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## **INTRODUCTION MAZDA N4A-EL**

The N4A-EL is a four speed overdrive transmission with shifts and shift timing being controlled by the on board EC-AT control unit. The torque converter is equipped with a lock-up mechanism and is also controlled by the EC-AT control unit. This converter has a stall ratio of 1.900:1.

The line pressure used for shift feel is determined by engine vacuum to the modulator, pressure regulator valve, and spring in the transmission. This transmission consists of three planetary gear sets, four clutch packs, two bands and two sprags. It holds 7.7 US quarts of Dextron II or M-III automatic transmission fluid and is currently found in the Mazda 929 and early MPV'S.

**We thank MAZDA  
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.**

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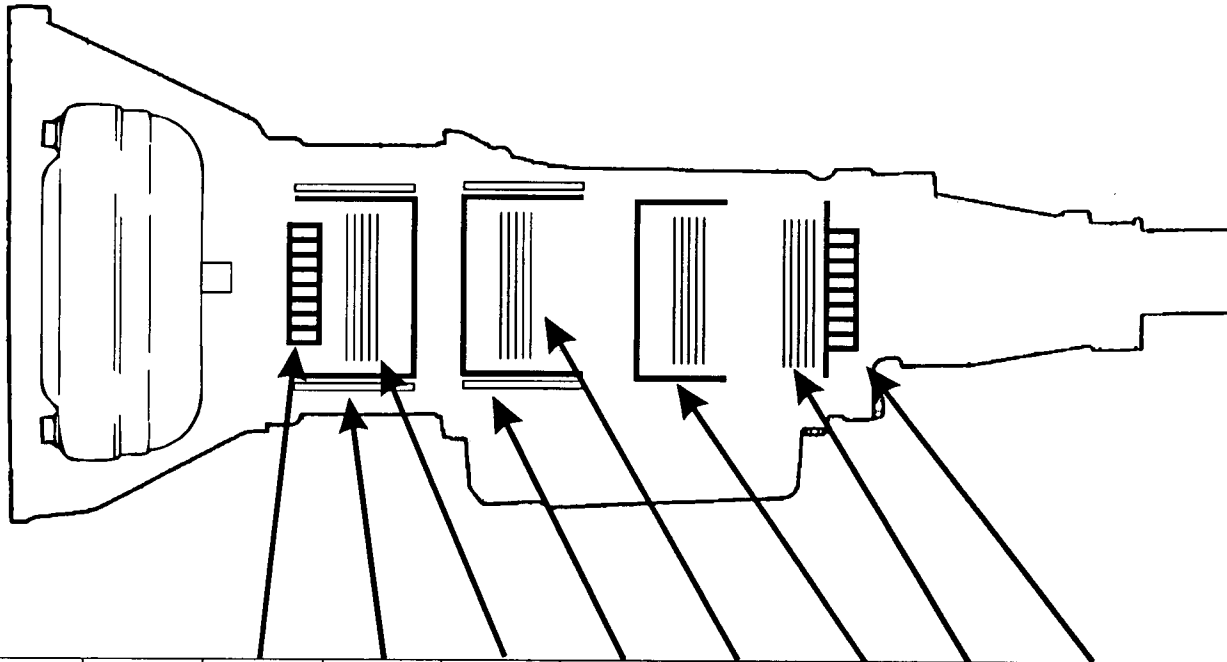
**ED KRUSE**  
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## Technical Service Information

### N4A-EL CLUTCH AND BAND APPLICATION CHART



SELECTOR POSITION	GEAR	O.D. SPRAG	O.D. BAND	DIRECT CLUTCHES	INTER. BAND	HIGH CLUTCHES	FORWARD CLUTCHES	LOW/REV CLUTCHES	LOW SPRAG	GEAR RATIO
R	REVERSE	ON		ON		ON		ON		2.40:1
D	FIRST	ON		ON			ON		ON	2.84:1
	SECOND	ON		ON	ON		ON			1.54:1
	THIRD	ON		ON		ON	ON			1:1
	O.D.		ON			ON	ON			.72:1
S	FIRST	ON		ON			ON		ON	2.84:1
	SECOND	ON		ON	ON		ON			1.54:1
	THIRD	ON		ON		ON	ON			1:1
L	FIRST	ON		ON			ON	ON		2.84:1
	SECOND	ON		ON	ON		ON			1.54:1



## Technical Service Information

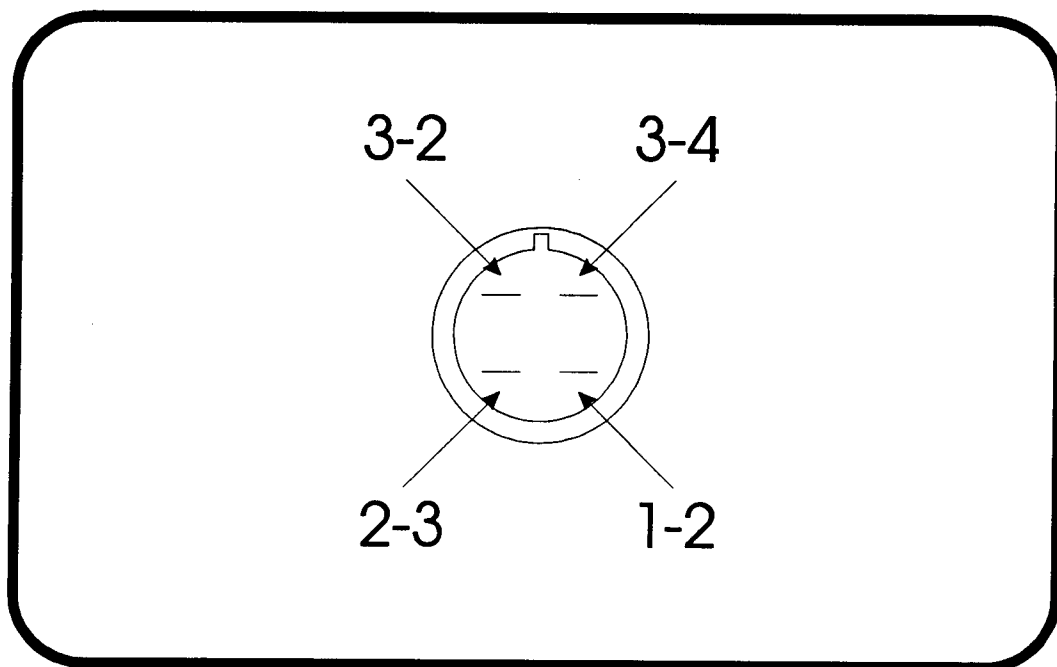
### SOLENOID VALVE APPLICATION CHART

SELECTOR POSITION	GEAR	SOLENOID VALVES			
		1-2	2-3	3-4	LOCK-UP
<b>R</b>	REVERSE			ON	
<b>D</b>	FIRST	ON	ON	ON	
	SECOND		ON	ON	
	THIRD			ON	ON*
	O.D.				ON*

\* LOCK-UP CONTROL VALVE COMES ON IN THIRD AND O.D. RANGES WITH RESPECT TO THROTTLE POSITION, VEHICLE SPEED AND TEMPERATURE.

THE 3-2 CONTROL SOLENOID IS "ENERGIZED" MOMENTARILY ON A 3-2 DOWNSHIFT

THESE SHIFT SOLENOIDS CAN BE OPERATED WITH A 12 VOLT JUMPER WIRE. ILLUSTRATED BELOW IS THE SOLENOID WIRE HARNESS CONNECTOR WITH EACH TERMINAL IDENTIFICATION FOR TEST PURPOSES.



## OIL PRESSURE TEST

This step checks line pressures for checking the hydraulic components and for oil leakage.

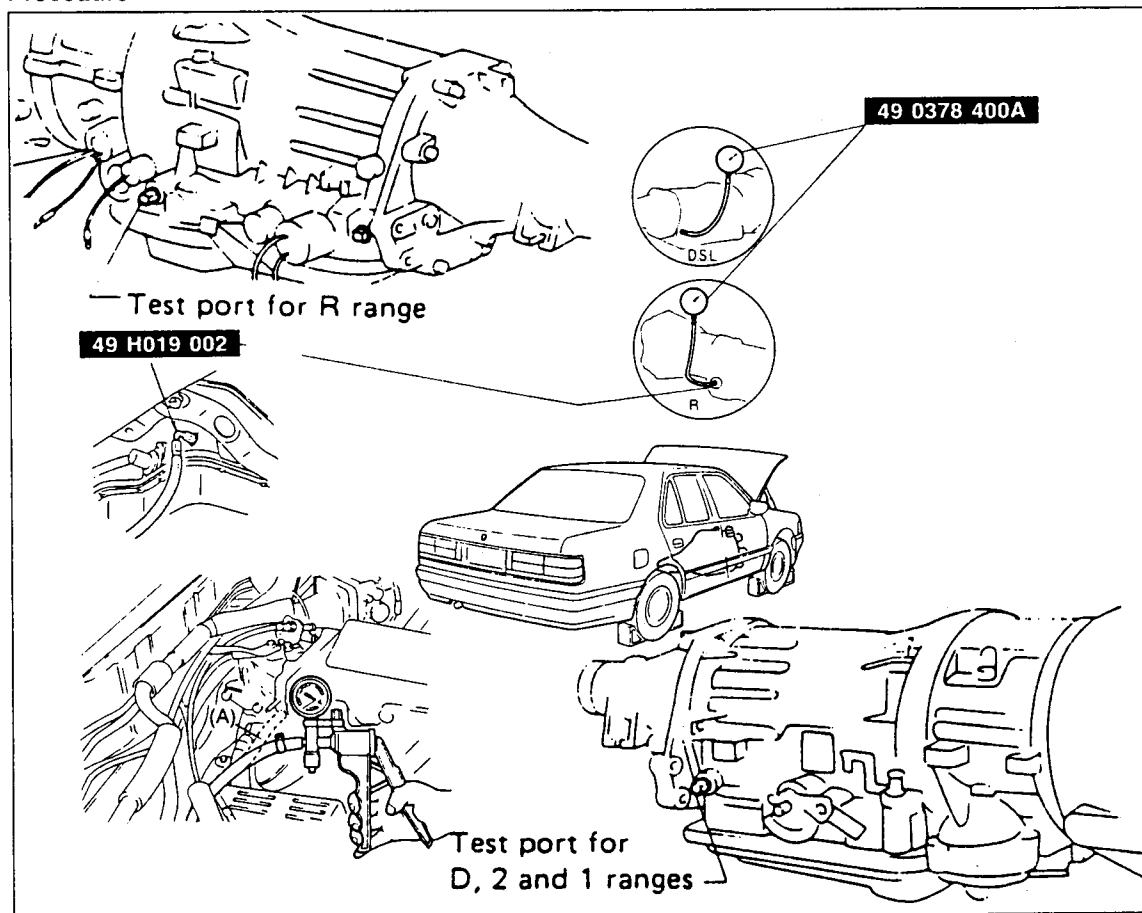
### Preparation

1. Perform the preparation procedure shown in STEP 4 (STALL TEST).
2. Connect a tachometer to the engine.
3. Connect the **SST** to the line pressure inspection holes.

**Note** **SST = SPECIAL SERVICE TOOL**

- a) Left side hole is for R range.
- b) Right side hole is for D, S, L ranges.
- c) R range test should be performed before D,S,L range tests.

### Procedure



1. Start the engine and check that the idle speed is  $650 \pm 20$  rpm.
2. Shift the selector lever to R range and read the oil pressure at idle.
3. Depress the brake pedal firmly with the left foot and gradually depress the accelerator pedal with the right foot.
4. Read the oil pressure as soon as the engine speed becomes constant, then release the accelerator pedal.
5. Shift the selector lever to N range and run the engine at idle for at least one minute.
6. Read the line pressure at idle and engine stall speeds for each range in the same manner.



## Technical Service Information

### Specified line pressure:

Range		Pressure kPa (kg/cm <sup>2</sup> , psi)	
		Idle	Stall
D range	Economy mode	290—390 (3—4, 43—57)	880—1080 (9—11, 128—156)
S range	Economy mode	290—390 (3—4, 43—57)	880—1080 (9—11, 128—156)
	Hold mode	290—390 (3—4, 43—57)	880—1080 (9—11, 128—156)
L range		290—390 (3—4, 43—57)	880—1080 (9—11, 128—156)
R range		540—640 (5.5—6.5, 78—92)	1470—1670 (15—17, 213—242)

7. Cool the transmission and reconnect the **SST** to the right side inspection hole.
8. Disconnect the vacuum hose (A) from the surge tank and connect a vacuum pump to the hose.
9. Shift the selector lever to R range.
10. Read the line pressure at idle as described below.

**SST = SPECIAL SERVICE TOOL**

### Specified line pressure:

Vacuum	Line pressure kPa (kg/cm <sup>2</sup> , psi)
Atmospheric pressure	880—1080 (9—11, 128—156)
200 mmHg (7.87 inHg)	690—780 (7—8, 100—114)
400 mmHg (15.7 inHg)	390—490 (4—5, 57—71)

### Evaluation of Stall Line Pressure

Condition		Possible Cause
Below specification	In all ranges	Worn oil pump Fluid leakage from the oil pump, control valve body, and/or transmission case Stuck pressure regulator valve Fluid leakage from the direct clutch and/or OD band servo release side hydraulic circuit
	In D (Econ.), S (Econ.), and L ranges	Fluid leakage from the rear clutch hydraulic circuit Stuck pressure modifier valve
	In S (Econ. & Hold) and L ranges	Fluid leakage from the throttle backup valve hydraulic circuit
	In L and R ranges	Fluid leakage from the low-and-reverse hydraulic circuit
	In R range only	Fluid leakage from the front clutch and/or 2nd band servo release side hydraulic circuit
	In S range (Hold)	Stuck throttle backup valve Stuck backup control valve Backup control function (electronic) not operating properly
Excessive line pressure		Stuck pressure modifier valve Stuck backup control valve

### Evaluation of Idle Line Pressure

Condition		Possible Cause
Below specification		Same as Stall Line Pressure
Excessive pressure	In all ranges	Leaking or disconnected vacuum hose Leaking vacuum diaphragm Over length diaphragm rod Stuck vacuum throttle valve Stuck pressure regulator valve
	In S range (Hold)	Stuck pressure modifier valve
	No variation	Missing diaphragm rod
Incorrect line pressure with specified vacuum at vacuum diaphragm	Incorrect variation (Above or below specification)	Incorrect diaphragm rod length Stuck vacuum throttle valve Stuck pressure regulator valve Stuck pressure regulator plug

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## Technical Service Information

### Shift Pattern Determination

The EC-AT has the nine shift patterns described below. The EC-AT control unit selects the proper pattern based on the range and mode conditions.

The range is determined according to signals received from the switches (D, S, L, N & P) within the inhibitor switch.

The mode is determined according to the signals from the economy switch within the mode switch, and those from the hold switch.

	R range	P&N range	L range	S range	D range
Power mode	Reverse (3rd)	Neutral (3rd or 1st)	1 = 2 ( = 3)	1 = 2 = 3 (L/U)	1 = 2 = 3 = OD (L/U) (L/U)
Economy mode					1 = 2 = 3 = O (L/U) (L/U)
Hold mode			1 ( - 2 - 3)	2 ( - 3)	2 = 3 (=OD) (L/U)

#### 1. D range

Three shift patterns are provided.

(1) Power and Economy modes

1st, 2nd, 3rd, 3rd (lockup), OD, and OD (lockup) shifts are provided. Shift points in power mode are at higher speeds than those of economy mode.

(2) Hold mode

The 2nd and 3rd shifts are provided. 2nd gear is selected at only 20 km/h (12 mph) or below to assure acceleration. After that, 3rd gear is held. However, to prevent over speeding the engine during OD → 3 downshift, OD is held until OD → 3 downshift speed (162 km/h [100 mph]) is achieved.

#### 2. S range

Two shift programs are provided.

(1) Power and Economy mode

1st, 2nd, 3rd, and 3rd (lockup) shifts are provided. The shift points for both modes are the same and these shift points are the same as those of D range power mode.

(2) Hold mode

2nd gear is provided and held. To prevent over speeding the engine during 3 → 2 downshift, 3rd gear is held until 3 → 2 downshift speed (103 km/h [64 mph]) is achieved.

#### 3. L range

Two shift programs are provided.

(1) Power and Economy mode

1st and 2nd gears are provided. The shift points for both modes are the same and these shift points are the same as those of D range power mode. To prevent over speeding the engine during 3 → 2 downshift, 3rd gear is held until 3 → 2 downshift speed (103 km/h [64 mph]) is achieved.

(2) Hold mode

1st gear is provided and held. To prevent over speeding the engine during 3 → 2 → 1 downshift, 3rd or 2nd gears are held until 3 → 2 or 2 → 1 downshift speed (103 km/h [64 mph] or 48 km/h [30 mph]) is achieved.

#### 4. P & N range

The transmission is in neutral position hydraulically, however, the shift solenoid valves are in the pattern for 3rd or 1st gear according to vehicle speed.

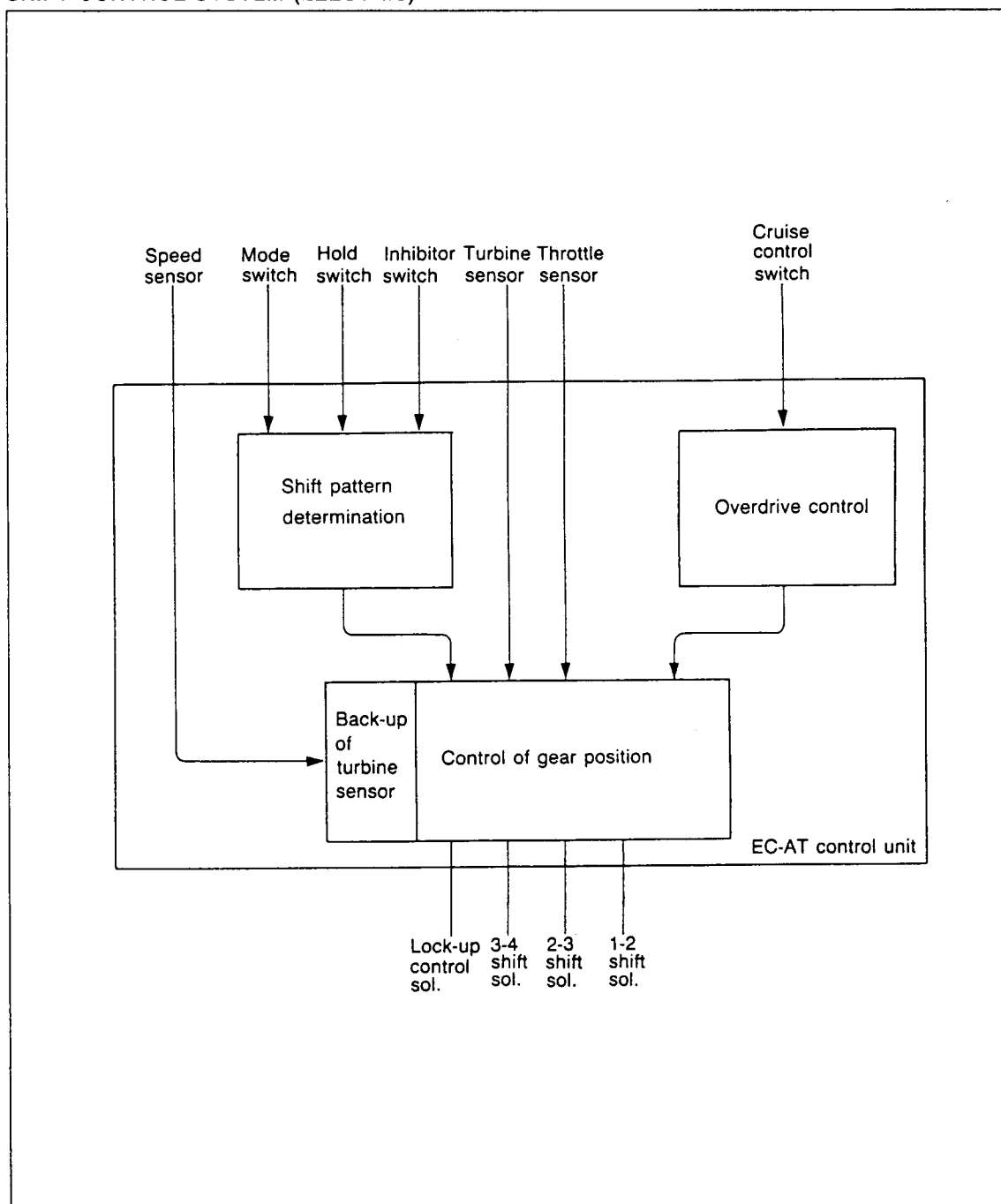
This is to prepare for shifting to D range.

Solenoid pattern	Vehicle speed
3rd pattern	Above 15—17 km/h (9—11 mph)
1st pattern	Below 15—17 km/h (9—11 mph)



## Technical Service Information

### SHIFT CONTROL SYSTEM (ELECTRIC)



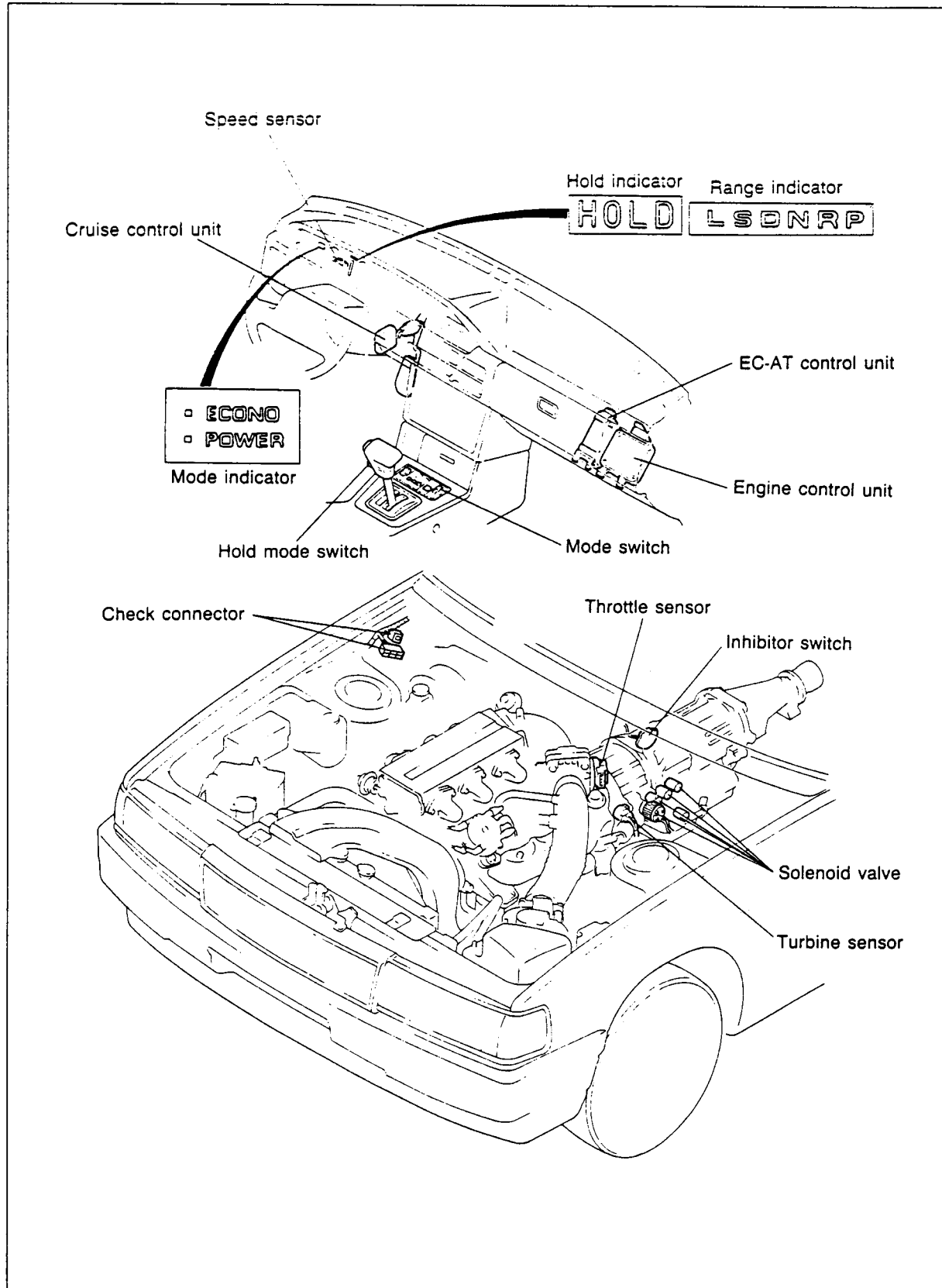
99U07B-005

This system is composed of three sensors, seven switches, the EC-AT control unit, and four solenoid valves. The EC-AT control unit selects one of nine shift patterns according to the status of the inhibitor switch, mode switch, and hold switch, then determines a gear position according to signals from the throttle sensor and turbine sensor.

In addition, overdrive is inhibited according to the driving conditions as detected by the signal from the cruise control switch (in the cruise control unit).



## COMPONENT LOCATION





## Technical Service Information

### **WARNING CODE RETRIEVAL:**

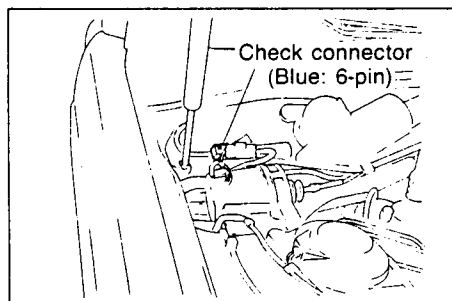
It is necessary to use a hand held scanner such as a Monitor 4000-E, Snap-on, or EC-AT Tester set in order to retrieve the warning codes memorized in the EC-AT control unit. There are a total of 8 possible warning codes that the EC-AT control unit could memorize. They are:

- 06 - THE SPEED SENSOR OR CIRCUIT
- 12 - THE THROTTLE POSITION SENSOR OR CIRCUIT
- 55 - THE TURBINE SENSOR OR CIRCUIT
- 60 - 1-2 SHIFT SOLENOID, VALVE OR CIRCUIT
- 61 - 2-3 SHIFT SOLENOID, VALVE OR CIRCUIT
- 62 - 3-4 SHIFT SOLENOID, VALVE OR CIRCUIT
- 63 - LOCKUP CONTROL VALVE OR CIRCUIT
- 64 - 3-2 SHIFT SOLENOID, VALVE OR CIRCUIT

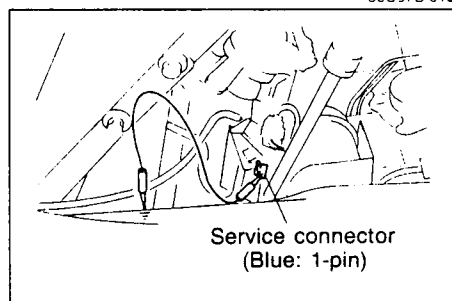
You will need to use the manufactures instructional guide book to hook up the scanner you are using to the vehicle. These testers use the 6 pin blue check connector and the 1 pin blue service connector illustrated below.

### **MAZDA Connector Location**

**All Models** ..... Engine compartment near wiper motor



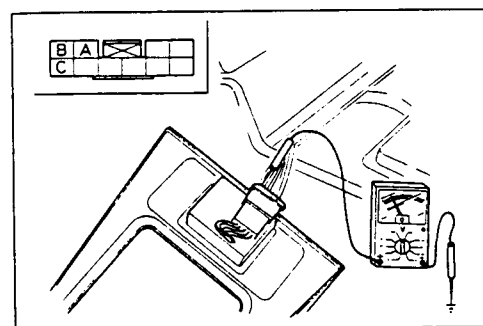
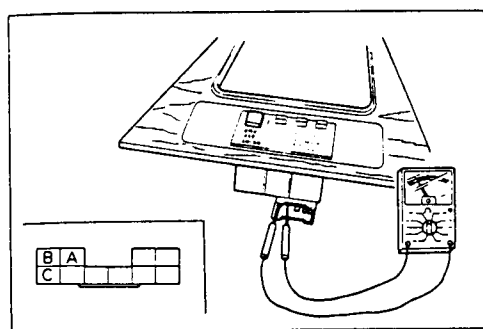
86U07B-019



**Blue 6-Pin Capacity  
Connector for  
Transmission Codes**



**Blue 1-Pin Capacity  
Connector for  
Transmission Codes**



## ELECTRONIC SYSTEM COMPONENTS

### MODE SWITCH

#### Inspection of Continuity

1. Remove the upper plate.
2. Disconnect the mode switch connector.
3. Check continuity of the terminals.

Mode	Connector terminal		
	A	B	C
Power	○	○	○
Economy	○	○	

○—○: Indicates continuity

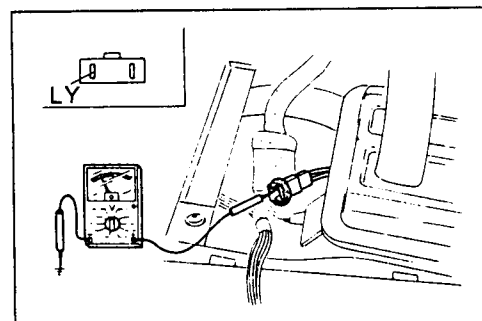
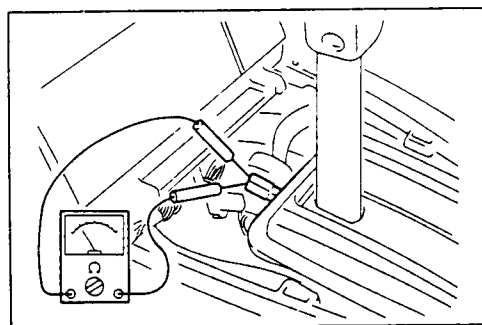
4. If not correct, replace the mode switch.
5. If correct, check terminal voltage

#### Inspection of Terminal Voltage

1. Check that continuity of switch is O.K.
2. Reconnect the mode switch connector.
3. Turn the ignition switch ON.
4. Check the voltage between each terminal and ground.

Terminal	Voltage		
	Power mode	Economy mode	Hold mode
A	Below 1.5V	Below 1.5V	Approx. 12V
B	Approx. 12V	Below 1.5V	Approx. 12V
C	Below 1.5V	Approx. 12V	Approx. 12V

5. If not correct in the power or economy mode, check wiring harness.
6. If not correct at the hold mode, check the 1A terminal (mode indicator) of the EC-AT control unit and the hold switch.



### HOLD SWITCH

#### Inspection of Continuity

1. Remove the upper plate
2. Disconnect the hold switch connector.
3. Check for continuity between the terminals while depressing the switch.

Continuity	Switch
YES	Released
NO	Depressed

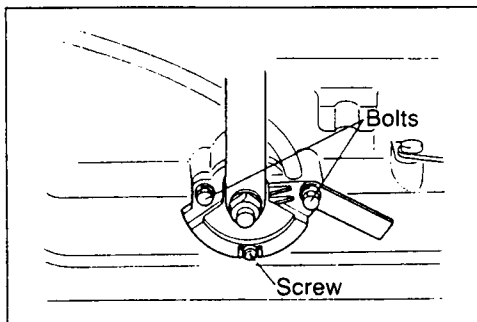
4. If not correct, replace the hold switch.
5. If correct, check terminal voltage.

#### Inspection of Terminal Voltage

1. Check that continuity of the switch is O.K.
2. Reconnect the hold switch connector.
3. Turn the ignition switch ON.
4. Check the voltage between the terminal (LY) and ground while depressing the switch.

Terminal voltage	Switch
Approx. 12V	Depressed
Below 1.5V	Released

5. If not correct, check wiring harness.



## INHIBITOR SWITCH

### Adjustment

1. Shift the manual shaft to the "N" position.
2. Loosen the inhibitor switch mounting bolts.
3. Remove the screw and move the inhibitor switch so that the small hole is aligned with the screw hole.
4. Set the alignment by inserting a **2.0 mm (0.079 in)** diameter pin through the holes.

5. Tighten the switch mounting bolts to specification.

### Tightening torque:

**4.9—6.9 N·m (50—70 cm·kg, 43—61 in·lb)**

6. Remove the pin, and install and tighten the screw to specification.

### Tightening torque:

**0.4—0.7 N·m (4—7 cm·kg, 3.5—6.0 in·lb)**

7. Recheck the continuity of the individual terminals.

### Inspection of continuity

1. Disconnect the inhibitor switch connector.
2. Check continuity of the terminals.

Position	Connector terminal								
	A	B	C	D	E	F	G	H	I
P	○	○	○	○	○	○	○	○	○
R			○	○	○	○	○	○	○
N	○	○	○	○	○	○	○	○	○
D			○	○	○	○	○	○	○
S			○	○	○	○	○	○	○
L			○	○	○	○	○	○	○

○—○: Indicates continuity

3. If not correct, replace the switch.

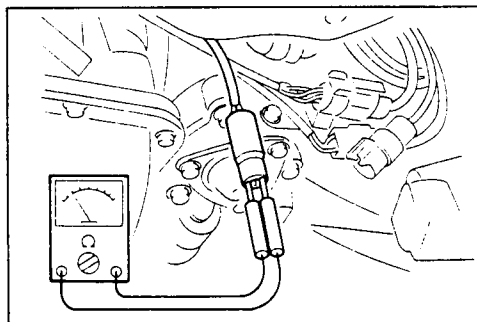
## TURBINE SENSOR

### Inspection of Resistance

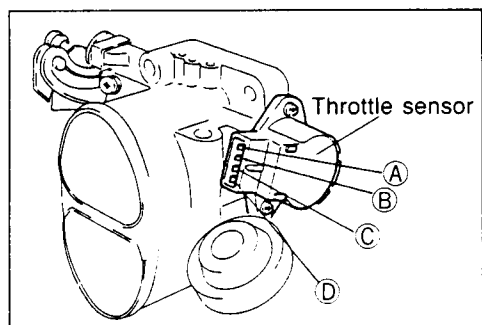
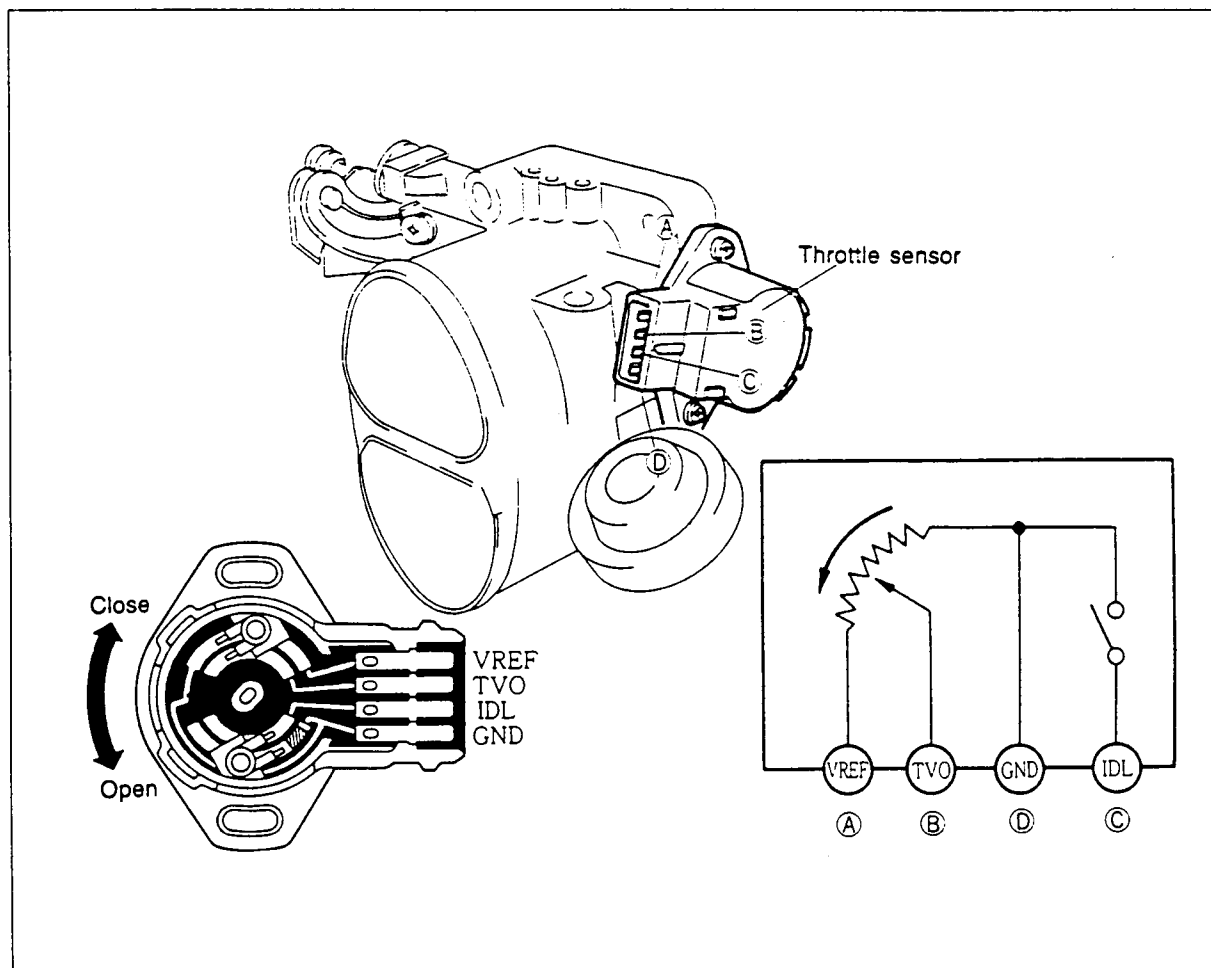
1. Disconnect the turbine sensor connector.
2. Check resistance at the terminals.

**Resistance: Approx. 245 Ω**

3. If not correct, check voltage generation of the sensor.



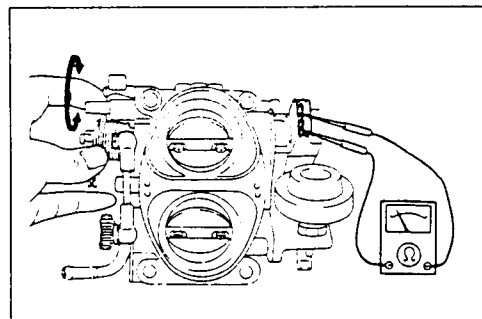
## THROTTLE SENSOR



### Inspection Variable resistor

1. Disconnect the throttle sensor connector from the throttle sensor, and connect an ohmmeter between (A) and (D) terminals.
2. Check the resistance.

**Resistance: 3.5—6.5 k $\Omega$**

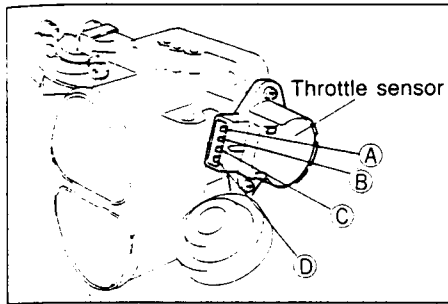


3. Connect an ohmmeter between (B) and (D) terminals.
4. Gradually open the throttle valve, check the resistance.

### Resistance:

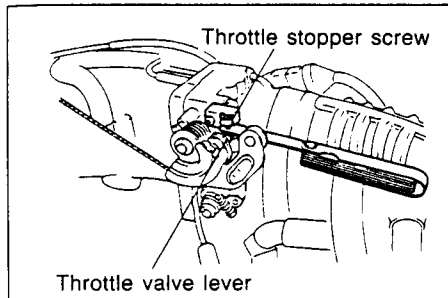
**Below approx. 1 k $\Omega$ .... Throttle valve fully closed**  
**Approx. 3.5—6.5 k $\Omega$ ..... Throttle valve fully open**

5. If not within specification, check the throttle sensor adjustment.



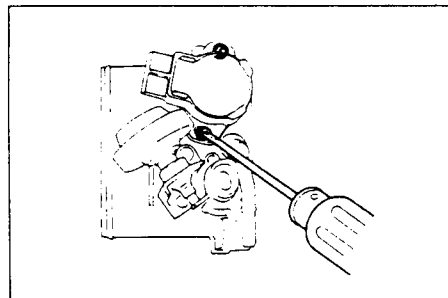
## Idle switch

1. Disconnect the throttle sensor connector from the throttle sensor.
2. Connect an ohmmeter between (C) and (D) terminals.

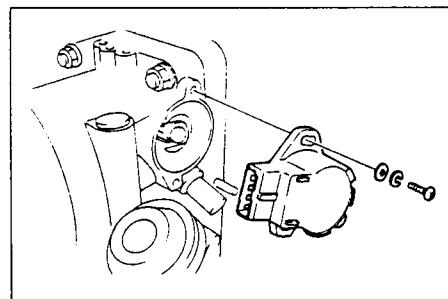


3. Check for continuity between (C) and (D) with a feeler gauge inserted between the throttle stopper screw and throttle valve lever.

Thickness gauge	Continuity between terminals ((C) ↔ (D))
0.5 mm (0.02 in)	Yes
0.7 mm (0.028 in)	No

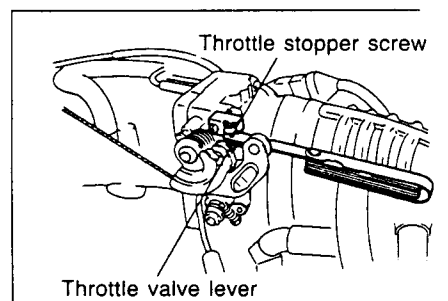


4. If not within specification, loosen the screws and rotate the throttle sensor to adjust.
5. Tighten the screws and seal them with white paint.
6. After checking and adjusting the sensor, connect the throttle sensor connector.

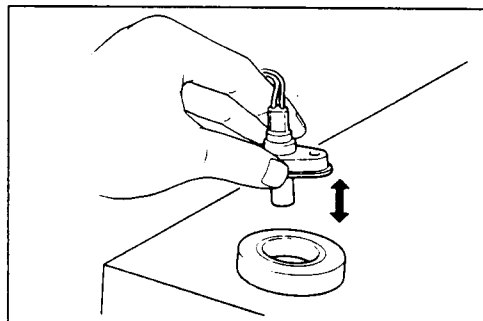


## Replacement

1. Disconnect the throttle sensor connector.
2. Remove the screws.
3. Remove the throttle sensor.

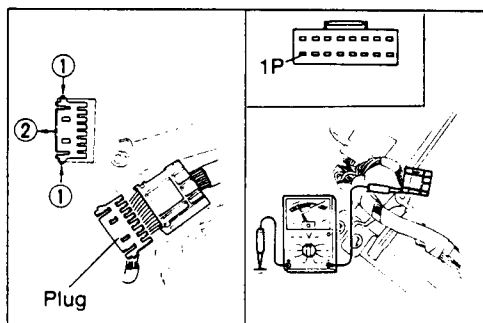


4. Install the throttle sensor.
5. Adjust the idle switch.
6. Tighten the screws and seal them with white paint.



## Inspection of Voltage Generation

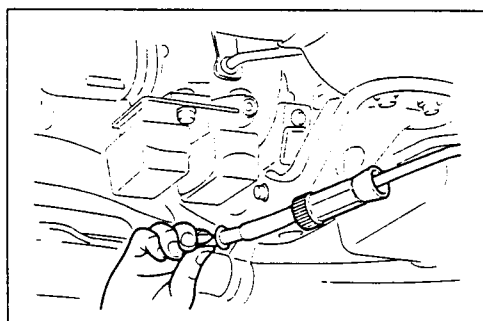
1. Remove the turbine sensor.
2. Connect a voltmeter (0.1 volt range) to the terminals.
3. Wave the the tip of turbine sensor approx. 5 mm (0.197 in) away from a magnet and check that the sensor generates voltage.
4. If not correct, replace the turbine sensor.



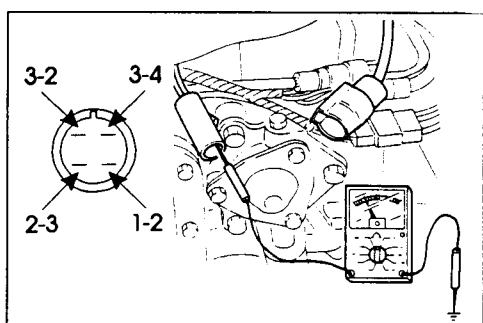
## SPEED SENSOR

### Inspection of voltage

1. Disconnect the 16-pin connector from the EC-AT control unit.
2. Remove the plug from the connector.
3. Connect a voltmeter between the 1P terminal and ground as shown.
4. Turn the ignition switch ON.



5. Remove the speedometer cable from the transmission.
6. Slowly turn the speedometer cable one turn.
7. Check that approx. 7V is shown 4 times.
8. If not correct, check the speedometer.



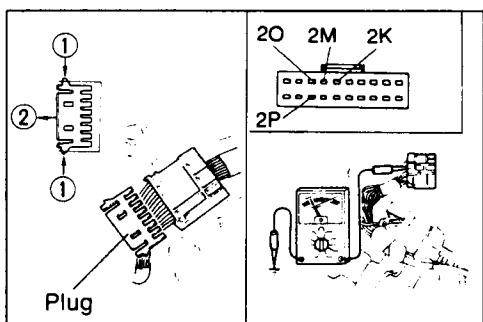
## SOLENOID VALVE (1-2 shift, 2-3 shift, 3-4 shift, 3-2 control)

### Inspection of Resistance

1. Disconnect the solenoid valve connector.
2. Check resistance between each terminal and ground.

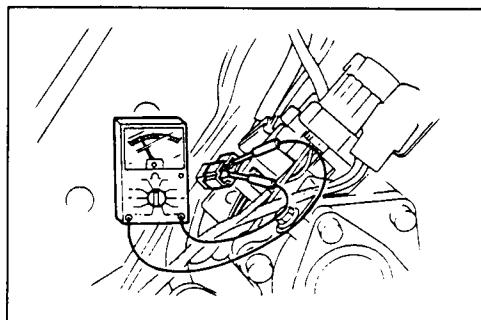
**Resistance: 13—27  $\Omega$**

3. If not correct, check the wiring harness for an open or short-circuit. Replace the solenoid valve, if necessary.



### Inspection of Continuity

1. Disconnect the 20-pin connector from the EC-AT control unit.
2. Remove the plug from the connector.
3. Check continuity between terminals 2K, 2M, 2O and 2P and ground.
4. If not correct, check the wiring harness for an open-circuit.



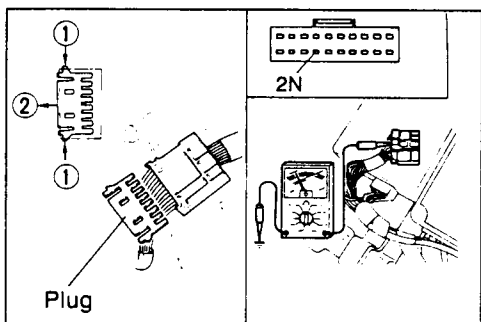
## SOLENOID VALVE (Lockup control)

### Inspection of Resistance

1. Disconnect the solenoid valve connector.
2. Check resistance between the terminals.

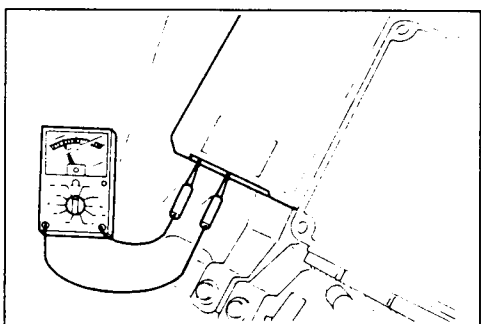
**Resistance: 13—25  $\Omega$**

3. If not correct, replace the solenoid valve.



### Inspection of Continuity

1. Disconnect the 20-pin connector from the EC-AT control unit.
2. Remove the plug from the connector.
3. Check continuity between the terminal 2N and ground.
4. If not correct, check the wiring harness for an open-circuit.



## EC-AT CONTROL UNIT

### Inspection of Solenoid Transistor

1. Disconnect the connectors from the EC-AT control unit.
2. Check continuity between terminals 2K, 2M, 2N, 2O, 2P, and 2S.
3. If there is no continuity at any one terminal, replace the EC-AT control unit.

Terminal	Connected to	Voltage	Condition
1A (Output)	Mode indicator	Approx. 12V	Hold mode
		Below 1.5V	Power or economy mode
1B (Output)	Hold indicator	Below 1.5V	Hold mode
		Approx. 12V	Other modes
1C (Output)	EC-AT Tester (malfunction code)	Approx. 12V	Normal
		Below 1.5V or Approx. 12V (fluctuating)	If malfunction present
		Code signal	Self-diagnosis check connector grounded
1E (Input)	EC-AT check connector	Approx. 12V	—
1H (Input)	Hold switch	Approx. 12V	Switch depressed
		Below 1.5V	Switch released
1I (Input)	Mode switch (Economy side)	Below 1.5V	Economy switch depressed (Economy mode)
		Approx. 12V	Power switch depressed or hold mode
1J (Ground)	Engine ground	Below 1.5V	—
1M (Input)	Cruise control unit	Below 1.5V	SET or RESUME switch ON, or vehicle speed 3 km/h (2 mph) lower than preset speed (Driving vehicle; cruise control ON)
		Approx. 12V	Other (normal) conditions





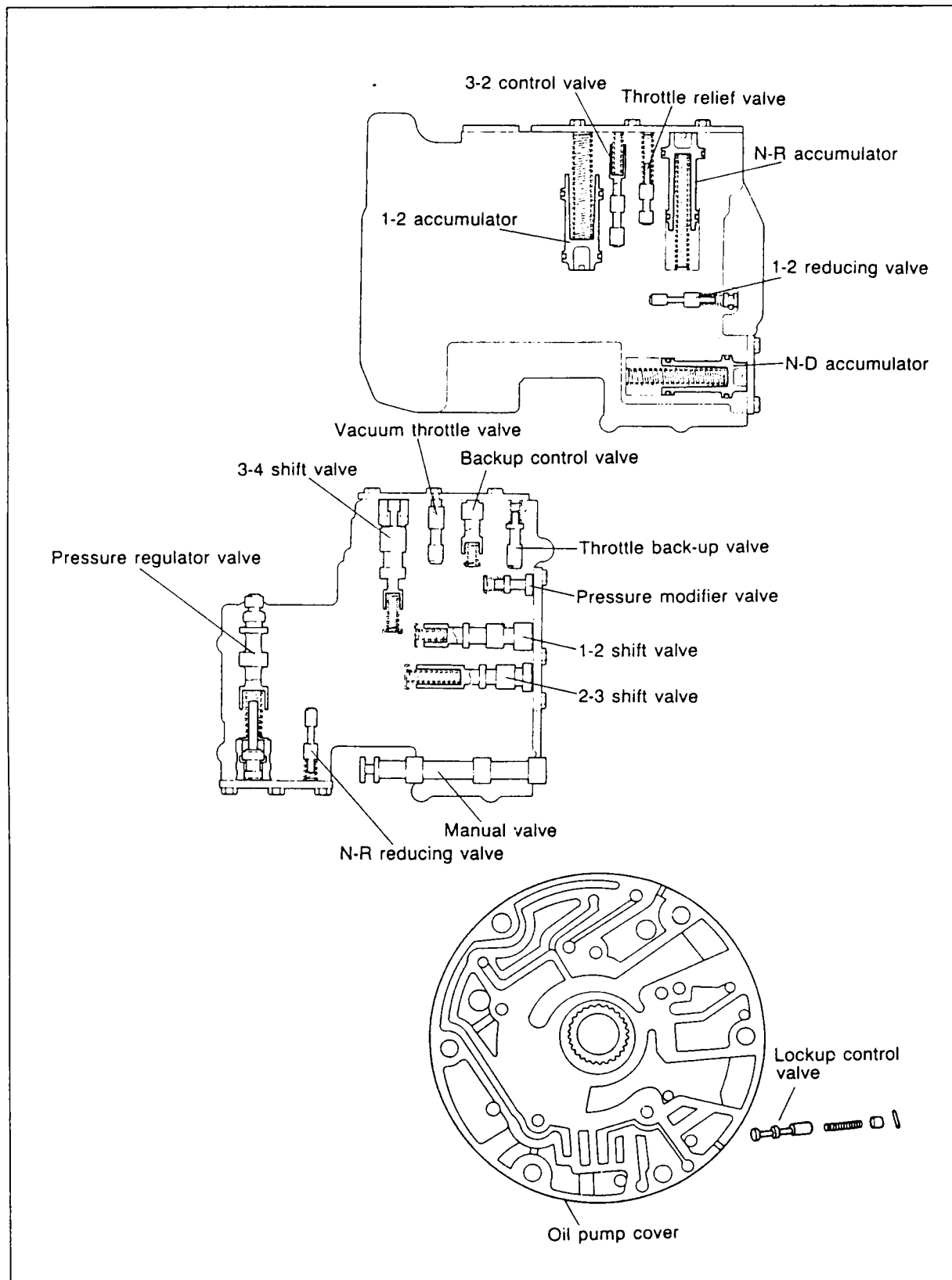
## Technical Service Information

Terminal	Connected to	Voltage	Condition
1N (Input)	EGI control unit (IU terminal)	Below 1.5V	Coolant temperature below 55°C (131°F)
		Approx. 12V	Coolant temperature above 55°C (131°F)
1O (Input)	Idle switch (in throttle sensor)	Below 1.5V	Throttle valve closed fully
		Approx. 12V	Throttle valve opened
1P (Input)	Speed sensor	Approx. 4V	While driving
		Approx. 7—9V or Below 1.5V	Vehicle stopped
2A (Input)	Inhibitor switch (D range)	Approx. 12V	D range
		Below 1.5V	Other ranges
2B (Input)	Inhibitor switch (N and P range)	Below 1.5V	N or P range
		Approx. 12V	Other ranges
2C (Input)	Inhibitor switch (L range)	Approx. 12V	L range
		Below 1.5V	Other ranges
2D (Input)	Inhibitor switch (S range)	Approx. 12V	S range
		Below 1.5V	Other ranges
2E (Input)	Turbine sensor	0.05—0.1	Engine running
		Approx. 0.05V	Engine stopped
2F (Ground)	Turbine sensor	Below 1.5V	—
2G (Input)	Throttle sensor	0.4—4.4V	Ignition switch ON
2I (Input)	Throttle sensor	4.5—5.5V	Ignition switch ON
2K (Output)	3-2 control solenoid valve	Approx. 12V	3-2 or 4-2 downshift
		Below 1.5V	Other conditions
2L (Memory power)	Battery	Approx. 12V	—
2M (Output)	2-3 shift solenoid valve	Approx. 12V	1st or 2nd gear position
		Below 1.5V	3rd or OD gear position
2N (Output)	Lockup control solenoid valve	Approx. 12V	Lockup
		Below 1.5V	Other
2O (Output)	1-2 shift solenoid valve	Approx. 12V	1st gear position
		Below 1.5V	2nd, 3rd, and OD gear position
2P (Output)	3-4 shift solenoid valve	Approx. 12V	1st, 2nd, and 3rd gear position
		Below 1.5V	OD position
2Q (Battery power)	Battery	Approx. 12V	—
2R (Ground)	Engine ground	Below 1.5V	—
2S (Battery power)	Battery	Approx. 12V	—
2T (Output)	EC-AT indicator	Below 1.5V	—

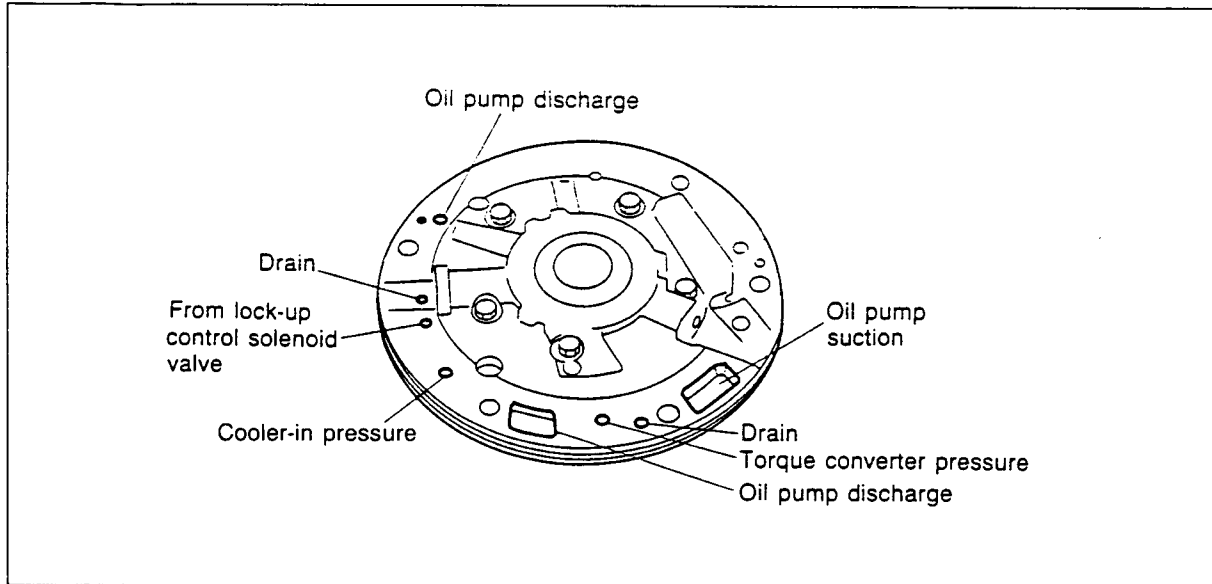
**Terminal Voltage Chart**  
**Terminal**

2S	2Q	2O	2M	2K	2I	2G	2E	2C	2A	O	M	K	I	G	E	C	A
2T	2R	2P	2N	2L	2J	2H	2F	2D	2B	P	N	L	J	H	F	D	B

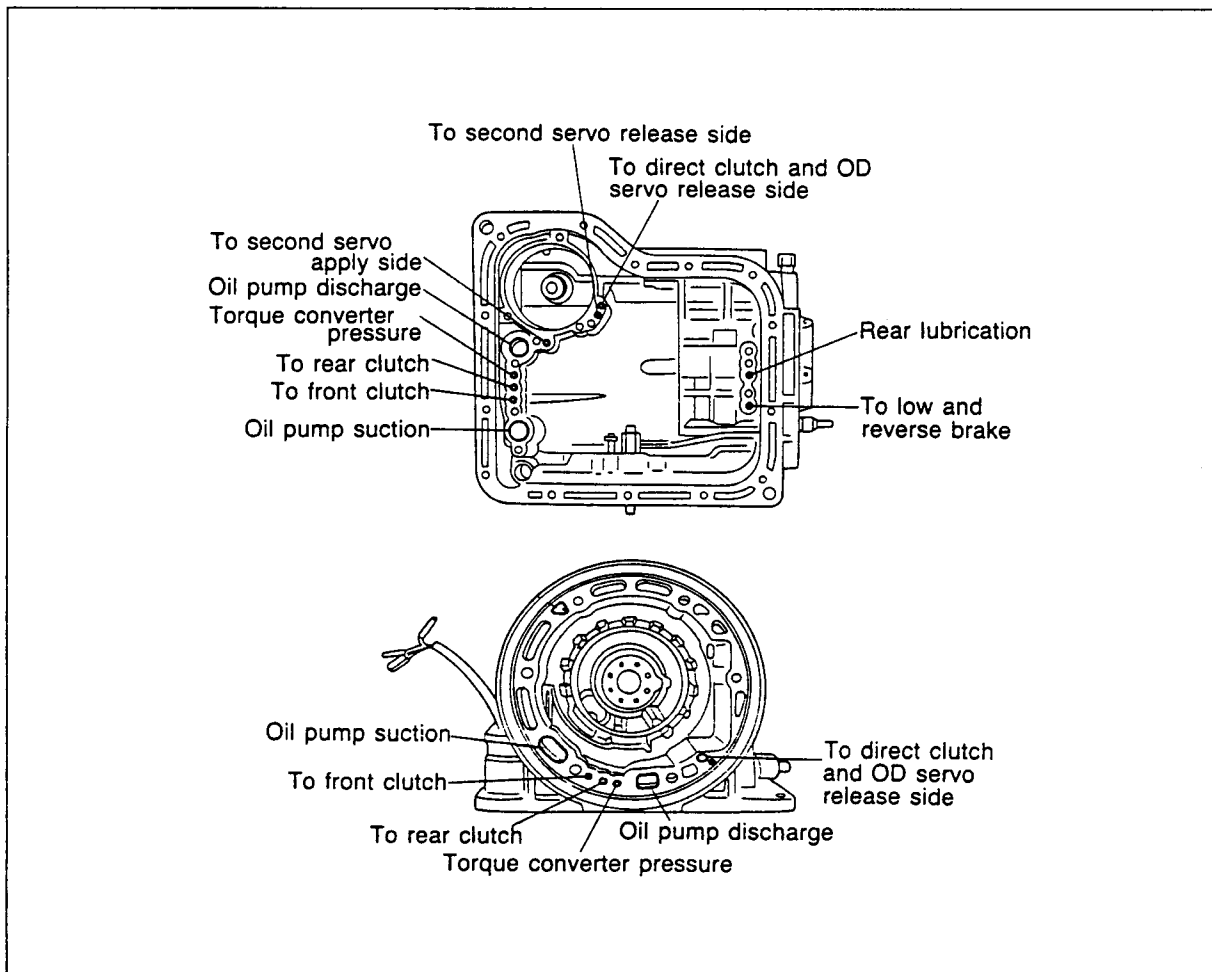
## Valve and Fluid Passage Locations Control valve



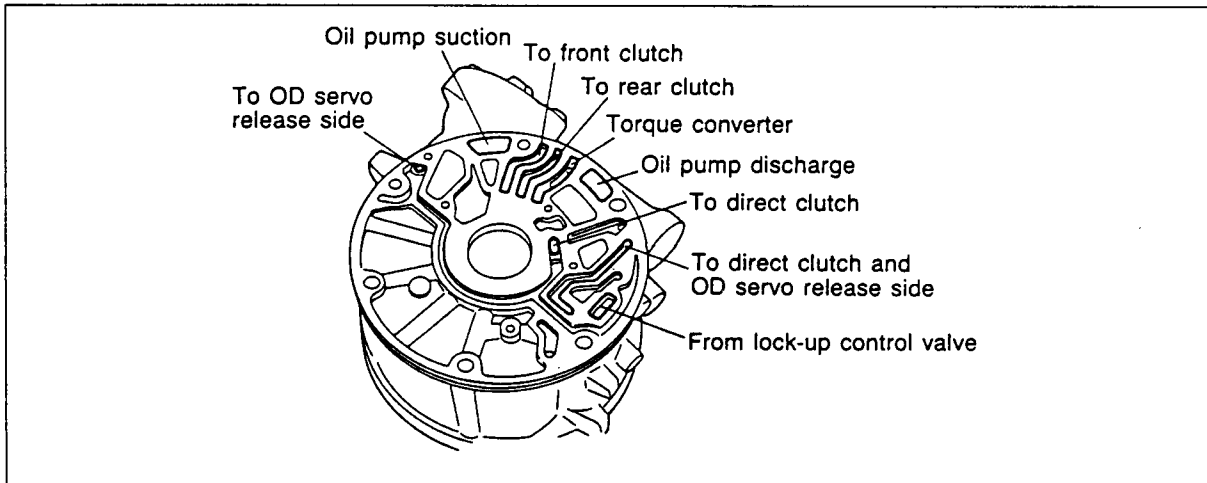
## Oil pump



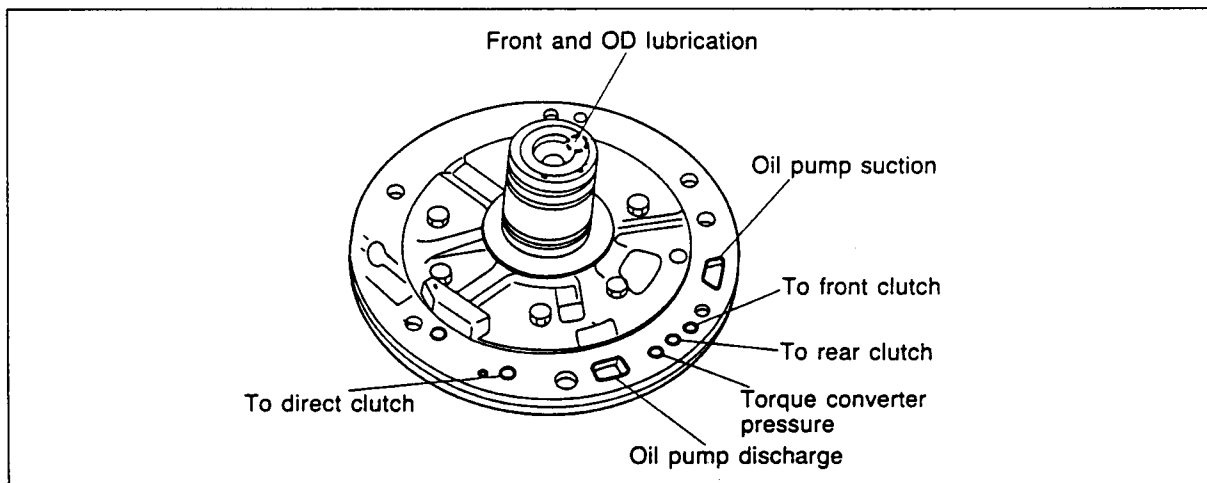
## Transmission case



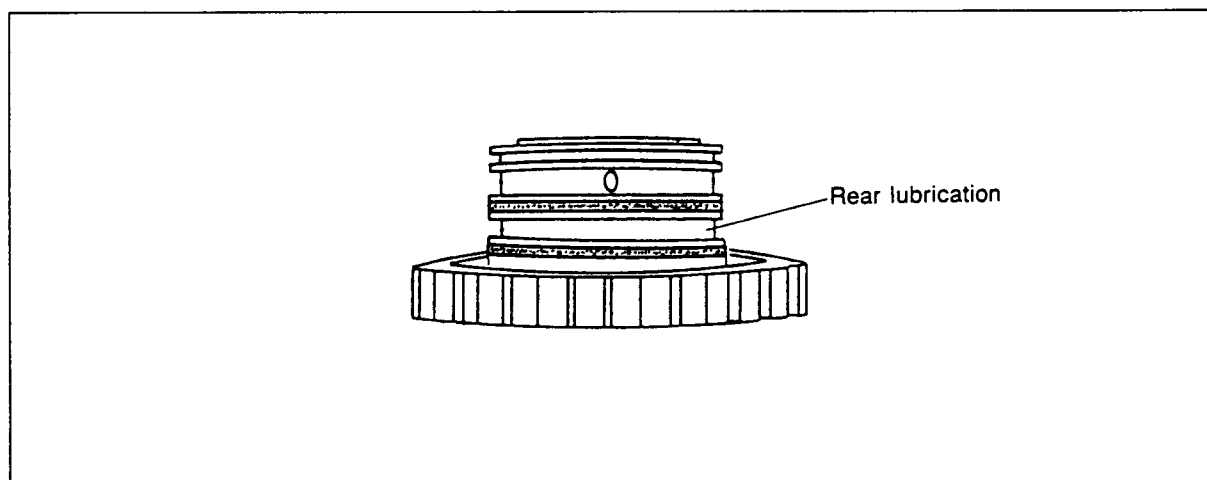
## OD case



## Drum support



## Oil distributor

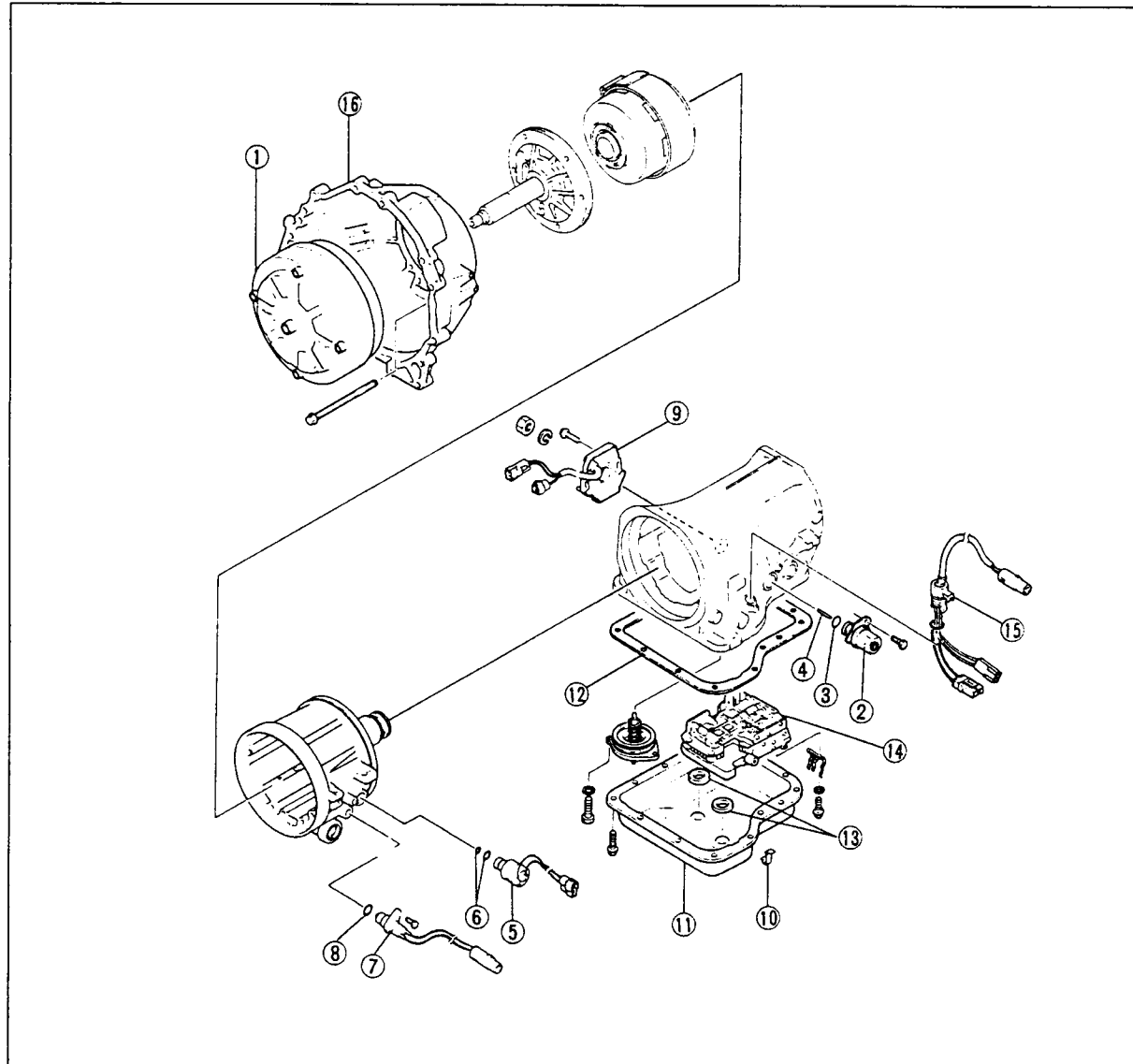


## DISASSEMBLY

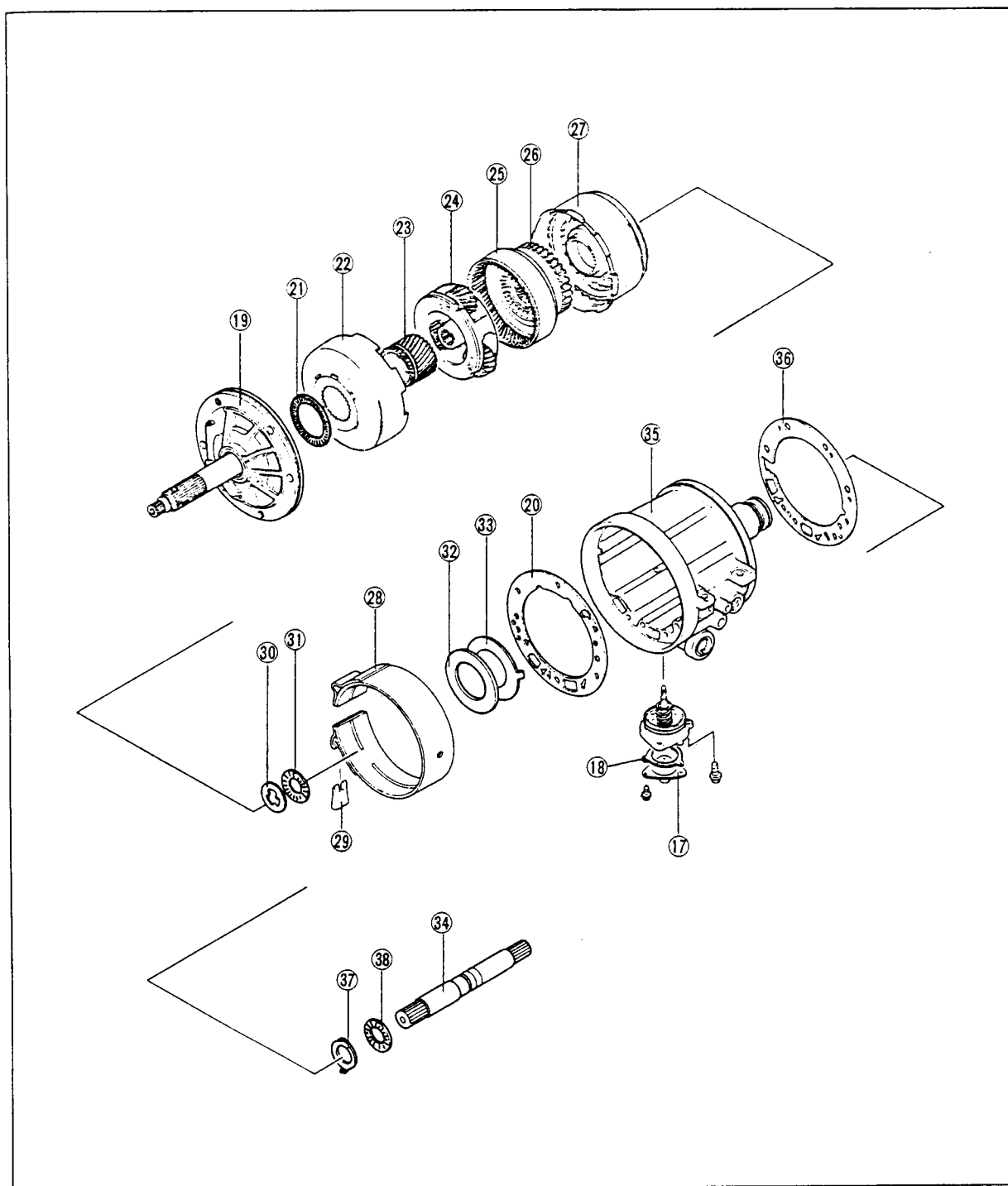
### PRECAUTION

1. Disassemble the transmission in a clean area (dustproof workspace) to prevent dust entry into the mechanisms.
2. Clean the transmission exterior thoroughly with steam and/or cleaning solvents prior to disassembly.
3. Inspect the individual transmission components in accordance with the troubleshooting chart during disassembly.
4. Use only plastic hammers when applying force to separate the light alloy case joints.
5. During disassembly, never use rags which may leave particles that can clog fluid passages.

### COMPONENTS



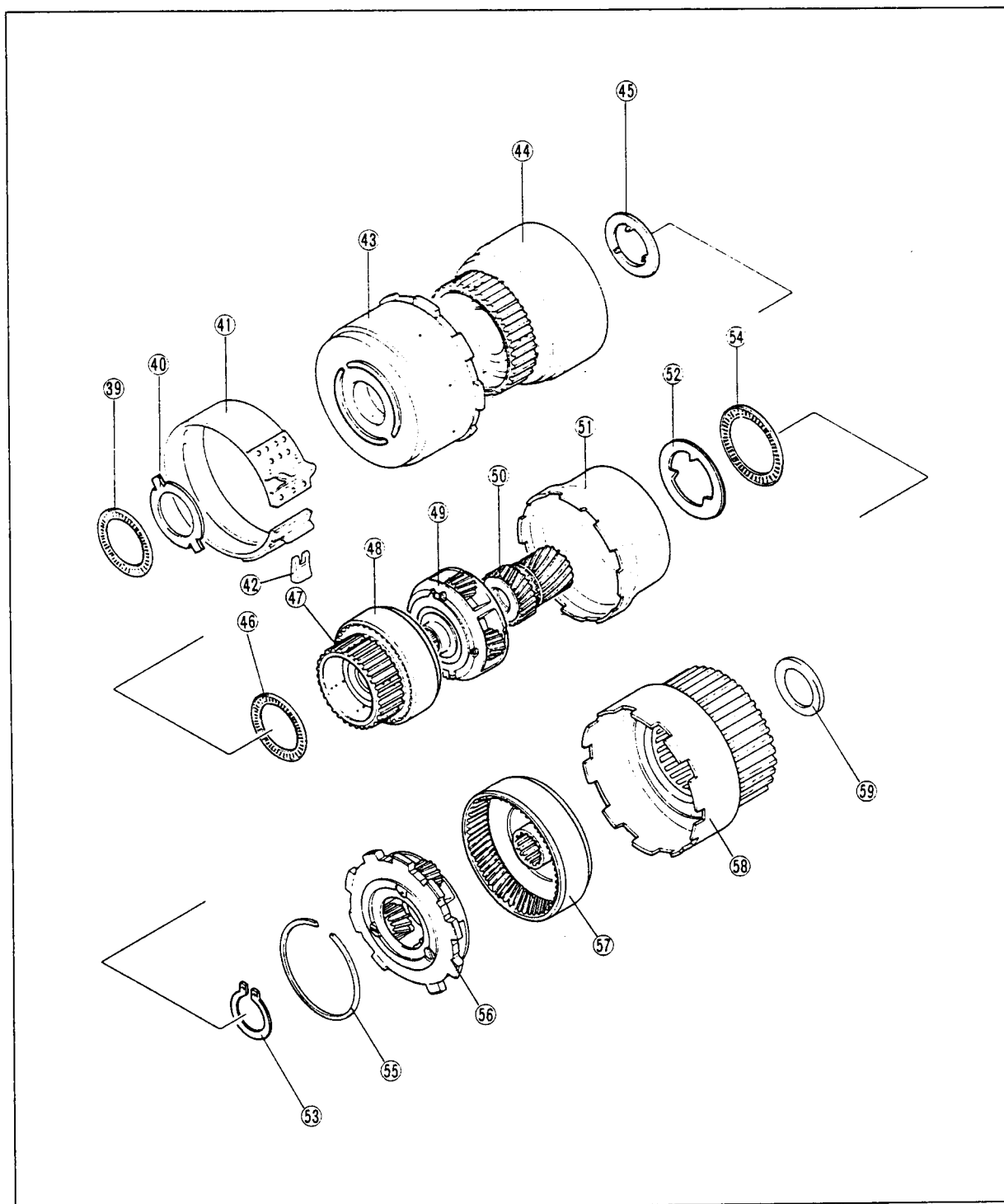
- |                            |                     |                              |
|----------------------------|---------------------|------------------------------|
| 1. Torque converter        | 6. O-ring           | 11. Oil pan                  |
| 2. Vacuum diaphragm        | 7. Turbine sensor   | 12. Gasket                   |
| 3. O-ring                  | 8. O-ring           | 13. Magnet                   |
| 4. Vacuum diaphragm rod    | 9. Inhibitor switch | 14. Valve body assembly      |
| 5. Lockup control solenoid | 10. Bracket         | 15. Solenoid valve connector |
|                            |                     | 16. Converter housing        |



17. OD band servo cover  
18. Gasket  
19. Oil pump  
20. Gasket  
21. Bearing  
22. Connecting shell  
23. Sun gear

24. OD planetary pinion carrier  
25. Internal gear  
26. OD clutch hub  
27. Direct clutch  
28. OD brake band  
29. Band strut  
30. Bearing race  
31. Bearing

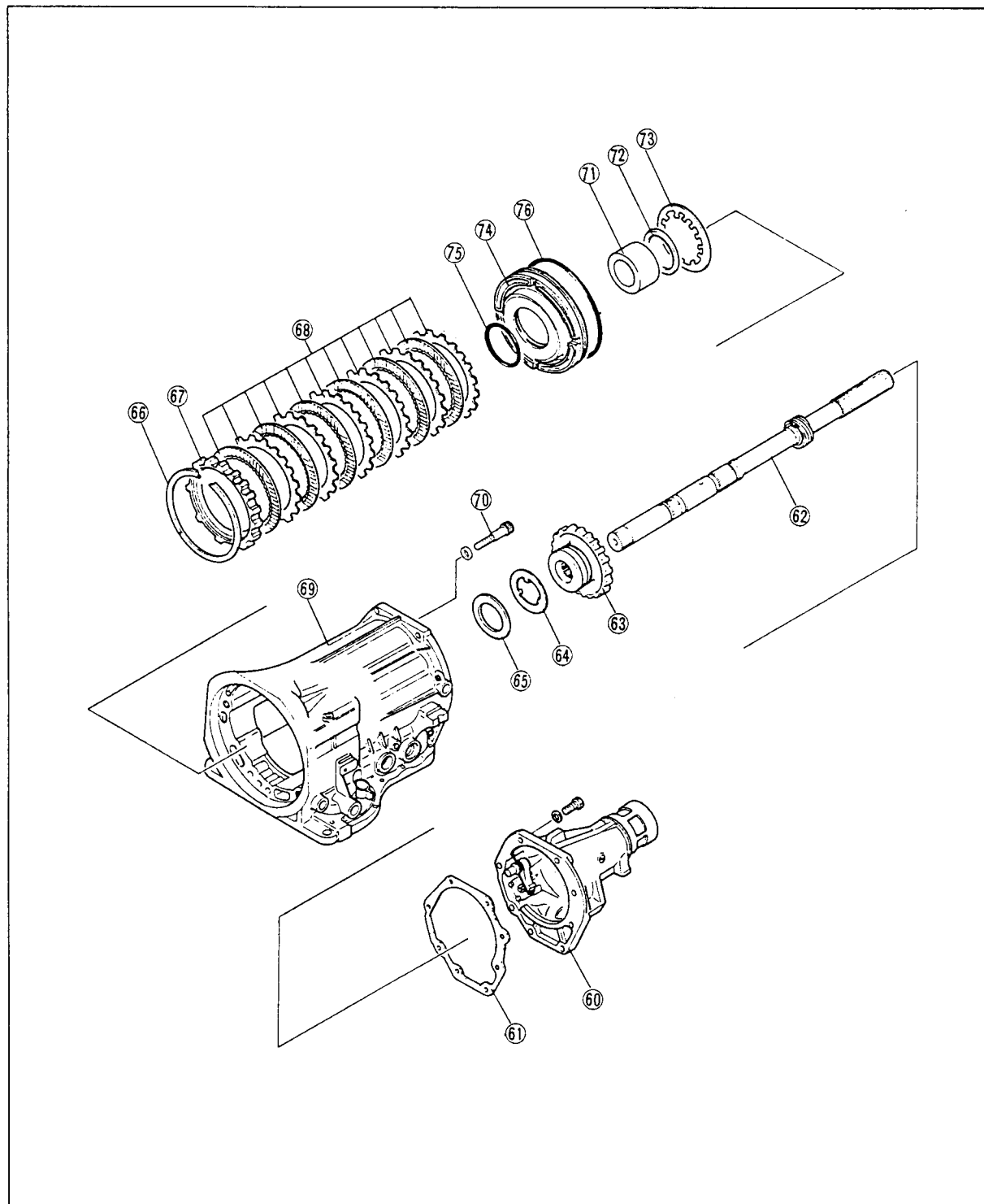
32. Bearing  
33. Bearing race  
34. Intermediate shaft  
35. OD case  
36. Gasket  
37. Bearing race  
38. Bearing



39. Bearing  
40. Bearing race  
41. 2nd brake band  
42. Band strut  
43. Front clutch  
44. Rear clutch  
45. Bearing race

46. Bearing  
47. Rear clutch hub  
48. Internal gear  
49. Front planetary pinion carrier  
50. Sun gear  
51. Connecting shell  
52. Bearing race

53. Snap ring  
54. Bearing  
55. Snap ring  
56. Rear planetary pinion carrier  
57. Internal gear  
58. Connecting drum  
59. Bearing



60. Extension housing  
61. Gasket  
62. Output shaft  
63. Oil distributor  
64. Bearing race  
65. Bearing

66. Snap ring  
67. Retaining plate  
68. Drive plates and driven plates  
69. Transmission case  
70. Allen head bolts  
71. One-way clutch inner race

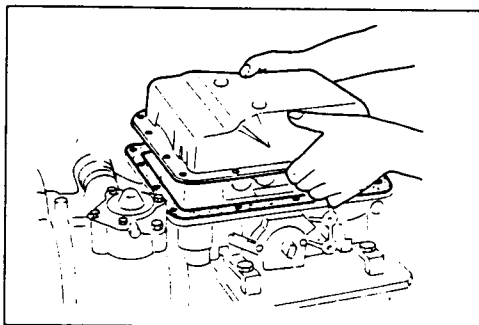
72. Thrust washer  
73. Return spring  
74. Low and reverse brake piston  
75. O-ring  
76. Piston seal

## AUTOMATIC TRANSMISSION SERVICE GROUP

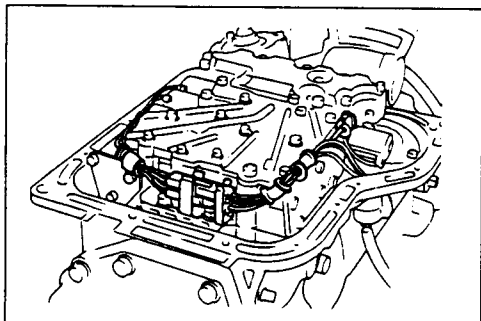




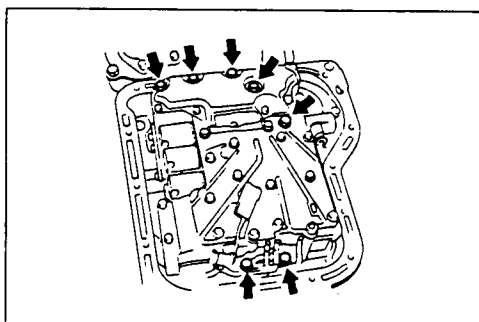
## Technical Service Information



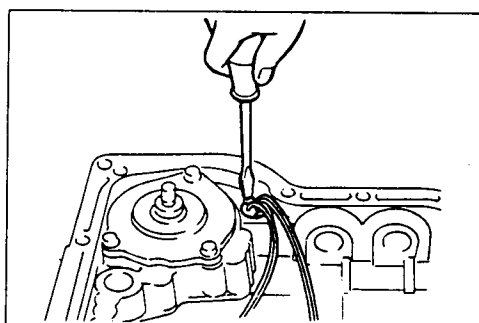
1. Remove the bolts and bracket.
2. Remove the oil pan and gasket.
3. Remove the magnets.



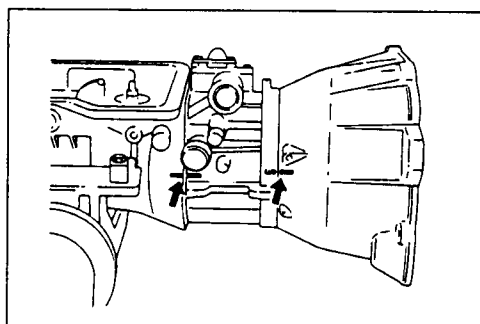
4. Disconnect the solenoid valve connectors.
5. Remove the harnesses from the bracket.



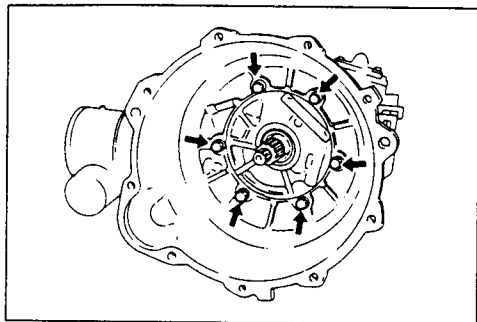
6. Remove the valve body assembly.



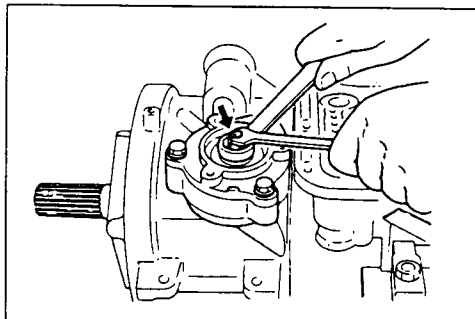
7. Remove the solenoid valve connector from the transmission case.



8. Put marks on the converter housing, OD case, and transmission case for proper reassembly.

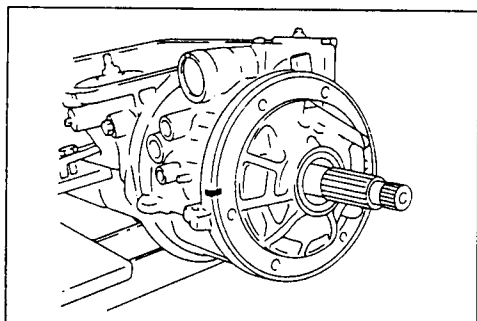


9. Remove the converter housing.

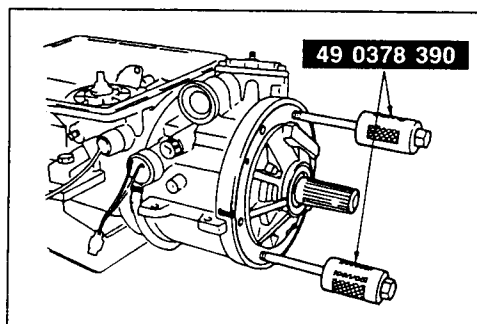


10. Remove the OD band servo cover and gasket.

11. Loosen the OD band servo locknut and tighten the piston stem.

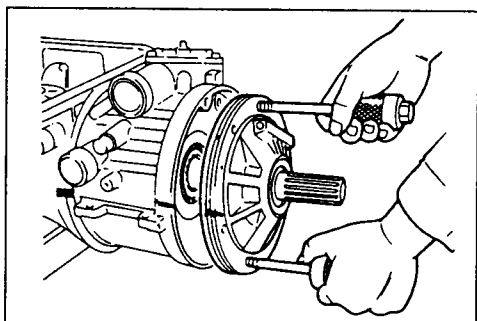


12. Put marks on the OD case and oil pump for proper reassembly.



13. Screw the **SST** into the oil pump.

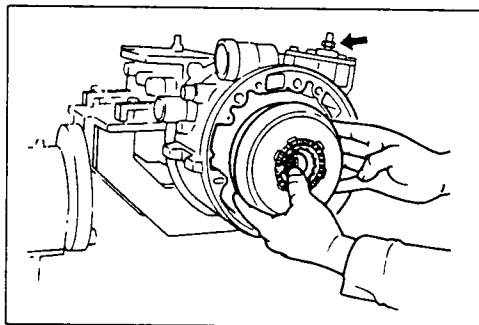
**SST = SPECIAL SERVICE TOOL**



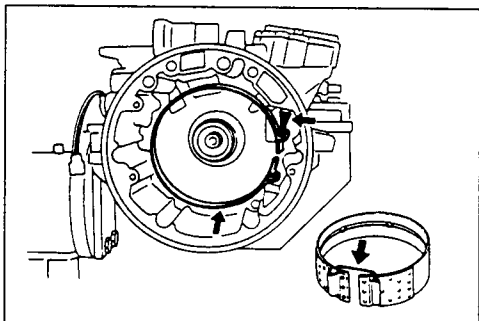
14. Slide the weights of the oil pump pullers to remove the oil pump; then remove the gasket.

## Caution

Remove the oil pump gently to prevent the OD connecting shell, sun gear, and planetary pinion carrier from falling out.



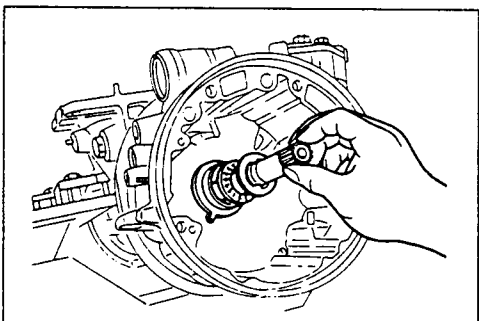
15. Loosen the piston stem of the OD band servo.
16. Remove the bearings and direct clutch assembly (connecting shell, sun gear, OD planetary pinion carrier, internal gear, OD clutch hub, and direct clutch).



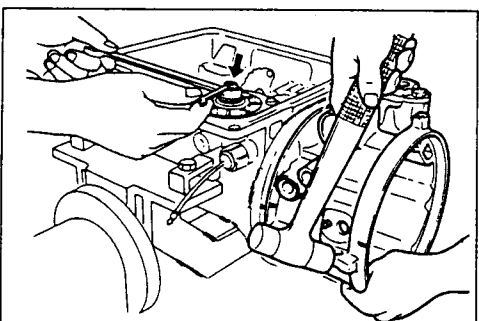
17. Remove the OD brake band and band strut.

## Caution

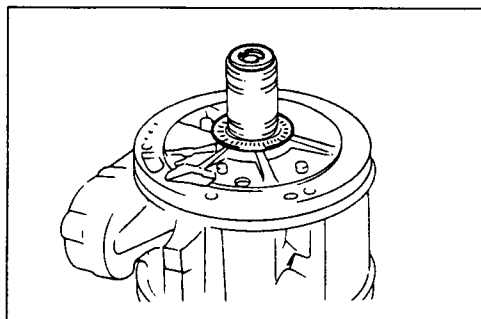
To prevent the brake lining from cracking or peeling, do not stretch the OD brake band. Secure it with a wire clip.



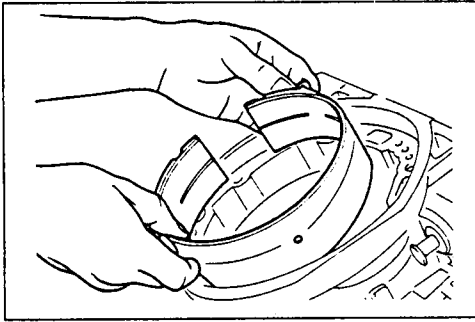
18. Remove the bearing races and bearing.
19. Remove the intermediate shaft.



20. Loosen the 2nd band servo locknut and tighten the piston stem.
21. Separate the OD case from the transmission case by tapping it lightly with a plastic hammer.
22. Remove the gasket.



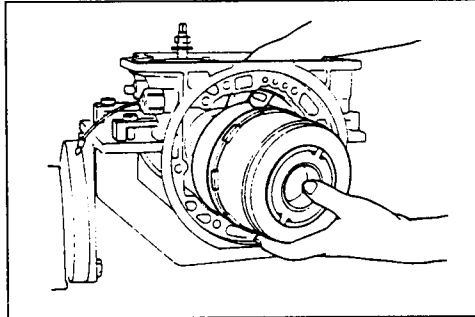
23. Remove the bearing race and bearings.



24. Loosen the piston stem of the 2nd band servo.
25. Remove the 2nd brake band and band strut.

**Caution**

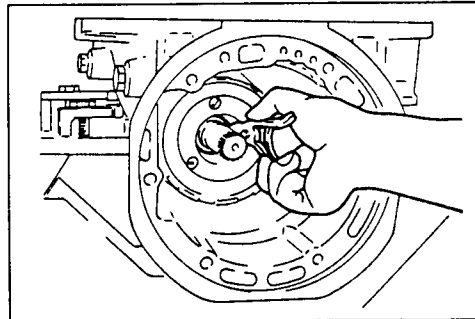
To prevent the brake lining from cracking or peeling, do not stretch the 2nd band brake. Secure it with a wire clip.



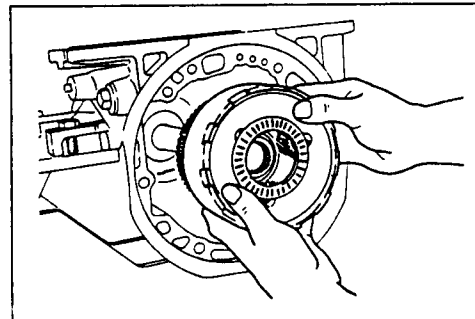
26. Remove the front clutch, rear clutch, rear clutch hub, front planetary pinion carrier, connecting shell, internal gear, bearing races, bearing, and sun gear as a unit.

**Note**

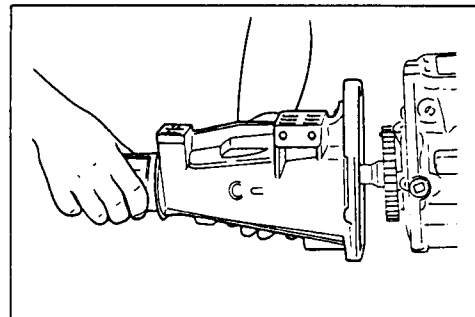
After the unit is removed, it should be disassembled and arranged to prepare for inspection and repair.



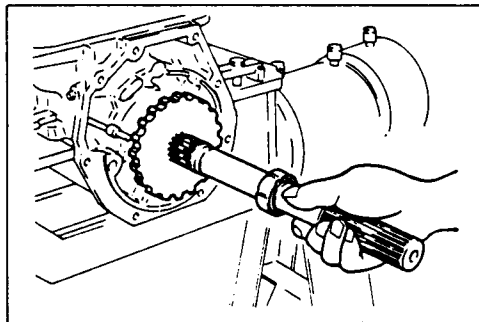
27. Remove the snap ring from the output shaft with snap-ring pliers.



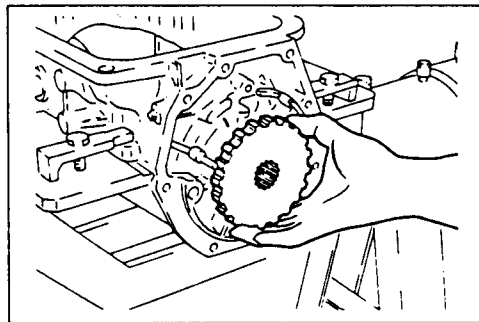
28. Remove the connecting drum, rear planetary pinion carrier, internal gear, and bearings as a unit.



29. Remove the rear extension housing and gasket.

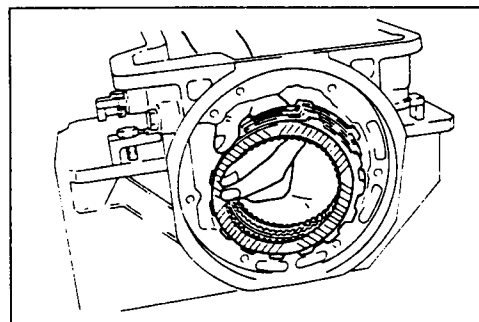


30. Pull out the output shaft.



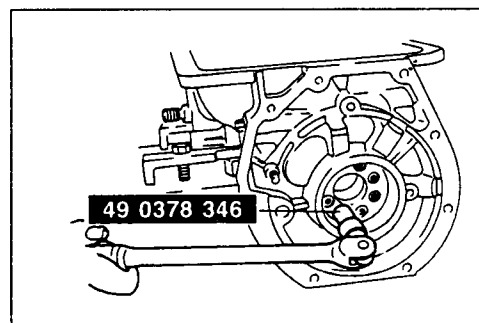
31. Remove the oil distributor.

32. Remove the bearing race and bearing.



33. Remove the snap ring from the low and reverse brake with a screwdriver.

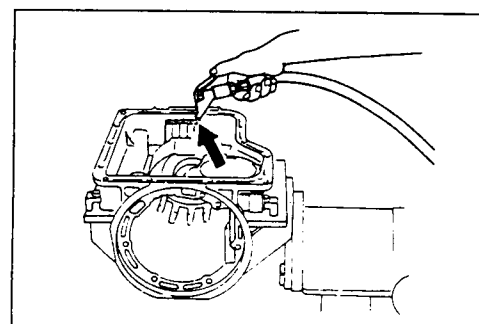
34. Remove the retaining plate, drive plates, and driven plates.



35. Remove the allen head bolts from the rear of the transmission case with the **SST**.

Remove the one-way clutch inner race, thrust washer, and piston return spring.

**SST = SPECIAL SERVICE TOOL**

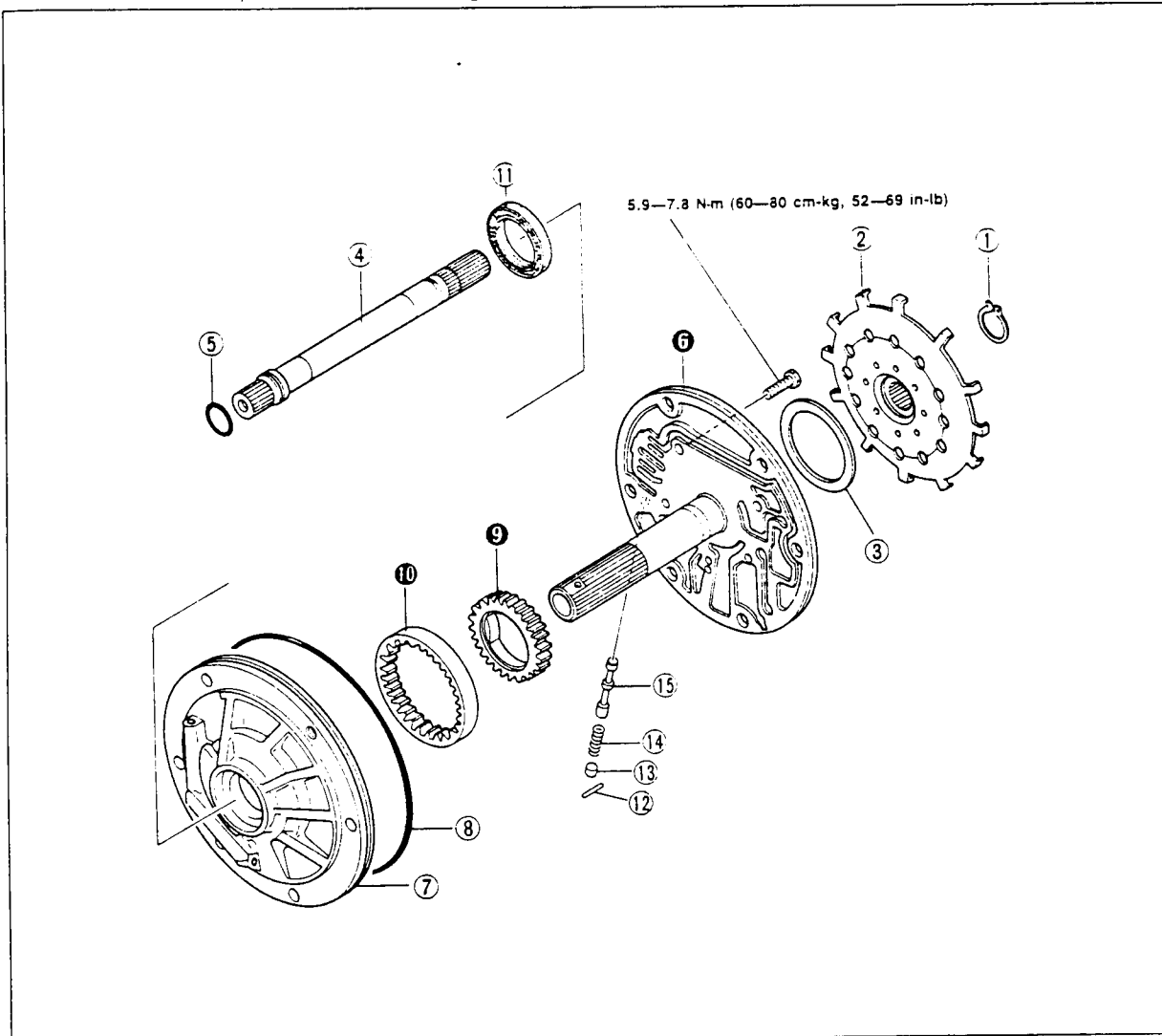


36. Apply compressed air to the oil passage as illustrated in the figure, and remove the low and reverse brake piston. Remove the O-ring and piston seal.

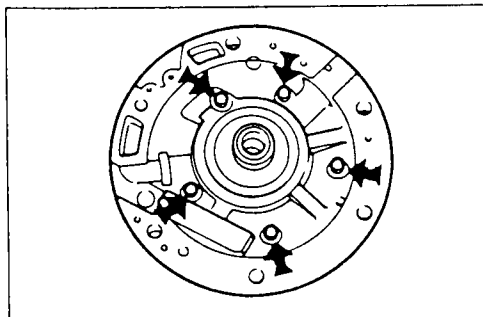
## OIL PUMP

### Disassembly

Disassemble in the sequence shown in the figure referring to **Disassembly note** for the specially marked parts.



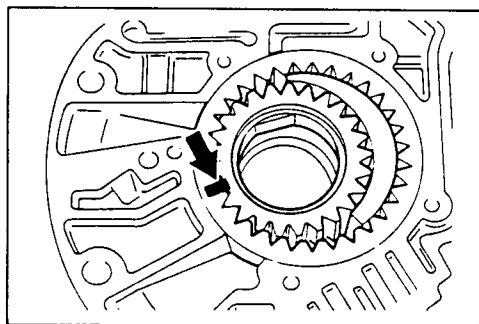
- |                  |                 |                          |
|------------------|-----------------|--------------------------|
| 1. Snap ring     | 6. Pump cover   | 11. Oil seal             |
| 2. Sensing rotor | 7. Pump housing | 12. Roll pin             |
| 3. Bearing       | 8. O-ring       | 13. Plug                 |
| 4. Input shaft   | 9. Inner gear   | 14. Spring               |
| 5. O-ring        | 10. Outer gear  | 15. Lockup control valve |



### Disassembly note

#### Pump cover

Remove the mounting bolts and remove the pump cover from the housing.

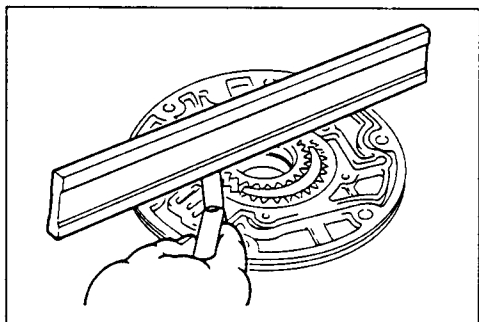


## Inner gear and outer gear

Mark the inner and outer gear positions and remove the gears from the housing.

### Caution

**Do not use a punch to mark the gears.**



## Inspection

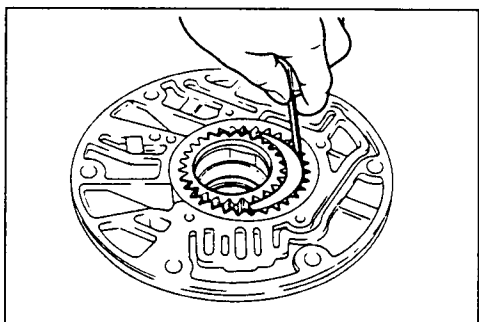
Inspect the following parts and replace if necessary.

1. Clearance between gears and pump cover.

### Standard clearance:

**0.02—0.04 mm (0.0008—0.0016 in)**

**Maximum: 0.08 mm (0.0031 in)**

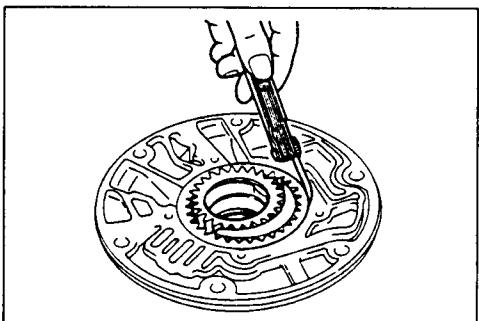


2. Clearance between outer gear teeth tip and crescent.

### Standard clearance:

**0.14—0.21 mm (0.0055—0.0083 in)**

**Maximum: 0.25 mm (0.0098 in)**

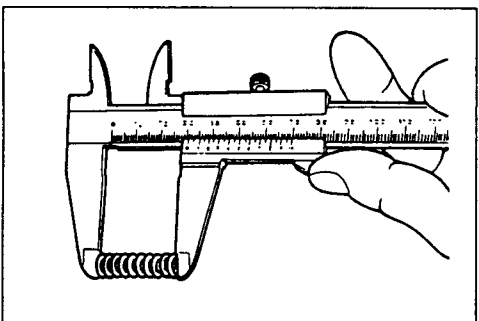


3. Side clearance between outer gear and housing.

### Standard clearance:

**0.05—0.20 mm (0.0020—0.0079 in)**

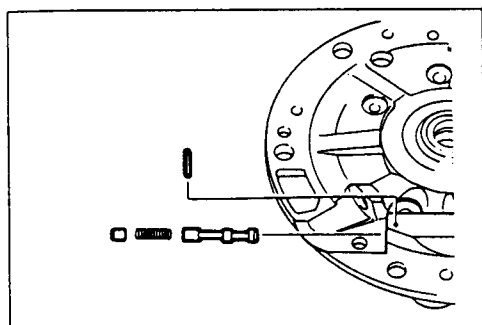
**Maximum: 0.25 mm (0.0098 in)**



4. Weakening of spring tension.

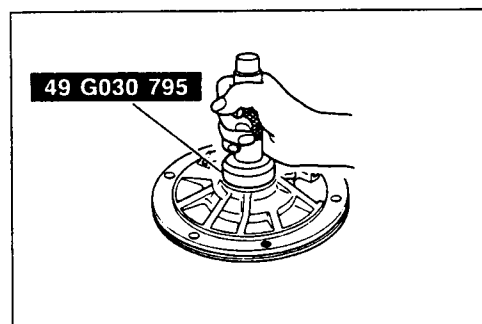
**Free spring length: 25.7 mm (1.01 in)**

5. Damage of lockup control valve.

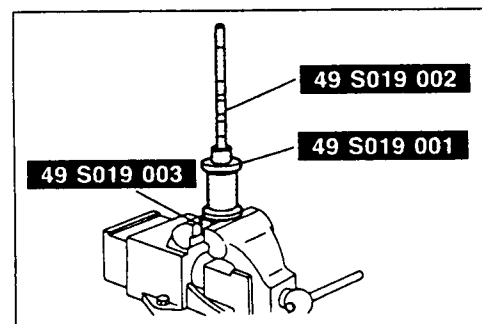


## Assembly

1. Install the lockup control valve, spring, and plug.
2. Tap in the roll pin.



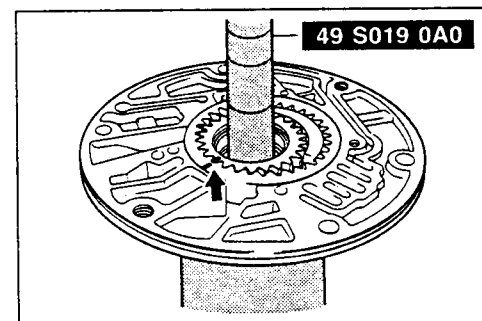
3. Install a new oil seal with the **SST**.



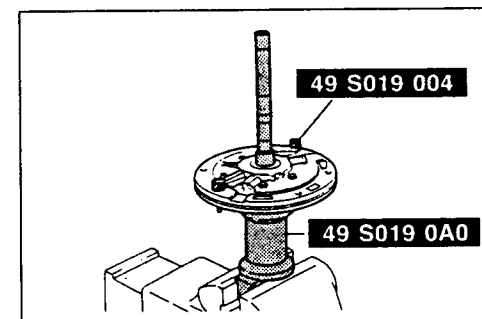
4. Assemble the **SST** and secure it in a vise.

## Note

Use protective plates to prevent damage to the SST.



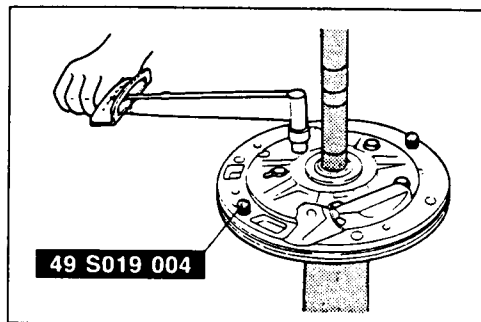
5. Place a new O-ring in the pump cover.
6. Set the pump housing on the **SST**.
7. Install the inner and outer gears in the pump housing with their matching marks toward the pump cover.



8. Set the pump cover on the **SST**.
9. Install the **SST** (pins).

**SST = SPECIAL SERVICE TOOL**



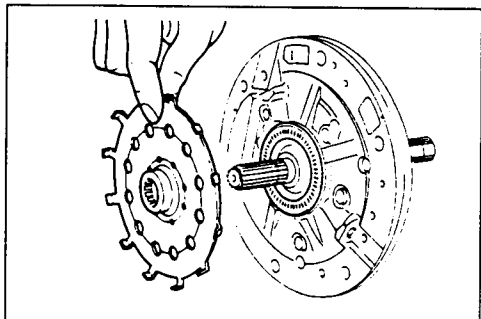


10. Tighten the installation bolts and remove the **SST** (pins).

**SST = SPECIAL SERVICE TOOL**

**Tightening torque:**

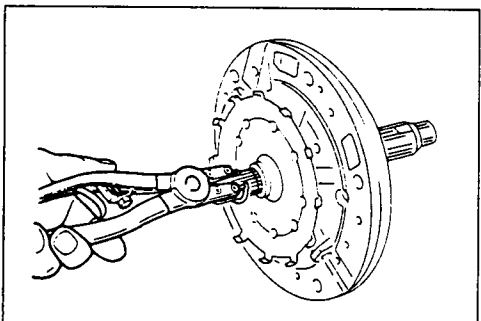
**5.9—7.8 N·m (60—80 cm·kg, 52—69 in·lb)**



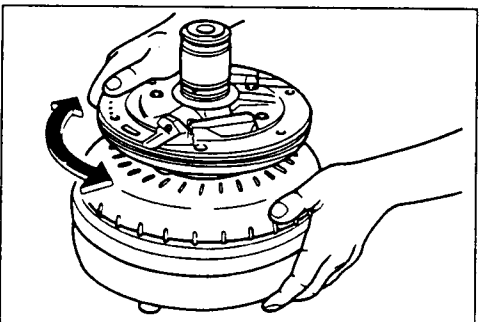
11. Install a new O-ring on the input shaft.

12. Install the bearing and sensing rotor.

**Bearing outer diameter: 69.9 mm (2.75 in)**



13. Install the snap ring on the input shaft with snap-ring pliers.

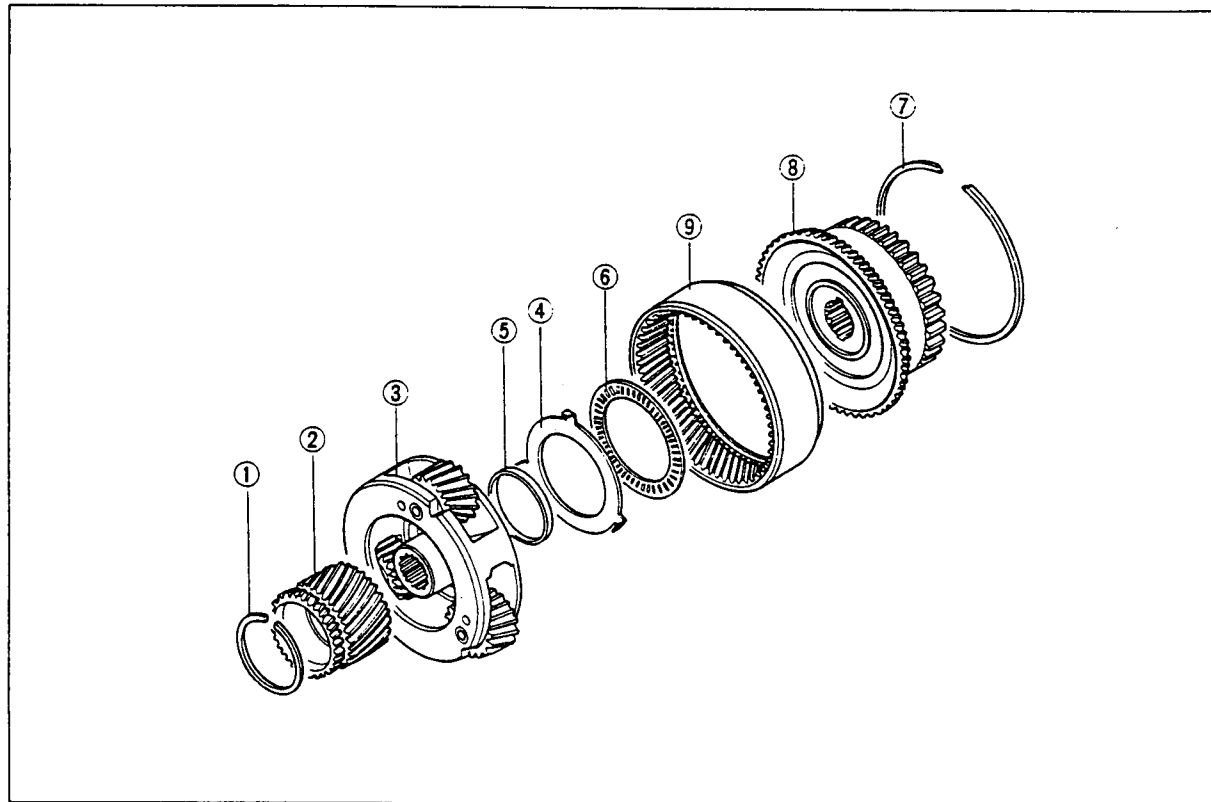


14. Set the oil pump on the torque converter, and check that the gears turn smoothly.

## OD PLANETARY GEAR UNIT (OD PLANETARY PINION CARRIER, OD CLUTCH HUB)

### Disassembly

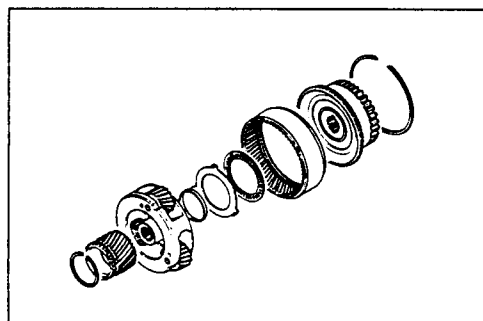
Disassemble in the sequence shown in the figure.



1. Snap ring
2. Sun gear
3. OD planetary pinion carrier

4. Bearing race
5. Seal sleeve
6. Bearing

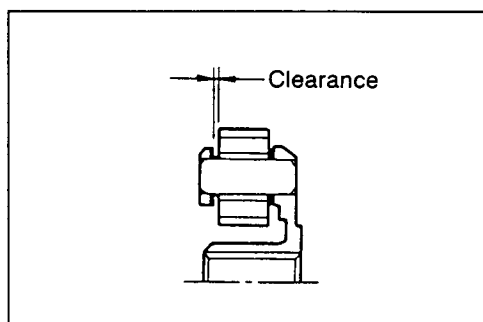
7. Snap ring
8. OD clutch hub
9. Internal gear



### Inspection

Inspect the following parts and replace if necessary.

1. Fracture and wear of snap ring
2. Wear of individual gears
3. Rotation of front carrier pinion gear
4. Rotation and damage or wear of bearing

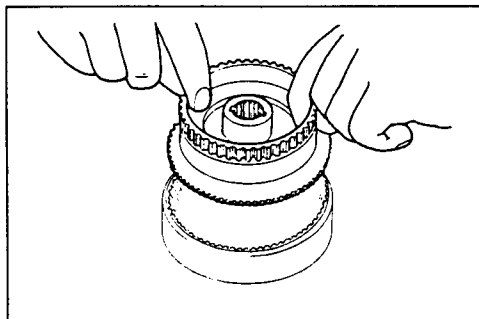


5. Clearance between pinion washer and planetary pinion carrier

### Standard clearance:

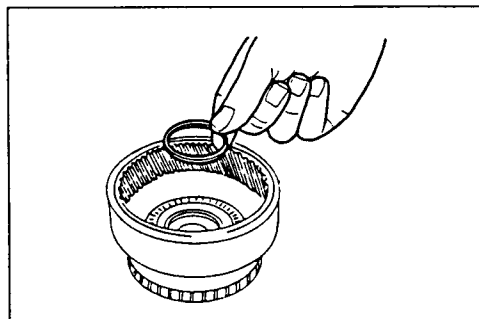
0.2—0.7 mm (0.008—0.028 in)

Maximum: 0.8 mm (0.031 in)



## Assembly

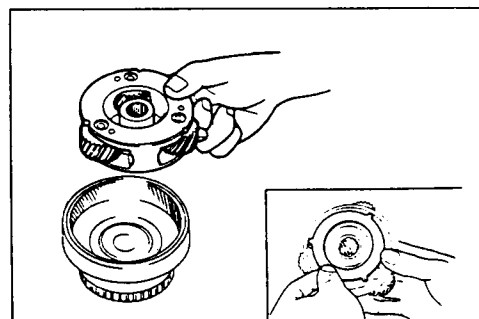
1. Install the OD clutch hub in the internal gear.
2. Install the snap ring.



3. Install the bearing.

**Bearing outer diameter: 69.9 mm (2.75 in)**

4. Install a new seal sleeve in the OD clutch hub.



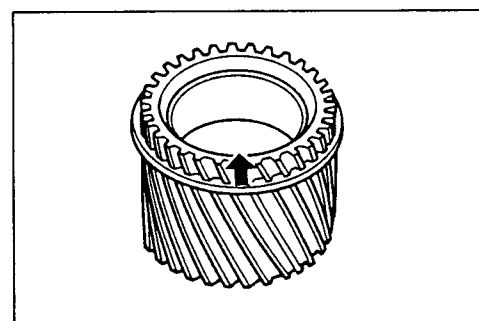
5. Install the bearing race in the OD planetary pinion carrier.

**Bearing race outer diameter: 70.0 mm (2.76 in)**

## Note

**Affix the bearing race with petroleum jelly.**

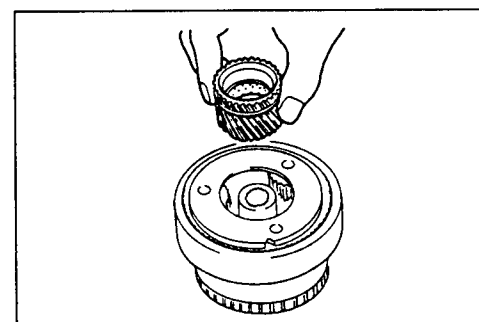
6. Install the OD planetary pinion carrier in the internal gear.



7. Install the snap ring on the sun gear.

## Note

**Pay close attention to the front and rear direction of the sun gear. The grooved side (arrow) is the front.**

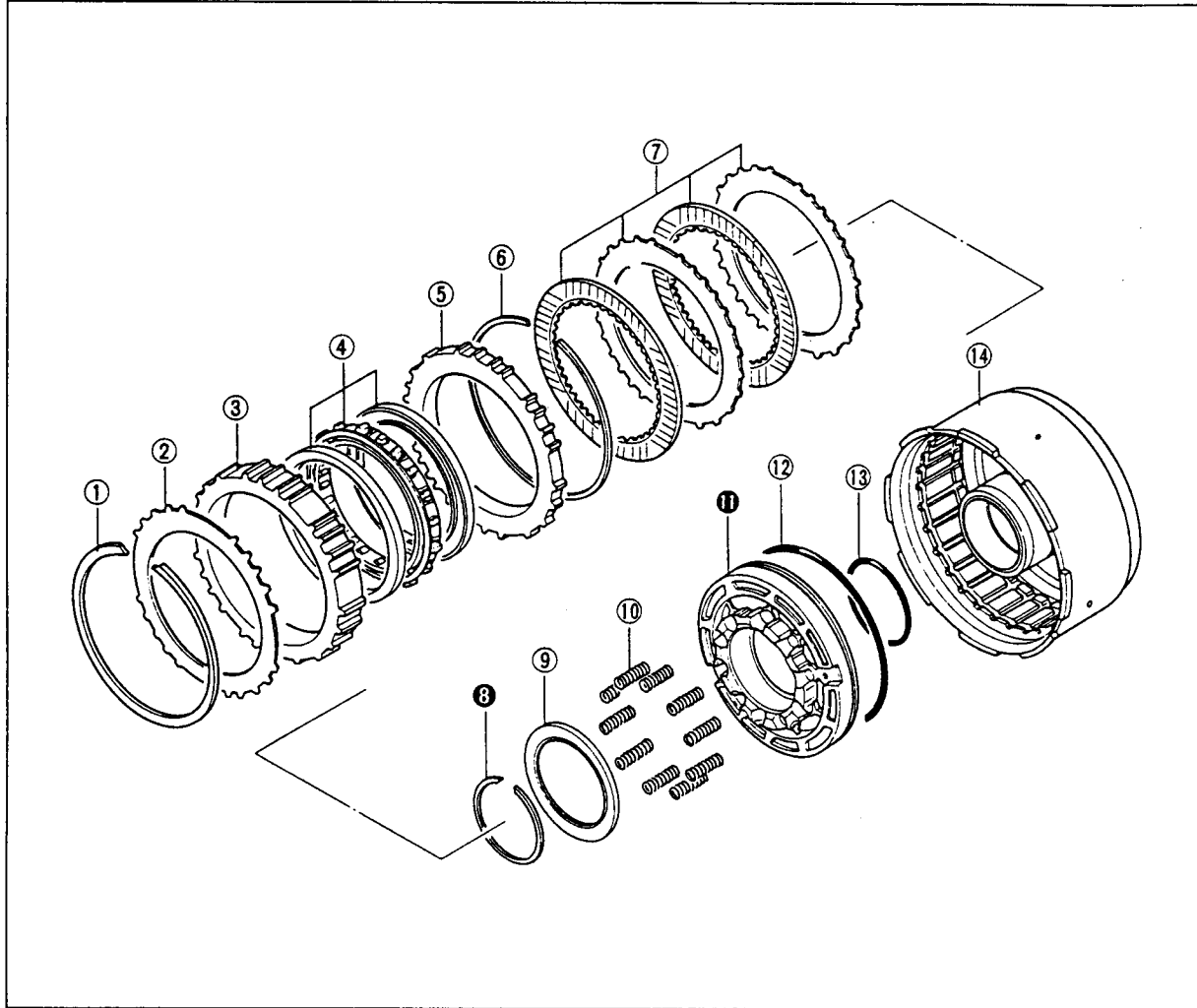


8. Install the sun gear in the OD planetary pinion carrier.

## DIRECT CLUTCH

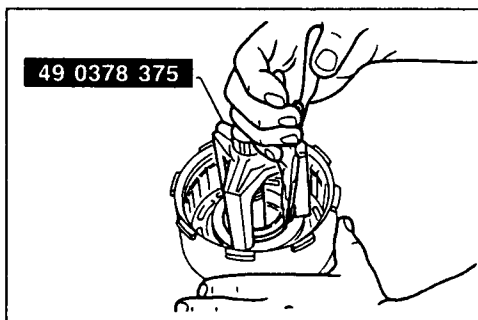
### Disassembly

Disassemble in the sequence shown in the figure referring to **Disassembly note** for the specially marked parts.



1. Snap ring
2. Side plate
3. Outer race
4. One-way clutch
5. Retaining plate
6. Snap ring
7. Drive plates and driven plates

8. Snap ring
9. Spring retainer
10. Spring
11. Piston
12. Seal ring
13. O-ring
14. Direct clutch drum

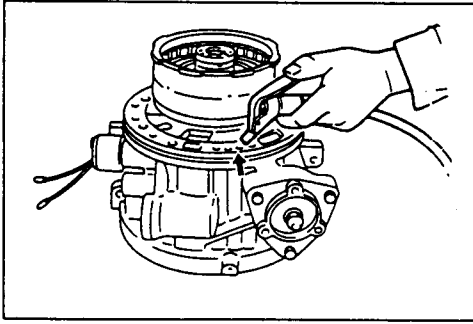


### Disassembly note

#### Snap ring

1. Compress the spring with the **SST**, then remove the snap-ring with snap-ring pliers.
2. Remove the spring retainer and spring.

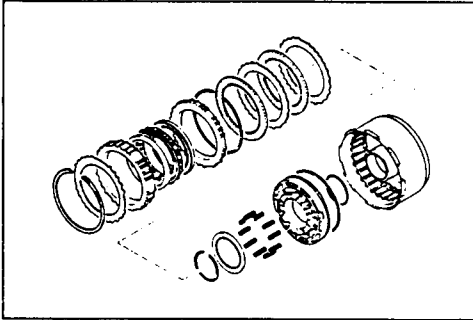
**SST = SPECIAL SERVICE TOOL**



## Piston

1. Set the direct clutch drum on the drum support.
2. Remove the piston by applying compressed air to the oil passage.

**Air pressure: 392 kPa (4.0 kg/cm<sup>2</sup>, 57 psi) max.**



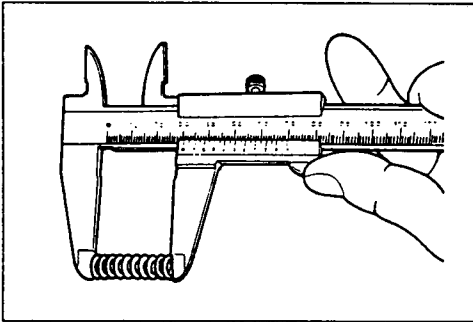
## Inspection

Inspect the following parts and replace if necessary.

1. Damage or wear of drive plate facing
2. Fracture or wear of snap ring
3. Spring retainer deformation
4. Check ball stuck in piston

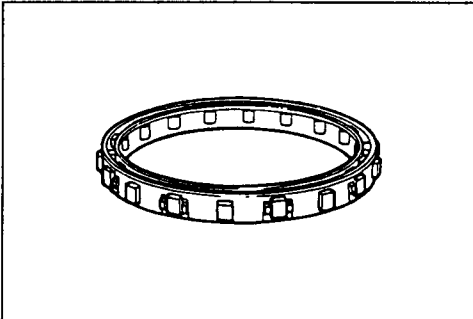
## Note

**Check that the ball is free by shaking the piston.**

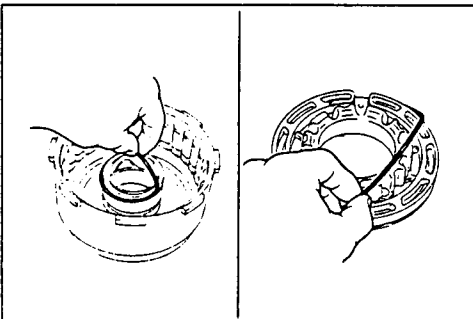


5. Spring fracture
6. Weakening of spring tension

**Free spring length: 30.5 mm (1.20 in)**

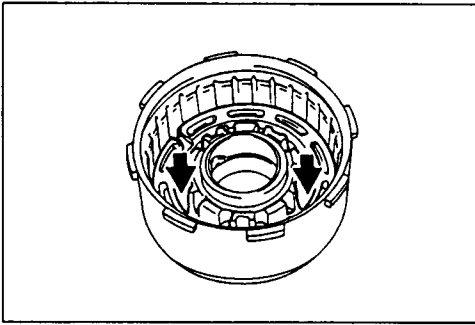


7. Wear of one-way clutch



## Assembly

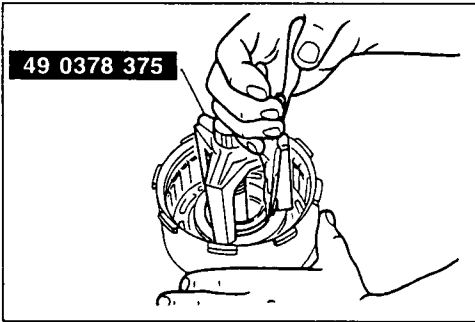
1. Apply ATF to the O-ring and install it in the direct clutch drum.
2. Apply ATF to the seal ring and install it onto the piston.



3. Install the piston in the direct clutch drum.

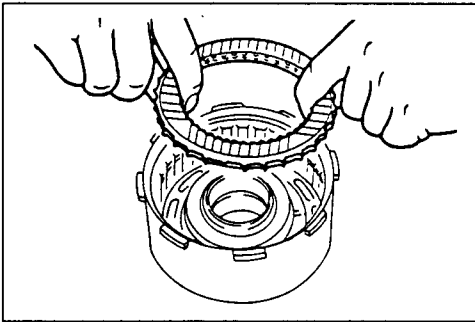
**Caution**

Apply even pressure to the perimeter of the piston to avoid damaging the seal rings when installing.



4. Install the springs and spring retainer and compress them with the **SST**. **SST = SPECIAL SERVICE TOOL**

5. Install the snap ring.

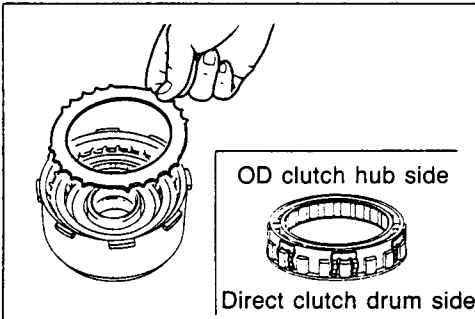


6. Install the driven plates and drive plates.

**Note**

Installation order:  
Driven-Drive-Driven-Drive

7. Install the snap ring.



8. Install the retaining plate, one-way clutch, outer race, and side plate.

**Caution**

a) Check that the spring cage of the one-way clutch faces toward the direct clutch drum.

b) Align the flats of the retaining plate and outer race with the lubrication hole of the clutch drum, then set them in the drum.

9. Install the snap ring.

10. Measure the clearance between the side plate and snap ring with a feeler gauge. Adjust the clearance by installing the correct side plate.

**Clearance:**

Maximum: 0.2 mm (0.008 in)

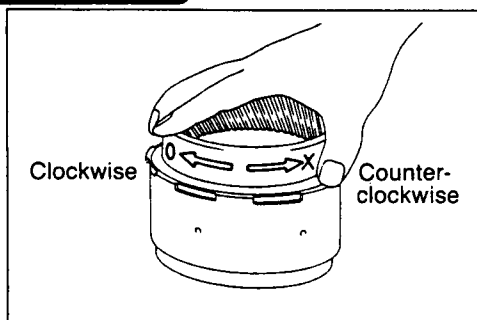
**Side plate sizes**

mm (in)

0.4 (0.016)	0.6 (0.024)	0.8 (0.031)
1.0 (0.039)	1.2 (0.047)	



## Technical Service Information



11. Insert the direct clutch hub on the top of the direct clutch.
12. Check the one-way clutch operation by turning to right and left.

### Note

**The direct clutch hub should turn clockwise only. If it turns counterclockwise, the one-way clutch is reversely installed.**

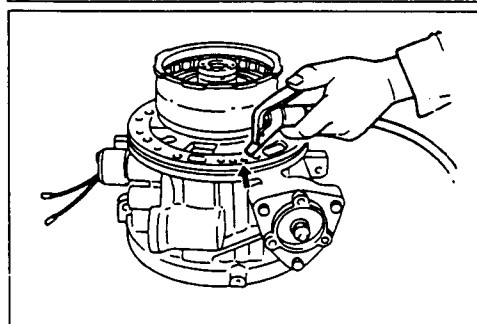
13. Set the direct clutch on the drum support. Apply compressed air to the oil passage, and check the clutch operation.

### Air pressure:

**392 kPa (4.0 kg/cm<sup>2</sup>, 57 psi) max.**

### Caution

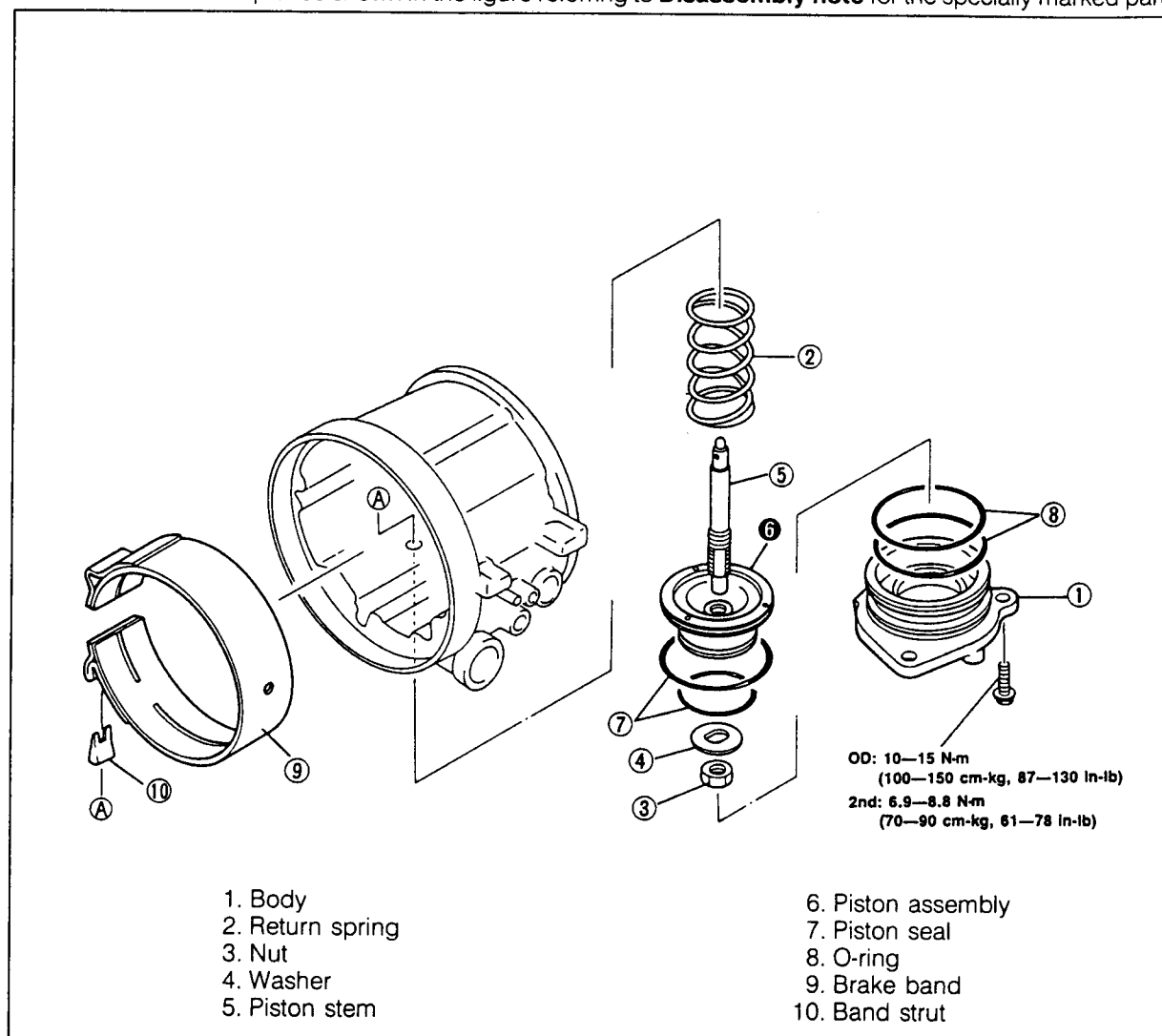
**Apply air for no more than 3 seconds.**



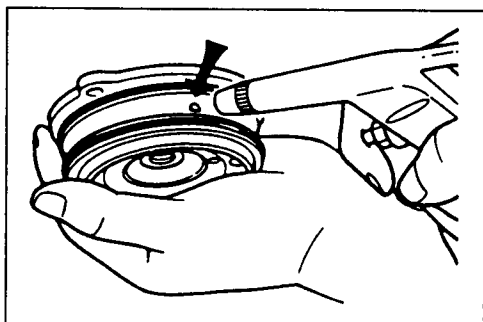
### Disassembly

Disassemble in the sequence shown in the figure referring to **Disassembly note** for the specially marked part.

### OD AND 2ND BAND SERVO



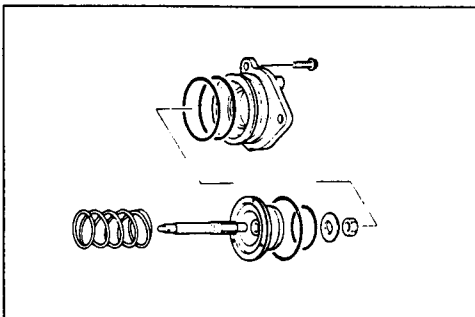
AUTOMATIC TRANSMISSION SERVICE GROUP



## Disassembly note

### Piston assembly

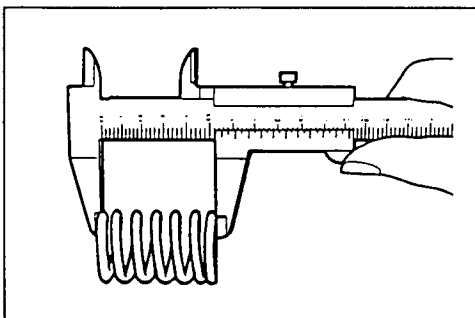
Remove the piston assembly from the body by applying compressed air to the oil passage hole.



## Inspection

Inspect the following parts and replace if necessary.

1. Damage or wear of piston stem
2. Damage or wear of piston assembly and body

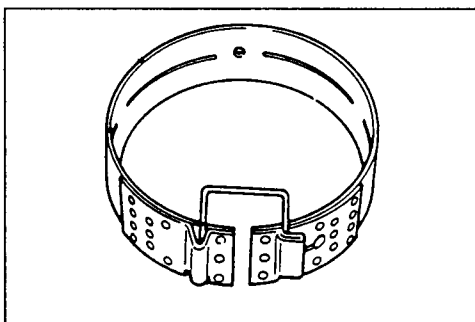


3. Weakening of return spring tension

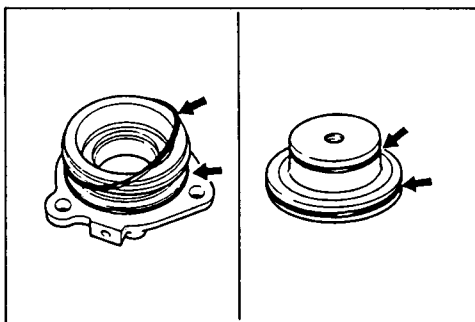
### Free spring length:

OD: 48.0 mm (1.89 in)

2nd: 35.0 mm (1.38 in)



4. Cracking or peeling of brake band facing



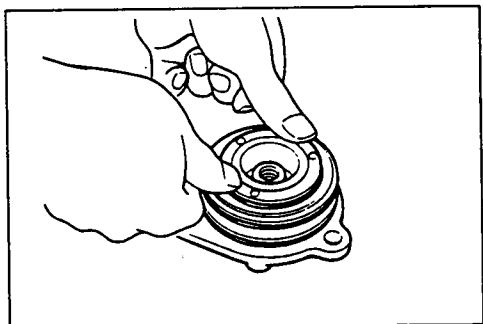
## Assembly

1. Apply ATF to the O-ring and install them onto the body.
2. Apply ATF to the piston seals and install them onto the piston assembly.





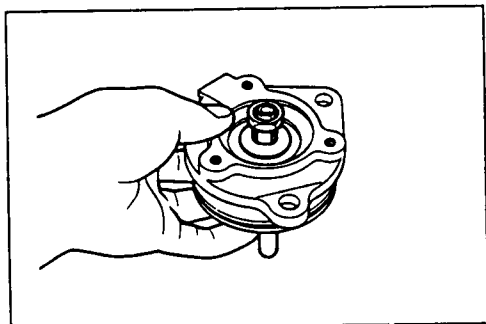
## Technical Service Information



3. Press the piston assembly in the body.

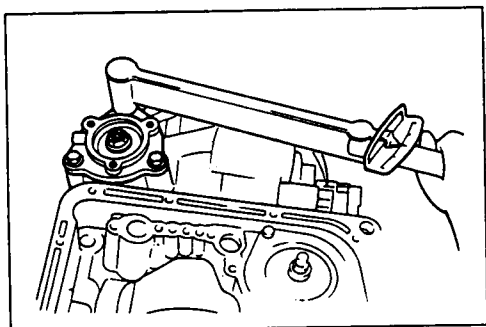
**Caution**

**Apply even pressure to the perimeter of the piston to avoid damaging the seal rings when installing.**



4. Install the piston stem and washer.

5. Loosely tighten the nut.



6. Install the return spring.

7. Install the piston assembly and body.

**Caution**

**Apply even pressure to the perimeter of the body to avoid damaging the O-ring when installing.**

8. Tighten the bolts.

**Tightening torque:**

**OD band servo:**

9.8—15 N·m (1.0—1.5 m·kg, 7.2—11 ft·lb)

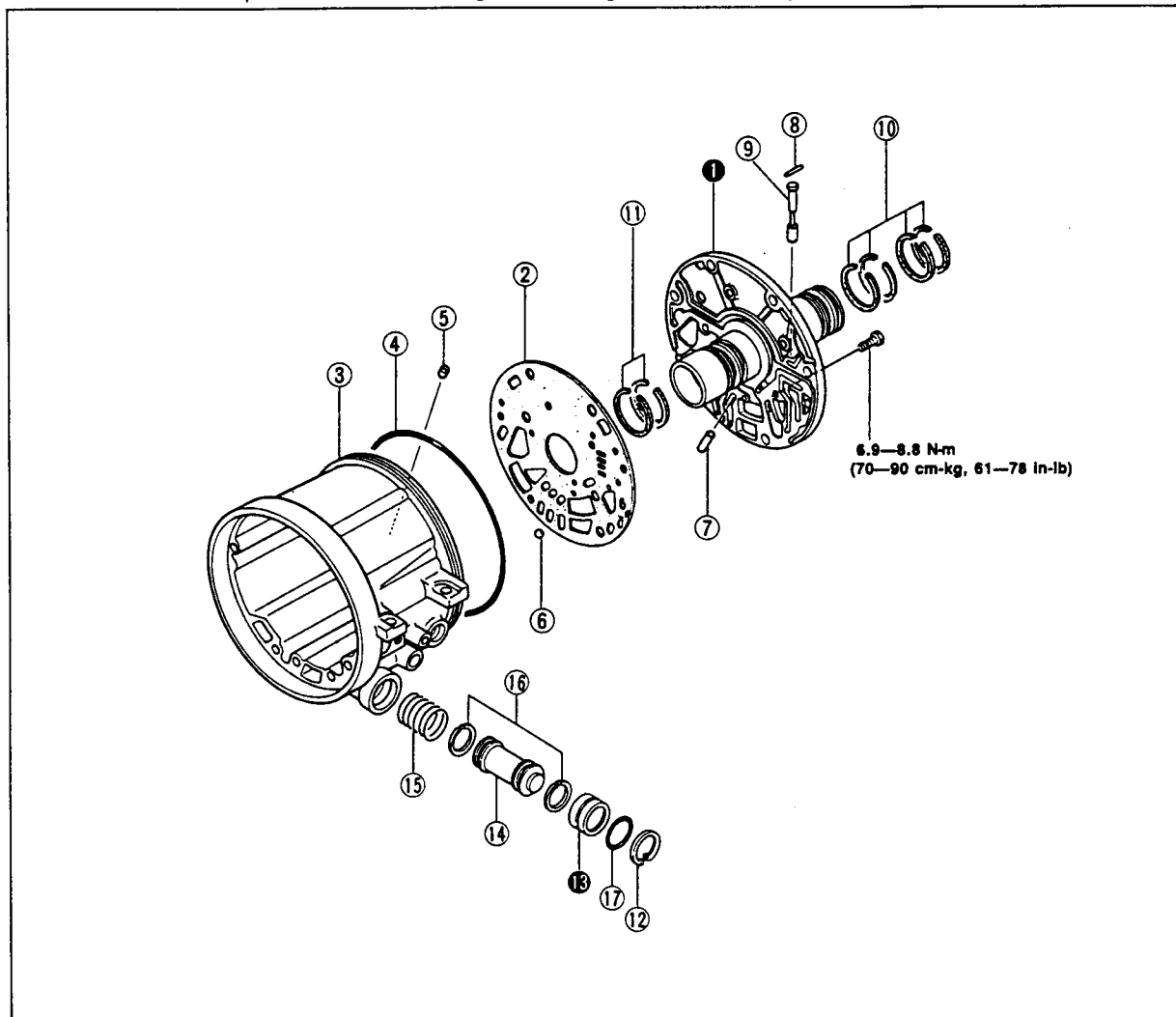
**2nd band servo:**

6.9—8.8 N·m (70—90 cm·kg, 61—78 in·lb)

## DRUM SUPPORT, ACCUMULATOR, OD CASE

### Disassembly

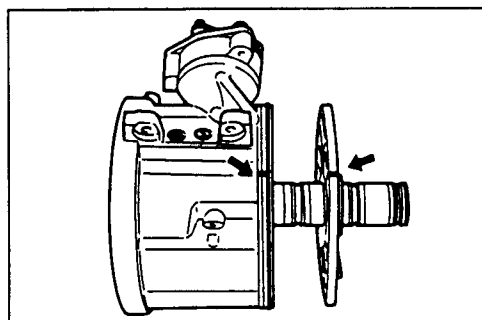
Disassemble in the sequence shown in the figure referring to **Disassembly note** for the specially marked parts.



1. Drum support
2. Gasket
3. OD case
4. Seal ring
5. One-way valve
6. Steel ball

7. Plug
8. Roll pin
9. Plug
10. Seal ring
11. Seal ring
12. Snap ring

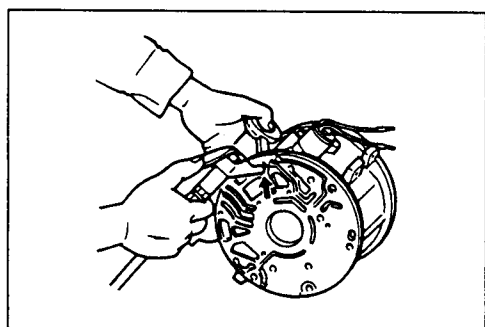
13. Accumulator plug
14. Accumulator piston
15. Spring
16. Seal ring
17. O-ring



### Disassembly note

#### Drum support

Make matching marks on the OD case and drum support for proper reassembly, then remove the drum support.

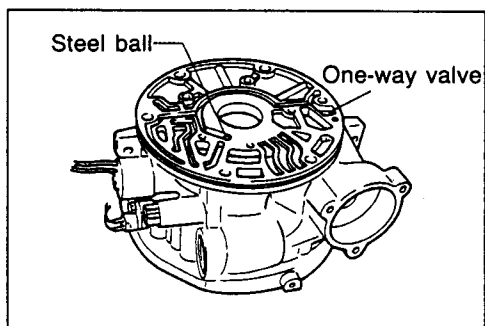


## Accumulator plug

1. Clean the oil passage with compressed air.
2. Remove the accumulator piston and spring.

## Warning

Apply compressed air gradually to prevent residual oil from flying out with force.

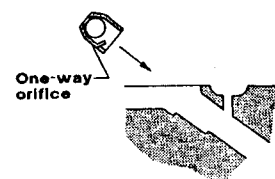


## Inspection

### Drum support

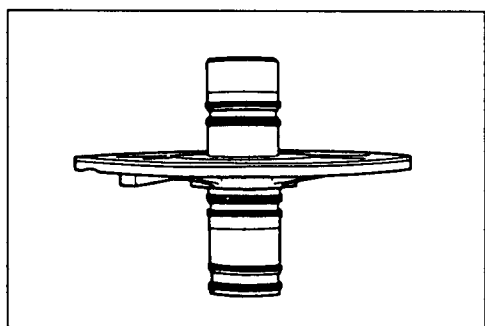
Inspect the following parts and replace if necessary.

1. Cracks in case
2. Damage to oil passages
3. Damage to gasket
4. Damage to plug
5. Check ball stuck in OD case

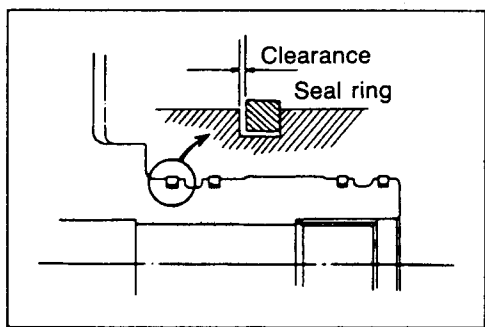


## Note

Check that the ball is free by shaking the OD case.



6. Fracture or wear of drum support seal rings

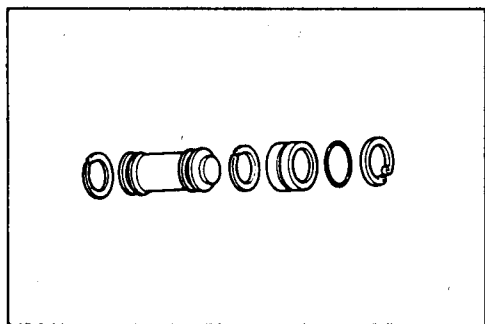


7. Clearance between seal ring and seal ring groove

## Standard clearance:

0.04—0.16 mm (0.0016—0.0063 in)

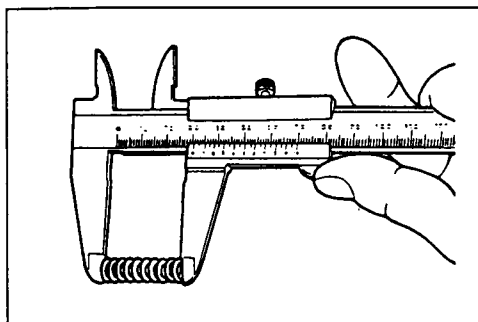
Maximum: 0.40 mm (0.0157 in)



## Accumulator

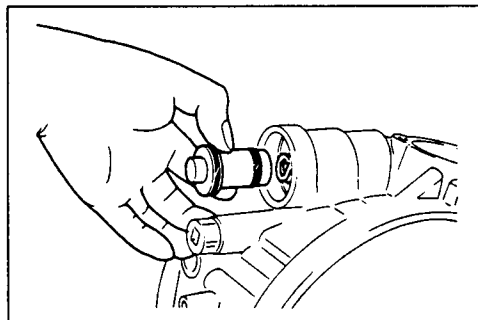
Inspect the following parts and replace if necessary.

1. Damage or wear of piston
2. Fracture or wear of snap ring
3. Damage to seal rings



4. Weakening of return spring tension.

**Free spring length: 40.4 mm (1.59 in)**

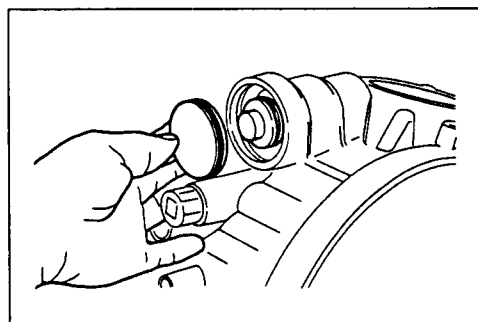


## Assembly

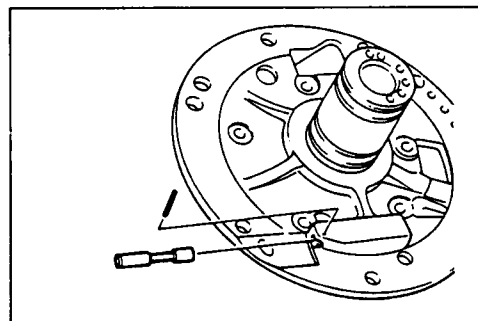
1. Apply ATF to the seal rings and install them onto the accumulator piston.
2. Install the spring and accumulator piston.

## Caution

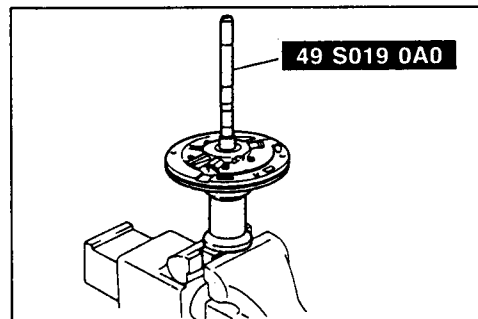
**Apply even pressure to the perimeter of the piston to avoid damaging the seal rings when installing.**



3. Apply ATF to the O-ring and install it onto the accumulator plug.
4. Install the accumulator plug and snap ring.
5. Check the accumulator operation by applying compressed air to the oil passage.



6. Install the plug.
7. Tap in the roll pin.



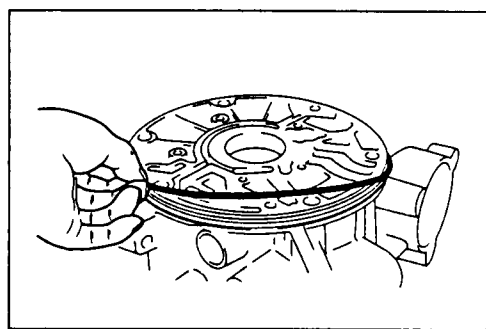
8. Set the oil pump on the SST.

## Note

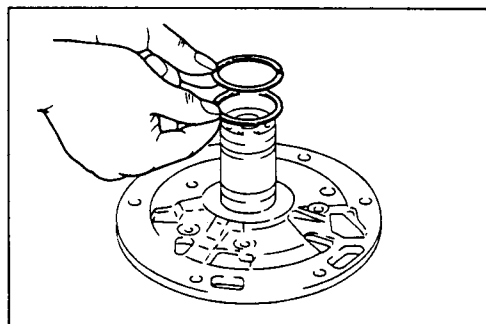
**Use protective plates to prevent damage to the SST.**

9. Mount the OD case on the oil pump.

**SST = SPECIAL SERVICE TOOL**

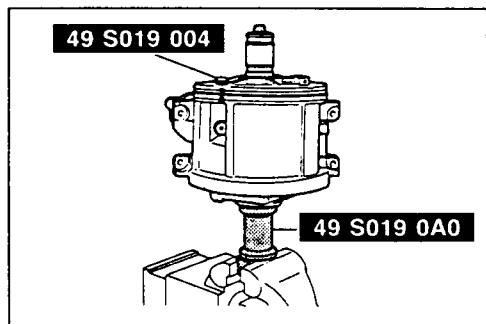


10. Apply ATF to the seal ring and install it onto the OD case.



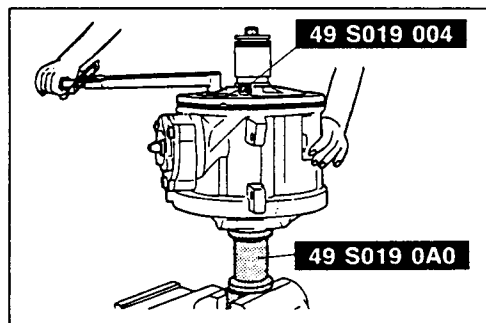
11. Install the one-way valve and steel ball.

12. Apply ATF to the seal rings and install them onto the drum support.



13. Install the drum support on the OD case and align the matching marks.

14. Install the **SST** (pins). **SST = SPECIAL SERVICE TOOL**



15. Tighten the drum support mounting bolts and remove the pins.

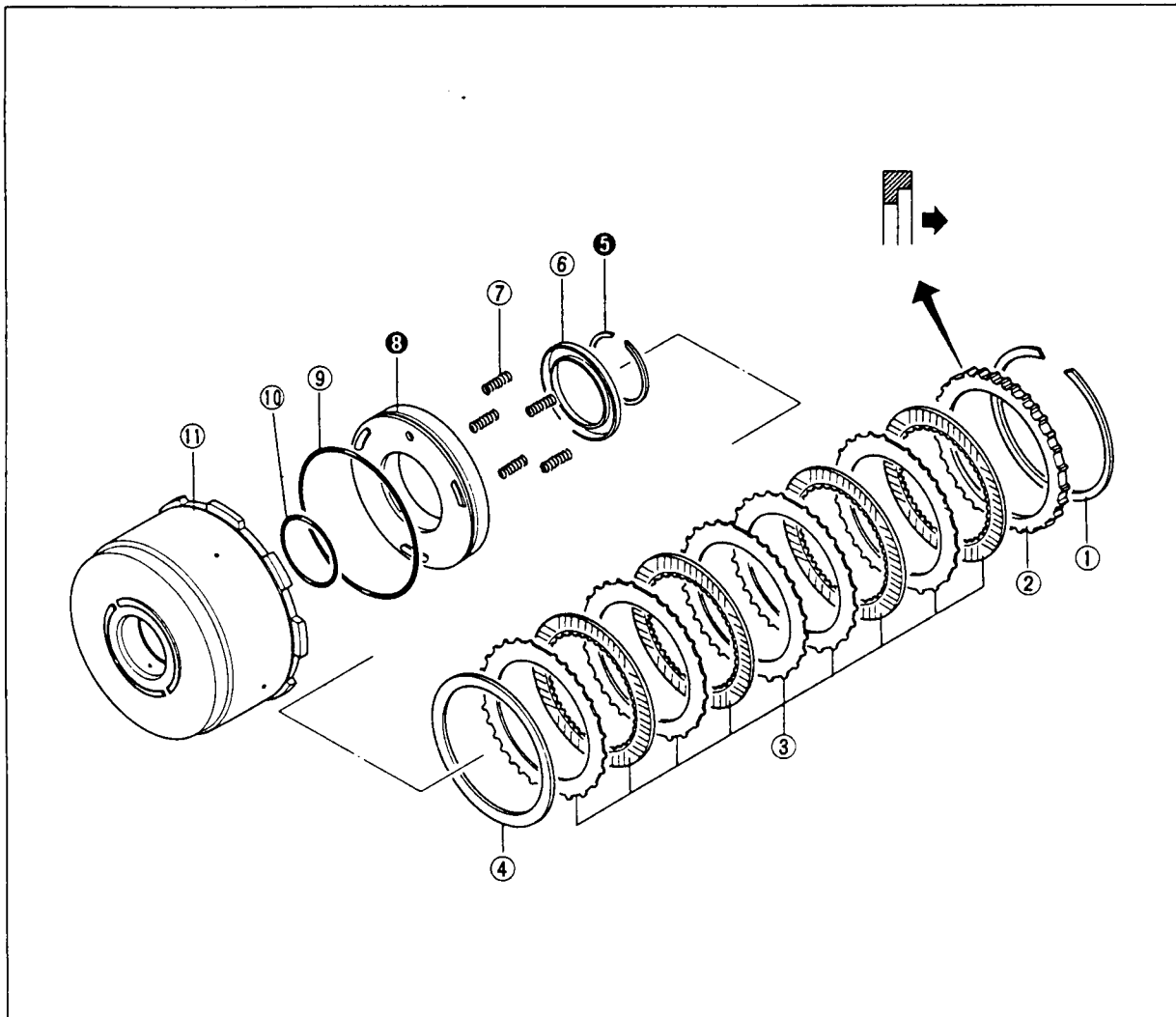
**Tightening torque:**

6.9—8.8 N·m (70—90 cm·kg, 61—78 in·lb)

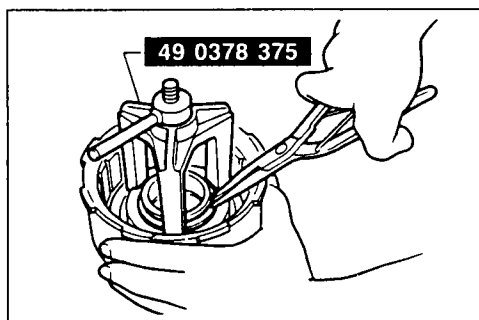
## FRONT CLUTCH

### Disassembly

Disassemble in the sequence shown in the figure referring to **Disassembly note** for the specially marked parts.



- |                                   |                       |
|-----------------------------------|-----------------------|
| 1. Snap ring                      | 7. Spring             |
| 2. Retaining plate                | 8. Piston             |
| 3. Drive plates and driven plates | 9. Seal ring          |
| 4. Dished plate                   | 10. O-ring            |
| 5. Snap ring                      | 11. Front clutch drum |
| 6. Spring retainer                |                       |

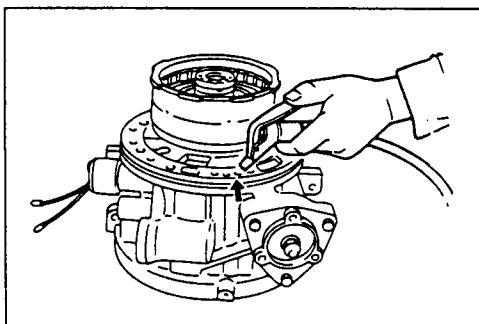


### Disassembly note

#### Snap ring

1. Compress the spring with the **SST**, then remove the snap-ring with snap-ring pliers.
2. Remove the spring retainer and spring.

**SST = SPECIAL SERVICE TOOL**

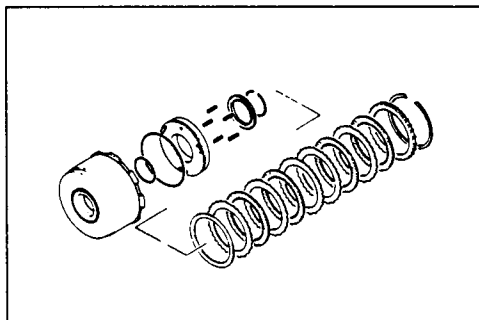


## Piston

1. Set the front clutch drum on the drum support.
2. Remove the piston by applying compressed air to the oil passage.

## Air pressure:

**392 kPa (4.0 kg/cm<sup>2</sup>, 57 psi) max.**



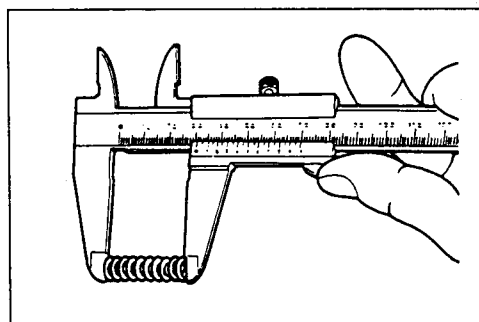
## Inspection

Inspect the following parts and replace if necessary.

1. Damage or wear of drive plate facing
2. Fracture or wear of snap ring
3. Spring retainer deformation
4. Check ball stuck in piston

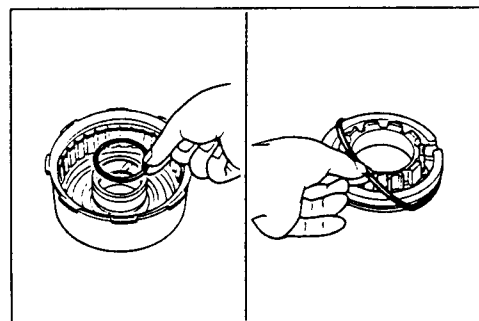
## Note

**Check that the ball is free by shaking the piston.**



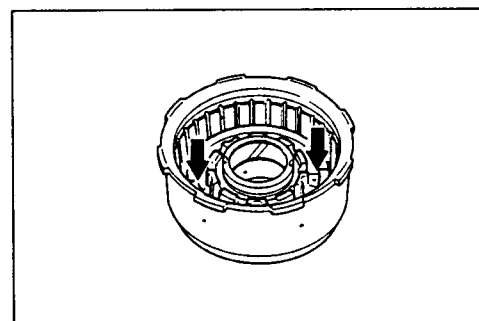
5. Fracture of spring
6. Weakening of return spring tension

**Free spring length: 30.5 mm (1.20 in)**



## Assembly

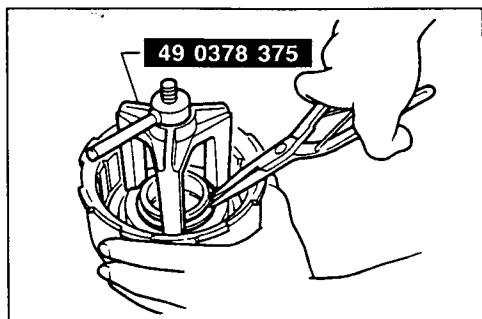
1. Apply ATF to the O-ring and install it in the front clutch drum.
2. Apply ATF to the seal ring and install it onto the piston.



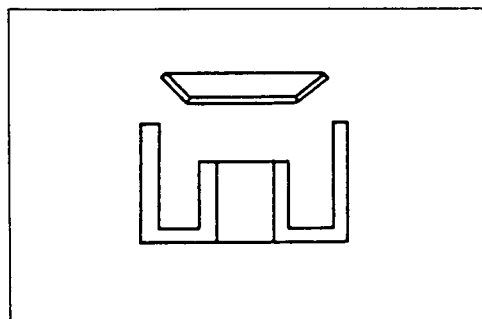
3. Install the piston in the front clutch drum.

## Caution

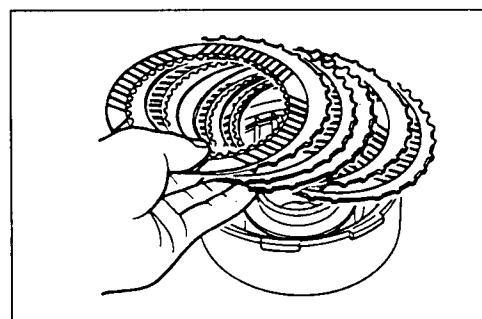
**Apply even pressure to the perimeter of the piston to avoid damaging the seal rings when installing.**



4. Install the springs and spring retainer, then compress them with the **SST**.
5. Install the snap ring. **SST = SPECIAL SERVICE TOOL**

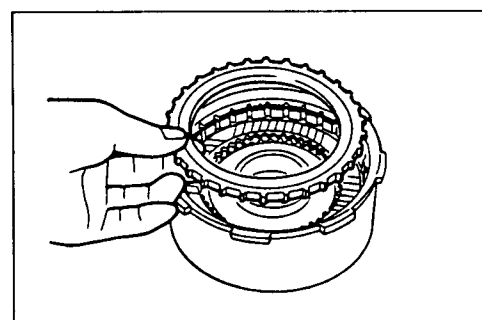


6. Install the dished plate as shown in the figure.

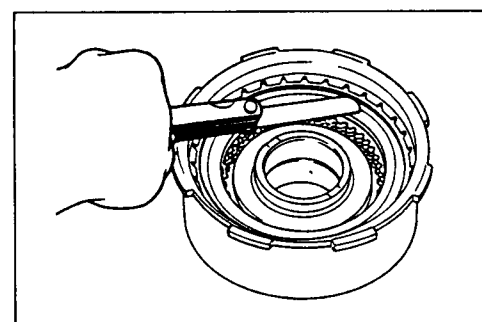


7. Install the driven plates and drive plates.

**Note**  
**Installation order:**  
**Driven-Drive-Driven-Drive-Driven-Driven-Drive-Driven-Drive**



8. Install the retaining plate with the step facing upward.
9. Install the snap ring.



10. Measure the clearance between the retaining plate and snap ring with a feeler gauge. Adjust the clearance by installing the correct retaining plate.

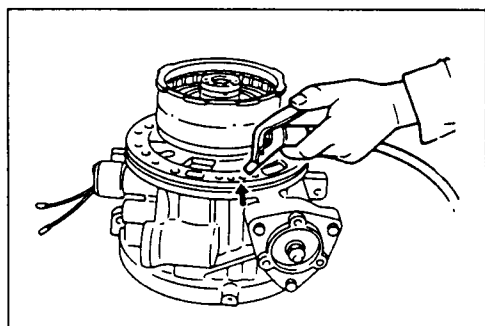
**Clearance: 0.9—1.1 mm (0.035—0.043 in)**

**Retaining plate sizes**

mm (in)

5.0 (0.197)	5.2 (0.205)	5.4 (0.213)
5.6 (0.220)	5.8 (0.228)	6.0 (0.236)
6.2 (0.244)		





11. Set the front clutch on the drum support. Apply compressed air to the oil passage and check the clutch operation.

**Air pressure: 392 kPa (4.0 kg/cm<sup>2</sup>, 57 psi) max.**

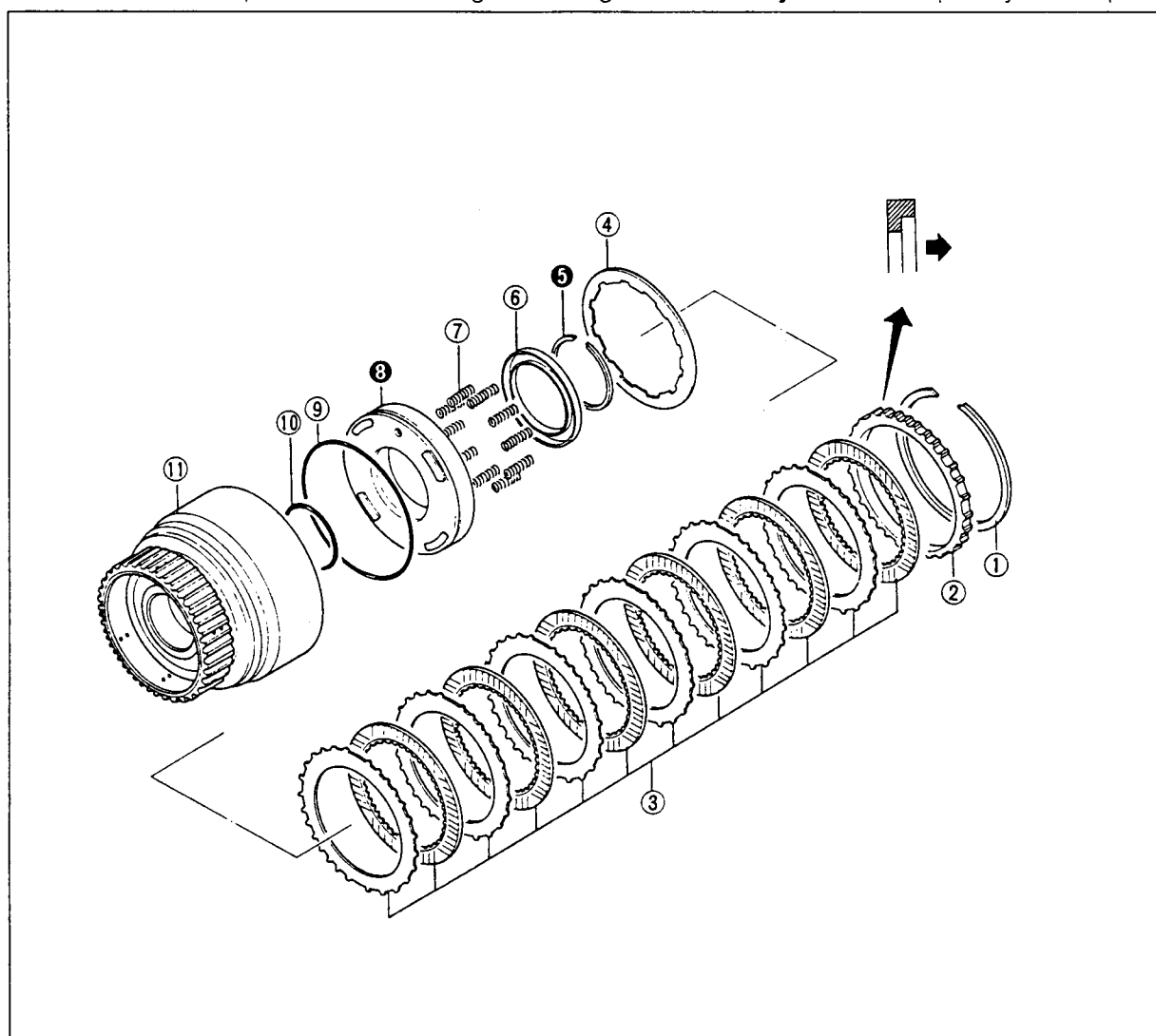
**Caution**

**Apply air for no more than 3 seconds.**

## REAR CLUTCH

### Disassembly

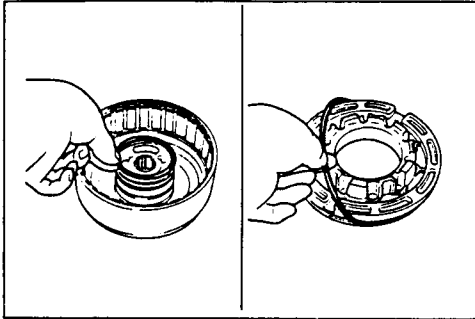
Disassemble in the sequence shown in the figure referring to **Disassembly note** for the specially marked parts.



- 1. Snap ring
- 2. Retaining plate
- 3. Drive plates and driven plates
- 4. Dished plate

- 5. Snap ring
- 6. Spring retainer
- 7. Spring
- 8. Piston

- 9. Seal ring
- 10. O-ring
- 11. Rear clutch drum

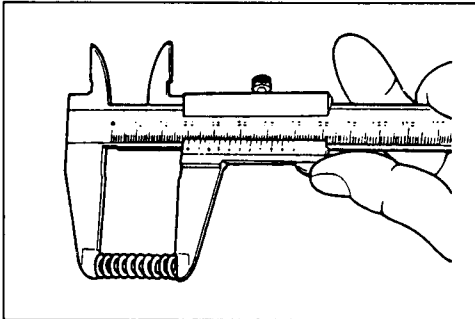


## Disassembly note

### Snap ring

1. Compress the spring with the **SST**, then remove the snap ring with snap-ring pliers.
2. Remove the snap ring retainer and spring.

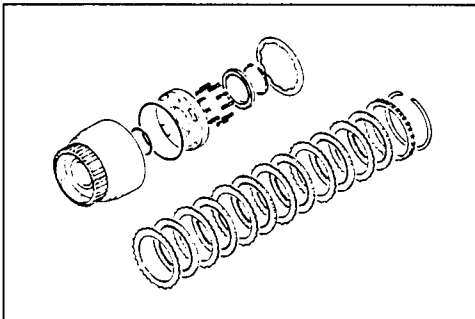
**SST = SPECIAL SERVICE TOOL**



## Piston

1. Set the rear clutch drum on the drum support.
2. Remove the piston by applying compressed air to the oil passage.

**Air pressure: 392 kPa (4.0 kg/cm<sup>2</sup>, 57 psi) max.**



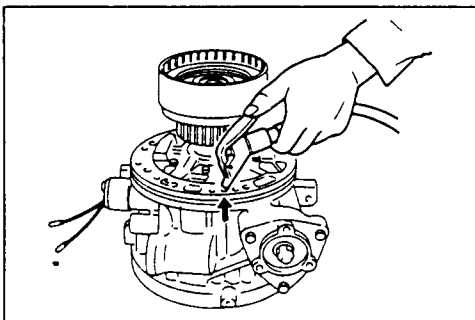
## Inspection

Inspect the following parts and replace if necessary.

1. Damage or wear of drive plate facing
2. Fracture or wear of snap rings
3. Spring retainer deformation
4. Check ball stuck in piston

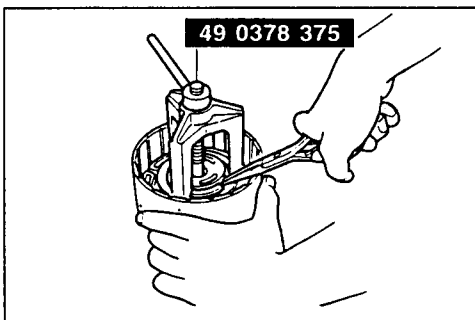
## Note

**Check that the ball is free by shaking the piston.**



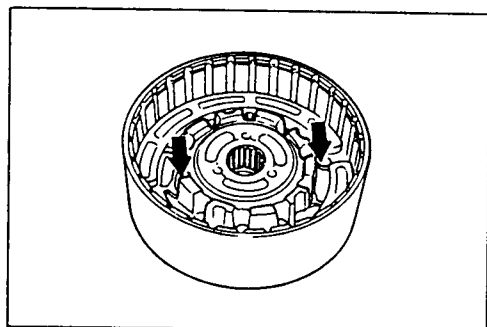
5. Fracture of spring
6. Weakening of return spring tension

**Free spring length: 30.5 mm (1.20 in)**



## Assembly

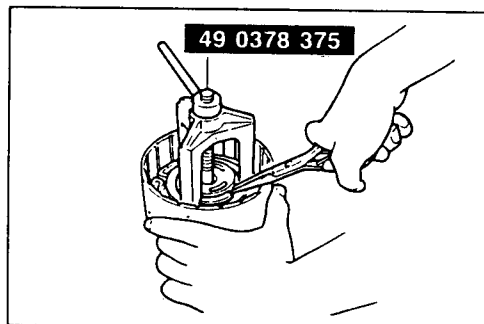
1. Apply ATF to the O-ring and install it in the rear clutch drum.
2. Apply ATF to the seal ring and install it onto the piston.



3. Install the piston in the rear clutch drum.

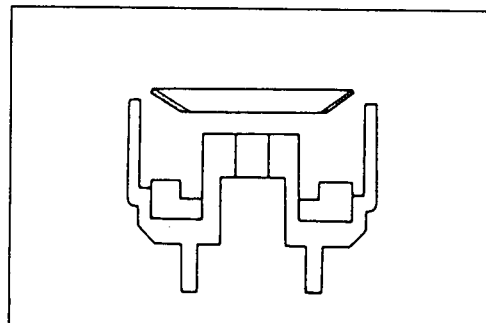
**Caution**

Apply even pressure to the perimeter of the piston to avoid damaging the seal rings when installing.

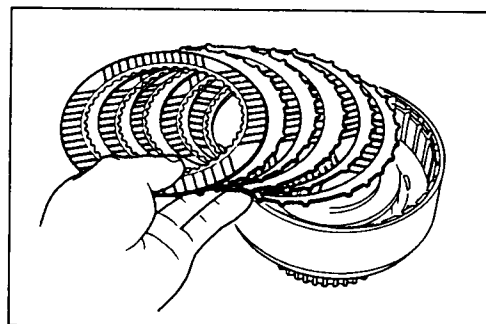


4. Install the springs and spring retainer and compress them with the **SST**.

5. Install the snap ring.



6. Install the dished plate as shown in the figure.

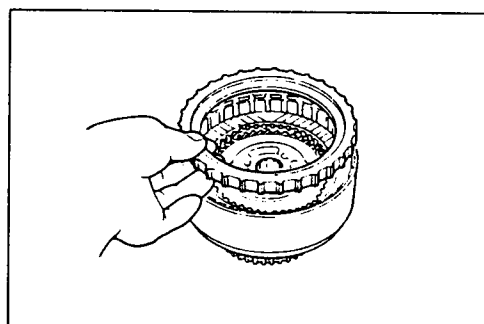


7. Install the driven plates and drive plates.

**Note**

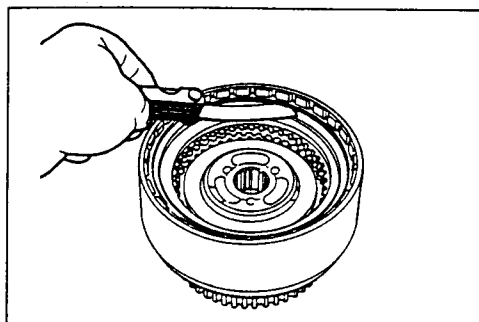
Installation order:

**Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive**



8. Install the retaining plate with the step facing upward.

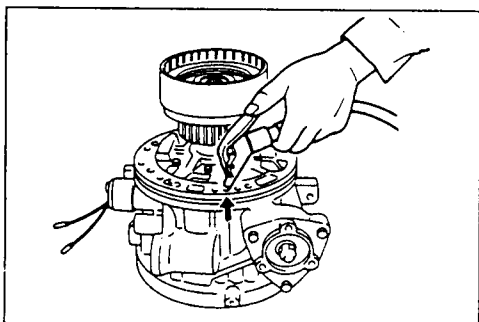
9. Install the snap ring.



10. Measure and adjust the rear clutch clearance. Replace all drive and driven plates if the clearance exceeds specification.

**Clearance:**

**Maximum: 0.8—1.0 mm (0.031—0.039 in)**



11. Set the rear clutch on the drum support. Apply compressed air to the oil passage and check the clutch operation.

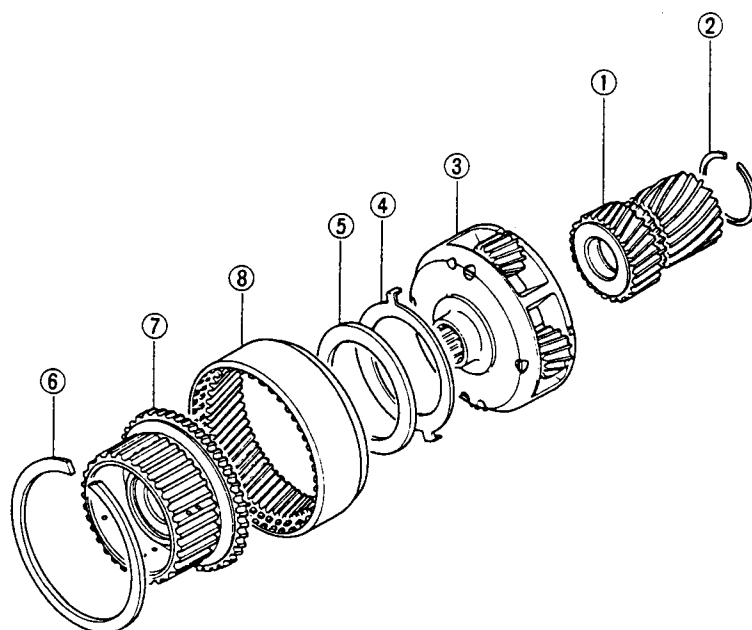
**Air pressure: 392 kPa (4.0 kg/cm<sup>2</sup>, 57 psi) max.**

**Caution**

**Apply air for no more than 3 seconds.**

## FRONT PLANETARY GEAR UNIT (REAR CLUTCH HUB, FRONT PLANETARY PINION CARRIER) Disassembly

Disassemble in the sequence shown in the figure.

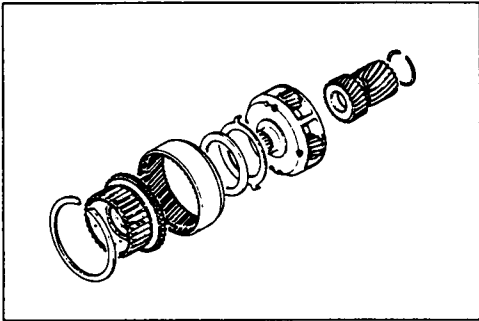


1. Sun gear
2. Snap ring
3. Front planetary pinion carrier
4. Bearing race

5. Bearing
6. Snap ring
7. Rear clutch hub
8. Internal gear



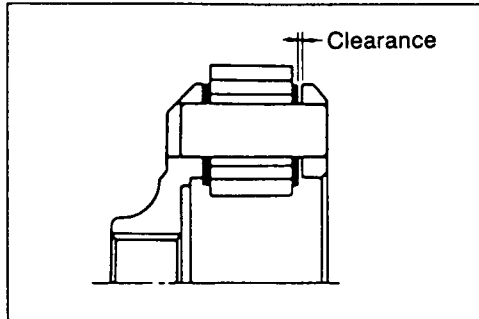
## Technical Service Information



### Inspection

Inspect the following parts and replace if necessary.

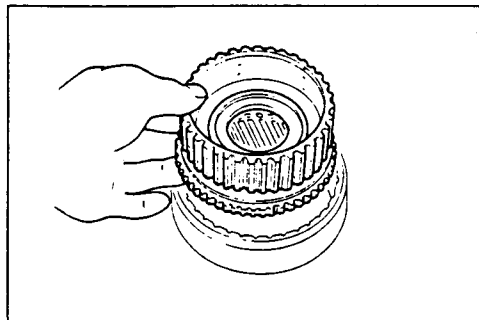
1. Fracture or wear of snap ring
2. Wear of individual gears
3. Rotation of front carrier pinion gear
4. Rotation and damage or wear of bearing



5. Clearance between pinion washer and planetary pinion carrier

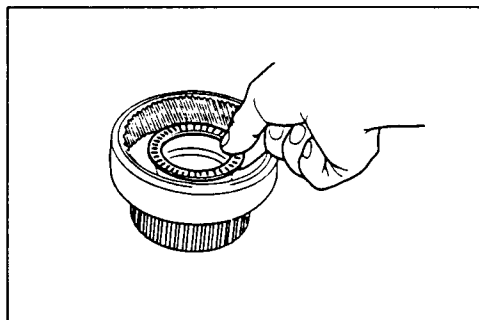
**Standard clearance: 0.2—0.7 mm (0.008—0.028 in)**

**Maximum: 0.8 mm (0.031 in)**



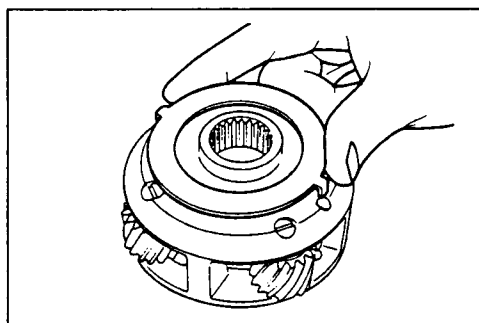
### Assembly

1. Install the rear clutch hub in the internal gear.
2. Install the snap ring.



3. Install the bearing.

**Bearing outer diameter: 69.9 mm (2.75 in)**

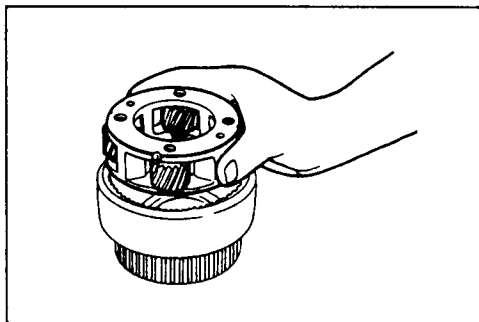


4. Install the bearing race on the front planetary pinion carrier.

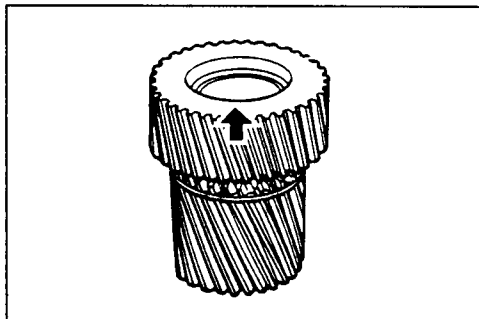
**Bearing race outer diameter: 70.0 mm (2.76 in)**

### Note

**Affix the bearing race with petroleum jelly.**



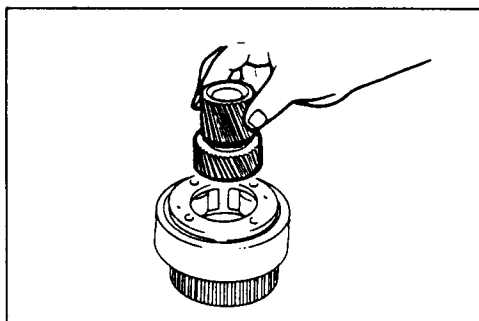
5. Install the front planetary pinion carrier in the internal gear.



6. Install the snap ring on the sun gear.

**Note**

**Pay close attention to the front and rear direction of the sun gear. The grooved side (arrow) is the front.**

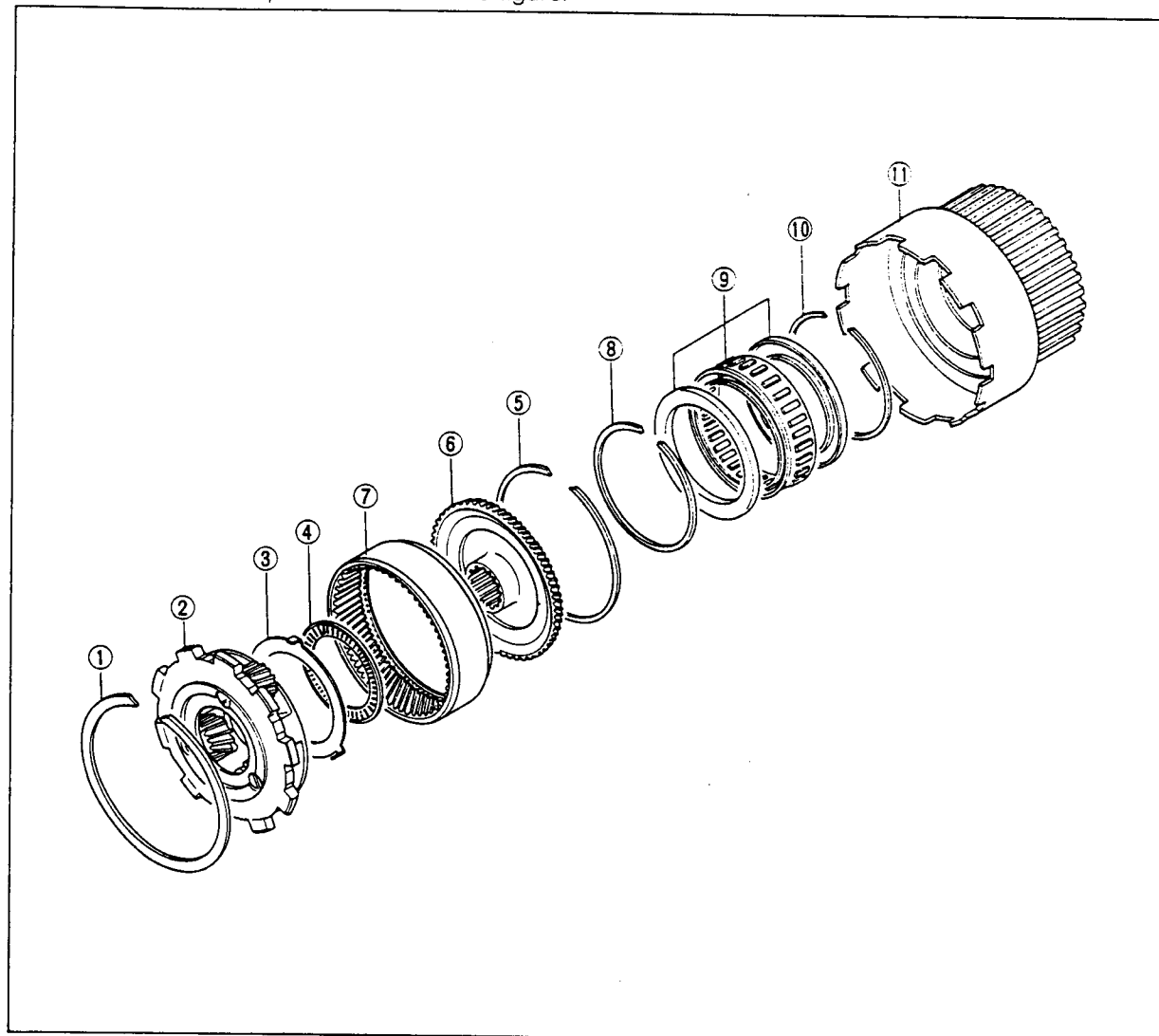


7. Install the sun gear in the front planetary pinion carrier.

## REAR PLANETARY GEAR UNIT (CONNECTING DRUM, REAR PLANETARY PINION CARRIER, ONE-WAY CLUTCH)

### Disassembly

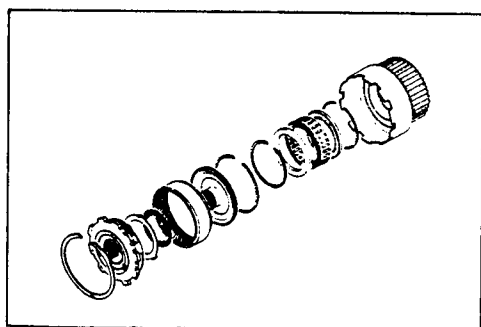
Disassemble in the sequence shown in the figure.



- 1. Snap ring
- 2. Rear planetary pinion carrier
- 3. Bearing race
- 4. Bearing

- 5. Snap ring
- 6. Drive flange
- 7. Internal gear
- 8. Snap ring

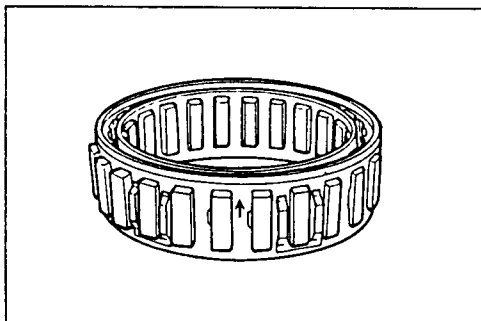
- 9. One-way clutch
- 10. Snap ring
- 11. Connecting drum



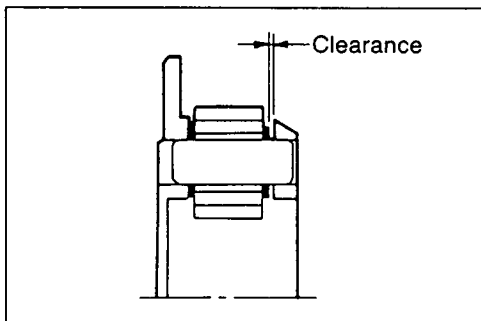
### Inspection

Inspect the following parts and replace if necessary.

- 1. Fracture or wear of snap ring
- 2. Damage or wear of individual gears
- 3. Rotation and damage or wear of bearing

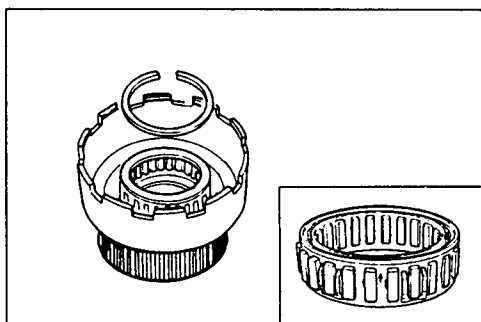


4. Wear of one-way clutch



5. Clearance between pinion washer and planetary pinion carrier

**Standard clearance: 0.2—0.7 mm (0.008—0.028 in)**  
**Maximum: 0.8 mm (0.031 in)**

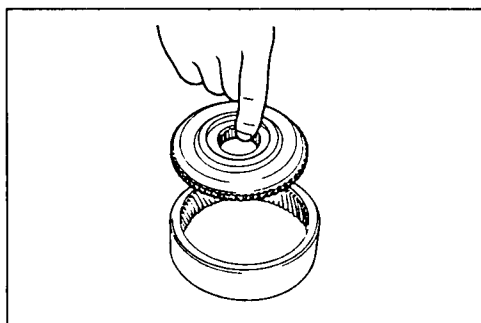


## Assembly

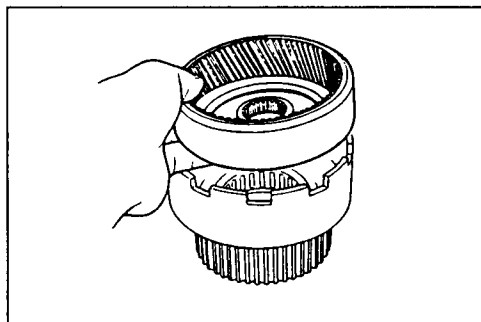
1. Install the snap ring in the connecting drum.
2. Install the one-way clutch and snap ring.

## Caution

**Install the side indicated by an arrow in the figure toward the front when inserting the one-way clutch into the one-way clutch outer race.**



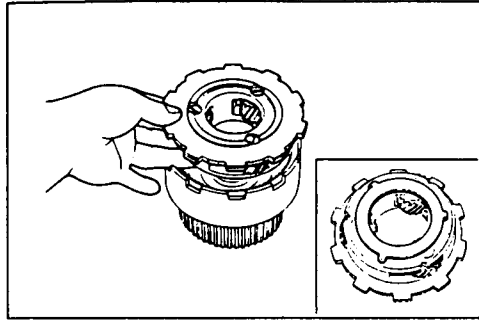
3. Install the drive flange in the internal gear.
4. Install the snap ring.



5. Install the internal gear and drive flange in the connecting drum.
6. Install the bearing.

**Bearing outer diameter: 69.9 mm (2.75 in)**





7. Install the bearing race in the rear planetary pinion carrier.

**Bearing race outer diameter: 70.0 mm (2.76 in)**

**Note**

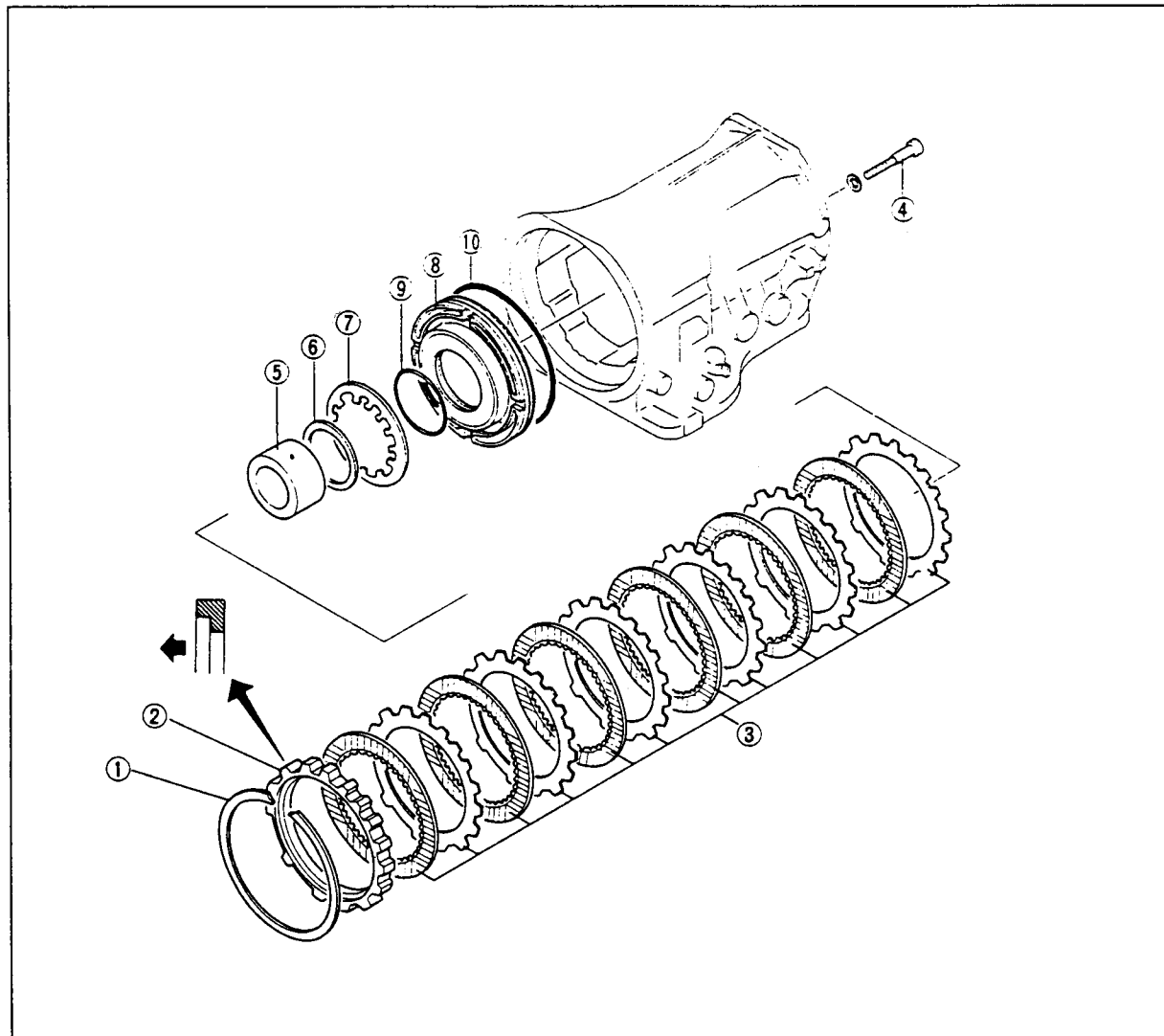
**Affix the bearing with petroleum jelly.**

8. Install the rear planetary pinion carrier in the connecting drum.

9. Install the snap ring.

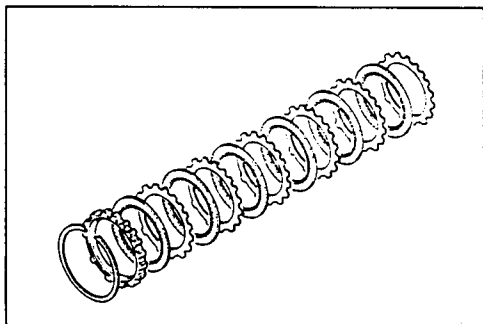
**10. WHEN THE CONNECTING DRUM IS INSTALLED IN THE CASE, THE DRUM MUST TURN CLOCKWISE AND LOCK COUNTER CLOCKWISE**

## LOW AND REVERSE BRAKE Components



1. Snap ring
2. Retaining plate
3. Drive plates and driven plates
4. Allen head bolt
5. One-way clutch inner race

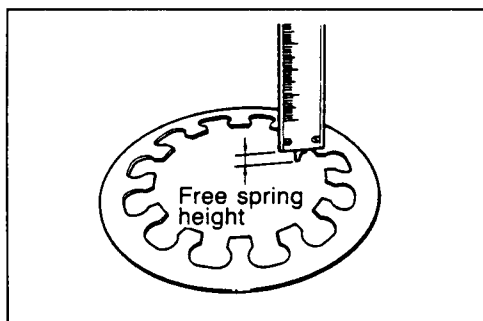
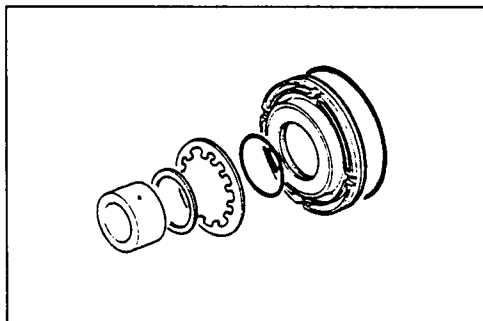
6. Thrust washer
7. Return spring
8. Low and reverse brake piston
9. O-ring
10. Seal ring



## Inspection

Inspect the following parts and replace if necessary.

1. Damage or wear of drive plate facing
2. Damage of driven plate
3. Fracture or wear of snap ring
4. Wear of one-way clutch inner race
5. Damage to thrust washer
6. Damage or wear of low and reverse brake piston or seal rings
7. Weakening of return spring tension

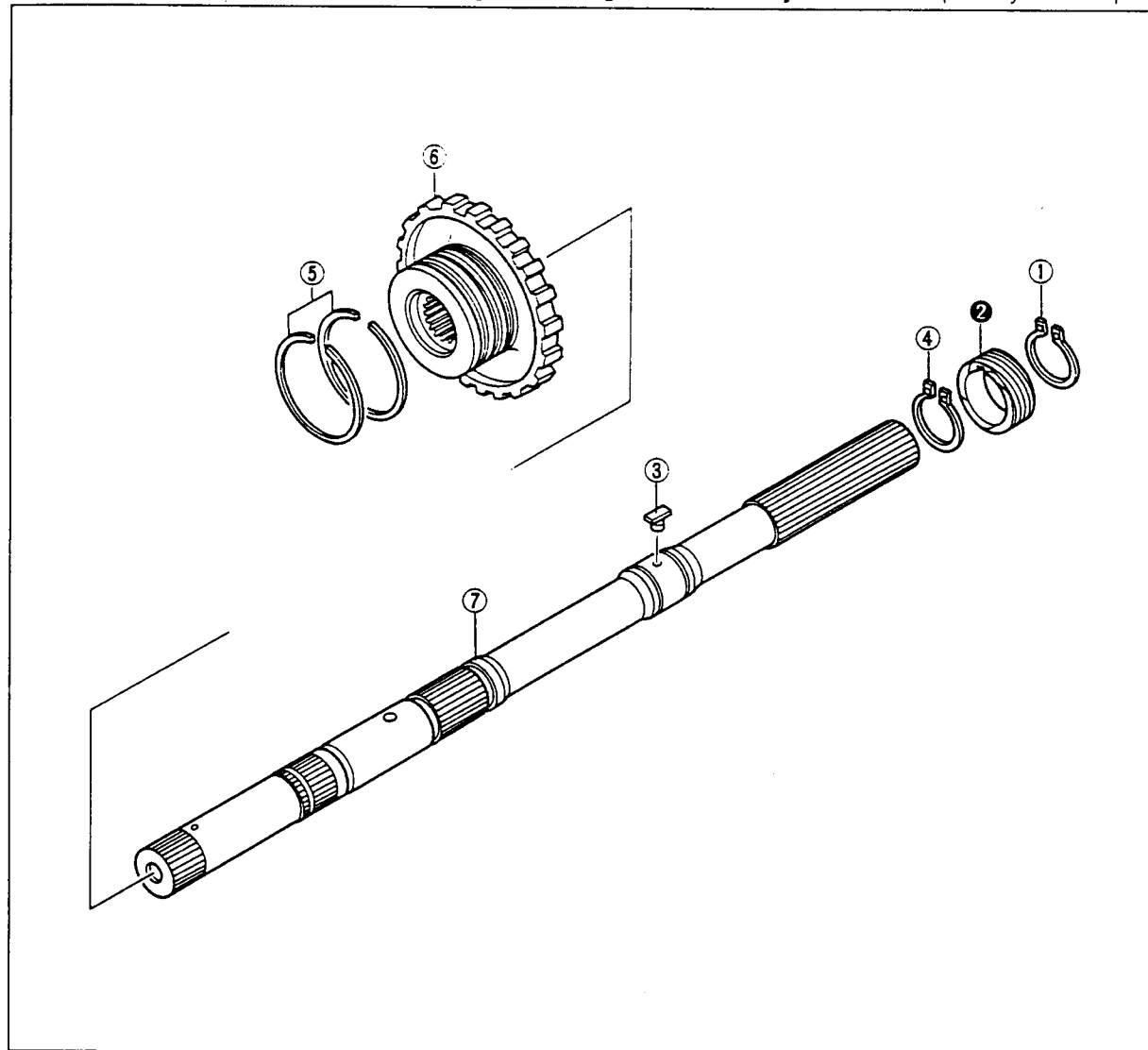


**Free spring height: 5.3—6.2 mm (0.209—0.244 in)**

## OUTPUT SHAFT, OIL DISTRIBUTOR

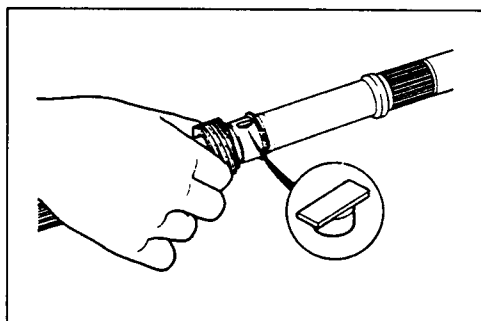
### Disassembly

Disassemble in the sequence shown in the figure referring to **Disassembly note** for the specially marked part.



1. Snap ring
2. Speedometer drive gear
3. Key
4. Snap ring

5. Seal ring
6. Oil distributor
7. Output shaft



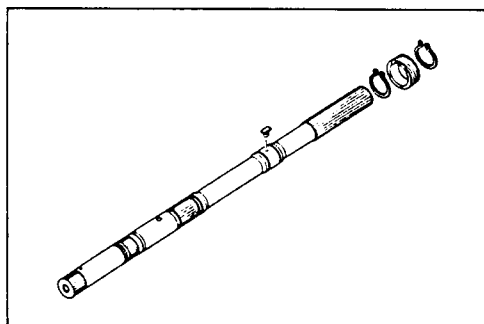
### Disassembly note

#### Speedometer drive gear

Remove the speedometer drive gear.

### Note

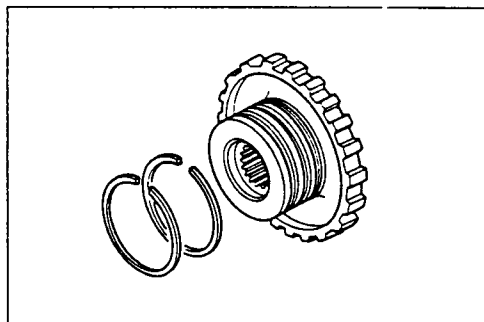
Be careful not to lose the key.



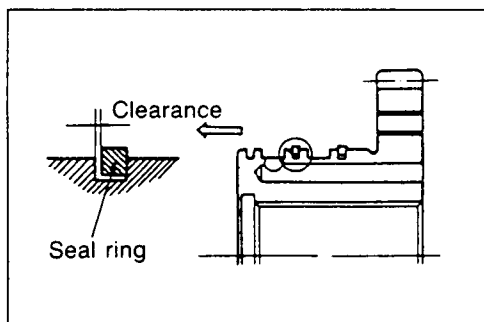
## Inspection

Inspect the following parts and replace if necessary.

1. Bend or wear of output shaft
2. Damage or wear of speedometer drive gear
3. Damage or wear of key



4. Damage or wear of oil distributor
5. Damage to seal rings



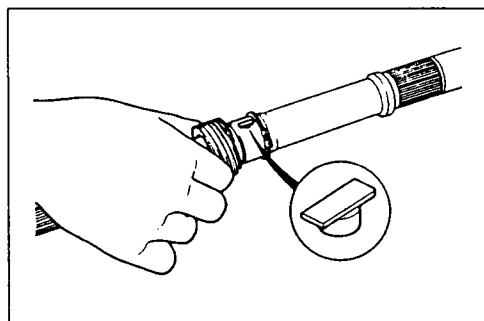
6. Clearance between seal rings and seal ring grooves

## Standard clearance:

0.04—0.16 mm (0.0016—0.0063 in)

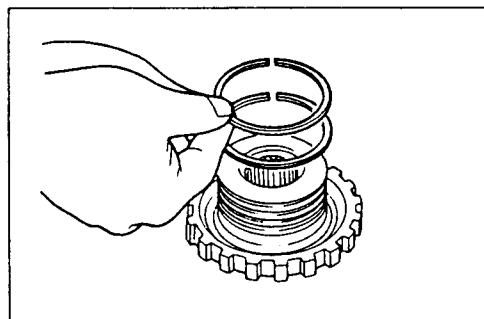
Maximum: 0.40 mm (0.0157 in)

7. Damage to seal ring



## Assembly

1. Install the snap ring.
2. Install the key and speedometer drive gear.
3. Install the snap ring.

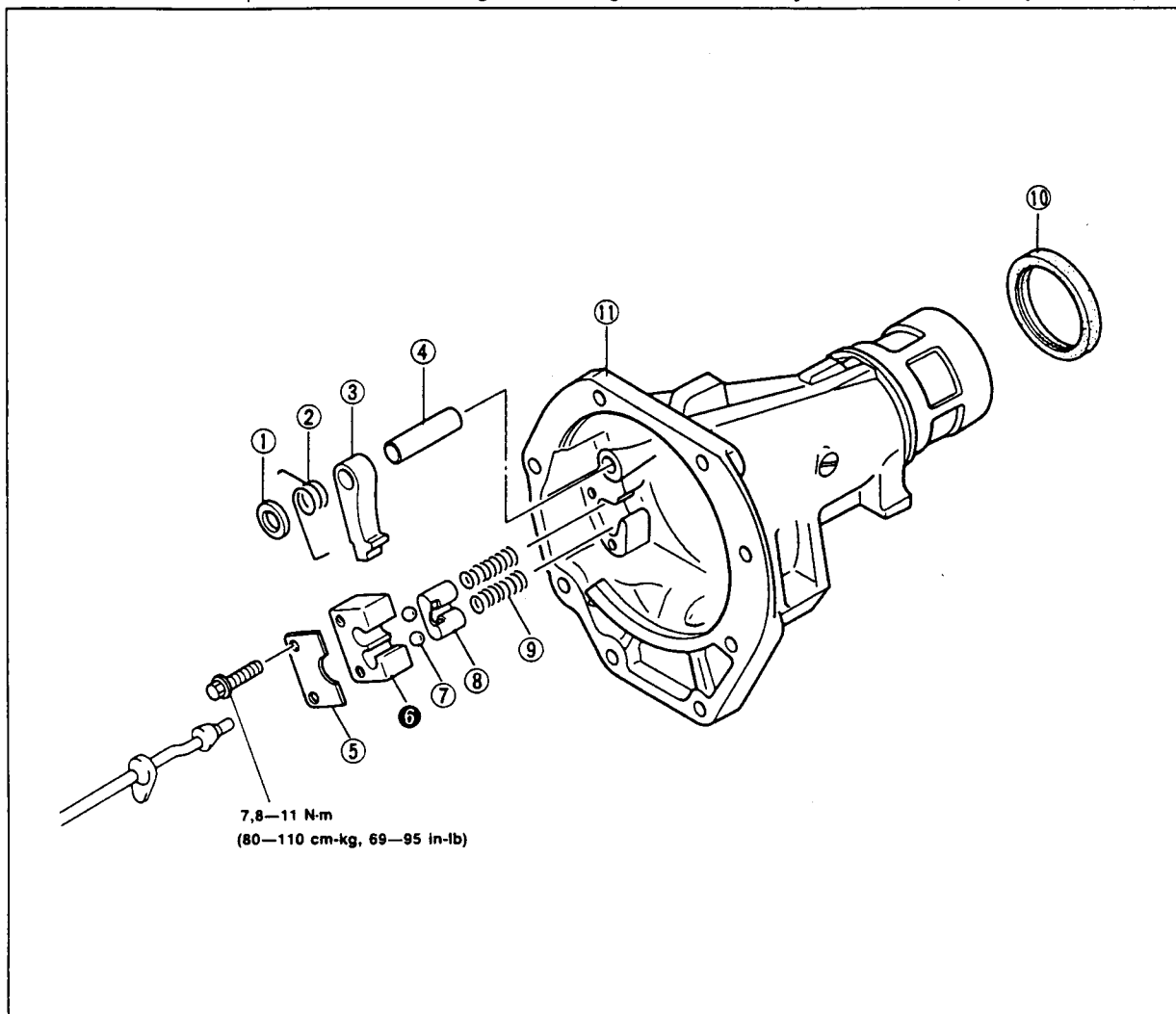


4. Apply ATF to the seal rings and install them onto the oil distributor.

## EXTENSION HOUSING

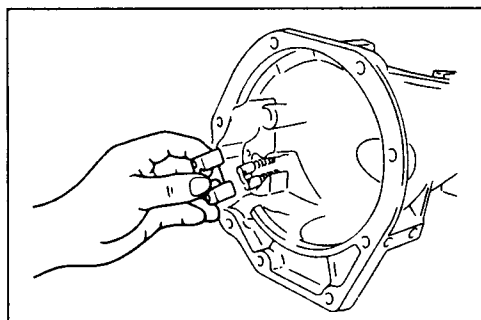
### Disassembly

Disassemble in the sequence shown in the figure referring to **Disassembly note** for the specially marked part.



1. Dowel spacer
2. Return spring
3. Parking pawl
4. Pawl shaft
5. Retaining plate

6. Actuator support
7. Steel ball
8. Retainer
9. Spring
10. Oil seal
11. Housing



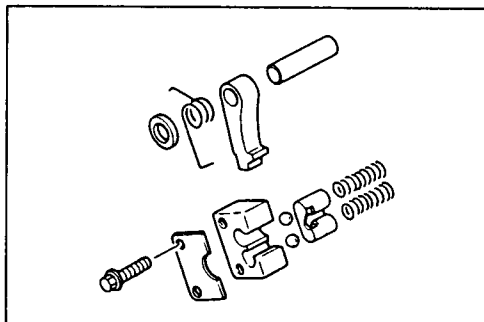
### Disassembly note

#### Actuator support

Remove the actuator support and steel ball.

### Note

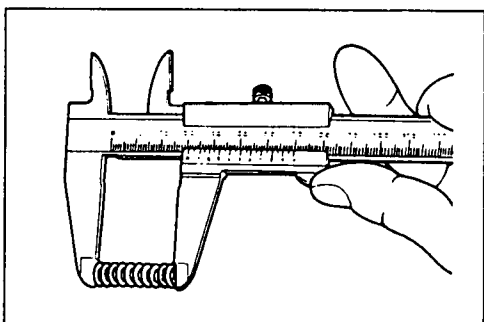
Remove the actuator support slowly because the steel ball may pop out.



## Inspection

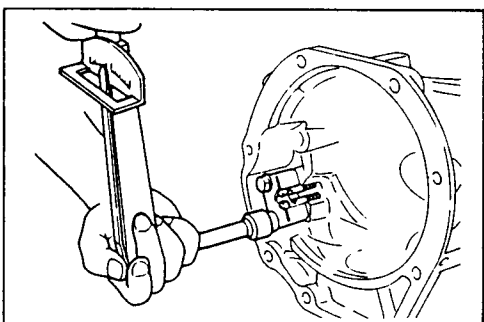
Inspect the following parts and replace if necessary.

1. Damage or wear of parking pawl
2. Damage or wear of pawl shaft
3. Damage or wear of actuator support
4. Damage to steel ball



5. Fracture of spring
6. Weakening of spring tension

**Free spring length: 32.0 mm (1.26 in)**

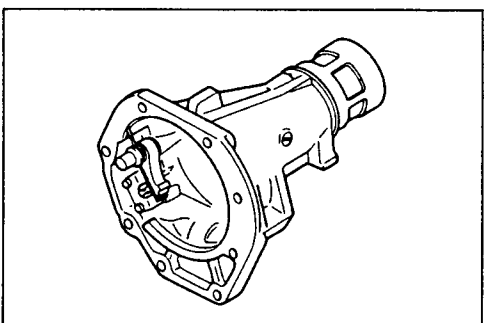


## Assembly

1. Install a new oil seal in the housing.
2. Install the spring and retainer.
3. Install the steel ball and actuator support.
4. Tighten the retaining plate mounting bolts.

### Tightening torque:

**7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)**

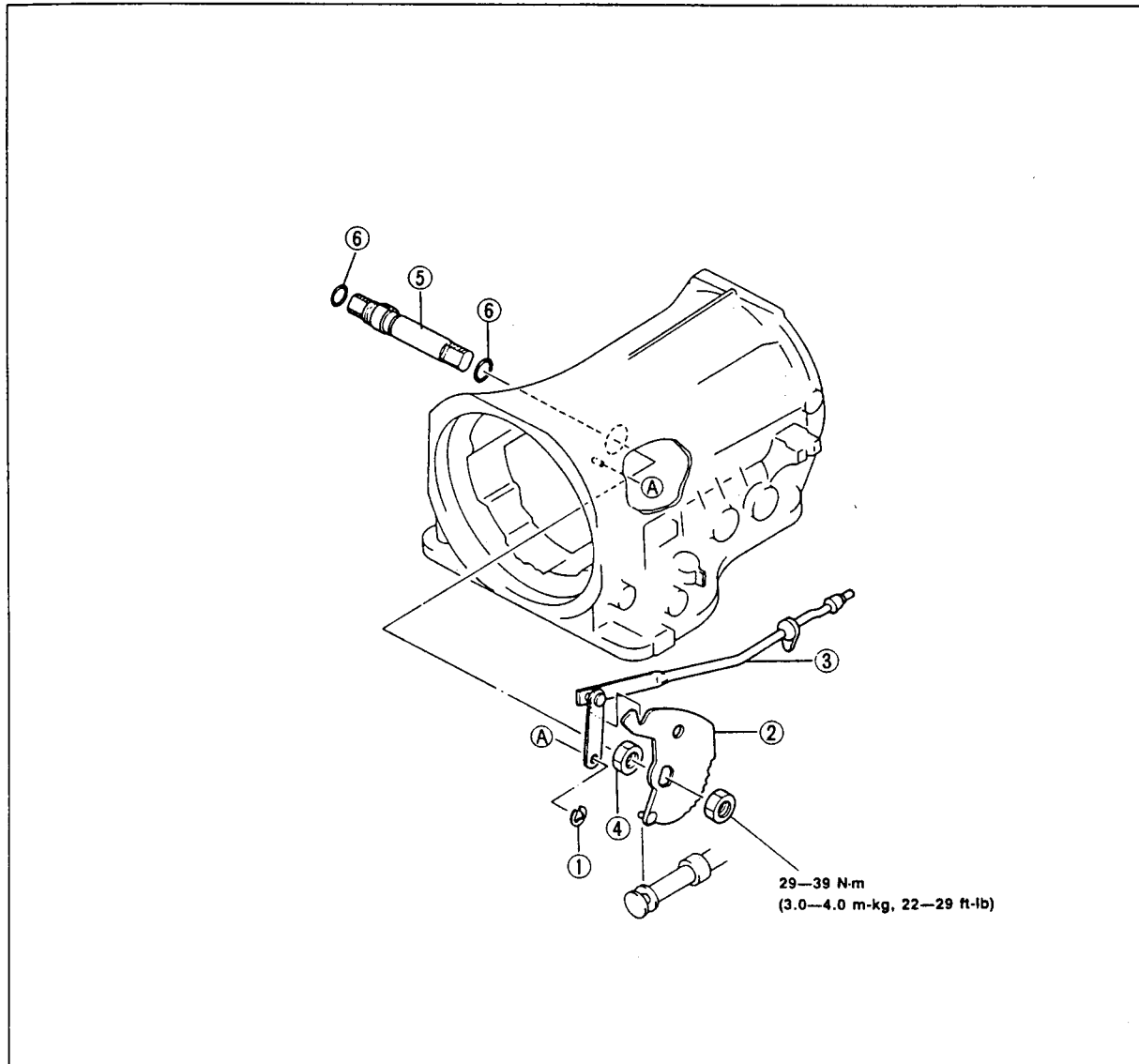


5. Install the pawl shaft.
6. Install the parking pawl and return spring.
7. Install the dowel spacer.

## TRANSMISSION CASE

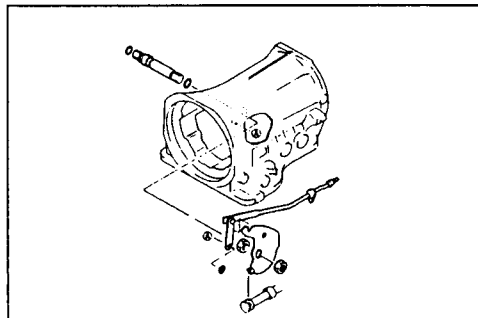
### Disassembly

Disassemble in the sequence shown in the figure.



1. Retaining ring
2. Manual plate
3. Parking rod

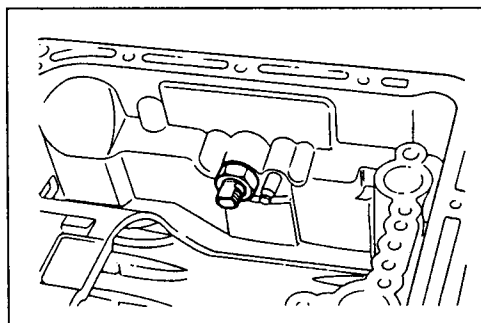
4. Spacer
5. Manual shaft
6. O-ring



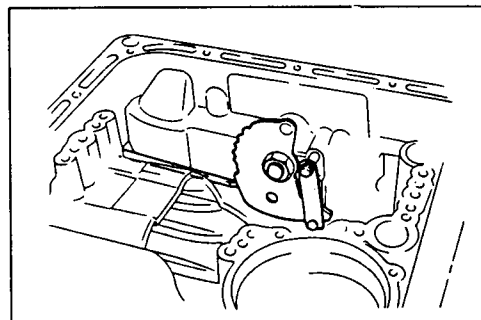
### Inspection

Inspect the following parts and replace if necessary.

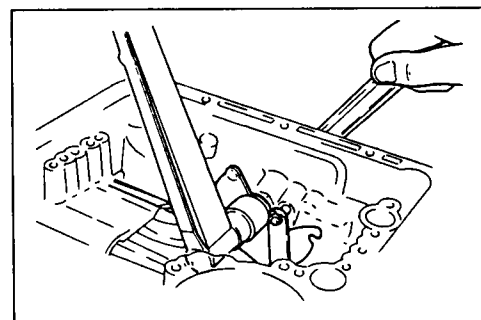
1. Damage or wear of parking rod
2. Damage or wear of manual plate
3. Damage or wear of manual rod

**Assembly**

1. Apply ATF to the O-rings and install them onto the manual shaft.
2. Install the manual shaft and spacer.



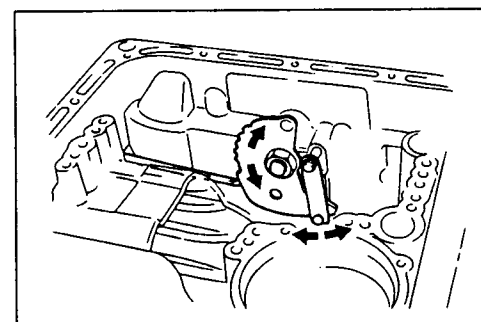
3. Install the parking rod and retaining ring.
4. Install the manual plate on the manual shaft.
5. Loosely tighten the locknut.



6. Tighten the locknut.

**Tightening torque:**

29—39 N·m (3.0—4.0 m·kg, 22—29 ft·lb)



7. Check the parking mechanism operation.



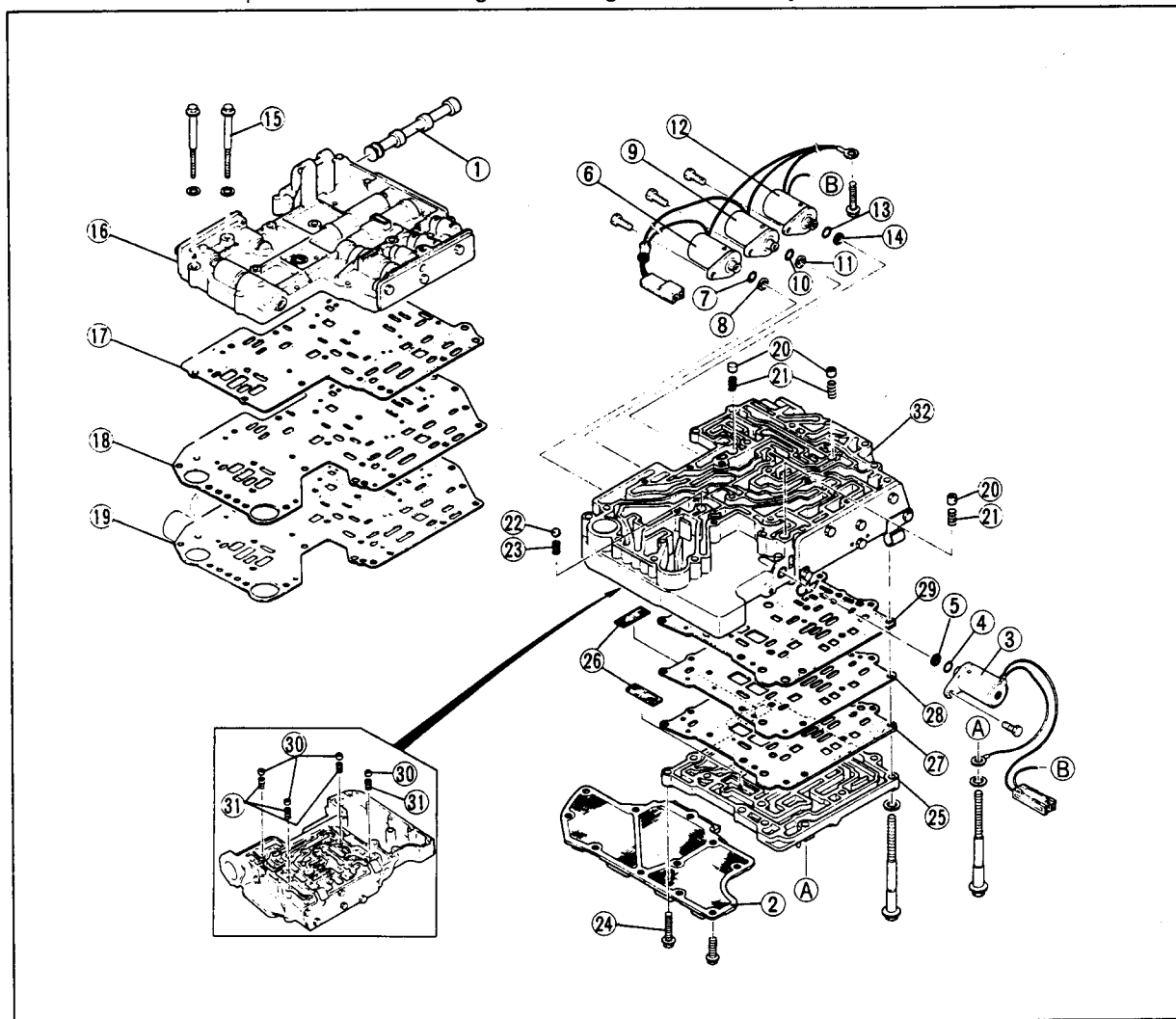
## CONTROL VALVE

### Precaution

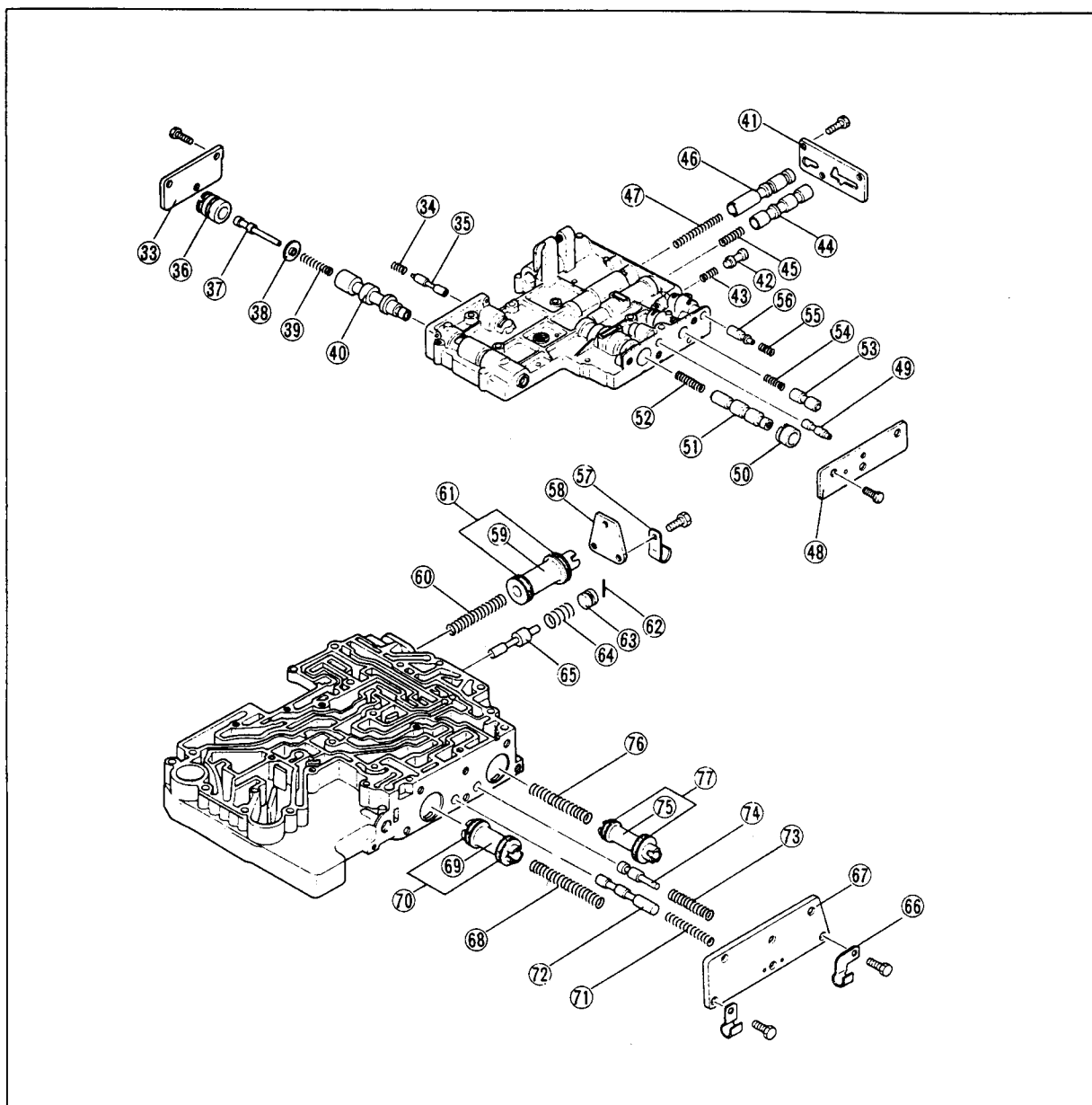
1. Pay close attention when handling the control valve because it consists of the most precise and delicate parts of the transmission.
2. Neatly arrange the removed parts in order to avoid mixing up similar parts.
3. Disassemble the control valve assembly and thoroughly clean it when the clutch and/or brake bands are burned and/or when the ATF is degenerated.

### Disassembly

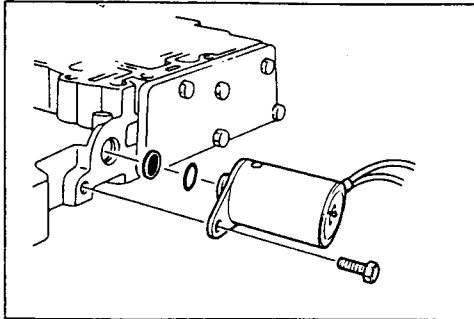
Disassemble in the sequence shown in the figure referring to **Disassembly note** for the specially marked parts.



- |                               |                              |                         |
|-------------------------------|------------------------------|-------------------------|
| 1. Manual valve               | 12. 3-4 shift solenoid valve | 23. Spring              |
| 2. Oil strainer               | 13. O-ring                   | 24. Bolt                |
| 3. 3-2 control solenoid valve | 14. Oil strainer             | 25. Valve body cover    |
| 4. O-ring                     | 15. Bolt                     | 26. Inner strainer      |
| 5. Oil strainer               | 16. Upper valve body         | 27. Cover gasket        |
| 6. 1-2 shift solenoid valve   | 17. Upper gasket             | 28. Separate plate      |
| 7. O-ring                     | 18. Separate plate           | 29. Lower gasket        |
| 8. Oil strainer               | 19. Lower gasket             | 30. Orifice check valve |
| 9. 2-3 shift solenoid valve   | 20. Orifice check valve      | 31. Spring              |
| 10. O-ring                    | 21. Spring                   | 32. Lower valve body    |
| 11. Oil strainer              | 22. Throttle relief ball     |                         |



- |                               |                            |                                |
|-------------------------------|----------------------------|--------------------------------|
| 33. Side plate                | 48. Side plate             | 63. Stopper plug               |
| 34. N-R reducing spring       | 49. Vacuum throttle valve  | 64. 1-2 reducing spring        |
| 35. N-R reducing valve        | 50. 3-4 shift sleeve       | 65. 1-2 reducing valve         |
| 36. Pressure regulator sleeve | 51. 3-4 shift valve        | 66. Clip                       |
| 37. Pressure regulator plug   | 52. 3-4 shift spring       | 67. Side plate                 |
| 38. Spring seat               | 53. Backup control valve   | 68. 1-2 accumulator spring     |
| 39. Pressure regulator spring | 54. Backup control spring  | 69. 1-2 accumulator piston     |
| 40. Pressure regulator valve  | 55. Throttle backup spring | 70. Seal ring                  |
| 41. Side plate                | 56. Throttle backup valve  | 71. 3-2 control spring         |
| 42. Pressure modifier valve   | 57. Clip                   | 72. 3-2 control valve          |
| 43. Pressure modifier spring  | 58. Side plate             | 73. Throttle relief spring     |
| 44. 1-2 shift valve           | 59. N-D accumulator piston | 74. Throttle relief valve      |
| 45. 1-2 shift spring          | 60. N-D accumulator spring | 75. N-R/2-3 accumulator piston |
| 46. 2-3 shift valve           | 61. Seal ring              | 76. N-R/2-3 accumulator spring |
| 47. 2-3 shift spring          | 62. Roll pin               | 77. Seal ring                  |



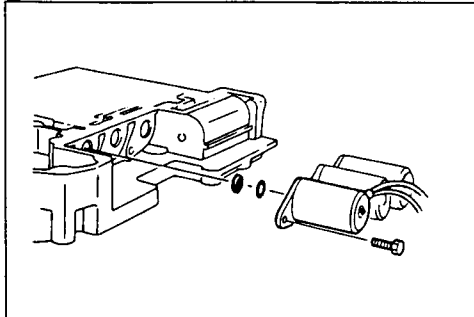
## Disassembly note

### 3-2 control solenoid valve

1. Remove the 3-2 control solenoid valve.
2. Remove the oil strainer and O-ring.

#### Note

Be careful not to lose the oil strainer.

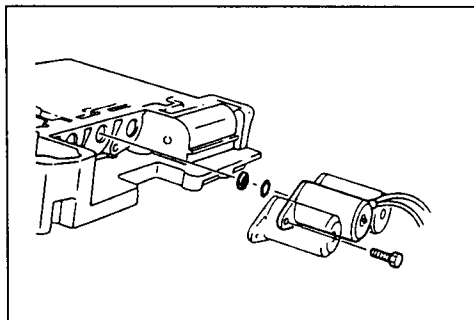


### 1-2 shift solenoid valve

1. Remove the 1-2 shift solenoid valve.
2. Remove the oil strainer and O-ring.

#### Note

Be careful not to lose the oil strainer.

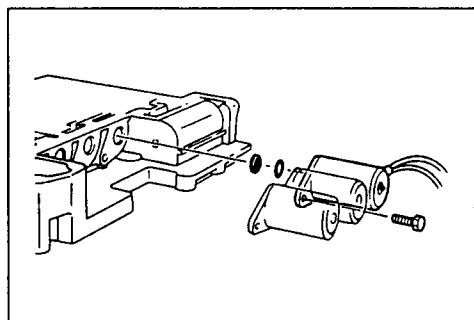


### 2-3 shift solenoid valve

1. Remove the 2-3 shift solenoid valve.
2. Remove the oil strainer and O-ring.

#### Note

Be careful not to lose the oil strainer.

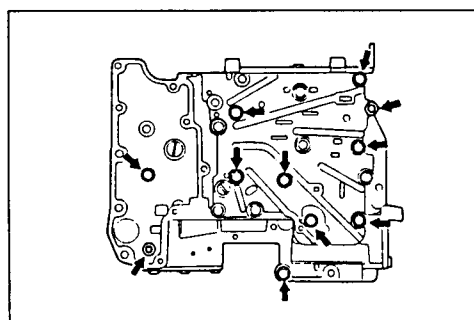


### 3-4 shift solenoid valve

1. Remove the 3-4 shift solenoid valve.
2. Remove the oil strainer and O-ring.

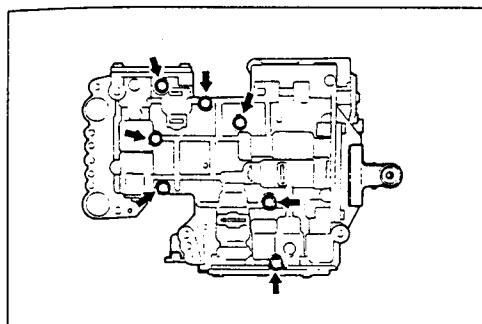
#### Note

Be careful not to lose the oil strainer.

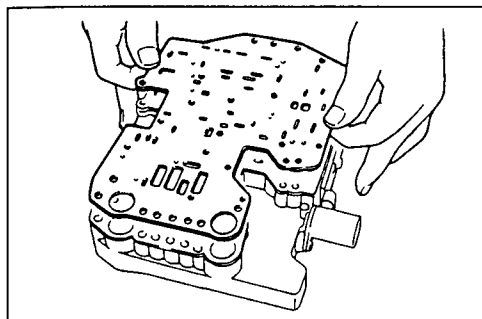


### Upper valve body

1. Remove the bolts and nuts shown in the figure.



2. Hold the lower valve body and separate plate together with a large clip.
3. Remove the upper valve body.

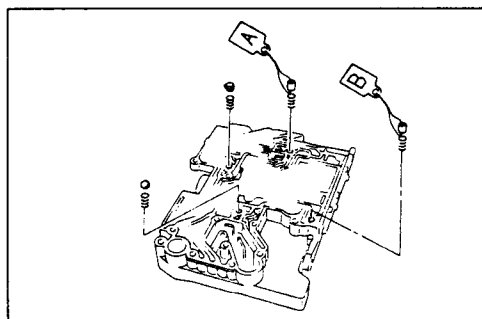


## Separate plate

1. Remove the clip.
2. Remove the separate plate and lower gasket.

### Caution

Remove the separate plate and lower gasket gently to avoid losing the orifice check valves and springs and the throttle relief ball and spring in the valve body.

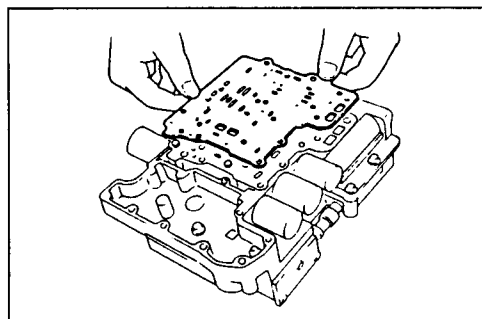


## Orifice check valve, Throttle relief ball, Spring

Remove the orifice check valves, throttle relief ball, and springs.

### Note

Tag the orifice check valves as shown for proper reassembly.

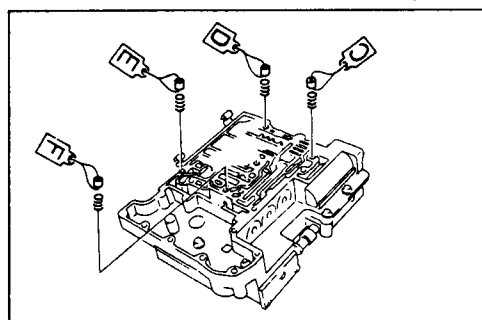


## Separate plate

Remove the separate plate and lower gasket.

### Caution

Remove the separate plate and lower gasket gently to avoid losing the orifice check valves and springs in the valve body.

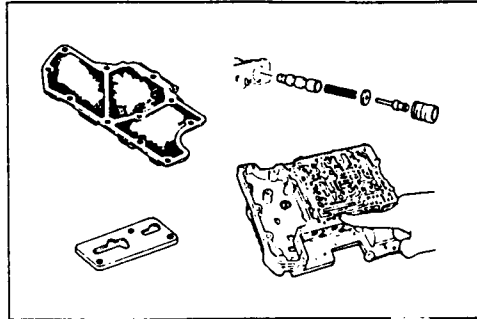


## Orifice check valve, Spring

Remove the orifice check valves and springs.

### Note

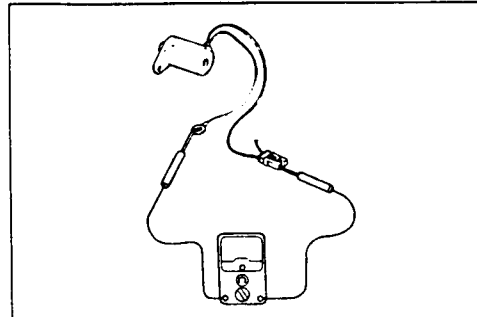
Tag the orifice check valves as shown for proper reassembly.



## Inspection

Inspect the following parts and replace if necessary.

1. Damage or wear of individual valves
2. Damage to oil passages
3. Cracks or damage of valve body
4. Operation of individual valves
5. Damage or wear of side plate
6. Damage of oil strainer

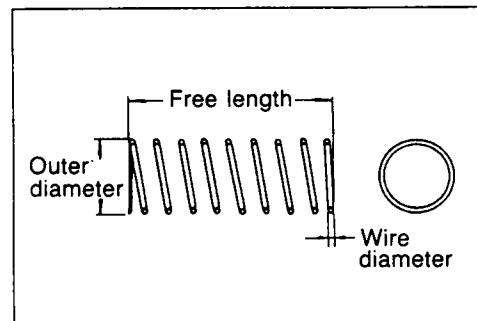


7. Check resistance of each solenoid valve with an ohmmeter.

## Resistance

**Lockup: 13—25Ω**

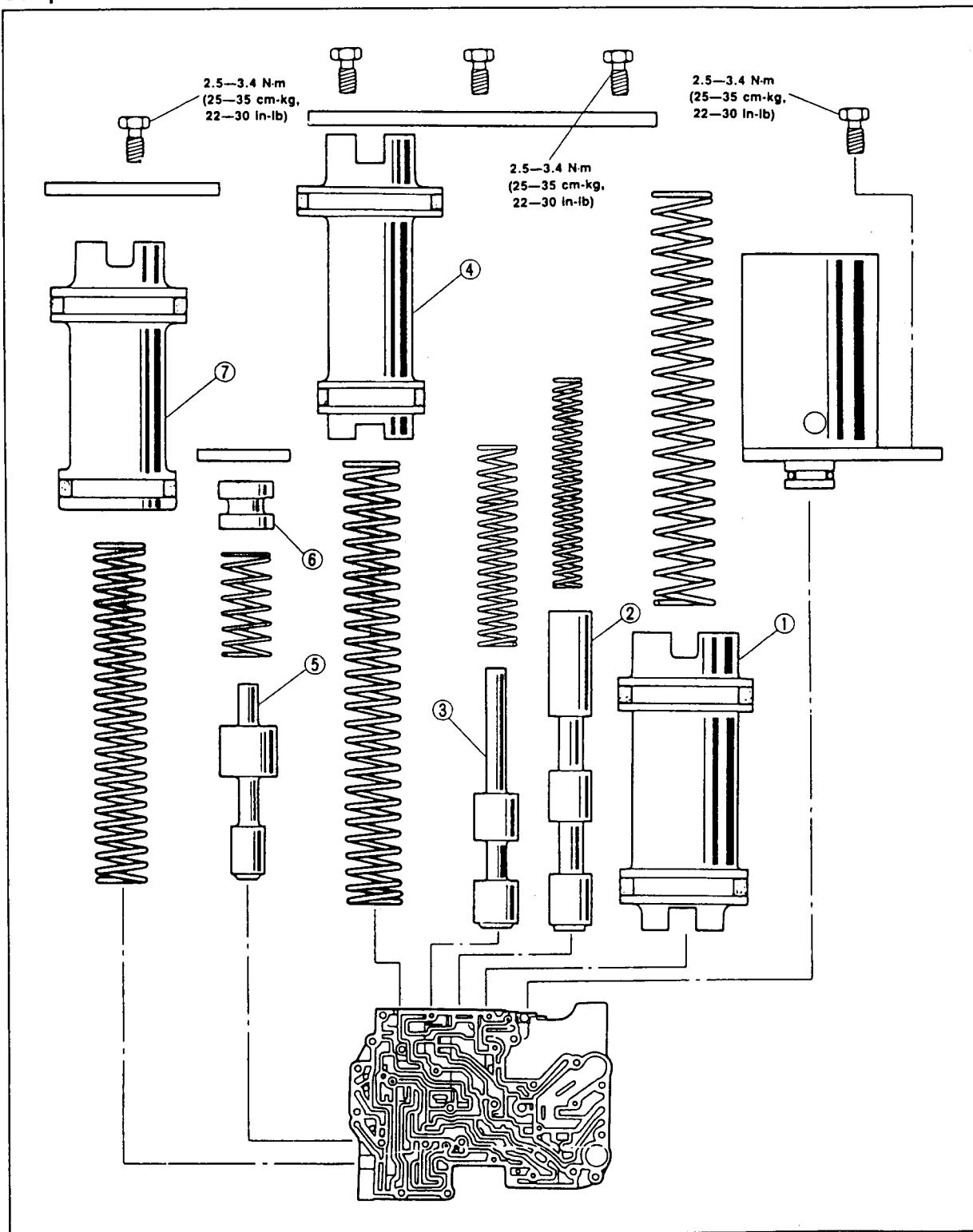
**Others : 13—27Ω**



8. Check spring specifications.

Valve spring	Outer dia. mm (in)	Free length mm (in)	No. of coils	Wire dia. mm (in)
Pressure regulator	11.7 (0.461)	43.0 (1.693)	15.0	1.2 (0.047)
1-2 shift	7.4 (0.291)	26.4 (1.039)	11.6	0.7 (0.028)
2-3 shift	7.4 (0.291)	57.6 (2.268)	26.0	0.9 (0.035)
3-4 shift	7.5 (0.295)	40.2 (1.583)	17.0	0.8 (0.031)
Pressure modifier	9.2 (0.362)	19.8 (0.780)	7.3	0.7 (0.028)
Throttle backup	8.3 (0.327)	18.3 (0.720)	7.5	0.8 (0.031)
N-R reducing	7.4 (0.291)	14.5 (0.571)	7.0	0.6 (0.024)
Backup control	8.5 (0.335)	21.3 (0.839)	9.3	0.9 (0.035)
N-R/2-3 accumulator	8.9 (0.350)	82.5 (3.248)	31.7	1.1 (0.043)
N-D accumulator	9.5 (0.374)	63.8 (2.512)	22.9	1.4 (0.055)
1-2 reducing	9.5 (0.374)	19.5 (0.768)	7.6	0.9 (0.035)
Throttle relief	7.4 (0.291)	38.2 (1.504)	17.0	1.1 (0.043)
3-2 control	5.5 (0.217)	39.5 (1.555)	22.4	0.7 (0.028)
1-2 accumulator	11.8 (0.465)	78.0 (3.071)	21.5	1.4 (0.055)
Orifice check	5.0 (0.197)	15.5 (0.610)	12.0	0.2 (0.008)
Throttle relief (ball)	6.5 (0.256)	26.8 (1.055)	16.0	0.9 (0.035)

## Components

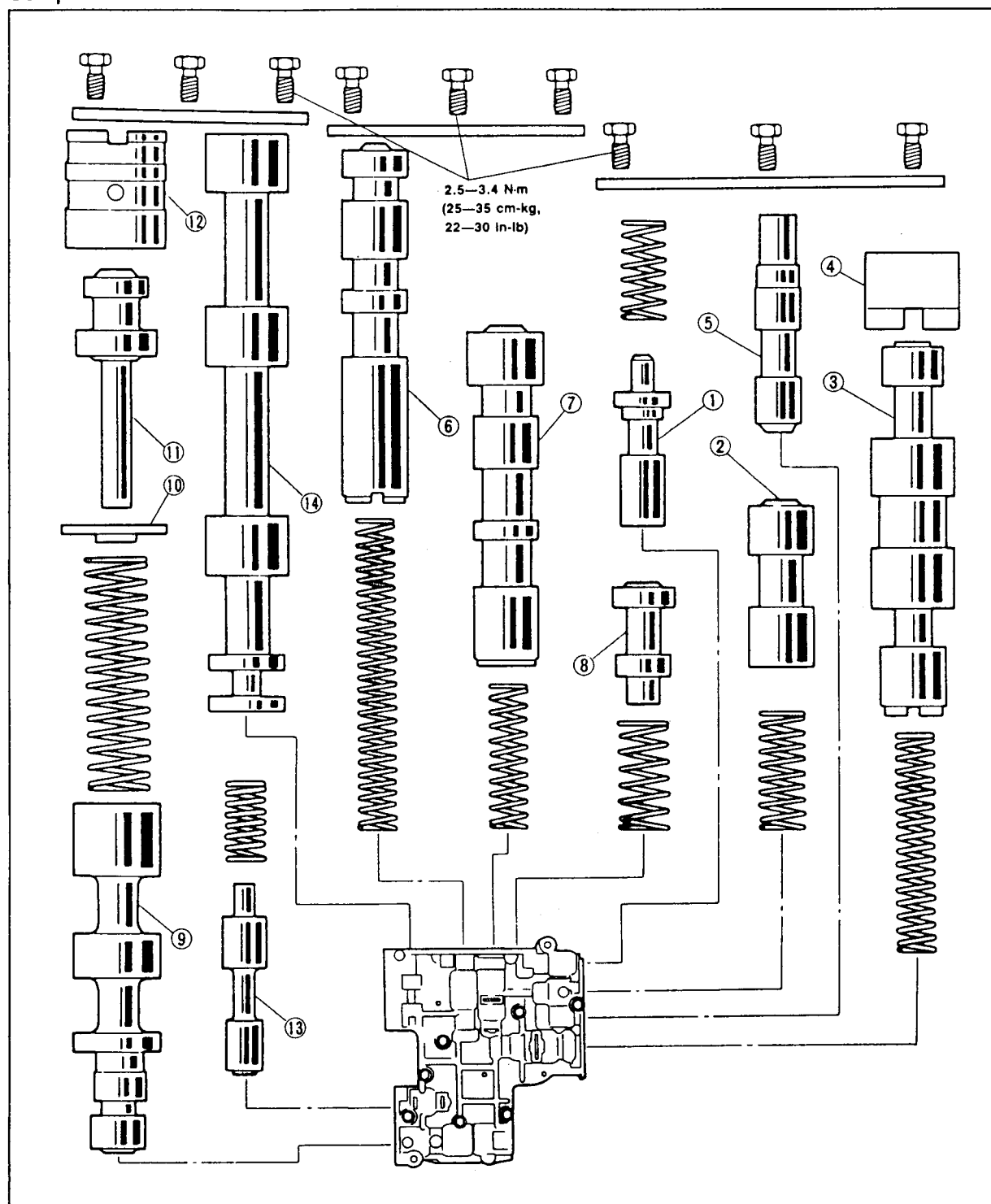


1. 1-2 accumulator piston  
2. 3-2 control valve  
3. Throttle relief valve

4. N-R/2-3 accumulator piston  
5. 1-2 reducing valve  
6. Stopper plug

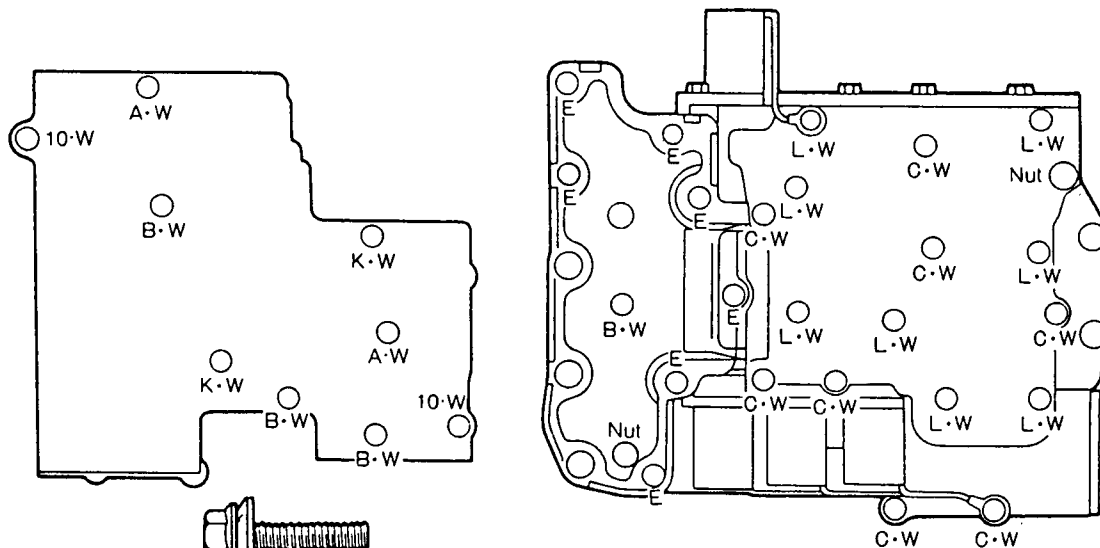
7. N-D accumulator piston

## Components



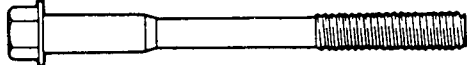
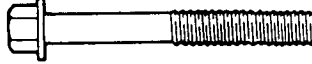

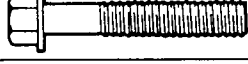
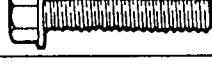

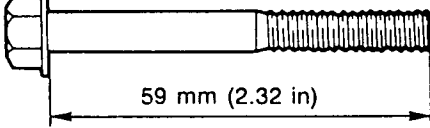
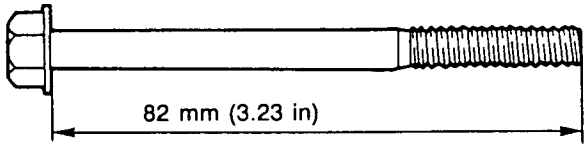
- |                          |                             |                               |
|--------------------------|-----------------------------|-------------------------------|
| 1. Throttle backup valve | 6. 2-3 shift valve          | 11. Pressure regulator plug   |
| 2. Backup control valve  | 7. 1-2 shift valve          | 12. Pressure regulator sleeve |
| 3. 3-4 shift valve       | 8. Pressure modifier valve  | 13. N-R reducing valve        |
| 4. 3-4 shift sleeve      | 9. Pressure regulator valve | 14. Manual valve              |
| 5. Vacuum throttle valve | 10. Spring seat             |                               |

## Bolt locations

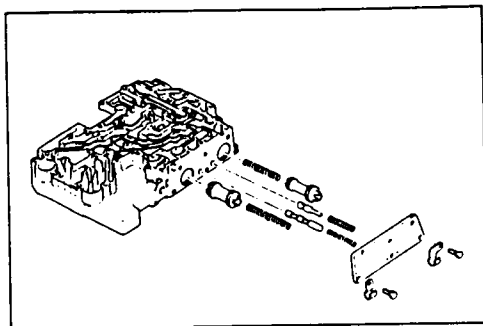


Dished washer direction

W:Dished washer

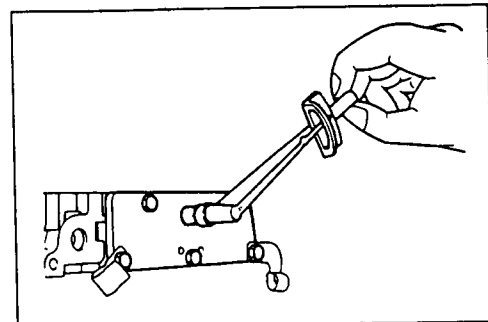
Identification letter	Bolts	Torque specification
L		6.5—7.8 N·m (66—80 cm·kg, 57—69 in·lb)
A		
B		
K		
C		
E		
10	 59 mm (2.32 in)	11—15 N·m (1.1—1.5 m·kg, 8.0—11 ft·lb)
10	 82 mm (3.23 in)	





## Assembly

1. Apply ATF to the seal rings and install them onto the 1-2 accumulator piston.
2. Insert the 1-2 accumulator piston and spring.
3. Insert the 3-2 control valve and spring.
4. Insert the throttle relief valve and spring.
5. Apply ATF to the seal rings and install them onto the N-R/2-3 accumulator piston.
6. Insert the N-R/2-3 accumulator spring and valve.
7. Install the side plate.



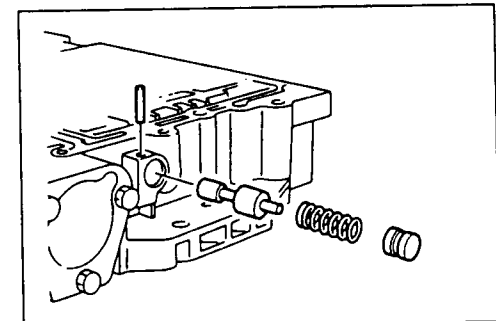
8. Install the clip and bolts.

## Tightening torque:

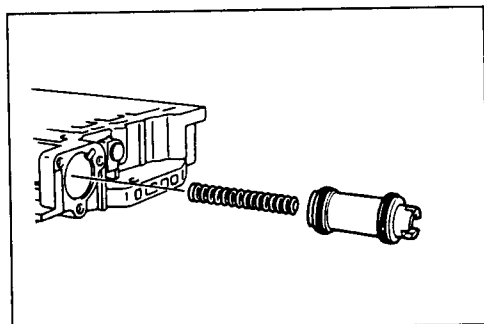
2.5—3.4 N·m (25—35 cm·kg, 22—30 in·lb)

## Note

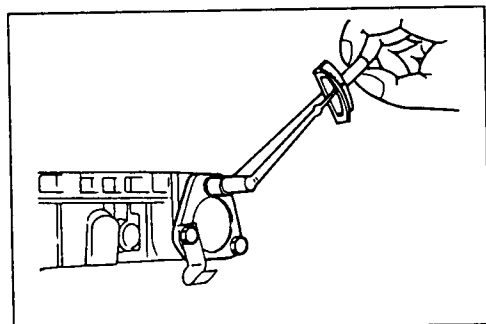
Install the valves by consecutively blocking them with the side plate held with a bolt at the end.



9. Insert the 1-2 reducing valve, spring, and stopper plug.
10. Tap in the roll pin.



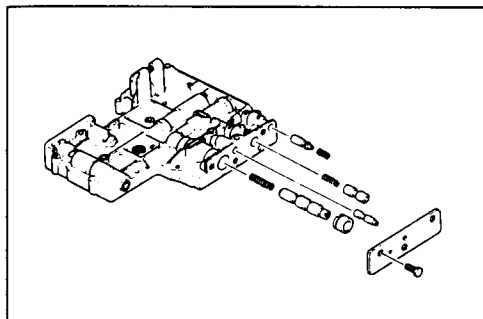
11. Apply ATF to the seal rings and install them onto the N-D accumulator piston.
12. Insert the N-D accumulator spring and piston.



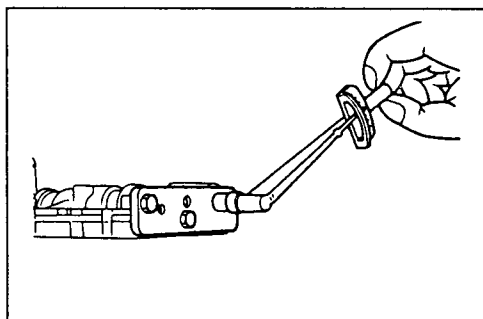
13. Install the clip and bolts.

## Tightening torque:

2.5—3.4 N·m (25—35 cm·kg, 22—30 in·lb)



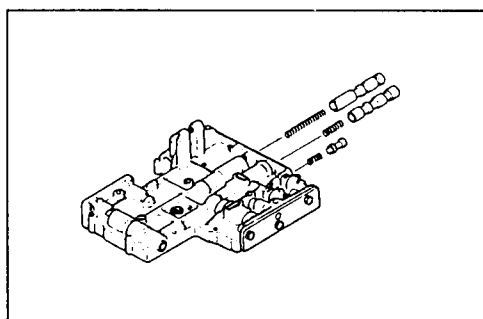
14. Insert the throttle backup valve and spring.
15. Insert the backup control spring and valve.
16. Insert the 3-4 shift spring, valve, and sleeve.
17. Insert the vacuum throttle valve.
18. Install the side plate so that it does not contact the vacuum throttle valve.



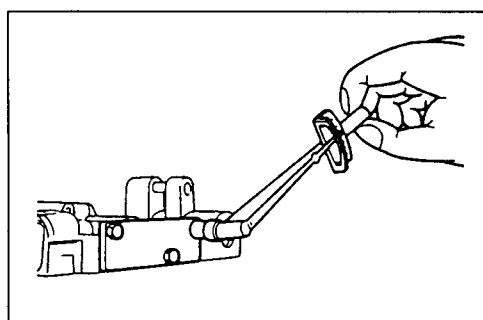
19. Tighten the installation bolts.

**Tightening torque:**

**2.5—3.4 N·m (25—35 cm·kg, 22—30 in·lb)**



20. Insert the 2-3 shift spring and valve.
21. Insert the 1-2 shift spring and valve.
22. Insert the pressure modifier spring and valve.



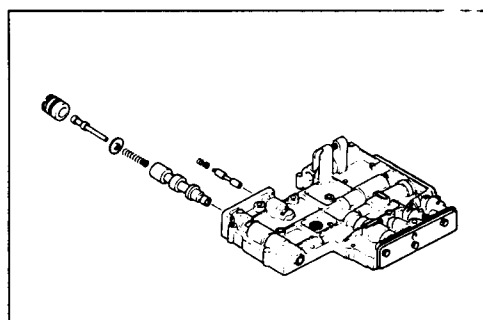
23. Install the side plate.
24. Tighten the installation bolts.

**Tightening torque:**

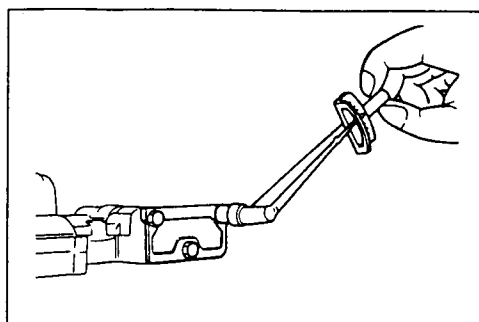
**2.5—3.4 N·m (25—35 cm·kg, 22—30 in·lb)**

**Note**

**Install the valves by consecutively blocking them with the side plate held with a bolt at the end.**

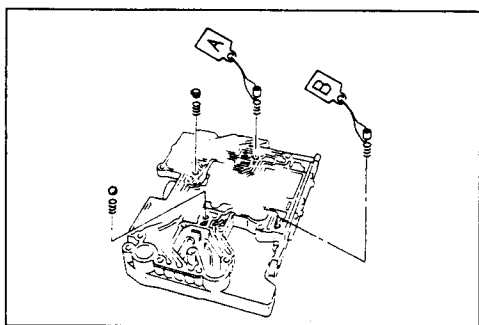


25. Insert the pressure regulator valve, spring, spring seat, plug, and sleeve.
26. Insert the N-R reducing valve and spring.



27. Install the side plate.
28. Tighten the installation bolts.

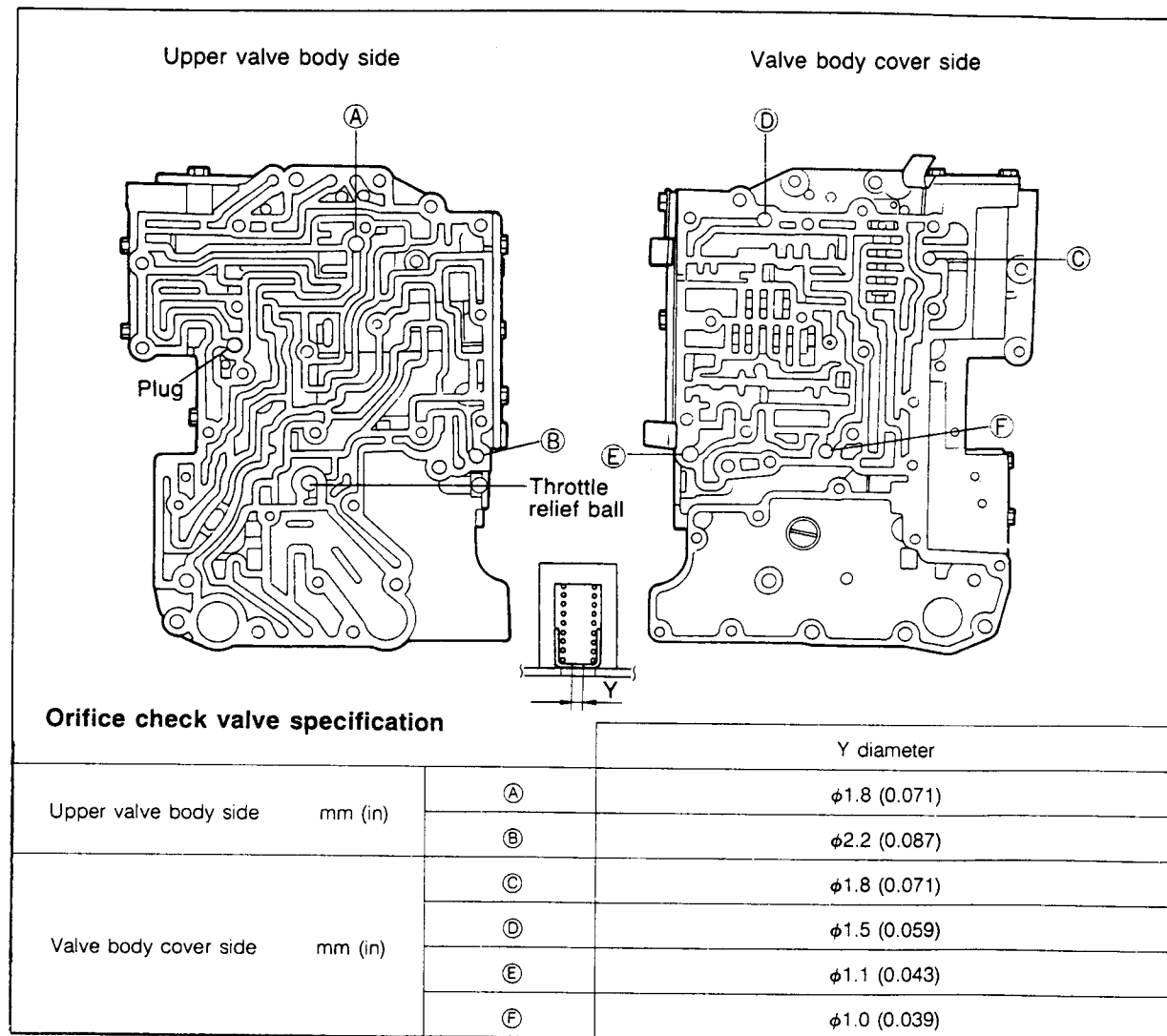
**Tightening torque:**  
2.5—3.4 N·m (25—35 cm·kg, 22—30 in·lb)

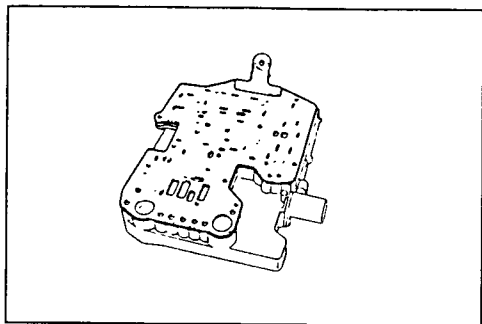


29. Insert the orifice check valve, plug and springs, and the check ball and spring in the lower valve body.

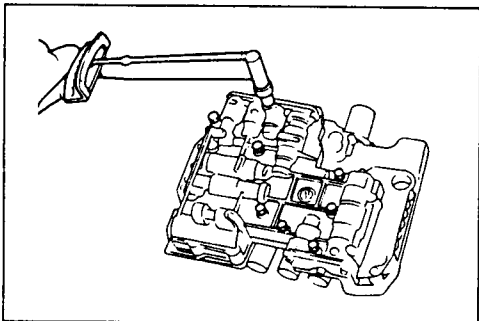
**Note**  
Check that the orifice check valves and check ball are properly inserted. (Refer to page 7B—121.)

**Orifice check valve location**





30. Position the separate plate and lower gasket on the lower valve body. Align the plate and valve body and hold them together with large clips.



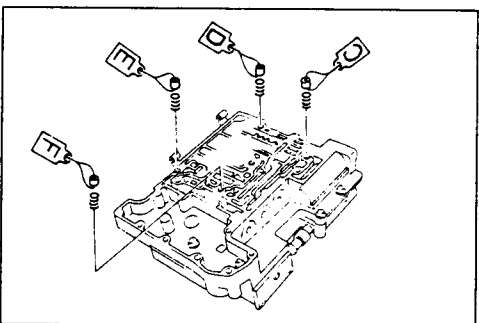
31. Install the upper gasket and upper valve body on the separate plate.  
32. Tighten the installation bolts.

**Tightening torque:**

6.5—7.8 N·m (66—80 cm·kg, 57—69 in·lb)

**Note**

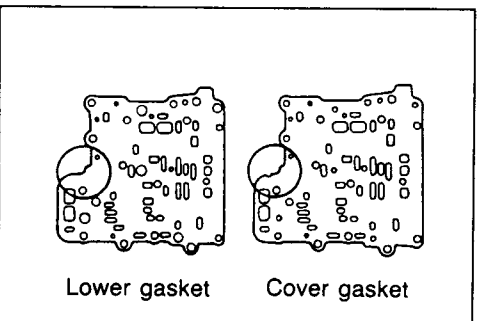
Check that the installation bolts are installed in the correct position. (Refer to page 7B—117.)



33. Turn over the valve body assembly and insert the orifice check valves and springs in the lower valve body.

**Note**

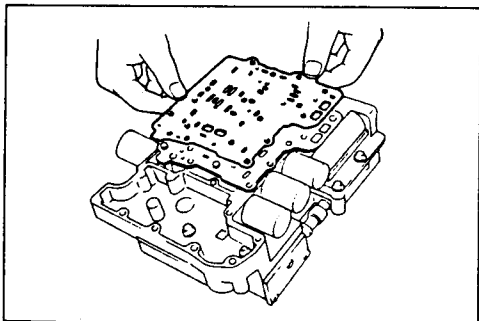
Check that the orifice check valves are properly inserted. (Refer to page 7B—121.)



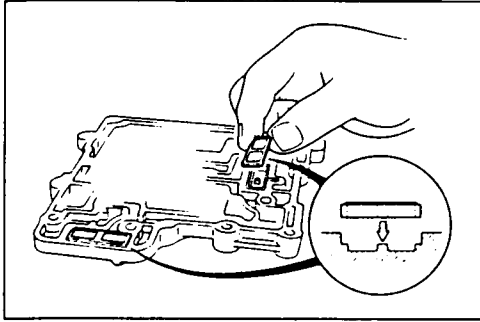
34. Install the lower gasket on the lower valve body.

**Note**

The lower gasket is identified as shown.



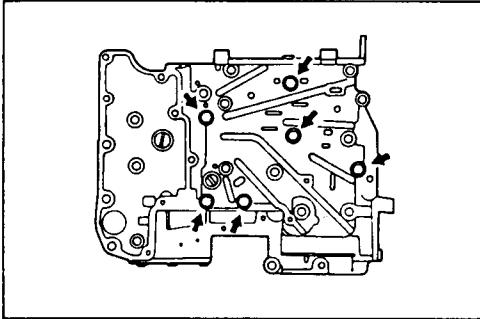
35. Install the lower gasket, separate plate, and cover gasket.



36. Install the inner strainer in the valve body cover.

**Note**

**Affix the inner strainer with ATF.**



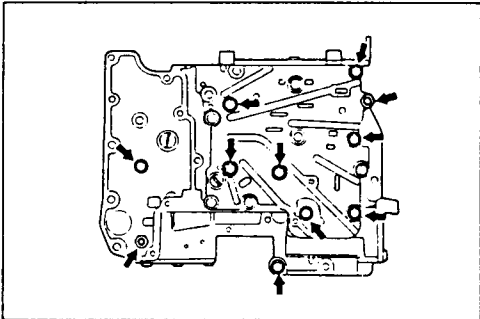
37. Install the valve body cover on the cover gasket.

**Tightening torque:**

**6.5—7.8 N·m (66—80 cm·kg, 57—69 in·lb)**

**Note**

**Check that the installation bolts are installed in the correct position. (Refer to page 7B—117.)**



38. Tighten the installation bolts and nuts.

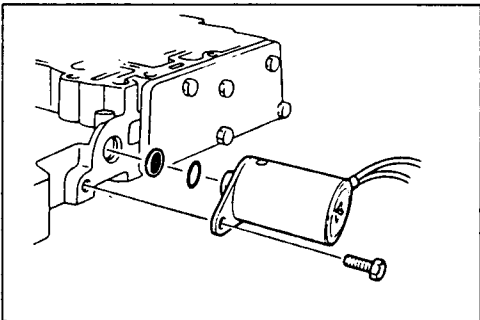
**Tightening torque:**

**Bolt: 6.5—7.8 N·m (66—80 cm·kg, 57—69 in·lb)**

**Nut: 11—15 N·m (1.1—1.5 m·kg, 8.0—15 ft·lb)**

**Note**

**Check that the installation bolts are installed in the correct position. (Refer to page 7B—117.)**



39. Apply ATF to the O-rings and install them onto the each solenoid valve.

40. Install the oil strainer in the lower valve body.

**Note**

**Affix the oil strainer with ATF.**

41. Install the 3-2 control solenoid valve.

42. Tighten the installation bolt.

**Tightening torque:**

**2.5—3.4 N·m (25—35 cm·kg, 22—30 in·lb)**

43. Install the oil strainer in the lower valve body.

**Note**

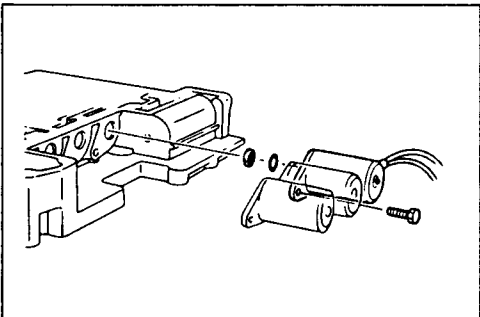
**Affix the oil strainer with ATF.**

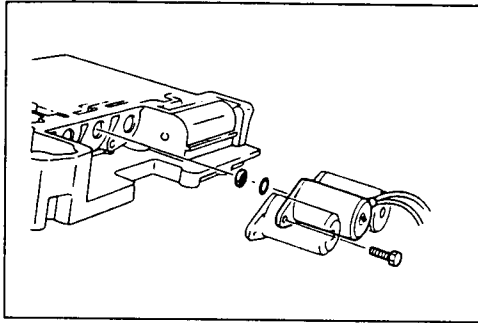
44. Install the 3-4 shift solenoid valve.

45. Tighten the installation bolt.

**Tightening torque:**

**2.5—3.4 N·m (25—35 cm·kg, 22—30 in·lb)**





46. Install the oil strainer in the lower valve body.

**Note**

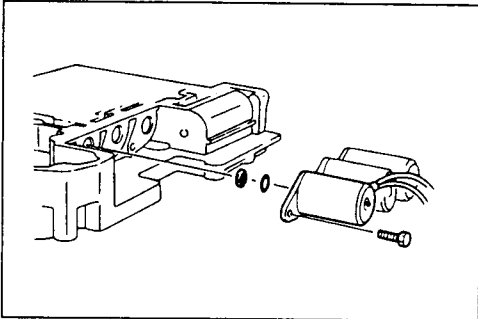
**Affix the oil strainer with ATF.**

47. Install the 2-3 shift solenoid valve.

48. Tighten the installation bolt.

**Tightening torque:**

2.5—3.4 N·m (25—35 cm·kg, 22—30 in·lb)



49. Install the oil strainer in the lower valve body.

**Note**

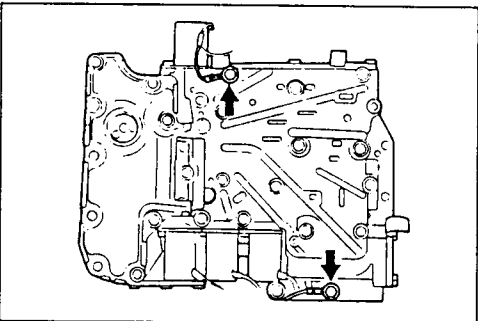
**Affix the oil strainer with ATF.**

50. Install the 1-2 shift solenoid valve.

51. Tighten the installation bolt.

**Tightening torque:**

2.5—3.4 N·m (25—35 cm·kg, 22—30 in·lb)



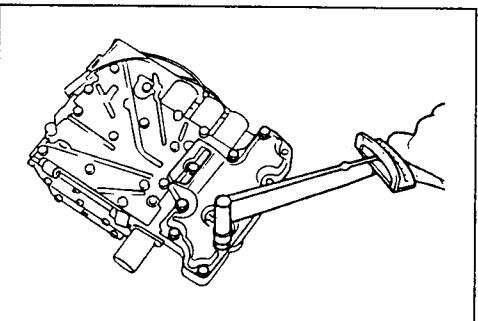
52. Connect the ground terminals and tighten the bolts.

**Tightening torque:**

6.5—7.8 N·m (66—80 cm·kg, 57—69 in·lb)

**Note**

**Check that the installation bolts are installed in the correct position. (Refer to page 7B—117.)**



53. Mount the oil strainer.

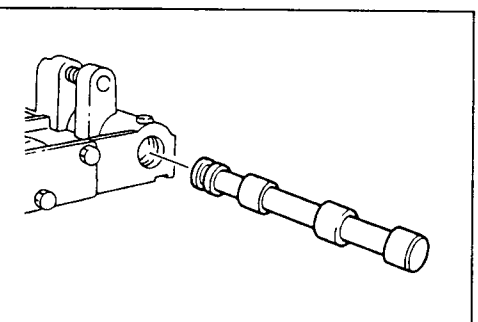
54. Tighten the installation bolts.

**Tightening torque:**

6.5—7.8 N·m (66—80 cm·kg, 57—69 in·lb)

**Note**

**Check that the installation bolts are installed in the correct position. (Refer to page 7B—117.)**



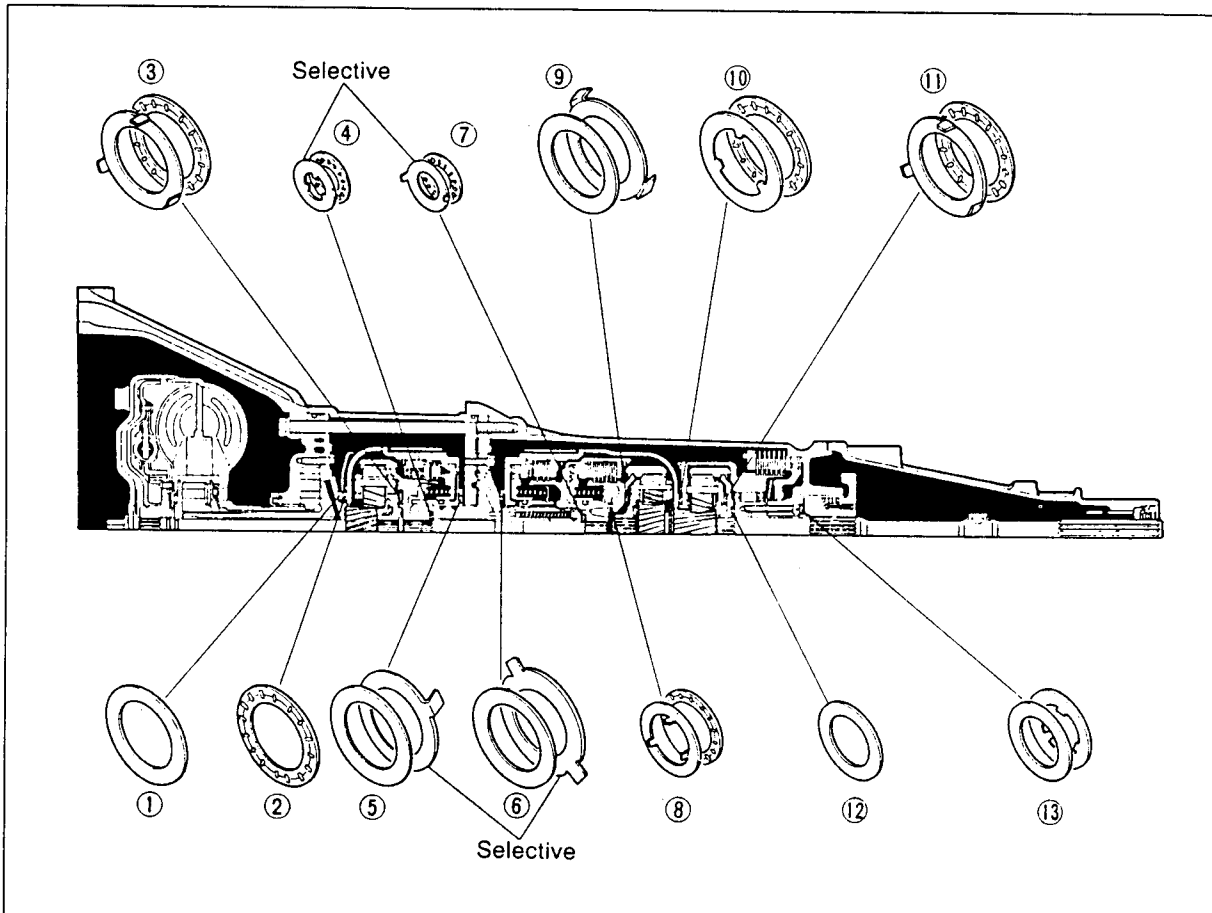
55. Install the manual valve.

## ASSEMBLY

### PRECAUTION

1. The automatic transmission consists of high-precision finished parts, necessitating careful inspection before assembly because even a small nick could cause fluid leakage or affect performance.
2. Clean out oil holes and oil passages with compressed air, and check that there are no obstructions.
3. Before assembly, apply ATF to each O-ring, seal ring, rotating part, and friction part.
4. If brake bands or drive plates are replaced with new ones, first soak them in ATF for at least 2 hours.
5. Each seal, gasket, and O-ring must be replaced with new ones.
6. Be sure to install thrust bearings and races in the correct direction and position.

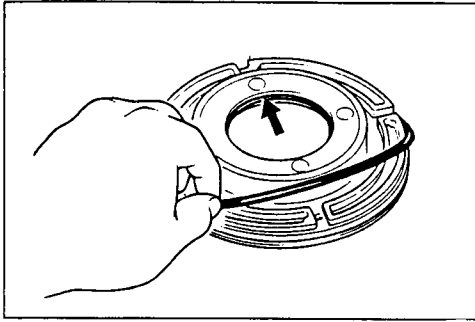
### Thrust Washer, Bearing, and Race Location



### Outer diameter of bearing and race

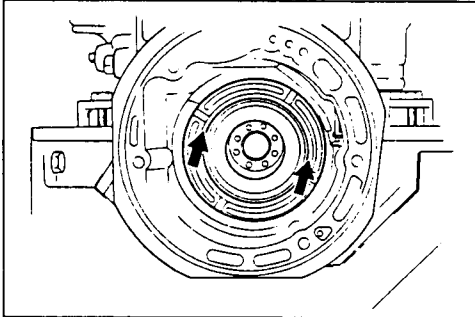
		1	2	3	4	5	6	7
Bearing	mm (in)	69.9 (2.75)	69.9 (2.75)	69.9 (2.75)	34.9 (1.37)	69.9 (2.75)	69.9 (2.75)	34.9 (1.37)
Race	mm (in)	—	—	70.0 (2.76)	33.0 (1.30)	70.0 (2.76)	76.0 (2.99)	33.0 (1.30)

		8	9	10	11	12	13
Bearing	mm (in)	52.9 (2.08)	69.9 (2.75)	69.9 (2.75)	69.9 (2.75)	46.9 (1.85)	52.9 (2.08)
Race	mm (in)	51.5 (2.03)	70.0 (2.76)	70.0 (2.76)	70.0 (2.76)	—	51.5 (2.03)



## Procedure

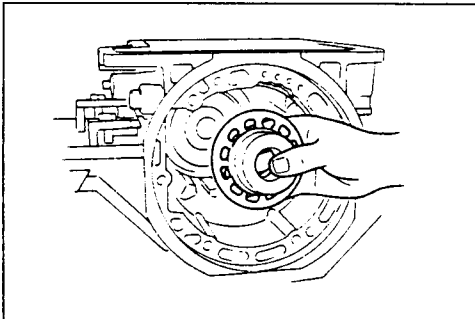
1. Mount the transmission case on the engine stand.
2. Apply ATF to the seal ring and install it onto the low and reverse brake piston.
3. Apply ATF to the O-ring and install it in the low and reverse brake piston.



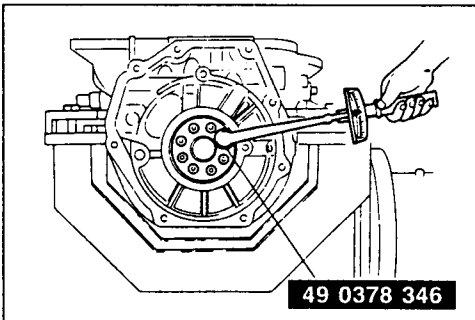
4. Install the low and reverse brake piston.

## Caution

**Apply ATF to the seal rings, and press the perimeter of the piston evenly when installing.**



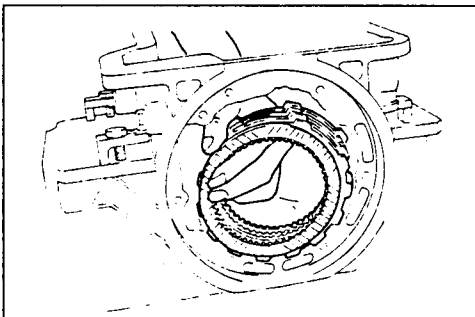
5. Assemble the one-way clutch inner race, thrust washer, and piston return spring, and install them in the transmission case.
6. Check that the return spring, thrust washer, and rings are properly positioned before securing the bolts.



7. Tighten the inner race mounting bolts with the **SST**.

## Tightening torque:

**13—18 N·m (1.3—1.8 m·kg, 9.4—13 ft·lb)**



8. Install the driven plates and drive plates.

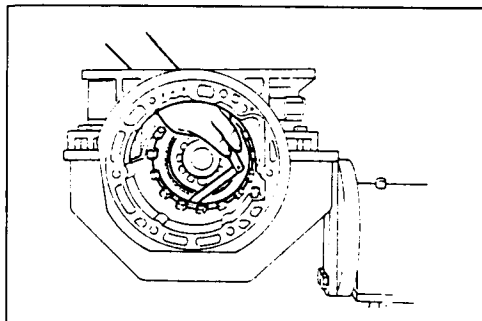
## Note

### Installation order:

**Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive**

9. Install the retaining plate.
10. Install the snap ring.



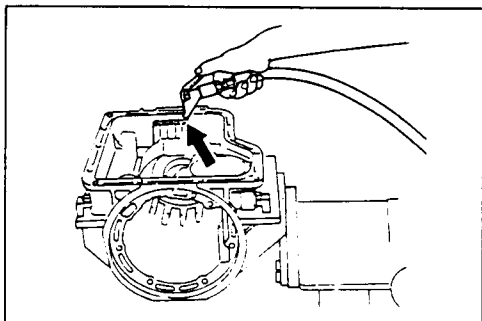


11. Measure the clearance between the snap ring and the retaining plate. Adjust the clearance by installing the proper retaining plate.

**Clearance: 0.8—1.05 mm (0.031—0.041 in)**

**Retaining plate sizes**

mm (in)		
11.8 (0.465)	12.0 (0.472)	12.2 (0.480)
12.4 (0.488)	12.6 (0.496)	12.8 (0.503)

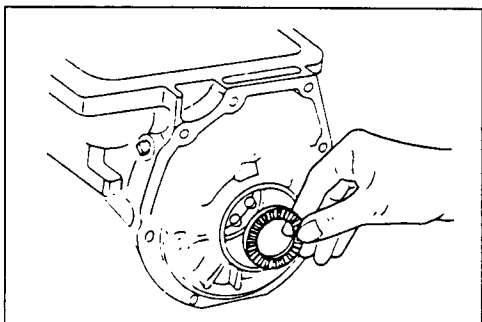


12. Check operation of the piston by applying compressed air to the oil passage of the low and reverse brake.

**Air pressure: 392 kPa (4.0 kg/cm<sup>2</sup>, 57 psi) max.**

**Caution**

**Apply air for no more than 3 seconds.**

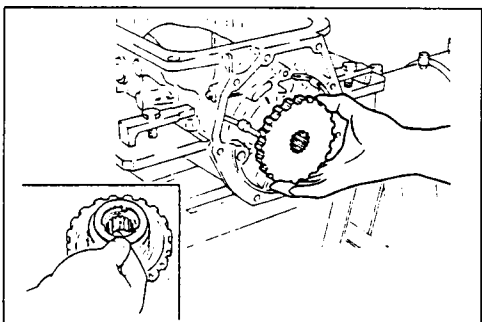


13. Install the bearing in the rear of the transmission case.

**Bearing outer diameter: 52.9 mm (2.08 in)**

**Note**

**Affix the bearing with petroleum jelly.**



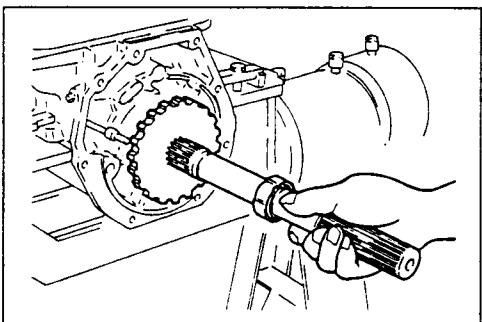
14. Install the bearing race on the oil distributor.

**Bearing race outer diameter: 51.5 mm (2.03 in)**

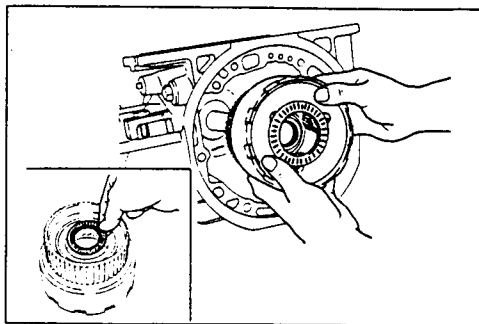
**Note**

**Affix the bearing race with petroleum jelly.**

15. Install the oil distributor in the transmission case.



16. Insert the output shaft.



17. Install the bearings on the rear and front side of planetary gear unit.

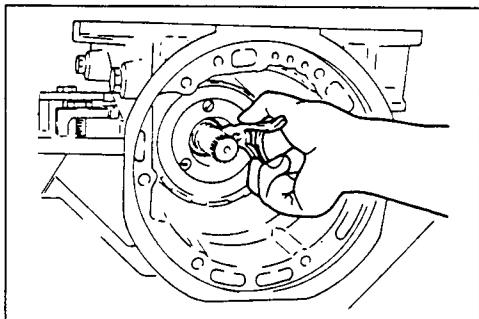
**Bearing outer diameter**

Connecting shell side: 69.9 mm (2.75 in)

One-way clutch inner race side: 46.9 mm (1.85 in)

**Note**

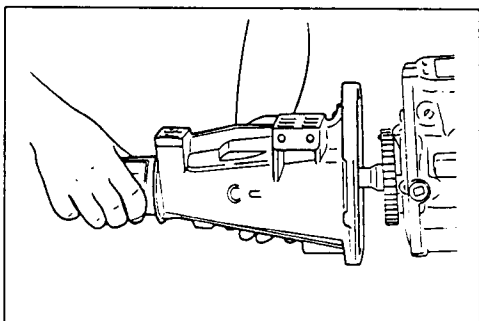
**Affix the bearings with petroleum jelly.**



18. Install the rear planetary gear unit (connecting drum, internal gear, and rear planetary pinion carrier) in the low and reverse brake side.

19. Install the snap ring on the front side of the output shaft.

**WHEN THE CONNECTING DRUM IS INSTALLED IN THE CASE, THE DRUM MUST TURN CLOCKWISE AND LOCK COUNTER CLOCKWISE**



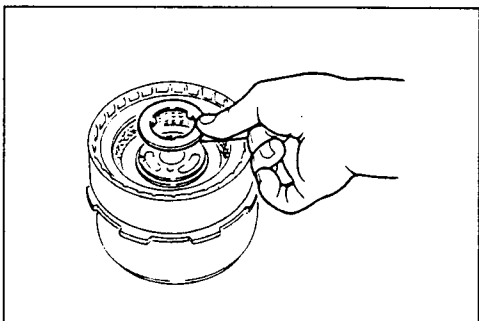
20. Install a new gasket on the transmission case.

21. Install the rear extension housing.

**Tightening torque:**

**20—25 N·m (2.0—2.5 m·kg, 14—18 ft·lb)**

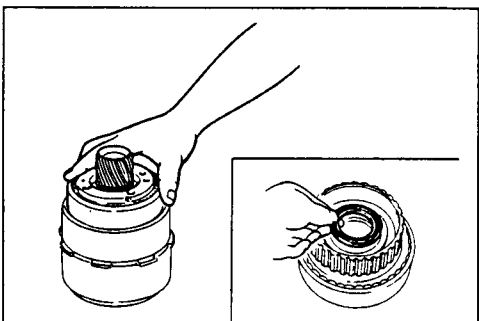
22. Check that the output shaft is locked with the manual lever in P range.



23. Set the rear clutch assembly on the top of the front clutch assembly.

24. Install the bearing race on the rear clutch assembly.

**Bearing race outer diameter: 51.5 mm (2.03 in)**



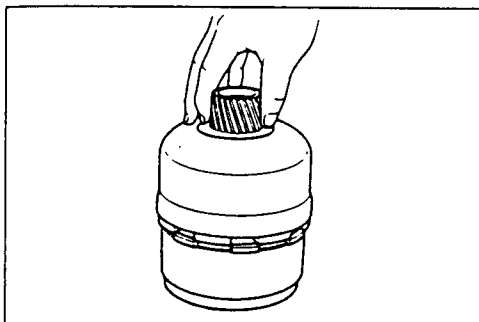
25. Install the bearing on the front planetary gear unit.

**Bearing outer diameter: 52.9 mm (2.08 in)**

**Note**

**Affix the bearing with petroleum jelly.**

26. Install the front planetary gear unit (rear clutch hub, front planetary pinion carrier, and sun gear) in the rear clutch assembly.

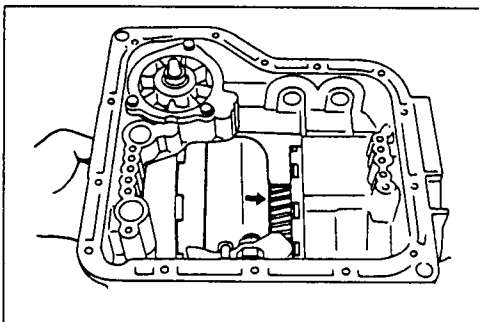


27. Install the connecting shell and bearing race from the top of the front planetary gear unit.

**Bearing race outer diameter: 70.0 mm (2.76 in)**

**Note**

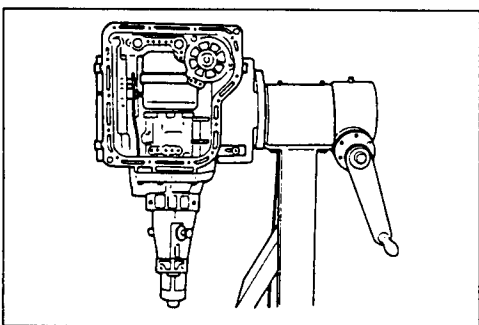
**Affix the bearing race with petroleum jelly.**



28. Install the front clutch, rear clutch, rear clutch hub, front planetary pinion carrier, connecting shell, internal gear, sun gear, bearing, and bearing races as a unit into the transmission case.

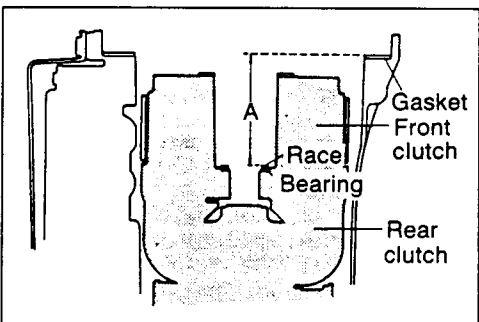
**Caution**

**Pay close attention to prevent incorrect assembly of the many similar bearings and races.**



29. Check and adjust the rear clutch total end play.

- (1) Position the front of the transmission case upward.
- (2) Set the drum support bearing and race on the rear clutch.
- (3) Install a new drum support gasket in the transmission case.



- (4) Measure distances A and B with a straightedge and vernier calipers.
- (5) Calculate the total end play by using the formula below.

$$\text{Formula: } T = A - B - 0.1 \text{ mm (0.0039 in)}$$

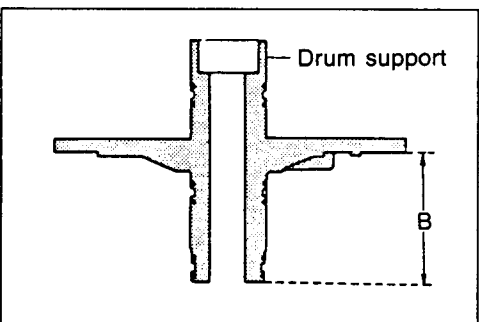
T: Total end play

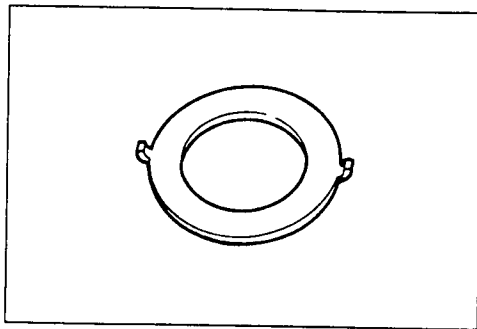
A: The distance between the drum support mounting surface (including the drum support gasket) and the drum support bearing race surface on the rear clutch assembly.

B: The distance between the drum support bearing race contact surface and the drum support gasket contact surface.

0.1: The compression amount of a new gasket.

**Total end play: 0.25—0.50 mm (0.0098—0.0197 in)**

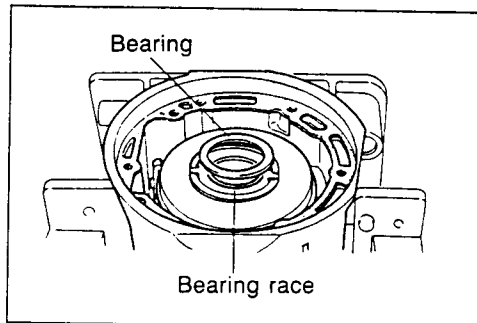




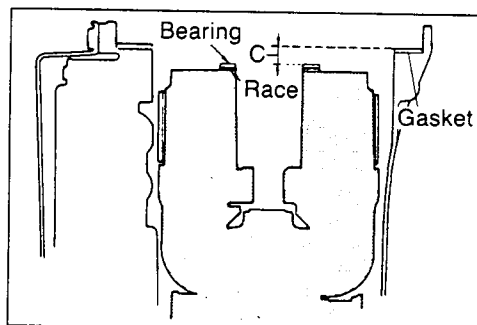
- (6) Adjust the total end play by selecting the proper bearing race.

## Bearing race sizes

mm (in)		
1.2 (0.047)	1.4 (0.055)	1.6 (0.063)
1.8 (0.071)	2.0 (0.079)	2.2 (0.087)



30. Check and adjust the front clutch end play.  
(1) Install the bearing race and bearing in position.

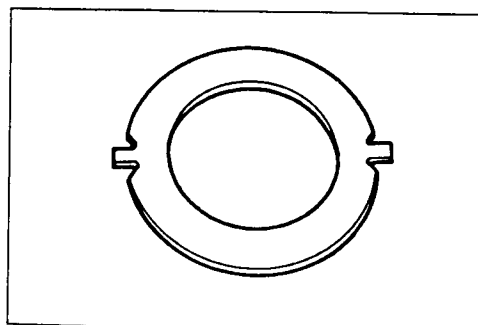
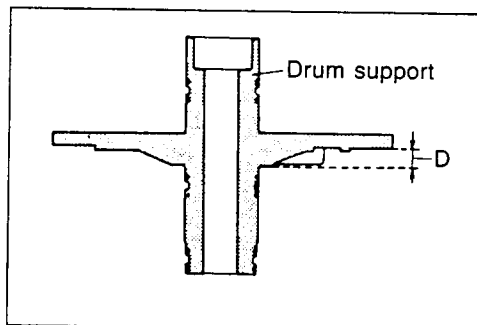


- (2) Measure distances C and D with a straightedge and vernier calipers.  
(3) Calculate the front clutch end play by using the formula below.

$$\text{Formula: } T = C - D - 0.1 \text{ mm (0.0039 in)}$$

- T: Front clutch end play  
C: The distance between the drum support mounting surface (including the drum support gasket) of the transmission case and the bearing surface on the front clutch assembly.  
D: The distance between the sliding surface of the bearing and the drum support gasket contact surface.  
0.1: The compression amount of a new gasket.

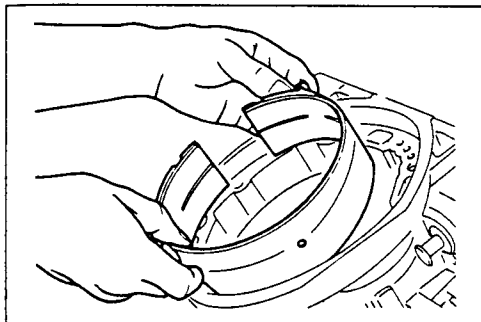
**Front clutch end play: 0.5—0.8 mm (0.020—0.031 in)**



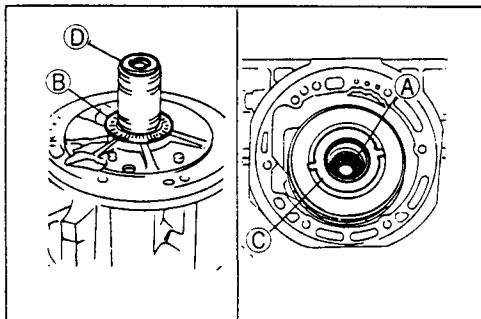
- (4) Adjust the front clutch end play by selecting the proper bearing race.

## Bearing race sizes

mm (in)		
0.8 (0.031)	1.0 (0.039)	1.2 (0.047)
1.4 (0.055)	1.6 (0.063)	1.8 (0.071)
2.0 (0.079)	2.2 (0.087)	



31. Install the 2nd brake band and strut in position.
32. Tighten the piston stem lightly.



33. Install the bearings and bearing races as shown in the figure.

## Bearing outer diameter

A: 34.9 mm (1.37 in)

B: 69.9 mm (2.75 in)

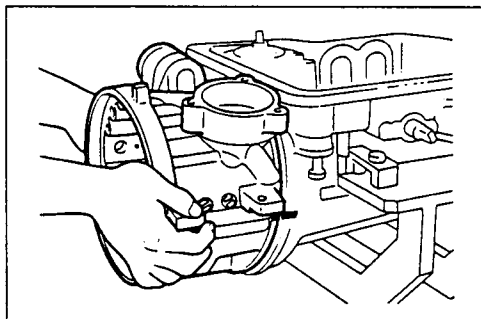
## Bearing race outer diameter

C: 76.0 mm (2.99 in)

D: 33.0 mm (1.30 in)

## Note

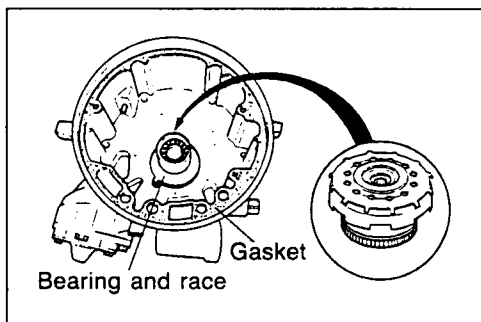
**Affix the bearings and bearing races with petroleum jelly.**



34. Install a new gasket in the transmission case.
35. Check that the bearing race is on top of the front clutch and the bearing is at the bottom of the front clutch, then mount the OD case.

## Note

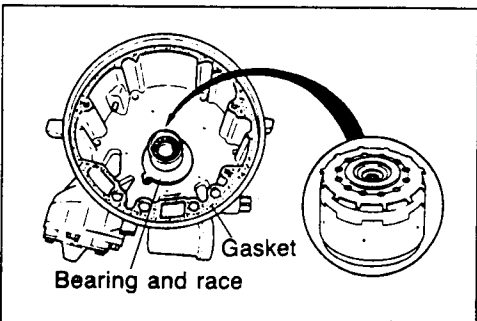
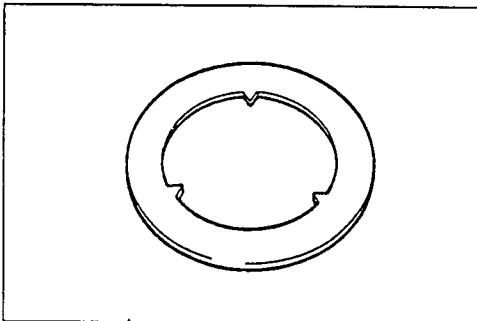
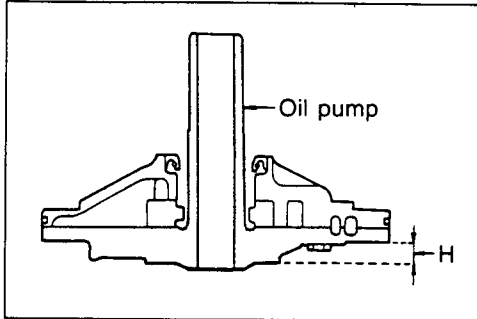
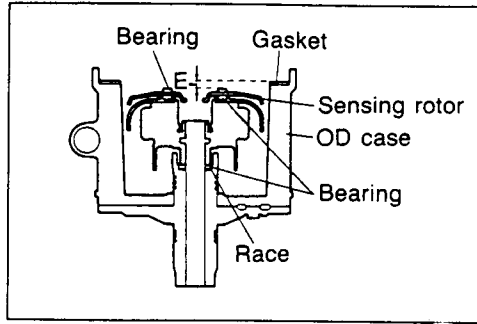
- a) Align the matching marks of the transmission case and OD case. Tap lightly with a plastic hammer to avoid damaging the seal rings when installing.
- b) Install two bolts for alignment.



36. Check and adjust the OD planetary gear unit total end play.
  - (1) Position the OD case upright.
  - (2) Install the bearing and race on the OD case.
  - (3) Install the planetary carrier, sun gear, connecting shell, and bearing as a unit in the OD case.
  - (4) Install the sensing rotor and bearing on the connecting shell.

## Note

- a) Do not install the direct clutch drum at this time.
- b) The sensing rotor and bearing are part of the oil pump assembly.



- (5) Install a new oil pump gasket in the OD case.
- (6) Measure distances E and H with a straightedge and vernier calipers.
- (7) Calculate the OD gear train total end play by using the formula below.

$$\text{Formula: } T = E - H - 0.1 \text{ mm (0.0039 in)}$$

T: Total end play

E: The distance between the oil pump mounting surface (including the oil pump gasket) and the sensing rotor bearing surface.

H: The distance between the oil pump side sensing rotor bearing contact surface and the oil pump gasket contact surface.

0.1: The compression amount of a new gasket.

**Total end play: 0.25—0.50 mm (0.0098—0.0197 in)**

- (8) Adjust the total end play by selecting the proper bearing race.

## Bearing race sizes

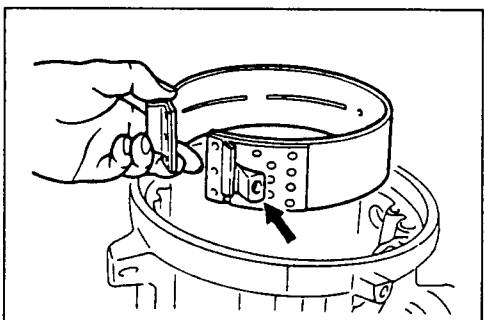
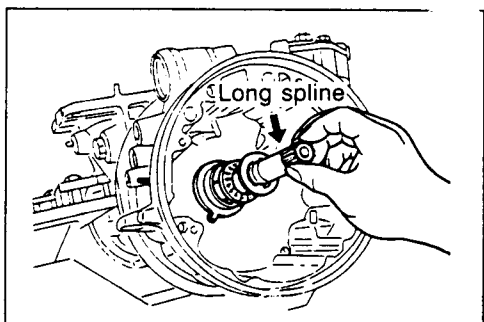
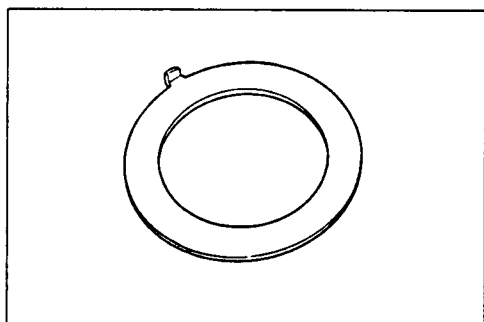
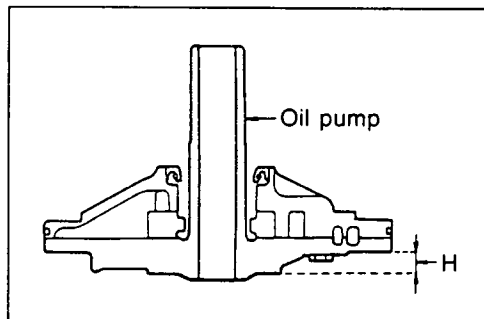
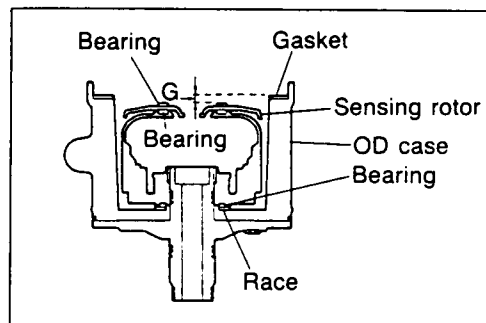
mm (in)		
1.2 (0.047)	1.4 (0.055)	1.6 (0.063)
1.8 (0.071)	2.0 (0.079)	2.2 (0.087)

37. Check and adjust the direct clutch end play.

- (1) Install the bearing race in the OD case.
- (2) Install the direct clutch, sun gear, connecting shell, and bearings in the OD case.
- (3) Install the sensing rotor and bearing on the connecting shell.

## Note

- a) Do not install the planetary pinion carrier at this time.
- b) The sensing rotor and bearing are part of the oil pump assembly.



- (4) Measure distances G and H with a straightedge and vernier calipers.
- (5) Calculate the direct clutch end play by using the formula below.

$$\text{Formula: } T = G - H - 0.1 \text{ mm (0.0039 in)}$$

- T: Total end play  
 G: The distance between the oil pump mounting surface (including the oil pump gasket) and the sensing rotor bearing surface.  
 H: The distance between the oil pump side sensing rotor bearing contact surface and the oil pump gasket contact surface.  
 0.1: The compression amount of a new gasket.

**Total end play: 0.5—0.8 mm (0.020—0.031 in)**

- (6) Adjust the direct clutch end play by selecting the proper bearing race.

## Bearing race sizes

mm (in)

0.8 (0.031)	1.0 (0.039)	1.2 (0.047)
1.4 (0.055)	1.6 (0.063)	1.8 (0.071)
2.0 (0.079)	2.2 (0.087)	

38. Insert the intermediate shaft.

## Caution

**The end with the long spline is the front.**

**Long spline: 23.0 mm (0.91 in)**

**Short spline: 18.6 mm (0.73 in)**

39. Install the large bearing race.

**Bearing race outer diameter: 70.0 mm (2.76 in)**

## Note

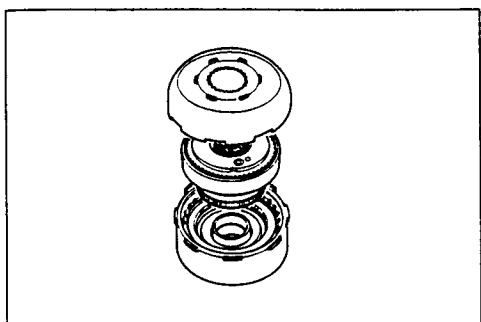
**Affix the bearing race with petroleum jelly.**

40. Install the small bearing, then the small bearing race.

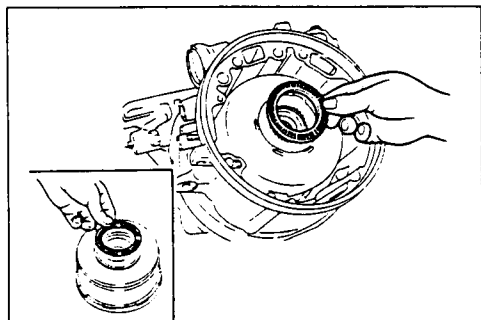
**Bearing outer diameter: 34.9 mm (1.37 in)**

**Bearing race outer diameter: 33.0 mm (1.30 in)**

41. Install the OD brake band and band strut.



42. Install the OD planetary gear unit (OD clutch hub, internal gear, OD planetary carrier, and sun gear) on the direct clutch.
43. Install the OD connecting shell on the OD planetary gear unit.



44. Install the bearing on the direct clutch assembly.

**Bearing outer diameter: 69.9 mm (2.75 in)**

**Note**

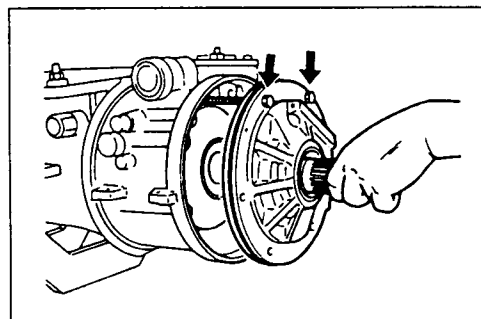
**Affix the bearing with petroleum jelly.**

45. Install the direct clutch assembly.
46. Install the bearing on the OD connecting shell.

**Bearing outer diameter: 69.9 mm (2.75 in)**

**Note**

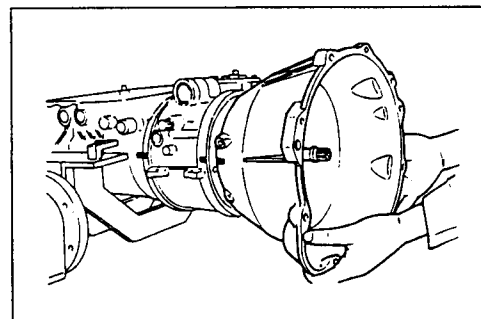
**Affix the bearing with petroleum jelly.**



47. Install a new gasket in the OD case.
48. Install the oil pump, input shaft, bearing, and sensing rotor as a unit.

**Note**

**Position the pump with two bolts and install by tapping lightly with a plastic hammer.**



49. Apply sealant to the bolt flanges and converter housing contact surface.
50. Install the converter housing.

**Tightening torque:**

**59—69 N·m (6.0—7.0 m·kg, 43—51 ft·lb)**

51. Apply ATF to the piston stem.
52. Adjust the 2nd brake band.
  - (1) Loosen the locknut and tighten the piston stem.

**Tightening torque:**

**12—14 N·m (1.25—1.45 m·kg, 9.0—10.5 ft·lb)**

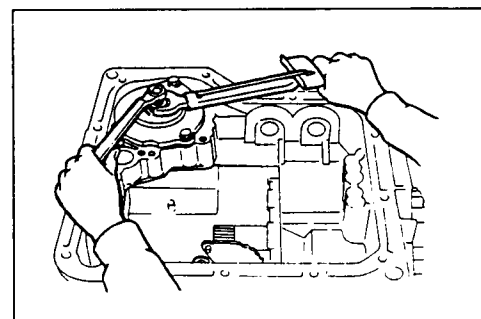
- (2) Loosen the stem the number of turns shown below.

**Stem: 2 1/2 turns**

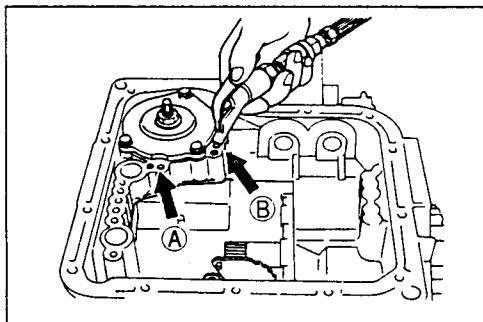
- (3) Hold the piston stem and tighten the locknut.

**Tightening torque:**

**15—39 N·m (1.5—4.0 m·kg, 11—29 ft·lb)**





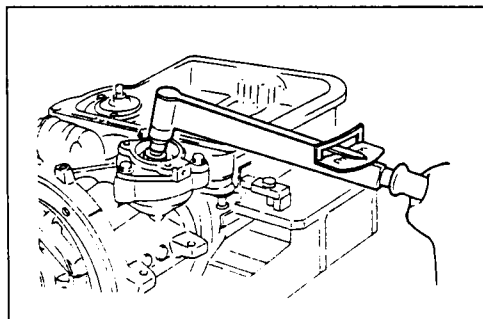


53. Check the servo piston operation by applying compressed air to the oil passage of the 2nd band servo.

**A:Engage**  
**B:Release**

**Air pressure: 392 kPa (4.0 kg/cm<sup>2</sup>, 57 psi) max.**

**Caution**  
**Apply air for no more than 3 seconds.**



54. Apply ATF to the piston stem.  
55. Adjust the OD brake band.  
(1) Loosen the locknut and tighten the piston stem.

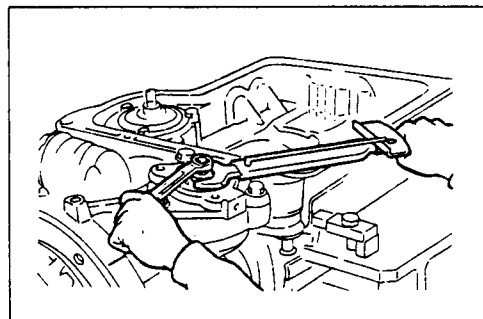
**Tightening torque:**  
**12—15 N·m (1.2—1.5 m·kg, 8.7—11 ft·lb)**

- (2) Loosen the stem the number of turns shown below.

**Stem: 2 turns**

- (3) Hold the piston stem and tighten the locknut.

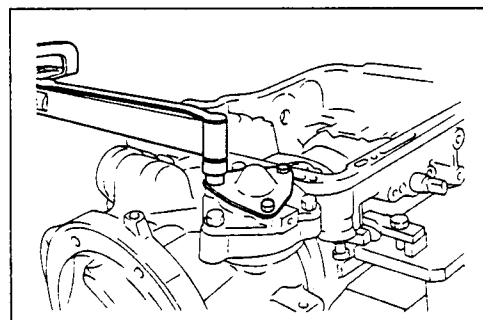
**Tightening torque:**  
**15—39 N·m (1.5—4.0 m·kg, 11—29 ft·lb)**



56. Check the servo piston operation by applying compressed air to the oil passage of the OD band servo.

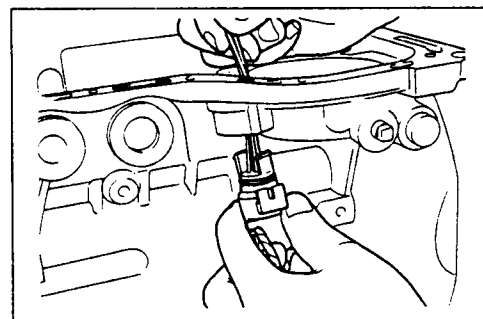
**Air pressure: 392 kPa (4.0 kg/cm<sup>2</sup>, 57 psi) max.**

**Caution**  
**Apply air for no more than 3 seconds.**

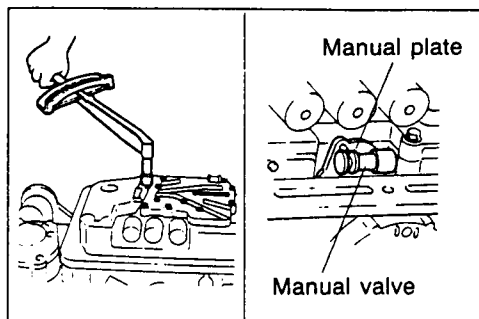


57. Install a new gasket on the OD band servo.  
58. Install the OD band servo cover.

**Tightening torque:**  
**4.9—6.9 N·m (50—70 cm·kg, 43—61 in·lb)**



59. Apply ATF to the O-ring and install it onto the solenoid valve connector.  
60. Install the solenoid valve connector in the transmission case.



61. Install the valve body assembly.

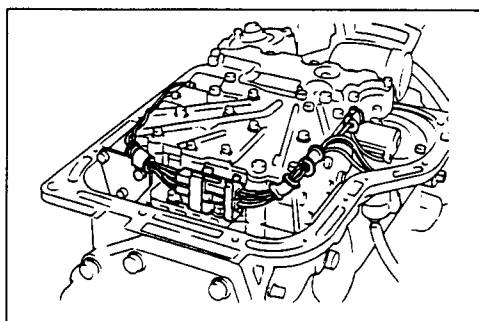
**Note**

**Be sure to align the manual plate and the manual valve.**

62. Install the bolts.

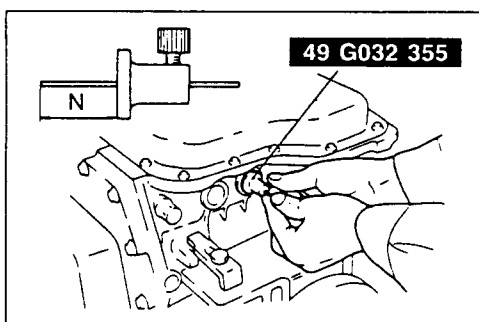
**Tightening torque:**

**11—15 N·m (1.1—1.5 m·kg, 8.0—11 ft·lb)**



63. Connect the solenoid valve connectors.

64. Install the harnesses.



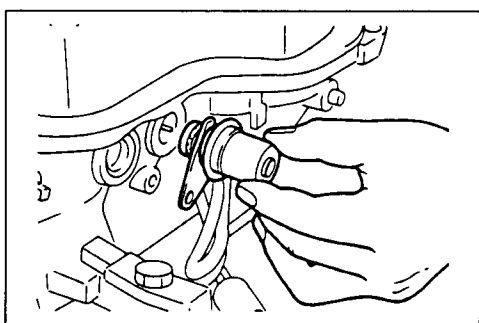
65. Apply ATF to the O-ring and install it onto the vacuum diaphragm.

66. Select the diaphragm rod.

- (1) Measure the N dimension with the **SST** and a scale.
- (2) Select the diaphragm rod in accordance with the table below.

**SST = SPECIAL SERVICE TOOL**

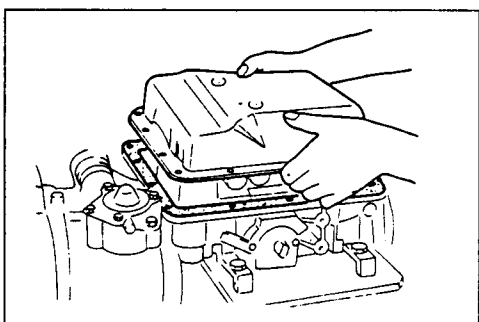
N dimension	Applicable diaphragm rod length
Below 27.20 mm (1.0709 in)	29.0 mm (1.14 in)
27.30—28.70 mm (1.0748—1.0905 in)	29.5 mm (1.16 in)
27.80—28.20 mm (1.0945—1.1102 in)	30.0 mm (1.18 in)
28.30—28.70 mm (1.1142—1.1300 in)	30.5 mm (1.20 in)
28.80 mm (1.1339 in) or over	31.0 mm (1.22 in)



67. Install the vacuum diaphragm.

**Tightening torque:**

**7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)**



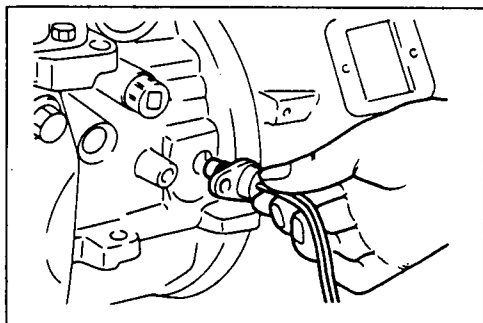
68. Install the magnets in the oil pan.

69. Install the oil pan and a new gasket.

70. Install the bracket and bolts.

**Tightening torque:**

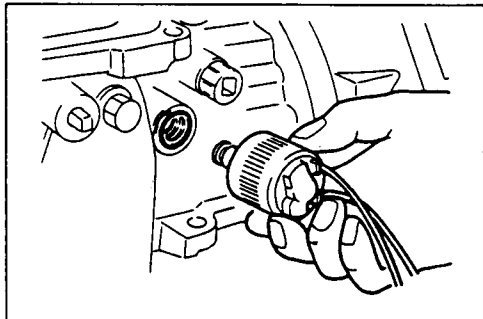
**5.9—7.8 N·m (60—80 cm·kg, 52—69 in·lb)**



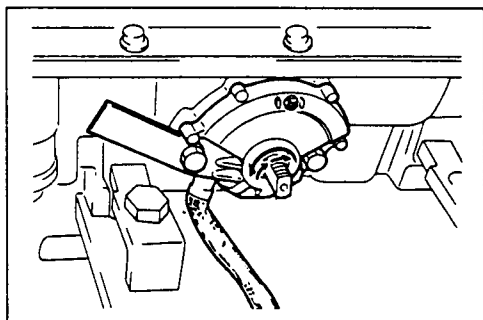
71. Apply ATF to the O-ring and install it onto the turbine sensor.
72. Apply locking compound to the mounting bolt threads, then install the turbine sensor.

**Tightening torque:**

**7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)**



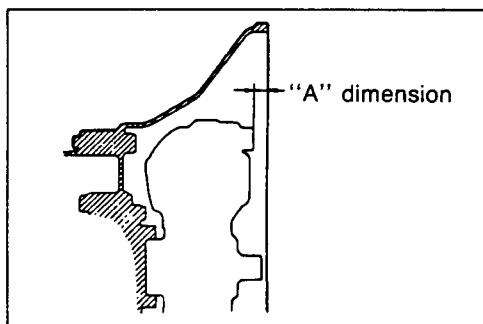
73. Apply ATF to the O-rings and install them into the transmission case.
74. Install the lockup control solenoid.



75. Rotate the manual shaft forward fully, then return it 2 notches to the N position.
76. Loosely tighten the inhibitor switch bolts.
77. Remove the screw on the switch body and slightly move the inhibitor switch so that the screw hole on the switch body is aligned with the small hole inside the switch. Check their alignment by inserting a **2.0 mm (0.0079 in)** diameter pin into the holes.
78. Tighten the switch attaching bolts.
79. Remove the pin and tighten the screw into the hole.

**Tightening torque:**

**4.9—6.9 N·m (50—70 cm·kg, 43—61 in·lb)**



80. Before installing, hold the torque converter in an erect position and fill it with ATF. Do not allow the fluid to overflow.
81. Ensure that the torque converter is installed correctly by measuring the clearance ("A") between the end of the torque converter and the end of the converter housing.

**"A": 32 mm (1.26 in) min.**



## MAZDA N4AEL SOFT OR FLARED SHIFTS WHEN WARM

**Complaint:** Shifts seem fine when cold, but become increasingly drawn out as the transmission warms up.

**Cause:** Valve body calibration problems related to fluid temperature.

- Correction:**
1. Check all accumulator piston teflon rings for fit.
  2. Replace the 1-2 accumulator piston teflon rings with suitable "O" rings. Replace the 1-2 accumulator spring with a stronger spring (A 700-R4 throttle plunger spring is sufficient if it is shimmed 1/4 in. on the piston side). **SEE FIGURE 1.**
  3. Move orifice **B** (servo release orifice) to the orifice **D** (direct clutch orifice) location and move the orifice **D** to the orifice **B** location. **SEE FIGURE 2.**
  4. Replace the intermediate band servo spring with a weaker one. The L4N71B servo spring is weaker or a blue accumulator spring from an AXOD.

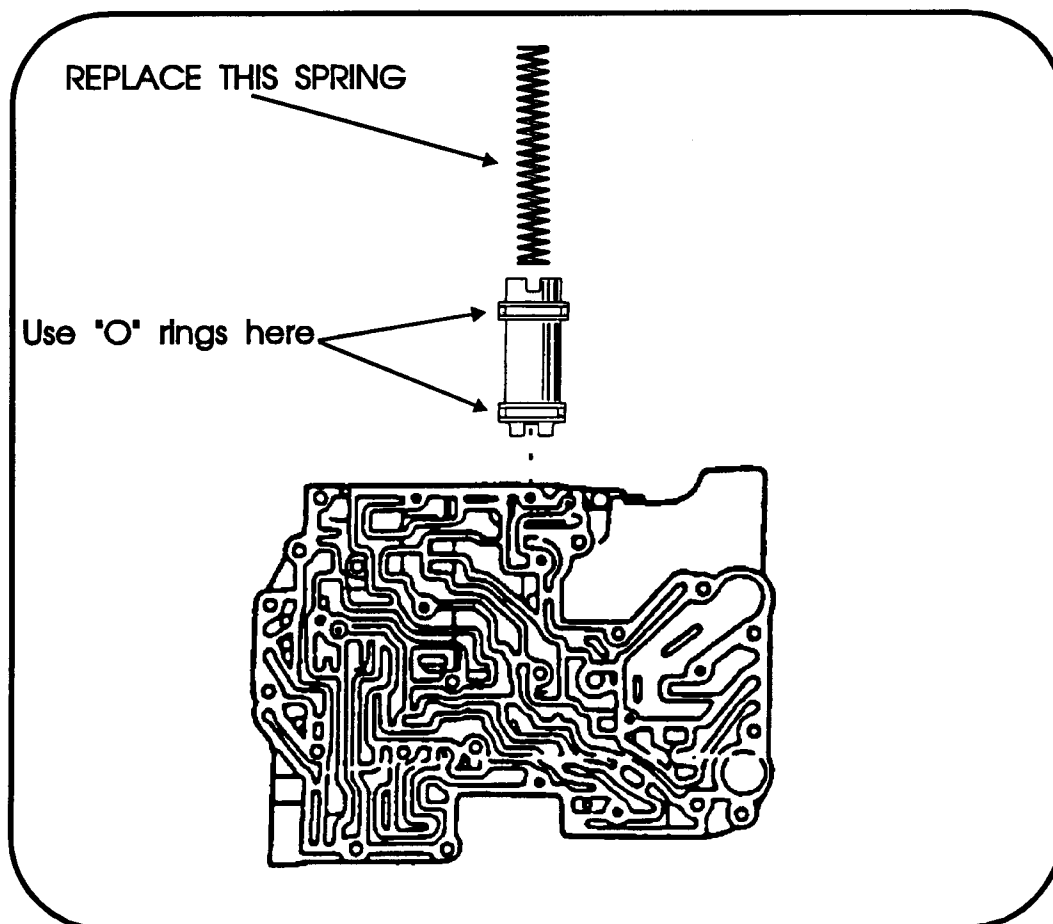


Figure 1.

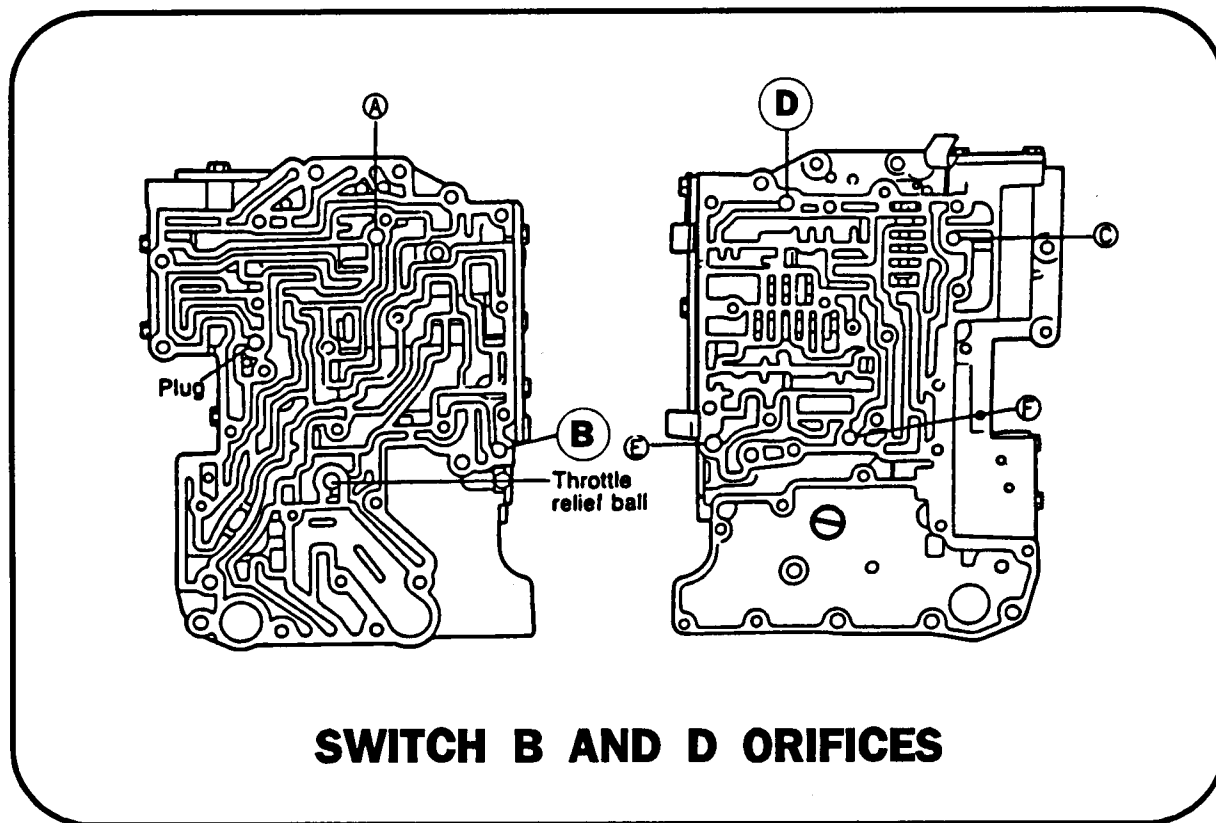


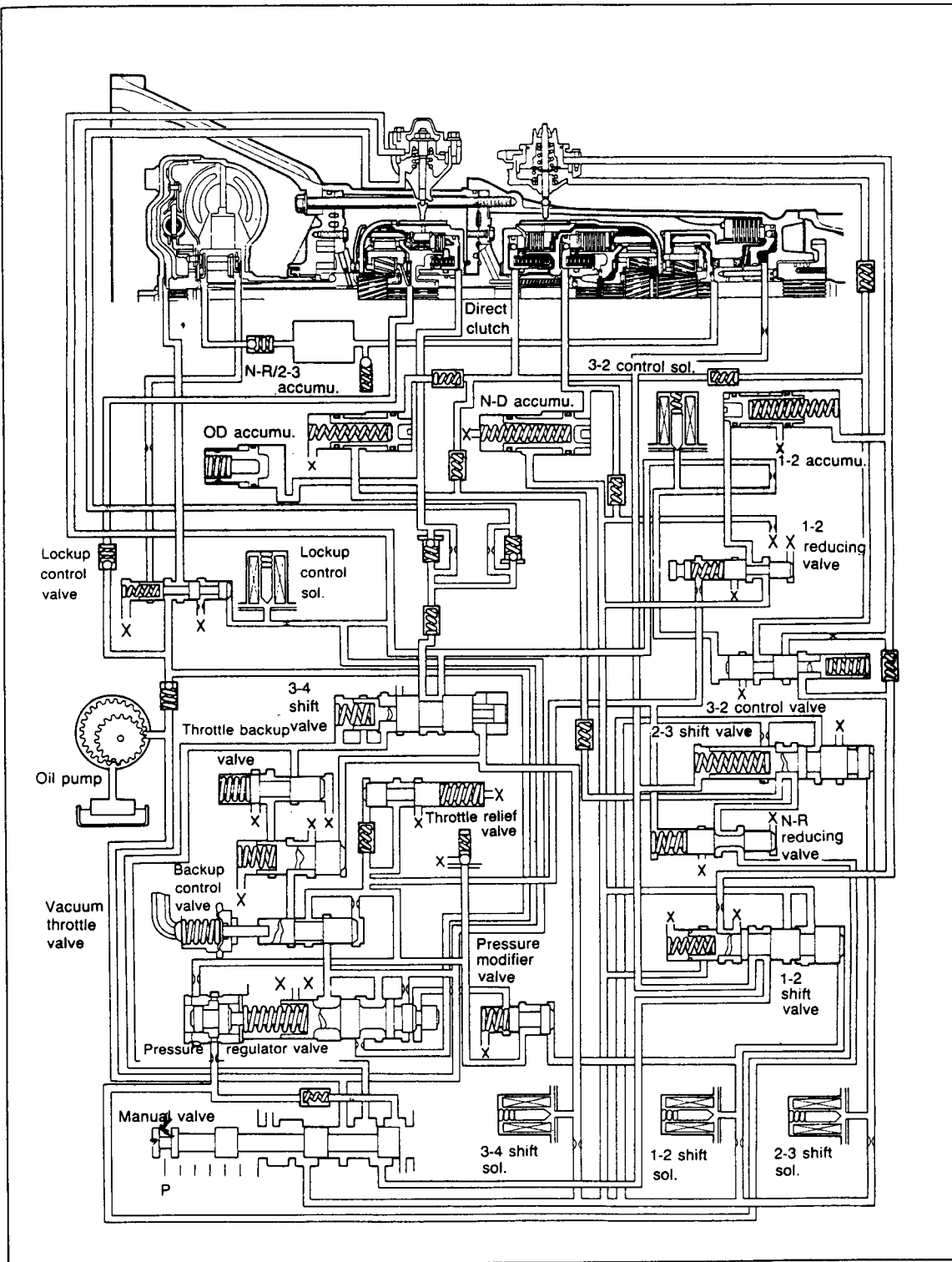
Figure 2.



# Technical Service Information

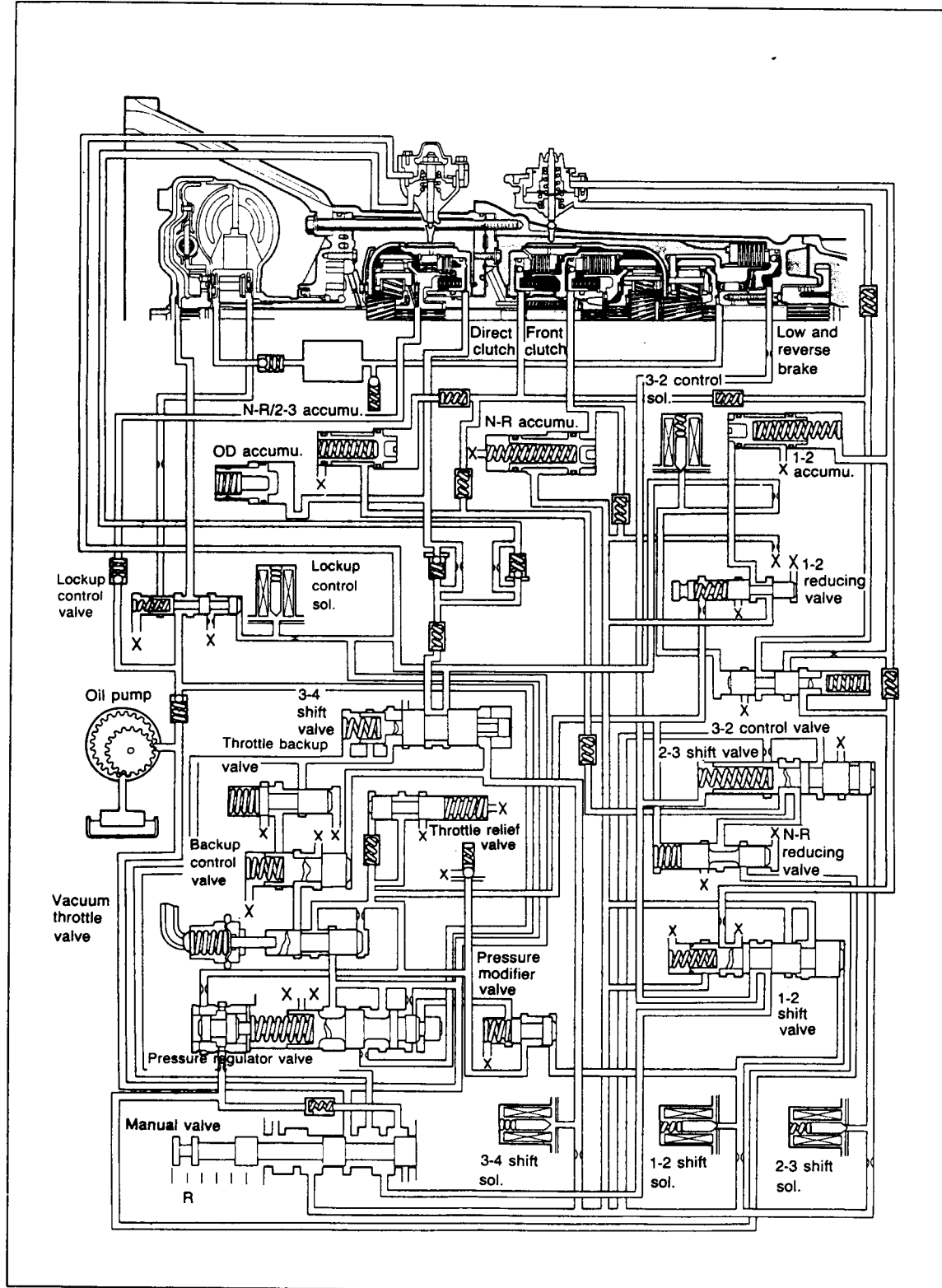
## HYDRAULIC CIRCUIT

P RANGE



AUTOMATIC TRANSMISSION SERVICE GROUP

## R RANGE



## D RANGE; OD, LOCKUP ON

