MAZDA G4A-HL

INDEX

CAUTION: ATSG service manuals are intended for use by professional, qualified technicians. Attempting repairs or service without the proper training, tools and equipment could cause injury to you or others and damage to the vehicle that may cause it not to operate properly.

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INTRODUCTION
MAZDA G4A-HL

The Mazda G4A four speed automatic transaxle can come with hydraulic or computer shift control. Although both units share common parts there are many differences. The hydraulic control (HL) unit is readily identifiable by the governor assembly on the top right front of the unit and has a converter clutch. This booklet covers teardown / assembly and diagnostic information of this unit.

We thank Mazda Motors for the information
And illustrations that have made this booklet possible.

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

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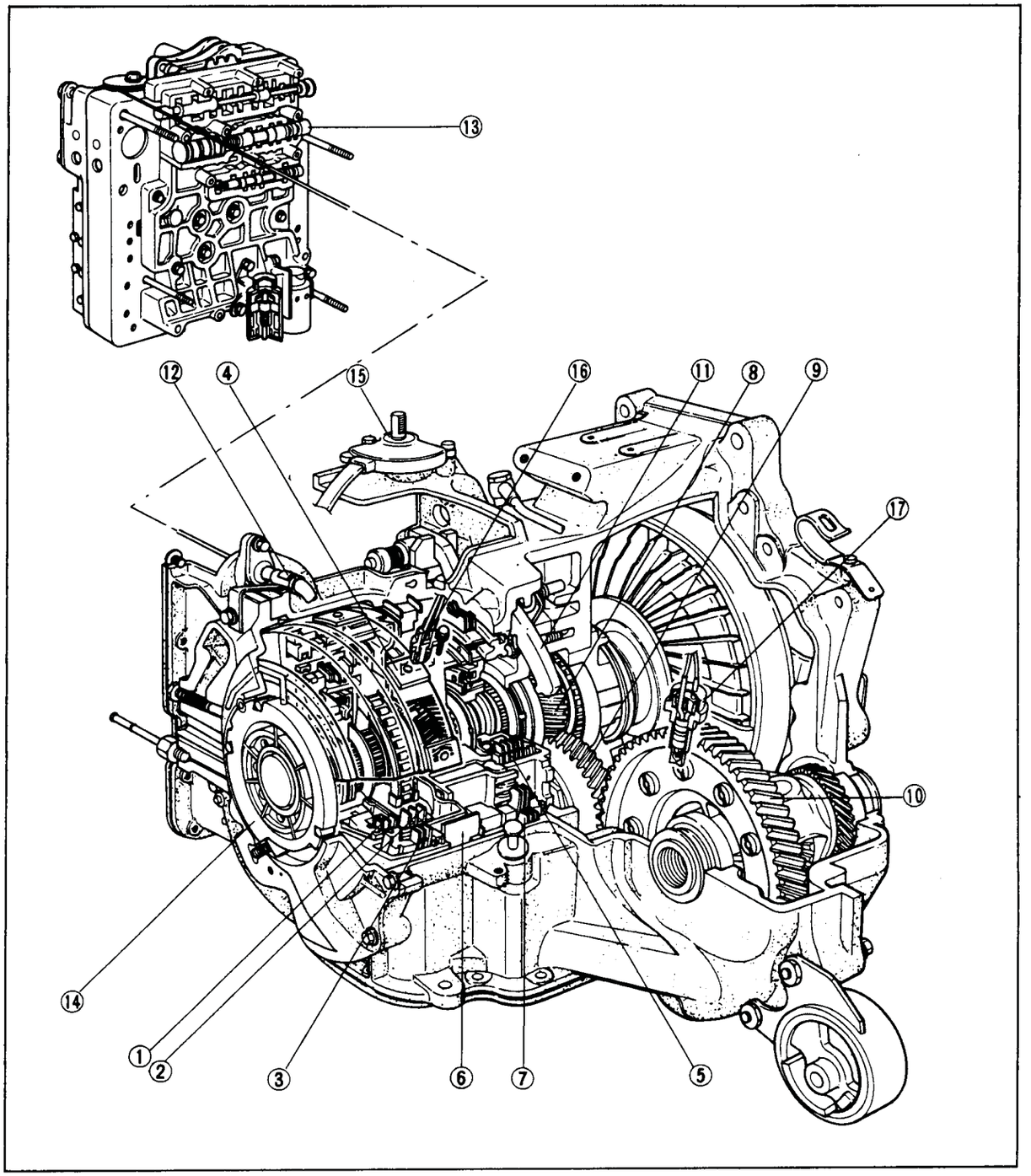
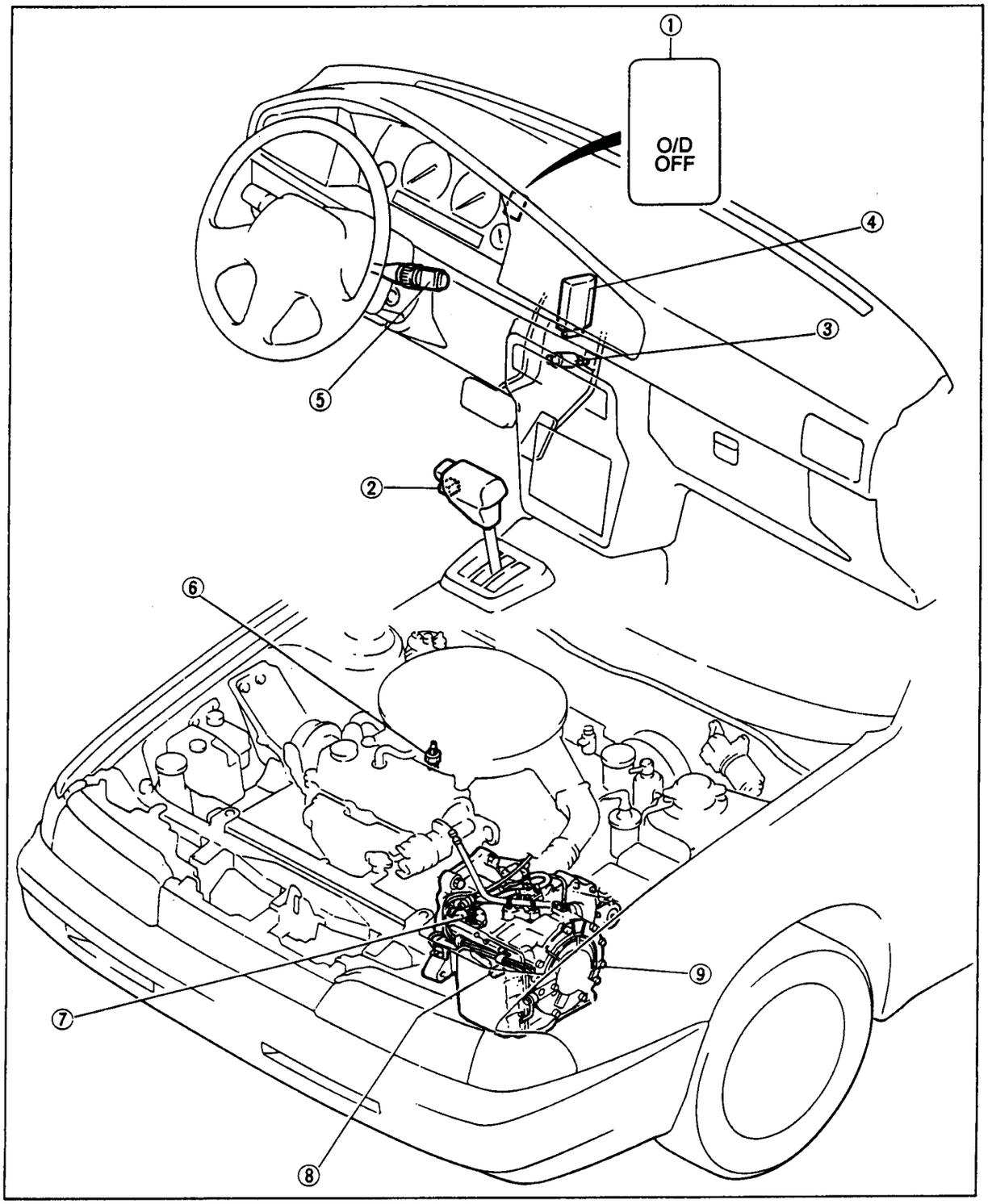
STRUCTUAL VIEW



1. Coasting clutch
2. Forward clutch
3. Reverse clutch
4. Reverse and forward drum
5. 3-4 clutch
6. 2-4 brake band
7. Low and reverse brake
8. Output gear
9. Idle gear
10. Differential
11. Parking pawl
12. Throttle cable
13. Control body
14. Oil pump
15. Inhibitor switch
16. Pulse generator
17. Fluid temperature switch

G4A-HL

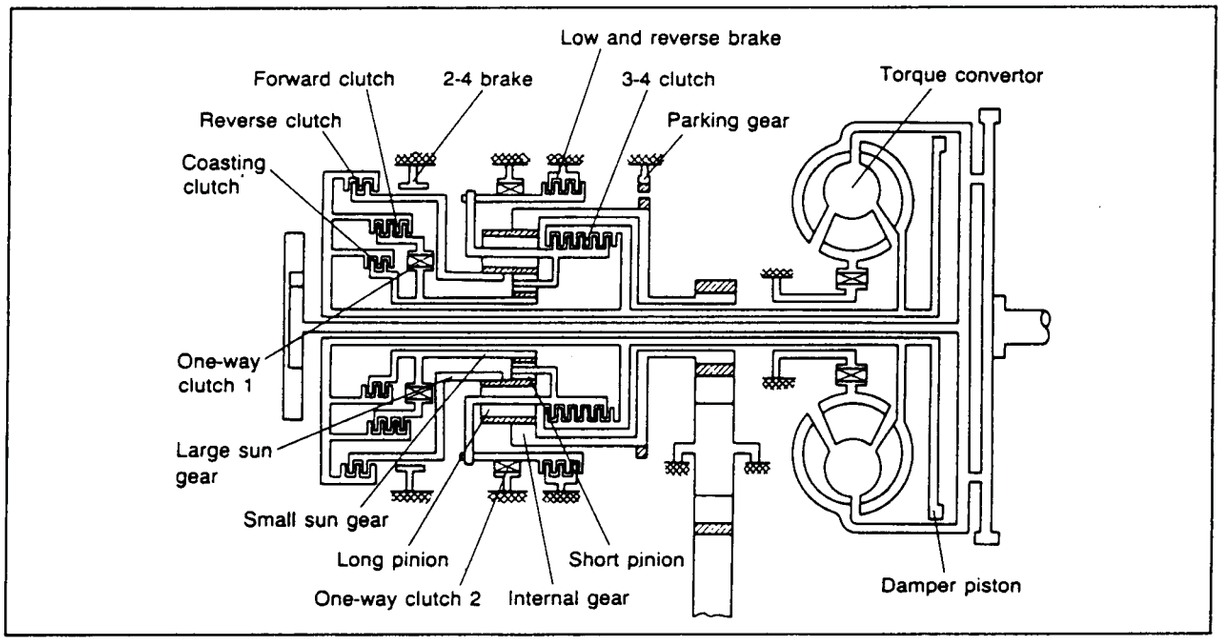


1. OD OFF indicator light
2. OD OFF switch
3. Kick-down switch
4. Cruise control unit
5. Cruise control switch
6. Water temperature switch
7. Inhibitor switch
8. OD release solenoid valve
9. Automatic transaxle

SPECIFICATIONS

Model		G4A-EL (EC-AT)	G4A-HL (4-speed)	
			FE engine	F8 engine
Torque converter stall torque ratio		1.710—1.900 : 1	1.900—2.100 : 1	
Gear ratio	First	2.800		
	Second	1.540		
	Third	1.000		
	Fourth (OD)	0.700		
	Reverse	2.333		
Final gear ratio		3.700		
Number of drive plates/ driven plates	Forward clutch	3/3		
	Coasting clutch	2/2		
	3-4 clutch	5/5	4/4	
	Reverse clutch	2/2		
	Low and reverse brake	3/3	4/4	
Servo diameter (Piston outer dia./retainer inner dia.) mm (in)		78/53 (3.07/2.09)	78/49 (3.07/1.93)	78/56 (3.07/2.20)
Speedometer gear ratio (Driven/Drive gear)		20 : 25 or 21 : 25		
Automatic transmission luid	Type	Dexron II or MIII		
	Capacity liters (US qt, Imp qt)	6.8 (7.2, 6.0)		

OPERATION OF COMPONENTS

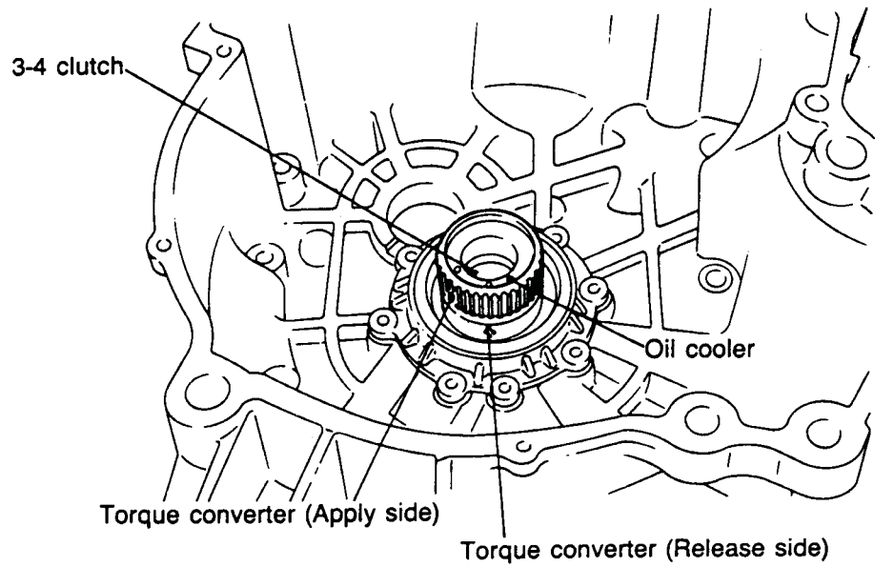


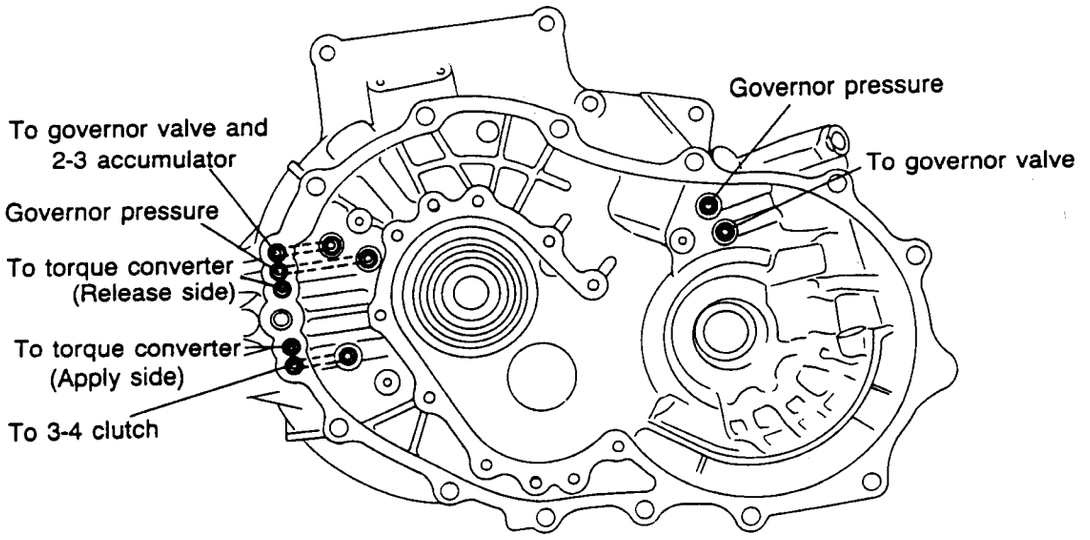
Operation Table (G4A-HL)

Range	Gear	Operation elements									
		Engine braking effect	Forward clutch	Coasting clutch	3-4 clutch	Reverse clutch	2-4 brake		Low & reverse brake	One-way clutch 1	One-way clutch 2
							Applied	Released			
P	—	—									
R	—	Yes				○			○		
N	—	—									
D	1st	No	○							○	○
	2nd	No	○				○			○	
	3rd	Yes	○	○	○		⊗	○		○	
	OD	Yes	◎		○		○				
2	2nd	Yes	○	○			○			○	
1	1st	Yes	○	○				○	○	○	
	2nd	Yes	○	○			○			○	

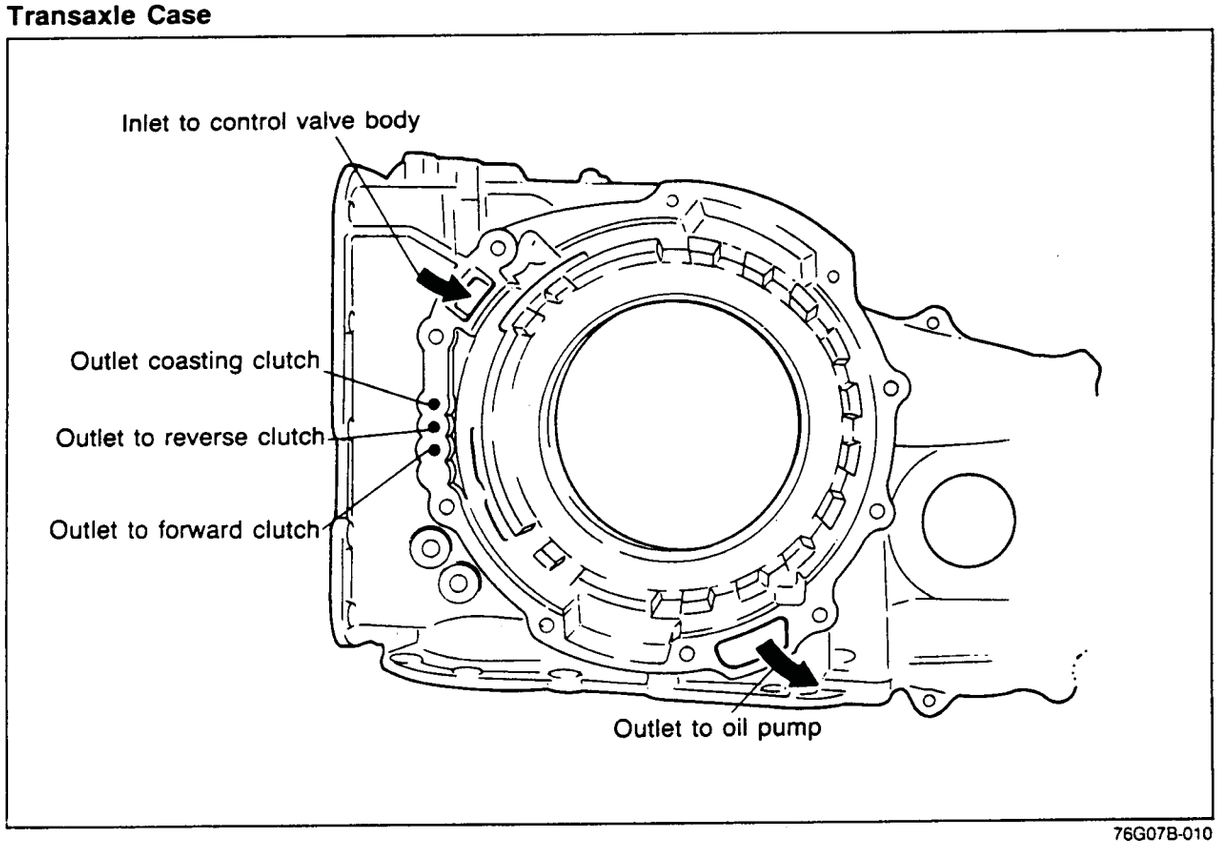
⊗ : Indicates fluid pressure to servo but band not applied due to pressure difference in servo.
◎ : Indicates that it does not function to transmit power.

FLUID PASSAGE LOCATION
Converter Housing





Transaxle Case



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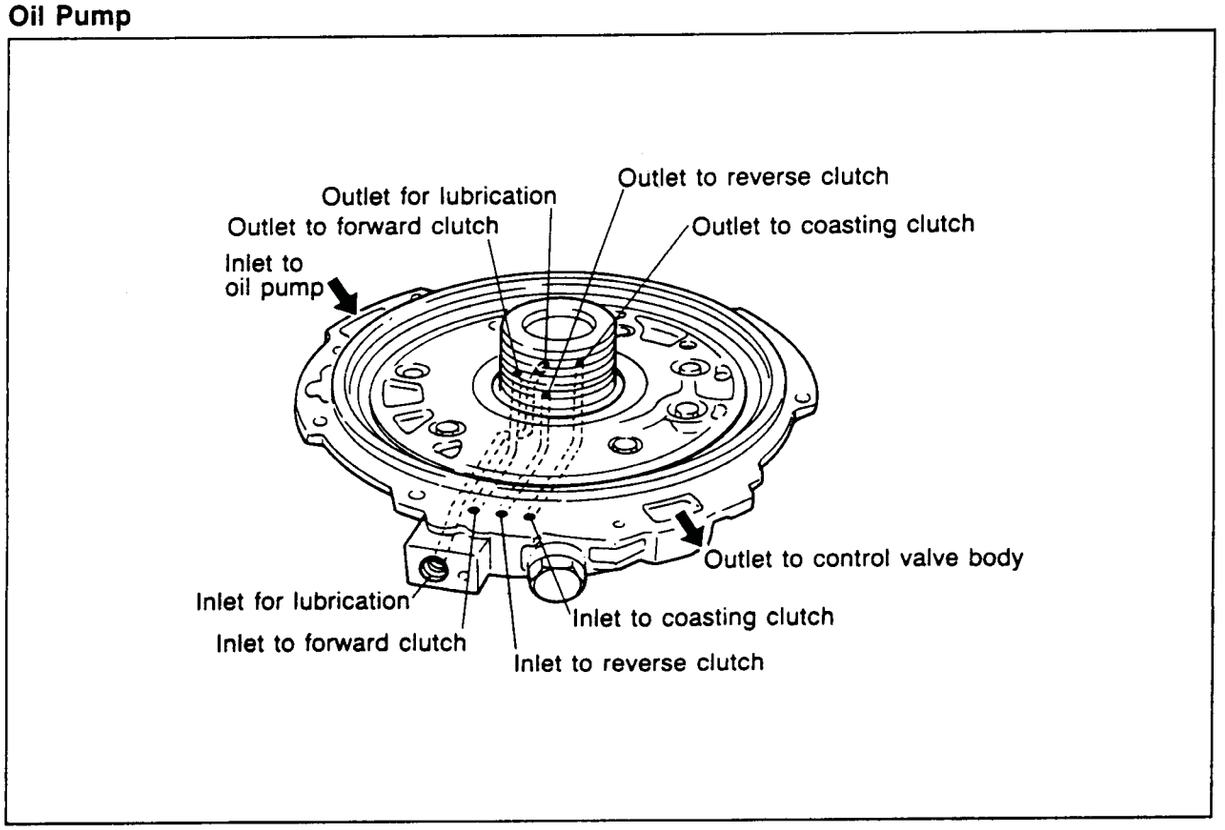
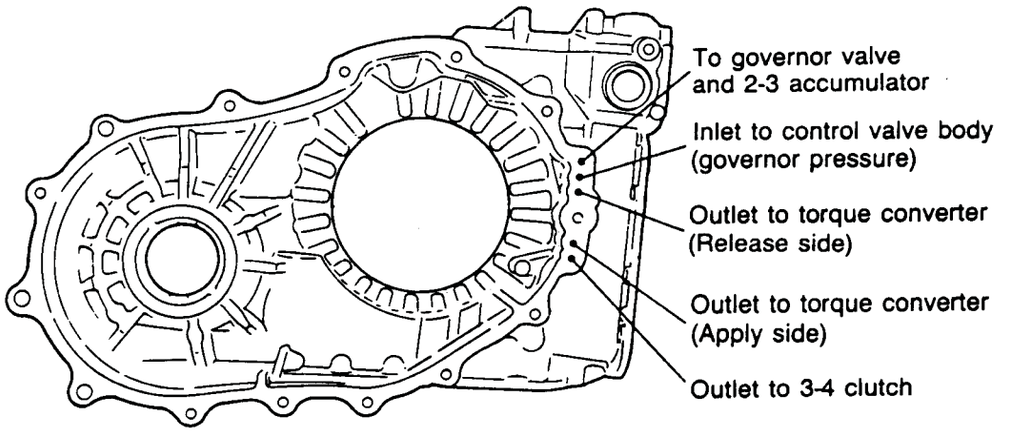
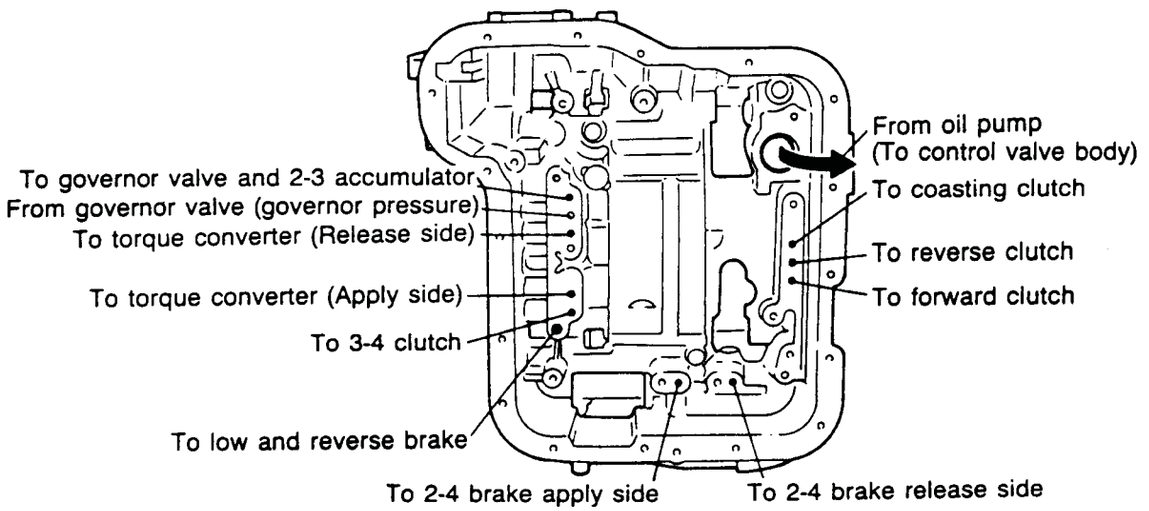
Oil Pump



Transaxle Case





TROUBLESHOOTING (G4A-HL)

GENERAL NOTE

In the event of a problem with the automatic transaxle, the cause may be in the engine, power train, hydraulic control system, or electrical control system.
When troubleshooting, therefore, it is recommended to begin from those points that can be judged quickly and easily. The recommended troubleshooting sequence is described below.

STEP 1: PRELIMINARY INSPECTION
Check preliminary check items
- ATF level and condition
- Oil leakage
- Selector lever position
- Idle speed and ignition timing
- Tire inflation pressure
- Inhibitor switch
- Throttle cable

..... This step checks conditions surrounding the automatic transaxle.

STEP 2: ELECTRICAL SYSTEM INSPECTION
Check electrical control system

..... This step checks the electrical control system.
- Function of the electrical control system
- Components

STEP 3: STALL TEST
Check engine stall speed

..... This step checks the power train.
- Friction element slipping
- Torque converter capacity

STEP 4: TIME LAG TEST
Check time lag of oil pressure supply

..... This step checks operation of the hydraulic control system.
- Accumulators
- Friction elements slipping
- Regulating valves

STEP 5: ROAD TEST
Check items on road test
- Shift point
- Shift schedule
- Kick-down
- Shift shock
- Lock-up and overdrive inhibition

..... This step checks functions of the electric control system and hydraulic control system.

STEP 6: OIL PRESSURE TEST
Check line, throttle, and governor pressures

..... This step checks major points of the hydraulic control system.
- Oil pump
- Line pressure control
- Throttle pressure control
- Governer pressure control

By following the above 6 steps, the cause of the problem should be located.
As another guide to faster location of the causes of problems, the Quick Diagnosis Chart is included

In this chart, a circle is used to indicate the components that might be the cause of trouble for 20 types of problems. It is only necessary to check those components indicated by circles, at each step of the troubleshooting process, in order to quickly locate the cause of the problem.

Quick Diagnosis Chart

The Quick Diagnosis Chart shows various problems and the relationship of various components that might be the cause of the problem.

The following is an explanation of the symbols used in this chart.

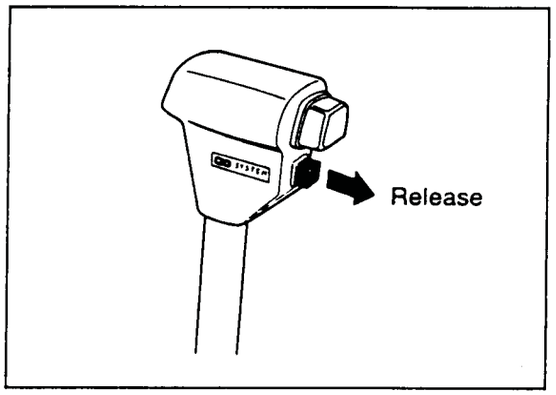
1. Components indicated in the "Adjustment" column indicate that there is a possibility that the problem may be the result of an incorrect adjustment.
   Check the adjustment of each component, and readjust if necessary.
2. The components indicated in the "Electrical System Inspection" column can be checked for malfunction by the results of the checking procedure.
3. Components indicated in the "Stall Test" column can be checked for malfunction by the results of the stall test.
4. Components indicated in the "Time Lag Test" column can be checked for malfunction by the results of the time lag test.
5. Components indicated in the "Road Test" column can be checked for malfunction by the results of the road test.
6. Components indicated in the "Oil Pressure Test" column can be checked for malfunction by the results of the oil pressure test.
7. The checking, adjusting, repair or replacement procedures for each component

Inspection point / Item	Electrical control system						Prelimi-nary				Hydraulic control system					Power train										
	Inhibitor switch	OD OFF switch	Cruise control switch	Water temperature switch	Kick-down switch	OD release solenoid valve	ATF level and condition	Selector lever	Throttle cable	Idle speed and ignition timing	Control valves	Accumulators	Oil pump	Governor valve	Hydraulic circuit	Torque converter	Forward clutch	Coasting clutch	Reverse clutch	3-4 clutch	2-4 brake and servo	Low and reverse brake	One-way clutch 1	One-way clutch 2	Parking gear	Planetary gear	Differential assembly
Adjustment	○						○	○	○	○																
Electrical System Inspection		○	○		○	○																				
Stall Test											○		○		○	○	○		○		○	○	○	○			
Time Lag Test											○	○			○		○		○			○	○	○			
Oil Pressure Test									○		○	○	○	○	○		○	○	○		○	○					
Road Test						○					○			○	○												

Condition	Inspection point and reference page	ON VEHICLE: Electrical control system: Inhibitor switch	OD OFF switch	Cruise control switch	Water temperature switch	Kick-down switch	OD release solenoid valve	Preliminary: ATF level and condition	Selector lever	Throttle cable	Idle speed and ignition timing	Hydraulic control system: Control valves	Accumulators	Oil pump	Governor valve	Hydraulic circuit	OFF VEHICLE: Power train: Torque converter	Forward clutch	Coasting clutch	Reverse clutch	3-4 clutch	2-4 brake and servo	Low and reverse brake	One-way clutch 1	One-way clutch 2	Parking gear	Planetary gear	Differential assembly
Accelerating	Vehicle does not move in D, 2, 1, or R range							○	○			○		○		○	○	○		○			○	○	○	○		
	Vehicle moves in N range								○			○				○												
	Excessive creep									○	○	○					○											
	No creep at all							○	○	○	○	○		○		○	○	○		○			○	○	○			
Shifting	No shift							○				○		○	○	○												
	Abnormal shift sequence		○	○	○		○	○	○	○		○			○	○		○	○		○	○		○	○			
	Frequent shifting		○	○	○	○	○					○			○													
	Excessive high or low shift point					○	○	○	○	○		○		○	○	○	○											
	No lock-up		○	○	○	○	○		○			○			○	○	○											
	No kick-down					○			○			○			○	○												
Slipping	Engine run away or slip when starting vehicle							○		○		○		○		○		○		○			○	○	○			
	Engine run away or slip when up- or down-shifting							○		○		○		○		○		○	○		○	○		○	○			
Shift shock	Excessive N to D or N to R shift shock							○			○	○	○															
	Excessive shift shock when upshifting or downshifting							○		○		○	○					○	○		○	○		○				
	Excessive shift shock when changing range							○	○	○		○	○					○	○		○	○	○	○				
Noise	Transaxle noisy in N or P range							○				○		○	○		○											
	Transaxle noisy in D, 2, 1, or R range							○				○		○	○		○										○	○
Others	No engine braking							○			○	○				○	○		○			○	○					
	Transaxle overheats							○				○		○		○	○											
	Engine will not start	○							○																			

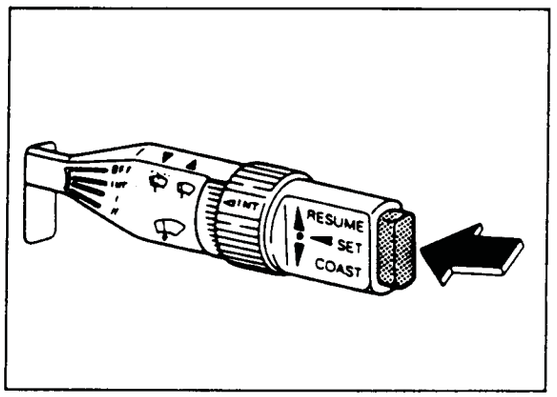
(ELECTRICAL SYSTEM INSPECTION)

In this step, the function of the electrical control system (Inhibition of OD and lock-up) is checked. The electrical control system components should be checked to determine if it functions correctly.



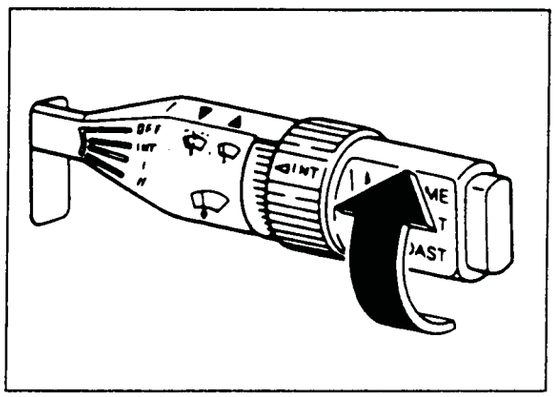
O/D OFF Switch Inhibition Function

1. Warm up the engine and ATF.
2. Check that the D range, OD, and lock-up is provided.
3. When driving the vehicle with D range, OD, and lock-up selected, depress the O/D OFF switch and check that OD and lock-up is cancelled.
4. If not cancelled, check the O/D OFF switch.
5. Release the O/D OFF switch after completion.

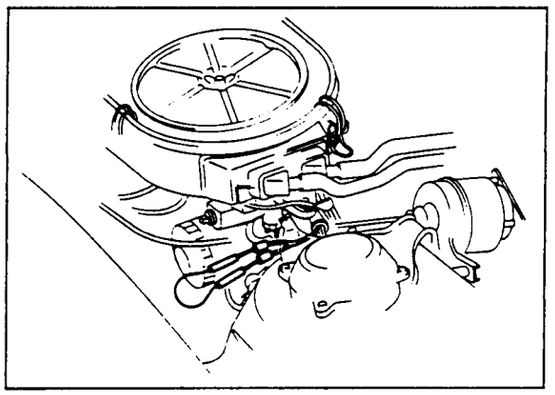


Cruise Control Switch Inhibition Function

1. Drive the vehicle in D range, OD, and lock-up selected again.
2. Depress the Set switch of the cruise control and check that OD and lock-up is cancelled.
3. If not cancelled, check the cruise control system.

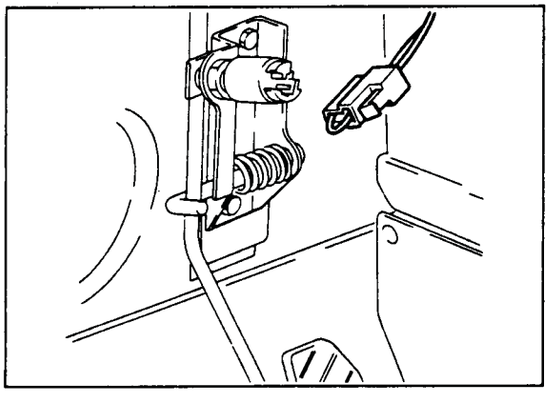


4. Again drive the vehicle in D range, OD, and lock-up.
5. Turn the Resume switch of the cruise control and check that OD and lock-up is cancelled.
6. If not cancelled, check the cruise control system.



Water Temperature Switch Inhibition Function

1. Stop the vehicle.
2. Disconnect the water temperature switch connector.
3. Drive the vehicle in D range selected.
4. Check that OD and lock-up does not operate.
5. If not cancelled, check the wiring harness of the water temperature switch.
6. Stop the vehicle and reconnect the water temperature switch connector.



Kick-down Switch Inhibition Function

1. Connect the terminals of the kick-down switch connector with a jumper wire.
2. Drive the vehicle in D range selected.
3. Check that the OD and lock-up do not achieve.
4. If not correct, check wiring harness of kick-down switch.
5. Stop the vehicle and reconnect the connector to the switch.

(STALL TEST)

This step is performed to determine if there is slippage of the friction elements or malfunction of the hydraulic components.

Preparation

Check the following items prior to testing:

1. Engine coolant, engine oil and ATF levels.
2. Warm the engine thoroughly to raise the ATF temperature to operating level (50—80°C, 122—176°F).
3. Engage the parking brake and use wheel chocks at the front and rear wheels.

1. Connect a tachometer to the engine.
2. Shift the selector lever to D range.
3. Depress the brake pedal firmly with the left foot and gradually depress the accelerator pedal with the right foot.
4. Read and note the engine speed as soon as it becomes constant, then release the accelerator pedal.

Caution
Steps 3 to 4 must be performed within 5 seconds.

5. Shift the selector to N range and run the engine at idle speed for at least one minutes.

Note
This one minute idle period is performed to cool the ATF and prevent oil degradation.

6. Perform stall tests for the following ranges in the same manner.
   (1) 2 range
   (2) 1 range
   (3) R range

Standard stall speed:

FE engine
D.S.L range 2430—2530 rpm
R range 2390—2490 rpm

F8 engine
D.S.L range 2180—2280 rpm
R range 2140—2240 rpm

Caution
Always provide adequate cooling time between individual range stall tests.

Evaluation	Condition	Possible cause	
Above specification	In all ranges	Insufficient line pressure	Worn oil pump
			Oil leakage from oil pump, control valve, and/or transaxle case
			Stuck pressure regulator valve
	In D 2, and 1	One-way clutch 1 slipping	
	In D range only	One-way clutch 2 slipping	
	In 2 range only	2-4 brake slipping	
	In R range only	Low and reverse brake slipping	
		Reverse clutch slipping	
		Perform a road test, to determine if this is caused by the low and reverse brake or the reverse clutch, as follows: a) Effective engine braking in 1 range.....Front clutch b) No engine braking in 1 range.....Low and reverse brake	
Within specification		All shift control elements within transaxle are functioning normally.	
Below specification		Engine out of tune	
		One-way clutch slipping within torque converter	

(TIME LAG TEST)

If the selector lever is shifted while the engine is idling, there will be a certain time lapse, or time lag, before shock is felt. This step checks this time lag for checking the condition of the N-D and N-R accumulators, forward, reverse and one-way clutches, and low and reverse brake.

1. Start the engine and check that the idle speed is **900** $\pm^{50}_{0}$ rpm.
2. Shift from N range to D range
3. Measure the time it takes from shifting until shock is felt using a stop watch.
4. Shift the selector to N range and run the engine at idle speed for at least one minute.
5. Perform the test for the shift from N range to R range in the same manner.

Note
Make three measurements for each test and take the average value.

Specified time lag: N → D range ..... 0.4—1.2 second
N → R range ..... 0.4—1.5 second

Evaluation

Condition		Possible Cause
N → D shift	More than specification	Insufficient line pressure
		Forward clutch slipping
		One-way clutch 1 slipping
		One-way clutch 2 slipping
	Less than specification	N-D accumulator not operating properly
		Excessive line pressure
N → R shift	More than specification	Insufficient line pressure
		Low & reverse brake slipping
		Reverse clutch slipping
	Less than specification	N-R accumulator not operating properly
		Excessive line pressure

(ROAD TEST)

This step is performed to inspect for problems at the various ranges. If these tests show any problems, adjust or replace by referring to the mechanical sections.

Caution
Perform the test at normal ATF operating temperature (50—80°C, 122—176°F).

D Range Test
Shift point, shift pattern, and shift shock

1. Shift the selector lever to D range and depress the OD OFF switch.
2. Accelerate the vehicle with half (4/8) and full (8/8) throttle valve opening.
3. Check that 1-2, 2-3 and 3-OD up-shifts and downshifts and lock-up are obtained. The shift points must be as shown in the D range shift diagram.

Note
Abnormal noise and vibration can also be caused by the torque converter, drive shaft, or differential. Therefore, checking of cause must be made with extreme care.

b) There is no lock-up or OD when the coolant temperature is below 72°C (162°F), when the cruise control is operating and when there is a 3 km/h (1.9 mph) difference between the pre-set cruise speed and vehicle speed, when set or resume switch is ON, and when the OD OFF switch is depressed.

4. Check the up and down shifts for shift shock or slippage.
5. While driving in 3rd **(50—60 km/h, 31—37 mph)** shift the selector lever to 2 range and check that 3-2 downshift immediately occurs, then decelerate and check that engine braking effect is felt in 2nd gear.

P Range Test

1. Shift into P range on a gentle slope, release the brake and check that the vehicle does not roll.
2. Shift into P range while driving the vehicle at maximum of **4 km/h (2.5 mph)** on a level surface, and check that the vehicle stops.

Vehicle Speed at Gearshift Table

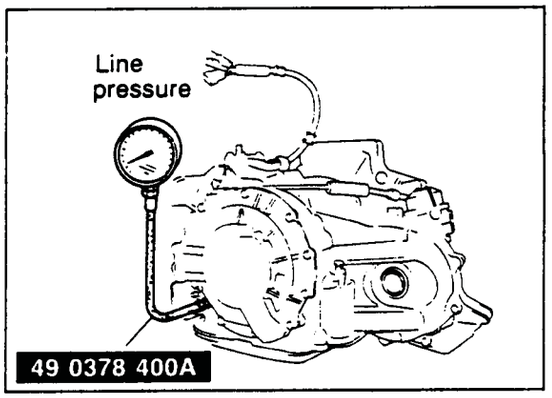
Range	Throttle condition	Shifting	Vehicle speed km/h (mph)	
			FE engine	F8 engine
D	Fully opened	1st → 2nd	50—65 (31—40)	47—62 (29—38)
		2nd → 3rd	100—115 (62—71)	94—109 (58—68)
	Half throttle (1/2)	1st → 2nd	17—32 (11—20)	16—31 (10—19)
		2nd → 3rd	42—57 (26—35)	
		3rd → OD	79—94 (49—58)	74—89 (46—55)
		Lock-up	74—89 (46—55)	
	Kick-down	OD → 3rd	More than 88 (55)	More than 82 (51)
		OD → 2nd	34—103 (21—64)	33—97 (20—60)
		OD → 1st	27—49 (17—30)	26—48 (16—30)
		3rd → 2nd	34—103 (21—64)	33—97 (20—60)
		3rd → 1st	11—49 (7—30)	10—48 (6—30)
		2nd → 1st	4—49 (2—30)	3—48 (2—30)
1	Fully opened	1st → 2nd	56—71 (35—44)	52—67 (32—42)
	Half throttle (1/2)	1st → 2nd	56—71 (35—44)	52—67 (32—42)
	Kick-down	2nd → 1st	46—61 (29—38)	43—58 (27—36)

Evaluation

Condition		Possible Cause
No 1-2 shift		Insufficient governor pressure
		Stuck 1 range control valve
		Stuck 1-2 shift control valve
		Stuck 1-2 shift valve
		No check ball (rubber ball)
No 2-3 shift		Insufficient governor pressure
		Stuck 2 range control valve
		Stuck servo control valve
		Stuck 2-3 shift valve
		No check ball (rubber ball)
No 3-OD shift		Insufficient governor pressure
		Excessive throttle pressure
		Stuck OD release valve
		Stuck needle valve of the OD release solenoid valve
		Stuck 3-4 shift valve
		No check ball (rubber ball)
No. Lock-up (Electric circuit is OK)		Insufficient governor pressure
		Stuck OD release valve
		Stuck needle valve of the OD release solenoid valve
		Stuck OD lock-up valve
		Stuck lock-up control valve
Shift occurred in 2 range		Stuck 1-2 control valve
		Stuck 2 range control valve
No kick-down		Stuck throttle valve
		Stuck kick-down valve
Incorrect shift point	In D and 1 range	Excessive or insufficient governor pressure
		Excessive or insufficient throttle pressure
		Excessive or insufficient line pressure
	In 1 range	Stuck 1 range control valve
No engine braking effect		Stuck coasting bypass valve
		Fluid leakage from 2-3 accumulator seal rings
		No check ball (rubber ball)
Shift shock or slippage	In 1-2 and/or 3-OD shift	Fluid leakage from 1-2 accumulator seal rings
		No check ball (rubber ball) or leakage
		No one-way check orifice or leakage
	In 2-3 shift	Fluid leakage from 2-3 accumulator seal ring
		Stuck bypass valve
		Stuck 2-3 timing valve
		Stuck coast bypass valve
		Stuck servo control valve
		No one-way check orifice or leakage
		No check ball (rubber ball) or leakage
	In 3-2 shift	Fluid leakage from 1-2 accumulator seal ring
		No check ball (rubber ball) or leakage
		Stuck 3-2 timing valve
		Stuck 3-2 capacity valve

(OIL PRESSURE TEST)

This step checks line, throttle, and governor pressures to check the operation of hydraulic components and for oil leakage.



Line Pressure Test
Preparation

1. Connect the **SST** to the line pressure output point (square head plug L).
2. Connect a tachometer to the engine.
3. Perform the preparation procedure shown in STEP 3 (STALL TEST).

1. Start the engine and check that the idle speed is **900** $\pm^{50}_{0}$ rpm.
2. Shift the selector lever to D range.
3. Read the line pressure at idle.
4. Depress the brake pedal firmly with the left foot and gradually depress the accelerator pedal with the right foot.
5. Read the line pressure as soon as the engine speed becomes constant, then release the accelerator pedal.

Caution
Steps 4 to 5 must be performed within 5 seconds.

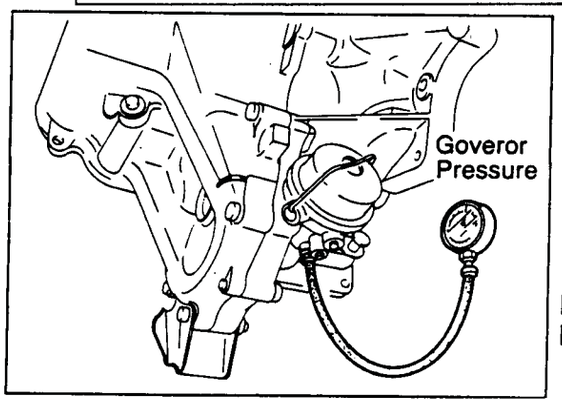
5. Shift the selector lever to N range and run the engine at idle for at least one minute.
6. Read the line pressure at idle and engine stall speeds for each range in the same manner.

Specified Line pressure:

Condition	Line pressure kPa (kg/cm², psi)	
Range	D S L	R
When idling	350—490 (3.6—5.0, 51—71)	600—830 (6.1—8.5, 87—121)
At stall speed	980—1230 (10.0—12.5, 142—178)	1470—1960 (15.0—20.0, 213—284)

Evaluation

Condition		Possible Cause
Below specification	In all ranges	Worn oil pump
		Fluid leakage from the oil pump, control valve body and/or transaxle case
		Stuck pressure regulator valve
		Stuck throttle valve
		Stuck pressure modulator valve
	In D, 2 and 1 range	Fluid leakage from the forward clutch hydraulic circuit
		Fluid leakage from the governor valve hydraulic circuit
		Fluid leakage from the N-R accumulator seal rings
	In D and 1 range	Fluid leakage from the 2-3 accumulator seal rings
		Fluid leakage from the 1-2 accumulator seal rings
	In D and R range	Fluid leakage from the N-D accumulator seal rings
	In 2 and 1 range	Fluid leakage from the coasting clutch hydraulic circuit
		Stuck throttle backup valve
	In R and 1 range	Fluid leakage from the low and reverse brake hydraulic circuit
	In 2 range only	Fluid leakage from 2-4 brake servo hydraulic circuit
	In 1 range only	Stuck low reducing valve
	In R range only	Fluid leakage from reverse clutch hydraulic circuit
Excessive line pressure		Stuck throttle valve
		Stuck throttle modulator valve
		Stuck pressure regulator valve
		Stuck throttle backup valve



Governor Pressure Test

Preparation

1. Connect the **SST** to the governor pressure output point.
2. Place the pressure gauge inside the vehicle.
3. Warm up ATF and check ATF level.

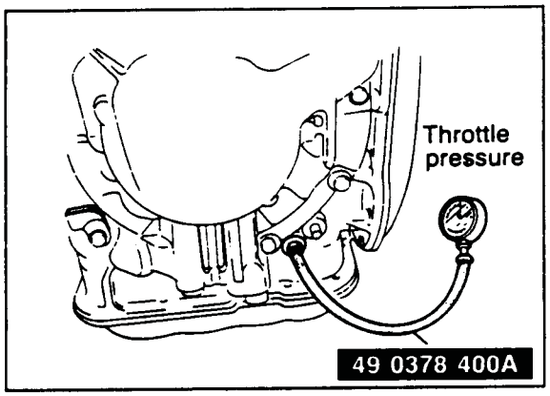
Drive the vehicle in D range.
Read the governor pressure at the speeds listed in the table below.

Specified governor pressure:

Vehicle Speed km/h (mph)	Governor Pressure kPa (kg/cm^2, psi)	
	FE engine	F8 engine
30 (19)	79—114 (0.81—1.16, 12—16)	82—117 (0.84—1.19, 12—17)
55 (34)	146—190 (1.49—1.94, 21—28)	157—201 (1.60—2.05, 23—29)
85 (53)	276—339 (2.81—3.46, 40—49)	302—366 (3.08—3.73, 44—53)

Evaluation

Condition	Possible Cause
Not within specification	Fluid leakage from the line pressure hydraulic circuit
	Fluid leakage from the governor pressure hydraulic circuit
	Defective or stuck governor valve



Throttle Pressure Test
Preparation
1. Connect the **SST** to the throttle pressure output point (Square head plug T).
2. Connect a tachometer to the engine.
3. Perform the preparation procedure shown in STEP 3 (STALL TEST).

1. Start the engine and check that the idle speed is **900** $\pm^{50}_{0}$ rpm.
2. Shift the selector to D range.
3. Read the throttle pressure at idle.
4. Depress the brake pedal firmly with the left foot and gradually depress the accelerator pedal with the right foot.
5. Read the throttle pressure as soon as the engine speed becomes constant, then release the accelerator pedal.

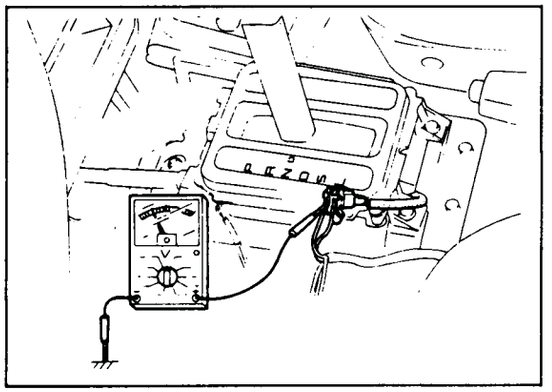
Caution
Steps 4 to 5 must be performed within 5 seconds.

Specified throttle pressure:

Condition	Throttle pressure kPa (kg/cm^2, psi)
When idling	83—113 (0.85—1.15, 12—16)
At stall speed	540—610 (5.5—6.2, 78—88)

Evaluation

Condition	Possible Cause
Not within specification	Stuck throttle valve
	Stuck pressure regulator valve
	Improper adjustment of throttle cable

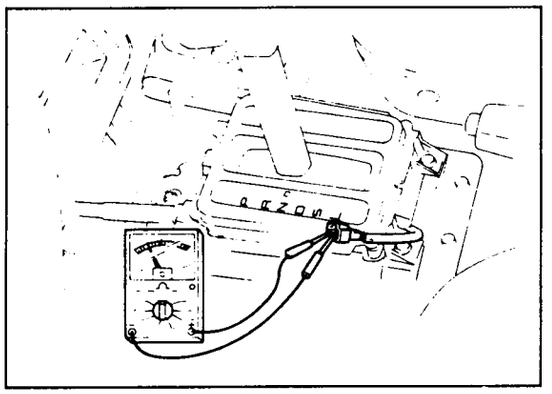


Inspection of Terminal Voltage

1. Remove the consol box.
2. Turn the ignition switch ON.
3. Check the voltage between the terminal (B) and ground while depressing the switch.

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

4. If correct, check continuty between the terminal.

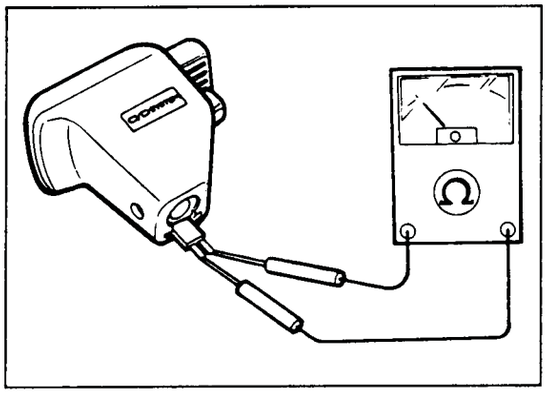


Inspection of Continuity

1. Disconnect the hold switch connector.
2. Check for continuity between the terminals while depressing the switch.

Continuity	Switch
YES	Released
NO	Depressed

3. If not correct, replace the hold switch.



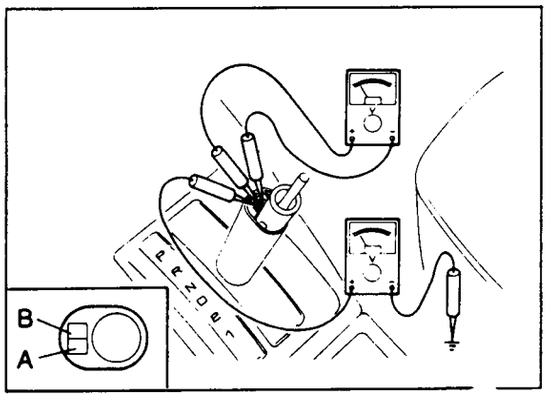
OD OFF SWITCH (G4A-HL)

Inspection of Continuity

1. Remove the selector lever knob.
2. Check the continuity of the terminals.

Switch	Continuity
Depressed	No
Released	Yes

3. If not correct, replace the selector lever knob.

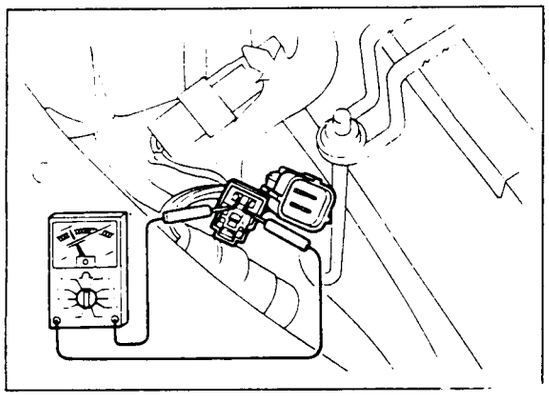


Inspection of Terminal Voltage

1. Check that continuity of the switch is OK.
2. Turn the ignition switch ON.
3. Check the voltage between terminal A and B, and between terminal A and ground.

Terminal	Voltage
A and B	Approx. 12V
A and ground	Approx. 12V

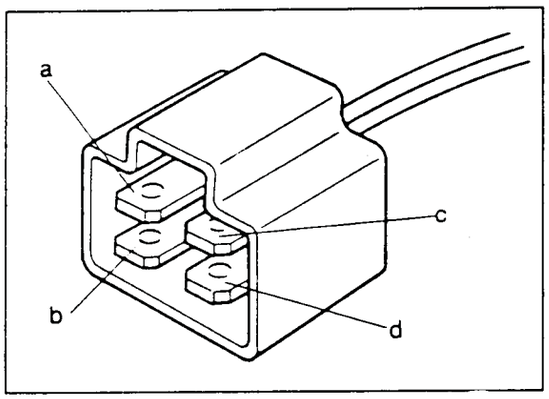
4. If not correct, check the wiring harness.



INHIBITOR SWITCH

Inspection

1. Check that the starter turns with the ignition switch at START position and the selector in the P and N ranges, and dose not operate in other positions.
2. Check that the back-up (reverse) light illuminates when shifted to the R range with the ignition switch in the ON position.
3. Check the inhibitor switch if it is not working properly.

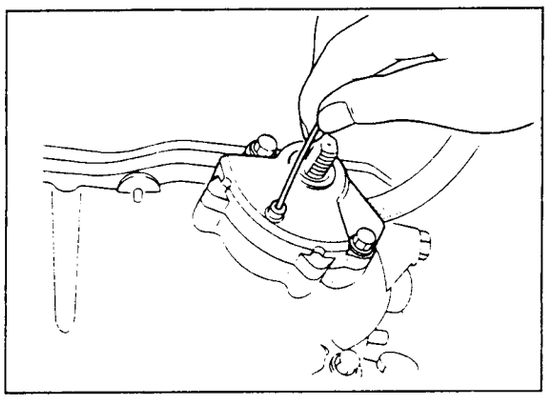


G4A-HL

Position	Connector terminal			
	a	b	c	d
P			○—○	
R	○—○			
N			○—○	
D, 1, 2				

○—○: indicates continuity

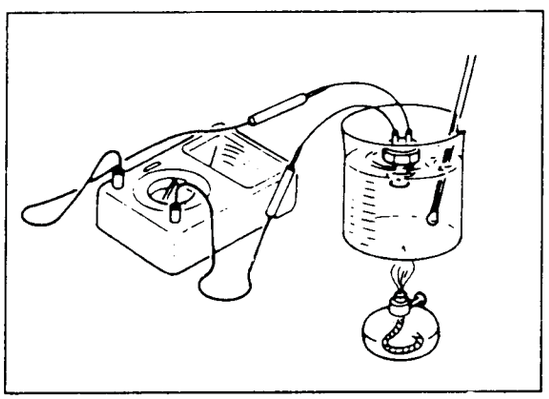
3. If not correct, replace switch and perform adjustment of inhibitor switch.



3. Remove the screw and move the inhibitor switch so that the small hole is aligned with the screw hole.
4. Set the alignment by inserting a **2.0 mm (0.079 in)** diameter pin through the holes.
5. Loosely tighten the switch mounting bolts, remove the pin, and reinstall the screw.
6. Tighten the switch mounting bolts to specification.

Tightening torque:
8—11 N·m (80—110 cm-kg, 69—95 in-lb)

7. Recheck the continuity of the individual terminals.



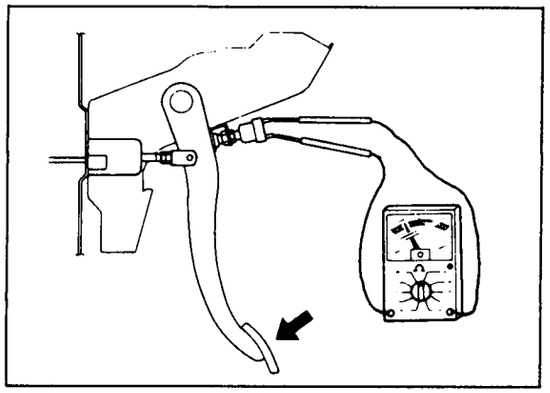
WATER TEMPERATURE SWITCH

Inspection

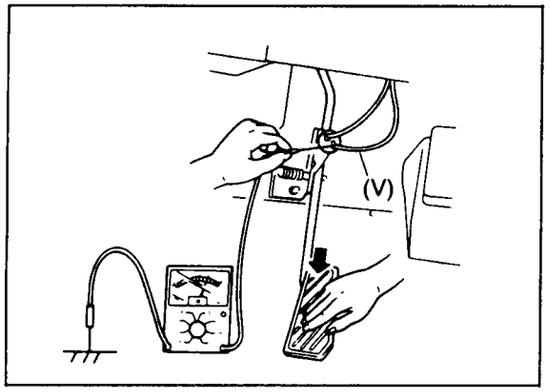
1. Remove the water temperature switch.
2. Place the switch in water with a thermometer and heat up the water gradually.
3. Check the continuity of the terminals. If necessary replace the switch.

Connection guide

Water temperature	Continuity
Below 65°C (149°F)	Yes
Above 72°C (162°F)	No



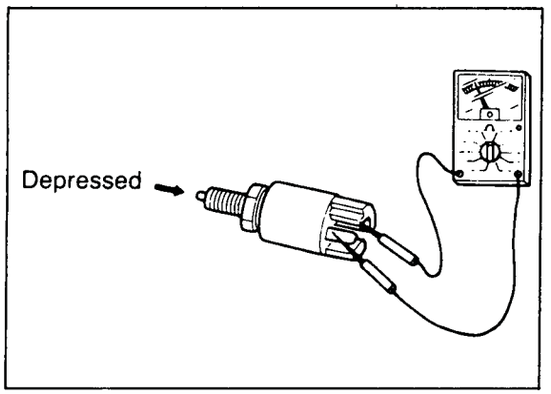
Inspection of Continuity
1. Disconnect the brake light switch connector.
2. Check for continuity between the terminals while depressing the brake pedal.



KICK-DOWN SWITCH (G4A-HL)
Inspection of Terminal Voltage
1. Turn the ignition switch ON.
2. Check the voltage at terminal (V) with a voltmeter.

Depressing stroke	Terminal voltage
7/8—8/8 (Full)	Approx. 12V
0—7/8	Below 1.5V

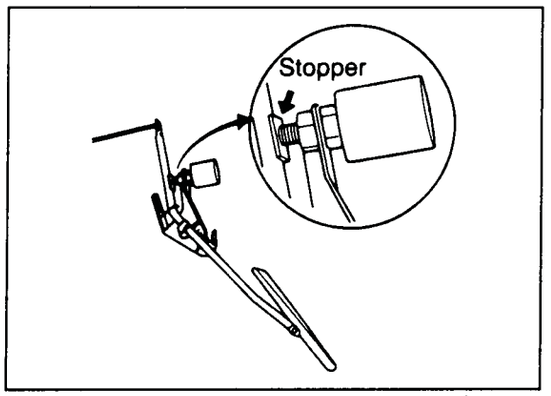
3. If not correct, check the wiring harness, switch, or adjust the switch position.



Inspection of Continuty
1. Disconnect the kick-down switch connector.
2. Check for continuity of the switch with an ohmmeter.

Switch	Continuity
Pushed	Yes
Released	No

3. If not correct, replace the kick-down switch.



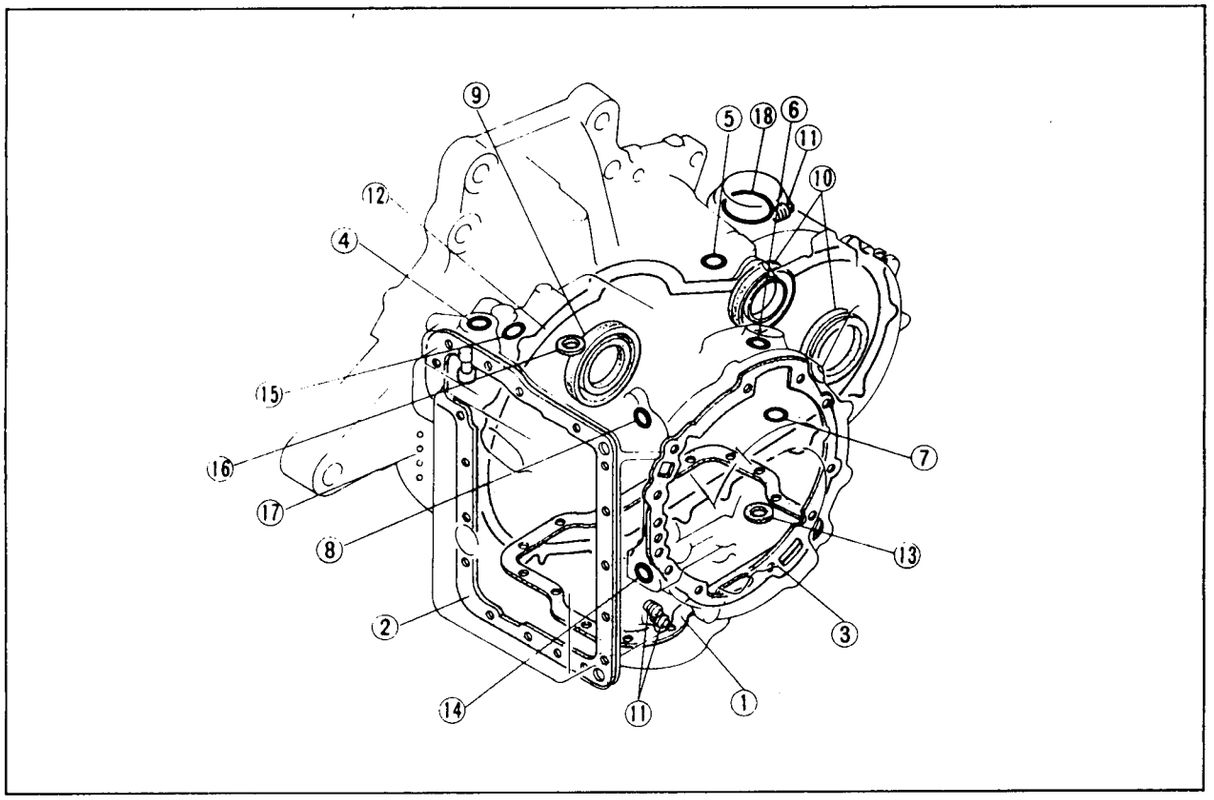
Adjustment
1. Loosen the kick-down switch locknuts.
2. Depress the accelerator pedal fully.
3. Turn the switch until the threaded case touches the stopper.
4. Turn the switch counterclockwise by one half revolution.
5. Secure the switch with the locknut.

ON-VEHICLE MAINTENANCE

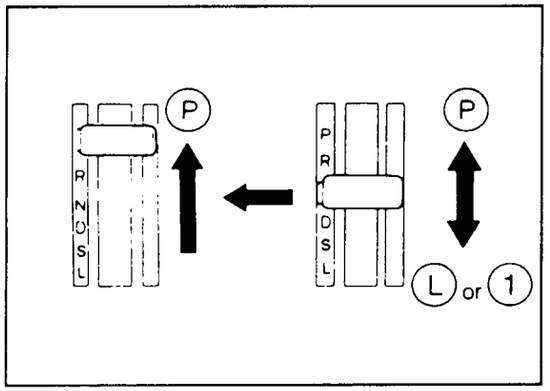
AUTOMATIC TRANSAXLE FLUID (ATF)

Inspection for Fluid Leaks

Check for fluid leaks; the following figure shows the locations where fluid leakage may possibly occur.



1. Oil pan
2. Control valve body cover
3. Oil pump
4. Inhibitor switch
5. Speedometer driven gear
6. Pulse generator (G4A-EL)
7. Oil filler tube
8. Throttle cable
9. Bearing cover
10. Driveshaft
11. Square head plug
12. Transaxle case
13. Drain plug
14. Oil cooler return pipe
15. Oil cooler outlet pipe
16. Fluid temperature switch (G4A-EL)
17. Blind plugs
18. Governor cover (G4A-HL)

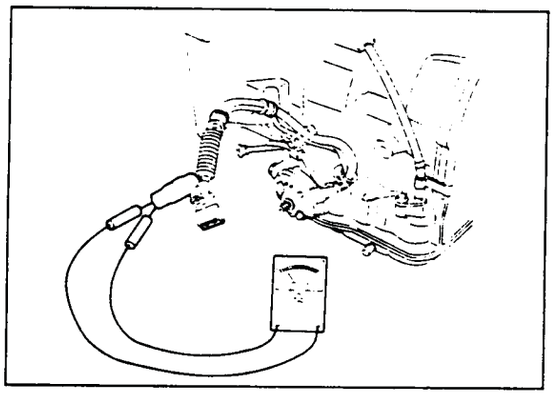


Inspection of Level

1. Apply the parking brake and position wheel chocks to prevent the car from rolling forward.

   Note
   Place the car on a flat, level surface.

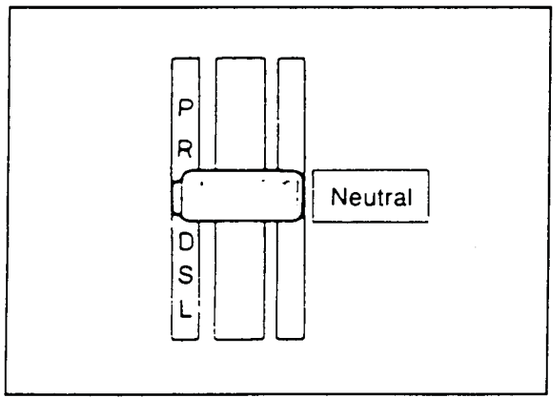
2. Run the engine so that the automatic transaxle fluid reaches specified temperature.
3. While the engine is idling, shift the select lever from P to L or P to 1 and back again.
4. Let the engine idle.
5. Shift the select lever to P.



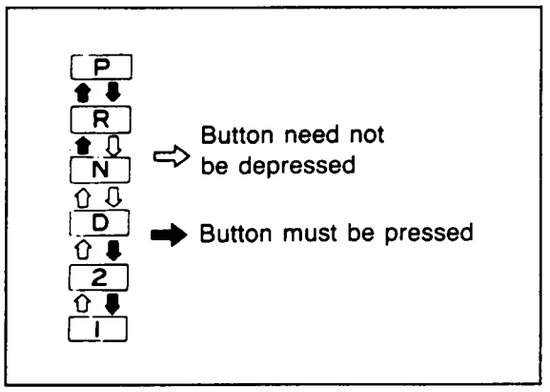
OD RELEASE SOLENOID VALVE (G4A-HL)
Inspection of Resistance
1. Disconnect the solenoid valve connector.
2. Check resistance between the terminals.

Resistance: 13—27 Ω

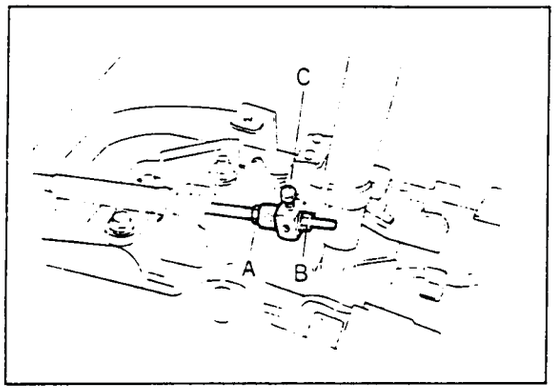
3. If not correct, replace the solenoid valve.



Adjustment
1. Shift the selector lever to N range.
2. Loosen the inhibitor switch mounting bolts.

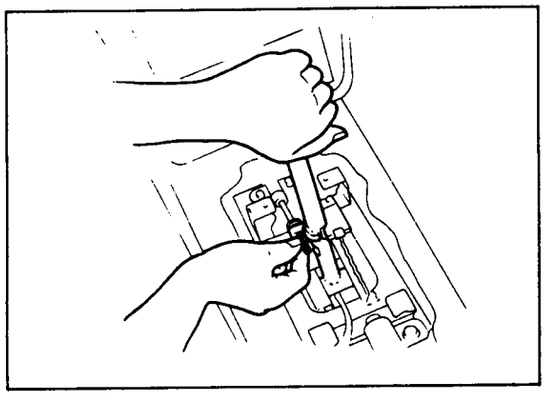


SELECTOR LEVER
Inspection
1. Check that the selector lever can only be shifted as shown in the figure.
2. Make sure there is a click at each range when shifted from the P ↔ L or P ↔ 1 range.
3. Check that the position of the selector lever and the indicator are exact.
4. Check that the button returns smoothly when used to shift the selector.



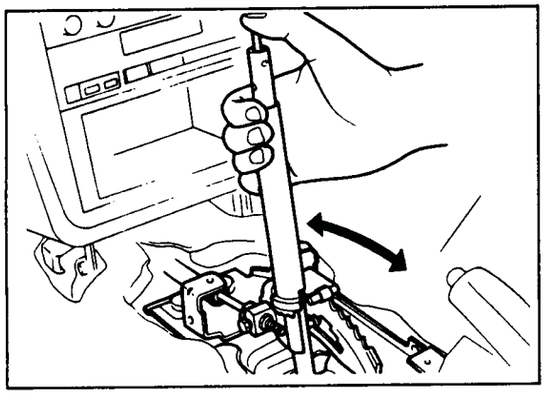
Adjustment
1. Loosen locknuts A, B, and C.
2. Shift the selector lever to the P range.
3. Shift the transmission to the P range by moving the manual shaft of the transmission.
4. Tighten locknut C to the specified torque.

Tightening torque:
8—11 N·m (80—110 cm-kg, 67—96 in-lb)

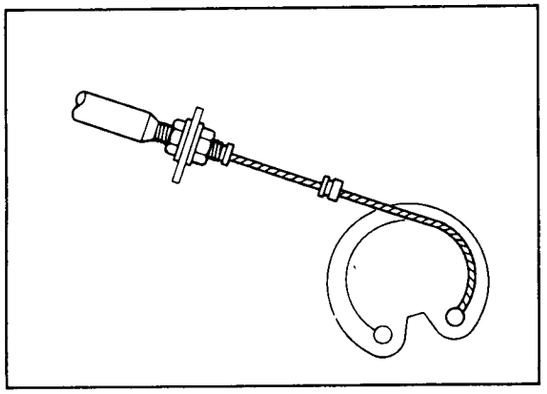


5. Turn the nut by hand until locknut A touches the spacer lightly.
6. Tighten locknut B to the specified torque.

Tightening torque:
8—11 N·m (80—110 cm-kg, 67—96 in-lb)



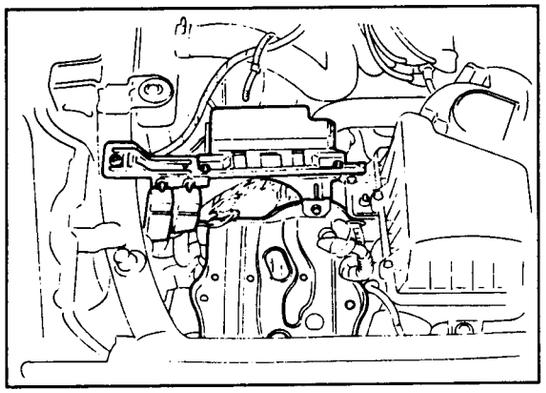
7. Verify that there is a click at each range when shifted from the P ↔ L range.
8. Check that the position of the selector lever and the indicator are exact.
9. Check that the button returns smoothly when used to shift the selector.
10. If necessary, check the spring condition.



THROTTLE CABLE

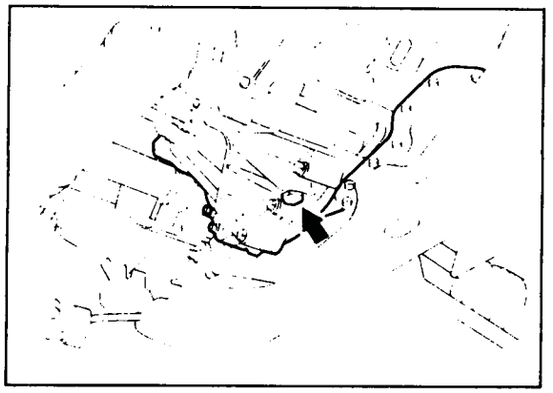
Inspection

1. Check the inner and outer cable for damage.
2. Make sure that the accelerator operates smoothly.

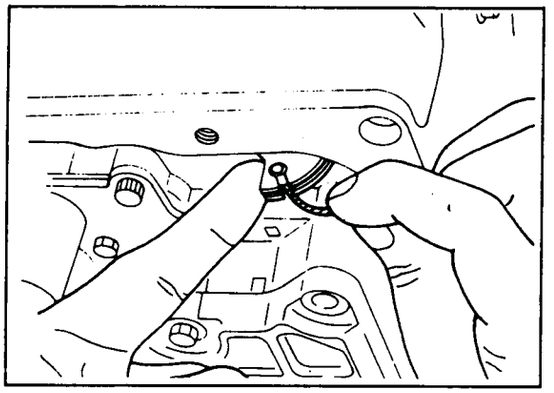


Removal

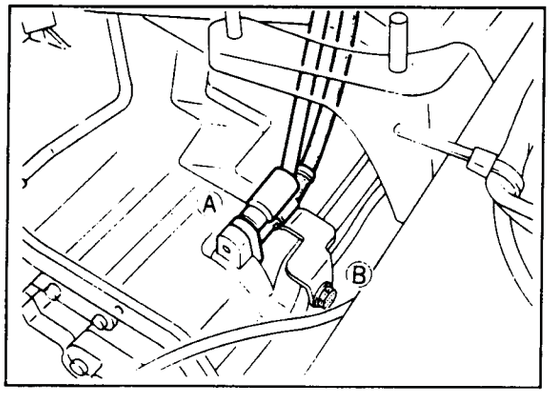
Remove the battery and battery carrier.



Separate the harness from the clip.
Jack up the vehicle and support it with safety stands, then drain the ATF.



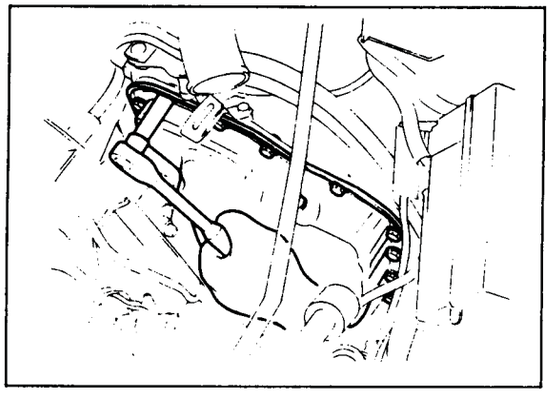
Remove the throttle cable from the throttle cam (throttle chamber).
Remove the control valve body cover and gasket.
Remove the throttle cable from the throttle cam (control valve body).
Remove the mounting bolt and throttle cable from the transaxle.
Remove the O-ring.



Installation
Install in the reverse order of removal referring to installation note.

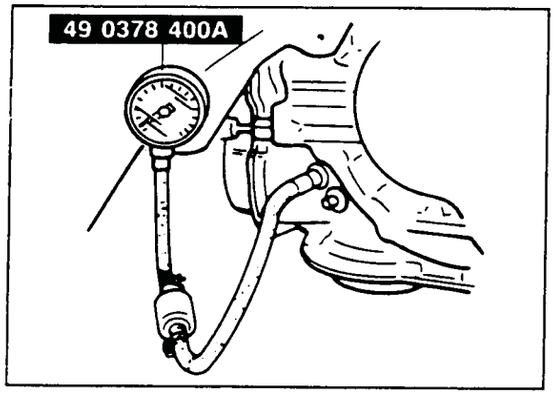
Installation note
Throttle cable
Install the throttle cable and a new O-ring into the transaxle case.

Tightening torque:
Ⓐ 8—11 N·m
(80—110 cm-kg, 69—95 in-lb)
Ⓑ 19—26 N·m
(1.9—2.6 m-kg, 14—19 ft-lb)



Control valve body cover
Install the control valve body cover and a new gasket.

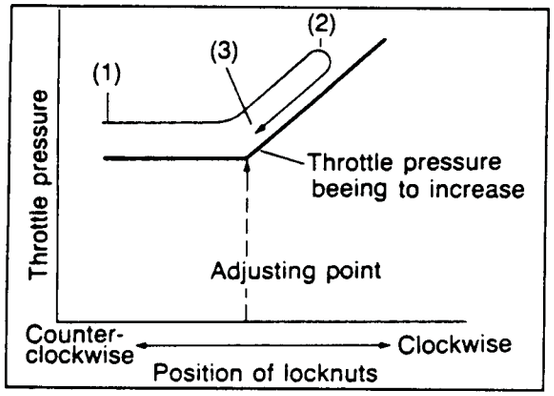
Tightening torque:
8—11 N·m (85—110 cm-kg, 74—95 in-lb)



Adjustment (G4A-HL)

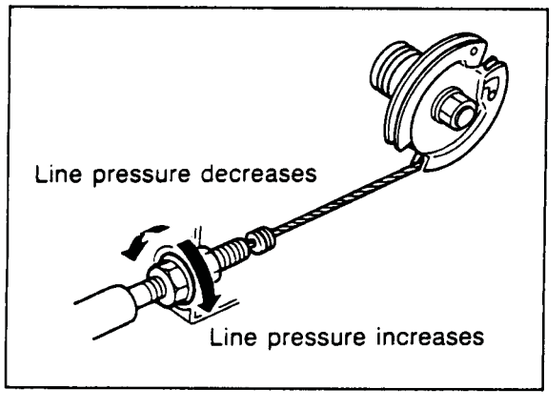
1. Remove the splash shield next to the left front tire.
2. Remove the square head plug T and install the **SST**.
3. Shift into P range and start the engine. Warm up the engine to normal operating temperature, and adjust the idle speed.

Idle speed: 900 $^{+50}_{0}$ rpm



4. Adjust locknuts as follows:
   When the locknuts are moved, throttle pressure is increased or decreased as shown. Adjust the locknuts to the correct position using the following procedure.

   (1) Initially install the locknuts fully away from the throttle cam. (Loosen the cable all the way)
   (2) Adjust the locknuts in a clockwise direction as viewed from the front of the vehicle until the throttle pressure begins to increase above the specification shown below.

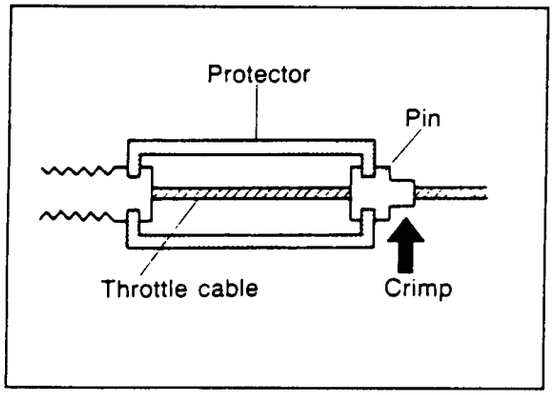


   (3) Adjust the locknuts in a counterclockwise direction until the throttle pressure decreases to the specification. Tighten the locknuts.

Specified pressure: 88—108 kPa (0.9—1.1 kg/cm^2, 13—16 psi)

Note
Transmission in P range

5. Turn off the engine.



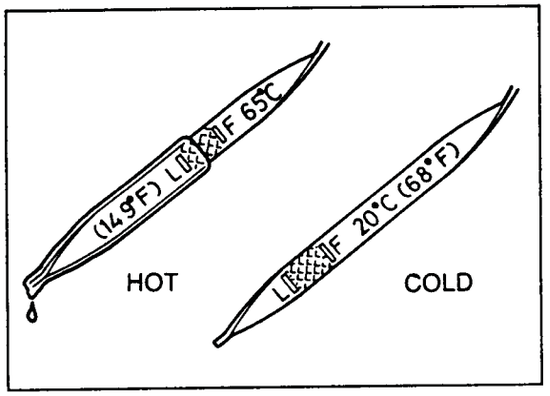
6. Reinstall the square head plug.

Tightening torque:
5—10 N·m (50—100 cm-kg, 43—87 in-lb)

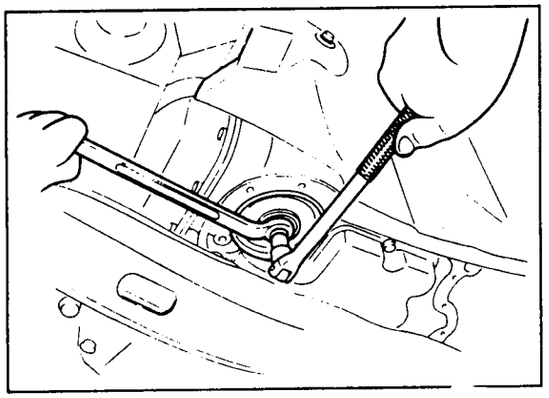
7. Fully open the throttle valve; then crimp the pin with the protector installed as shown.
8. Remove the protector.

Install the magnets on the oil pan as shown and install the oil pan along with a new gasket.

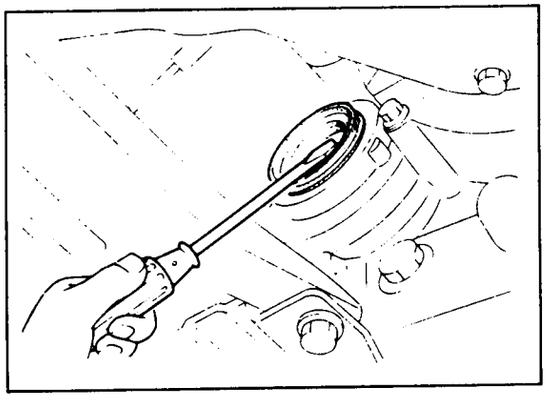
Tightening torque:
8—11 N·m (80—110 cm-kg, 69—95 in-lb)



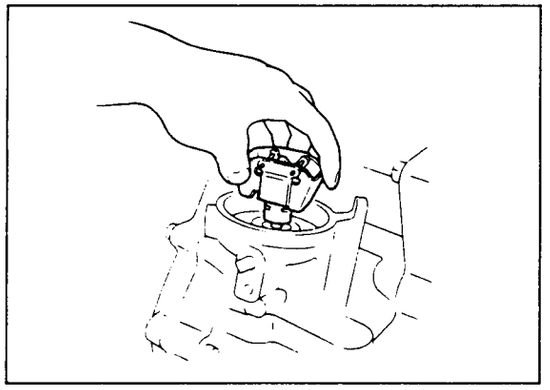
Add ATF, and with the engine idling, check the fluid level and for leaks.



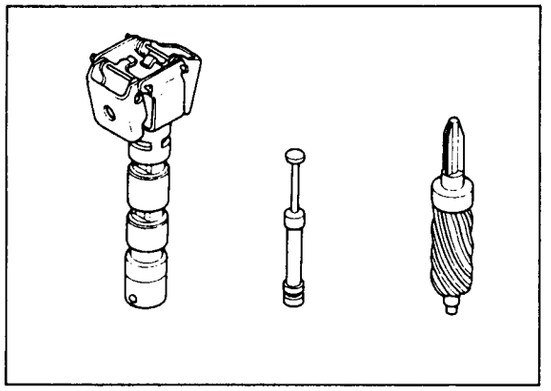
ADJUSTMENT OF 2-4 BRAKE BAND
Remove the oil pan.
Adjust the 2-4 brake band.



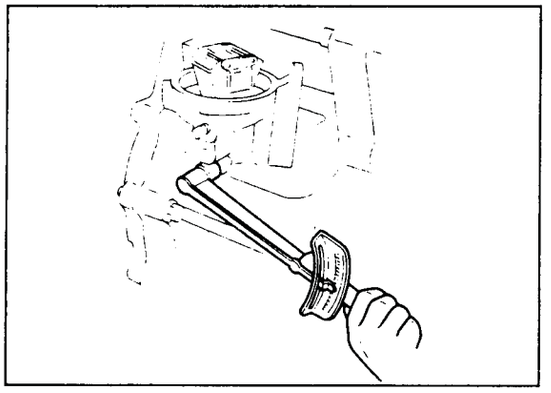
REPLACEMENT OF DRIVESHAFT OIL SEAL
Replace the oil seal in the same manner as for the manual transaxle.



GOVERNOR (G4A-HL)
Removal
Remove the clip from the governor cover.
Remove the stopper bolt; then remove the governor assembly.



Disassembly, Inspection and Assembly
Refer to Governor section of INSPECTION AND REPAIR.



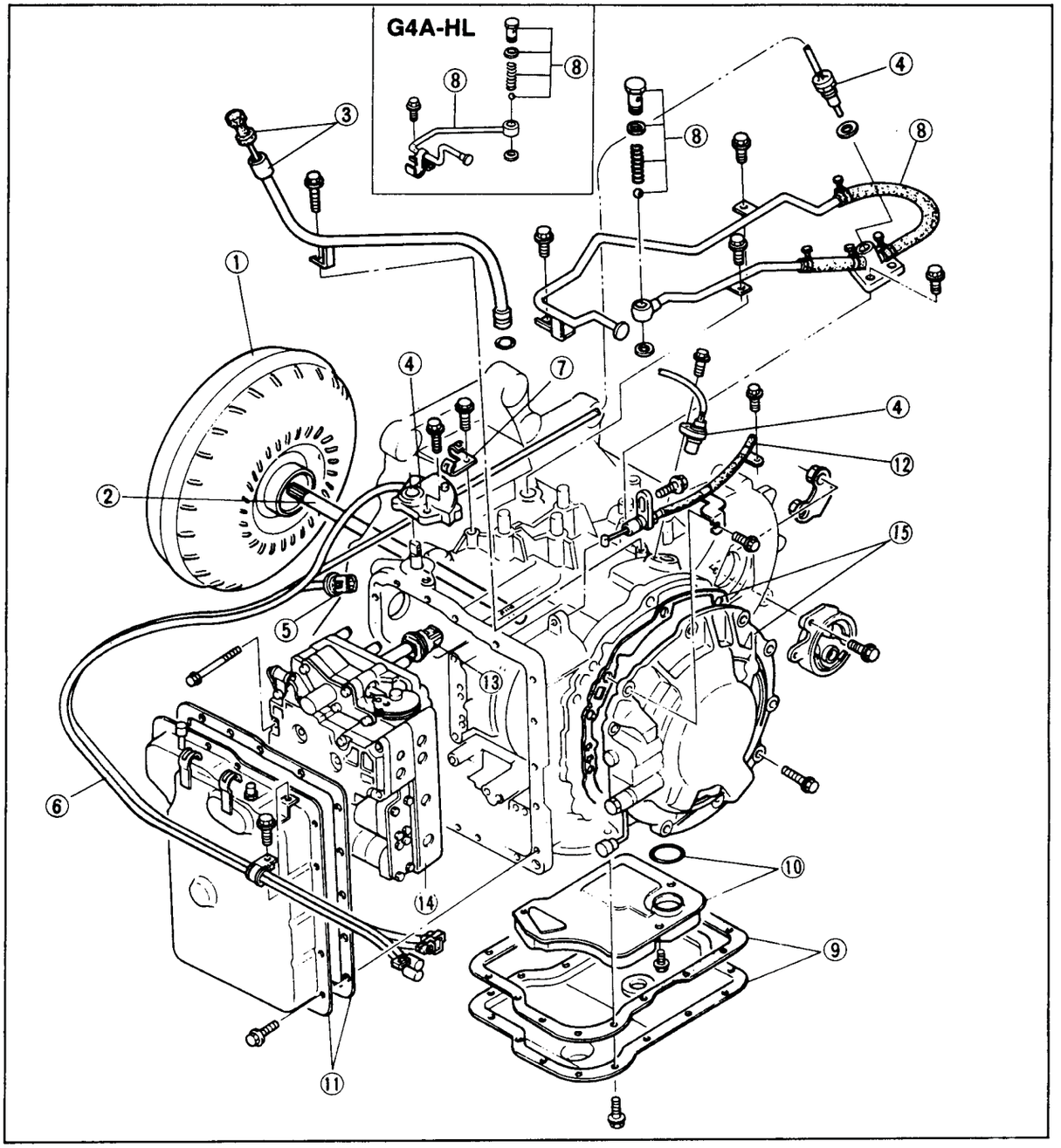
Installation
Install in the reverse order of removal referring to installation note.

Installation note
Stopper bolt
Tighten the stopper bolt.

Tightening torque:
6—9 N·m (60—90 cm-kg, 52—78 in-lb)

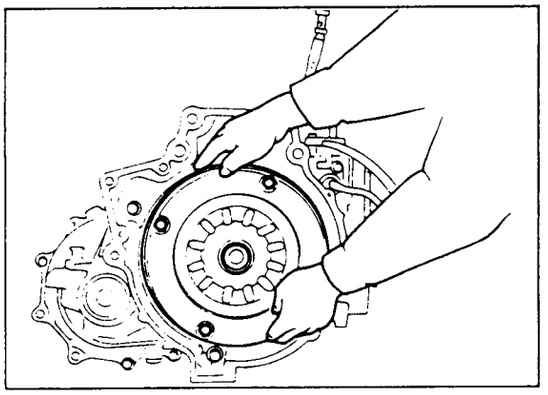
DISASSEMBLY

DISASSEMBLY
Components



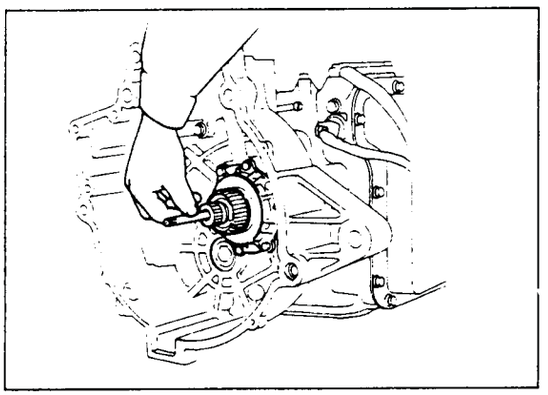
1. Torque converter
2. Oil pump shaft
3. Oil level gauge and oil filler tube
4. Pulse generator, fluid temperature switch, and inhibitor switch
5. Solenoid connector
6. Wire harnesses
7. Harness clip
8. Oil pipes, oil hoses, and switch box
9. Oil pan and gasket
10. Oil strainer and O-ring
11. Control valve body cover and gasket
12. Throttle cable
13. Solenoid connector (Valve body side)
14. Control valve body
15. Oil pump and gasket

Procedure
Precaution
(1) Drain the ATF before removing the transaxle from the vehicle.
(2) Disassemble the transaxle in a clean area (dustproof workspace) to prevent dust entry into the mechanisms.
(3) Clean the transaxle exterior thoroughly with steam and/or cleaning solvents prior to disassembly.
(4) Inspect the individual transaxle components in accordance with the Troubleshooting during disassembly.
(5) Use plastic hammers when applying force to separate the light alloy case joints.
(6) Do not use rags during disassembly.
(7) Neatly arrange the removed parts in order during disassembly.

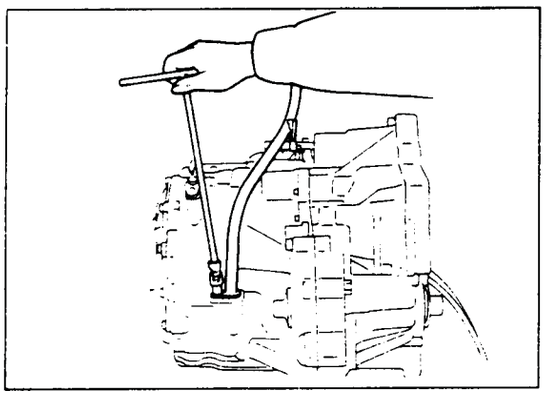


1. Remove the torque converter from the converter housing.

Note
Do not allow the ATF to spill when removing the torque converter.

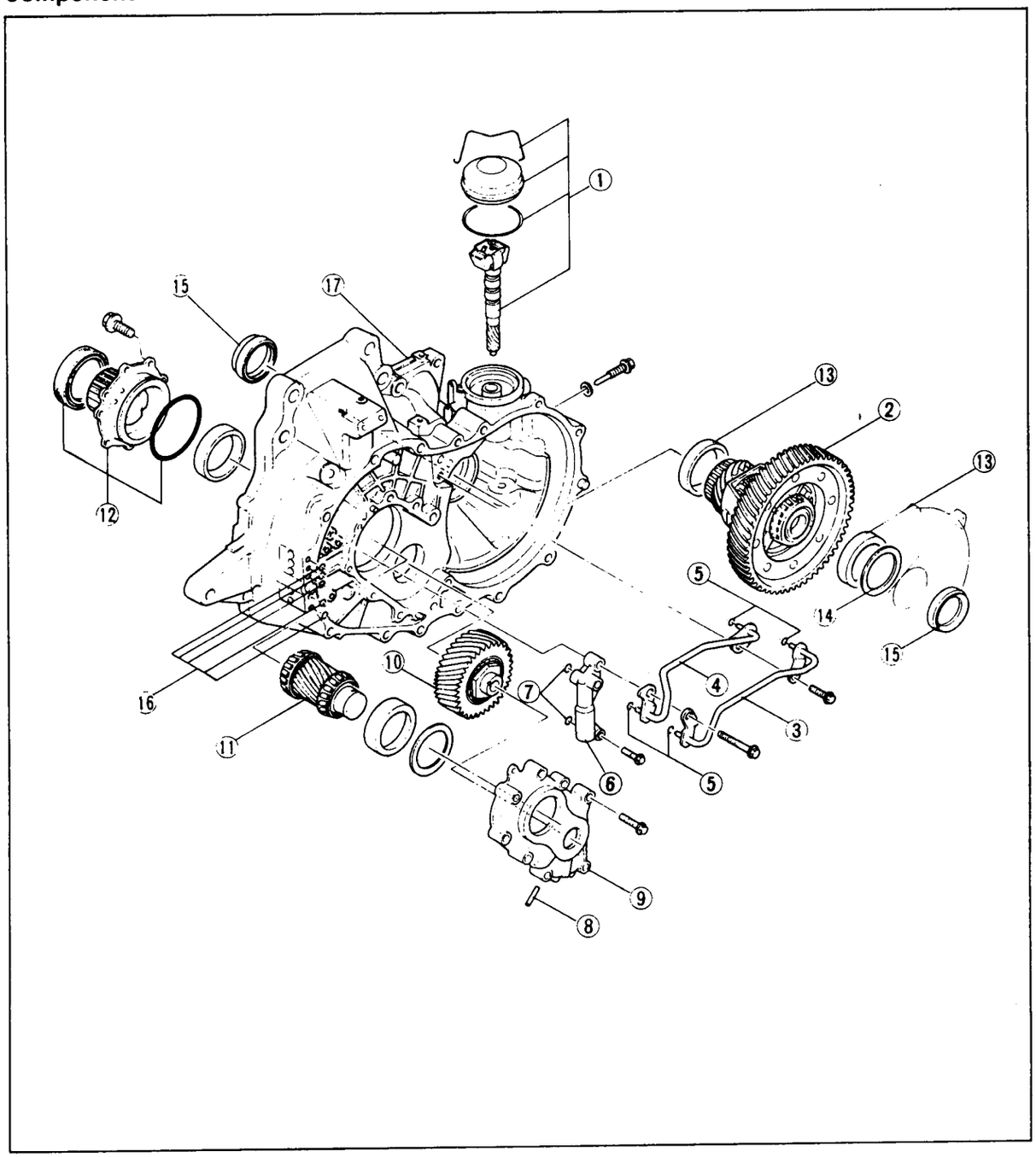


2. Pull out the oil pump shaft by hand.

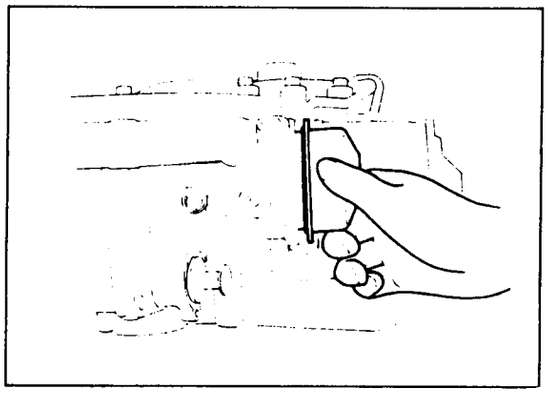


3. Remove the oil level gauge and oil filler tube.

DISASSEMBLY-
Component



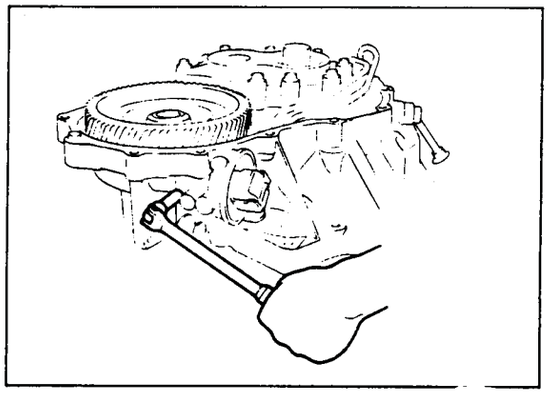
1. Governor assembly (G4A-HL)
2. Differential assembly
3. Governor outlet pipe (G4A-HL)
4. Governor inlet pipe (G4A-HL)
5. O-rings (G4A-HL)
6. 2-3 accumulator piston assembly
7. O-rings
8. Roll pin
9. Bearing housing
10. Idle gear assembly
11. Output gear assembly
12. Bearing cover assembly
13. Bearing outer races
14. Adjust shim
15. Oil seals
16. O-rings
17. Converter housing



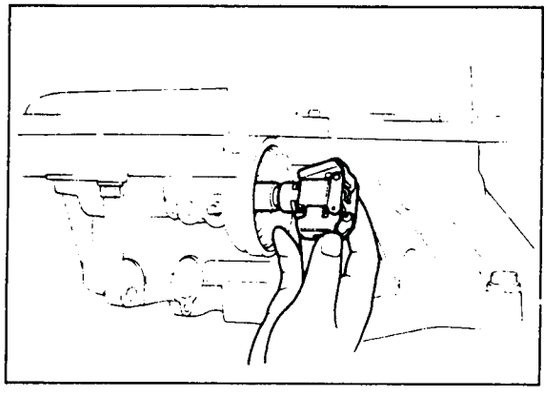
Procedure

Remove the governor assembly.

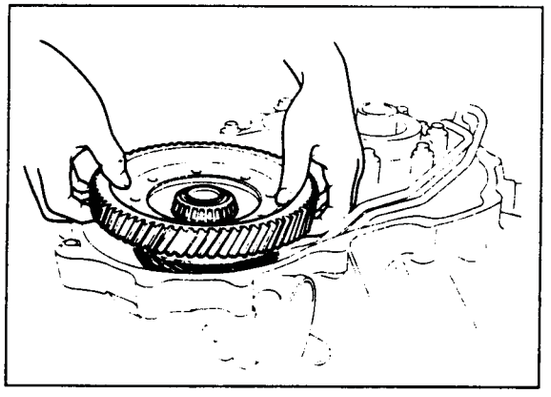
(1) Remove the clip, governor cover and O-ring.



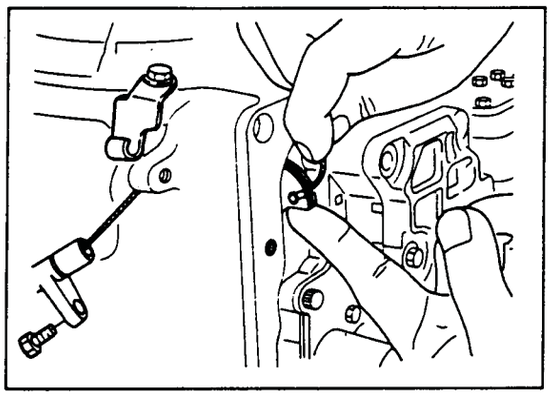
(2) Remove the stopper bolt.



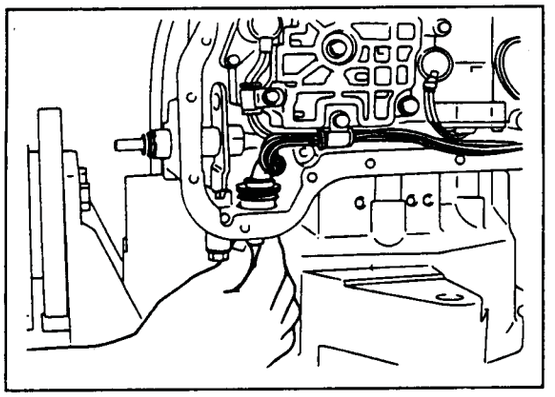
(3) Remove the governor assembly.



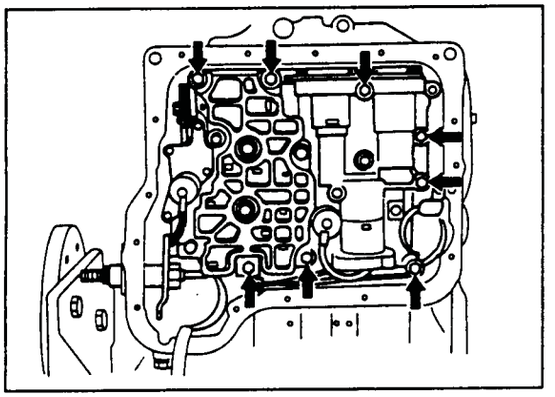
Remove the differential assembly.



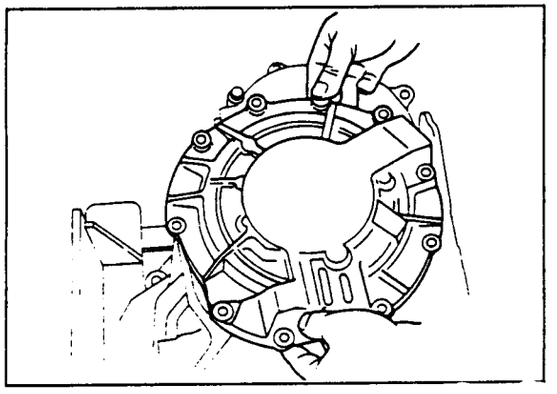
Remove the throttle cable.
(1) Remove the throttle cable attaching bolt and bracket.
(2) Remove the cable from the throttle cam of the valve body.



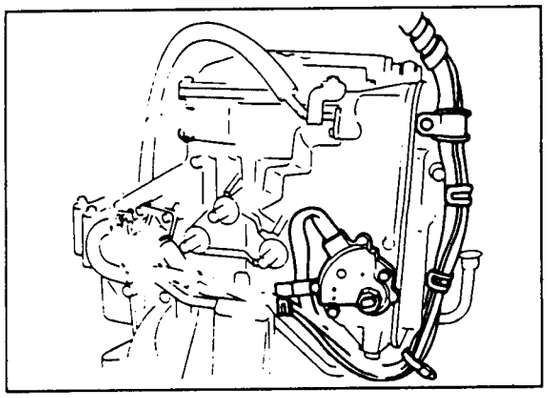
Pinch the teeth of the solenoid connector and remove it by pushing inward.



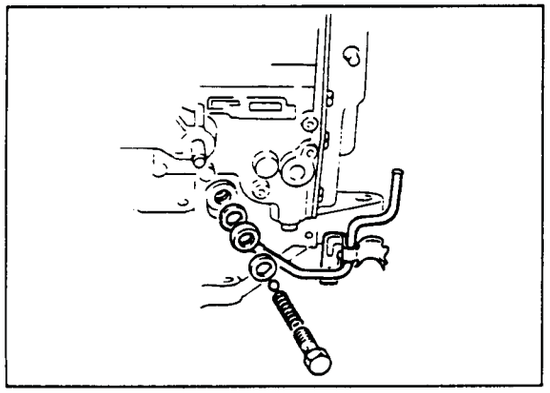
Remove the control valve body as an assembly.



Remove the oil pump as an assembly.

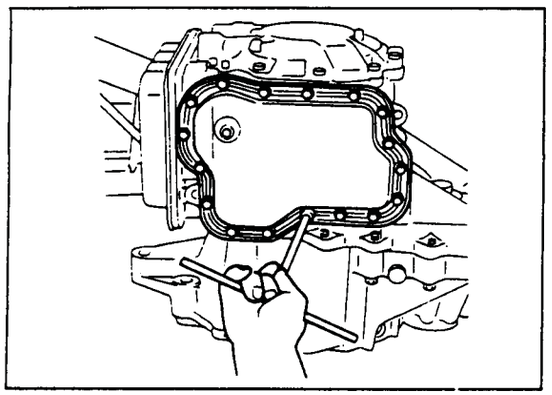


G4A-HL
Remove the inhibitor switch.

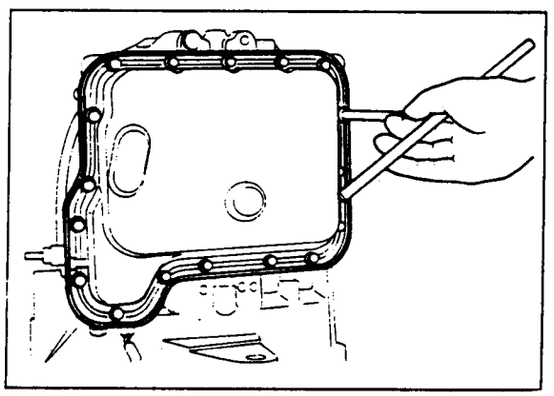


G4A-HL
Remove the oil pipe.

Note
Remove the ball from the case.

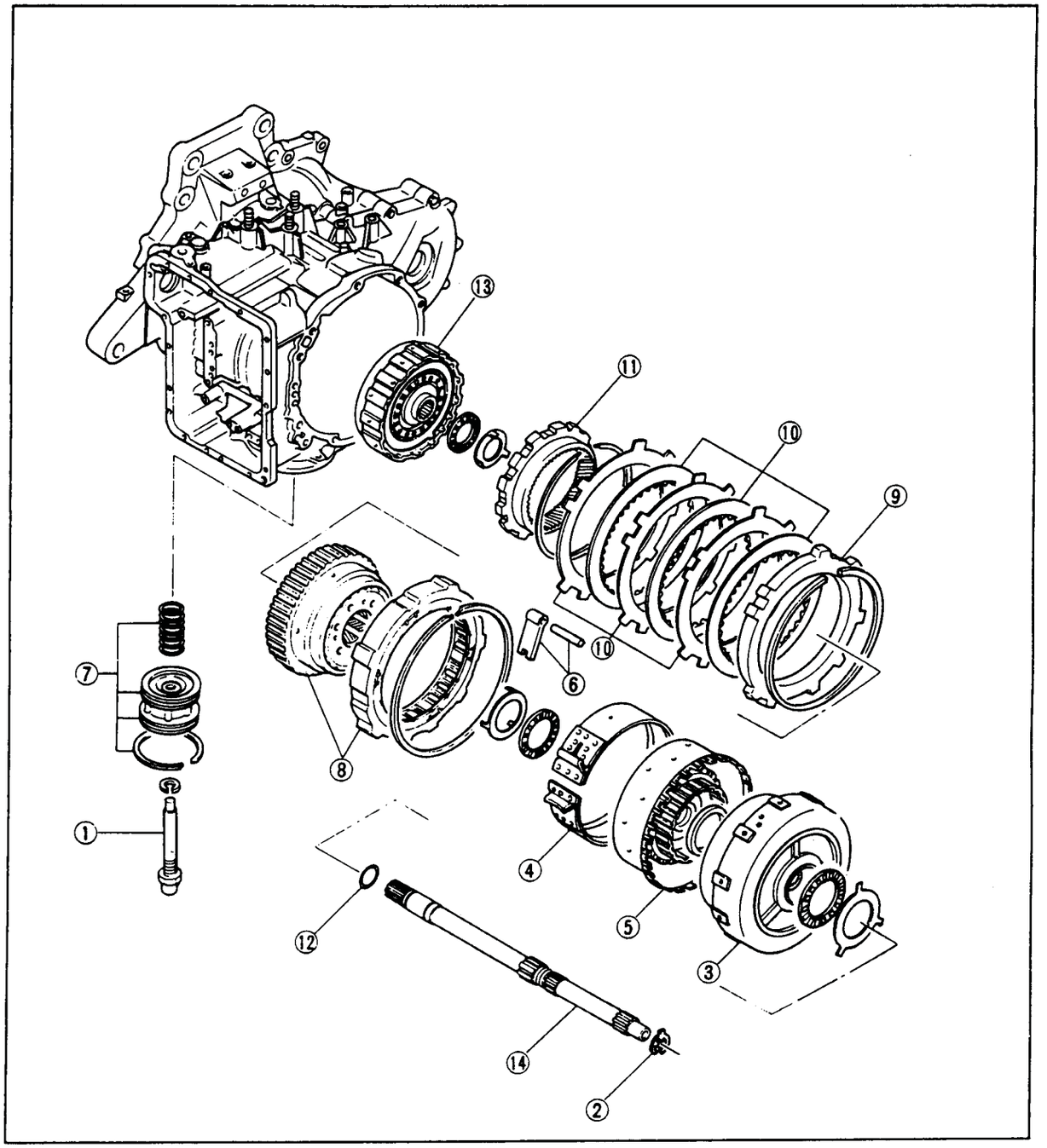


Remove the oil pan and gasket.



Remove the control valve body cover and gasket.

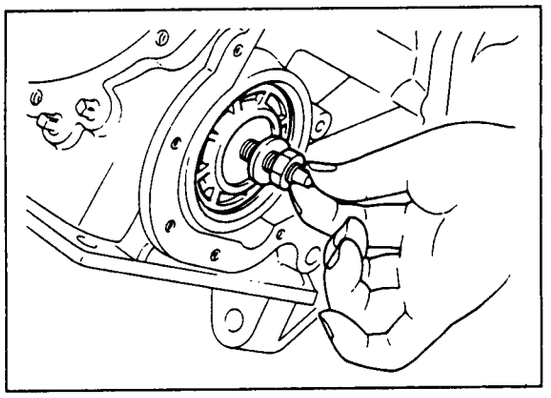
DISASSEMBLY
Components



1. Piston stem
2. Snap ring
3. Clutch assembly
4. 2-4 brake band
5. Small sun gear and one-way clutch
6. Anchor strut and shaft
7. Servo
8. One-way clutch and carrier hub assembly

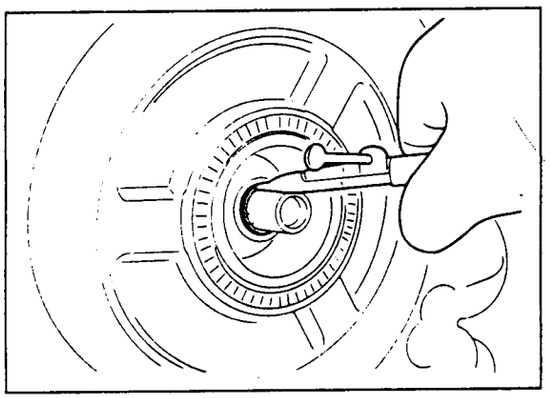
—Low and reverse brake—

9. Retaining plate
10. Drive and driven plates
11. Internal gear
12. O-ring
13. 3-4 clutch assembly
14. Turbine shaft



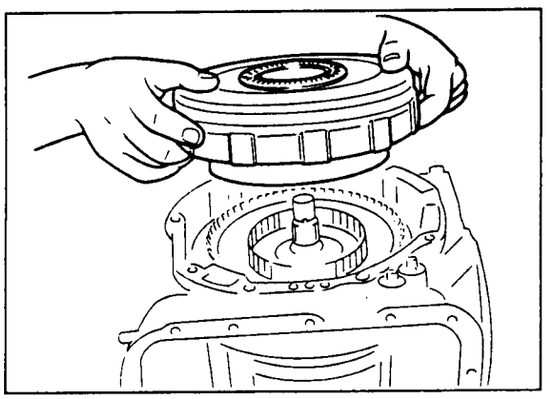
Procedure

Remove the piston stem from the servo.

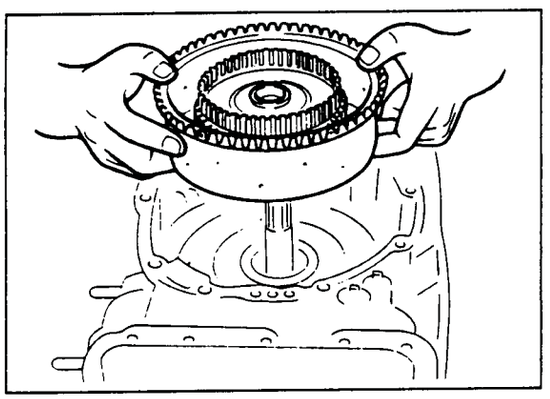


Remove the clutch assembly.

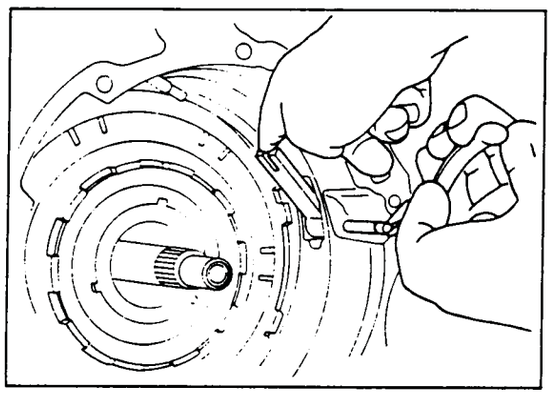
(1) Remove the turbine shaft snap ring.



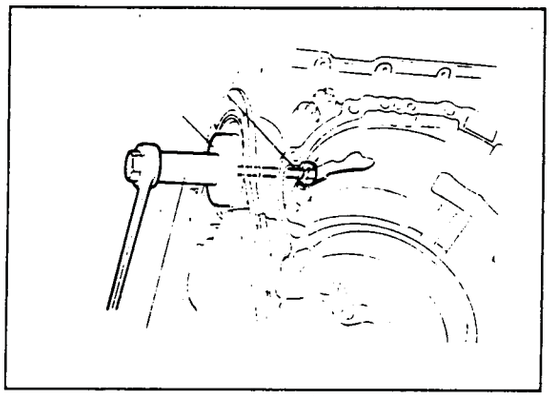
(2) Pull the reverse and forward drum and remove the clutch assembly.



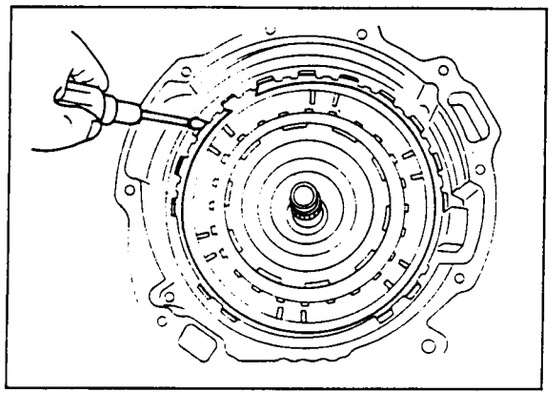
Remove the small sun gear and one-way clutch.



Pull the anchor shaft while holding the strut, then remove the strut.

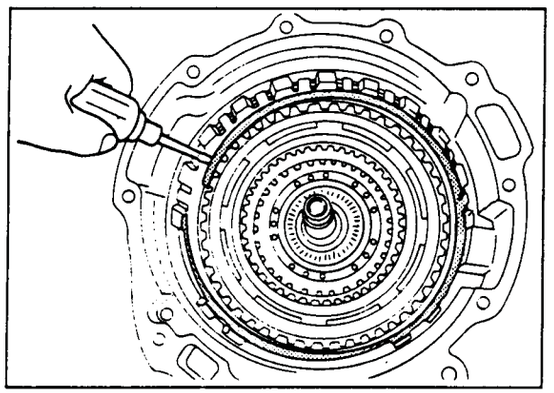


Remove the servo.
(1) Remove the snap ring with the **SST**.
(2) Remove the servo and spring.

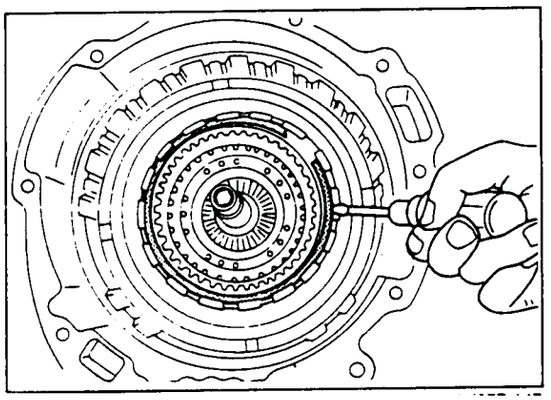


Remove the one-way clutch and carrier hub assembly.
Remove the snap ring.

Remove the internal gear from the 3-4 clutch drum.

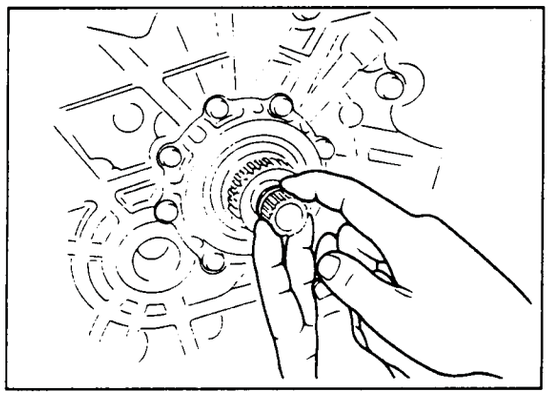


Remove the low and reverse brake assembly.
Remove the snap ring.

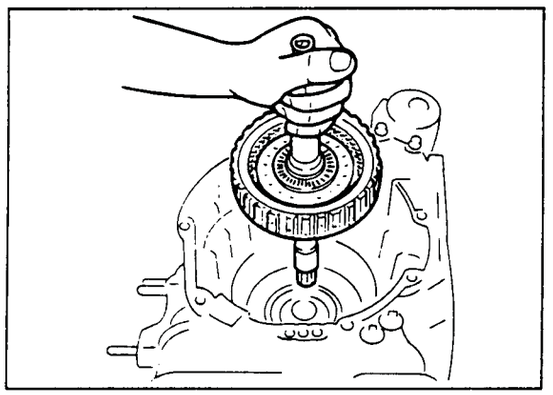


Remove the internal gear.
Remove the snap ring.

Remove the retaining plate and the drive and driven plates.



Remove the 3-4 clutch assembly.
Remove the O-ring from the turbine shaft at the converter housing side.

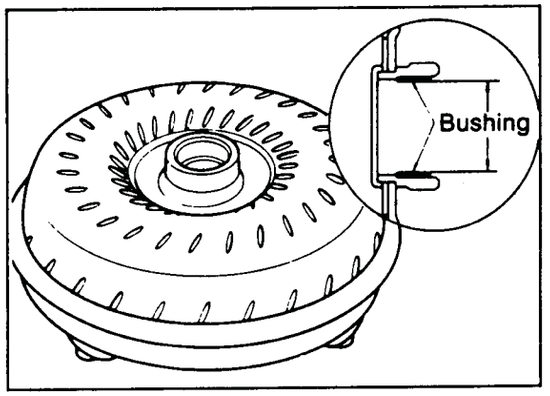


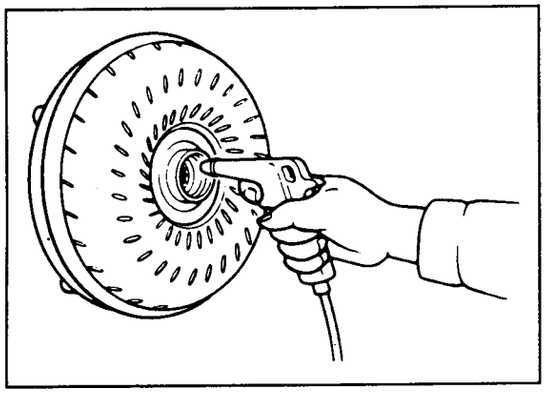
Pull out the turbine shaft to remove the 3-4 clutch assembly.
Remove the 3-4 clutch assembly.

INSPECTION AND REPAIR

PRECAUTION

(1) Several of the parts resemble each other; organize them so that they do not get mixed up.
(2) Clean each part with cleaning oil, clean out the oil holes and oil passages with compressed air, and check that there are no obstructions.
(3) When using cleaning oil and compressed air, wear protective eyewear.
(4) If a clutch plate or brake band is replaced with a new one, soak it in ATF for 2 hours or more before installing.
(5) Before assembly, apply ATF to all seal rings, rotating parts, and sliding parts.
(6) All seals, gaskets and roll pins must be replaced with new ones during assembly.
(7) Use petroleum jelly, not grease where required.
(8) When it is necessary to replace a bushing, replace the assembly which includes that bushing.





TORQUE CONVERTER

The torque converter is welded together and cannot be disassembled.

Inspection

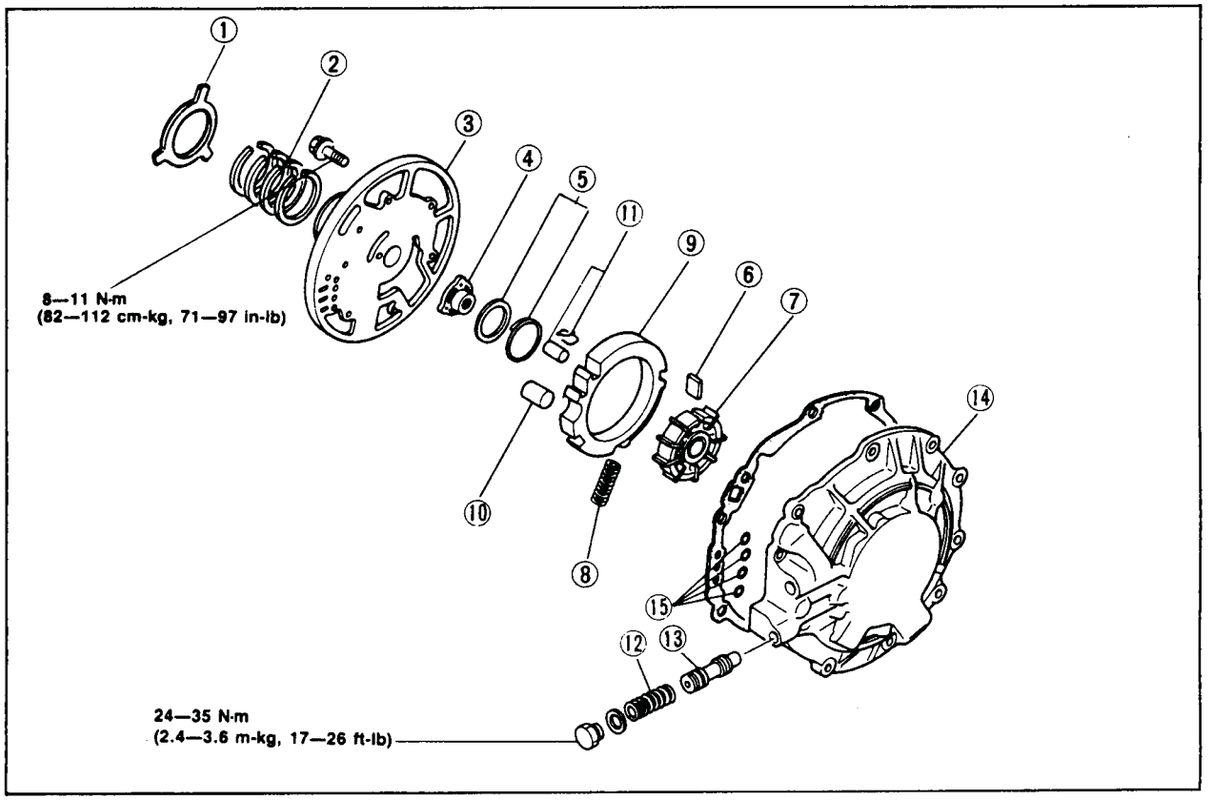
1. Check the outer part of the converter for damage or cracks, and replace it if necessary.
2. Check whether there is any rust on the pilot hub of the converter or on the boss. If there is any, remove it completely.
3. Measure the bushing of the converter boss. Replace the converter assembly if the bushing is worn.

Bushing inner diameter
Standard: 53.030 mm (2.088 in)
Maximum: 53.076 mm (2.090 in)

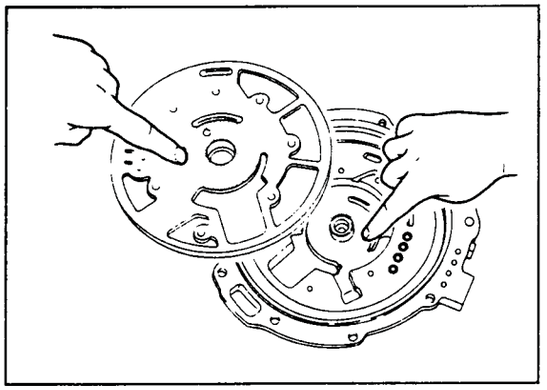
Washing Inside of Converter

1. Drain any ATF remaining in the converter.
2. Pour in solvent [approximately **0.5 liter (0.53 US qt, 0.44 Imp qt)**].
3. Shake the converter to clean the inside. Pour out the solvent.
4. Clean the inside of the converter with compressed air so that the inside is perfectly empty.
5. Pour in ATF.
6. Shake the converter to clean the inside. Pour out the ATF.

OIL PUMP
Disassembly
Disassemble in the sequence shown in the figure.



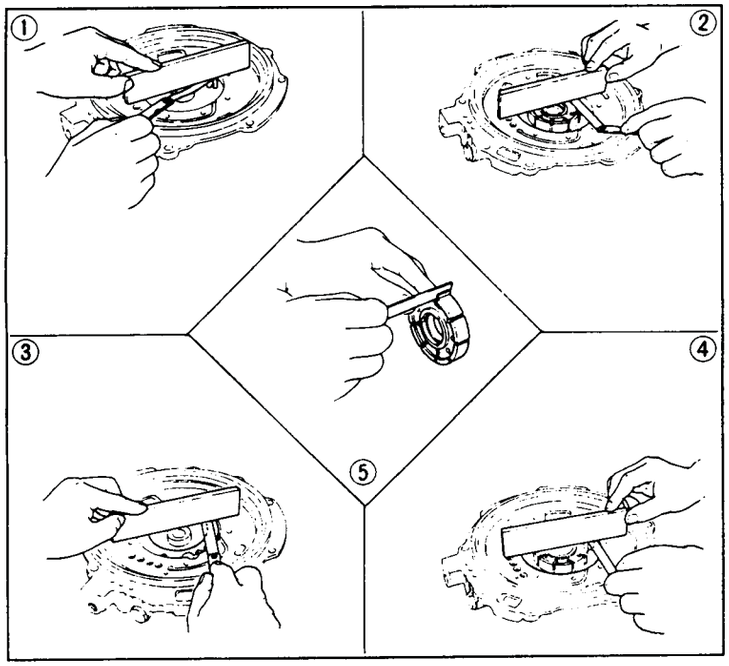
1. Bearing race
2. Seal rings
3. Oil pump cover
4. Pump flange
5. Guide ring and guide spring
6. Vane
7. Rotor
8. Spring
9. Cam ring
10. Pivot roller
11. Seal pin and spring
12. Spring
13. Valve
14. Oil pump body
15. O-ring



Inspection
Check the following and replace any faulty parts.
1. Sliding surfaces of the oil pump cover and oil pump body for damage or wear
2. Broken or worn seal ring
3. Weakened spring

Free length of springs:
(1) For the cam ring (No. 8)
41.6 mm (1.64 in)
(2) For the valve (No. 12)
35.0 mm (1.38 in)

4. Clearance
Measure the clearances below; if not within specification, replace the oil pump.



1. Seal pin—Oil pump cover
Standard:
0.005—0.020 mm
(0.0002—0.0008 in)
Maximum: 0.060 mm (0.002 in)

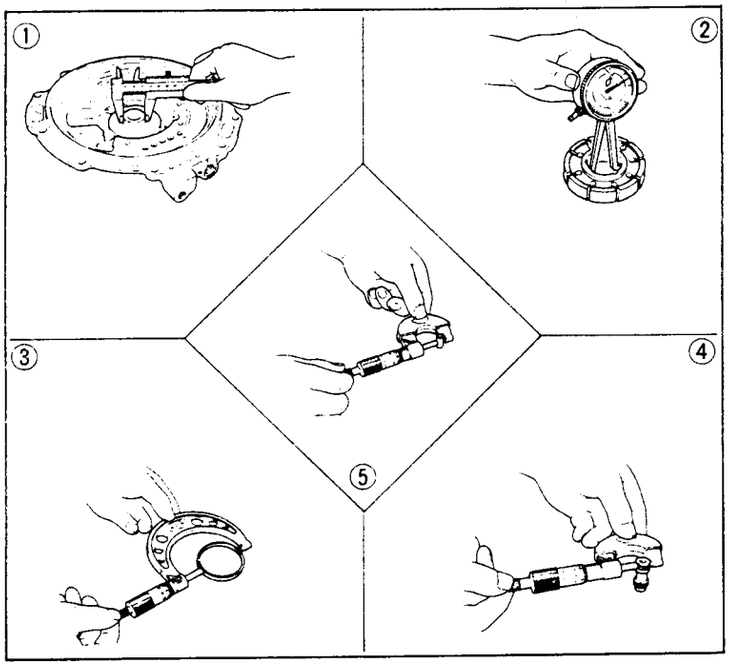
2. Rotor—Oil pump cover
Standard:
0.005—0.020 mm
(0.0002—0.0008 in)
Maximum: 0.030 mm (0.0012 in)

3. Cam ring—Oil pump cover
Standard:
0.005—0.020 mm
(0.0002—0.0008 in)
Maximum: 0.080 mm (0.003 in)

4. Vane—Oil pump cover
Standard:
0.015—0.050 mm
(0.0006—0.0020 in)
Maximum: 0.080 mm (0.003 in)

5. Vane—Rotor groove
Standard:
0.010—0.045 mm
(0.0004—0.0018 in)
Maximum: 0.065 mm (0.0026 in)

5. Wear limit
Check each part for wear; if not within specification, replace the oil pump.



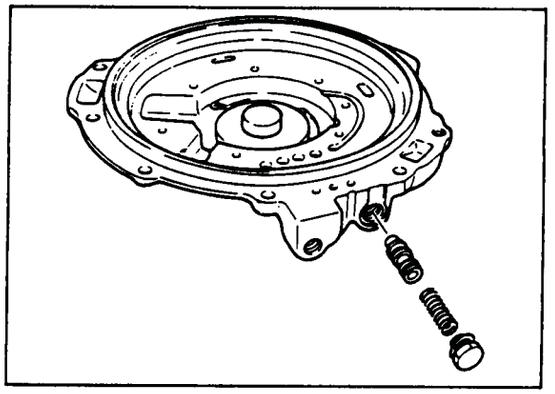
1. Oil pump body sleeve.. outer diameter
Standard: 28.00 mm (1.102 in)

2. Rotor bushing .... inner diameter
Standard: 28.00 mm (1.102 in)
Maximum: 28.05 mm (1.104 in)

3. Guide ring ..... outer diameter
Standard: 57.85 mm (2.278 in)
Minimum: 57.70 mm (2.272 in)

4. Valve..... outer diameter
Standard: 12.00 mm (0.472 in)
Minimum: 11.86 mm (0.467 in)

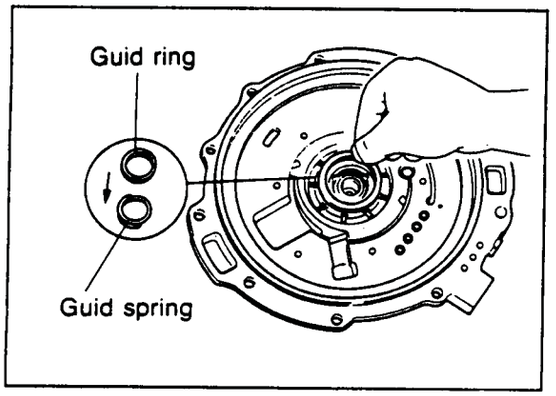
5. Seal pin..... outer diameter
Standard: 5.00 mm (0.197 in)
Minimum: 4.90 mm (0.193 in)



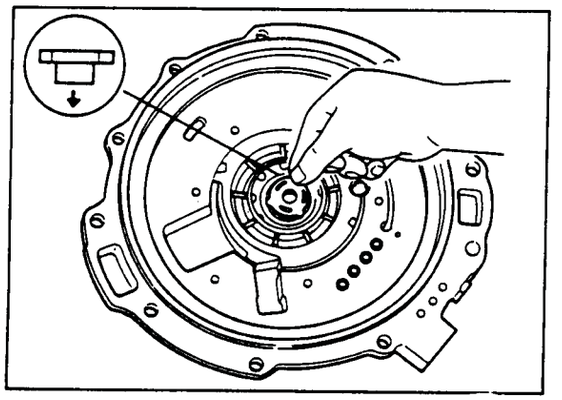
Assembly

Install the valve and spring into the oil pump body, and check that the valve moves smoothly. Install the plug.

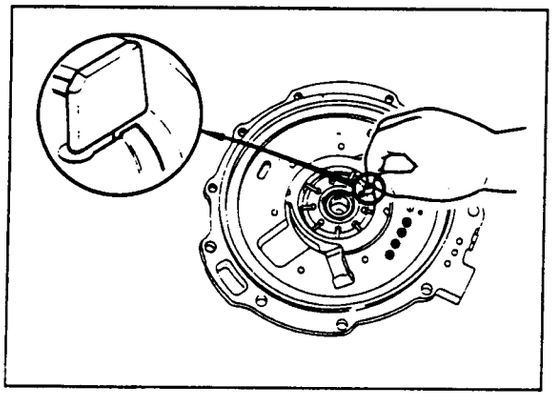
Tightening torque:
24—35 N·m (2.4—3.6 m-kg, 17—26 ft-lb)



Install the guide spring and guide ring while expanding the vanes toward the cam ring.



Install the pump flange onto the rotor.

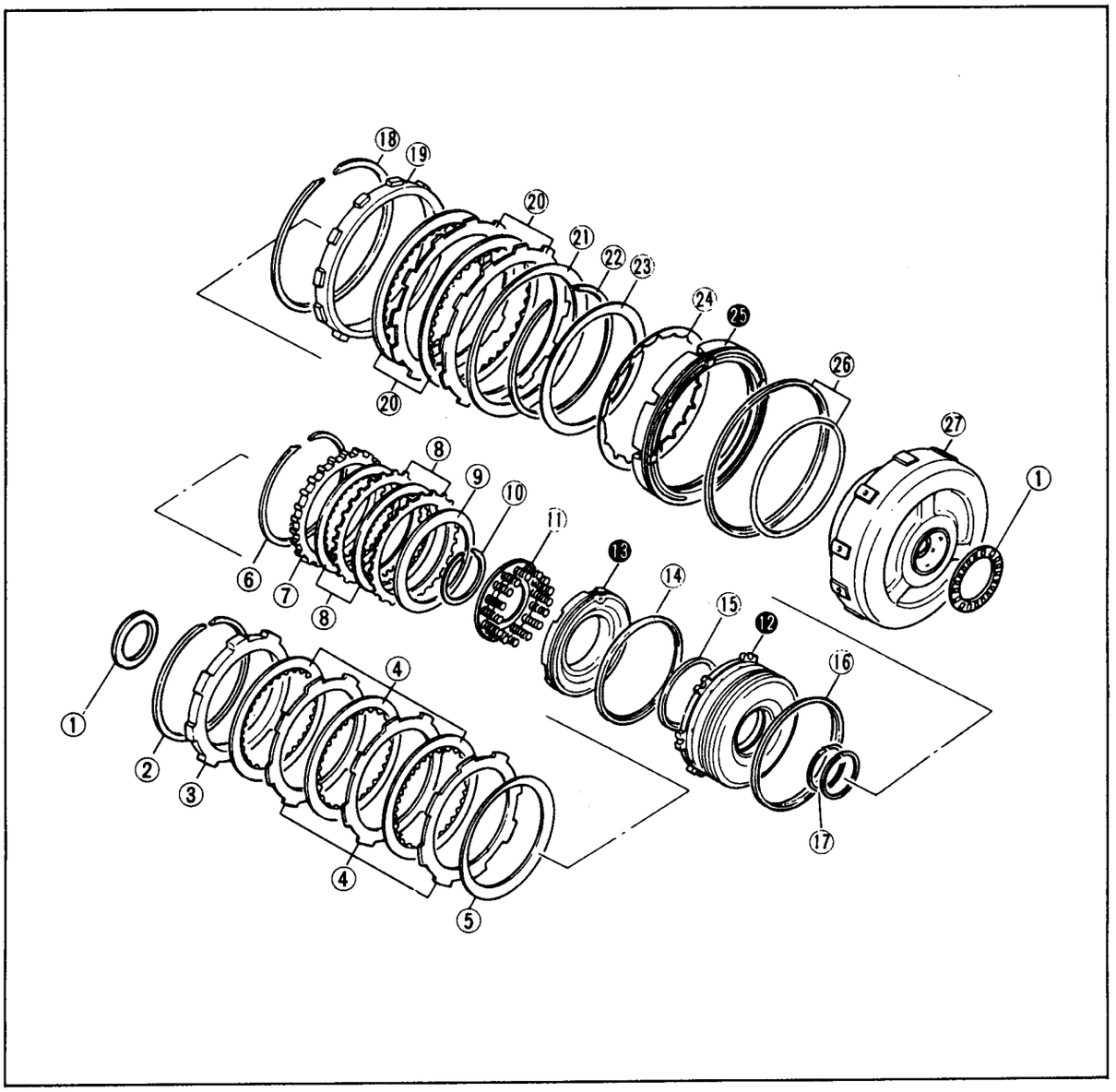


Install the vanes into the rotor as shown.

CLUTCH ASSEMBLY

Disassembly

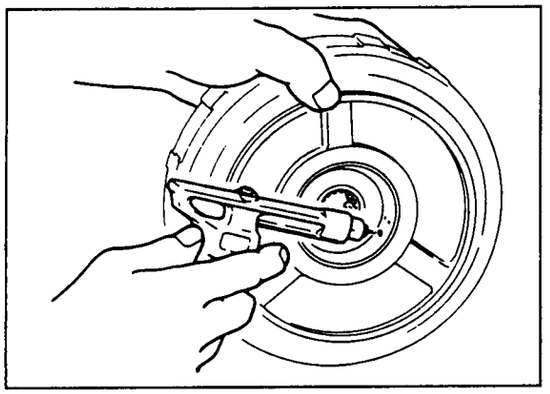
Disassemble in the sequence shown in the figure referring to the disassembly note for the specially marked parts.



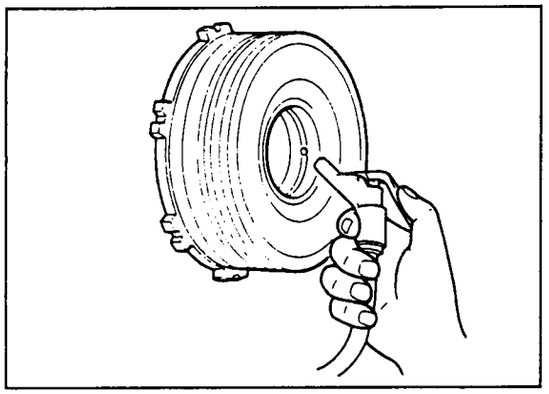
—Forward clutch—
1. Thrust bearings
2. Snap ring
3. Retaining plate
4. Drive and driven plates
5. Dished plate

—Coasting clutch—
6. Snap ring
7. Retaining plate
8. Drive and driven plates
9. Dished plate
10. Snap ring
11. Spring and retainer assembly
12. Coasting clutch drum
13. Coasting piston
14. Outer seal
15. Inner seal
16. Outer seal
17. Seal rings

—Reverse clutch—
18. Snap ring
19. Retaining plate
20. Drive and driven plates
21. Dished plate
22. Snap ring
23. Return spring stopper
24. Piston return spring
25. Reverse piston
26. Seal rings (inner and outer)
27. Reverse and forward drum

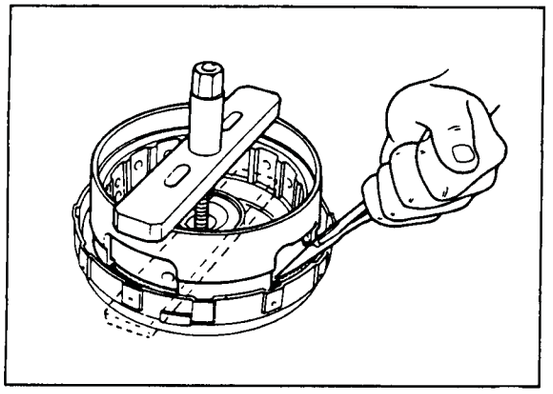


Remove the coasting clutch drum from the reverse and forward drum by applying compressed air through the fluid passage.

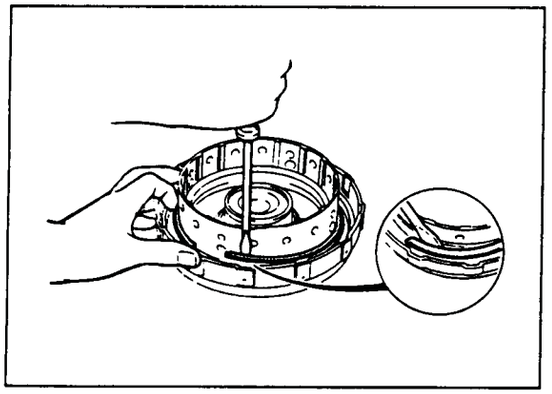


Coasting piston

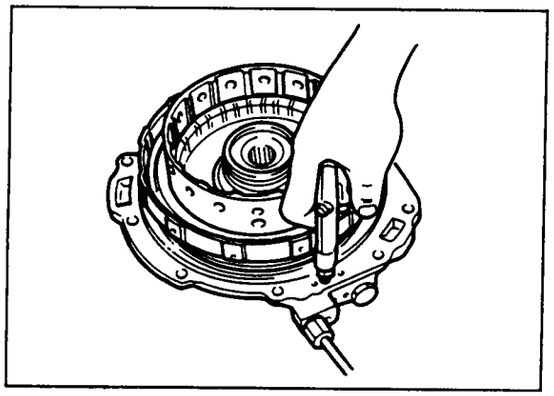
Remove the coasting clutch piston from the coasting clutch drum by applying compressed air through the fluid passage.



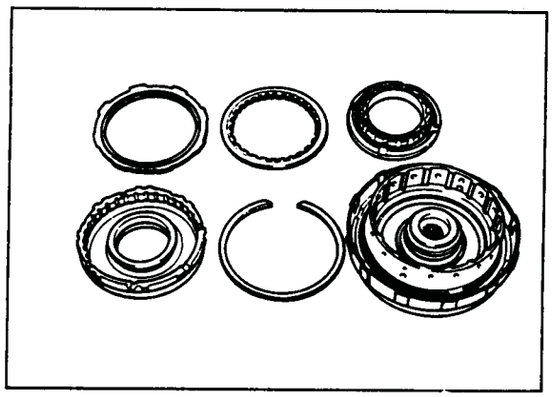
Remove one end of the snap ring from the groove with snap ring pliers.



Remove the **SST** from the reverse and forward drum.
Remove the snap ring with a screw driver.



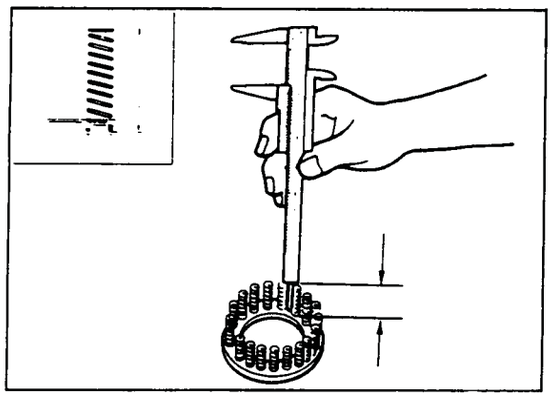
Place the reverse and forward drum on the oil pump.
Remove the reverse piston by applying compressed air through the fluid passage.



Inspection
Check the following and repair or replace any faulty parts.
Drive and driven plates for damage or wear

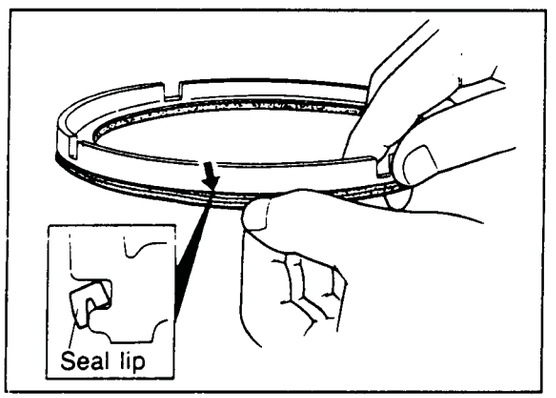
Drive plate thickness
Standard: 1.6 mm (0.063 in)
Minimum: 1.4 mm (0.055 in)

Clutch piston for damage or cracks
Clutch drum for damage or deformation
Seal contact area for damage
Check ball for leaking sticking
Broken or worn snap ring
Broken or weakened spring

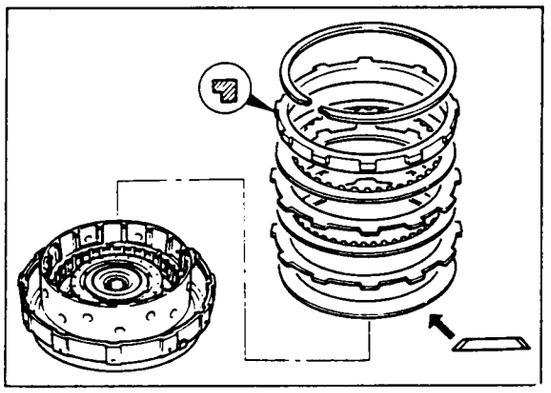


Spring and retainer assembly for separation or deformation

Free length of spring:
29.8 mm (1.173 in)



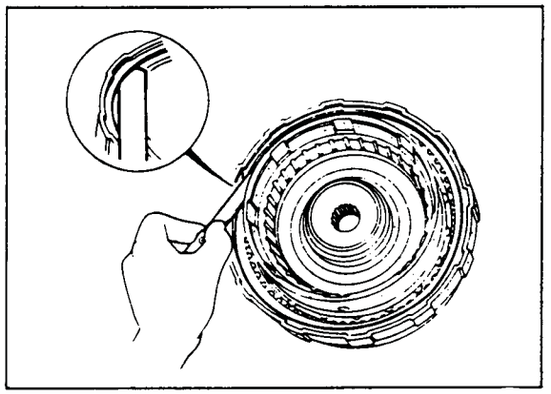
Assembly
Reverse clutch
Install the reverse piston.
Apply ATF to inner and outer faces of the seals, and install them to the reverse piston.
Face the outer seal lip toward the inside by gently rolling it down around the circumference for easier installation into the reverse clutch drum.



Install the dished plate with the dished side facing the piston as shown.
Install the drive and driven plates.

Note
Installation order:
Driven-Drive-Driven-Drive

Install the retaining plate with the step facing downward.
Install the snap ring.

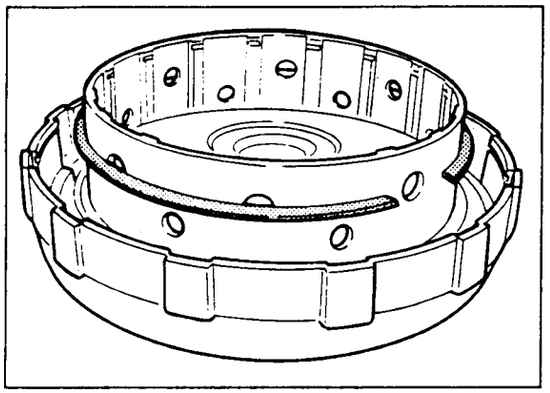


Check the reverse clutch clearance.
Measure the clearance between the snap ring and the retaining plate of the reverse clutch. If the clearance is not within specification, adjust it by selecting a proper retaining plate.

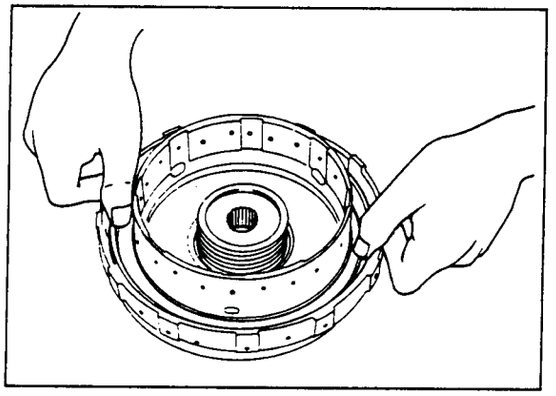
Reverse clutch clearance:
2.1—2.4 mm (0.083—0.094 in)

Retaining plate sizes mm (in)

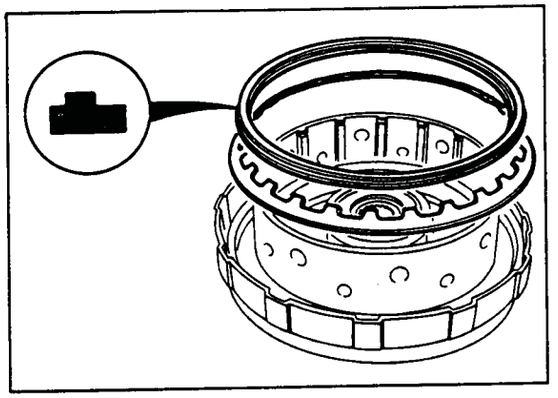
6.6 (0.260)	6.8 (0.268)	7.0 (0.276)
7.2 (0.283)	7.4 (0.291)	7.6 (0.299)



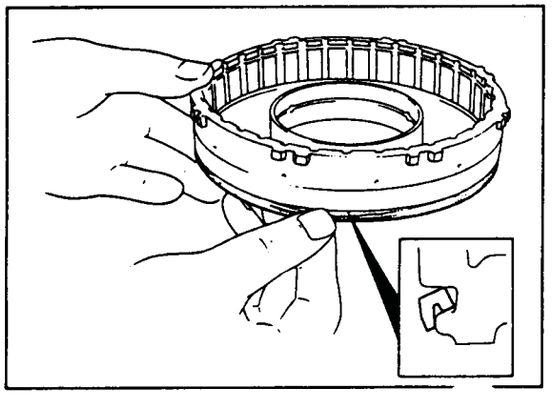
Install the snap ring half-way down the reverse forward drum as shown.



Install the reverse piston by pushing evenly around the circumference, being careful not to damage the seal rings.



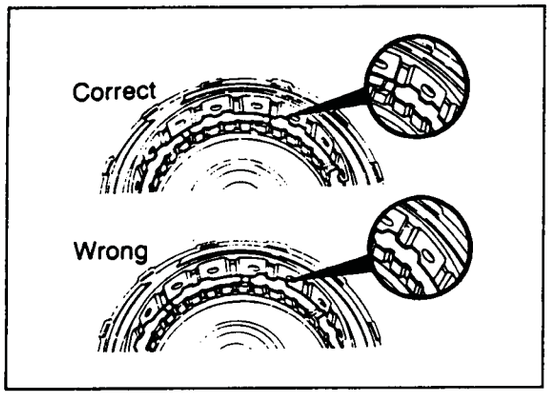
Install the piston return spring with the tabs facing away from the reverse piston.
Install the return spring stopper with the step facing upwards.



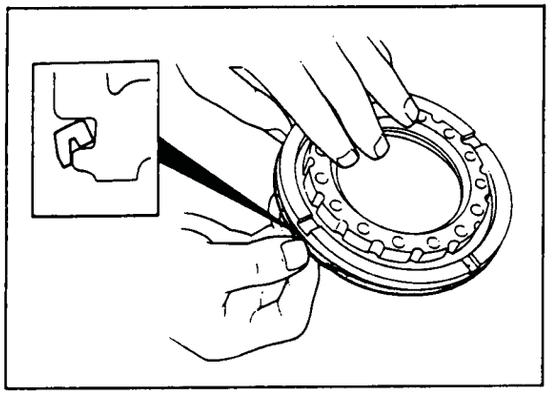
Coasting clutch

Install the coasting clutch drum.

Apply ATF to inner and outer faces of the seal, and install it onto the coasting clutch drum. Face the outer seal lip toward the inside by gently rolling it down around the circumference for easier installation into the drum.

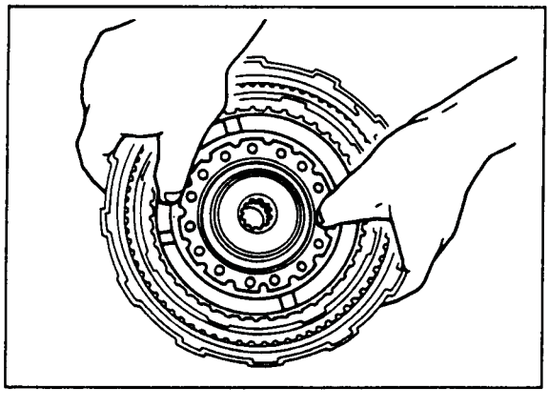


Install the coasting clutch drum the correct position in the reverse and forward drum.
Push evenly around the circumference, being careful not to damage the outer seal.

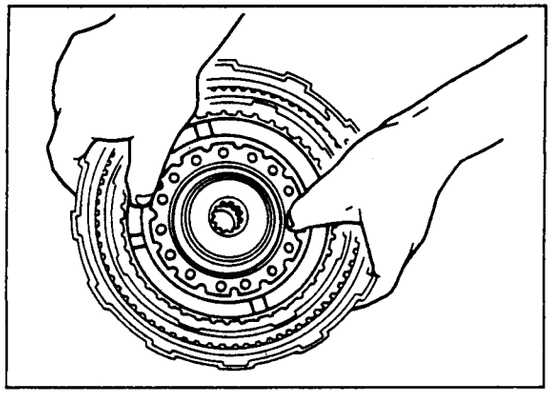


Install the coasting piston

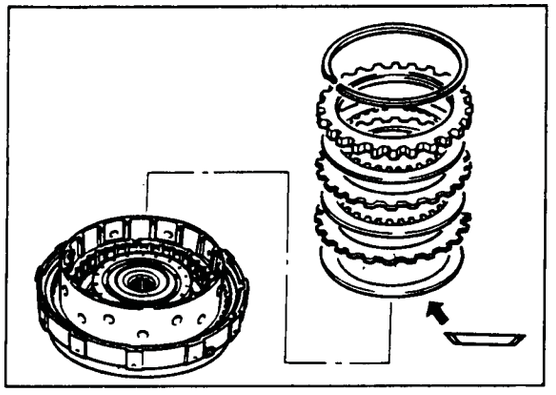
Apply ATF to inner and outer faces of the seals and install them onto the coasting piston. Face the outer seal lip toward the inside by gently rolling it down around the circumference for easier installation into the drum.



Install the coasting piston by pushing evenly around the circumference, being careful not to damage the outer seal.



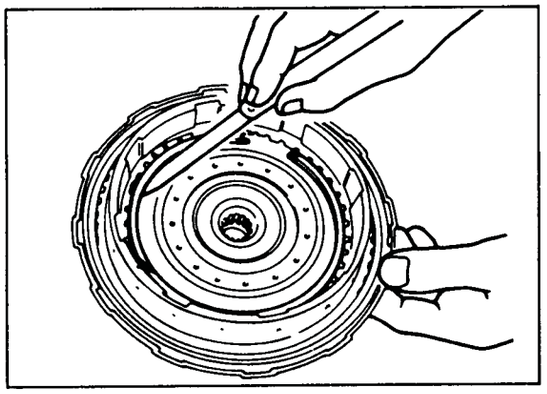
Install the spring and retainer assembly.



Install the dished plate with the dished side upward.
Install the drive and driven plates.

Note
Installation order:
Driven-Drive-Driven-Drive

Install the retaining plate.
Install the snap ring.

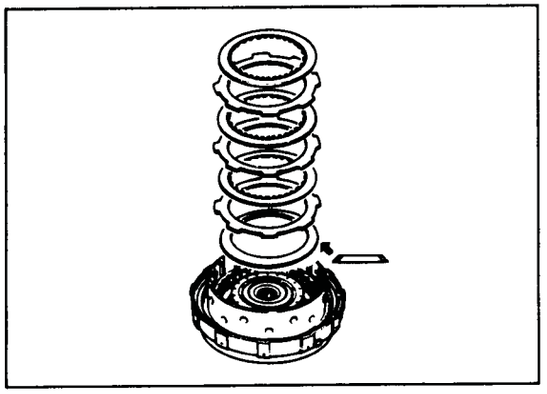


Check the coasting clutch clearance.
Measure the clearance between the snap ring and the retaining plate of the coasting clutch. If the clearance is not within specification, adjust it by selecting a proper retaining plate.

Coasting clutch clearance:
1.0—1.2 mm (0.040—0.047 in)

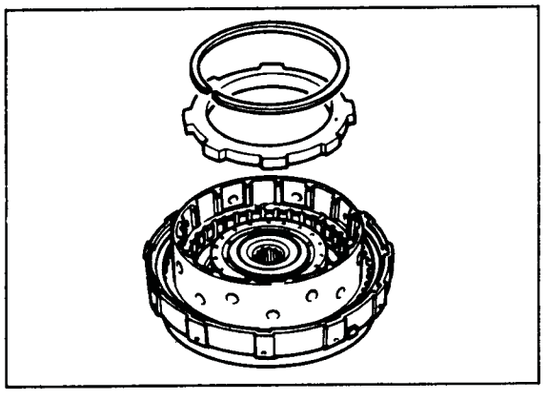
Retaining plate sizes mm (in)

4.6 (0.181)	4.8 (0.189)	5.0 (0.197)
5.2 (0.205)	5.4 (0.213)	5.6 (0.220)

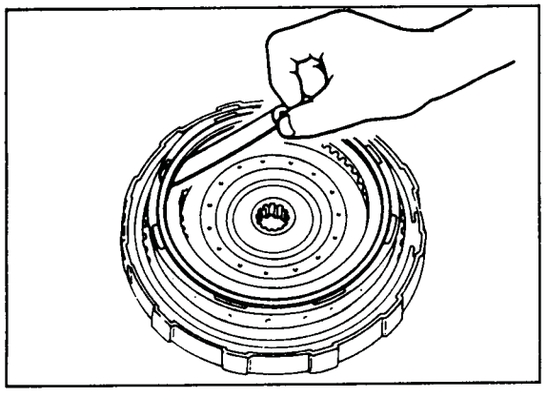


Forward clutch
Install the dished plate with the dished side downward.
Install the drive and driven plates.

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



Install the retaining plate.
Install the snap ring.

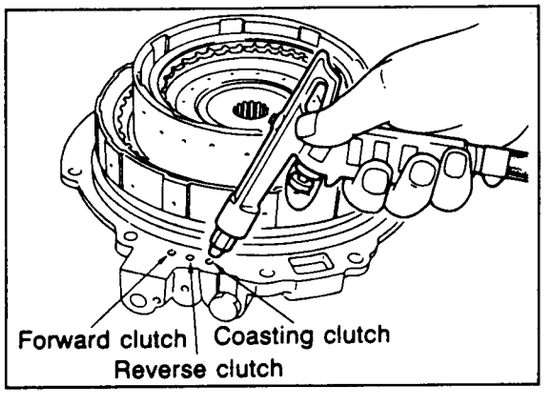


Check the forward clutch clearance.
Measure the clearance between the snap ring and the retaining plate of the forward clutch. If the clearance is not within specification, adjust it by selecting a proper retaining plate.

Forward clutch clearance:
1.0—1.2 mm (0.040—0.047 in)

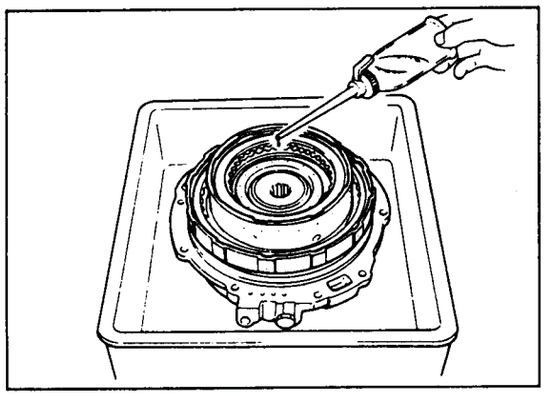
Retaining plate sizes mm (in)

5.9 (0.232)	6.1 (0.240)	6.3 (0.248)
6.5 (0.256)	6.7 (0.264)	8.9 (0.350)

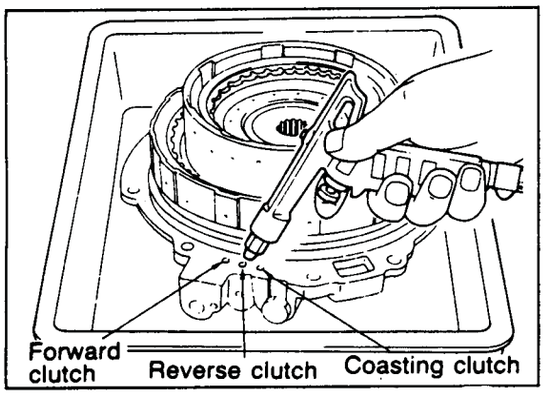


Check for the clutch operation as follows.
Set the clutch assembly onto the oil pump. Check the clutch operation by applying compressed air through the fluid passages as shown.

Applied air pressure:
392 kPa (4.0 kg/cm^2, 57 psi)

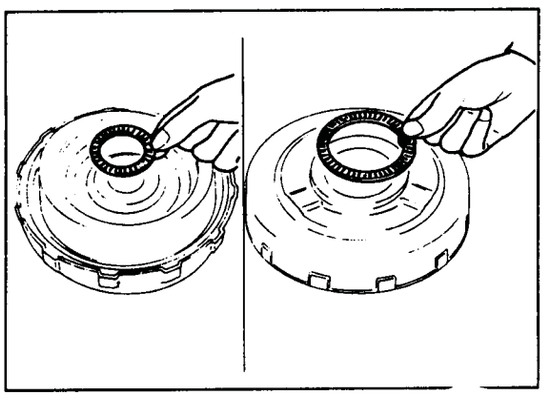


Pour in ATF so that the reverse piston, coasting clutch drum, and coasting clutch piston are fully submerged.



Check that no bubbles come from between the piston and drum seal when applying compressed air through the fluid passages as shown.

Caution
The compressed air must be under 392 kPa (4.0 kg/cm^2, 57 psi), and should not applied for over 3 seconds.



Apply petroleum jelly to the thrust bearings to secure them; then install them on both sides of the reverse and forward drum.

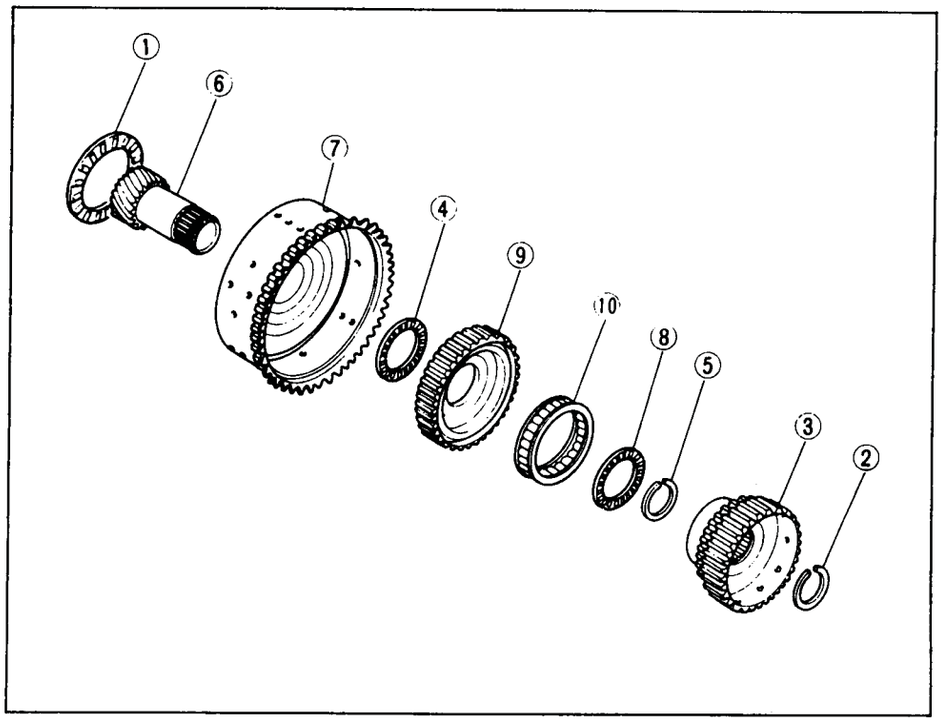
Thrust bearing outer diameter
Oil pump side: 86.0 mm (3.39 in)

Small sun gear and one-way clutch side:
56.1 mm (2.21 in)

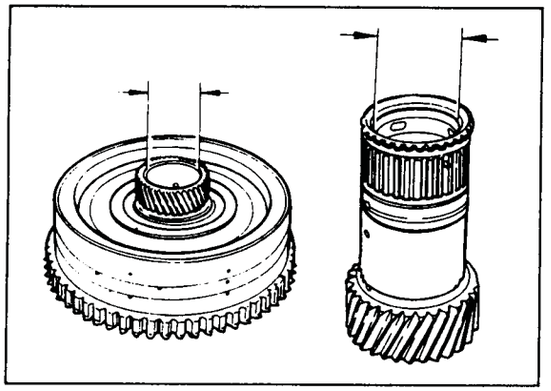
SMALL SUN GEAR AND ONE-WAY CLUTCH

Disassembly

Disassemble in the sequence shown in the figure.



1. Thrust bearing
2. Snap ring
3. One-way clutch inner race
4. Thrust bearing
5. Snap ring
6. Small sun gear
7. Sun gear drum
8. Thrust bearing
9. One-way clutch outer race
10. One-way clutch



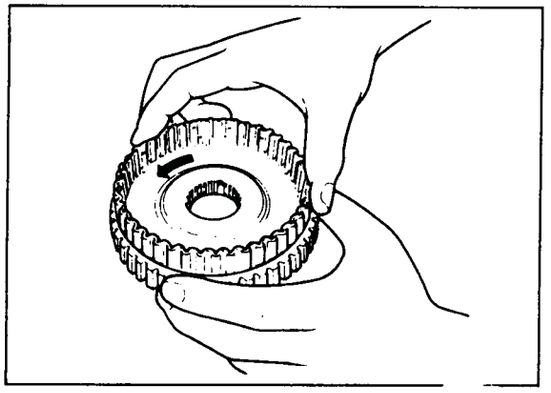
Inspection

Check the following and replace any faulty parts.

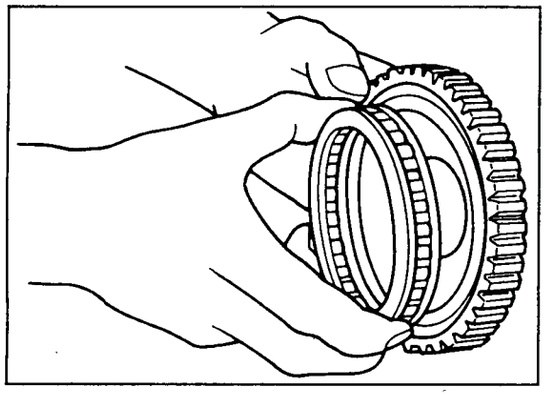
1. Sun gear drum and small sun gear for damage or wear
2. Bushing for damage or wear

Specification:

Sun gear drum: 33.425 mm (1.316 in) max.
Small sun gear: 24.021 mm (0.946 in) max.

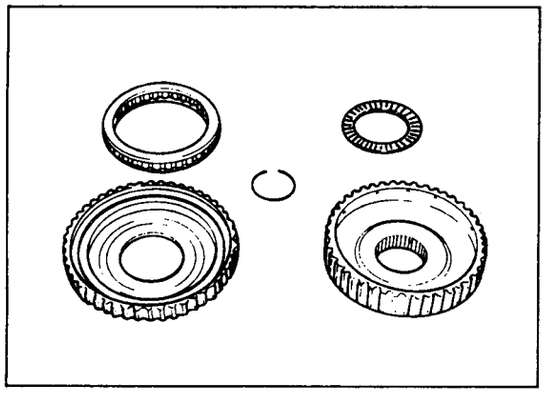


3. Inner and outer race for damage or wear
4. Damaged or worn clutch hub
5. Damaged or worn gear
6. Damaged or worn thrust bearing
7. Broken or worn snap ring
8. One-way clutch operation
   Hold the one-way clutch outer race. Check that the inner race turns only counterclockwise.

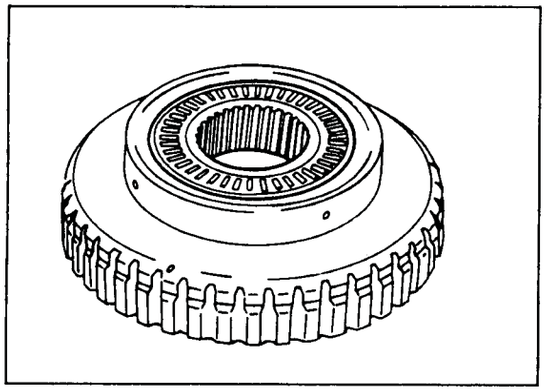


Replacement of one-way clutch

Remove the one-way clutch inner race.
Remove the one-way clutch.
Remove the thrust bearing.

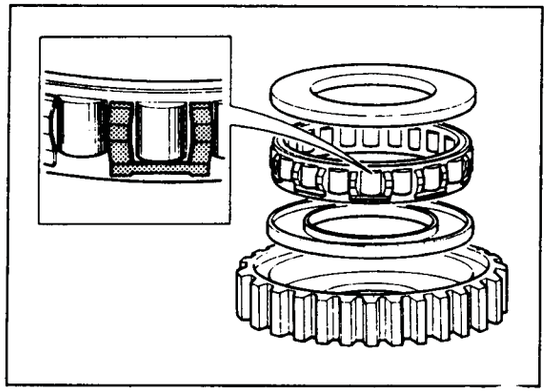


Inspect the one-way clutch inner and outer race, and replace if necessary.



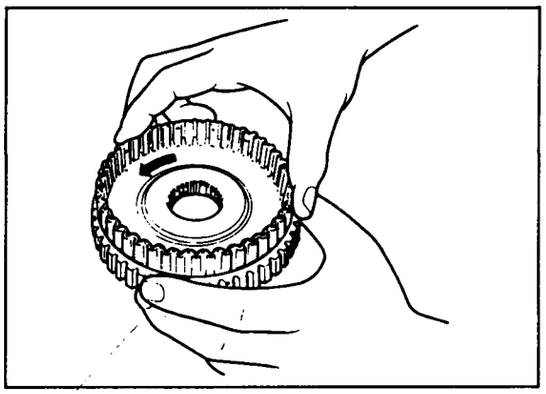
Apply petroleum jelly to the thrust bearing to secure it; then install it to the one-way clutch inner race.

Thrust bearing outer diameter:
62.1 mm (2.44 in)

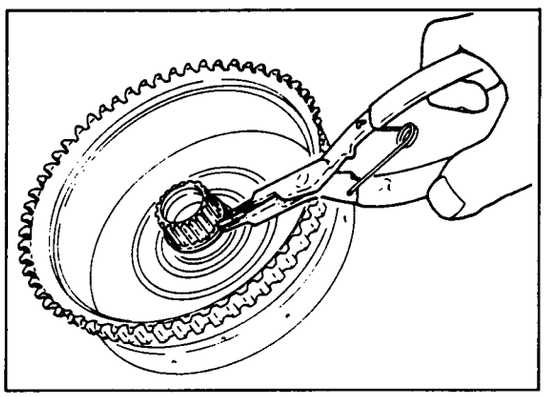


Install the one-way clutch into the one-way clutch outer race.

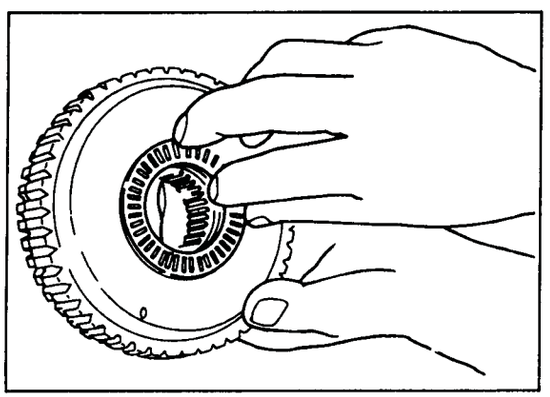
Caution
Check that the spring cage of the one-way clutch faces toward the outer race.



Install the one-way clutch inner race into the one-way clutch outer race by turning inner race counterclockwise.
Hold the one-way clutch outer race. Check that the inner race turns only counterclockwise.

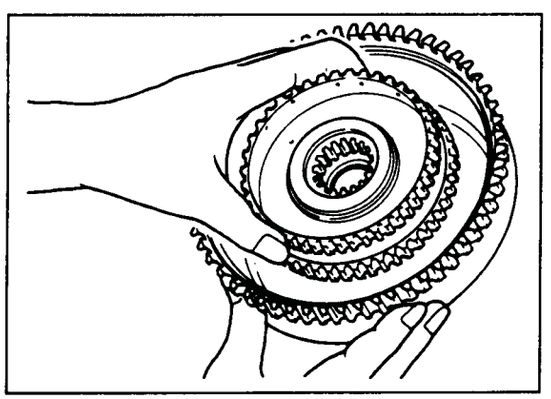


Assembly
Install the small sun gear into the sun gear drum.
Install the snap ring.



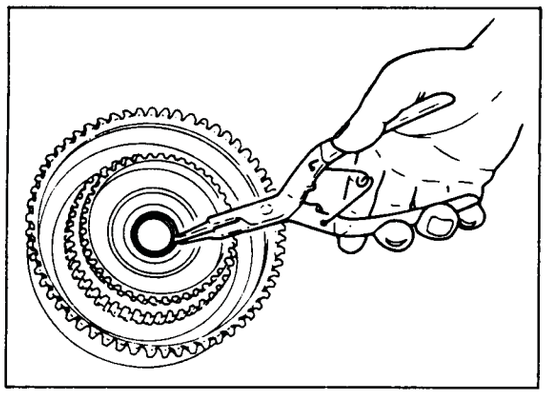
Apply petroleum jelly to the thrust bearing to secure it; then install it to the one-way clutch inner race.

Thrust bearing outer diameter:
62.1 mm (2.44 in)

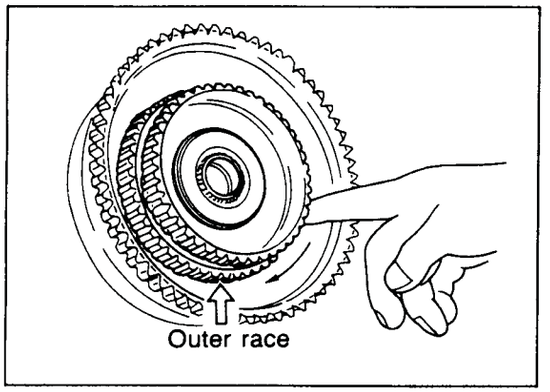


Install the one-way clutch inner and outer race to the sun gear drum.

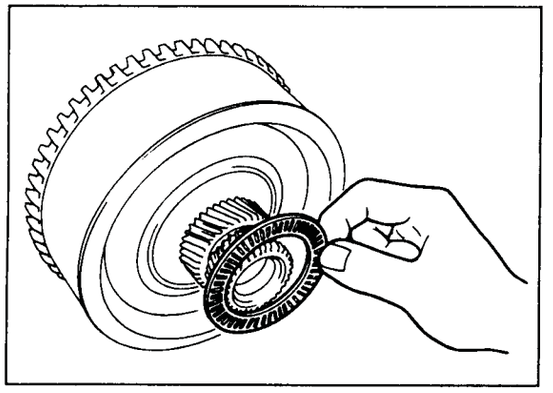
Note
Align the splines of the one-way clutch inner race and small sun gear clutch hub.



Install the snap ring.



Check that when the small sun gear is held, the one-way clutch outer race turns smoothly and only clockwise.



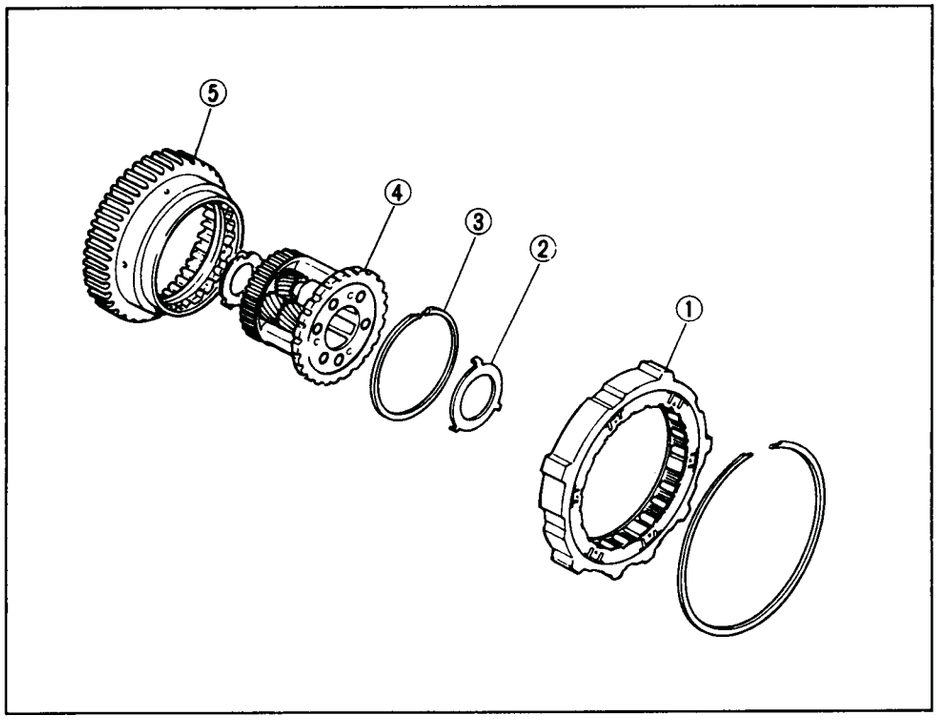
Apply petroleum jelly to the thrust bearing to secure it; then install it to the sun gear drum.

Thrust bearing outer diameter:
72.0 mm (2.83 in)

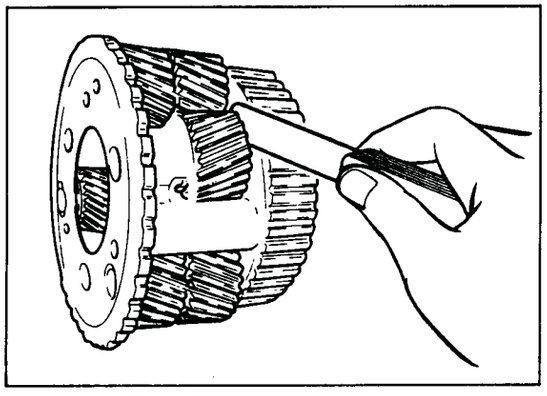
ONE-WAY CLUTCH AND CARRIER HUB ASSEMBLY

Disassembly

Disassemble in the sequence shown in the figure.



1. One-way clutch
2. Bearing races
3. Snap ring
4. Carrier hub assembly
5. Inner race (Low and reverse hub)



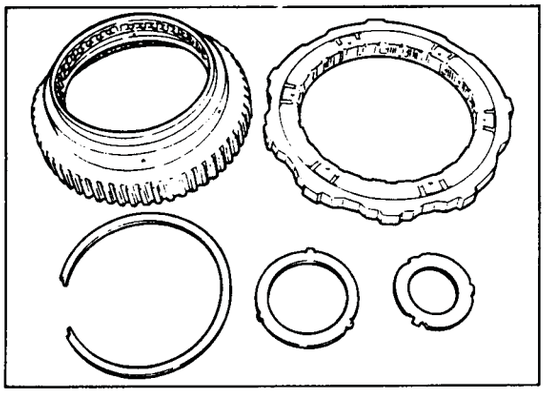
Inspection

Check the following and replace any faulty parts.

Damaged or worn gear and operation

Clearance between pinion washer and planetary carrier

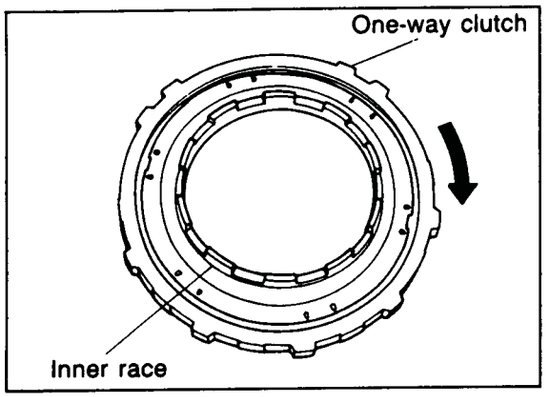
Clearance:
0.2—0.7 mm (0.008—0.028 in)



Damaged or worn inner race

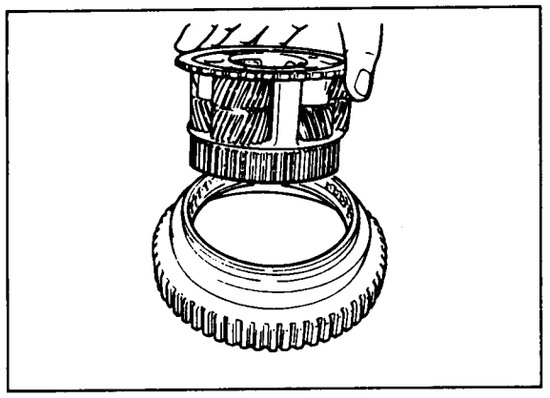
Broken or worn snap ring

Damaged or worn bearing race

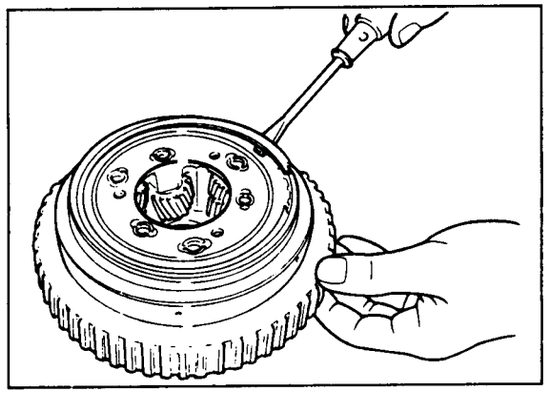


Damaged or worn one-way clutch and operation
Detached roller

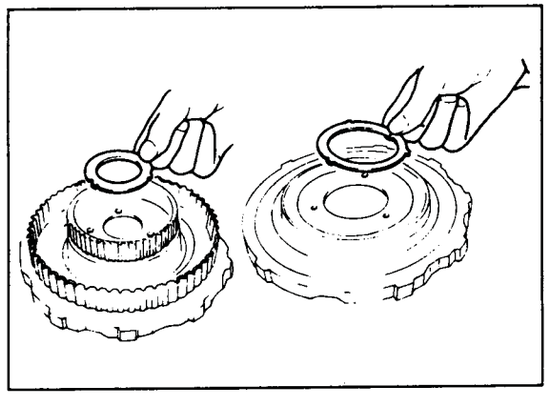
Note
Assemble the one-way clutch and the inner race, then confirm that the one-way clutch rotates only clockwise and smoothly.



Assembly
Assemble the carrier hub assembly to the inner race.



Install th snap ring.



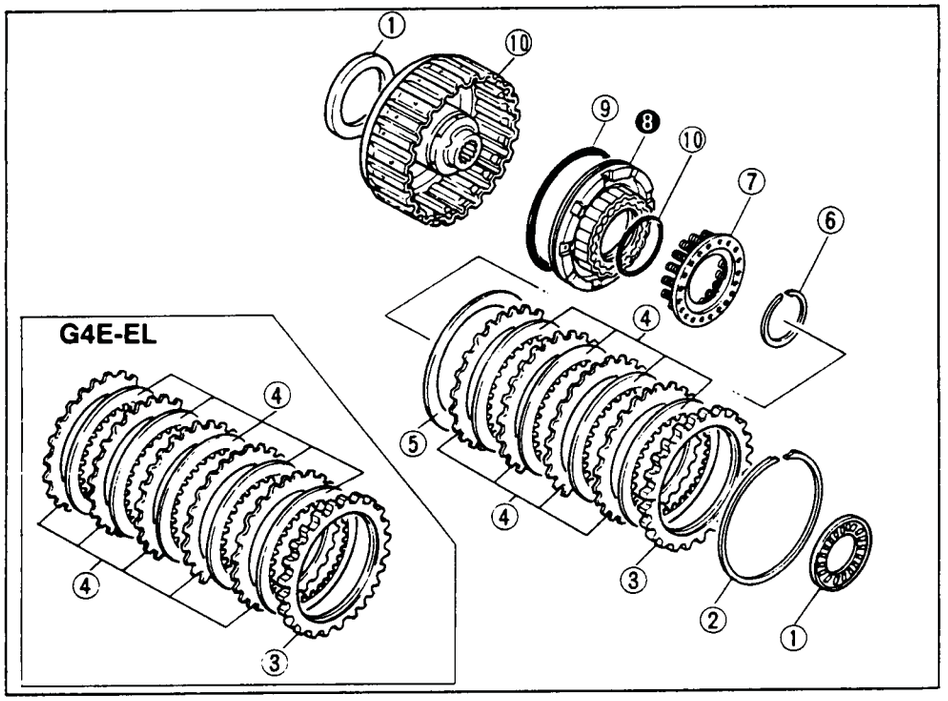
Apply petroleum jelly to the bearing races to secure them; then install them to both sides of the one-way clutch and carrier hub assembly.

Bearing race outer diameter
Sun gear drum side: 72.0 mm (2.83 in)
3-4 clutch side: 57.0 mm (2.21 in)

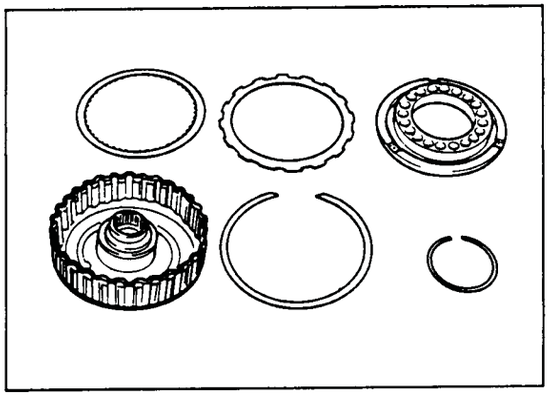
Note
Install the tabs of the bearing race into the alignment holes.

3-4 CLUTCH
Disassembly

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



1. Thrust bearings
2. Snap ring
3. Retaining plate
4. Drive and driven plates
5. Dished plate (G4A-HL)
6. Snap ring
7. Spring and retainer assembly
8. 3-4 clutch piston
9. Outer seal
10. Inner seal
11. 3-4 clutch drum



Inspection

Check the following and repair or replace any faulty parts.

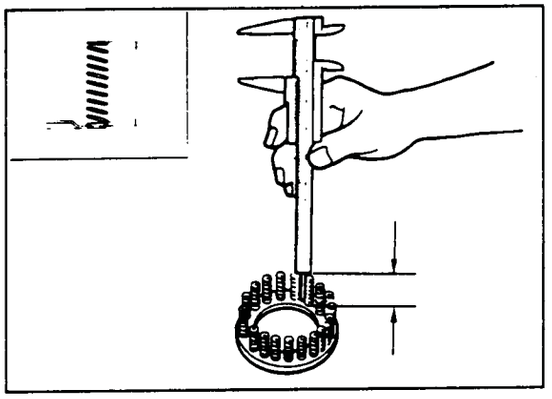
Drive and driven plates for damage or wear

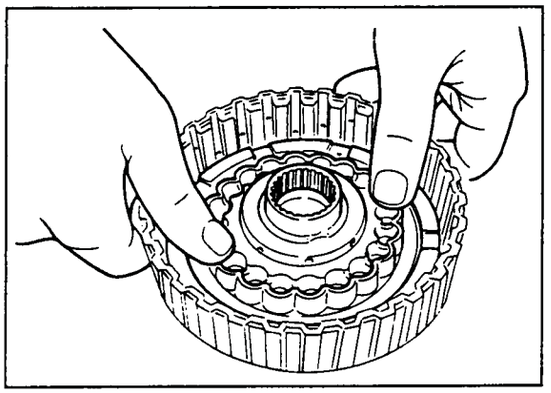
Drive plate thickness
Standard: 1.6 mm (0.063 in)
Minimum: 1.4 mm (0.055 in)

Clutch piston for damage or cracks
Clutch drum for damage or deformation
Seal contact areas for damage
Check ball for leaking or sticking
Spring and retainer assembly for separation or deformation
Broken or worn snap ring

Broken or weakened spring

Free length of spring:
33.2 mm (1.307 in)



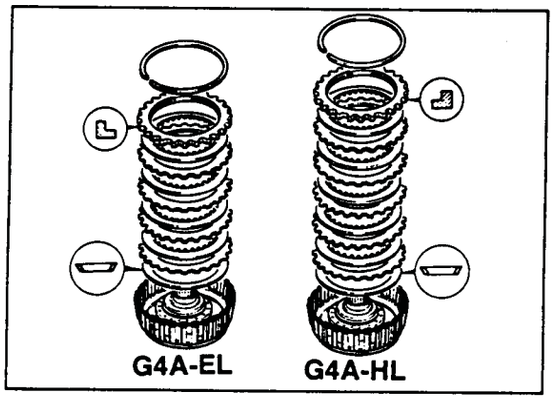


Assembly

Install the 3-4 clutch piston.

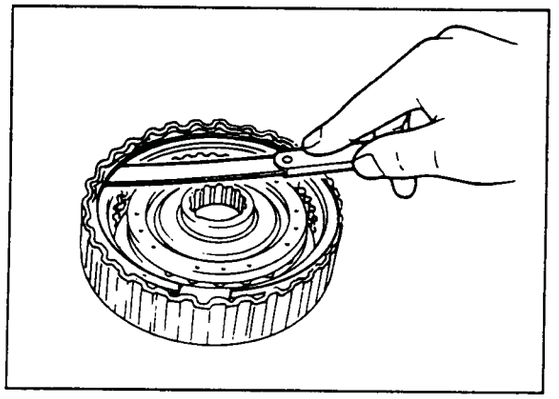
Apply ATF to the inner and outer seals, and install them onto the 3-4 clutch piston.
Install the piston by pushing evenly around the circumference, being careful not to damage the seal rings.

Install the spring and retainer assembly.



Install the dished plate the dished side up ward (G4A-HL).
Install the drive and driven plates.

Note
Installation order:
G4A-EL
Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive
G4A-HL
Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive



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

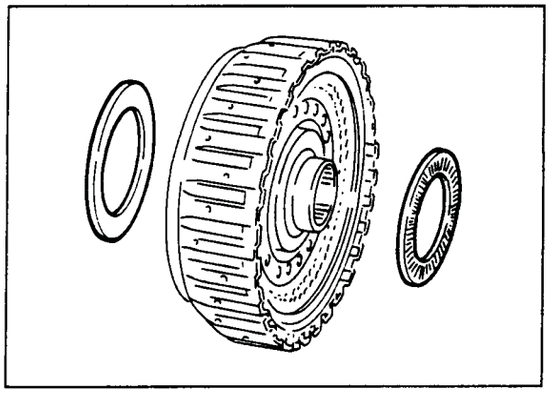
Check the 3-4 clutch clearance.

Measure the clearance between the snap ring and the retaining plate of the 3-4 clutch.
If the clearance is not within specification, adjust it by selecting a proper retaining plate.

3-4 clutch clearance:
1.3—1.5 mm (0.051—0.059 in)

G4A-HL

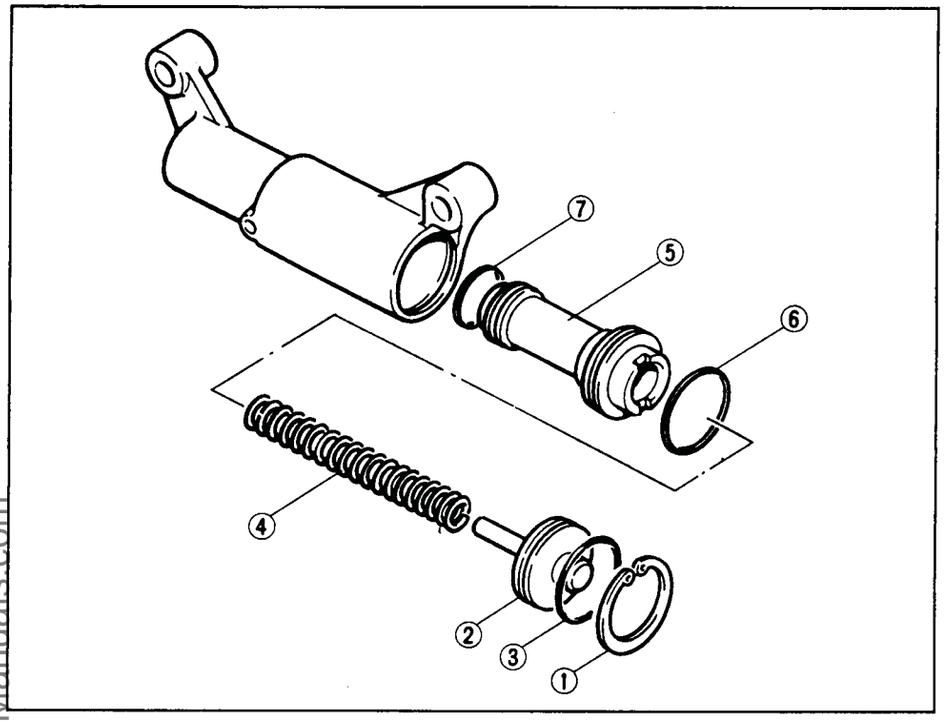
4.8 (0.189)	5.0 (0.197)	5.2 (0.205)
5.4 (0.213)	5.6 (0.220)	



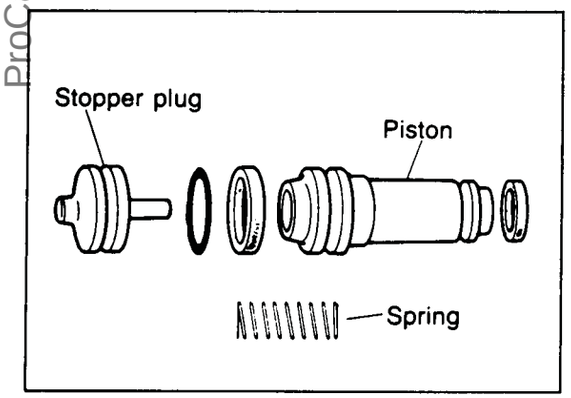
Apply petroleum jelly to the thrust bearings and secure them to both sides of the 3-4 clutch drum.

Thrust bearing outer diameter
Carrier hub side: 56.1 mm (2.21 in)
Output shell side: 72.1 mm (2.84 in)

2-3 ACCUMULATOR
Disassembly
Disassemble in the sequence shown in the figure.

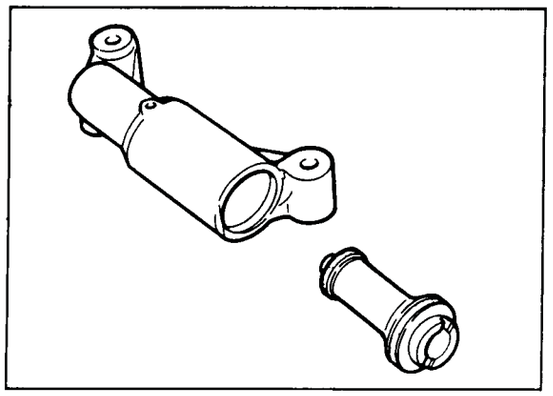


1. Snap ring
2. Stopper plug
3. O-ring
4. 2-3 accumulator spring
5. 2-3 accumulator piston
6. Large seal ring
7. Small sea ring

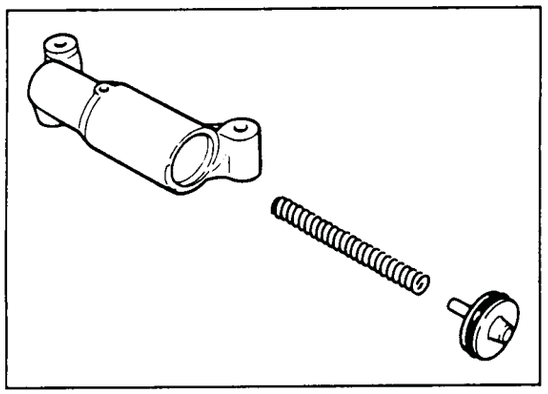


Inspection
Check the following and replace any faulty parts.
Damaged or worn piston
Damaged or worn stopper plug
Broken or weakened spring

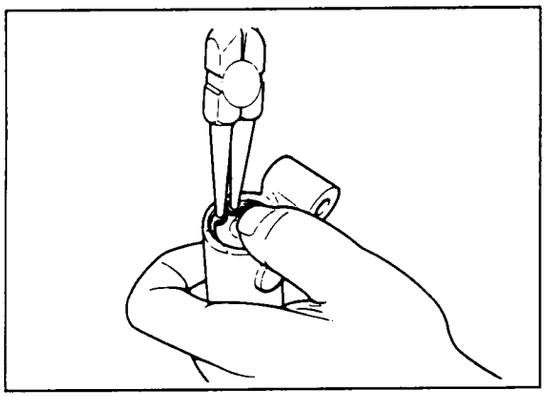
Free length of spring:
G4A-EL 83.3 mm (3.280 in)
G4A-HL 76.0 mm (2.992 in)



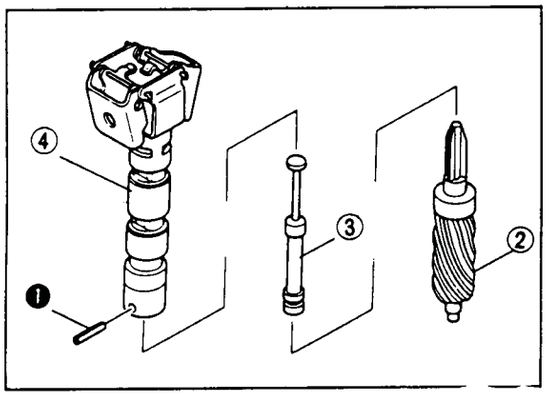
Assembly
Install the 2-3 accumulator.
Apply ATF to large and small seal rings; then install them to the accumulator piston.
Insert the 2-3 accumulator.



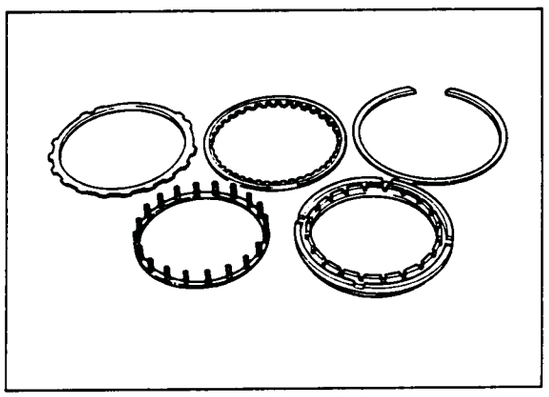
Install the spring to the piston.
Install the stopper plug.
(1) Apply ATF to O-ring, and install it onto the stopper plug.
(2) Install the stopper plug.



4. Install the snap ring while holding in the stopper plug.



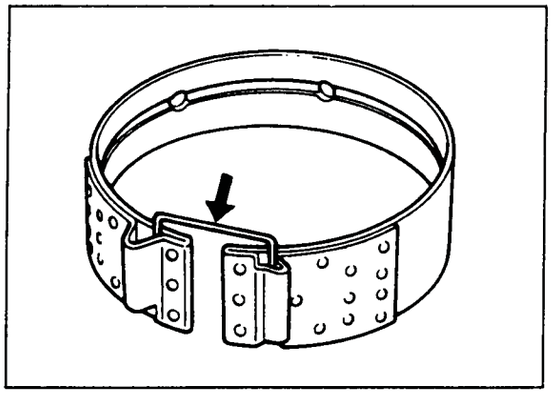
GOVERNOR ASSEMBLY (G4A-HL)
Disassembly
Disassemble in the sequence shown in the figure referring to the disassembly note for the specially marked part.
1. Roll pin
2. Governor driven gear
3. Governor valve
4. Governor carrier and sleeve



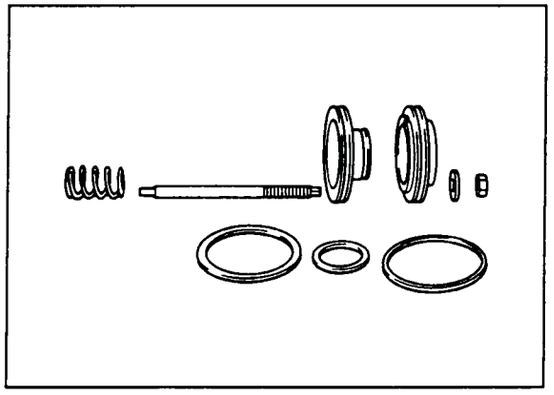
LOW AND REVERSE BRAKE
Inspection
Check the following and replace any faulty parts.
1. Damaged or worn drive and driven plates

Drive plate thickness
Standard: 1.6 mm (0.063 in)
Minimum: 1.4 mm (0.055 in)

Free length of spring:
20.5 mm (0.807 in)

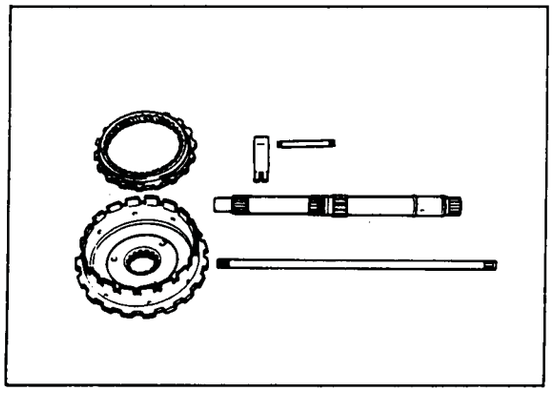


2-4 BRAKE BAND
Inspection
Check the following and replace if necessary.
1. Damaged or worn 2-4 brake band

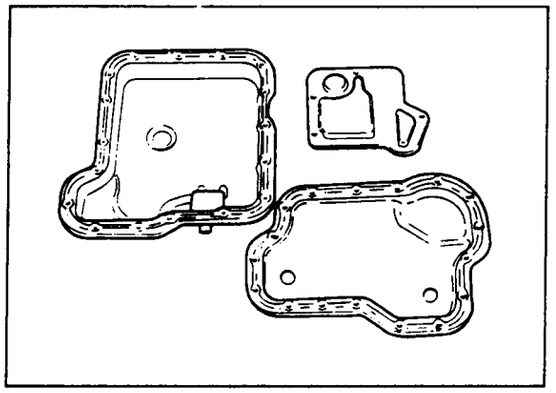


BAND SERVO
Inspection
Check the following and replace any faulty parts.
1. Damaged or worn piston
2. Weakened return spring

Free length of spring:
G4A-EL: 43.25 mm (1.703 in)
G4A-HL: FE engine 42.0 mm (1.654 in)
F8 engine 43.25 mm (1.703 in)

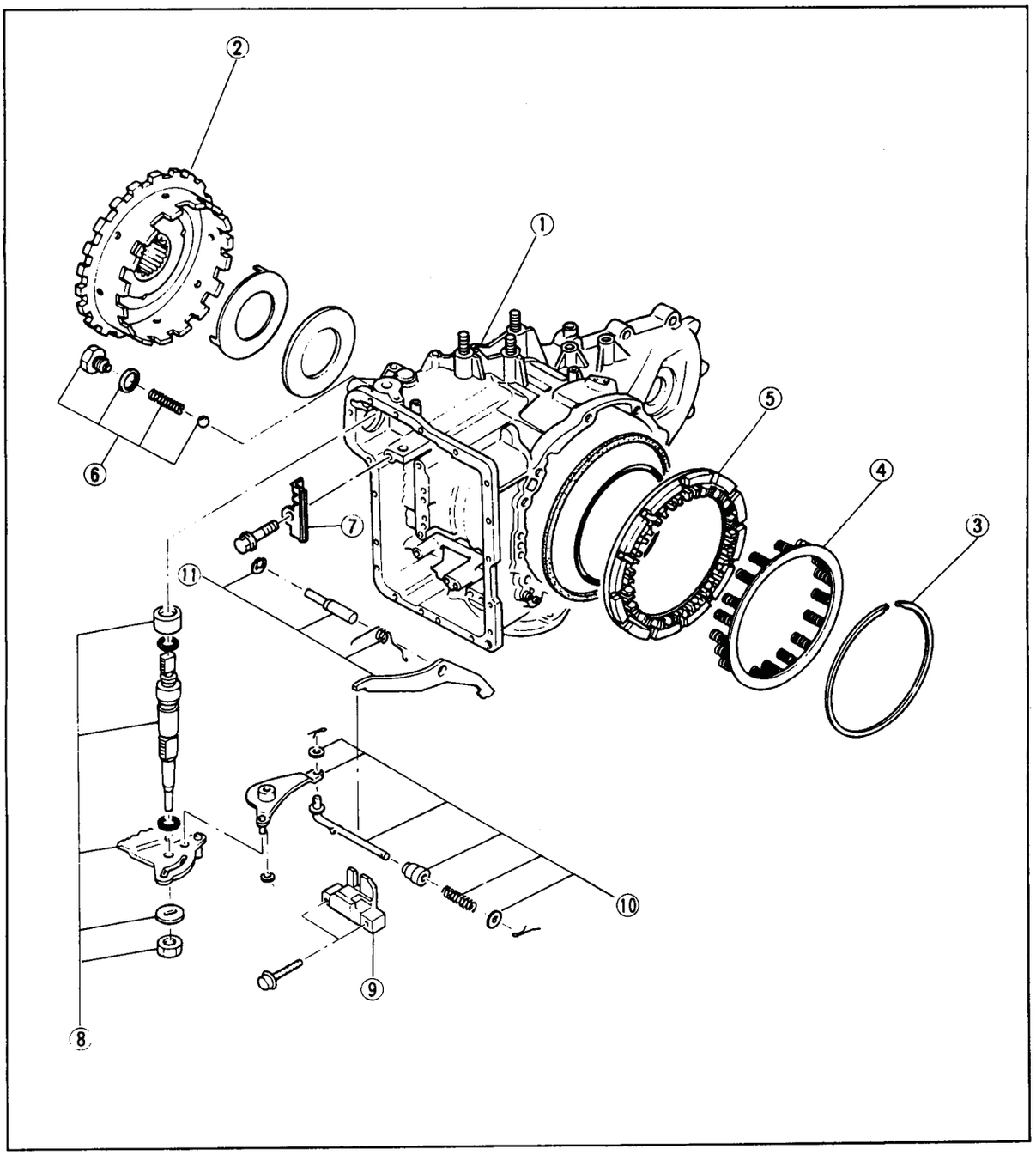


OTHER INSPECTION
Check the following and replace any faulty parts.
1. Damaged or worn output shell
2. Damaged or worn internal gear
3. Damaged or worn turbine shaft
4. Damaged or worn oil pump shaft
5. Damaged or worn anchor strut and shaft

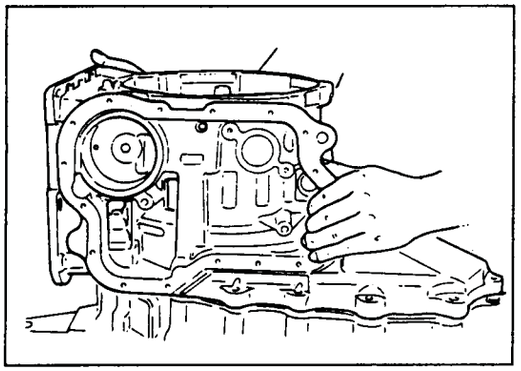


6. Damaged or cracked valve body cover
7. Damaged or cracked oil pan
8. Damaged or clogged oil strainer

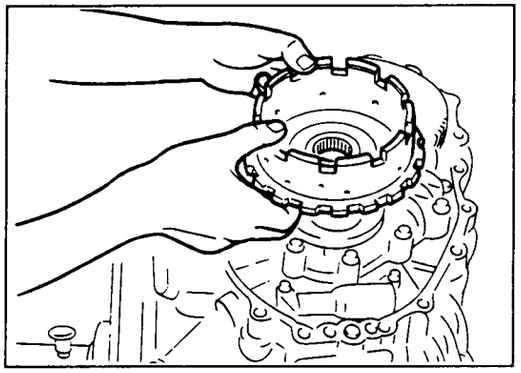
DISASSEMBLY
Component



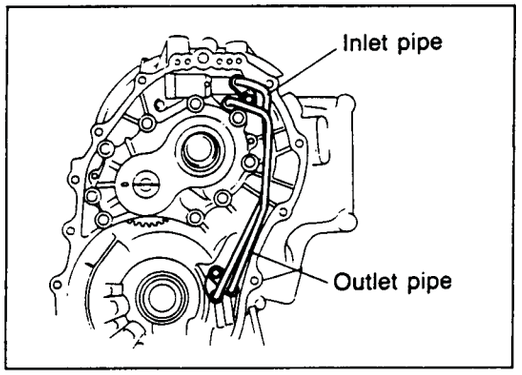
1. Transaxle case
2. Output shell
3. Snap ring
4. Spring and retainer assembly
5. Low and reverse brake piston
6. Plug, washer, spring, and detent ball
7. Bracket
8. Manual shaft and manual plate
9. Actuator support
10. Parking assist lever
11. Parking pawl



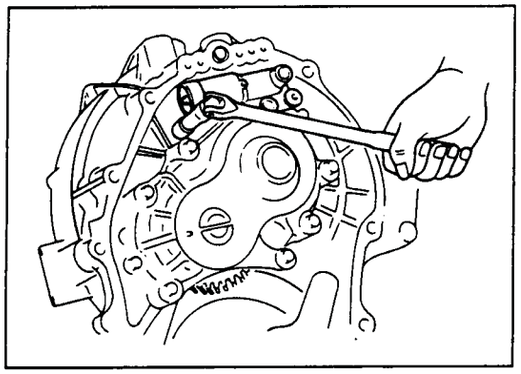
Remove the bolts; then remove the transaxle case by tapping lightly with a plastic hammer.



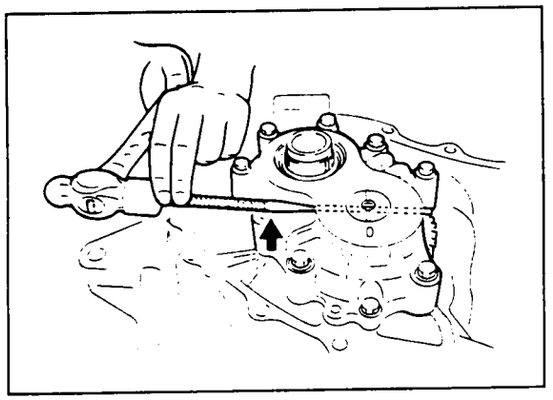
Remove the output shell from the output gear.



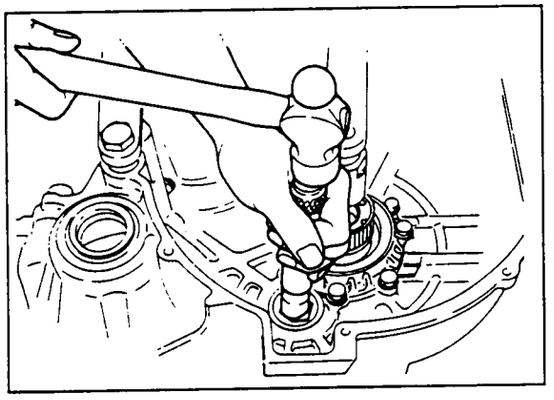
Remove the governor outlet pipe, governor inlet pipe, and O-rings.



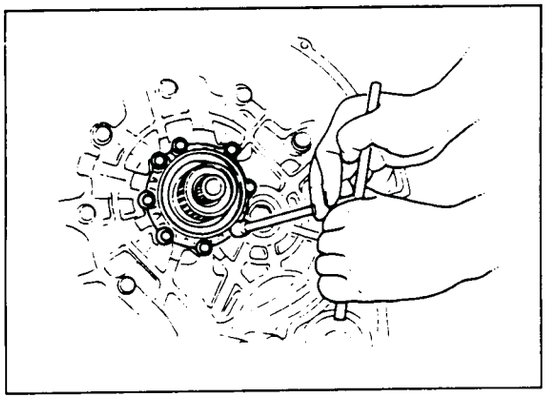
Remove the 2-3 accumulator piston assembly and O-rings.



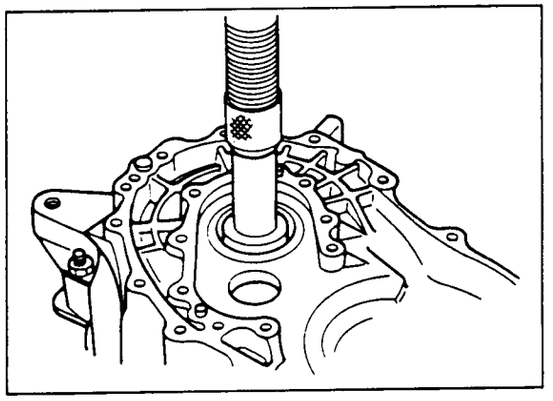
Remove the bearing housing.
(1) Remove the bolt indicated in the figure.
(2) Remove the roll pin with a pin punch.
(3) Remove the bearing housing by tapping lightly with a plastic hammer.



Remove the idle gear assembly and output gear assembly by tapping out from the torque converter side.



Remove the bearing cover.
(1) Remove the converter housing from the transaxle hanger.
(2) Remove the bearing cover bolts.



(3) Press the bearing cover assembly out of the converter housing.

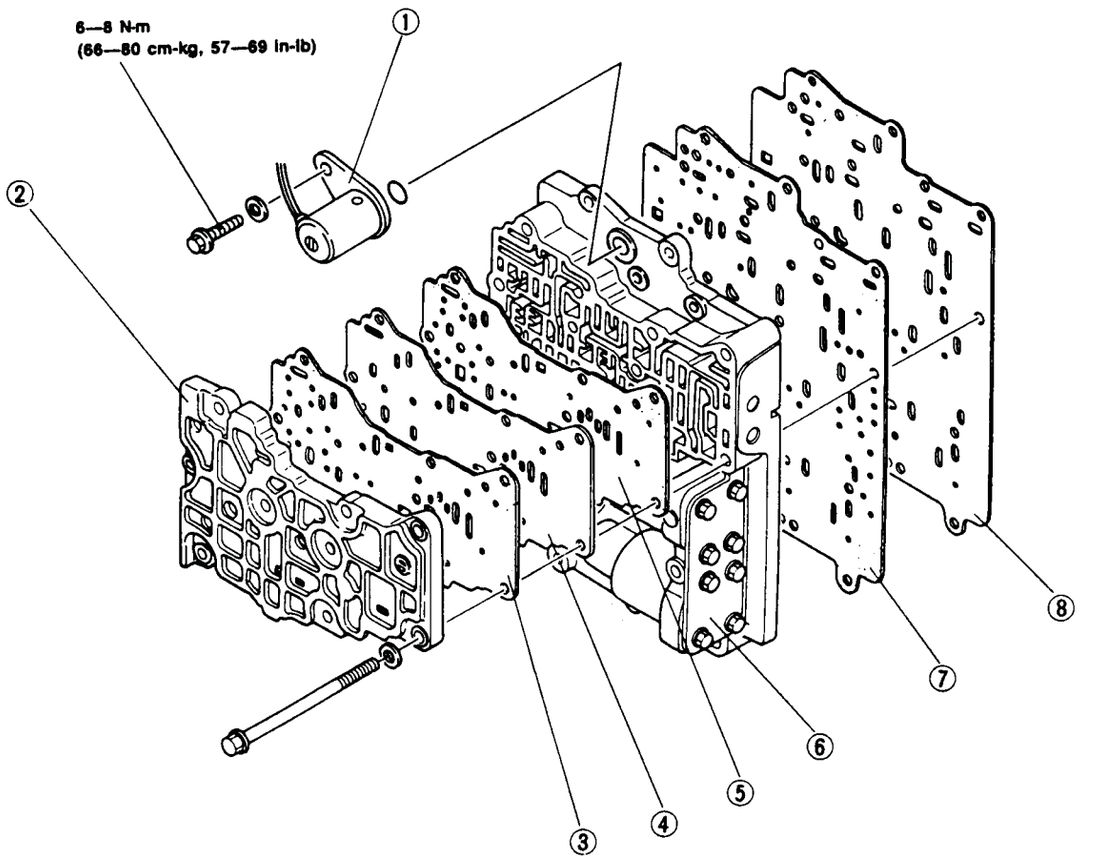
CONTROL VALVE BODY (G4A-HL)

Precaution

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

Components I

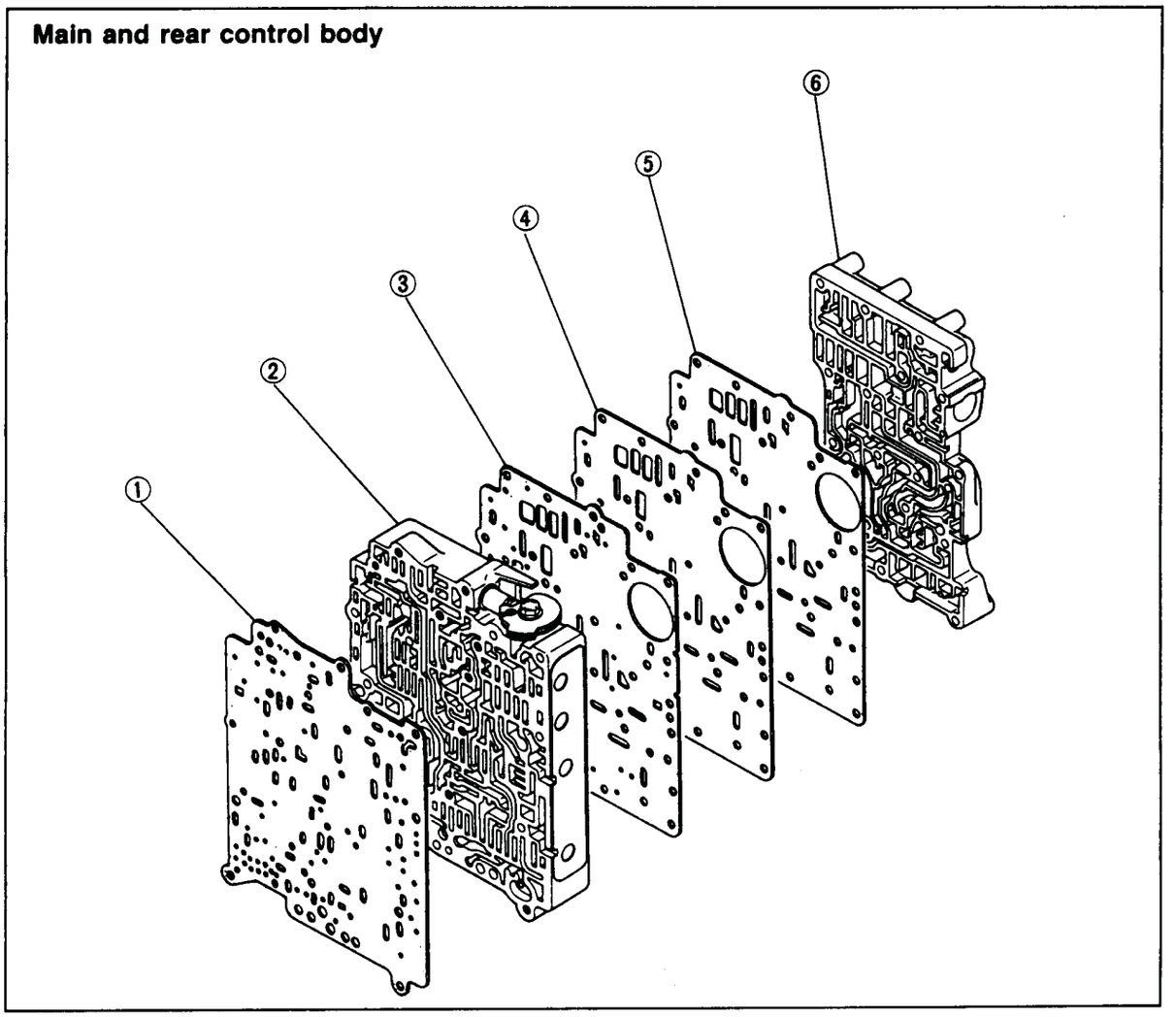
Front and premain control body



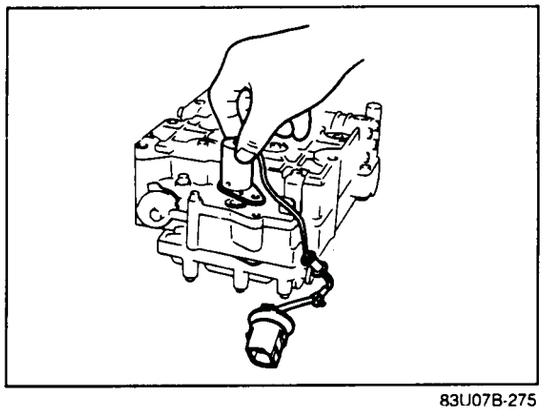
1. Lock-up solenoid valve
2. Front control body
3. Front/premain front gasket
4. Premain separator
5. Front/premain rear gasket
6. Premain control body
7. Premain/main front gasket
8. Main separator

Components II

Main and rear control body



1. Premain/main rear gasket
2. Main control body
3. Main/rear front gasket
4. Rear separator
5. Main/rear rear gasket
6. Rear control body



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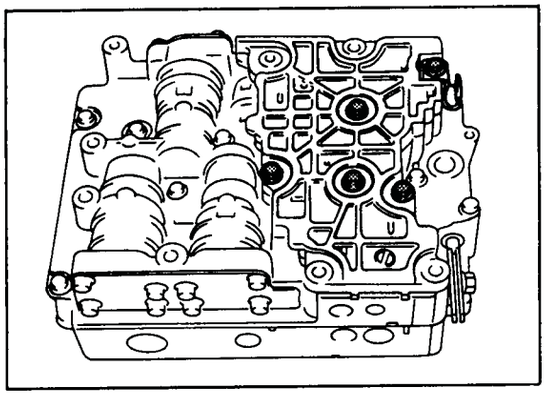
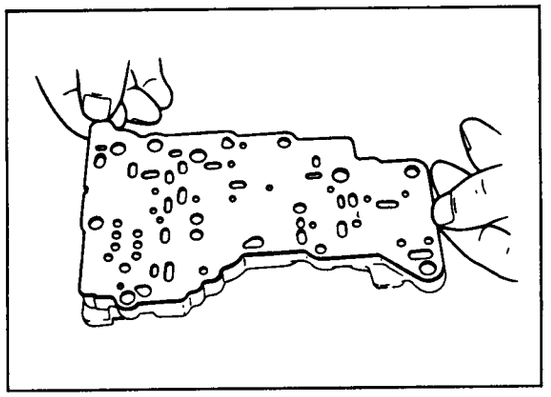
Disassembly of Control Valve Body

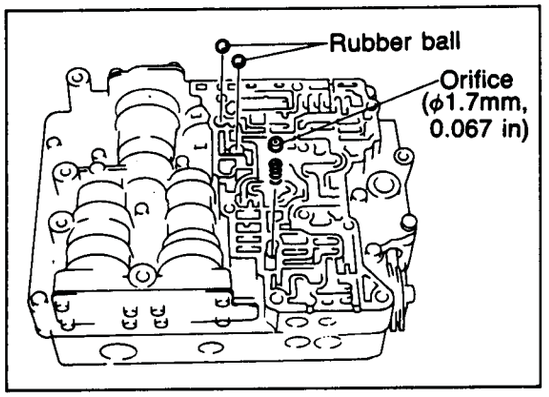
1. Remove the lock-up solenoid valve.
2. Remove the O-ring and oil strainer.



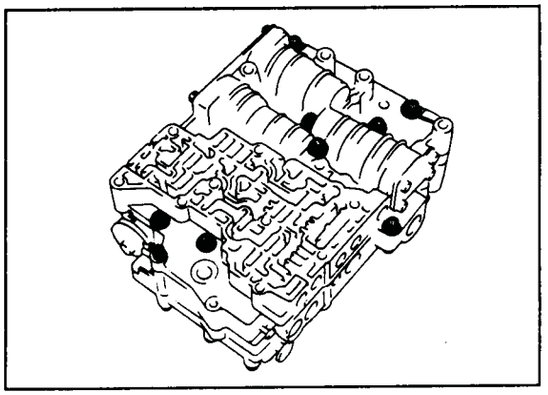
3. Remove the indicated bolts and bracket, and pull out the front control body with the premain separator as a unit.



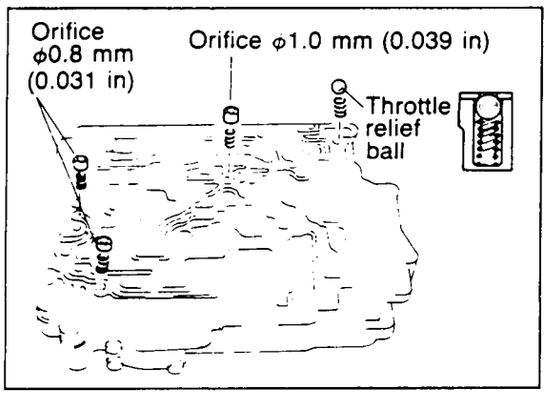
4. Remove the front/premain gaskets and separator from the front control body.



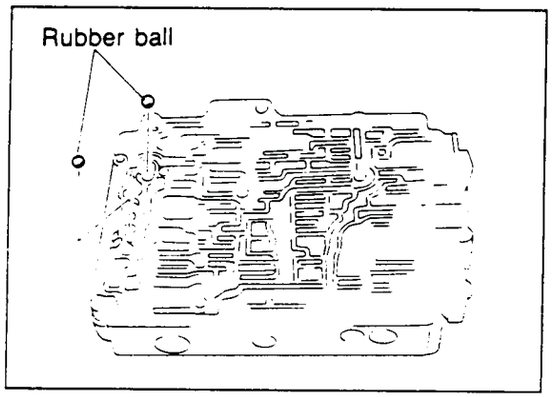
5. Remove the rubber balls, orifice check valve (ϕ1.7 mm, 0.067 in) and spring from the premain control body.



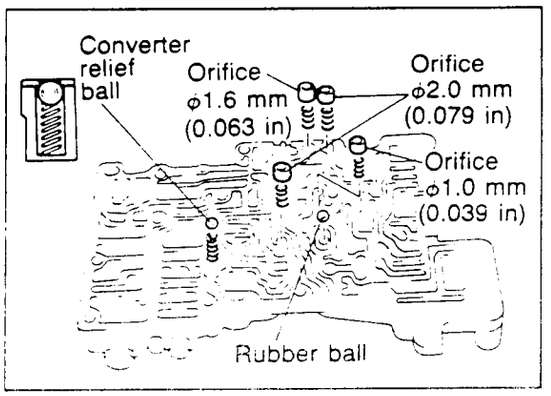
6. Remove the bolts and hexagonal head bolt and remove the premain control body and the main separator as a unit.



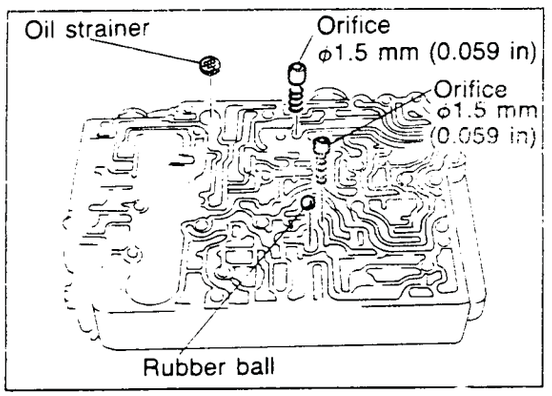
7. Remove the premain/main gaskets and separator from the premain control body.
8. Remove the orifice check valves (φ1.0 mm, 0.039 in; φ0.8 mm, 0.031 in) and springs, and the throttle relief ball and spring from the premain control body.



9. Remove the rubber balls from the main control body.

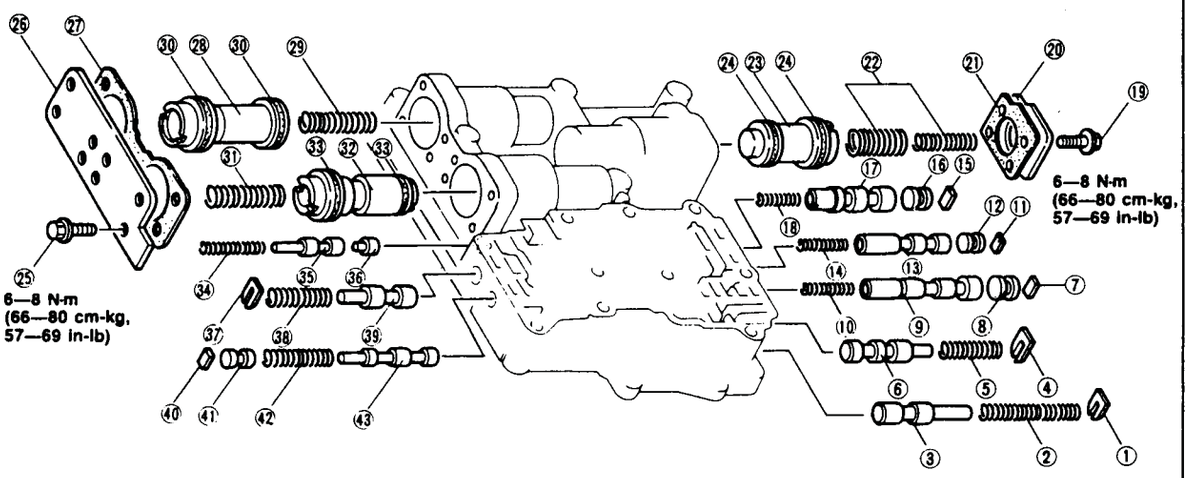


11. Remove the main/rear gaskets and separator from the rear control body.
12. Remove the orifice check valves (φ2.0 mm, 0.079 in; φ1.6 mm, 0.063 in; φ1.0 mm, 0.039 in) and springs, converter relief ball and spring, and the rubber ball from the rear control body.

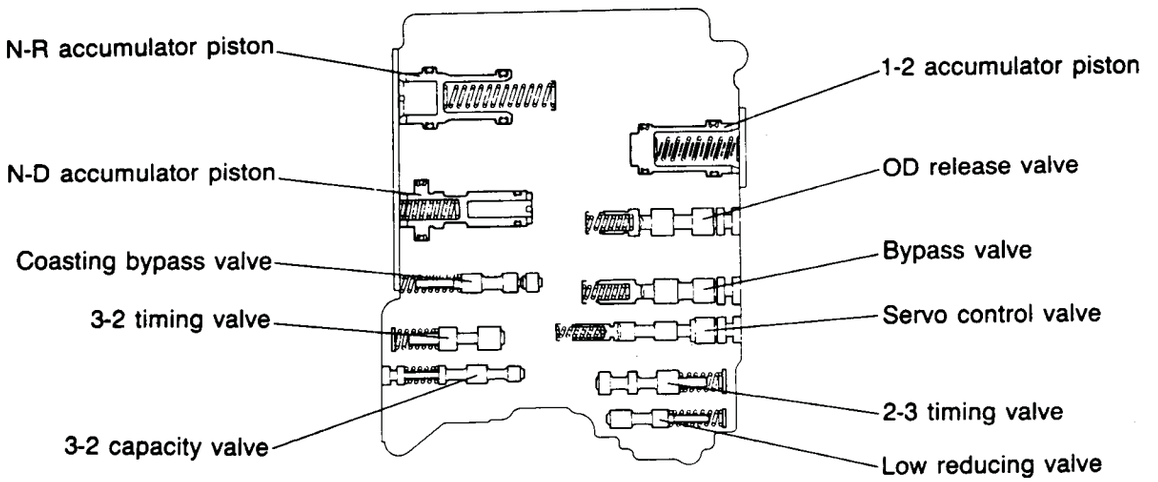


13. Remove the orifice check valves (φ1.5 mm, 0.059 in) and springs, oil strainer, and rubber ball from the main control body.

Premain Control Body
Disassembly
Disassemble in the sequence shown in the figure.



Valve Location

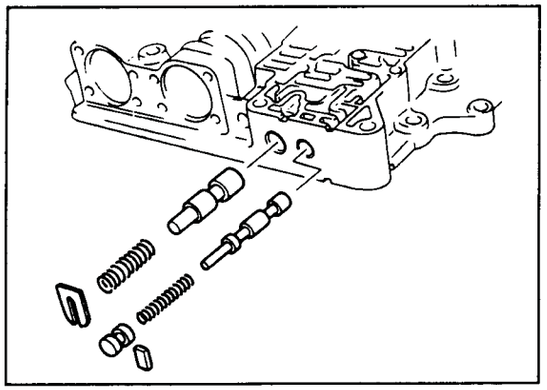


1. Retainer
2. Low reducing spring
3. Low reducing valve
4. Retainer
5. 2-3 timing spring
6. 2-3 timing valve
7. Stopper pin
8. Stopper plug
9. Servo control valve
10. Servo control spring
11. Stopper pin
12. Stopper plug
13. Bypass valve
14. Bypass spring
15. Stopper pin
16. Stopper plug
17. OD release valve
18. OD release spring
19. Bolt
20. 1-2 accumulator plate
21. 1-2 accumulator gasket
22. 1-2 accumulator springs
23. 1-2 accumulator piston
24. 1-2 accumulator seal rings
25. Bolt
26. N-R accumulator plate
27. N-R accumulator gasket
28. N-R accumulator piston
29. N-R accumulator rear spring
30. N-R accumulator seal rings
31. N-D accumulator front spring
32. N-D accumulator piston
33. N-D accumulator seal rings
34. Coasting bypass spring
35. Coasting bypass valve
36. Coasting bypass plug
37. Retainer
38. 3-2 timing spring
39. 3-2 timing valve
40. Stopper pin
41. Stopper plug
42. 3-2 capacity spring
43. 3-2 capacity valve

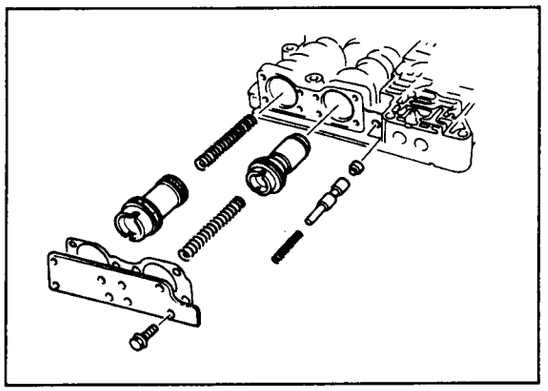
Inspection
Check the following and replace any faulty parts.
1. Damaged or worn valves
2. Damaged oil passage
3. Cracked or damaged valve body
4. Operation of each valve
5. Weakened spring

Spring

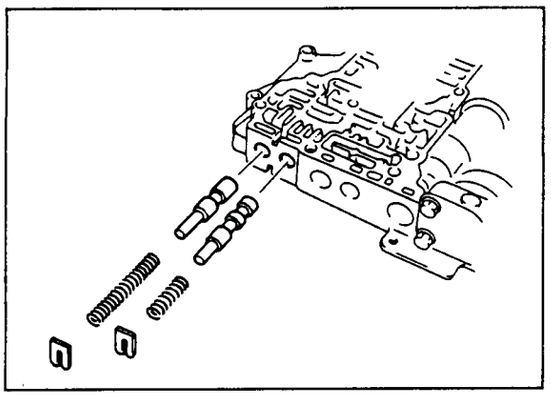
Spring name		Outer dia. mm (in)	Free length mm (in)	Wire dia. mm (in)	Spring color
1-2 accumulator small spring	F8 engine	9.9 (0.400)	84.7 (3.335)	1.2 (0.047)	Red
1-2 accumulator large spring	FE engine	13.0 (0.512)	73.2 (2.881)	1.8 (0.071)	Pink
	F8 engine	16.0 (0.630)	84.7 (3.335)	2.0 (0.079)	White
Bypass spring		5.0 (0.197)	25.1 (0.988)	0.7 (0.028)	Yellow
Servo control spring		4.9 (0.193)	27.1 (1.067)	0.5 (0.020)	Light blue
2-3 timing spring		8.3 (0.327)	26.5 (1.043)	0.8 (0.031)	—
N-R accumulator rear spring		11.1 (0.437)	68.2 (2.685)	1.0 (0.039)	Blue
N-D accumulator front spring		9.8 (0.386)	60.9 (2.398)	1.1 (0.043)	Yellow
Low reducing spring		8.7 (0.343)	38.3 (1.508)	0.9 (0.035)	Black
OD release spring		6.0 (0.236)	32.6 (1.283)	0.6 (0.024)	Orange
Coasting bypass spring		5.8 (0.228)	31.3 (1.232)	0.6 (0.024)	Yellow
3-2 timing spring		8.2 (0.323)	28.55 (1.124)	0.8 (0.031)	Maroon
3-2 capacity spring		5.55 (0.219)	30.5 (1.201)	0.55 (0.022)	Light green
Throttle relief ball spring		6.6 (0.260)	20.3 (0.799)	0.8 (0.031)	Light green



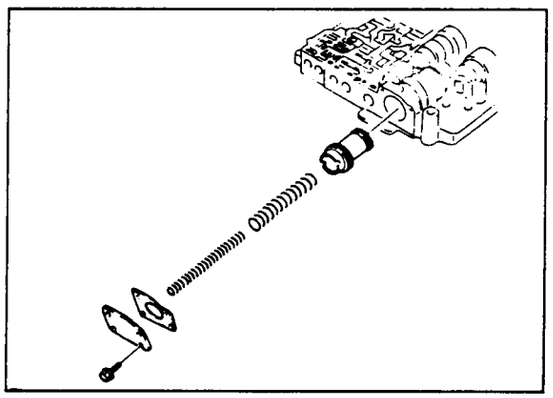
Assembly
Install the 3-2 capacity valve, 3-2 capacity spring, stopper plug, and stopper pin.
Install the 3-2 timing valve, 3-2 timing spring, and retainer.



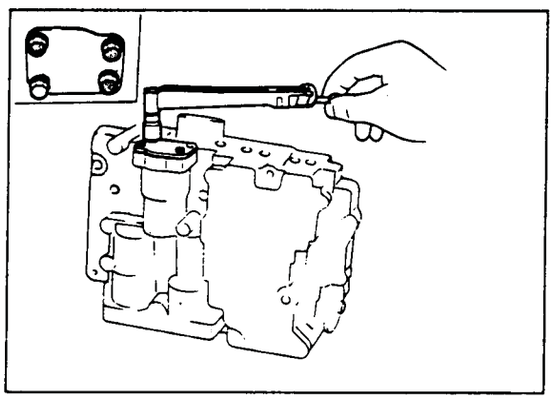
Install the coasting bypass plug, coasting bypass valve, and coasting bypass spring.
Apply ATF to the O-rings, and install them onto the piston; then insert the N-R accumulator rear spring, and N-R accumulator piston.
Apply ATF to the O-rings, and install them onto the piston; then insert the N-D accumulator piston, and N-D accumulator front spring.



Install the 2-3 timing valve, 2-3 timing spring, and retainer.
Install the low reducing valve, low reducing spring, and retainer.

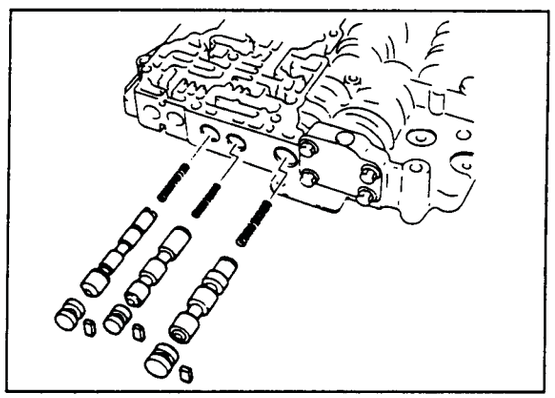


Apply ATF to the O-rings, and install them onto the piston; then install the 1-2 accumulator piston and 1-2 accumulator springs.



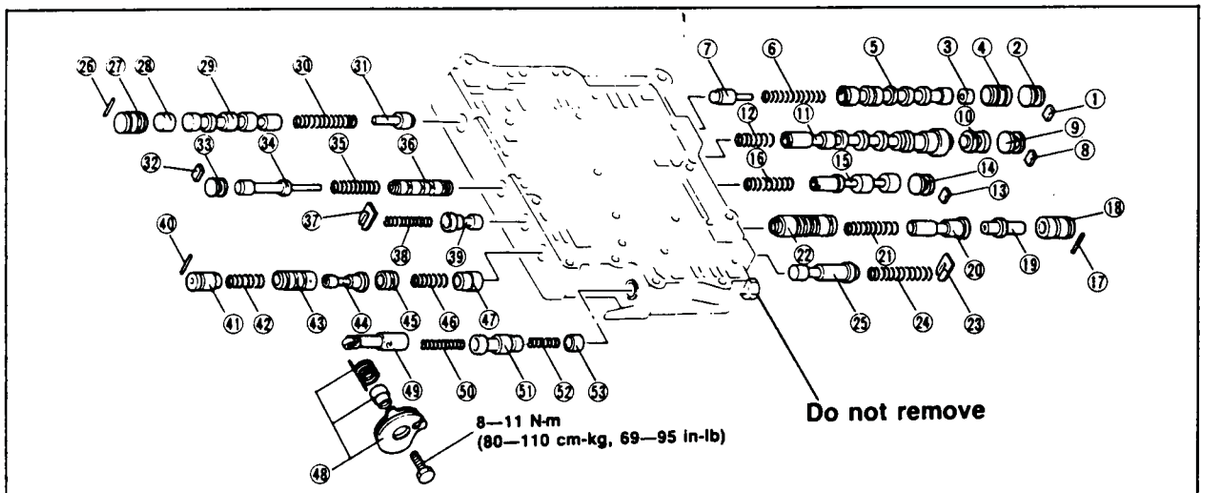
Install the 1-2 accumulator gasket and plate; then tighten the plate.

Tightening torque:
6—8 N·m (66—80 cm-kg, 57—69 in-lb)

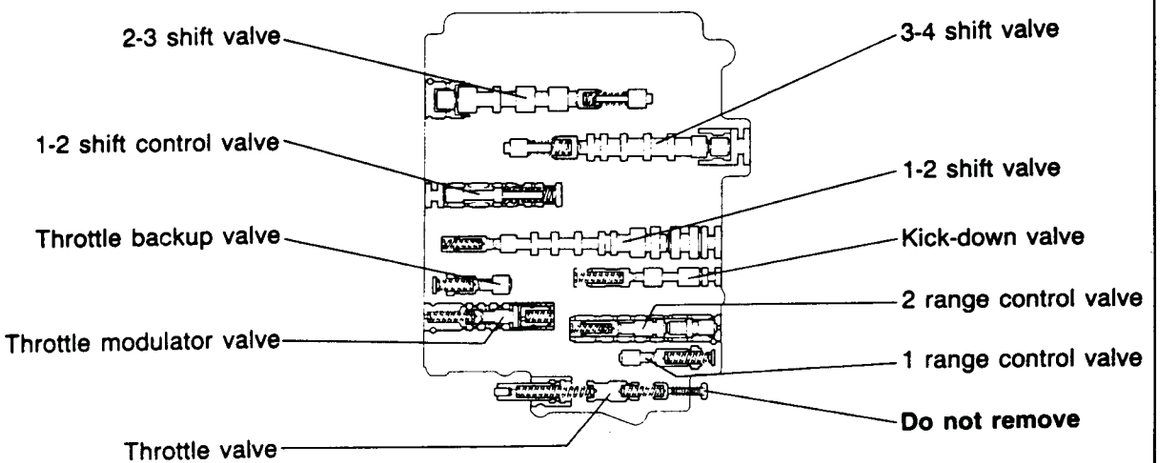


Install the OD release spring, OD release valve, stopper plug, and stopper pin.
Install the bypass spring, bypass valve, stopper plug, and stopper pin.
Install the servo control spring, servo control valve, stopper plug, and stopper pin.

Main Control Body
Disassembly
Disassemble in the sequence shown in the figure.



Valve Location

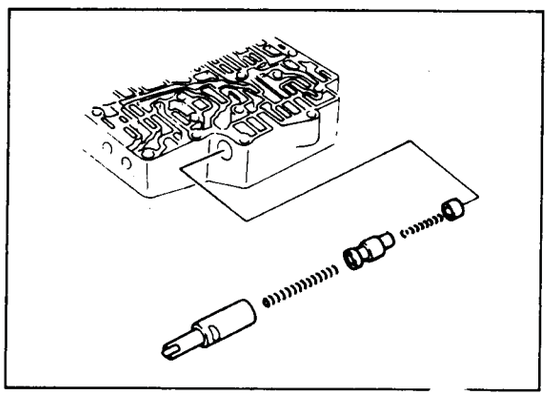


1. Stopper pin
2. Stopper plug
3. 3-4 shift front plug
4. 3-4 shift sleeve
5. 3-4 shift valve
6. 3-4 shift spring
7. 3-4 shift rear plug
8. Stopper pin
9. Stopper plug
10. 1-2 shift plug
11. 1-2 shift valve
12. 1-2 shift spring
13. Stopper pin
14. Stopper plug
15. Kick-down valve
16. Kick-down spring
17. Stopper pin
18. 2 range control front sleeve
19. 2 range control plug
20. 2 range control valve
21. 2 range control spring
22. 2 range control rear sleeve
23. Retainer
24. 1 range control spring
25. 1 range control valve
26. Stopper pin
27. 2-3 shift sleeve
28. 2-3 shift front plug
29. 2-3 shift valve
30. 2-3 shift spring
31. 2-3 shift rear plug
32. Stopper pin
33. Stopper plug
34. 1-2 shift control valve
35. 1-2 shift control spring
36. 1-2 shift control sleeve
37. Retainer
38. Throttle backup spring
39. Throttle backup valve
40. Stopper pin
41. Throttle modulator sleeve A
42. Throttle modulator front spring
43. Throttle modulator sleeve B
44. Throttle modulator valve
45. Throttle modulator sleeve C
46. Throttle modulator rear spring
47. Throttle modulator plug
48. Throttle cam assembly
49. Throttle plug assembly
50. Throttle spring
51. Throttle valve
52. Throttle assist spring
53. Throttle adjust plug

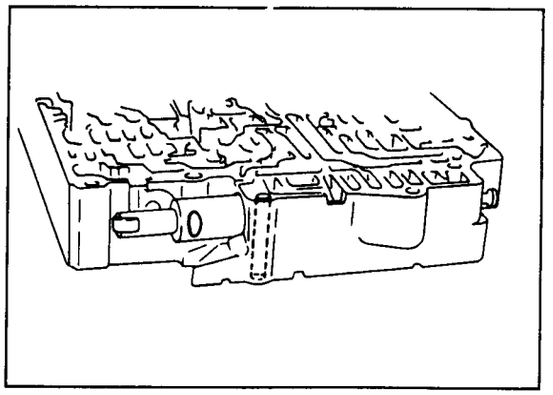
Inspection
Check the following and replace any faulty parts.
1. Damaged or worn valves
2. Damaged oil passage
3. Cracked or damaged valve body
4. Operation of each valve
5. Weakened spring

Spring

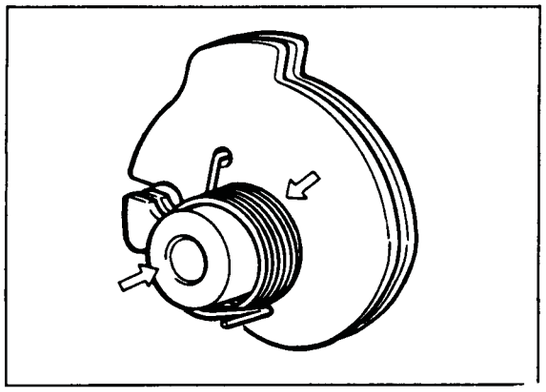
Spring name	Outer dia. mm (in)	Free length mm (in)	Wire dia. mm (in)	Spring color
1-2 shift control spring	5.5 (0.217)	46.0 (1.811)	0.5 (0.020)	Light green
1-2 shift spring	5.0 (0.197)	24.9 (0.980)	0.5 (0.020)	Gray
2-3 shift spring	6.1 (0.240)	39.7 (1.563)	0.65 (0.026)	Pink
3-4 shift spring	6.4 (0.252)	37.0 (1.457)	0.6 (0.024)	—
Throttle backup spring	6.4 (0.252)	33.5 (1.319)	0.6 (0.024)	Pink
Throttle modulator front spring	5.0 (0.197)	27.8 (1.094)	0.6 (0.024)	Red
Throttle modulator rear spring	7.15 (0.281)	30.8 (1.213)	0.85 (0.033)	Red
1 rang control spring	6.15 (0.242)	39.2 (1.543)	0.65 (0.026)	White
2 rang control spring	3.95 (0.156)	32.1 (1.264)	0.45 (0.018)	—
Kick-down spring	5.4 (0.213)	38.1 (1.500)	0.8 (0.031)	—
Throttle assist spring	5.15 (0.203)	32.3 (1.272)	0.55 (0.022)	Dark green
Throttle spring	5.4 (0.213)	48.3 (1.902)	0.8 (0.031)	—
Converter relief ball spring	6.9 (0.272)	24.1 (0.949)	0.9 (0.035)	Maroon
Orifice check valve spring	5.0 (0.197)	12.5 (0.492)	0.23 (0.009)	—



Assembly
1. Install the throttle adjust plug, throttle assist spring, throttle valve, throttle spring, and throttle plug assembly.

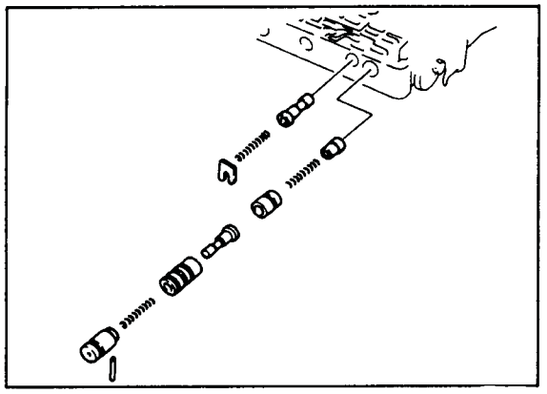


Caution
Install the throttle plug assembly with the groove aligned with the bolt hole.

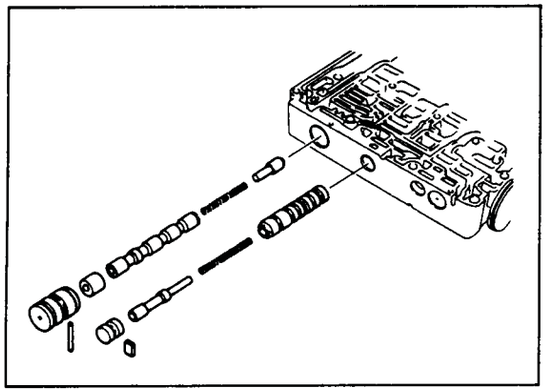


2. Install the throttle return spring as shown.
3. Install the throttle cam assembly to the main control body.

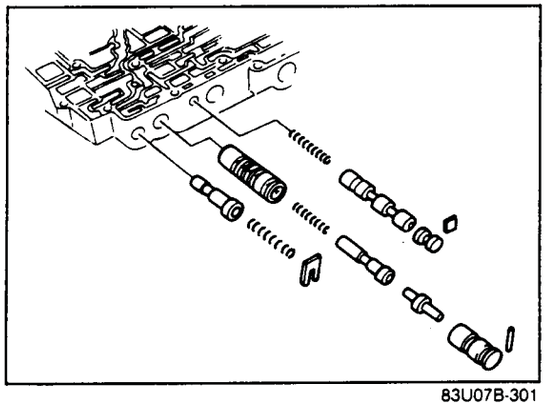
Tightening torque:
8—11 N·m (80—110 cm-kg, 69—95 in-lb)



4. Install the throttle modulator plug, throttle modulator rear spring, throttle modulator sleeve C, throttle modulator valve, throttle modulator sleeve B, throttle modulator front spring, throttle modulator sleeve A, and stopper pin.
5. Install the throttle backup valve, throttle backup spring, and retainer.



6. Install the 1-2 shift control sleeve, 1-2 shift control spring, 1-2 shift control valve, stopper plug, and stopper pin.
7. Install the 2-3 shift rear plug, 2-3 shift spring, 2-3 shift valve, 2-3 shift front plug, 2-3 shift sleeve, and stopper pin.



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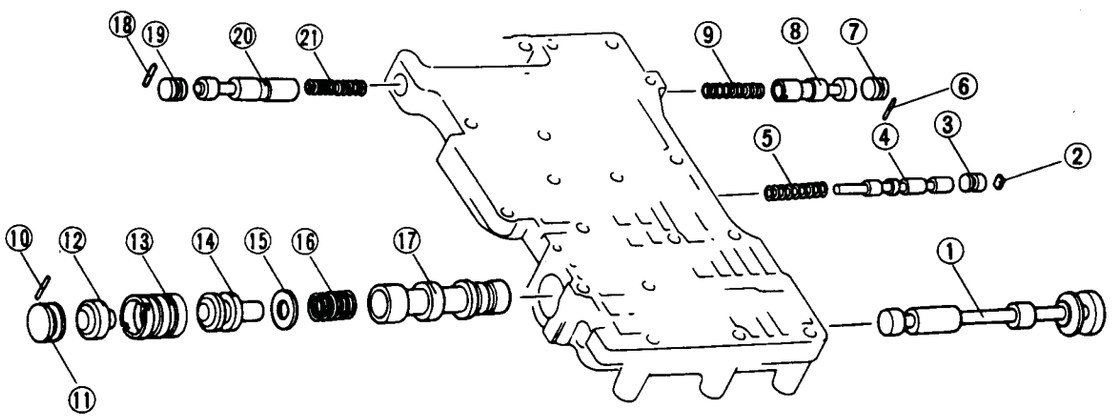
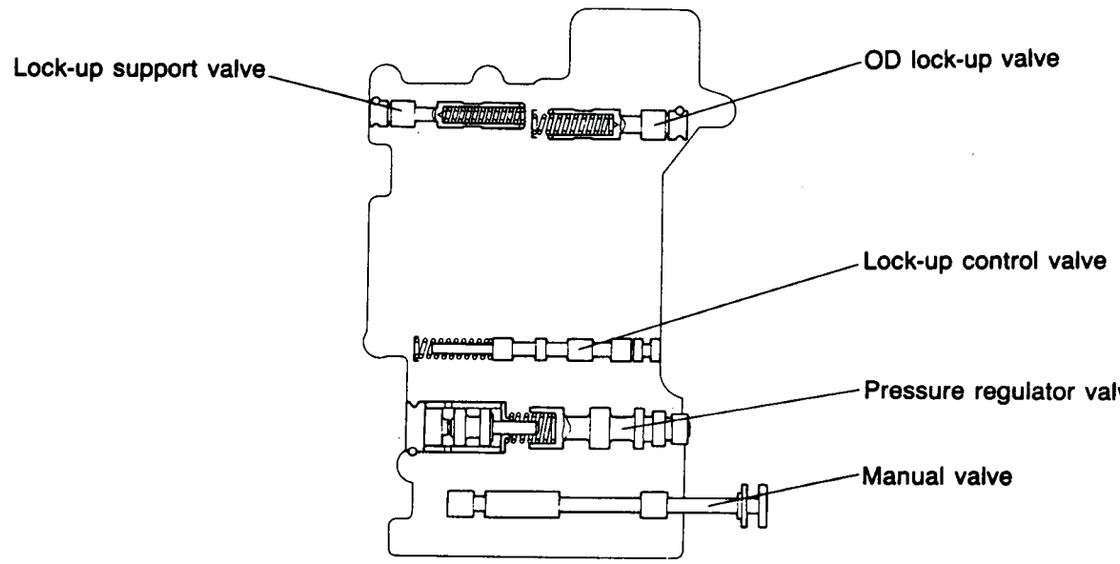
8. Install the 1 range control valve, 1 range control spring, and retainer.
9. Install the 2 range control rear sleeve, 2 range control spring, 2 range control valve, 2 range control plug, 2 range control front sleeve, and stopper pin.
10. Install the kick-down spring, kick-down valve, stopper plug, and stopper pin.

Rear Control Body
Disassembly
Disassemble in the sequence shown in the figure.



Valve Location

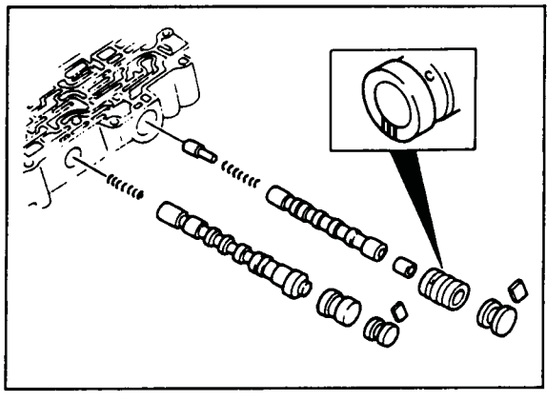


1. Manual valve
2. Stopper pin
3. Stopper plug
4. Lock-up control valve
5. Lock-up control spring
6. Stopper pin
7. Stopper plug
8. OD lock-up valve
9. OD lock-up spring
10. Stopper pin
11. Stopper plug
12. Pressure regulator backup plug
13. Pressure regulator plug sleeve
14. Pressure regulator plug
15. Pressure regulator spring seat
16. Pressure regulator spring
17. Pressure regulator valve
18. Stopper pin
19. Stopper plug
20. Lock-up support valve
21. Lock-up support spring

Inspection
Check the following and replace any faulty parts.
1. Damaged or worn valves
2. Damaged oil passage
3. Cracked or damaged valve body
4. Operation of each valve
5. Weakened spring

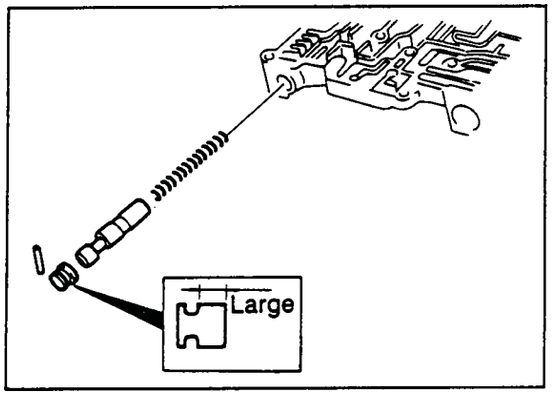
Spring

Spring name	Outer dia. mm (in)	Free length mm (in)	Wire dia. mm (in)	Spring color
Pressure regulator spring	9.5 (0.374)	30.7 (1.209)	0.7 (0.028)	—
Lock-up control spring	7.3 (0.287)	46.2 (1.819)	0.8 (0.031)	Blue
Lock-up support spring	6.1 (0.240)	43.5 (1.713)	0.65 (0.026)	Blue
OD lock-up spring	7.1 (0.280)	66.5 (2.618)	0.8 (0.031)	Red



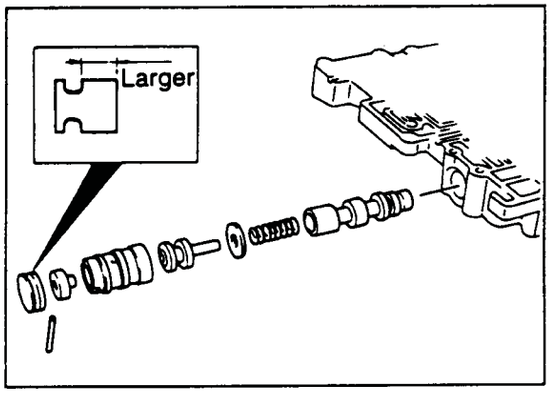
Install the 1-2 shift spring, 1-2 shift valve, 1-2 shift plug, stopper plug, and stopper pin.
Install the 3-4 shift rear plug, 3-4 shift spring, 3-4 shift valve, 3-4 shift sleeve, 3-4 shift front plug, stopper plug, and stopper pin.

Note
Install the 3-4 shift sleeve with the identification notches facing inward.



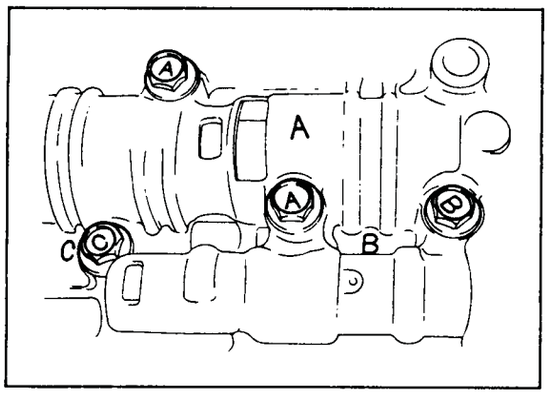
Assembly
Install the lock-up support spring, lock-up support valve, stopper plug, and stopper pin.

Note
Install the stopper plug large end first.



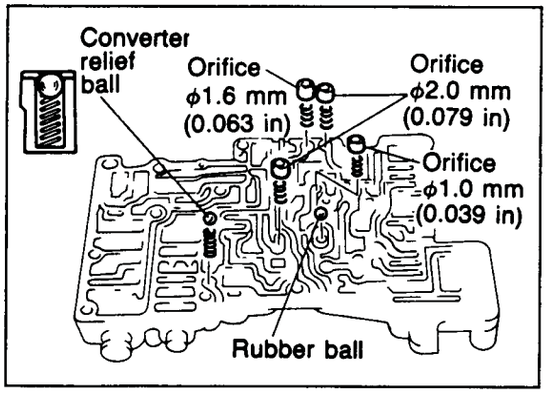
Install the pressure regulator valve, pressure regulator spring, pressure regulator spring seat, pressure regulator plug, pressure regulator plug sleeve, pressure regulator backup plug, stopper plug, and stopper pin.

Note
Install the stopper plug large end first.

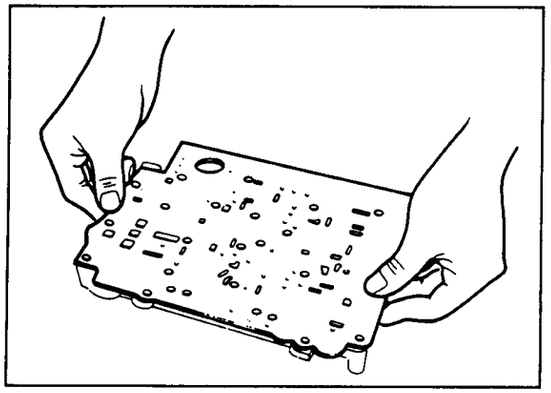


Assembly of Control Valve Body

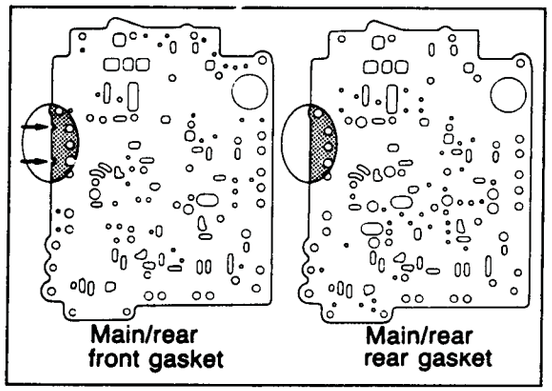
Note
a) Do not mix-up the front and rear gaskets during assembly.
b) Match the bolt head letter and the control valve body letter.



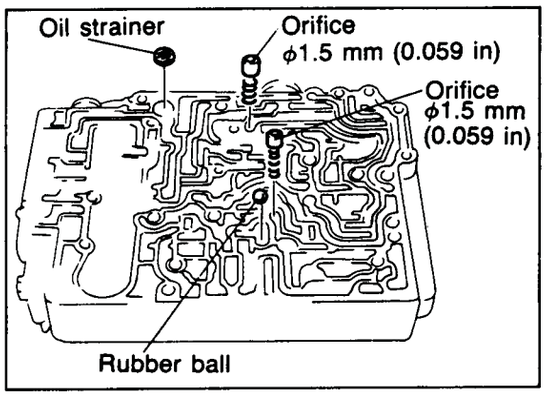
Install the orifice check valves (φ2.0 mm, 0.079 in; φ1.6 mm, 0.063 in; φ1.0 mm, 0.039 in) and springs, converter relief ball and spring, and rubber ball in the rear control body as shown.



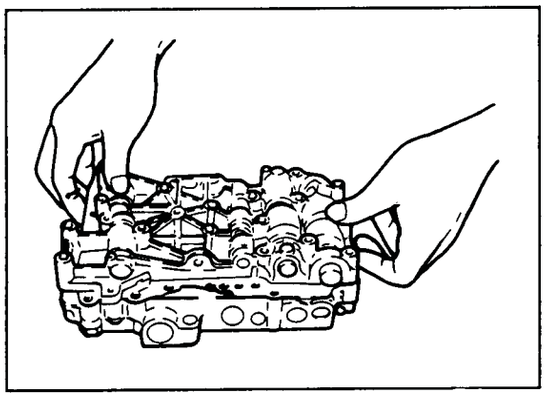
Install the gaskets on both sides of the rear separator; then install it onto the rear control body.



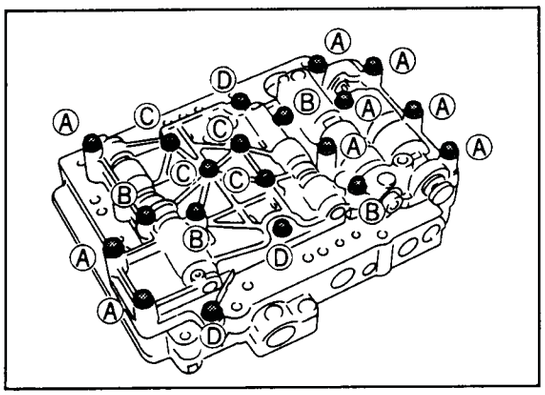
Note
The main/rear rear gasket and main/rear front gasket are not interchangeable.



Install the orifice check valves (ϕ1.5 mm, 0.059 in) and springs, oil strainer, and rubber ball in the main control body as shown.

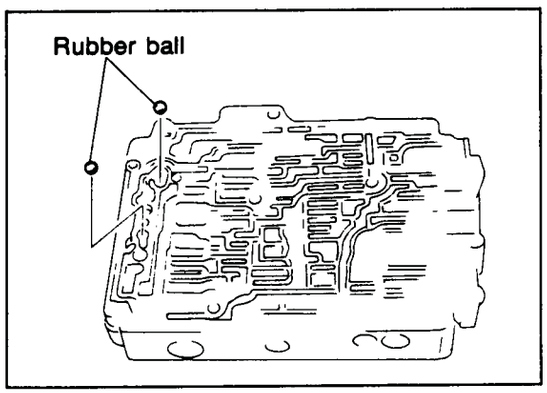


Install the rear control body to the main control body.

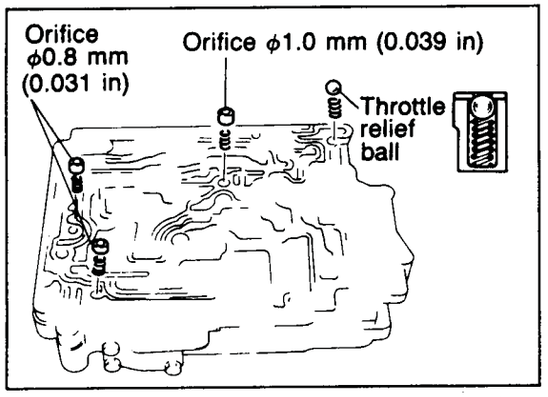


Loosely tighten the bolts.

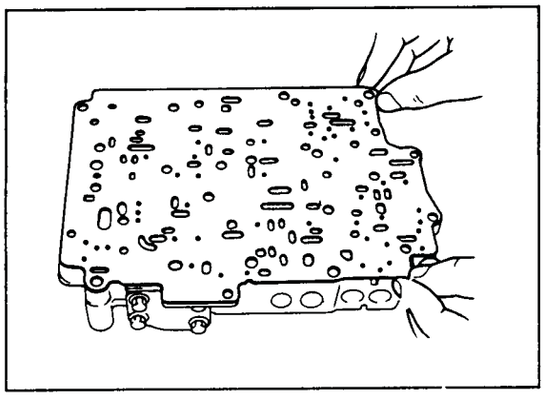
Note
Match the bolt head letter as shown.



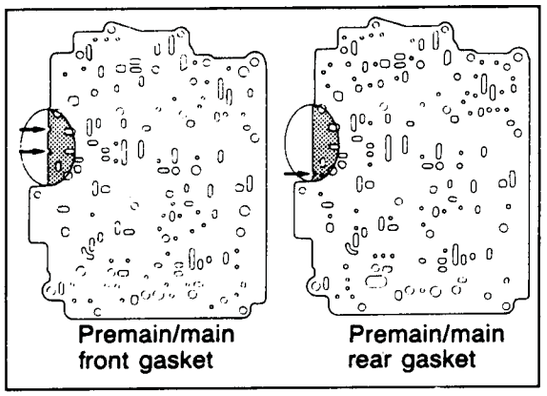
Turn the assembly over and install the rubber balls in the main contrcl body as shown.



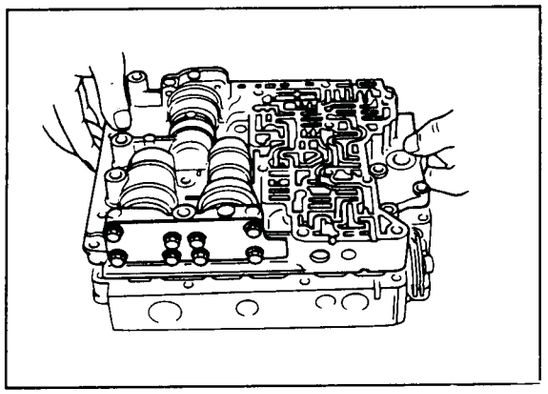
Install the orifice check valves (ϕ1.0 mm, 0.039 in; ϕ0.8 mm; 0.031 in) and springs, and the throttle relief ball and spring in the premain control body as shown.



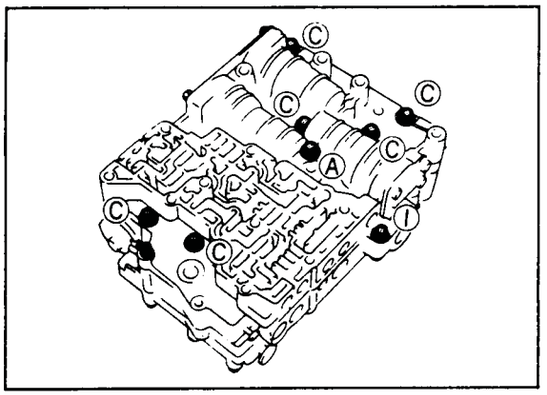
Install the gaskets on both sides of the main separator; then install it onto the premain control body.



Note
The premain/main rear gasket and premain/main front gasket are not interchangeable.

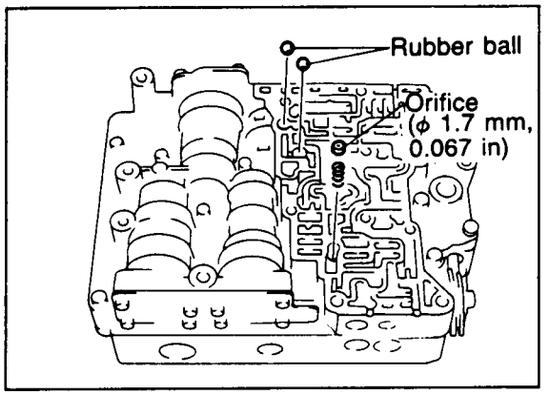


Set the premain control body onto the main control body.

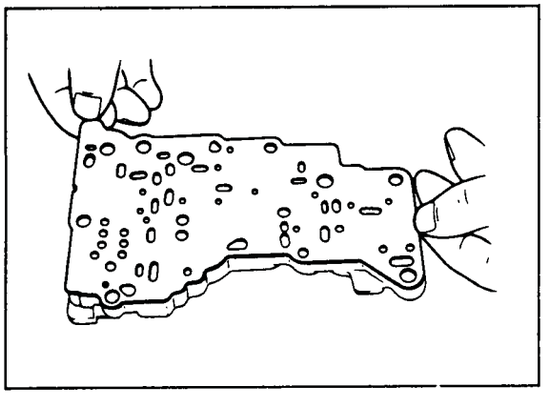


Loosely tighten the bolts.

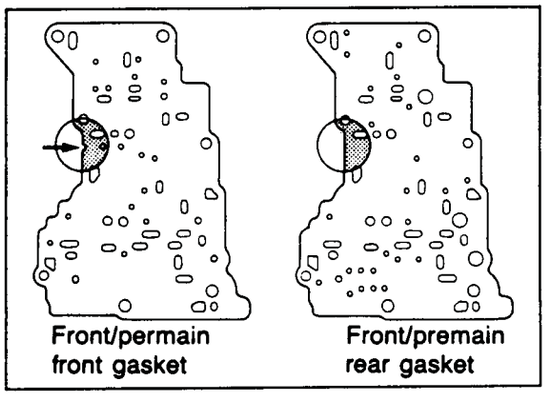
Note
Match the bolt head letter as shown.



Install the rubber balls, orifice check valve (ϕ1.7 mm, 0.067 in) in and spring in the premain control body as shown.

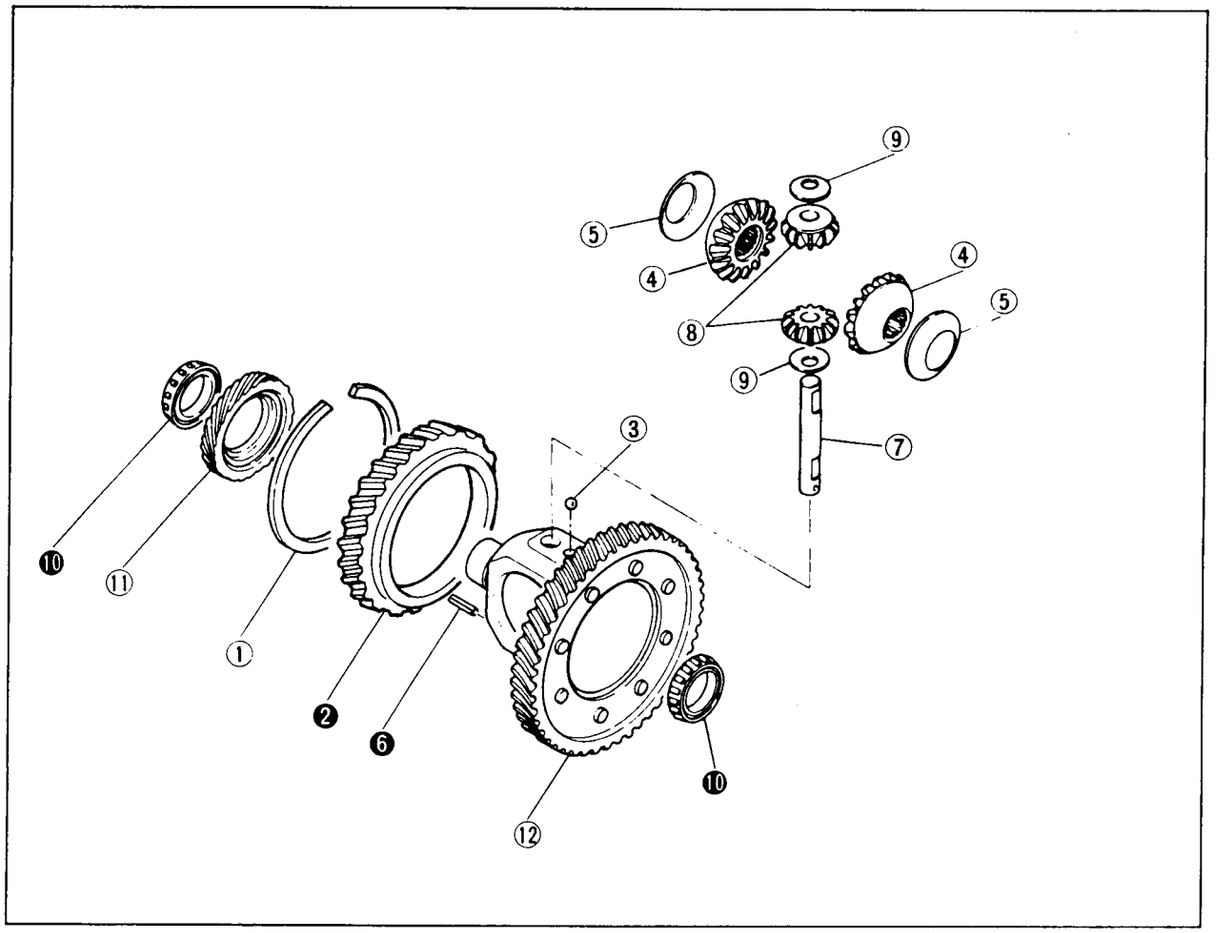


Install the gaskets on both sides of the premain separator; then install it onto the front control body.

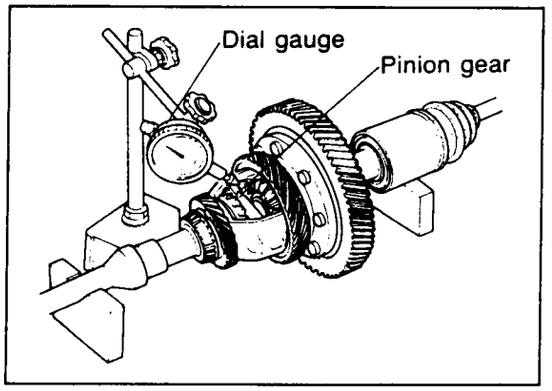


Note
The front/premain front gasket and front/premain rear gasket are not interchangeable.

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

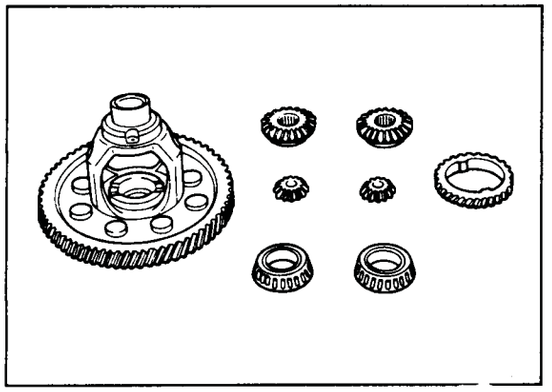


1. Snap ring (G4A-HL)
2. Governor drive gear (G4A-HL)
3. Steel ball (G4A-HL)
4. Side gear
5. Side gear thrust washer
6. Roll pin
7. Pinion shaft
8. Pinion gear
9. Pinion gear thrust washer
10. Side bearing inner race
11. Speedometer drive gear
12. Ring gear and gear case assembly

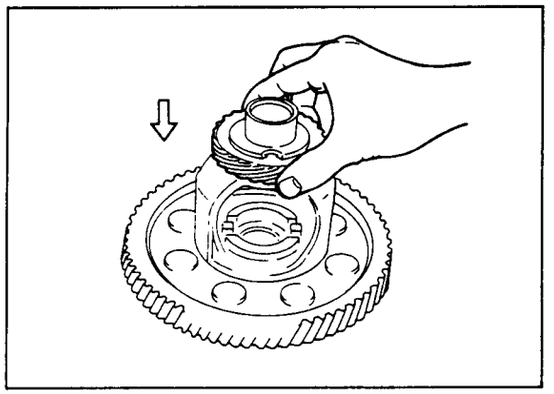


Disassembly note
Checking backlash
Before disassembly, measure the backlash of the side gears and pinion gears. If it is not within specification, replace the differential assembly.

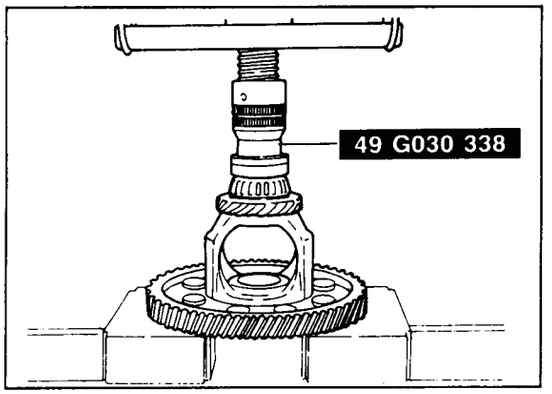
Backlash:
Standard 0.025—0.1 mm (0.001—0.004 in)
Maximum 0.5 mm (0.020 in)



Inspection
Check the following and replace any faulty parts.
1. Damaged or worn gears
2. Cracked or damaged gear case
3. Damaged bearings

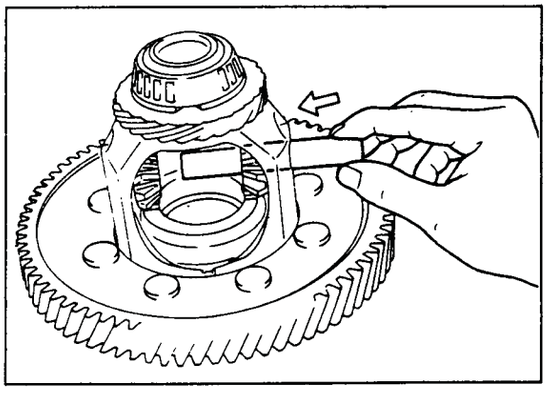


Assembly
Set the speedometer drive gear onto the ring gear and case assembly.



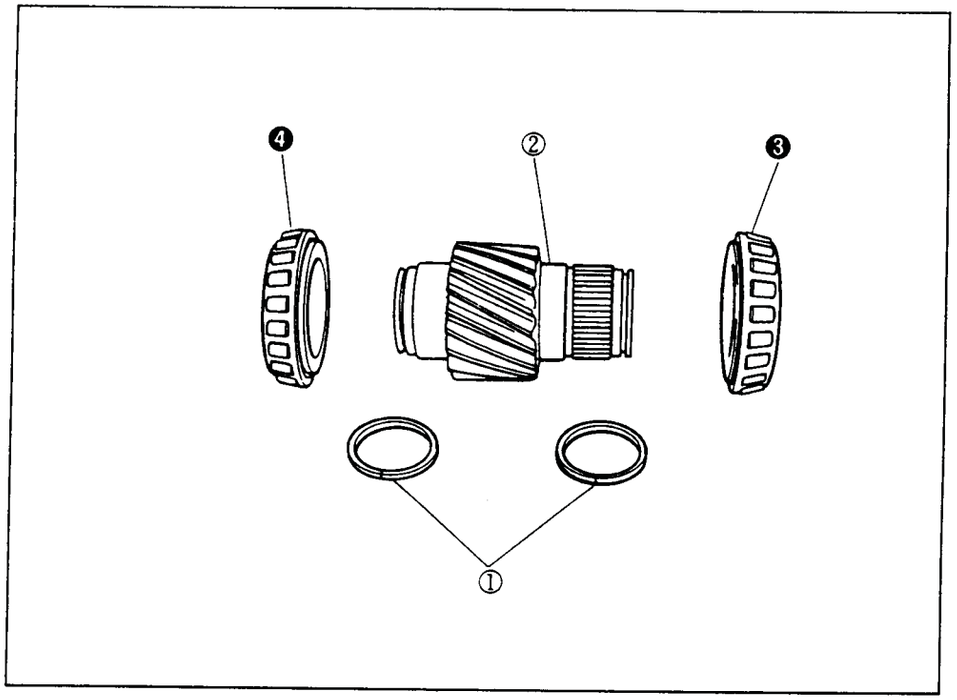
Install the side bearing inner races.
(1) Press the side bearing inner race (side opposite the ring gear) onto the ring gear and case assembly with the **SST**.
(2) Press on the other side bearing inner race (ring gear side) in the same manner.

Caution
Do not reuse the bearings if they were removed.



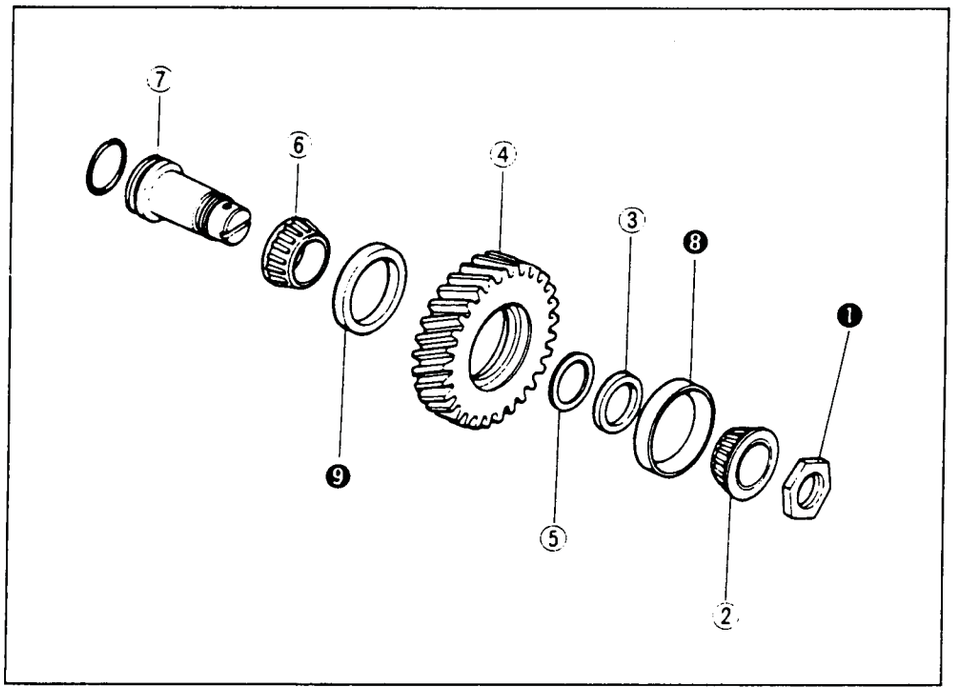
Install the pinion gears and thrust washers into the case.
Install the pinion shaft.

OUTPUT GEAR
Disassembly
Disassemble in the sequence shown in the figure referring to the disassembly note for the specially marked parts.



1. Seal ring
2. Output gear
3. Output gear bearing
4. Output gear bearing

IDLE GEAR
Disassembly
Disassemble in the sequence shown in the figure referring to the disassembly note for the specially marked parts.

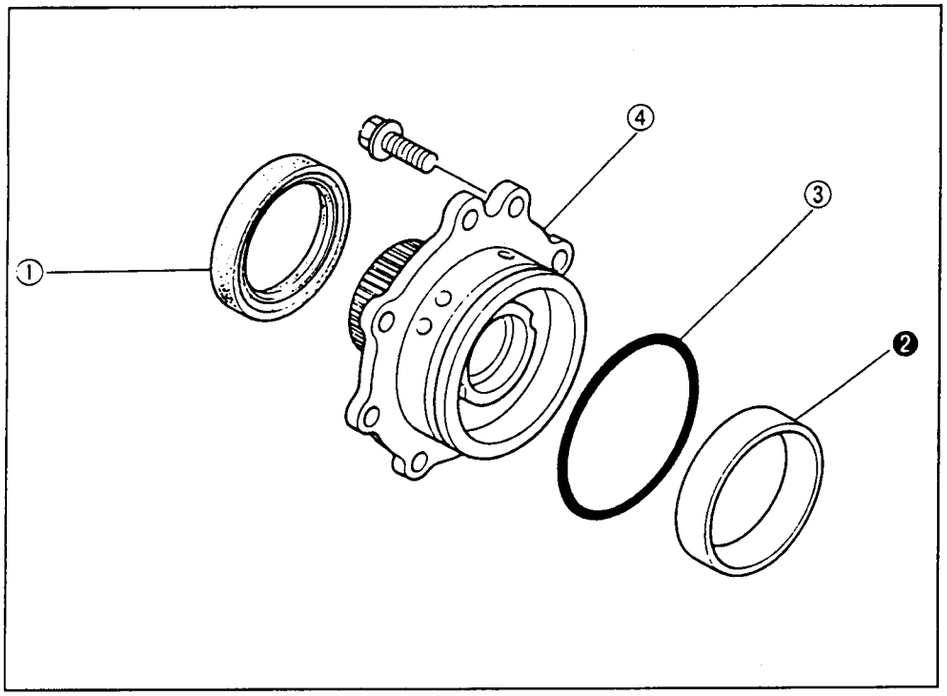


1. Locknut
2. Idle gear bearing
3. Spacer
4. Idle gear
5. Adjust shim
6. Idle gear bearing
7. Idle shaft
8. Bearing outer race
9. Bearing outer race

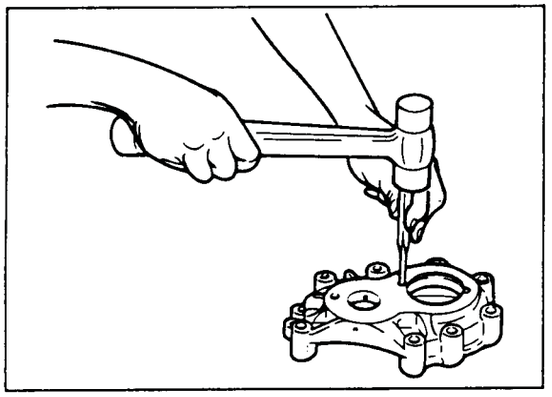
BEARING COVER ASSEMBLY

Disassembly

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



1. Oil seal
2. Bearing outer race
3. O-ring
4. Bearing cover

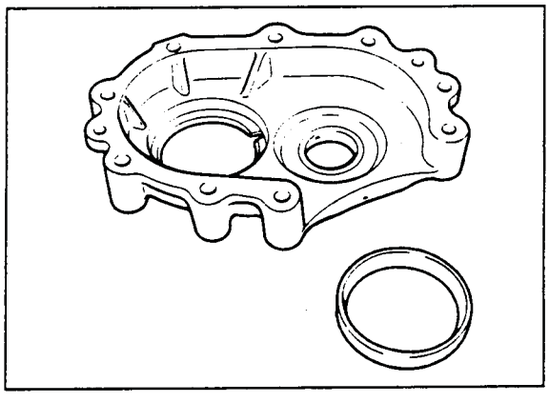


BEARING HOUSING

Disassembly

Remove the bearing outer race with a pin punch and hammer

Note
Install the bearing outer race during reassembly of transaxle to adjust the preload.



Inspection

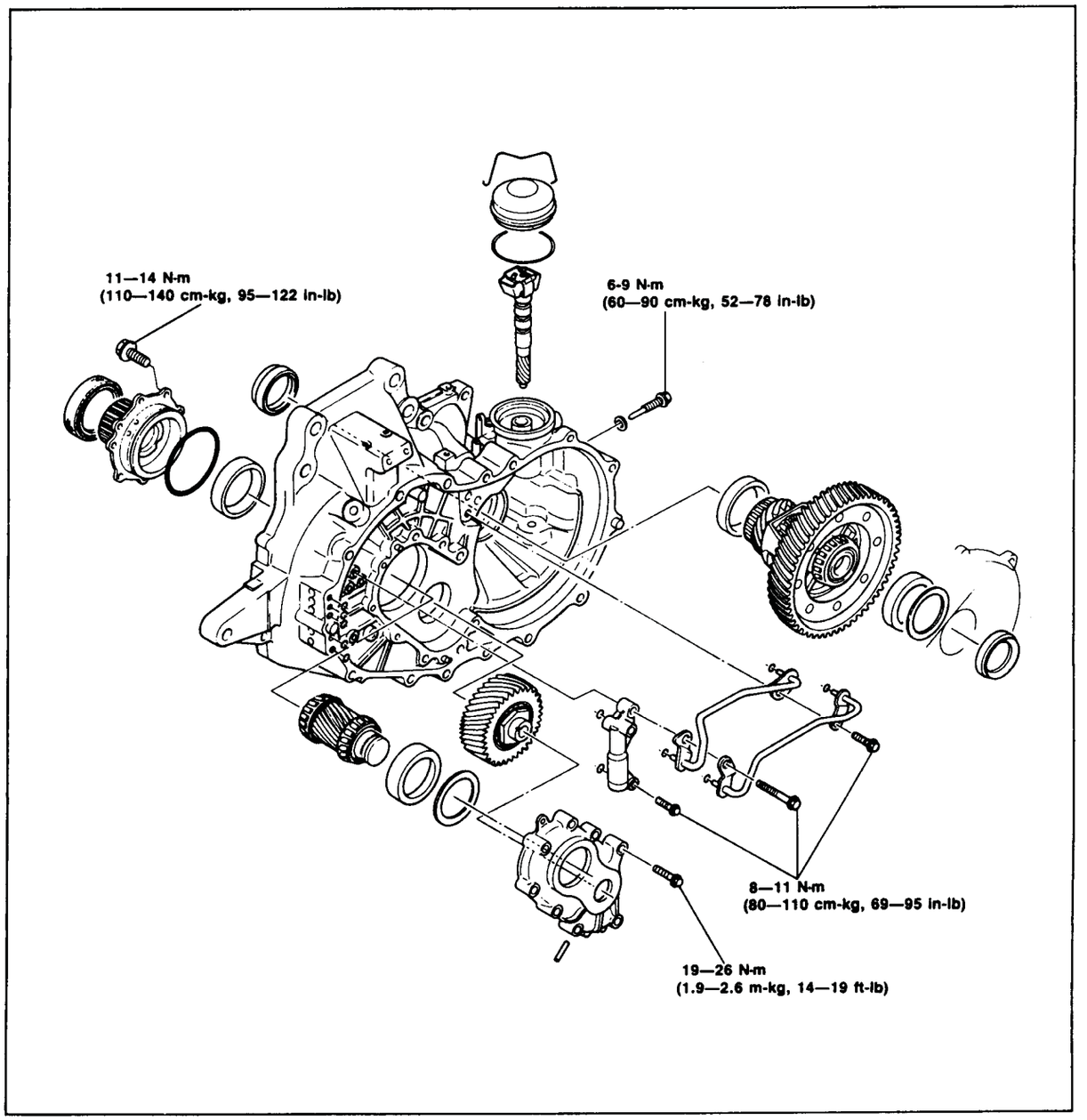
Check the following and replace any faulty parts.
1. Damaged bearing housing
2. Damaged bearing outer race

ASSEMBLY

PRECAUTION

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

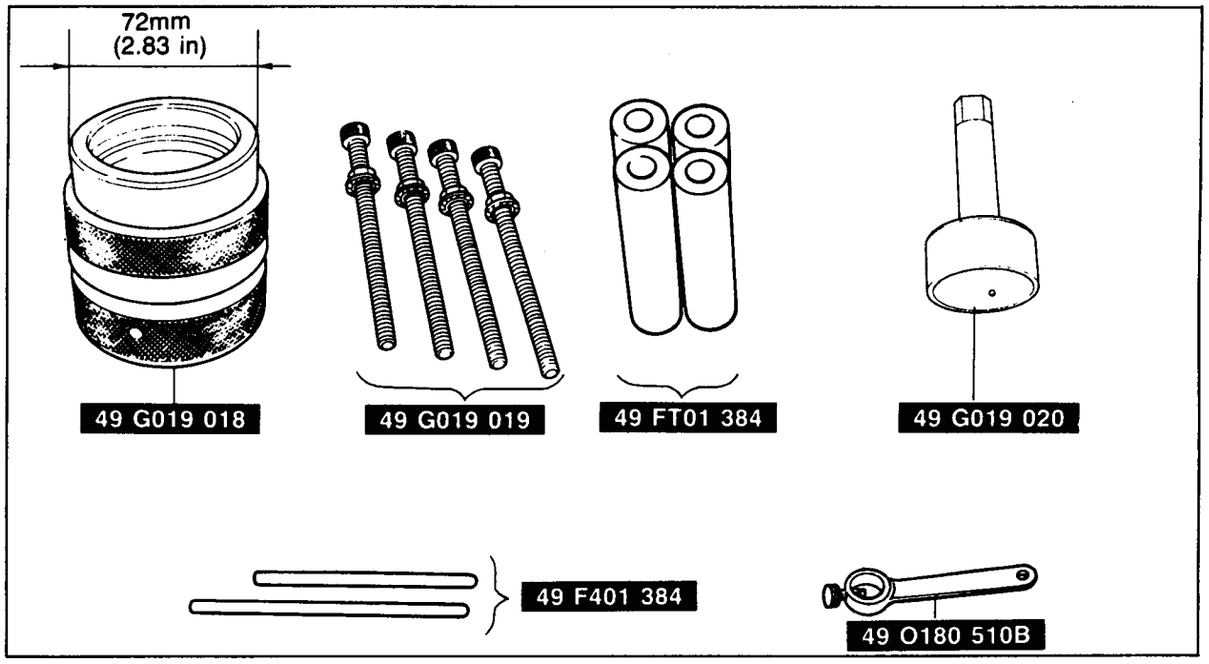
ASSEMBLY-
Torque Specifications

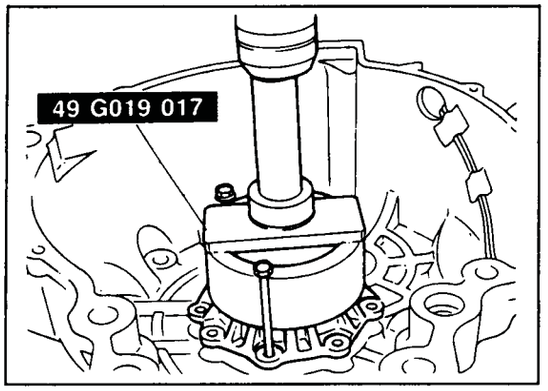


Procedure

1 Adjust the preload of the output gear bearing and select the adjust shim(s) as described below.

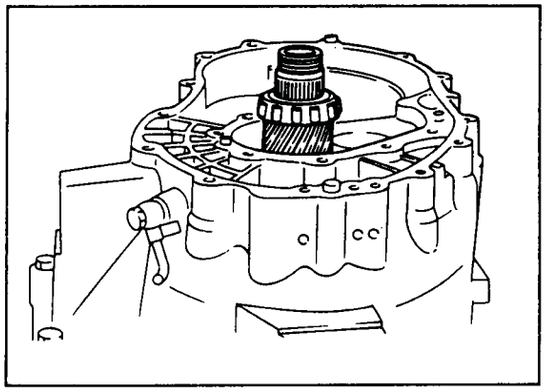
Note
To adjust the preload, use the SST shown below.



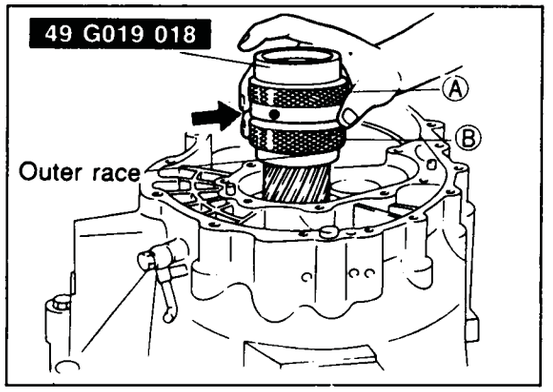


(1) Press the bearing cover in after aligning it with guide bolts as shown.

Tightening torque: 11—14 N·m (110—140 cm-kg, 95—122 in-lb)

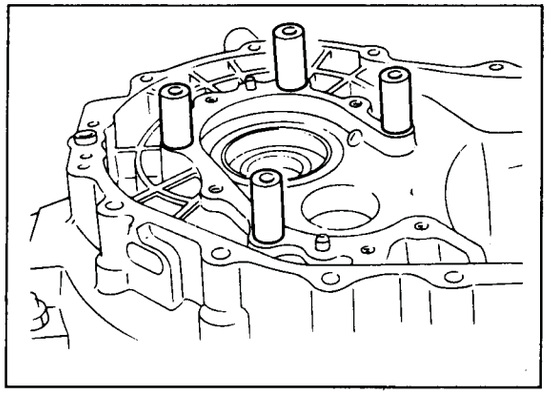


(2) Install the converter housing onto the **SST**.
(3) Remove the bearing outer race and adjust shims from the bearing housing. (Refer to page 7B—185)
(4) Mount the output gear assembly onto the converter housing.

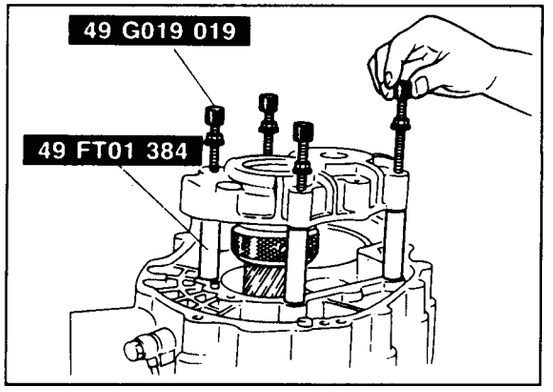


Install the outer race removed in step (2) to the **SST**; then mount them on the output gear assembly.

Caution
Eliminate the gap (arrow) by turning A or B of the selector.

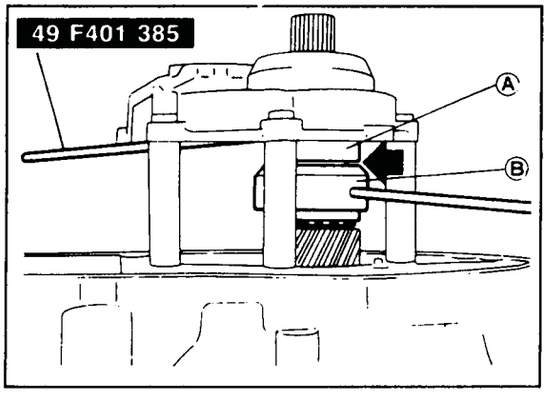


Set the four **SST** on the converter housing in the positions shown.



Set the bearing housing on the **SST** (selector) and install the four **SST** (bolts); then tighten them to the specified torque.

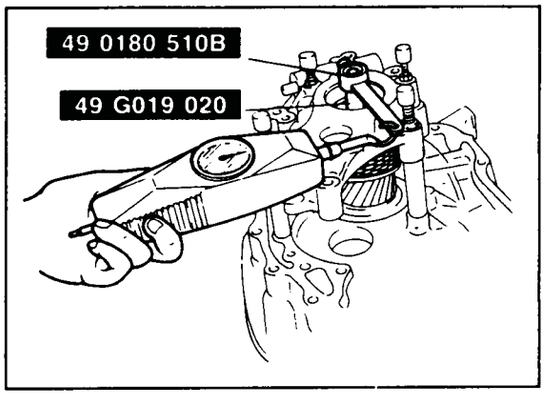
Tightening torque:
19—26 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



Turn the **SST** (selector) to increase the clearance indicated by the arrow with the **SST** (bars) until it no longer turns.

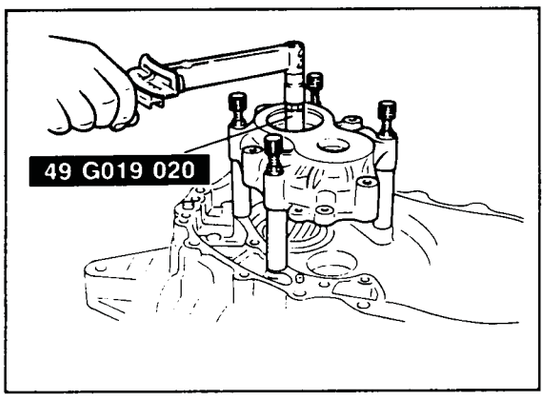
Note
This is to seat the bearing.

Turn the selector in the opposite direction until the preload is eliminated (gap is reduced).

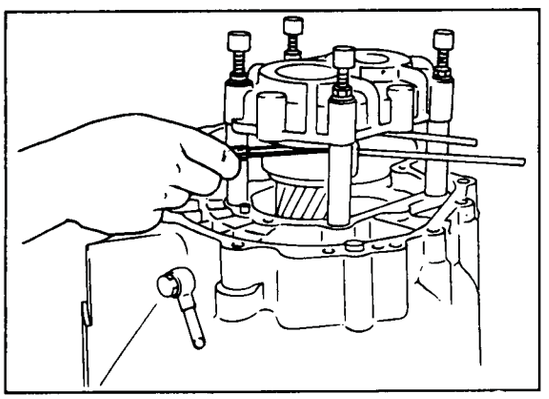


Mount the **SST** and pull scale or torque wrench on the output gear.
Increase the clearance between A and B to obtain the specified preload/pull scale reading.

Preload: 0.5—0.9 N·m
(5.0—9.0 cm-kg, 4.34—7.81 in-lb)
Reading on pull scale: 5—9 N
(0.5—0.9 kg, 1.1—1.98 lb)

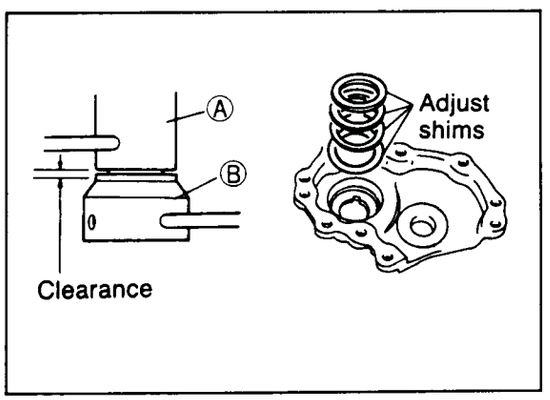


Note
Read the preload when the output gear starts to turn.

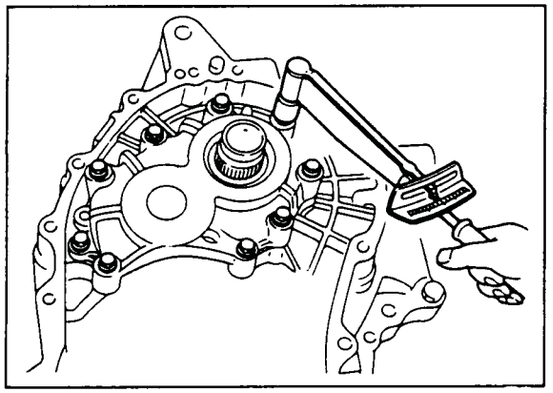


Measure the clearance. Select adjust shim(s) equivalent to the measured clearance.

Thickness of shim	
0.10 mm (0.004 in) 0.12 mm (0.005 in) 0.14 mm (0.006 in) 0.16 mm (0.0063 in)	0.18 mm (0.007 in) 0.20 mm (0.008 in) 0.50 mm (0.020 in)



Caution
a) Measure the clearance around the entire circumference, and select shims equivalent to the maximum clearance.
b) The maximum allowable number of shims is 7.



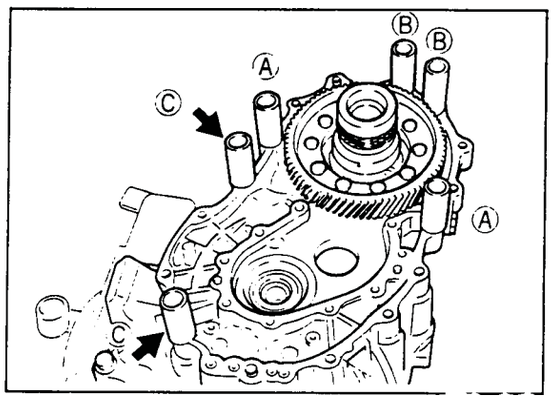
Install the bearing housing.

Tightening torque:
19—26 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

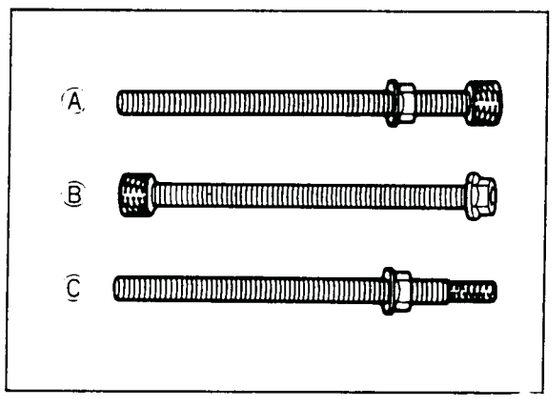
Check that the preload/pull scale reading is within specification. If not within specification return to step (2).

Preload: 0.03—0.9 N·m
(0.3—9.0 cm-kg, 0.26—7.81 in-lb)
Reading on pull scale:
0.3—9 N (0.03—0.9 kg, 0.066—1.98 lb)

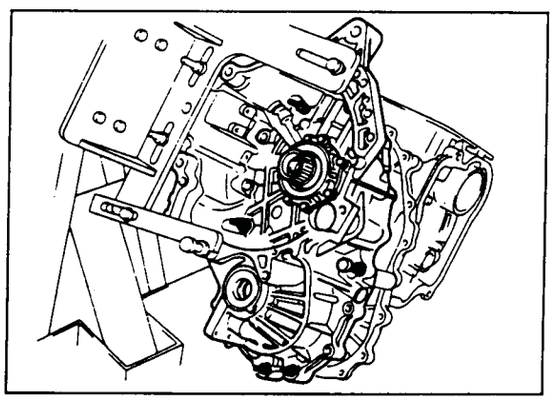
Remove the bearing housing.



Set the six **SST** in the positions shown.

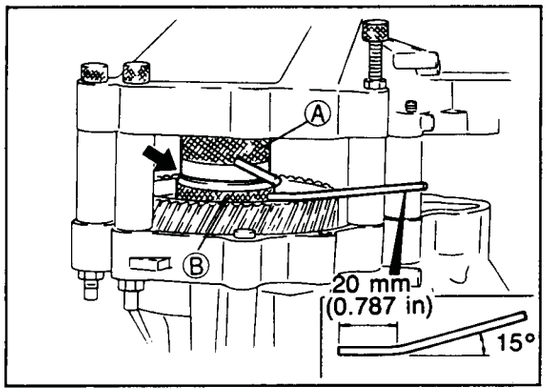


Note
Install the bolts in the positions shown in the illustration above.



Set the transaxle case on the selectors.
Tighten the **SST** (bolts) to the specified torque.

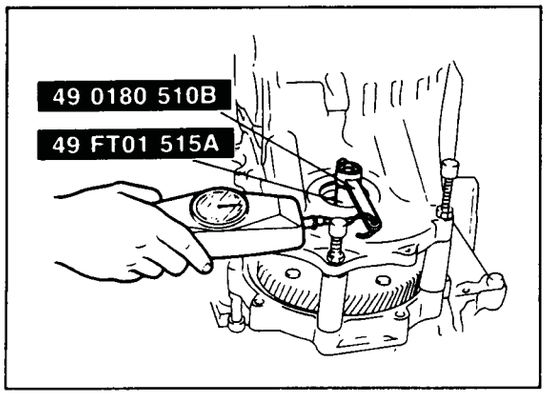
Tightening torque:
37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)



Turn the **SST** (selector) to increase the clearance indicated by the arrow with the **SST** (bars), until it no longer turns.

Note
a) This is to seat the bearings.
b) To turn the SST (B), bend the bar as shown.

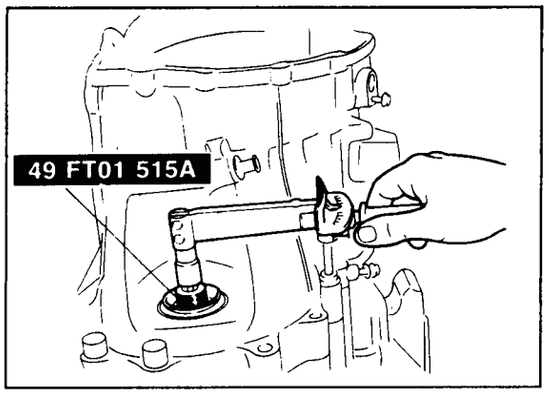
Turn the selector in the opposite direction until the preload is eliminated (gap is reduced).



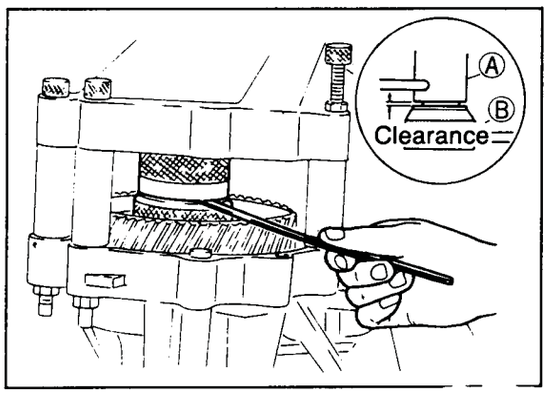
Insert the **SST** through the oil seal hole of the transaxle case and attach it to the pinion shaft. Mount the **SST** and pull scale or torque wrench.
Widen the clearance between A and B to obtain the specified preload/pull scale reading.

Preload:
0.5 N·m (5 cm-kg, 4.3 in-lb)
Reading on pull scale:
5 N (0.5 kg, 1.1 lb)

Note
Read the preload when the differential starts to turn.

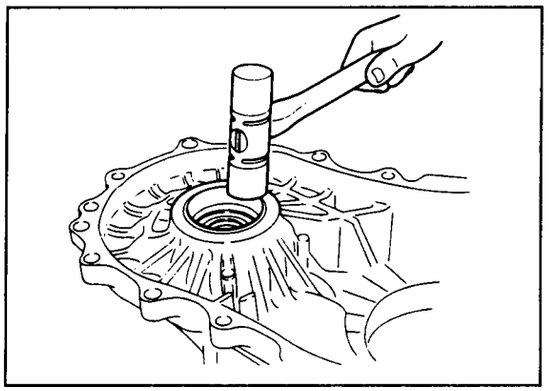


Measure the clearance between A and B.
Add **0.3 mm (0.0118 in)** to the measured clearance, and select the shim(s) closest in valve to that measurement.

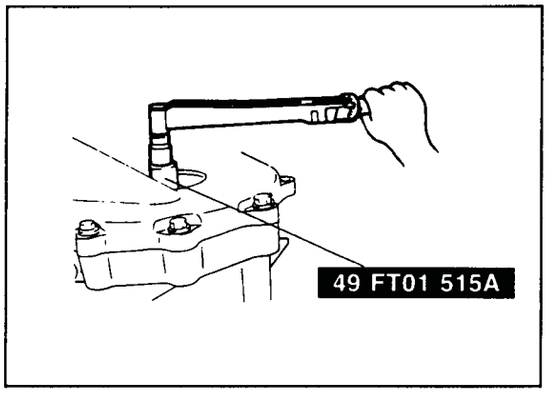


Thickness of shim	
0.10 mm (0.004 in)	0.20 mm (0.008 in)
0.12 mm (0.005 in)	0.50 mm (0.020 in)
0.14 mm (0.006 in)	0.70 mm (0.028 in)
0.16 mm (0.0063 in)	1.00 mm (0.039 in)
0.18 mm (0.007 in)	

Caution
a) Measure the clearance around the entire circumference, and select shims equivalent to the maximum clearance.
b) The maximum allowable number of shims is 3.



Remove the transaxle case and selector.
Install the required shim(s) and tap the bearing race into the transaxle case.



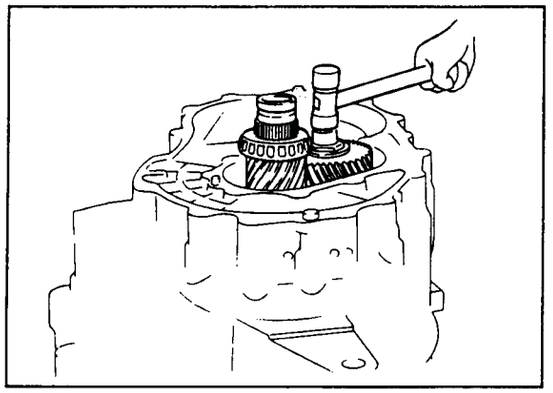
Install the transaxle case.

Tightening torque:
37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

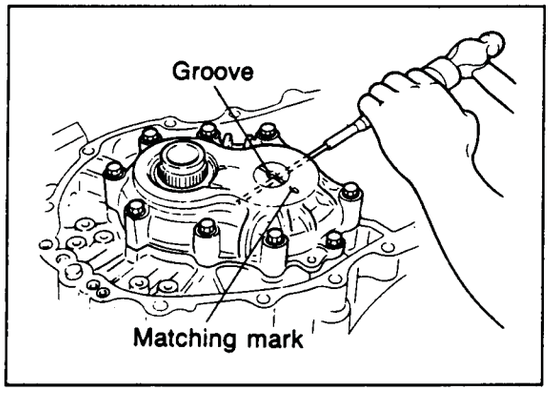
Check that the preload is within specification.
If not within specification,

Preload: 2.9—3.9 N·m
(30—40 cm-kg, 26—35 in-lb)
Reading on pull scale: 29—39 N
(3.0—4.0 kg, 6.6—8.8 lb)

Remove the transaxle case and differential assembly.



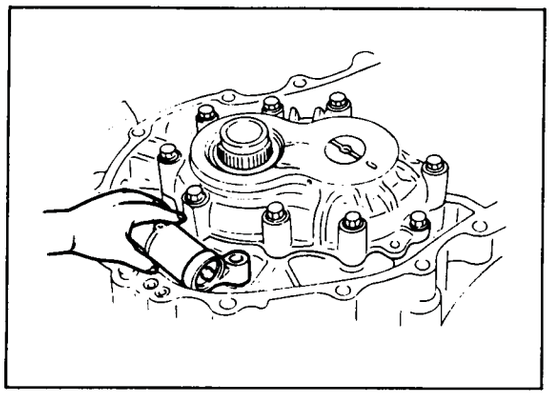
Install the idle gear and output gear as an assembly by tapping in with a plastic hammer.



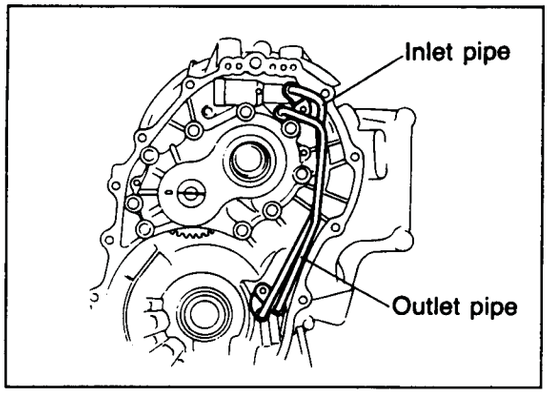
Install the bearing housing.
Install the bearing housing on the converter housing.

Tightening torque:
19—26 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

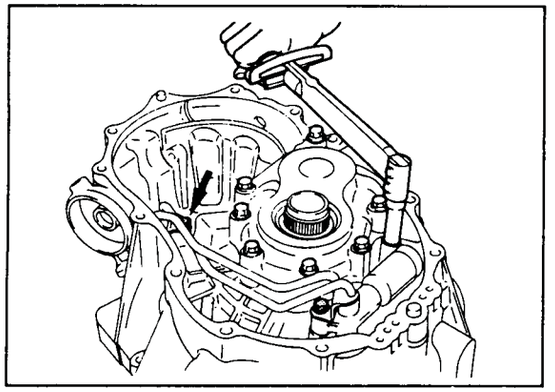
Align the groove on the idle shaft with the matching mark on the bearing housing.
Tap the roll pin in with a pin punch and hammer.



Apply ATF to the O-rings and install them into the 2-3 accumulator; then temporarily install the 2-3 accumulator piston assembly in the converter housing.

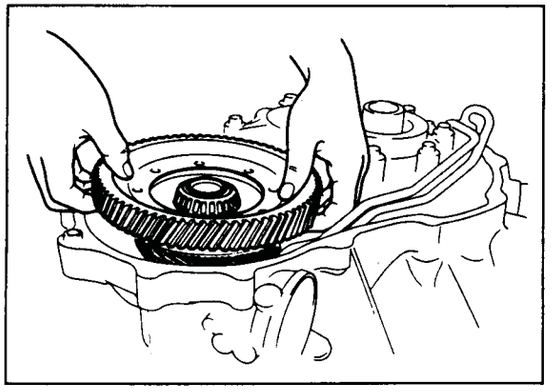


Apply ATF to the O-rings and install them onto the governor inlet pipe and governor outlet pipe; then temporarily install the inlet and outlet pipes.

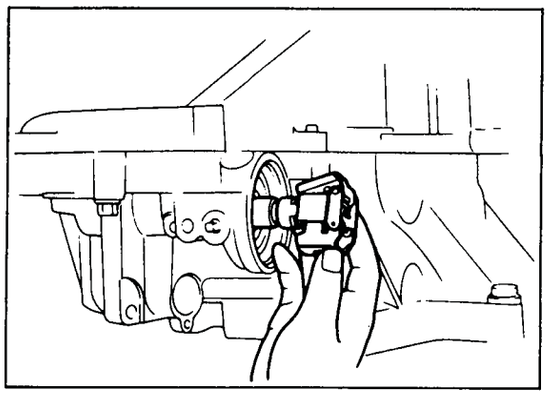


Tighten the bolts.

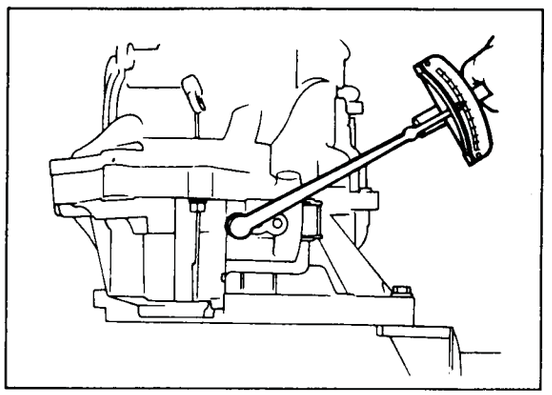
Tightening torque: 8—11 N·m (80—110 cm-kg, 69—95 in-lb)



Set the differential assembly into the converter housing.

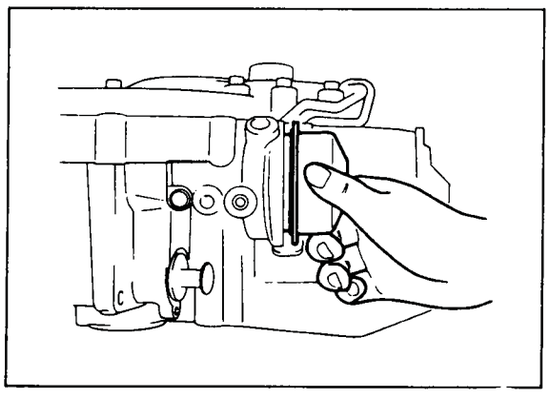


Install the governor assembly.
Install the governor assembly.



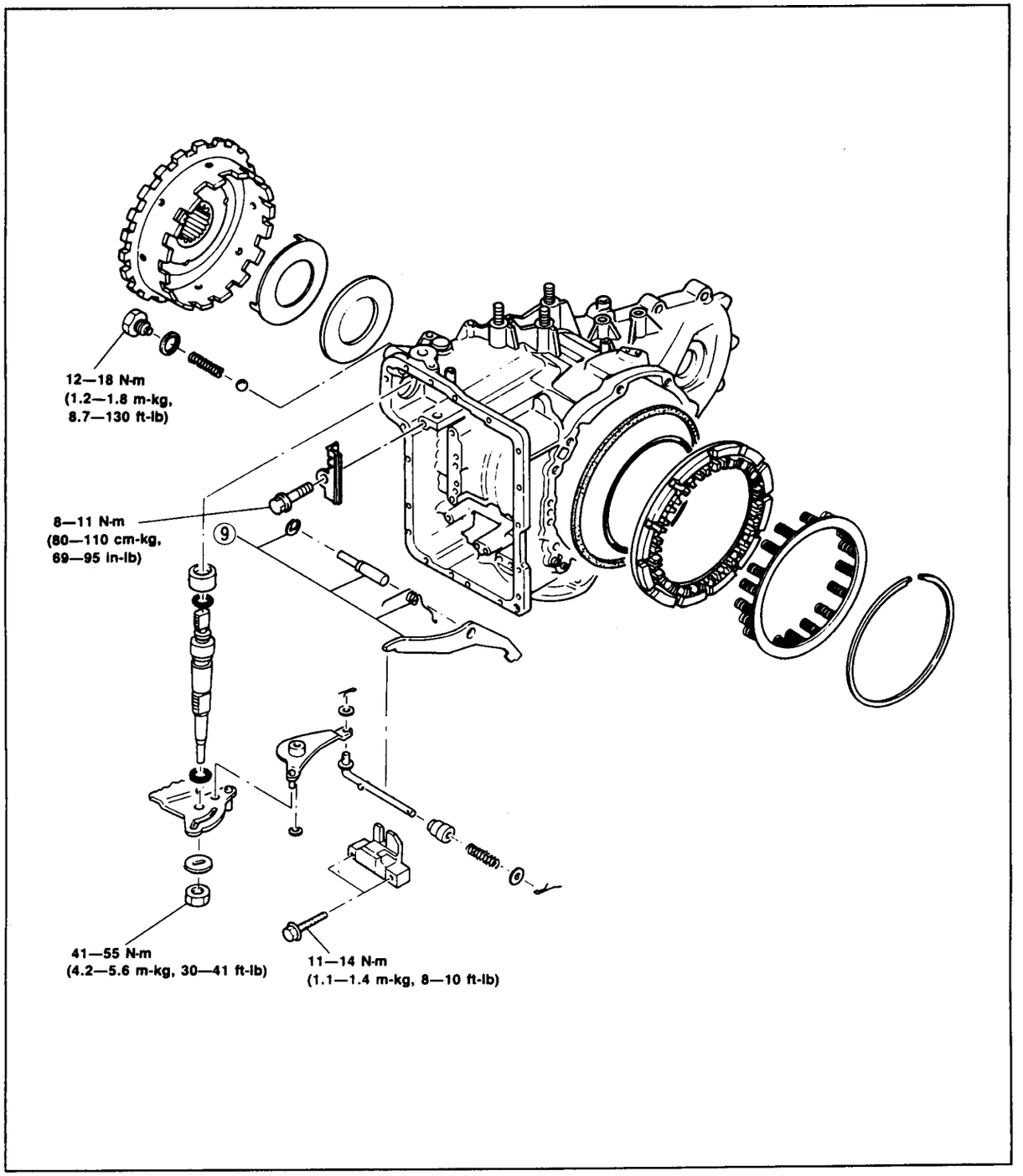
Install the stopper bolt.

Tightening torque: 6—9 N·m (60—90 cm-kg, 52—78 in-lb)

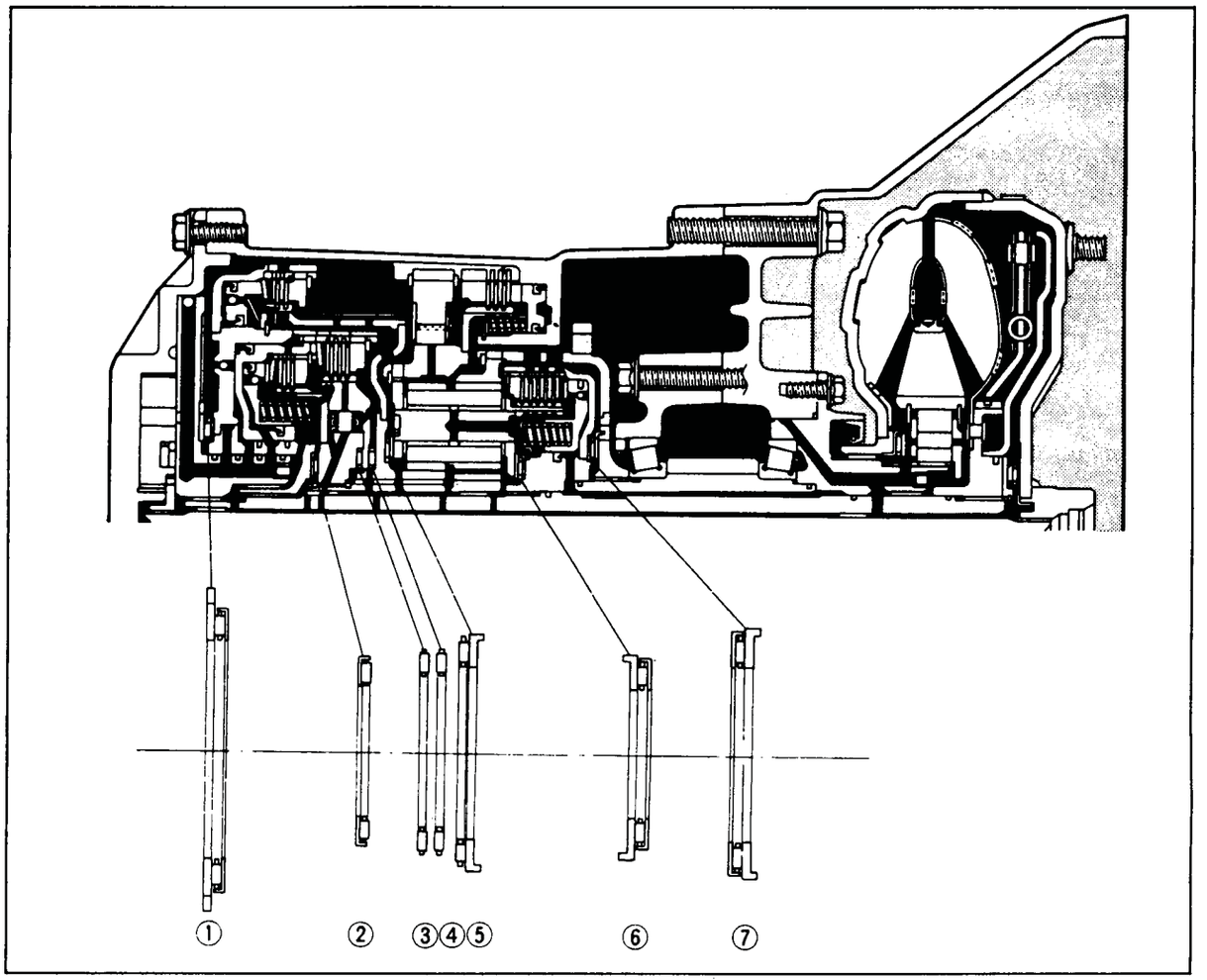


Install the O-ring on the governor cover.
Install the governor cover and clip.

ASSEMBLY-
Torque Specifications



Thrust Washer, Bearing, and Race Locations

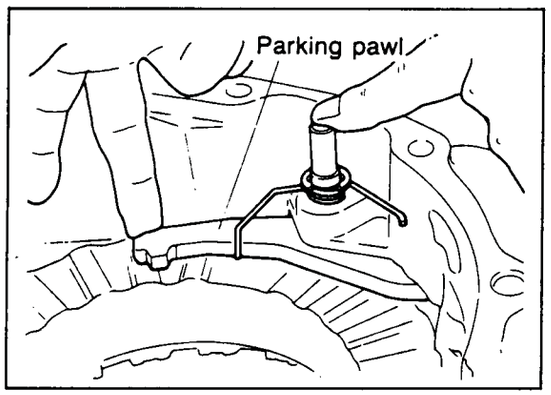


Outer diameter of bearing and race

mm (in)

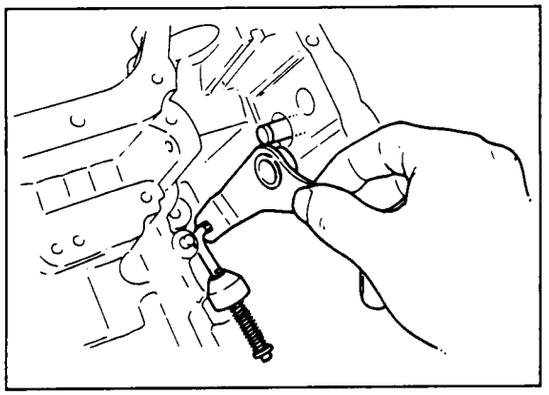
	1	2	3	4	5	6	7
Bearing	86.0 (3.39)	56.1 (2.21)	62.1 (2.44)	62.1 (2.44)	72.0 (2.83)	56.1 (2.21)	72.1 (2.84)
Race	88.0 (3.46)	—	—	—	72.0 (2.83)	57.0 (2.21)	72.0 (2.83)

Note: Install with petroleum jelly to prevent the thrust bearing or bearing race from falling out.

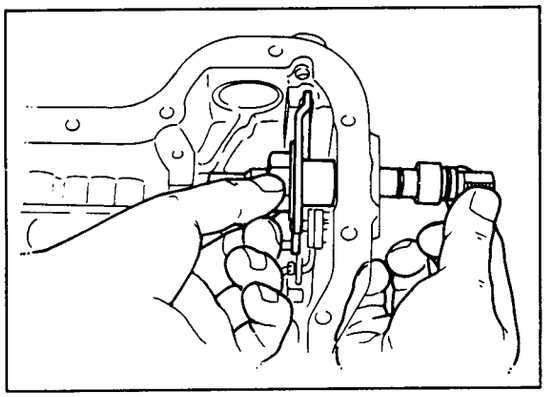


Procedure

1. Install the parking pawl.
   (1) Install the parking pawl and shaft.
   (2) Install the spring and snap ring.
   (3) Move the manual shaft and check that the parking pawl operates.

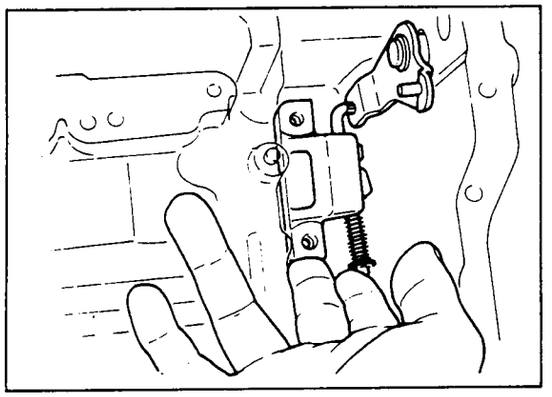


Install the parking assist lever and snap ring.



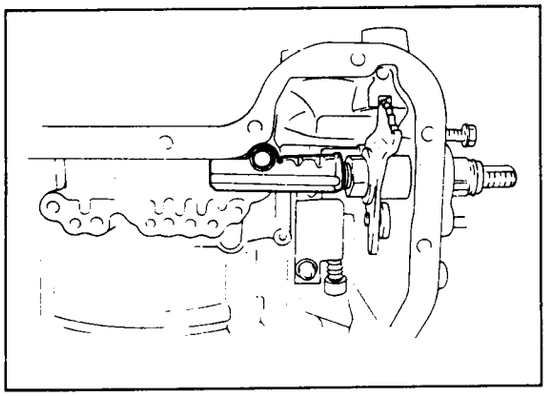
Install the actuator support.

Tightening torque:
11—14 N·m (1.1—1.4 m-kg, 8.0—10 ft-lb)



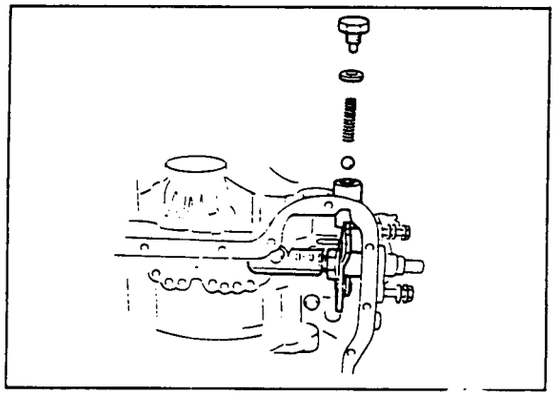
Install the manual shaft and manual plate.
Install the manual plate, spacer, washer, and nut.
Tighten the nut to specified torque.

Tightening torque:
41—55 N·m (4.2—5.6 m-kg, 30—41 ft-lb)



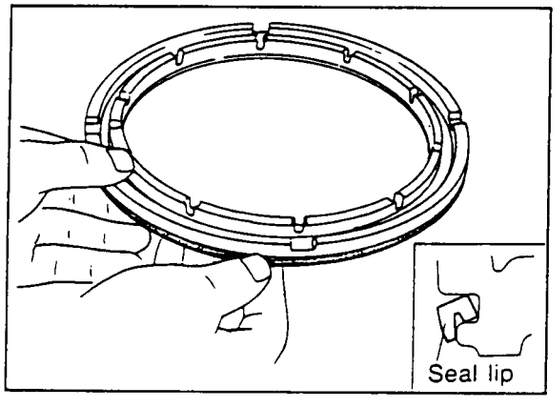
Install the bracket.

Tightening torque:
8—11 N·m (80—110 cm-kg, 69—95 in-lb)

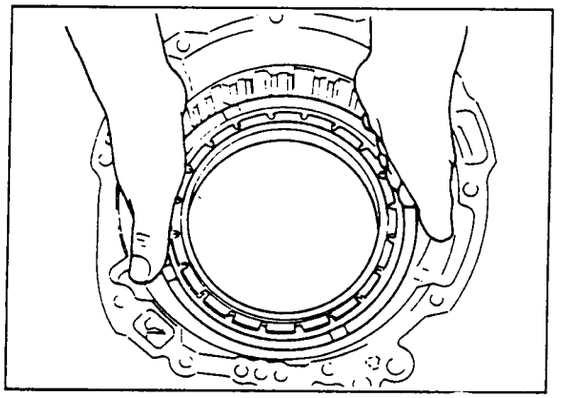


Install the detent ball, spring, washer and plug; then tighten the plug.

Tightening torque:
12—18 N·m (1.2—1.8 m-kg, 8.7—13 ft-lb)

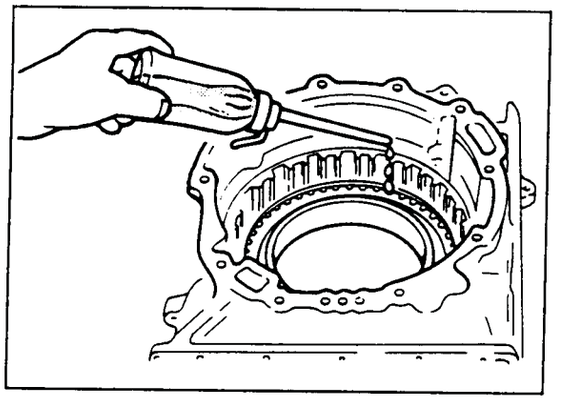


Install the low and reverse brake piston.
Apply ATF to the inner and outer seals, and install them to the low and reverse brake piston. Face the outer seal lip toward the inside by gently rolling it down around the circumference for easier installation into the case.



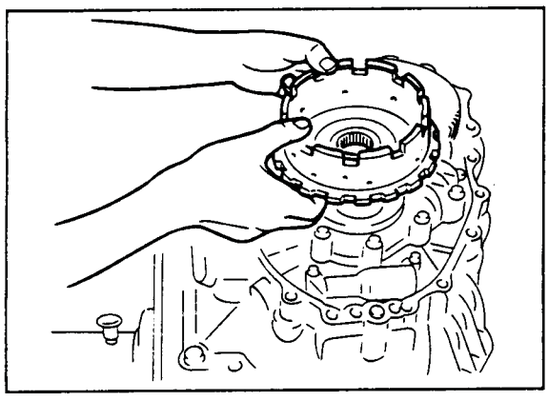
Install the low and reverse brake piston by pushing evenly around the circumference, being careful not to damage the outer seal.

Install the spring and retainer assembly.



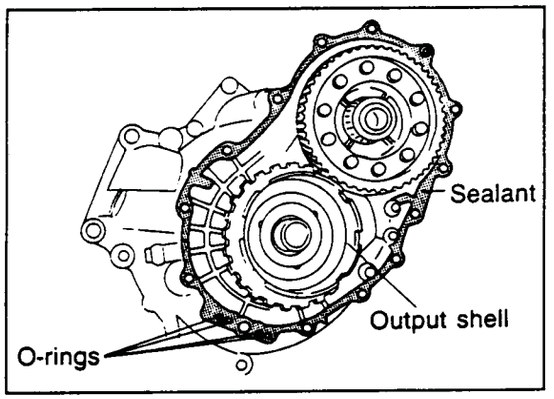
Check the low and reverse brake piston operation.
Pour in ATF so that the low and reverse brake piston is fully submerged.
Check that no bubbles come from between the piston and seals when applying compressed air through the fluid passage. (Refer to page 7B—204)

Caution
The compressed air must be under 392 kPa (4.0 kg/cm^2, 57 psi) and not applied for over 3 seconds.



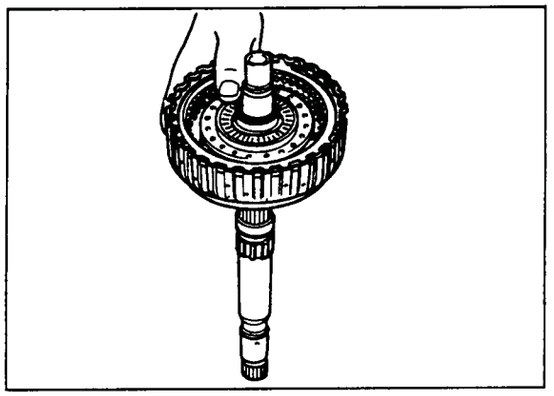
Install the output shell to the output gear, and install the bearing race onto the output shell.

Bearing race outer diameter.
72.0 mm (2.83 in)

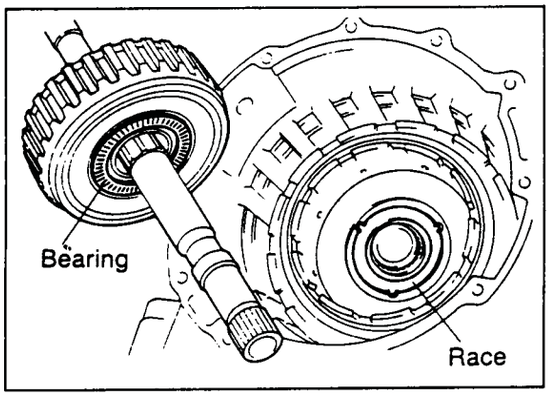


Apply a thin coat of silicon sealant to the contact surfaces of the converter housing and transaxle case.
Install the O-rings.
Install the transaxle case to the converter housing.

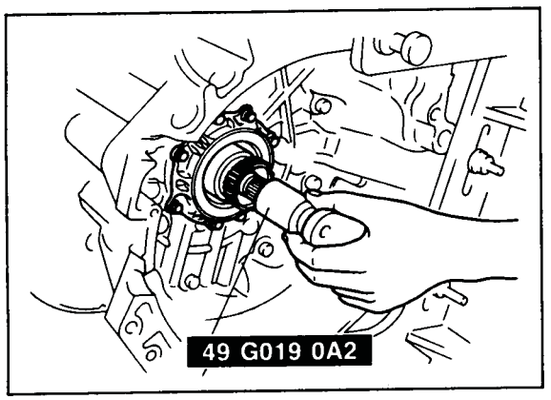
Tightening torque:
37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)



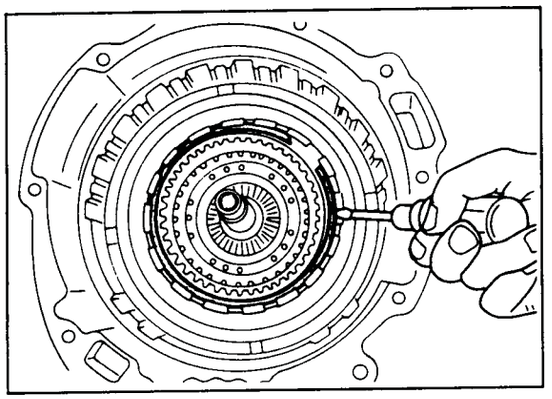
Install the turbine shaft and 3-4 clutch assembly.
Assemble the turbine shaft and 3-4 clutch assembly.



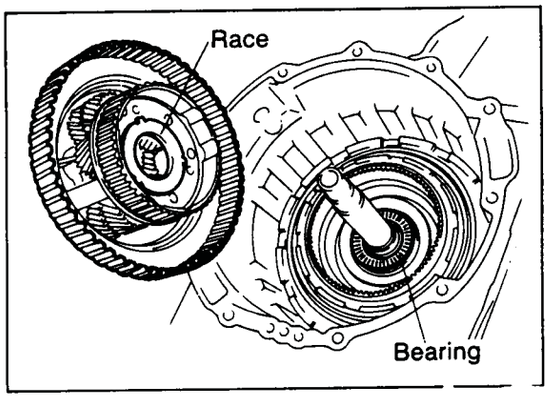
Check that the thrust bearing and bearing race are installed in the correct position.
Install the turbine shaft and 3-4 clutch assembly into the transaxle case.



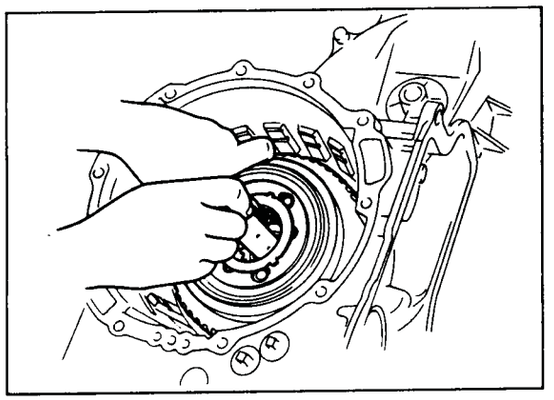
Adjust the **SST** position so that it contacts and holds the turbine shaft.



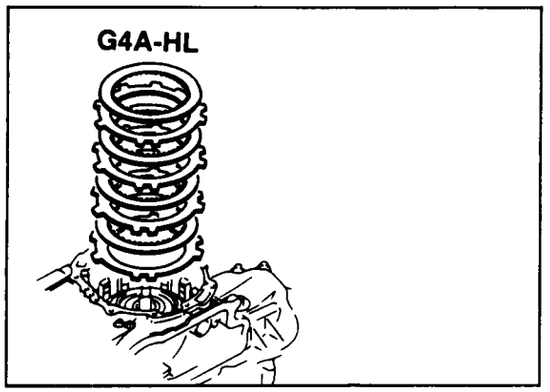
Install the internal gear.
(1) Install the internal gear to the 3-4 clutch drum.
(2) Install the snap ring.



Install the carrier hub assembly.
(1) Check that the thrust bearing and bearing race are installed in the correct position.



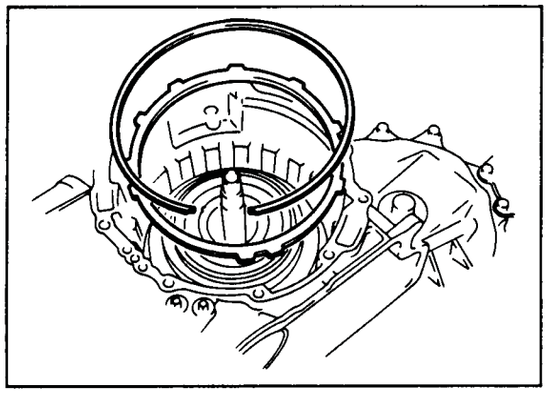
(2) Hold the turbine shaft with one hand to prevent it from rotating.
(3) Install the carrier hub assembly into the 3-4 clutch drum by rotating it.



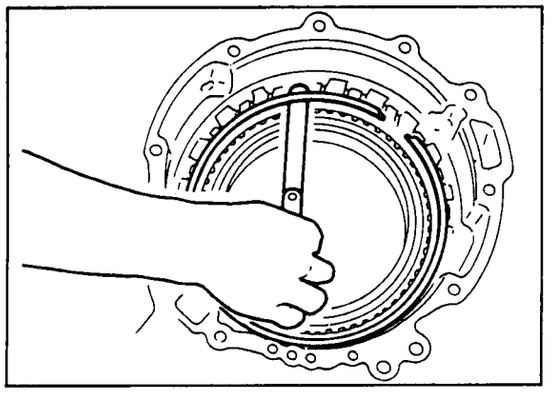
Install the drive and driven plates.

Note
Installation order:

G4A-HL
Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive



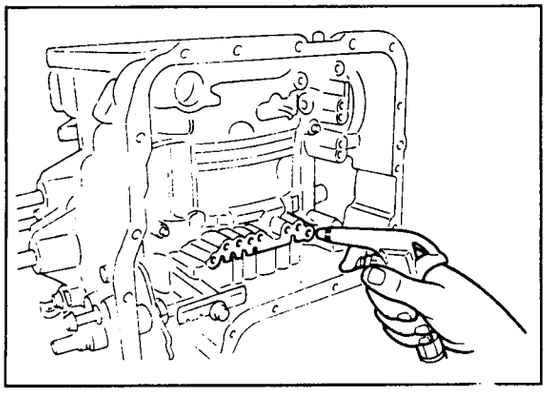
Install the retaining plate.
Install the snap ring.



Check the low and reverse brake clearance.
(1) Measure the clearance between the snap ring and the low and reverse brake retaining plate.
(2) If the clearance is not within specification, adjust it by selecting a proper retaining plate.

Low and reverse brake clearance:
2.1—2.4 mm (0.083—0.094 in)

mm (in)

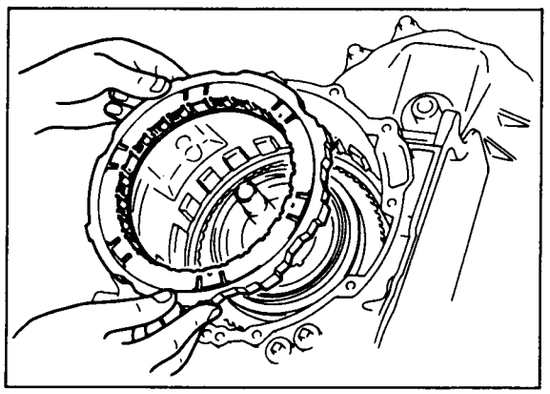


G4A-HL

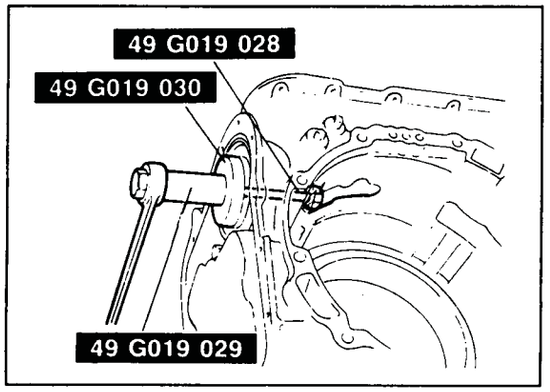
6.8 (0.268)	7.0 (0.276)	7.2 (0.283)
7.4 (0.291)	7.6 (0.299)	7.8 (0.307)

Check the low and reverse brake operation by applying compressed air through the fluid passage as shown in the figure.

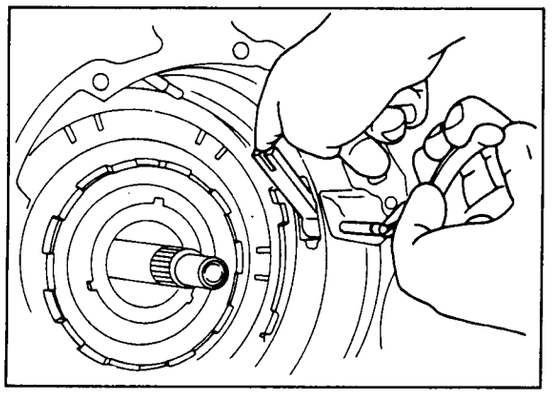
Air pressure:
392 kPa (4.0 kg/cm^2, 57 psi)



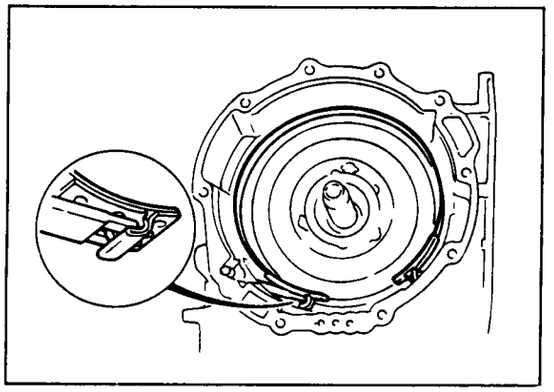
Install the one-way clutch.
(1) Hold the one-way clutch horizontally.
(2) Install it by turning the carrier hub assembly counterclockwise.
(3) Install the snap ring.



Install the servo to the transaxle case.
(1) Install the servo spring and servo.
(2) Compress the servo with the **SST**.
(3) Install the snap ring.
(4) Remove the **SST**.
(5) Install the piston stem.

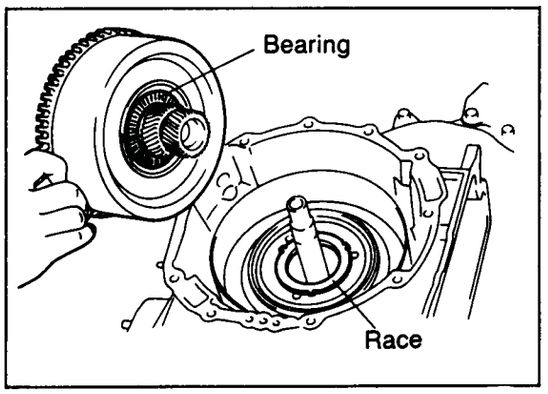


Install the anchor strut.

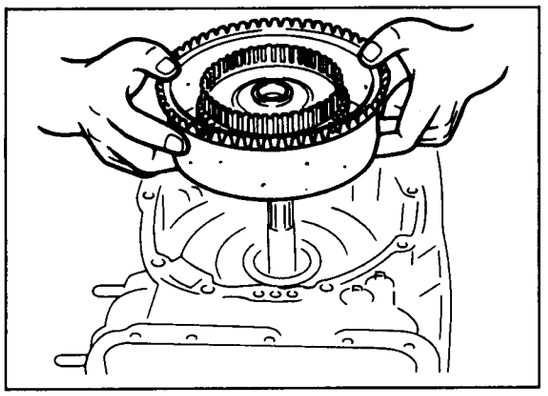


Install the 2-4 brake band in the transaxle case so that it is expanded fully.

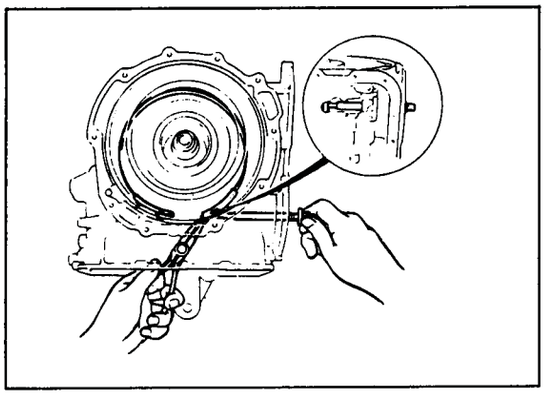
Note
Interlock the 2-4 brake band and anchor strut as shown.



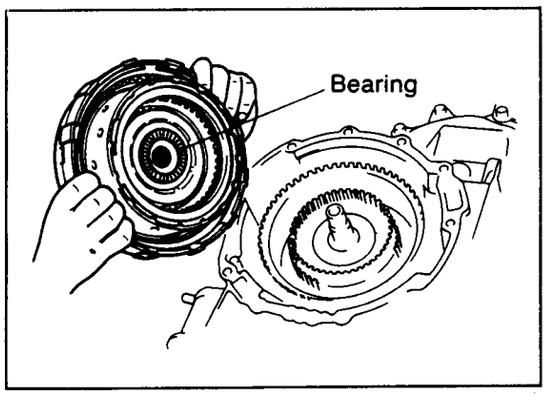
Install the small sun gear and one-way clutch.
Check that the thrust bearing and bearing race are installed in the correct position.



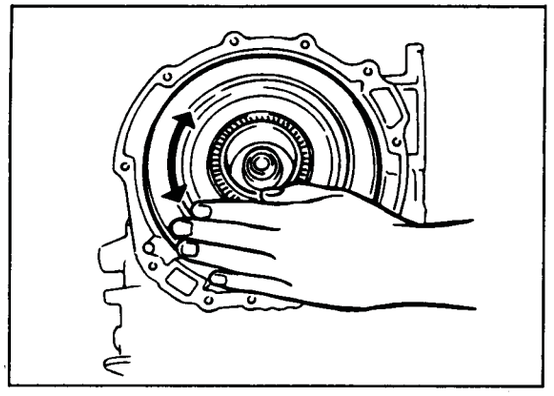
Install the small sun gear and one-way clutch by rotating it.



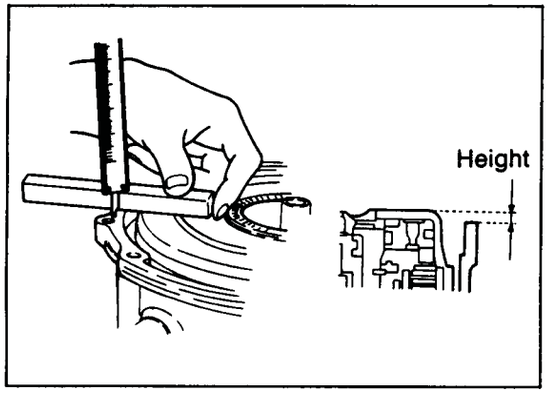
Install the piston stem in the position while pulling out the 2-4 brake band with a pliers; then loosely tighten the piston stem by hand.



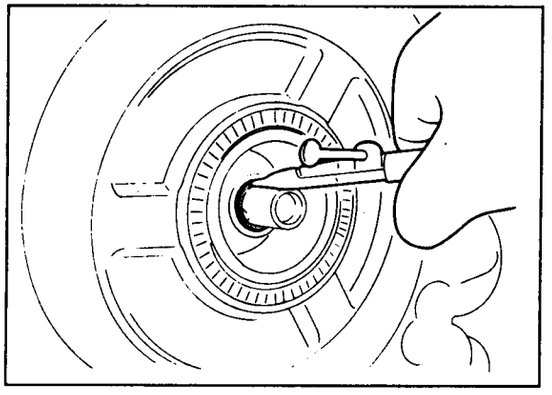
Install the clutch assembly.
Check that the thrust bearing is installed in the correct position.



Install the clutch assembly by rotating it.

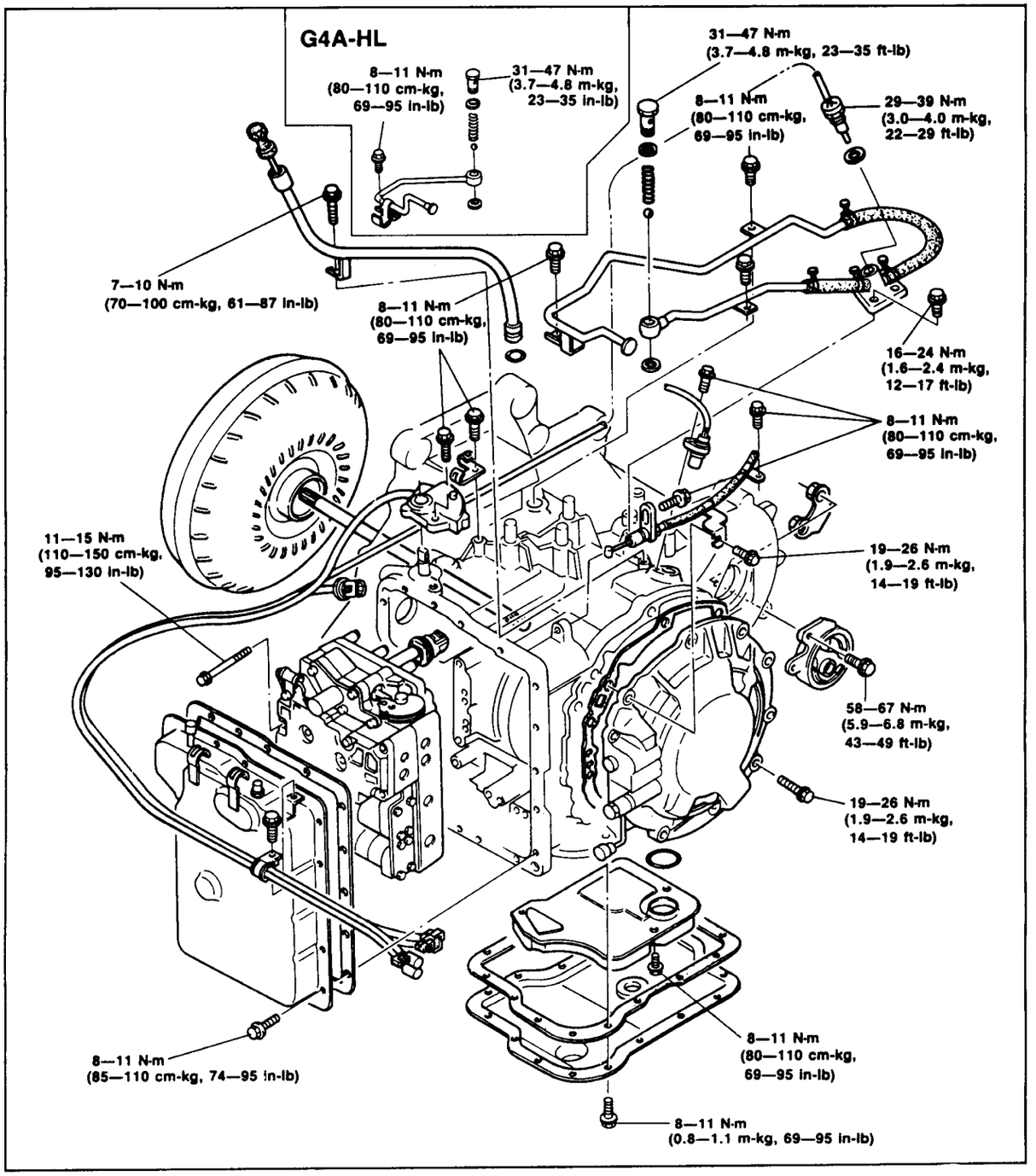


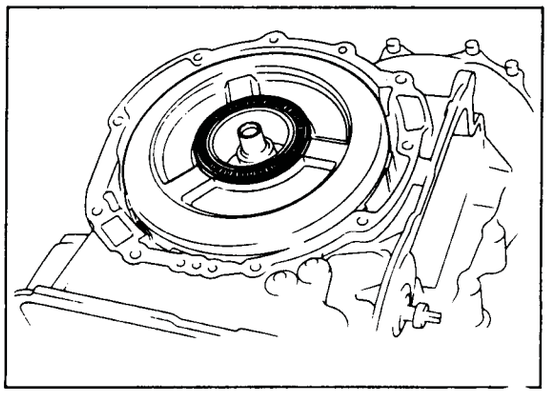
Note
Measure the height difference between the reverse and forward drum and transaxle case.
Standard height: 0.8 mm (0.032 in)



Install the snap ring into the bottom ring groove of the turbine shaft.

ASSEMBLY
Torque Specifications

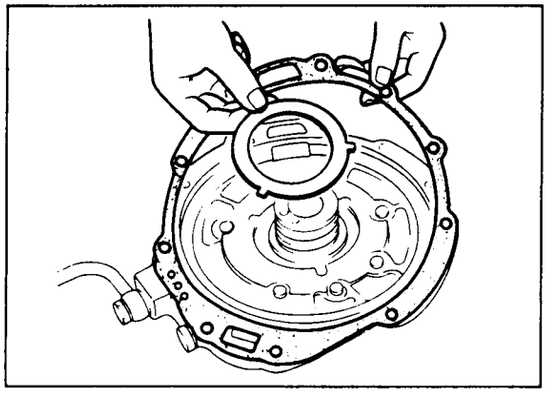




Procedure

Use the following procedure to adjust the total end play and select a suitable bearing race.

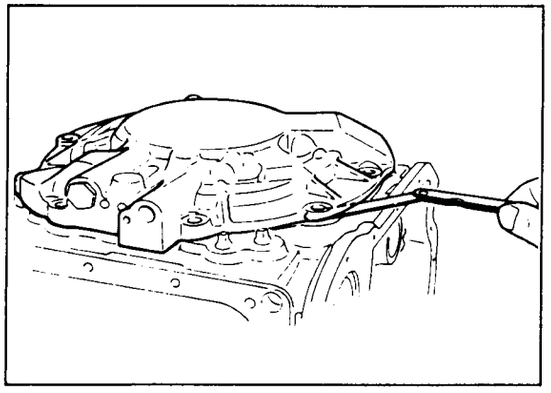
Set the thrust bearing onto the clutch assembly.



Remove the previous race and gasket..

Set the thickest bearing race **2.2 mm (0.087 in)** onto the oil pump.

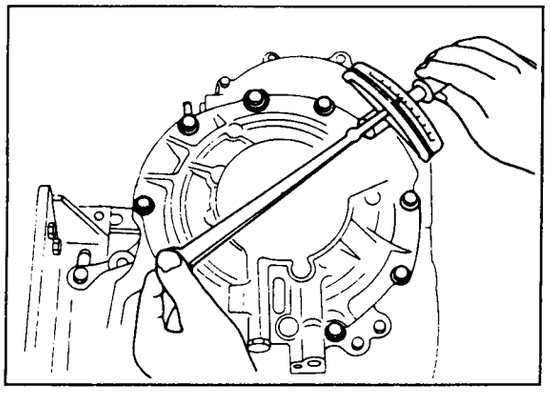
Set the oil pump onto the clutch assembly.



Measure clearance between the transaxle case and oil pump.

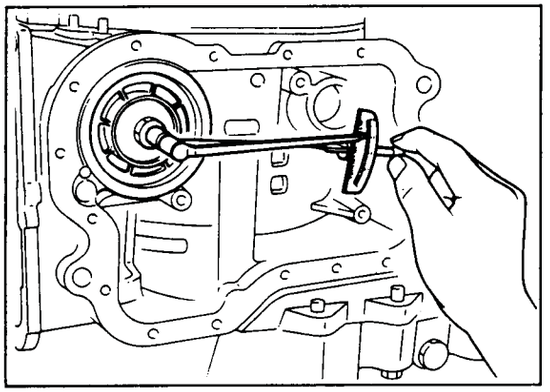
Select a suitable bearing race from the chart below.

Clearance mm (in)	Select this bearing race mm (in)
0.91—1.10 (0.036—0.043)	1.2 (0.047)
0.71—0.90 (0.028—0.035)	1.4 (0.055)
0.51—0.70 (0.020—0.027)	1.6 (0.063)
0.31—0.50 (0.012—0.019)	1.8 (0.071)
0.11—0.30 (0.004—0.011)	2.0 (0.078)
0—0.10 (0—0.003)	2.2 (0.087)



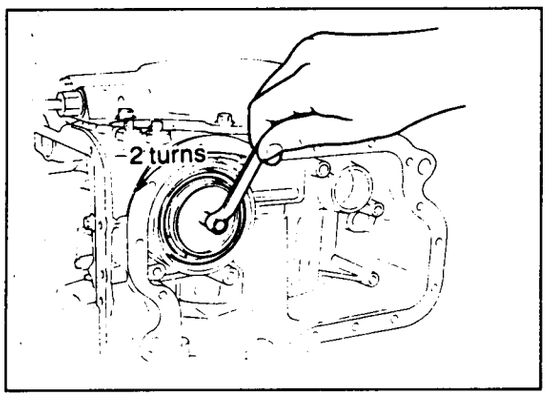
(7) Remove the oil pump.
(8) Place the selected bearing race and a new gasket onto the oil pump.
(9) Install the oil pump onto the clutch assembly.

Tightening torque:
19—26 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



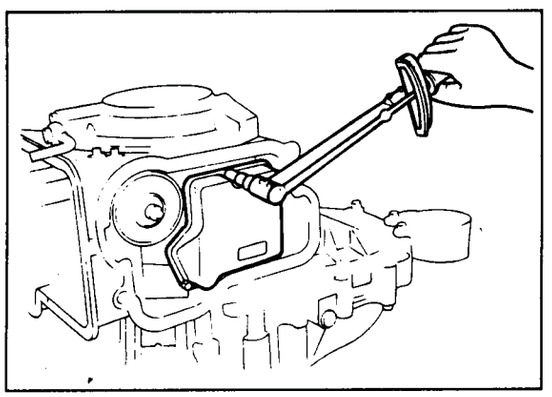
Adjust the 2-4 brake band.
Loosen the locknut and tighten the piston stem to the specified torque.

Tightening torque:
9—11 N·m (90—110 cm-kg, 78—95 in-lb)



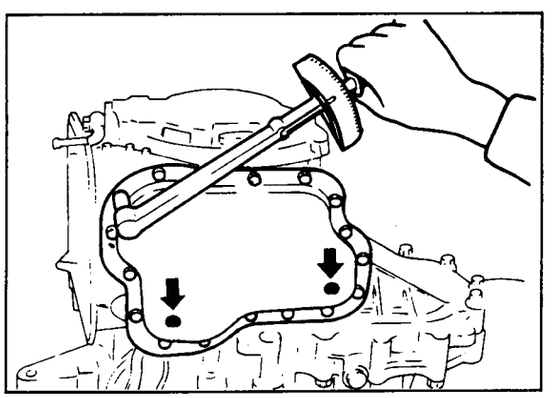
Loosen the piston stem 2 turns.
Tighten the locknut to the specified torque.

Tightening torque:
25—39 N·m (2.5—4.0 m-kg, 18—29 ft-lb)



Install the oil strainer along with a new O-ring to the transaxle.

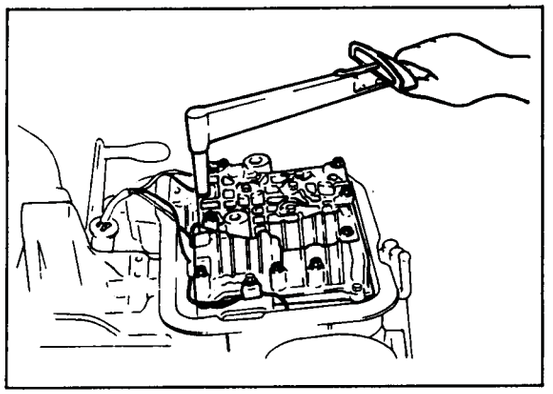
Tightening torque:
8—11 N·m (80—110 cm-kg, 69—95 in-lb)



Install the oil pan along with a new gasket.

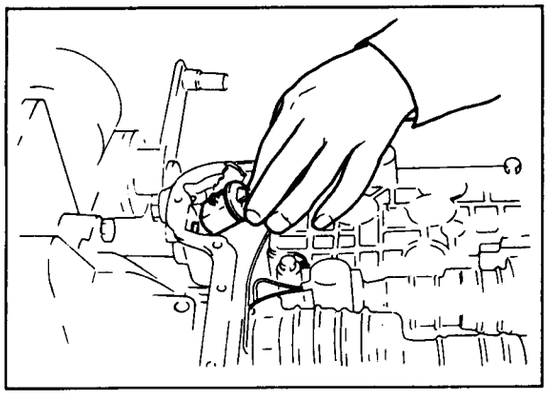
Tightening torque:
8—11 N·m (85—110 cm-kg, 74—95 in-lb)

Note
Install the magnets in the positions shown in the illustration.

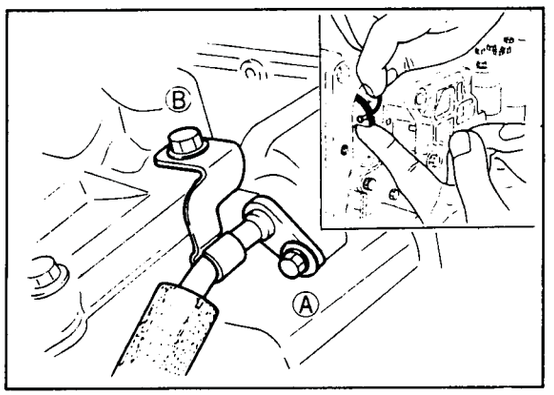


Align the manual valve with the pin on the manual plate, and install the control valve body into the transaxle case.

Tightening torque:
11—15 N·m
(110—150 cm-kg, 95—130 in-lb)

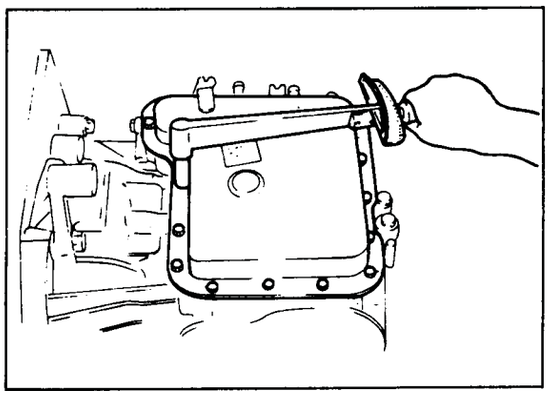


Install the solenoid connector and a new O-ring in the transaxle case.



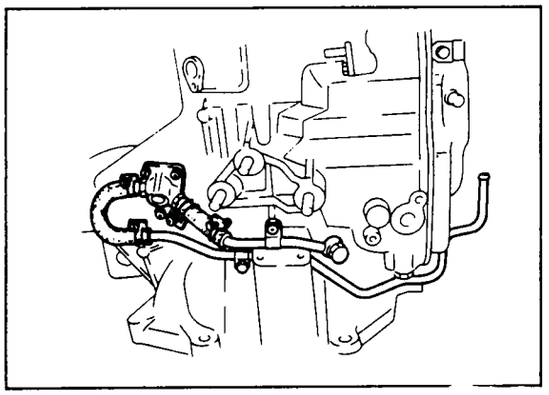
Install a new O-ring on the bracket; then feed the throttle cable through the transaxle case and connect it to the throttle cam.
Install the throttle cable attaching bolts and bracket.

Tightening torque:
Ⓐ 8—11 N·m
(80—110 cm-kg, 69—95 in-lb)
Ⓑ 19—26 N·m
(1.9—2.6 m-kg, 14—19 ft-lb)



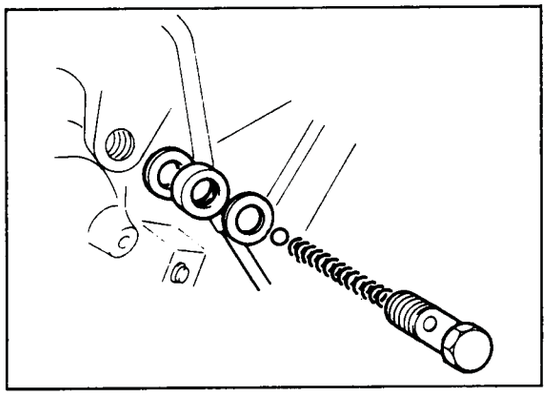
Install the control valve body cover along with a new gasket.

Tightening torque:
8—11 N·m (85—110 cm-kg, 74—95 in-lb)



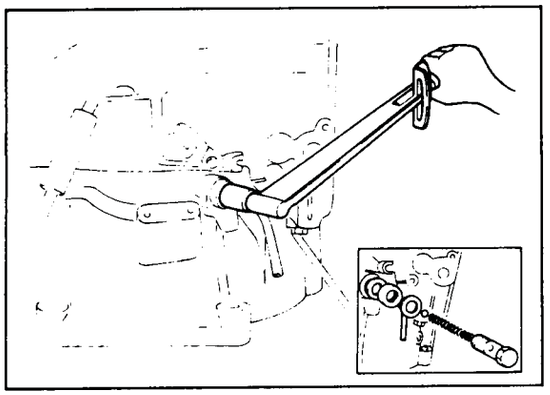
Install the oil pipes, oil hoses, and switch box as an assembly; then install the harness clip.

Tightening torque:
Switch box
16—24 N·m (1.6—2.4 m-kg, 12—17 ft-lb)
Harness clip
8—11 N·m (80—110 cm-kg, 69—95 in-lb)



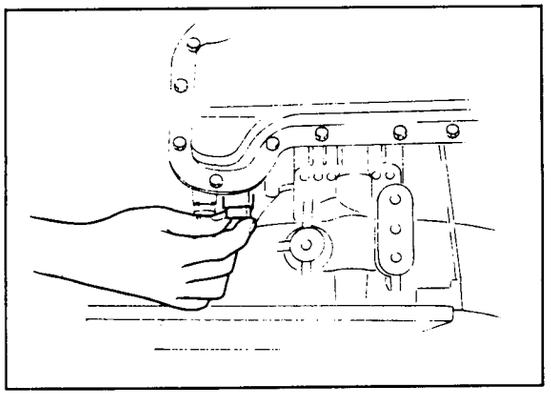
Install the ball, spring, gasket, and a plug.

Tightening torque:
31—47 N·m (3.2—4.8 m-kg, 23—35 ft-lb)

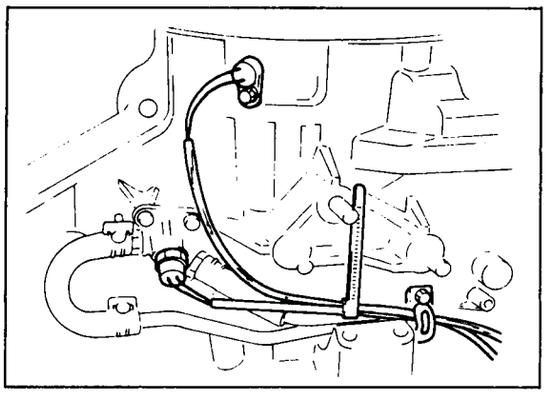


G4A-HL
Install the oil pipe, ball, spring, oil pipe, gasket, and plug.

Tightening torque: 31—47 N·m
(3.2—4.8 m-kg, 23—35 ft-lb)

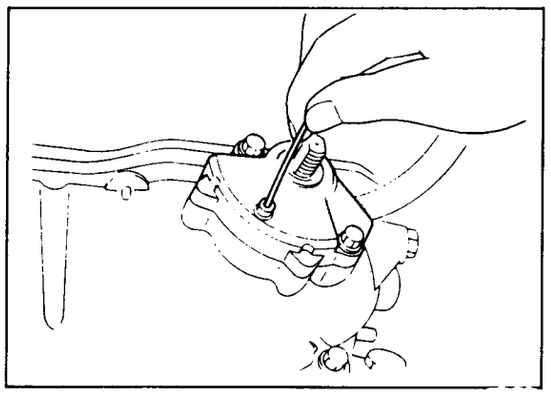


Install the solenoid connector.



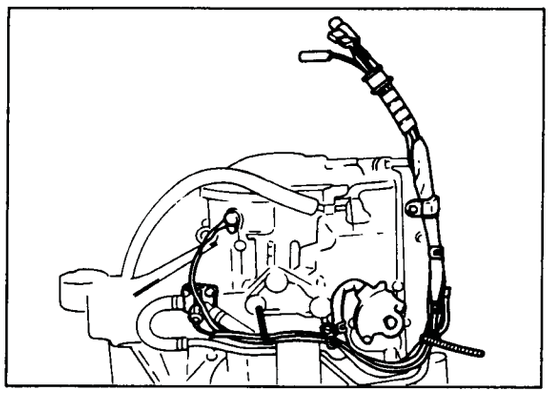
Install the pulse generator and fluid temperature switch.

Tightening torque:
Pulse generator
8—11 N·m (80—110 cm-kg, 69—95 in-lb)
Fluid temperature switch
29—39 N·m (3.0—4.0 m-kg, 22—29 in-lb)



Install the inhibitor switch.
Turn the manual shaft to the "N" position.
Install the inhibitor switch and loosely tighten the bolts.
Remove the screw and move the inhibitor switch so that the alignment hole is aligned with the screw hole.
Insert a **2.0 mm (0.079 in)** diameter pin through the holes.
Install the screw; then tighten the bolts to the specified torque.

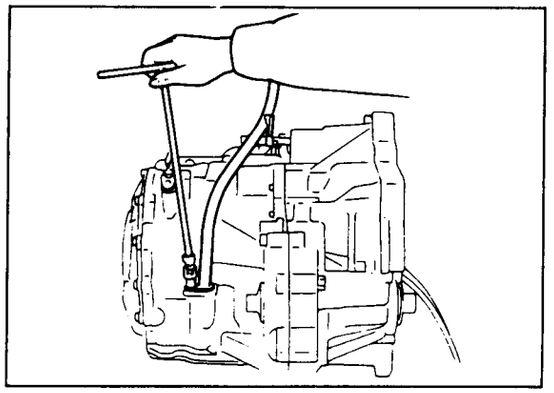
Tightening torque:
8—11 N·m (80—110 cm-kg, 69—95 in-lb)



Install the harness with the remaining clip.

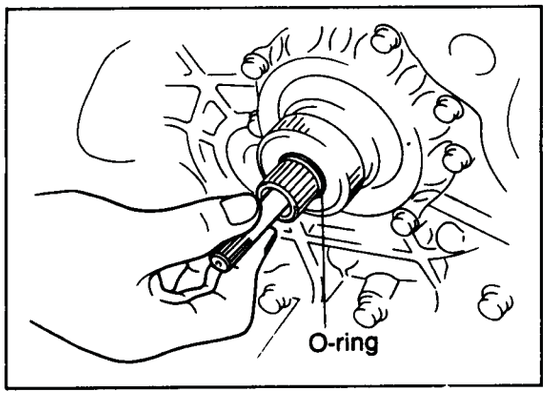
Tightening torque:
8—11 N·m (80—110 cm-kg, 69—95 in-lb)

Remove the transaxle from the **SST**.

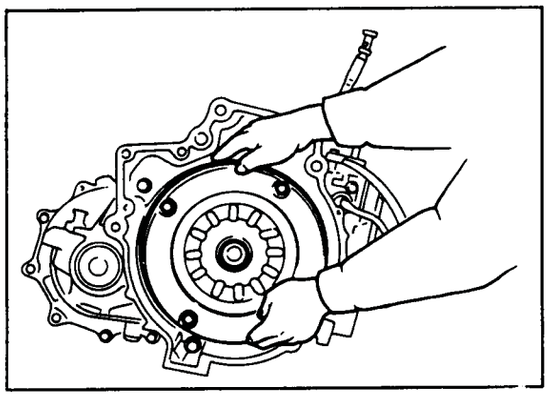


Install the oil level gauge and tube along with a new O-ring to the transaxle case.

Tightening torque:
7—10 N·m (70—100 cm-kg, 61—87 in-lb)



Install the oil pump shaft.
Install a new O-ring onto the turbine shaft.

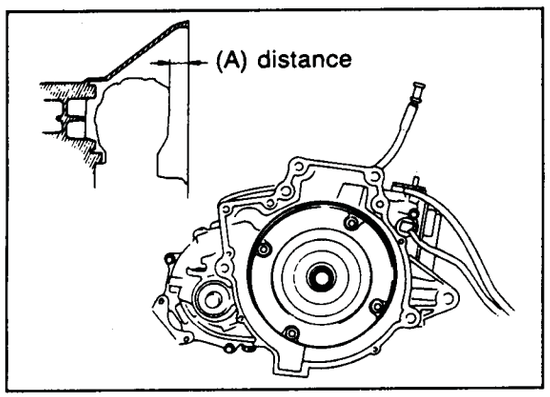


Fill the torque converter with ATF if it has been drained and washed.

ATF type: Dexron II or M III

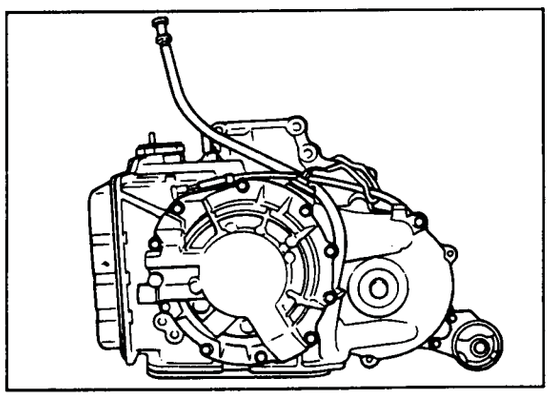
Install the torque converter in the converter housing while rotating it to align the splines.

Caution
a) Hold the torque converter in an erect position when filling it with ATF, do not allow the fluid to overflow.
b) If the converter does not fit in easily, do not try to force it; install carefully.



To ensure that the torque converter is installed accurately, measure distance A between the end of the torque converter and the end of the converter housing.

(A): approx. 25 mm (0.98 in)



Install the engine mount No.1

Tightening torque:
58—67 N·m (5.9—6.8 m-kg, 43—49 ft-lb)