negative (-) terminal cable from the battery and wait at least 30 seconds.
2. Disconnect SRSCM harness connector and clock spring.
3. Connect SRS harness checker to the SRSCM harness connector and clock spring harness side connector.
4. Connect battery and turn ignition "ON"
5. Check voltage between terminals 1, 2 and body ground.

LIMIT 0V

OK → Replace SRSCM

NG → Replace Air-bag harness

4. Check Clock Spring



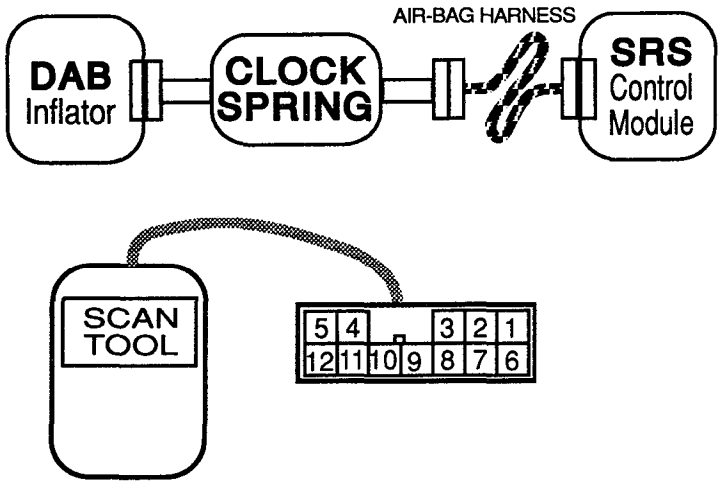
1. Disconnect DAB and clock spring connector and SRSCM connector.
2. Connect the SRS harness checker to the clock spring connector
3. Connect battery and turn ignition "ON".
4. Check voltage between terminals 5, 6 and body ground.

LIMIT 0V

OK → 5

NG → Replace clock spring

5. Check Inflator



1. Turn ignition switch to lock, and disconnect the negative (-) terminal cable from battery and wait at least 30 seconds.
2. Connect inflator connector
3. Connect negative (-) terminal cable to battery and wait at least 5 seconds
4. Connect the SCAN TOOL terminal, and turn ignition switch ON

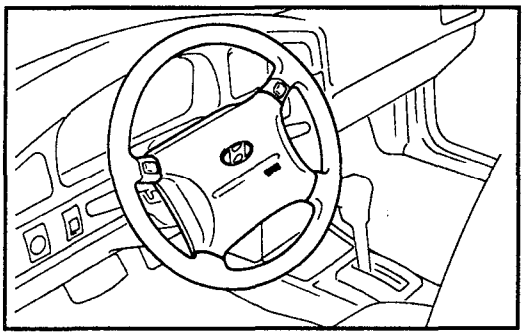
LIMIT

Diagnostic code 2 is not displayed

NOTE
Code other than code 2 may be displayed at this time, but this is not relevant to this check

OK → Connect all system and recheck	**NG** → Replace DAB

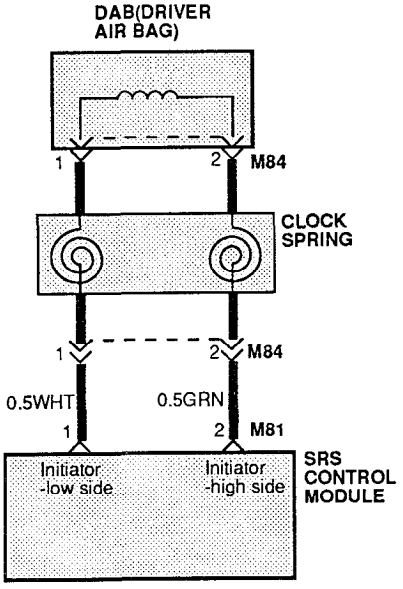
DRIVER AIR-BAG MODULE CIRCUIT (Resistance too high, Open circuit)



The Air-bag SRSCM shall measure the resistance of the DAB (Driver Air-Bag module) to detect a resistance which lies outside the allowed range. Do not attempt to measure the resistance of DAB.

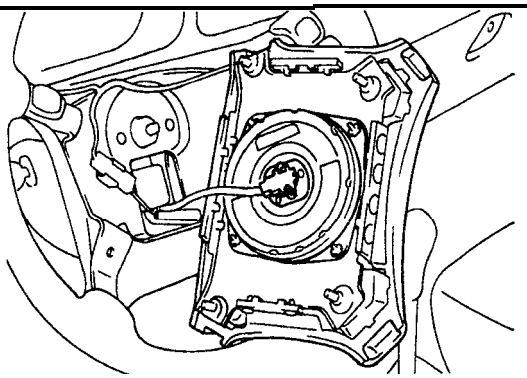
Code No.	Symptom	Trouble cause
3 (Active) 53 (History)	DAB (Driver Air-Bag module) circuit resistance too high, open circuit.	o Open circuit in DAB wire harness o Air-bag module malfunction (DAB) o Clock spring cable malfunction o SRSCM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1. Before inspection



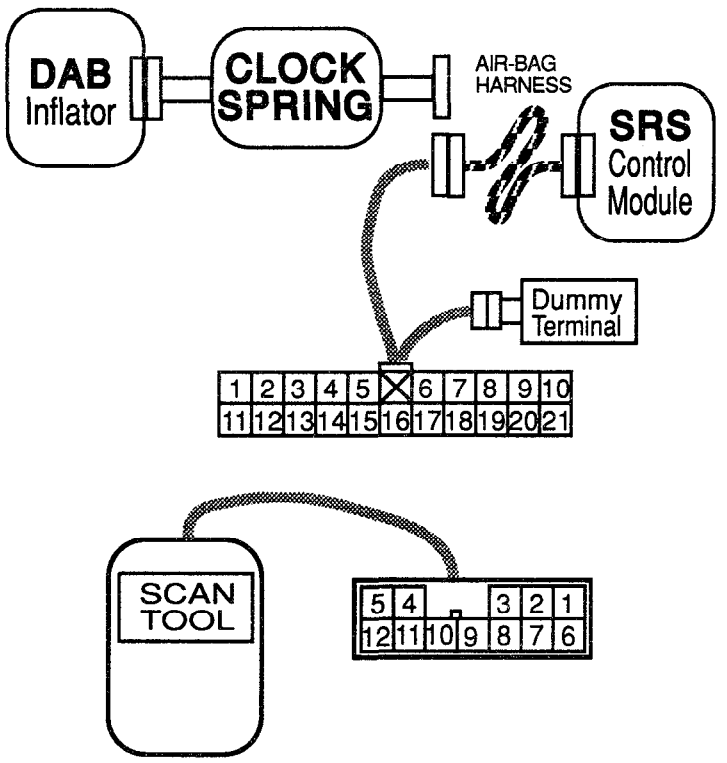
1. Disconnect battery negative (-) terminal cable

Caution !
Wait at least 30 seconds.

2. Remove the air-bag module.

Caution !
When storing air-bag module, keep the pad surface facing upward.

2. Check Air-bag SRSCM



1. Disconnect clock spring connector.
2. Connect dummy-terminal to the harness side of the inflator connector with SRS harness checker.
3. Connect negative (-) terminal cable to battery, and wait at least 5 seconds.
4. Connect the SCAN TOOL terminal, and turn ignition switch ON

LIMIT

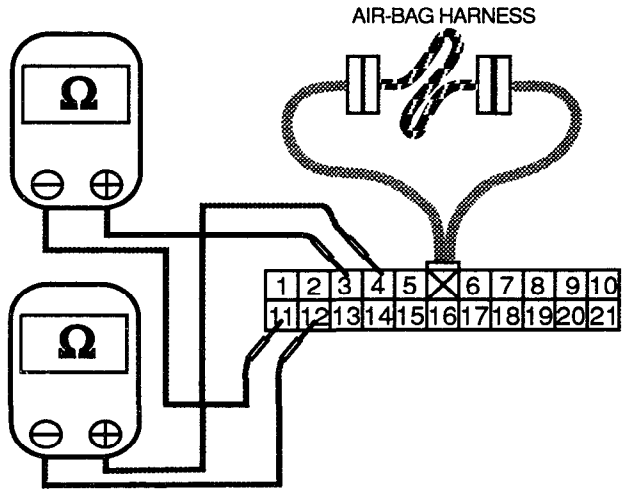
Diagnostic code 3 is not displayed

NOTE
Code other than code 3 may be displayed at this time, but this is not relevant to this check.

OK→ 4

NG→ 3

3. Check Inflator circuit



1. Disconnect SRSCM harness connector.
2. Connect the SRS harness checker to the clock spring harness side connector.
3. Check between checker terminals as follows.

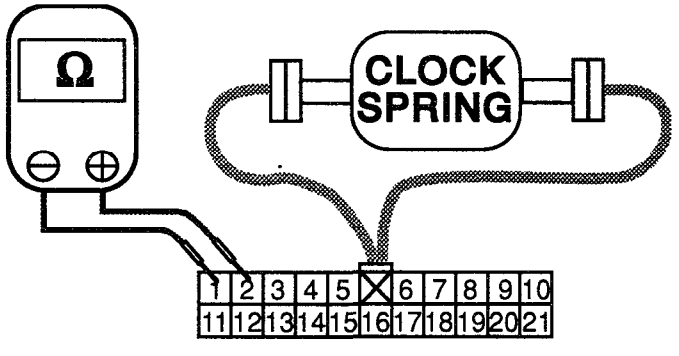
LIMIT

Terminals 3 and 11	Continuity
Terminals 4 and 12	Continuity

OK→ Replace SRSRSCM.

NG→ Replace Air-bag harness

4. Check Clock Spring



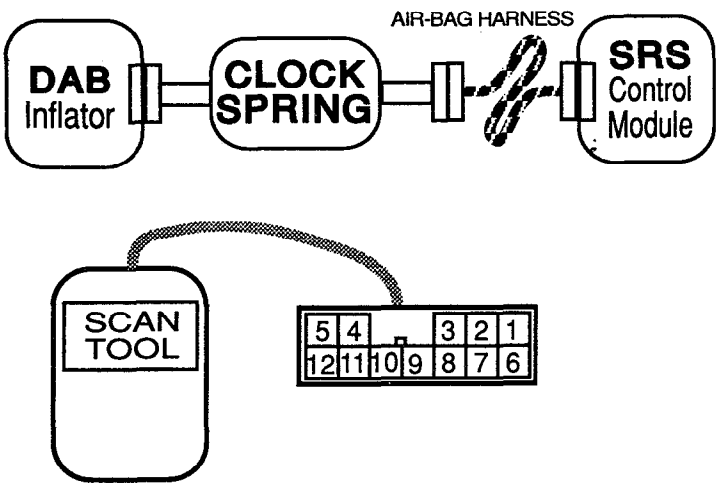
1. Remove the clock spring connectors.
2. Connect SRS harness checker to clock spring connector
3. Check continuity between checker terminal 1 and 2.

LIMIT Continuity

OK→ 5

NG→ Replace clock spring

5. Check Inflator



1. Turn ignition switch to lock, and disconnect the negative (-) terminal cable from battery and wait at least 30 seconds.
2. Connect inflator connector
3. Connect negative (-) terminal cable to battery and wait at least 5 seconds
4. Connect the scan tool terminal, and turn ignition switch ON

LIMIT

Diagnostic code 3 is not displayed

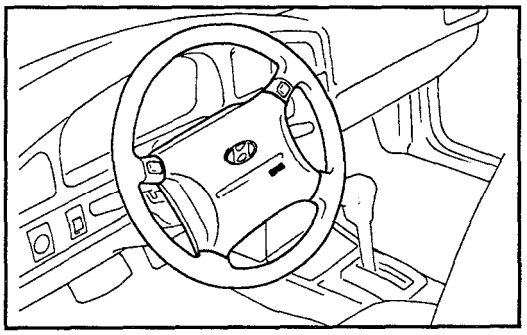
NOTE
Code other than code 3 may be displayed at this time, but this is not relevant to this check

OK → Connect all system and recheck

NG → Replace DAB.

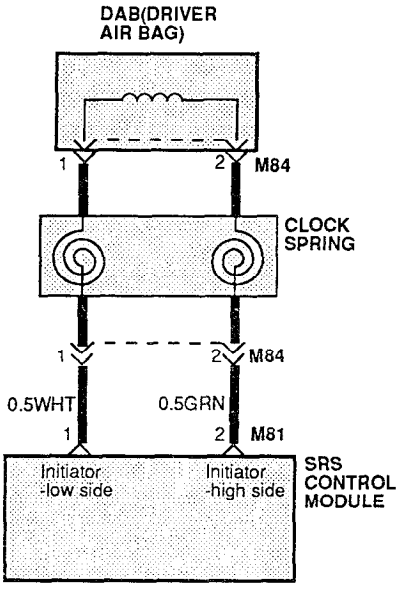
DRIVER AIR-BAG MODULE CIRCUIT (Resistance too Low, Short Circuit)

The Air-bag SRSCM shall measure the resistance of the DAB (Driver-Air-Bag module) to detect a resistance which lies outside the allowed range. Never attempt to measure the resistance of the DAB.



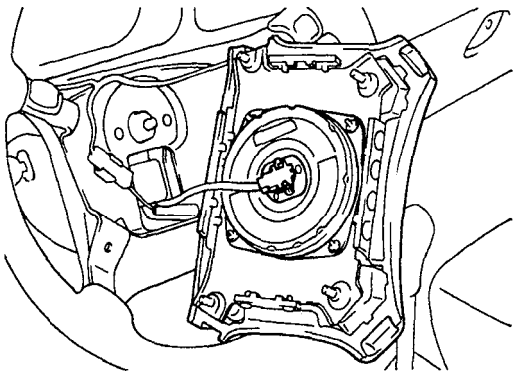
Code No.	Symptom	Trouble Area
5 (Active) 55 (History)	DAB (Driver Air-Bag module) circuit resistance too low, short circuit.	o Short circuit in DAB wire harness o Air-bag module malfunction (DAB) o Clock spring cable malfunction o SRSCM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1. Before inspection



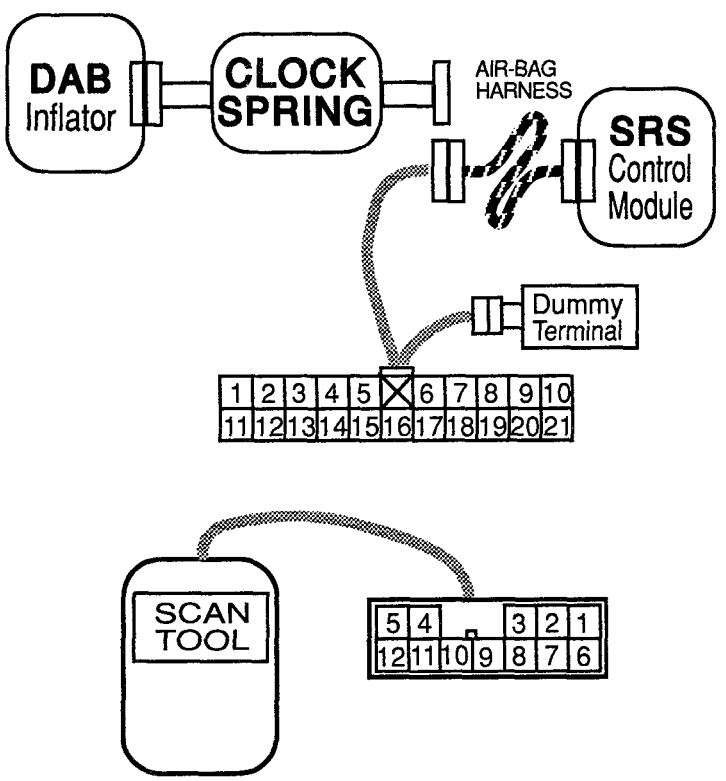
1. Disconnect battery negative (-) terminal cable

Caution !
Wait at least 30 seconds.

2. Remove the air-bag module.

Caution !
When storing air-bag module, keep the pad surface facing upward.

2. Check Air-bag SRSCM



1. Disconnect clock spring connector.
2. Connect dummy-terminal to harness side of the inflator connector with SRS harness checker.
3. Connect negative (-) terminal cable to battery, and wait at least 5 seconds.
4. Connect the SCAN TOOL terminal, and turn ignition switch ON.

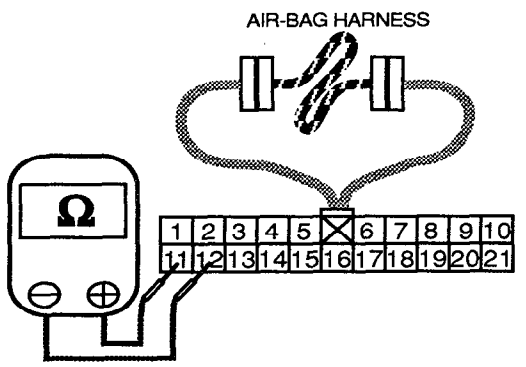
LIMIT

Diagnostic code 5 is not displayed

NOTE
Code other than code 5 may be displayed at this time, but this is not relevant to this check.

OK→ 4	NG→ 3

3. Check Inflator circuit (Driver)



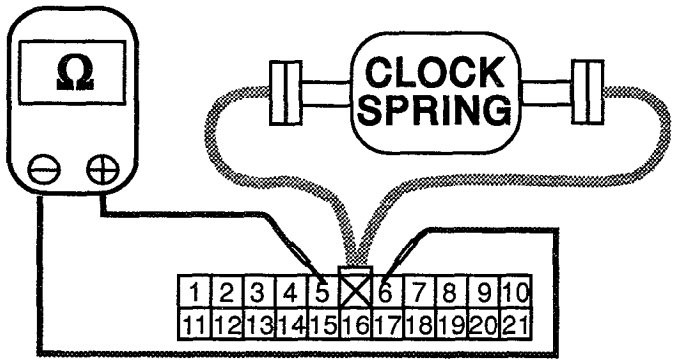
1. Disconnect SRSCM harness connector.
2. Connect the SRS harness checker to the SRSCM connector.
3. Check between checker terminal 11 and 12.

LIMIT No continuity

OK→ Replace SRSRSCM

NG→ Replace Air-bag harness

4. Check Clock Spring



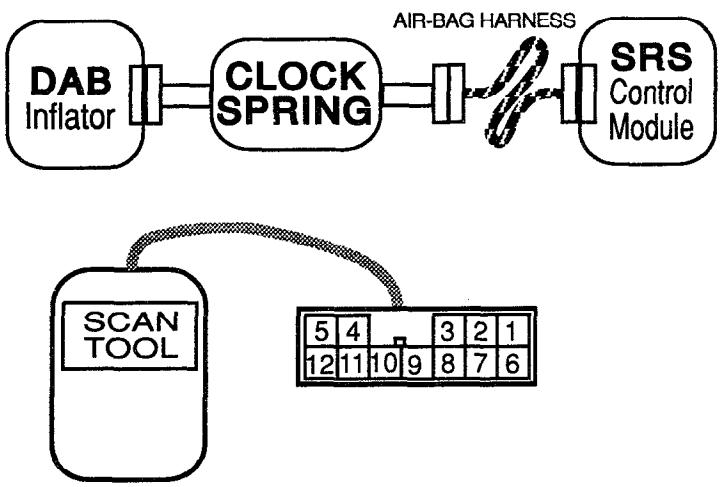
1. Remove the clock spring connectors.
2. Connect SRS harness checker to clock spring connector
3. Check continuity between checker terminal 5 and 6

LIMIT No continuity

OK→ 5

NG→ Replace clock spring.

5. Check Inflator



1. Turn ignition switch to lock, and disconnect the negative (-) terminal cable from the battery and wait at least 30 seconds.
2. Connect inflator connector.
3. Connect negative (-) terminal cable to battery and wait at least 5 seconds.
4. Connect the scan tool terminal, and turn ignition switch ON.

LIMIT

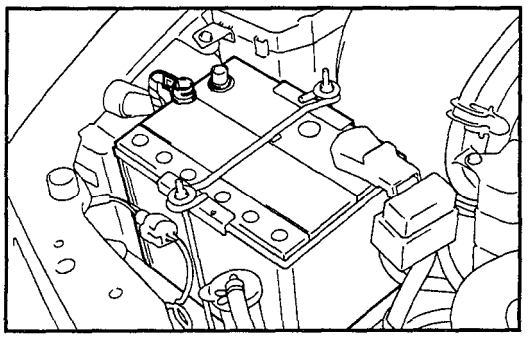
Diagnostic code 5 is not displayed

NOTE
Code other than code 5 may be displayed at this time, but this is not relevant to this check

OK→ Connect all system and recheck	**NG→** Replace DAB

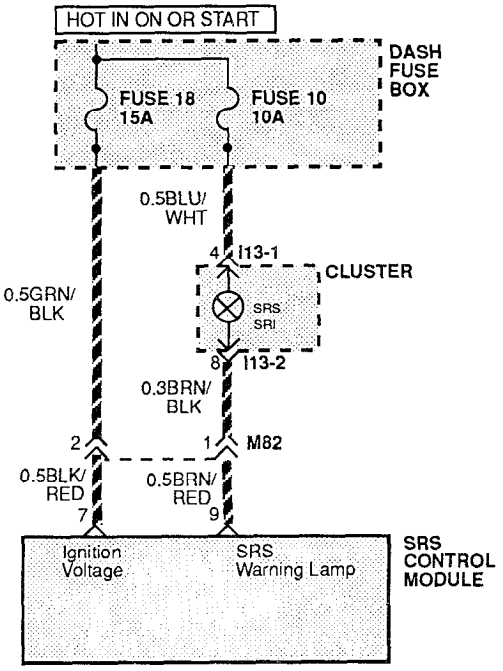
IGNITION POWER VOLTAGE CIRCUIT

The Air-bag SRSCM shall measure the voltage at the ignition input to detect an operating voltage which is out of the normal operating range.

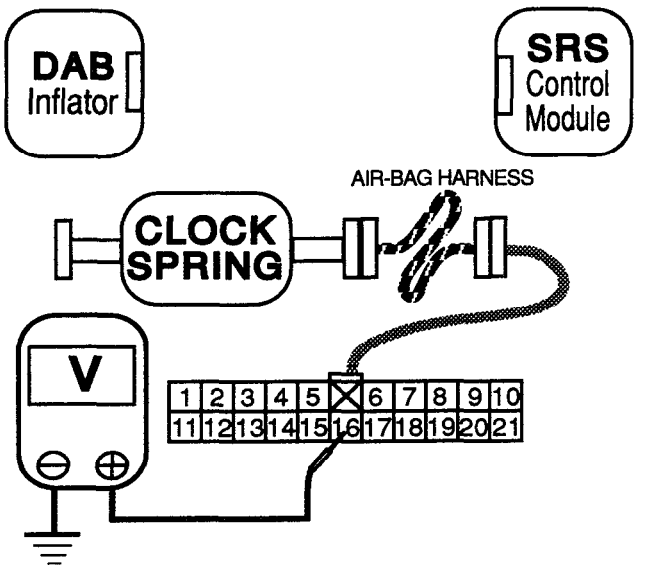


Code No.	Symptom	Trouble Area
7 (Active) 57 (History)	Ignition input voltage too low	o Fuse 15 in dash fuse box o Air-bag harness o Charging system
8 (Active) 58 (History)	Ignition input voltage too high	

WIRING DIAGRAM



1. Power source



1. Disconnect battery negative (-) terminal cable

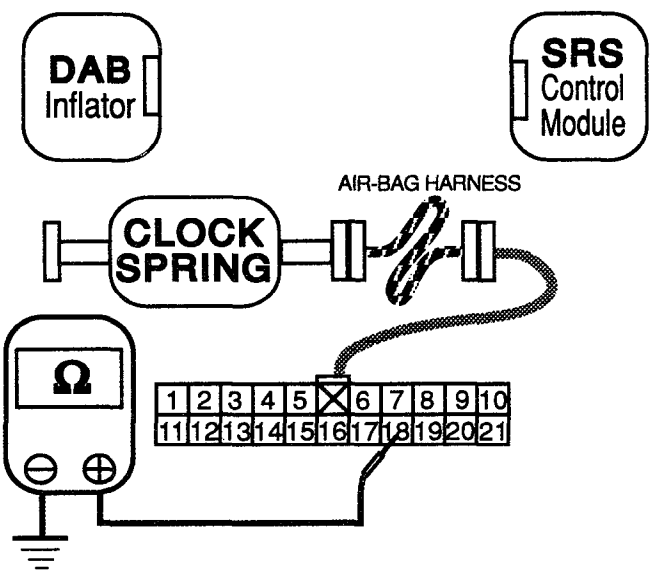
Caution !
Wait at least 30 seconds

2. Turn ignition switch to LOCK.
3. Disconnect SRSCM connector.
4. Connect SRS harness checker to SRSCM connector and connect battery negative (-) terminal cable.
5. Turn ignition switch to ON (Engine stop).
6. Measure voltage between checker terminal 16 and body ground.

LIMIT 9.0 V to 16.0 V

OK→ 3 | **NG→ 2**

2. Ground connection

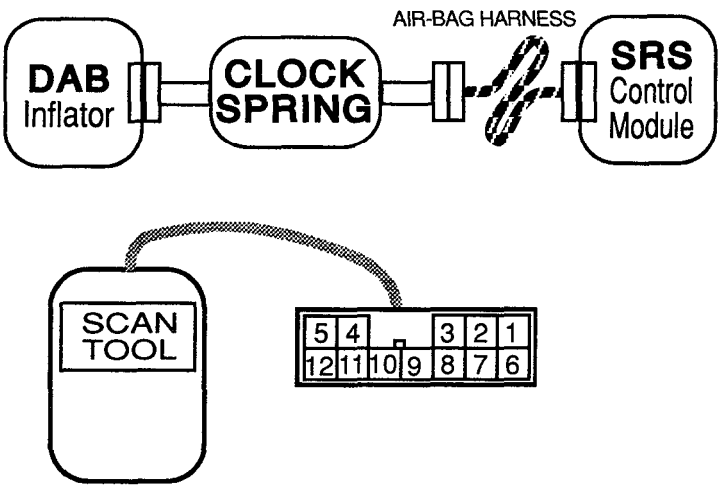


1. Turn ignition switch to LOCK.
2. Check continuity between SRS harness checker terminal 20 and body ground.

LIMIT Continuity

OK→ 3 | **NG→** Replace harness.

3. Check SCAN TOOL display



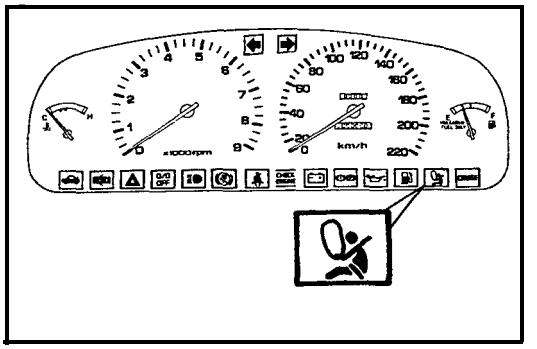
1. Remove battery negative (-) terminal cable.
2. Connect SRSCM connector.
3. Connect battery negative (-) terminal cable.
4. Turn ignition switch ON and wait at least 30 second, and check that the air bag SRS SRI goes off

LIMIT SRS SRI goes off

NOTE
If the fault disappears or is corrected between two ignition cycles (i.e. while the Air-bag SRSCM is off), the warning lamp shall remain on for 15 second after the bulb check in the sub sequent ignition cycle.

NG→ Check battery and charging system

Service Reminder Indicator (SRI) Circuit

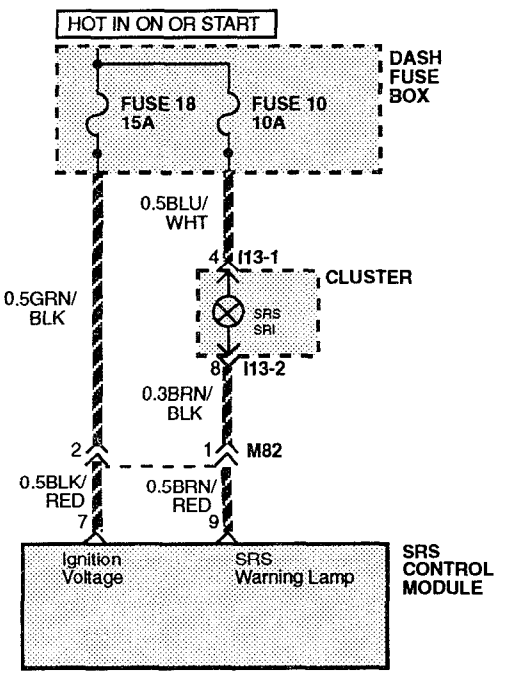


The SRI is located on the cluster.
When the air bag system is normal, the SRI flashes for approx. 6 seconds after the ignition switch is turned ON, and then turns off automatically.
If there is a malfunction in the air bag system, the SRI lights up to inform the driver of the abnormality.
The SRSCM shall measure the voltage at the air-bag SRI (Malfunction Indicator Light) output pin, both when the lamp is on and when the lamp is off, to detect whether the commanded state matches the actual state.

Diag. No.	Symptom	Trouble Area
13 (Active) 63 (History)	SRS SRI short to ground or to battery voltage, open circuit	o SRI circuit o SRSCM

SRI does not light up	GO TO 53
SRI light up permanently	GO TO 54

WIRING DIAGRAM

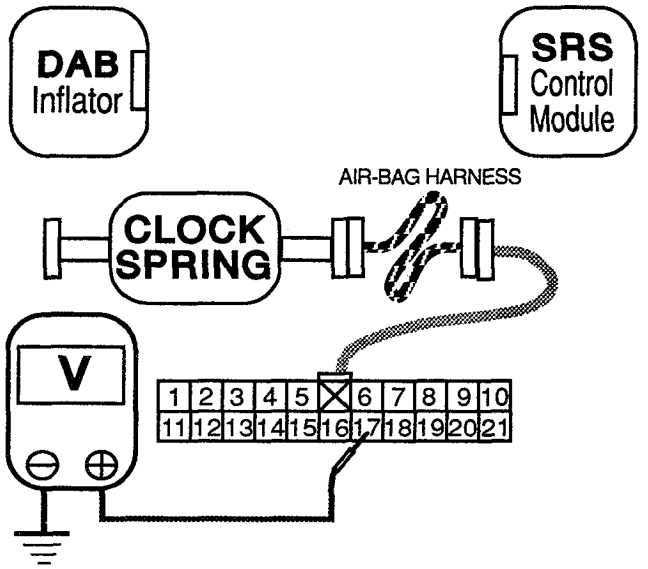


INSPECTION PROCEDURE (DOES NOT LIGHT UP)

1. Check Air-bag Fuse

	1. Remove fuse 1 and 18 located in dash fuse box 2. Check continuity of fuse 1 and 18. LIMIT Continuity
OK→ 2	NG→ Replace fuse

2. Check SRS SRI circuit

	1. Disconnect battery negative (-) terminal cable, and wait 30 seconds. 2. Remove the DAB connector. 3. Disconnect SRSCM connector and connect SRS harness checker to SRSCM connector. 4. Connect battery negative (-) terminal cable. 5. Measure voltage between Air bag checker terminals 17 and body ground. LIMIT 5.5V or higher
NG→ First check cluster connector If ok replace Air bag harness	OK→ Replace SRSCM

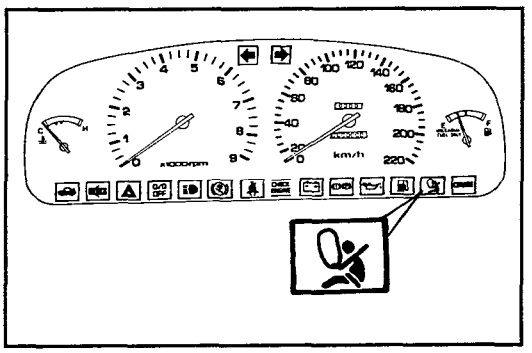
Inspection Procedure (Light up permanently)

NOTE

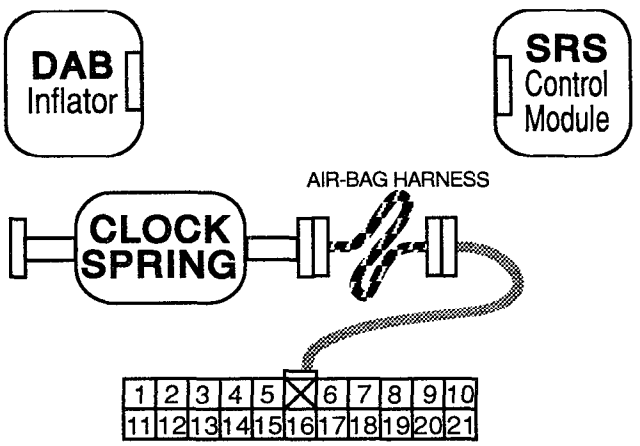
AIR-BAG SRSCM INDEPENDENT LAMP ACTIVATION

There are certain fault conditions in which the SRSCM cannot function and thus cannot control the operation of the lamp. In these cases, the lamp is directly activated by appropriate circuitry that operates independently of the SRSCM, as follows:

1. Loss of ignition voltage supply to the SRSCM: lamp turned on continuously
2. Loss of internal operating voltage: lamp turned on continuously.
3. Loss of SRSCM operation: lamp turned on continuously.
4. SRSCM not connected: lamp turned on through shorting bar in wiring harness connector.



1. Check Air-bag SRSCM connector



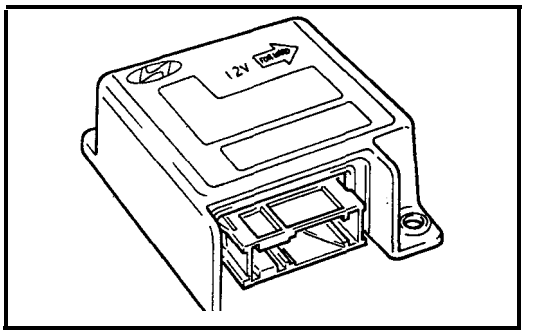
1. Turn ignition switch “ON” to “LOCK”.
2. Disconnect battery negative (-) terminal cable and wait at least 30 seconds.
3. Disconnect SRSCM connector and DAB connector
4. Connect Air bag checker connector to SRSCM harness side connector.
5. Connect battery negative (-) terminal cable
6. Turn ignition switch “ON”

LIMIT Does not light up

NG→ First check cluster and if good
Replace Air bag harness

OK→ Replace SRSCM.

SRSCM MALFUNCTION



The SRSCM shall also cyclically monitor the following:

a) Functional readiness of the firing circuit activation transistors (driver and passenger side)
b) Adequacy of deployment energy reserves (driver and passenger-side)
c) Safing sensor integrity: detection of faulty closure (longer than 4 seconds)
d) Plausibility of accelerometer signal
e) Operation of SRSCM components (A/D-converter, etc.)

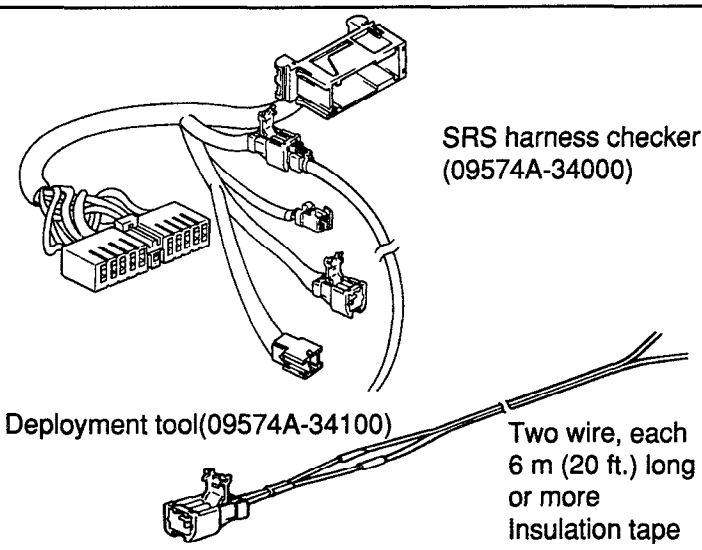
The timely completion of all tests is monitored by a separate hardware watchdog. During normal operation, the watchdog is triggered periodically by the SRSCM; if the SRSCM fails to trigger the watchdog, the watchdog will reset the SRSCM and activate the SRI (Service Reminder Indicator)

Diag. NO.	Symptom	Trouble area	
14 (Active) 64 (History)	Internal fault	SRSCM	Replace SRSCM
15 (Active) 65 (History)	Crash recorded	SRSCM	Replace SRSCM

AIR BAG MODULE DISPOSAL PROCEDURES

Before either disposing of a vehicle equipped with an air bag, or prior to disposing of the air bag module, be sure to first follow the procedures described below to deploy the air bag.

AIR BAG REMOTE DEPLOYMENT DEVICES

Tool, Number, Name	Use
	o Deployment inside the vehicle (when vehicle will not longer be driven)

DISPOSAL PLAN

When the problem occurs, take disposal steps as fallows.

CASE	DISPOSAL PLAN
Abnormal problems in air bag module	Return to HMC dealer
Car scrapping	Deploy the air bag module in the scrapper yard with SST
Crash (Deployed)	Service station disposes the Air-bag module

UNDEPLOYED AIR BAG MODULE DISPOSAL

Caution

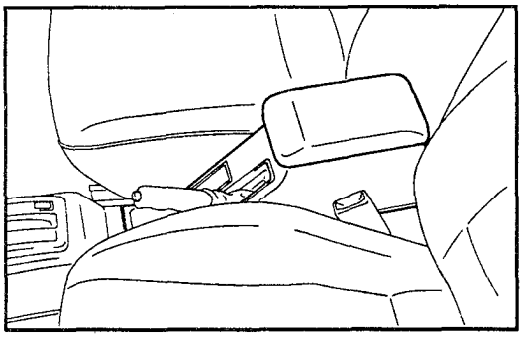
1. **If the vehicle is to be scrapped, junked, or otherwise disposed of, deploy the air bag inside the vehicle.**
2. **Since there is a loud noise when the air bag is deployed, avoid residential areas whenever possible. If anyone is nearby, give warning of the impending noise.**
3. **Since a large amount of smoke is produced when the air bag is deployed, select a well-ventilated site. Moreover, never attempt the test near a fire or smoke sensor.**

DEPLOYMENT INSIDE THE VEHICLE (when vehicle will no longer be driven)

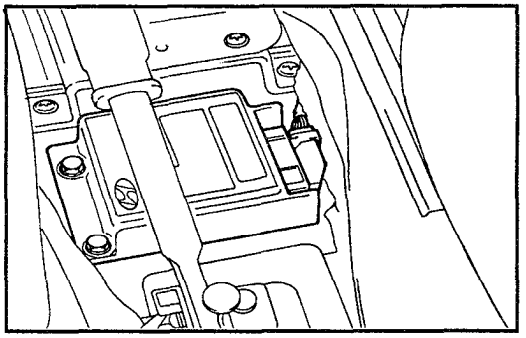
1. Open all windows and doors of the vehicle. Move the vehicle to an isolated spot.
2. Disconnect the negative (-) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle.

Caution
Wait at least 30 seconds after disconnecting the battery cable before doing any further work.

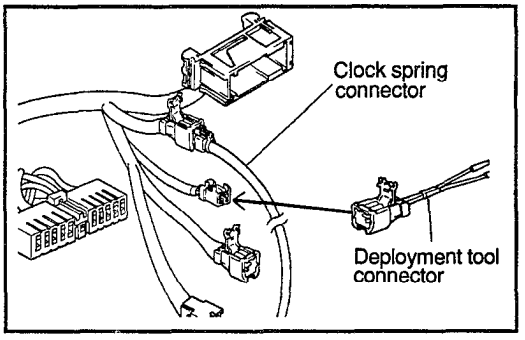
3. Remove the rear console assembly.



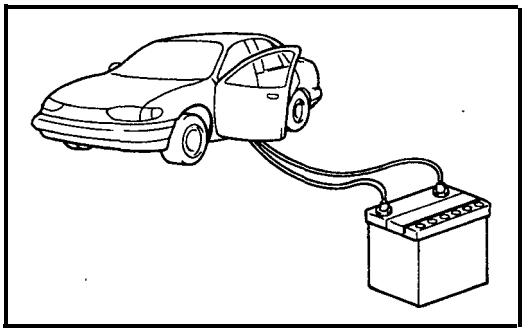
4. Remove SRSCM connector.
5. Connect SRS harness checker and deployment tool.



6. Connect the SRS harness checker to the battery (+) and (-) when the SRS harness checker is still disconnected, to prevent sudden unexpected deployment of the air bag.
   Connect the SRS harness checker to the SRSCM harness side connector.



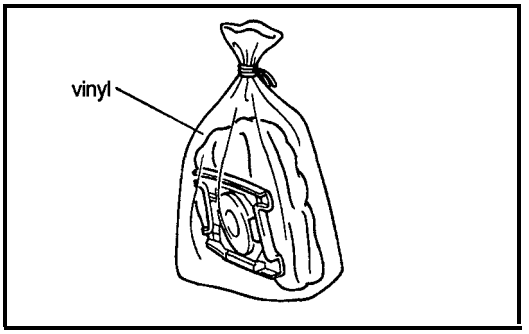
7. Connect the other end of the two connectors to the battery (+) and (-) terminals.
8. At a location as far away from the vehicle as possible, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (removed from the vehicle) to deploy the air bag.'



Caution

1. **Before deploying the air bag in this manner, first check to be sure that there is no one in or near the vehicle. Wear safety glasses.**
2. **The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it.**
   Although not poisonous, do not inhale gas from air bag deployment.
   See Deployed Air Bag Module Disposal Procedures for post-deployment handling instructions.

DEPLOYED AIR BAG MODULE DISPOSAL PROCEDURES



After deployment, the air bag module should be disposed of in the same manner as any other scrap parts, except that the following points should be carefully noted during disposal.

1. The inflator will be quite hot immediately following deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it.
2. Do not put water or oil on the air bag after deployment.
3. There may be, adhered to the deployed air bag module, material that could irritate the eyes and/or skin, so wear gloves and safety glasses when handling a deployed air bag module.
   IF DESPITE THESE PRECAUTIONS, THE MATERIAL DOES, GET INTO THE EYES OR ON THE SKIN, IMMEDIATELY RINSE THE AFFECTED AREA WITH A LARGE AMOUNT OF CLEAN WATER.
   IF ANY IRRITATION DEVELOPS, SEEK MEDICAL ATTENTION.
4. Tightly seal the air bag module in a strong vinyl bag for disposal.
5. Be sure to always wash your hands after completing this operation.

STEERING SYSTEM

Return To Main Table of Contents

GENERAL 2
STEERING COLUMN AND SHAFT 13
POWER STEERING GEARBOX 18
POWER STEERING OIL PUMP 31
POWER STEERING HOSES 36

GENERAL

SPECIFICATIONS

Power Steering	
Shaft and joint type	Collapsible, cross joints, tilt column with pop-up weight
Steering gear type	Rack and pinion
Rack stroke	136 ± 1 mm (lock to lock : 2.97 turns)
	124 ± 1 mm (lock to lock : 2.71 turns) [1.8 A/T only]
Oil pump type	Vane type
Oil pump displacement	9.6 cm^3/rev. (0.59 in^3/rev.)
Oil pump pressure switch operating pressure	1.5-2.0 MPa (1520 kg/cm^2, 213-284 psi)

SERVICE STANDARD

Power Steering	
Standard value	
Steering wheel free play	0-30 mm (0-1.1 in.)
Steering angle	
Inner wheel	$37^o83' \pm 1^o30'$
Outer wheel	32^o95
Difference between LH and RH	2^o *or less*
Stationary steering effort	37 N (3.8 kg, 8.3 lbs) or less
Belt deflection [under 98N (10 kg, 22 lb) force]	6-9 mm
Oil pump relief pressure	5.5-6.2 MPa (56-63 kg/cm^2, 782-881 psi)
Total pinion preload	0.6-1.3 Nm (6-13 kg.cm, 5.2-11.3 lb.in.)
Tie rod swing resistance	2-5 Nm (20-50 kg.cm, 1.4-3.6 lb.ft)

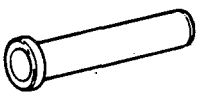
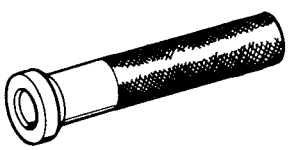
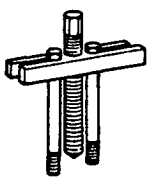
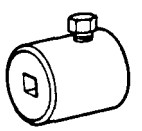
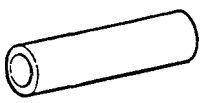
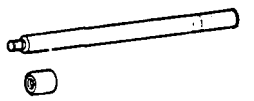
TIGHTENING TORQUE

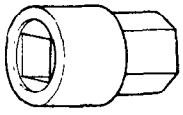
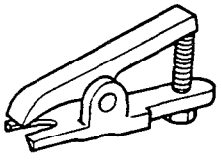
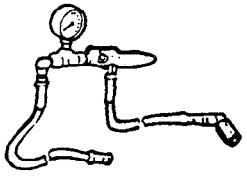
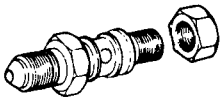
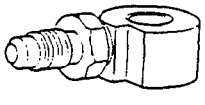
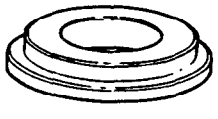
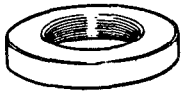
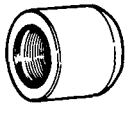
	Nm	kg.cm	lb.ft
Steering wheel and shaft	35-45	350-450	26-33
Steering column and shaft assembly mounting bracket	9-14	90-140	6.6-10
Steering shaft and joint	15-20	150-200	11-15
Dust cover mounting bolt	4-6	40-60	3-4
Gear box mounting clamp	60-80	600-800	44-59
Tie rod end lock nut	34-50	340-500	25-37
Tie rod end ball joint slotted nut	15-34	150-340	11-25
Yoke rod to rack	50-70	500-700	37-52
Tie rod to rack	80-100	800-1000	59-74
Valve body housing to rack housing assembly	17-26	170-260	13-19
Pressure and return tube to gear box	12-18	120-180	9-13
Pinion and valve assembly to self-locking nut	20-30	200-300	15-22
End plug	50-70	500-700	37-52
Feed tube	12-18	120-180	9-13
Oil pump mounting bracket bolt	45-55	450-550	33-41
Oil pump bracket to engine	25-33	250-330	18-24
Pressure hose to oil pump	14-21	140-210	10-15
Pressure hose to body	9-14	90-140	6.6-10
Oil reservoir mounting bolt	9-14	90-140	6.6-10
Oil pump suction connector to pump body	14-18	140-180	10-13

LUBRICANTS

	Recommended lubricant	Quantity
Teeth of rack and pinion	Multipurpose grease SAE J310, NLGI No.2	As required
Moving parts of rack and bushings	Multipurpose grease SAE J310, NLGI No.2	As required
Moving parts of pinion and needle bearing	Multipurpose grease SAE J310, NLGI No.2	As required
Lip of gear box oil seal	Multipurpose grease SAE J310, NLGI No.2	As required
Tie rod side groove of bellows	Silicone grease	As required
Inside surface and lip of tie rod end dust cover	Multipurpose grease SAE J310, NLGI No.2	As required
Power steering fluid	ATF DEXRON®II type	0.9 liter (0.95 qts.)

SPECIAL TOOLS

Tool (Number and name)	Illustration	Use
09517-21400 Drift		Removal of pinion gear bearing.
09222-21100 Valve stem oil seal installer		Installation of the pinion gear bearing.
09432-21600 Bearing installer		Installation of the pinion gear bearing.
09434-14200 Counter shaft bearing installer		Installation of the valve housing oil seal.
09561-11002 Steering wheel puller		Removal of the steering wheel.
09565-11100 Pre-load socket		Measurement of the mainshaft pre-load.
09565-21000 Pinion bearing remover and installer		Removal & installation of pinion gear bearing.
09555-21000 Bar		Removal & installation of the oil seal.

Tool (Number and name)	Illustration	Use
09565-21100 Yoke plug torque wrench socket		Removal, installation and adjustment of steering gear yoke plug.
09568-31000 Tie rod end puller		Separation of the tie rod end ball joint.
09572-21000 Oil pressure gauge		Measurement of the oil pressure. (use with 09572-33100, 09572-21200, 09572-32100)
09572-21200 Oil pressure gauge adapter		Measurement of the oil pressure. (use with 09572-21000, 09572-33100)
09572-33100 Oil pressure gauge adapter		Measurement of the oil pressure. (use with 09572-21000, 09572-21200)
09573-21000 Oil seal installer guide		Installation of the back-up washer and oil seal. (use with 09573-21100, 09573-21200, 09517-11000, 09555-21000)
09573-21100 Oil seal installer		Installation of the back-up washer and oil seal. (use with 09573-21000, 09573-21200, 09555-21000)
09573-21200 Oil seal guide		Removal & installation of the oil seal. (use with 09573-21000, 09573-21100, 09555-21000)

TROUBLESHOOTING

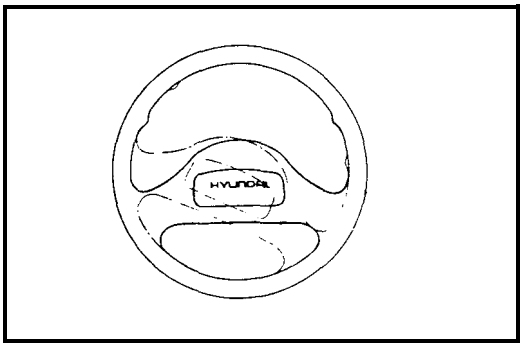
Symptom	Probable cause	Remedy
Excessive play of steering wheel	Loose rack support cover	Retighten
	Loose steering gear mounting bolts	Retighten
	Loose or worn tie-rod end	Retighten or replace as necessary
Steering wheel operation is heavy (Insufficient power assist)	V-belt slippage	Check
	Damaged V-belt	Replace
	Low fluid level	Replenish
	Air in the fluid	Bleed air
	Twisted or damaged hoses	Correct the routing or replace
	Insufficient oil pump pressure	Repair or replace the oil pump
	Sticky flow control valve	Replace
	Excessive internal oil pump leakage	Replace damaged parts
	Excessive oil leaks from rack and pinion in gear box	Replace damaged parts
	Distorted or damaged gear box or valve body seal ring	Replace
The steering wheel does not return properly	Excessive turning resistance of tie-rod end	Replace
	Excessively tightened rack support cover	Adjust
	Rough turning or inner tie-rod and/or ball joint	Replace
	Loose mounting of gear box to gear box mounting bracket	Retighten
	Worn steering shaft joint and/or body grommet	Correct or replace
	Distorted rack	Replace
	Damaged pinion bearing	Replace
	Twisted or damaged hoses	Reroute or replace
	Damaged oil pressure control valve	Replace
	Damaged oil pump input shaft bearing	Replace
Noise	**Hissing Noise in Steering Gear** There is some noise in all power steering systems. One of the most common is a hissing sound when the steering wheel is turned and the car is not moving. This noise will be most evident when turning the wheel while the brakes are applied. There is no relationship between this noise and steering performance. Do not replace the valve unless the “hissing” noise is extremely objectionable. A replacement valve will also have a slight noise, and is not always a cure for the condition.	

Symptom	Probable cause	Remedy
Rattling or chucking noise in rack and pinion	Interference with hoses from vehicle body Loose gear box bracket Loose tie-rod end and/or ball joint Worn tie-rod end and/or ball joint	Reroute Retighten Retighten Replace
Noise in the oil pump	Low fluid level Air in the fluid Loose pump mounting bolts	Replenish Bleed air Retighten

NOTE
A slight "grinding noise" may be heard immediately after the engine is started in extremely cold whether condition (below -20°C): This is due to power steering fluid characteristics in extreme cold conditions and is not a malfunction.

SERVICE ADJUSTMENT PROCEDURE

Checking Steering Wheel Free Play

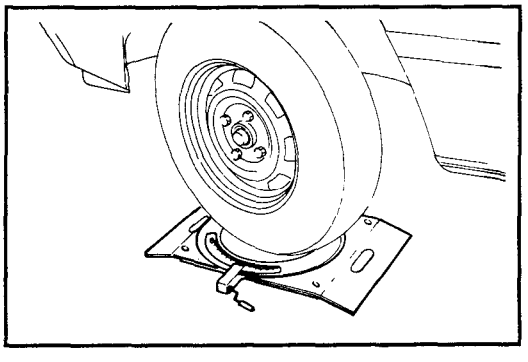


1. Start the engine and with the steering wheel in the straight ahead position, apply a force of 5 N (1.1 lb) while turning the steering wheel.
2. Measure the play at the circumference of the steering wheel.

Steering wheel free play [Standard value] .....
0-30 mm (0-1.1 in.)

3. If the play exceeds the standard value, inspect the contact of the steering shaft and tie rod ends.

Checking Steering Angle

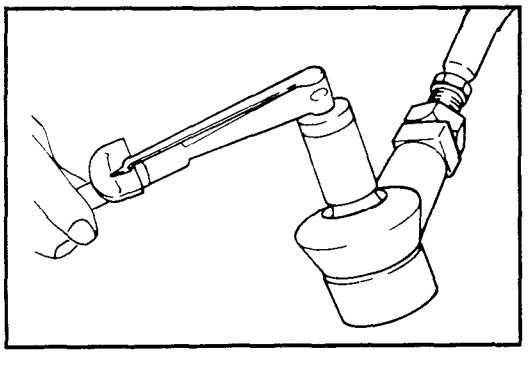


1. Place the front wheel on a turning radius gauge and measure the steering angle.

Wheel angle [Standard value]
Inner wheel ..... $37^{o}83' \pm 1^{o}30$
Outer wheel ..... $32^{o}95'$

2. If the measured value is not within the standard value, adjust the linkage.

Checking Tie Rod End Ball Joint Starting Torque



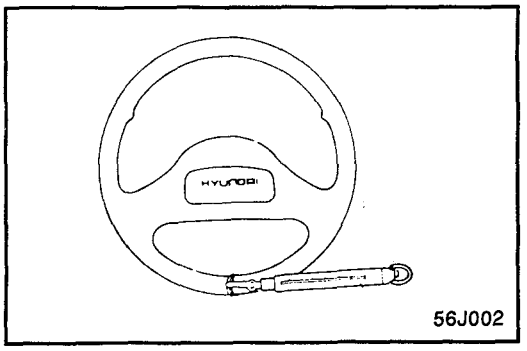
1. Mount two nuts on the ball joint, and then measure the starting torque.

Tie rod end ball joint starting torque
[Standard value] .....
0.5-2.5 Nm (5-25 kg.cm, 4-22 lb.in.)

2. If the starting torque exceeds the standard value, replace the tie rod end.

NOTE
Even if the starting torque is below limit of the standard value, the ball joint may be reused unless it has drag or excessive play.

Checking Stationary Steering Effort



1. Place the vehicle on a level surface and place the steering wheel in the straight ahead position.
2. Increase the engine speed to 1,000 rpm

   NOTE:
   After checking, reset the engine speed to the standard value (idling speed).

3. Measure the turning force with a spring scale by turning the steering wheel clockwise and count clockwise one and a half turns.

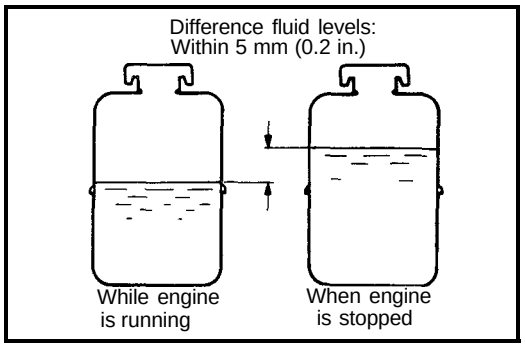
Stationary steering effort [Standard value]	37 N (3.8 kg, 8.3 lbs) or less

4. Check that there is no excessive force change while turning the steering wheel.
5. If the stationary steering effort is excessive, check and adjust the following points:
   1) Damage or cracks of the dust covers of the lower arm ball joint and tie rod end.
   2) Pinion preload of the steering gear box and turning starting torque of the tie rod end ball joint.
   3) Turning starting torque of the lower arm ball joint.

Checking Steering Wheel Return

Check the steering wheel return and confirm the following points:
1. The force required to turn the steering wheel and the wheel return should be the same for both moderate and sharp turns.
2. When the steering wheel is turned 90^{o} and held for a couple of seconds while the vehicle is being driven at 35 km/h (22 mph), the steering wheel should return at least 70% when it is released.

Checking Power Steering Fluid Level



1. Position the vehicle on a level surface.
2. Start the engine. With the vehicle kept stationary, turn the steering wheel several times continuously to raise the fluid temperature from 50-60°C (122-140°F).
3. With the engine at idle, turn the steering wheel fully clockwise and counterclockwise several times.
4. Make sure there is no foaming or cloudiness in the reservoir fluid.
5. Stop the engine to check for a difference in fluid level between a stationary and a running engine.

NOTE

1) If the fluid level varies 5 mm (0.2 in.) or more, bleed the system again.

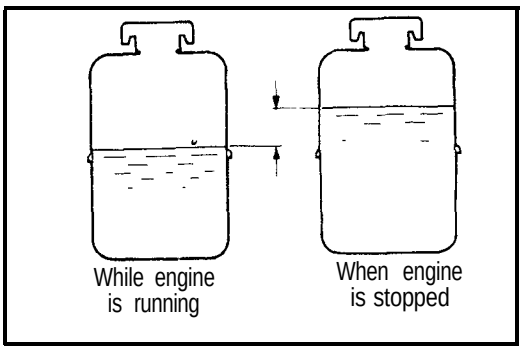
2) If the fluid level suddenly rises after stopping the engine, insufficient bleeding is indicated.

3) Incomplete bleeding will produce a chattering sound in the pump and a noise in the flow control valve, de creasing durability of the pump.

Replacing Power Steering Fluid

1. Jack up the front of the car and support with rigid racks.
2. Disconnect the return hose from the oil reservoir and plug the oil reservoir.
3. Connect a hose to the disconnected return hose, and drain the oil into a container.
4. Disconnect the high-tension cable at the ignition coil side. While operating the starter motor intermittently, turn the steering wheel all the way to the left and then to the right several times to drain the fluid.
5. Connect the return hoses, then fill the oil reservoir with the specified fluid.
6. Bleed the system.
   Automatic transmission fluid DEXRON®II type:
   Total quantity : Approx. 0.9 liter (0.95 qts.)

Air Bleeding



1. Disconnect the ignition coil high tension cable, and then, while operating the starter motor intermittently (for 15 to 20 seconds), turn the steering wheel all the way to the left and then to the right five or six times.

NOTE
1) During air bleeding, replenish the fluid supply so that the level does not fall below the lower position of the filter.
2) If air bleeding is done while the vehicle is idling, the air will be broken up and absorbed into the fluid. Be sure to do the bleeding only while cranking.

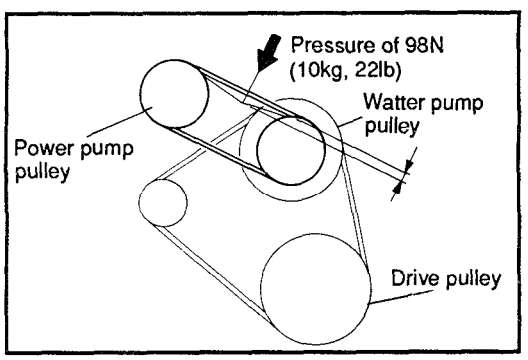
2. Connect the high tension cable, and then start the engine.
3. Turn the steering wheel to the left and then to the right. until there are no air bubbles in the oil reservoir.

NOTE
Do not hold the steering wheel turned all the way to either stop for longer than ten seconds.

4. Confirm that the fluid is not milky, and that the level is up to the specified position.
5. Check that there is little change in the fluid level when the steering wheel is turned left and right.

NOTE
1) If the level of the fluid changes considerably, air bleeding should be done again.
2) If the fluid level rises suddenly when the engine is stopped, it indicates that there is still air in the system.
3) If there is air in the system, a jingling noise may be heard from the pump and the control valve. Air in the system will shorten the life of the pump and other parts.

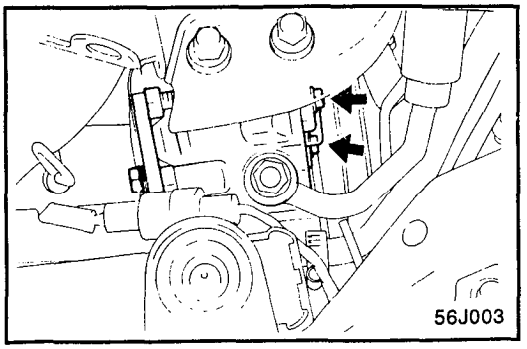
Checking Power Steering Belt Tension



1. Depress the V-belt by applying a pressure of 98 N (10 kg, 22 lb) at the specified point, and measure the deflection to confirm that it is within the standard value.

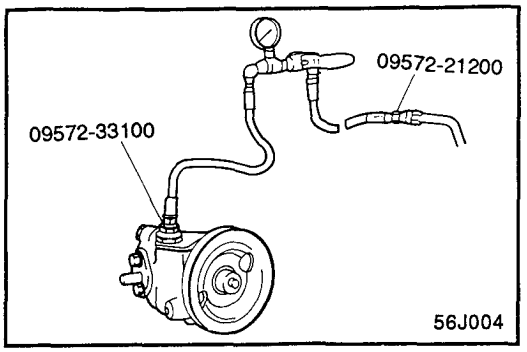
V-belt deflection [Standard value]	6-9 mm (0.24-0.35 in.)

2. To adjust the belt tension, loosen the oil pump mounting bolts, move the oil pump, and then retighten the bolts.



Oil Pump Pressure Test

1. Disconnect the pressure hose from the oil pump. Connect the special tool between the oil pump and pressure hose as illustrated.
2. Bleed the air, and then start the engine and turn the steering wheel several times so that the fluid temperature rises to approximately 50-60°C (122-140°F).
3. Increase the engine speed to 1,000 rpm.
4. Close the shut-off valve of the special tool and measure the fluid pressure to confirm that it is within the standard value range.



Oil pump pressure [Standard value]
Relief presssure .....
5.5-6.2 MPa (56-63 kg/cm^2, 782-881 psi)

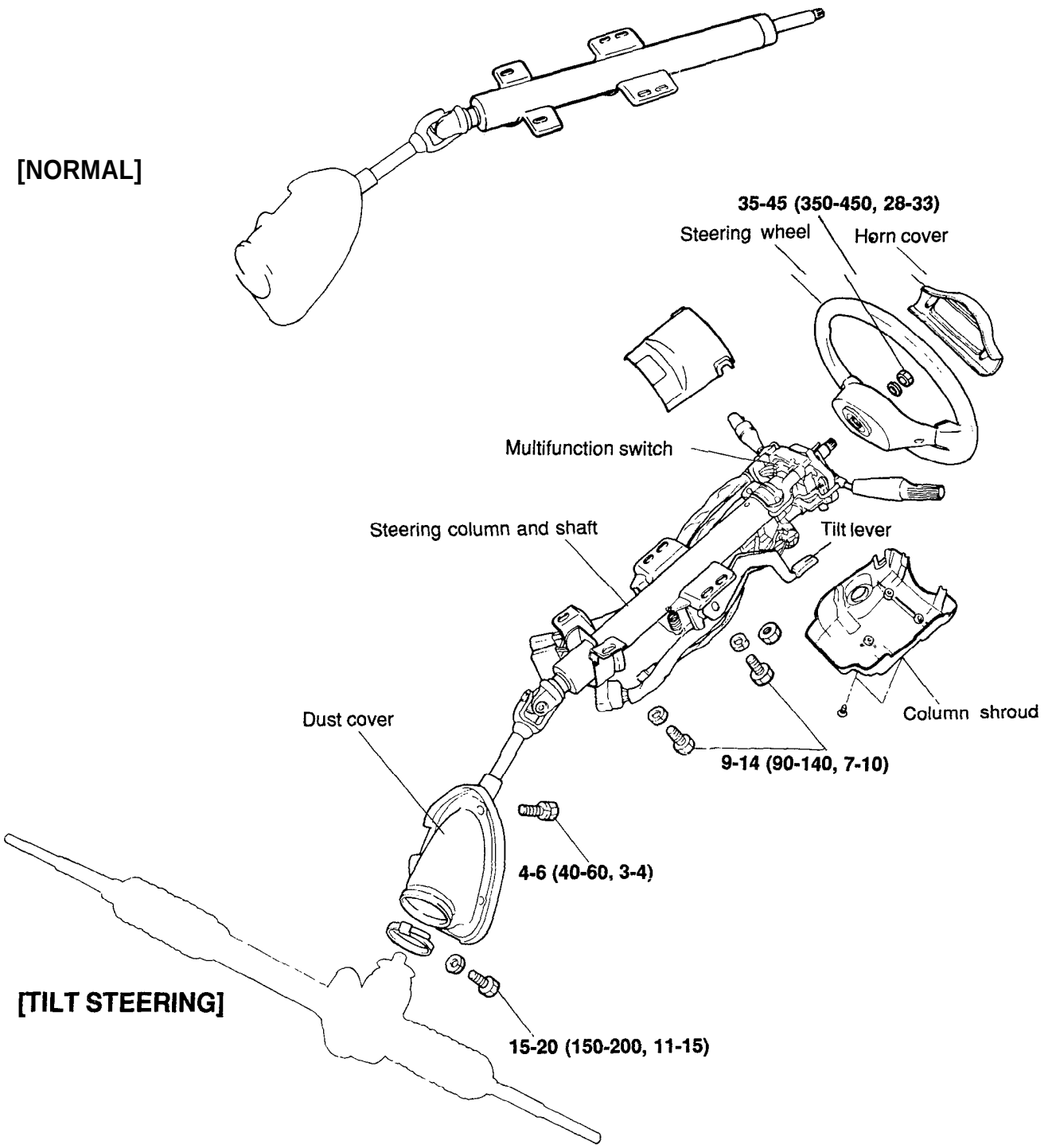
CAUTION
Do not keep the shut-off valve on the pressure gauge closed for more than ten seconds.

5. Remove the special tools, and tighten the pressure hose to the specified torque.

Tightening torque .....
14-21 Nm (140-210 kg.cm, 10-15 lb.ft)

6. Bleed the system.

STEERING COLUMN AND SHAFT

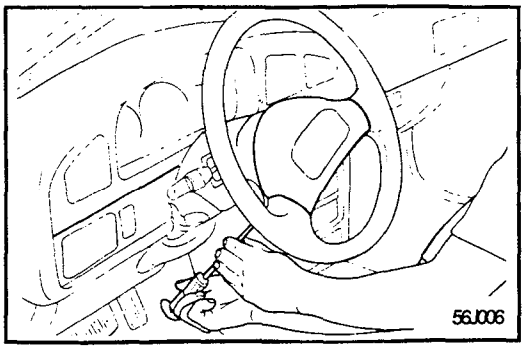


TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

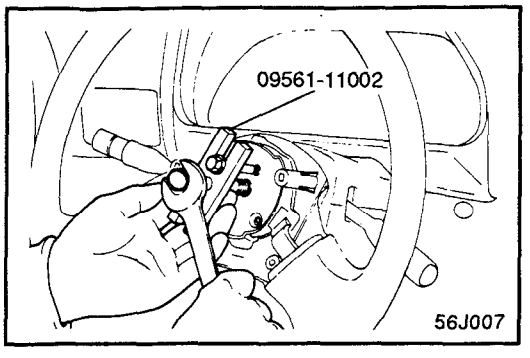
1. Remove the horn cover assembly.
2. Remove the upper and lower horn plate, and disconnect the horn button connector.

CAUTION
Before doing these procedures, see the SRS section (56A GROUP) for further information (SRS equipped vehicle only).

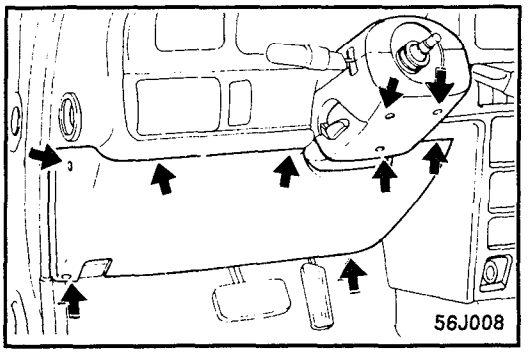


3. Remove the steering wheel lock nut.
4. After making alignment marks on the steering shaft and wheel, remove the steering wheel, using the special tool.

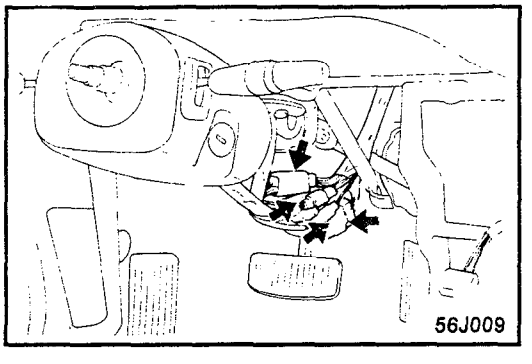
NOTE
Do not hammer on the steering wheel to remove it: doing so may damage the steering column.



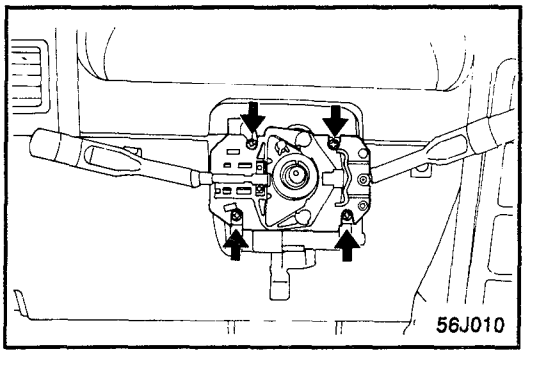
5. Remove the lower crash pad, and disconnect the rheostat connector.
6. Remove the column shroud.



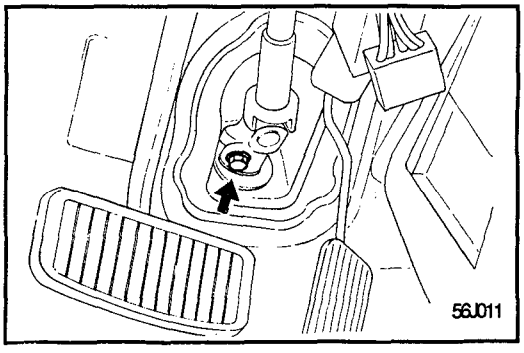
7. Disconnect the connectors.



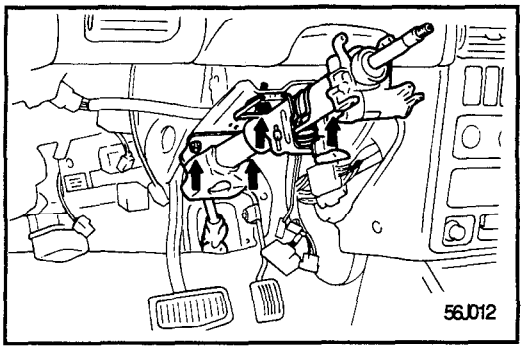
8. Remove the multifunction switch.



9. Remove the bolt coupling the universal joint and pinion.



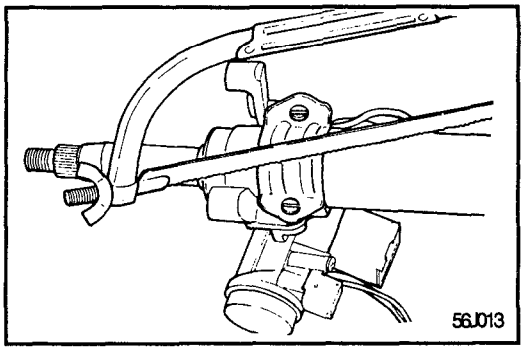
10. After removing the bolts used to secure the column bracket to the frame, remove the steering column and shaft assembly.



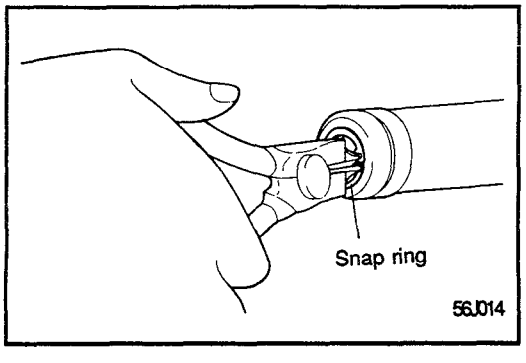
DISASSEMBLY

1. If necessary to remove the steering lock, cut a slot in the mounting screw heads and bracket with a hack saw. Loosen the screws with a flat-blade screwdriver to remove the steering wheel lock.

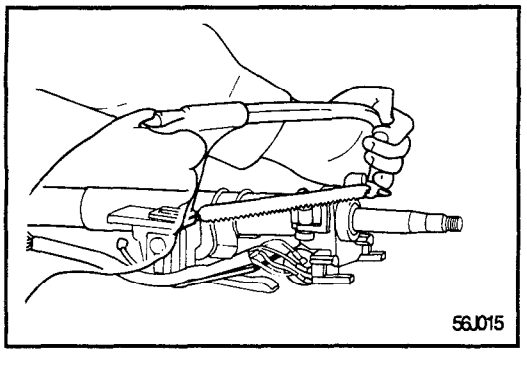
   CAUTION
   When the steering wheel lock is reinstalled, the steering wheel lock assembly and screws should be replaced with new parts.



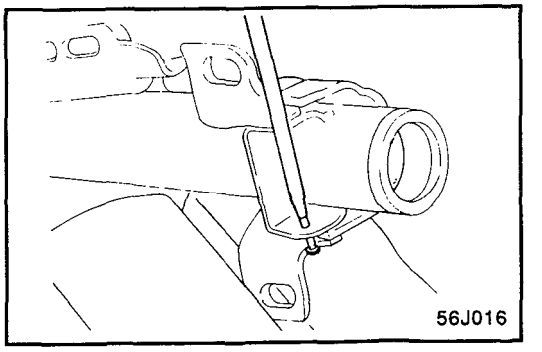
2. Remove the snap ring and remove the steering shaft downward.



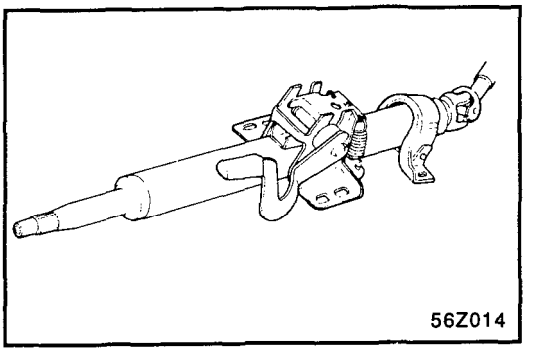
3. If it is necessary to remove the steering column brackets, use a hack-saw to cut a groove on the head of the special bolt, and then use screwdriver to remove the column brackets.



4. Remove the snap ring then tap out the clevis pin from the inner side. (Tilt steering only)



5. If necessary, remove the tilt steering lever and mounting bracket. (Tilt steering only)



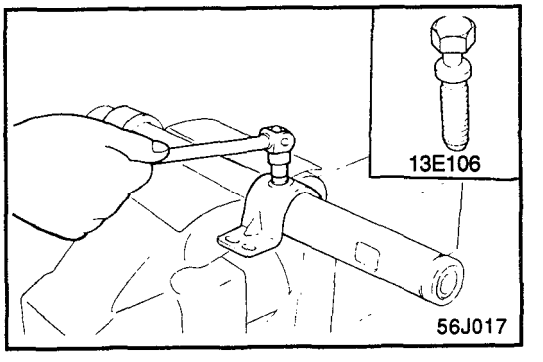
INSPECTION

1. Check the steering column and shaft for damage and distortion.
2. Check the joints for play, damage or rough movement.
3. Check the tilt bracket and spring for cracks and damage.
4. Check that the steering lock mechanism operates properly.
5. Check the dust cover for cracks or damage.
   If necessary, replace.

ASSEMBLY

1. When installing the steering column brackets, tighten the special bolt until the head twists off.

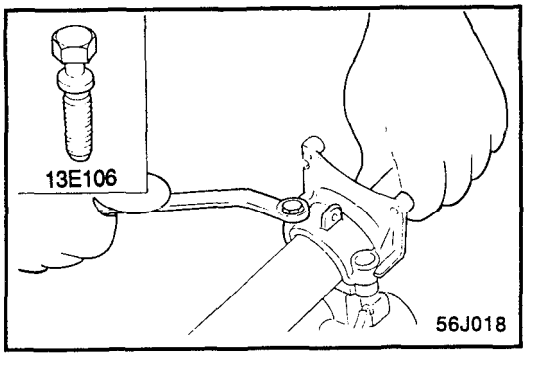
   CAUTION
   A new special screw must be used each time.



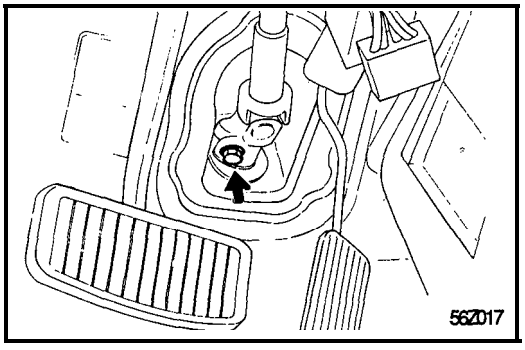
INSTALLATION

1. When installing the steering lock and steering lock bracket to the column tube, temporarily install the steering lock in alignment with the column boss.
2. After checking the lock works properly, tighten the special bolts until the head twists off.

   CAUTION
   The steering lock bracket and bolts must be replaced with new ones when the steering lock is installed.



3. Mount the steering column shaft to the mounting frame.



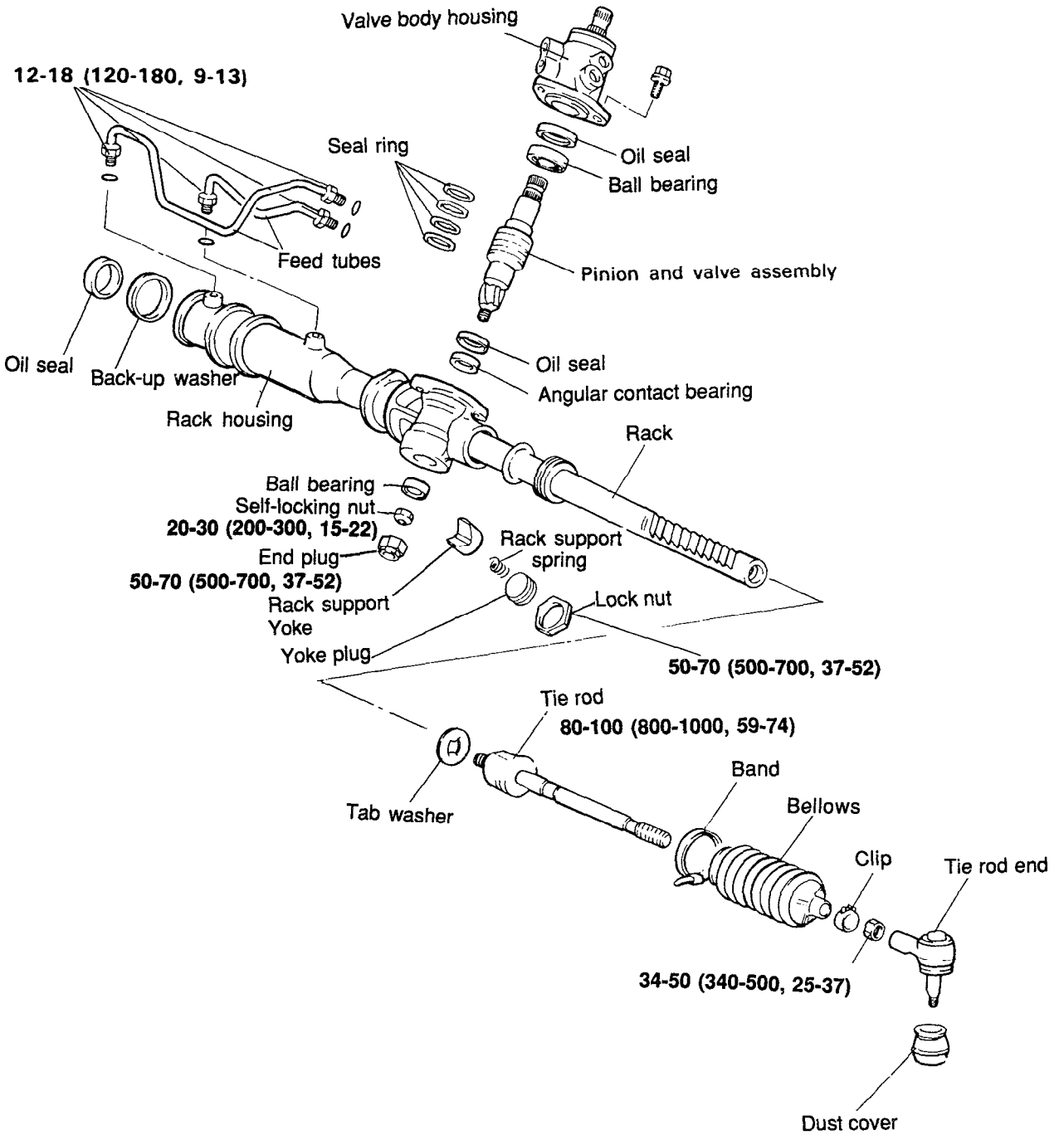
NOTE
When installing, be careful not to distort the steering column.

4. Install the multifunction switch and connect the connectors.
5. Install the column shroud.
6. Connect the rheostat connector and install the lower crash pad.
7. Install the steering wheel.

NOTE
When the steering is installed, make sure that the alignment marks are in alignment and that the steering wheel is in the straight ahead position.

POWER STEERING GEAR BOX

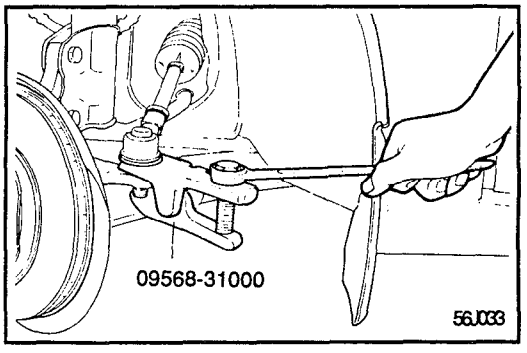
COMPONENTS



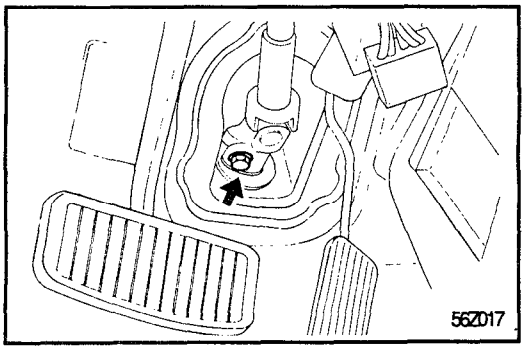
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

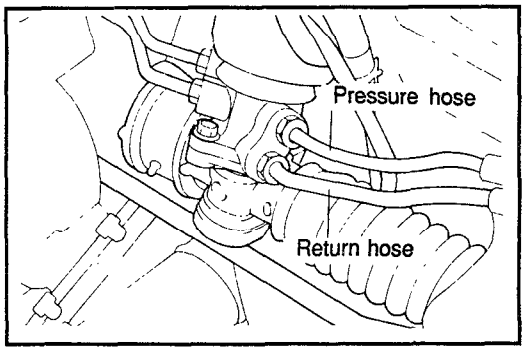
1. Using special tool, disconnect the tie rod end from the knuckle.



2. Disconnect the shaft assembly from the gear box inside the driver's seat compartment.

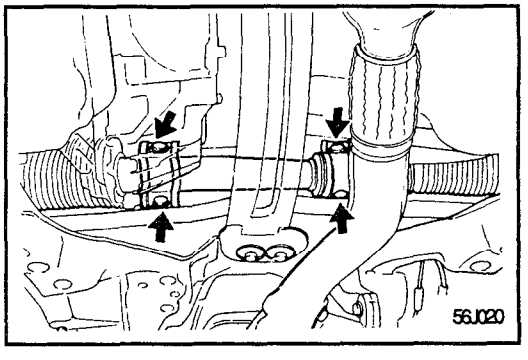


3. Drain the fluid.
4. Disconnect the pressure and return hoses from the gear box.
5. Remove the band from the steering joint cover.



6. Remove the gear box mounting bolts.
7. Pull the gear box out toward the right side of the vehicle.

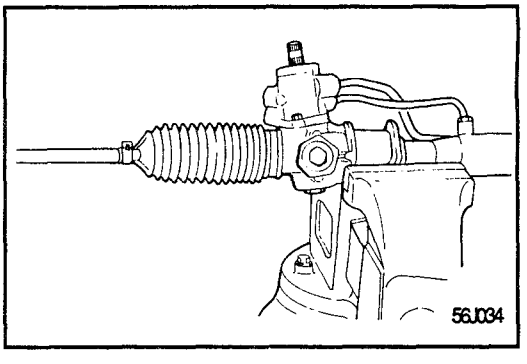
NOTE
When the gear box is to be removed, pull it out carefully and slowly so as not to cause damage to the boots.



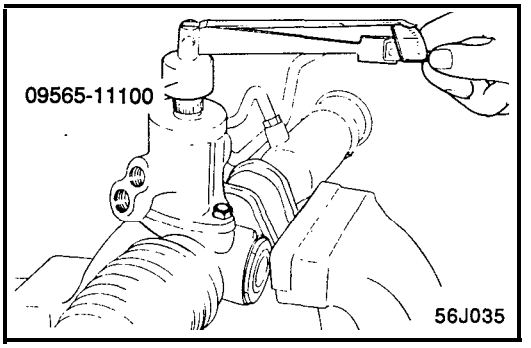
INSPECTION AND ADJUSTMENT PRIOR TO DISASSEMBLY

Mount the gear box in a soft jawed vise.

NOTE
Do not tighten the vise on the gear housing. Use the mounting section of the rack to secure it in the vise.



Total Pinion Preload



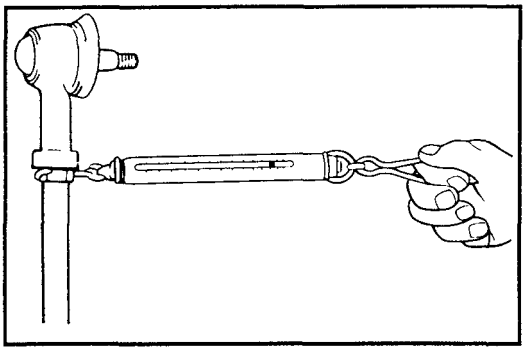
1. Rotate the pinion gear for approximately 4 to 6 seconds for one rotation to confirm the total pinion preload.

Total pinion preload [Standard value] . . . . . 0.6-1.3 Nm (6-13 kg.cm, 5.2-11.3 lb.in.)

NOTE
Measure the pinion preload through the entire stroke of the rack.

2. If the measured value is out of specifications, first adjust the yoke plug, then recheck the total pinion preload.
3. If the rack support cover adjustment does not obtain the total pinion preload, check or replace the rack support cover components.

Tie Rod Swing Resistance



1. Give 10 hard swings to the tie rod.
2. Measure the tie rod swing resistance with a spring scale.

Tie rod swing resistance [Standard value] ..... 8-22 N (1.9-4.6 lb) [2-5 Nm (20-50 kg.cm, 1.4-3.6 lb.in.)J

3. If the measured value exceeds the standard value, replace the tie rod assembly.

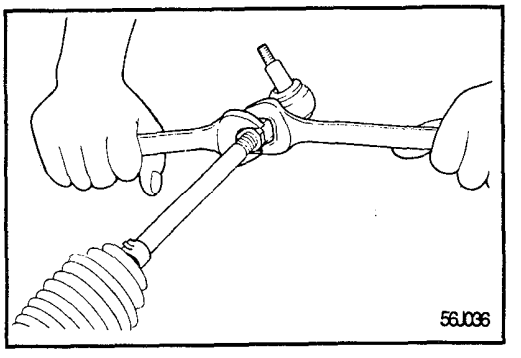
NOTE
Even if the measured value is below the standard value, a tie rod that swings smoothly without excessive play may be used. If the measured value is below 4.3 N (0.9 lb)[100 Ncm (8.7 lb.in.)], replace the tie rod.

Bellows Inspection

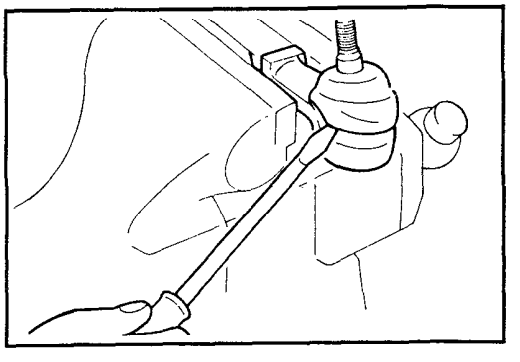
1. Inspect the bellows for damage or deterioration.
2. Make sure the bellows are secured in the correct position.
3. If the bellows are defective, replace them.

DISASSEMBLY

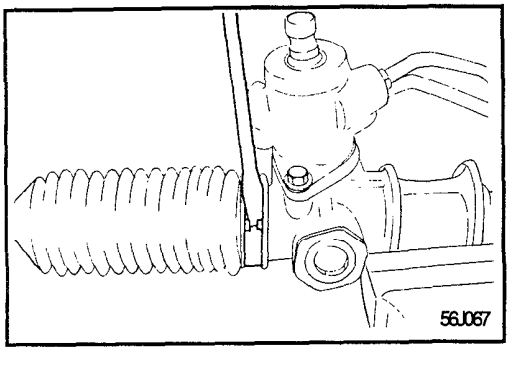
1. Remove the tie rod end from the tie rod.



2. Remove the dust cover from the ball joint.



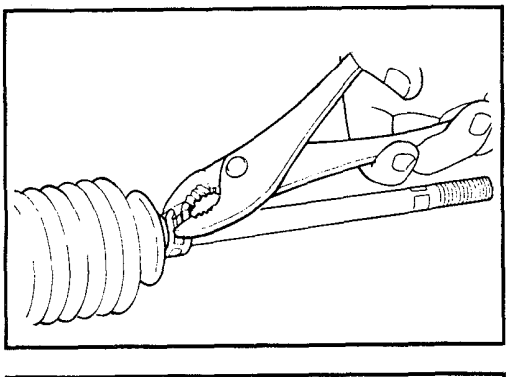
3. Remove the bellows band.



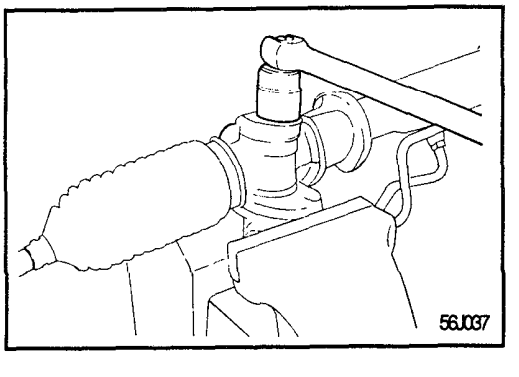
4. Remove the bellows clip.
5. Pull the bellows out toward the tie rod.

NOTE
Check for rust on the rack when the bellows are replaced.

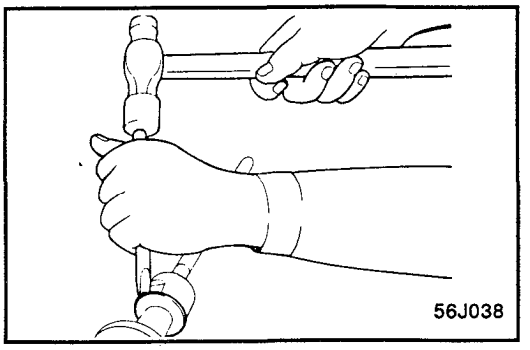
6. Remove the feed line from the gear housing.
7. While moving the rack slowly, drain the fluid from the gear housing.



8. Remove the end plug.
9. With the pinion turned clockwise until the rack is locked, remove the self-locking nut.

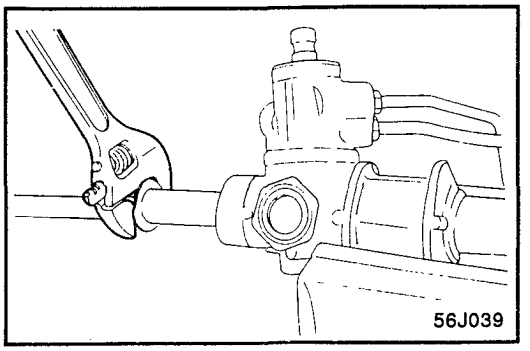


10. Unstake the tab washer between the tie rod and rack with a chisel.

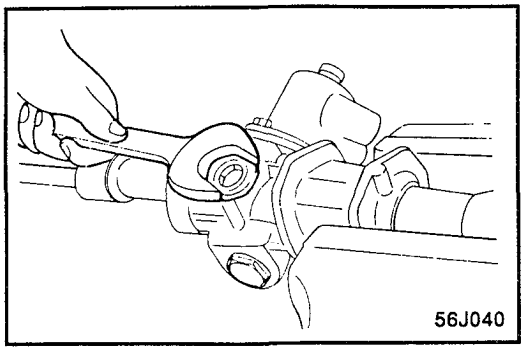


11. Remove the tie rod from the rack.

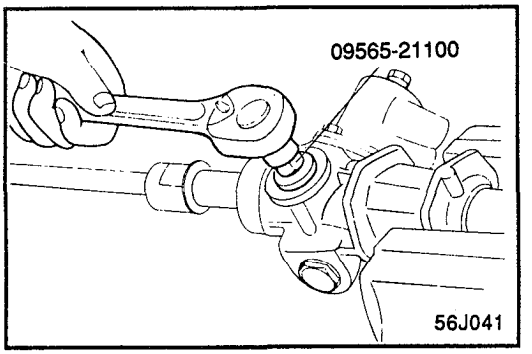
NOTE
Remove the tie rod from the rack, taking care not to twist the rack.



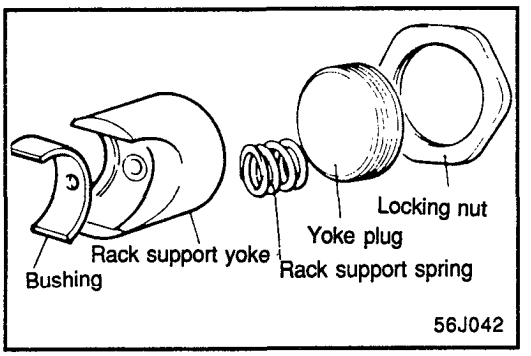
12. Remove the yoke plug locking nut.



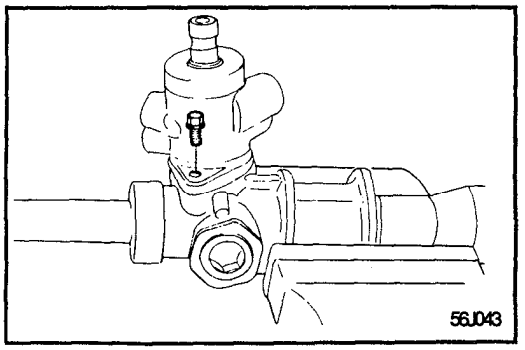
13. Using special tool, remove the yoke plug.



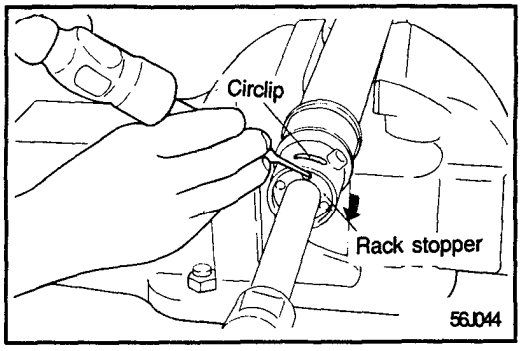
14. Remove the rack support spring, rack support yoke from the gear box.



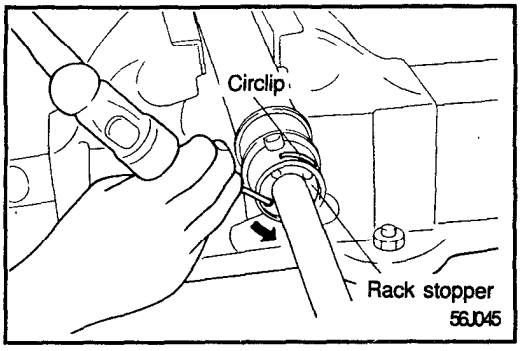
15. Remove the valve body housing by loosening the two bolts.



16. Turn the rack stopper clockwise until the end of the circlip comes out of the slot in the gear housing.

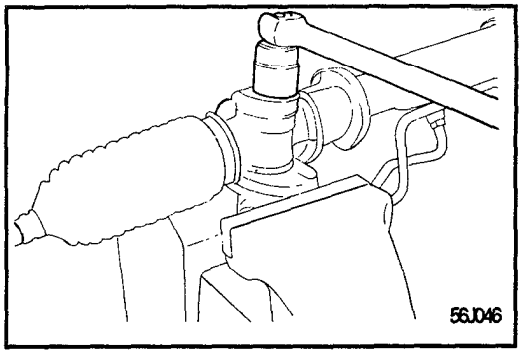


17. When the end of the circlip comes out from the notched hole of the housing rack cylinder, turn the rack stopper counterclock and remove the circlip.

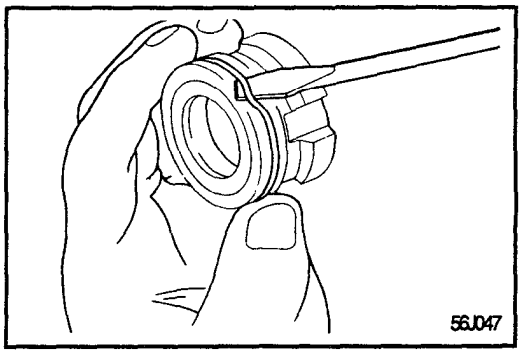


18. Remove the rack stopper, rack bushing and rack from the gear housing by moving it toward the pinion side.

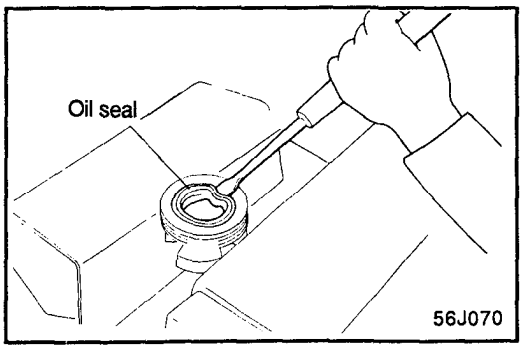
NOTE
When the rack has been removed, be sure to replace the housing side oil seal.



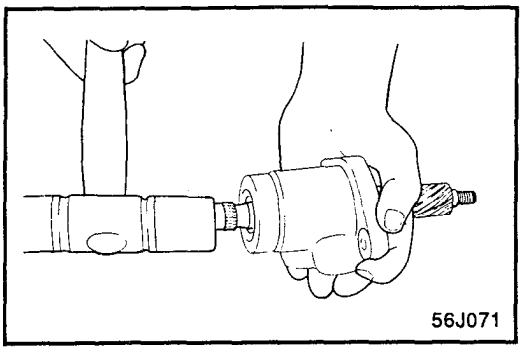
19. Remove the O-ring from the rack bushing.



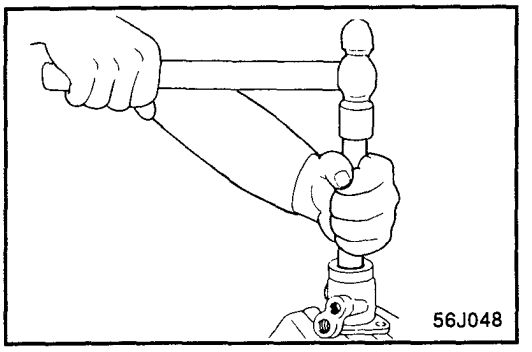
20. Remove the oil seal from the rack bushing.



21. Remove the valve body from valve body housing with a soft hammer.

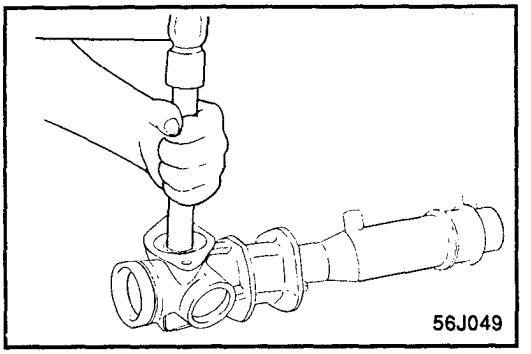


22. Use the special tool to remove the oil seal and ball bearing from the valve body housing.

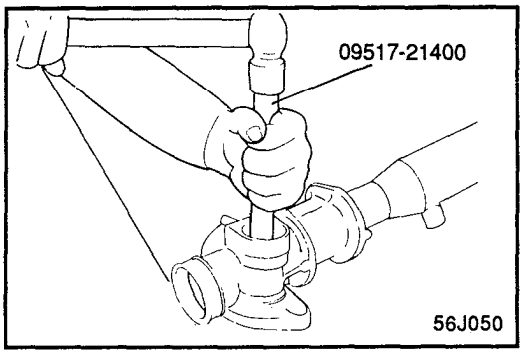


23. Use the special tool to remove the ball bearing from the gear housing.

NOTE
Be careful not to damage the pinion valve cylinder inside of the gear housing.

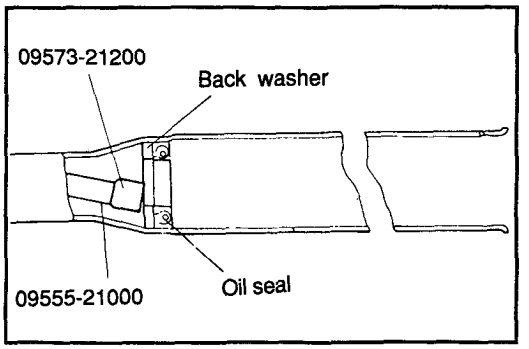


24. Use the special tool (09517-21400) to remove the angular contact bearing from the gear housing.



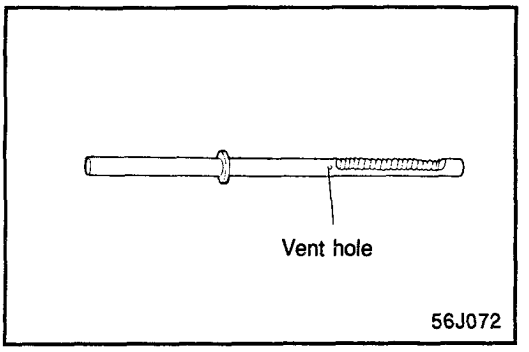
25. Use the special tools to remove the back washer and oil seal from the gear housing.

NOTE
Be careful not to damage the rack cylinder inside of the gear housing.

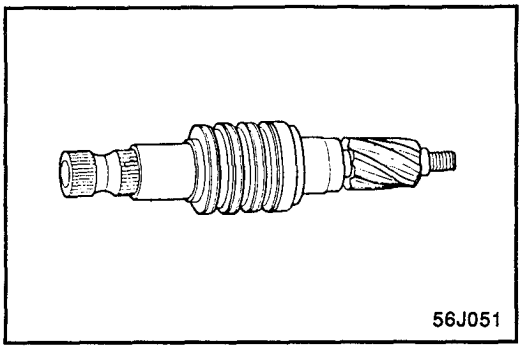


INSPECTION

1. Rack
   1) Rack tooth face damage or wear
   2) Oil seal contact surface damage
   3) Rack distortion
   4) Oil seal ring damage or wear
   5) Oil seal damage or wear



2. Pinion Valve
   1) Pinion gear tooth face damage or wear
   2) Oil seal contact surface damage
   3) Seal ring damage or wear
   4) Oil seal damage or wear

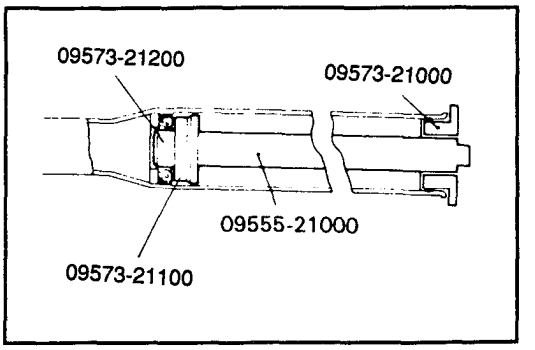


3. Bearing
   1) Seizure or abnormal noise during bearing rotation.
   2) Excessive play.
   3) Missing angular contact bearing.
4. Others
   1) Damage of the gear housing cylinder bore
   2) Boot damage or deterioration

ASSEMBLY

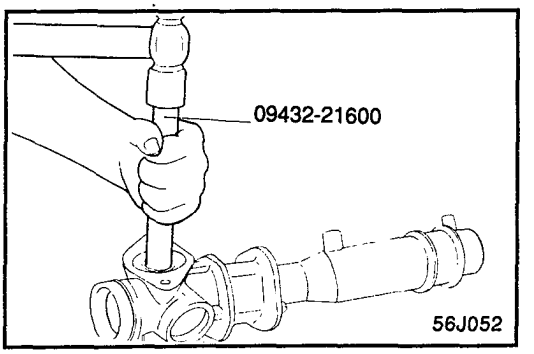
7. Apply the specified oil to the entire surface of the rack oil seal.

Recommended fluid	Automatic transaxle fluid DEXRON®II type



2. Install the backup washer and oil seal to the specified position in the gear housing.
3. Apply the specified grease to the entire surface of the angular contact bearing.

Recommended grease	Multipurpose grease SAE J310, NLGI No.2



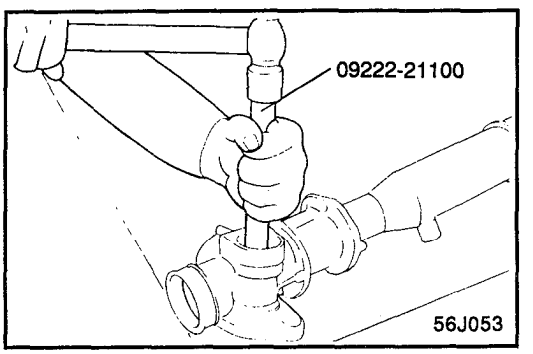
4. Set the scribed side of the angular contact bearing the special tool and install it into the gear housing (until the special tool contacts the gear housing).

NOTE
Note the direction of the angular contact bearing.

5. Apply the specified grease *to* the ball bearing and install using the special tool.

Recommended grease	Multipurpose grease SAE J310, NLGI No.2

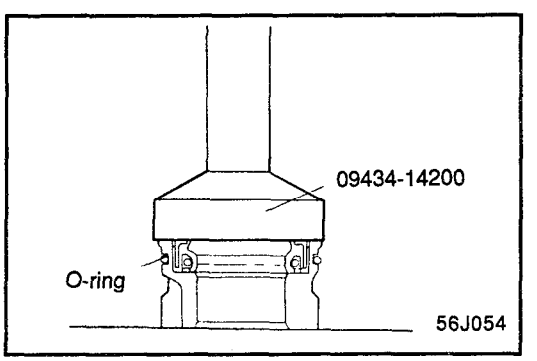
NOTE
Always use a new bearing



6. Apply the specified oil to the entire surface of the rack bushing oil seal.

Recommended fluid	Automatic transaxle fluid DEXRON®II type

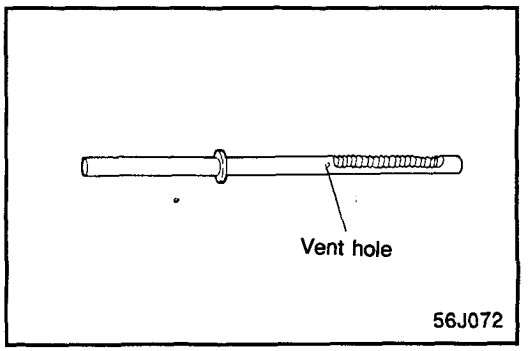
7. Install the oil seal in the rack bushing.
8. Apply the specified oil to the entire surface of the O-ring and install it in the rack bushing.



9. Apply the specified grease to the rack teeth.

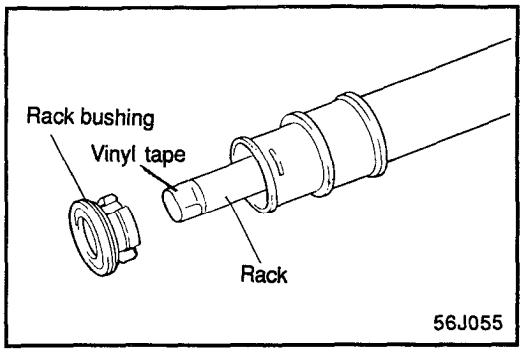
Recommended grease	Multipurpose grease SAE J310, NLGI No.2

NOTE
Do not plug the vent hole in the rack with grease.



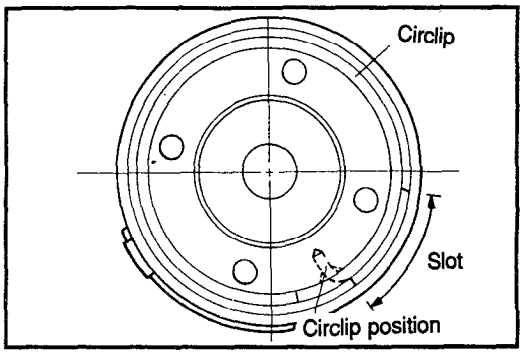
10. Wrap the rack end with vinyl tape, apply a coating of the specified fluid, and then install the rack bushing and rack stopper.

NOTE
Do not allow oil seal retainer spring to slip out.

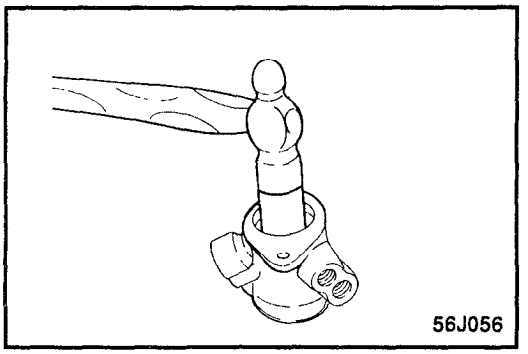


11. Push in the rack stopper until the circlip groove of the rack stopper is aligned with the notched hole of the rack housing. Install the circlip while turning the rack stopper.

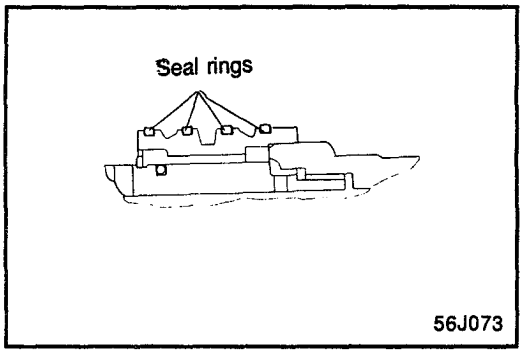
NOTE
The circlip end should not be visible through the notched hole of the rack housing.



12. Using special tool, install the oil seal and the ball bearing in the valve body.

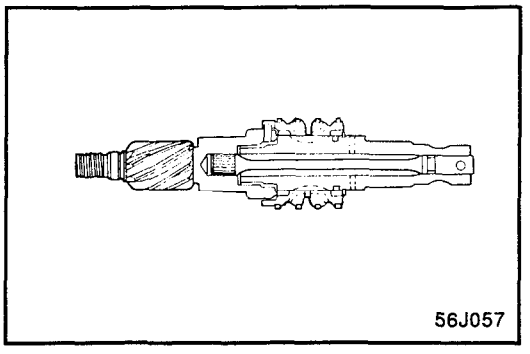


13. When installing seal rings, press firmly into valve groove. Apply specified fluid.

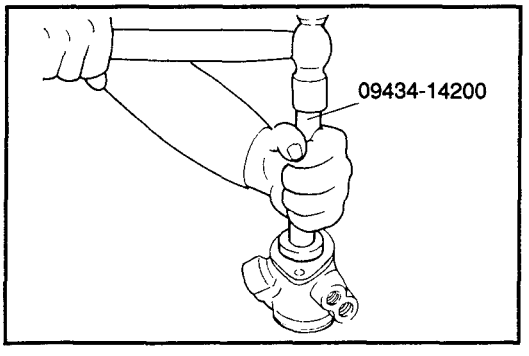


14. Apply the specified oil and grease to the pinion valve assembly and install in the gear housing assembly.

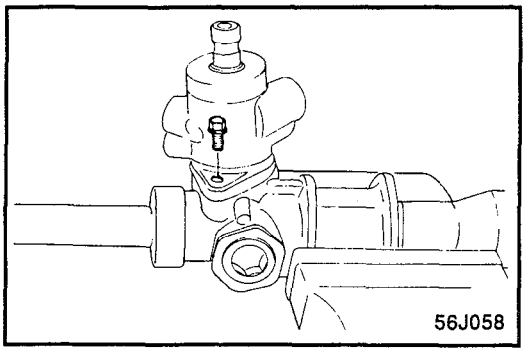
Recommended fluid	Automatic transaxle fluid DEXRON®II type
Recommended grease	Multipurpose grease SAE J310, NLGI No.2



15. Apply the specified oil and then use the special tool to install the seal in the valve body housing.

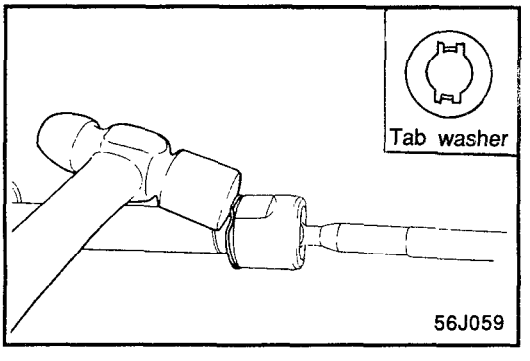


16. Install the valve body assembly with the seal ring to the gear box.



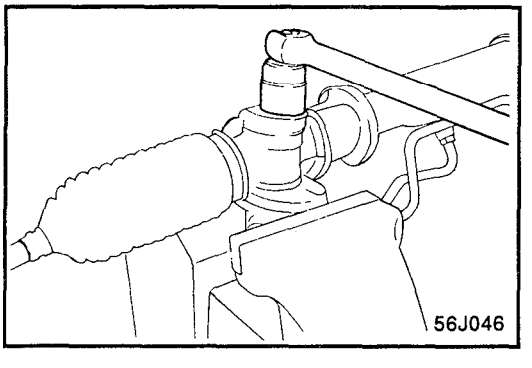
17. Install the tab washer and the tie rod and stake the tab washer end at two points over the tie rod.

NOTE
1) Align the tab washer pawls with the rack grooves.
2) Always use a new tab washer.



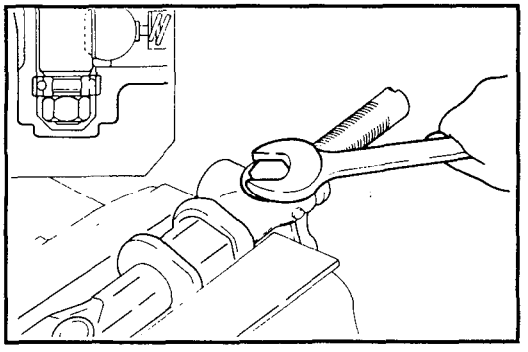
18. With the pinion turned all the way clockwise, tighten the self-locking nut.

CAUTION
Always use a new nut.



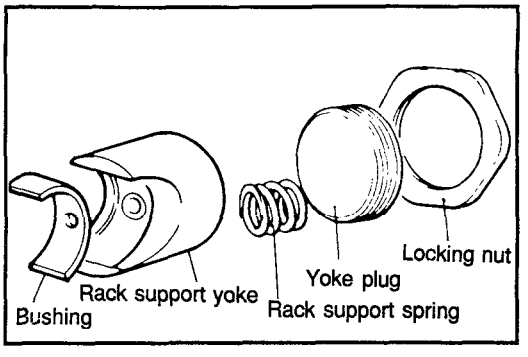
19. Apply semi-drying sealant to the threaded section of the end plug and tighten to the specified torque.

Tightening torque	50-70 Nm (500-700 kg.cm, 37-52 lb.ft)



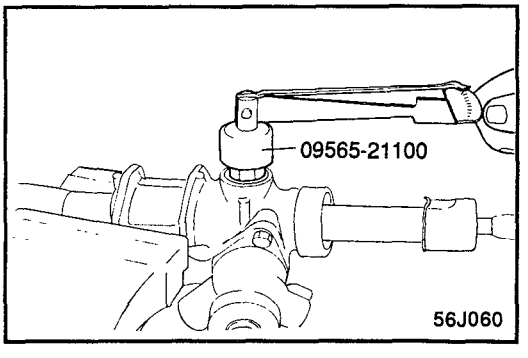
20. Stake the end plug at two points on its circumference with a punch.

21. Install the rack support yoke, rack support spring and yoke plug in the order shown. Apply semi-drying sealant to the threaded section of the yoke plug before installation.



22. With the rack placed in the center position, attach the rack support cover to the gear housing. Tighten the rack support cover to 15 Nm (150 kg.cm, 11 lb.ft), using the special tool. Loosen the yoke plug approximately 30 to 60°, and tighten the locking nut to the specified torque.

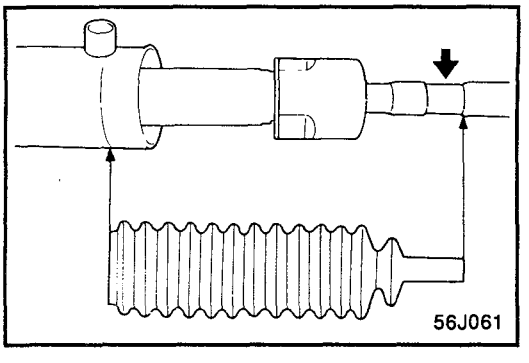
Tightening torque	50-70 Nm (500-700 kg.cm, 37-52 lb.ft)



23. Tighten the feed tube to the specified torque and install the mounting rubber using adhesive.

24. Apply the specified grease to the bellows mounting position (fitting groove) of the tie rod.

Recommended grease	Silicone grease

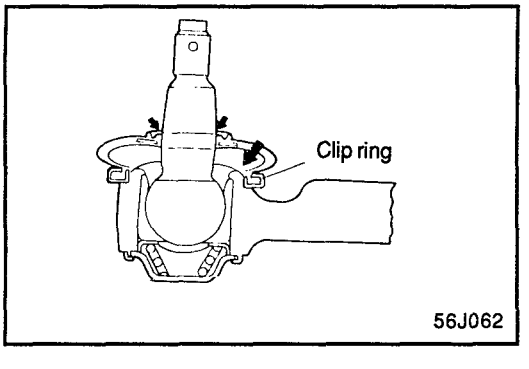


25. Install the attaching band to the bellows.

NOTE
When the bellows are installed, a new band must be used.

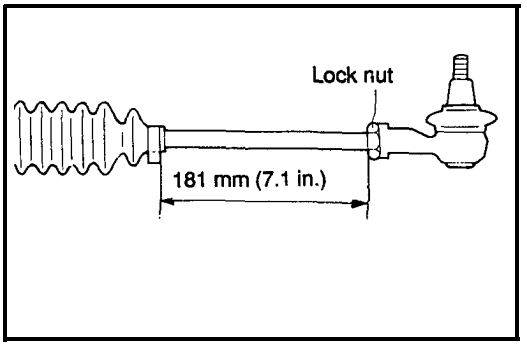
26. Install the bellows in position, taking care not to twist it.

27. Fill the dust cover inner side and lip with the specified multi-purpose grease, and place the dust cover in position with the clip ring attached in the groove of the tie rod end.



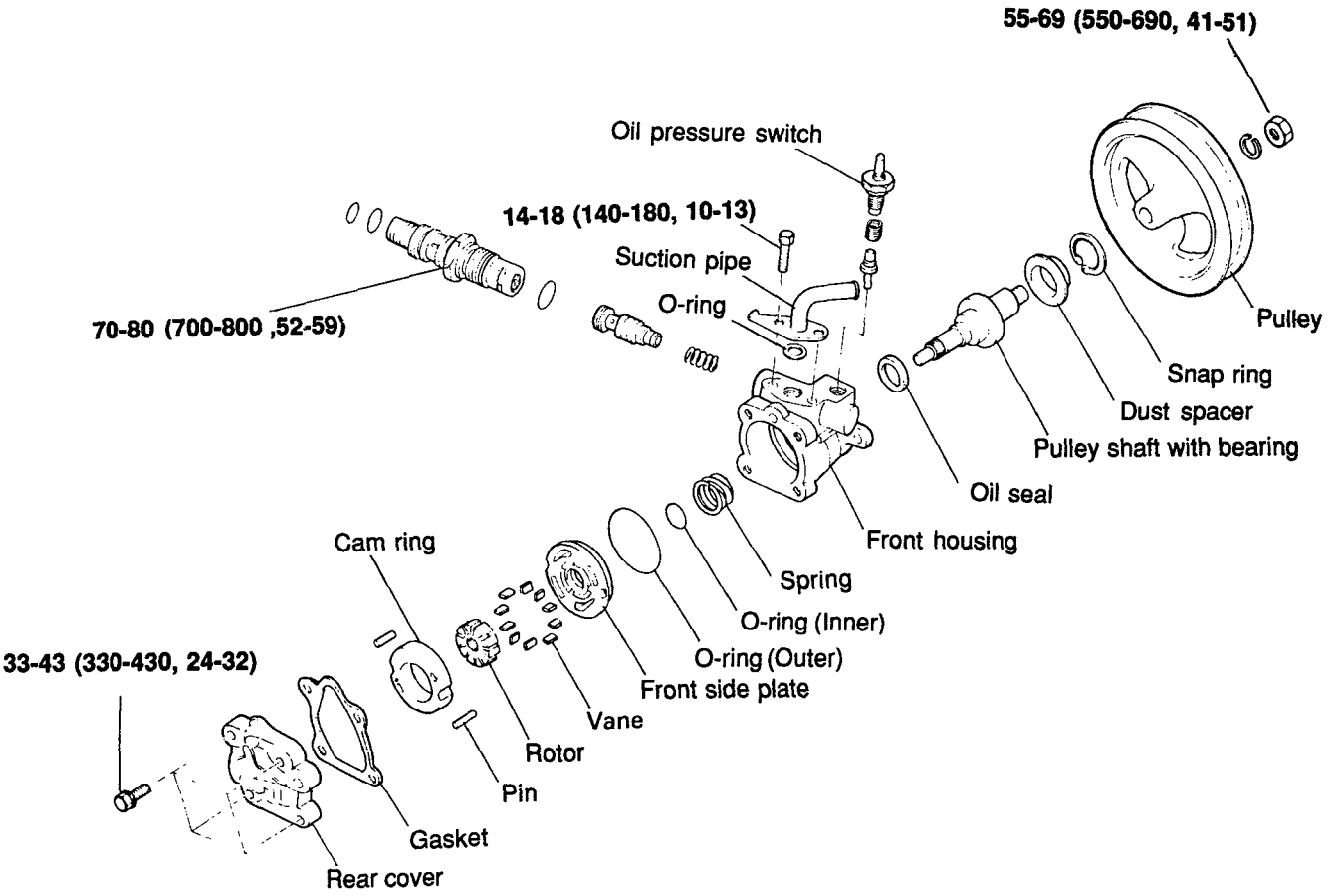
INSTALLATION

1. Screw in tie rod end to have its right and left length as illustrated. Lock with lock nut.



POWER STEERING OIL PUMP

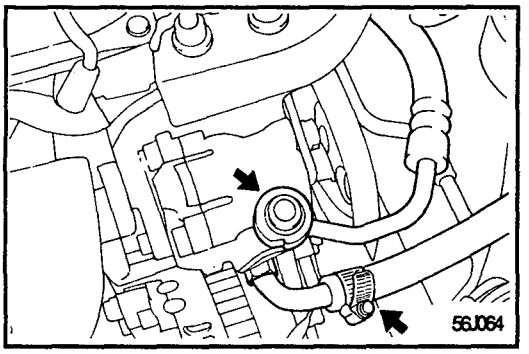
COMPONENTS



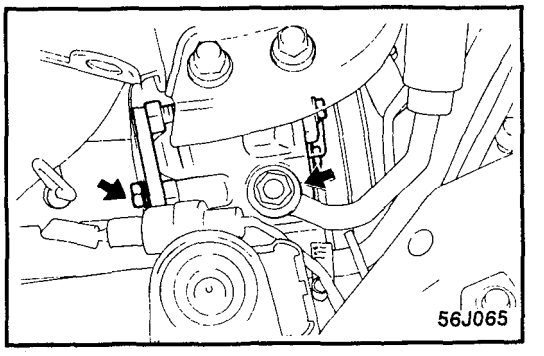
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Remove the pressure hose from the oil pump.
2. Disconnect the suction hose from the suction connector and drain the fluid into a container.

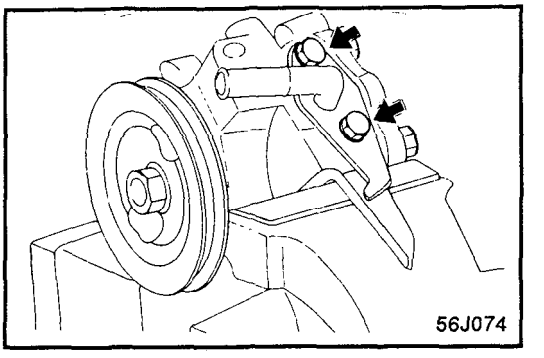


3. Loosen the oil pump mounting bolts to remove the V-belt.
4. Remove the oil pump bracket mounting bolts and disconnect the pressure switch connector.

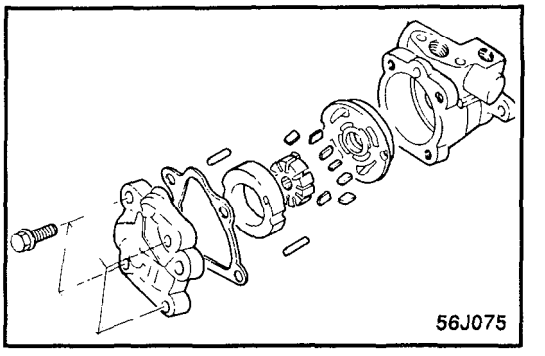


DISASSEMBLY

1. Remove the suction connector and the O-ring from the oil pump.

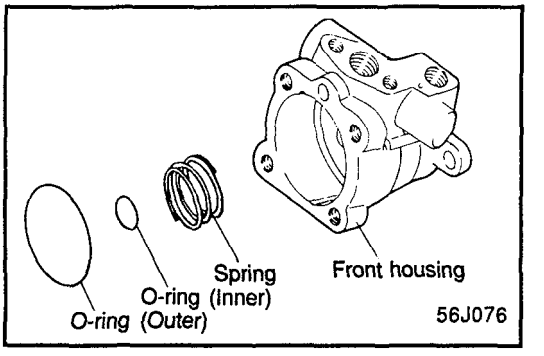


2. Remove the rear cover with the gasket and pins.
3. Remove the cam ring.
4. Remove the rotor and vanes.
5. Remove the front side plate.

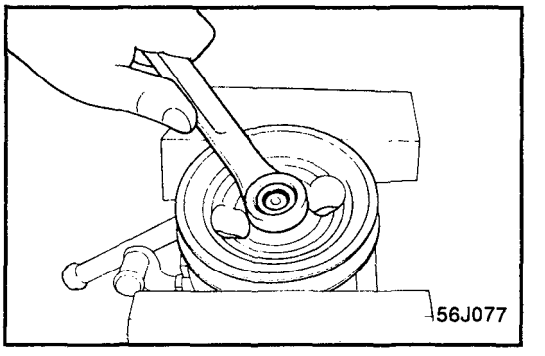


6. Remove the inner and outer O-ring.
7. Remove the spring.

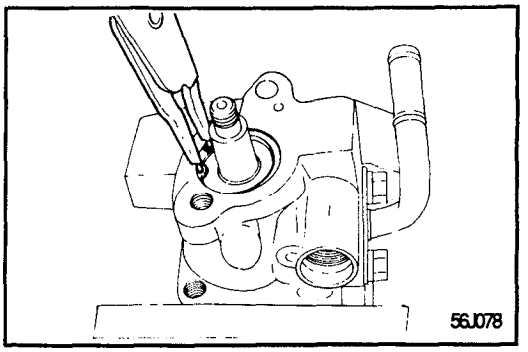
NOTE
When assembling, use a new gasket and O-ring.



8. Remove the pulley nut with the spring washer.
9. Pull off the pulley and the woodruff key.

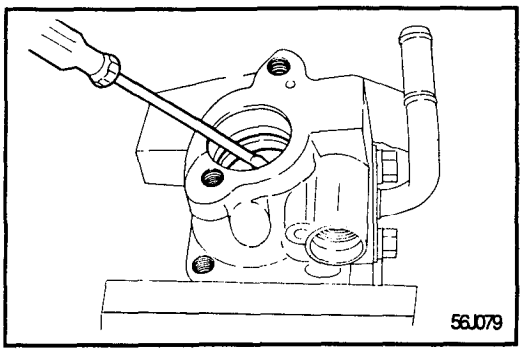


10. Remove the snap ring using snap ring pliers.
11. Drive out the pulley shaft with the bearing.
    If necessary, use plastic hammer.



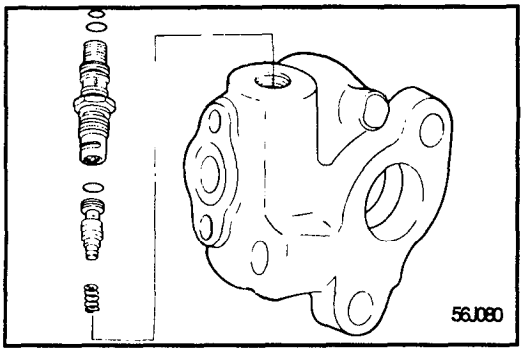
12. Remove the oil seal from the oil pump body.

    NOTE
    When assembling, use a new oil seal.

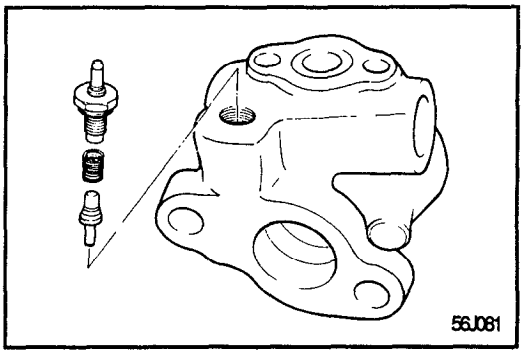


13. Remove the guide bracket and nut.
14. Remove the connector from the oil pump body, and take out the flow control valve and the flow control spring.
15. Remove the O-ring from the connector.

    CAUTION
    Do not disassemble the flow control valve.



16. Remove the oil pump switch.
17. Take out the spring and the spool.
18. Remove the O-ring from the oil pump switch.



INSPECTION

1. Clean all disassembled parts with suitable cleaning solvent.
2. If any inside parts of the oil pump have been damaged, replace the pump as an assembly.
3. If the pulley is cracked or deformed, replace it.
4. If oil leaks from around pulley shaft oil seal, replace the oil seal.
5. If the serrations of the pulley or pulley shaft are deformed or worn, replace them.

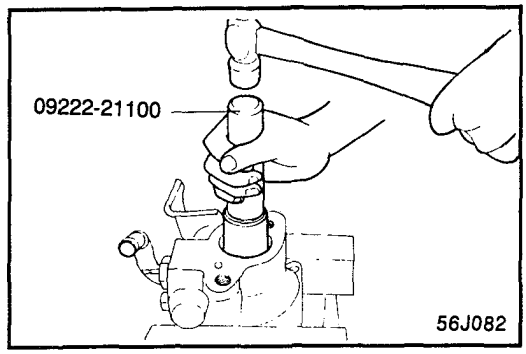
ASSEMBLY

1. Install the oil pump switch.
2. Install the flow control valve spring, valve and connector in the pump body.

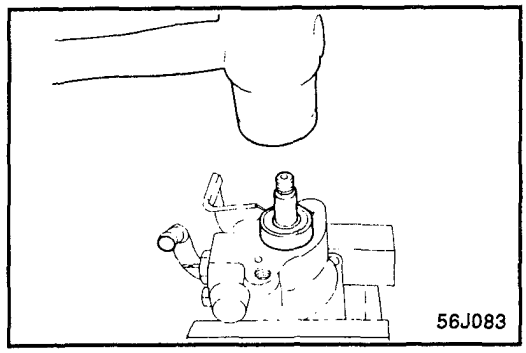
NOTE
Apply a thin coat of A.T.F. to all the replaced parts including the oil seal and the O-ring.

3. Install the guide bracket and nut.

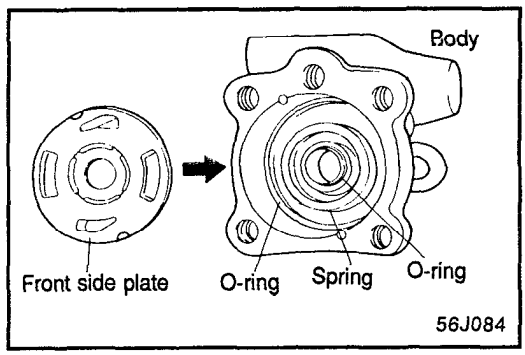
4. Using special tool, install the oil seal into the pump body.



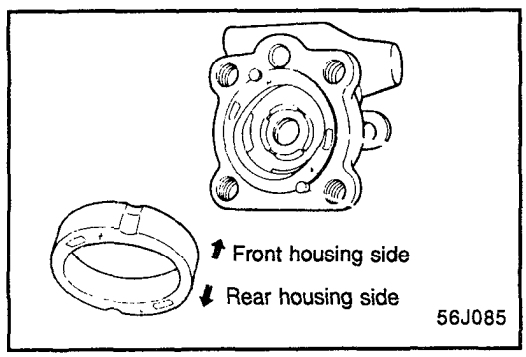
5. Gently insert the shaft assembly and install the snap ring.
6. Install the pump pulley with woodruff key in place.



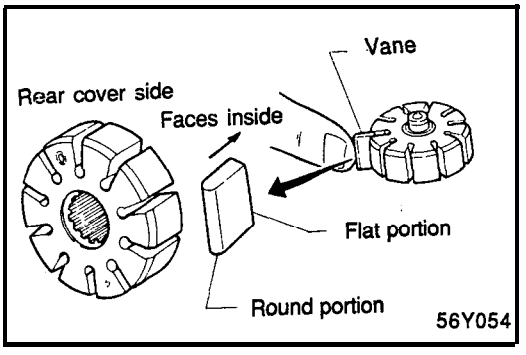
7. Install the spring and the inner and outer O-rings.
8. Install the front side plate.



9. Insert the pins into the pin grooves of front housing, then install the cam ring, paying attention to its direction.



10. Install the rotor with its punch marked side facing towards the front side plate.
11. Install the vane plates with the round end facing outward.



12. Install the gasket and the rear cover.
13. Tighten the suction connector.

INSTALLATION

1. Install the oil pump to the oil pump bracket.
2. Install the suction hose.
3. Install the V-belt and adjust the V-belt tension.
4. Connect the pressure hose to the oil pump, and the return hose to the oil reservoir.

   NOTE
   Install the hoses so that they are not twisted and they do not come in contact with any other parts.

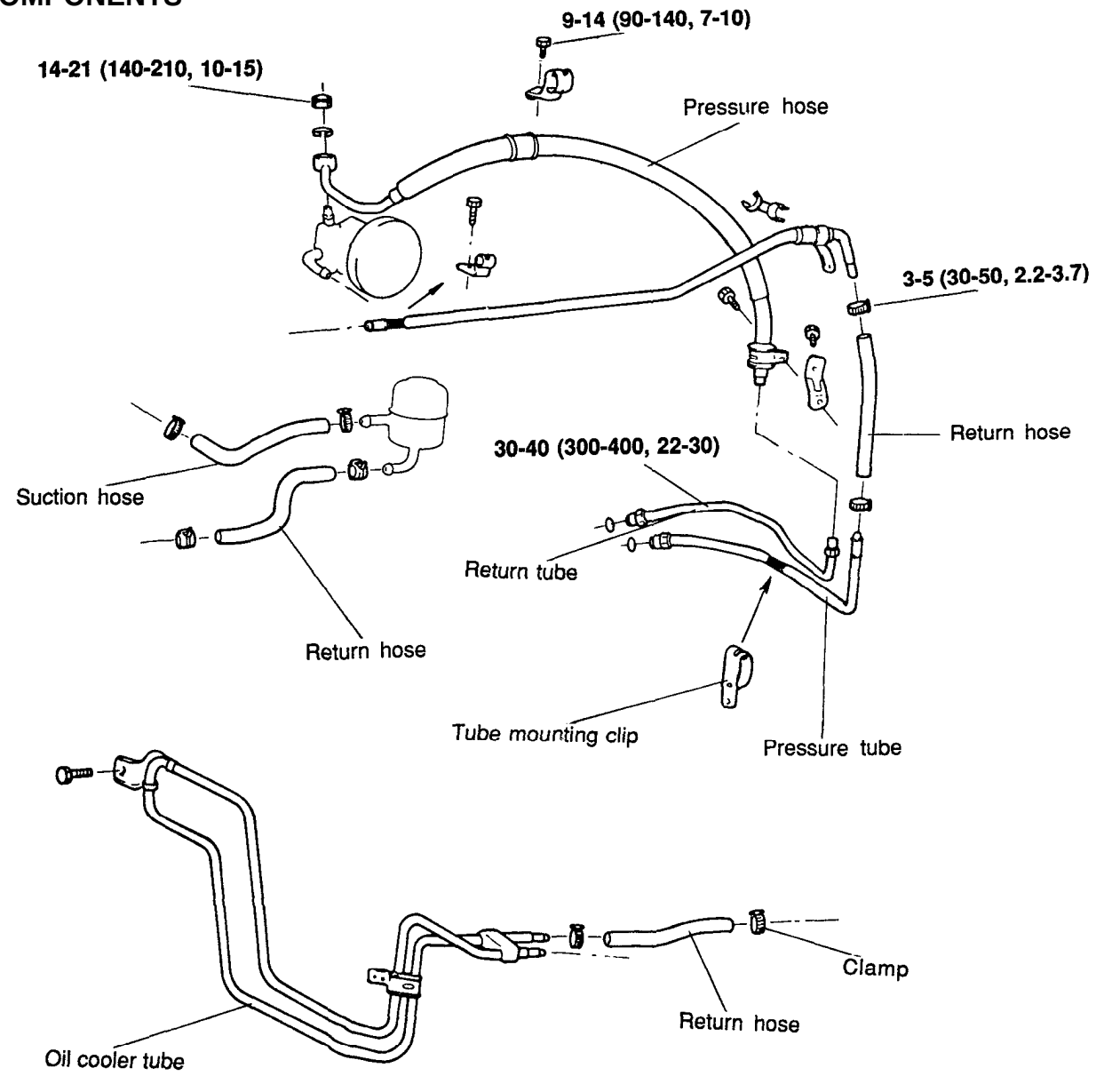
5. Replenish the fluid.

Recommended fluid	Specified automatic transmission fluid

6. Bleed the system.
7. Check the oil pump pressure.
8. Install parts by reference to the torque specification.

POWER STEERING HOSES

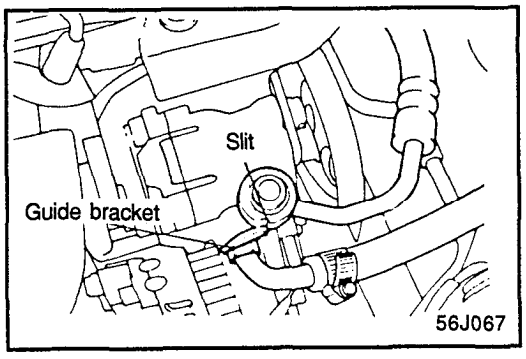
COMPONENTS



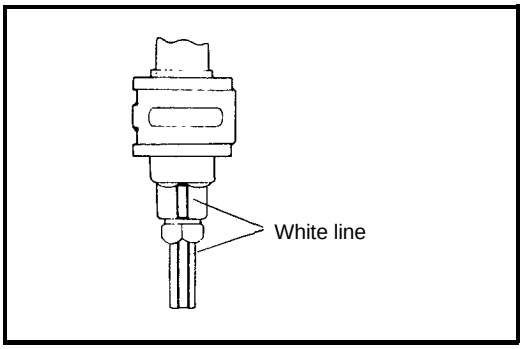
TORQUE : Nm (kg.cm, lb.ft)

INSTALLATION

1. Connect the pressure hose so that its slit part contacts the oil pump's guide bracket.



2. When the pressure hose is installed, align the white line on the pressure hose with the white line on the pressure tube so that together they form a straight line.



FRONT SUSPENSION

Return To Main Table of Contents

GENERAL 2
STRUT ASSEMBLY 11
LOWER ARM 13
STABILIZER BAR 17
CENTER MEMBER 19
WHEEL AND TIRE 21

GENERAL

SPECIFICATIONS

Suspension system	Macpherson strut with coil spring

Coil spring
Free height and identification color

Model	Free height mm (in.)	Identification color
1.6 GL - A/C	365.4 (14.38)	Green 3 lines
1.6 GL + A/C 1.8 GLS -A/C 1.8 GL ALL	372.8 (14.67)	Red 3 lines
1.8 GLS + A/C	382.7 (15.06)	Yellow 3 lines

GL, GLS : Trim level A/C : Air conditioning

Shock absorber		
Type		Hydraulic cylindrical double-acting type
Maximum length		478 mm (18.8 in.)
Compressed length		320 mm (12.6 in.)
Stroke		158 mm (6.2 in.)
Stabilizer bar		
Length (center to center)		1000 mm (39.4 in.)
O.D.		20 mm (0.8 in.)
Wheel and Tire		
Tire size		P 175/70 HR 14 P 185/60 HR 14
Temporary tire		T 125/70 D 15
Tire inflation pressure	kPa (psi)	200 (29)
Temporary tire		414 (60)
Wheel size		5.5 JJ x 14 (Steel wheel) 5.5 JJ x 14 (Al, wheel) 4T x 15 (Temporary tire)

SERVICE STANDARD

Standard value		
Toe	3 mm in - 3 mm out	
Camber	0^{o} ± 30'	
Caster	2^{o} 34' ± 30'	
King pin inclination angle	13^{o} 3'	
King pin offset	-2.6 mm	
Wheel runout	[Steel wheel	[Aluminum wheel]
Radial mm (in.)	0.7 (0.028) : Average of LH & RH	0.3 (0.012)
Axial mm (in.)	1.0 (0.039)	0.3 (0.012)

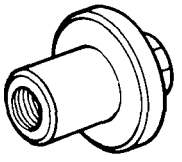
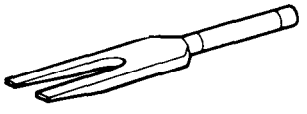
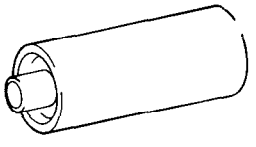
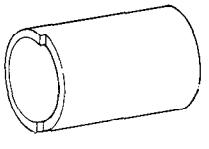
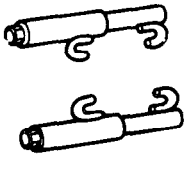
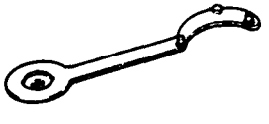
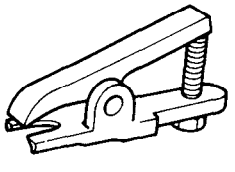
TIGHTENING TORQUE

	Nm	kg.cm	lb.ft
Strut upper installation nut	35-45	350-450	25-33
Strut assembly to knuckle	110-130	1100-1300	80-94
Strut mounting self locking nut	60-70	600-700	43-51
Lower arm ball joint to knuckle	60-72	600-720	43-52
Lower arm front mounting nut	95-120	950-1200	69-87
Lower arm rear mounting bolt	60-80	600-800	43-58
Stabilizer link to lower arm mounting nut	55-70	550-700	40-51
Stabilizer bar lower/upper bracket mounting bolt	17-26	170-260	12-19
Tie rod end ball joint to knuckle	15-34	150-340	11-25

LUBRICANTS

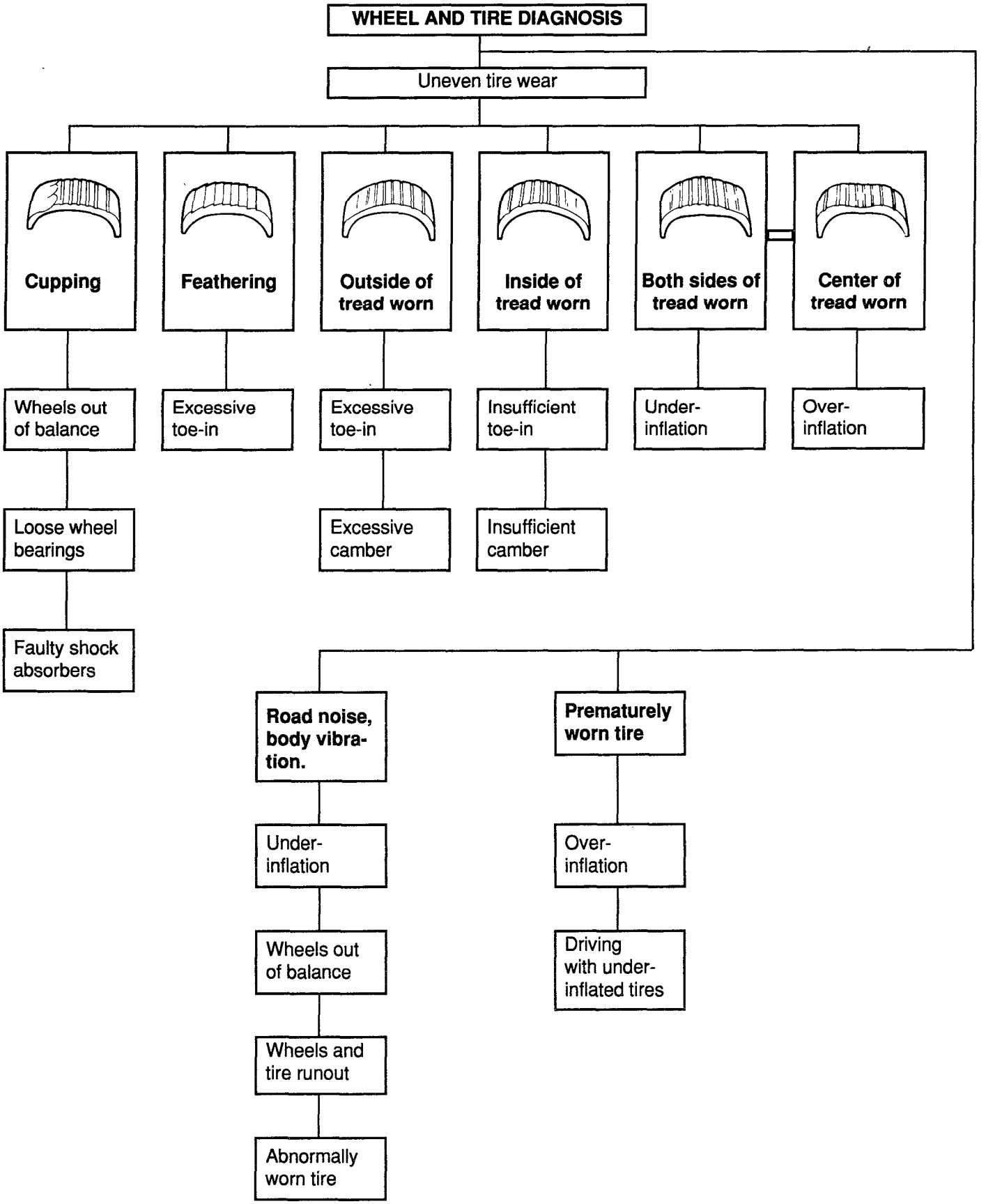
Front wheel bearing	SAE J310a Multi-purpose grease NLGI-2 or equivalent	As required
In ball joint of lower arm	Valiant R-2 grease or poly lub gly 801 K	As required
In insulator bearing of strut	SAE J310a, Chassis grease (NLGI No.0 or equivalent)	As required
Inside surface and lip of ball joint dust cover	Sunlight MB-2	As required

SPECIAL TOOLS

Tool (Number and Name)	Illustration	Use
09529-21000 Wheel alignment gauge attachment		Front wheel alignment for aluminum type wheel.
09532-11600 Pre-load socket		Measurement of the front lower arm ball joint starting torque. (use with torque wrench)
09545-21000 Ball joint remover		Removal of the front lower arm ball joint
09545-28100 Lower arm bushing arbor		Removal and installation of the front lower arm bushing. (use with 09545-28000)
09545-28000 Lower arm bushing remover and installer, base		Removal & installation of the front lower arm bushing. (use with 09545-28100)
09546-11000 (J38402) Spring compressor		Compression of the front coil spring.
09546-21000 Special spanner		1) Removal & installation of the front coil spring. 2) Removal & installation of the shock absorber oil seal.
09568-31000 Tie rod end puller		Separation of the tie rod end ball joint.

TROUBLESHOOTING

Symptom	Probable cause	Remedy
Hard steering	Improper front wheel alignment Excessive turning resistance of lower arm ball joint Low tire pressure No power assist	Correct Replace Adjust Repair and replace
Poor return of steering wheel to center	Improper front wheel alignment	Correct
Poor or rough ride	Improper front wheel alignment Malfunctioning shock absorber Broken or worn stabilizer Broken or worn coil spring Worn lower arm bushing	Correct Repair or replace Replace Replace Replace the lower arm assembly
Abnormal tire wear	Improper front wheel alignment Improper tire pressure Malfunctioning shock absorber	Correct Adjust Replace
Wandering	Improper front wheel alignment Poor turning resistance of lower arm ball joint Loose or worn lower arm bushing	Correct Repair Retighten or replace
Vehicle pulls to one side	Improper front wheel alignment Excessive turning resistance of lower arm ball joint Broken or worn coil spring Bent lower arm	Correct Replace Replace Repair
Steering wheel shimmy	Improper front wheel alignment Poor turning resistance of lower arm ball joint Broken or worn stabilizer Worn lower arm bushing Malfunctioning shock absorber Broken or worn coil spring	Correct Replace Replace Replace Replace Replace
Bottoming	Broken or worn coil spring Malfunctioning shock absorber	Replace Replace


WHEEL AND TIRE DIAGNOSIS
Uneven tire wear
Cupping
Feathering
Outside of tread worn
Inside of tread worn
Both sides of tread worn
Center of tread worn
Wheels out of balance
Excessive toe-in
Excessive toe-in
Insufficient toe-in
Under-inflation
Over-inflation
Loose wheel bearings
Excessive camber
Insufficient camber
Faulty shock absorbers
Road noise, body vibration.
Prematurely worn tire
Under-inflation
Over-inflation
Wheels out of balance
Driving with under-inflated tires
Wheels and tire runout
Abnormally worn tire

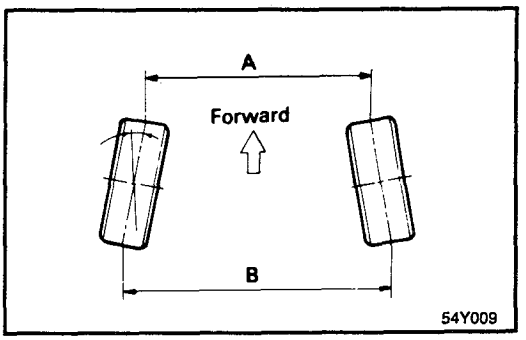
SERVICE ADJUSTMENT PROCEDURES
FRONT WHEEL ALIGNMENT

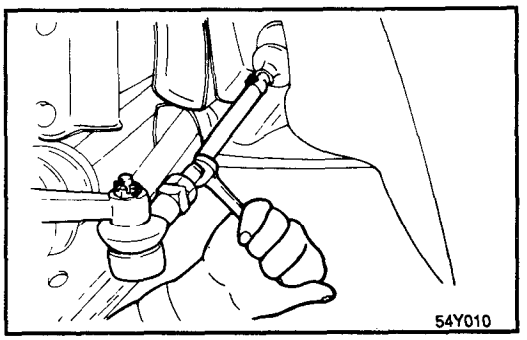
When using a wheel alignment tester to inspect front wheel alignment, always position the car on a level surface and the front wheels in the straight ahead position. Prior to inspection make sure that the front suspension and steering system are in normal operating condition and that wheels and tires are free of deflection and tires are inflated to specification.

Toe-in

Toe-in (B-A or angle e) is adjusted by turning the tie rod turnbuckles. Toe in on the left front wheel can be reduced by turning the tie rod toward the rear of the car. Toe change is achieved by turning the tie for the right and left wheels simultaneously the same amount as follows:

Description		Toe changes mm (in.)/deg.
No. of turns of tie rod (Same amount for right and left)	1/2	Approx. 5.5 (0.217)/32.5'
	1	Approx. 11 (0.433)/1°5'





NOTE
1) **Toe-in adjustment should be made by turning the right and left tie rods the same amount.**
2) **When adjusting toe-in, loosen the outer bellows clip to prevent twisting the bellows.**
3) **After the adjustment, firmly tighten the tie rod end lock nuts and reinstall the bellows clip.**

Toe (B-A) mm (in.) [Standard value] ..... **3** in-3 out (0.12 in-0.1 2 out)

Tie rod end lock nuts tightening torque ..... 34-50 Nm (340-500 kg.cm, 25-36 Ib.ft)

Camber

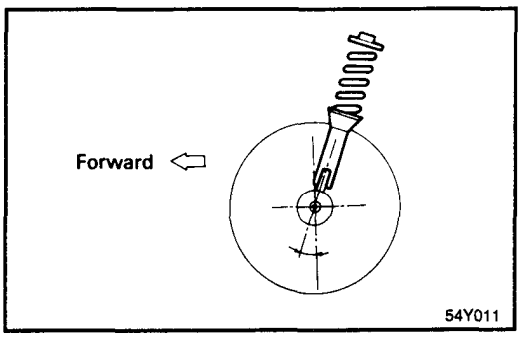
The steering knuckle which is integral with the strut assembly is pre-adjusted to the specified camber at the factory and requires no adjustment.

Camber [Standard value] ..... 0°±30'

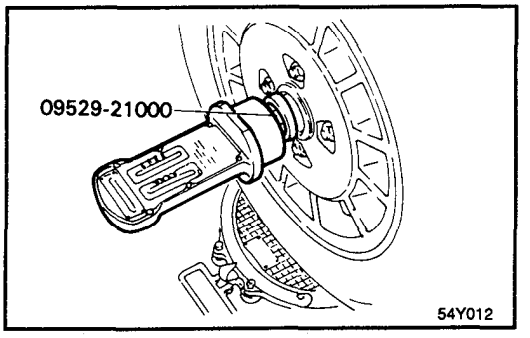
Caster

Caster is pre-set at the factory and can not be adjusted. If caster is not within standard value, replace the bent or damaged parts.

Caster [Standard value]	$2^{\circ}34' \pm 30'$



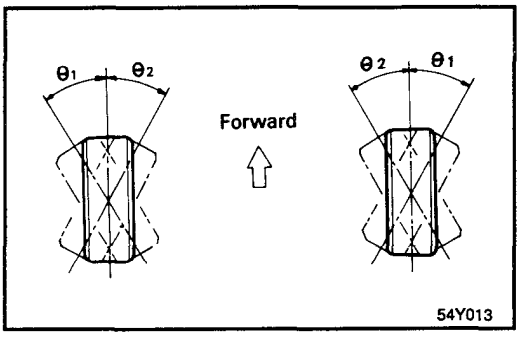
NOTE
1) The front suspension assembly must be free of worn, loose or damaged parts prior to measuring front wheel alignment.
2) Measure wheel alignment by using the special tool.
3) Camber and caster are pre-set at the factory and cannot be adjusted.
4) If camber and caster are not within specifications, replace bent or damaged parts.



Steering Angle

Steering angle, as a rule, requires no adjustment. However, if there is a difference in steering angle between the right and left wheels, change the length of the right and left tie rods.

Steering angle [Standard value]	
Inner wheel	$39^{\circ}25' \pm 1^{\circ}30'$
Outer wheel θ_2	$33^{\circ}59'$



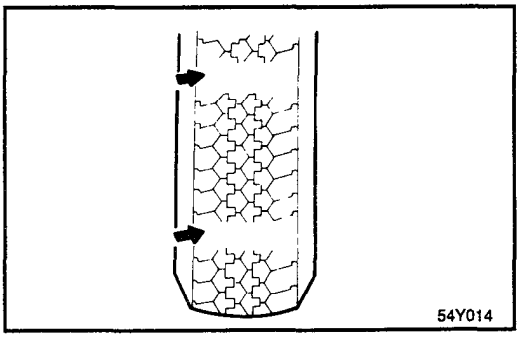
TIRE WEAR

1. Measure the tread depth of the tires.

Tread depth of tire [Limit]	1.6 mm (0.06 in.)

2. If the remaining tread depth is less than the limit, replace the tire.

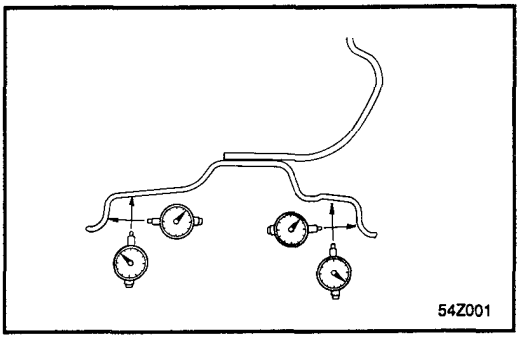
NOTE
When the tread depth of the tires is reduced to 1.6 mm (0.06 in.) or less, the wear indicators will appear.



WHEEL RUNOUT

1. Jack up the vehicle and support it with jack stands.
2. Measure wheel runout with a dial indicator as illustrated.
3. Replace the wheel if wheel runout exceeds the limit.

Wheel runout [Limit]	
Steel wheel	Radial 0.7 mm (0.028 in.) :(Average of LH & RH)
	Axial 1.0 mm (0.039 in.)
Aluminum type wheel	Radial 0.3 mm (0.012 in.)
	Axial 0.3 mm (0.012 in.)



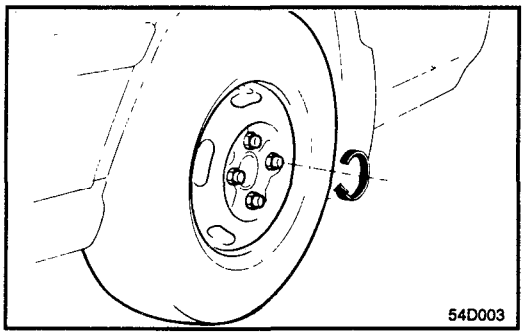
WHEEL NUT TIGHTENING

1. Tightening torque
   Steel and aluminium alloy wheel

Specified torque	90-110 Nm (900-1,100 kg.cm, 65-80 lb.ft)

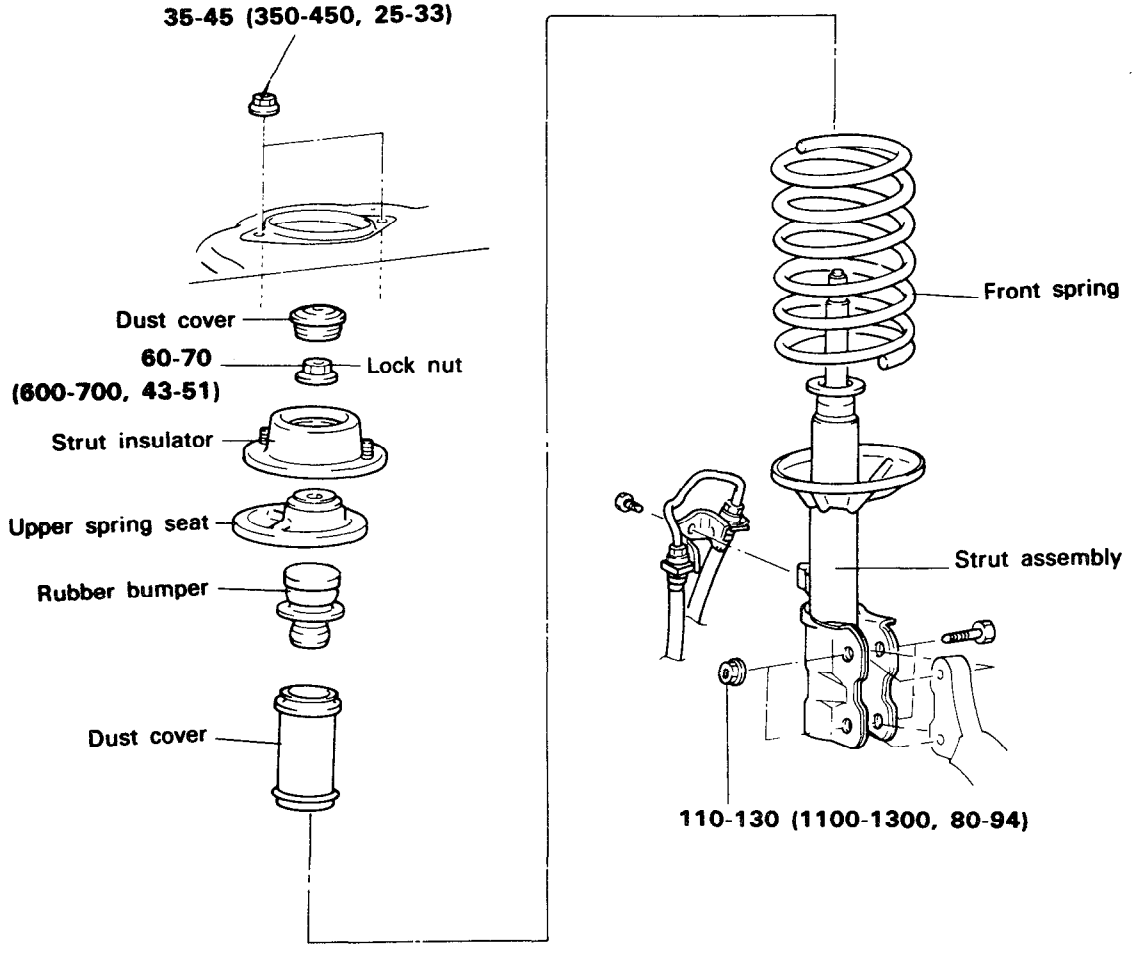
CAUTION
When using impact-wrench, final tightening torque should be checked using a hand torque wrench.

2. Tightening order
   Go around the wheel tightening every other nut until they are all tight.
   Then double-check each nut for tightness.



STRUT ASSEMBLY

COMPONENTS



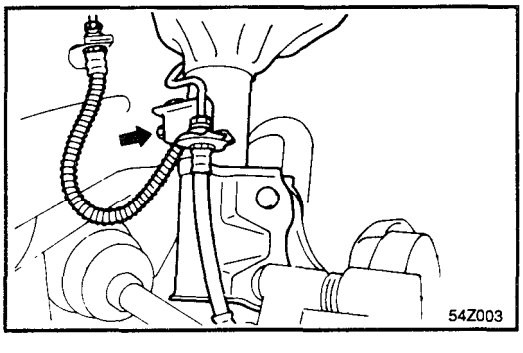
TORQUE : Nm (kg.cm, lb.ft)

54J001

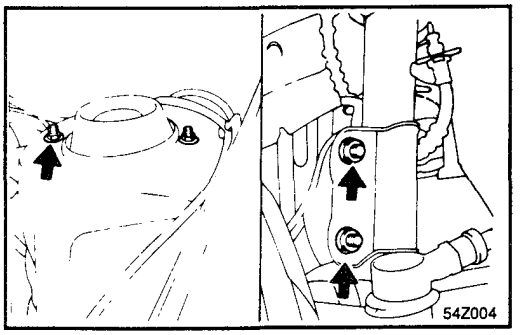
REMOVAL

1. Raise the front of the vehicle and mount it on a jack stand.
2. Remove the wheel and tire.
3. Detach the brake hose and tube bracket from the strut assembly.

NOTE
Do not pry or force the components.

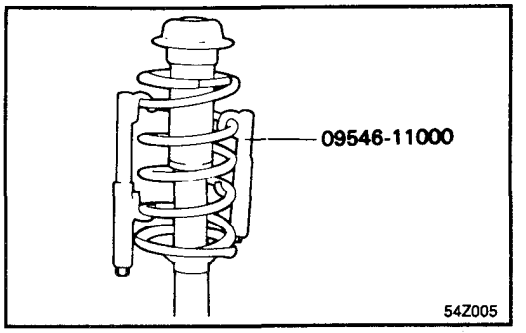


4. Remove the strut assembly from the knuckle and wheel house.

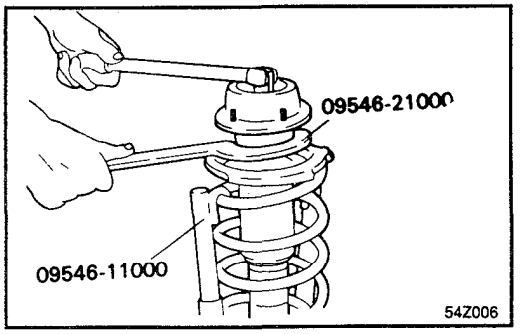


DISASSEMBLY

1. Using special tool, spring compressor, compress the coil spring.

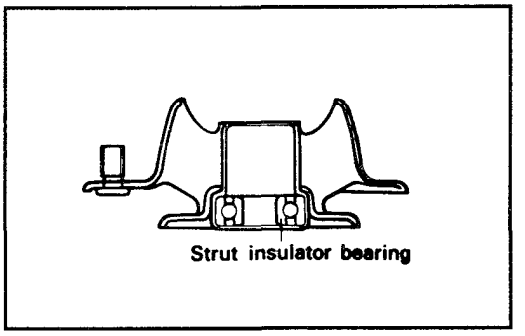


2. Holding the upper spring seat with special tool, special spanner, loosen the nut at the top end of the shock absorber and remove the insulator.
3. Remove the spring seat, spring and rubber bumper.



INSPECTION

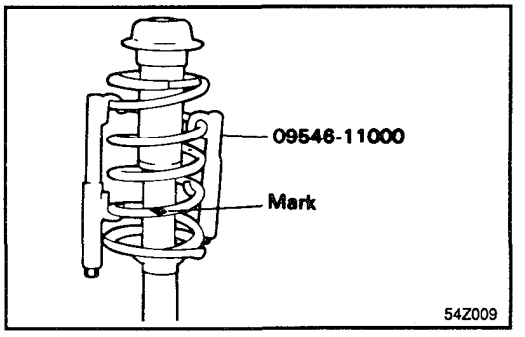
1. Check the bearing for wear.
2. Check the rubber parts for cracks and wear.
3. Check the coil spring for sagging and weakness.



ASSEMBLY

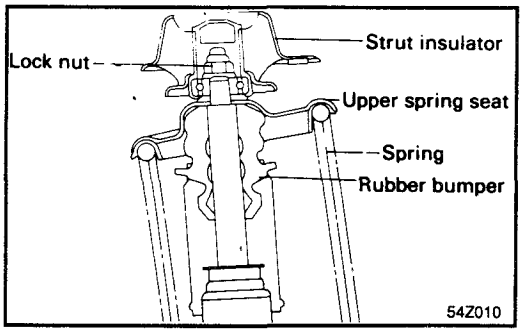
1. Install special tool, on the coil spring and compress the spring. After spring is fully compressed, install it on the strut sub-assembly.

N O T E
Install the coil spring with the identification mark directed toward the knuckle.



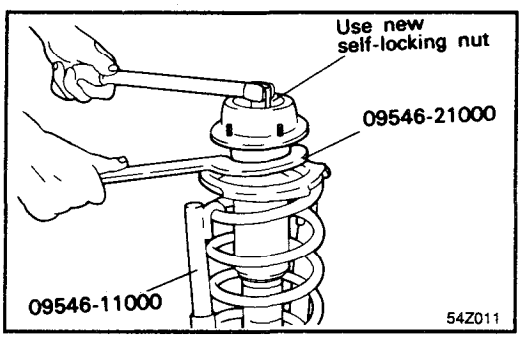
2. Install the rubber bumper, upper rubber seat, upper seat assy, insulator and washer in the order.

NOTE
Align the D-shaped hole in the spring seat upper assembly with the indentation on the piston rod.



3. After having correctly seated the upper and lower ends of the coil spring in the upper and lower spring seat grooves, loosen special tool.
4. Using special tool, hold the upper spring seat and tighten the self-locking nut to the specified torque.

Tightening of spring seat to piston rod	**60-70** Nm (600-700 kg.cm, 43-51 lb.ft)



5. Pack grease in the strut upper bearing and install the cap.

CAUTION
Make sure that no grease is on the insulator rubber.

Recommended grease	SAE J310a, Chassis grease (NLGI No.0, equivalent)

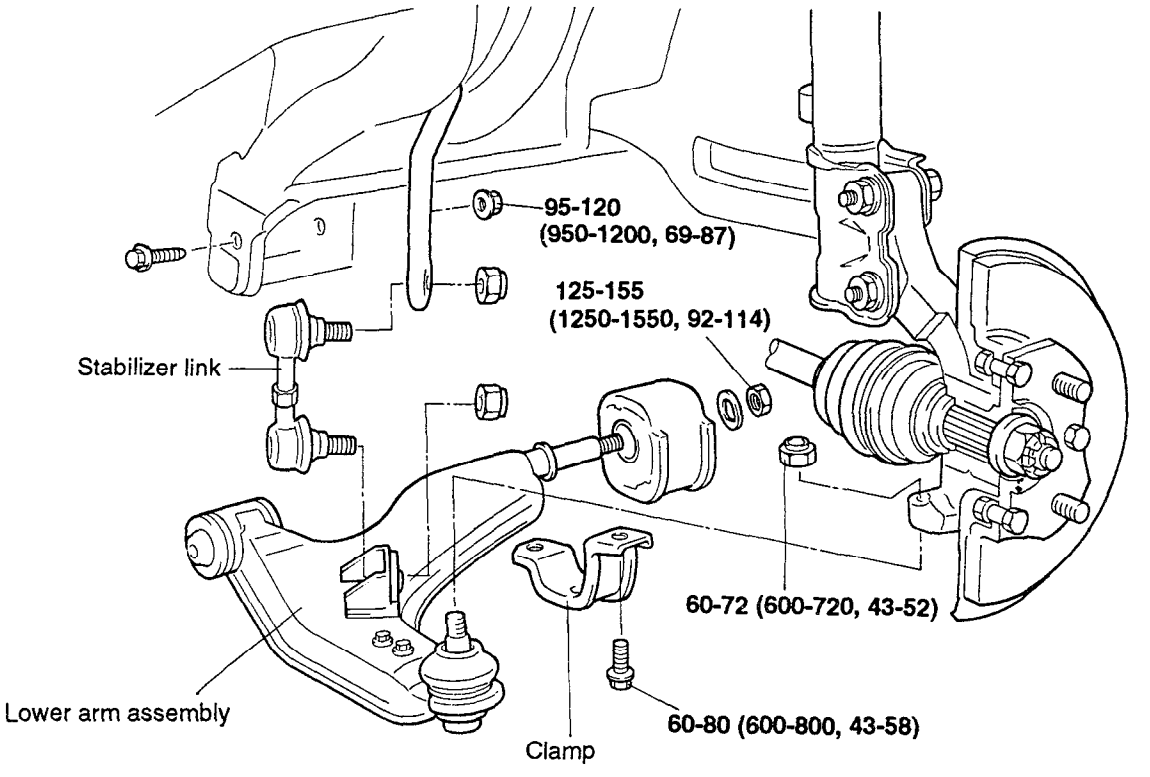
INSTALLATION

1. When installing the strut, the mating surface must be clean.
2. Tighten the following parts to the specified torque.

Tightening torque	Nm (kg.cm, lb.ft)
Strut upper installation nut	**35-45 (350-450, 25-33)**
Strut assembly to knuckle	110-130 (1100-1300, 80-94)

3. Install the brake hose and bleed the brake system.

COMPONENTS

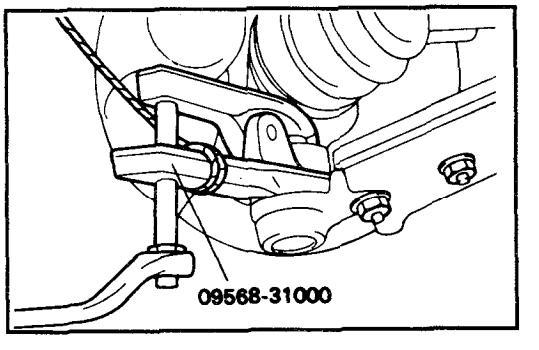


TORQUE : Nm (kg.cm, lb.ft)

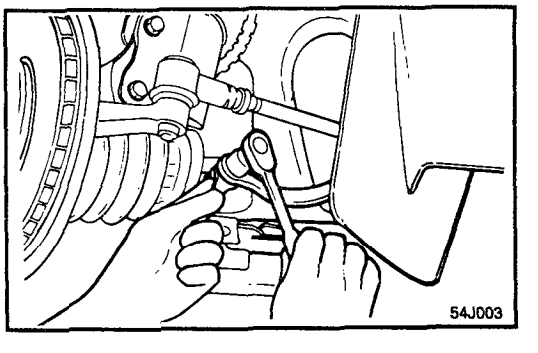
REMOVAL

1. Using special tool, disconnect the lower arm ball joint from the knuckle.

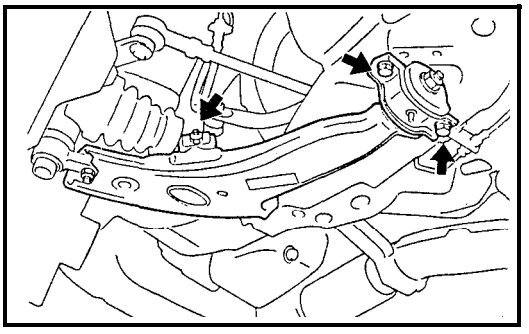
   NOTE
   Be sure to tie a cord to the special tool and to a nearby part.



2. Remove the stabilizer link mounting self-locking nut, and detach the stabilizer bar from the lower arm.



3. Remove the lower arm mounting nut and bolt.



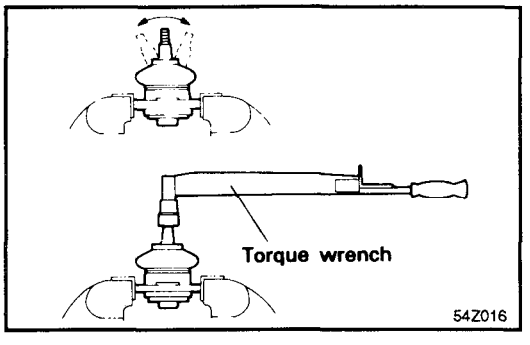
INSPECTION

1. Check the lower arm for bend or breakage.
2. Check the clamp for deterioration or damage.
3. Check the ball joint dust cover for cracks.
4. Check all bolts for condition and straightness.

INSPECTION OF BALL JOINTS

1. Remove the ball joint assembly from the lower arm.
2. Inspect the ball joints for rotation condition.
   1) As shown in the figure, flip the ball joint stud back and forth 5 times.
      Using a torque gauge, measure rotation starting torque.

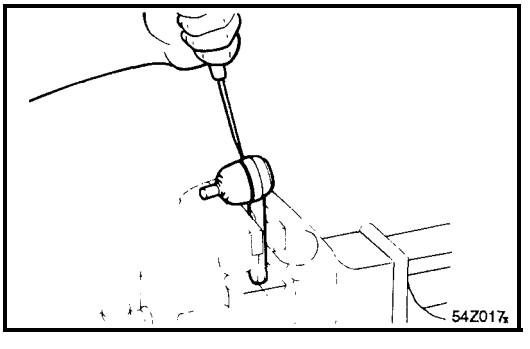
Rotation condition [Standard value]	Nm (kg.cm, lbf-in)
Vertical play	0
Rotation starting torque	2-9.5 (20-95, 17.7-84.1)
Rotating torque	2-5.5 (20-55, 17.7-48.7)



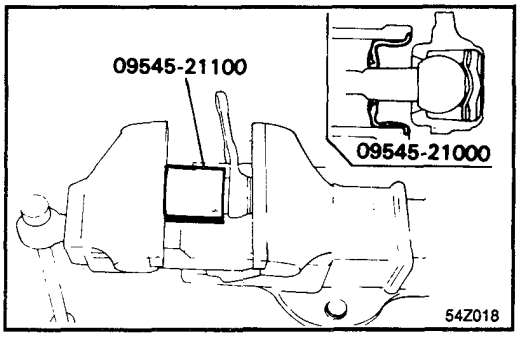
BALL JOINT AND DUST COVER REPLACEMENT

1. Remove the dust cover from the ball joint.
2. Pack the specified grease or equivalent in the new dust cover.

Recommended grease	Sunlight MB-2

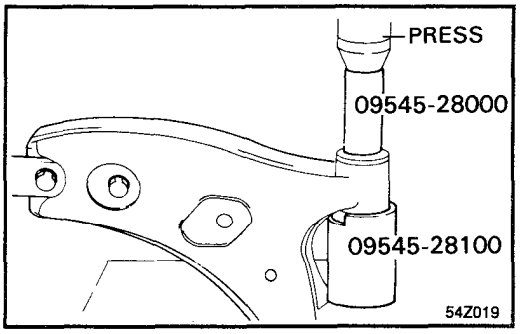


3. Press fit the dust cover to the ball joint with special tool.

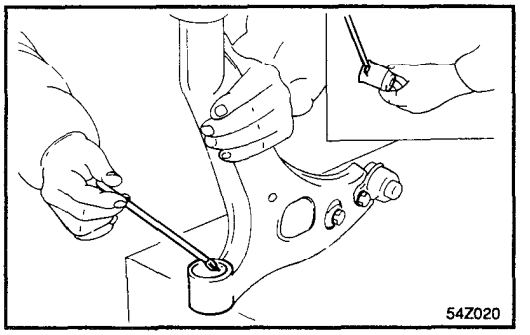


LOWER ARM BUSHING (A) REPLACEMENT

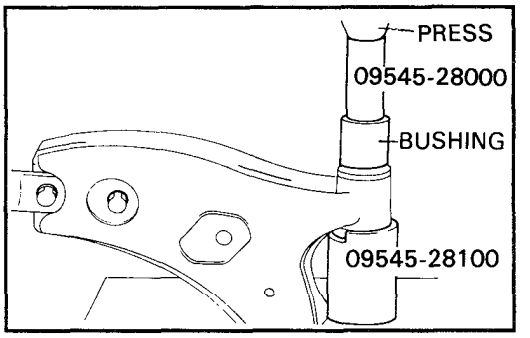
1. Install the Special Tools (09545-28000, 09545-28100) on the lower arm
2. Press out the bushing.



3. Apply soap solution to the following portions.
   1) Outer surface of the new bushing.
   2) Inner surface of the lower arm bushing mount.
   3) Inner surface of the Special Tools.



4. Install the Special Tools and new bushing onto the lower arm.
5. Press fit the bushing into the lower arm bushing mount.

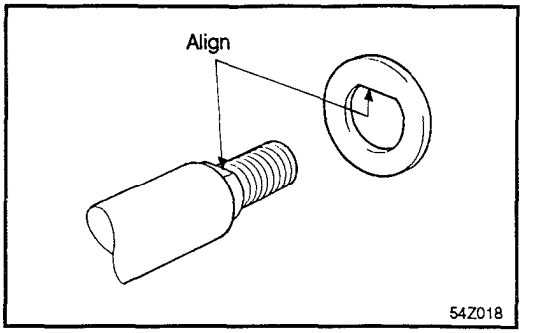


6. Center the bushing by the following procedure, if necessary.
   1) Reset the Special Tools and lower arm.
   2) Center the bushing.

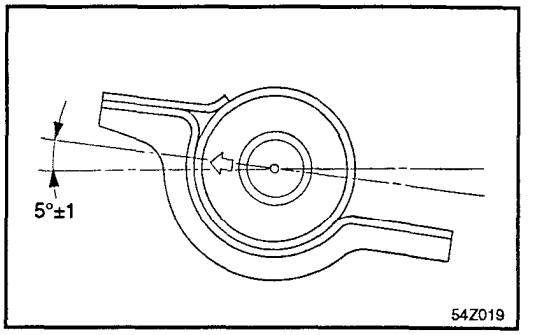
NOTE
After centering the bushing, wipe off the soap solution.

LOWER ARM BUSHING (B) REPLACEMENT

1. Align the washer with the flat area provided on the lower arm mounting part.



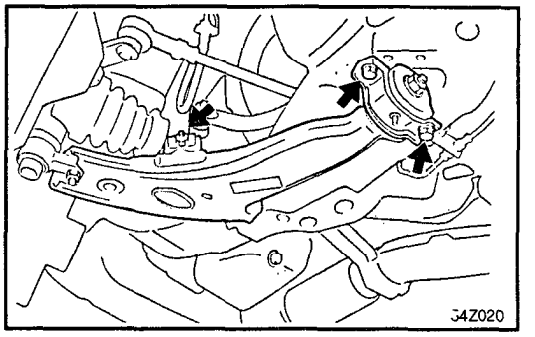
2. After positioning the lower arm bushing (B) at the angle indicated in the illustration, install the self-locking nut.



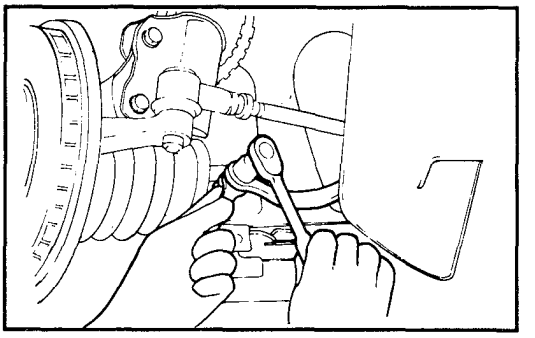
INSTALLATION

1. Install the lower arm mounting bolt and nut.

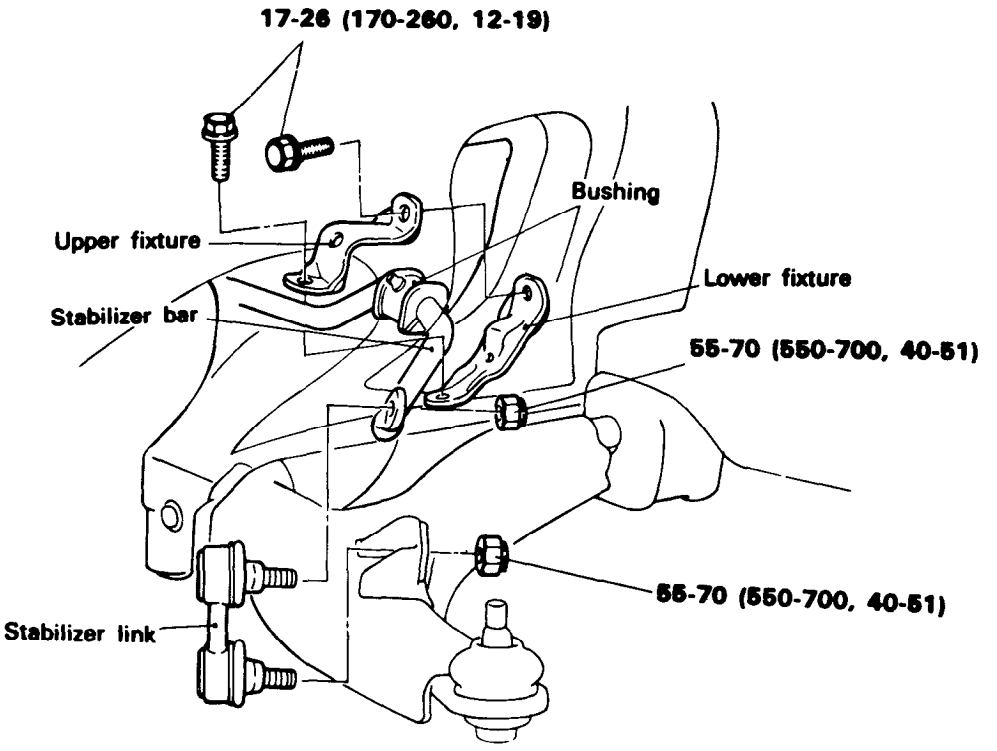
Lower arm front mounting nut	95-120 Nm (950-1200 kg.cm, 69-87 lb.ft)
Lower arm rear mounting bolt	60-80 Nm (600-800 kg.cm, 43-58 lb.ft)



2. Tighten the stabilizer link with a spanner wrench (14 mm or 9/16 in.) then install the self locking nut.



COMPONENTS

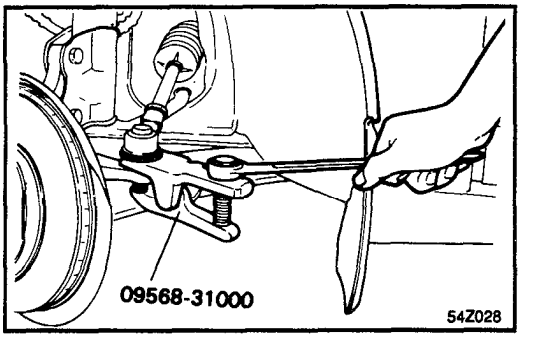


TORQUE : Nm (kg.cm, lb.ft)

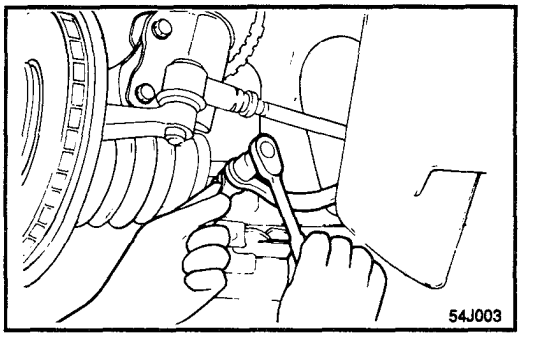
REMOVAL

1. Disconnect the tie rod end ball joint from the knuckle using special tool.

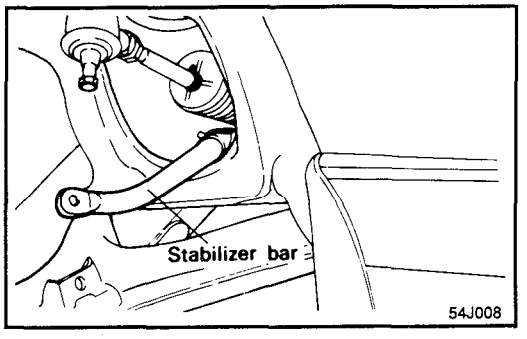
   NOTE
   Be sure to tie a cord to the special tool and to a nearby prt.



2. Remove the stabilizer link self locking nut with a spanner wrench **(14** mm or 9/16 in.)



3. Remove the stabilizer bar through the access opening.
4. Detach the upper and lower fixtures; then remove the bushing.



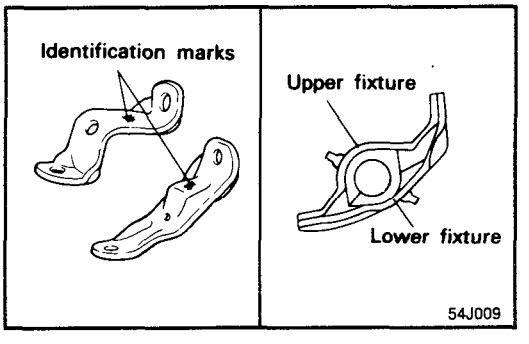
INSPECTION

1. Check the stabilizer bar for deterioration and damage.
2. Check all bolts for condition and straightness.

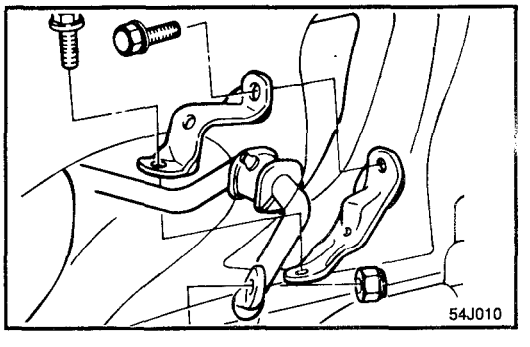
INSTALLATION

1. Install the bushing onto the stabilizer bar.
2. Align the upper and lower fixtures with the bushing. Make sure the projections are securely in the space between the fixtures.

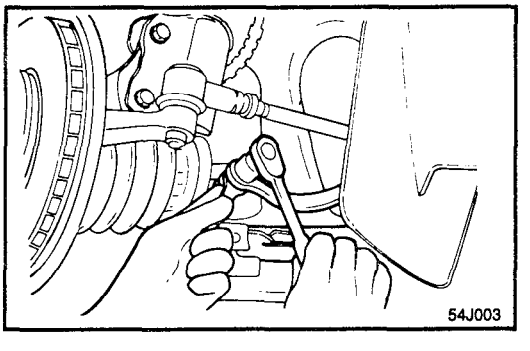
NOTE
When installing, distinguish the fixtures by noting their identification mark.
Identification mark : R for R.H. side
L for L.H. side



3. Using the access opening, temporarily tighten the bushing fixtures then position the opposite side bushing.

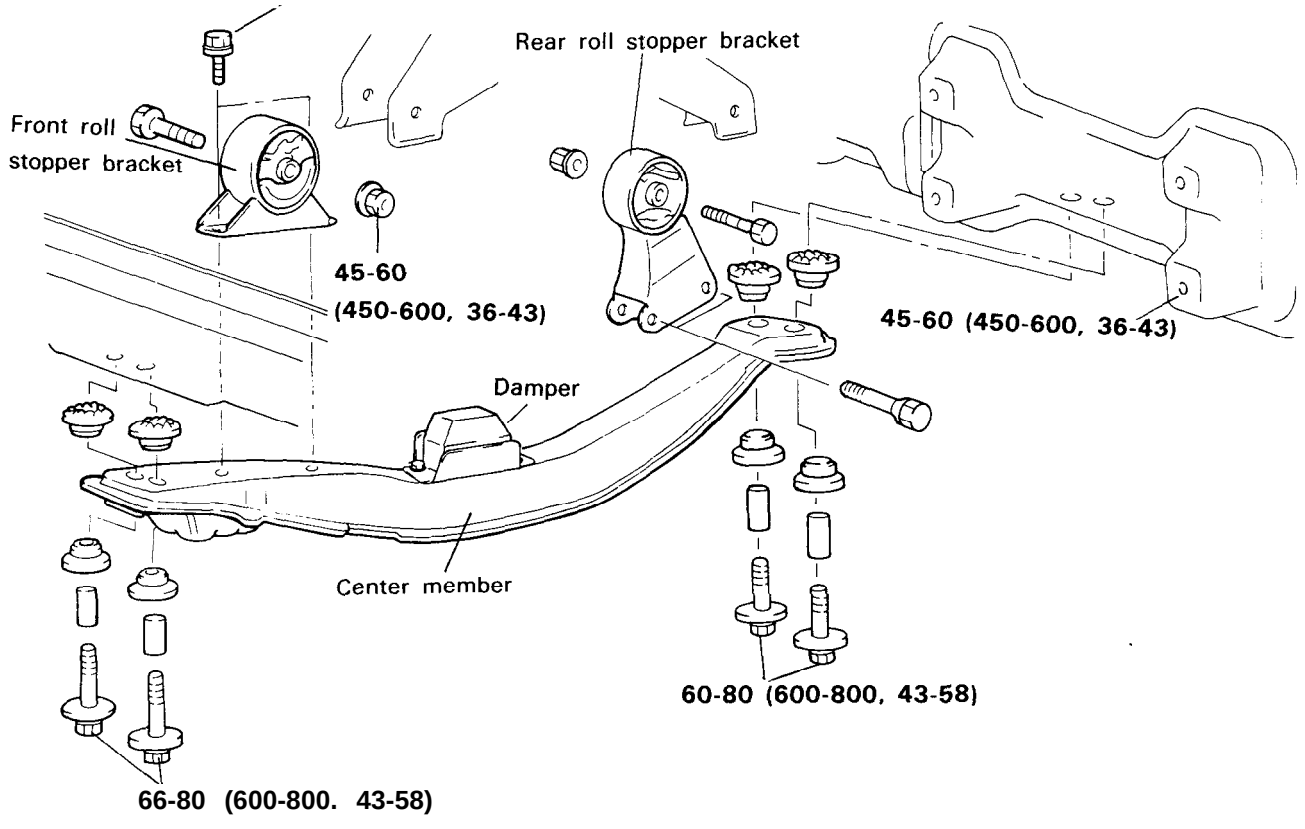


4. Tighten the stabilizer link with a spanner wrench (14 mm or 9/16 in.) then install the self locking nut.
5. Connect the tie rod end ball joint to the knuckle.



CENTER MEMBER

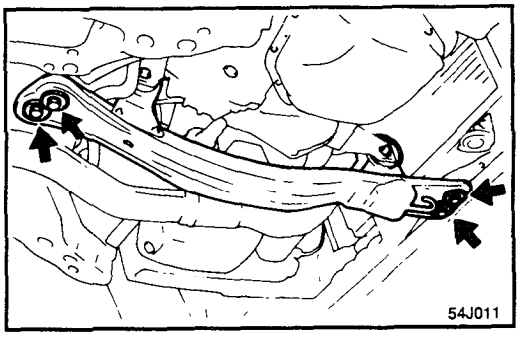
COMPONENTS



TORQUE : Nm (kg.cm, ib.ft)

REMOVAL

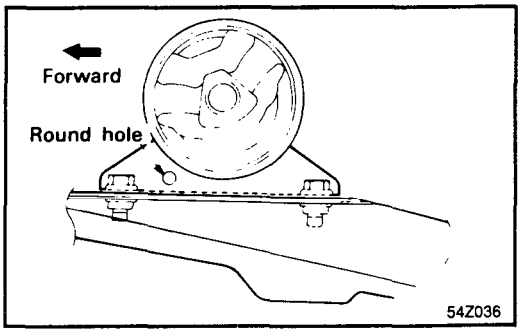
1. Raise the vehicle and position the jack stands.
2. Detach the front and rear roll stopper brackets from the engine mounting bracket.
3. Remove the center member assembly.



INSPECTION

1, Check each insulator and bushing for cracks or deterioration.
2. Check each bracket for distorsion or damage.

INSTALLATION



1. Install the front roll stopper bracket so that its round hole faces forward.
2. Fit the rear roll stopper bracket to the center member, and install the center member assembly.
3. Temporarily tighten the front roll stopper bracket bolt. After the total weight of the engine has been placed on the vehicle body, securely tighten the nut.

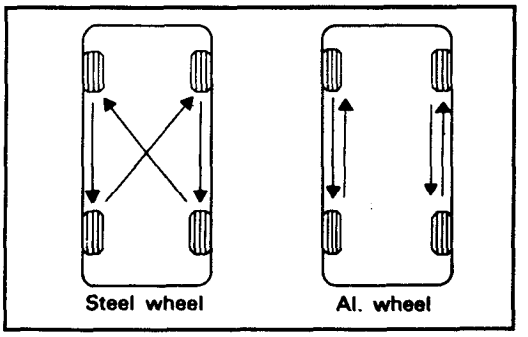
Center member mounting bolt	60-80 Nm (600-800 kg.cm, 43-58 lb.ft)
Front roll stopper bracket to center member bolt	30-40 Nm (300-400 kg.cm, 25-29 lb.ft)
Rear roll stopper bracket to center member bolt	45-60 Nm (450-600 kg.cm, 33-43 lb.ft)
Insulator to engine mounting bracket bolts	45-60 Nm (450-600 kg.cm, 33-43 lb.ft)

WHEEL AND TIRE

WHEEL ROTATION

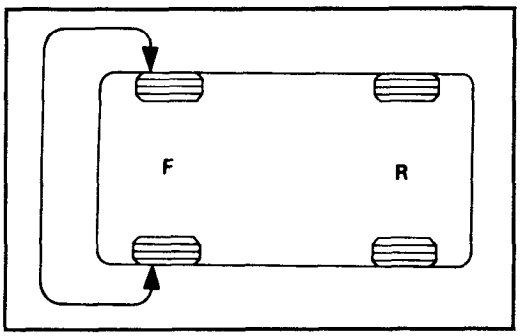
1. Rotate the tires in the patterns illustrated.

NOTE
The temporary spare tire should not used in the wheel rotation.

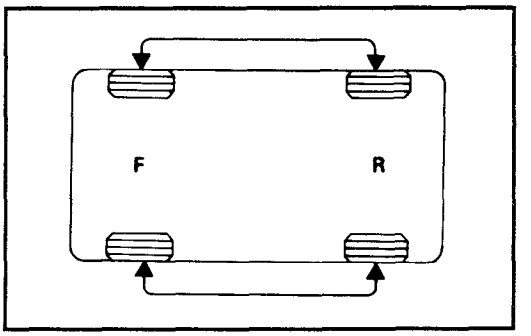


Checking for pull and wander

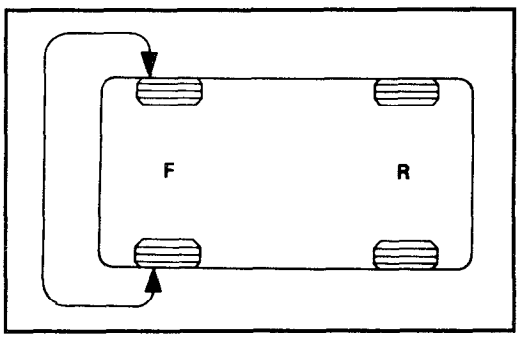
1. If the steering pulls to one side, use the following wheel rotation procedure.
   1) Switch the front right and front left tires, and perform the road test in order to confirm vehicle stability.



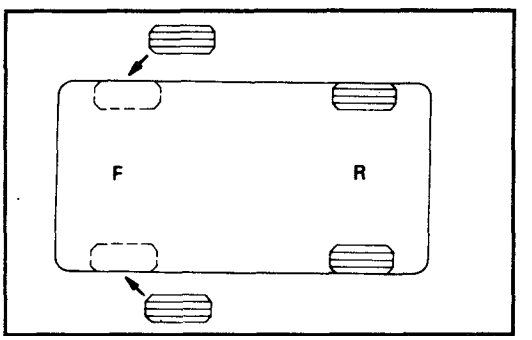
   2) If the steering pulls to opposite side, switch the front and rear tires, and again perform the road test.



   3) If the steering continues to pull to one side, switch the front right and left tires again, and again perform the road test.



   4) If the steering continues to pull to the opposite side, replace the front wheels with new ones.



INSTRUCTIONS FOR ALUMINUM TYPE WHEELS

1. Aluminum is vulnerable to alkalies. If the vehicle has been exposed to automobile washing detergent, or salt from sea water, or road chemicals, rinse the vehicle as soon as possible. Then apply wax to the wheels to prevent corrosion.
2. When steam cleaning the vehicle, do not direct the steam onto the aluminum wheels.
   When tightening nuts for aluminum wheels, observe the following:
   1) Clean the hub surface.
   2) After finger-tightening the wheel nuts, tighten to specifications.
   3) Do not use an impact wrench or push the wrench by foot to tighten the wheel nuts.
   4) Do not apply oil to the threaded portions.

TIRE CHAINS AND SNOW TIRES

1. Use tire chains only on the front wheels. Do not use tire chains on rear wheels.
2. When using snow tires, use them on all four wheels for maneuverability and safety.

REAR SUSPENSION

Return To Main Table of Contents

GENERAL 2
REAR SUSPENSION 7
REAR AXLE HUB 13

GENERAL

SPECIFICATIONS

Suspension system	3-link, torsion axle with coil spring

Coil spring
Free height and identification color

Model	Free height mm (in.)	identification color
1.6 GL ALL 1.8 GL ALL	339.0 (13.34)	Yellow 1 line
1.8 GLS ALL	346.5 (13.64)	White 1 line

GL, GLS : Trim level

Shock absorber	
Type	Hydraulic, cylindrical, double acting type
Max. length	619 mm (24.37 in.)
Min. length	432 mm (17.01 in.)
Stroke	187 mm (7.36 in.)

SERVICE STANDARD

Toe	0 mm (0 in.)
Camber	-40

NOTE
The rear wheel alignment is set at the factory and cannot be adjusted. If toe or camber is not within the specification, replace the damaged parts.

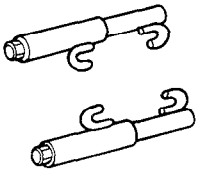
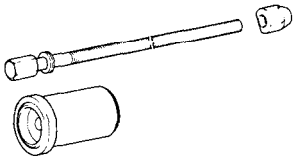
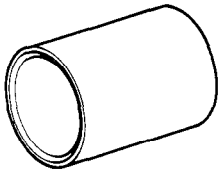
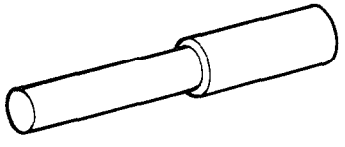
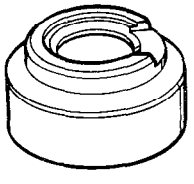
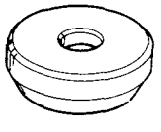
TIGHTENING TORQUE

	Nm	kg.cm	lb.ft
Wheel bearing self locking nut	150-200	1500-2000	108-145
Shock absorber upper mounting nut	25-35	250-350	18-25
Shock absorber lower mounting nut	80-100	800-1000	58-72
Lateral rod to body	80-100	800-1000	58-72
Lateral rod to axle beam	80-100	800-1000	58-72
Trailing arm mounting bolt	130-150	1300-1500	94-108
Brake assembly mounting bolt	50-60	500-600	36-43

LUBRICANT

	Recommended lubricant	Quantity
Wheel bearings, oil seal lip, inside surface of the hub and hub cap	SAE J310a, Multi-purpose grease NLGI-2 or equivalent	As required

SPECIAL TOOLS

Tool (Number and Name)	Illustration	Use
09546-11000 Spring compressor or J-38402		Compression of the front coil spring.
09555-28000 Torsion arm bushing remover and installer		Removal and installation of the torsion arm bushing (use with 09216-21100).
09216-21100 Mounting bushing remover and installer base		Removal and installation of the lateral rod bushing (use with 09545-21400, 09556-31000, 09555-28000).
09545-21400 Lateral rod bushing arbor		Removal and installation of the lateral rod bushing (use with 09216-21100, 09556-31000).
09556-31000 Bushing remover and installer		Removal and installation of the lateral rod bushing (use with 09216-21100, 09545-21400).
09517-21400 Drift		Removal of rear wheel bearing outer race.
09432-21700 Bearing outer race installer		Installation of rear hub bearing outer race (use with 09500-21000).
09500-21000 Bar		Removal and installation of oil seal and bearing (use with 09432-21700).

TROUBLESHOOTING

Symptom	Probable cause	Remedy
Abnormal sound	Loose installation parts Damaged or worn wheel bearings Faulty shock absorber Defective tire	Retighten Replace Replace damaged parts Replace
Poor ride control	Excessive tire pressure Faulty shock absorber Loose wheel nuts Sagging or broken coil spring Defective tire Worn bushings	Adjust pressure Replace Tighten to specified torque Replace Replace Replace
Vehicle body tilts to one side	Deformation of torsional axle and arm assembly Worn bushings Sagging or broken coil spring	Replace Replace Replace

SERVICE ADJUSTMENT PROCEDURE

REAR WHEEL ALIGNMENT

The rear suspension assembly must be free of worn, loose or damaged parts prior to measurement of rear wheel alignment.

Standard value
- Toe ..... 0 mm
- Camber ..... -40

NOTE
The rear wheel alignment is set at the factory and cannot be adjusted. If toe or camber is not within the standard value, replace the bent or damaged parts.

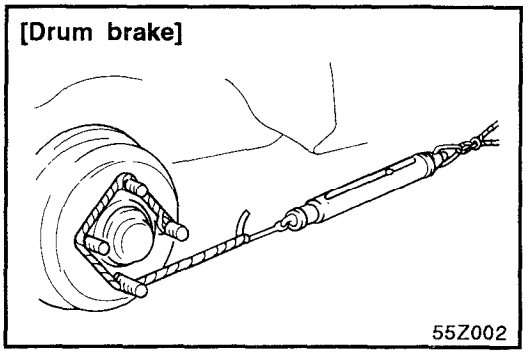
WHEEL BEARING STARTING FORCE INSPECTION

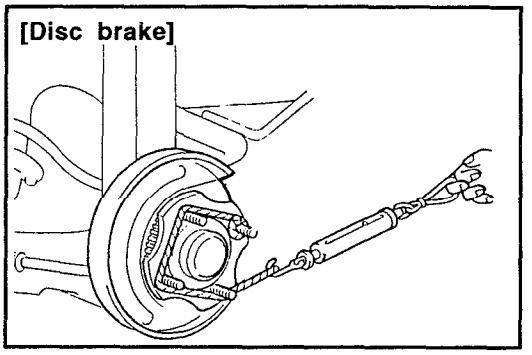
1. Remove the rear wheels.
2. Release the parking brake.
3. Measure the hub and drum starting force.

Service limit ..... 22 N (2.2 kg, 4.9 lbs.) or less

4. If the hub and drum starting force exceeds the limit, remove the hub cap, loosen the wheel bearing nut and retighten it, and recheck the hub and drum starting force.
5. If the hub starting force is still beyond the limit, replace the bearings.

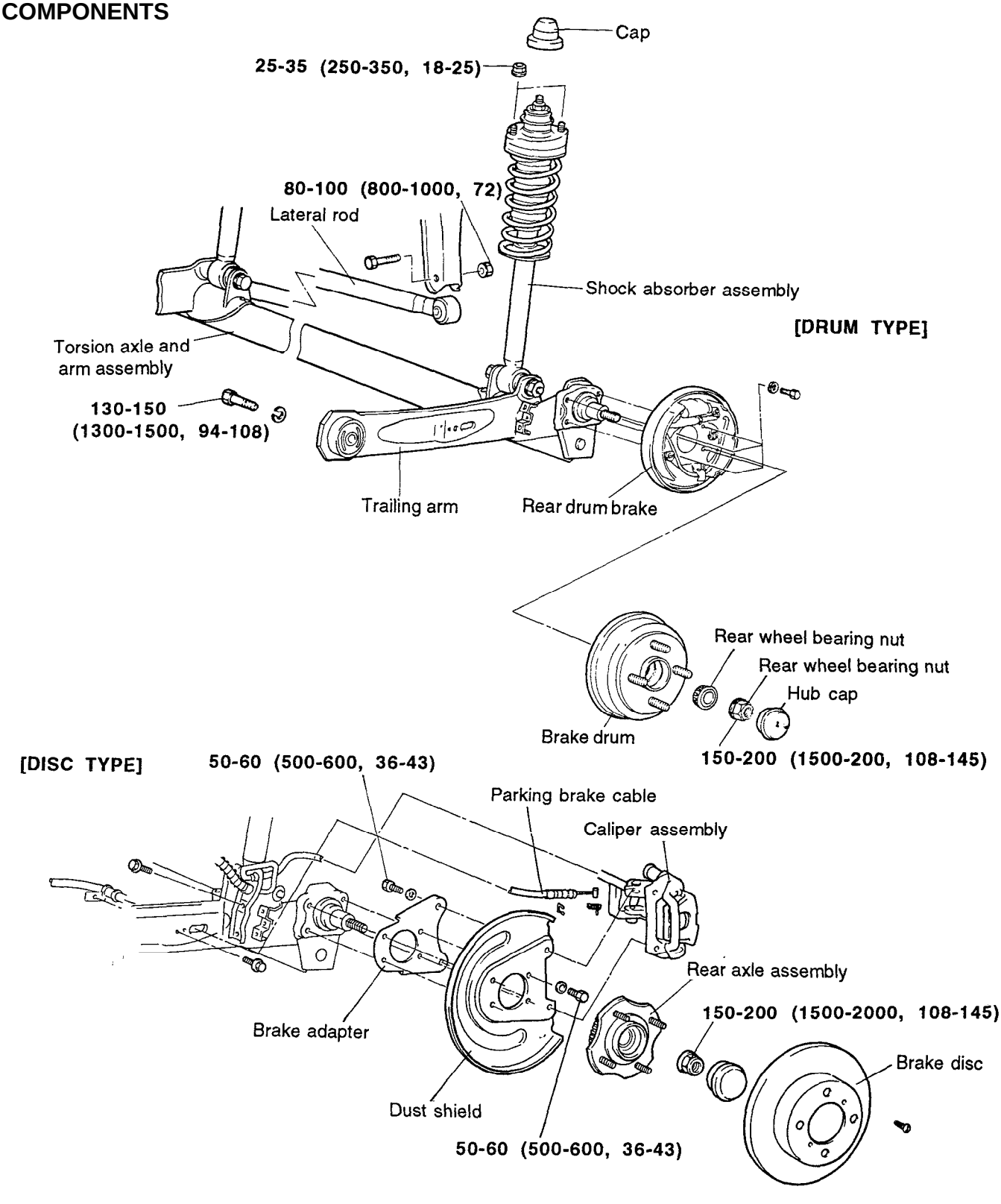
NOTE
There should be no axial clearance for hub and bearing.





REAR SUSPENSION

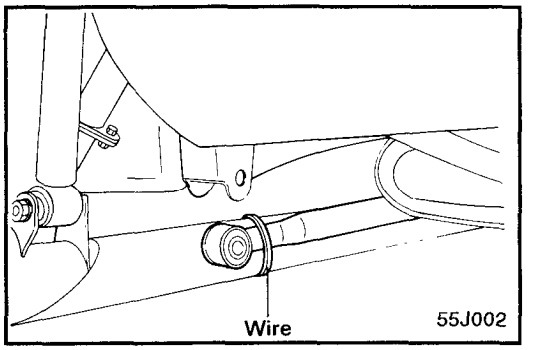
COMPONENTS



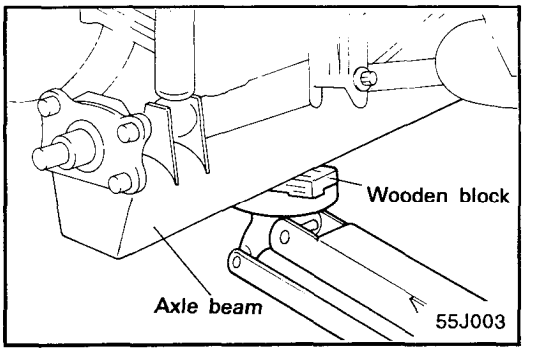
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Remove the lateral rod assembly.
2. Hold the lateral rod to the axle beam with wire, etc.



3. Jack up the torsion axle and arm assembly.
4. Remove the shock absorber mounting nuts and trailing arm mounting bolts.

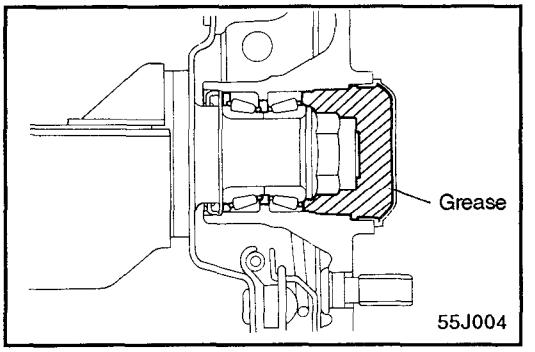


INSPECION

1. Check the trailing arm and axle beam for deformation or damage.
2. Check the torsion bar for damage.
3. Check the lateral rod for damage or deformation.
4. Check the bushings for crack, deterioration, or unusual wear.

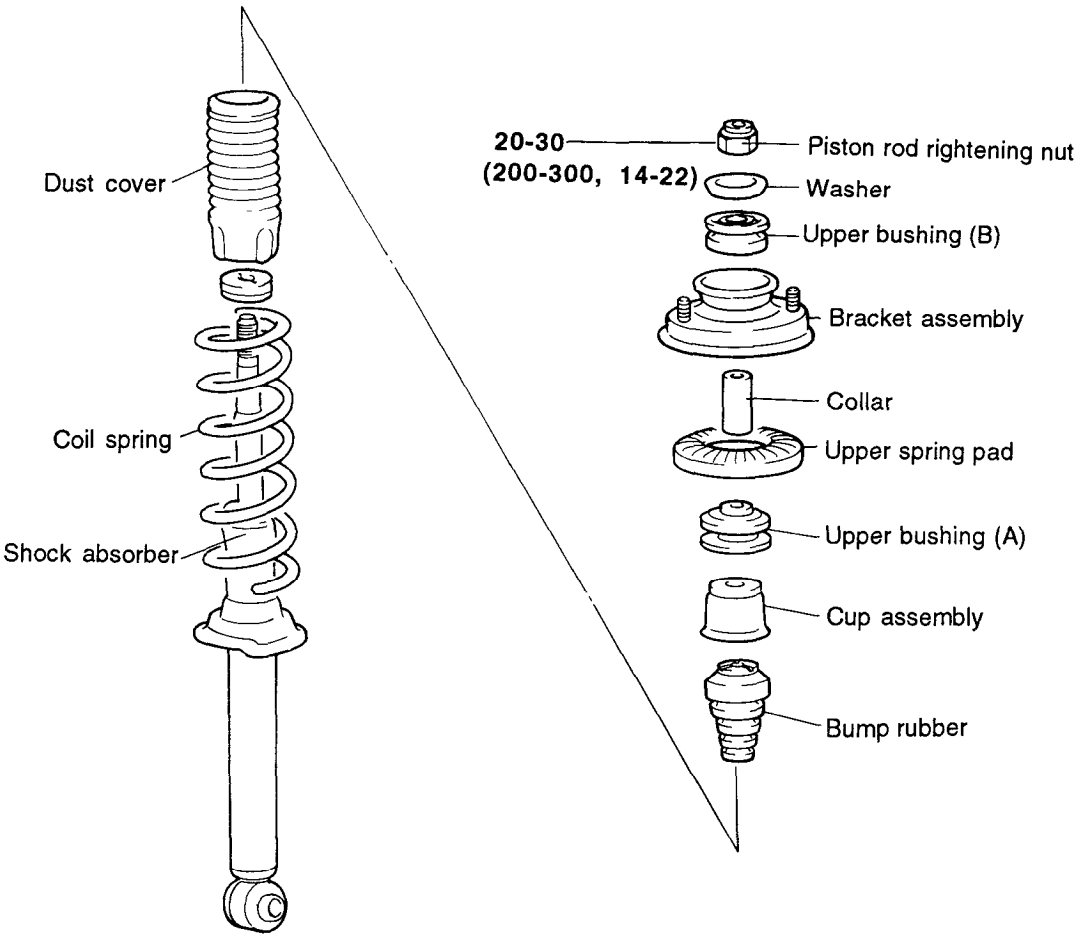
INSTALLATION

1. Install and tighten the rear wheel bearing nut to the specified torque. Check the wheel bearing for end play and starting force. (Refer to Page 55-6).
2. After filling the hub cap with multipurpose grease, install the hub cap.



SHOCK ABSORBER

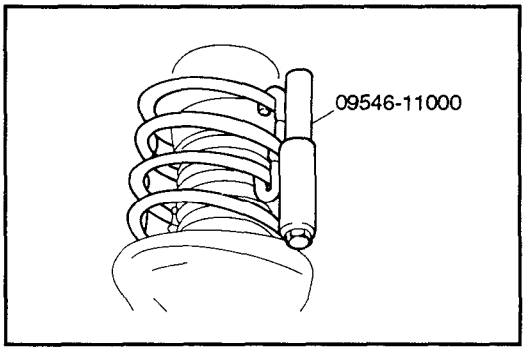
COMPONENTS



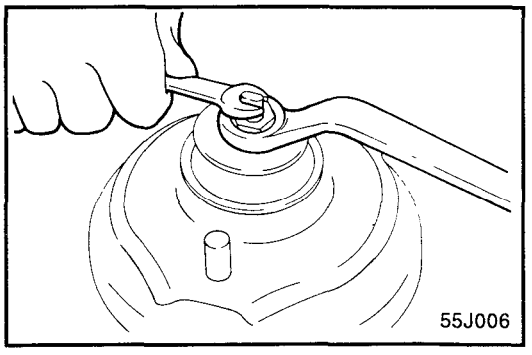
TORQUE : Nm (kg.cm, lb.ft)

DISASSEMBLY

1. Before removing the piston rod tightening nut, compress the coil spring using the special tool.
   CAUTION
   Do not use an air tool to compress the special tool.



2. While holding the piston rod, remove the piston rod tightening nut.

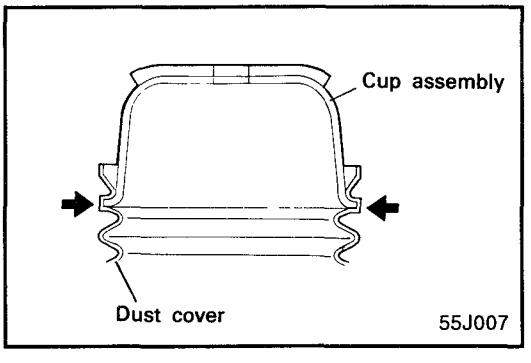


INSPECTION

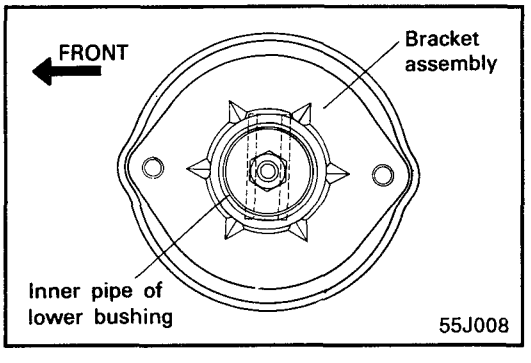
1. Check the rubber parts for damage.
2. Check the coil springs for damage or deterioration.

ASSEMBLY

1. As shown in the illustration, fit the dust cover to the cup assembly.

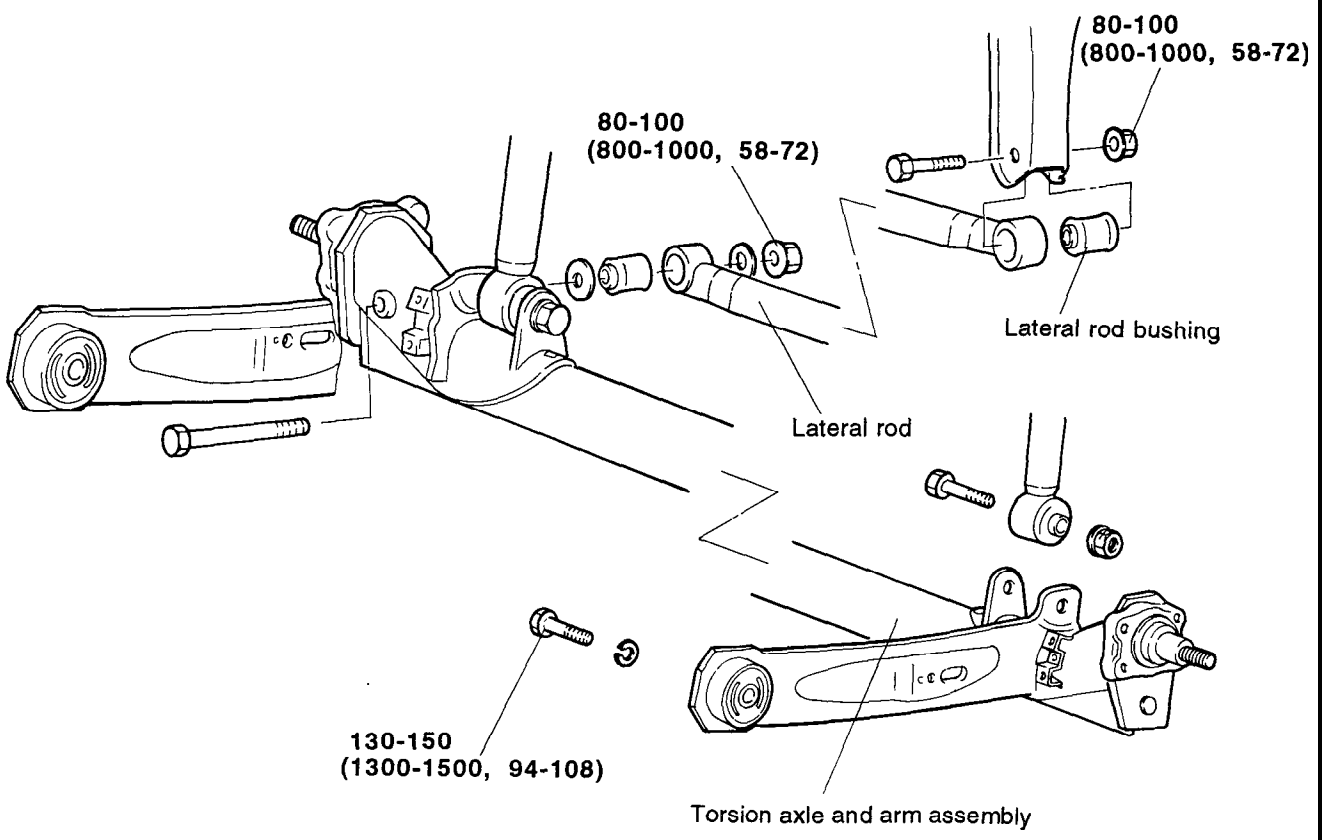


2. With the position of the bracket assembly as shown in the figure, tighten the tightening nut according to the specified torque.



TORSION AXLE, ARM ASSEMBLY AND LATERAL ROD

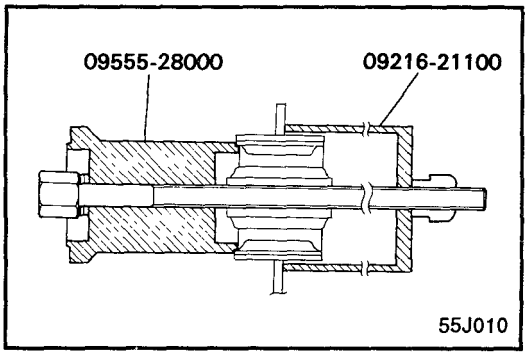
COMPONENTS



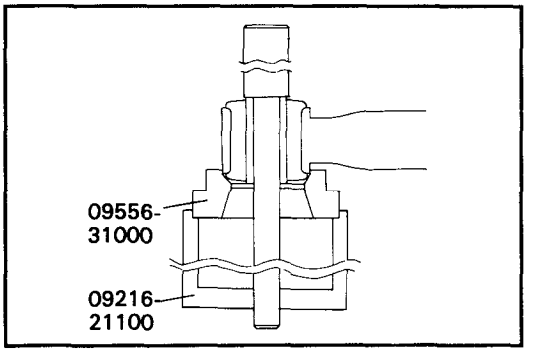
TORQUE : Nm (kg.cm, lb.ft)

DISASSEMBLY

1, Drive out and press in the arm bushing using the special tool.

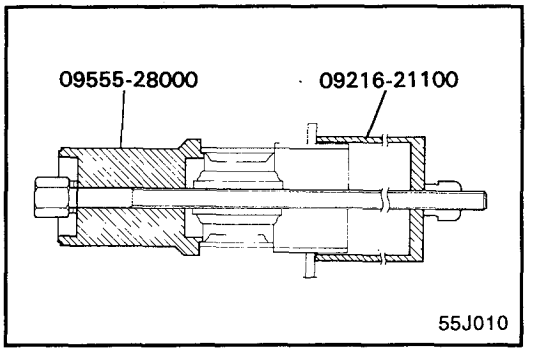


2. Drive out and press in the lateral rod bushing using the special tool.

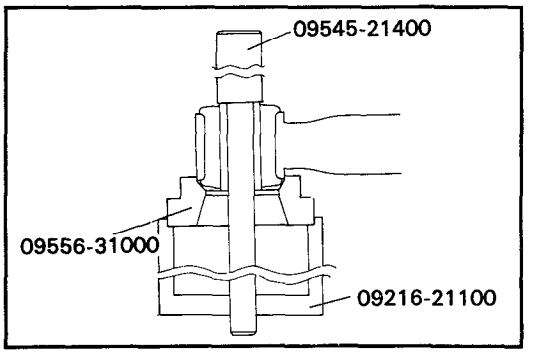


ASSEMBLY

1. Install the trailing arm bushing with the special tool.



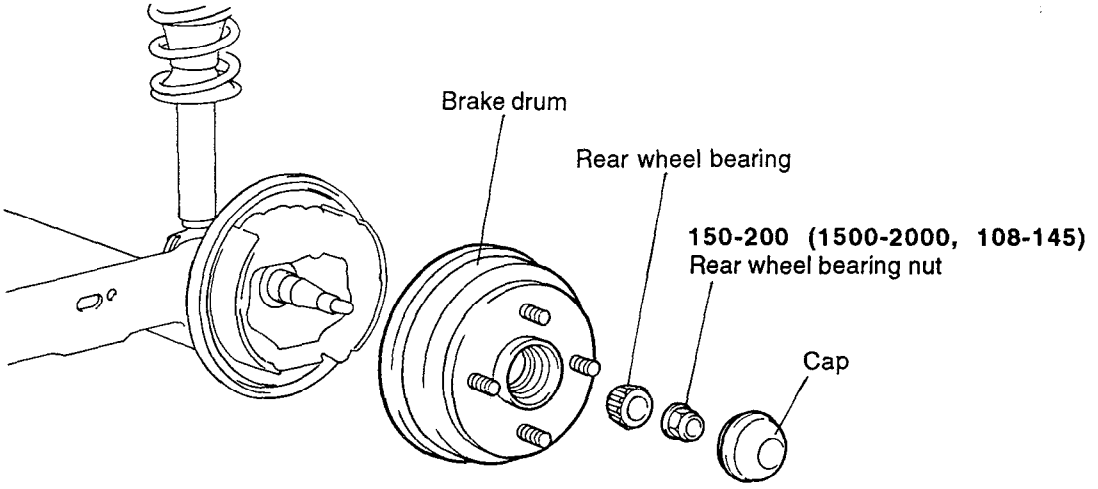
2. Press in the lateral rod bushing with the special tool.
   Press in the bushing so that the amount of projection is equal on either side.



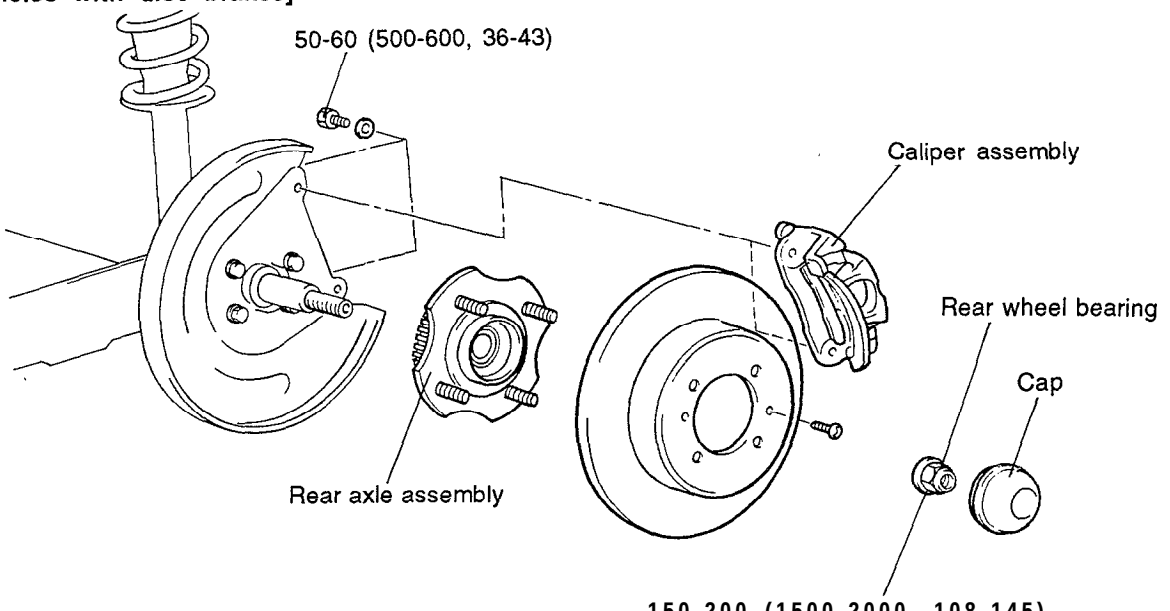
REAR AXLE HUB

COMPONENTS

[Vehicles with drum brakes]



[Vehicles with disc brakes]



TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Remove the caliper assembly (Rear disc brake)
2. Remove the disc (Rear disc brake)
3. Remove the hub cap and self-locking nut
4. Remove the outer wheel bearing
5. Remove the rear hub assembly (Rear drum brake)
6. Remove the rear axle assembly (Rear disc brake)

INSPECTION

1. Check the surface of bearings for seizure, discoloration or roughened raceway.
2 Check the rear hub for wear or damage.

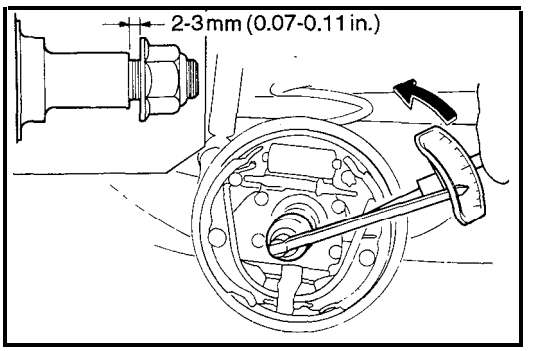
NOTE
The unit ball bearing must be replaced as an assembly.

INSTALLATION

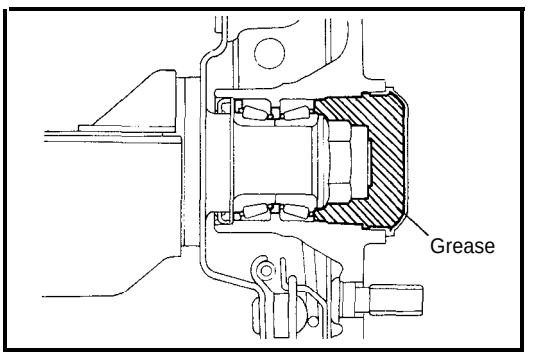
1. Before installing the rear hub assembly, inspect the rear wheel bearing nut using the following method to determine whether it is reusable or not.
   1) Screw in the rear wheel bearing nut on the spindle untill the gap shown in the illustration is achieved.
   2) Measure the torque required to rotate the rear wheel bearing nut while backing it off (turning it counterclockwise).

      Limit : 5.5 Nm (48 ft.lbs.)

   3) If the measured torque is less than the limit, replace the rear wheel bearing nut with a new one.

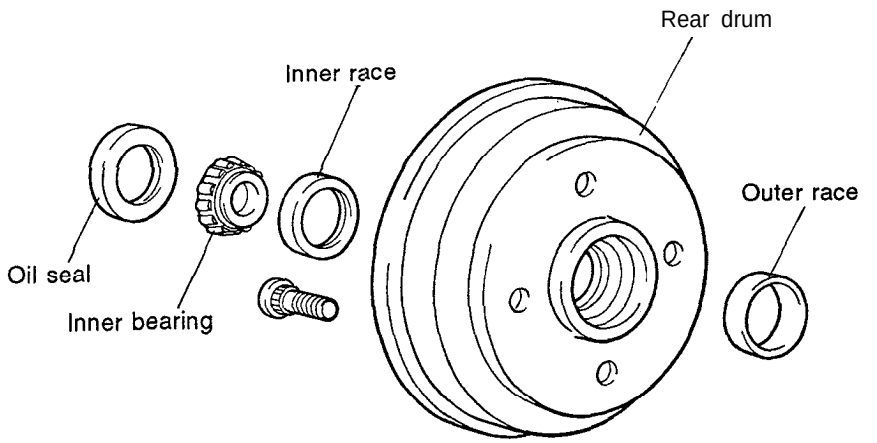


2. Install and tighten the rear wheel bearing nut to the specified torque. Check the wheel bearing for end play and starting force. (Refer to Page 55-6)
3. After filling the hub cap with multipurpose grease, install the hub cap.

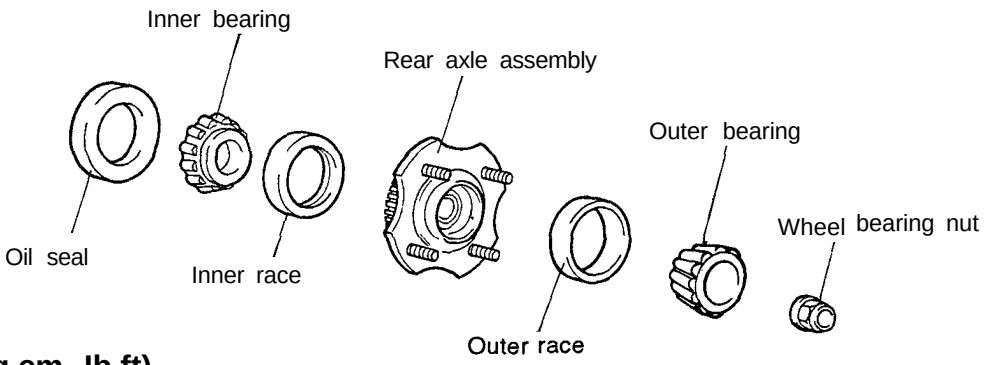


COMPONENTS

[Drum brake]



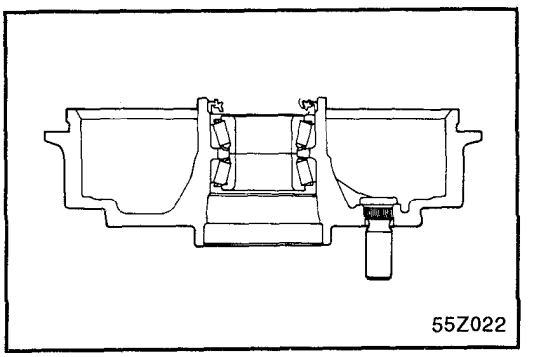
[Disc brake]



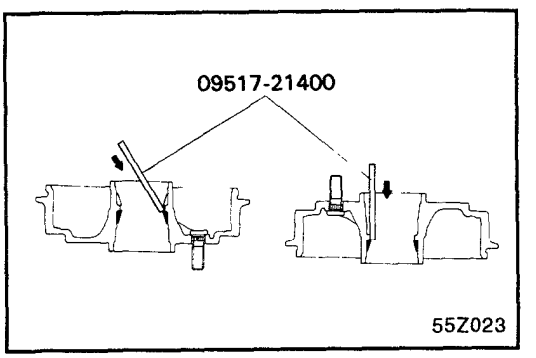
TORQUE : Nm (kg.cm, lb.ft)

DISASSEMBLY

1. Using a flat-blade screwdriver, remove the grease seal from the drum.

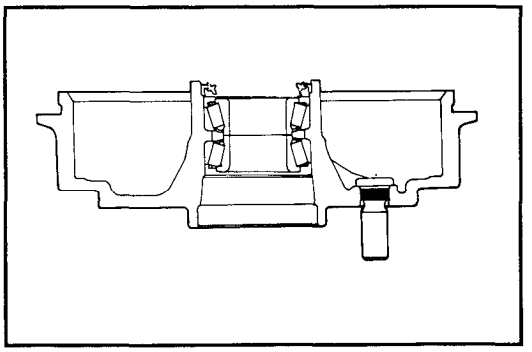


2. After removing grease from inside the hub, remove the bearing outer races, using a hammer and drift.



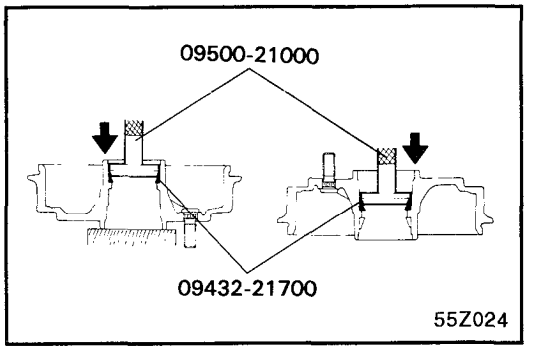
INSPECTION

1. Check for a damaged or worn bearing.
2. Check for a worn or damaged brake drum inside surface.
3. Check oil seal for crack or damage.



ASSEMBLY

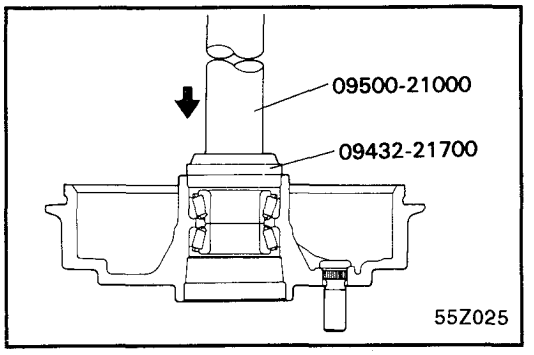
1. After applying the specified grease to the bearing surface, drive the bearing outer races into position.



2. Install the inside bearing inner race.
3. install the grease seal and apply grease to the seal lips.

   NOTE
   Be sure to use a new grease seal.

4. Install the outside bearing inner race.



AUTOMATIC TRANSAXLE

Return To Main Table of Contents

GENERAL 2
TRANSAXLE CONTROL 46
SHIFT LEVER ASSEMBLY 51
AUTOMATIC TRANSAXLE 53
AUTOMATIC TRANSAXLE ASSEMBLY 57
OIL PUMP ASSEMBLY 88
FRONT CLUTCH ASSEMBLY 91
REAR CLUTCH ASSEMBLY 94
END CLUTCH ASSEMBLY 97
PLANETARY GEAR SET 100
INTERNAL GEAR AND TRANSFER DRIVE GEAR SET ASSEMBLY 104
DIFFERENTIAL 106
VALVE BODY 109
KICKDOWN SERVO 124
SPEEDOMETER SLEEVE 125
TRANSAXLE CASE 126
AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT 127

GENERAL

SPECIFICATIONS

Type	Automatic four speed with torque converter and internal differential KM 175
Torque converter	
Type	Spring type damper clutch
Engine stall speed	2000±200 rpm
Stall torque ratio	**2.17**
Transaxle	
Type	Electronically controlled 4-speed full-automatic
Gear ratio	
First	2.646
Second	1.661
Third	1.000
Fourth	0.665
Reverse	2.176
Final gear ratio	4.360
Speedometer gear ratio	Drive 36/Driven 32

TIGHTENING TORQUE

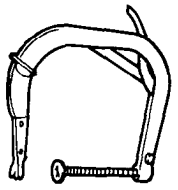
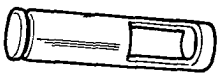
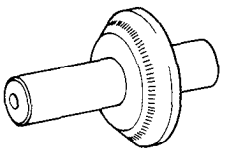
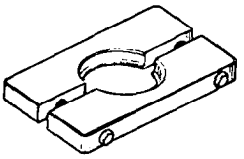
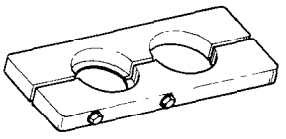
Items	Nm	kg.cm	lb.ft
Oil pan bolts	10-12	100-120	7-9
Tie rod end to knuckle	24-35	240-350	17-25
Lower arm ball joint to knuckle	60-72	600-720	43-52
Transaxle mounting bracket to transaxle	60-80	600-800	43-58
Special bolts	46-53	460-530	33-38
Selector lever assembly mounting bolts	9-14	90-140	7-10
Starter motor mounting bolt	27-34	270-340	20-24
Oil cooler hose clamp	4-6	40-60	3-4
Hose bracket	3-5	30-50	2-4
Cover to selector knob	2.0 or more	20 or more	1.4 or more
Selector knob to lever assembly	2.0 or more	20 or more	1.4 or more
Bell housing cover to engine	10-12	100-120	7-9
Transaxle mounting bolt [10 mm (0.40 in.) diameter bolt]	43-55	430-550	31-40
Transaxle mounting bolt [8 mm (0.31 in.) diameter bolt]	30-35	300-350	22-25
Torque converter to drive plate	73-77	730-770	53-55
Control cable to body	9-14	90-140	7-10
Indicator panel	1.5 or more	15 or more	1.1 or more
Lever assembly to bracket assembly	14-20	140-220	10-14
Drive plate-to-converter tightening bolt	46-53	460-530	34-38
Drain plug	30-35	300-350	22-25
Pressure check plug	8-10	80-100	6-7
Pulse generator mounting bolt	10-12	100-120	7-9
Bearing retainer screw	17-22	170-220	12-15
Lock plate bolt	48-60	480-600	35-43
Converter housing bolt	19-23	190-230	14-16
One-way clutch outer race bolt	25-35	250-350	18-25
Differential drive gear bolt	130-140	1300-1400	94-101
Manual control lever nut	17-21	170-210	13-15
Manual control shaft set screw	8-10	80-100	6-7
Transaxle range switch	10-12	100-120	7-9
Sprag rod support bolt	20-27	200-270	15-19
Pump housing-to-reaction shaft support bolt	10-12	100-120	7-9
Oil pump assembly mounting bolt	15-22	150-220	11-15
Valve body bolt	4-6	40-60	3-4
Valve body assembly mounting bolt	10-12	100-120	7-9
Oil filter bolt	5-7	50-70	4-5
Speedometer sleeve locking plate bolt	3-5	30-50	2-4
End clutch cover	6-8	60-80	5-6
Kickdown lock nut	25-32	250-320	18-23

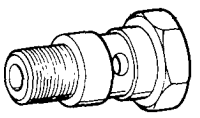
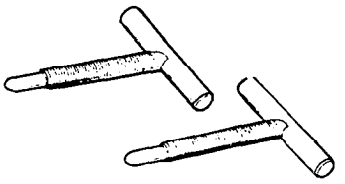
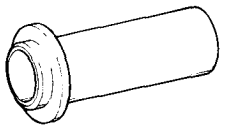
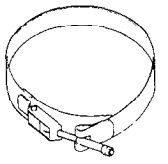
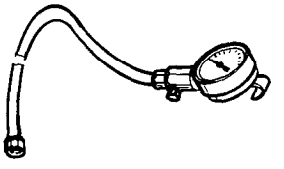
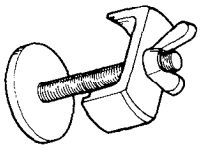
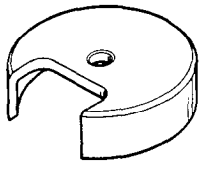
LUBRICANTS

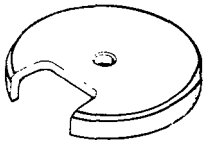
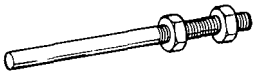
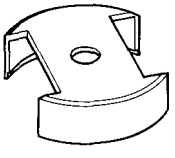
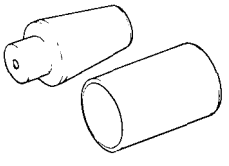
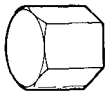
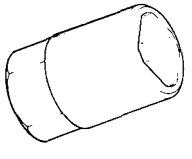
Items	Specified lubricant	Quantity
Transaxle fluid lit. (U.S. qts., Imp.qts.)	GENUINE HYUNDAI ATF AUTOMATIC TRANSAXLE FLUID OR *MOPAR ATF PLUS TYPE 7176, OR EQUIVALENT DIAMOND ATF SP.	6.1 (6.4, 5.4)
Drive shaft oil seal lip	Automatic transaxle fluid	As required
Sliding part of bushing	Chassis grease SAE J310, NLGI No.0	As required
Selector lever sliding portion	Multipurpose grease SAE J310, NLGI No.2	As required

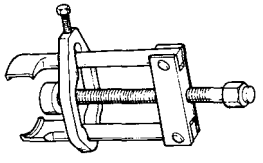
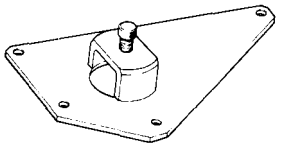
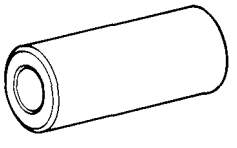
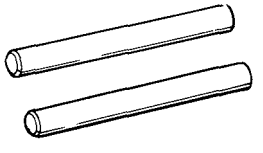
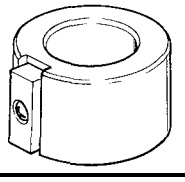
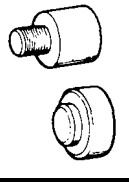
* : Mopar ATF PLUS TYPE 7176 is the recommended lubricant.

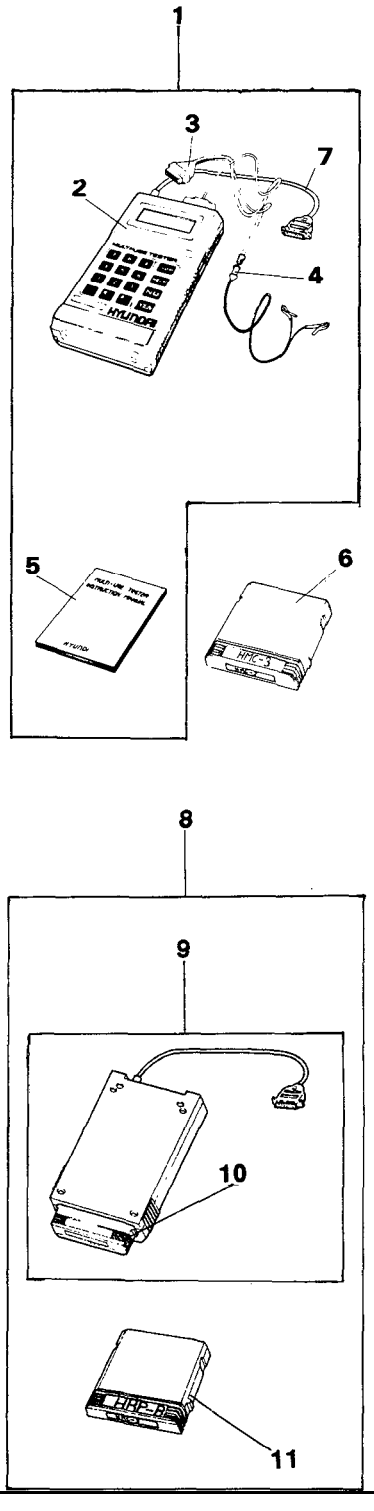
SPECIAL TOOLS

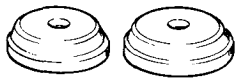
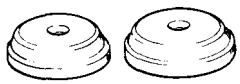
Tool (Number and name)	Illustration	Use
09222-28000 Valve spring compressor		Removal and installation of the kickdown servo. (use with 09222-28100)
09222-28100 Valve spring compressor holder		Removal and installation of the kick down servo (use with 09222-28000)
09431-21200 Oil seal installer		Installation of differential oil seal.
09433-21000 Removing plate		1) Removal of transfer driven gear taper bearing .(use with 09432-33800). 2) Removal of differential ball bearing.
09432-33200 Removing plate		Removal of transfer shaft bearing.
09432-33800 Bearing installer		Installation of transfer shaft bearing
09452-21001 Oil pressure gauge adapter		Measurement of the oil pressure. (use with 09452-21500 and 09452-21002)

Tool (Number and name)	Illustration	Use
09453-21102 Oil pressure gauge adapter		Measurement of the oil pressure. (use with 09452-21500 and 09452-21001)
09452-21100 Oil pump remover		Removal of the oil pump.
09452-21200 Oil pump oil seal installer		Installation of the oil pump oil seal.
09452-21301 Oil pump band		Assembling the oil pump. (use with 09452-21401)
09452-21401 Guide pin		Installation of the oil pump. (use with 09452-21301)
09452-21500 Oil pressure gauge		Measurement of the oil pressure. (use with 09452-21001 and 09452-21002)
09453-21000 Spring compressor		Removal and installation of the snap ring and return spring of the front clutch.
09453-21100 Spring compressor		Removal and installation of the rear clutch (use with 09453-21000)

Tool (Number and name)	Illustration	Use
09453-21200 Spring compressor		Removal and installation of snap ring of low-reverse brake. (use with 09454-33000)
09453-21310 Center support remover and installer		Removal and installation of the center sup-
09453-21400 Dial gauge support		Measurement of the input shaft and transfer shaft end play. (use with dial gauge)
09453-24000 Spring compressor		Removal and installation of snap ring and return spring of front clutch. (use with 09453-21000)
09453-33000 Snap ring installer		Installation of end clutch snap ring.
09453-33100 Dial gauge extension		Measurement of the low and reverse brake end play (use with dial gauge)
09454-21100 Wrench adapter		Loosening and tightening of the transfer idler shaft.
09454-33101A Kickdown servo socket wrench-A		Adjustment of kickdown servo. (use with 09454-33101B)

Tool (Number and name)	Illustration	Use
09454-33101B Kickdown servo socket wrench-B		Adjustment of kickdown. (use with 09454-33101A)
09455-21000 Bearing and gear puller		Removal of ball bearing and transfer drive gear.
09455-21100 Bearing installer		1) Installation of differential ball bearing. 2) Installation of ball bearing and transfer drive gear.
09455-21301 Transfer shaft retainer		Supporting the transfer shaft.
09455-33200 Bearing installer		1) Installation of ball bearing and transfer drive gear 2) Installation of the transfer shaft rear side bearing
09456-21000 Guide pin		Assembling of the valve body and transfer plate.
09458-33001 Wrench adapter		Preload measurement of transfer idler shaft.
09456-21100 Adapter set		Removal and installation of kickdown servo. (use with 09222-28000, 09222-28100)

Tool (Number and name)	Illustration	Use
09391-33002 Scan tool assy		Scan tool for MFI, automatic transaxle and cruise control system.
09391-33100 1. Scan tool sub assy		
09391-33200 2. Scan tool main body		
09391-33300 3. Test harness		
09391-33500 4. Battery harness		
09391-33600 5. Instruction manual		
09391-33402 6. ROM Pack		
09391-33700 7. Connector RS 232C		
09391-33902 8. Adapter assembly		
09391-33802 9. Adapter sub assembly		
09391-33822 10. Adapter system pack-B		
09391-33452 11. ROM pack (HRP-B)		For connection to the external communication device such as personal computer etc. in using Scan tool.

Tool (Number and name)	Illustration	Use
09500-11000 Bar		Installation of differential bearing outer race and output shaft bearing outer race. (use with 09532-11500)
09500-21000 Bar		Installation of transfer shaft bearing outer race. (use with 09532-32000)
09352-11500 Pinion bearing outer race installer		1) Installation of transfer shaft front bearing outer race. (use with 09500-11000). 2) Installation of differential bearing outer race and output shaft bearing oute race. (use with 09500-11000)
09532-32000 Bearing installer		Installtion of transfer shaft bearing outer race. (use with 09500-21000)

TROUBLESHOOTING

Malfunctions of the auto transaxle can lead to other problems, such as those described below:

1. Improper maintenance and/or adjustments
2. Electronic control malfunctions
3. Mechanical functions
4. Hydraulic control
5. Engine performance malfunctions

etc.

In order to properly troubleshoot the source of these malfunctions, it is first essential to methodically question the owner concerning the problem. The driver should also be asked whether or not the problem has occurred more than once.

Tests should be conducted troubleshooting, as described at the right.

Based upon the use of the troubleshooting guide, the probable location of the problem should be determined.

↓

Checks should be make of the ATF fluid level and the condition as well as the adjustment condition of the manual control cables.

↓

If a presumption has been made that there is an abnormal condition somewhere in the electronic-control system, the scan tool should be used to estimate the probable location by checking the malfunction-indication pattern.

↓

When the abnormal system is discovered during the road test, check each element (sensors, etc.) one by one, and make repairs as necessary.

↓

When the abnormal condition is presumed to be in the oil-pressure-control system, check by making an oil-pressure test.

↓

When the result of the oil-pressure test does not satisfy the specified pressure, check each system at places related to the valve body, check the oil-pressure passages for leakage, etc.

↓

If the problem is unusually dirty ATF, abnormal noises, oil leakage, or slippage of the clutch or brakes, or an abnormal condition of the transaxle itself, disassemble and repair the transaxle.

TROUBLESHOOTING GUIDE

		Problem / Presumed cause	Driving impossible or abnormal (before start-off)											
			Starter motor won't function	Forward/backward movement impossible	Forward movement impossible	Backward movement impossible	Engine stalls when N-D or R	Clutch slips at D (stall rpm too high)	Clutch slips at R (stall rpm too high)	Stall rpm too low	Vehicle moves at P or N	Engine starts, or vehicle moves, between NR ro ND	Parking doesn't hold	Abnormal vibration-shock when shift to D-2-L-R
	1	Abnormal idle rpm					X							X
	2	Poor performance					X			X				
	3	Improper adjustment of manual linkage	X	X	X	X		X	X		X	X	X	X
	4	Malfunction of torque converter (including damper clutch)		X	X	X				X				
	5	Operation malfunction of oil pump		X	X	X		X	X					
	6	Malfunction of one-way clutch			X			X						
	7	Damaged or worn gear or other rotating part, or improper adjustment of the preload			X									
	8	Malfunction of parking mechanism									X		X	
	9	Cracked drive plate, or loose bolt		X										
	10	Worn inside diameter of front clutch retainer				X			X					
	11	Low fluid level		X	X	X		X	X					
	12	Line pressure too low (seal damaged, leakage, looseness, etc.)		X	X	X		X	X					
	13	Malfunction of valve body (sticking valve, working cavity, adjustment, etc.)		X	X	X	X	X	X		X	X		X
	14	Malfunction of front clutch or piston				X			X					X
	15	Malfunction of rear clutch or piston			X			X						X
	16	Malfunction of kickdown band or piston												
	17	Improper adjustment of kickdown servo												
	18	Malfunction of low-reverse brake or piston		X		X			X					X
	19	O-ring of low-reverse brake circuit between valve body and case not installed				X			X					
	20	Malfunction of end clutch or piston (check ball hole, other)												
	21	Malfunction of inhibitors switch, damaged or disconnected wiring, or improper adjustment	X								X	X		X
	22	Malfunction of TPS, or improper adjustment												X
	23	Pulse generator (A) damaged or disconnected wiring, or short-circuit												
	24	Pulse generator (B) damaged or disconnected wiring, or short-circuit				X								
	25	Malfunction of kickdown servo switch												
	26	SCSV-A or B damaged or disconnected wiring, or short-circuit or sticking (valve open)												
	27	Malfunction of ignition signal system												
	28	Incorrectly grounded ground strap												
	29	PCSV damaged or disconnected wiring, or short-circuit												
	30	PCSV damaged or disconnected wiring (valve open)		X	X	X		X	X					
	31	DCCSV damaged or disconnected wiring (valve closed)												
	32	DCCSV short-circuit or sticking (valve open)					X							
	33	Malfunction of OD switch												
	34	Malfunction of accelerator switch, or improper adjustment (Untill 1993 model)												X
	35	Malfunction of oil-temperature sensor												
	36	Malfunction of reed switch												
	37	Poor contact of ignition switch												
	38	Malfunction of transaxle control module												X

NOTE: X indicates items of high priority during inspection.
Abbreviations: TPS = Throttle Position Sensor SCSV = Shift Control Solenoid Valve

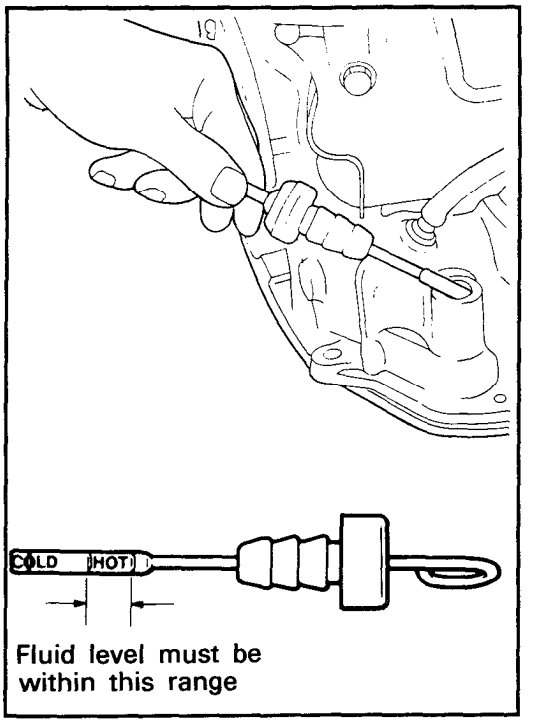
	Transaxle malfunction of shift-shock (after start-off)																Abnormal noise, other			
	Won't shift from 2nd to 3rd	Won't shift to 4th	OD switch doesn't function	Doesn't shift according to shift pattern (shifting is possible)	Improper start-off (starts off from 2nd, etc.)	Excessive creeping or idling vibration	Excessive vibration-shock when shift 1-2 or 3-4	Excessive vibration-shock when shift 2-3 or 4-3	Excessive vibration-shock during upshift	Excessive vibration-shock during D-2 downshift	Sudden engine rpm increase during upshift	Sudden engine rpm increase during 3-2 shift excessive vibration	Excessive vibration-shock (other than already described)	Excessive vibration shock only when cold	Damper clutch won't function	Abnormal vibration in high-load region in low gear (japprox. 1 Hz)	Abnormal noise from convertor housing together with engine rpm	Mechanical noise (clatter noise)from convertor housing	Abnormal noise inside transaxle case	Locked in 3rd gear
1						X														
2					X		X	X	X	X			X	X		X				
3		X			X															X
4					X										X	X				
5												X					X			
6																				
7																			X	
8																			X	
9																				
10	X	X									X	X						X		X
11												X								X
12											X	X		X						X
13	X			X	X		X	X	X	X	X	X	X	X	X	X				X
14	X							X	X		X									X
15																				X
16							X				X	X								X
17							X				X	X		X						X
18										X										X
19																				X
20		X					X				X									X
21		X			X															X
22				X			X	X	X	X	X	X		X	X	X				
23							X	X	X	X	X	X		X	X	X				X
24				X											X	X				X
25							X					X								X
26																				X
27							X	X	X	X	X	X		X	X					
28																				X
29																				X
30	X	X									X	X								X
31			X												X					
32																X				X
33		X																		
34					X	X									X					
35														X	X	X				
36			X																	X
37				X																X
38	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X			X

PCSV = Pressure control selenoid valve
DCCSV = Damper clutch control solenoid valve

DIAGNOSIS AND TEST

FLUID LEVEL AND CONDITION

1. Place the vehicle on level floor.
2. Before removing the dipstick, wipe all dirt from the area around the dipstick.
3. With the selector lever in “P” (Park), and the parking brakes applied, start the engine.
4. The engine should be running at idle speed. Fluid should be at normal operating temperature [70-80°C (160-180°F)].
5. Move the selector lever sequentially to every position to fill the torque converter and hydraulic system with fluid, then place the selector lever in “N” (Neutral) position. This operation is necessary to be sure that the fluid level check is accurate.
6. Check to see if the fluid level is in “HOT” range on dipstick. If fluid is low, add automatic transaxle fluid until level reaches the “HOT” range.
   Low fluid level can cause a variety of conditions because it allows the pump to take in air along with fluid. Air trapped in the hydraulic system forms bubbles, which are compressable. Therefore, the pressure will be erratic.
   Improper filling can also cause the fluid level to be too high. When transaxle has too much fluid, gears churn up foam and cause the same conditions which occur with low fluid level. This results in accelerated deterioration of the automatic transaxle fluid. In either case, air bubbles can cause overheating, fluid oxidation, and varnshing, which can interfere with normal valve, clutch, and servo operation.
   Foaming can also result in fluid escaping from the transaxle vent, where it may be mistaken for a leak.



MANUAL CONTROL CABLE

Proper manual control linkage adjustment can be determined by checking whether inhibitor switch is performing correctly.

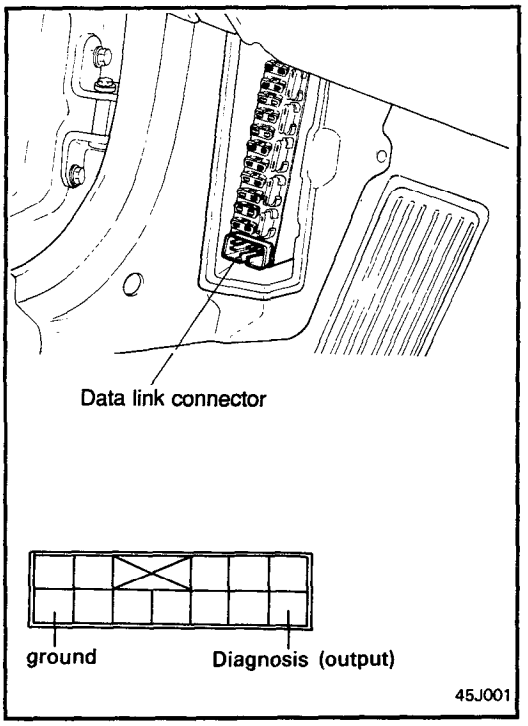
1. Apply parking and service brakes securely.
2. Place the selector lever in “R” range.
3. Set the ignition key to “ST” position.
4. Slowly move the selector lever upward until it clicks as it fits in the notch of the “P” range. If the starter motor operates when the lever makes a click, “P” range. If the starter motor operates when the lever makes a click, “P” position is correct.
5. Then slowly move the selector lever to the “N” range by the same procedure as in the foregoing paragraph. If the starter motor operates when the selector lever is in “N”, the “N” position is correct and the control cable is correctly adjusted.
6. Also check to be sure that the vehicle doesn’t begin to move and the lever doesn’t stop between P-R-N-D.
7. The manual-control cable is properly adjusted if (as described above) the starter motor will crank in both the “P” range and “N” range.

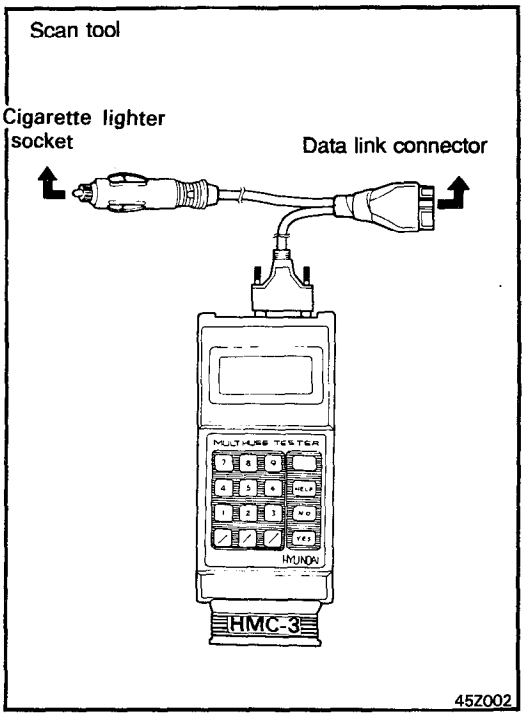
OBTAINING DIAGNOSTIC TROUBLE CODES

1. Connect the voltmeter or scan tool to the connector for diagnosis.
2. Read the output diagnostic trouble codes.
   Then follow the remedy procedures according to the "DIAGNOSTIC TROUBLE CODE DESCRIPTION" on the following page.

   NOTE
   - **As many a maximum of ten diagnostic trouble codes (in the sequence of occurrence) can be stored in the Random Access Memory (RAM) incorporated within the control model.**
   - **The same diagnostic trouble code can be stored as many as three times.**
   - **If the number of stored diagnostic trouble codes or diagnostic trouble patterns exceeds ten, already stored diagnostic trouble codes will be erased, in sequence beginning with the oldest.**
   - **Do not disconnect the battery until all diagnostic trouble codes or diagnostic trouble patterns have been read out, because all stored diagnostic trouble codes or diagnostic trouble patterns will be canceled when the battery is disconnected.**

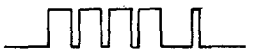
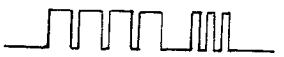
3. If the fail-safe system is activated and the transaxle is locked in third gear, the diagnostic trouble code in the Fail-Safe Code Description will be stored in the RAM.
   Three of these diagnostic trouble codes can be stored.
4. The cancelation will occur if, with the transaxle locked in third gear, the ignition key is turned to the OFF position, but the diagnostic trouble code is stored in the RAM.

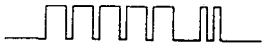




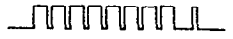
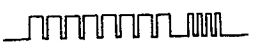
DIAGNOSTIC TROUBLE CODE DESCRIPTION

code	Diagnostic trouble code (for voltmeter)	Cause	Remedy
11		Excessively high throttle position sensor output	o Check the throttle position sensor connector. o Check the throttle position sensor itself. o Adjust the throttle position sensor. o Check the accelerator switch (No.24 : output or not).
12		Excessively low throttle position sensor output	
13		Throttle position sensor malfunction	
14		Improperly adjusted throttle position sensor system	
15		Open in the low-temperature side of the oil temperature sensor circuit.	o Oil temperature sensor connector inspection o Oil temperature sensor inspection
16		Short in the high-temperature side of the oil temperature sensor circuit.	
17		Open in the high-temperature side of the oil temperature sensor circuit or short in the low-temperature side circuit	
21		Open kickdown servo switch circuit	o Check the kickdown servo switch connector. o Check the kickdown servo switch.
22		Shorted kickdown servo switch circuit	
23		Open ignition pulse pickup cable circuit	o Check the ignition pulse signal line.

code	Diagnostic trouble code (for voltmeter)	Cause	Remedy
24		Open-circuited or improperly adjusted accelerator switch	o Check the accelerator switch connector o Check the accelerator switch itself o Adjust the accelerator switch.
31		Open pulse generator A circuit	o Check the pulse generator A and pulse generator B. o Check the vehicle speed reed switch (for chattering)
32		Open pulse generator B circuit	
41		Open shift control solenoid valve A circuit	o Check the solenoid valve connector. o Check shift control solenoid valve A.
42		Shorted shift control solenoid valve A circuit	
43		Open shift control solenoid valve B circuit	o Check the solenoid valve connector. o Check shift control solenoid valve B
44		Shorted shift control solenoid valve B circuit	
45		Open pressure control solenoid valve circuit	o Check the solenoid valve connector. o Check the pressure control solenoid valve.
46		Shorted pressure control solenoid valve circuit	

code	Diagnostic trouble code (for voltmeter)	Cause	Remedy
47		Open circuit in damper clutch control solenoid valve	o Inspection of solenoid valve connector. o Individual inspection of damper clutch control solenoid valve
48		Short circuit in damper clutch control solenoid valve	
49		Defect in the damper clutch system	o Inspection of damper clutch hydraulic system o Individual inspection of damper clutch control solenoid valve o Replacement of control module
51		Shifting to first gear does not match the engine speed.	o Check the pulse generator A and pulse generator B. o Check pulse generator A and pulse generator B. o Rear clutch slippage.
52		Shifting to second gear does not match the engine speed.	o Check the pulse generator A connector o Check pulse generator A o Kickdown brake slippage.
53		Shifting to third gear does not match the engine speed.	o Check the pulse generator A and pulse generator B connector o Check pulse generator A and pulse generator B. o Front clutch slippage. o Rear clutch slippage.
54		Shifting to fourth gear does not match the engine speed.	o Check the pulse generator A connector. o Check pulse generator A. o Kickdown brake slippage.
-	(Continue)	Normal	-
-	Constant output (or 0V)	Defective transaxle control module (TCM)	o TCM power supply inspection o TCM earth inspection o TCM replacement

FAIL-SAFE ITEM

Output code		Description	Fail-safe	Note (relation to diagnostic trouble code)
Code No.	Output pattern (for voltmeter)			
81		Open-circuited pulse generator A	Locked in third (D) or second	When code No. 31 is generated fourth time
82		Open-circuited pulse generator B	Locked in third (D) or second (2, L) gear	When code No. 32 is generated fourth time
83		Open-circuited or shorted shift control solenoid valve A	Lock in third	When code No. 41 or 42 is generated fourth time
84		Open-circuited or shorted shift control solenoid valve B	Lock in third gear	When code No. 43 or 44 is generated fourth time
85		Open-circuited or shorted pressure control solenoid valve	Locked in third (D) or second (2, L)	When code No. 45 or 46 is generated fourth time.
86		Gear shifting does not match the engine speed	Locked in third (D) or second (2, L)	When either code No. 51, 52, 53 or 54 is generated fourth time.
-	Constant output (or 0V)	Defective transaxle control module (TCM)	Fixed for third speed	-

CHECKING THE CONTROL SYSTEM (WHEN A SCAN TOOL IS USED)

Check items	Check procedures		Probalbe cause (or remedy) if a malfunction is found
	Check conditions	Normal value	
Throttle position sensor (TP Sensor) o Data list o Item No. 11	Accelerator pedal fully released	0.5-0.6 V	o TP Sensor adjusted improperly if voltage is high when accelerator fully released or pressed to floor o TP Sensor or circuit harness is fault if no change occurs o Falulty TP Sensor or accelerator pedal cable is faulty if gradual change is not noted
	Press accelerator pedal slowly	Varies with accelerator opening	
	Accelerator pedal pressed to floor	4.5-5.0 V	
Oil temperature sensor o Data list o Item No. 15	Cold engine (before starting)	Equivalent to outside air temperature	o Faulty oil temperature sensor or circuit harness
	While warming up engine	Gradual increase	
	After warming up engine	80-110°C	
Kickdown servo switch o Data list o Item No. 21	L range : Idling	ON	o Kickdown servo maladjusted o Faulty kickdown servo switch or circuit harness o Faulty kickdown servo
	D range : first or third gear	ON	
	D range : second or fourth gear	OFF	
Ignition signal wire o Data lit o Item No.23	N range : Idling	650-900 rpm	o Faulty ignition system o Faulty ignition signal pick-up circuit harness
	N range : 2,500 rpm (tachometer reading)	2,400-2,600 rpm	
Idle switch o Data list o Item No. 25	Accelerator pedal fully released	ON	o Idle position switch (fixed SAS) mal-adjusted. o Faulty idle position switch or circuit harness
	Accelerator pedal pressed very slightly	OFF	
Air conditioning relay signals o Data list o Item No. 26	D range : air conditioning idle up	ON	o Air conditioning power relay ON signal detection circuit harness faulty
	D range : air conditioning switch OFF	OFF	
Transaxle gear position o Data list o Item No. 27	D range : idling	C	o Faulty TCM o Faulty accelerator pedal switch system o Faulty transaxle range switch system o Faulty TP Sensor system
	L range : idling	First	
	2 range : second gear	Second	
	D range : overdrive-OFF : third gear	Third	
	D range : overdrive-ON : fourth gear	Fourth	
Pulse generator A o Data list o Item No.31	D range : driving at 30 km/h (19 mph) in second gear	0 rpm	o Pulse generator A or circuit harness faulty o Faulty pulse generator A shielded wire o Incoming noise from outside o Slipping kickdown brake
	D range : driving at 50 km/h (31 mph) in third gear	1,600-2,000 rpm	
	D range : driving at 50 km/h (31 mph) in fourth gear	0 rpm	

Check items	Check procedures		Probalbe cause (or remedy) if a malfunction is found
	Check conditions	Normal value	
Pulse generator B o Data list o Item No. 32	D range : stopped	0 rpm	o Pulse generator B or circuit harness faulty o Faulty pulse generator B shielded wire o Incoming noise from outside
	D range : driving at 50 km/h (31 mph) in third gear	1,600-2,000 rpm	
	D range : driving at 50 km/h (31 mph) in fourth gear	1,600-2,000 rpm	
Overdrive switch o Data list o Item No. 35	Overdrive switch is turned ON	OD-ON	o Overdrive switch or circuit harness faulty
	Overdrive switch is turned OFF	OD-OFF	
Normal/Economy select switch o Data reading o Item No. 36	Selection of the normal pattern (including during E pattern control when oil temperature is low)	Normal	o Normal/Economy select switch or circuit harness malfunction
	Selection of the Economy pattern	Economy	
Transaxle range switch o Data list o Item No. 37	Shift selector lever to P range	P	o Transaxle range switch maladjusted o Transaxle range switch or circuit harness faulty o Faulty manual control cable o If selector lever is inoperative, check shift lock mechanism
	Shift selector lever to R range	R	
	Shift selector lever to N range	N	
	Shift selector lever to D range	D	
	Shift selector lever to 2 range	2	
	Shift selector lever to L range	L	
Vehicle speed reed switch o Data list o Item No. 38	Keep vehicle stopped	0 km/h	o Vehicle speed reed switch is faulty if high speed signal is delivered while vehicle is stopping o In other cases, vehicle speed reed switch or circuit harness is faulty
	Driving at 30 km/h (19 mph)	30 km/h (19 mph)	
	Driving at 50 km/h (31 mph)	50 km/h (31 mph)	
PCSV duty o Data list o Item No. 45	D range : idling	50-70%	o When accelerator pedal is slightly pressed while idling in D range, duty should become 100 % o Faulty TCM o Faulty TP Sensor system o Faulty accelerator pedal switch system
	D range : first gear	100 %	
	D range : during shift	Varies with condition	
Damper clutch slippage amount o Data list o Item No. 47	D range ; third gear 1,500 rpm (tachometer reading)	200-300 rpm	o Faulty damper clutch o Ignition signal wire or pulse generator B system faulty o Inappropriate transaxle fluid pressure o Faulty DCCSV
	D range ; third gear 3,500 rpm (tachometer reading)	0 rpm	
DCCSV duty o Data list o Item No. 49	D range ; third gear 1,500 rpm (tachometer reading)	0%	o Faulty TCM o Faulty TP Sensor system o Pulse generator B system faulty
	D range ; third gear 3,500 rpm (tachometer reading)	Varies with load	

ELEMENT IN USE AT EACH POSITION OF SELECTOR LEVER

Selector lever position	Overdrive control switch	Shifting gear	Gear ratio	Engine start	Parking Mechanism	Clutch				Brake	
						C1	C2	C3	OWC	B1	B2
P	-	Neutral	-	Possible	O						
R	-	Reverse	2.176			O					O
N	-	Neutral	-	Possible							
D	ON	1st	2.846				O		O		
		2nd	1.581				O			O	
		3rd	1.000			O	O	O			
		OD	0.685					O		O	
D	OFF	1st	2.846				O		O		
		2nd	1.581				O			O	
		3rd	1.000			O	O	O			
2	-	1st	2.846				O		O		
		2nd	1.581				O			O	
L	-	1st	2.846				O				O

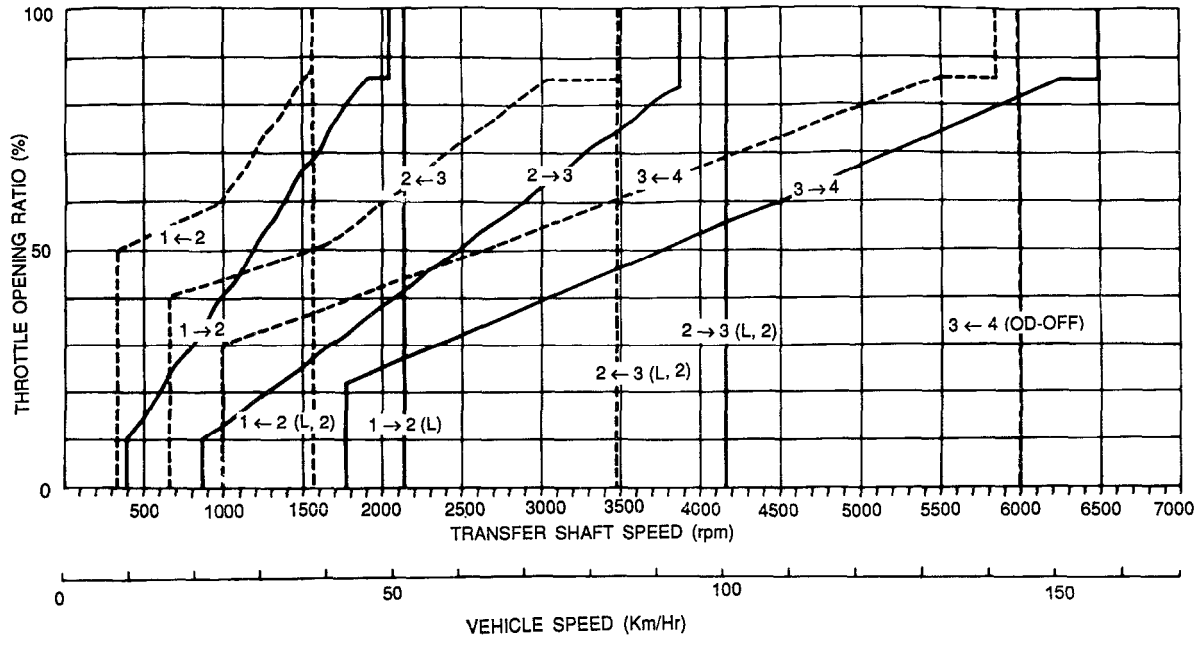
C1 : Front clutch
C2 : Rear clutch
C3 : End clutch
OWC : One way clutch
B1 : Kickdown brake
B2 : Low & reverse brake

SHIFT PATTERNS

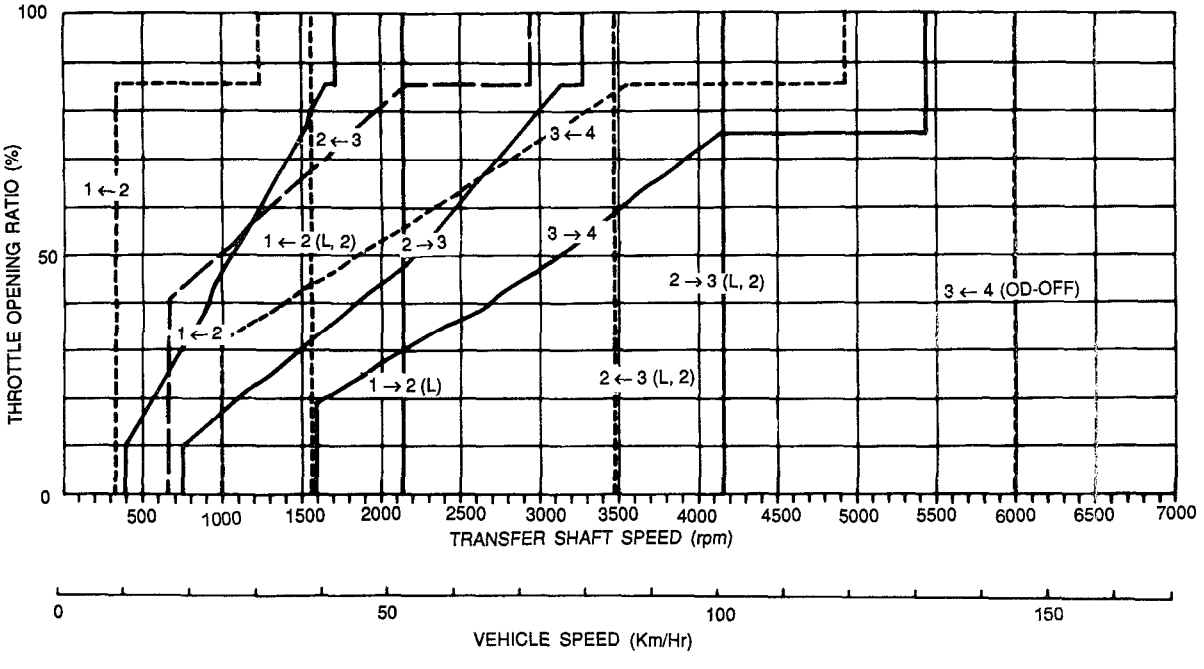
Two shift patterns are stored in the control module of this transaxle. One is the Normal pattern (for more powerful performance), and the other is the Economy pattern (for improved fuel consumption and quieter operation) (Refer to the diagram next page).
The driver can switch to the desired pattern by using the Normal/ Economy select switch on the center console.
The solid lines shown on these shift patterns graphs indicate up-shifts, and the broken lines indicate down-shifts. The difference between the shift points for up-shifts and for down-shifts is because up-shiftsanddown-shifts will not occur when driving at a speed close to that of the shift point.
When the vehicle is stopped, the transaxle is shifted into second gear in order to prevent vehicle creep “creeping”. Then when the accelerator pedal is depressed, the vehicle starts off in first gear.

SHIFT PATTERN

NORMAL RANGE



ECONOMY RANGE



INSPECTION OF ELECTRONIC CONTROL SYSTEM COMPONENTS

1. Wiring

→ Based on the wiring diagram, check whether the continuity and grounding of each harness is OK.

→ No continuity → Improper connection of connector, damaged or disconnected harness, or incorrect wiring connection.

→ Reconnect the connector; repair or replace the harness.

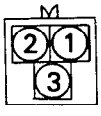
Based on the wiring diagram, check whether the continuity and grounding of each harness is OK.

→ Continuity

→ Normal

2. Oil-temperature sensor

Sensor side connector terminal



1 : Low temperature side
2 : Ground
3 : High temperature side

→ Vary the thermo-sensitive part from low temperature to high temperature and check the resistance between the 1 and 2 or 2 and 3.

→ No continuity (resistance: ∞) → Damaged or disconnected wiring

→ Replace the oil-temperature sensor.

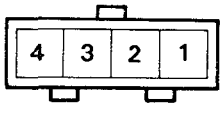
Vary the thermo-sensitive part from low temperature to high temperature and check the resistance between the 1 and 2 or 2 and 3.

→ Changes of the resistance continuous and smooth.

→ Normal

3. Throttle-position sensor (TPS)

Sensor side connector terminal



1: ground
3: output
4: power supply

→ Check the resistance between terminals 1 and 4 of the TPS.

→ Resistance: high or infinite → Damaged or disconnected wiring

→ Replace the TPS.

Check the resistance between terminals 1 and 4 of the TPS.

→ 3.5-6.5 KΩ/20°C (68°F)

→ Check the resistance between terminals 3 and 1 with the engine idling after throttle-valve opening warm-up.

→ Resistance: more or less than 0.4 KΩ/20°C (68°F) → Improper adjustment

→ Readjust the TPS installation

Check the resistance between terminals 3 and 1 with the engine idling after throttle-valve opening warm-up.

→ Resistance (actual measurement) between terminals 1-3: approx. 0.4 KΩ/20°C (68°F)

→ Check for changes of the resistance between terminals 1 and 3.

→ Changes of the resistance are not continuous. → Poor contact

→ Replace the TPS.

Check for changes of the resistance between terminals 1 and 3.

→ Changes of the resistance continuous and smooth.

→ Normal

4. Pulse generator A or B

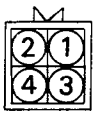
Check the resistance between terminals 1 and 2, 3 and 4.

Resistance: very low or very high → Short-circuit, damaged or disconnected wiring. → Replace the pulse generator.

215-275Ω/20°C (68°F) → Normal

Pulse generator side connector terminals

1-2: pulse generator A
3-4: pulse generator B



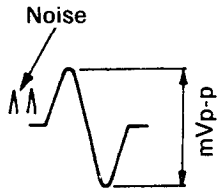
5. Pulse generator A or B (check by using an oscilloscope)

Connect the pulse generator and body harness, and connect an oscilloscope. Check on a chassis dynamotor or with the front wheels raised.

With the selector lever at the "L" position and the engine running at 1,000 rpm, check the voltage waveform between terminals 1 and 2.

Oscilloscope waveform

Oscilloscope waveform

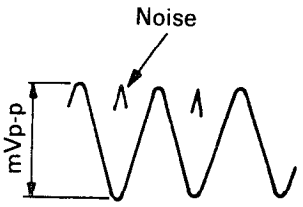


Very low voltage → Incorrect installation, or malfunction of the pulse generator. → Correct the installation condition, or replace the pulse generator.

1,000 mVp-p or higher

Noise in the waveform → Improper grounding of the pulse generator circuit's shielded wiring. → Replace the pulse generator.

With the selector lever at the "L" position and the engine running at 1,000 rpm, check the voltage waveform between terminals 3 and 4.



Very low voltage → Incorrect installation of the pulse generator, or malfunction of the pulse generator. → Correct the installation condition, or replace the pulse generator.

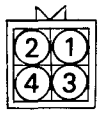
500 mVp-p or higher

Noise in the waveform → Improper grounding of the pulse generator circuit's shielded wiring. → Replace the pulse generator.

Normal

6. Pressure-control solenoid valve (PCSV)

Solenoid valve side connector terminals



1: DCCSV
2: PCSV
3: SCSV-B
4: SCSV-A

Check the resistance between terminal 2 of the solenoid valve connector and the transaxle case.

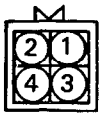
- Resistance; too low or too high → Short-circuit, damaged or disconnected wiring → Replace the PCSV.
- 2.9±0.3Ω/20°C (68°F)

Connect 12V between the transaxle case and terminal 2; switch ON and OFF and check for operation noise.

- No operation noise. (stroke: 0.3 mm (0.012 in. or less) → Foreign material caught between the valve and guide → Replace the PCSV.
- Noise exists
- Normal

7. Shift-control solenoid valve (SCSV) A or B

Solenoid valve side connector terminals



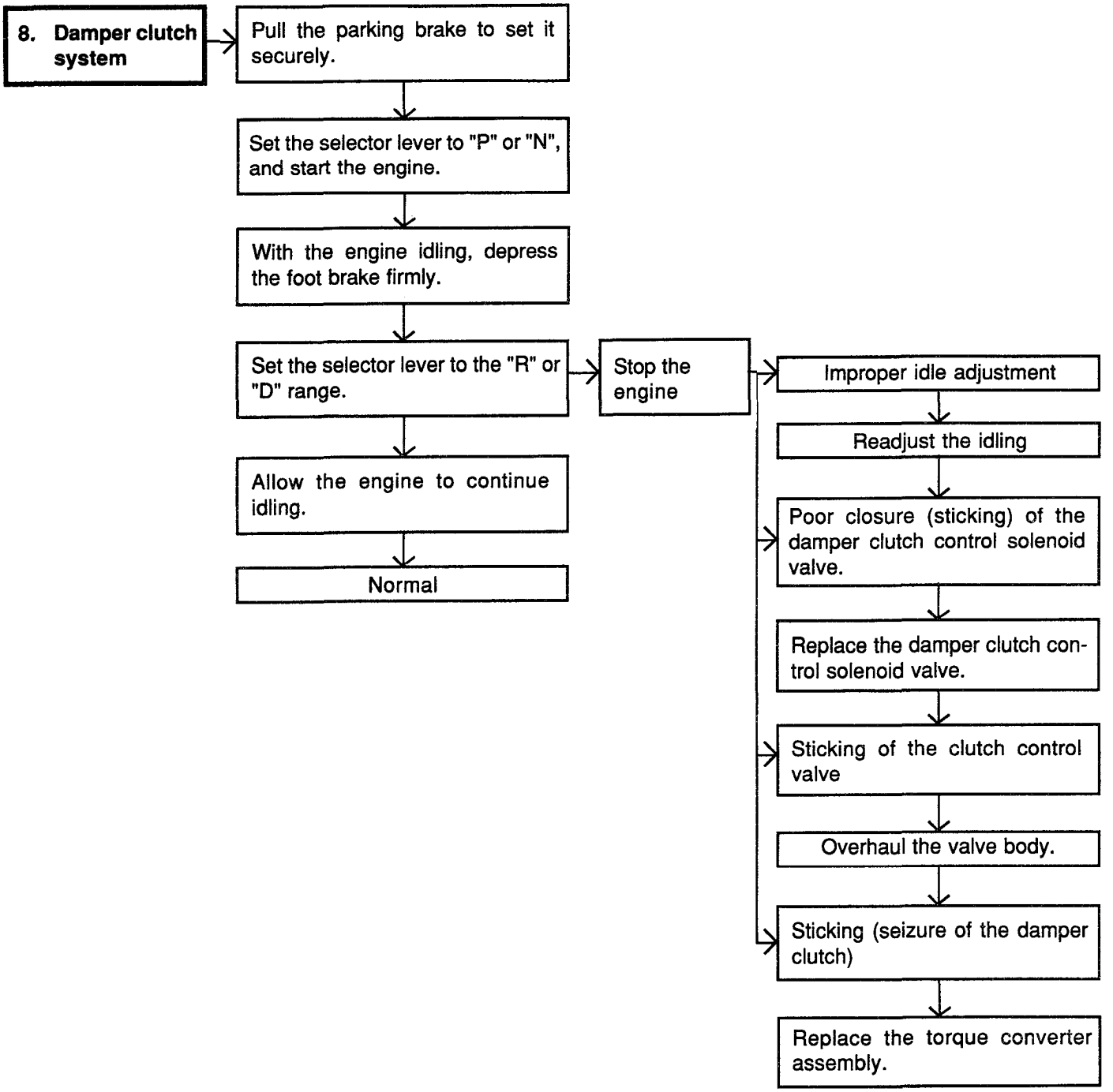
1: DCCSV
2: PCSV
3: SCSV-B
4: SCSV-A

Check the resistance between terminal 3 and 4 of the solenoid valve connector and the transaxle case.

- Resistance: too low or too high → Short-circuit, or damaged or disconnected wiring → Replace the SCSV.
- 22.3±1.5Ω/20°C (68°F)

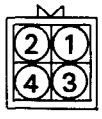
Connect 12V between the transaxle case and terminal 3 and 4; switch ON and OFF and check for operation noise of the solenoid valve, and check the valve stroke.

- No operation noise. (stroke: 0.25 mm (0.010 in. or less) → Residue accumulated in valve and core. → Replace the SCSV.
- Noise exists.
- Normal


8. Damper clutch system
Pull the parking brake to set it securely.
Set the selector lever to "P" or "N", and start the engine.
With the engine idling, depress the foot brake firmly.
Set the selector lever to the "R" or "D" range.
Allow the engine to continue idling.
Normal
Stop the engine
Improper idle adjustment
Readjust the idling
Poor closure (sticking) of the damper clutch control solenoid valve.
Replace the damper clutch control solenoid valve.
Sticking of the clutch control valve
Overhaul the valve body.
Sticking (seizure of the damper clutch)
Replace the torque converter assembly.

9. Damper clutch control solenoid valve (DCCSV)

Solenoid valve side connector terminals



1: DCCSV
2: PCSV
3: SCSV-B
4: SCSV-A

Check the resistance between terminal 1 of the solenoid valve connector and the transaxle case.

→ Resistance: too low or too high → Short-circuit, damaged or disconnected wiring. → Replace the DCCSV.

Standard value: 3Ω/20°C

Connect 12V between the transaxle case and terminal 1; switch ON and OFF and check for operation noise.

→ No operation noise. Check for sticking. * (Valve stroke: 0.3 mm (0.012 in.) or less) → Foreign material caught between the valve and guide → Replace the DCCSV.

Noise exists.

Normal

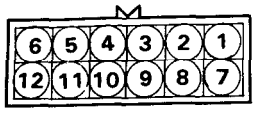
* Sticking is usually at the release side.

10. Idle switch

→ Refer to 31 Group (MFI COMPONENTS INSPECTION

11.Transaxle range switch

Switch side connector terminal



In the "P" range, check for continuity between terminals 3 and 4, and terminals 10 and 11.

↓

Continuity exists

↓

In the "R" range, check for continuity between terminals 3 and 12, and terminals 8 and 9.

↓

Continuity exists

↓

In the "N" range, check for continuity between terminals 3 and 5, and terminals 10 and 11.

↓

Continuity exists

→ No continuity → Poor contact, or damaged or disconnected wiring.

↓

Replace the transaxle range switch.

↓

In the "D" range, check for continuity between terminals 1 and 3.

↓

Continuity exists

↓

In the "2" range, check for continuity between terminals 3 and 6.

↓

Continuity exists

↓

In the "L" range, check for continuity between terminals 2 and 3.

↓

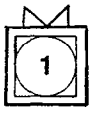
Continuity exists

↓

Normal

12.Kickdown (K/D) servo switch

Switch side connector terminal



Check for continuity between the kickdown servo switch terminal 1 and the transaxle case.

- No continuity → Poor contact, or damaged or disconnected wiring. → Replace the K/D servo switch.
- Continuity exists → Start the engine, set to the "L" range, and let the engine idle; check for continuity between the kickdown servo switch terminal and the transaxle case.
  NOTE: Be sure the brakes are applied during this check.
  - Continuity exists → Poor contact (sticking) → Replace the K/D servo switch
  - No continuity → Normal

13.Transaxle control moduel(TCM)

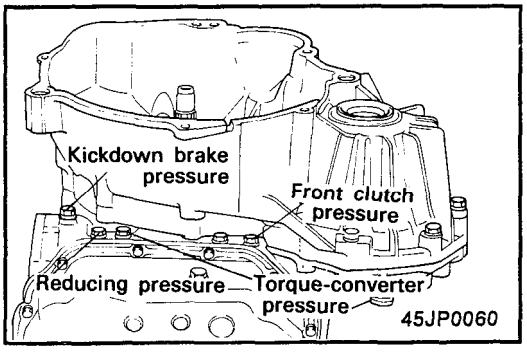
Disconnect the harness (both A and B connectors) from the vehicle's TCM. Then connect, (via an intermediate harness for checking), a new TCM to this harness and make a road test.

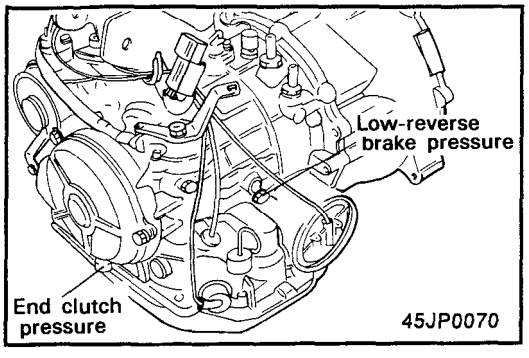
- The problem does not occur. → Malfunction of the original TCM. → Install a new TCM.
- Consider the original TCM to be normal, and again check the sensors, wiring, etc.

OIL PRESSURE TESTS

1. Completely warm up the transaxle.
2. Raise the front of the vehicle so that the front wheels can be rotated.
3. Connect an engine tachometer and place it in a position where it's easy to see.
4. Attach the special oil-pressure gauge (09452-21500) and the adapter (09452-21001, 09452-21002) to each oil-pressure outlet port.
   When the reverse pressure is to be tested, the 3,000 kPa (400 psi) type of gauge should be used.

5. Measure the oil pressure under various conditions. Check to be sure that the measured results are within the standard value range shown in the "Standard oil pressure table" below.
   If the oil pressure is not within the specified range, check and repair as described in the section "Preliminary Steps If Oil Pressure Is Not Normal" on the next page.





Standard Oil Pressure Table

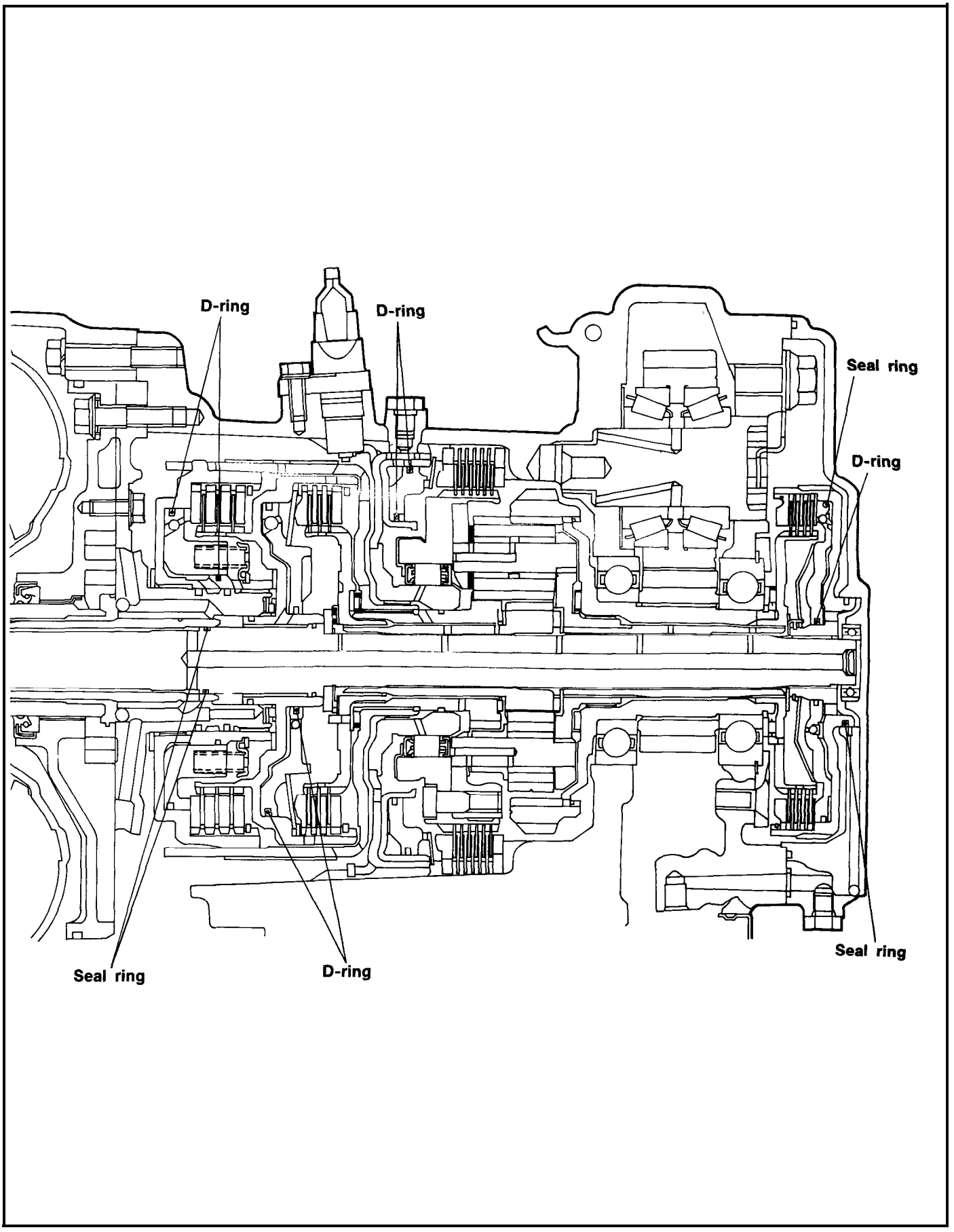
No.	Conditions				Standard oil pressure KPa (psi)					
	Selector lever position	(Reference) vehicle speed km/h (mph)	Engine speed rpm	Shift position	1 Reducing pressure	2 Kickdown brake pressure	3 Front clutch pressure	4 End clutch pressure	5 Low-reverse brake pressure	6 Torque-converter pressure
1	N	0 (0)	Idle	Neutral	353-470 (51-68)	-	-	-	-	*
2	D	0 (0)	Idle	second gear	353-470 (51-68)	100-210 (14-30)	-	-	-	*
3	D (SW-ON)	110 (68)	Approx. 2,500	fourth gear	353-470 (51-68)	830-900 (120-130)	-	830-900 (120-130)	-	450-650 (65-94)
4	D (SW-OFF)	75 (47)	Approx. 2,500	third gear	353-470 (51-68)	830-900 (120-130)	830-900 (120-130)	830-900 (120-130)	-	450-650 (65-94)
5	2	50 (31)	Approx. 2,500	second gear	353-470 (51-68)	830-900 (120-130)	-	-	-	450-650 (65-94)
6	L	0 (0)	Approx. 1,000	first gear	353-470 (51-68)	-	-	-	300-450 (44-60)	*
7	R	35 (22)	Approx. 2,500	Reverse	353-470 (51-68)	-	1,640-2,240 (238-325)	-	1,640-2,240 (233-328)	450-650 (65-94)
		0 (0)	Approx. 1,000				1,000 (145) or more		1,000 (145) or more	

NOTE:
- must be 9.9 kPa (1.4 psi) or less.
SW-ON : Switch ON the overdrive control switch.
SW-OFF : Switch OFF the overdrive control switch.
*** : Hydraulic pressure is generated, but not the standard value.**

Preliminary Steps if Oil Pressure Is Not Normal

Trouble symptom	Probable cause	Remedy
1. * Line pressures are all low (or high). NOTE "Line pressures" refers to oil pressures 2, 3, 4, 5, 6 and 7 in the "Standard oil pressure table" on the previous page.	a. Clogging on oil filter	a. Visually inspect the oil filter; replace the oil filter if it is clogged.
	b. Improper adjustment of oil pressure (line pressure) regulator valve	b. Measure line pressure 2 (kickdown brake pressure); if the pressure is not the standard value, readjust the line pressure, or if necessary, replace the valve body assembly.
	c. Sticking of regulator valve	c. Check the operation of the regulator valve; repair if necessary, or replace the valve body assembly.
	d. Looseness of valve body tightening part	d. Tighten the valve body tightening bolt and installation bolt.
	e. Improper oil pump discharge pressure	e. Check the side clearance of the oil pump gear; replace the oil pump assembly if necessary.
2. Improper reducing pressure	a. Improper line pressure	a. Check the 2 kickdown brake pressure (line pressure); if the line pressure is not the standard value, check as described in item 1 above.
	b. Clogging of the filter (L-shaped type) of the reducing-pressure circuit	b. Disassemble the valve body assembly and check the filter; replace the filter if it is restricted.
	c. Improper adjustment of the reducing pressure	c. Measure the 1 reducing pressure; if it is not the standard value, readjust, or replace the valve body assembly.
	d. Sticking of the reducing valve	d. Check the operation of the reducing valve; if necessary, repair it, or replace the valve body assembly.
	e. Looseness of valve body tightening part	e. Tighten the valve body tightening bolt and installation bolt.
3. Improper kickdown brake pressure	a. Malfunction of the D-ring or seal ring of the sleeve or kickdown servo piston.	a. Disassemble the kickdown servo and check whether the seal ring or D-ring is damaged. If it is cut or has scratches, replace the seal ring or D-ring.
	b. Looseness of valve body tightening part	b. Tighten the valve body tightening bolt and installation bolt.
	c. Functional malfunction of the valve body assembly.	c. Replace the valve body assembly.

Trouble symptom	Probable cause	Remedy
4. Improper front clutch pressure	a. Malfunction of the D-ring or seal ring of the sleeve or kickdown servo piston.	a. Disassemble the kickdown servo and check whether the seal ring or D-ring is damaged. If it is cut or has scratches, replace the seal ring or D-ring.
	b. Looseness of valve body tightening part	b. Tighten the valve body tightening bolt and installation bolt.
	c. Malfunction of the valve body assembly.	c. Replace the valve body assembly.
	d. Wear of the front clutch piston or retainer, or malfunction of the D-ring. (Refer to the figure on the next page.)	d. Disassemble the transaxle itself and check whether or not there is wear of the front clutch piston and retainer inner circumference, or damage of the D-ring. If there is any wear or damage, replace the piston, retainer, D-ring and/or seal ring.
5. Improper end clutch pressure	a. Malfunction of a D-ring, seal ring of the end clutch or O-ring of the pipe (Refer to the following figure.)	a. Disassemble the end clutch and check the seal ring, D-ring of the piston, seal ring of the retainer, etc.; replace if there are cuts, scars, scratches or damage.
	b. Looseness of valve body tightening part.	b. Tighten the valve body tightening bolt and installation bolt.
	c. Malfunction of the valve body assembly	c. Replace the valve body assembly.
6. Improper low-reverse brake pressure	a. O-ring between valve body and transaxle damaged or missing	a. Remove the valve body assembly and check to be sure that the O-ring at the upper surface of the upper valve body is not missing or damaged; install or replace the O-ring if necessary.
	b. Looseness of valve body tightening part	b. Tighten the valve body tightening bolt and installation bolt.
	c. Malfunction of the valve body assembly	c. Replace the valve body assembly.
	d. Malfunction of the O-ring of the low-reverse brake piston or the O-ring of the retainer (Refer to the following figure.)	d. Disassemble the transaxle itself and check the O-ring for damage; replace if there are cuts, scars, scratches or damage.
7. Improper torque converter pressure	a. Sticking of the damper clutch control solenoid valve (DCCSV) or the damper clutch control valve.	a. Check the operation of the damper clutch system and the DCCSV.
	b. Clogging or leaking of the oil cooler and/or lines.	b. Repair or replace, as necessary, the cooler and/or lines.
	c. Damaged seal ring of the input shaft (Refer to the following the figure)	c. Disassemble the transaxle itself and check for damage of the seal ring; replace the seal ring if there is damage.
	d. Malfunction of the torque converter	d. Replace the torque converter.


D-ring
D-ring
Seal ring
D-ring
Seal ring
D-ring
Seal ring

CONVERTER STALL TEST

Stall test consist of determining maximum engine speed obtained at full throttle in 'ID" and "R" positions. This test checks torque converter stator overrunning clutch operation, and holding ability of transaxle clutches and low-reverse brake.

Warning:
During this test, make sure that no one stand in front of or behind vehicle.

1. Check transaxle fluid level. Fluid should be at normal operating temperature [70-80^{o} (758-176°F). Engine coolant should also be at normal operating temperature] 80-90°C (176-205°F).
2. Apply chocks to both rear wheels.
3. Attach an engine tachometer.
4. Apply the parking and service brakes fully.
5. Start the engine.
6. With the selector lever in the "D" position, depress the accelerator pedal fully to read maximum engine rpm. Do not hold the throttle wide open any longer than is necessary to obtain maximum engine rpm reading, and never longer than 5 seconds at a time. If more than one stall test is required, operate the engine at approximately 1,000 rpm in neutral for 2 minutes to cool the transaxle fluid between tests.

   Stall speed : 1,800-2200 rpm

7. Place the selector lever in the "R" position and perform the stall test by the same procedure as previously described.

Stall Speed Above Specification in "D"

If stall speed is higher than specification, rear clutch or overrunning clutch of transaxle is slipping. In this case, perform hydraulic test to locate cause of slippage.

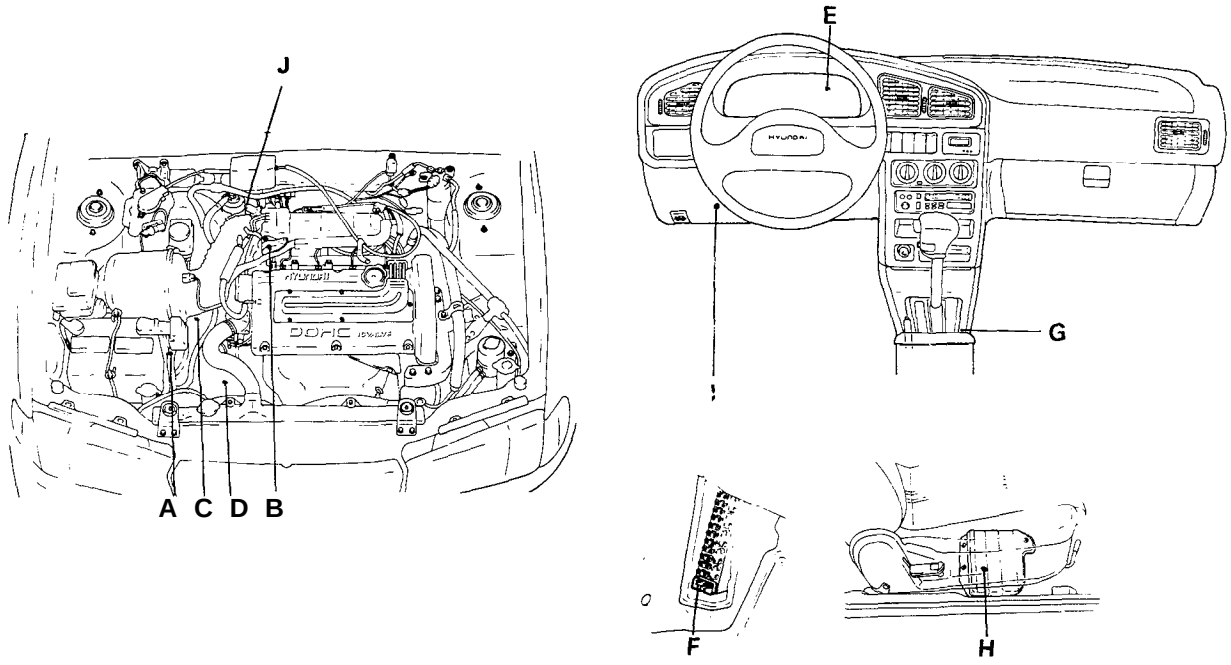
Stall Speed Above Specification in "R"

If the stall speed is higher than specification, the front clutch of the transaxle or low-reverse brake is slipping. In this case, perform the hydraulic test to locate the cause of slippage.

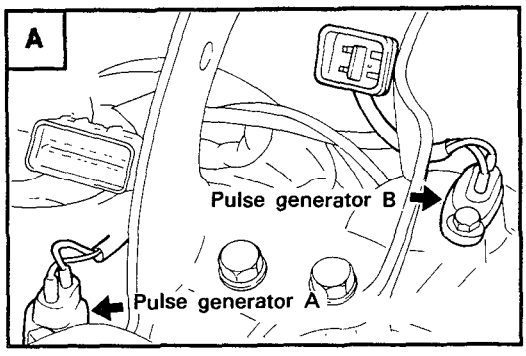
Stall Speed Below Specification in "D" and "R"

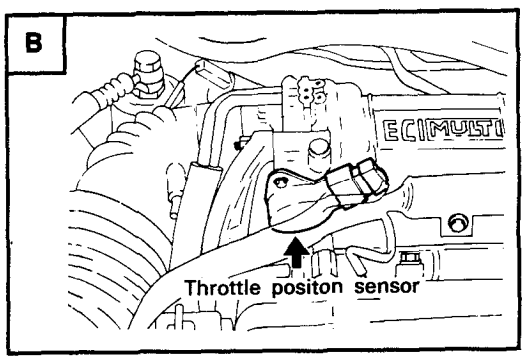
If the stall speed is lower than specification, insufficient engine output or a faulty torque converter is suspected. Check for engine misfiring, improper ignition timing, or valve clearance etc. If these are good, the torque converter is faulty.

E.L.C. 4-SPEED AUTOMATIC TRANSAXLE CONTROL COMPONENTS

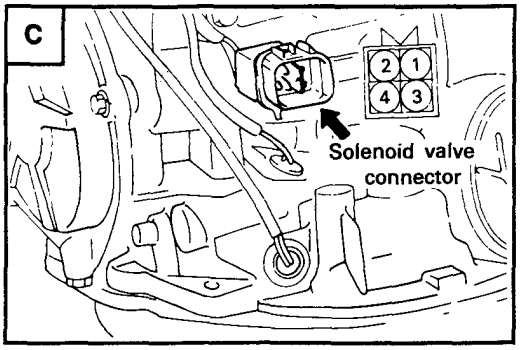


Name	Symbol	Name	Symbol
Pulse generator A, B	A	Data link connector	F
Throttle position sensor	B	Normal/Economy switch	G
Solenoid valve connector	C	4 A/T control module	H
Oil temperature sensor	D	M.F.I control module	I
Vehicle speed sensor	E	Idle switch	J

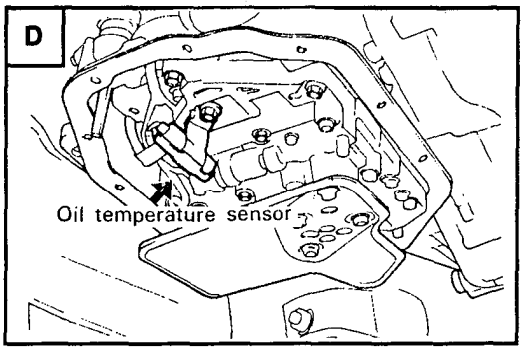




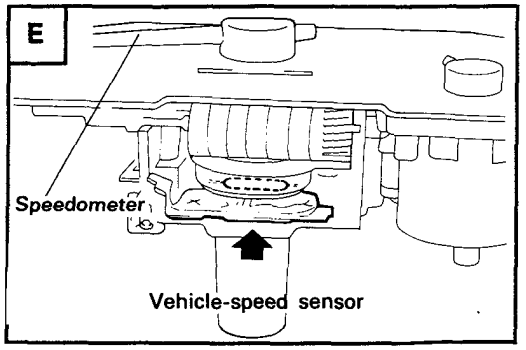
C


2 1
4 3
Solenoid valve connector

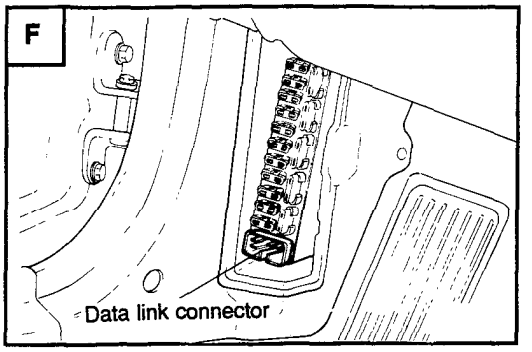
D


Oil temperature sensor

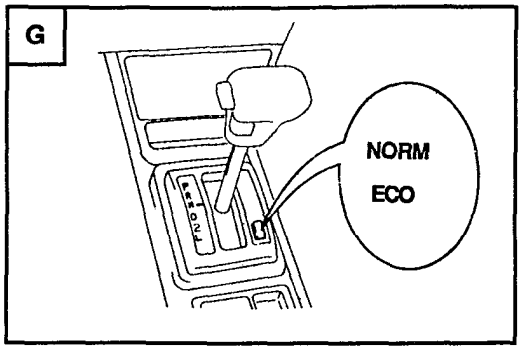
E


Speedometer
Vehicle-speed sensor

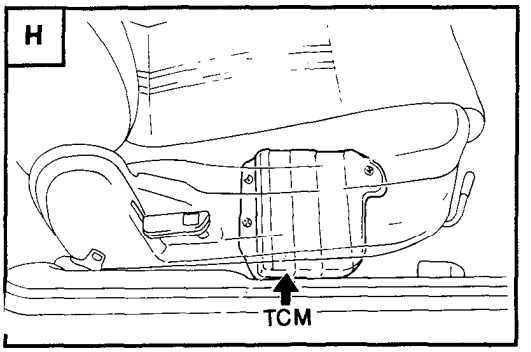
F


Data link connector

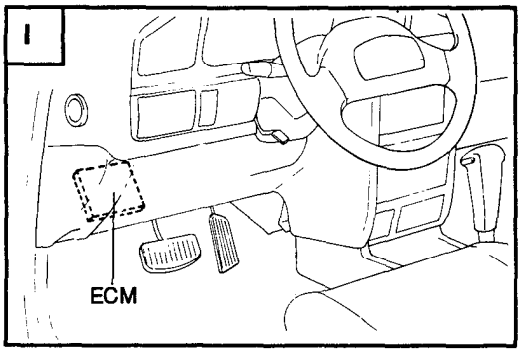
G


NORM
ECO

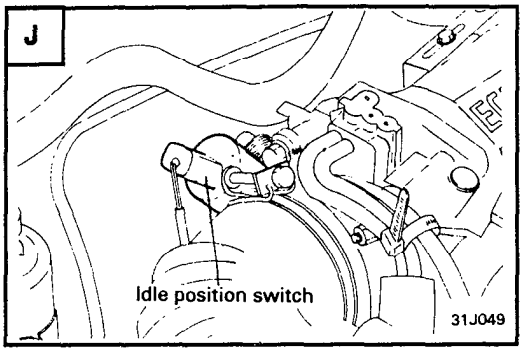
H


TCM

I

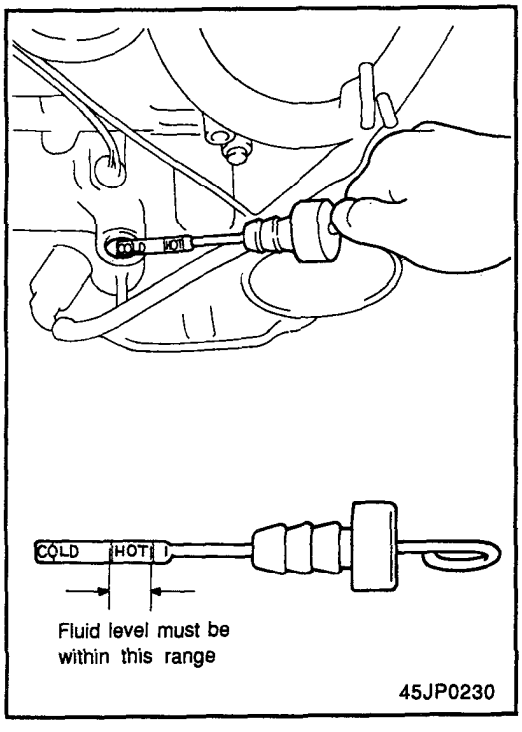

ECM

J


Idle position switch
31J049

SERVICE ADJUSTMENT PROCEDURES

TRANSAXLE FLUID LEVEL INSPECTION



1. Drive the vehicle until the fluid temperature reaches normal operating temperature [70-80°C (158-176°F)].
2. Place the vehicle on a level floor.
3. Move the selector lever sequentially to every position. This will fill the torque converter and hydraulic system with fluid, then place lever in "N" (Neutral) position.
4. Before removing the dipstick, wipe all contaminante from area around the dipstick, Then take out the dipstick and check the condition of the fluid.
5. Check to see if the fluid level is in the "HOT" range on dipstick. If fluid level is low, add automatic transaxle fluid until the level reaches the "HOT" range.

   Transaxle fluid :
   GENUINE HYUNDAI ATF AUTOMATIC TRANSAXLE FLUID OR MOPAR ATF PLUS TYPE 7176, DIAMOND ATF SP OR EQUIVALENT.

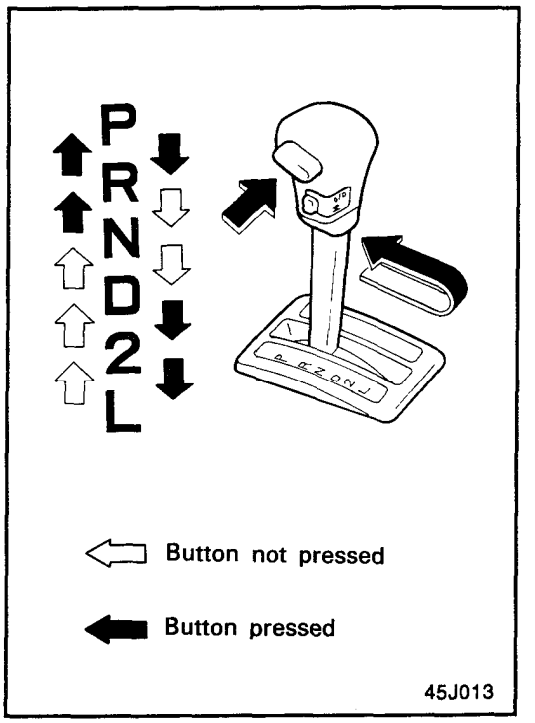
   Low fluid level can cause a variety of abnormal conditions because it allows the pump to take in air along with fluid. Air trapped in the hydraulic system forms bubbles which are compressable. Therefore, pressures will be erratic, causing delayed shifting, sliping clutch and brakes, etc.
   Improper filling can also raise fluid level too high. When the transaxle has too much fluid, gears churn up foam and cause the same conditions which occur with low fluid level, resulting in accelerated deterioration of automatic transaxle fluid.
   In either case, air bubbles can cause overheating, and fluid oxidation, which can interfere with normal valve, clutch, and servo operation. Foaming can also result in fluid escaping from the transaxle vent where it may be mistaken for a leak.
6. Be sure to examine the fluid on the dipstick closely.

TRANSAXLE FLUID REPLACEMENT

Refer to GROUP 10-Lubrication and Maintenance.

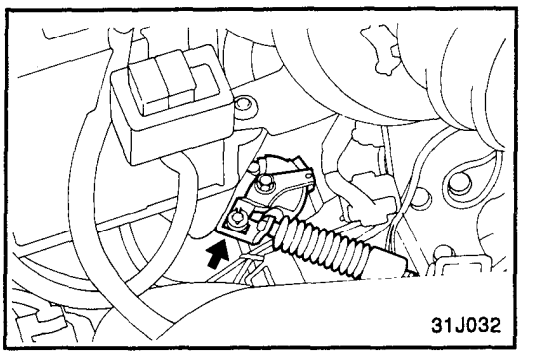
SELECTOR LEVER OPERATION CHECK

1. Shift the selector lever to each range and check to see that the lever moves smoothly and is controlled. Check to see that the position indicator is correct.
2. Check to be sure that the selector lever can be shifted to each position (by button operation as shown in the illustration).
3. Start the engine and check to see if the vehicle moves forward when the selector lever is shifted from "N" to "D", and moves backward when shifted to "R".
4. When the shift lever malfunctions, adjust the control cable and the selector lever sleeve. Check for worn shift lever assembly sliding parts.



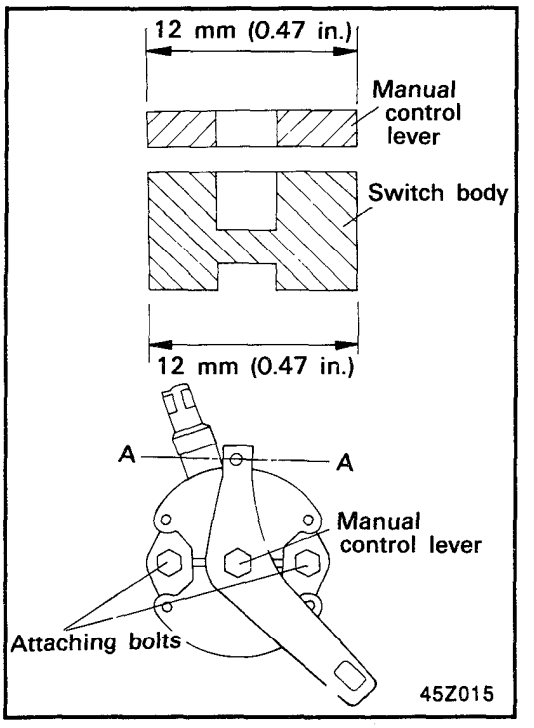
TRANSAXLE RANGE SWITCH ADJUSTMENT

1. Place selector lever in "N" (Neutral) position.
2 Loosen the manual control lever flange nut to separate the cable and lever.

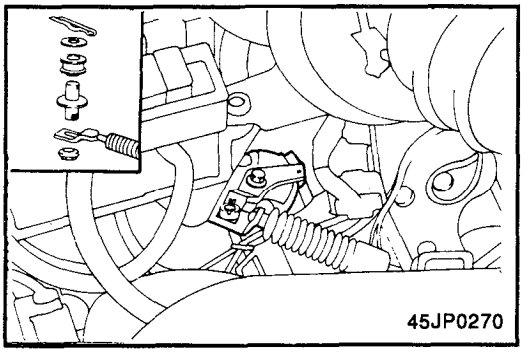


3. Place the manual control lever in the "N" (Neutral) position.
4. Turn the transaxle range switch body until the 12 mm (.47 in.) wide end of the manual control lever aligns with the switch body flange [12 mm (0.472 in.) wide portion].
5. Tighten the attaching bolts (2 pcs.) to the specified torque.
   Transaxle range switch attaching Bolt:
   10-12 Nm (100-120 kg.cm, 7-9 lb.ft)

NOTE
When setting up the switch body, be careful not to drop the O-ring from switch body.
Tighten the attaching bolts carefully.

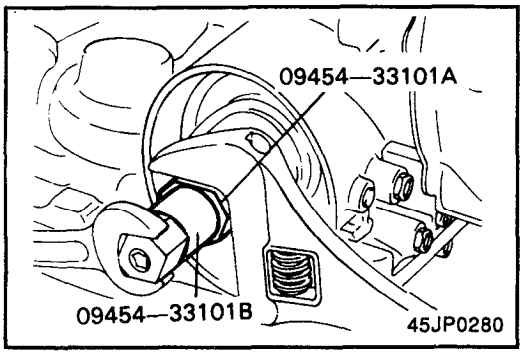


6. Make sure that the selector lever is in the "N" (Neutral) position.
7. Adjust the flange nut so that there is no slack in the control cable and make sure that the selector lever operates smoothly.
8. Run the vehicle and confirm that the transaxle is set in each range when the selector lever is shifted to each position.



KICKDOWN SERVO ADJUSTMENT

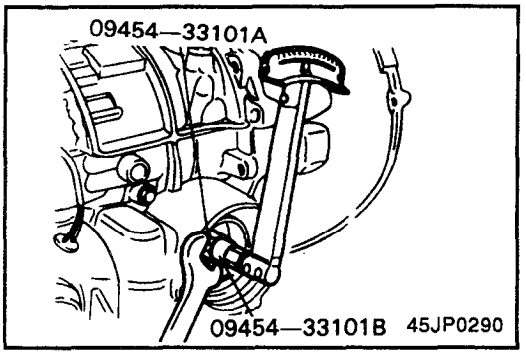
1. Completely remove all dirt and other contaminating materials adhered around the kickdown servo switch.
2. Remove the snap ring.
3. Remove the kickdown servo switch.
4. Loosen the lock nut.

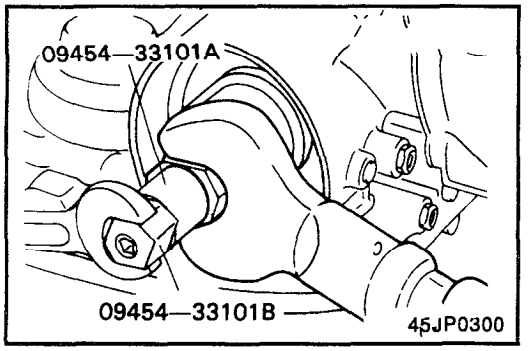


5. While holding with the special tool (09454-33101A) so that the kickdown servo piston won't turn, use a kickdown servo socket wrench-B (09454-33101B) to "tighten", the adjustment screw at 10 Nm (7.2 lb.ft). Loosen and tighten the adjustment screw two turns, and then finish tighten at a torque of 5 Nm (3.6 lb.ft). Again loosen the adjustment screw 2 to 2-1/4 turns.
6. While holding with special tool (09454-33101B) so that the kickdown servo piston won't turn, tighten the lock nut to the specified torque use special tool (09454-33101A).

   Lock nut: 25-32 Nm (250-320 kg.cm, 18-23 lb.ft)

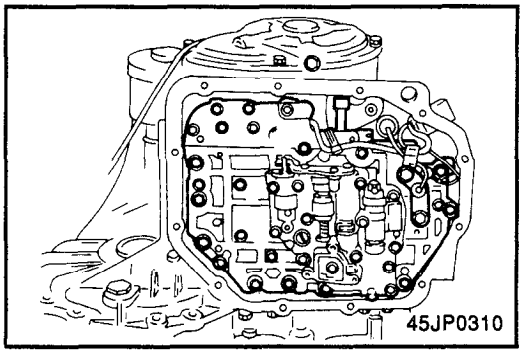
7. After installing a new O-ring in the groove surrounding the kickdown servo switch, arrange the O-ring so that it is not twisted. Install the kickdown servo switch into the case, and then install the snap ring.



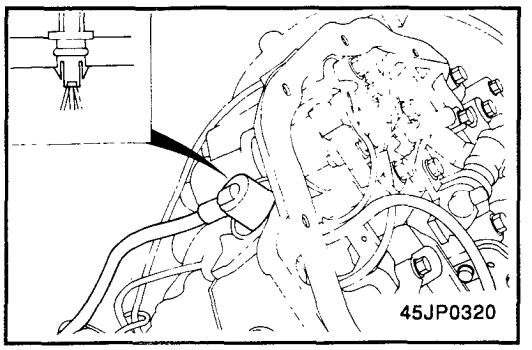


LINE PRESSURE ADJUSTMENT

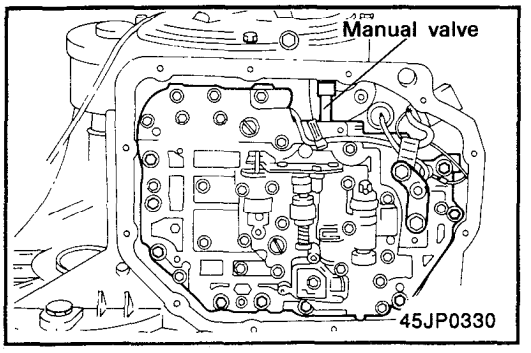
1. Drain the automatic transaxle fluid.
2. Remove the oil pan.
3. Remove the oil filter.
4. Remove the oil-temperature sensor.



5. Press the tab of the solenoid valve harness grommet and push in.

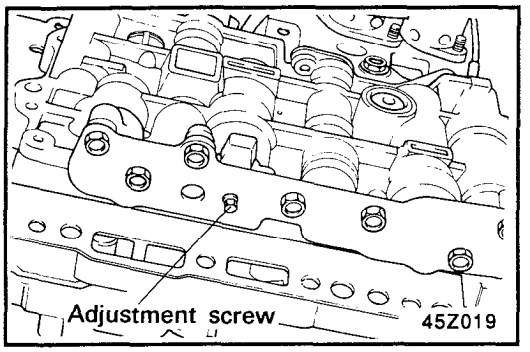


6. Remove the valve body assembly.
   Be careful not to drop the manual valve.

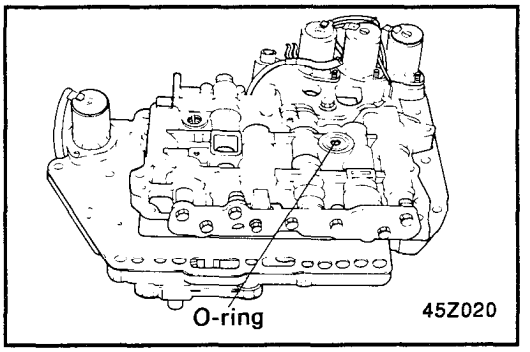


7. If the line pressure needs adjustment, then turning the screw clockwise, will lower to pressure, while turning the screw counter-clockwise, increase the pressure.

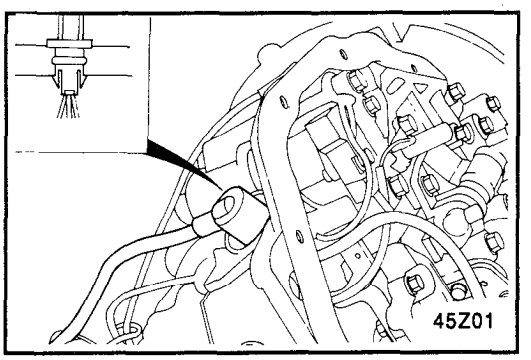
   Standard value :
   870-890 kPa (124-127 psi, 8.87-9.08 kg/cm^2)
   Oil pressure change for each turn of adjustment screw :
   38 kPa (54 psi, 0.39 kg/cm^2)



8. Check to be sure that the O-ring is installed on the upper surface of the valve body at the place shown in the figure.
9. Replace the O-ring of the solenoid valve connector with a new one.



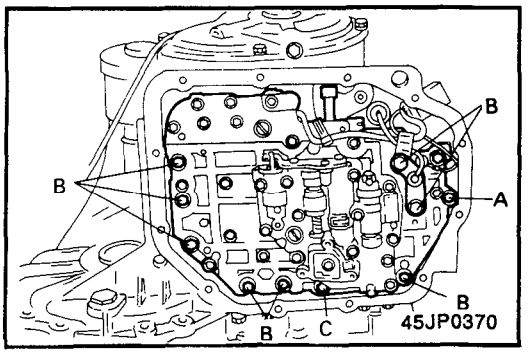
10. Install the valve body assembly to the case and then insert the solenoid valve connector into the case. Be sure, at this time, that the notched part of the connector faces as shown in the figure.
    Also be careful that the lead wiring isn't caught.



11. Tighten the ten(10) valve body assembly mounting bolts to 10-12Nm (100-120kg.cm, 7-9lb.ft).

    A : 18 mm (0.709 in.) long
    B : 25 mm (0.984 in.) long
    C : 40 mm (1.575 in.) long

12. Install the oil filter.
13. Install a new oil pan gasket with the oil pan.
14. Pour in the specified amount of Automatic transaxle fluid.
15. Make the oil pressure test. Readjust if necessary.



REDUCING PRESSURE ADJUSTMENT

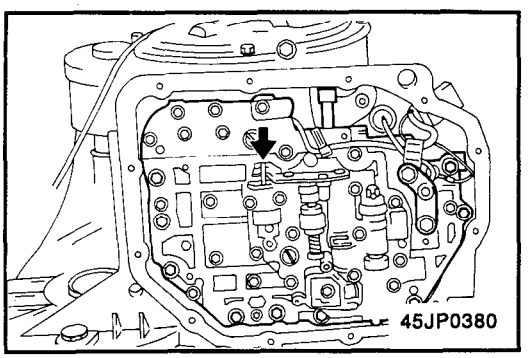
(If the Scan Tool is not available)

1. Remove parts up to the oil filter in the same way as for adjustment of the line pressure. The valve body need not be removed.
2. Turn the adjustment screw of the lower valve body and adjust so that the reducing pressure is the standard value.
   When the adjustment screw is turned clock wise, the reducing pressure becomes lower; when it is turned to the counter clock wise, it becomes higher.

   NOTE:
   When adjusting the reducing pressure, aim for the center value (425 kPa, 60 psi) of the standard value allowance.

   Standard value :
   425 ± 10 kPa (80 ± 1 psi, 4.3 ± 1 kg/cm^2)
   Oil pressure change for each turn of the adjustment screw:
   30 kPa (4.3 psi, 0.3 kg/cm^2)

3. Install the oil filter and oil pan in the same way as for adjustment of the line pressure.
4. Make the oil pressure test. Readjust if necessary.



(If the Scan Tool is used)

1. Adjust to obtain the specified kick down brake pressure when the pressure continued solenoid is activated at 50% duty ratio with the multi-use tester.

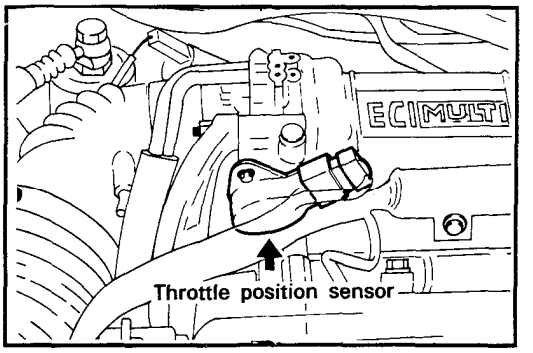
   Standard value :
   275 ± 10 kPa (39 ± 1 psi, 2.8 ± 1 kg/cm^2)
   Oil pressure change for each turn of the adjustment screw:
   20 kPa (3 psi, 0.2 kg/cm^2)

2. Check to be sure that the reducing pressure (after the adjustment is completed) is within the range of 370-490 kPa (53-70 psi, 3.8-5.0 kg/cm^2)

NOTE:
This adjustment should be made at an oil temperature of 70-60°C(166-176°F).
If the adjustment is made at a temperature that is too high, the line pressure will drop during idling, with the result that it might not be possible to make the correct adjustment.

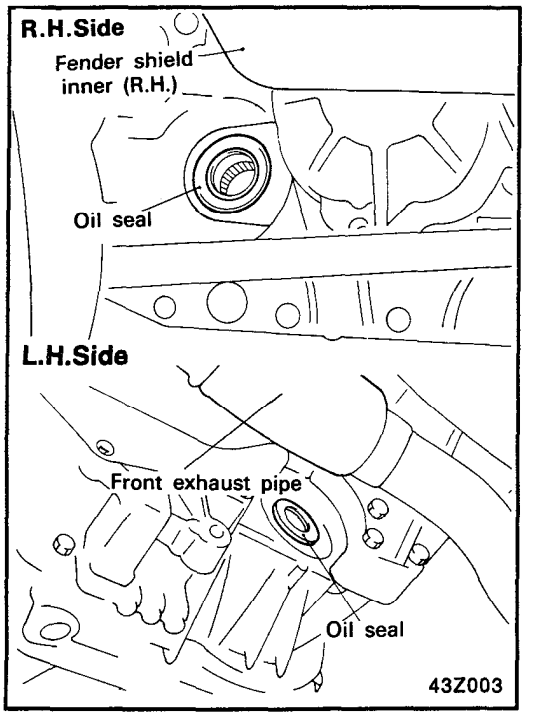
THROTTLE-POSITION SENSOR ADJUSTMENT

Refer to GROUP 31 -FUEL SYSTEM.

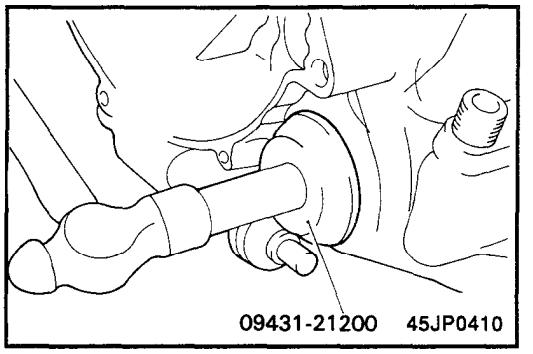


DRIVE SHAFT OIL SEALS REPLACEMENT

1. Disconnect the drive shaft from the transaxle. (Refer to FRONT SUSPENSION-Drive Shaft)
2. Using a flat-tip (-) screwdriver, remove the oil seal.

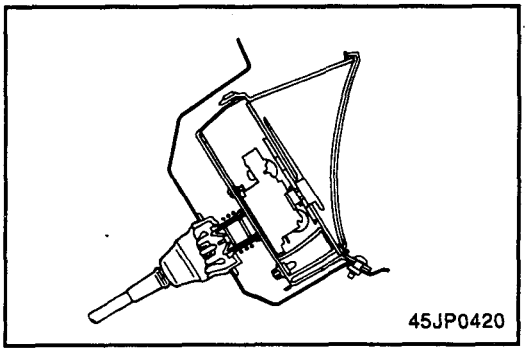


3. Using the special tool (09431-21200), tap the drive shaft oil seal into the transaxle.
4. Apply a coating of the transaxle fluid to the lip of the oil seal.



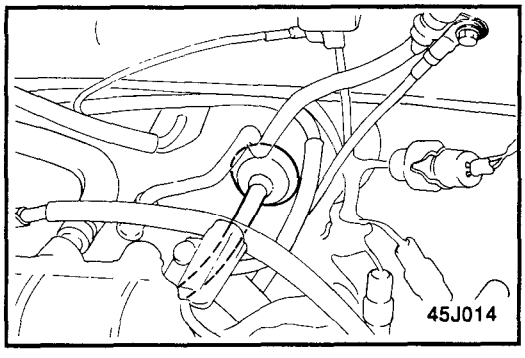
SPEEDOMETER CABLE REPLACEMENT

1. Correctly insert the adapter into the instrument panel, and fasten the new speedometer cable.



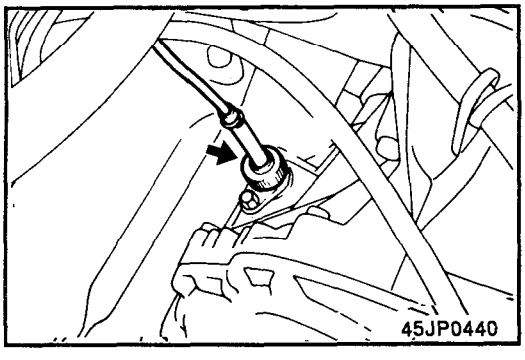
2. Install the grommet so that, as shown in the illustration, the cable attachment part and the projection part are horizontal.

   NOTE:
   The cable arrangement should be made so that the radius of the cable bends is 150 mm (5.9 in.) or more.

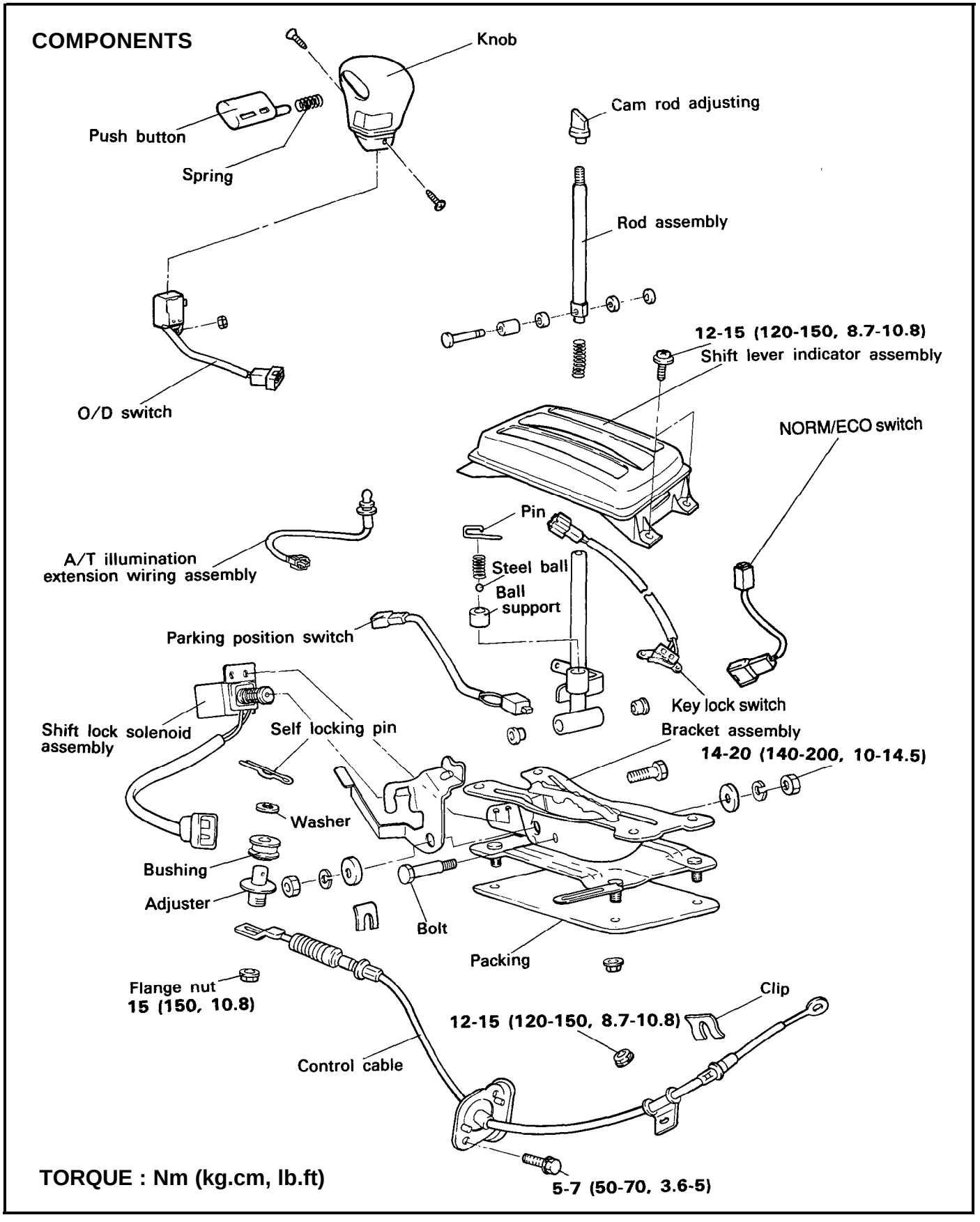


3. At the transaxle end of the speedometer cable, the key joint should be inserted into the transaxle, and the nut should be securely tightened.

   NOTE:
   If the cable is not correctly and securely connected, it may cause an incorrect reading on the speedometer, or abnormal noise. Be sure to connect it correctly.

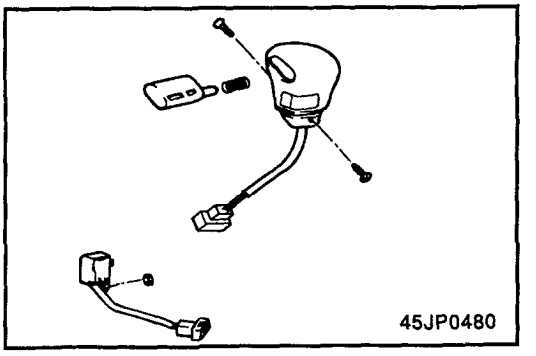


TRANSAXLE CONTROL

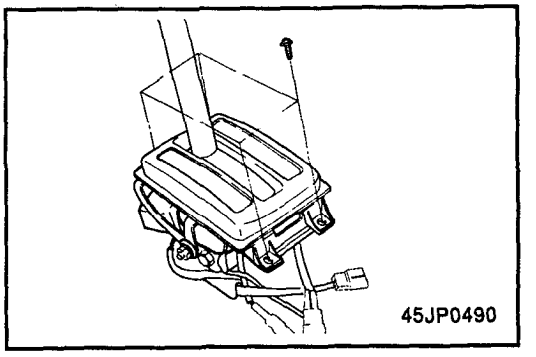


REMOVAL

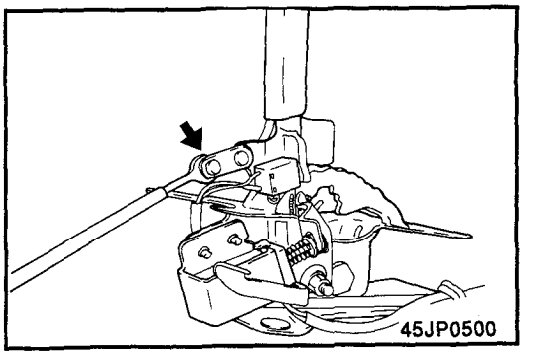
1. Remove the console box assembly. (Refer to Body Group).
2. Remove the knob installation screws.
3. Disconnect the overdrive switch connector and then remove the knob.



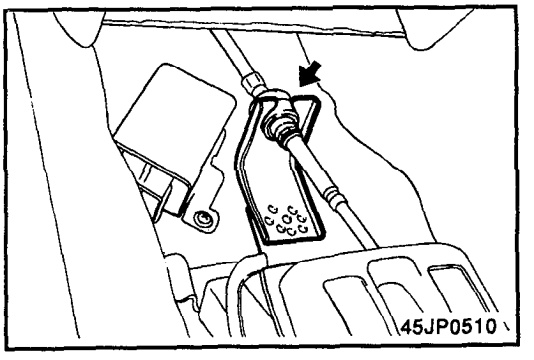
4. Remove the shift lever indicator assembly.
5. Disconnect the position indicator light connector and normal/ economy select switch connector.



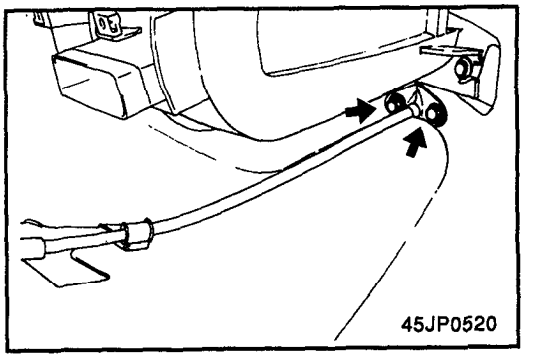
6. Remove the pin, self lock pin from the link.



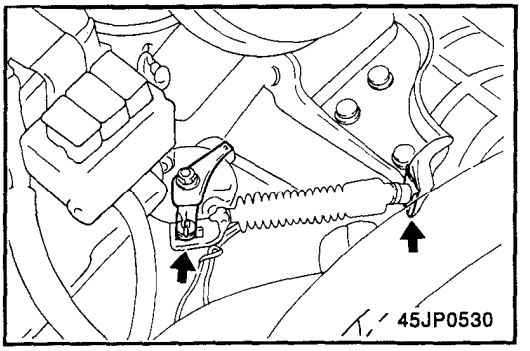
7. Remove the clip, nut from the shift lever side.



8. Remove the bolt-washer assembly located on dash panel.

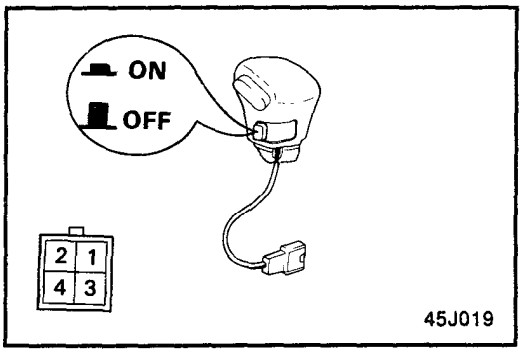


9. Remove the clip, flange nut from the transaxle side.
10. Remove the transaxle control cable assembly.



INSPECTION

1. Check the control cable for function and for damage.
2. Check the bushing for wear or damage.
3. Check the spring for damage or deterioration.
4. Check the overdrive switch for continuity.



○—○ Continuity

Terminal / Switch position	1 (0.3-RW)*	2 (0.3-LR)*	3 (0.3-BW)*
Overdrive activation	○	○	
Overdrive non-activation	○		○

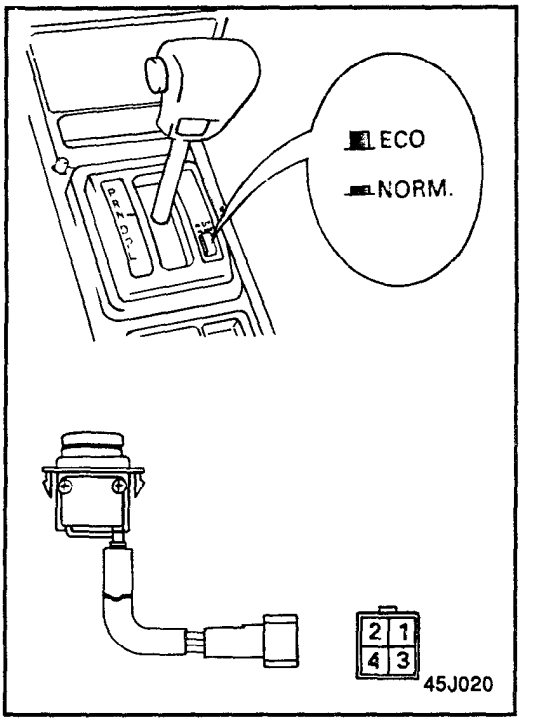
NOTE

*Color code	Color of wire	*Color code	Color of wire
R	Red	B	Black
W	White	L	Blue

5. Check the P/N switch for continuity.

○—○ : Continuity

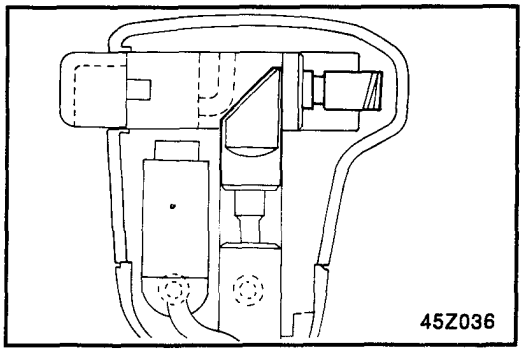
Terminal / Position	1	2	4
ECO (Free)	○		○
NORM (Push)	○	○	



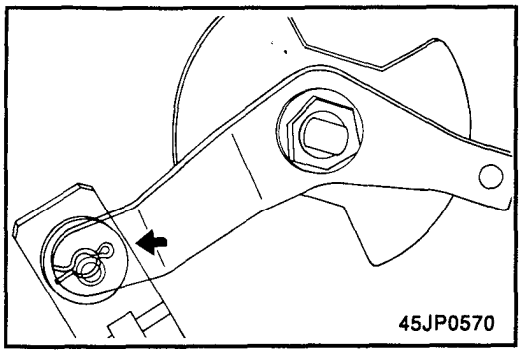
INSTALLATION

1. Apply a coating of the specified grease to the interior of the bushing.

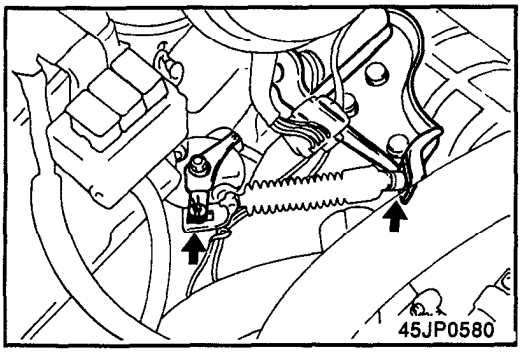
   Specified grease : Chassis grease SAE J310, NLGI No.2



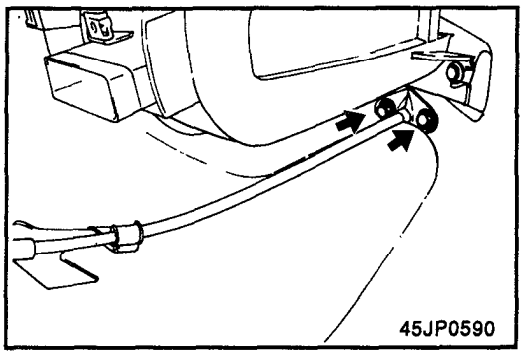
2. Move the shift lever and the transaxle range switch to the "N" position, and install the control cable.



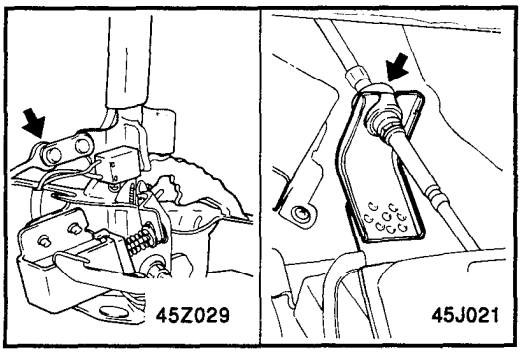
3. When connecting the control cable to the transaxle mounting bracket, install the clip until it contacts the control cable, in position switch in the figure.



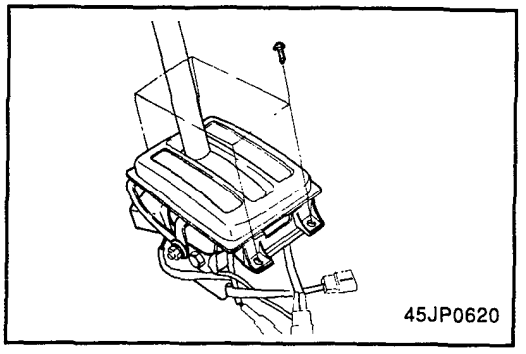
4. Install the bolt-washer assembly, nut.



5. Install the clip pin, self lock pin. (shift lever side).

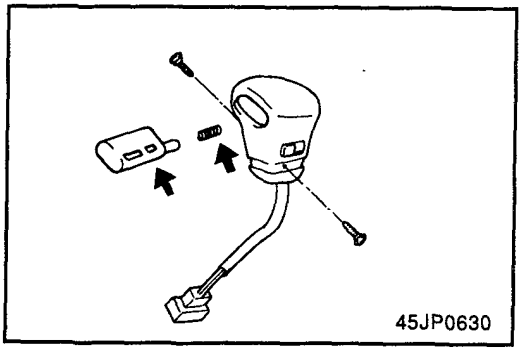


6. Connect the position indicator light connector, the O/D switch connector, the parking position switch connector, power/ normal select switch connector, and the shift lock solenoid connector.
7. Install the shift lever indicator assembly.



8. Apply the specified grease at the place shown in the figure.

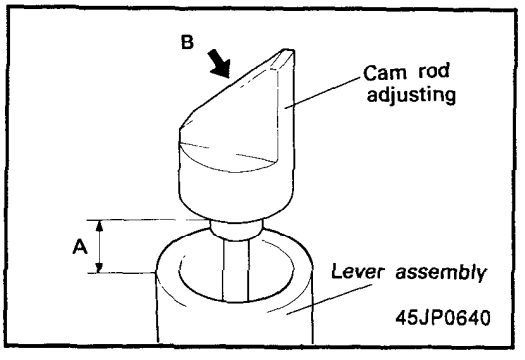
   Specified grease : Multipurpose grease SAE J310, NLGI No.2



9. Place the shift lever in the "N" position, and then turn the cam adjusting so that the clearance between the cam adjusting and the lever assembly end in within the standard value.

   Standard value (A) : 15.2-15.9 mm (0.596-0.625 in.)

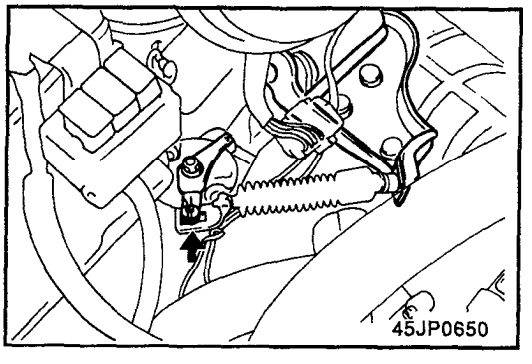
   NOTE
   Be sure to face B of the adjusting cam to the push button (driver's side).



10. install the selector knob.
11. Install the console box. (Refer to BODY GROUP).

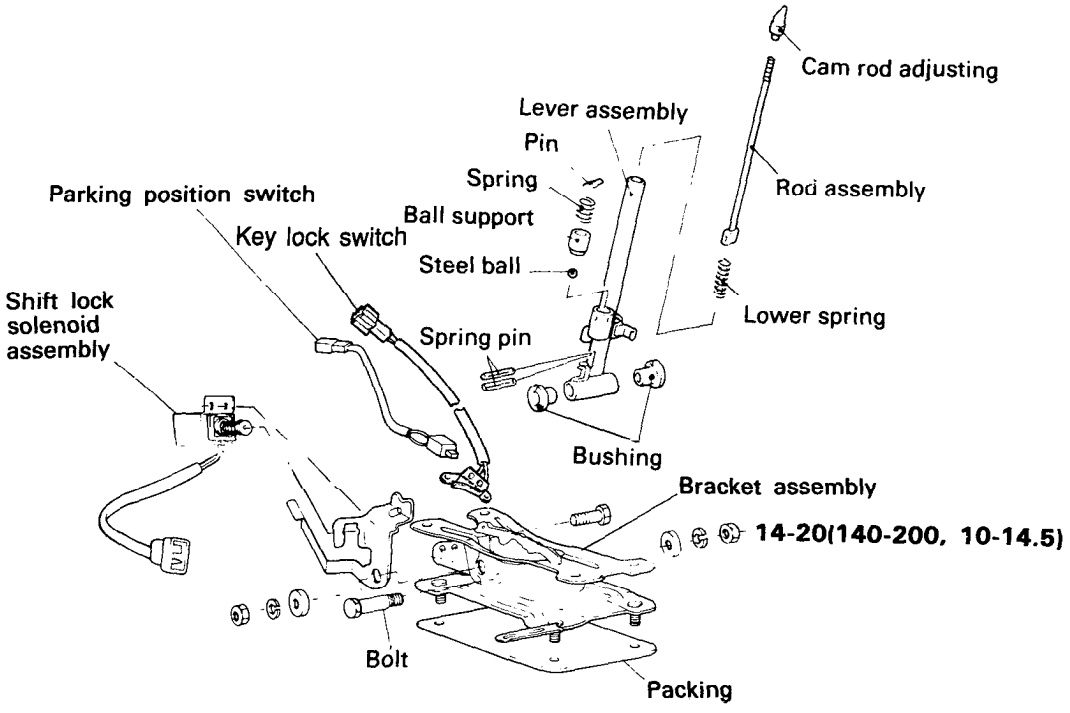
ADJUSTMENT OF CONTROL CABLE

1. Eliminate slack from the control cable with the adjusting flange nut and check that the select lever operates smoothly.
2 Driving the car, check that the transaxle is set in the proper range when the select lever is shifted to each position.



SHIR LEVER ASSEMBLY

COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

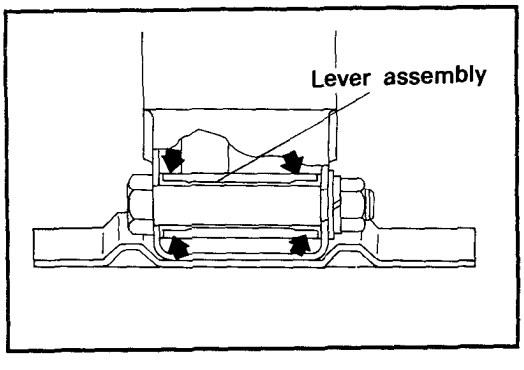
INSPECTION

- Check the detent place for wear.
- Check the bushing for wear or damage.
- Check the spring for damage or deterioration.
- Check the pin at the end of rod assembly for wear.

ASSEMBLY

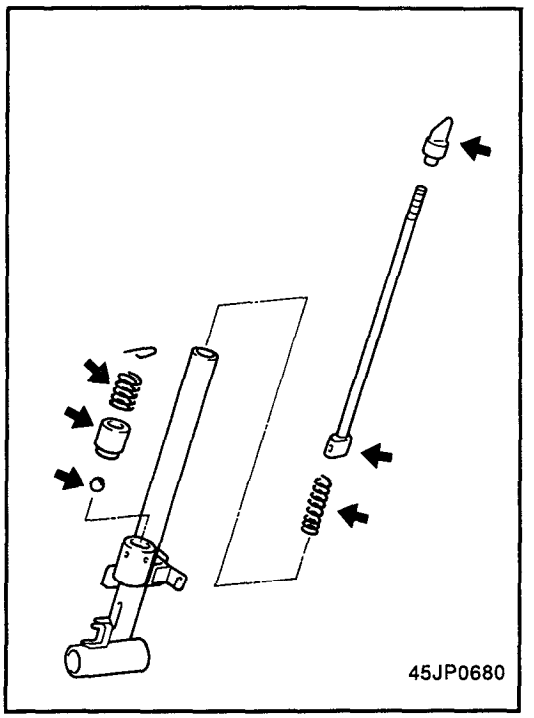
1. Apply a coating of grease to the sliding part of the bushing.

   Specified grease : Chassis grease SAE J310, NLGI No.2



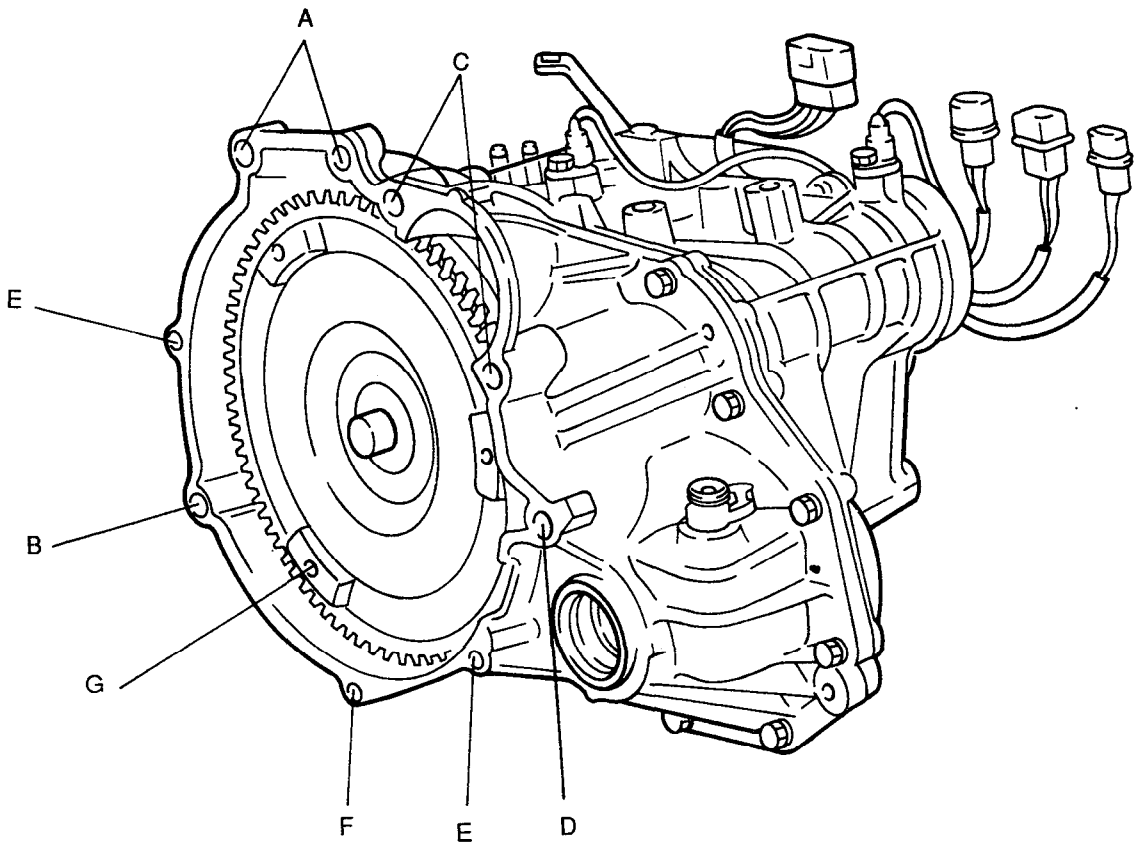
2 Apply the specified grease at the places shown in the figure.

Specified grease : Multipurpose grease SAE J310, NLGI No.2



AUTOMATIC TRANSAXLE

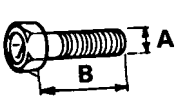
COMPONENTS



	Nm	Kg.cm	lb.ft	O.D. x Length mm (in.)
A	43-55	430-550	31-40	7 10x40(1.6)
B	43-55	430-550	31-40	7 10x65(2.6)
C	27-34	270-340	20-24	7 10x55(2.2)
D	30-35	300-350	22-25	10 8x60(2.4)
E	10-12	100-120	7-9	7 6x12(0.5)
F	30-35	300-350	22-25	7 8x12(0.5)
G	46-53	460-530	34-38	

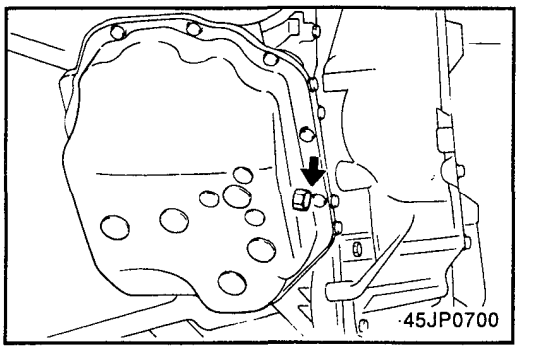
Bolt identification

7 A x B



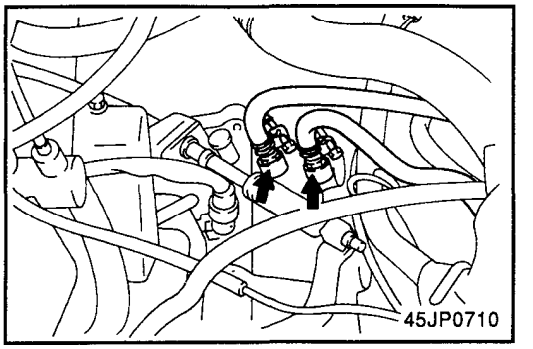
REMOVAL AND INSTALLATION

1. Remove the drain plug and drain the transaxle fluid.
2. Disconnect and remove the air cleaner assembly.

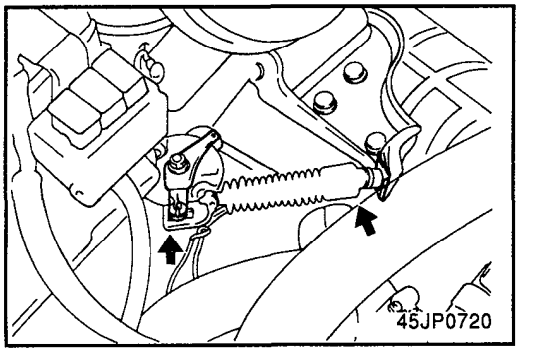


3. Loosen the mounting clamps and disconnect the return and supply hose.

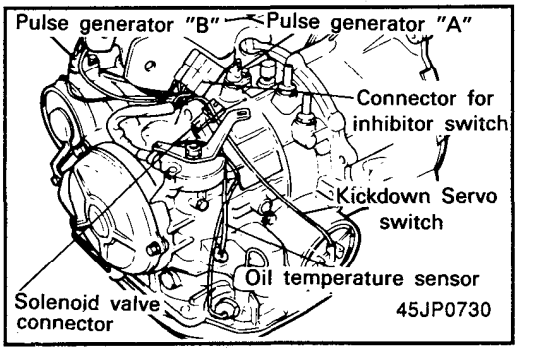
NOTE
To prevent to entry of dust and foreign matter, plug the disconnected hoses and the transaxle fitting part.



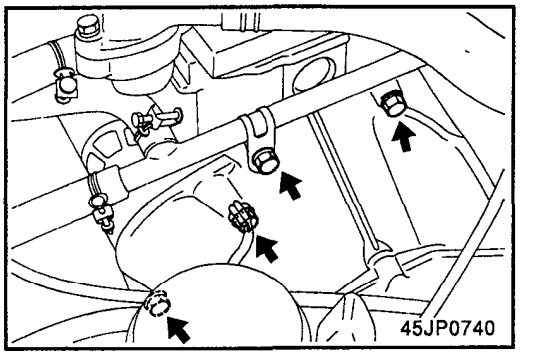
4. Remove the control cable.
5. Remove the speedometer cable.



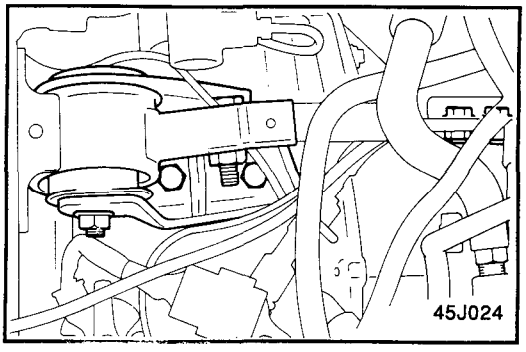
6. Separate the pulse generator connector, transaxle range switch connector, kickdown servo switch connector, solenoid valve connector, and the oil temperature sensor connector.



7. Remove the transaxle-to-engine bolt from the upper portion of the transaxle.

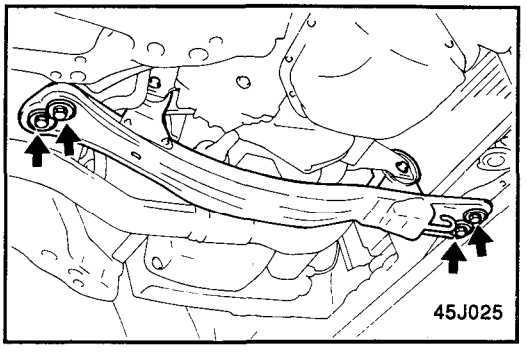


8. Remove the transaxle mounting bracket.



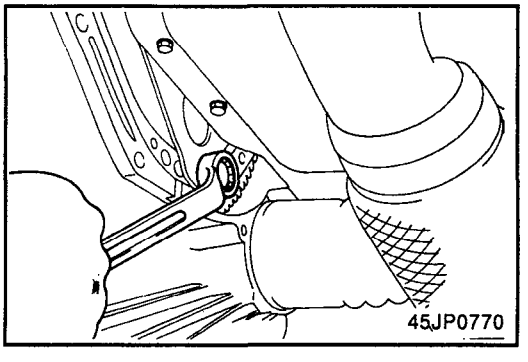
9. While supporting the lower part of the transaxle by using a jack, remove the center member mounting bolts.

CAUTION:
Support a wide area of the transaxle so that an excessive amount of pressure is not applied to the oil pan.

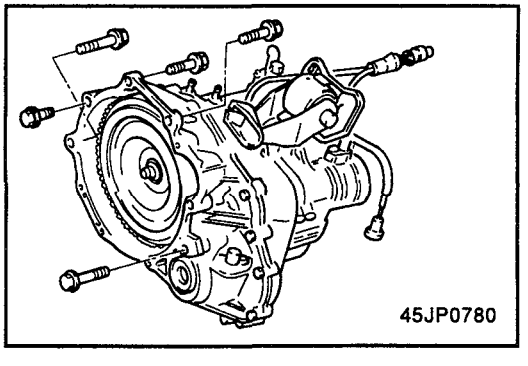


10. Remove the bell housing cover.
11. Remove the three special bolts connecting the converter to the drive plate.

NOTE
To remove the special bolts of torque converter, turn engine crankshaft with a box wrench to bring one of the bolts to the position appropriate for removal.
After removing the bolt, turn the crankshaft in the-same manner as above and remove all remaining bolts one after another.
Bring the transaxle shift lever into the "N" (Neutral) position.

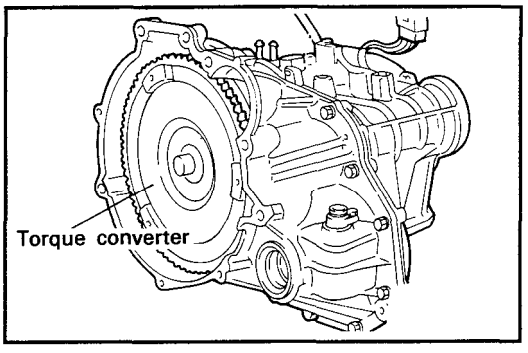


12. After removing the special bolts, re-install the center member assembly.
13. Remove the lower arm ball joint (Refer to DRIVE SHAFT GROUP)
14. Remove the remaining engine connecting bolts while at the same time supporting the transaxle with a floor jack.



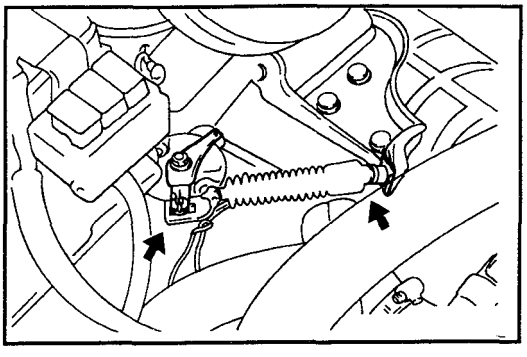
INSTALLATION

1. Attach the torque converter on the transaxle side and mount the transaxle assembly onto the engine.



CAUTION
If the torque converter is mounted first on the engine, the oil seal on the transaxle side may be damaged. Therefore, be sure to first assemble the torque converter to the transaxle.

2. Install the transaxle control cable and adjust as follows.
   1) Move the shift lever and the inhibitor switch to the "N" position, and install the control cable.
   2) When connecting the control cable to the transaxle mounting bracket, install the clip until it contacts the control cable. (as shown in the illustration)
   3) Remove any free-play in the control cable by adjusting nut and then check to see that the selector lever moves smoothly.
   4) Check to see that the control cable has been adjusted correctly.

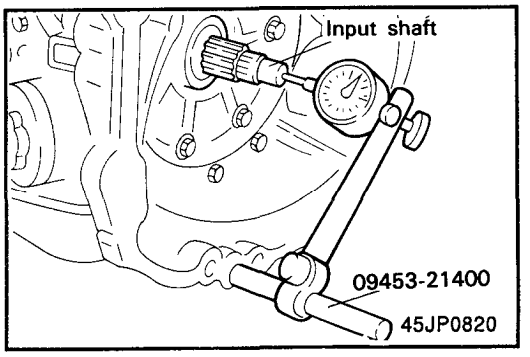


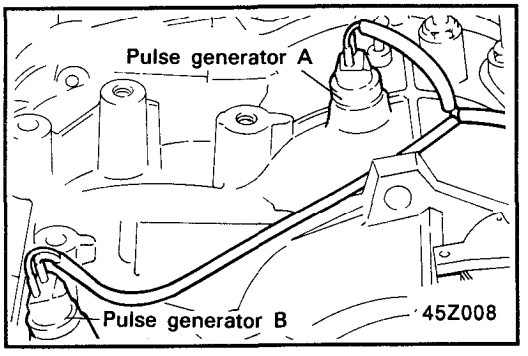
DISASSEMBLY

NOTE

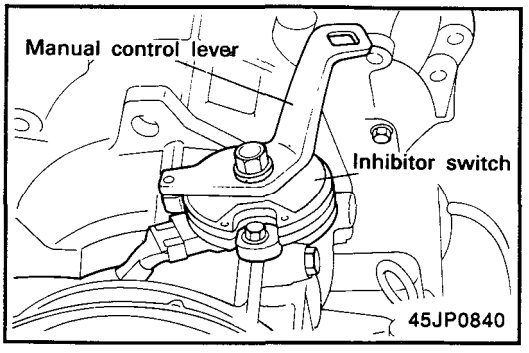
The automatic transaxle is composed of precision component parts, these parts should be very carefully handled during disassembly and assembly, to prevent and damage.
During disassembly, cloth gloves or rags should not not be used.
If such items must be used, use nylon, or use paper towels.
All disassembled parts must be thoroughly cleaned. Metal parts may be cleaned with ordinary detergents, but must be thoroughly air dried.
Clean the clutch disc, resin thrust plate and rubber parts by using ATF (automatic transaxle fluid), being careful that dust, dirt, etc. do not adhere.
If the transaxle pan has excessive metal residue, flush the radiator transaxle cooler system.

1. Clean away any sand, mud, etc. adhered around the transaxle.
2. Place the transaxle assembly on the workbench with the oil pan down.
3. Remove the torque converter.
4. Measuring input shaft end play before disassembly will usually indicate when a thrust washer change is required (except when major parts are replaced).
   Thrust washer are located between the reaction shaft support and rear clutch retainer, and between the reaction shaft support and front clutch retainer.
   Mount a dial indicator to the converter housing with the dial indicator support.
   Make sure that the indicator plunger is seated against the end of the input shaft.
   When checking end play, pull out or push in the input shaft with pliers. Be careful not to scratch the input shaft. Record indicator reading for reference when reassembling the transaxle.
5. Remove the pulse generators “A” and “B”.

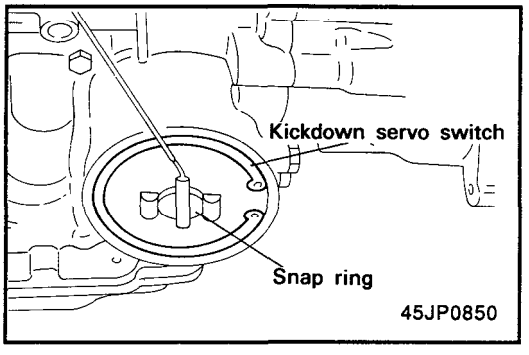




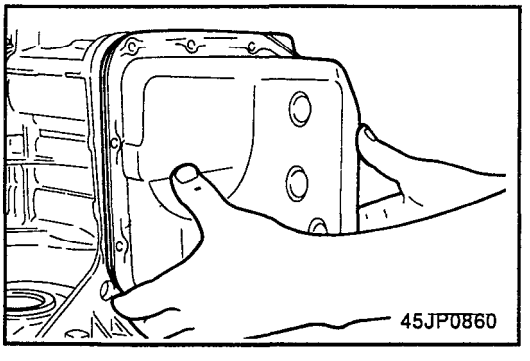
6. Remove manual control lever, then remove the transaxle range switch.



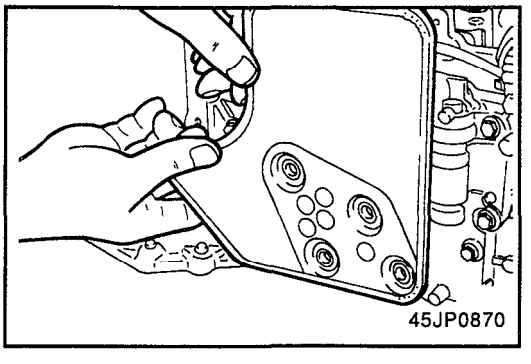
7. Remove the snap ring and kickdown servo switch.



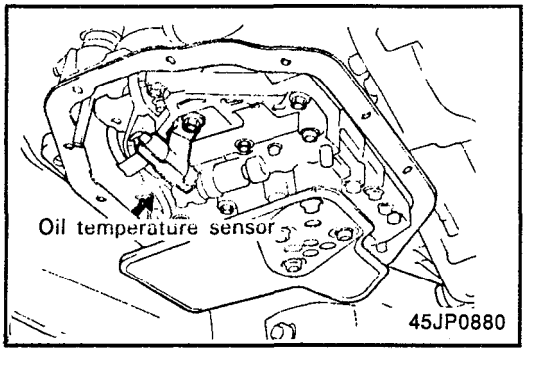
8. Remove the oil pan and gasket.



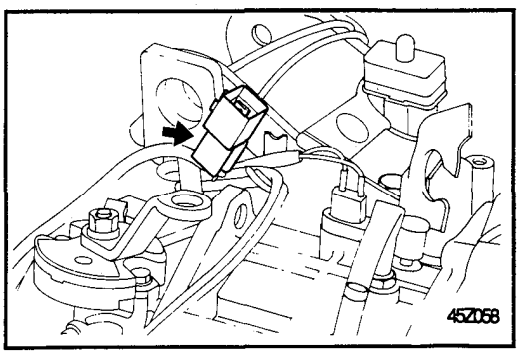
9. Remove the oil filter from the valve body.



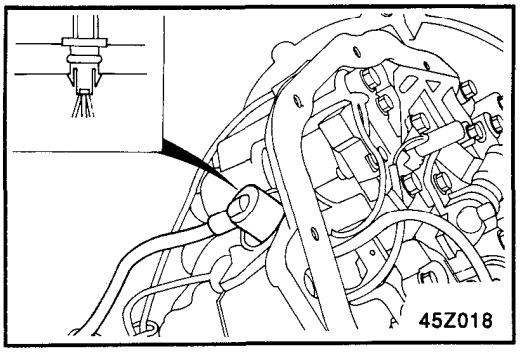
10. Remove the oil-temperature sensor installation bolt; then, after removal from the bracket, pull out from the connector side.



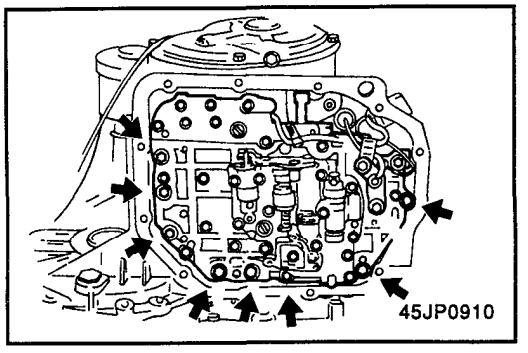
11. Pull up the solenoid valve connector.



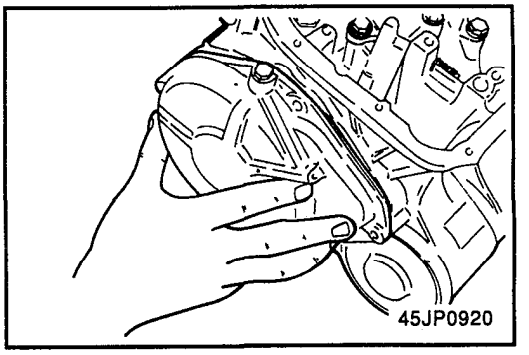
12. Press the tab of the solenoid valve harness grommet and push in.



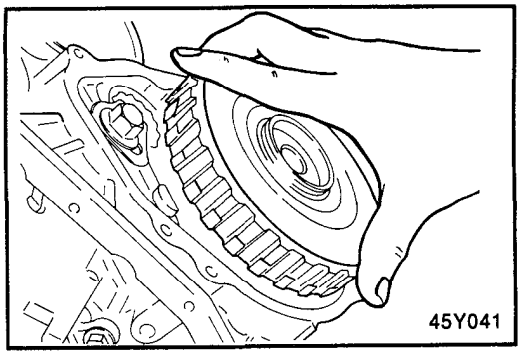
13. Remove the 8 valve body bolts. Remove the valve body.



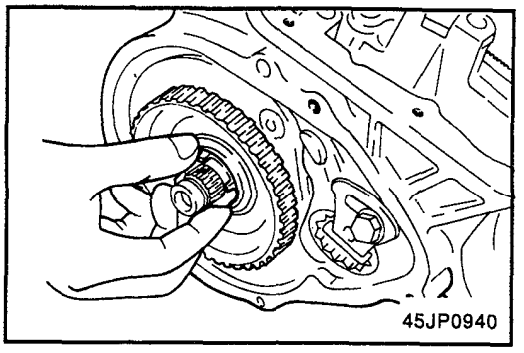
14. Remove the end clutch cover mounting bolts, the cover holder, and the end clutch cover.



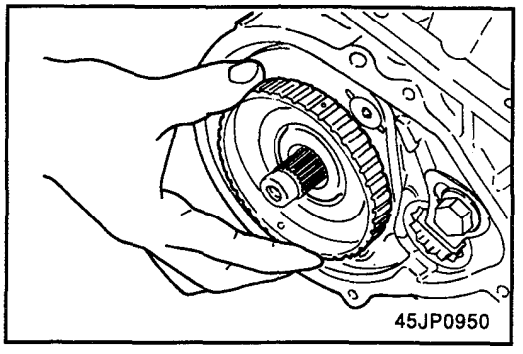
15. Remove the end clutch assembly.



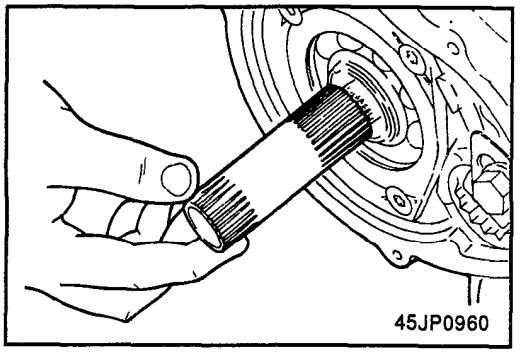
16. Remove the thrust plate.



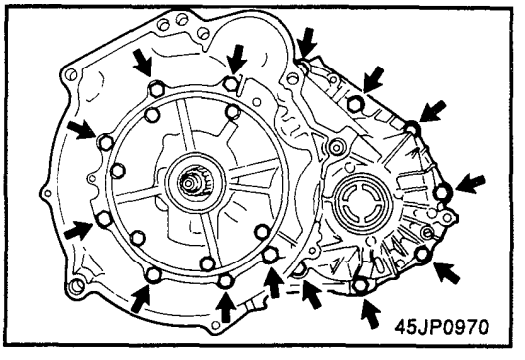
17. Remove the end clutch hub and thrust bearing.



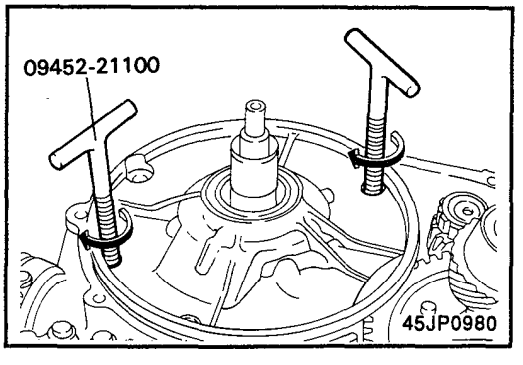
18. Pull out the end clutch shaft.



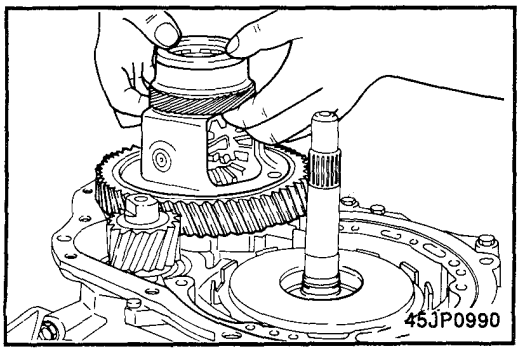
19. Remove the 14 converter bolts. Remove the converter housing.



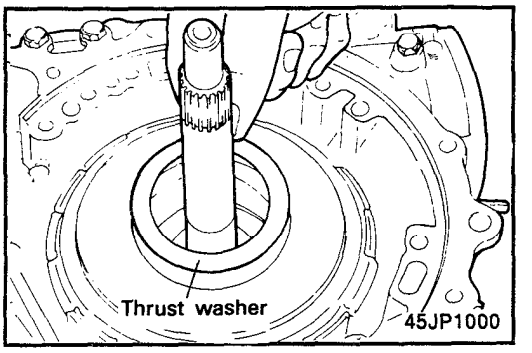
20. Using the special tool (09452-21100) remove the 6 oil pump assembly bolts. Remove the oil pump assembly.



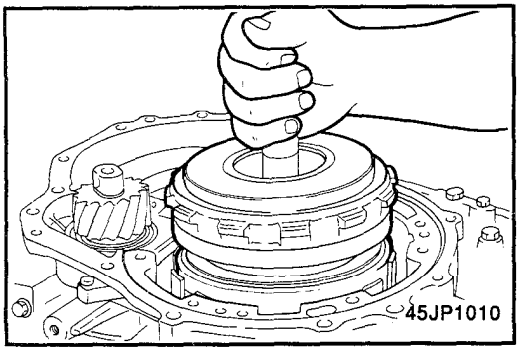
21. Remove the spacer and the differential assembly.



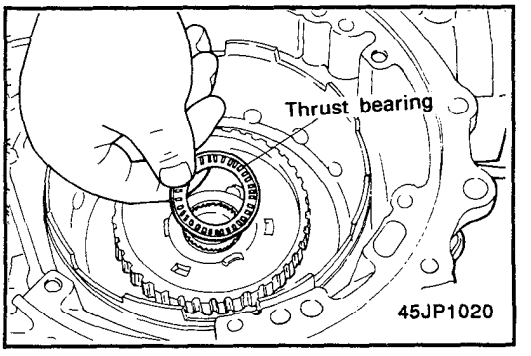
22. Remove the fiber thrust washer.



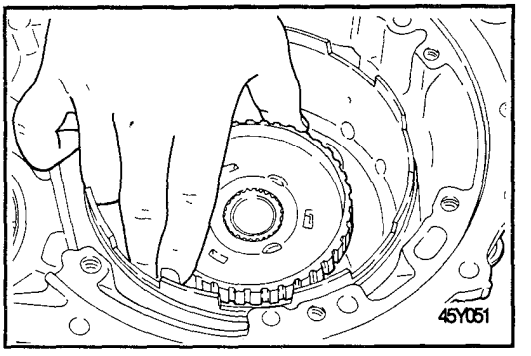
23. Pull up the input shaft, and remove the front clutch assembly and the rear clutch assembly together.



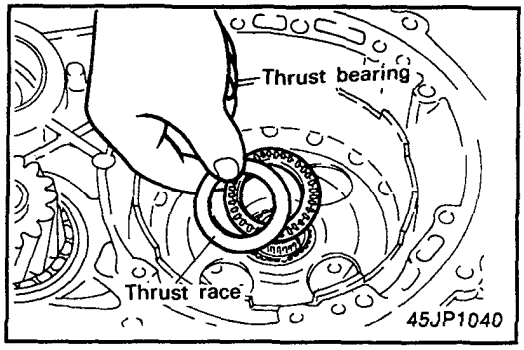
24. Remove the thrust bearing.



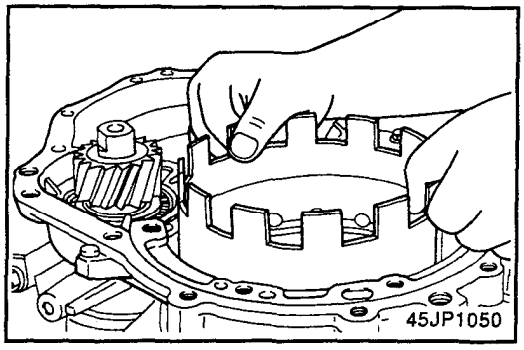
25. Remove the clutch hub.



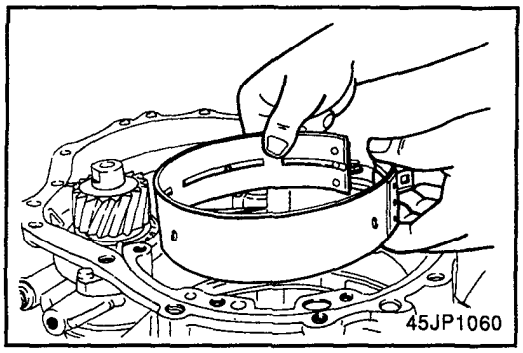
26. Remove the thrust race and bearing.



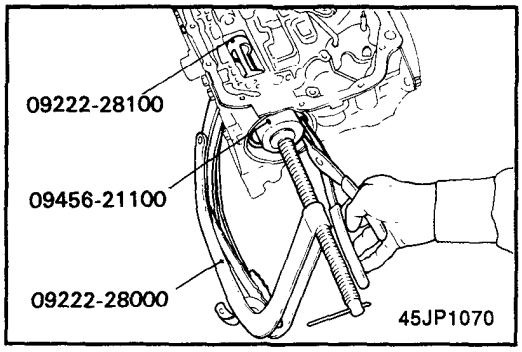
27. Remove the kickdown drum.



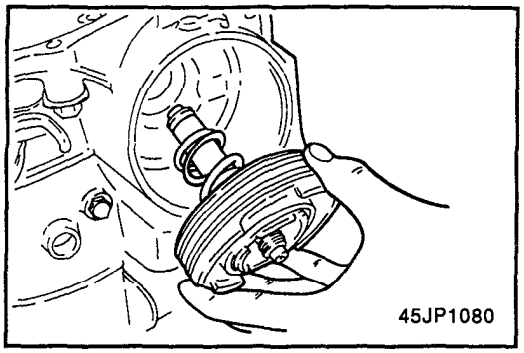
28. Remove the kickdown band,



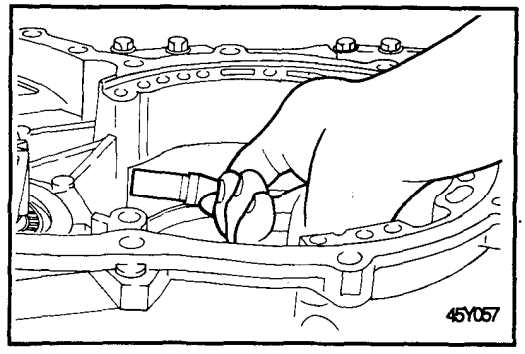
29. Using the special tools (09222-28000, 09222-28100, 09456-21100), push in the kickdown servo and remove the snap ring.



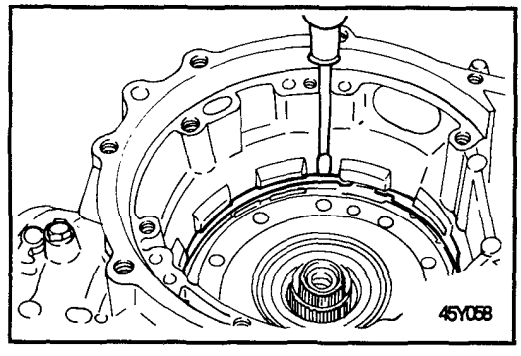
30. Remove the kickdown servo piston and spring.



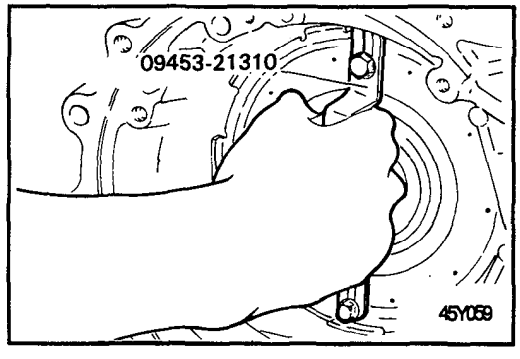
31. Remove the anchor rod.



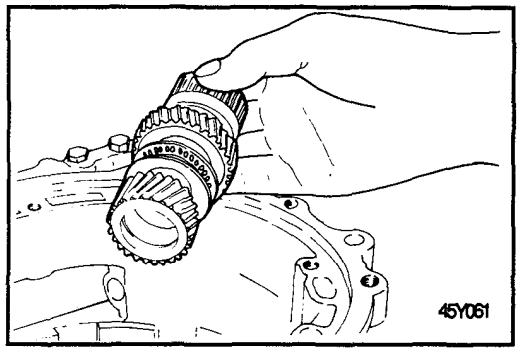
32. Remove the snap ring.



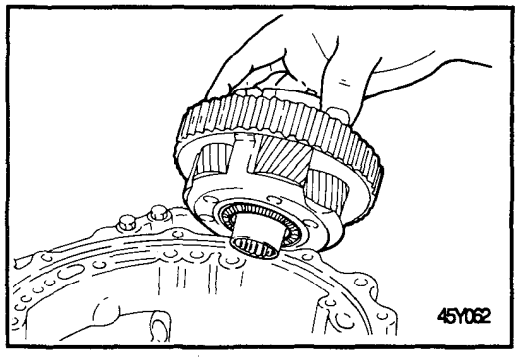
33. Attach the special tool (09453-21310) on the center support. Holding the handle of the tool, pull the center support straight upward.



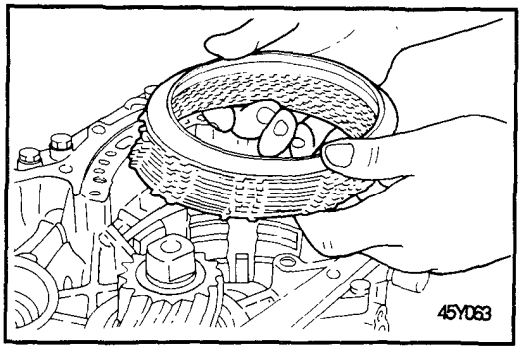
34. Remove the reverse sun gear and the forward sun gear together.



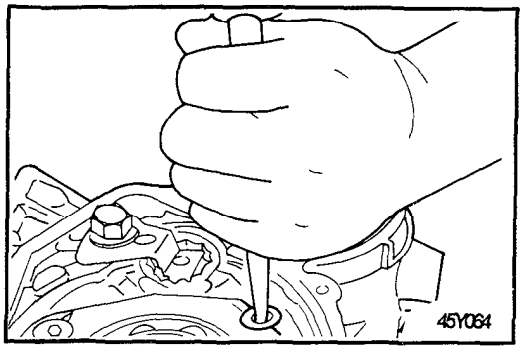
35. Remove the planet carrier assembly and thrust bearing.



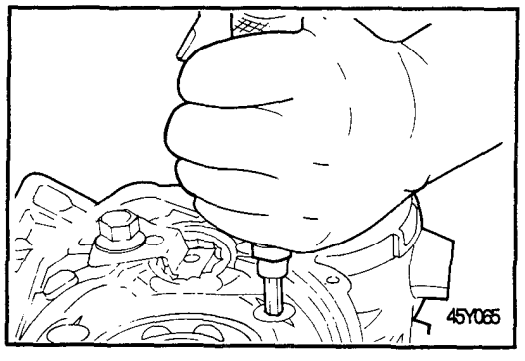
36. Remove the wave spring, return spring, reaction plate, brake disc, and brake plate.



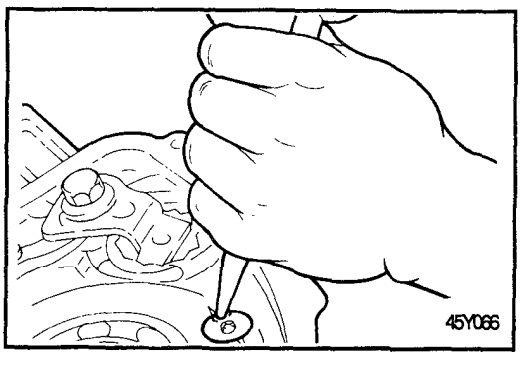
37. Since a thread locking compound is applied to the bolt threads, tap the bolt head for easier removal.



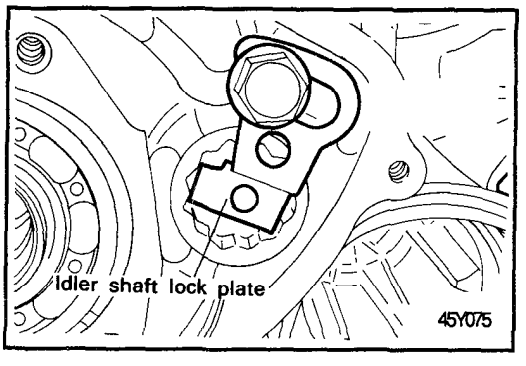
38. Using an impact driver, loosen the bolt.



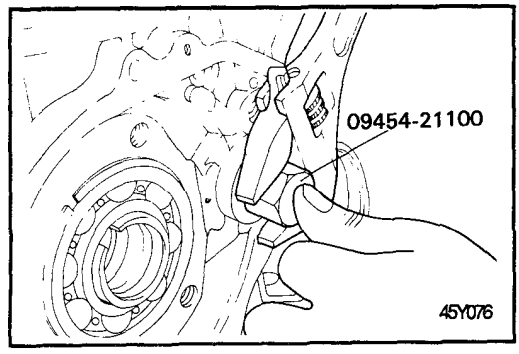
If an impact driver is not available, use a punch or something similar.



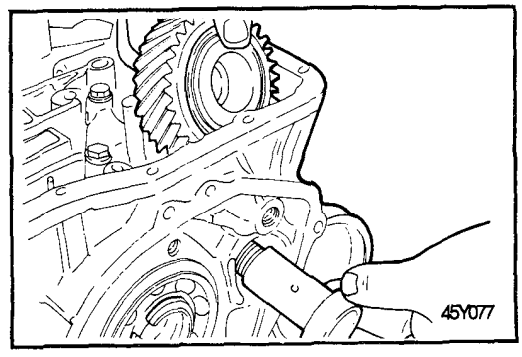
39. Remove the idler shaft lock plate.



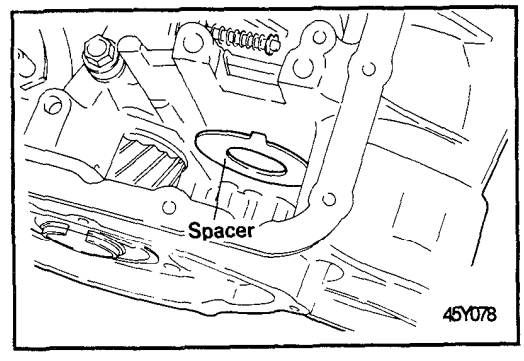
40. Loosen the transfer idler shaft with the special tool (09454-21100).



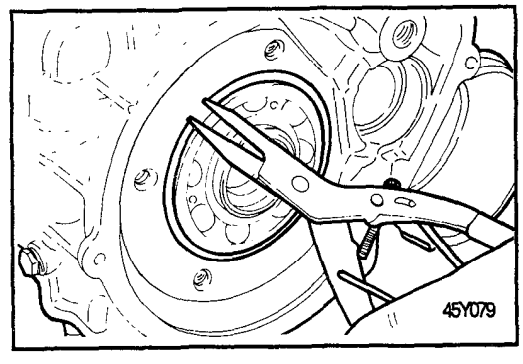
41. Remove the transfer idler shaft. Remove the transfer idle gear bearing inner races (2 pieces) from inside the case.



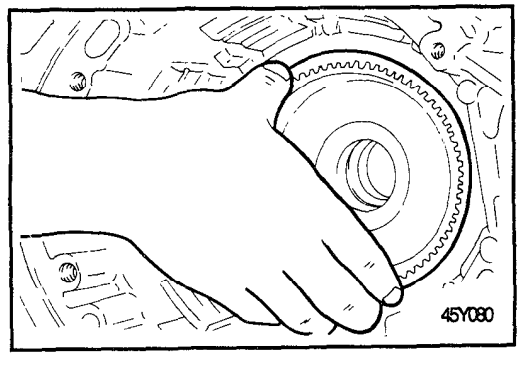
42: Remove the spacer.



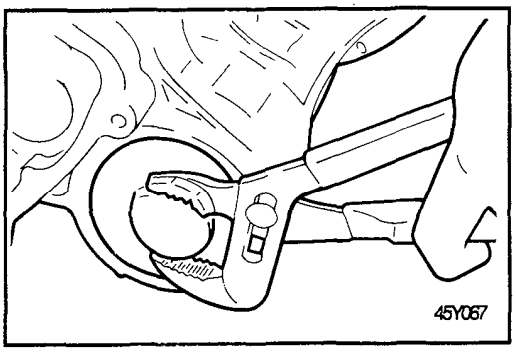
43. Remove the snap ring from the bearing.



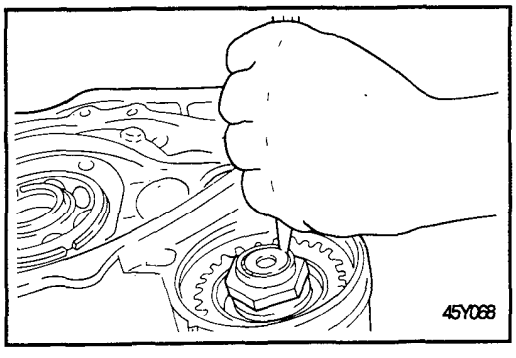
44. Remove the internal gear, output flange, transfer drive gear and bearing as an assembly from the case.



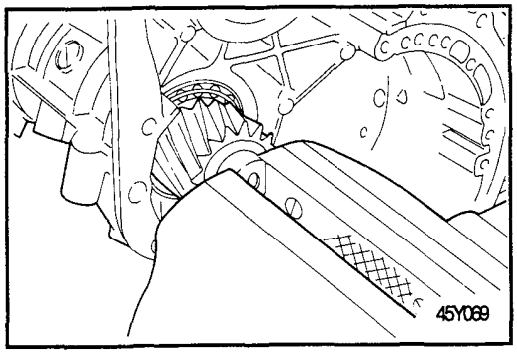
45. Remove the transfer shaft cover.



46, Unstake the transfer shaft lock nut.

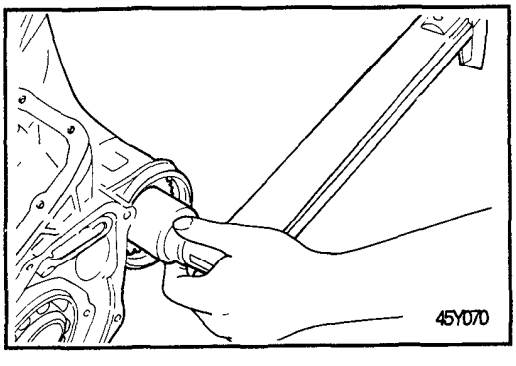


47. Fix the transfer shaft converter housing side.

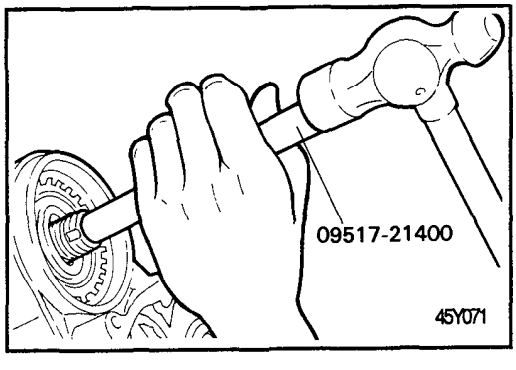


48. Remove the locking nut.

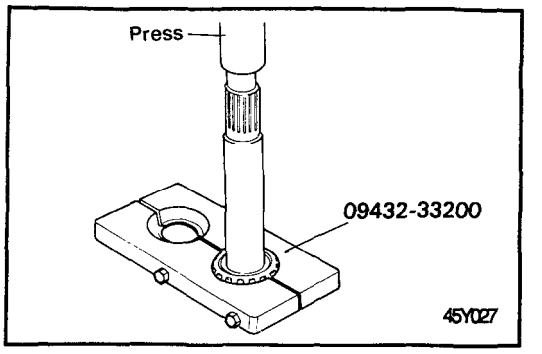
NOTE:
The lock nut has left-hand threads.



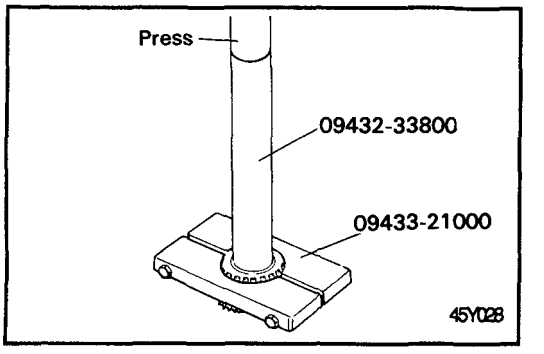
49. Knock off the transfer shaft to the converter housing side.



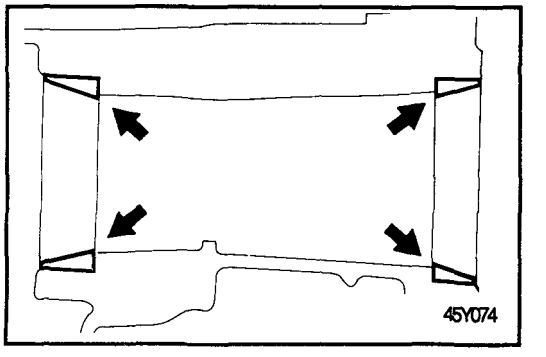
50. Using the special tool (09432-33200), pull the bearing from the transfer shaft.



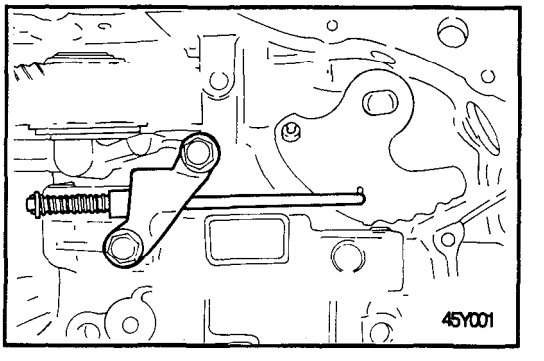
51. Using the special tools (09432-33800, 09433-21000), pull the bearing from the transfer driven gear.



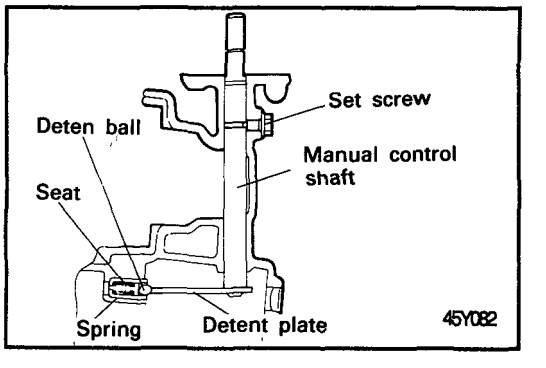
52. Using a screwdriver, remove the outer race.



53. Remove two bolts and the parking sprag rod.



54. Remove the set screw and the manual control shaft assembly. Remove the steel ball, the seat and the spring together at this time.



ASSEMBLY

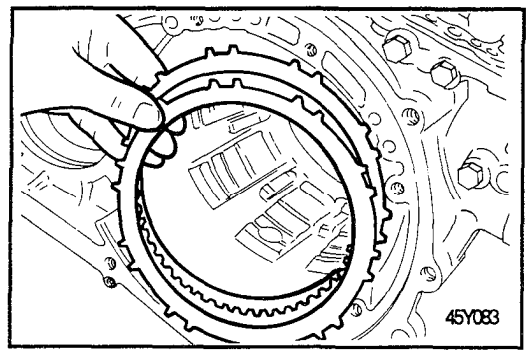
NOTE:
Do not reuse gaskets, oil seals and rubber parts. Replace them with new ones. The O-ring of the oil level dipstick need not be replaced.
Do not use grease other than petrolatum or industrial Vaseline. Apply automatic transaxle fluid to friction elements, rotating parts, and sliding parts before installation. Refer to page 45-4 concerning automatic transaxle fluid. New clutch discs should be immersed in automatic transaxle fluid for a minimum of two hours before installation.
Do not apply sealer or adhesive to gaskets.
When bushings must be replaced, replace their complete assembly which.
Do not use shop towels during disassembly and reassembly operation.
The oil in the cooler should also be replaced.

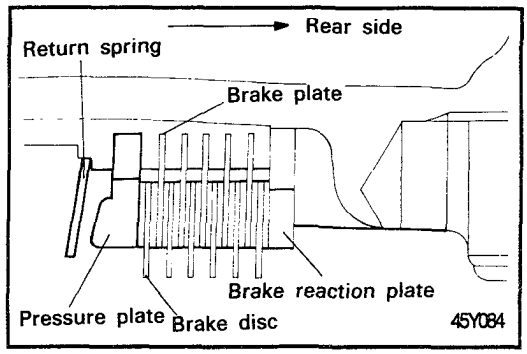
1. Before assembly of the transaxle, measure the end play of the low-reverse brake, and select a pressure plate to be used so that the end play will be the standard value.
   1) Install the brake reaction plate, brake plate and brake disc to the transaxle case.

      NOTE :
      If new brake discs are used, be sure to immerse them in ATF for a minimum of two hours.

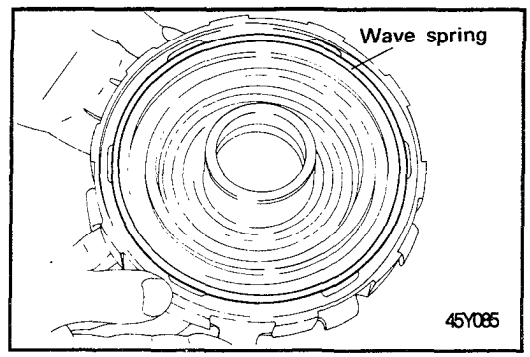
   2) Install the appropriate pressure plate and then install the return spring.

      NOTE :
      Be sure that the return spring is installed so that it faces in the correct direction.

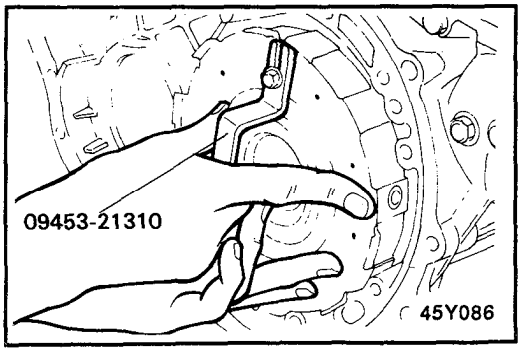




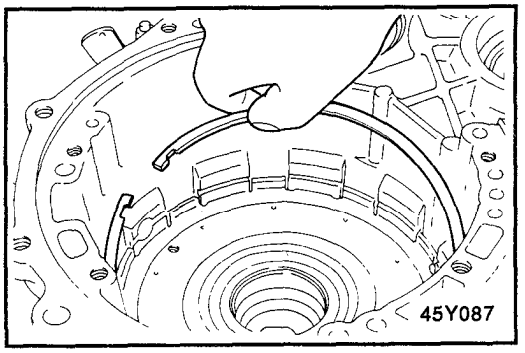
   3) Apply a coating of petroleum jelly to the wave spring and attach it to the center support.



4) Install the special tool (09453-21310) to the center support.

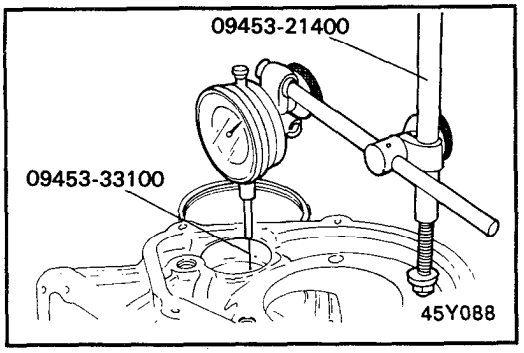


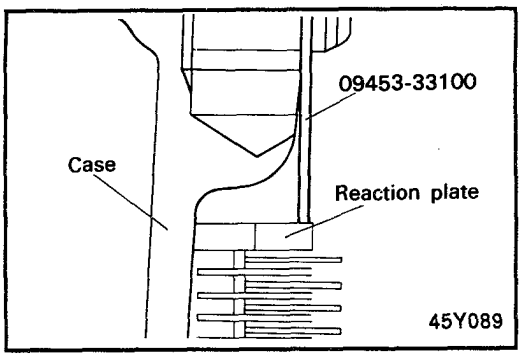
5) Install the snap ring.



6) Install the special tools (09453-21400, 09453-33100) and a dial gauge at the rear side of the transaxle case.

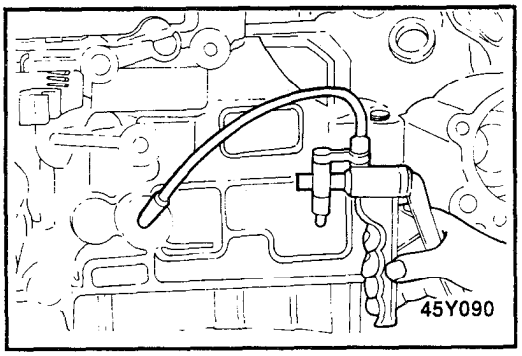
NOTE :
Install the dial gauge so that it contacts the brake reaction plate at a right angle from the transfer idler shaft hole.



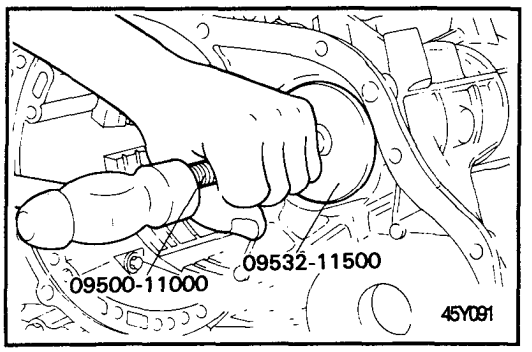


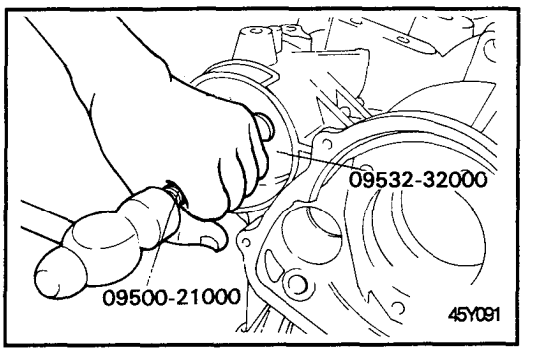
7) Using a manual pump, pump air in from the position shown in the illustration. Read the dial indicator gauge, and select the pressure plate that will provide the standard value.

Standard value: 0.78-1.09 mm (0.0307-0.043 in.)



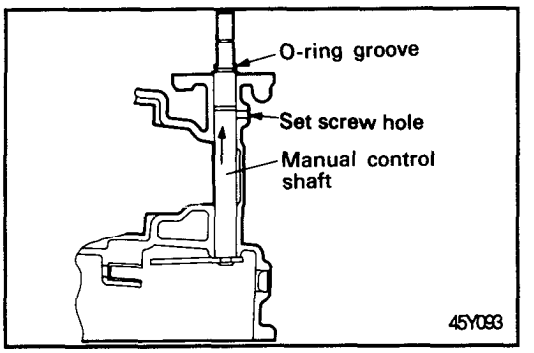
2. Using the special tools (09500-11000, 09500-21000,09532-11500, 09532-32000) tap in the bearing outer race.



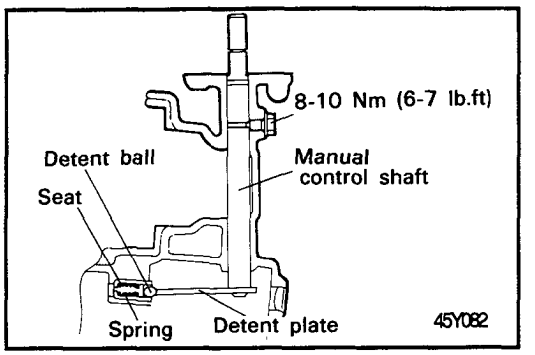


3. Insert manual control shaft into the transaxle case and push it toward the manual control lever.
   At this time, do not install the larger one of the two O-rings on the manual control shaft.

   'NOTE
   If installed before inserting the shaft, the O-ring will interfere with shaft set screw hole.

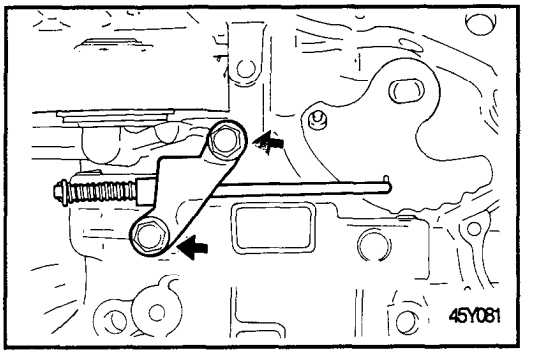


4. After installing the new O-ring on manual control shaft, draw shaft back into case. Install the set screw and gasket. Install the detent steel ball, seat and spring at the same time.

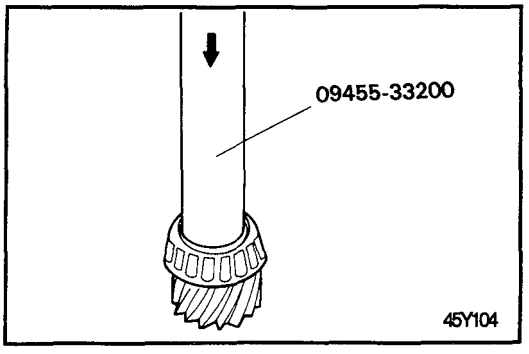


5. Install the parking sprag rod to the detent plate (manual control shaft).
   Install the sprag rod support and tighten the two bolts.

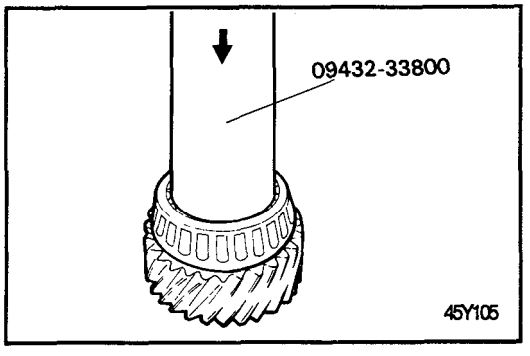
   Sprag rod support bolts:
   20-27 Nm (200-270 kg.cm, 15-19 lb.ft)



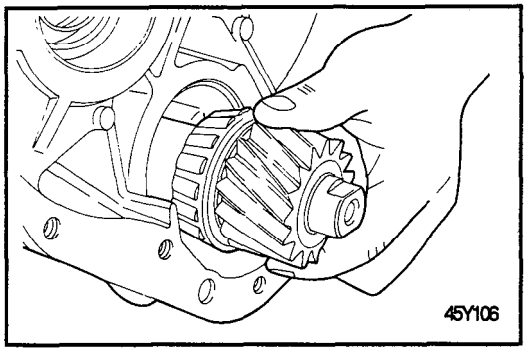
6. Press-fit the bearing inner race to the transfer driven gear, then press-fit the bearing outer race to the transaxle end clutch side.



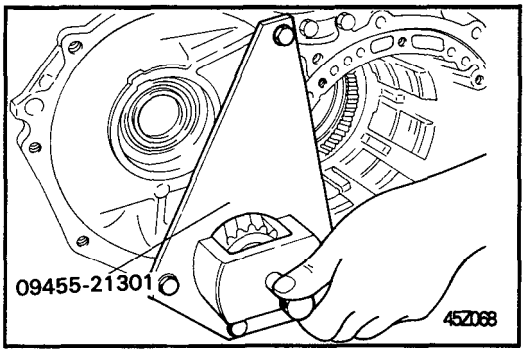
7. Press-fit the bearing inner race to the transfer shaft, then press-fit the bearing outer race to the transaxle case converter housing side.



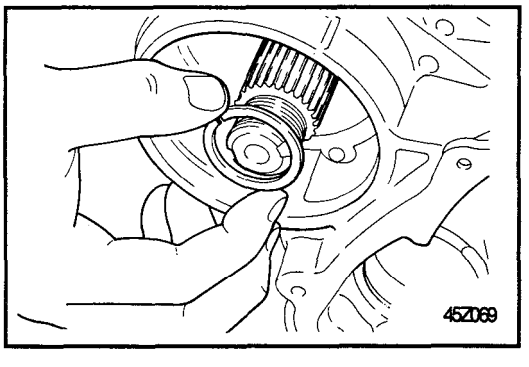
8. Attach the transfer shaft to the transaxle case.



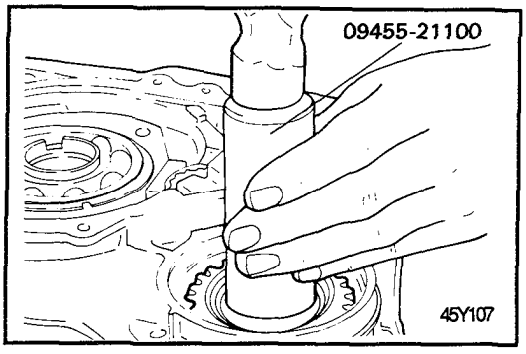
9. Install the special tool (09455-21301) to the transaxle case to support the transfer shaft.



10. Insert the thickest spacer 1.80 mm (0.0709 in.).



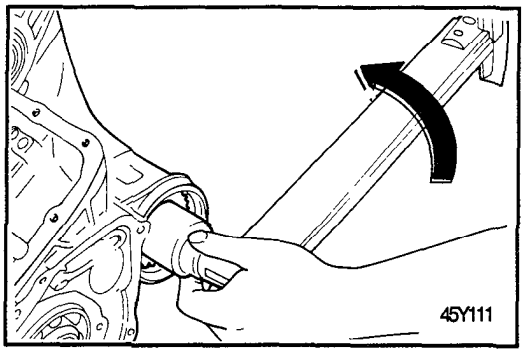
11. Attach the transfer driven gear.



12. After removing the special tool, place the converter housing side of the transfer shaft in a vise.

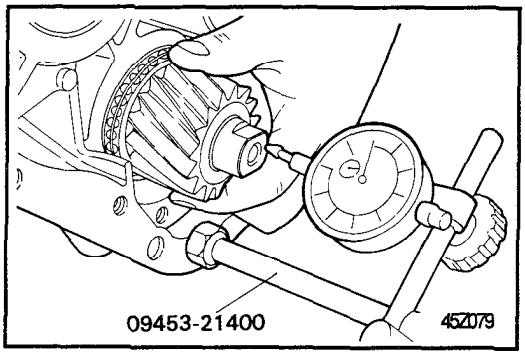
13. Tighten the lock nut to the specified torque.

Transfer lock nut:
200-230 Nm (2000-2300 kg.cm, 145-166 lb.ft)

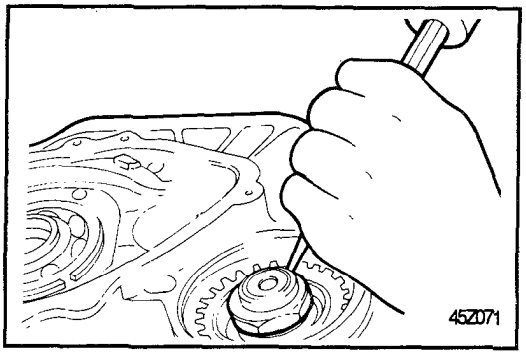


14. After installing the special tool (09453-21400), measure the end play of the transfer shaft; then select the spacer(s) needed to obtain the standard value, and refit.

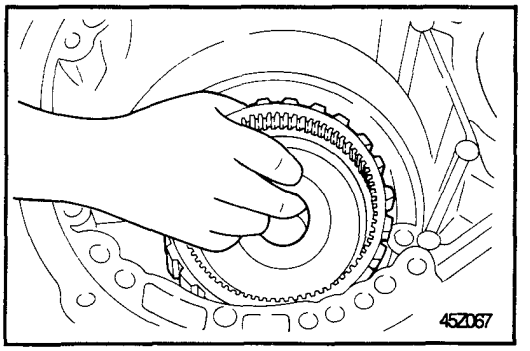
Transfer shaft end play: 0-0.025 mm (0-.0010 in.)



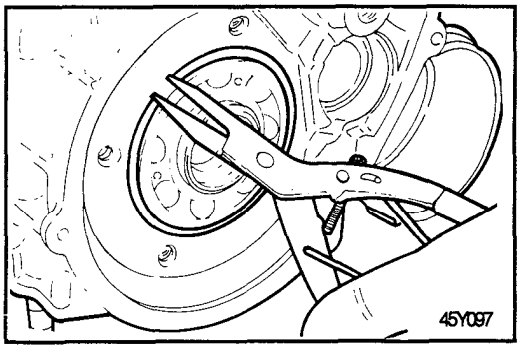
15. Using a punch, lock the lock nut to prevent rotation.
16. Attach the transfer cover.



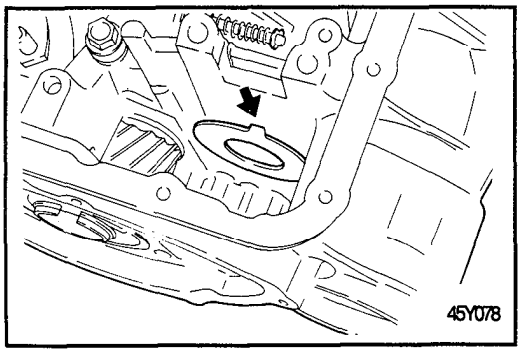
17. Insert the internal gear, output flange transfer drive gear and bearing assembly into the case.



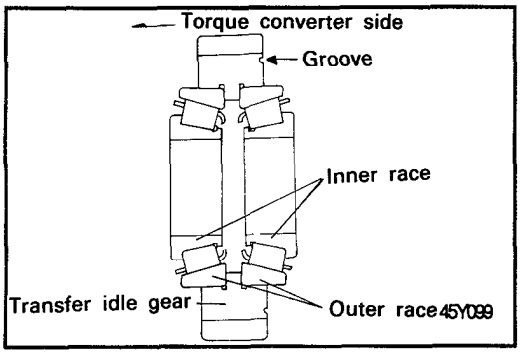
18. Install the snap ring on the output flange rear bearing.



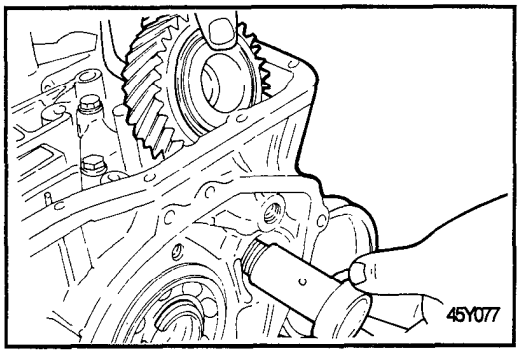
19. Coat petroleum jelly on the spacer and attach it to the transaxle case.



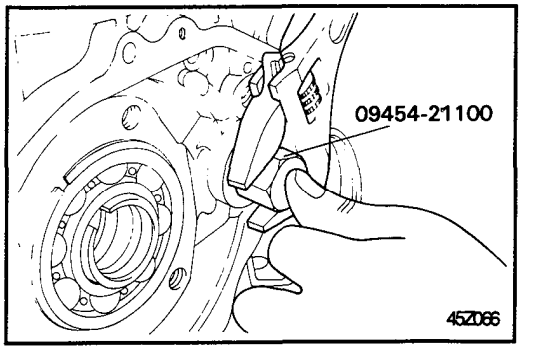
20. Install the two taper roller bearings and spacer onto the transfer idler gear.



21. Place the transfer idler gear (assembled in the preceding section) into the case, and then insert the idler shaft from the outer side of the case and screw it in.

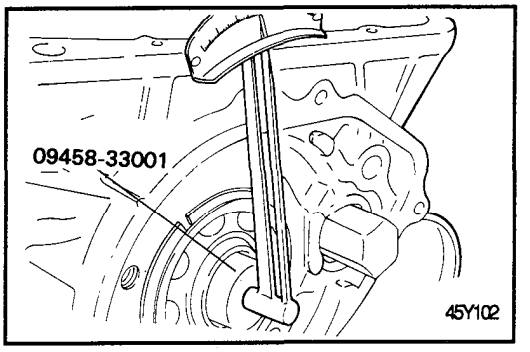


22. Tighten the idler shaft by using the special tool (09454-21100).



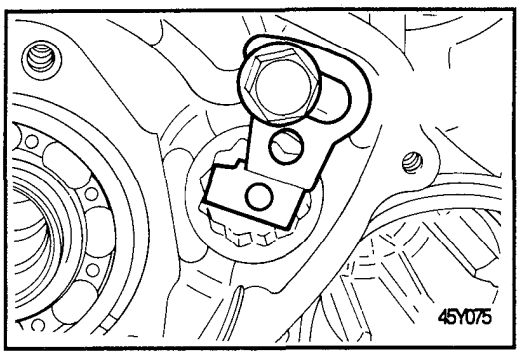
23. Insert the special tool (09458-33001) into the output flange and measure the preload using a torque wrench.
Adjust preload by tightening or loosening the transfer idler shaft.

Preload: 1.5 Nm (15 kg.cm, 1.0 lb.ft)



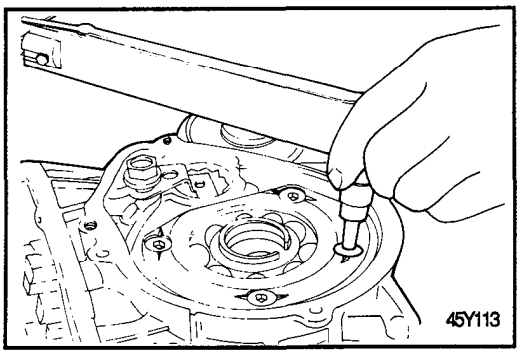
24. After the preload adjustment is completed, eliminate the back lash between the idler shaft and the lock plate by moving the idler shaft in the loosening direction. Attach the lock plate and tighten the lock plate bolt.

Lock plate bolt:
48-60 Nm (460-600 kg.cm, 35-43 lb.ft)

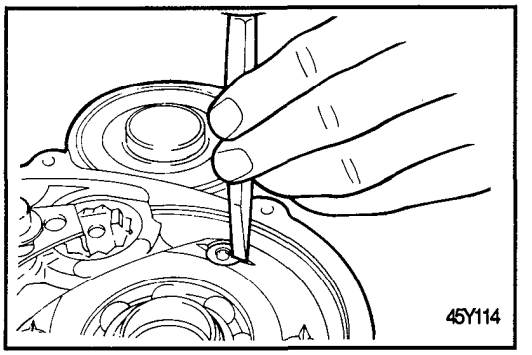


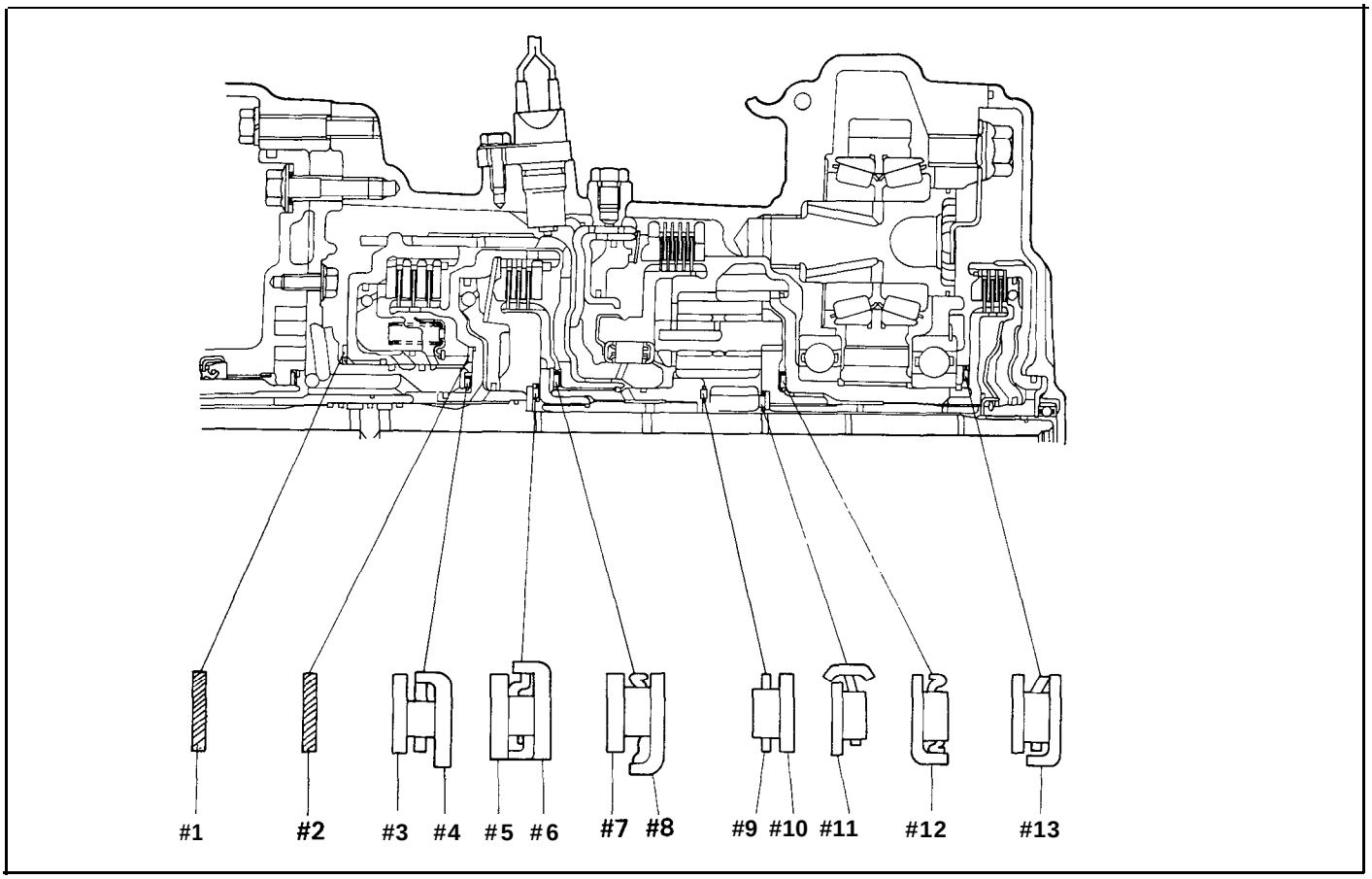
25. Install the bearing retainer. Tighten the screws to the specified torque. Apply a 5 mm (0.2 in.) width of sealant (3M Stud Locking No. 4176). Sealant should not stick out of screw head.

Screw: 17-22 Nm (170-220 kg.cm, 13-15 lb.ft)



26. Using a punch, lock the flush head screw to prevent rotation.



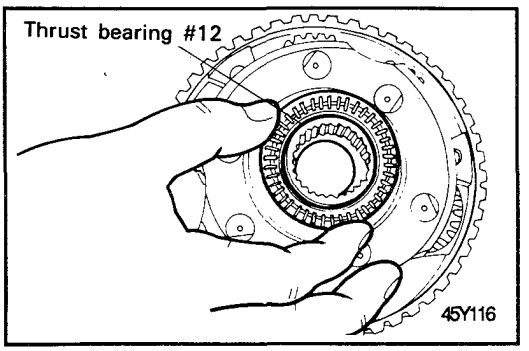


Identification of thrust bearings, thrust races and thrust washers

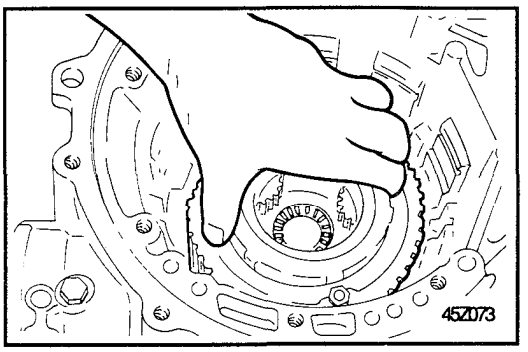
Unit: mm (in.)

Outer diameter	Inner diameter	Thickness	Code No.	Outer diameter	Inner diameter	Thickness	Code No.
70 (2.756)	55.7 (2.193)	1.4 (0.055)	#1	48.1 (1.894)	34.4 (1.354)	-	#4
70 (2.756)	55.7 (2.193)	1.8 (0.071)		40 (1.575)	21 (0.827)	2.4 (0.094)	#5
70 (2.756)	55.7 (2.193)	2.2 (0.087)		42.6 (1.677)	28 (1.102)	-	#6
70 (2.756)	55.7 (2.193)	2.6 (0.103)		54 (2.126)	38.7 (1.524)	1.6 (0.063)	#7
70 (2.756)	55.7 (2.193)	1.8 (0.071)	#2	52 (2.047)	36.4 (1.433)	-	#8
48.9 (1.925)	37 (1.457)	1.0 (0.040)	#3	41 (1.614)	28 (1.102)	-	#9
48.9 (1.925)	37 (1.457)	1.2 (0.047)		39 (1.535)	28 (1.102)	1.2 (0.047)	#10
48.9 (1.925)	37 (1.457)	1.4 (0.055)		38 (1.496)	22.2 (0.874)	-	#11
48.9 (1.925)	37 (1.457)	1.6 (0.063)		52 (2.047)	36.4 (1.433)	-	#12
48.9 (1.925)	37 (1.457)	1.8 (0.071)		58 (2.283)	44 (1.732)	-	#13
48.9 (1.925)	37 (1.457)	2.0 (0.079)					
48.9 (1.925)	37 (1.457)	2.2 (0.087)					
48.9 (1.925)	37 (1.457)	2.4 (0.094)					

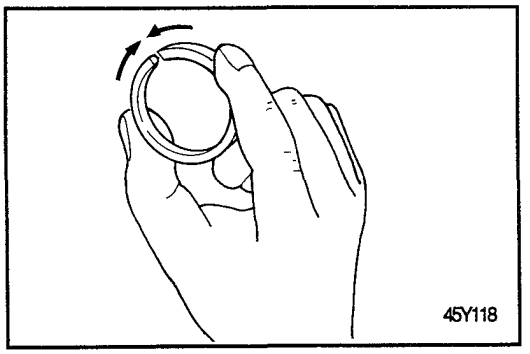
27. Apply a coating of petroleum jelly to thrust bearing #12 and attach to the planetary carrier.



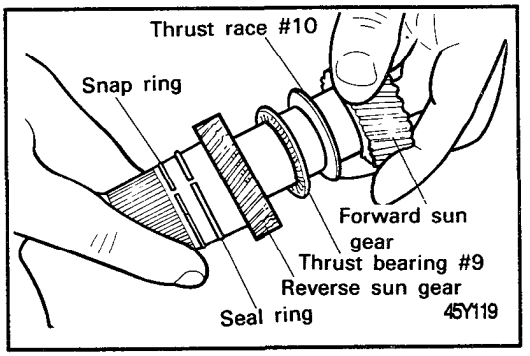
28. Install the planetary carrier to the case.



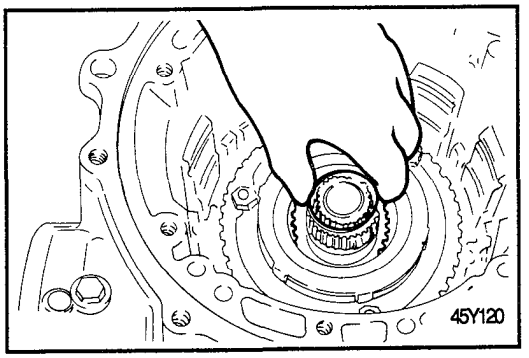
29. Assemble the reverse sun gear and the forward sun gear in the following order:
    1) Attach the seal ring and the snap ring to the reverse sun gear. When attaching, squeeze the seal ring as shown in the figure.
    2) Attach thrust bearing #9 to the forward sun gear.
    3) Attach thrust race #10 to the forward sun gear.



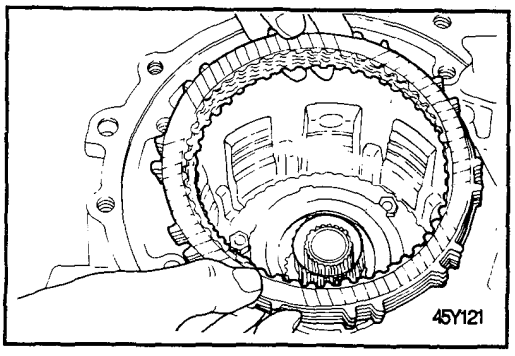
    4) Assemble the reverse sun gear, and then the forward sun gear.



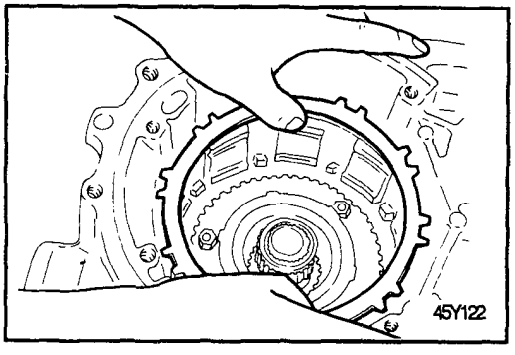
30. Install both of the previously assembled sun gears inside the planetary carrier.



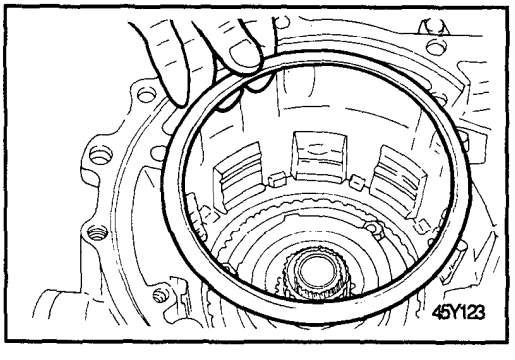
31. Install the brake disc and brake plate.



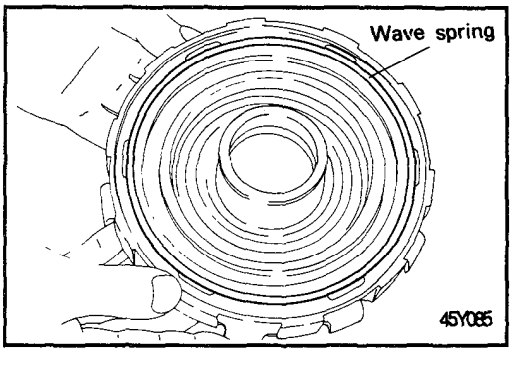
32. Install the selected brake pressure plate.



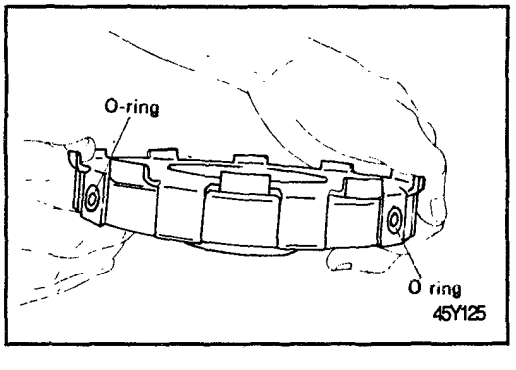
33. Install the return spring.



34. Apply a coating of petroleum jelly to the wave spring and attach it to the center support.

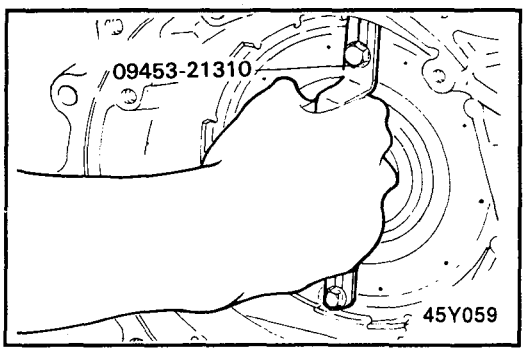


35. Install the two new O-rings to the center support.



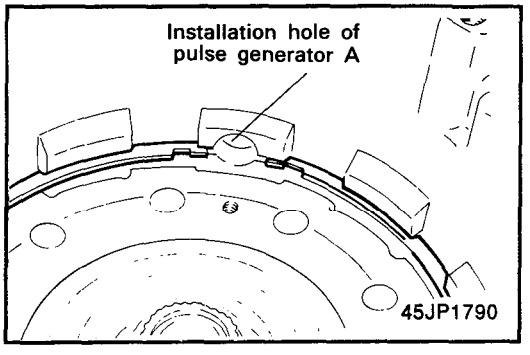
36. After applying a coating of ATF to the O-rings, install the special tool (09453-21310) to the center support, and install into the case.

Caution:
Be sure that the wave spring is not out of position.

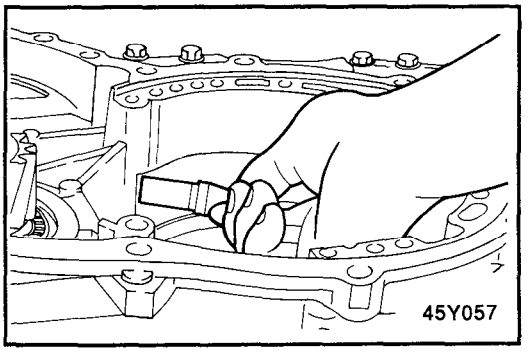


37. Install the snap ring.

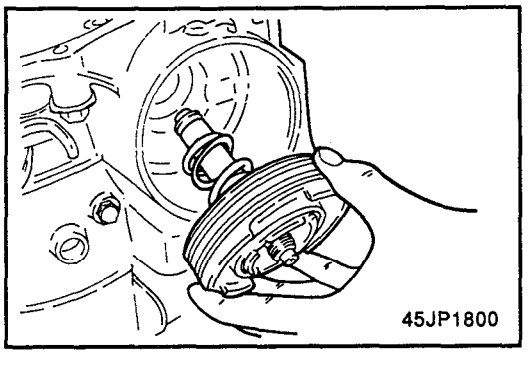
Caution:
The mating hole of the snap ring must be aligned with the installation hole of pulse generator A.



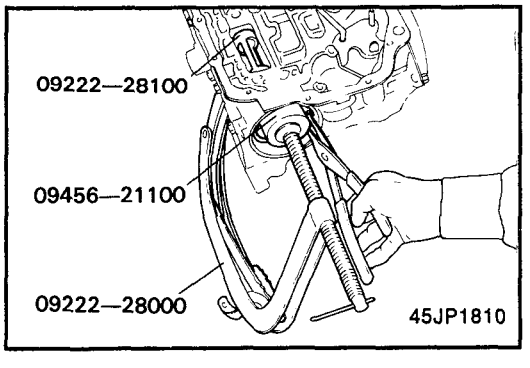
38. Install the anchor rod.



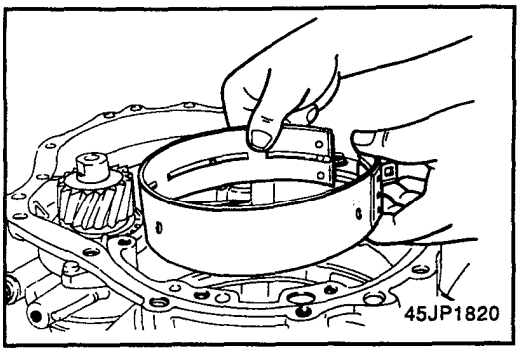
39. Assemble a new seal ring (large diameter) and D-ring (small diameter) to the kickdown servo piston, and install a new O-ring in the groove around the sleeve; then assemble the kickdown servo spring, piston and sleeve in the transaxle case.



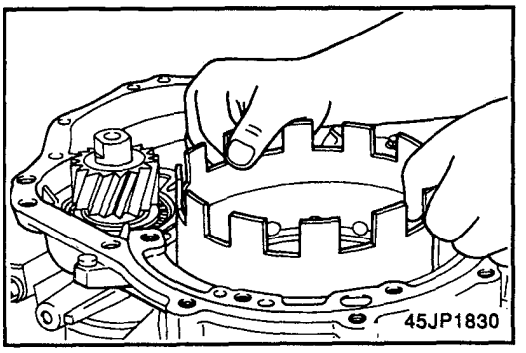
40. Press the kickdown servo and sleeve in by using the valve spring compressor and special tools (09456-21100,09222-28000,09222-28100), install the snap ring.



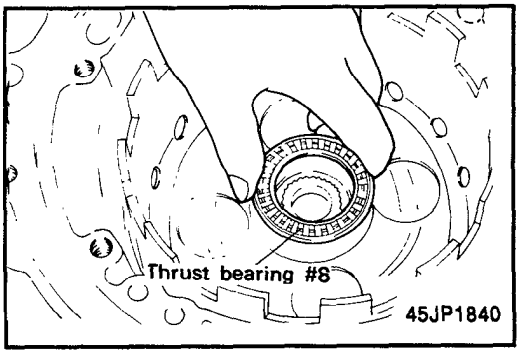
41. Install the kickdown band; attach the ends of band to the end of the anchor rod and servo piston rod.



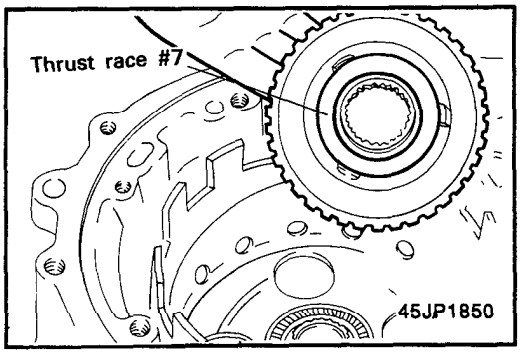
42. Install kickdown drum with its splines in mesh with the sun gear. Place the kickdown band on the kickdown drum and tighten the kickdown servo adjusting screw to keep the band in position.



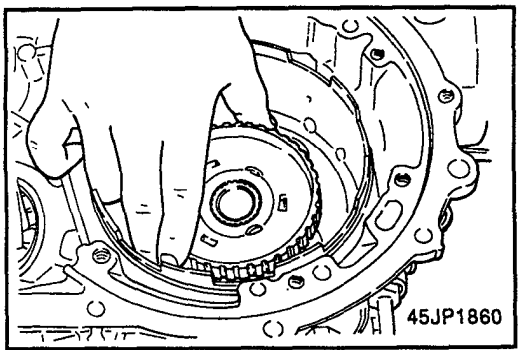
43. Apply a coating of petroleum jelly to thrust bearing #8, and then attach to the kickdown drum.



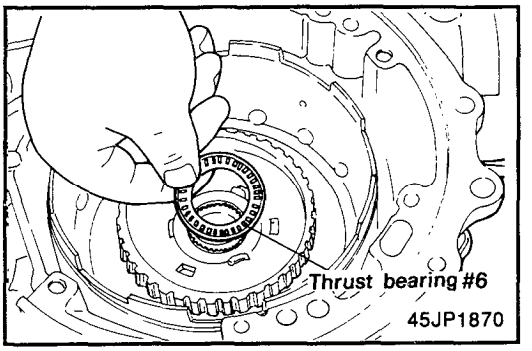
44. Apply a coating of petroleum jelly to thrust race #7, and then attach to the rear clutch hub.



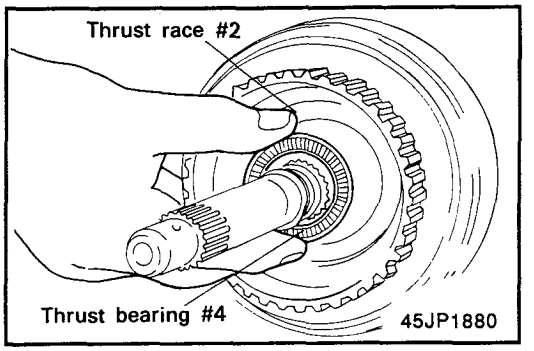
45. Install the clutch hub to the sun gear splines.



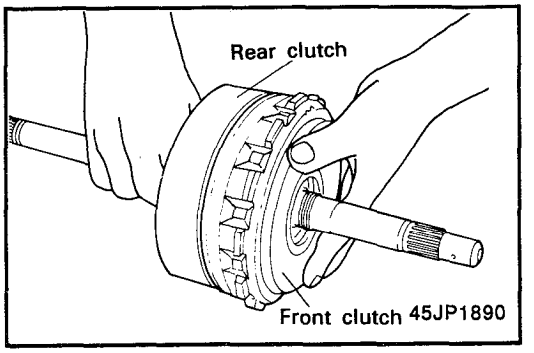
46. Attach thrust bearing #6 onto the hub using petroleum jelly.



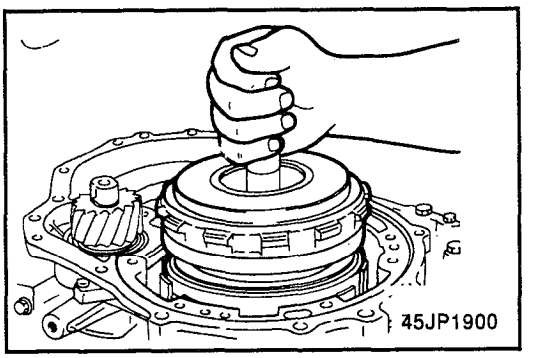
47. Apply a coating of petroleum jelly to thrust race #2 and thrust bearing #4. Attach to the rear clutch assembly.



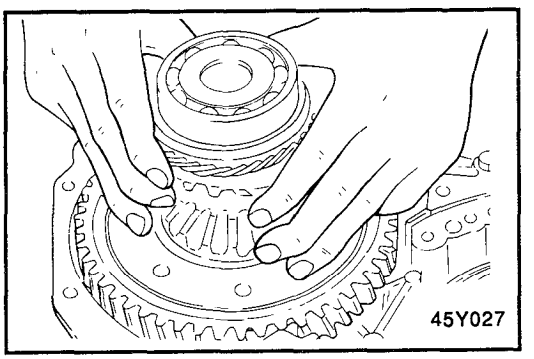
46. Combine the rear clutch and the front clutch assemblies.



49. Install the clutch assembly.



50. Install the differential assembly.



51. If end play which was measured and recorded at disassembly is not within standard value, adjust to specification by selecting thrust race #3.

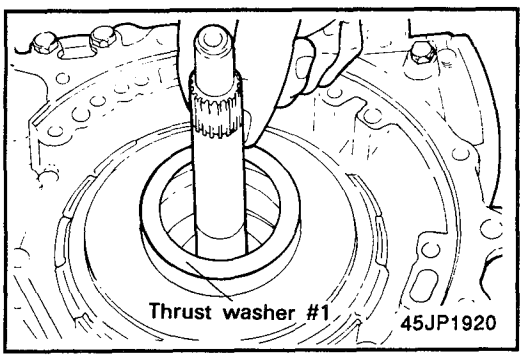
Standard value: 0.3-1.0 mm (0.012-0.040 in.)

When the thrust race is replaced with that of a different thickness, also replace thrust washer #1 located between the oil pump and front clutch. Use a washer of proper corresponding thickness corresponding to thrust race.
Find correct pair of thrust races (metal) and thrust washers (fiber) from following table.

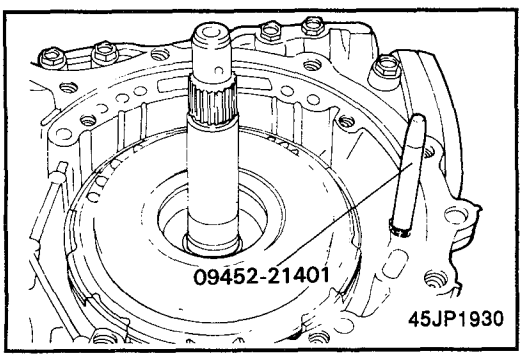
Thrust washer #1 (fiber)	Thrust race #3 (metal)
Thickness mm (in.)	Thickness mm (in.)
1.4 (0.055)	1.0 (0.039)
1.4 (0.055)	1.2 (0.047)
1.8 (0.071)	1.4 (0.055)
1.8 (0.071)	1.6 (0.063)
2.2 (0.087)	1.8 (0.071)
2.2 (0.087)	2.0 (0.079)
2.6 (0.102)	2.2 (0.087)
2.6 (0.102)	2.4 (0.095)

Note:
When a different thickness thick thrust race is selected, a corresponding thrust washer must be paired with it.

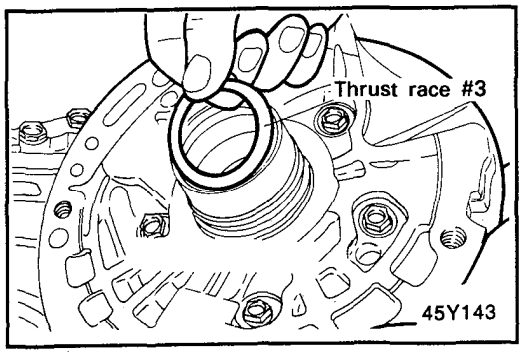
52. Attach the reused thrust washer #1, or the one selected in step 51, to the front clutch by using petroleum jelly.



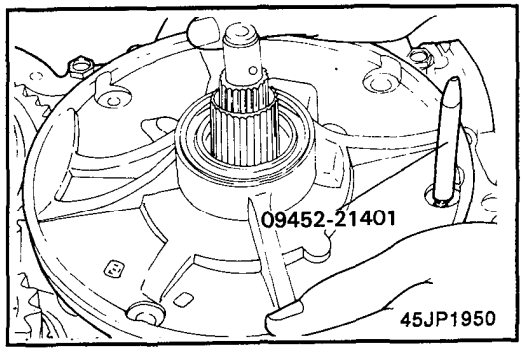
53. Install the special tool (09452-21401) to the case.



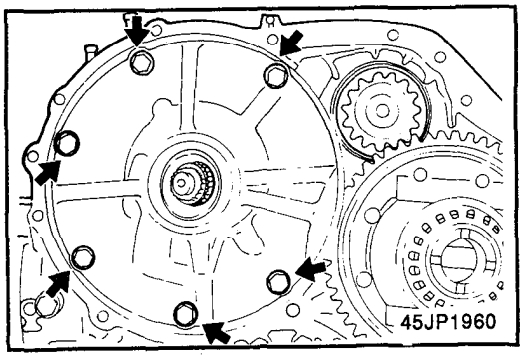
54. Attach the reused thrust race #3 or the one selected in step 51, to the oil pump by using petroleum jelly.



55. Install a new oil pump gasket and the oil pump assembly.

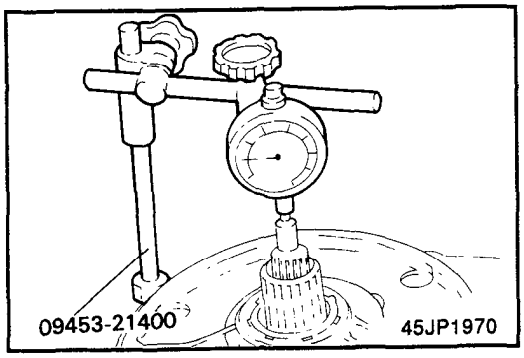


56. Install a new O-ring in the groove of the oil pump housing and lightly apply automatic transaxle fluid to the outside surface of the O-ring.
57. install the oil pump assembly by tightening the six bolts evenly. When installing this oil pump assembly, be careful that the thrust washer remains in place.

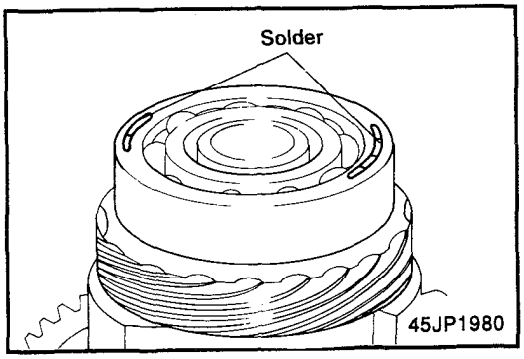


58. Check the input shaft end play. Readjust if necessary (see step 51).

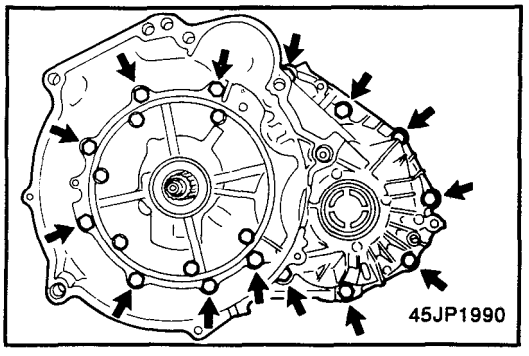
Standard value: 0.3-1.0 mm (0.012-0.040 in.)



59. Apply solder [10 mm (0.40 in.) in length and 3 mm (0.118 in.) in diameter] to the locations shown in the illustration.

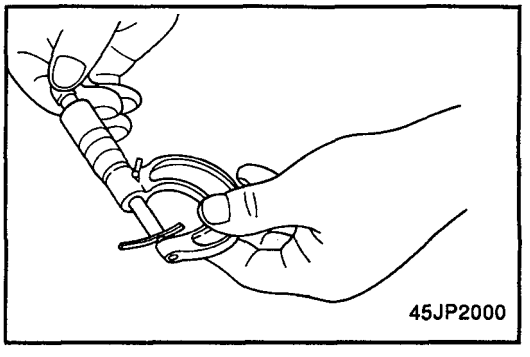


60. Install a new case gasket to the transaxle case.
61. Install the converter housing and tightening the 14 bolts to 19-**23** Nm (190-230 kg.cm, 14-16 lb.ft).

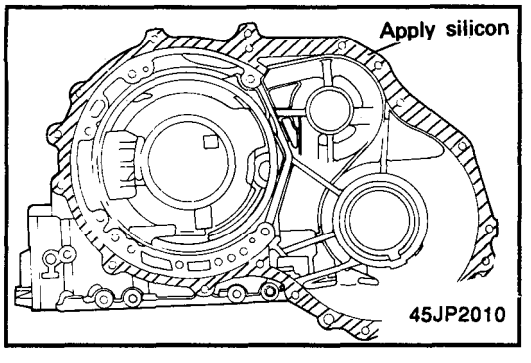


62. Remove the converter housing and gasket.
63. Remove the crushed solder from the outer race of the differential bearing.
64. Measure the thickness of the crushed solder using an outside micrometer and select and install a spacer that produces a standard preload.

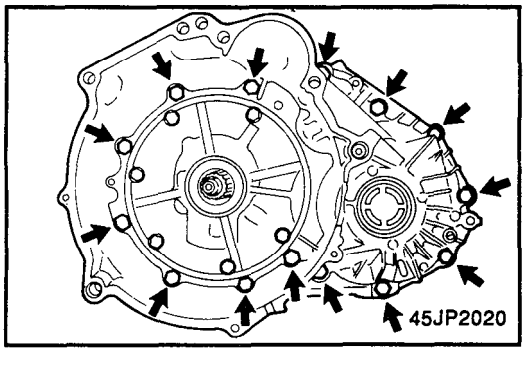
Standard value: 0.080-0.130 mm (0.003-0.005 in.)



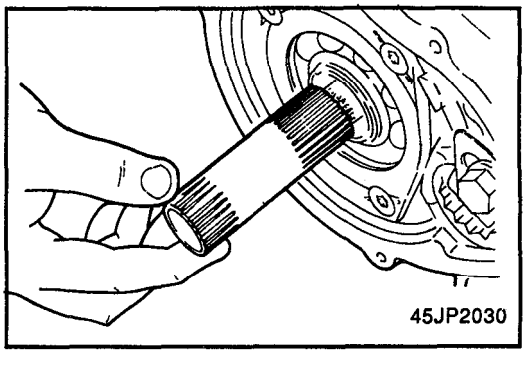
65. Apply silicone to the mating surface hatched area of the transaxle case.
66. Install a new case gasket on the transaxle case.



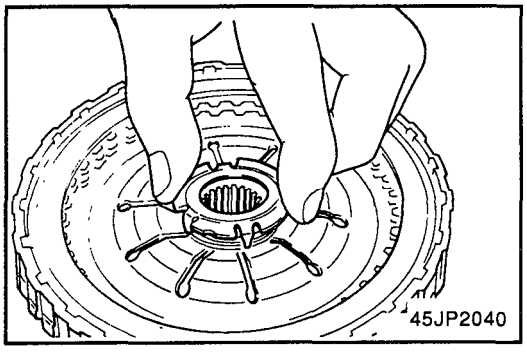
67. Install the converter housing and tighten the 14 bolts to 19-23 Nm (190-230 kg.cm, 14-16 lb.ft)



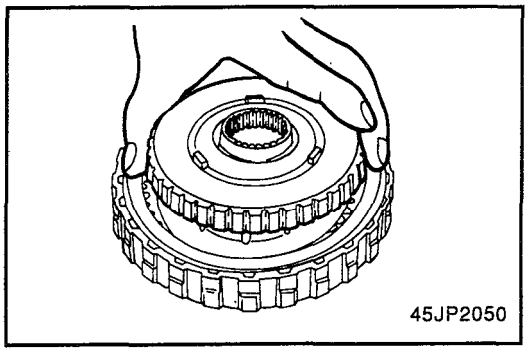
66. Install the end clutch shaft. Be sure to install the longer spline toward the front as shown.



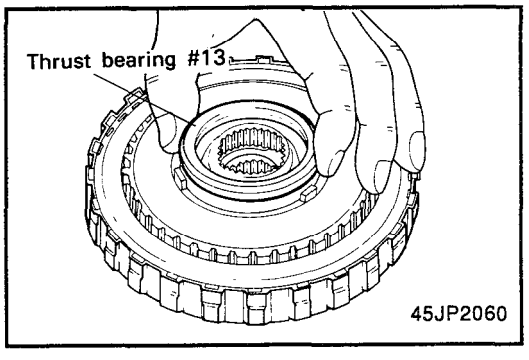
69. Fit the thrust washer toward the return spring at the end clutch side.



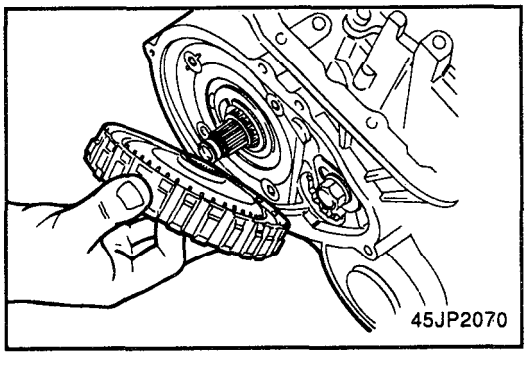
70. Install the end clutch hub to end clutch.



71. Attach, using petroleum jelly, thrust bearing #13 to the end clutch hub.

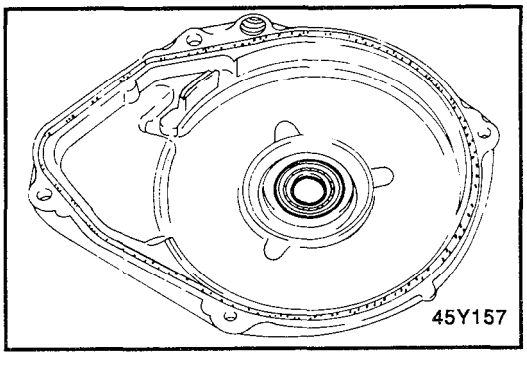


72. Install end clutch assembly.



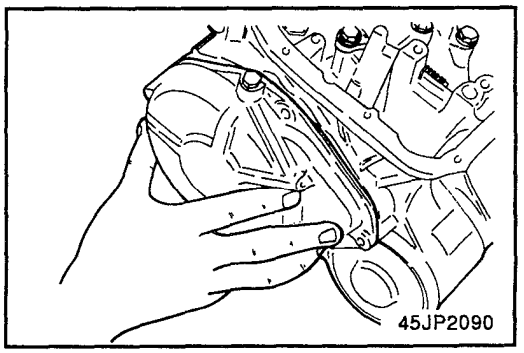
73. Attach a new O-ring and D-ring to the end clutch cover.

NOTE :
Install so that the D-ring is not twisted.
Apply a sufficient amount of automatic transaxle fluid to the bearing.

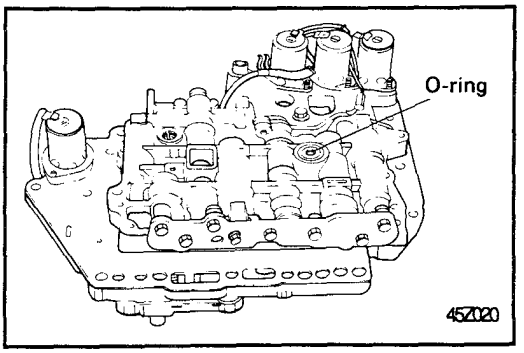


74. Attach the end cover and fasten it with four bolts.

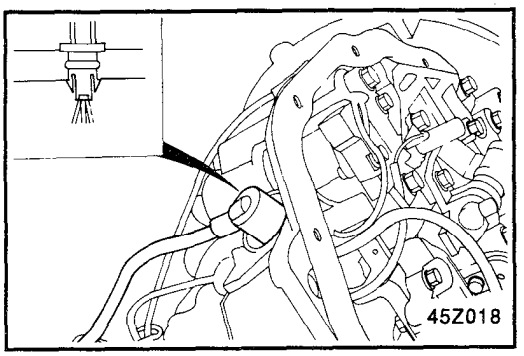
NOTE :
When installing the end cover, be sure the screw hole is correctly aligned. If the end cover is turned (after it is installed) in order to align with the screw hole, the O-ring and/or the D-ring may be twisted as a result.



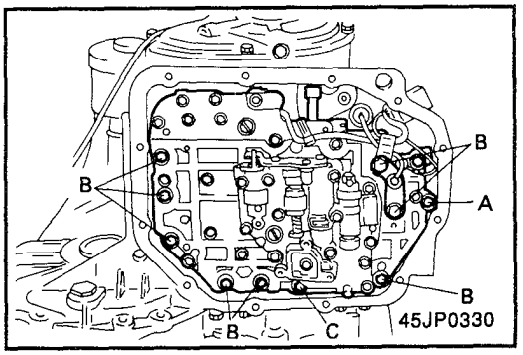
75. Install the O-ring at the center of the top of the valve body assembly (brake oil pressure passage).
76. Install the valve body assembly to the case, fitting the detent plate (manual control shaft) pin in the slot of the manual valve.



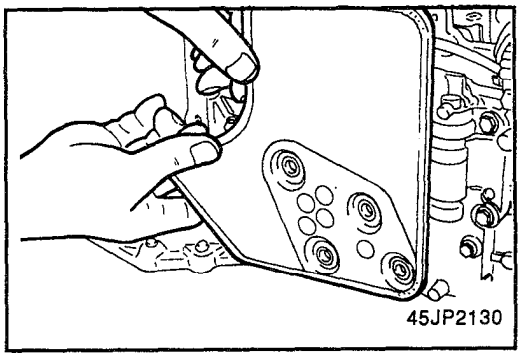
77. Replace the O-ring of the solenoid valve connector with a new one.
78. Insert the solenoid valve connector into the case. Be sure that the notched part of the connector faces as shown in the illustration.



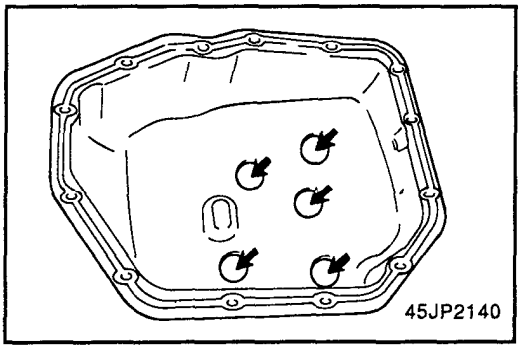
79. Install the oil-temperature sensor, and then tighten the ten(10) valve body assembly mounting bolts to 10-12 Nm (100-120 kg.cm, 7-9 lb.ft)
A : 18 mm (0.709 in.) long
B : 25 mm (0.984 in.) long
C : 40 mm (1.575 in.) long



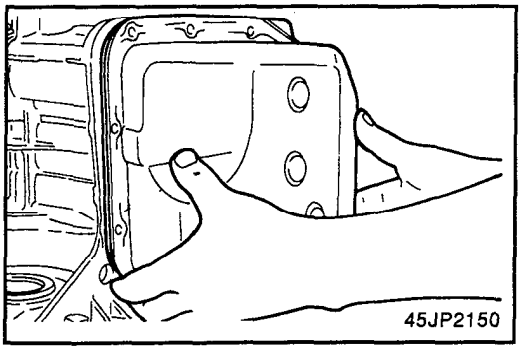
80. Install the oil filter. Tighten the four oil filter mounting bolts to 5-7 Nm (50-70 kg.cm, 4-5 lb.ft)



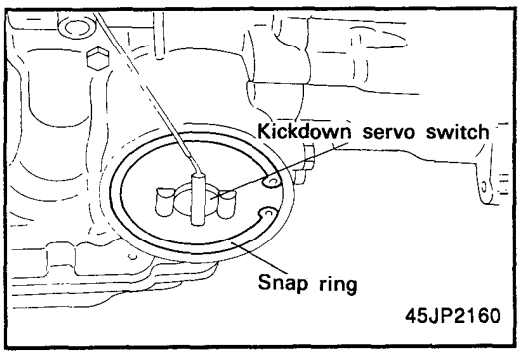
81. Install five magnets into the five depressions provided in the oil pan.



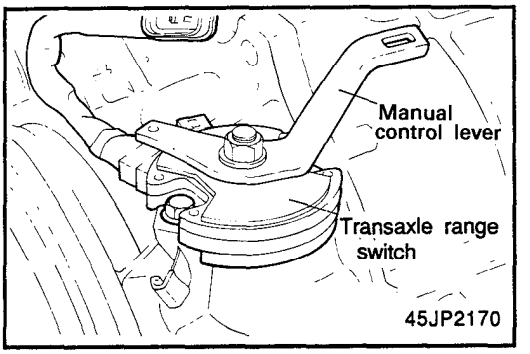
82. Install a new oil pan gasket and oil pan. Tightening 12 bolts to 10-12 Nm (100-120 kg-cm, 7-9 Ib.ft).



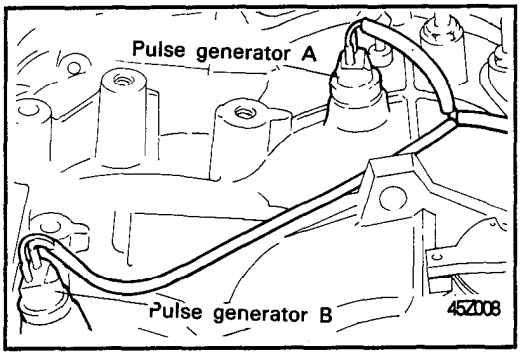
83. Install a new D-ring to the kickdown servo switch. Press into the case and secure using the proper snap ring.



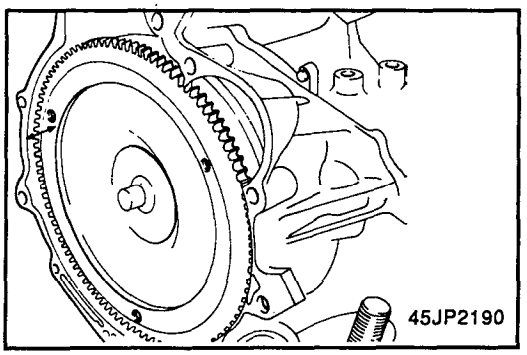
84. Install the inhibitor switch and manual lever. Adjust the inhibitor switch.



85. Install the pulse generator A and B.

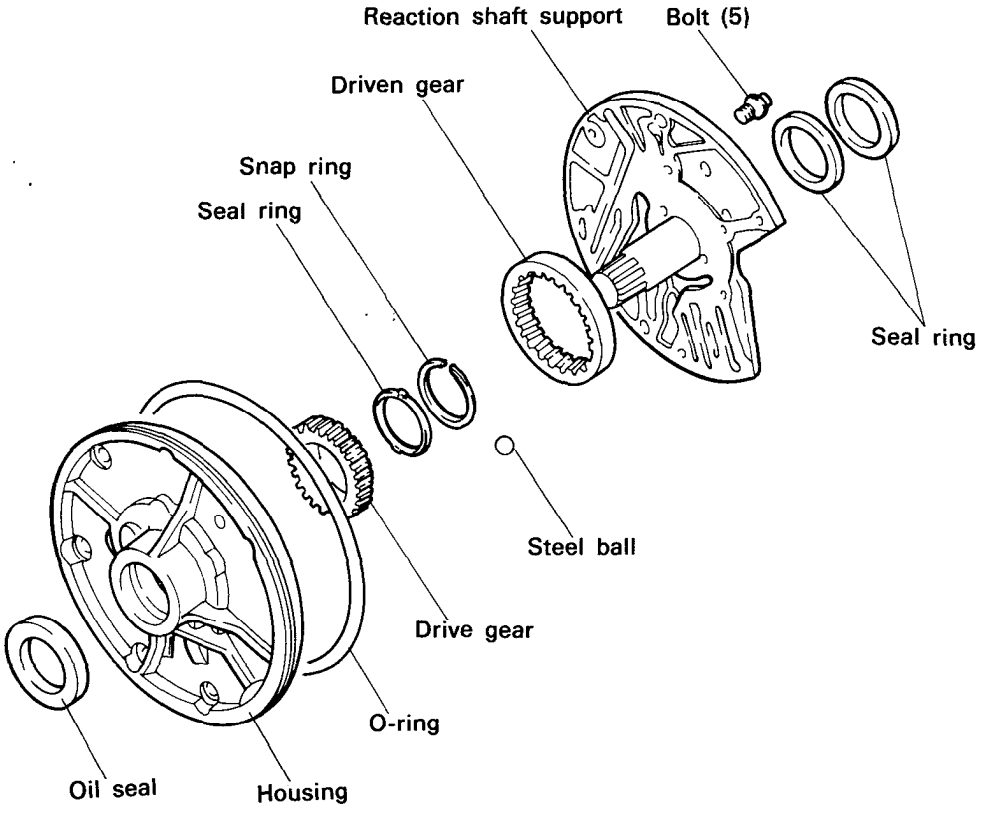


86. After applying automatic transaxle fluid to the outside surface of the oil pump-side cylindrical portion of the torque converter, install the torque converter carefully so as not to damage the seal lip. Make certain that the torque converter is in mesh with oil pump drive gear.
    Measure the distance between the ring gear end and the converter housing end. The torque converter has been properly installed when measurement is approximately 12 mm (0.47 in.).



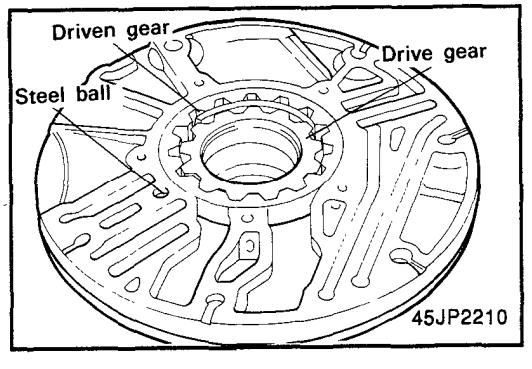
OIL PUMP ASSEMBLY

COMPONENTS

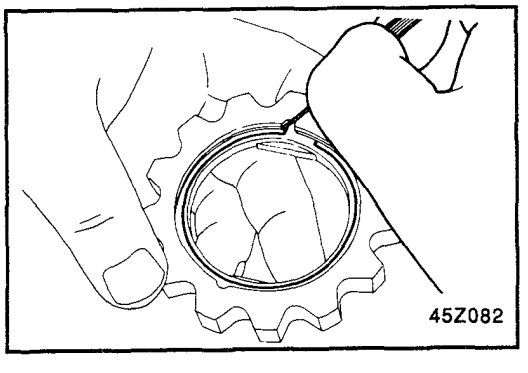


DISASSEMBLY

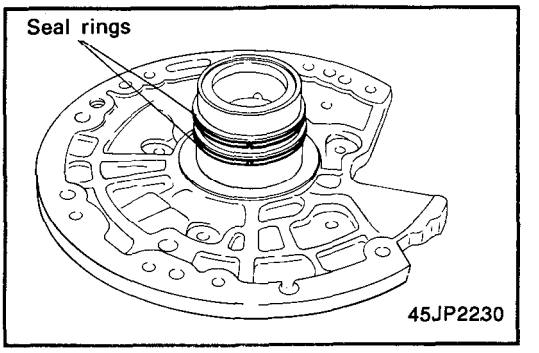
1. Remove the O-ring from oil pump housing.
2. Remove the five bolts and reaction shaft support from the housing.
3. Remove the oil **pump** drive and driven gears from the pump housing.
4. Make reassembly alignment marks on the drive and driven gears.
5. Remove the steel ball from the housing.



6. Remove the snap ring and oil seal from the oil pump drive gear.



7. Remove the two seal rings from the reaction shaft support.

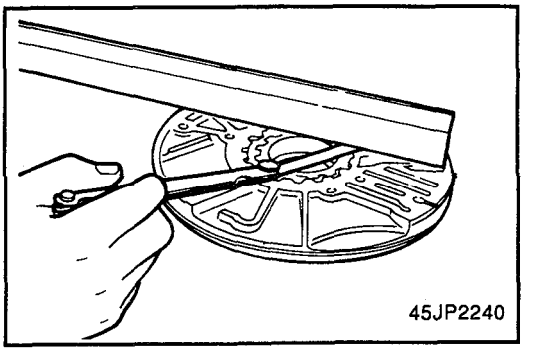


INSPECTION

1. Measure the side clearance of the oil pump gear. If the clearance exceeds the standard value, or if an inspection of the surface area (of the oil pump housing) that contacts the oil pump gear reveals indications of interference, replace the entire oil pump assembly.

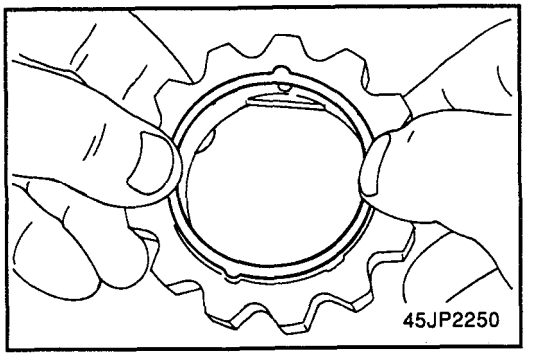
   Standard value: 0.03-0.05 mm (0.0012-0.0020 in.)

2. Check the surface of the reaction shaft support that contacts the oil pump gear. If there are indications of interference, replace the entire oil pump assembly.

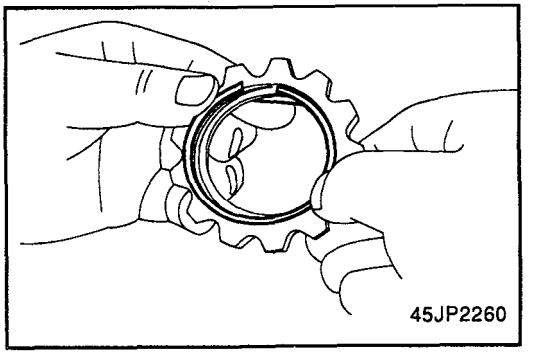


ASSEMBLY

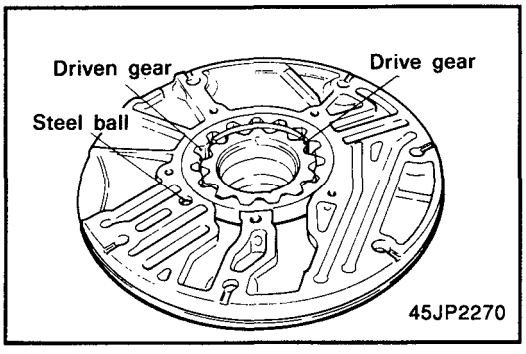
1. Install the oil seal to the oil pump drive gear.



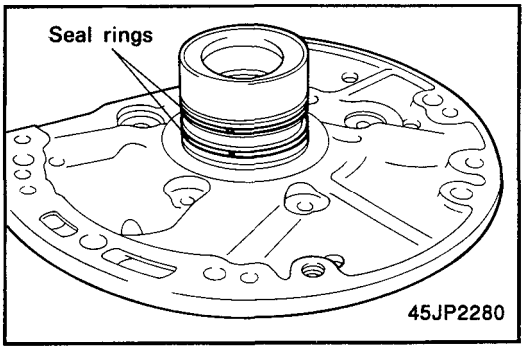
2. Install the snap ring.



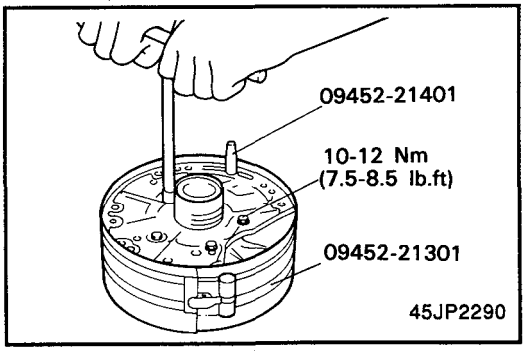
3. After immersing the drive and driven gears in automatic transaxle fluid, install them into pump housing. When reusing gears, install with mating marks properly aligned.
4. Fit a new O-ring into the groove at the inner circumference of the drive gear.
5. Install the steel ball in the hole as shown in the illustration.



6. Install the two seal rings, coated with automatic transaxle fluid, to the reaction shaft support.

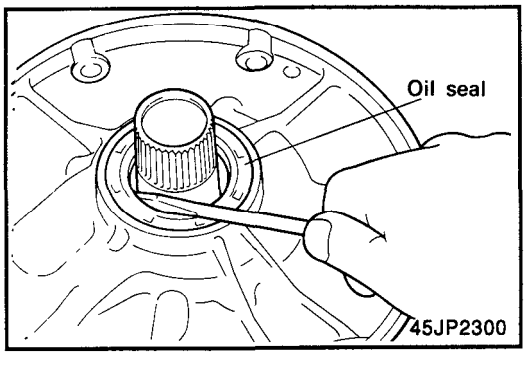


7. Make sure that oil pump gear turns freely.
8. Install a new O-ring in the groove provided in the circumference of the pump housing and apply petroleum jelly to the circumference of the O-ring.
9. Loosely install the reaction shaft support on the pump housing. Tighten the five bolts fingertight.
10. With the reaction shaft support properly positioned on the pump housing, using special tools (09452-21401, 09452-21301) tighten the five bolts to 10-12 Nm (100-120 kg.cm, 7.5-8.5 lbft).

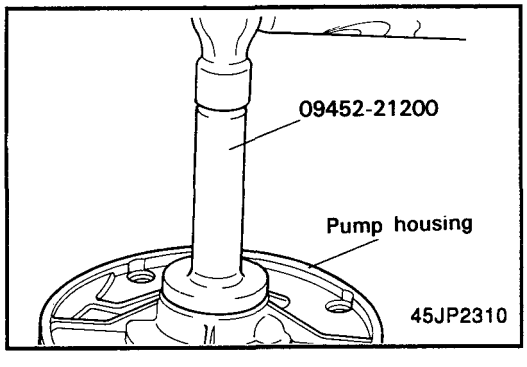


OIL SEAL REPLACEMENT

1. Pry off the pump housing oil seal using a screwdriver.

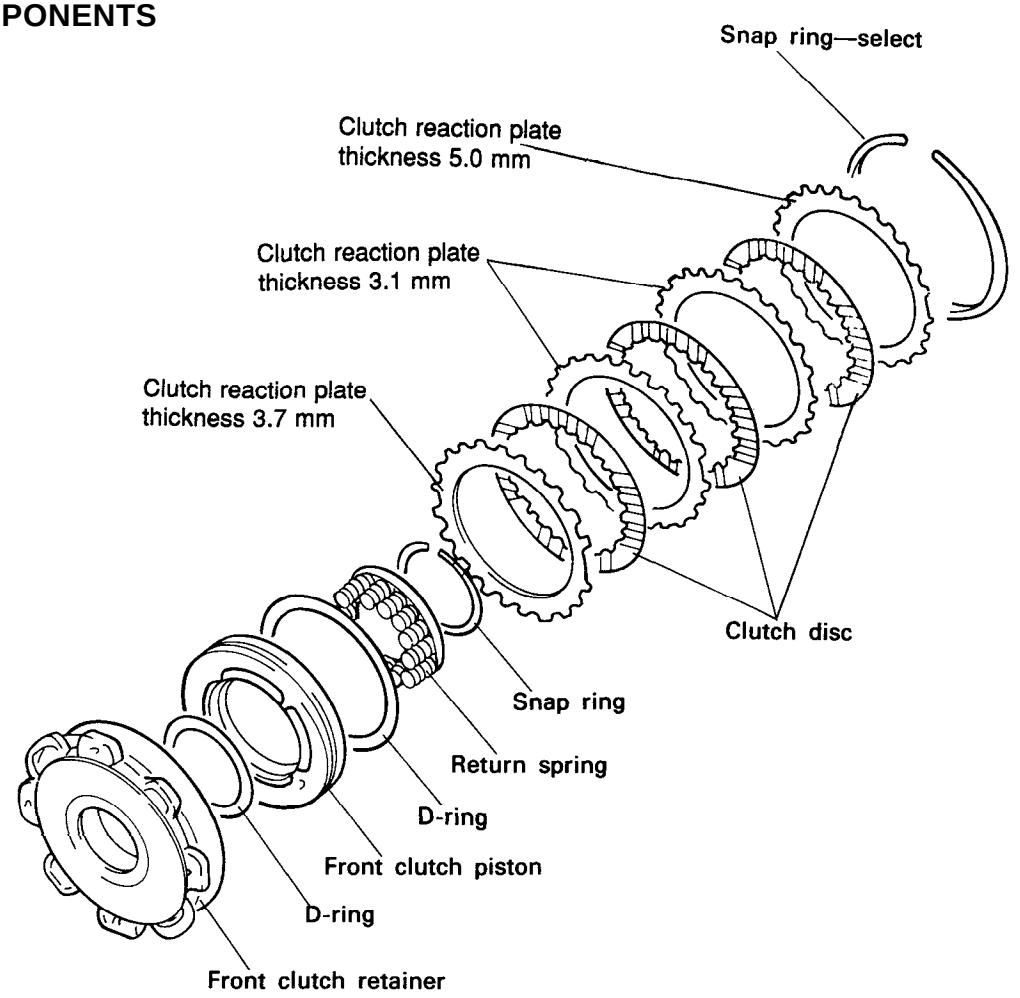


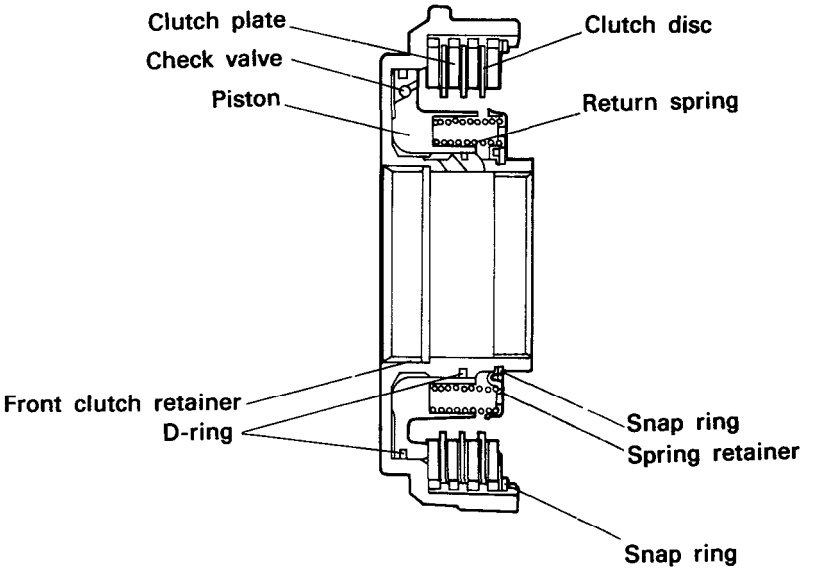
2 Using the special tool (09452-21200), install the oil seal to the pump housing. Apply a thin coat of automatic transaxle fluid to the lip of the oil seal before installation.



FRONT CLUTCH ASSEMBLY

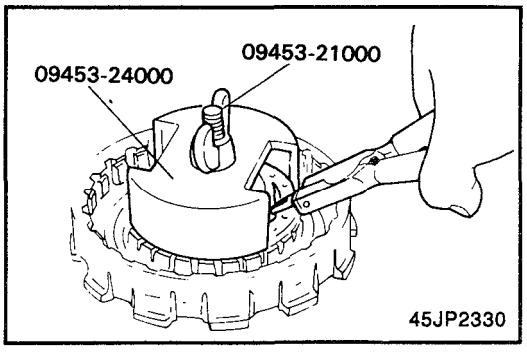
COMPONENTS





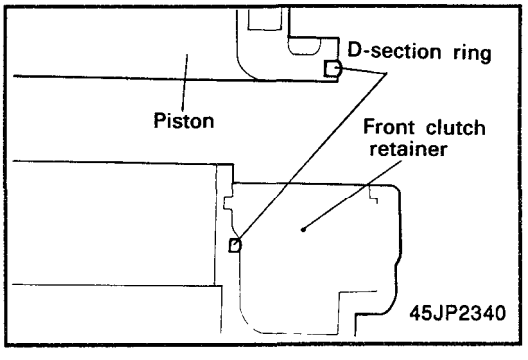
DISASSEMBLY

1. Remove the snap ring from the clutch retainer.
2. Take out the three clutch reaction plates and two clutch discs. If the clutch reaction plates and the clutch discs are to be reused, be sure not to change the installation order or direction.
3. With return spring compressed with the special tool (09453-21000, 09453-24000), Spring Compressor, remove snap ring, then spring retainer and return spring.
4. Remove the piston from the retainer.
5. Remove the D-section rings from the inner and outer circumferences of the piston.

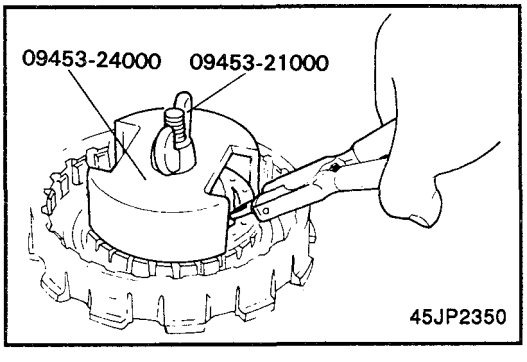


ASSEMBLY

1. Install the D-section ring in the groove on the outside surface of the piston with its round side out. Install another D-section ring to the front clutch retainer.
2. Apply automatic transaxle fluid to the outside surface of the D-section rings. Then push the piston into front clutch retainer by hand.

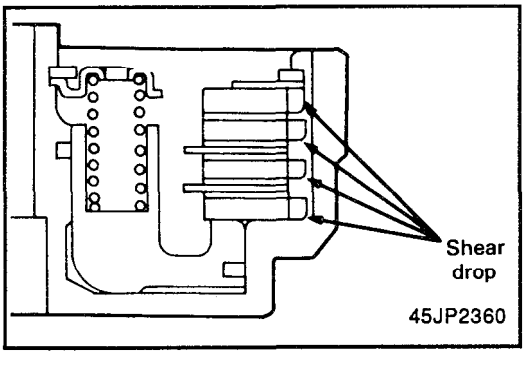


3. Install the return spring and spring retainer.
4. Compress the return spring with the special tool (09453-21000, 09453-24000) and install the snap ring.

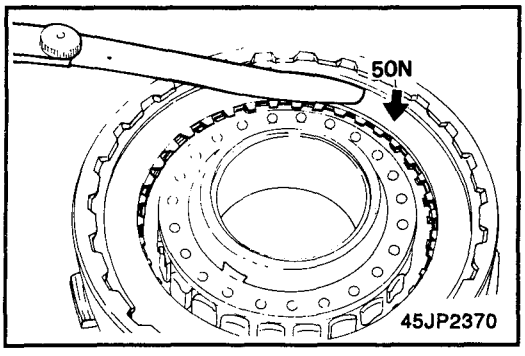


5. Install the three clutch reaction plates and two clutch discs. Prior to installation, apply automatic transaxle fluid to them.

NOTE:
When new clutch discs are used, they should be immersed in automatic transaxle fluid a minimum of two hours prior to installation.

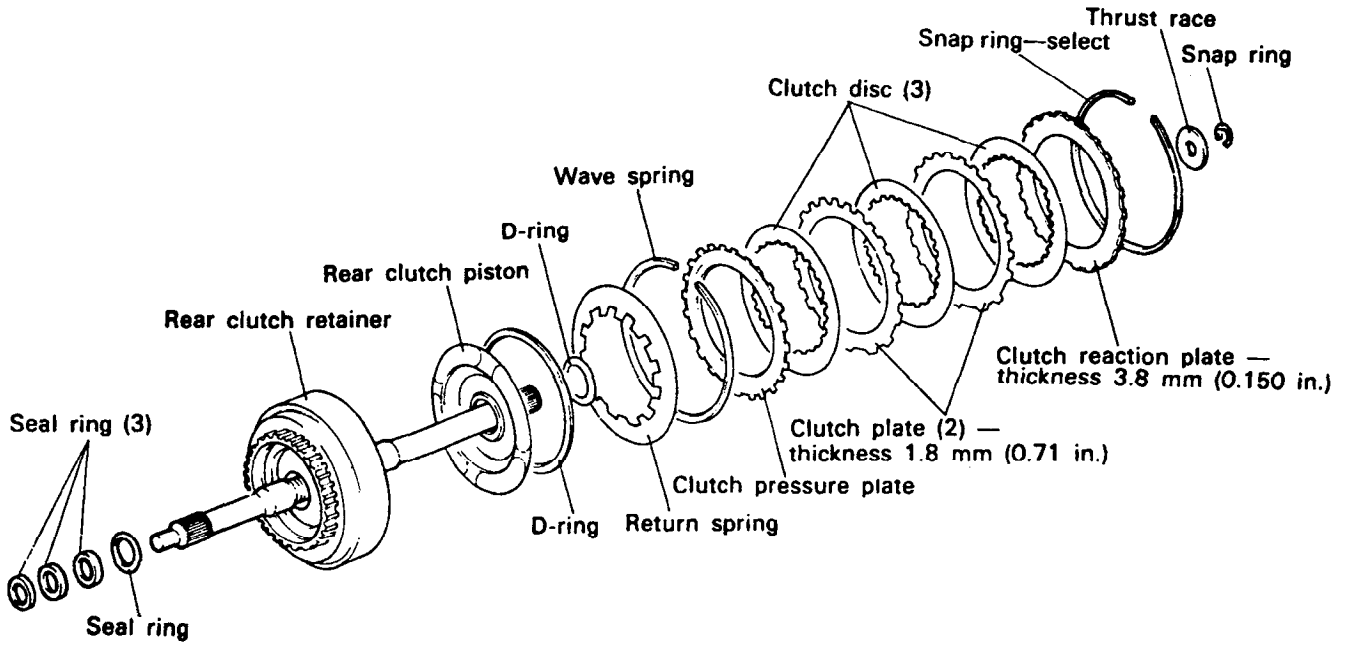


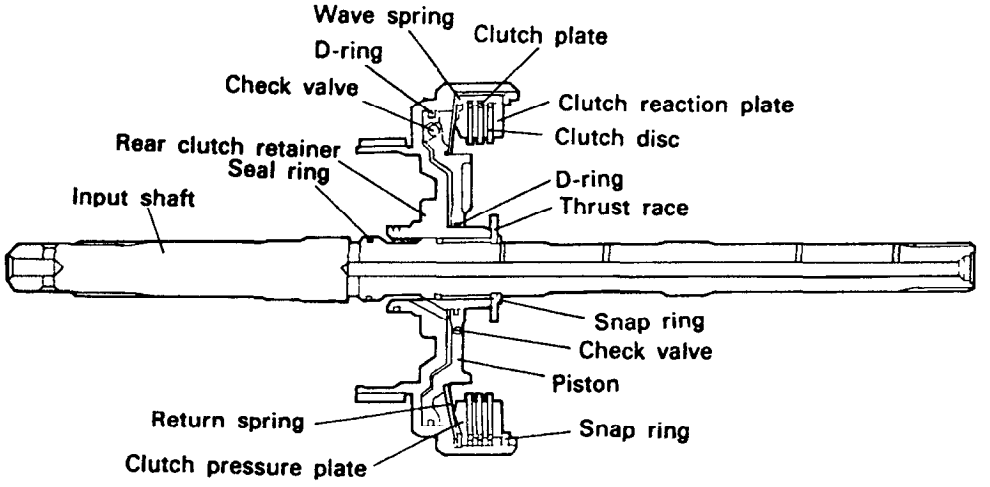
6. After installing the snap ring, check to see if there is a 0.4-0.6 mm (0.0157-0.0236 in.) clearance between the snap ring and the clutch reaction plate.
   To check clearance, hold the entire circumference of the clutch reaction plate down with 50 N (11 lb.) force. If clearance is out of specification, adjust the clearance by selecting the proper snap ring.



REAR CLUTCH ASSEMBLY

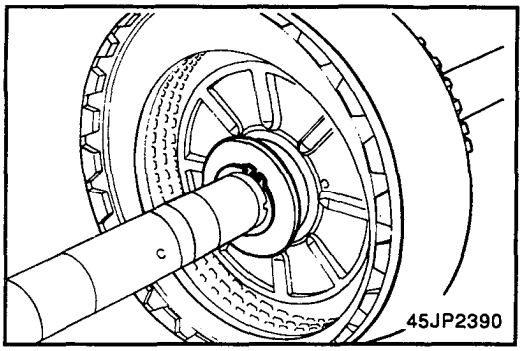
COMPONENTS



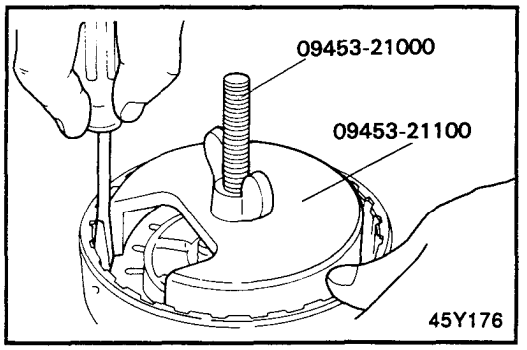


DISASSEMBLY

1. Remove the snap ring and thrust race.
2. Remove the input shaft from the rear clutch retainer.
3. Remove the snap ring from the clutch retainer.
4. Remove the clutch reaction plate, one clutch plates, two clutch discs and clutch pressure plate from the retainer.

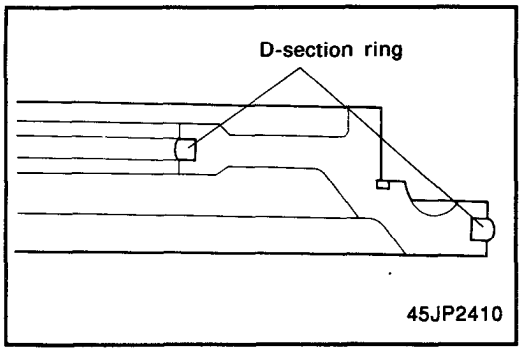


5. Compress the return spring by using the spring compressor.
6. Using a screwdriver, remove the wave spring.
7. Remove the return spring and piston.
8. Remove the two D-section rings from the piston.



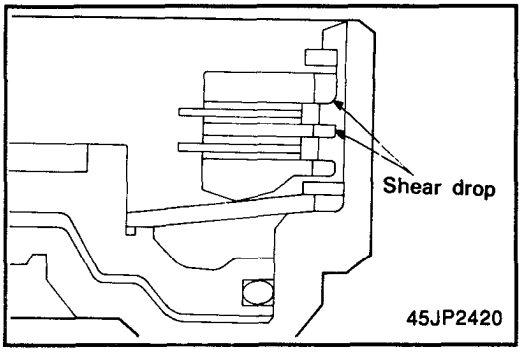
ASSEMBLY

1. Install the D-section rings in the grooves in the outside and inside surfaces of the piston.
2. After applying automatic transaxle fluid to the outside surface of the D-section rings, push the piston into the rear clutch retainer by hand.
3. Install the return spring on the piston.
4. Compress the return spring with the snap ring, by pushing down with a screwdriver and setting the snap ring in its groove.

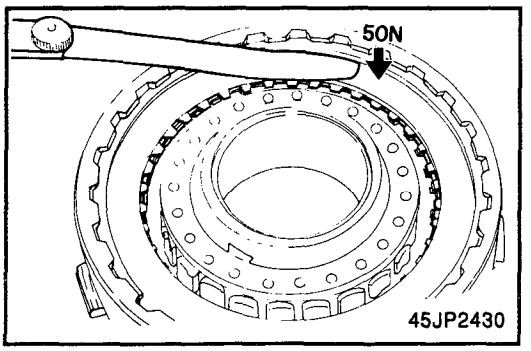


5. Install clutch pressure plate, two clutch discs, clutch plate and clutch reaction plate into the rear clutch retainer.
   When the reaction plate, clutch plate and clutch disc are removed, reinstall them by reversing the order of disassembly. Prior to installing, apply automatic transaxle fluid to the plates and discs.

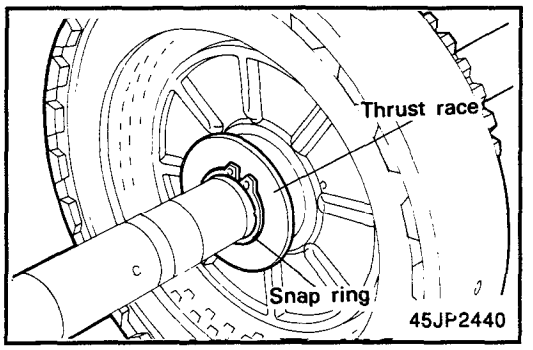
   NOTE :
   When new clutch discs are used, immerse them in automatic transaxle fluid for a minimum of two hours prior to installation



6. Install the snap ring. Check to see that the clearance between the snap ring and clutch reaction plate is 0.3-0.5 mm (0.012-0.020 in.). To check clearance, hold the entire circumference of the clutch reaction plate down with 50N (11 lbs.) force. If clearance is out of specification, adjust by selecting the proper snap ring. Snap rings are the same as those used for the front clutch.
7. Insert the input shaft into the clutch retainer.

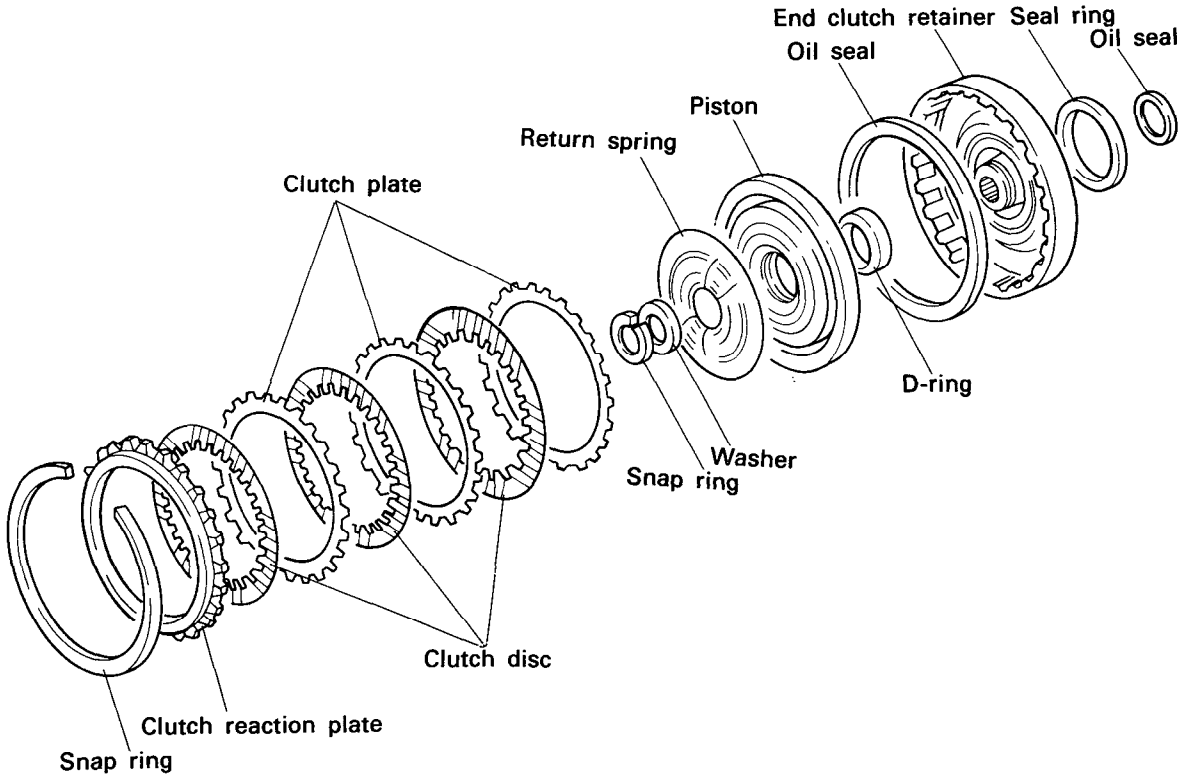


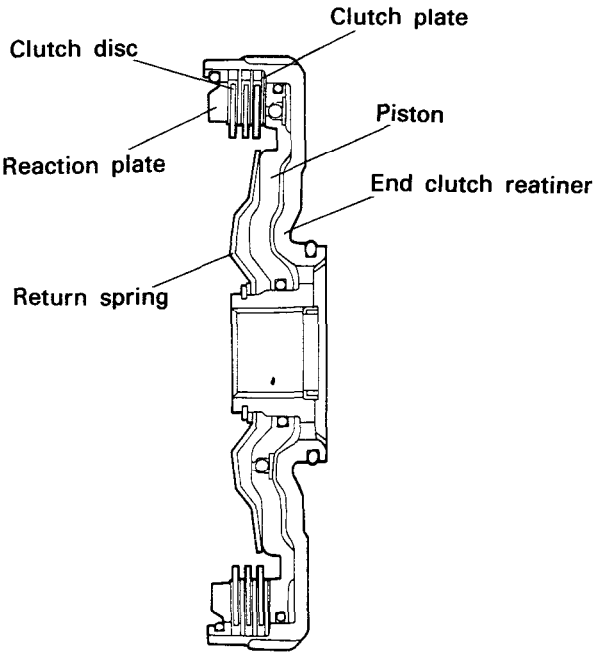
8. Install the thrust race, and snap ring.
9. Install the three seal rings to the grooves in the input shaft.



END CLUTCH ASSEMBLY

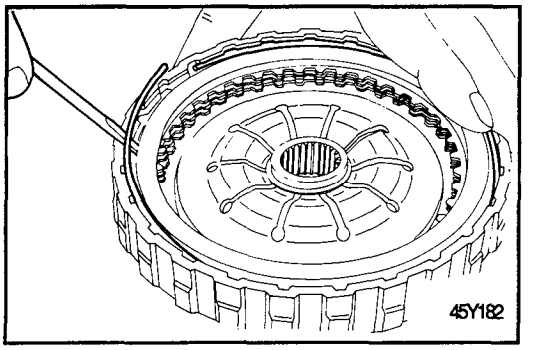
COMPONENTS



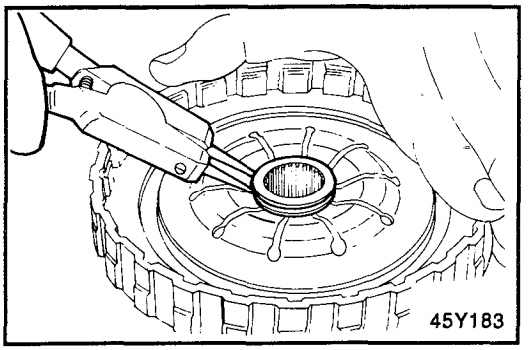


DISASSEMBLY

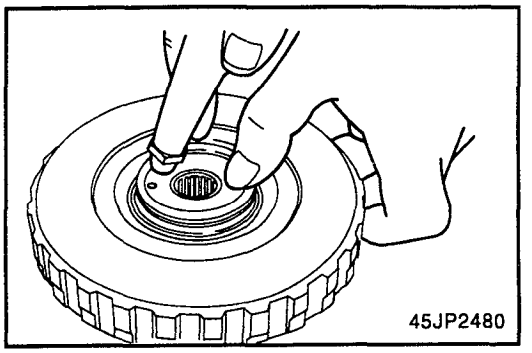
1. Remove the snap ring, clutch reaction plate, clutch disc, and the clutch plate. If the disc and plate are reused, note the installation order and direction when they are disassembled.



2. Remove the snap ring with snap-ring pliers, and then remove the washer and return spring.

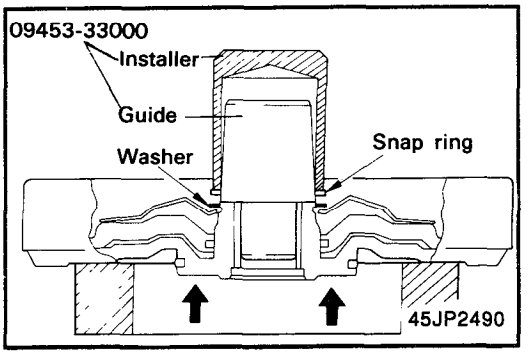


3. Remove the piston. If it is difficult to remove, face the piston side downward, and, with the retainer on a base, blow air in through the oil passage on the **rear surface.**
4. Remove the seal ring from the retainer.
5. Remove the two D-section rings and oil seal from the piston.



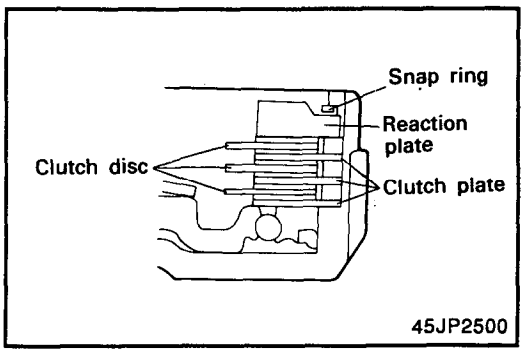
ASSEMBLY

1. Install the D-section rings and oil seal in the piston inner and outer grooves.
2. After applying a coating of automatic transaxle fluid to the D-section rings outer circumference, manually press the piston into the end clutch retainer.
3. Install the return spring and washer.
4. After fitting a new snap ring into the guide of the special tool (09453-33000), install the retainer. Push the snap ring as far down on the guide as possible.
   Attach the installer and press until the snap ring enters the groove. Do not press more than necessary. The places indicated by arrows in the illustration (center projections) are not to be supported.

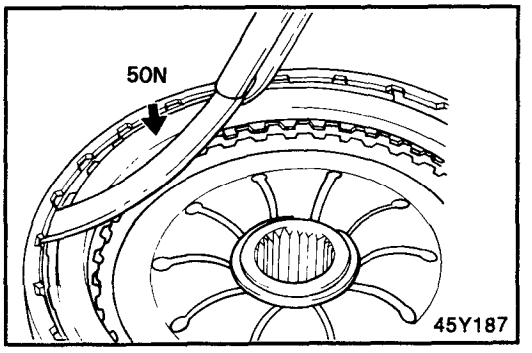


5. Install the clutch plate, clutch disc and reaction plate to the end clutch retainer.
   If the reaction plate, clutch plate and clutch disc are reused, install them in the same order they were disassembled. Apply a coating of automatic transaxle fluid.

   NOTE :
   When a new clutch disc is used, soak it in automatic transaxle fluid for 2 hours before using it.

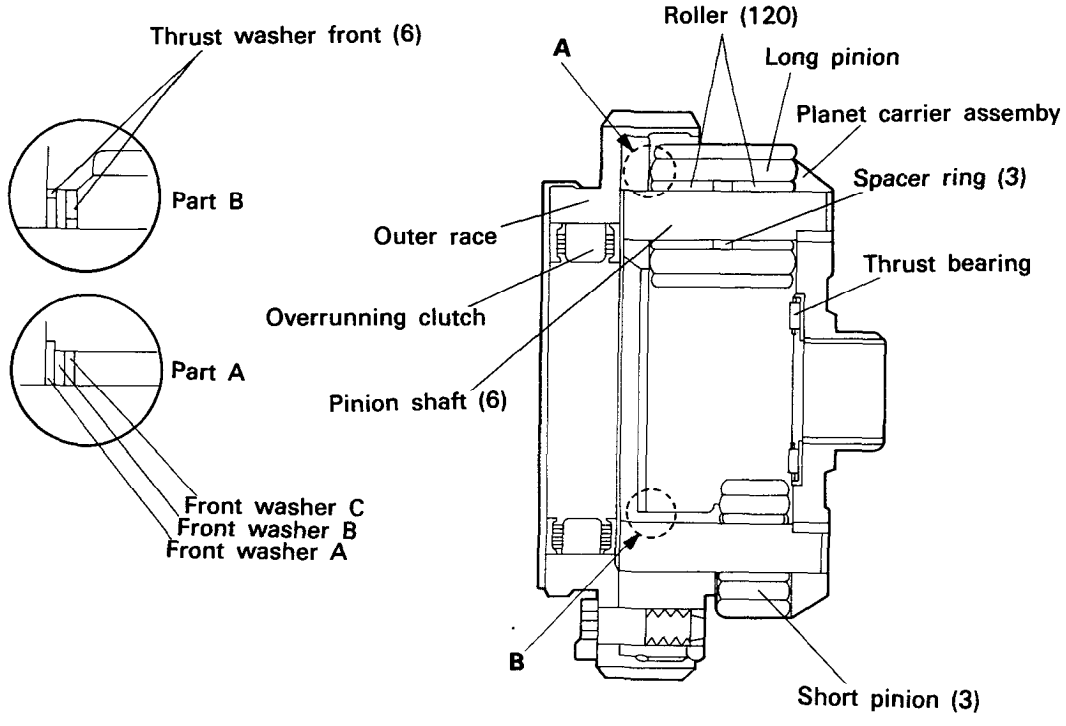


6. Install the snap ring. Check that the clearance between the snap ring and the clutch reaction plate is 0.4-0.65 mm (0.016-**0.026** in.).
   To check the clearance, hold the circumference of the clutch reaction plate down with 50N (11 lb.) force.
   If clearance is out of specifications, adjust the clearance by selecting the proper snap ring.



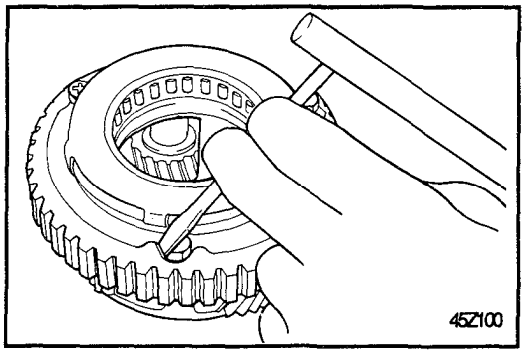
PLANETARY GEAR SET

COMPONENTS

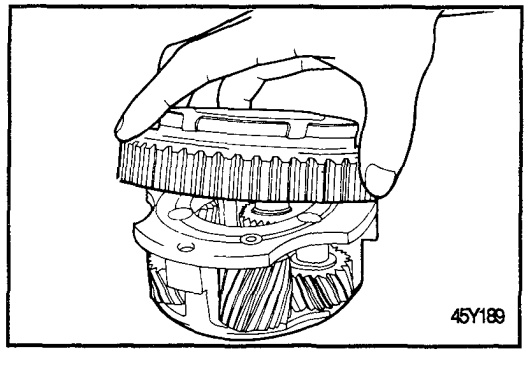


DISASSEMBLY

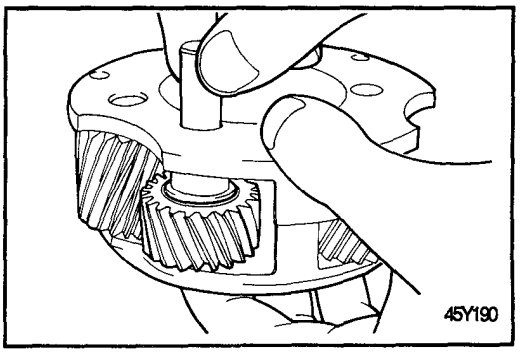
1. Remove three bolts.



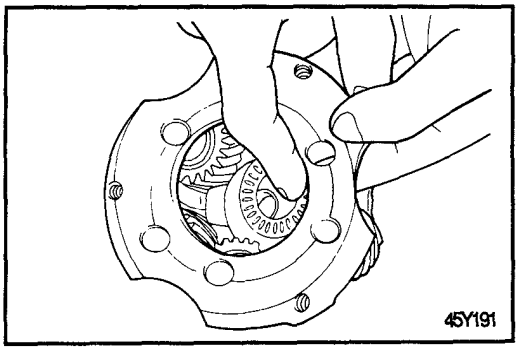
2. Remove the overrunning clutch outer race assembly. Remove the overrunning clutch end plate.



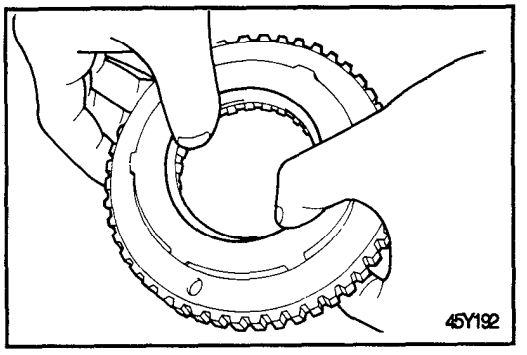
3. Remove the shaft of only one short pinion.
4. Remove the spacer bushing and two front thrust washers.
5. Remove the pinion. Do not drop the 17 roller bearings in the pinion.



6. Remove the thrust bearing.

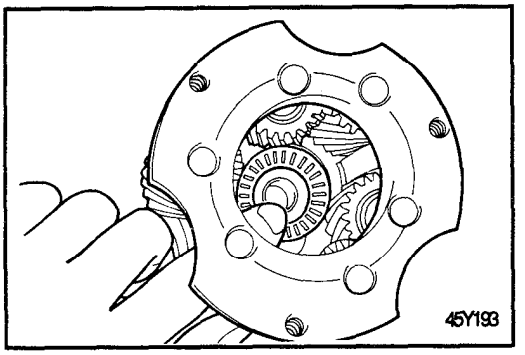


7. Push the overrunning clutch out of the outer race by hand.

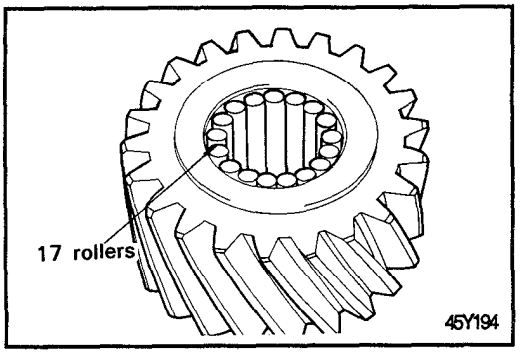


ASSEMBLY

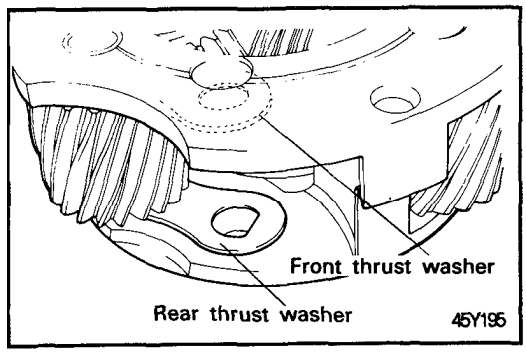
1. Install the thrust bearing in the carrier. Be sure that it fits correctly in the carrier.



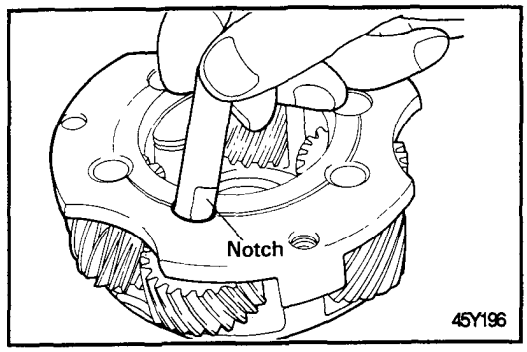
2. Apply a generous amount of petroleum jelly to the inside of the short pinion to hold the 17 rollers bearings in place.



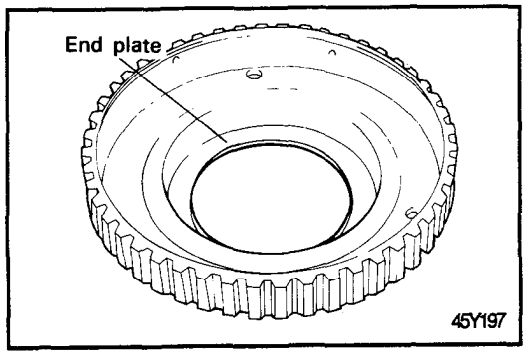
3. Line up the holes in the rear thrust washer and front thrust washer with the shaft of the carrier.
4. Install the short pinion, spacer bushing and two front thrust washers and align the holes. Use care not to allow the rollers to move out of position.



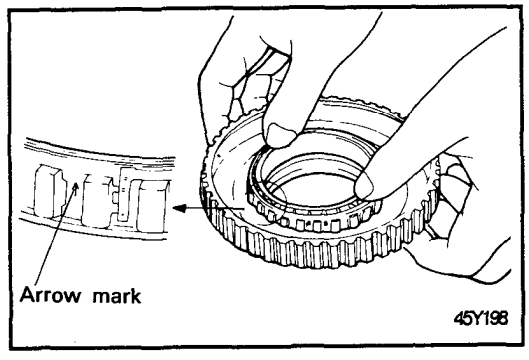
5. Insert the pinion shaft. Be sure that the flattened end of the pinion shaft fits properly into the hole in the rear thrust plate when the pinion shaft is inserted.



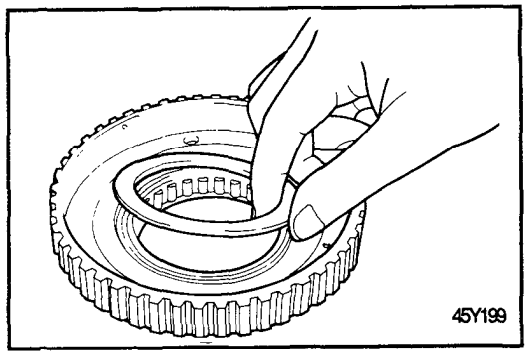
6. Install the end plate in the outer race.



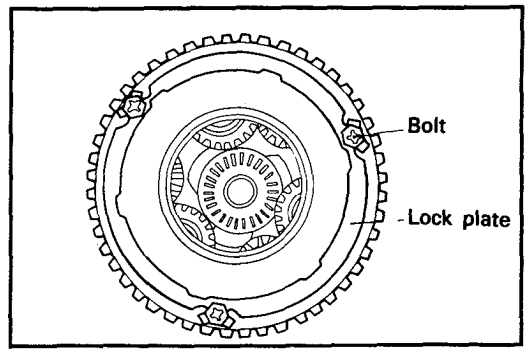
7. Press the overrunning clutch into the outer race. Be sure that the arrow on the outside circumference of the cage is pointing upward as shown in the illustration when the overrunning clutch is installed.



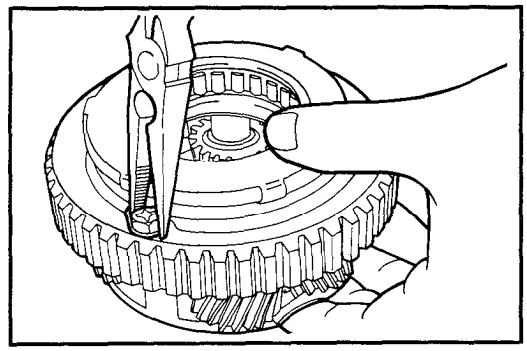
8. Apply petroleum jelly to the overrunning clutch end plate to retain it inside the overrunning clutch. Install the end plate in the clutch.



9. Install overrunning clutch assembly to carrier and align bolt holes.
10. Install three bolts and tighten three bolts to 25-35 Nm (18-25 ft.lbs.)

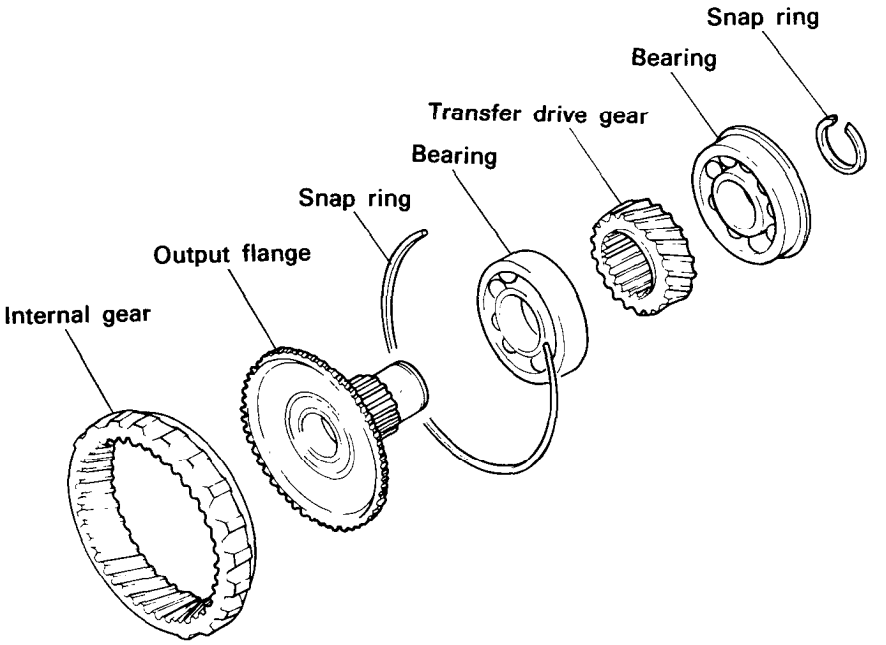


11. Bend the lock plate over the bolt head.



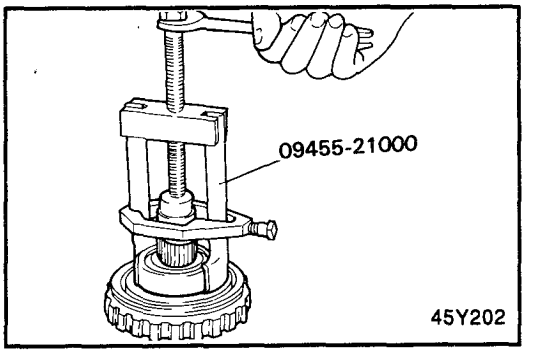
INTERNAL GEAR AND TRANSFER DRIVE GEAR SET ASSEMBLY

COMPONENTS

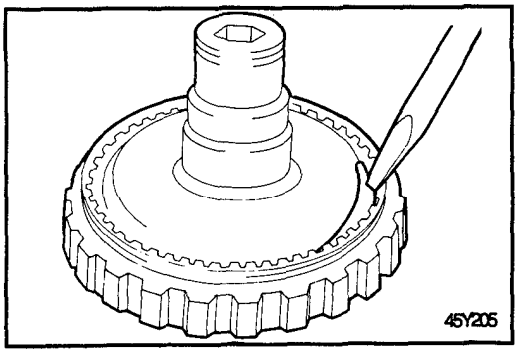


DISASSEMBLY

1. **Remove** the **snap ring** from the rear of the output flange.
2. Using the special tool (09455-21000) remove the bearing from the output flange.



3. Remove the snap ring, and separate the internal gear from the output flange.

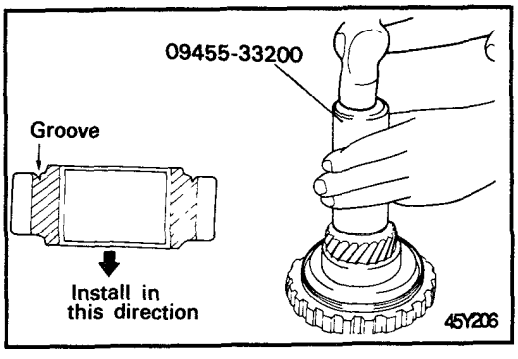


ASSEMBLY

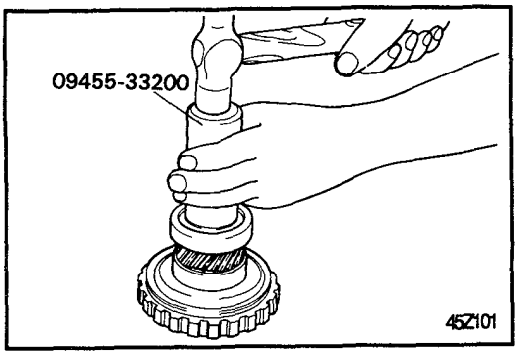
1. Using the special tool (09455-33200) press the bearing and transfer drive gear onto output flange.

   CAUTION
   Replace the output flange and transfer drive gear as a set.

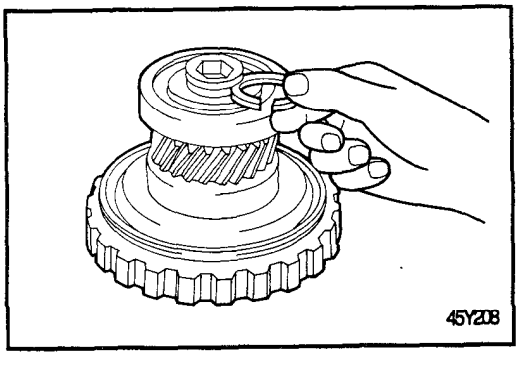
2. Install the transfer drive gear in the proper direction as shown in the illustration.



3. Install the ball bearing.

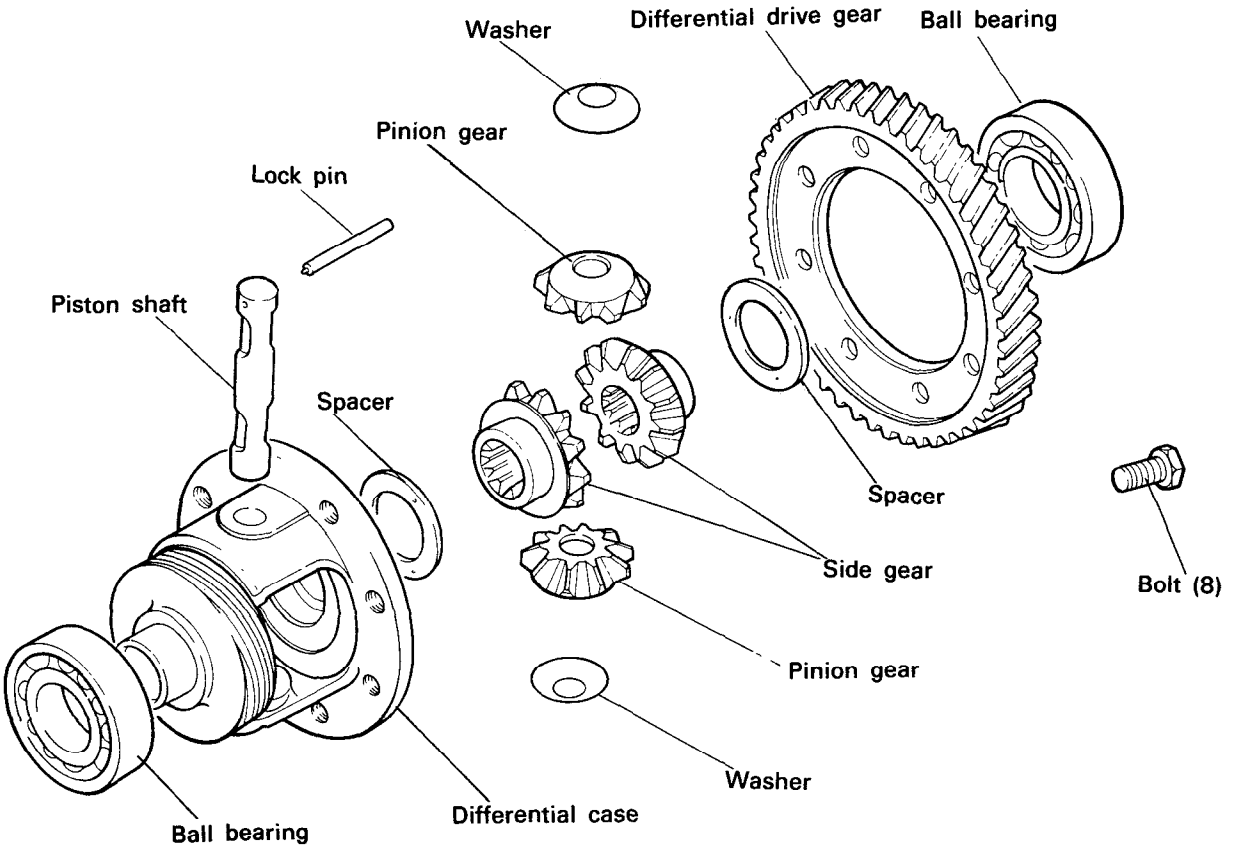


4. Select the thickest snap ring that can be installed in groove.



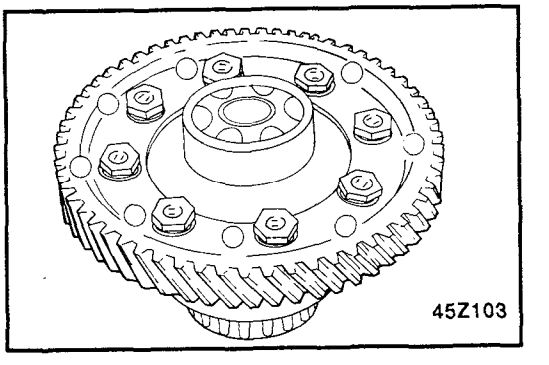
DIFFERENTIAL

COMPONENTS

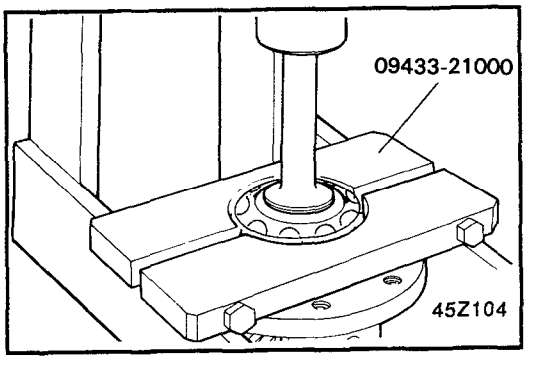


DISASSEMBLY

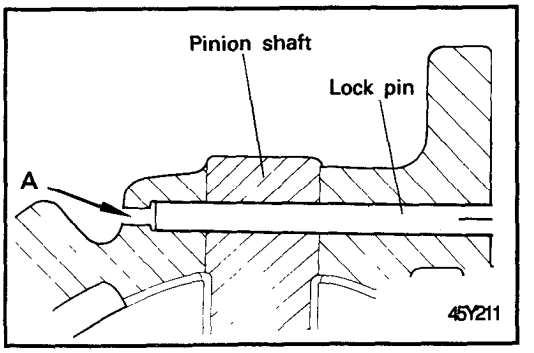
1. Remove the drive gear retaining bolts and drive gear from the differential case.



2. Remove the ball bearing with the special tool (09433-21000).



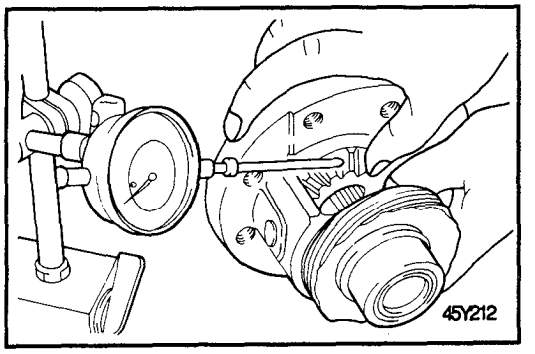
3. Drive out the lock pin with a punch inserted in hole “A”.
4. Remove the pinion shaft, pinion gears and washers.
5. Remove the side gears and spacers.
   Do not mix the gears and spacers between the left and right sides.



ASSEMBLY

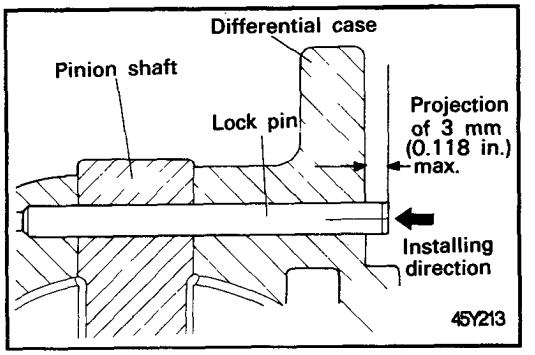
1. With the spacers installed on the back of the differential side gears, install the gears into the differential case. If reusing parts, install them in their original positions noted during disassembly.
   If using new differential side gears, install medium thickness spacers 1.0mm (0.039in.).
2. Install the washers on the back of the pinion gears. Install gears into the differential case, then insert the pinion shaft.
3. Measure the backlash between the side gear and the pinion gear.
   Backlash should be 0.025-0.150 mm (.0010-.0059 in.) and the right and left hand gear pairs should have equal backlash. If the backlash is out of specification, disassemble and reassemble using different spacers for the correct backlash.-

   Standard value: 0.025-0.150 mm (.0010-.0059 in.)

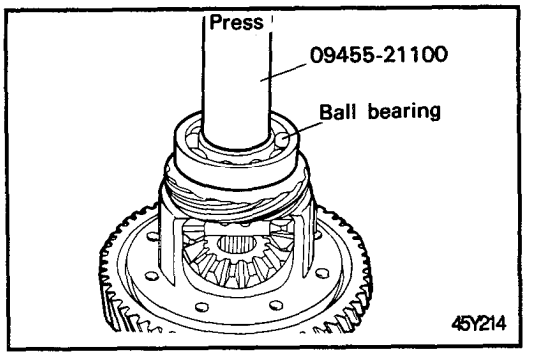


4. Install the pinion shaft lock pin in the direction specified in the illustration. After installation, check that the projection is less than 3 mm (.118 in.).-

   NOTE :
   The lock pin must not be reused.

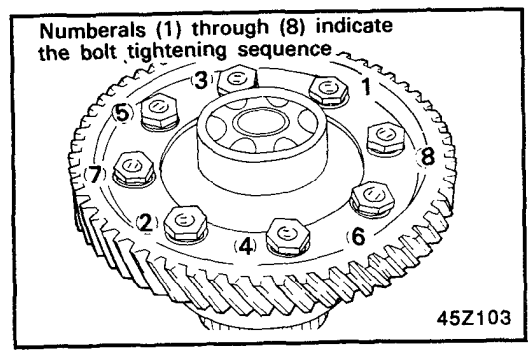


5. Press the bearings onto both ends of differential case. Press on the inner race when installing the bearings. Do not apply load to outer race.
6. Install the differential drive gear onto the case.



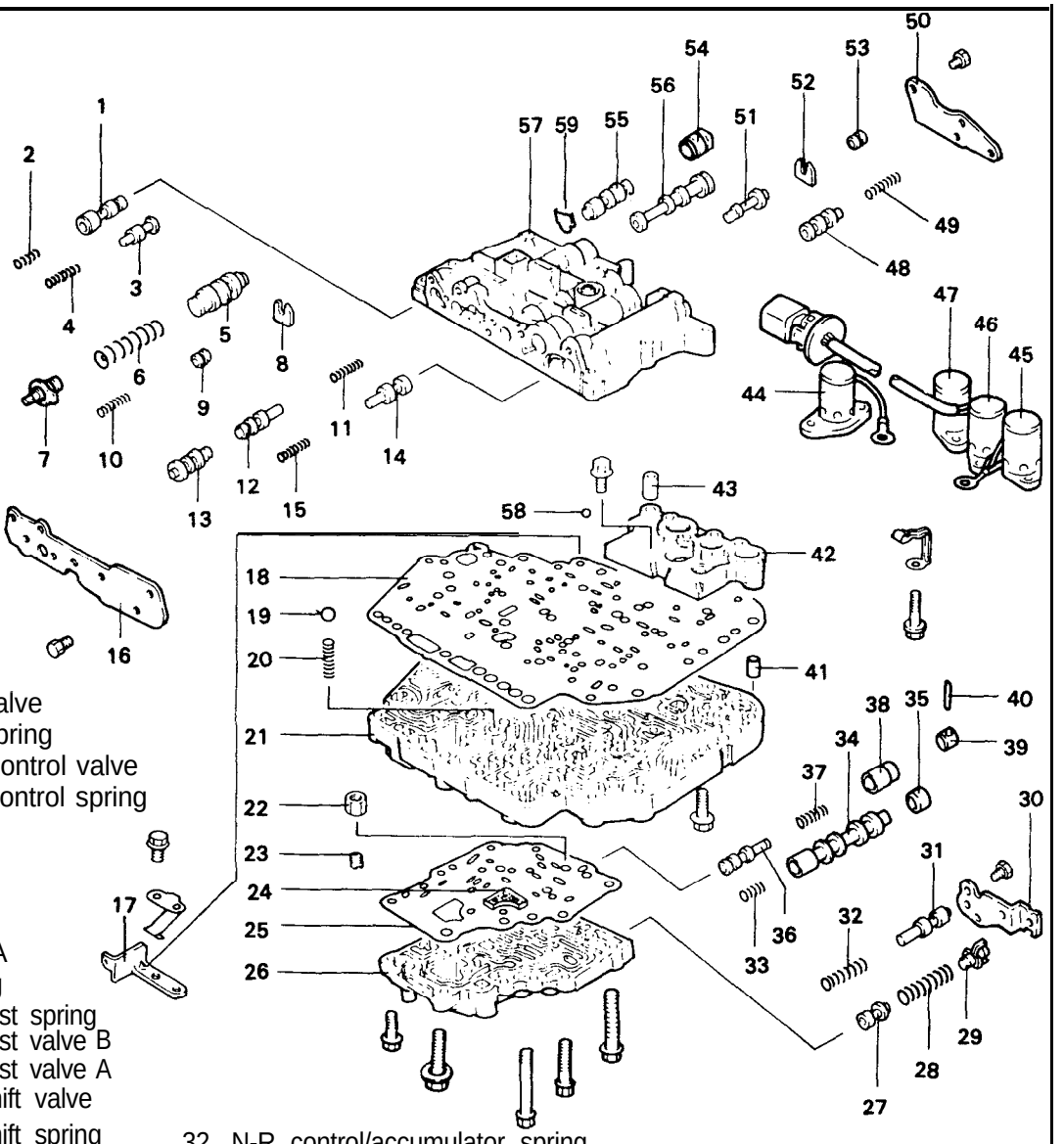
7. Apply ATF to the bolts and tighten the bolts to the specified torque in the sequence shown in the illustration.-

Tightening torque:
130-140 Nm (1300-1400 kg.cm, 94-101 lb.ft)



VALVE BODY

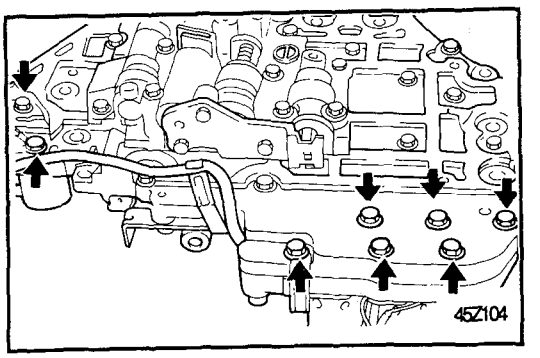
COMPONENTS



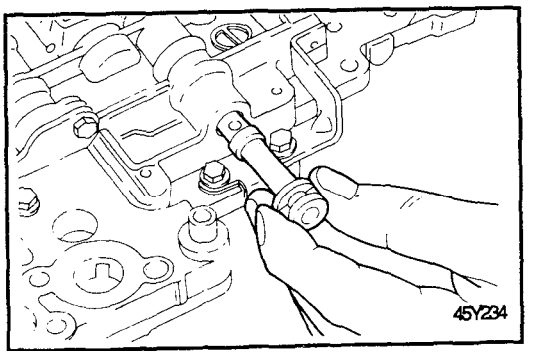
1. Pressure control valve
2. Pressure control spring
3. Torque converter control valve
4. Torque converter control spring
5. Regulator valve
6. Regulator spring
7. Adjusting screw
8. Stopper plate
9. Shift control plug A
10. Shift control spring
11. Rear clutch exhaust spring
12. Rear clutch exhaust valve B
13. Rear clutch exhaust valve A
14. 2nd-3rd/4th-3rd shift valve
15. 2nd-3rd/4th-3rd shift spring
16. Front end cover
17. Valve stopper
18. Upper separating plate
19. Steel ball
20. Relief spring
21. Intermediate plate
22. Nut
23. Jet
24. Oil filter
25. Lower separating plate
26. Lower valve body
27. Reducing valve
28. Reducing spring
29. Adjusting screw
30. End cover
31. N-R control/accumulator valve
32. N-R control/accumulator spring
33. Damper clutch control spring
34. Damper clutch control valve
35. Damper clutch control sleeve
36. End clutch valve
37. End clutch spring
38. End clutch plug
39. Stopper
40. Pin
41. Dowel bushing
42. Block
43. Pipe
44. Pressure control solenoid valve (PCSV)
45. Shift control solenoid valve B (SCSV-B)
46. Shift control solenoid valve A (SCSV-A)
47. Damper clutch control solenoid valve (DCCSV)
48. 1-2 shift valve
49. 1-2 shift spring
50. Rear end cover
51. Shift control cover
52. Stopper plate
53. Shift control plug B
54. N-D control sleeve
55. N-D control valve
56. Manual valve
57. Upper valve body
58. Teflon ball
59. N-D plate

DISASSEMBLY

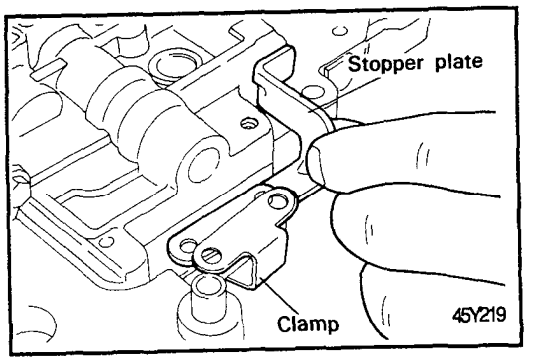
1. Remove the 4 solenoid valves.



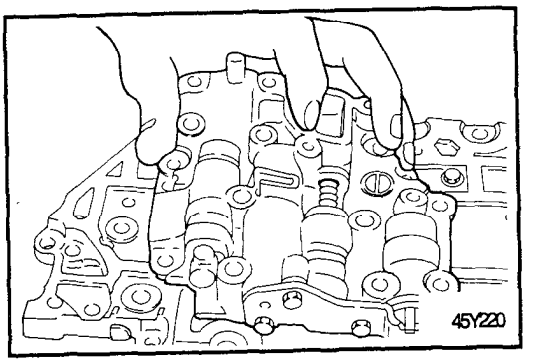
2. Remove the manual valve.



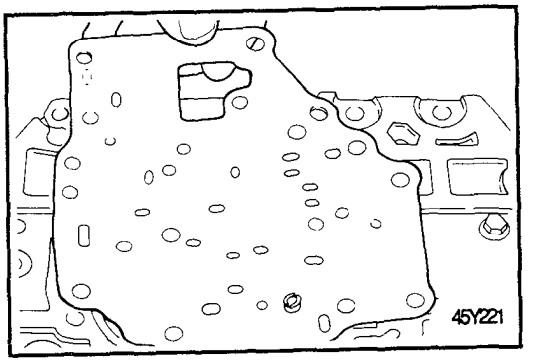
3. Remove the valve stopper and clamp.



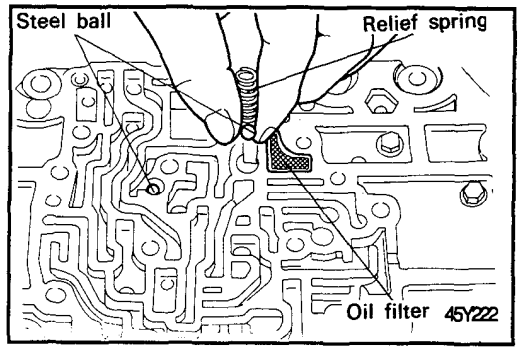
4. Remove the bolts (13), and then remove the lower valve body.



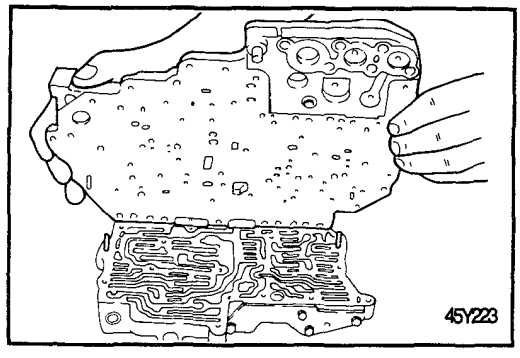
5. Remove the separating plate.



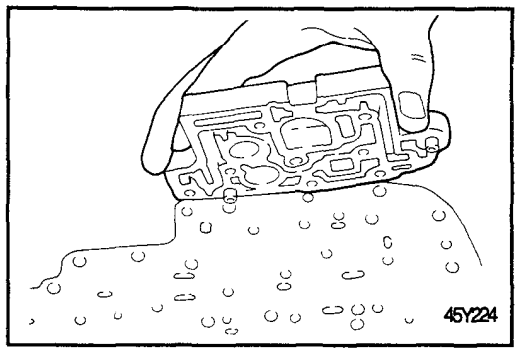
6. Remove the relief spring, two steel balls and oil filter from the intermediate plate,



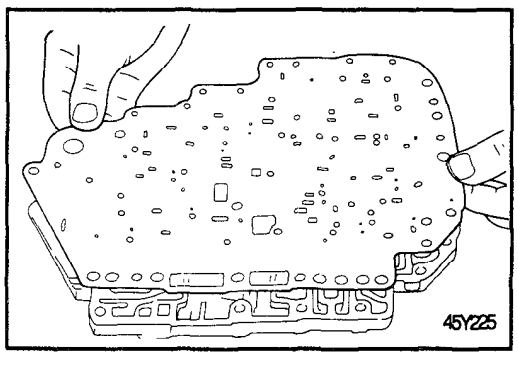
7. Remove the bolts (8) and then remove the intermediate and upper separation plates.



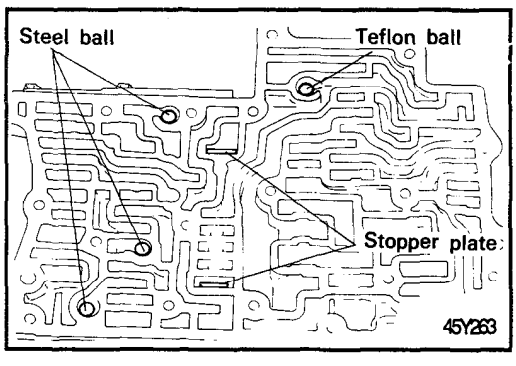
8. Remove the block.



9. Remove the upper separating plate.

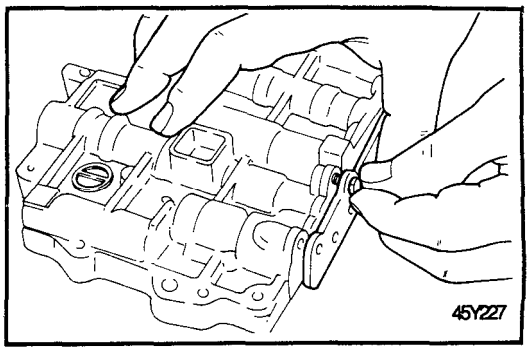


10. Remove, from the upper valve body, the three steel balls, the teflon ball, and the two stopper plates.

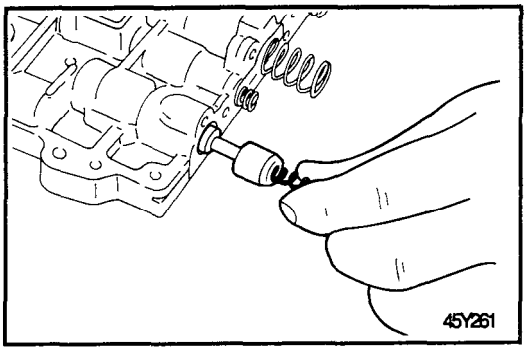


11. Remove from the upper valve body, the seven bolts. Then remove the front end cover and the adjustment screw.-

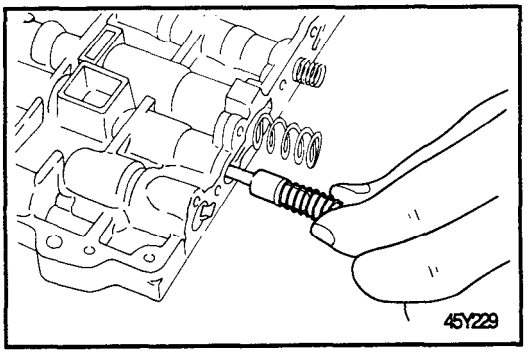
NOTE :
When removing the bolts, be sure to hold the front end cover (as shown in the illustration) to prevent the spring from causing the adjustment screw to fall out.



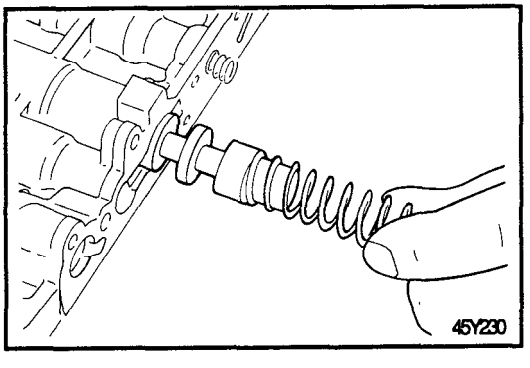
12. Remove the pressure control spring and the pressure control valve.



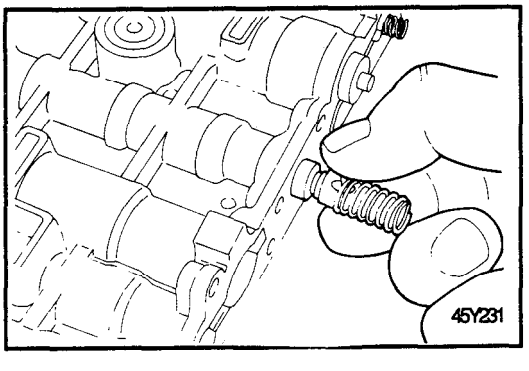
13. Remove the torque converter control spring and the torque converter control valve.



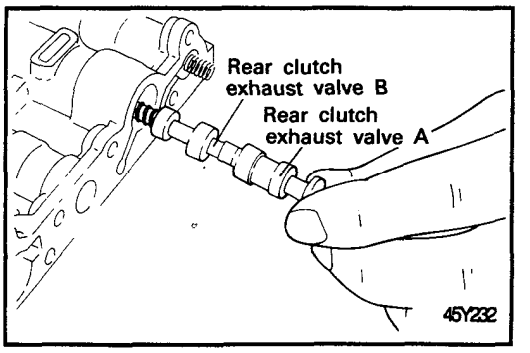
14. Remove the regulator spring and the regulator valve.



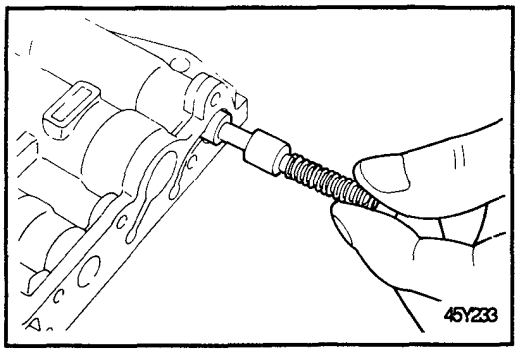
15. Remove the shift-control spring and shift-control plug A.



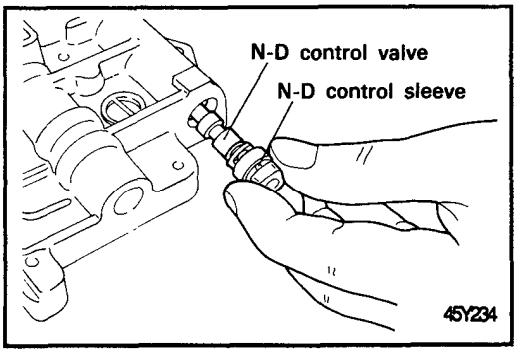
16. Remove the rear clutch exhaust valves A and B as well as the rear clutch exhaust spring.



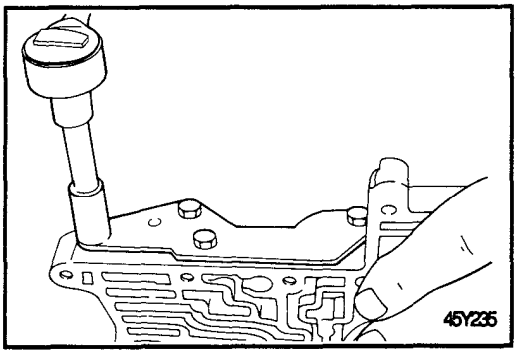
17. Remove the 2-3/4-3 shift spring and the shift valve.



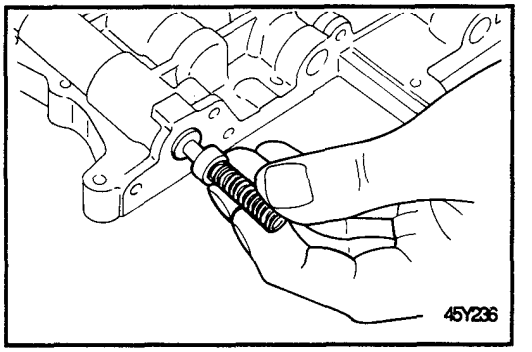
18. Remove, from the rear side of the upper valve body, the N-D plate, the N-D control sleeve and the N-D control valve.



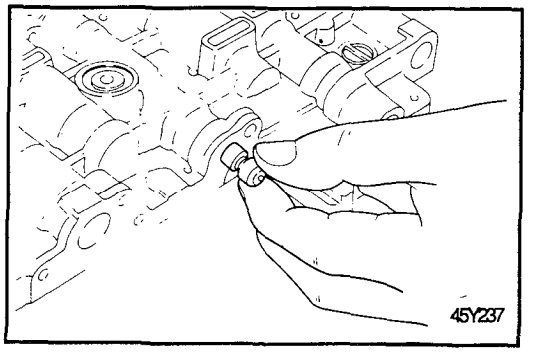
19. Remove the four bolts, and then remove the rear end cover.



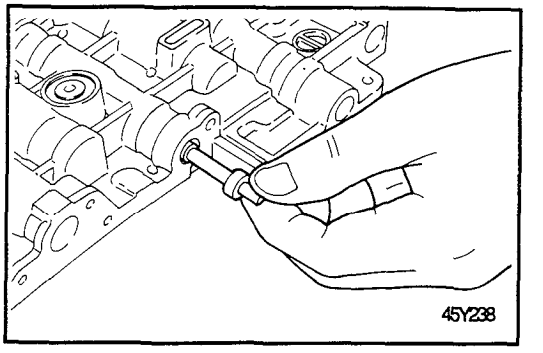
20. Remove the 1-2 shift spring and the 1-2 shift valve.



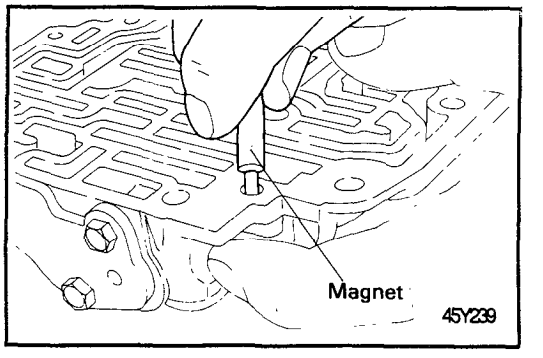
21. Remove shift-control plug B.



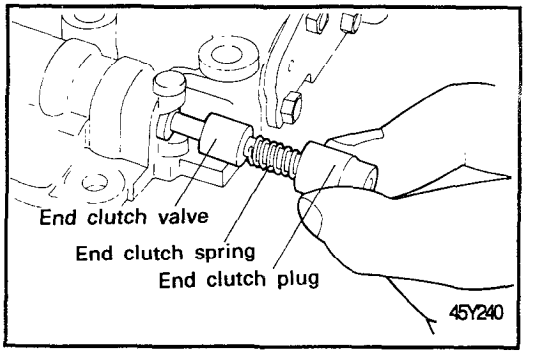
22. Remove the shift-control valve.



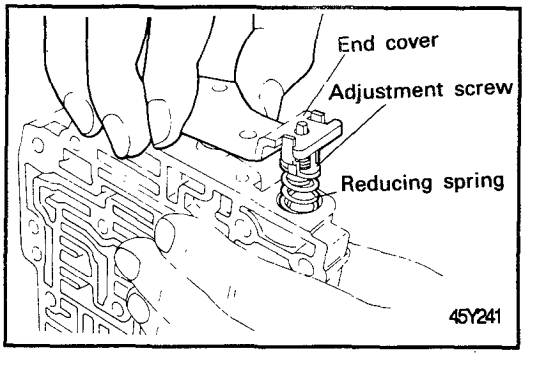
23. Using a magnet, extract the pin from the lower valve body, and then remove the stopper.



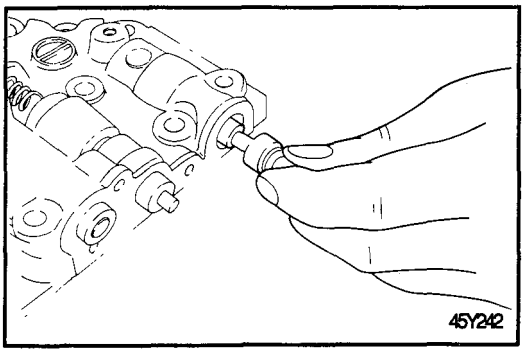
24. Remove the end clutch valve plug, end clutch spring, and end clutch valve.



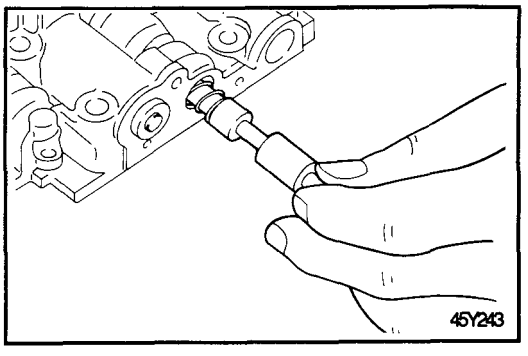
25. Remove the three bolts from the lower valve body, and then remove the end cover, adjustment screw, and reducing spring.



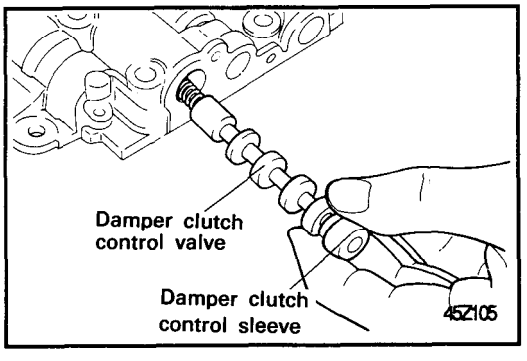
26. Remove the reducing valve.



27. Remove the N-R control/accumulator valve and the N-R control/accumulator spring.

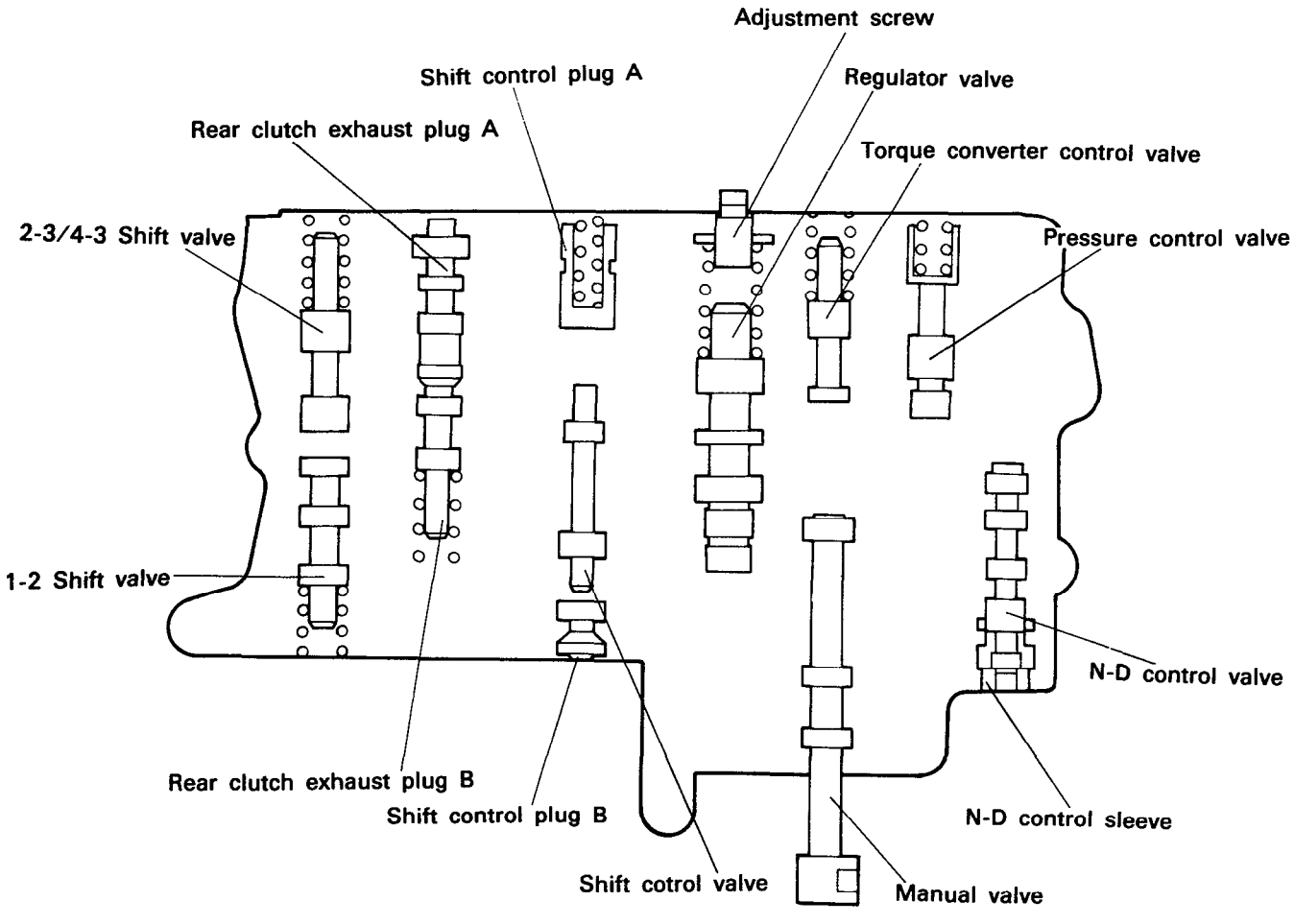


28. Remove the damper clutch control sleeve, damper clutch control valve, and the damper clutch control spring.

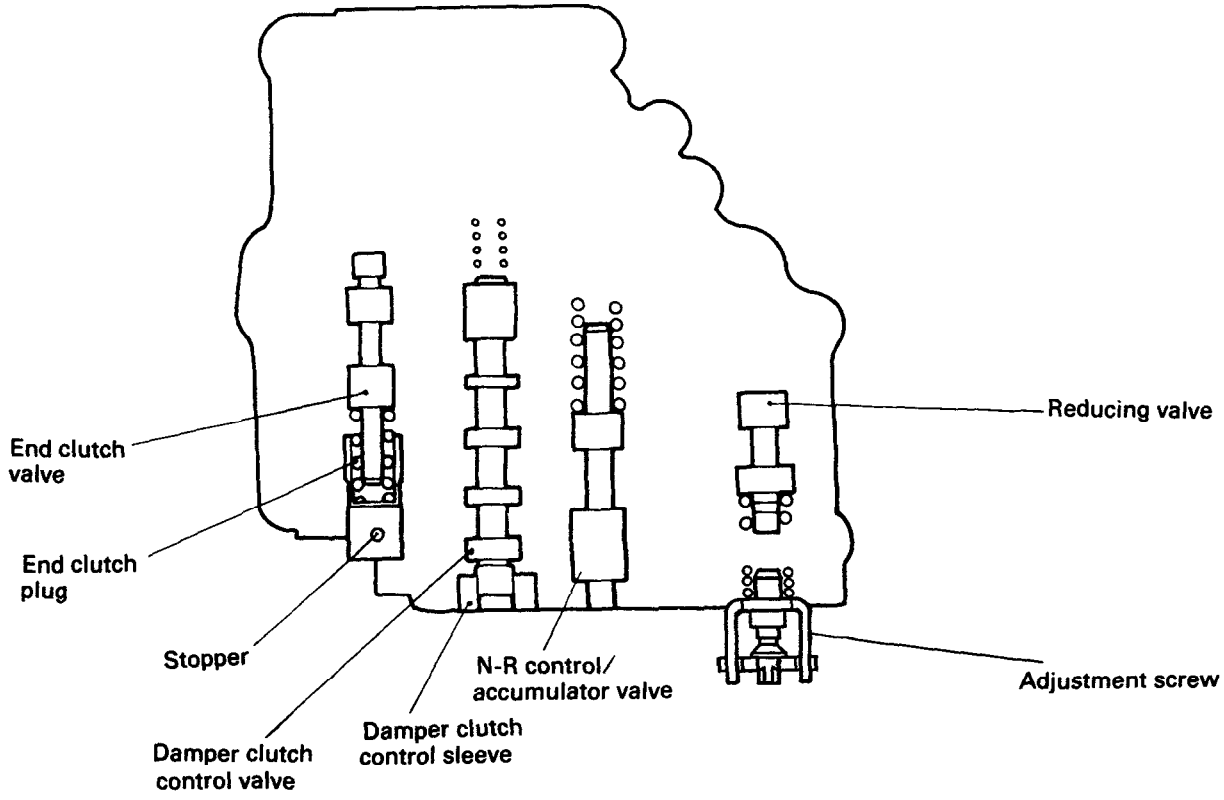


VALVE INSTALLATION POSITIONS

Upper Valve Body

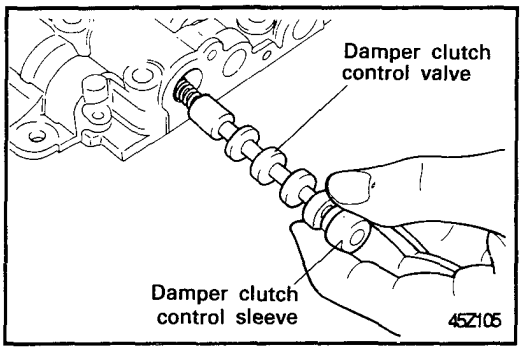


Lower Valve Body

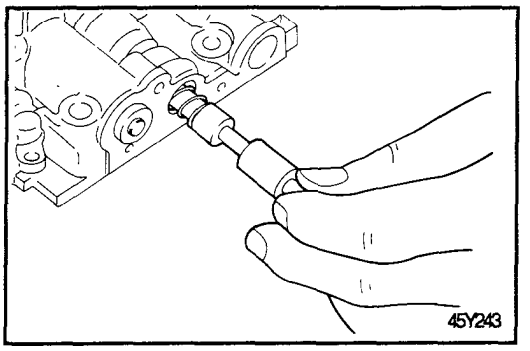


ASSEMBLY

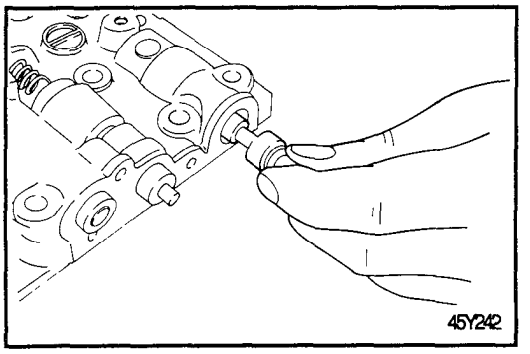
1. install in the lower valve body, the damper clutch control spring, damper clutch control valve, and the damper clutch control sleeve.



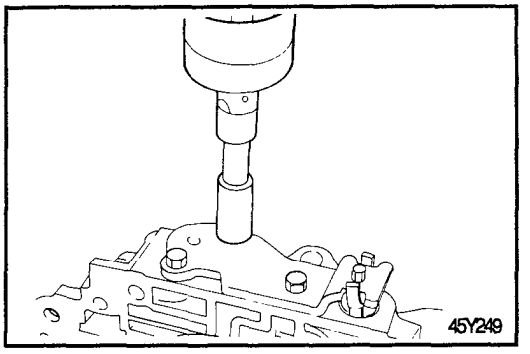
2. Install the N-R control/accumulator spring and the N-R control/ accumulator valve.



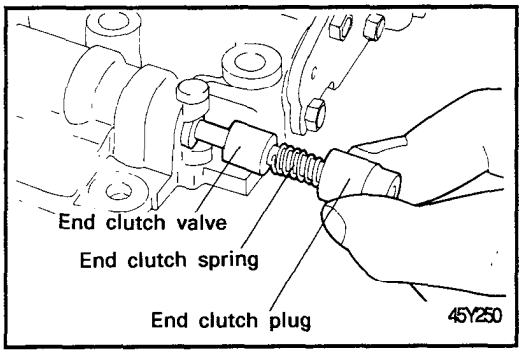
3. Install the reducing valve.



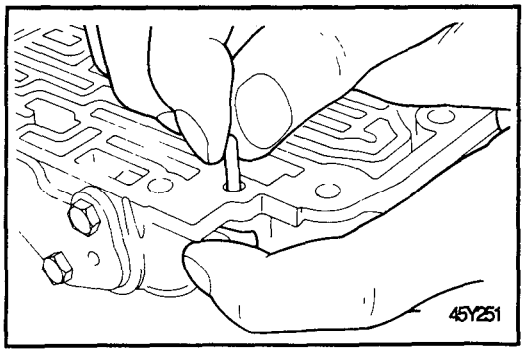
4. Install the reducing spring, adjustment screw, and end cover. Tighten the bolts to the specified torque.



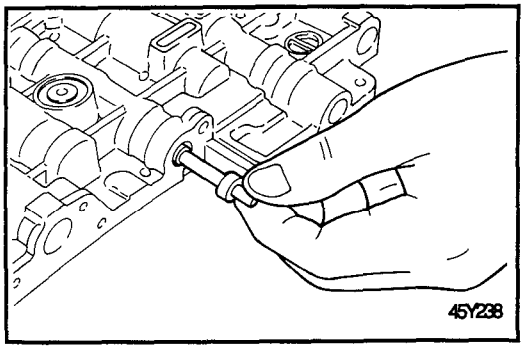
5. Install the end clutch valve, end clutch spring, and end clutch plug.



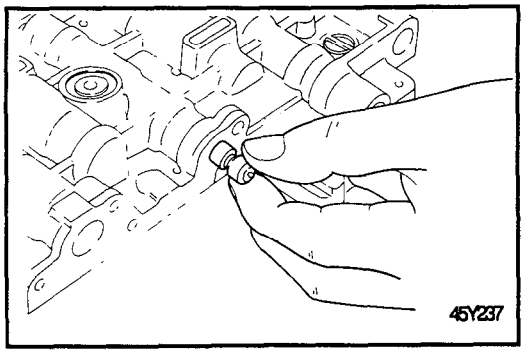
6. Install the stopper and secure it with the pin.



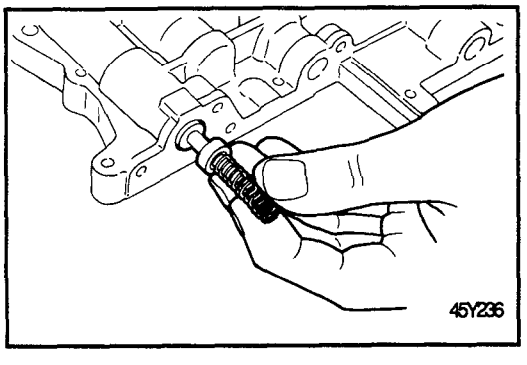
7. Install the 1-2 shift-control valve to the upper valve body.



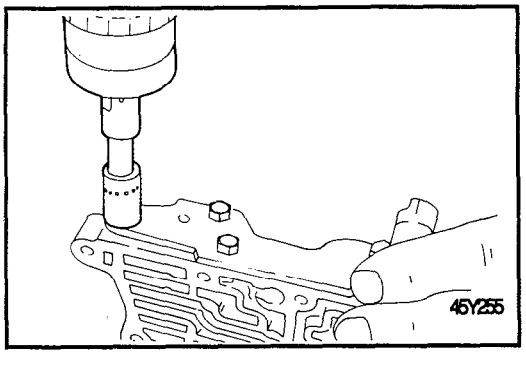
8. Install the 1-2 shift-control plug.



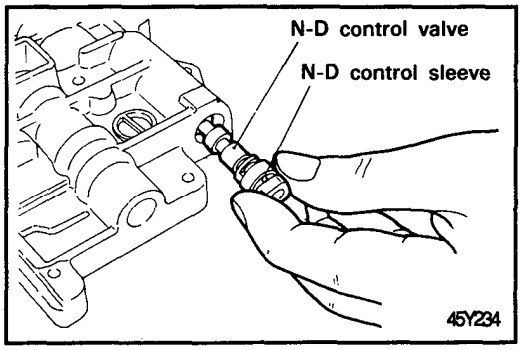
9. Install the 1-2 shift valve and 1-2 shift spring.



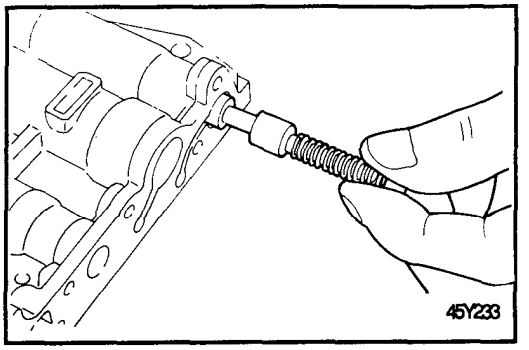
10. Install the rear and cover.



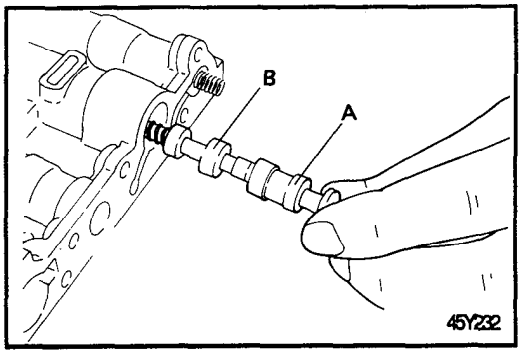
11. Install the N-D control valve, N-D control sleeve, and N-D plate.



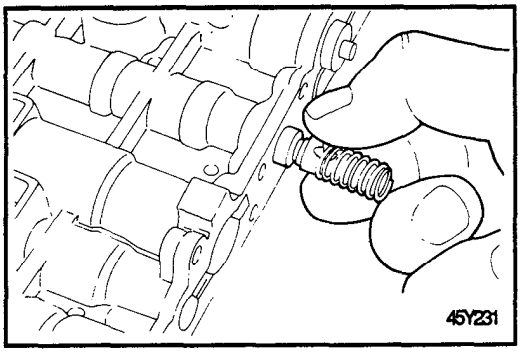
12. Install the 2-3/4-3 shift valve and the 2-3/4-3 shift spring.



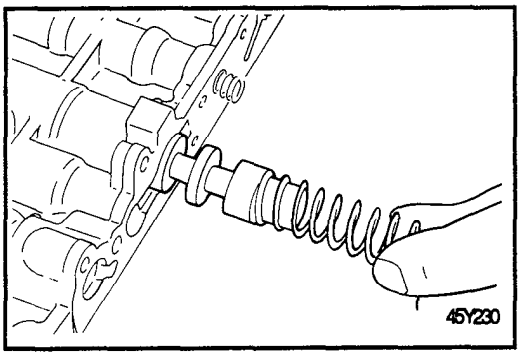
13. Install the rear clutch exhaust spring and rear clutch exhaust valves A and B.



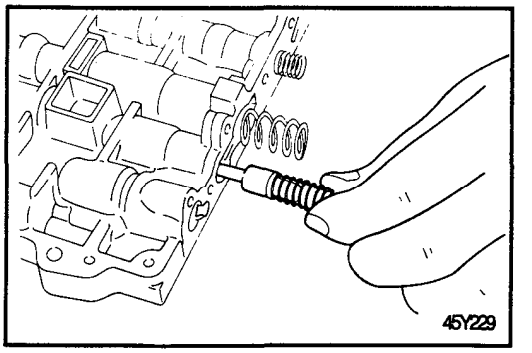
14. Install the shift-control valve and shift control spring.



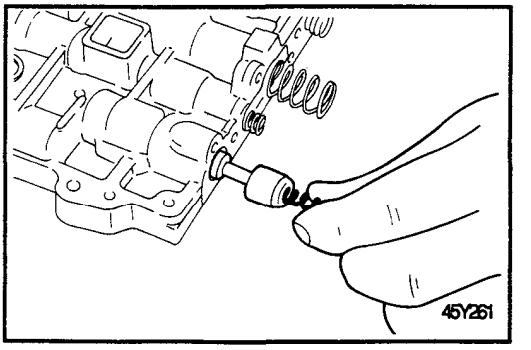
15. Install the regulator valve and regulator spring.



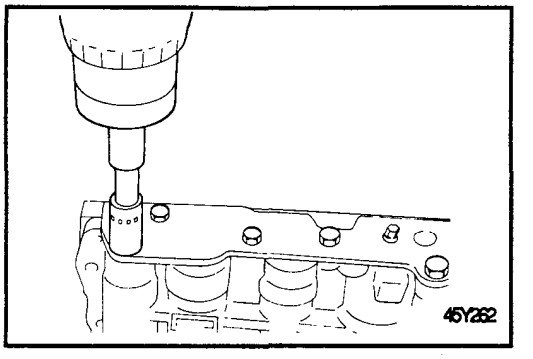
16. Install the torque converter control valve and torque converter control spring.



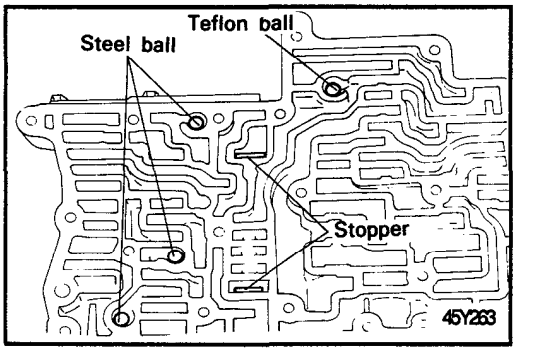
17. Install the pressure control valve and pressure control spring.



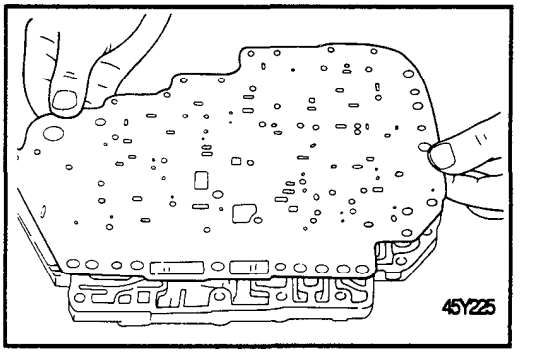
18. Install the adjustment screw and front end cover. Tighten the bolts to the specified torque.



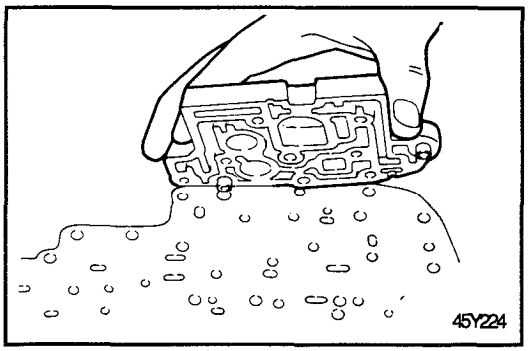
19. Install, in the upper valve body, the three steel balls, the teflon ball, and the stopper plate.



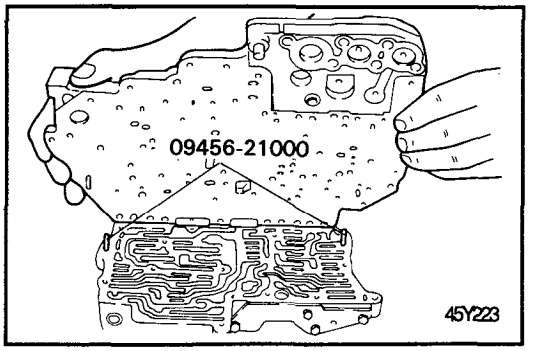
20. Install the upper separating plate.



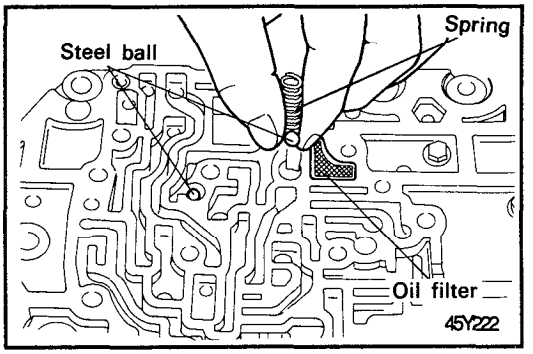
21. Install the block.



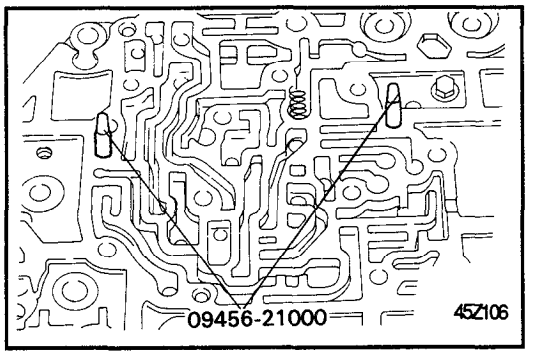
22. Install the special tool (09456-21000). Then, after securing the upper separating plate and the intermediate plate with the eight installation bolts, remove the special tool.



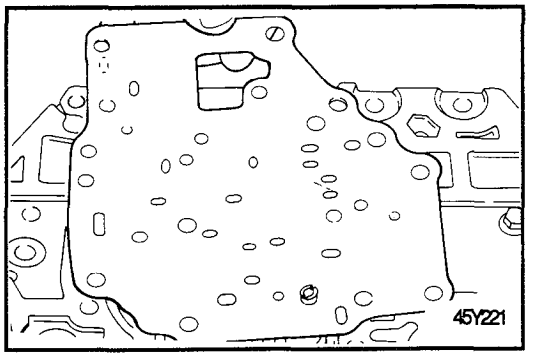
23. Install to the intermediate plate, the oil filter, the two steel balls, and the spring.



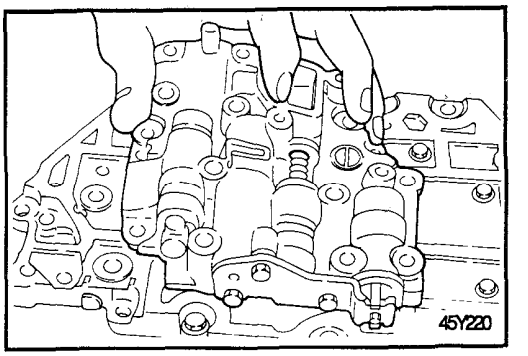
24. Install the special tool (09456-21000) to the intermediate plate.



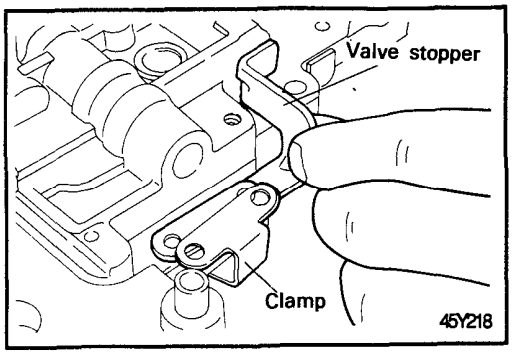
25. Install the separating plate.



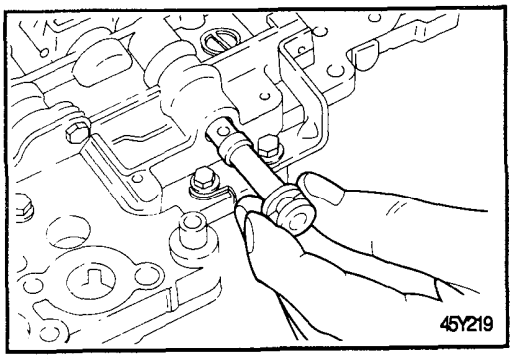
26. After securing the lower valve body using the 13 installation bolts, remove the special tool.



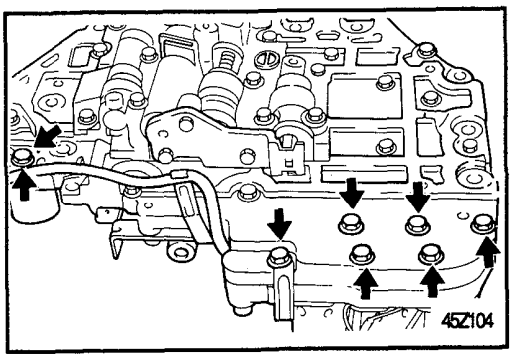
27. Install the valve stopper and clamp.



28. Install the manual valve.

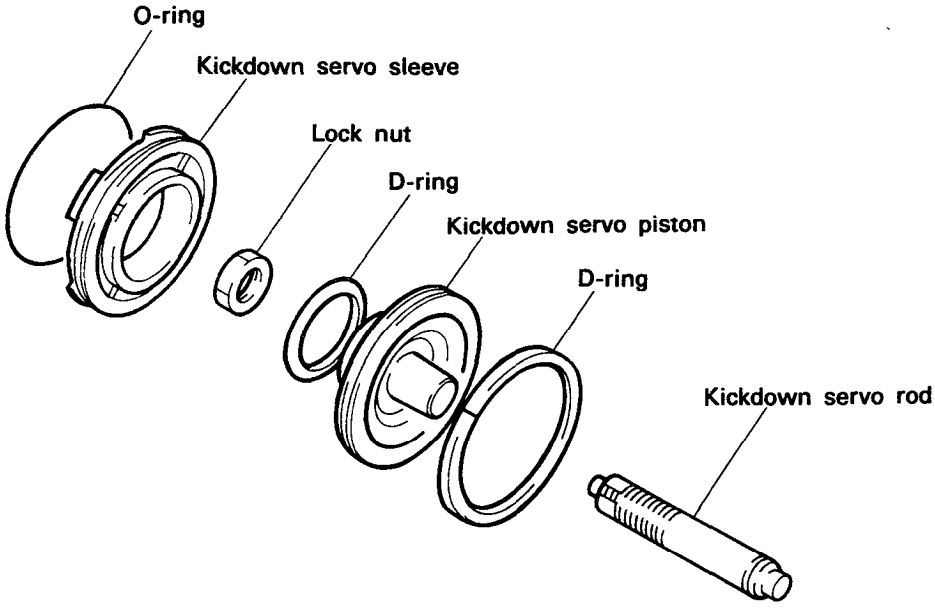


29. Secure the four solenoid valves using the installation bolts.



KICKDOWN SERVO

COMPONENTS

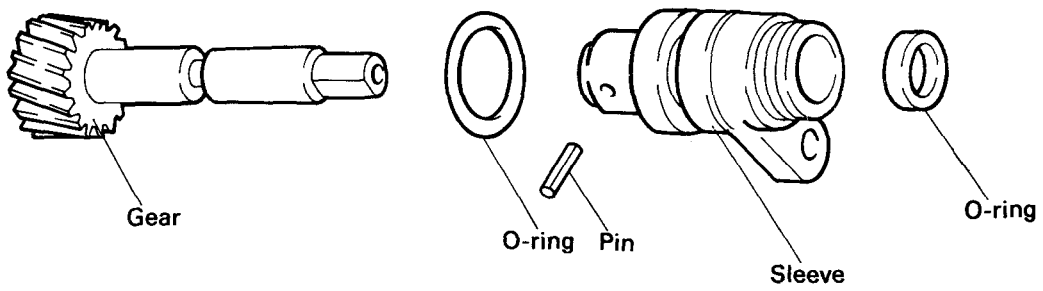


ASSEMBLY

1. Install the rod and nut to the kickdown servo piston.
2. Install two new D-rings (one large and one small) around the circumference of the piston, and then apply a coating of ATF to the D-rings.
3. Install the kickdown servo piston in the sleeve.
4. Install a new O-ring around the circumference of the sleeve, and apply a coating of ATF to the O-ring.

SPEEDOMETER SLEEVE

COMPONENTS



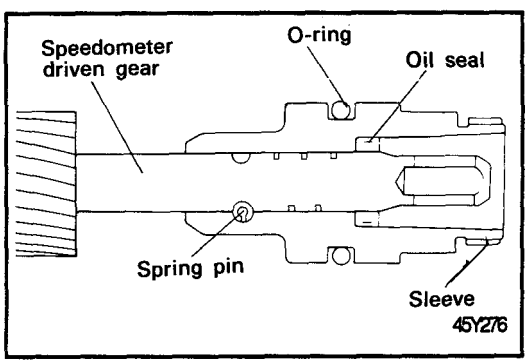
DISASSEMBLY

Drive the spring pin out, and disassemble the gear and sleeve.

NOTE :
Do not reuse the O-rings and spring pin.

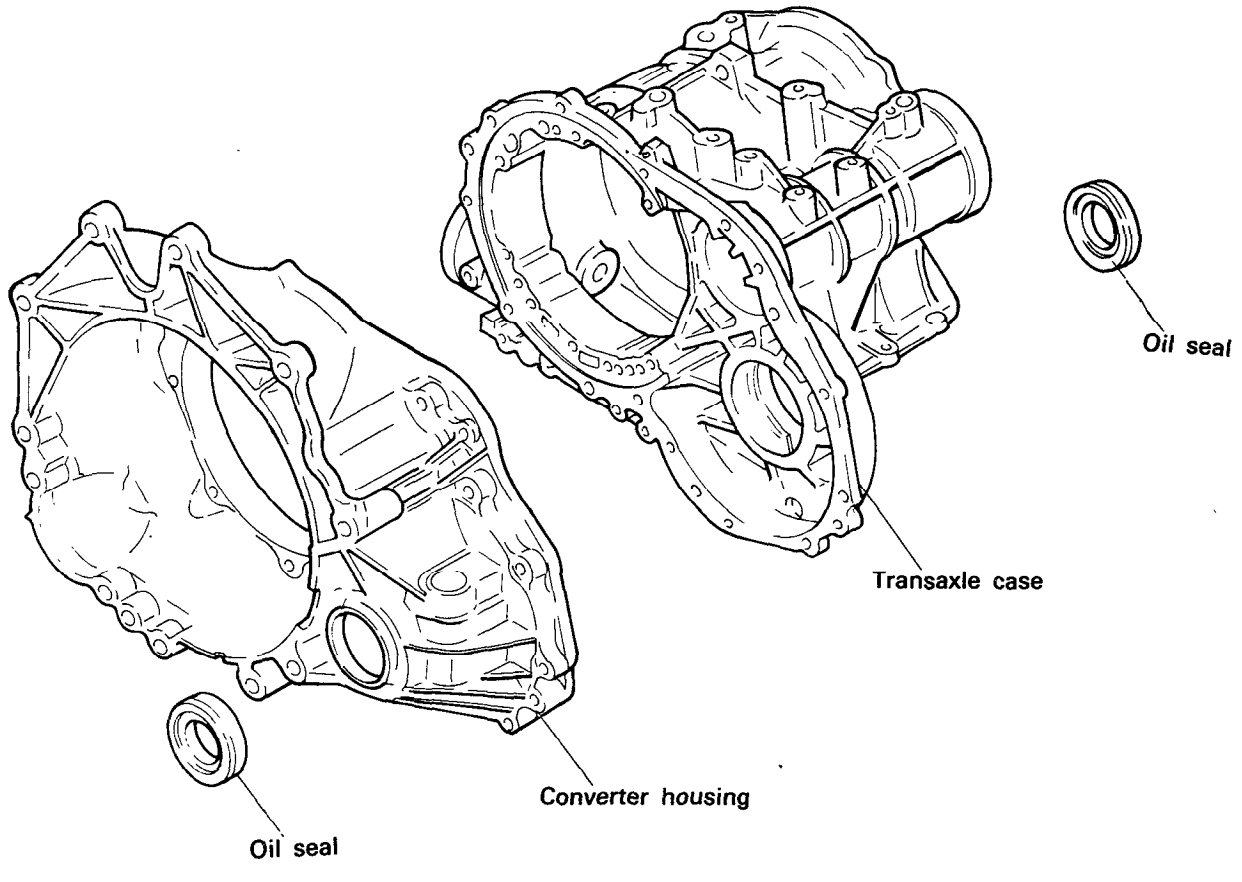
ASSEMBLY

1. Install a new O-ring to the shaft part of the gear, and apply ATF to the O-ring.
2. Insert the gear into the sleeve, and align the pin hole and the groove of the gear's shaft.
3. Tap-a new spring pin into the sleeve. When tapping it in, be sure that the slit is not at the gear side.
4. Install a new O-ring into the outer groove of the sleeve, and apply a coating of ATF to the outer circumference of the O-ring.



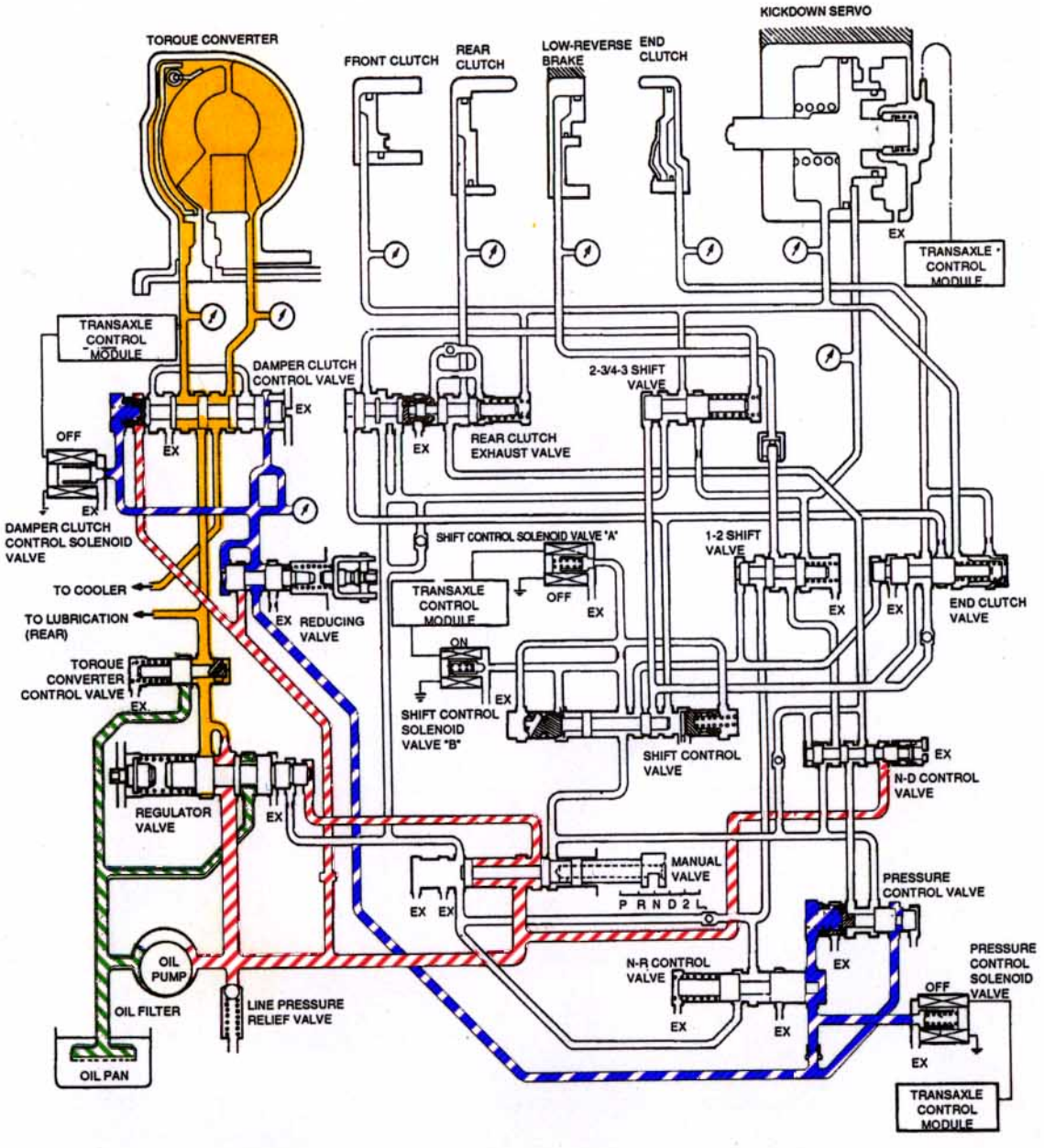
TRANSAXLE CASE

COMPONENTS



ASSEMBLY

1. Using the special tool (09431-21200), drive the shaft oil seal into the transaxle case.

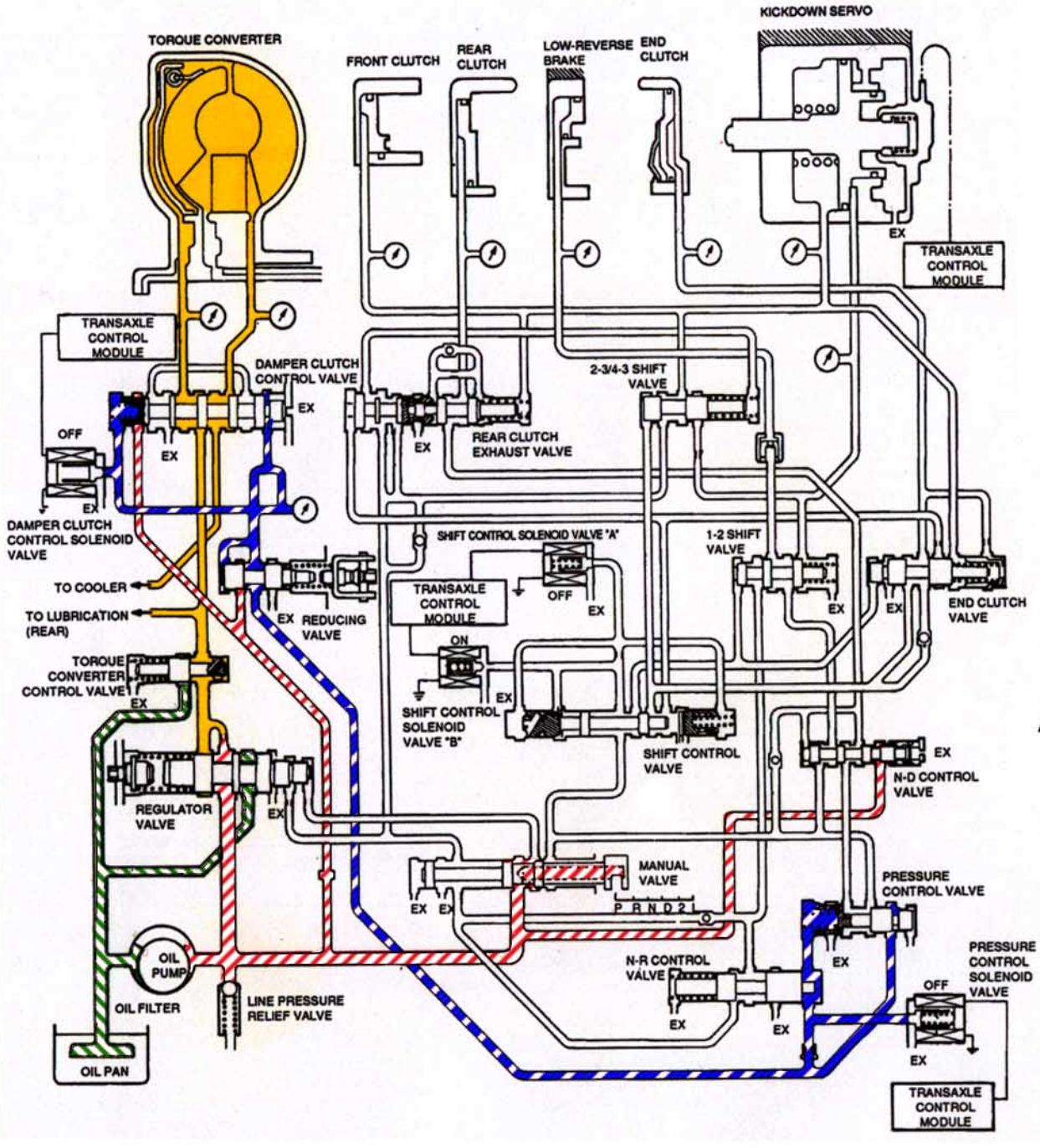


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE

NEUTRAL

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

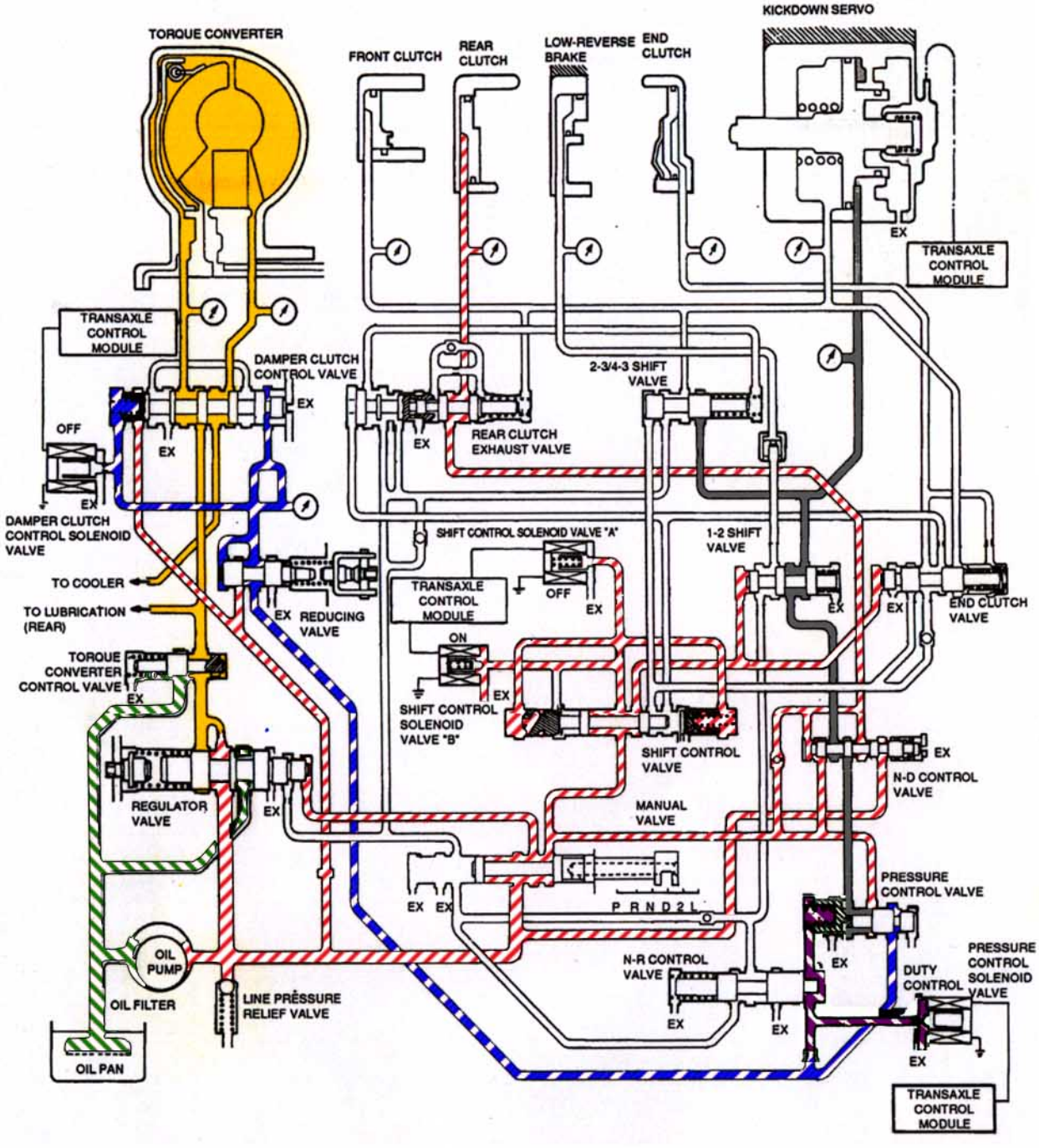


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE

PARKING

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

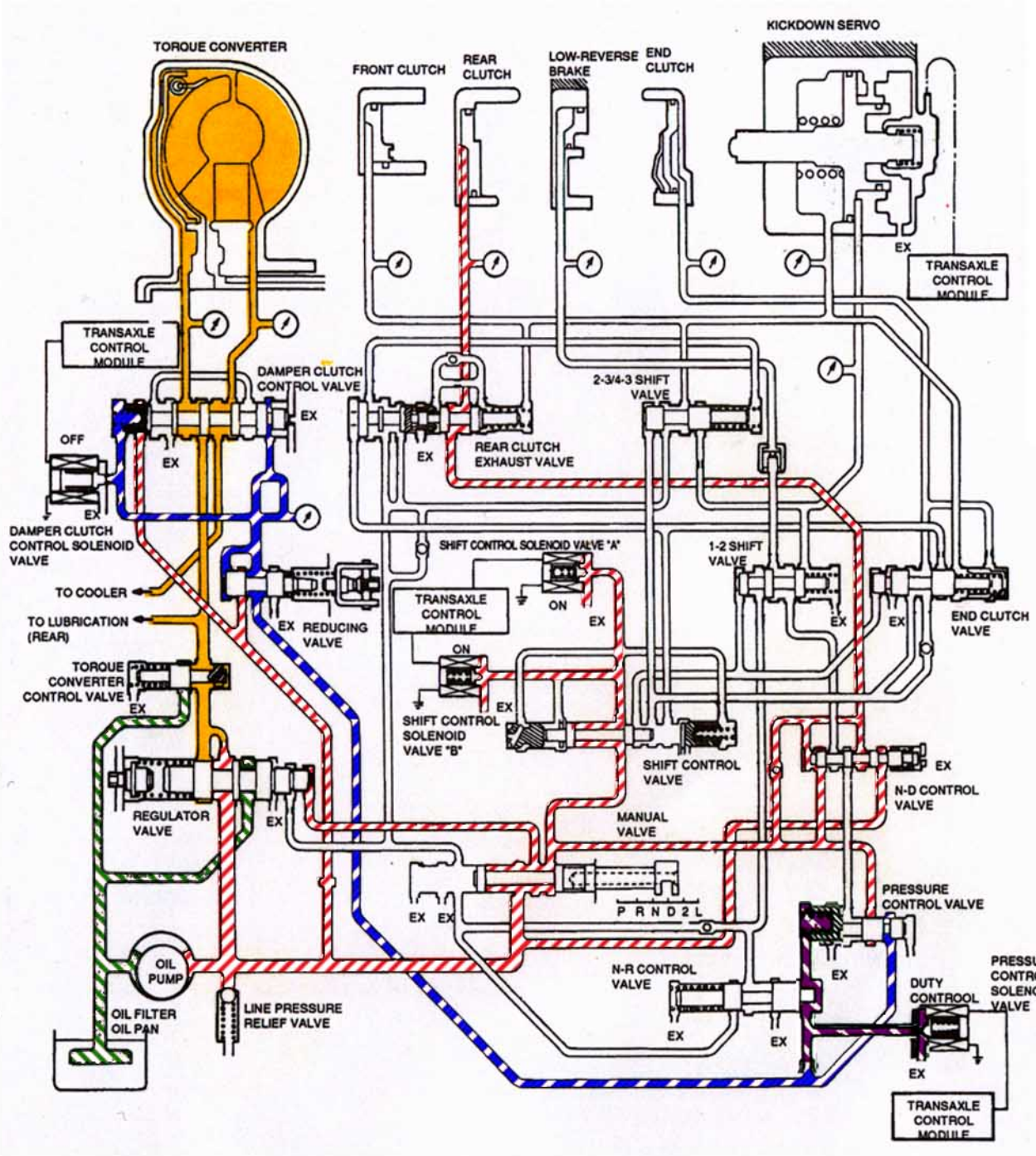


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE
- LINE PRESSURE (SECOND HOLD PRESSURE)
- CONTROL PRESSURE

DRIVE (STOPPING)

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

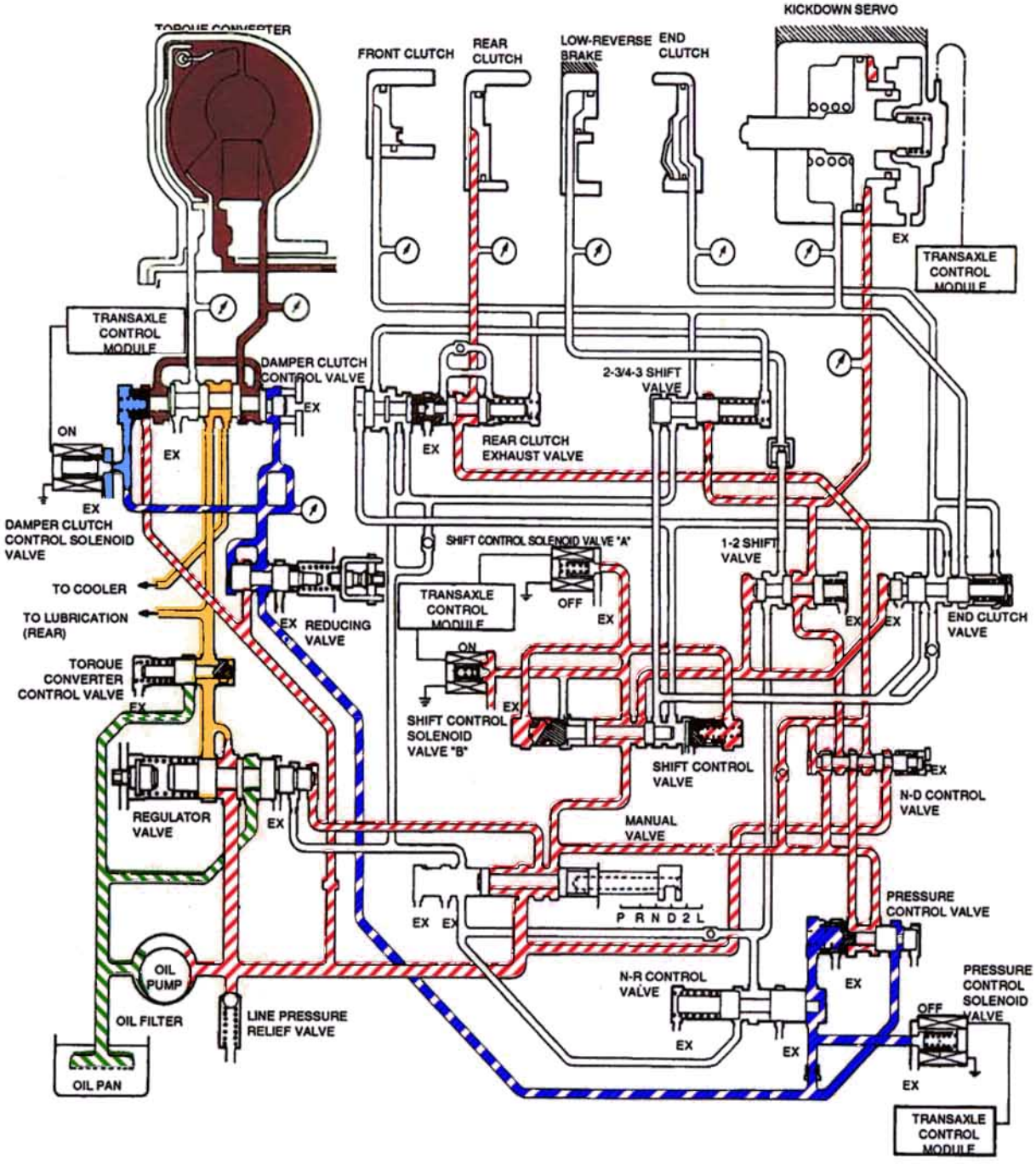


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE
- CONTROL PRESSURE

DRIVE (FIRST)

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

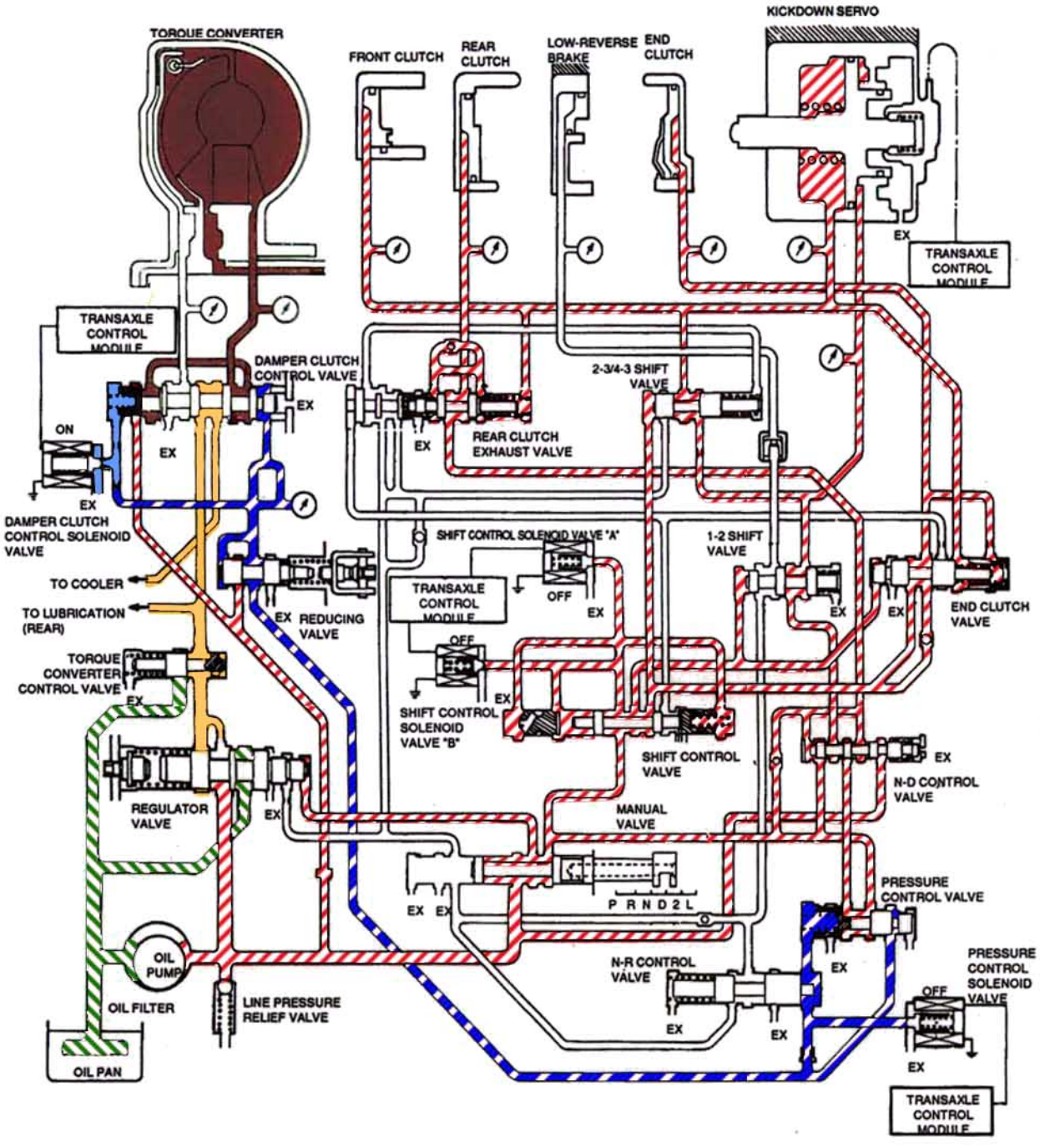


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE
- DAMPER CLUTCH PRESSURE
- DAMPER CLUTCH CONTROL SOLENOID VALVE PRESSURE

DRIVE (SECOND)

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

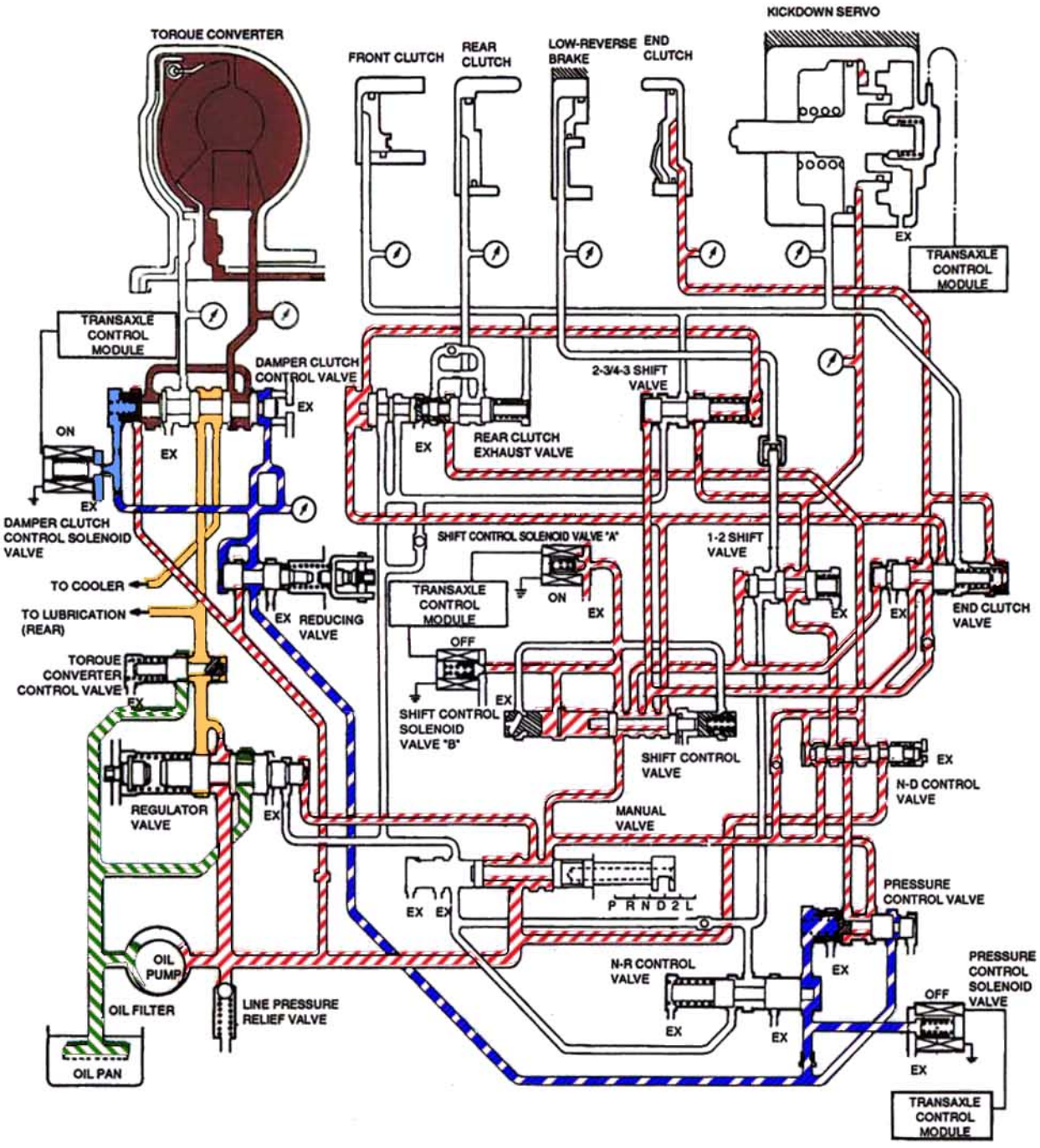


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE
- DAMPER CLUTCH PRESSURE
- DAMPER CLUTCH CONTROL SOLENOID VALVE PRESSURE

DRIVE (THIRD)

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

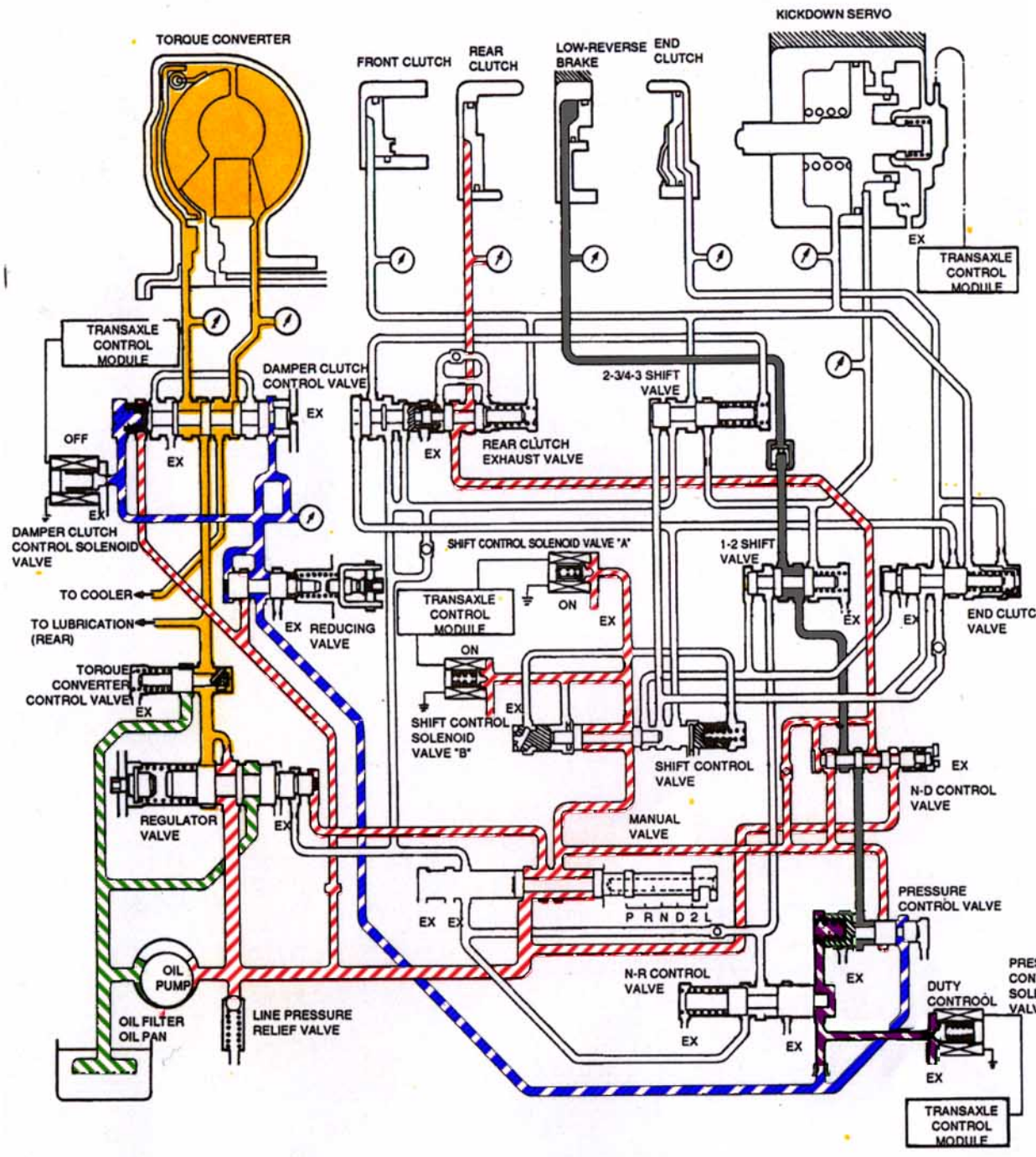


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE
- DAMPER CLUTCH PRESSURE
- DAMPER CLUTCH CONTROL SOLENOID VALVE PRESSURE

DRIVE (FOURTH)

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

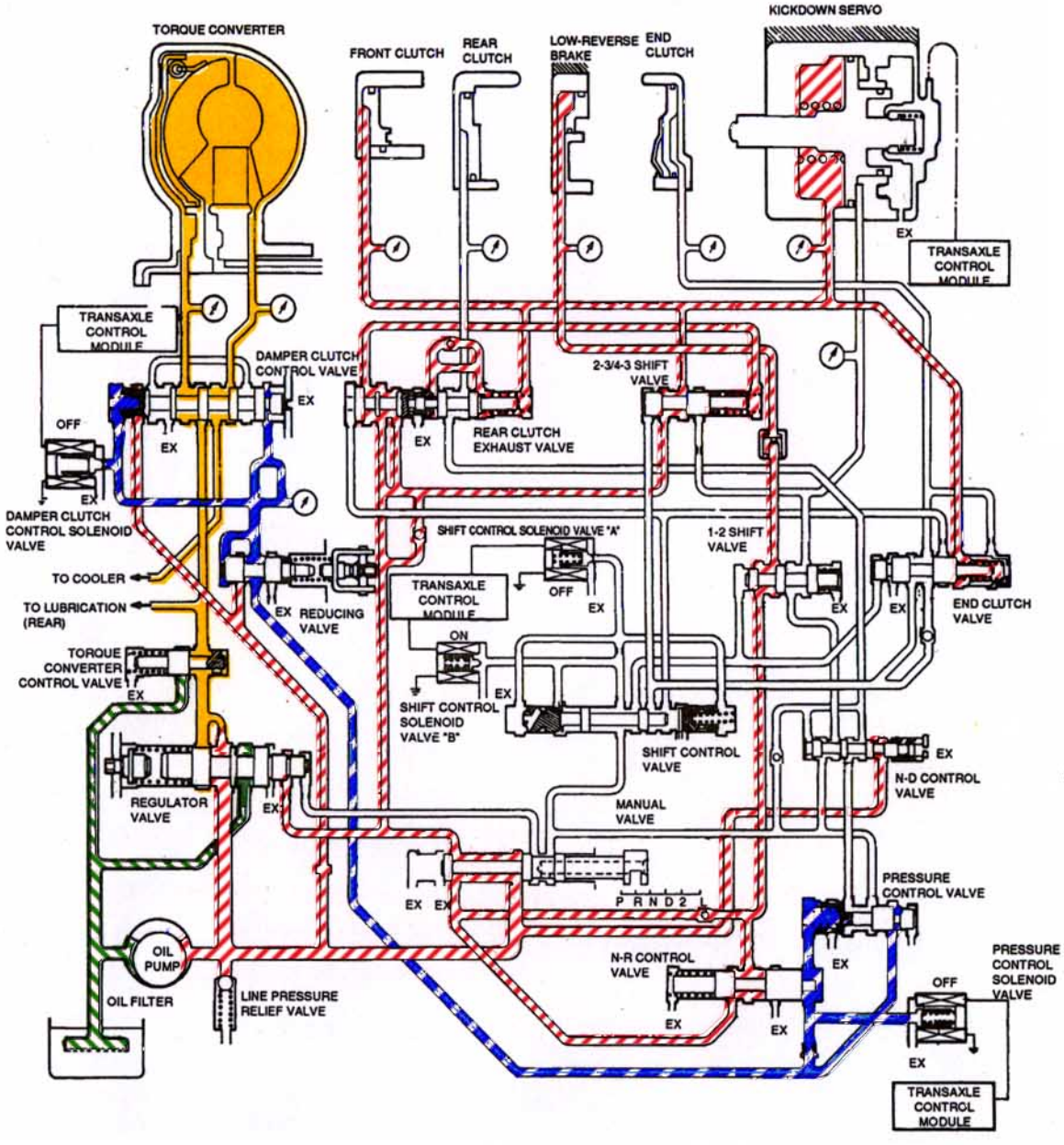


LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE
- LINE PRESSURE "L" RANGE
- CONTROL PRESSURE

LOCK UP

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT



LEGEND

- LINE PRESSURE
- TORQUE CONVERTER AND LUBRICATION PRESSURE
- REDUCING PRESSURE
- PUMP SUCTION PRESSURE

REVERSE

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

MANUAL TRANSAXLE

Return To Main Table of Contents

GENERAL 2
MANUAL TRANSAXLE CONTROL 12
SHIFT LEVER ASSEMBLY 14
MANUAL TRANSAXLE 15
MANUAL TRANSAXLE ASSEMBLY 17
FIFTH SPEED SYNCHRONIZER ASSEMBLY.. 31
INPUT SHAFT 33
INTERMEDIATE SHAFT 39
OUTPUT SHAFT 44
SHIFT FORK 45
DIFFERENTIAL 46
CLUTCH HOUSING 49
SPEEDOMETER DRIVEN GEAR ASSEMBLY 53

GENERAL

SPECIFICATIONS

Model	
Type	S-speed floor shift
Gear ratio First	3.083
Second	1.947
Third	1.285
Fourth	0.939
Fifth	0.756
Reverse	3.083
Final gear ratio	4.592
Speedometer gear ratio (driven/drive)	32/36

SERVICE STANDARD

Standard value	
Input shaft front bearing end play	0.01-0.12 mm (0.0004-0.0047 in.)
Input shaft rear bearing end play	0.01-0.09 mm (0.0004-0.0035 in.)
Intermediate shaft front bearing end play	0.01-0.14 mm (0.0004-0.0055 in.)
Intermediate shaft rear bearing end play	0.05-0.10 mm (0.002-0.0039 in.)
Output shaft bearing end play	0.05-0.10 mm (0.002-0.0039 in.)
Differential case end play	0.05-0.10 mm (0.002-0.0039 in.)
Differential side gear and pinion backlash	0.025-0.15 mm (0.001-0.006 in.)
Limit	
Synchronizer ring and clutch gear clearance	0.5 mm (0.02 in.)

LUBRICANTS

	Recommended lubricant	Quantity
Transaxle oil lit (U.S. gts., Imp.qts.)	Hypoid gear oil, SAE 75W-85W, AP1-GL4	1.8 (1.9, 1.6)
Return spring and bracket sliding part	Multipurpose grease SAE J310, NLG1 NO.2	As required
Drive shaft oil seal lip	Hypoid gear oil, SAE 75W-85W, AP1-GL4	As required
Shift lever bushing	Multipurpose grease SAE J310, NLG1 NO.2	As required

SEALANTS AND ADHESIVES

	Recommended sealants and adhesives	Quantity
Transaxle case and clutch housing alignment surface	THREE BOND 1216	As required
Transaxle case and rear cover alignment surface	THREE BOND 1216	As required
Differential drive gear bolt	THREE BOND 1303 or LOCTITE 648	As required
Bearing retainer bolt (flush bolt only)	THREE BOND 1303	As required

SNAP RING FOR ADJUSTMENT AND SPACER

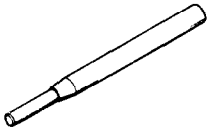
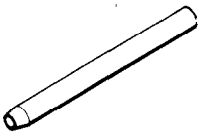
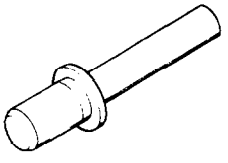
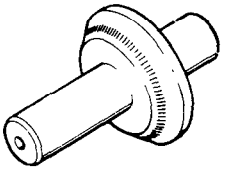
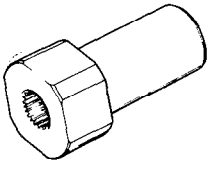
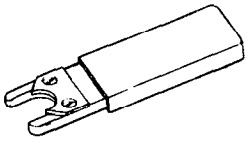
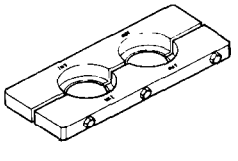
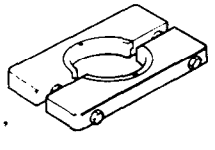
Part name	Thickness mm. (in.)	Identification symbol
Snap ring (For adjustment of input shaft front bearing end play)	2.24 (0.0882) 2.31 (0.0909) 2.38 (0.0937)	None Blue Brown
Snap ring (For adjustment of input shaft rear bearing end play)	1.80 (0.0709) 1.87 (0.0736) 1.94 (0.0764) 2.01 (0.0791) 2.08 (0.0819) 2.15 (0.0846)	Blue White None Green Yellow Brown
Snap ring (For adjustment of intermediate shaft bearing end play)	1.4 (0.0551) 1.5 (0.0591) 1.6 (0.0630) 1.7 (0.0669) 1.8 (0.0708)	Brown None Blue Red White
Spacer: (For adjustment of intermediate shaft end play)	0.62 (0.0244) 0.65 (0.0255) 0.68 (0.0268) 0.71 (0.0280) 0.74 (0.0291) 0.77 (0.0303)	62 65 68 71 74 77
	0.80 (0.0315) 0.83 (0.0327) 0.86 (0.0338) 0.89 (0.0350) 0.92 (0.0362) 0.95 (0.0374) 0.98 (0.0386) 1.01 (0.0394) 1.04 (0.0409) 1.07 (0.0421) 1.10 (0.0433) 1.13 (0.0445) 1.16 (0.0457) 1.19 (0.0468) 1.22 (0.0480) 1.25 (0.0492) 1.28 (0.0504) 1.31 (0.0516) 1.34 (0.0527) 1.37 (0.0539)	80 83 86 89 92 95 98 01 04 07 10 13 16 19 22 25 28 31 34 37

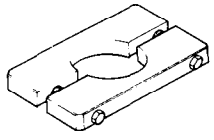
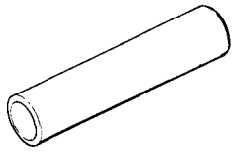
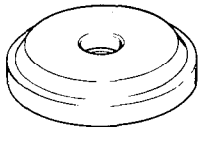
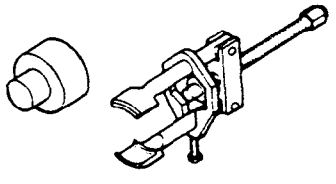
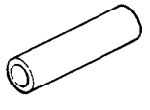
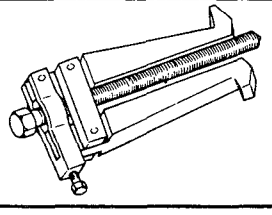
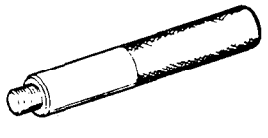
Part name	Thickness mm. (in.)	Identification symbol
Spacer (For adjustment of output shaft end play)	0.74 (0.0291) 0.77(0.0303) 0.80(0.0315) 0.83(0.0327) 0.86(0.0338) 0.89(0.0350) 0.92(0.0362) 0.95(0.0374) 0.98(0.0386) 1.01(0.0398) 1.04(0.0409) 1.07(0.0421) 1.10(0.0433) 1.13(0.0445) 1.16(0.0457) 1.19(0.0468) 1.22(0.0480) 1.25(0.0492) 1.28(0.0504) 1.31(0.0516) 1.34(0.0527)	74 77 80 83 86 89 92 95 98 01 04 07 10 13 16 19 22 25 28 31 34
Spacer (For adjustment of differential case end play)	0.80(0.0315) 0.83(0.0327) 0.86(0.0338) 0.89(0.0350) 0.92(0.0362) 0.95(0.0374) 0.98(0.0386) 1.01(0.0398) 1.04(0.0409) 1.07(0.0421) 1.10(0.0421) 1.13(0.0445) 1.16(0.0457) 1.19(0.0469) 1.22(0.0480)	80 83 86 89 92 95 98 01 04 07 10 13 16 19 22
Spacer (For adjustment of differential pinion backlash)	0.75-0.82(0.0295-0.0323) 0.83-0.92(0.0327-0.0362) 0.93-1.00(0.0366-0.0394) 1.01-1.08(0.0398-0.0425) 1.09-1.16(0.0429-0.0457)	- - - - -

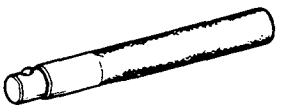
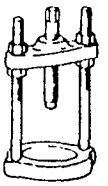
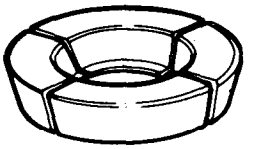
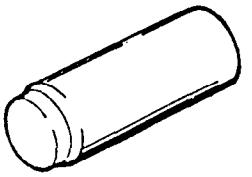
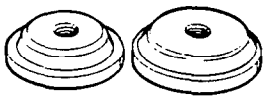
TIGHTENING TORQUE

	Nm	Kg.cm	lb.ft
Shift cable and select cable to body	12-15	120-150	9-1
Shift lever assembly to body	9-14	90-140	17-10
Shift lever (A) to bracket assembly	19-28	190-280	13-20
Clutch release cylinder mounting bolts	20-27	200-270	15-19
Clutch tube flare nut	13-17	130-170	9-12
Clutch tube to transaxle assembly	15-22	150-220	11-16
Starter motor mounting bolts	27-34	270-340	20-25
Transaxle mount bracket to transaxle	60-80	600-800	43-58
Transaxle mount bracket to body	90-110	900-1100	65-80
Transaxle mount bracket to tension rod	75-95	750-950	54-69
Tension rod to tension rod bracket	35-55	350-550	25-40
Bell housing cover mounting bolts	8-10	80-100	6-7
Transaxle mounting bolt [12 mm (0.47 in.) diameter bolt]	43-55	430-550	32-39
Transaxle mounting bolt [10 mm (0.39 in.) diameter bolt]	30-35	300-350	22-25
Transaxle mounting bolt [8 mm (0.31 in.) diameter bolt]	8-10	80-100	6-7
Rear cover bolt	15-22	150-220	11-15
Backup lamp switch	30-35	300-350	22-25
Poppet plug	30-42	300-420	22-30
Filler plug	30-35	300-350	22-25
Drain plug	30-35	300-350	22-25
Speedometer sleeve bolt	3-5	30-50	2-4
Input shaft lock nut	140-160	1400-1600	102-115
Intermediate shaft lock nut	140-160	1400-1600	102-115
Reverse idler gear shaft bolt	43-55	430-550	32-39
Transaxle case tightening bolt	35-42	350420	26-30
Stopper bracket bolt	15-22	150-220	11-15
Restriction ball assembly	30-35	300-350	22-25
Reverse shift lever assembly installation bolt	15-22	150-220	11-15
Bearing retainer bolt	15-22	150-220	11-15
Differential drive gear bolt	130-140	1300-1400	94-10
Interlock plate bolt	20-27	200-270	115-191
Select lever assembly mounting bolt	15-22	150-220	1-15
Reverse brake cone mounting bolts	4.0-5.5	40-55	3-4

SPECIAL TOOLS

Tool (Number and Name)	Illustration	Use
09414-11000 Lock pin extractor		1) Driving out the spring pin of the clutch shaft 2) Driving out the spring pin of the shift fork
09414-11100 Lock pin installer		Driving in the spring pin of the shift fork
09431-21000 Front oil seal installer		Installation of the input shaft front oil seal
09431-21200 Oil seal installer		Installation of differential oil seal
09432-21101 Input shaft holder		Holding the input shaft when loosening input shaft nut
09432-21201 Snap ring remover		Removal of input shaft snap ring
09432-21300 Removing plate		Removal of input shaft front and rear bearing
09432-33100 Removing plate		1) Removal of intermediate shaft first gear and taper roller bearing 2) Removal of intermediate shaft second gear

Tool (Number and Name)	Illustration	Use
09432-33200 Removing plate		1) Removal of taper roller bearing of output shaft. 2) Removal of input shaft third, fourth gear and bearing.
09432-33300 Bearing installer		1) Installation of input shaft bearing sleeve. 2) Installation of output shaft taper roller bearing. 3) Installation of the intermediate shaft front and rear bearing. 4) Installation of the input shaft third, fourth gear and bearing.
09432-33400 Bearing race installer		Installation of intermediate shaft bearing outer race (use with 09500-21000)
09455-21000 Bearing and gear puller		1) Removal of intermediate gear and needle bearing. 2) Removal of input shaft fifth speed gear sleeve.
09455-21100 Bearing installer		Installation of differential bearing
09455-32200 Oil seal puller		Removal of output shaft bearing outer race and intermediate shaft bearing outer race
09500-11000 Bar		Installation of differential bearing outer race and output shaft bearing outer race (use with 09532-11500)

Tool (Number and Name)	Illustration	Use
09500-21000 Bar		Installation of intermediate shaft bearing outer race (use with 09432-33400)
09532-11000 Taper roller bearing puller		Removal of the differential case side bearing (use with 09532-11100 and 09532-11301)
09532-11100 Side bearing remove adaptor		Removal of the differential case side bearing (use with 09532-11000 and 09532-11301)
09532-11301 Puller cup		Removal of the differential case side bearing (use with 09532-11000 and 09532-11100)
09532-11500 Pinion bearing outer race installer		1) Installation of differential bearing outer race and output shaft bearing outer race (use with 09500-11000) 2) Installation of output shaft bearing outer race (use with 09500-11000)

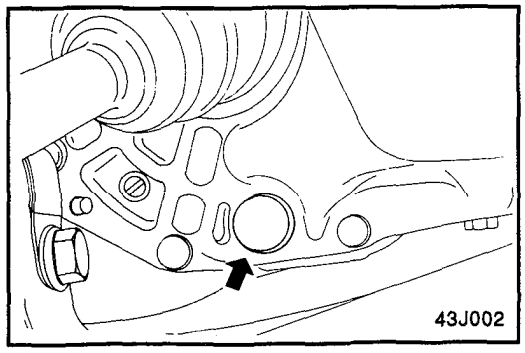
TROUBLESHOOTING

Symptom	Probable cause	Remedy
Vibration, noise	Loose or damaged transaxle and engine-mounts	Tighten or replace mounts
	Inadequate shaft end play	Correct end play
	Worn or damaged gears	Replace gears
	Use of inadequate grade of oil	Replace with specified oil
	Low oil level	Replenish
	Inadequate engine idle speed	Adjust idle speed
Oil leakage	Broken or damaged, oil seal or O-ring	Replace oil seal or O-ring
Hard shift	Faulty control cable	Replace control cable
	Poor contact or wear of synchronizer ring and gear cone	Correct or replace
	Weakened synchronizer spring	Replace synchronizer spring
	Use of inadequate grade of oil	Replace with specified oil
Jumps out of gear	Worn gear shift fork or broken poppet spring	Replace shift fork or poppet spring
	Synchronizer hub to sleeve spline clearance too large	Replace synchronizer hub and sleeve

SERVICE ADJUSTMENT PROCEDURES

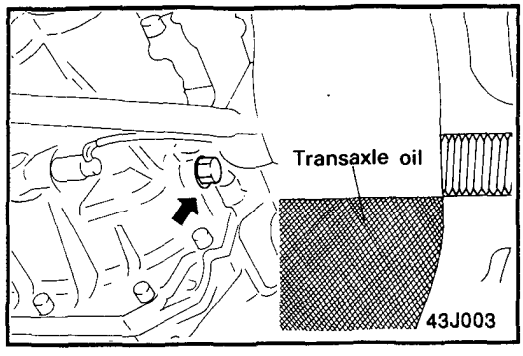
REPLACEMENT OF TRANSAXLE OIL

1. With the vehicle on a flat and level surface, remove the drain plug and drain out the transaxle oil.



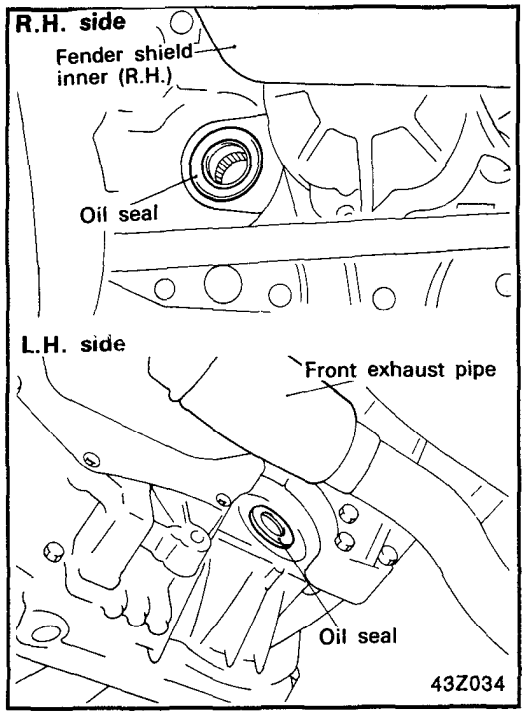
2. Fill transaxle oil (through the filler plug pat) until the oil level is the same level as the **plug hole.**

   Transaxle oil : Hypoid gear oil, SAE 75W-85W, API-GL4 [1.8 LIT. (1.9 U.S.qts., 1.6 Imp.qts.)]

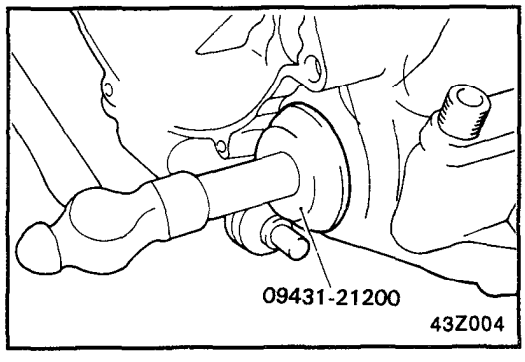


REPLACEMENT OF DRIVE SHAFT OIL SEALS

1. Disconnect the drive shaft from the transaxle (Refer to drive shaft).
2. Using a flat-tip (-) screwdriver, remove the oil seal.

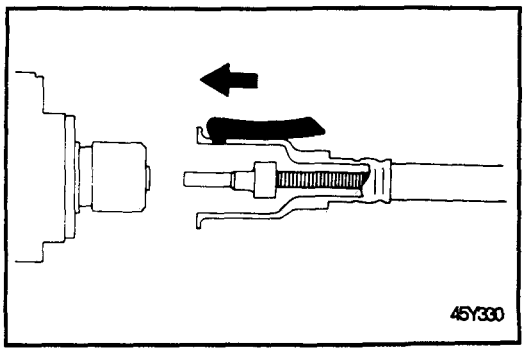


3. Using the special tool (09431-21200), tap the drive shaft oil seal into the transaxle.
4. Apply a coating of the transaxle oil to the lip of the oil seal.



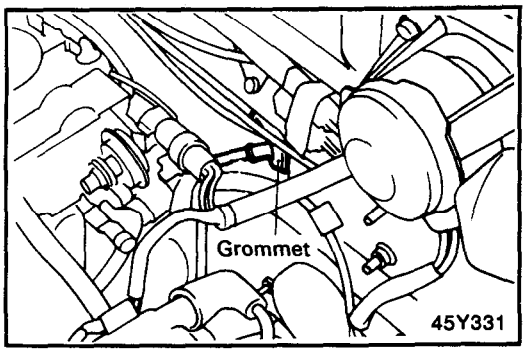
REPLACEMENT OF SPEEDOMETER CABLE

1. Remove the old cable.
2. When connecting the cable to the speedometer, insert the cable until its stopper properly fits to the meter side groove.



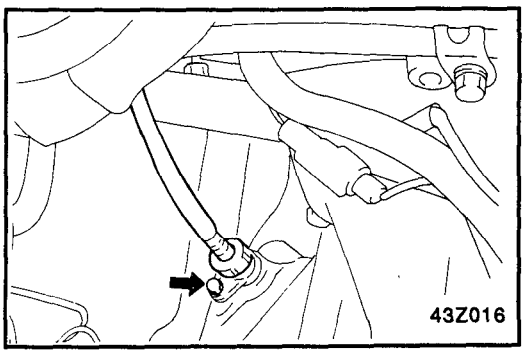
3. Install the grommet so that, as shown in the illustration, the cable attachment part and the projecting part are horizontal.

   Caution
   The cable arrangement should be made so that the radius of the cable bend is 150 mm (5.9 in.) or more.



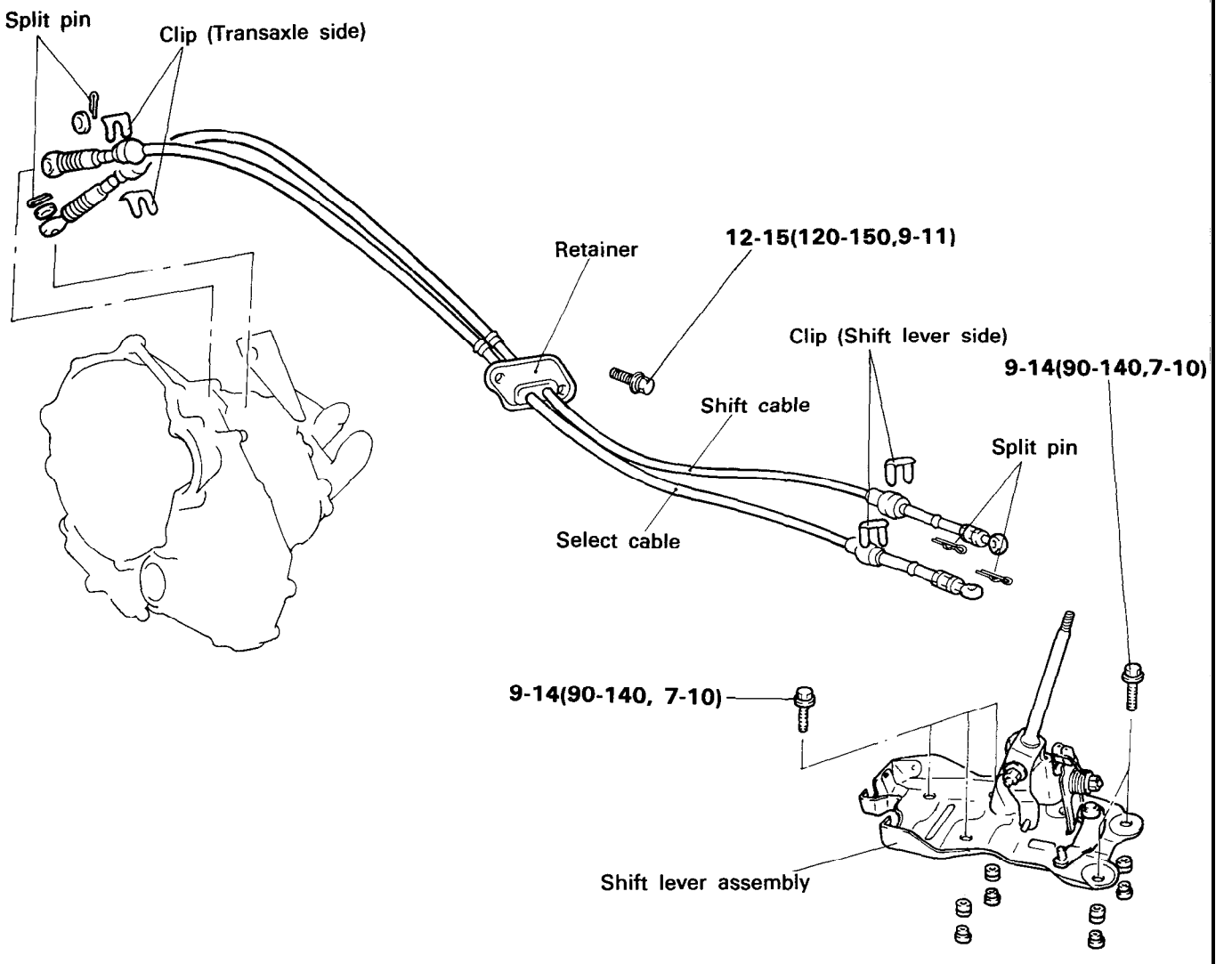
4. At the transaxle end of the speedometer cable, the key joint should be inserted into the transaxle, and the nut tightened.

   Caution
   If the cable is not correctly and securely connected, it may cause incorrect reading by the speedometer or abnormal noise.



MANUAL TRANSAXLE CONTROL

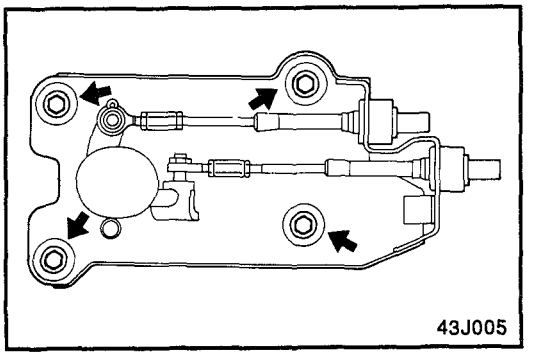
COMPONENTS



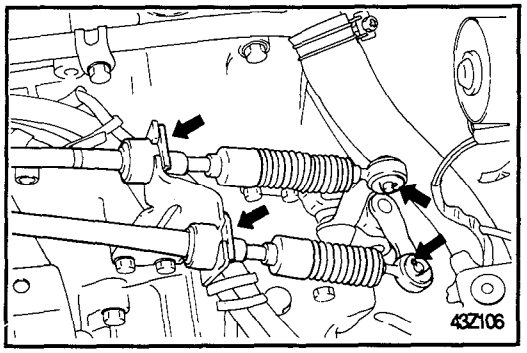
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Remove the console assembly (Refer to CONSOLE).
2. Remove the split pins and clips (shift lever side).
3. Remove the shift lever assembly.



4. Remove the retainer and bolts.
5. Remove the air cleaner assembly.
6. Remove the split pins and clips (Transaxle side).
7. Remove the shift cable and select cable.

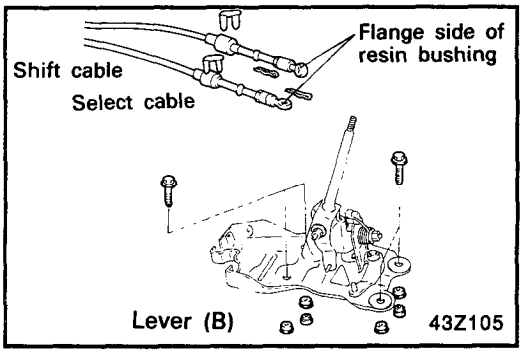


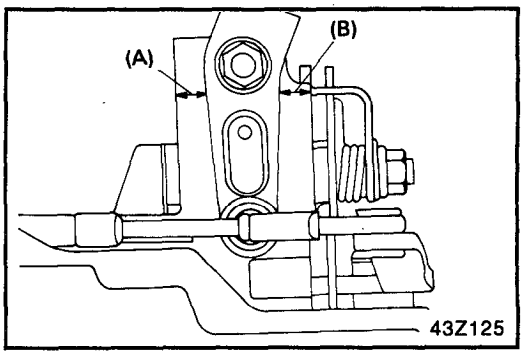
INSPECTION

1. Check the select cable for operation and for damage.
2. Check the shift cable for proper operation and for damage.
3. Check the boot for damage.
4. Check each bushing for wear, abrasion, sticking, restricted movement or damage.
5. Check for a weak or damaged spring.

INSTALLATION

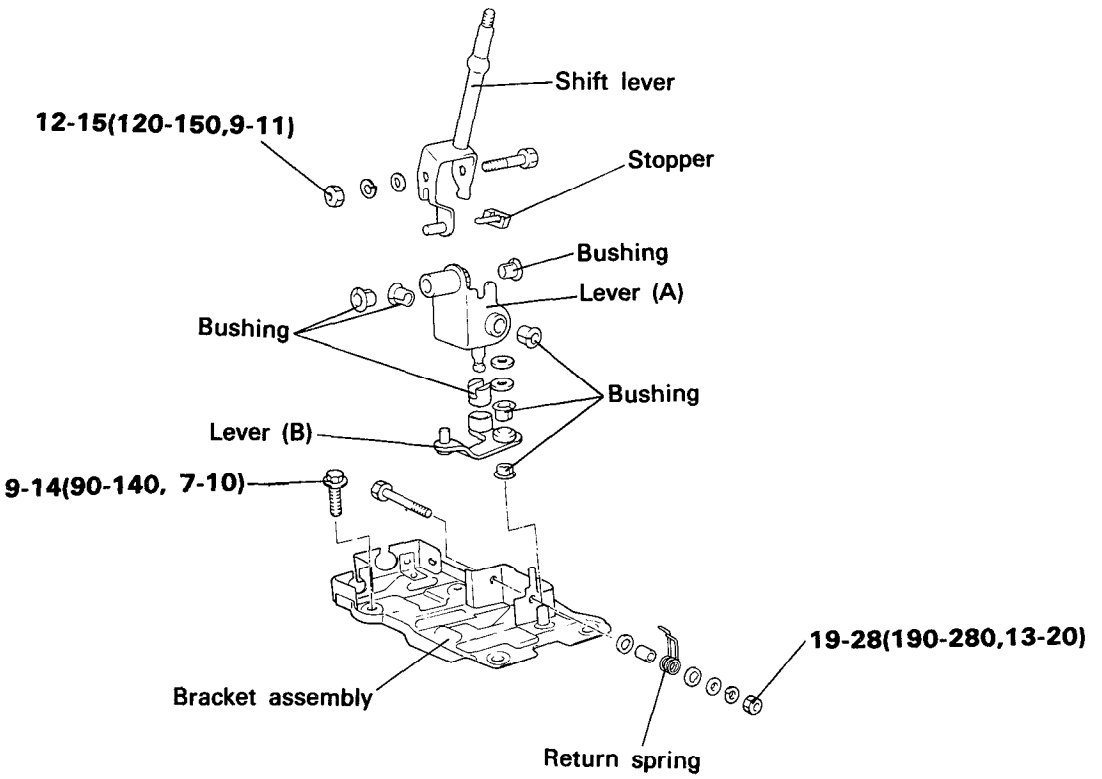
1. Install the shift lever assembly.
2. Installation of shift lever and select cable.
   1) Move the transaxle select lever and shift lever to the neutral position.
   2) When connecting the select cable to lever(B), adjust the select cable's length so that lever (B) is at the neutral position.
   3) The flange side of the resin bushing at the select cable end should be at the lever (B) end surface.
   4) The flange side of the resin bushing at the shift cable end should be at the shift lever's cotter pin hole.
   5) After connecting the shift cable, check that the dimensions (A) and (B) shown in the illustration are equal.
   6) Move the shift lever to each position and verify that the shifting is smooth.
3. Install the retainer and bolts.
4. Install the air cleaner assembly





SHIFT- LEVER ASSEMBLY

COMPONENTS



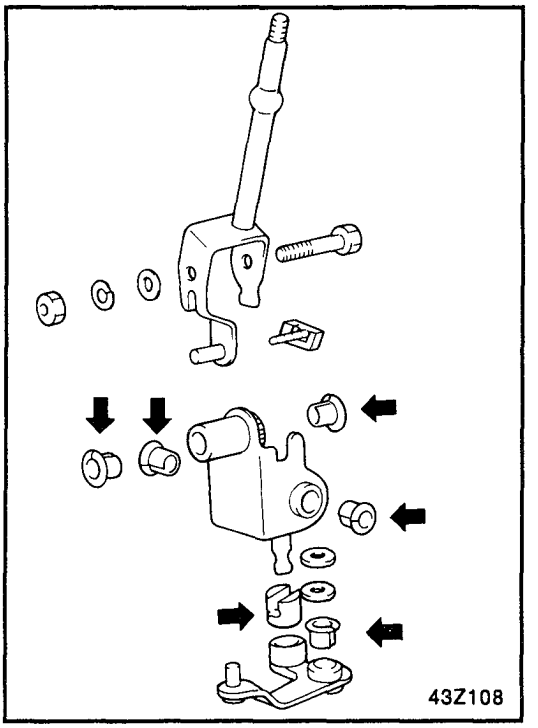
TORQUE : Nm (kg.cm, lb.ft)

INSPECTION

1. Inspect the bushing for wear or damage.
2. Inspect the return spring for damage or deterioration.

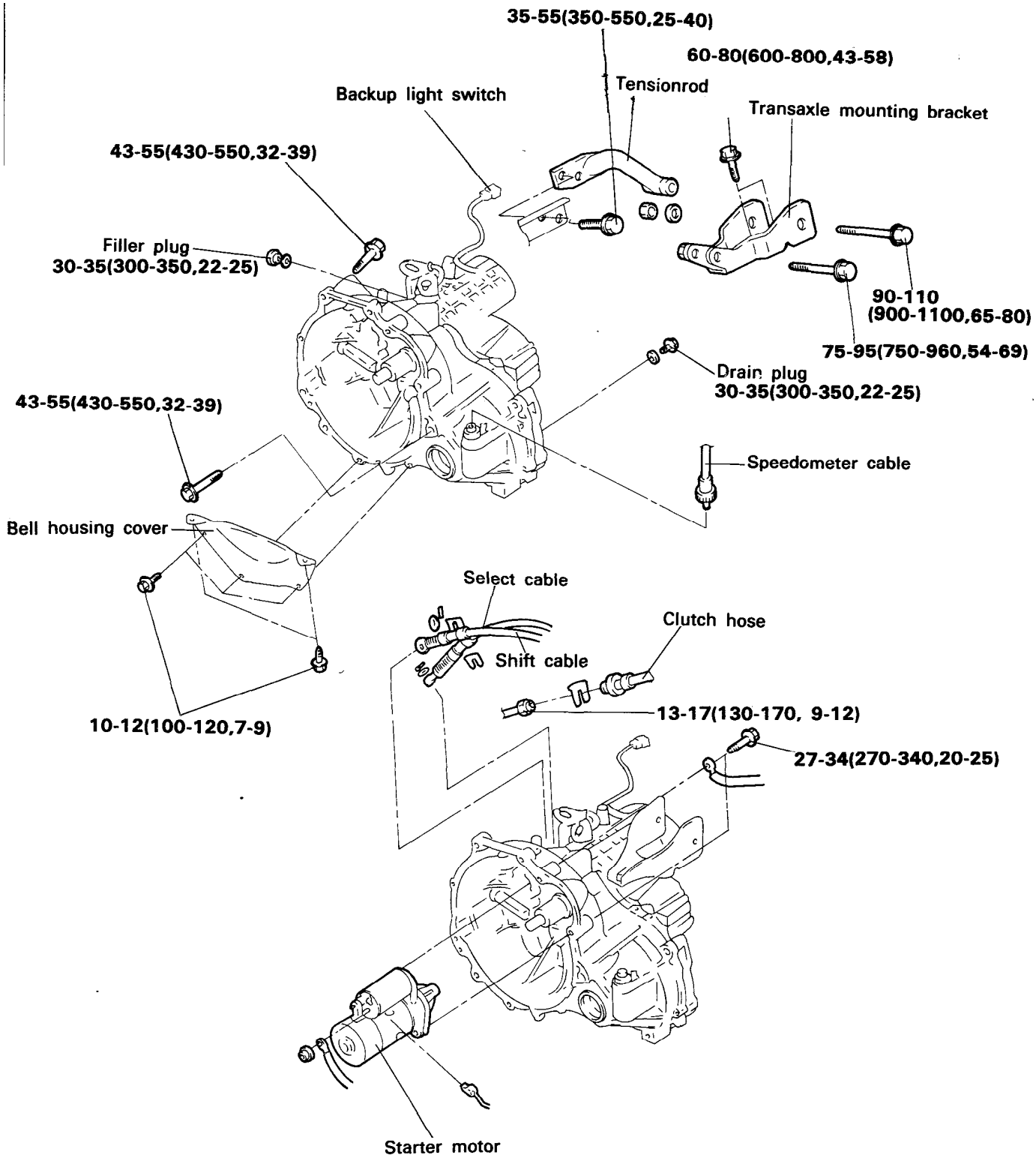
ASSEMBLY

1. Apply multi-purpose grease to the sliding part of the bushings.
2. Assembly is the reverse of disassembly.



MANUAL TRANSAXLE

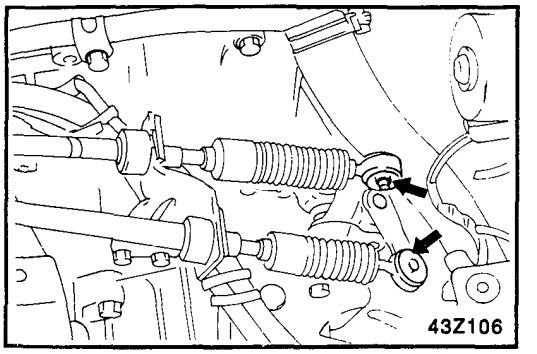
COMPONENTS



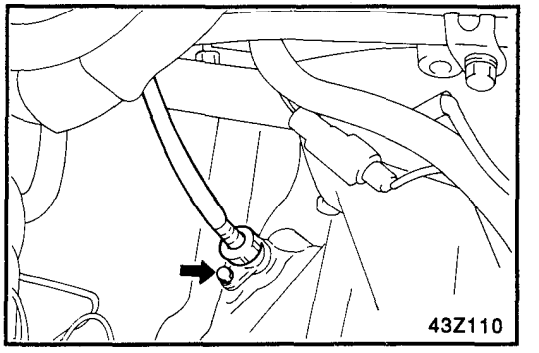
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

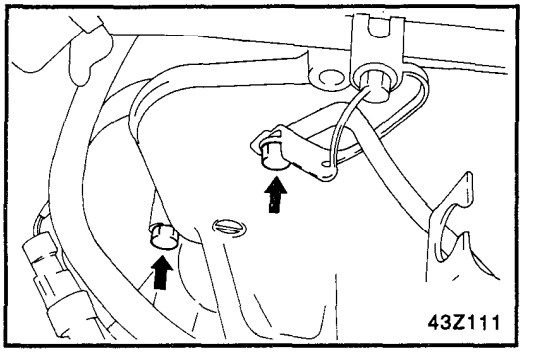
1. Remove the clutch release cylinder (Refer to clutch part.)
2. Remove the drain plug and drain the transaxle oil.
3. Remove the air cleaner assembly.
4. Remove the select cable and shift cable (Refer to MANUAL TRANSAXLE CONTROL SECTION)



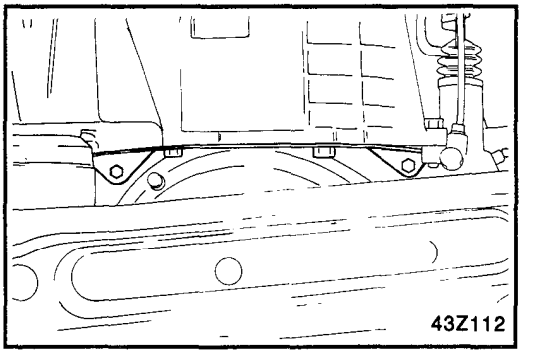
5. Separate the backup light switch connector.
6. Disconnect the speedometer cable.



7. Remove the starter motor mounting bolts.
   Remove the transaxle assembly upper connecting bolts and transaxle mounting bracket bolt.

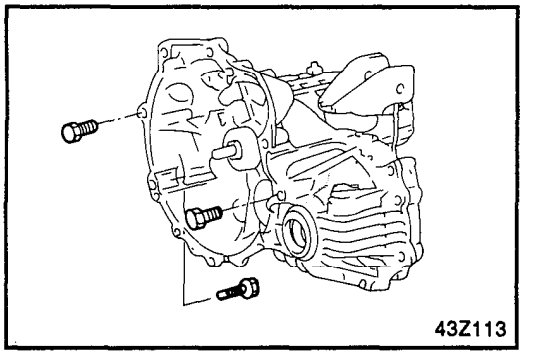


8. Remove the splash shield.
9. Disconnect the tie rod end, lower the arm ball joint and drive shaft (Refer to DRIVE SHAFT AND FRONT AXLE SECTION)
10. Remove the bell housing cover.

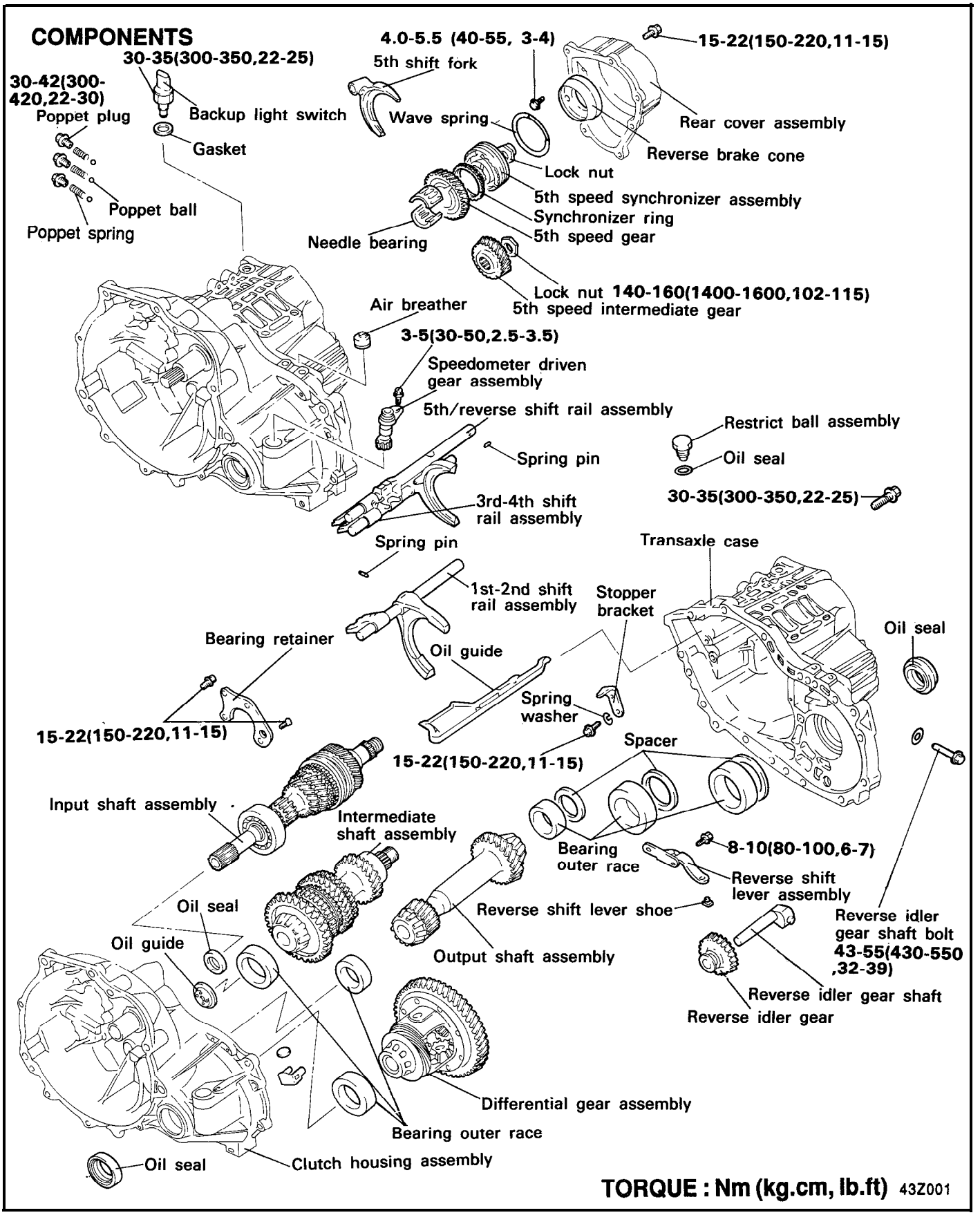


11. Remove the transaxle assembly lower mounting bolts with the transaxle assembly supported by a jack.
12. Remove the transaxle assembly.

NOTE
When supporting the transaxle assembly, make sure that the lifting force is applied to a wide area, not to a small localized area.

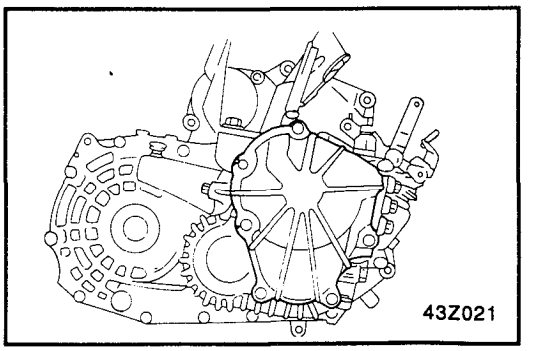


MANUAL TRANSAXLE ASSEMBLY

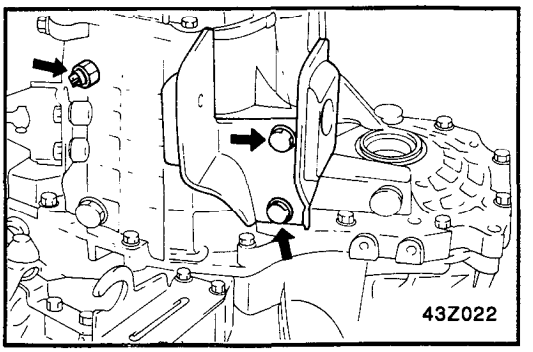


DISASSEMBLY

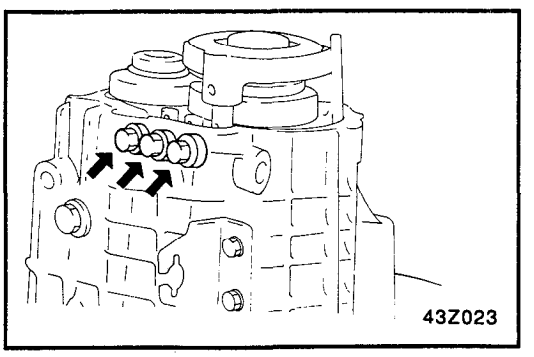
1. Remove the rear cover bolt and rear cover.



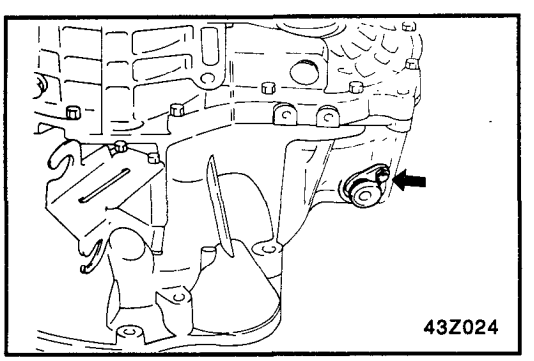
2. Remove the backup light switch, gasket and mounting bracket.



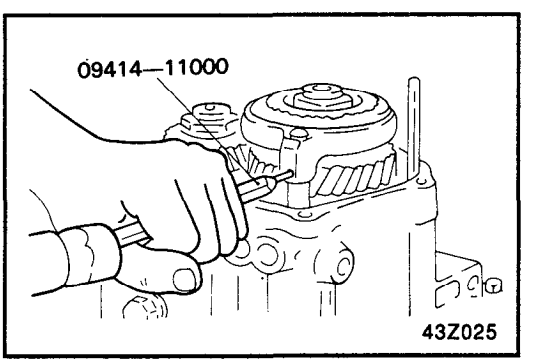
3. Remove the poppet plugs, poppet springs and poppet balls.



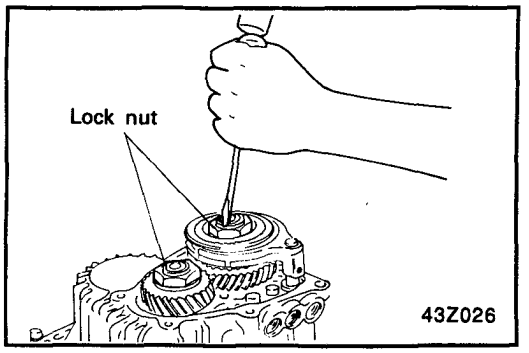
4. Remove the speedometer driven gear assembly.



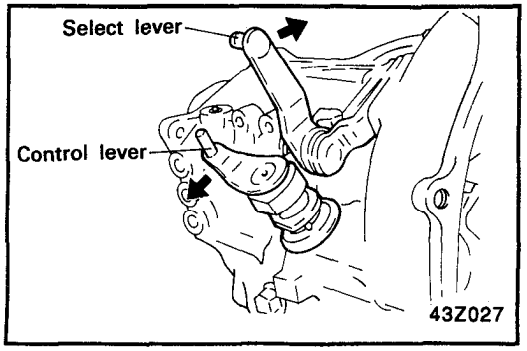
5. Remove the spring pin using the special tool (09414-11000).



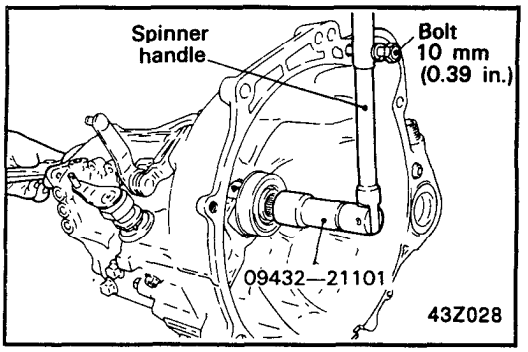
6. Removal of the lock nuts
   1) Unstake lock nuts of the input shaft and intermediate shaft.



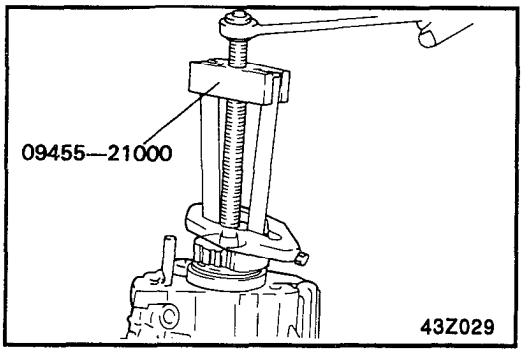
   2) Shift the transaxle in reverse using the control lever and select lever.



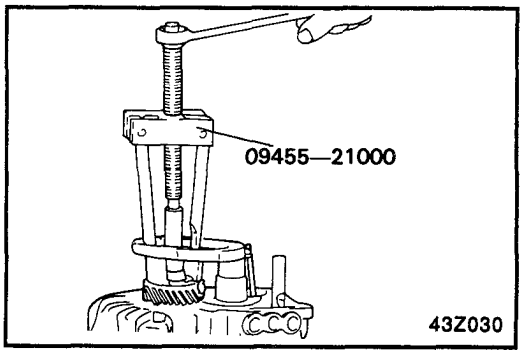
   3) Install the special tool (09432-21101) onto the input shaft.
   4) Screw a bolt 10 mm (0.39 in.) into the hole on the periphery of clutch housing and attach a spinner handle to the special tool.
   5) Remove the lock nut, while using the bolt as a spinner handle stopper.



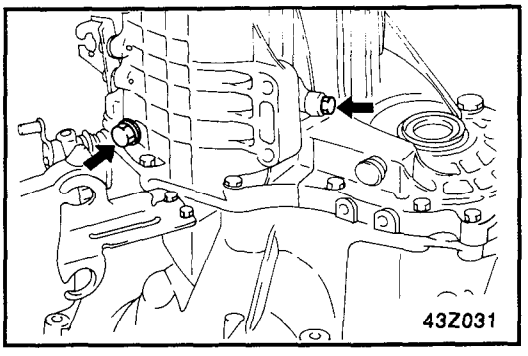
7. Remove the fifth speed synchronizer sleeve and fifth speed shift fork.
8. Remove the fifth speed synchronizer hub, synchronizer ring, fifth speed gear and needle bearing.



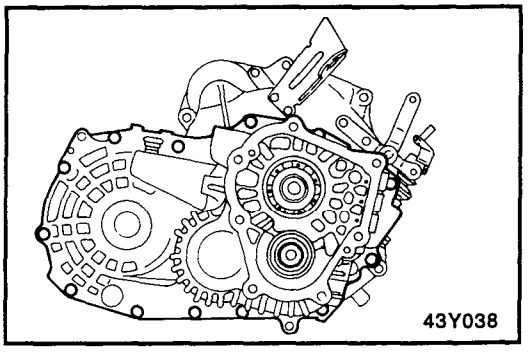
9. Remove the intermediate gear using the special tool (09455 21000).



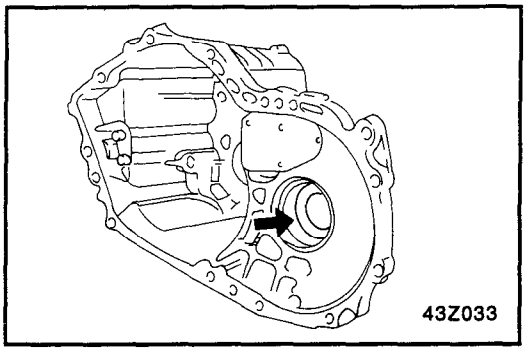
10. Remove the reverse idler gear shaft bolt and restriction ball assembly.



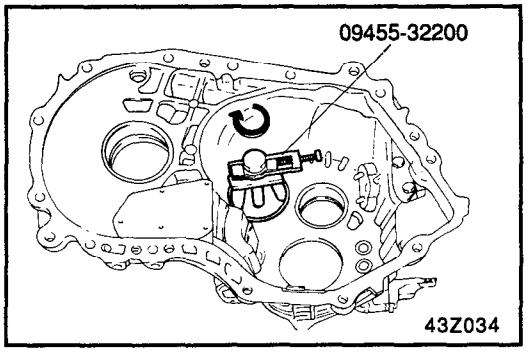
11. Remove the transaxle cover bolts (13 EA) and transaxle cover.



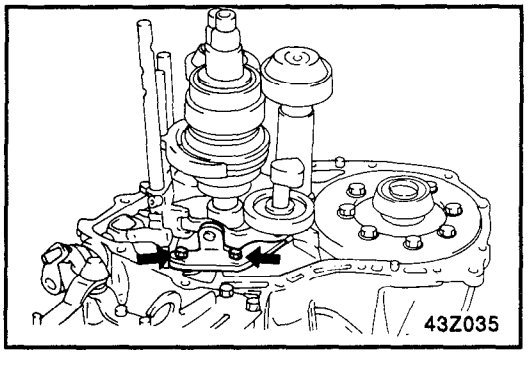
12. Remove the differential oil seal and oil guide.



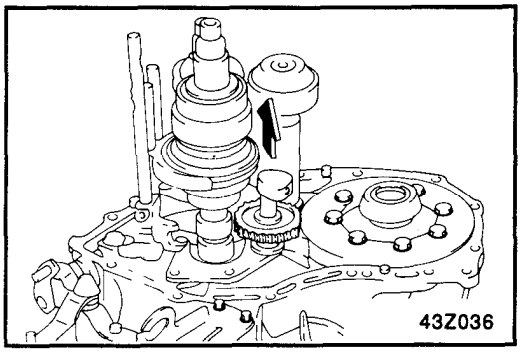
13. Remove the output shaft bearing outer race and spacer using the special tool (09455-32200).
14. Remove the intermediate shaft bearing outer race and spacer.
15. Remove the differential bearing outer race and spacer.



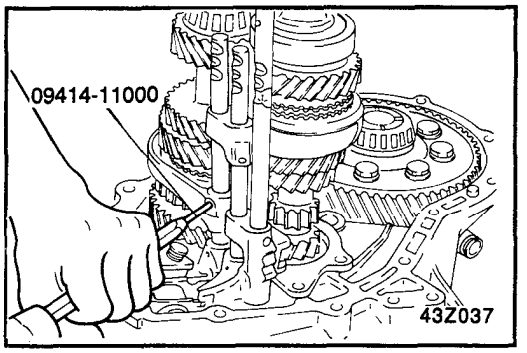
16. Remove the reverse shift lever and the reverse shift shoe.



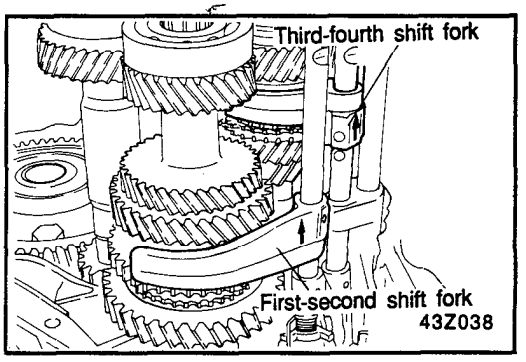
17. Remove the reverse gear shaft and reverse gear.



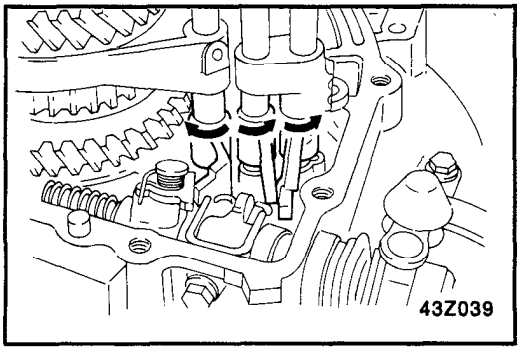
18. Remove the spring pins using the special tool ,(09414-11000).



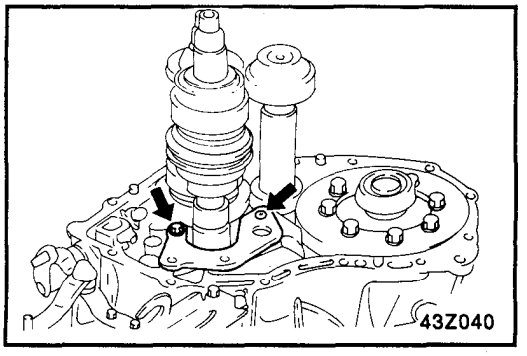
19. Disassembly of shift rail assembly.
    1) Shift the first-second speed shift fork to the second speed.
    2) Shift the third-fourth speed shift fork to the fourth speed.



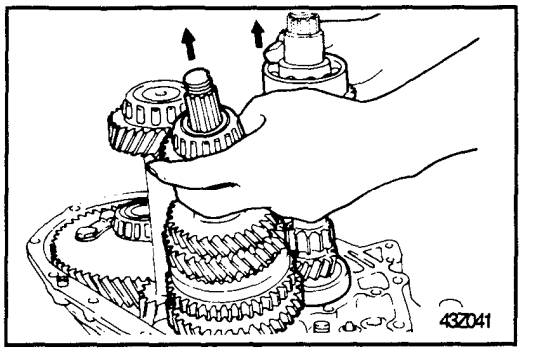
    3) Remove the shift rail assembly.



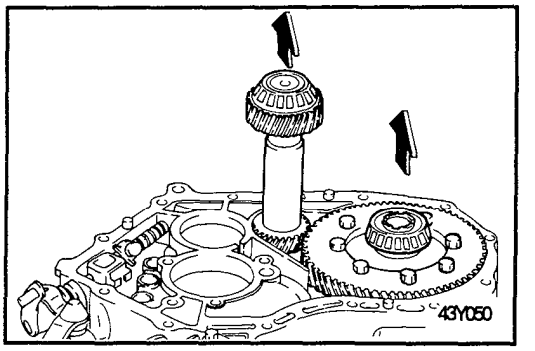
20. Remove the bearing retainer.



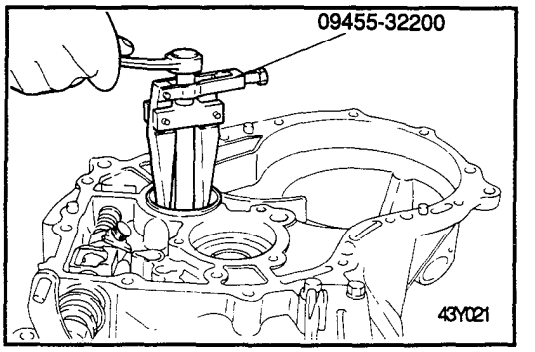
21. Lift up the input shaft assembly and remove the intermediate shaft assembly.



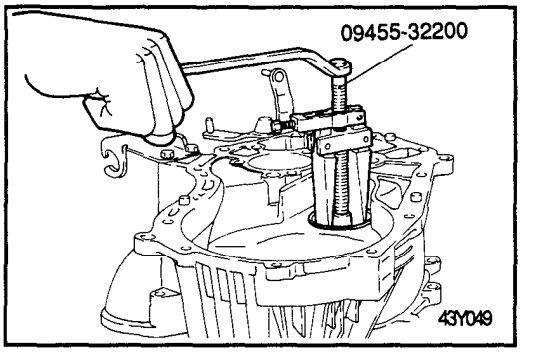
22. Remove the output shaft assembly and differential gear assembly.



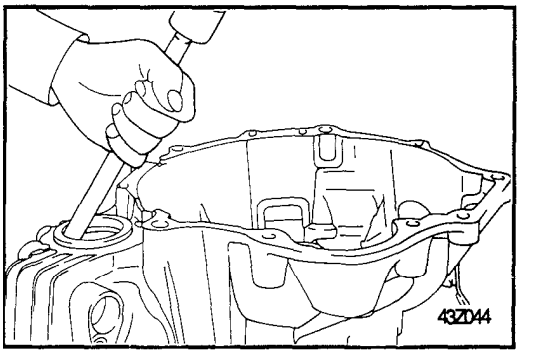
23. Remove the intermediate shaft bearing outer race and spacer and oil guide using the special tool (09455-32200).



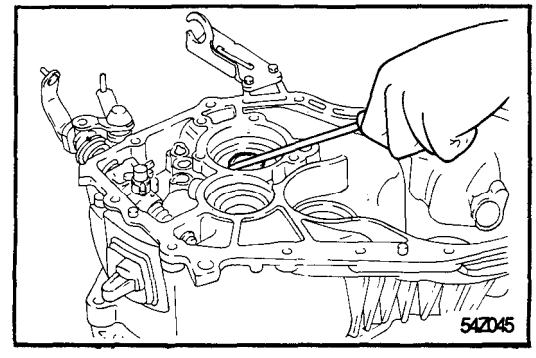
24. Remove the output shaft bearing outer race and spacer using the special tool (09455-32200).



25. Remove the differential bearing oil seal and the differential bearing outer race.

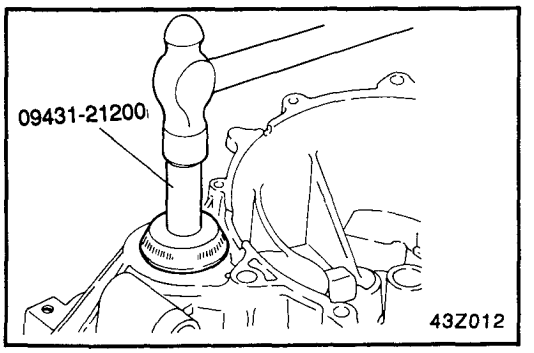


26. Remove the input shaft oil seal.

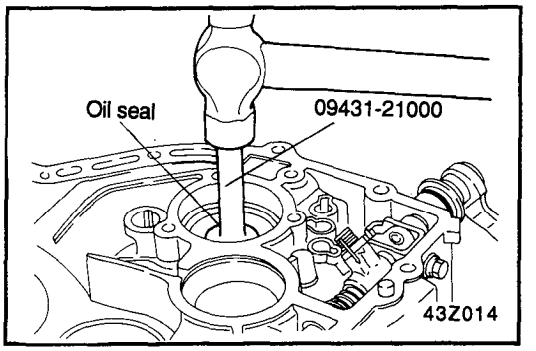


INSTALLATION

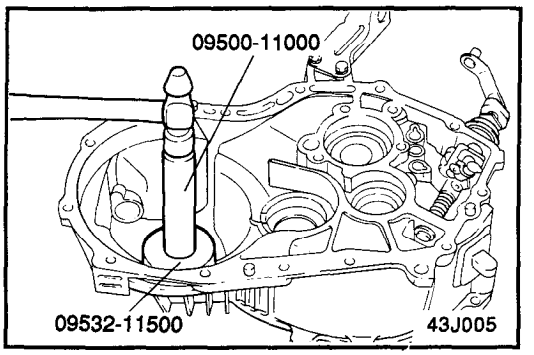
1. Install the drive shaft oil seal using the special tool (09431-21200).



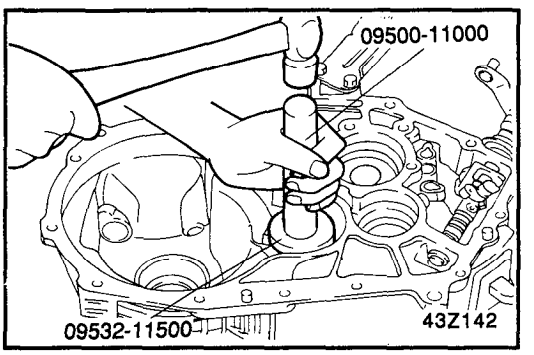
2. Install the input shaft front oil seal using the special tool (09431-21000).



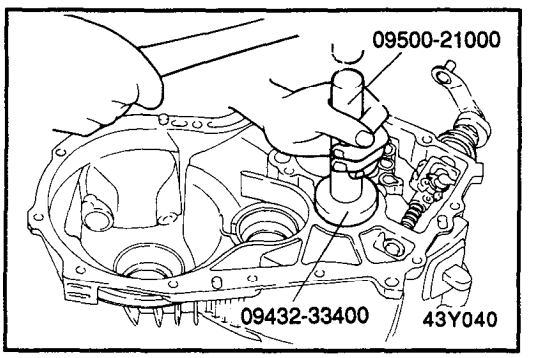
3. Install the differential gear bearing outer race and spacer using the special tool (09532-11500, 09500-11000).



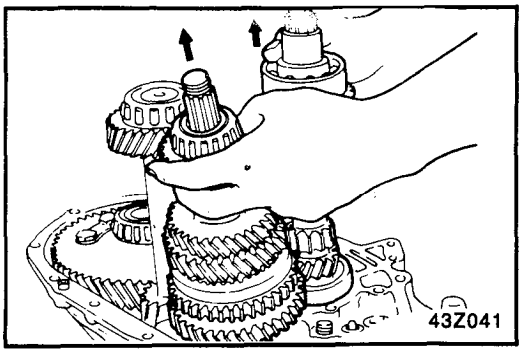
4. Install the output shaft bearing outer race and spacer using the special tool (09500-11000, 09532-11500).



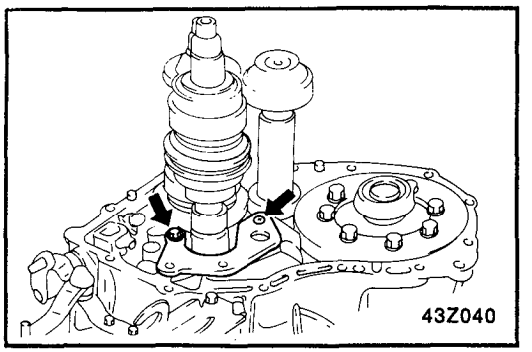
5. Install the oil guide and intermediate shaft bearing outer race and spacer using the special tools (09500-21000, 09432-33400).



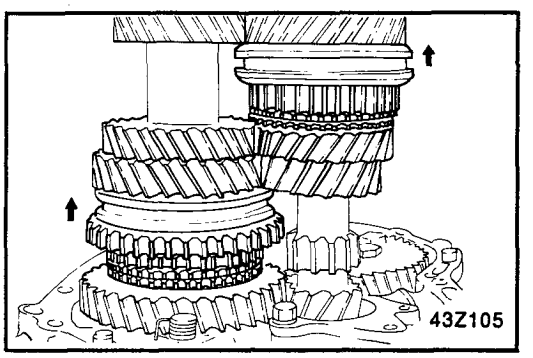
6. Install the differential gear assembly and output shaft assembly.
7. While lifting up the input shaft assembly, install it simultaneously with the intermediate shaft assembly.



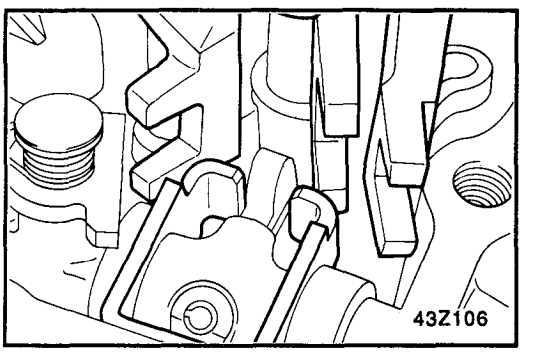
8. Install the retainer.



9. Reassembly of shift rail assembly.
   1) Set the first-second speed shift sleeve at second speed.
   2) Set the third-fourth speed shift sleeve at fourth speed.
   3) Install the first-second shift rail and fork assembly with the select lever pulled to fifth-reverse shift rail side.

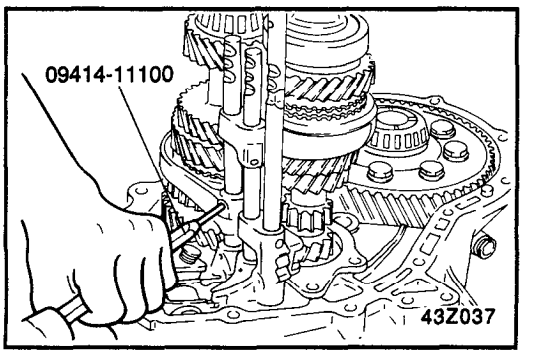


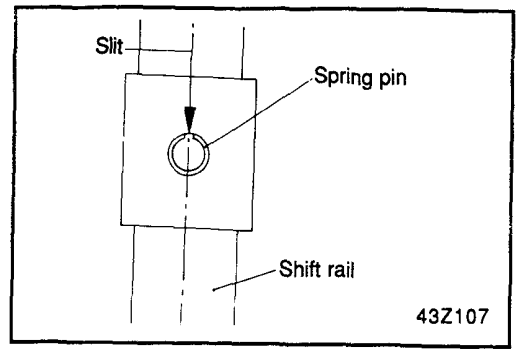
   4) Install the third-fourth/fifth-reverse shift rail and fork assembly together with the select lever fully pushed to first-second rail side.
   5) Install the third-fourth/reverse shift rail and fork assembly each other with the select lever fully pushed to first-second rail side.
   6) Turn the shift rail to engine shift lug.



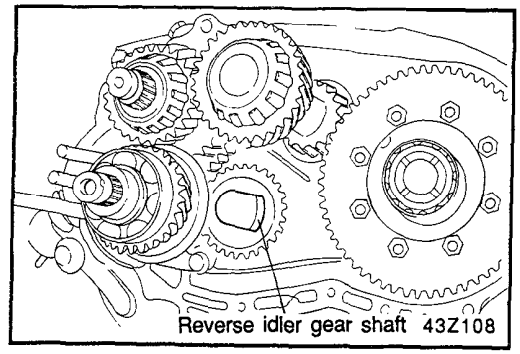
10. Reassembly of spring pin.
    1) Install the spring pins using the special tool (09414-11100).
    2) When installing, make sure that the slit of the spring pin is aligned with the shift rail center line.

Caution
Do not reuse the spring pins.

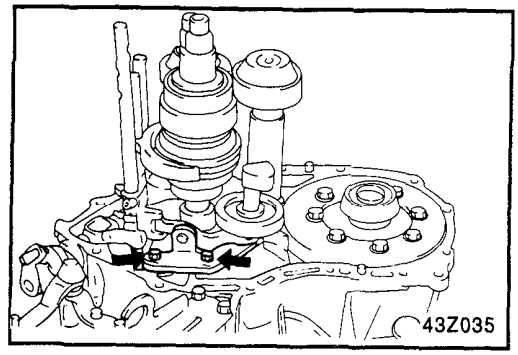




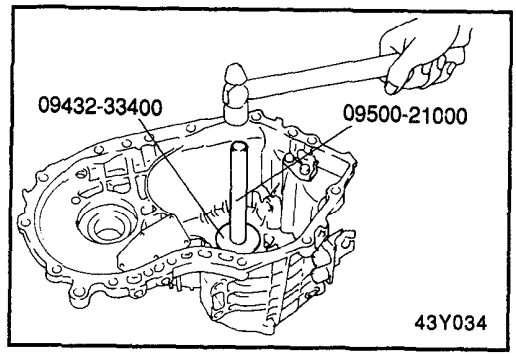
11. Install the reverse gear lever assembly.
12. install the reverse gear shaft and reverse gear in the direction illustrated.



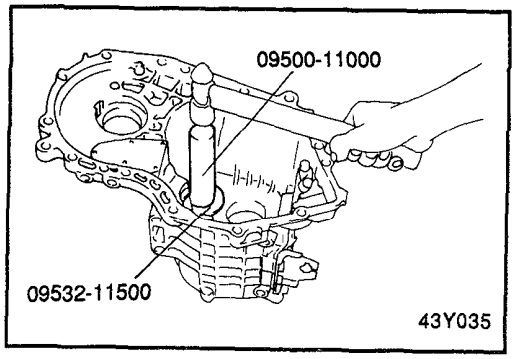
13. Install the reverse shift lever and shoe.



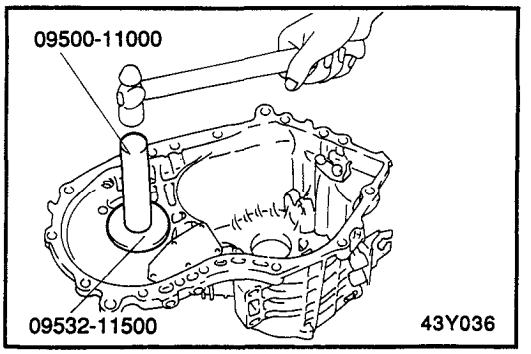
14. Install the intermediate shaft bearing outer race and spacer to the transaxle case using the special tools (09500-21000, 09432-33400).



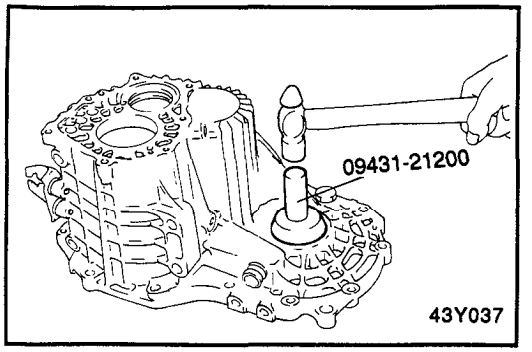
15. Install the output shaft bearing outer race and spacer to the transaxle case using the special tools (09500-11000, 09532-11500).



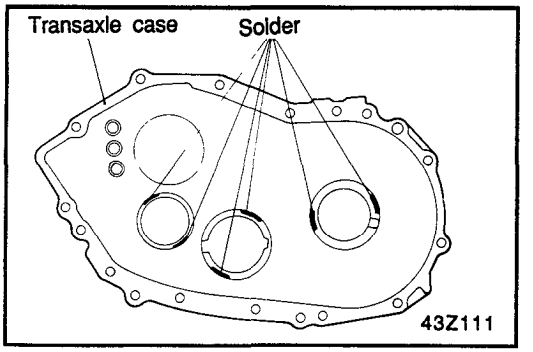
16. Install the differential bearing outer race and spacer to the transaxle case using the special tools (09500-11000, 09532-11500).



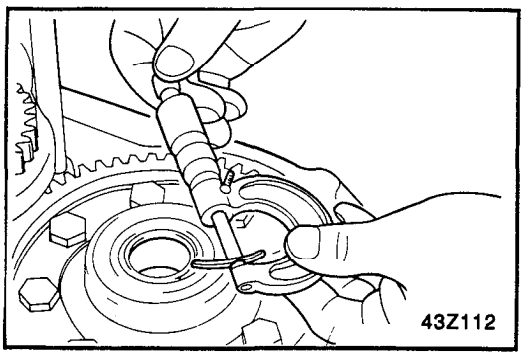
17. install the drive shaft oil seal to the transaxle case using the special tool (09431-21200).



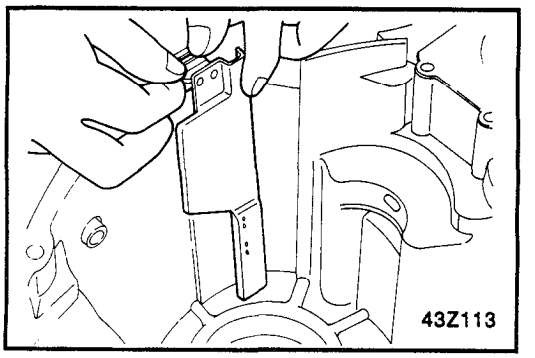
18. Reassembly of spacers (adjustment of end play).
    1) Place two pieces of solder measuring about 10 mm (0.4 in.) in length and 3 mm (0.12 in.) in diameter on the bearing outer race as shown in the illustration, and install the outer race.
    2) Install the transaxle case and tighten the bolts to the specified torque.
    3) Remove the transaxle case.
    4) Remove the outer races and remove the solder.



    5) Measure the thickness of the crushed solder with a micrometer and select and install spacer of tickness that gives standard end play.
    Standard value:
    intermediate shaft end play:
    0.05-0.10 mm (0.002-0.004 in.)
    Output shaft end play:
    0.05-0.10 mm (0.002-0.004 in.)
    Differential case end play:
    0.05-0.10 mm (0.002-0.004 in.)

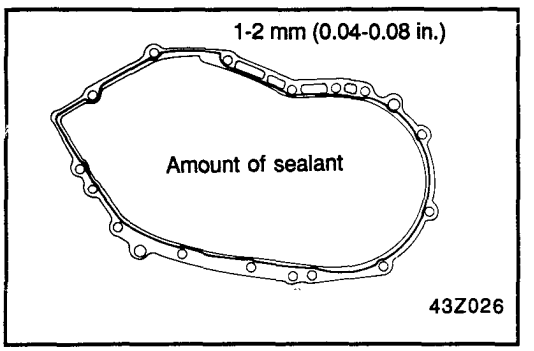


19. Install the oil guide to the transaxle case.

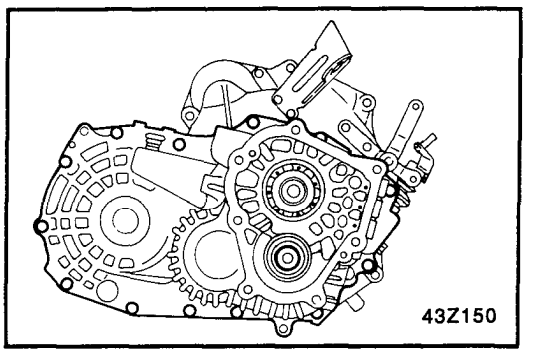


20. Apply specified sealant to the clutch housing side of the transaxle case.

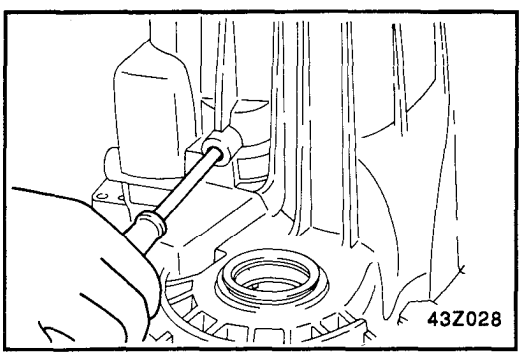
    Specified sealant : THREE BOND 1216



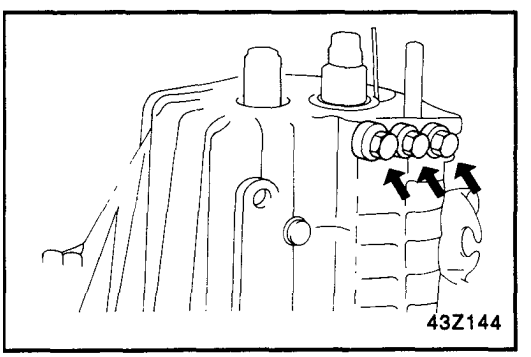
21. install the transaxle case to the clutch housing assembly and tighten the (13) bolts.



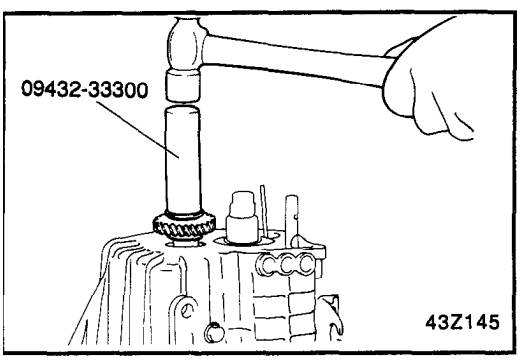
22. Install the restriction ball and gasket.
23. Center the shaft with a phillips screwdriver.
24. Tighten the reverse idler gear shaft bolt to the specified torque.



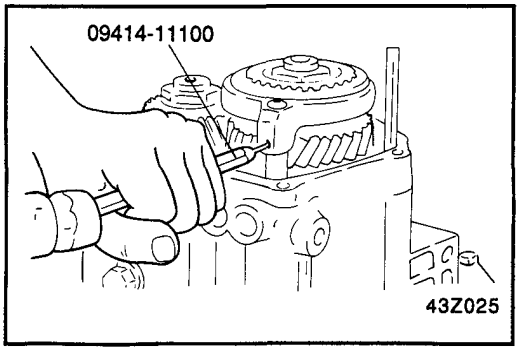
25. Install the poppet balls, poppet springs and poppet plugs.
26. Install the backup light assembly.



27. Install the intermediate gear using the special tool (09432-33300).
28. Install the fifth speed gear and needle roller bearing synchronizer ring, synchronizer hub.
29. Install the fifth speed shift fork and the fifth speed synchronizer sleeve at the same time.

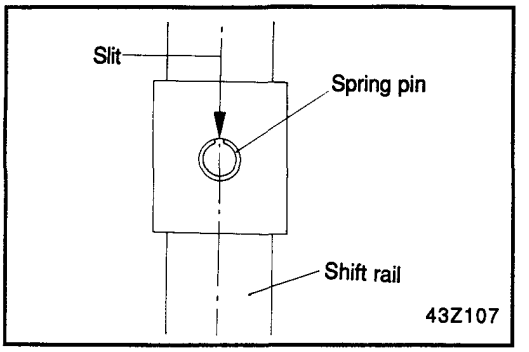


30. Install the spring pin using the special tool (09414-11100).

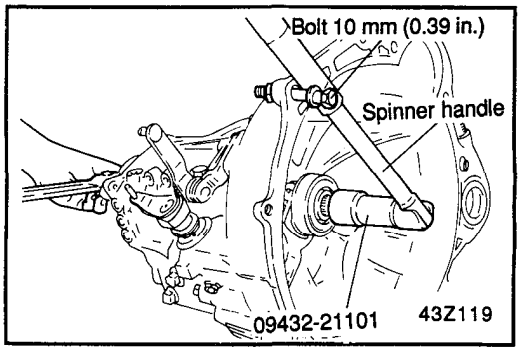


31. When installing, make sure that the slit of the spring pin is aligned with the shift railcenter line.

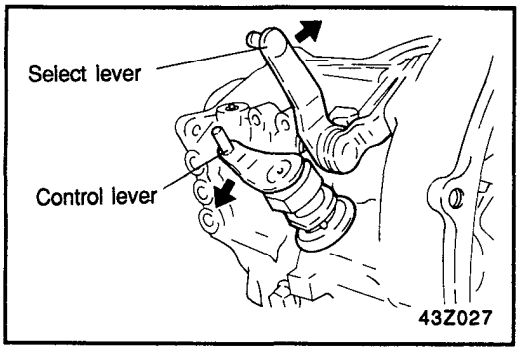
Caution
Do not reuse the spring pin.



32. Reassembly of lock nuts.
    1) Install the special tool (09432-21101) onto the input shat.
    2) Screw a bolt [10 mm (0.39 in.)] into the hole on the surface of clutch housing and attach a spinner handle to the special tool (09432-21101).

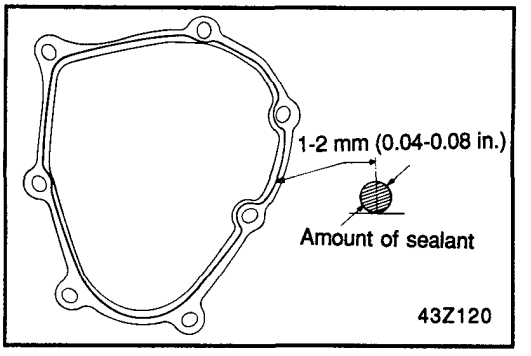


    3) Shift the transaxle in reverse using control lever and select lever.
    4) Tighten the lock nut to the specified torque.
    5) Stake the lock nut.

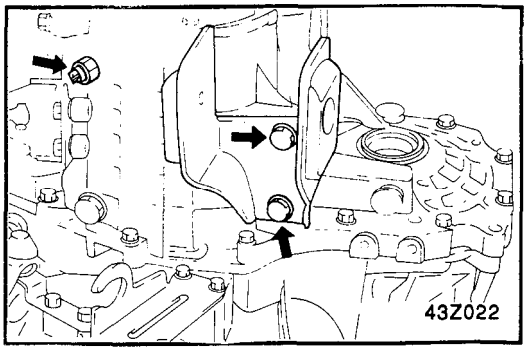


33. Apply the specified sealant to the rear cover and install the rear cover.

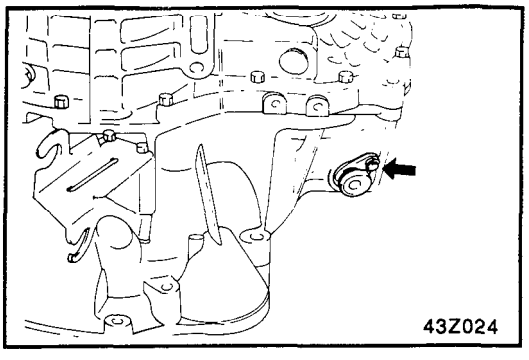
Specified sealant : THREE BOND 1216



34. Install the mounting bracket.

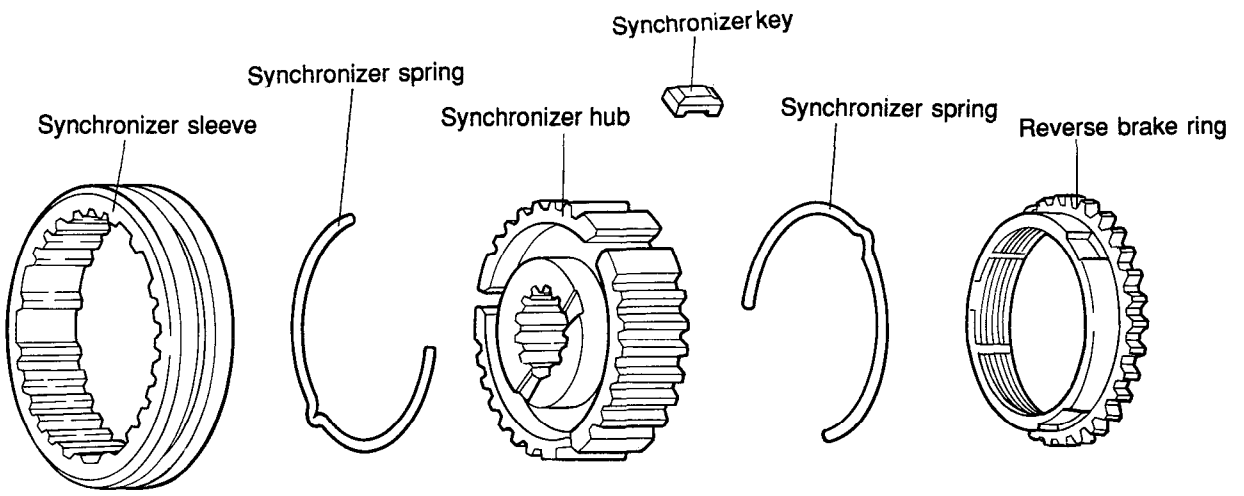


35. Install the speedometer driven gear assembly.



FIFTH SPEED SYNCHRONIZER ASSEMBLY

COMPONENTS

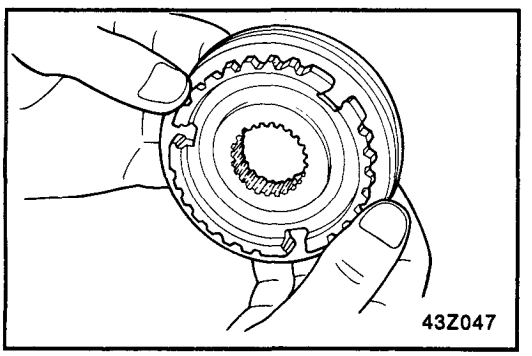


INSPECTION

SYNCHRONIZER SLEEVE AND HUB

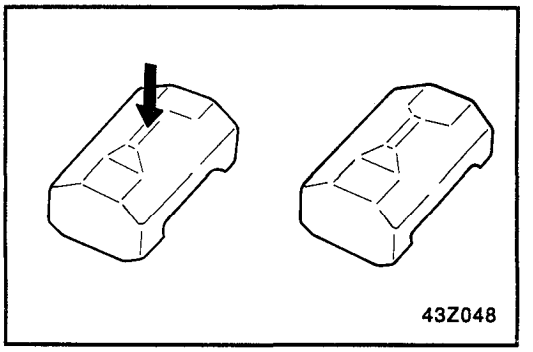
1. Combine the synchronizer sleeve and hub and check that they slide smoothly.
2. Check that the sleeve is free from-damage at its inside front and rear ends.
3. Check for wear of the hub front end (surface in contact with the fifth speed gear).

Caution
Replace the synchronizer hub and sleeve as a set.



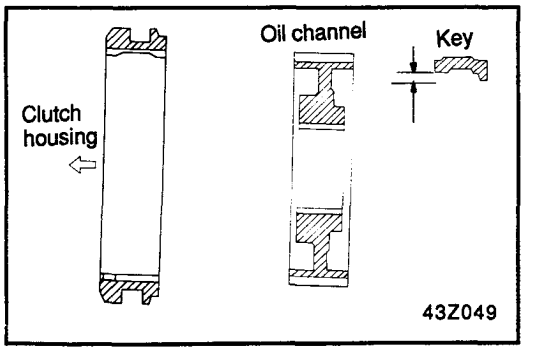
SYNCHRONIZER KEY AND SPRING

1. Check for wear of the synchronizer key center protrusion.
2. Check the spring for weakness, deformation and breakage.

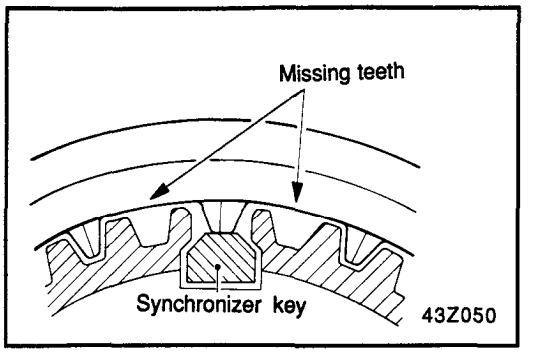


ASSEMBLY

1. Assemble the synchronizer hub, sleeve and key noting their direction.

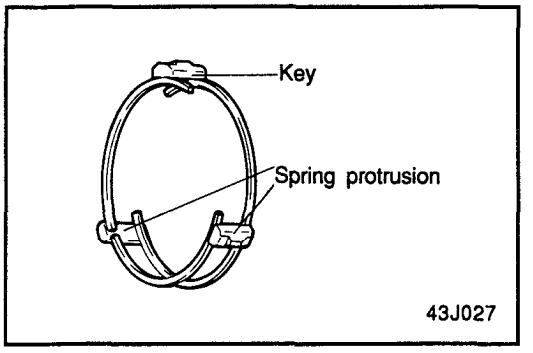


2. The synchronizer sleeve has teeth missing at six portions. Assemble the hub to the sleeve so that the center tooth between the two missing teeth will touch the synchronizer key.



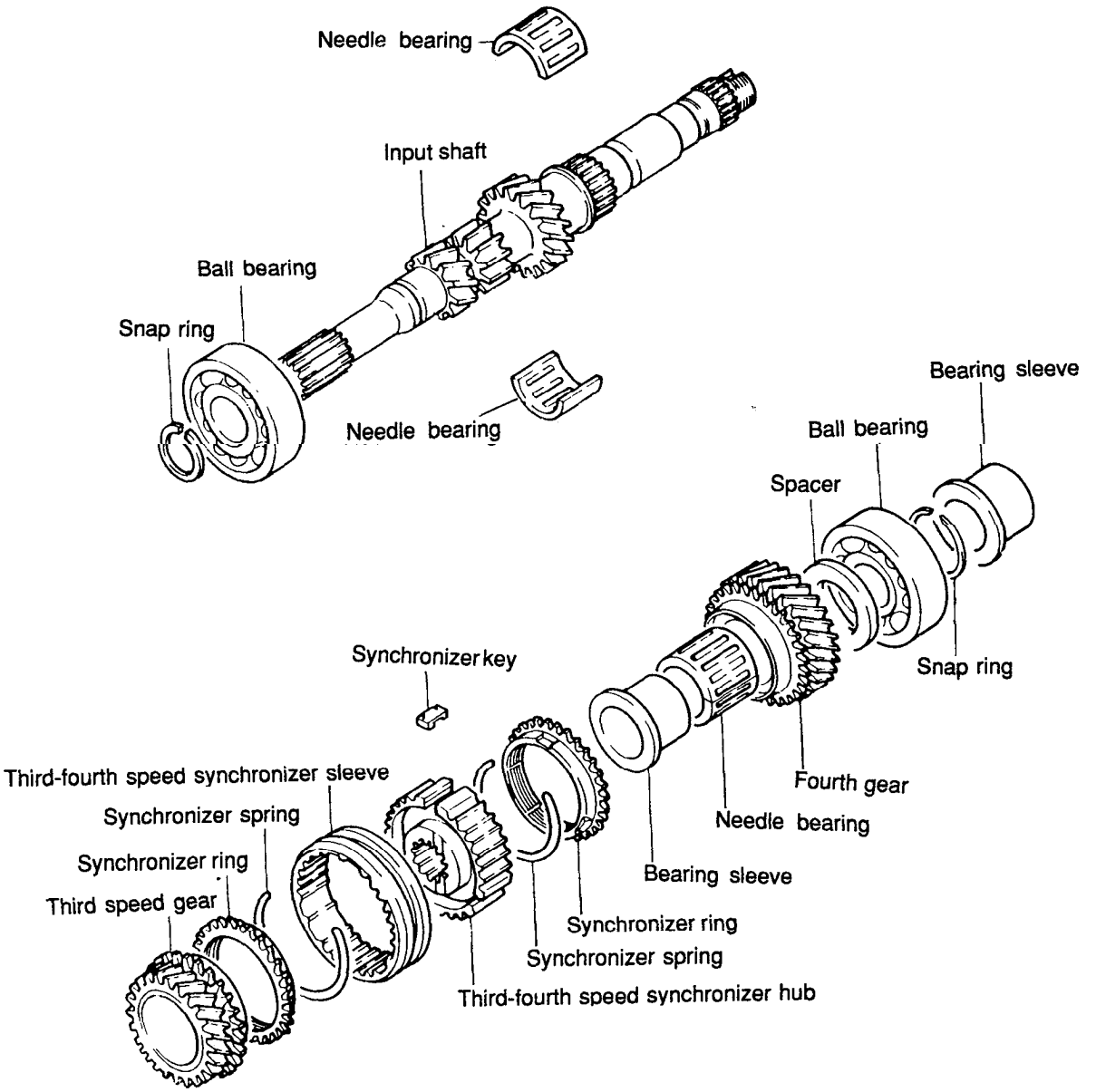
3. Install the synchronizer spring so that the its protrusion may be engaged in the groove of the synchronizer key.

Caution
When installing the synchronizer springs, make sure that the front and rear ones are not faced in same direction.



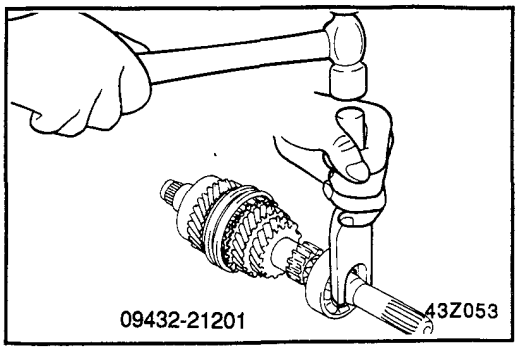
INPUT SHAFT

COMPONENTS

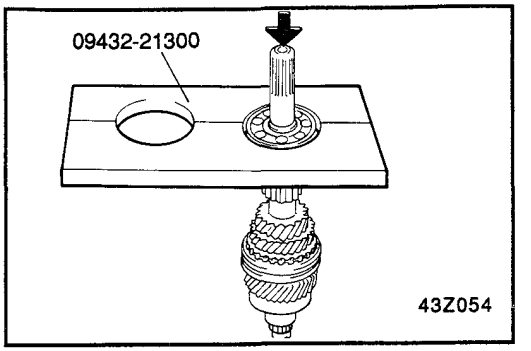


DISASSEMBLY

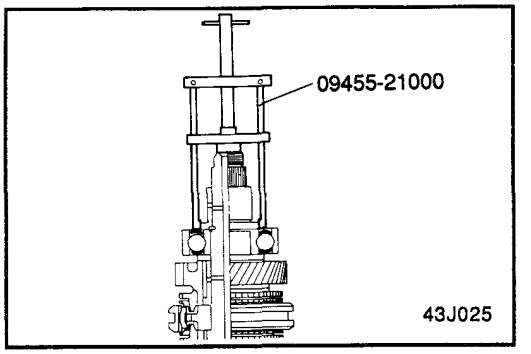
1. Remove the snap ring using the special tool (09432-21201).



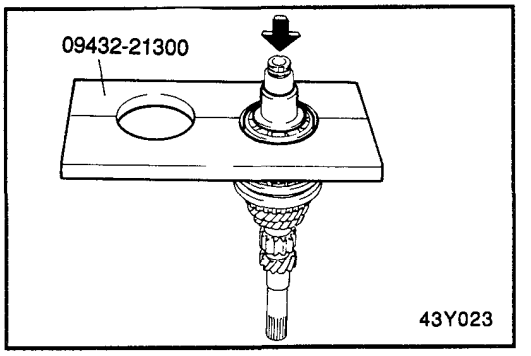
2. Remove the front bearing using the special tool (09432-21300).



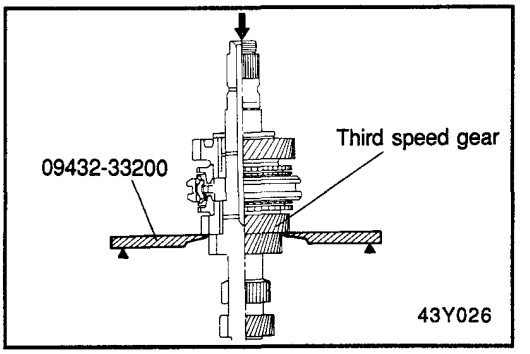
3. Remove the bearing sleeve using the special tool (09455 21000).
4. Remove the snap ring.



5. Remove the rear bearing using the special tool (09432-21300).



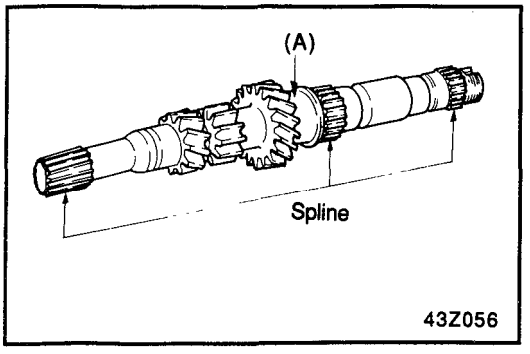
6. Remove the fourth speed gear and needle roller bearing, synchronizer ring, third-fourth speed synchronizer sleeve.
7. Remove the needle roller bearing sleeve, third-fourth synchronizer hub, synchronizer ring, third speed gear, needle roller bearing using the special tool (09432-33200).



INSPECTION

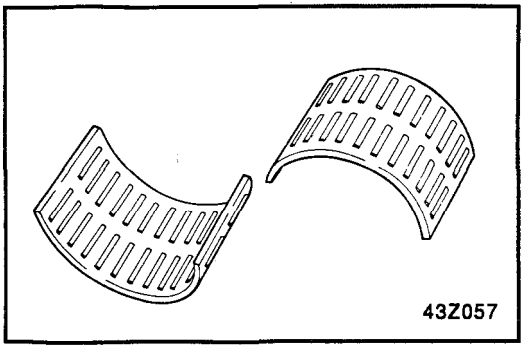
INPUT SHAFT

1. Check the outer surface of the input shaft where the needle bearing is mounted for damage or abnormal wear [portion (A)].
2. Check the splines for damage or wear.



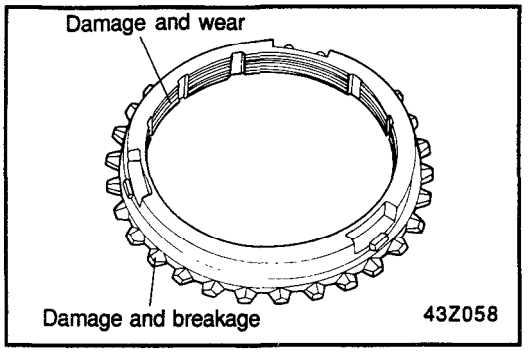
NEEDLE BEARING

1. Combine the needle bearing with the shaft or bearing sleeve and gear and check that it rotates smoothly without abnormal noise or play.
2. Check the needle bearing cage for deformation,



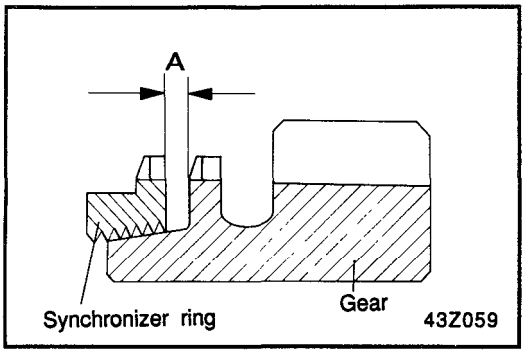
SYNCHRONIZER RING

1. Check the clutch gear teeth for damage and breakage.
2. Check the internal surface for damage, wear and broken threads.



3. Force the synchronizer ring toward the clutch gear and check clearance “A”. Replace if it is out of specification.

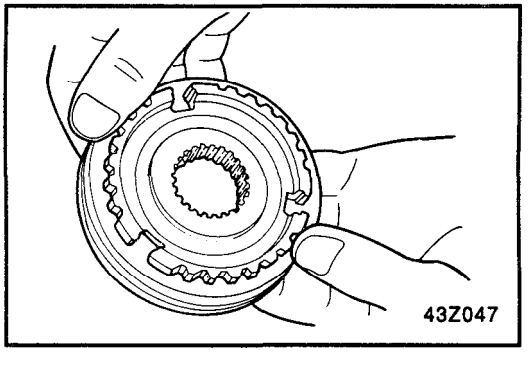
   Limit : 0.5 mm (0.02 in.)



SYNCHRONIZER SLEEVE AND HUB

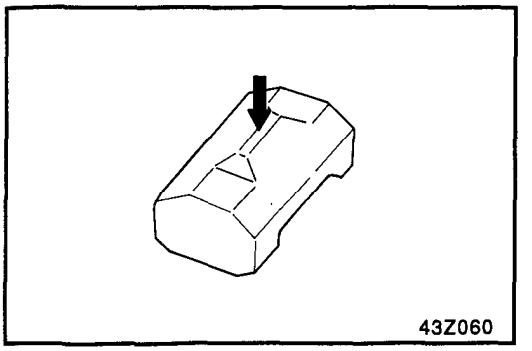
1. Combine the synchronizer sleeve and hub and check that they slide smoothly.
2. Check that the sleeve is free from damage at its inside front and rear ends.
3. Check for wear of the hub end surfaces (in contact with each speed gear).

   Caution
   Replace the synchronizer hub and sleeve as a set.



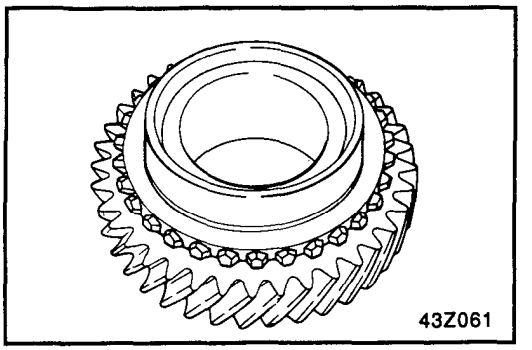
SYNCHRONIZER KEY AND SPRING

1. Check for wear of the synchronizer key center protrusion.
2. Check the spring for weakness, deformation and breakage.



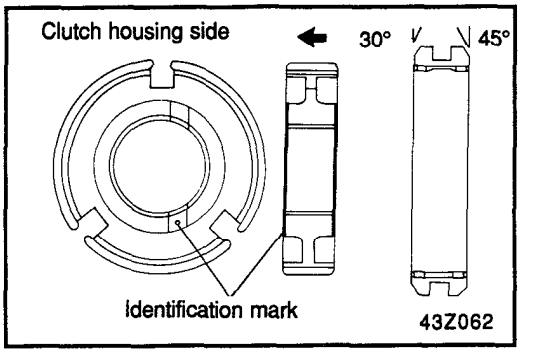
SPEED GEARS

1. Check the bevel gear and clutch gear teeth for damage and wear.
2. Check the synchronizer cone for rough surface, damage and, wear.
3. Check the gear bore and front and rear ends for damage and wear.

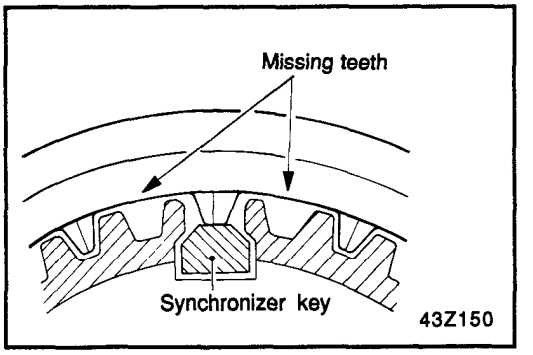


ASSEMBLY

1. Install the synchronizer hub and sleeve so that they are positioned as shown in the figure.

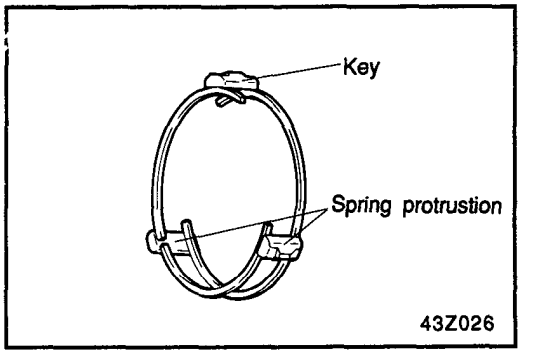


2. The synchronize sleeve has teeth missing at six portions. Assemble the hub to the sleeve so that the center tooth between the two missing teeth will touch the synchronizer key.



3. Install the synchronizer spring so that its protrusion fits into the groove in the synchronizer key.

Caution
When installing the synchronizer springs, make sure that the front and rear ones are not faced in same direction.

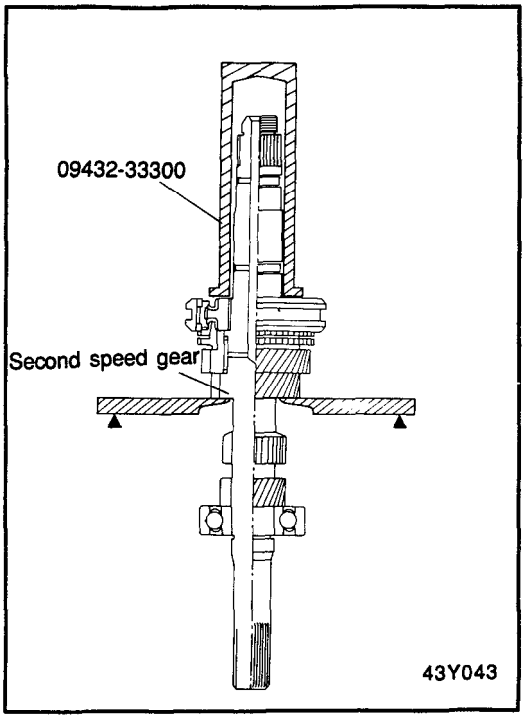


4. Install the needle roller bearing and third speed gear to the input Shaft.
5. Install the third-fourth speed synchronizer assembly over the input shaft using the special tool (09432-33300).

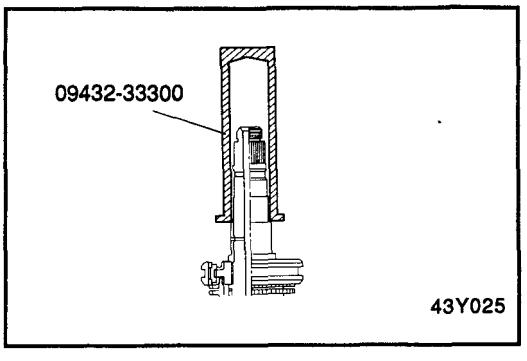
Caution

1. When installing the synchronizer assembly, make sure that three synchronizer keys are seated correctly in respective grooves of the synchronizer ring.

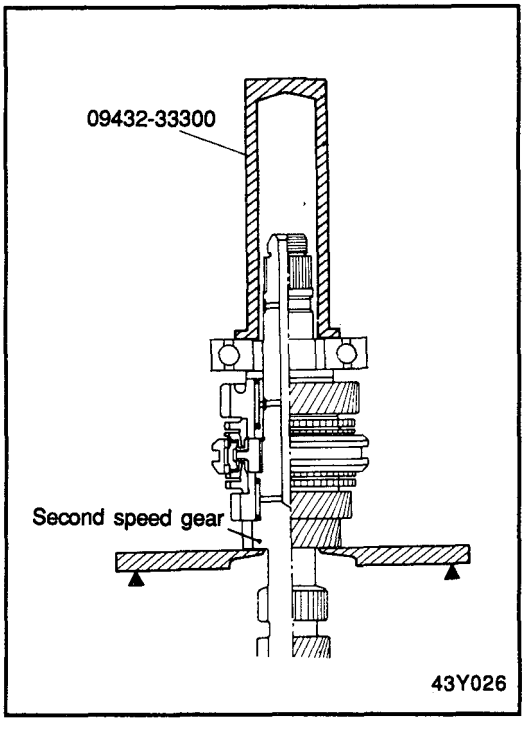
2. After installing of the synchronizer assembly, check that the third speed gear rotates smoothly.



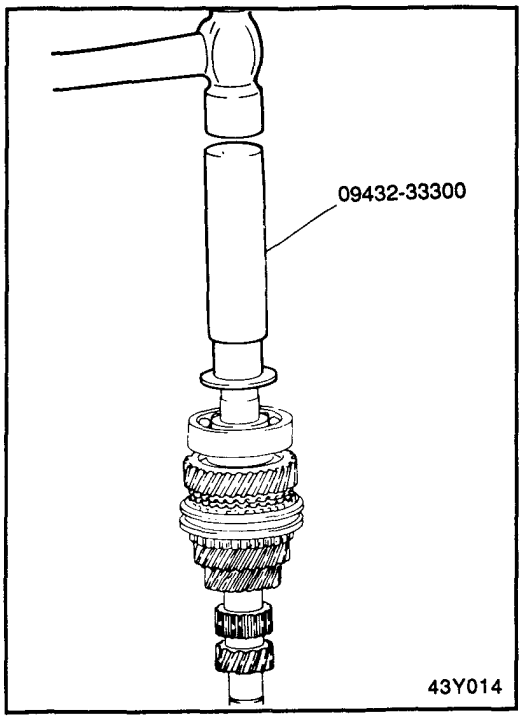
6. Install the needle roller bearing sleeve using the special tool (09432-33300).
7. Install the synchronizer ring, needle roller bearing, fourth gear and spacer.



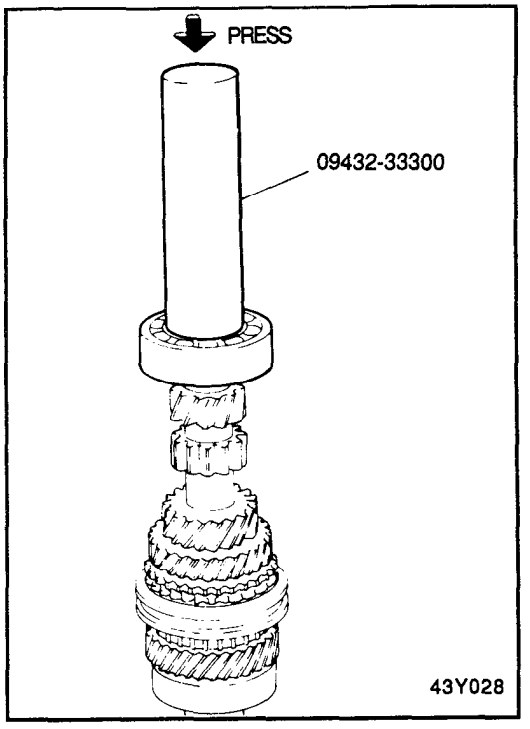
8. Install the rear bearing using the special tool (09432-33300).
9. Install the snap ring.



10. Install the rear bearing sleeve using the special tool (09432-**33300).**

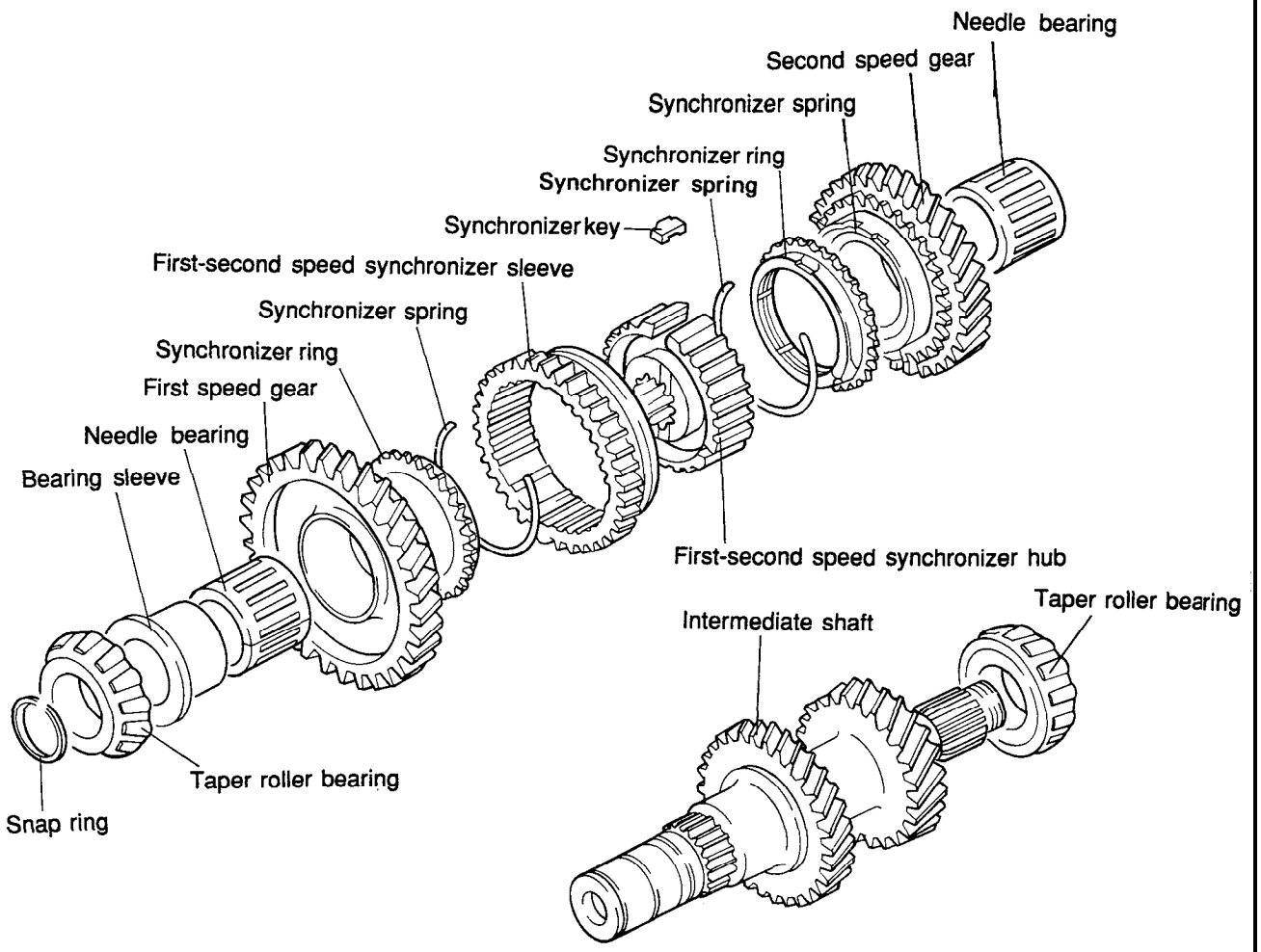


11. Install the front bearing using the special tool (09432-33300).
12. Install the snap ring.



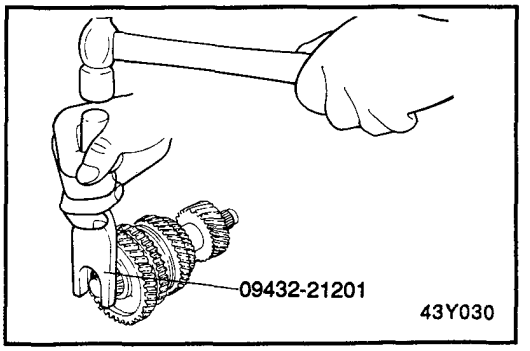
INTERMEDIATE SHAFT

COMPONENTS



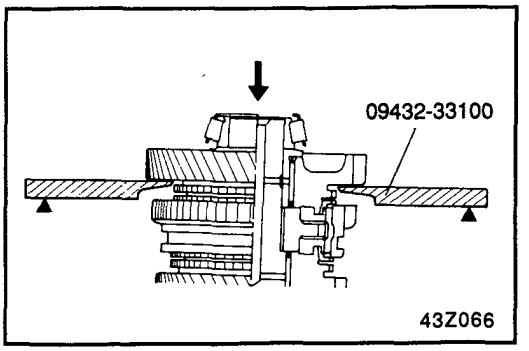
DISASSEMBLY

1. Remove the snap ring using the special tool (09432-21201).

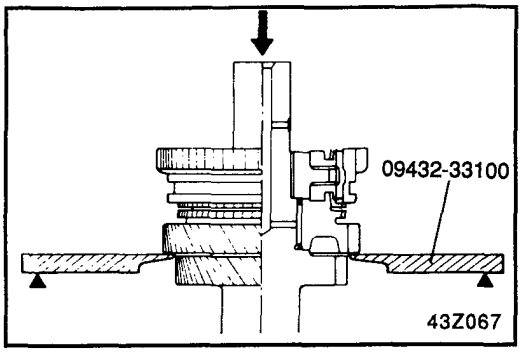


2. Remove the taper roller bearing, first speed gear and bearing sleeve and needle roller bearing using the special tool (09432-33100).

CAUTION
1. Do not reuse the bearing removed from the shaft.
2. Replace the inner and outer races of the tapered roller bearing as a set.

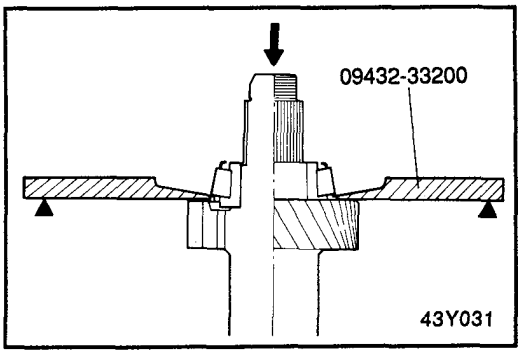


3. Remove the first-second speed synchronizer assembly and second speed gear, needle roller bearing together using the special tool (09432-33100).



4. Remove the taper roller bearing using the special tool (09432-33200).

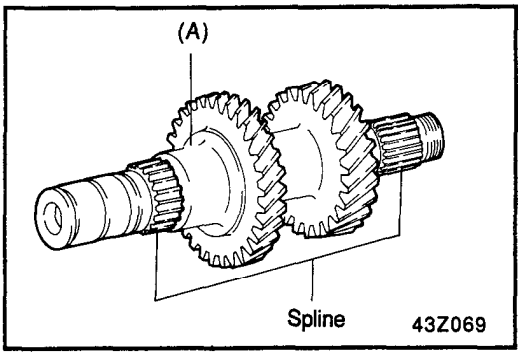
CAUTION
1. Do not reuse the bearing removed from the shaft.
2. Replace the inner and outer races of the tapered roller bearing as a set.



INSPECTION

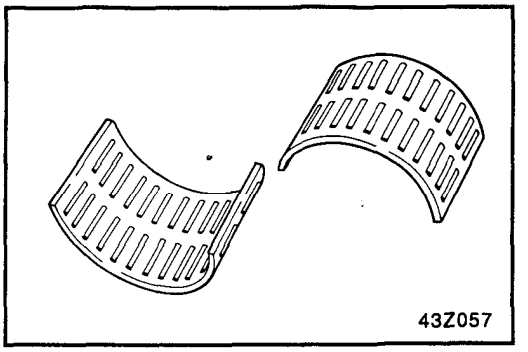
INTERMEDIATE SHAFT

1. Check the outer surface of the intermediate shaft where the needle bearing is mounted for damage or abnormal wear [portion (A)]
2. Check the splines for damage and wear.



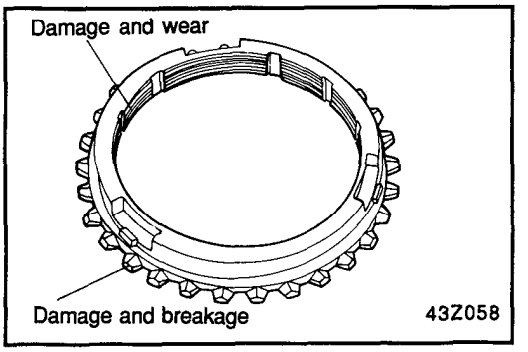
NEEDLE BEARING

1. Combine the needle bearing with the shaft or bearing sleeve and gear and check that it rotates smoothly without abnormal noise or play.
2. Check the needle bearing cage for deformation.



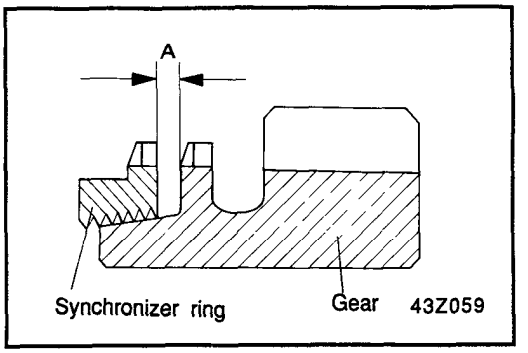
SYNCHRONIZER RING

1. Check the clutch gear teeth for damage and breakage.
2. Check the internal surface for damage, wear and broken threads.



3. Force the synchronizer ring toward the clutch gear and check clearance "A". Replace if it is out of specification.

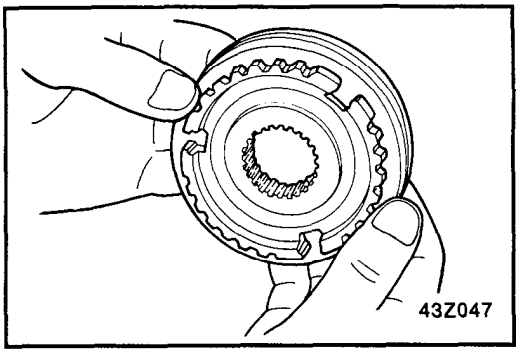
   Limit : 0.5 mm (0.02 in.)



SYNCHRONIZER SLEEVE AND HUB

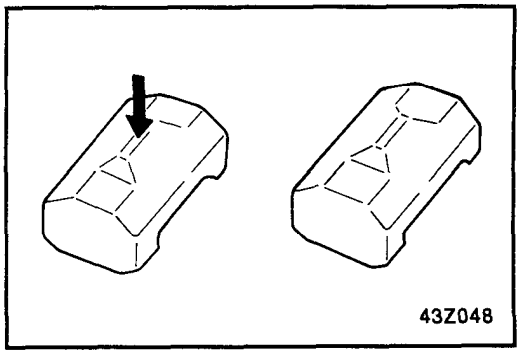
1. Combine the synchronizer sleeve and hub and check that they slide smoothly.
2. Check that the sleeve is free from damage at its inside front and rear ends.
3. Check for wear of the hub end surfaces (in contact with each speed gear).

   Caution
   Replace the synchronizer hub and sleeve as a set.



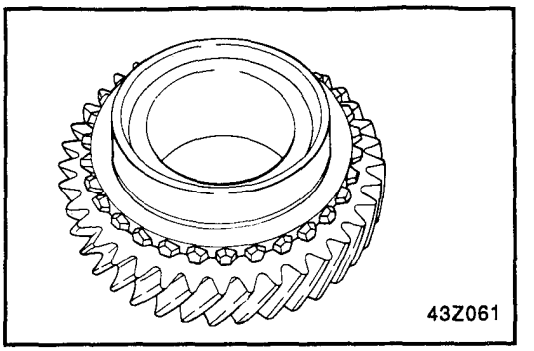
SYNCHRONIZER KEY AND SPRING

1. Check for wear of the synchronizer key center protrusion.
2. Check the spring for weakness, deformation or breakage.



SPEED GEARS

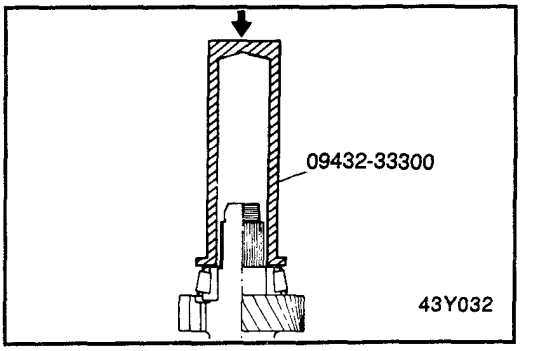
1. Check the bevel gear and clutch gear teeth for damage and wear.
2. Check the synchronizer cone for a rough surface, damage or wear.
3. Check the gear bore and front and rear ends for damage or wear.



ASSEMBLY

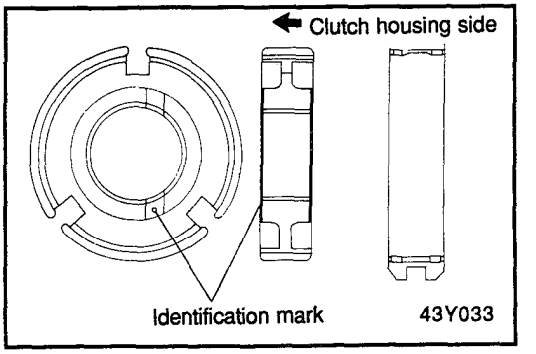
1. Install the taper roller bearing over the intermediate shaft using the special tool (09432-33300).

   CAUTION
   When installing the bearing, push on the inner race only.

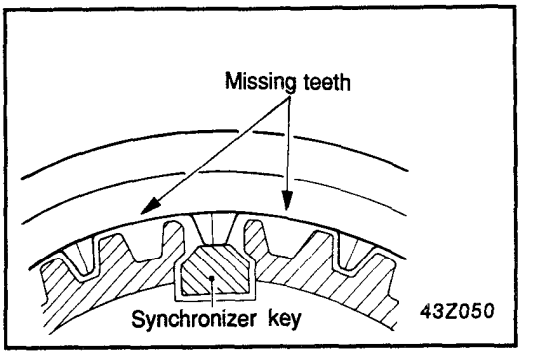


2. Install the first gear synchronizer ring noting its identification mark.

3. Combine the first-second speed synchronizer hub and sleeve.

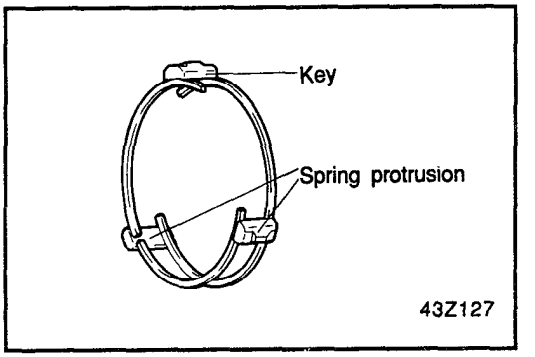


4. The synchronizer sleeve has teeth missing at six portions. Assemble the hub to the sleeve so that the center tooth between the two missing teeth will touch the synchronizer key.



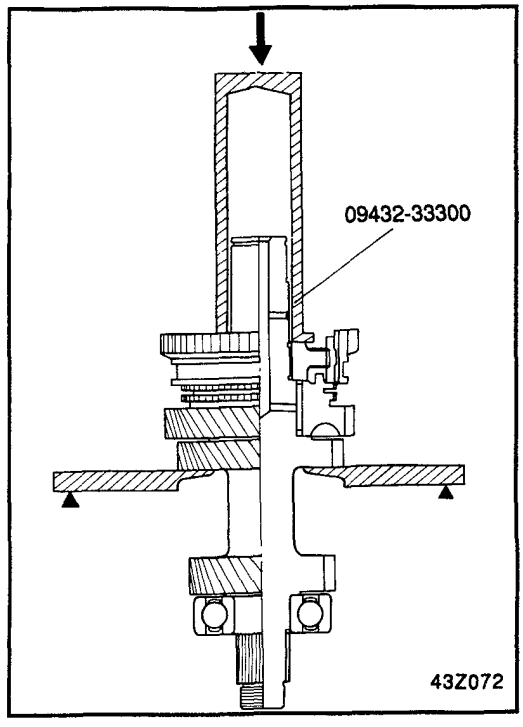
5. Install the synchronizer spring so that its portions fits into the groove in the synchronizer key.

   CAUTION
   When installing the synchronizer springs, make sure that the front and rear ones are not faced in same direction.

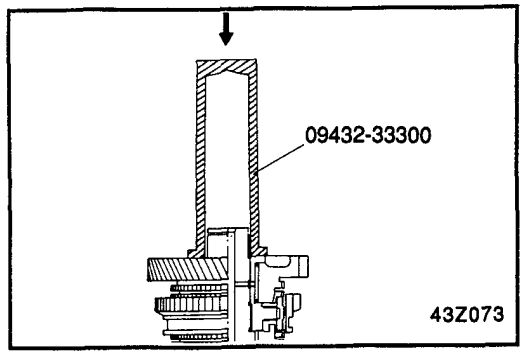


6. Install the needle roller bearing, second gear, first-second speed synchronizer assembly over the intermediate shaft using the special tool (09432-33300).

CAUTION
1. When installing the synchronizer assembly, make sure that the three synchronizer keys are seated correctly in their respective grooves of the synchronizer ring.
2. After installation of the synchronizer assembly, check that third gear rotates smoothly.



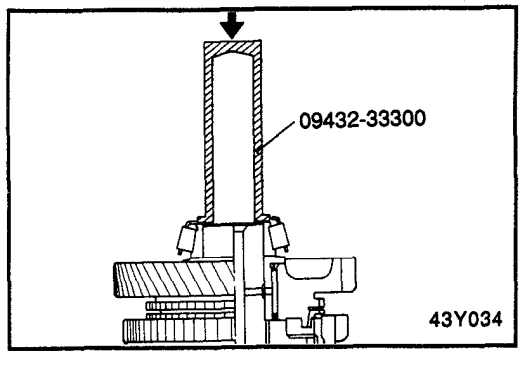
7. Install the needle roller bearing, first speed gear, bearing sleeve together using the special tool (09432-33300).



8. Install the taper bearing using the special tool (09432-33300).

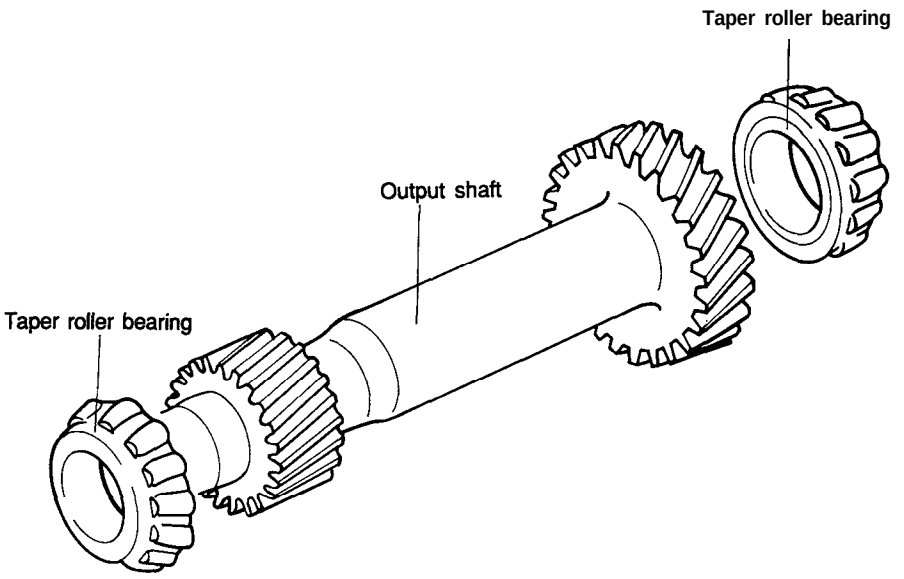
CAUTION
When installing the bearing, push on the inner race only.

9. Install the snap ring.



OUTPUT SHAFT

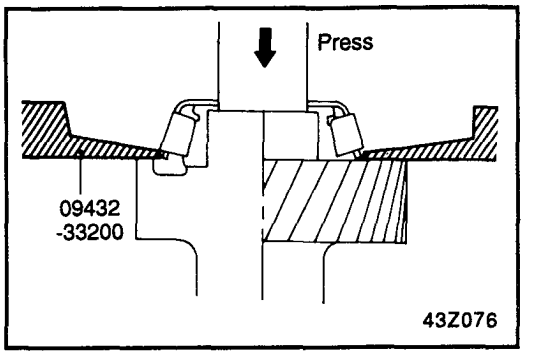
COMPONENTS



DISASSEMBLY

1. Remove the tapered roller bearing using the special tool (09432-33200).

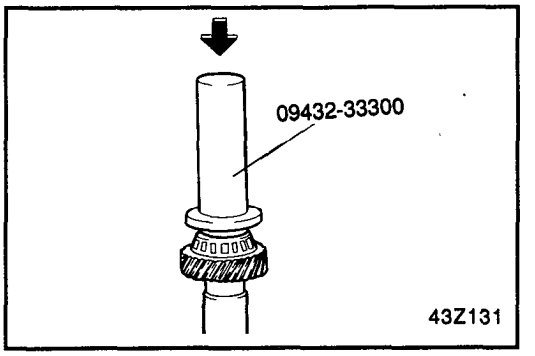
CAUTION
Do not reuse the bearing removed from the shaft.



ASSEMBLY

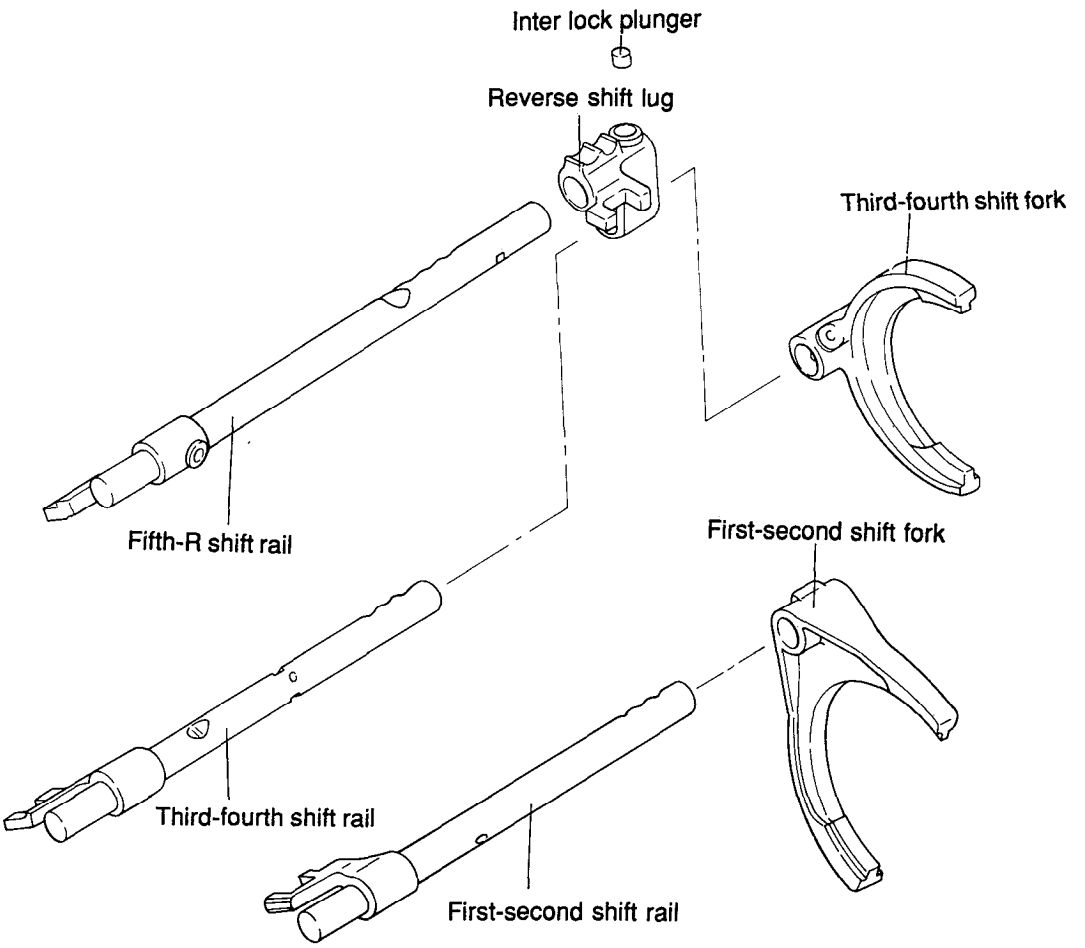
1. Install the tapered roller bearing using the special tool (09432-33300)

CAUTION
When installing the bearing, push on the inner race only.



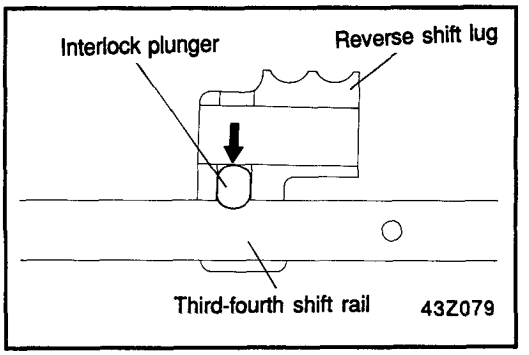
SHIFT FORK

COMPONENTS



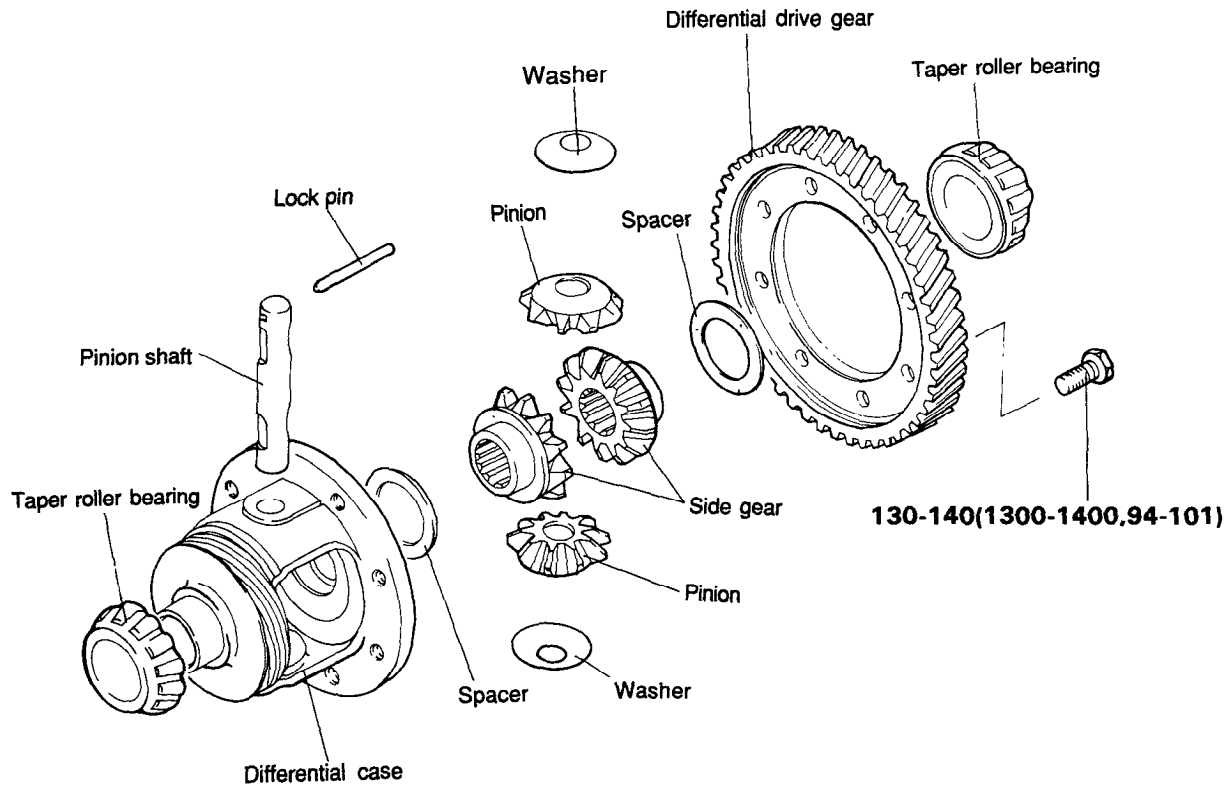
ASSEMBLY

1. Insert the interlock plunger as illustrated on the third-fourth speed shift rail.



DIFFERENTIAL

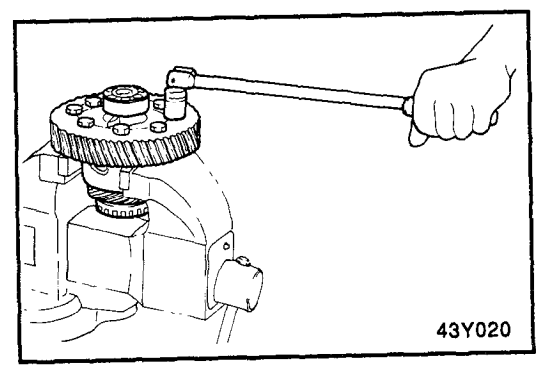
COMPONENTS



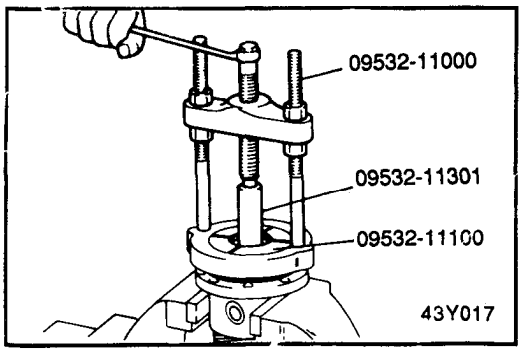
TORQUE : Nm (kg.cm, lb.ft)

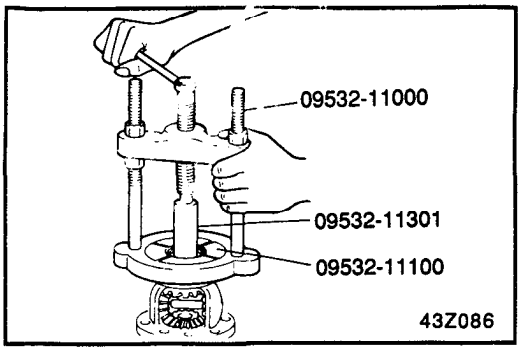
DISASSEMBLY

1. Clamp the differential case in a vise.
2. Remove the differential drive gear retaining bolts and remove the differential drive gear from differential case.

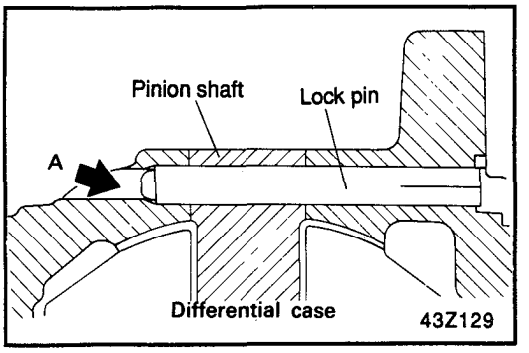


3. Remove the taper roller bearings using the special tool (09532-11000, 09532-11100, 09532-11301).





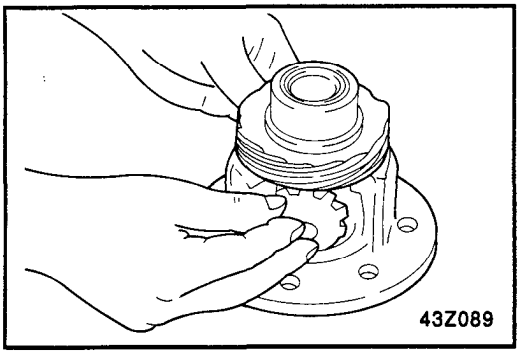
4. Drive out the lock pin from the hole A using a punch.
5. Drive out the pinion shaft.
6. Remove the pinion gears, washers, side gears and spacers.



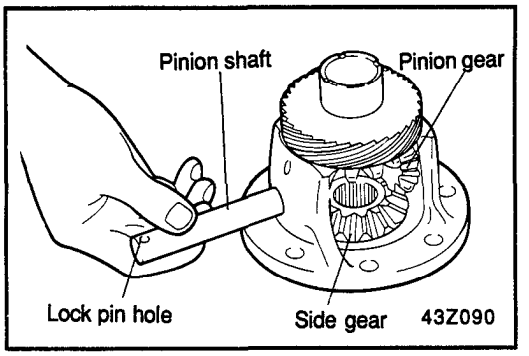
ASSEMBLY

1. Install the spacer on the back of the side gear and then install the gear in the differential case.

CAUTION
1. When installing a new side gear, use a spacer of medium thickness [0.93-1.00 mm (0.036-0.04 in.)]
2. Do not reuse the lock pin.
3. The lock pin head must be sunk below the flange surface of the differential case.

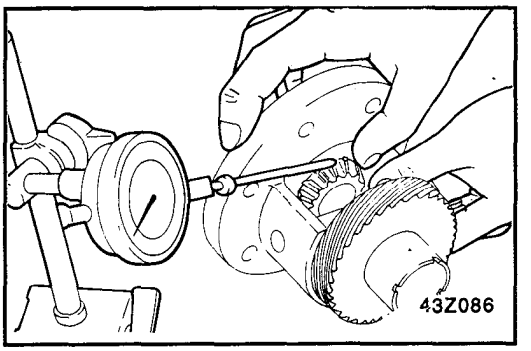


2. Set the washer on the back of each pinion and insert the two pinions to the specified position while engaging them with the side gears by turning them.
3. Insert the pinion shaft.



4. Measure the backlash between the side gears and pinions.

   Standard value : 0.025-0.150 mm (0.001-0.006 in.)

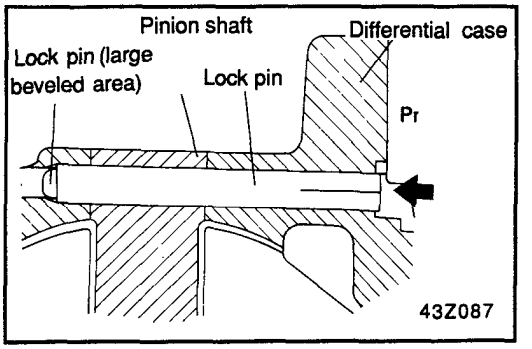


5. If the backlash is out of specification, disassemble and use the correct spacer, reassemble and remeasure.

   CAUTION
   Adjust the backlash of both side gears to the same specification.

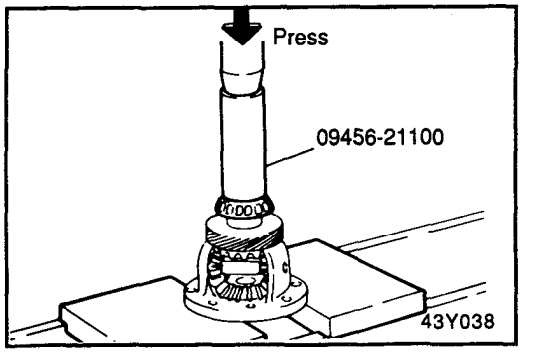
6. Align the pinion shaft lock pin hole with the case lock pin hole and insert the lock pin,

   CAUTION
   1. Do not reuse the lock pin.
   2. The lock pin head must be below the flange surface of the differential case.



7. Install the taper roller bearings on both sides of the differential case using the special tool (09455-21100).

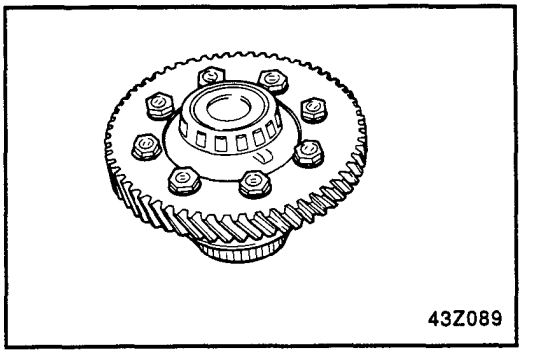
   CAUTION
   When press-fitting the bearings, push the inner race only.



8. Apply specified sealant to the entire threads of the bolt and tighten in the order shown in figure to the specified torque with the differential case clamped in a vise.

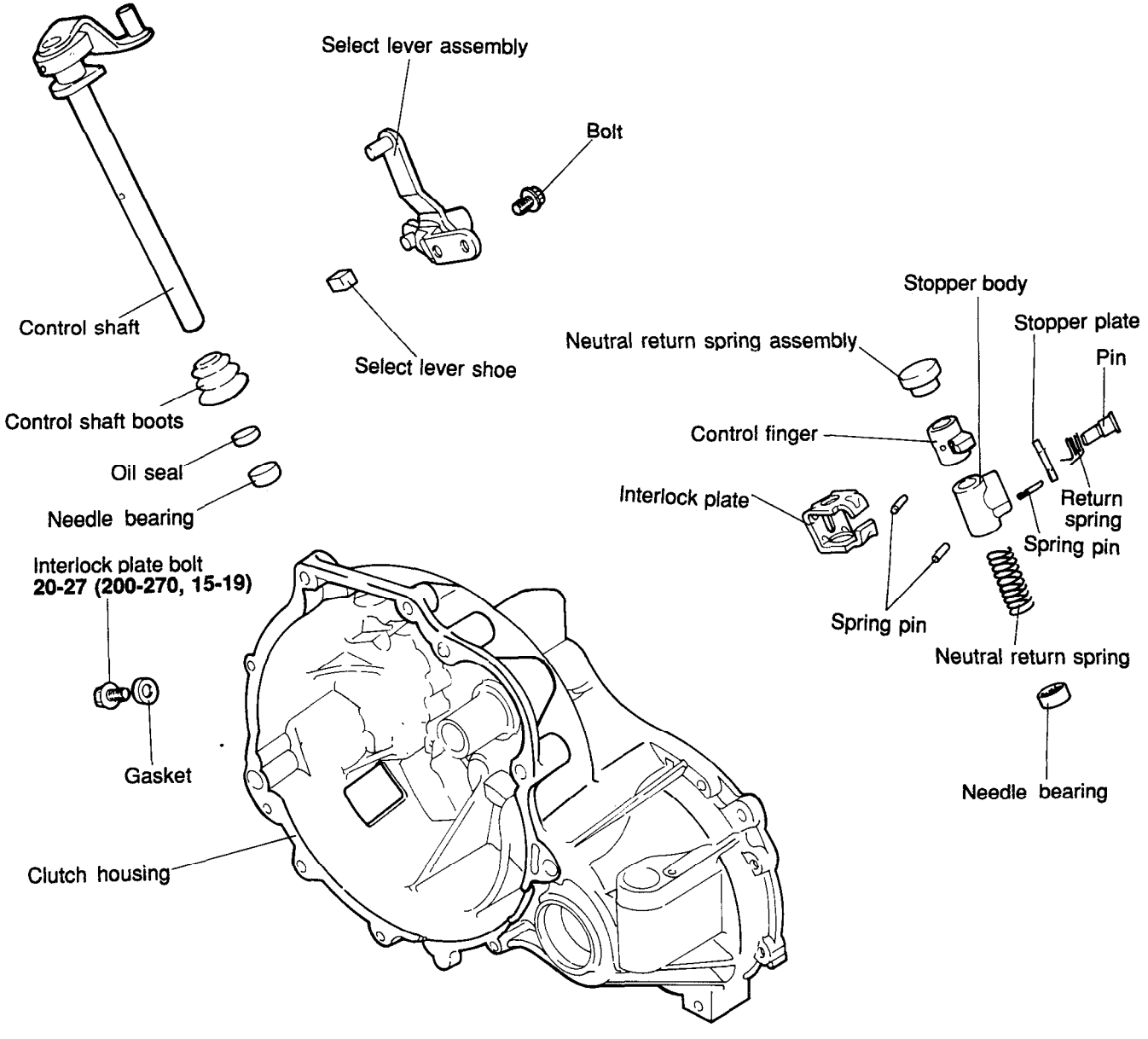
   Specified sealant : 3M Stud Locking No.4170

   CAUTION
   If a bolt is reused, remove the old sealant from the threads.



CLUTCH HOUSING

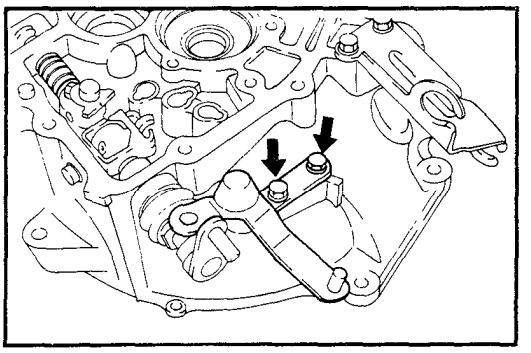
COMPONENTS



TORQUE : Nm (kg.cm, lb.ft)

DISASSEMBLY

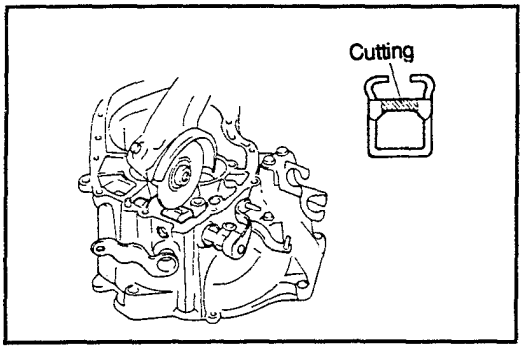
1. Remove the select lever assembly and the select lever shoe.
2. Remove the interlock plate bolt and gasket.



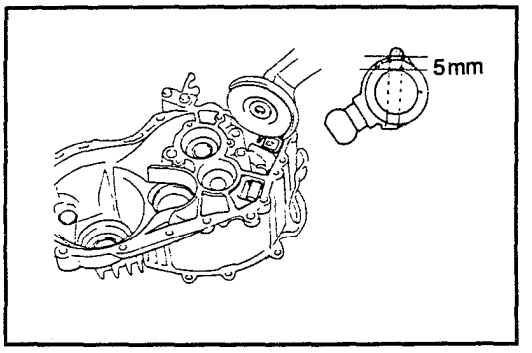
FIRST METHOD

If using following procedure, you should replace the shifting control shaft ass'y as new one.
This method is recommended as removal procedures in case that the clutch housing is normal and shifting control shaft is abnormal

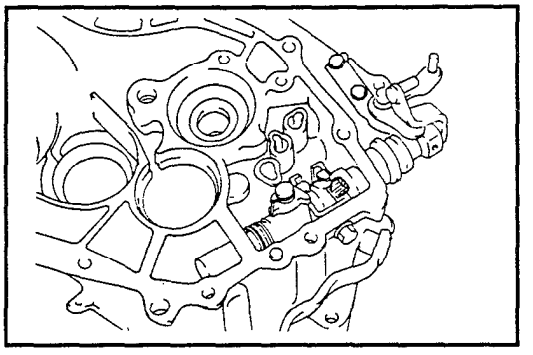
3. Cut the interlock plate which prevent the shifting control shafts turning, as shown in figure.



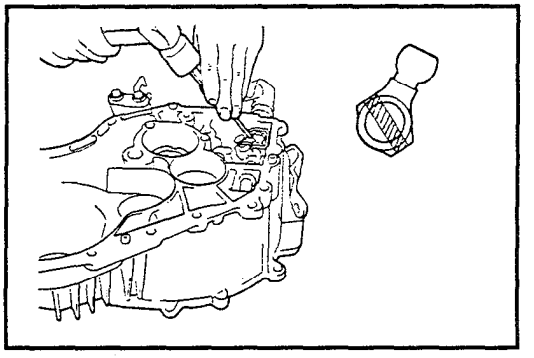
4. Grind the head of lock pin and shifting control shaft over 5mm.



5. Turn the shfiting control shaft to the opposite side.



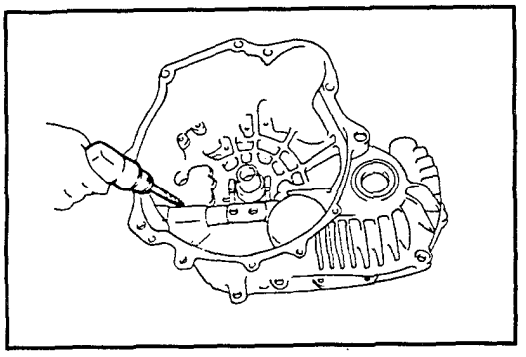
6. Remove the lock pin from the shifting control shift by punching the bottom of the lock pin using the special tool (09414-11000).



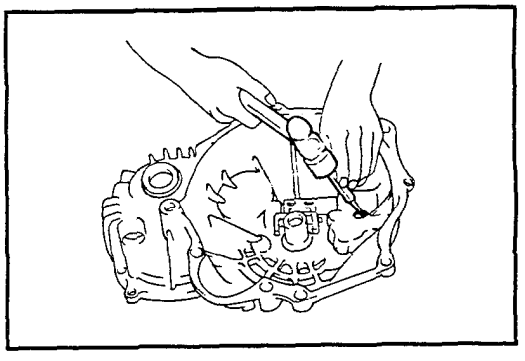
SECOND METHOD

If using following method, you should replace the clutch housing as new one.
This method is recomended in case that the clutch housing is abnormal such as crack, oil leaking, etc.

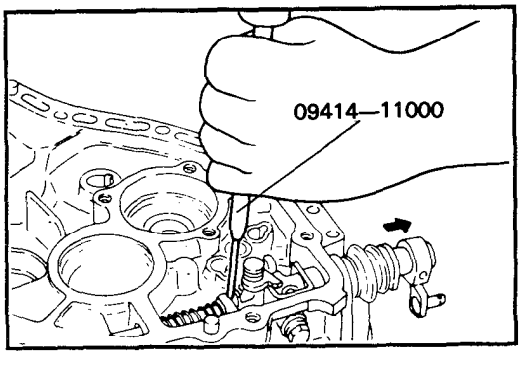
7. Drill the clutch housing to the inside as shown in figure.



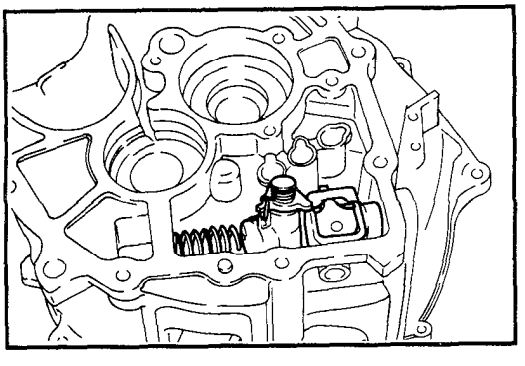
8. Punch and remove the lock pin, inserting the punch through its hole.



9. Drive out the spring pin from the stopper body using the special tool (09414-11000).
10. Pull out the control shaft and remove the control shaft boots and oil seal.

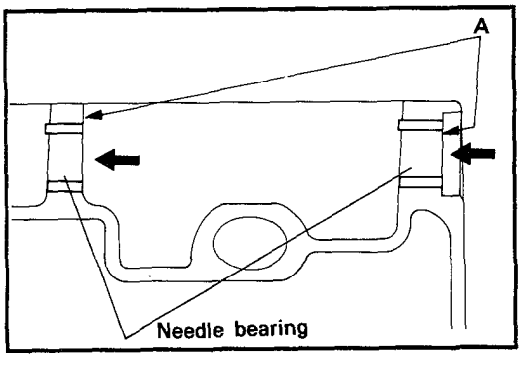


11. Remove the neutral return spring assembly, control finger, interlock plate, stopper body, neutral return spring.
12. Remove the control shaft oil seal the needle bearings.

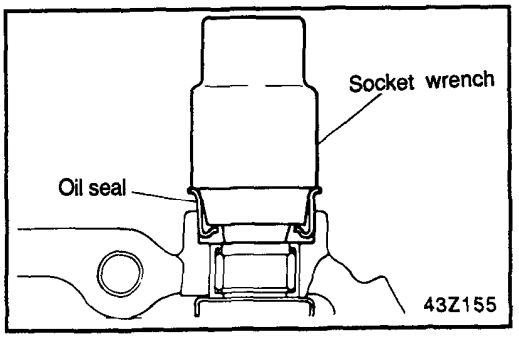


ASSEMBLY

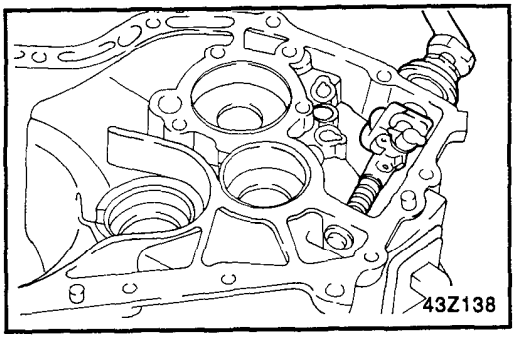
1. Install the needle bearing flush with the surface A of the clutch housing.



2 Install the control shaft oil seal using a socket wrench.



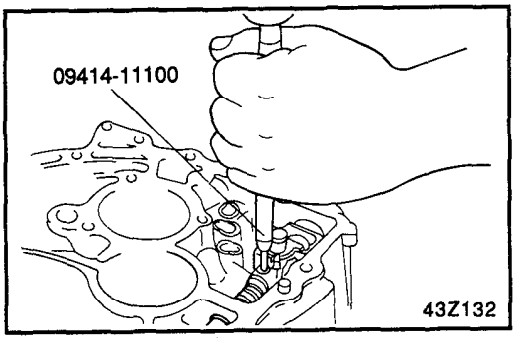
3. Install the neutral return spring assembly, control finger, interlock plate, stopper body, neutral return spring with the control shaft.

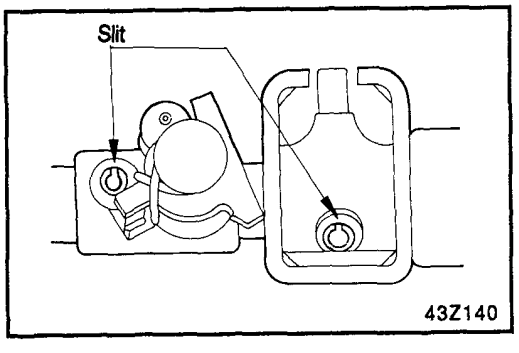


4. Install new spring pins using the special tool (09414-11100).

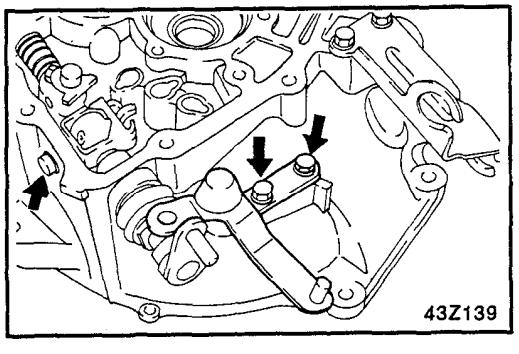
Caution

1. **Do not reuse the spring pins.**
2. **Install the spring pins with their slit at right angle to the control shaft center.**



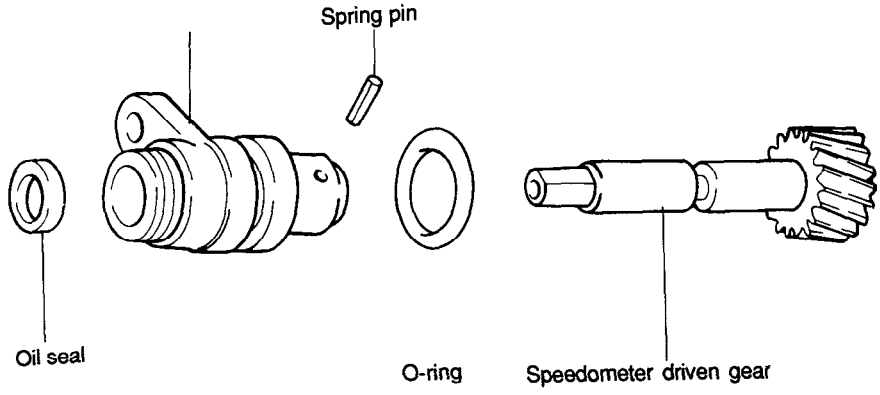


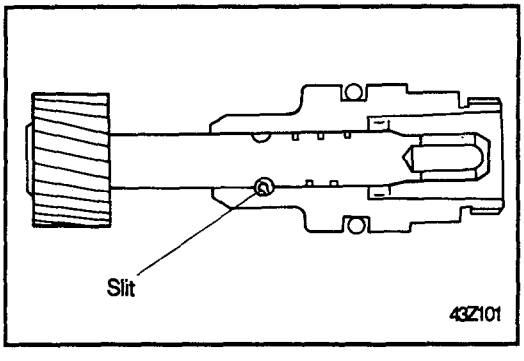
5. Install the interlock plate bolt and gasket.
6. Install the select lever assembly and select shoe.



SPEEDOMETER DRIVEN GEAR ASSEMBLY

COMPONENTS



ASSEMBLY

1. Apply gear oil sparingly to the speedometer driven gear shaft and insert the shaft
2. Install the spring pin in such a way that it slit does not face the gear shaft.