



## SUBARU 3 SPEED

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## INTRODUCTION SUBARU 3 SPEED

This booklet contains general description and the procedures necessary to repair, overhaul, or service the three speed Subaru automatic transaxle. Although this transaxle comes in 2 wheel drive and 4 wheel drive the transfer case is not covered. The 3 speed transaxle have both lock-up and non-lock-up converters. The lock-up version is found in most 1986-UP models.

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

*The information and part numbers contained in this booklet have  
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## SERVICE PROCEDURE

### General

#### GENERAL PRECAUTION

When disassembling or assembling the automatic transmission, observe the following instructions.

##### 1) Workshop

Provide a place that is clean and free from dust. Principally the conventional workshop is suitable except for a dusty place. In a workshop where grinding work, etc. which produces fine particles is done, make independent place divided by the vinyl curtain or the equivalent.

##### 2) Worktable

The size of 1 x 1.5 m (40 x 60 in) is large enough to work, and it is more desirable that its surface be covered with flat plate like iron plate which is not rusted too much.

##### 3) Cleaning of exterior

(1) Clean the exterior surface of transmission with steam and/or kerosene prior to disassembly, however it should be noted that vinyl tape be placed on the airbreather or oil level gauge to prevent infiltration of the steam into the transmission and also the cleaning job be done away from the place of disassembly and assembly.

(2) Partial cleaning will do, depending on the extent of disassembly (such as when disassembly is limited to some certain parts).

##### 4) Disassembly, assembly and cleaning

(1) Disassemble and assemble the transmission while inspecting the parts in accordance with the Troubleshooting.

(2) During job, don't use gloves.

Don't clean the parts with rags: Use chamois or nylon cloth.

(3) Pay special attention to the air to be used for cleaning.

Get the moisture and the dust rid of the air as much as possible.

Be careful not to scratch or dent any part while checking for proper operation with an air gun.

(4) Complete the job from cleaning to completion of assembly as continuously and speedily as possible in order to avoid occurrence of secondary troubles caused by dust. When stopping the job unavoidably cover the parts with clean chamois or nylon cloth to keep them away from any dust.

(5) Use kerosene, white gasoline or the equivalent as washing fluid.

Use always new fluid for cleaning the automatic transmission parts and never reuse. The used fluid is usable in disassemble and assemble work of engine and manual transmission.

(6) Although the cleaning should be done by dipping into the washing fluid or blowing of the pressurized washing fluid, the dipping is more desirable. (Do not rub with a brush.) Assemble the parts immediately after the cleaning without exposure to the air for a while. Besides in case of washing rubber parts, perform the job quickly not to dip them into the washing fluid for long time.

(7) Apply the automatic transmission fluid (ATF) onto the parts immediately prior to assembly, and the specified tightening torque should be observed carefully.

(8) Use vaseline if it is necessary to hold parts in the position when assembling.

(9) Drain ATF and differential gear oil into a saucer so that the conditions of fluid and oil can be inspected.

(10) Do not support axle drive shaft, stator shaft, input shaft or various pipes when moving transmission from one place to another.

(11) Always discard old oil seals and bushings, and install new ones.

(12) Do not reuse old pipes, gaskets, plugs (1/8"), spring pins, etc.

Install new ones.

(13) Be sure to replace parts which are damaged, worn, scratched, discolored, etc.

#### SECTIONS THAT CAN BE DETACHED/ASSEMBLED

2WD

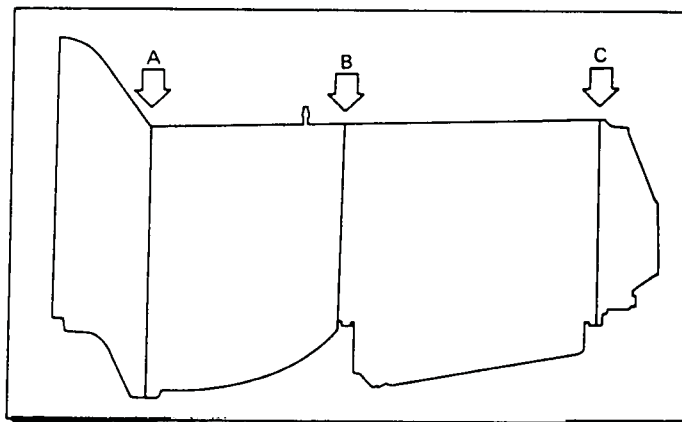


Fig. 50

Section A . . . . . Yes

Section B . . . . . Yes

Section C . . . . . Yes

4WD

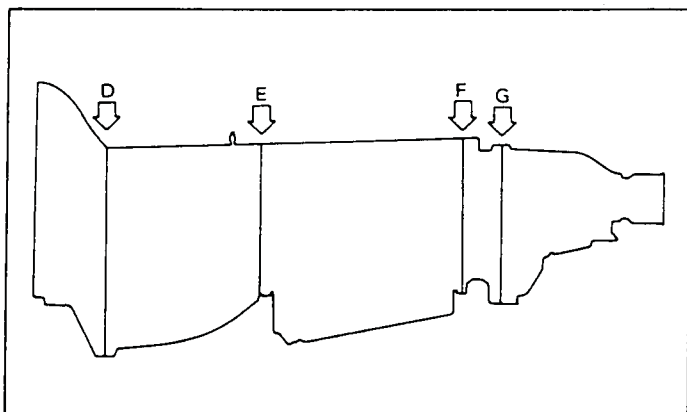


Fig. 51

Section D . . . . . Yes

Section E . . . . . No

Proceed as follows:

1. Detach section D.
2. Detach oil pan CP and control valve ASSY.
3. Detach section E.

Section F . . . . . No

Proceed as follows:

1. Detach section G.
2. Detach section F.

Section G . . . . . Yes

## On-Car Service

### ADJUSTMENTS

#### ATF LEVEL

- 1) Raise the ATF temperature to 60 to 80°C (140 to 176°F). [This temperature may be attained by running a distance of 5 to 10 km (3 to 6 miles)].

The level of ATF varies with fluid temperature. Pay attention to the fluid temperature when checking oil level. A change in the ATF level by oil temperature is shown in the following figure.

- 2) Ensure the vehicle is level. After selecting all positions (P, R, N, D, 2, 1), set the selector lever in "P" range. Measure fluid level with the engine idling.

**After running, idle the engine for one or two minutes before measurement.**

- 3) If the fluid level is below the center between high and low marks, add the recommended ATF until the fluid level is found within the specified range (above the center between high and low marks). When the transmission is hot, the level should be above the center of upper and lower marks, and when it is cold, the level should be found below the center of these two marks.

**Use care not to exceed the upper limit level.**

#### ■ ATF level

- 1) ATF level varies with temperature as shown in figure. Remember that the addition of fluid to the upper limit mark when the transmission is cold will result in the overfilling of fluid.

- 2) Fluid temperature rising speed

- By idling the engine

Time for rising temperature to 60°C (140°F) with atmospheric temperature of 0°C (32°F): More than 25 minutes (Reference)

Time for temperature rise to 30°C (86°F) with atmospheric temperature of 0°C (32°F): Approx. 8 minutes

- By running the vehicle

Time for temperature rise to 60°C (140°F) with atmospheric temperature of 0°C (32°F): More than 10 minutes

- 3) Method for checking fluid level upon delivery or at periodic inspection.

Check fluid level after a warm-up run of approx. 10 minutes. During this warm-up period, the automatic transmission functions can also be checked.

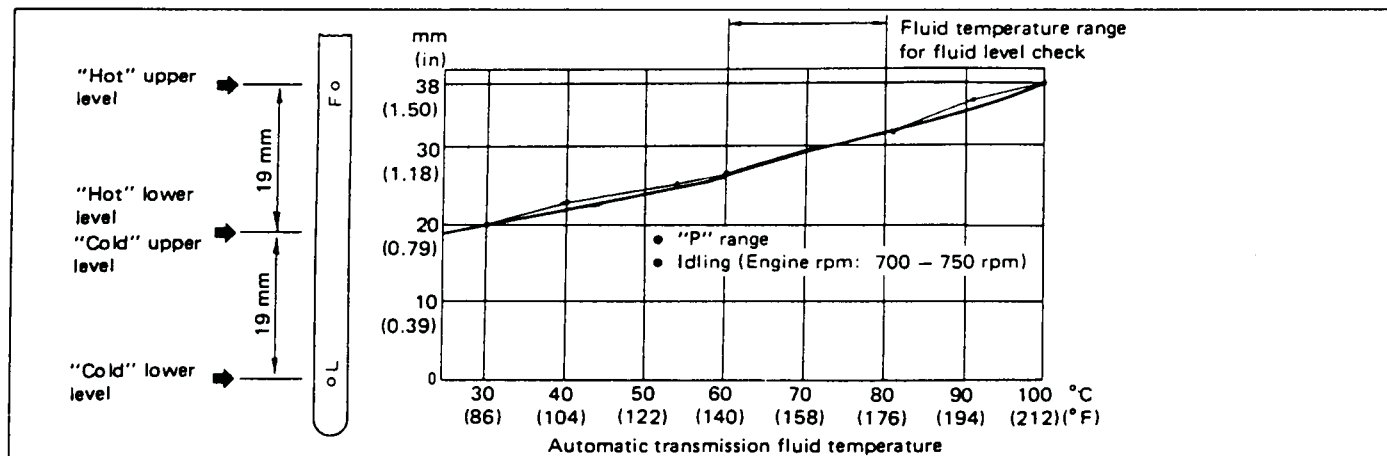


Fig. 52



## Technical Service Information

### DIFFERENTIAL GEAR OIL LEVEL

- 1) Ensure the vehicle is level.

**Do not check the oil level nor add oil to the case with the front end of the vehicle jacked up; this will result in an incorrect reading of the oil level.**

- 2) Check whether the oil level is between the upper and lower marks. If it is below the lower limit mark, add oil until the level reaches the upper mark. The difference in level between upper and lower marks corresponds to 0.4ℓ (0.8 US pt, 0.7 Imp pt).

### OIL LEAKAGE CHECK POINTS

It is difficult to accurately determine the precise position of a oil leak, since the surrounding area also becomes wet with oil. The places where oil seals and gaskets are used are as follows:

#### Jointing portion of the case

- Transmission case and final reduction case jointing portion
- Final reduction case and converter housing jointing portion
- Transmission case and transmission cover (or intermediate case) jointing portion
- Intermediate case and extension case jointing portion

#### Converter housing

- Engine crankshaft oil seal
- Torque converter impeller sleeve oil seal
- ATF pipe connector

#### Final reduction case

- Final reduction case and governor cover
- Axle shaft oil seal
- O-ring on the outside diameter of axle shaft oil seal holder
- Differential oil filler port
- Differential oil drain plug
- Speedometer cable mounting portion
- Governor test plug
- Air breather

#### Automatic transmission case

- Mating surface of oil pan and transmission case
- O-ring on the outer diameter of servo piston cover
- Test plug (Servo connecting side and servo release side)
- Oil supply pipe connections
- ATF pipe connector
- Vacuum diaphragm location
- Downshift solenoid location
- O-ring on the outer diameter of servo adjusting screw
- Oil pan drain plug
- Governor pressure and line pressure checking blind plugs (steel ball)

#### Intermediate case

- Test plugs (two plugs for line pressure, and plugs on forward clutch, reverse clutch, and transfer clutch)
- Blind plug (steel ball)

#### Extension

- Rear drive shaft oil seal
- Transfer solenoid location
- Thermoswitch location

The points listed above should be checked for fluid leak. Checking method is as follows:

- Place the vehicle in the pit, and check whether the leaking oil is ATF or not. The ATF is wine red in color, and can be discriminated easily from engine oil and gear oil.
- Wipe clean the leaking oil and dust from a suspectable area, using a noninflammable organic solvent such as carbon tetrachloride.
- Run the engine to raise the fluid temperature, and set the selector lever to "D" in order to increase the fluid pressure and quickly detect a leaking point.

### ENGINE IDLING SPEED

Excessively low engine idling rpm will lead to rough engine operation and excessively high idling rpm will lead to a sudden shift shock or creeping when shifting from N to D or R.

---

Idling rpm for automatic transmission cars (N or P range):  
800±100 rpm (Except SPFI)  
700±100 rpm (SPFI)

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### KICKDOWN SWITCH AND DOWNSHIFT SOLENOID

Set the ignition switch to ON, and fully depress the accelerator pedal to see whether the solenoid functions or not. If no kickdown occurs, or if the shift point occurs with the throttle half open, check the kickdown switch, downshift solenoid and associated wires. If kickdown failure occurs infrequently, it may be due to malfunction of the solenoid contaminated with dirt. Wash the inside of solenoid while moving the push rod. After washing, carefully check the operation of the solenoid.

**Before removing or installing the solenoid, drain approx. 2ℓ (2.1 US qt, 1.8 Imp qt) of ATF.**

### INTAKE MANIFOLD VACUUM PRESSURE

Check whether pressure is over -60.0 kPa (-450 mmHg, -17.72 inHg) at idling speed of engine, and whether pressure decreases in proportion to increase of engine speed when accelerator pedal is depressed.

### CREEPING

Check whether car exhibits a certain amount of creeping when it is brought to a temporary stop with selector lever in "D", "2", "1" or "R" position.



## Technical Service Information

### MANUAL LINKAGE

Adjustment of the manual linkage, like the inspection of fluid level, is an important operation in the automatic transmission service. Remember that improper adjustment may lead to a damaged transmission.

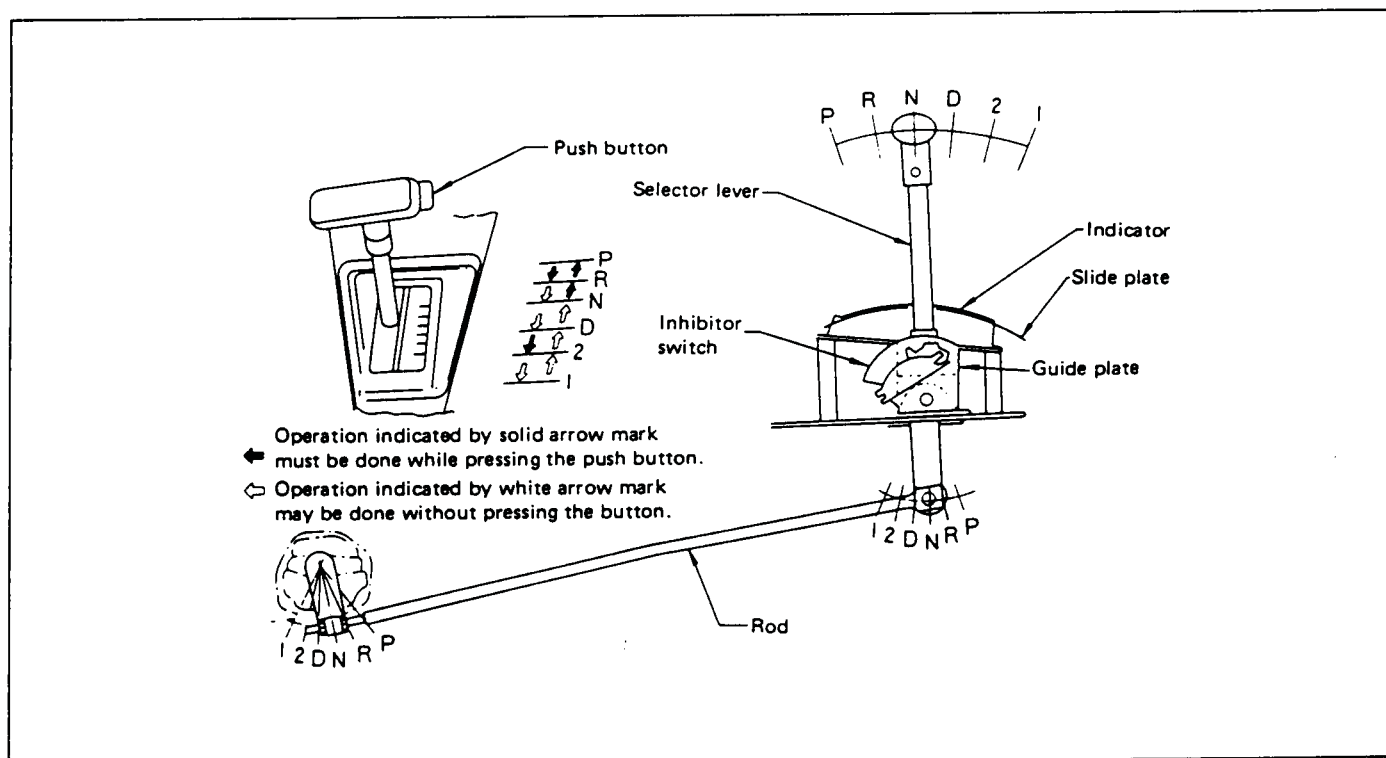


Fig. 53

#### ■ Inspection

- 1) While pressing the release button, move the selector lever from the "P" to "1" range; a click will be heard in each position. This clicking sound is caused by a detent of the manual valve in the transmission, and it indicates the correct selector lever position. Check to see that the indicator needle is aligned to this position, and also see that it is aligned with the groove of the guide plate when the release button and selector lever are released.
- 2) Confirm that the selector lever cannot be moved into "R" from "N" when pushed lightly, without first pressing the release button.
- 3) Confirm that the engine can only be started in "P" and "N" ranges.
- 4) Confirm that the backup lamp will light only when the selector lever is moved to the "R" range.
- 5) Place the vehicle on a slope, and set the selector lever to "P" and check whether the vehicle is locked properly.

#### ■ Adjustment

If the manual valve detent position is not aligned with the guide plate groove position, perform the adjustment as follows.

- 1) Set the selector lever to "N".
- 2) Loosen the adjusting nut of the linkage rod.
- 3) Set the detent position so the selector arm is aligned with the "N" locating mark of the transmission case [within the range of a 6 mm (0.24 in) dia. boss].

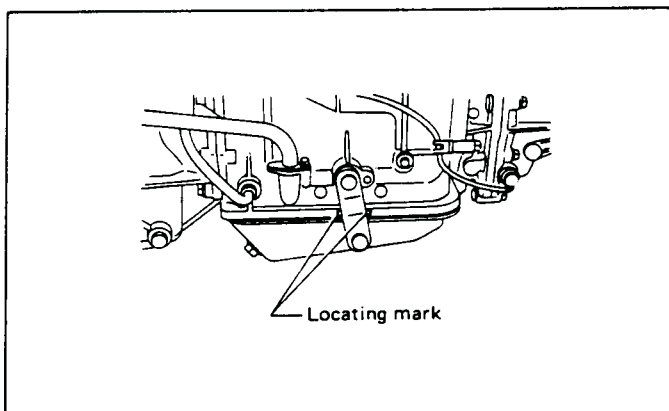


Fig. 54



- 4) Adjust the rod so that the "N" mark of the guide plate is aligned correctly with this detent position.
- 5) If the indicator needle is not aligned with the guide plate marking, remove the console box, loosen the four indicator mounting screws and adjust the position of the indicator ASSY.

## VACUUM DIAPHRAGM AND VACUUM HOSE

A loose or disconnected vacuum hose will result in rough engine idling and an abrupt shifting shock even with light acceleration. In such a case, check the vacuum hose for cracks or check the vacuum hose joint. Excessively large shift shocks and the emission of white exhaust smoke while running may indicate a broken vacuum diaphragm. If such symptoms occur, loosen the two bolts securing the vacuum pipe (at governor cover and at the engine and transmission jointing), and turn the vacuum pipe upward around the bracket of the diaphragm joint until the bracket comes free from the bolts. Pull the vacuum hose and vacuum pipe out toward you and drain approx. 2ℓ (2.1 US qt, 1.8 Imp qt) of ATF. Remove the vacuum diaphragm by rotating by hand.

- a. Be sure to remove the vacuum diaphragm when the transmission is cold. (To avoid a burn.)
- b. Also take out the diaphragm rod.

## GOVERNOR VALVE

If automatic shifting is not performed normally while running in the D range, or if acceleration is possible only up to 50 to 60 km/h (31 to 37 MPH) in the D range, it is often attributable to malfunctioning of the governor valve. Such malfunctioning may be caused by sticking of the valve due to clogged dirt, burrs or nicks on the valve body, etc.

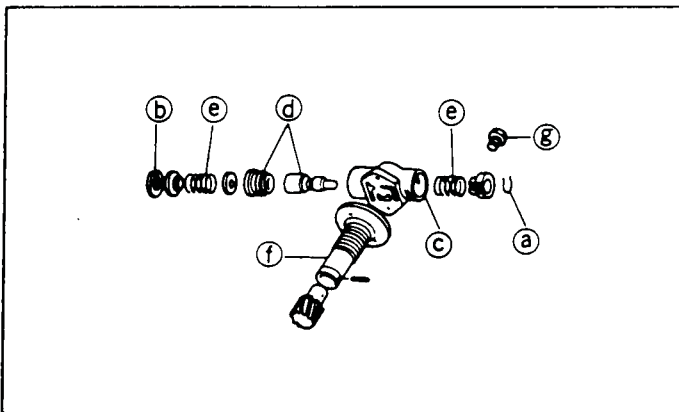


Fig. 55

## ■ Disassembly

- 1) Remove the three governor cover mounting bolts from the right side of the final reduction case, and remove the governor cover by turning it slightly in order to avoid interference from the vacuum pipe bracket.
- 2) Pull the governor valve out while carefully turning clockwise.
- 3) Remove the E-clip (a) snap ring (b) then remove the valve (d), spring (e) and other parts from the body (c).
- 4) Remove two bolts (g) securing the shaft (f) and body (c) and disassemble them.

**Be sure to perform the steps 3) and 4) after pulling the governor valve out from the final reduction case.**

## ■ Checking

Check the governor valve and body visually and by feeling with a finger for burrs and dents, and repair as necessary. If the sliding surface of the body or valve is defective, replace the governor body ASSY with a new one.

## ■ Correcting

- 1) To correct the governor valve and governor valve 2, lightly apply a fine grained oil stone to the burred edge as shown in the figure, and rotate the valve one or two turns. Check whether or not the burrs have been removed by feeling with a finger. Repeat this operation until the burrs are no longer felt.

- a. Note that the finishing of the end face is not chamfering, but it is light deburring. A sharp edge having no burrs is desirable.
- b. Replace the valve ASSY if flaws and dents are noted on the sliding surface.



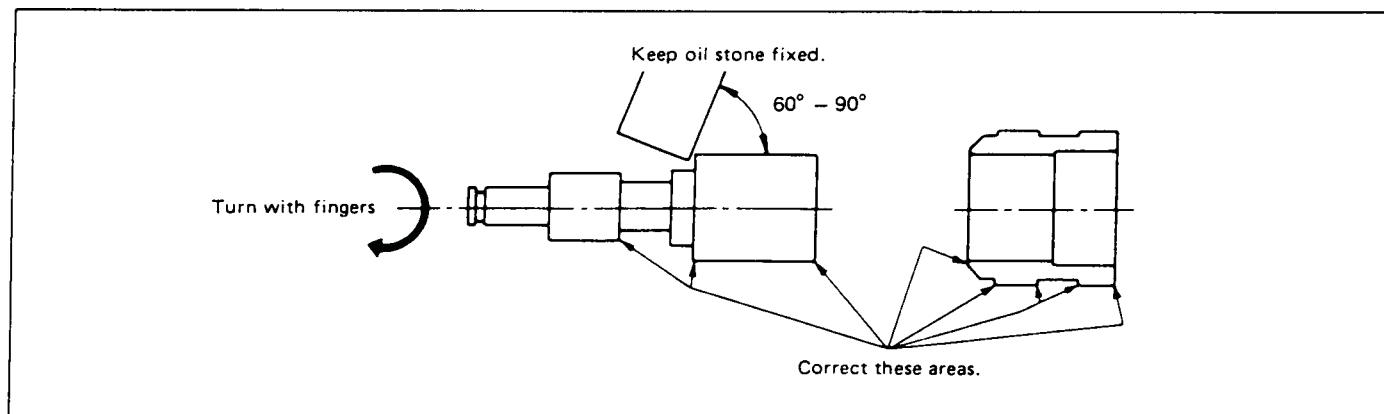


Fig. 56

- 2) Burrs and nicks at the edge of the valve body groove should be removed by using a small standard screwdriver.
- 3) Clean the repaired parts in clean lamp oil or white gasoline. Fit the governor valve and governor valve 2 into the valve body, and check for smooth sliding of these parts by lightly pressing them to the inside of the valve body while rotating.

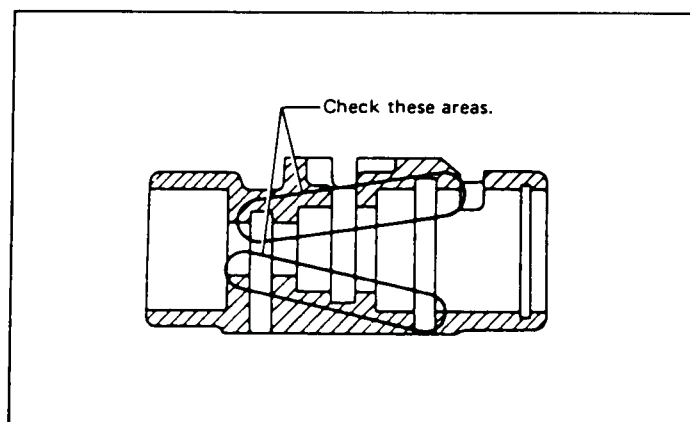


Fig. 57

**If the governor valve checks out to operate normally, the seal ring of governor sleeve must be checked.**

## ■ Reassembling

- 1) Reassemble the governor valve components by referring to the figure shown above.  
Pay attention to the orientation of the weight.
- 2) Confirm that there is no foreign matter in the oil passage of the governor shaft, and tighten the shaft to the governor body after washing.

## Tightening torque:

9 – 11 N·m (0.9 – 1.1 kg-m, 6.5 – 8.0 ft-lb)

**When tightening, fix the flange of the shaft, and be careful not to damage the nylon gear of the shaft.**

- 3) When assembling the governor valve to the final reduction case, it is unnecessary to dry out the governor valve. However, the governor valve should be assembled after confirming that the seal ring is normal.

**When assembling, use special care not to damage the seal ring, and the lip of the oil seal installed inside the case.**

- 4) Before assembling the governor cover, replace the gasket (governor cover) and confirm that the washer is included.

## Tightening torque:

14 – 17 N·m (1.4 – 1.7 kg-m, 10 – 12 ft-lb)

## BRAKE BAND

If the following abnormal shifting conditions are noted in a road test, the brake band must be adjusted.

### ■ Shift state and adjustment

- 1) The 2nd gear state can be achieved but:
  - the engine rpm increase excessively shifting up from 2 to 3.
  - a shift delay (over 0.7 sec) accompanies at kickdown from 3 to 2.

If any of these problems occurs, it is attributable to excessive clearance between the reverse clutch drum and brake band: Tighten the adjust screw by turning it clockwise.

- 2) The 2nd gear state can be achieved, but:
  - the shifting shock is too small at shifting up from 1 to 2.
  - a braking phenomenon is noted when shifting up from 2 to 3.

If any of these phenomena are noted, it is attributable to excessively small brake band clearance: Loosen the adjust screw by turning it counterclockwise.

- 3) When accelerating, direct shift up from 1st to 3rd occurs:
  - ..... Excessively large clearance.
 When shifting up from 2nd to 3rd, tire slip occurs:
  - ..... Excessively small clearance.

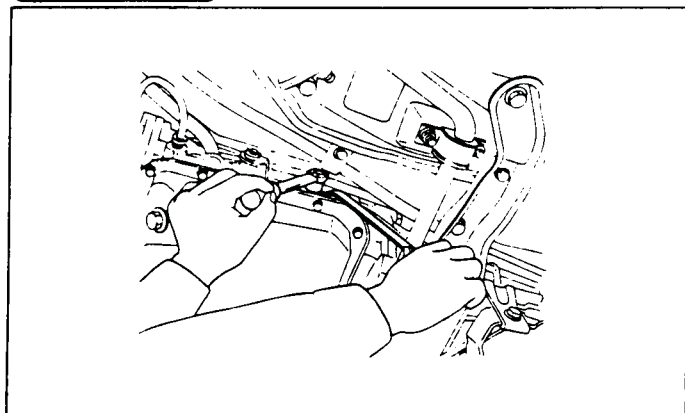


Fig. 58

## ■ Adjustment of the adjusting screw

1) Using a socket wrench, immobilize the end of the 10 mm screw projecting on the left side of the transmission case, and loosen the nut with a double-end wrench.

In the case of occurrence of problems 1) and 2) mentioned previously, perform the adjustment by loosening or tightening the nut within a range of 3/4 turn from this state.

Tool No.	Tool Name
398603610	Socket wrench

**Do not loosen excessively; otherwise, the band strut on the servo piston will drop off.**

2) In case of the occurrence of problem 3) mentioned previously, perform the adjustment as follows:

Adjusting procedure: Tighten adjust screw to 9 N·m (0.9 kg-m, 6.5 ft-lb) torque, then back off two turns.

**Do not tighten the adjusting screw with an excessively large torque.**

3) With the adjusting screw immobilized, tighten the lock nut to  $26 \pm 2$  N·m ( $2.7 \pm 0.2$  kg-m,  $20 \pm 1.4$  ft-lb) torque.

## TRANSFER SOLENOID

If the 4WD pilot lamp on the instrument panel remains off even when the 4WD pushbutton switch has been depressed, check the transfer solenoid and wiring.

If the 4WD mode is not achieved with the lamp illuminated, the solenoid may be malfunctioning. Check the solenoid and transfer valve as follows.

## ■ Removal

- 1) Open the hood.
- 2) Disconnect the battery ground cable.
- 3) Remove the spare tire.

4) Loosen the pitching stopper (to a position just before it comes off).

5) Disconnect the 4WD selector solenoid harness. (Keep the disconnected harness suspended.)

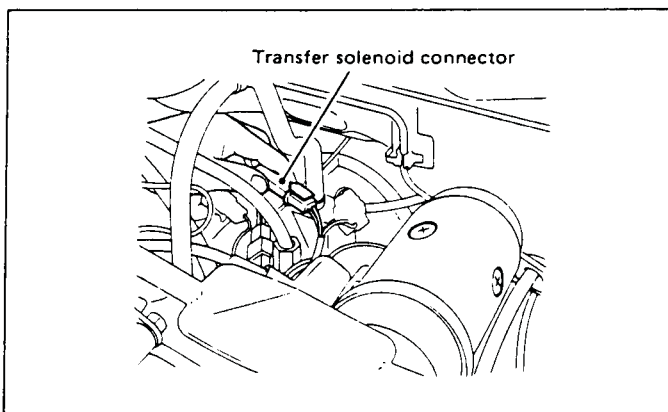


Fig. 59

6) Remove the uppercover. [This is necessary for removing the exhaust pipe (F).]

7) Remove the exhaust pipe (F).

8) Remove the intermediate side cable clamp.

9) Drain the torque converter oil (one liter).

(The oil will not come out of the case when the valve is removed, if one liter of oil has been drained. Measure the drained amount so that the amount to be added after completing the inspection can be easily determined.)

10) Remove the rear crossmember. (To ensure safety, support the oil pan with a transmission jack.)

11) Remove the side cable from the body clip. (Move it downward as far as possible.)

12) Push the transmission to the left. (Insert a piece of wood between the clearance thus achieved.)

13) Remove the solenoid valve.

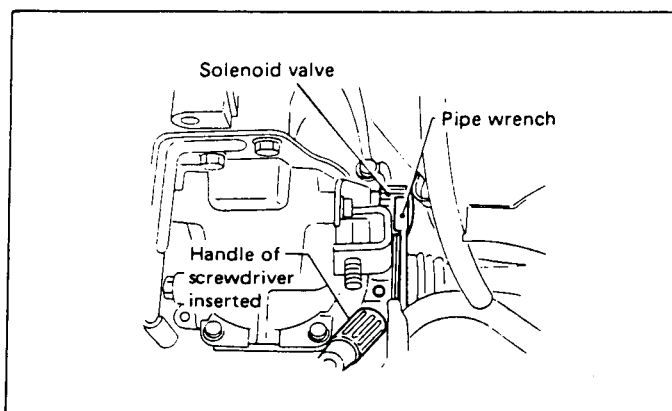


Fig. 60

## ■ Installation

Reverse the sequence of removal procedure.



## Technical Service Information

### TRANSFER SECTION

#### ■ Disassembly

- 1) Completely drain the AFT.
- 2) Remove the transfer solenoid. Refer to the Removal and Installation of the Transfer Solenoid for details.
- 3) Remove the temperature switch harness from the clamp.
- 4) Remove the eight 8 mm bolts and extract the transfer section and extension ASSY as a unit from the intermediate case.

- a. Be careful not to drop the internal component parts.
- b. Place a container to collect the remaining oil.

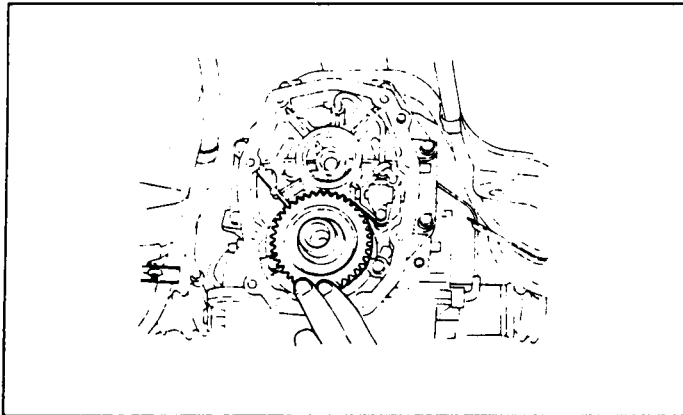


Fig. 61

- 5) Separate the clamp from the pipe at the bent position and disconnect the transfer pipe from the valve body and intermediate case.

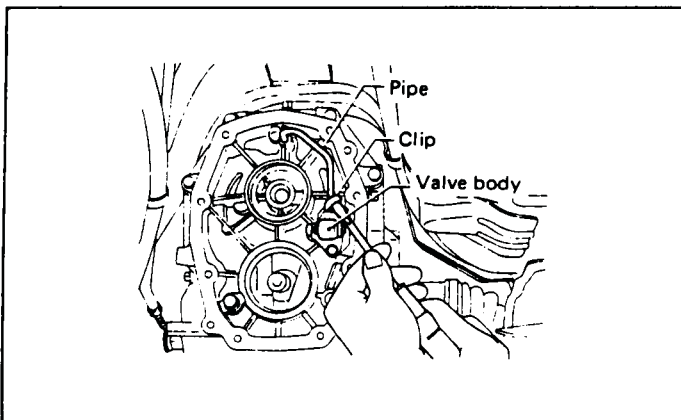


Fig. 62

- 6) Remove the two 6 mm bolts securing the valve body.
- 7) Remove the E-clip and remove the transfer valve from the body.

**Be careful not to lose the coil spring.**

#### ■ Inspection

- Visually check all peripheries to ensure they are free from burrs, dirt, metal chips, etc.
- Cleaning all parts by washing them and install them in the valve body. Ensure these parts move smoothly without binding.
- If the valve body or the frictional surface of the valve is faulty, replace with a new one.

#### ■ Assembly

- 1) To assemble the transfer valve parts, refer to the following figure.

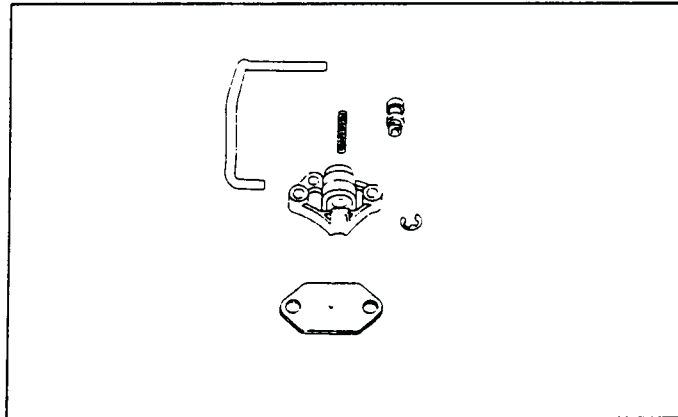


Fig. 63

- 2) Attach the valve body to the intermediate case and tighten with the two 6 mm bolts.

#### Tightening torque:

6 – 8 N·m (0.6 – 0.8 kg·m, 4.3 – 5.8 ft·lb)

- a. Do not forget to install the plate.
- b. Pay attention to the direction of the valve body.
- c. Do not forget to install the clamp.

- 3) Insert the transfer pipe into the intermediate case and tighten the clamp by bending.

**Always use a new pipe and clamp.**

- 4) To assemble the transfer unit, reverse the order of disassembly.

**Be sure to install the rear drive shaft seal ring.**

- 5) Replenish ATF and check the level.

### CONTROL VALVE

#### ■ Disassembly

- 1) Raise the vehicle with a jack and drain ATF.
- 2) Disconnect the vacuum hose, and remove the downshift solenoid and vacuum diaphragm.



## Technical Service Information

Also remove the diaphragm rod together with the vacuum diaphragm.

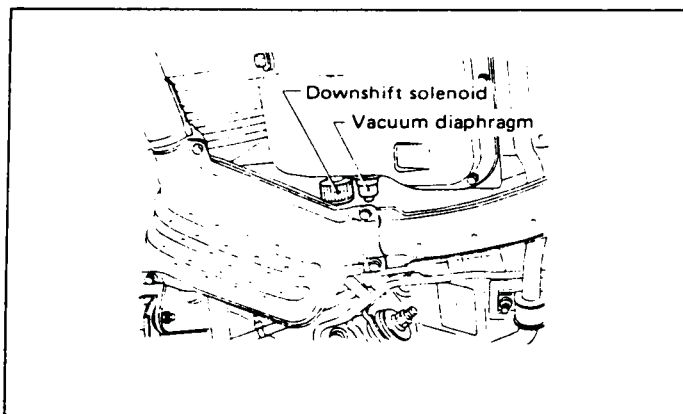


Fig. 64

- 3) Remove the converter oil pan. Be sure to place a container under the oil pan to collect ATF remaining in the oil pan.
- 4) Disconnect the servo pipes.

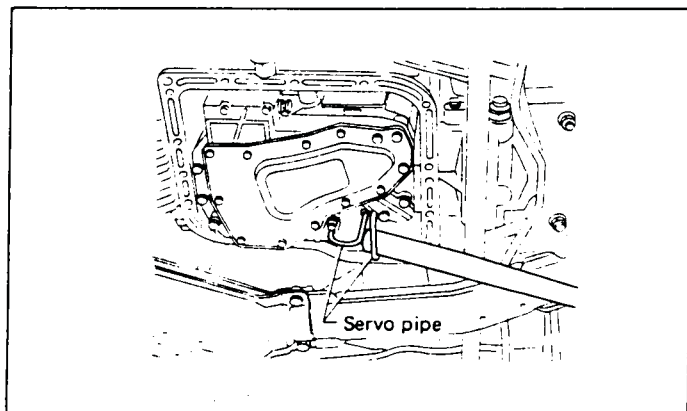


Fig. 65

- 5) Remove the six 6 mm bolts (shown by the arrow) and detach the control valve ASSY.

- a. Be careful not to drop the manual valve.
- b. Be careful not to damage the oil strainer.
- c. Be careful not to allow dust or dirt from getting into the valve ASSY.

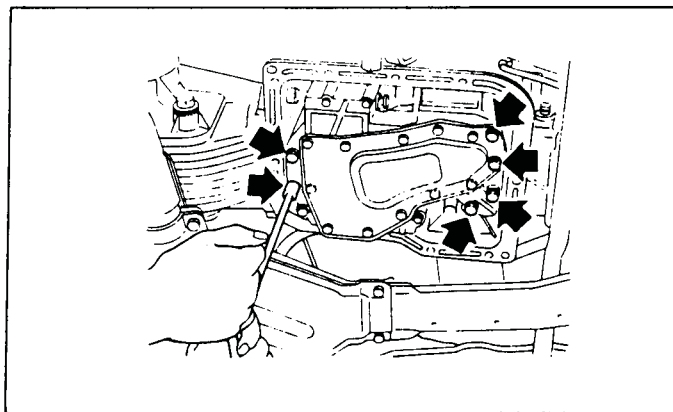


Fig. 66

### ■ Inspection

Refer to the Control Valve ASSY section.

### ■ Assembly

- 1) Install the control valve ASSY.

**Be sure to tighten the bolts equally – one at a time – using a torque wrench.**

#### Tightening torque:

6 – 8 N·m (0.6 – 0.8 kg·m, 4.3 – 5.8 ft·lb)

- 2) Connect the servo pipes.

**Always install new servo pipes.**

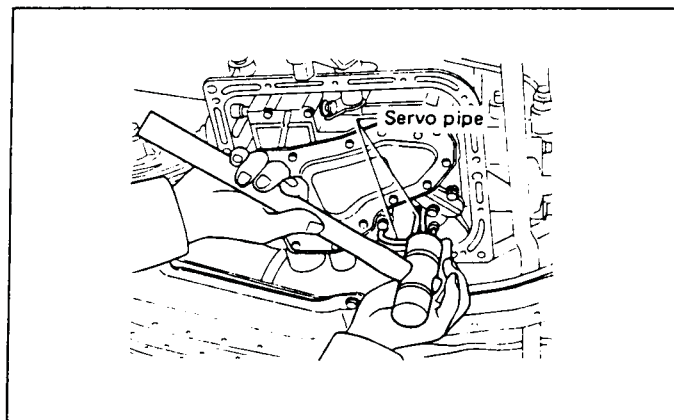


Fig. 67

- 3) Align the mating surfaces of the converter oil pan and converter to ensure no clearance exists at any point. The gasket should not be used at this point.

- 4) Wipe any oil from the mating surfaces and install the converter oil pan with the gasket in place.



## Technical Service Information

**Always use a new gasket.**

---

**Tightening torque:**

**3.4 – 4.4 N·m (0.35 – 0.45 kg-m, 2.5 – 3.3 ft-lb)**

**Drain plug tightening torque:**

**25 N·m (2.5 kg-m, 18 ft-lb)**

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- 5) Using the Diaphragm Rod Gauge Set, check the length of the diaphragm rod is within specifications and, if the length is correct, install the vacuum diaphragm.
- 6) Install the downshift solenoid and connect the vacuum hose.

**Do not forget to install the O-ring.**

- 7) Replenish ATF and check the oil level. The amount of ATF to be replenished is approximately 4 liters (4.2 US qt, 3.5 Imp qt).

## Various Tests

### STALL TESTS AND INTERPRETATION OF TEST RESULTS

The stall test is of extreme importance in diagnosing the condition of the automatic transmission and the engine. It should be conducted to measure the engine stall speeds in all shift ranges except the P and N ranges.

#### Purposes of the stall test

- 1) To check the operation of the automatic transmission clutch and brake band.
- 2) To check the operation of the torque converter.
- 3) To check engine performance.

#### Test methods

Prior to the stall tests, check to ensure the carburetor throttle valve opens fully, and that the levels of engine oil, cooling water and ATF are correct. Set the select lever in the P range and idle the engine at 1,200 rpm for several minutes until the ATF reaches approximately 60°C (140°F).

- 1) Install an engine tachometer at a location visible from the driver's compartment and mark the stall speed range on the tachometer scale.

---

**Stall speed (at sea level):**

**Non-TURBO**

**2,250 – 2,550 rpm**

**TURBO**

**2,650 – 2,950 rpm**

---

- 2) Place the wheel chocks at the front and rear of all wheels and engage the parking brake.
- 3) Move the manual linkage to ensure it operates properly, and shift the select lever to the D range.
- 4) While forcibly depressing the foot brake pedal, gradually depress the accelerator pedal until the engine operates at full throttle.
- 5) When the engine speed is stabilized, read that speed quickly and release the accelerator pedal.
- 6) Shift the select lever to Neutral, and cool down the engine by idling it for more than one minute.
- 7) Record the stall speed.
- 8) Perform the stall tests with the select lever in the 2, 1 and R ranges.

**a. Do not continue the stall test for MORE THAN FIVE SECONDS at a time (from closed throttle, fully open throttle to stall speed reading). Failure to follow this instruction causes the engine oil and ATF to deteriorate and the clutch and brake band to be adversely affected.**

**Be sure to cool down the engine for at least one minute after each stall test with the select lever set in the P or N range and with the idle speed lower than 1,200 rpm.**

**b. If the stall speed is higher than the specified range, attempt to finish the stall test in as short a time as possible, in order to prevent the automatic transmission from sustaining damage.**



## Technical Service Information

### Interpretation of stall test results

Stall speed (at sea level)	Assessment	Cause	Remarks
Higher than 2,550 rpm (Non-TURBO) or 2,950 rpm (TURBO)	Slippage of automatic transmission clutch, brake band, etc. (Further stall tests are not necessary.)	<ul style="list-style-type: none"> <li>• Low line pressure (If stall speed is higher than specified range at any shift position).</li> <li>• One-way clutch slippage. (If stall speed is higher than specified range only in the D range.)</li> <li>• *1: Brake band slippage (If stall speed is higher than specified range only in the 2 range.)</li> <li>• *2: Slippage of low &amp; reverse brake or reverse brake (If stall speed is higher than specified range only in the R range.)</li> </ul>	<p>*1: Brake band slippage cannot be judged by stall tests; however, if it slips, engine speed is higher than specified rpm while car is being driven in the 2 range.</p> <p>*2: Slippage of reverse clutch/low &amp; reverse brake can be judged by road tests. If engine compression can be used as a brake with select lever in the 1 range, reverse clutch is slipping; if it cannot be used, low &amp; reverse brake is slipping.</p>
2,250 – 2,550 rpm (Non-TURBO) or 2,650 – 2,950 rpm (TURBO)	<ul style="list-style-type: none"> <li>• Control members are in good order in the D, 2, 1 and R ranges.</li> <li>• Engine in good order.</li> </ul>		<ul style="list-style-type: none"> <li>• One-way clutch can be checked for condition by road tests.**</li> </ul>
Lower than 2,250 rpm (Non-TURBO) or 2,650 rpm (TURBO)	<ul style="list-style-type: none"> <li>• Throttle not fully opened.</li> <li>• Erroneous engine operation or one-way clutch slippage.</li> </ul>		
** Road test	<ul style="list-style-type: none"> <li>• Acceleration is not properly made up to 50 km/h (31 MPH).</li> <li>• Car speed does not attain more than 80 km/h (50 MPH).</li> <li>• Operation is not proper at all car speeds.</li> </ul>	<p>One-way clutch slippage.</p> <p>*3: One-way clutch jamming. Erroneous engine operation.</p>	<p>*3: Abnormal temperature rise occurs.</p>



## Technical Service Information

### ROAD TEST

Road tests should be conducted to properly diagnose the condition of the automatic transmission.

### Speed change characteristics

The standard speed change characteristics are indicated in the following table.

#### Non-TURBO

Intake manifold pressure -kPa (-mmHg, -inHg)	Shift	Car speed km/h (MPH)
Kickdown 4.0 - 6.7 (30 - 50, 1.18 - 1.97)	D <sub>1</sub> → D <sub>2</sub>	57.2±4 (35.5±2.5)
	D <sub>2</sub> → D <sub>3</sub>	104.7±5 (65.1±3.1)
	D <sub>3</sub> → D <sub>2</sub>	96.9±5 (60.2±3.1)
	D <sub>2</sub> → D <sub>1</sub>	46.5±4 (28.9±2.5)
Half throttle 26.7 (200, 7.87)	D <sub>1</sub> → D <sub>2</sub>	17.0±2 (10.6±1.2)
	D <sub>2</sub> → D <sub>3</sub>	47.0±3 (29.2±1.9)
	D <sub>3</sub> → D <sub>2</sub>	19.0±3 (11.8±1.9)
	D <sub>2</sub> → D <sub>1</sub>	17.0±2 (10.6±1.2)
Full throttle 4.0 - 6.7 (30 - 50, 1.18 - 1.97)	1 <sub>2</sub> → 1 <sub>1</sub>	46.0 <sup>+2.5</sup> <sub>-7.5</sub> (28.6 <sup>+1.6</sup> <sub>-4.7</sub> )
Minimum 53.3 - 60.0 (400 - 450, 15.75 - 17.72)	1 <sub>2</sub> → 1 <sub>1</sub>	46.0 <sup>+2.5</sup> <sub>-7.5</sub> (28.6 <sup>+1.6</sup> <sub>-4.7</sub> )

#### TURBO

Intake manifold pressure kPa (mmHg, inHg)	Shift	Car speed km/h (MPH)
Kickdown 44.0 - 46.7 (330 - 350, 12.99 - 13.78)	D <sub>1</sub> → D <sub>2</sub>	60.7±4 (37.7±2.5)
	D <sub>2</sub> → D <sub>3</sub>	113.1±5 (70.3±3.1)
	D <sub>3</sub> → D <sub>2</sub>	103.9±5 (64.6±3.1)
	D <sub>2</sub> → D <sub>1</sub>	46.5±4 (28.9±2.5)
Half throttle 0 (0, 0)	D <sub>1</sub> → D <sub>2</sub>	18.0±2 (11.2±1.2)
	D <sub>2</sub> → D <sub>3</sub>	68.0±3 (42.3±1.9)
	D <sub>3</sub> → D <sub>2</sub>	34.0±3 (21.1±1.9)
	D <sub>2</sub> → D <sub>1</sub>	16.5±2 (10.3±1.2)
Full throttle 44.0 - 46.7 (330 - 350, 12.99 - 13.78)	1 <sub>2</sub> → 1 <sub>1</sub>	43 <sup>+2.5</sup> <sub>-7.5</sub> (26.7 <sup>+1.6</sup> <sub>-4.7</sub> )
Minimum throttle -57.3 to -60.0 (-430 to -450, -16.93 to -17.72)	1 <sub>2</sub> → 1 <sub>1</sub>	43 <sup>+2.5</sup> <sub>-7.5</sub> (26.7 <sup>+1.6</sup> <sub>-4.7</sub> )

### Shift characteristics

Pay careful attention to ensure the shift is made smoothly at the proper car speed at which shifting begins.

- 1) Shifting shocks are encountered or smooth shifting does not occur.
- 2) Shifting occurs slowly in response to the condition of the engine throttle.

The above two problems are due to incorrect throttle pressure or other factors involved in throttle pressure.

### Checking for shift patterns

- 1) In the D range, shifting should be made as D<sub>1</sub> → D<sub>2</sub> → D<sub>3</sub> smoothly and vice versa; it should not be made in the R range.
- 2) Kick down should activate properly.
- 3) When the select lever is shifted from the D range to the 2 or 1 range, shifting should be made as D<sub>2</sub> → 2 (1<sub>2</sub>) → 1<sub>1</sub>. Engine compression can be utilized as a brake at 1<sub>2</sub> and 1<sub>1</sub>.
- 4) Shifting should not occur while the select lever is at the 1 range.



5) With the shift lever in the 2 range, the 2nd gear is engaged and 2nd speed is maintained.

6) The select lever should be locked when placed in the P range.

In road tests, if any abnormality is noticed in the 2 range, it is necessary to adjust the brake band. If by inspection the brake band is in good order, check the servo piston for any sign of oil leakage from the seal.

## Check for the 4WD function

With the car in the 4WD mode, turn the vehicle in a circle while lightly depressing the accelerator pedal, and then shift the vehicle into the FWD mode. When the vehicle is shifted into the FWD mode, a light shock should be felt.

Whenever the transfer clutch facing is replaced with a new one, the above test should be conducted, for the run-in purpose, two to three times with the vehicle set in the 4WD mode and with the steering wheel fully turned.

## LINE PRESSURE TEST

If the clutch or the brake band shows a sign of slippage or shifting sensation is not correct, the line pressure should be checked.

- Excessive shocks during upshifting or shifting takes place at a higher point than under normal circumstances, may be due to the line pressure being too high.
- Slippage or inability to operate the car may, in most cases, be due to loss of oil pressure for the operation of the clutch, brake band or control valve.

1) Line pressure measurement (under no load)

a. Before measuring line pressure, jack-up front wheels (front-wheel-drive model) or all wheels (4-wheel drive model).

b. Maintain temperature of ATF at approximately 80°C (176°F) during measurement.

(ATF will reach the above temperature after idling the engine for approximately 30 minutes with shift lever in "N" or "P.")

2) Line pressure measurement (under heavy load)

a. Before measuring line pressure, apply both foot and parking brakes with all wheels chocked (Same as for "stall" test conditions).

b. Measure line pressure for 5 to 10 seconds. Before measuring it again, idle the engine for 2 - 5 minutes.

c. Before measuring line pressure, always shift the lever from "D" to "2" - not from "1" to "2."

d. Maintain the temperature of ATF at approximately 80°C (176°F) during measurement. (ATF will reach the above temperature after idling the engine for approximately 30 minutes with the shift lever in "N" or "P.")

## Measuring the line pressure

1) Temporarily attach the Oil Pressure Gauge ASSY to a suitable place in the driver's compartment, remove the blind plug located in front of the toeboard and pass the hose of the Gauge ASSY to the engine compartment.

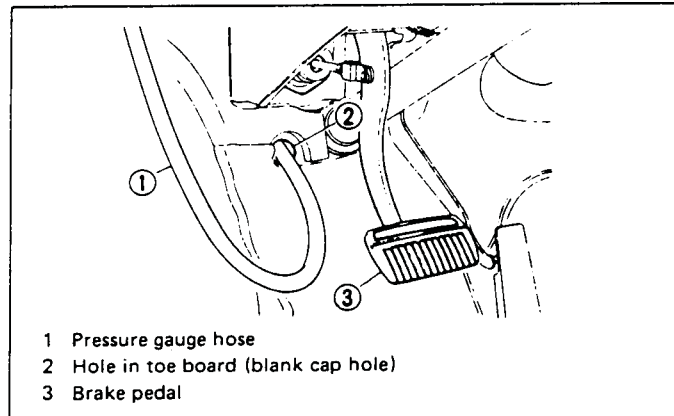


Fig. 68

Tool No.	Tool Name
398573600	Oil pressure gauge ASSY

2) Using the socket wrench (7), remove the pressure check plug from transmission cover (or intermediate case).

3) Attach an oil pressure adapter to the pressure check plug hole in transmission cover (or intermediate case).

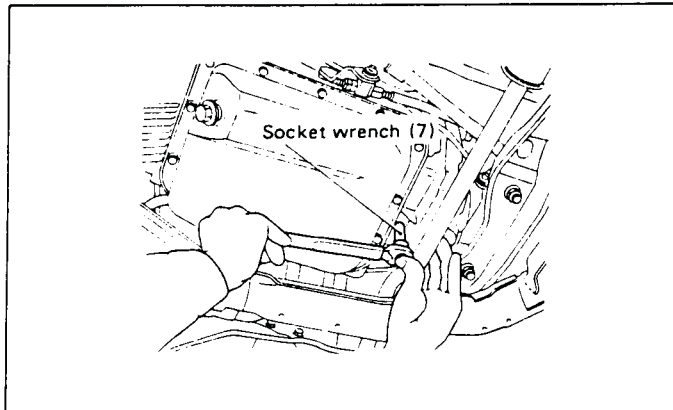


Fig. 69

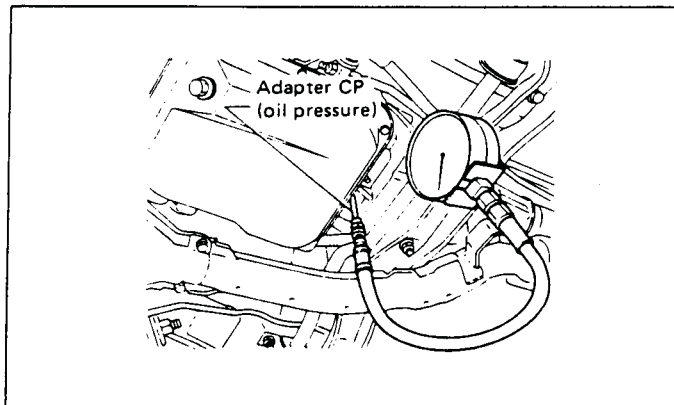


Fig. 70



## Technical Service Information

Tool No.	Tool Name
498897000	Oil pressure adapter
498597000	Socket wrench (7)

4) Connect the oil pressure adapter and the tip end of the Gauge ASSY.

5) Run the engine and check the line pressures with the engine at a minimum-throttle and full-throttle operations.

### Line pressure in each select range

Refer to the "SERVICE DATA".

### 2) Car in the 4WD mode

If an abnormality occurs in the 4WD operation, check the line pressure in the transfer clutch oil circuit to determine the cause of the problem.

	Symptom	Probable cause
Engine at idle (1,500 rpm) in Neutral	Pressure difference between 4WD and FWD operation modes is more than 29 kPa (0.3 kg/cm <sup>2</sup> , 4 psi).	<ul style="list-style-type: none"><li>Transfer pipe disconnected.</li><li>Rear shaft seal ring not installed.</li></ul>
	Pressure difference between 4WD and FWD operation modes is less than 29 kPa (0.3 kg/cm <sup>2</sup> , 4 psi).	<ul style="list-style-type: none"><li>Solenoid or transfer valve inoperative.</li></ul>

### Interpretation of line pressure

#### 1) Car in the FWD (front-wheel drive) mode

	Symptom	Probable cause
Engine at idle (1,500 rpm) in N range	Low	<ul style="list-style-type: none"><li>Oil pump worn or clearance improperly adjusted.</li><li>Leakage in oil pressure circuit.</li><li>Pressure regulator valve inoperative.</li></ul>
	High	<ul style="list-style-type: none"><li>Leakage at vacuum hose or vacuum diaphragm or diaphragm too long.</li><li>Pressure regulator valve jamming.</li></ul>
Engine at full throttle	Pressure will not rise.	<ul style="list-style-type: none"><li>If pressure fails to rise even though vacuum pressure drops, check to see if diaphragm rod was not installed.</li></ul>
	Pressure rises but does not enter specified range.	<ul style="list-style-type: none"><li>In most cases problems may be due to jamming of vacuum throttle valve, pressure regulator valve or pressure regulator plug.</li></ul>

Change of the diaphragm rod by one rank or [0.5 mm (0.020 in)] causes the line pressure to change approximately 29 kPa (0.3 kg/cm<sup>2</sup>, 4 psi).

### GOVERNOR PRESSURE TEST

If the governor valve operation is questionable as a result of road tests, conduct the governor pressure test.

1) Remove the test plug from the right side of the final reduction case and, in its place, install the Adapter.

Tool No.	Tool Name
398893600	Adapter

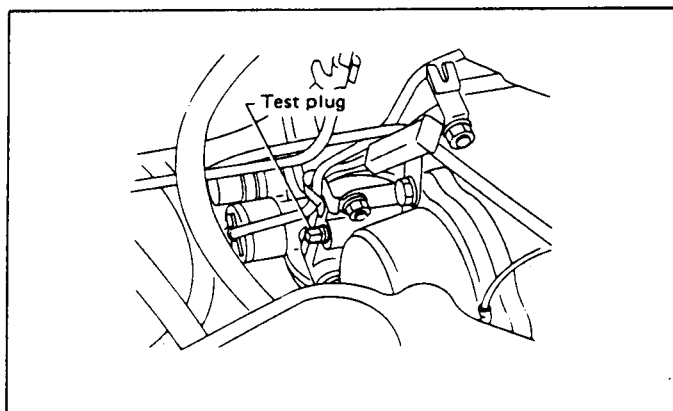


Fig. 71



## Mechanical Operation

The component units used in the SUBARU automatic transmission operate as shown in the following table, transmitting power corresponding with the driving condition in each selector position.

Range	Gear	Gear ratio	Clutch		Low & Reverse brake B <sub>1</sub>	Brake band B <sub>2</sub>	One-way clutch C <sub>3</sub>	Parking Pawl P
			Forward C <sub>1</sub>	Reverse C <sub>2</sub>				
P	Parking				○			○
R	Reverse	2.257		○	○			
N	Neutral							
D	1st	2.821	○				○	
	2nd	1.559	○			○		
	3rd	1.000	○	○				
2	2nd (locked)	1.559	○			○		
1	2nd	1.559	○			○		
	1st	2.821	○		○			

Fig. 3

NOTE: ○-marked units operate in each corresponding gear.

## Hydraulic Control Circuits

### 1) N Range

When the transmission is in the N range, the clutches are released, as pressure oil is not delivered from the oil controlling mechanism to the speed controlling elements (clutches and brake band). Therefore, the power from the input shaft (turbine shaft) is not transmitted to the output shaft.

\* The pressure of the oil discharged from the oil pump is regulated by the pressure regulating valve ① and the pressurized oil, called line pressure 7, is delivered to the manual valve ②, vacuum throttle valve ⑥, and solenoid

downshift valve ⑧. The oil then travels to the torque converter as torque converter oil 14, and, on the way to the converter, part of the oil is supplied to the forward and reverse clutches as rear lubricating oil. Other part of the oil is directed as front lubricating oil to the planetary gears, oneway clutch and low & reverse brake through the oil pump shaft. Since the oil pump is rotating at the same speed as the engine, the volume of oil from the oil pump increases with engine speed, excess oil being returned through the pressure regulating valve ① directly to the oil pan.

## 2) 4-wheel Drive (4WD)

If the pushbutton on the selector lever is set to the 4WD position from the FWD position, the transfer valve opens the circuit to the transfer clutch as the solenoid is activated, and, at the same time, the green 4WD pilot lamp illuminates on the meter panel.

The line pressure, led through; transfer pipe → intermediate case → rear drive shaft, connects the transfer clutch (hydraulic clutch).

The power is branched to the front and to the rear on the front hypoid pinion. The power branched to the rear from the shaft end of the pinion is led through; transfer drive shaft → transfer gear → transfer clutch → rear drive shaft → propeller shaft → rear differential, and transmitted to the rear wheels.

These characteristics have been established as being necessary to transmit the power from the engine to the rear wheels. If an excessive brake torque is created on the front and rear wheels in a tight cornering operation, the transfer clutch acts as a torque limiter (that is, the clutch slips), and weakens the braking torque, and also protects the driving members. The torque limiting function is more effective when the line pressure is lower (that is, when the throttle opening is smaller).

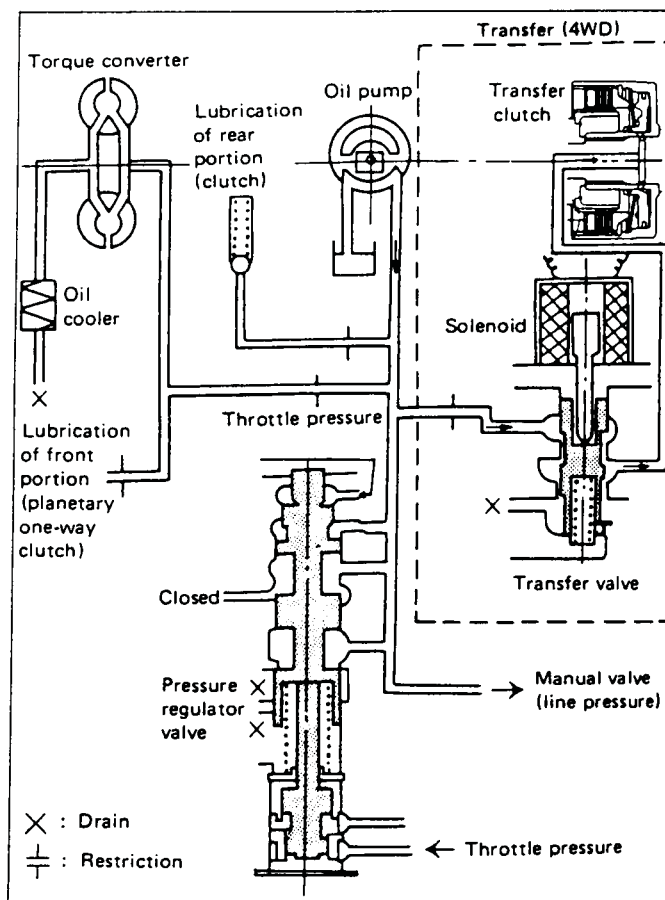


Fig. 27 Hydraulic circuit in 4WD mode

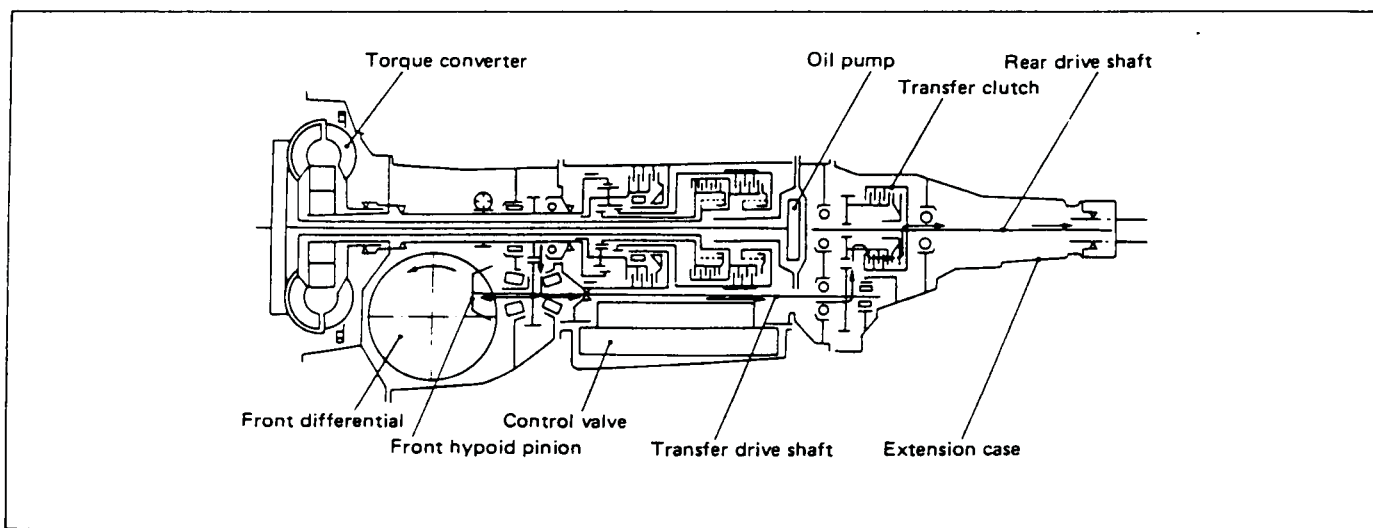


Fig. 28 Transmission of power in 4WD mode



## MECHANISM AND FUNCTION

### Cross Sectional View

4WD

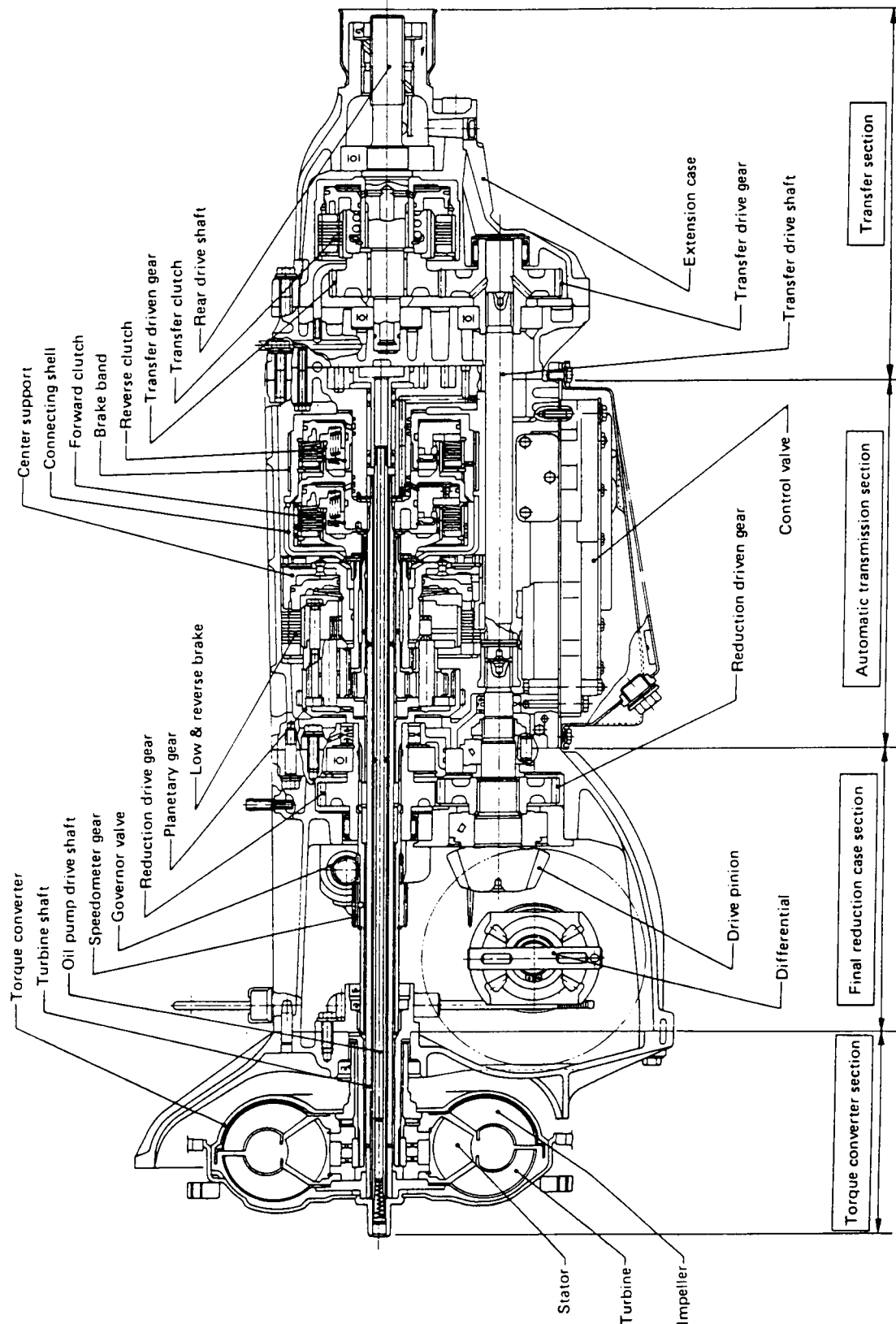


Fig. 1

2WD

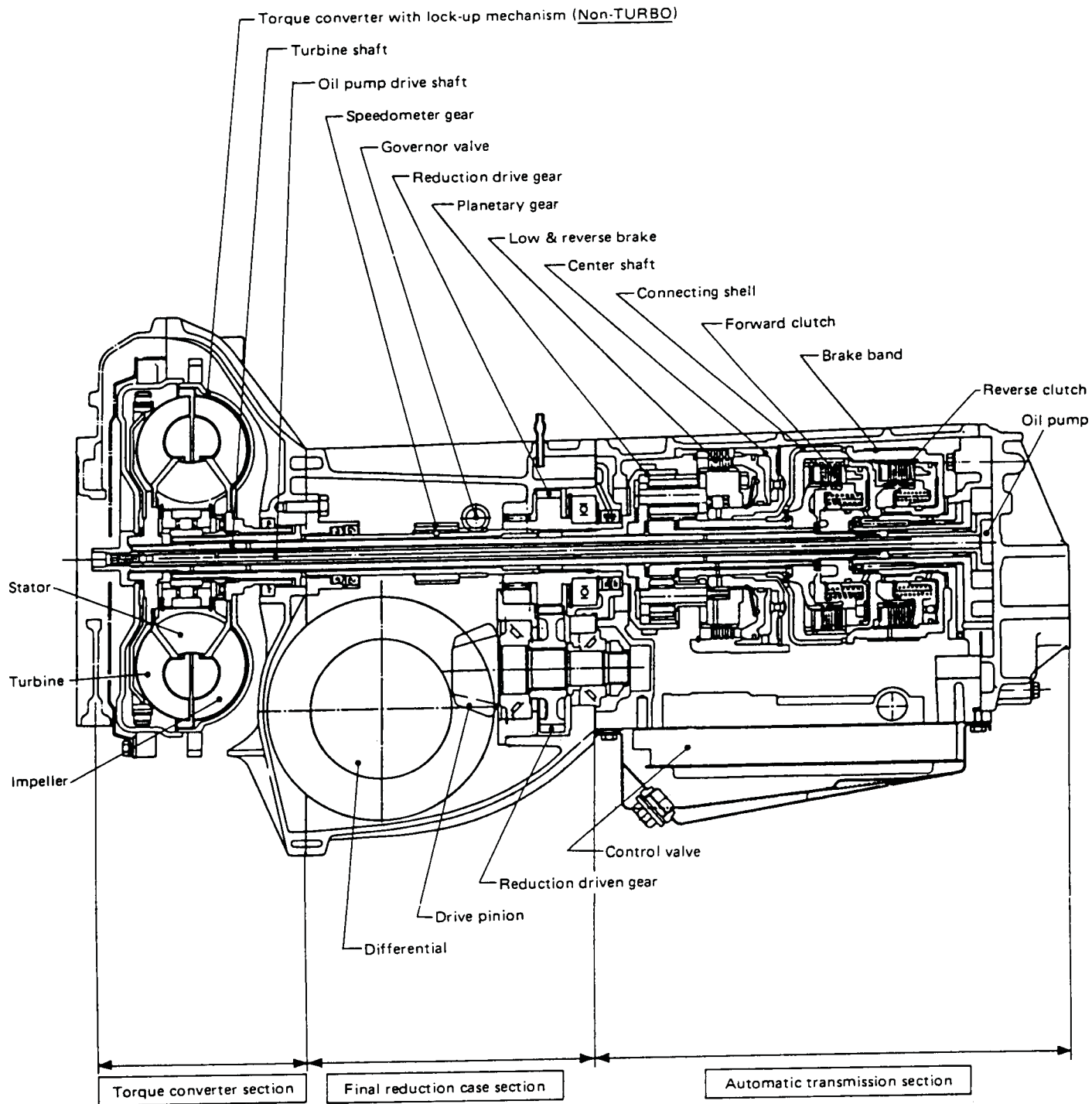


Fig. 2

## 1. Torque Converter

The torque converter is a kind of clutch that transmits driving power through oil. It works as an automatic clutch at starting and serves to multiply the torque at the preliminary step before the power flows into the transmission (when starting).

It is composed of three parts, an impeller, turbine and stator, as illustrated in the figure. The impeller is directly connected to the engine and the turbine is connected to the transmission.

As the torque converter is filled with oil the rotation of the impeller (engine) causes rotation of the turbine (driven shaft), so that the torque converter works as an automatic clutch at starting.

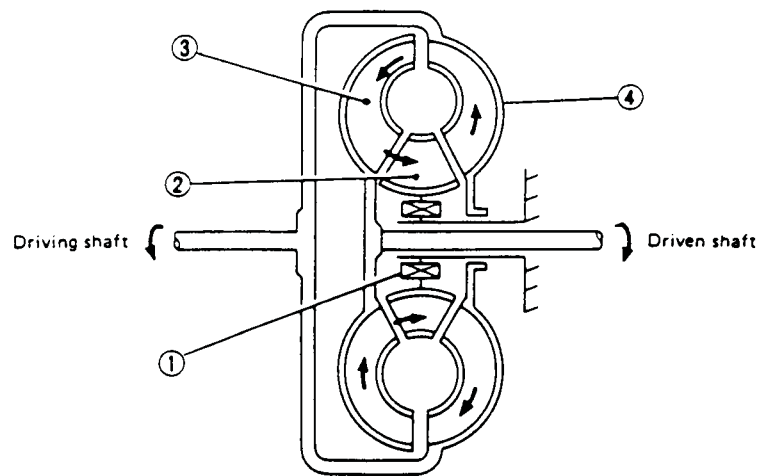
Further, when the driven shaft (turbine) rotates slowly compared to the engine (impeller) rotation as when the car is starting, the converter multiplies the engine torque and thereby the torque transmitted to the transmission. This torque multiplying action is achieved by the stator, based on the following mechanism:

1) First, impeller rotation throws oil away radially by centrifugal force, which goes into the turbine from the outer side and flows along the vanes, giving the turbine a torque of the same direction as that of the impeller rotation.

The figure illustrates a pattern of oil flow in the mechanism.

2) Now, without the stator, the oil coming out of the turbine would flow in the direction as indicated by P in the figure, hindering the impeller rotation. This is an effect of what is called fluid coupling, in which the torque looked on the impeller is the same as that exerted on the turbine based on the principle of the action (impeller) and reaction (turbine).

3) There is a stator, however, which reverses the direction of the oil flow coming out of the turbine, as indicated by Q in the figure, helping the impeller rotation and thereby reducing the torque load on the impeller.



- 1 One-way clutch
- 2 Stator
- 3 Turbine
- 4 Impeller

Fig. 12-12

A13-266

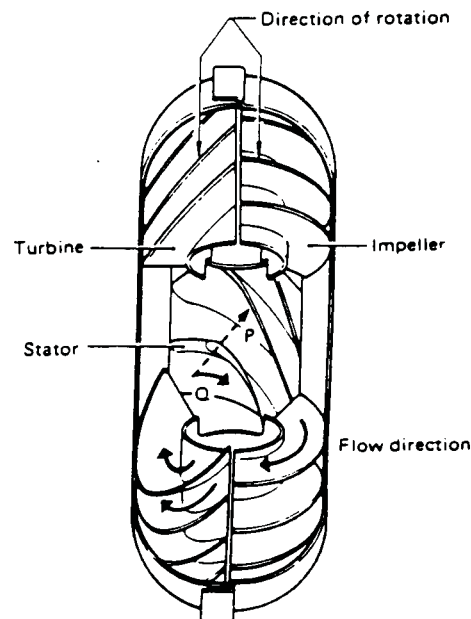


Fig. 12-13



4) Therefore, less impeller torque is required in the torque converter with the stator, than in the fluid coupling, to give the same torque to the turbine. This means that the turbine (driven shaft) torque is high compared with the engine torque, which is the transmission torque multiplication effect of the torque converter. In reversing the direction of the oil flow, the stator is given torque in a direction reverse to that of the impeller and turbine rotations, so the stator must be fixed to the case. However, as the speed of turbine increases approaching the impeller speed, the oil coming out of the turbine exerts torque on the stator not in its lock direction but in the reverse direction, that is, in the same direction as the impeller and turbine rotations. This inversion point is called coupling point. Then, if the stator is still kept locked, the stator becomes an obstacle to the power transmission reducing the efficiency. This is why the stator is fixed on the case with a one-way clutch so that it is allowed to freely rotate when its locking power transmission.

Performance curves of such torque converters are illustrated in the figure.

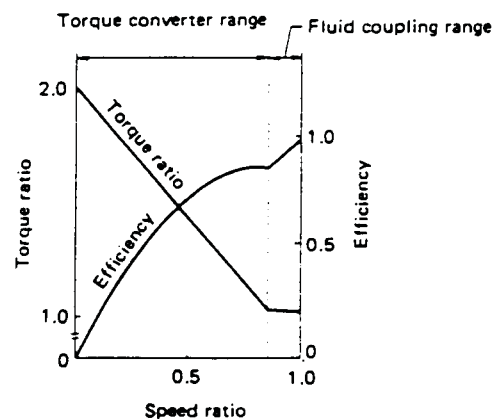


Fig. 12-14

A13-268

Torque ratio, speed ratio and efficiency in the figure are expressed by the following formulas.

$$\text{Torque ratio} = \frac{\text{Torque of turbine shaft (output shaft)}}{\text{Torque of impeller shaft (input shaft)}}$$

$$\text{Speed ratio} = \frac{\text{RPM of turbine shaft (output shaft)}}{\text{RPM of impeller shaft (input shaft)}}$$

$$\text{Efficiency} = \frac{\text{Output horse power}}{\text{Input horse power}} \times 100$$

The torque multiplication range with stator stationary is called torque converter range and that with stator rotating is called fluid coupling range. In this coupling range, the stator is rotating and the torque converter functions as only the fluid coupling, thereby the torque is not multiplied. The state where only impeller rotates with turbine stalled is called stall state (the vehicle is standing still), where the torque ratio becomes maximum value. This maximum torque ratio is called stall torque ratio and this engine speed is called stall speed.

## 8) Automatic Transmission Fluid Passages

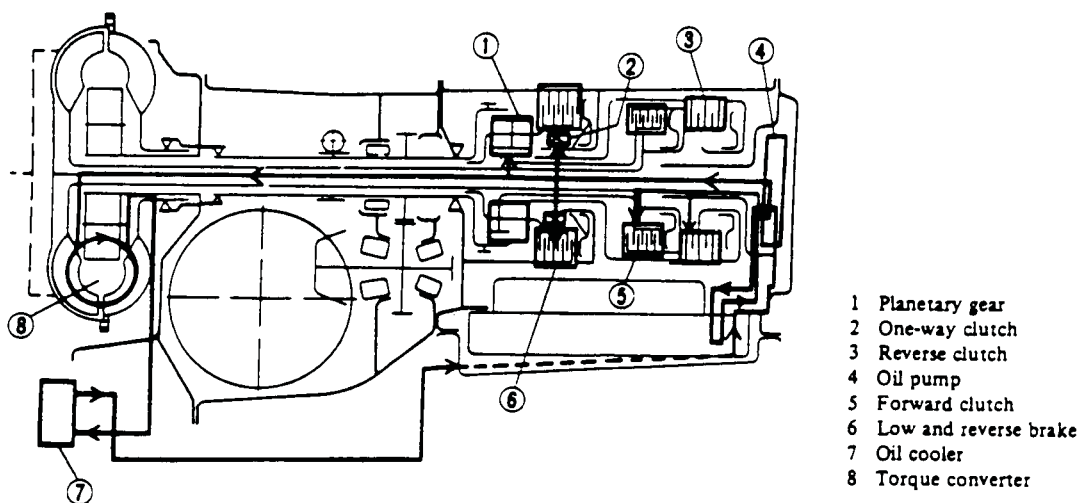
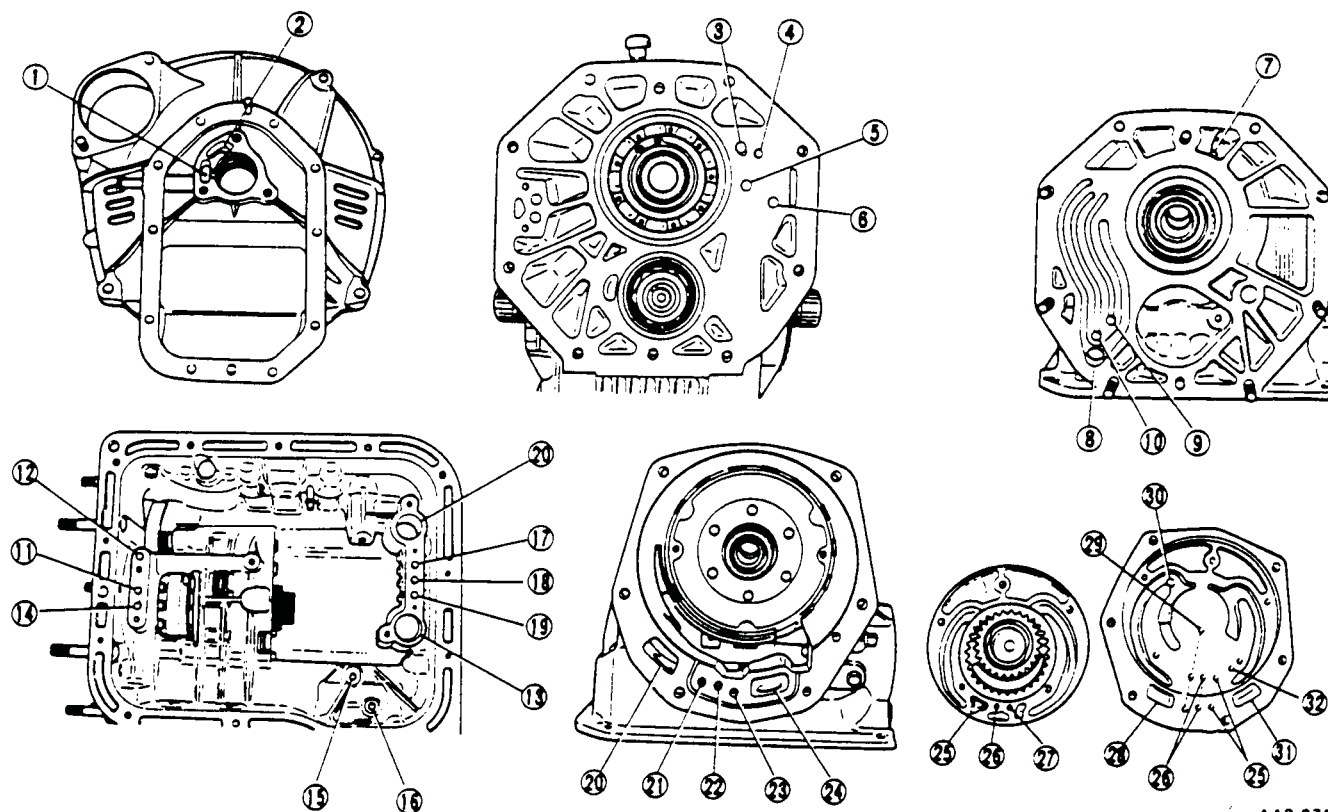


Fig. 12-31 Automatic transmission fluid passages in automatic transmission

A13-277



A13-278

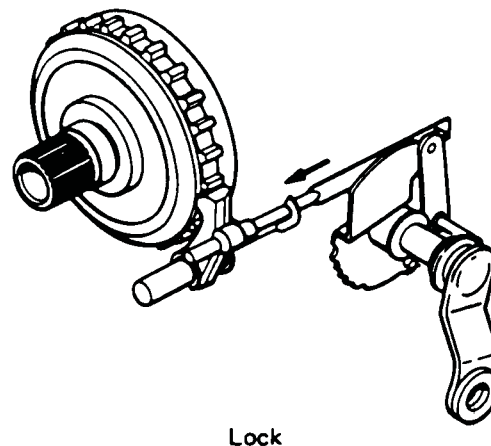
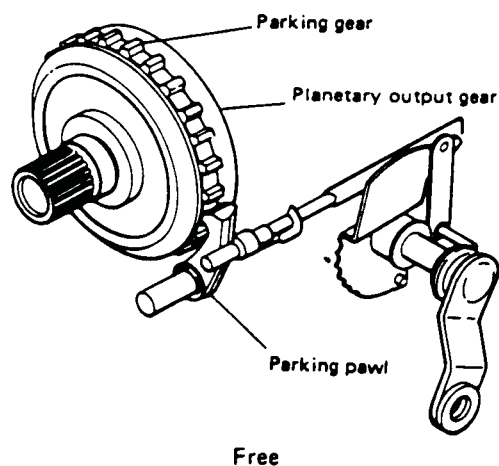
- |                                     |   |   |
|-------------------------------------|---|---|
| 1 To oil cooler (14)                | 12 Low & reverse brake pressure                   | 23 Torque converter pressure and lubrication (14) |
| 2 Drain                             | 13 Discharge hole of oil pump (7)                 | 24 Discharge hole of oil pump (7)                 |
| 3 Governor feed pressure (1)        | 14 Governor pressure (15)                         | 25 Reverse clutch pressure (11)                   |
| 4 Governor pressure (15)            | 15 Servo "release" pressure (10)                  | 26 Forward clutch pressure (1)                    |
| 5 Drain                             | 16 Servo "apply" pressure (9)                     | 27 To rear lubrication (14)                       |
| 6 Governor pressure inspection hole | 17 Reverse clutch pressure                        | 28 Discharge hole of oil pump                     |
| 7 Air breather                      | 18 Forward clutch pressure (1)                    | 29 To torque converter (14)                       |
| 8 Drain                             | 19 Torque converter pressure and lubrication (14) | 30 Line pressure inspection hole                  |
| 9 Governor feed pressure (1)        | 20 Suction hole of oil pump                       | 31 Suction hole of oil pump                       |
| 10 Governor pressure (15)           | 21 Reverse clutch pressure (11)                   | 32 Reverse clutch pressure inspection hole        |
| 11 Governor feed pressure (1)       | 22 Forward clutch pressure (1)                    |   |

Fig. 12-32 Fluid passages in transmission cases

## 2) P (Parking) Range

With the transmission in the P range, the clutches are functionally in the same condition as in the N range. But, in the locked condition as shown in the figure, the parking pawl is meshed with the parking gear so that

the axle shaft connected to the planetary output gear is mechanically locked.



## 3) R (Reverse) Range

The reverse clutch and the low & reverse brake are engaged when the transmission is in the R range. The power flow is from the turbine shaft, through the reverse clutch, and from the connecting shell to the reverse sun gear. As the planetary carrier is held stationary by the low & reverse brake, the reverse sun gear turns clockwise. This causes the output ring gear to turn counterclockwise at a reduced speed providing a gear ratio of 2.166 to 1.

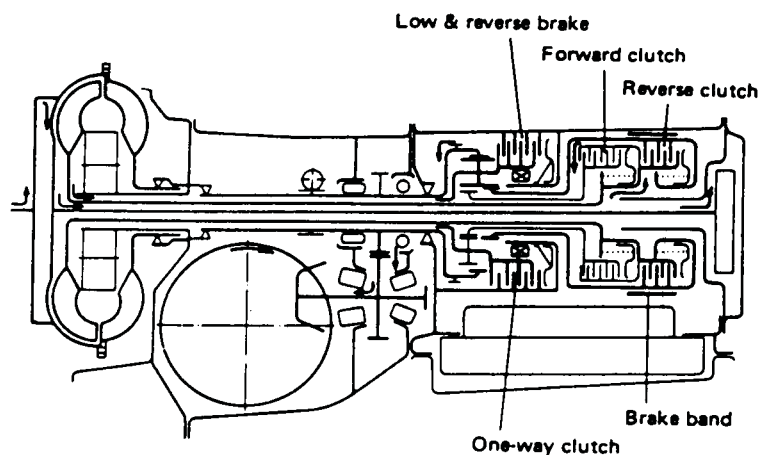
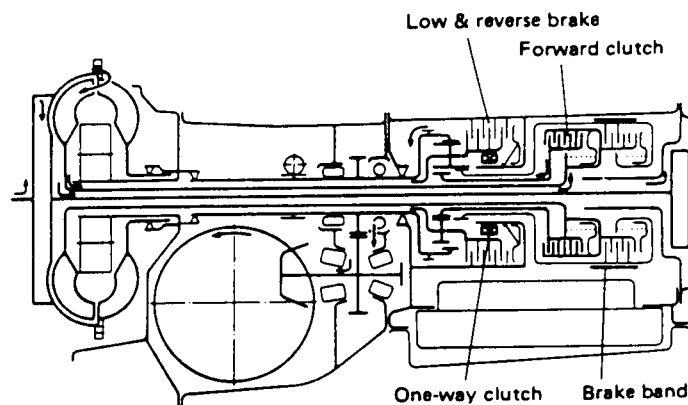


Fig. 12-38 Power flow in R (reverse) range

## 4) D (1st gear) Range

When the transmission is in the D (1st gear) range, the forward clutch is engaged and power from the turbine shaft is transmitted to the forward sun gear. The planetary carrier is locked to the transmission case through the one-way clutch outer race, one-way clutch and center support.

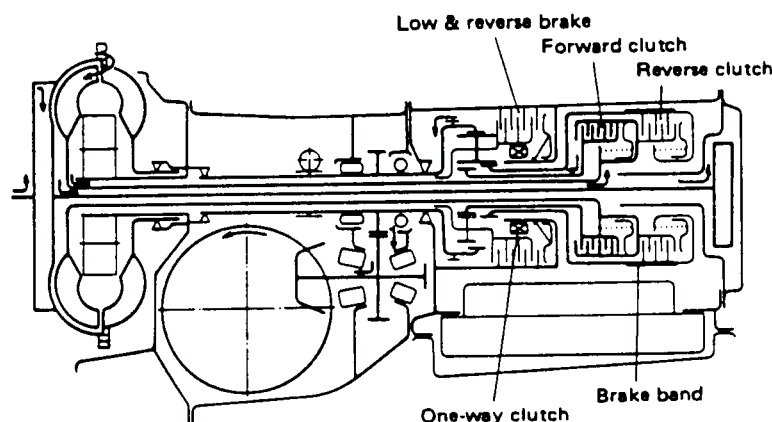
The planetary gear system in this range provides a ratio of 2.600 to 1. Since the planetary carrier tends to turn clockwise when the car is coasting, the one-way clutch is released and runs idle. In this condition, no reverse drive is transmitted to the engine so that the engine brake will not be applied.



## 5) D (2nd gear), 2 and 1 (2nd gear), Range

When the transmission is in the D (2nd gear) range, the forward clutch is engaged and power from the turbine shaft is transmitted to the forward sun gear. Also, the brake band is applied to hold stationary the reverse clutch drum interlocked with the reverse sun gear and connecting shell.

The power also flows in the same manner with the transmission in the 2 and 1 (2nd gear) range. With the reverse sun gear held stationary, the planetary carrier rotates clockwise as the pinions circle around the reverse sun gear. Thus, the one-way clutch outer race runs idle and a gear ratio of 1.505 to 1 is obtained in this gear position.

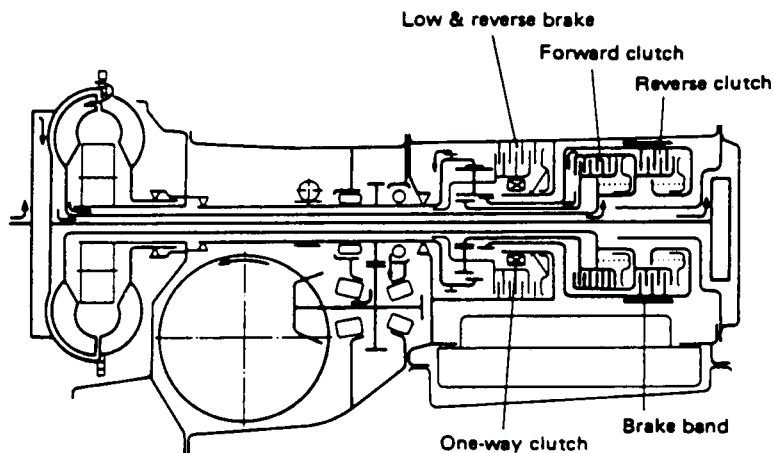


## 6) D (3rd gear) Range

With the transmission in the D (3rd gear) range, the forward clutch and the reverse clutch are engaged. Although oil pressure is applied to the servo piston on both the "apply" and "release" sides, the brake band is released as the servo piston is released by the combined releasing force which consists of the return spring force and the thrust caused by oil pressure acting on the annular surfaces of the servo piston which are different in area.

The power transmitted from the turbine shaft to the forward clutch drum is divided into two streams; one is transmitted from the forward clutch drum to the forward sun gear and the other from the reverse clutch to the reverse sun gear through the connecting shell.

Since the forward sun gear and the reverse sun gear make the same rotation, the planetary-gear system turns as a unit and the output ring gear also turns in the same direction at the same speed. Hence, there is no gear reduction in the transmission and a gear ratio of 1 to 1 is achieved.



## 7) D Range Kickdown

While operating at speeds below approximately 80 to 90 km/h (50 to 56 MPH), a kick "3rd to 2nd" downshift can be accomplished by fully depressing the accelerator.

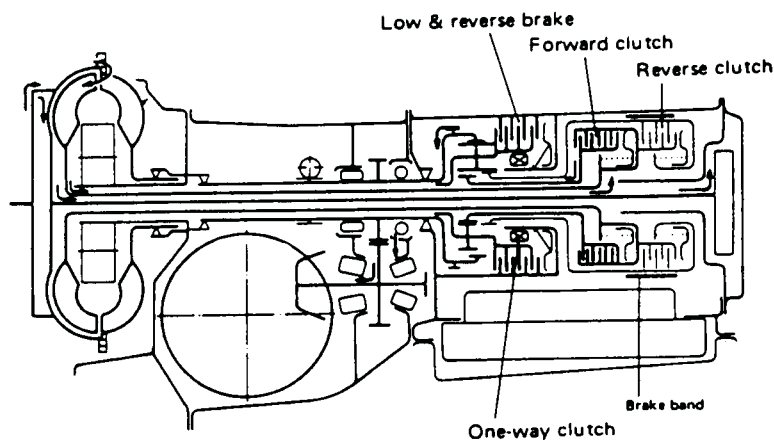
A kick "3rd to 1st" or "2nd to 1st" downshift can be accomplished below approximately 37 to 47 km/h (23 to 29 MPH).

## 8) 2 Range

Regarding the mechanical operation of this range, refer to Item 5) "D (2nd gear), 2 and 1 (2nd gear) range".

## 9) 1 Range

When the transmission is in the 1 (1st gear) range, the forward clutch is engaged and the planetary carrier is locked by the low & reverse brake. The planetary-gear system is in the same operating condition as in the D (1st gear) range, except that instead of the one-way clutch, the low & reverse brake is applied to hold the planetary carrier stationary, so that engine braking can be used.





## TROUBLESHOOTING

Many troubles of the automatic transmission may be corrected by performing the basic inspection and adjustment procedures. Before starting the regular troubleshooting operation, carry out the following preliminary inspection.

### NECESSARY TEST GAUGES

- 1) Tachometer (It is desirable to be able to read to 50 rpm.)
- 2) Vacuum gauge (It is used for measuring intake manifold vacuum.)
- 3) Oil pressure gauge [0 to 2,452 kPa (0 to 25 kg/cm<sup>2</sup>, 0 to 356 psi) range].

Set above gauges so that the driver can see them.

### PRELIMINARY INSPECTION

- 1) Confirm that the engine tune-up has been completed. Check the idling speed and idling boost.  
If engine is out of adjustment, check also the stall speed.
- 2) Check that the linkage between the accelerator pedal and the carburetor is functioning properly. (Check the full-opened and fully closed positions.)

- 3) Ensure that the vacuum pipe is not disconnected.
- 4) See that no fluid is leaking from the ATF cooler circulation pipe.
- 5) Check that the kickdown switch functions at the normal pedal position.
- 6) Check that the electrical circuits of the kickdown solenoid, transfer solenoid and inhibitor switch are functioning properly.
- 7) Confirm that the manual linkage adjustment has been completed.
- 8) See that no fluid is leaking out of the transmission.
- 9) See that the ATF level and differential oil level are normal.

After completing the above listed operations, perform checks on the items listed in 4. according to the Troubleshooting chart.

### Chattering of transfer clutch

- If considerable chattering is felt in the transfer clutch when making a turn in 4WD mode, replace two to three liters of transmission oil with the recommended ATF.

## TROUBLESHOOTING

Trouble	On the car check item	Off the car check item
Large shock when shifting "N" → "D"	G, J	j
Car will not run, slip, or acceleration is very poor in "D", "2", or "1" (Car runs in "R".)	G, J	j, r
Car will not run, slip, or acceleration is very poor in "R". (Car runs in "D", "2", and "1".)	G, J	n, k, r
Car will not run in any range.	G, J	q, r, v
Slip is felt when starting in FWD D range. (Car runs in "1" range.)	G, J	r, t
Slip is felt when starting in 4WD mode. (Car runs in FWD mode.)		e
Car runs even in "N".	J	j, k
Low maximum speed, or poor acceleration.	H, L, G	m, n, h
Car is braked if lever is set in "R".	L	j, m, v
No shift from 1st to 2nd.	K, M, J, X	m, r
No shift from 2nd to 3rd.	K, L, M, J	k, r
Shift points too high from 1-2 and 2-3.	G, J	r
Shift occurs from 1 to 3.	L, K, G, M, J	m, r
Large shock when shifting 1-2.	L, G, J	m



## Technical Service Information

Trouble	On the car check item	Off the car check item
Large shock when shifting 2-3.	L, G, M, J	k, m
No shock when shifting 1-2, or slip occurs.	L, G, M, J	m, r
No shock when shifting 2-3, or slip occurs. Engine races.	L, G, M, J	k, r
Car is braked when shifting 1-2.	J	n, k, t
Car is braked when shifting 2-3.	L, J	m
No shift from 3rd to 2nd.	K, G, M, J	k, m, r
No shift from 2nd to 1st, or from 3rd to 1st.	K, L, J	m, t
Large shock is felt when car speed decreases when accelerator pedal released.	K, G, J	r
3-2 shift point or 2-1 shift point is too high.	K, G, J	r
No kickdown occurs when accelerator pedal is depressed from 3rd. (Within kickdown limit speed.)	K, M, J	m, r
Kickdown occurs or engine overruns when accelerator pedal is depressed from 3rd. (Above kickdown limit.)	G, K, J	k, r
Engine races when gear is changed from 3rd to 2nd and accelerator pedal is depressed.	L, G, M, J	k, m, r
Gear remains in 3rd and is not changed to 2nd even when lever is set to "2".	L, G, M, J	m, r
No shock is felt, or engine races when shifted from "1" to "2".	L, N, M, J	m
Gear remains in 3rd and is not changed to 2nd even when lever is set to "1".	L, K, G, J	k, m, r
No engine brake is applied in 1st gear.	G, J	n, r
Gear shift 1-2 or 2-3 occurs in "1".	J	r
Gear shift 2-1 does not occur in "1".	K, L, J	n, r
Car begins to move even when lever is set to "P", or parking gear remains engaged even when lever is moved from "P".		v
Transmission overheats.	G, H, L	k, m, n, h, j
Fluid spouts out while running. Car exhaust emits white smoke while running.	H, G, W	k, m, n, h, j
Unusual smell from oil supply pipe.	N	j, k, m, n
Large noise in "P" or "N".		q
Large noise in "2", "1", or "R".		q, t, l
Differential gear oil is contaminated with automatic transmission fluid.		z, r, g
Automatic transmission fluid is contaminated with differential gear oil.		z, g
Large noise when running in FWD 3rd gear.		w, x
Large noise when running in 4WD 3rd gear.		l'





## Technical Service Information

### INSPECTION ITEMS

#### Inspection items with automatic transmission mounted on vehicle

- G Oil pressure check
- H Stall speed
- J Control valve
- K Governor valve
- L Brake band adjustment
- M Servo pipe
- N Inspection of fluid by draining
- W Vacuum diaphragm
- X Governor gear

#### Inspection item with automatic transmission detached from vehicle

- e Transfer valve, transfer pipe, rear drive shaft seal ring

- f Transfer clutch
- g Drive pinion rear oil seal
- h Torque converter one-way clutch
- j Forward clutch
- k Reverse clutch
- l Planetary gear
- l' Transfer gear
- m Brake band and band support
- n Low & reverse brake
- q Oil pump
- r Leak from hydraulic circuit
- t Power train one-way clutch
- v Parking linkage
- w Hypoid gear
- x Reduction gear
- z Stator shaft and reduction drive gear oil seals and O-rings, and governor shaft oil seal

## Fluid Passages

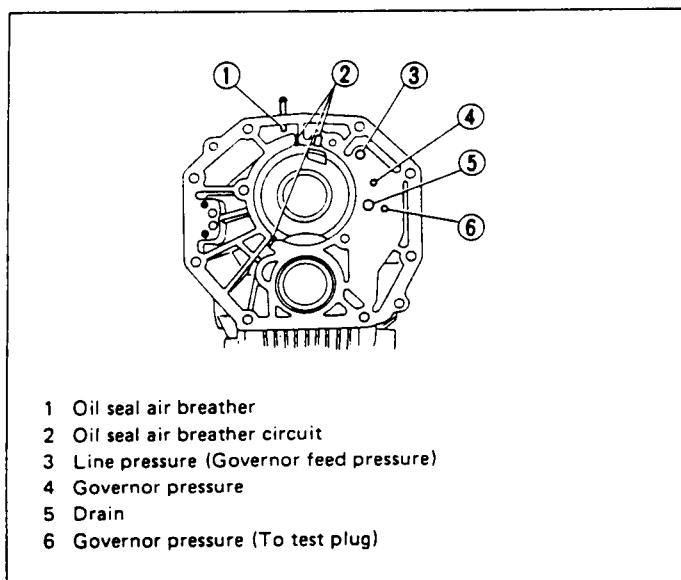


Fig. 29

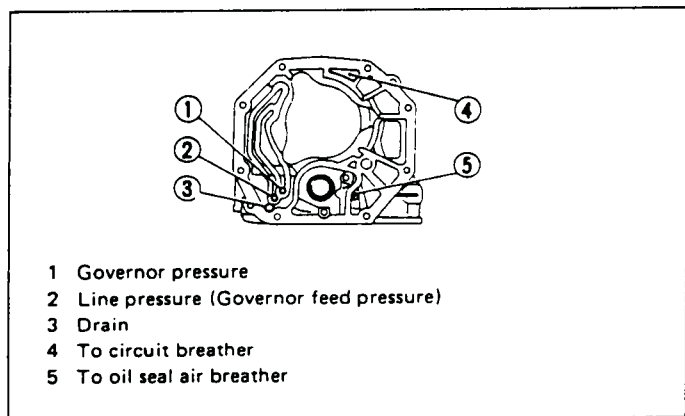


Fig. 30

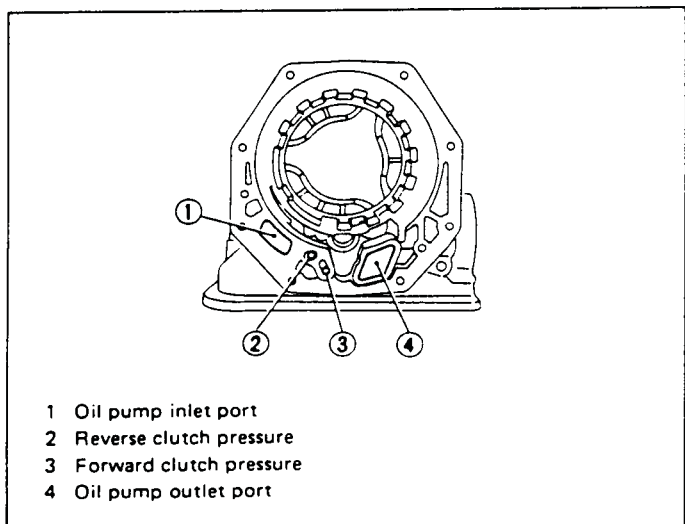


Fig. 31

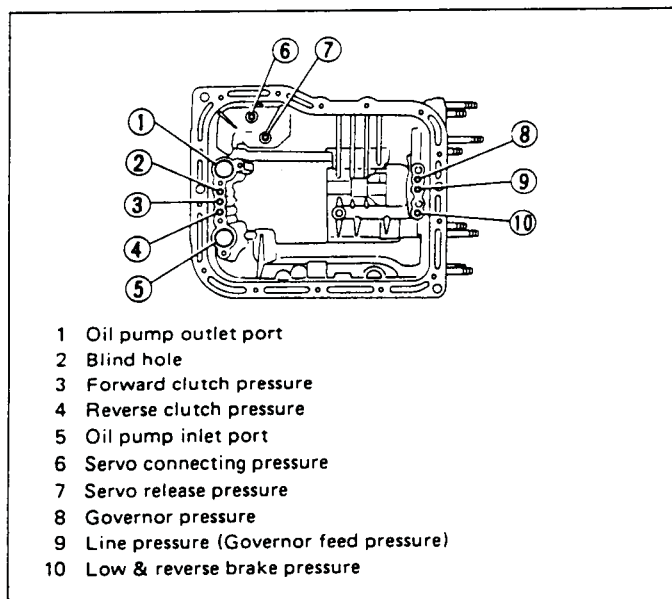


Fig. 32

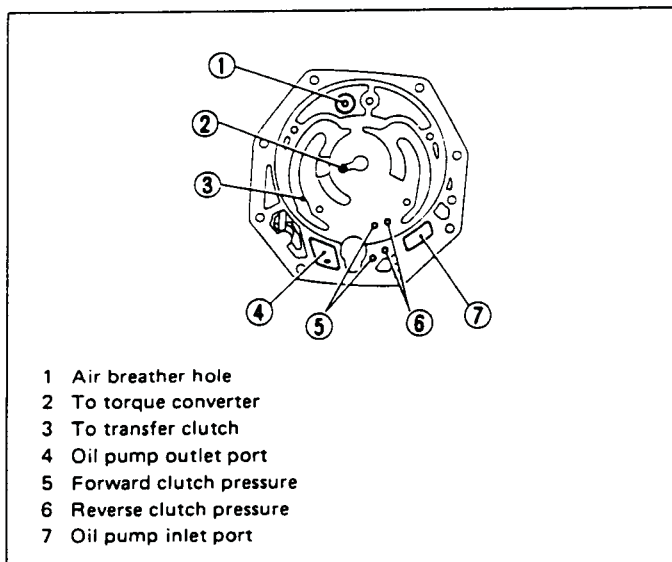


Fig. 33

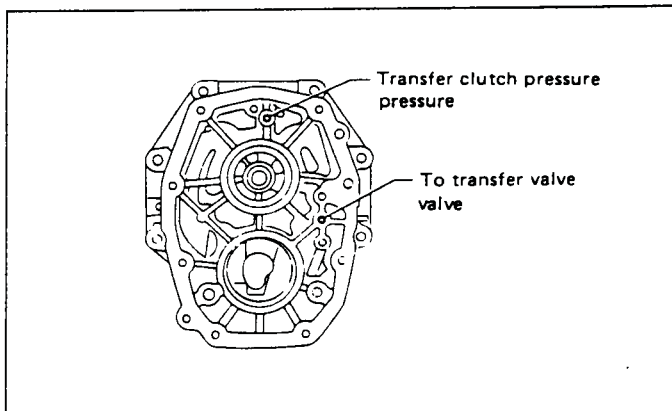


Fig. 34

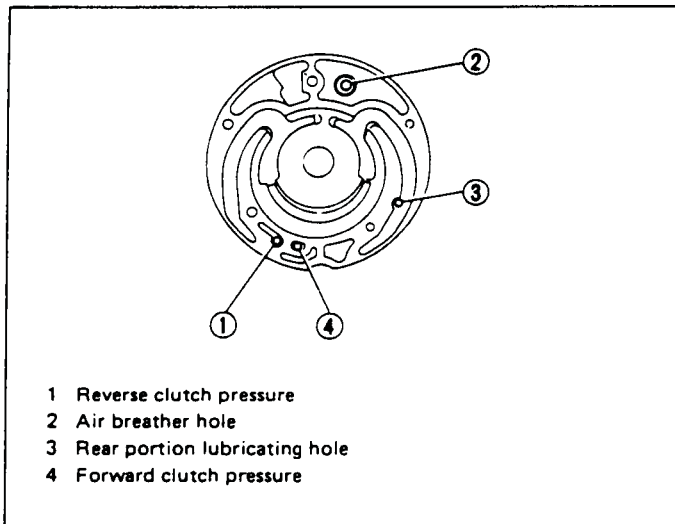


Fig. 35

## Automatic Transmission Fluid (ATF) Cooling System

This system consists of an oil cooler built in the radiator, pipes and hoses to circulate oil between the torque converter and oil cooler.

Heated oil circulating through the torque converter returns to the oil cooler and is cooled by coolant, thereby being maintained at an adequate temperature.

- Oil cooler

Radiation capacity has been improved by 20% [1.221 to 1.454 kW/°C (1,050 to 1,250 kcal/h°C, 4,166 to 4,960 BTU/h°C)]. This is caused by changing cooler type. (Double cylinder type to laminate type)

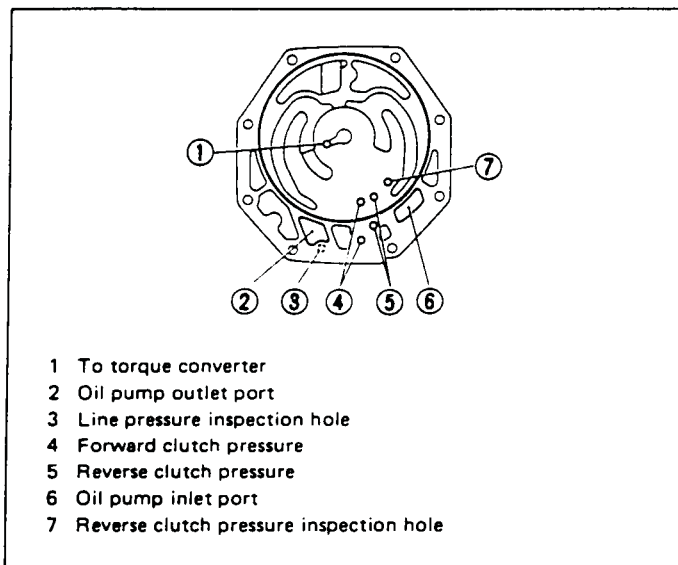


Fig. 36

			2WD		4WD	
			Non-TURBO	TURBO	Non-TURBO	TURBO
Automatic Transmission (continued)	Hydraulic control	Type	Automatic shift control over 3 forward speeds based on intake-manifold vacuum and output shaft speed.			
		Fluid	Automatic transmission fluid (ATF) DEXRON II			
		Fluid capacity	6.0 – 6.4ℓ (6.3 – 6.8 US qt, 5.3 – 5.6 Imp qt)		6.8 – 7.2ℓ (7.2 – 7.6 US qt, 6.0 – 6.3 Imp qt) (Including transfer section)	
	Lubri- cation	Lubrication system	Forced feed lubrication with oil pump			
		Oil	Automatic transmission fluid (above-mentioned)			
	Cool- ing	Cooling system	Liquid-cooled oil cooler incorporated in radiator			
Transfer section	Transfer gear ratio		—		0.933 (42/45)	
	Transfer clutch		—		Hydraulic multi-disc clutch	
	Control method		—		Hydraulic remote control	
	Lubricant		—		The same Automatic transmission fluid used in Automatic transmission	
Final reduction mechanism	1st reduction gear ratio		0.974 (38/39)			
	2nd reduction gear ratio	Front drive	3.700 (37/10)	3.454 (38/11)	3.700 (37/10)	3.454 (38/11)
		Rear drive	—		3.900 (39/10)	3.700 (37/10)
	Governor gear ratio		1.090 (12/11)			
	Speedometer gear ratio		3.090 (34/11)	2.909 (32/11)	3.181 (35/11)	2.909 (32/11)
	Lubricating oil		API. GL-5			
	Oil capacity	Front drive	1.2ℓ (1.3 US qt, 1.1 Imp qt)			
		Rear drive	—		0.8ℓ (0.8 US qt, 0.7 Imp qt)	
ATF cooling system	Radiation capacity		Non-TURBO : 45.822 kW (39,400 kcal/h, 156,339 BTU/h) TURBO : 56.522 kW (48,600 kcal/h, 192,845 BTU/h)			



# Technical Service Information

## Service Data

### SERVICE STANDARD VALUE

Measuring location				Standard value	
				Non-TURBO	TURBO
Idling speed (N or P position)				Except SPFI	800±100 rpm
				SPFI	700±100 rpm
Brake band adjusting screw				Turning screw back two turns after tightening it to the torque of 9 N·m (0.9 kg-m, 6.5 ft-lb)	
Axial clearance between governor cover and governor body				0.2 – 0.8 mm (0.008 – 0.031 in)	
Clutch	Forward/Reverse clutch	Facing	Thickness	1.6 mm (0.063 in)	
			Number	4 (Forward clutch)	
				3 (Reverse clutch)	
		Steel plate	Thickness	2.0 mm (0.079 in)	
			Number	4 (Forward clutch)	
				3 (Reverse clutch)	
		Dish plate	Thickness	1.8 mm (0.071 in)	
			Warping	1.2 mm (0.047 in)	
		Clutch clearance	Forward clutch	1.0 – 1.2 mm (0.039 – 0.047 in)	
			Reverse clutch	1.6 – 1.8 mm (0.063 – 0.071 in)	
	Low and reverse brake clutch	Facing*	Thickness	2.3 mm (0.091 in) . . . NSK Warner	
				2.4 mm (0.094 in) . . . DAIKIN RM	
			Number	5	
		Steel plate		Thickness	2.3 mm (0.091 in)
			Number	5	
		Clutch clearance		0.7 – 1.0 mm (0.028 – 0.039 in)	
	Transfer clutch	Facing	Thickness	2.9 mm (0.114 in)	
			Number	3	4
		Steel plate	Thickness	1.8 mm (0.071 in)	
			Number	2	3
Clutch clearance		0.4 – 0.8 mm (0.016 – 0.031 in)			
Oil pump		Clearance between inner/outer gear and transmission cover		0.02 – 0.04 mm (0.0008 – 0.0016 in)	
	Clearance between cresent and tooth tip of outer gear		0.14 – 0.21 mm (0.0055 – 0.0083 in)		
	Radial clearance between outer gear and oil pump carrier		0.05 – 0.20 mm (0.0020 – 0.0079 in)		
	Clearance between seal ring and groove		0.04 – 0.16 mm (0.0016 – 0.0063 in)		
Clearance between planetary carrier and planetary pinion washer				0.15 – 0.60 mm (0.0059 – 0.0236 in)	

\* Always use the same manufacturer's parts as a set (5 pcs.).



## Technical Service Information

Measuring location		Standard value	
Clearance between manual plate and spacer		0.1 – 0.3 mm	(0.004 – 0.012 in)
Clearance between rear shaft and intermediate case		0.05 – 0.3 mm	(0.0020 – 0.0118 in)
End play	Total axial end play	0.25 – 0.50 mm	(0.0098 – 0.0197 in)
	Reverse clutch drum end play	0.50 – 0.80 mm	(0.0197 – 0.0315 in)
Run-out at the tip of reduction drive gear shaft		0.08 mm or less	(0.0031 in or less)
Starting friction torque of drive pinion		1.23 – 1.62 N·m (12.5 – 16.5 kg-cm, 10.9 – 14.3 in-lb)	
Distance from the final reduction case face to the end face of the reduction drive gear		19.6 – 19.8 mm	(0.772 – 0.780 in)
Run-out of converter drive plate surface		0.5 mm or less	(0.020 in or less)

### AUTOMATIC SHIFT CHARACTERISTICS

Non-TURBO

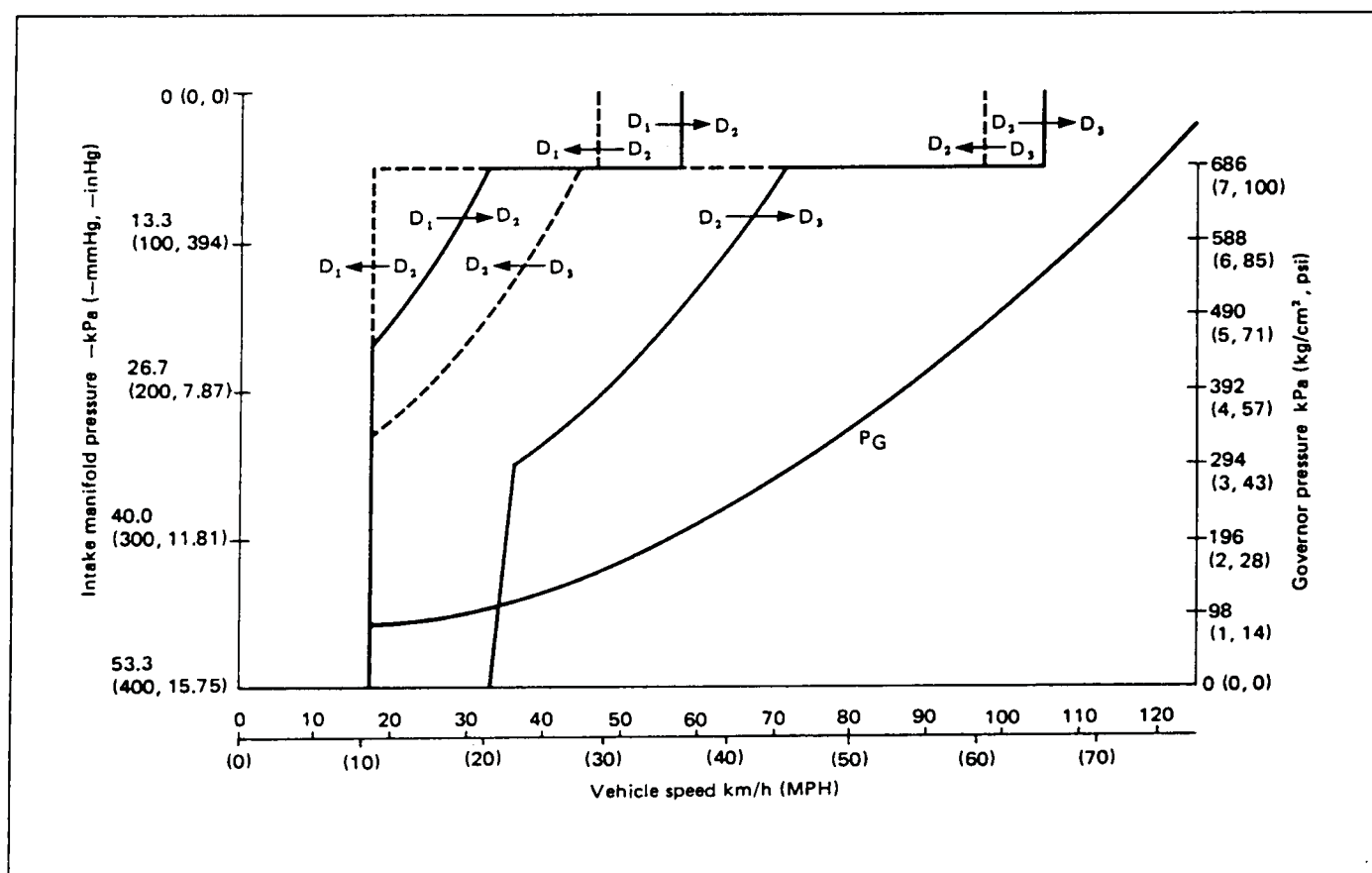


Fig. 37



## Technical Service Information

TURBO

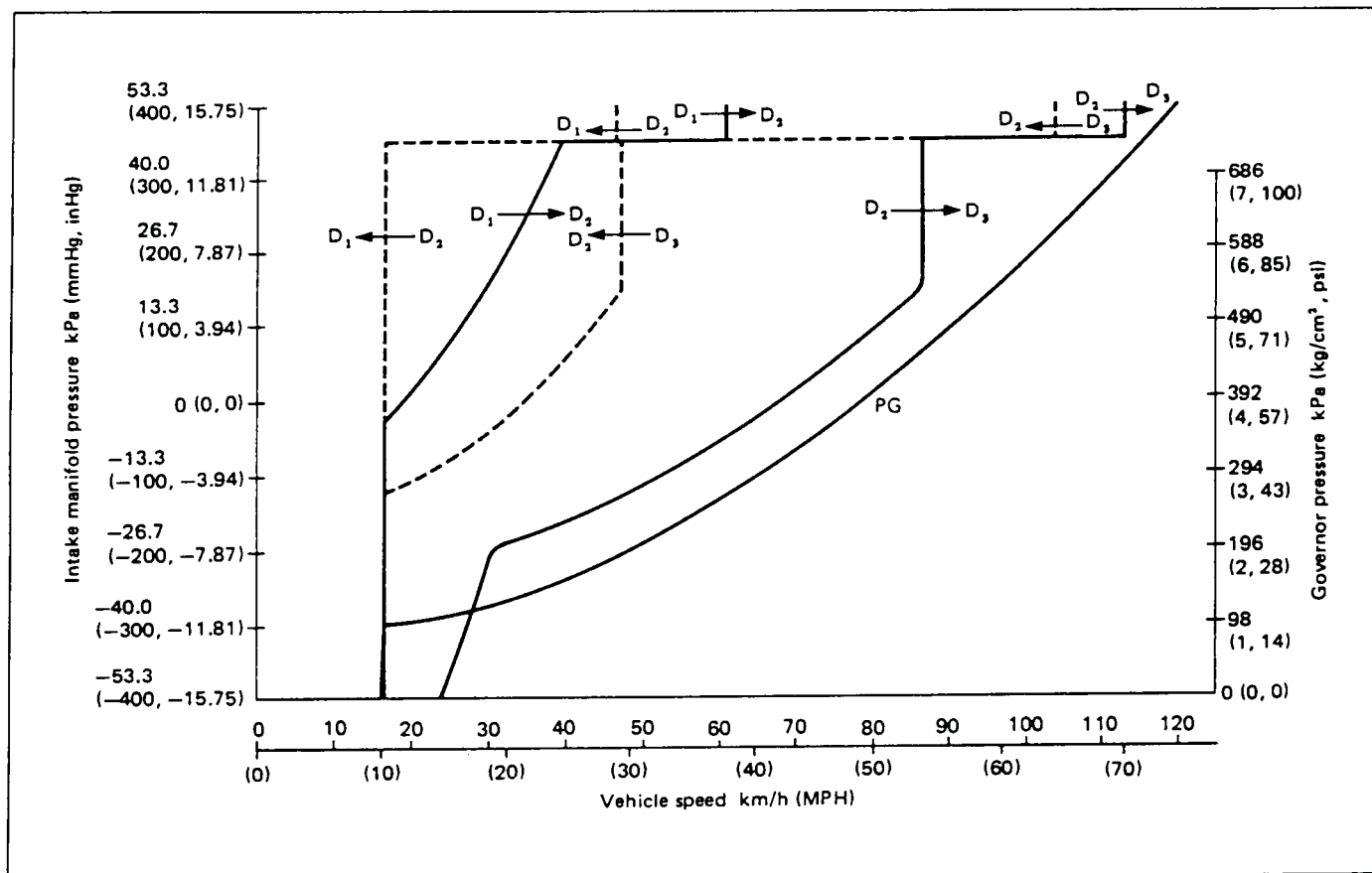


Fig. 38

### LINE PRESSURE

#### Line pressure characteristics

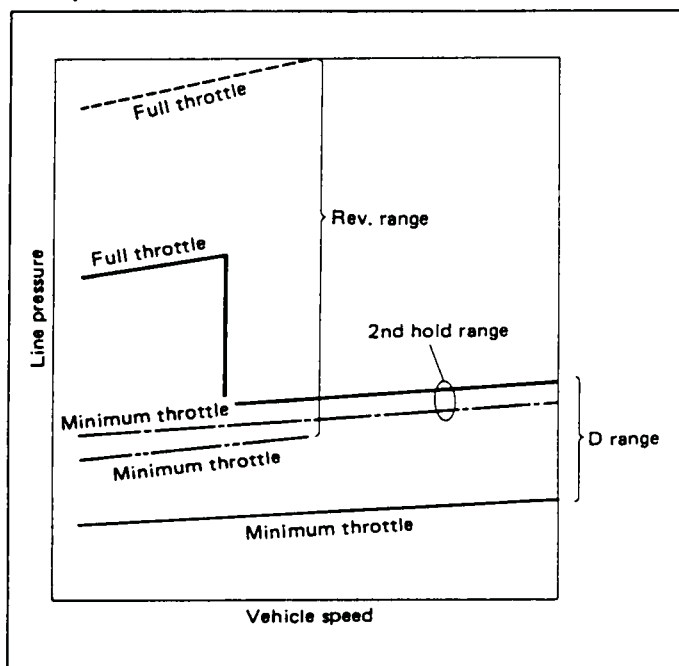


Fig. 39

AUTOMATIC TRANSMISSION SERVICE GROUP





## Technical Service Information

Line pressure in each range

### Non-TURBO

Line pressure under light load

Range	Engine speed rpm	Intake manifold pressure —kPa (—mmHg, —inHg)	Line pressure kPa (kg/cm <sup>2</sup> , psi)
R	1,500±50	64.0 (480, 18.90)	441 – 539 (4.5 – 5.5, 64 – 78)
N	1,500±50	66.7 (500, 19.69)	314 – 412 (3.2 – 4.2, 46 – 60)
D <sub>3</sub>	1,500±50	58.7 (440, 17.32)	314 – 412 (3.2 – 4.2, 46 – 60)
2	1,500±50	64.0 (480, 18.90)	785 – 883 (8.0 – 9.0, 114 – 128)
1	1,500±50	64.0 (480, 18.90)	314 – 412 (3.2 – 4.2, 46 – 60)

Line pressure under heavy load

Range	Engine speed rpm	Intake manifold pressure kPa (mmHg, inHg)	Line pressure kPa (kg/cm <sup>2</sup> , psi)
R	“Stall” rpm	6.7 (50, 1.97)	1,373 – 1,569 (14.0 – 16.0, 199 – 228)
D <sub>1</sub>	“Stall” rpm	6.7 (50, 1.97)	883 – 1,079 (9.0 – 11.0, 128 – 156)
2	“Stall” rpm	6.7 (50, 1.97)	1,030 – 1,226 (10.5 – 12.5, 149 – 178)
1	“Stall” rpm	6.7 (50, 1.97)	883 – 1,079 (9.0 – 11.0, 128 – 156)

### TURBO

Line pressure under light load

Range	Engine speed rpm	Intake manifold pressure —kPa (—mmHg, —inHg)	Line pressure kPa (kg/cm <sup>2</sup> , psi)
R	1,500±50	64.0 (480, 18.90)	441 – 539 (4.5 – 5.5, 64 – 78)
N	1,500±50	66.7 (500, 19.69)	314 – 412 (3.2 – 4.2, 46 – 60)
D <sub>3</sub>	1,500±50	58.7 (440, 17.32)	314 – 412 (3.2 – 4.2, 46 – 60)
2	1,500±50	64.0 (480, 18.90)	657 – 755 (6.7 – 7.7, 95 – 109)
1	1,500±50	64.0 (480, 18.90)	314 – 412 (3.2 – 4.2, 46 – 60)

Line pressure under heavy load

Range	Engine speed rpm	Intake manifold pressure kPa (mmHg, inHg)	Line pressure kPa (kg/cm <sup>2</sup> , psi)
R	“Stall” rpm	50.7 (380, 14.96)	1,814 – 2,010 (18.5 – 20.5, 263 – 292)
D <sub>1</sub>	“Stall” rpm	50.7 (380, 14.96)	1,324 – 1,520 (13.5 – 15.5, 192 – 220)
2	“Stall” rpm	50.7 (380, 14.96)	1,324 – 1,520 (13.5 – 15.5, 192 – 220)
1	“Stall” rpm	50.7 (380, 14.96)	1,324 – 1,520 (13.5 – 15.5, 192 – 220)

a. Line pressures in each of D, 2 and R ranges will change in steps at certain points (where pressure modifier valve functions) and these points are called “Cutdown point”.

b. The line pressure during idling of the engine corresponds to the oil pressure before cutdown operation with the minimum throttle.



# Technical Service Information

## LOCATION AND DIMENSION OF ADJUSTING PARTS

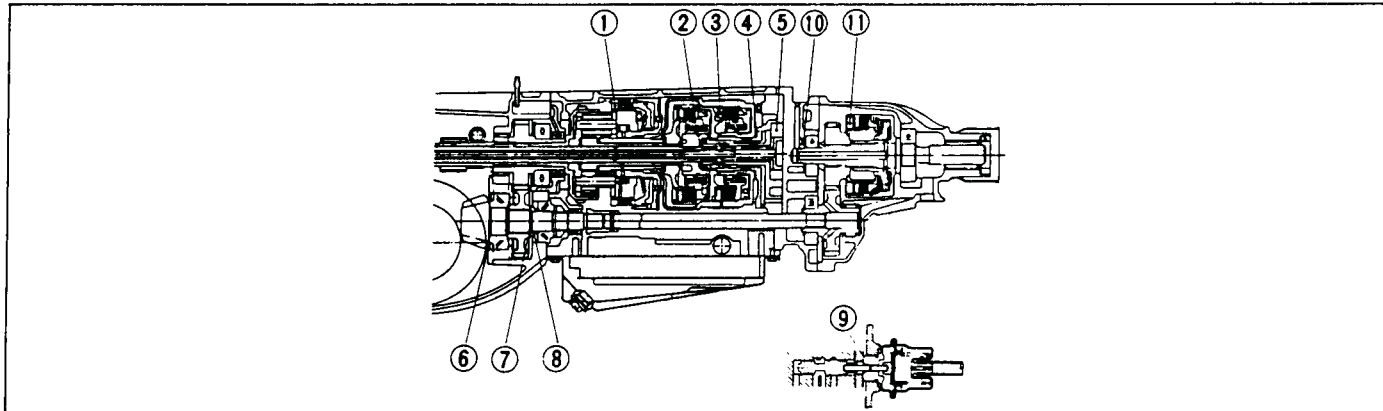


Fig. 40

No.	Part Name	Part Number	Dimension mm (in)	Application
1	Retaining plate 2	31667AA080 – 170	7.8, 8.0, 8.2, 8.4, 8.6, 8.8, 9.0, 9.2, 9.4, 9.6 (0.307, 0.315, 0.323, 0.331, 0.339, 0.346, 0.354, 0.362, 0.370, 0.378)	Adjusting clearance of low and reverse brake
2	Thrust bearing (20 x 35 x t)	806520030 – 90	3.8, 4.0, 4.2, 4.4, 4.6, 4.8, 5.0 (0.150, 0.157, 0.165, 0.173, 0.181, 0.189, 0.197)	Adjusting total end play
3	Retaining plate	31567X2900 – 6	5.0, 5.2, 5.4, 5.6, 5.8, 6.0, 6.2 (0.197, 0.205, 0.213, 0.220, 0.228, 0.236, 0.244)	Adjusting clearance of reverse clutch
4	Washer	31528X0100 – 6	1.9, 2.1, 2.3, 2.5, 2.7, 1.5, 1.7 (0.075, 0.083, 0.091, 0.098, 0.106, 0.059, 0.067)	Adjusting end play of reverse clutch drum
5	Oil pump gear	Inner gear 31346X0F04 – 6 Outer gear 31347X0100 – 2	16.00 – 15.99 (0.6299 – 0.6295) 15.99 – 15.98 (0.6295 – 0.6291) 15.98 – 15.97 (0.6291 – 0.6287)	Adjusting side clearance of oil pump
6	Shim 2	31453AA000 – 070	0.15, 0.175, 0.20, 0.225, 0.25 (0.0059, 0.0069, 0.0079, 0.0089, 0.0098) 0.275, 0.30, 0.50 (0.0108, 0.0118, 0.0197)	Adjusting drive pinion height
7	Shim	31451AA000 – 040	0.6, 0.8, 1.0, 1.2, 1.4 (0.024, 0.031, 0.039, 0.047, 0.055)	Adjusting preload of drive pinion bearing
8	Spacer	31454AA000 – 070	9.600, 9.625, 9.650, 9.675 (0.3780, 0.3789, 0.3799, 0.3809) 9.700, 9.725, 9.750, 9.775 (0.3819, 0.3829, 0.3839, 0.3848)	Adjusting preload of drive pinion bearing
9	Vacuum diaphragm rod	31932X0F00 – 4	36, 35.5, 35, 34.5, 34 (1.417, 1.398, 1.378, 1.358, 1.339)	Adjusting line pressure
10	Washer (42 x 51 x t)	803242010 – 1	0.2, 0.5 (0.008, 0.020)	Adjusting end play of rear drive shaft
11	Front pressure plate	31593AA000 – 040	4.7, 5.0, 5.3, 5.6, 5.9 (0.185, 0.197, 0.209, 0.220, 0.232)	Adjusting clearance of transfer clutch



## Technical Service Information

### BACKLASH

Planetary gear	Forward sun gear to Short pinion	0.15 – 0.22 mm (0.0059 – 0.0087 in)
	Reverse sun gear to Long pinion	0.15 – 0.22 mm (0.0059 – 0.0087 in)
	Short pinion to Long pinion	0.15 – 0.22 mm (0.0059 – 0.0087 in)
	Long pinion to Planetary output gear	0.18 – 0.25 mm (0.0071 – 0.0098 in)
1st reduction gears		0.05 – 0.12 mm (0.0020 – 0.0047 in)
2nd reduction gears		0.13 – 0.18 mm (0.0051 – 0.0071 in)
Governor gears		0.30 – 0.81 mm (0.0118 – 0.0319 in)
Speedometer gears		0.30 – 0.81 mm (0.0118 – 0.0319 in)
Transfer gears		0.051 – 0.125 mm (0.0020 – 0.0049 in)

### ATF COOLING SYSTEM

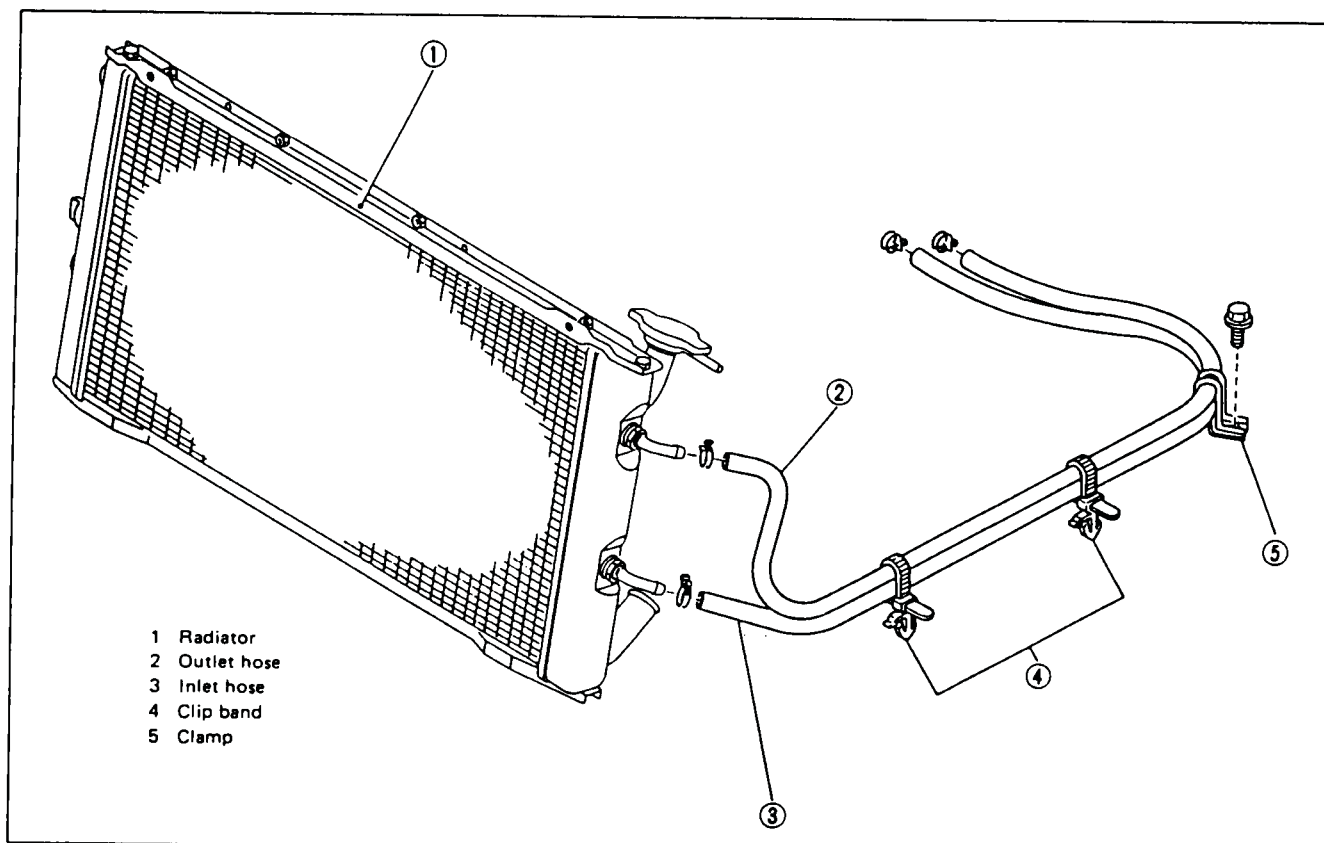
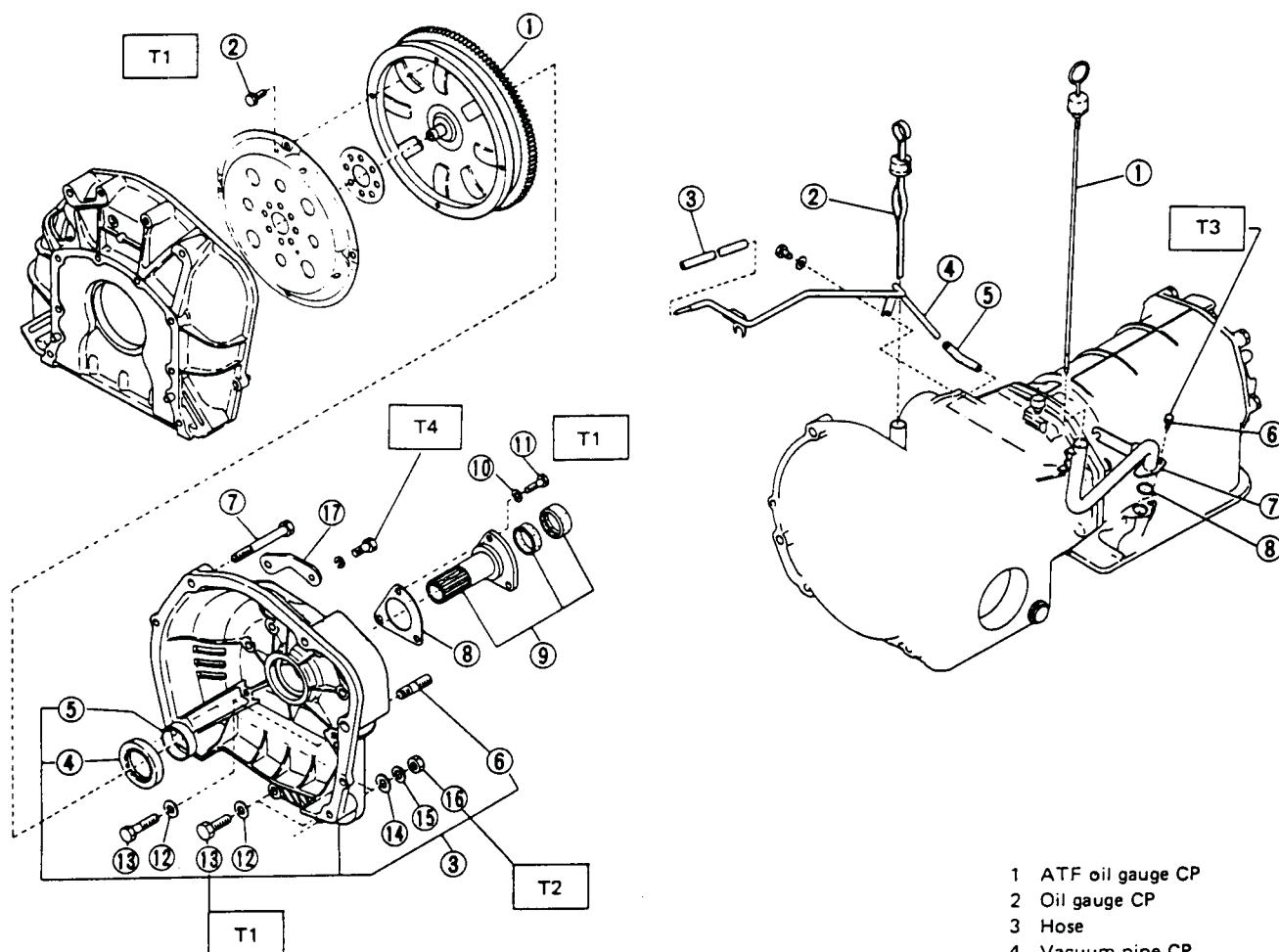


Fig. 49

## COMPONENT PARTS

### TORQUE CONVERTER & HOUSING AND GAUGE & PIPING SYSTEM



- 1 ATF oil gauge CP
- 2 Oil gauge CP
- 3 Hose
- 4 Vacuum pipe CP
- 5 Vacuum hose
- 6 Bolt & washer ASSY
- 7 Oil supply pipe CP
- 8 O-ring

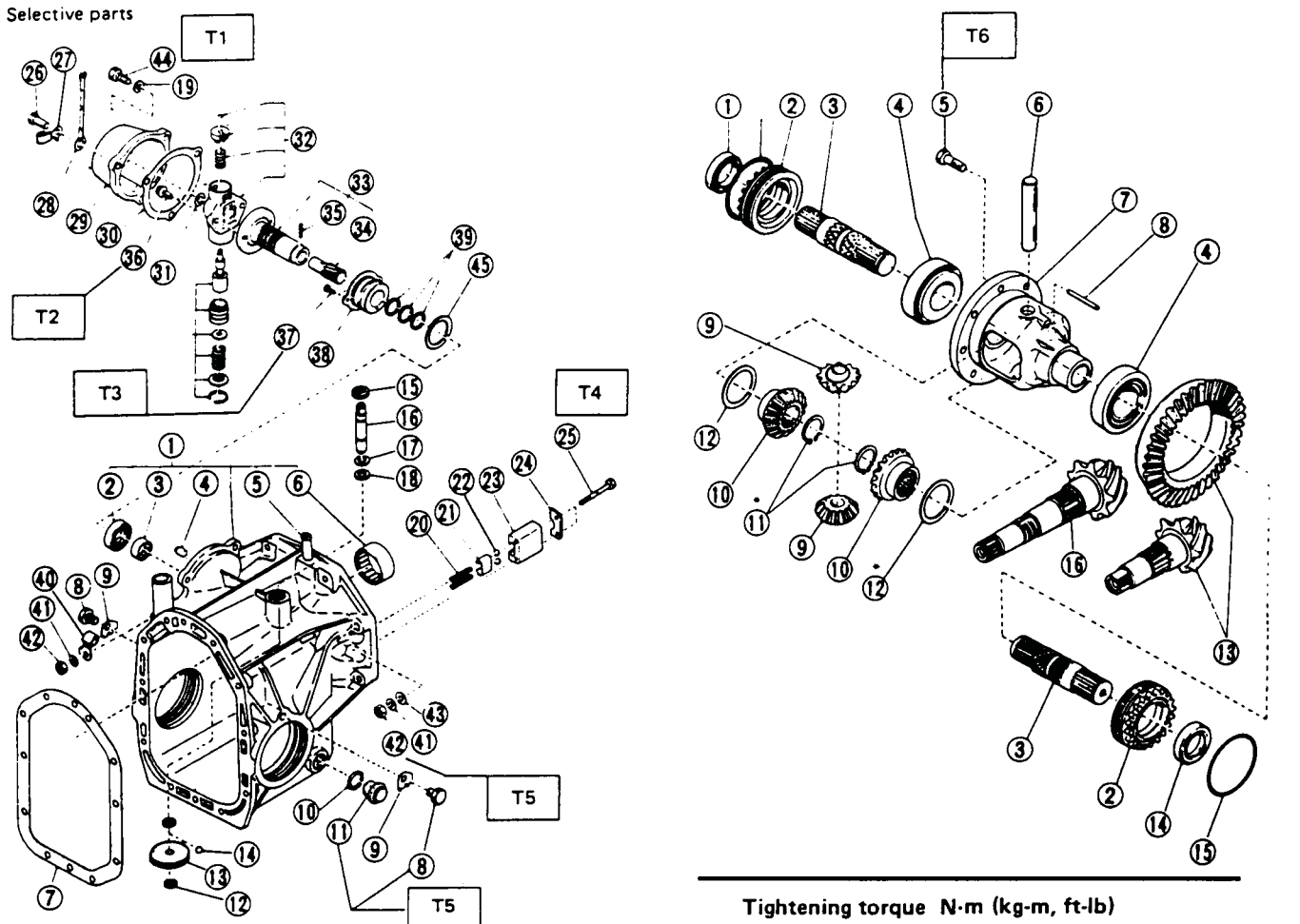
#### Tightening torque N·m (kg-m, ft-lb)

- T1: 23 – 26 (2.3 – 2.7, 17 – 20)
- T2: 45 – 53 (4.6 – 5.4, 33 – 39)
- T3: 6 – 8 (0.6 – 0.8, 4.3 – 5.8)
- T4: 14.2 – 17.2 (1.45 – 1.75, 10.5 – 12.7)

- |                             |                  |
|-----------------------------|------------------|
| 1 Torque converter ASSY     | 10 Spring washer |
| 2 Bolt                      | 11 Bolt          |
| 3 Converter housing CP      | 12 Washer        |
| 4 Oil seal (42 x 60 x 9 mm) | 13 Bolt          |
| 5 Bushing                   | 14 Washer        |
| 6 Stud                      | 15 Spring washer |
| 7 Bolt                      | 16 Nut           |
| 8 Stator shaft gasket       | 17 Hanger        |
| 9 Stator shaft CP           |                  |

## FINAL REDUCTION CASE AND DIFFERENTIAL GEAR

\* Selective parts



- |                                    |                               |
|------------------------------------|-------------------------------|
| 1 Final reduction case             | 24 Ball retaining plate       |
| 2 Oil seal (22 x 40 x 10 mm)       | 25 Bolt                       |
| 3 Needle bearing (22 x 28 x 12 mm) | 26 Bolt                       |
| 4 Plug                             | 27 Oxygen sensor harness clip |
| 5 Nipple                           | 28 Earth cord                 |
| 6 Needle bearing (45 x 55 x 20 mm) | 29 Governor cover             |
| 7 Converter housing gasket         | 30 Governor cover gasket      |
| 8 Bolt                             | 31 Washer                     |
| 9 Oil seal holder lock plate       | 32 Governor body              |
| 10 Oil drain gasket                | 33 Governor shaft             |
| 11 Oil drain plug                  | 34 Governor driven gear       |
| 12 Snap ring                       | 35 Spring pin                 |
| 13 Speedometer driven gear         | 36 Bolt                       |
| 14 Ball                            | 37 Bolt                       |
| 15 Oil seal (12 x 17.5 x 8 mm)     | 38 Governor shaft sleeve      |
| 16 Speedometer shaft               | 39 Governor seal ring         |
| 17 Snap ring                       | 40 Vacuum hose clamp          |
| 18 Washer                          | 41 Spring washer              |
| 19 Washer                          | 42 Nut                        |
| 20 Parking ball spring             | 43 Washer                     |
| 21 Spring retainer                 | 44 Bolt                       |
| 22 Ball                            | 45 Seal ring                  |
| 23 Parking actuator support        |                               |

### Tightening torque N·m (kg-m, ft-lb)

- |     |                               |
|-----|-------------------------------|
| T1: | 14 - 17 (1.4 - 1.7, 10 - 12)  |
| T2: | 9 - 11 (0.9 - 1.1, 6.5 - 8.0) |
| T3: | 4 - 5 (0.4 - 0.5, 2.9 - 3.6)  |
| T4: | 8 - 11 (0.8 - 1.1, 5.8 - 8.0) |
| T5: | 23 - 26 (2.3 - 2.7, 17 - 20)  |
| T6: | 57 - 67 (5.8 - 6.8, 42 - 49)  |

- |     |                                   |
|-----|-----------------------------------|
| 1   | Oil seal (LH)                     |
| 2   | Axle shaft oil seal holder        |
| 3   | Axle drive shaft                  |
| 4   | Roller bearing                    |
| 5   | Bolt                              |
| 6   | Differential pinion shaft         |
| 7   | Differential case                 |
| 8   | Straight pin                      |
| 9   | Differential pinion               |
| 10  | Differential side gear            |
| *11 | Snap ring                         |
| *12 | Washer                            |
| 13  | Pinion & crown gear set (Non-4WD) |
| 14  | Oil seal (RH)                     |
| 15  | O-ring                            |
| 16  | Pinion & crown gear set (4WD AT)  |

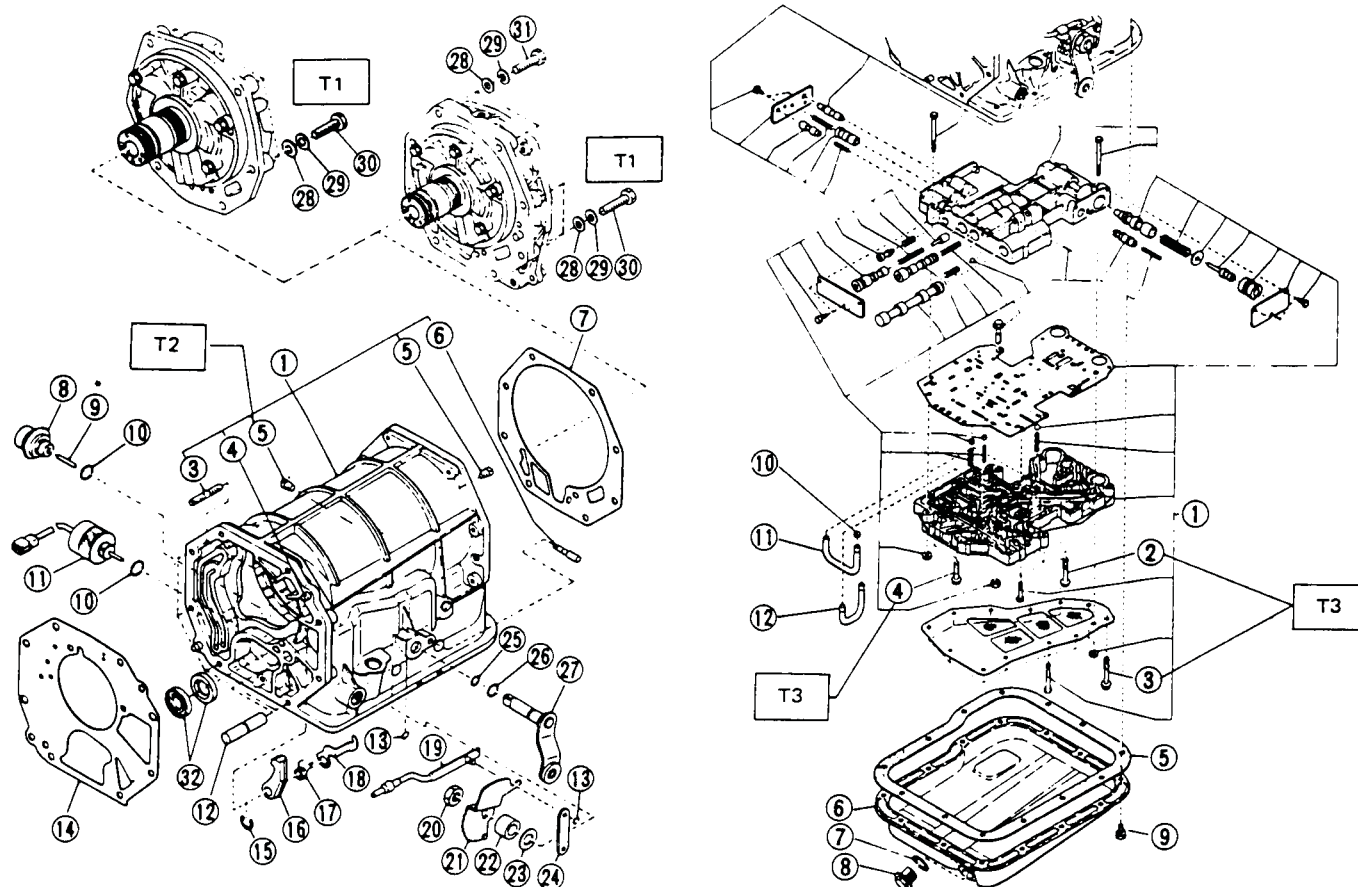
Fig. 42



# Technical Service Information

## TRANSMISSION CASE AND CONTROL VALVE

\* Selective parts



### Tightening torque N·m (kg-m, ft-lb)

T1: 23 – 26 (2.3 – 2.7, 17 – 20)

T2: 8 – 10 (0.8 – 1.0, 5.8 – 7.2)

T3: 6 – 8 (0.6 – 0.8, 4.3 – 5.8)

- |                                      |                                |                         |
|--------------------------------------|--------------------------------|-------------------------|
| 1 Transmission case CP               | 17 Parking return spring       | 1 Control valve ASSY    |
| 3 Stud bolt (8 x 47 x 12 mm)         | 18 Parking shaft support plate | 2 Bolt (6 x 36 x 18 mm) |
| 4 Straight pin (8 x 18 mm)           | 19 Parking rod                 | 3 Bolt (6 x 40 x 16 mm) |
| 5 Plug (1/8 in)                      | 20 Nut                         | 4 Bolt (6 x 25 x 16 mm) |
| 6 Parking lever pin                  | 21 Manual plate                | 5 Gasket                |
| 7 Transmission cover gasket (4WD AT) | 22 Manual shaft spacer         | 6 Oil pan CP            |
| 8 Vacuum diaphragm ASSY              | 23 Washer (15.2 x 26 x 0.2 mm) | 7 Oil drain gasket      |
| *9 Diaphragm rod                     | 24 Parking lever               | 8 Oil drain plug        |
| 10 O-ring (22 mm)                    | 25 O-ring (10 mm)              | 9 Bolt & washer         |
| 11 Downshaft solenoid ASSY           | 26 Dust seal                   | 10 Orifice              |
| 12 Parking pawl shaft                | 27 Selector arm                | 11 Servo-apply pipe     |
| 13 Clip                              | 28 Washer                      | 12 Servo-release pipe   |
| 14 Transmission case gasket (4WD AT) | 29 Spring washer               |                         |
| 15 Clip                              | 30 Bolt                        |                         |
| 16 Parking pawl                      | 31 Bolt                        |                         |

Fig. 43

AUTOMATIC TRANSMISSION SERVICE GROUP



## Technical Service Information

### SHAFT & REDUCTION GEAR

\*Selective parts

Tightening torque N·m (kg-m, ft-lb)

T1: 23 – 26 (2.3 – 2.7, 17 – 20)

T2: 113 – 123 (11.5 – 12.5, 83 – 90)

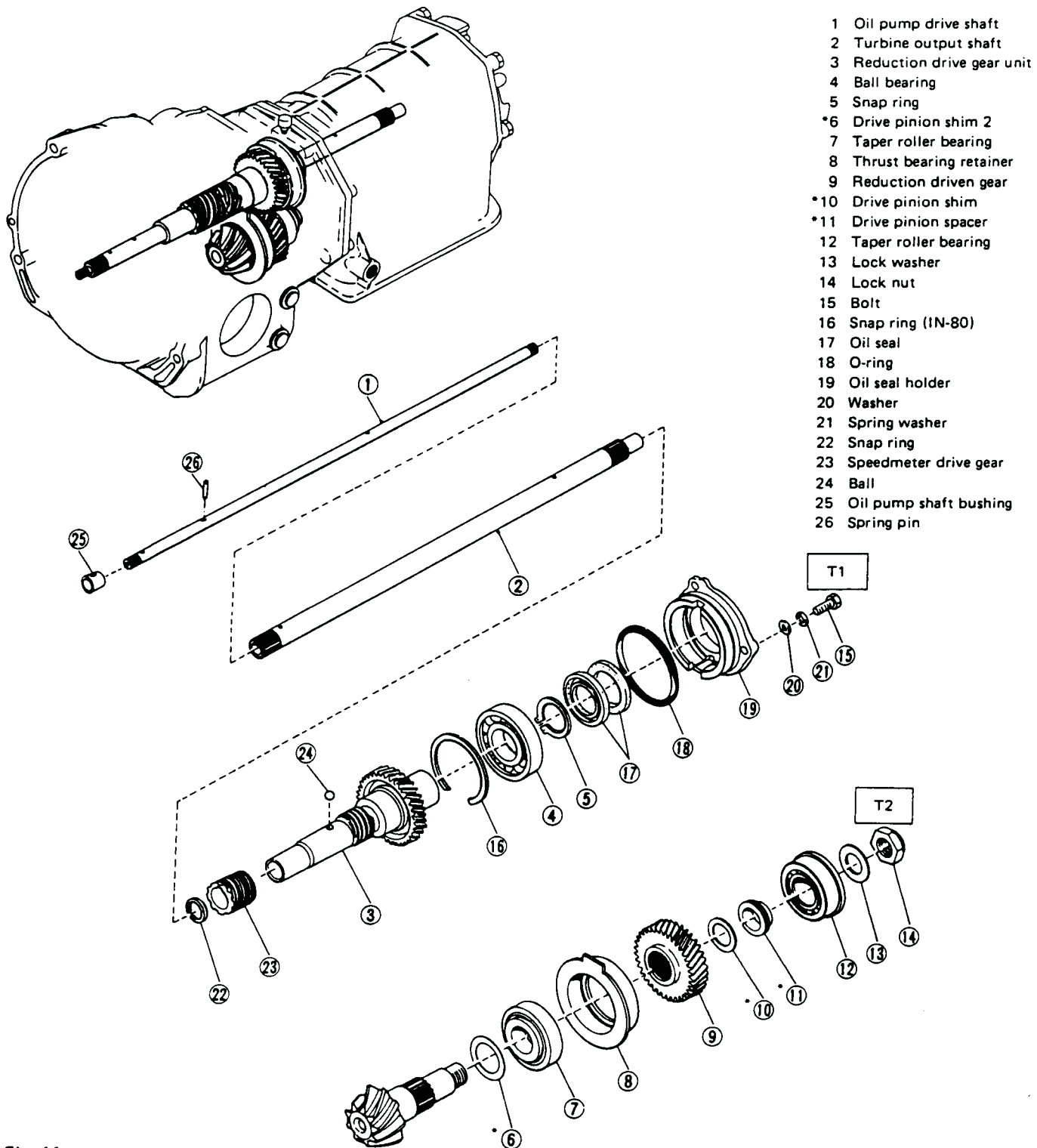


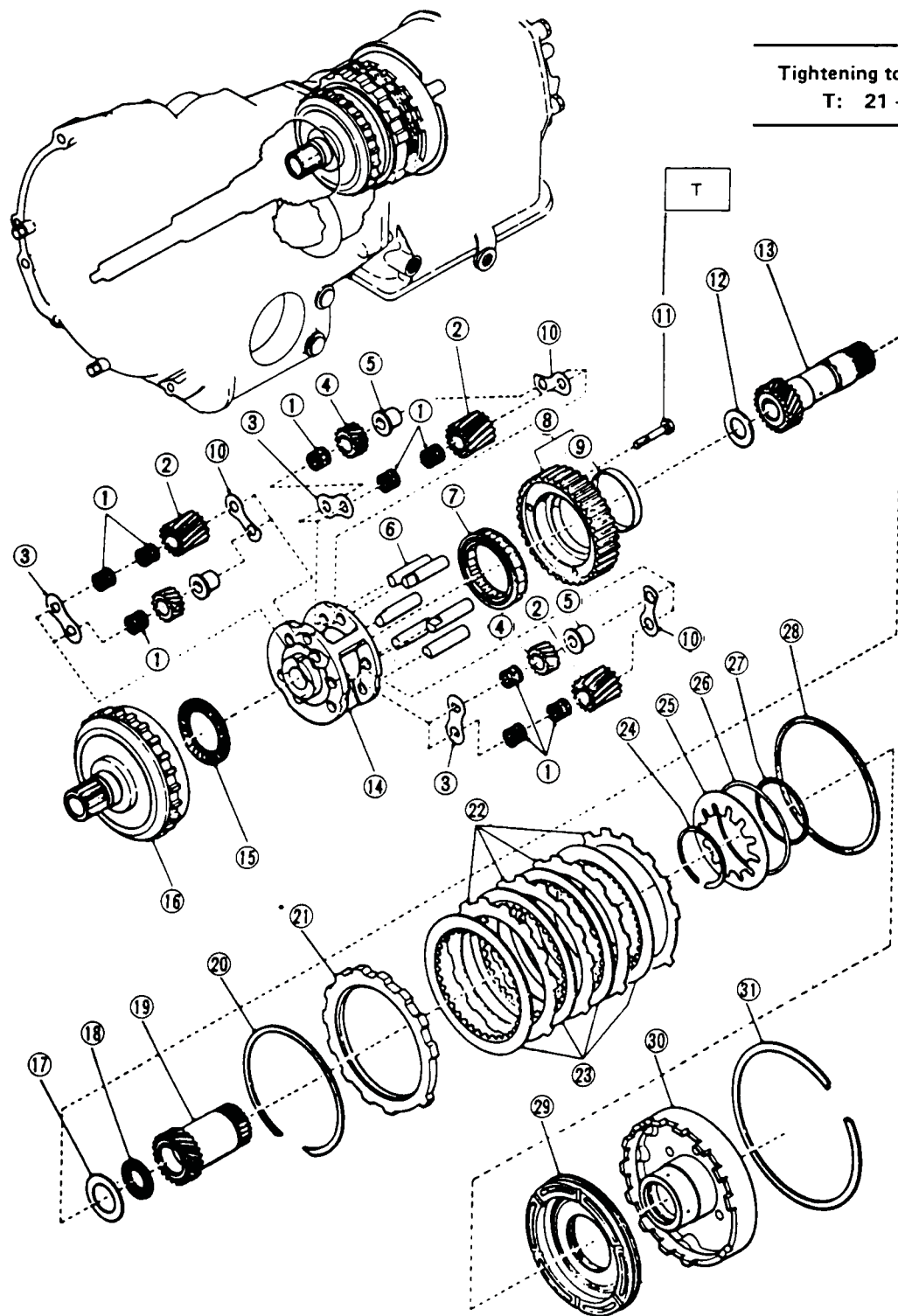
Fig. 44

AUTOMATIC TRANSMISSION SERVICE GROUP



## PLANETARY GEAR AND LOW & REVERSE BRAKE

\*Selective parts



Tightening torque N-m (kg-m, ft-lb)

T: 21 – 23 (2.1 – 2.3, 15 – 17)

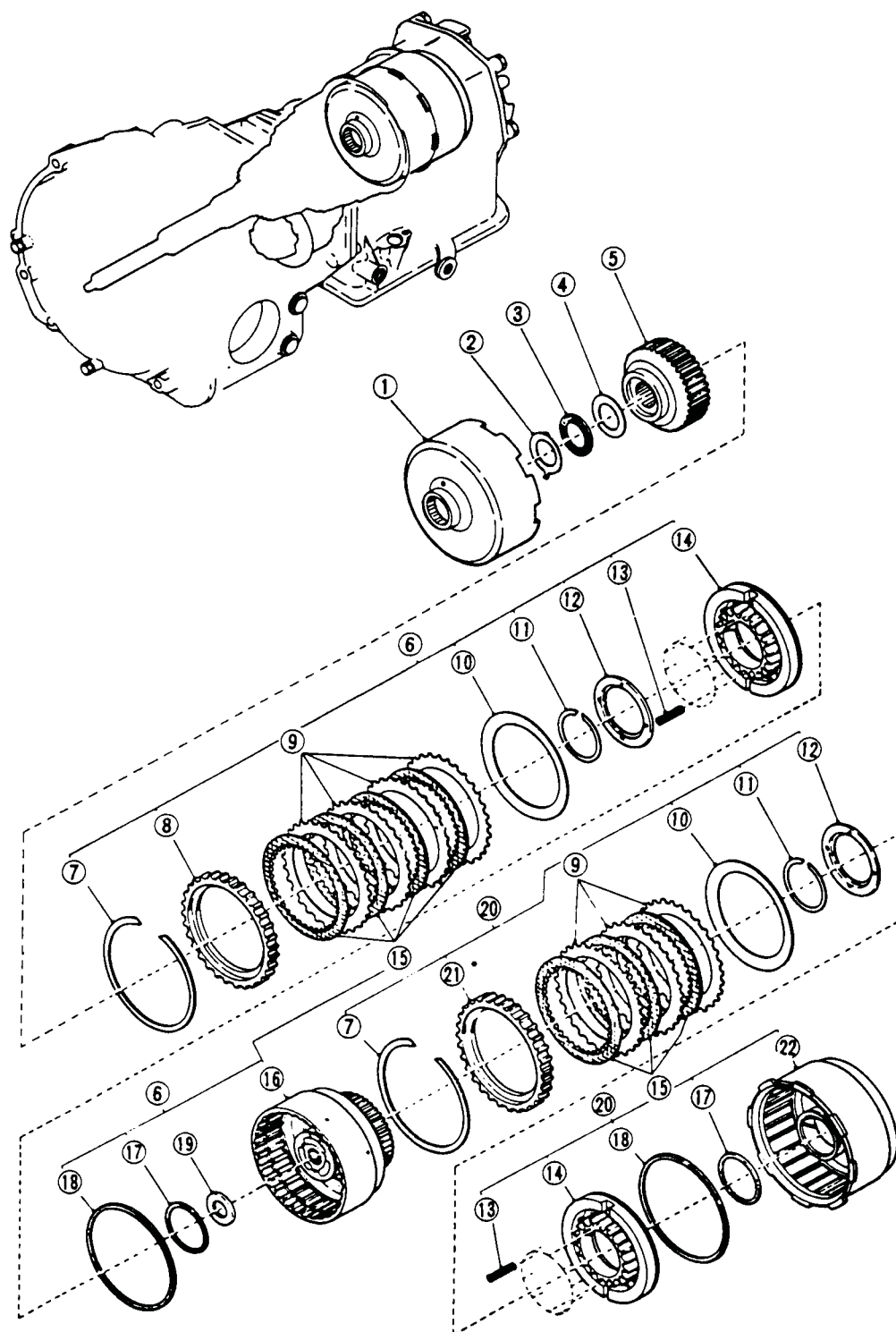
- 1 Needle bearing
- 2 Planetary pinion 2
- 3 Planetary pinion washer
- 4 Planetary pinion
- 5 Planetary pinion spacer
- 6 Planetary pinion pin
- 7 Low free wheel
- 8 Free wheel outer race
- 9 Planetary bushing
- 10 Planetary pinion washer
- 11 Bolt
- 12 Thrust bearing
- 13 Planetary input gear
- 14 Planetary carrier
- 15 Thrust bearing
- 16 Planetary output gear
- 17 Washer
- 18 Thrust bearing
- 19 Planetary input gear 2
- 20 Circlip
- \*21 Retaining plate 2
- 22 Clutch driven plate 2
- 23 Clutch drive plate 2
- 24 Outer snap ring (55 mm)
- 25 Low & reverse return spring
- 26 Thrust spring ring
- 27 O-ring (56 mm)
- 28 Lathe cut seal ring (132 mm)
- 29 Clutch piston 2
- 30 Center-support
- 31 Inner snap ring (144 mm)

Fig. 45



## FORWARD CLUTCH & REVERSE CLUTCH

\*Selective parts



- 1 Connecting shell
- 2 Lock washer
- 3 Thrust bearing
- 4 Washer
- 5 Clutch hub
- 6 Forward clutch ASSY
- 7 Snap ring
- 8 Retainer plate
- 9 Driven plate 115
- 10 Dished plate
- 11 Snap ring
- 12 Spring retainer
- 13 Spring
- 14 Clutch piston ASSY
- 15 Drive plate 115
- 16 Forward clutch drum
- 17 Seal ring
- 18 Lathe cut seal ring
- 19 Thrust bearing
- 20 Reverse clutch ASSY
- \*21 Retainer plate
- 22 Reverse clutch drum

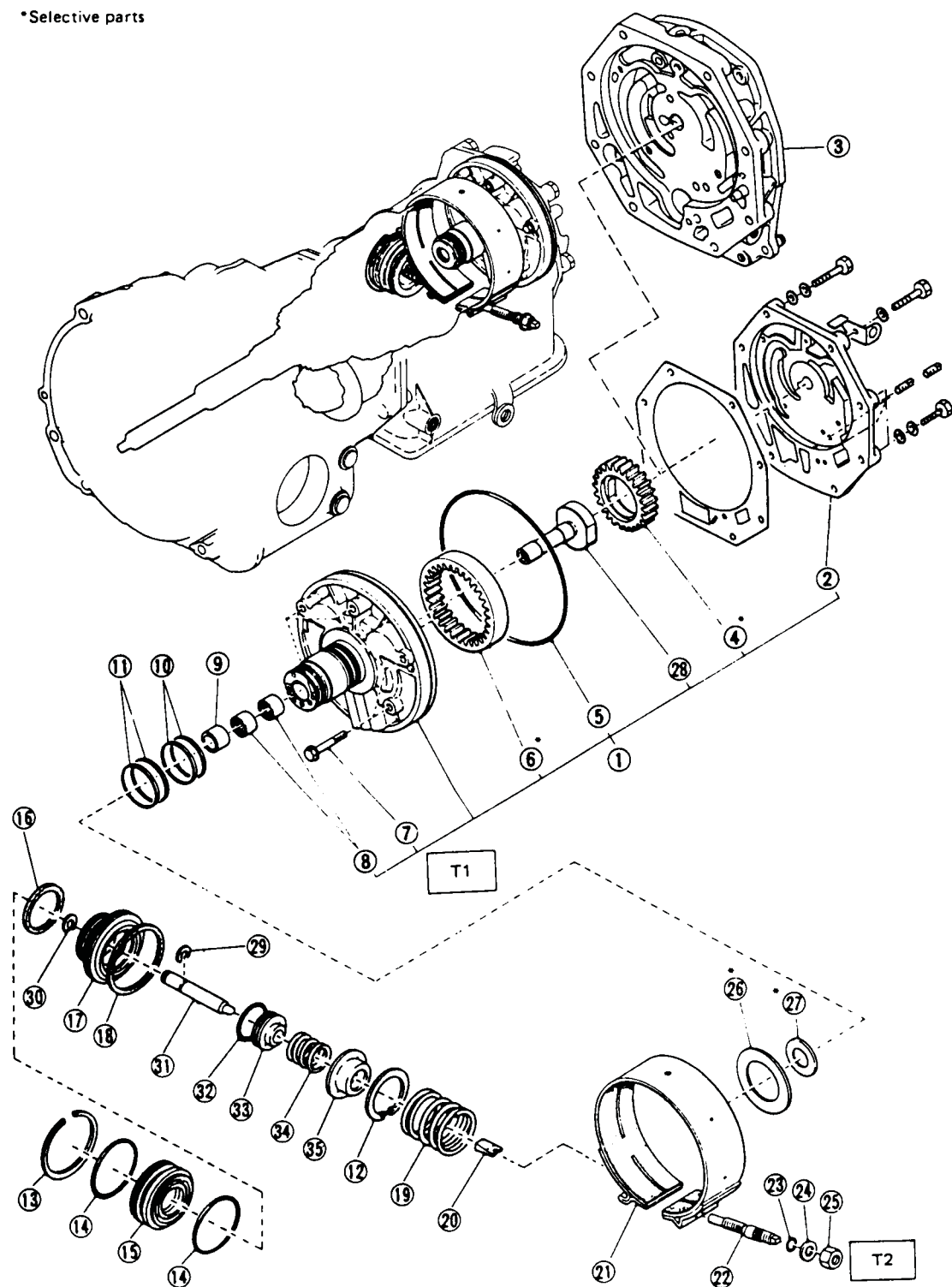
Fig. 46



# Technical Service Information

## BAND SERVO & OIL PUMP

\* Selective parts



- Adjusting brake band  
Tighten adjusting screw to a torque of 9 N·m (0.9 kg·m, 6.5 ft·lb), then turn it back two turns.  
Tighten lock nut to secure the adjustment.

- 1 Oil pump ASSY
- 2 Transmission cover CP
- 3 Intermediate case
- \*4 Oil pump inner gear
- 5 O-ring
- \*6 Oil pump outer gear
- 7 Bolt
- 8 Needle bearing
- 9 Oil pump carrier bushing
- 10 Seal ring
- 11 Seal ring
- 12 Band servo clip
- 13 Snap ring
- 14 O-ring
- 15 Servo-piston cover
- 16 Seal ring
- 17 Servo-piston CP
- 18 Seal ring
- 19 Servo return spring
- 20 Brake band strut
- 21 Brake band ASSY
- 22 Brake band adjust screw
- 23 O-ring
- 24 Washer
- 25 Nut
- \*26 Thrust washer
- \*27 Thrust bearing
- 28 Oil pump drive shaft 2
- 29 Snap ring (Inner)
- 30 Snap ring (Outer)
- 31 Servo piston rod
- 32 O-ring
- 33 Accumulator piston
- 34 Accumulator spring
- 35 Accumulator supporter

Tightening torque N·m (kg·m, ft·lb)  
T1: 6 – 8 (0.6 – 0.8, 4.3 – 5.8)  
T2: 25 – 28 (2.5 – 2.9, 18 – 21)

Fig. 47

\*Selective parts

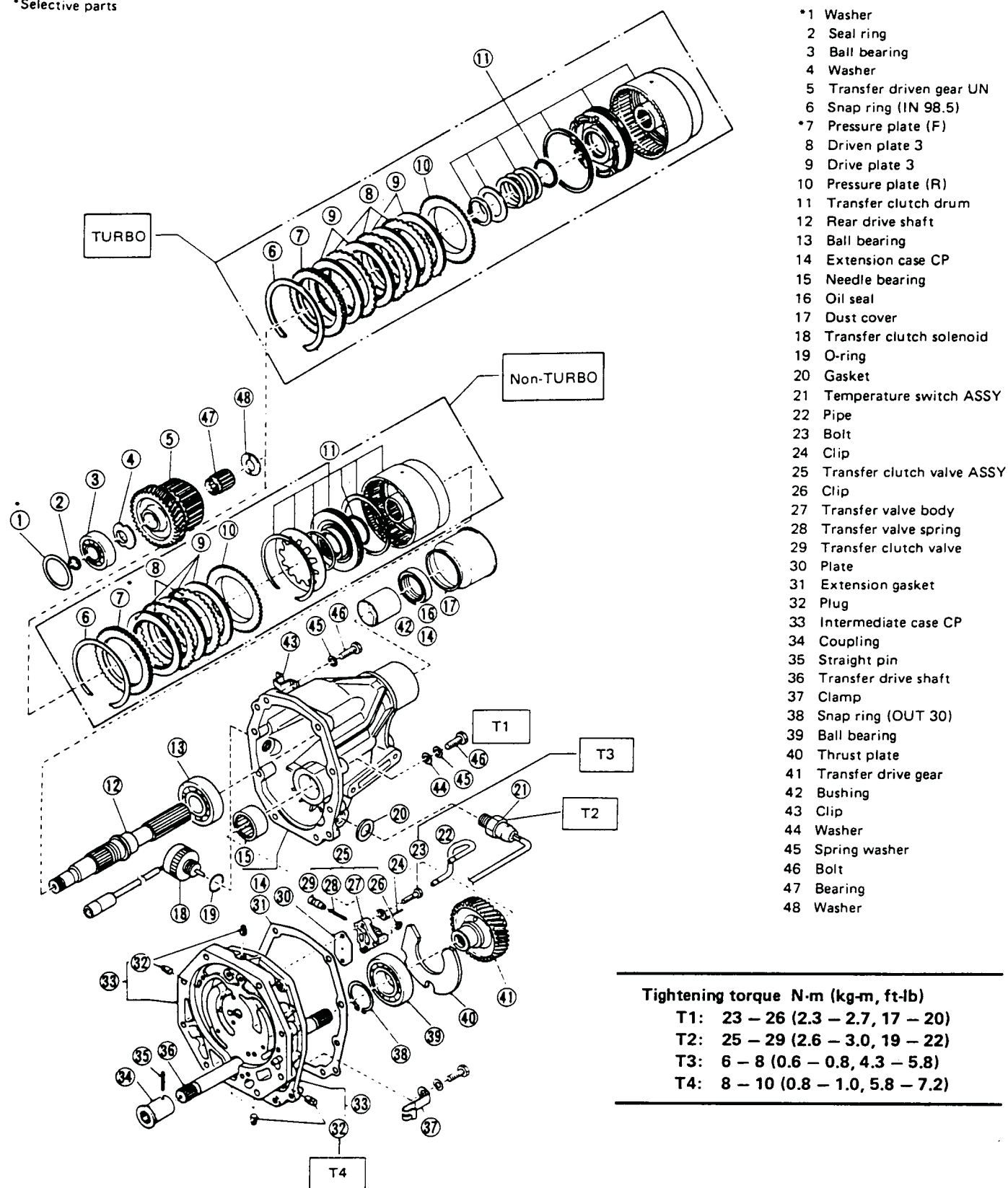


Fig. 48

- 2) Install the Gauge ASSY in a suitable location in the driver's compartment and pass the gauge hose to the engine compartment and attach the Adapter to the hose end.
- 3) Warm up the engine by idling for several minutes until the oil reaches its operating temperature. While the car is being driven, shift to the 2 range and check the governor pressure.

Standard governor pressure

Vehicle speed km/h (MPH)	Governor pressure kPa (kg/cm <sup>2</sup> , psi)	
	Non-TURBO	TURBO
Under 10 (6)	0 (0, 0)	0 (0, 0)
40 (25)	139.3±29.4 (1.42±0.3, 20.2±4.3)	163.8±29.4 (1.67±0.3, 23.7±4.3)
80 (50)	346.2±49.0 (3.53±0.5, 50.2±7.1)	394.2±49.0 (4.02±0.5, 57.2±7.1)

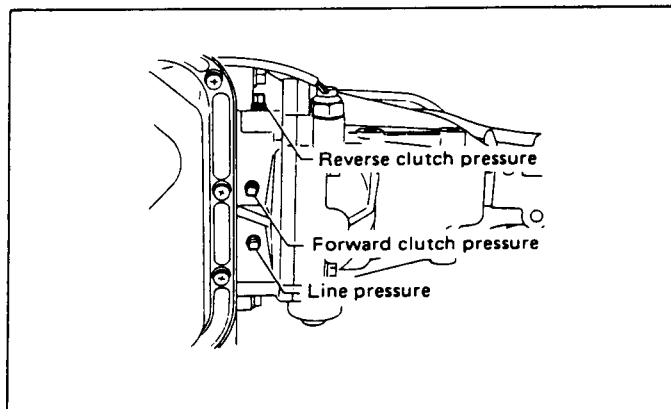


Fig. 74

[For reference]

Locations of other oil pressure check holes.

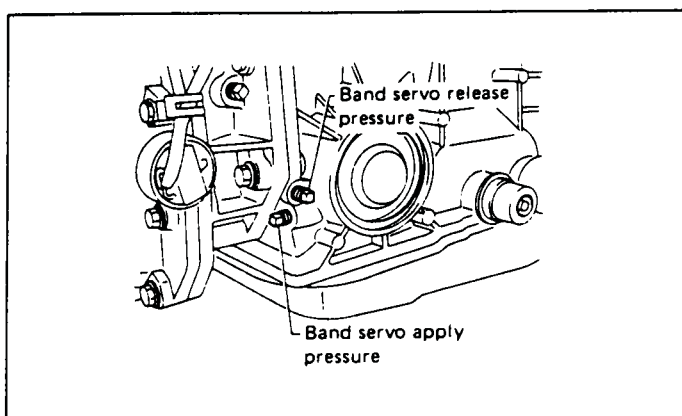


Fig. 72

## Torque Converter

As torque converter is welded all around it, it is impossible to disassemble it.

## REMOVAL

- 1) Remove oil pan drain plug and drain the ATF.

**Check the volume and state (color, smell, etc.) of the ATF.**

- 2) Take out the torque converter ASSY from converter housing taking care of the following.

(1) Prepare the appropriate saucer under converter housing to receive the ATF which pours out from the torque converter ASSY, turbine shaft and/or oil pump drive shaft.

(2) When taking out torque converter, turbine shaft and oil pump drive shaft may come out together. In this case take them out straight and gradually not to bend them.

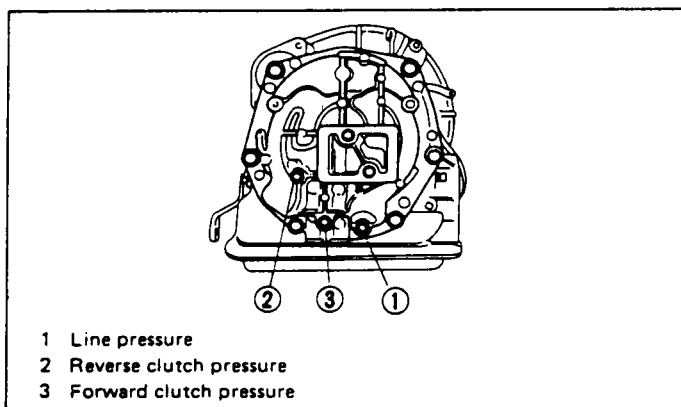


Fig. 73



## INSPECTION

1) Check the one-way clutch function of stator with the spline of stator shaft engaged into stator and replace if defective.

It is normal that when turning stator shaft counterclockwise, one-way clutch is engaged, and when clockwise, the clutch is released.

2) Check for the exterior damage, oil leakage, bend and depression, and replace if defective.

3) Completely take off the rust on the pilot and/or sleeve of converter.

4) If the ATF is soiled or excessively deteriorated, wash the interior of torque converter as follows.

(1) Take off the remained ATF in torque converter.

(2) Pour 0.5ℓ (0.5 US qt, 0.4 Imp qt) of gasoline. (unleaded gasoline or kerosene)

(3) Blow in the compressed air to wash the interior and then drain the gasoline.

(4) Pour 0.5ℓ (0.5 US qt, 0.4 Imp qt) of ATF.

(5) Blow in the compressed air and drain the ATF.

## INSTALLATION

Install torque converter straight onto shaft while turning it slowly.

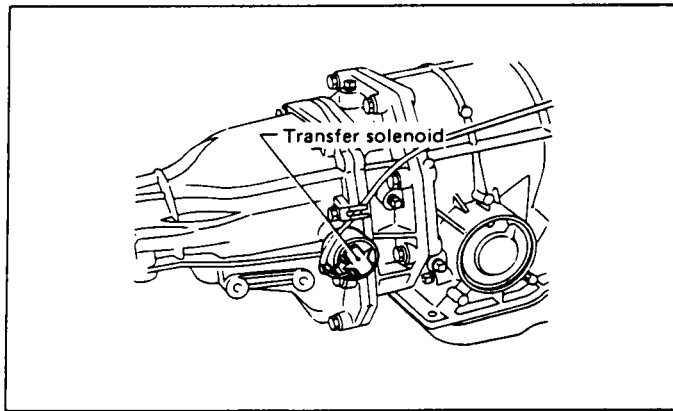


Fig. 75

3) Remove the temperature switch with a wrench.

**Ensure that the harness is detached from the clamp in advance.**

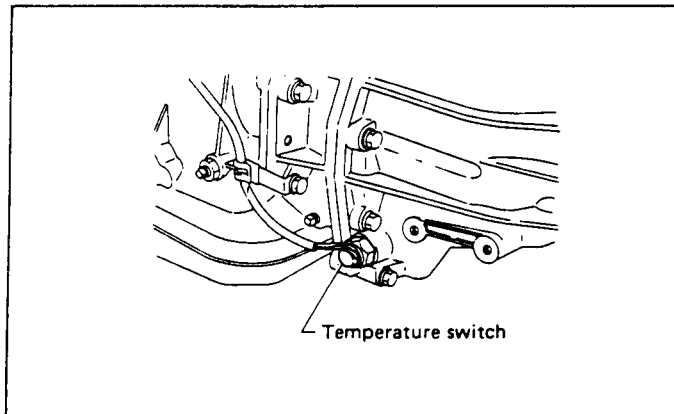


Fig. 76

4) Remove the extension ASSY.

To do this, remove the eight 8 mm bolts and extract the transfer section together with the extension ASSY.

## Extension Case (4WD)

### REMOVAL

1) Remove the rear engine mount (rubber cushion) and place the transfer unit on a work bench with the oil pan facing down.

2) Remove the solenoid from the transfer unit by turning it by hand.

**a. Be sure to remove the solenoid first.**

**b. Ensure that the harness is detached from the clamp before separating the transfer unit from the engine.**

**c. Remove the O-ring together with the harness.**

**a. Place a container to receive ATF remaining in the extension.**

**b. Be careful not to drop the rear drive gear thrust plate and transfer drive gear ASSY.**

**c. Remove the washer from the bearing bore on the upper side of the intermediate case.**

**d. Do not place the opening of the extension ASSY down, as this may cause the rear shaft ASSY to drop.**



## Technical Service Information

# DISASSEMBLY

- 1) Remove the washer from the upper surface of the intermediate case at the bearing bore location.
- 2) Remove the rear shaft ASSY from the extension case.

**Be careful not to damage the oil seal located at the rear of the extension.**

- 3) Remove the seal ring.
- 4) Using REMOVERS (899864100) and (499717000), drive out the ball bearing (20 x 52 x 15), washer (20 x 38 x 4), transfer driven gear UN, bearing and washer.

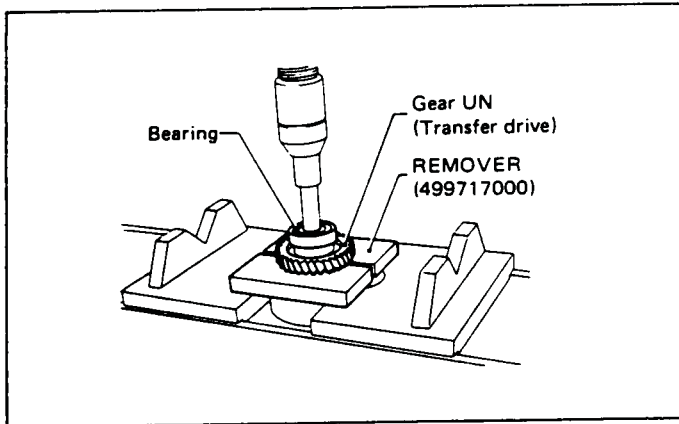


Fig. 77

- 5) Remove drum AY using REMOVER (499717000).

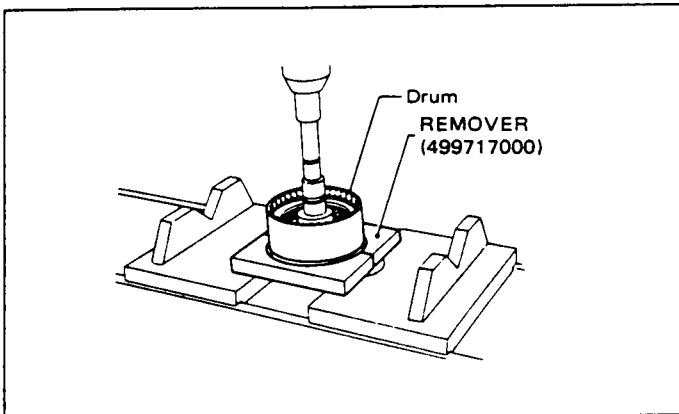


Fig. 78

- 6) Drive the ball bearing (30 x 72 x 12) out, using REMOVER (499717000).

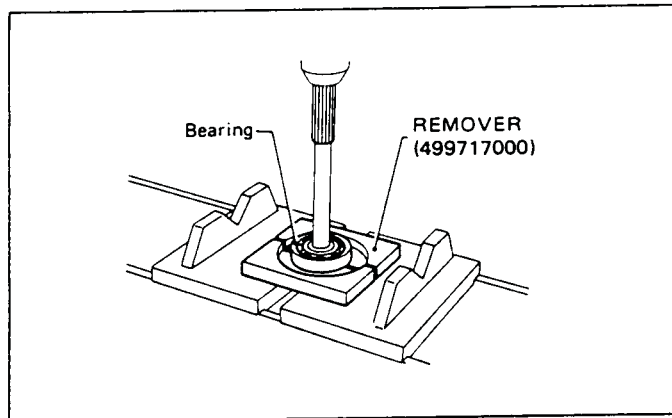


Fig. 79

- 7) Disassemble the transfer clutch ASSY. Pry off the snap ring (inner: 98.5) and remove the front pressure plate, drive plates, driven plates and rear pressure plate.

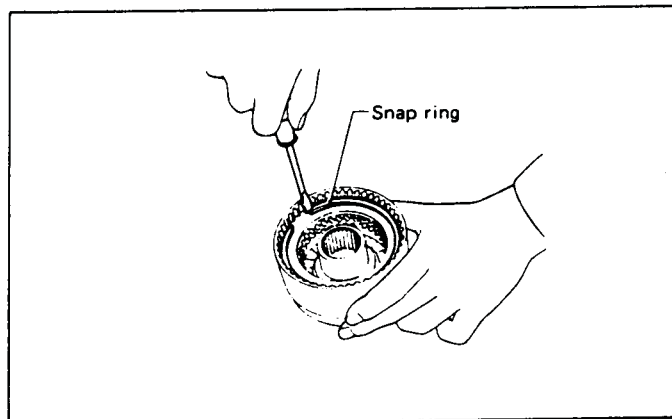


Fig. 80

**When removing needle bearing from extension case, use PULLER ASSY (499707200).**

## INSPECTION

Wash the disassembled parts and check for the following:

### 1) Bearings

Replace any bearing if:

- (1) The balls, outer race or inner race are damaged or rusted.
- (2) Various parts of the bearing are worn excessively.
- (3) The bearing does not spin smoothly or is noisy even after being lubricated with gear oil.
- (4) Other abnormalities are noticed.

### 2) Transfer gear

**Backlash:**

**0.051 – 0.125 mm (0.0020 – 0.0049 in)**

Replace the transfer gear if:

- (1) The surface is chipped, worn or otherwise damaged.
- (2) The roller surface is worn or otherwise damaged.
- (3) The bore of the transfer driven gear UN or the end face is damaged.

### 3) Rear drive shaft

Repair or replace if the sliding surface of the transfer driven gear UN is excessively damaged.

### 4) Plates UN3 and 3

Replace if plates or surfaces are worn\* or damaged.

**\*: If the measured clutch clearance during disassembly exceeds 1.3 mm (0.051 in).**

• Always replace plates UN3 together with the pressure plate and adjacent steel plates.

### 5) Extension oil seal (35 x 50 x 11)

Replace the oil seal if the sealing lip is deformed, hardened, worn or otherwise damaged.

### 6) Rear drive shaft seal ring

Replace if the seal ring is worn or otherwise damaged.

## ASSEMBLY

### 1) Transfer clutch ASSY

Apply a coat of recommended ATF to all parts and assemble all parts in the order of disassembly.

- (1) Assemble the bearing (30 x 72 x 19) and drum ASSY to the rear shaft.
- (2) Install the rear pressure plate, plates 3, plates UN3 and front pressure plate.

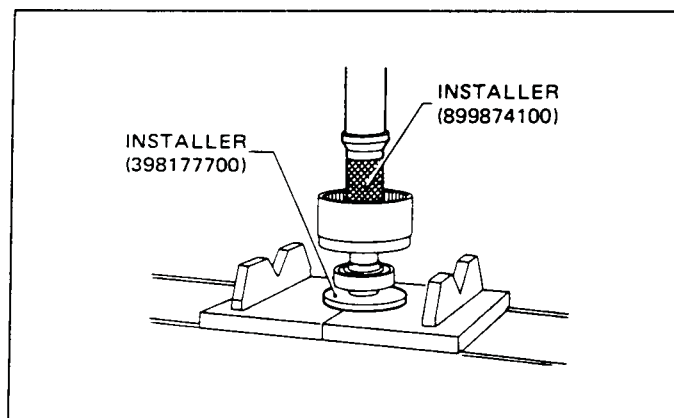


Fig. 81

a. Use a suitable **INSTALLER** when driving the drum into place.

Special tool:	<b>INSTALLER 899874100</b>
Special tool:	<b>INSTALLER 499277000</b>
Special tool:	<b>INSTALLER 398177700</b>

b. Direct compressed air into the oil hole to ensure that the piston moves properly.

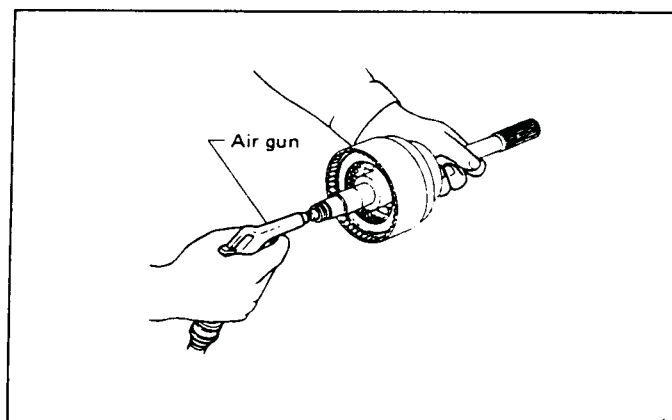


Fig. 82





## Technical Service Information

- a. Pay attention to the directions of the front and rear pressure plates.
- b. Always use recommended ATF to coat parts with oil.

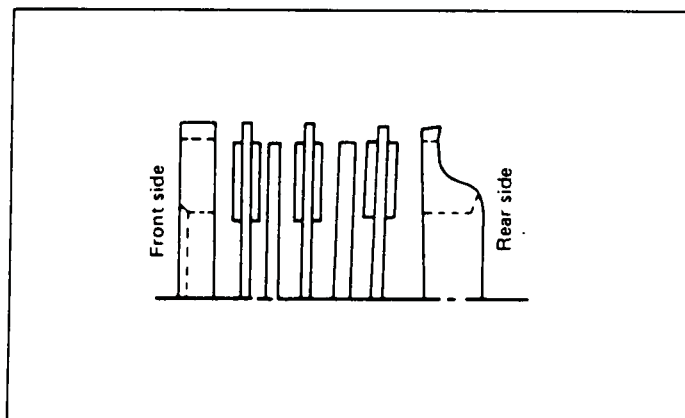


Fig. 83

(3) After parts have been assembled, measure the clearance between the outer snap ring (98.5) and front pressure plate and select a suitable pressure plate to ensure the clearance is within specifications.

**Transfer clutch clearance:**

0.4 – 0.8 mm (0.016 – 0.031 in)

**Available front pressure plates**

Part No.	Plate thickness
447677000	4.7 mm (0.185 in)
447677001	5.0 mm (0.197 in)
447677002	5.3 mm (0.209 in)
447677003	5.6 mm (0.220 in)
447677004	5.9 mm (0.232 in)

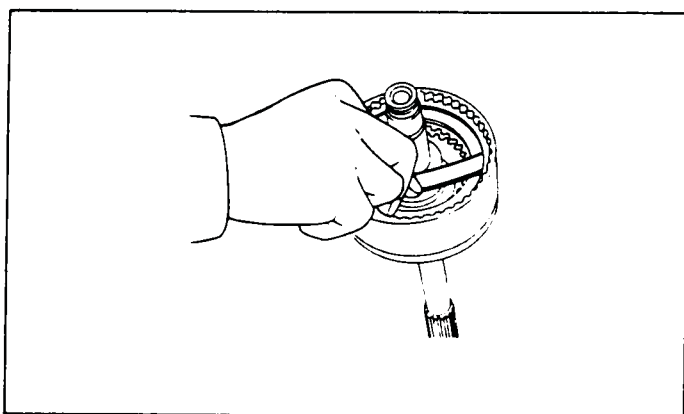


Fig. 84

Direct compressed air through the oil hole to move the drum two to three times.

- 2) Using the installer, install washer, bearing, transfer drive gear UN, washer (20 x 38 x 4) and ball bearing (20 x 52 x 15).

Special tool:	INSTALLER	398177700
Special tool:	SNAP RING PRESS	899754102

Before installing, apply a coat of recommended ATF to the sliding surfaces of transfer drive gear UN and rear drive shaft.

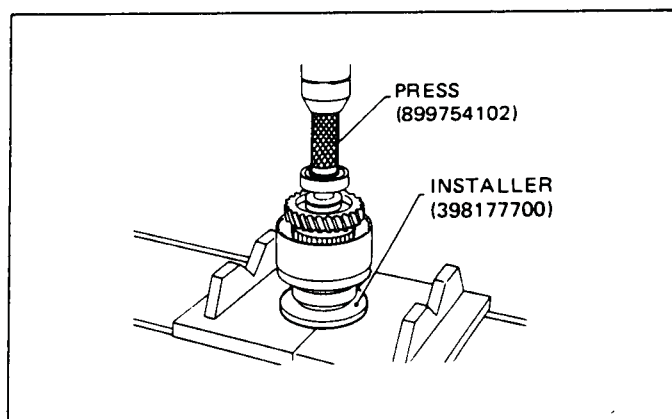


Fig. 85

- 3) Install the seal ring onto the rear drive shaft.
- 4) Install the rear shaft ASSY in the extension case.

a. Be careful not to damage the bushing and oil seal near the rear end of the rear drive shaft.  
b. After the rear shaft ASSY has been installed, do not place the opening of the case down as this may cause the rear shaft ASSY to drop.

- 5) Select a suitable washer (42 x 51 x t) so that the clearance between the rear shaft ASSY and intermediate case is with specifications.

**Standard clearance between rear shaft ASSY and intermediate case:**

0 – 0.3 mm (0 – 0.012 in)



(1) Measure dimension "m" (shown in the figure) using DEPTH GAUGE (498147001) and LOW & REVERSE BRAKE GAUGE (398643600).

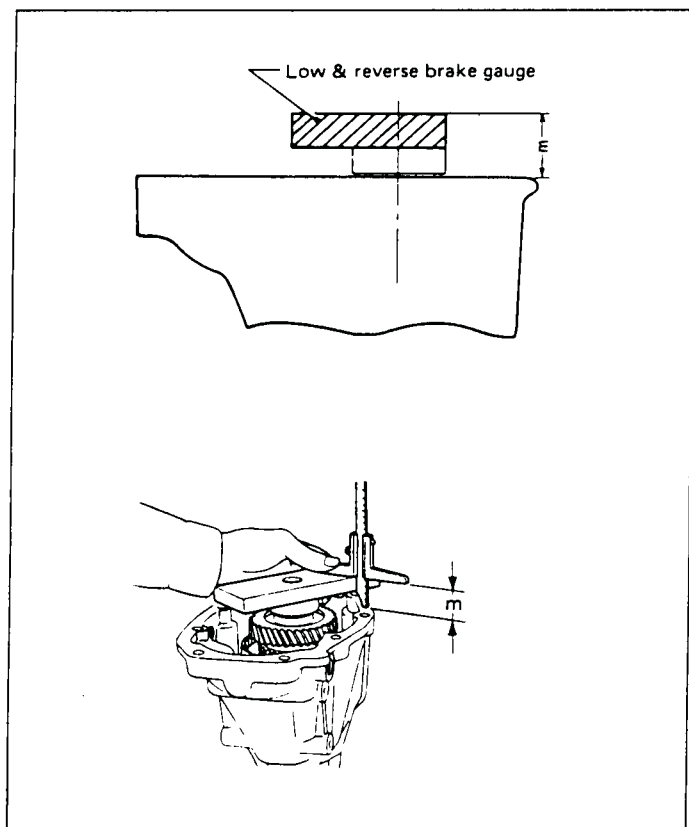


Fig. 86

(2) Using the same tools described in item (1) above, measure dimension "M".

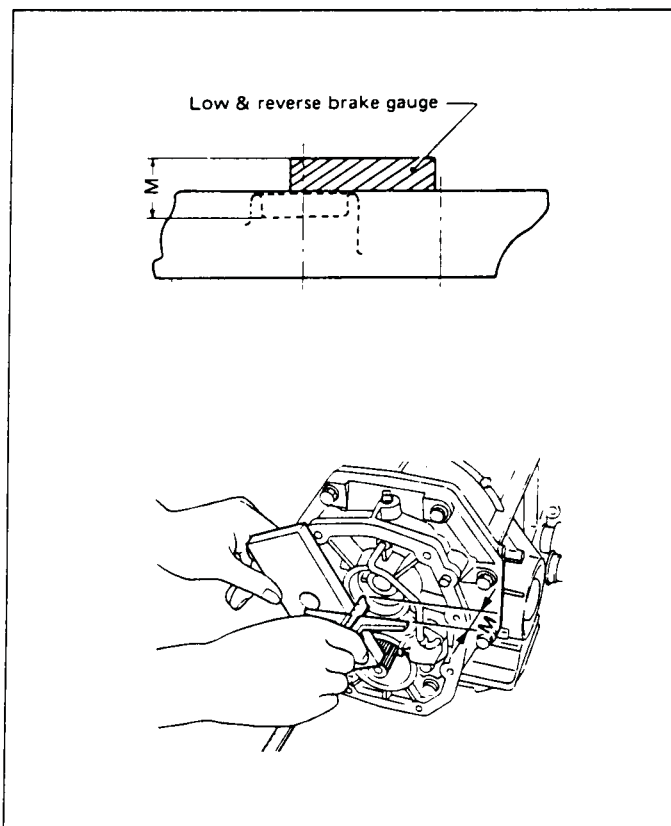


Fig. 87

(3) The thickness (t) of the washer (42 x 51 x t) can be determined by the following equation:

$$t = (M + 0.2) - (0 \text{ to } 0.3) - m$$

Select suitable washers (up to three pieces) from the table on the right to obtain the specified thickness.

Part No.	Thickness
803242010	0.2 mm (0.008 in)
803242011	0.5 mm (0.020 in)

6) Install the rear drive gear thrust plate and transfer drive gear CP onto the intermediate case.

**When installing the thrust plate, be sure to align the notch in the plate with the mounting bolt.**



# INSTALLATION Transmission Case

## REMOVAL

- 1) Install the extension ASSY.

Using the selected washer in the intermediate case, install the extension ASSY and tighten the eight 8 mm bolts to the specified torque.

---

**Tightening torque:**

25 N·m (2.5 kg-m, 18 ft-lb)

---

- a. Tighten the clip (one place) for the transfer solenoid harness with one of the eight bolts.
- b. Be sure to install the seal ring.

- 2) Install the transfer solenoid.

Attach the O-ring to the bore in the extension case and install the transfer solenoid.

**Always install the solenoid securely with your hand—not by any tool.**

- 3) Install the temperature switch.

Install the temperature switch with the gasket in place and tighten to the specified torque.

---

**Tightening torque:**

18 N·m (1.8 kg-m, 13 ft-lb)

---

**Always use a new gasket.**

- 4) Fasten the harnesses with clamps.

- 5) Install the rear engine mount rubber cushion and tighten the two 8 mm bolts to the specified torque.

---

**Tightening torque:**

25 N·m (2.5 kg-m, 18 ft-lb)

---

- 1) Remove the extension ASSY. (4WD)
- 2) Drain AFT. (AFT should be drained when the transmission is dismantled from the vehicle.)
- 3) Carefully pull the turbine output shaft and oil pump drive shaft straight out.

If they are hard to remove by hand, wrap their splines with a cloth or vinyl tape and extract them using pliers. Be careful not to damage the splines.

**When removing pin for oil pump drive shaft bushing, use REMOVER (OIL PUMP SHAFT) (498797000).**

- 4) Disconnect the oil cooler pipe from the transmission case.
- 5) Remove the lead wire clips.

To do this, remove the nuts which secure the transmission case to the final reduction case, and remove the downshift solenoid, transfer solenoid and temperature switch lead wire clips.

- 6) Remove the vacuum pipe and ground lead wire.

To do this, remove the bolts which retain the governor cover and disconnect the vacuum pipe and ground lead wire.

- 7) Remove the oil supply pipe.

Disconnect the oil supply pipe from the transmission case. Ensure that ATF is drain out before disconnecting the pipe.

**Be careful not to lose the O-ring located at the end of the pipe.**

- 8) Drain the differential gear oil completely.

- 9) Also drain ATF remaining in the transmission case and place the transmission on a bench with the housing down, as shown in the figure.

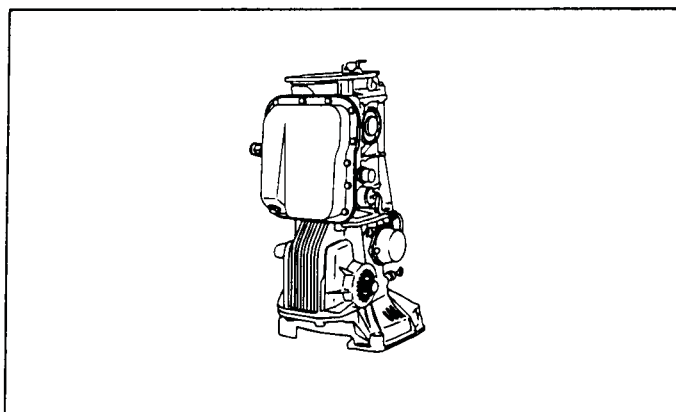


Fig. 88

- a. The automatic transmission and the differential sections are not separated from each other under normal circumstances.



## Technical Service Information

b. However, if the two must be separated, follow the disassembly procedure of the final reduction case section to separate the two, and place the automatic transmission section on STAND (399933610).

### DISASSEMBLY

- 1) Remove the converter oil pan.
- 2) Remove the downshift solenoid and vacuum diaphragm.

- a. Also remove the diaphragm rod.
- b. Remove each O-ring at the same time.

- 3) Remove the servo apply pipe and servo release pipe.
- 4) Remove the control valve ASSY.
- 5) Remove the transfer valve.

To remove, separate the bending portion of the transfer pipe clip from the transfer pipe, disconnect the pipe and remove the two bolts which secure the transfer clutch body.

For disassembly, inspection and inspection of the transfer valve, refer to the instructions under the heading "On-Car Service".

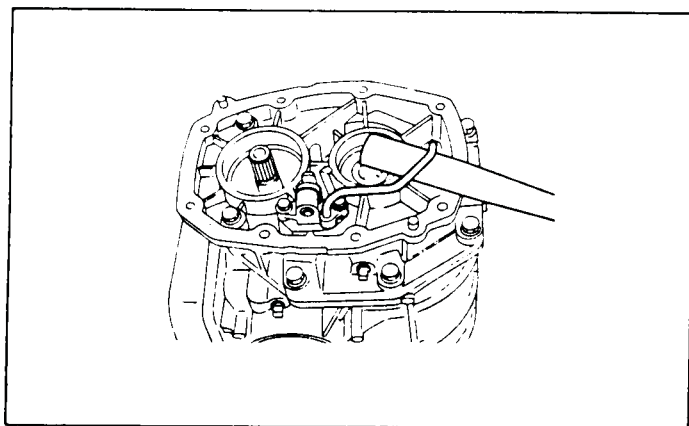


Fig. 89

**Always install new transfer pipe and its clip during each ASSY.**

- 6) Remove the oil pump ASSY.
  - (1) Tighten the adjusting screw until the reverse clutch is lightly held by the brake band.
  - (2) Remove bolts which secure transmission cover (intermediate case) and, using a plastic hammer, lightly tap the periphery of the case until the oil pump ASSY is removed.

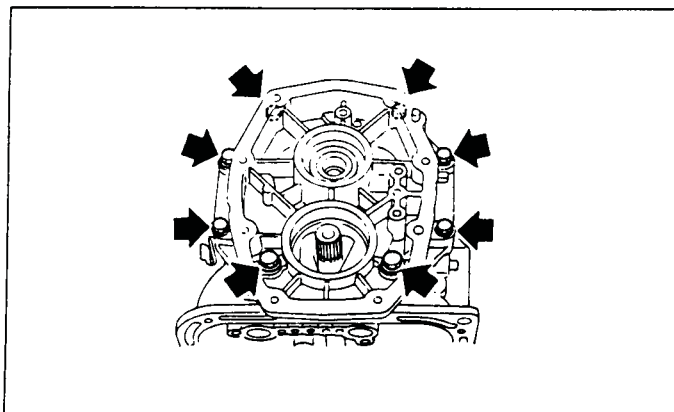


Fig. 90

a. Be careful not to lose the thrust washer located at the end of the oil pump carrier.

b. There are six needle thrust bearings, three thrust washers and three toothed thrust washers in the removal steps until 16). Be careful not to lose these parts during disassembly.

- 7) Move the transfer drive shaft upward and remove transfer coupling from the rear spline of the drive pinion. Then, extract the transfer drive shaft as shown in the figure below.

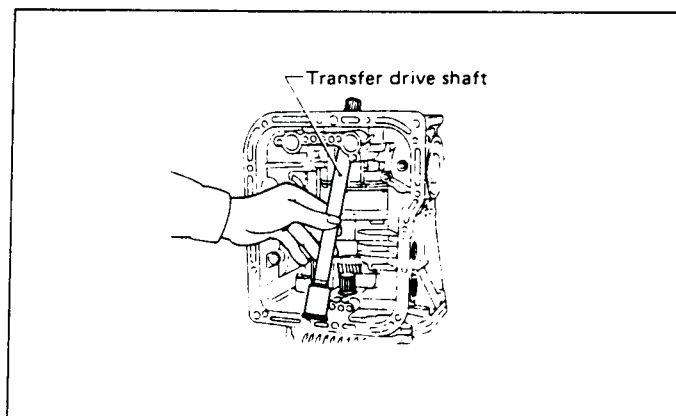


Fig. 91

- 8) Remove the band servo piston CP with PLIER (398663600).
- 9) Remove the strut band.
- 10) Remove the brake band ASSY, reverse clutch ASSY and forward clutch ASSY.
- 11) Remove the connecting shell.
- 12) Remove the center support ASSY by using two 6 mm bolts.
- 13) Remove the planetary input gear and planetary input gear 2.
- 14) Remove the planetary gear ASSY and low & reverse brake plates.
- 15) Remove retaining plate 2.

AUTOMATIC TRANSMISSION SERVICE GROUP

16) Remove the planetary output gear.

**Perform steps 17), 18) and 20) below, if needed.**

17) Remove the selector arm.

18) Remove the manual plate and parking rod.

19) Remove the transmission case.

(1) Wrap a vinyl tape around the rear splines of the drive pinion to prevent damage to the oil seal.

(2) Remove the nuts securing the transmission case to the final & reduction case, and separate the transmission case from the final & reduction case by lightly tapping the periphery of the former case with a plastic hammer.

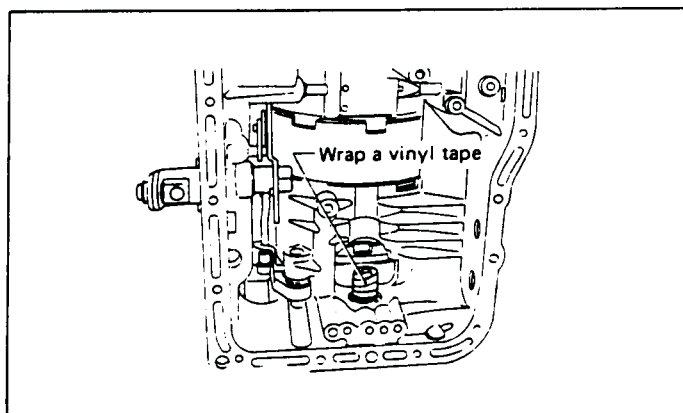


Fig. 92

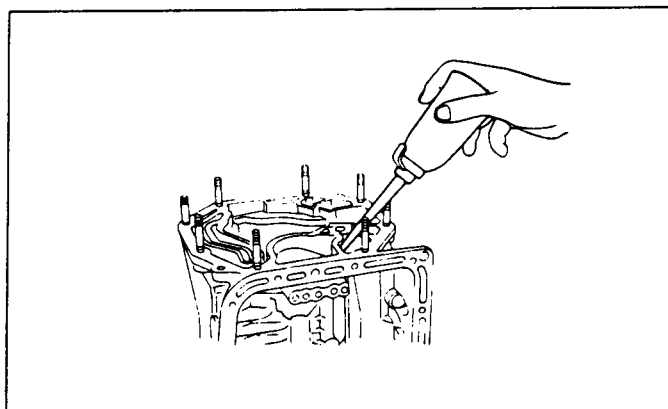


Fig. 93

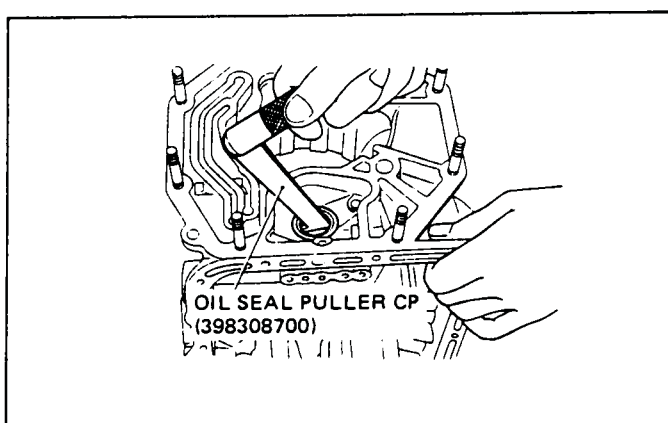


Fig. 94

20) Remove the parking pawl, parking pawl shaft and parking shaft support plate.

## INSPECTION

1) Transmission case and transmission cover (intermediate case).

(1) Replace transmission case and/or transmission cover (intermediate case) if cracks, damage, etc. are noticed.

(2) Repair if the mounting surface is dented or gouged.

(3) Check the drive pinion oil seal (21 x 33 x 6.5) and oil seal breather for scratches at the passage location and, if necessary, replace.

To remove the oil seal, always use OIL SEAL PULLER (398308700) and drive the oil seal out as shown in the figure.

When installing the oil seal, use DRIVE PINION OIL SEAL INSTALLER (499247000).

- Pay attention to the direction of the oil seal.
- Before installing the oil seal, apply a coat of oil to its periphery.
- Tilting of the oil seal should be kept to a minimum.

Tool No.	Tool Name
398308700	Oil seal puller
499247000	Drive pinion oil seal installer



## Technical Service Information

# ASSEMBLY

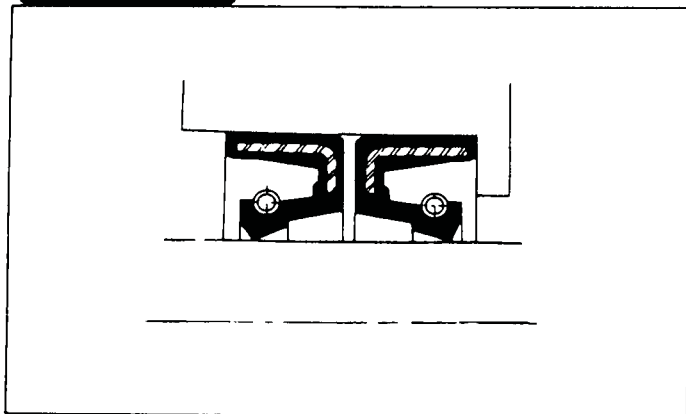


Fig. 95

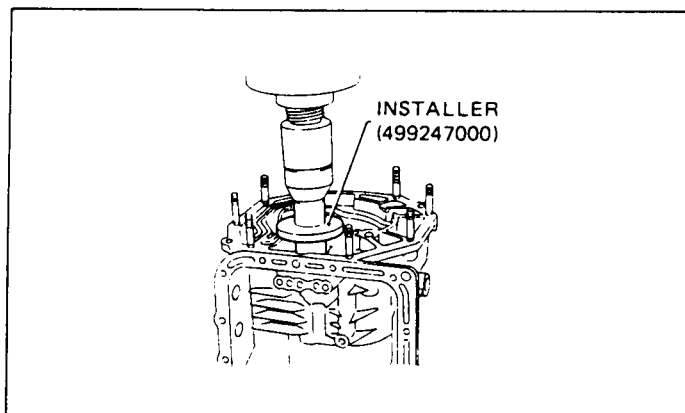


Fig. 96

- 2) Low & reverse brake and brake band.  
If facing is excessively worn or otherwise damaged, replace the brake and/or brake band.
- 3) Gaskets, O-rings and seal rings.
  - (1) Install new gaskets during each ASSY.
  - (2) If the O-ring and seal ring are folded, cracked or otherwise damaged, replace.
  - (3) Check for tightness of the two straight pins (8 x 18) driven into the transmission case used for alignment with the differential. If found loose, remove the two using a wooden or plastic hammer and install new ones.

**Before installing the straight pins, apply a coat of Lock Tite to their mating surfaces and drive them into the transmission case 9 mm (0.35 in).**

To assemble, reverse the order of disassembly.

- 1) Installation of parking pawl and parking pawl shaft  
Install parking rod support plate, parking pawl return spring and parking pawl to case in that order and retain with clip after inserting parking pawl shaft from the front side.
- 2) Installation of parking rod and parking lever  
Connect parking rod and parking lever and retain with clip.  
After hanging parking rod on the notched portion of parking shaft support plate with its cam portion positioned at the back of parking pawl, install parking lever to parking lever pin and retain with clip.
- 3) Connect the transmission case and final reduction case.  
Install DRIVE PINION OIL SEAL GUIDE (499257100) onto the splines of the drive pinion rear end and secure the transmission case to the final reduction case with the eight 8 mm nuts.

### Tightening torque:

25 N·m (2.5 kg-m, 18 ft-lb)

- a. Be careful not to damage the sealing lip of the oil seal.
- b. Apply a thin coat of ATF to the guide in advance.

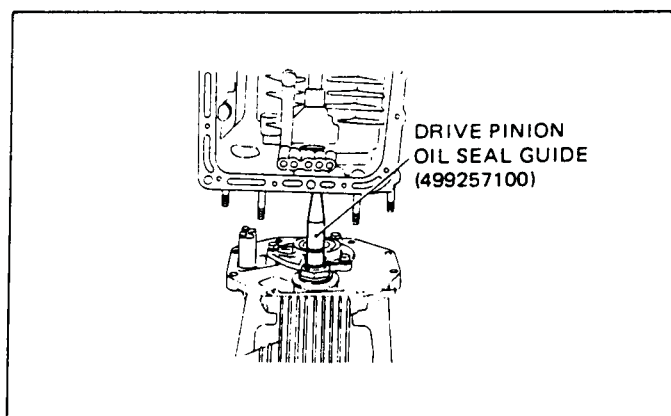


Fig. 97

- 4) Checking the operation of one-way clutch  
Make certain that the clutch turns clockwise only, as viewed from the front side with the planetary carrier ASSY assembled to the center support.
- 5) Installation of the planetary gear ASSY
- 6) Selection of retaining plate 2  
This is for determining the proper retaining plate 2 so that the clearance between piston 2 and driven plate is within specifications. Putting the component parts on BASE (499687100) as shown in the figure, select a proper retaining plate 2 so that "H" is within specifications.

H = 82.35 – 82.55 mm (3.2421 – 3.2500 in)

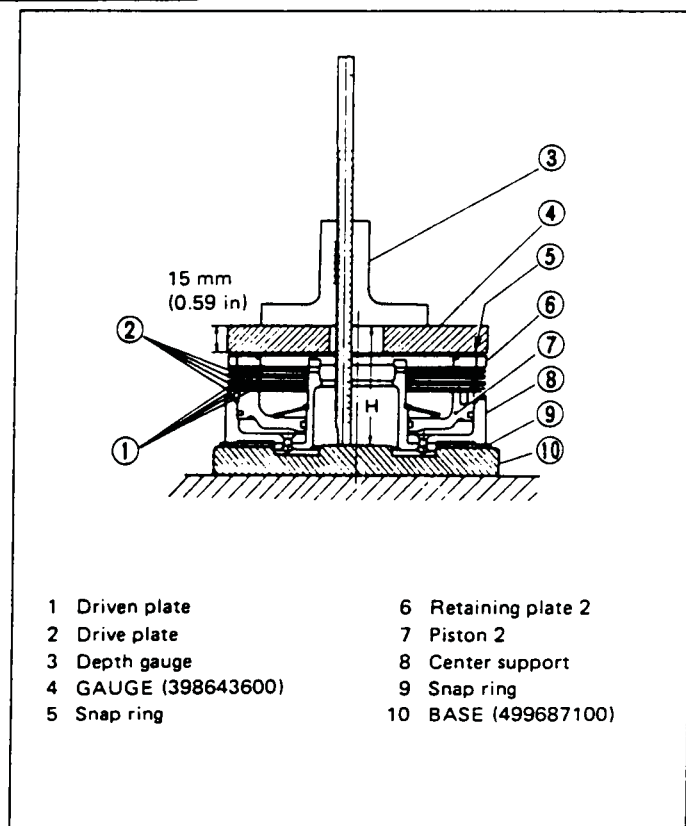


Fig. 98

Retaining plate 2	
Part No.	Thickness
31667AA080	7.8 mm (0.307 in)
31667AA090	8.0 mm (0.315 in)
31667AA100	8.2 mm (0.323 in)
31667AA110	8.4 mm (0.331 in)
31667AA120	8.6 mm (0.339 in)
31667AA130	8.8 mm (0.346 in)
31667AA140	9.0 mm (0.354 in)
31667AA150	9.2 mm (0.362 in)
31667AA160	9.4 mm (0.370 in)
31667AA170	9.6 mm (0.378 in)

7) Installation of low & reverse brake parts  
Install snap ring, retaining plate 2, drive plates, driven plates, center support ASSY and snap ring into case in that order.  
Quantity of drive plates ..... 5  
Quantity of driven plates ..... 5

- When installing the center support, screw the 6 mm bolts in the center support, and then install it into the transmission case while turning the center support gradually.
- The center support is engaged with the transmission case by splines at one position. When installing the center support, be careful not to damage the one way clutch and bushing by the end of the center support.
- Install the snap ring (134 mm) with its open ends positioned sideward or upward.
- If difficulty is encountered in installing the center support, loosen the bolt that fixes the transmission case to stand.

8) Measuring the clearance between piston 2 and driven plate  
After assembly, measure the clearance between piston 2 and driven plate. The clearance should be within the specifications.

## Low & reverse brake clearance:

0.7 – 1.0 mm (0.028 – 0.039 in)

- Checking the operation of low & reverse brake  
Apply air into the oil hole in low & reverse brake to see that the piston moves properly.
- Installation of connecting shell, lock washer, thrust bearing, washer and clutch hub  
Install connecting shell and clutch hub as an ASSY to the spline of reverse sun gear and forward sun gear.
- Installation of forward clutch ASSY and reverse clutch ASSY  
Install forward clutch ASSY and reverse clutch ASSY in that order.  
Make certain that the thickness of thrust bearing which is installed between forward clutch ASSY and clutch hub is 4.0 mm (0.157 in).
- Installation of brake band  
Match the projected portions of the brake band with the notches in the transmission case to install the brake band.

**When handling the brake band, be careful not to open its open end too much.**

**Too much opening causes separation and damage of the facing.**

13) Measure the total end play in the axial direction. Determine the thickness of the washer (21 x 31.2 x t) to be used at the oil pump carrier end. The total end play should be within specifications.

## Total end play:

0.25 – 0.5 mm (0.0098 – 0.020 in)

(1) Measure dimension "L", as shown, using DEPTH GAUGE (498147001) and LOW & REVERSE BRAKE GAUGE (398643600).

**When measuring dimension "L", ensure that the thrust bearing (20 x 35 x 2.8) is not installed.**

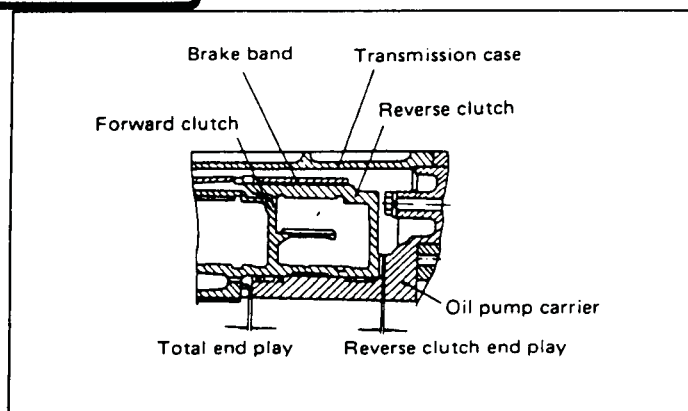


Fig. 99

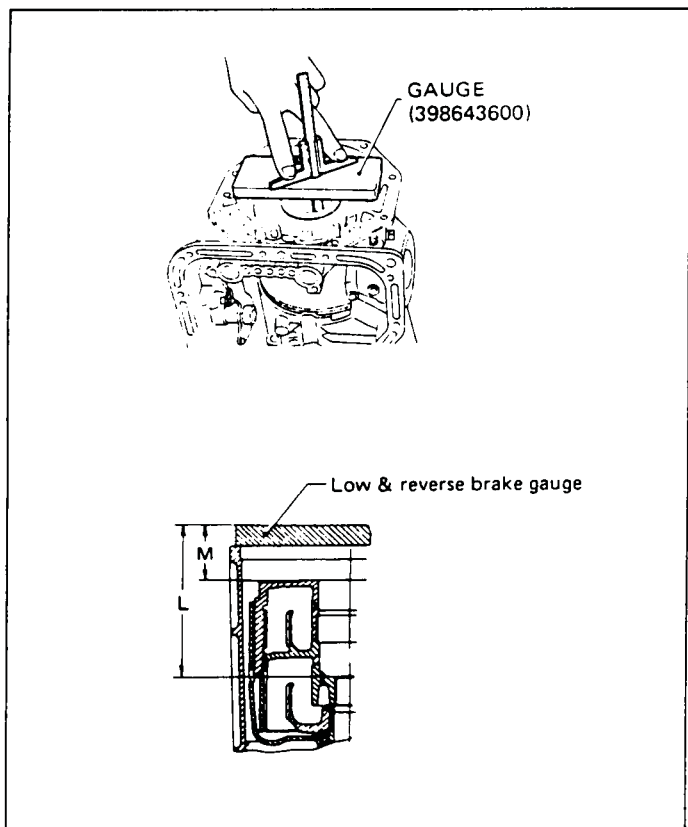


Fig. 100

(2) Using the same tools as those in (1) above, measure dimension "L".

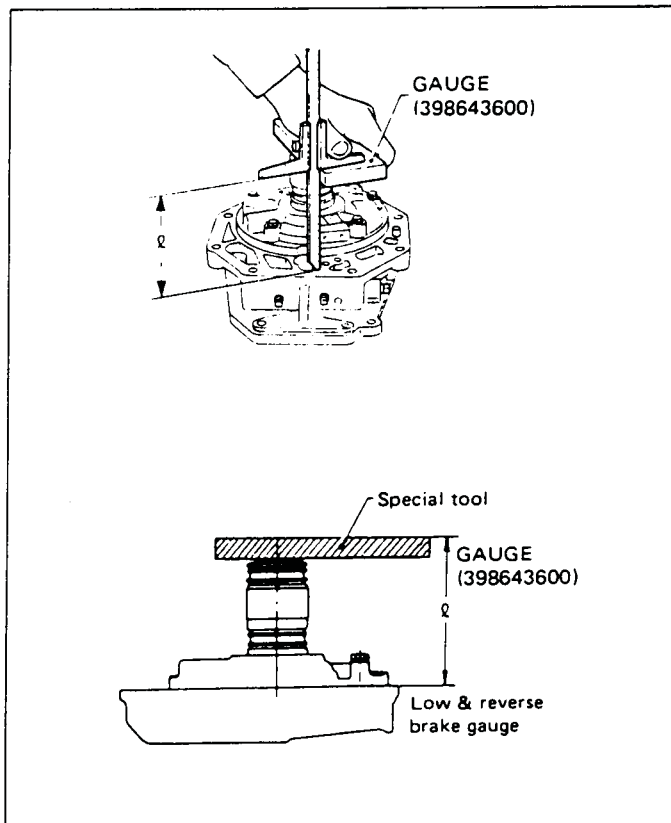


Fig. 101

(3) Determine thickness T by the following equation and select the suitable thrust bearing (20 x 35 x t) from those listed in table.

$$T = (L + 0.4) - (0.25 \text{ to } 0.50) - \ell$$

Part No.	Thickness
806520030	3.8 mm (0.150 in)
806520040	4.0 mm (0.157 in)
806520050	4.2 mm (0.165 in)
806520060	4.4 mm (0.173 in)
806520070	4.6 mm (0.181 in)
806520080	4.8 mm (0.189 in)
806520090	5.0 mm (0.197 in)

14) Measure the end play of the reverse clutch drum. Select a suitable thrust front clutch washer so that the end play between the reverse clutch drum and oil pump carrier is within specifications.



Reverse clutch end play:  
0.5 – 0.8 mm (0.020 – 0.031 in)

(1) Measure dimension "M", as shown, using DEPTH GAUGE (498147001) and LOW & REVERSE BRAKE GAUGE (398643600).

(2) Using the same tools as in (1) above, measure dimension "m".

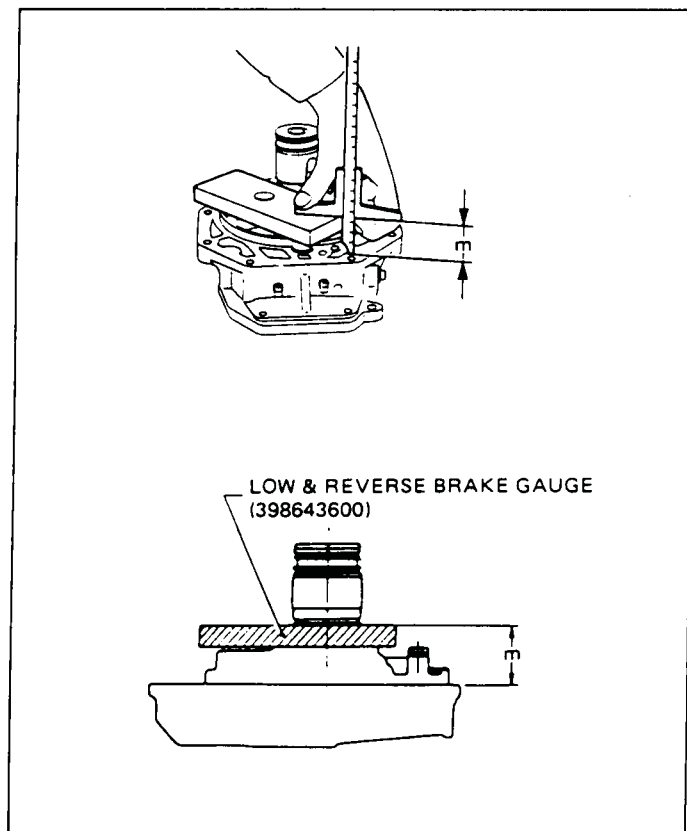


Fig. 102

(3) Thickness  $t$  of the thrust front clutch washer to be used can be determined by the following equation.

$$t = (M + 0.4) - (0.5 \text{ to } 0.8) - m$$

Select a suitable washer from those listed in the table below.

Washer	
Part No.	Thickness
31528X0100	1.9 mm (0.075 in)
31528X0101	2.1 mm (0.083 in)
31528X0102	2.3 mm (0.091 in)
31528X0103	2.5 mm (0.098 in)
31528X0104	2.7 mm (0.106 in)
31528X0105	1.5 mm (0.059 in)
31528X0106	1.7 mm (0.067 in)

15) Installing the transfer drive shaft.

Secure the transfer coupling to the transfer drive shaft with the spring pin and engage the shaft with the drive pinion at the splines.

**Always use a new spring pin.**

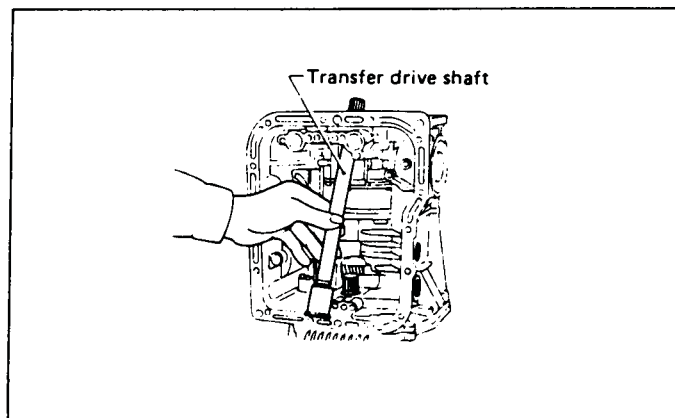


Fig. 103

16) Assembling the oil pump ASSY.

Assemble the thrust bearing (20 x 35 x 2.8) to the forward clutch. Apply vaseline to the washers which have been selected in steps 13) and 14) and affix them to the oil pump carrier. Install the oil pump ASSY, being careful not to drop the washers. Before installing the oil pump ASSY, ensure that the mating surfaces of transmission cover (intermediate) and transmission case gaskets are clean from oil.

**Tightening torque of case mounting bolts:**

23 – 26 N·m (2.3 – 2.7 kg·m, 17 – 20 ft·lb)

17) Assembling the band servo piston and servo piston cover.

With the band servo piston assembled to the servo piston cover, insert the transmission case into place, using the piston rod as a guide, and attach the servo piston cover with the inner snap ring.





## Technical Service Information

- a. Be careful not to damage the O-ring located at the periphery of the servo piston cover.
- b. Be sure to install the servo return spring on the piston in advance, paying attention to its orientation.

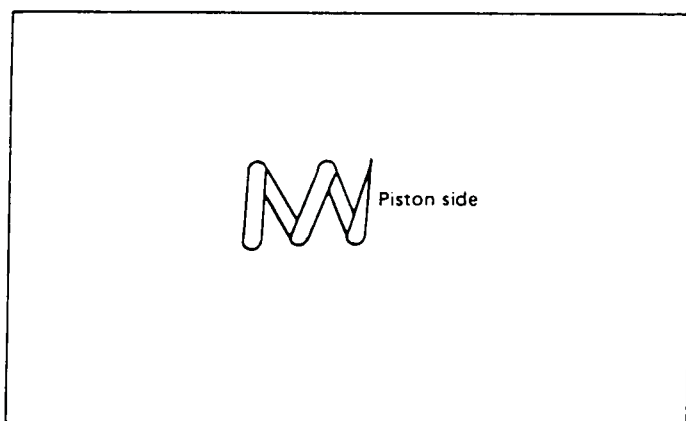


Fig. 104

### 18) Adjusting the brake band ASSY.

Install the brake band strut correctly. Tighten the brake band adjusting screw to a torque of 9 N·m (0.9 kg-m, 6.5 ft-lb) and back-off the screw two rotations. Then tighten the lock nut (10 x 8) to  $26 \pm 2$  N·m ( $2.7 \pm 0.2$  kg-m,  $20 \pm 1.4$  ft-lb).

**Do not tighten both the adjusting screw and lock nut to more than their specified torque settings.**

### 19) Installation of manual plate

Adjust the clearance between manual plate and spacer by shim(s) until it is within 0.3 mm (0.012 in), and install manual plate.

Tighten nut to the specified torque.

#### Torque:

**34 – 44 N·m (3.5 – 4.5 kg-m, 25 – 33 ft-lb)**

### 20) Installation of control valve ASSY.

Adjust the groove ① to the manual plate pin ②, and install to transmission case.

#### Torque (Valve body attaching bolt):

**6 – 8 N·m (0.6 – 0.8 kg-m, 4.3 – 5.8 ft-lb)**

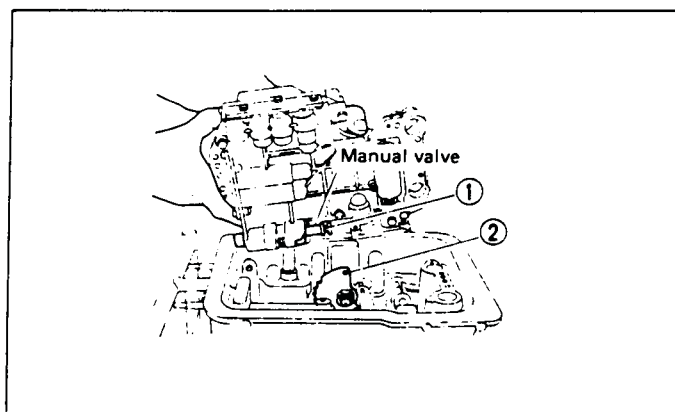


Fig. 105

### 21) Assemble the vacuum diaphragm ASSY.

(1) Attach the ROD DIAPHRAGM GAUGE SET to the transmission case and screw it in until it butts up against the throttle valve.

(2) Read the scale of the ROD DIAPHRAGM GAUGE where it aligns with the end face of the holder, and select a suitable diaphragm rod from those listed in the following table.

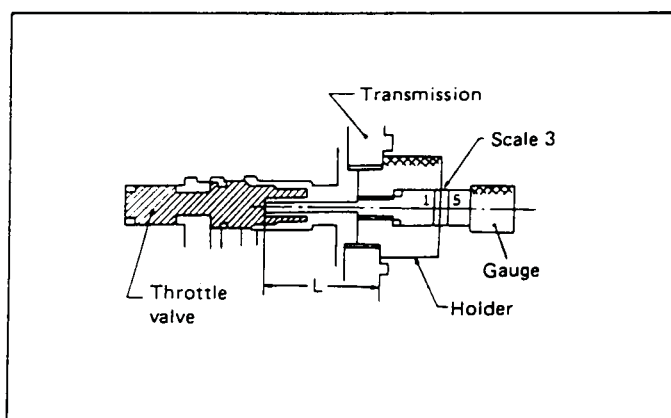


Fig. 106

Gauge Indication	Part No.	Diaphragm rod length mm (in)	Dimension "L" (Measured) mm (in)
1	31932XF04	34.0 (1.339)	Below 30.5 (1.201)
Between 1 and 3	31932XF03	34.5 (1.358)	30.65 – 31.05 (1.2067 – 1.2224)
3	31932XF02	35 (1.38)	31.15 – 31.55 (1.2264 – 1.2421)
Between 3 and 5	31932XF01	35.5 (1.398)	31.65 – 32.05 (1.2461 – 1.2618)
5	31932XF00	36.0 (1.417)	Above 32.05 (1.2618)



## Technical Service Information

Install the vacuum diaphragm together with the selected rod.

**Do not forget to install the O-ring.**

### 22) Assembling the downshift solenoid ASSY.

Install the downshift solenoid ASSY in the bore on the front side of the transmission case turning it by hand.

**Do not forget to install the O-ring.**

### 23) Assembling the servo apply pipe and servo release pipe.

Lightly drive the pipes into their proper positions. Ensure that the pipes' height (at points where the pipes are supported by the oil pan) does not exceed 41 mm (1.61 in) as measured from the mating surface of the converter oil pan.

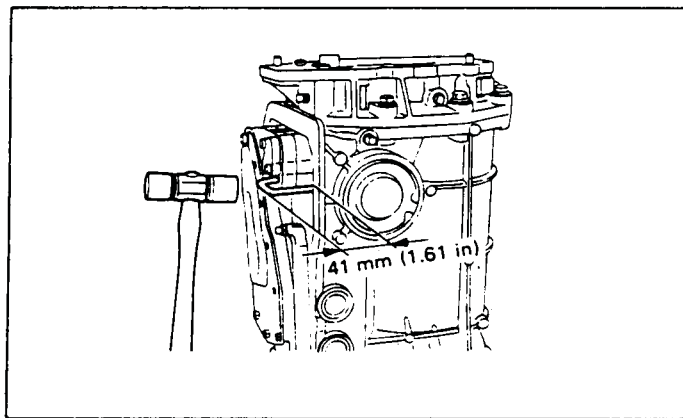


Fig. 107

- a. Be careful not to deform or bend the pipe.
- b. Install new pipes at each ASSY.

### 24) Installing the converter oil pan.

Before installing the oil pan, be sure to clean the oil from the mating surface of the oil pan and gasket.

**Install a new gasket at each ASSY.**

**Tightening torque of converter oil pan:**

**3.4 – 4.4 N·m (0.35 – 0.45 kg·m, 2.5 – 3.3 ft·lb)**

## INSTALLATION

- 1) Install the oil supply pipe.
- 2) Install the vacuum pipe and ground lead wire and clip them.
- 3) Connect the oil cooler pipe.
- 4) Install the turbine output shaft and oil pump drive shaft.
- 5) Pour ATF and differential gear oil.
- 6) Install the extension ASSY (4WD).

The transmission section contains many small parts which are similar in configuration and are machined accurately. Before assembling and/or installing these parts, place them in neat order so that they may be assembled properly to their proper positions. Be sure to check the operation of parts.

## Reverse Clutch

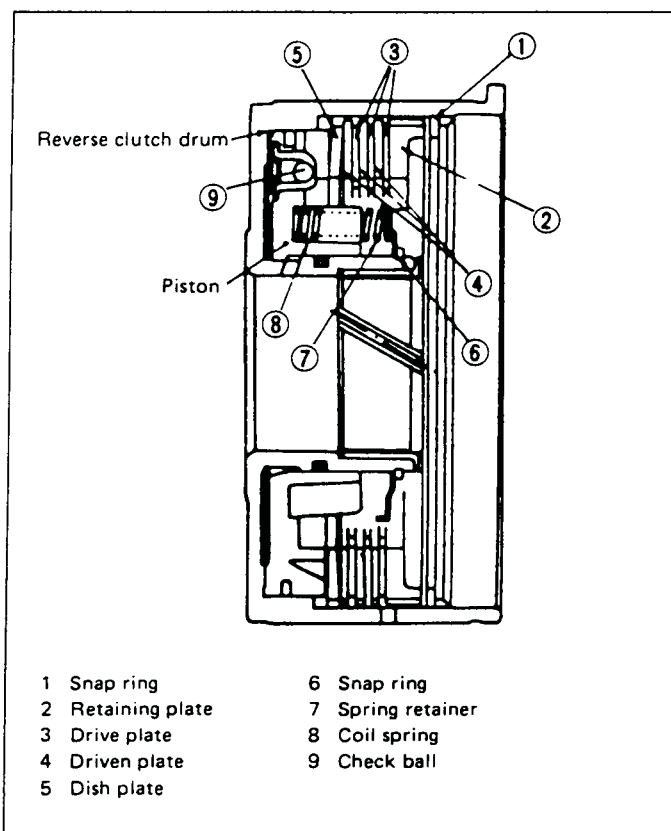


Fig. 108

## DISASSEMBLY

Pry off the snap ring ① with a screwdriver, and remove the retaining plate ②, drive plates ③, driven plates ④, and dish plate ⑤. Using CLUTCH SPRING COMPRESSOR (398673600) and PLIERS (399893600), pry off the snap ring ⑥ from the coil spring retainer ⑦. Remove the coil spring retainer ⑦ and coil springs ⑧. Apply air into the oil hole to remove the piston

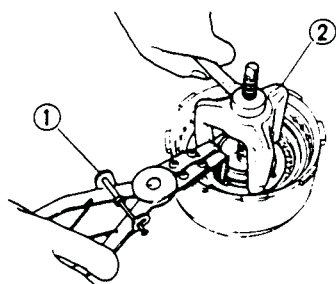
## INSPECTION

- 1) Replace the clutch drive plate if the facing is worn or damaged.
- 2) Replace defective parts if snap ring is worn, return spring is fatigued or broken or spring retainer is deformed.

## ASSEMBLY

To assemble, reverse the disassembling procedure, applying the ATF onto all the parts.

- 1) Install the driven plates to the clutch drum. Be sure to align the driven plate missing tooth portion with the oil hole in the clutch drum.



- 1 PLIERS (399893600)
- 2 COMPRESSOR (398673600)

Fig. 109

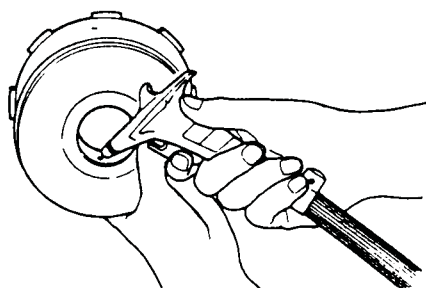
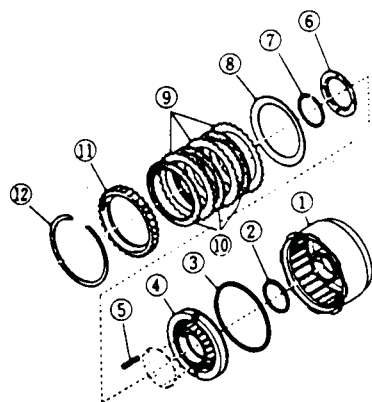


Fig. 110



- |                         |                    |
|-------------------------|--------------------|
| 1 Reverse clutch drum   | 7 Snap ring        |
| 2 O-ring                | 8 Dish plate       |
| 3 Lathe cut seal ring   | 9 Driven plate     |
| 4 Reverse clutch piston | 10 Drive plate     |
| 5 Return spring         | 11 Retaining plate |
| 6 Spring retainer       | 12 Snap ring       |

Fig. 111

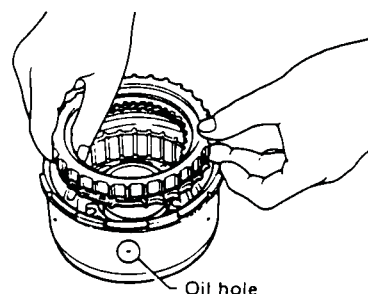
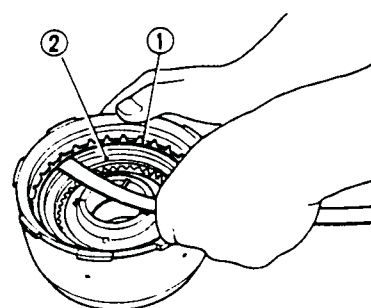


Fig. 112

- 2) Check the clearance between the snap ring (1) and retaining plate (2) to ensure that it is within the specifications. If it is not, change the retaining plate with a proper one.

**Reverse clutch clearance:**  
1.60 – 1.80 mm (0.0630 – 0.0709 in)



- 1 Snap ring
- 2 Retaining plate

Fig. 113



## Technical Service Information

Retaining plates are available in seven different sizes as follows:

Part No.	Thickness
31567X2900	5.0 mm (0.197 in)
31567X2901	5.2 mm (0.205 in)
31567X2902	5.4 mm (0.213 in)
31567X2903	5.6 mm (0.220 in)
31567X2904	5.8 mm (0.228 in)
31567X2905	6.0 mm (0.236 in)
31567X2906	6.2 mm (0.244 in)

3) Install the reverse clutch ASSY to the oil pump carrier. Apply air into the oil hole to see that the reverse clutch moves properly as shown in the figure.

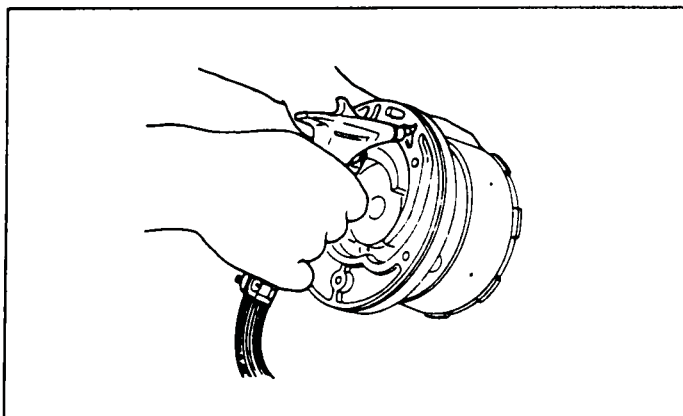
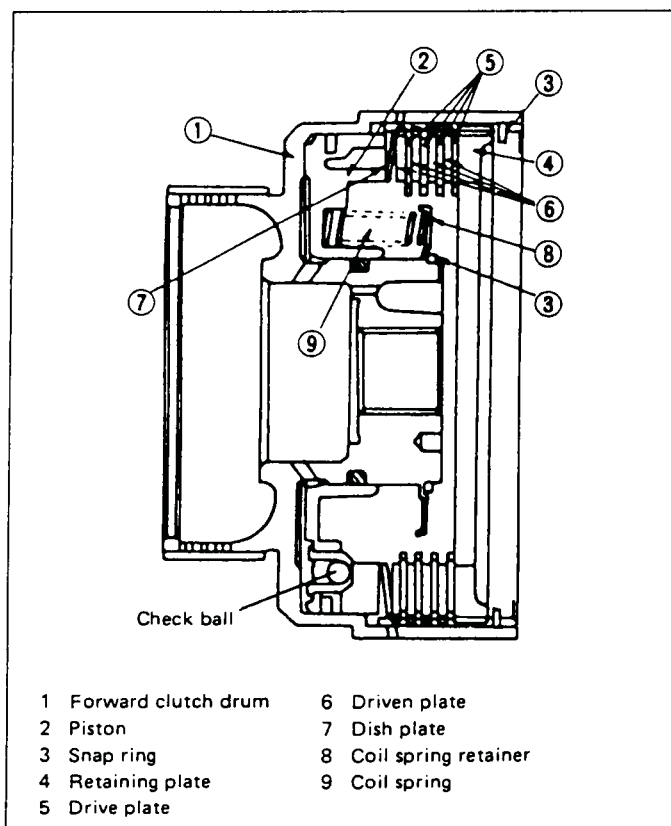


Fig. 114

## Forward Clutch

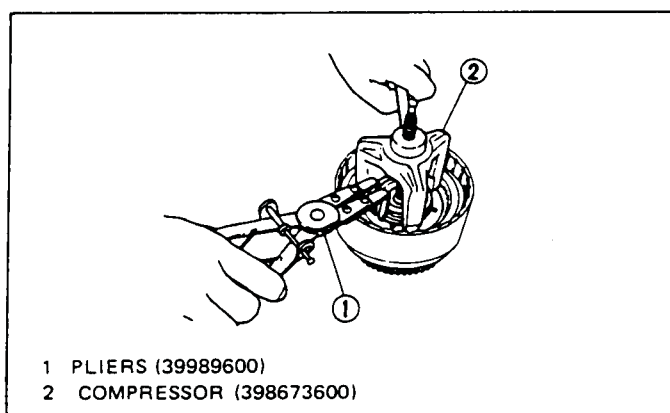


- |                       |                        |
|-----------------------|------------------------|
| 1 Forward clutch drum | 6 Driven plate         |
| 2 Piston              | 7 Dish plate           |
| 3 Snap ring           | 8 Coil spring retainer |
| 4 Retaining plate     | 9 Coil spring          |
| 5 Drive plate         |                        |

Fig. 115

## DISASSEMBLY

1) Using the same disassembling procedure as that for the reverse clutch, remove the snap ring ③, retaining plate ④, drive plates ⑤, driven plates ⑥ and dish plate ⑦. Remove the snap ring from the coil spring retainer ⑧.



- |                          |
|--------------------------|
| 1 PLIERS (39989600)      |
| 2 COMPRESSOR (398673600) |

Fig. 116



## Technical Service Information

- 2) Drive the piston out by applying air into the oil hole.

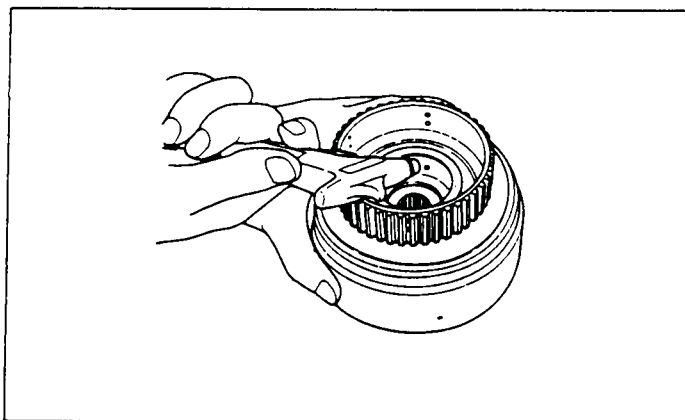


Fig. 117

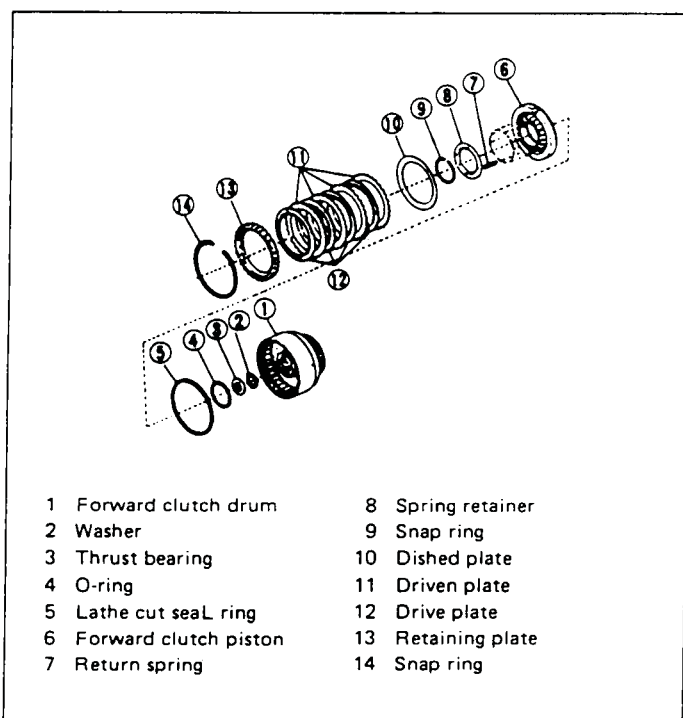


Fig. 118

## INSPECTION

Refer to the topic under the reverse clutch previously described.

## ASSEMBLY

To assemble forward clutch, reverse the order of disassembly. Be sure to apply the ATF to all parts when assembling.

- 1) After assembly, check the clearance between the snap ring ① and retaining plate ② to see that it is within the specifications.

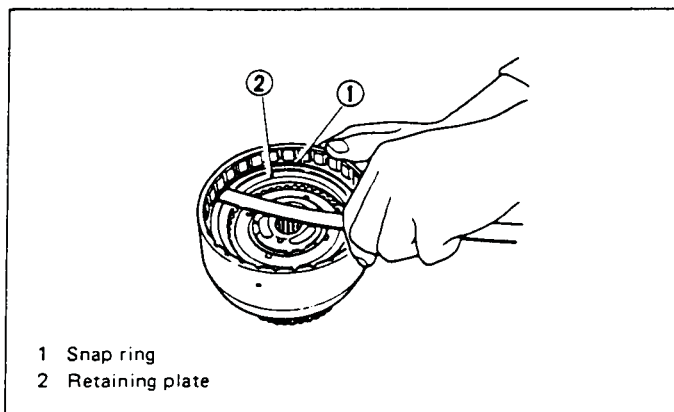


Fig. 119

Forward clutch clearance:

1.00 – 1.20 mm (0.0394 – 0.0472 in)

- 2) Install the forward and reverse clutch assemblies to the oil pump carrier. Apply air into the oil hole to see that the forward clutch moves properly.

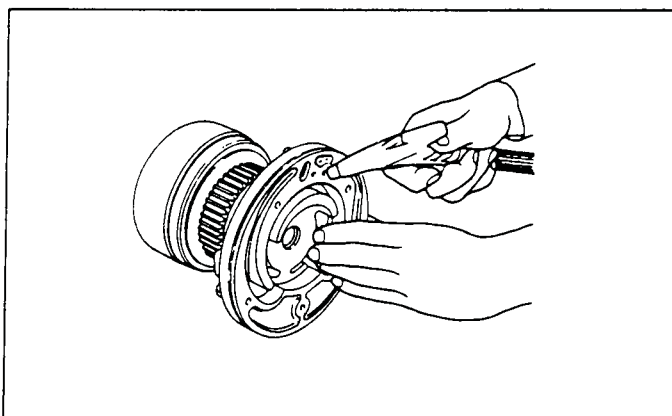


Fig. 120

## Center Support

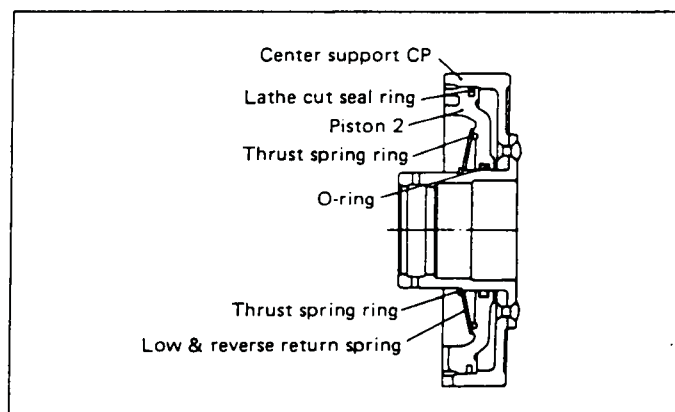


Fig. 121

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# Technical Service Information

## DISASSEMBLY INSPECTION

1) Use the following tools to remove the snap ring from the center support.

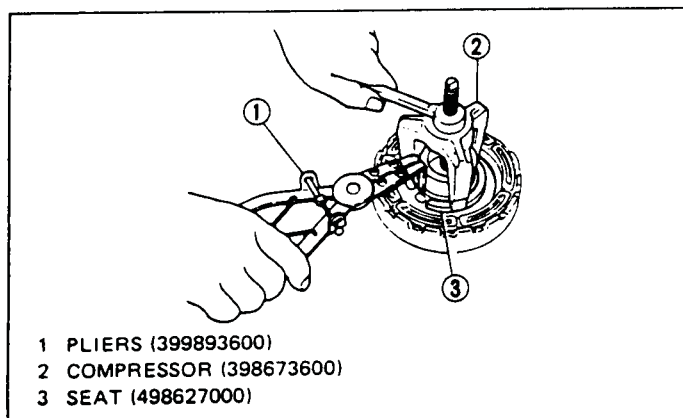


Fig. 122

2) Remove clutch piston 2 by applying air into the oil hole in center support.

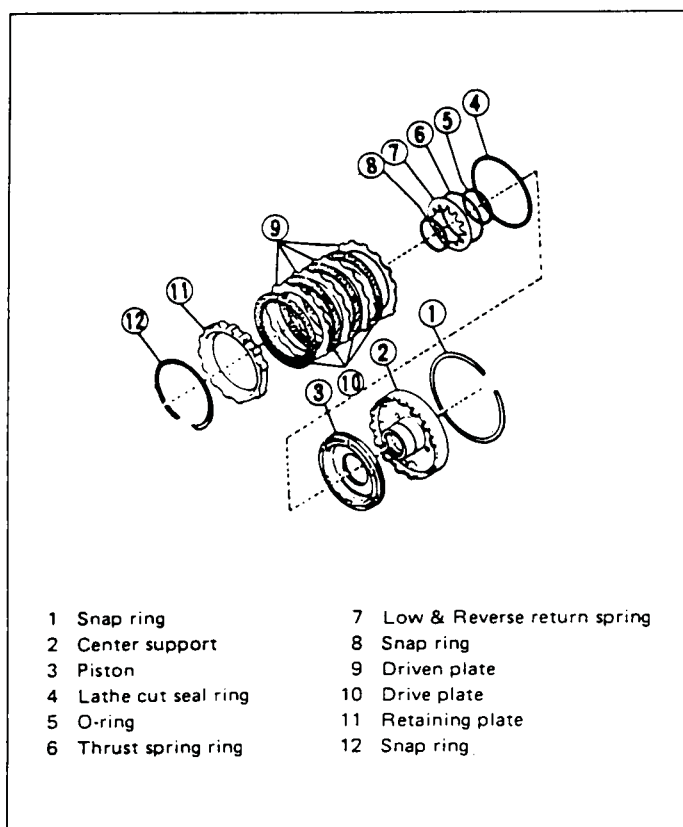


Fig. 123

- 1) Replace low & reverse return spring if it is fatigued.
- 2) Check seal ring and O-ring for damage. If necessary, replace.
- 3) Replace other parts which are worn or damaged.

## ASSEMBLY

To assemble the center support ASSY, reverse the order of disassembly.

Be sure to apply the ATF onto all parts when assembling.

For center support ASSY, use the same tools as those used during disassembly, and be careful not to damage the seal ring during ASSY.

## Oil Pump

## DISASSEMBLY

Remove the bolts and disassemble the oil pump carrier and transmission cover (intermediate case).

Remove the inner and outer gears from the oil pump carrier.

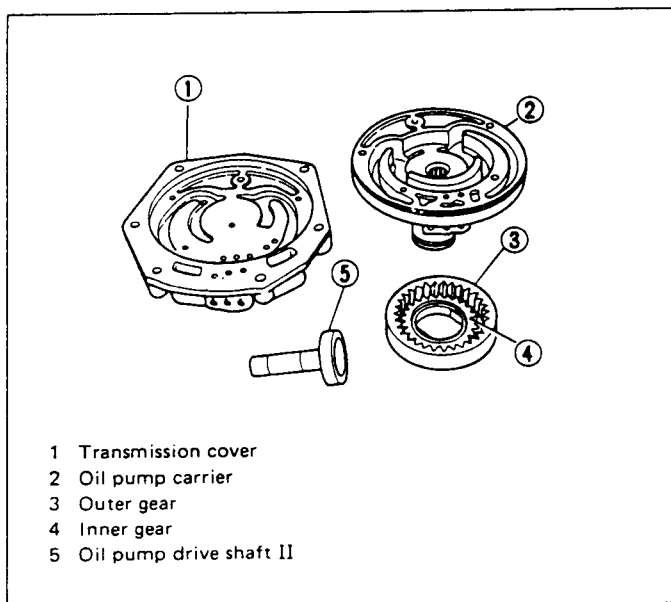


Fig. 124

When disassembling the oil pump, note the positions of the side faces of inner gear and outer gear so that they may be installed with their side faces facing the same way.



## INSPECTION

- 1) Check the inner and outer gear tooth faces for damage or wear. If necessary, replace.  
Replace the O-ring and seal rings if they are damaged.

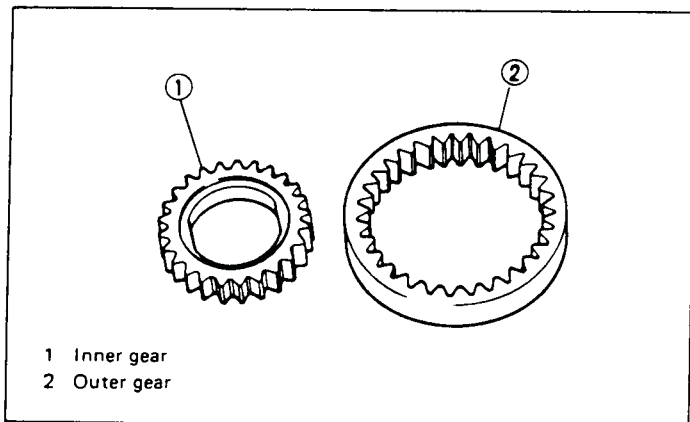


Fig. 125

- 2) Check the bushing and two needle roller bearings (15 x 21 x 12 mm) located in the oil pump carrier. If they are damaged, replace.
- 3) Replace oil pump carrier and/or transmission cover if the contacting surface with inner gear or outer gear is damaged.
- 4) Replace oil pump shaft 2 if the shaft portion or contacting surface with inner gear is damaged.

## REMOVAL INSTALLATION

- 1) Removal of needle bearing and bushing

Set up the oil pump carrier as shown in the figure, and drive out the bushing and two roller bearings at one time with NEEDLE BEARING REMOVER 2 (399903600).

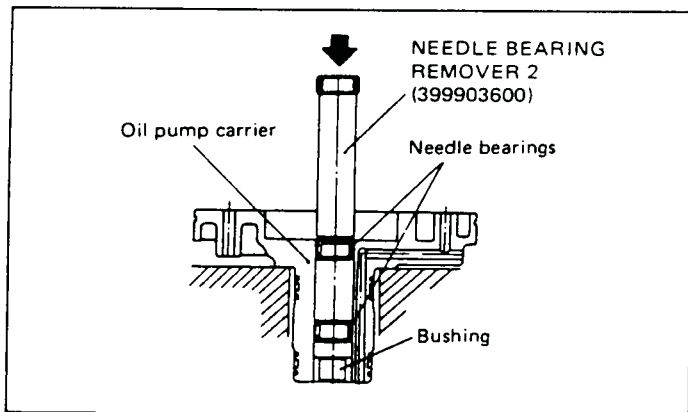


Fig. 126

- 2) Installation of needle bearing and bushing  
(1) When installing the middle needle roller bearing, use INSTALLER (399543600) and INSTALLER 2 (398863600) as shown in the figure.

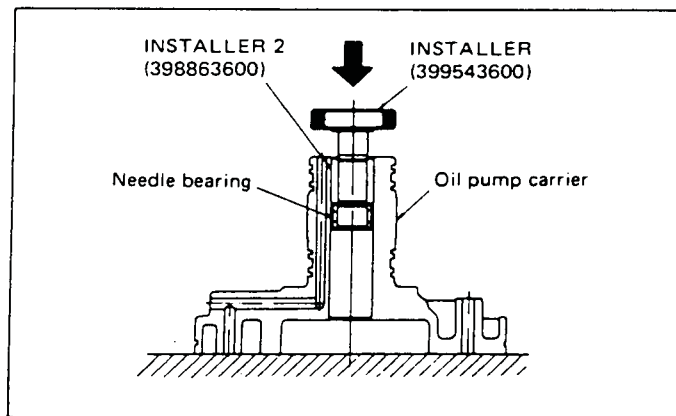


Fig. 127

- (2) When installing the bushing and remaining needle roller bearing, use INSTALLER (399543600), as shown in the figure.

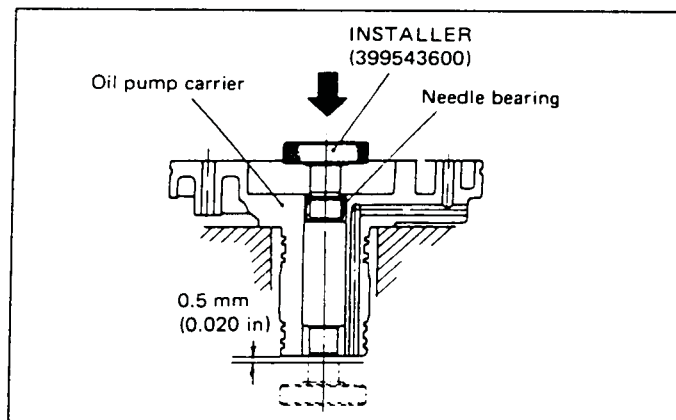


Fig. 128

## MEASUREMENT

To check clearances, use GAUGE (398643600) and THICKNESS GAUGE (499667000).

- 1) Clearance between inner/outer gear and transmission cover (intermediate case).

Standard clearance:

0.02 – 0.04 mm (0.0008 – 0.0016 in)

Replace the gears as a set if the clearance exceeds 0.08 mm (0.0031 in).

Inner gear	31346X0F04	31346X0F05	31346X0F06
Outer gear	31347X0100	31347X0101	31347X0102
Thickness mm (in)	16 – 15.99 (0.6299 – 0.6295)	15.99 – 15.98 (0.6295 – 0.6291)	15.98 – 15.97 (0.6291 – 0.6287)

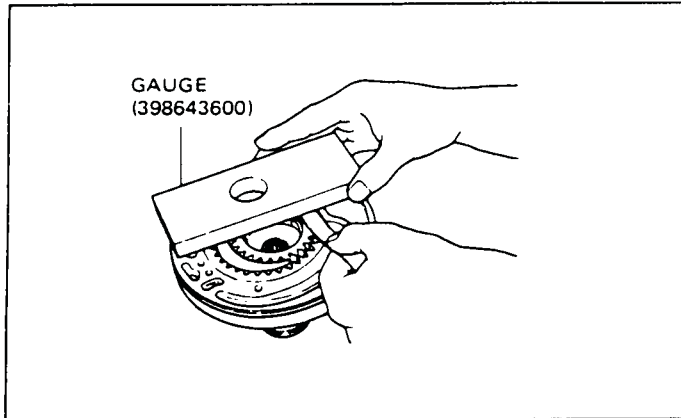


Fig. 129

- 2) Clearance between crescent and tooth tip of outer gear.

**Standard clearance:**  
0.14 – 0.21 mm (0.0055 – 0.0083 in)

Replace the gears as a set if the clearance exceeds 0.25 mm (0.0098 in).

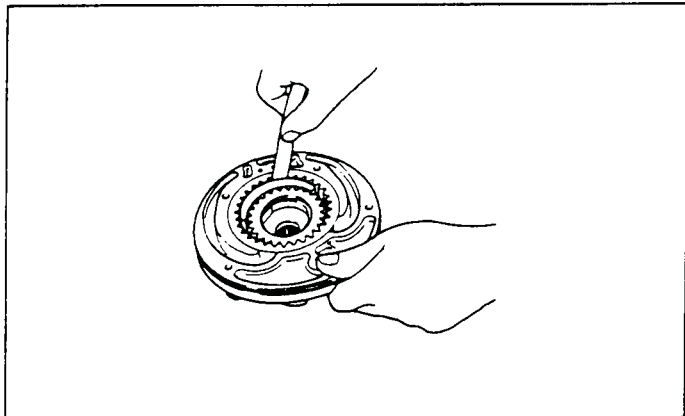


Fig. 130

- 3) Radial clearance between outer gear and oil pump carrier.

**Standard clearance:**  
0.05 – 0.20 mm (0.0020 – 0.0079 in)

If the clearance exceeds 0.25 mm (0.0098 in), replace the gears as a set.

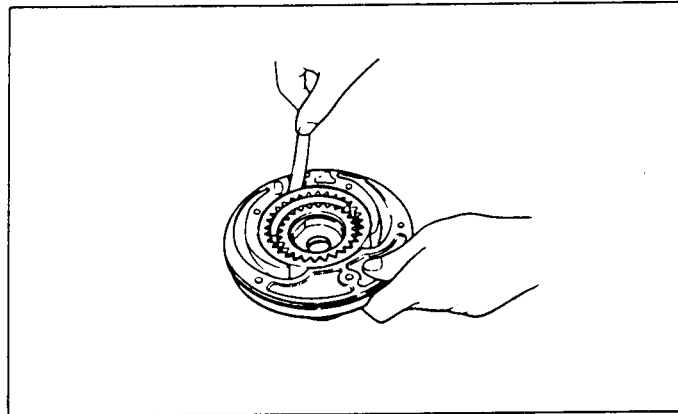


Fig. 131

- 4) Clearance between seal ring and groove.

**Standard clearance:**  
0.04 – 0.16 mm (0.0016 – 0.0063 in)

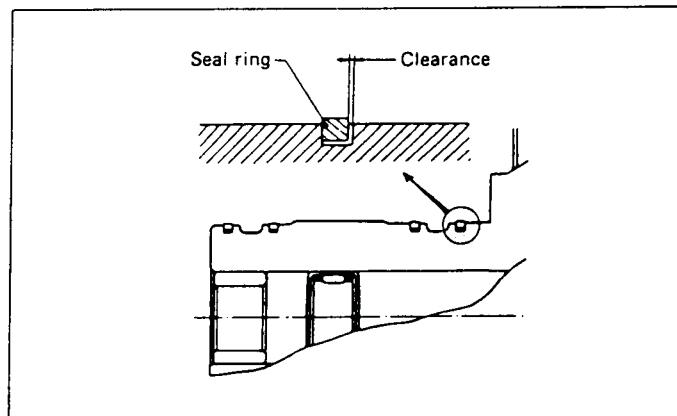


Fig. 132

## ASSEMBLY

- 1) Place the oil pump carrier as shown in the figure, set the inner and outer gears properly, and insert the oil pump drive shaft II into the oil pump carrier.





## Technical Service Information

### Planetary Gear

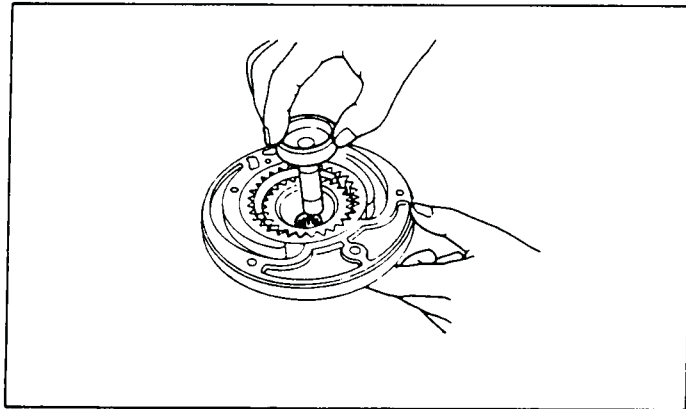


Fig. 133

- a. When installing the inner and outer gears, be sure that the faces of the gears face as before disassembly.
- b. Apply the ATF to the side faces of the gears.

2) Apply the ATF to the O-ring located on the periphery of the oil pump carrier.

When installing the transmission cover, be sure to align the bolt holes. Then, tighten the cover with the bolts.

#### Torque:

6 – 8 N·m (0.6 – 0.8 kg·m, 4.3 – 5.8 ft·lb)

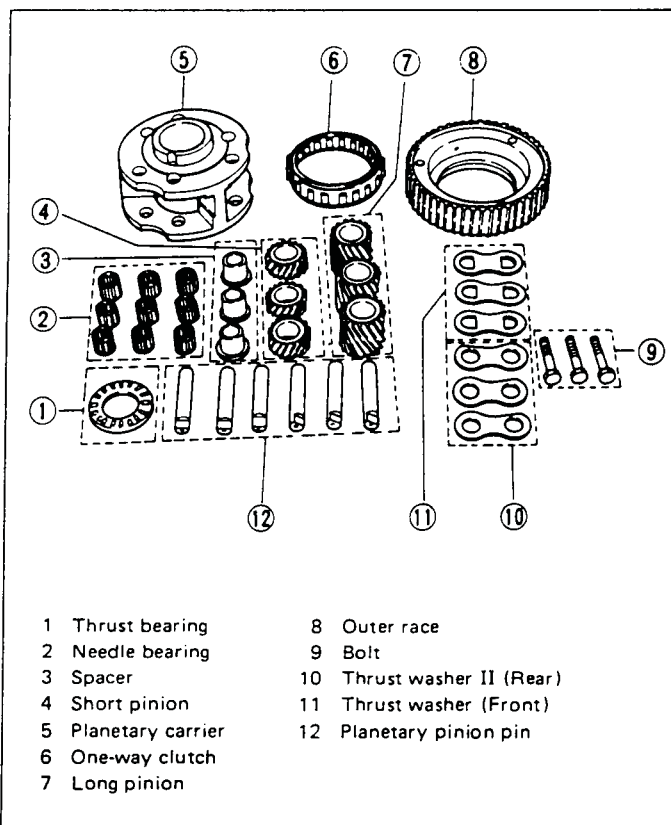


Fig. 135

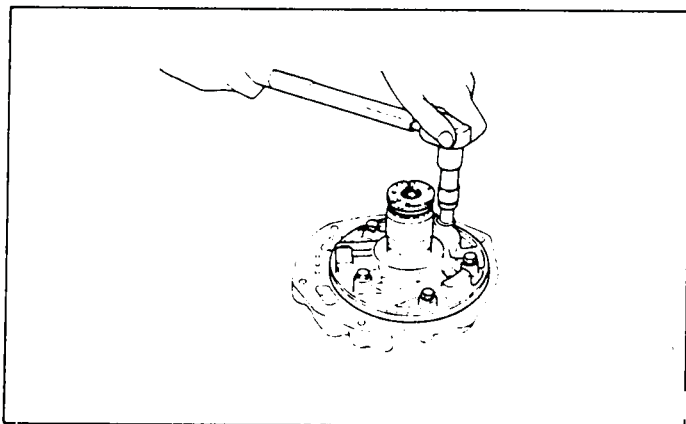


Fig. 134

- a. When inserting the oil pump carrier into the cover, press gradually so as not to damage the O-ring.
- b. After installing the oil pump to the transmission case, fit the oil pump drive shaft to the oil pump drive shaft II and then check that the oil pump gears can easily be rotated with hand.
- c. When assembling the intermediate case and oil pump carrier, pay attention to the assembling direction of the O-ring.

## DISASSEMBLY

Remove the bolts securing the one-way clutch outer race to the planetary carrier.

Push the pinion pin out toward the one-way clutch side, and detach the short pinions, long pinions, thrust washers, thrust washer IIs, needle roller bearings, spacers, and thrust bearing.

Remove the one-way clutch from the outer race.

## INSPECTION

Check gear faces for damage.

Check the needle bearings and thrust washers for damage. If necessary, replace.

Check the one-way clutch sprag for wear or damage. If necessary, replace.

Check the bushing at the one-way clutch outer race for wear or damage. If necessary, replace.

Check the planetary carrier-to-thrust washer clearance to see that it is within the specifications.

**Standard clearance:**

0.15 – 0.60 mm (0.0059 – 0.0236 in)

If the clearance exceeds 0.70 mm (0.0276 in), replace.

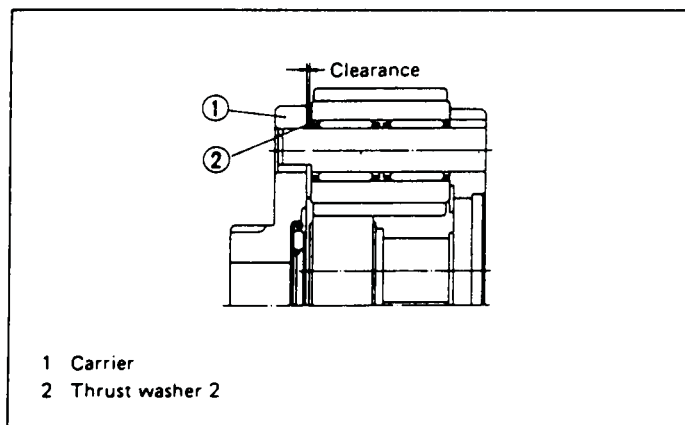


Fig. 136

## ASSEMBLY

- 1) Install thrust bearing to planetary carrier.
- 2) To assemble the planetary gear, reverse the order of disassembly. Pay particular attention to see that the installed parts face properly.
- 3) When installing the one-way clutch on the outer race, push the T bar with finger to insert the one-way clutch until a snap is felt on the finger. Secure the one-way clutch retainer in the outer race.

**Torque:**

14 – 16 N·m (1.4 – 1.6 kg·m, 10 – 12 ft·lb)

## Control Valve

The control valve is composed of parts which are accurately machined to a high degree and should be handled carefully during disassembly and assembly. As these parts are similar in shape, they should be arranged in neat order on a table after disassembly so that they can be easily installed to their original positions. Spring-loaded parts should be also handled carefully, as springs may jump out of place when the parts are disassembled or removed. Extreme care should be taken so as not to drop valves on the floor. Before assembling, the parts and valves should be dipped in a container filled with the ATF.

Make sure that the valves are clean and free from any foreign material before assembly. Torque specifications should also be observed.

If clutch seizure, brake band burning, or oil contamination is encountered, disassemble the control valve ASSY for inspection. When reassembling, flush all parts.

## DISASSEMBLY

1) Oil strainer

Remove the bolts and nut securing the oil strainer, and detach the oil strainer. The nut is marked "⊕" and the bolt is marked (↓) in the figure.

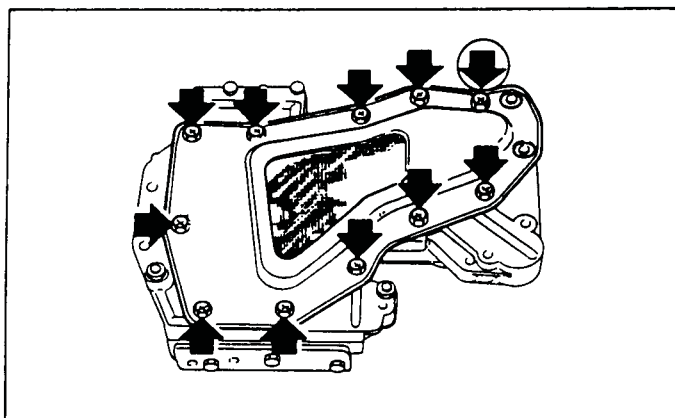


Fig. 137

**Do not use a cross-head screwdriver.**

2) Valve bodies and plate

Remove the bolts, and separate the lower valve body, plate and upper valve body.

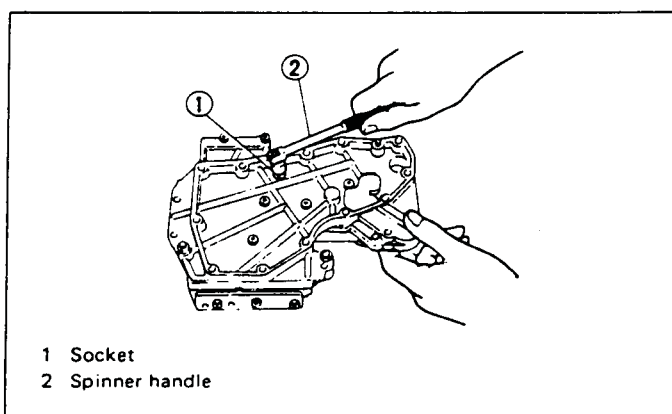


Fig. 138



## Technical Service Information

When removing the plate, be careful not to lose the following parts located in the lower valve body:

Orifice check valve, spring, throttle relief spring and steel ball.

3) Manual valve

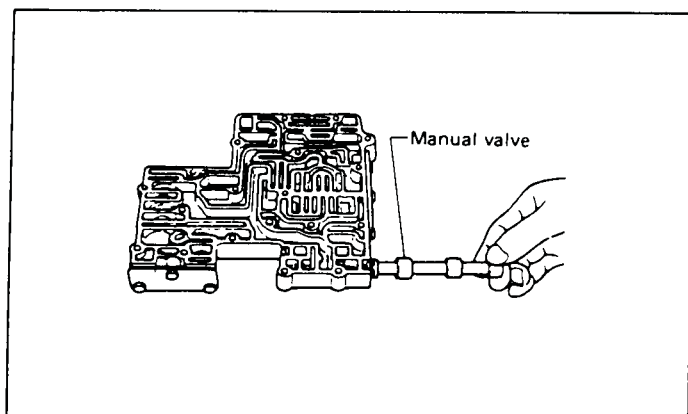


Fig. 139

4) 1-2 shift and 2-3 shift valves and pressure modifier valve.

**Do not use a cross-head screwdriver.**

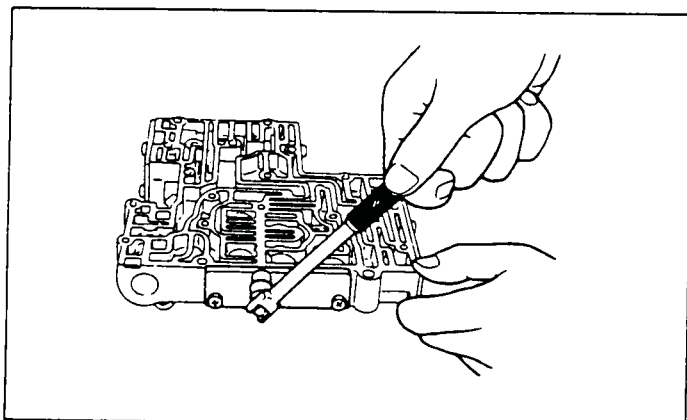


Fig. 140

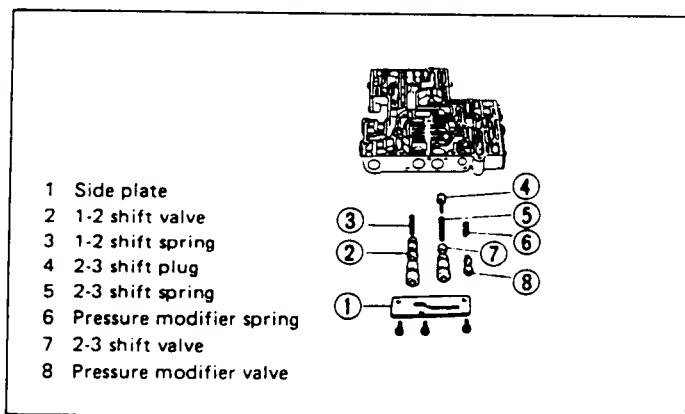


Fig. 141

5) Pressure regulating valve and second lock valve.

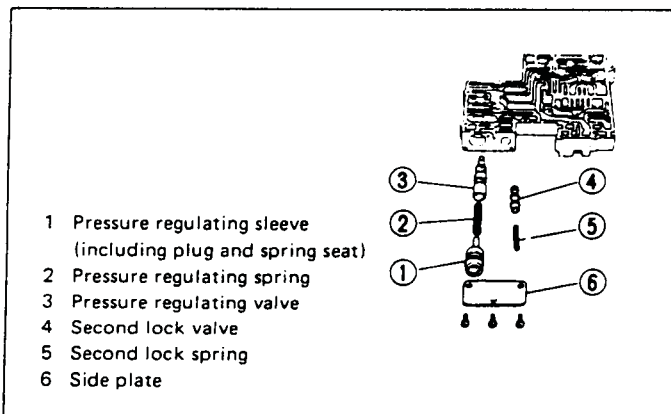


Fig. 142

6) Solenoid downshift valve, throttle back-up valve, 3-2 timing valve and vacuum throttle valve.

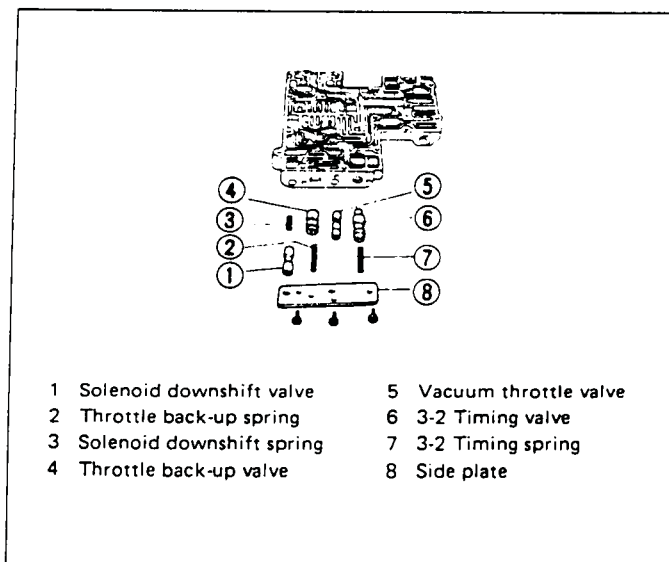


Fig. 143

## INSPECTION

Replace the control valve ASSY as a set if excessive defect is found in the following parts.

- Seized valves
- Fatigued valve spring or check valve
- Damaged oil strainer
- Leaky plate
- Valve body with damaged oil passages
- Valve body with damaged threads

Description of springs in valves.

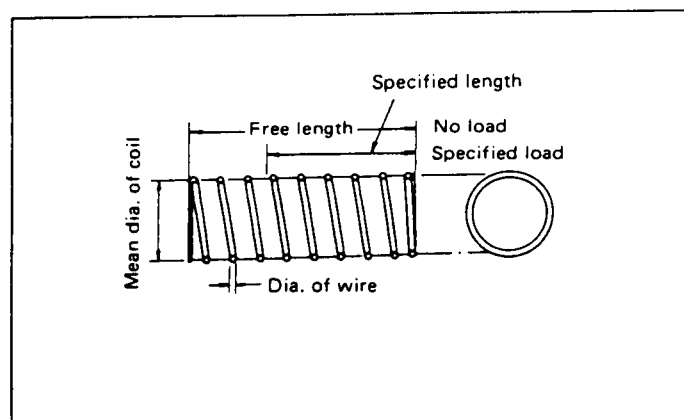


Fig. 144

Valve		Wire dia. mm (in)	Mean dia. of coil mm (in)	Effective turn	Free length mm (in)	When installed	
						Specified length mm (in)	Specified load N (kg, lb)
Detent manual		1.3 (0.051)	6.0 (0.236)	15.0	32.4 (1.276)	26.5 (1.043)	53.9 (5.5, 12.1)
Pressure regulator		1.2 (0.047)	10.5 (0.413)	13.0	43.0 (1.693)	23.5 (0.925)	27.5 (2.8, 6.2)
Pressure modifier	Non-TURBO	0.4 (0.016)	8.0 (0.315)	5.0	18.5 (0.728)	9.0 (0.354)	1.0 (0.1, 0.2)
	TURBO	0.5 (0.020)	8.0 (0.315)	5.5	17.7 (0.697)	9.0 (0.354)	2.0 (0.2, 0.4)
1-2 shift		0.7 (0.028)	6.3 (0.248)	12.5	32.0 (1.260)	16.0 (0.630)	10.79 (1.10, 2.43)
2-3 shift		0.7 (0.028)	6.2 (0.244)	18.0	41.0 (1.614)	17.0 (0.669)	13.73 (1.40, 3.09)
Throttle backup	Non-TURBO	0.8 (0.031)	6.5 (0.256)	14.0	36.0 (1.417)	18.8 (0.740)	18.83 (1.92, 4.23)
	TURBO	1.0 (0.039)	6.3 (0.248)	11.0	25.8 (1.016)	18.8 (0.740)	25.50 (2.60, 5.73)
Solenoid downshift		0.55 (0.022)	5.0 (0.197)	12.0	22.0 (0.866)	12.5 (0.492)	5.88 (0.60, 1.32)
Second lock		0.55 (0.022)	5.0 (0.197)	16.0	33.5 (1.319)	21.0 (0.827)	5.88 (0.60, 1.32)
Throttle relief	Non-TURBO	0.9 (0.035)	5.6 (0.220)	14.0	26.8 (1.055)	19.0 (0.748)	21.48 (2.19, 4.83)
	TURBO	1.0 (0.039)	5.5 (0.217)	13.0	25.0 (0.984)	19.0 (0.748)	27.95 (2.85, 6.28)
Orifice check		0.2 (0.008)	4.8 (0.189)	15.0	21.5 (0.846)	11.5 (0.453)	0.10 (0.01, 0.02)
3-2 timing	Non-TURBO	0.8 (0.031)	5.5 (0.217)	17.0	35.4 (1.394)	27.0 (1.063)	12.16 (1.24, 2.73)
	TURBO	0.8 (0.031)	5.5 (0.217)	17.0	38.8 (1.528)	27.0 (1.063)	17.06 (1.74, 3.84)

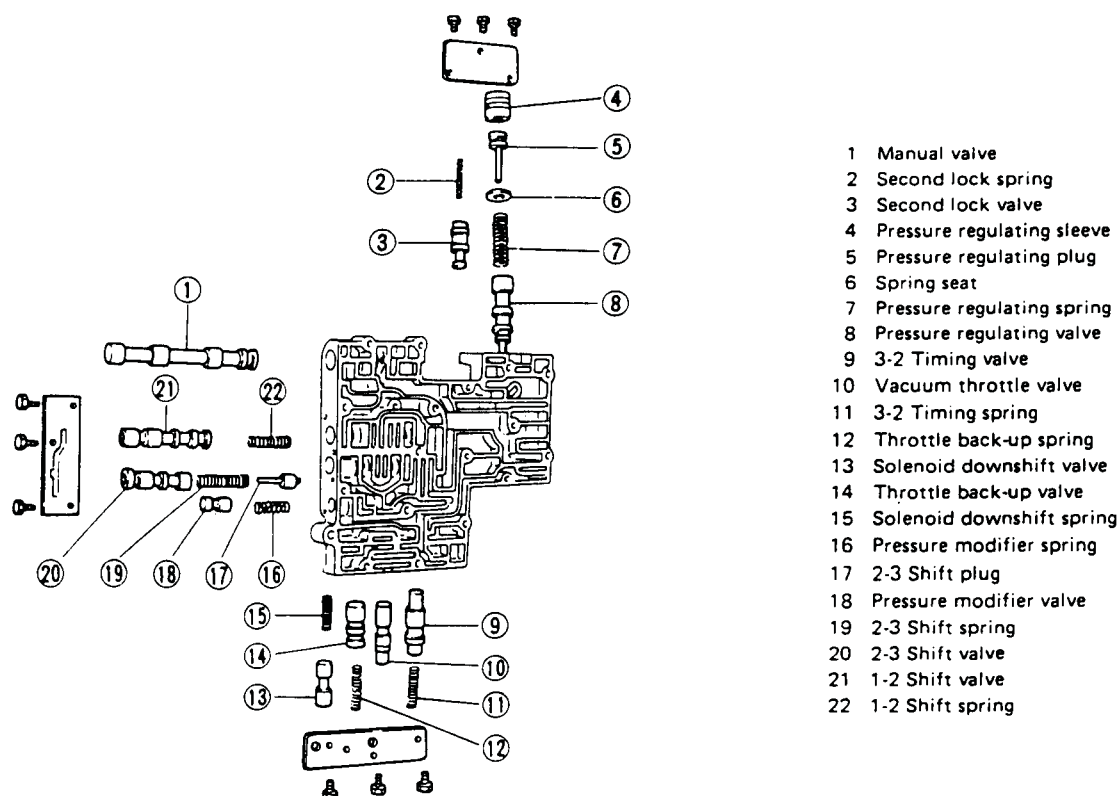


Fig. 145

## ASSEMBLY

To assemble the control valve ASSY, reverse the order of disassembly. Observe the following instructions.

When assembling minor parts, such as valve springs, and valves, refer to the general exploded view and detailed description of valve springs, in figure before. Apply the ATF to all valves when installing.

When tightening parts, be sure to observe the specified torques. Do not force valves into place, but lightly push them into place with hand.

1) Be sure to install the side plates:

**Torque (Side plate attaching screw):**

**2.5 – 3.4 N·m (0.25 – 0.35 kg·m, 1.8 – 2.5 ft-lb)**

2) Install the orifice check valves, spring, throttle relief spring and steel ball to the lower valve body.

**Do not misplace the check valve and relief valve.**

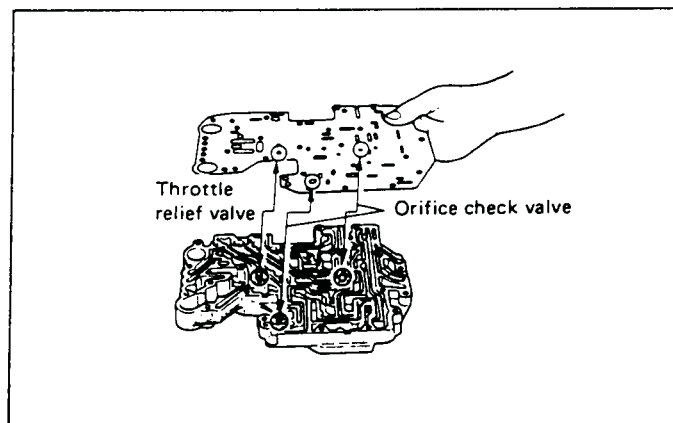


Fig. 146

3) Assemble the upper and lower valve bodies.

**Before tightening bolts to combine the upper and lower valve bodies, fix them in position by two reamer bolts at ↓-marks in the figure.**

**Torque (Control valve bolt):**  
2.5 – 3.4 N·m (0.25 – 0.35 kg-m, 1.8 – 2.5 ft-lb)

**Torque (Reamer bolt):**  
3.4 – 4.4 N·m (0.35 – 0.45 kg-m, 2.5 – 3.3 ft-lb)

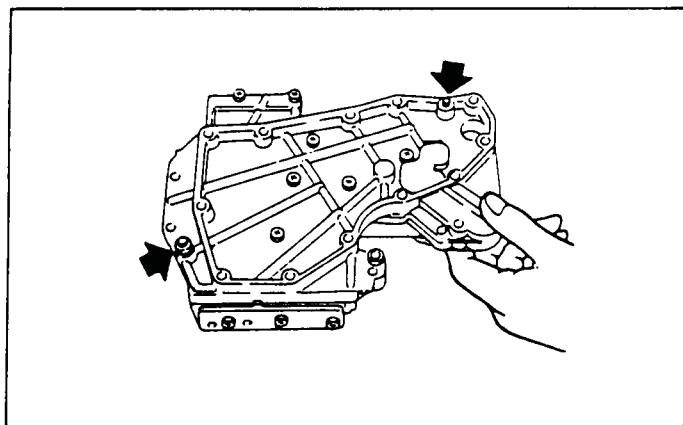


Fig. 147

4) Install the oil strainer.

**Torque (Oil strainer bolt):**  
3 – 4 N·m (0.3 – 0.4 kg-m, 2.2 – 2.9 ft-lb)

After completing ASSY of control valve ASSY, wrap it in paper to prevent dust from accumulating on it.

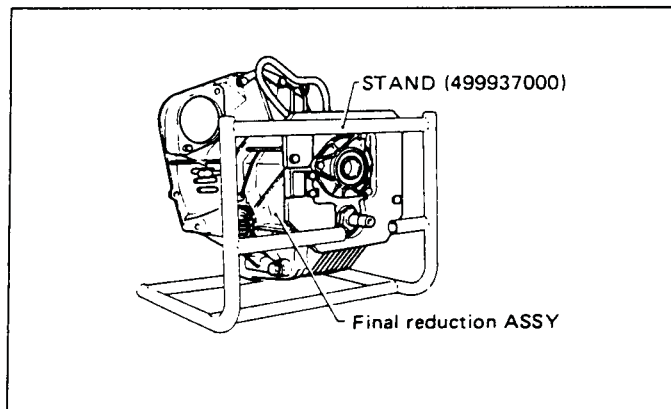


Fig. 148

6) Remove the 10 bolts combining the final reduction case and the converter housing. A small amount of oil will flow out when separating the cases. Place a container to receive the oil.

7) Remove the bolts securing the governor cover, and detach the governor body ASSY as shown in the figure.

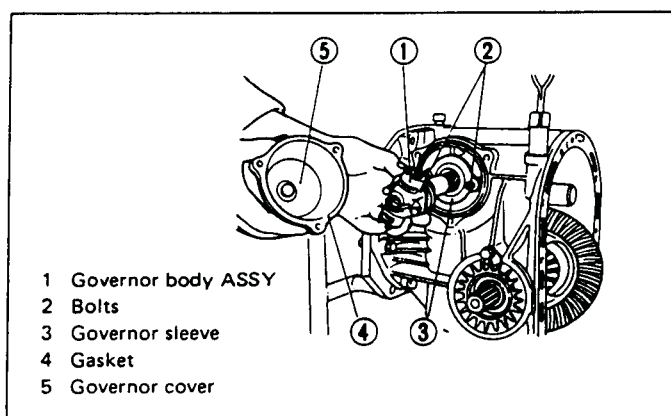


Fig. 149

## Final Reduction Case REMOVAL

- 1) Remove extension ASSY. (4WD)
- 2) Remove oil pan and control valve. (4WD)
- 3) Wrap vinyl tape around the spline portions of the drive pinion rear end in order not to damage the oil seal. (4WD)
- 4) Separate the transmission case section from the final reduction case section.
- 5) Place the final reduction ASSY with gasket on STAND (499937000). Then secure them with the two appropriate bolts and nuts.

When pulling out governor ASSY, turn it to the right slowly.

- 8) Parking actuator.
- 9) Remove the 3 bolts securing reduction gear oil seal holder.
- 10) Pry out the snap rings from the axle drive shafts in the differential case.
- 11) Remove the lock plates, and detach the axle shaft oil seal holders and the axle drive shafts as an ASSY.

Wrap vinyl tape over the shaft splines to avoid damaging the oil seal.

- 12) Move the differential ASSY to one side, and take it out of the final reduction case.



## Technical Service Information

- a. Do not confuse the right roller bearing (37 x 72 x 18.25 mm) with the left one.
- b. Remove oil level gauge before removing differential ASSY.

### 13) Drive pinion.

- (1) Put SHAFT (398653600) into the reduction drive gear, and engage it with STOPPER (398781600) to securely lock the reduction drive gear.
- (2) Remove the drive pinion lock nut with SOCKET WRENCH (35 mm) (499987100).

The staking may be left as it is.

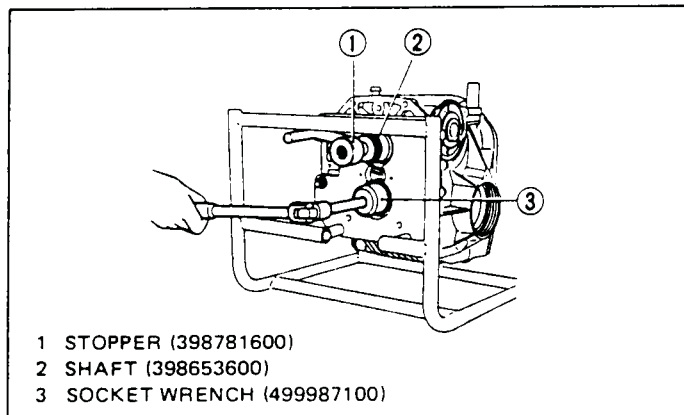


Fig. 150

(3) Remove final reduction case from Stand, and press out drive pinion. Pay attention to the reduction drive gear end which protrudes from the mating surface.

(4) Press out the reduction driven gear and bearing retainer as an ASSY from the transmission side by pressing the driven gear with an appropriate size of steel rod or pipe.

During this operation, pay attention to keep the reduction driven gear free from interfering with the case.

### 10) Speedometer driven gear.

- (1) Remove the snap ring from the end of the speedometer shaft, and detach the driven gear and steel ball.
- (2) Remove the snap ring from the speedometer shaft.

### 11) Reduction drive gear.

### 12) Stator shaft

### 2) Gaskets, oil seals, O-rings

Replace gaskets at every removal.

Replace O-rings if the sealing lips are folded, torn or deformed. Replace oil seals if getting loose or spring, deformation of lip or any other abnormality are recognized.

### 3) Bearings

Check bearings for damaged roller face and abnormal wear.

If necessary, replace bearings as an ASSY.

Replace bearings which show abnormal color on the roller face.

### 4) Gears

If damage or abnormality are recognized on the tooth surface of hypoid gear, differential gear, reduction gear and governor gear, replace them with new ones.

Check the gears carefully, because worn tooth surface of abnormal tooth contact, which is difficult to find on external appearance, will become a cause of gear noise.

## INSTALLATION

1) When final reduction components are disassembled, assemble them properly.

2) Press thrust bearing retainer with front bearing cup preset in it and reduction driven gear into final reduction case by using INSTALLER (499427000) and HANDLE (498477000).

a. Be sure to align the projection of retainer flange with the groove of case.

b. Press the retainer until the end surface of retainer flange reaches that of case.

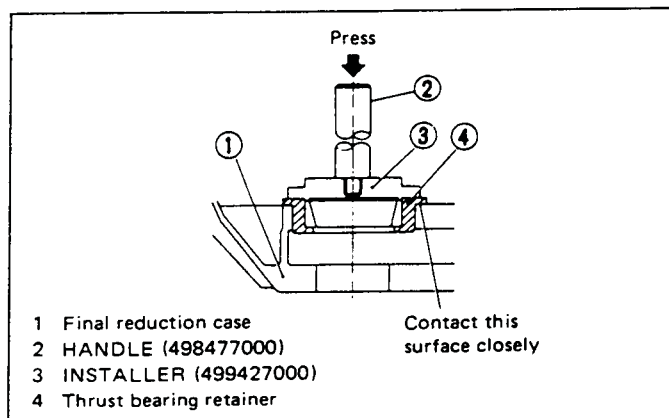


Fig. 151

## INSPECTION

Wash all parts and carefully inspect them as follows:

### 1) Cases

Replace if cracked or damaged.

Repair if a mating surface is scored or seized.

Replace seized or cocked bushings.

3) Install the transmission case's front gasket and reduction drive gear on the final reduction case, and snugly tighten the 8 mm bolts at three places.





## Technical Service Information

Do not forget to install the "O" ring on the periphery of the holder.

4) Using REDUCTION BEARING INSTALLER (499247200), press the holder into the bore in the final reduction case.

Be careful not to damage the gasket.

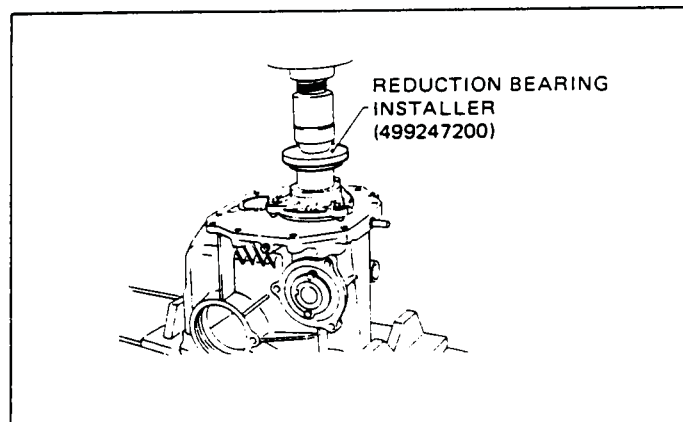


Fig. 152

5) Secure the final reduction case to the Differential Stand with two bolts [tightening torque: 10 N·m (1.0 kg·m, 7 ft·lb)] and tighten the three holder retaining bolts to the specified torque.

**Tightening torque of holder:**  
25 N·m (2.5 kg·m, 18 ft·lb)

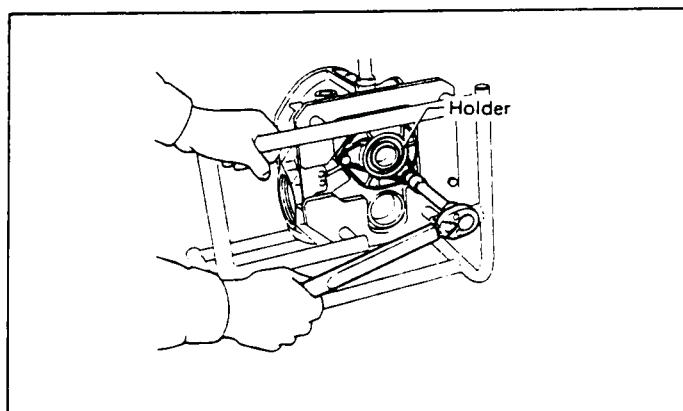


Fig. 153

6) Install speedometer driven gear.

7) Make certain that the run-out at the tip of reduction drive gear shaft is within specifications by turning it with SHAFT (398653600) and HANDLE (899924100).

**Run-out (Reduction drive gear shaft):**  
0 – 0.08 mm (0 – 0.0031 in)

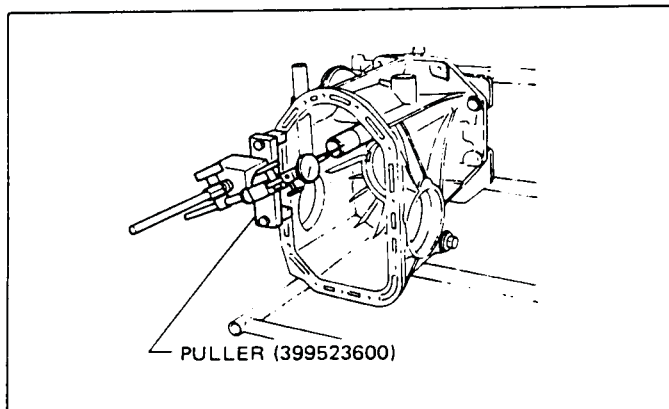


Fig. 154

Use PULLER (399523600) as an attachment.

8) Preload adjustment of drive pinion bearings  
(1) Install the front bearing cone, SPACER (399913604), and rear bearing cone in this order onto MASTER 2 (499917400) in final reduction case as shown in the figure. Using SOCKET WRENCH (499987100) tighten HOLDER (399913603) with an open end wrench put inside the case to lock as shown in the figure.

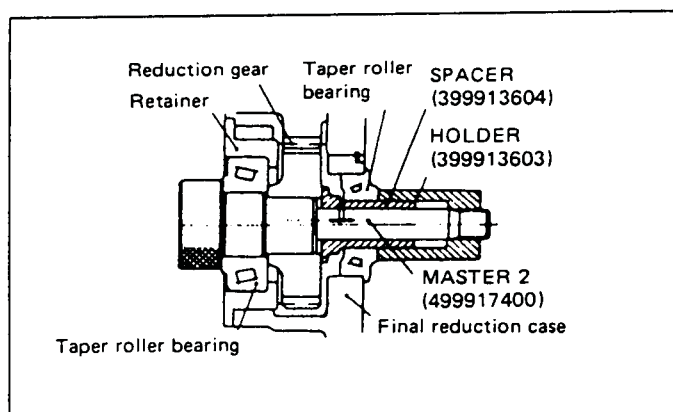


Fig. 155

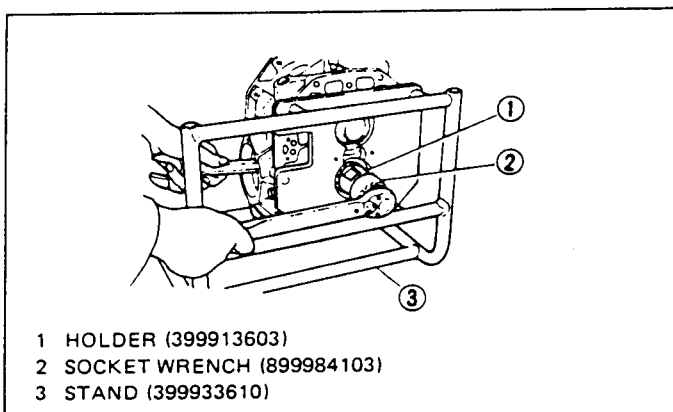


Fig. 156

(2) Attach PULLEY (498567000) on the hexagonal head of HOLDER, and tighten HOLDER so that the tension of the spring balance reads 29 to 39 N (3 to 4 kg, 7 to 9 lb) to give the specified preload.

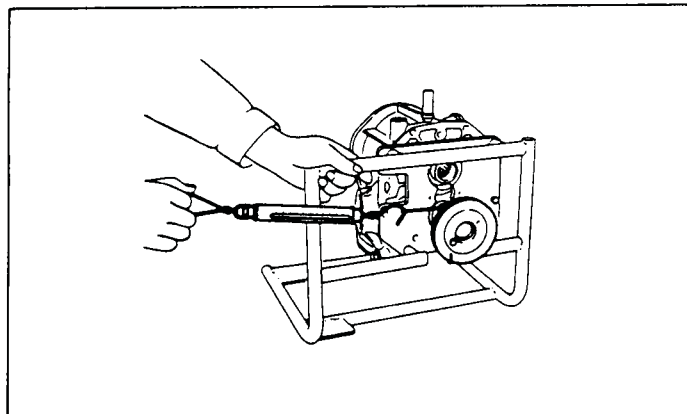


Fig. 157

- Don't tighten HOLDER excessively.
- The torque to give the specified preload is approximately 10 to 12 N·m (1.0 to 1.2 kg·m, 7 to 9 ft·lb).
- The starting friction torque of the drive pinion is 1.23 to 1.62 N·m (12.5 to 16.5 kg·cm, 10.9 to 14.3 in·lb).

(3) Measure the maximum clearance between SPACER and the rear bearing which is preloaded (that is, with the tool installed) by sliding SPACER in the axial direction to the extremes with the help of MAGNET BASE (498247001) attached DIAL GAUGE (498247100) as shown in the figure.

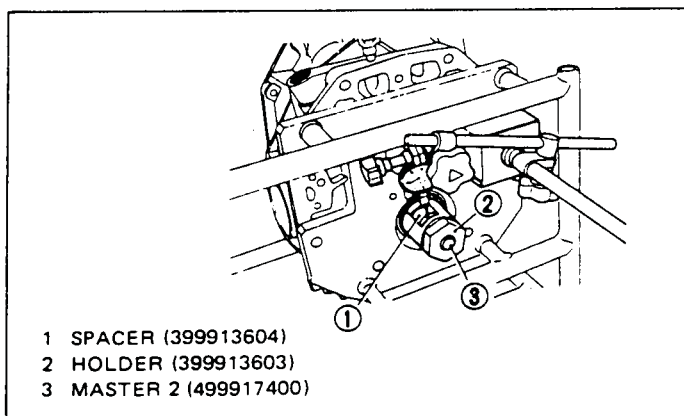


Fig. 158

(4) Select a combination of a shim and a spacer from those in the following table.  
Thickness of shim plus spacer to be installed should be determined by the following formula.

$$t = 10 + h + [\pm H \times 0.001] + 0.07$$

unit: mm

t : Thickness of shim plus spacer to be installed

H : Number stamped on SPACER (399913604)

h : Movement of SPACER (399913604) in axial direction (dial gauge reading)

Drive pinion spacer	
Part No.	t
31454AA000	9.600 mm (0.3780 in)
31454AA010	9.625 mm (0.3789 in)
31454AA020	9.650 mm (0.3799 in)
31454AA030	9.675 mm (0.3809 in)
31454AA040	9.700 mm (0.3819 in)
31454AA050	9.725 mm (0.3829 in)
31454AA060	9.750 mm (0.3839 in)
31454AA070	9.775 mm (0.3848 in)

Drive pinion shim	
Part No.	t
31451AA000	0.6 mm (0.024 in)
31451AA010	0.8 mm (0.031 in)
31451AA020	1.0 mm (0.039 in)
31451AA030	1.2 mm (0.047 in)
31451AA040	1.4 mm (0.055 in)

- If the shim and spacer which are installed are thinner than the thickness calculated by the formula, the preload will be greater than what is indicated by the spring balance. If the selected thickness is thicker than the calculated one, the preload will be smaller than the reading on the spring balance.
- DIAL GAUGE should be fixed firmly as shown in the previous figure.
- The selected shim and spacer should be installed after adjusting the pinion height.

## 9) Adjustment of drive pinion height

(1) Drive pinion height adjustment is made by shim(s) inserted between the front bearing cone and the back face of the pinion gear.

With the devices for preload measurement installed and tightened as described in "f", set MASTER (399913601) and GAUGE (398643600) to measure the clearance N



## Technical Service Information

between MASTER and GAUGE using THICKNESS GAUGE (499667000) as shown in the following figures.

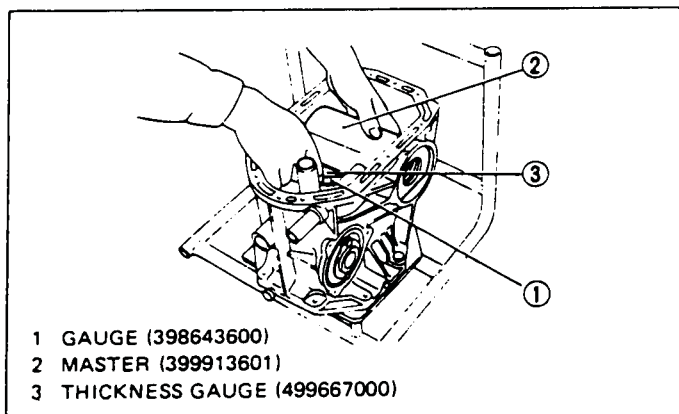


Fig. 159

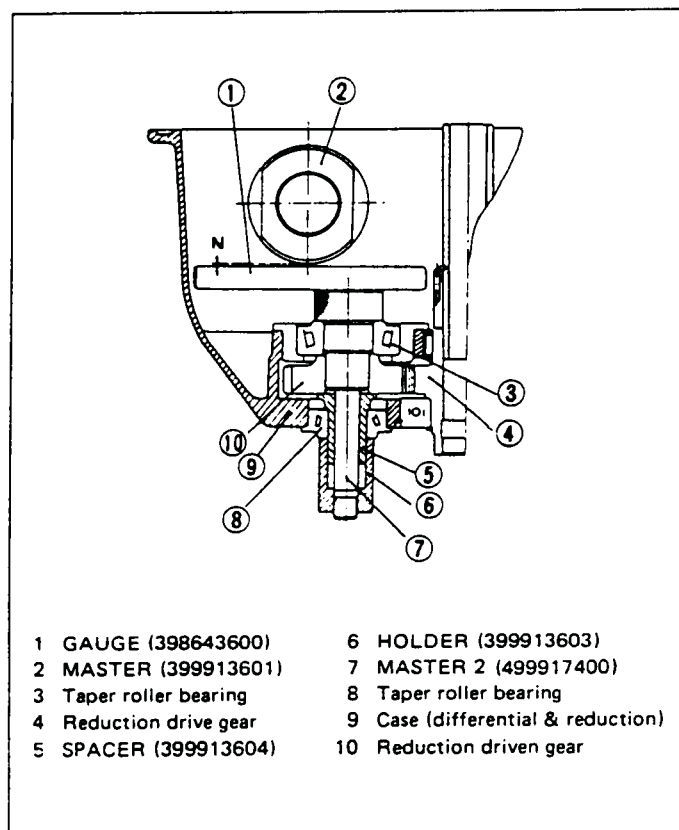


Fig. 160

a. When inserting MASTER into the hole of the final reduction case be careful not to damage the hole surface. Damaged surface must be reconditioned with oil stone, etc. since it can result in oil leakage from the periphery of the axle shaft oil seal holder.

b. Applying oil around MASTER makes its setting easier.

(2) Thickness of adjusting shim(s) (1 to 3 pieces) to be installed can be obtained by the following formula.

$$T = N + [\pm G \times 0.001] + [\pm L \times 0.001]$$

Unit: mm

T : Shim thickness

N : Measurement by thickness gauge

G : Figure on GAUGE (398643600)

L : Figure on MASTER 2 (499917400)

(3) Select shim(s) from those in the table.

Shim 2	
Part No.	t
31453AA000	0.150 mm (0.0059 in)
31453AA010	0.175 mm (0.0069 in)
31453AA020	0.200 mm (0.0079 in)
31453AA030	0.225 mm (0.0089 in)
31453AA040	0.250 mm (0.0098 in)
31453AA050	0.275 mm (0.0108 in)
31453AA060	0.300 mm (0.0118 in)
31453AA070	0.500 mm (0.0197 in)

### 10) Installation of drive pinion.

(1) Install the shim(s) selected in the drive pinion height adjustment to the drive pinion, and press the front bearing cone (the same one as used in the preload adjustment previously described) into drive pinion using INSTALLER (899580100) and INSTALLER (899874100).

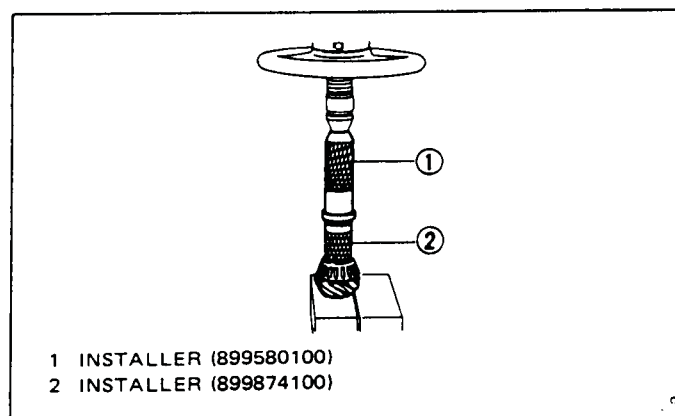


Fig. 161

Do not press the bearing retainer with INSTALLER.

(2) Install the drive pinion with the reduction driven gear in place and install the shim and spacer determined during the preload adjustment, and the rear bearing cone onto the drive pinion.

(3) Install the lock washer and lock nut.  
Using SHAFT (398653600), STOPPER (398781600), and SOCKET WRENCH (499987100), tighten the nut to specification as shown in the figure and stake the lock nut.

**Torque (Lock nut):**  
118 N·m (12 kg-m, 87 ft-lb)

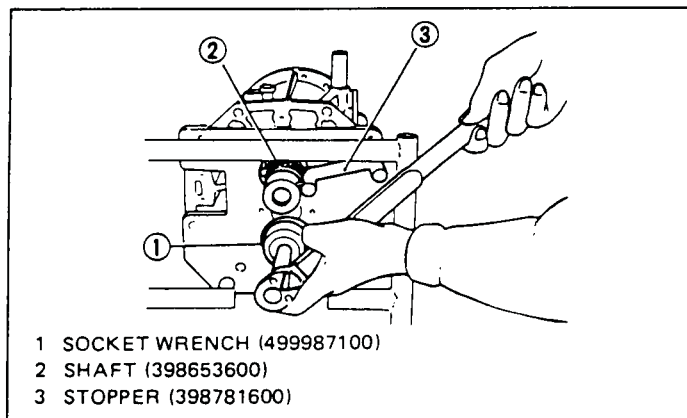


Fig. 162

## 11) Recheck of preload.

(1) Recheck the preload by attaching PULLEY (498567000) to the lock nut as shown in the figure. If the reading of the spring balance is not within 29 to 39 N (3 to 4 kg, 7 to 9 lb) select another shim and spacer combination.

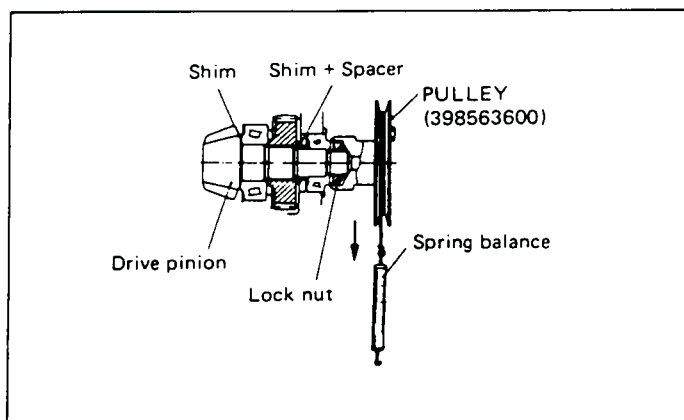


Fig. 163

(2) When rechecking the preload by using SOCKET WRENCH (499987100) and beam type torque wrench, observe whether the starting friction torque is within the following range.

**Torque:**  
1.23 – 1.62 N·m (12.5 – 16.5 kg-cm, 10.9 – 14.3 in-lb)

Before measuring preload, insert SHAFT (398653600) into the splined end of the reduction drive gear, and install HANDLE (899924100) to give the shaft 2 or 3 turns. After rechecking the preload, stake the lock nut at two points.

## 12) Installation of differential ASSY.

(1) Insert the differential ASSY without axle shaft into final reduction case.

Pay attention not to damage the axle shaft oil seal holder bores in final reduction case.

(2) Install the right and left axle shafts and secure with the snap rings.

Check the clearance between the differential pinion shaft and the axle drive shaft to see that it is within the specifications.

**Specified clearance:**  
0 – 0.2 mm (0 – 0.008 in)

Two snap rings are available for the adjustment of the above clearance.

Snap ring	
Part No.	Thickness
805026010	1.00 – 1.10 mm (0.0394 – 0.0433 in)
031526000	1.15 – 1.25 mm (0.0453 – 0.0492 in)

(3) Install axle shaft oil seal holder with WRENCH (399780111).

- Pay attention to the R and L marks of the oil seal.
- Remove the O-rings on the axle shaft oil seal holders.

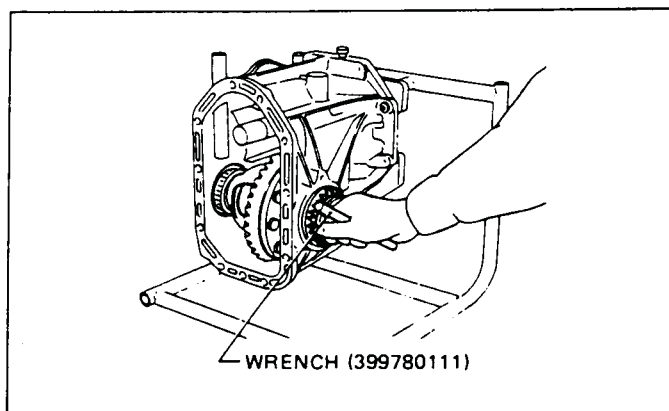


Fig. 164



## Technical Service Information

(4) Install HANDLE (899924100) and SHAFT (398653600) to the reduction drive gear, and turn the gear several times, and screw in the holder on the crown gear side until it lightly bottoms.

Repeat this operation several times to locate the proper position.

(5) Screw in the other holder until it bottoms.

(6) Attach oil seal holder lock plate and back off holder on the crown gear side approx. 1.5 notches, and tighten holder on the opposite side.

(7) Temporarily tighten the lock plate on the crown gear side.

(8) Screw in the holder opposite the crown gear by 0.5 to 1 notch, and tighten the lock plate temporarily.

13) Measurement of backlash between crown gear and drive pinion.

Turn HANDLE (899924100) several times, and attach MAGNET BASE (498247001) with DIAL GAUGE (498247100) to STAND.

Check the hypoid gear backlash to see if it is within the specifications.

---

**Backlash between crown gear and drive pinion:**  
**0.10 – 0.18 mm (0.0039 – 0.0071 in)**

---

14) Crown gear tooth contact patterns.

Apply a coat of Prussian blue over the three of four tooth faces of the crown gear, move the gear in forward and backward directions to obtain gear contact patterns.

Refer to the figure for various gear contact patterns.

If proper gear contact patterns are not obtained, readjust. If correct adjustment has been made, loosen the holder until the O-ring groove is appeared, then fit the O-ring into the groove and tighten in the holder to the position where the holder has been tightened to. Place the lock plate on the holder and tighten it to the specified torque. Perform the same job with the opposite axle shaft oil seal holder.

---

**Torque (Lock plate):**

**22 – 27 N·m (2.2 – 2.8 kg-m, 16 – 20 ft-lb)**

---

15) Installation of governor ASSY.

(1) Apply a coat of vaseline to needle bearing for governor shaft and the sealing lip of oil seal. Install governor ASSY.

**When installing the governor valve, be careful not to damage the seal ring and oil seal lip inside of the final reduction case.**

(2) Install gasket and governor cover with the mating surface of governor cover clean.

Tighten cover attaching bolts to the specified torque.

---

**Torque:**

**14 – 17 N·m (1.4 – 1.7 kg-m, 10 – 12 ft-lb)**

---

a. Before installing the cover, attach the washer to the governor cover with vaseline.

b. Replace the gasket with new one at every disassembly.



## Technical Service Information

### Crown Gear Tooth Contact Pattern

Checking item	Contact pattern	Corrective action
Correct tooth contact Tooth contact pattern slightly shifted toward toe under no-load rotation. (When loaded, contact pattern moves toward heel.)		
Face contact Backlash is too large.	 This may cause noise and chipping at tooth ends.	 Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.
Flank contact Backlash is too small.	 This may cause noise and stepped wear on surfaces.	 Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.
Toe contact (Inside end contact)	 Contact area is small. This may cause chipping at toe ends.	Adjust as for flank contact. 
Heel contact (Outside end contact)	 Contact area is small. This may cause chipping at heel ends.	Adjust as for face contact. 

Fig. 165

A1

#### 16) Installation of stator shaft.

Install the stator shaft to the converter housing with the gasket in place and with the flange of the shaft facing upward.

#### Torque:

23 – 26 N·m (2.3 – 2.7 kg-m, 17 – 20 ft-lb)

#### 17) Mating of final reduction case and converter housing.

- (1) Clean the mating surface.
- (2) Apply a coat of differential gear oil on the reduction drive gear shaft before mating the cases to facilitate the insertion of the reduction drive gear shaft into the stator shaft oil seal.
- (3) Replace the gasket with new one.

## Torque:

23 – 26 N·m (2.3 – 2.7 kg-m, 17 – 20 ft-lb)

## 18) Installation of parking actuator.

Install the actuator with the spacer on final reduction case.

## Torque:

8 – 11 N·m (0.8 – 1.1 kg-m, 5.8 – 8.0 ft-lb)

**When separating the final reduction case from STAND, be careful not to damage the gasket.**

19) Set the final reduction case section with converter housing downward.

20) Clean the mating surfaces of the cases.

21) After putting GUIDE (499257100) on the spline portion of drive pinion rear end, join the transmission case section to the final reduction case section. Also install transfer drive shaft.

## Torque:

23 – 26 N·m (2.3 – 2.7 kg-m, 17 – 20 ft-lb)

a. Be careful that the parking rod and parking actuator engages properly and the sealing lip is not damaged when assembling the cases.

b. Engagement of the reduction drive gear and planetary output gear will be completed easily by giving a slow and staccato turn to the axle drive shaft.

c. Apply a thin coat of ATF to GUIDE beforehand.

22) Install the following parts to the transmission case.

- (1) Control valve
- (2) Vacuum diaphragm ASSY
- (3) Down shift solenoid valve
- (4) Servo apply pipe and servo release pipe
- (5) Oil pan

23) Install the turbine shaft and oil pump drive shaft to the transmission, with the oil supply ports positioned as shown in the figure.

The turbine shaft and pump drive shaft must be installed from the front of the transmission.

Install the torque converter ASSY onto the stator shaft, turbine shaft and pump drive shaft.

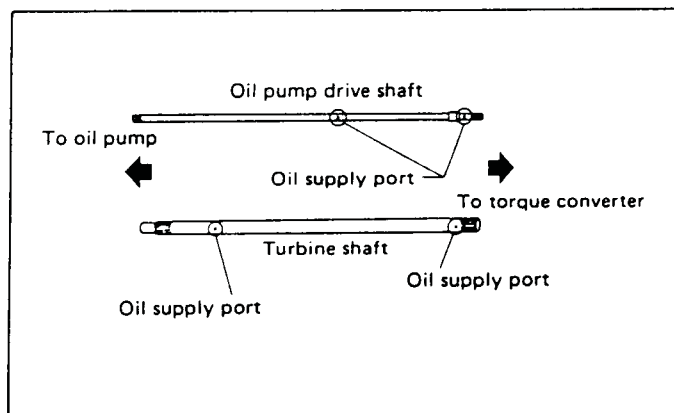


Fig. 166

**Take care not to damage the oil seal in the converter housing.**

24) Install vacuum pipe, oil supply pipe, ground wire and oil cooler pipe.

## Reduction Drive Gear

When gears, bearings, oil seals, etc. are damaged or when the passage in the air breather for the oil seal is blocked, disassemble and correct.

## DISASSEMBLY

1) After removing snap ring outer, remove speedometer drive gear and ball.

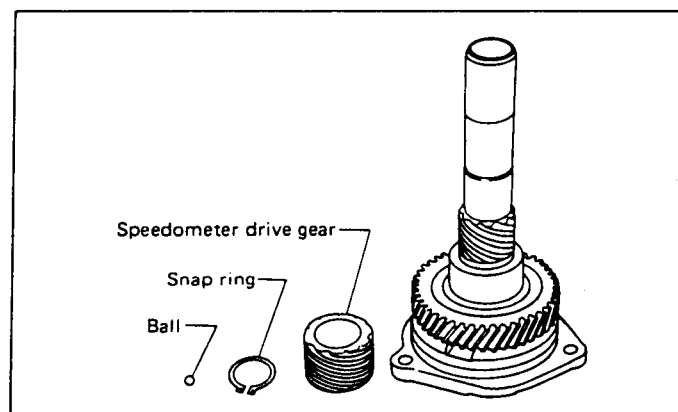


Fig. 167

2) Using a flat-bladed screwdriver, detach snap ring.





## Technical Service Information

3) Press the drive gear and ball bearing (from the holder) out, using GUIDE (498847000).

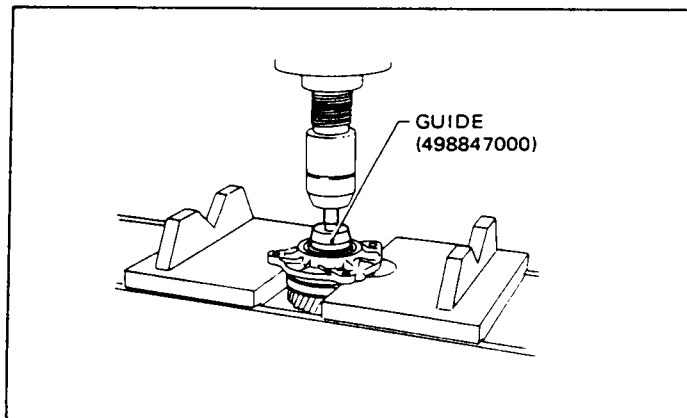


Fig. 168

- 4) Press the oil seal out.  
5) Pry the snap ring off the reduction drive gear, using the special tool and remove the bearing using GUIDE (498847000) and REMOVER (499717000).

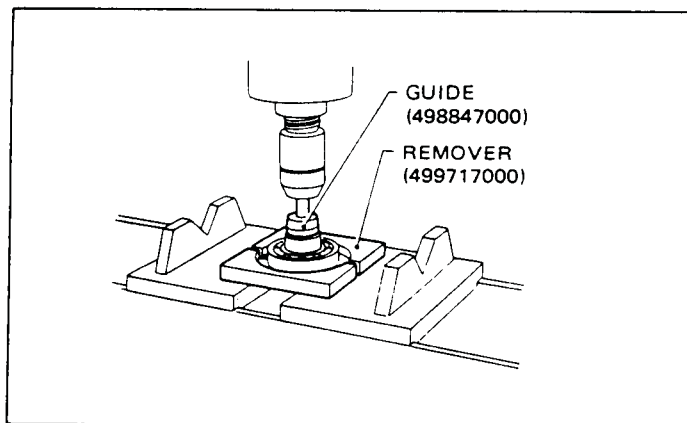


Fig. 169

## ASSEMBLY

- 1) Press the bearing into the holder and install the snap ring.

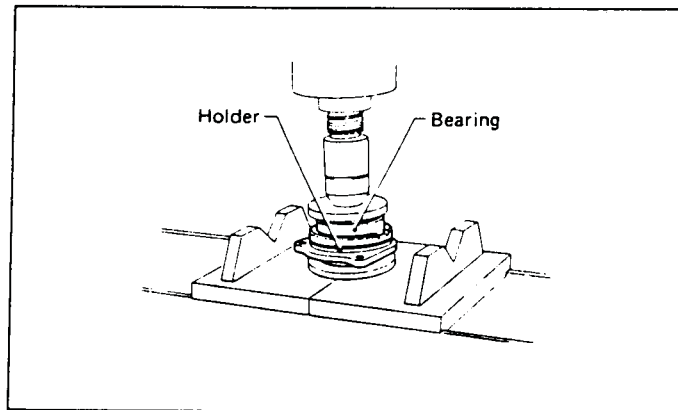


Fig. 170

- 2) Using a press, drive the bearing holder (incl. the bearing) into the reduction drive gear.

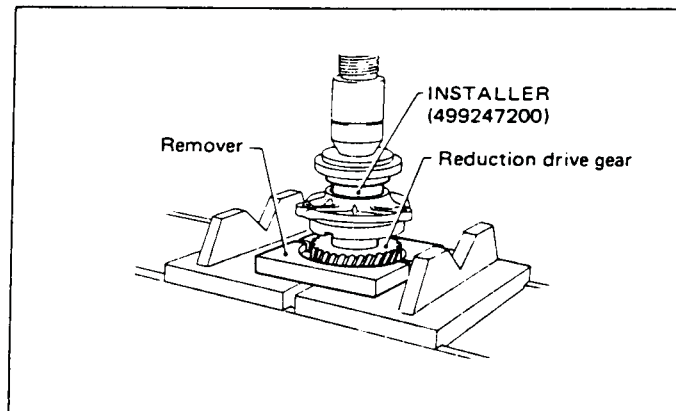


Fig. 171

- 3) Install the snap ring and, using INSTALLER (499247100), GUIDE (498847000) and SPACER (499267100), drive the oil seal into holder.

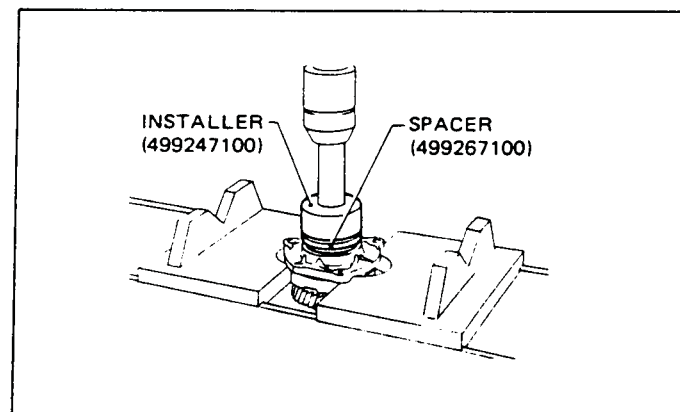


Fig. 172

AUTOMATIC TRANSMISSION SERVICE GROUP

- When installing the snap ring, be careful not to damage the oil seal surface.
- Always install the two oil seals with their backs facing each other.

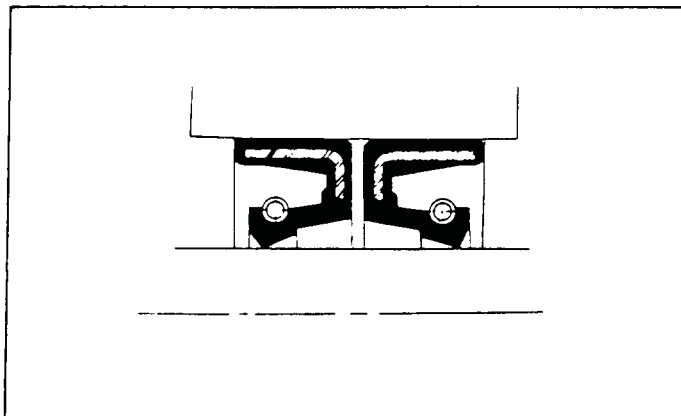


Fig. 173

- Install the ball into the shaft hole and set the gear. Then, install snap ring outer.

## Governor Valve Assembly

Refer to "ON-CAR SERVICE".

## Differential Assembly

Refer to Chapter 3-1 "Manual Transmission and Differential".

## Drive Pinion Rear Bearing Cup

### DISASSEMBLY AND ASSEMBLY

Attach INSTALLER (399513600) to the end face of the bearing cup from the inside of the case, and press it out. Installer is also used when installing the bearing cup.

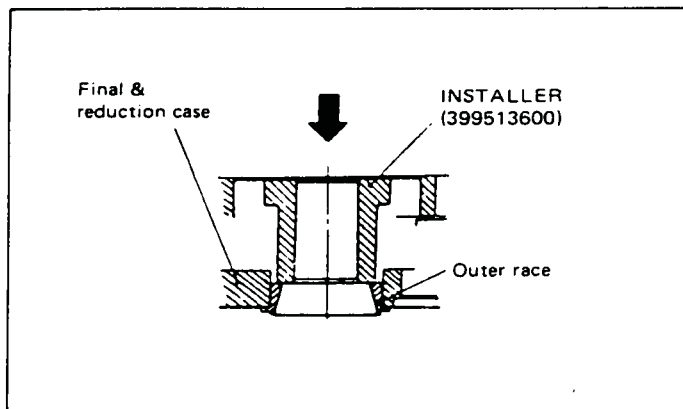


Fig. 174

When assembling, be sure to press the bearing cup until its end surface of flange contacts the final reduction case.

## Drive Pinion Front Bearing Cone

### DISASSEMBLY AND ASSEMBLY

Using REPLACER (498517000), remove drive pinion front bearing cone as shown in the figure.

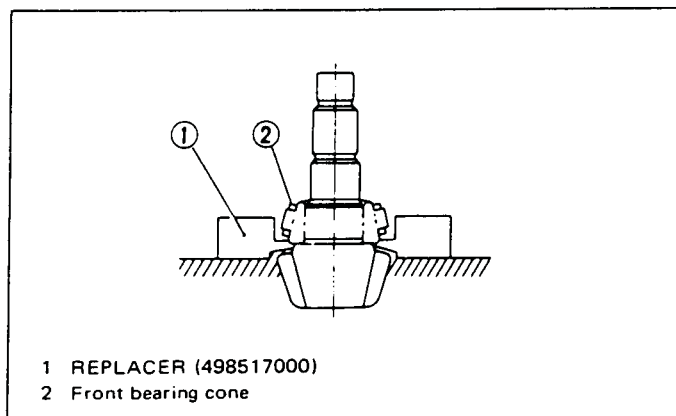


Fig. 175

When assembling, press it with INSTALLER (899580100) and INSTALLER (899874100).

Don't press the bearing retainer with INSTALLER.

## Drive Pinion Front Bearing Cup

### DISASSEMBLY AND ASSEMBLY

Press out drive pinion front bearing cup with DRIFT (398437700).

In assembling, press the cup with INSTALLER (499427000) until its end surface contacts thrust bearing retainer.

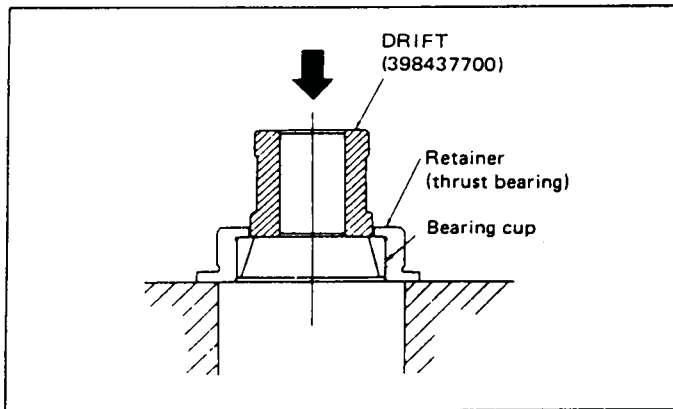


Fig. 176

## Axle Shaft Oil Seal Holder DISASSEMBLY AND ASSEMBLY

- 1) Bearing cup
  - (1) Remove bearing cup from holder with PULLER (399703600) as shown in the figure.

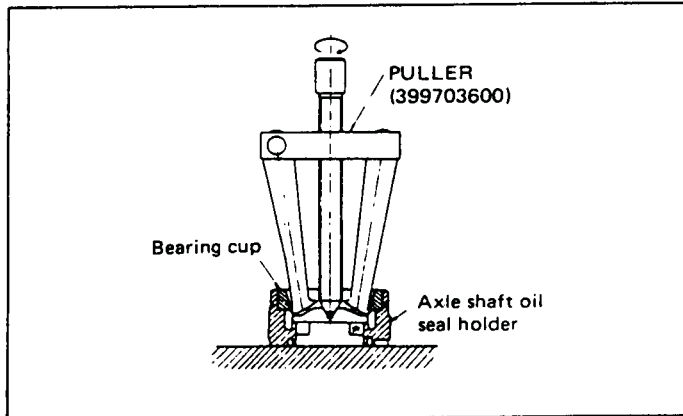


Fig. 177

- (2) Press bearing cup into holder with INSTALLER (499427000) until its end contacts the end of holder as shown in the figure.

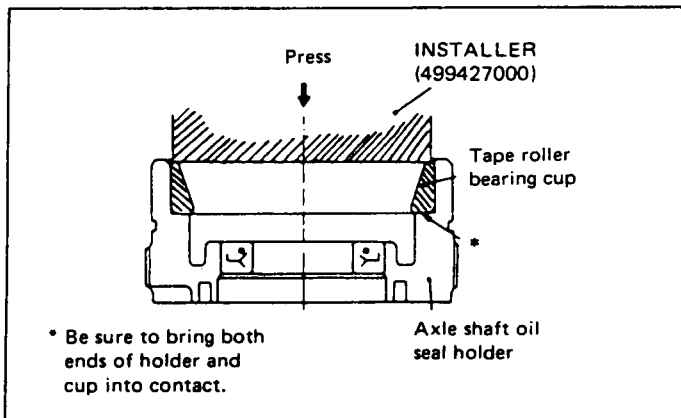


Fig. 178

- 2) Oil seal
  - (1) Remove oil seal from holder with REPRESSER (498107000).
  - (2) Press oil seal into holder with INSTALLER (399790100).

Note that the right and left oil seals are different.  
After installation of the oil seal, apply a coat of differential gear oil to the sealing lip.

## Speedometer Shaft and Oil Seal

### DISASSEMBLY AND ASSEMBLY

Remove the snap ring from the tip of the speedometer shaft, and drive the speedometer shaft out of the case by lightly applying hammer blows to it. The oil seal will be removed together with the shaft.

Remove a washer remaining in the case.

To install, install the speedometer shaft with the washer into the case and drive the oil seal in by applying hammer blows on PRESS (499827000).

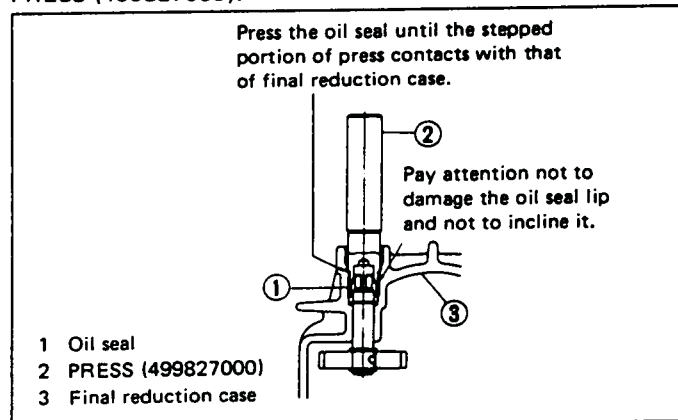


Fig. 179

## Needle Bearing at Reduction Drive Gear

### DISASSEMBLY AND ASSEMBLY

- 1) Remove bearing from the front side using REMOVER (499867000) and HANDLE (498477000) by press.

Make sure to remove governor shaft beforehand.

- 2) Press bearing into case using REMOVER (499867000) and GUIDE (498807000) as shown in the figure.

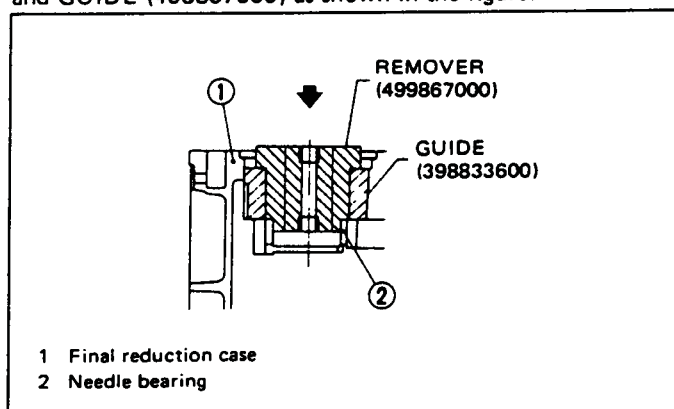


Fig. 180



## Oil Seal and Needle Bearing of Governor Shaft

### DISASSEMBLY AND ASSEMBLY

- 1) Remove bolts securing governor sleeve to the case and remove the governor sleeve.
- 2) Remove needle bearing and oil seal with PULLER SET (499527000) as shown in the figure.

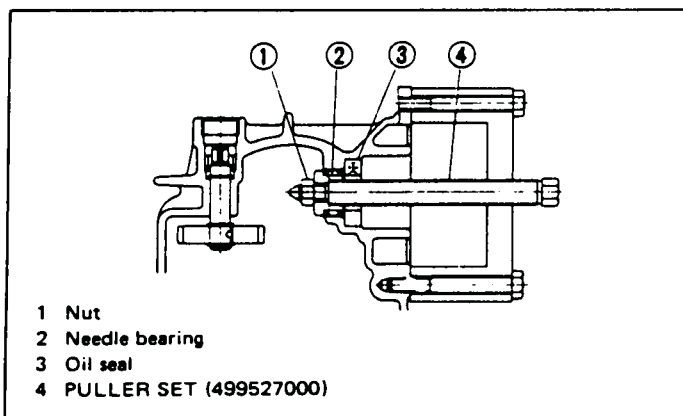


Fig. 181

- 3) Install needle bearing with PULLER SET (499527000) and INSTALLER (399793600) as shown in the figure.

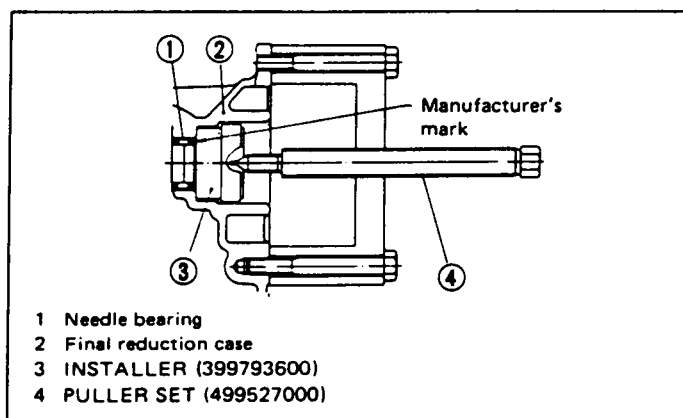


Fig. 182

- 4) Install oil seal with PULLER SET (499527000) and INSTALLER (399793600) as shown in the figure.

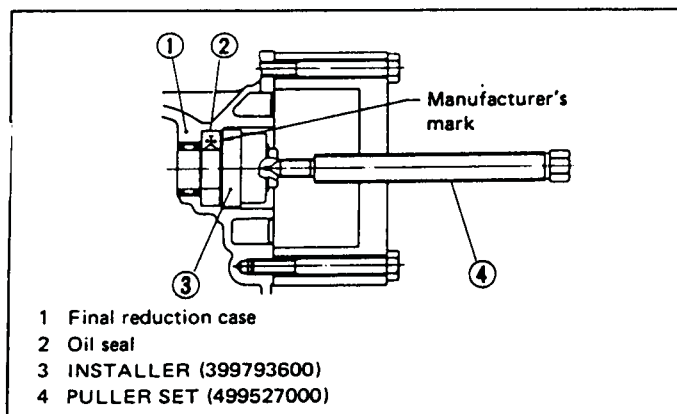


Fig. 183

- 5) Install governor sleeve to case and tighten bolts to the specified torque.

#### Torque:

4 – 5 N·m (0.4 – 0.5 kg·m, 2.9 – 3.6 ft·lb)

- a. Make sure to install governor sleeve into case with its drain hole facing downward.
- b. When installing governor sleeve to case, be sure to install seal ring.

## Bushing and Oil Seal in Converter Housing

### DISASSEMBLY AND ASSEMBLY

- 1) Remove oil seal from converter housing with thin minus screwdriver or the like.

Pay attention not to damage the contact surface of housing.

- 2) Remove bushing by using REPLACER (498107000) and HANDLE (498477000) as shown in the figure.

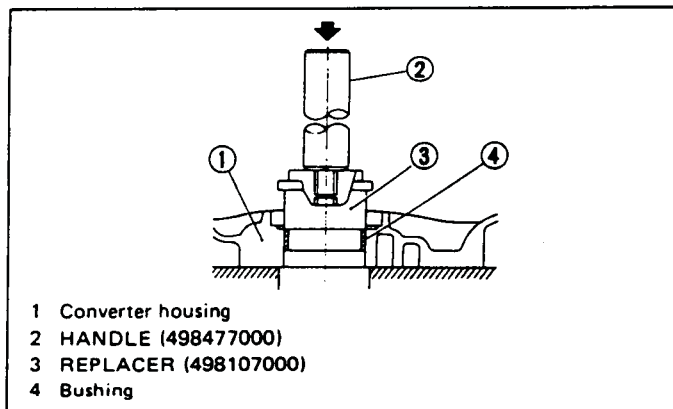


Fig. 184

- 3) Press bushing into housing with REPLACER upsidedown as shown in the figure.

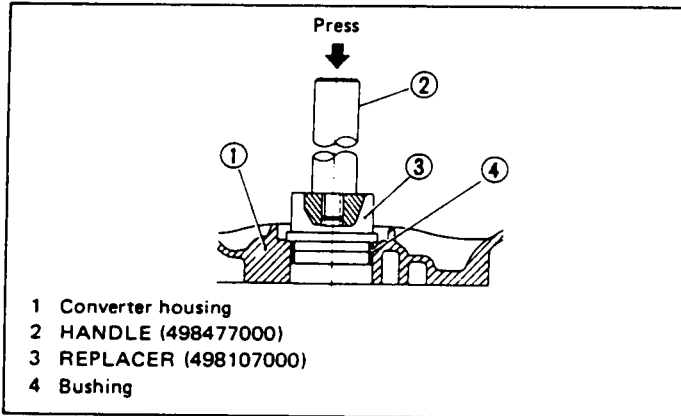


Fig. 185

- 4) Press oil seal into housing by using DRIFT (398437700) as shown in the figure.

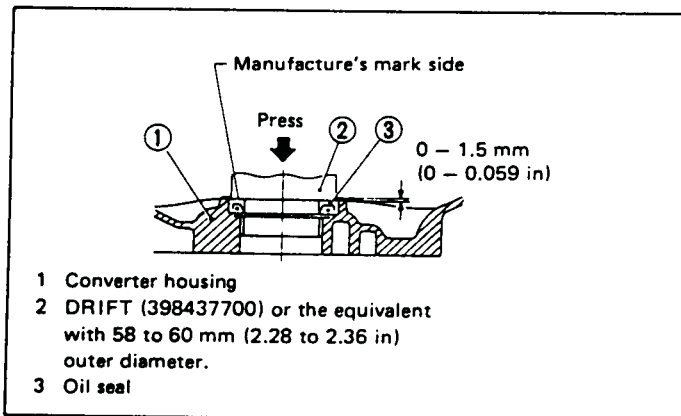


Fig. 186

- a. When pressing oil seal, be careful not to incline it.
- b. Apply the ATF around the oil seal lip.

## ATF Cooling System REMOVAL

- 1) Remove drain plug, and drain torque converter oil.
- 2) Loosen hose clamp, and disconnect hose from pipe.
- 3) Remove clamping screw which holds hose to side frame and remove holddown band.
- 4) Remove flare nut from pipe CP on transmission, loosen clamp which holds pipe, and disconnect pipe.

## INSTALLATION

- 1) Tighten drain plug.
- 2) Tighten pipe CP to transmission using flare nut and clamp.
- 3) Secure hose to side frame using clamp.
- 4) Tighten hose clamp.
- 5) Pour the specified amount of automatic transmission fluid into tank.

After completion of installing all parts, check oil level as well as leakage at connections, etc. while idling the engine.