MITSUBISHI
KM 175

INDEX

AUTOMATIC TRANSMISSION SERVICE GROUP
18639 S.W. 107TH AVENUE
MIAMI, FLORIDA 33157
(305) 670-4161

Updated
Jan, 2007

INTRODUCTION
MITSUBISHI KM-175

This manual covers the procedures necessary to disassemble, inspect, assemble and repair the KM-175 transaxle found in both the Mitsubishi and Hyundai vehicles. Also included are some of the electrical diagnosis procedures necessary for some of the sensors. This unit is very similar to the KM-176 and KM-177 units. The designation of these units are dependant on the vehicle engine size.

We wish to thank Mitsubishi Corporation for the information and illustrations that have made this booklet possible.

The information and part numbers contained in this booklet have been carefully compiled from industry sources known for their reliability, but ATSG does not guarantee its accuracy.

DALE ENGLAND
FIELD SERVICE CONSULTANT

WAYNE COLONNA
TECHNICAL SUPERVISOR

PETER LUBAN
TECHNICAL CONSULTANT

JON GLATSTEIN
TECHNICAL CONSULTANT

JERRY GOTT
TECHNICAL CONSULTANT

GERALD CAMPBELL
TECHNICAL CONSULTANT

RICHARD GRAHAM
TECHNICAL CONSULTANT

JIM DIAL
TECHNICAL CONSULTANT

ED KRUSE
TECHNICAL CONSULTANT

GREGORY LIPNICK
TECHNICAL CONSULTANT

DAVID CHALKER
TECHNICAL CONSULTANT

ROLAND ALVAREZ
TECHNICAL CONSULTANT

MIKE SOUZA
TECHNICAL CONSULTANT

AUTOMATIC TRANSMISSION SERVICE GROUP
18639 S.W.107th BLVD
MIAMI, FLORIDA 33157
(305) 670-4161

TROUBLESHOOTING

TROUBLESHOOTING

Functional malfunctions of the ELC-4A/T can lead to other problems, such as those described below:
(1) Improper maintenance and/or adjustments
(2) Malfunctions of the electronic control functions
(3) Malfunctions of mechanical functions
(4) Malfunctions of the hydraulic control functions
(5) Malfunctions of engine performance
etc.
In order to properly determine ("troubleshoot") the source of these malfunctions, it is first essential to methodically question the user concerning the details of the problem, such as the condition of the problem, the situation at the time the problem occurred, and any other relevant information, all in as much detail as possible. The user should also be asked whether or not the problem has occurred more than once, and under what conditions.
Subsequently, certain tests should be conducted in a certain order, as described at the right.

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

⇩

Checks should be made of fluid levels and the condition of the ATF, as well as the condition of the manual control cables; adjustments should then be made if found to be necessary.

⇩

If a presumption has been made that there is an abnormal condition somewhere in the electronic-control system, the diagnosis tester should be used to estimate the probable location by checking the malfunction-indication pattern. If the ignition key was already turned to OFF, however, check by making a road test.

⇩

When the abnormal system is discovered during the road test, check each element (sensors, etc.) one by one, and makes 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 transmission itself, disassemble and repair the transmission.

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 N-R or N-D	Parking doesn't hold	Abnormal vibration-shock when shift to D-2-L-R
Engine	1	Abnormal idling rpm					⊗							X
	2	Performance malfunciton					X			X				
Transmission (power train)	3	Improper adjustment of manual linkage	X	⊗	⊗	⊗		⊗	⊗		⊗	⊗	⊗	⊗
	4	Malfunction of torque convertor (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												
	8	Incorrect tightening of center support		X	X	X			X					
	9	Malfunction of parking mechanism									X		X	
	10	Cracked drive plate, or loose bolt		X										
	11	Worn inside diameter of front clutch retainer				X			X					
Oil-pressure system (including friction elements)	12	Low fluid level		⊗	⊗	⊗		X	X					
	13	Line pressure too low (seal damaged, leakage, looseness, etc.)		⊗	⊗	⊗		⊗	⊗					
	14	Malfunction of valve body (sticking valve, working cavity, adjustment, etc.)		⊗	⊗	⊗	X	X	X		X	X		X
	15	Malfunction of front clutch or piston				X			X					X
	16	Malfunction of rear clutch or piston			⊗			X						X
	17	Malfunction of kickdown band or piston												
	18	Improper adjustment of kickdown servo												
	19	Malfunction of low-reverse brake or piston		X		X			X					X
	20	O-ring of low-reverse brake circuit between valve body and case not installed				X			X					
	21	Malfunction of end clutch or piston (check ball hole, other)												
Electronic-control system	22	Malfunction of inhibitors switch, damaged or disconnected wiring, or improper adjustment	X								X	X		X
	23	Malfunction of TPS, or improper adjustment												X
	24	Pulse generator (A) damaged or disconnected wiring, or short-circuit												
	25	Pulse generator (B) damaged or disconnected wiring, or short-circuit				X								
	26	Malfunction of kickdown servo switch												
	27	SCSV-A or B damaged or disconnected wiring, or short-circuit or sticking (valve open)												
	28	Malfunction of ignition signal system												
	29	Incorrectly grounded ground strap												
	30	PCSV damaged or disconnected wiring, or short-circuit												
	31	PCSV damaged or disconnected wiring (valve open)		⊗	⊗	⊗		X	X					
	32	DCCSV damaged or disconnected wiring (valve closed)												
	33	DCCSV short-circuit or sticking (valve open)					⊗							
	34	Malfunction of OD switch												
	35	Malfunction of accelerator switch, or improper adjustment												X
	36	Malfunction of water-temperature sensor												
	37	Mlafunction of lead switch												
	38	Poor contact of ignition switch												
	39	Malfunction of transmission control unit												X

NOTE: ⊗ indicates items of high priority during inspection. Abbreviations: TPS = Throttle position sensor SCSV = Shift control solenoid valve

	Transmission malfunction or 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 only when cold	Excessive vibration-shock (other than already described)	Damper clutch won't function	Abnormal vibration in high-load region in low gear (approx. 1 Hz)	Abnormal noise from convertor housing together with engine rpm	Mechanical noise (clatter noise) from convertor housing	Abnormal noise inside transmission case	3rd gear is held
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		
11	X	X									X	X								X
12												X								X
13											⊗	⊗		X						X
14	X			X	X		X	X	X	X	X	X	X	X	X	X				X
15	X							X	X		X									X
16																				X
17							X				X	X								X
18							X				X	X		X						
19										X										X
20																				X
21		⊗					X				X									X
22		X			X															X
23				⊗			X	X	⊗	X	⊗	X		X	X	X				
24							X	X	X	X	X	X		X	X	X				X
25				X											X	X				X
26							X					X								X
27																				X
28							X	X	X	X	X	X		X	X					
29																	•			X
30																				X
31	X	X									X	X								X
32															X					
33																X				X
34		X	X																	
35					X	X									X					
36														X	X	X				
37																				X
38				X																X
39	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X

PCSV = Pressure control solenoid valve

DCCSV = Damper clutch control solenoid valve

Manual Control Cable

Whether manual linkage is properly adjusted can be confirmed by checking whether inhibitor switch is performing well.

1. Apply parking brakes and service brakes securely.
2. Place selector lever to "R" range.
3. Set ignition key to "ST" position.
4. Slowly move the selector lever upward until it clicks as it fits in notch of "P" range. If starter motor operates when lever makes a click, "P" position is correct.
5. Then slowly move selector lever to "N" range by the same procedure as in foregoing paragraph. If starter motor operates when selector lever fits in "N", "N" position is correct.
6. Also check to be sure 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 starts at both the "P" range and the "N" range.

Road Test

If the ignition key has not been turned to the OFF position, the malfunction-indication pattern can be checked before the road test by connecting the diagnosis tester.

If, however, the ignition key was switched to OFF, the road test should be made as a re-test.

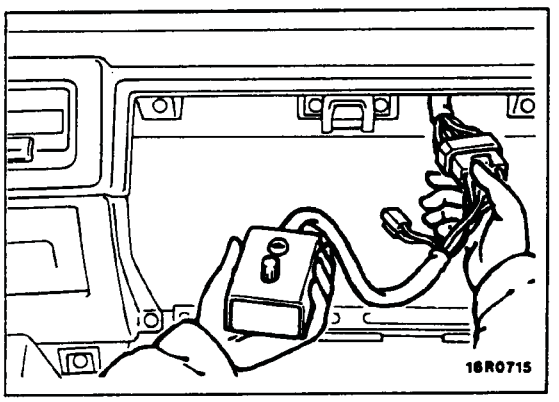
Before making the road test, the "fundamental checks" should first be made in order to confirm that there is no abnormal condition.

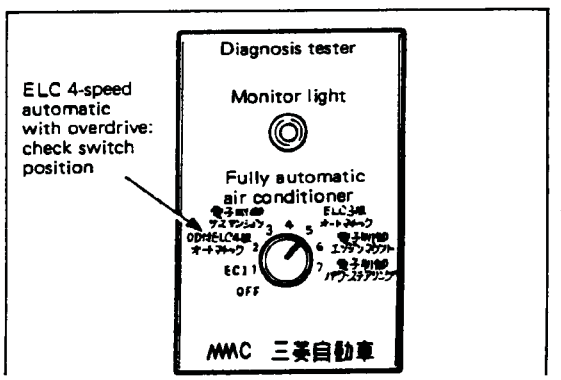
Moreover, the road test should be made, in the procedural order described below, after first checking to be sure that the wiring of sensors, etc. is normal and is correctly and securely connected to connectors and ground.

1. Warm-up the engine. [Engine coolant tempearture: 50°C (120°F) or higher]
2. Turn the ignition key to OFF.
3. Connect the diagnosis tester to the connector for diagnosis (in the glove compartment).
4. Set the diagnosis tester's selector to the "ELC 4-speed automatic with overdrive" position.
5. Move the selector lever to the "P" range and switch ON the OD switch.
6. Conduct the test in the order described in the test order table on the next page.

Check whether or not the check points are satisfied after each operation step. If they are not, it is probable that there is an abnormal condition of the transmission control unit (TCU) connector terminal, indicated in the "Presumed abnormal terminal of TCU" column.

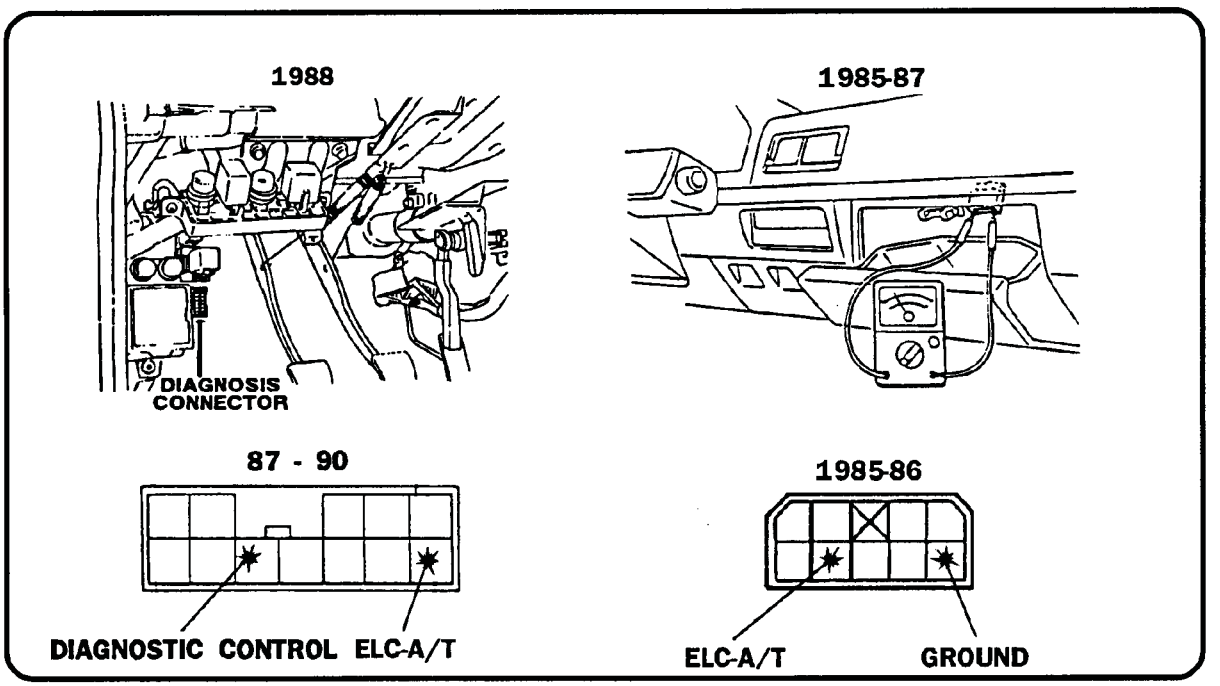
When the abnormal condition is confirmed, stop the test immediately. Then, after checking the malfunction-indication pattern by using the diagnosis tester, refer to the "Diagnosis





MITSUBISHI ELECTRICAL DIAGNOSIS

The KM175-177 series transaxle is fully computer controlled and usually has four solenoids on the valve body. There are two solenoids for shifting, one for pressure control, and one for converter clutch engagement. Certain versions have only three solenoids and use no converter clutch. The ELC 4 Speed Control Unit and the diagnostic connector is located behind the glove box on 1985-1986 models, but on later models the Transmission Controller was moved to behind the console and the radio. The diagnostic connector was moved next to the fuse panel in 1988. The ELC 4 Speed Control Unit can store trouble codes after a malfunction occurs, but when the ignition is turned off the codes are erased. To retrieve codes the ignition must remain on after the malfunction has occurred. The codes can be retrieved with many hand held scanner tools, analog volt meter, or with an LED tester by jumping the pins as shown in the figure below.

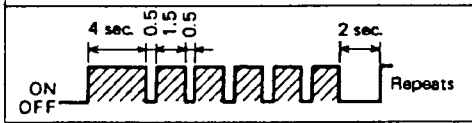
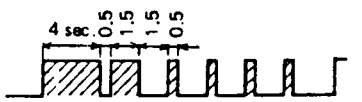
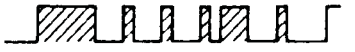


For trouble code translation refer to the following pages. The codes and their meaning have changed year to year and it is very important to determine the model year that you are testing. This transmission will have 3rd gear only if electrical failure occurs or if the Transmission control Unit puts the transmission in fail safe.

TO MAKE YOUR OWN L.E.D. TESTER
REFER TO PAGE 96.

Order	Operation	Check item	Possible abnormal terminal
1	Connect the diagnosis tester to the output connector in the glove compartment. Then set the diagnosis tester switch to the "ELC 4-speed automatic with overdrive" position.	—	—
2	The selector lever should be set to "P" and the overdrive switch to "ON".	—	—
3	Turn the ignition key to "ON".	Diagnosis tester LED illuminates intermittently.	A-10, B-12
4	Start the engine.	LED stops illuminating within 16 seconds after the engine is started.	A-17
5	With the engine speed at 1,500 rpm, move the selector lever from "P" to "R".	There should not be any abnormal feeling of shifting impact.	A-3, A-14
6	With the engine idling, shift from "R" to "N".	Same as above	—
7	With the engine speed at 1,500 rpm, shift from "N" to "D".	Same as above	A-4, A-7, A-14
8	Engine idling (selector lever still in "D")	"Creeping" should be small. (4,500 mm (177 in.) or less in 5 seconds)	A-7, A-8, A-14, B-10
9	Accelerate to 70 km/h (43 mph) with the accelerator fully open.	Shift from "1" to "2" at 52-62 km/h (32-38 mph).	B-2, B-8, B-10, A-7, A-15
		There should be no abnormal feeling of shifting impact.	A-14, B-1, B-7, B-9
10	Drive the prescribed course at 70 km/h (43 mph). (Continue for 20 seconds or more.)	Shift from "2" to "3" and then from "3" to "4" (overdrive). There should be no abnormal feeling of shifting impact. Also check damper clutch control. After stopping, use the diagnosis tester to check whether there is an abnormal condition.	A-2, A-14, B-1, B-2, B-7, B-8
11	Switch the overdrive switch to OFF at the same time the accelerator is fully closed (when the accelerator pedal is released).	Shift from 4th to 3rd to increase the engine speed.	A-2, A-15
12	Shift from "D" to "2" after checking item 11.	Shift from 3rd to 2nd to increase the engine speed.	A-7, A-13
13	Shift from "2" to "L" after checking item 12.	Shift from 2nd to 1st at 42-52 km/h (26-32 mph).	A-5, A-7, A-15
14	Stop the vehicle (let engine idle).	Check to be sure that the diagnosis tester does not indicate a malfunction code (LED OFF).	When the LED flashes, determine the location of the malfunction by following the indication pattern (*1).
15	Turn the ignition key to OFF.	Stop the engine.	—

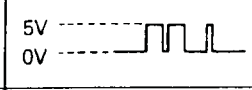
1985 - 1988 FAULT CODES

	Malfunction indication code	Diagnosis	Assumed location
1		Microprocessor (computer) malfunction; not remedied by resetting.	Low power-supply voltage (recharging system) Computer
2		First gear signal is detected at high vehicle speed.	Pulse generator B Computer
3		Vehicle speed detected by pulse generator B is much lower than actual vehicle speed.	Pulse generator B Computer
4		Operation of shift-control solenoid valve A differs from computer command.	Shift-control solenoid valve A Computer
5		Operation of shift-control solenoid valve B differs from computer command.	Shift-control solenoid valve B Computer
6		Kickdown servo switch signal differs from actual gear engaged.	Kickdown servo switch Pressure-control solenoid valve Computer
7		Shifting doesn't finish.	Pulse generator A Pressure-control solenoid valve Computer
8		Pressure-control solenoid valve drive differs from computer command.	Pressure-control solenoid valve Computer
9		Engine speed is judged to be 6,500 rpm or more.	Pulse generator B Ignition coil (ignition signal system) Computer
10		Kickdown drum rotation speed is judged to be 6,500 rpm or more.	Pulse generators A · B Computer
11		Damper clutch control solenoid valve is directly connected.	Damper clutch control system Computer
12		No ignition signal.	Ignition coil Ignition signal system Computer

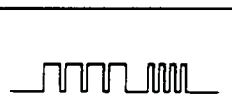
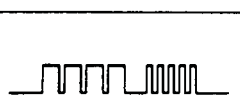
1989 FAULT CODES

Output code		Description	Fail-safe	Note (relation to fault code)
Code No.	Output pattern (for voltmeter)			
11		Malfunction of the microprocessor	Locked in 3rd gear	When code No. 31 is generated 4th time.
12		First gear command during high speed driving	Locked in 3rd (D) or 2nd (2, L) gear	When code No. 32 is generated 4th time.
13		Damaged or disconnected wiring of the pulse generator B system	Locked in 3rd (D) or 2nd (2, L) gear	When code No. 33 is generated 4th time.
14		Damaged or disconnected wiring, or short circuit, of shift control solenoid valve A	Locked in 3rd gear	When code No. 41 or 42 is generated 4th time.
15		Damaged or disconnected wiring, or short circuit, of shift control solenoid valve B	Locked in 3rd gear	When code No. 43 or 44 is gnerated 4th time.
16		Damaged or disconnected wiring, or short circuit, of the pressure control solenoid valve	Locked in 3rd (D) or 2nd (2, L) gear	When code No. 45 or 46 is generated 4th time.
17		Shift steps non-synchronous	Locked in 3rd (D) or 2nd (2, L) gear	When either code No. 51, 52 53 or 54 is generated 4th time.

1989 FAULT CODES (CONT.)

Fault code	Fault code (for voltmeter)	Cause	Remedy
21		Abnormal increase of TPS output	Check the throttle position sensor connector. Check the throttle position sensor itself. Adjust the throttle position sensor. Check the accelerator switch (No. 28; output or not). Check the throttle position sensor output circuit harness.
22		Abnormal decrease of TPS output	
23		Incorrect adjustment of the throttle-position sensor system	
24		Damaged or disconnected wiring of the oil temperature sensor system	Check the oil temperature sensor circuit harness. Check the oil temperature sensor connector. Check the oil temperature sensor itself.
25		Damaged or disconnected wiring of the kickdown servo switch system, or improper contact	Check the kickdown servo switch output circuit harness. Check the kickdown servo switch connector. Check the kickdown servo switch itself.
26		Short circuit of the kickdown servo switch system	
27		Damaged or disconnected wiring of the ignition pulse pick-up cable system	Check the ignition pulse signal line.
28		Short circuit of the accelerator switch system or improper adjustment	Check the accelerator switch output circuit harness. Check the accelerator switch connector. Check the accelerator switch itself. Adjust the accelerator switch.
31		Malfunction of the microprocessor	Replace the control unit.
32		First gear command during high-speed driving	Replace the control unit.
33		Damaged or disconnected wiring of the pulse generator B system	Check the pulse generator B output circuit harness. Check pulse generator B itself. Check the vehicle speed reed switch (for chattering).

1989 FAULT CODES (CONT.)

Fault code	Fault code (for voltmeter)	Cause	Remedy
41		Damaged or disconnected wiring of the shift control solenoid valve A system	Check the solenoid valve connector. Check shift control solenoid valve A itself. Check the shift control solenoid valve A drive circuit harness
42		Short circuit of the shift-control solenoid valve A system	
43		Damaged or disconnected wiring of the shift control solenoid valve B system	Check the solenoid valve connector. Check shift control solenoid valve B itself. Check the shift control solenoid valve B drive circuit harness.
44		Short circuit of the shift control solenoid valve B system	
45		Damaged or disconnected wiring of the pressure control solenoid valve system	Check the solenoid valve connector. Check the pressure control solenoid valve itself. Check the pressure control solenoid valve drive circuit harness.
46		Short circuit of the pressure control solenoid valve system	
51		First gear non-synchronous	Check the pulse generator output circuit harness. Check the pulse generator connector. Check pulse generator A and pulse generator B themselves. Kickdown brake slippage.
52		Second gear non-synchronous	Check the pulse generator A output circuit harness. Check the pulse generator A connector. Check pulse generator A itself. Kickdown brake slippage.
53		Third gear non-synchronous	Check the pulse generator A output circuit harness. Check the pulse generator connector. Check pulse generator A and pulse generator B themselves. Front clutch slippage. Rear clutch slippage.
54		Fourth gear non-synchronous	Check the pulse generator A output circuit harness. Check the pulse generator A connector. Check pulse generator A itself. Kickdown brake slippage.

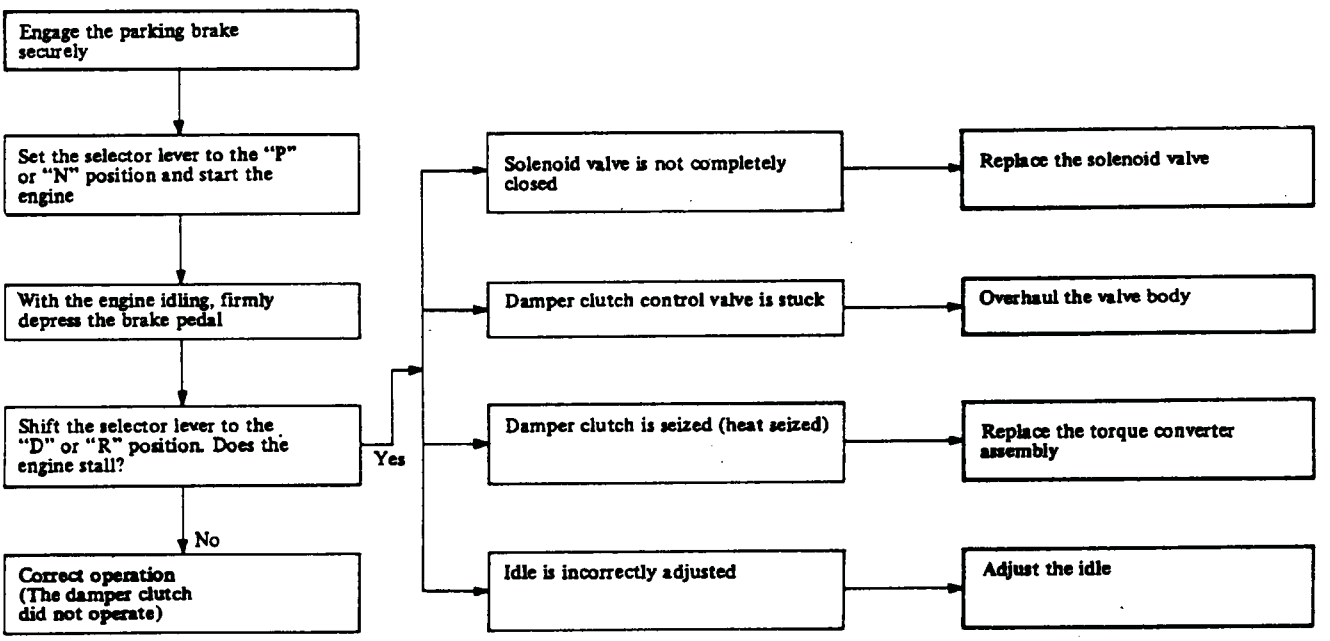
FLUID LEAKAGE – TRANSAXLE CONVERTER HOUSING AREA

1. Check for source of leakage. Since fluid leakage at or around converter area may originate from engine oil leak, area should be examined closely. Transaxle factory fill fluid is dyed red and, therefore, can be distinguished from engine oil.
2. Prior to removing transaxle, perform following checks: When leakage is determined to originate from transaxle, check fluid level prior to removal of transaxle and torque converter. High oil level can result in oil leakage out of vent located in top of oil pump. If fluid level is high, adjust to proper level and recheck for leakage.
3. After completing these steps, recheck once more for leakage.

DAMPER CLUTCH TORQUE CONVERTER – DIAGNOSIS

Test-1

Inspection of damper clutch torque converter operation with engine idling.



Test-2

Inspection procedures and malfunction classification for each element

(1) Wiring

Check for continuity in the harness, following the wiring diagram
- Is there a broken wire in the harness?
- Are there any improper connections?

Yes → Generally disengages in all ranges → Repair or correct the wiring

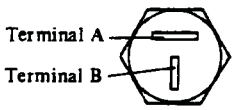
No → Go to (2)

(2) Coolant temperature sensor

Is there continuity between terminal B and the case when the coolant temperature exceeds 60°C (140°F)?

Resistance too high / Broken wire → No → Disengages in all ranges → Replace the coolant temperature sensor

Yes → Go to (3)



01K015

(3) Throttle position sensor

NOTE Check while set to the MPI

Check the resistance between terminals 1 and 3.
Is the resistance 3.5-6.5 kΩ at 20°C (68°F)?

Resistance less than 8% → No → Disengages in all range → Replace the throttle position sensor

Yes

171089

Throttle position sensor terminals

Check the resistance between terminals 2 and 1 while idling
Is the resistance just 8% of resistance between terminals 1 and 3?

Resistance more then 8% → No → Engine stalls during sudden braking with wheels locked → Adjust the resistance value by using the adjusting screw → Disengages at 20 km/h (13 mph) in 2nd → Adjust the resistance value by using the adjusting screw

Yes

Check the resistance between terminals 2 and 1 at full open
Is the resistance just 96% of resistance between terminals 1 and 3?

Resistance too high → No → Disengages in all range

Yes

Becomes ∞ midway through stroke

Does the resistance value between terminals 2 and 3 change continuously between idling and full open?

No → Disengages at a throttle opening when engine speed exceeds approx. 2,500 rpm

Changes continuously

Go to (4)

∞ : broken wire
or
0 : short

(4) Pulse generators A · B

A: Kickdown side lead wire with short transparent tube
B: Transfer driven gear side lead wire with long black tube

Check the resistance between terminals 1 and 2.
Is the resistance approx. 520Ω at 20°C?

No → Operation is OK in 2nd, but when subsequently driven in 3rd for longer than 5 seconds, disengages in all ranges

Replace the pulse generator

Yes

171090

Pulse generators A · B terminals
A = 1 and 2
B = 3 and 4

∞ : broken wire
or
0 : short

Check the resistance between terminals 3 and 4.
Is the resistance approx. 520Ω at 20°C?

No → Disengages in all ranges

Replace the pulse generator

Yes

Go to (5)

(5) Pulse generators A · B
(Use an oscilloscope to check.)

Connect the wiring harness and the pulse generator, and check with a chassis dynamometer, or with the front wheels raised

Insufficient voltage

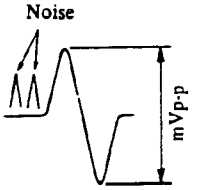
With the engine running at 800 rpm in low ("L"), use the oscilloscope to check the voltage waveform between terminals 1 and 2.
Is the voltage approx. 650 mV P-P or more?

No → Operation is OK in 2nd, but when subsequently driven in 3rd for longer than 5 seconds, disengages in all ranges

Adjust the gap between pulse generator A and the kickdown drum because it is excessive, or replace the pulse generator

Yes

Noise



01K015

Noise in the waveform

Disengages in 3rd only
Operation is OK in 2nd

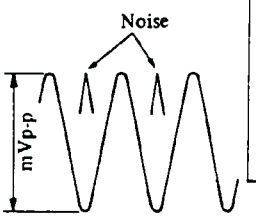
Poor grounding of shielded wire of pulse generator circuit

With the engine running at 1,000 rpm in low ("↓"), use the oscilloscope to check the voltage waveform between terminals 3 and 4.
Is the voltage approx. 180 mV P-P or more?

Insufficient voltage

No → Disengages in all ranges → Adjust the gap between pulse generator A and the kickdown drum because it is excessive, or replace the pulse generator

Yes



01K015

Noise in the wave form → Disengages in all ranges, or vibration occurs → Poor grounding of shielded wire of pulse generator circuit

Go to (6)

(6) Solenoid

Check the resistance between the solenoid terminals and the transaxle case.
Is the resistance approx. 3Ω at 20°C (68°F)?

∞ : broken wire
or
0 : short

No → Disengaes in all ranges → Refer to notes (1) and (2) → Replace the solenoid

Yes

NOTES
(1) If resistance is ∞, minus (−) side lead wire may not be connected
(2) If there is a short in the solenoid, the control unit may be damaged

Is there any foreign matter on the valve seat?

Yes → Engine stalls when shifted from "N" or "P" to a driving gear → Replace the solenoid

No

Go to (7)

(7) Brands of automatic transmission fluid

Run the engine at 2,500 rpm or more and check the steering wheel for vibration

Excessive vibration → Check the brand of the automatic transmission fluid

(8) Computer → Disconnect the body harness from the computer. After connecting the extension harness to the body harness, connect another computer

Same abnormal condition — No → Replace the computer

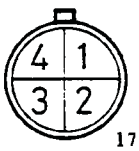
Same abnormal condition — Yes → Normal

(9) Pressure control (PC) solenoid valve → Check the resistance between solenoid valve terminal 1 and the transmission case (ground)

∞ (damage or disconnection) or 0 (short-circuit) → Replace the PC solenoid valve

2.6-3.2Ω at 20°C (68°F) → Check whether there is dirt in the valve seat

Solenoid valve connector



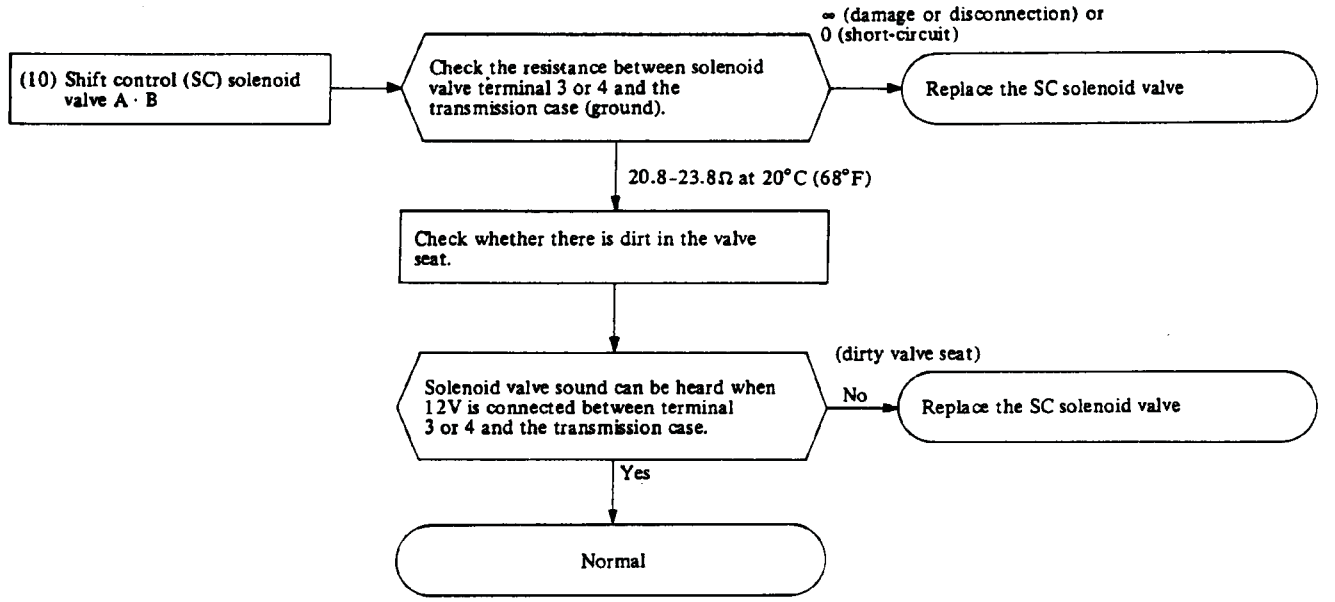
171095

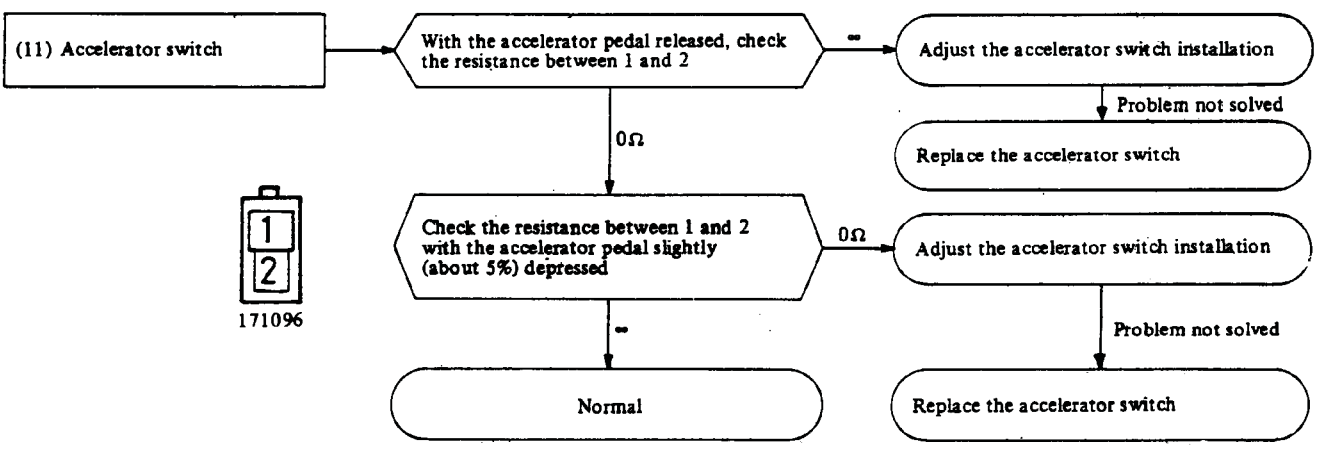
1: PC solenoid valve
2: Damper clutch solenoid valve
3: SC solenoid valve A
4: SC solenoid valve B

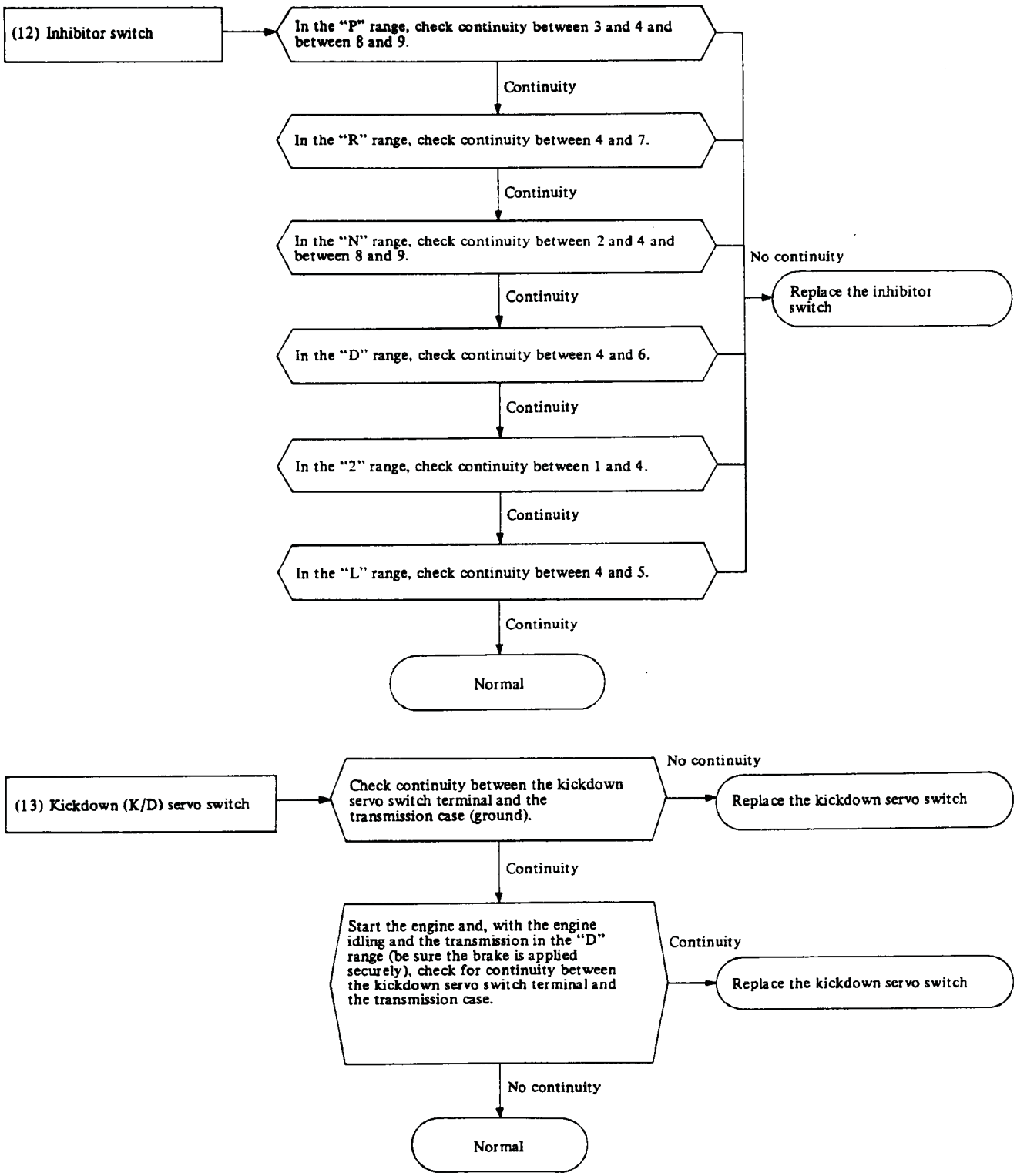
Check whether there is dirt in the valve seat → Solenoid valve sound can be heard when 12V is connected between terminal 1 and the transmission case

(dirty valve seat) — No → Replace the PC solenoid valve

Solenoid valve sound can be heard when 12V is connected between terminal 1 and the transmission case — Yes → Normal

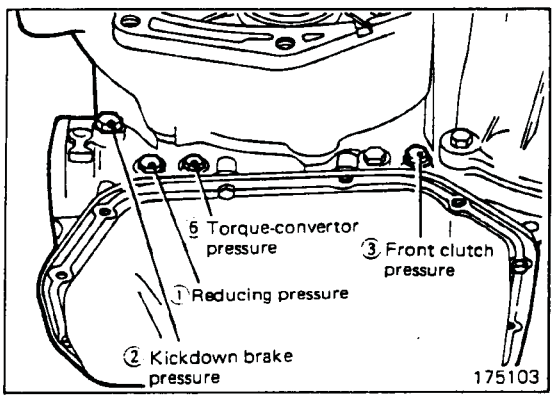

∞ (damage or disconnection) or
0 (short-circuit)
(10) Shift control (SC) solenoid valve A · B
Check the resistance between solenoid valve terminal 3 or 4 and the transmission case (ground).
Replace the SC solenoid valve
20.8-23.8Ω at 20°C (68°F)
Check whether there is dirt in the valve seat.
(dirty valve seat)
Solenoid valve sound can be heard when 12V is connected between terminal 3 or 4 and the transmission case.
No
Replace the SC solenoid valve
Yes
Normal


(11) Accelerator switch
With the accelerator pedal released, check the resistance between 1 and 2
∞
Adjust the accelerator switch installation
Problem not solved
Replace the accelerator switch
0Ω
1
2
171096
Check the resistance between 1 and 2 with the accelerator pedal slightly (about 5%) depressed
0Ω
Adjust the accelerator switch installation
∞
Problem not solved
Normal
Replace the accelerator switch

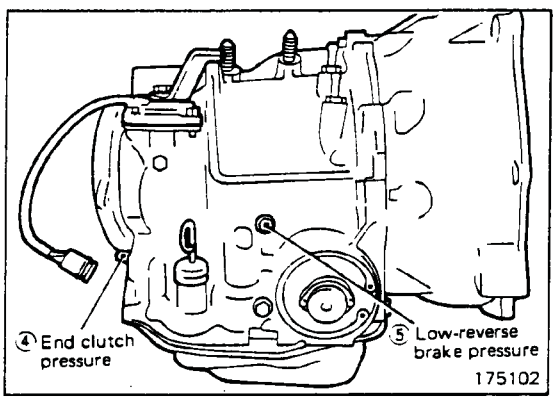

(12) Inhibitor switch
In the "P" range, check continuity between 3 and 4 and between 8 and 9.
Continuity
In the "R" range, check continuity between 4 and 7.
Continuity
In the "N" range, check continuity between 2 and 4 and between 8 and 9.
Continuity
In the "D" range, check continuity between 4 and 6.
Continuity
In the "2" range, check continuity between 1 and 4.
Continuity
In the "L" range, check continuity between 4 and 5.
Continuity
Normal
No continuity
Replace the inhibitor switch
(13) Kickdown (K/D) servo switch
Check continuity between the kickdown servo switch terminal and the transmission case (ground).
No continuity
Replace the kickdown servo switch
Continuity
Start the engine and, with the engine idling and the transmission in the "D" range (be sure the brake is applied securely), check for continuity between the kickdown servo switch terminal and the transmission case.
Continuity
Replace the kickdown servo switch
No continuity
Normal

OIL PRESSURE TESTS

1. Completely warm up the transaxle.
2. Raise the vehicle by using a jack 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 30 kg/cm² (MD998330) and the adaptor (MD998332-01) to each oil-pressure outlet port.
   When the reverse pressure is to be tested, the 30 kg/cm² type of gauge should be used.



5. Measure the oil pressure under various conditions, and 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 "Remedial steps if oil pressure is not normal" on the next page.



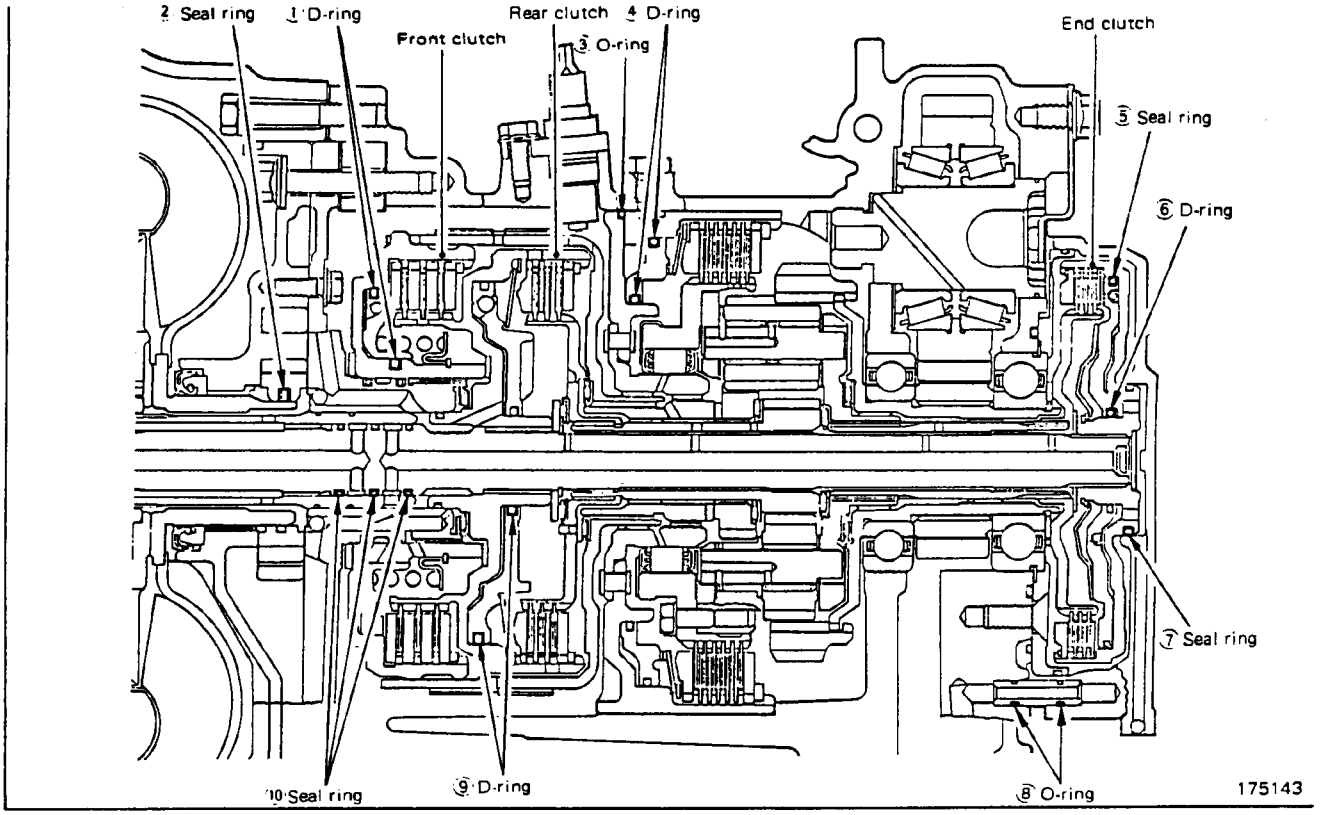
Standard Oil Pressure Table

No	Conditions				Standard oil pressure kg/cm²					
	Select lever position	(Reference) vehicle speed km/h	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-convertor pressure
1	N	0	Idling	Neutral	2.5 ~ 3.9	–	–	–	–	–
2	N	0	Approx. 2500	Neutral	–	–	–	–	–	2.0 ~ 2.4
3	D	0	Idling	2nd gear	2.5 ~ 3.9	1.0 ~ 2.1	–	–	–	–
4	D (SW-ON)	110	Approx. 2500	4th gear	2.5 ~ 3.9	6.2 ~ 6.8	–	6.2 ~ 6.8	–	–
5	D (SW-OFF)	75	Approx. 2500	3rd gear	2.5 ~ 3.9	6.2 ~ 6.8	6.2 ~ 6.8	6.2 ~ 6.8	–	–
6	2	50	Approx. 2500	2nd gear	2.5 ~ 3.9	6.2 ~ 6.8	–	–	–	–
7	L	0	Approx. 1000	1st gear	2.5 ~ 3.9	–	–	–	3.0 ~ 4.2	–
8	R	35(0)	Approx. 2500	Reverse	2.5 ~ 3.9	–	11.6 ~ 17.6	–	11.6 ~ 17.6	–

NOTE
- must be 0.1 kg/cm² or less.
SW-ON : Switch ON the OD switch.
SW-OFF : Switch OFF the OD switch.

Remedial 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 and ⑤ in the "Standard oil pressure table" on the previous page.	a. Clogging of oil filter	a. Visually inspect the oil filter; replace the oil filter if it is clogged.
	b. Improper adjustment of oil pressure (line pressure) of 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 dischange 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 clogged.
	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 kick-down 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.
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. Functional 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 ① D-ring and ② seal 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 or seal 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 seal ring ⑤ or ⑦, D-ring ⑥ of the end clutch or O-ring ⑧ 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, O-ring of the pipe, 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. Functional malfunction of the valve body assembly	c. Replace the valve body assembly.



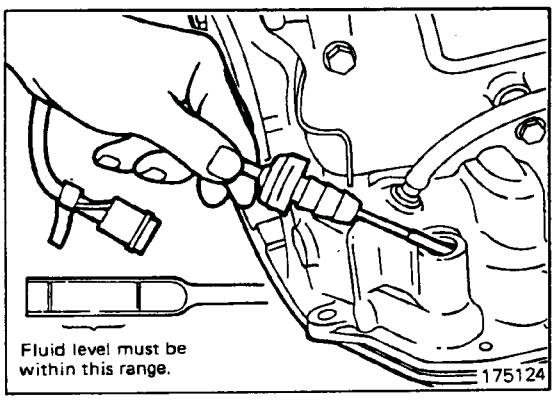
Trouble symptom	Probable cause	Remedy
6. Improper low-reverse brake pressure	a. O-ring between valve body and transmission damaged or missing	a. Remove the valve body assembly and check to be sure that the O-ring at the upper surface of the upper valve body is not missing or damaged; install or replace the O-ring if necessary.
	b. Looseness or improper tightening of center support tightening bolt	b. After removing the valve body assembly, check the tightened condition of the bolt; re-tighten it if necessary.
	c. Looseness of valve body tightening part	c. Tighten the valve body tightening bolt and installation bolt.
	d. Functional malfunction of the valve body assembly	d. Replace the valve body assembly.
	e. Malfunction of the D-ring ④ of the low-reverse brake piston or the O-ring ③ of the retainer (Refer to the figure above.)	e. Disassemble the transaxle itself and check the D-ring and O-ring for damage; replace if there are cuts, scars, scratches or damage.
7. Improper torque convertor 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 piping	b. Repair or replace, as necessary, the cooler and/or piping.
	c. Damaged seal ring ⑩ of the input shaft (Refer to the figure above.)	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 convertor	d. Replace the torque convertor.

SERVICE ADJUSTMENT PROCEDURES- MAINTENANCE AND ADJUSTMENT

LUBRICATION

Checking Fluid Level and Replenishing Fluid

Check and replenish interval:
Every 24,000 km (15,000 miles)
Inspect fluid level on dipstick with engine idling, transaxle in neutral position and vehicle on level ground.
A proper fluid level should be between upper and lower lines of dipstick when fluid temperature is 50–80°C (120–180° F).



Changing Fluid

Recommended fluid	DEXRON II

NOTES
When factory fill fluid is changed as recommended above. If transaxle is disassembled for any reason, fluid and filter should be changed.

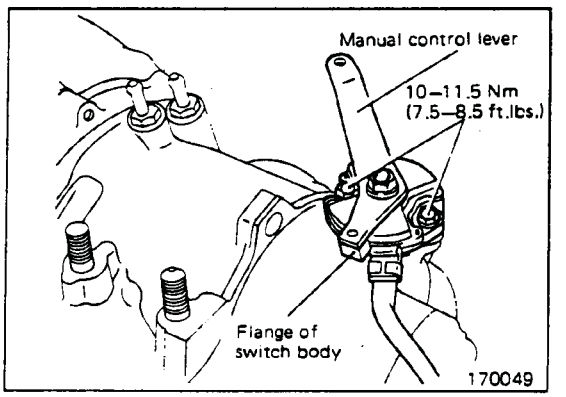
Fluid Changing Procedure

Caution
When the unit is damaged and the ATF is changed, be sure to also clean the cooler system.

1. Raise vehicle on hoist. Place drain container with large opening, under drain plug.
2. Remove drain plug to let fluid drain.
3. Place a drain container with large opening under the transaxle oil pan.
4. Loosen the oil pan bolt. (Do not remove it.) Then gently tap the corner of the oil pan to remove it and drain the ATF. Then remove the oil pan, taking care not to spill the ATF still remaining in it.
5. Check for clogging or damage of the oil filter; replace if necessary.
6. Clean gasket surfaces of transaxle case and oil pan.
7. Install oil pan with new gasket and tighten oil pan bolts to 10 to 11 Nm (7.5 to 8.5 ft.lbs.).
8. Clean drain plug and tighten drain plug with gasket to 30 to 34 Nm (22 to 25 ft.lbs.).
9. Pour 4 liters (4.2 U.S.qts., 3.5 Imp.qts.) of recommended ATF into case through dipstick hole. [Total quantity of ATF required is approx. 5.8 liters (6.1 U.S.qts., 5.1 Imp.qts.). Actually, however, approx. 4.5 liters (4.8 U.S.qts., 4.0 Imp.qts.) of fluid can be replaced because rest of fluid remains in torque converter.]
10. 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.
11. Add sufficient ATF to bring fluid lever to lower mark. Recheck fluid level after transaxle 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 transaxle.

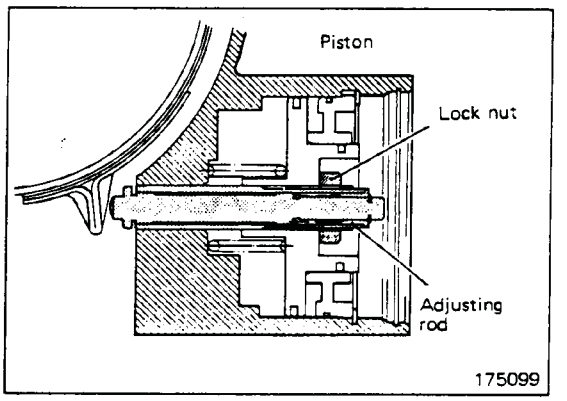
INHIBITOR SWITCH ADJUSTMENT

1. Place manual control lever in "N" Neutral position.
2. Turn inhibitor switch body until 12 mm (.472 in.)- wide end "A" of manual control lever overlaps switch body flange.
3. Tighten two attaching bolts to torque between 10 and 11.5 Nm (7.5 and 8.5 ft.lbs.) while paying attention to prevention of switch body dislocation.



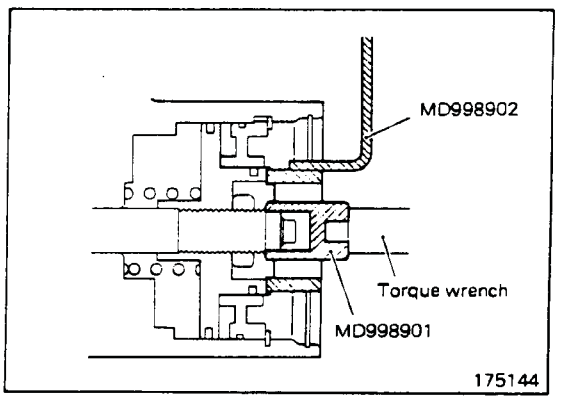
ADJUSTMENT OF THE KICKDOWN SERVO

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



5. While holding with special tool MD998902 so that the kickdown servo piston won't turn, use special tool MD998901 to "tighten", at 9.8 Nm (7.2 ft.lbs.), and "return" the adjustment screw two times each, and then tighten at a torque of 4.9 Nm (3.6 ft.lbs.). Then return the adjustment screw 2 to 2-1/4 turns.
6. While holding with special tool MD998902 so that the kickdown servo piston won't turn, tighten the lock nut to the specified torque.

Lock nut	25-31 Nm (18-23 ft.lbs.)



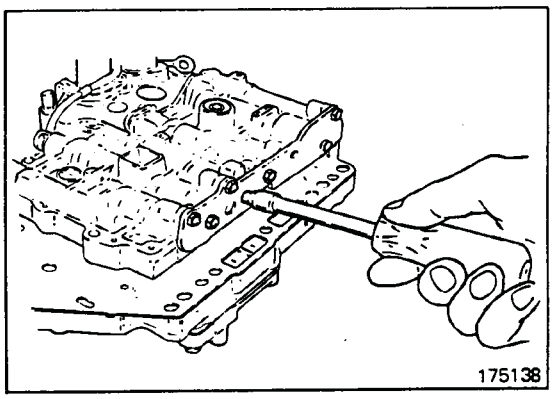
7. After fitting a new D-ring in the groove around the cover, install the cover to the case so that the D-ring won't be twisted, and then install the snap ring.
8. Install the kickdown servo switch to the cover.

Kickdown servo switch screw	1.0-1.4 Nm (0.7-1.0 ft.lbs.)

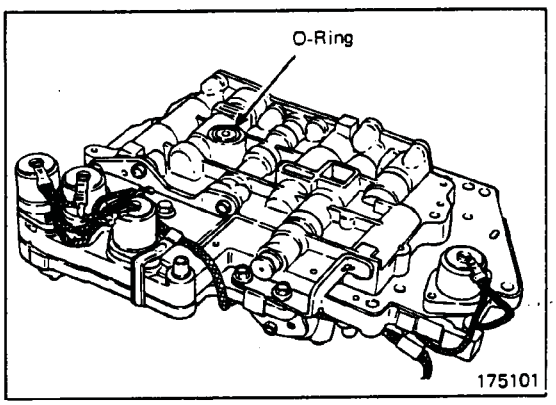
ADJUSTMENT OF THE LINE PRESSURE

1. Drain out the ATF.
2. Remove the oil pan.
3. Remove the oil filter.
4. Remove the valve body assembly. The manual valve can come out, so be careful not to drop it.
5. Turn the adjustment screw of the regulator valve and adjust so that the line pressure (kickdown brake pressure) becomes the standard value.

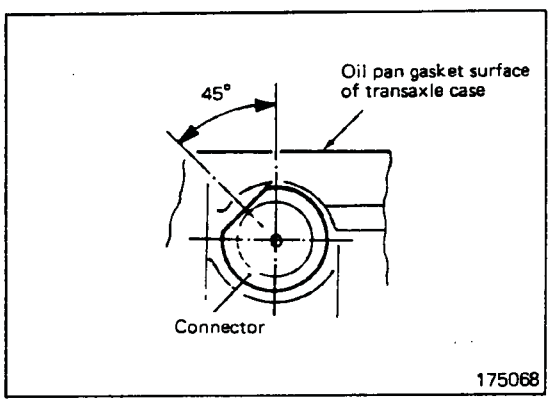
Standard value	647 ± 9.8 kPa (94 ± 1.4 psi)
Oil pressure change for each turn of adjustment screw	28 kPa (4 psi)



6. 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.

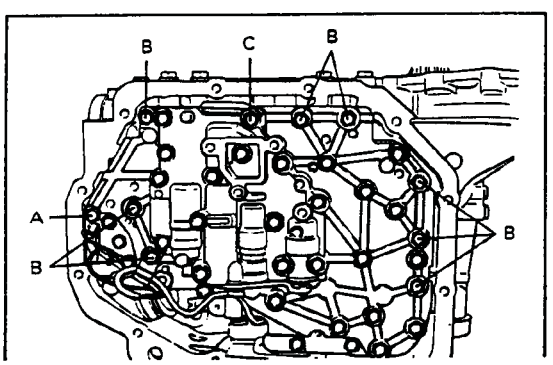


7. Replace the O-ring of the solenoid valve connector with a new one.
8. Install the valve body assembly to the case and then insert the solenoid valve connector into the case. Be sure, at this time, that the notched part of the connector faces as shown in the figure.
   Also be careful that the lead wiring isn't caught.



9. Tighten valve body assembly mounting bolts (10 pieces) to 10-11.5 Nm (7.5-8.5 ft.lbs.).

A bolt	20 mm (.787 in.) long
B bolt	28 mm (1.102 in.) long
C bolt	45 mm (1.772 in.) long



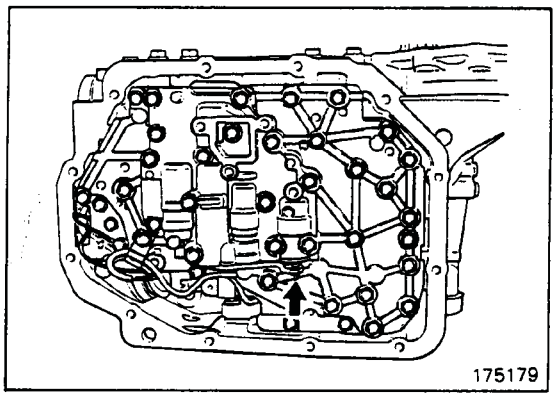
10. Install the oil filter.
11. Install a new oil pan gasket and oil pan, and tighten the 12 bolts.
12. Pour in the specified amount of ATF.
13. Make the oil pressure test. Readjust if necessary.

ADJUSTMENT OF THE REDUCING PRESSURE

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.

Standard value	314 ± 9.8 kPa (46 ± 1.4 psi)
Oil pressure change for each turn of adjustment screw	16 kPa (2.3 psi)

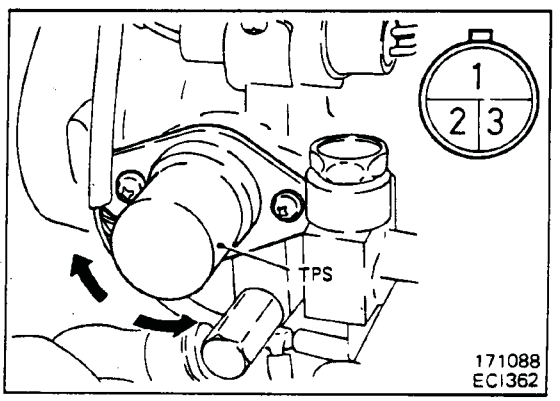
3. Install the oil filter and oil pan in the same way as for adjustment of the line pressure.
4. Make the oil pressure test. Readjust if necessary.



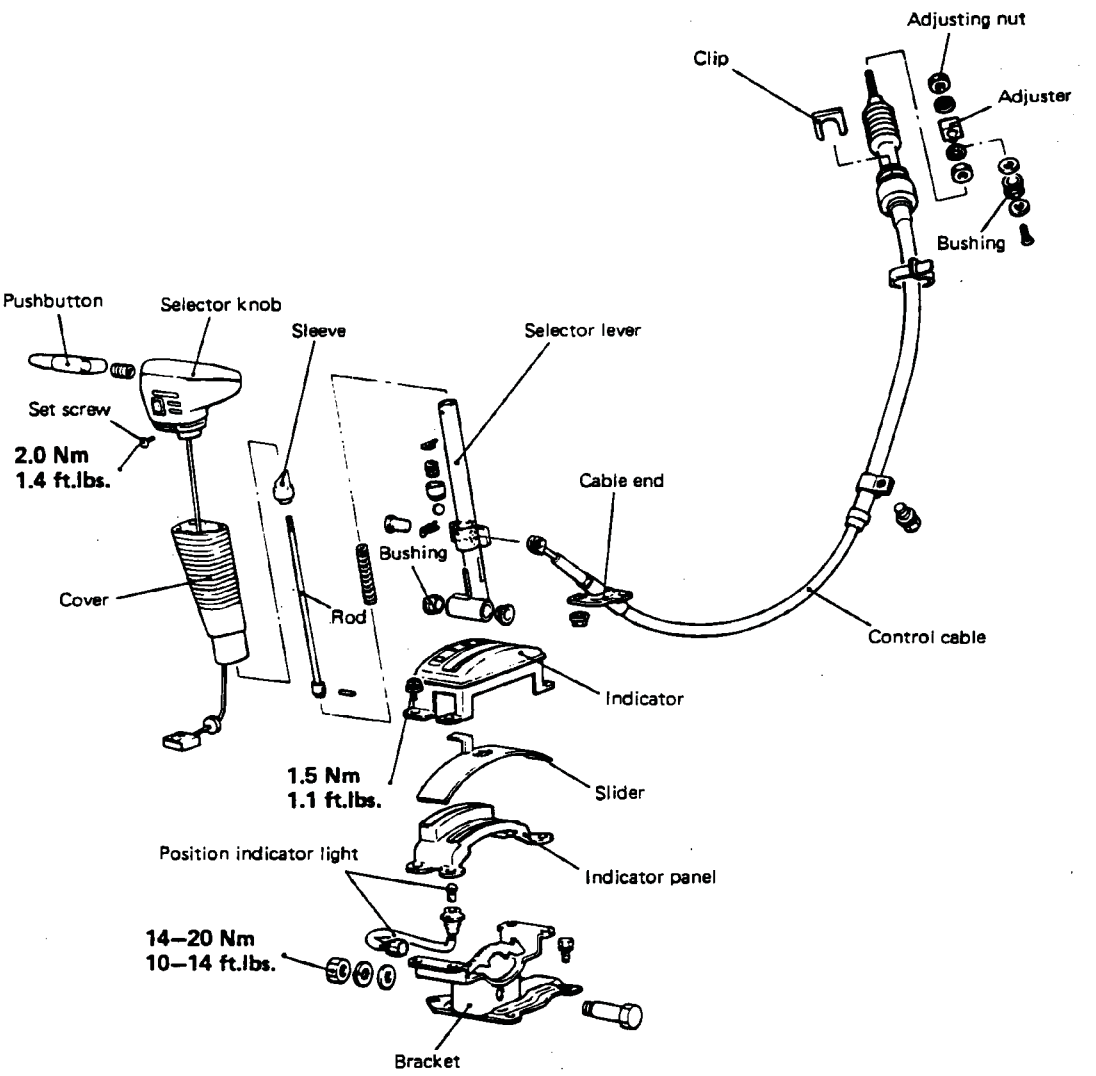
ADJUSTMENT OF THE THROTTLE-POSITION SENSOR (TPS)

1. Measure and make a note of the resistance between terminals 1 and 3.
2. Measure and make a note of the resistance between terminals 2 and 3. Measure the resistance after the engine has warmed up, in the throttle idle open condition.
3. If the measured resistance is not the standard value, turn the body of the TPS to adjust to get the standard value.

Standard value	Resistance between terminals 2 and 3: 8% of resistance between terminals 1 and 3.

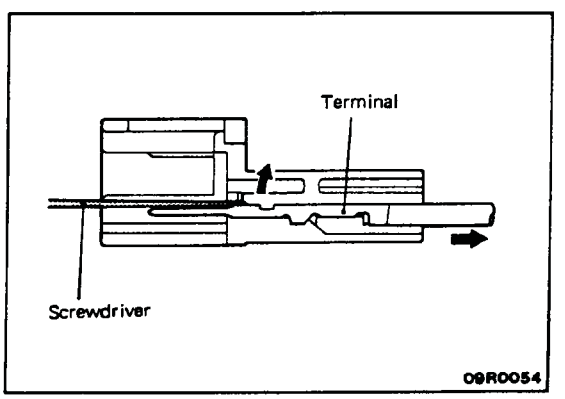


COMPONENT SERVICE-AUTOMATIC TRANSAXLE CONTROL

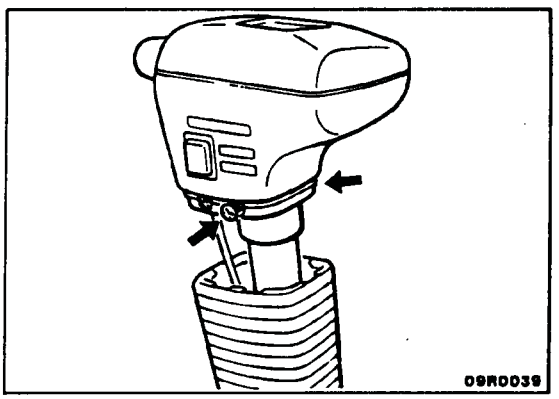


REMOVAL

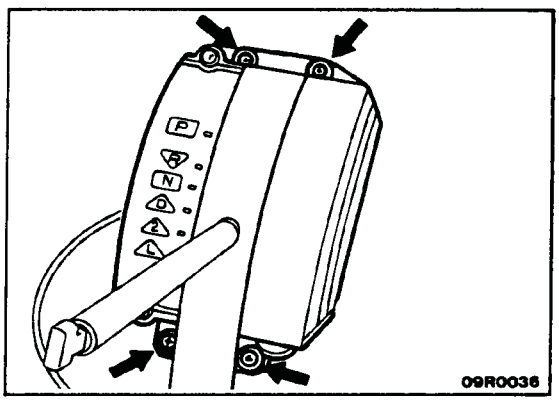
1. Remove the console box. (Refer to GROUP 23.)
2. Disconnect the overdrive switch connector.
3. Remove the terminal from the overdrive switch connector case. (09R0054)



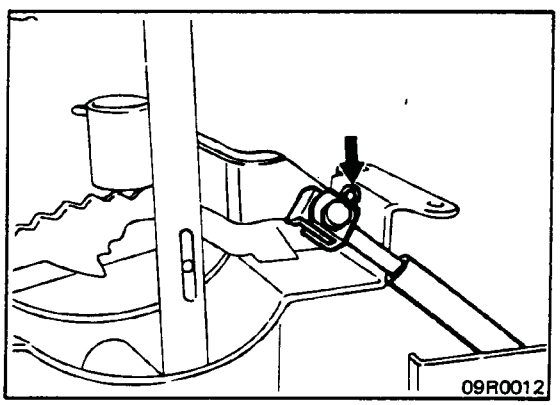
4. Push the cover downward.
5. Remove the selector knob from the selector lever. (09R0039)



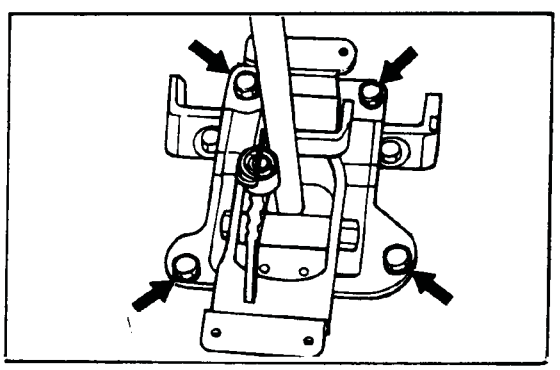
6. Remove the indicator panel. (09R0036)
7. Disconnect the connector of the position indicator light.



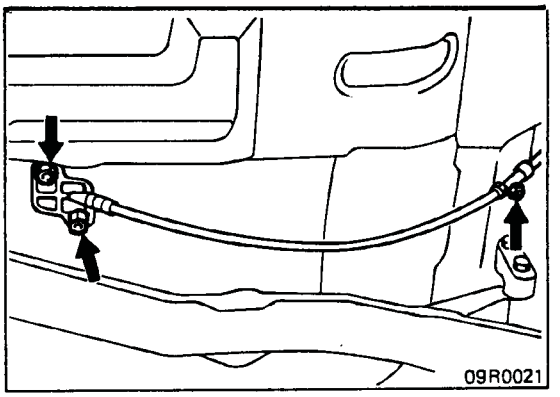
8. Disconnect the control cable from the lever.



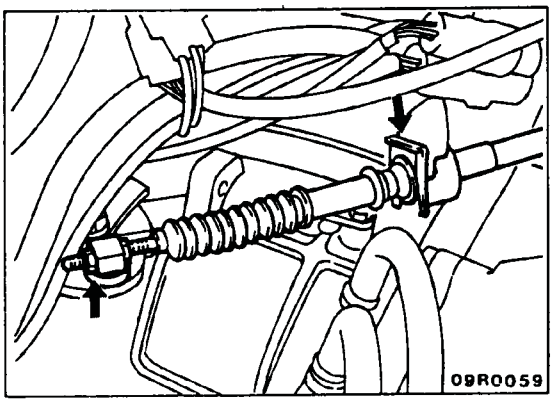
9. Remove the bracket from floor panel.



10. Raise the vehicle, remove the cable end installation nut from the floor panel, and pull the control cable toward the lower part of the chassis.
11. Remove the control cable installation bolt and holding band at the floor panel. (09R0021)



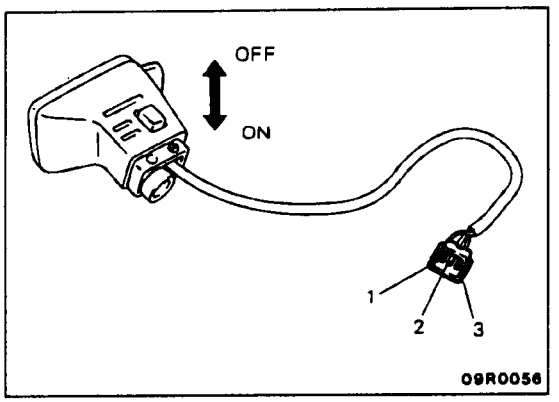
12. Remove the control cable from the transaxle and the transaxle mount bracket.



INSPECTION

1. Check detent place for wear.
2. Check pin at the end of selector lever for wear.
3. Check contact surface of the push button and the sleeve for wear.
4. Check control cable for function and for damage.
5. Check busing for wear or damage.
6. Check overdrive switch for continuity. (09R0056)

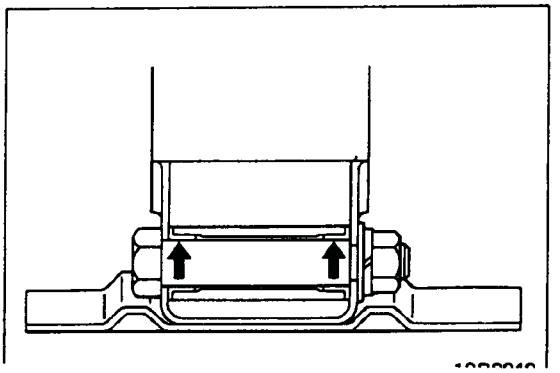
Terminal / Switch position	1 (0.3-RW)	2 (0.3-BW)	3 (0.3-YW)
Overdrive activation (OFF)	o	o	
Overdrive non-activation (ON)	o		o



INSTALLATION

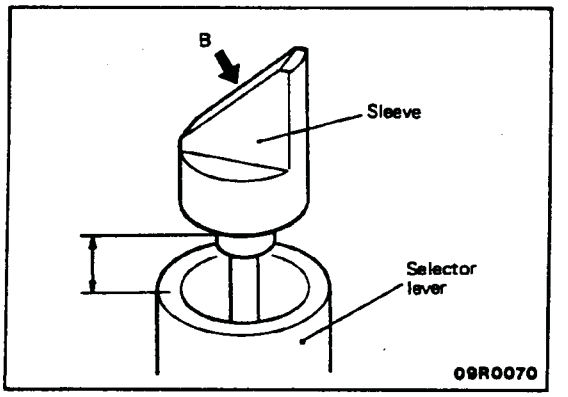
1. Apply chassis grease to each sliding part.
2. Apply a coating of multi-purpose grease to the sliding part of the selector lever bushing. (19R0040)

Recommended multi-purpose grease ..... SAE J310a, NLGI grade #3



3. Place the selector lever in the "N" position, and then turn the sleeve so that the clearance between the sleeve and the selector lever end is within the specified range. (09R0070)

Clearance between sleeve and selector lever end	15.2-15.9 mm (.598-.625 in.)

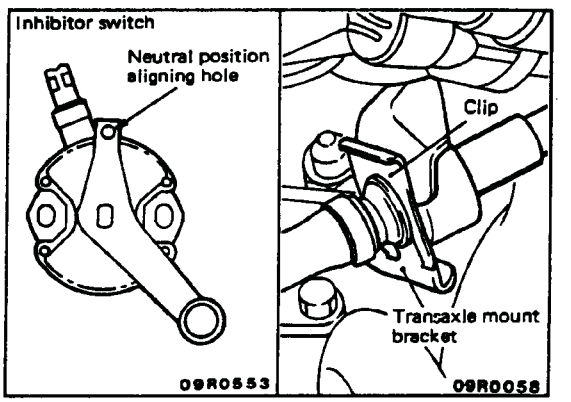


NOTE
Be sure to face B of the adjusting cam to the pushbutton (driver's side) (09R0070)

4. After installing the indicator panel, move the selector lever to each position and check to be sure that the indicator panel indication agrees with the transmission position.

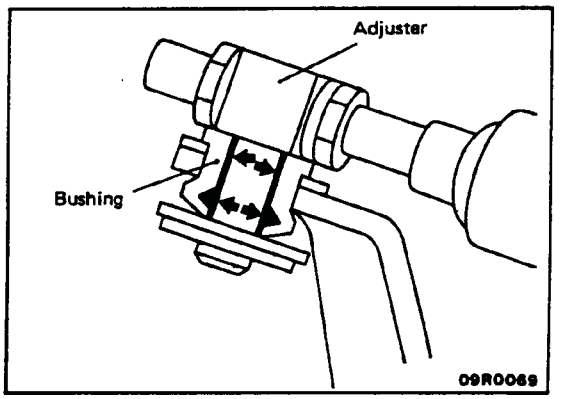
5. Move the selector lever and the inhibitor switch to the "N" position, and install the control cable. (09R0553)

Caution
When connecting the control cable to the transaxle mount bracket, install the clip until it contacts the control cable, in the position shown in the figure. (09R0058)

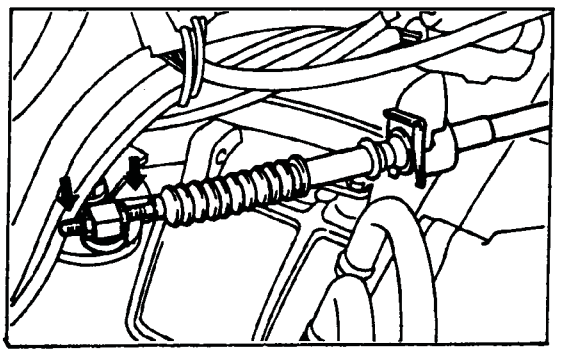


6. Apply a coating of the specified multi-purpose grease to the interior of the bushing, and fill it.

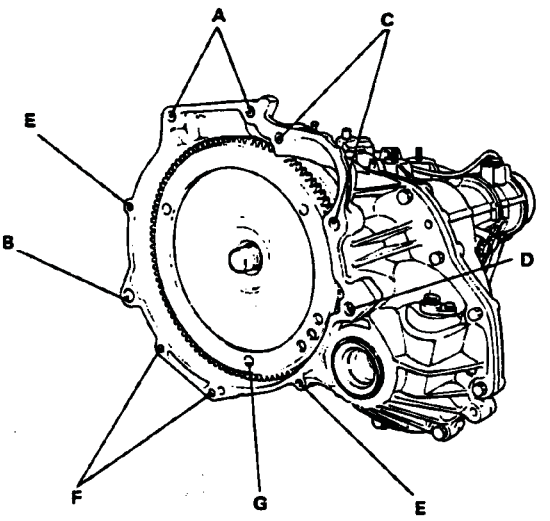
Recommended multi-purpose grease	SAE J310a, NLGI grade #3



7. Adjust the adjusting nut on the transaxle side so that there is no looseness in the control cable. (09R0059)
8. Confirm that selector lever operation is smooth, that the correct gear is selected at each position of the lever, and that the corresponding position mark is indicated at each position.
9. Confirm that the ignition switch will operate the starter motor when the selector lever is moved to the "N" and "P" positions, and that it will not in the other positions.
10. With the vehicle moving, operate the overdrive switch and check to be sure that overdrive operates and is released correctly.

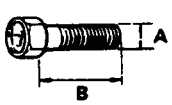


COMPONENTS



	Nm	ft. lbs.	O.D. x Length mm (in.)
A	43-55	31-40	⑦ 10 x 40 (1.6)
B	43-55	31-40	⑦ 10 x 65 (2.6)
C	22-32	16-23	⑦ 10 x 55 (2.2)
D	30-35	22-25	⑩ 10 x 60 (2.4)
E	10-12	7-9	⑦ 8 x 14 (0.6)
F	15-22	11-16	⑦ 8 x 20 (0.8)
G	35-42	25-30	

Bolt identification ⑦ A x B

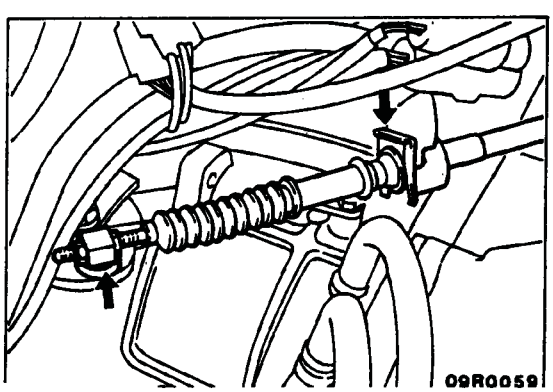


Y09512

TRANSAXLE

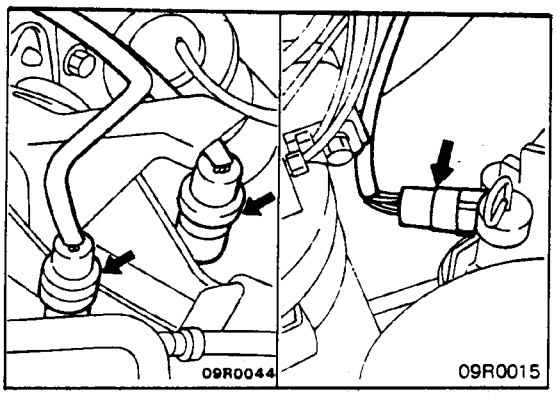
Removal

1. Remove the hood.
2. Remove the air cleaner case.
3. Disconnect the control cable from the transaxle. (09R0059)

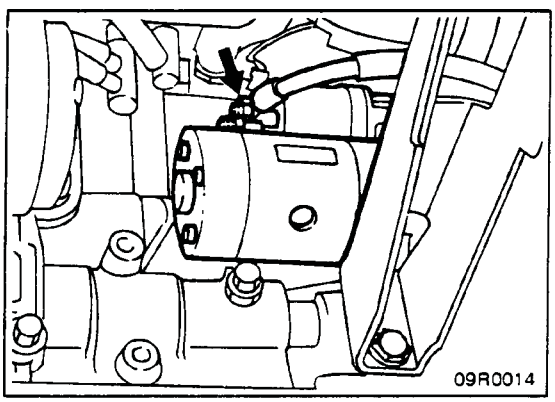


4. Disconnect the inhibitor switch connector, pulse generator connector, oil cooler hoses, speedometer cable. (09R0044, 09R0015)
5. For models equipped with the Electronic Controlled Suspension system, remove the compressor assembly and the reserve tank assembly. (Refer to GROUP 2.)

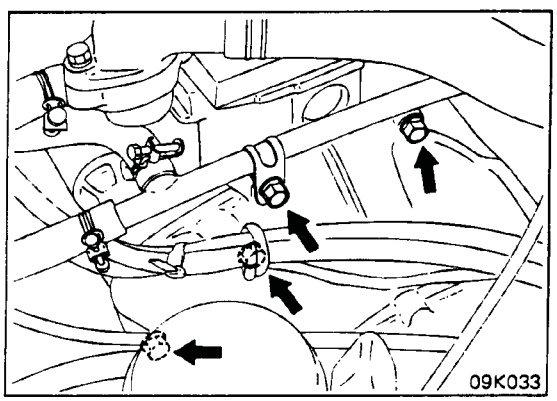
Caution
Be careful that the fluid does not drain out of the cooler hoses after the hoses have been disconnected, and install plugs on the hoses and the transaxle so that foreign matter does not enter.



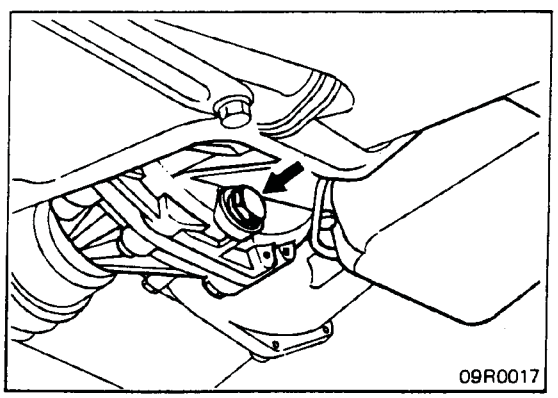
6. Disconnect the starter motor harness.



7. Remove the upper five bolts connecting the transaxle to the engine. (09K033)
8. Remove the starter motor.

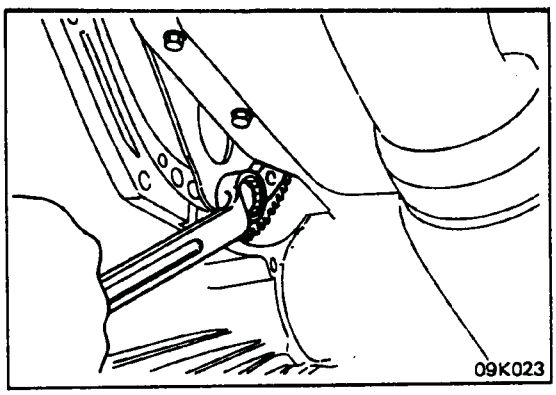


9. Lift the vehicle and remove the wheels.
10. Remove the undercover panel.
11. Drain transmission fluid. (09R0017)
12. Remove the right and left drive shafts from the transaxle as follows.
    (1) Using the special tool, (MB990778-01) disconnect the knuckle from the lower arm ball joint. (Refer to GROUP 2.)
    (2) Using the special tool, (MB990635-01) disconnect the tie rod from the knuckle. (Refer to GROUP 19.)
    (3) Remove the drive shaft from the transaxle. (Refer to GROUP 2.)
13. Attach the wire to the engine hook, suspend the engine by a block & tackle to the extent that there is no looseness in the wire, and then remove the center member.



14. Remove the bell housing cover.
15. Remove the three special bolts (three pieces) connecting the converter with the drive plate. (09K023)

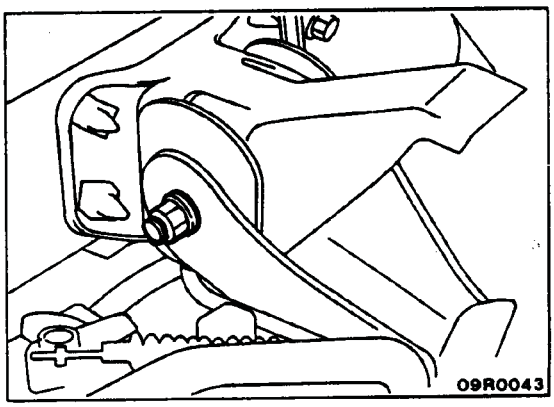
NOTE
Remove the converter while rotating the flywheel by turning the crank pulley.
In order not to leave the torque converter in the engine, push the torque converter into the transaxle after removal of the special bolts.



16. While supporting the lower part of the transaxle with a transmission jack, remove the remaining engine connecting bolts.

Caution
Support a wide area of the transaxle so that the oil pan is not distorted when supported.

17. Remove the transaxle mount insulator bolts. (09R0043)
18. Slide the transaxle assembly toward the right then lower it to remove.



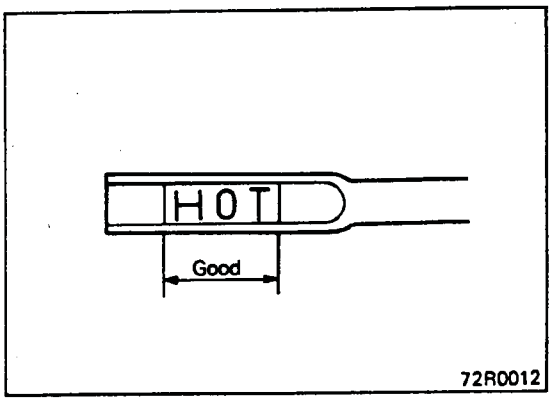
Installation

1. Be sure to install the torque converter first to the transaxle and then to the engine.

Caution
If the torque converter is installed first to the engine, oil seals on the transaxle side may be damaged.

2. Refill the transaxle with fluid to the specified level. (72R0012)

Recommended fluid	ATF DEXRON II type
Quantity	3.0 lit. (3.2 U.S.qts., 2.6 Imp.qts.)

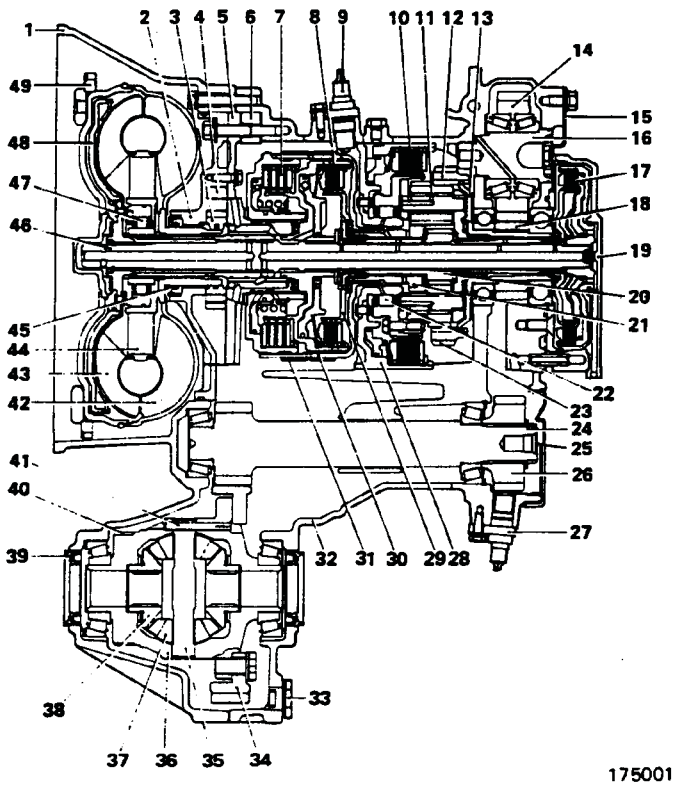


NOTE
With the vehicle on a level surface, check by shifting the selector lever from "P" through "L" positions with the engine idling.

3. Adjust the throttle control cable.
4. Adjust the control cable. (Refer to P.21-43.)
5. Be sure the inhibitor switch harness does not contact the transaxle insulator bracket.
6. Be sure the engine does not start when the selector lever is placed at other than the "N" and "P" positions.
7. Install the parts and torque to specifications.

SECTIONAL VIEW

COMPONENT SERVICE-AUTOMATIC TRANSAXLE ASSEMBLY



1. Converter housing
2. Oil pump housing
3. Oil pump drive gear
4. Oil pump driven gear
5. Reaction shaft support
6. Adapter
7. Front clutch
8. Rear clutch
9. Pulse generator A
10. Low-reverse brake
11. Planet gear set
12. Internal gear
13. Output flange
14. Transfer idle gear
15. Lock plate
16. Transfer idle shaft
17. End clutch
18. Transfer drive gear
19. Bearing retainer
20. Forward sun gear
21. Reverse sun gear
22. One-way clutch
23. Parking sprag
24. Transfer shaft
25. Cover
26. Transfer driven gear
27. Pulse generator B
28. Center support
29. Clutch hub
30. Kickdown drum
31. Kickdown band
32. Transaxle case
33. Drain plug
34. Differential drive gear (Ring gear)
35. Pinion shaft
36. Differential case
37. Pinion gear (2)
38. Side gear (2)
39. Drive shaft oil seal (2)
40. Speedometer drive gear
41. Pinion shaft lock pin
42. Impeller
43. Turbine
44. Stator
45. Pump oil seal
46. Input shaft
47. One-way clutch
48. Clutch plate
49. Starter ring gear

DISASSEMBLY

Caution

Because the automatic transaxle is composed of component parts of an especially high degree of precision, these parts should be very carefully handled during disassembly and assembly so as not to scar or scratch them.

A rubber mat should be placed on the workbench, and it should always be kept clean.

During disassembly, cloth gloves or rags should not be used. If such items must be used, use articles made of nylon, or use paper towels.

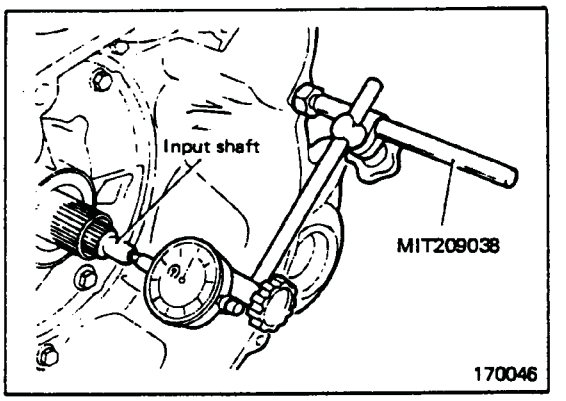
All disassembled parts must be thoroughly cleaned. Metal parts may be cleaned with ordinary detergents, but must be thoroughly air dried.

Clean the clutch disc, resin thrust plate and rubber parts by using ATF (automatic transmission fluid), being very careful that dust, dirt, etc. do not adhere.

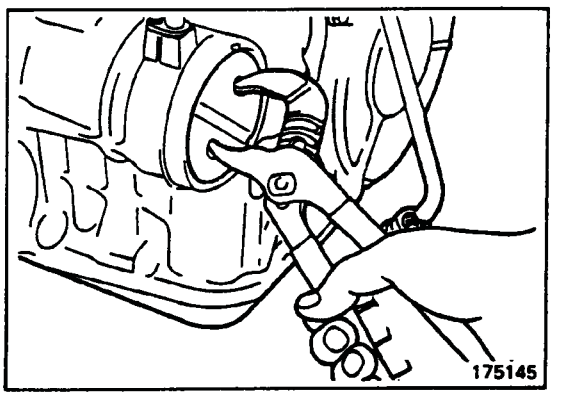
If the transaxle main unit is damaged, also disassemble and clean the cooler system.

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.

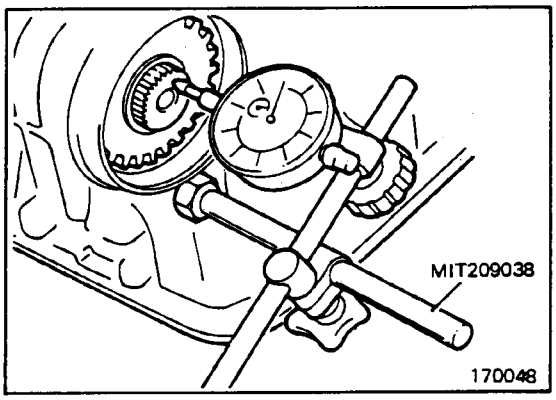
4. Measuring input shaft end play before disassembly will usually indicate when a thrust washer change is required (except when major parts are replaced). Thrust washers are located between reaction shaft support and rear clutch retainer, and between reaction shaft support and front clutch retainer.
   Mount a dial indicator MIT209038 to converter housing with the Dial Indicator Support. Make sure that the indicator plunger is seated against end of 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 transaxle.



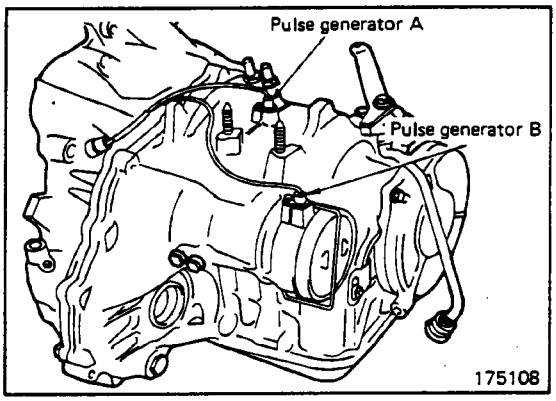
5. Remove the cover retainer and then remove the cover.



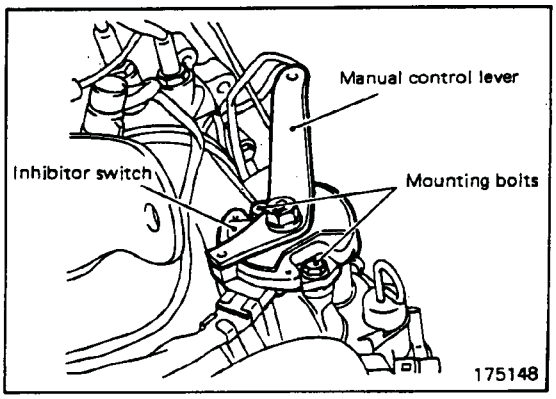
6. Measuring transfer shaft end play before disassembly will usually indicate when a spacer change is required. Spacer is located between the front transfer shaft bearing outer race and the converter housing.
   Attach a dial indicator to transaxle case using Special Tool, Dial Indicator MIT209038 with its plunger seated against end of transfer shaft.
   After removing the idler shaft lock plate, install the special tool into the lock plate bolt hole. When checking end play, pull out or push in on transfer shaft with pliers. Be careful not to scratch the shaft. Record indicator reading for reference when reassembling transaxle.



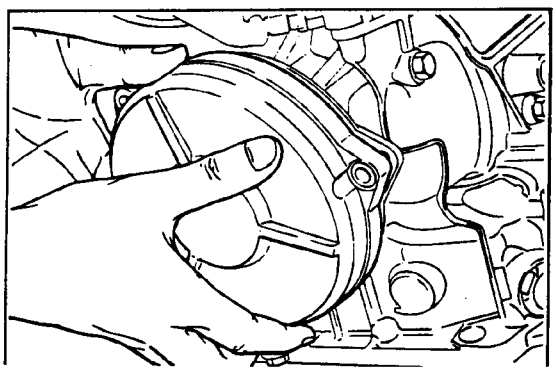
7. Remove the pulse generator "A" and "B".



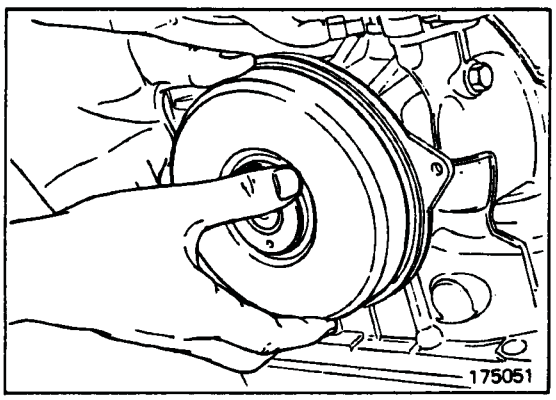
8. Remove manual control lever, then remove inhibitor switch.



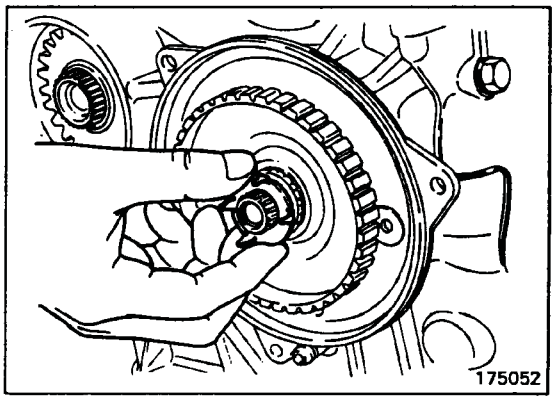
9. Remove the end clutch cover.



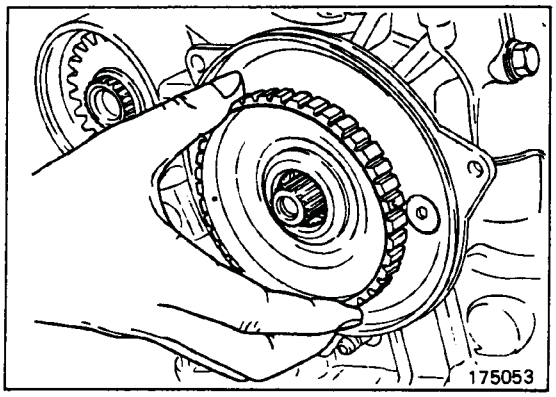
10. Remove the end clutch assembly.



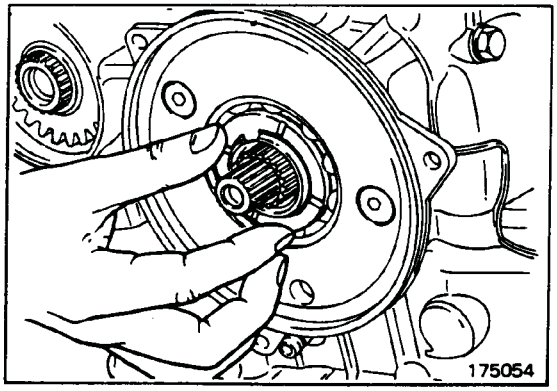
11. Remove the thrust washer.



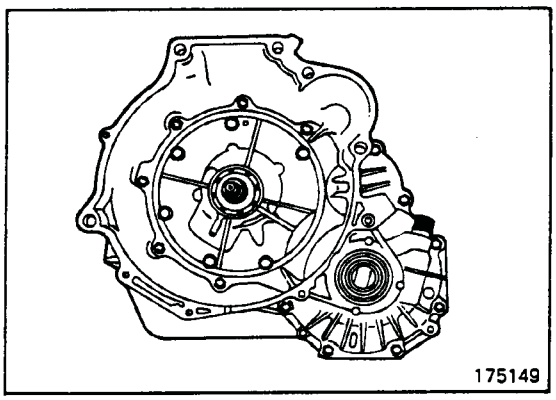
12. Remove the end clutch hub.



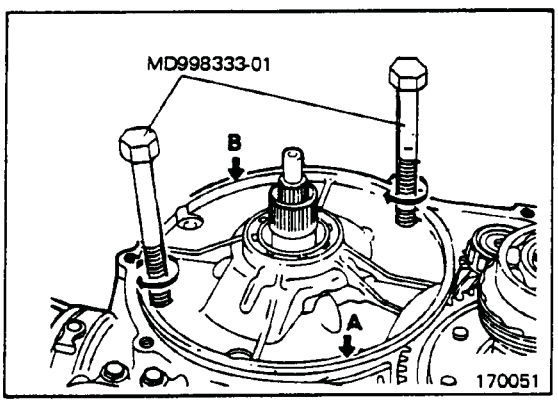
13. Remove the thrust washer, and pull out the end clutch shaft.



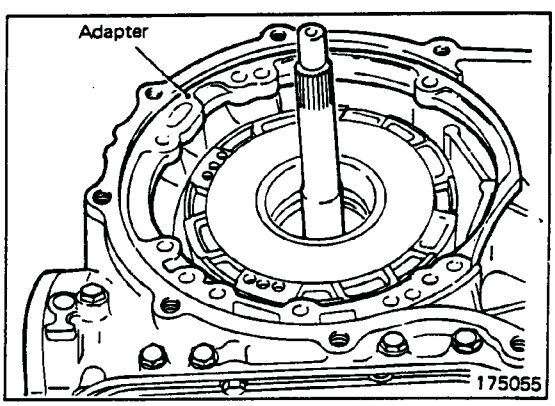
14. **Place transaxle with engine mounting surface up.**
15. Remove 13 bolts and remove converter housing. (175149)



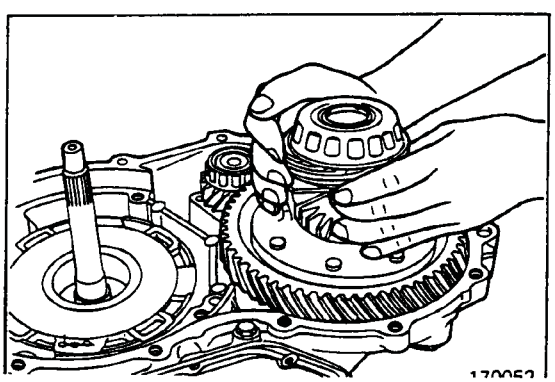
16. Remove six oil pump mounting bolts. Screw Special Tools MD998333, into two oil pump removing holes in oil pump housing. Turn both removers simultaneously and uniformly to remove oil pump assembly.
    Oil pump may sometimes tilt to A side, because straight line connecting oil pump removing holes does not pass center of pump. If this is the case, tap oil pump lightly on B side or tilt removers to B side as pump is removed.
17. Remove the oil pump gasket.



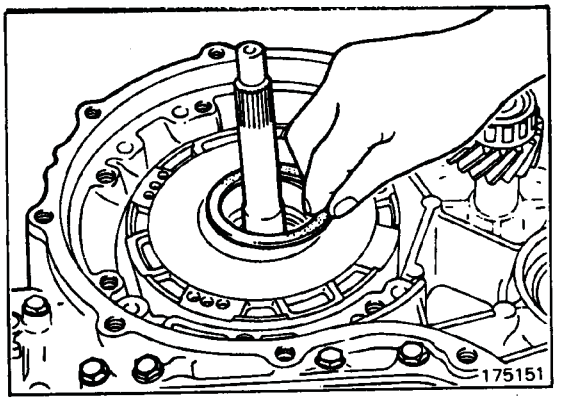
18. Remove the oil pump adapter and gasket.



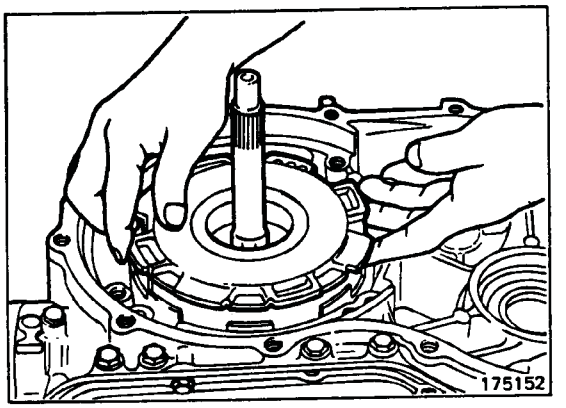
19. Remove the differential assembly.



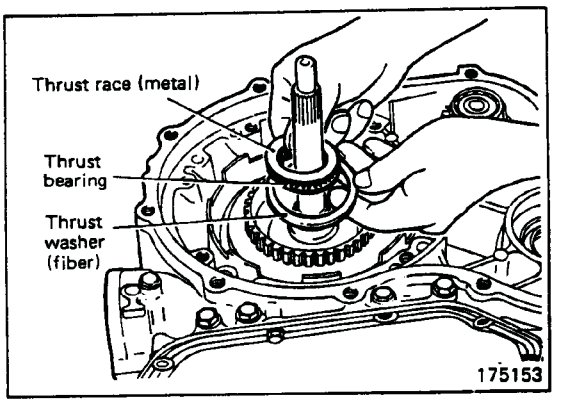
20. Remove the fiber thrust washer.



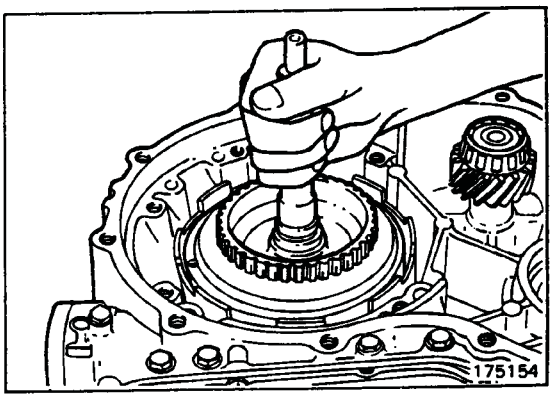
21. Remove the front clutch assembly.



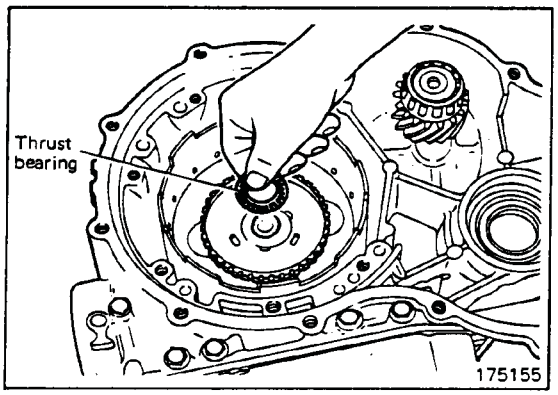
22. Remove the fiber thrust washer, the metal thrust race, and the thrust bearing.



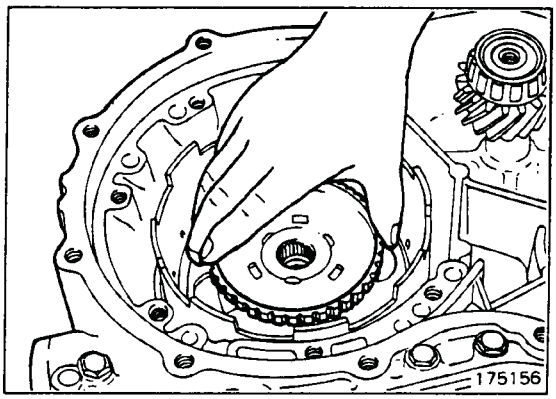
23. Remove the rear clutch assembly.



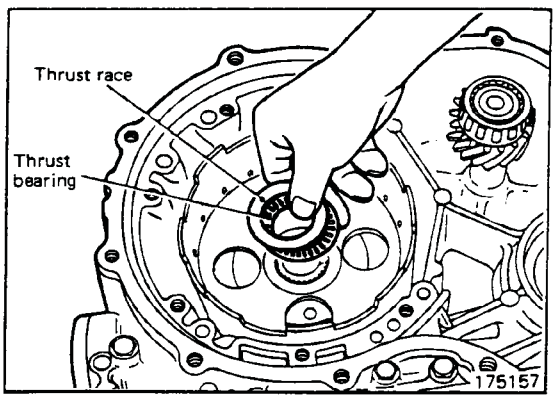
24. Remove the thrust bearing.



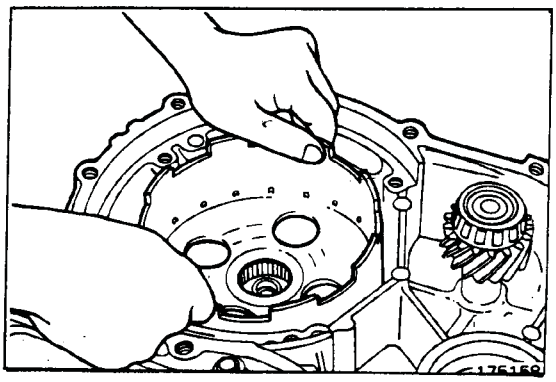
25. Remove the clutch hub.



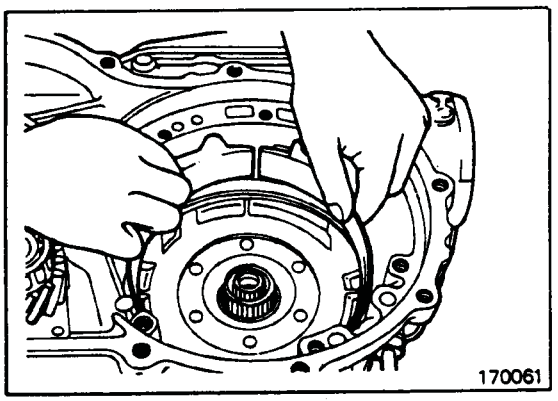
26. Remove the thrust race and bearing.



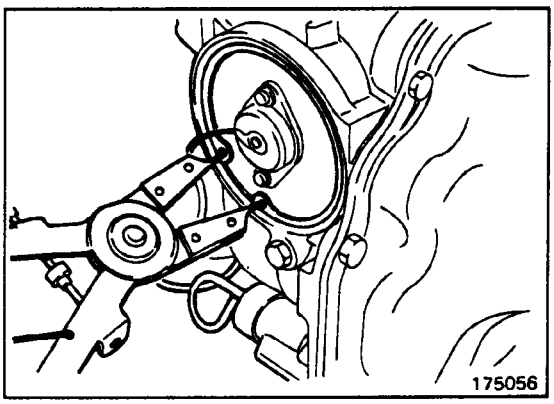
27. Remove the kickdown drum.



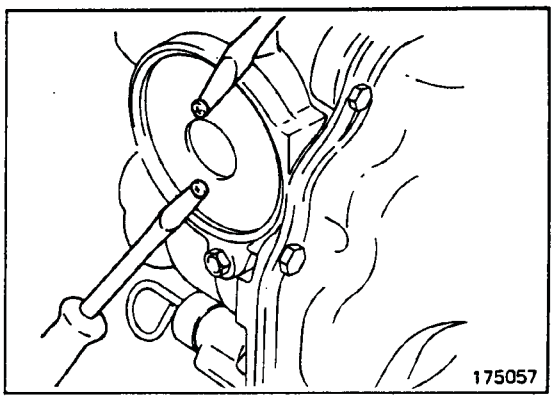
28. Remove the kickdown band.



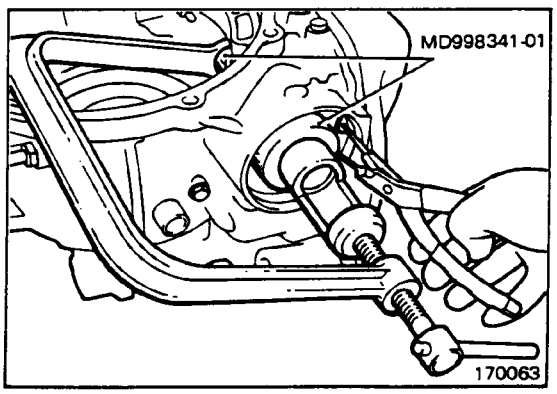
29. Remove the kickdown servo cover snap ring. Then remove the kickdown servo switch.



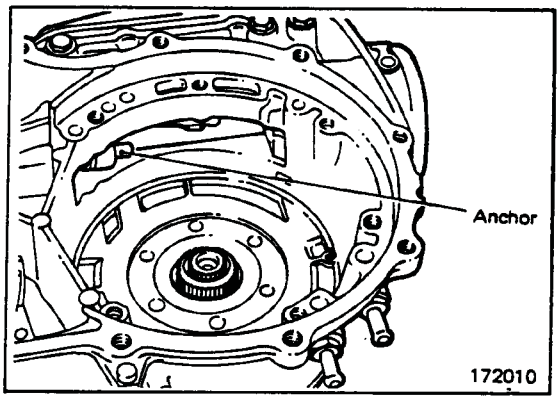
30. Remove the kickdown servo cover.



31. Using the valve spring compressor and special tool MD-998341-01, push in the kickdown servo and remove the snap ring.

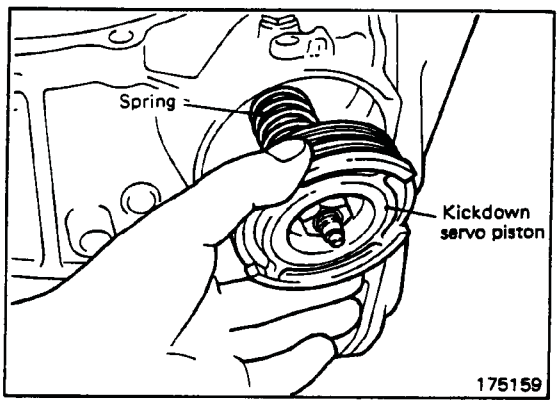


32. Remove the anchor rod.

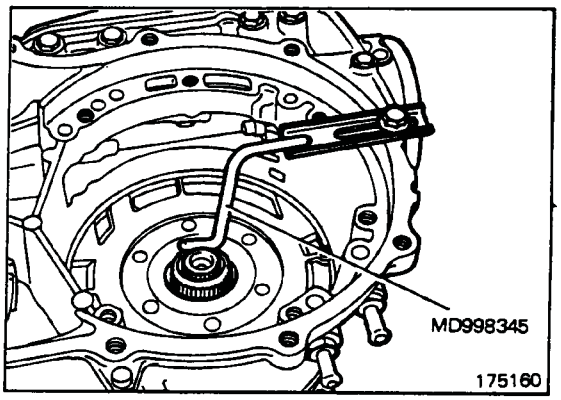


33. Remove the kickdown servo piston and spring.

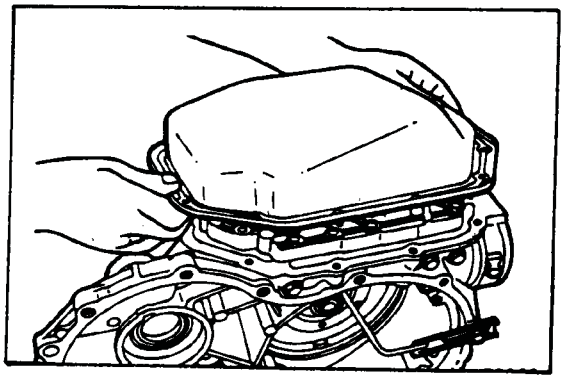
Caution
Do not place (turn) transaxle upside down as planetary gearset thrust washers could fall out of place.



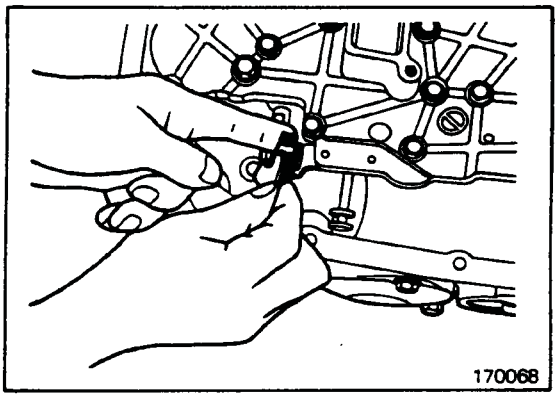
34. Hold reverse sun gear with Special Tool MD998345, so that when transaxle is placed upside down, forward sun gear front and rear thrust bearings will stay in position. When no center support or further disassembly is made, it is especially important to hold reverse sun gear.



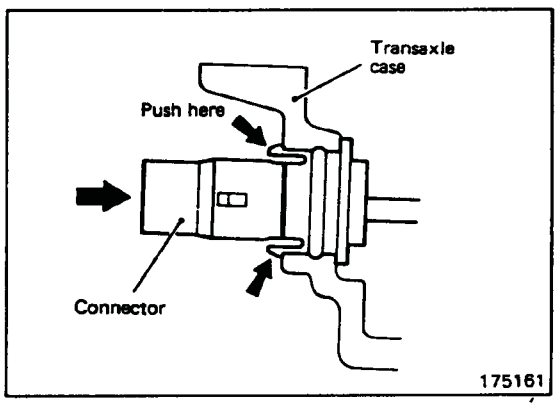
35. Turn the transaxle over so that the oil pan is facing upward. Be careful not to scratch or scar the end of the manual control shaft.
36. Remove the oil pan and gasket.
37. Remove the oil filter from the valve body.



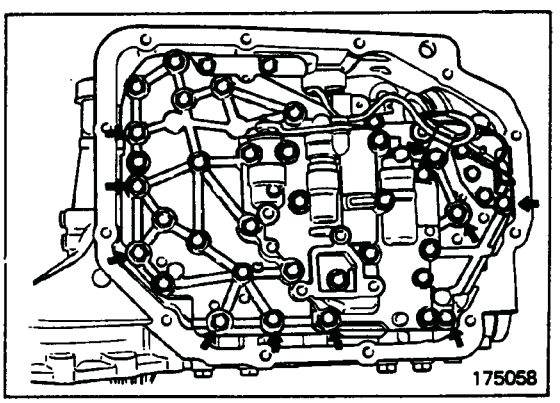
38. Disconnect the throttle control cable from the throttle cam which is attached to valve body.



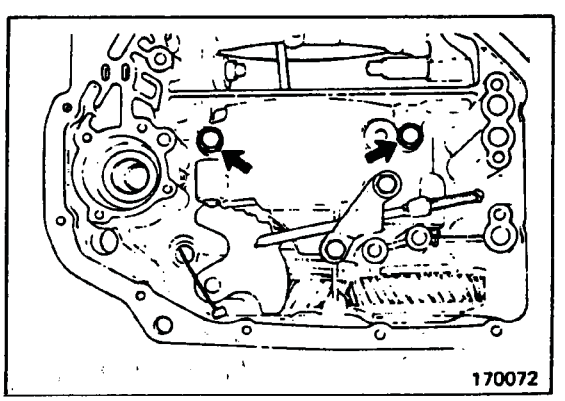
39. Push catches and remove the ELC connector from the transaxle case.



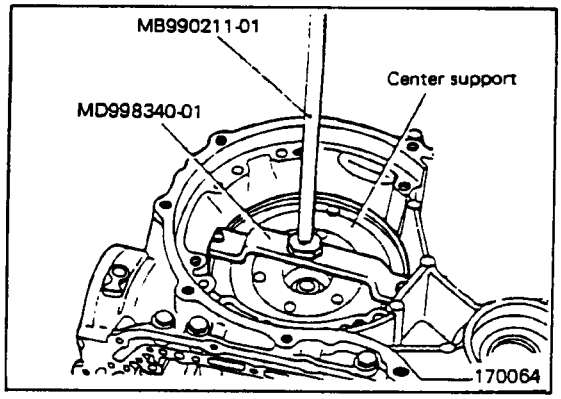
40. Remove 10 valve body assembly bolts. (175058)
41. Remove valve body from transaxle case.



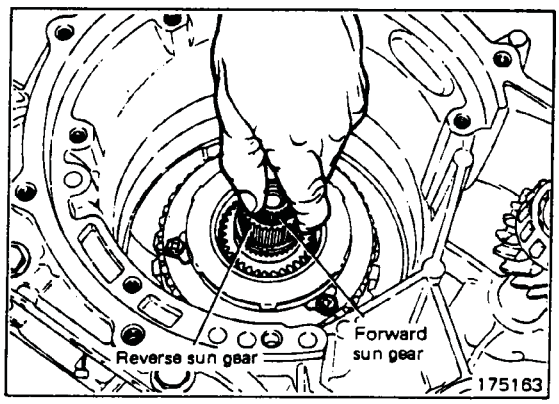
42. Remove two center support bolts.



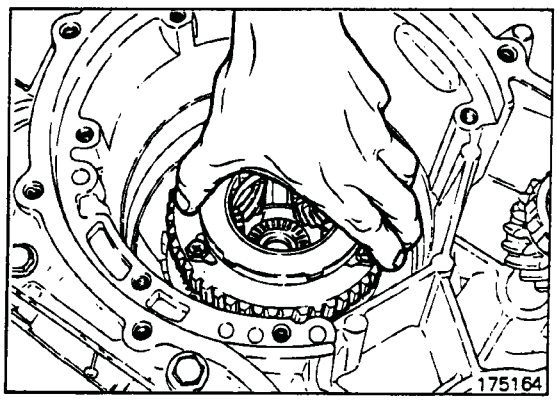
43. **Place case with oil pump side up.**
44. Remove Special Tool MD998345 from the case.
45. Remove Special Tool MD998340-01 and MB990211-01, to center support.
    Holding tool, pull center support straight upward. (170064)



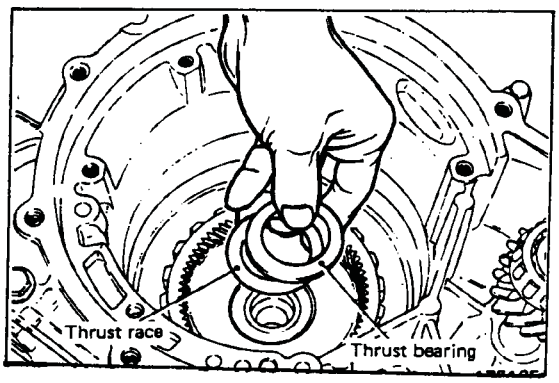
46. Remove reverse sun gear and forward sun gear together.



47. Remove planet carrier assembly.

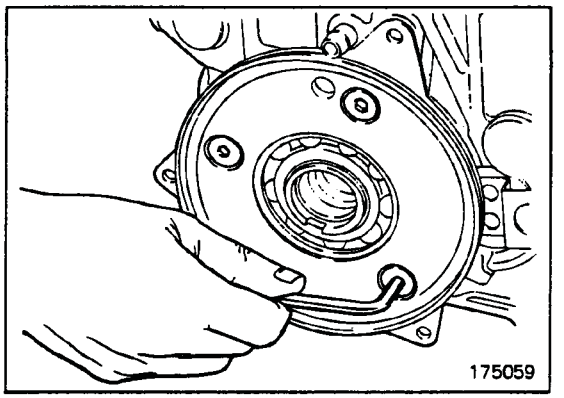


48. Remove the thrust bearing and thrust races.

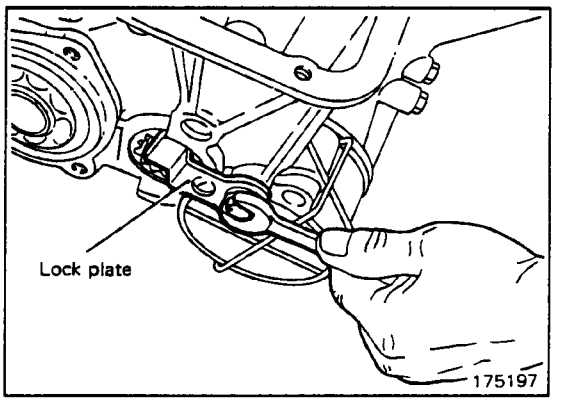


49. Remove the bearing retainer, then remove the oil pipe.

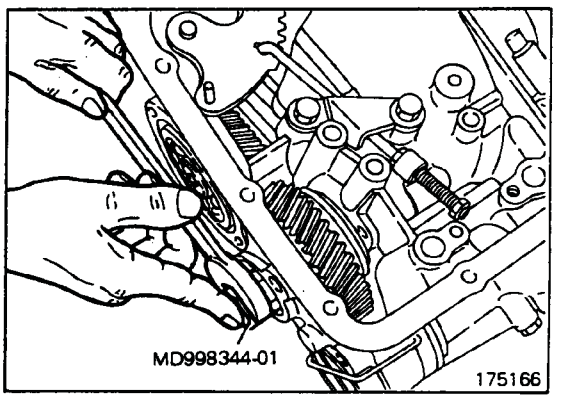
Caution
The flat-head bolt with hexagonal hole may be difficult to remove because of attached adhesive. If so, remove it after first tapping its head with a hammer.



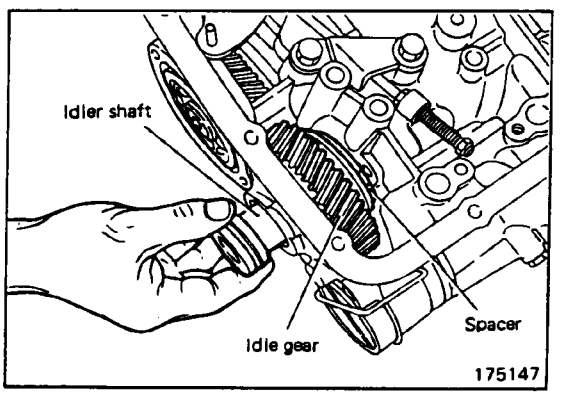
50. Remove idler shaft lock plate.



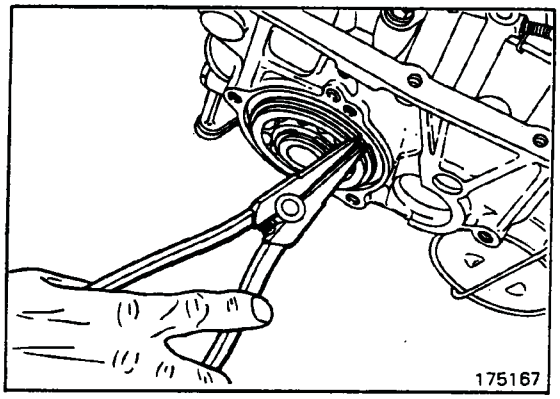
51. Loosen transfer idler shaft with Special Tool MB998344-01.



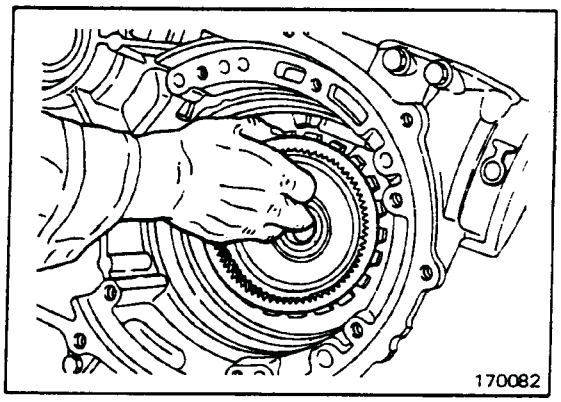
52. Pull out transfer idler shaft. Remove transfer idle gear bearing inner races (2 pieces) and spacer from inside of case.



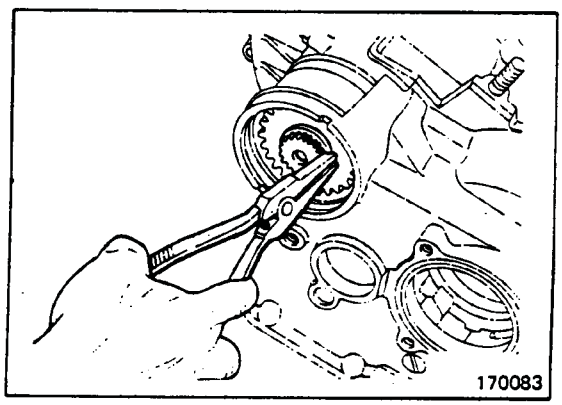
53. Remove snap ring from bearing.



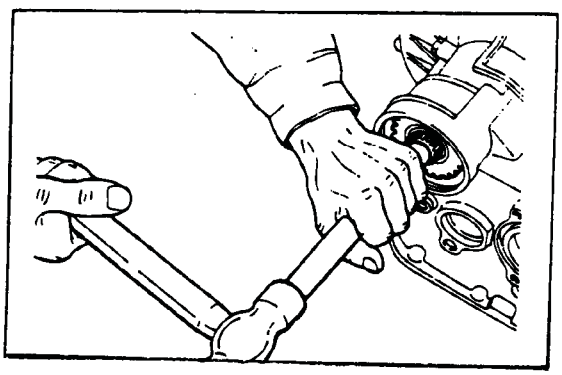
54. Remove internal gear, output flange, transfer drive gear and bearing as assembly from case.



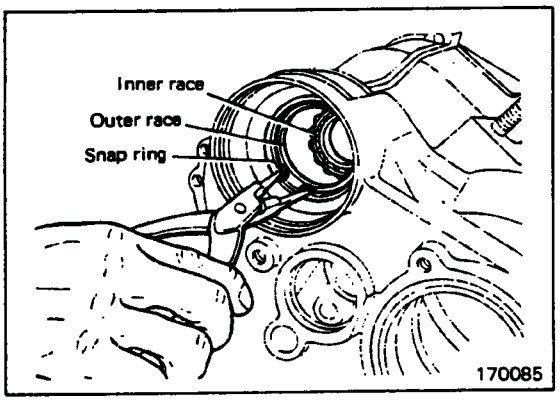
55. Remove transfer shaft rear end snap ring.



56. Using steel drift on rear end of transfer shaft, drive transfer shaft toward engine mounting surface. Transfer driven gear comes off.



57. Remove snap ring from transaxle case, then remove taper roller bearing inner and outer races.



REASSEMBLY

Caution

Do not reuse gaskets, oil seals and rubber parts. Replace them with new ones at every reassembly. O-ring of oil level dipstick need not be replaced.

Do not use grease other than petrolatum or industrial vaseline.

Apply automatic transmission fluid to friction element, rotating parts, and sliding parts before installation. Use "DEXRON II" type automatic transmission fluid. New clutch disc should be immersed in automatic transmission fluid for more than two hours before installation.

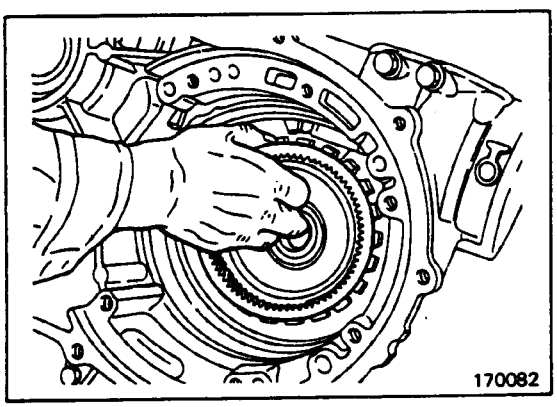
Do not apply sealer or adhesive to gaskets.

When bushing must be replaced, replace assembly which includes it.

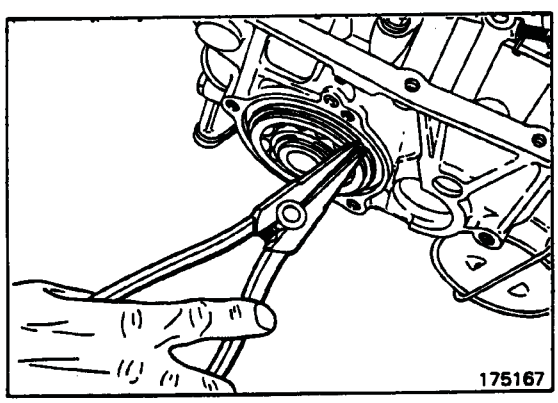
Do not use shop towels during disassembly and reassembly operation.

The oil in the cooler should also be replaced.

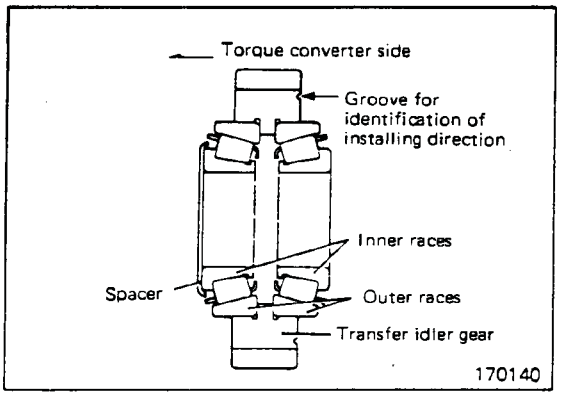
1. Place transaxle case on bench with oil pan mounting surface up.
2. Insert in position internal gear and output flange assembly (with two ball bearings and transfer drive gear attached) from inside of transaxle case. (170082)



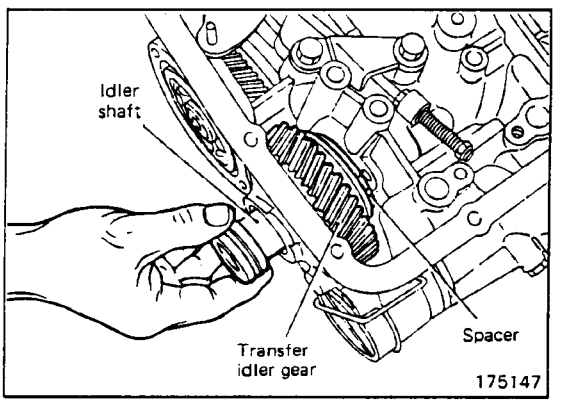
3. Install snap ring on output flange rear bearing.



4. Install two taper roller bearings and spacer to transfer idler gear.
   Using petrolatum or vaseline for industrial use, affix spacer to inner race of bearing installed on non-grooved side of transfer idler gear. (170140)
5. Install new O-ring in the groove of transfer idler gear shaft. (170140)

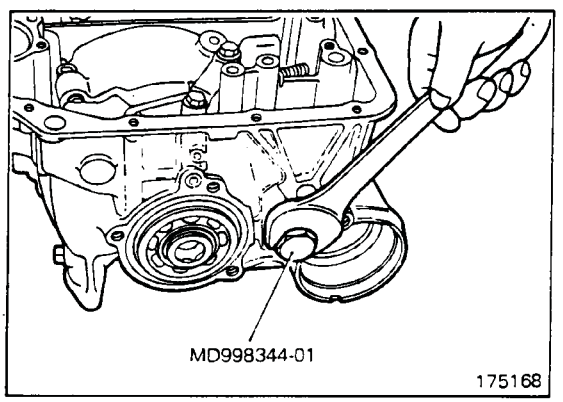


6. Place the transfer idler gear (assembled in the preceding section) into the case, and then insert the idler shaft from the outer side of the case and screw it in.



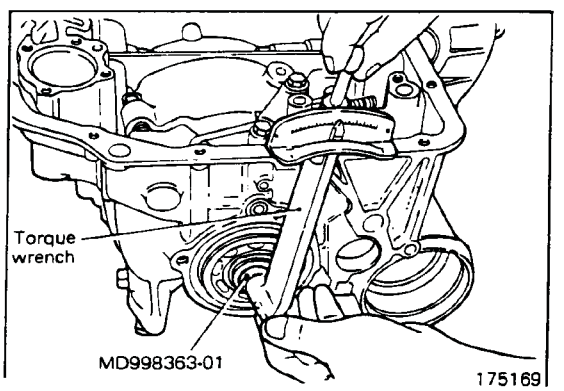
7. Tighten the idler shaft by using special tool MD998344-01. Replace the O-ring of the idler shaft with a new one.

Caution
Be sure to install transfer idler gear in proper direction as shown in illustration. (170140)



8. Insert Special Tool MD998363-01 into output flange and measure preload using a low reading torque wrench. Adjust preload by tightening or loosening transfer idler shaft.

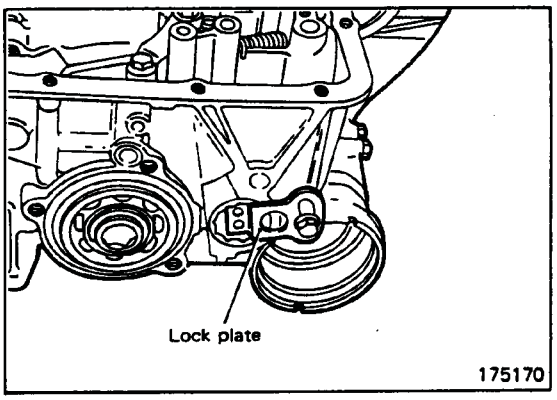
Preload	1.5 Nm (1 ft. lbs.)



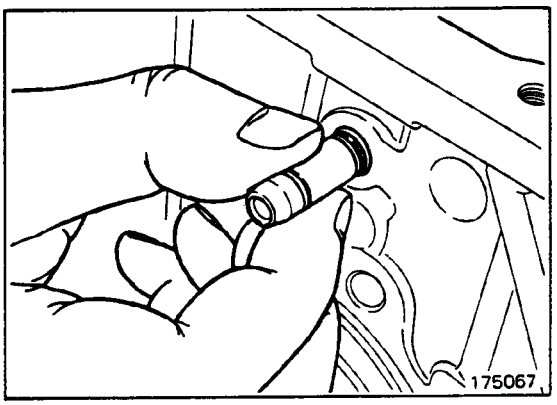
9. After completing preload adjustment, install idler shaft lock plate. Tighten lock plate bolt.

Lock plate bolt	20-26 Nm (15-19 ft. lbs.)

Caution
The clearance between the idler shaft and the lock plate should be closed in the direction that will prevent idler shaft looseness, and then the lock plate should be tightened.

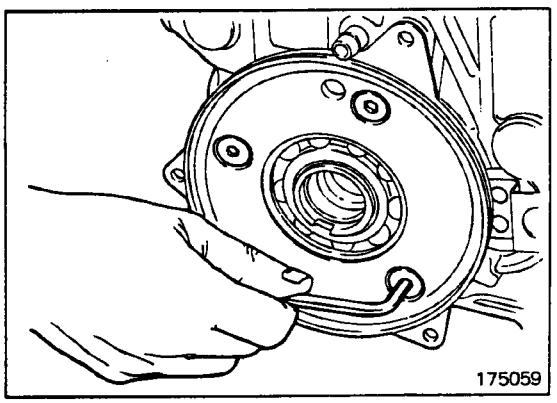


10. Install two new O-rings on the oil pipe, and install the oil pipe to case, being sure to install it in the proper direction. (175067)

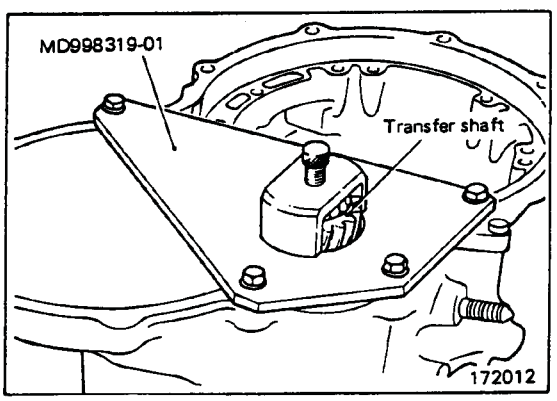


11. Fit a new O-ring into the groove (output flange part) in the rear of the transaxle case.
12. Install bearing retainer, and tighten screws to specified torque, apply a 5 mm (.2 in.) width of sealant (THREEBOND #1303) the top of screws. Sealant should not stick out of screw head. Install new O-ring for retainer edge.

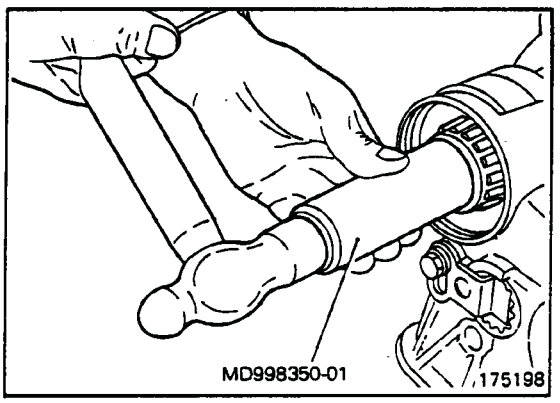
Screw	17-21 Nm (13-15 ft. lbs.)



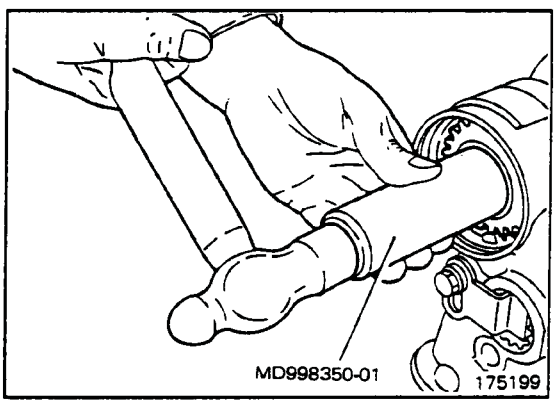
13. Insert transfer shaft (with taper bearing inner race) into case.
14. Install Special Tool MD998319-01, to converter housing mating surface of transaxle case. (172012)



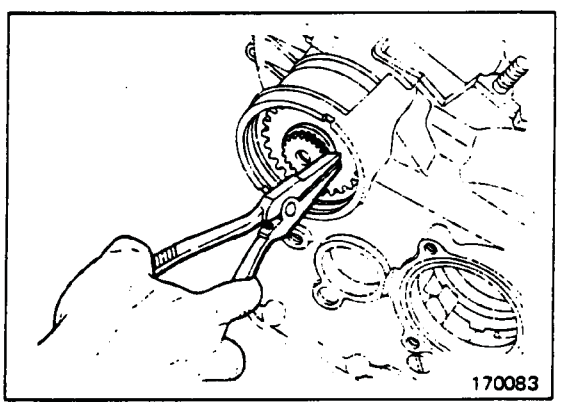
15. Using Special Tool MD998350-01, drive bearing inner race onto transfer shaft. (175198)
16. Install taper roller bearing outer race, then install snap ring.



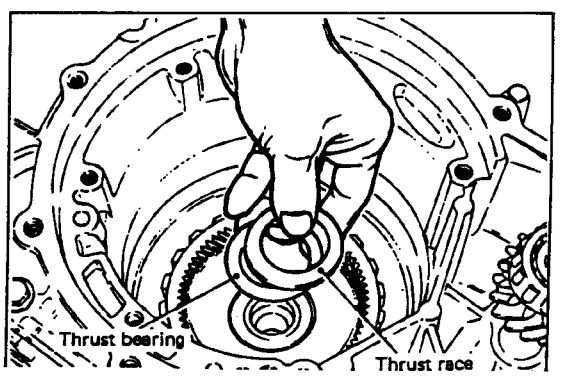
17. Using Special Tool MD998350-01, install transfer driven gear onto transfer shaft. (175199)
    Be sure to install transfer driven gear in proper direction as shown in illustration. (175199)

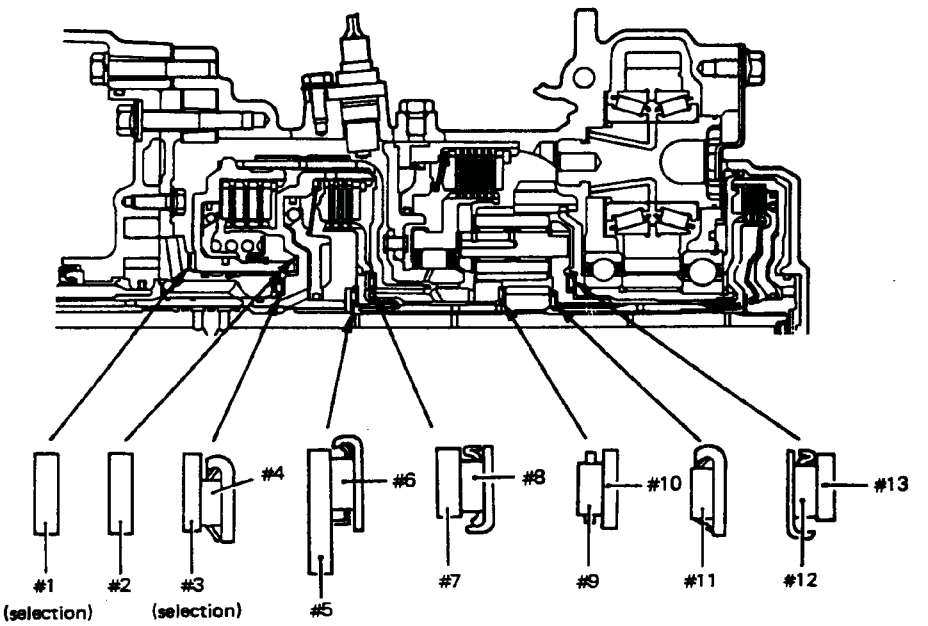


18. Install snap ring to end of transfer shaft. Turn transaxle so that engine side is up.



19. Apply petrolatum (or vaseline for industrial use) to thrust races #13 (175100) and thrust bearing #12 (175100) and position it on output flange.

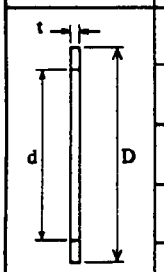
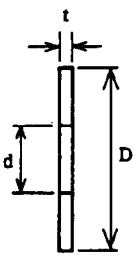
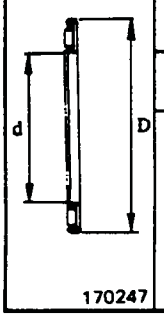
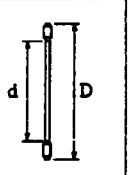




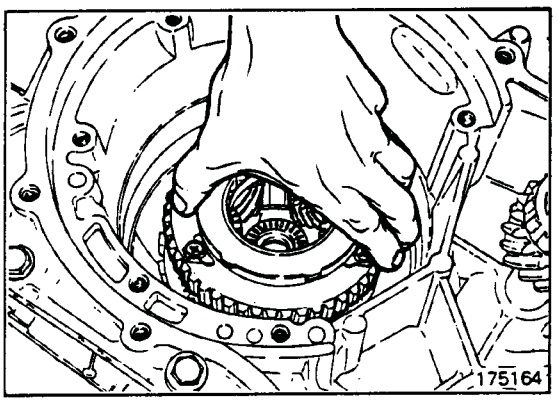
175100

Identification of thrust bearings, thrust races and thrust washers

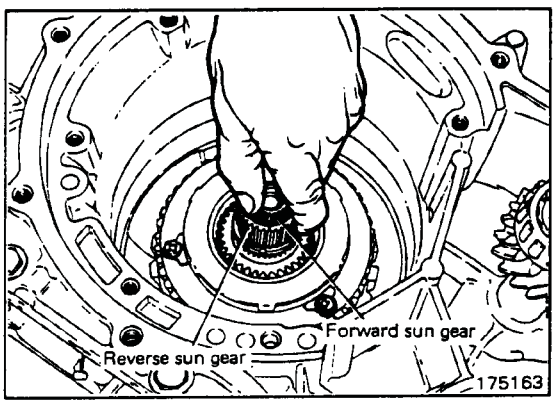
Unit: mm

Shape	D	d	t	Part no.	Code	Shape	D	d	t	Part no.	Code
 170232	70	55.7	1.8	MD707901 (incl. *1)	#1	 170229	48.9	37	0.8	*1	#3
	70	55.7	2.2	MD707902 (incl. *2)			48.9	37	1.2	*2	
	70	55.7	2.6	MD707903 (incl. *3)			48.9	37	1.6	*3	
	70	55.7	3.0	MD707904 (incl. *4)			48.9	37	2.0	*4	
	70	55.7	1.8	MD707290	#2		40	19	2.4	MD704980	#5
 170247	48.1	34.4	–	MD707271	#4		54	38.7	1.6	MD704936	#7
	42.6	26	–	MD704930	#6		41	26	1.2	MD955671	#10
	38.0	22.2	–	MD707270	#11		54	38.7	0.8	MD704935	#13
	52	36.4	–	MD720010	#8 #12	 170228	41	26	–	MD704933	#9

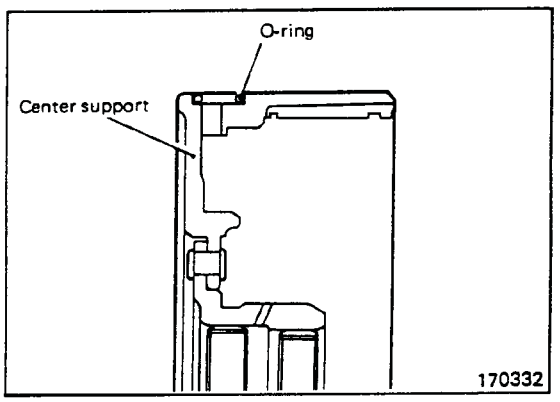
20. Assemble the planet carrier assembly.
Check whether or not thrust bearing #11 is assembled within the carrier.



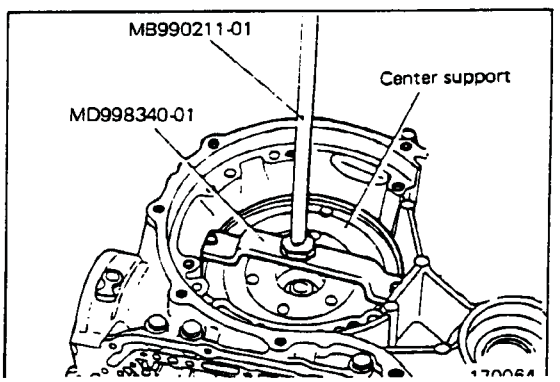
21. After attaching thrust race #10 and thrust bearing #9 to the forward sun gear by using petrolatum, assemble the reverse sun gear and then assemble both sun gears together within the planet carrier assembly.



22. Install the O-ring into the pressure plug port of the center support assembly.



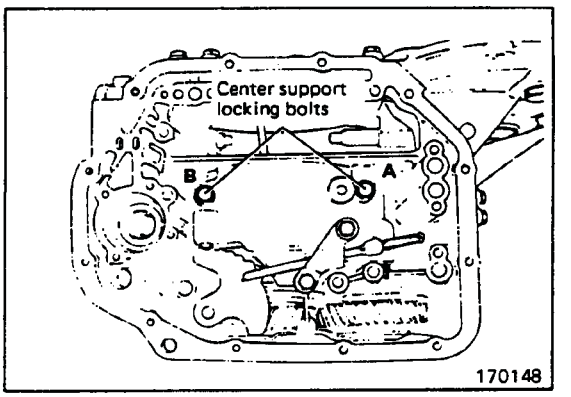
23. Attach Special Tool MD998340-01 and MB990211-01 to center support.
24. Apply automatic transmission fluid to overrunning clutch inner race fitting area of center support. Insert center support (with low-reverse brake) assembly into case by holding handle of tool.



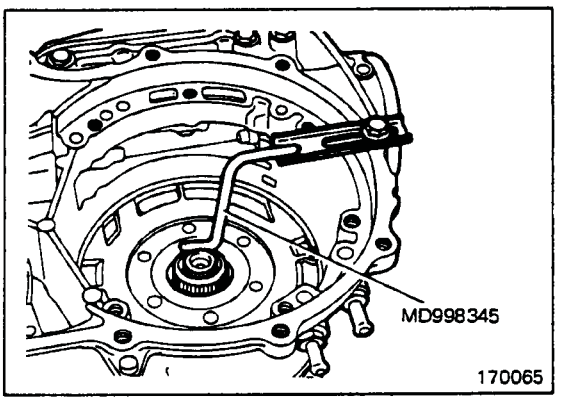
25. Install two center support locking bolts. While pressing center support firmly with about 98 N (22 lbs.) pressure and tighten bolts to specified torque.

Center support lock bolts	20-26 Nm (15-19 ft. lbs.)

NOTE
For proper alignment of the reverse and low apply port, be sure to tighten bolt A first.

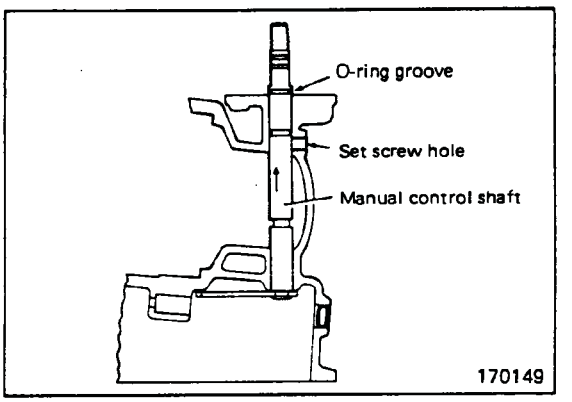


26. Attach Special Tool MD998345, to retain reverse sun gear firmly.

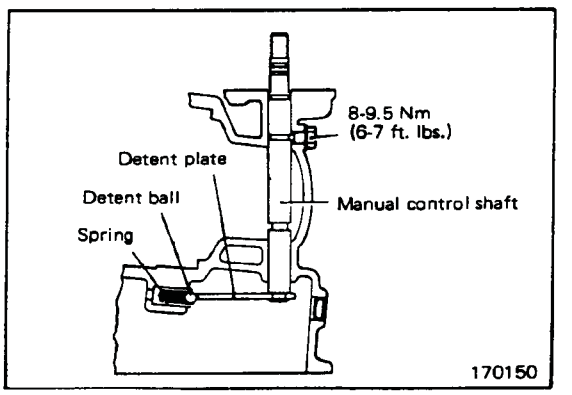


27. Insert manual control shaft into transaxle case and push it fully toward manual control lever.
At this time, do not install O-ring (larger one of two O-rings) on manual control shaft.

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

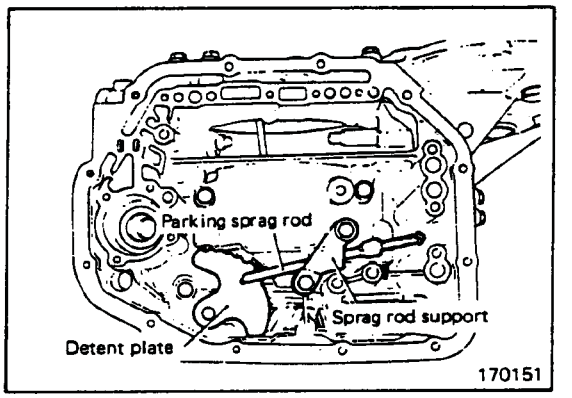


28. After installing new O-ring on manual control shaft, draw shaft back into case, then install set screw and gasket. Also install detent steel ball and spring at the same time. (170150)
29. Place case with oil pan mounting surface up.

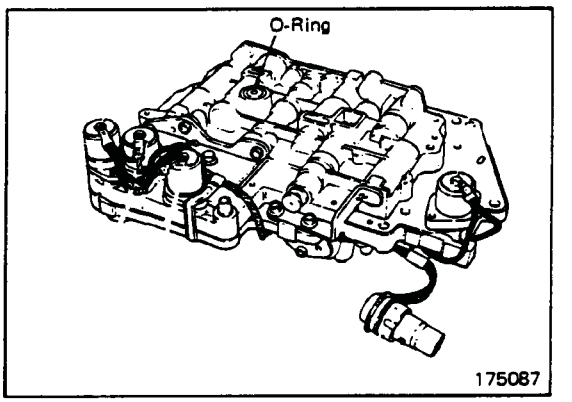


30. The oil pan installation surface should face upward.
31. Install parking sprag rod to detent plate (manual control shaft).
32. Install sprag rod support and tighten two bolts.

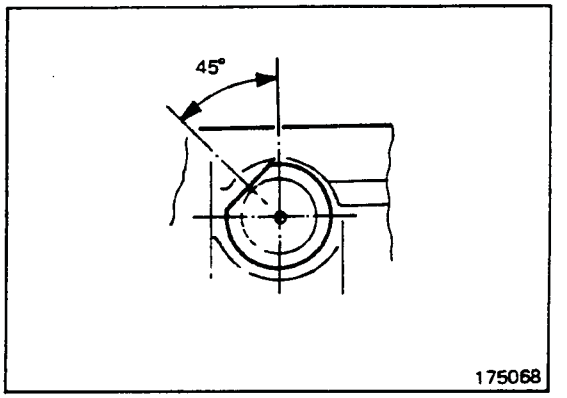
Sprag rod support bolts	20-26 Nm (15-19 ft. lbs.)



33. Install O-ring at center of top of valve body assembly (brake oil pressure passage). (175087)
34. Install valve body assembly to case, fitting detent plate (manual control shaft) pin in slot of manual valve.

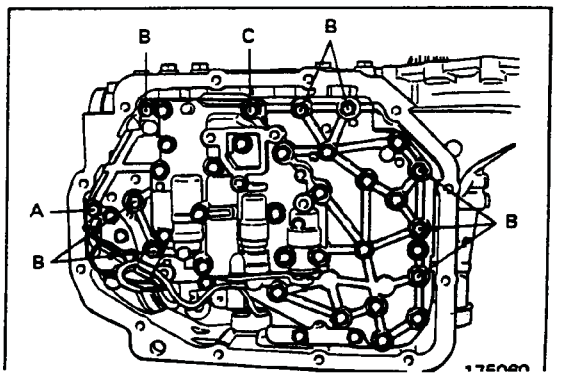


35. Replace the O-ring of the solenoid valve connector with a new one.
36. Insert the solenoid valve connector into the case. Be sure that the notched part of the connector faces as shown in the figure.

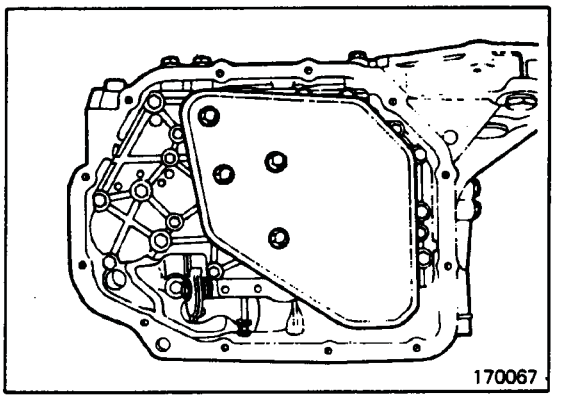


37. Tighten valve body assembly mounting bolts (10 pieces) to 10-11.5 Nm (7.5-8.5 ft.lbs.).

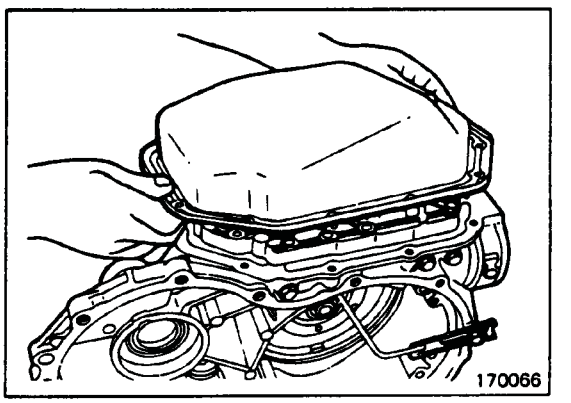
A bolt	20 mm (.787 in.) long
B bolt	28 mm (1.102 in.) long
C bolt	45 mm (1.772 in.) long



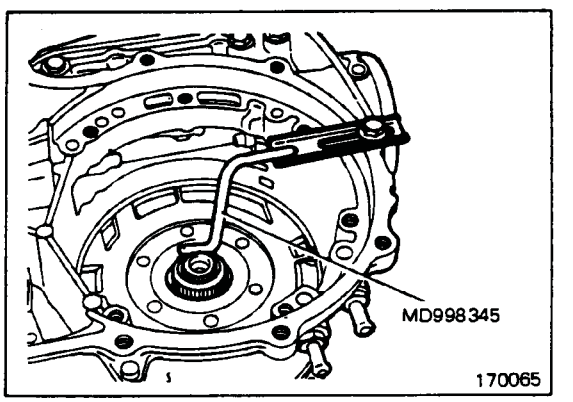
38. Install oil filter. Tighten four oil filter mounting bolts to 5-6.5 Nm (4-5 ft. lbs.).



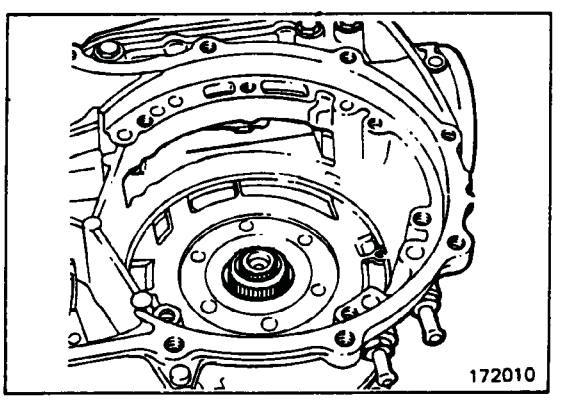
39. Install new oil pan gasket and oil pan by tightening 12 bolts to 10-11.5 Nm (7.5-8.5 ft. lbs.). (170066)



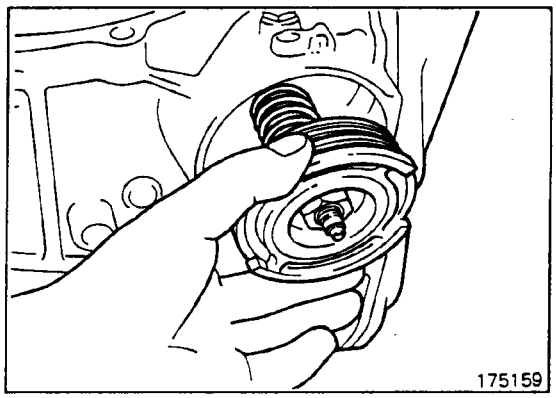
40. Place transaxle case with oil pump mounting surface facing upward.
41. Remove Special Tool (MD998345).



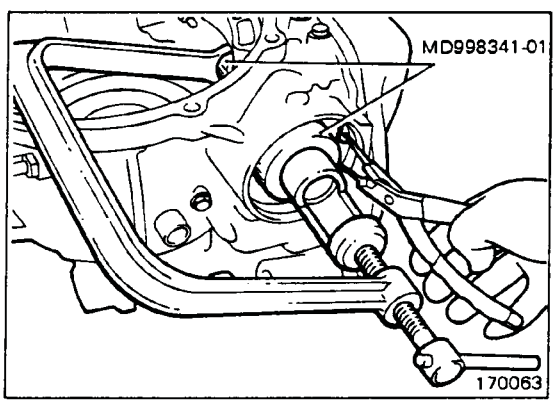
42. Install the anchor rod for the kickdown band.



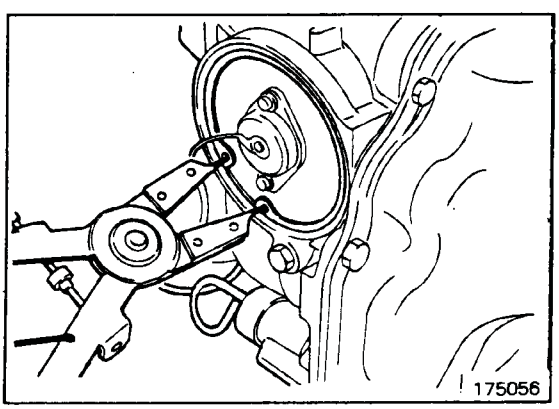
43. Assemble a new seal ring (large diameter) and D-ring (small diameter) to the kickdown servo piston, and install a new O-ring in the groove around the sleeve; then assemble the kickdown servo spring, piston and sleeve in the transaxle case.



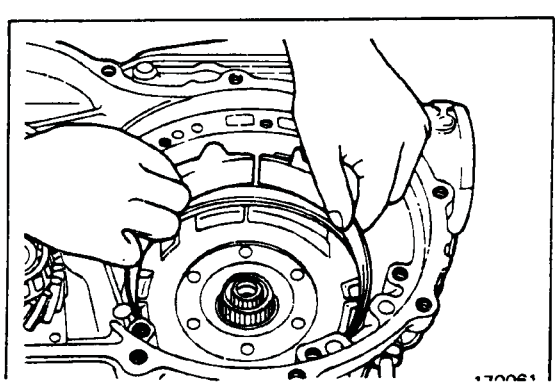
44. Press the kickdown servo and sleeve in by using the valve spring compressor and special tool MD998341-01, and then install the snap ring.



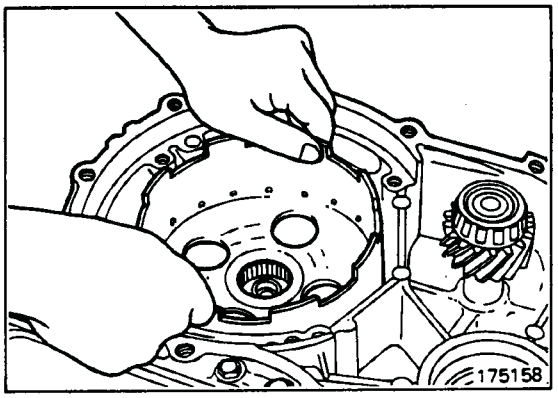
45. Install the kickdown servo cover, and then install the kickdown servo switch.
46. Install the kickdown servo cover snap ring.



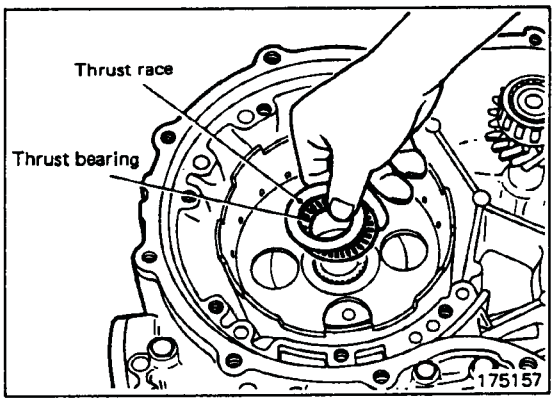
47. Install kickdown band; attach the ends of band to the ends of anchor rod and servo piston rod.



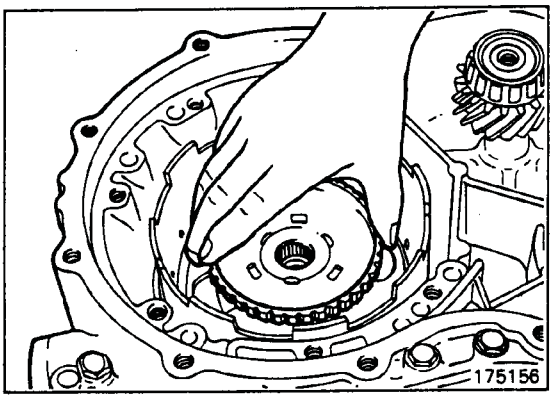
48. Install kickdown drum with its splines in mesh with sun gear. Place kickdown band on kickdown drum and tighten kickdown servo adjusting screw to keep band in position.



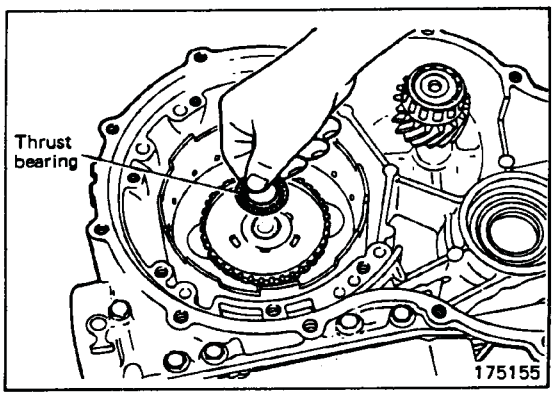
49. Apply petrolatum to thrust bearing #8 (refer to P.21-62) and thrust race (#7) and position these parts on kickdown drum.



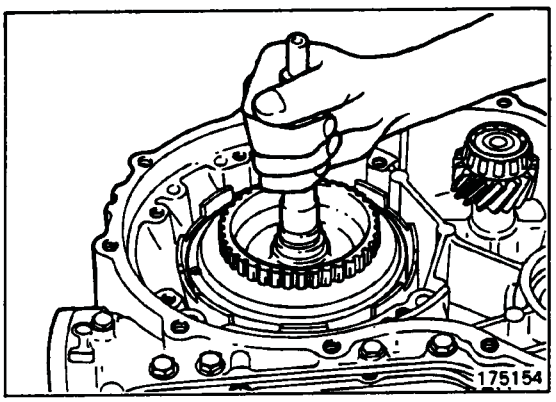
50. Install clutch hub to sun gear splines.



51. Attach thrust bearing #6 onto the hub with petrolatum.

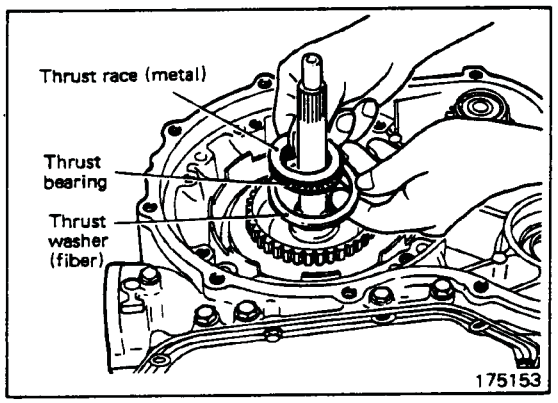


52. Install the rear clutch assembly.



53. Attach thrust washer #2 (resin) (refer to P.21-62.) to the rear clutch retainer by using petrolatum. Then attach thrust bearing #4 to the rear clutch retainer by using petrolatum.

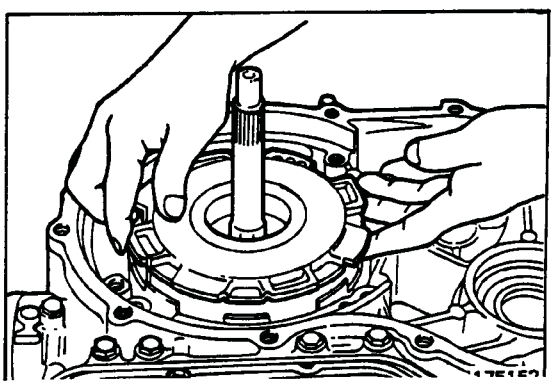
54. Install thrust race #3. If the end play of the input shaft (measured and noted at the time of disassembly) is the standard value, make the selection of thrust race #3 so that the end play will be within the standard value. If thrust race #3 was changed for one of a different thickness, thrust washer #1 (between the oil pump and the front clutch) must be replaced with one which will correspond to the thickness of the thrust race.



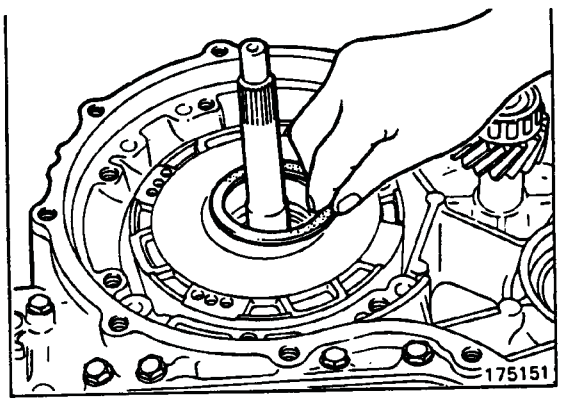
Thrust race #3 (metal)	Thrust washer #1 (fiber)	Parts No. of thrust washer set
Thickness mm (in.)	Thickness mm (in.)	
0.8 (.031)	1.8 (.071)	MD707901
1.2 (.047)	2.2 (.087)	MD707902
1.6 (.063)	2.6 (.102)	MD707903
2.0 (.079)	3.0 (.118)	MD707904

Example
When 1.6 mm (.063 in.)-thick thrust race #3 is selected, 2.6 mm (.102 in.) thrust washer #1 is one to be paired with it.

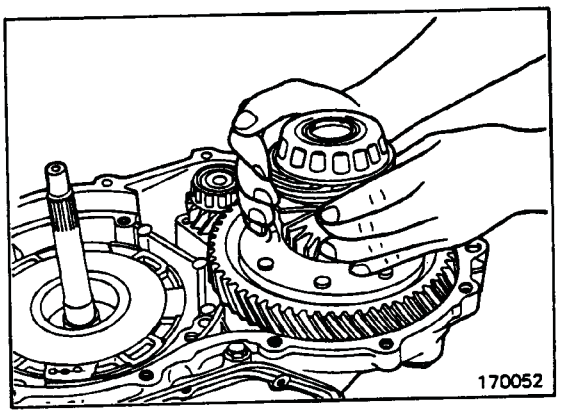
55. Install the front clutch assembly.



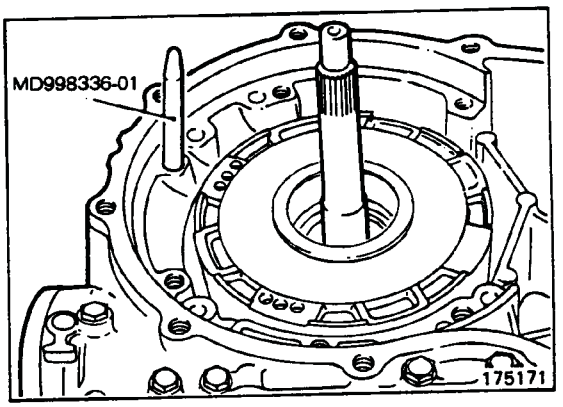
56. Attach the re-used thrust washer #1, or the one selected in step 54, to the front clutch by using petrolatum.



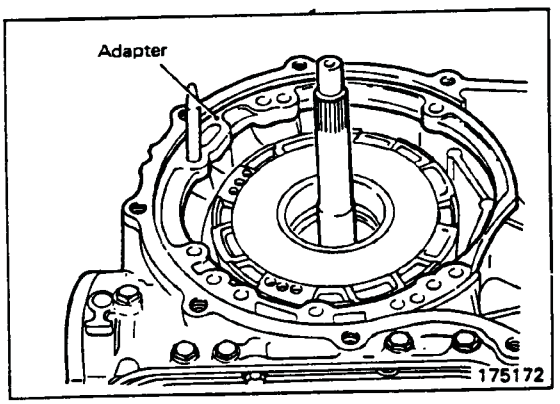
57. Install the differential assembly.



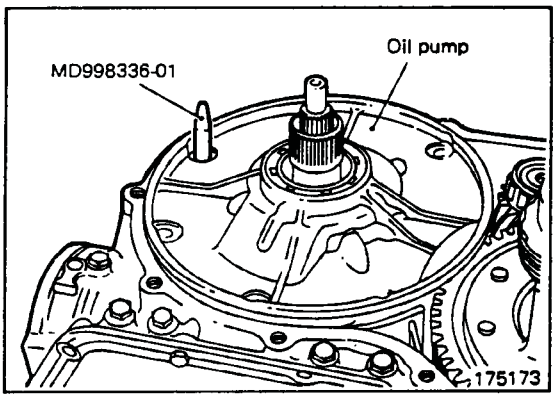
58. Install special tool MD998336-01 to the case.



59. Install new oil pump gasket and the adapter.

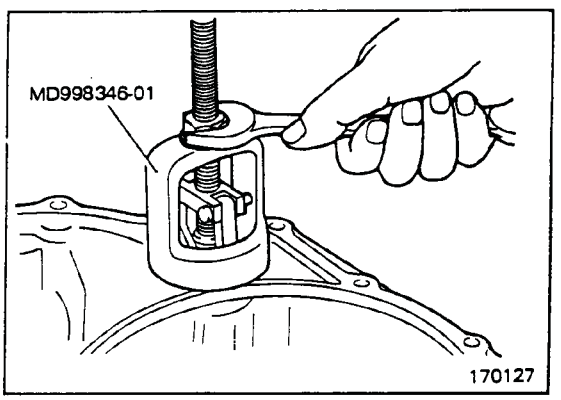


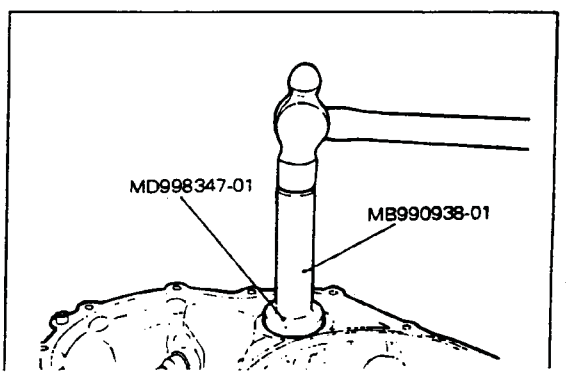
60. Install new oil pump gasket and the oil pump assembly.



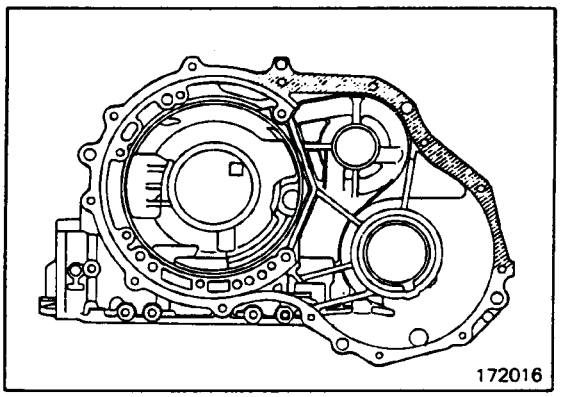
61. Install new O-ring in groove of oil pump housing and apply automatic transmission fluid lightly to outside surface of O-ring.
62. Install oil pump assembly by tightening six bolts evenly to 15-21 Nm (11-15 ft. lbs.). When installing this oil pump assembly, be careful that thrust washer will not drop.

63. Prior to installation of converter housing, make certain that transfer shaft end play measured and recorded at disassembly is same. If measurement is out of specification, pull off taper roller bearing outer race from converter housing and replace spacer with spacer of suitable thickness.
Standard end play is between 0.025 mm (.0010 in.) (tight) and 0.025 mm (.0010 in.) (loose).
Use Special Tools MD998346 and MD998347-01 and MB990938-01 to remove taper roller bearing outer race from and install it to converter housing. (170127 and 170128)

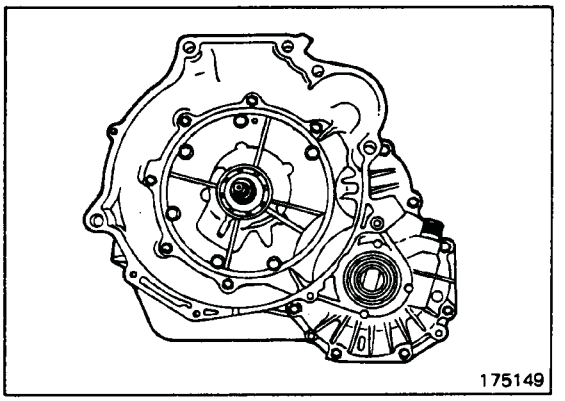




64. Place spacer on differential bearing out race.
65. Apply silicon grease to shaded area of transaxle case flange.
66. Install new case gasket to transaxle case.



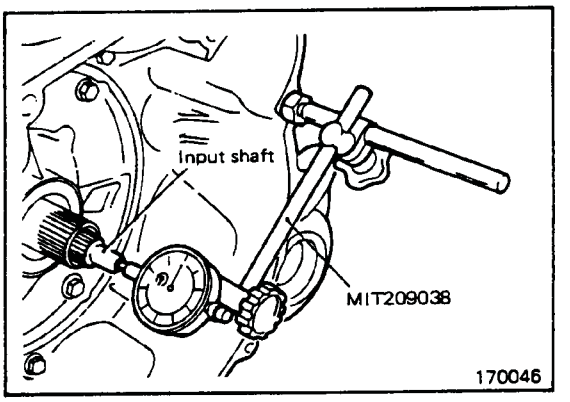
67. Install converter housing by tightening 13 bolts to torque between 19-22 Nm (14-16 ft. lbs.). (175149)



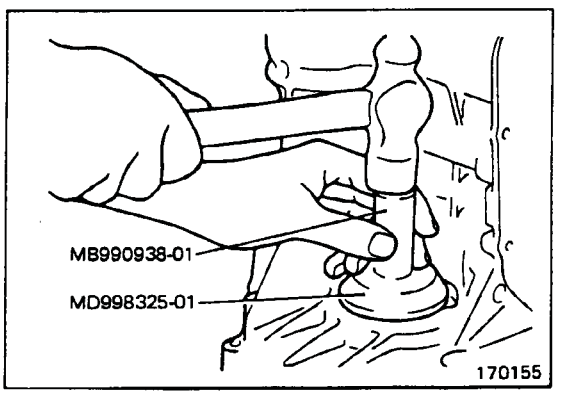
68. Using Dial Indicator Special Tool MIT209038, check input shaft end play, transfer shaft end play and differential case end play. Readjust if necessary. (170046)

Input shaft end play	0.5-1.4 mm (.020-.055 in.)
Transfer shaft end play	0.025 (tight)-0.025 mm (loose) [.0010 (tight)-.0010 in. (loose)]
Differential end play	0-0.15 mm (0-.006 in.)

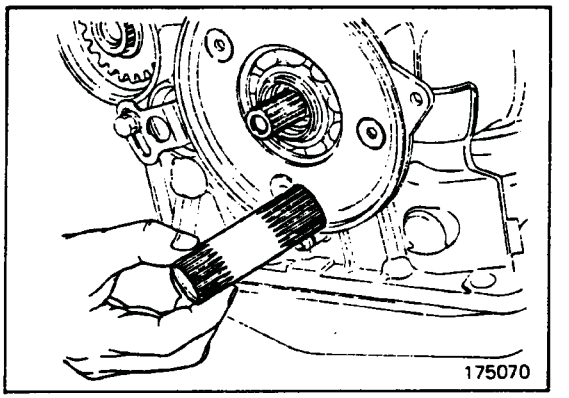
69. Install transfer shaft cover, then cover holder.



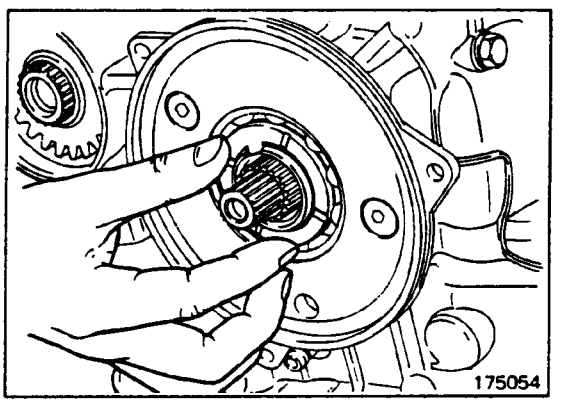
70. Using Special Tool MD998325-01 and MB990938-01, drive two drive shaft oil seals into transaxle case and converter housing. (170155)
71. Install inhibitor switch and manual lever.
Adjust inhibitor switch. (See ADJUSTMENT.)



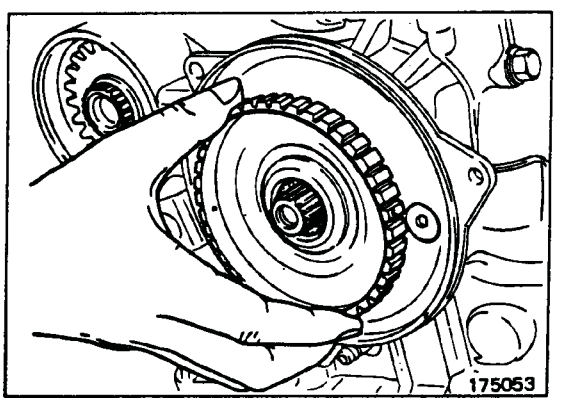
72. Insert the end clutch shaft. Be sure to install the longest spline toward the front as shown.



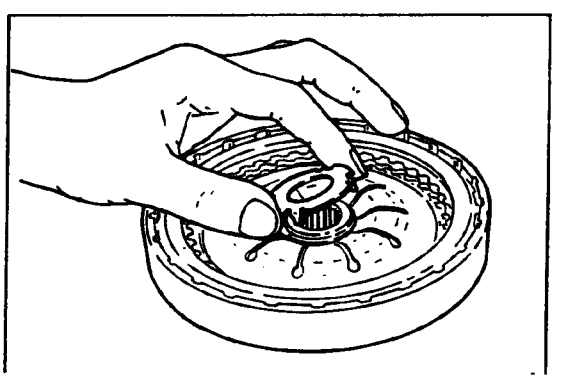
73. Install the thrust washer with the grooved side outward.



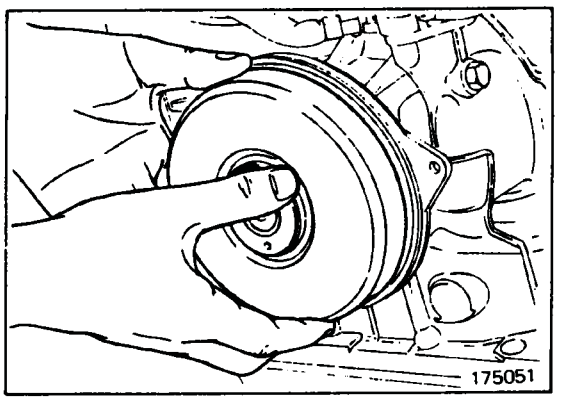
74. Install the end clutch hub.



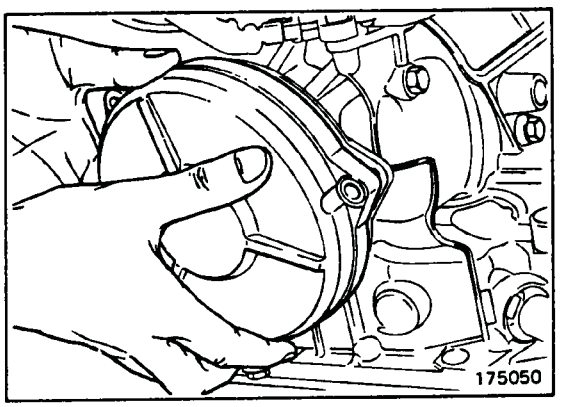
75. Fit the thrust washer to the return spring at the end clutch side.



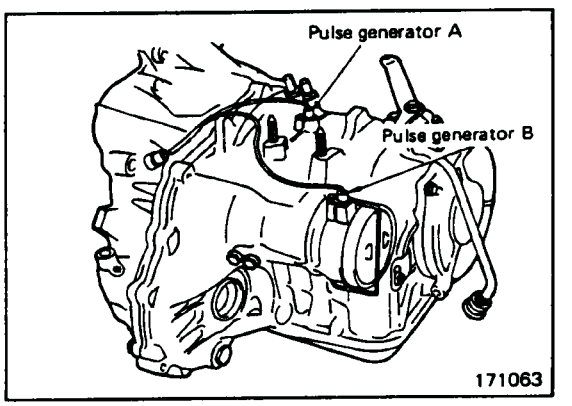
76. Install the end clutch assembly.



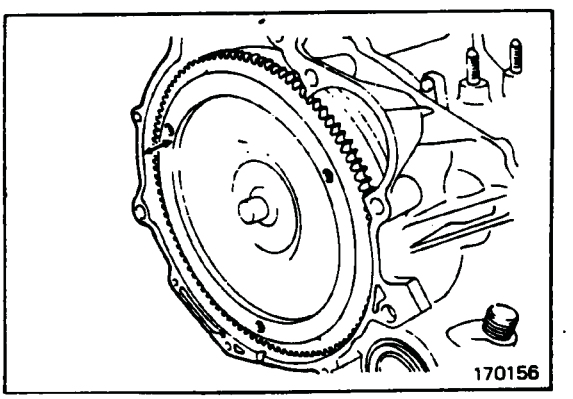
77. Install the end clutch cover. Install and torque the two bolts and nut to 6.0-8.0 Nm (4.0-6.0 ft.lbs.).



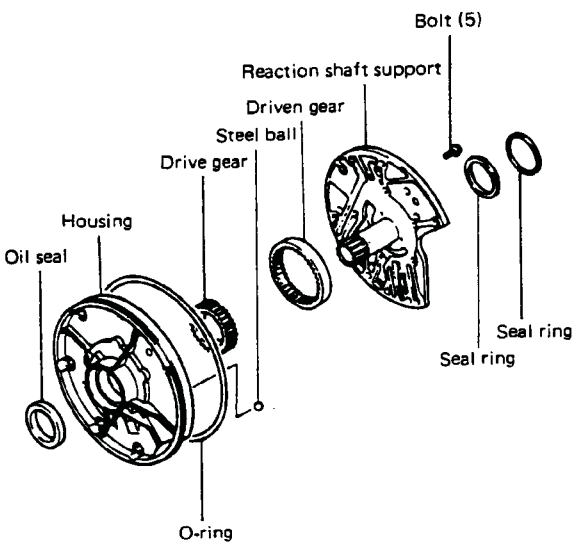
78. Install the pulse generator A and B.



79. After applying automatic transmission fluid to outside surface of oil pump-side cylindrical portion of torque converter, install torque converter carefully so as not to damage the oil seal lip. Make certain that torque converter is in mesh with oil pump drive gear.
Measure distance between ring gear end and converter housing end. Torque converter has been properly installed when measurement is about 12 mm (.47 in.).



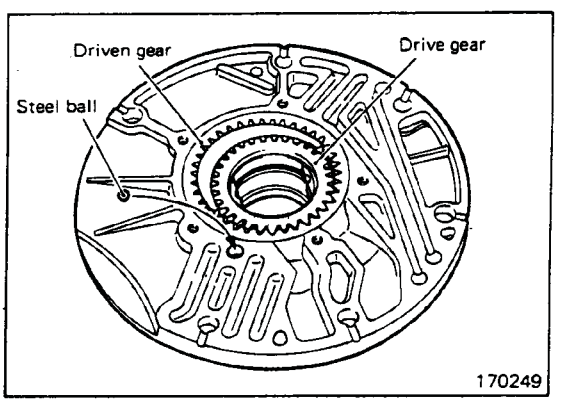
COMPONENT SERVICE-OIL PUMP ASSEMBLY



170173

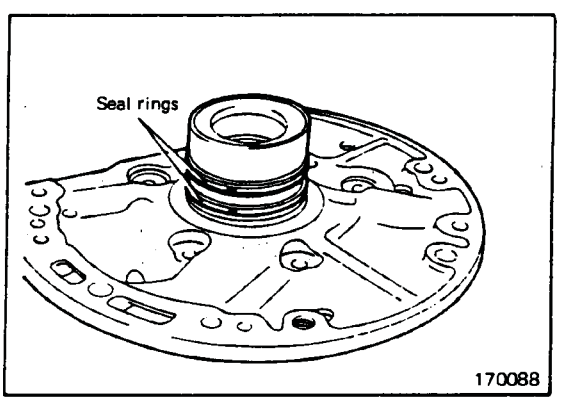
DISASSEMBLY

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



170249

6. Remove two seal rings from reaction shaft support.

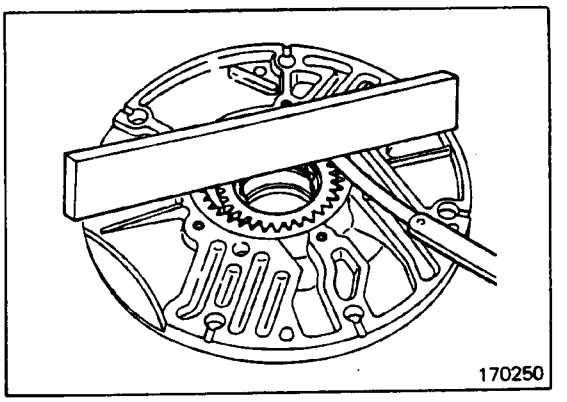


170088

INSPECTION

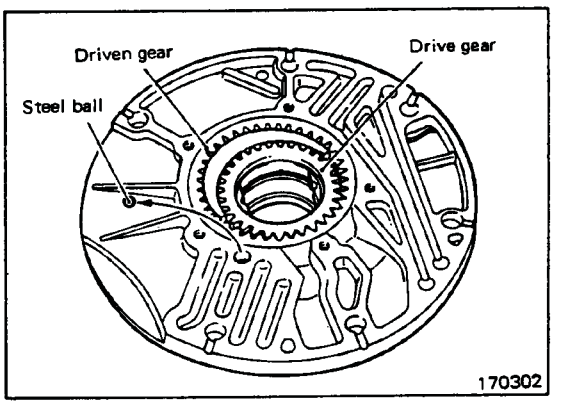
1. Measure the side clearance of the oil pump gear; if the measurement exceeds the standard value, replace the gear or the oil pump assembly.
2. Replace if the gear contact part of the reaction shaft support shows step-like wear.

Drive and driven gear side clearance	0.025 to 0.05 mm (.001 to .002 in.)

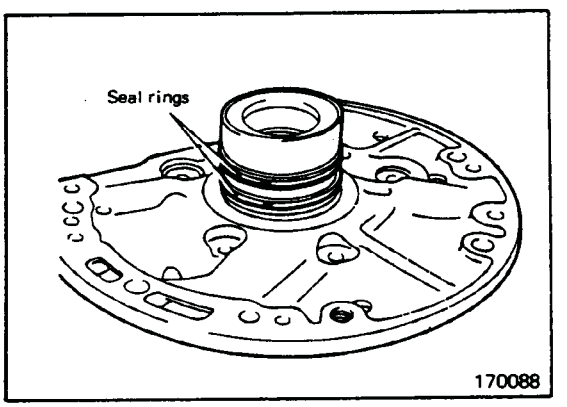


REASSEMBLY

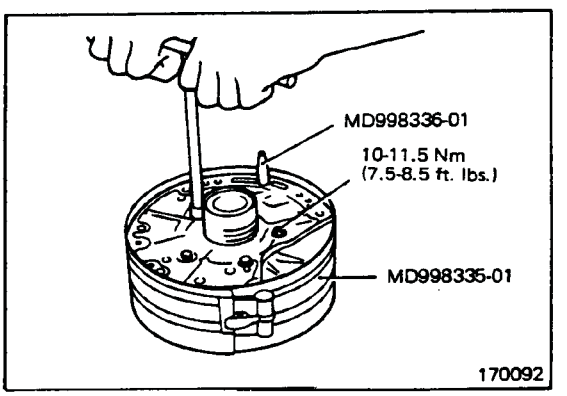
1. After immersing drive and driven gears in automatic transmission fluid, install them to pump housing. When reusing gears, install with mating marks properly aligned.
2. Fit a new O-ring into the groove at the inner circumference of the drive gear.
3. Install steel ball in hole as shown in the illustration. (170302)



4. Install two seal rings coated with automatic transmission fluid to reaction shaft support.

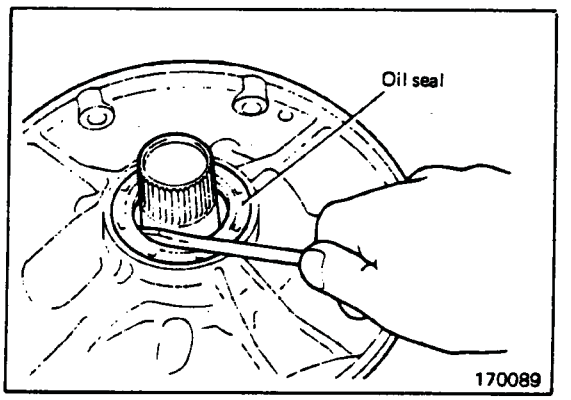


5. Make sure that oil pump gear turns freely.
6. Install new O-ring in groove provided in circumference of pump housing and apply petrolatum or industrial vaseline to circumference of O-ring.
7. Loosely install reaction shaft support on pump housing. Tighten five bolts fingertight.
8. With reaction shaft support properly positioned on pump housing using Special Tools MD998336-01 and MD998335-01 tighten five bolts to 10-11.5 Nm (7.5-8.5 ft. lbs.).

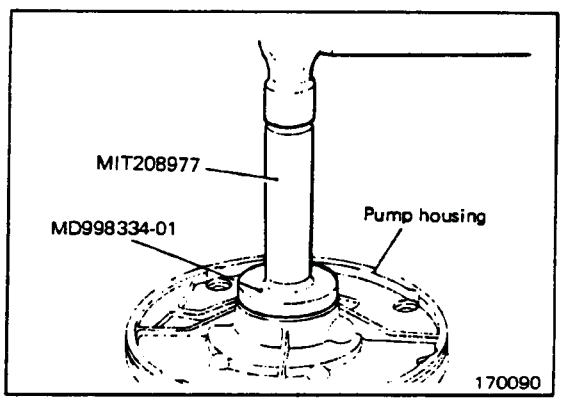


OIL SEAL REPLACEMENT

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

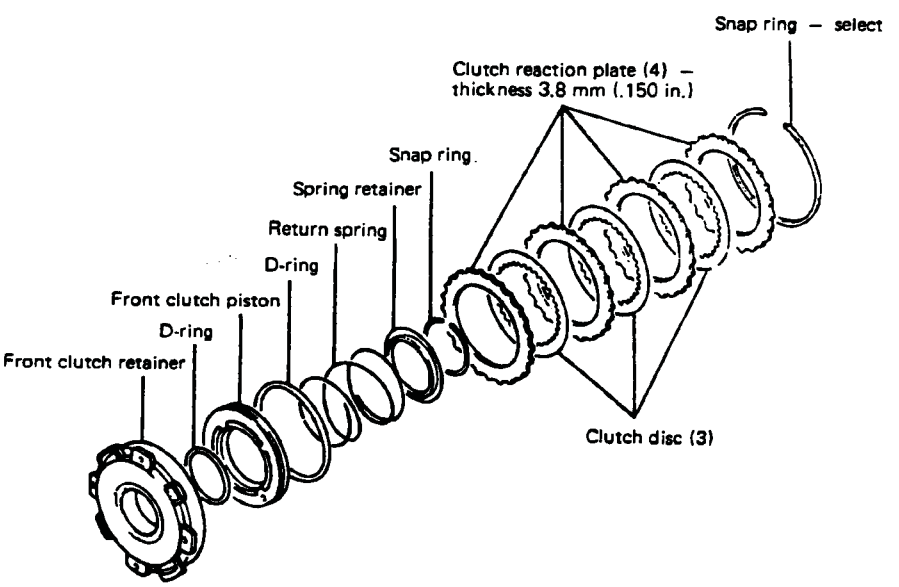


2. Use Special Tool MD998334-01 and MIT208977 install oil seal to pump housing. Apply thin coat of automatic transmission fluid to oil seal lip before installation.



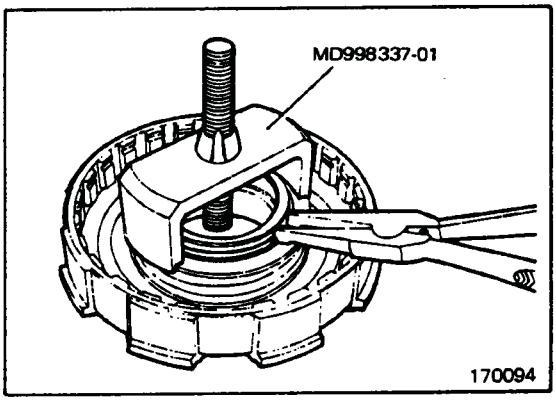
FRONT CLUTCH ASSEMBLY

COMPONENTS



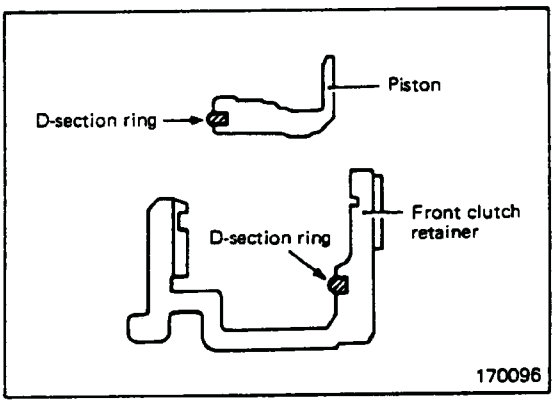
DISASSEMBLY

1. Remove snap ring from clutch retainer.
2. Take out four clutch reaction plates and three clutch discs.
   If the clutch reaction plates and the clutch discs are to be re-used, be sure not to change the installation order or direction.
3. With return spring compressed with Special Tool, Spring Compressor (MD998337-01), remove snap ring, then spring retainer and return spring. (170094)
4. Remove piston from retainer.
5. Remove the D-section rings from the inner and outer circumferences of the piston.

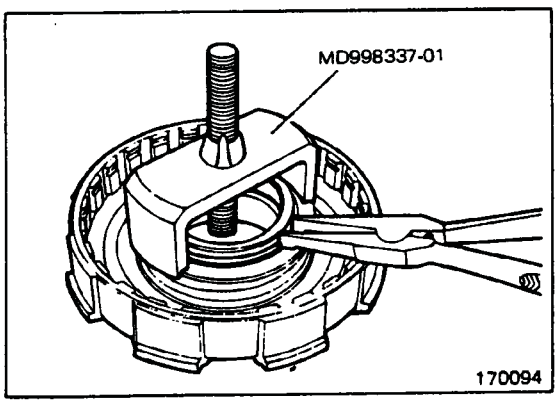


REASSEMBLY

1. Install D-section ring in groove in outside surface of piston with its round side out. Install another D-section ring to front clutch retainer. (170096)
2. Apply automatic transmission fluid to outside surface of D-section rings, then push piston into front clutch retainer by hand.

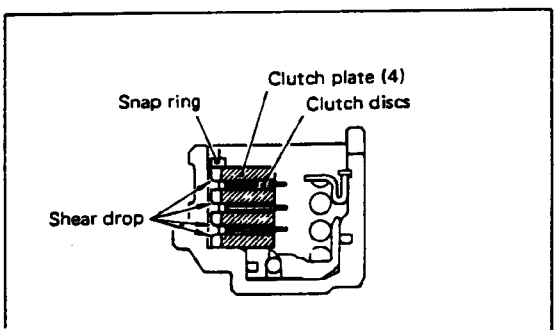


3. Install return spring and spring retainer.
4. Compress return spring with Special Tool MD998337-01 and install snap ring.

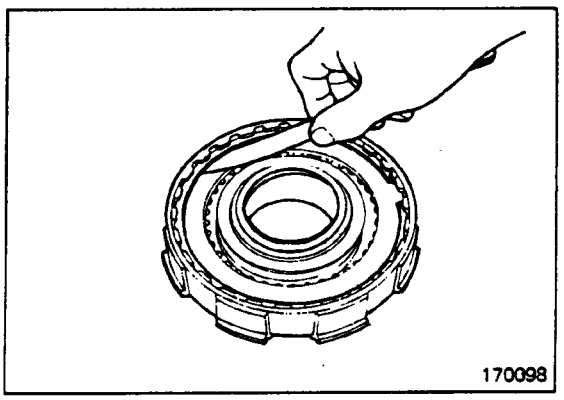


5. Install four clutch reaction plates and three clutch discs. Prior to installation, apply automatic transmission fluid to them.

Caution
When new clutch discs are used, they should be immersed in automatic transmission fluid for more than two hours before installation.



6. After installing snap ring, check to see if there is a 0.6-0.8 mm (.024-.031 in.) clearance between snap ring and clutch reaction plate.
   To check clearance, hold entire circumference of clutch reaction plate down with 50 N (11 lbs.) force. If clearance is out of specification, select snap ring for correct clearance.

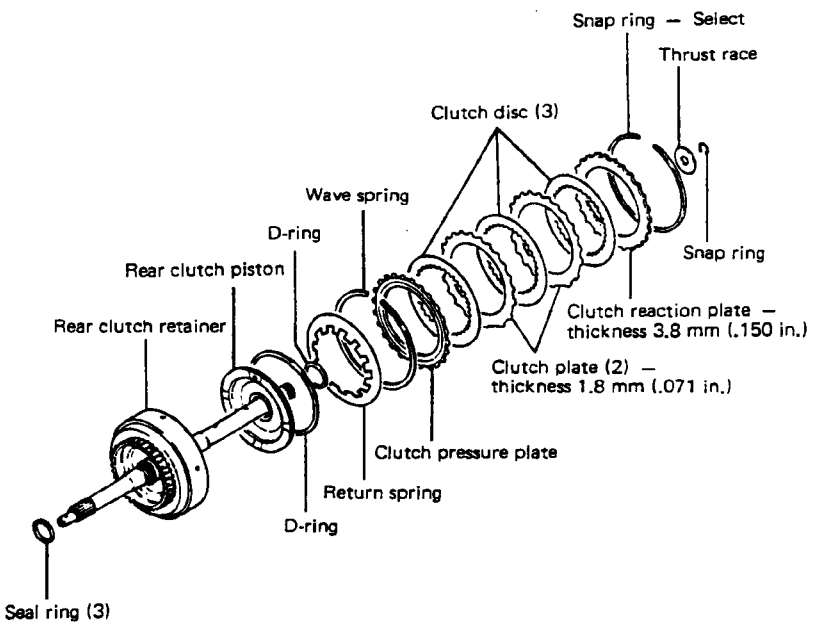


Kinds of snap ring

Thickness mm (in.)	Ident. color	Parts No.
1.6 (.063)	None	MD955630
1.8 (.071)	Blue	MD955631
2.0 (.079)	Brown	MD955632
2.2 (.087)	None	MD955633
2.4 (.094)	Blue	MD955634
2.6 (.102)	Brown	MD955635
2.8 (.110)	None	MD955636
3.0 (.118)	Blue	MD955637

REAR CLUTCH ASSEMBLY

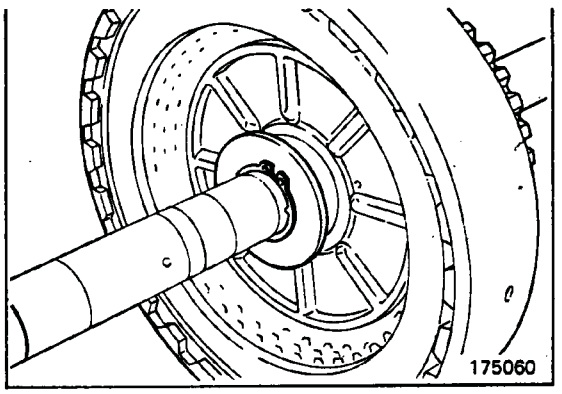
COMPONENTS



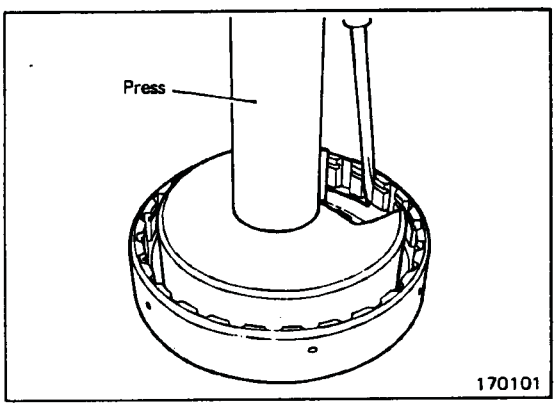
175135

DISASSEMBLY

1. Remove snap ring and then remove thrust race. (175060)
2. Remove the input shaft from the rear clutch retainer.
3. Remove snap ring from clutch retainer.
4. Remove the clutch reaction plate, two clutch plates, three clutch discs and clutch pressure plate from retainer.

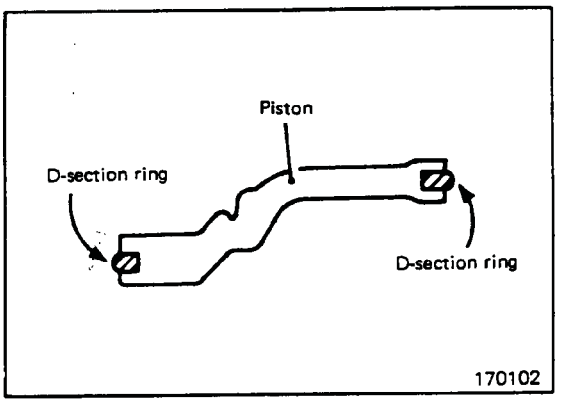


5. Compress the return spring by using the spring compressor. (170101)
6. Using a screwdriver, remove wave spring.
7. Remove return spring and piston.
8. Remove the two D-section rings from the piston.



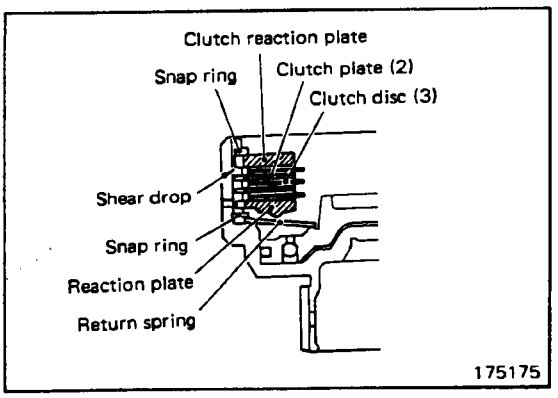
REASSEMBLY

1. Install D-section rings in grooves in outside and inside surfaces of piston. (170102)
2. After applying automatic transmission fluid to outside surface of D-section rings, push piston into rear clutch retainer by hand.
3. Install return spring on piston.
4. Compress return spring with snap ring, by pushing down with a screwdriver and setting snap ring in its groove.

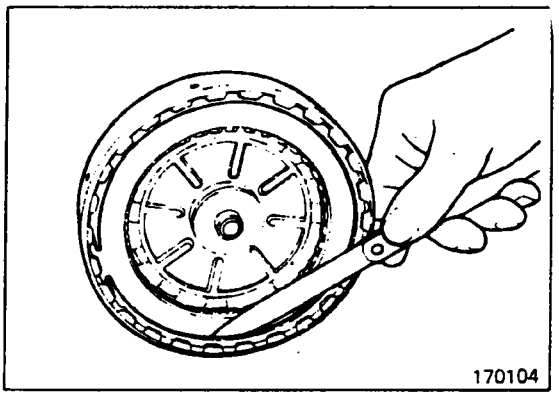


5. Install clutch pressure plate, three clutch discs, two clutch plates and clutch reaction plate to rear clutch retainer.
   When reaction plate, clutch plate and clutch discs are removed, reinstall them by reversing order of disassembly. Prior to installing, apply automatic transmission fluid to plates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

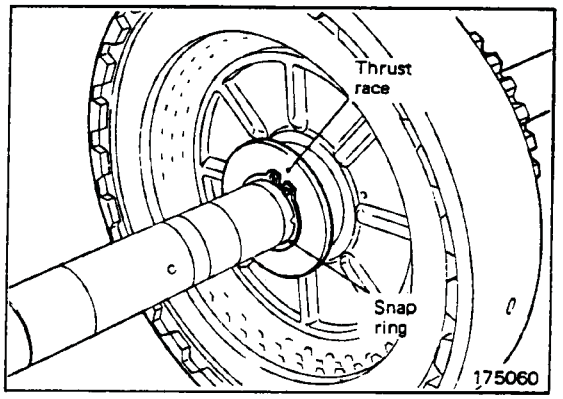
Caution
When new clutch discs are used, immerse them in automatic transmission fluid for more than two hours before installation.



6. Install snap ring. Check to see that clearance between snap ring and clutch reaction plate is 0.4-0.6 mm (.016-.024 in.) To check clearance, hold entire circumference of clutch reaction plate down with 50 N (11 lbs.) force. If clearance is out of specification, adjust clearance by selecting a proper snap ring. Snap rings are common to those for front clutch.
7. Insert the input shaft into the clutch retainer.

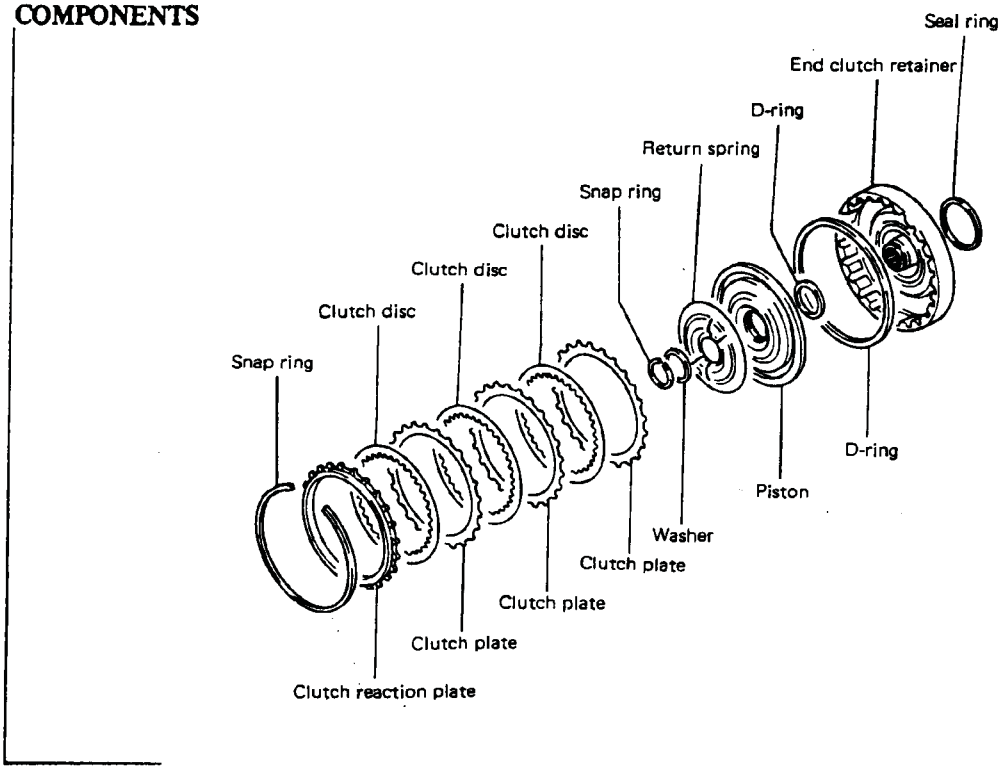


8. Install thrust race, then snap ring.
9. Install the three seal rings to the grooves in the input shaft.



END CLUTCH

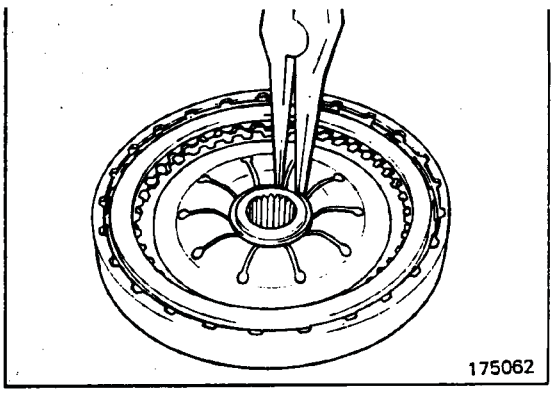
COMPONENTS



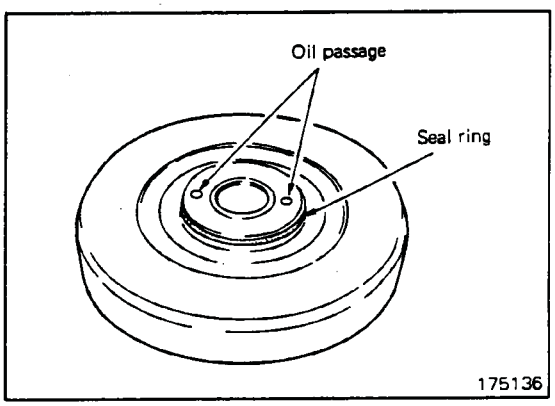
175061

DISASSEMBLY

1. Remove the snap ring by using snap-ring pliers, and then remove the washer and return spring.
2. Remove the snap ring, and then remove the clutch reaction plate, the clutch disc, and the clutch plate. If the disc and plate are reused, be sure not to change the installation order and direction when they are disassembled.

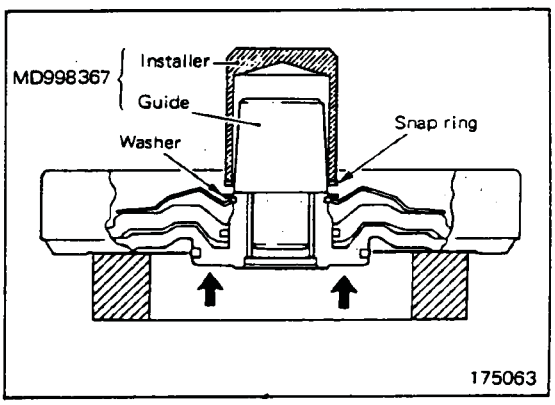


3. Remove the piston. If it is difficult to remove, face the piston side downward, and, with the retainer on a base, blow air in through the oil passage on the rear surface.
4. Remove the seal ring from the retainer.
5. Remove the two D-section rings and oil seal from the piston.



REASSEMBLY

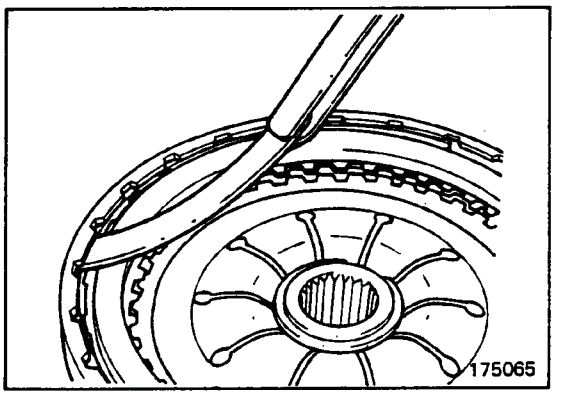
1. Install the D-section rings and oil seal in the piston inner and outer grooves.
2. After applying a coating of automatic transmission fluid to the D-section rings outer circumference, manually press the piston into the end clutch retainer.
3. Install the return spring and washer.
4. After fitting a new snap ring into the guide of the special tool snap-ring installer (MD998367), install the retainer. Fit 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 transmission fluid.

Caution
When a new clutch disc is used, soak it in automatic transmission fluid for 2 hours before using it.

6. After installing the snap ring, check to be sure that the clearance between the snap ring and the clutch reaction plate is from 0.4 to 0.65 mm. When measuring the clearance, apply a firm pressure (5 kg) all around the circumference of the clutch reaction plate.
   If the clearance is not within the specified range, use a snap ring of a thickness which will adjust to the specified range.

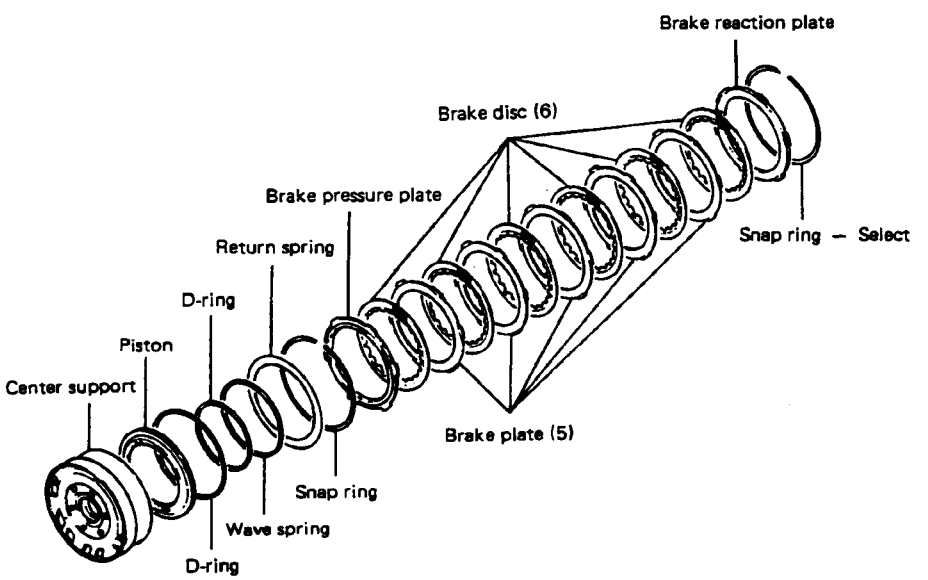


Types of snap rings

Snap ring thickness mm (in.)	Ident. color	Part no.
1.05 (.04)	White	MD715800
1.30 (.05)	Yellow	MD715801
1.55 (.06)	None	MD715802
1.80 (.07)	Green	MD715803
2.05 (.08)	Pink	MD720849

LOW-REVERSE BRAKE ASSEMBLY

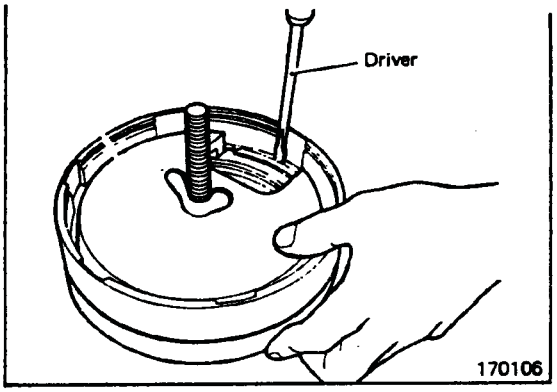
COMPONENTS



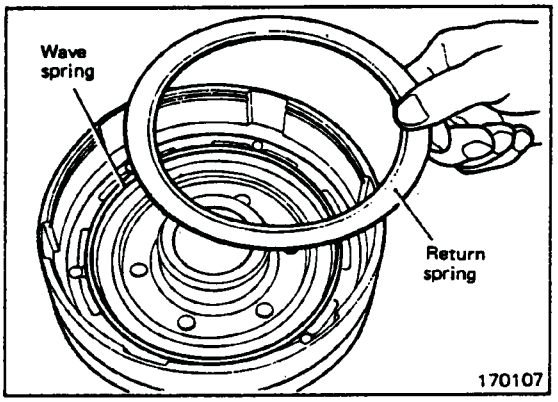
172021

DISASSEMBLY

1. Remove snap ring from center support.
2. Take out reaction plate, brake discs, brake plates and brake pressure plate.
   If the discs and plates are to be re-used, be sure not to change the installation order or direction.
3. Compress the return spring by using the spring compressor, and then remove the snap ring.

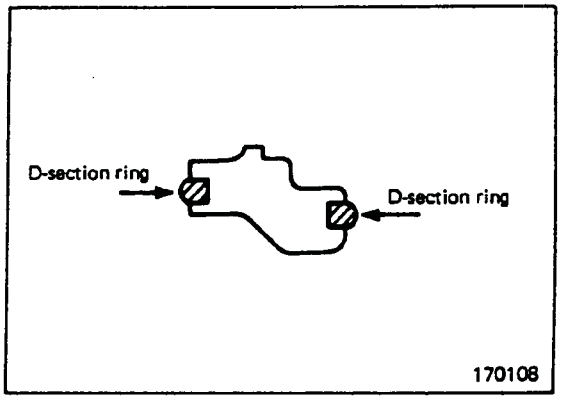


4. Remove return spring and wave spring.
5. Remove the piston. If it is difficult to remove, face the piston side downward, place the center support on a working surface, and then blow air through the oil passages to remove.
6. Remove the D-section ring from the piston.

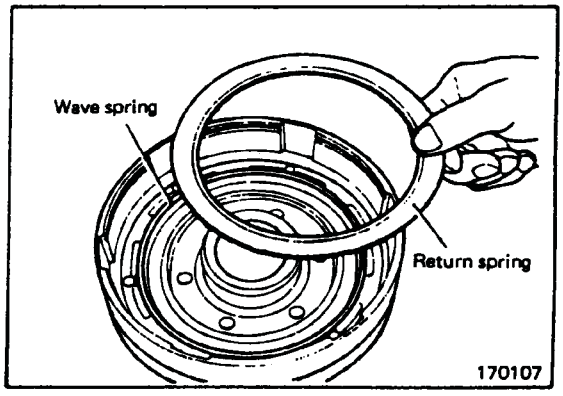


REASSEMBLY

1. Install new D-section rings to piston. (170108)
2. Apply automatic transmission fluid to circumference of D-section rings, and push piston into center support by hand.



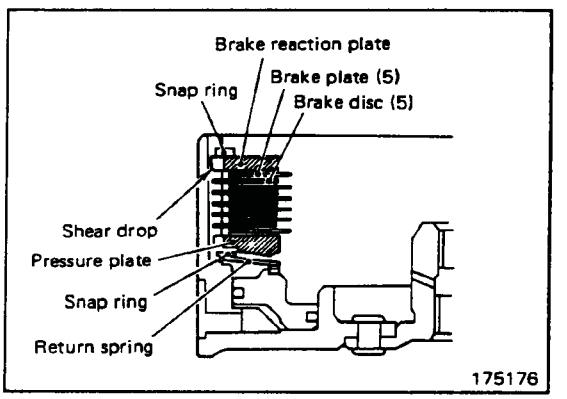
3. Install wave spring and return spring.



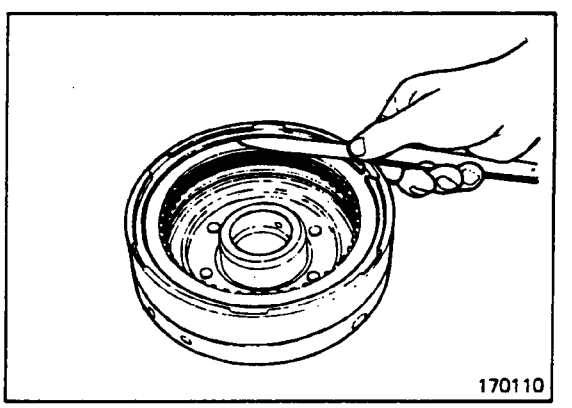
4. Compress return spring with snap ring by pushing down with a screwdriver and setting snap ring in its groove.

5. Install pressure plate, three plates, four discs and reaction plate to center support.

Caution
When a new disc is used, immerse it in automatic transmission fluid for more than two hours before installation.



6. Install snap ring, then check to see if clearance between snap ring and brake reaction plate is 1.2-1.4 mm (.047-.055 in.). To check clearance, hold entire circumference of clutch reaction plate down with 50 N (11 lbs.) force. If clearance is out of specification, adjust by selecting proper snap ring.

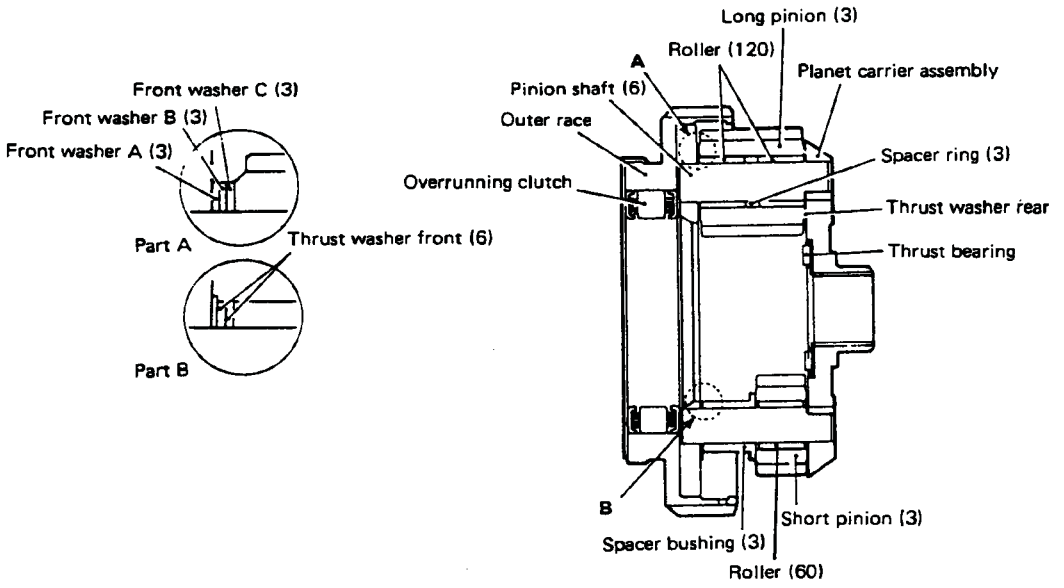


Kinds of snap ring

Thickness mm (in.)	Ident. color	Parts No.
1.8 (.071)	Blue	MD707413
2.0 (.079)	Brown	MD707406
2.2 (.087)	None	MD707407
2.4 (.094)	Blue	MD707408
2.6 (.102)	Brown	MD707409
2.8 (.110)	None	MD707410
3.0 (.118)	Blue	MD707411
3.2 (.126)	Brown	MD707412

COMPONENTS

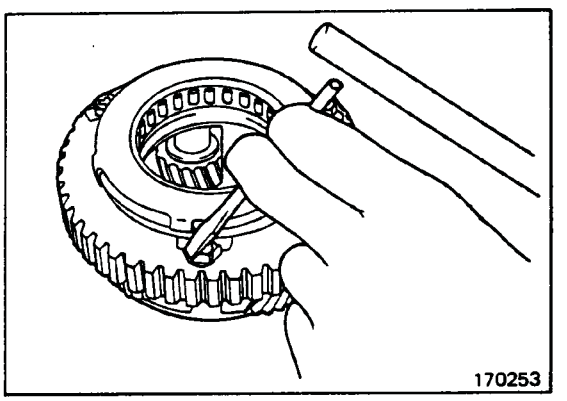
COMPONENT SERVICE-PLANET CARRIER ASSEMBLY



175066

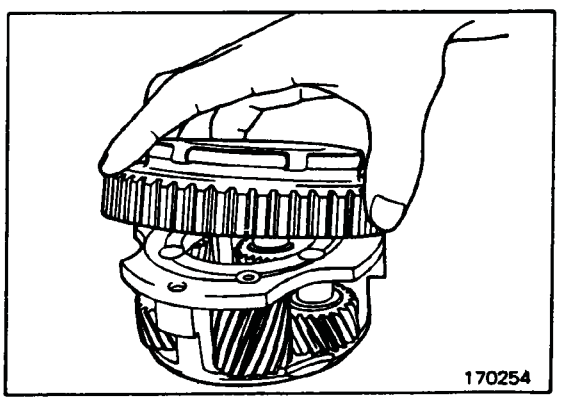
DISASSEMBLY

1. Unbend three lock plates and then remove three bolts.



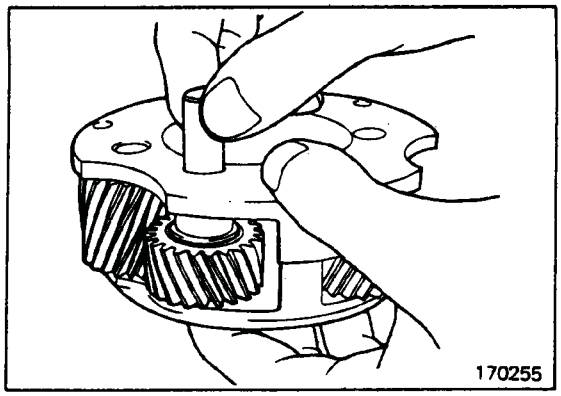
170253

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

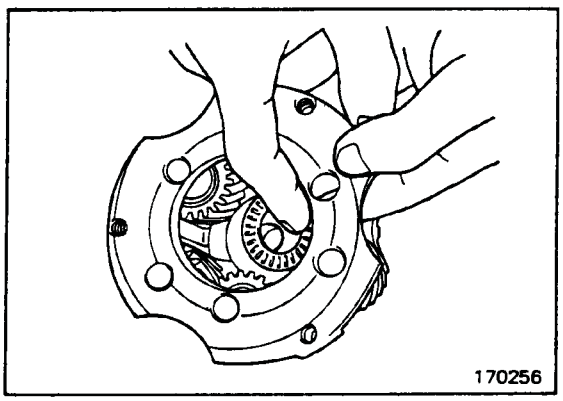


170254

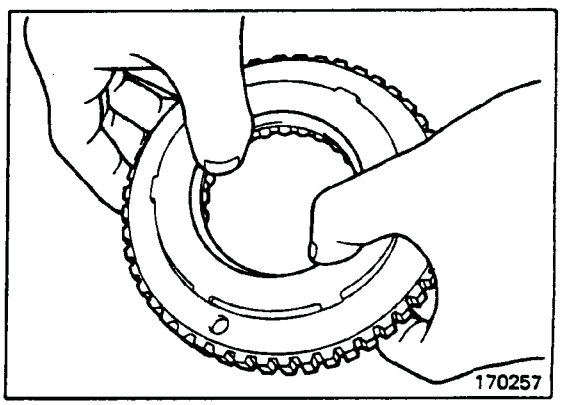
3. Remove pinion shaft. (any one place of the short pinion).
4. **Remove spacer bushing and two front thrust washers.**
5. Remove only one short pinion. Use care not to drop and lose 20 rollers in short pinion.



6. Remove thrust bearing.

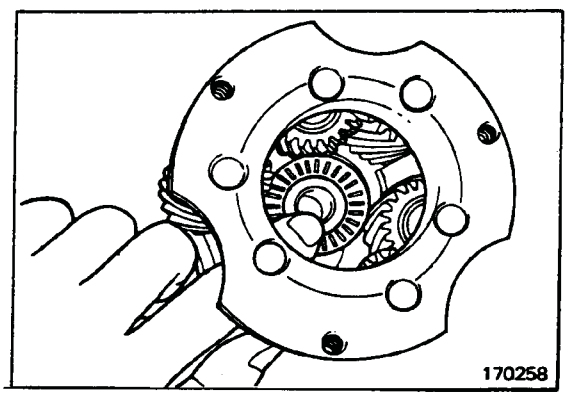


7. Push overrunning clutch out of outer race with fingers.

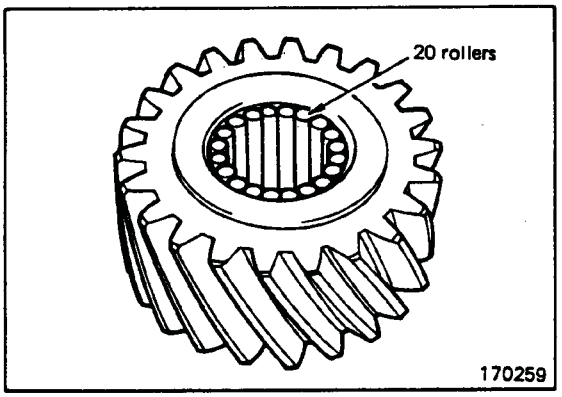


REASSEMBLY

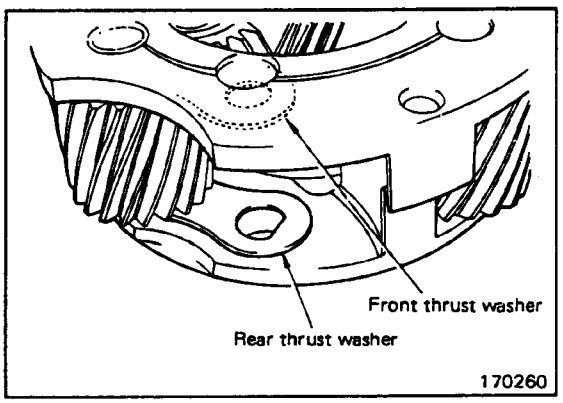
1. Install thrust bearing to carrier. Be sure that it fits correctly in carrier.



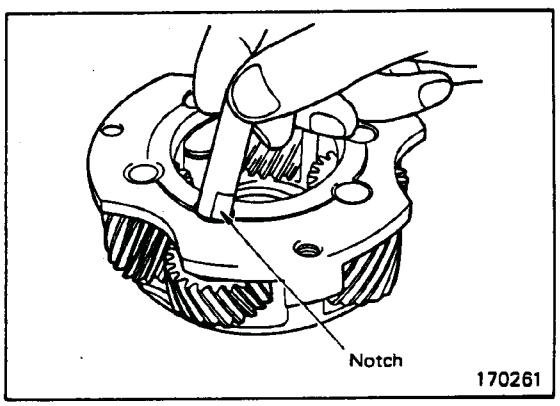
2. **Apply a generous amount of vaseline to inside diameter of short pinion to hold the 20 rollers.**



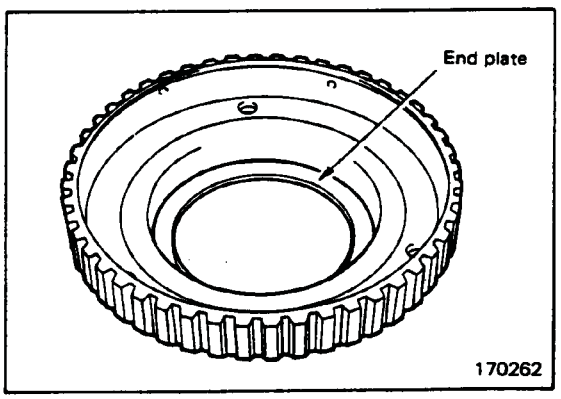
3. Line up holes in rear thrust washer and front thrust washer with shaft hole of carrier.
4. Install short pinion, spacer bushing and two front thrust washers and align holes. Use care not to allow rollers to get out of position.



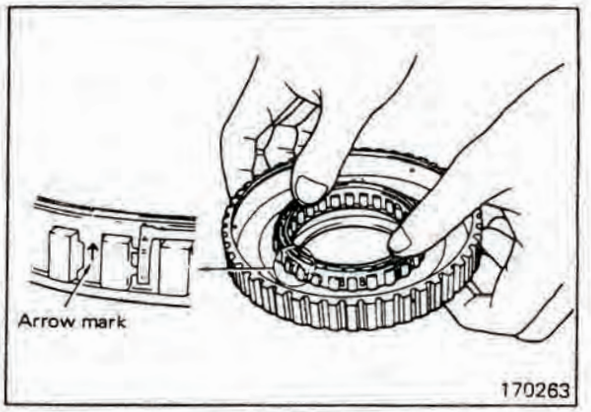
5. Insert pinion shaft. Be sure that flattened end of pinion shaft fits properly into the hole in rear thrust plate when pinion shaft is inserted.



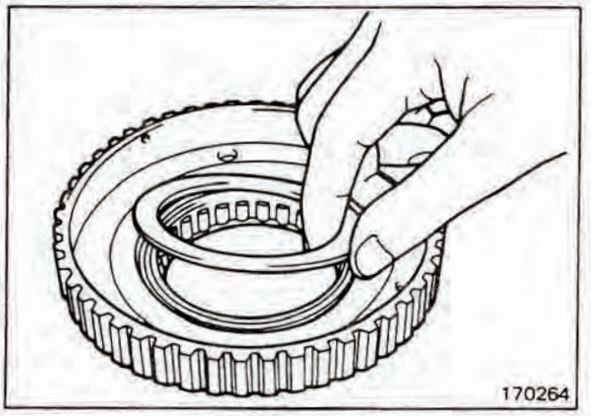
6. Install end plate to outer race.



7. Push overrunning clutch into outer race. Be sure that arrow on outside circumference of cage is directed upward as shown in the illustration (170263) when overrunning clutch is installed.



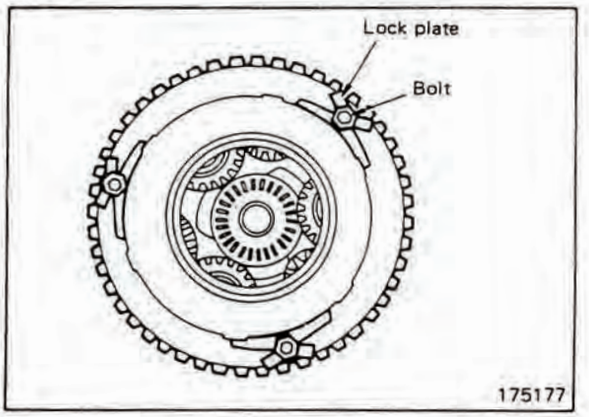
8. Apply vaseline to overrunning clutch end plate to retain it to overrunning clutch. Install the end plate to the clutch.



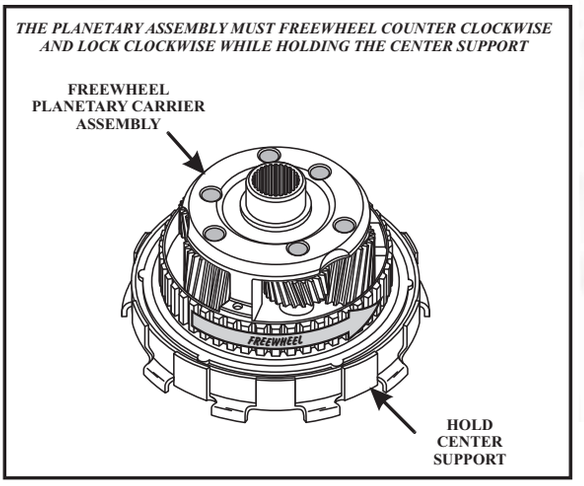
9. Install overrunning clutch assembly to carrier and align bolt holes.
10. Install three lock plates and three bolts and tighten three bolts to 12 to 13.5 Nm (9 to 10 ft. lbs.).

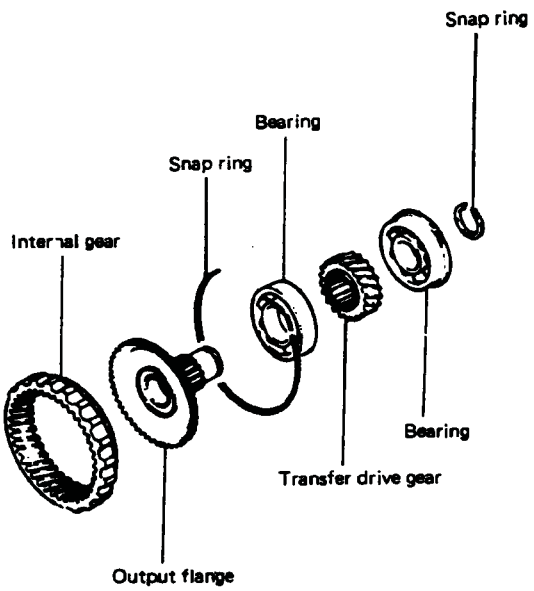
Caution
Lock plates must not be reused.

11. Bend lock plates exactly along bolt heads.



Install the planetary onto the center support and ensure the proper rotation of the planetary assembly.

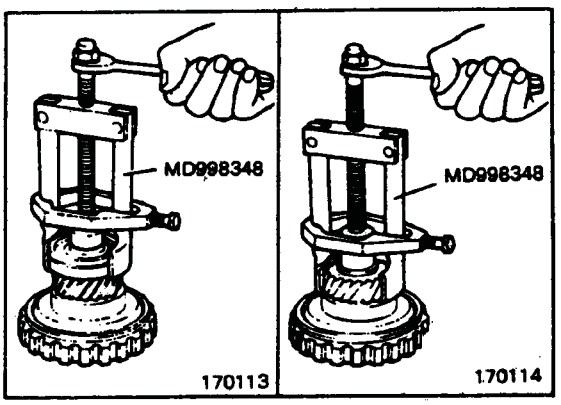


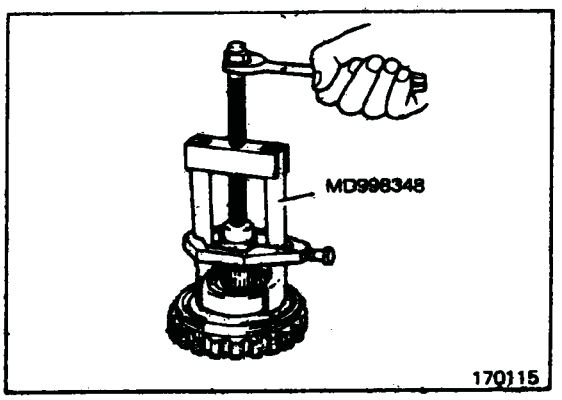


170178

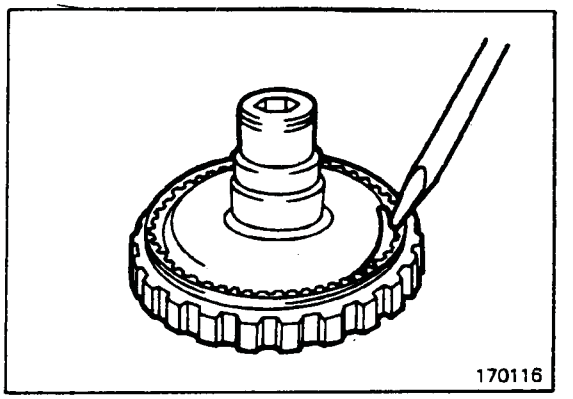
DISASSEMBLY

1. Remove snap ring from rear end of output flange.
2. Using Special Tool MD998348, pull off ball bearings (2 pieces) and transfer drive gear from output flange. (170113, 170114 and 170115)





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

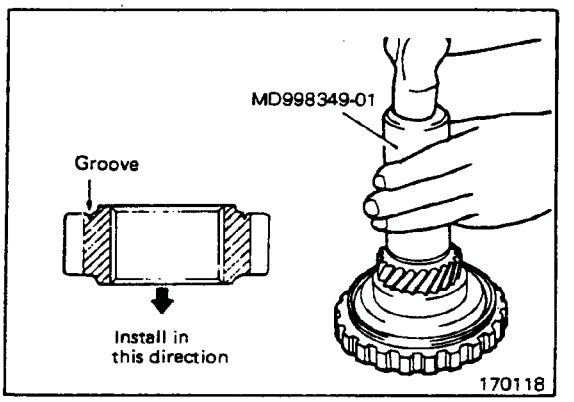


REASSEMBLY

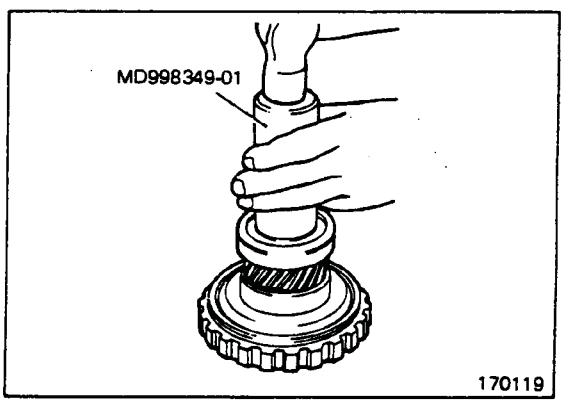
1. Using Special Tool MD998349-01 press ball bearing and transfer drive gear onto output flange.

Caution
Replace output flange and transfer drive gear as a set.

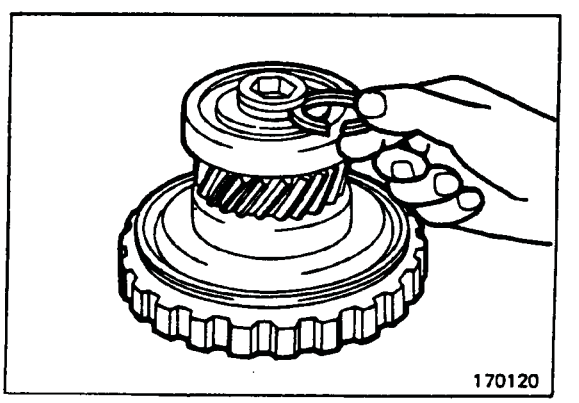
2. Install transfer drive gear in proper direction with attention paid to groove provided in side surface.



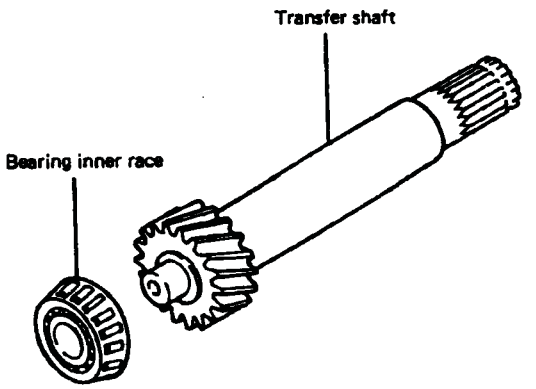
3. Install the ball bearing.



4. Select snap ring, which should be the thickest one that can be installed in groove.



COMPONENTS

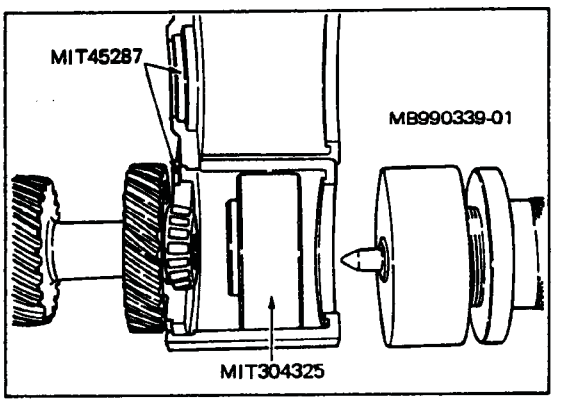


170179

DISASSEMBLY

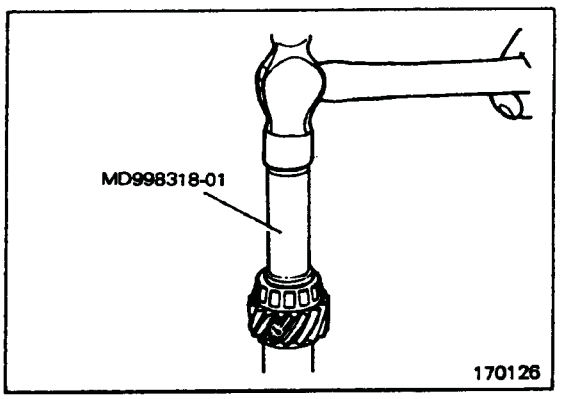
If tapered roller bearing is damaged, remove it using Special Tool MD990339-01 (MIT45287 and MIT304325).

Caution
Replace taper roller bearing inner and outer races as a set.

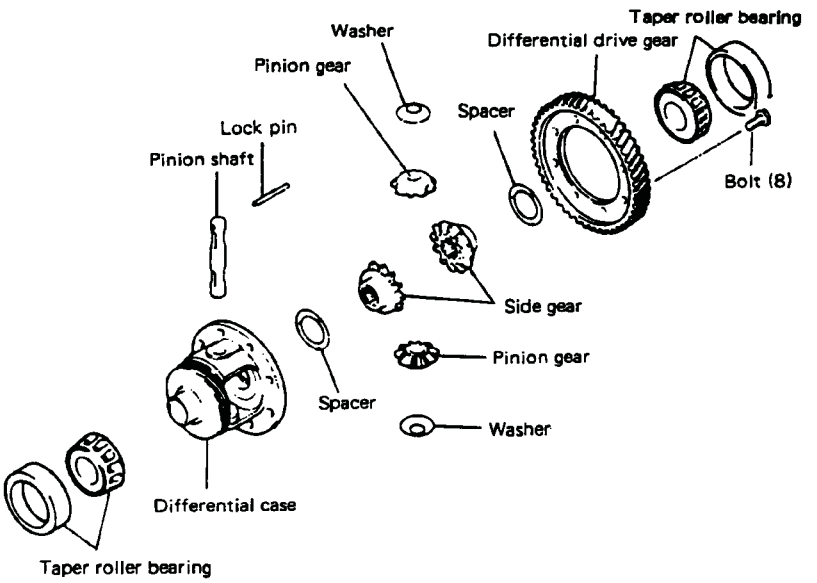


REASSEMBLY

Install taper roller bearing inner race assembly using Special Tool MD998318-01.



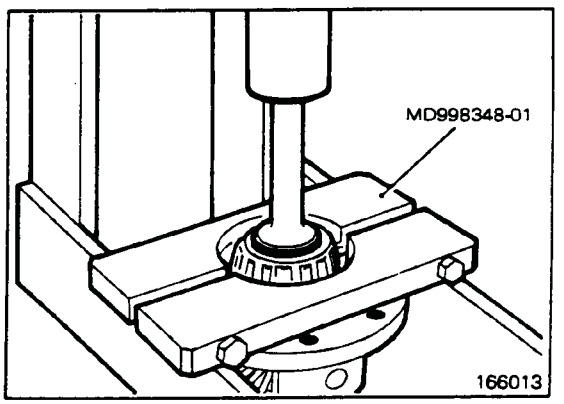
COMPONENTS



166012

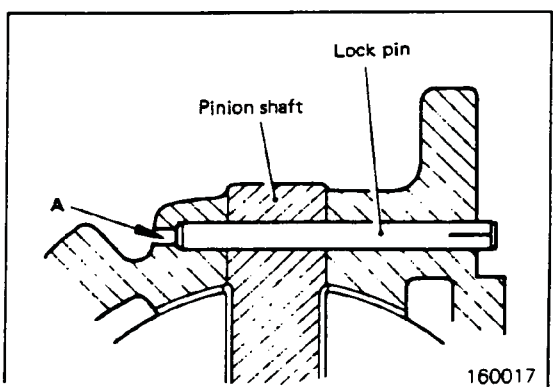
DISASSEMBLY

1. Remove the drive gear retaining bolts and remove the drive gear from differential case.
2. Remove the taper roller bearing inner race by using gear puller . (166013)



166013

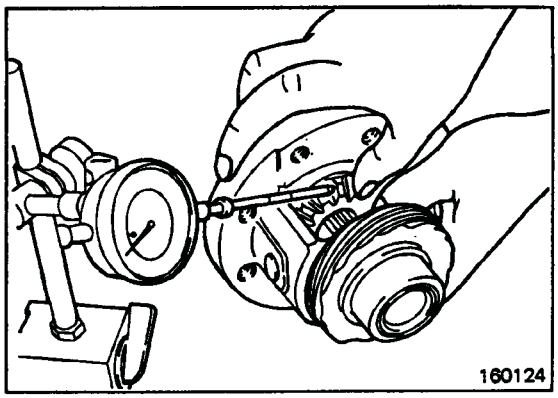
3. Drive out lock pin with a punch inserted in hole "A" (160017)
4. Remove the pinion shaft, the pinion gears and washers.
5. Remove the side gears and spacers.
   Distinguish between the removed gears and spacers for the left and right sides.



160017

REASSEMBLY

1. **With spacers installed to back of differential side gears,** install gears in differential case. If reusing removed parts, install them in original positions noted during disassembly. If using new differential side gears, install spacers of medium thickness 1.0 $^{0}_{-0.07}$ mm (.039 $^{0}_{-0.03}$ in.).
2. Install washers to back of pinion gears, install gears in differential case, and then insert pinion shaft.
3. Measure backlash between side gear and pinion gear. Backlash should be 0-0.076 mm (0-.0030 in.) and right and left hand gear pairs should have equal backlash. If backlash is out of specification. Disassemble and reassemble them by using spacers selected for correct backlash. (160124)



Backlash	0-0.076 mm (0-.0030 in.)

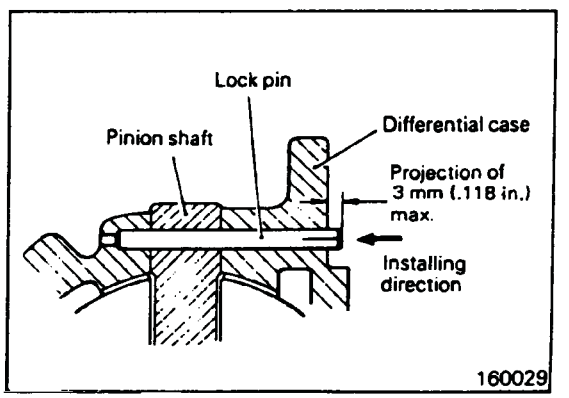
Kinds of spacer

Thickness mm (in.)	Parts No.
1.0 $^{+0.16}_{+0.09}$(.0394 $^{+.0063}_{+.0035}$)	MA180876
1.0 $^{+0.08}_{+0.01}$(.0394 $^{+.0031}_{+.0004}$)	MA180875
1.0 $^{0}_{-0.07}$(.0394 $^{0}_{-.0028}$)	MA180860
1.0 $^{-0.08}_{-0.17}$(.0394 $^{-.0031}_{-.0067}$)	MA180861
1.0 $^{-0.18}_{-0.25}$(0.394 $^{-.0071}_{-.0098}$)	MA180862

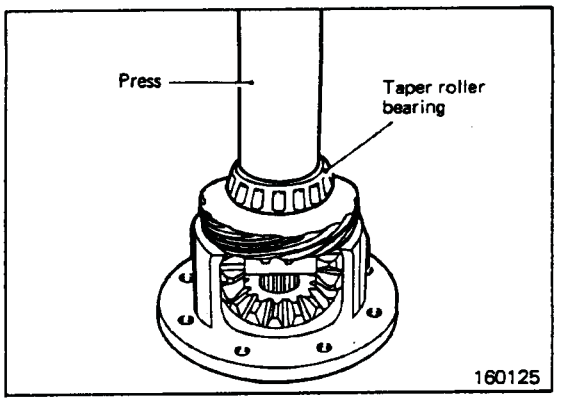
4. Install pinion shaft lock pin in direction specified in illustration. After installation, check to ensure that projection is less than 3 mm (.118 in.). (160029)

Caution

Lock pin must not be reused. Lock pin not requiring more than 1,960 N (44 lbs.) installation load must not be used.

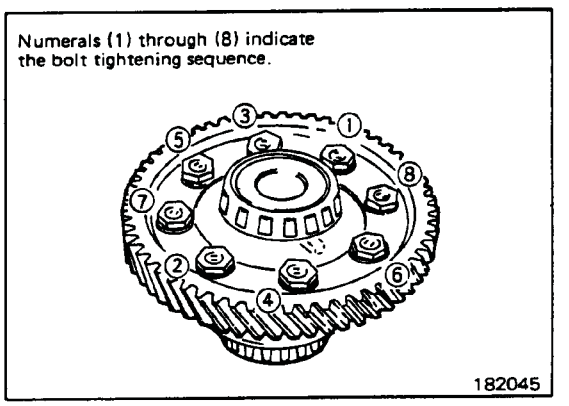


5. Press taper roller bearing inner races onto both ends of differential case. Apply load to inner race when pressing in bearings. Do not apply load to outer race.
6. Install the differential drive gear onto the case.

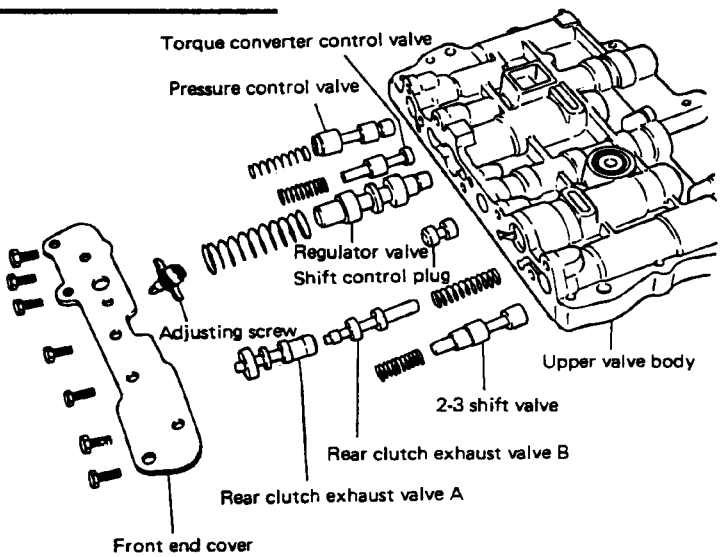


7. Apply ATF to bolts and tighten bolts to specified to torque in sequence shown in illustration.

Tightening torque ..... 128-127 Nm (94-101 ft.lbs.)



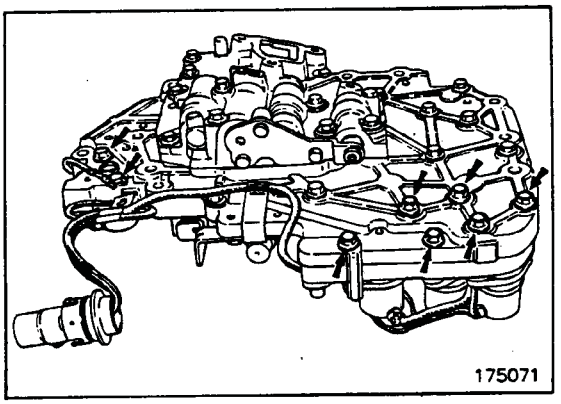
COMPONENT SERVICE-VALVE BODY (AUTOMATIC TRANSAXLE)



175078

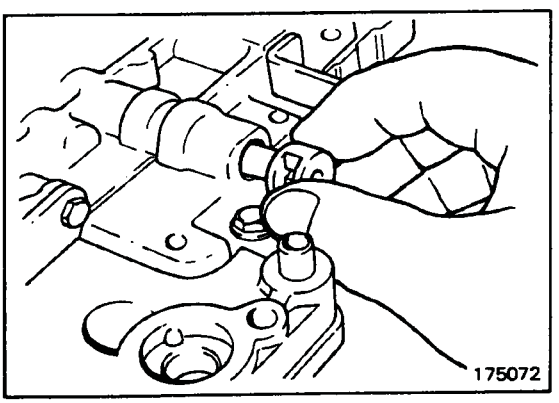
DISASSEMBLY

1. Remove the 4 solenoid valves.



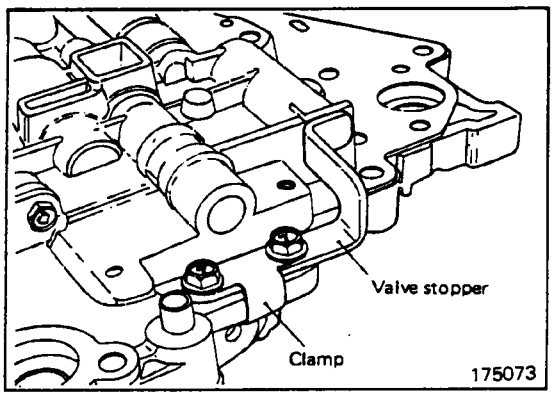
175071

2. Remove the manual valve.

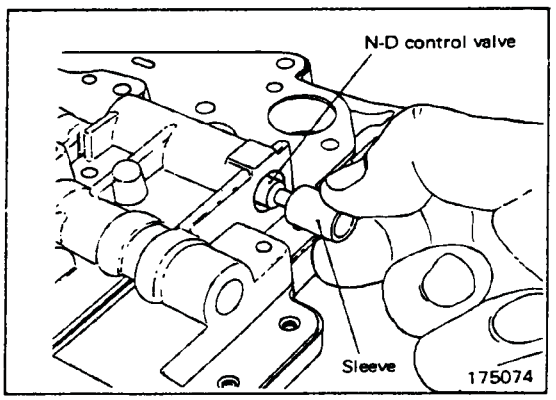


175072

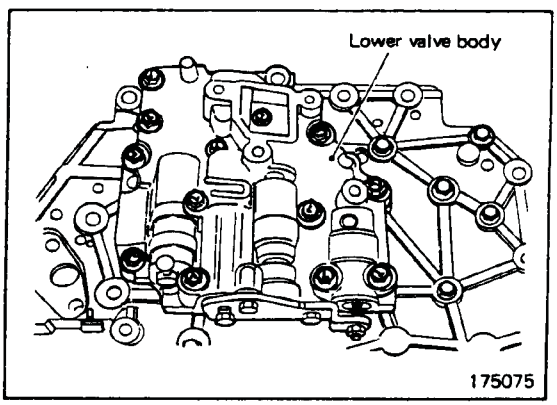
3. **Remove the valve stopper and clamp.**



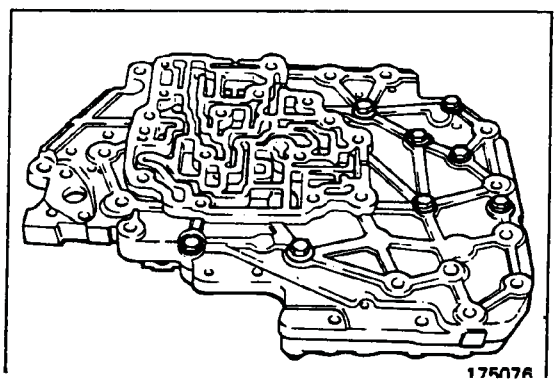
4. Remove the N-D control sleeve and valve.



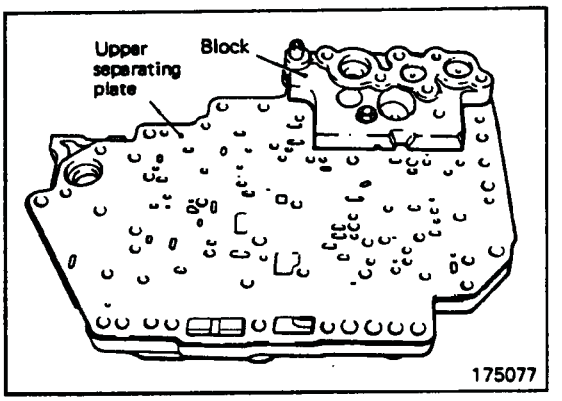
5. Remove the bolts (13), and then remove the lower valve body assembly and the separation plate.
6. Remove the relief spring and steel balls (two) from the intermediate plate.



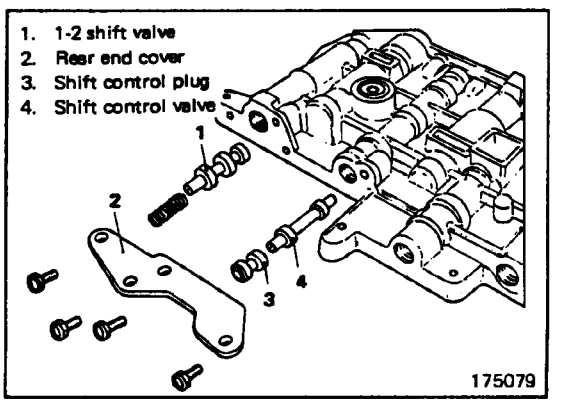
7. Remove the bolts (8), and then remove the intermediate plate and upper separation plate.
8. Remove the four steel balls from the upper valve body.



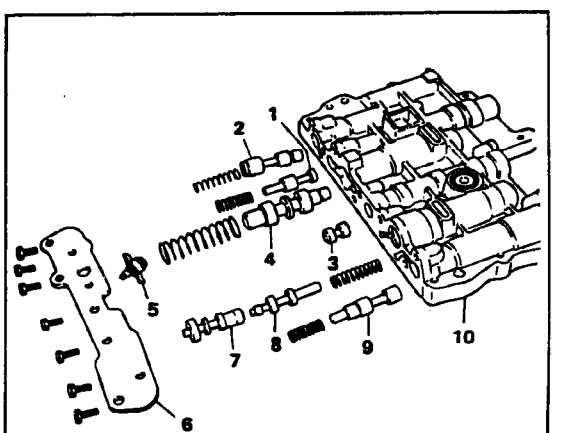
9. **Remove the block, and then the upper separation plate.**



10. **Remove the end cover, and then remove the 1-2 shift valve, spring, shift control plug and valve from the upper valve body.**



11. **After removing the end cover, remove the spring and valve shown in the figure from the upper valve body.**

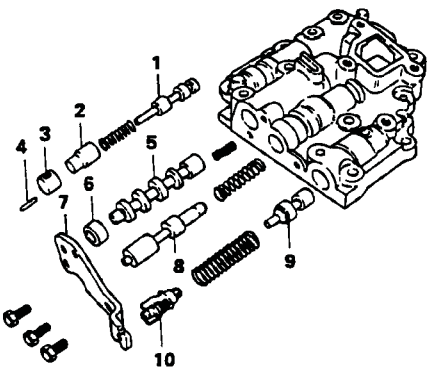


1. Torque converter control valve
2. Pressure control valve
3. Shift control plug
4. Regulator valve
5. Adjusting screw
6. Front end cover
7. Rear clutch exhaust valve A
8. Rear clutch exhaust valve B
9. 2-3/4-3 shift valve
10. Upper valve body

175078

12. Pull out the pin, remove the stopper and then remove the plug spring and end clutch valve.
13. Remove the end cover and then remove the valve and spring shown in the figure.

1. End clutch valve
2. End clutch valve plug
3. Stopper
4. Pin
5. Damper clutch control valve
6. Damper clutch valve sleeve
7. End cover
8. N-R control valve
9. Reducing valve
10. Adjusting screw



175091

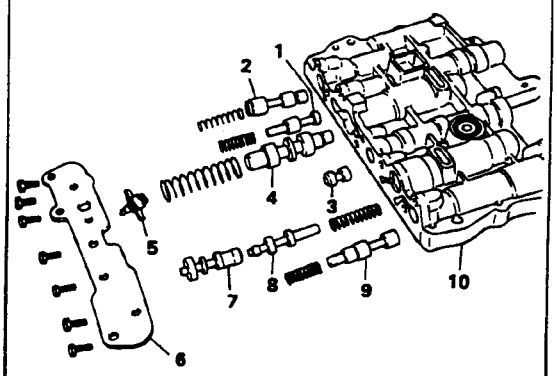
REASSEMBLY

Caution

Note the following when assembling the valve body.

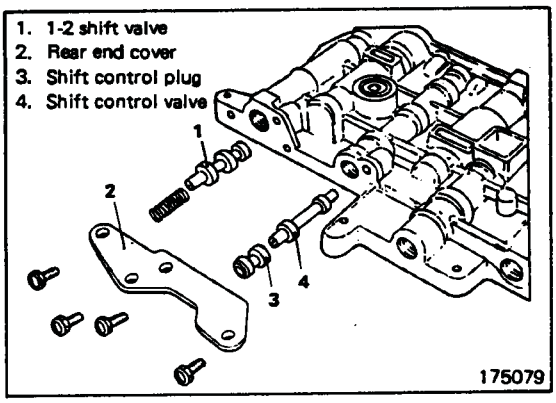
- **Thoroughly clean each component in clean automatic transmission fluid before installation. Do not wipe them with a rag.**
- **When inserting the valve into the valve body, do not apply excessive force.**
- **Tighten all bolts to the specified torque using a torque screwdriver or similar tool. All valve body bolts are to be tightened to 4.0-6.0 Nm (3.0-4.0 ft.lbs.).**

1. Install the valve springs shown in illustration to the upper valve body, install the front end cover, and tighten the bolt to 4.0-6.0 Nm (3.0-4.0 ft.lbs.). (175078)

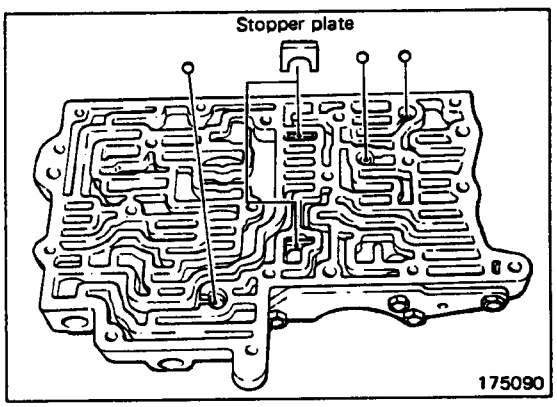


1. Torque converter control valve
2. Pressure control valve
3. Shift control plug
4. Regulator valve
5. Adjusting screw
6. Front end cover
7. Rear clutch exhaust valve A
8. Rear clutch exhaust valve B
9. 2-3/4-3 shift valve
10. Upper valve body

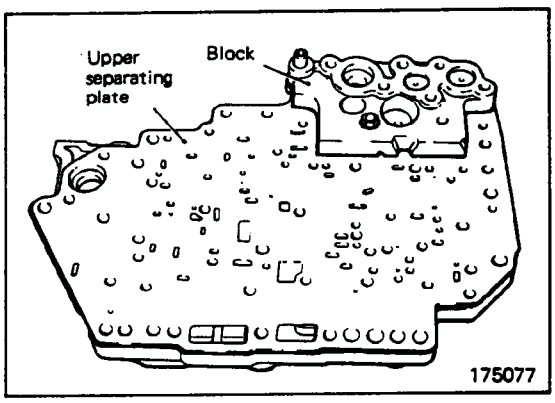
2. Install the 1-2 shift valve, spring, shift control valve and plug to the upper valve body, install the rear end cover, and tighten the bolt to 4.0-6.0 Nm (3.0-4.0 ft.lbs.).



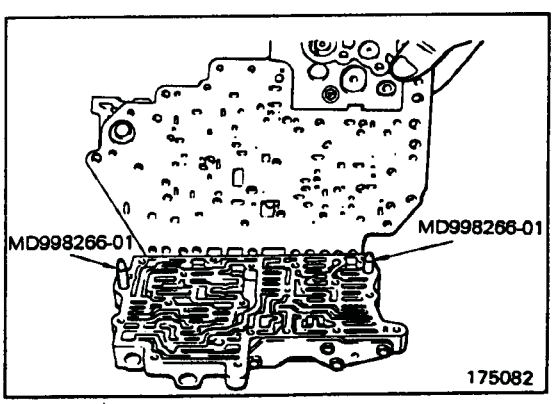
3. Install the steel balls (4) and the stopper plate.



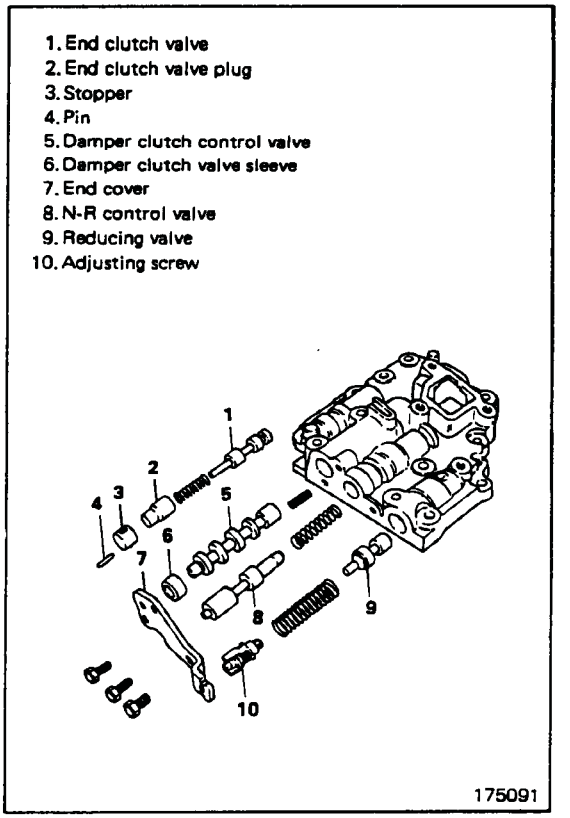
4. Install the upper separation plate and the block to the intermediate plate, and then temporarily tighten the bolt (1).



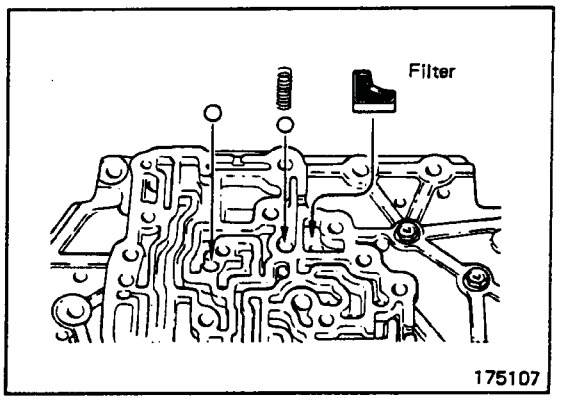
5. Insert the special tool guide pin (MD998266-01) into the guide pin hole of the lower valve body.
6. With the guide pin as a reference, install the intermediate plate upper separation plate assembly. After tightening the bolts (8), pull out the guide pin.



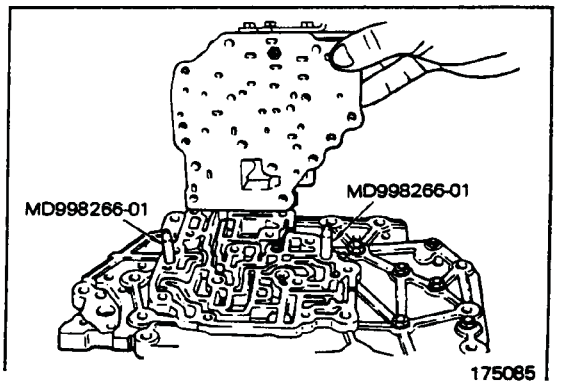
7. **Install each of the valve springs to the lower valve body, install the end cover, and then tighten the bolt.**



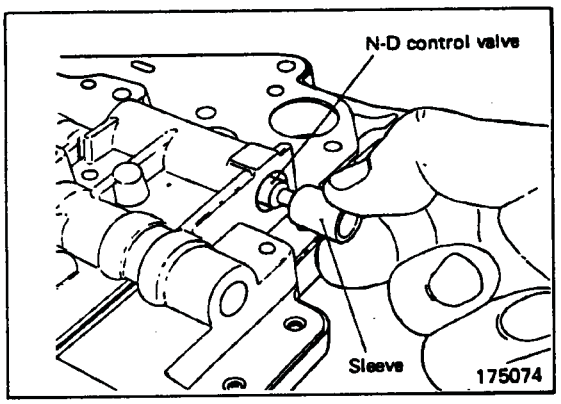
8. Install the steel ball spring and filter to the intermediate plate.



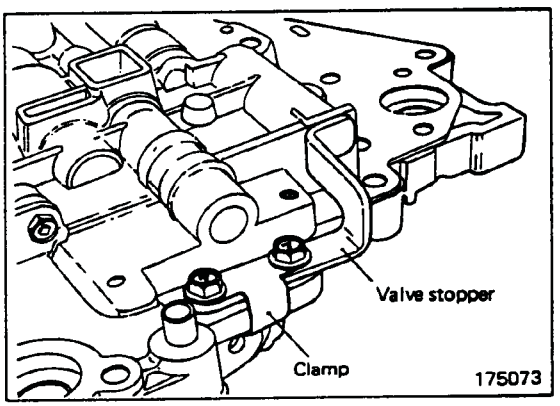
9. Insert the special tool guide pin (MD998266-01) into the guide pin hole of the intermediate plate.
10. With the guide pin as a reference, install the lower separation plate lower valve body. After tightening the bolts (13), pull out the guide pin.



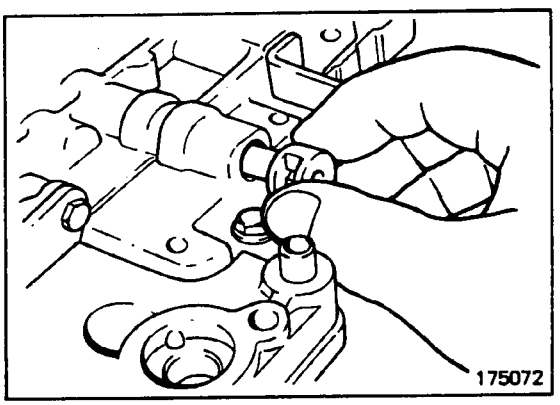
11. Install the N-D control sleeve and valve.



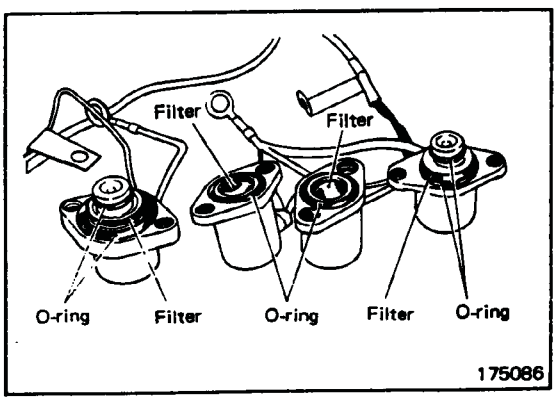
12. Install the valve stopper and clamp.



13. Install the manual valve.

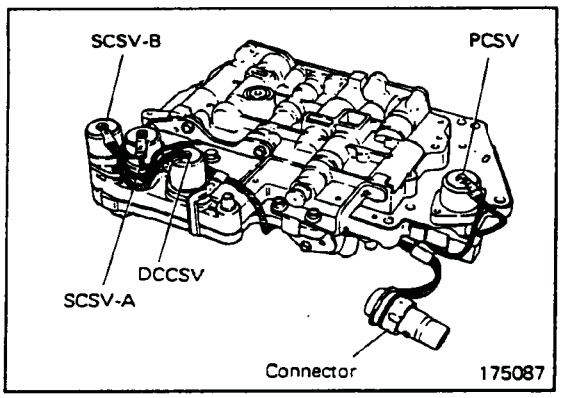


14. After cleaning the filter part of each of the solenoid valves, replace all O-rings with new ones.



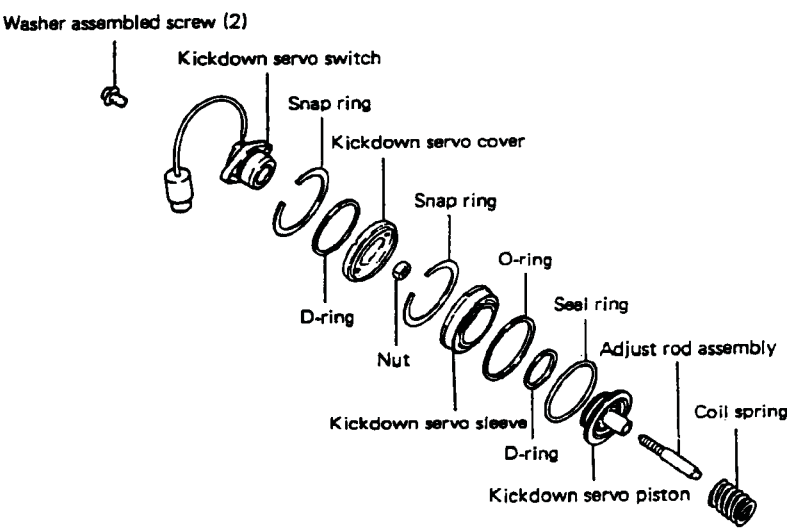
15. Install the solenoid valves.
Use the shape and lead wiring colors to identify so that the installation positions are not mistaken.

Solenoid valve	Lead wiring color
Damper clutch control solenoid valve (DCCSV)	Red
Shift control solenoid valve A (SCSV-A)	Orange
Shift control solenoid valve B (SCSV-B)	Yellow
Pressure control solenoid valve (PCSV)	Blue



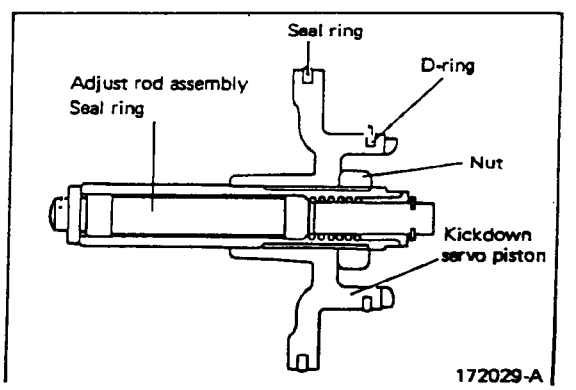
KICKDOWN SERVO PISTON ASSEMBLY

COMPONENTS

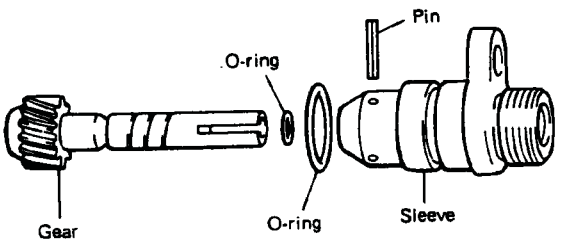


REASSEMBLY

1. Insert the adjust rod assembly into kickdown servo piston, and then screw the nut.
2. Install new D-rings and Seal ring to piston.
3. Apply automatic transmission fluid to D-rings and Seal ring.



COMPONENTS



172002

DISASSEMBLY

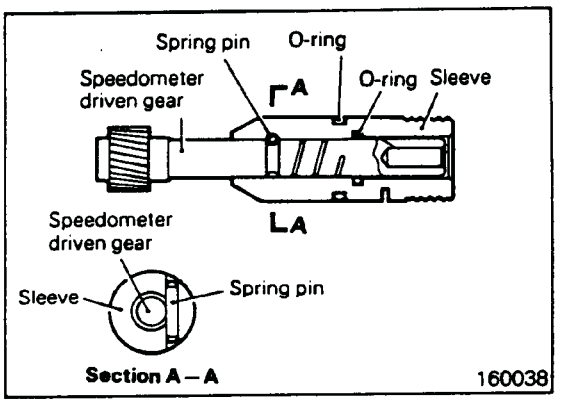
Drive spring pin out, and gear and sleeve can be disassembled.

Caution

Do not reuse O-rings and spring pin.

REASSEMBLY

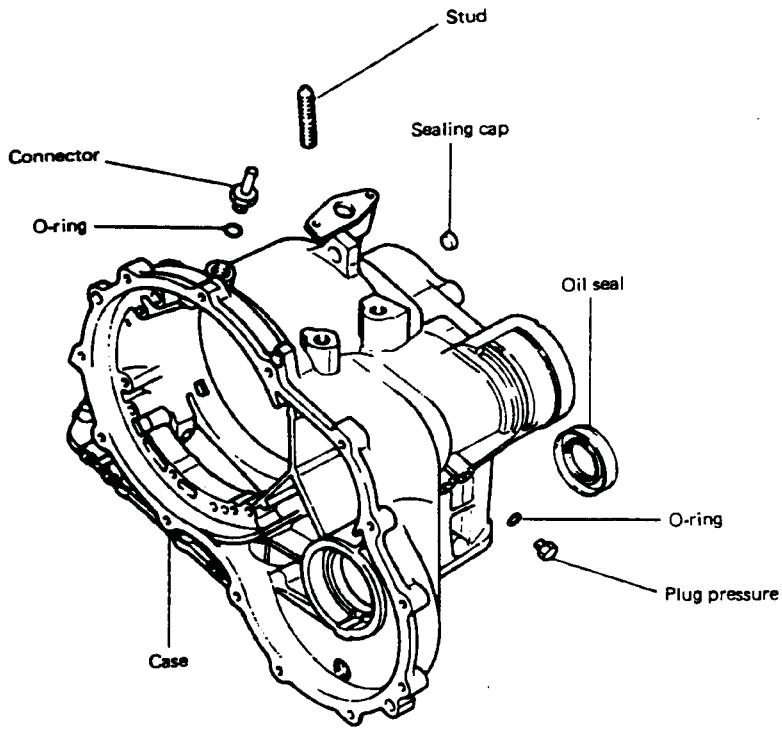
1. Install a new O-ring to the shaft part of the gear, and coat a small amount of ATF onto the O-ring.
2. Insert the gear into the sleeve, and align the pin hole and the groove of the gear's shaft.
3. Tap a new spring pin into the sleeve. When tapping it in, be sure that the slit is not at the gear side.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



160038

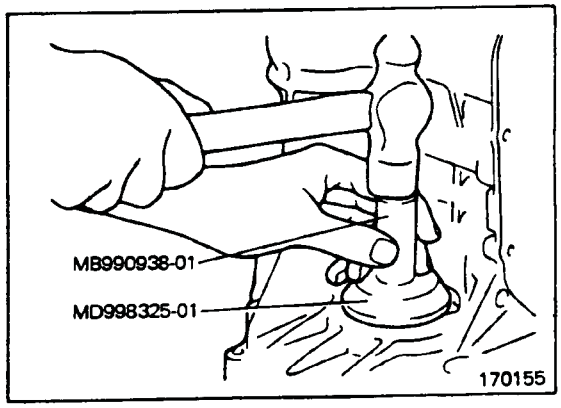
COMPONENT SERVICE-CASE ASSEMBLY (AUTOMATIC TRANSAXLE)

COMPONENTS

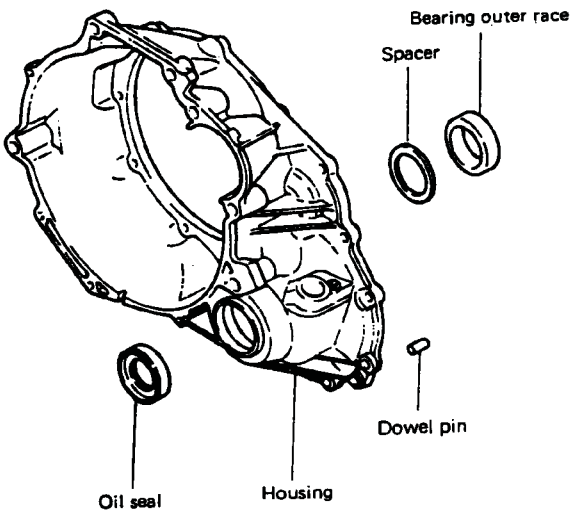


REASSEMBLY

Using Special Tool MD998325-01 and MB990938-01, drive two drive shaft oil seals into transaxle case.



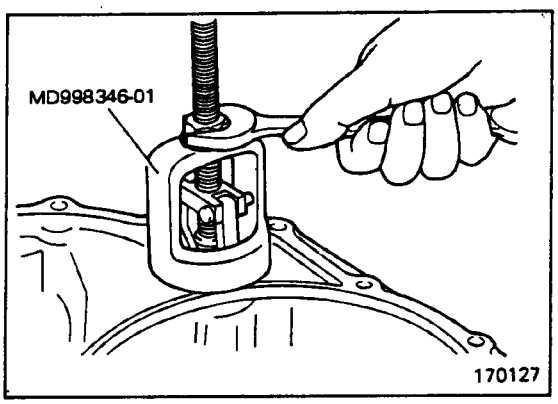
COMPONENTS



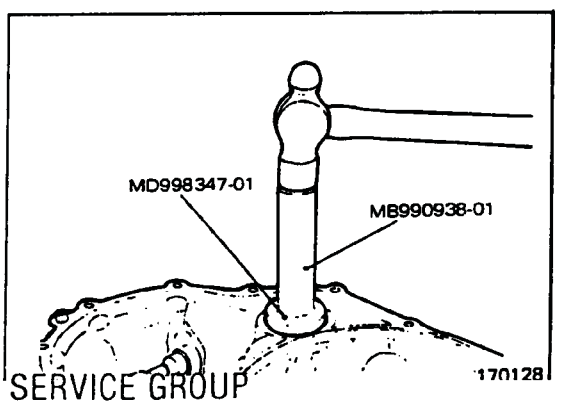
170183

REPLACEMENT OF OUTER TAPER ROLLER BEARING

When replacing taper roller bearing outer race (press fitted in converter housing), use Special Tools MD998346-01, MD998347-01 and MB990938-01.



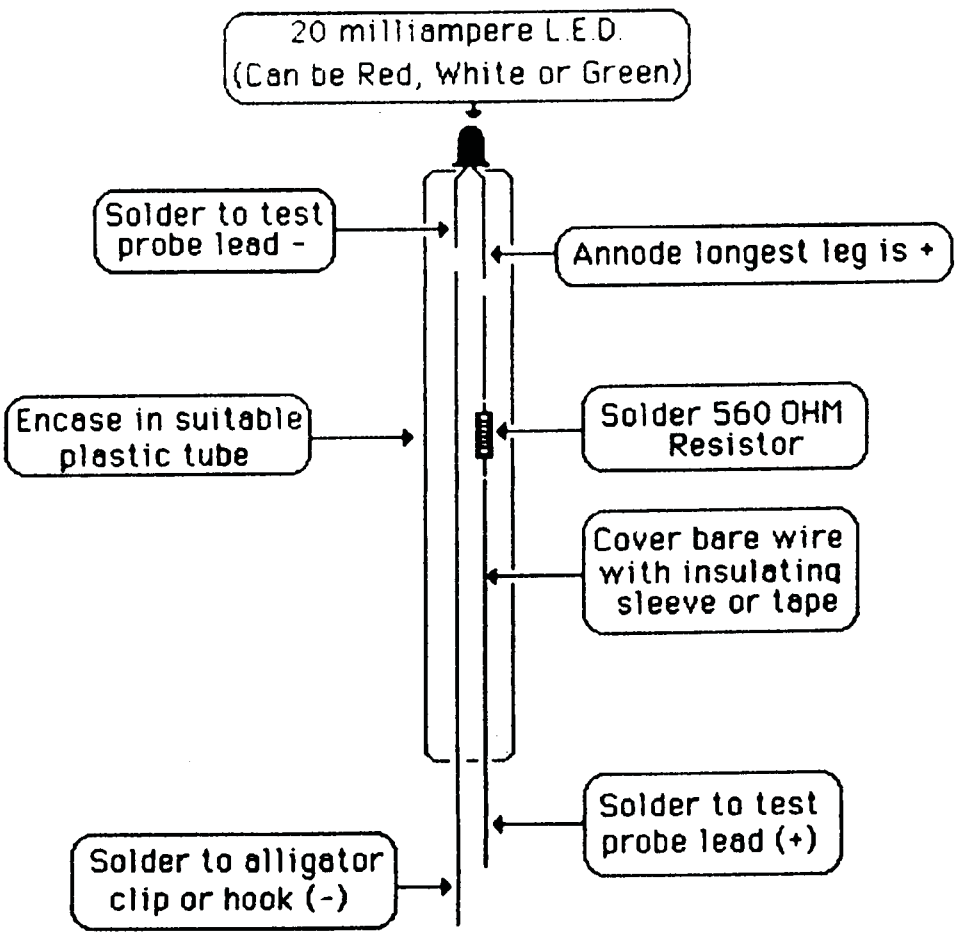
170127



170128

MAKE YOUR OWN AUTOMOTIVE ELECTRONICS 12 VOLT

L.E.D. TESTER



TEST PROBE LEADS MAY BE
ANY LENGTH DESIRED