

2003 Mazda MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS Overhaul - SB4A-EL - MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS

Overhaul - SB4A-EL - MX-5 Miata

APPLICATION

AUTOMATIC TRANSMISSION APPLICATIONS

Application	Transmission Model
MX-5 Miata	SB4A-EL

AUTOMATIC TRANSMISSION DESCRIPTION

GEAR POSITION AND OPERATION OF FEATURED PARTS

Range	Mode	Gear position	Clutch			Brake			One-way clutch			Solenoid			
			C0	C1	C2	B0	B1	B2	I. P.	O. P.	F0	F1	F2	S1	S2
					I. P.			B3							
P	—	—	○											○	
R	—	Reverse*	○		○	○			○	○	○			○	
N	—	—	○											○	
D	O/D OFF switch OFF	1GR	○	○						○		○	○		
		2GR	○	○				○		○	○		○	○	
		3GR*	○	○	○			○		○					
		4GR*		○	○	○	○	○							
	O/D OFF switch ON	1GR	○	○						○		○	○		
		2GR	○	○				○		○	○		○	○	
		3GR*	○	○	○			○		○					
2	—	1GR*	○	○						○		○	○		
		2GR*	○	○				○	○		○	○		○	○
		3GR*	○	○	○			○		○					
1	—	1GR*	○	○					○	○	○		○	○	
		2GR*	○	○				○	○		○	○		○	○
		3GR*	○	○	○			○		○					

C0: 4GR clutch

C1: Forward clutch

C2: Direct clutch

B0: 4GR brake

B1: Second coast brake

B2: Second brake

B3: 1st and reverse brake

F0: One-way clutch No. 0

F1: One-way clutch No. 1

F2: One-way clutch No. 2

S1: Shift solenoid A

S2: Shift solenoid B

○ : Operating

* : Engine over speed protection

I. P.: Inner piston

O. P.: Outer piston

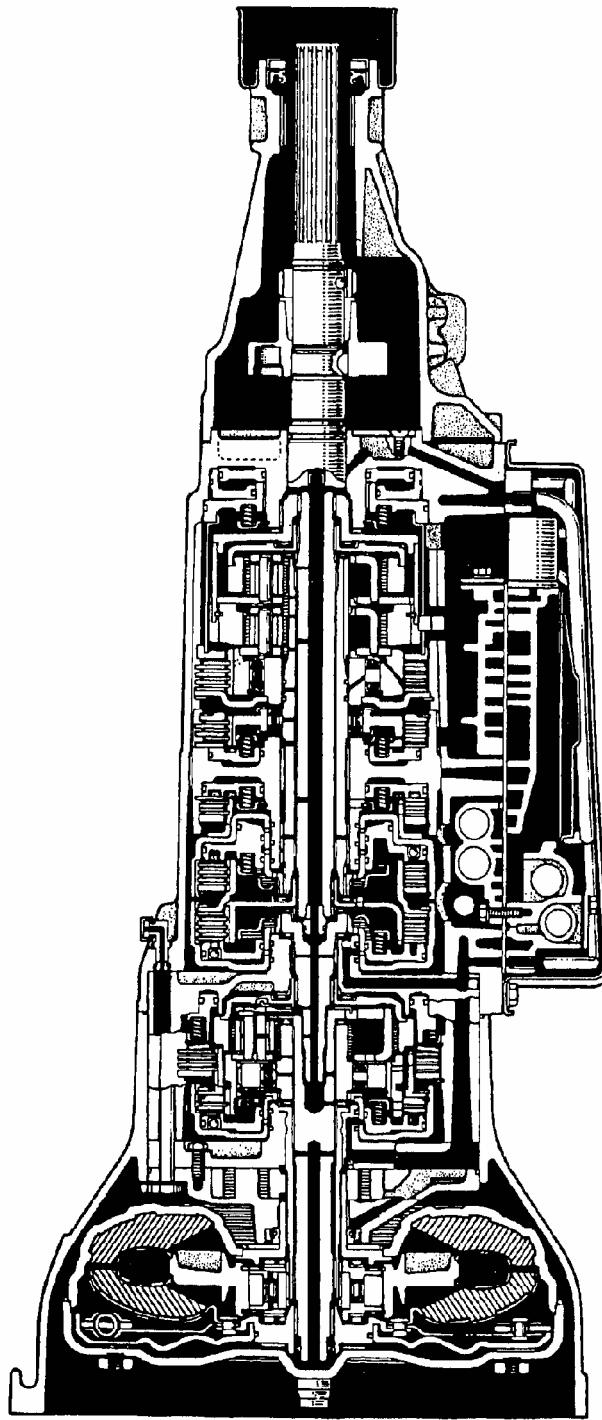
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Fig. 1: Gear Position & Operation Of Featured Parts Chart

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Courtesy of MAZDA MOTORS CORP.



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Fig. 2: Cutaway View Of Transmission
Courtesy of MAZDA MOTORS CORP.

TORQUE CONVERTER DESCRIPTION

OUTLINE

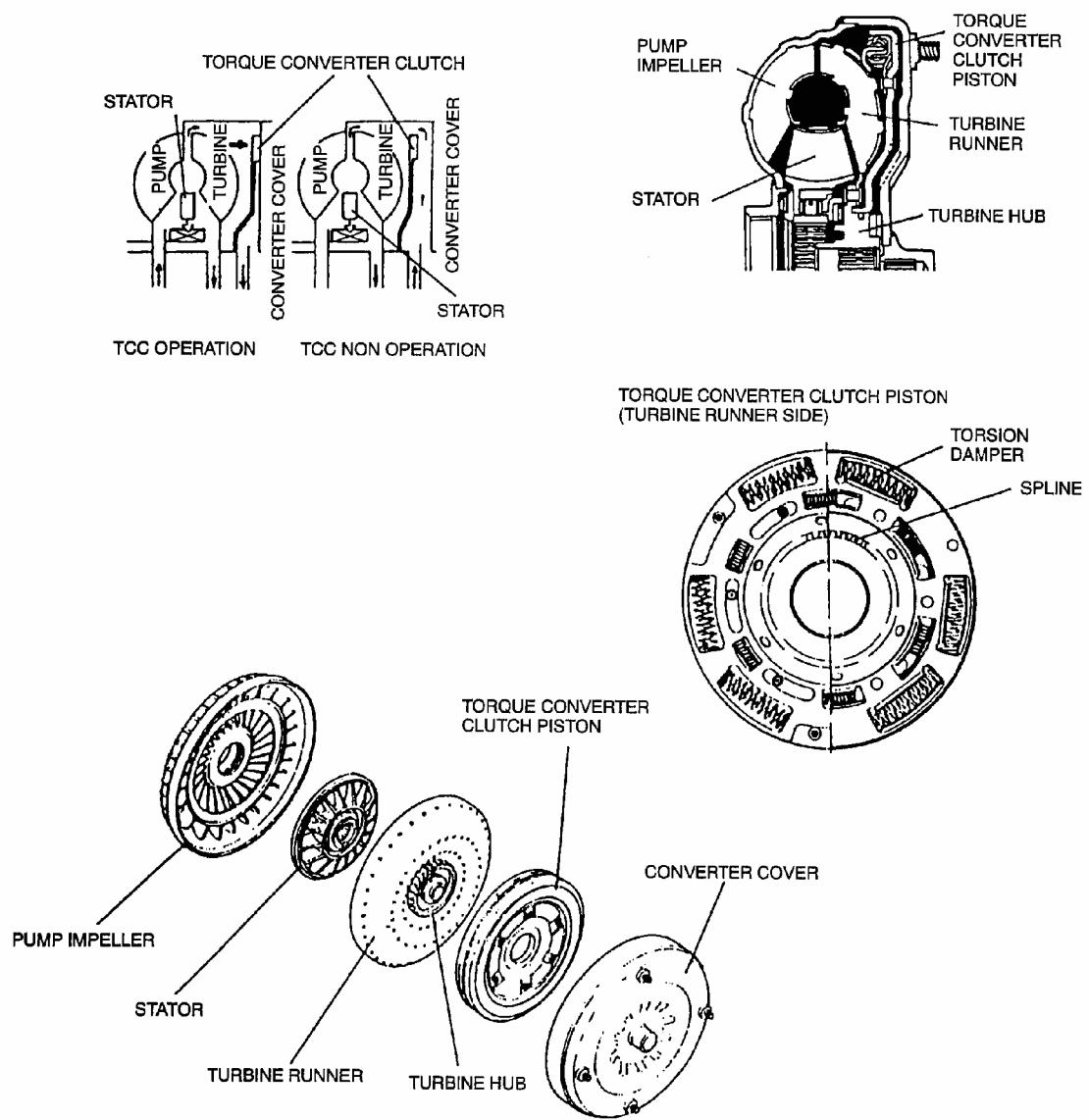
- The torque converter improves driveability by transmitting the drive force through the use of fluid. However, in certain ranges, a difference in rotation between the pump and the turbine caused by slipping of the fluid, decreases the transmission efficiency of the drive force as well as fuel efficiency.
- The torque converter clutch mechanism under certain conditions transmits the drive force by automatically connecting the pump impeller with the turbine runner as opposed to using fluid. Therefore it prevents the torque converter from slipping in the manner mentioned above.

CONSTRUCTION

- The torque converter, which includes a torque converter clutch mechanism, houses the turbine runner, the pump impeller, the stator, and the torque converter clutch. The torque converter clutch is spline-fitted to the turbine hub. During torque converter clutch engagement, it slides over the turbine hub and is pressed tightly together with the converter cover. A torsion spring is installed in the torque converter clutch to absorb engine torque friction when the torque converter clutch is pressed onto the torque converter.

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Fig. 3: Identifying Torque Converter Components
Courtesy of MAZDA MOTORS CORP.

POWERTRAIN DESCRIPTION

COMPONENT DESCRIPTIONS

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Component	Function
4GR clutch	Connects 4GR planetary pinion carrier and 4GR sun gear
Forward clutch	Connects input shaft and intermediate shaft
Direct clutch	Connects input shaft and sun gear
4GR brake	Locks 4GR sun gear
Second coast brake	Locks sun gear
Second brake	Locks counterclockwise rotation of sun gear
1st and reverse brake	Locks front planetary pinion carrier
One-way clutch No. 0	Connects 4GR planetary pinion carrier and 4GR sun gear
One-way clutch No. 1	Locks counterclockwise rotation of 4GR sun gear when second brake is on operation
One-way clutch No. 2	Locks counterclockwise rotation of front planetary pinion carrier

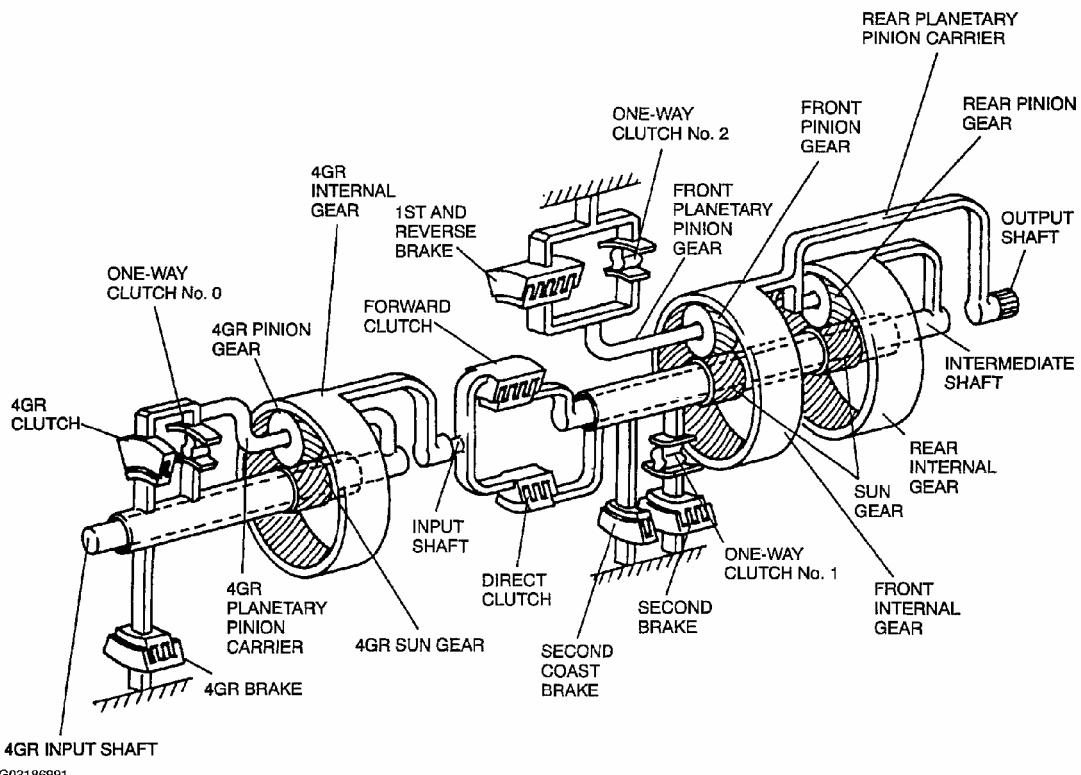


Fig. 4: Powertrain Component Descriptions
Courtesy of MAZDA MOTORS CORP.

OIL PUMP DESCRIPTION

Outline

- The oil pump feeds oil to the torque converter, lubricates the powertrain, and maintains operating pressure for the hydraulic control system.

Construction

- The outer gear and inner gear are integrated in the oil pump housing, and they are offset with one part of the gear engaged.

- The inner gear is engaged on the end of the torque converter.
- Due to this, when the crankshaft rotates, the drive plate, torque converter, inner gear, and outer gear all rotate together as a single unit.

Operation

- When the inner gear and outer gear rotate, the fluid drawn up through the oil strainer is sent by the inner gear and outer gear to the control valve.

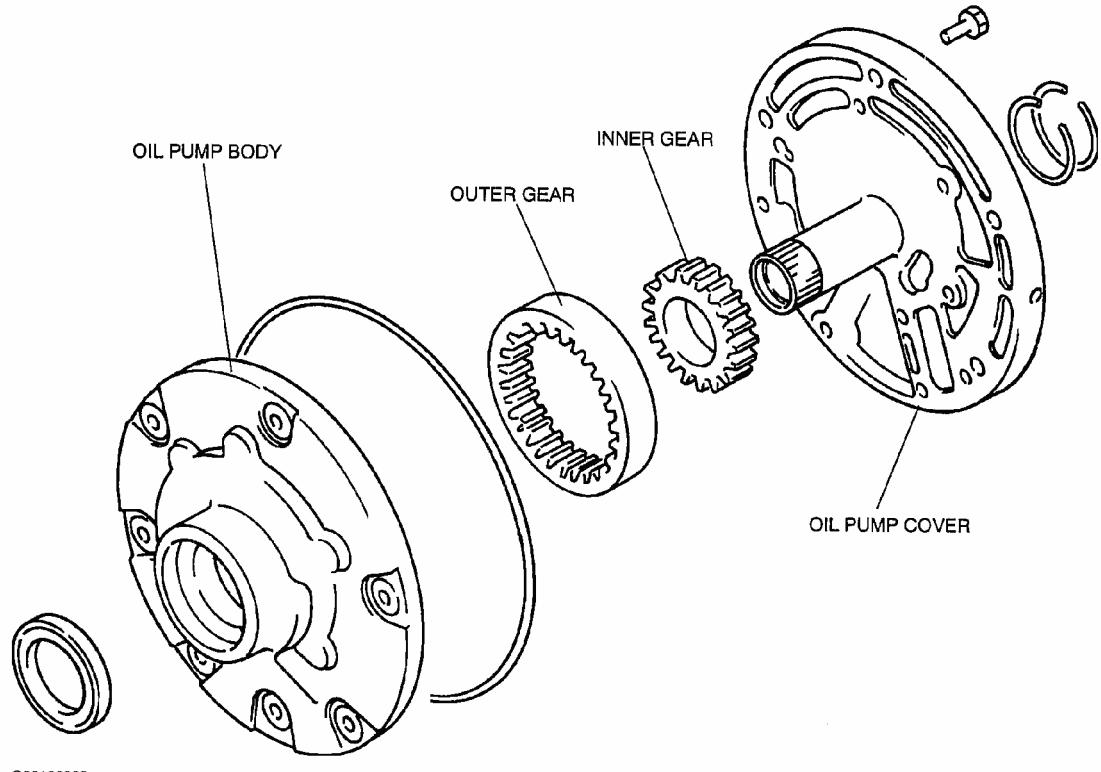


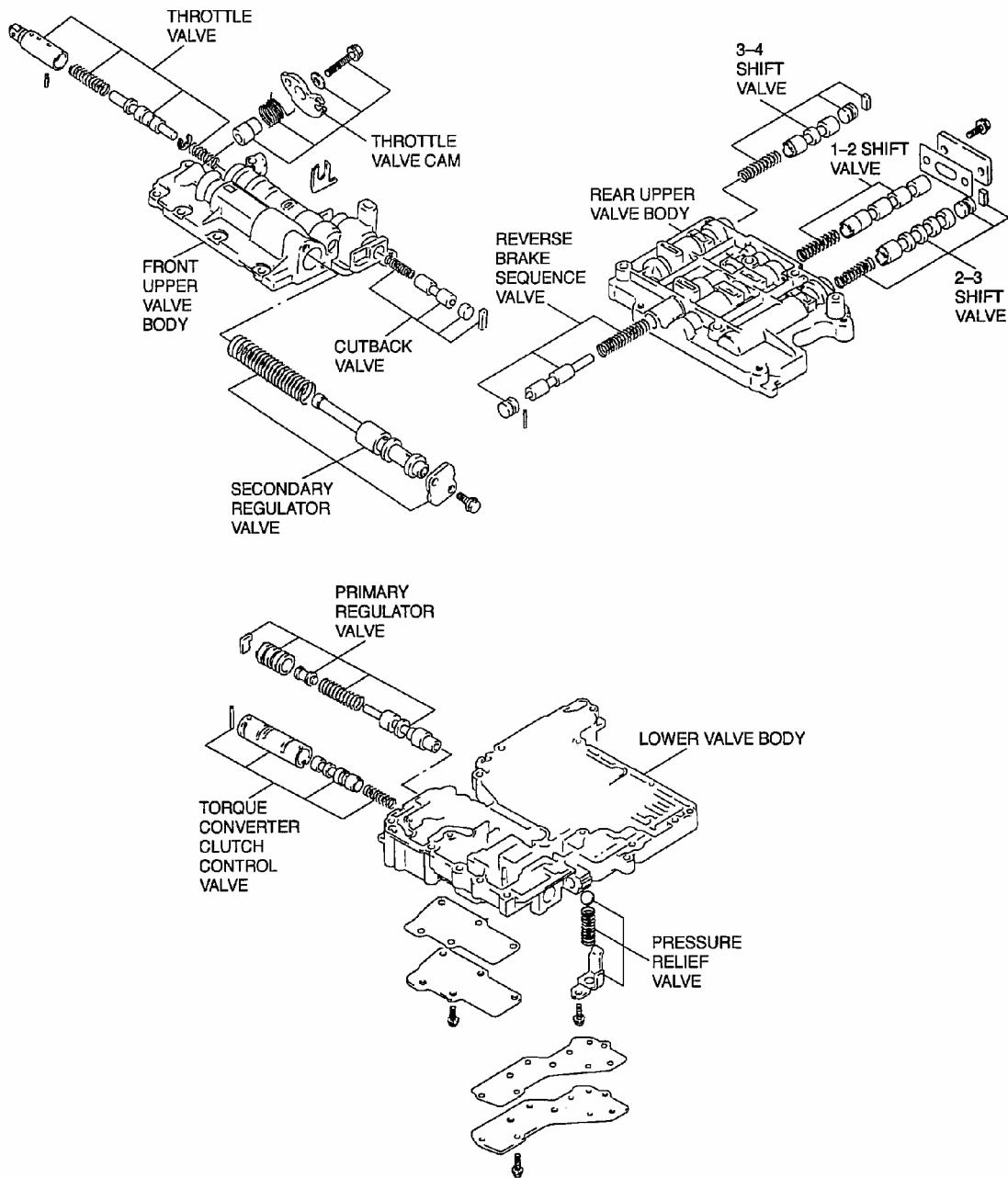
Fig. 5: Identifying Oil Pump Components
Courtesy of MAZDA MOTORS CORP.

CONTROL VALVE DESCRIPTION

CONTROL VALVE COMPONENT LOCATION

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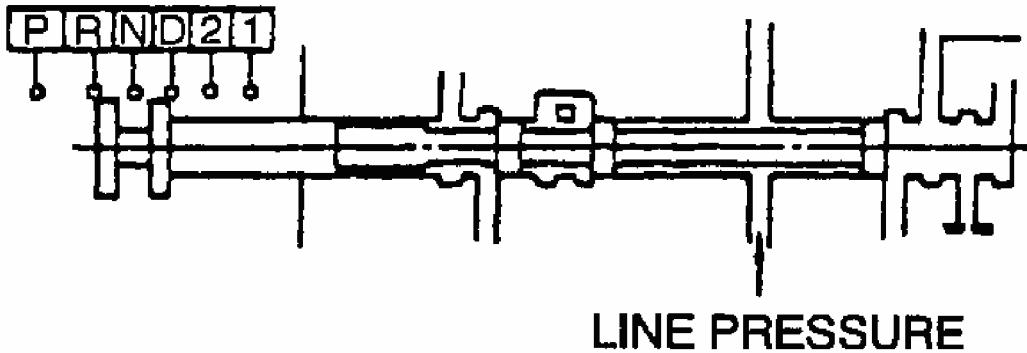


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Fig. 6: Identifying Control Valve Components
Courtesy of MAZDA MOTORS CORP.

MANUAL VALVE

- The manual valve switches the hydraulic paths for the line pressure. It is linked to the selector lever beside the driver's seat and it switches the ranges P, R, N, D, 2, and 1 according to the lever positions.

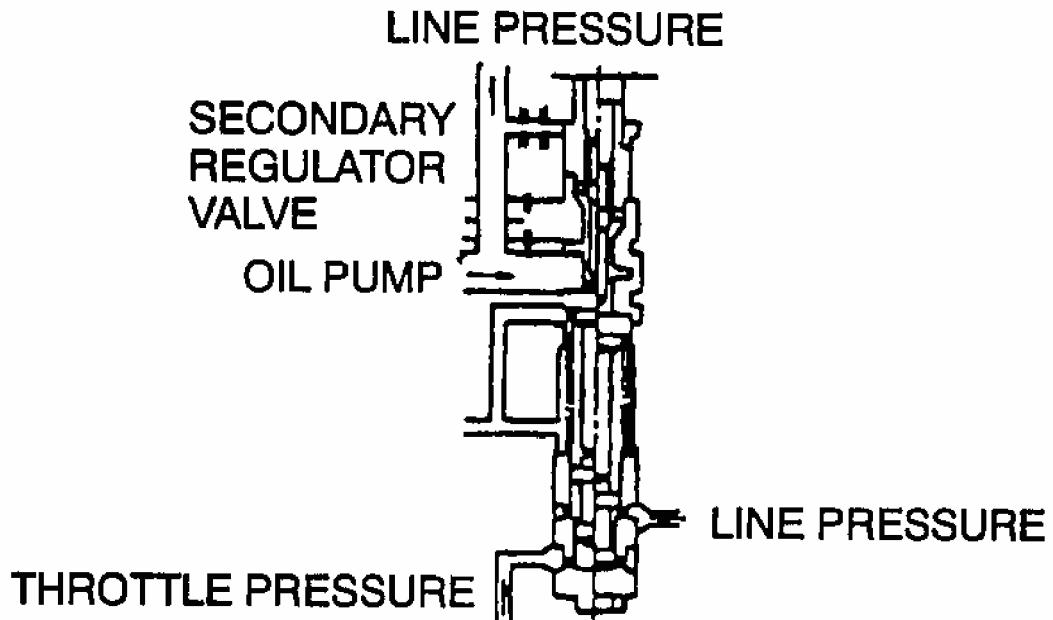


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Fig. 7: Manual Valve Hydraulic Paths
Courtesy of MAZDA MOTORS CORP.

PRIMARY REGULATOR VALVE

- The primary regulator valve automatically adjusts the hydraulic pressure to each element to the most suitable level according to the vehicle speed and engine load (throttle valve opening). Consequently, it prevents the oil pump from losing power unnecessarily.

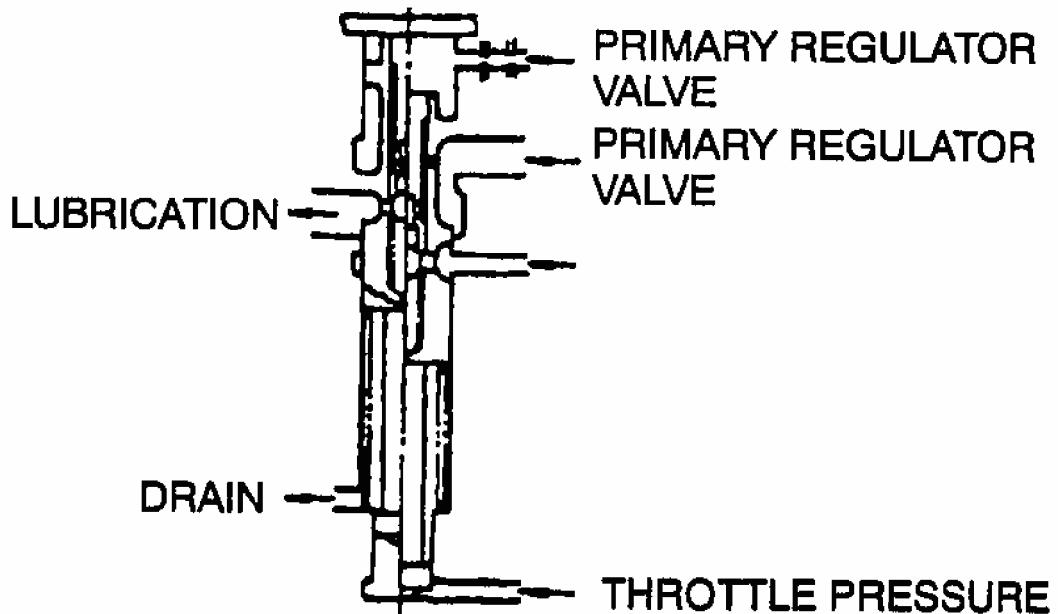


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Fig. 8: Primary Regulator Valve Operation
Courtesy of MAZDA MOTORS CORP.

SECONDARY REGULATOR VALVE

- The secondary regulator valve adjusts suitable converter pressure, lubrication hydraulic pressure, and cooler pressure according to the vehicle speed and the engine load (throttle valve opening).



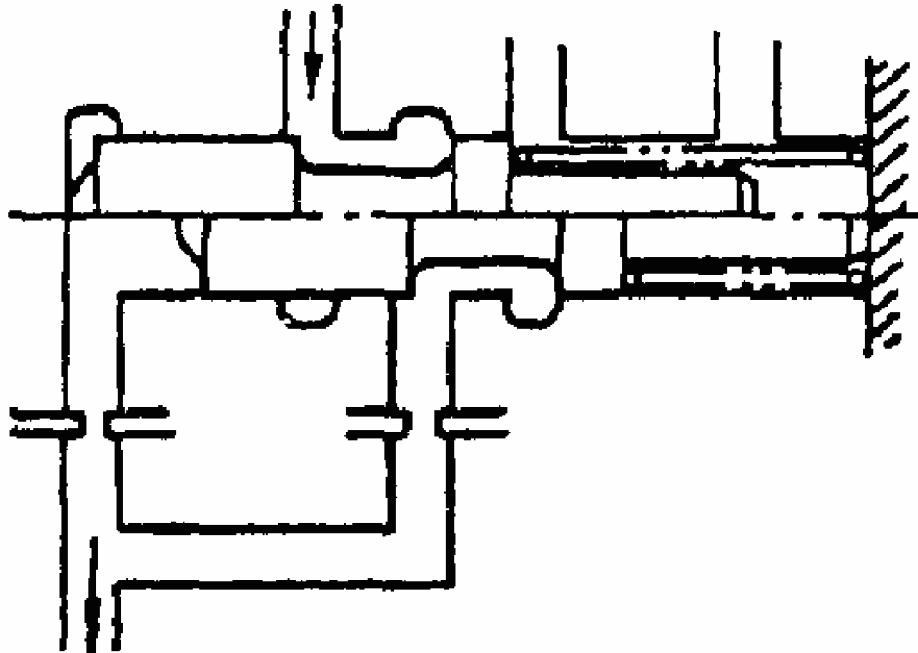
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Fig. 9: Secondary Regulator Valve Operation
Courtesy of MAZDA MOTORS CORP.

INTERMEDIATE COAST MODULATOR VALVE

- The intermediate coast modulator valve adjusts the line pressure of the second coast brake piston to reduce the engine brake shock when the selector lever is in second gear, at 2 range.

MANUAL VALVE



SECOND BRAKE

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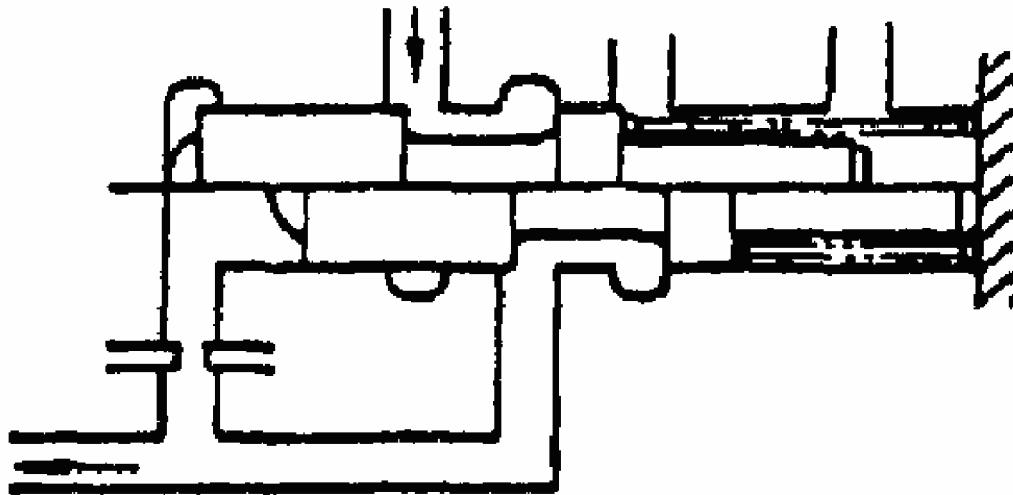
Fig. 10: Intermediate Coast Modulator Valve Operation

Courtesy of MAZDA MOTORS CORP.

LOW COAST MODULATOR VALVE

- The low coast modulator valve adjusts the line pressure which acts on this valve to the low hydraulic pressure (low modulator pressure) when the valve is at 1 range. The pressure goes through the low coast shift valve and operates on the 1st and reverse brake to reduce the brake shock.

MANUAL VALVE



1ST AND REVERSE BRAKE

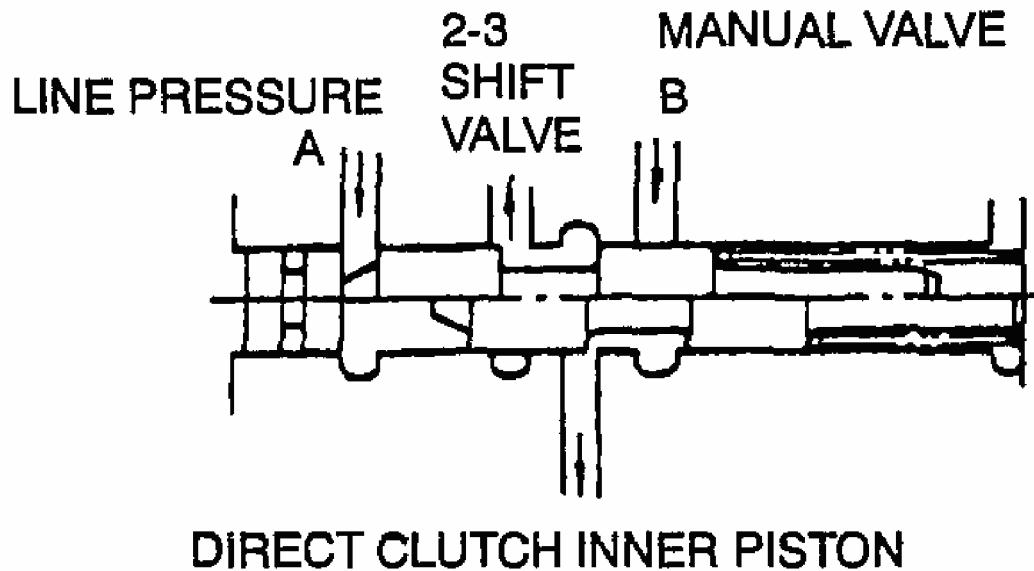
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Fig. 11: Low Coast Modulator Valve Operation

Courtesy of MAZDA MOTORS CORP.

REVERSE BRAKE SEQUENCE VALVE

- The reverse brake sequence valve reduces the shock when the selector lever is shifted to R position, and it is controlled by the line pressure which acts on the direct clutch outer piston. The line pressure acts on both circuits A and B at the same time when the selector lever is at R position. The outer piston operates after the inner piston, since circuit B will not open until hydraulic pressure A on this valve or the line pressure on the inner piston overcomes the valve spring tension.
- When the selector lever is in third gear at D range, only the outer piston can operate since circuit B is closed by the manual valve.

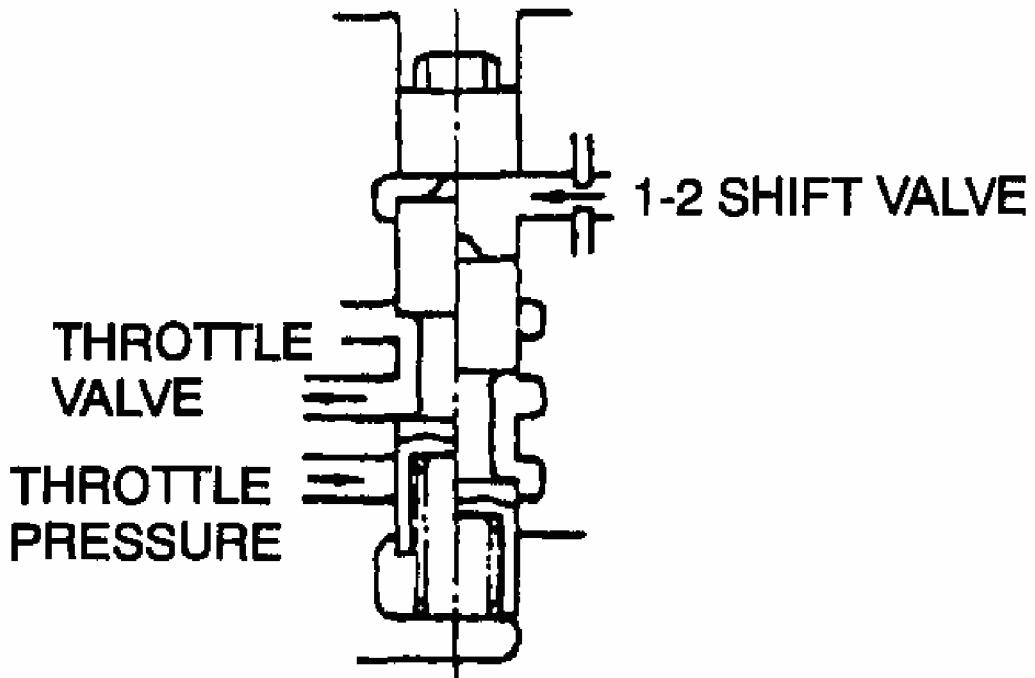


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Fig. 12: Reverse Brake Sequence Valve Operation
Courtesy of MAZDA MOTORS CORP.

CUTBACK VALVE

- The cutback valve adjusts the cutback pressure which acts on the throttle valve. The cutback valve operates with the line pressure from the 1-2 shift valve and the throttle pressure. The cutback pressure's effect on the throttle valve reduces the throttle pressure and prevents the oil pump from losing power unnecessarily.

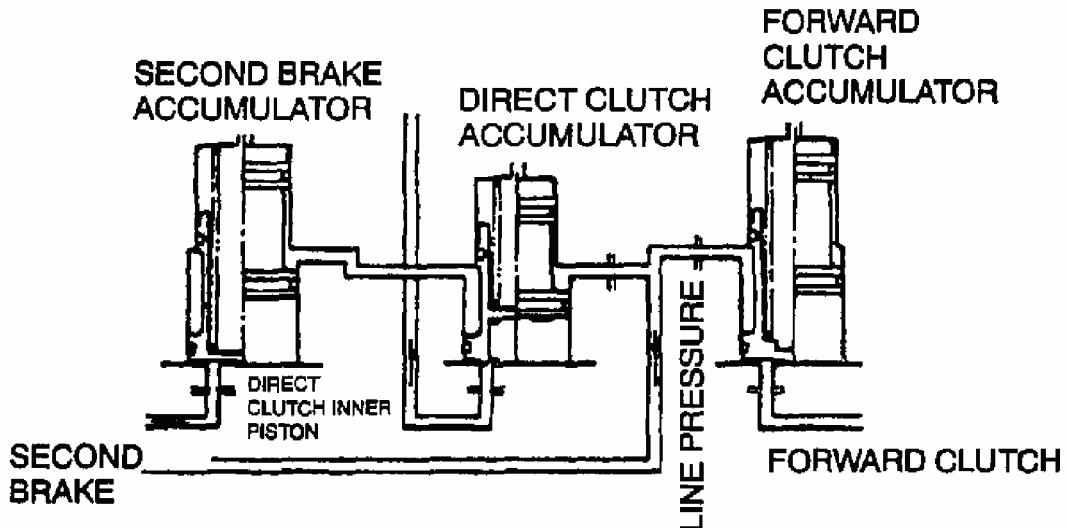


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Fig. 13: Cutback Valve Operation
Courtesy of MAZDA MOTORS CORP.

ACCUMULATOR

- Accumulators are set at each location to reduce shift shock generated when the forward clutch, the direct clutch, or second brake is in operation. There is an area difference between the working side and the back pressure side of the accumulator piston; the working side area is larger than the back pressure side. The line pressure acts on the back pressure side at all times to push down the piston. When the passage to the working side opens and the line pressure is in operation, the piston is gradually pushed up and reduces shift shock.

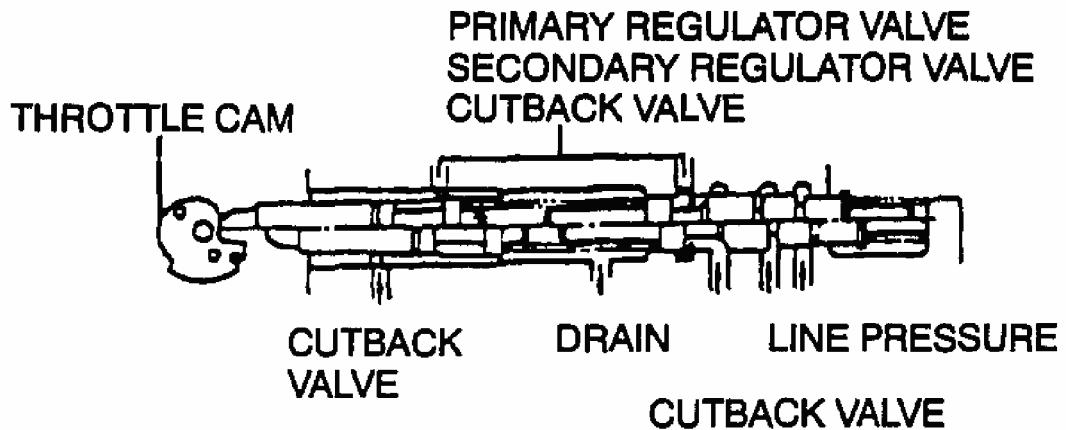


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Fig. 14: Accumulator Operation
Courtesy of MAZDA MOTORS CORP.

THROTTLE VALVE

- The throttle valve gets the throttle pressure to correspond to acceleration or the engine load. The throttle cable interlocked with the accelerator pedal transmits the pressure to the throttle cam, and the throttle cam pushes the downshift plug to shift the throttle valve by compressing the two springs in front and behind. Then the line pressure passage opens and throttle pressure is generated. However, the throttle pressure also operates behind the valve, and the throttle valve is pushed back because of the hydraulic pressure. The throttle valve closes the line pressure passage, with the tension of the two springs in the downshift plug position balanced.
- Consequently, the throttle pressure is regulated by the throttle valve opening angles. The hydraulic pressure adjusts the primary regulator valve and the secondary regulator valve to relieve the line pressure.

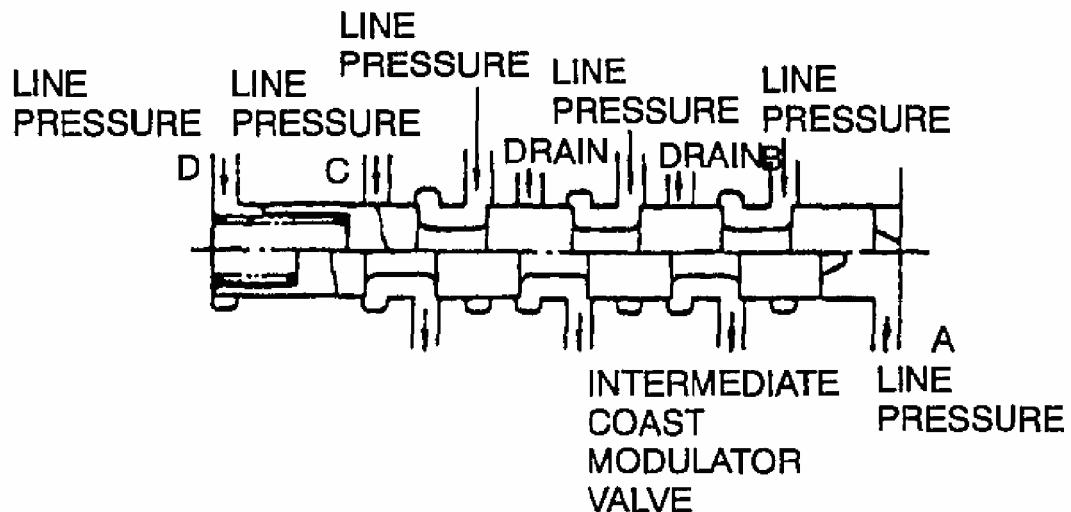


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Fig. 15: Throttle Valve Operation
Courtesy of MAZDA MOTORS CORP.

1-2 SHIFT VALVE

- 1-2 shift valve automatically controls shifts between first and second gear by switching shift solenoid B on/off.
- In first gear position, with shift solenoid B off, line pressure from passage A acts on the valve to shift, and the passage to second brake is closed. With shift solenoid B on, passage A line pressure is drained, the valve shifts with the spring tension, the passage to second brake is opened, and the position turns to second gear.
- In 2 or 1 range, passage B line pressure acts on second coast brake through the intermediate modulator valve, only when the valve is in second position. This enables the engine brake to operate in second gear. In 1 range, passage C pressure acts on reverse brake only when the valve is in first position. This enables the engine brake to operate in first gear.

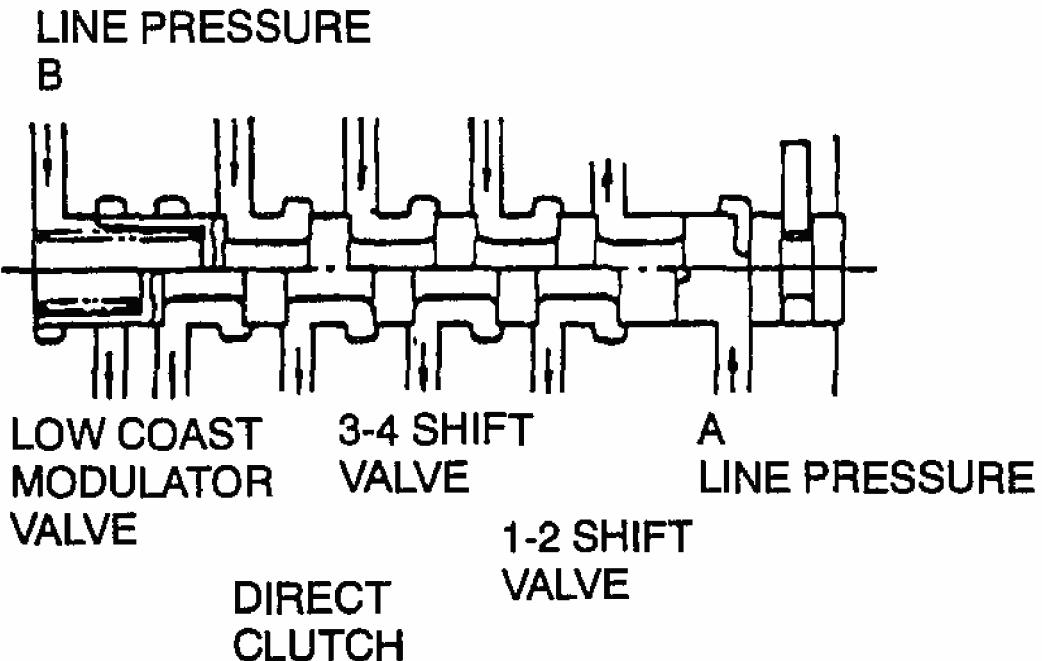


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Fig. 16: 1-2 Shift Valve Operation
Courtesy of MAZDA MOTORS CORP.

2-3 SHIFT VALVE

- The 2-3 shift valve automatically controls shifts between second and third gear by switching shift solenoid A on/off.
- In second gear position, with shift solenoid A on, passage A line pressure is drained and the passage to the direct clutch is closed. The passage A line pressure causes the valve to shift by switching shift solenoid A off, and the passage to the direct clutch is opened, engaging third gear.

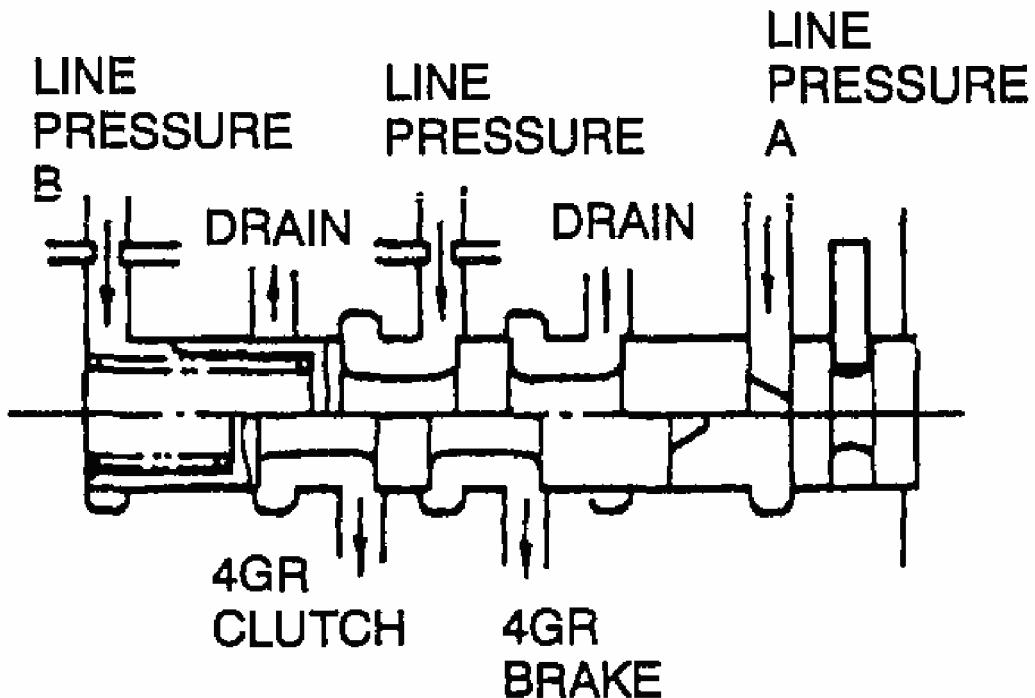


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Fig. 17: 2-3 Shift Valve Operation
Courtesy of MAZDA MOTORS CORP.

3-4 SHIFT VALVE

- The 3-4 shift valve automatically controls shifts between third gear and 4GR gear by switching shift solenoid B on/off.
- In third gear position, with shift solenoid B on, passage A line pressure is drained. This allows the 4GR clutch passage to be opened and the 4GR brake passage to be closed. With shift solenoid B off, the passage A line pressure causes the valve to shift. This allows 4GR clutch passage to be closed and the 4GR brake passage to be opened, engaging 4GR gear.
- Also in first gear position, shift solenoid B is off and the passage A line pressure is on. However, the passages to the 4GR clutch and to the 4GR brake are not shifted, because passage B line pressure does not allow the valve to shift.



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Fig. 18: 3-4 Shift Valve Operation
Courtesy of MAZDA MOTORS CORP.

POWER TRANSMISSION/HYDRAULIC MECHANISM DESCRIPTION

R POSITION

Power Transmission

- The driving force of the 4GR input shaft is transmitted to the input shaft because 4GR clutch and one-way clutch No. 0 are engaged, and 4GR planetary gear unit rotates as a unit.
- The driving force of the input shaft is transmitted to the sun gear through the direct clutch, causing the sun gear to rotate clockwise. The front pinion gear, however, does not revolve because the front planetary pinion carrier is locked by the reverse brake. This causes the sun gear to rotate the front planetary pinion gear counterclockwise.
- As a result, the output shaft also rotates counterclockwise, and the driving force is transmitted to the driving wheels.

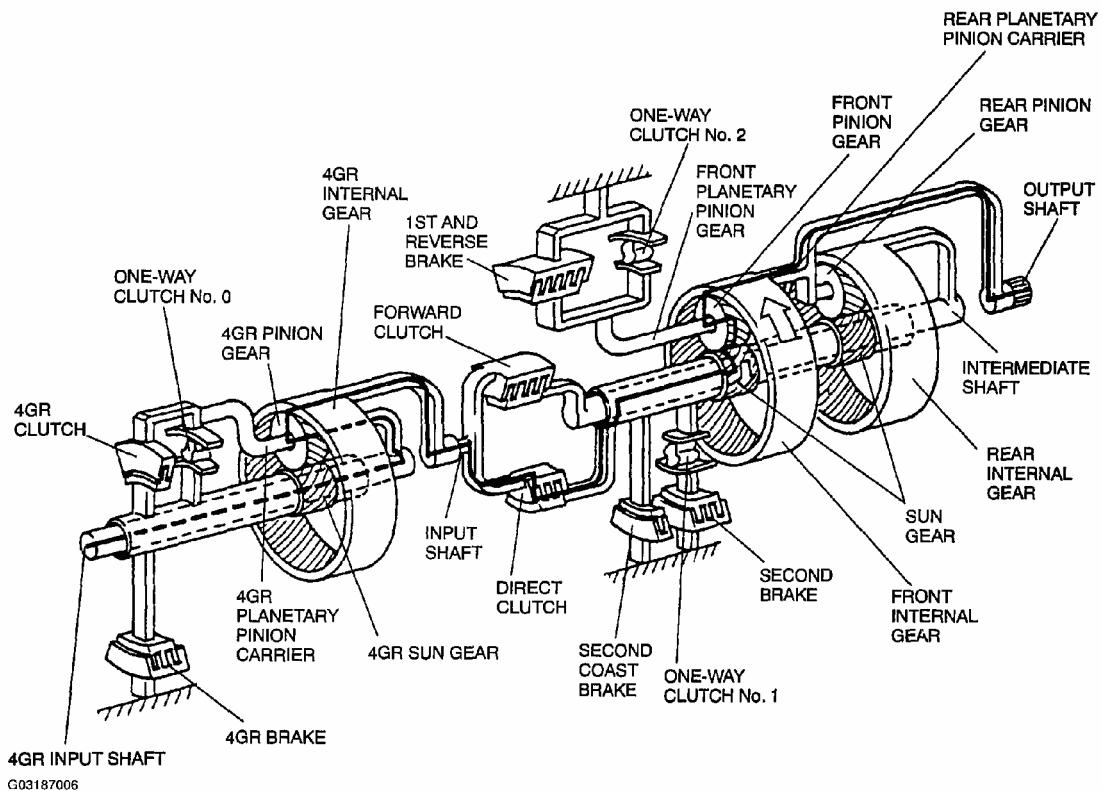


Fig. 19: R Position Power Flow
Courtesy of MAZDA MOTORS CORP.

- The line pressure flows in the manual valve and operates the 4GR clutch, direct clutch, and 1st and reverse brake.

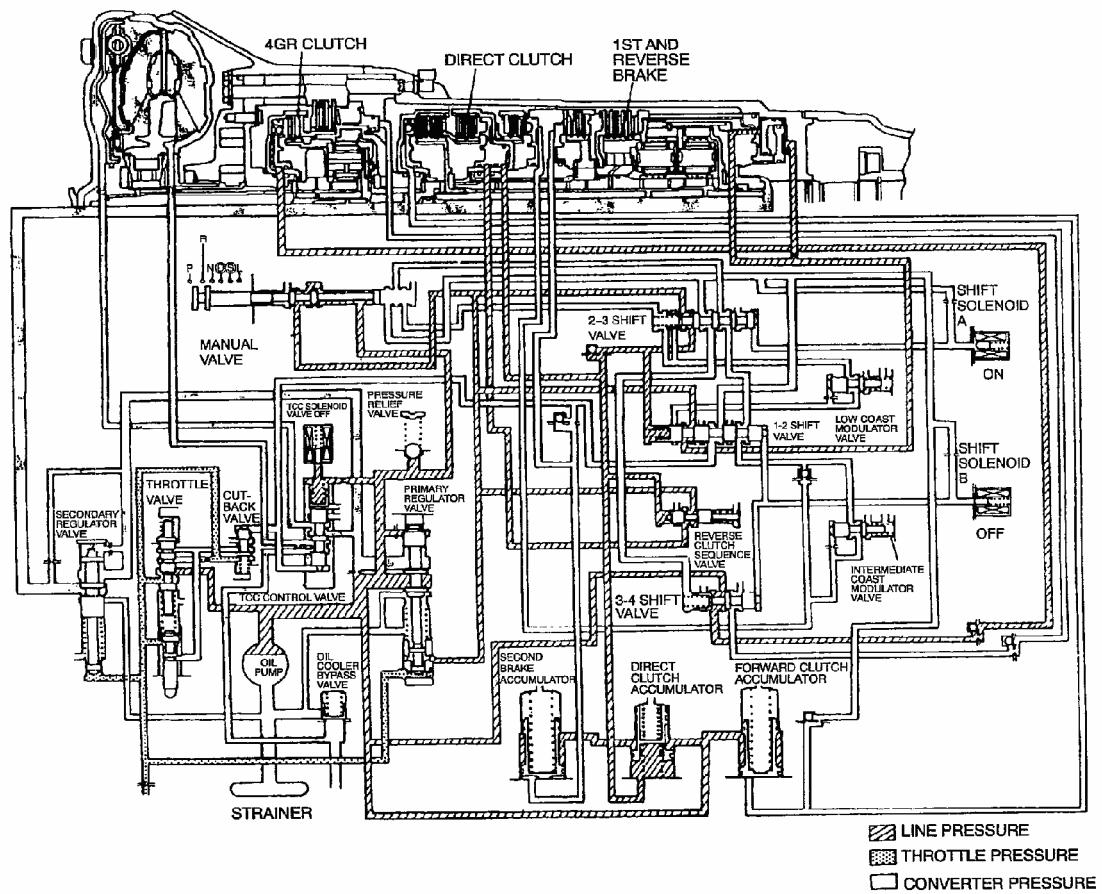


Fig. 20: Hydraulic Pressure Diagram
Courtesy of MAZDA MOTORS CORP.

FIRST GEAR

Power Transmission

- The driving force of the 4GR input shaft is transmitted to the input shaft because 4GR clutch and one-way clutch No. 0 are engaged, and 4GR planetary gear unit rotates as a unit. The forward clutch transmits this driving force to the rear internal gear to rotate. However, the rear planetary pinion carrier, which is set together with the output shaft or the driving wheels, does not revolve because it is locked by the load when the vehicle is at a standstill. This causes the rear pinion gear to rotate clockwise.
- This rotation is transmitted to the sun gear, causing the gear to rotate counterclockwise. However, the front internal gear, which is also set together with the output shaft, does not revolve when the vehicle is at a standstill. The front pinion gear cannot revolve counterclockwise due to one-way clutch No. 2 set operation, though it is going to revolve around the sun gear while it is rotating clockwise.
- As a result, the front pinion gear rotates clockwise, overcoming the load of the stopped vehicle, and rotates the front internal gear clockwise. This also causes the output shaft

to rotate clockwise, and this driving force is transmitted to the driving wheels through the propeller shaft.

- During deceleration, the front pinion gear rotates at higher speed than the sun gear, causing one-way clutch No. 2 to freewheel and the front planetary pinion carrier to rotate clockwise. As a result, reverse torque from the driving wheels is not transmitted to the engine, so the engine brake does not operate.

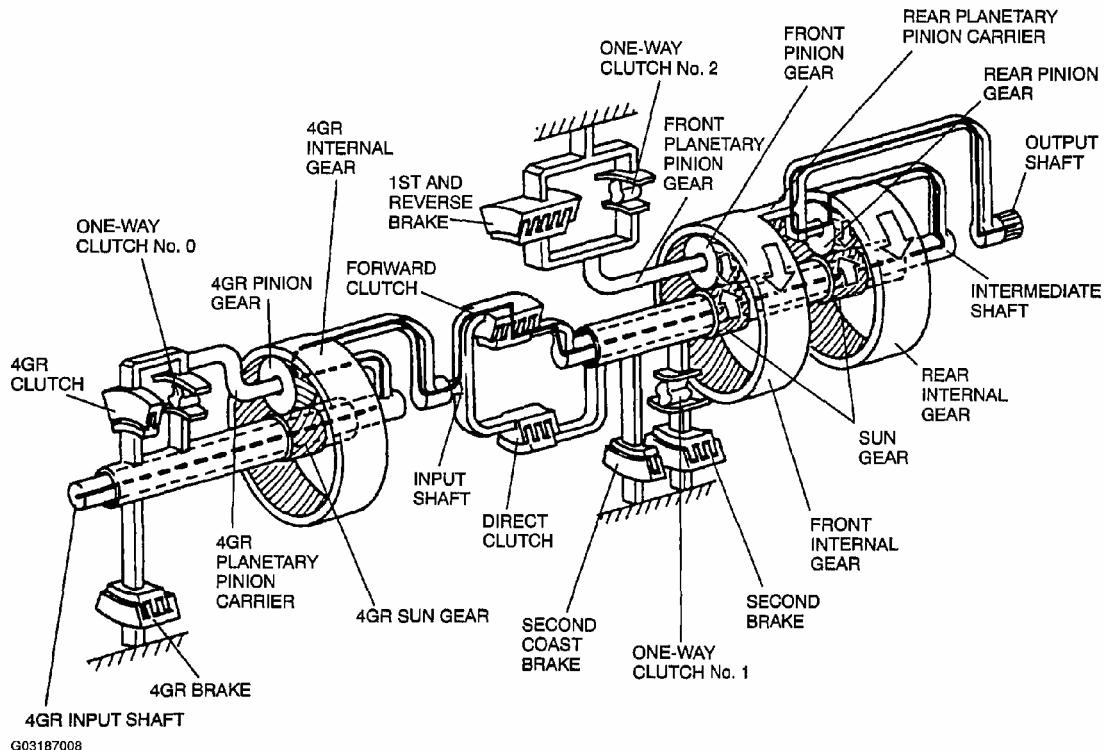


Fig. 21: First Gear Position Power Flow
Courtesy of MAZDA MOTORS CORP.

Hydraulic Pressure Operation

- The line pressure driven to the manual valve works on the forward clutch and 4GR clutch, engaging each clutch to be in first gear position. With the shift solenoid B off, the 1-2 shift valve is pushed to the left side, so the line pressure from the manual valve does not flow beyond the 1-2 shift valve.

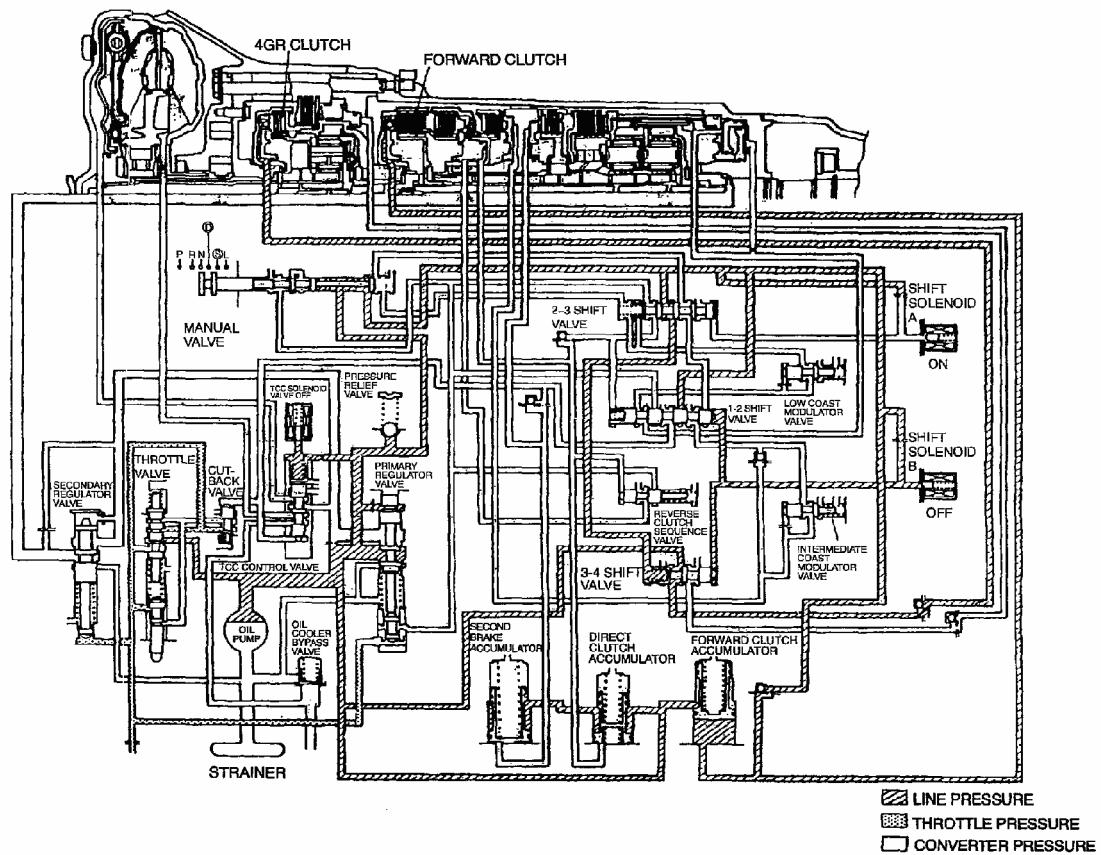


Fig. 22: First Gear Hydraulic Pressure Operation
Courtesy of MAZDA MOTORS CORP.

SECOND GEAR

Power Transmission

- The driving force of the 4GR input shaft is transmitted to the input shaft because 4GR clutch and one-way clutch No. 0 are engaged, and 4GR planetary gear unit rotates as a unit. The driving force of the input shaft is transmitted to the rear internal gear through the forward clutch, causing the rear internal gear to rotate.
- This rotation is transmitted to the sun gear through the pinion gear. Though the sun gear is going to rotate counterclockwise, it cannot due to second brake set operation.
- As a result, the rear pinion gear rotates clockwise, and it rotates the rear planetary pinion carrier clockwise. The output shaft also rotates clockwise, and the driving force is transmitted to the driving wheels through the propeller shaft.
- During deceleration, the driving force is transmitted from the driving wheels, as opposed to the operation in driving. This causes the one-way clutch No. 2 to freewheel. Thus the reverse torque from the driving wheels is not transmitted to the engine, and the engine brake does not operate.

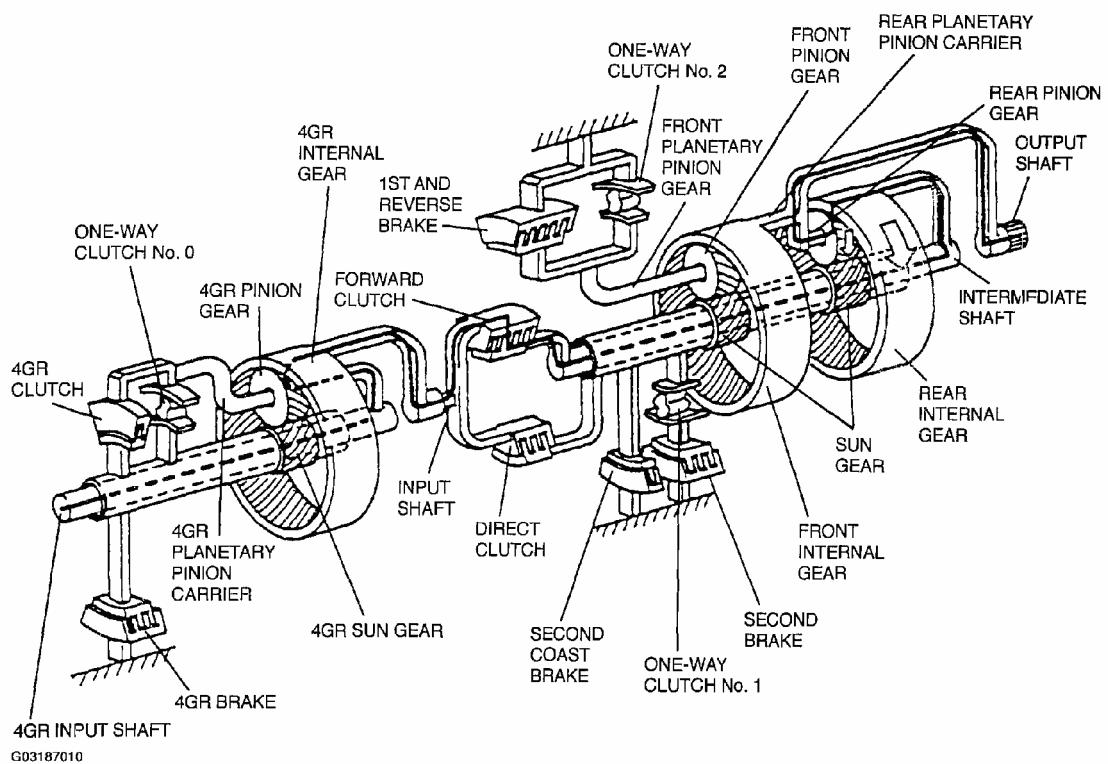


Fig. 23: Second Gear Position Power Flow
Courtesy of MAZDA MOTORS CORP.

Hydraulic Pressure Operation

- When the position is switched to second gear after accelerating in first gear, shift solenoid B turns on and line pressure works on the 1-2 shift valve. The hydraulic pressure which works on the 1-2 shift valve flows to the accumulator and to second brake, causing second brake to operate. The accumulator reduces shift shock generated when second brake is operated.

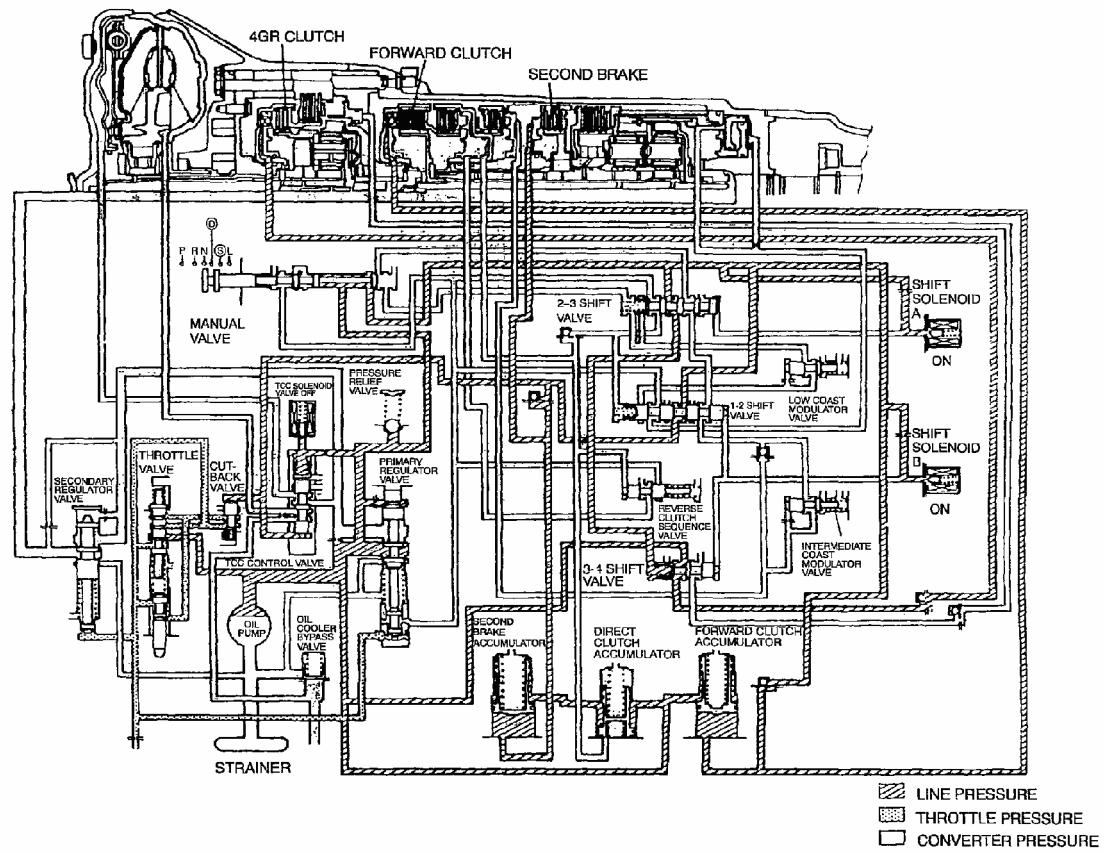


Fig. 24: Second Gear Hydraulic Pressure Operation
Courtesy of MAZDA MOTORS CORP.

THIRD GEAR

Power Transmission

- The driving force of the 4GR input shaft is transmitted to the input shaft because 4GR clutch and one-way clutch No. 0 are engaged, and 4GR planetary gear unit rotates as a unit. The driving force of the input shaft is transmitted to the rear internal gear through the forward clutch, causing the rear internal gear to rotate clockwise. The force is also transmitted to the sun gear through the direct clutch, and it rotates the sun gear clockwise.
- Because the rear internal gear and the sun gear rotate in the same direction at the same time, the rear pinion gear does not rotate, causing the rear planetary pinion carrier to rotate together with the rear internal gear and the sun gear. This torque is transmitted to the driving wheels through the propeller shaft.
- During deceleration, the driving force is transmitted from the driving wheels as opposed to the operation in driving, causing the engine brake to operate.

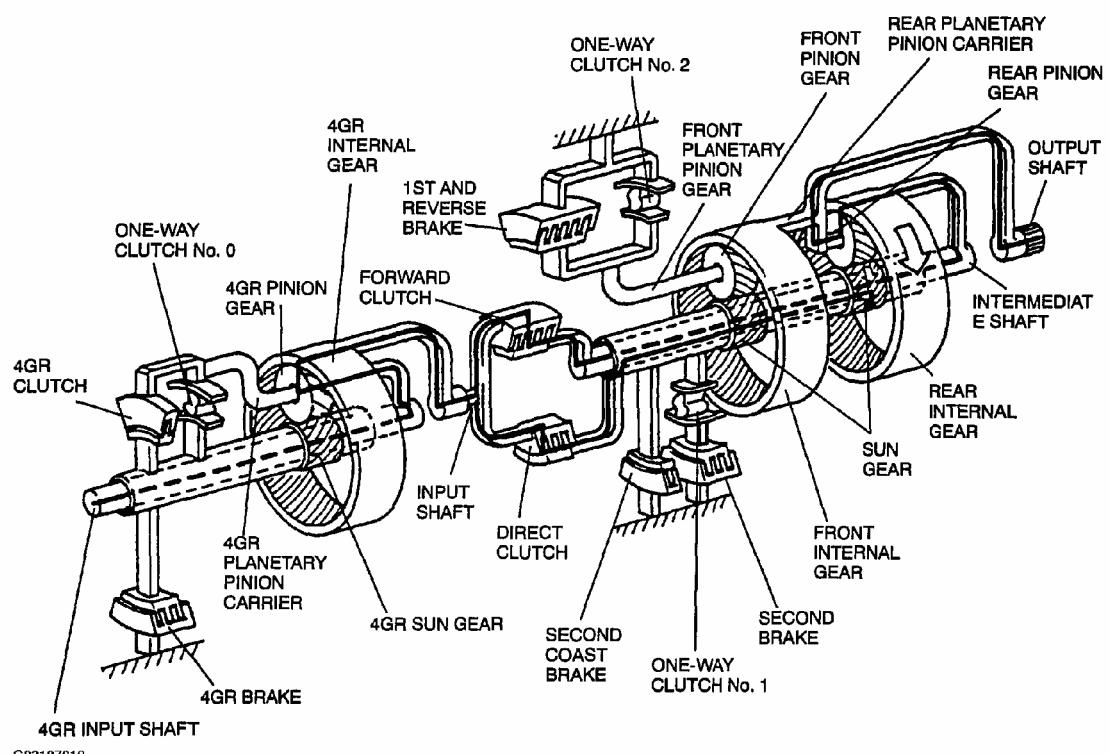


Fig. 25: Third Gear Position Power Flow
Courtesy of MAZDA MOTORS CORP.

Hydraulic Pressure Operation

- When the position is switched to third gear after accelerating in second gear, shift solenoid A turns off. Thus the hydraulic pressure works on the 2-3 shift valve and operates the direct clutch.

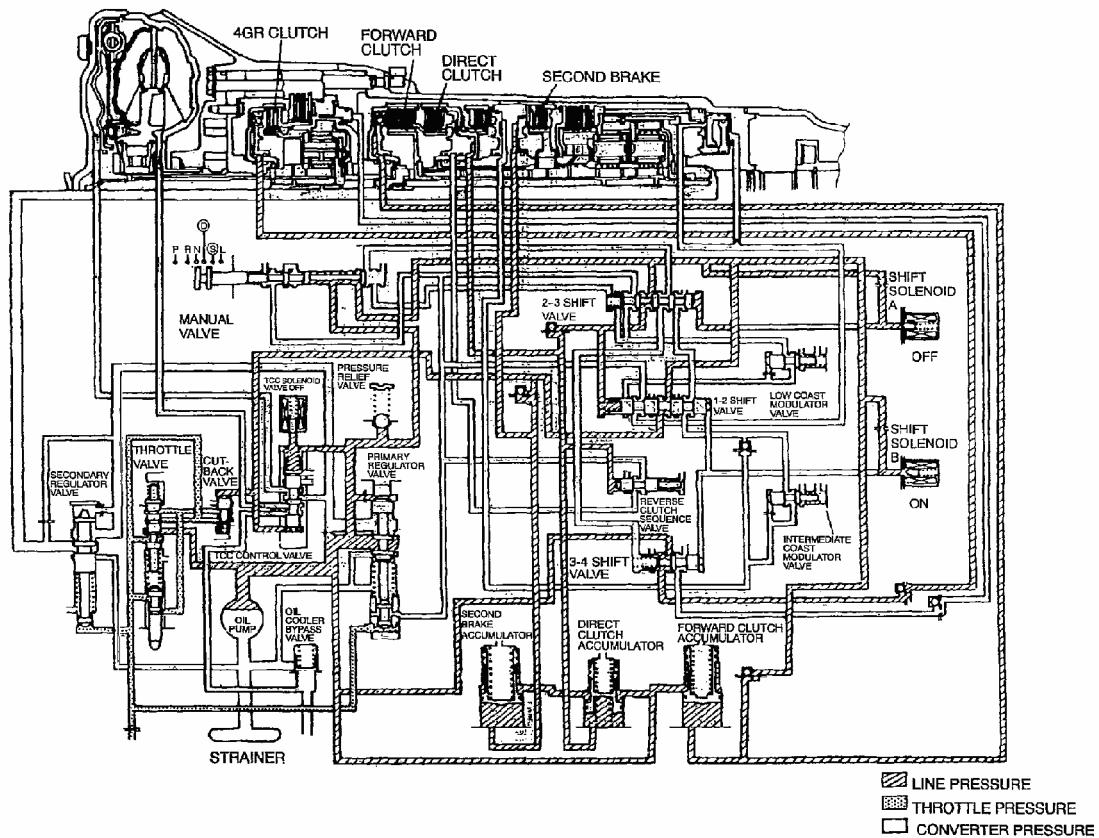


Fig. 26: Third Gear Hydraulic Pressure Operation
Courtesy of MAZDA MOTORS CORP.

FOURTH GEAR

Power Transmission

- The driving force of the 4GR input shaft is transmitted to the 4GR planetary pinion carrier, causing the 4GR planetary pinion carrier to rotate clockwise. The 4GR sun gear does not rotate, locked by the 4GR brake. This causes the 4GR pinion gear to revolve and rotate clockwise, the 4GR internal gear to rotate clockwise, and the force is transmitted to the input shaft. The driving force of the input shaft is transmitted to the rear internal gear through the forward clutch, causing the rear internal gear to rotate clockwise. Also the force is transmitted to the sun gear through the direct clutch, causing the sun gear to rotate clockwise.
- Because the rear internal gear and the sun gear rotate in the same direction at the same time, the rear pinion gear does not rotate, causing the planetary pinion carrier to rotate together with the rear internal gear and the sun gear. This torque is transmitted to the driving wheels through the propeller shaft.
- During deceleration, the driving force is transmitted from the driving wheels as opposed to the operation in driving, causing the engine brake to operate.

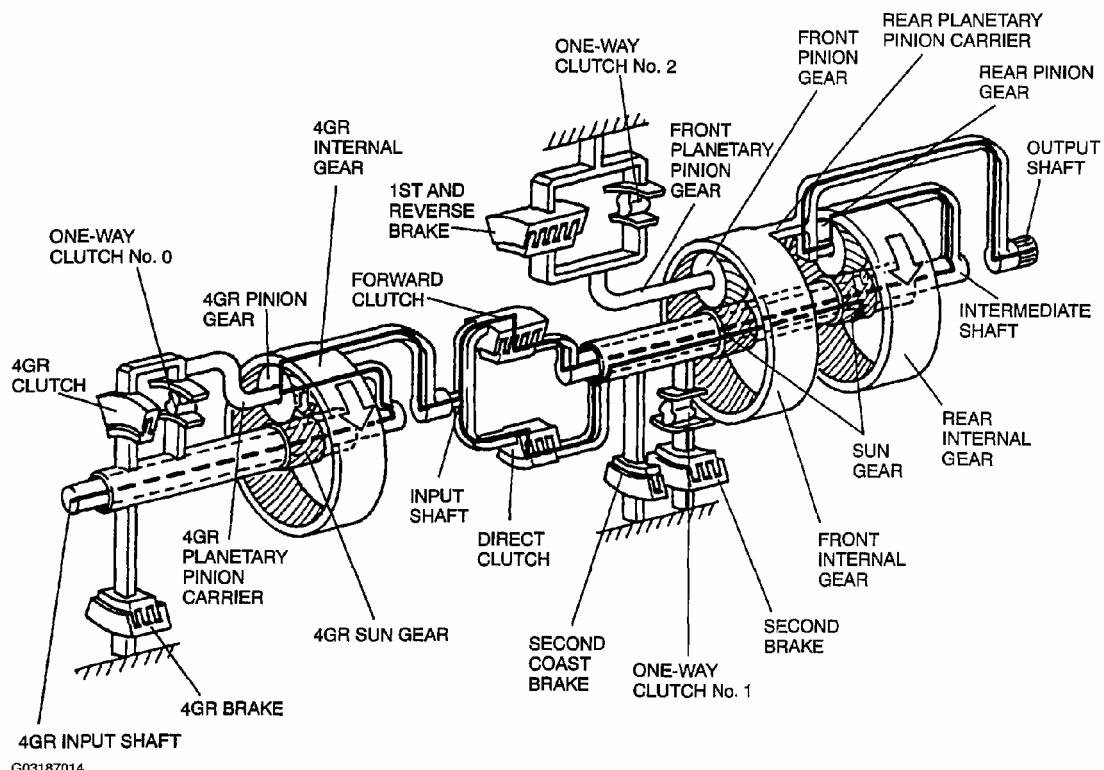


Fig. 27: Fourth Gear Position Power Flow
Courtesy of MAZDA MOTORS CORP.

Hydraulic Pressure Operation

- When the position is switched to fourth gear after accelerating in third gear, shift solenoid B is switched off and the line pressure works on the 3-4 shift valve. The hydraulic pressure which works on the 3-4 shift valve flows to the 4GR brake, causing the brake to operate.

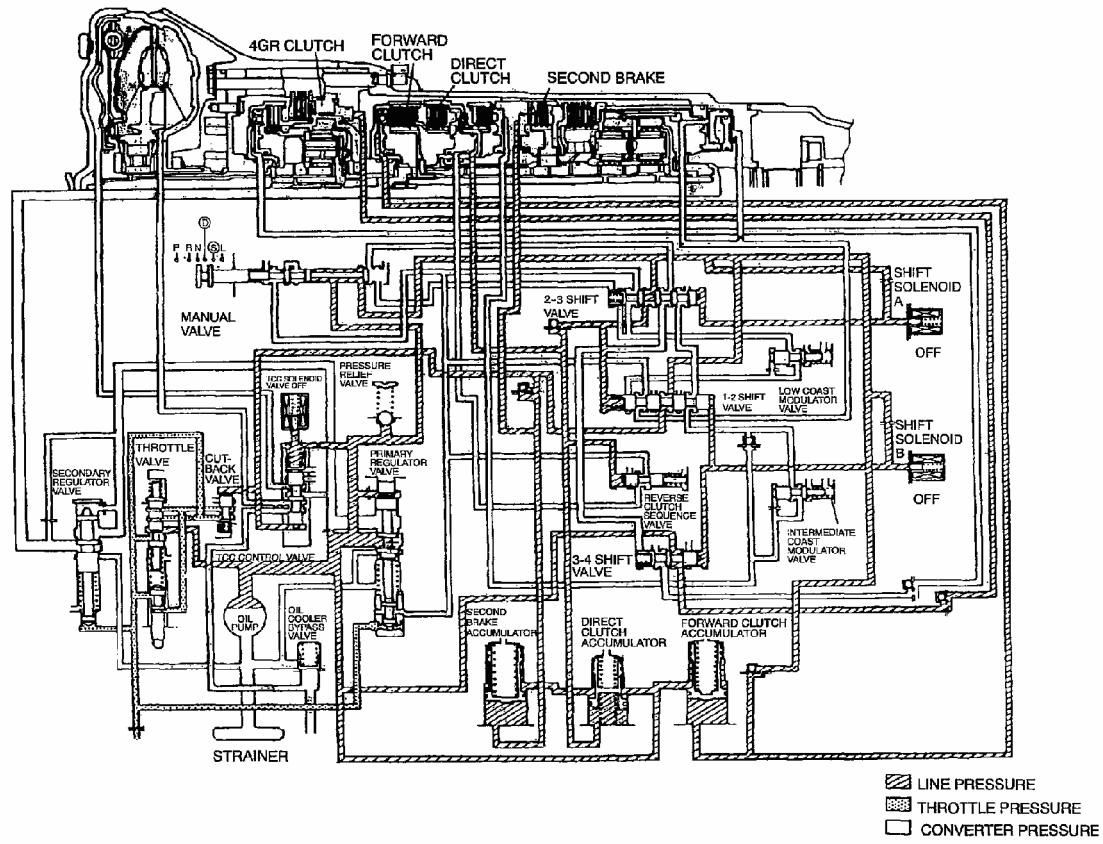


Fig. 28: Fourth Gear Hydraulic Pressure Operation
Courtesy of MAZDA MOTORS CORP.

AUTOMATIC TRANSMISSION

AUTOMATIC TRANSMISSION CLEANING

Cleaning Notes

1. Clean the transmission exterior thoroughly with steam, cleaning solvents, or both, before disassembly.

WARNING:

- Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.

2. Clean the removed parts with cleaning solvent, and dry with compressed air. Clean out all holes and passages with compressed air, and verify that there are no obstructions.

AUTOMATIC TRANSMISSION DISASSEMBLY

Precaution

General Notes

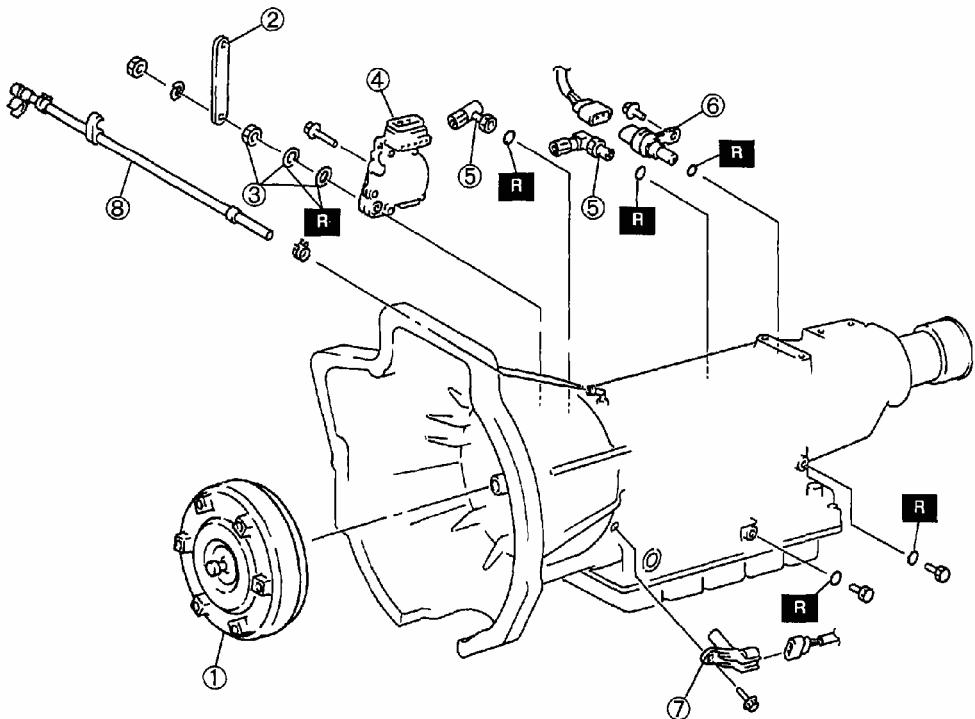
- The oil pan could contain small chips, shavings, and other particles helpful in inspecting the condition of the transmission and diagnosing certain problems. To ensure that all foreign particles stay in the oil pan, make sure that the transmission is never tipped completely over while the oil pan is still installed.
 1. Disassemble the transmission in a clean area (dustproof work space) to prevent entry of dust into the mechanisms.
 2. Use only plastic hammers when applying force to separate the light alloy case joints.
 3. Never use rags during disassembly; they may leave particles that can clog fluid passage.
 4. Several parts resemble one another, arrange them so that they do not get mixed up.
 5. Disassemble the control valve component and thoroughly clean it when the clutch has burned or when the ATF has degenerated.

Disassembly

Components

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1	Torque converter
2	Transmission control lever
3	Nut, lock washer, packing
4	Transmission range switch

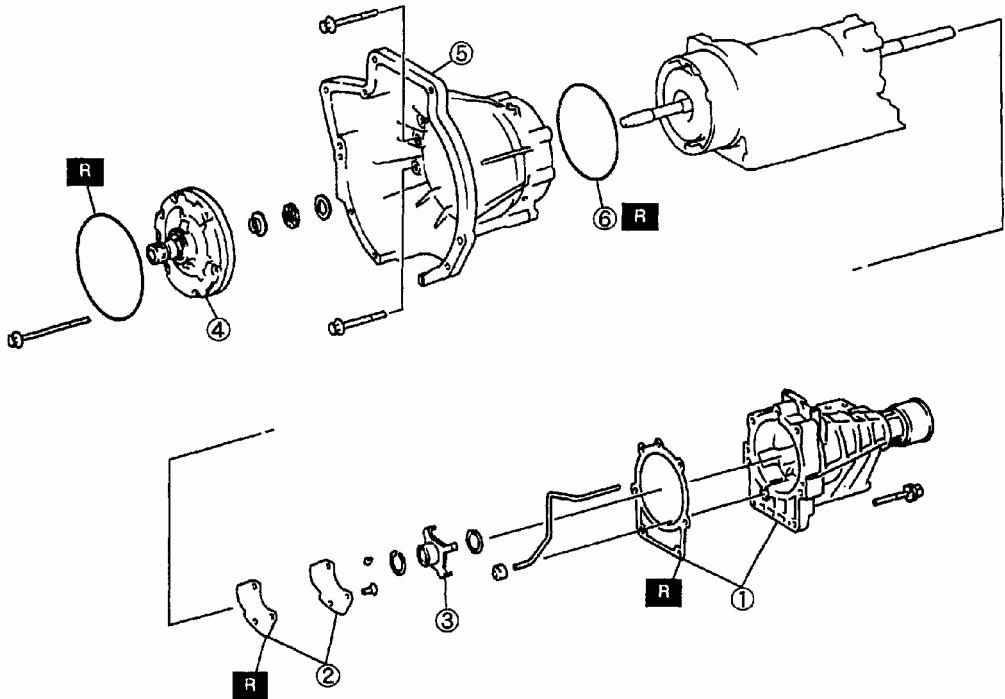
5	Elbow
6	Output speed sensor
7	Input/turbine speed sensor
8	Breather hose

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Fig. 29: Disassembling Transmission Assembly (1 Of 4)
Courtesy of MAZDA MOTORS CORP.

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1	Extension housing, gasket
2	Transmission rear cover, gasket
3	Speed sensor rotor

4	Oil pump
5	Converter housing
6	O-ring

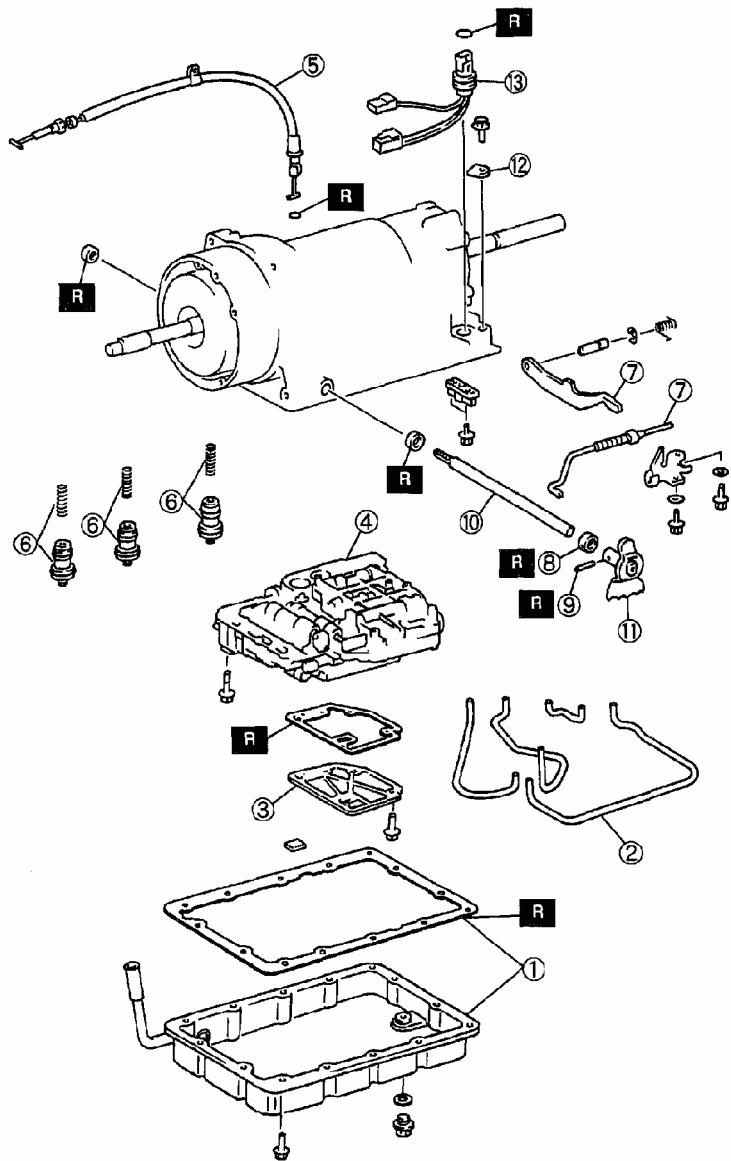
G03186827

Fig. 30: Disassembling Transmission Assembly (2 Of 4)

Courtesy of MAZDA MOTORS CORP.

2003 Mazda MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS Overhaul - SB4A-EL - MX-5 Miata



1	Oil pan, gasket
2	Tube
3	Oil strainer
4	Control valve body
5	Throttle cable
6	Accumulator pistons, springs
7	Parking rod, parking pawl

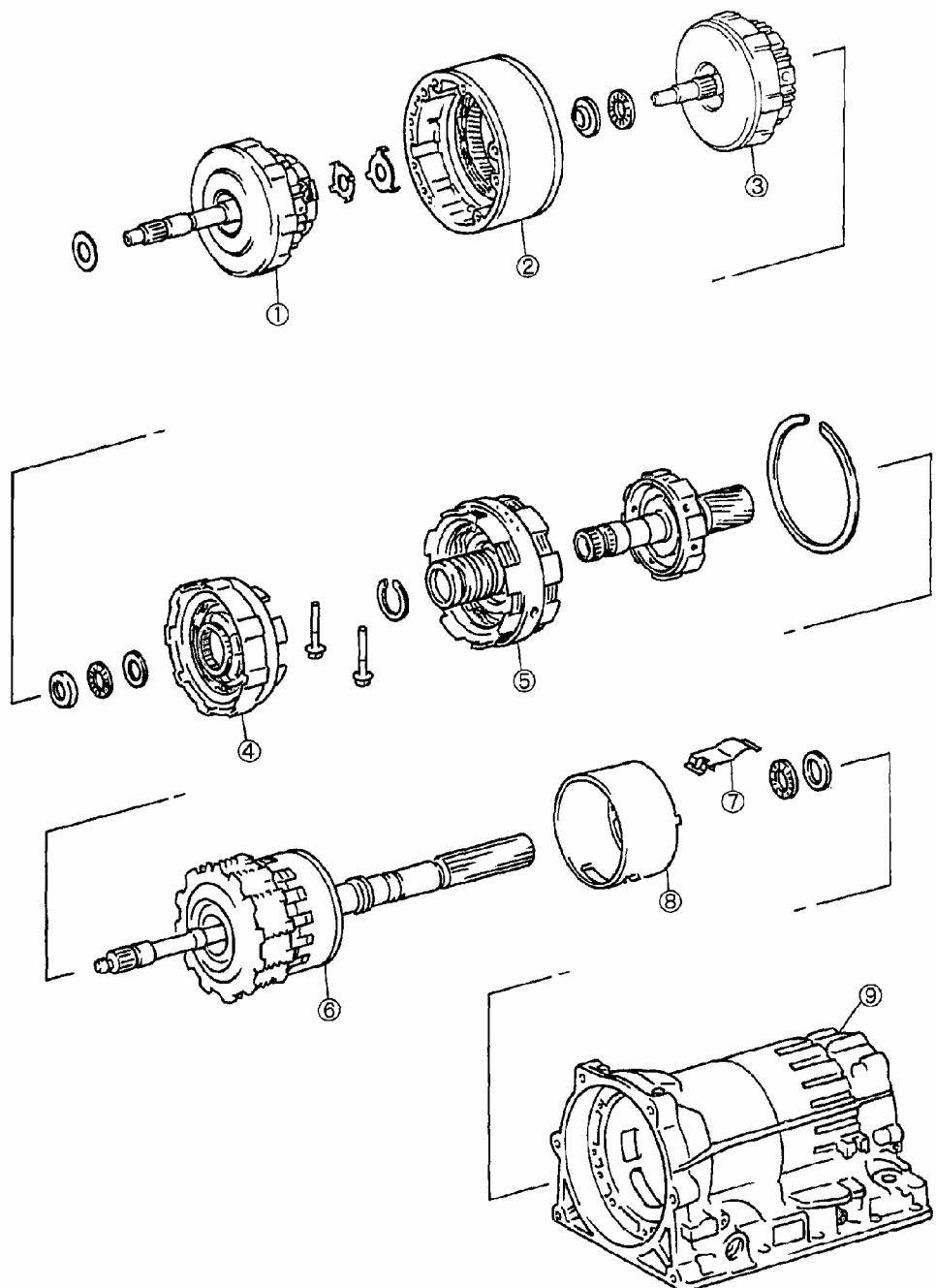
8	Sleeve cover
9	Roll pin
10	Manual shaft
11	Manual shift lever
12	Lock plate
13	Transmission wire

G03186828

Fig. 31: Disassembling Transmission Assembly (3 Of 4)
Courtesy of MAZDA MOTORS CORP.

2003 Mazda MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS Overhaul - SB4A-EL - MX-5 Miata



1	4GR clutch component
2	4GR case
3	Forward clutch
4	Direct clutch
5	Center support component

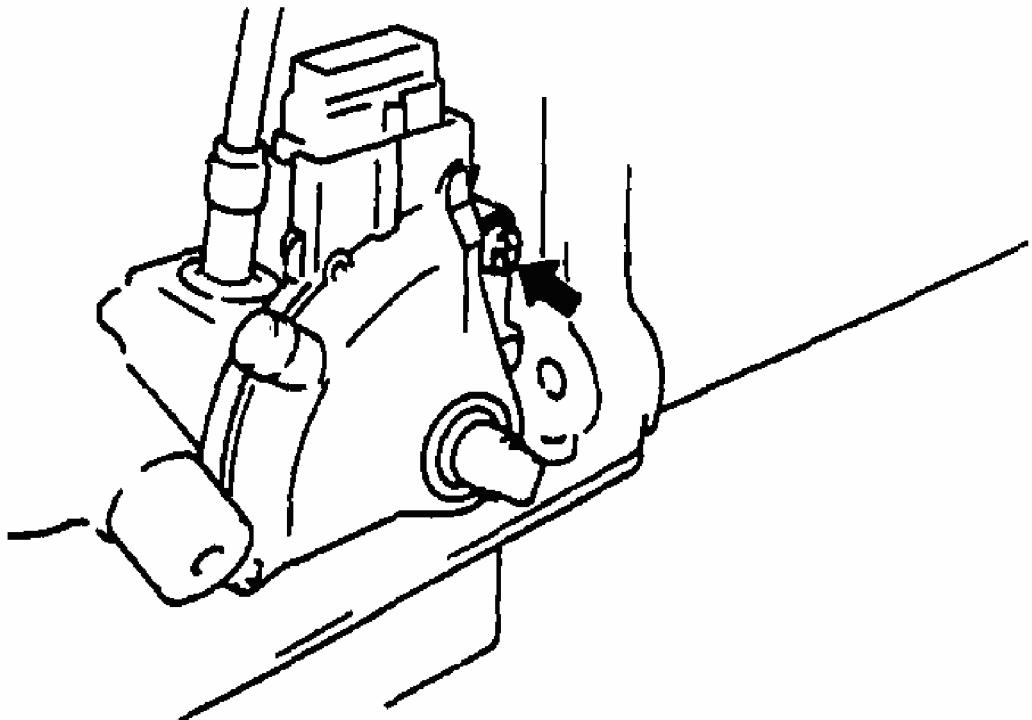
6	Planetary gear component
7	Leaf spring
8	Brake applying cover
9	Transmission case

G03186829

Fig. 32: Disassembling Transmission Assembly (4 Of 4)
Courtesy of MAZDA MOTORS CORP.

Disassembly Procedure

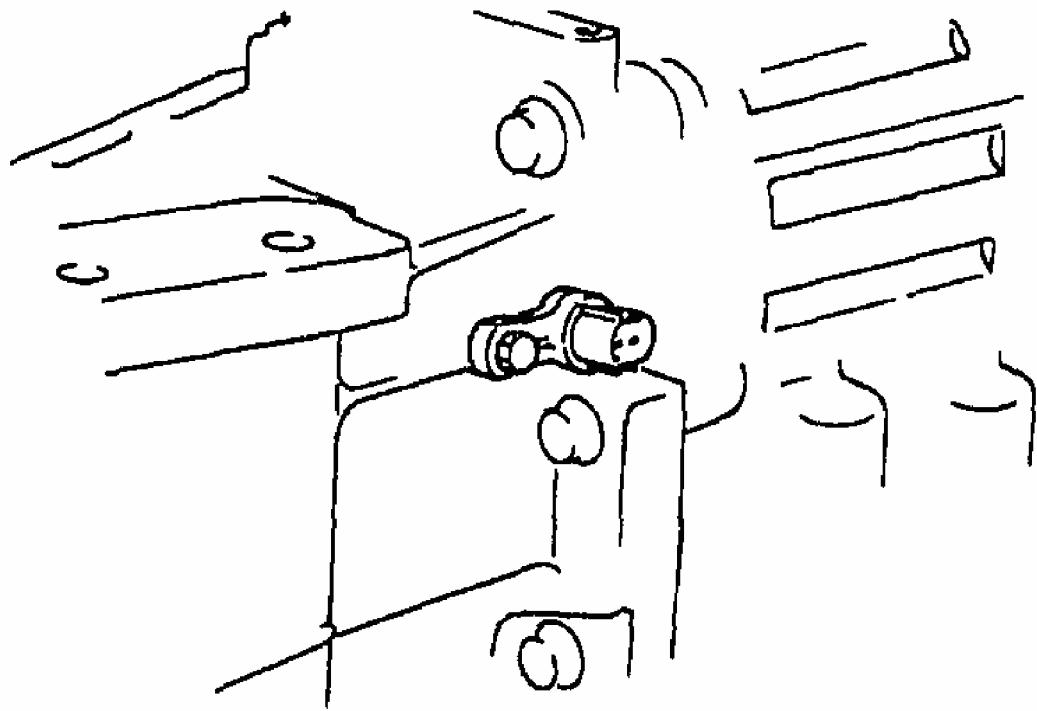
1. Remove the torque converter, and immediately turn it so that the hole faces upward. This will help to keep any remaining fluid from spilling.
2. Remove the throttle cable cramp.
3. Remove the transmission control lever.
4. Remove the staking of the lock washer, using the screwdriver.
5. Remove the nut, lock washer, and packing.
6. Remove the bolt.
7. Remove the transmission range switch.



G03186830

Fig. 33: Removing Transmission Range Switch
Courtesy of MAZDA MOTORS CORP.

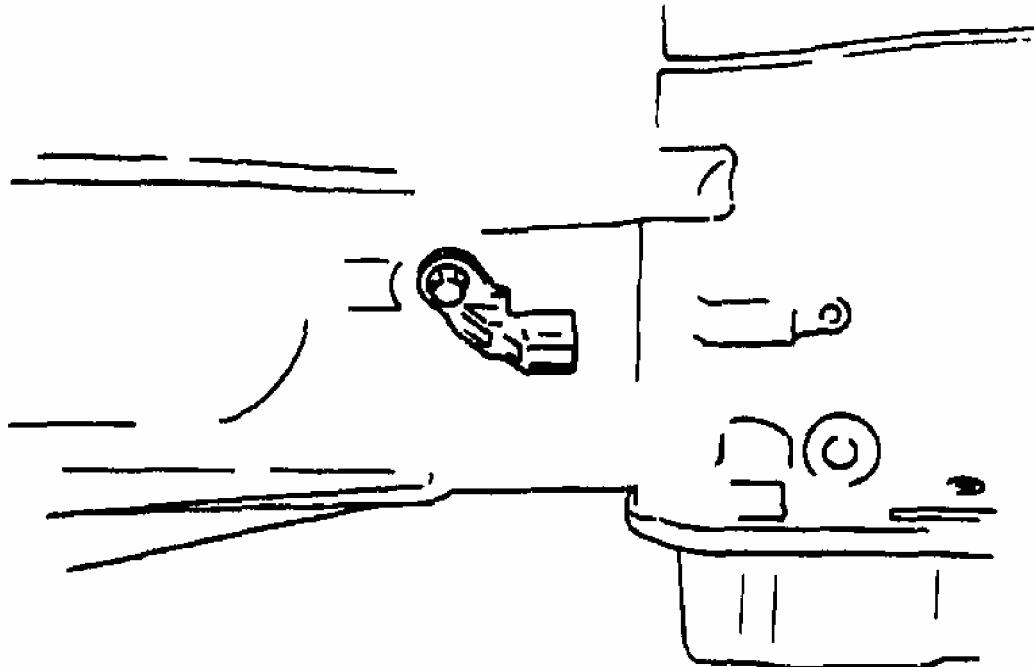
8. Remove the lock bolt.
9. Remove the elbow.
10. Remove the O-ring from the elbow.
11. Remove the bolt and output speed sensor.



G03186831

Fig. 34: Removing Output Speed Sensor
Courtesy of MAZDA MOTORS CORP.

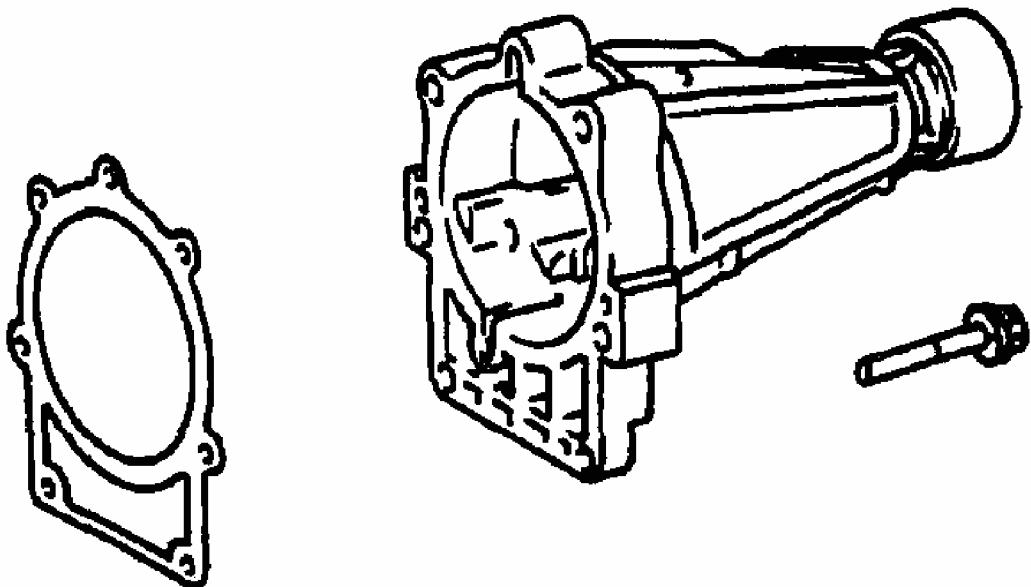
12. Remove the O-ring from the output speed sensor.
13. Remove the bolt and input/turbine speed sensor.



G03186832

Fig. 35: Removing Input/Turbine Speed Sensor
Courtesy of MAZDA MOTORS CORP.

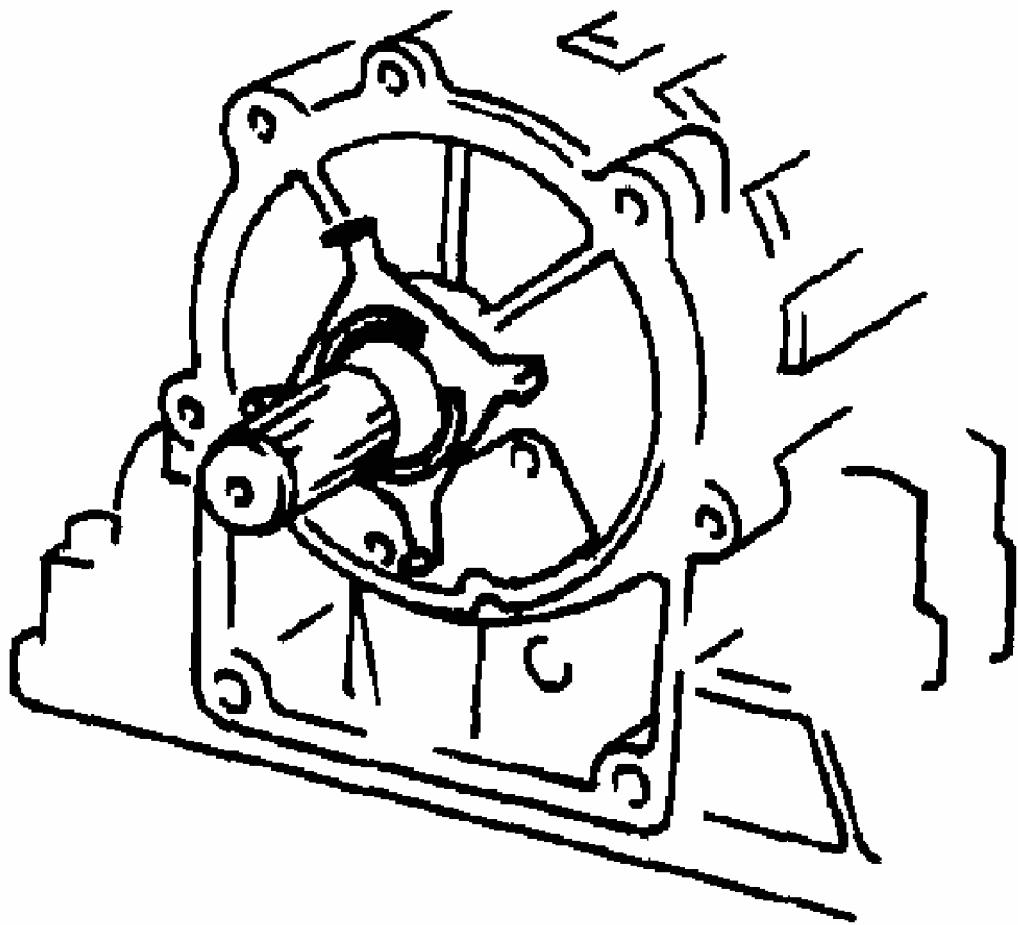
14. Remove the O-ring from the input/turbine speed sensor.
15. Remove the breather hose.
16. Remove the extension housing and gasket.



G03186833

Fig. 36: Removing Extension Housing & Gasket
Courtesy of MAZDA MOTORS CORP.

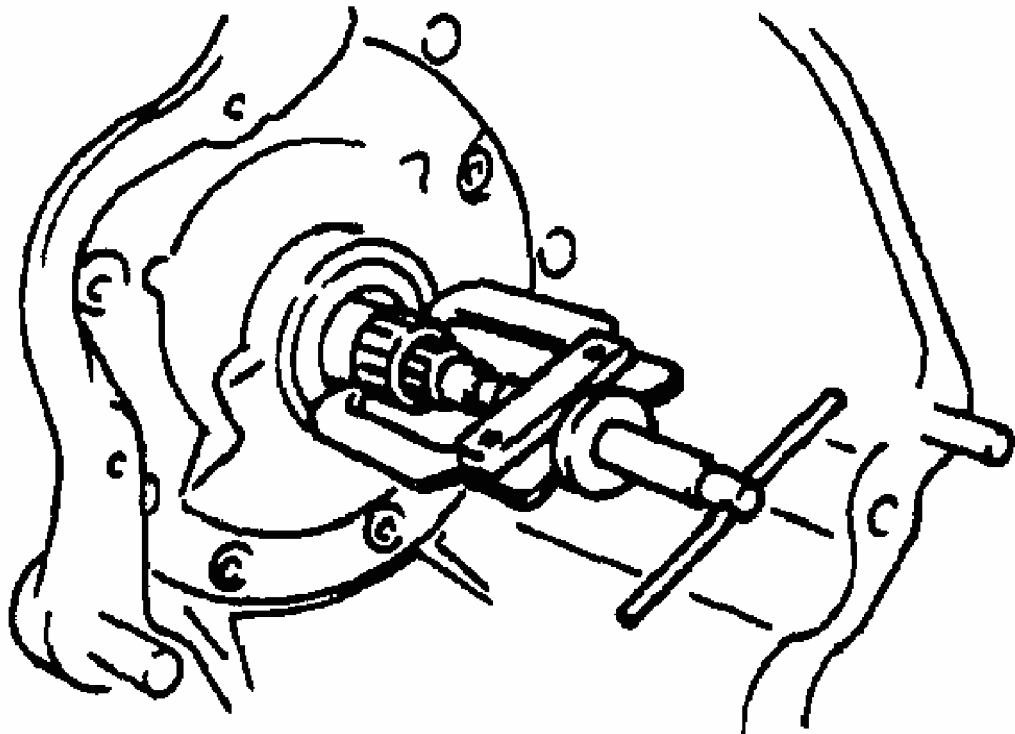
17. Remove the C-ring and then remove the speed sensor rotor.



G03186834

Fig. 37: Removing Speed Sensor Rotor
Courtesy of MAZDA MOTORS CORP.

18. Remove the bolts.
19. Remove the oil pump by using the puller.



G03186835

Fig. 38: Removing Oil Pump
Courtesy of MAZDA MOTORS CORP.

20. Remove the bearing at the rear of oil pump.
21. Remove the bolts.
22. Holding input shaft by hand, remove the converter housing.
23. Inspect the dimensions of 4GR case surface and clutch cylinder surface for reassembly.

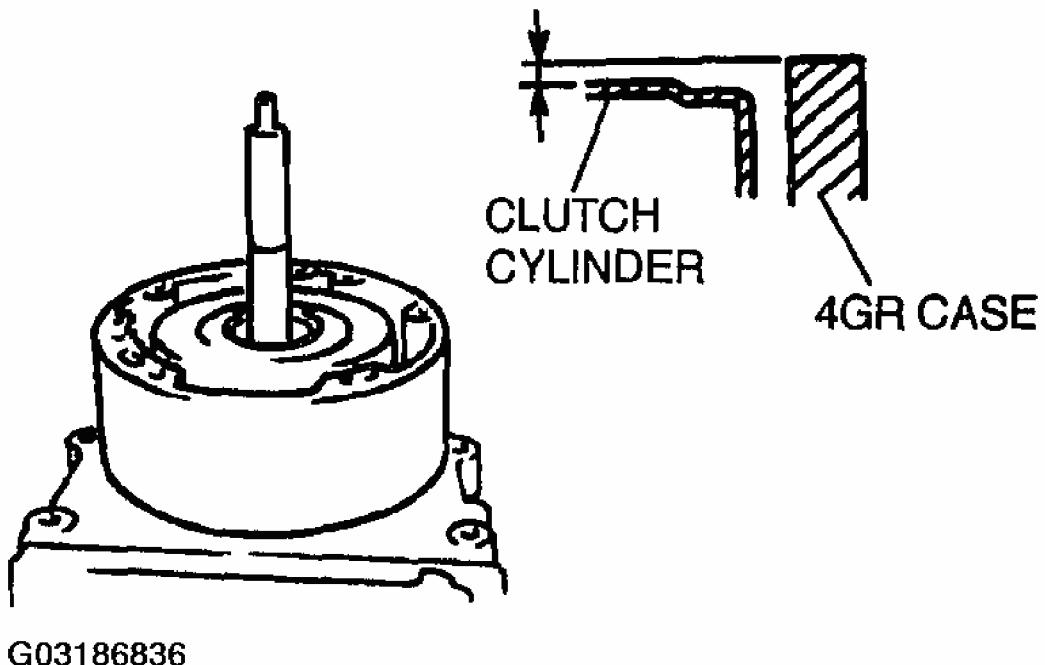


Fig. 39: Inspecting Dimensions Of 4GR Case Surface & Clutch Cylinder Surface
Courtesy of MAZDA MOTORS CORP.

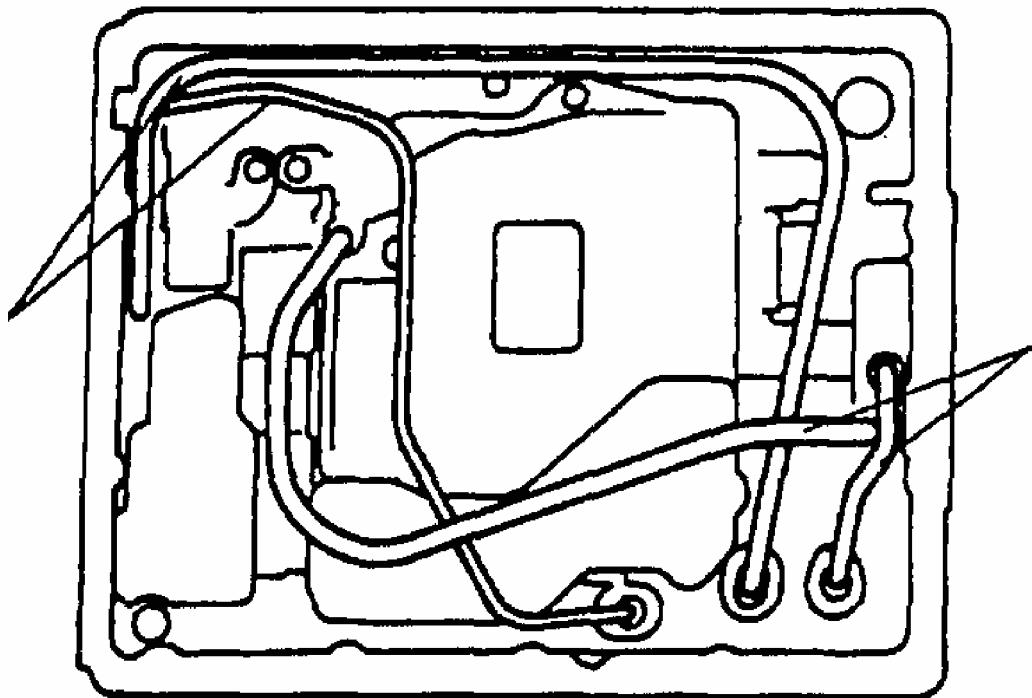
24. Remove the 4GR clutch component by holding input shaft.
25. Remove the 4GR case, bearing and bearing race.
26. Remove the oil pan.

Examine any material found in the pan or on the magnet to determine the condition of the transmission.

If large amounts of material are found, replace the torque converter and carefully inspect the transmission for the cause.

1. Clutch facing material.
 - Drive plate wear.
2. Steel (magnetic).
 - Bearing, gear, and driven plate wear.
3. Aluminum (nonmagnetic).
 - Aluminum part wear.

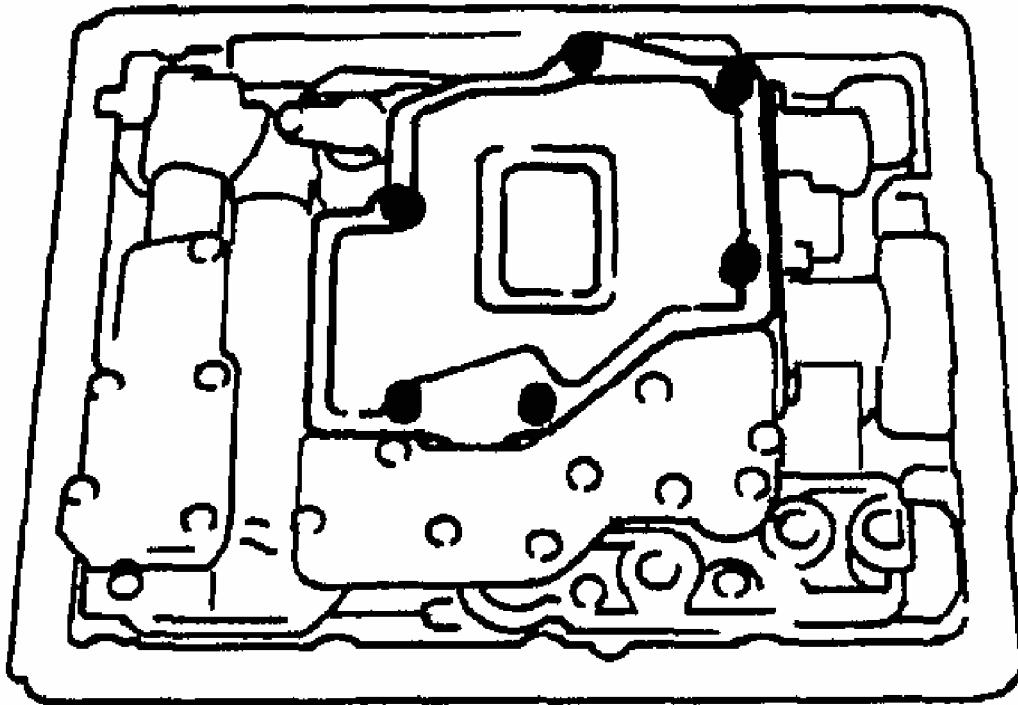
CAUTION: • To prevent deforming of the tube, remove the tube by pulling both ends up.



G03186837

Fig. 40: Removing Tube
Courtesy of MAZDA MOTORS CORP.

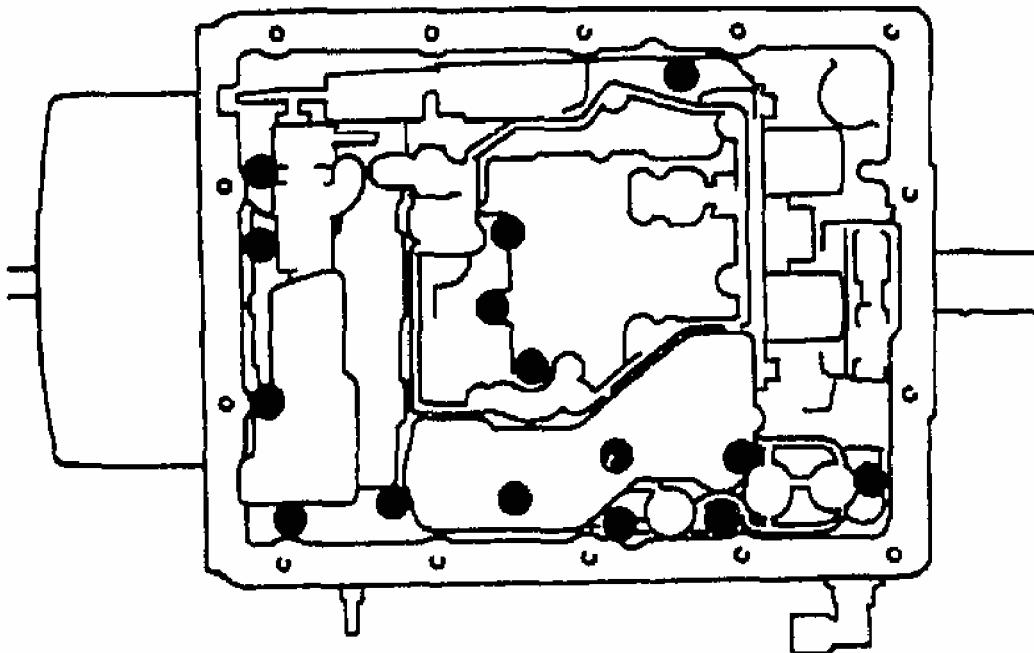
27. Remove the tube.
28. Disconnect the shift solenoid A, B, and torque converter clutch solenoid valve connector.
29. Remove the oil strainer.



G03186838

Fig. 41: Removing Oil Strainer
Courtesy of MAZDA MOTORS CORP.

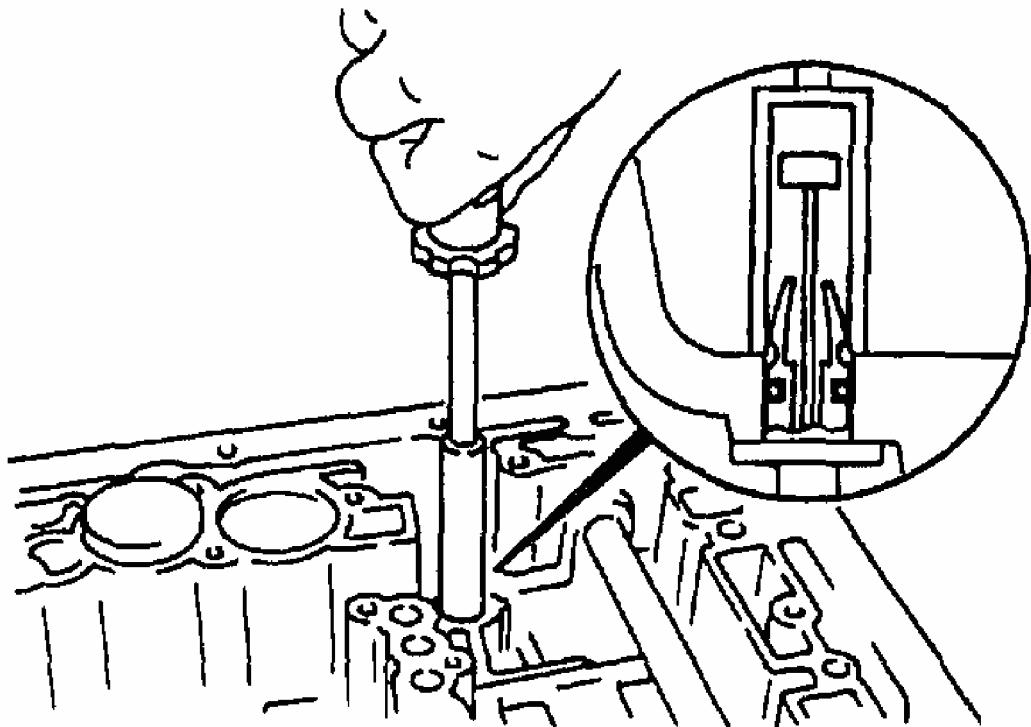
30. Remove the control valve body installation bolts.
31. Lift control valve body and disconnect throttle cable from the throttle valve cam.
32. Remove the control valve body.



G03186839

Fig. 42: Removing Control Valve Body
Courtesy of MAZDA MOTORS CORP.

33. Remove the throttle cable from the transmission case by using the **10 mm {0.4 in}** socket wrench.



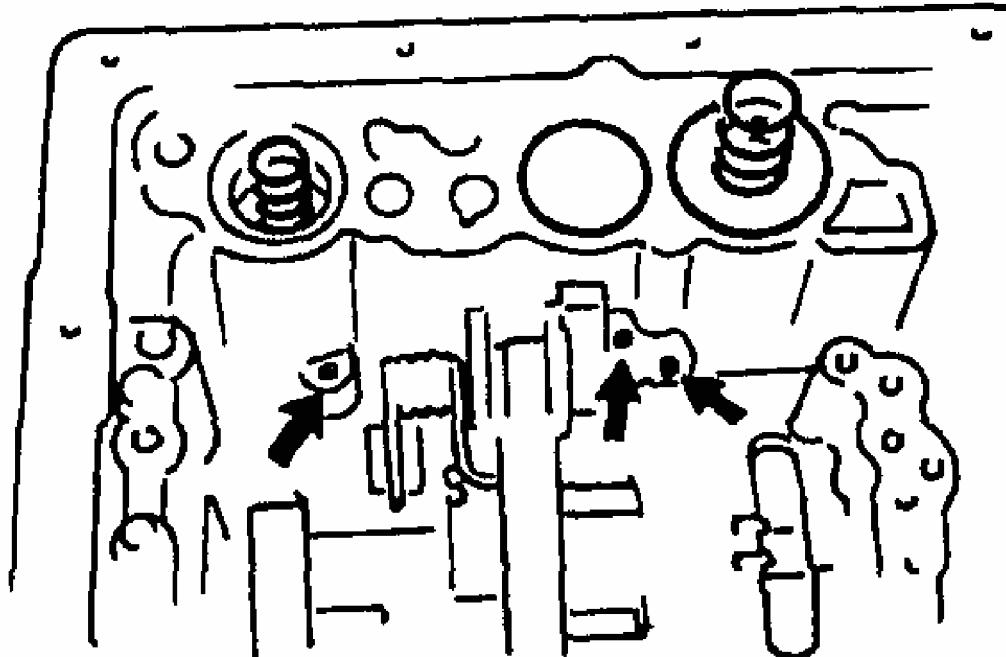
G03186840

Fig. 43: Removing Throttle Cable
Courtesy of MAZDA MOTORS CORP.

34. Remove the accumulator piston from the transmission case by applying compressed air through the fluid passage.

Air Pressure

390 kPa {4.0 kgf/cm², 57 psi} max.

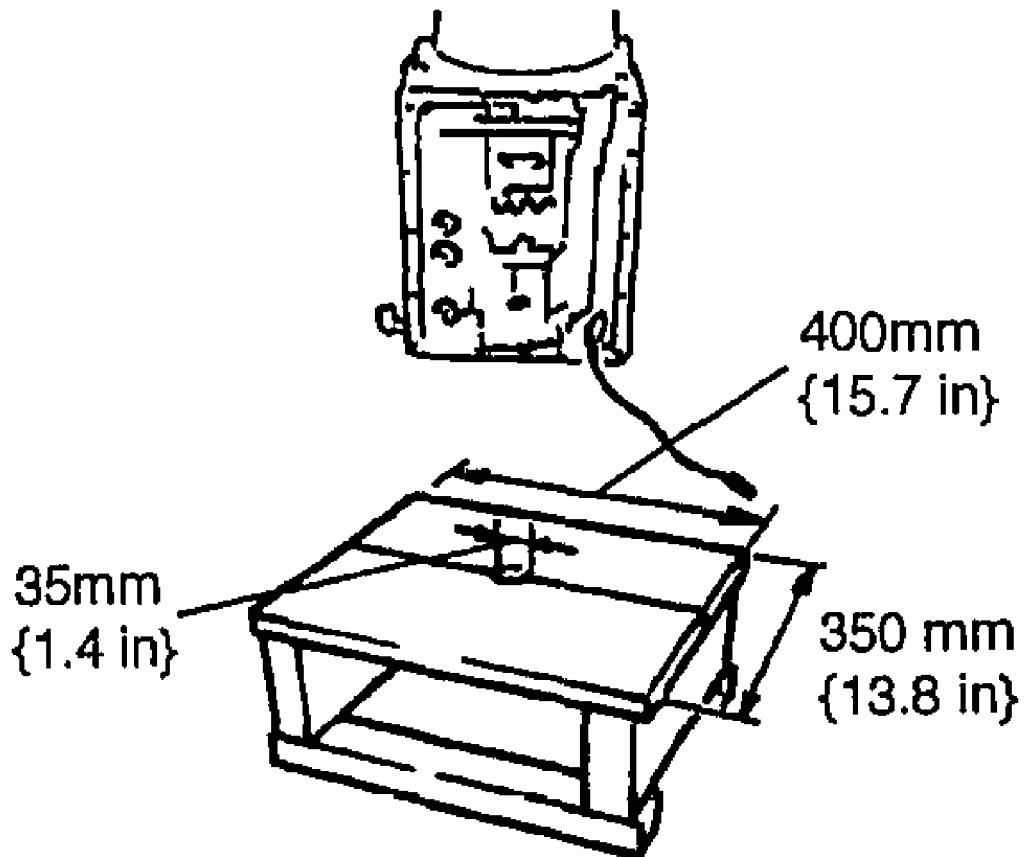


G03186841

Fig. 44: Removing Accumulator Piston
Courtesy of MAZDA MOTORS CORP.

NOTE:

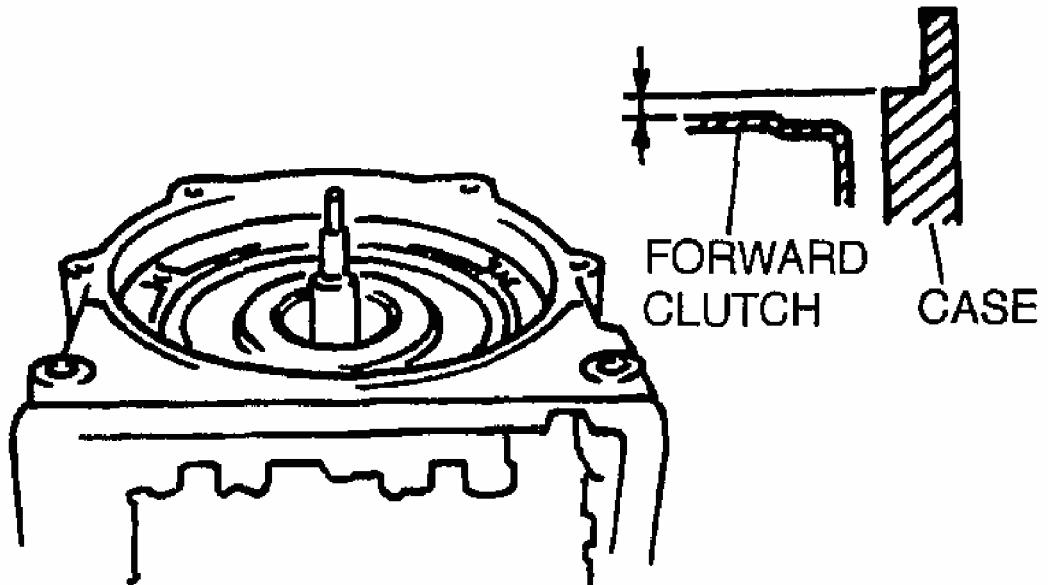
- To prevent transmission case from getting damaged, protect its contacting surface with stand by using rags or the like.
- A stand of such size as shown in figure will facilitate work.



G03186842

Fig. 45: Placing Transmission Upright
Courtesy of MAZDA MOTORS CORP.

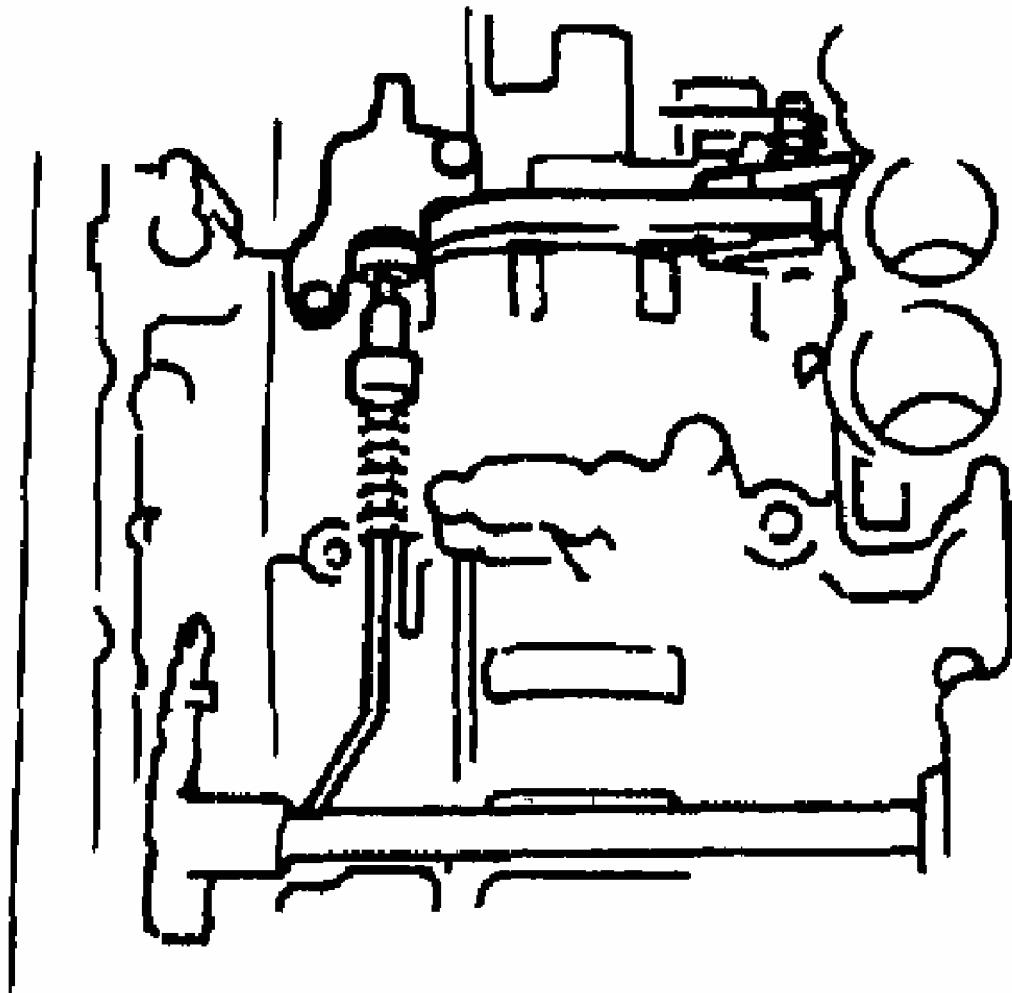
35. Place transmission upright as shown in the figure.
36. Inspect top surface level of forward clutch against case for reassembly.



G03186843

Fig. 46: Inspecting Top Surface Level Of Forward Clutch Against Case
Courtesy of MAZDA MOTORS CORP.

37. Remove the forward clutch.
38. Remove the direct clutch.
39. Remove the parking rod and parking pawl.

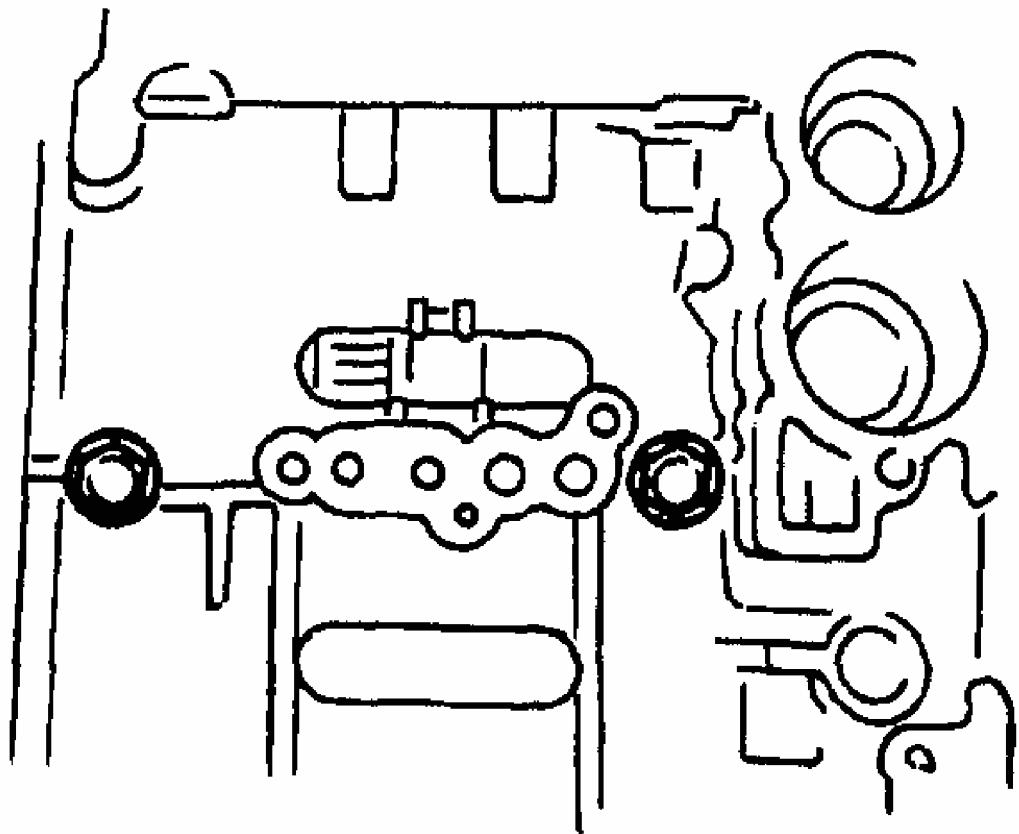


G03186844

Fig. 47: Removing Parking Rod & Parking Pawl

Courtesy of MAZDA MOTORS CORP.

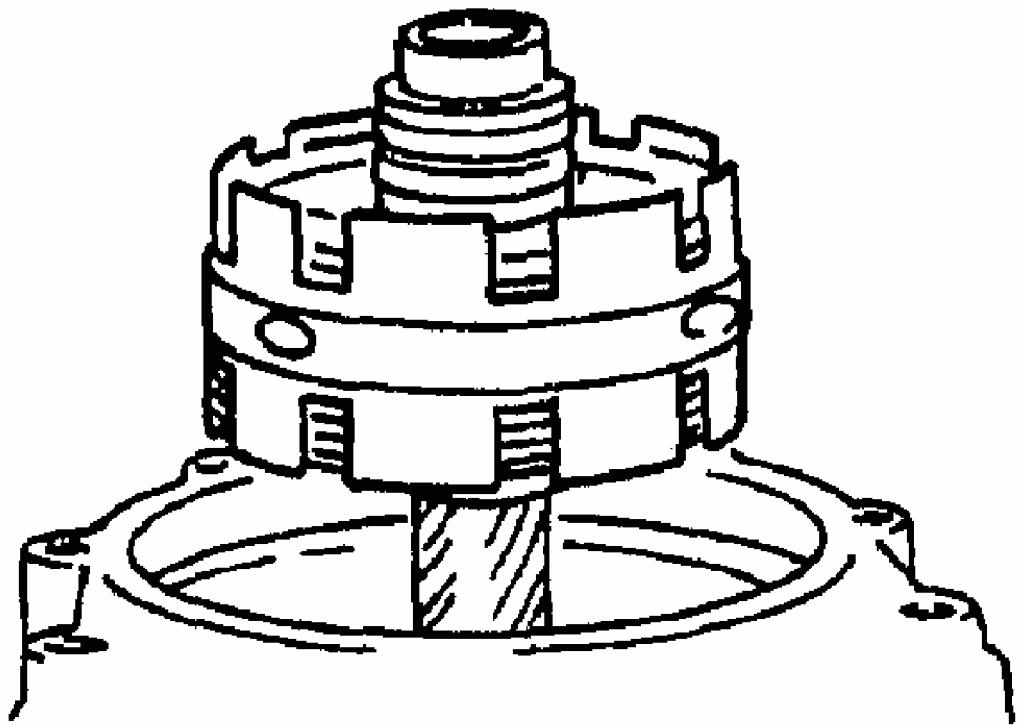
40. Remove the bolts from valve body side to remove the center support.



G03186845

Fig. 48: Removing Bolts From Valve Body Side
Courtesy of MAZDA MOTORS CORP.

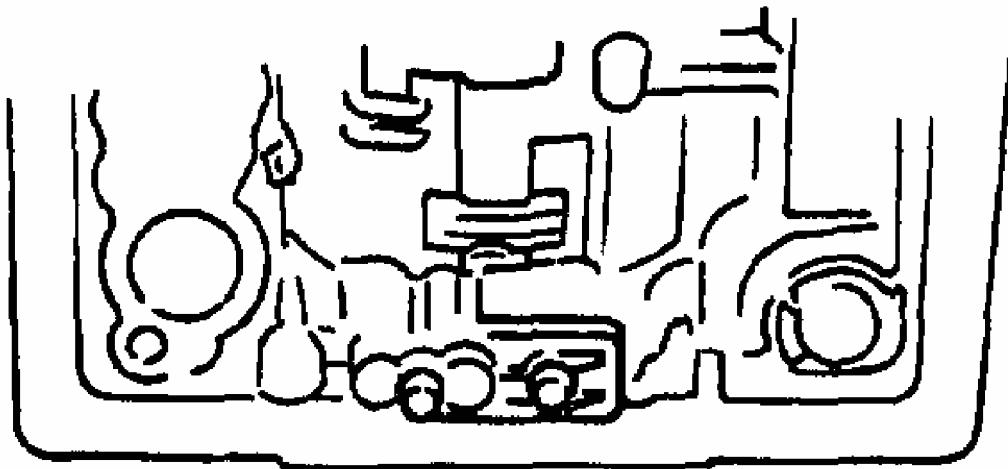
41. Remove the center support component.



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Fig. 49: Removing Center Support Component
Courtesy of MAZDA MOTORS CORP.

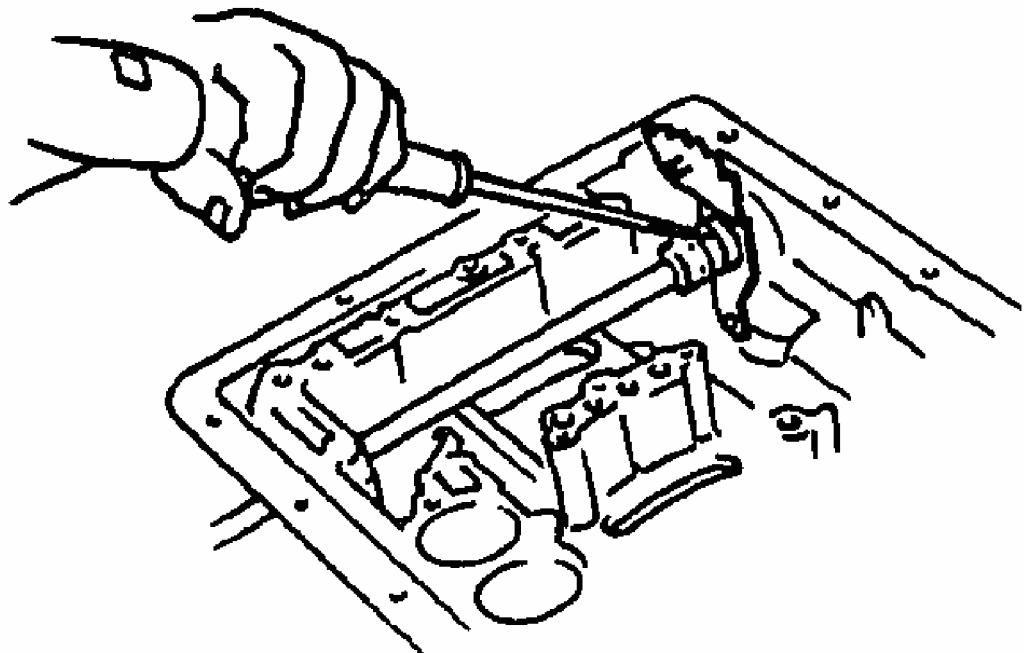
42. Remove the retaining ring, planetary gear component and leaf spring.
43. Remove the brake applying cover.



G03186847

Fig. 50: Removing Brake Applying Cover
Courtesy of MAZDA MOTORS CORP.

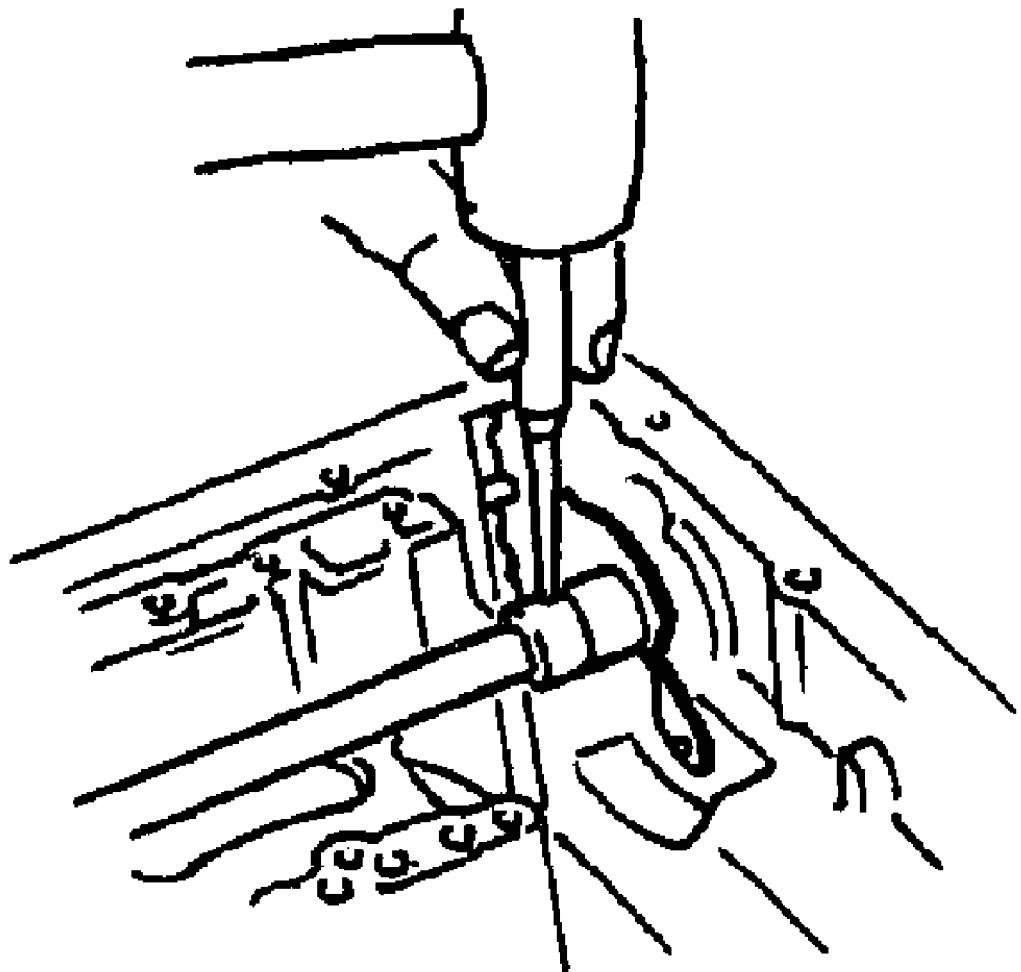
44. Undo caulking of sleeve cover by using the pin punch and move sleeve cover.



G03186848

Fig. 51: Removing Sleeve Cover
Courtesy of MAZDA MOTORS CORP.

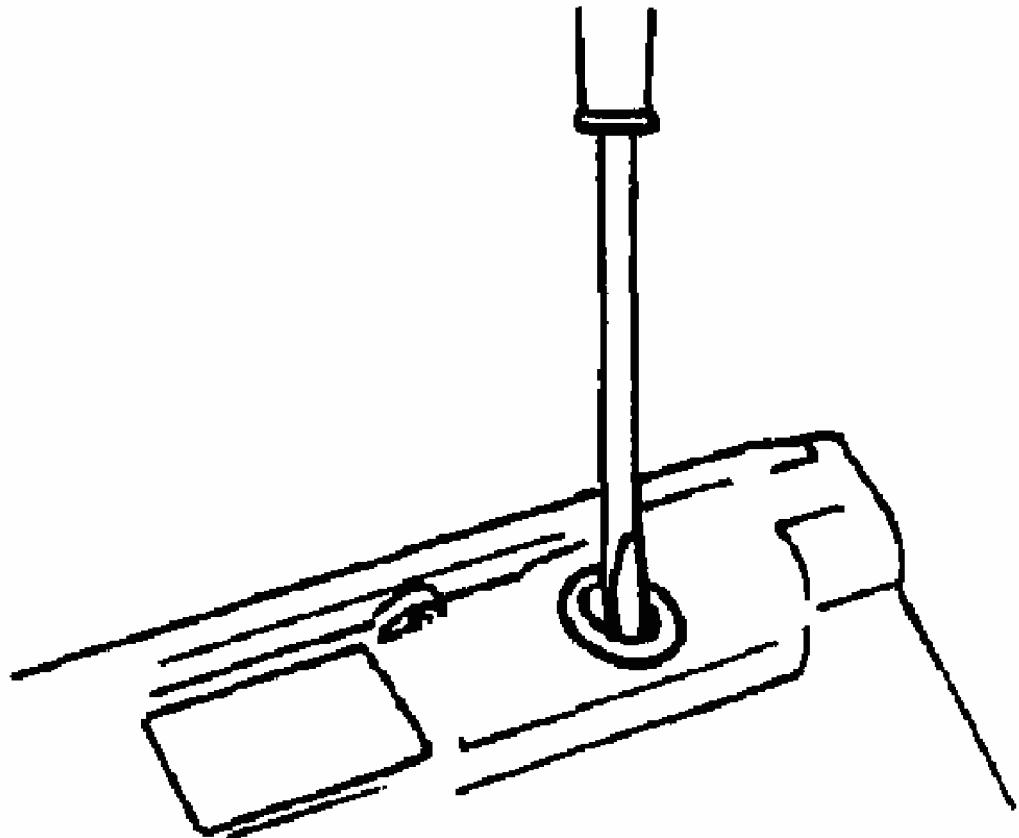
45. Using a pin punch, drive out roll pin, pull out manual shift shaft and remove manual shift lever. Then remove sleeve cover from manual shift lever.



G03186849

Fig. 52: Removing Pin Punch
Courtesy of MAZDA MOTORS CORP.

46. Remove oil seal from both sides of transmission case.

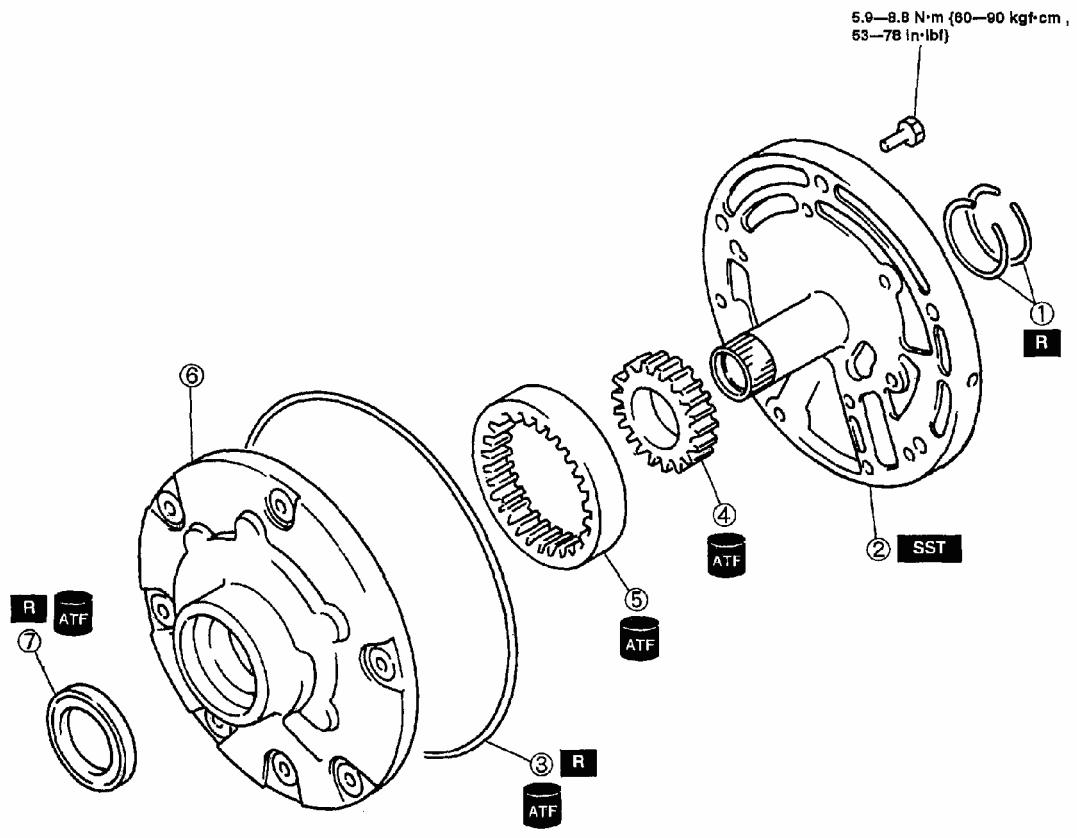


G03186850

Fig. 53: Removing Oil Seal
Courtesy of MAZDA MOTORS CORP.

OIL PUMP DISASSEMBLY/ASSEMBLY

1. Remove in the order indicated in the figure.



1	Seal ring
2	Oil pump cover (See OIL PUMP COVER DISASSEMBLY NOTE)
3	O-ring

4	Inner gear
5	Outer gear
6	Oil pump body
7	Oil seal

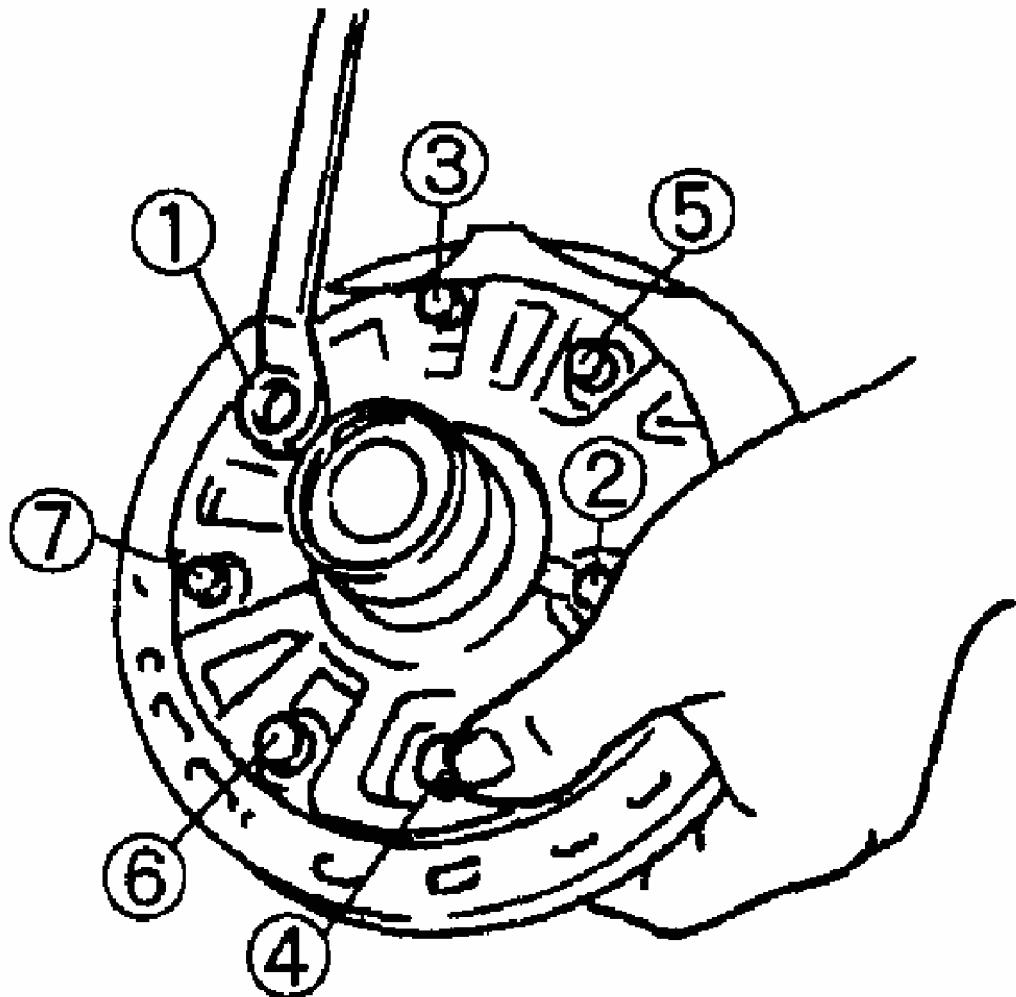
G03186851

Fig. 54: Disassembling/Assembling Oil Pump
Courtesy of MAZDA MOTORS CORP.

2. Install in the reverse order of removal.

Oil Pump Cover Disassembly Note

1. Loosen the mounting bolts evenly in the order shown.
2. Remove the oil pump cover from the oil pump body.



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Fig. 55: Oil Pump Cover Bolt Loosening Sequence
Courtesy of MAZDA MOTORS CORP.

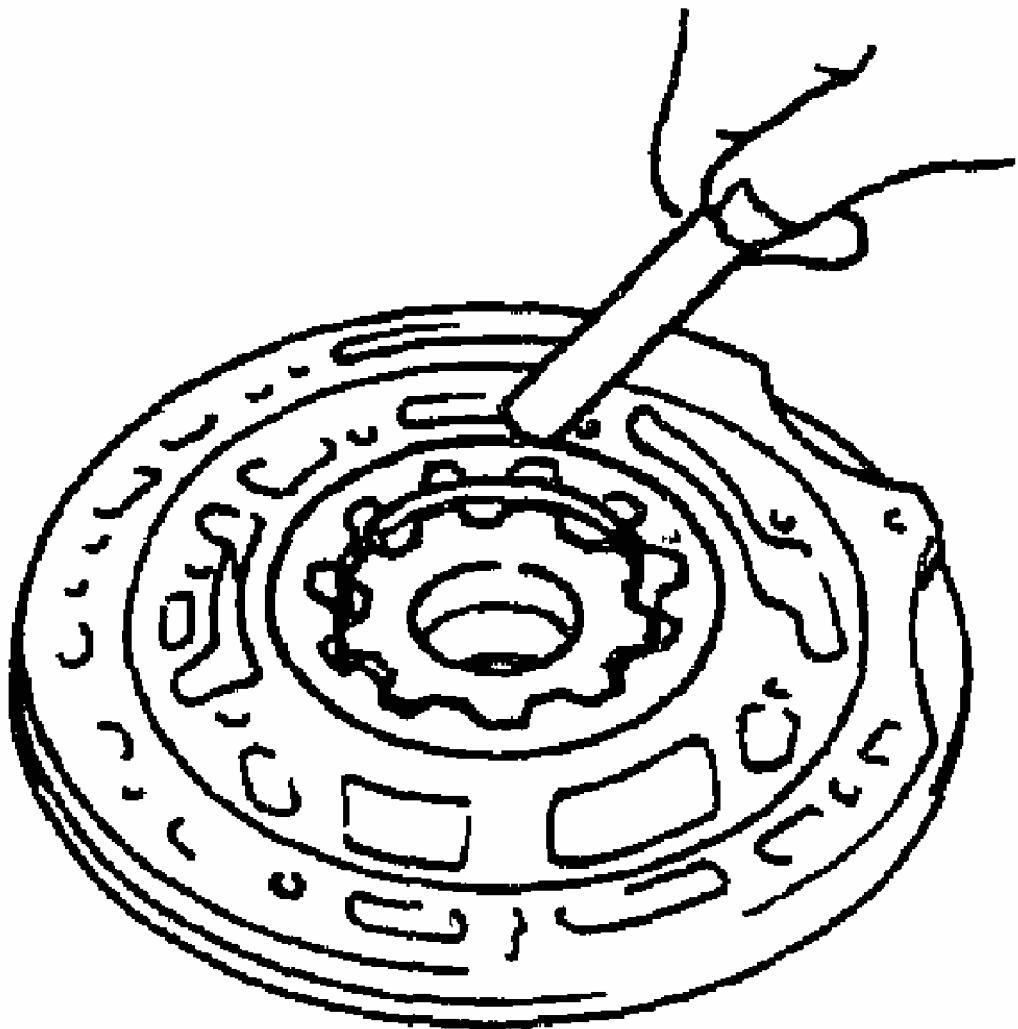
Assembly Procedure

1. Measure the clearance between the end of the oil pump body and at the outer gear at four places along their circumferences.

Clearance

Standard: 0.07-0.15 mm {0.003-0.005 in}

Maximum: 0.3 mm {0.01 in}



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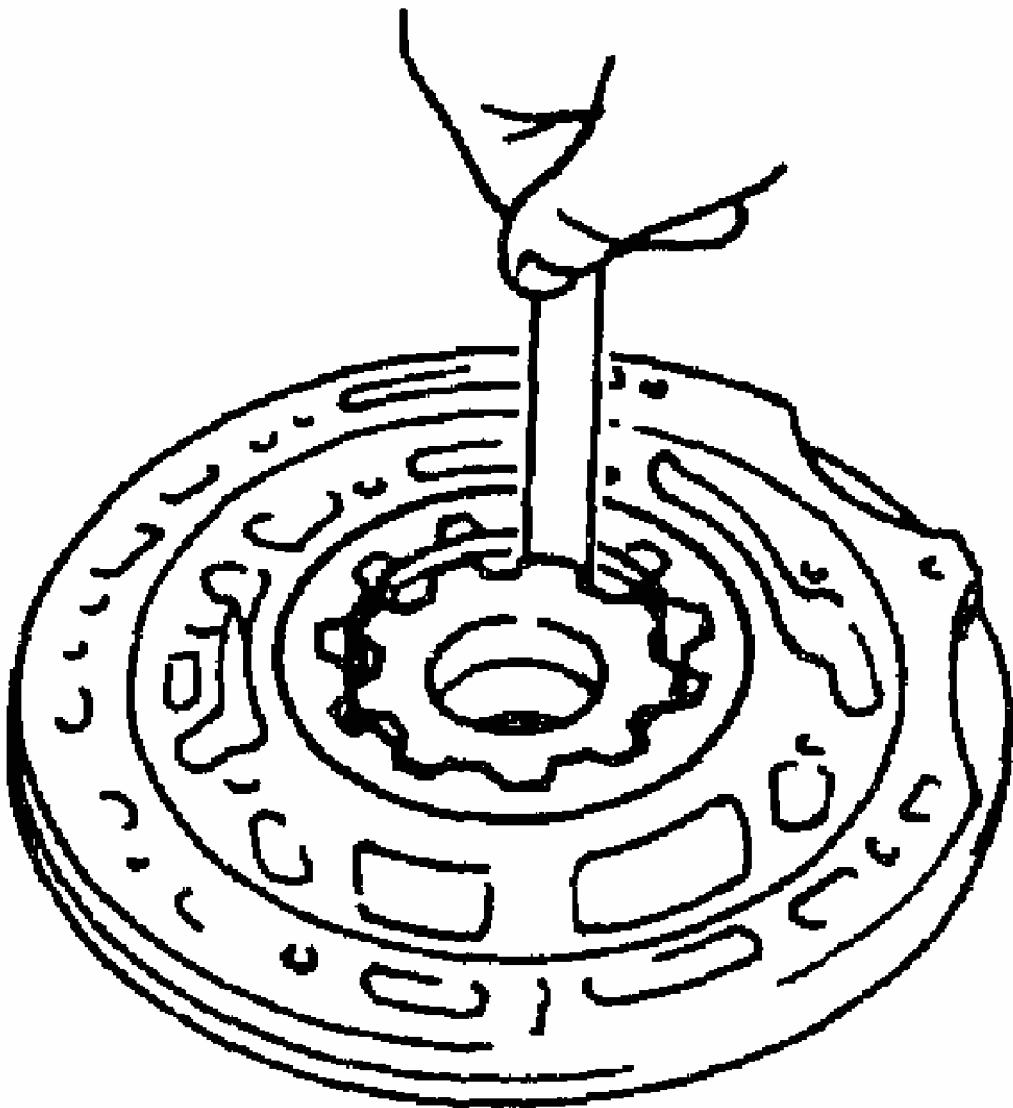
Fig. 56: Measuring Clearance Between End Of Oil Pump Body & Outer Gear
Courtesy of MAZDA MOTORS CORP.

2. If not within the specification, replace the oil pump component.
3. Measure the clearance between the outer gear and the crescent.

Clearance

Standard: 0.11-0.14 mm {0.0044-0.0055 in}

Maximum: 0.3 mm {0.0118 in}



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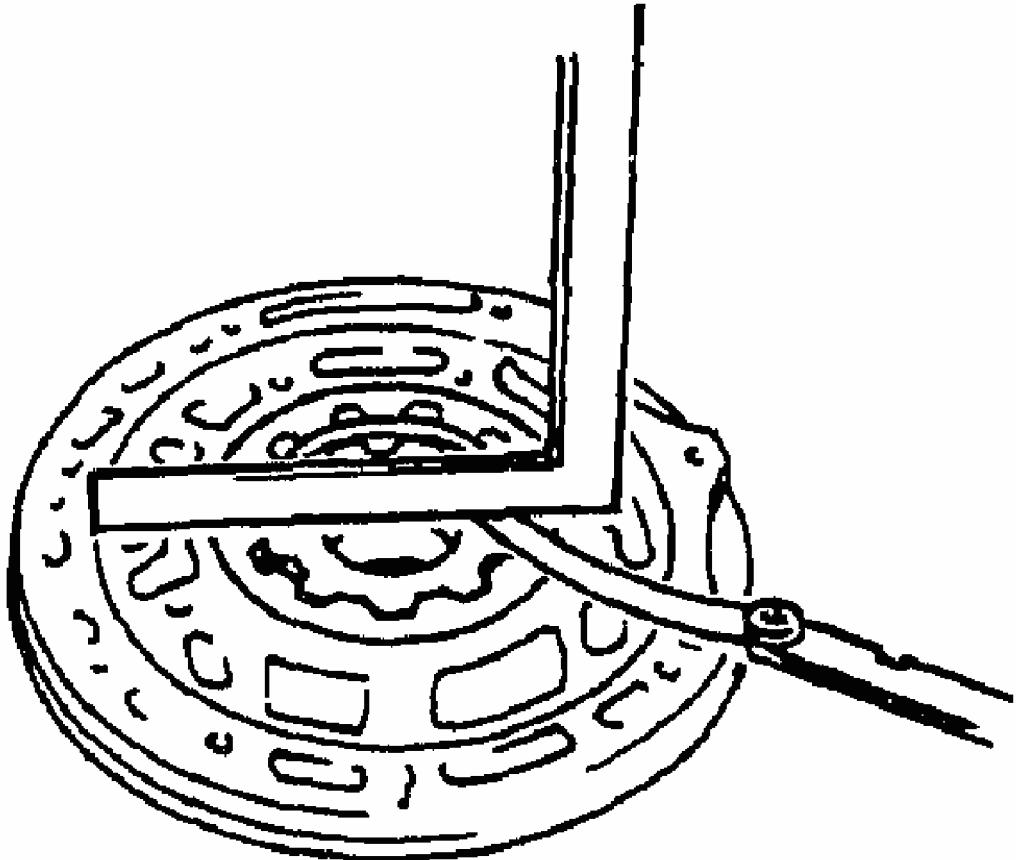
Fig. 57: Measuring Clearance Between Outer Gear & Crescent
Courtesy of MAZDA MOTORS CORP.

4. If not within the specification, replace the oil pump component.
5. Measure the clearance between the end of the oil pump body and the inner gear and outer gear four places along their circumferences.

Clearance

Standard: 0.02-0.05 mm {0.00079-0.00196 in}

Maximum: 0.1 mm {0.00394 in}

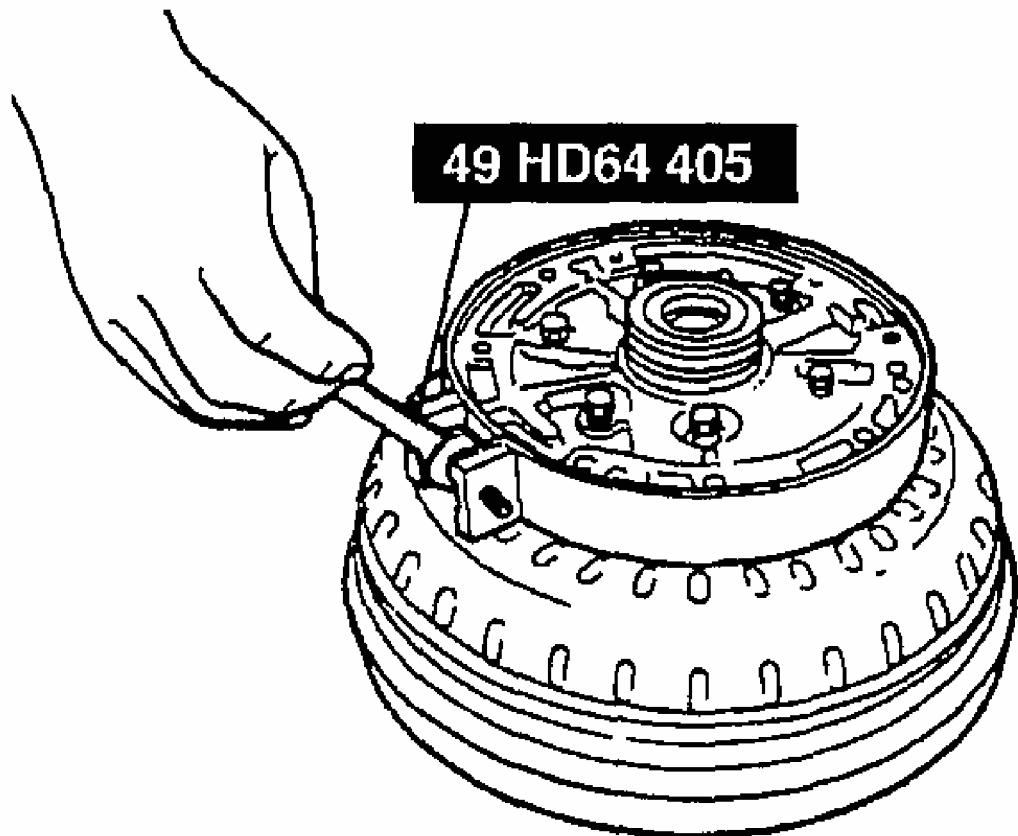


G03186855

Fig. 58: Measuring Clearance Between End Of Oil Pump Body & Inner Gear & Outer Gear

Courtesy of MAZDA MOTORS CORP.

6. If not within the specification, replace the oil pump component.
7. Apply ATF to the new oil seal.
8. Apply ATF to the inner gear, outer gear, and oil pump body.
9. Install the inner gear and outer gear to the oil pump body.
10. Install the oil pump body to the torque converter.
11. Install the oil pump cover to the oil pump body.
12. Loosen the bolts.
13. Install the SST to the oil pump component.



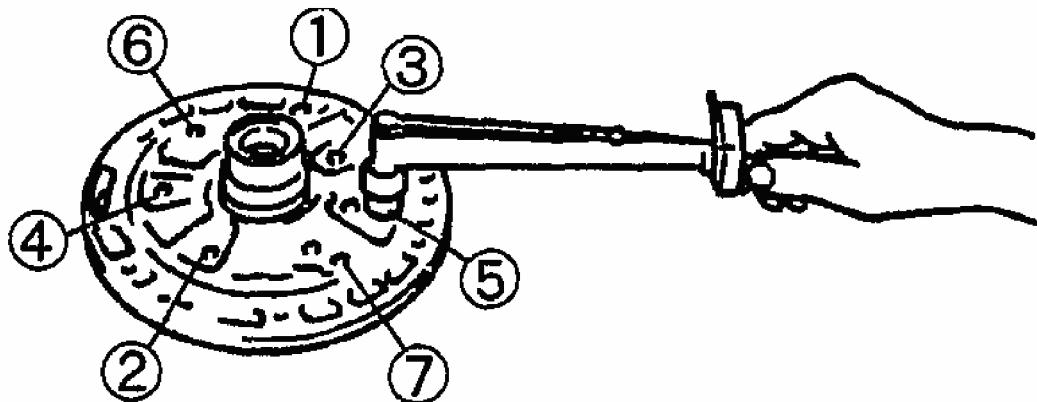
G03186856

Fig. 59: Installing SST To Oil Pump Component
Courtesy of MAZDA MOTORS CORP.

14. Tighten the bolts evenly and gradually in the order shown.

Tightening Torque

5.9-8.8 N.m {60-90 kgf.cm, 53-78 in.lbf}



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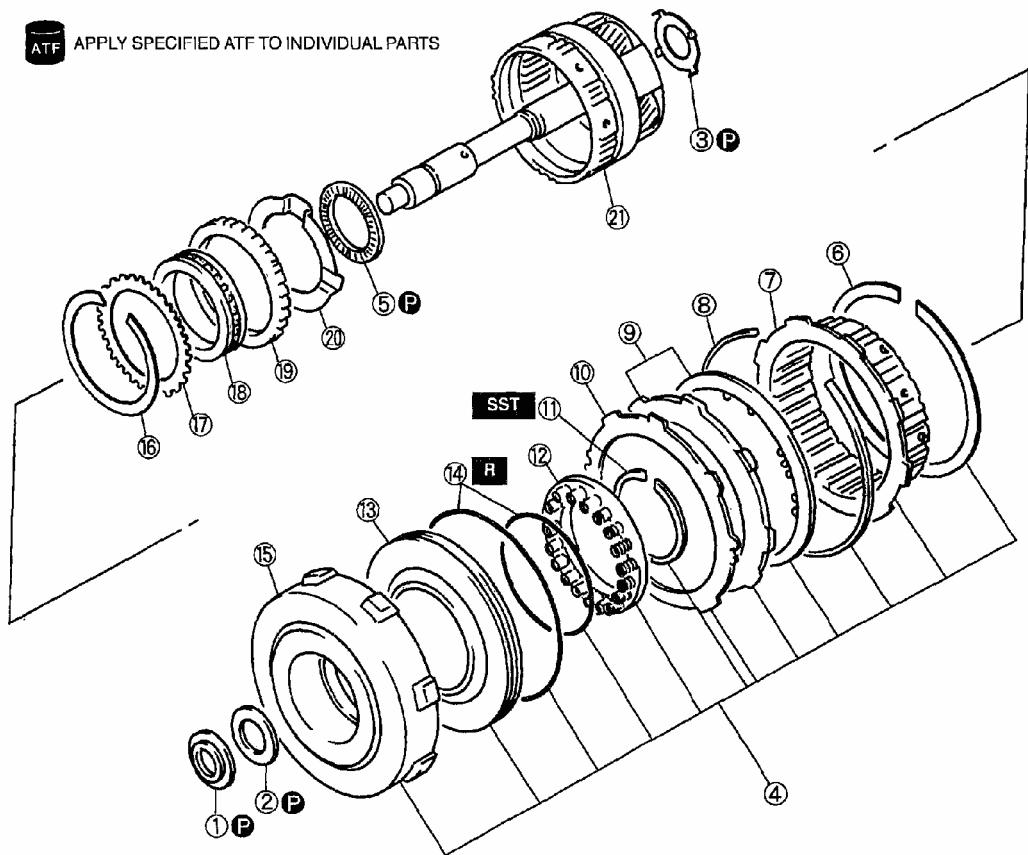
Fig. 60: Oil Pump Cover Bolt Tightening Sequence

Courtesy of MAZDA MOTORS CORP.

15. Remove the SST .
16. Apply ATF to the O-ring.
17. Install the O-ring to the oil pump component.
18. When assembly is completed, make sure that the gears turn easily.
19. Remove the oil pump from the torque converter.

4GR INPUT SHAFT AND 4GR CLUTCH DISASSEMBLY/ASSEMBLY

1. Carry out the preinspection before disassembly. (Refer to **AUTOMATIC TRANSMISSION INSPECTION , 4GR INPUT SHAFT AND 4GR CLUTCH PREINSPECTION ONE-WAY CLUTCH OPERATION .**)
2. Disassemble in the order indicated in the figure.



1	Bearing
2	Bearing race
3	Thrust washer
4	4GR clutch component
5	Thrust bearing
6	Outer snap ring
7	4GR brake hub
8	Snap ring
9	Drive, driven plate
10	Dished plate
11	Inner snap ring (See INNER SNAP RING DISASSEMBLY NOTE)

12	Spring retainer component
13	4GR clutch piston (See 4GR CLUTCH PISTON DISASSEMBLY NOTE)
14	O-ring
15	4GR clutch drum
16	Snap ring
17	Thrust washer
18	4GR one-way clutch
19	Outer race
20	Thrust washer
21	4GR planetary pinion carrier

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Fig. 61: Disassembling/Assembling 4GR Input Shaft & 4GR Clutch
Courtesy of MAZDA MOTORS CORP.

- Assemble in the reverse order of disassembly.

Inner Snap Ring Disassembly Note

CAUTION:

- Depress the piston return spring only enough to remove the snap ring. Overpressing will damage the retainer component edges.

1. Install the SSTs in the 4GR clutch drum as shown.
2. Compress the piston return spring.

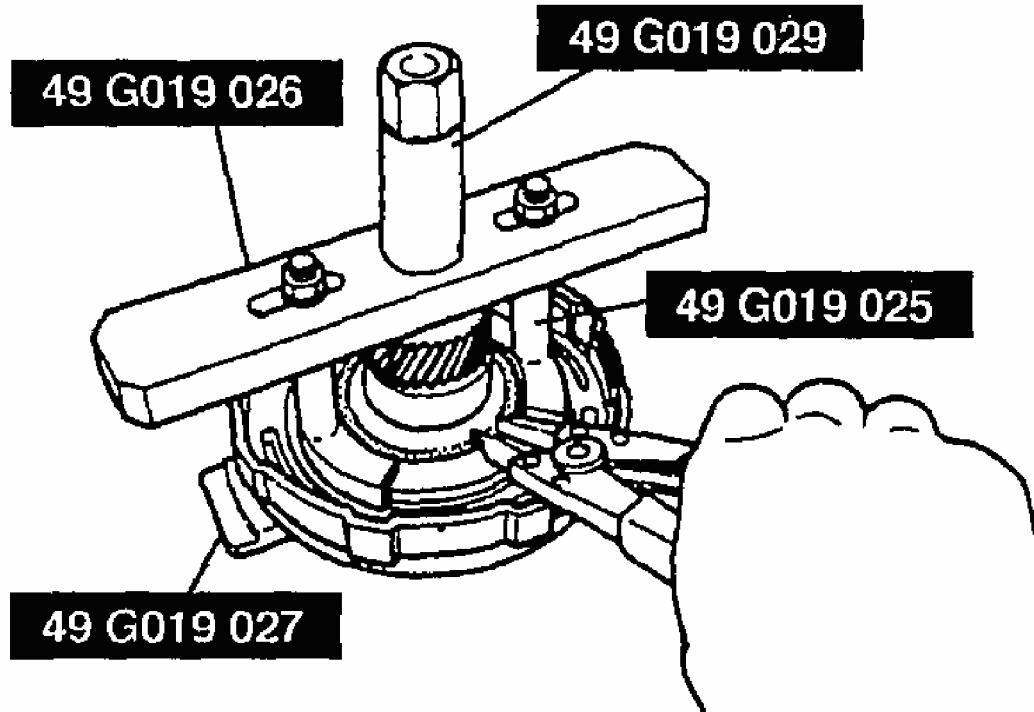


Fig. 62: Compressing Piston Return Spring
Courtesy of MAZDA MOTORS CORP.

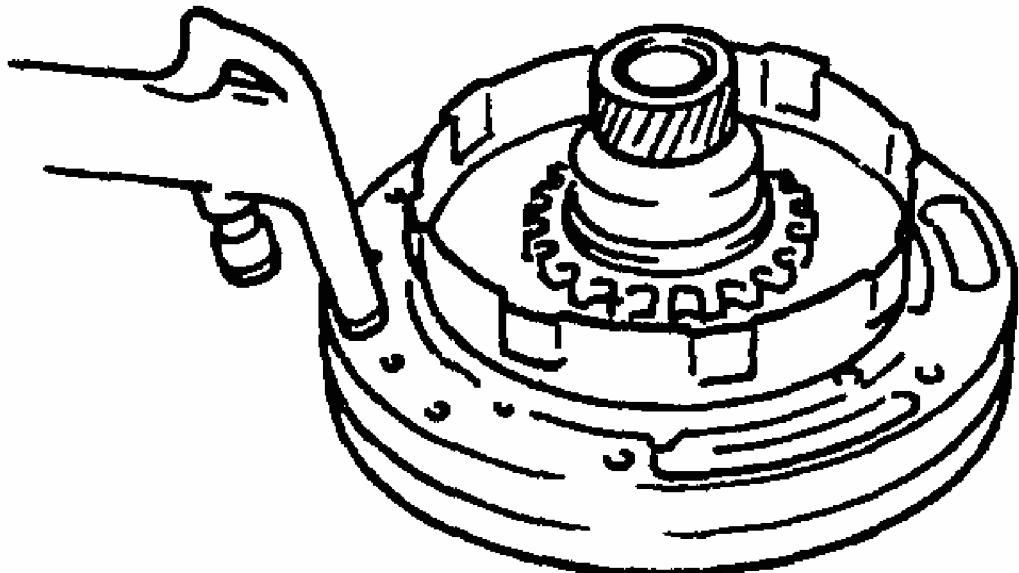
3. Remove one-end of the snap ring from the groove with snap ring pliers.
4. Remove the SSTs from the 4GR clutch drum.
5. Remove the snap ring.

4GR Clutch Piston Disassembly Note

1. Set the 4GR clutch drum onto the oil pump.
2. Remove the 4GR clutch piston by applying compressed air through the fluid passage.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.



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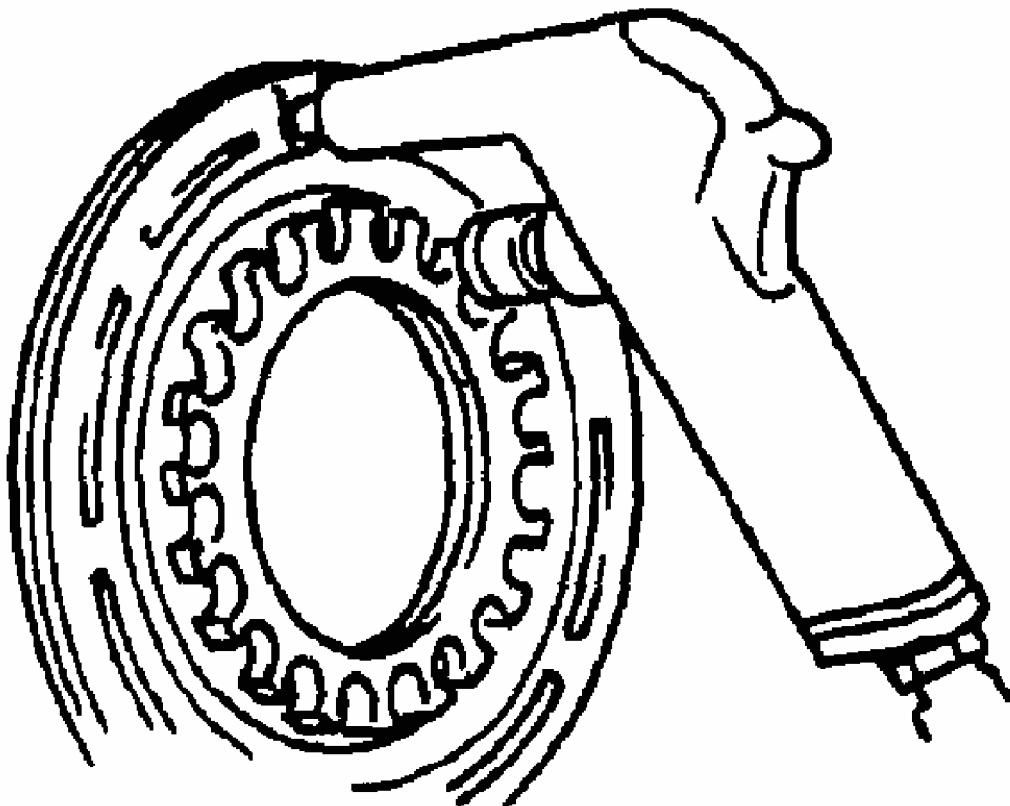
Fig. 63: Removing 4GR Clutch Piston
Courtesy of MAZDA MOTORS CORP.

Assembly Procedure

1. Verify that there is no air leakage when applying compressed air through the oil hole opposite the return spring.
2. Verify that there is air flow when applying compressed air through the oil hole on the return spring side.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.



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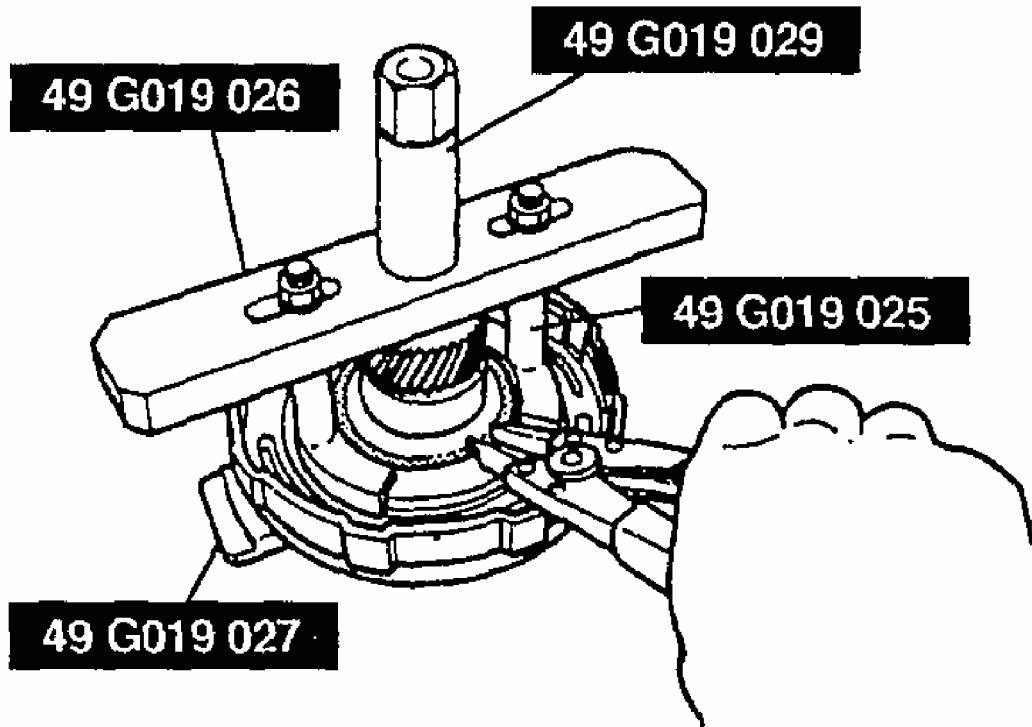
Fig. 64: Verifying Air Flow

Courtesy of MAZDA MOTORS CORP.

3. Replace the 4GR input shaft and 4GR clutch component if damaged or malfunctioning.
4. Install the 4GR one-way clutch to the outer race.
5. Install the thrust washer and one-way clutch component to the planetary pinion carrier.
6. Install the snap ring.
7. Apply ATF to the new O-ring.
8. Install the O-ring to the piston.
9. Install the piston to the 4GR clutch drum.
10. Install the spring and retainer component and snap ring.

CAUTION:

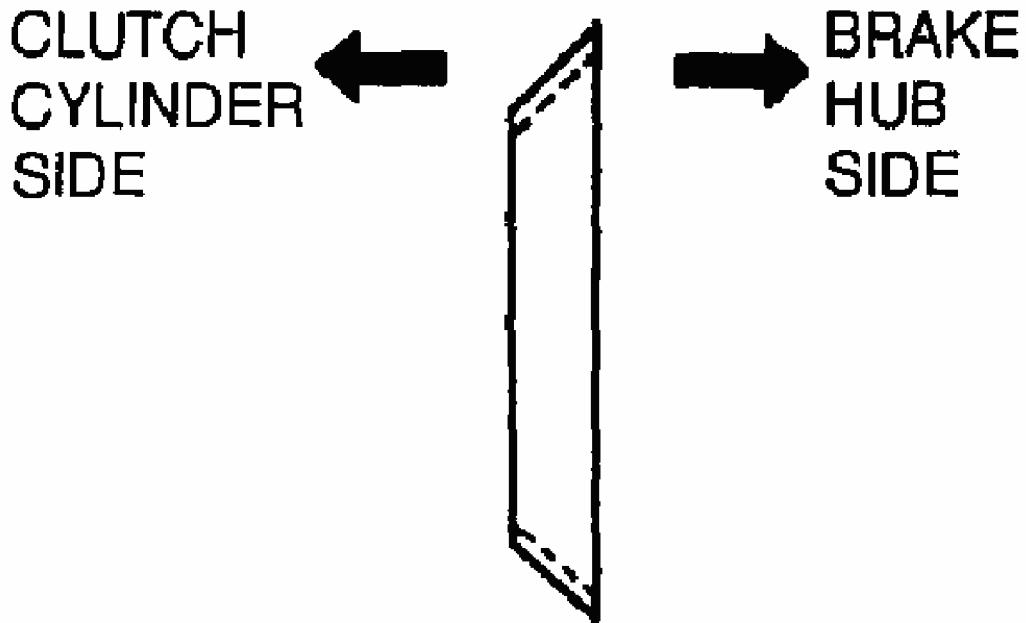
- Depress the piston return spring only enough to install the snap ring. Overpressing will damage the retainer component edges.



G03186862

Fig. 65: Installing Snap Ring
Courtesy of MAZDA MOTORS CORP.

11. Install the SSTs on the 4GR clutch drum.
12. Compress the spring and retainer component.
13. Install the snap ring.
14. Remove the SSTs .
15. Install the dished plate with the dished side facing brake hub side.



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Fig. 66: Identifying Brake Hub Side
Courtesy of MAZDA MOTORS CORP.

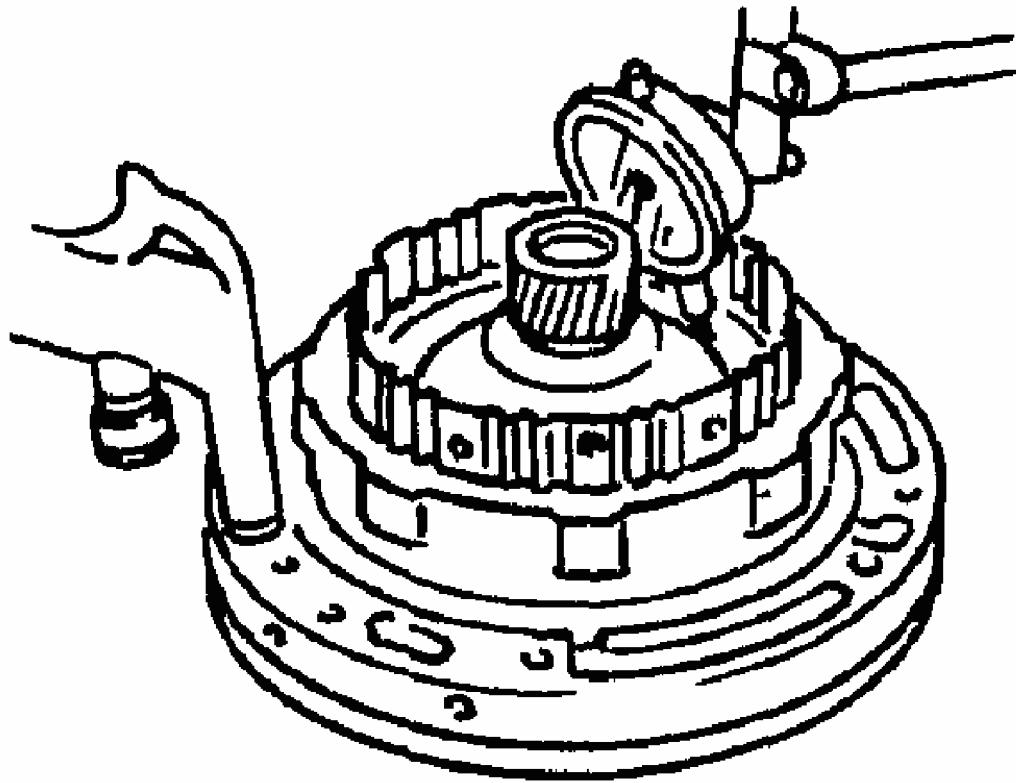
16. Inspect the 4GR clutch piston stroke.
 1. Install the 4GR brake hub and outer snap ring.
 2. Install the 4GR clutch drum onto the oil pump component.
 3. Using a dial indicator, measure the 4GR clutch piston stroke applying and releasing the compressed air as shown.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.

Piston Stroke

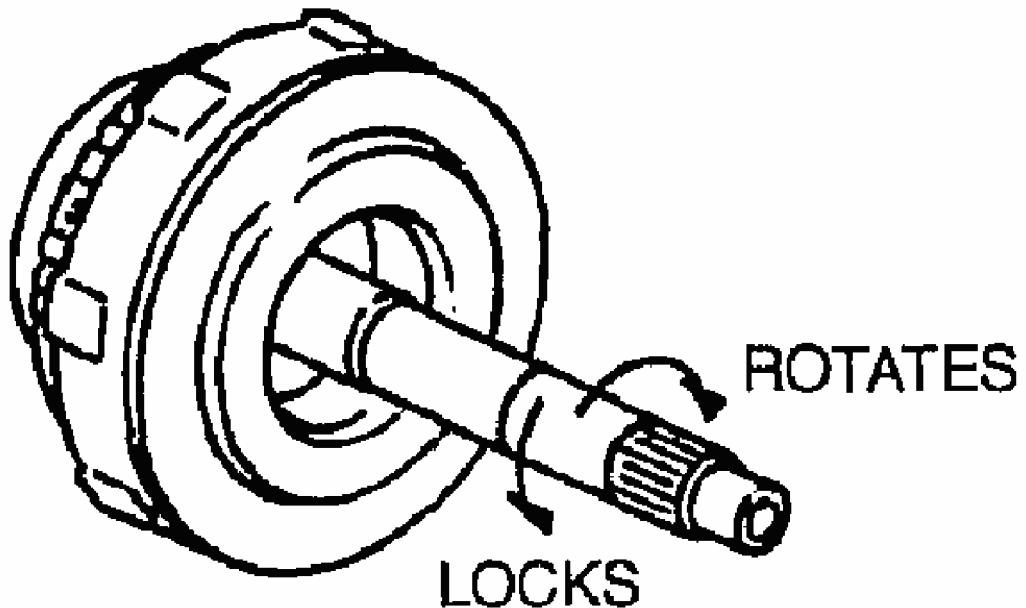
1.77-2.58 mm {0.07-0.10 in}



G03186864

Fig. 67: Measuring 4GR Clutch Piston Stroke
Courtesy of MAZDA MOTORS CORP.

17. If not as specified, replace the drive plate.
18. Remove the outer snap ring and 4GR brake hub.
19. Install the snap ring to the 4GR clutch drum.
20. Install the 4GR brake hub and snap ring.
21. Apply petroleum jelly to the thrust bearing and bearing race.
22. Install the thrust bearing and bearing race.
23. Install the 4GR clutch component and 4GR planetary gear.
24. While holding the 4GR clutch drum, verify that the input shaft rotates smoothly when turned clockwise and locks when turned counterclockwise. If not as specified, replace 4GR input shaft and 4GR clutch component.



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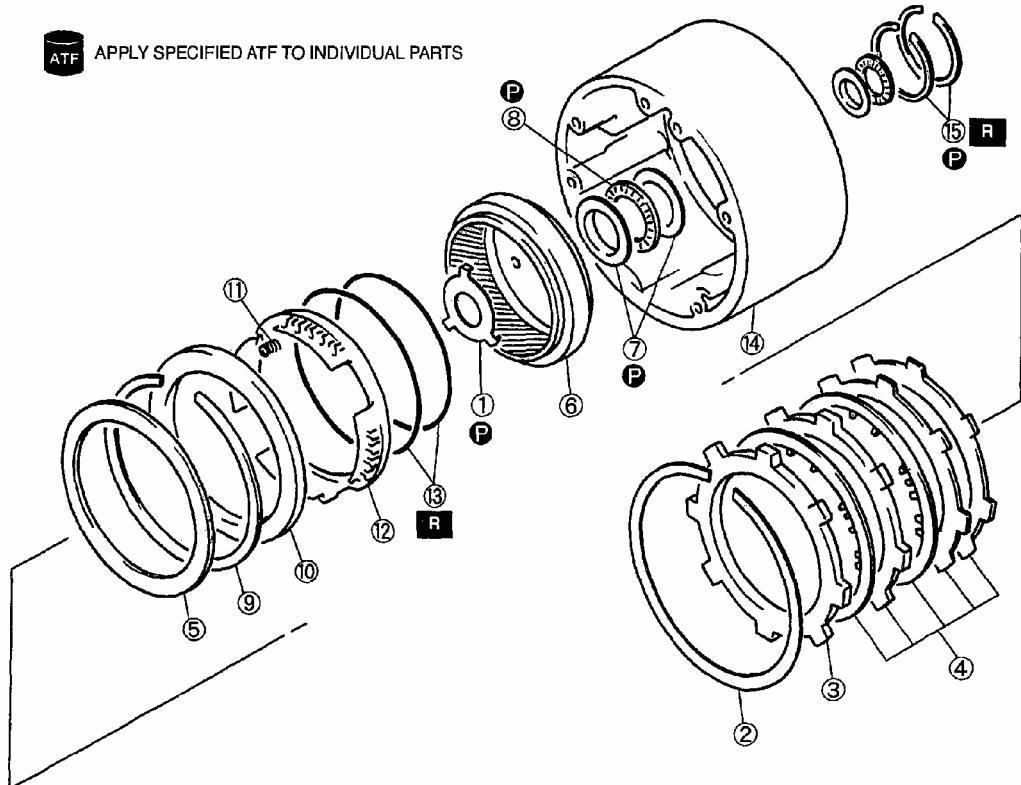
Fig. 68: Verifying Input Shaft Rotation

Courtesy of MAZDA MOTORS CORP.

25. Install the thrust washer to the 4GR input shaft and 4GR clutch.
26. Apply petroleum jelly to the thrust bearing and race.
27. Install the thrust bearing and bearing race to the 4GR clutch side.

4GR CASE AND 4GR BRAKE DISASSEMBLY/ASSEMBLY

1. Carry out the preinspection before disassembly. (Refer to **AUTOMATIC TRANSMISSION INSPECTION , 4GR CASE AND 4GR BRAKE PREINSPECTION CLUTCH CLEARANCE .**)
2. Disassemble in the order indicated in the figure.



1	Thrust washer
2	Snap ring
3	Retaining plate
4	Drive, driven plate
5	Dished plate
6	Internal gear
7	Bearing race
8	Bearing

9	Snap ring
10	Spring retainer
11	Spring
12	4GR brake piston (See 4GR BRAKE PISTON DISASSEMBLY NOTE)
13	O-ring
14	4GR case
15	Seal ring

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Fig. 69: Disassembling/Assembling 4GR Case & 4GR Brake
Courtesy of MAZDA MOTORS CORP.

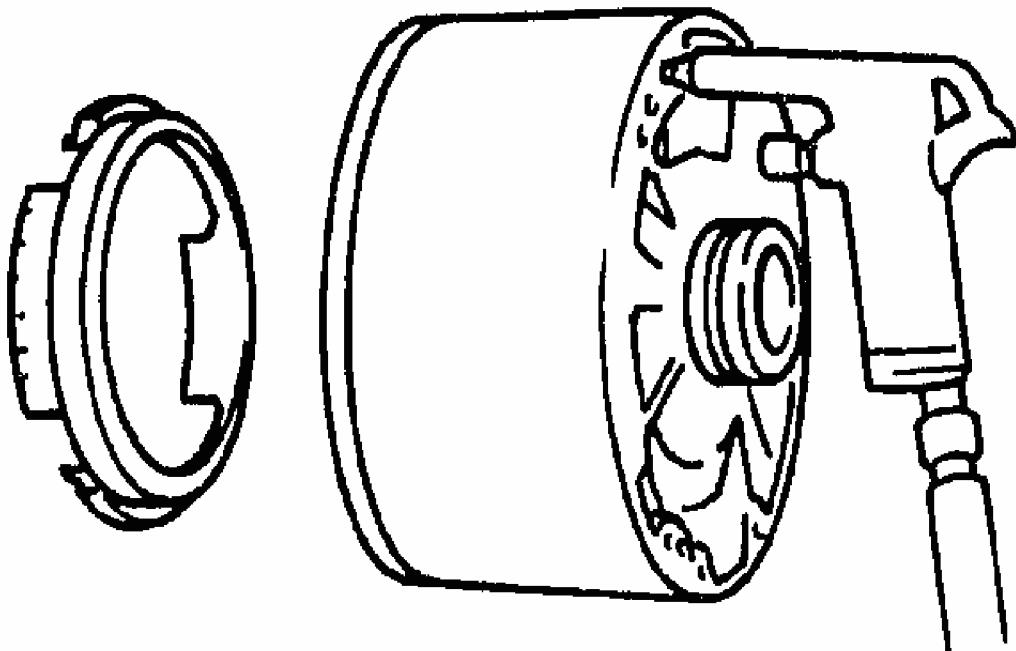
- Assemble in the reverse order of disassembly.

4GR Brake Piston Disassembly Note

- Remove the 4GR brake piston by applying compressed air through the fluid passage.

Air Pressure

390 kPa {4.0 kgf/cm², 57 psi} max.

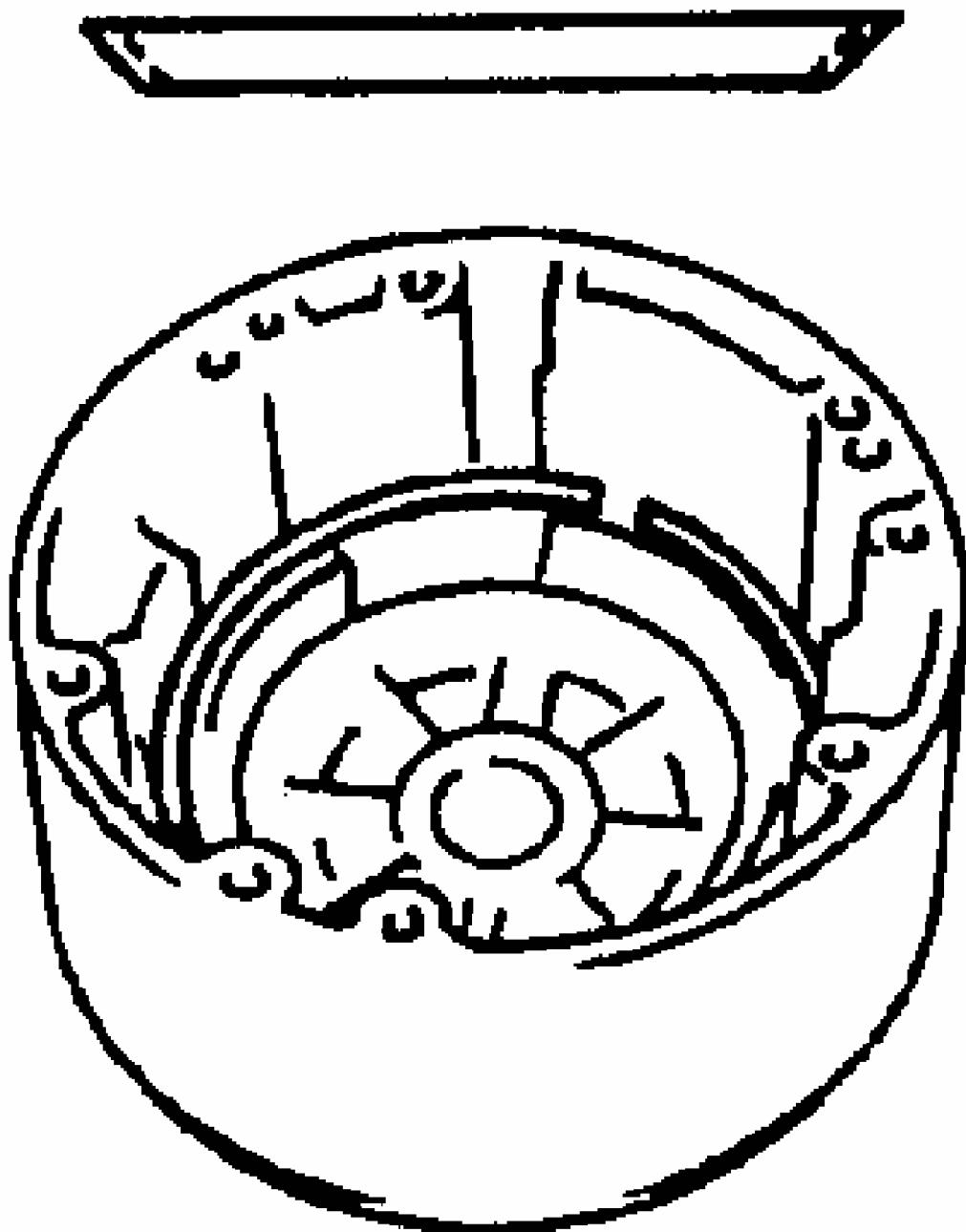


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Fig. 70: Removing 4GR Brake Piston
Courtesy of MAZDA MOTORS CORP.

Assembly Procedure

1. Install seal ring to the 4GR case.
2. Apply ATF to the new O-ring.
3. Install the O-ring to the 4GR brake piston.
4. Install the 4GR brake piston to the 4GR case.
5. Install the spring, spring retainer, and snap ring.
6. Install the bearing race to the 4GR case.
7. Install the internal gear.
8. Install the dished plate with the dished side facing upward.



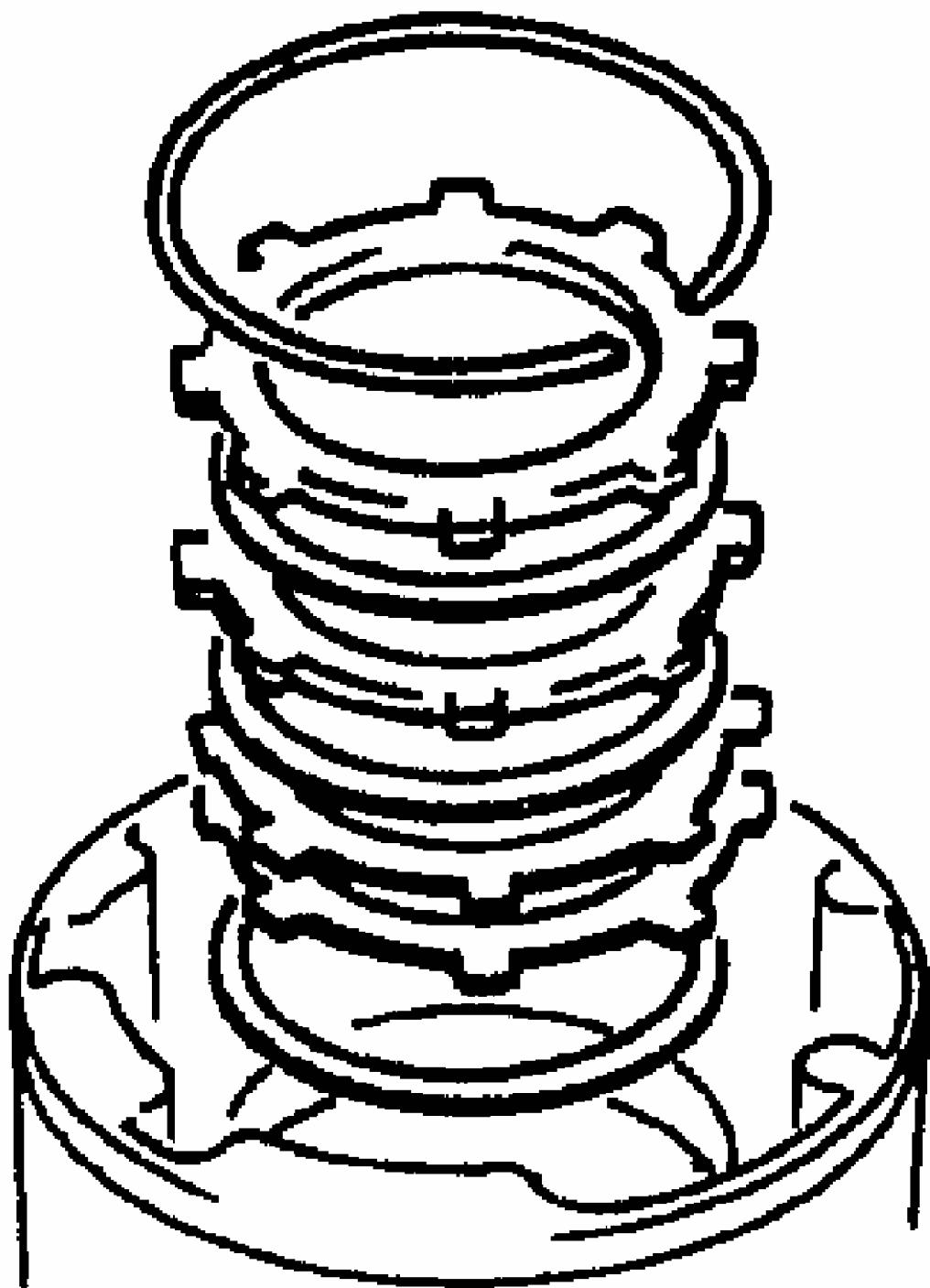
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Fig. 71: Installing Dished Plate
Courtesy of MAZDA MOTORS CORP.

9. Install the drive and driven plates in the following order.

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Fig. 72: Installing Drive & Driven Plates
Courtesy of MAZDA MOTORS CORP.

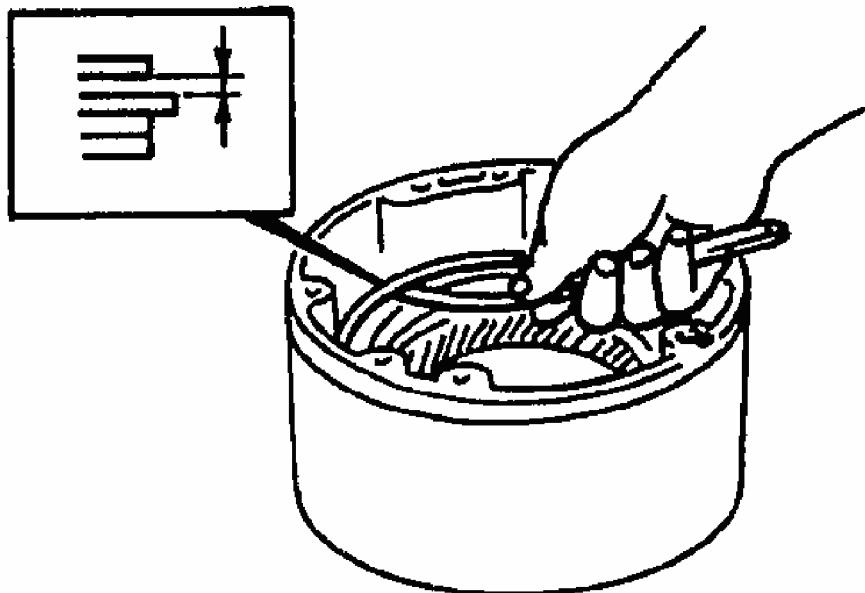
10. Install the retaining plate.
11. Install the snap ring.
12. Measure the clearance between the snap ring and the retaining plate. Make several measurements and calculate the average value.

Clearance

0.56-1.62 mm {0.03-0.06 in}

Clearance

0.56—1.62 mm {0.03—0.06 in}

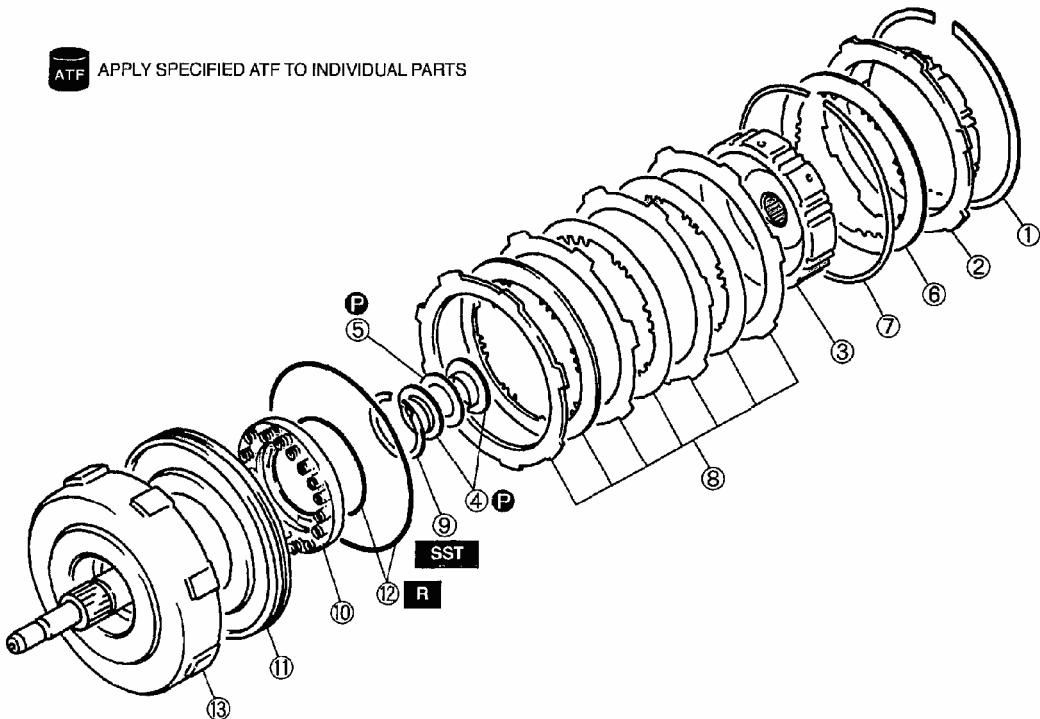


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Fig. 73: Measuring Clearance Between Snap Ring & Retaining Plate
Courtesy of MAZDA MOTORS CORP.

13. If not as specified, replace the drive plate.
14. Install the thrust washer to the internal gear.

1. Carry out the preinspection before disassembly. (Refer to **AUTOMATIC TRANSMISSION INSPECTION , FORWARD CLUTCH PREINSPECTION** .)
2. Disassemble in the order indicated in the figure.



1	Outer snap ring
2	Direct clutch hub
3	Forward clutch hub
4	Bearing race
5	Thrust bearing
6	Drive plate
7	Snap ring

8	Driven, drive plate
9	Inner snap ring (See INNER SNAP RING DISASSEMBLY NOTE)
10	Spring and retainer component
11	Forward clutch piston (See FORWARD CLUTCH PISTON DISASSEMBLY NOTE)
12	O-ring
13	Forward clutch drum

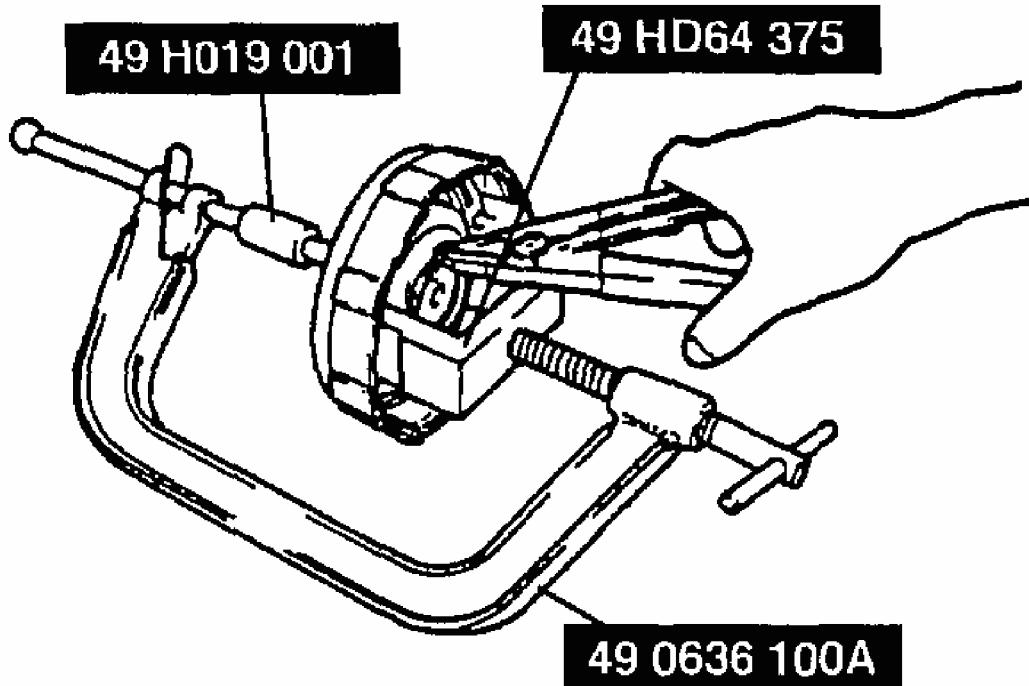
G03186871

Fig. 74: Disassembling/Assembling Forward Clutch
Courtesy of MAZDA MOTORS CORP.

3. Assemble in the reverse order of disassembly.

Inner Snap Ring Disassembly Note

1. Install the SSTs to the forward clutch drum.



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Fig. 75: Installing SSTs To Forward Clutch Drum
Courtesy of MAZDA MOTORS CORP.

CAUTION: • Depress the piston return spring only enough to remove the snap ring. Overpressing will damage the retainer assembly edges.

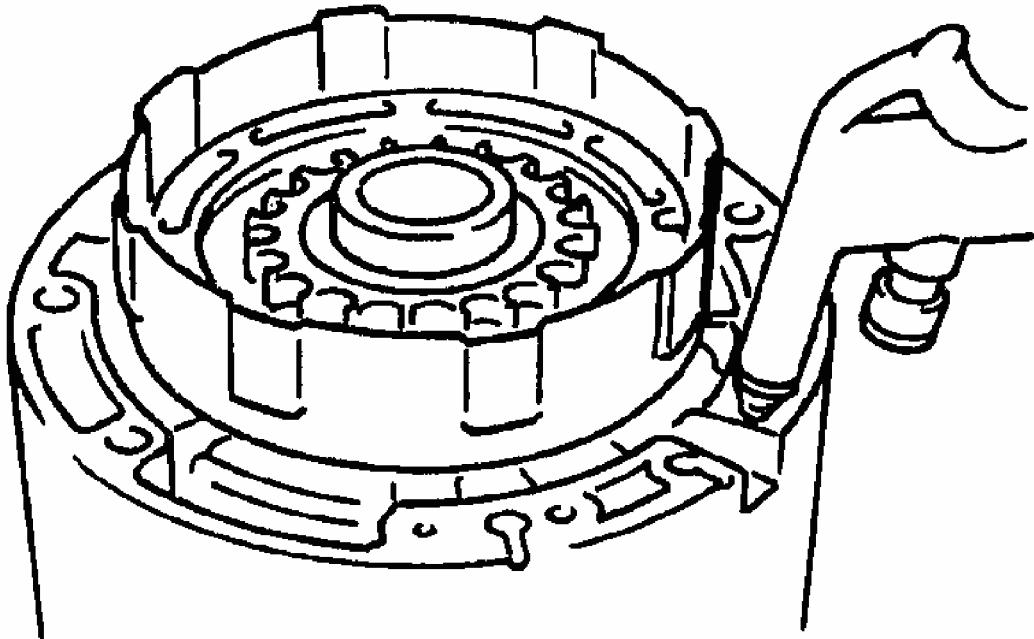
2. Compress the piston return spring.
3. Remove one end of the snap ring from the groove with snap ring pliers.

Forward Clutch Piston Disassembly Note

1. Install the forward clutch onto the 4GR case.
2. Remove the forward clutch piston from the forward clutch drum by applying compressed air through the fluid passage.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.



G03186873

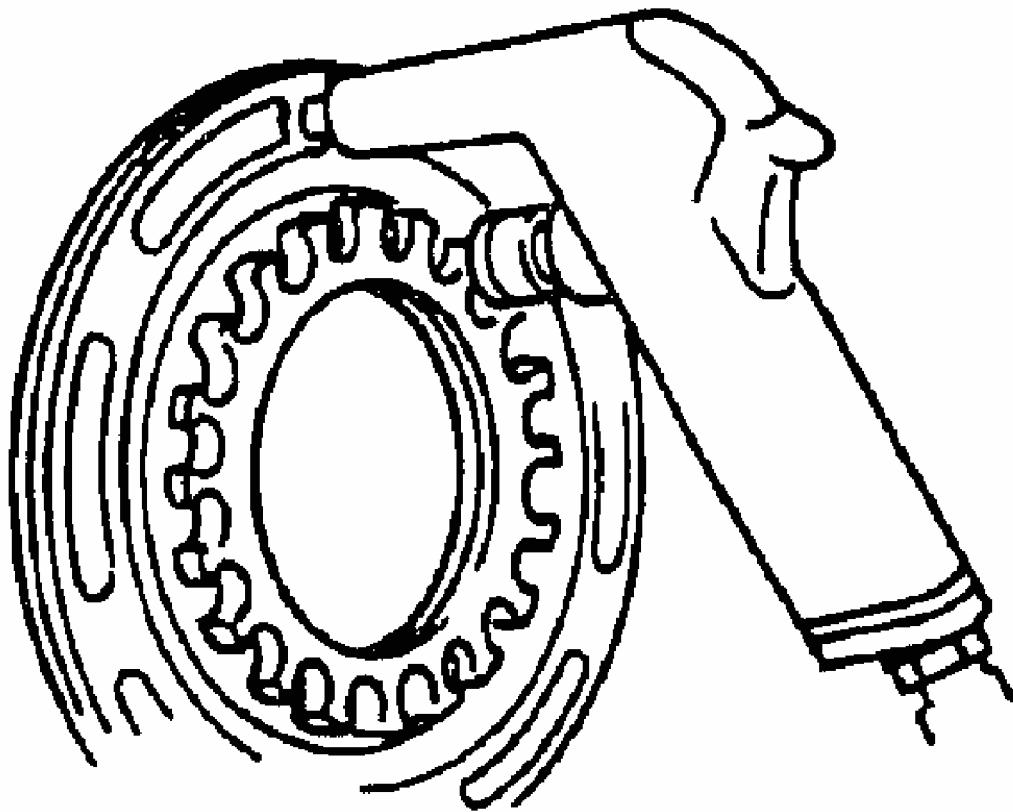
Fig. 76: Removing Forward Clutch Piston
Courtesy of MAZDA MOTORS CORP.

Assembly Procedure

1. Verify that there is no air leakage when applying compressed air through the oil hole opposite the return spring.
2. Verify that there is air flow when applying compressed air through the oil hole on the return spring side.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.



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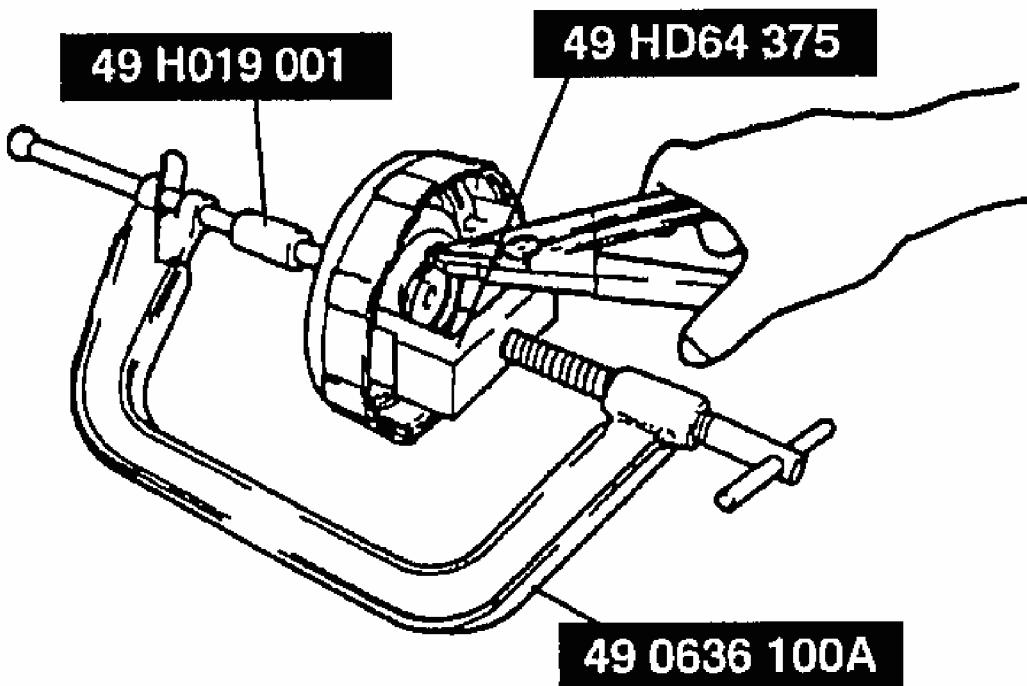
Fig. 77: Verifying Air Flow
Courtesy of MAZDA MOTORS CORP.

3. Replace the forward clutch component if damaged or malfunctioning.
4. Apply ATF to the O-ring.
5. Install the O-ring to the piston.
6. Install the forward clutch piston to the drum.
7. Install the spring and retainer component and snap ring.
8. Install the SSTs to the forward clutch drum.

CAUTION: • Depress the piston return spring only enough to install the snap ring. Overpressing will damage the retainer component edges.

9. Compress the spring and retainer component.

10. Install the snap ring.



G03186875

Fig. 78: Installing Snap Ring
Courtesy of MAZDA MOTORS CORP.

11. Remove the SSTs .
12. Install the drive and driven plates.
13. Install the direct clutch hub and outer snap ring.
14. Install the forward clutch drum onto the 4GR case.
15. Using a dial indicator, measure the forward clutch piston stroke applying and releasing the compressed air as shown.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.

Stroke

1.40-1.60 mm {0.056-0.062 in}

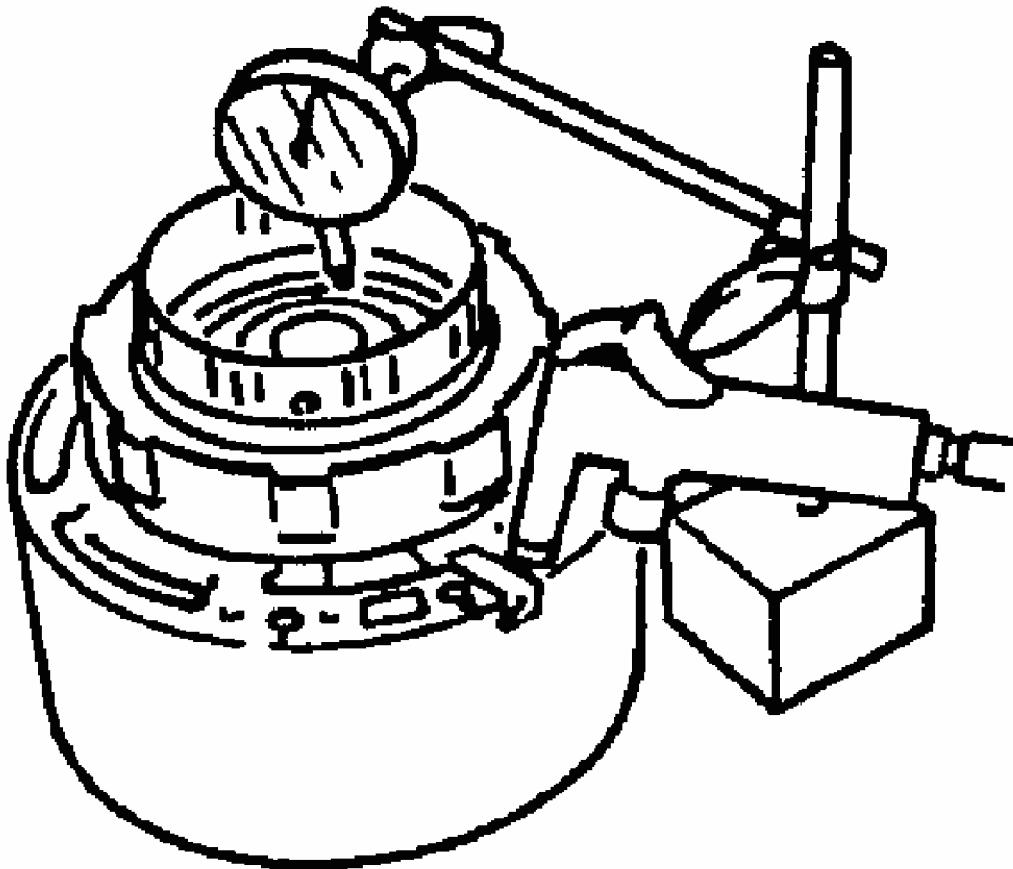
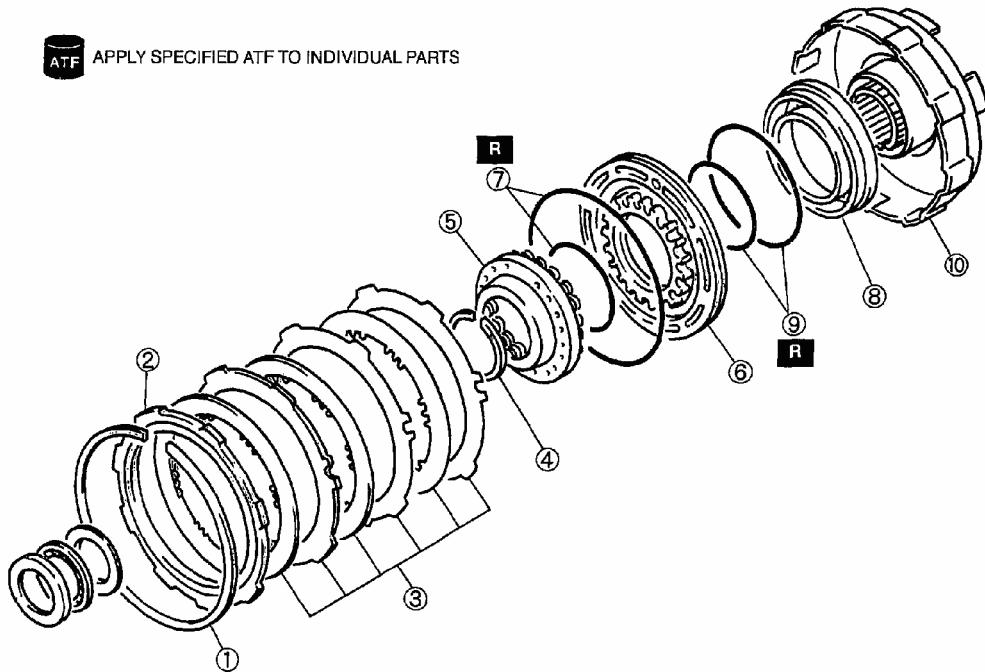
**G03186876**

Fig. 79: Measuring Forward Clutch Piston Stroke
Courtesy of MAZDA MOTORS CORP.

16. If measured value is not within standard range, use either **1.8 mm {0.07 in}** or **2.0 mm {0.08 in}** drive plate to adjust it to standard value.
17. Remove the outer snap ring, direct clutch hub, and drive plate.
18. Install the snap ring.
19. Apply petroleum jelly to the thrust bearing and race.
20. Install the forward clutch hub.
21. Install the drive plate, direct clutch hub, and outer snap ring.
22. Install the thrust bearing and bearing race to the forward clutch.

DIRECT CLUTCH DISASSEMBLY/ASSEMBLY

1. Carry out the preinspection before disassembly. (Refer to **AUTOMATIC TRANSMISSION INSPECTION**, **DIRECT CLUTCH PREINSPECTION**.)
2. Disassemble in the order indicated in the figure.



1	Outer snap ring
2	Retaining plate
3	Drive, driven plate
4	Inner snap ring (See INNER SNAP RING DISASSEMBLY NOTE)
5	Spring and retainer component

6	Direct clutch piston (See DIRECT CLUTCH PISTON DISASSEMBLY NOTE)
7	O-ring
8	Direct clutch inner piston
9	O-ring
10	Direct clutch hub

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Fig. 80: Disassembling/Assembling Direct Clutch
Courtesy of MAZDA MOTORS CORP.

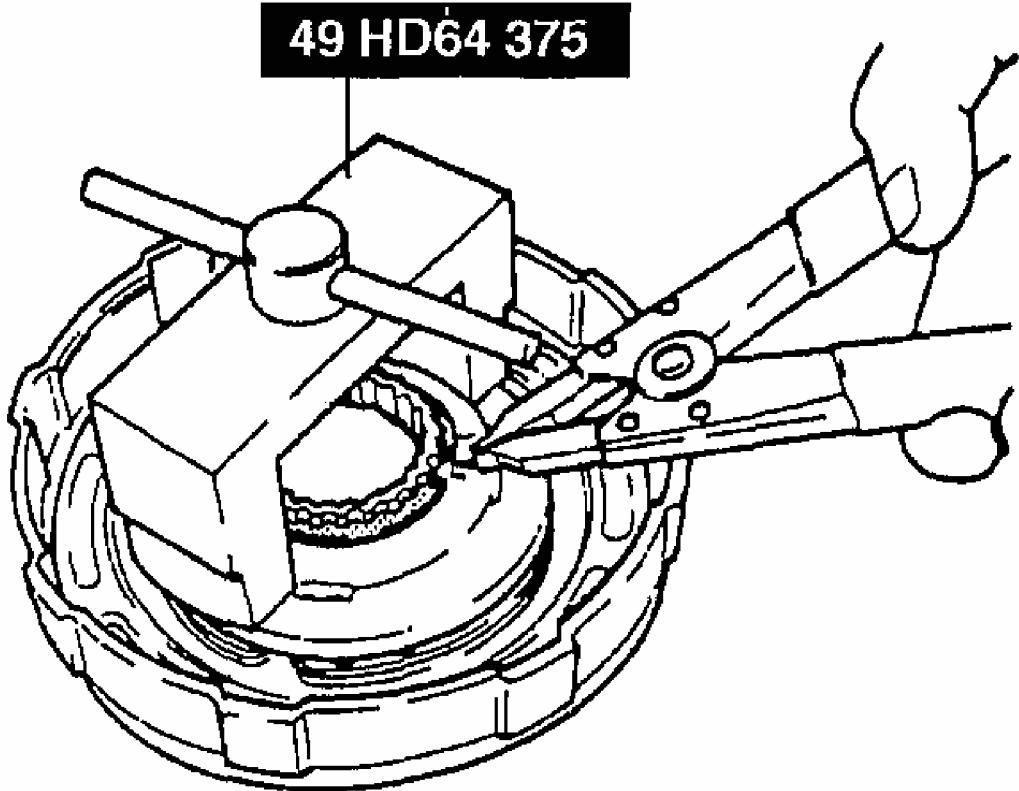
3. Assemble in the reverse order of disassembly.

Inner Snap Ring Disassembly Note

1. Install the SSTs to the direct clutch hub.

CAUTION: • Depress the piston return spring only enough to remove the snap ring. Overpressing will damage the retainer component edges.

2. Compress the piston return spring.
3. Remove one end of the snap ring from the groove with snap ring pliers.



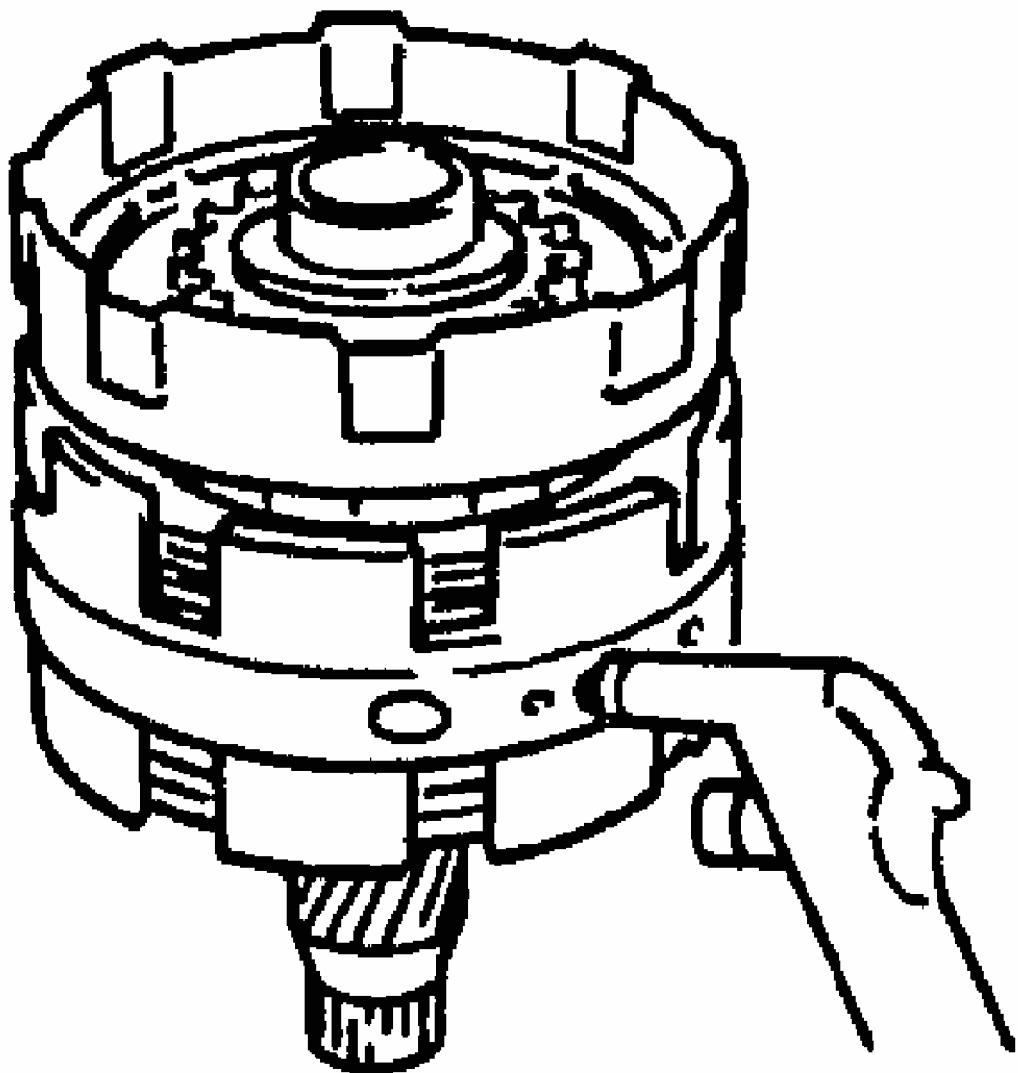
G03186878

Fig. 81: Removing Snap Ring
Courtesy of MAZDA MOTORS CORP.

4. Remove the SSTs .

Direct Clutch Piston Disassembly Note

1. Install the direct clutch hub onto the center support.
2. Remove the piston from direct clutch hub by applying compressed air through the fluid passage.



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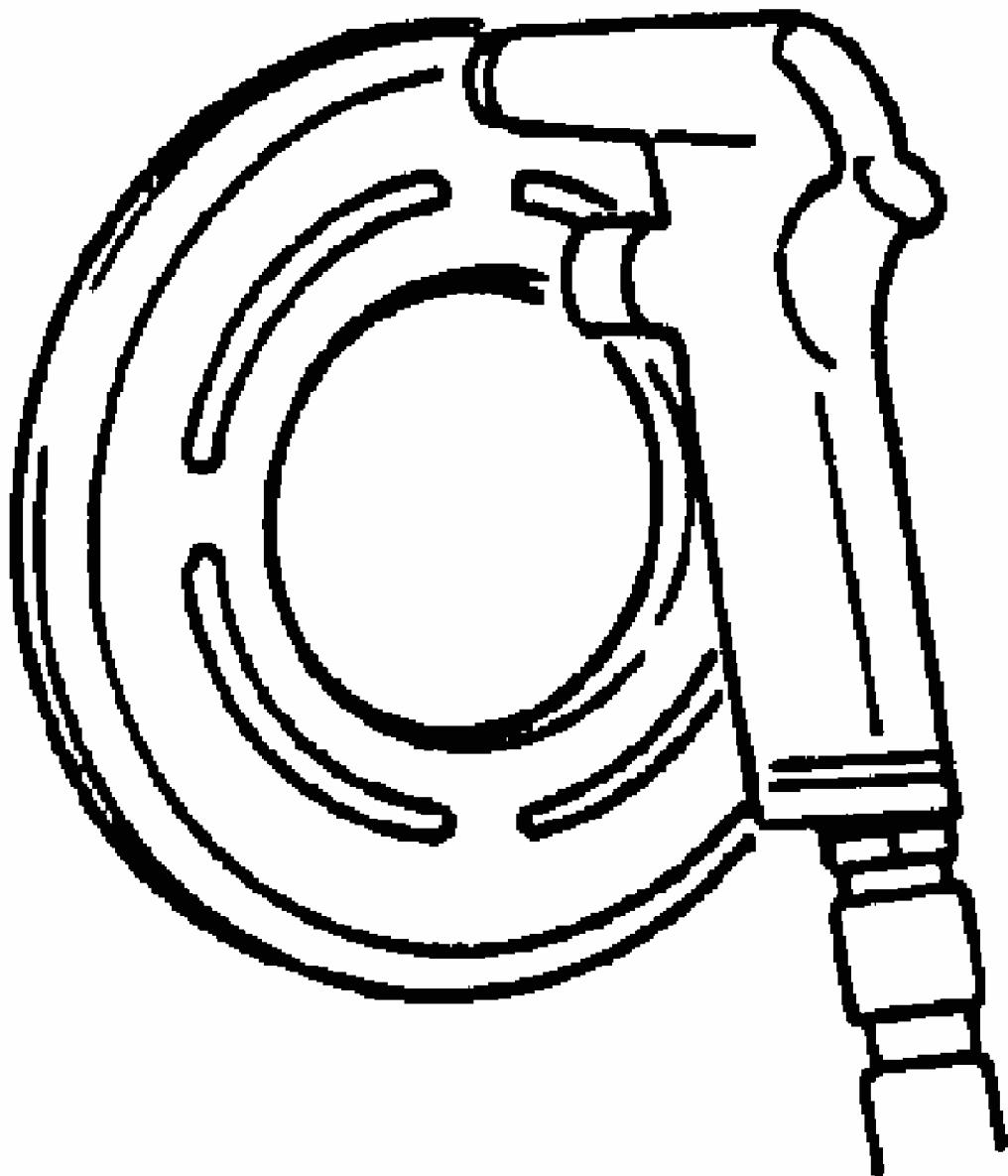
Fig. 82: Removing Direct Clutch Hub Piston
Courtesy of MAZDA MOTORS CORP.

Assembly Procedure

1. Verify that there is no air leakage when applying compressed air through the oil hole opposite the return spring.
2. Verify that there is air flow when applying compressed air through the oil hole on the return spring side.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.



G03186880

Fig. 83: Verifying Air Flow
Courtesy of MAZDA MOTORS CORP.

3. Replace the direct clutch component if damaged or malfunctioning.
4. Apply ATF to the new O-ring.

5. Install the O-ring to the direct clutch piston.
6. Install the direct clutch piston to the direct clutch hub.
7. Install the return spring and retainer component and snap ring to the direct clutch hub.
8. Install the SSTs .

CAUTION: • Depress the piston return spring only enough to install the snap ring. Overpressing will damage the retainer component edges.

9. Compress the spring and retainer component.
10. Install the snap ring.

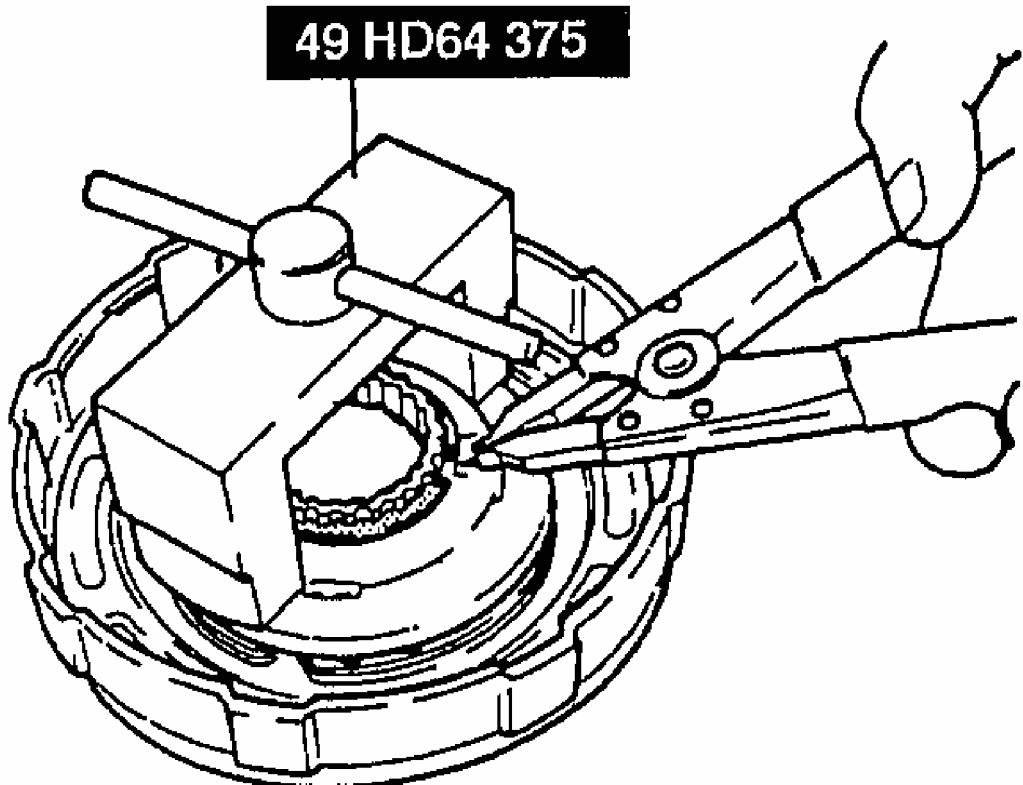
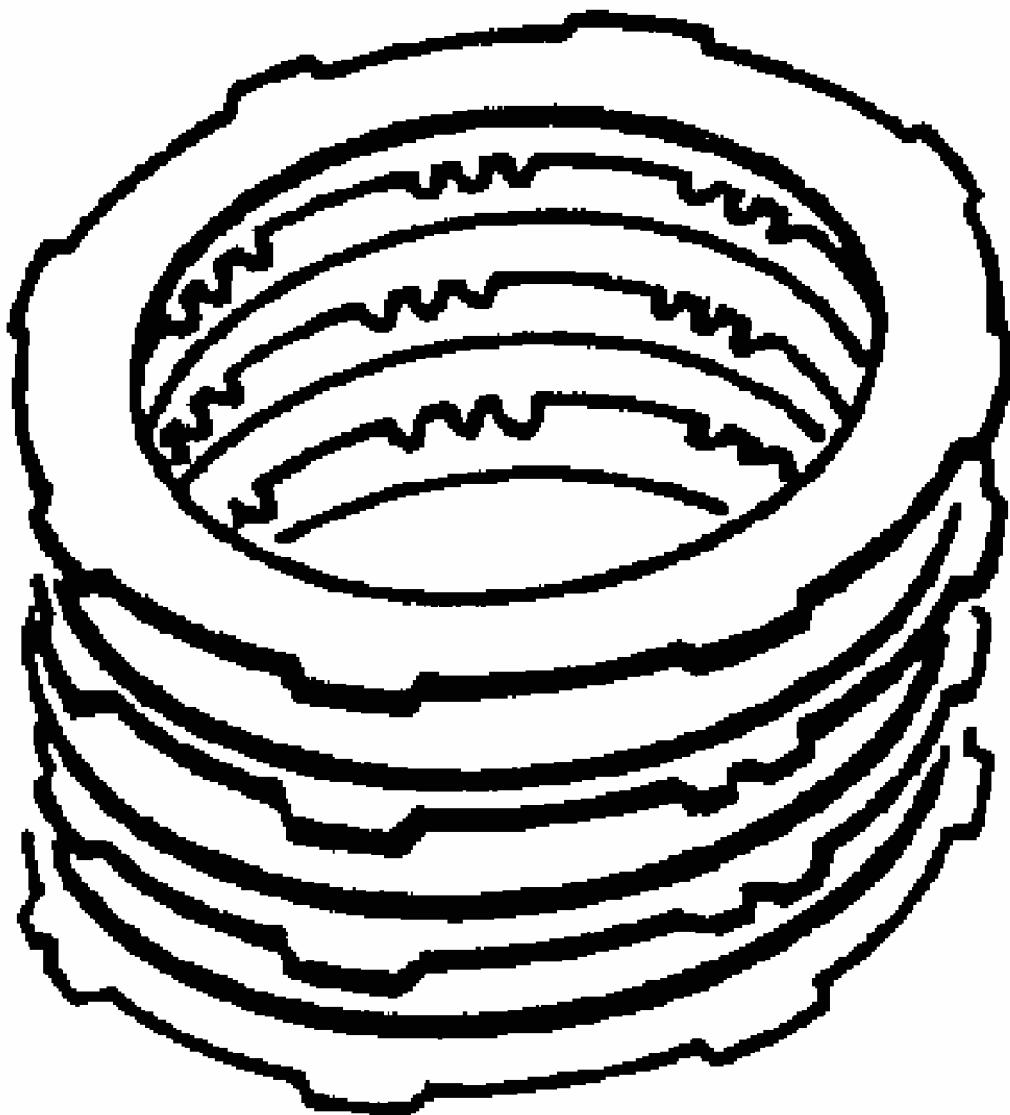


Fig. 84: Installing Snap Ring
Courtesy of MAZDA MOTORS CORP.

11. Remove the SSTs .

12. Install the drive and driven plates in the following order.



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Fig. 85: Installing Drive & Driven Plates
Courtesy of MAZDA MOTORS CORP.

13. Install the retaining plate.
14. Install the snap ring.
15. Install the direct clutch component onto the center support.
16. Using a dial indicator, measure the direct clutch piston stroke applying and releasing

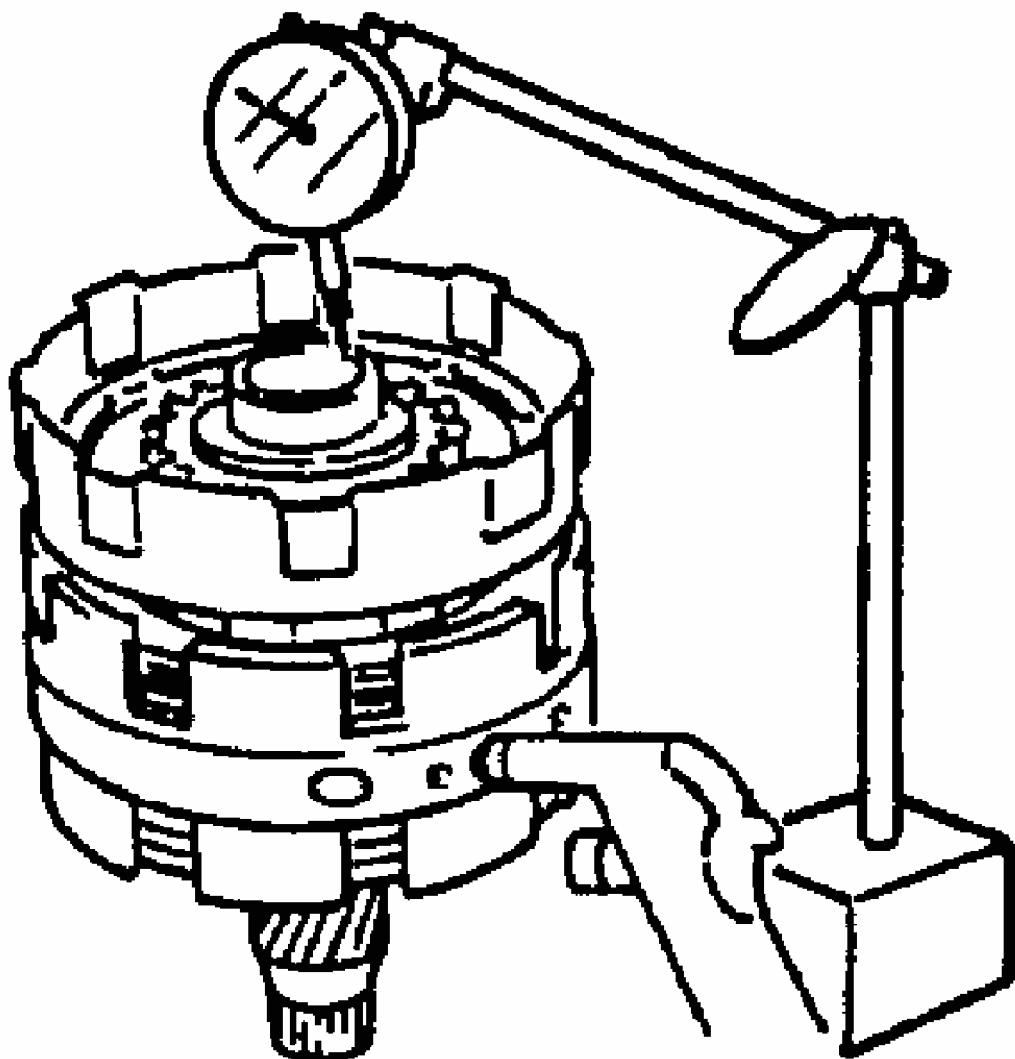
the compressed air as shown.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.

Piston Stroke

1.60-1.64 mm {0.05-0.06 in}



G03186883

Fig. 86: Measuring Direct Clutch Piston Stroke
Courtesy of MAZDA MOTORS CORP.

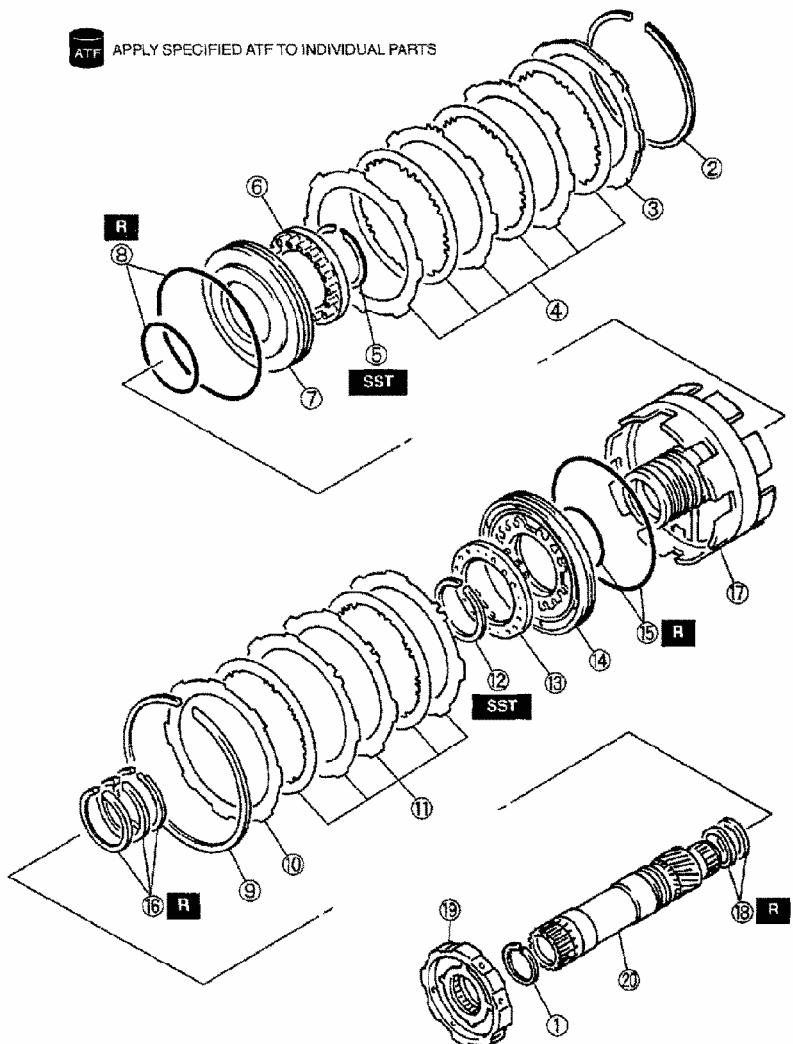
17. If it is not within standard range, use **3.55 mm {0.14 in}, 3.75 mm {0.15 in}, or 4.0 mm {0.16 in}** drive plate to adjust it to standard stroke.
18. Remove the direct clutch component.

CENTER SUPPORT COMPONENT (FRONT BRAKE, REAR BRAKE, AND FRONT ONE-WAY CLUTCH) DISASSEMBLY/ASSEMBLY

1. Carry out the preinspection before disassembly. (Refer to **AUTOMATIC TRANSMISSION INSPECTION , CENTER SUPPORT COMPONENT (FRONT BRAKE, REAR BRAKE, AND FRONT ONE-WAY CLUTCH) PREINSPECTION.**)
2. Disassemble in the order indicated in the figure.

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1	Snap ring
2	Outer snap ring
3	Retaining plate
4	Drive, driven plate
5	Inner snap ring (See INNER SNAP RING DISASSEMBLY NOTE)
6	Spring and retainer component
7	Front brake piston (See FRONT BRAKE PISTON DISASSEMBLY NOTE)
8	O-ring
9	Outer snap ring
10	Retaining plate
11	Drive, driven plate

11	Drive, driven plate
12	Inner snap ring (See INNER SNAP RING DISASSEMBLY NOTE)
13	Spring and retainer component
14	Rear brake piston (See REAR BRAKE PISTON DISASSEMBLY NOTE)
15	O-ring
16	Seal ring
17	Center support
18	Seal ring
19	Rear brake hub, front one-way clutch
20	Sun gear shaft

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Fig. 87: Disassembling/Assembling Center Support Component
Courtesy of MAZDA MOTORS CORP.

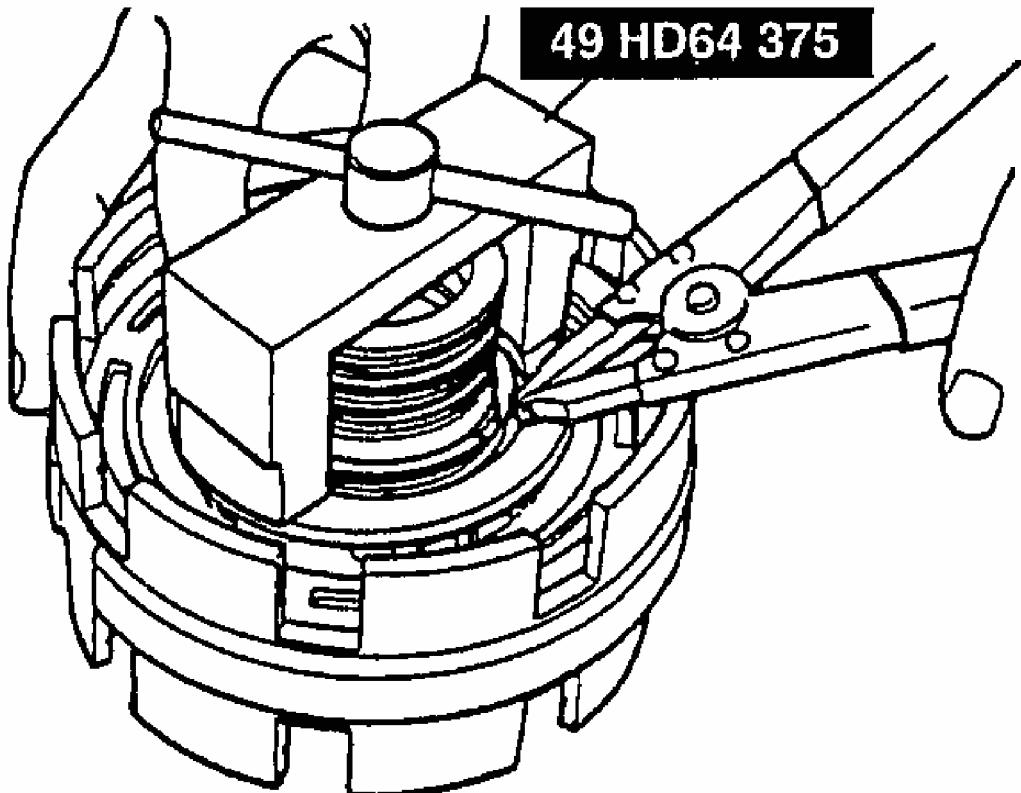
3. Assemble in the reverse order of disassembly.

Inner Snap Ring Disassembly Note

1. Install the SSTs .

CAUTION: • Depress the piston return spring only enough to remove the snap ring. Overpressing will damage the retainer component edges.

2. Compress the piston return spring.
3. Remove the one end of the snap ring from the groove with snap ring pliers.



G03186885

Fig. 88: Removing Snap Ring
Courtesy of MAZDA MOTORS CORP.

4. Remove the SSTs .

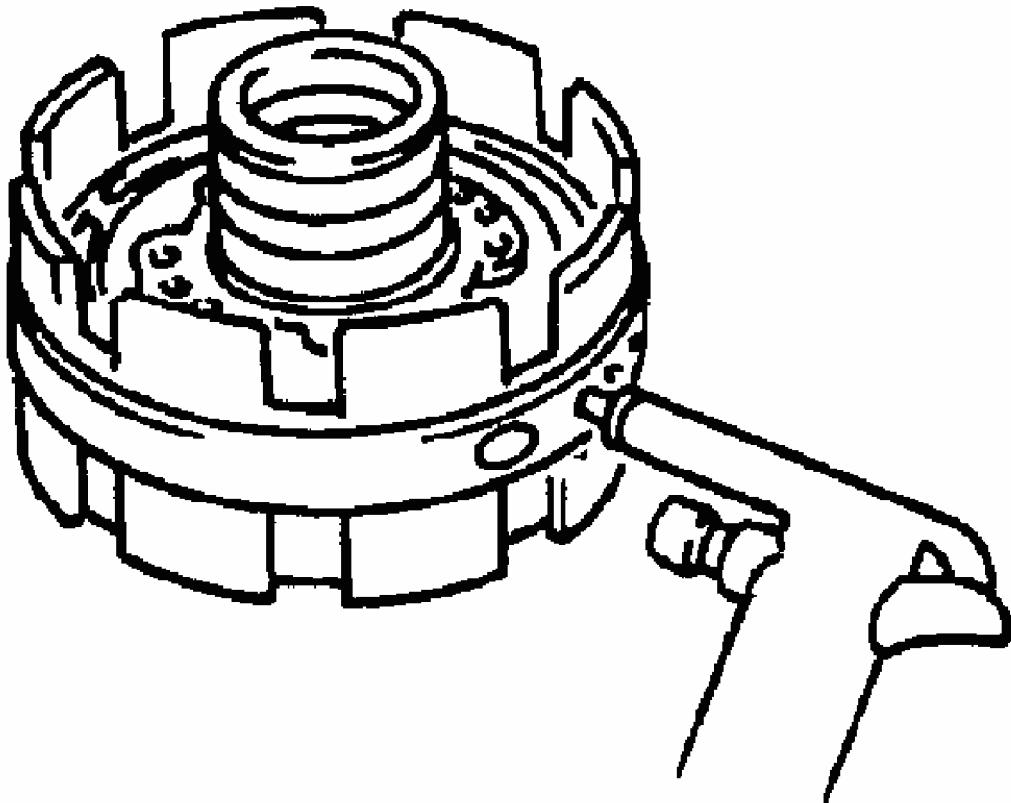
Front Brake Piston Disassembly Note

- Remove the front brake piston from the center support by applying compressed air

through the fluid passage.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.



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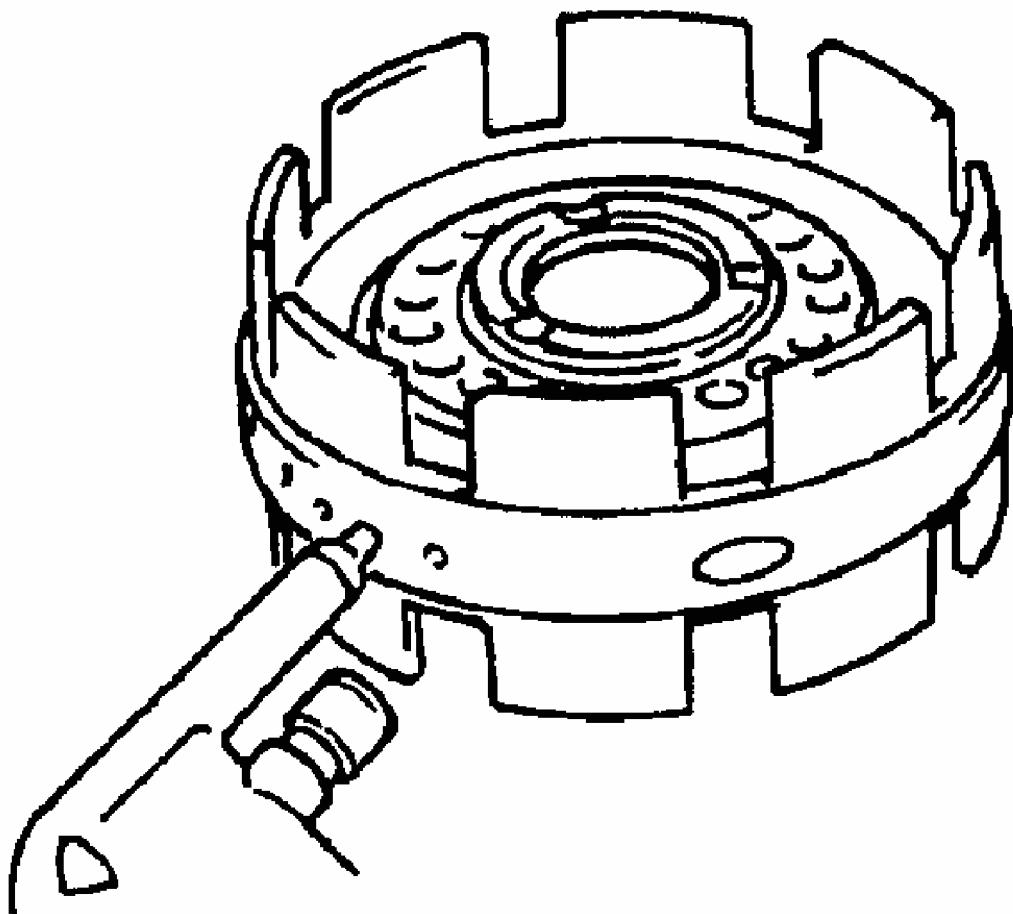
Fig. 89: Removing Front Brake Piston
Courtesy of MAZDA MOTORS CORP.

Rear Brake Piston Disassembly Note

- Remove the rear brake piston from the center support by applying compressed air through the fluid passage.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.



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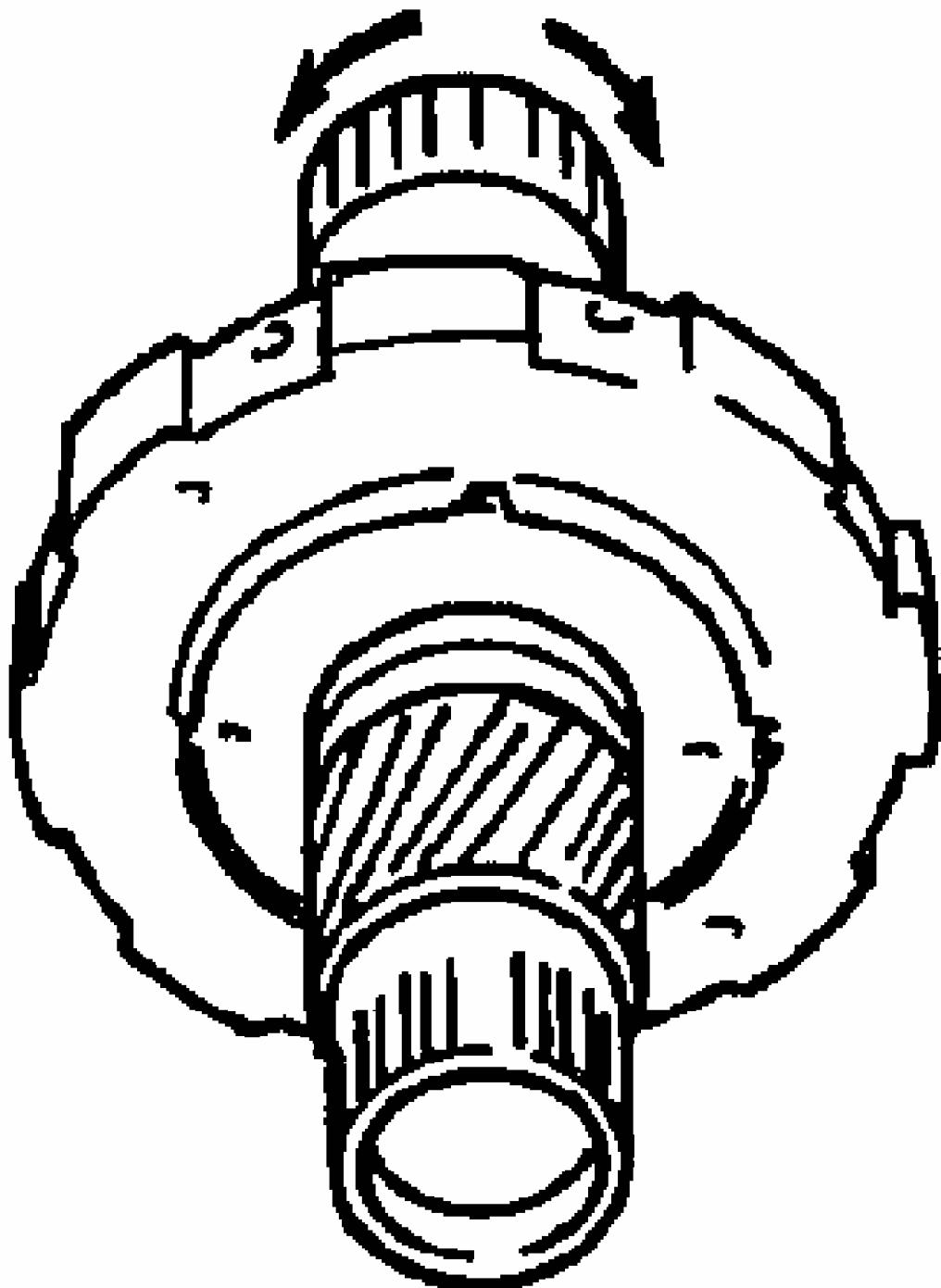
Fig. 90: Removing Rear Brake Piston
Courtesy of MAZDA MOTORS CORP.

Assembly Procedure

1. While holding the rear hub, verify that the sun gear shaft rotates smoothly when turned clockwise and locks when turned counterclockwise. If not as specified, replace the center support component.

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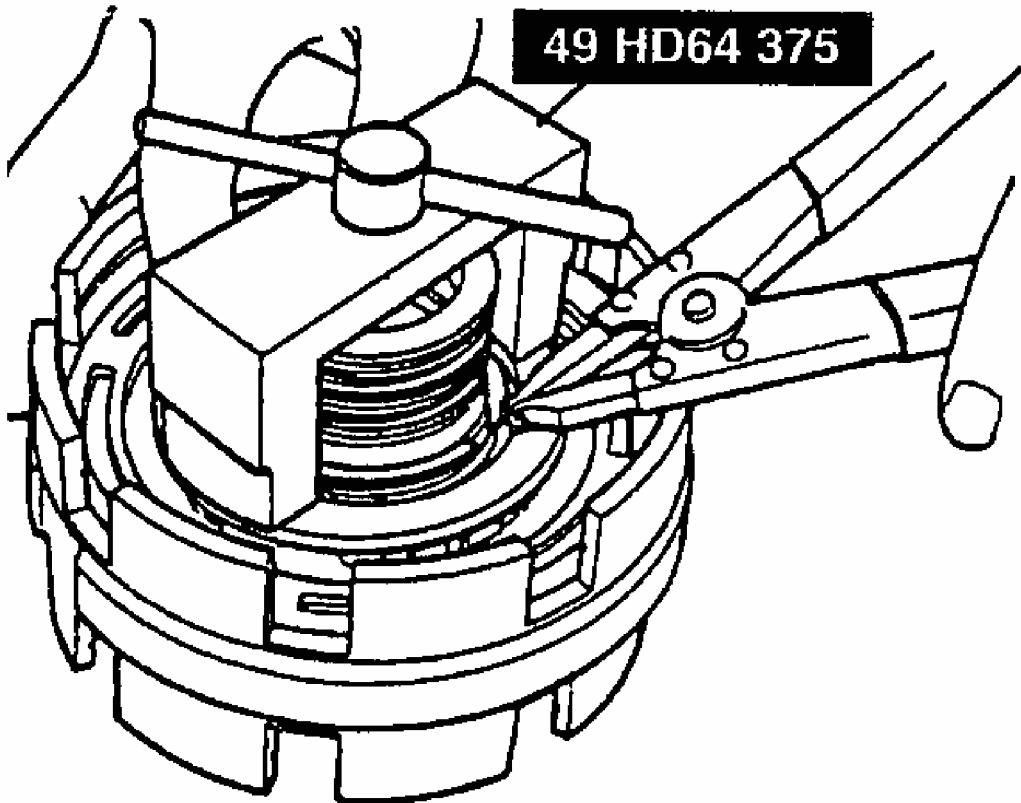
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Fig. 91: Verifying Sun Gear Shaft Rotation
Courtesy of MAZDA MOTORS CORP.

2. Apply ATF to the new seal ring.
3. Install the seal ring to the sun gear shaft.
4. Install the one-way clutch component to the sun gear shaft.
5. Install the new seal ring to the center support.
6. Apply ATF to the new O-ring.
7. Install the O-ring to the front brake piston.
8. Install the front brake piston to the center support.
9. Install the spring and retainer component and snap ring to the center support.
10. Install the SST .

CAUTION: • Depress the piston return spring only enough to install the snap ring. Overpressing will damage the retainer component edges.

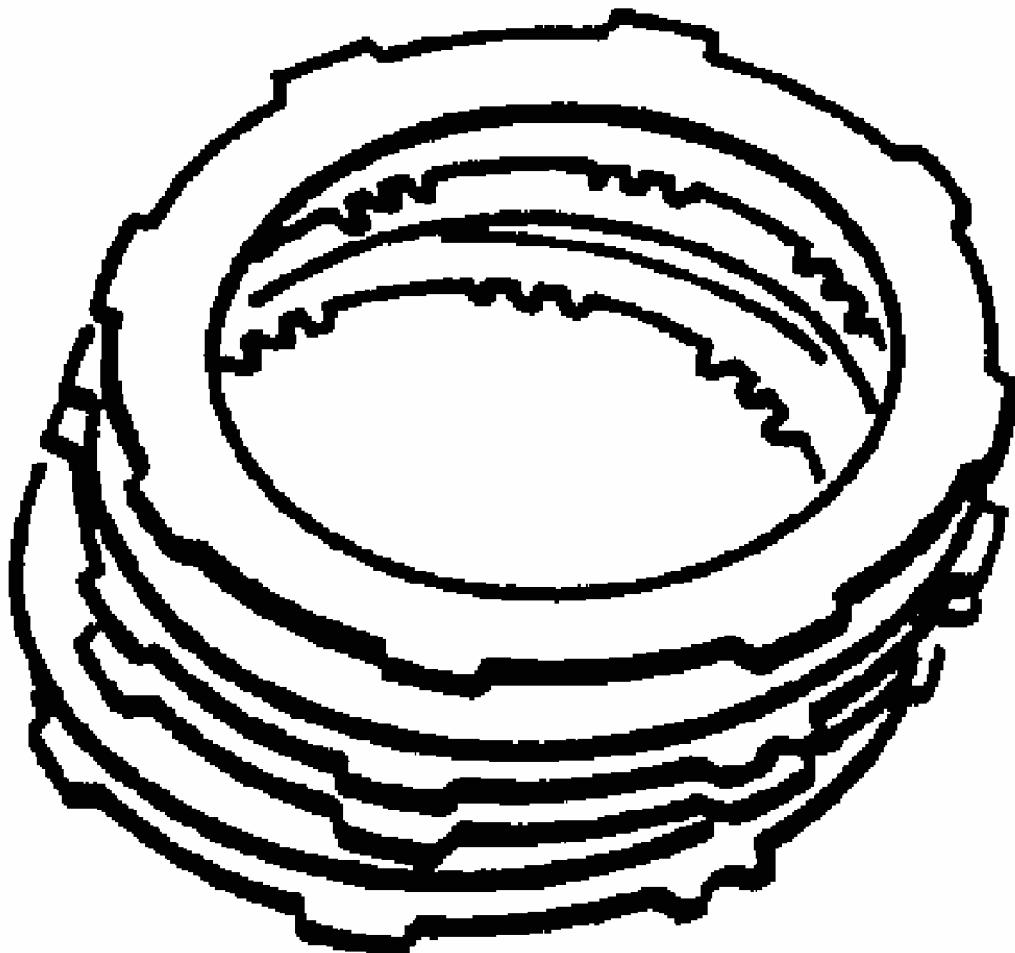
11. Compress the spring and retainer component.
12. Install the snap ring.



G03186889

Fig. 92: Installing Snap Ring
Courtesy of MAZDA MOTORS CORP.

13. Remove the SSTs .
14. Install the drive and driven plates in the following order.



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Fig. 93: Installing Drive & Driven Plates
Courtesy of MAZDA MOTORS CORP.

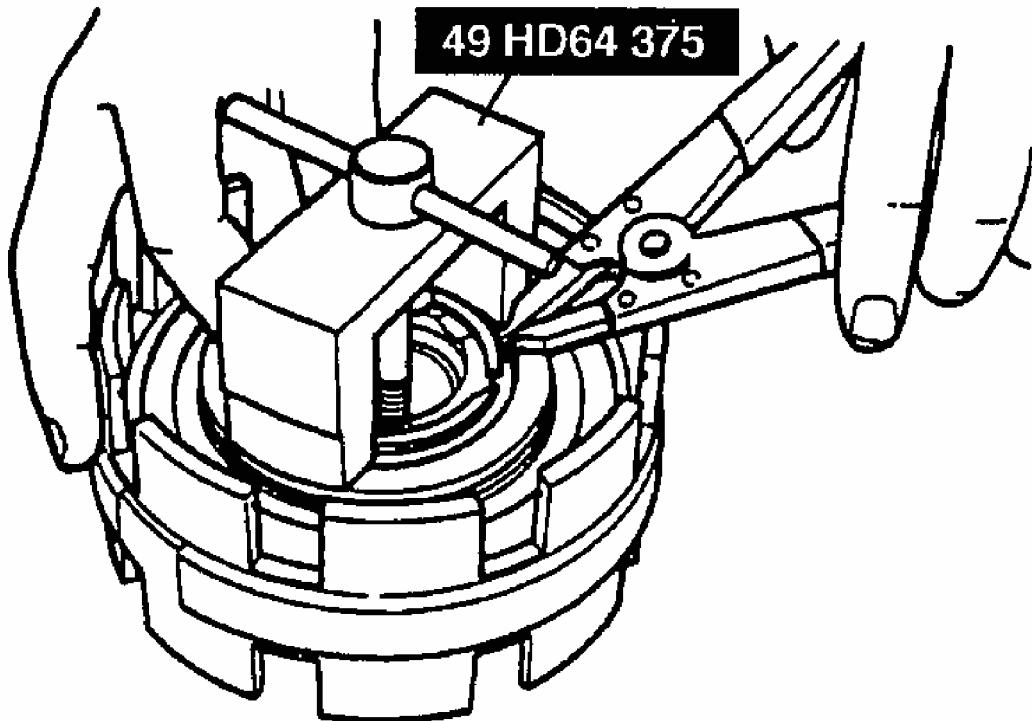
15. Install the retaining plate.
16. Install the snap ring.
17. Apply ATF to the new O-ring.
18. Install the O-ring to the rear brake piston.
19. Install the rear brake piston to the center support.
20. Install the spring and retainer component and snap ring.
21. Install the SSTs .

CAUTION:

- Depress the piston return spring only enough to install the snap ring. Overpressing will damage the retainer component edges.

22. Compress the spring retainer component.

23. Install the snap ring.



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Fig. 94: Installing Snap Ring
Courtesy of MAZDA MOTORS CORP.

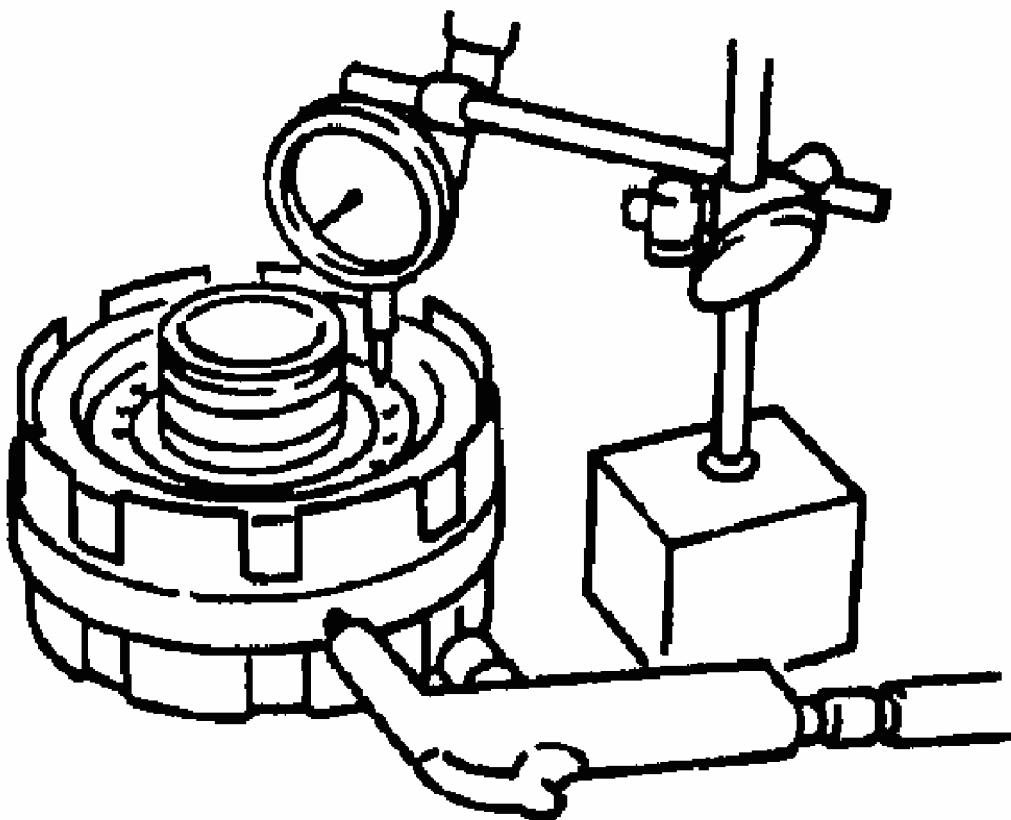
24. Remove the SSTs .
25. Install the drive and driven plates.
26. Install the retaining plate.
27. Install the snap ring.
28. Using a dial indicator, measure the front clutch piston stroke applying and releasing the compressed air as shown.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.

Piston Stroke

0.78-1.32 mm {0.04-0.05 in}



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Fig. 95: Measuring Front Clutch Piston Stroke
Courtesy of MAZDA MOTORS CORP.

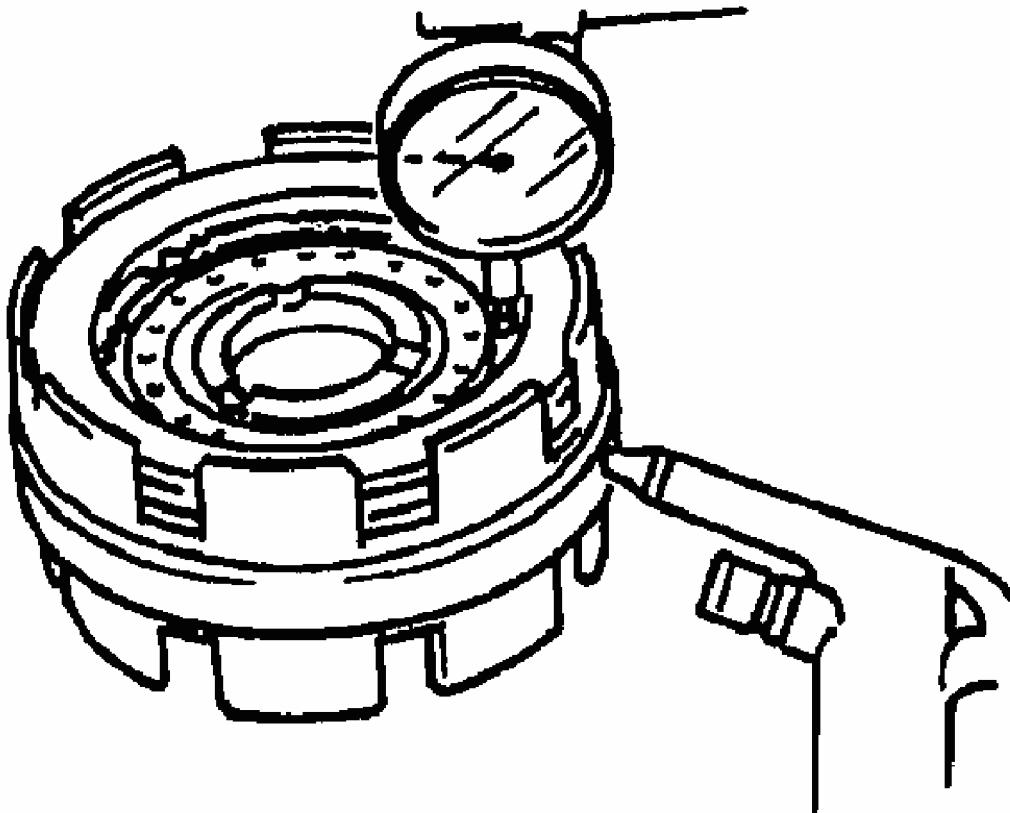
29. If not within specification, replace the drive plate.
30. Using a dial indicator, measure the rear brake piston stroke applying and releasing the compressed air as shown.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.

Piston Stroke

1.03-1.65 mm {0.05-0.06 in}



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Fig. 96: Measuring Rear Brake Piston Stroke
Courtesy of MAZDA MOTORS CORP.

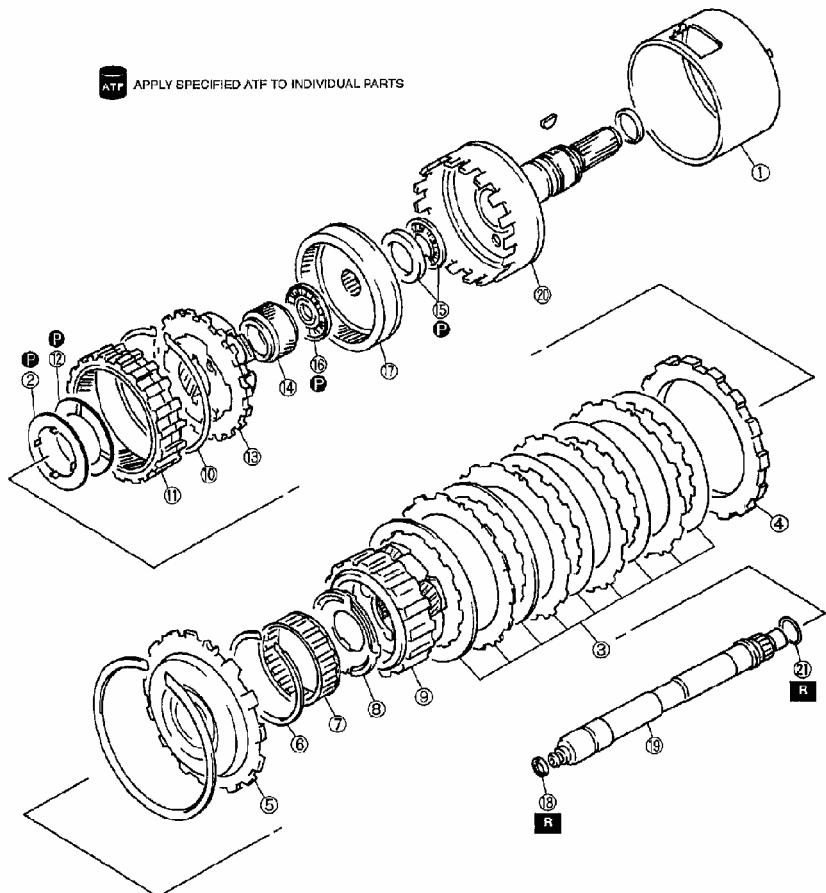
31. If not as specified, replace the drive plate.
32. Install the sun gear shaft to the center support.
33. Install the snap ring to the sun gear shaft.

PLANETARY GEAR AND OUTPUT SHAFT (REAR ONE-WAY CLUTCH AND LOW AND REVERSE BRAKE) DISASSEMBLY/ASSEMBLY

1. Carry out the preinspection before disassembly. (Refer to **AUTOMATIC TRANSMISSION INSPECTION , PLANETARY GEAR AND OUTPUT SHAFT (REAR ONE-WAY CLUTCH AND LOW AND REVERSE BRAKE)**)

PREINSPECTION.)

2. Disassemble in the order indicated in the figure.



1	Brake tube
2	Thrust bearing
3	Drive, driven plate
4	Retaining plate
5	Inner race component
6	Snap ring
7	Rear one-way clutch
8	Thrust washer
9	Front planetary pinion carrier
10	Snap ring
11	Front internal gear
12	Thrust washer
13	Rear planetary pinion carrier
14	Planetary sun gear
15	Thrust bearing and race component
16	Bearing race
17	Rear internal gear
18	O-ring
19	Intermediate shaft
20	Output shaft
21	Sear ring

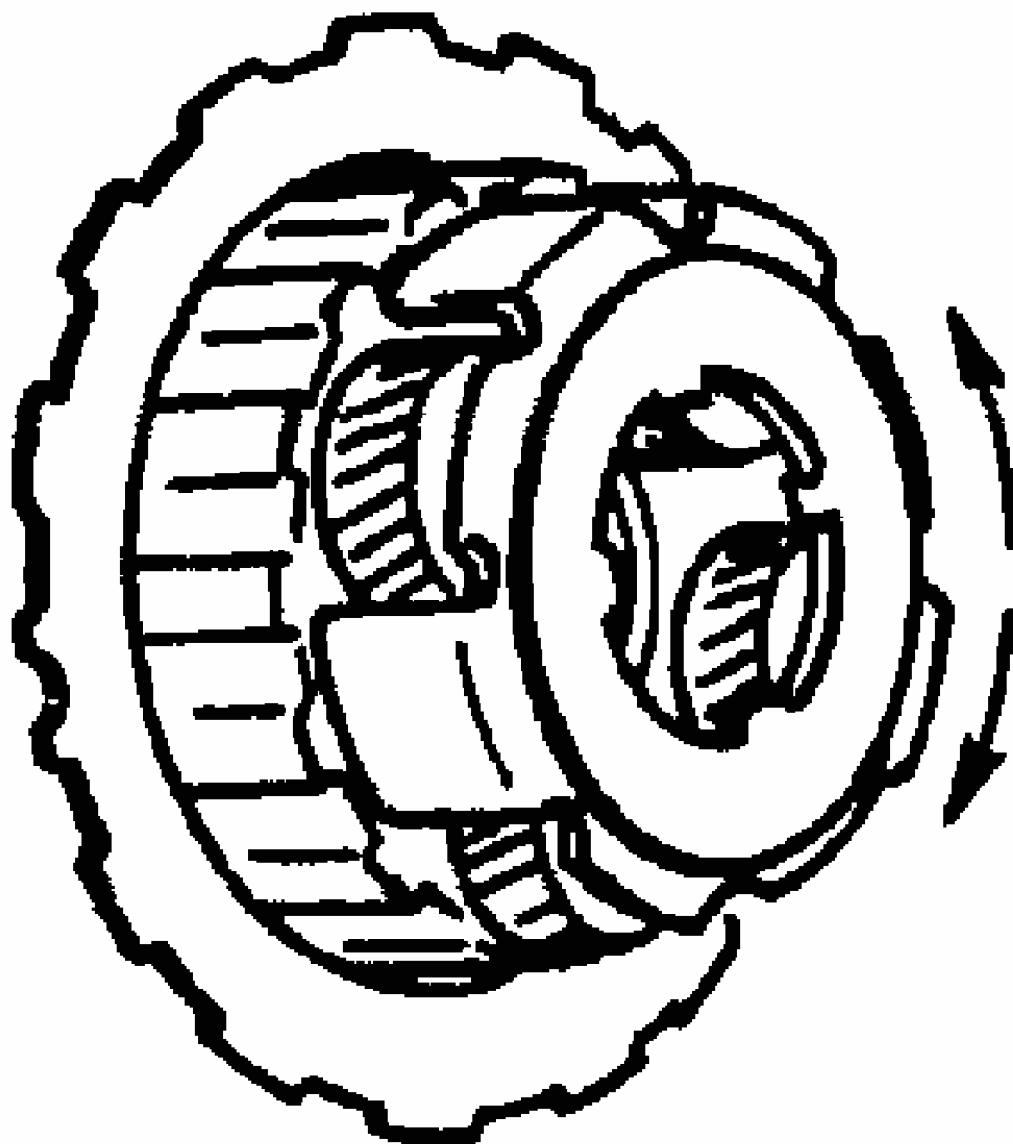
G03186894

Fig. 97: Disassembling/Assembling Planetary Gear & Output Shaft
Courtesy of MAZDA MOTORS CORP.

3. Assemble in the reverse order of disassembly.

Assembly Procedure

1. Install the reverse brake reaction plate to front planetary gear. With reverse brake reaction plate fixed stationary, turn front planetary gear clockwise to inspect that it locks and then counterclockwise to inspect that it turns smoothly.



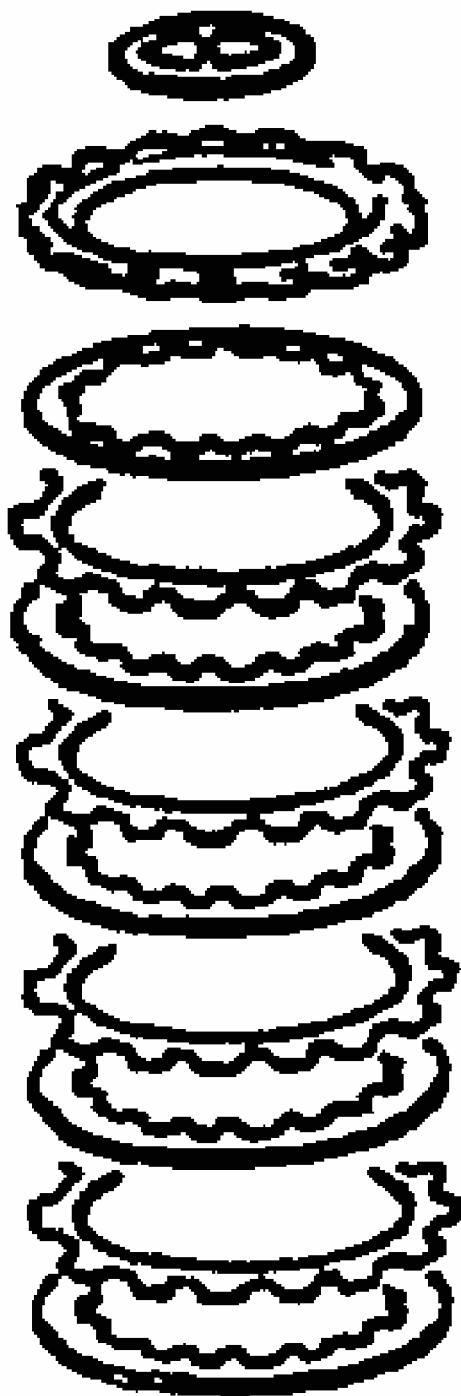
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Fig. 98: Checking Planetary Gear Operation
Courtesy of MAZDA MOTORS CORP.

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2. Install the bearing race and rear internal gear to the intermediate shaft.
3. Install the snap ring.
4. Install the thrust bearing and rear component.
5. Install the rear planetary pinion carrier to the intermediate shaft.
6. Install the thrust washer to the rear planetary pinion carrier.
7. Install the seal ring to the output shaft.
8. Install the thrust bearing and race.
9. Install the intermediate shaft to the output shaft.
10. Install the snap ring to the front internal gear.
11. Install the front internal gear to the output shaft.
12. Install the thrust washer to the front planetary carrier.
13. Install the retainer and rear one-way clutch to the front carrier component.
14. Install the snap ring.
15. Install the inner race to the front carrier component.
16. Apply petroleum jelly to the rear thrust washer.
17. Install the thrust washer to the front carrier component.
18. Install the front carrier component to the front internal gear.
19. Install the drive and driven plates.

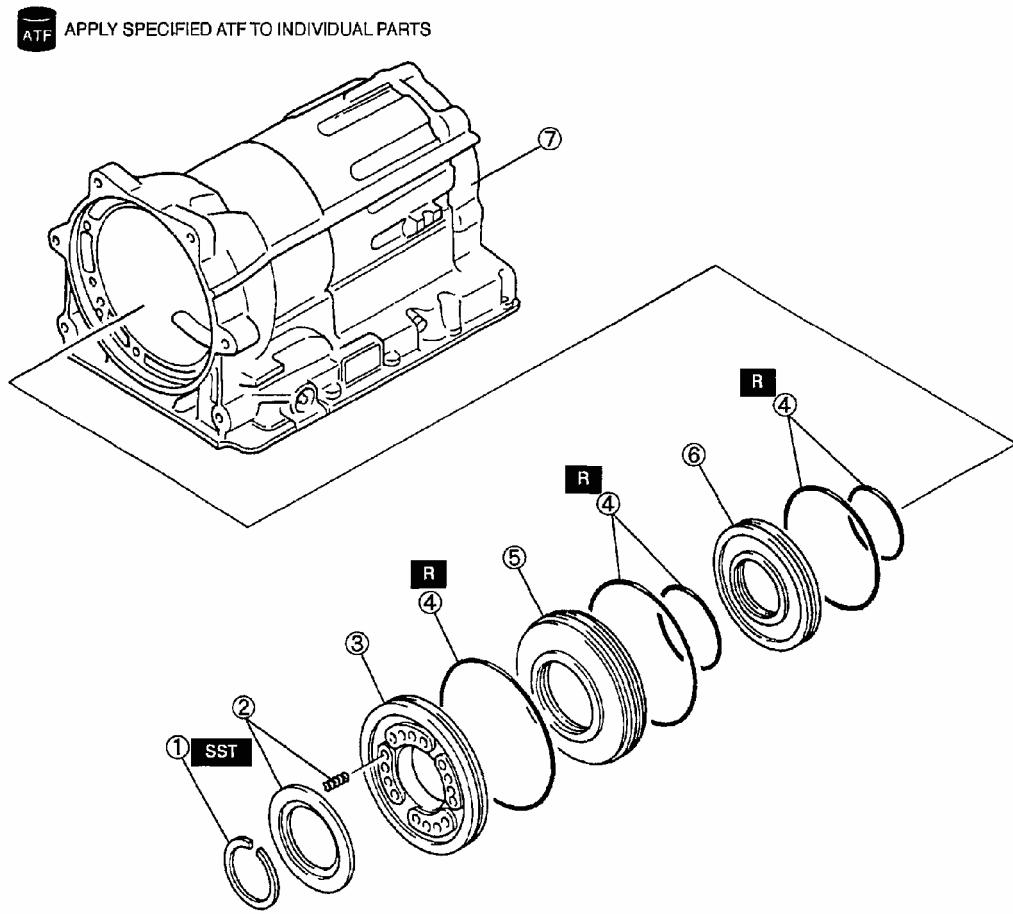


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Fig. 99: Installing Drive & Driven Plates
Courtesy of MAZDA MOTORS CORP.

20. Install the retaining plate.
21. Install the inner race component to the rear one-way clutch.

1. Disassemble in the order indicated in the figure.



1	Snap ring (See SNAP RING DISASSEMBLY NOTE)
2	Spring and retainer component
3	Outer piston
4	O-ring

5	Sleeve (See SLEEVE DISASSEMBLY NOTE)
6	Inner piston (See INNER PISTON DISASSEMBLY NOTE)
7	Transmission case

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Fig. 100: Disassembling/Assembling Low & Reverse Brake
Courtesy of MAZDA MOTORS CORP.

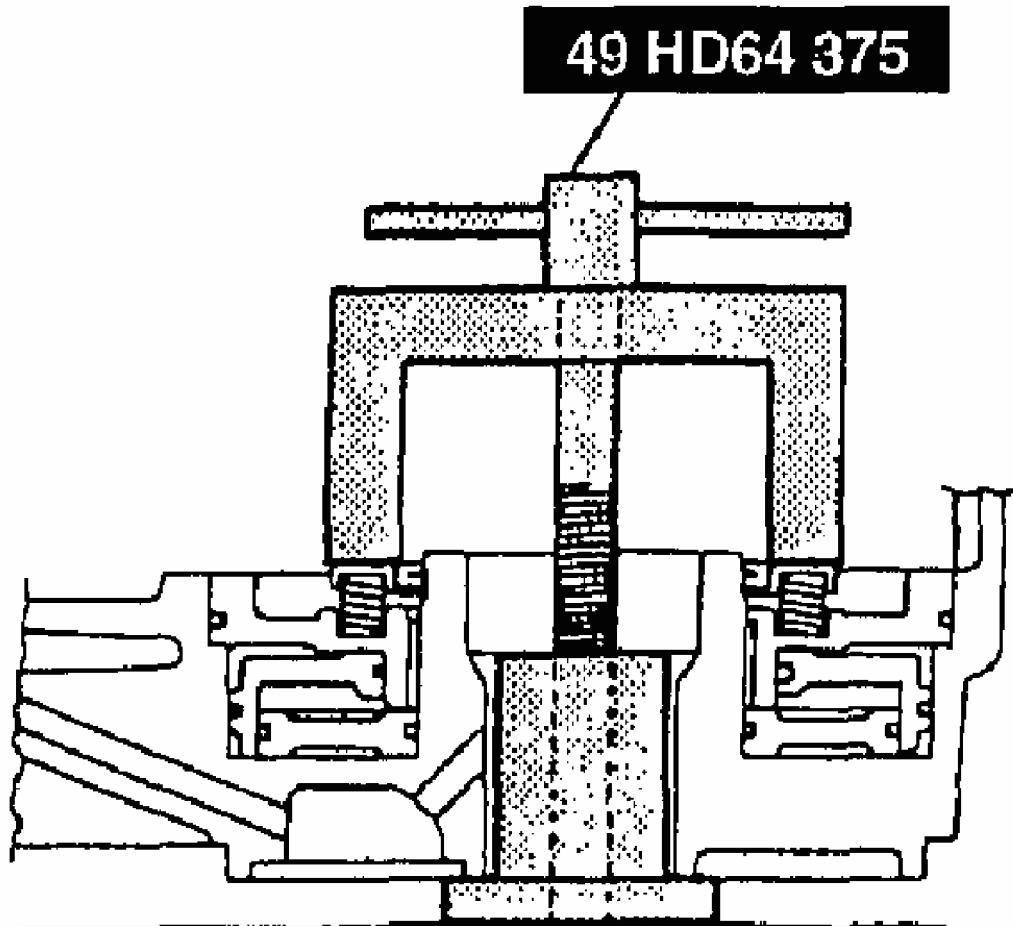
2. Assemble in the reverse order of disassembly.

Snap Ring Disassembly Note

1. Install the SSTs .

CAUTION: • Depress the piston return spring only enough to remove the snap ring. Overpressing will damage the retainer component edges.

2. Compress the piston return spring.



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Fig. 101: Compressing Piston Return Spring

Courtesy of MAZDA MOTORS CORP.

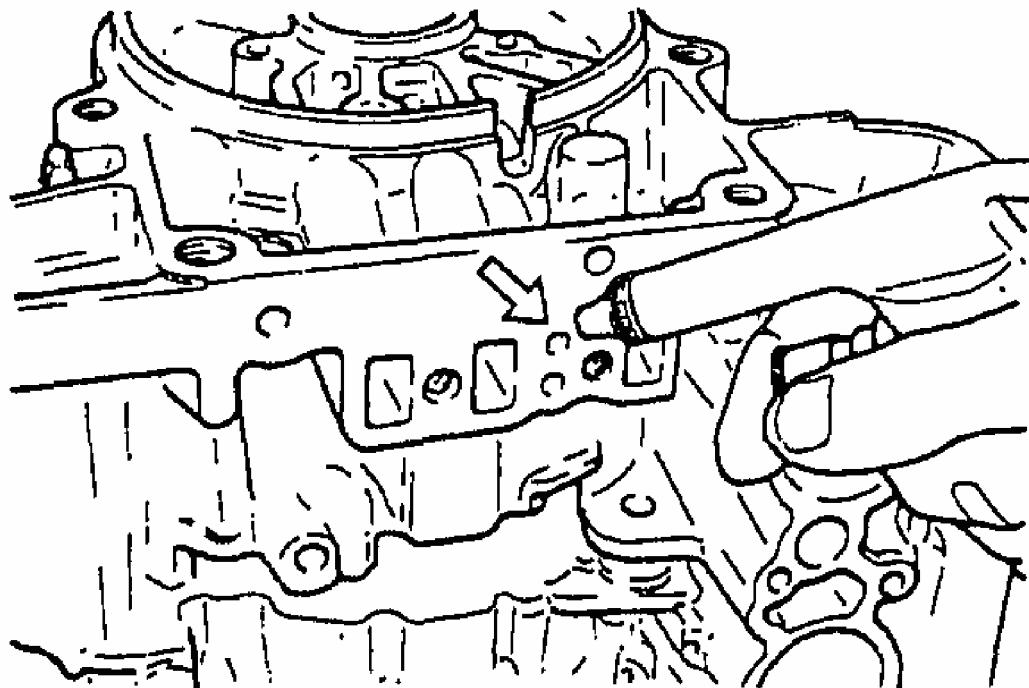
3. Remove one end of the snap ring from the groove with snap ring pliers.

Sleeve, Inner Piston Disassembly Note

1. Remove the piston and sleeve from transmission case by applying compressed air through the fluid passage.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.



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Fig. 102: Removing Piston & Sleeve
Courtesy of MAZDA MOTORS CORP.

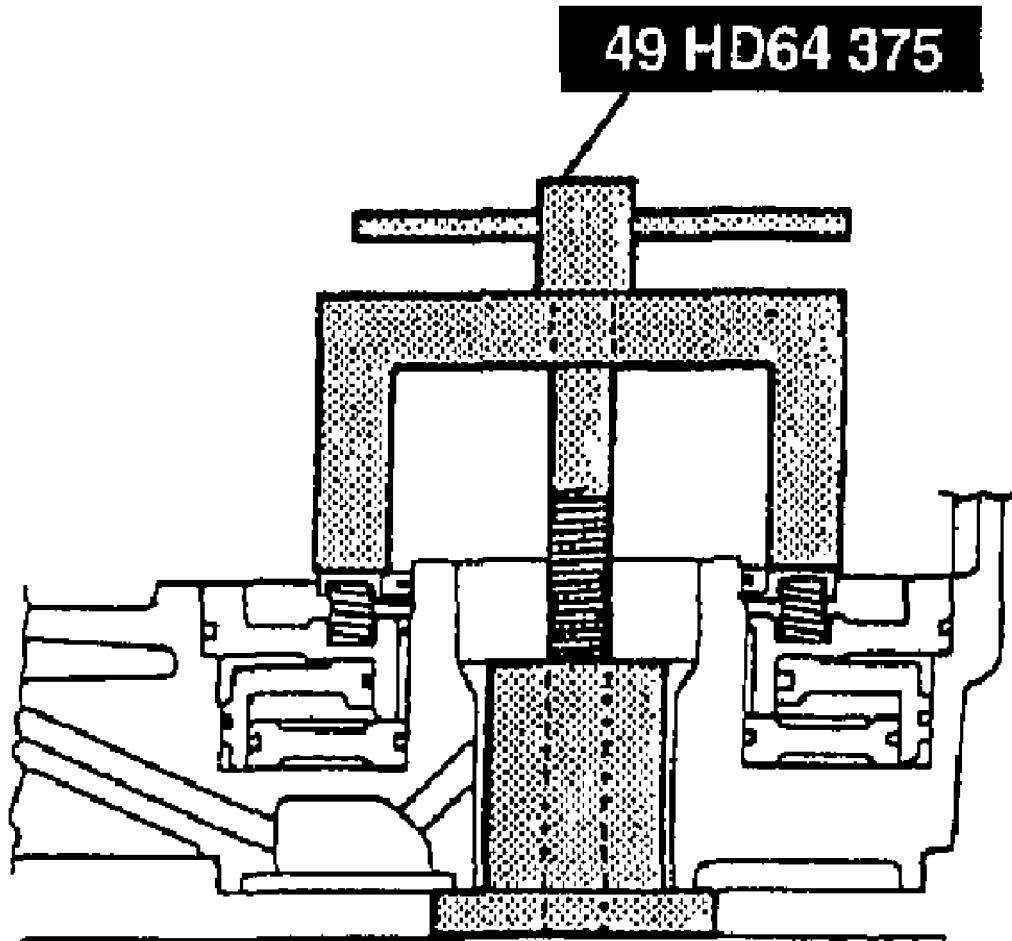
2. Remove the outer piston and inner piston from the sleeve.
3. Remove the O-ring from the piston and sleeve.

Assembly Procedure

1. Apply ATF to the new O-ring.
2. Install the O-ring to the piston and sleeve.
3. Install the inner piston and outer piston to the sleeve.
4. Install the piston and sleeve to the transmission case.
5. Install the spring and retainer component and snap ring.
6. Install the SSTs .

CAUTION: • Depress the piston return spring only enough to install the snap ring. Overpressing will damage the retainer component edges.

7. Compress the spring retainer component.



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Fig. 103: Compressing Spring Retainer Component
Courtesy of MAZDA MOTORS CORP.

8. Install the snap ring.
9. Remove the SSTs .

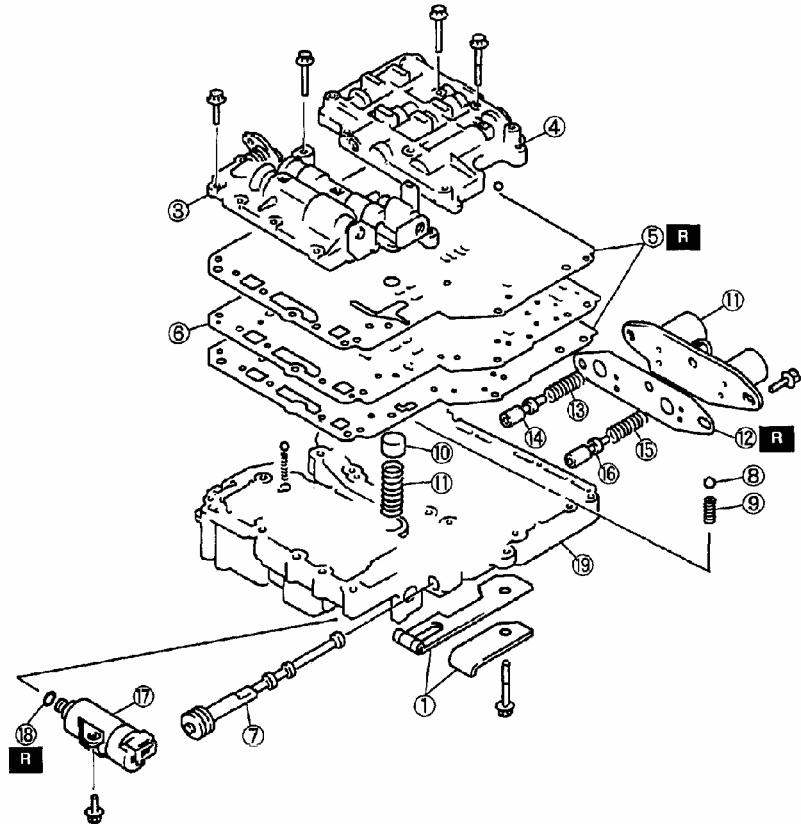
CONTROL VALVE BODY DISASSEMBLY/ASSEMBLY

Control Valve Body Disassembly

CAUTION: • Denting or scratching these components will reduce

the ability of the transmission to shift properly. When handling these components or the valve body that contains them, be careful not to drop or hit them.

1. Disassemble in the order indicated in the figure.



1	Detent spring, plate
2	Upper front valve body
3	Upper rear valve body
4	Gasket
5	Separator plate
6	Manual valve
7	Valve body ball
8	Ball spring
9	Bypass valve
10	Bypass valve spring
11	Solenoid valve A and B
12	Gasket
13	Spring
14	Intermediate coast modulator valve
15	Spring
16	Low coast modulator valve
17	Torque converter clutch solenoid valve
18	O-ring
19	Lower valve body

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Fig. 104: Disassembling/Assembling Control Valve Body

Courtesy of MAZDA MOTORS CORP.

2. Neatly arrange the removed parts to avoid confusing the similar parts.

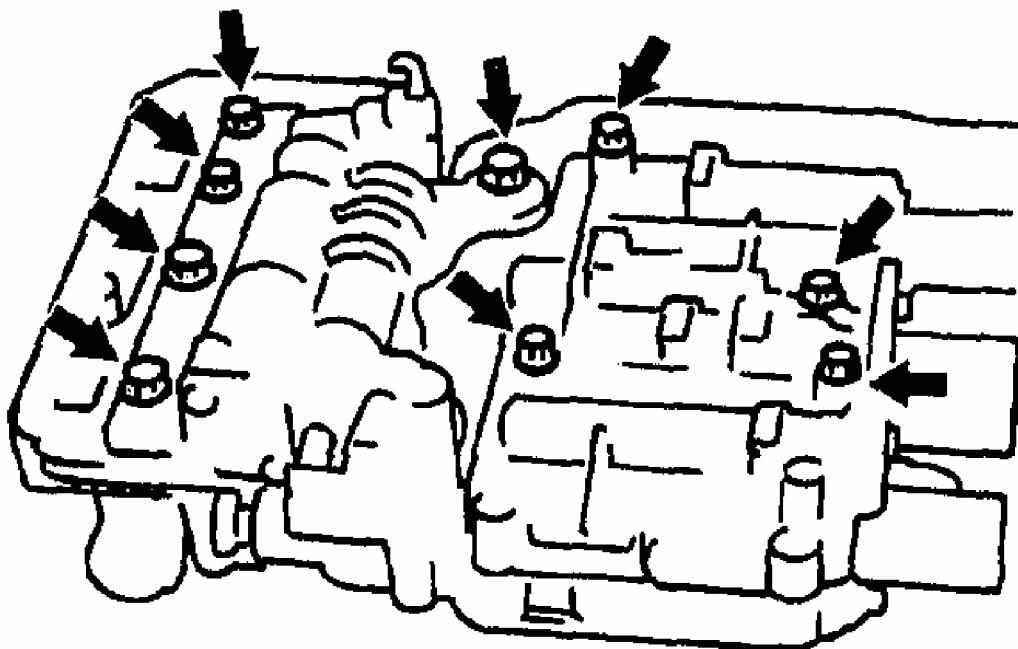
WARNING:

- Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.

3. Clean the removed parts with cleaning solvent, then use compressed air to dry them. Use compressed air to clean out all holes and passages.

Disassembly Procedure

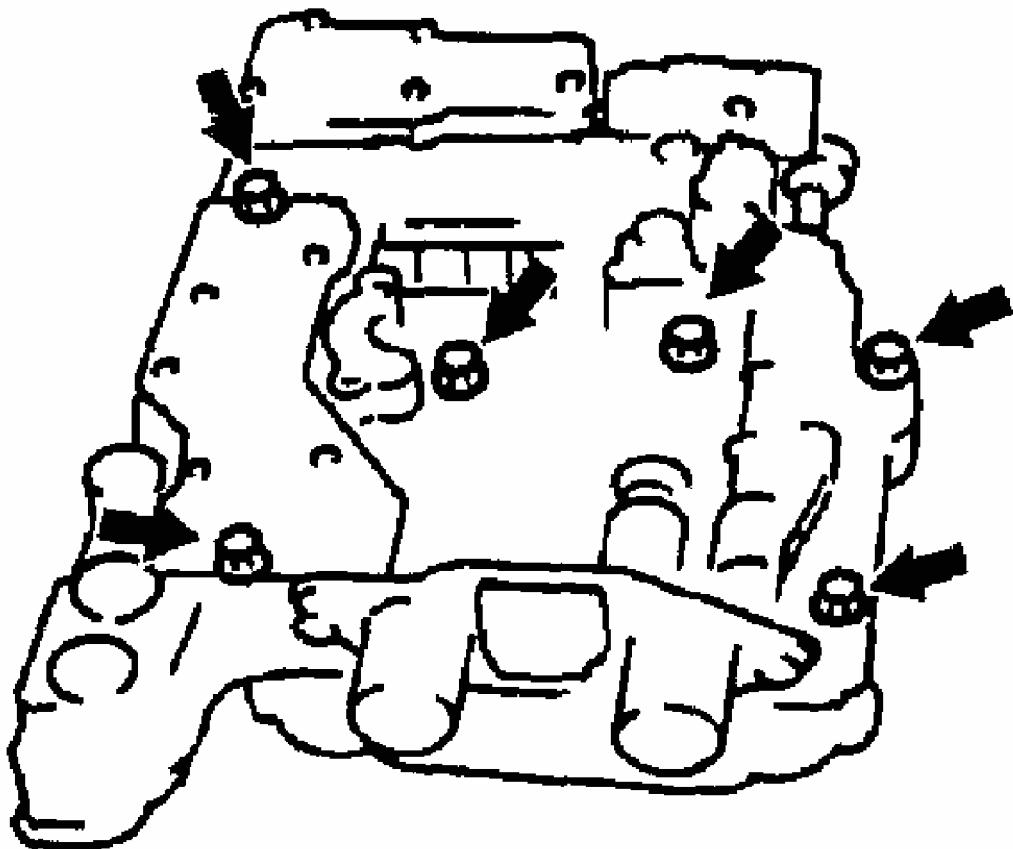
1. Remove the bolts from upper front valve body and upper rear valve body side.



G03186902

Fig. 105: Removing Upper Valve Body Bolts
Courtesy of MAZDA MOTORS CORP.

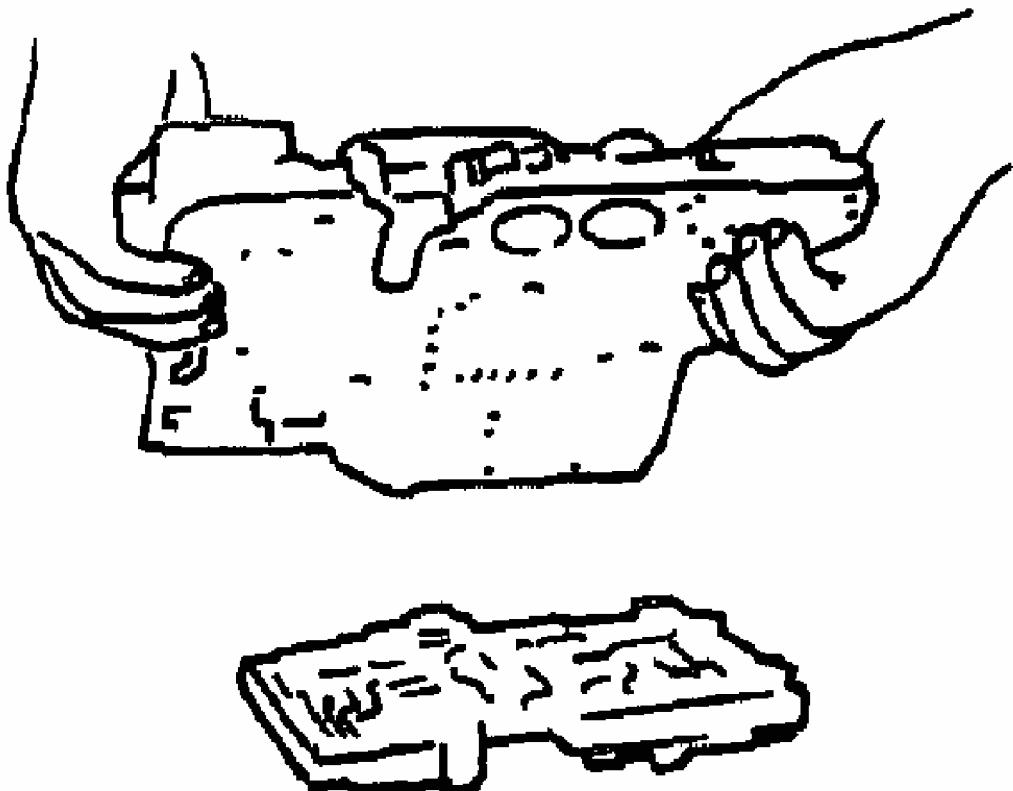
2. Remove the bolts from the lower valve body side.



G03186903

Fig. 106: Removing Lower Valve Body Bolts
Courtesy of MAZDA MOTORS CORP.

3. Separate upper front valve body, upper rear valve body, and lower valve body while pressing separator plate and valve body gasket against lower valve body to prevent balls, spring and others from coming out of valve body.



G03186904

Fig. 107: Separating Valve Body
Courtesy of MAZDA MOTORS CORP.

4. Remove the solenoid valve A, B, and gasket.
5. Remove the spring and intermediate coast modulator valve.
6. Remove the spring and low coast modulator valve.
7. Remove the torque converter clutch solenoid valve.

Upper Front Valve Body Disassembly/Assembly

CAUTION:

- Denting or scratching these precisely machined components will reduce the ability of the transmission to shift properly. When handling these components or the valve body that contains them, be careful not to drop or hit them.

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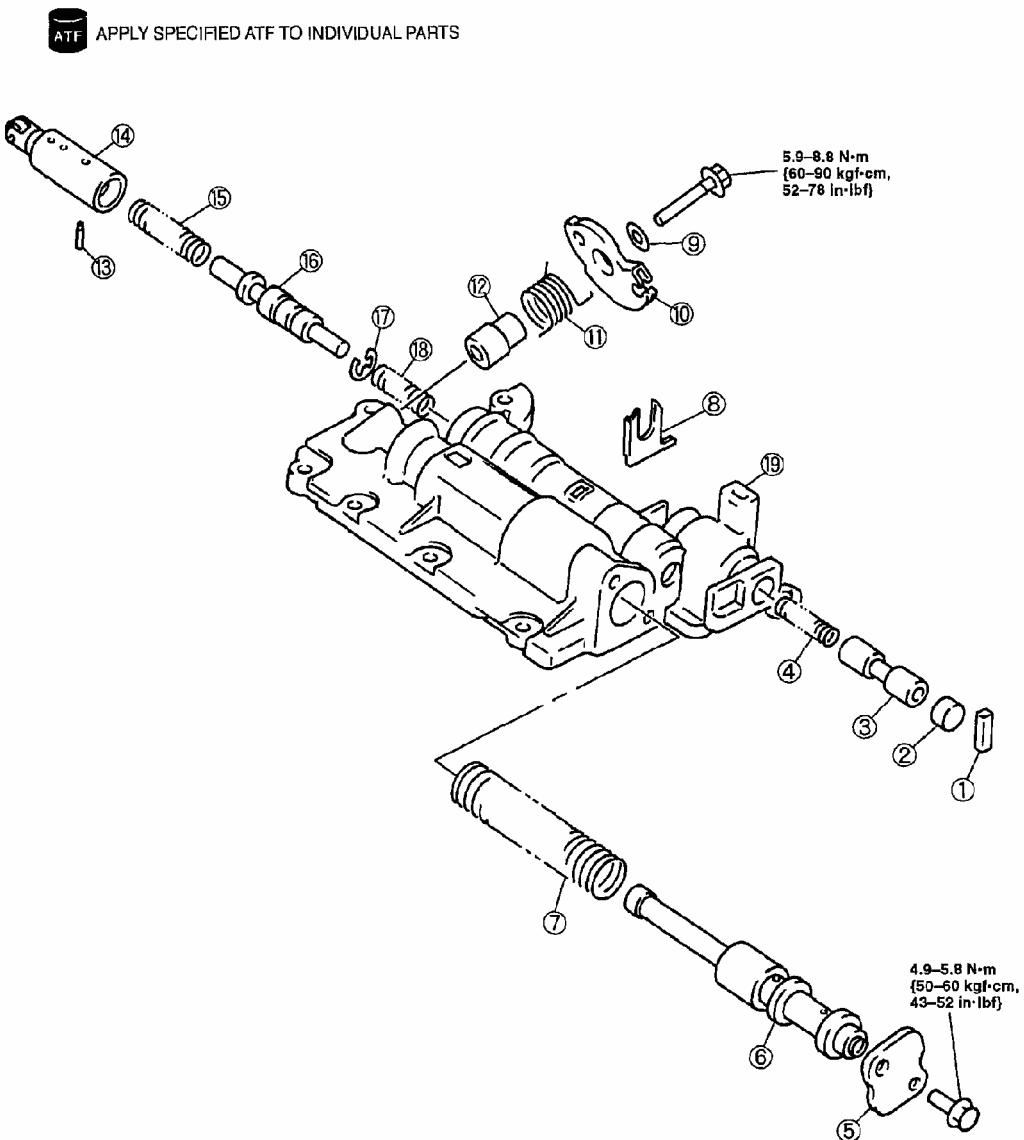
NOTE:

- If a valve does not slide out under its own weight, place the valve body open side down and tap on the valve body lightly with a plastic hammer.**

1. Disassemble in the order indicated in the figure.

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1	Cut back valve retainer
2	Cut back plug
3	Cat back valve
4	Spring
5	Front valve end cover
6	Secondary regulator valve
7	Secondary regulator spring
8	Throttle valve keep plate
9	Washer
10	Throttle valve cam

11	Cam return spring
12	Cam spacer
13	Locating pin
14	Primary down shift plug
15	Throttle valve primary spring
16	Throttle valve
17	Throttle valve compensating ring
18	Throttle valve secondary spring
19	Upper front valve body

G03186905

Fig. 108: Disassembling/Assembling Upper Front Valve Body
Courtesy of MAZDA MOTORS CORP.

WARNING: • Using compressed air can causing dirt and other

**particles to fly out, causing injury to the eyes.
Wear protective eye wear whenever using
compressed air.**

2. Clean all parts and holes by using compressed air and apply ATF to them immediately before assembly.
3. Assemble in the reverse order of disassembly.

Assembly Procedure

1. Measure the spring free length.

VALVE BODY SPRING SPECIFICATIONS

Spring	Outer Diameter - (mm {in})	Free Length - (mm {in})
Secondary Regulator Valve Spring	17.43 {0.686}	71.27 {2.806}
Cut Back Valve Spring	6.85 {0.27}	23.00 {0.906}
Throttle Valve Secondary Spring	7.16 {0.28}	19.24 {0.757}
Throttle Valve Primary Spring	10.90 {0.429}	39.55 {1.557}

2. If not within the specification, replace the control valve body component.
3. Install the throttle valve.
4. Install the throttle valve keep plate.
5. Install the throttle valve compensating ring and secondary valve spring.

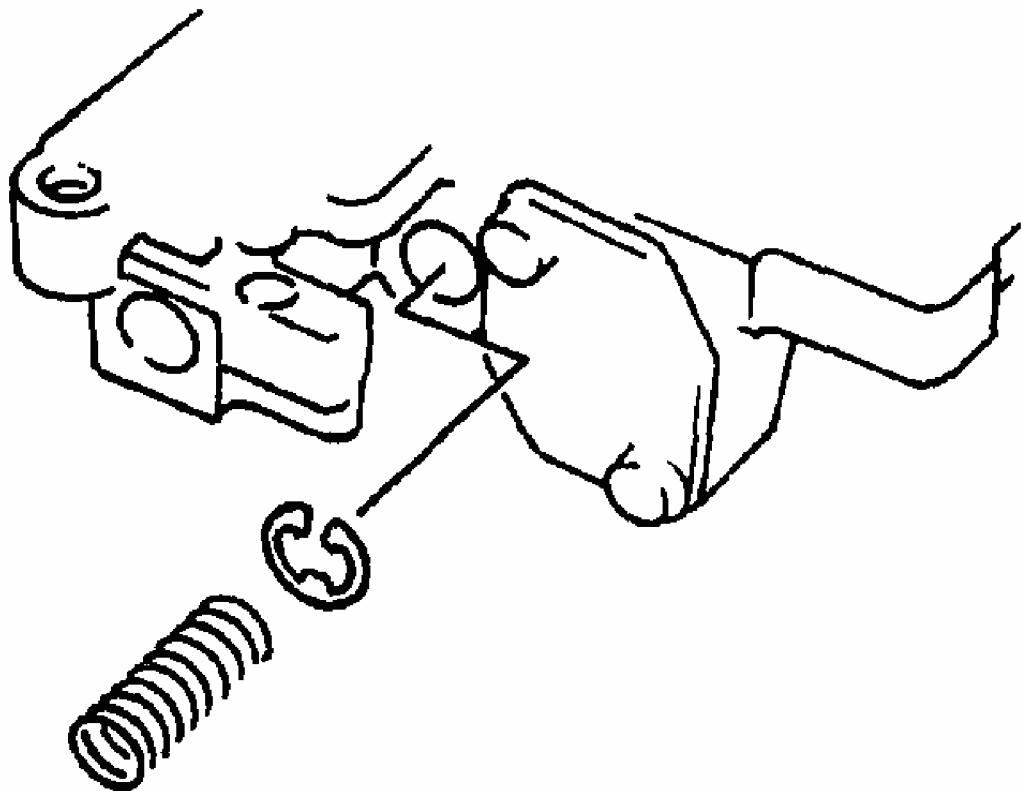
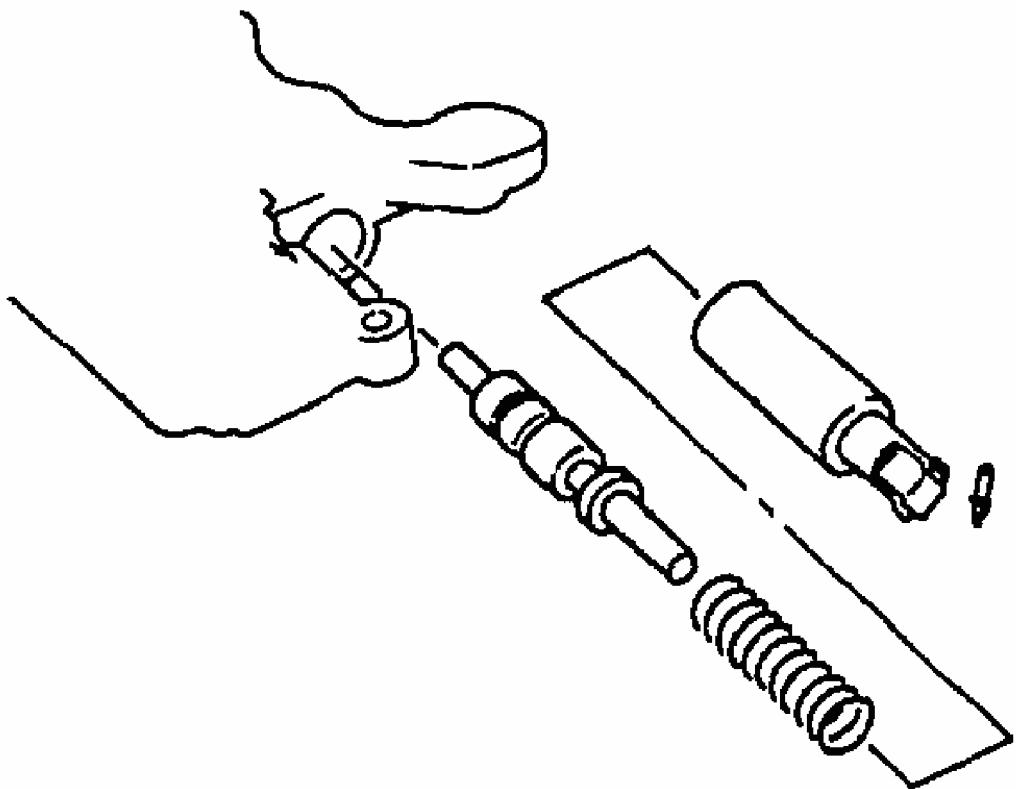


Fig. 109: Installing Throttle Valve Compensating Ring & Secondary Valve Spring
Courtesy of MAZDA MOTORS CORP.

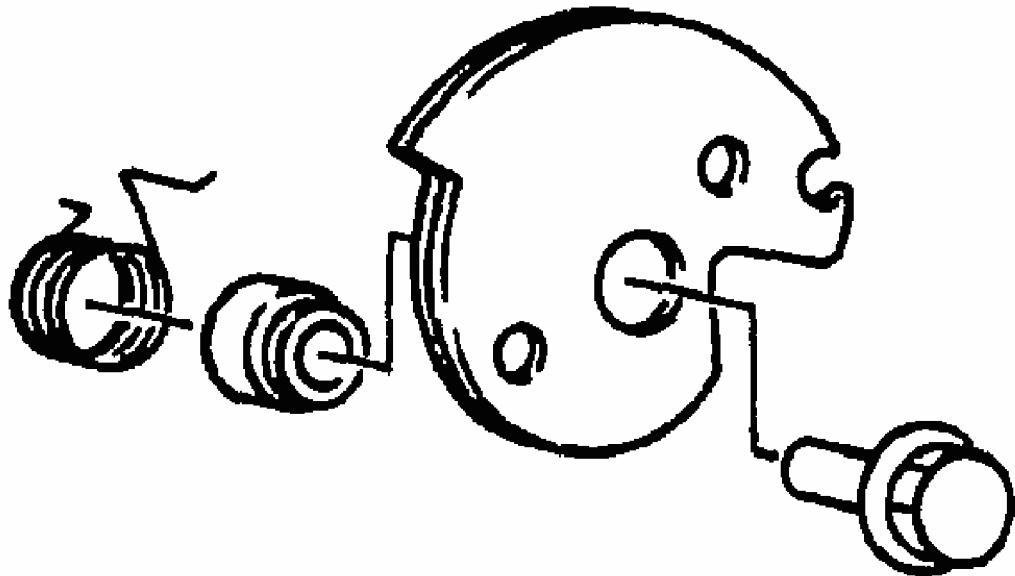
6. Install the throttle valve primary spring and shift down plug.



G03186907

Fig. 110: Installing Throttle Valve Primary Spring & Shift Down Plug
Courtesy of MAZDA MOTORS CORP.

7. Install the throttle valve cam.



G03186908

Fig. 111: Installing Throttle Valve Cam

Courtesy of MAZDA MOTORS CORP.

8. Install the throttle valve cam to the valve body.

Tightening Torque

5.9-8.8 N.m {60-90 kgf.cm, 52-78 in.lbf}

9. Install the secondary regulator spring, secondary regulator valve, and front valve end cover.

Tightening Torque

4.9-5.8 N.m {50-60 kgf.cm, 43-52 in.lbf}

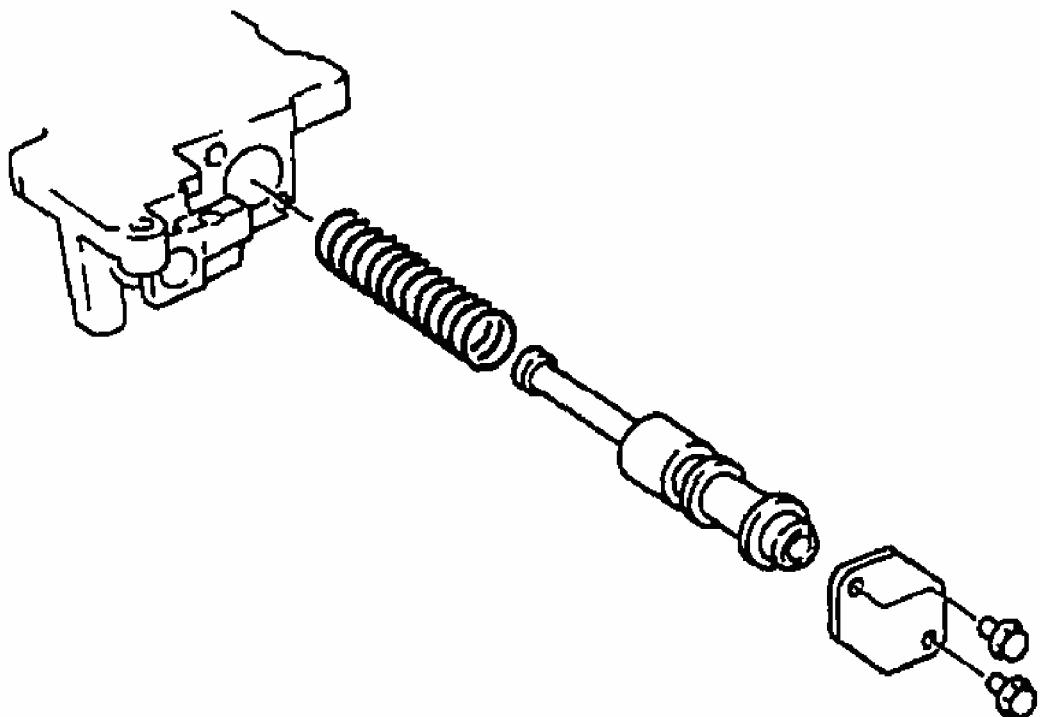
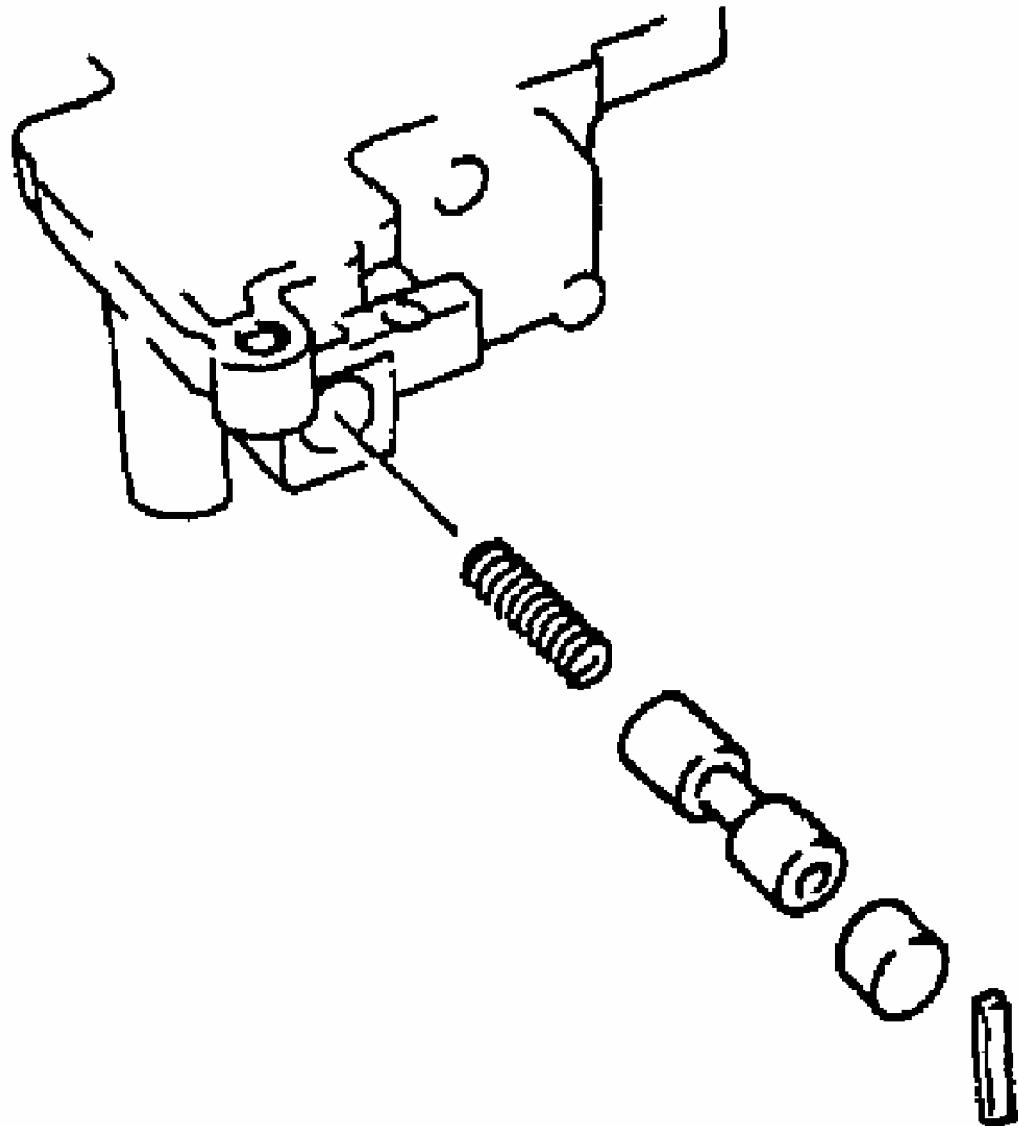


Fig. 112: Installing Secondary Regulator Spring, Secondary Regulator Valve & Front Valve End Cover

Courtesy of MAZDA MOTORS CORP.

10. Install the spring, cutback valve, cut back plug, and cut back retainer.



G03186910

Fig. 113: Installing Spring, Cutback Valve, Cut Back Plug & Cut Back Retainer
Courtesy of MAZDA MOTORS CORP.

Upper Rear Valve Body Disassembly/Assembly

CAUTION:

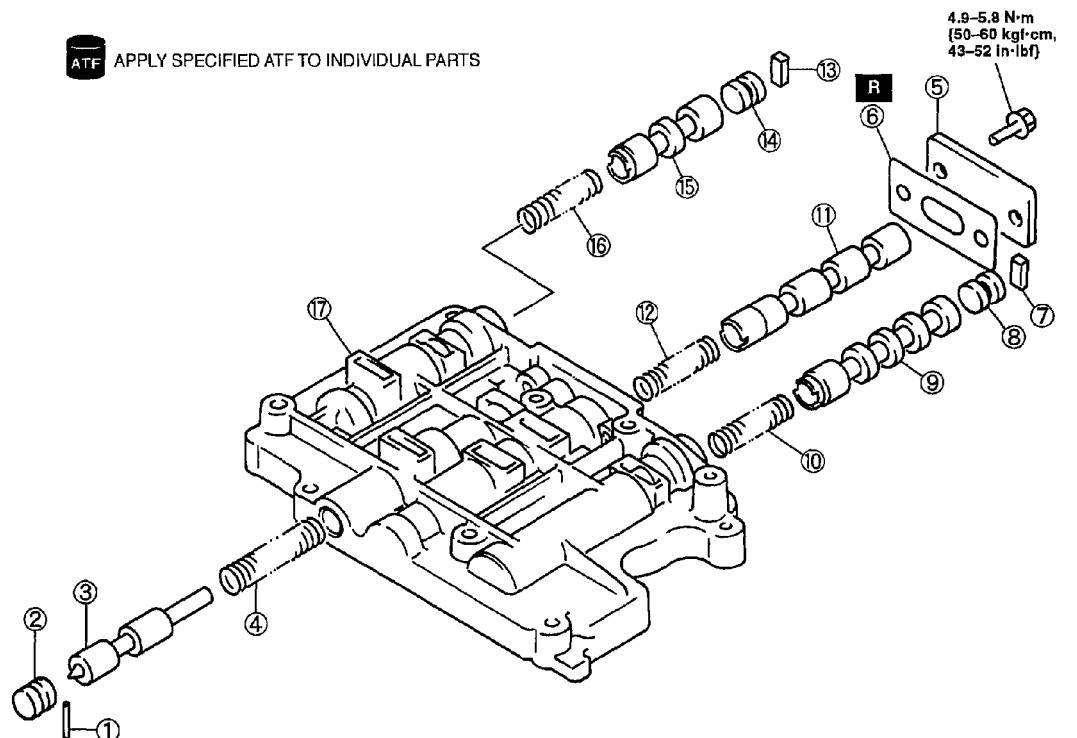
- Denting or scratching these precisely machined components will reduce the ability of the transmission to shift properly. When handling these components or the valve body that contains them, be careful not to

drop or hit them.

NOTE:

- If a valve does not slide out under its own weight, place the valve body open side down and tap on the valve body lightly with a plastic hammer.

1. Disassemble in the order indicated in the figure.



1	Needle roller
2	3-2 kickdown control valve plug
3	Clutch sequence valve
4	Reverse brake sequence valve spring
5	Plate
6	Gasket
7	Retainer
8	Shift valve plug
9	2-3 shift valve

10	Shift valve spring
11	1-2 shift valve
12	Shift valve spring
13	Retainer
14	Shift valve plug
15	3-4 shift valve
16	Shift valve spring
17	Upper rear valve body

G03186911

Fig. 114: Disassembling/Assembling Upper Rear Valve Body
Courtesy of MAZDA MOTORS CORP.

WARNING:

- Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.

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2. Clean all parts and holes by using compressed air and apply ATF to them immediately before assembly.
3. Assemble in the reverse order of disassembly.

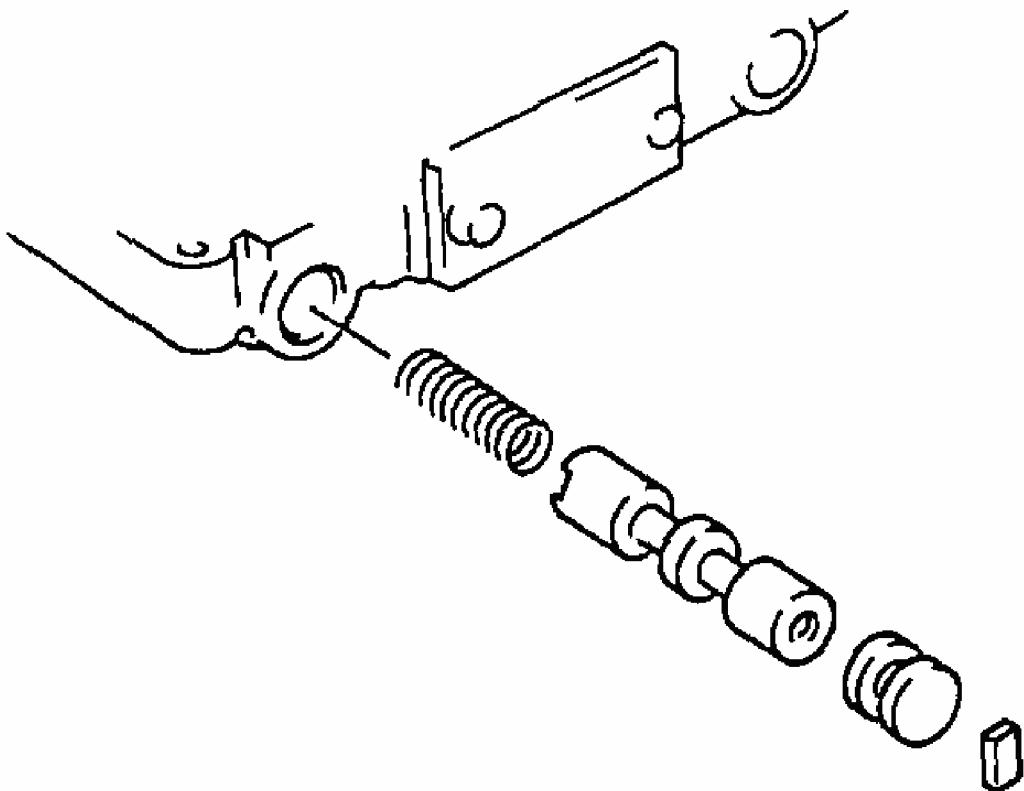
Assembly Procedure

1. Measure the spring free length.

UPPER REAR VALVE BODY SPRING SPECIFICATIONS

Spring	Outer Diameter - (mm {in})	Free Length - (mm {in})
Clutch Sequence Valve Spring	9.10 {0.36}	37.55 {1.478}
1-2 Shift Valve Spring	8.90 {0.35}	29.15 {1.148}
2-3 Shift Valve Spring	8.90 {0.35}	29.15 {1.148}
3-4 Shift Valve Spring	8.90 {0.35}	215 {1.148}

2. If not within the specification, replace the control valve body component.
3. Install the shift valve spring, 3-4 shift valve, shift valve plug, and retainer.

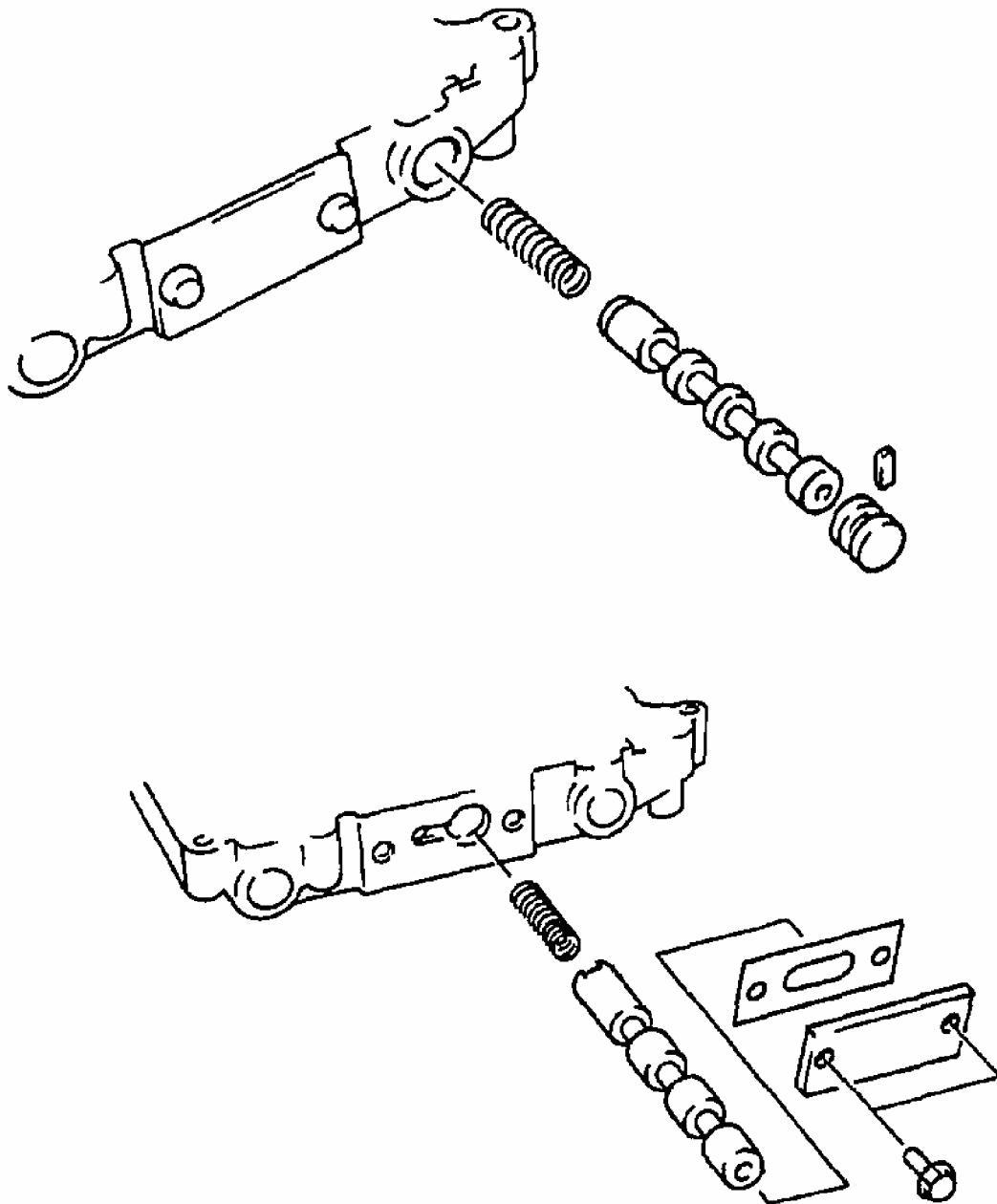


G03186912

Fig. 115: Installing Shift Valve Spring, 3-4 Shift Valve, Shift Valve Plug & Retainer

Courtesy of MAZDA MOTORS CORP.

4. Install the shift valve spring, 1-2 shift valve, Shift valve spring, 2-3 shift valve, shift valve plug, and retainer.



G03186913

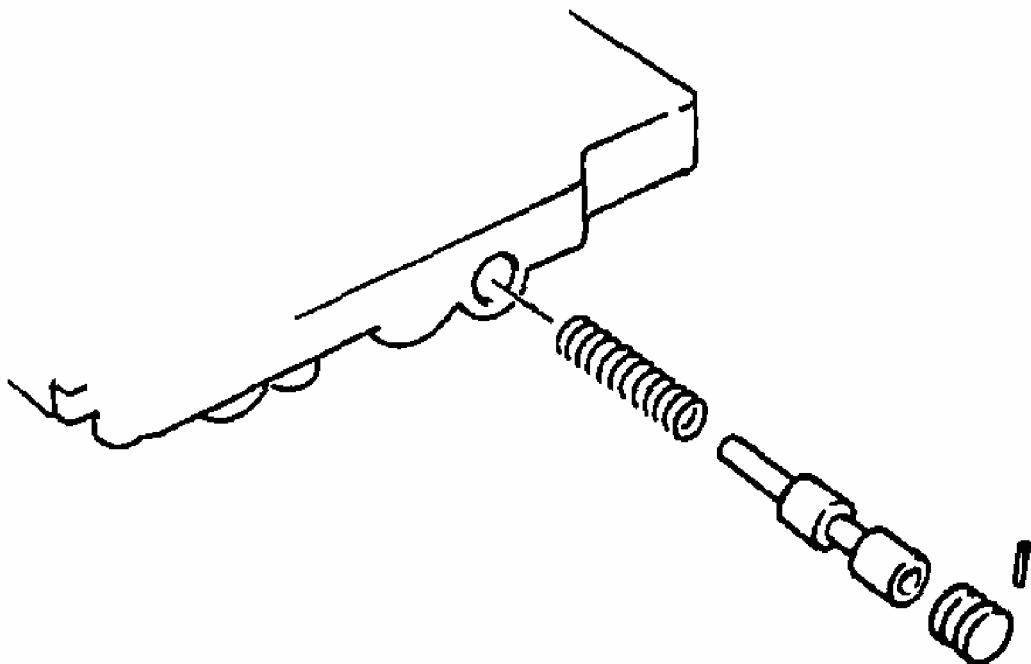
Fig. 116: Installing Shift Valve Spring, 1-2 Shift Valve, Shift Valve Spring, 2-3 Shift Valve, Shift Valve Plug & Retainer
Courtesy of MAZDA MOTORS CORP.

5. Install the gasket and plate.
6. Tighten the bolt.

Tightening Torque

4.9-5.8 N.m {50-60 kgf.cm, 43-52 in.lbf}

7. Install the reverse brake sequence valve spring, clutch sequence valve, 3-2 kickdown control valve plug, and needle roller.



G03186914

Fig. 117: Installing Reverse Brake Sequence Valve Spring, Clutch Sequence Valve, 3-2 Kickdown Control Valve Plug & Needle Roller
Courtesy of MAZDA MOTORS CORP.

Lower Valve Body Disassembly/Assembly

CAUTION:

- Denting or scratching these precisely machined components will reduce the ability of the transmission to shift properly. When handling these components or the valve body that contains them, be careful not to drop or hit them.

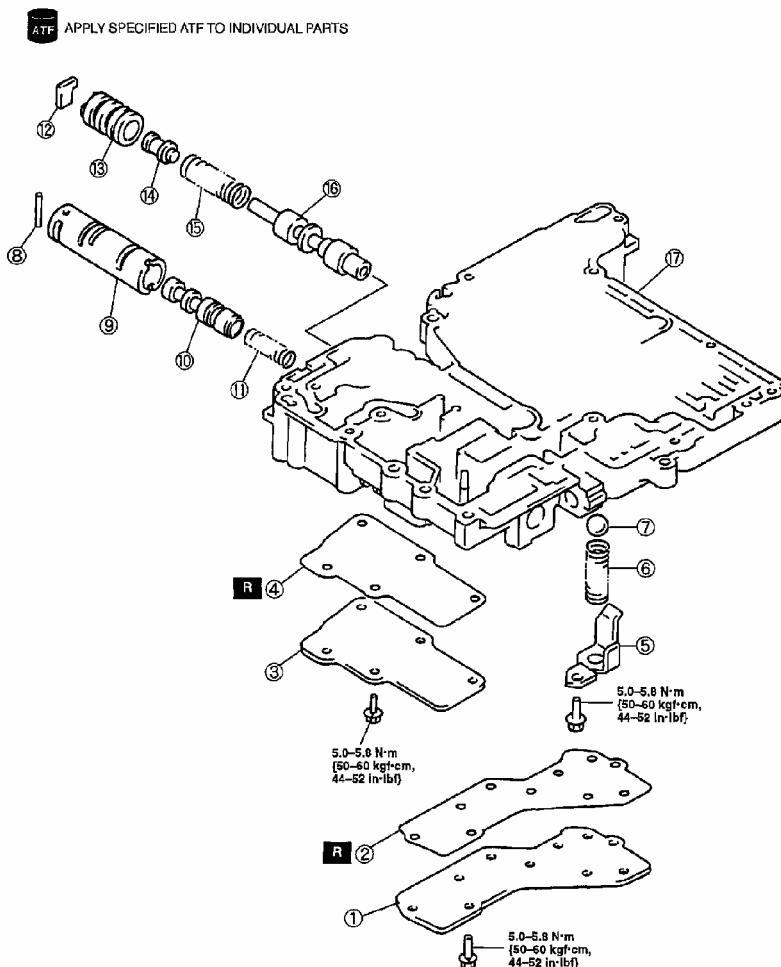
NOTE:

- If a valve does not slide out under its own weight, place the valve body open side down and tap on the valve body lightly with a plastic hammer.

2003 Mazda MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS Overhaul - SB4A-EL - MX-5 Miata

1. Disassemble in the order shown in the figure, noting the proper reassembly direction of the valves and internal parts.



1	Lower valve body plate
2	Lower valve body gasket
3	Torque converter clutch control valve plate
4	Torque converter clutch control valve gasket
5	Pressure relief valve retainer
6	Spring
7	Pressure relief valve ball
8	Pin
9	Torque converter clutch control valve
10	Torque converter clutch control valve
11	Spring
12	Retainer
13	Primary regulator valve sleeve
14	Primary regulator valve plunger
15	Spring
16	Primary regulator valve
17	Lower valve body

G03186915

Fig. 118: Disassembling/Assembling Lower Valve Body
 Courtesy of MAZDA MOTORS CORP.

WARNING:

- Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.

2. Clean all parts and bores with compressed air and apply ATF to them immediately before assembly.
3. Assemble in the reverse order of disassembly.

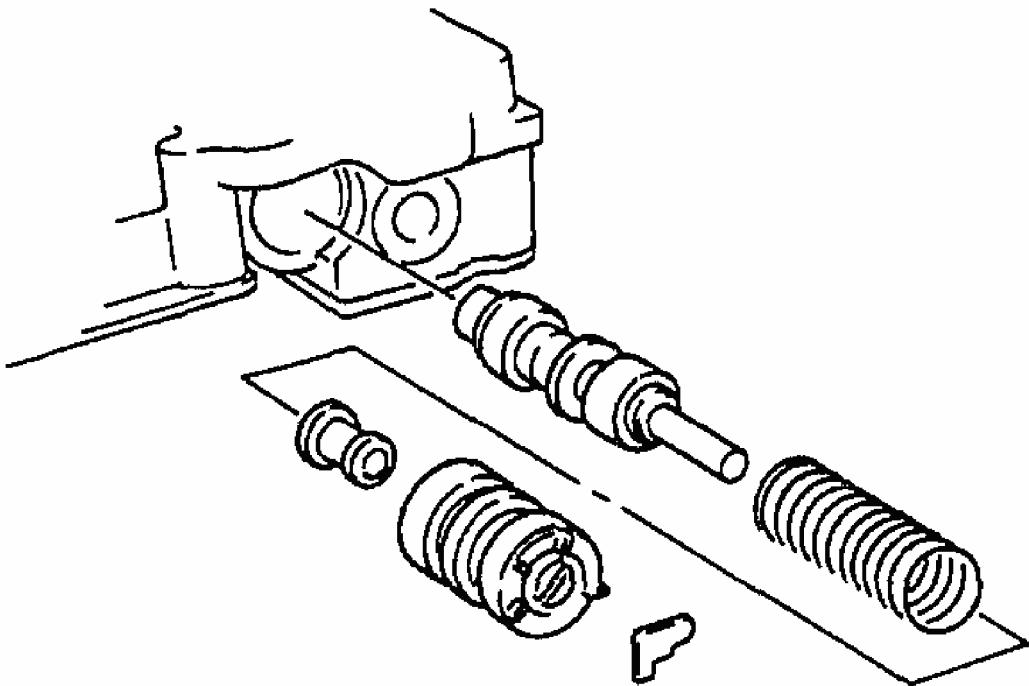
Assembly Procedure

1. Measure the spring free length.

LOWER VALVE BODY SPRING SPECIFICATIONS

Spring	Outer Diameter - (mm {in})	Free Length - (mm {in})
Pressure Relief Valve Spring	13.14 {0.517}	32.14 {1.265}
TCC Control Valve Spring	11.40 {0.449}	32.60 {1.283}
Valve Damping Spring	4.97 {0.20}	20.00 {0.787}
Primary Regulator Ball Valve Spring	6.00 {0.24}	16.45 {0.648}

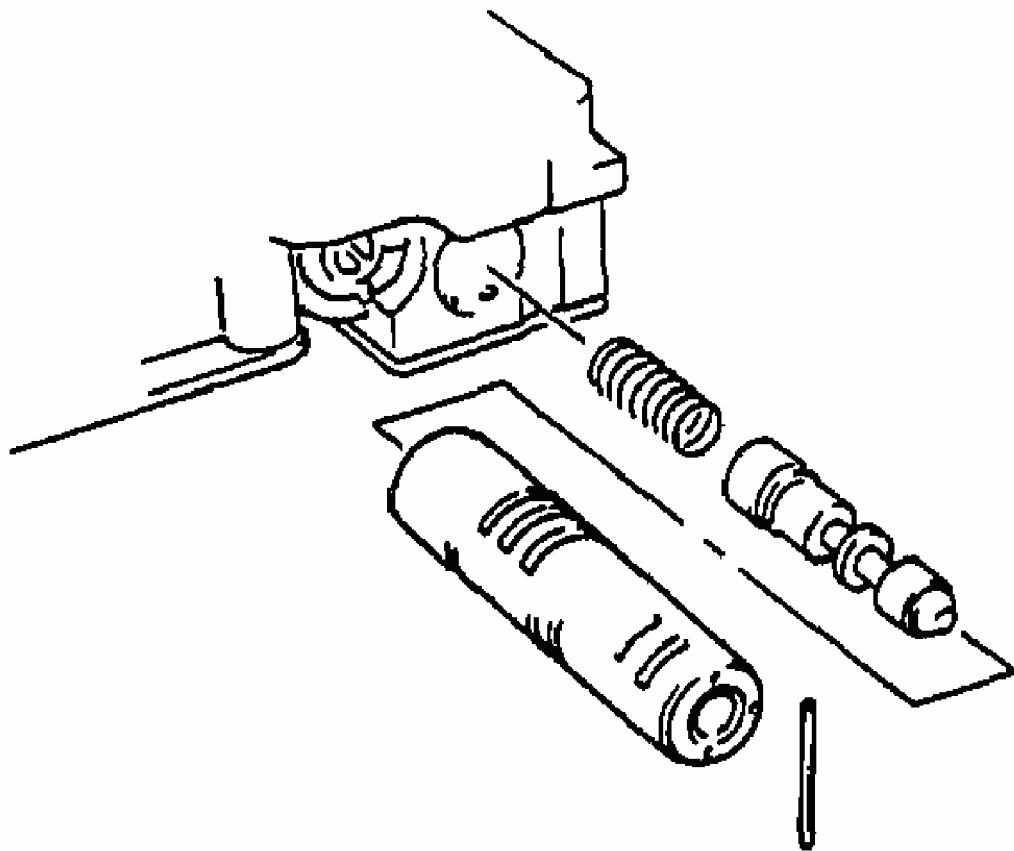
2. If not within the specifications, replace the control valve body component.
3. Install the primary regulator valve, spring, primary regulator valve plunger, primary regulator valve sleeve, and retainer.



G03186916

Fig. 119: Installing Primary Regulator Valve, Spring, Primary Regulator Valve Plunger, Primary Regulator Valve Sleeve & Retainer
Courtesy of MAZDA MOTORS CORP.

4. Install the spring, torque converter clutch control valve, torque converter clutch valve sleeve, and pin.



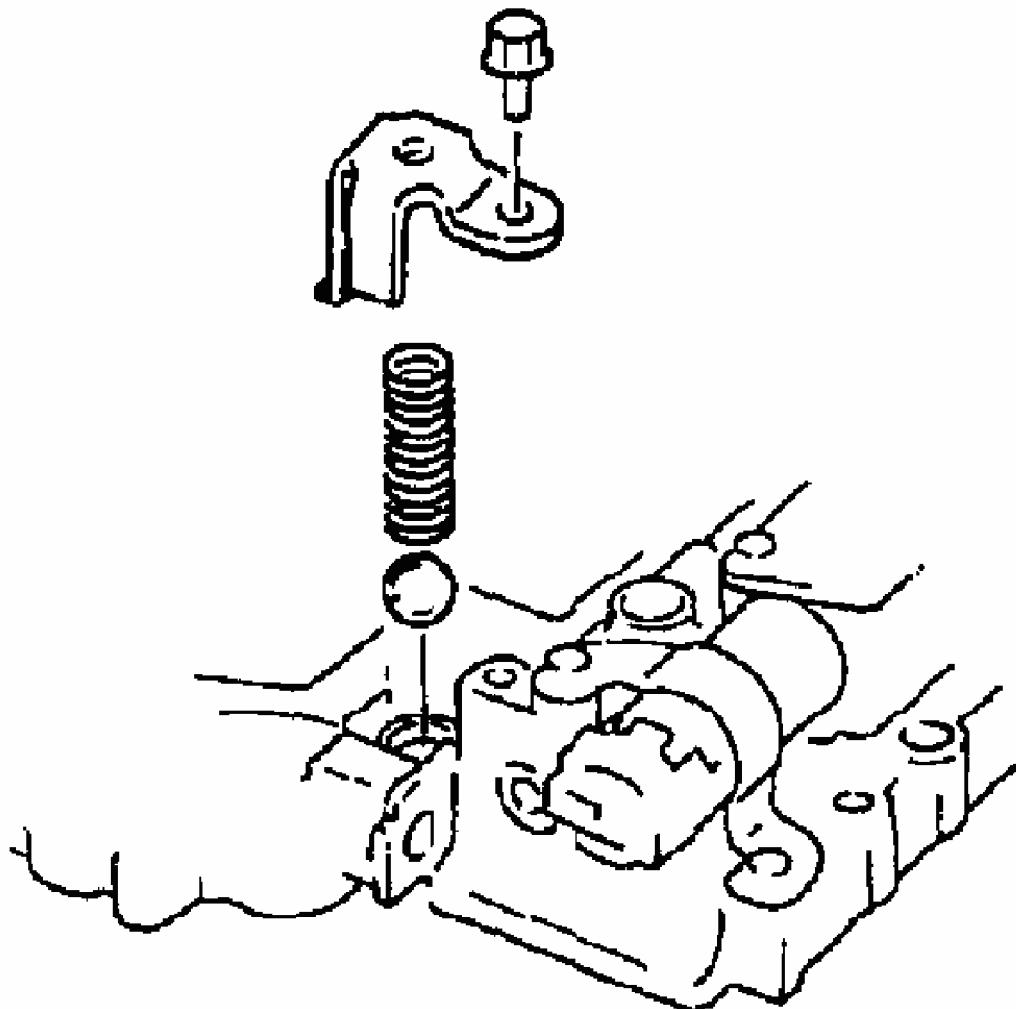
G03186917

Fig. 120: Installing Spring, Torque Converter Clutch Control Valve, Torque Converter Clutch Valve Sleeve & Pin
Courtesy of MAZDA MOTORS CORP.

5. Install the pressure relief valve ball, spring and pressure relief valve retainer.
6. Tighten the bolt

Tightening Torque

5.0-5.8 N.m {50-60 kgf.cm, 44-52 in.lbf}



G03186918

Fig. 121: Installing Pressure Relief Valve Ball, Spring & Pressure Relief Valve Retainer

Courtesy of MAZDA MOTORS CORP.

7. Install the new gasket and lower valve body plate and tighten the bolts.

Tighten Torque

5.0-5.8 N.m {50-60 kgf.cm, 44-52 in.lbf}

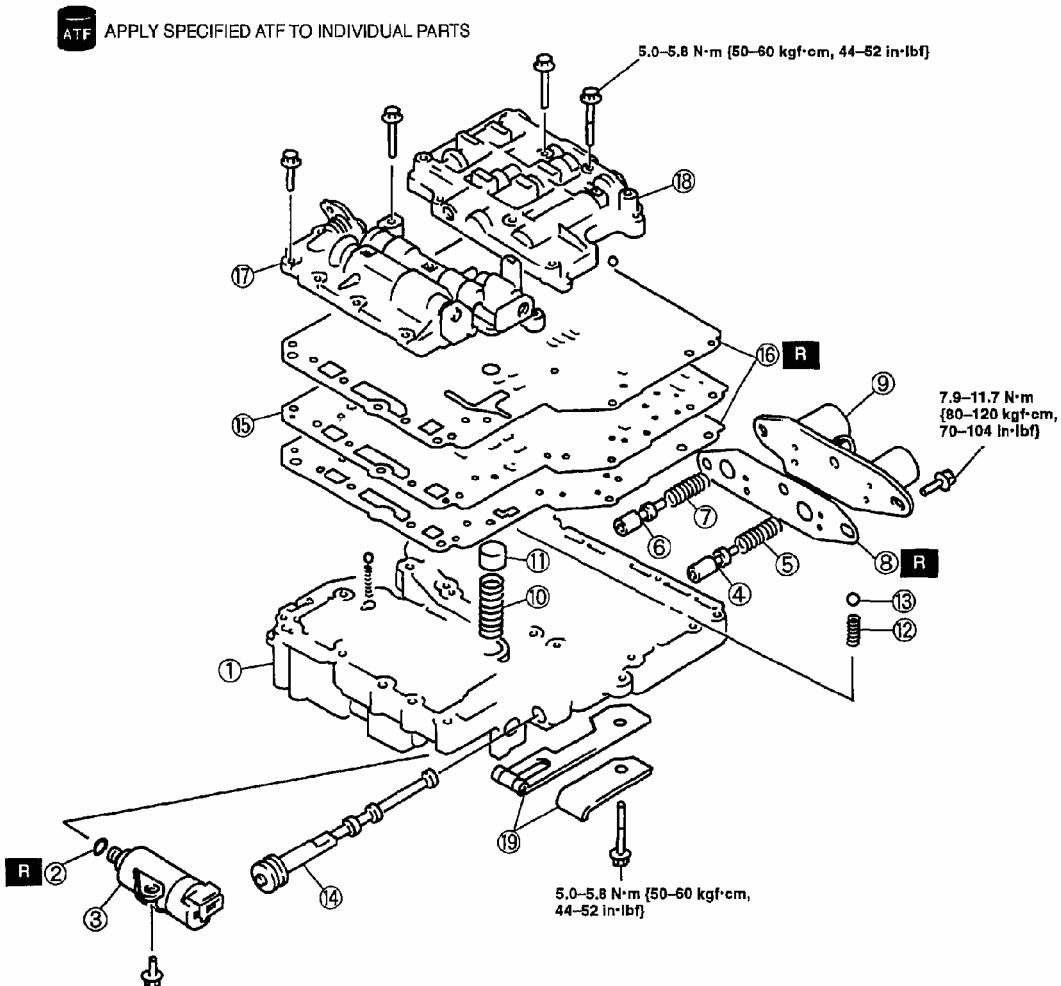
8. Install the new gasket and torque converter clutch control valve plate and tighten the bolts.

Tighten Torque

5.0-5.8 N·m {50-60 kgf·cm, 44-52 in·lbf}

Control Valve Body Assembly

1. Verify that all parts are clean and free of dust and other small particles.
2. Apply ATF to all parts.
3. Assemble in the reverse order.



1	Lower valve body
2	O-ring
3	Torque converter clutch solenoid valve
4	Low coast modulator valve
5	Spring
6	Intermediate coast modulator valve
7	Spring
8	Gasket
9	Solenoid valve A and B
10	Bypass valve spring

11	Bypass valve
12	Ball spring
13	Valve body ball
14	Manual valve
15	Separator plate
16	Gasket
17	Upper rear valve body
18	Upper front valve body
19	Detent spring

Fig. 122: Assembling Control Valve Body
Courtesy of MAZDA MOTORS CORP.

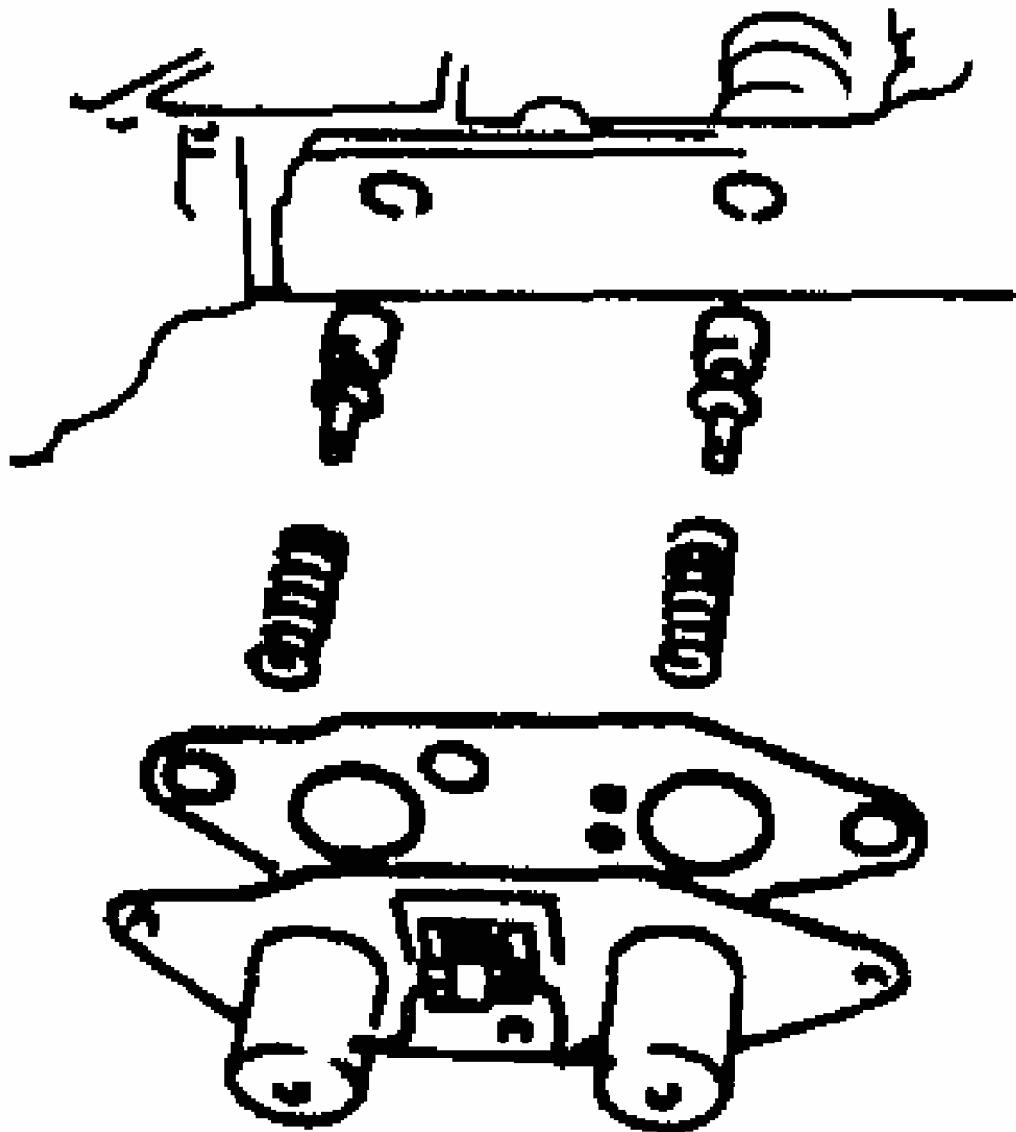
Assembly Procedure

1. Measure the spring free length.

CONTROL VALVE BODY SPRING SPECIFICATIONS

Spring	Outer Diameter - (mm {in})	Free Length - (mm {in})
Ball Valve Spring	6.20 {0.24}	15.00 {0.591}
Bypass Valve Spring	13.80 {0.543}	28.90 {1.138}
Low Coast Modulator Valve Spring	9.24 {0.36}	42.35 {1.667}
Intermediate Coast Modulator Valve Spring	9.04 {0.356}	27.26 {1.073}

2. If not within the specification, replace the control valve body component.
3. Install the low coast modulator valve, spring, intermediate coast modulator valve, spring, new gasket, shift solenoid A, and B.



G03186920

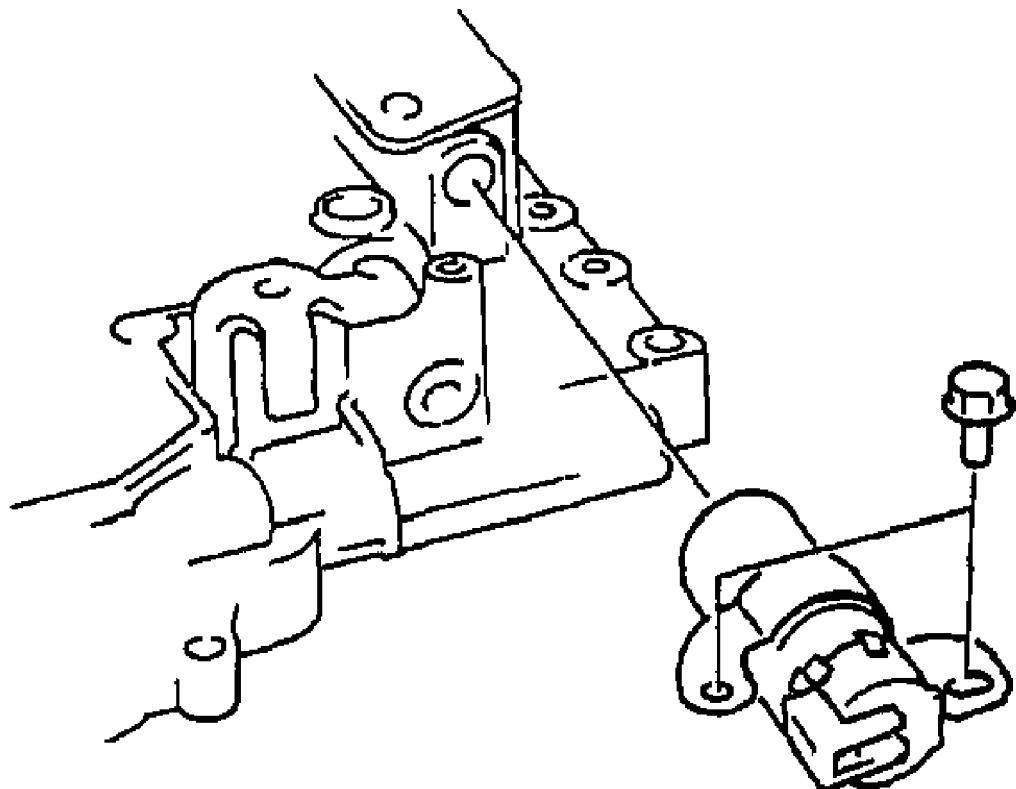
Fig. 123: Installing Low Coast Modulator Valve, Spring, Intermediate Coast Modulator Valve, Spring, New Gasket, Shift Solenoid A & B
Courtesy of MAZDA MOTORS CORP.

4. Tighten the bolts.

Tighten Torque

7.9-11.7 N.m {80-120 kgf.cm, 70-104 in.lbf}

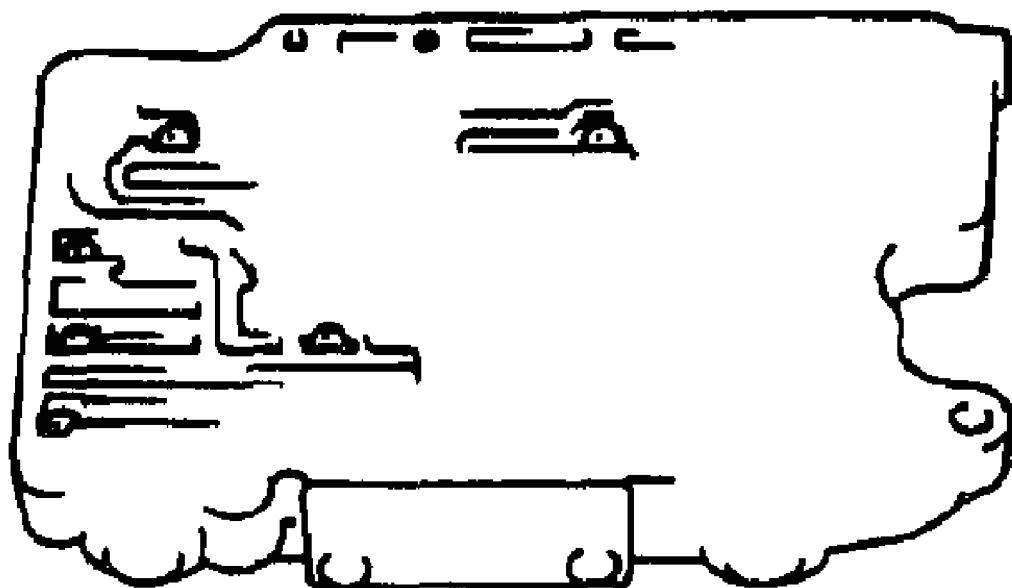
5. Apply ATF to the new O-ring.
6. Install the O-ring to the TCC solenoid valve.
7. Install the TCC solenoid valve to the lower valve body.



G03186921

Fig. 124: Installing TCC Solenoid Valve
Courtesy of MAZDA MOTORS CORP.

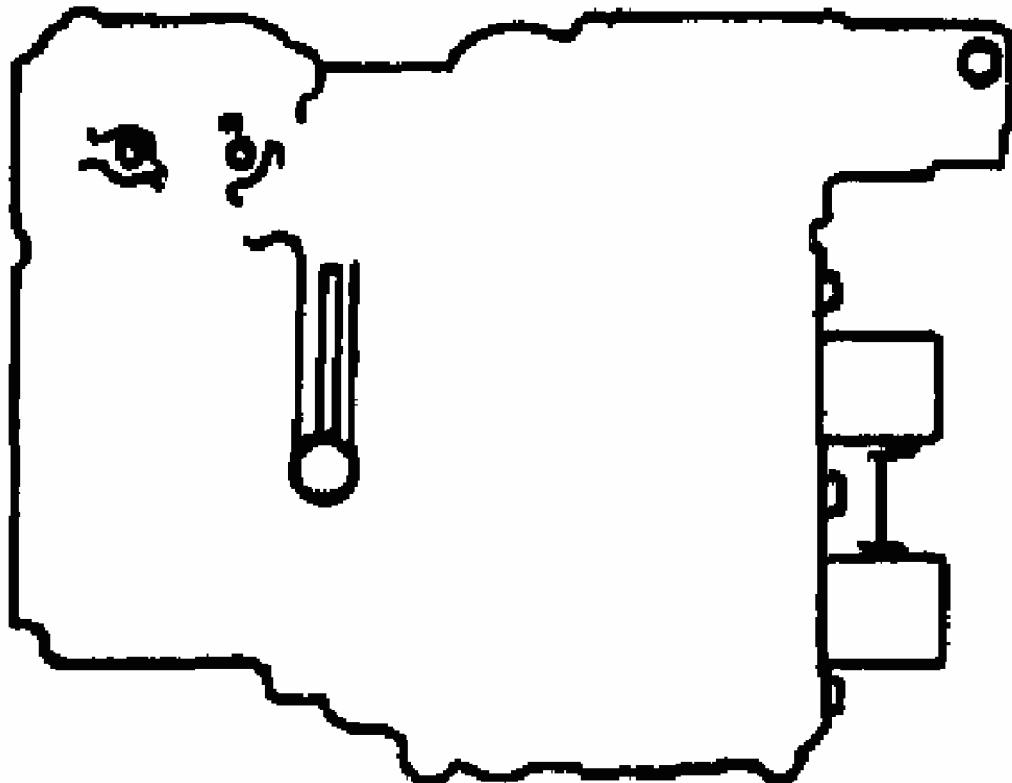
8. Install the valve body balls to the upper rear valve body.



G03186922

Fig. 125: Installing Valve Body Balls To Upper Rear Valve Body
Courtesy of MAZDA MOTORS CORP.

9. Install the valve body ball, inspect ball, and bypass valve, to the lower valve body.

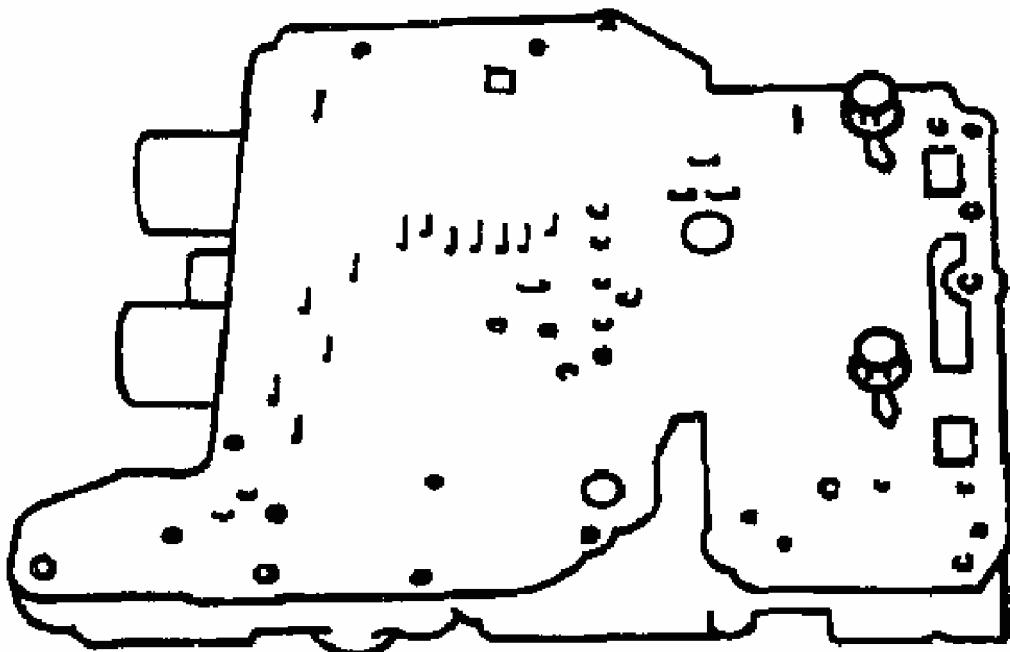


G03186923

Fig. 126: Installing Valve Body Ball, Inspect Ball & Bypass Valve To Lower Valve Body

Courtesy of MAZDA MOTORS CORP.

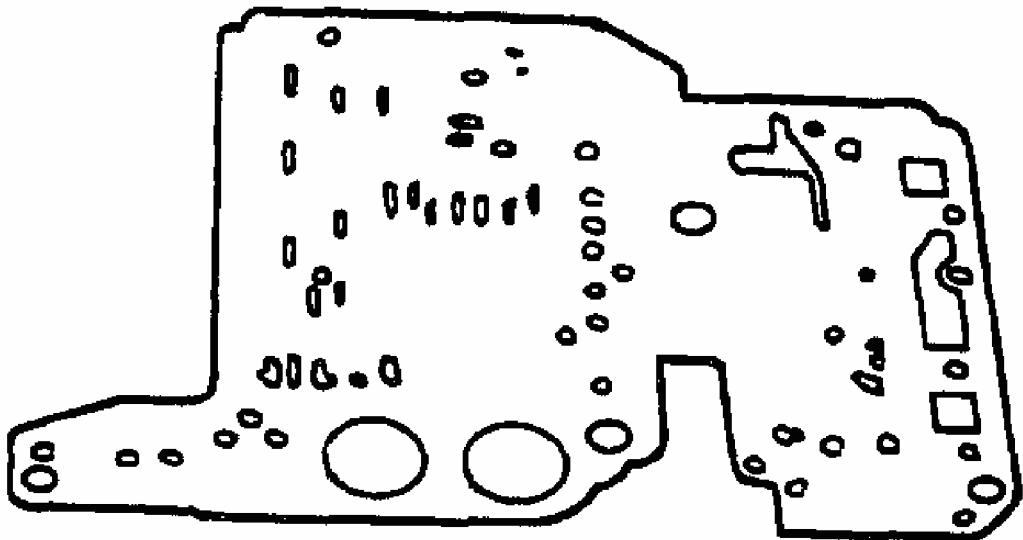
10. Place separator plate and new lower valve body gasket on lower valve body component and tighten installation section of front upper valve body component with 2 bolts temporarily.



G03186924

Fig. 127: Installing Separator Plate & Lower Valve Body Gasket
Courtesy of MAZDA MOTORS CORP.

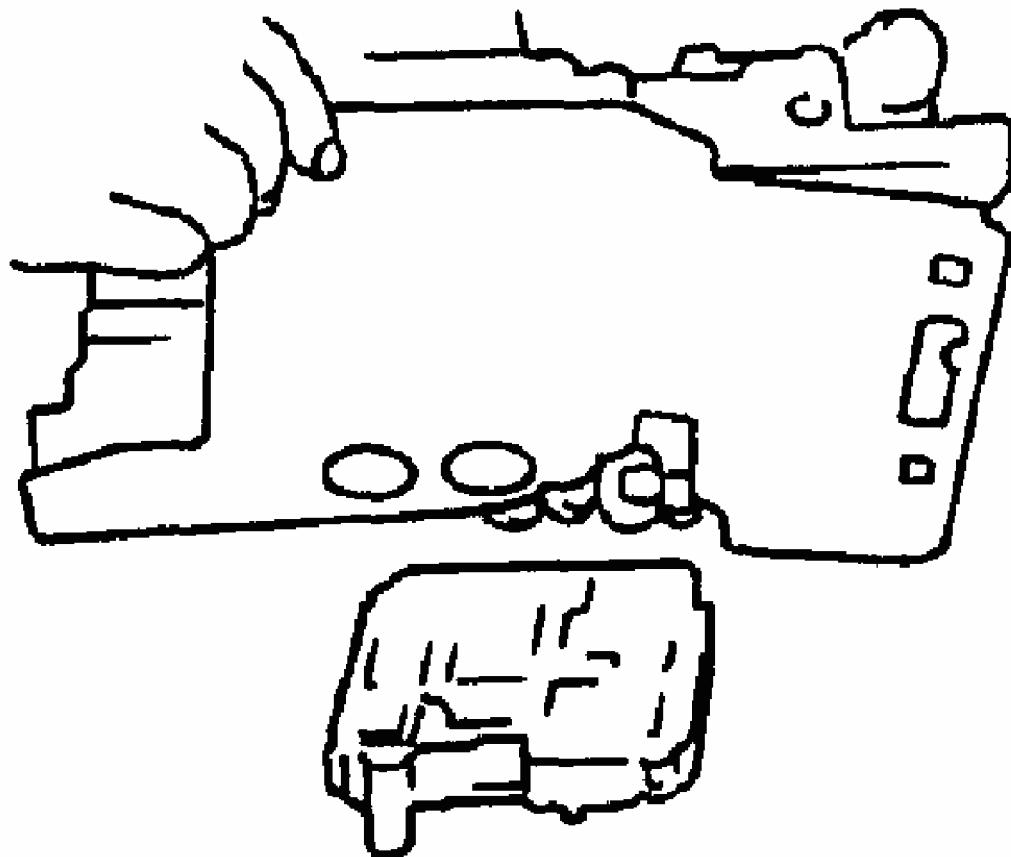
11. Place new upper valve body gasket on lower valve body component.



G03186925

Fig. 128: Installing Upper Valve Body Gasket On Lower Valve Body Component
Courtesy of MAZDA MOTORS CORP.

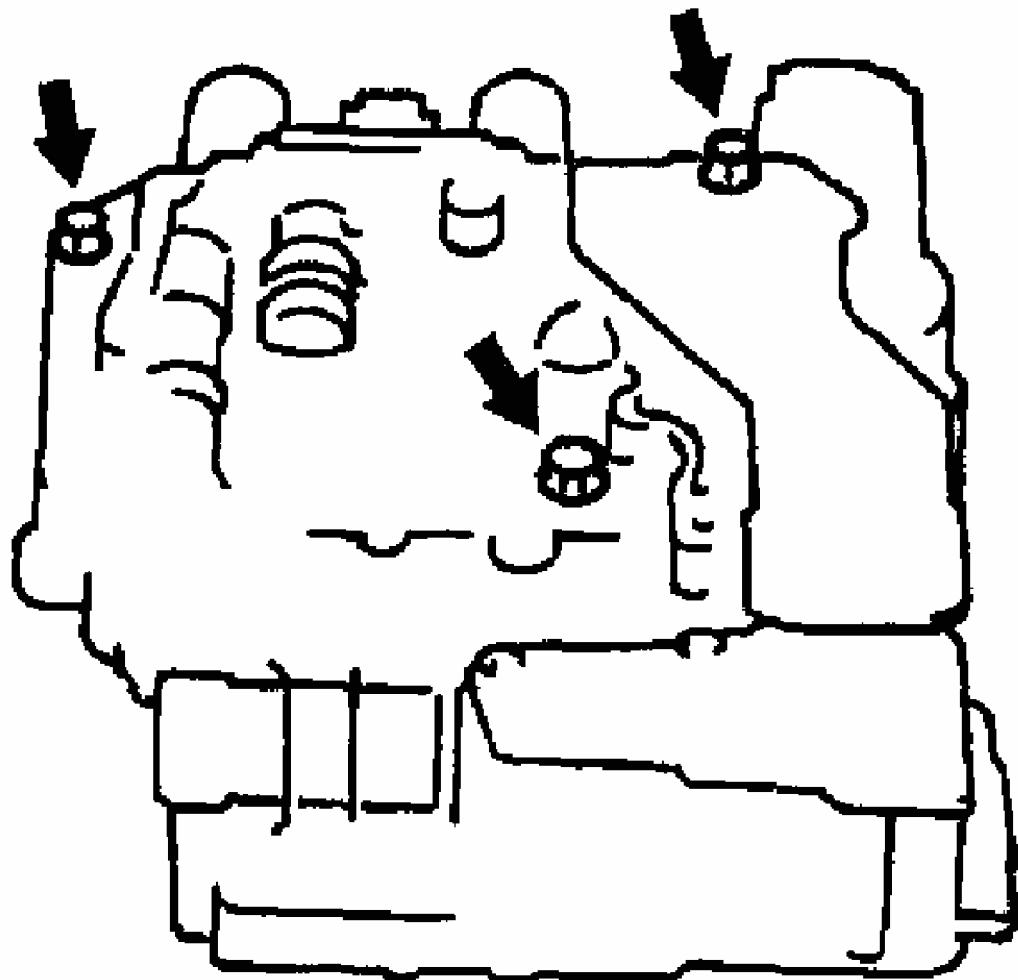
12. While holding upper valve body gasket and lower valve body component together, install it on rear upper valve body component.



G03186926

Fig. 129: Installing Upper Valve Body Gasket & Lower Valve Body Component On Rear Upper Valve Body Component
Courtesy of MAZDA MOTORS CORP.

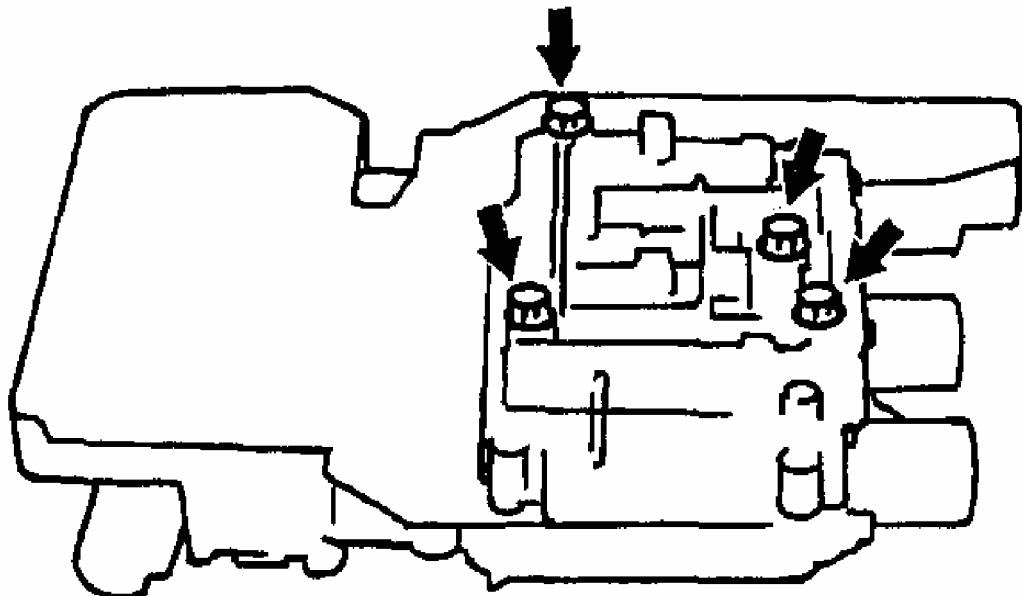
13. Tighten 3 bolts indicated temporarily.



G03186927

Fig. 130: Identifying 3 Valve Body Bolts
Courtesy of MAZDA MOTORS CORP.

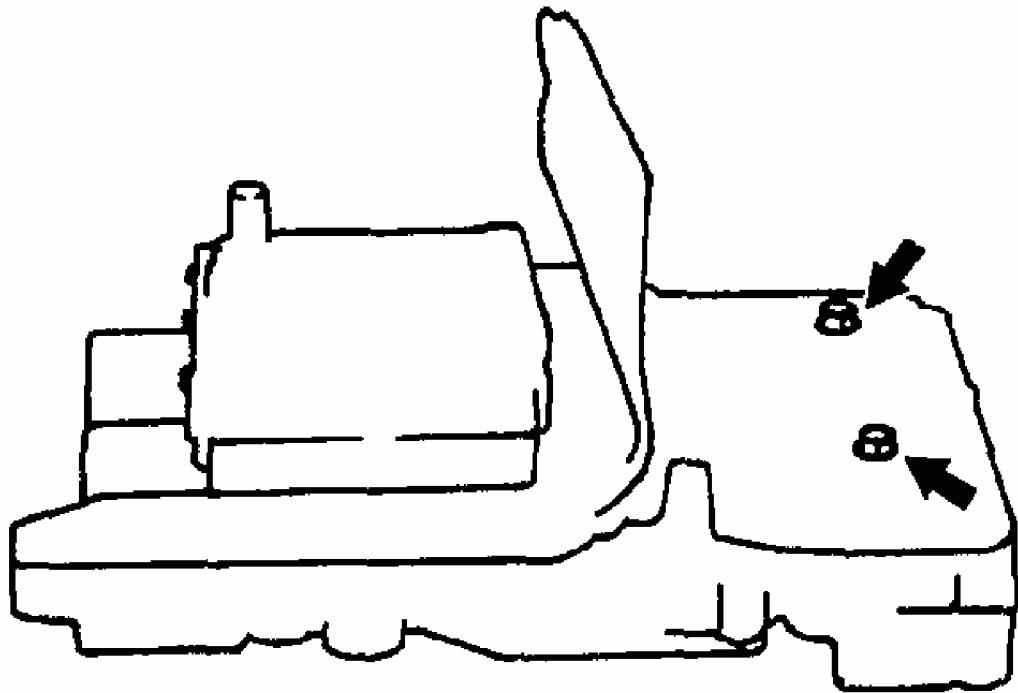
14. Turn over lower valve body component and tighten 4 bolts indicated temporarily.



G03186928

Fig. 131: Identifying 4 Valve Body Bolts
Courtesy of MAZDA MOTORS CORP.

15. Remove the 2 bolts tightened temporarily in step 5.

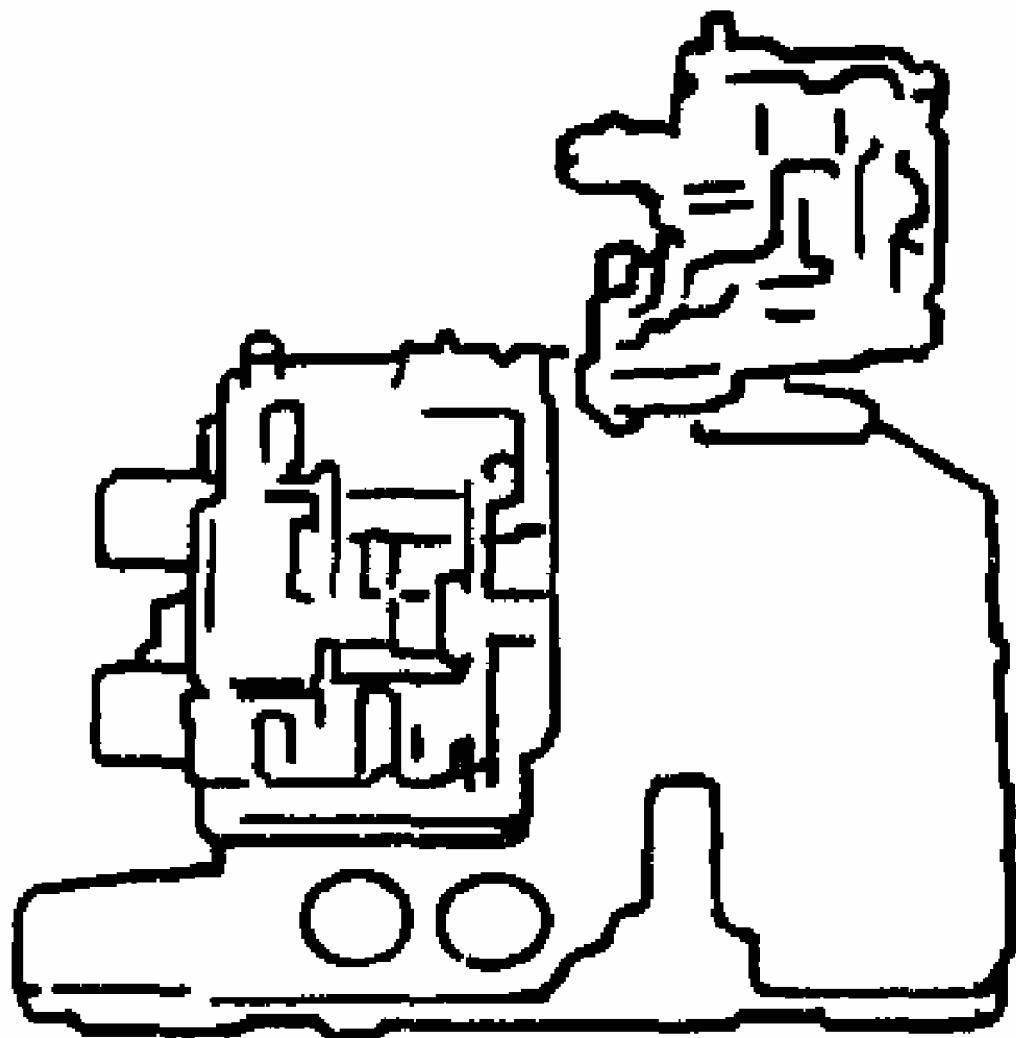


G03186929

Fig. 132: Identifying 2 Valve Body Bolts

Courtesy of MAZDA MOTORS CORP.

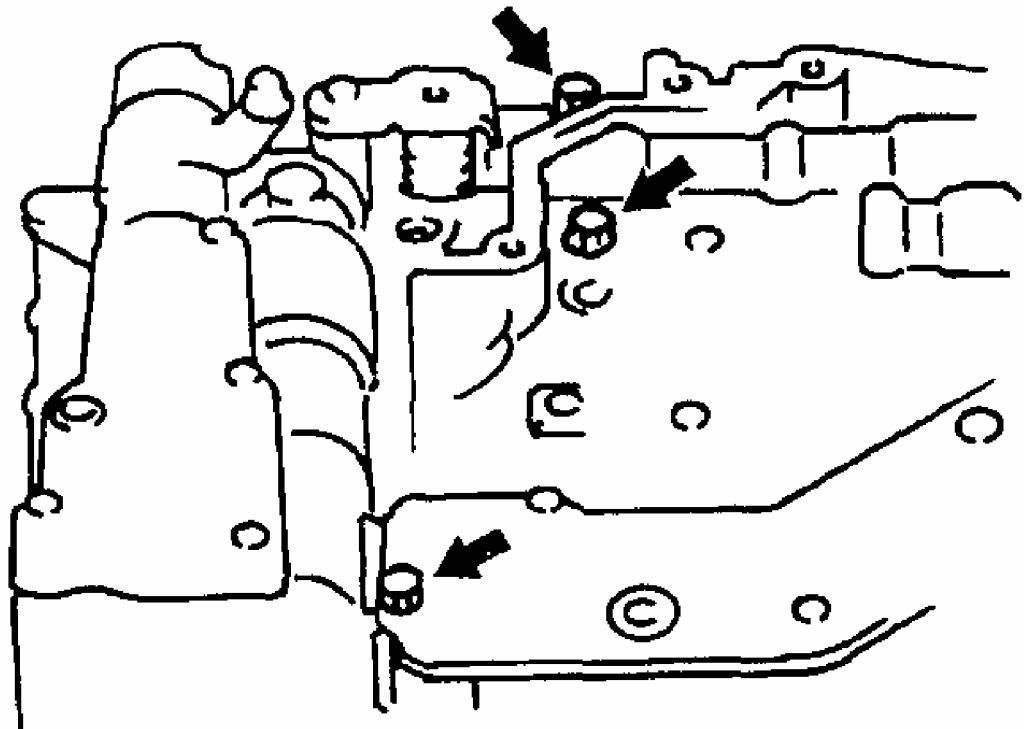
16. Install lower valve body component on front upper valve body.



G03186930

Fig. 133: Installing Lower Valve Body Component On Front Upper Valve Body
Courtesy of MAZDA MOTORS CORP.

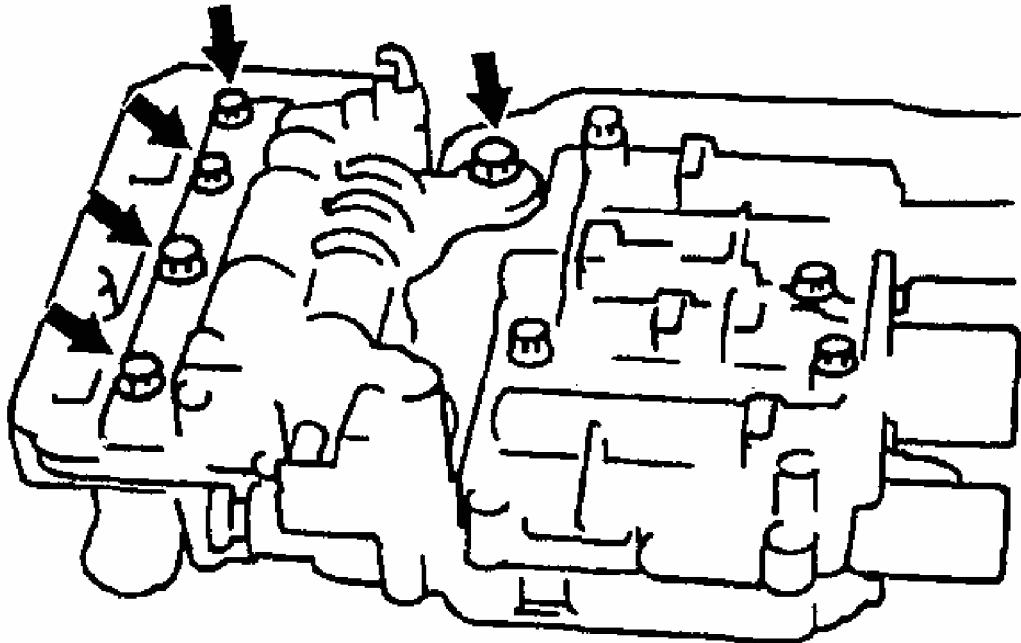
17. Tighten 3 bolts indicated in figure at the left temporarily.



G03186931

Fig. 134: Identifying 3 Valve Body Bolts
Courtesy of MAZDA MOTORS CORP.

18. Turn over lower valve body and tighten 5 bolts indicated in figure at the left temporarily.



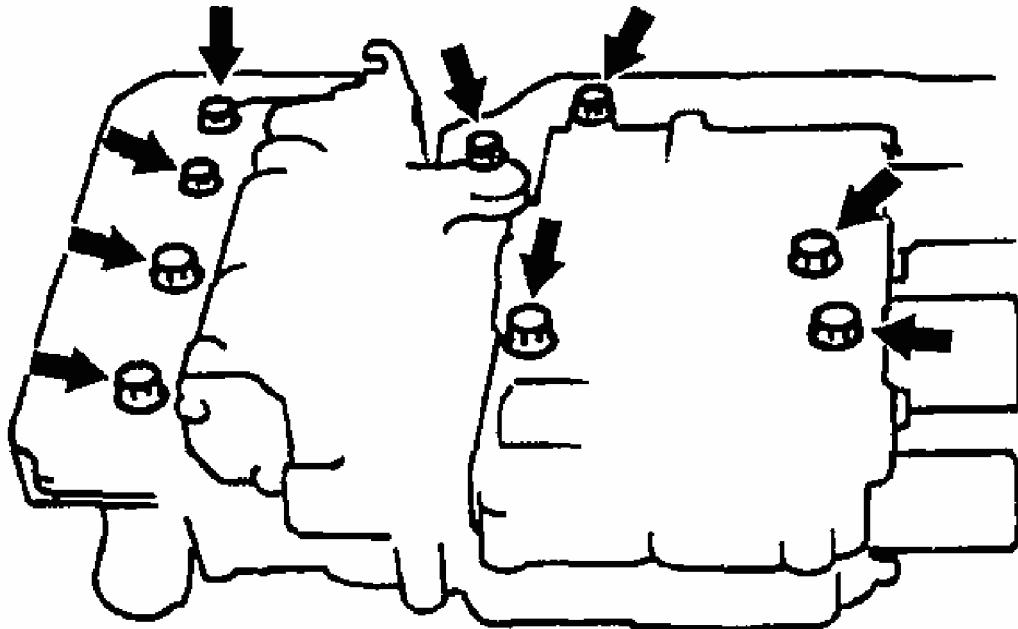
G03186932

Fig. 135: Identifying 5 Valve Body Bolts
Courtesy of MAZDA MOTORS CORP.

19. Tighten bolts on upper valve body side to specified torque.

Tightening Torque

5.0-5.8 N.m {50-60 kgf.cm, 44-52 in.lbf}



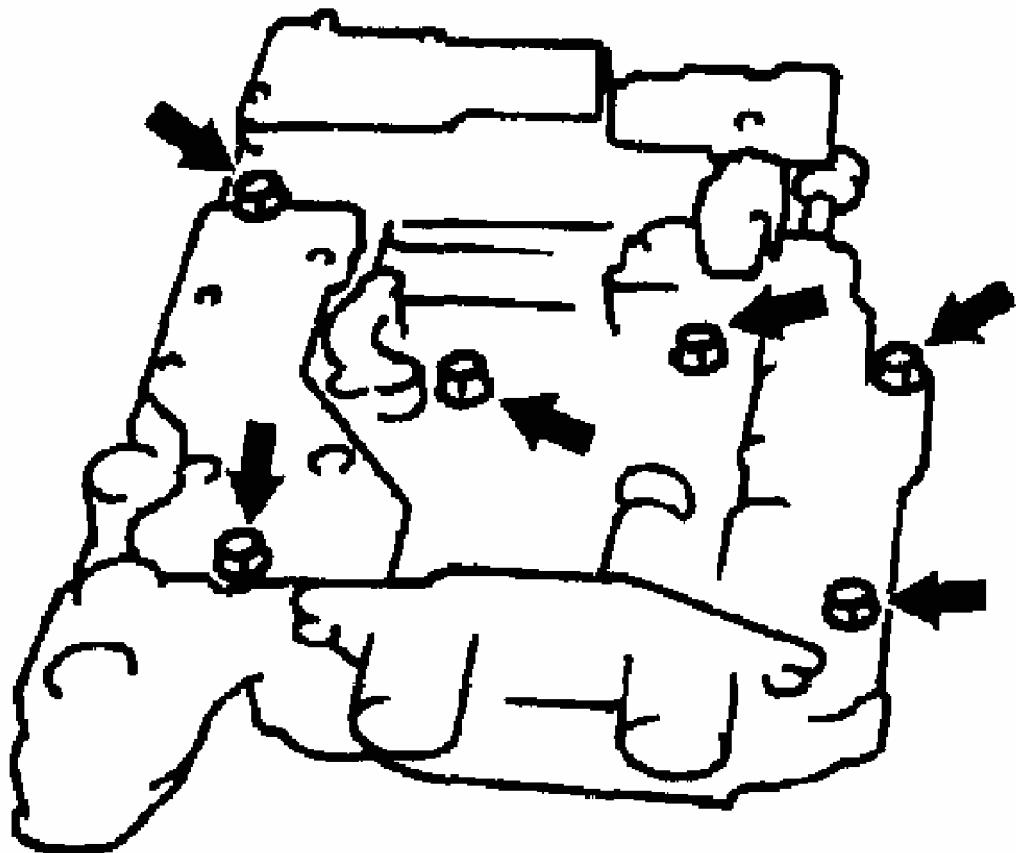
G03186933

Fig. 136: Tightening Upper Valve Body Side Bolts
Courtesy of MAZDA MOTORS CORP.

20. Tighten bolts on lower valve body inside to specified torque.

Tightening Torque

5.0-5.8 N.m {50-60 kgf.cm, 44-52 in.lbf}



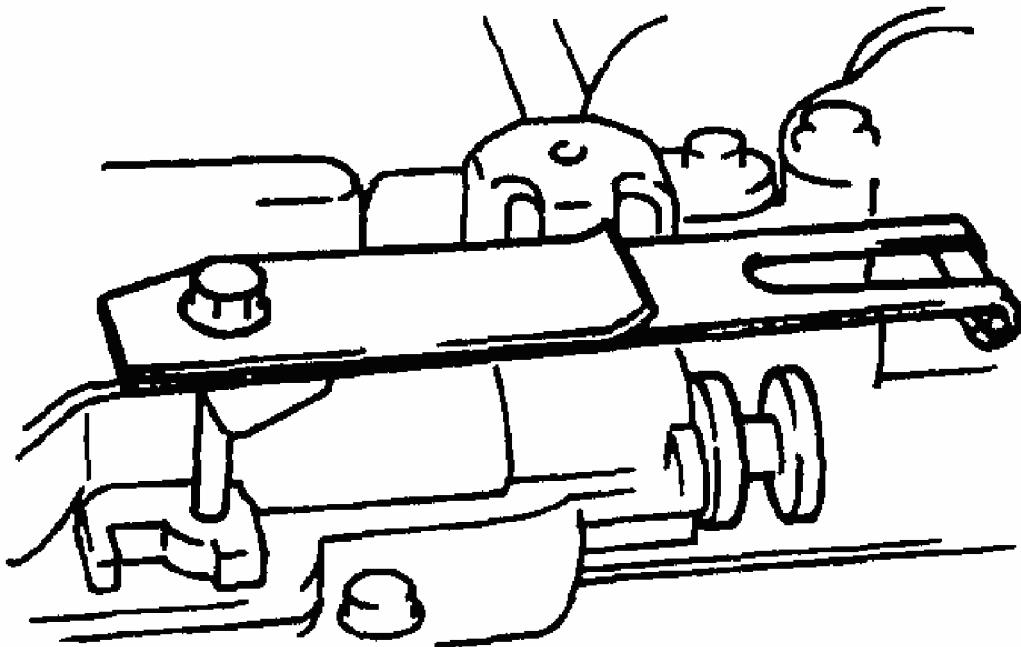
G03186934

Fig. 137: Tightening Lower Valve Body Inside Bolts
Courtesy of MAZDA MOTORS CORP.

21. After installing manual valve, install detent spring and plate and tighten detent spring bolt to specified torque.

Tightening Torque

5.0-5.8 N.m {50-60 kgf.cm, 44-52 in.lbf}



G03186935

Fig. 138: Installing Detent Spring & Plate

Courtesy of MAZDA MOTORS CORP.

AUTOMATIC TRANSMISSION ASSEMBLY

Precaution

General Note

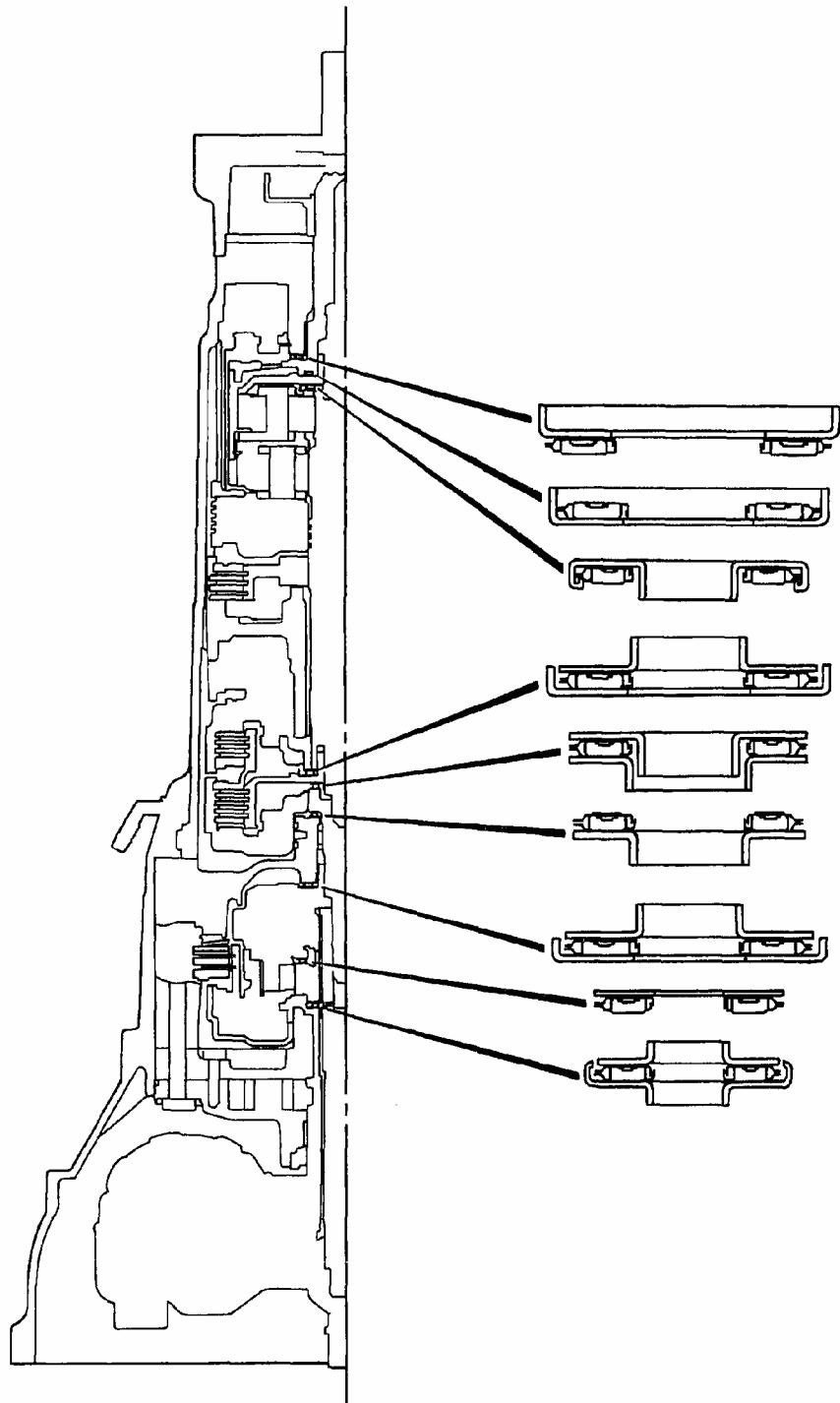
1. If the drive plates are replaced with new ones, soak the new part in ATF for at least two hours before installation.
2. Before assembly, apply ATF to all seal rings, rotating parts, O-rings, and sliding parts.
3. All O-ring, seals, and gaskets must be replaced with the new ones included in the overhaul kit.
4. Use petroleum jelly, not grease, during reassembly.
5. When it is necessary to replace a bushing, replace the subassembly that includes that bushing.
6. Assemble the housing within 10 minutes after applying sealant, and allow it to cure for at least 30 minutes after assembly before filling the transmission with ATF.

Assembly

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Bearing And Race Locations



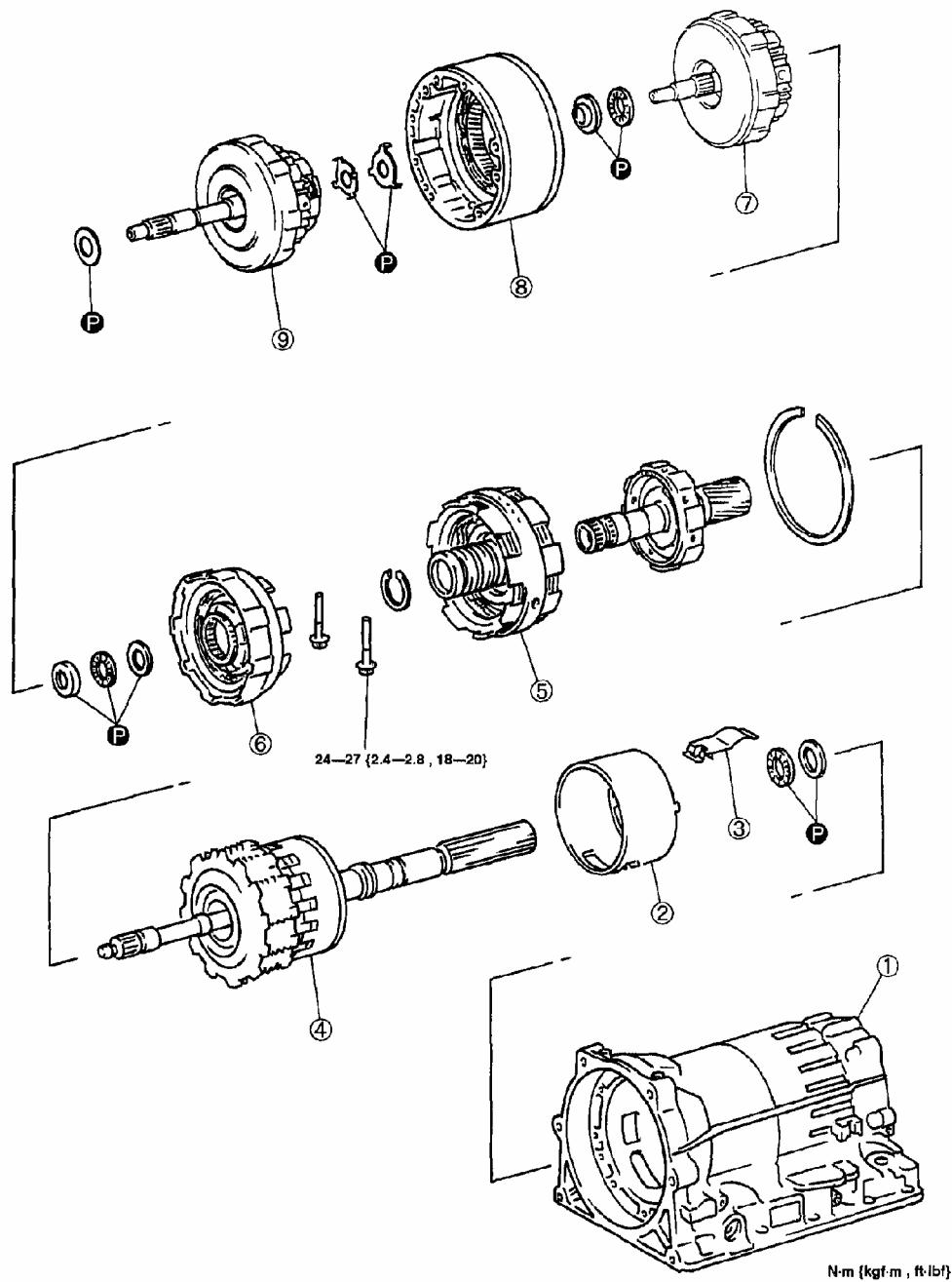
G03186936

Fig. 139: Identifying Bearing & Race Locations
Courtesy of MAZDA MOTORS CORP.

Components

2003 Mazda MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS Overhaul - SB4A-EL - MX-5 Miata



1	Transmission case
2	Brake applying cover
3	Leaf spring
4	Planetary gear component
5	Center support component

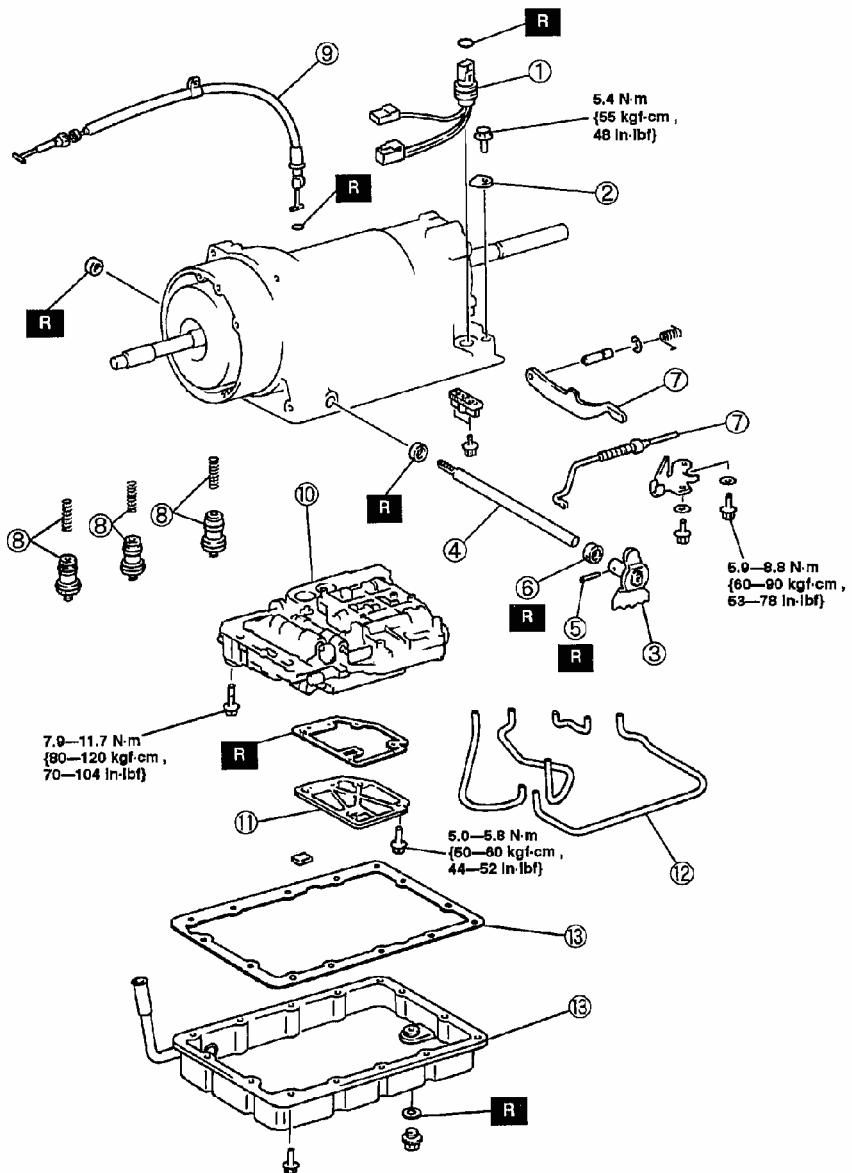
6	Direct clutch
7	Forward clutch
8	4GR case
9	4GR clutch component

G03186937

Fig. 140: Identifying Transmission Components (1 Of 4)
Courtesy of MAZDA MOTORS CORP.

2003 Mazda MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS Overhaul - SB4A-EL - MX-5 Miata



1	Transmission wire
2	Lock plate
3	Manual shift lever
4	Manual shaft
5	Roll pin
6	Sleeve cover
7	Parking rod, parking pawl

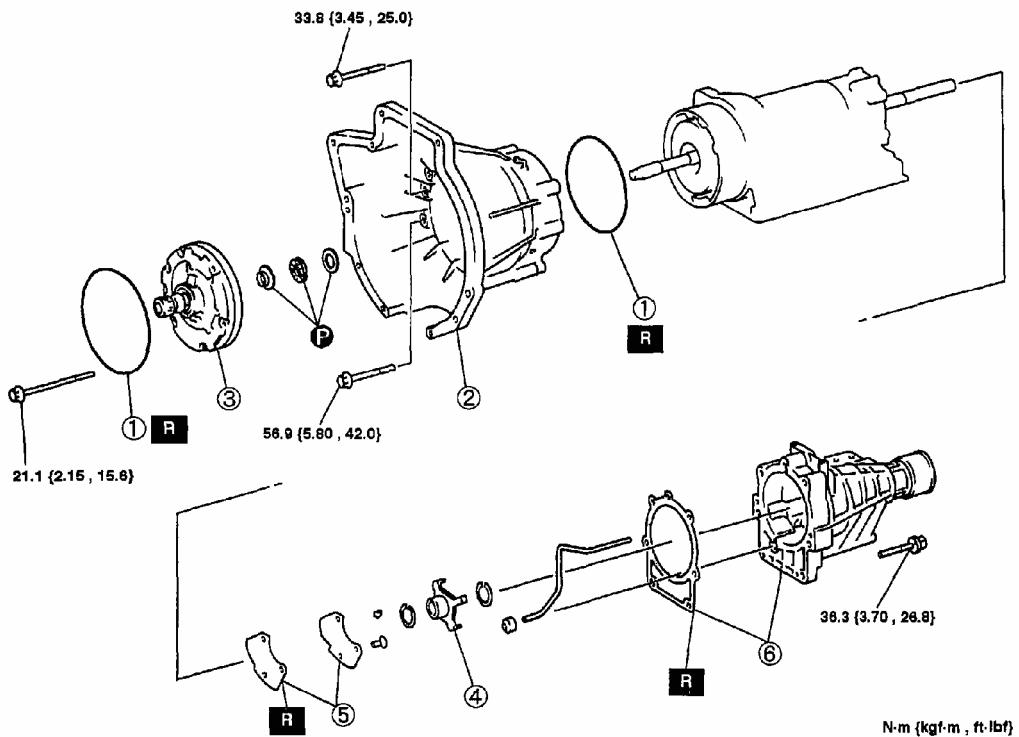
8	Accumulator pistons, springs
9	Throttle cable
10	Control valve body
11	Oil strainer
12	Tube
13	Oil pan, gasket

G03186938

Fig. 141: Identifying Transmission Components (2 Of 4)
Courtesy of MAZDA MOTORS CORP.

2003 Mazda MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS Overhaul - SB4A-EL - MX-5 Miata



1	O-ring
2	Converter housing
3	Oil pump

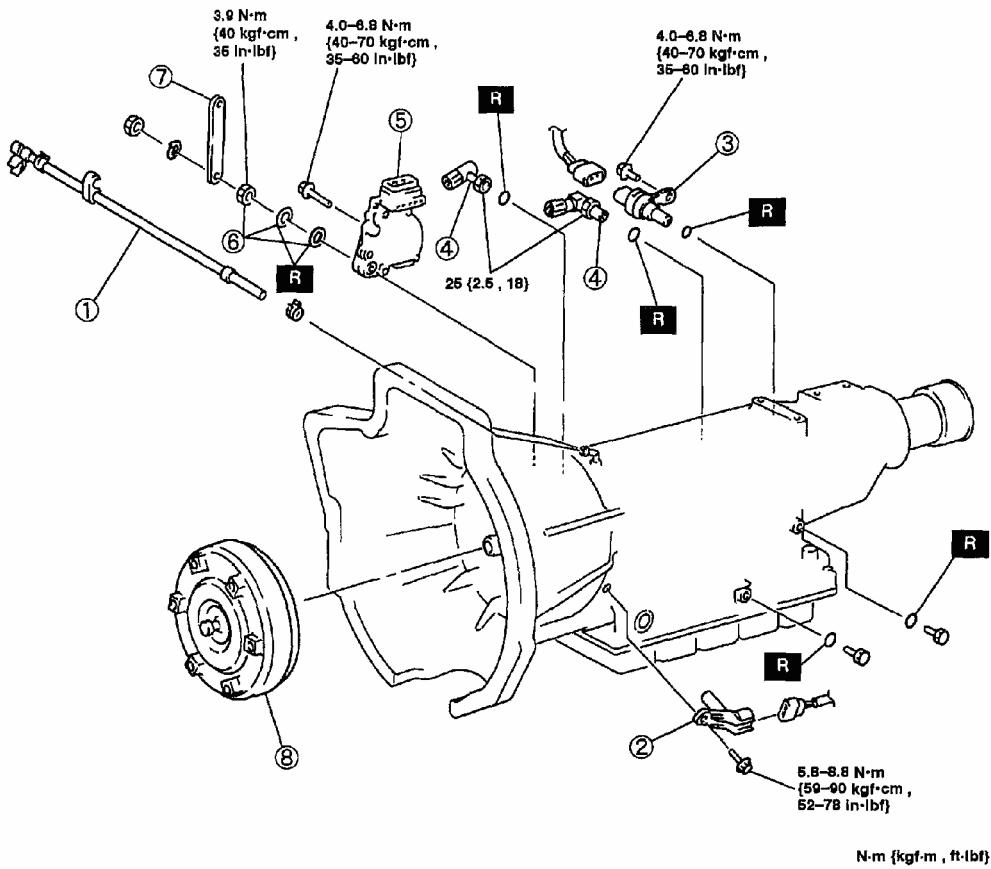
4	Speed sensor rotor
5	Transmission rear cover, gasket
6	Extension housing, gasket

G03186939

Fig. 142: Identifying Transmission Components (3 Of 4)
Courtesy of MAZDA MOTORS CORP.

2003 Mazda MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS Overhaul - SB4A-EL - MX-5 Miata



1	Breather hose
2	Input/turbine speed sensor
3	Output speed sensor
4	Elbow

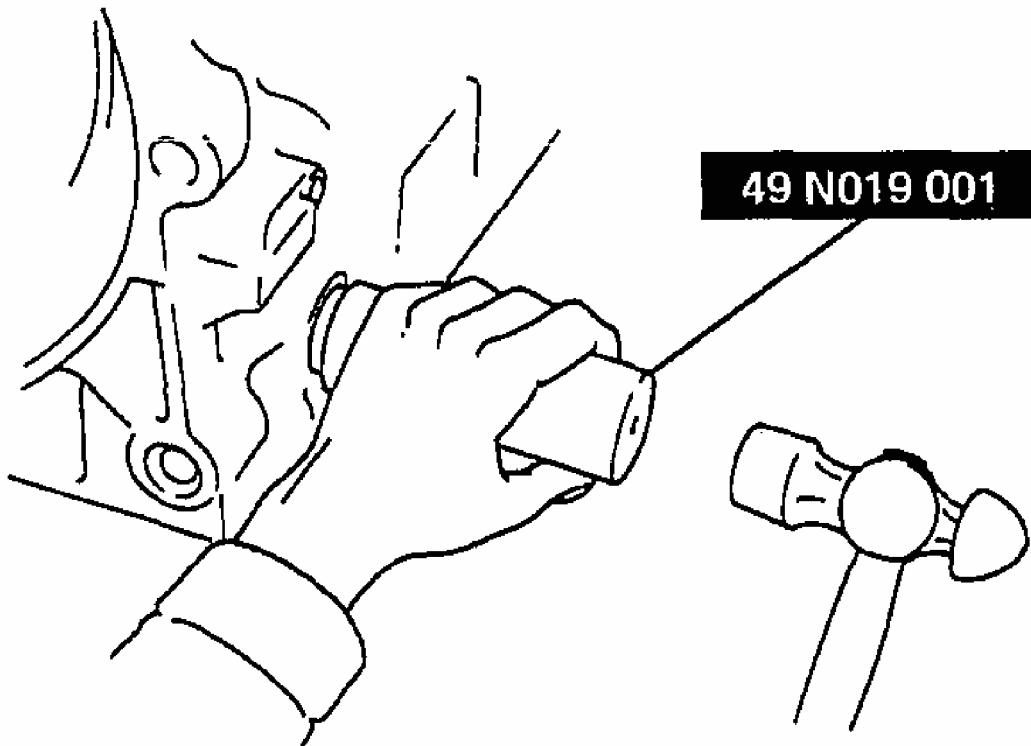
5	Transmission range switch
6	Packing, lock washer, nut
7	Transmission control lever
8	Torque converter

G03186940

Fig. 143: Identifying Transmission Components (4 Of 4)
Courtesy of MAZDA MOTORS CORP.

Assembly Procedure

1. Apply ATF to the new oil seal.
2. Install the oil seal to the transmission case using the SST .



49 N019 001

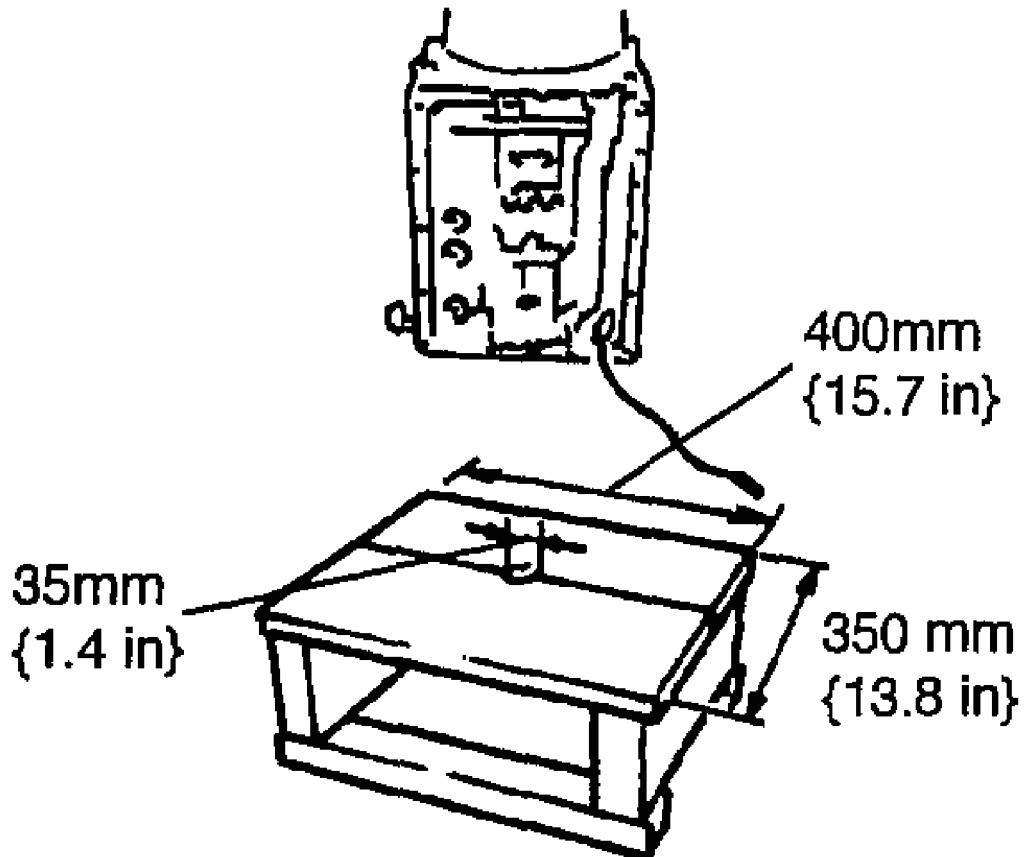
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Fig. 144: Installing Oil Seal

Courtesy of MAZDA MOTORS CORP.

NOTE:

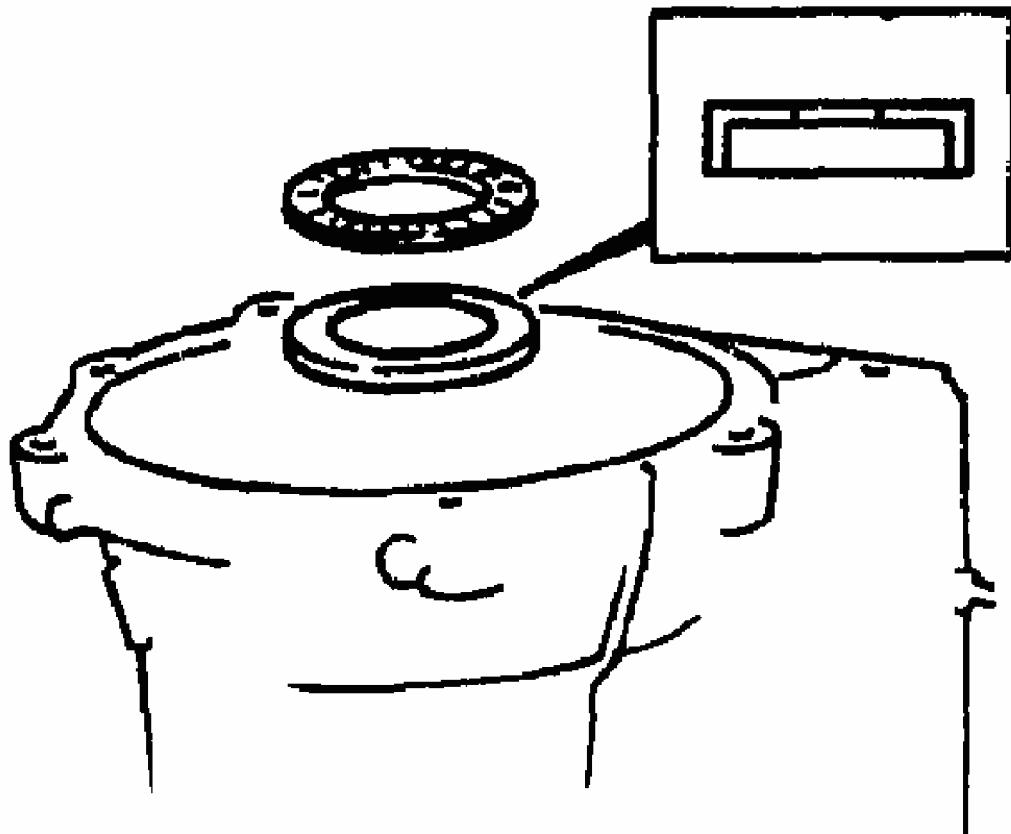
- To protect transmission case against damage, spread cloth on stand.
- A stand of such size as shown in figure will facilitate work.



G03186942

Fig. 145: Preparing Transmission Stand
Courtesy of MAZDA MOTORS CORP.

3. Prepare a stand as shown. It is necessary because work will be done with transmission case set upright from this step on.
4. Install thrust output shaft bearing and thrust bearing output shaft race after lubricating them with petroleum jelly.

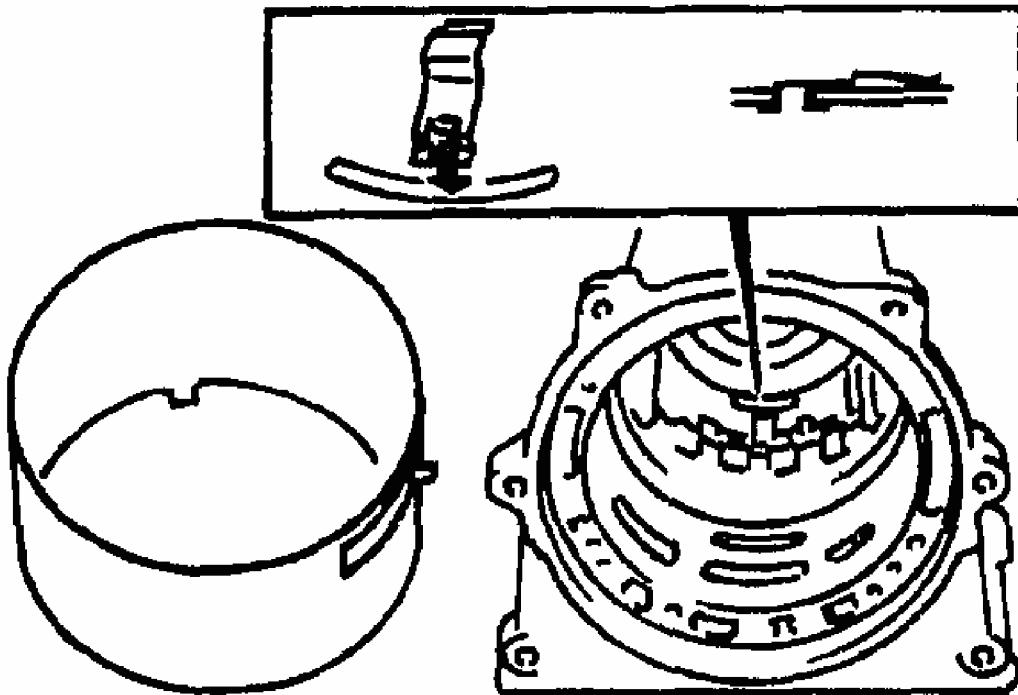


G03186943

Fig. 146: Installing Thrust Output Shaft Bearing & Thrust Bearing Output Shaft Race

Courtesy of MAZDA MOTORS CORP.

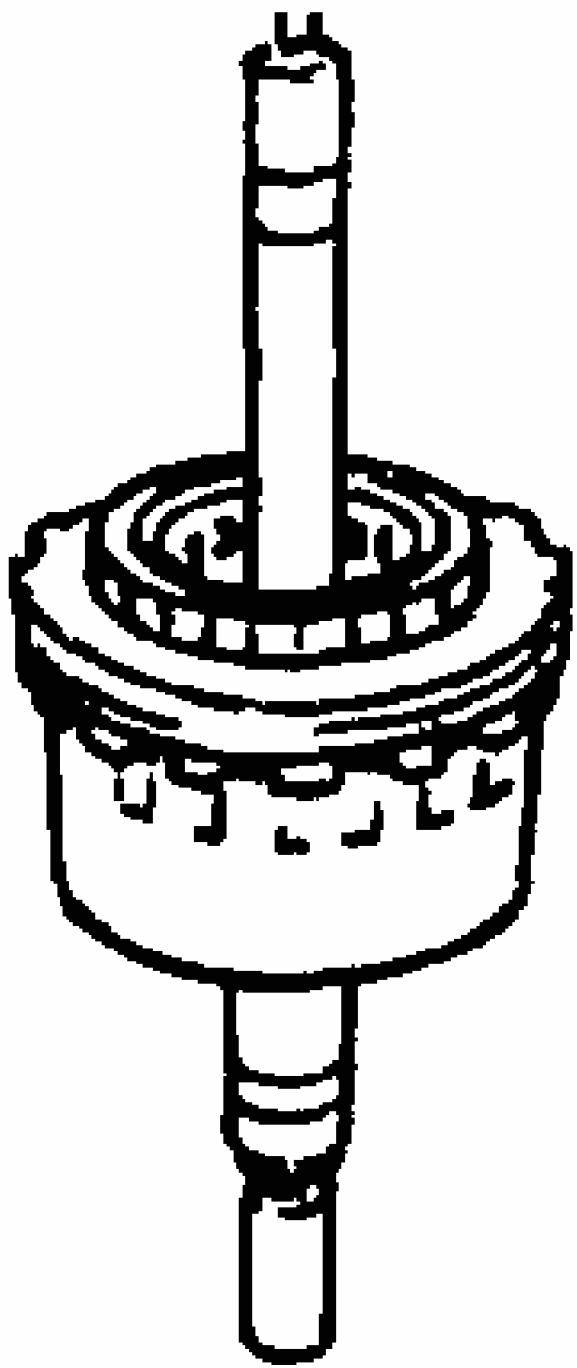
5. Install brake applying tube so that its lug A fits in B in transmission case. After installation, verify that 4 lugs along the underside of brake applying tube fit inside of reverse brake piston and leaf spring is installed properly.



G03186944

Fig. 147: Installing Brake Applying Tube
Courtesy of MAZDA MOTORS CORP.

6. Remove reverse brake reaction plate of planetary gear component and align lugs of reverse brake plate, reverse brake disc and reverse brake packing plate. Install planetary gear component to transmission case so that aligned lugs fit in groove in transmission case.



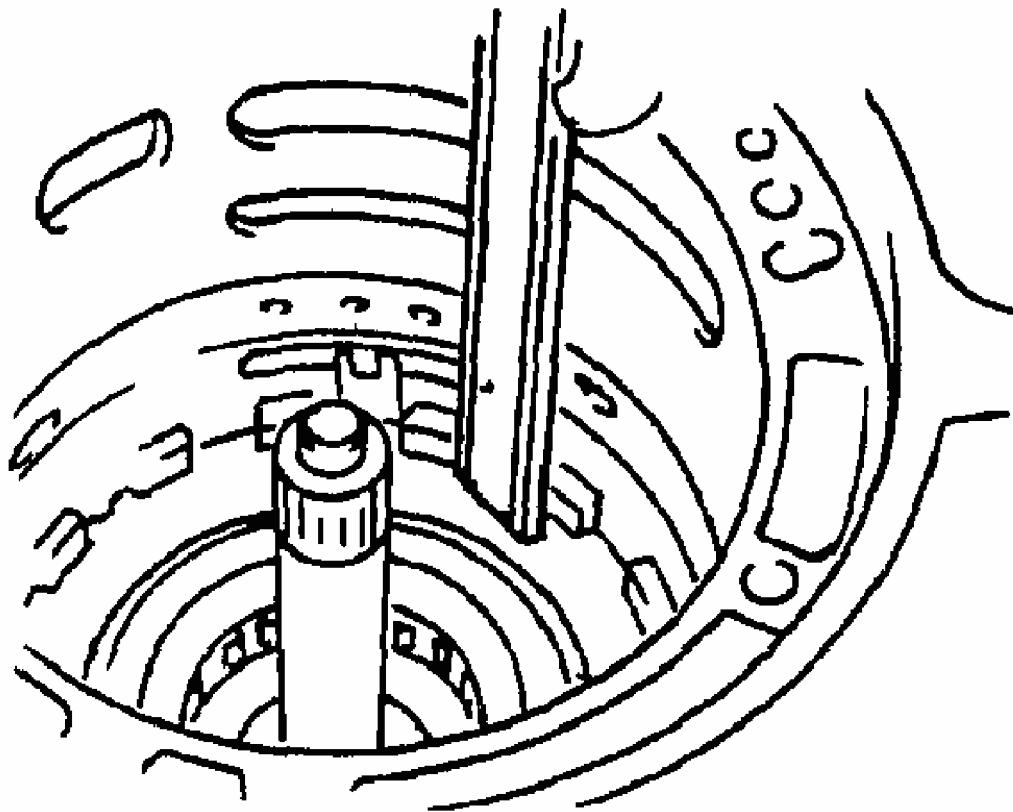
G03186945

Fig. 148: Installing Planetary Gear Component
Courtesy of MAZDA MOTORS CORP.

7. Measure clearance between reverse brake plate and lugs of transmission case.

Standard Clearance

0.61-1.93 mm {0.03-0.07 in}

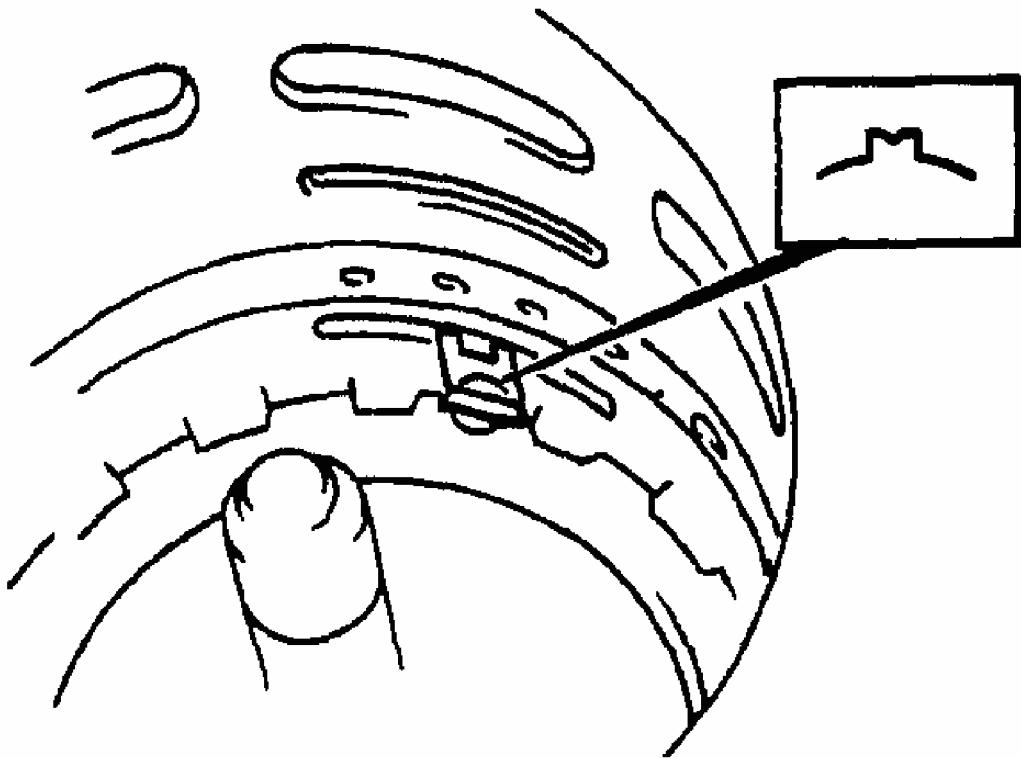


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Fig. 149: Measuring Clearance Between Reverse Brake Plate & Lugs Of Transmission Case

Courtesy of MAZDA MOTORS CORP.

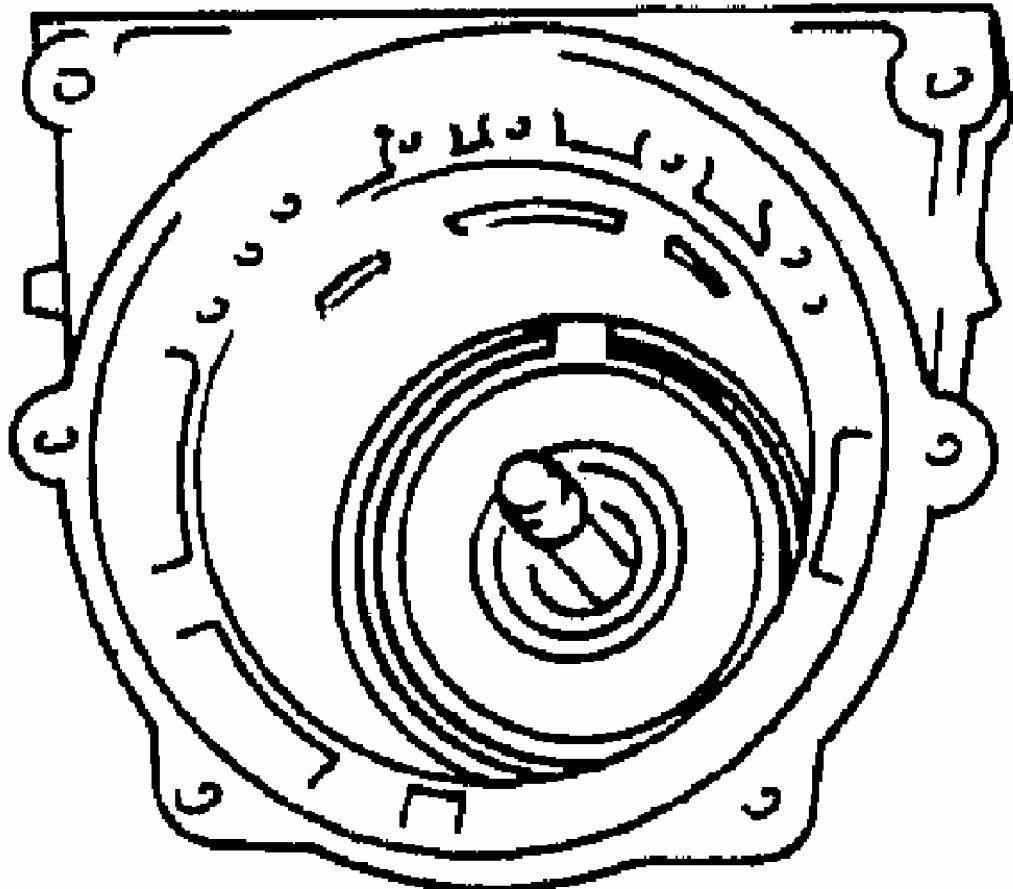
8. If measured value is less than standard range, it is possible that something is installed improperly or dust or fluid is on reverse brake disk, etc. If it exceeds standard range, replace reverse brake disc, reverse brake plate or reverse brake backing plate.
9. Install reverse brake reaction plate so that its lug with dent comes to the same position as leaf spring.



G03186947

Fig. 150: Installing Reverse Brake Reaction Plate
Courtesy of MAZDA MOTORS CORP.

10. Using screwdriver with vinyl tape or the like wound at its tip, install retaining reaction plate ring. After installation, verify that ring is in groove securely.

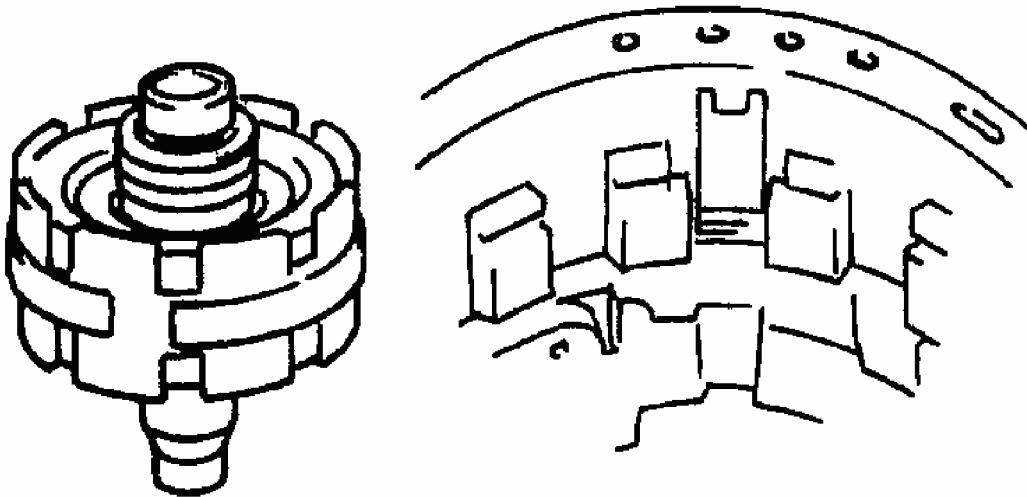


G03186948

Fig. 151: Installing Retaining Reaction Plate Ring
Courtesy of MAZDA MOTORS CORP.

NOTE:

- Unless retaining direct clutch ring of planetary sun gear is held, brake valve gets off center support and that will make it impossible to align fluid holes with bolt holes.



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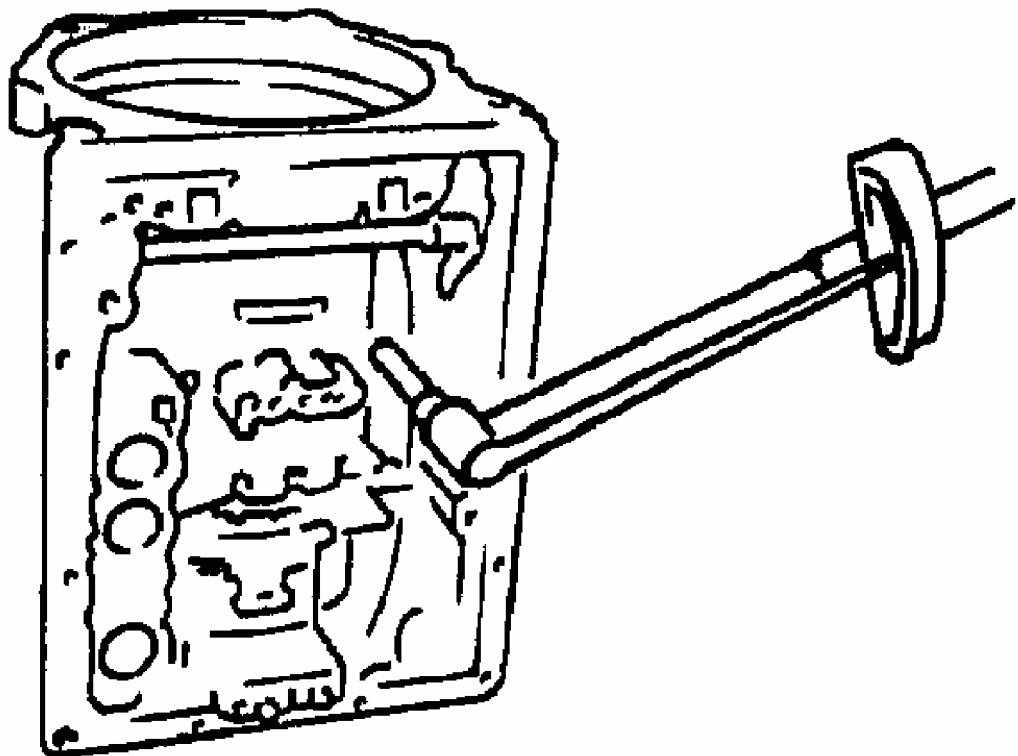
Fig. 152: Installing Center Support Component, Aligning Fluid Holes In Center Support & Transmission Case

Courtesy of MAZDA MOTORS CORP.

11. After confirming that lugs of all brake plates and brake discs are in grooves securely, hold retaining direct clutch ring of planetary sun gear, install center support component by aligning fluid holes in center support and transmission case.
12. Tighten center support bolts by certain amount at a time till specified tightening torque is obtained.

Tightening Torque

24-27 N.m {2.4-2.8 kgf.m, 18-20 ft.lbf}

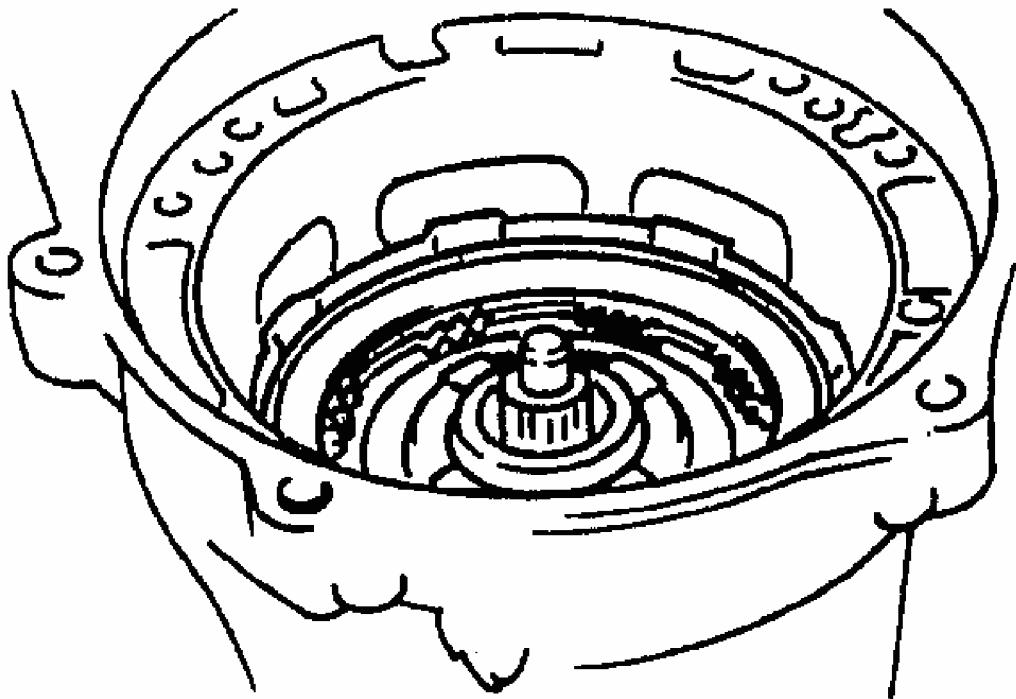


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Fig. 153: Tightening Center Support Bolts
Courtesy of MAZDA MOTORS CORP.

NOTE:

- Ends of splines in direct clutch cylinder and planetary sun gear should come almost in alignment.

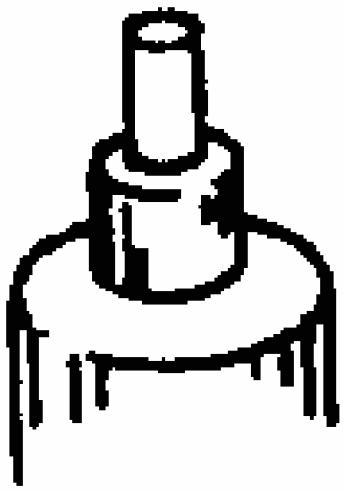
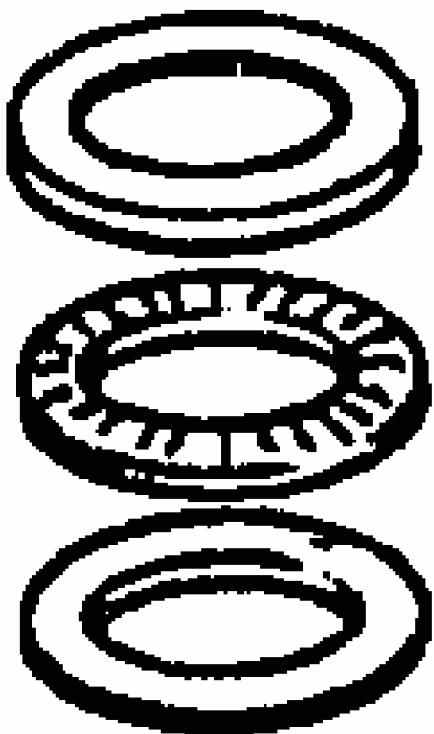


G03186951

Fig. 154: Installing Direct Clutch Component

Courtesy of MAZDA MOTORS CORP.

13. Install direct clutch component by aligning splines in direct clutch cylinder with planetary sun gear.
14. Apply petroleum jelly to forward clutch rear No. 1 race, thrust rear bearing, thrust bearing rear planetary ring race and install thrust bearing planetary ring race to direct clutch cylinder and forward clutch rear No. 1 race and thrust bearing to forward clutch hub.



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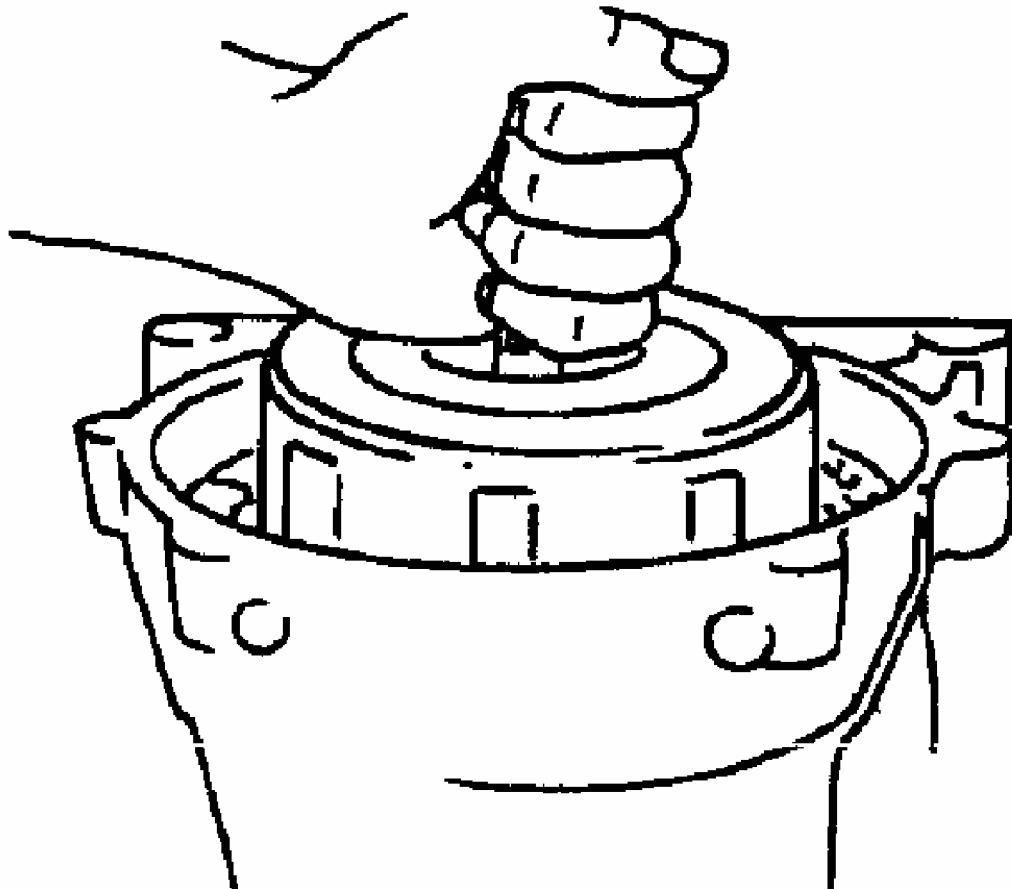
Fig. 155: Installing Thrust Bearing Planetary Ring Race To Direct Clutch Cylinder & Forward Clutch Rear No. 1 Race & Thrust Bearing To Forward Clutch Hub

Courtesy of MAZDA MOTORS CORP.

NOTE:

- Use care not to let forward clutch rear No. 1 race and

thrust bearing installed to forward clutch hub fall off.



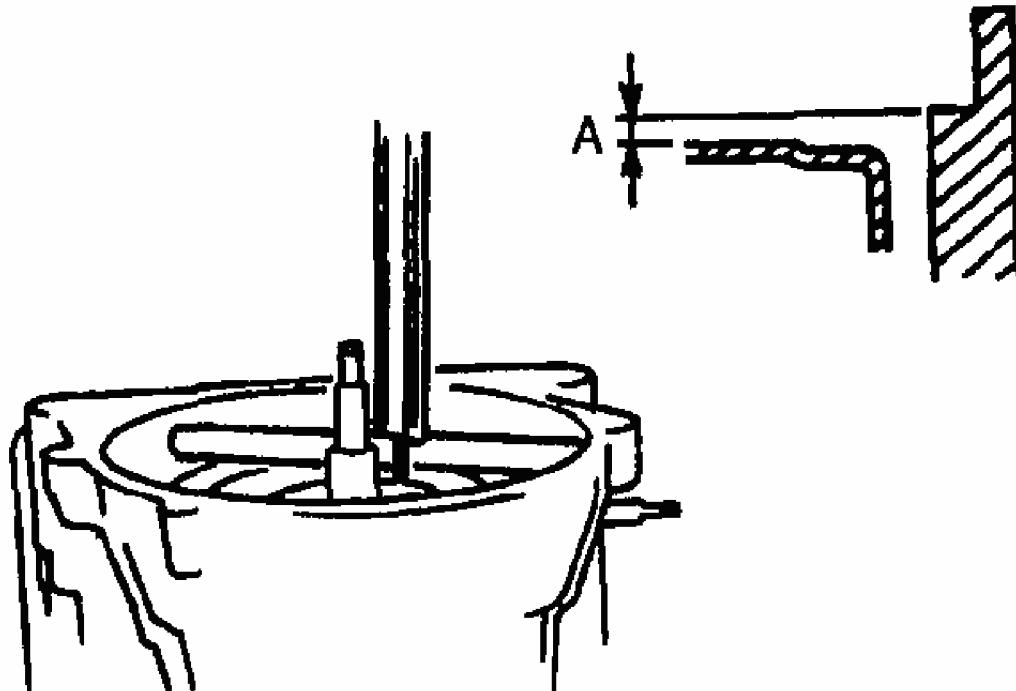
G03186953

Fig. 156: Installing Forward Clutch Component
Courtesy of MAZDA MOTORS CORP.

15. Install forward clutch component by putting all lugs of direct clutch disc hub together and matching them with groove cut in direct clutch input hub, and at the same time aligning splines in forward clutch hub with inner shaft.

NOTE:

- If measured value is less than standard value, remove forward clutch component and install it again.



G03186954

Fig. 157: Inspecting Height Difference Between Forward Clutch Input Shaft & Transmission Case

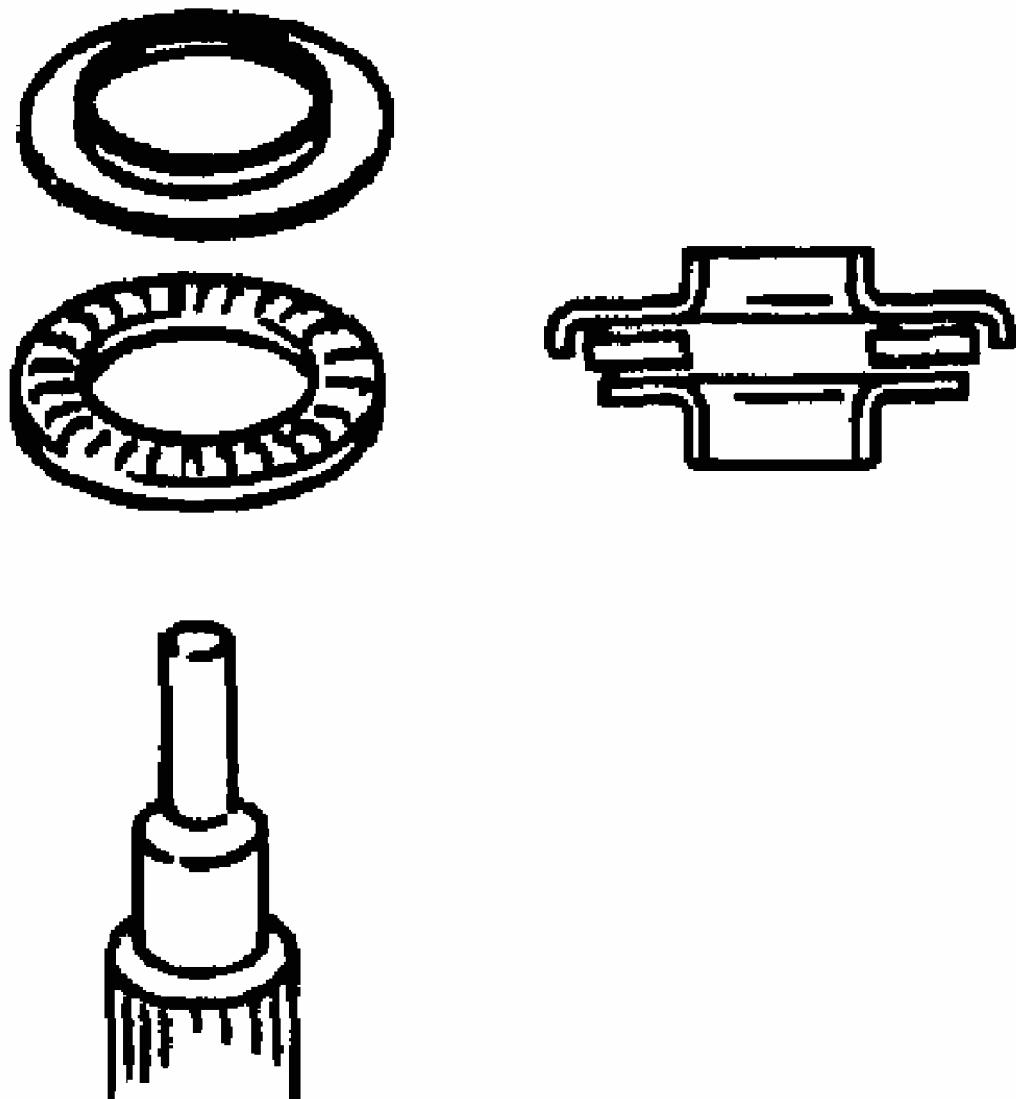
Courtesy of MAZDA MOTORS CORP.

16. When clutch disc and plate have been replaced, inspect height difference between forward clutch input shaft and transmission case by measuring as shown in figure.

Standard Height Difference A

About 3.0 mm {about 0.1 in}

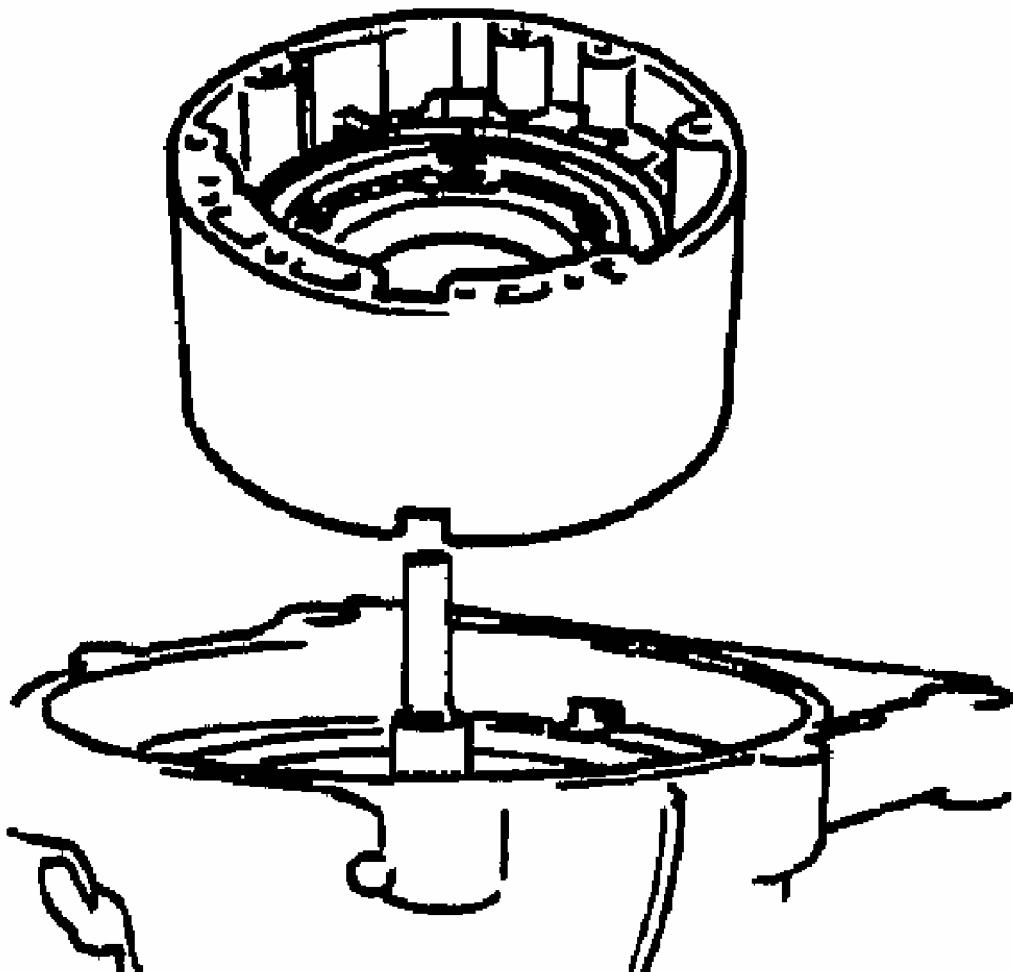
17. Apply petroleum jelly to thrust forward clutch bearing and install it to forward clutch input shaft. Also apply petroleum jelly to thrust rear race and install it to 4GR case.



G03186955

Fig. 158: Installing Thrust Forward Clutch Bearing
Courtesy of MAZDA MOTORS CORP.

18. Install 4GR case by aligning cutouts in 4GR case and transmission case.

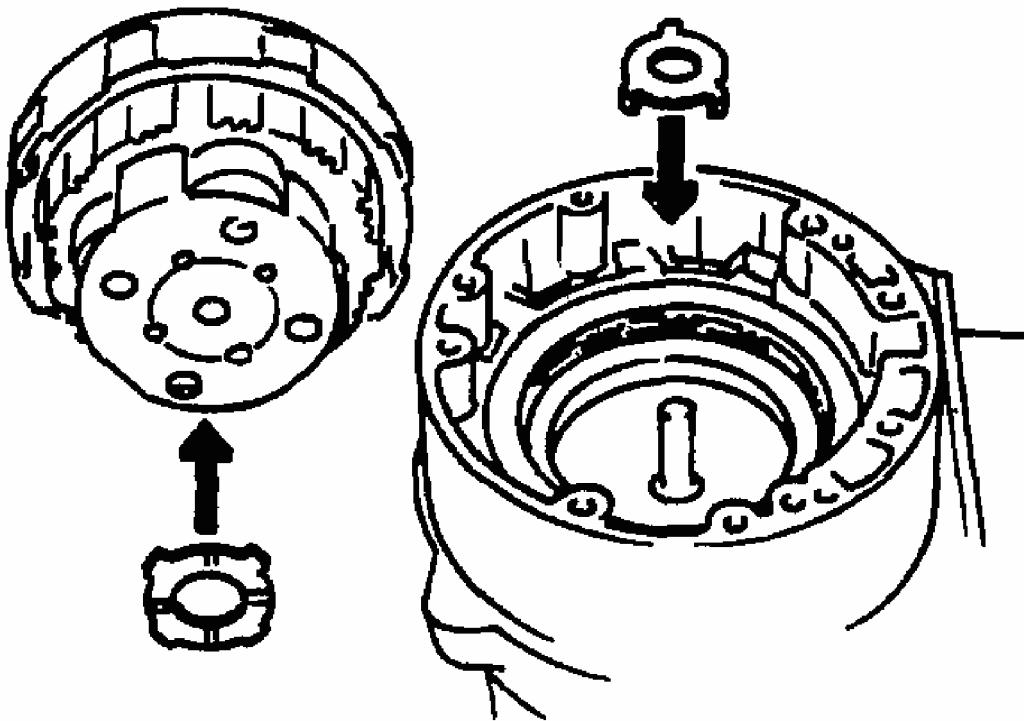


G03186956

Fig. 159: Installing 4GR Case By Aligning Cutout Case By Aligning Cutouts
Courtesy of MAZDA MOTORS CORP.

NOTE:

- Fit claws of thrust planetary rear washer and thrust planetary ring front race into holes securely.
- Use care not to drop thrust planetary rear washer installed to 4GR planetary gear.



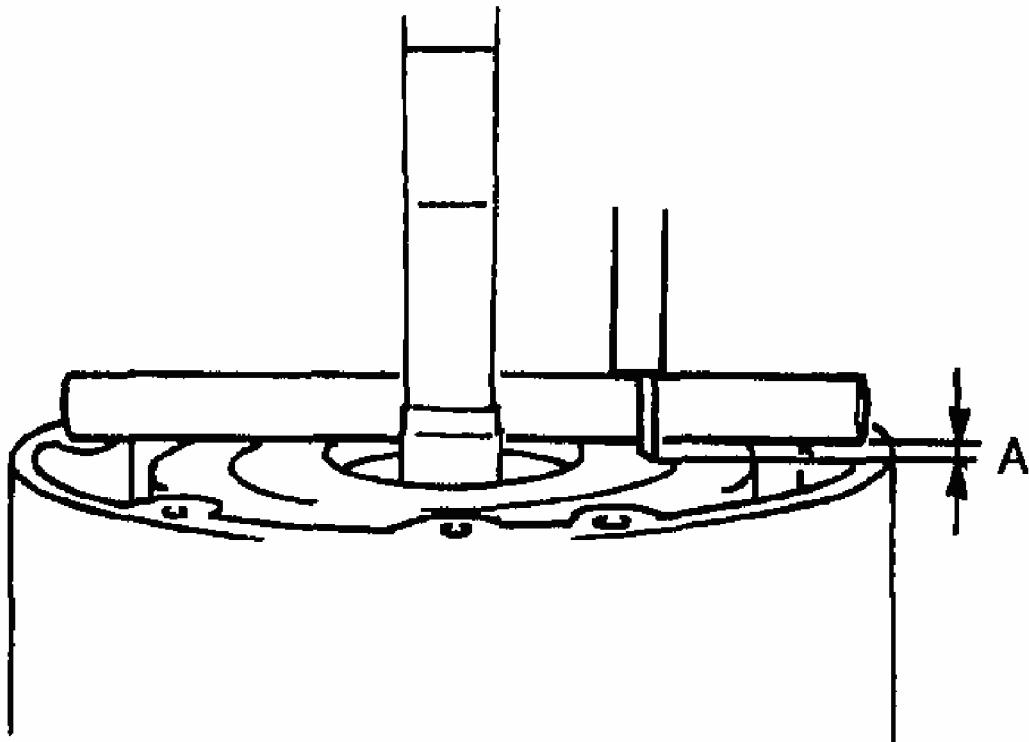
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Fig. 160: Installing Thrust Planetary Rear Washer, Thrust Planetary Ring Front Race & 4GR Input Shaft Component
Courtesy of MAZDA MOTORS CORP.

19. Apply petroleum jelly to thrust planetary rear washer and install it to 4GR planetary gear. Also apply petroleum jelly to thrust planetary ring front race and install it to planetary ring gear and then install 4GR input shaft component to 4GR case.
20. When clutch disc or plate has been replaced, inspect height difference between 4GR case and 4GR clutch cylinder by measuring it as shown in figure.

Standard Height Difference A

About 2.0 mm {0.08 in}



G03186958

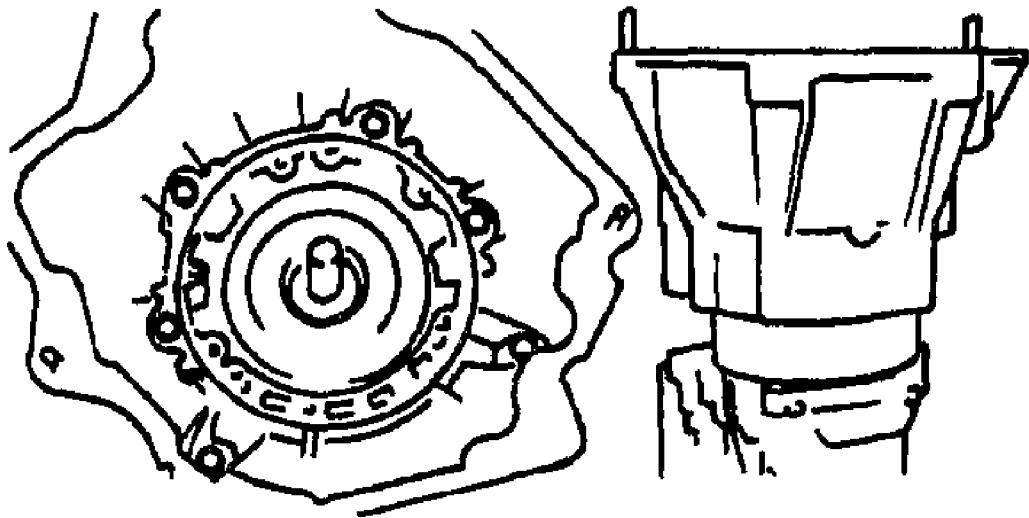
Fig. 161: Inspecting Height Difference Between 4GR Case & 4GR Clutch Cylinder
Courtesy of MAZDA MOTORS CORP.

21. Apply ATF to the new O-ring.
22. Install the O-ring to the 4GR housing.
23. Install the converter housing.

Tightening Torque

A: 33.8 N.m {3.45 kgf.m, 25.0 ft.lbf}

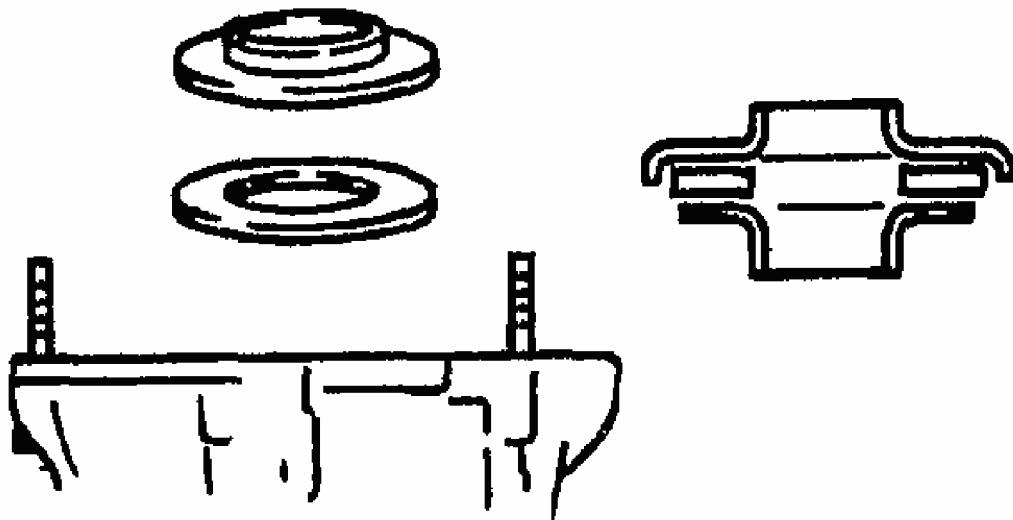
B: 56.9 N.m {5.80 kgf.m, 42.0 ft.lbf}



G03186959

Fig. 162: Installing Converter Housing
Courtesy of MAZDA MOTORS CORP.

24. Apply petroleum jelly to bearing race.
25. Install the bearing race to the 4GR clutch cylinder.



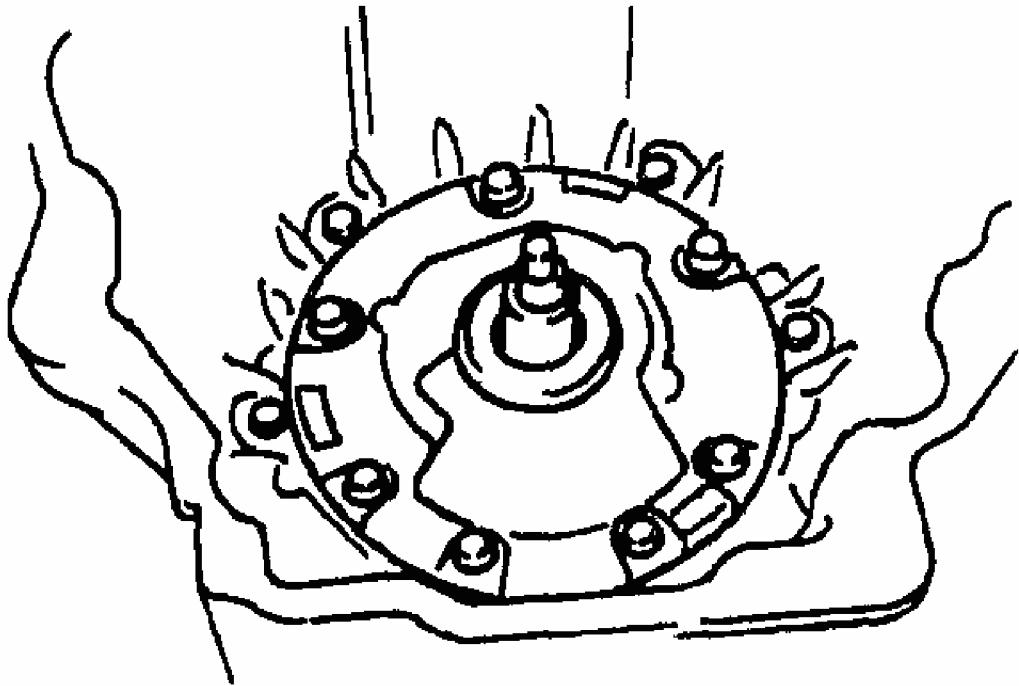
G03186960

Fig. 163: Installing 4GR Clutch Cylinder Bearing Race
Courtesy of MAZDA MOTORS CORP.

26. Apply petroleum jelly to front bearing component.
27. Install the front bearing component to the oil pump.
28. Apply ATF to new O-ring.
29. Install the O-ring to the oil pump component.
30. Install the oil pump component aligning bolt holes in 4GR case with those in transmission case oil pump component.
31. Apply seal packing to oil pump component bolts and tighten them by certain amount of torque each time one after another till specified torque is attained.

Tightening Torque

21.1 N.m {2.15 kgf.m, 15.6 ft.lbf}



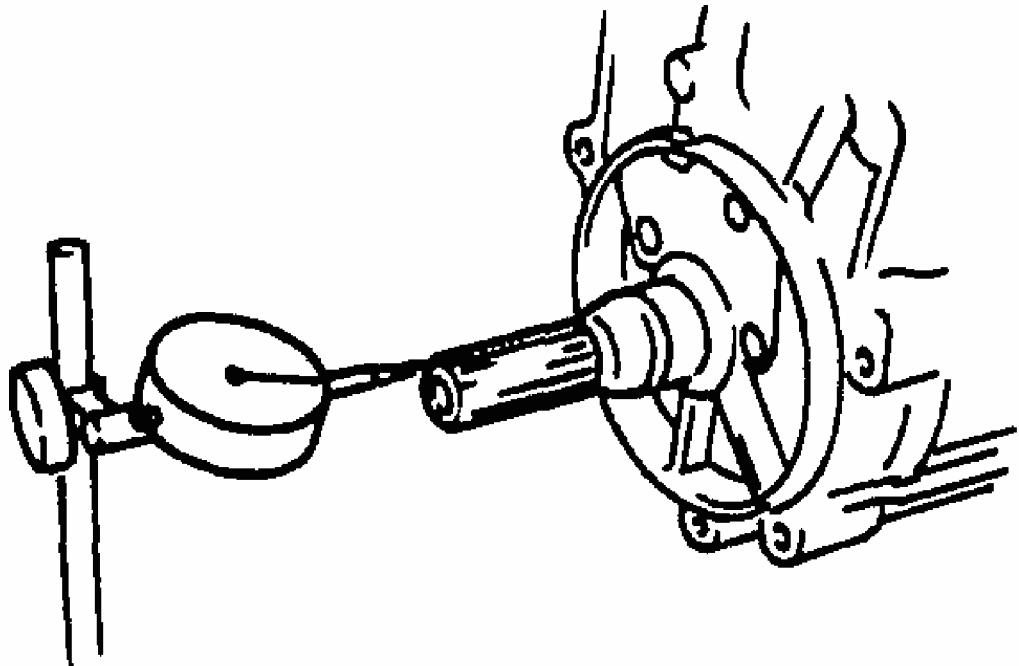
G03186961

Fig. 164: Tightening Oil Pump Bolts
Courtesy of MAZDA MOTORS CORP.

32. Take down transmission from stand and measure clearance in shaft direction by applying dial gauge to output shaft as shown.

Standard Clearance

0.3-0.9 mm {0.012-0.035 in}

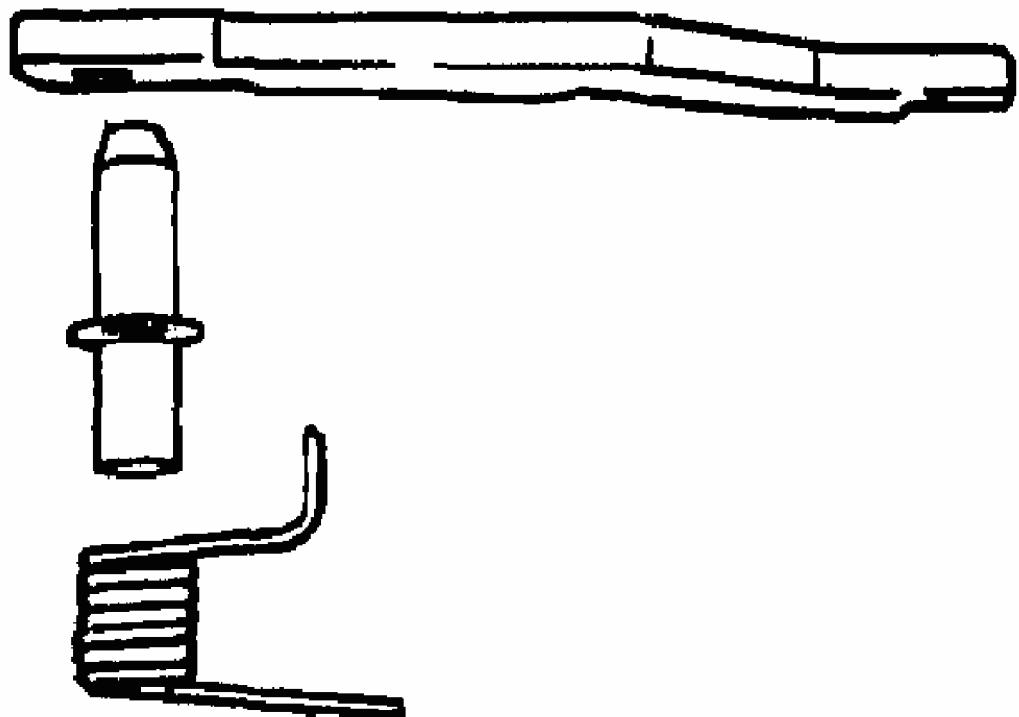


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Fig. 165: Measuring Clearance In Shaft Direction

Courtesy of MAZDA MOTORS CORP.

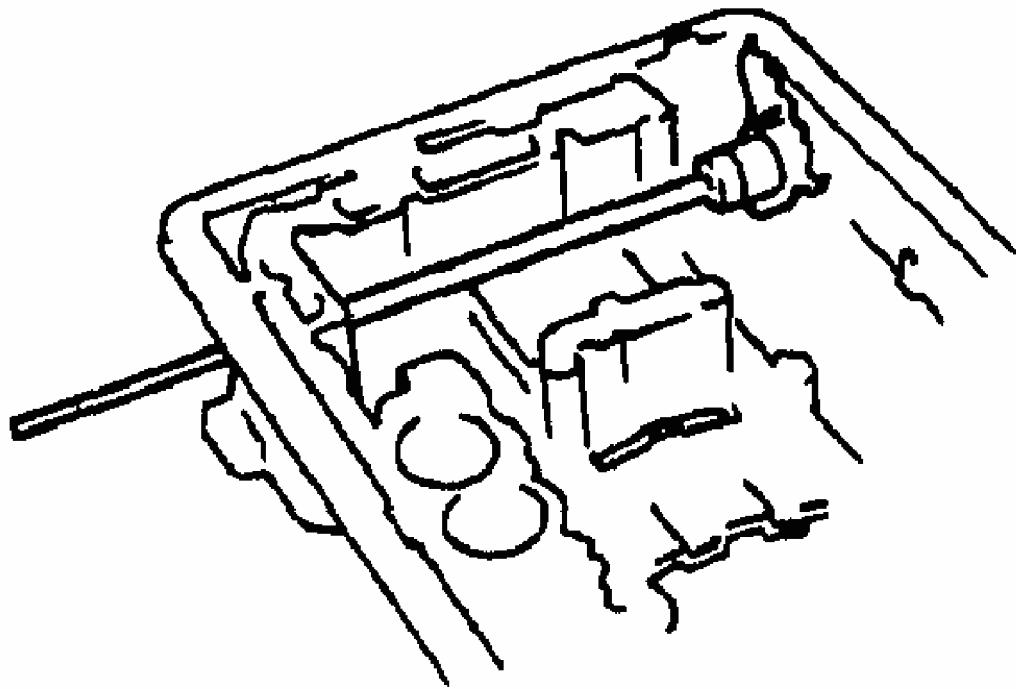
33. Inspect that inner shaft runs smoothly.
34. Install the parking lock pawl, pawl pin, and pawl spring to the transmission case.



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Fig. 166: Installing Parking Lock Pawl, Pawl Pin & Pawl Spring
Courtesy of MAZDA MOTORS CORP.

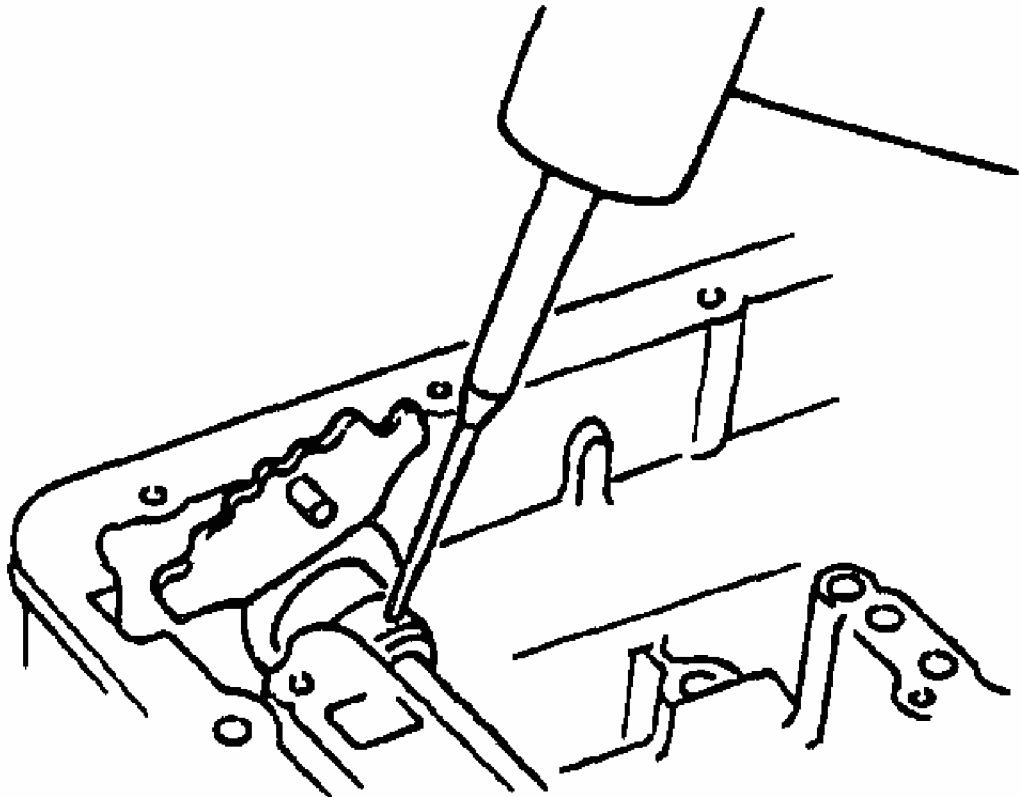
35. After installing new sleeve cover to manual shift lever, install manual shift shaft and manual shift lever to transmission case.



G03186964

Fig. 167: Installing Manual Shift Shaft & Manual Shift Lever
Courtesy of MAZDA MOTORS CORP.

36. Align hole in manual shift shaft with that in manual shift lever and drive in new manual shift lever pin.

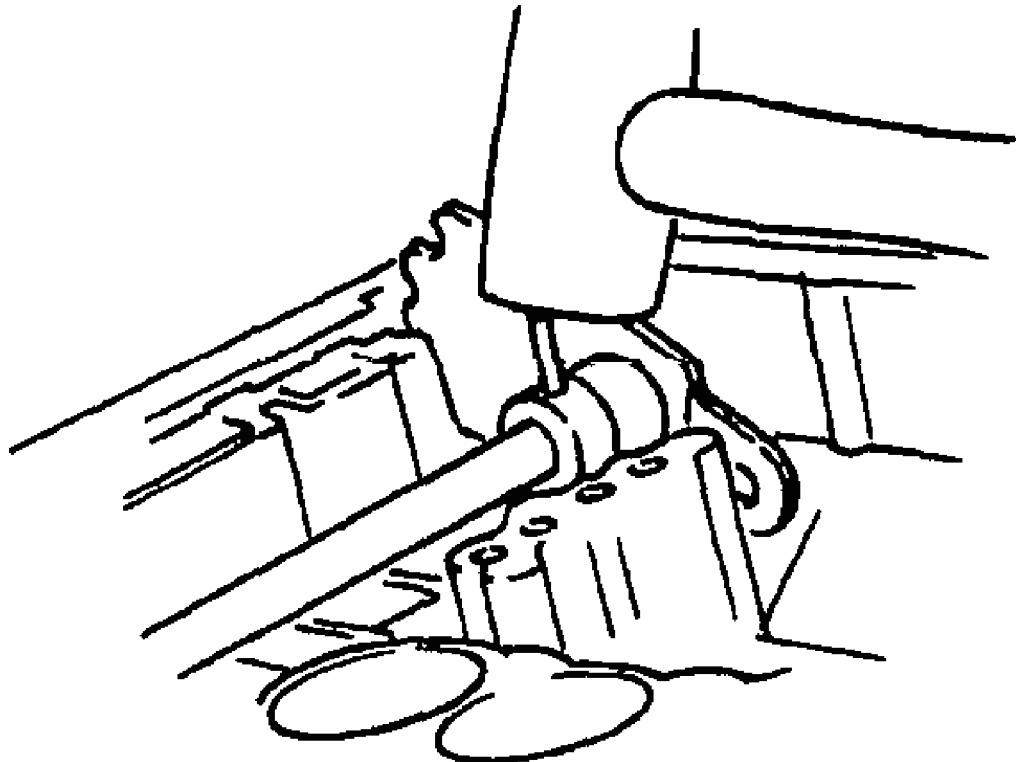


G03186965

Fig. 168: Installing Manual Shift Lever Pin

Courtesy of MAZDA MOTORS CORP.

37. Align hole in sleeve cover with dent in manual shift lever and caulk securely with pin punch. Then verify that manual shift shaft turns smoothly.



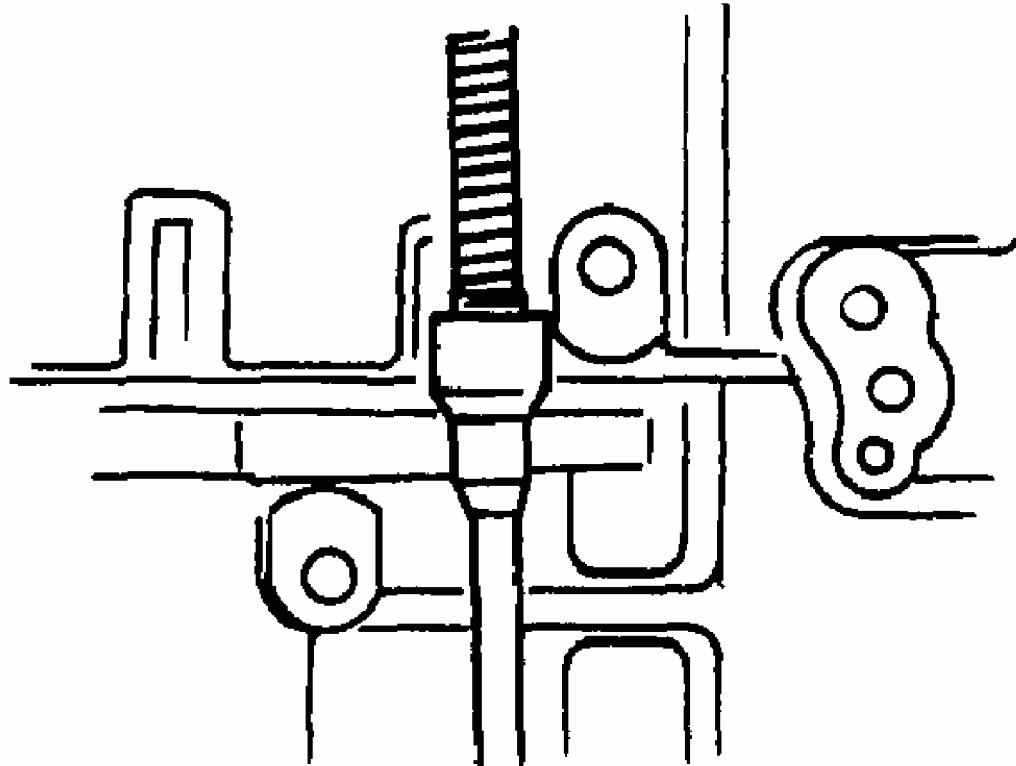
G03186966

Fig. 169: Denting & Caulking Manual Shift Lever
Courtesy of MAZDA MOTORS CORP.

38. With parking lock rod installed to manual shift lever, place parking lock rod on parking lock pawl as shown in figure. Then install pawl bracket and tighten bracket screw to specified torque.

Tightening Torque

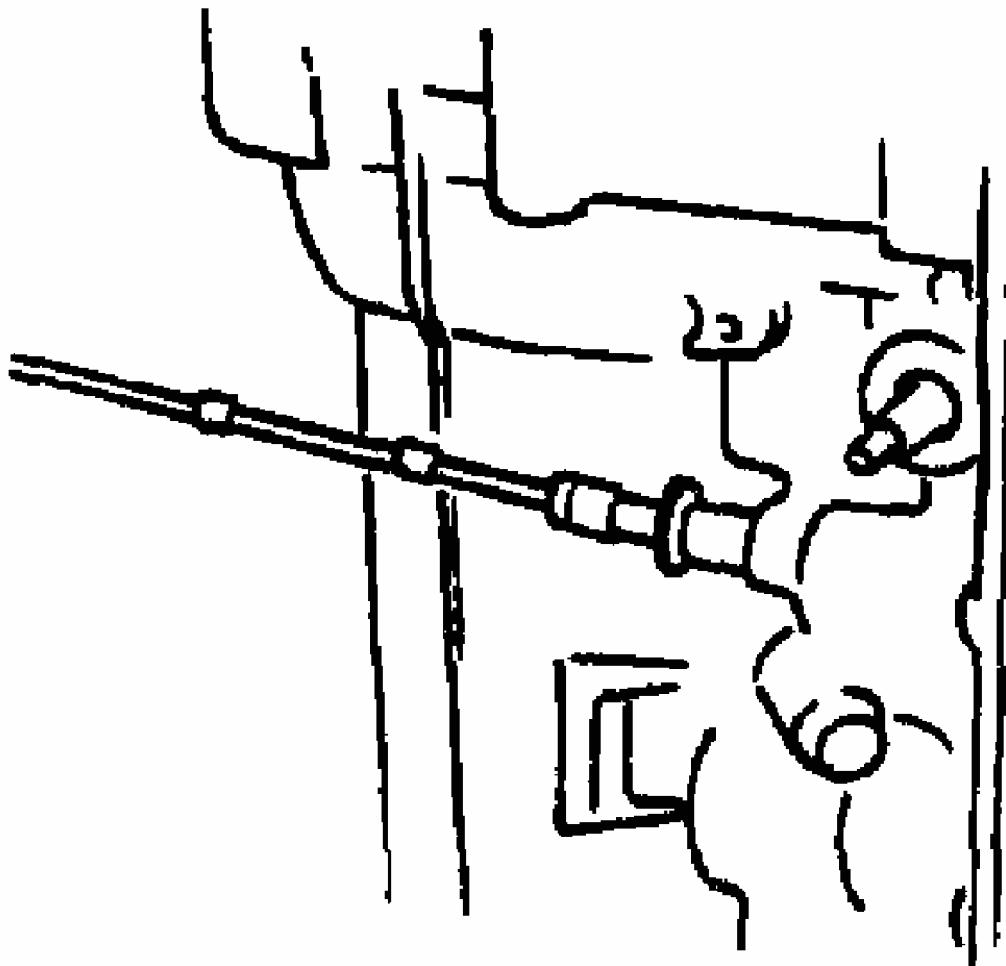
5.9-8.8 N.m {60-90 kgf.cm, 53-78 in.lbf}



G03186967

Fig. 170: Installing Parking Lock Rod & Pawl Bracket
Courtesy of MAZDA MOTORS CORP.

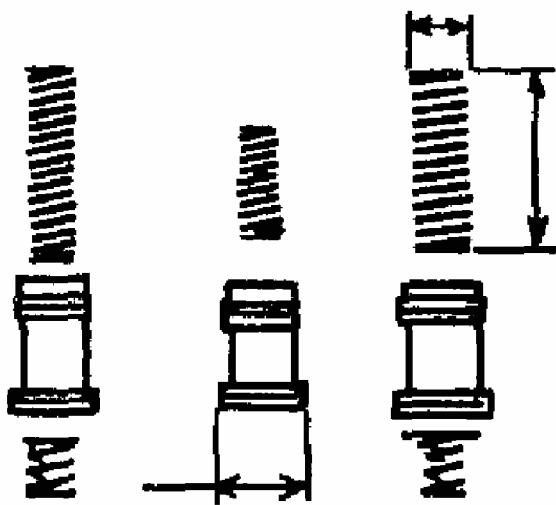
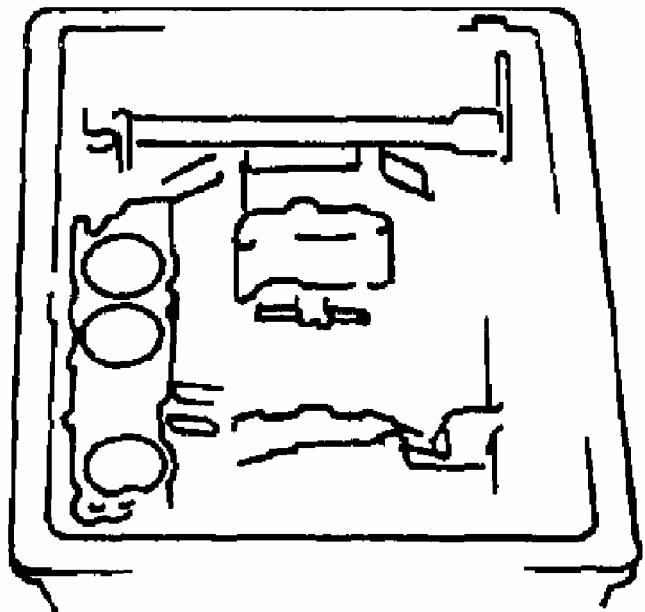
39. Apply ATF to new O-ring.
40. Install the O-ring to the throttle cable.
41. Install the throttle cable to the transmission case.



G03186968

Fig. 171: Installing Throttle Cable
Courtesy of MAZDA MOTORS CORP.

42. Apply ATF to new O-ring.
43. Install the O-ring to the accumulator piston.
44. Install the accumulator piston and spring to the transmission case.



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Fig. 172: Installing Accumulator Pistons & Springs
Courtesy of MAZDA MOTORS CORP.

ACCUMULATOR SPRING SPECIFICATIONS

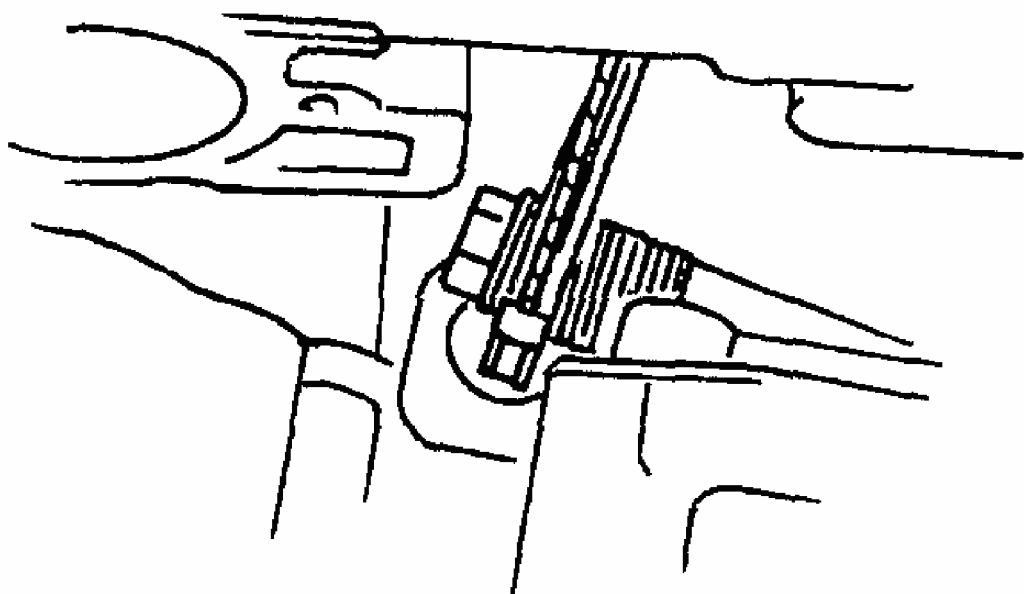
Spring	Outer Diameter - (mm {in})	Free Length - (mm {in})

2003 Mazda MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS Overhaul - SB4A-EL - MX-5 Miata

Upper Direct Clutch Accumulator	14.20 {0.560}	38.00 {1.496}
Forward Clutch Accumulator	17.50 {0.689}	64.68 {2.546}
Upper Second Brake Accumulator	18.79 {0.740}	56.40 {2.220}
Low Second Brake Accumulator	12.80 {0.504}	17.50 {0.689}
Lower Direct Clutch Accumulator	15.50 {0.610}	30.00 {1.181}

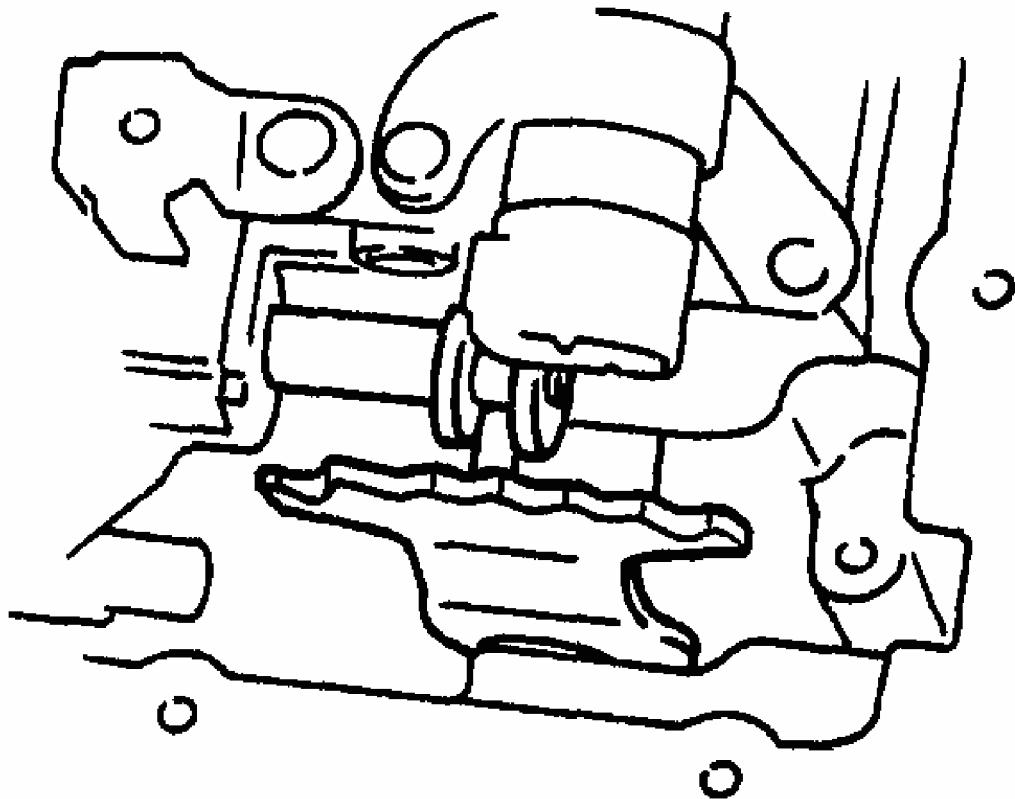
45. Lift the valve body a little and install nipple of throttle cable to throttle valve cam.



G03186970

Fig. 173: Installing Nipple Of Throttle Cable To Throttle Valve Cam
Courtesy of MAZDA MOTORS CORP.

46. After confirming that accumulator piston is pushed all the way down, match pin of manual shaft lever with groove in manual valve.



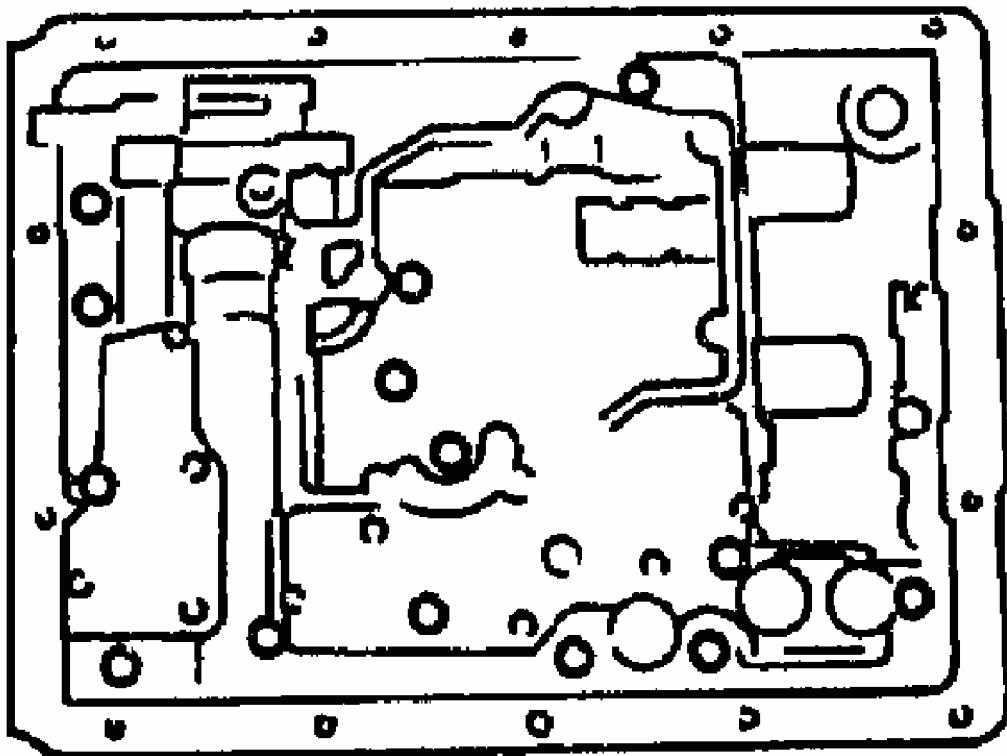
G03186971

Fig. 174: Matching Pin Of Manual Shaft Lever With Groove In Manual Valve
Courtesy of MAZDA MOTORS CORP.

47. Fix valve body by using bolts with each nominal length as indicated in figure and tightening to specified torque.

Tightening Torque

7.9-11.7 N.m {80-120 kgf.cm, 70-104 in.lbf}



G03186972

Fig. 175: Locating Valve Body Bolts
Courtesy of MAZDA MOTORS CORP.

48. Install the new gaskets and oil strainer.

Tightening Torque

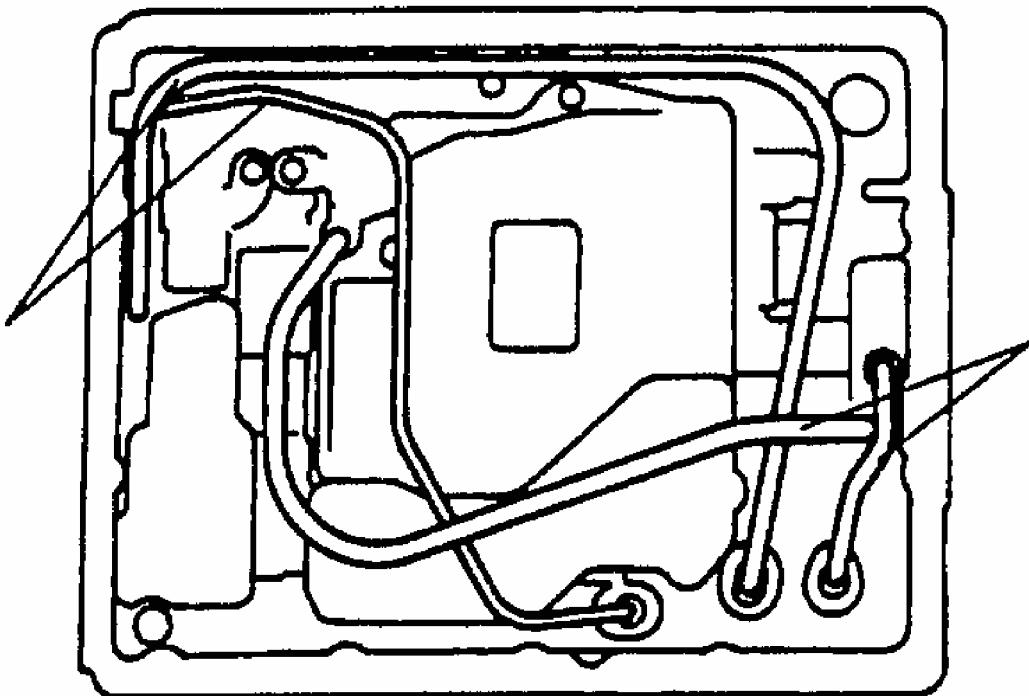
5.0-5.8 N.m {50-60 kgf.cm, 44-52 in.lbf}

49. Apply ATF to new O-ring.
50. Install the O-ring to the transmission wire.
51. Install the transmission wire to the transmission case.

Tightening Torque

5.4 N.m {55 kgf.cm, 48 in.lbf}

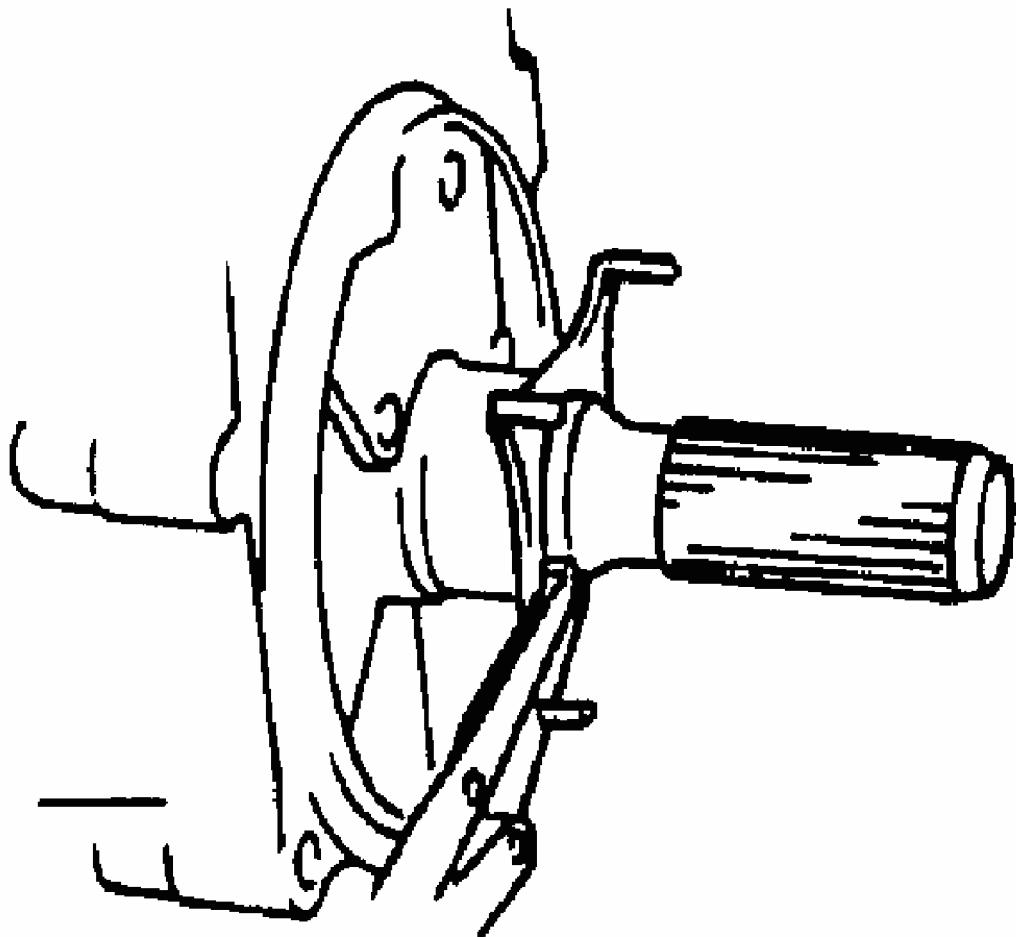
52. Connect the solenoid valve connectors.
53. Install the tubes.



G03186973

Fig. 176: Installing Tubes
Courtesy of MAZDA MOTORS CORP.

54. Install the gasket and oil pan.
55. With wood rough key attached to output shaft, install rotor sensor by aligning its key groove with wood rough key and install retaining ring.



G03186974

Fig. 177: Installing Rotor Sensor
Courtesy of MAZDA MOTORS CORP.

56. Install the new gasket and extension housing to the transmission case.

Tightening Torque

36.3 N.m {3.70 kgf.m, 26.8 ft.lbf}

57. Install the breather hose.
58. Apply ATF to the O-ring.
59. Install the new O-ring to the input/turbine speed sensor.
60. Install the input/turbine speed sensor to the transmission case.

Tightening Torque

5.8-8.8 N.m {59-90 kgf.cm, 52-78 in.lbf}

61. Apply ATF to the O-ring.
62. Install the O-ring to the output speed sensor.
63. Install the output speed sensor to the transmission case.

Tightening Torque

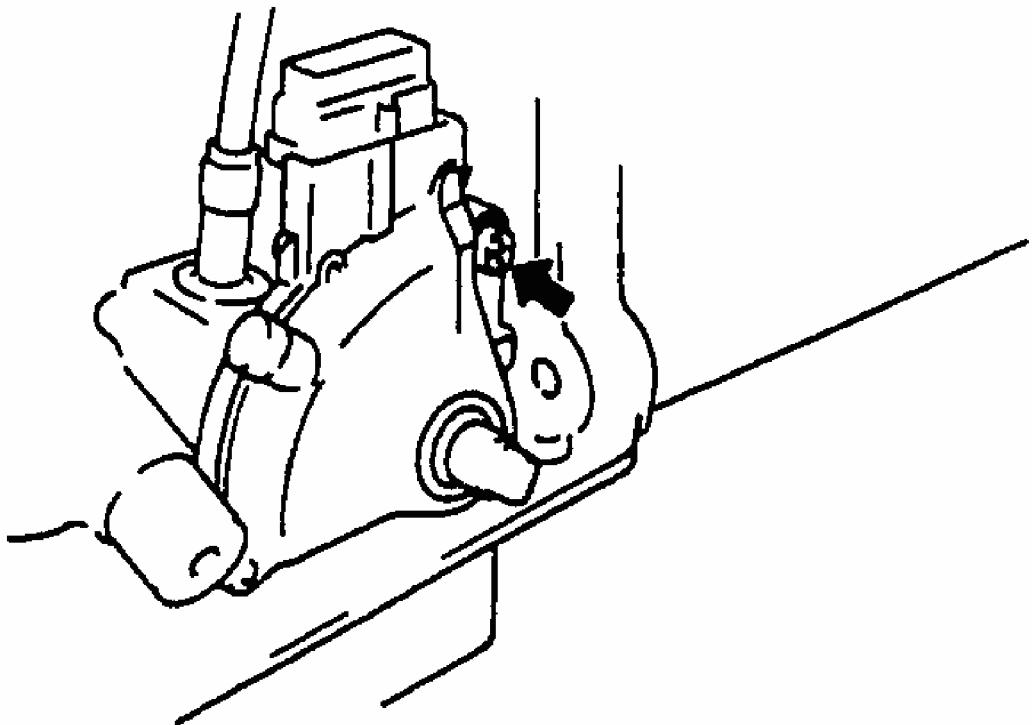
4.0-6.8 N.m {40-70 kgf.cm, 35-60 in.lbf}

64. Apply ATF to the O-ring.
65. Install the O-ring to the elbow.
66. Install the elbow to the transmission case.
67. Install the lock bolt.

Tightening Torque

25 N.m {2.5 kgf.m, 18 ft.lbf}

68. Install the transmission range switch.
69. Hand-tighten the transmission range switch bolt.



G03186975

Fig. 178: Installing Transmission Range Switch

Courtesy of MAZDA MOTORS CORP.

70. Install the new packing.
71. Install the new lock washer.

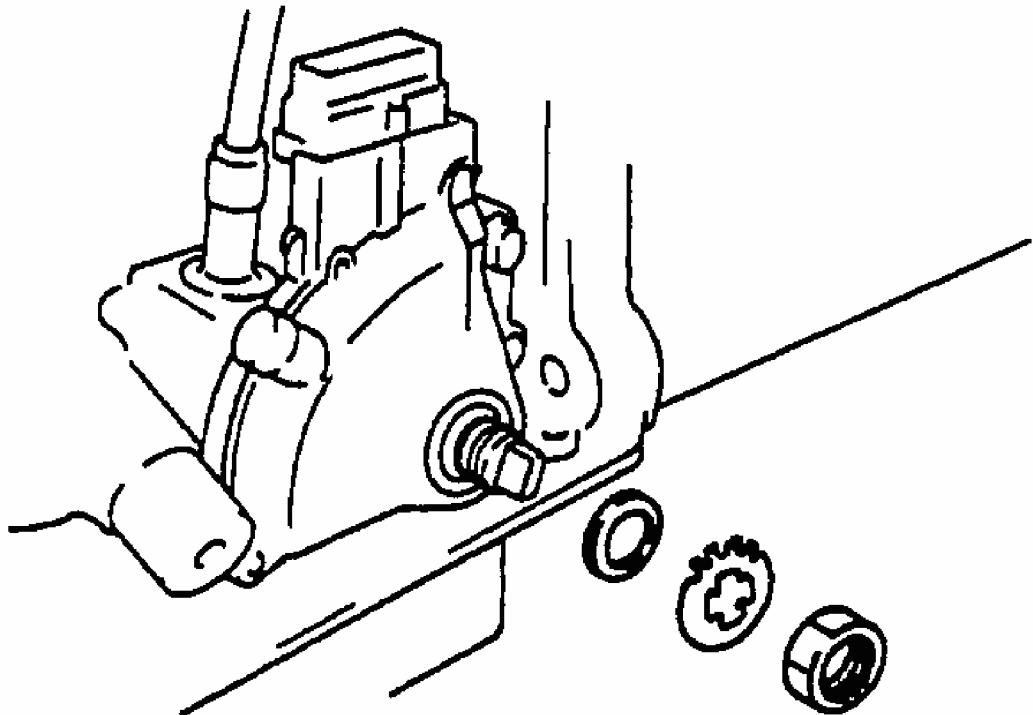


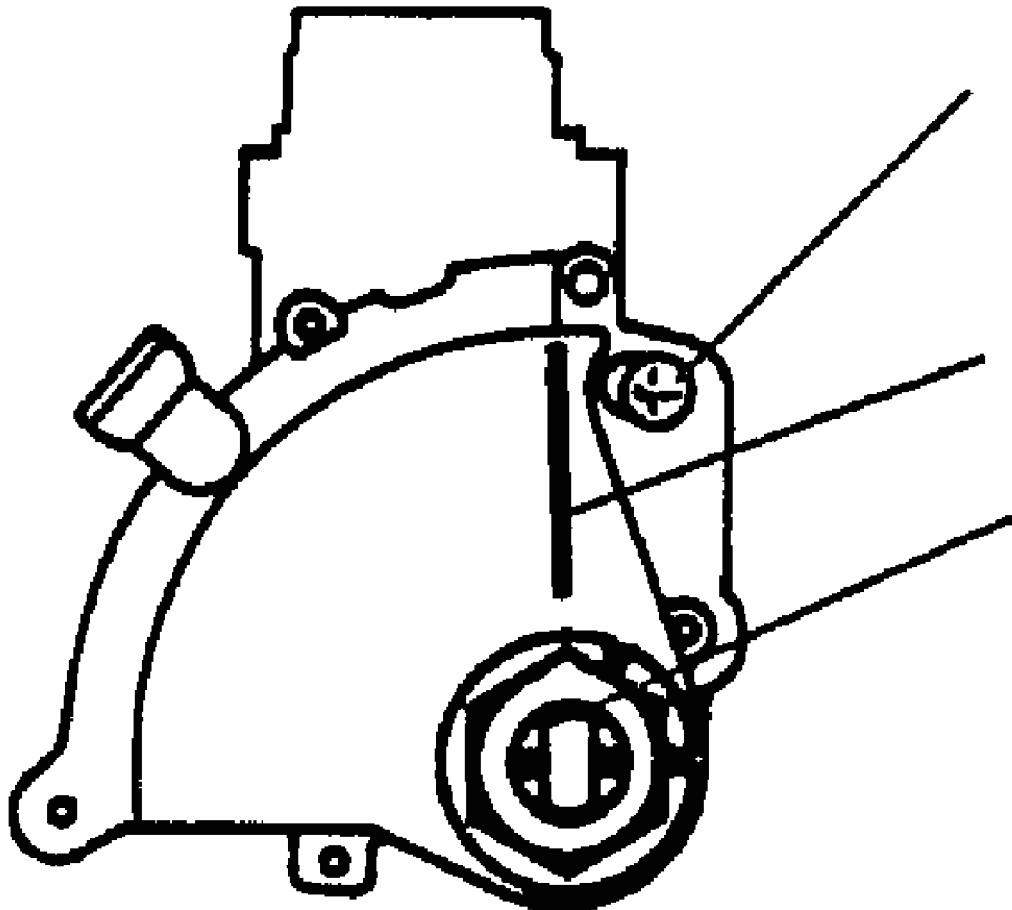
Fig. 179: Installing Packing, Lock Washer & Nut
Courtesy of MAZDA MOTORS CORP.

72. Tighten the nut.

Tightening Torque

3.9 N.m {40 kgf.cm, 35 in.lbf}

73. Bend claws of lock washer.
74. Rotate the manual shaft to the N position.
75. With neutral reference line and cut groove in switch aligned.



G03186977

Fig. 180: Aligning Neutral Reference Line & Cut Groove In Switch
Courtesy of MAZDA MOTORS CORP.

76. Tighten the transmission range switch mounting bolt.

Tightening Torque

4.0-6.8 N.m {40-70 kgf.cm, 35-60 in.lbf}

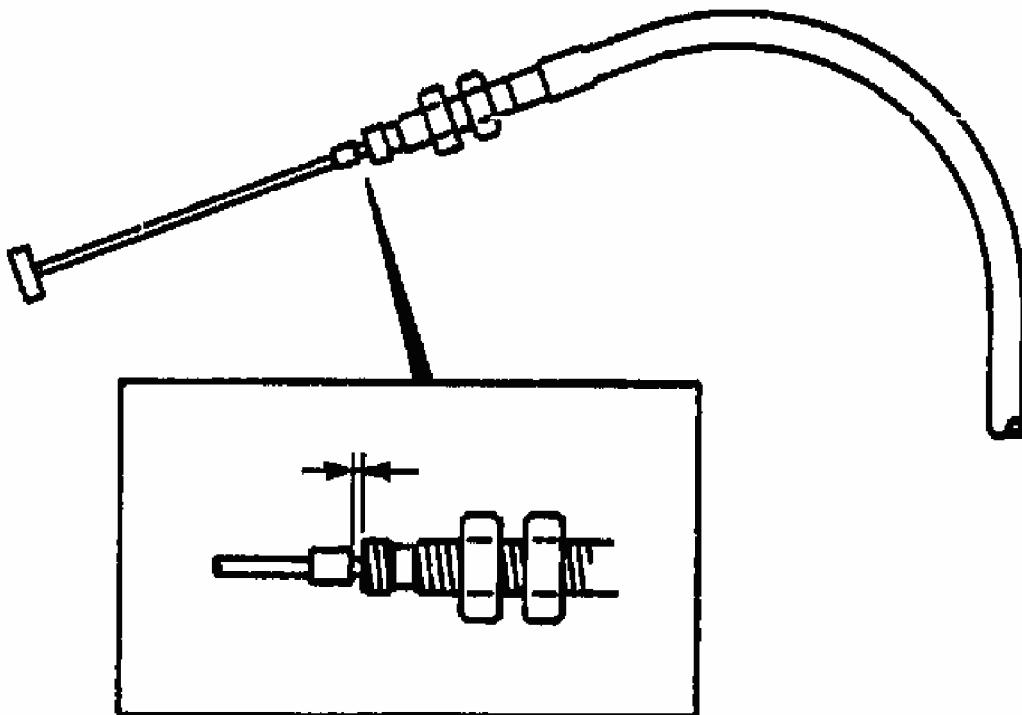
77. Install the transmission control lever.

NOTE:

- Step 78 is for throttle cable replacement only.

78. With throttle cable installed to the throttle cam, bend near the center of throttle cable to

a radius of **200 mm {7.87 in}**. Then, pull the throttle cable until there is no play or just before the throttle cam starts to move, and stake the adjustment mark at the position shown in the figure.



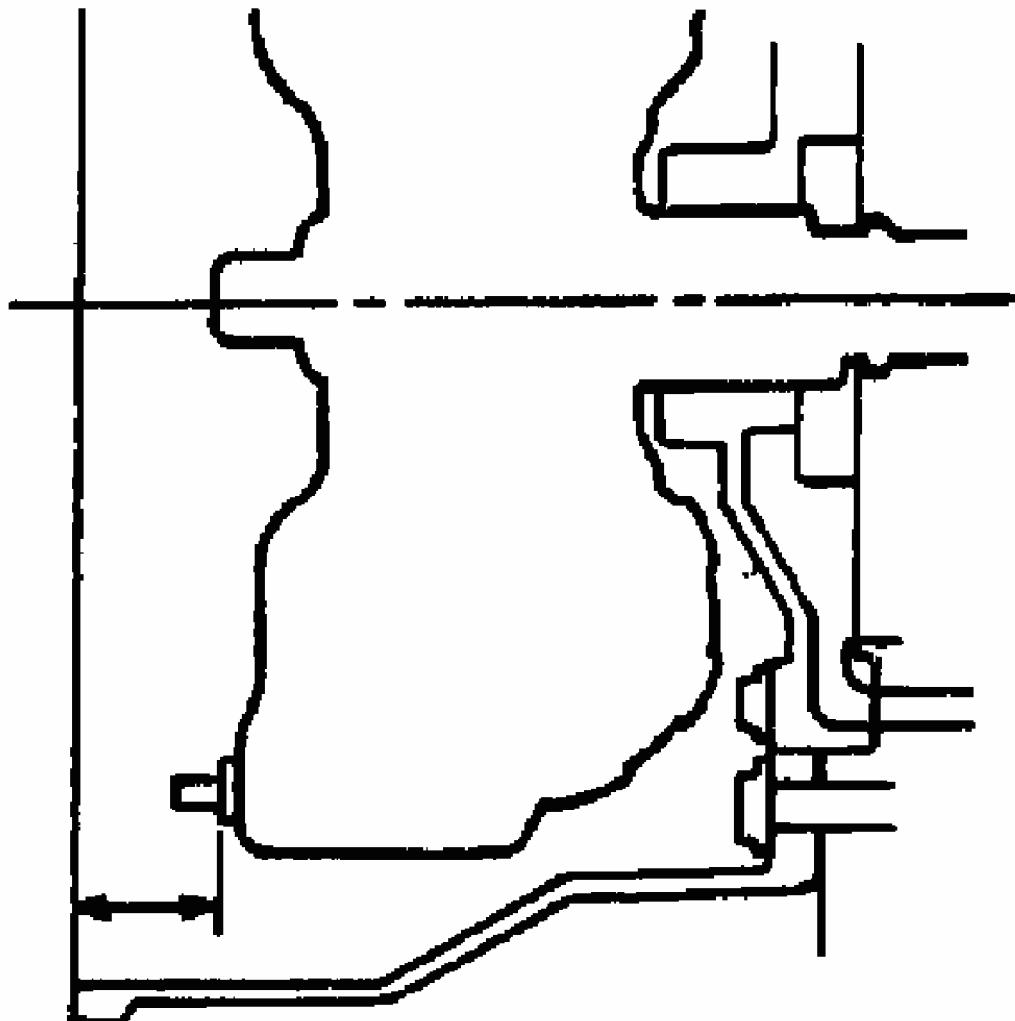
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Fig. 181: Staking Throttle Cable Adjustment Mark
Courtesy of MAZDA MOTORS CORP.

79. Install the throttle cable cramp.
80. Install the torque converter.
81. To ensure that the torque converter is installed accurately, measure distance A between the end of the torque converter and the face of the converter housing.

Distance A

22.7 mm {0.88 in}



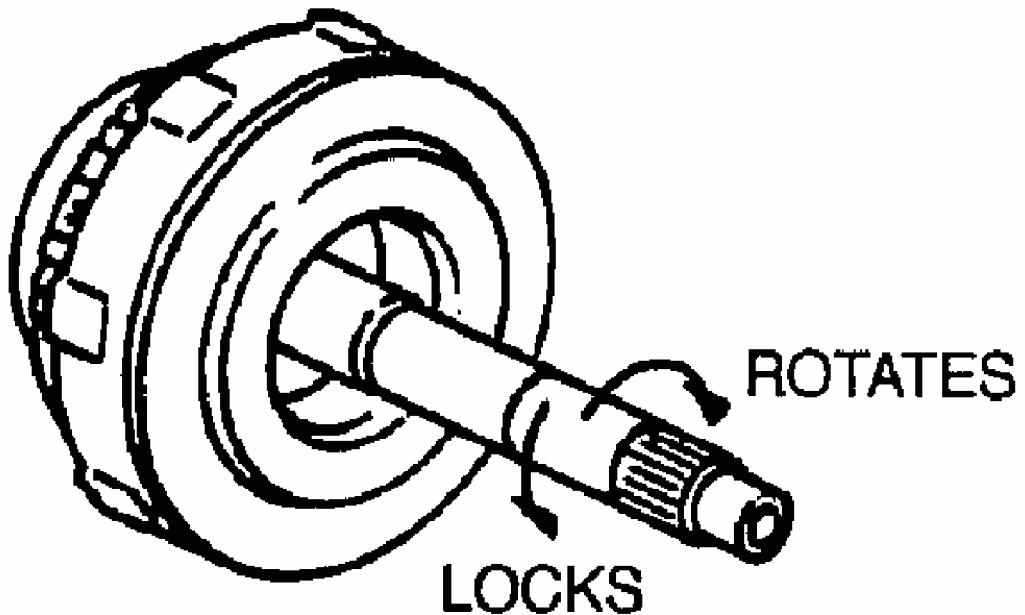
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Fig. 182: Measuring Distance A Between End Of Torque Converter & Face Of Converter Housing
Courtesy of MAZDA MOTORS CORP.

AUTOMATIC TRANSMISSION INSPECTION

4GR Input Shaft And 4GR Clutch Preinspection One-Way Clutch Operation

1. While holding the 4GR clutch drum, verify that the input shaft rotates smoothly when turned clockwise and locks when turned counterclockwise.



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Fig. 183: Verifying Input Shaft Rotation
Courtesy of MAZDA MOTORS CORP.

2. If not as specified, replace the 4GR input shaft and 4GR clutch component. (Refer to **4GR INPUT SHAFT AND 4GR CLUTCH DISASSEMBLY/ASSEMBLY** .)

Clutch Operation

CAUTION: • Applying compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the seal. Do not apply compressed air for more than the aforementioned time when testing the system.

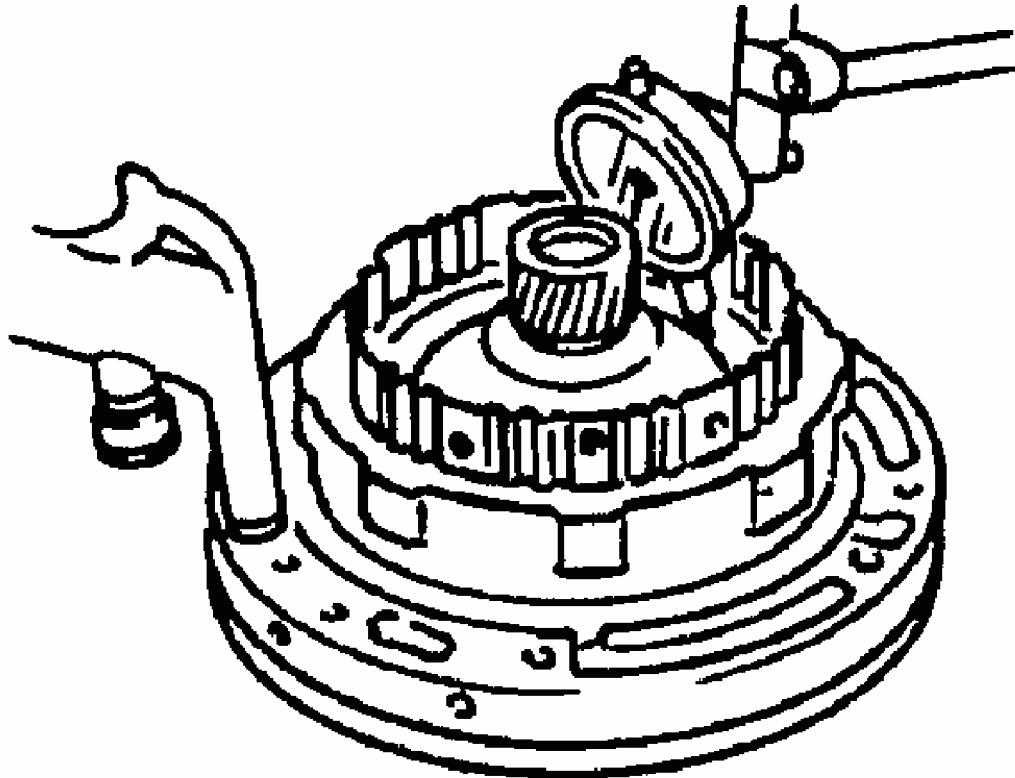
1. Remove the 4GR planetary gear component.
2. Using a dial indicator, measure the 4GR clutch piston stroke applying and releasing the compressed air as shown.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.

Piston Stroke

1.77-2.58 mm {0.07-0.101 in}



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Fig. 184: Measuring 4GR Clutch Piston Stroke
Courtesy of MAZDA MOTORS CORP.

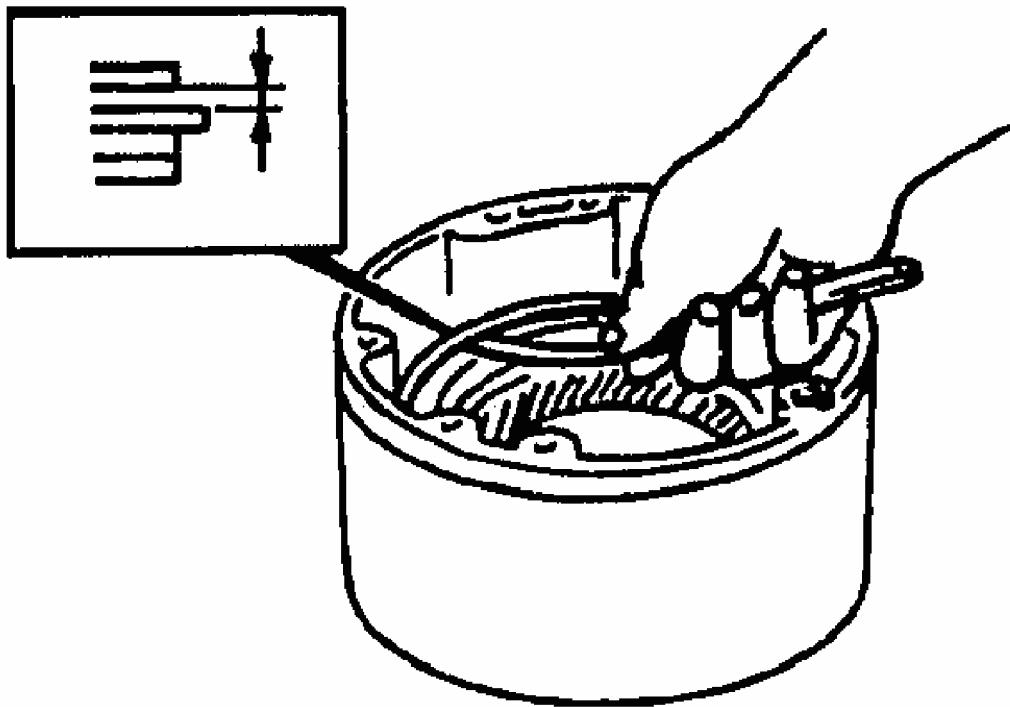
3. If not as specified, replace parts as necessary. (Refer to **4GR INPUT SHAFT AND 4GR CLUTCH DISASSEMBLY/ASSEMBLY**.)

4GR CASE AND 4GR BRAKE PREINSPECTION CLUTCH CLEARANCE

1. Measure the clearance.

Standard Clearance

0.56-1.62 mm {0.03-0.06 in}



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Fig. 185: Measuring 4GR Case & 4GR Brake Clutch Clearance
Courtesy of MAZDA MOTORS CORP.

2. If not as specified, replace parts as necessary. (Refer to **4GR CASE AND 4GR BRAKE DISASSEMBLY/ASSEMBLY**.)

FORWARD CLUTCH PREINSPECTION

Clutch Clearance

CAUTION: • Applying compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the seal. Do not apply compressed air for more than the aforementioned time when testing the system.

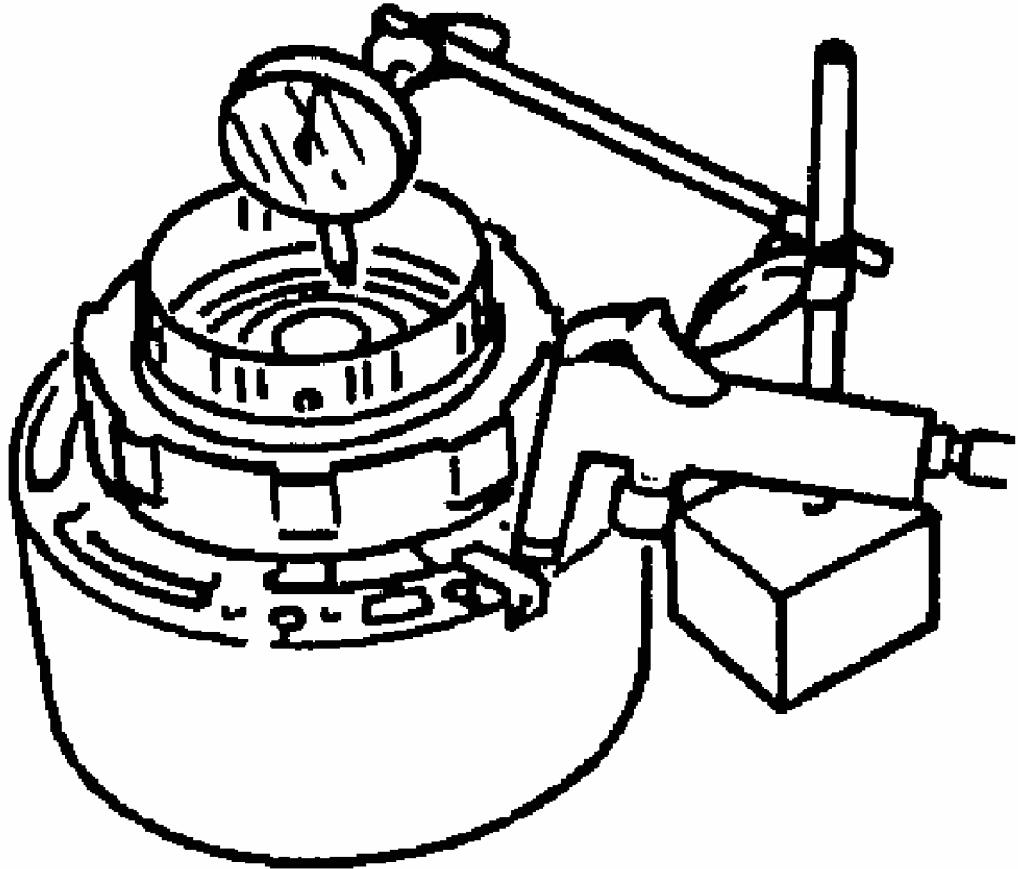
1. Install the forward clutch to the 4GR case.
2. Using a dial indicator, measure the forward clutch piston stroke applying and releasing the compressed air as shown.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.

Stroke

1.40-1.60 mm {0.056-0.062 in}



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Fig. 186: Measuring Forward Clutch Piston Stroke
Courtesy of MAZDA MOTORS CORP.

3. If not as specified, replace parts as necessary. (Refer to **FORWARD CLUTCH DISASSEMBLY/ASSEMBLY.**)

Direct Clutch Preinspection

Clutch Clearance

CAUTION:

- Applying compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the seal. Do not apply compressed air for more than the aforementioned time when testing the system.

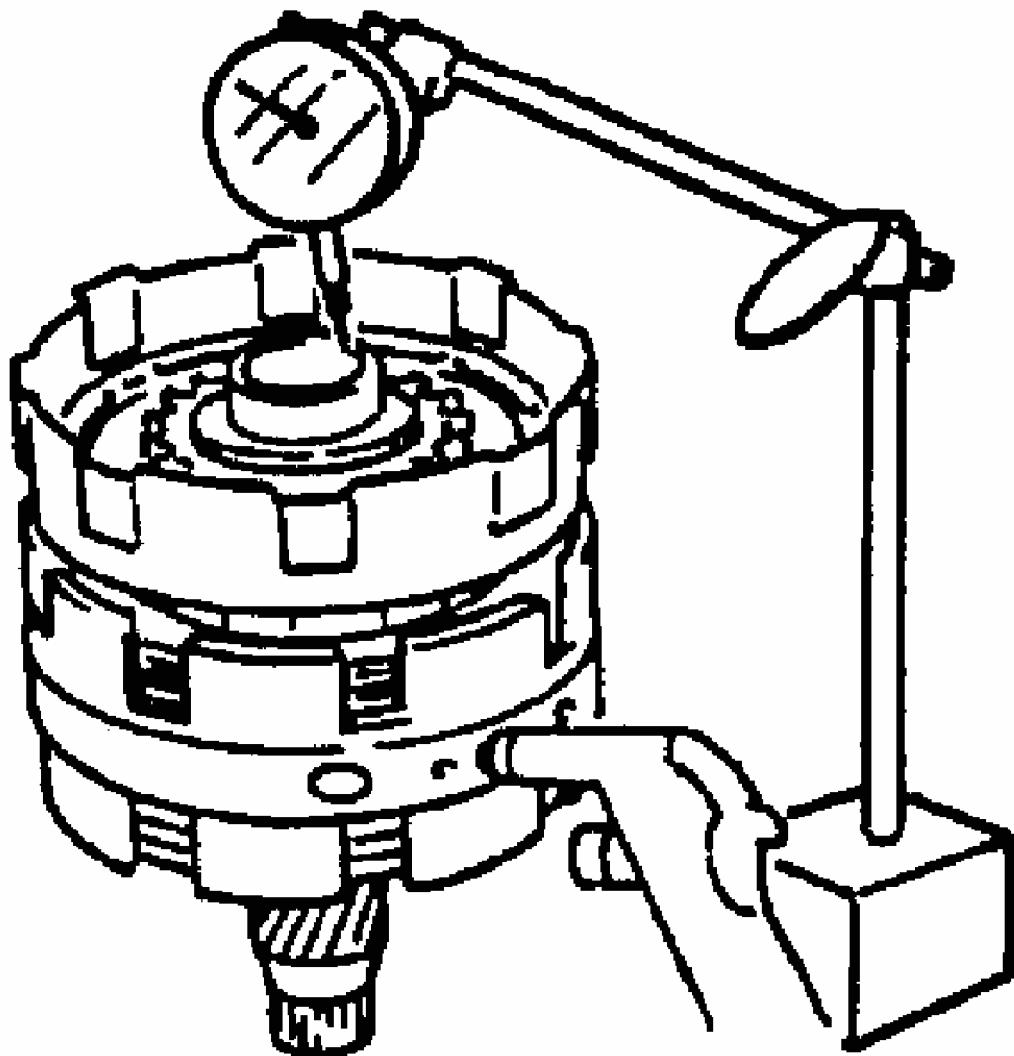
1. Install the direct clutch component to the center support.
2. Using a dial indicator, measure the direct clutch piston stroke applying and releasing the compressed air as shown.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.

Piston Stroke

1.06-1.64 mm {0.04-0.06 in}



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Fig. 187: Measuring Direct Clutch Piston Stroke
Courtesy of MAZDA MOTORS CORP.

3. If not as specified, replace parts as necessary. (Refer to **DIRECT CLUTCH DISASSEMBLY/ASSEMBLY**.)

Center Support Component (Front Brake, Rear Brake, And Front One-Way Clutch) Preinspection Clutch Clearance

CAUTION: • Applying compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the

seal. Do not apply compressed air for more than the aforementioned time when testing the system.

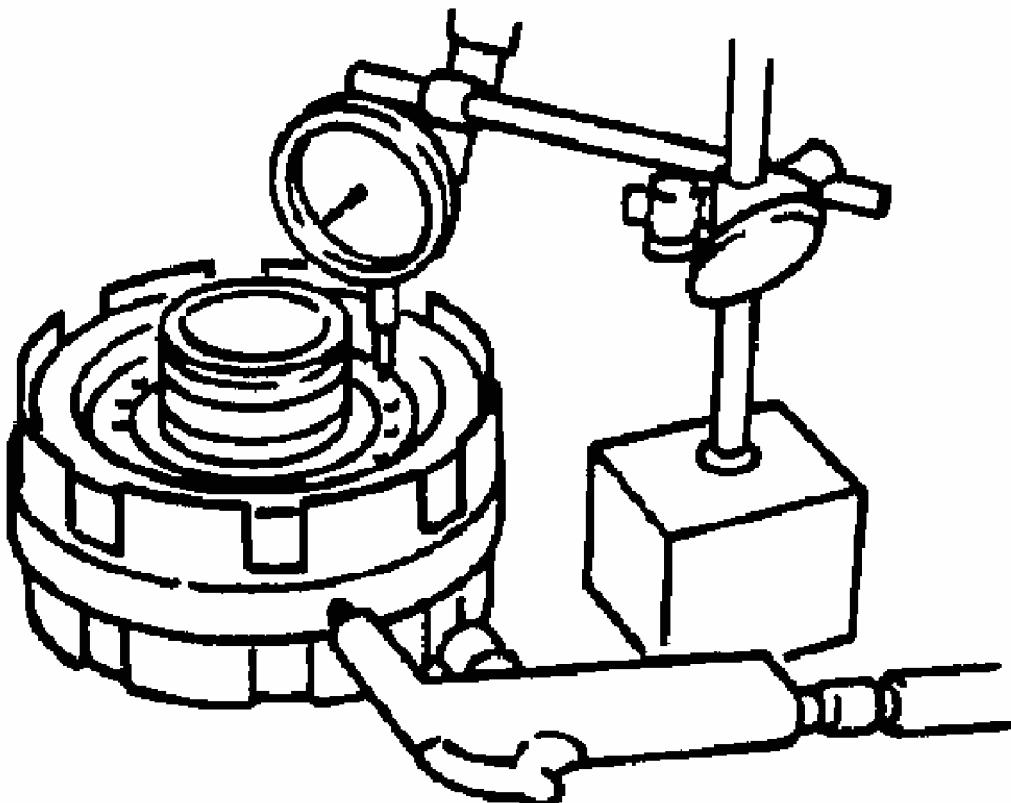
1. Using a dial indicator, measure the front clutch piston stroke applying and releasing the compressed air as shown.

Air Pressure

390 kPa {4.0 kgf/cm², 57 psi} max.

Piston Stroke

0.78-1.32 mm {0.04-0.05 in}



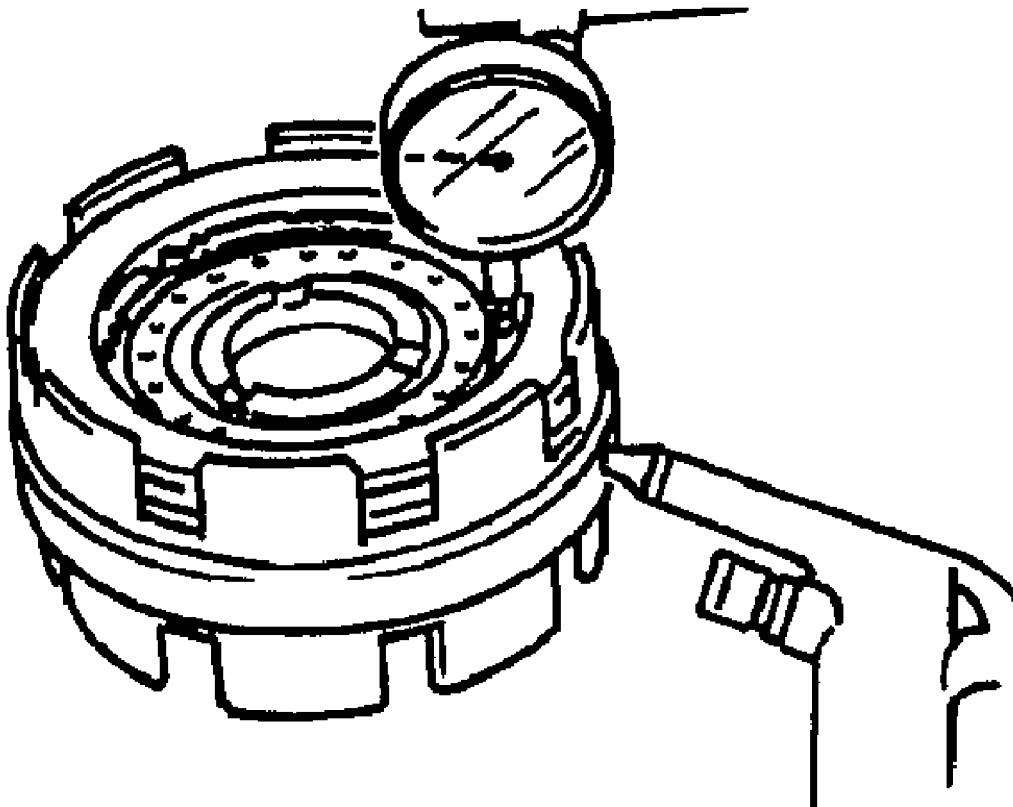
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Fig. 188: Measuring Front Clutch Piston Stroke
Courtesy of MAZDA MOTORS CORP.

2. If not within the specification, replace the drive plate. (Refer to **CENTER SUPPORT**

COMPONENT (FRONT BRAKE, REAR BRAKE, AND FRONT ONE-WAY CLUTCH) DISASSEMBLY/ASSEMBLY .**CAUTION:**

- Applying compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the seal. Do not apply compressed air for more than the aforementioned time when testing the system.



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Fig. 189: Measuring Rear Clutch Piston Stroke
Courtesy of MAZDA MOTORS CORP.

3. Using a dial indicator, measure the rear clutch piston stroke applying and releasing the compressed air as shown.

Air Pressure

390 kPa {4.0 kgf/cm² , 57 psi} max.

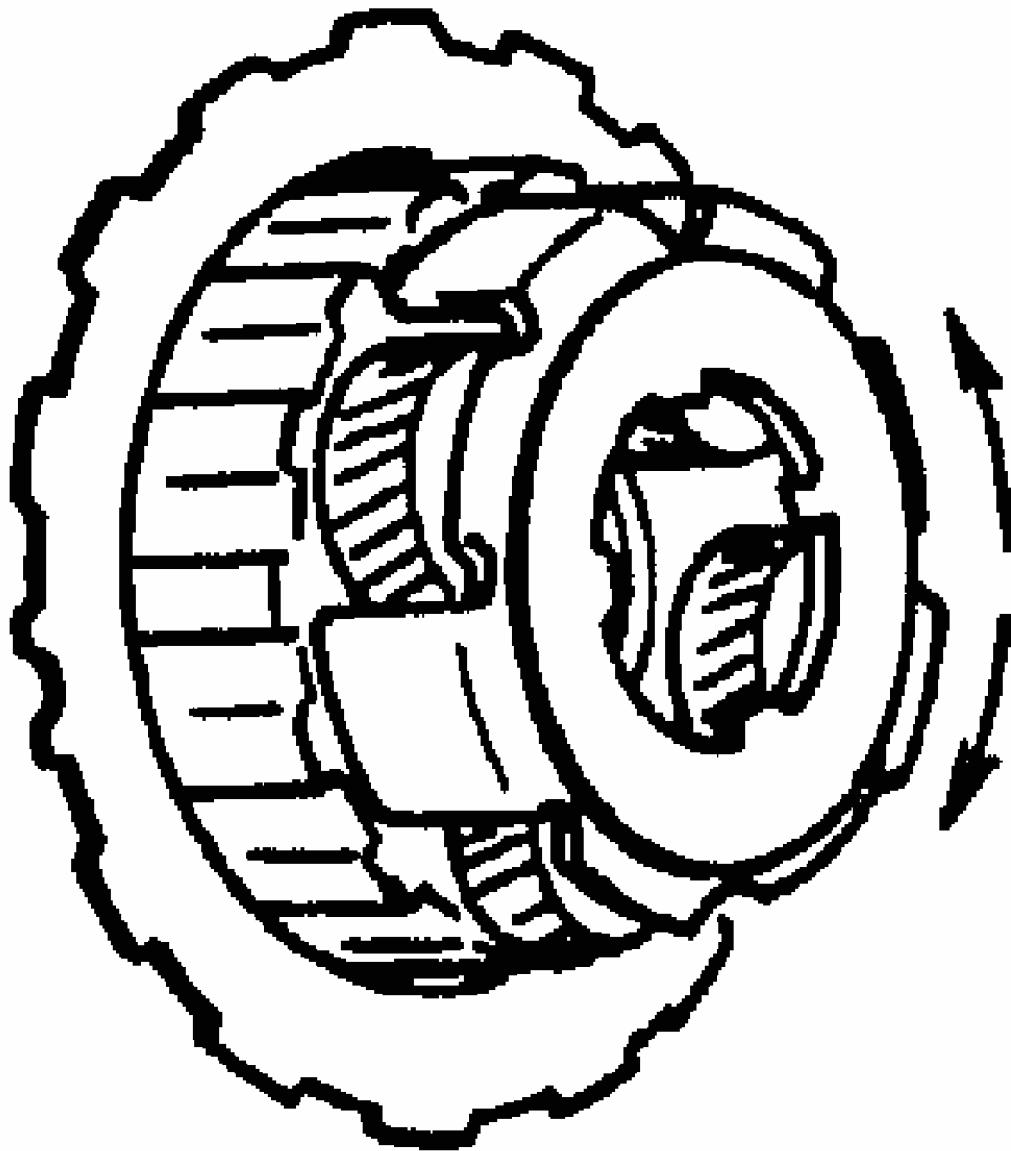
Piston Stroke

1.03-1.65 mm {0.05-0.06 in}

4. If not within the specification, replace the drive plate. (Refer to **CENTER SUPPORT COMPONENT (FRONT BRAKE, REAR BRAKE, AND FRONT ONE-WAY CLUTCH) DISASSEMBLY/ASSEMBLY** .)

Planetary Gear And Output Shaft (Rear One-Way Clutch And Low And Reverse Brake) Preinspection One-Way Clutch Operation

1. Install reverse brake reaction plate to front planetary gear. With reverse brake reaction plate fixed stationary, turn front planetary gear clockwise to inspect that it locks and then counterclockwise to inspect that it turns smoothly.



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Fig. 190: Verifying Front Planetary Gear Rotation
Courtesy of MAZDA MOTORS CORP.

2. If not as specified, replace the one-way clutch. (Refer to **PLANETARY GEAR AND OUTPUT SHAFT (REAR ONE-WAY CLUTCH AND LOW AND REVERSE BRAKE) DISASSEMBLY/ASSEMBLY.**)

TORQUE SPECIFICATIONS

2003 Mazda MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS Overhaul - SB4A-EL - MX-5 Miata

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Center Support-To-Case Bolt	18-20 (24-27)
Extension Housing-To-Case Bolt	26.8 (36.3)
Oil Pump-To-Case Bolt	15.6 (21.1)
Transmission Case-To-Converter Housing Bolt	
Bolt A	25 (33.8)
Bolt B	42 (56.9)
INCH Lbs. (N.m)	
1-2 & 2-3 Shift Valve Cover Plate Bolt	43-52 (4.9-5.8)
Detent Spring Bolt	44-52 (5.0-5.8)
Front Valve End Cover Bolt	43-52 (4.9-5.8)
Lower Valve Body Inside Bolt	44-52 (5.0-5.8)
Lower Valve Body Plate Bolt	44-52 (5.0-5.8)
Manual Shaft Body (Valve Body) Bolt	70-104 (7.9-11.7)
Oil Pump Housing Bolt	53-78 (5.9-8.8)
Oil Strainer Bolt	44-52 (5.0-5.8)
Output Speed Sensor Bolt	35-60 (4.0-6.8)
Pawl Bracket Screw	53-78 (5.9-8.8)
Pressure Relief Valve Retainer Bolt	44-52 (5.0-5.8)
Shift Solenoid A & B Bolt	70-104 (7.9-11.7)
Throttle Cam Bolt	52-78 (5.9-8.8)
Transmission Range Switch	
Shift Shaft Set Nut	35 (3.9)
Shift Switch Mounting Bolt	35-60 (4.0-6.8)
Transmission Wire-To-Transmission Case Retainer Bolt	48 (5.4)
Torque Converter Clutch Control Valve Plate Bolt	44-52 (5.0-5.8)
Turbine Speed Sensor Bolt	52-78 (5.9-8.8)
Upper Valve Body-To-Lower Valve Body Bolt	44-52 (5.0-5.8)

SPECIFICATIONS**AUTOMATIC TRANSMISSION SPECIFICATIONS**

Item	Specification
Transmission Type	SB4A-EL
Gear Ratio	
1GR	2.450
2GR	1.450
3GR	1.000

2003 Mazda MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS Overhaul - SB4A-EL - MX-5 Miata

4GR	0.730
Reverse	2.222

Automatic Transmission Fluid (ATF)

Type	M-III Or Equivalent (e.g. Dexron(R) II)
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Capacity (L {US qt, Imp qt})	6.4 {6.8, 5.6}
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Torque Converter Stall Torque Ratio	2.300
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Hydraulic System (Number Of Drive/Driven Plates)

4GR Clutch	1/1
Forward Clutch	4/4
Direct Clutch	3/3
4GR Brake	2/3
Second Coast Brake	1/1
Second Brake	3/3
1st & Reverse Brake	5/4

Number Of Front Planetary Gear Teeth

Sun Gear	27
Pinion Gear	17
Internal Gear	60

Number Of Rear Planetary Gear Teeth

Sun Gear	27
Pinion Gear	17
Internal Gear	60

Number Of 4GR Planetary Gear Teeth

Sun Gear	27
Pinion Gear	23
Internal Gear	73

TECHNICAL DATA

2003 Mazda MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS Overhaul - SB4A-EL - MX-5 Miata

TECHNICAL DATA

Application	Specification
Engine Type	BP
Transmission Type	SB4A-EL
Oil Pump	
Outer Gear & Body (mm {in})	
Standard	0.07-0.15 {0.003-0.005}
Maximum	0.3 {0.01}
Inner Gear & Outer Gear (mm {in})	
Standard	0.11-0.14 {0.0044-0.0055}
Maximum	0.3 {0.01}
Inner Gear & Outer Gear & Pump Body (mm {in})	
Standard	0.02-0.05 {0.00079-0.00196}
Maximum	0.1 {0.00394}
4GR Clutch	
Number Of Drive/Driven Plates	1/1
4GR Clutch Clearance (mm {in})	1.77-2.58 {0.07-0.10}
Forward Clutch	
Number Of Drive/Driven Plates	4/4
Forward Clutch Clearance (mm {in})	1.40-1.60 {0.06-0.07}
Direct Clutch	
Number Of Drive/Driven Plates	3/3
Direct Clutch Clearance (mm {in})	1.06-1.64 {0.04-0.06}
4GR Brake	
Number Of Drive/Driven Plates	2/3
4GR Brake Clearance (mm {in})	0.56-1.62 {0.02-0.06}
Second Coast Brake	
Number Of Drive/Driven Plates	1/1
Second Coast Brake Clearance (mm {in})	0.78-1.32 {0.03-0.05}
Second Brake	
Number Of Drive/Driven Plates	3/3
Second Brake Clearance (mm {in})	1.03-1.65 {0.04-0.06}

2003 Mazda MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS Overhaul - SB4A-EL - MX-5 Miata

{in})

1st & Reverse Brake

Number Of Drive/Driven Plates		5/4
Reverse Brake Clearance (mm {in})	0.61-1.93 {0.02-0.07}	
Height Difference Between Forward Clutch Input Shaft & Transmission Case (mm {in})		3.0 {0.12}
Height Difference Between 4GR Case & 4GR Clutch Cylinder (mm {in})		2.0 {0.08}
Output Shaft Clearance (mm {in})		0.3-0.9 {0.012-0.035}
Torque Converter & The Face Of The End Of The Converter Housing (Distance A) (mm {in})		22.7 {0.89}

SPRING SPECIFICATIONS

Spring	Outer Diameter - (mm {in})	Free Length - (mm {in})	No. Of Coils	Wire Diameter - (mm {in})
Accumulator				
Upper Direct Clutch Accumulator Spring	14.20 {0.559}	38.0 {1.496}	12.40	1.80 {0.071}
Lower Direct Clutch Accumulator Spring	15.50 {0.610}	30.00 {1.181}	13.70	1.80 {0.071}
Forward Clutch Accumulator Spring	17.50 {0.689}	64.68 {2.546}	15.50	2.00 {0.078}
Upper Second Brake Accumulator Spring	18.79 {0.740}	56.40 {2.220}	16.39	2.40 {0.094}
Lower Second Brake Accumulator Spring	12.80 {0.504}	17.50 {0.689}	10.70	1.60 {0.063}
Control Valve Body				
Secondary Regulator Valve Spring	17.43 {0.686}	71.27 {2.806}	15.50	1.93 {0.076}
Cut Back Valve Spring	6.85 {0.27}	23.00 {0.906}	6.20	0.65 {0.026}

2003 Mazda MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS Overhaul - SB4A-EL - MX-5 Miata

Clutch Sequence Valve Spring	9.10 {0.36}	37.55 {1.478}	8.00	1.10 {0.043}
1-2 Shift Valve Spring	8.90 {0.35}	29.15 {1.148}	8.00	0.90 {0.035}
2-3 Shift Valve Spring	8.90 {0.35}	29.15 {1.148}	8.00	0.90 {0.035}
3-4 Shift Valve Spring	8.90 {0.35}	29.15 {1.148}	8.00	0.90 {0.035}
Pressure Relief Valve Spring	13.14 {0.517}	32.141 {1.265}	11.11	2.03 {0.080}
Torque Converter Clutch Control Valve Spring	11.40 {0.449}	32.60 {1.283}	10.40	1.00 {0.039}
Primary Regulator Valve Damping Spring	4.97 {0.20}	20.00 {0.787}	4.57	0.40 {0.016}
Low Coast Modulator Valve Spring	9.24 {0.36}	42.35 {1.667}	8.40	0.84 {0.033}
Intermediate Coast Modulator Valve Spring	9.04 {0.356}	27.26 {1.073}	7.94	1.10 {0.043}
Ball Valve Spring	6.20 {0.244}	15.00 {0.590}	5.80	0.40 {0.016}
Bypass Valve Spring	13.80 {0.543}	28.90 {1.138}	12.20	1.60 {0.063}
Primary Regulator Ball Valve Spring	6.00 {0.236}	16.45 {0.648}	5.40	0.60 {0.024}
Ball Valve Spring	6.00 {0.236}	16.45 {0.648}	5.40	0.60 {0.024}
Throttle Valve Secondary Spring	8.58 {0.338}	21.94 {0.864}	7.87	0.71 {0.028}

SERVICE TOOLS

2003 Mazda MX-5 Miata

2001-05 AUTOMATIC TRANSMISSIONS Overhaul - SB4A-EL - MX-5 Miata

49 N019 001 Oil Seal Installer	49 HD64 375 Clutch Spring Compressor Set	49 0636 100B Valve Spring Lifter Arm
49 G019 0A7A Return Spring Compressor Set	49 H019 001 Attachment	49 G030 795 Oil Seal Installer
49 HD64 405 Oil Pump Body Centering Band	—	—

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Fig. 191: Identifying Service Tools
Courtesy of MAZDA MOTORS CORP.