

## ABBREVIATIONS USED IN THIS MANUAL

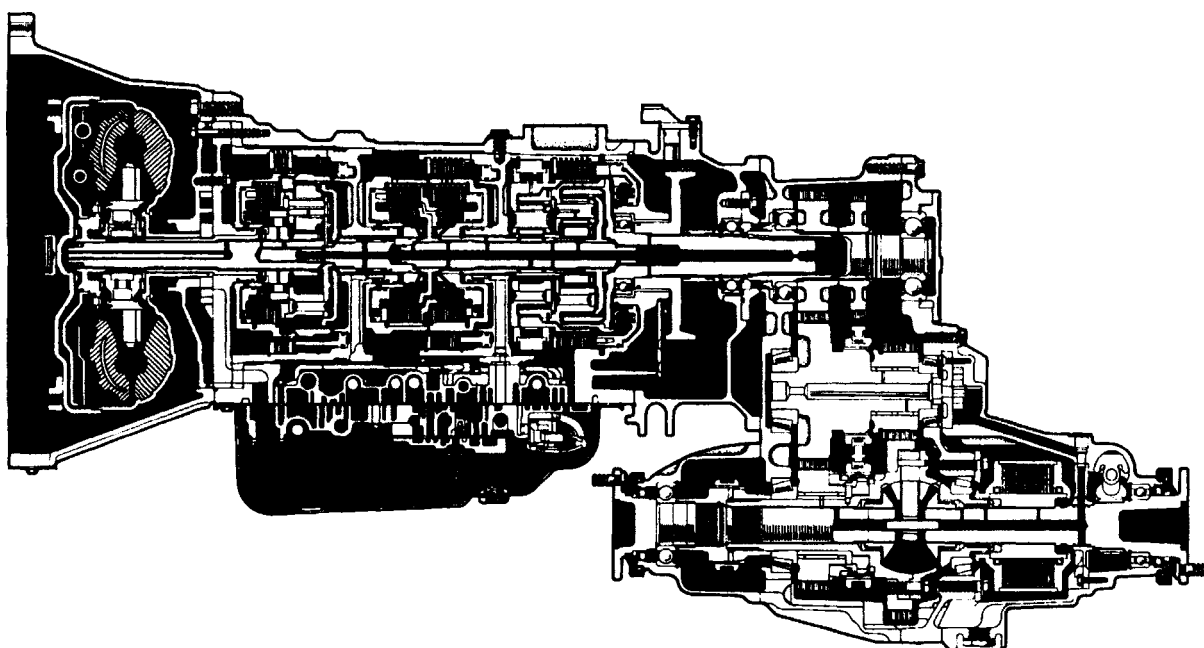
ATF	Automatic Transmission Fluid
B <sub>0</sub>	Overdrive Brake
B <sub>2</sub>	Second Brake
B <sub>3</sub>	No. 3 Brake
C <sub>0</sub>	Overdrive Direct Clutch
C <sub>1</sub>	Front Clutch
C <sub>2</sub>	Rear Clutch
D	Disc
Ex.	Except
F	Flange
F <sub>0</sub>	O/D One-way Clutch
F <sub>2</sub>	No. 2 One-way Clutch
MP	Multipurpose
O/D	Overdrive
P	Plate
SSM	Special Service Materials
SST	Special Service Tools
w/	with

# DESCRIPTION

## GENERAL

The A442F automatic transmission is a 4-speed Electronically Controlled Automatic Transmission and has the following features;

- © **Electronic control provides shift and lock-up points most appropriate for the power characteristics of each engine and improves shift response.**
- © **A high-performance super flow torque converter clutch is used to improve starting off, acceleration and fuel economy.**
- © **For easier operation, the shift lever positions have been reduced from 7 (P, R, N, D, 3, 2, L) to the 6 positions (P, R, N, D, 2, L) used in passenger vehicles, and an O/D main switch has been provided on the shift lever.**
- © **On vehicles using the 1FZ-FE engine, shift response has been greatly improved by communication between the ECM and TCM to momentarily reduce engine output when shifting.**



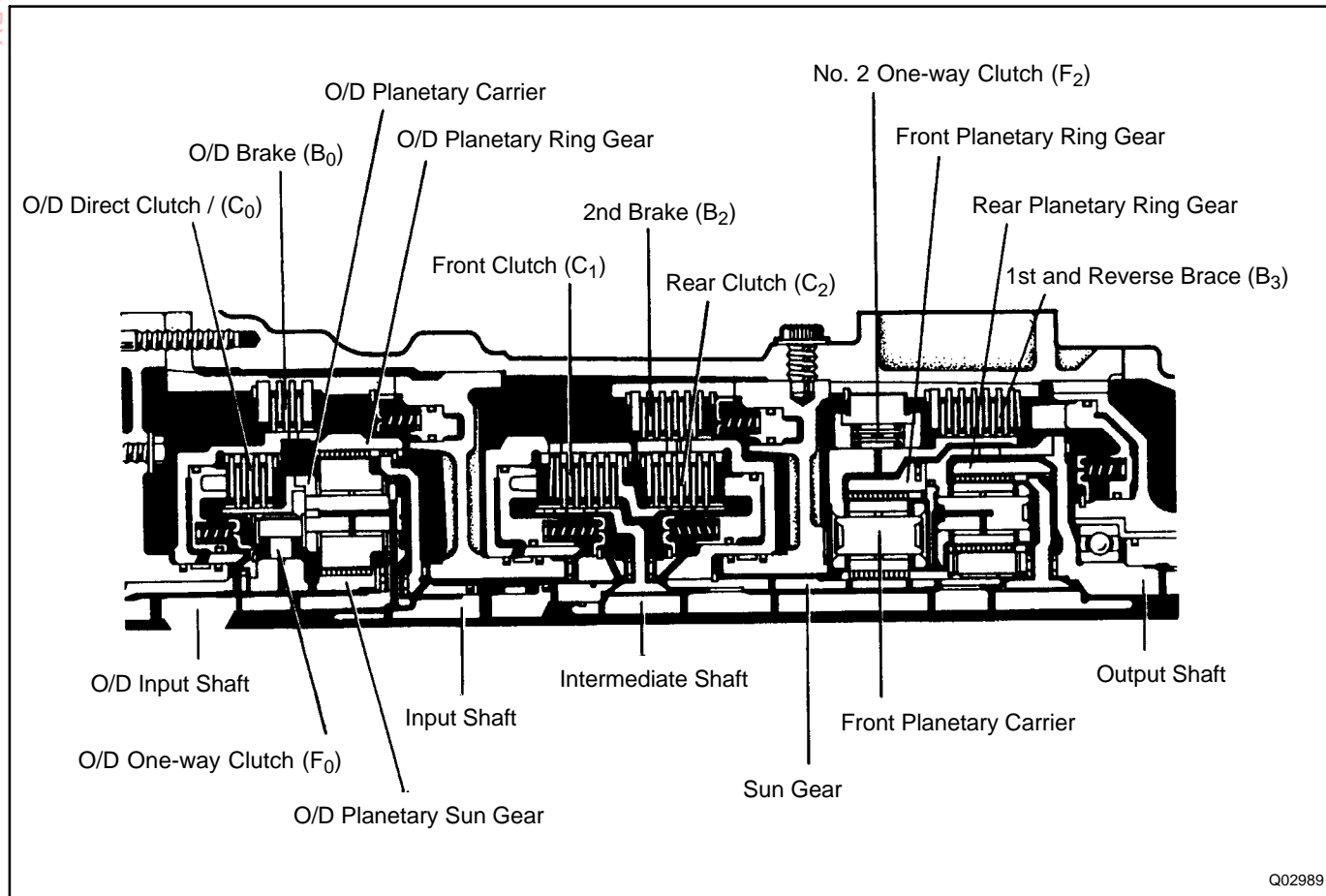
V01778

**GENERAL SPECIFICATIONS**

Type of Transmission	A442F
Type of Engine	1FZ-FE
Torque Converter Stall Torque Ratio	1.8 : 1
Lock-up Mechanism	Equipped
Gear Ratio	1st Gear 2.950 2nd Gear 1.530 3rd Gear 1.000 O/D Gear 0.765 Reverse Gear 2.678
Number of Discs and Plates	Front Clutch (C <sub>1</sub> ) 6/6 Rear Clutch (C <sub>2</sub> ) 5/5 O/D Direct Clutch (C <sub>0</sub> ) 3/3 2nd Brake (B <sub>2</sub> ) 5/5 1st and Reverse Brake (B <sub>3</sub> ) 6/6 O/D Brake (B <sub>0</sub> ) 3/3
ATF Type	ATF DEXRON★ II
Capacity (US pts, Imp. qts)	Total 13.0 (13.7, 11.4) Drain & Refill 6.0 (6.3, 5.3)

# OPERATION

## OPERATING CONDITIONS



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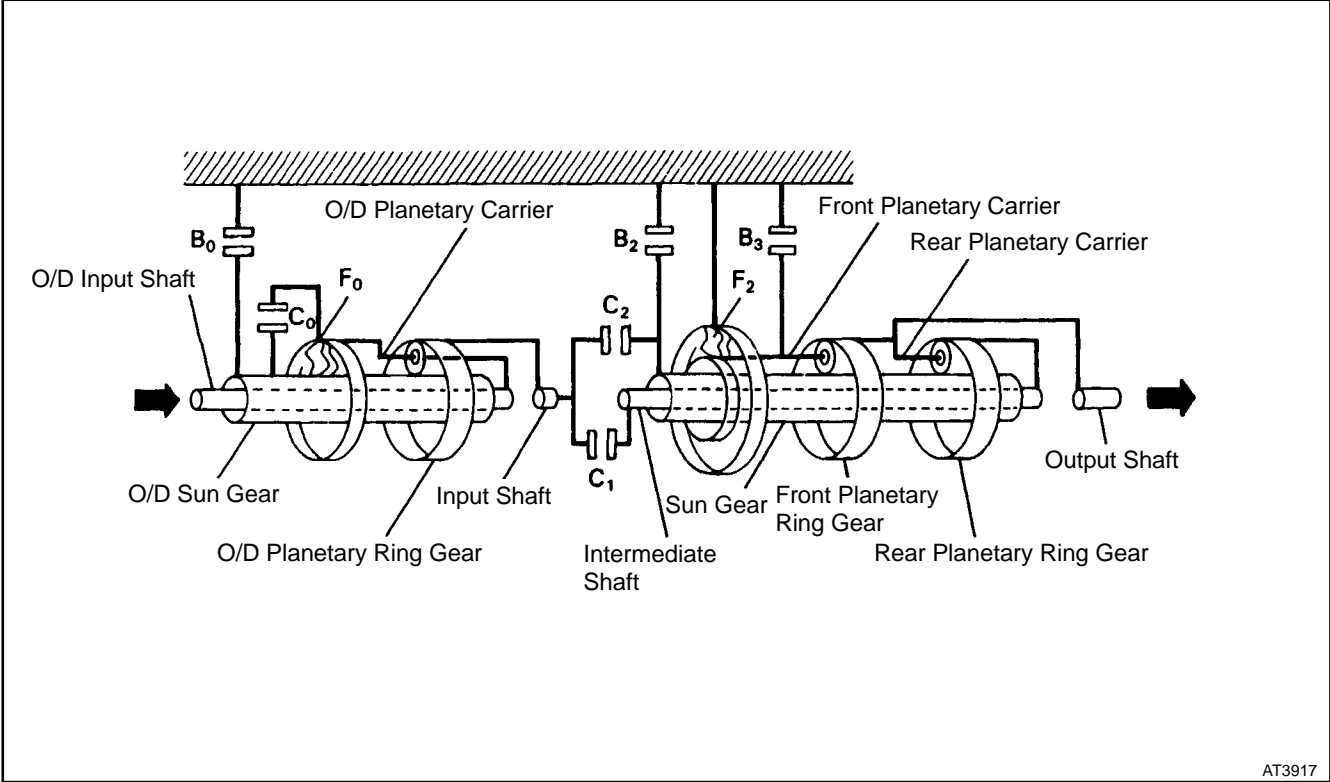
Shift lever position	Gear position	C <sub>0</sub>	C <sub>1</sub>	C <sub>2</sub>	B <sub>0</sub>	B <sub>2</sub>	B <sub>3</sub>	F <sub>0</sub>	F <sub>2</sub>
P	Parking	★						★	
R	Reverse	★		★			★	★	
N	Neutral	★						★	
D	1st	★	★					★	★
	2nd		★			★		★	
	3rd	★	★	★				★	
	O/D		★	★	★				
2	2nd	★	★			★		★	
L	1st	★	★				★	★	★

★.....Operating

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FUNCTION OF COMPONENTS

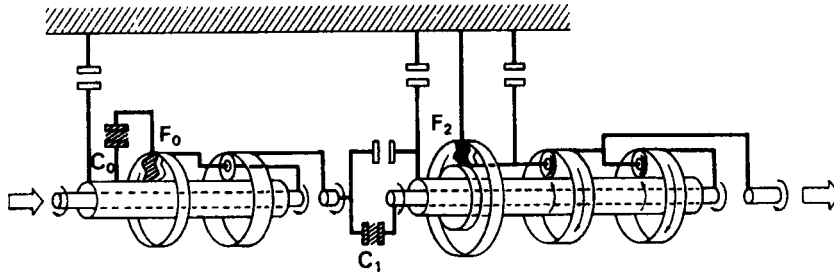
NOMENCLATURE	OPERATION
O/D Direct Clutch ( $C_0$ )	Connects overdrive sun gear and overdrive carrier
O/D Brake ( $B_0$ )	Prevents overdrive sun gear from turning either clockwise or counterclockwise
O/D One-Way Clutch ( $F_0$ )	When transmission is being driven by engine, connects overdrive sun gear and overdrive carrier
Front Clutch ( $C_1$ )	Connects input shaft and intermediate shaft
Rear Clutch ( $C_2$ )	Connects input shaft and front & rear planetary sun gear
2nd Brake ( $B_2$ )	Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise
1st & Reverse Brake ( $B_3$ )	Prevents front planetary carrier from turning either clockwise or counterclockwise
No. 2 One-Way Clutch ( $F_2$ )	Prevents front planetary carrier from turning counterclockwise



AT3917

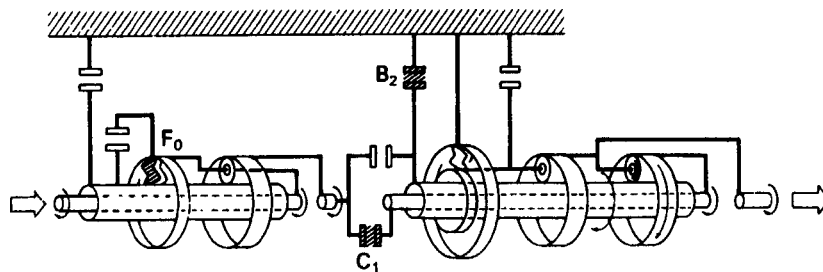
The condition of operation for each gear position are shown on the following illustration:

D or 2 Position 1st Gear



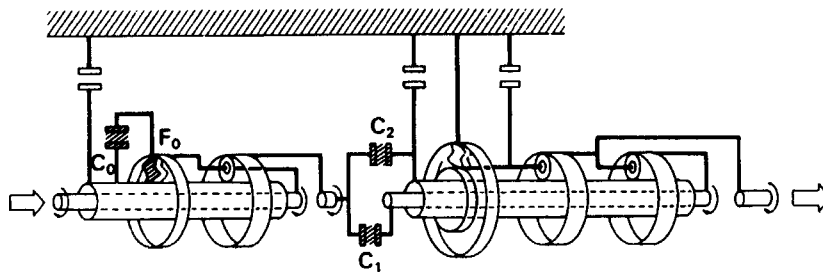
AT5949

D or 2 Position 2nd Gear



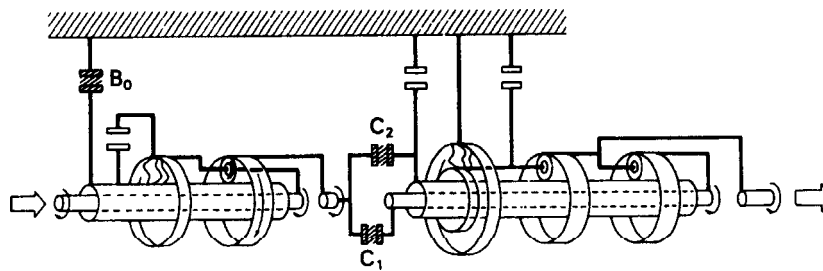
AT5950

D Position 3rd Gear



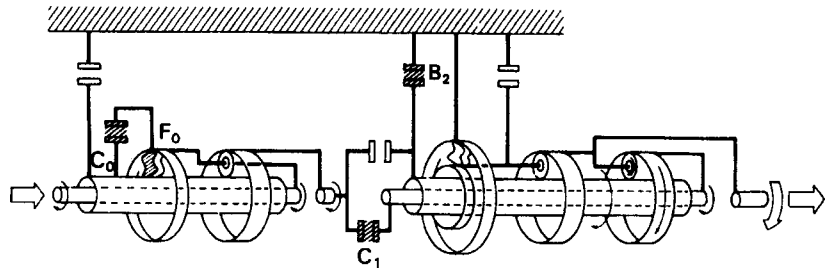
AT5951

D Position O/D



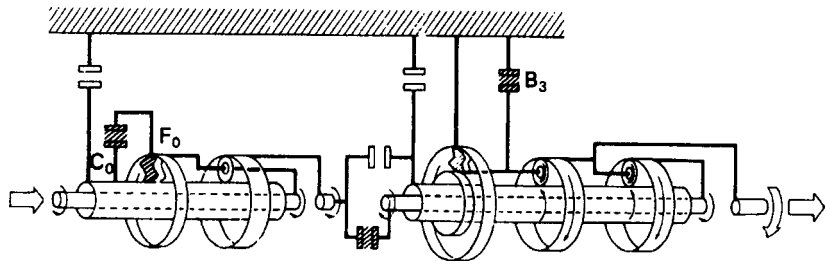
AT5952

2 Position 2nd Gear



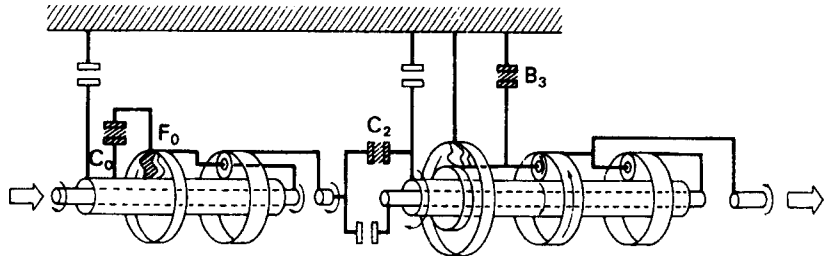
AT5953

L Position 1st Gear



AT5954

R Position Reverse Gear



AT5955

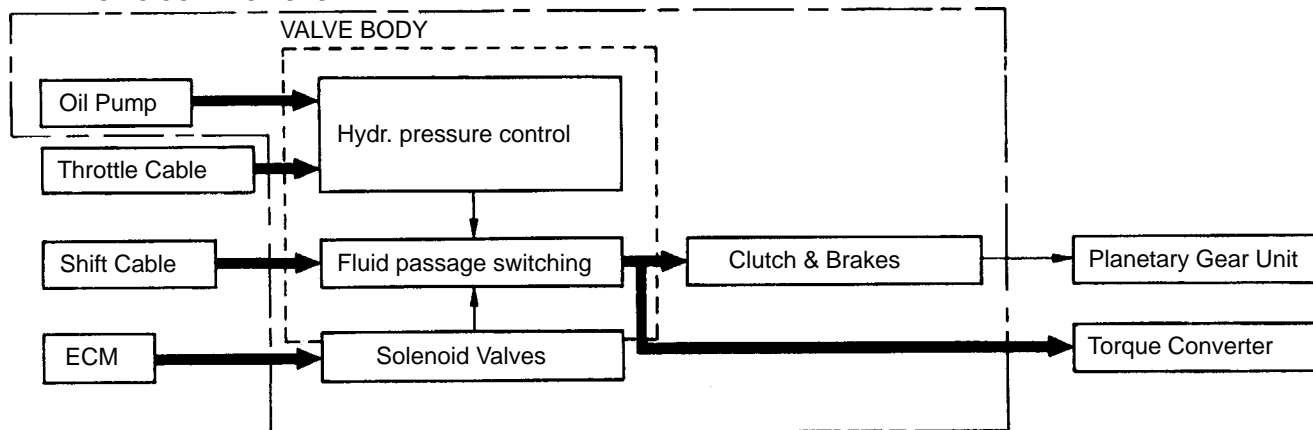
## HYDRAULIC CONTROL SYSTEM

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valve, the accumulators, the clutches and brakes, as well as the fluid passages which connect all of these components.

Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter clutch, clutches and brakes in accordance with the vehicle driving conditions.

There are 4 solenoid valves on the valve body.

### HYDRAULIC CONTROL SYSTEM



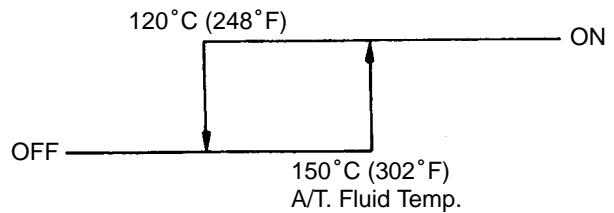
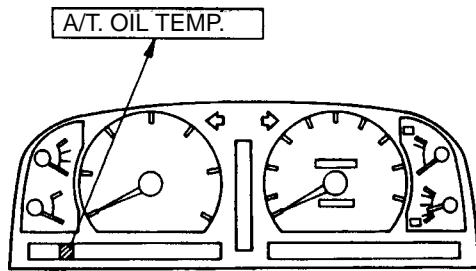
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## WARNING AND INDICATOR LIGHTS

### A.T FLUID TEMPERATURE WARNING SYSTEM

The TCM detects the transmission fluid temperature by means of a fluid temperature sensor fitted to the union. The transmission fluid may become extremely hot when the vehicle is under and extreme load, as when driving on sand or climbing uphill. Should the fluid temperature increases above 150°C (302°F), the TCM lights the warning light located the combination meter. The light goes off when the temperature falls below 120°C (248°F).

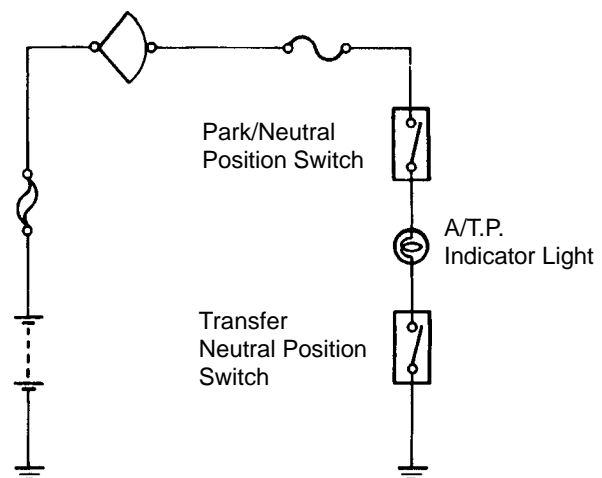
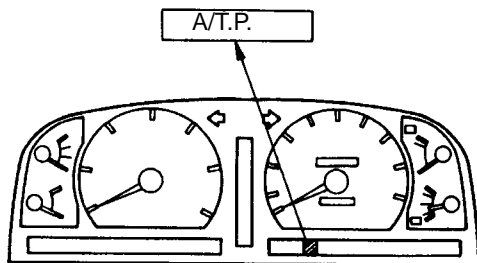


AT6023

V01585

### A.T.P. (Automatic Transmission Parking) INDICATOR

The rear propeller shaft and rear wheels are free even when the transmission shift lever is set to "P" as long as the transfer shift lever is in "neutral" position. The A.T.P. indicator lights up to warn the driver that the propeller shaft and wheels are not locked. If the A.T.P. indicator light does come on, the transfer shift lever should be shifted out of "N" position.



AT6024 AT3920

V01586

# COMPONENT PARTS INSTALLATION

Disassembly, inspection and assembly of each component group have been indicated in the preceding chapter. Before assembly, make sure again that all component groups are assembled correctly.

If something wrong is found in a certain component group during assembly, inspect and repair this group immediately.

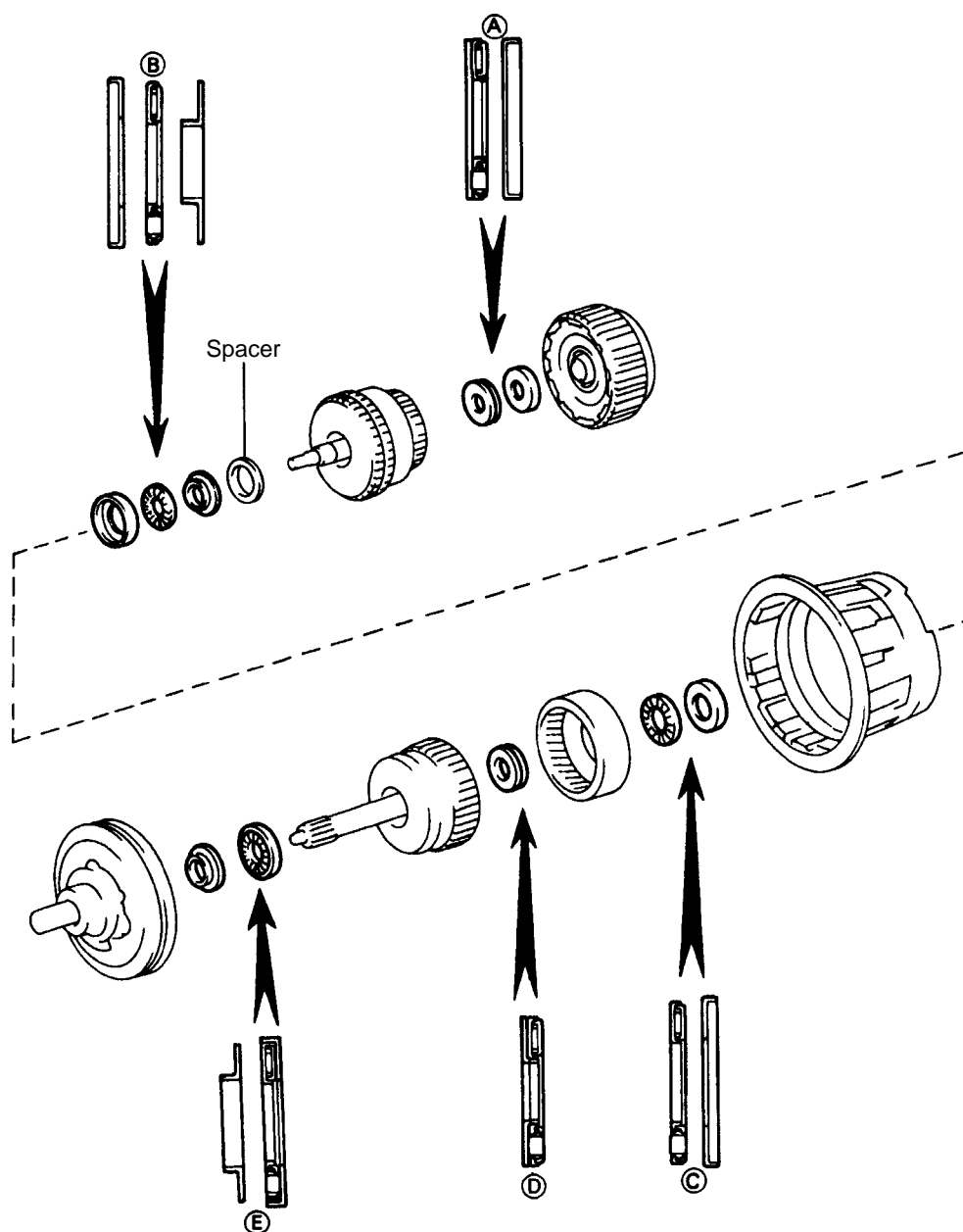
Recommended ATF:

**DEXRON® II**

## GENERAL INSTALLATION NOTES

1. The automatic transmission is composed of highly precision-finished parts, necessitating careful inspection before assembly because even a small nick could cause fluid leakage and affect performance.
2. Before assembling new clutch discs, soak them in automatic transmission fluid for at least 15 minutes.
3. Apply automatic transmission fluid on sliding or rotating surfaces of parts before assembly.
4. Use petroleum jelly to keep small parts in their places.
5. Do not use adhesive cements on gaskets and similar parts.
6. When assembling the transmission, be sure to use new gaskets and O-rings.
7. Dry all parts with compressed air, never use shop rags.

## BEARINGS AND RACES LOCATION

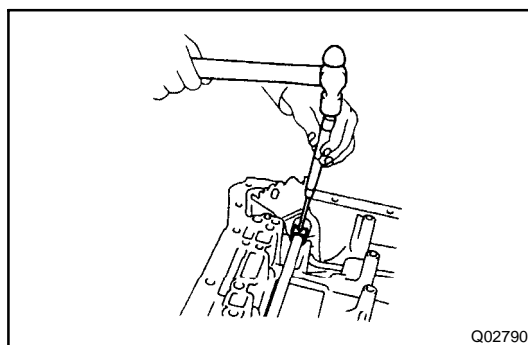
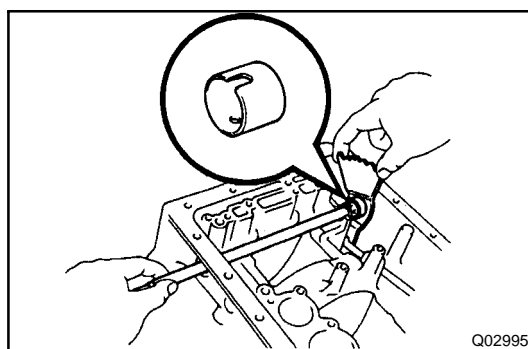
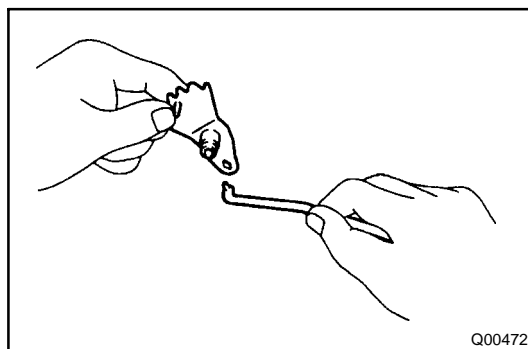
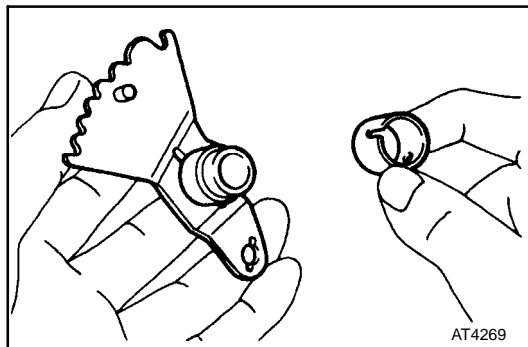
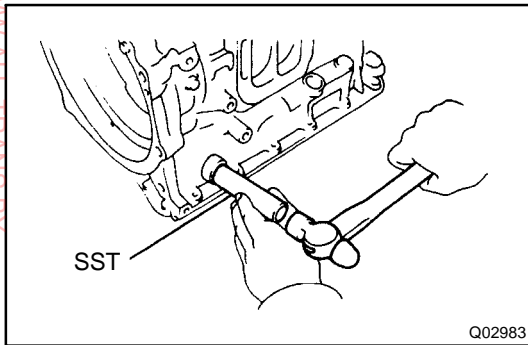


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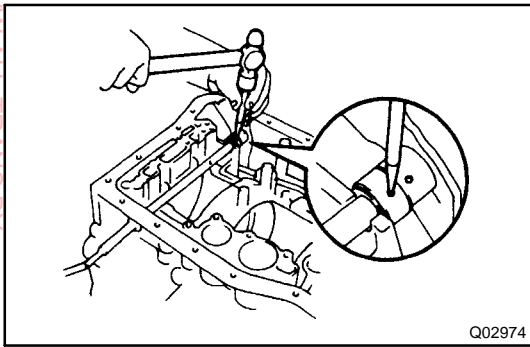
Mark	Thrust Bearing Diameter Inside/Outside mm (in.)	Front Race Diameter Inside/Outside mm (in.)	Rear Race Diameter Inside/Outside mm (in.)
Ⓐ	32.8 / 52.0 (1.291 / 2.047)	—	37.0 / 52.0 (1.457 / 2.047)
Ⓑ	34.7 / 52.0 (1.366 / 2.047)	37.0 / 52.0 (1.457 / 2.047)	32.8 / 50.4 (1.291 / 1.984)
Ⓒ	34.7 / 52.0 (1.366 / 2.047)	—	37.0 / 52.0 (1.457 / 2.047)
Ⓓ	23.2 / 42.0 (0.913 / 1.654)	—	—
Ⓔ	28.5 / 48.0 (1.122 / 1.819)	27.1 / 43.0 (1.067 / 1.693) 27.9 / 43.0 (1.098 / 1.693) 28.3 / 43.0 (1.114 / 1.693)	—

**BASIC SUBASSEMBLY REASSEMBLY****1. INSTALL MANUAL VALVE LEVER, SHAFT AND OIL SEALS**

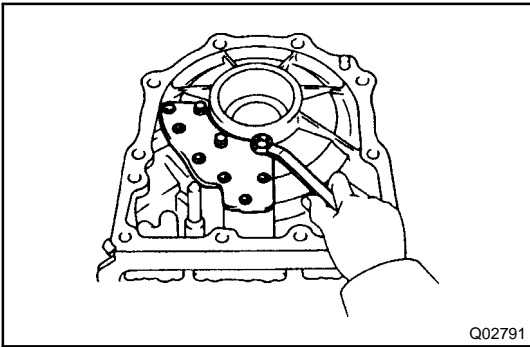
- (a) Using SST, tap in new 2 oil seals.  
SST 09350-36010 (09350-06150)
- (b) Apply MP grease to the oil seal lip.



- (b) Assemble a new spacer to the manual valve lever.
- (d) Connect the parking lock rod to the manual valve lever.
- (e) Install the manual valve lever shaft to the transmission case through the manual valve lever.
- (f) Using a hammer, tap in the pin with the slot at a right angle to the shaft.



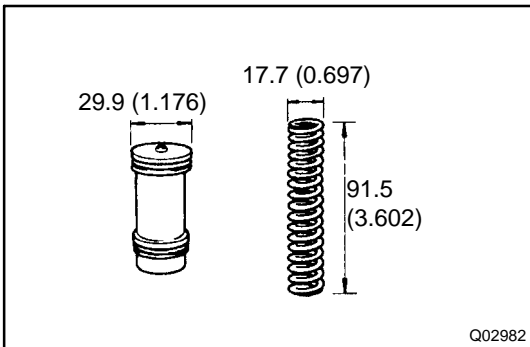
- (g) Match the spacer hole to the lever calking hollow and calk the spacer to the lever.
- (h) Make sure the manual valve lever shaft turns smoothly.



## 2. INSTALL TRANSMISSION REAR COVER

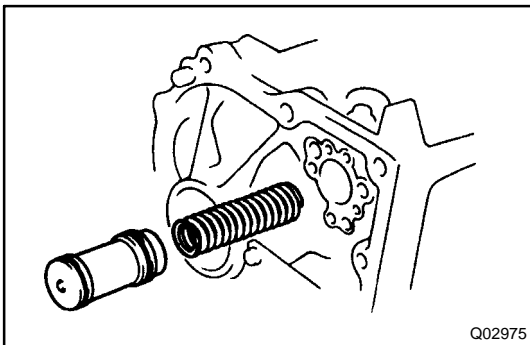
Install a new gasket and rear cover with the 3 bolts and 6 screws.

**Torque: 7.8 N-m (80 kgf-cm, 69 in.-lbf)**

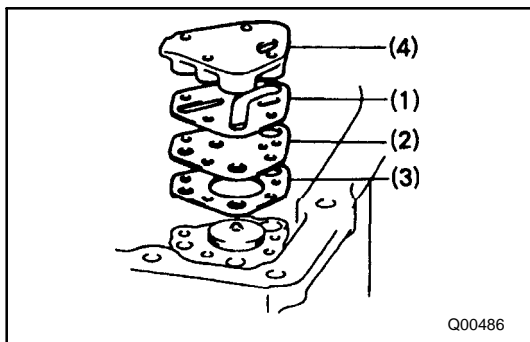


## 3. INSTALL C<sub>1</sub> ACCUMULATOR PISTON AND SPRING

- (a) Coat new 2 O-rings with ATF, and install them to the piston.



- (b) Install the spring and accumulator piston into the bore of the transmission case.

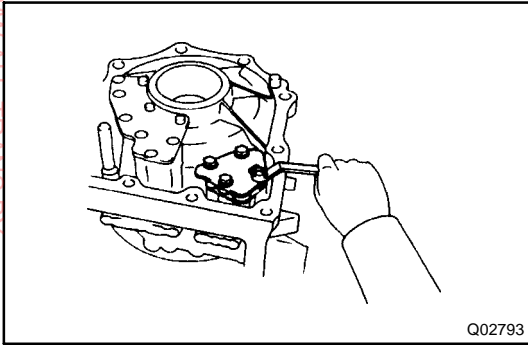


- (c) Place the following parts on the transmission case.

- (1) **New gasket**
- (2) **Plate**
- (3) **New gasket**
- (4) **Front clutch accumulator cover**

- (d) Install the 4 bolts.

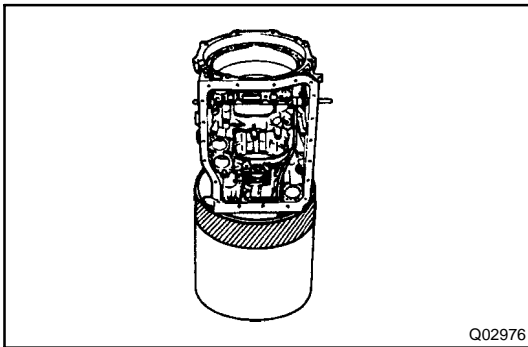
**Torque: 7.8 N-m (80 kgf-cm. 69 in.-lbf)**



#### 4. INSTALL FIRST AND REVERSE BRAKE PISTON

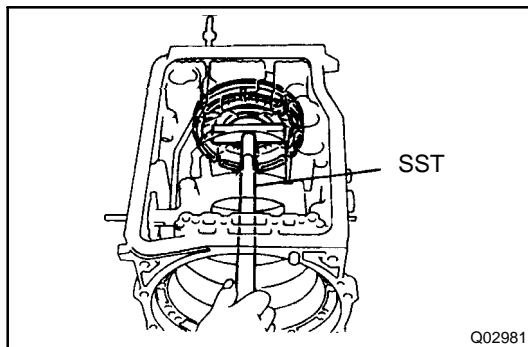
- (a) Place the transmission case on a cylinder.

**NOTICE: Be careful not to damage the transmission case. Tape the top of the cylinder.**

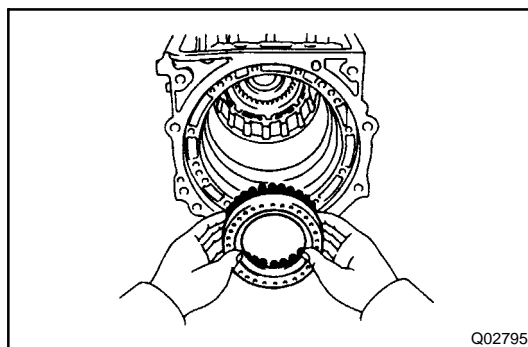


- (b) Coat new 2 O-rings with ATF, and install them to the brake piston.

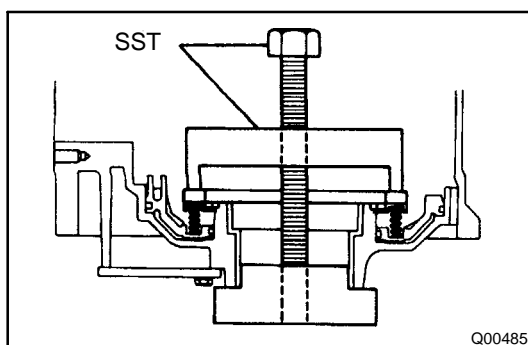
- (c) Using SST, pushing the brake piston.  
SST 09350-36010 (09350-06035, 09350-06050)

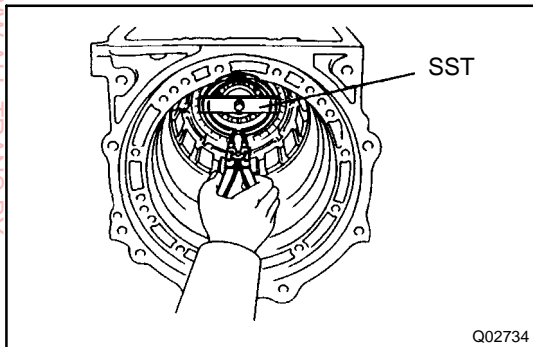


- (d) Place the return spring on the brake piston.

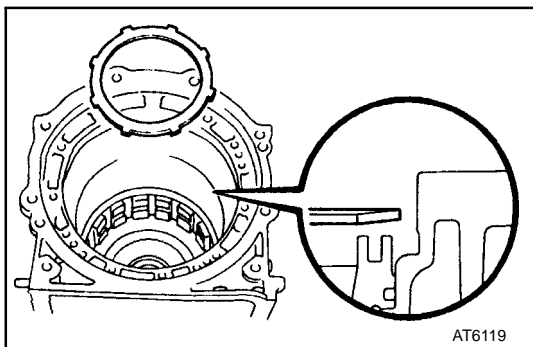


- (e) Using SST, compress the return spring.  
SST 09350-36010 (09350-06030)

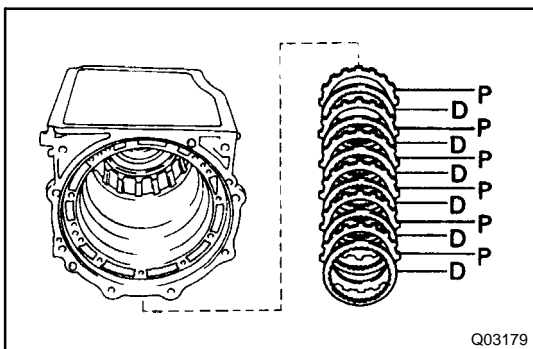




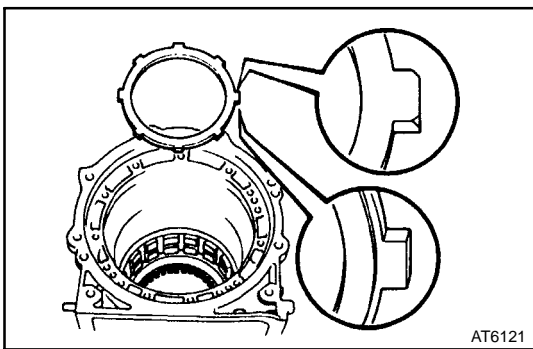
- (f) Using snap ring plies, install the snap ring.



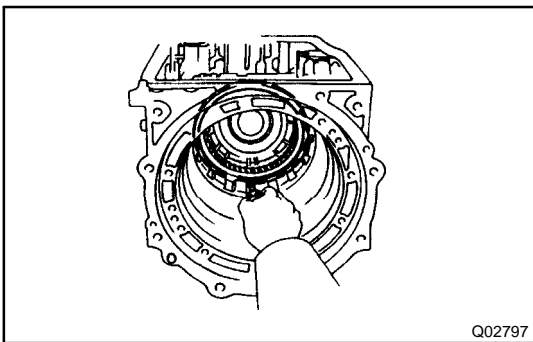
- (g) Install the cushion plate, facing the rounded edge inward.



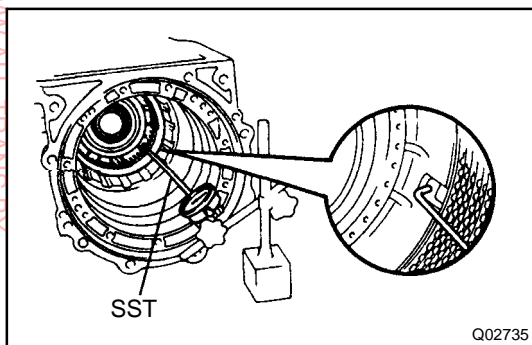
- (h) Install the 6 plates and 6 discs in order:  
P = Plate D = Disc  
P-D-P-D-P-D-P-D-P-D



- (i) Install the flange, facing the rounded edge outward.  
HINT: If the flange is step-edged, install the flange with the step-edge facing inward.



- (j) Install the snap ring.  
HINT: Be sure the end of the snap ring is not aligned with the cutout portion of the transmission case.



## 5. CHECK PISTON STROKE OF FIRST AND REVERSE BRAKE

Using SST and a dial indicator, measure the piston stroke while applying and releasing compressed air 392 - 785 kPa (4 - 8 kgf-cm<sup>2</sup>, 57 - 114 psi).

SST 09350-36010 (09350-06120, 09350-06130)

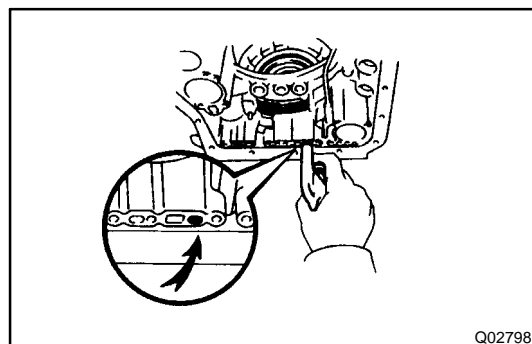
**Piston stroke:**

**3.3 - 3.8 mm (0.130 - 0.150 in.)**

If the piston stroke is not as specified, select another flange.

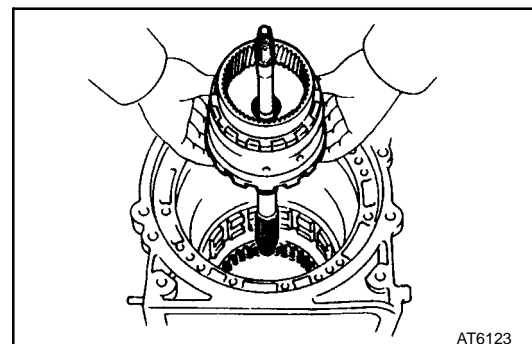
### Flange thicknesses

No.	Thickness	mm (in.)
E	6.65 (0.2618)	
F	7.05 (0.2776)	
G	7.45 (0.2933)	



## 6. INSTALL PLANETARY GEARS, ONE-WAY CLUTCH AND OUTPUT SHAFT ASSEMBLY

- Place the transmission case on a cylinder.
- Install the rear planetary carrier and output shaft assembly to the transmission case.



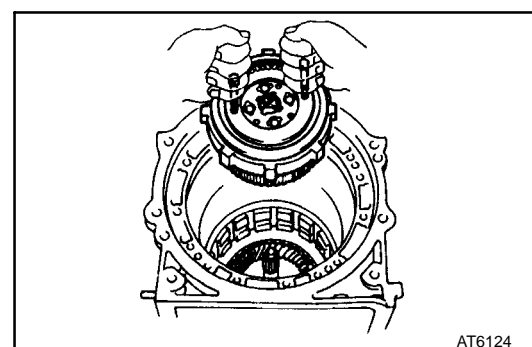
- Temporarily install 2 bolts to the front planetary carrier.  
HINT: Use two 6 mm (1 mm pitch) bolts. Do not tighten for more than 5 revolutions.
- Align the spline of the one-way clutch with the spline groove of the transmission case.
- Install the front planetary carrier and one-way clutch assembly into the transmission case.

HINT:

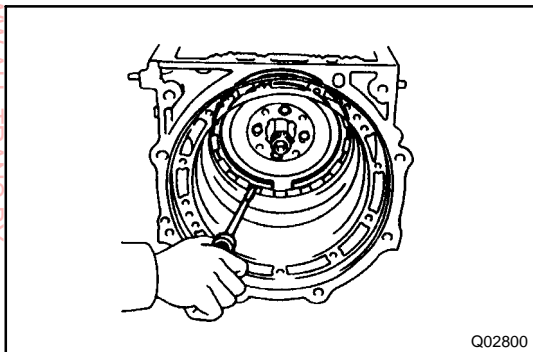
Mesh the spline of the front planetary carrier with the flukes of the discs by rotating and pushing the front planetary carrier clockwise.

If the front planetary carrier will not rotate clockwise, check the installation of the one-way clutch.

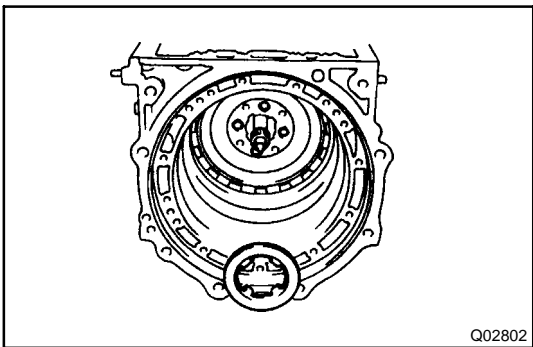
- Remove the 2 bolts from the front planetary carrier.



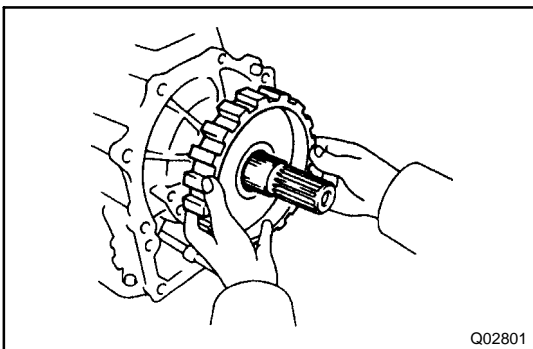




- (g) Using a screwdriver, install the snap ring.  
HINT: Be sure the end of the snap ring is not aligned with the cutout portion of the transmission case.

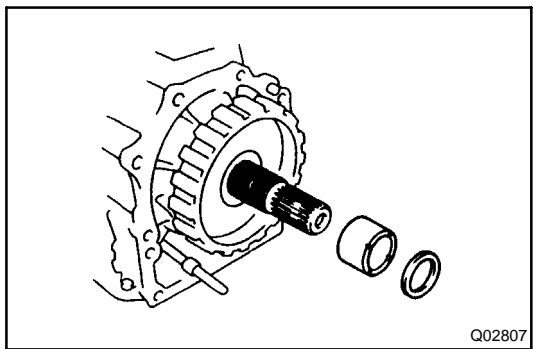


- (h) Coat the thrust washer with petroleum jelly, and install it onto the front planetary carrier.  
HINT: Securely fit the claws of the thrust washer into the grooves of the front planetary gear.



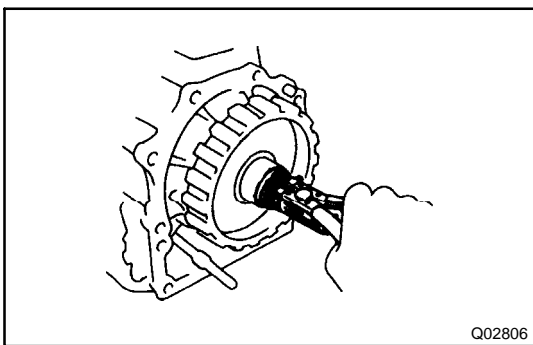
## 7. INSTALL SPEED SENSOR ROTOR

Install the speed sensor rotor onto the output shaft.



## 8. INSTALL OUTPUT SHAFT SPACERS

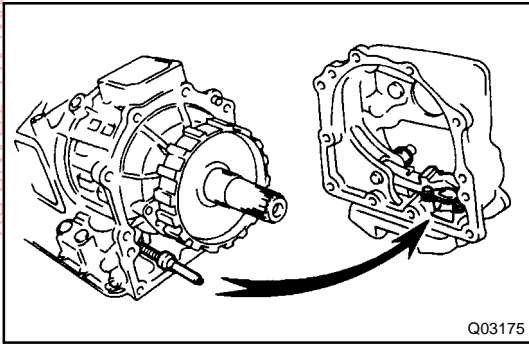
- (a) Install the 2 output shaft spacers.



- (b) Using snap ring pliers, install the snap ring.

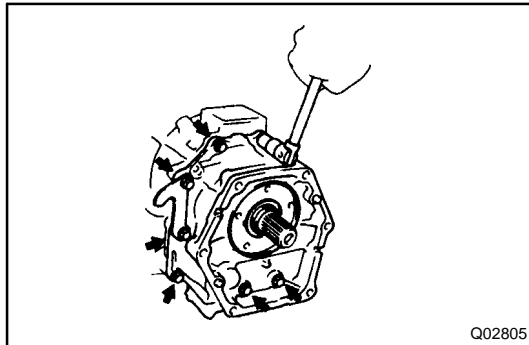
## 9. INSTALL TRANSFER ADAPTOR AND OUTPUT SHAFT REAR BEARING

- (a) Place a new gasket on the transmission case.
- (b) Install the parking lock rod between the parking lock pawl and bracket, and attach the transfer adaptor on the transmission case.



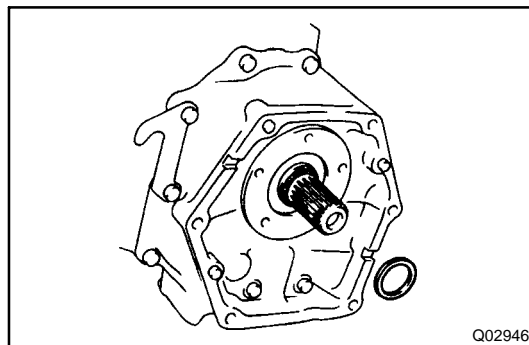
- (c) Install the transfer adaptor with 10 bolts.

**Torque: 37 N-m (380 kgf-cm, 27 ft-lbf)**

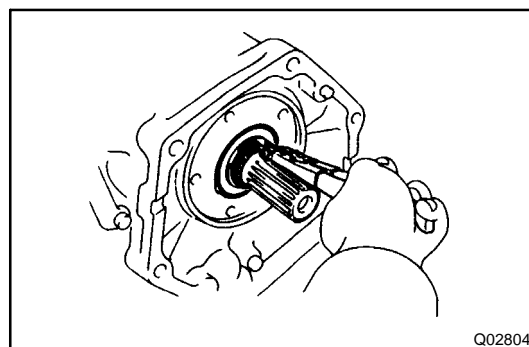


## 10. INSTALL OUTPUT SHAFT SPACER

- (a) Install the spacer onto the output shaft.

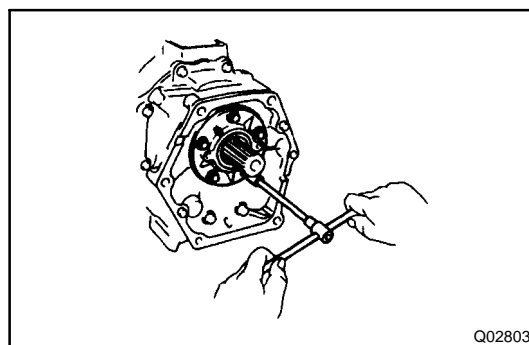


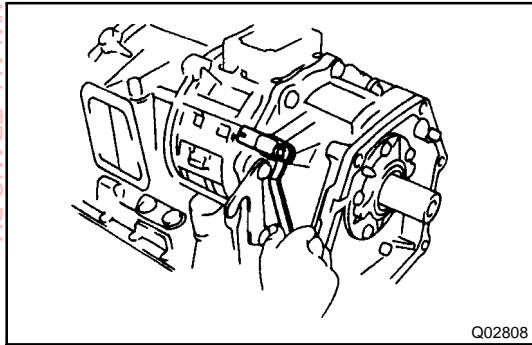
- (b) Using snap ring pliers, install the snap ring.



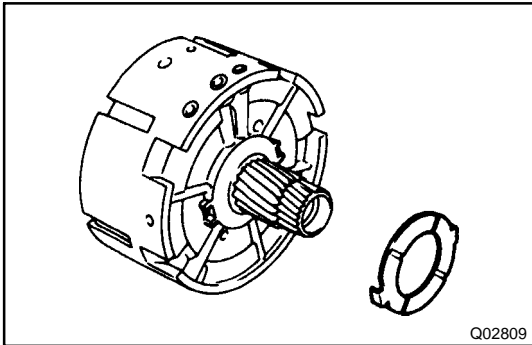
## 11. INSTALL OUTPUT SHAFT REAR BEARING RETAINER

Install the output shaft rear bearing with 5 bolts.



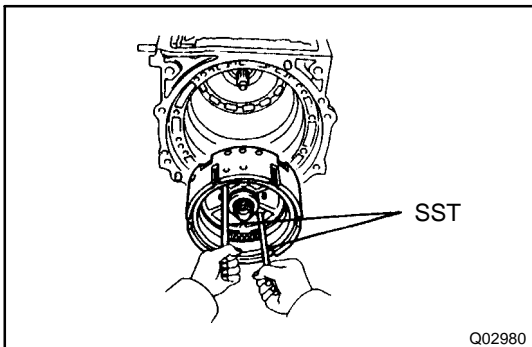


## 12. INSTALL SPEED SENSOR

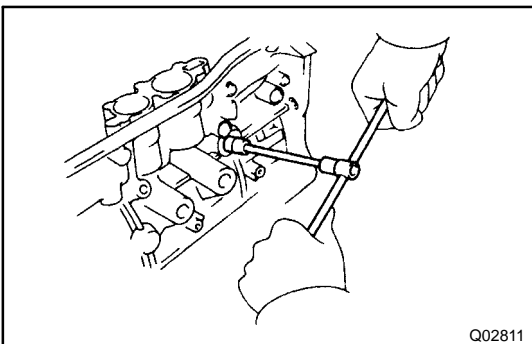


## 13. TEMPORARILY INSTALL CENTER SUPPORT ASSEMBLY

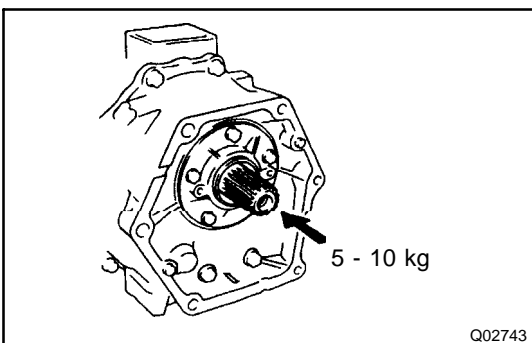
- (a) Coat the thrust washer with petroleum jelly, and install it onto the rear side of the center support.  
HINT: Securely fit the claws of the thrust washer into the grooves of the center support.



- (b) Install SST (2 bolts) to the center support.  
SST 09350-36010 (09350-06140)
- (c) Align the oil holes and bolt holes of the center support and transmission case.
- (d) Install the center support assembly into the transmission case.

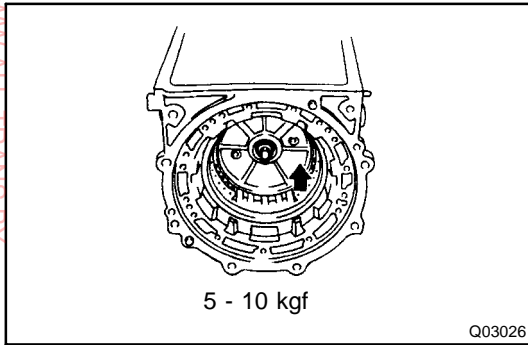


- (e) Install the 3 center support bolts.  
**Torque: 25 N-m (250 kgf-cm, 18 ft-lbf)**

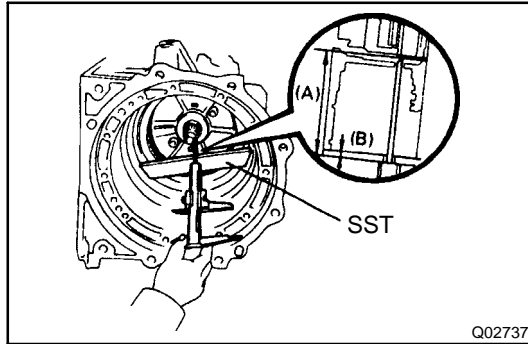


## 14. ADJUST THRUST CLEARANCE OF CENTER SUPPORT

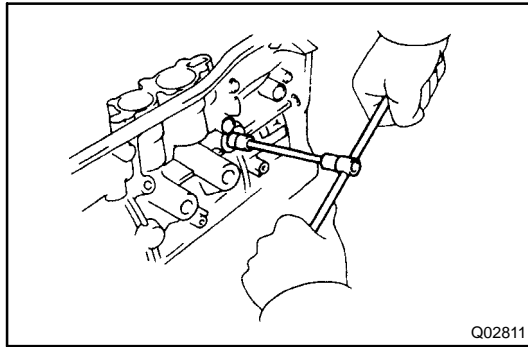
- (a) Push the transmission output shaft toward the front of the transmission by applying a force of 49 - 89 N (5-10 kgf, 11.0 - 22.0 lbf), then pull with the same amount of force.



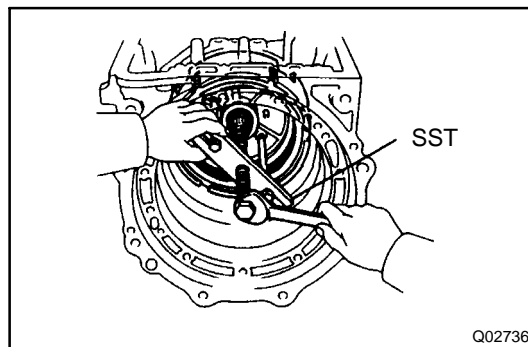
- (b) Push the center support toward the rear of the transmission by applying a force of 49 - 89 N (5 - 10 kgf, 11.0 - 22.0 lbf), then pull with the same amount of force.



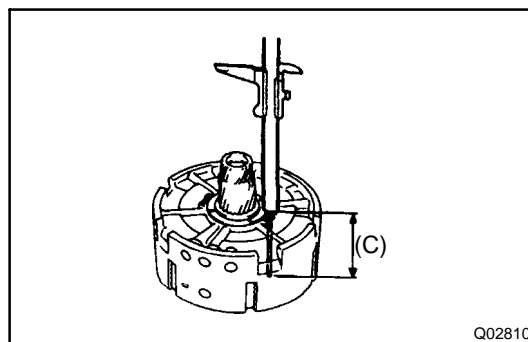
- (c) Place SST on the center support.  
SST 09350-36010 (09350-06090)
- (d) Using calipers, measure distance (A) between the tops of SST and the thrust washer on the front planetary gear.
- (e) Using calipers, measure thickness (B) of SST.



- (f) Remove the 3 center support set bolts.



- (g) Using SST, remove the center support assembly from the transmission case.  
SST 09350-36010 (09350-06140)



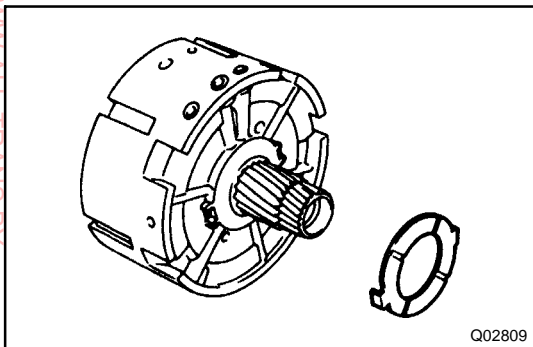
- (h) Turn over the center support together with the thrust washer, and place it on a flat surface.
- (i) Inserting calipers into the thrust washer hole, measure the distance (C) between it and the flat surface.

**Center support thrust clearance:**

$$A - (B + C)$$

**Standard thrust clearance:**

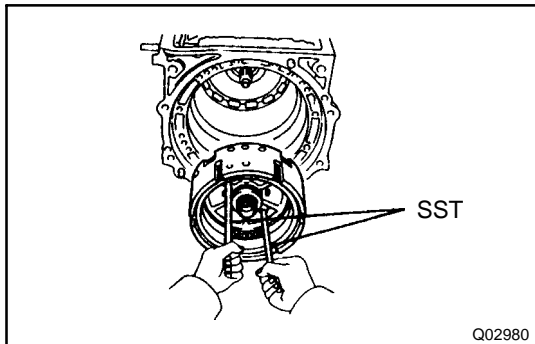
0.30 - 0.70 mm (0.0118 - 0.0276 in.)

**Maximum thrust clearance:****0.90 mm (0.0354 in.)**

If the thrust clearance is greater than the maximum, select and install a thrust washer.

**Thrust washer thicknesses**

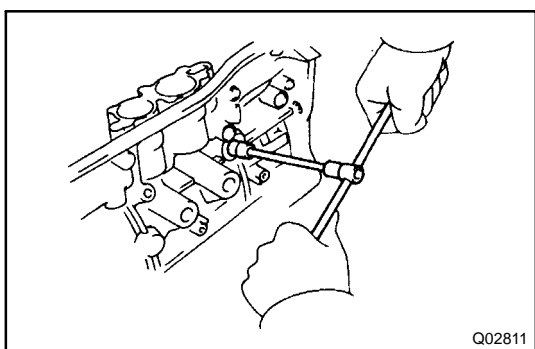
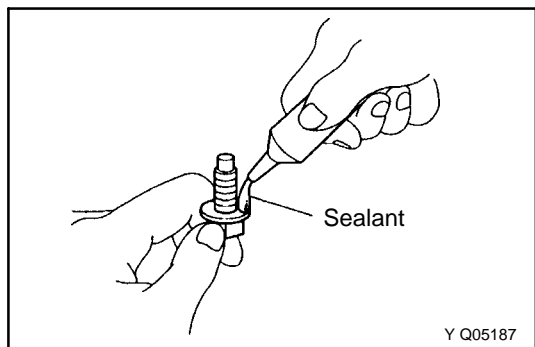
Thickness	mm (in.)	Thickness	mm (in.)
1.5	(0.059)	1.8	(0.071)
2.4	(0.094)	2.1	(0.083)
2.7	(0.106)		

**15. INSTALL CENTER SUPPORT ASSEMBLY**

- Coat new 3 O-rings with ATF and install them to the oil holes of the center support.
- Install SST (2 bolts) to the center support. SST 09350-36010 (09350-06140)
- Align the oil holes and bolt hole of the center support and transmission case.
- Install the center support assembly into the transmission case.
- Apply sealant to the threads of the center support set bolts.

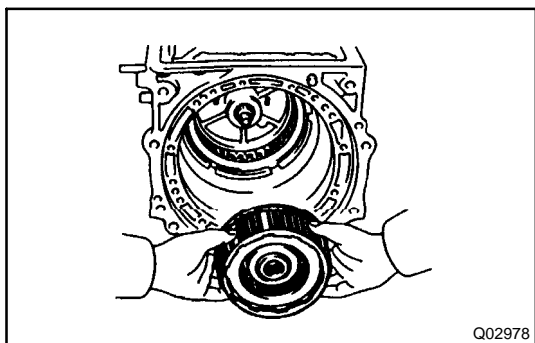
**Sealant:**

**Part No. 08833 - 00080, THREE BOND 1344, LOCTITE 240 or equivalent**



- Install the 3 center support set bolts.

**Torque: 25 N-m (250 kgf-cm, 18 ft-lbf)**

**16. INSTALL REAR CLUTCH ASSEMBLY**

Install the rear clutch assembly into the transmission case.

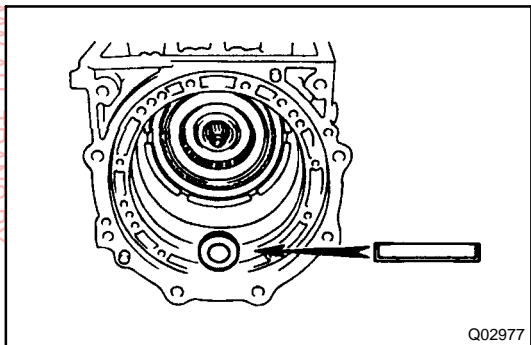
**HINT:** Mesh the spline of the rear clutch drum with the flukes of the discs by rotating and pushing the rear clutch drum clockwise or counterclockwise.

**17. INSTALL FRONT CLUTCH ASSEMBLY**

- (a) Coat the race with petroleum jelly, and install it onto the rear clutch drum.

**Race diameter**

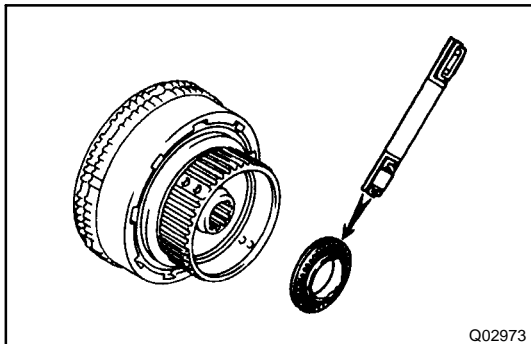
Diameter mm (in.)	Inside	Outside
Race	37.0 (1.457)	52.0 (2.047)



- (b) Coat the bearing with petroleum jelly, and install it onto the front clutch hub.

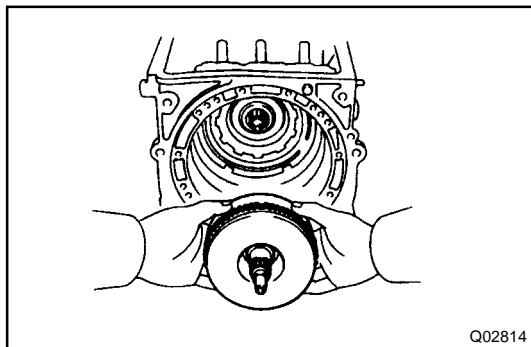
**Bearing and race diameters**

Diameter mm (in.)	Inside	Outside
Bearing	32.8 (1.291)	52.0 (2.047)



- (c) Install the front clutch assembly into the transmission case.

**HINT:** Mesh the spline of the front clutch hub with the flukes of the discs by rotating and pushing the front clutch drum clockwise or counterclockwise.

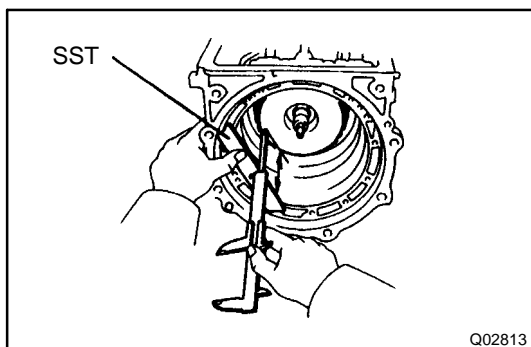
**18. CHECK CORRECT INSTALLATION OF FRONT CLUTCH ASSEMBLY**

- (a) Place SST on the installation surface of the oil pump.

SST 09350-36010 (09350-06090)

- (b) Using calipers, measure the distance between the tops of SST and the clutch drum.

If the distance corresponds to that during disassembly, the front clutch assembly is installed correctly.



## 19. TEMPORARILY INSTALL OVERDRIVE CASE ASSEMBLY

- Remove the oil seal ring from the input shaft
- Coat the race and bearing with petroleum jelly, and install them with the spacer onto the front clutch drum.

### Bearing and race diameter

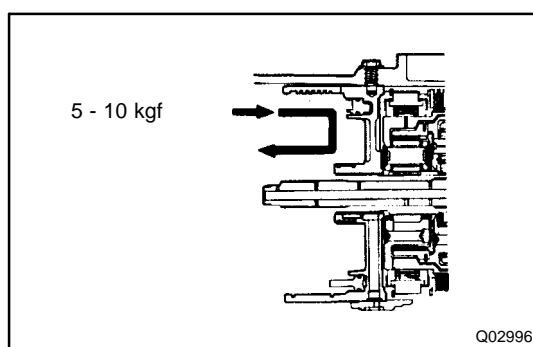
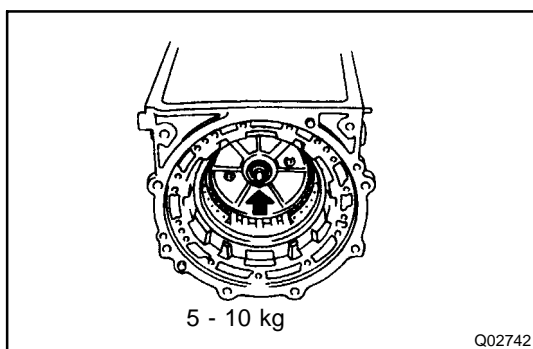
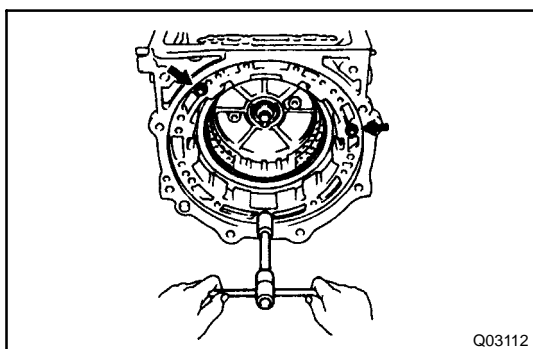
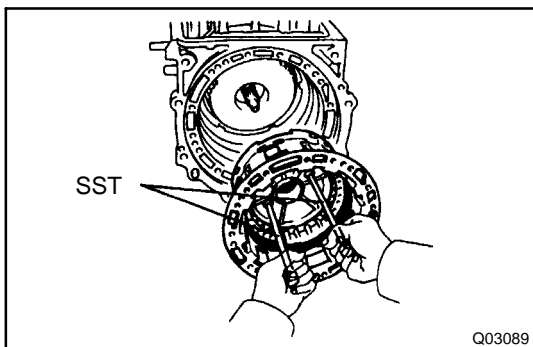
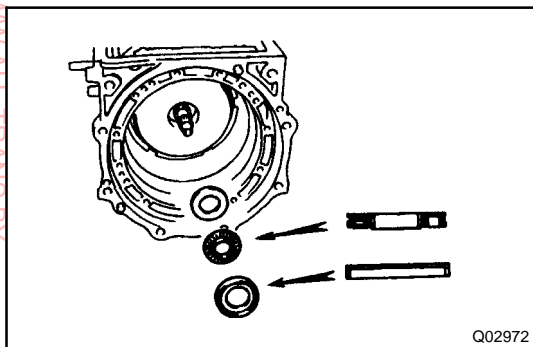
Diameter mm (in.)	Inside	Outside
Bearing	34.7 (1.366)	52.0 (2.047)
Race (Front)	37.0 (1.457)	52.0 (2.047)
Race (Rear)	32.8 (1.291)	50.4 (1.984)

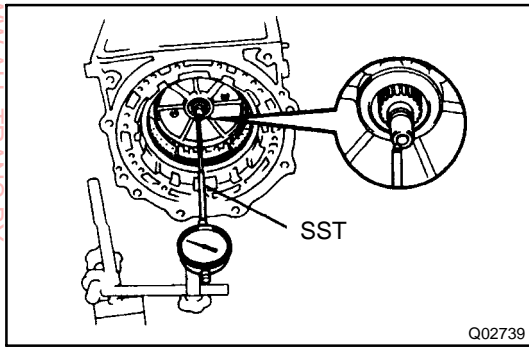
- Install SST (2 bolts) to the O/D case.  
SST 09350-36010 (09350-06140)
- Align the oil holes and bolt holes of the O/D case and transmission case.

- Temporarily install the 3 bolts  
**Torque: 25 N-m (250 kgf-cm, 18 ft-lbf)**

## 20. ADJUST THRUST CLEARANCE OF INPUT SHAFT (FRONT CLUTCH DRUM)

- Push the transmission output shaft toward the front of the transmission by applying a force of 49 - 98 N (5-10 kgf, 11.0 - 22.0 lbf).
- Push the O/D case toward the rear of the transmission by applying a force of 49 - 98 N (5 - 10 kgf, 11.0 - 22.0 lbf).





- (c) Using SST and a dial indicator, measure the thrust clearance of the input shaft.

SST 09350-36010 (093520-06130)

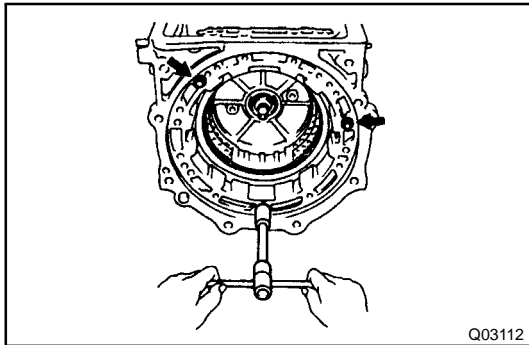
**Standard thrust clearance:**

**0.30 - 0.70 mm (0.0118 - 0.0276 in.)**

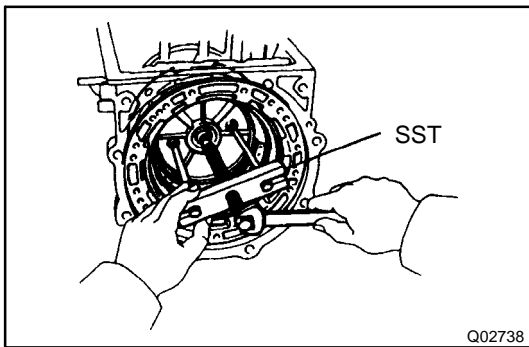
**Maximum thrust clearance:**

**0.70 mm (0.0276 in.)**

If the thrust clearance is greater than the maximum, adjust with a spacer.

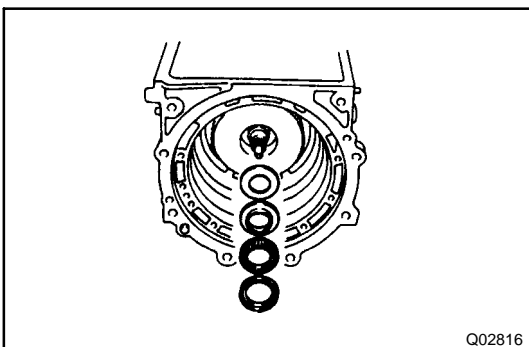


- (d) Remove the set bolts.



- (e) Using SST, remove the O/D case assembly.

SST 09350-36010 (09350-06140)



- (f) Remove the thrust bearing, two races, and spacer from the front clutch drum or O/D case.

- (g) Select a spacer.

**Spacer thicknesses**

Thickness	mm (in.)	Thickness	mm (in.)
0.9 (0.035)		1.8 (0.071)	
1.2 (0.047)		2.1 (0.083)	
1.5 (0.059)			

**HINT:** There are 5 different thicknesses for spacer.

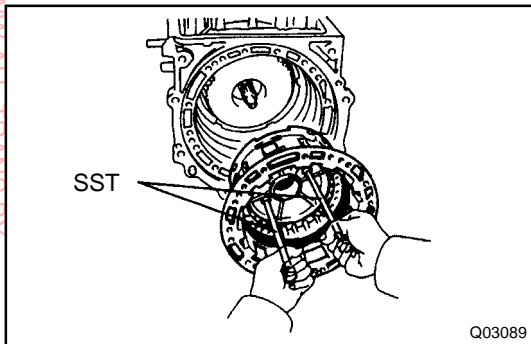
- (h) Install the spacer, 2 races and bearing onto the front clutch drum.

- (i) Reinstall the oil seal ring to the input shaft.



**21. INSTALL OVERDRIVE CASE ASSEMBLY**

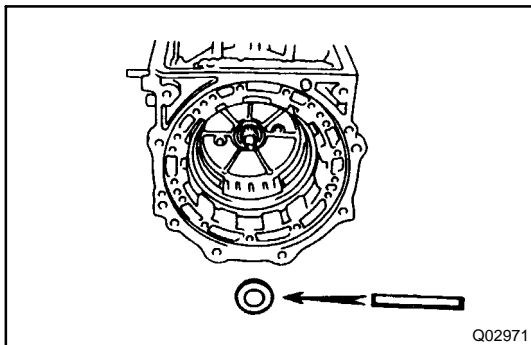
- Coat 3 new O-rings with ATF, and install them to the oil holes of the O/D case.
- Install SST (2 bolts) to the O/D case.  
SST 09350-36010 (09350-06140)
- Align the oil holes and bolt holes of the O/D case and transmission case.

**22. INSTALL OVERDRIVE RING GEAR ASSEMBLY**

- Coat the race with petroleum jelly, and install it onto the O/D case.

**Race diameter**

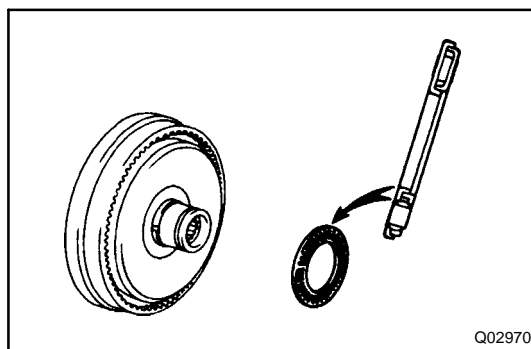
Diameter mm (in.)	Inside	Outside
Race	37.0 (1.457)	52.0 (2.047)



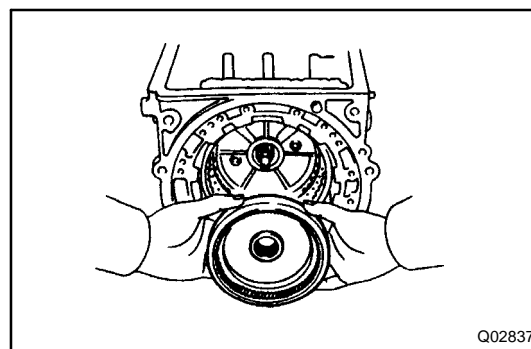
- Coat the bearing with petroleum jelly, and install it onto the ring gear flange.

**Bearing diameter**

Diameter mm (in.)	Inside	Outside
Bearing	34.7 (1.366)	52.0 (2.047)



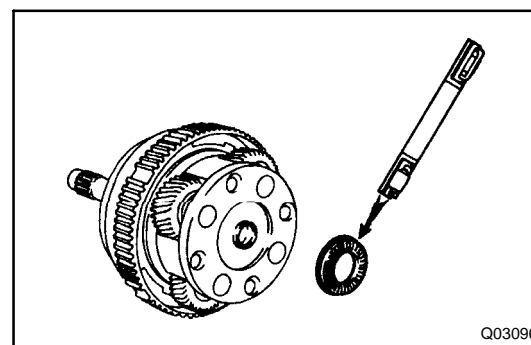
- Install the ring gear assembly into the O/D case.

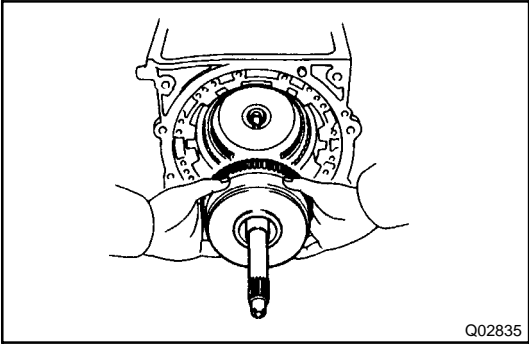
**23. INSTALL OVERDRIVE PLANETARY GEAR, OVER-DRIVE DIRECT CLUTCH AND ONE-WAY CLUTCH ASSEMBLY**

- Coat the bearing with petroleum jelly, and install them onto the planetary gear.

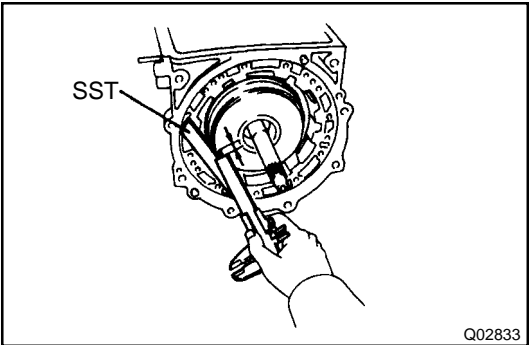
**Bearing and race diameters**

Diameter mm (in.)	Inside	Outside
Bearing	23.2 (0.913)	42.0 (1.654)



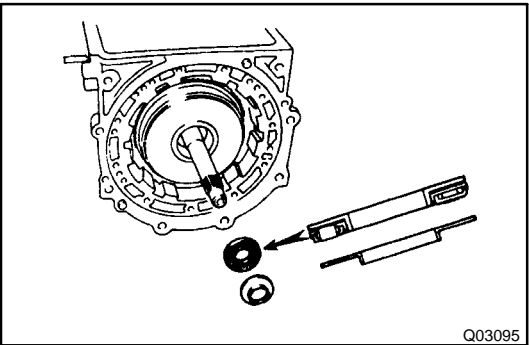


- (b) Install the planetary gear, direct clutch and one-way clutch assembly into transmission case.  
HINT: Mesh the spline of the O/D direct clutch drum with the flukes of the discs by rotating and pushing the O/D direct clutch drum clockwise or counterclockwise.



**24. CHECK CORRECT INSTALLATION OF OVERDRIVE PLANETARY GEAR, OVERDRIVE DIRECT CLUTCH AND ONE-WAY CLUTCH ASSEMBLY**

- (a) Place SST on the installation surface of the oil pump.  
SST 09350-36010 (09350-06090)
- (b) Using calipers, measure the distance between the tops of SST and the clutch drum.  
If the distance corresponds to that during disassembly, the O/D planetary gear, O/D direct clutch and one-way clutch assembly is installed correctly.

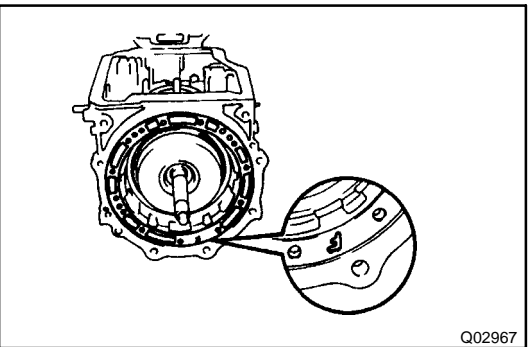


**25. TEMPORARILY INSTALL OIL PUMP**

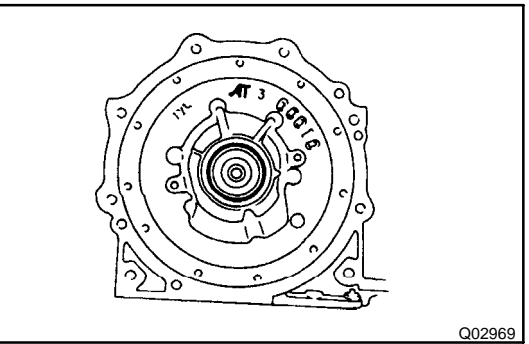
- (a) Coat the bearing with petroleum jelly, and install the bearing and race onto the clutch drum.

**Bearing and race diameters**

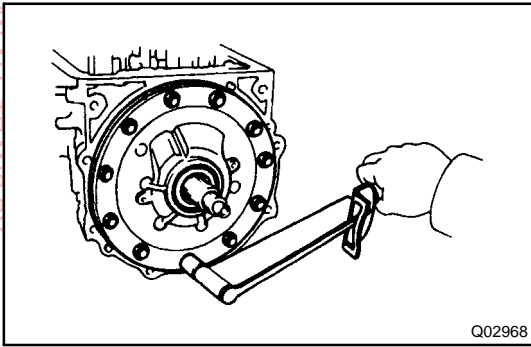
Diameter mm (in.)	Inside	Outside
Bearing	28.5 (1.122)	48.0 (1.890)
Race	27.1 (1.067) 27.9 (1.098) 28.3 (1.114)	43.0 (1.693)



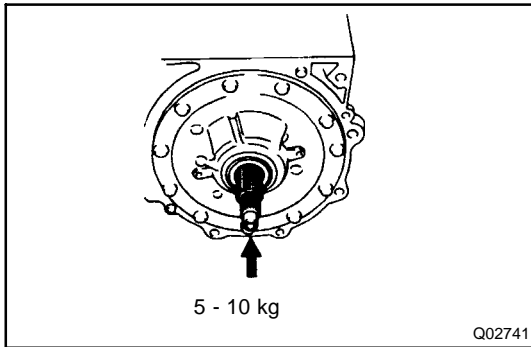
- (b) Place the gasket on the transmission case.



- (c) Align the bolt holes of the pump body and transmission case, and install it.

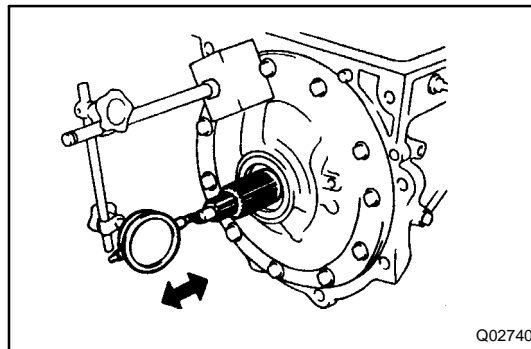


- (d) Install and tighten the 11 bolts.  
**Torque: 21 N-m (210 kgf-cm, 16 ft-lbf)**



## 26. ADJUST THRUST CLEARANCE OF OVERDRIVE INPUT SHAFT (OVERDRIVE PLANETARY GEAR)

- (a) Push the O/D input shaft toward the rear of the transmission by a force of 49 - 98 N (5 - 10 kgf, 11.0-22.0 lbf).



- (b) Using a dial indicator, measure the thrust clearance of the input shaft.

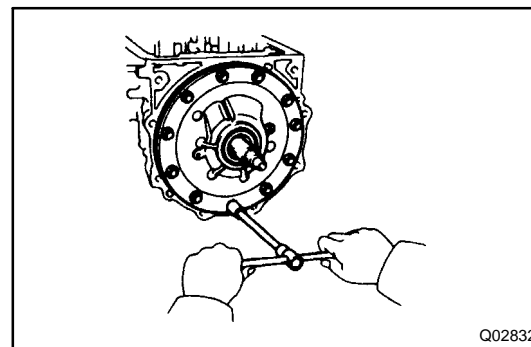
**Standard thrust clearance:**

**0.40 - 0.90 mm (0.0157 - 0.0354 in.)**

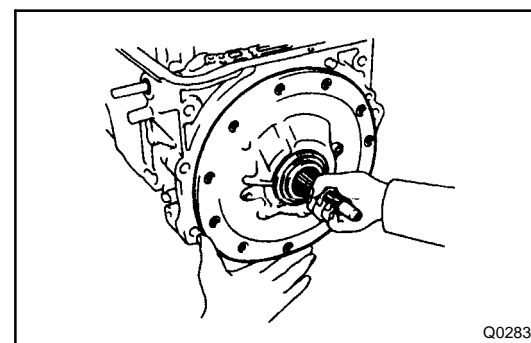
**Maximum thrust clearance:**

**0.90 mm (0.0354 in.)**

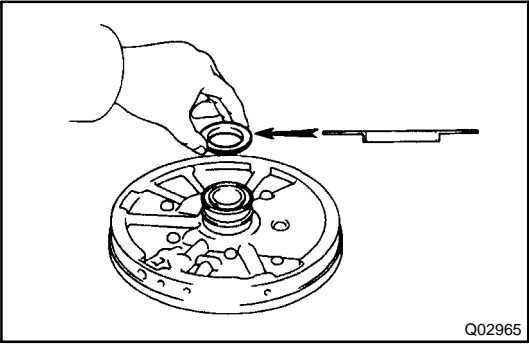
If the thrust clearance is greater than the maximum, select an alternative race.



- (c) Remove the 11 oil pump set bolts.



- (d) Remove the oil pump and gasket.



- (e) Remove the race from the oil pump cover.
- (f) Select a race.

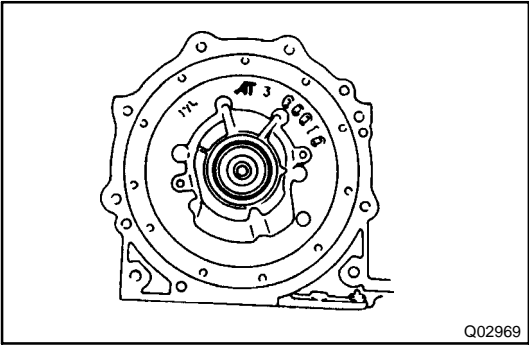
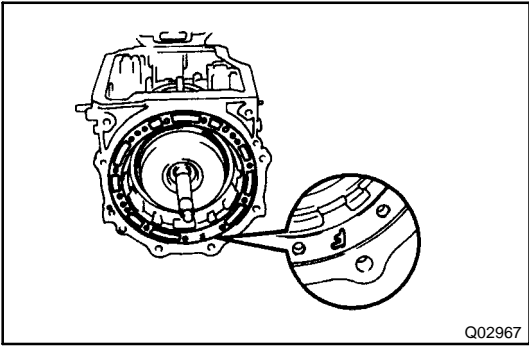
**Race thicknesses**

Thickness	mm (in.)	Thickness	mm (in.)
0.8 (0.031)		1.4 (0.055)	
1.0 (0.039)			

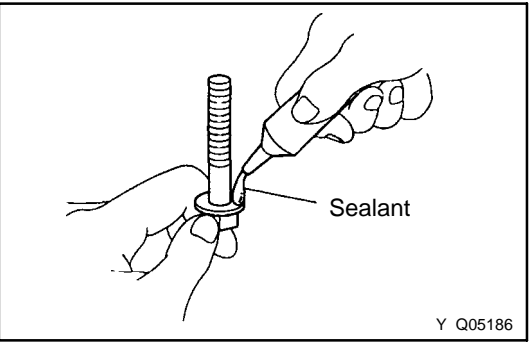
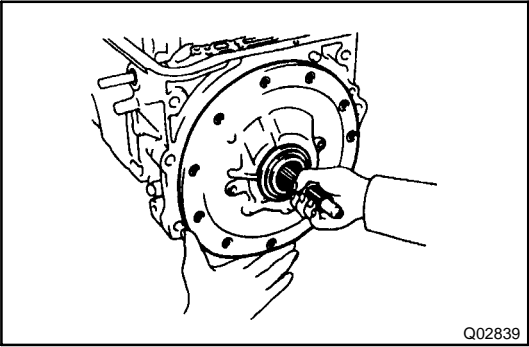
- (g) Coat the race with petroleum jelly, and install the oil pump cover.

**27. INSTALL OIL PUMP**

- (a) Place a new gasket on the transmission case.



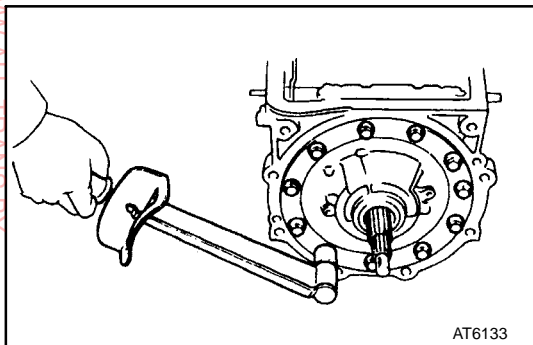
- (b) Align the bolt holes of the pump body and transmission case.



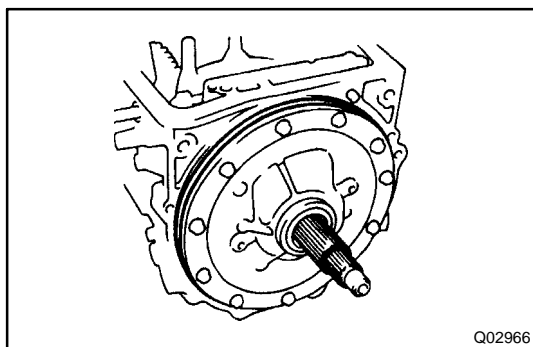
- (c) Apply sealant to the threads of the oil pump set bolts.

**Sealant:**

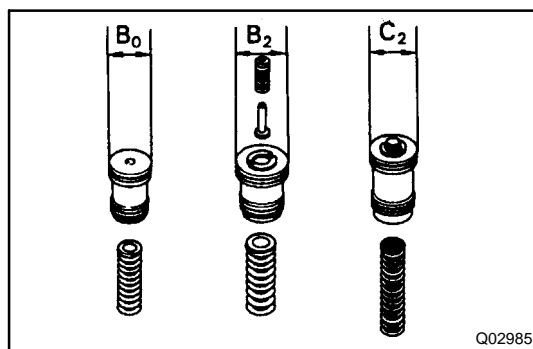
**Part No. 08833 - 00080, THREE BOND 1344, LOCTITE 242 or equivalent.**



- (d) Install and tighten the 11 bolts.  
**Torque: 21 N-m (210 kgf-cm, 16 ft-lbf)**



- (e) Coat 2 new O-rings with ATF, and install them to the oil pump body,



## 28. INSTALL C<sub>2</sub>, B<sub>0</sub>, B<sub>2</sub> ACCUMULATOR SPRINGS AND PISTONS

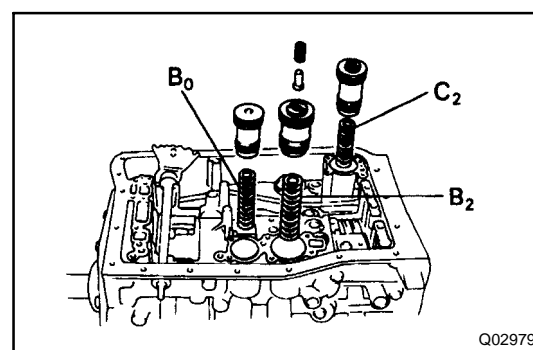
- (a) Coat new O-rings with ATF, and install them to the pistons.  
 (b) Install the 3 springs and accumulator pistons into the bore of the transmission case.

### Piston diameter

	Piston Diameter	mm (in.)
B <sub>0</sub>	35.9	(1.413)
B <sub>2</sub>	43.9	(1.728)
C <sub>2</sub>	39.9	(1.571)

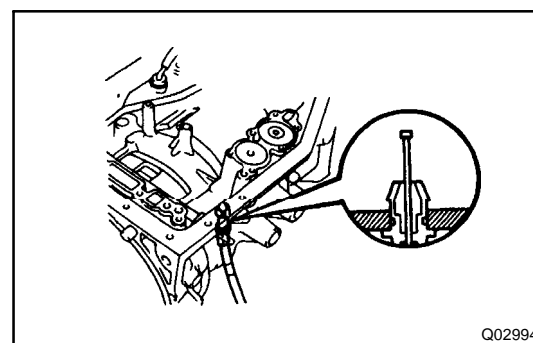
### Spring diameter and free length

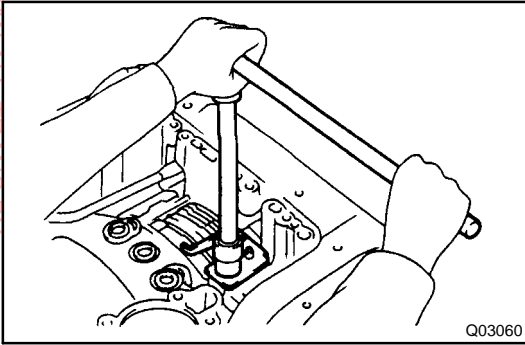
Spring (Color)	mm (in.)	Free Length	Diameter
B <sub>0</sub> (Light Green)	63.1	(2.484)	20.7 (0.815)
B <sub>2</sub> (Blue)	65.0	(2.559)	25.1 (0.988)
C <sub>2</sub> (Green)	83.5	(3.287)	21.7 (0.854)



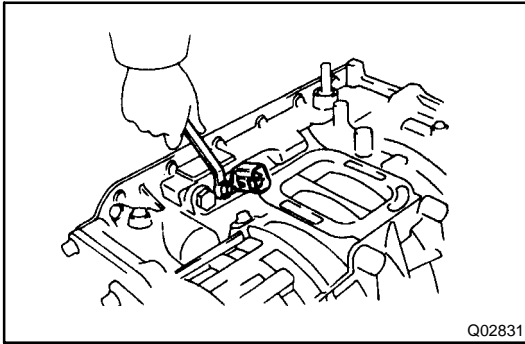
## 29. INSTALL THROTTLE CABLE

- (a) Coat a new O-ring with ATF, and install it to the cable.  
 (b) Install the cable to the transmission case.



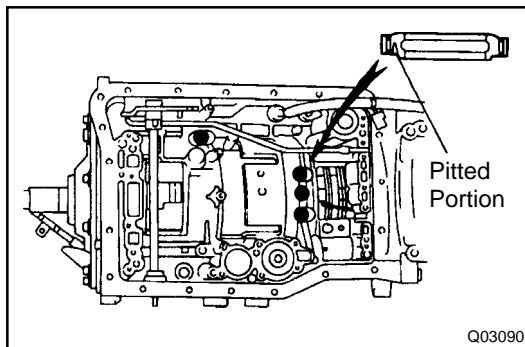


### 30. INSTALL FIRST AND REVERSE BRAKE GUIDE



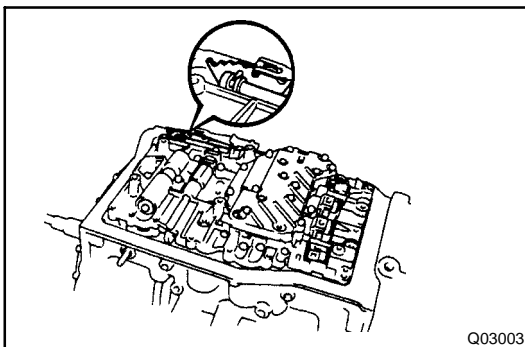
### 31. INSTALL SOLENOID WIRING

- (a) Coat a new O-ring with ATF, and install it to the wiring.
- (b) Install the solenoid wiring to the transmission case.



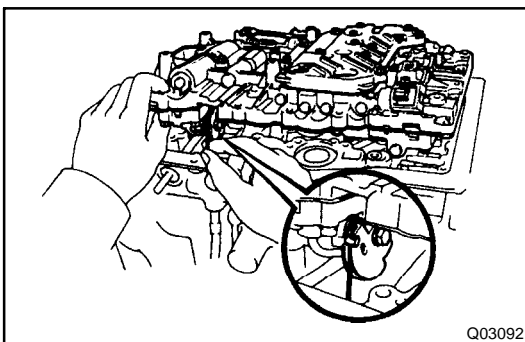
### 32. INSTALL CENTER SUPPORT APPLY GASKET

Install 4 new gaskets, facing the pitted side toward the transmission case.

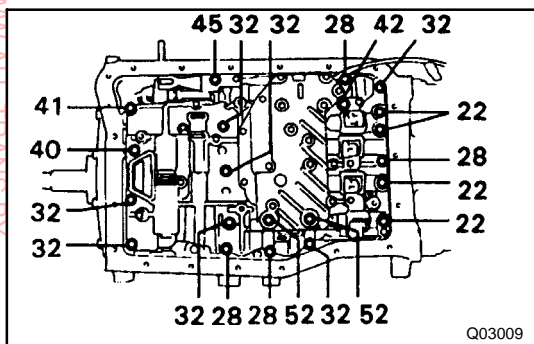


### 33. INSTALL VALVE BODY

- (a) Align the groove of the manual valve with the pin of the manual valve lever.



- (b) Connect the throttle cable to the cam.



- (c) Install the bolts.

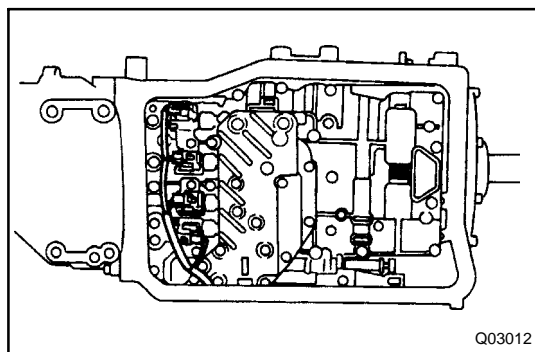
HINT: Each bolt length (mm) is indicated in the illustration.

**Bolt length:**

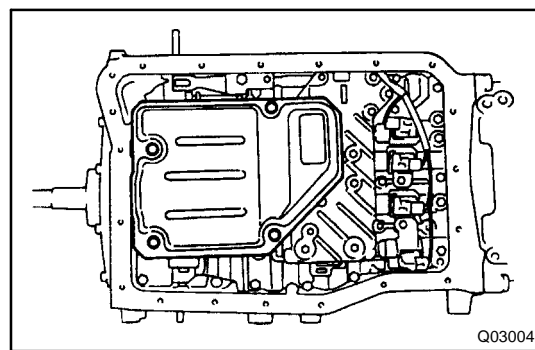
22 mm (0.87 in.)  
 28 mm (1.10 in.)  
 32 mm (1.26 in.)  
 40 mm (1.57 in.)  
 41 mm (1.61 in.)  
 42 mm (1.65 in.)  
 45 mm (1.77 in.)  
 52 mm (2.04 in.)

- (d) Check that the manual valve lever contacts the center of the roller at the tip of the detent spring.  
 (e) Tighten the bolts.

**Torque: 10 N-m (100 kgf-cm, 7 in.-lbf)**



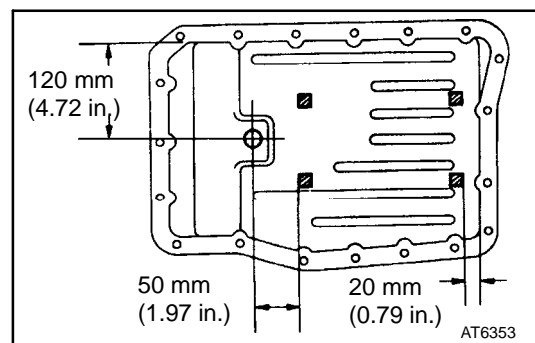
### 34. CONNECT 4 SOLENOID CONNECTORS



### 35. INSTALL OIL STRAINER

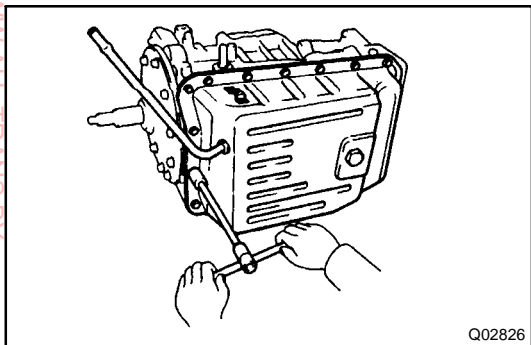
Install a new gasket and the oil strainer with the 7 wave washers (for 8 mm head bolts) and 10 bolts.

**Torque: 10 N-m (100 kgf-cm, 77 ft-lbf)**

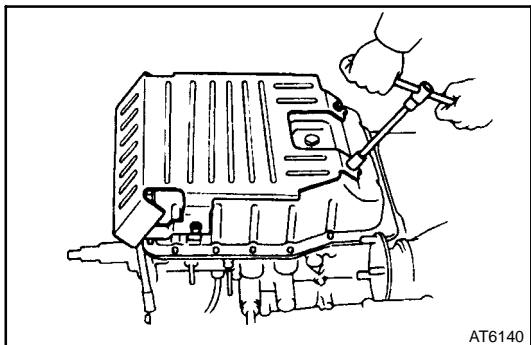


### 36. INSTALL MAGNETS IN PAN

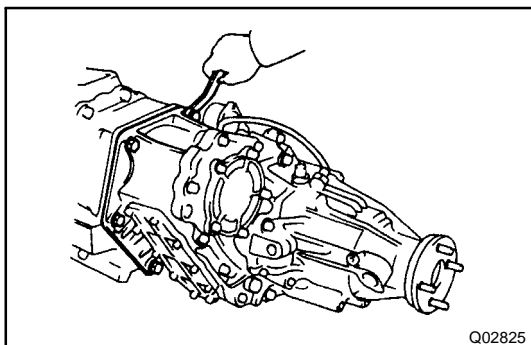
Install the 2 magnets in the oil pan.

**37. INSTALL OIL PAN**

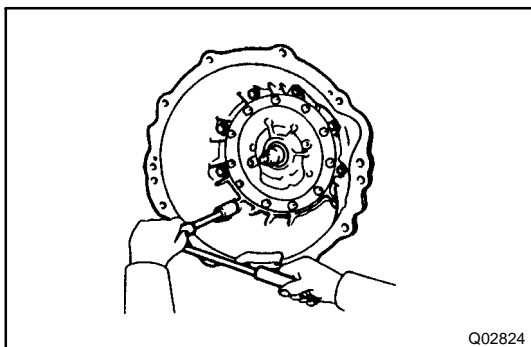
- (a) Remove any packing material and be careful not to drop oil on the contacting surface of the transmission case and oil pan.
- (b) Apply seal packing to the oil pan.  
**Seal packing: Part No. 08826 - 00090, THREE BOND 1281B or equivalent**
- (c) Install and torque the 20 bolts.  
**Torque: 6.9 N-m (70 kgf-cm, 61 in.-lbf)**

**38. INSTALL OIL PAN PROTECTOR**

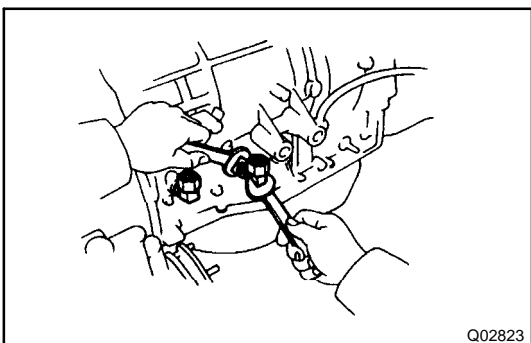
Install the protector with the 4 bolts.

**39. INSTALL TRANSFER ASSEMBLY**

Install the transfer assembly with 6 bolts.

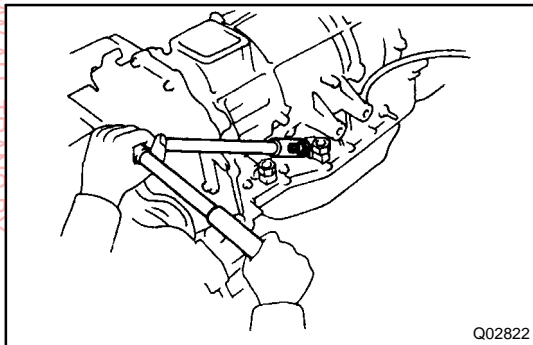
**40. INSTALL TRANSMISSION HOUSING**

- (a) Install the transmission housing with the 8 bolts.  
**NOTICE: Be careful do not damage the 2 O-rings around the oil pump body when installing the transmission housing.**  
**Torque: 64 N-m (650 kgf-cm, 47 ft-lbf)**
- (b) Install the throttle cable to the transmission case with the bolt.

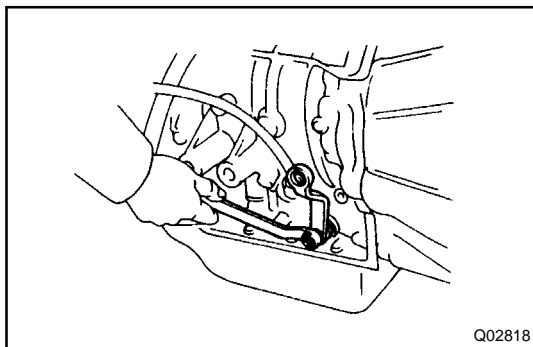
**41. INSTALL 2 TRANSMISSION OIL COOLER UNIONS**

- (a) Coat new O-rings with ATF, and install it to each union.
- (b) Install the 2 unions.  
**Torque: 29 N-m (300 kgf-cm, 22 ft-lbf)**

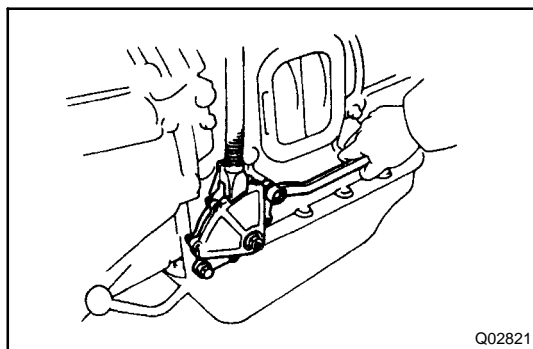


**42. INSTALL A/T FLUID TEMPERATURE SENSOR**

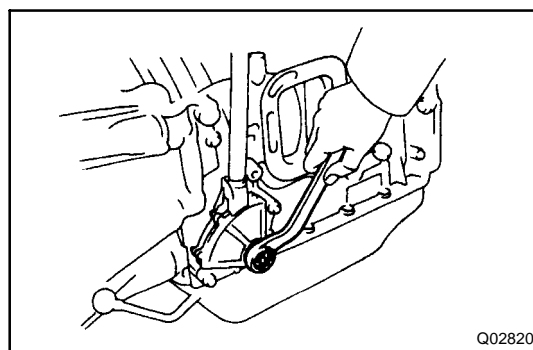
- (a) Coat a new O-ring with ATF, and install it to the sensor.
  - (b) Install the sensor to the front union.
- Torque: 34 N-m (350 kgf-cm, 25 ft-lbf)**

**43. INSTALL CONTROL SHAFT LEVER**

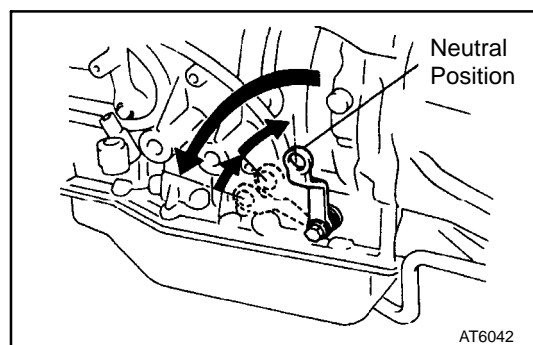
**Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)**

**44. INSTALL PARK/NEUTRAL POSITION SWITCH**

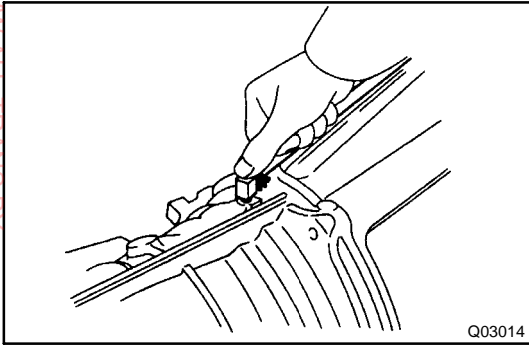
- (a) Temporarily install the park/neutral position switch with the 2 bolts.



- (b) Install the grommet, a new lock washer and the nut.
- Torque: 6.9 N-m (70 kgf-cm, 61 in.-lbf)**

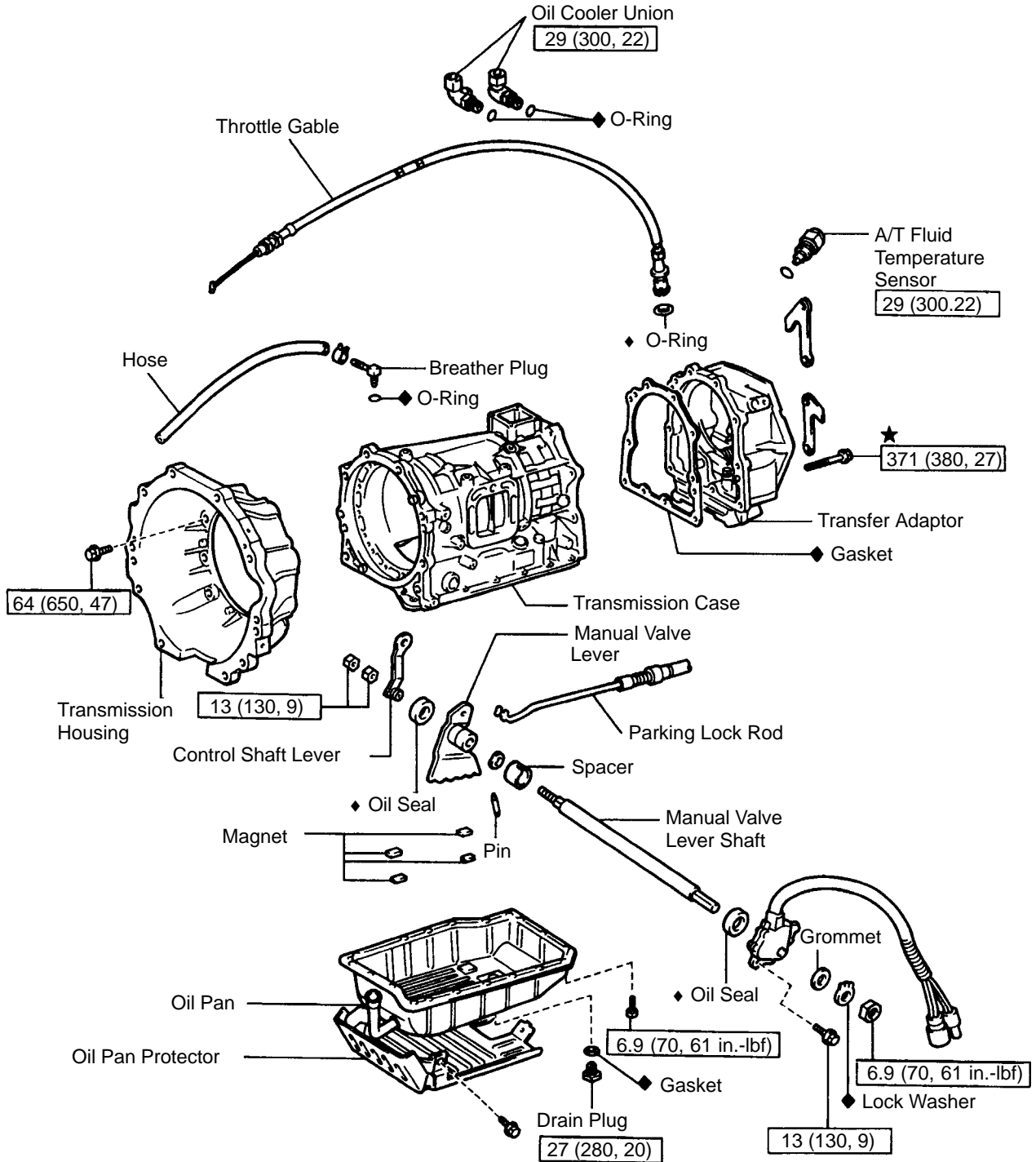


- (c) Fully turn the control shaft lever back and return 2 notches. It is now in neutral position.

**45. INSTALL BREATHER PLUG AND HOSE**

- (a) Coat a new O-ring with ATF, and install it to the breather plug.
- (b) Install the breather plug and hose.

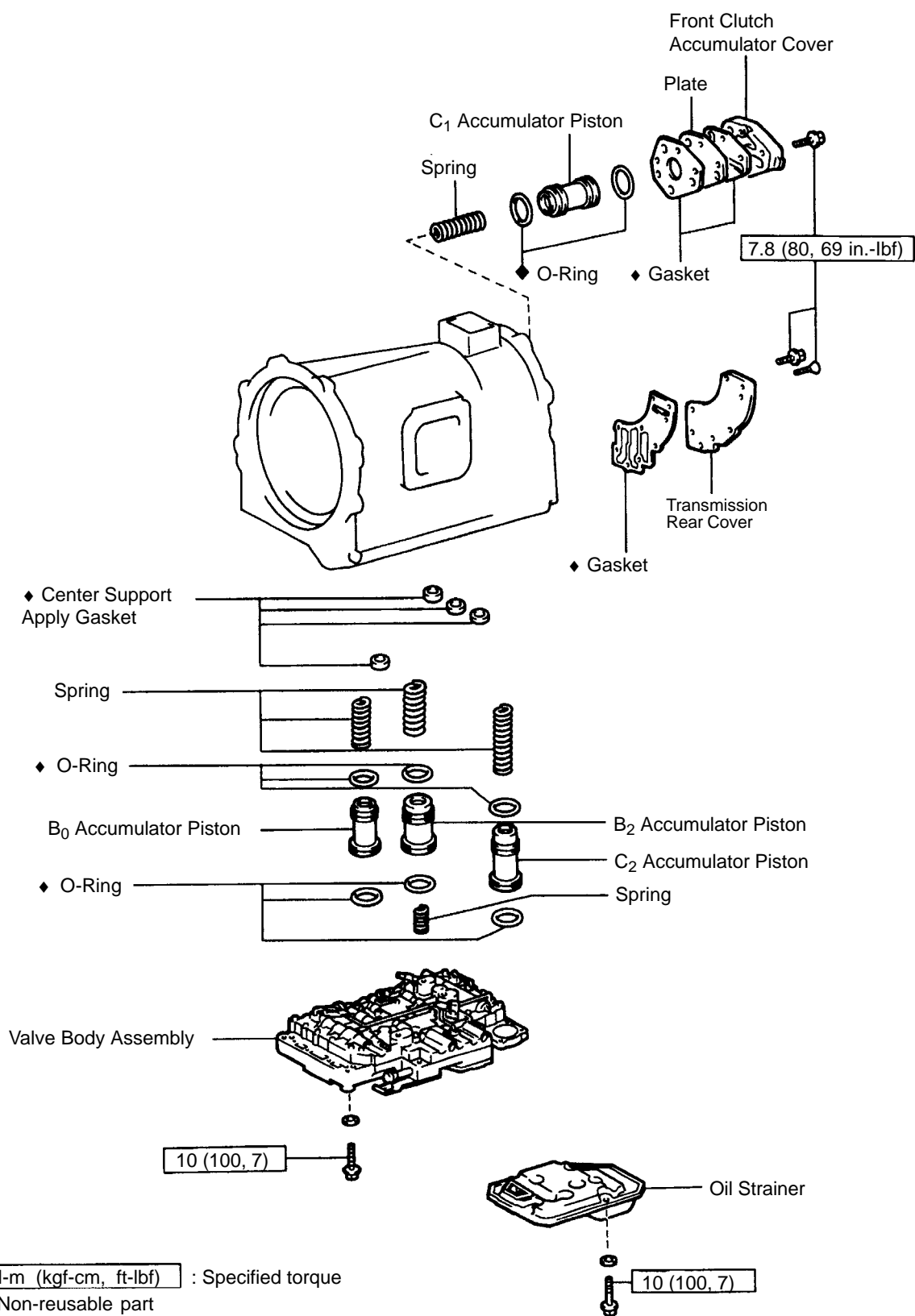
# COMPONENT PARTS REMOVAL COMPONENTS

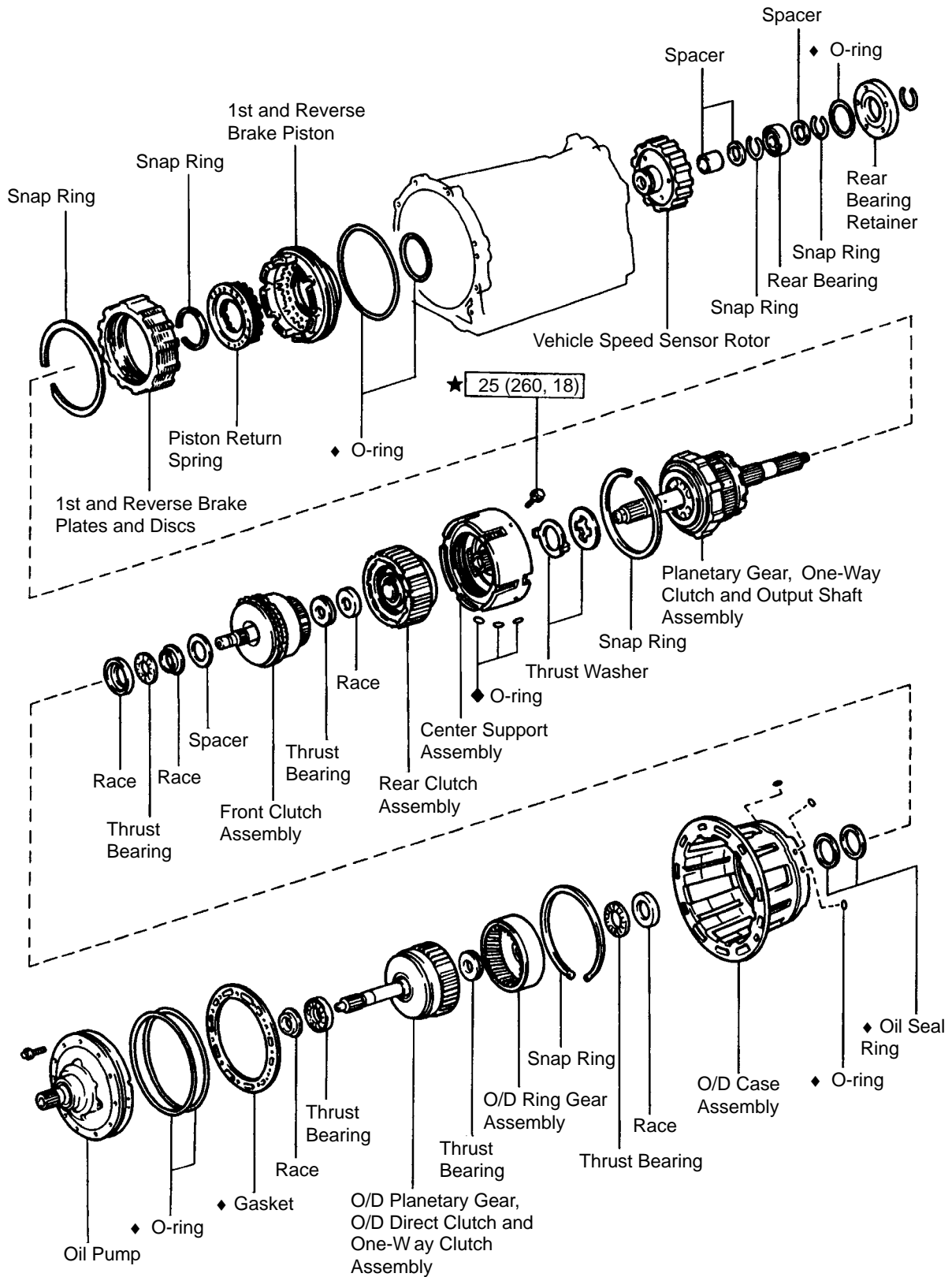


N-m (kgf-cm, ft-lbf) : Specified torque

◆ Non-reusable part

★ Precoated part





N-m (kgf-cm, ft-lbf) : Specified torque

◆ Non-reusable part

★ Precoated part

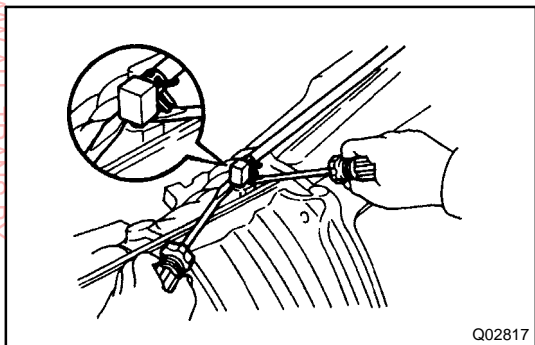
## SEPARATE BASIC SUBASSEMBLY

### 1. REMOVE TRANSMISSION WIRING

Disconnect the connectors and remove the transmission wiring.

### 2. REMOVE BREATHER LUG AND HOSE

- (a) Using 2 screwdrivers, pry out the breather plug.
- (b) Remove the O-ring from the breather plug.

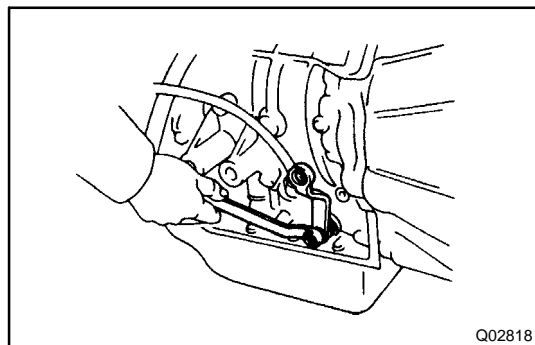


### 3. REMOVE CONTROL SHAFT LEVER

Remove the 2 nuts and the lever.

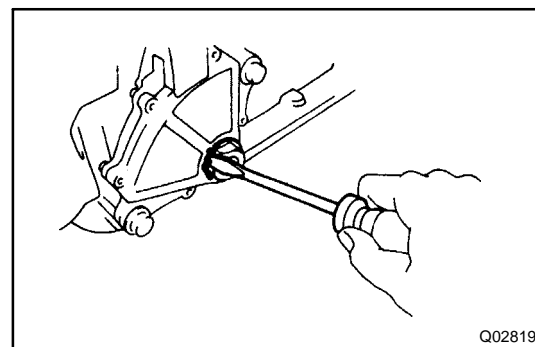
### 4. REMOVE OIL COOLER PIPES

- (a) Remove the mount stay bolt.
- (b) Loosen the 2 union bolts, and remove the 2-cooler pipe assembly.

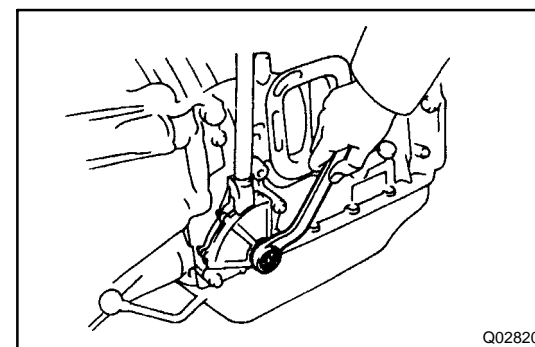


### 5. REMOVE PARK/NEUTRAL POSITION SWITCH

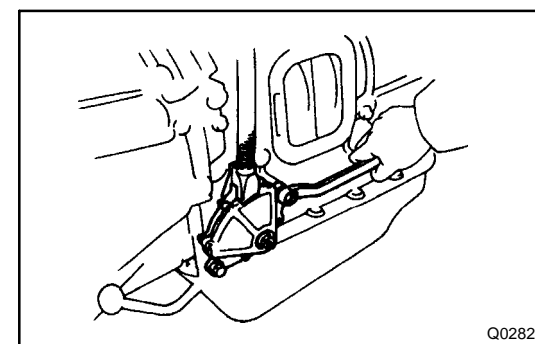
- (a) Unstake the lock washer.

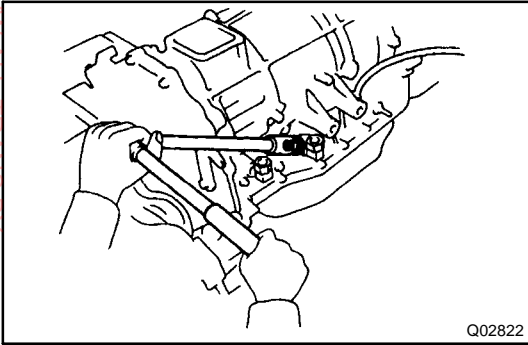


- (b) Remove the nut, lock washer and grommet.

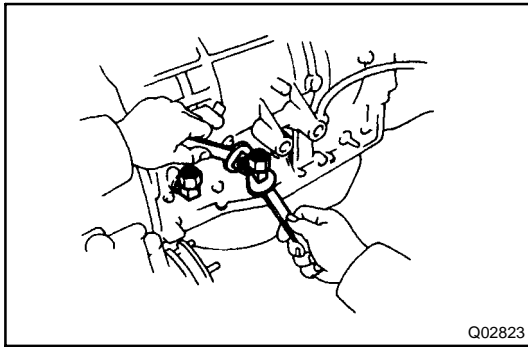


- (c) Remove the 2 bolts and park/neutral position switch.

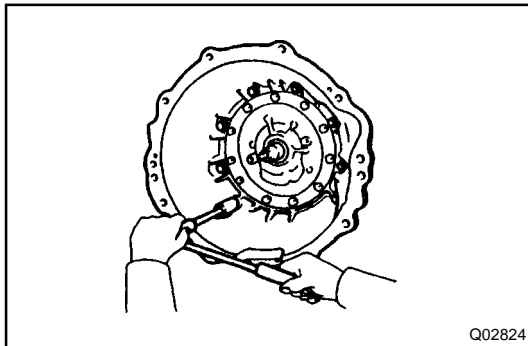


**6. REMOVE TRANSMISSION TEMPERATURE SENSOR**

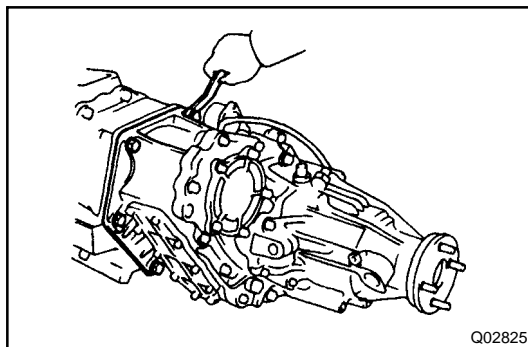
- (a) Remove the sensor the from front union.
- (b) Remove the O-ring from the sensor.

**7. REMOVE OIL COOLER UNIONS**

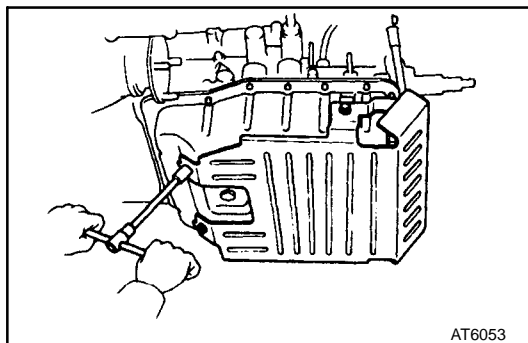
- (a) Remove the 2 unions.
- (b) Remove the O-rings from both the unions.

**8. REMOVE TRANSMISSION HOUSING**

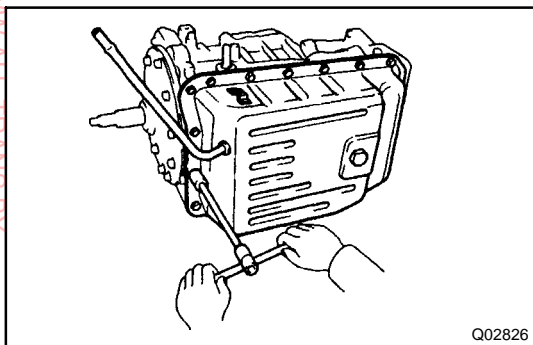
- (a) Remove the throttle cable clamp bolt.
- (b) Remove the 8 bolts and transmission housing.

**9. REMOVE TRANSFER ASSEMBLY**

Remove the 6 bolts and the transfer.

**10. REMOVE OIL PAN PROTECTOR**

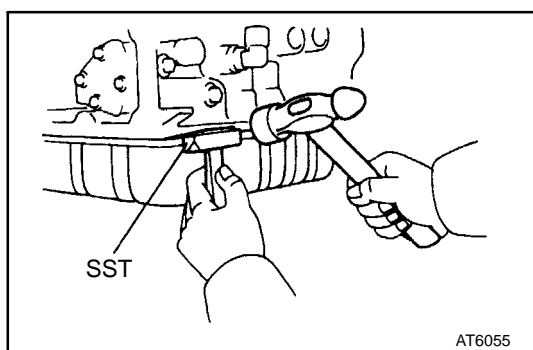
Remove the 4 bolts and protector.



## 11. REMOVE OIL PAN

**NOTICE:** Do not turn the transmission over as this will contaminate the valve body with any foreign matter at the bottom.

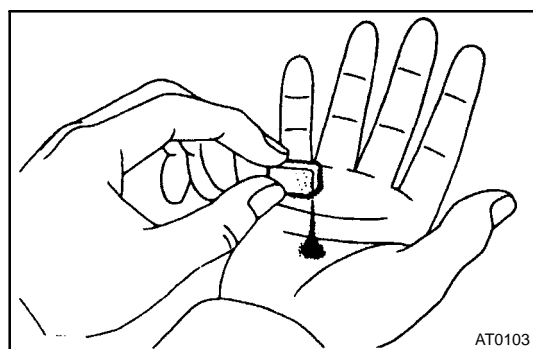
(a) Remove the 20 bolts.



(b) Tap in the SST blade between the transmission and oil pan, cut off applied sealer.

SST 09302-00100

**NOTICE:** Be careful not to damage the oil pan flange.

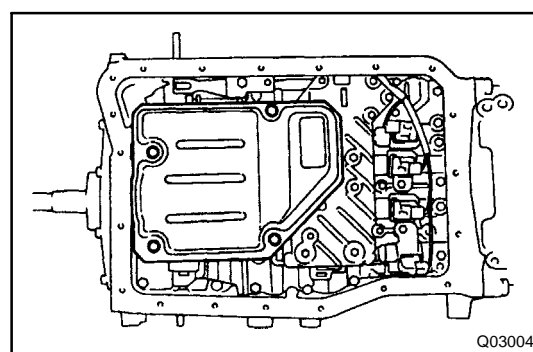


## 12. EXAMINE PARTICLES IN PAN

Remove the magnets and use there to collect any steel particles.

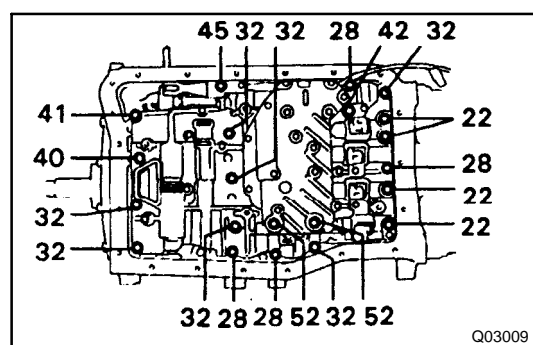
Carefully look at the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission:

- © **Steel (magnetic): Bearing, gear, and clutch**
- © **Brass (non-magnetic): Bushing wear**



## 13. REMOVE OIL STRAINER

Remove the 4 bolts and oil strainer.

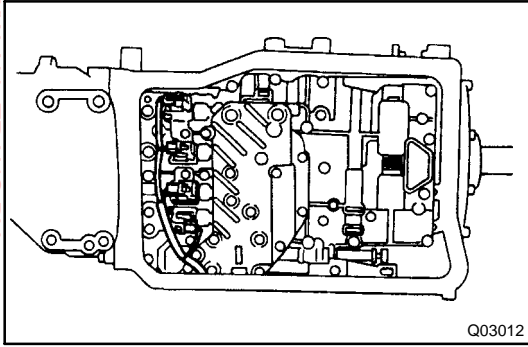


## 14. REMOVE VALVE BODY

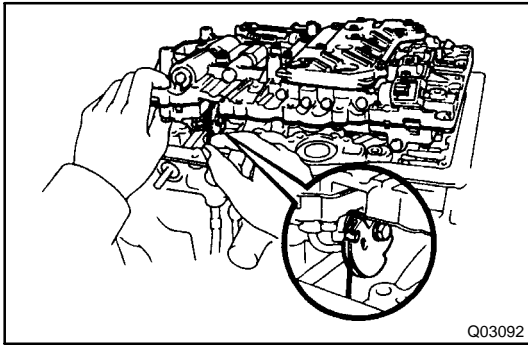
(a) Remove the 21 bolts.

The length (mm) of the bolts is indicated in the illustration.

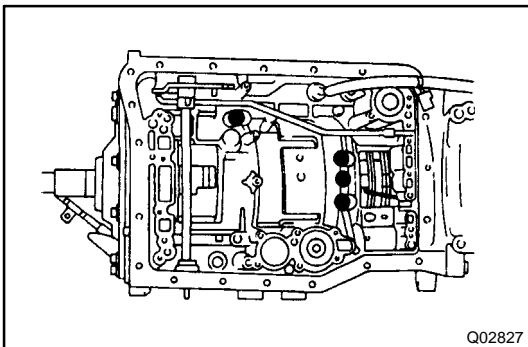




- (b) Disconnect the 4 connectors from the solenoids.

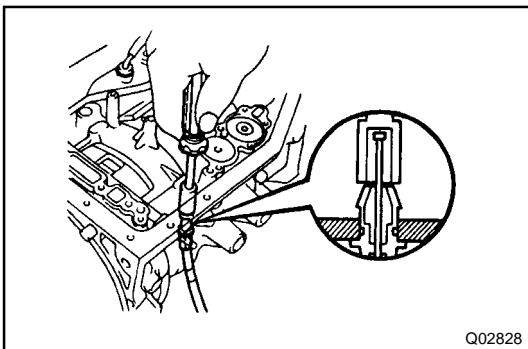


- (c) Disconnect the throttle cable from the cam and remove the valve body.



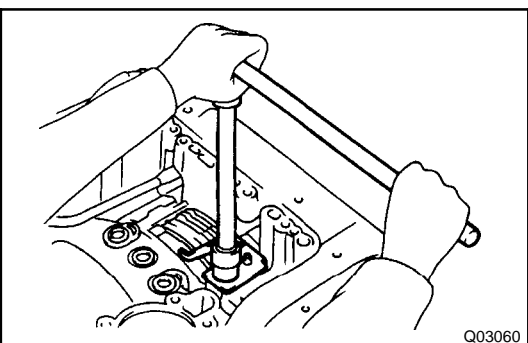
**15. REMOVE O/D CASE AND CENTER SUPPORT  
APPLY GASKETS**

Remove the 4 apply gaskets.



**16. REMOVE THROTTLE CABLE**

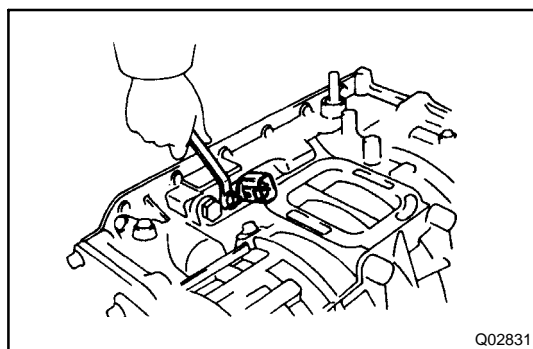
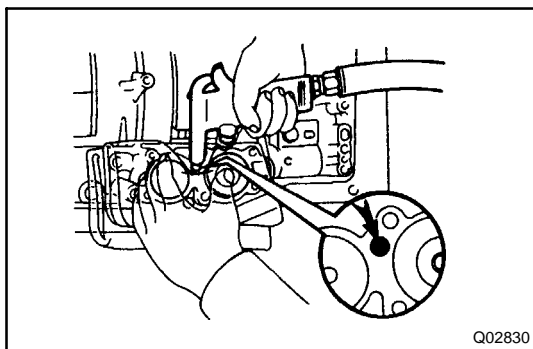
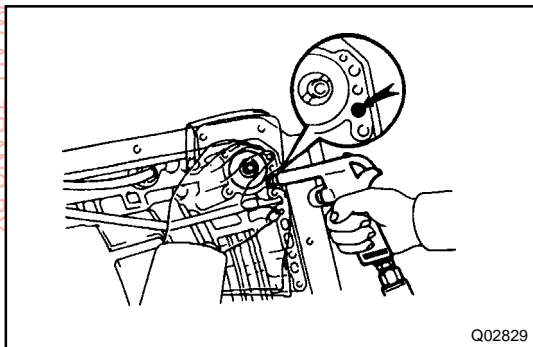
Using 10 mm socket driver, remove the throttle cable by pushing the retainer portion of the throttle cable.



**17. REMOVE ONE-WAY CLUTCH RETAINER**

## 18. REMOVE C<sub>2</sub> B<sub>0</sub> B<sub>2</sub> ACCUMULATOR PISTONS AND SPRINGS

- Remove the C<sub>2</sub> accumulator piston and spring by applying compressed air 392 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57-114 psi) to the oil hole.
- Remove the B<sub>0</sub> accumulator piston together with the B<sub>2</sub> accumulator piston by applying compressed air to the oil hole.
- Remove the B<sub>0</sub> and B<sub>2</sub> accumulator pistons.
- Remove the O-ring from the accumulator pistons.

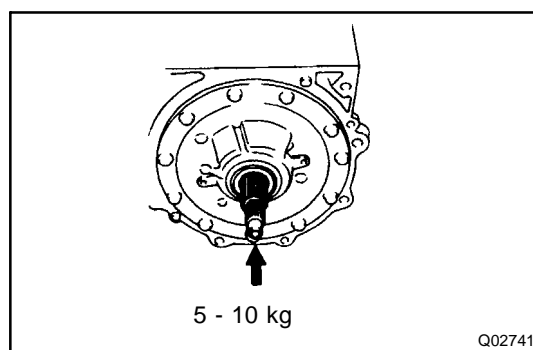


## 19. REMOVE SOLENOID WIRING

- Remove the bolt and the solenoid wiring.
- Remove the O-ring from it.

## 20. CHECK THRUST CLEARANCE OF OVERDRIVE INPUT SHAFT (OVERDRIVE PLANETARY GEAR)

- Push the O/D input shaft toward the rear of the transmission by applying a force of 49 - 98 N (5 - 10 kgf, 11.0 - 22.0 lbf).



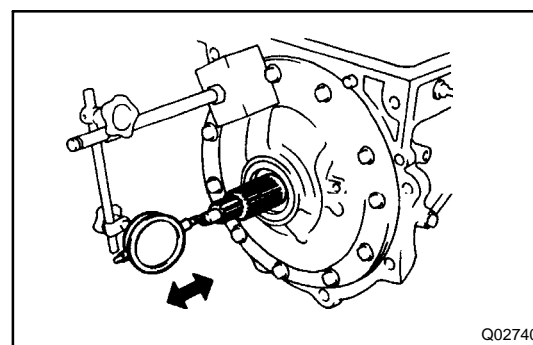
- Using dial indicator, measure the thrust clearance of the input shaft.

**Standard thrust clearance.**

**0.40 - 0.90 mm (0.0157 - 0.0354 in.)**

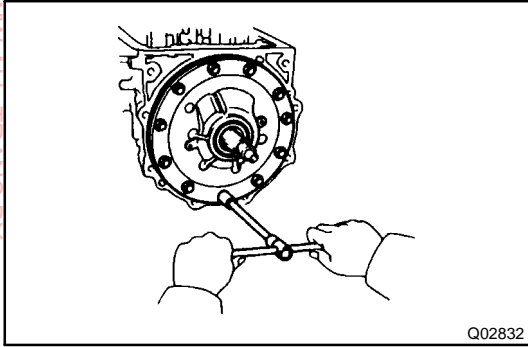
**Maximum thrust clearance:**

**0.90 mm (0.0354 in.)**

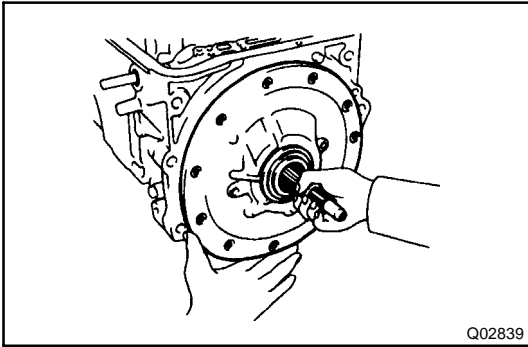


**21. REMOVE OIL PUMP**

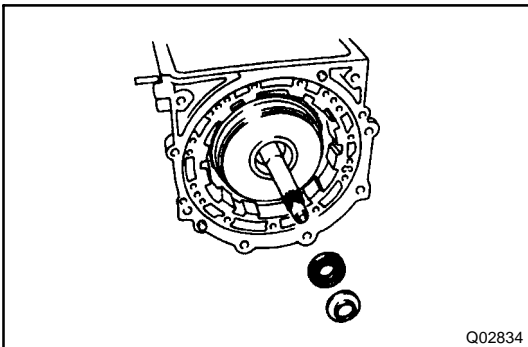
- (a) Remove the 11 bolts holding the oil pump to the transmission case.



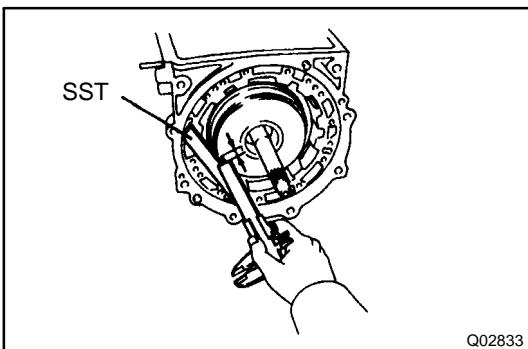
- (b) Remove the oil pump and gasket.  
 (c) Remove the O-ring from the oil pump.  
 (d) Remove the oil pump gasket.



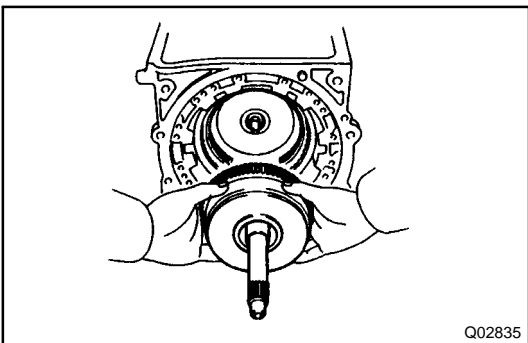
- (d) Remove the race and thrust bearing from the O/D direct clutch drum or oil pump.

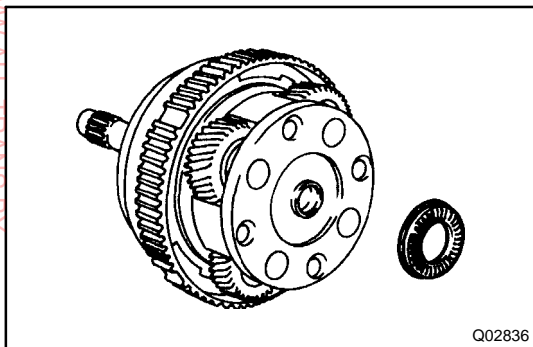
**22. REMOVE OVERDRIVE PLANETARY GEAR, OVERDRIVE DIRECT CLUTCH AND ONE-WAY CLUTCH ASSEMBLY**

- (a) Place SST on the installation surface of the oil pump.  
 09350 - 36010 (09350 - 06090)  
 (b) Using calipers, measure the distance between the tops of SST and the clutch drum for assembly.

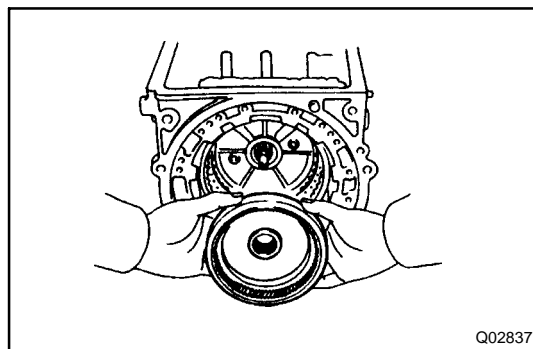


- (c) Remove the O/D planetary gear, direct clutch and one-way clutch assembly.



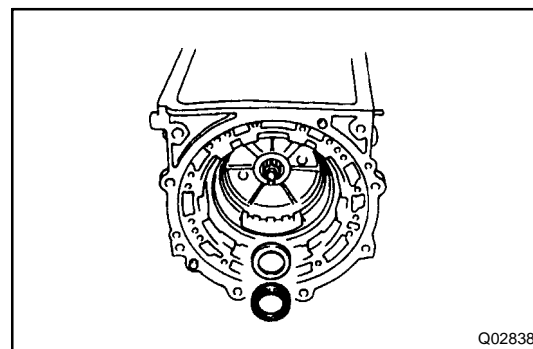


- (d) Remove the bearing from the O/D planetary gear or ring gear flange.

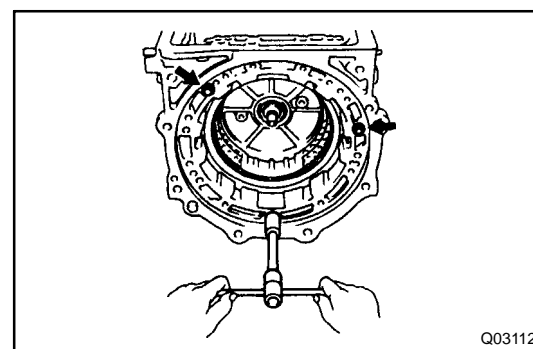


### 23. REMOVE OVERDRIVE PLANETARY RING GEAR ASSEMBLY

- (a) Remove the ring gear assembly from the O/D case.

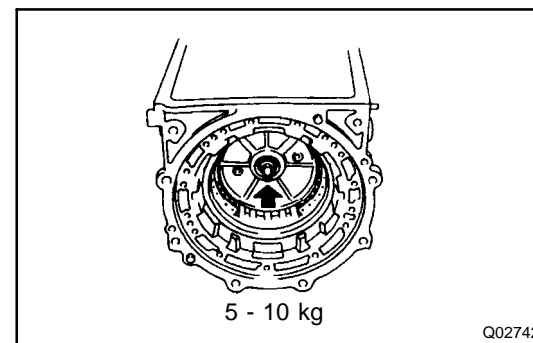


- (b) Remove the thrust bearing and race from the O/D case or ring gear flange.

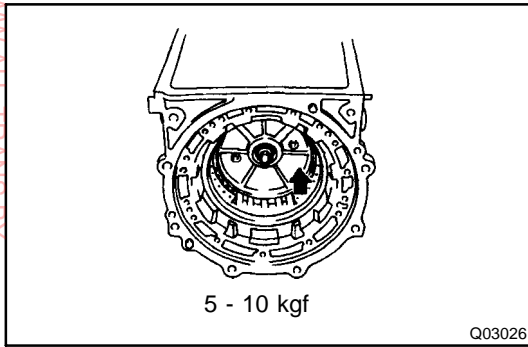


### 24. CHECK THRUST CLEARANCE OF INPUT SHAFT (FRONT CLUTCH DRUM)

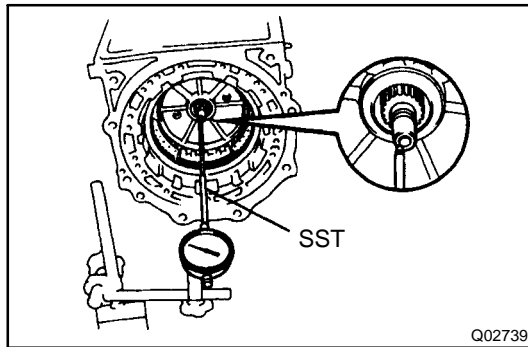
- (a) Temporarily install the 3 bolts.



- (b) Push the transmission output shaft toward the front of the transmission by applying a force of 49 - 98 N (5-10 kgf, 11.0 - 22.0 lbf).



- (c) Push the O/D case toward the rear of the transmission by applying a force of 49 - 98 N (5 - 10 kgf, 11.0-22.0 lbf).



- (d) Using SST and dial indicator, measure the thrust clearance of the input shaft.

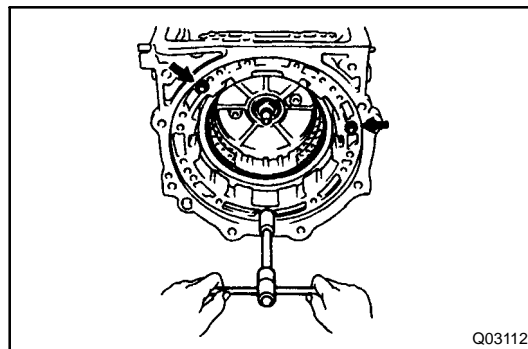
SST 09350-36010 (09350-06130)

**Standard thrust clearance:**

**0.30 - 0.70 mm (0.0118 - 0.0276 in.)**

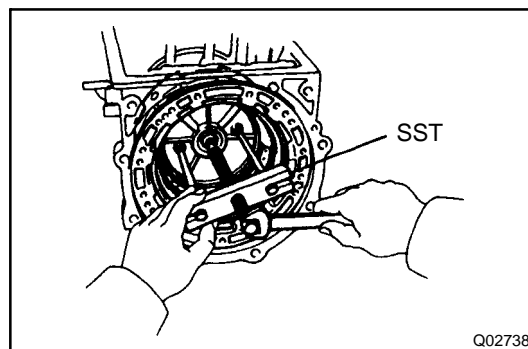
**Maximum thrust clearance:**

**0.70 mm (0.0276 in.)**



## 25. REMOVE OVERDRIVE CASE ASSEMBLY

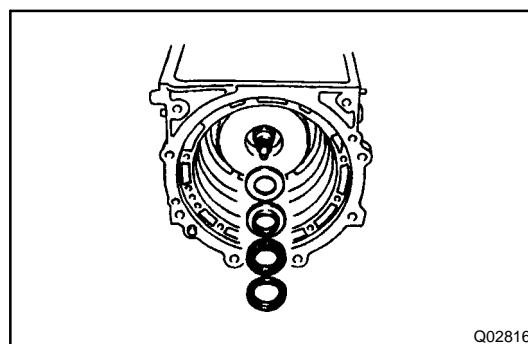
- (a) Remove 3 bolts.



- (b) Using SST, remove the O/D case assembly.

SST 09350-36010 (09350-06140)

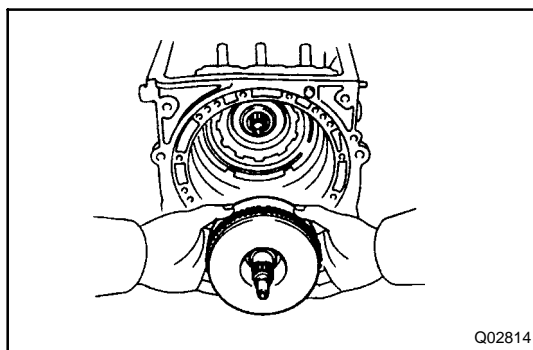
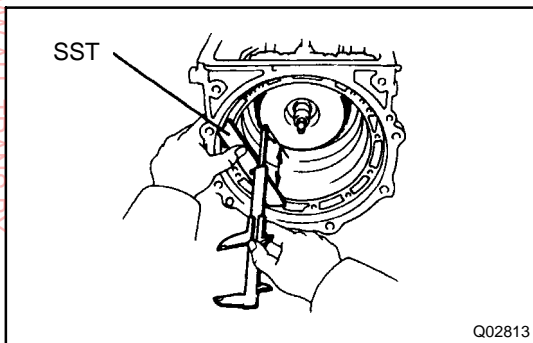
- (c) Remove the 3 O-rings from the oil holes of the O/D case.



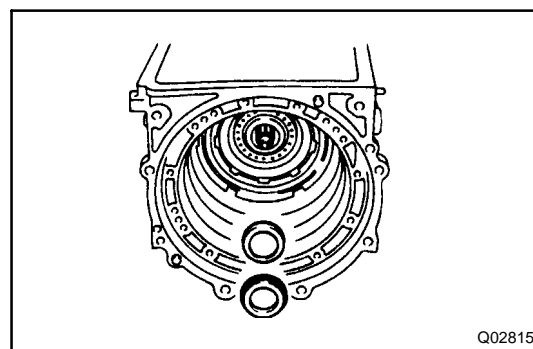
- (d) Remove the oil seal ring from the input shaft.  
 (e) Remove the 2 races, thrust bearing and spacer from the front clutch drum or O/D case.  
 (f) Reinstall the oil seal ring to the input shaft.

**26. REMOVE FRONT CLUTCH ASSEMBLY**

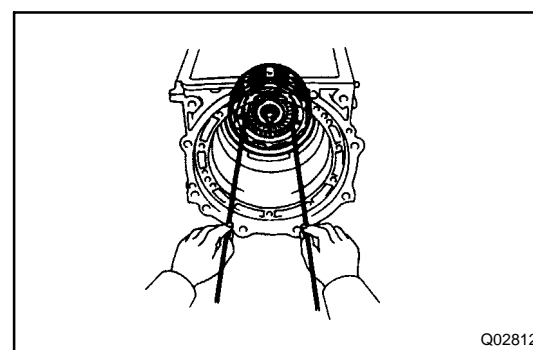
- (a) Place SST, on the installation surface of the oil pump.  
SST 09350-36010 (09350-06090)
- (b) Using calipers, measure the distance between the tops of SST and the clutch drum for assembly.



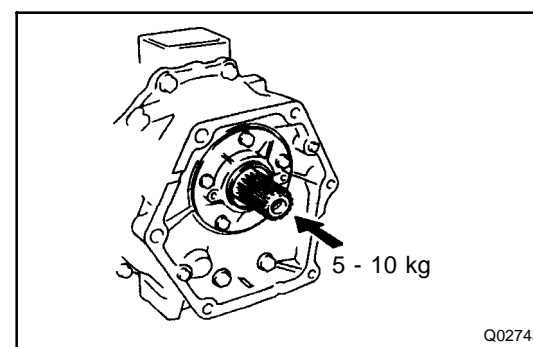
- (c) Remove the front clutch assembly.



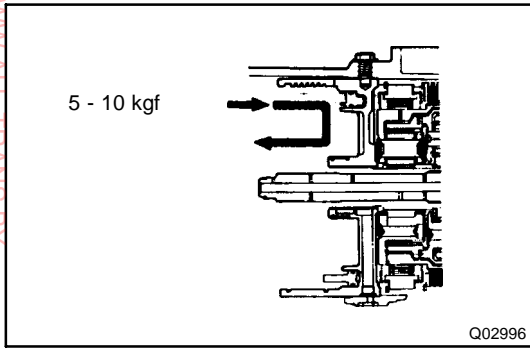
- (d) Remove the race and thrust bearing from the rear clutch drum or front clutch hub.

**27. REMOVE REAR CLUTCH ASSEMBLY**

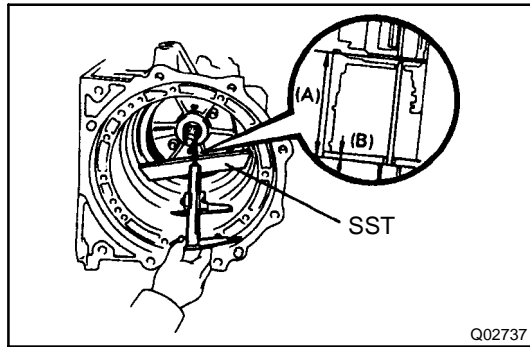
Install 2 wires into flukes of the clutch discs, and remove the rear clutch assembly.

**28. CHECK THRUST CLEARANCE OF CENTER SUPPORT, AND REMOVE CENTER SUPPORT ASSEMBLY**

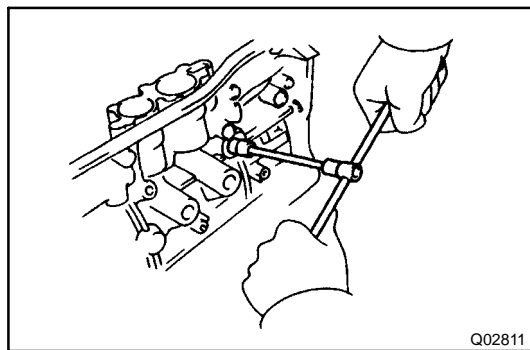
- (a) Push the transmission output shaft toward the front of the transmission by applying a force of 49 - 98 N (5-10 kgf, 11.0 - 22.0 lbf).



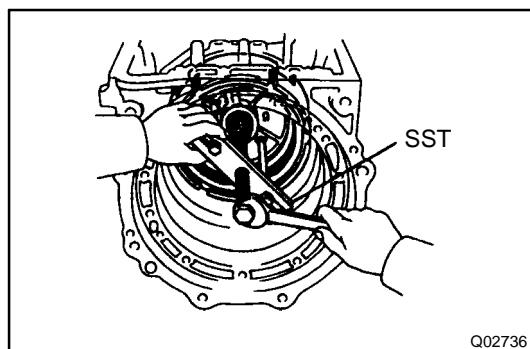
- (b) Push the center support toward the rear of the transmission by applying a force of 49 - 98 N (5 - 10 kgf, 11.0 - 22.0 lbf), then pull with the same amount of force.



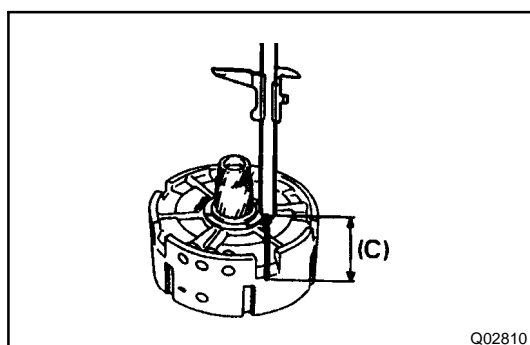
- (c) Place SST on the center support.  
SST 09350-36010 (09350-06090)
- (d) Using calipers, measure distance (A) between the tops of SST and the thrust washer on the front planetary gear.
- (e) Using calipers, measure the thickness (B) of SST.



- (f) Remove the 3 center support set bolts.



- (g) Using SST, remove the center support assembly.  
SST 09350-36010 (09350-06140)



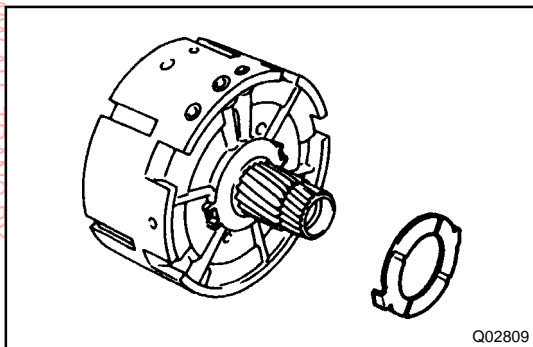
- (h) Turn the center support together with the thrust washer, and place it on that surface.
- (i) Inserting the calipers into the thrust washer hole, measure the distance (C) between it and the flat surface.

**Center support thrust clearance:**

$$A - (B + C)$$

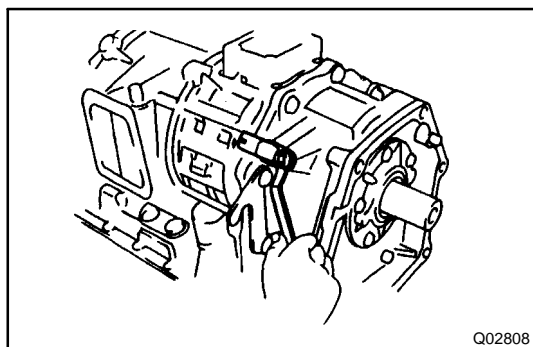
**Standard thrust clearance:**

0.30 - 0.70 mm (0.0118 - 0.0276 in.)

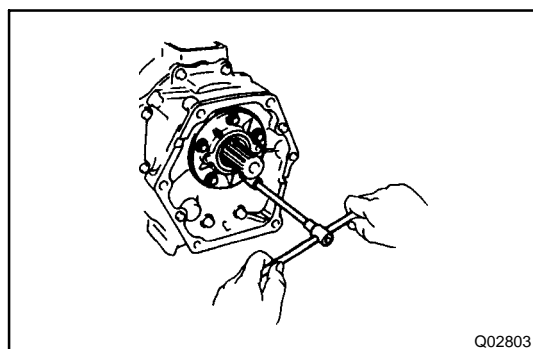


**Maximum thrust clearance:**  
**0.90 mm (0.0354 in.)**

- (j) Remove the thrust washer from the center support.

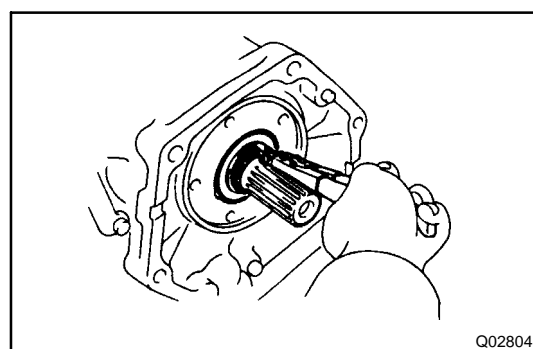


## 29. REMOVE SPEED SENSOR

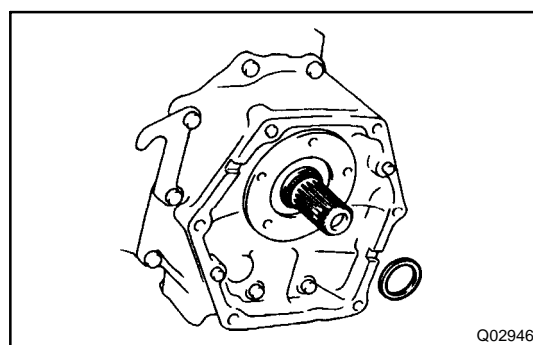


## 30. REMOVE TRANSFER ADAPTOR AND OUTPUT SHAFT REAR BEARING

- (a) Remove the 5 bolts and the rear bearing retainer.

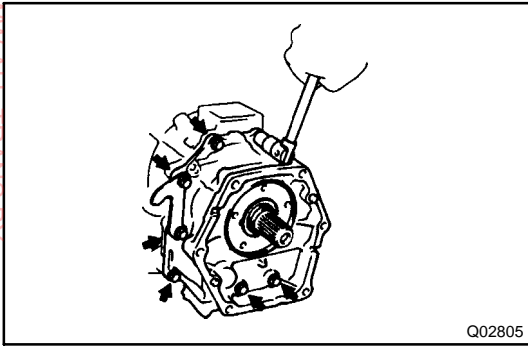


- (b) Using snap ring pliers, remove the snap ring.

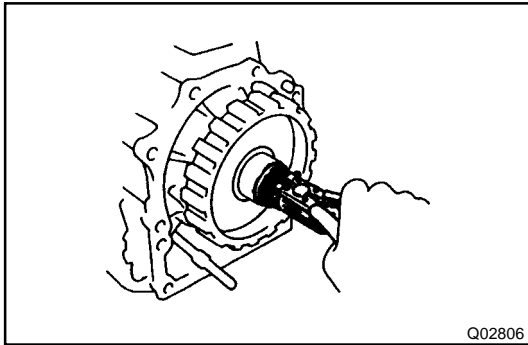


- (c) Remove the spacer from the output shaft.



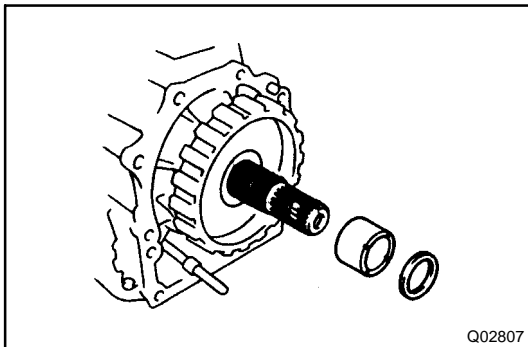


- (d) Remove the 10 bolts and the adaptor.
- (e) Remove the gasket.

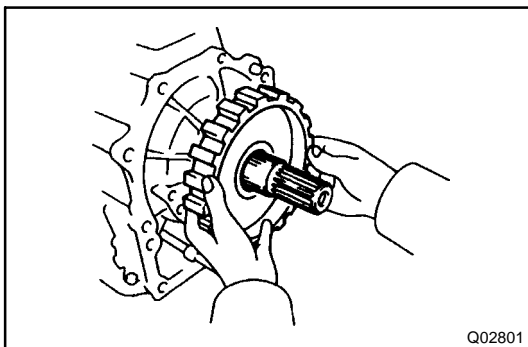


### 31. REMOVE OUTPUT SHAFT SPACER

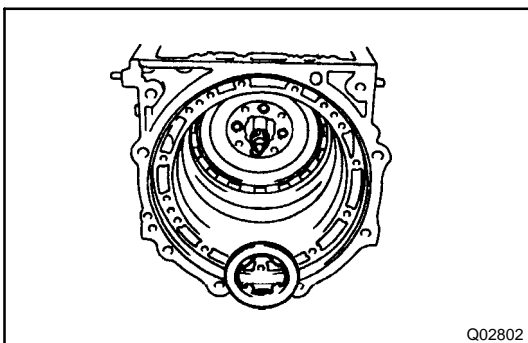
- (a) Using snap ring pliers, remove the snap ring.



- (b) Remove the output shaft spacer.

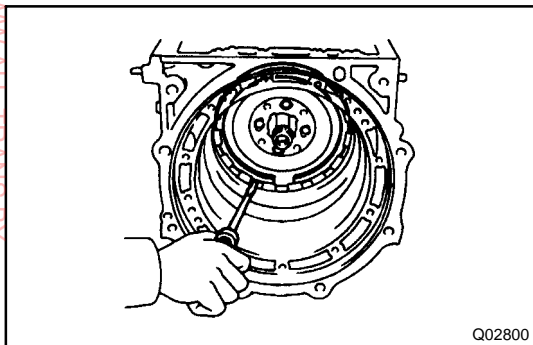


### 32. REMOVE SPEED SENSOR ROTOR

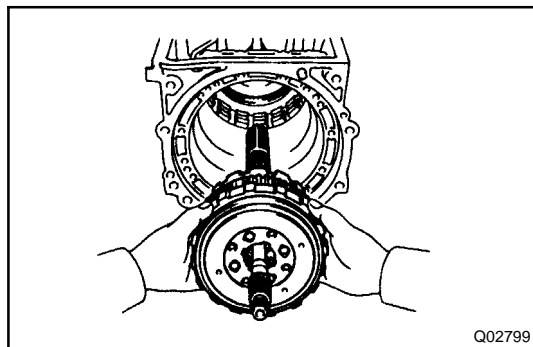


### 33. REMOVE PLANETARY GEARS, ONE-WAY CLUTCH AND OUTPUT SHAFT ASSEMBLY

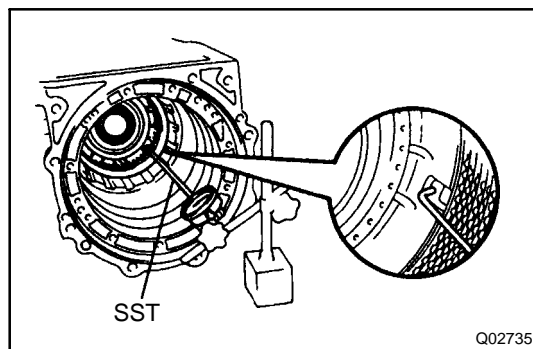
- (a) Remove the thrust washer from the planetary gear.



- (b) Using a screwdriver, remove the snap ring.



- (c) Remove the planetary gears, one-way clutch and output shaft assembly.



### 34. CHECK PISTON STROKE OF FIRST AND REVERSE BRAKE PISTON

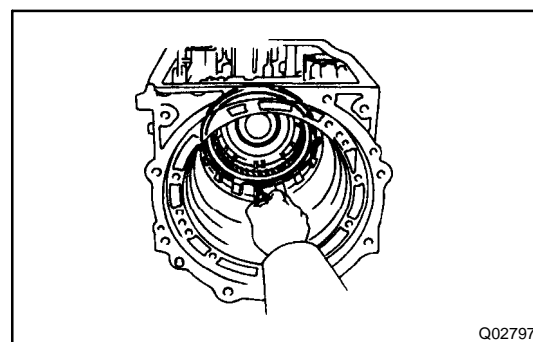
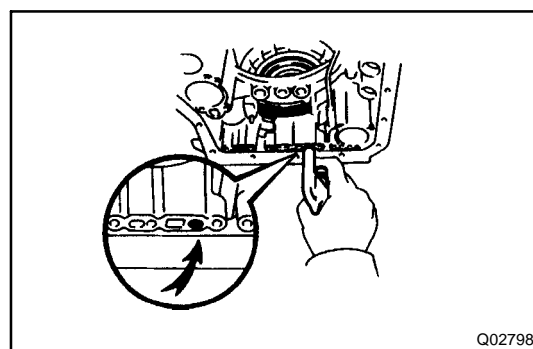
Using SST and a dial indicator, measure the piston stroke while applying and releasing compressed air 392 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi).

SST 09350-36010 (09350-06130)

**Piston stroke:**

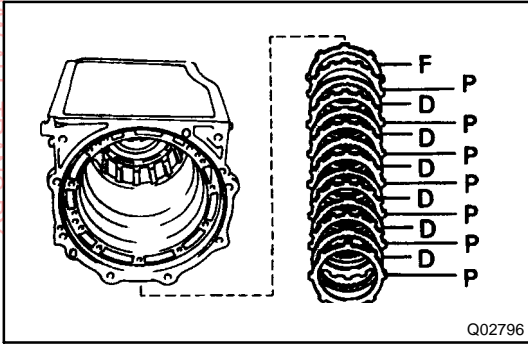
**3.30 - 3.80 mm (0.1299 - 0.1496 in.)**

If the piston stroke is not as specified, inspect the discs.

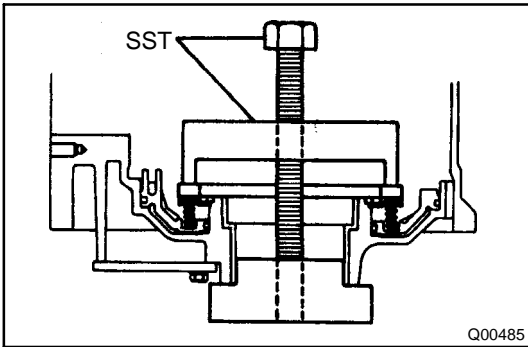


### 35. REMOVE FIRST AND REVERSE BRAKE PISTON

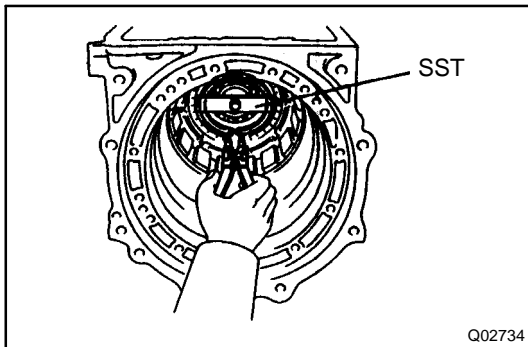
- (a) Using a screwdriver, remove the snap ring.



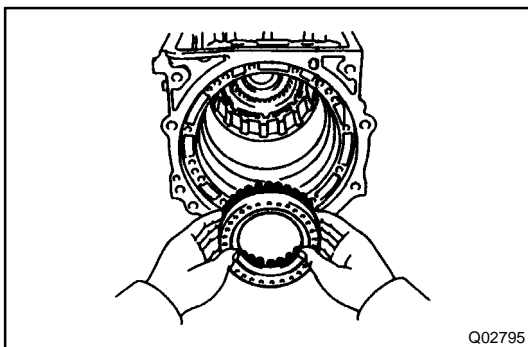
- (b) Remove the flange, 6 plates and cushion plate.



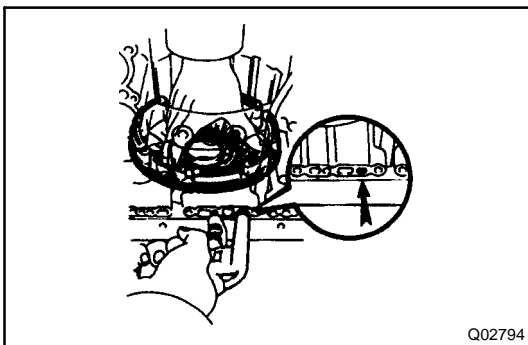
- (c) Set SST on the spring retainer, and compress the return spring.  
SST 09350-36010 (09350-06030)



- (d) Using snap ring pliers, remove the snap ring.



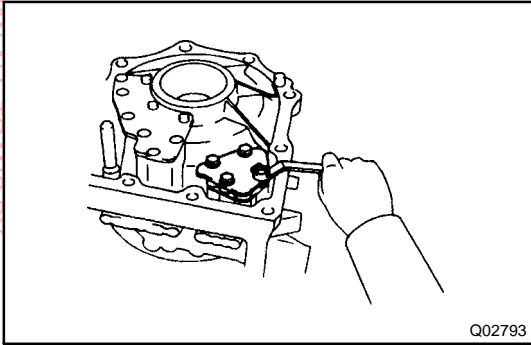
- (e) Remove the piston return spring.



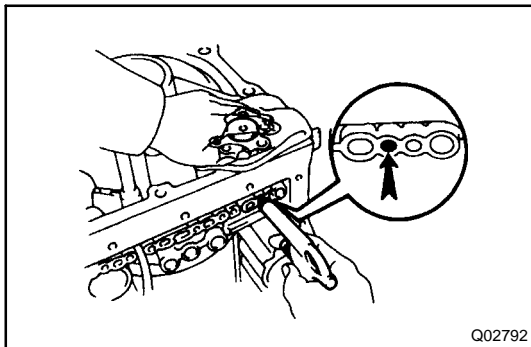
- (f) Holding first and reverse brake piston, apply compressed air 392 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi) to the oil hole of the transmission case to remove the first and reverse brake piston.  
(g) Remove the 2 O-rings from brake piston.

**36. REMOVE C<sub>1</sub> ACCUMULATOR PISTON AND SPRING**

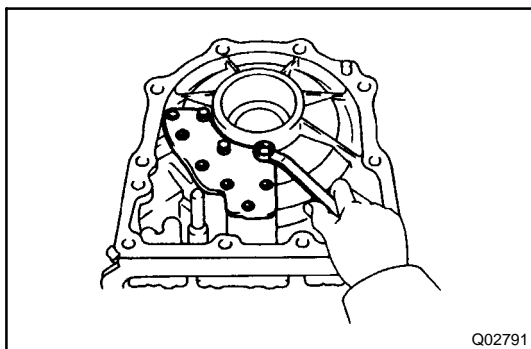
- (a) Remove the 4 bolts, front clutch accumulator cover, 2 gaskets and plate.



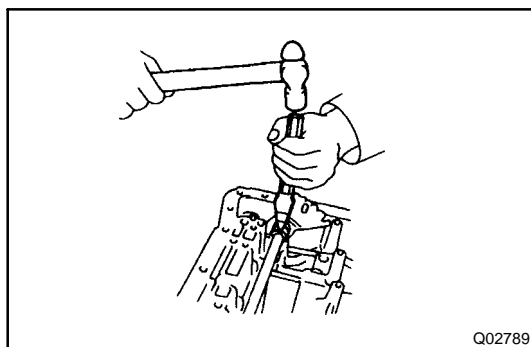
- (b) Remove the accumulator piston and spring by applying compressed air 392 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57-114 psi) to the oil hole.
- (c) Remove the O-rings from accumulator piston.

**37. REMOVE TRANSMISSION REAR COVER**

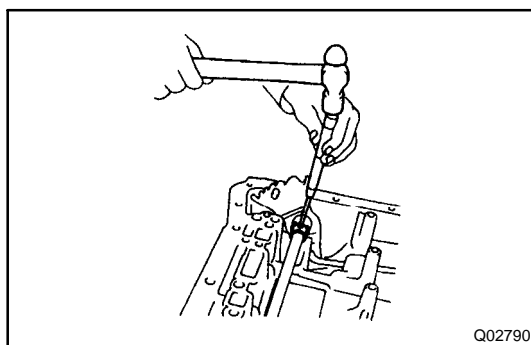
Remove the 3 bolts, 6 screws, rear cover and gasket.

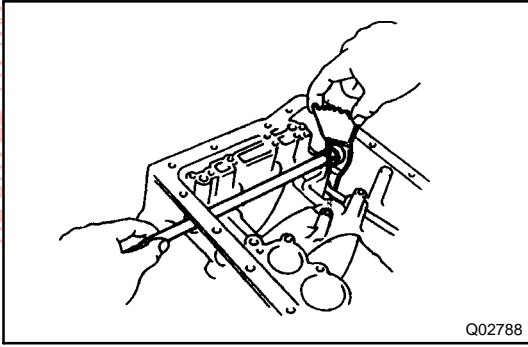
**38. REMOVE MANUAL VALVE LEVER, SHAFT AND OIL SEALS**

- (a) Using a chisel, cut off the spacer and remove it from the shaft.

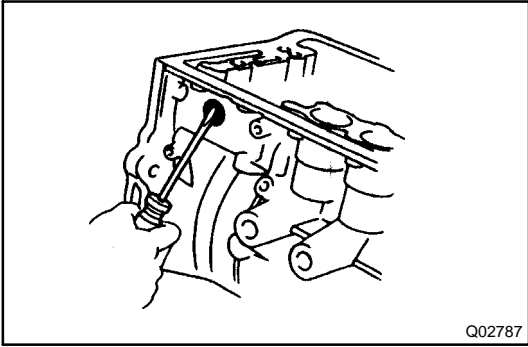


- (b) Using a pin punch, tap out the pin.





- (c) Pull the manual valve lever shaft out through the case, remove the manual valve lever. parking lock rod assembly, the 2 plate washers and wave washer.
- (d) Disconnect the parking lock rod from the manual valve lever.



- (d) Using a screwdriver, pry out the 2 oil seats.

## GENERAL NOTES

The instructions here are organized so that you work on only one component group at a time.

This will help avoid confusion from similar-looking parts of different subassemblies being on your workbench at the same time.

The component groups are inspected and repaired from the converter housing side.

As much as possible, complete the inspection, repair and assembly before proceeding to the next component group. If a component group cannot be assembled because parts are being ordered, be sure to keep all parts of that group in a separate container while proceeding with disassembly, inspection, repair and assembly of other component groups.

Recommended fluid of the automatic transmission is ATF type DEXRON II.

## GENERAL CLEANING NOTES:

1. All disassembled parts should be washed clean and any fluid passages and holes blown through with compressed air.
2. When using compressed air to dry parts, always aim away from yourself to prevent accidentally spraying automatic transmission fluid or kerosene on your face.
3. The recommended automatic transmission fluid or kerosene should be used for cleaning.

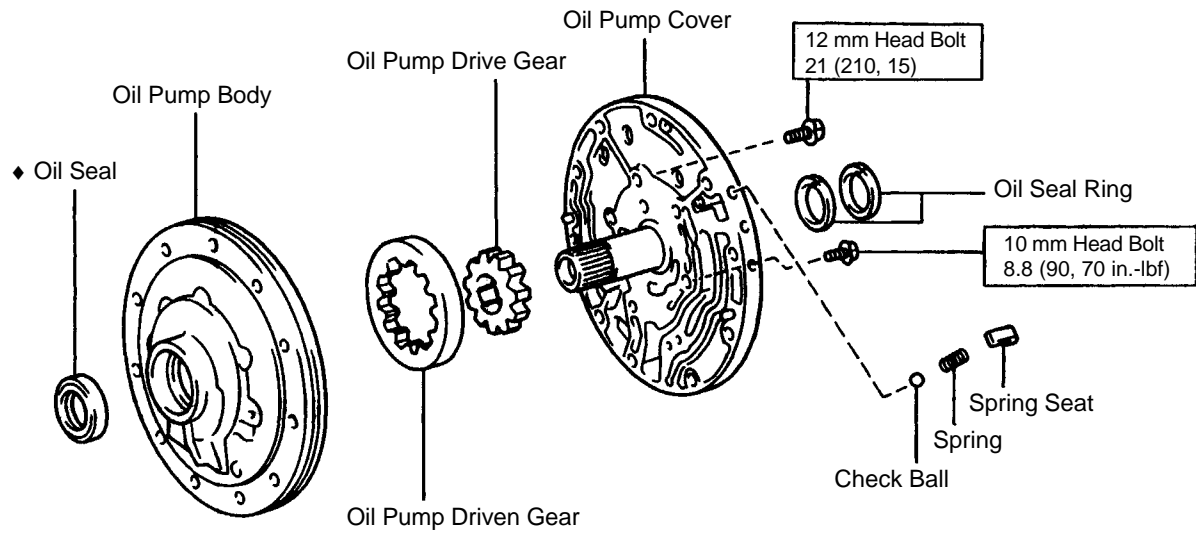
## PARTS ARRANGEMENT:

1. After cleaning, the parts should be arranged in the correct order to allow performing inspection, repairs and reassembly with efficiency.
2. When disassembling valve body, be sure to keep each valve together with the corresponding spring.
3. New discs for the brakes and clutches that are to be used for replacement must be soaked in transmission fluid for at least 15 minutes before assembly.

## GENERAL ASSEMBLY:

1. All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with transmission fluid prior to reassembly.
2. Make sure that the ends of snap rings are not aligned with one of the cutouts and are installed in the groove correctly.
4. If a worn bushing is to be replaced, the subassembly containing that bushing must also be replaced.
5. Check thrust bearings and races for wear or damage, Replace if necessary.
6. Use petroleum jelly to keep parts in place.

# OIL PUMP COMPONENTS

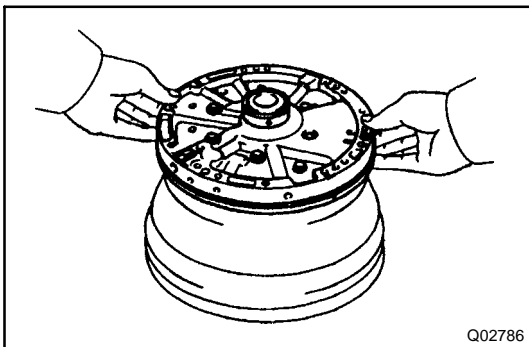


N-m (kgf-cm, ft-lbf) : Specified torque  
 ♦ Non-reusable part

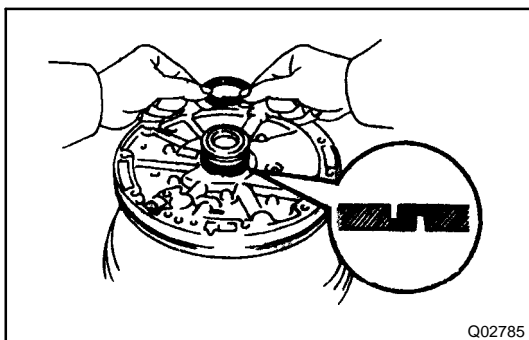
Q02657

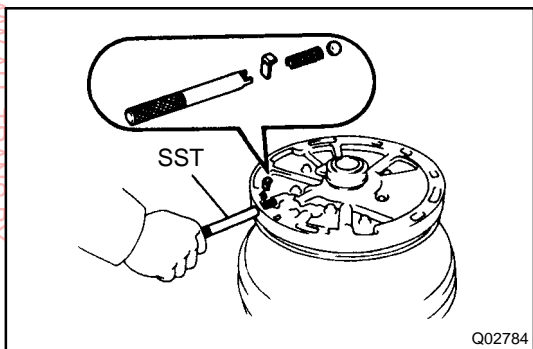
## COMPONENTS DISASSEMBLY

1. **USE TORQUE CONVERTER CLUTCH AS WORK STAND**



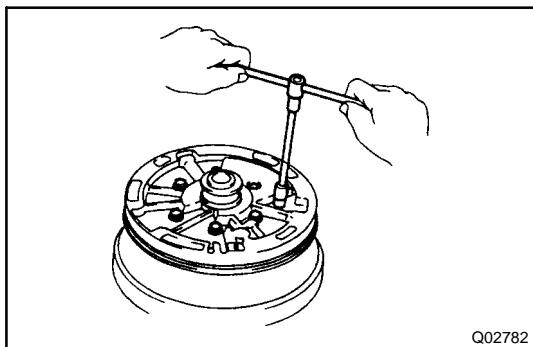
2. **REMOVE OIL SEAL RINGS**  
Remove the 2 oil seal rings.



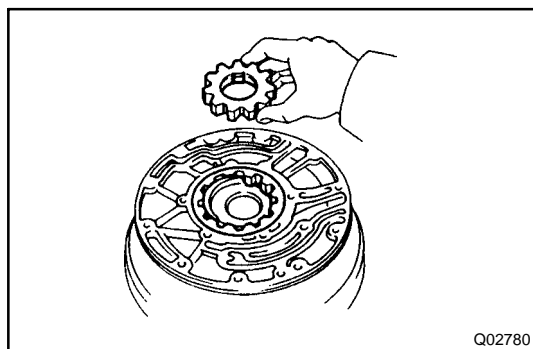


### 3. REMOVE CHECK BALL

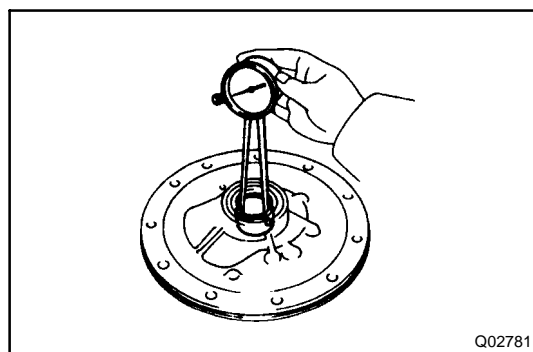
- (a) Using SST, compress the spring and remove the spring seat.  
SST 09350-36010 (09350-06100)
- (b) Remove the spring and check ball.



### 4. REMOVE 7 BOLTS AND PUMP COVER



### 5. REMOVE OIL PUMP DRIVE AND DRIVEN GEARS



## OIL PUMP INSPECTION

### 1. INSPECT BUSHING OF OIL PUMP BODY

Using a dial indicator, measure the inside diameter.

**Standard inside diameter:**

42.050 - 42.075 mm (1.6555 - 1.6565 in.)

**Maximum inside diameter:**

42.13 mm (1.6587 in.)

If the inside diameter is greater than maximum, replace the pump body.

### 2. INSPECT BUSHINGS OF OIL PUMP COVER

Using a dial indicator, measure the inside diameter.

**Front bushing standard inside diameter:**

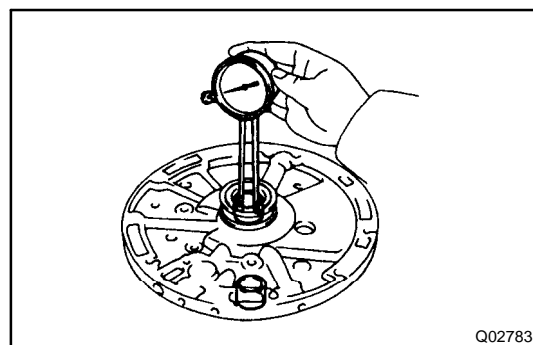
24.000 - 24.021 mm (0.9449 - 0.9457 in.)

**Rear bushing standard inside diameter:**

26.500 - 26.521 mm (1.0433 - 1.0441 in.)

**Front bushing maximum inside diameter:**

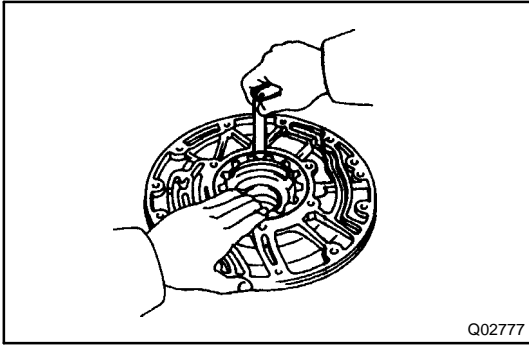
24.07 mm (0.9476 in.)





**Rear bushing maximum inside diameter:****26.57 mm (1.0461 in.)**

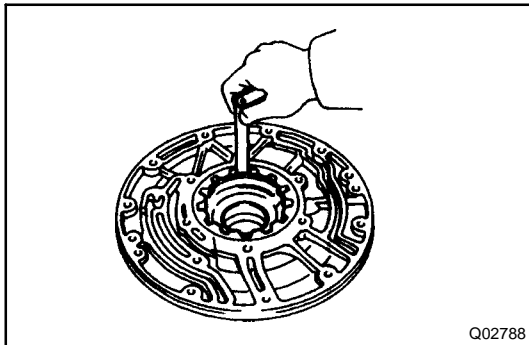
If the inside diameter is greater than the maximum, replace the pump cover.

**1. INSPECT BODY CLEARANCE OF DRIVEN GEAR**

- (a) Push the driven gear to one side of the body.
- (b) Use feeler gauge, measure the clearance between driven gear and body.

**Standard body clearance:****0.07 - 0.15 mm (0.0028 - 0.0059 in.)****Maximum body clearance:****0.3 mm (0.012 in.)**

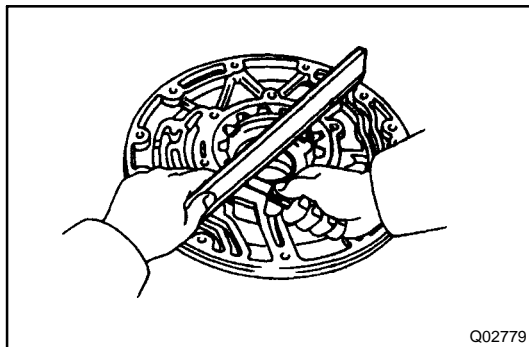
If the body clearance is greater than the maximum, replace the gears and pump body as a set.

**4. INSPECT TIP CLEARANCE OF DRIVEN GEAR**

Using a feeler gauge, measure the clearance between the gear teeth and the crescent-shaped part of the pump body.

**Standard tip clearance:****0.11 - 0.24 mm (0.0043 - 0.0094 in.)****Maximum tip clearance:****0.3 mm (0.012 in.)**

If the tip clearance is greater than the maximum, replace the gears and pump body as a set.

**5. INSPECT SIDE CLEARANCE OF DRIVE AND DRIVEN GEARS**

Using a steel straight edge and a feeler gauge, measure the clearance between the gears and steel straight edge.

**Standard side clearance:****0.02 - 0.05 mm (0.0008 - 0.0020 in.)****Maximum side clearance:****0.1 mm (0.04 in.)**

If the side clearance is greater than the maximum, select and replace the gears as set.

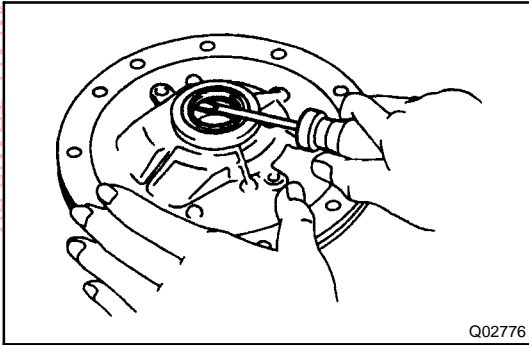
HINT: There are 2 different drive and driven gear thickness.

**Gear thickness:****11.967 - 11.982 mm (0.4711 - 0.4717 in.)****11.983 - 11.998 mm (0.4718 - 0.4724 in.)****11.999 - 12.014 mm (0.4724 - 0.4730 in.)**

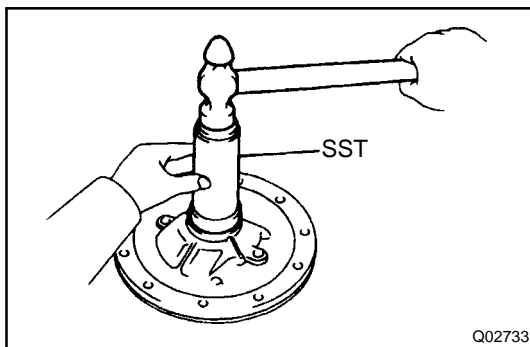
If necessary, replace the pump body.

**6. IF NECESSARY. REPLACE OIL SEAL**

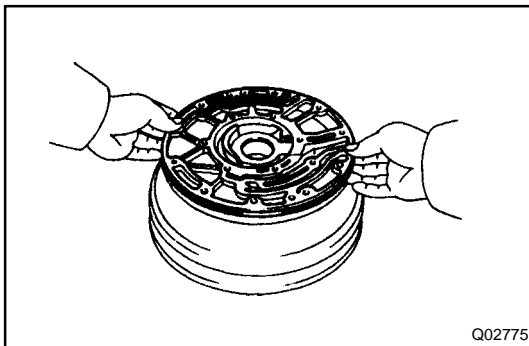
- (a) Using a screwdriver, pry off the oil seal.



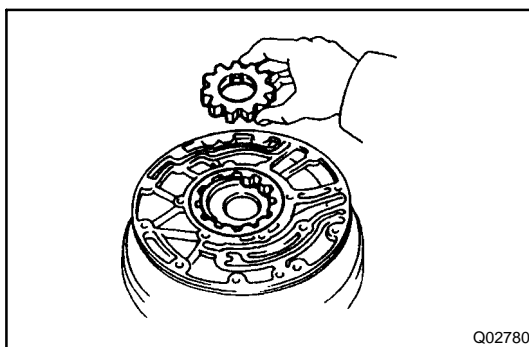
- (b) Using SST, tap in a new oil seal. The oil seal end should be with the outer edge of the pump body.  
SST 09350-36010 (09350-06040)



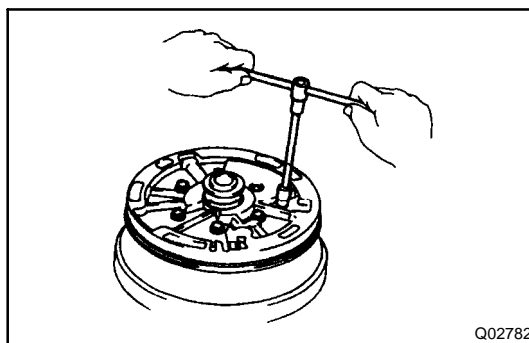
- (c) Apply MP grease to the oil seal lip.

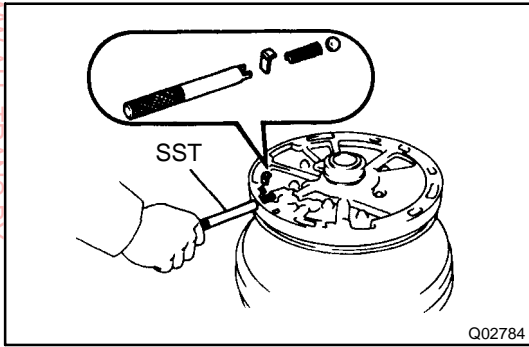
**OIL PUMP ASSEMBLY****1. PLACE OIL PUMP BODY ONTO TORQUE CONVERTER CLUTCH****2. INSTALL DRIVEN AND DRIVE GEARS TO OIL PUMP BODY**

- (a) Coat the driven and drive gears with ATF.  
(b) Install the driven and drive gears.

**3. INSTALL OIL PUMP COVER TO OIL PUMP BODY**

- (a) Align the bolt holes of the oil pump body and cover.  
(b) Install the pump cover with the 7 bolts.  
Torque (10 mm head bolt): 8.8 N-m (90 kgf-cm, 78 in.-lbf)  
Torque (12 mm head bolt): 21 N-m (210 kgf-cm, 15 ft-lbf)

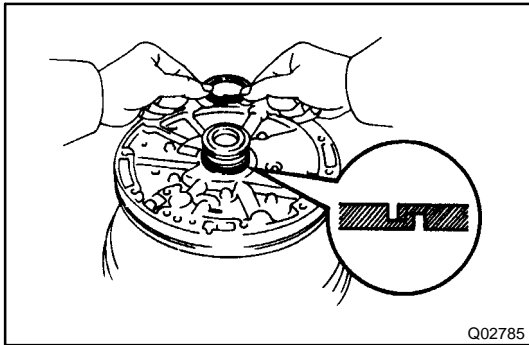




#### 4. INSTALL CHECK BALL

- (a) Install the check ball and spring.
- (b) Using SST, compress the spring and install the spring seat.

SST 09350-36010 (09350-06110)

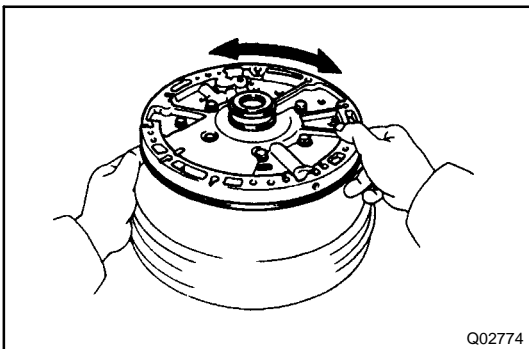


#### 5. INSTALL OIL SEAL RINGS

- (a) Coat the 2 oil seal rings with ATF.
- (b) Install the oil seal rings to the stator shaft, then snug them down by squeezing their ends together.

**NOTICE: Do not spread the ring ends too much.**

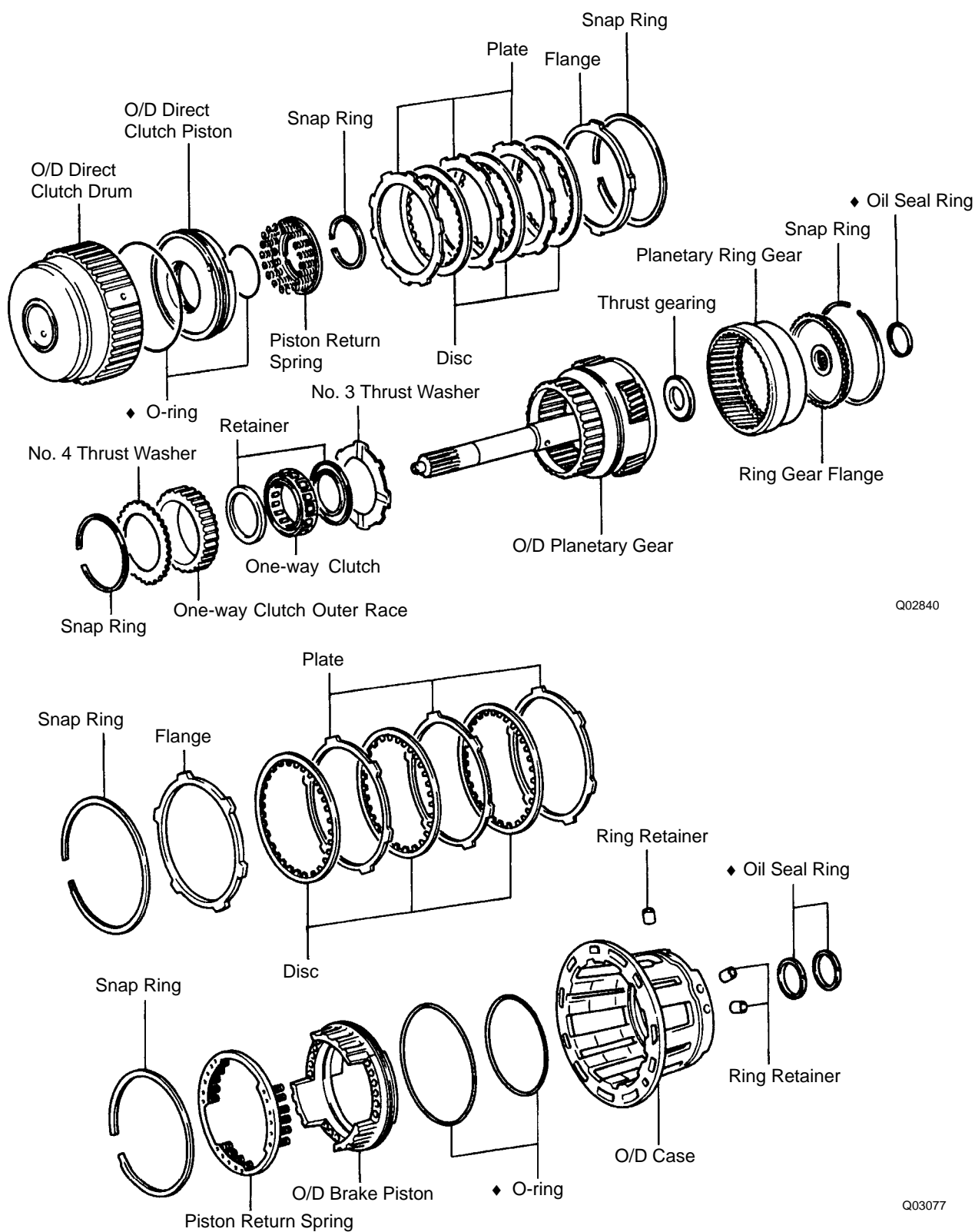
**HINT:** After installing the oil seal rings, check that they rotate smoothly.



#### 6. CHECK OIL PUMP DRIVE ROTATION

Make sure the drive gear rotates smoothly when installed to the torque converter clutch.

# OVERDRIVE UNIT COMPONENTS



Q02840

Q03077

◆ Non-reusable part

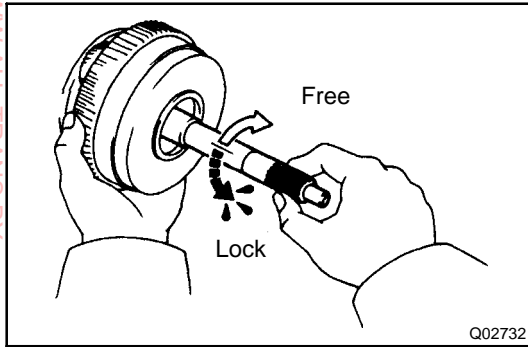
Z04681

## OVERDRIVE GEAR UNIT DISASSEMBLY

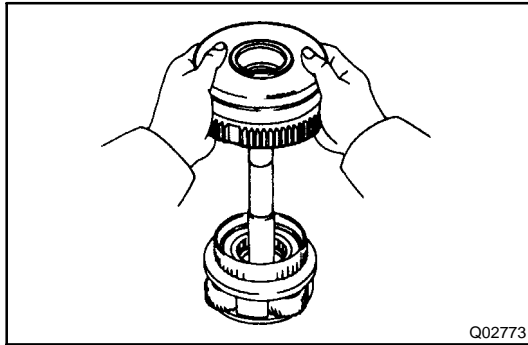
### 1. CHECK OPERATION OF ONE-WAY CLUTCH

Hold the O/D direct clutch drum and turn the input shaft.

The input shaft should turn freely clockwise and should lock counterclockwise.

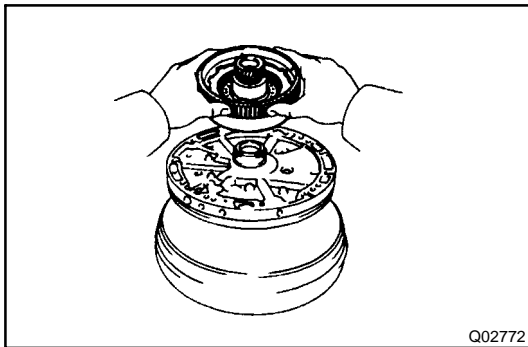


### 2. REMOVE OVERDRIVE DIRECT CLUTCH ASSEMBLY FROM OVERDRIVE PLANETARY GEAR



### 3. CHECK PISTON STROKE OF OVERDRIVE DIRECT CLUTCH

- (a) Place the oil pump onto the torque converter clutch, and then place the O/D direct clutch assembly onto the oil pump.



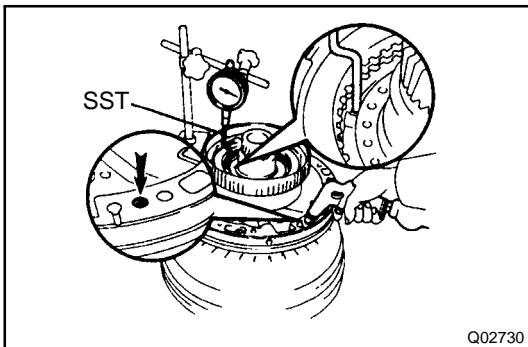
- (b) Using SST and a dial indicator, measure the piston stroke while applying and releasing compressed air 392 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi).

SST 09350-36010 (09350-06110)

**Piston stroke:**

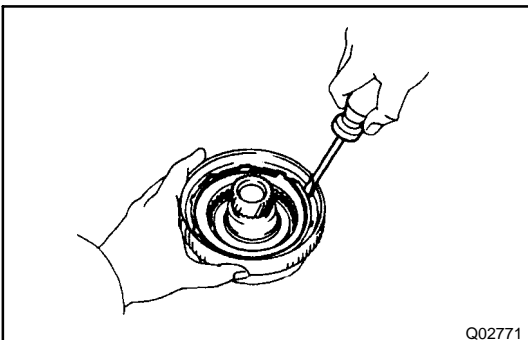
**1.80 - 2.00 mm (0.0709 - 0.0787 in.)**

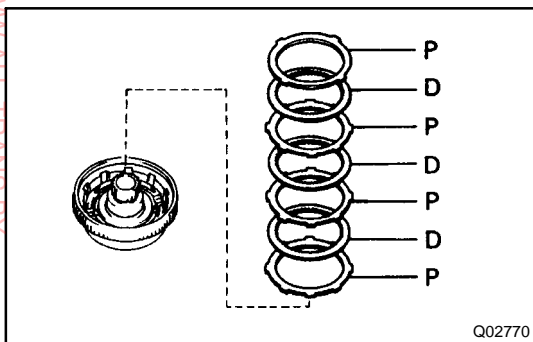
If the piston stroke is not as specified, inspect the discs.



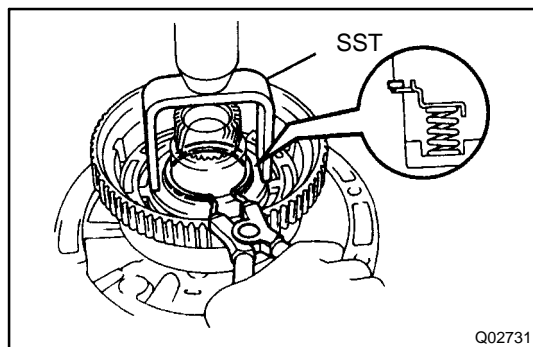
### 4. REMOVE FLANGE, PLATES AND DISCS

- (a) Using a screwdriver, remove the snap ring.



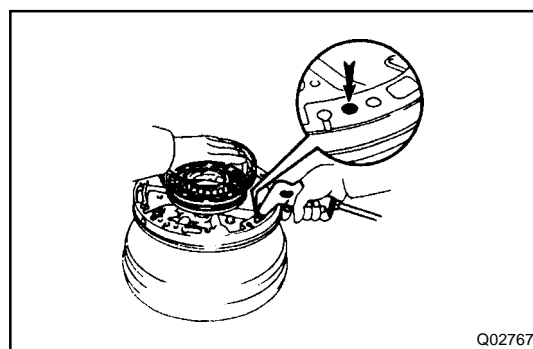


- (b) Remove the flange, 3 discs and 3 plates.



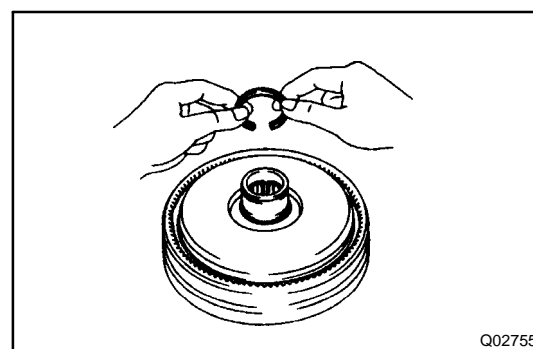
#### 5. REMOVE PISTON RETURN SPRING

- (a) Place SST on the spring seat, and compress the return spring with a shop press.  
SST 09350-36010 (09350-06010)
- (b) Using snap ring pliers, remove the snap ring.
- (c) Remove the piston return spring.

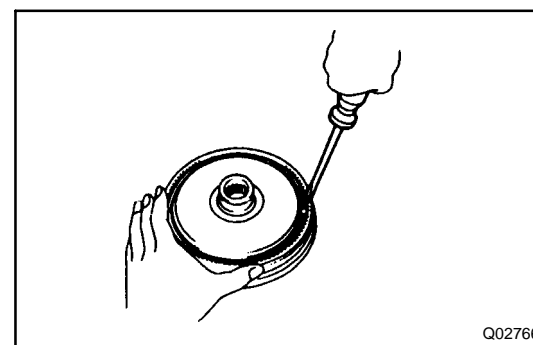


#### 6. REMOVE OVERDRIVE DIRECT CLUTCH PISTON

- (a) Place the oil pump onto the torque converter clutch, and then place the O/D direct clutch onto the oil pump.
- (b) Hold the clutch piston with hand, apply compressed air into the oil hole of the oil pump to remove the clutch piston.
- (b) Remove the 2 O-rings from the clutch piston.

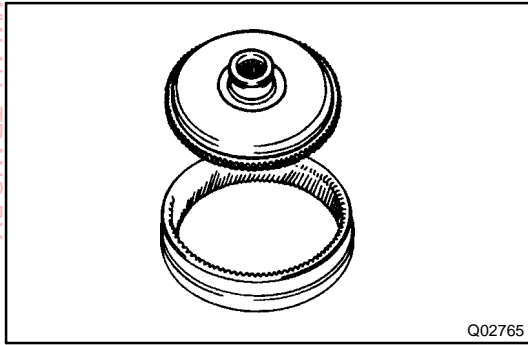


#### 7. REMOVE OIL SEAL RING FROM RING GEAR FLANGE

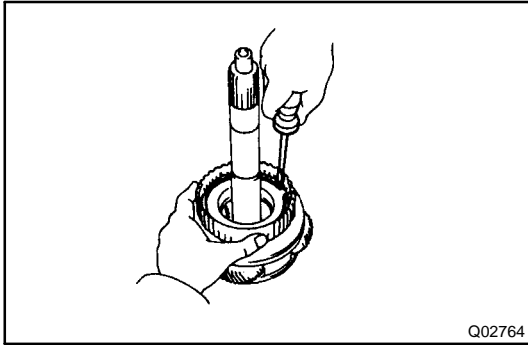


#### 8. REMOVE RING GEAR FLANGE

- (a) Using a small screwdriver, remove the snap ring.

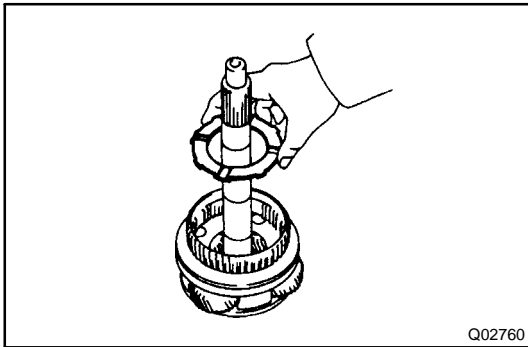


- (b) Remove the ring gear flange.

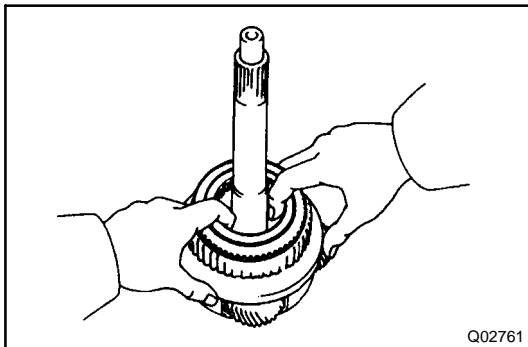


**9. REMOVE ONE-WAY CLUTCH FROM OVERDRIVE PLANETARY GEAR**

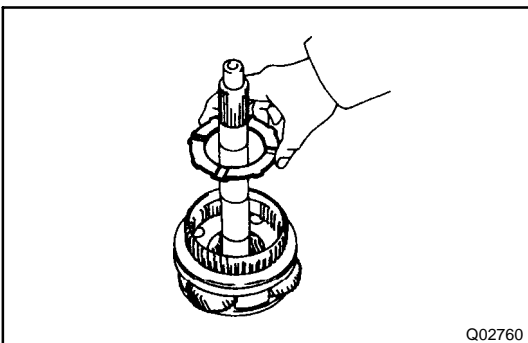
- (a) Using small screwdriver, remove the snap ring.



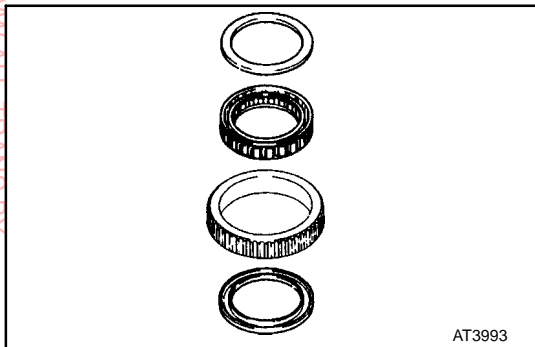
- (b) Remove the No. 4 thrust washer.



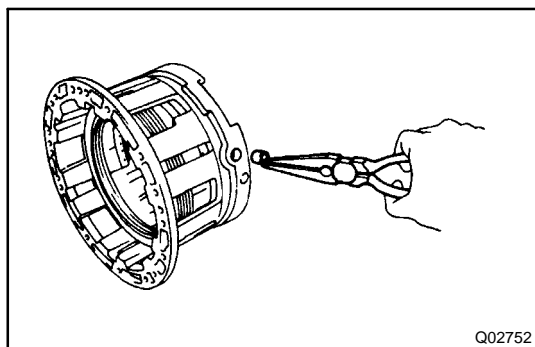
- (c) Remove the one-way clutch together with the outer race.



- (d) Remove the No. 3 thrust washer.

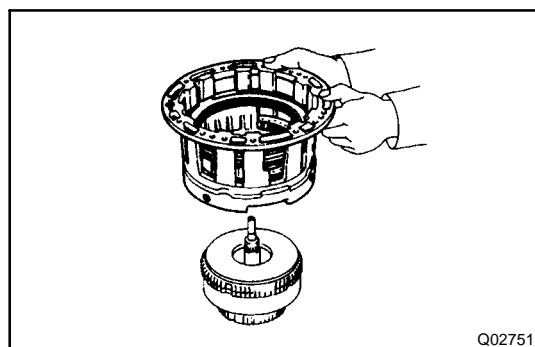


- (e) Remove the 2 retainers and one-way clutch from the outer race.



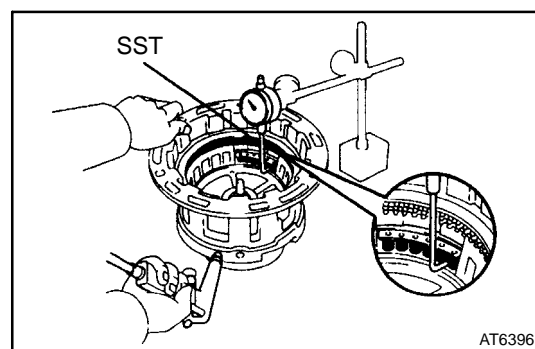
## 10. REMOVE RING RETAINERS

Using needle nose pliers, remove the 3 ring retainers from the oil holes of O/D case.



## 11. CHECK PISTON STROKE OF OVERDRIVE BRAKE

- (a) Place the O/D case assembly onto the rear clutch assembly.



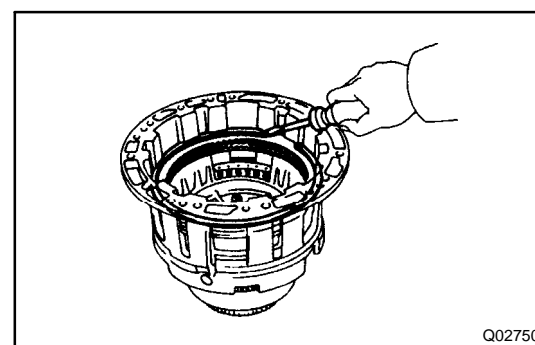
- (b) Using SST and a dial indicator, measure the piston stroke while applying and releasing compressed air 392 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi).

SST 09350-36010 (09350-06120)

### Piston stroke:

**1.25 - 1.85 mm (0.0492 - 0.0728 in.)**

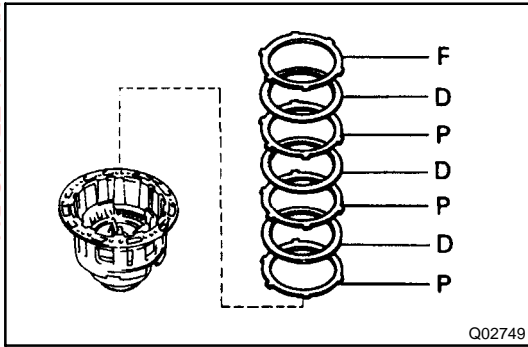
If the piston stroke is not as specified, inspect the discs.



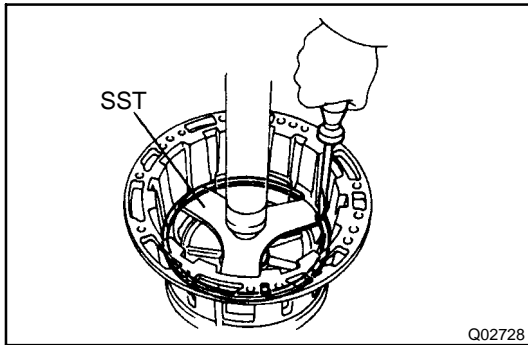
## 12. REMOVE FLANGE, DISCS AND PLATES

- (a) Using a screwdriver, remove the snap ring.



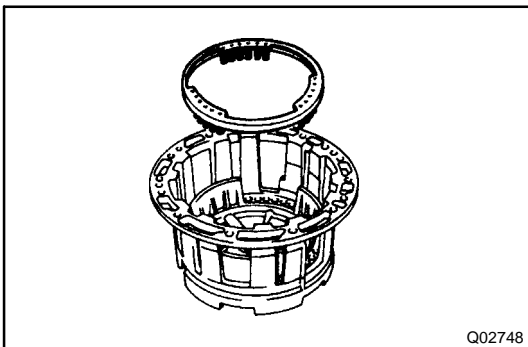


- (b) Remove the flange, 3 discs and 3 plates.

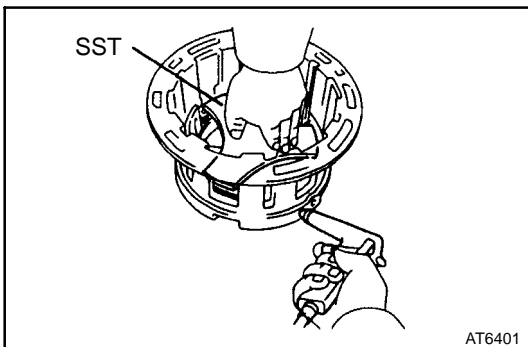


### 13. REMOVE PISTON RETURN SPRING

- (a) Place SST on the spring seat, and compress the return spring with a shop press.  
SST 09350-36010 (09350-06020)
- (b) Using screwdriver, remove the snap ring.

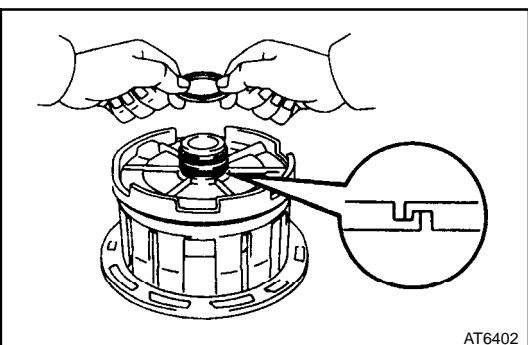


- (c) Remove the return spring.



### 14. REMOVE OVERDRIVE BRAKE PISTON

- (a) Place the return spring on the brake piston, and then place SST on the return spring.  
SST 09350-36010 (09350-06020)
- (b) Hold SST so it does not slant, and apply compressed air 392 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi) into the oil hole of the O/D case to remove the brake piston.  
SST 09350-36010 (09350-06020)
- (c) Remove the 2 O-rings from the brake piston.



### 15. REMOVE OIL SEAL RINGS

Remove the 2 oil seal rings from the O/D case.

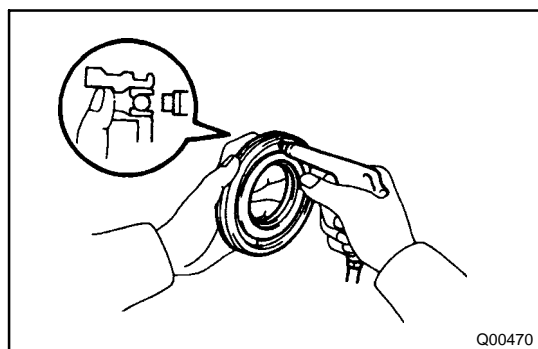
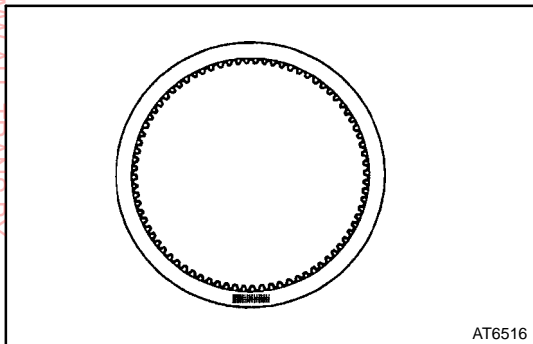
## OVERDRIVE UNIT INSPECTION

### 1. INSPECT DISCS, PLATES AND FLANGE

Check to see if the sliding surface of the disc, plate and flange are worn or burnt. If necessary, replace them.

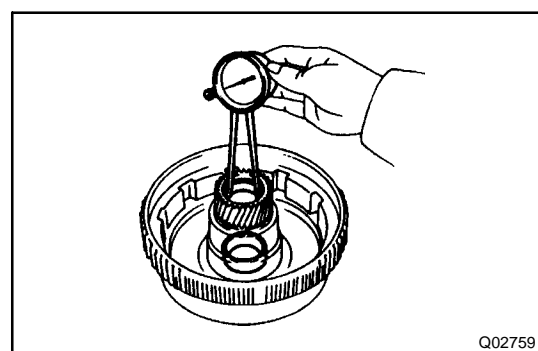
HINT:

- © If the lining of the disc is peeling off or discolored, or even if a part of the printed numbers are defaced, replace all discs.
- © Before assembling new discs, soak them in ATF for at least 15 minutes.



### 2. INSPECT OVERDRIVE DIRECT CLUTCH PISTON

- (a) Check that check ball is free by shaking the piston.
- (b) Check that the valve does not leak by applying low pressure compressed air 392 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi).



### 3. INSPECT BUSHINGS OF OVERDRIVE DIRECT CLUTCH DRUM

Using a dial indicator, measure the inside diameter

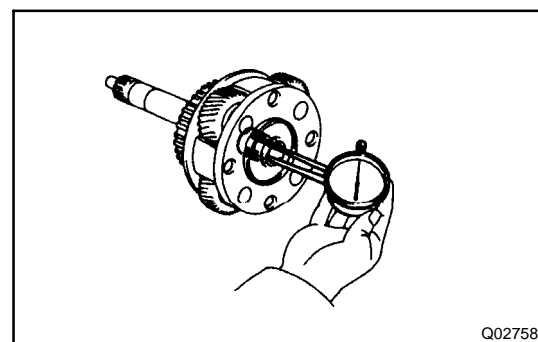
**Standard inside diameter:**

**26.500 - 25.521 mm (1.0433 - 1.0441 in.)**

**Maximum inside diameter:**

**26.57 mm (1.0461 in.)**

If the inside diameter is greater than maximum, replace the clutch drum.



### 4. INSPECT BUSHINGS OF OVERDRIVE PLANETARY GEAR

Using a dial indicator, measure the inside diameter.

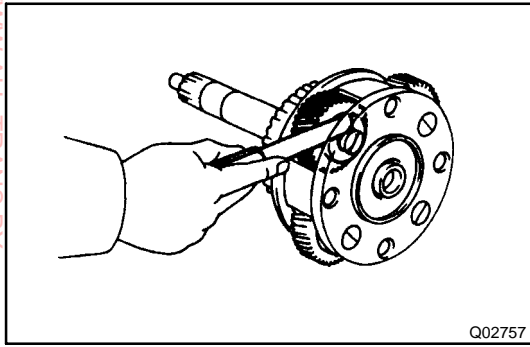
**Standard inside diameter:**

**12.000 - 12.018 mm (0.4724 - 0.4731 in.)**

**Maximum inside diameter:**

**12.070 mm (0.4752 in.)**

If the inside diameter is greater than maximum, replace the planetary gear.



### 5. INSPECT PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the clearance between the pinions and carrier.

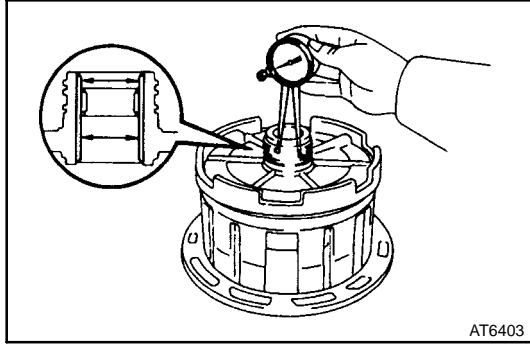
**Standard clearance:**

**0.20 - 0.59 mm (0.0079 - 0.0232 in.)**

**Maximum clearance:**

**0.80 mm (0.0315 in.)**

If the thrust clearance is greater than maximum, replace the planetary gear.



### 6. INSPECT BUSHING OF OVERDRIVE CASE

Using a dial indicator, measure the inside diameter.

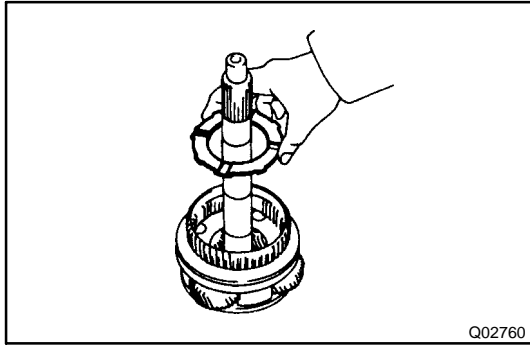
**Standard inside diameter:**

**33.10 - 33.15 mm (1.3031 - 1.3051 in.)**

**Maximum inside diameter:**

**33.20 mm (1.3071 in.)**

If the inside diameter is greater than the maximum, replace the O/D case.

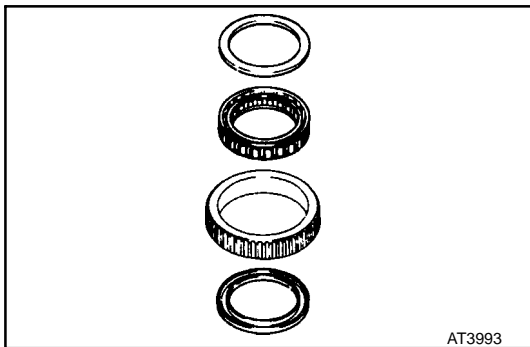


## OVERDRIVE UNIT ASSEMBLY

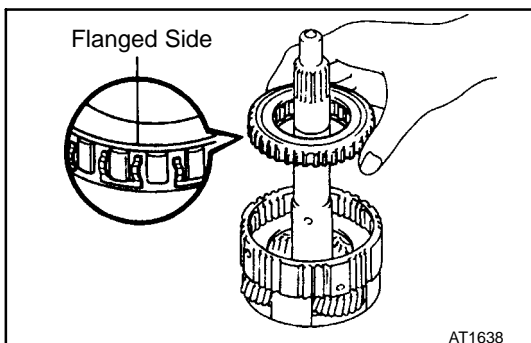
### 1. INSTALL ONE-WAY CLUTCH TO OVERDRIVE PLANETARY GEAR

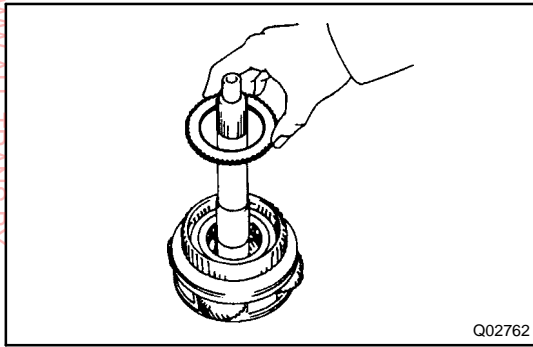
(a) Install the No. 3 thrust washer, facing the grooved side upward.

(b) Install the one-way clutch and 2 retainers into the outer race.

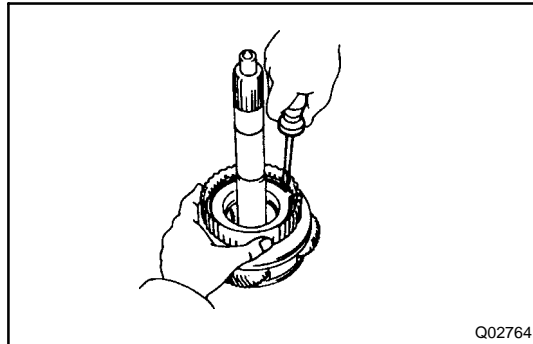


(c) Install the one-way clutch and outer race assembly, facing the flanged side of the one-way clutch upward.

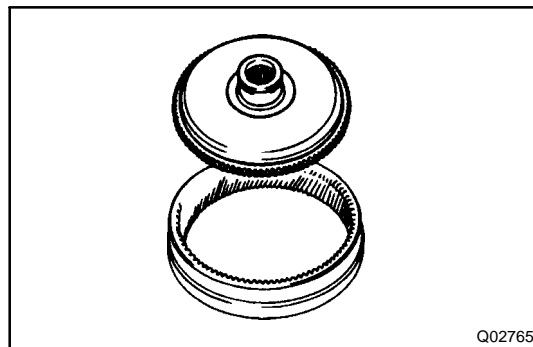




(d) Install the No. 4 thrust washer.

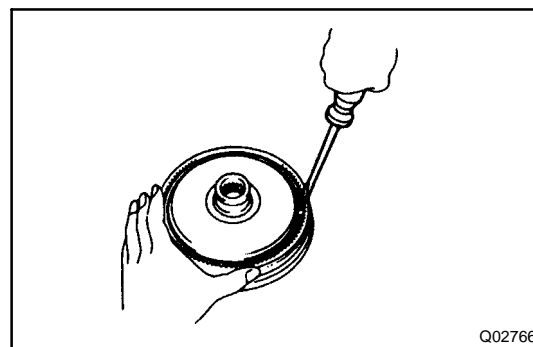


(e) Using a screwdriver, install the snap ring.

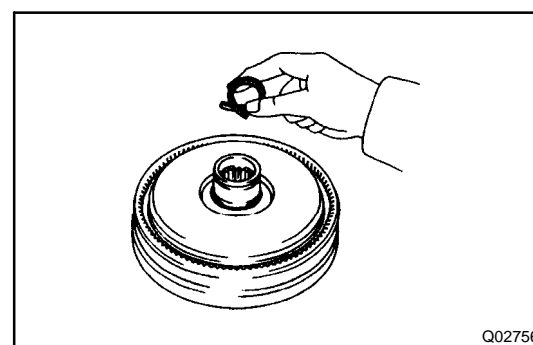


## 2. INSTALL RING GEAR FLANGE TO OVERDRIVE PLANETARY RING GEAR

(a) Install the gear flange.



(b) Using a screwdriver, install the snap ring.

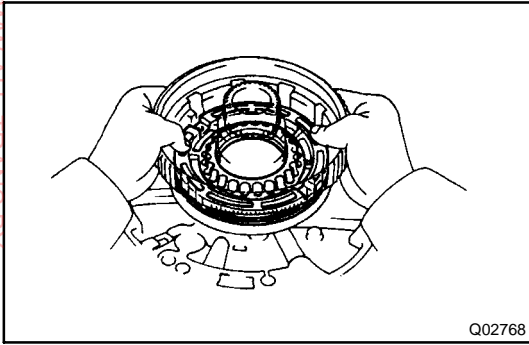


## 3. INSTALL OIL SEAL RING

Coat the oil seal ring with ATF, and install it to the ring gear flange.

**NOTICE:** Do not spread the ring ends more than necessary.

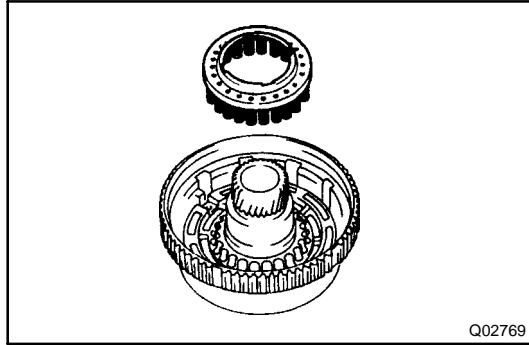
**HINT:** After installing the oil seal ring, check that it moves smoothly.



#### 4. INSTALL OVERDRIVE DIRECT CLUTCH PISTON

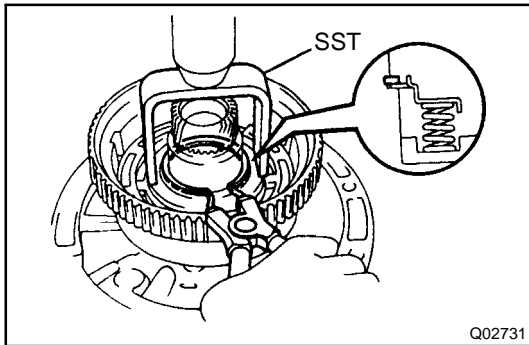
- (a) Coat new O-rings with ATF, and install them on the clutch piston.
- (b) Push in the clutch piston into the clutch drum with both hands.

**NOTICE:** Be careful not to damage the O-rings.



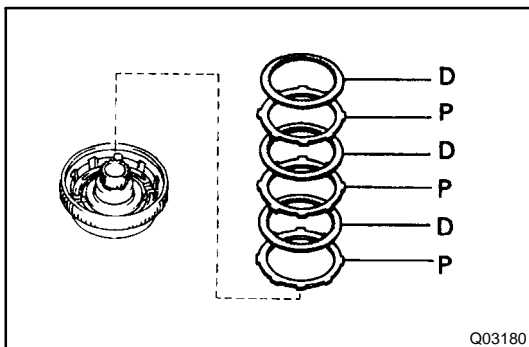
#### 5. INSTALL PISTON RETURN SPRING

- (a) Place the piston return spring on the clutch piston.



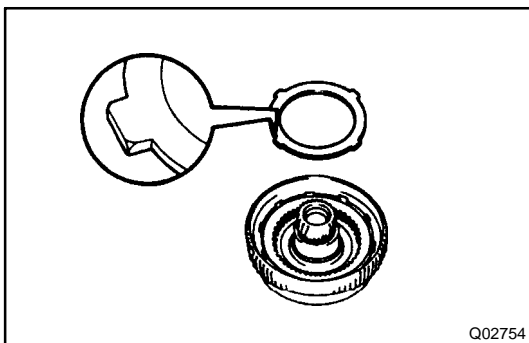
- (b) Place SST on the spring seat, and compress the return spring with a shop press  
SST 09350-36010 (09350-06010)

- (c) Using snap ring pliers, install the snap ring.  
HINT: Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

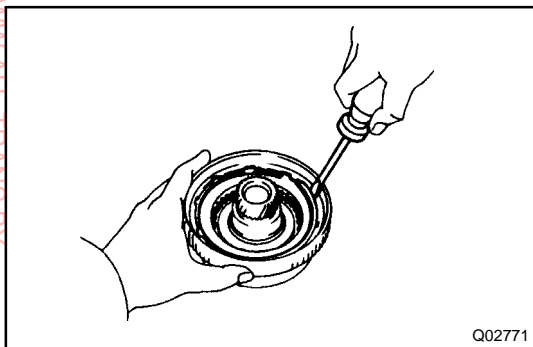


#### 6. INSTALL PLATES, DISCS AND FLANGE

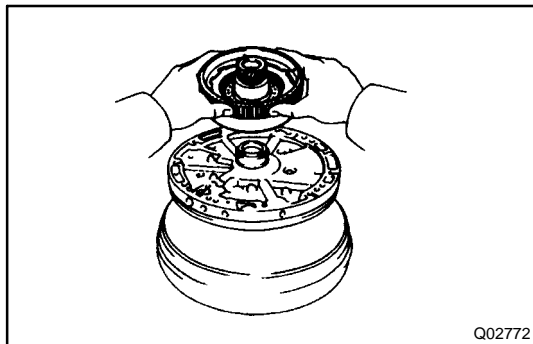
- (a) Install the 3 plates and 3 discs in order:  
P = Plate D = Disc  
P-D-P-D-P-D



- (b) Install the flange, facing the rounded edge upward.

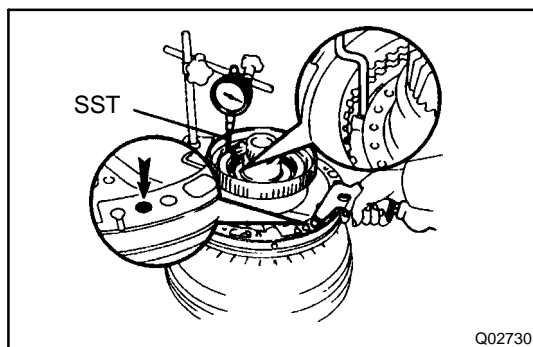


- (c) Using a screwdriver, install the snap ring.  
HINT: Be sure the end gap of the snap ring is not aligned with the cutout portion of the clutch drum.



## 7. CHECK PISTON STROKE OF OVERDRIVE DIRECT CLUTCH

- (a) Place the oil pump onto the torque converter clutch, and then place the O/D direct clutch assembly onto the oil pump.



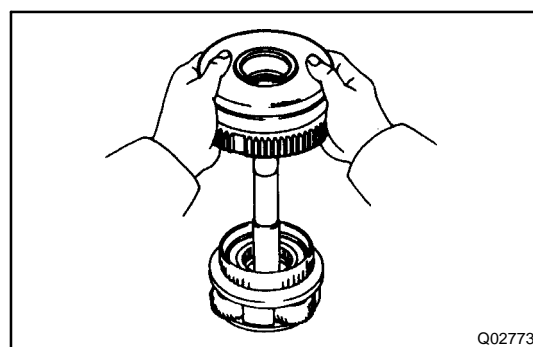
- (b) Using SST and a dial indicator, measure the piston stroke while applying and releasing compressed air 392 - 785 kPa (4 - 8kgf/cm<sup>2</sup>, 57 - 114 psi).

SST 09350-36010 (09350-06110)

### Piston stroke:

**1.80 - 2.00 mm (0.0709 - 0.0787 in.)**

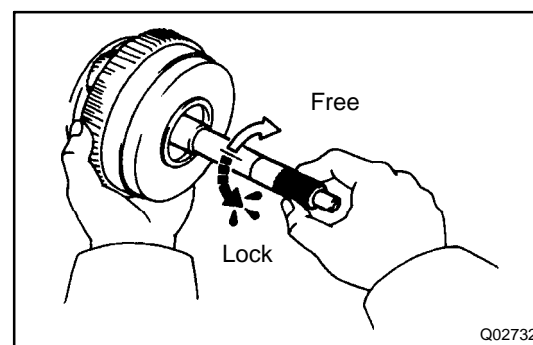
If the piston stroke is less than specified, parts may have been assembled incorrectly, check and reassemble again.



## 8. INSTALL OVERDRIVE DIRECT CLUTCH ASSEMBLY

Install the direct clutch assembly onto the O/D planetary gear.

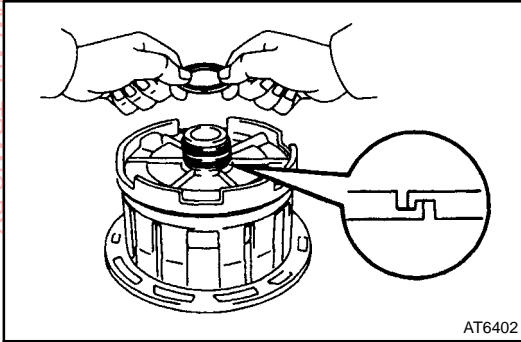
HINT: Mesh the spline of the O/D planetary gear with the flukes of the discs by rotating and pushing the O/D direct clutch counterclockwise.



## 9. CHECK OPERATION OF ONE-WAY CLUTCH

Hold the O/D direct clutch drum and turn the input shaft.

The input shaft should turn freely clockwise and should lock counterclockwise.

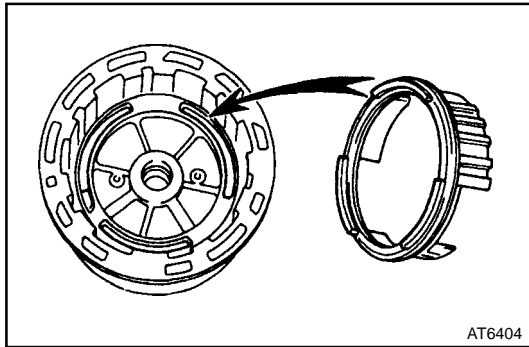


## 10. INSTALL OIL SEAL RINGS

- (a) Coat the 2 oil seal rings with ATF.
- (b) Install the oil seal rings to the O/D case, then snug them down by squeezing their ends together.

**NOTICE: Do not spread the ring ends more than necessary.**

**HINT:** After installing the oil seal rings, check that they rotate smoothly.

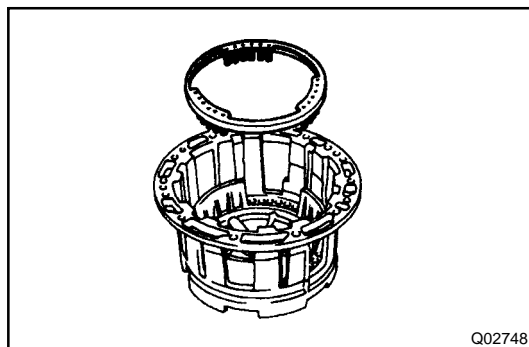
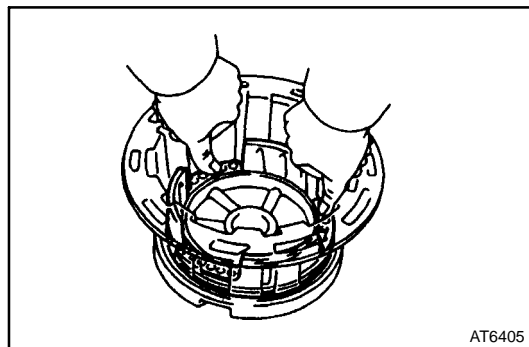


## 11. INSTALL OVERDRIVE BRAKE PISTON

- (a) Coat new 2 O-rings with ATF, and install them on the brake piston.
- (b) Align the protrusions of the brake piston with the grooves of the O/D case.

- (c) Push the brake piston into the O/D case with both hands.

**NOTICE: Be careful not to damage the O-rings.**



## 12. INSTALL PISTON RETURN SPRING

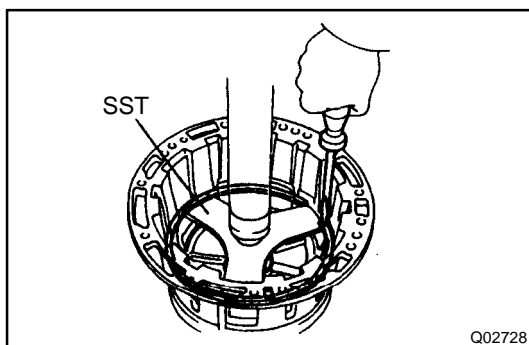
- (a) Place the return spring on the brake piston.

- (b) Place SST on the spring on the spring seat, and compress the return spring with a shop press.

SST 09350-36010 (09350-06020)

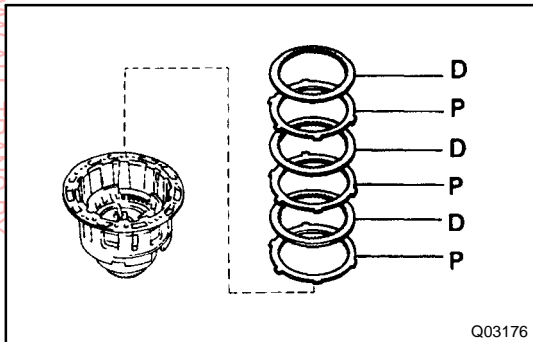
- (c) Using a screwdriver, install the snap ring.

**HINT:** Be sure the end gap of the snap ring is not aligned with the cutout portion of the O/D case.

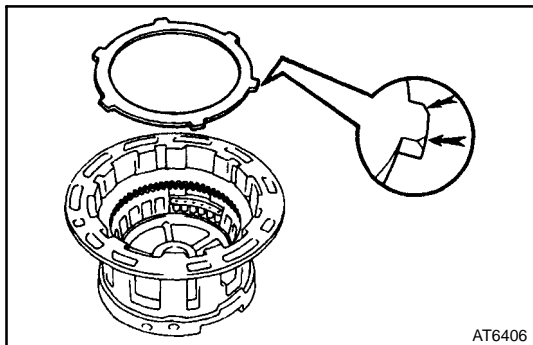


### 13. INSTALL PLATES, DISCS AND FLANGE

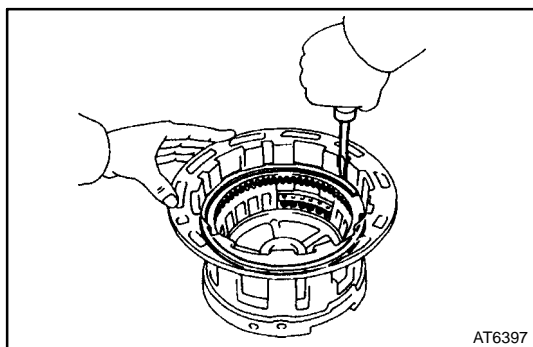
- (a) Install the 3 plates and 3 discs in order:  
P = Plate D = Disc  
P-D-P-D-P-D



- (b) Install the flange, facing the rounded edge upward.

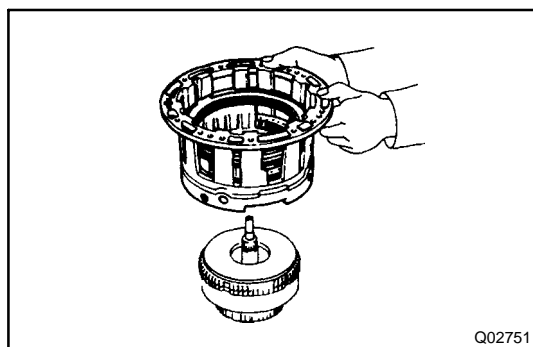


- (c) Using a screwdriver, install the snap ring.  
HINT: Be sure the end gap of the snap ring is not aligned with the cutout portion of the O/D case.



### 14. CHECK PISTON STROKE OF OVERDRIVE BRAKE

- (a) Place the O/D case assembly onto the rear clutch assembly.



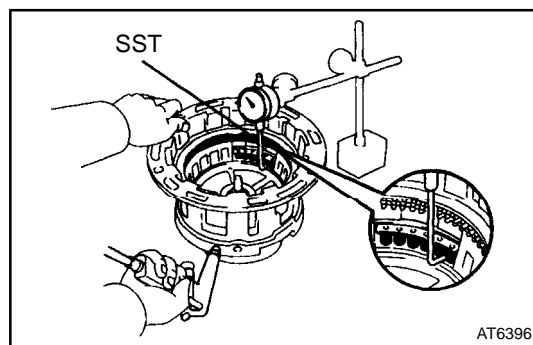
- (b) Using SST and a dial indicator, measure the piston stroke while applying and releasing compressed air 392 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi).

SST 09350-36010 (09350-06120)

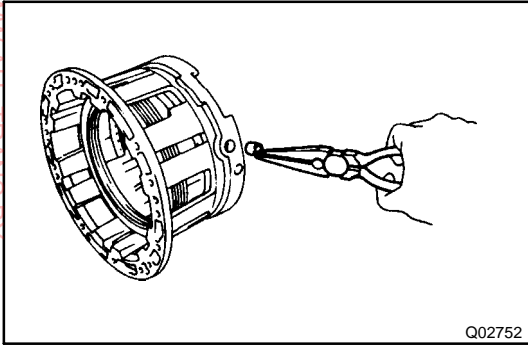
**Piston stroke:**

**1.25 - 1.85 mm (0.0492 - 0.0728 in.)**

If the piston stroke is less than specified, parts may have been assembled incorrectly, check and reassemble again.

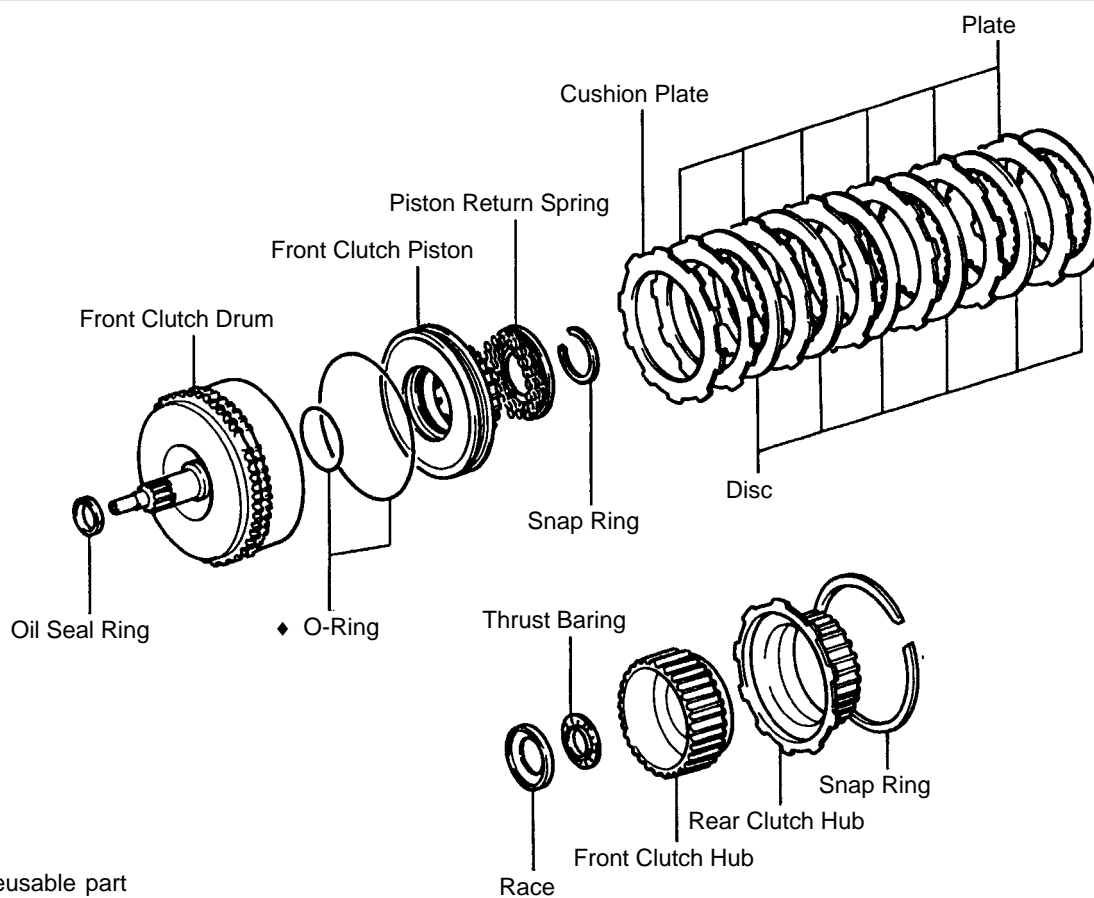




**15. INSTALL RING RETAINERS**

Using needle nose pliers, install the 3 ring retainers into the oil holes of the O/D case.

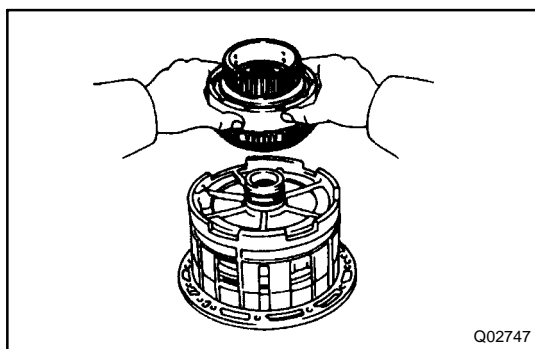
# FRONT CLUTCH COMPONENTS



Q02659

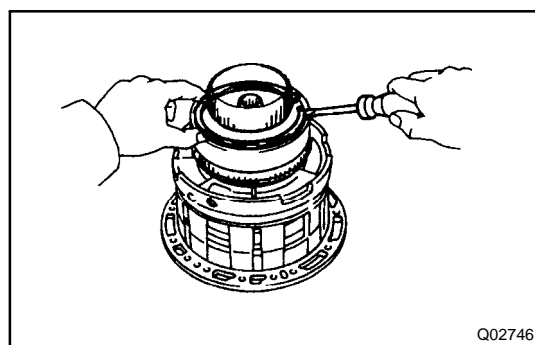
## FRONT CLUTCH DISASSEMBLY

1. PLACE FRONT CLUTCH ASSEMBLY ONTO OVER-DRIVE CASE ASSEMBLY



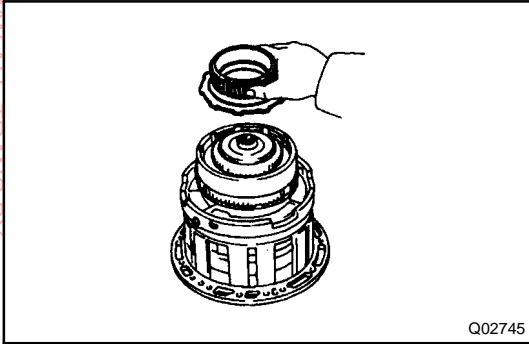
Q02747

2. REMOVE REAR AND FRONT CLUTCH HUBS
  - (a) Using a screwdriver, remove the snap ring.

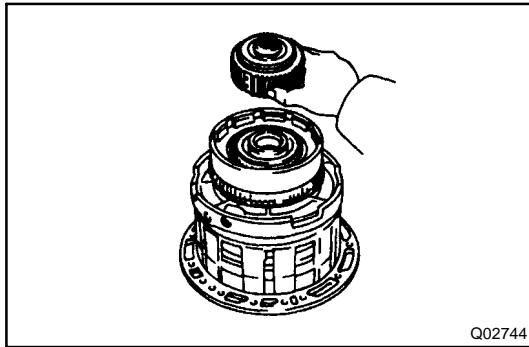


Q02746

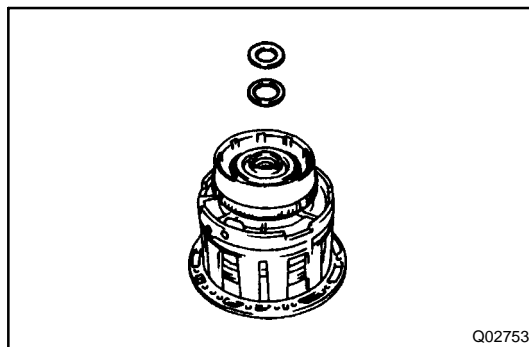
- (b) Remove the rear clutch hub.



- (c) Remove the front clutch hub.

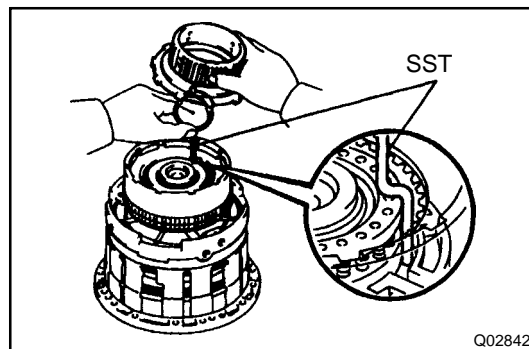


- (d) Remove the race and thrust bearing.



### 3. CHECK PISTON STROKE OF FRONT CLUTCH

- (a) Install SST to a dial indicator.  
SST 09350-36010 (09350-06110)
- (b) Place the assembled SST and a dial indicator on the clutch piston.
- (c) Install the rear clutch hub with the snap ring.



- (d) Using SST and a dial indicator, measure the piston stroke while applying and releasing compressed air 392 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi).

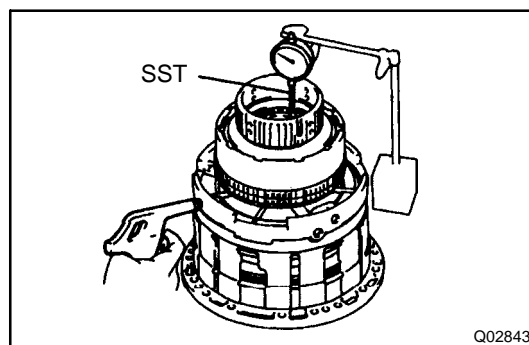
SST 09350-36010 (09350-06110)

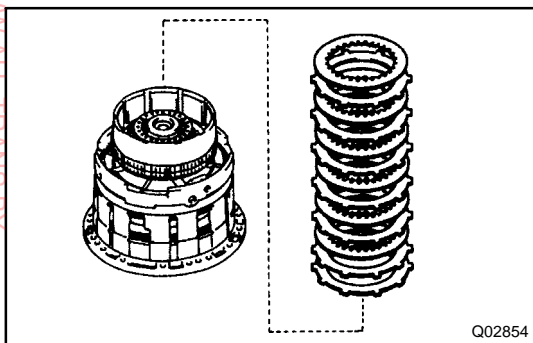
#### Piston stroke:

**3.93 - 4.23 mm (0.1547 - 0.1555 in.)**

If the piston stroke is not as specified, inspect the discs.

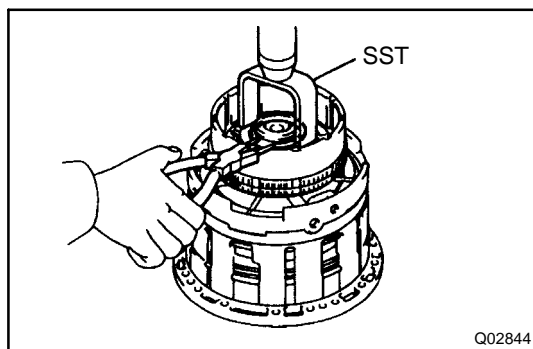
- (e) Remove the snap ring and rear clutch hub.





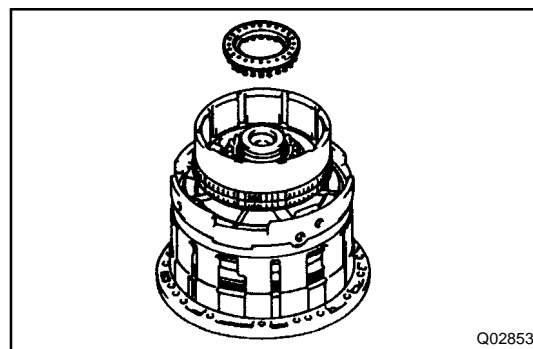
#### 4. REMOVE DISCS, PLATES AND CUSHION PLATE

Remove the 6 discs, 6 plates and cushion plate.

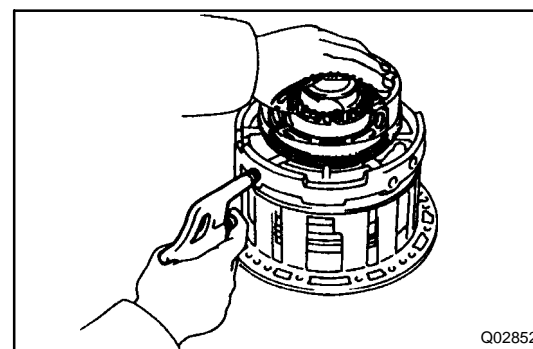


#### 5. REMOVE PISTON RETURN SPRINGS

- (a) Place SST on the spring seat, and compress the return springs with a shop press.  
SST 09350-36010 (09350-06010)
- (b) Using snap ring pliers, remove the snap ring.

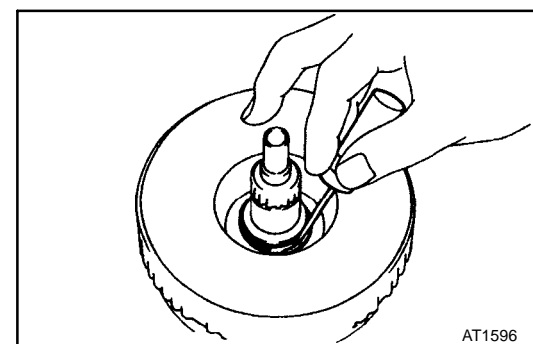


- (c) Remove the piston return spring.



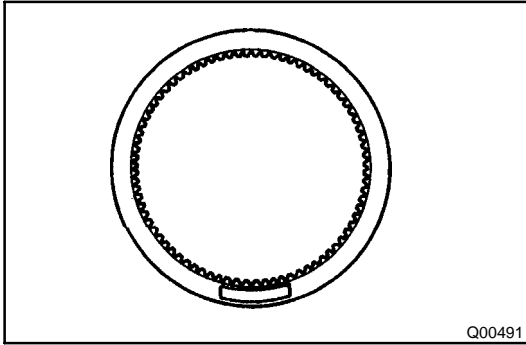
#### 6. REMOVE FRONT CLUTCH PISTON

- (a) Holding the clutch piston, apply compressed air 392 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi) into the oil hole of the O/D case to remove the clutch piston.
- (b) Remove the 2 O-rings from the clutch piston.



#### 7. REMOVE OIL SEAL RING

Using a small screwdriver, remove the oil seal ring from the clutch drum.



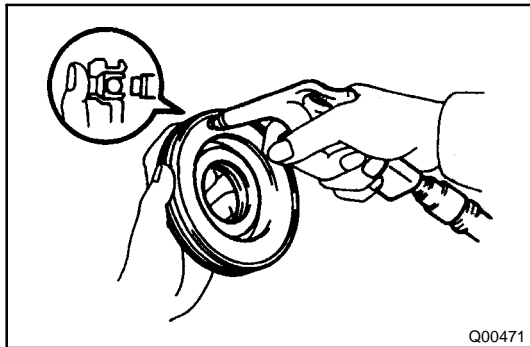
## FRONT CLUTCH INSPECTION

### 1. INSPECT DISCS, PLATES AND CUSHION PLATE

Check to see if the sliding surface of the disc, plate and cushion plate are worn or burnt. If necessary, replace all discs.

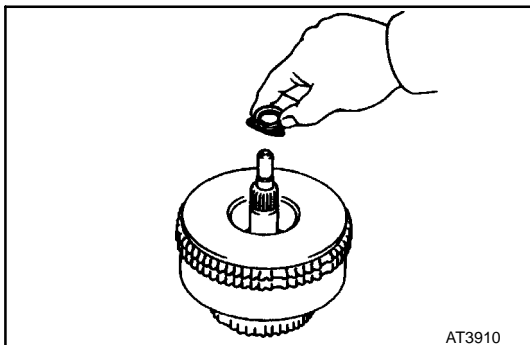
HINT:

- © If the lining of the disc is peeling off or discolored, or even if a parts of the printed numbers are defaced, replace all discs.
- © Before assembling new disc, soak them in ATF for at least 15 minutes.



### 2. INSPECT FRONT CLUTCH PISTON

- (a) Check that check ball is free by shaking the piston.
- (b) Check that the valve does not leak by applying compressed air 392 - 785 kPa (4 - 8 kgf-cm<sup>2</sup>, 57 - 114 psi).



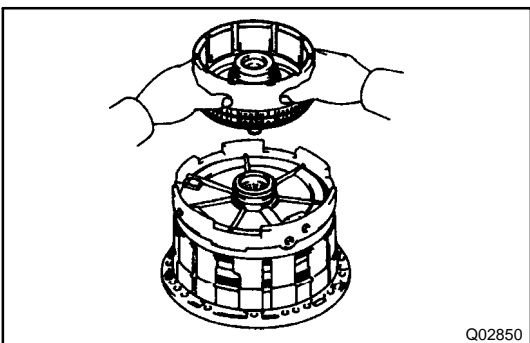
## FRONT CLUTCH ASSEMBLY

### 1. INSTALL OIL SEAL RING

- (a) Coat the oil seal ring with ATF.
- (b) Install oil seal ring to the clutch drum, then snug them down by squeezing their ends together.

**NOTICE: Do not spread the ring seals more than necessary.**

HINT: After installing the oil seal ring, check that they rotate smoothly.

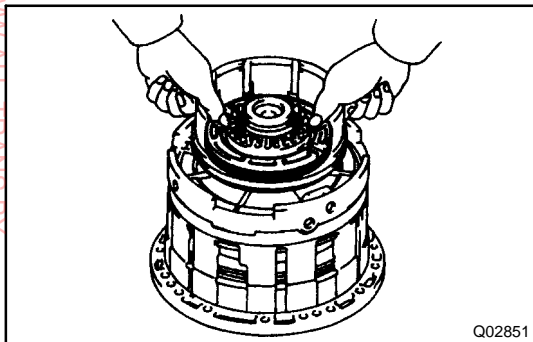


### 2. PLACE FRONT CLUTCH DRUM ONTO OVERDRIVE CASE ASSEMBLY

### 3. INSTALL FRONT CLUTCH PISTON

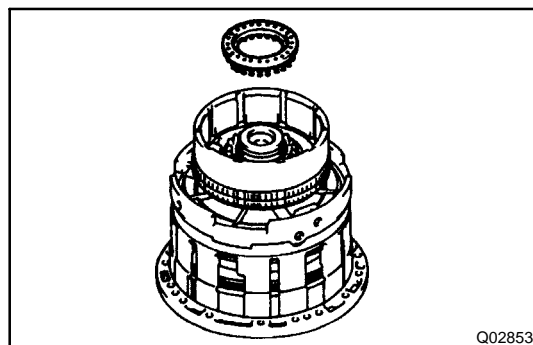
- Coat new 2 O-rings with ATF, and install them on the clutch piston.
- Push in the clutch piston into the clutch drum by both hands.

**NOTICE:** Be careful not to damage the O-rings.

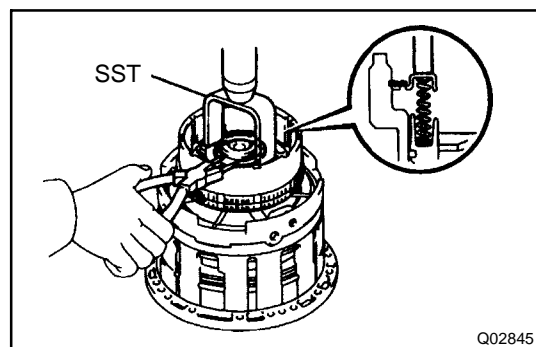


### 4. INSTALL PISTON RETURN SPRINGS

- Install the piston return spring.

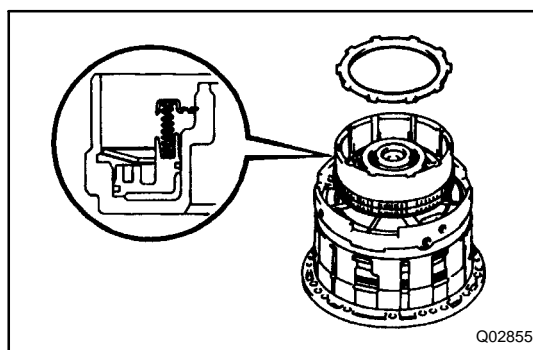


- Place SST on the spring seat, and compress the return springs with a shop press.  
SST 09350-36010 (09350-06010)
- Using snap ring pliers, install the snap ring.  
HINT: Be sure the end gap of the ring is not aligned with the spring seat claw.

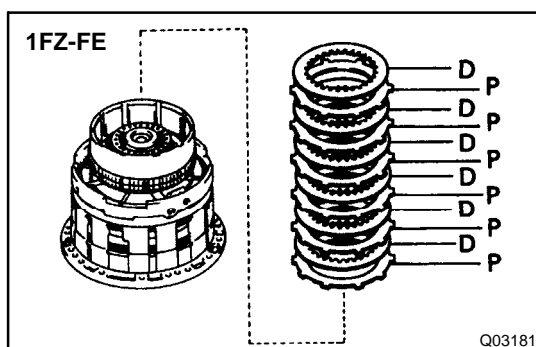


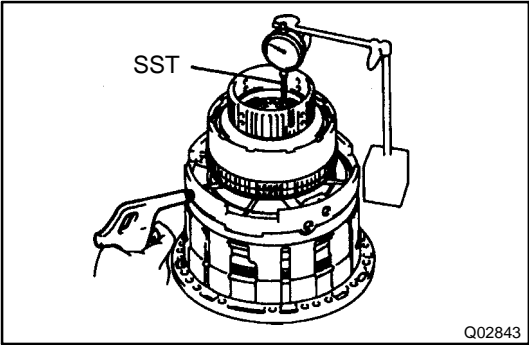
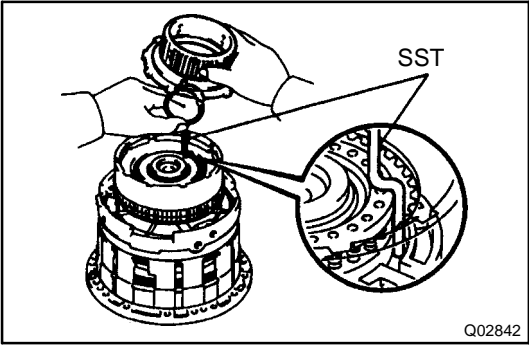
### 6. INSTALL CUSHION PLATE, PLATES AND DISCS

- Install the cushion plate, facing the rounded edge downward.



- Install the 6 plates and 6 discs in order:  
P = Plate D = Disc  
P-D-P-D-P-D-P-D-P-D-P-D





**6. CHECK PISTON STROKE OF FRONT CLUTCH**

- (a) Install SST to a dial indicator.  
SST 09350-36010 (09350-06110)
- (b) Place the assembled SST and a dial indicator on the clutch piston.
- (c) Install the rear clutch hub with the snap ring.

- (d) Using SST and a dial indicator, measure the piston stroke while applying and releasing compressed air 392 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi).

SST 09350-36010 (09350-06110)

**Piston stroke:**

**3.93 - 4.23 mm (0.1547 - 0.1665 in.)**

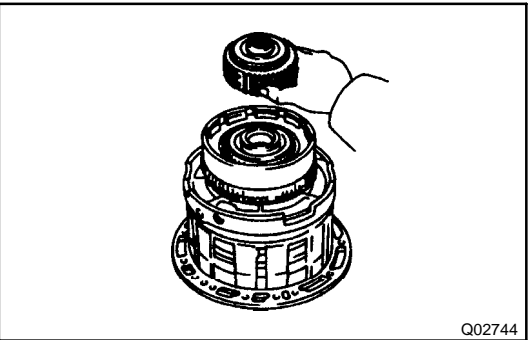
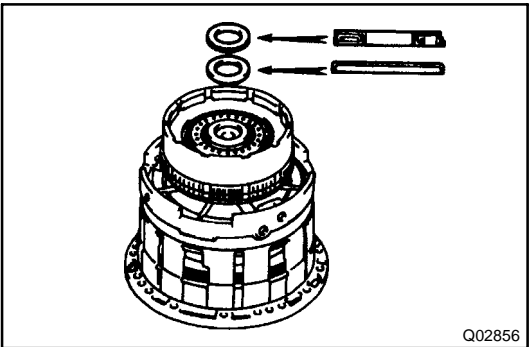
If the piston stroke is less than specified, parts may have been assembled incorrectly, check and reassemble again.

If the piston stroke is not as specified, select another plate.

**Plate thicknesses**

Thickness mm (in.)	Thickness mm (in.)
1.8 (0.071)	2.2 (0.087)
2.0 (0.079)	2.4 (0.094)

- (e) Remove the snap ring and rear clutch hub.



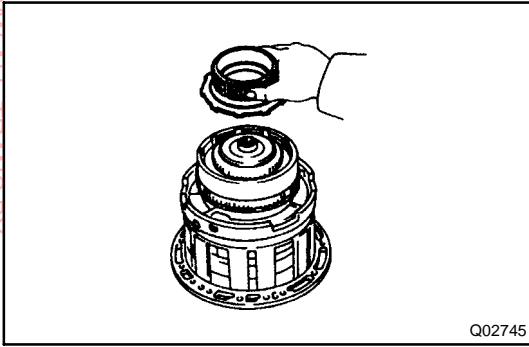
**7. INSTALL FRONT AND REAR CLUTCH HUBS**

- (a) Coat the race and thrust bearing with petroleum jelly, and install them onto the front clutch drum.

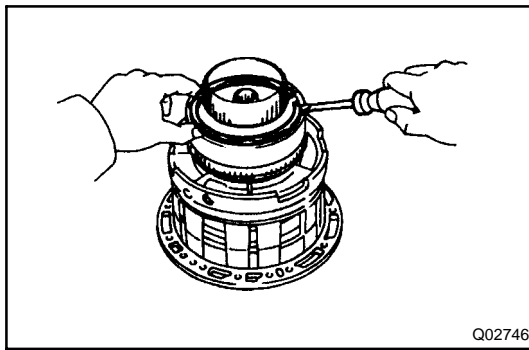
**Race and bearing diameter**

Diameter mm (in.)	Inside	Outside
Bearing	32.8 (1.291)	52.0 (2.047)
Race	37.0 (1.457)	52.0 (2.047)

- (b) Install the front clutch hub into the clutch drum.  
HINT: Mesh the spline of the front clutch hub with the flukes of the discs by rotating the front clutch hub clockwise or counterclockwise.



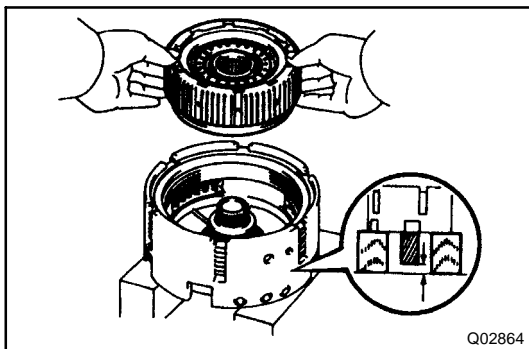
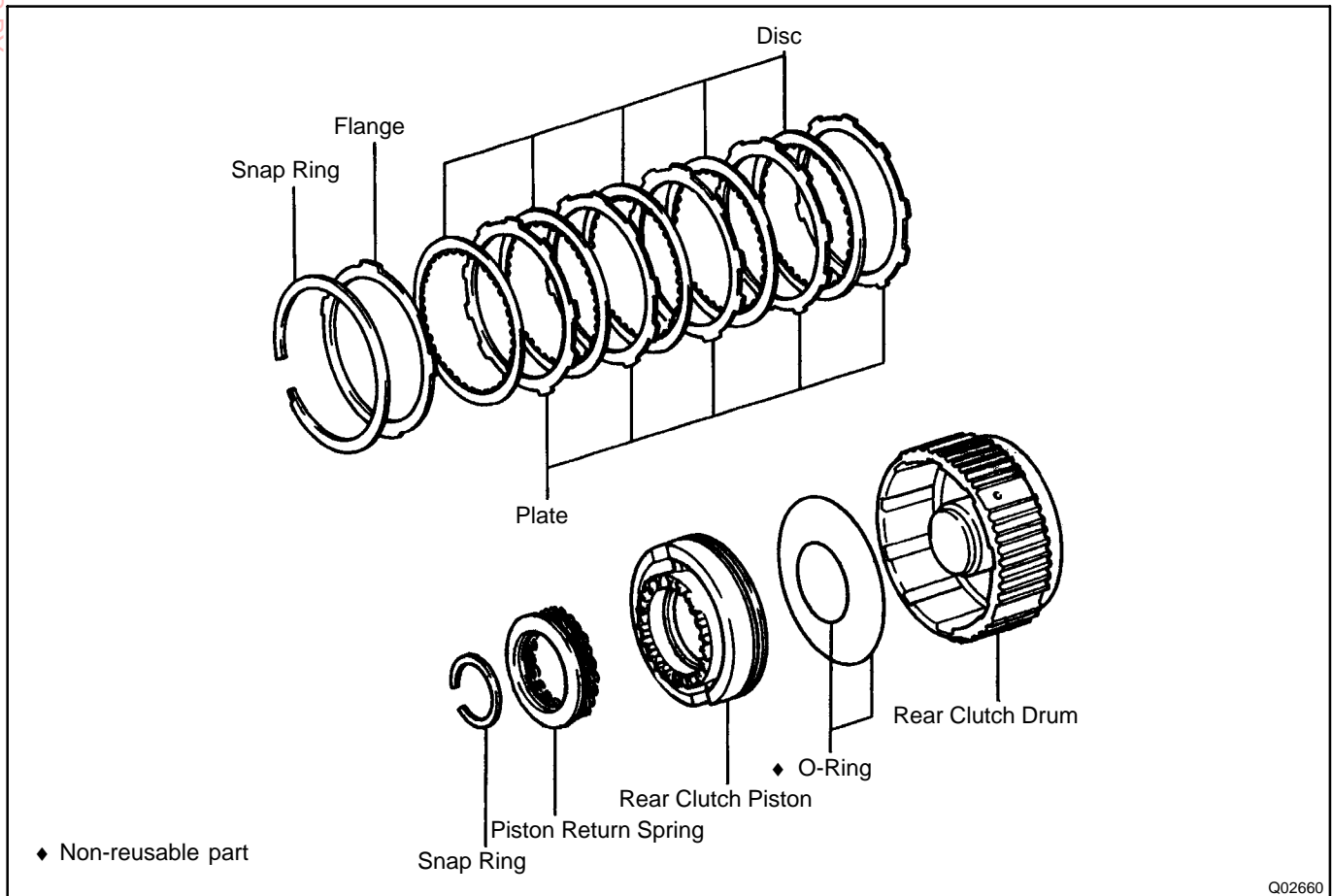
- (c) Install the rear clutch hub onto the clutch drum.



- (d) Using a screwdriver, install the snap ring.  
HINT: Be sure the end gap of the snap ring is not aligned with the cutout portion of the front clutch drum.



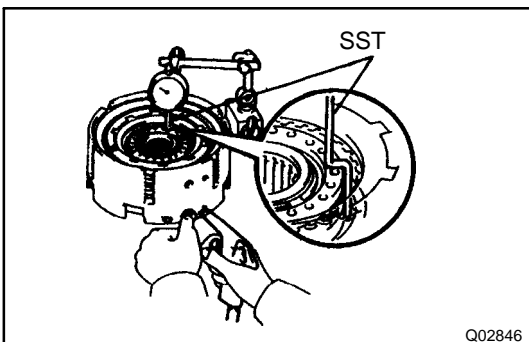
# REAR CLUTCH COMPONENTS



## REAR CLUTCH DISASSEMBLY

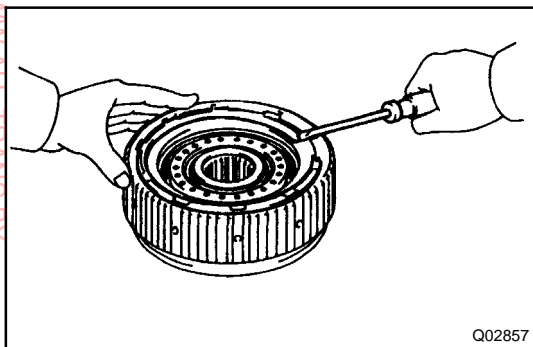
### 1. CHECK PISTON STROKE OF REAR-CLUTCH

- (a) Place the center support assembly on wooden blocks.  
HINT: Provide clearance so that the sun gear does not touch the rear clutch drum.
- (b) Place the rear clutch assembly into the outer support assembly.
- (c) Using SST and a dial indicator, measure the piston stroke while applying compressed air 392 - 785 kPa (4 - 8 kgf /cm<sup>2</sup>, 57 - 114 psi)  
SST 09350-36010 (09350-06110)  
**Piston stroke:**  
**2.00 - 2.20 mm (0.0787 - 0.0866 in.)**  
If the piston stroke is not as specified, inspect the discs.

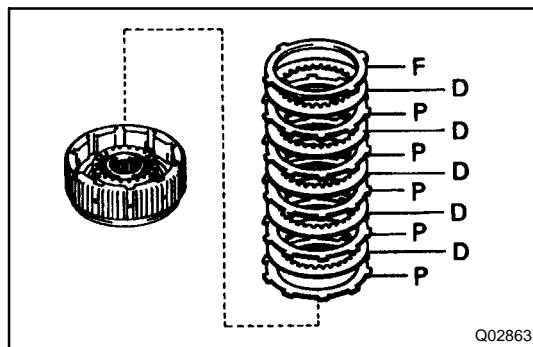


**2. REMOVE FLANGE, DISCS AND PLATES**

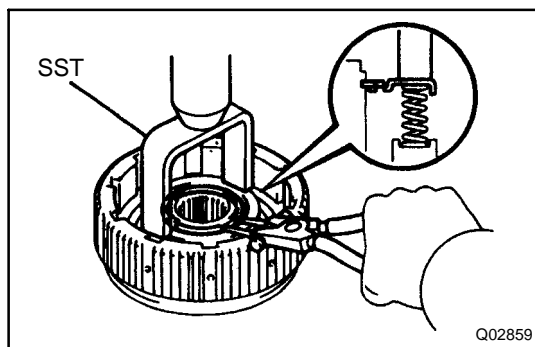
- (a) Using a screwdriver, remove the snap ring.



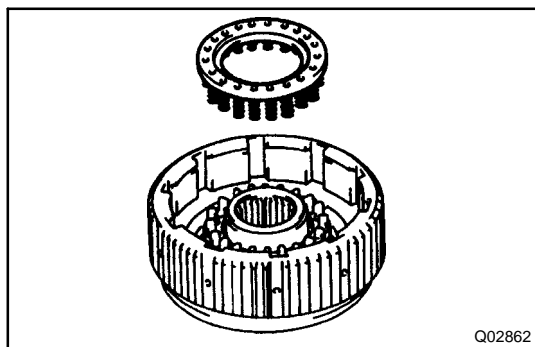
- (b) Remove the flange, 5 discs and 5 plates.

**3. REMOVE PISTON RETURN SPRINGS**

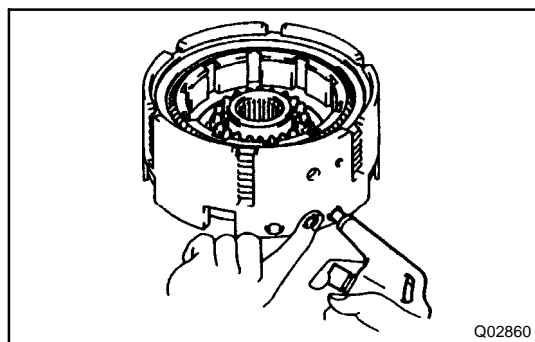
- (a) Place SST on the spring seat, and compress the return spring with a shop press.  
SST 09350-36010 (09350-06010)
- (b) Using snap ring pliers, remove the snap ring.

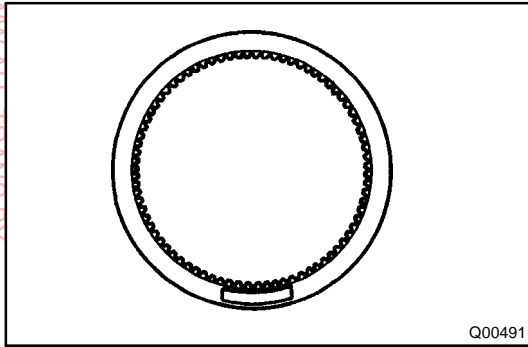


- (c) Remove the piston return spring.

**4. REMOVE REAR CLUTCH PISTON**

- (a) Place the center support assembly on wooden blocks.
- (b) Place the clutch drum onto the center support assembly.
- (c) Hold the piston with hand, apply compressed air 392-785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi) into the oil hole of the center support to remove the clutch piston.
- (d) Remove the 2 O-rings from the clutch piston.





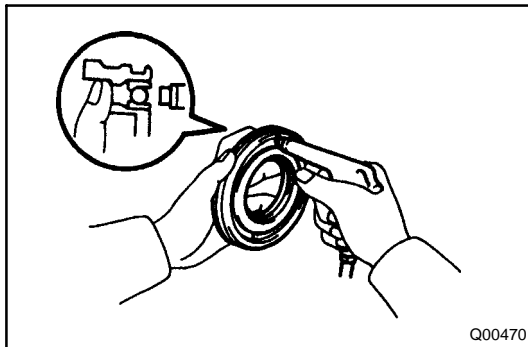
## REAR CLUTCH INSPECTION

### 1. INSPECT DISCS, PLATES AND FLANGE

Check to see if the sliding surface of the disc, plate and flange are worn or burnt. If necessary, replace them.

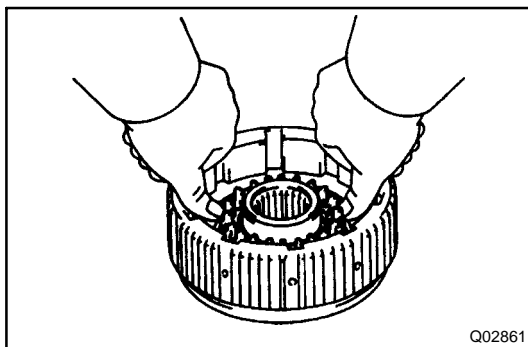
HINT:

- © If the lining of the disc is peeling off or discolored, or even if a part of the printed numbers are defaced, replace all discs.
- © Before assembling new discs, soak them in ATF for at least 15 minutes.



### 2. INSPECT REAR CLUTCH PISTON

- (a) Check that check ball is free by shaking the piston.
- (b) Check that the valve does not leak by applying compressed air 392 - 785 kPa- (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi).

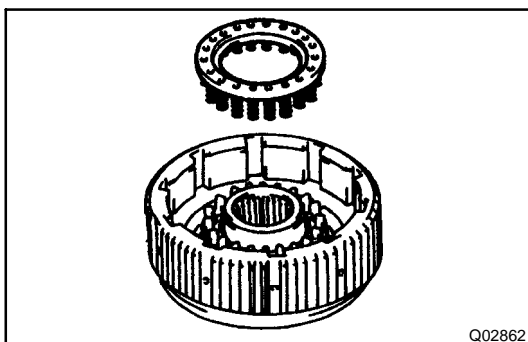


## REAR CLUTCH ASSEMBLY

### 1. INSTALL REAR CLUTCH PISTON

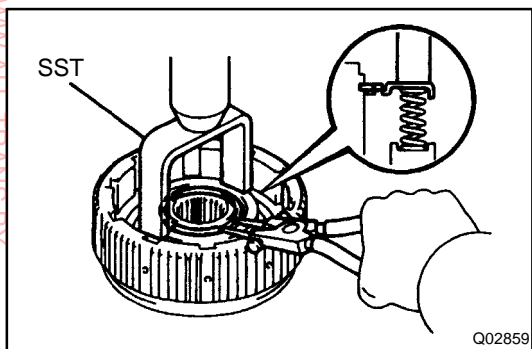
- (a) Coat new O-rings with ATF, and install them in the clutch drum.
- (b) Push in the clutch piston into the clutch drum with both hands.

**NOTICE:** Be careful not to damage the O-rings.

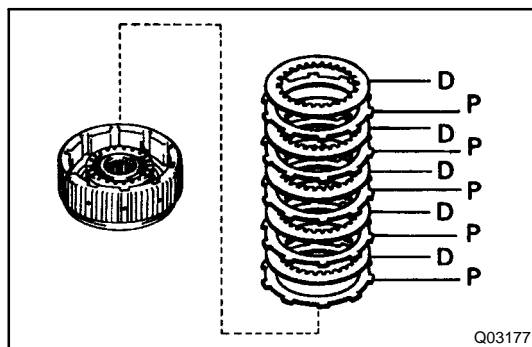


### 2. INSTALL PISTON RETURN SPRINGS

- (a) Place the piston return spring.

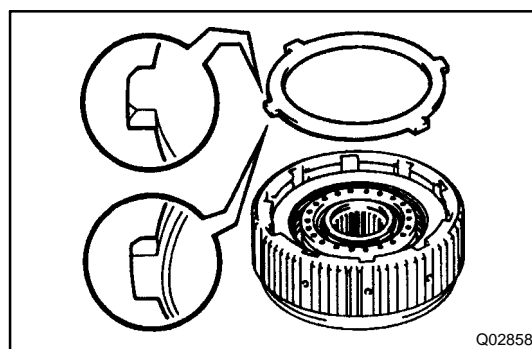


- (h) Place SST on the spring seat, and compress the return spring with a shop press.  
SST 09350-36010 (09350-06010)
- (c) Using snap ring pliers, install the snap ring.  
HINT: Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

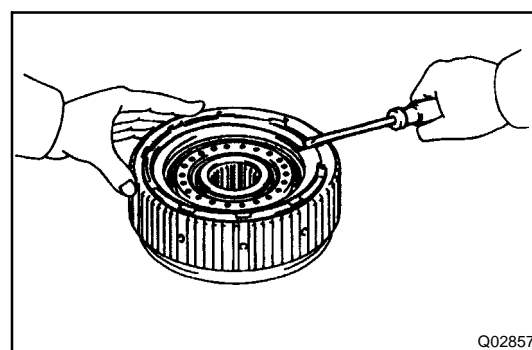


### 3. INSTALL PLATES, DISCS AND FLANGE

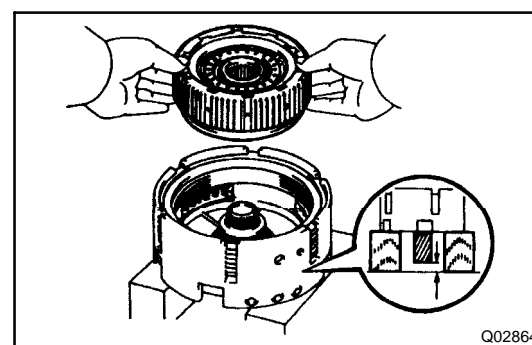
- (a) Install the 5 plates and 5 discs in order:  
P = Plate D = Disc  
P-D-P-D-P-D-P-D-P-D



- (b) Install the flange, facing the rounded edge upward.  
HINT: If the flange is step-edged, install the flange with the step-edge, facing downward.

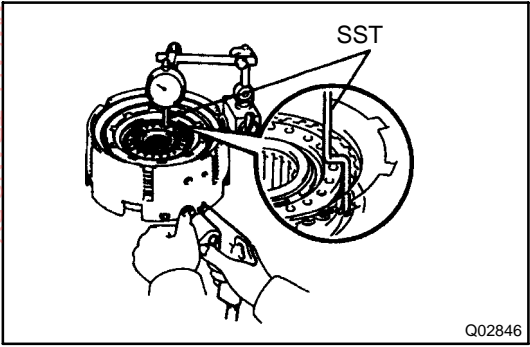


- (c) Using a screwdriver, install the snap ring.  
HINT: Be sure the end gap of the snap ring is not aligned with the cutout portion of the rear clutch drum.



### 4. CHECK PISTON STROKE OF REAR CLUTCH

- (a) Place the center support assembly on wooden blocks.  
HINT: Provide clearance so that the sun gear does not touch the rear clutch drum.
- (b) Place the rear clutch assembly onto the center support assembly.



- (c) Using SST and a dial indicator, measure the piston stroke while applying and releasing compressed air 392 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi).

SST 09350-36010 (09350-06110)

**Piston stroke:**

**2.00 - 2.20 mm (0.0790 - 0.0866 in.)**

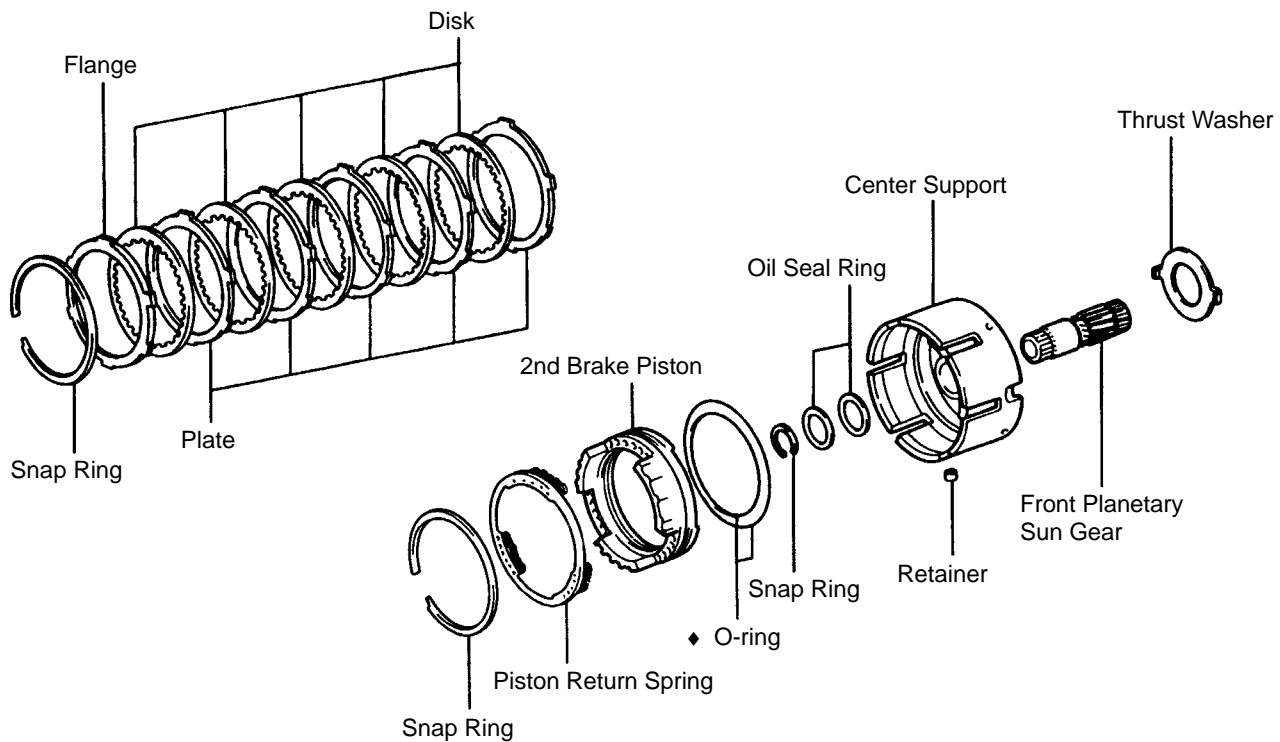
If the piston stroke is less than specified, parts may have been assembled incorrectly, check and reassemble again.

If the piston stroke is not as specified, select another flange.

**Flange thicknesses**

No.	Thickness mm (in.)	No.	Thickness mm (in.)
A	5.0 (0.197)	E	4.6 (0.181)
B	5.2 (0.205)	F	4.8 (0.189)

## SECOND BRAKE COMPONENTS



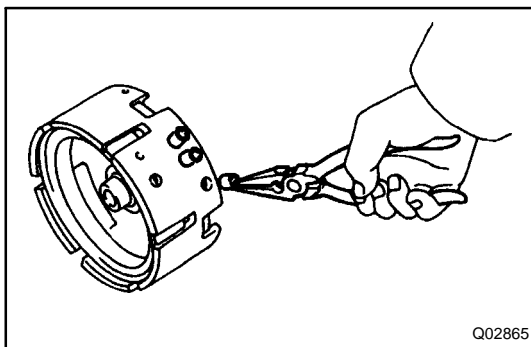
◆ Non-reusable part

Q03094

### SECOND BRAKE DISASSEMBLY

#### 1. REMOVE RING RETAINERS

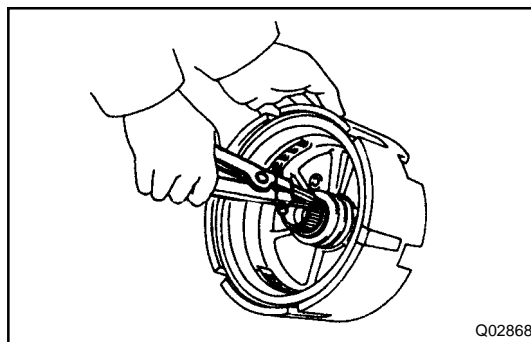
Using needle nose pliers, remove the 3 ring retainers from the oil holes of the center support.



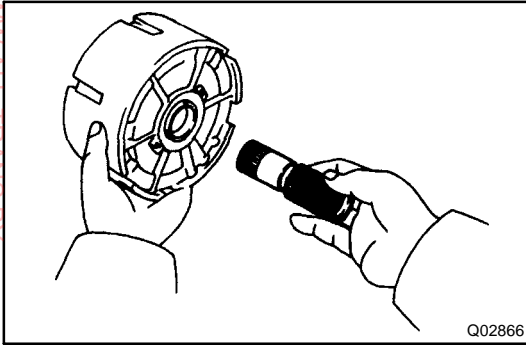
Q02865

#### 2. REMOVE FRONT PLANETARY SUN GEAR

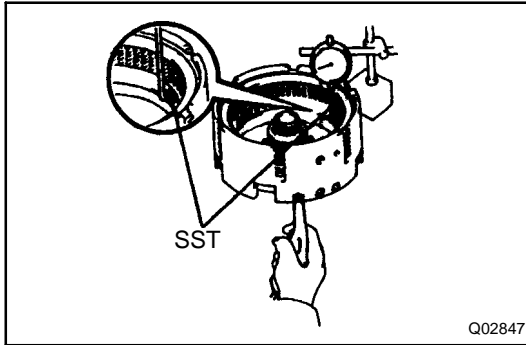
(a) Using snap ring plies, remove the snap ring.



Q02868



- (b) Remove the sun gear.



### 3. CHECK PISTON STROKE OF SECOND BRAKE

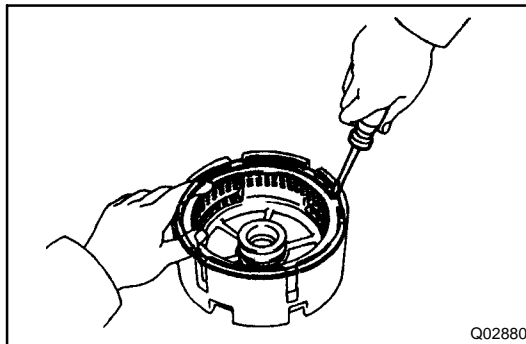
Using SST and a dial indicator, measure the piston stroke while applying and releasing compressed air 392 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi).

SST 09360-36010 (09350-06120)

**Piston stroke:**

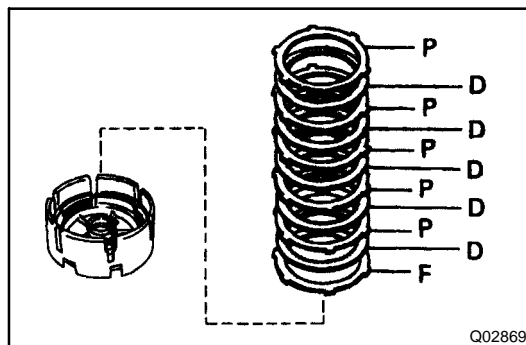
**1.86 - 2.06 mm (0.0732 - 0.0811)**

If the piston stroke is not as specified, inspect the discs.

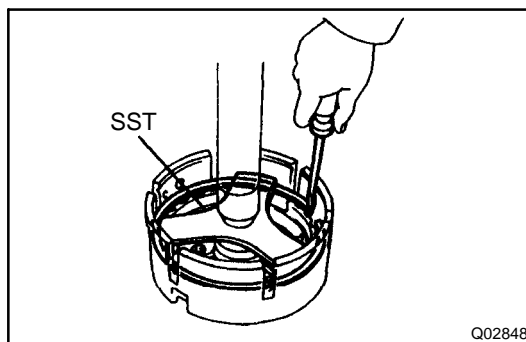


### 4. REMOVE FLANGE, DISCS AND PLATES

- (a) Using a screwdriver, remove the snap ring.

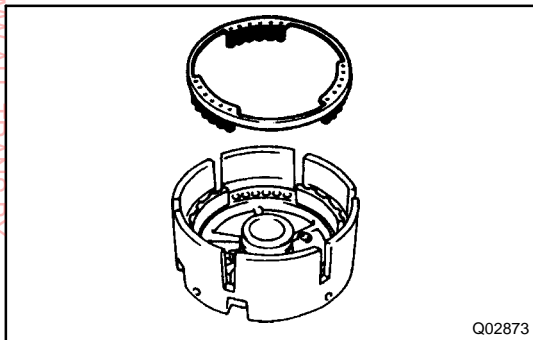


- (b) Remove the flange, 5 discs and 5 plates.

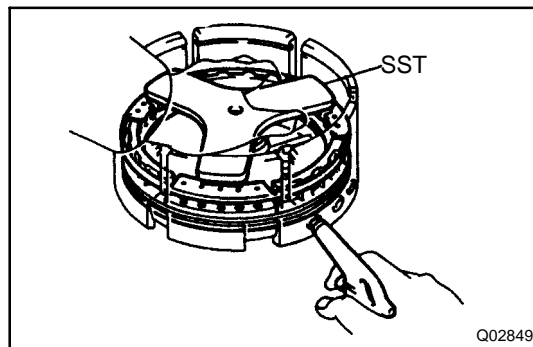


### 5. REMOVE PISTON RETURN SPRING

- (a) Place SST on the spring seat, and compress the return spring with a shop press.  
SST 09350-36010 (09350-06020)
- (b) Using a screwdriver, remove the snap ring.

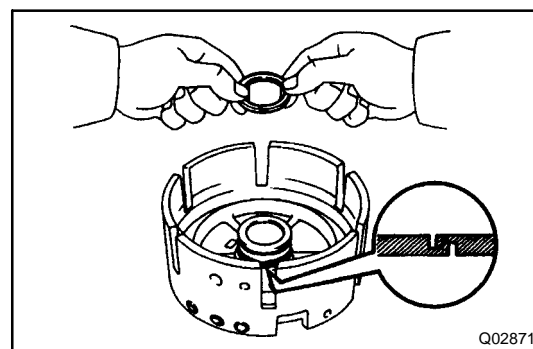


- (c) Remove the piston return spring.



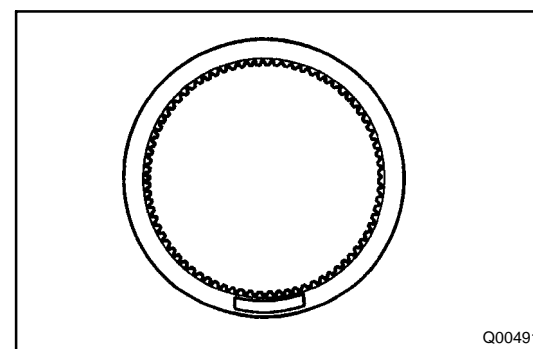
## 6. REMOVE SECOND BRAKE PISTON

- (a) Place the return spring on the brake piston, and then place SST on the return spring.  
SST 09350-36010 (09350-06020)
- (b) Hold SST so it does not slant, and apply compressed air 382 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi) into the oil hole of the center support to remove the brake piston.  
SST 09350-36010 (09350-06020)
- (c) Remove the 2 oil seal rings from the center support.



## 7. REMOVE OIL SEAL RINGS

Remove the 2 oil seal rings from the center support.



## SECOND BRAKE INSPECTION

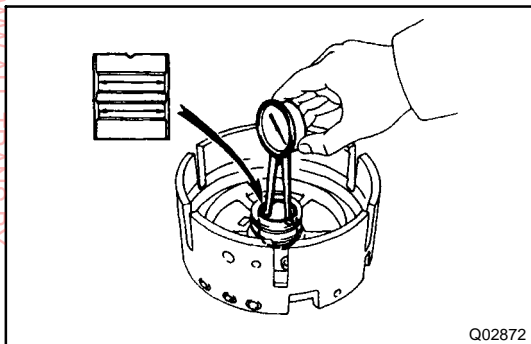
### 1. INSPECT DISCS, PLATES AND FLANGE

Check to see if the sliding surface of the disc, plate and flange are worn or burnt. If necessary, replace them.

HINT:

- © If the lining of the disc is peeling off or discolored, or even if a part of the printed numbers are defaced, replace all discs.
- © Before assembling new discs, soak them in ATF for at least 15 minutes.





## 2. INSPECT BUSHING OF CENTER SUPPORT

Using a dial indicator, measure the inside diameter.

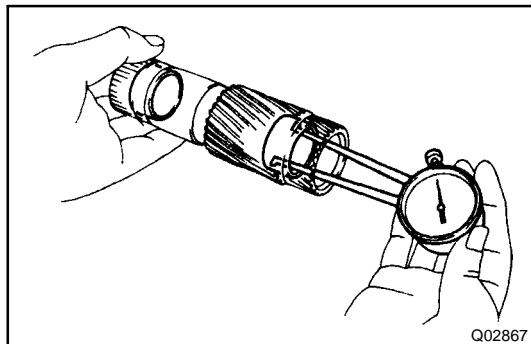
**Standard inside diameter:**

**35.000 - 35.025 mm (1.3780 - 1.3789)**

**Maximum inside diameter:**

**35.08 mm (1.3811 in.)**

If the inside diameter is greater than the maximum, replace the center support.



## 3. INSPECT BUSHINGS OF FRONT PLANETARY SUN GEAR

Using a dial indicator, measure the inside diameter.

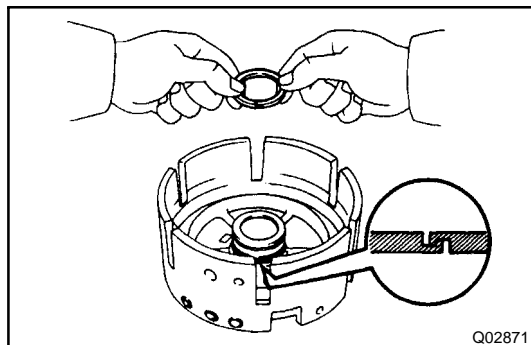
**Standard inside diameter:**

**25.000 - 25.021 mm (0.9842 - 0.9851 in.)**

**Maximum inside diameter:**

**25.070 mm (0.9870 in.)**

If the inside diameter is greater than the maximum, replace the front planetary sun gear.



## SECOND BRAKE ASSEMBLY

### 1. INSTALL OIL SEAL RINGS

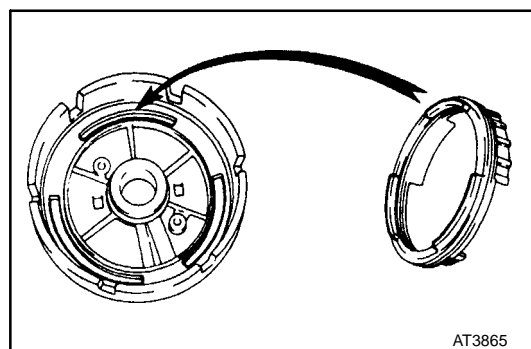
- (a) Coat the 2 oil seal rings with ATF.
- (b) Squeeze the oil seals, and install then onto the center support.

**NOTICE: Do not spread the ring ends more than necessary.**

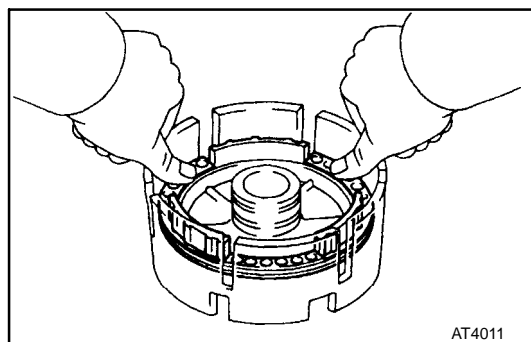
**HINT:** After installing the oil seal rings, check that they rotate smoothly.

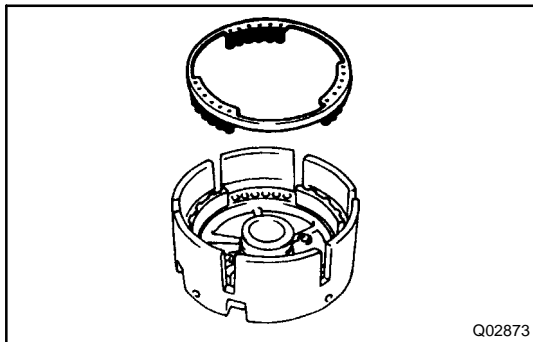
### 2. INSTALL SECOND BRAKE PISTON

- (a) Coat new 2 O-rings with ATF, and install them on the brake piston.
- (b) Align the protrusions of the brake piston with the grooves of the center support.



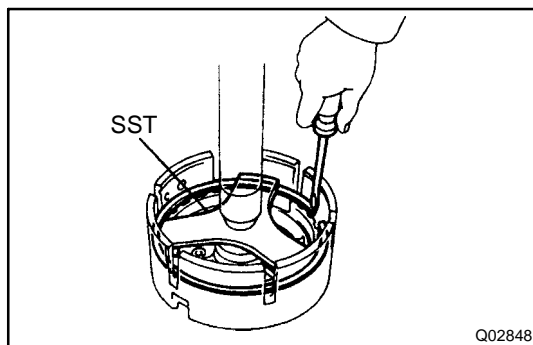
- (c) Push in the brake piston into the center support with both hands.
- NOTICE: Be careful not to damage the O-rings.**



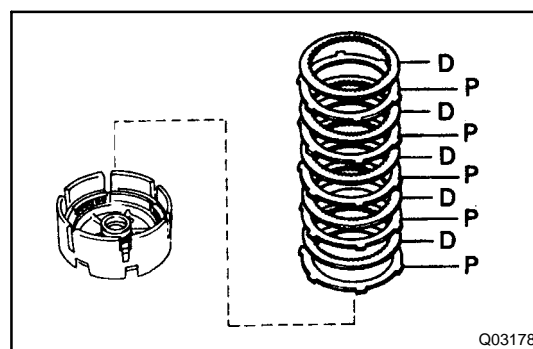


### 3. INSTALL PISTON RETURN SPRING

- (a) Place the return spring on the brake piston.

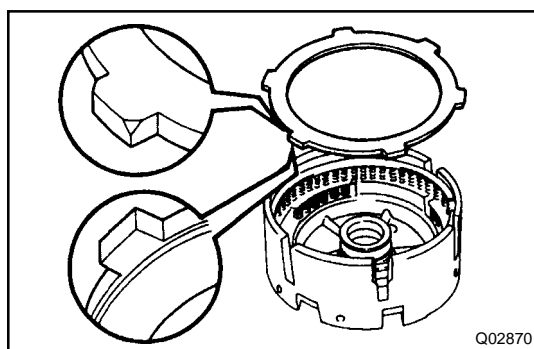


- (b) Place SST on the return spring, and compress the return spring with a shop press. SST 09350-36010 (09350-06020)
- (c) Using a screwdriver, install the snap ring. HINT: Be sure the end gap of the snap ring is not aligned with the cutout portion of the center support.

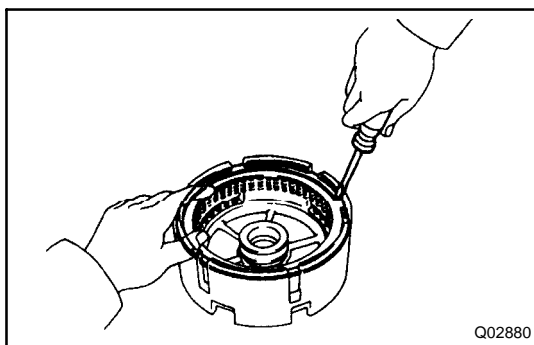


### 4. INSTALL PLATES, DISCS AND FLANGE

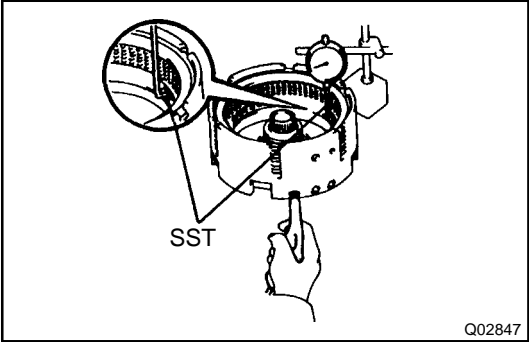
- (a) Install the 5 plates and 5 discs in order:  
P = Plate D = Disc  
P-D-P-D-P-D-P-D-P-D



- (b) Install the flange, facing the rounded edge upward. HINT: If the flange is step-edged, install the flange with the step-edge, facing downward.



- (c) Using a screwdriver, install the snap ring. HINT: Be sure the end gap of the snap ring is not aligned the cutout portion of the center support.



5. CHECK PISTON STROKE OF SECOND BRAKE

Using SST and a dial indicator, measure the piston stroke while applying and releasing compressed air 392 - 785 kPa (4 - 8 kgf/cm<sup>2</sup>, 57 - 114 psi).  
SST 09350-36010 (09350-06120)

**Piston stroke:**

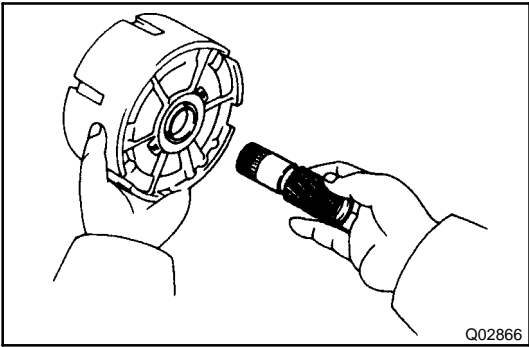
**1.86 - 2.06 mm (0.0732 - 0.0811 in.)**

If the piston stroke is less than specified, parts may have been assembled incorrectly, check and reassemble again.

If the piston stroke is not as specified, select another flange.

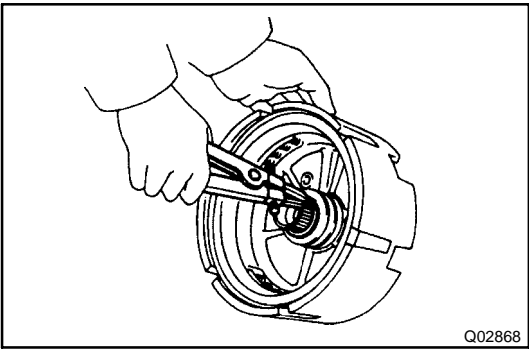
**Flange thicknesses**

No.	Thickness mm (in.)	No.	Thickness mm (in.)
A	5.0 (0.197)	C	5.4 (0.213)
B	5.2 (0.205)	D	5.6 (0.220)

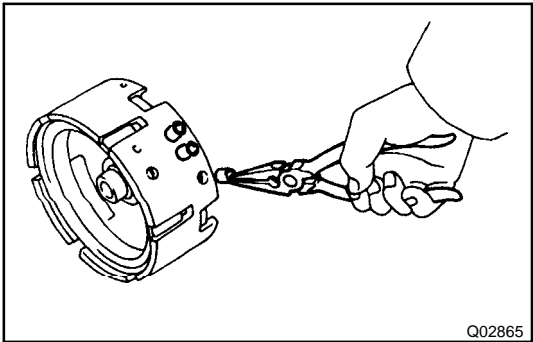


6. INSTALL FRONT PLANETARY SUN GEAR

(a) Install the sun gear.



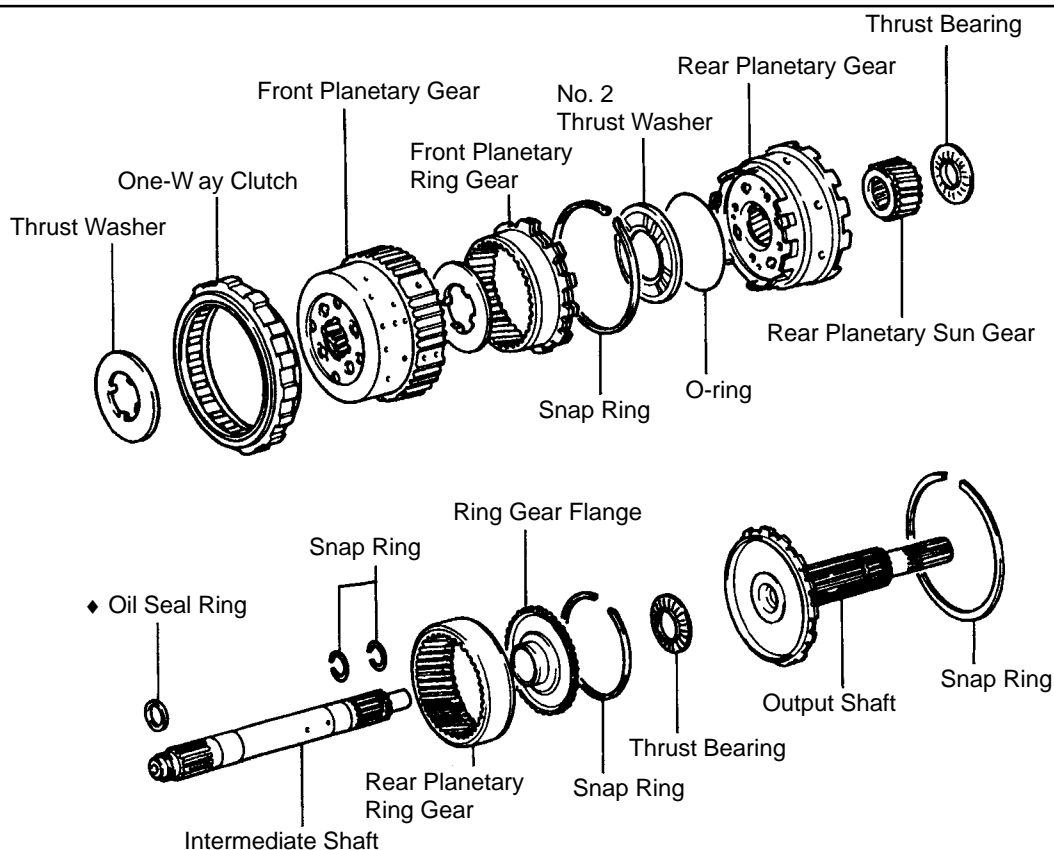
(b) Using snap ring pliers, install the snap ring.



7. INSTALL RING RETAINERS

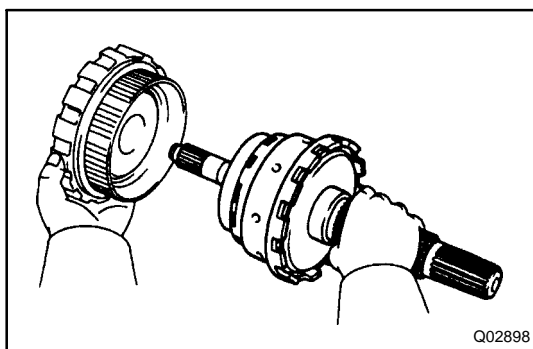
Using needle nose pliers, install the 3 ring retainers into the oil holes of the center support.

# FRONT AND REAR PLANETARY GEAR UNIT COMPONENTS



♦ Non-reusable part

Q02992



Q02898

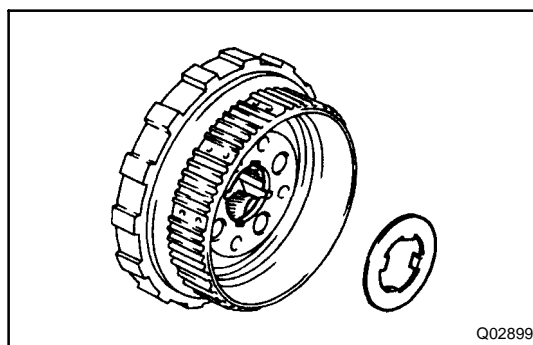
## FRONT AND REAR PLANETARY GEAR UNIT DISASSEMBLY

### 1. REMOVE REAR PLANETARY GEAR AND OUTPUT SHAFT ASSEMBLY

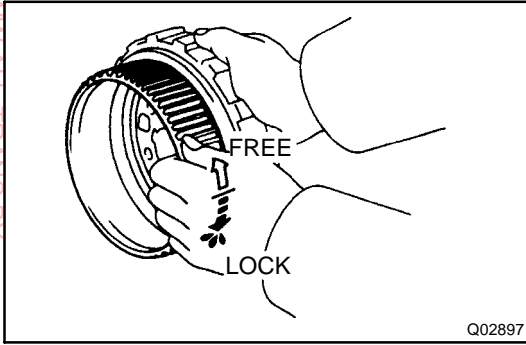
Remove the rear planetary gear and output shaft assembly from the front planetary gear.

### 2. REMOVE NO. 1 REAR THRUST WASHER

Remove the thrust washer from the rear side of the front planetary gear.

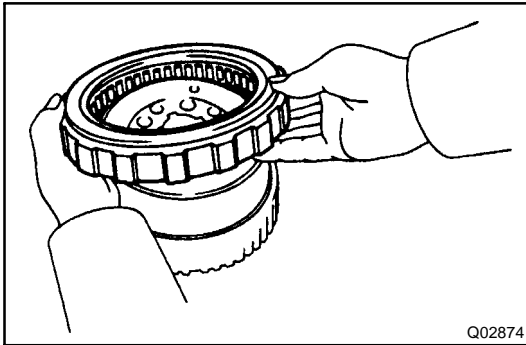


Q02899



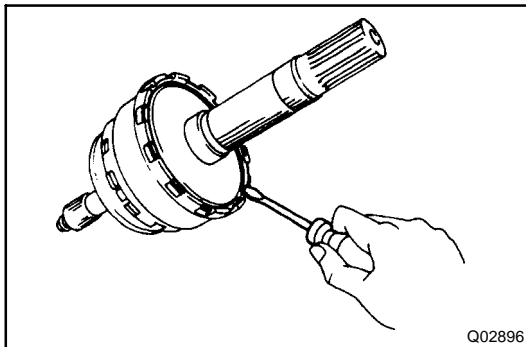
### 3. CHECK OPERATION OF ONE-WAY CLUTCH

Hold the one-way clutch outer race and turn the front planetary gear. The front planetary gear should turn freely counterclockwise and should lock clockwise. If operation is not as specified, replace the one-way clutch.



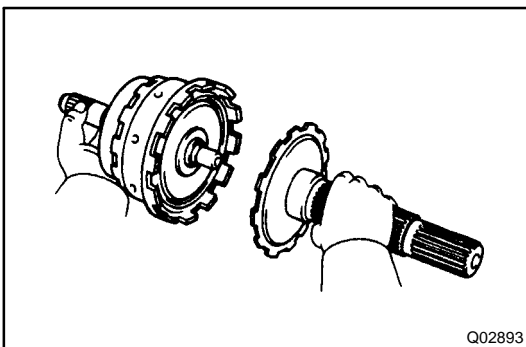
### 4. REMOVE ONE-WAY CLUTCH

Remove the one-way clutch from the front planetary gear.

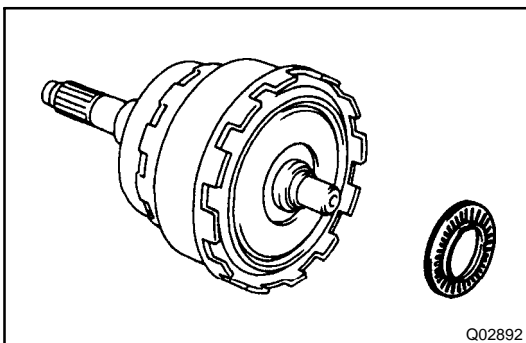


### 5. REMOVE OUTPUT SHAFT

(a) Using a screwdriver, remove the snap ring.



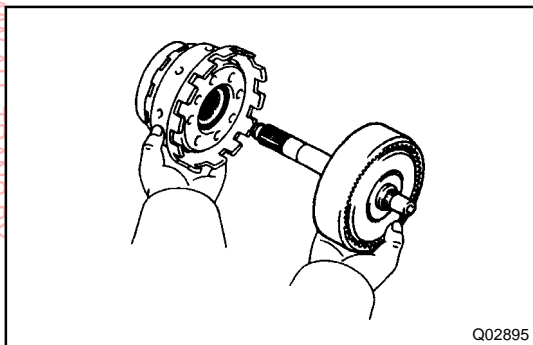
(b) Remove the output shaft from the rear planetary gear.



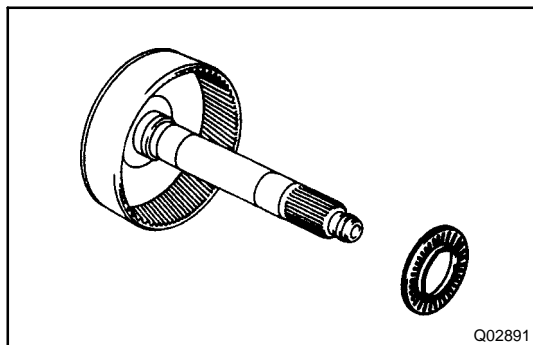
(c) Remove the thrust bearing and race from the rear side of the ring gear flange.

## 6. REMOVE REAR PLANETARY RING GEAR AND INTERMEDIATE SHAFT ASSEMBLY

- (a) Remove the ring gear and intermediate shaft assembly from the rear planetary gear.

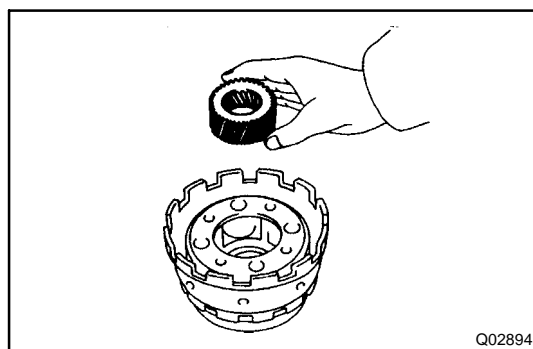


- (b) Remove the thrust bearing from the front side of the ring gear flange.



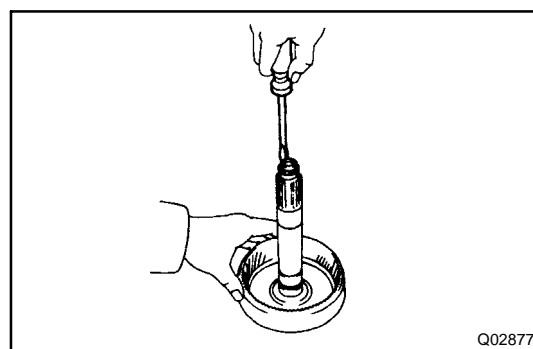
## 7. REMOVE REAR PLANETARY SUN GEAR

Remove the sun gear from the rear planetary gear.



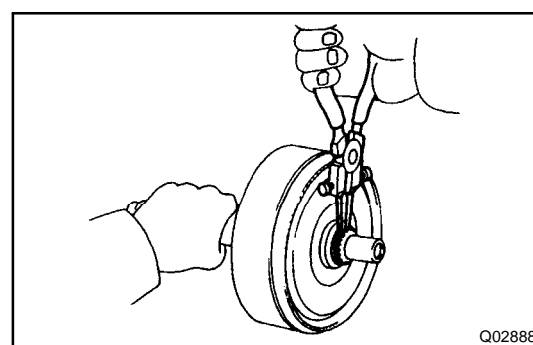
## 8. REMOVE OIL SEAL RING

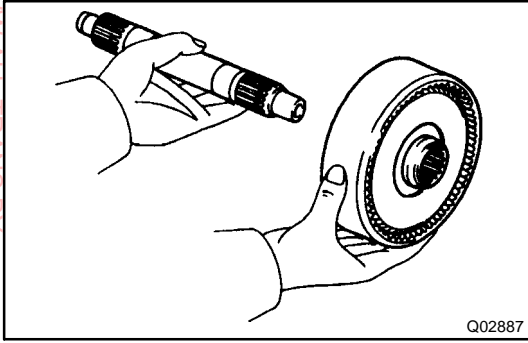
Using a small screwdriver, pry out the oil seal ring.



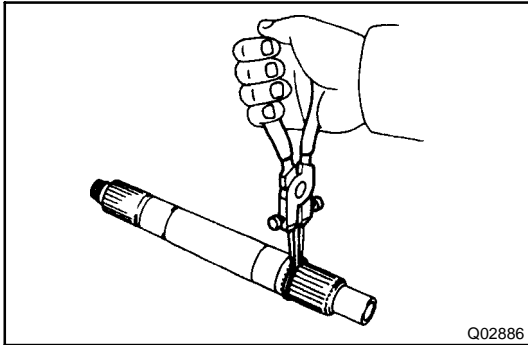
## 9. REMOVE REAR PLANETARY RING GEAR AND FLANGE ASSEMBLY

- (a) Using snap ring pliers, remove the snap ring from the rear side of the intermediate shaft.

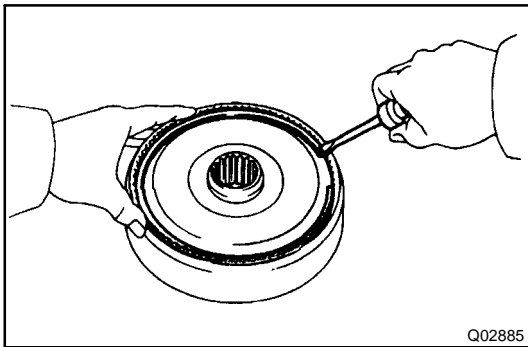




- (b) Remove the ring gear and flange assembly from the intermediate shaft.

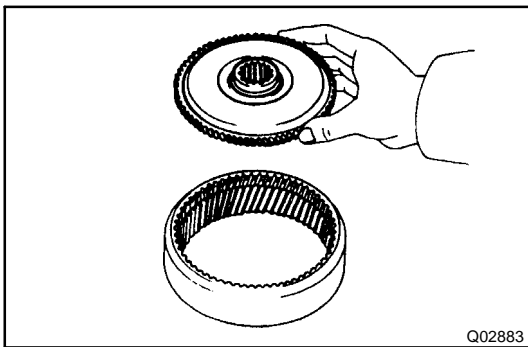


- (c) Using snap ring pliers, remove the snap ring from the front side of the intermediate shaft.

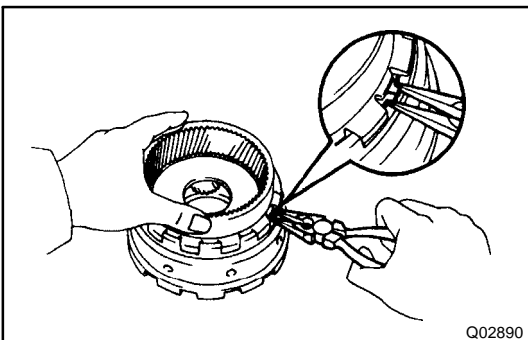


#### 10. REMOVE REAR PLANETARY RING GEAR FLANGE

- (a) Using a small screwdriver, remove the snap ring.

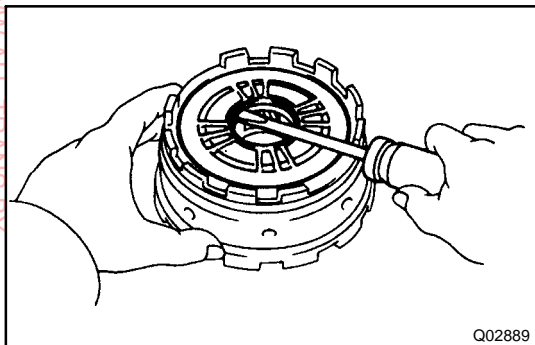


- (d) Remove the ring gear flange from the rear planetary ring gear.



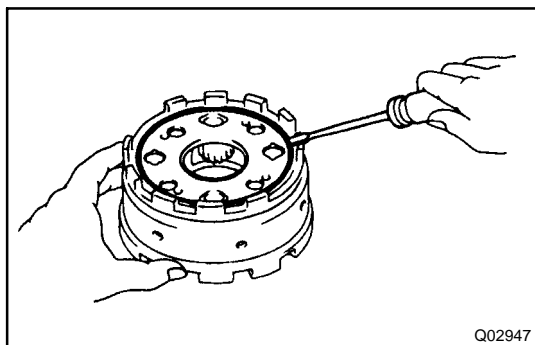
#### 11. REMOVE FRONT PLANETARY RING GEAR

Using needle nose pliers, pry out the ring gear while compressing the snap ring.

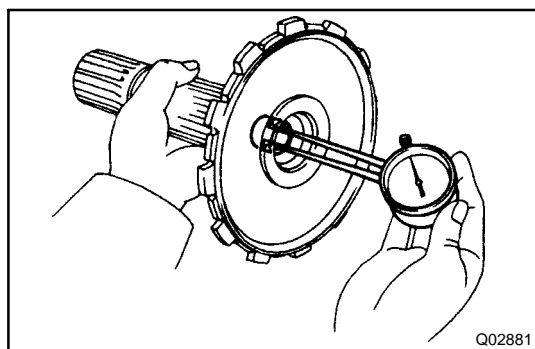
**12. REMOVE NO. 2 THRUST WASHER**

Remove the thrust washer from the rear planetary gear.

**NOTICE:** Do not damage the No. 2 thrust washer.

**13. REMOVE O-RING**

Using a small screwdriver, remove the o-ring from the rear planetary gear.

**FRONT AND REAR PLANETARY GEAR UNIT INSPECTION****1. INSPECT BUSHING OF OUTPUT SHAFT**

Using a dial indicator, measure the inside diameter.

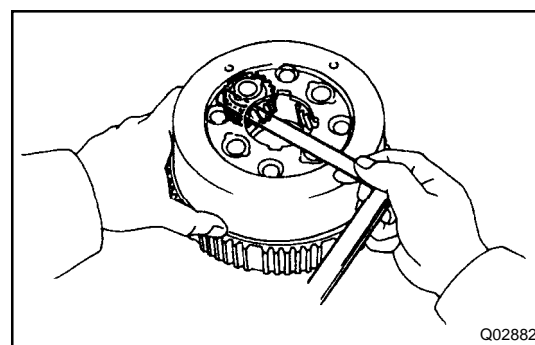
**Standard inside diameter:**

**17.000 - 17.021 mm (0.6693 - 0.6701 in.)**

**Maximum inside diameter:**

**17.07 mm (0.6720 in.)**

If the inside diameter is greater than maximum, replace the output shaft.

**2. INSPECT PLANETARY PINION GEAR THRUST CLEARANCE**

Using a feeler gauge, measure the thrust clearance between the pinions and carrier.

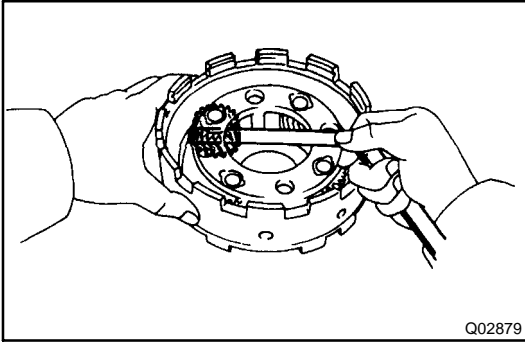
**Standard clearance:**

**0.20 - 0.59 mm (0.0079 - 0.0232 in.)**

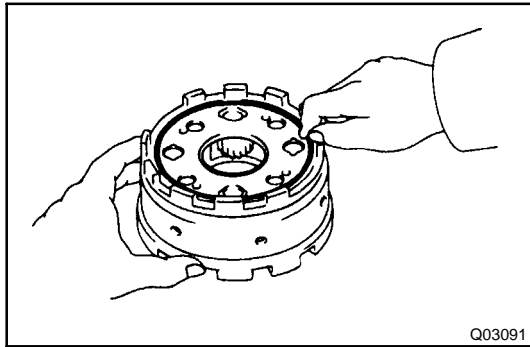
**Maximum clearance:**

**0.75 mm (0.0295 in.)**





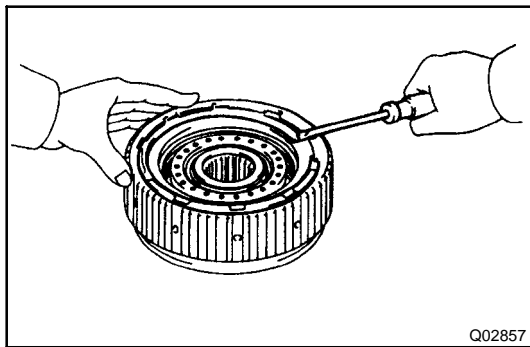
If the thrust clearance is greater than maximum, replace the planetary gear.



## FRONT AND REAR PLANETARY GEAR UNIT ASSEMBLY

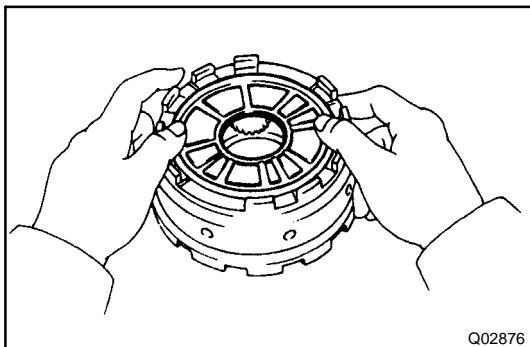
### 1. INSTALL O-RING

Coat a new O-ring with ATF, and install it to the rear planetary gear.

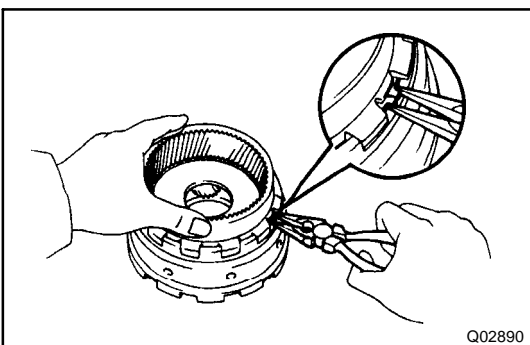


### 2. INSTALL NO. 2 THRUST WASHER

Coat the thrust washer with petroleum jelly, and install it onto the rear planetary gear.



**HINT:** Securely fit the lips of the thrust washer into the holes of the rear planetary gear.

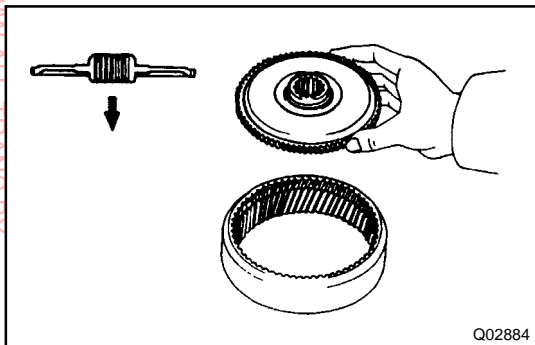


### 3. INSTALL FRONT PLANETARY RING GEAR

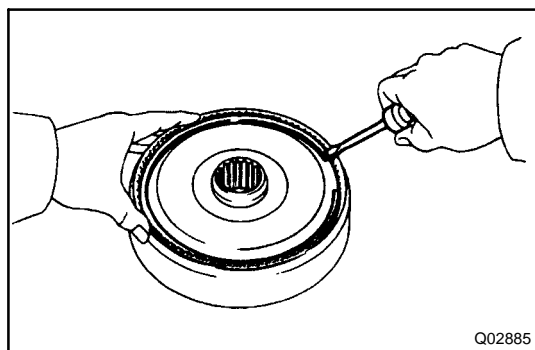
- (a) Align the snap ring end with the wide cutout portion of the rear planetary gear.
- (b) Using needle nose pliers, compress the snap ring and then install the ring gear.
- (c) Check that the snap ring is installed into the groove of the rear planetary gear.

**4. INSTALL REAR PLANETARY RING GEAR FLANGE**

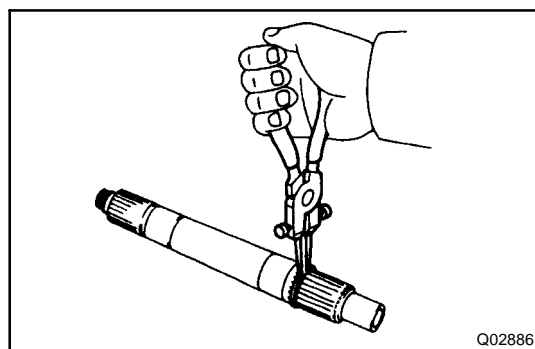
- (a) Install the ring gear flange to the rear planetary ring gear.



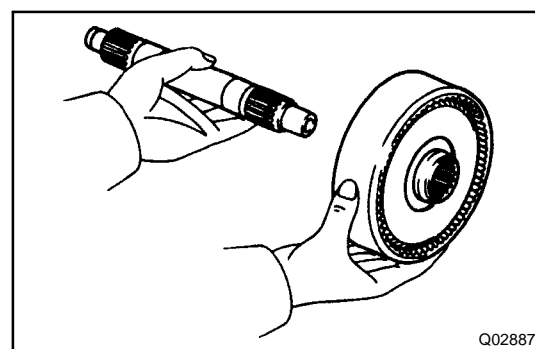
- (b) Using a small screwdriver, install the snap ring.

**5. INSTALL REAR PLANETARY RING GEAR AND FLANGE ASSEMBLY**

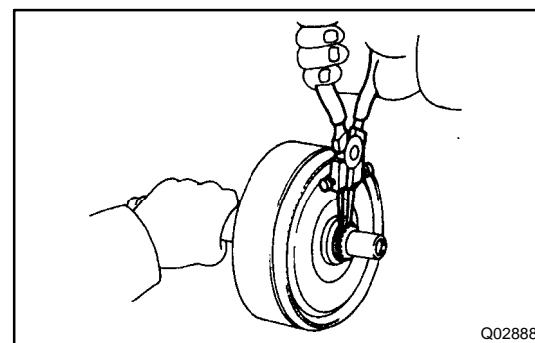
- (a) Using snap ring pliers, install the snap ring on the front side of the intermediate shaft.

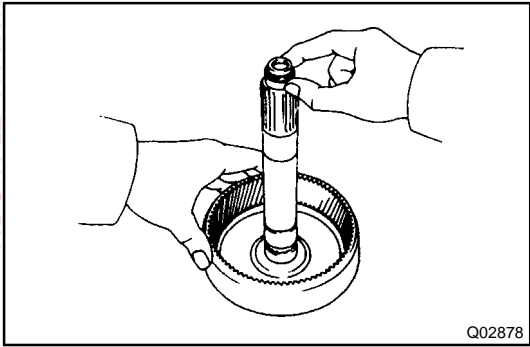


- (b) Install the ring gear and flange assembly.



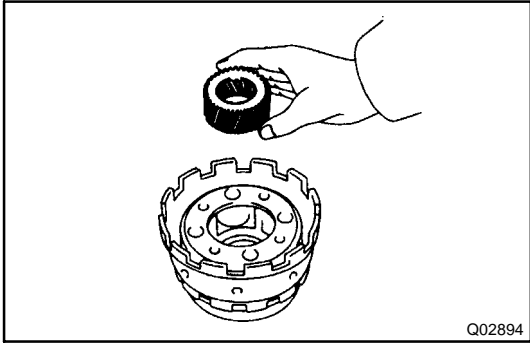
- (c) Using snap ring pliers, install the snap ring on the rear side of the intermediate shaft.





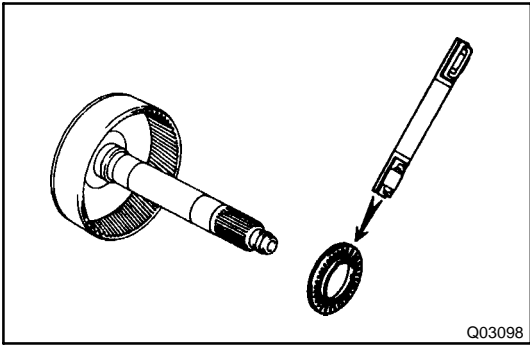
#### 6. INSTALL OIL SEAL RING

Coat a new oil seal ring with ATF, and install it on the intermediate shaft.



#### 7. INSTALL REAR PLANETARY SUN GEAR

Install the sun gear to the rear planetary gear.



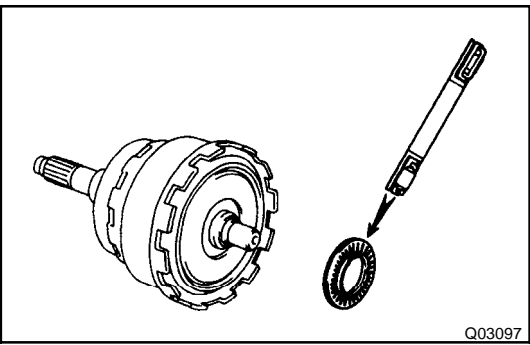
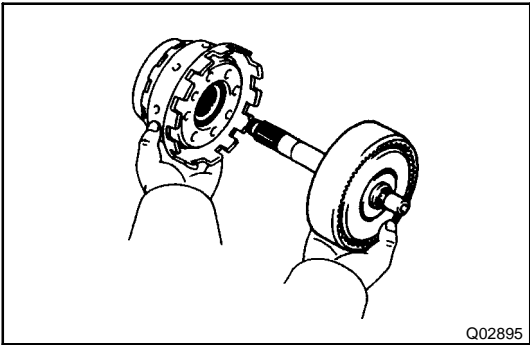
#### 8. INSTALL REAR PLANETARY RING GEAR AND INTERMEDIATE SHAFT ASSEMBLY

- Coat the thrust bearing with petroleum jelly.
- Install the thrust bearing onto the front side of the ring gear flange.

##### Race and bearing diameter

Diameter mm (in.)	Inside	Outside
Bearing	32.8 (1.291)	52.0 (2.047)

- Install the ring gear and intermediate shaft assembly to the rear planetary gear.

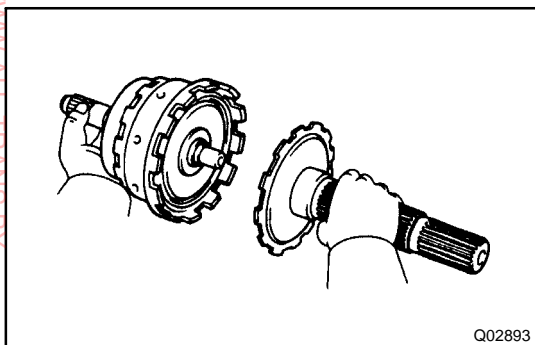


#### 9. INSTALL OUTPUT SHAFT

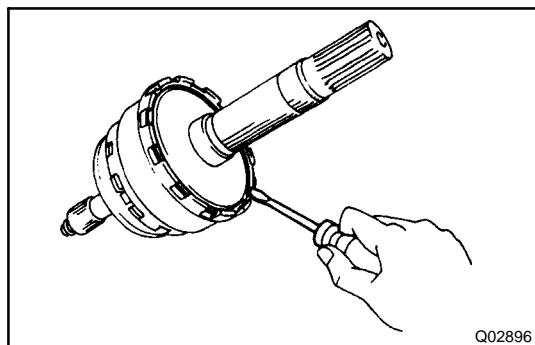
- Coat the race and thrust bearing with petroleum jelly.
- Install the thrust bearing onto the rear side of the ring gear flange.

##### Race and bearing diameter

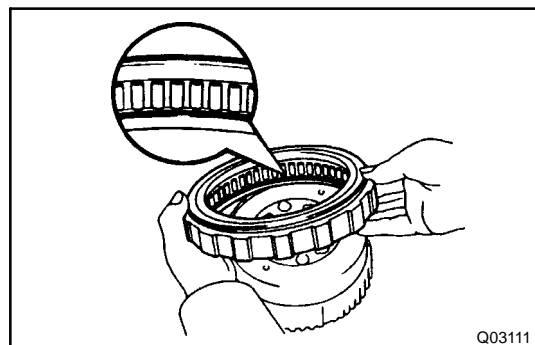
Diameter mm (in.)	Inside	Outside
Bearing	32.8 (1.291)	52.0 (2.047)



- (c) Install the output shaft to the rear planetary gear.

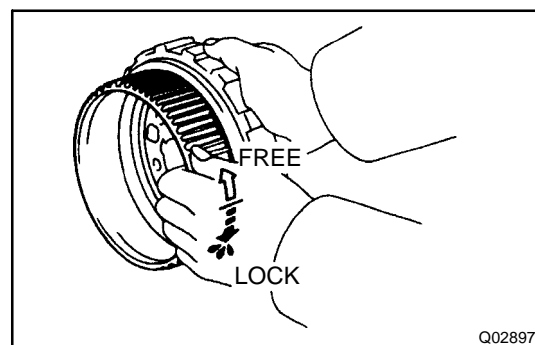


- (d) Using a screwdriver, install the snap ring.  
HINT: Be sure the end gap of the snap ring is not aligned with the cutout portion of the rear planetary gear.



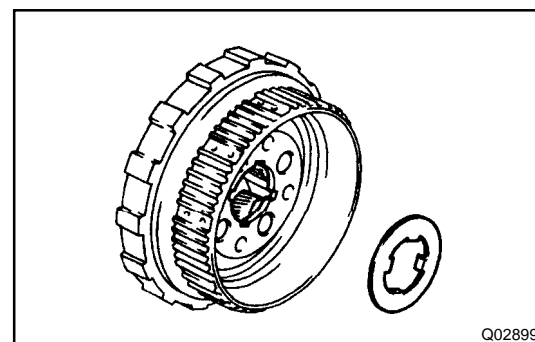
#### 10. INSTALL ONE-WAY CLUTCH

- (a) Position the one-way clutch on the front planetary gear, facing the flange side of the one-way clutch downward.
- (b) Install the one-way clutch outer race and turn the front planetary gear. The front planetary gear should turn freely counterclockwise and should lock clockwise.  
If operation is not as specified, replace the one-way clutch.



#### 11. CHECK OPERATION OF ONE-WAY CLUTCH

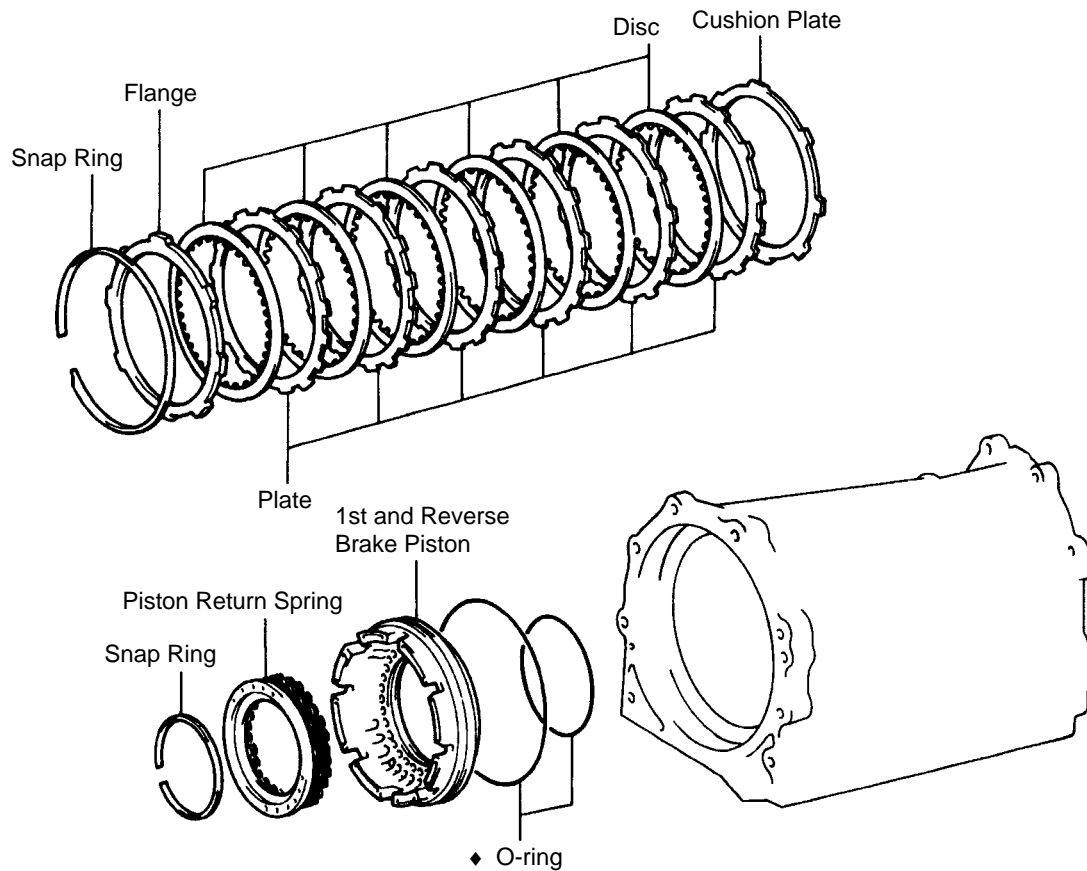
Hold the one-way clutch outer race and turn the front planetary gear. The front planetary gear should turn freely counterclockwise and should lock clockwise.  
If operation is not as specified, replace the one-way clutch.



#### 12. INSTALL NO. 1 REAR THRUST WASHER

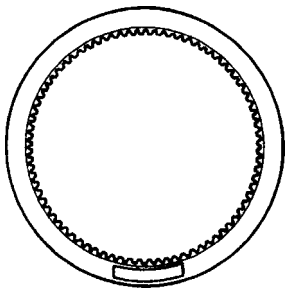
Coat the thrust washer with petroleum jelly, and install it onto the rear side of the front planetary gear. Securely fit the claws of the thrust washer into the grooves of the front planetary gear.

# FIRST AND REVERSE BRAKE COMPONENTS



◆ Non-reusable part

AT3964



Q00491

## FIRST AND REVERSE BRAKE INSPECTION

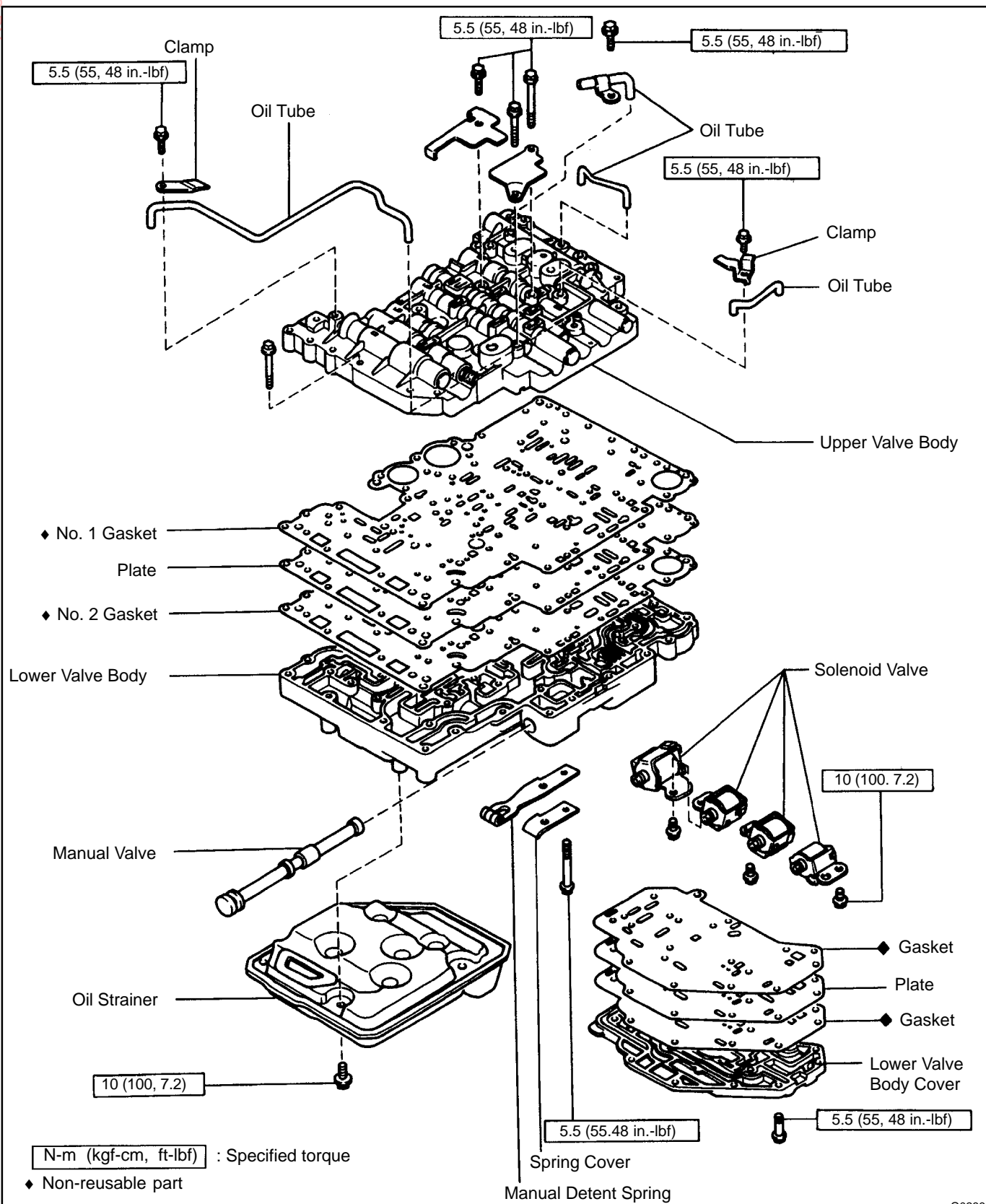
### INSPECT DISCS, PLATES AND CUSHION PLATE

Check to see if the sliding surface of the disc, plate and flange are worn or burnt. If necessary, replace them.

#### HINT:

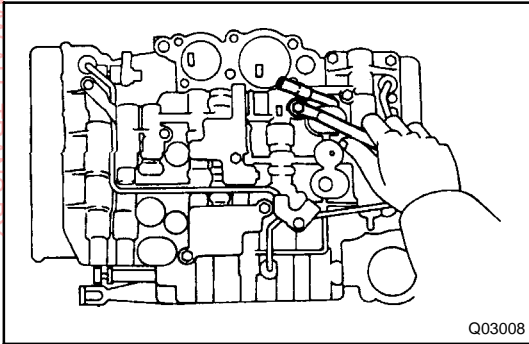
- ◎ If the lining of the disc is peeling off or discolored, or even if a part of the printed numbers are defaced, replace all discs.
- ◎ Before assembling new discs, soak them in ATF for at least 15 minutes.

# VALVE BODY COMPONENTS



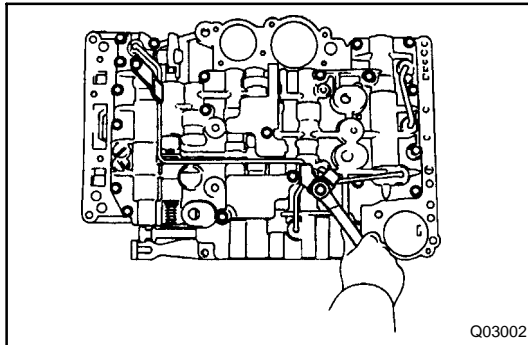
## VALVE BODY DISASSEMBLY

### 1. REMOVE DRAIN TUBE

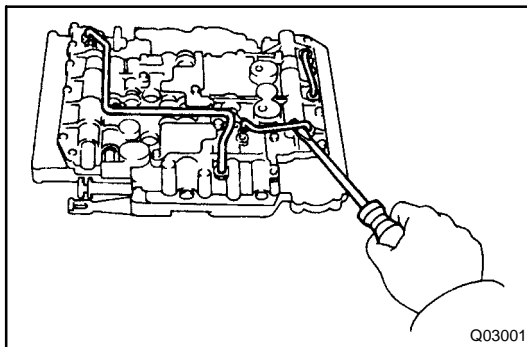


### 2. REMOVE OIL TUBES

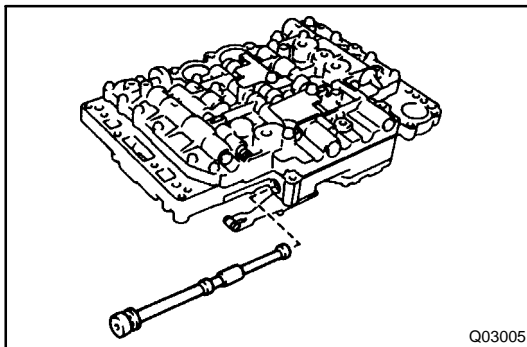
(a) Remove the 2 tube clamps.



(b) Using a large screwdriver, pry out the 3 oil tubes.



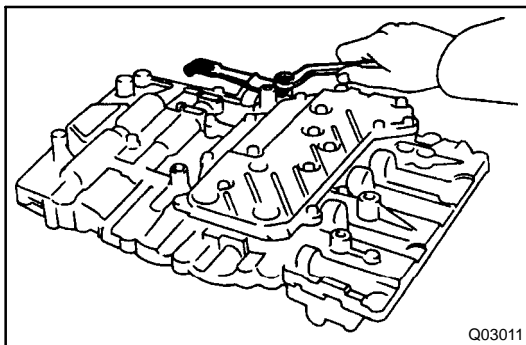
### 3. REMOVE MANUAL VALVE



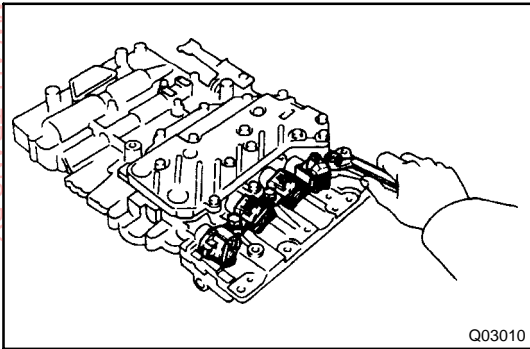
### 4. REMOVE MANUAL DETENT SPRING

(a) Turn over the valve body assembly.

(b) Remove the bolt, wave washer, spring cover and detent spring.

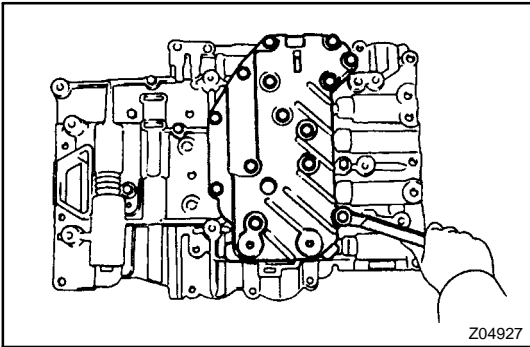


## 5. REMOVE 4 SOLENOID VALVES

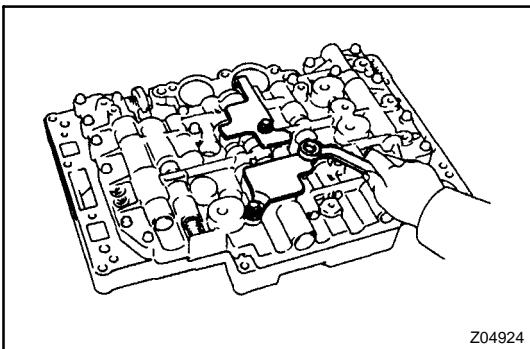


## 6. REMOVE LOWER VALVE BODY COVER AND PLATE

Remove the 16 bolts, wave washers, body cover, 2 gaskets and body plate.

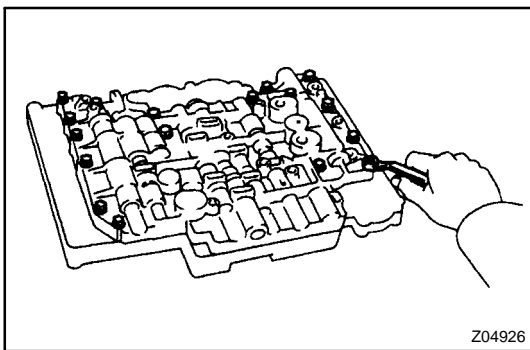


## 7. REMOVE 2 PLATES

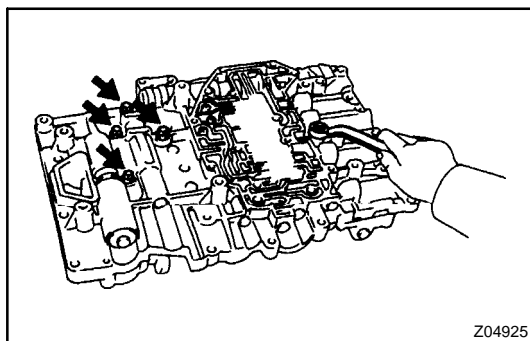


## 8. SEPARATE UPPER AND LOWER VALVE BODYS

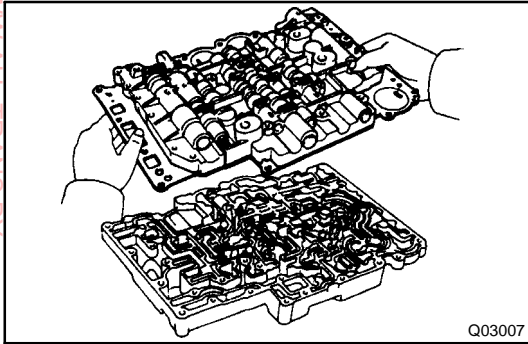
(a) Remove the 13 bolts from the upper valve body.



(b) Remove the 5 bolts from the lower valve body.  
**NOTICE:** Be careful that the check bails, springs and check valves do not fall out from the lower valve body.





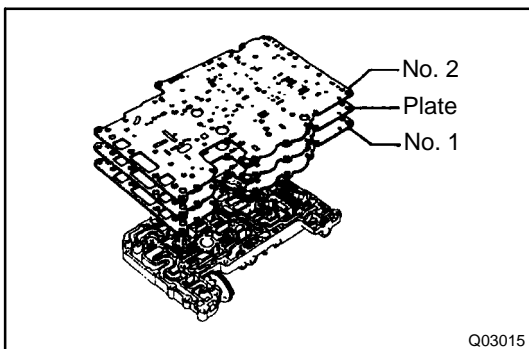
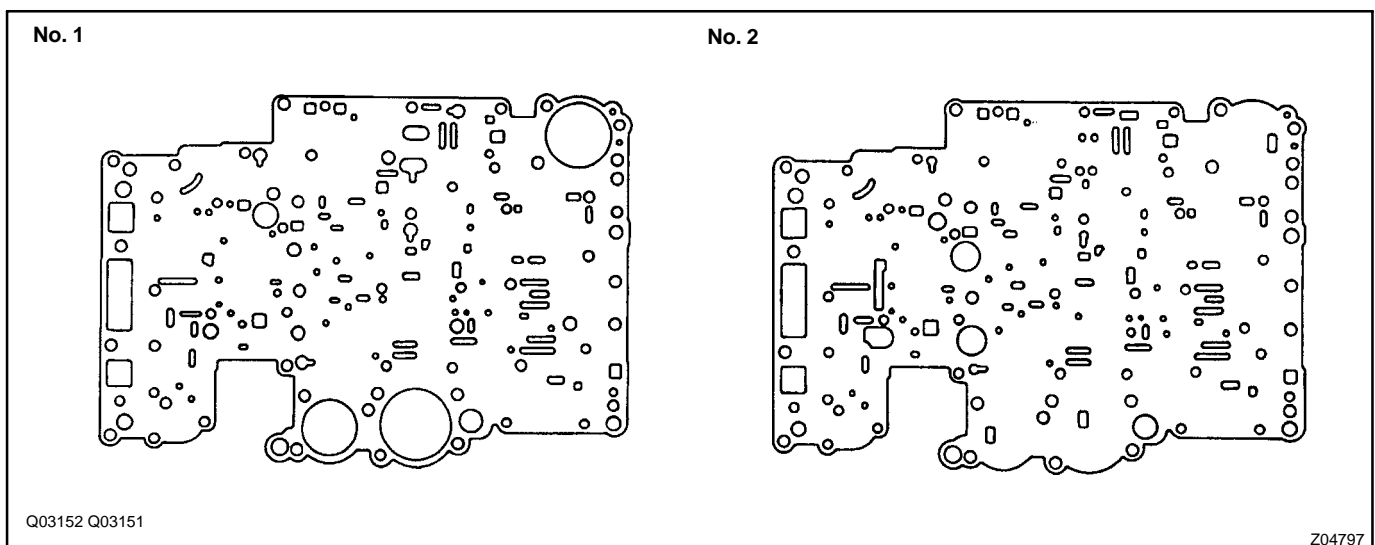


- (c) Remove the lower valve body together with the valve body

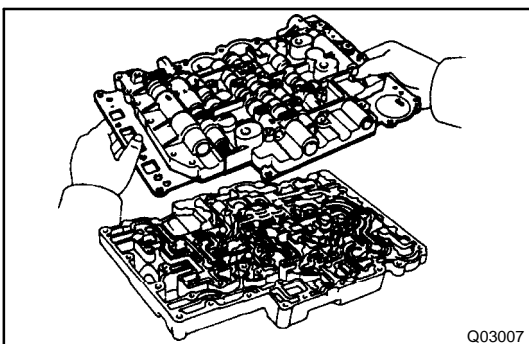
## VALVE BODY ASSEMBLY

### 1. INSTALL VALVE BODY PLATE

HINT: Since No. 1 and No. 2 gaskets look similar, use the illustrations below to differentiate between them.

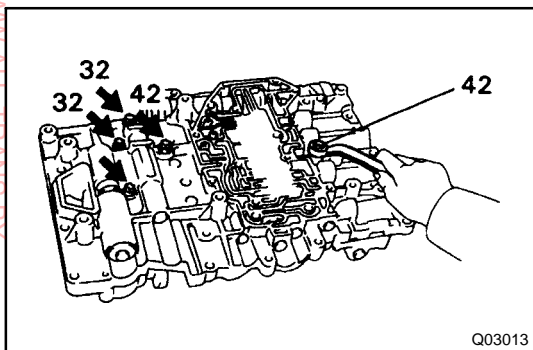


Place a new No. 1 gasket, the body plate and a new No. 2 gasket on the lower valve body.



### 2. INSTALL LOWER VALVE BODY

- (a) Turn over the valve body assembly together with the plate and 2 gaskets.  
HINT: Be careful that the check balls, check valve and spring do not fall out.
- (b) Place the lower valve body on the upper valve body.

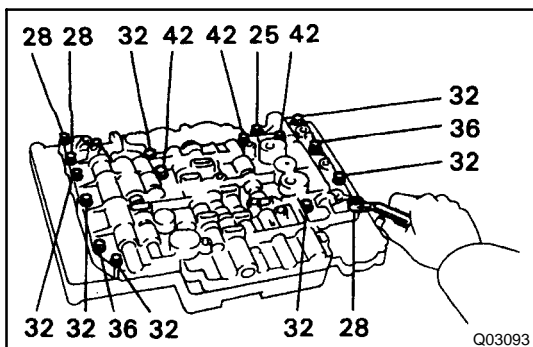


- (b) Temporarily install the 5 bolts.  
HINT: Each bolt length (mm) is indicated in the illustration.

**Bolt length:**

32 mm (1.26 in.)

42 mm (1.65 in.)

**3. INSTALL UPPER VALVE BODY INSTALLATION BOLTS**

- (a) Turn over the valve body assembly.

- (b) Temporarily install the 20 bolts.

HINT: Each bolt length (mm) is indicated in the illustration.

**Bolt length:**

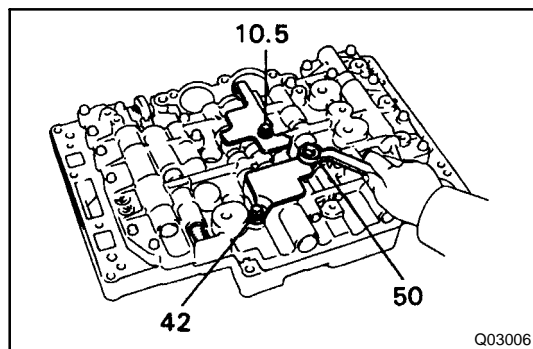
25 mm (0.98 in.)

28 mm (1.10 in.)

32 mm (1.26 in.)

36 mm (1.42 in.)

42 mm (1.65 in.)

**4. INSTALL 2 PLATES**

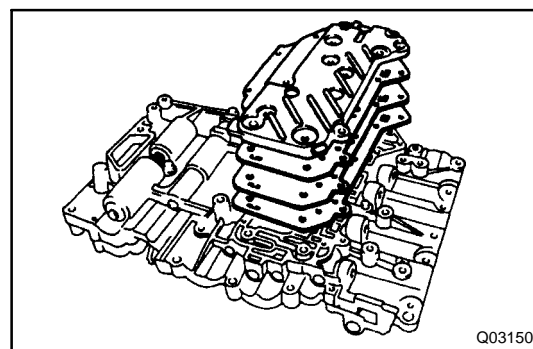
HINT: Each bolt length (mm) is indicated in the illustration.

**Bolt length:**

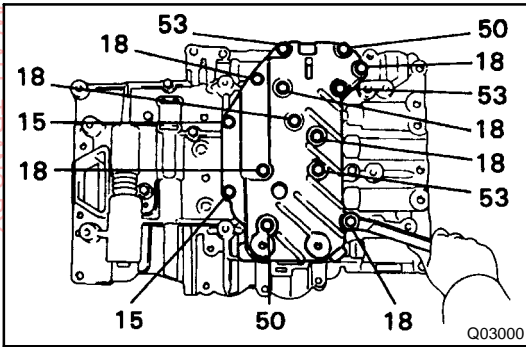
10.5 mm (0.41 in.)

42 mm (1.65 in.)

50 mm (1.97 in.)

**5. INSTALL LOWER VALVE BODY PLATE AND COVER**

- (a) Place a new No. 3 gasket, the body plate and a new No. 4 gasket on the lower valve body.



- (b) Install the body cover with the 2 wave washers and 14 bolts.

**Torque: 5.4 N-m (55 kgf-cm, 48 in.-lbf)**

HINT: Each bolt length (mm) is indicated in the illustration.

**Bolt length:**

15 mm (0.59 in.)

18 mm (0.71 in.)

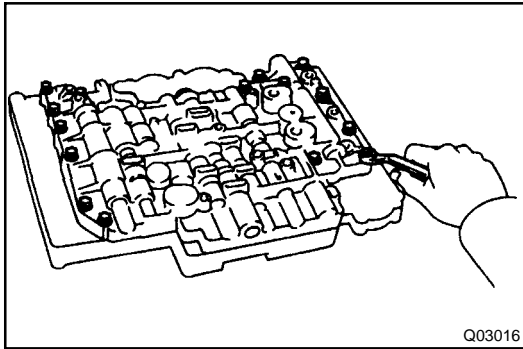
50 mm (1.97 in.)

53 mm (2.07 in.)

## 6. TIGHTEN BOLTS OF UPPER AND LOWER VALVE BODIES

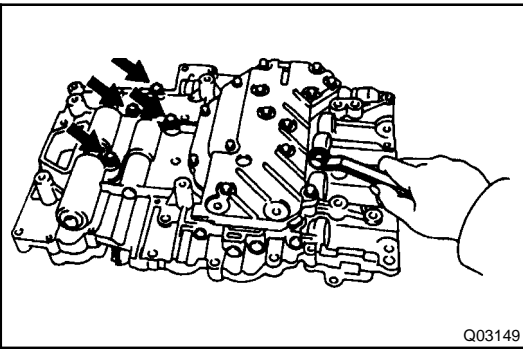
- (a) Upper Side:  
Tighten the 7 bolts.

**Torque: 5.4 N-m (55 kgf-cm, 48 in.-lbf)**



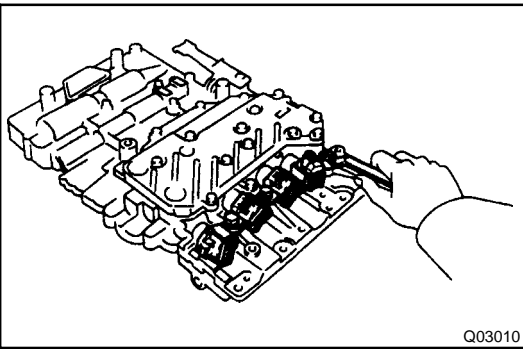
- (b) Lower Side:  
Tighten the 9 bolts.

**Torque: 5.4 N-m (55 kgf-cm, 48 in.-lbf)**



## 7. INSTALL 4 SOLENOID VALVES

**Torque: 10 N-m (100 kgf-cm, 7 ft-lbf)**

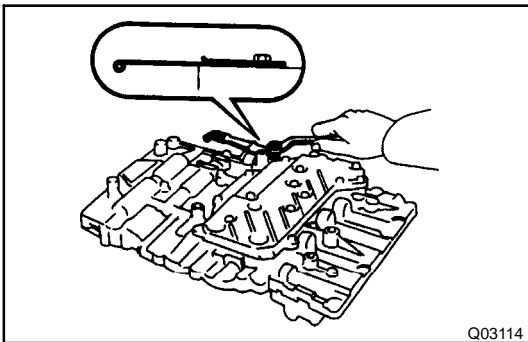


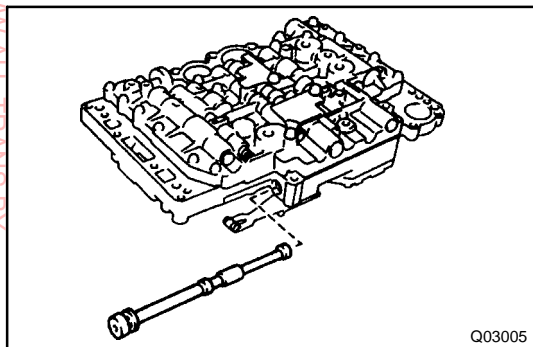
## 8. INSTALL MANUAL DETENT SPRING

Install the detent spring and cover with the wave washer and bolt.

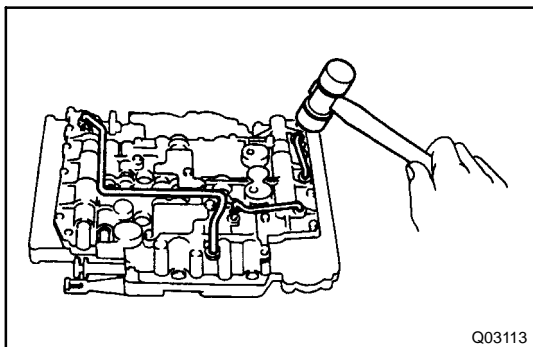
**Torque: 5.4 N-m (55 kgf-cm, 48 in.-lbf)**

HINT: Use the bolt which is 43 mm (1.69 in) in length.





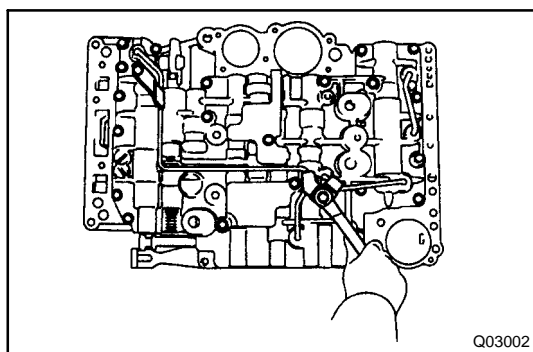
## 9. INSTALL MANUAL VALVE



## 10. INSTALL OIL TUBES

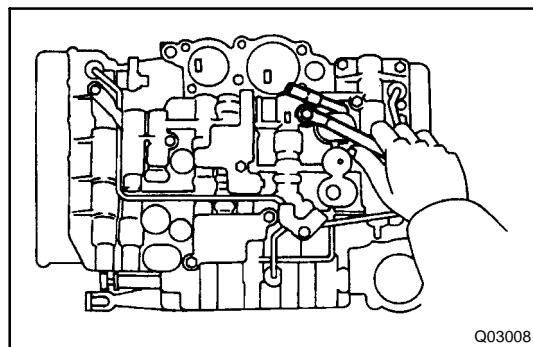
- (a) Using a plastic-faced hammer, tap in the oil tubes.

**NOTICE:** Be careful not to bend or damage the tubes.



- (b) Install the tube clamps with the 2 wave washers and bolts.

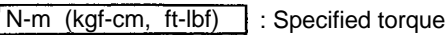
**HINT:** Use the bolt which is 10.5 mm (0.41 in.) in length.



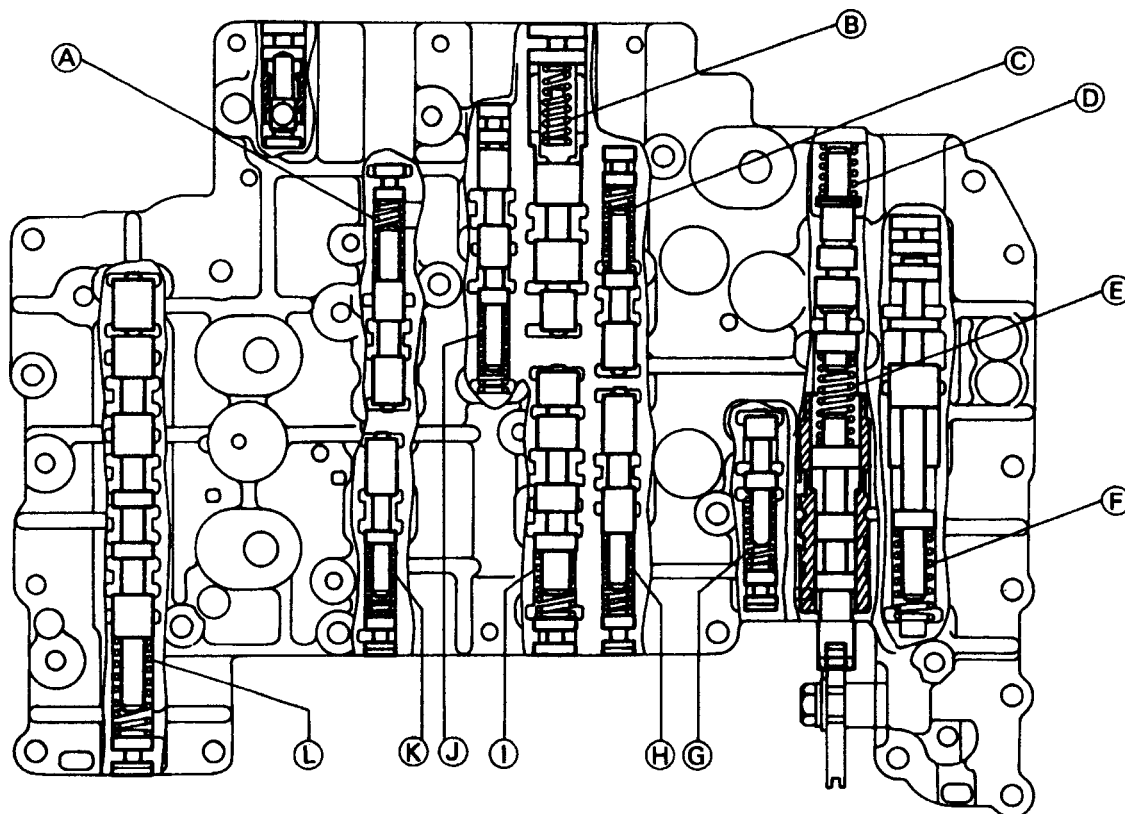
## 11. INSTALL DRAIN TUBE

Install the drain tube.

**HINT:** Use the bolt which is 10.5 mm (0.41 in.) in length.



## VALVE BODY SPRINGS SPECIFICATIONS

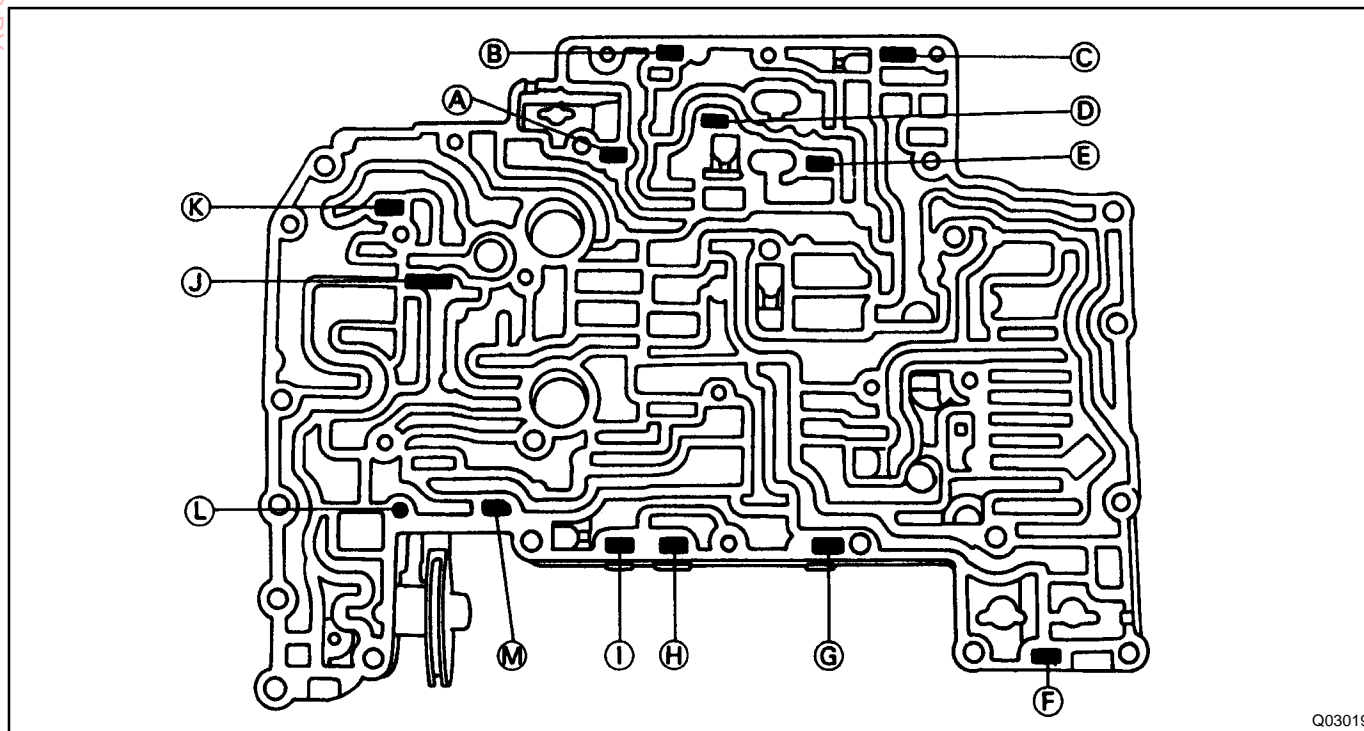


Q03017

Mark	Name (Color)	Free length / Outer Diameter mm (in.)	Total No. of coils
<b>A</b>	2-3 Shift Valve (Orange)	37.23 / 8.7 (1.466 / 0.343)	18.0
<b>B</b>	Reverse Inhibitor Valve (Light Blue)	29.3 / 6.5 (1.154 / 0.256)	20.0
<b>C</b>	Modulator Valve (Brown)	31.6 / 7.6 (1.244 / 0.299)	16.0
<b>D</b>	Throttle Valve (White)	25.3 / 9.2 (0.996 / 0.362)	9.5
<b>E</b>	Throttle Valve (Blue)	26.85 / 8.97 (1.057 / 0.353)	10.5
<b>F</b>	Secondary Regulator Valve (Red)	27.69 / 11.3 (1.090 / 0.445)	9.6
<b>G</b>	Cut-back Valve (Purple)	30.44 / 7.3 (1.198 / 0.287)	16.0
<b>H</b>	Lock-up Signal Valve (Purple)	30.44 / 7.3 (1.198 / 0.287)	16.0
<b>I</b>	Accumulator Control Valve (Blue)	24.8 / 10.5 (0.976 / 0.413)	10.0
<b>J</b>	Low Coast Modulator Valve (Beige)	30.7 / 7.3 (1.209 / 0.287)	16.0
<b>K</b>	Orifice Control Valve (Yellow Green)	22.5 / 7.5 (0.886 / 0.295)	12.0
<b>L</b>	Low Inhibitor Valve (Purple)	30.44 / 7.3 (1.198 / 0.287)	16.0

## RETAINER, PINS AND CHECK BALLS LOCATION

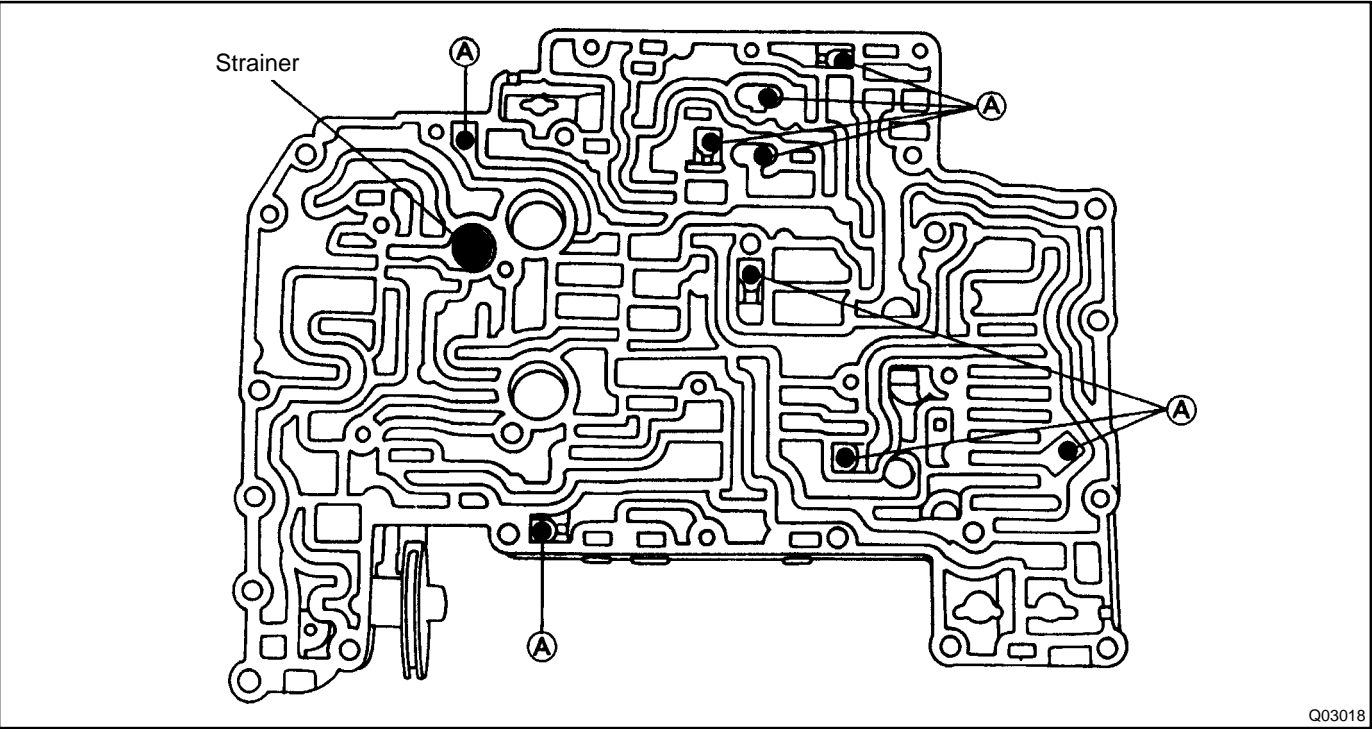
### 1. RETAINERS AND PINS



Q03019

Mark	Name	Length / Width / Thickness or diameter	mm (in.)
A	Retainer for Modulator Valve Plug	16.0 / 5.0 / 3.2 (0.630 / 0.197 / 0.126)	
B	Retainer for Reverse Inhibitor Valve Sleeve Plug	13.5 / 5.0 / 3.2 (0.531 / 0.197 / 0.126)	
C	Retainer for Check Valve Sleeve Plug	13.5 / 5.0 / 3.2 (0.531 / 0.197 / 0.126)	
D	Retainer for Low Coast Modulator Valve Plug	16.0 / 5.0 / 3.2 (0.630 / 0.197 / 0.126)	
E	Retainer for Low Inhibitor Valve Plug	13.5 / 5.0 / 3.2 (0.531 / 0.197 / 0.126)	
F	Retainer for 2 - 3 Shift Valve Plug	13.5 / 5.0 / 3.2 (0.531 / 0.197 / 0.126)	
G	Retainer for Orifice Control Valve plug	16.0 / 5.0 / 3.2 (0.630 / 0.197 / 0.126)	
H	Retainer for Accumulator Control Valve Plug	16.0 / 5.0 / 3.2 (0.630 / 0.197 / 0.126)	
I	Retainer for Lock-up Signal Valve Plug	16.0 / 5.0 / 3.2 (0.630 / 0.197 / 0.126)	
J	Stopper for Throttle Valve		
K	Retainer for Secondary Regulator Valve Plug	18.0 / 5.0 / 3.2 (0.709 / 0.197 / 0.126)	
L	Pin for Throttle Valve Sleeve	23.8 / 3.0 (0.937 / 0.118)	
M	Retainer for Cut-back Valve Plug	16.0 / 5.0 / 3.2 (0.630 / 0.197 / 0.126)	

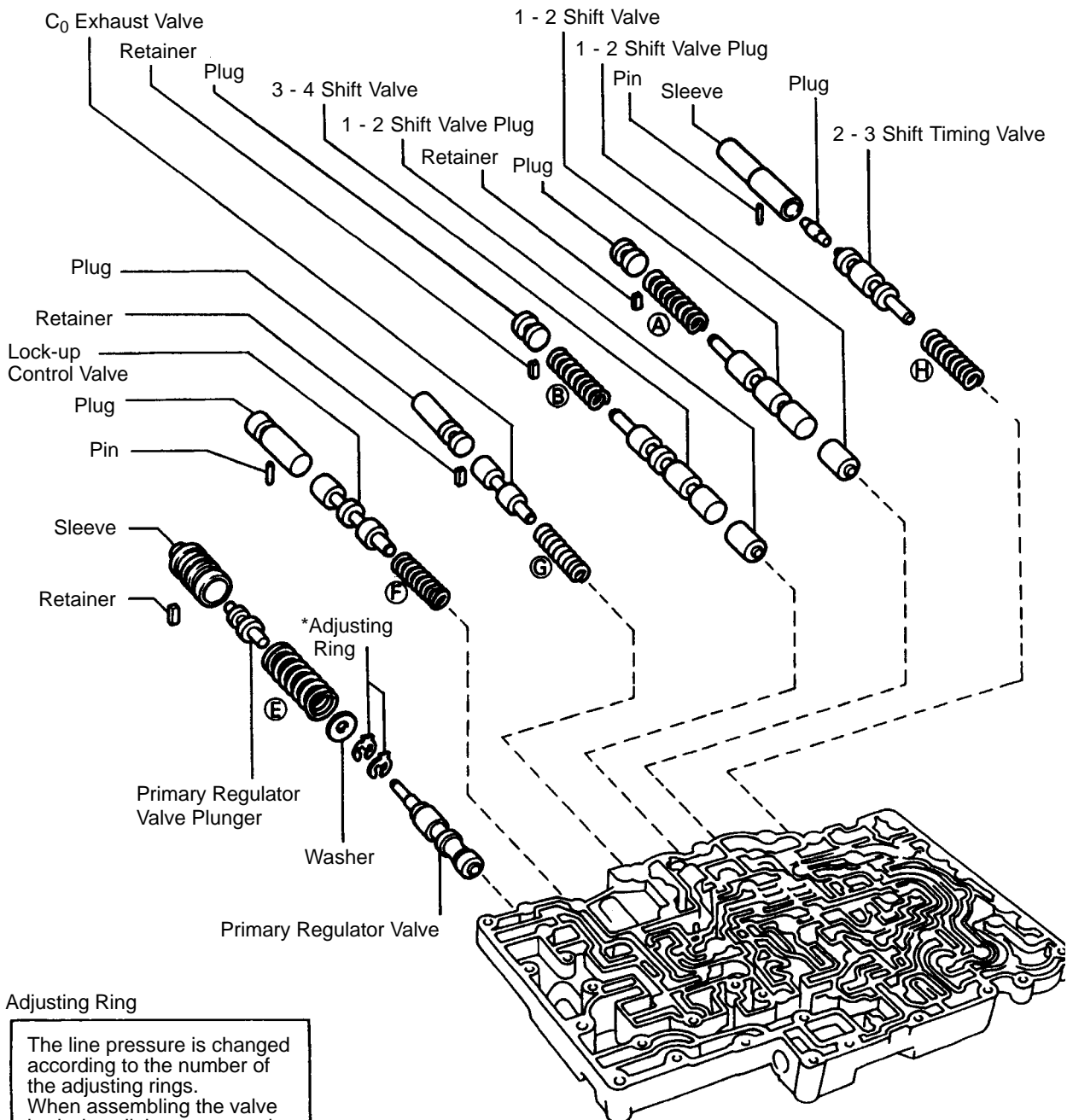
2. CHECK BALL



Mark	Name	Diameter	mm (in.)
A	Check Ball	6.4	(0.252)



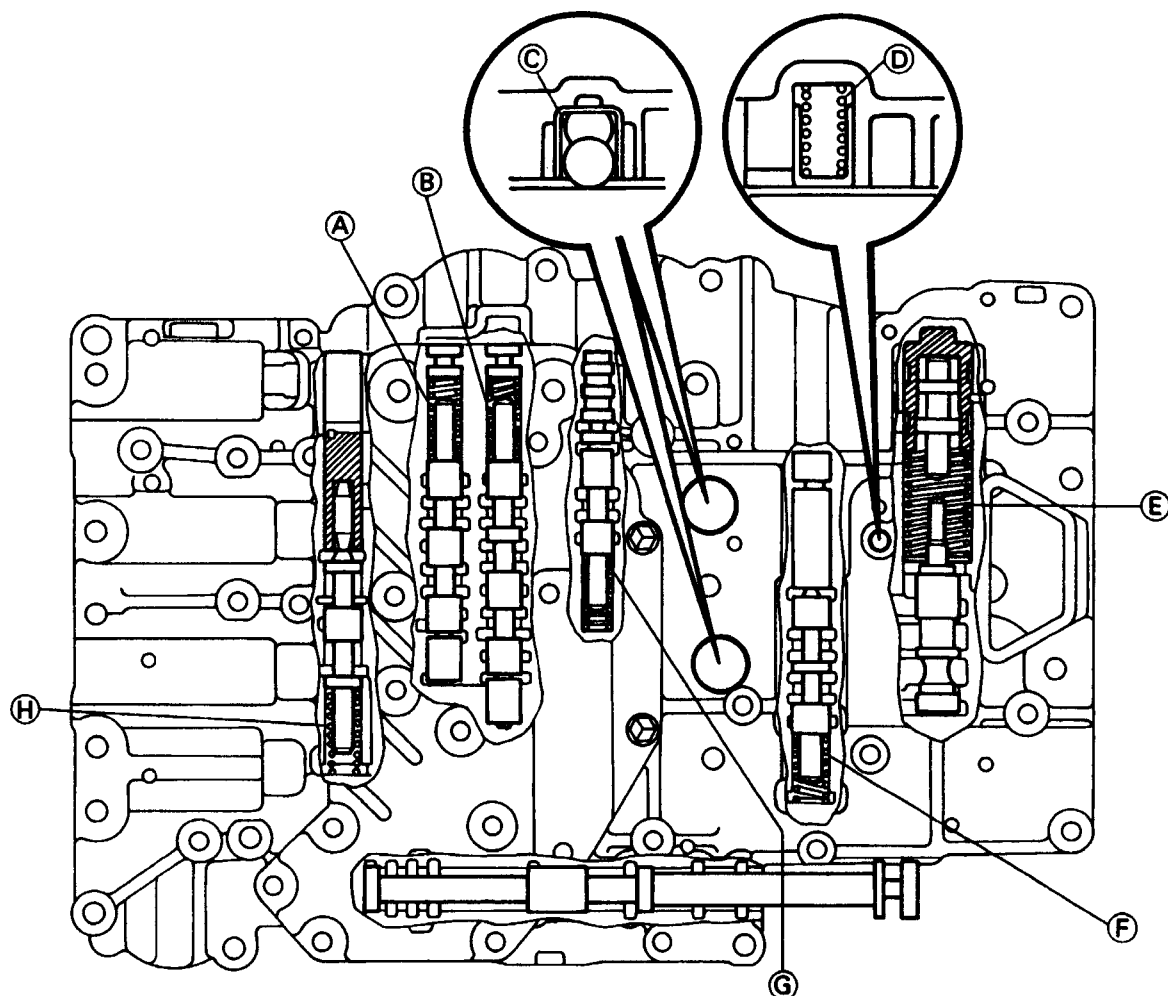
# LOWER VALVE BODY COMPONENTS



## \* Adjusting Ring

The line pressure is changed according to the number of the adjusting rings. When assembling the valve body, install the same number of adjusting rings as were removed. Some of the valve bodies do not have any adjusting rings.

## VALVE BODY SPRINGS SPECIFICATIONS

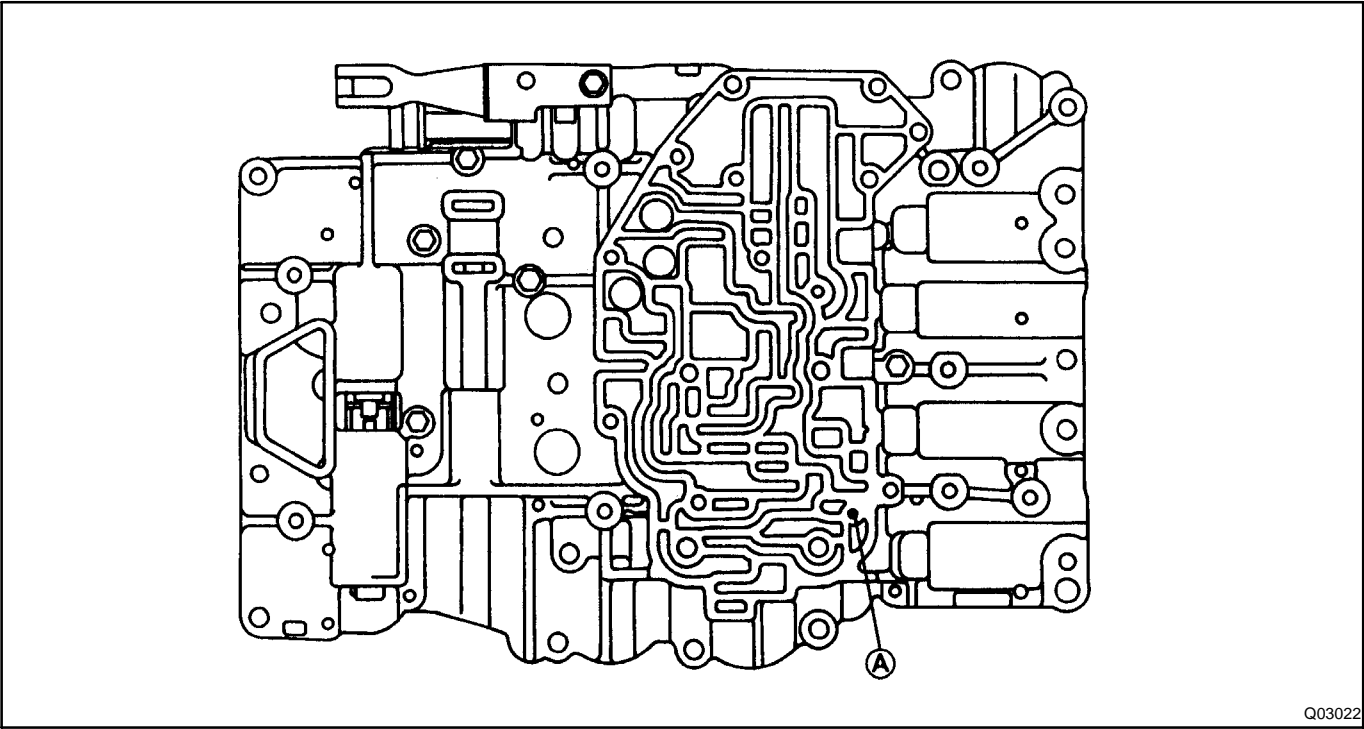


Q03021

Mark	Name (Color)	Free length / Outer Diameter mm (in.)	Total No. of coils
Ⓐ	1 - 2 Shift Valve (Orange)	37.23 / 8.7 (1.466 / 0.343)	18.0
Ⓑ	3 - 4 Shift Valve (Orange)	37.23 / 8.7 (1.466 / 0.343)	18.0
Ⓒ	Check Ball (Pink)	14.0 / 9.8 (0.551 / 0.386)	8.0
Ⓓ	Pressure Relief Valve (White)	24.0 / 8.2 (0.945 / 0.323)	12.0
Ⓔ	Primary Regulator Valve (Red)	58.2 / 20.9 (2.291 / 0.823)	11.0
Ⓕ	Lock-up Control Valve (White)	26.95 / 9.8 (1.061 / 0.386)	13.0
Ⓖ	C <sub>0</sub> Exhaust Valve (Yellow)	33.3 / 8.2 (1.311 / 0.323)	14.0
Ⓗ	2 - 3 Timing Valve (Green)	38.97 / 8.6 (1.534 / 0.339)	18.0

PARTS LOCATIONS

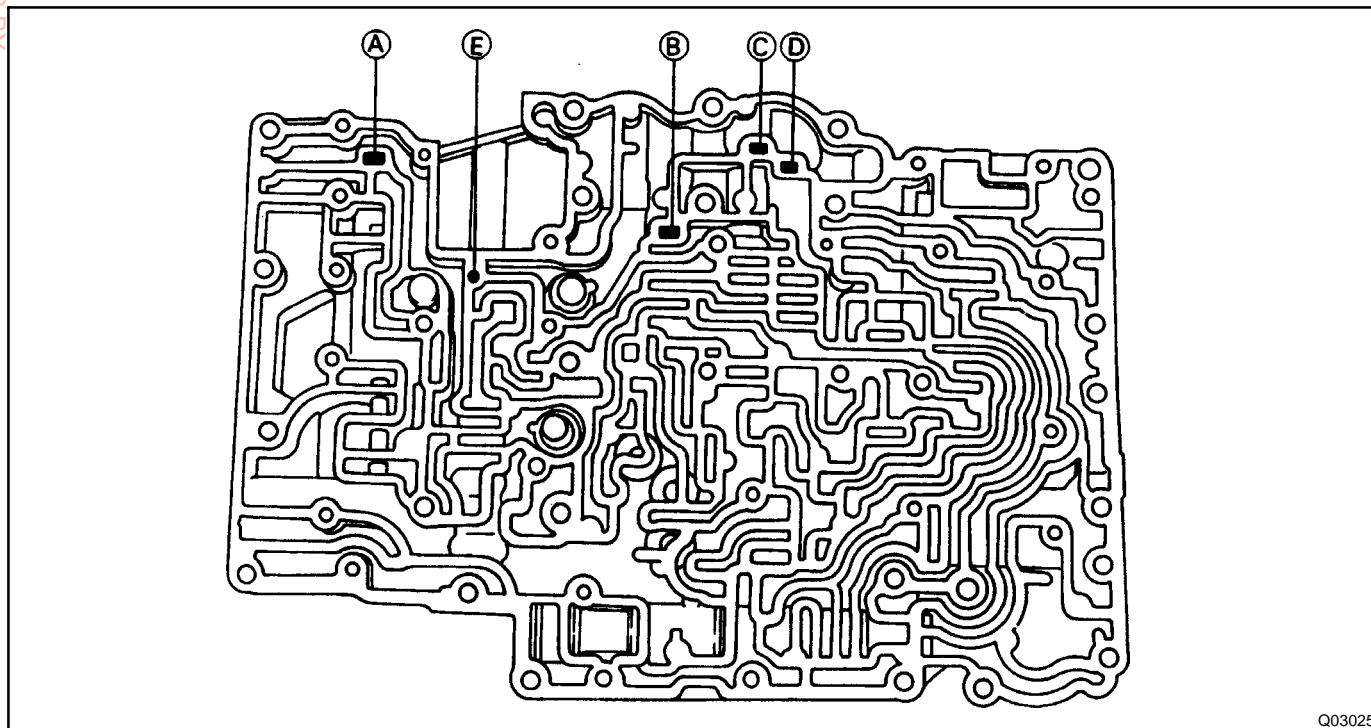
1. RETAINERS AND PINS  
LOWER SIDE



Q03022

Mark	Name	Length / Diameter	mm (in.)
Ⓐ	Pin for 2 - 3 Timing Valve Sleeve	19.8 / 2.5 (0.780 / 0.098)	

## UPPER SIDE

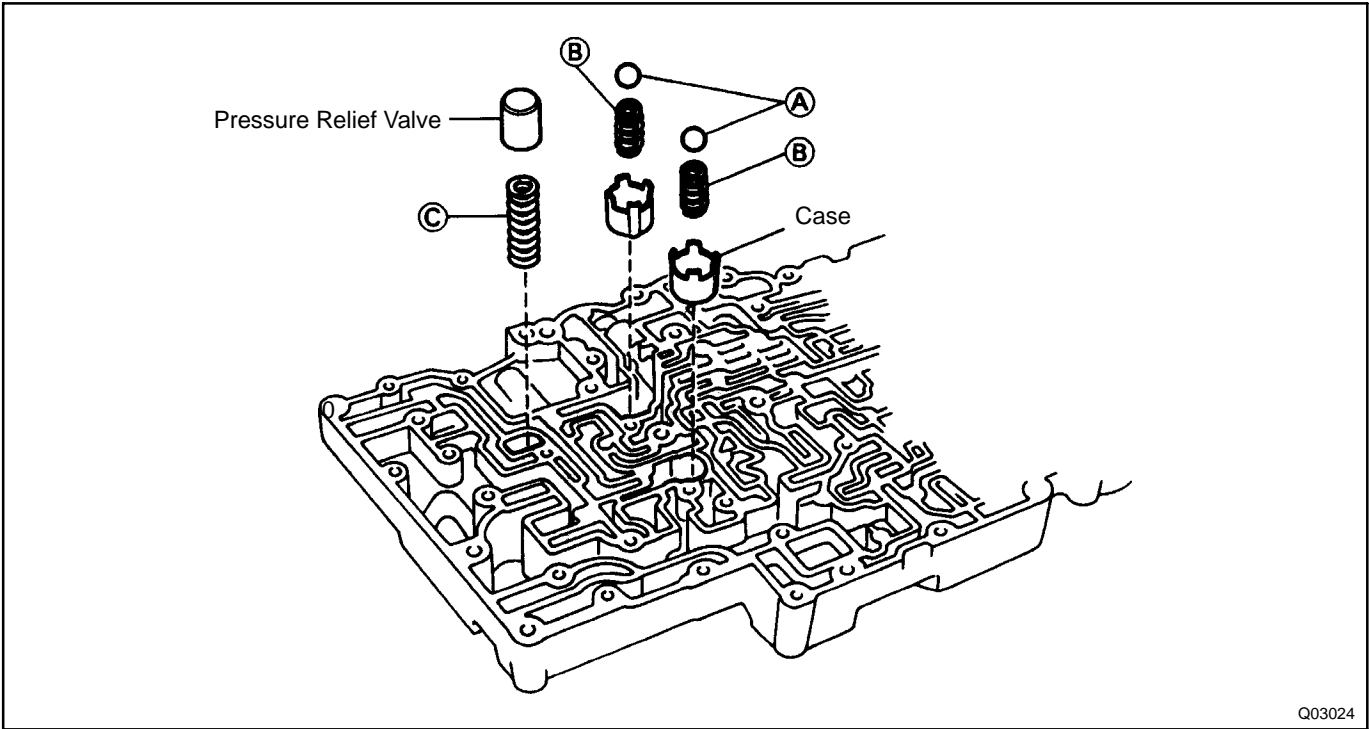


Q03025

Mark	Name	Length / Width / Thickness	mm (in.)
Ⓐ	Retainer for Primary Regulator Valve Plunger Sleeve	18.0 / 5.0 / 3.2 (0.709 / 0.197 / 0.126)	
Ⓑ	Retainer for C <sub>0</sub> Exhaust Valve	12.0 / 5.0 / 3.2 (0.472 / 0.197 / 0.126)	
Ⓒ	Retainer for 3 - 4 Shift Valve Plug	12.0 / 5.0 / 3.2 (0.472 / 0.197 / 0.126)	
Ⓓ	Retainer for 1-2 Shift Valve Plug	12.0 / 5.0 / 3.2 (0.472 / 0.197 / 0.126)	

Mark	Name	Length / Diameter	mm (in.)
Ⓔ	Pin for Lock-up control Valve Plug	23.8 / 2.5 (0.937 / 0.098)	

2. CHECK VALVE, BALL AND SPRINGS

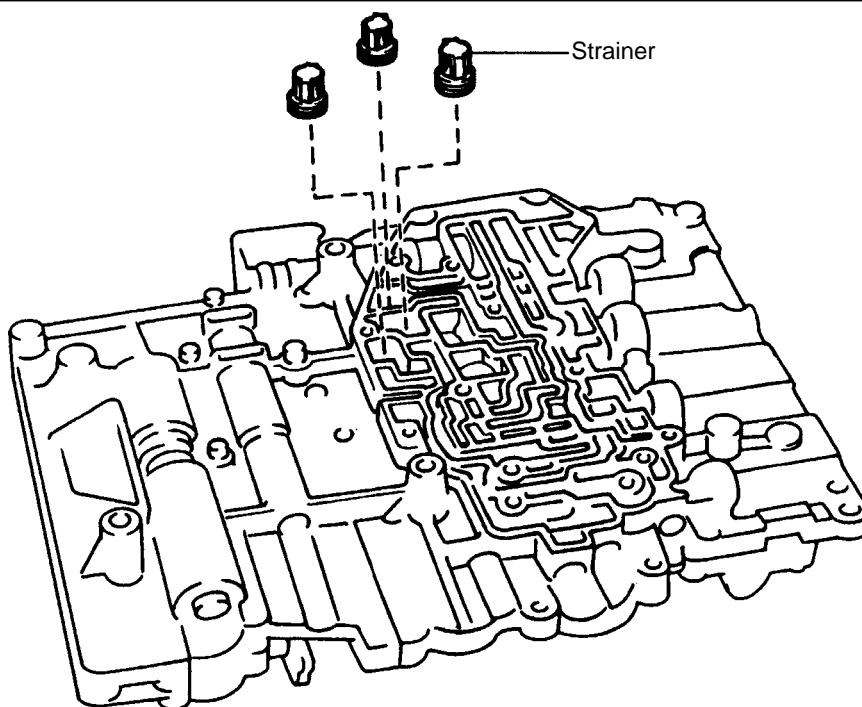


Q03024

Mark	Name	Diameter	mm (in.)
Ⓐ	Check Ball	10.0	(0.394)

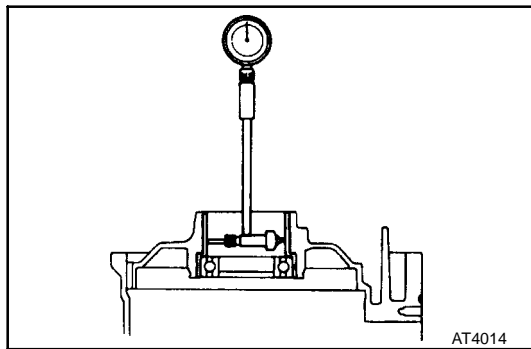
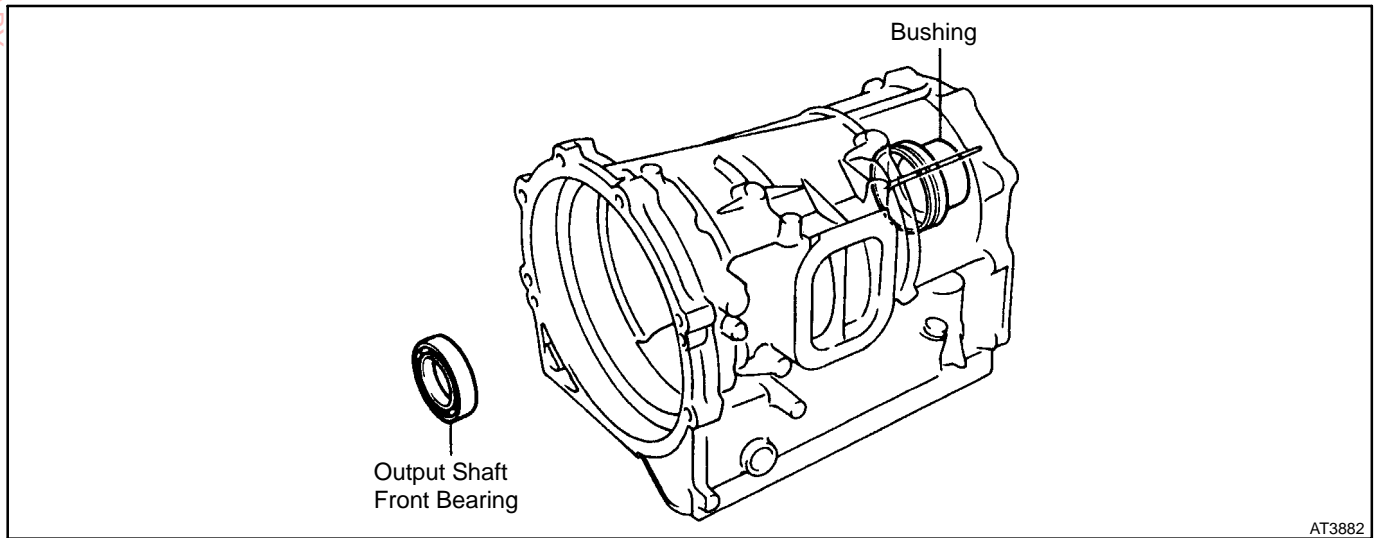
Mark	Name (Color)	Free length / Outer Diameter	Total No. of Coils
		mm (in.)	
Ⓑ	Check Ball (Pink)	14.0 / 9.8 (0.551 / 0.386)	8.0
Ⓒ	Pressure Relief Valve (White)	24.0 / 8.2 (0.945 / 0.323)	12.0

### 3. STRAINERS



Q03023

# TRANSMISSION CASE COMPONENTS



## TRANSMISSION CASE INSPECTION

### 1. INSPECT BUSHING OF TRANSMISSION CASE

Using a cylinder gauge, measure the inside diameter of the transmission case rear bushing.

**Standard inside diameter:**

**64.000 - 64.050 mm (2.5197 - 2.5216 in.)**

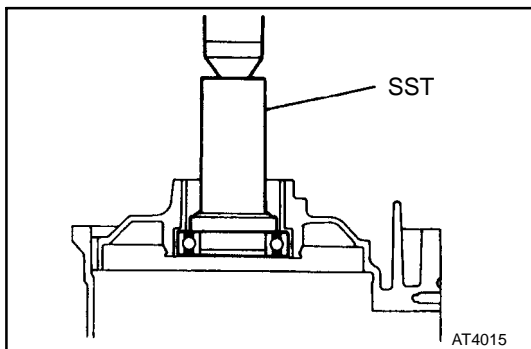
**Maximum inside diameter:**

**64.10 mm (2.5236 in.)**

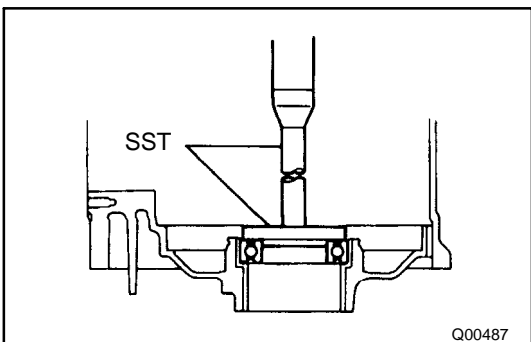
If the inside diameter is greater than the maximum, replace the transmission case.

### 2. IF NECESSARY, REPLACE OUTPUT SHAFT FRONT BEARING

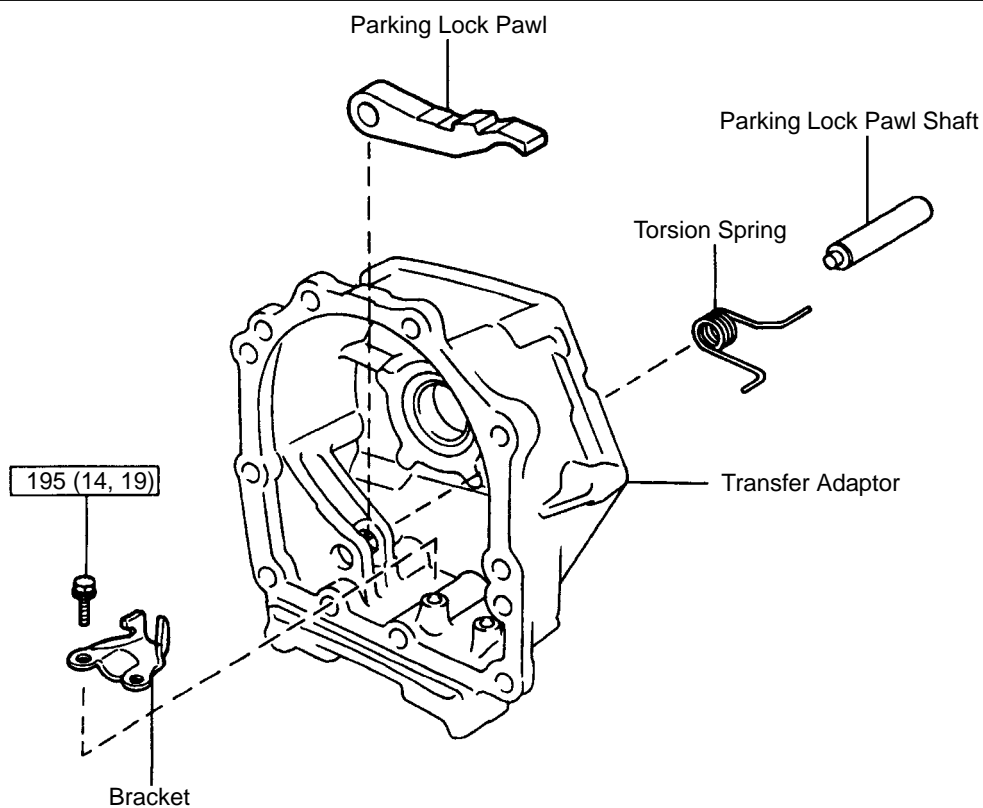
- (a) Using SST and a press, press out the bearing.  
SST 09350-36010 (09350-06060)



- (b) Using SST and a press, press in a new bearing.  
SST 09350-36010 (09350-06050, 09350-06060)
- (c) Check that the bearing rotates smoothly.

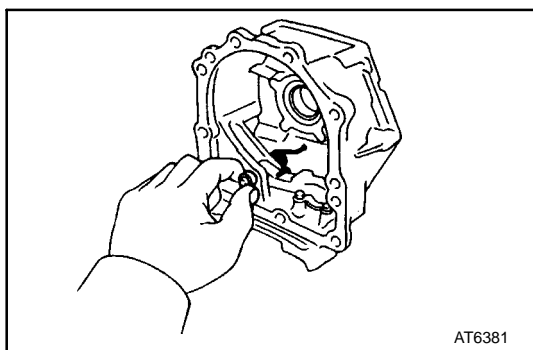


## PARKING LOCK PAWL COMPONENTS



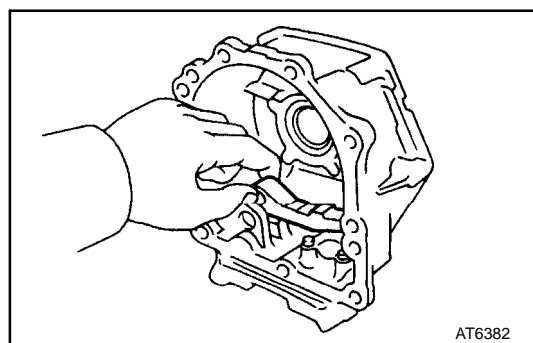
kg-cm (ft-lb, N-m) Specified torque

AT6380

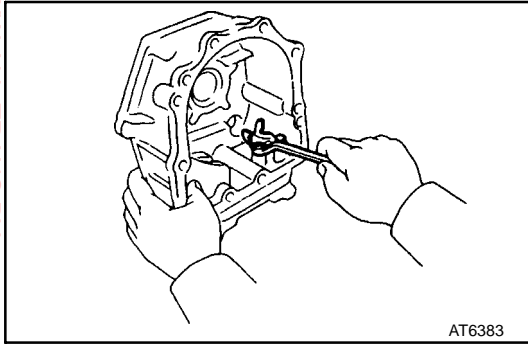


### PARKING LOCK PAWL DISASSEMBLY

- 1. REMOVE PARKING LOCK PAWL SHAFT**  
Remove the pawl shaft and snap ring.

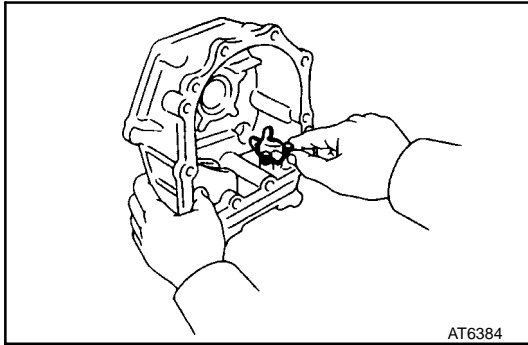






### 3. REMOVE PARKING LOCK PAWL BRACKET

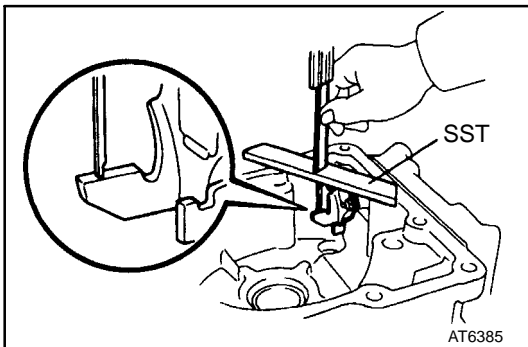
Remove the 2 bolts and pawl bracket.



## PARKING LOCK PAWL ASSEMBLY

### 1. INSTALL PARKING LOCK PAWL BRACKET

- (a) Temporarily install the pawl bracket with the 2 bolts.



- (b) Using SST and calipers, set the pawl bracket so that the distance between the transfer adaptor surface and the top of the bracket tab is the specified distance.

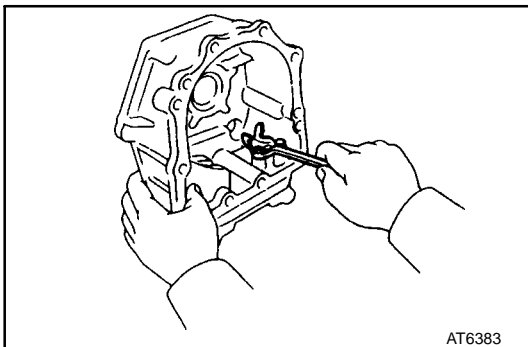
**Standard distance:**

**Total distance - SST thickness**

**Standard distance:**

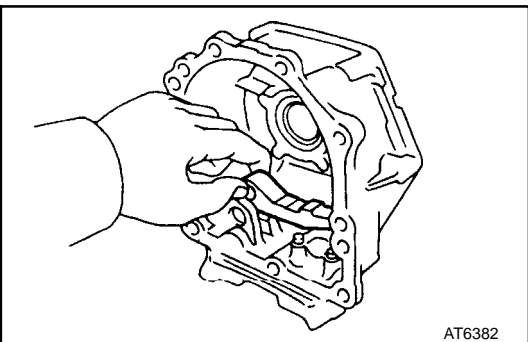
**47.5 - 47.6 mm (1.870 - 1.874 in.)**

SST 09350-36010 (09350-06091)

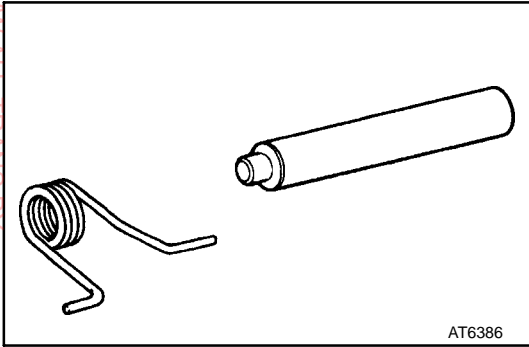


- (c) Tighten the bolts.

**Torque: 19 N-m (195 kgf-cm, 14 ft-lbf)**

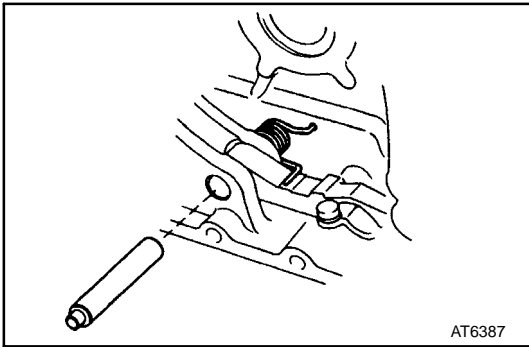


### 2. INSTALL PARKING LOCK PAWL

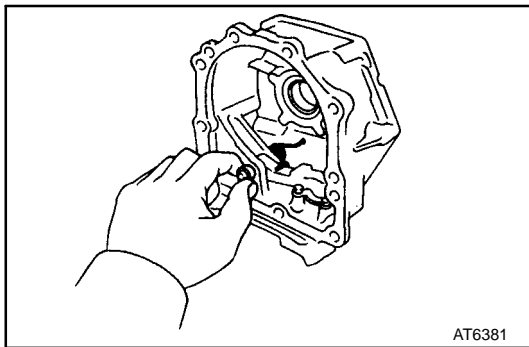


### 3. INSTALL PARKING LOCK PAWL SHAFT

(a) Install the spring.



(b) Install the spring end to the hole of the transfer adaptor, and install the pawl shaft.



(c) Hold the pawl shaft, hook another spring end to the pawl with a screwdriver.

(d) Make sure the pawl moves smoothly.

## CAUTION

This manual does not include all the necessary items about repair and service. This manual is made for the purpose of the use for the persons who have special techniques and certifications. In the cases that non-specialized or uncertified technicians perform repair or service only using this manual or without proper equipment or tool, that may cause severe injury to you or other people around and also cause damage to your customer's vehicle.

In order to prevent dangerous operation and damages to your customer's vehicle, be sure to follow-the instruction shown below.

- © Must read this manual thoroughly. It is especially important to have good understanding all the contents written in the PRECAUTION OF "IN" section.
- © The service method written in this manual is very effective to perform repair and service. When performing the operations following the procedures using this manual, be sure to use tools specified and recommended. If using non-specified or recommended tools and service method, be sure to confirm safety of the technicians and any possibility of causing personal injury or damage to the customer's vehicle before starting the operation.
- © If part replacement is necessary, must replace the part with the same part number or equivalent part. Do not replace it with inferior quality.
- © It is important to note that this manual contains various "Cautions" and "Notices" that must be carefully observed in order to reduce the risk of personal injury during service or repair, or the possibility that improper service or repair may damage the vehicle or render it unsafe. It is also important to understand that these "Cautions" and "Notices" are not exhaustive, because it is important to warn of all the possible hazardous consequences that might result from failure to follow these instructions.

## FOREWORD

This repair manual covers Disassembly, Inspection and Assembly procedures for the following Automatic Transmission;

Automatic Transmission	Applicable Model
A442F	LAND CRUISER

For On-vehicle Servicing (Inspection, Adjustment, Troubleshooting, Removal and Installation) of the Automatic Transmission, refer to the repair manual for the applicable vehicle model.

All information contained in this manual is the most up-to-date at the time of publication. However, specifications and procedures are subject to change without notice.

**TOYOTA MOTOR CORPORATION**

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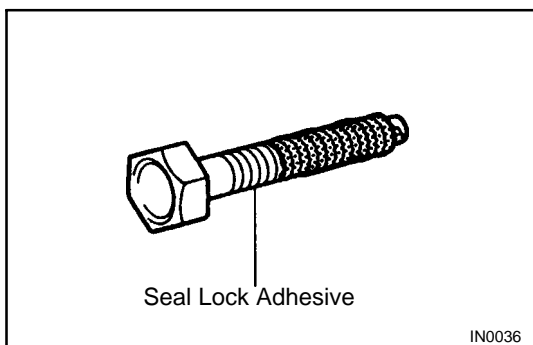
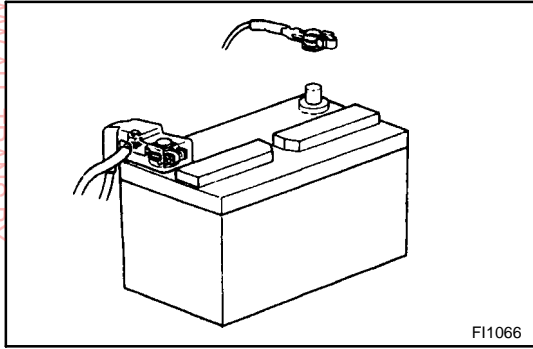
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## GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in the appropriate order to facilitate reassembly.
3. Observe the following:
  - (a) Before performing electrical work, disconnect the negative (-) terminal cable from the battery terminal.
  - (b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (-) terminal which is grounded to the vehicle body.
  - (c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable straight up without twisting or prying it.
  - (d) Clean the battery terminal posts and cable terminals with a clean shop rag. Do not scrape them with a file or other abrasive objects.
  - (e) Install the cable terminal to the battery post with the nut loose, and tighten the nut after installation. Do not use a hammer to tap the terminal onto the post.
  - (f) Be sure the cover for the positive (+) terminal is properly in place.
4. Check hose and wiring connectors to make sure that they are secure and correct.
5. Non-reusable parts
  - (a) Always replace cotter pins, gaskets, O-rings and oil seals etc. with new ones.
  - (b) Non-reusable parts are indicated in the component illustrations by the "♦" symbol.



6. Precoated parts
 

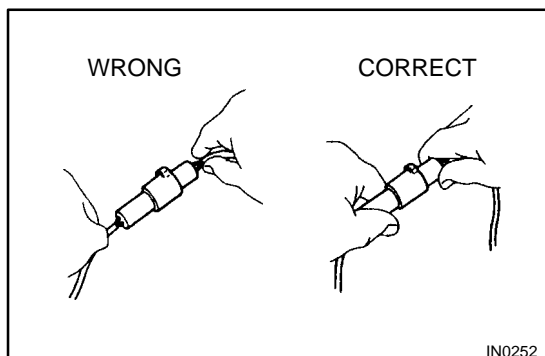
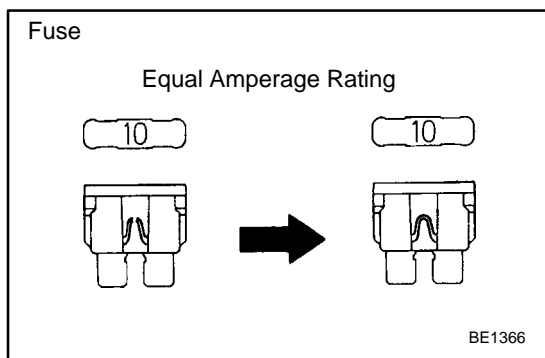
Precoated parts are bolts and nuts, etc. that are coated with a seal lock adhesive at the factory.

  - (a) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.

- (b) When reusing precoated parts, clean off the old adhesive and dry with compressed air. Then apply the specified seal lock adhesive to the bolt, nut or threads.
- (c) Precoated parts are indicated in the component illustrations by the "★" symbol.

7. **When necessary, use a sealer on gaskets to prevent leaks.**
8. **Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.**
9. **Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found at the preparation of AT section.**

10. **When replacing fuses, be sure the new fuse has the correct amperage rating. DO NOT exceed the rating or use one with a lower rating.**



11. **To pull apart electrical connectors, pull on the connector itself, not the wires.**
12. **Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations.**
  - (a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels at the opposite end in order to ensure safety.
  - (b) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on a vehicle raised on a jack alone, even for a small job that can be finished quickly.

# GLOSSARY OF SAE AND TOYOTA TERMS

This glossary lists all SAE-J1930 terms and abbreviations used in this manual in compliance with SAE recommendations, as well as their Toyota equivalents.

SAE ABBREVIATIONS	SAE TERMS	TOYOTA TERMS ( )- ABBREVIATIONS
A/C	Air Conditioning	Air Conditioner
ACL	Air Cleaner	Air Cleaner
AIR	Secondary Air Injection	Air Injection (AI)
AP	Accelerator Pedal	—
B+	Battery Positive Voltage	+B, Battery Voltage
BARO	Barometric Pressure	—
CAC	Charge Air Cooler	Intercooler
CARB	Carburetor	Carburetor
CFI	Continuous Fuel Injection	—
CKP	Crankshaft Position	Crank Angle
CL	Closed Loop	Closed Loop
CMP	Camshaft Position	Cam Angle
CPP	Clutch Pedal Position	—
CTOX	Continuous Trap Oxidizer	—
CTP	Closed Throttle Position	—
DFI	Direct Fuel Injection (Diesel)	Direct Injection (DI)
DI	Distributor Ignition	—
DLC1	Data Link Connector 1	1: Check Connector
DLC2	Data Link Connector 2	2: Toyota Diagnosis Communication Link (TDCL)
DLC3	Data Link Connector 3	3: OBD II Diagnostic Connector
DTC	Diagnostic Trouble Code	Diagnostic Code
DTM	Diagnostic Test Mode	—
ECL	Engine Control Level	—
ECM	Engine Control Module	Engine ECU (Electronic Control Unit)
ECT	Engine Coolant Temperature	Coolant Temperature, Water Temperature (THW)
EEPROM	Electrically Erasable Programmable Read Only Memory	Electrically Erasable Programmable Read Only Memory (EEPROM), Erasable Programmable Read Only Memory (EPROM)
EFE	Early Fuel Evaporation	Cold Mixture Heater (CMH), Heat Control Valve (HCV)
EGR	Exhaust Gas Recirculation	Exhaust Gas Recirculation (EGR)
EI	Electronic Ignition	Toyota Distributorless Ignition (TDI)
EM	Engine Modification	Engine Modification (EM)
EPROM	Erasable Programmable Read Only Memory	Programmable Read Only Memory (PROM)
EVAP	Evaporative Emission	Evaporative Emission Control (EVAP)
FC	Fan Control	—
FEEPROM	Flash Electrically Erasable Programmable Read Only Memory	—
FEPRM	Flash Erasable Programmable Read Only Memory	—
FF	Flexible Fuel	—
FP	Fuel Pump	Fuel Pump
GEN	Generator	Alternator
GND	Ground	Ground (GND)
HO2S	Heated Oxygen Sensor	Heated Oxygen Sensor (HO2S)

IAC	Idle Air Control	Idle Speed Control (ISC)
IAT	Intake Air Temperature	Intake or Inlet Air Temperature
ICM	Ignition Control Module	—
IFI	Indirect Fuel Injection	Indirect Injection
IFS	Inertia Fuel-Shutoff	—
ISC	Idle Speed Control	—
KS	Knock Sensor	Knock Sensor
MAF	Mass Air Flow	Air Flow Meter
MAP	Manifold Absolute Pressure	Manifold Pressure Intake Vacuum
MC	Mixture Control	Electric Bleed Air Control Valve (EBCV) Mixture Control Valve (MCV) Electric Air Control Valve (EACV)
MDP	Manifold Differential Pressure	—
MFI	Multiport Fuel Injection	Electronic Fuel Injection (EFI)
MIL	Malfunction Indicator Lamp	Check Engine Light
MST	Manifold Surface Temperature	—
MVZ	Manifold Vacuum Zone	—
NVRAM	Non-Volatile Random Access Memory	—
O <sub>2</sub> S	Oxygen Sensor	Oxygen Sensor, O <sub>2</sub> Sensor (O <sub>2</sub> S)
OBD	On-Board Diagnostic	On-Board Diagnostic (OBD)
OC	Oxidation Catalytic Converter	Oxidation Catalyst Converter (OC), CCo
OP	Open Loop	Open Loop
PAIR	Pulsed Secondary Air Injection	Air Suction (AS)
PCM	Powertrain Control Module	—
PNP	Park/Neutral Position	—
PROM	Programmable Read Only Memory	—
PSP	Power Steering Pressure	—
PTOX	Periodic Trap Oxidizer	Diesel Particulate Filter (DPF) Diesel Particulate Trap (DPT)
RAM	Random Access Memory	Random Access Memory (RAM)
RM	Relay Module	—
ROM	Read Only Memory	Read Only Memory (ROM)
RPM	Engine Speed	Engine Speed
SC	Supercharger	Supercharger
SCB	Supercharger Bypass	—
SFI	Sequential Multiport Fuel Injection	Electronic Fuel Injection (EFI), Sequential Injection
SPL	Smoke Puff Limiter	—
SRI	Service Reminder Indicator	—
SRT	System Readiness Test	—
ST	Scan Tool	—
TB	Throttle Body	Throttle Body
TBI	Throttle Body Fuel Injection	Single Point Injection Central Fuel Injection (Ci)
TC	Turbocharger	Turbocharger
TCC	Torque Converter Clutch	Torque Converter
TCM	Transmission Control Module	Transmission ECU (Electronic Control Unit)
TP	Throttle Position	Throttle Position
TR	Transmission Range	—



TVV	Thermal Vacuum Valve	Bimetallic Vacuum Switching Valve (BVSV) Thermostatic Vacuum Switching Valve (TVSV)
TWC	Three-Way Catalytic Converter	Three-Way Catalyst (TWC) $CC_{RO}$
TWC + OC	Three-Way + Oxidation Catalytic Converter	$CC_R + CCo$
VAF	Volume Air Flow	Air Flow Meter
VR	Voltage Regulator	Voltage Regulator
VSS	Vehicle Speed Sensor	Vehicle Speed Sensor (Read Switch Type)
WOT	Wide Open Throttle	Full Throttle
WU-OC	Warm Up Oxidation Catalytic Converter	—
WU-TWC	Warm Up Three-Way Catalytic Converter	Manifold Converter
3GR	Third Gear	—
4GR	Fourth Gear	—

# HOW TO USE THIS MANUAL

To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

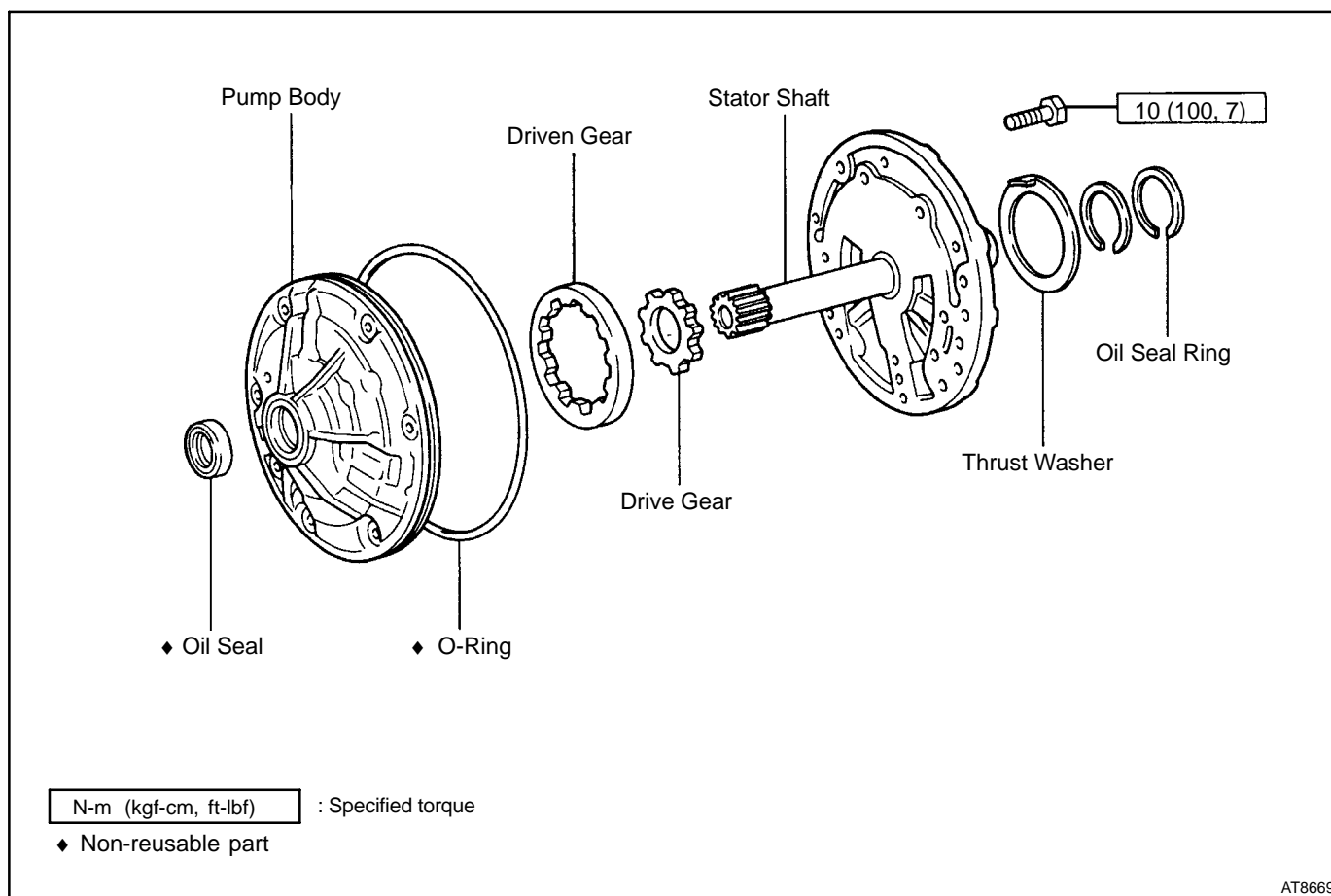
## PREPARATION

Preparation lists the SST (Special Service Tools), recommended tools, equipment, lubricant and SSM (Special Service Materials) which should be prepared before beginning the operation and explains the purpose of each one.

## REPAIR PROCEDURES

Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.

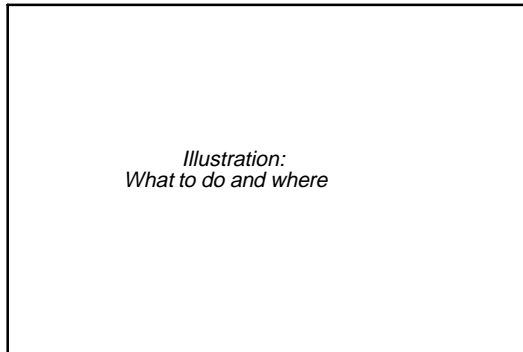
Example:



The procedures are presented in a step-by-step format:

- © **The illustration shows what to do and where to do it.**
- © **The task heading tells what to do.**
- © **The detailed text tells how to perform the task and gives other information such as specifications and warnings.**

Example:



## 21. CHECK PISTON STROKE OF OVERDRIVE BRAKE

- (a) Place SST and a dial indicator onto the overdrive brake piston as shown in the illustration.

SST 09350-30020 (09350-06120)

*Set part No.*

*Component part No.*

*Detail text: how to do task*

- (b) Measure the stroke applying and releasing the compressed air ( 392 - 785 kPa, 4 - 8 kgf/cm<sup>2</sup> or 57 - 114 psi) as shown in the illustration.

**Piston stroke: 1.40 - 1.70 mm (0.0551 - 0.0669 in.)**

*Specification*

This format provides the experienced technician with a FAST TRACK to the information needed. The upper case task heading can be read at a glance when necessary, and the text below it provides detailed information. Important specifications and warnings always stand out in bold type.

## REFERENCES

References have been kept to a minimum. However, when they are required you are given the page to refer to.

## SPECIFICATIONS

Specifications are presented in bold type throughout the text where needed. You never have to leave the procedure to look up your specifications. They are also found at the back of AT section, for quick reference.

## CAUTIONS, NOTICES, HINTS:

- © CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- © NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- © HINTS are separated from the text but do not appear in bold. They provide additional information to help you perform the repair efficiently.

## SI UNIT

The UNITS given in this manual are primarily expressed according to with the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the English System.

**Example:**

**Torque: 30 N-m (310 kgf-cm, 22 ft-lbf)**

# SERVICE SPECIFICATIONS

## SERVICE DATA

Oil Pump	Body Clearance	STD	0.07 - 0.15 mm	0.0028 - 0.0059 in.
		Limit	0.3 mm	0.012 in.
	Tip clearance	STD	0.11 - 0.24 mm	0.0043 - 0.0094 in.
		Limit	0.3 mm	0.012 in.
	Side clearance	STD	0.02 - 0.05 mm	0.0008 - 0.0020 in.
		Limit	0.1 mm	0.004 in.
	Drive and driven gear thickness		11.967 - 11.982 mm	0.4711 - 0.4717 in.
			11.983 - 11.998 mm	0.4718 - 0.4724 in.
			11.999 - 12.014 mm	0.4724 - 0.4730 in.
	Pump body bushing inside diameter	STD	42.050 - 42.075 mm	1.6555 - 1.6565 in.
		Limit	42.13 mm	1.6587 in.
	Pump cover bushing inside diameter			
O/D Planetary Gear and O/D Direct Clutch	Front	STD	24.000 - 24.021 mm	0.9449 - 0.9457 in.
		Limit	24.070 mm	1.9476 in.
	Rear	STD	26.500 - 26.521 mm	1.0433 - 1.0441 in.
		Limit	26.57 mm	1.0461 in.
	O/D input shaft thrust clearance (O/D planetary gear)	STD	0.40 - 0.90 mm	0.0157 - 0.0354 in.
		Limit	0.90 mm	0.0345 in.
	O/D input shaft thrust bearing race thickness		0.8 mm	0.031 in.
			1.0 mm	0.039 in.
			1.4 mm	0.055 in.
	Piston stroke		1.80 - 2.00 mm	0.0709 - 0.0787 in.
	O/D direct clutch drum bushing inside diameter	STD	26.500 - 26.521 mm	1.0433 - 1.0441 in.
		Limit	26.57 mm	1.0461 in.
O/D Brake	O/D planetary gear bushing inside diameter	STD	12.000 - 12.018 mm	0.4724 - 0.4731 in.
		Limit	12.07 mm	0.4752 in.
	Planetary pinion gear thrust clearance	STD	0.20 - 0.59 mm	0.0079 - 0.0232 in.
		Limit	0.80 mm	0.315 in.
O/D Brake	Piston stroke		1.25 - 1.85 mm	0.0492 - 0.0728 in.
	O/D case bushing inside diameter	STD	33.100 - 33.500 mm	1.3031 - 1.3189 in.
Front Clutch		Limit	33.20 mm	1.3071 in.
	Input shaft thrust clearance (forward clutch hub)	STD	0.30 - 0.70 mm	0.0118 - 0.0276 in.
		Limit	0.70 mm	0.0276 in.
	Input shaft spacer thickness		0.9 mm	0.035 in.
			1.2 mm	0.047 in.
			1.5 mm	0.059 in.
			1.8 mm	0.071 in.
			2.1 mm	0.083 in.
	Piston stroke		3.93 - 4.23 mm	0.1547 - 0.1665 in.
	Front clutch plate thickness		1.8 mm	0.071 mm
			2.0 mm	0.079 in.
			2.2 mm	0.087 in.
			2.4 mm	0.094 in.

Rear Clutch	Piston stroke		2.00 - 2.20 mm	0.0790 - 0.0866 in.
	Rear clutch flange thickness		4.6 mm	0.181 in.
			4.8 mm	0.189 in.
			5.0 mm	0.197 in.
			5.2 mm	0.205 in.
Second Brake	Center support thrust clearance	STD	0.30 - 0.70 mm	0.0118 - 0.0276 in.
		Limit	0.90 mm	0.0354 in.
	Center support thrust washer thickness		1.5 mm	0.059 in.
			1.8 mm	0.071 in.
			2.1 mm	0.083 in.
			2.4 mm	0.094 in.
			2.7 mm	0.106 in.
	Piston stroke		1.86 - 2.06 mm	0.0732 - 0.0811 in.
	Center support bushing inside diameter	STD	35.000 - 35.025 mm	1.3780 - 1.3789 in.
		Limit	35.08 mm	1.3811 in.
	Front planetary sum gear bushing inside diameter	STD		
		Limit	25.000 - 25.021 mm	0.9842 - 0.9851 in.
	Second brake flange thickness		25.07 mm	0.9851 in.
			5.0 mm	0.197 in.
			5.2 mm	0.205 in.
			5.4 mm	0.213 in.
			5.5 mm	0.220 in.
Planetary Gears and Output Shaft	Output shaft bushing inside diameter	STD	17.000 - 17.021 mm	0.6693 - 0.6701 in.
		Limit	17.07 mm	0.6720 in.
	Planetary pinion gear thrust clearance	STD	0.20 - 0.59 mm	0.0079 - 0.0232 in.
		Limit	0.75 mm	0.0295 in.
1st and Reverse Brake	Piston stroke		3.3 - 3.8 mm	0.130 - 0.150 in.
	1st and reverse brake flange thickness		6.65 mm	0.2618 in.
			7.05 mm	0.2776 in.
			7.45 mm	0.2933 in.
Transmission Case	Bushings inside diameter	STD	64.000 - 64.050 mm	2.5197 - 2.5216 in.
		Limit	64.10 mm	2.5236 in.
Parking Lock Pawl	Parking lock pawl bracket distance		47.5 - 47.6 mm	1.870 - 1.874 in.

## UPPER VALVE BODY Spring Specifications

Mark	Name (Colas)	Free length / Outer Diameter mm (in. )	Total No. of coils
Ⓐ	2 - 3 Shift Valve (Orange)	37.23 / 8.7 (1.466 / 0.343)	18.0
Ⓑ	Reverse Inhibiter Valve (Light Blue)	29.3 / 6.5 (1.154 × 0.256)	20.0
Ⓒ	Modulator Valve (Brown)	31.6 / 7.6 (1.244 × 0.299)	16.0
Ⓓ	Throttle Valve (White)	25.3 / 9.2 (0.996 / 0.362)	9.5
Ⓔ	Throttle Valve (Blue)	26.85 / 8.97 (1.057 / 0.353)	10.5
Ⓕ	Secondary Regulator Valve (Red)	27.96 / 11.3 / (1.090 / 0.445)	9.6
Ⓖ	Cut-back Valve (Purple)	30.44 / 7.3 (1.198 / 0.287)	16.0
Ⓗ	Lock-up Signal Valve (Purple)	30.44 / 7.3 (1.198 / 0.287)	16.0
Ⓙ	Accumulator Control Valve (Blue)	24.8 / 10.5 (0.976 / 0.413)	10.0
⓫	Low Coast Modulator Valve (Beige)	30.7 / 7.3 (1.209 / 0.287)	16.0
Ⓚ	Orifice Control Valve (Yellow Green)	22.5 / 7.5 (0.886 / 0.295)	12.0
Ⓛ	Low Inhibiter Valve (Purple)	30.44 / 7.3 (1.198 / 0.287)	16.0

## Retainers and Pins Specifications

Mark	Name	Length / Width / Thickness or diameter mm (in.)
Ⓐ	Retainer for Modulator Valve Plug	16.0 / 5.0 / 3.2 (0.630 / 0.197 / 0.126)
Ⓑ	Retainer for Reverse Inhibiter Valve Sleeve Plug	13.5 / 5.0 / 3.2 (0.531 / 0.197 / 0.126)
Ⓒ	Retainer for Check Valve Sleeve Plug	13.5 / 5.0 / 3.2 (0.531 / 0.197 / 0.126)
Ⓓ	Retainer for Low Coast Modulator Valve Plug	16.0 / 5.0 / 3.2 (0.630 / 0.197 / 0.126)
Ⓔ	Retainer for Low Inhibiter Valve Plug	13.5 / 5.0 / 3.2 (0.531 / 0.197 / 0.126)
Ⓕ	Retainer for 2 - 3 Shift Valve Plug	13.5 / 5.0 / 3.2 (0.531 / 0.197 / 0.126)
Ⓖ	Retainer for Orifice Control Valve plug	16.0 / 5.0 / 3.2 (0.630 / 0.197 / 0.126)
Ⓗ	Retainer for Accumulator Control Valve Plug	16.0 / 5.0 / 3.2 (0.630 / 0.197 / 0.126)
Ⓙ	Retainer for Lock-up Signal Valve Plug	16.0 / 5.0 / 3.2 (0.630 / 0.197 / 0.126)
⓫	Stopper for Throttle Valve	—
Ⓚ	Retainer for Secondary Regulator Valve Plug	18.0 / 5.0 / 3.2 (0.709 / 0.197 / 0.126)
Ⓛ	Pin for Throttle Valve Sleeve	23.8 / 3.0 (0.937 / 0.118)
Ⓜ	Retainer for Cut-back Valve Plug	16.0 / 5.0 / 3.2 (0.630 / 0.197 / 0.126)

## Check Balls Specifications

Mark	Name	Diameter mm (in.)
Ⓐ	Check Ball	6.4 (0.252)

## LOWER VALVE BODY Springs Specifications

Mark	Name (Color)	Free length / Outer Diameter mm (in.)	Total No. of coils
Ⓐ	1 - 2 Shift Valve (Orange)	37.23 / 8.7 (1.466 / 0.343)	18.0
Ⓑ	3 - 4 Shift Valve (Orange)	37.23 / 8.7 (1.466 / 0.343)	18.0
Ⓒ	Check Ball (Pink)	14.0 / 9.8 (0.551 / 0.386)	8.0
Ⓓ	Pressure Relief Valve (White)	24.0 / 8.2 (0.945 / 0.323)	12.0
Ⓔ	Primary Regulator Valve (Red)	58.2 / 20.9 (2.291 / 0.823)	11.0
Ⓕ	Lock-up Control Valve (White)	26.95 / 9.8 (1.061 / 0.386)	13.0
Ⓖ	C <sub>0</sub> Exhaust Valve (Yellow)	33.3 / 8.2 (1.311 / 0.323)	14.0

Ⓗ	2 - 3 Timing Valve (Green)	38.97 / 8.6 (1.534 / 0.339)	18.0
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**Retainers and Pins Specifications**

Mark	Name	Length / Diameter	mm (in.)
Ⓐ	Pin for 2 - 3 Timing Valve Sleeve	19.8 / 2.5 (0.780 / 0.098)	

Mark	Name	Length / Width / Thickness	mm (in.)
Ⓐ	Retainer for Primary Regulator Valve Plunger Sleeve	18.0 / 5.0 / 3.2 (0.709 / 0.197 / 0.126)	
Ⓑ	Retainer for C <sub>0</sub> Exhaust Valve	12.0 / 5.0 / 3.2 (0.472 / 0.197 / 0.126)	
Ⓒ	Retainer for 3 - 4 Shift Valve Plug	12.0 / 5.0 / 3.2 (0.472 / 0.197 / 0.126)	
Ⓓ	Retainer for 1 - 2 Shift Valve Plug	12.0 / 5.0 / 3.2 (0.472 / 0.197 / 0.126)	

Mark	Name	Length / Diameter	mm (in.)
Ⓔ	Pin for Lock-up control Valve Plug	23.8 / 2.5 (0.937 / 0.098)	

**Check Valve. Ball and Springs Specifications**

Mark	Name	Diameter	mm (in.)
Ⓐ	Check Ball	10.0 (0.394)	

Mark	Name (Color)	Free length / Outer Diameter mm (in.)	Total No. of coils
Ⓑ	Check Ball (Pink)	14.0 / 9.8 (0.551 / 0.386)	8.0
Ⓒ	Pressure Relief Valve (White)	24.0 / 8.2 (0.945 / 0.323)	12.0







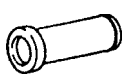


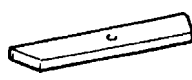
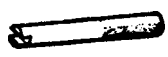


**ACCUMULATOR**




	Piston Diameter mm (in.)	Spring Free length / Outer Diameter mm (in.)	Spring Color
B <sub>0</sub>	35.9 (1.413)	63.1 / 20.7 (2.484 / 0.815)	Light Green
B <sub>2</sub>	43.9 (1.728)	65.0 / 25.1 (2.559 / 0.988)	Blue
C <sub>1</sub>	29.9 (1.413)	91.5 / 17.7 (3.602 / 0.697)	Green
C <sub>2</sub>	39.9 (1.571)	83.5 / 21.7 (3.287 / 0.854)	Green







# PREPARATION

## SST (SPECIAL SERVICE TOOLS)

	09032 - 00100 Oil Pan Seal Cutter	
	09350 - 36010 TOYOTA Automatic Transmission Tool Set	
	(09350 - 06010) No. 2 Piston Spring Compressor	
	(09350 - 06020) No. 3 Piston Spring Compressor	
	(09350 - 06030) No. 1 Piston Spring Compressor	
	(09350-06035) Attachment	
	(09350 - 06040) Oil Seal Replacer	
	(09350 - 06050) Handle	
	(09350 - 06060) Transmission Rear Bearing Replacer	
	(09350 - 06090) Plate	
	(09350 - 06100) Check Ball Spring Compressor	
	(09350 - 06110) No. 1 Measure Terminal	
	(09350 - 06120) No. 2 Measure Terminal	

	(09350 - 06130) Extension Bar	
	(09350 - 06140) Oil Pump Puller	
	(09350 - 06150) Oil Seal Replacer	

## RECOMMENDED TOOL

	09031 - 00030 Pin Punch	
	09905 - 00012 Snap Ring No. 1 Expander	
	09905 - 00013 Snap Ring Pliers	
	(09904 - 00090) Claw Set	

## EQUIPMENT

Feeler gauge	Check major clearance.
Vernier calipers	Check length of second coast brake piston rod.
Dial indicator	Check piston stroke and play of the output shaft.
Dial indicator	Check inside diameter of major bushing.
Straight edge	Check side clearance of oil pump.
Torque wrench	
Cylinder gauge	Check inside diameter of the transmission case rear bushing.

**LUBRICANT**







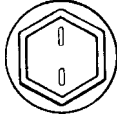

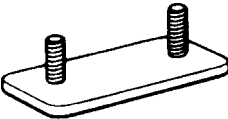

Item	Capacity	Clacification
Dry fill	13.0 liters (13.7 US qts, 11.4 Imp. qts)	ATF DEXRON★' 11
Drain and refill	6.0 liters (6.3 US qts, 5.3 Imp. qts)	

**SSM (SPECIAL SERVICE MATERIALS)**

08826 - 00090	Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)	
08833 - 00080	Adhesive 1344. THREE BOND 1344, LOCTITE 242 or equivalent	

# STANDARD BOLT TORQUE SPECIFICATIONS

## HOW TO DETERMINE BOLT STRENGTH

	Mark	Class		Mark	Class
Hexagon head bolt	4- 4T 5- 5T 6- 6T 7- 7T 8- 8T 9- 9T 10- 10T 11- 11T  Bolt head No.		Stud bolt	 No mark 4T	
	 No mark 4T				
Hexagon flange bolt w/ washer hexagon bolt	 No mark 4T			 Grooved 6T	
Hexagon head bolt	 2 protruding lines 5T				
Hexagon flange bolt w/ washer hexagon bolt	 2 protruding lines 6T		Welded bolt		
Hexagon head bolt	 3 protruding lines 7T			 4T	
Hexagon head bolt	 4 protruding lines 8T				

## SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N-m	kgf-cm	ft-lbf	N-m	kgf-cm	ft-lbf
4T	6	1	5	55	48 in.-lbf	6	60	52 in.-lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	-	-	-
5T	6	1	6.5	65	56 in.-lbf	7.5	75	65 in.-lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	-	-	-
6T	6	1	8	80	69 in.-lbf	9	90	78 in.-lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	-	-	-
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	-	-	-
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

# TORQUE SPECIFICATIONS

Part tightened	N-m	kgf-cm	ft-lbf
Oil pump cover × oil pump body	10 mm head bolt	8.8	90
	12 mm head bolt	21	210
Lower valve body cover × Lower valve body	5.4	55	48 in.-lbf
Upper valve body × Lower valve body	5.4	55	48 in.-lbf
Manual detent spring × Lower valve body	5.4	55	48 in.-lbf
Parking lock pawl × Transfer adaptor	19	195	14
Transmission rear cover × Transmission case	7.8	80	69 in.-lbf
C <sub>1</sub> accumulator cover × Transmission case	7.8	80	69 in.-lbf
Transfer Adaptor × Transmission case	37	380	27
Center support set bolt	25	250	18
Oil pan × Transmission case	6.9	70	61 in.-lbf
Transmission housing × Transmission case	64	650	47
Fluid Temp. sensor Transmission case	34	350	25
Oil cooler union × Transmission case	32	330	24
Park/neutral position switch × Transmission case	13	130	9
Park/neutral position switch × Manual valve shaft	6.9	70	61 in.-lbf
Control shaft × Transmission case	13	130	9
Oil pump × Transmission case	21	210	15
Valve body × Transmission case	10	100	7 ft-lbf
Solenoid valve × Valve body	10	100	7 ft-lbf
Oil strainer × Valve body	10	100	7 ft-lbf