SUBARU 4 SPEED
1990-1997

INDEX

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INTRODUCTION
SUBARU 4 SPEED

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This booklet contains general description and the procedures necessary to repair, overhaul, or service the 1990-97 Subaru 4 speed electronic automatic overdrive transmission. The Subaru 4 speed is a fully automatic front or All wheel drive transmission. This unit is based on the Nissan RE4R01A platform. The shift pattern is controlled electronically with a Transmission Control Module. The TCM will vary shift points, as it is constantly interpreting numerous electronic signals from various operational sensors located on the vehicle.

The TCM also controls the apply and release of the Transfer Clutch which on All wheel Drive models controls the rear drive shaft output for 4 wheel drive.

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 been carefully compiled from industry sources known for their reliability, but ATSG does not guarantee its accuracy.

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NOTES----NOTES----NOTES----NOTES

SERVICE PROCEDURE

1 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 Trouble-shooting.

(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.

1. 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, 3, 2), set the selector lever in "P" range. Measure fluid level with the engine idling.

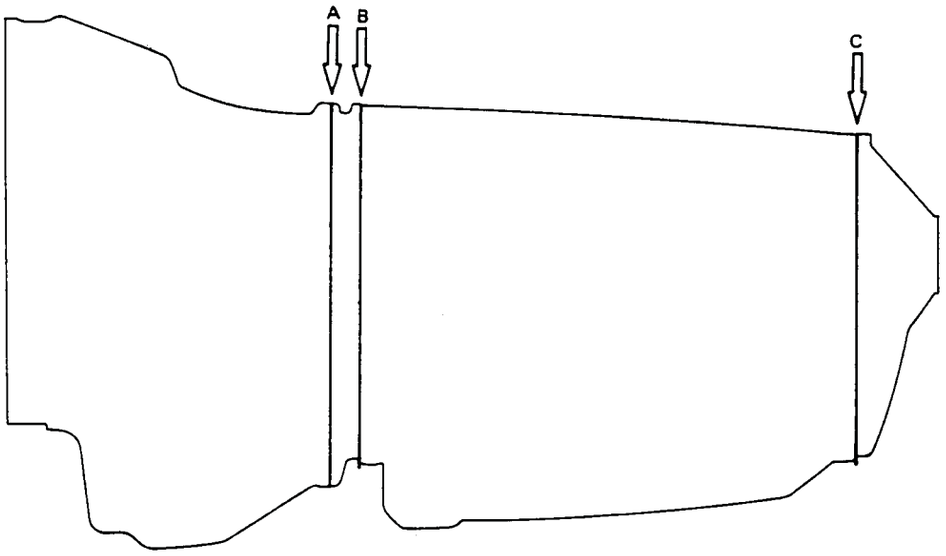
After running, idle the engine for one or two minutes before measurement.

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.

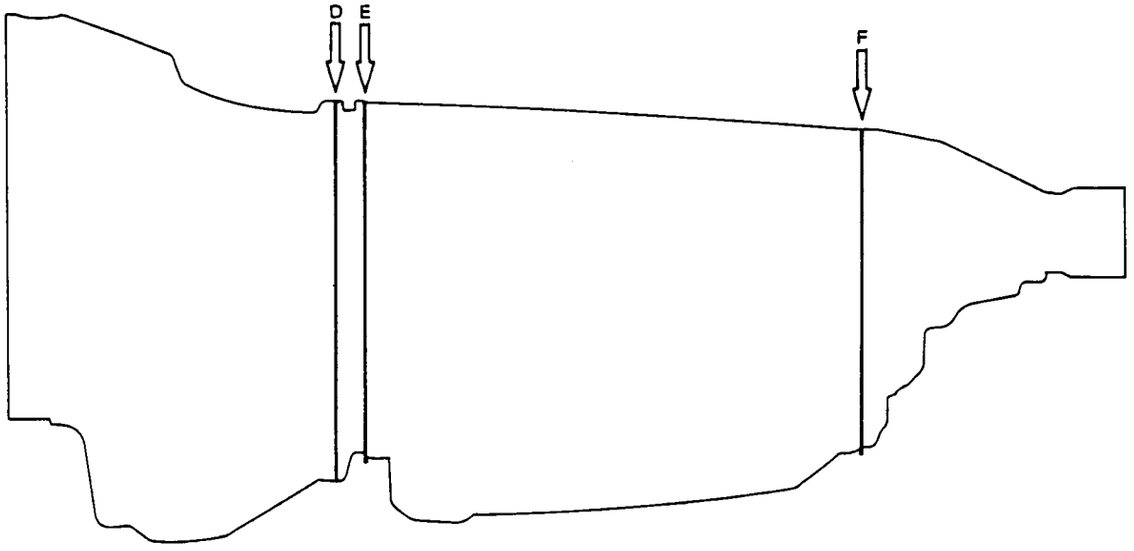
SECTIONS THAT CAN BE DETACHED/ASSEMBLED

2WD



Section A ... YES
Section B ... YES
Section C ... YES

4WD



Section D ... YES
Section E ... YES
Section F ... YES

On-Car Service

■ 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 the warm-up period, the automatic transmission functions can also be checked.

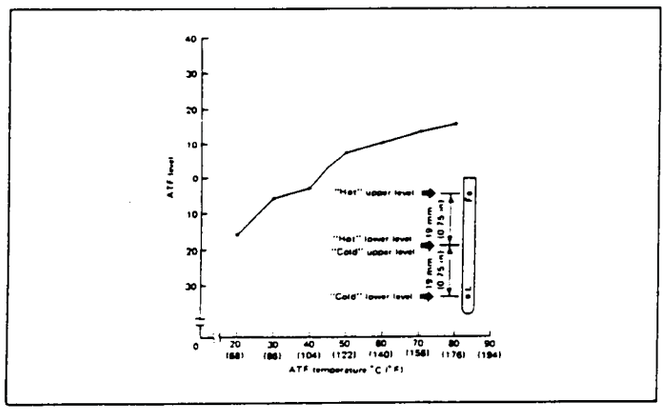


Fig. 277

2. DIFFERENTIAL GEAR OIL LEVEL

1) Ensure the vehicle

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 (F) and lower (L) 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 0.2ℓ (0.4 US pt, 0.4 Imp pt).

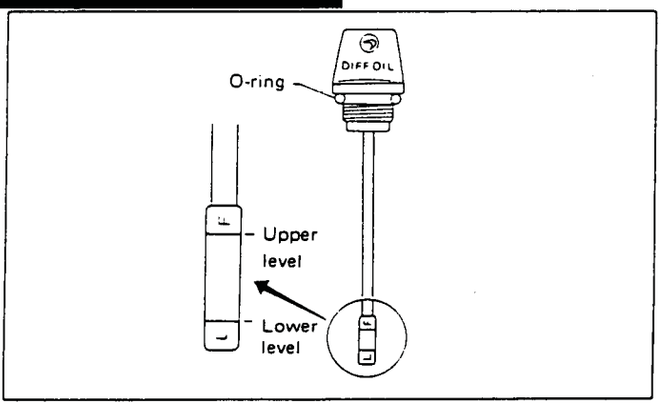


Fig. 278

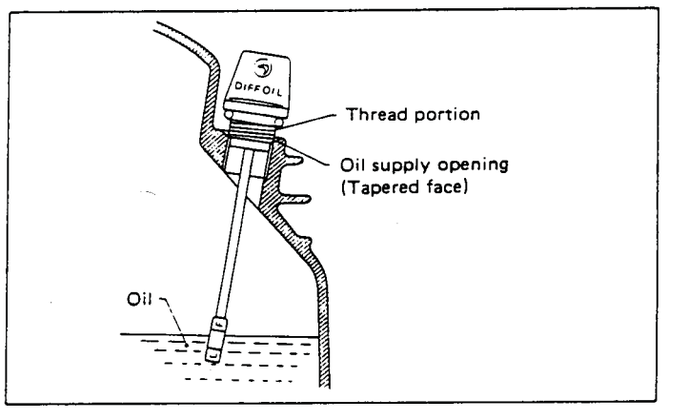


Fig. 279

3. 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 oil pump housing jointing portion
- Converter case and oil pump housing jointing portion
- Transmission case and transmission cover jointing portion (2WD)
- Transmission case and extension case jointing portion (4WD)

Converter housing

- Engine crankshaft oil seal
- Torque converter impeller sleeve oil seal
- A/T F cooler pipe connector
- Torque converter

Converter case

- Converter case
- Axle shaft oil seal
- O-ring on the outside diameter of axle shaft oil seal holder
- O-ring on the differential oil gauge
- Differential oil drain plug
- Speedometer cable mounting portion
- Location of steel balls

Oil pump housing

- Oil pump housing (Defective casting)
- O-ring on the test plugs
- Checking blind plugs
- Differential gear breather

Automatic transmission case

- Transmission case (Defective casting)
- Mating surface of oil pan
- O-ring on the test plugs
- Checking blind plugs (steel balls)
- Oil supply pipe connector
- ATF cooler pipe connector and gasket
- Oil pan drain plug
- O-ring on the transmission harness holder
- O-ring on the oil pump plugs
- ATF breather
- Shift lever oil seal

Extension case

- Extension case (Defective casting)
- O-ring on the revolution sensor
- Rear drive shaft oil seal
- Checking blind plugs (steel ball)
- O-ring on the test plug

Transmission cover

- Transmission cover (Defective casting)

The point 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.

4. 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

5. 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 and 4th gear state can be achieved but:

- the engine rpm increase excessively shifting up from 2nd to 3rd.
- a shift delay (over 1 sec) accompanies at kickdown from 3rd to 2nd.

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 and 4th gear state can be achieved, but:

- a braking phenomenon is noted when shifting up from 2nd to 3rd.

If this phenomenon is 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.

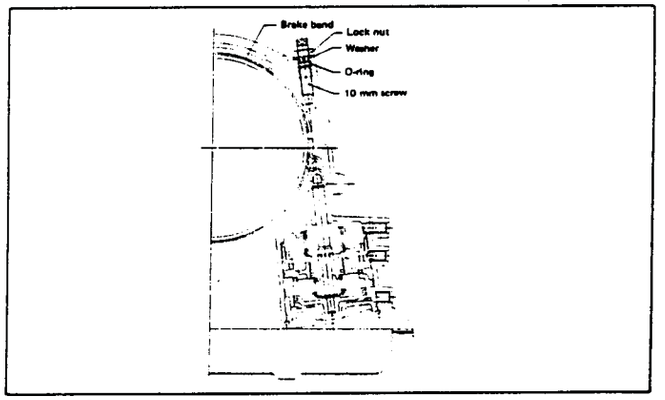


Fig. 280

■ 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±2 N·m (2.7±0.2 kg-m, 20±1.4 ft-lb) torque.

6. SHIFT SOLENOID OR VALVE BODY

When shift solenoid 1, 2 or 3 is faulty, duty solenoid A or B is faulty, the hydraulic control valve is sticking or malfunctioning (failure to shift, considerable shock in shifting, etc.) in accordance with trouble codes, inspect the shift solenoid valve or the control valve body as required.

(1) Removal of shift solenoid and valve body

1 CLEAN TRANSMISSION EXTERIOR
To help prevent contamination, clean the exterior of the transmission.

2 DRAIN TRANSMISSION FLUID
Remove the drain plug and drain fluid into a suitable container.

3 REMOVE OIL PAN AND GASKET

CAUTION:
Some fluid will remain in the oil pan. Be careful not to damage the filler tube and O-ring.

Remove all pan bolts, and carefully remove the pan assembly. Discard the gasket.

4 DISCONNECT FIVE CONNECTORS FROM SOLENOID

5 WHEN REPLACING LOCK-UP SOLENOID (Duty SOLENOID B)
(1) Remove the three bolts.
(2) Remove the solenoid.

Be careful not to damage the O-ring when installing the solenoid.

6 REMOVE OIL STRAINER
Remove the five bolts, and the oil strainer.

CAUTION:
Be careful as some oil will come out with the oil strainer.

7 REMOVE VALVE BODY
(1) Remove the eight long length bolts and eleven short length bolts.

CAUTION:
Be careful as some oil will come out with oil pressure circuits.

8 WHEN REPLACING SHIFT SOLENOID 1, 2, 3 and LINE PRESSURE SOLENOID (Duty solenoid A)
(a) For the shift solenoid 1, 2, 3
(1) Remove the two bolts and one nut.
(2) Remove the shift solenoid 1, 2, 3.
(b) For the line pressure solenoid (Duty solenoid A)
(1) Remove the one bolt and one nut.
Disassembly, inspection and assembly of valve body.
(2) Installation is in the reverse order of removal.

7. PARKING LINKAGE

When problems are in the parking linkage, remove the control valve body before inspection.

Before checking the parking pawl, parking actuator support, return springs, etc., remove the transmission from the car.

8. INHIBITOR SWITCH

The inhibitor switch allows the back-up lights to turn on when the select lever is in the R range and the starter motor to start when the lever is in the N or P range. It also monitors the input signal electronically controlled for each range and turns on the corresponding range lamp on the instrument panel.
When lamp operation, driving condition or starter motor operation is erroneous, first check the shift linkage for improper operation. If the shift linkage is functioning properly, check the inhibitor switch.

<Inspection>
Separate the cable end from the range select lever.

The N range is the 3rd position from the oil pump housing side.

(1) Using a circuit tester, check continuity in the connectors (for N, P, R, 3 and 2 ranges) at the inhibitor switch.

Refer to the Continuity Check chart under the heading "MECHANISM AND FUNCTION".

(2) Check if there is continuity at equal points when the select lever is turned 15° in both directions from the N range.
If there is continuity in one direction and no continuity in the other or if there is continuity at unequal points, adjust the inhibitor switch.

<Adjustment>
(1) Loosen the three inhibitor switch securing bolts.
(2) Shift the select lever to the N range.
(3) Insert STOPPER PIN (499267300) as vertical as possible into the holes in the inhibitor switch lever and switch body.
(4) Tighten the three inhibitor switch bolts.

Tightening torque:
2.0 - 2.5 N·m
(0.20 - 0.26 kg-m, 1.4 - 1.9 ft-lb)

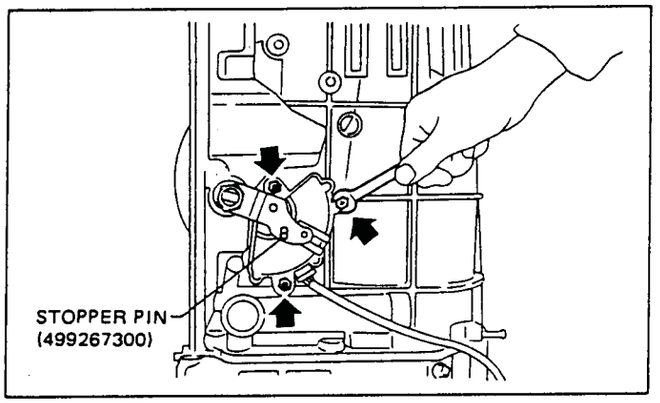


Fig. 281

(5) Repeat the above checks. If the inhibitor switch is determined to be "faulty," replace it.

9. TRANSMISSION HARNESS

The transmission harness conveys both input and output signals among the control unit, five/six (4WD) solenoids (inside the transmission) and temperature sensor. When a problem is manifested in accordance with trouble codes, check the harness and/or solenoids, as required.
Remove the control valve as outlined in step 6 above. Check the condition of each solenoid and temperature sensor. If O.K., check continuity in the transmission harness circuit using a circuit tester.

10. TRANSFER SOLENOID AND TRANSFER VALVE BODY

If unwanted "tight-corner braking" occurs when the steering wheel is turned fully at low speed, or the trouble code reveals a malfunctioning transfer solenoid, or if noise is heard from the solenoid, check the solenoid valve for improper operation, as follows:

1. **RAISE VEHICLE AND POSITION PAN TO CATCH ATF THAT MAY DRIP**

2. **REMOVE PROPELLER SHAFT**

3. **JACK UP TRANSMISSION SLIGHTLY**
Securely support the transmission on a transmission jack. Lift the transmission slightly to remove weight from the rear support member.

4. **REMOVE REVOLUTION SENSOR**

5. **REMOVE REAR MOUNTING BOLTS**

6. **REMOVE EXTENSION.**
   (1) Remove the eleven bolts.
   (2) Disconnect the transfer solenoid connector.

When extracting the extension, be careful of the connector fan duty sol. c in it.

7. **REMOVE EXTENSION GASKET**

8. **CLEAN AND INSPECT COMPONENT**

11. REVOLUTION SENSOR

When a problem exists in the revolution sensor as indicated by the corresponding trouble code, check the revolution sensor for improper operation.

5 Performance Test

- 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^2, 0 to 356 psi) range].

Set above gauges so that the driver can see them.

1. STALL TEST

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 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
2,450 – 2,850 rpm
TURBO
2,750 – 3,150 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 3, 2 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.

Interpretation of stall test results

Stall speed (at sea level)	Assessment	Cause	Remarks
Higher than 2,850 rpm (Non-TURBO) or 3,150 rpm (TURBO)	Slippage of automatic transmission clutch, brake band, etc. (Further stall tests are not necessary.)	• Low line pressure (If stall speed is higher than specified range at any shift position). • One-way clutch slippage. (If stall speed is higher than specified range only in the D range.) • Slippage of Forward clutch. (If stall speed is higher than specified range in D, 3, 2, 1ST Hold range. • *1: Slippage of low & reverse brake or reverse clutch. (If stall speed is higher than specified range only in the R range.)	*1: Slippage of reverse clutch/ low & 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 & reverse brake is slipping.
2,450 – 2,850 rpm (Non-TURBO) or 2,750 – 3,150 rpm (TURBO)	• Control members are in good order in the D, 3, 2 and R ranges. • Engine in good order.		• One-way clutch can be checked for condition by road tests.**
Lower than 2,450 rpm (Non-TURBO) or 2,750 rpm (TURBO)	• Throttle not fully opened. • Erroneous engine operation or torque converter one-way clutch slippage.		
** Road test	• Acceleration is not properly made up to 50 km/h (31 MPH). • Car speed does not attain more than 80 km/h (50 MPH). • Operation is not proper at all car speeds.	One-way clutch slippage. *3: One-way clutch jamming. Erroneous engine operation.	*3: Abnormal temperature rise occurs.

2. TIME LAG TEST

If the shift lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the forward clutch, reverse clutch, low & reverse brake, forward one-way clutch and low one-way clutch

CAUTION:
(a) Perform the test at normal operation fluid temperature (50 to 80°C or 122 to 176°F).
(b) Be sure to allow a one minute interval between tests.
(c) Make three measurements and take the average value.

Measure time lag

1) Fully apply the parking brake.
2) Start the engine.

Check idling speed (A/C OFF)

"N" range: 800 rpm

3) Shift the shift lever from "N" to "D" range.

Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: Less than 1.2 seconds

4) In same manner, measure the time lag for "N" → "R".

Time lag: Less than 1.5 seconds

Evaluation

1) If "N" → "D" time lag is longer than specified:
   - Line pressure too low
   - Forward clutch worn
   - Low one-way clutch not operating properly
2) If "N" → "R" time lag is longer than specified:
   - Line pressure too low
   - Reverse clutch worn
   - Low & Rev. clutch worn

3. 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)

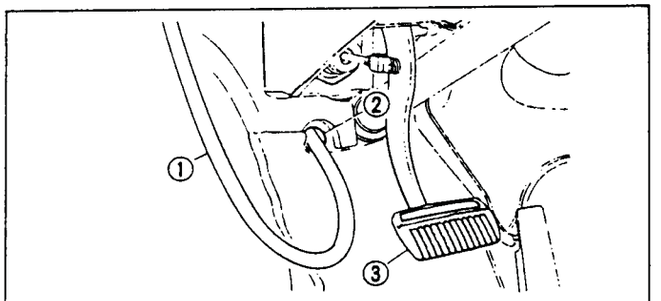
a. Before measuring line pressure, jack-up front wheels (front-wheel-drive model) or all wheels (4-wheel drive model).
b. Maintain temperature of ATF at approximately 80°C (176°F) during measurement.
(ATF will reach the above temperature after idling the engine for approximately 30 minutes with shift 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 to 5 minutes.
c. Before measuring line pressure, always shift the lever from "D" 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.



1 Pressure gauge hose
2 Hole in toe board (blank cap hole)
3 Brake pedal

Fig. 282

Tool No.	Tool Name
398573600	OIL PRESSURE GAUGE ASSY
498897100	OIL PRESSURE GAUGE ADAPTER

2) Connect the oil pressure adapter and the tip end of the gauge ASSY.
3) Run the engine and check the line pressures with the engine at a minimum-throttle and full-throttle operations.

Checking line pressure

1) Remove the line-pressure seal bolt and install the OIL PRESSURE GAUGE ADAPTER (498897100) instead.
2) Start the engine and warm it up by driving the car for at least 10 to 15 minutes.
3) Stop the engine. Connect an oil pressure gauge to the ADAPTER.
4) Check line pressure in accordance with the following chart.

< Standard line pressure >

Range	Min. line pressure 600 – 800 rpm	Max. line pressure Stall rpm
P	5.2 – 5.8	–
R	6.0 – 7.0	15.2 – 16.2
N	5.2 – 5.8	–
D	5.2 – 5.8	12.2 – 12.8
3	5.2 – 5.8	12.2 – 12.8
2	5.2 – 5.8	12.2 – 12.8
Accelerator pedal	Fully-closed	Fully-open

Checking transfer clutch pressure

1) Remove the transfer clutch pressure seal bolt and install the OIL PRESSURE GAUGE ADAPTER (498897100) instead.
2) Start the engine and allow it to warm up by driving the car for at least 10 to 15 minutes.
3) Stop the engine. Connect an oil pressure gauge to the ADAPTER.
4) Check transfer clutch pressure in accordance with the following chart.

Range	4WD mode		FWD mode
	Low pressure side	High pressure side	High pressure side
	600 – 800 rpm	Stall rpm	Stall rpm
R	0.5 – 0.8	7.3 – 8.0	0
D	0.5 – 0.8	7.3 – 8.0	0
Accelerator pedal	Fully-closed	Fully-open	Fully-open

If oil pressure is not produced or if it does not change in the 4WD mode, the duty solenoid C or transfer valve assembly may be malfunctioning. If oil pressure is produced in the FWD mode, the problem is similar to that in the 4WD mode.

4. 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 (2WD)

		Throttle fully-open km/h (MPH)					
		1 → 2	2 → 3	3 → 4	4 → 3	3 → 2	2 → 1
D range	NORMAL	50±2.5 (31±12)	94±2.5 (58±2)	144±2.5 (89±2)	134±2.5 (83±2)	84±2.5 (52±2)	40±2.5 (25±2)
	POWER	56±2.5 (35±2)	104±2.5 (65±2)	155±2.5 (96±2)	145±2.5 (90±2)	94±2.5 (58±2)	45±2.5 (28±2)
3 range		56±2.5 (35±2)	104±2.5 (65±2)	–	–	94±2.5 (58±2)	45±2.5 (28±2)
2 range	1st hold S/W OFF	56±2.5 (35±2)	104±2.5 (65±2)	–	–	94±2.5 (58±2)	45±2.5 (28±2)
	1st hold S/W ON	56±2.5 (35±2)	104±2.5 (65±2)	–	–	94±2.5 (58±2)	50±2.5 (31±2)

		Throttle fully-closed km/h (MPH)					
		1 → 2	2 → 3	3 → 4	4 → 3	3 → 2	2 → 1
D range	NORMAL	15±2.5 (9±2)	30±2.5 (19±2)	45±2.5 (28±2)	40±2.5 (25±2)	15±2.5 (9±2)	10±2.5 (6±2)
	POWER	15±2.5 (9±2)	30±2.5 (19±2)	50±2.5 (31±2)	40±2.5 (25±2)	20±2.5 (12±2)	10±2.5 (6±2)
3 range		15±2.5 (9±2)	30±2.5 (19±2)	–	–	20±2.5 (12±2)	10±2.5 (6±2)
2 range	1st hold S/W OFF	15±2.5 (9±2)	104±2.5 (65±2)	–	–	94±2.5 (58±2)	10±2.5 (6±2)
	1st hold S/W ON	56±2.5 (35±2)	104±2.5 (65±2)	–	–	94±2.5 (58±2)	50±2.5 (31±2)

TURBO (2WD & 4WD)

		Throttle fully-open km/h (MPH)					
		1 → 2	2 → 3	3 → 4	4 → 3	3 → 2	2 → 1
D range	NORMAL	53±2.5 (33±2)	99±2.5 (62±2)	152±2.5 (94±2)	142±2.5 (88±2)	88±2.5 (55±2)	40±2.5 (25±2)
	POWER	59±2.5 (37±2)	110±2.5 (68±2)	165±2.5 (103±2)	155±2.5 (96±2)	100±2.5 (62±2)	45±2.5 (28±2)
3 range		59±2.5 (37±2)	110±2.5 (68±2)	–	–	100±2.5 (62±2)	45±2.5 (28±2)
2 range	1st hold S/W OFF	18±2.5 (11±2)	110±2.5 (68±2)	–	–	100±2.5 (62±2)	10±2.5 (6±2)
	1st hold S/W ON	59±2.5 (37±2)	110±2.5 (68±2)	–	–	100±2.5 (62±2)	50±2.5 (31±2)

		Throttle fully-closed km/h (MPH)					
		1 → 2	2 → 3	3 → 4	4 → 3	3 → 2	2 → 1
D range	NORMAL	16±2.5 (10±2)	30±2.5 (19±2)	46±2.5 (29±2)	37±2.5 (23±2)	20±2.5 (12±2)	10±2.5 (6±2)
	POWER	18±2.5 (11±2)	30±2.5 (19±2)	55±2.5 (34±2)	40±2.5 (25±2)	20±2.5 (12±2)	10±2.5 (6±2)
3 range		18±2.5 (11±2)	30±2.5 (19±2)	–	–	20±2.5 (12±2)	10±2.5 (6±2)
2 range	1st hold S/W OFF	18±2.5 (11±2)	110±2.5 (68±2)	–	–	100±2.5 (62±2)	10±2.5 (6±2)
	1st hold S/W ON	59±2.5 (37±2)	110±2.5 (68±2)	–	–	100±2.5 (62±2)	50±2.5 (31±2)

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.

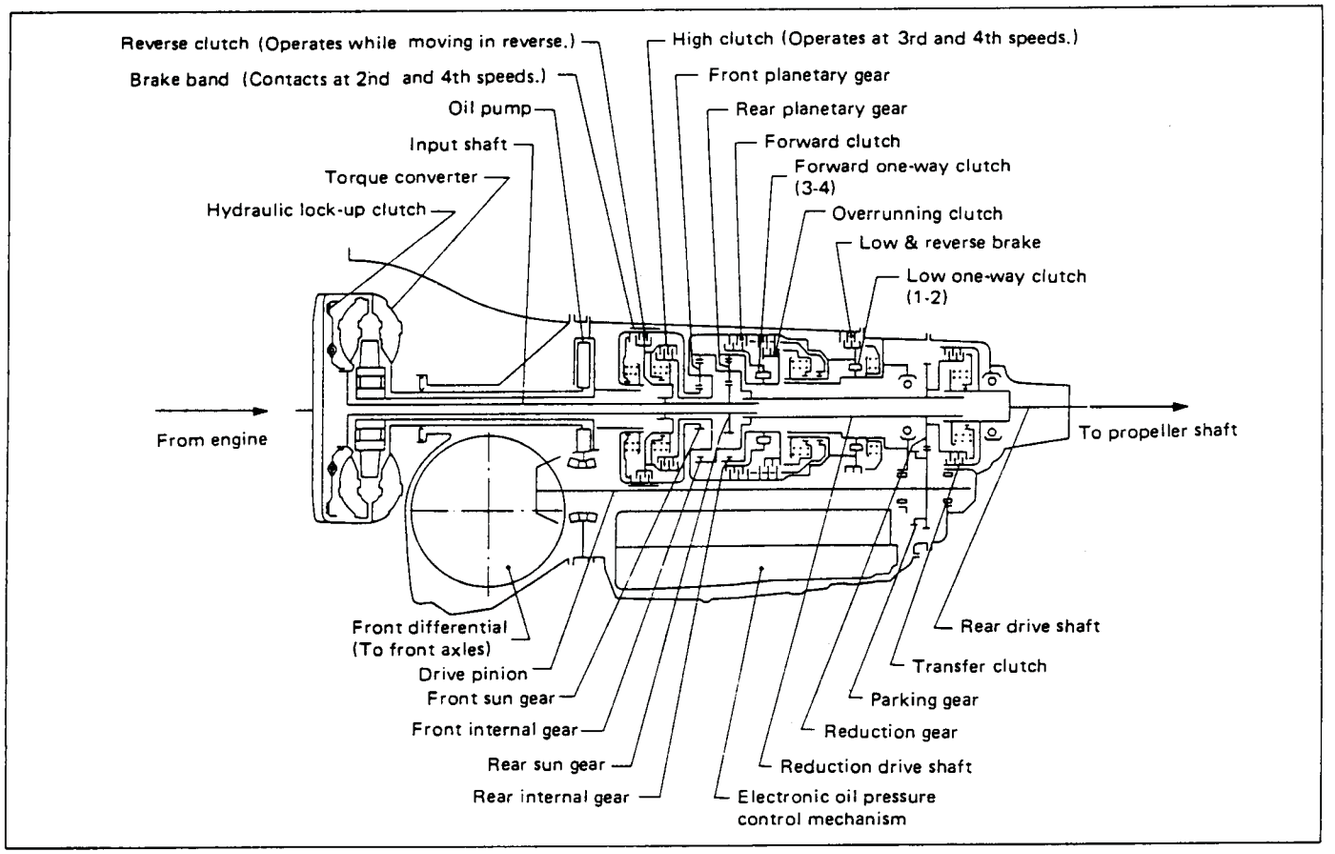
Checking for shift patterns

1) In the D range, shifting should be made as $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4$ 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 3 or 2 range, shifting should be made as 3 → 2 → 1. Engine compression can be utilized as a brake at 2 and 1st hold range.
4) With the shift lever in the 2 range, shifting should be made as 1 → 2 → 3 smoothly.
5) When pushing 1st hold switch, shifting should be made as 1 → 2 or 3 → 2 → 1.
6) The select lever should be locked when placed in the P range.

In road tests, if any abnormality is noticed, 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.

(1) Construction and operation

The gear train consists of two sets of planetary gears, four sets of multi-plate clutches, one brake band, one set of multi-plate brake and two sets of one-way clutches.



(2) N range and P range

1) N range

Because both the forward clutch and reverse clutch are in the release positions, the power of the input shaft is not transmitted to the drive pinion or the rear drive shaft.

2) P range

All controls do not operate, just as in the N range. The parking pawl interlocked with the selector lever meshes with the parking gear to mechanically hold the output shaft stationary, thus locking the power train.

(3) First speed of D or 3 range (D_1, 3_1)

- When the throttle is open wide, as during acceleration in the low-speed range, the forward clutch, one-way clutch (3-4) and one-way clutch (1-2) operate to prevent the rear internal gear from turning in the reverse direction.
- While coasting, the rear internal gear turns normally and the one-way clutch (3-4) is released and idles. Therefore, no power is transmitted and the engine does not provide braking action.
- During deceleration, the overrunning clutch is applied and the one-way clutch (3-4) is prevented from idling; however, since the one-way clutch (1-2) is released and is idling, reverse power is not transmitted and engine braking is not performed.

(4) Second speed of D, 3, or 2 range (D_2, 3_2, 2_2)

- During acceleration, the forward clutch is applied and connects the front planetary gear to the internal gear through the one-way clutch (3-4). Power is transmitted from the input shaft to the rear sun gear, turning the rear planetary carrier (i.e. front internal gear).
  Also, since the band brake is applied and the front sun gear is locked, the rear internal gear turns normally through the front planetary carrier and the forward clutch and one-way clutch (3-4) that are connected to that carrier. Thus, speed increases in proportion to the rotation of the rear internal gear compared with the first speed.
- Since the rear internal gear turns normally while coasting, the one-way clutch (3-4) is released and idles. Accordingly, reverse power is not transmitted to the engine and engine braking is not provided.
- During deceleration, the overrunning clutch operates to check idling of the one-way clutch (3-4). Reverse power is transmitted to the engine, providing engine braking action.

(5) Third speed of D or 3 range (D_3, 3_3)

- During acceleration, the high clutch is applied and the input shaft and front planetary carrier are connected. Further, the forward clutch and one-way clutch (3-4) operate to connect the front planetary carrier to the rear internal gear. Power is transmitted from the input shaft to the rear sun gear and rear internal gear. The rear sun gear and rear internal gear turn normally at the same speed. Therefore, the rear planetary carrier, rear sun gear and rear internal gear rotate normally as a unit.
- While coasting, because the rear internal gear turns normally, the one-way clutch (3-4) idles in a released state. Thus, reverse power is not transmitted to the engine and engine braking action is not provided.
- During deceleration, the overrunning clutch is applied and checks the reverse rotation of the one-way clutch (3-4). Thus, reverse power is transmitted to the engine and engine braking is performed.

(6) D-range fourth speed (D_4)

- During acceleration, the high clutch is applied and connects the input shaft to the front planetary carrier. Also, the forward clutch is applied, but it runs idle due to the one-way clutch (3-4) and takes no part in power transmission. Power is transmitted from the input shaft to the front planetary carrier by the function of the high clutch.
  When the front planetary carrier turns normally, because the front sun gear is held stationary by the brake band, the speed of the front internal gear increases and is delivered to the meshing reduction drive shaft in normal rotation.
- While coasting, because power transmission does not go through the one-way clutch, reverse power is transmitted to the engine and engine braking is performed.

(7) 2-range first speed or 1st hold first speed (2_1, 1st hold)

- During acceleration, the forward clutch and overrunning clutch are applied and the front planetary carrier and rear internal gear are connected. Also, the low & reverse brake is applied so that the front planetary carrier and internal gear remain stationary.
  The power flow is the same as in the first speed of "D", "3" and "2" range (except for the following points) and engine braking is performed.
  - Since the overrunning clutch is applied, the one-way clutch (3-4) is locked.
  - The low & reverse brake operates in place of the one-way clutch (1-2) and locks the rear internal gear.
- In coasting and deceleration, the idling of the one-way clutch (3-4) and one-way clutch (1-2) is checked, so that reverse power is transmitted to the engine and engine braking action is provided.

(8) R range

The reverse clutch is applied and power is transmitted from the input shaft through the reverse clutch to the front sun gear. Also, the low & reverse brake operates to lock the front planetary carrier. Therefore, when the front sun gear turns normally, the front internal gear slows and reverses.

<OPERATION OF EACH GEARSHIFT MEMBER>

			Rev./C	B/B	High/C	FWD/C	OWC (3-4)	OVR/C	Lo / Rev./B	OWC (1-2)
Selector lever operation	P									
	R		○						○	
	N									
	D	1ST				○	○			○
		2ND		○		○	○			
		3RD			○	○	○			
		4TH		○	○	○				
	3	1ST				○	○	○		○*2
		2ND		○		○	○	○		
		3RD			○	○	○	○		
	2	1ST				○	○	○	○	
		2ND *1		○		○	○	○		
		3RD			○	○	○	○		
Switchbutton handling	1st HOLD	1ST *1				○	○	○	○	
		2ND *1		○		○	○	○		
		3RD			○	○	○	○		

Only when selector lever is in "2" and 1st hold button is ON.

*1: For prevention of over-revolution

*2: Engine brake ineffective

Sol 1 (shift) and sol. 2 (shift)
If trouble occurs in either solenoid, the other one is turned OFF to attain the following gear setting to allow vehicle operation. Should trouble occur in both solenoids, the hydraulic circuit operates mechanically.

Shift position		Normal state			Faulty solenoid 1			Faulty solenoid 2			Faulty solenoids 1, 2		
		1	2	Gear	1	2	Gear	1	2	Gear	1	2	Gear
"D" range		○	○	1st	–	○→X	3rd	○→X	–	3rd	–	–	3rd
		X	○	2nd	–	○→X	3rd	X	–	3rd	–	–	3rd
		X	X	3rd	–	X	3rd	X	–	3rd	–	–	3rd
		○	X	4th	–	X	3rd	○→X	–	3rd	–	–	3rd
"3" range		○	○	1st	–	○→X	3rd	○→X	–	3rd	–	–	3rd
		X	○	2nd	–	○→X	3rd	X	–	3rd	–	–	3rd
		X	X	3rd	–	X	3rd	X	–	3rd	–	–	3rd
"2" range	1st hold switch released	○	○	1st	–	○→X	3rd	○→X	–	3rd	–	–	3rd
		X	○	2nd	–	○→X	3rd	X	–	3rd	–	–	3rd
		X	X	3rd	–	X	3rd	X	–	3rd	–	–	3rd
	1st hold switch operated	○	○	1st	–	○→X	3rd	○→X	–	3rd	–	–	3rd
		X	○	2nd	–	○→X	3rd	X	–	3rd	–	–	3rd
		X	X	3rd	–	X	3rd	X	–	3rd	–	–	3rd

○ : Energized X : Non-energized – : Failed

Duty sol. A (Line pressure)
If duty solenoid A fails, the solenoid is turned OFF and line pressure is raised to maximum to enable vehicle operation.

Duty sol. B (Lock-up)
If duty solenoid B fails, the solenoid is turned OFF and lock-up is released.

Sol. 3 (Overrunning clutch)
If the overrunning clutch solenoid fails, the solenoid is turned OFF. The overrunning clutch will engage so that the engine brake will be applied when reducing vehicle speed.

Duty sol. C (Transfer)
When the duty solenoid C becomes inoperative, it turns OFF. This causes maximum oil pressure to be applied to the transfer clutch so that the power is always transmitted to rear axles. (Direct-coupling 4WD)

THROTTLE SENSOR

The throttle sensor provides electrical signals corresponding to the throttle opening. It has the following characteristics. The throttle opening and accelerator depression speed are detected by this throttle sensor output.

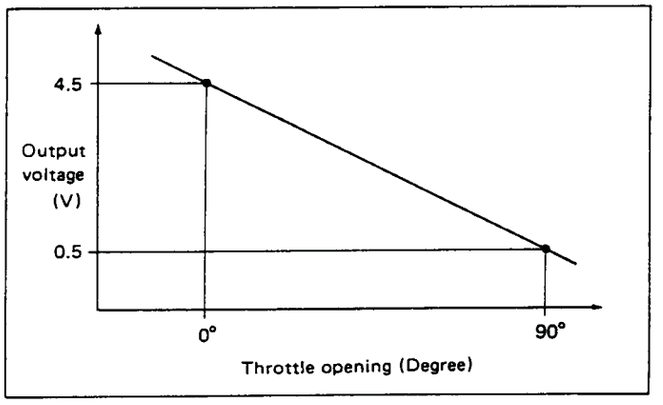


Fig. 76

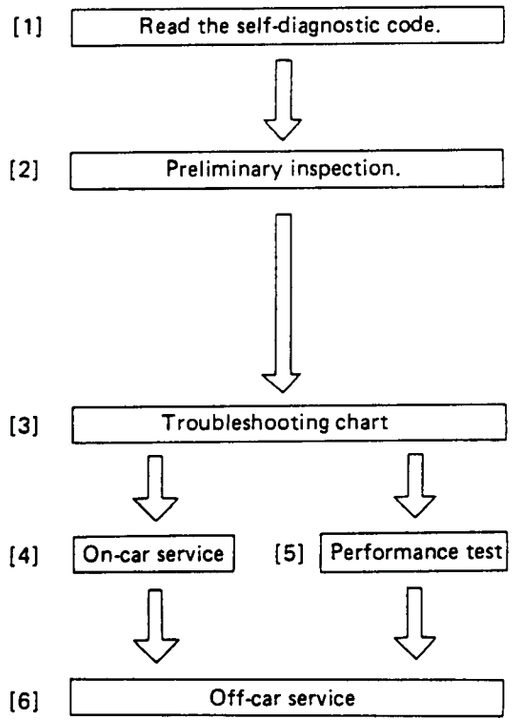
TROUBLESHOOTING

GENERAL NOTES

1) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when troubleshooting.

2) Troubleshooting should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in troubleshooting is to understand the customer's complaint, and distinguish between the three causes.

3) The general flow of troubleshooting is shown below:



Read the trouble code on the "POWER" indicator, and perform operation according to the code.

Check the following items:
- Fluid level
- Idling speed
- Inhibitor switch
- Shift linkage
- Tire inflation pressure
- Fluid leakage, etc.

See "Service Procedure".

1 Troubleshooting for Electrical Transmission Control System

1) Self-diagnosis function is builted in this electronical control system. Warning is noticed by lighting the POWER indicator.

(1) If a malfunction occurs in the speed sensor (No. 1 or 2), solenoid (No. 1, 2 or 3), duty solenoid (A, B or C), or throttle sensor system, the POWER indicator will be lighted for 2 seconds, subsequently blink once every 0.25 seconds (per 0.5 seconds cycle) during 8 seconds with the ignition switch turned to ON from OFF position. [See Fig. 1 (a).]

(2) If the system is operating normally (no malfunction), the POWER indicator will be turned on for 2 seconds period only with the same manner of ignition switch operation. [See Fig. 1 (b).]

Warning can be noticed only when the ignition switch is initially turned to ON.

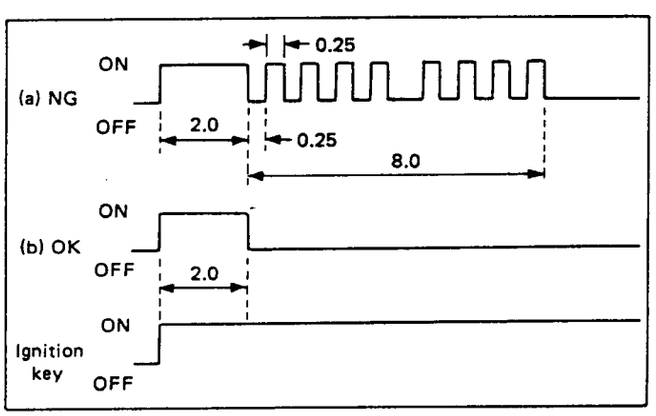
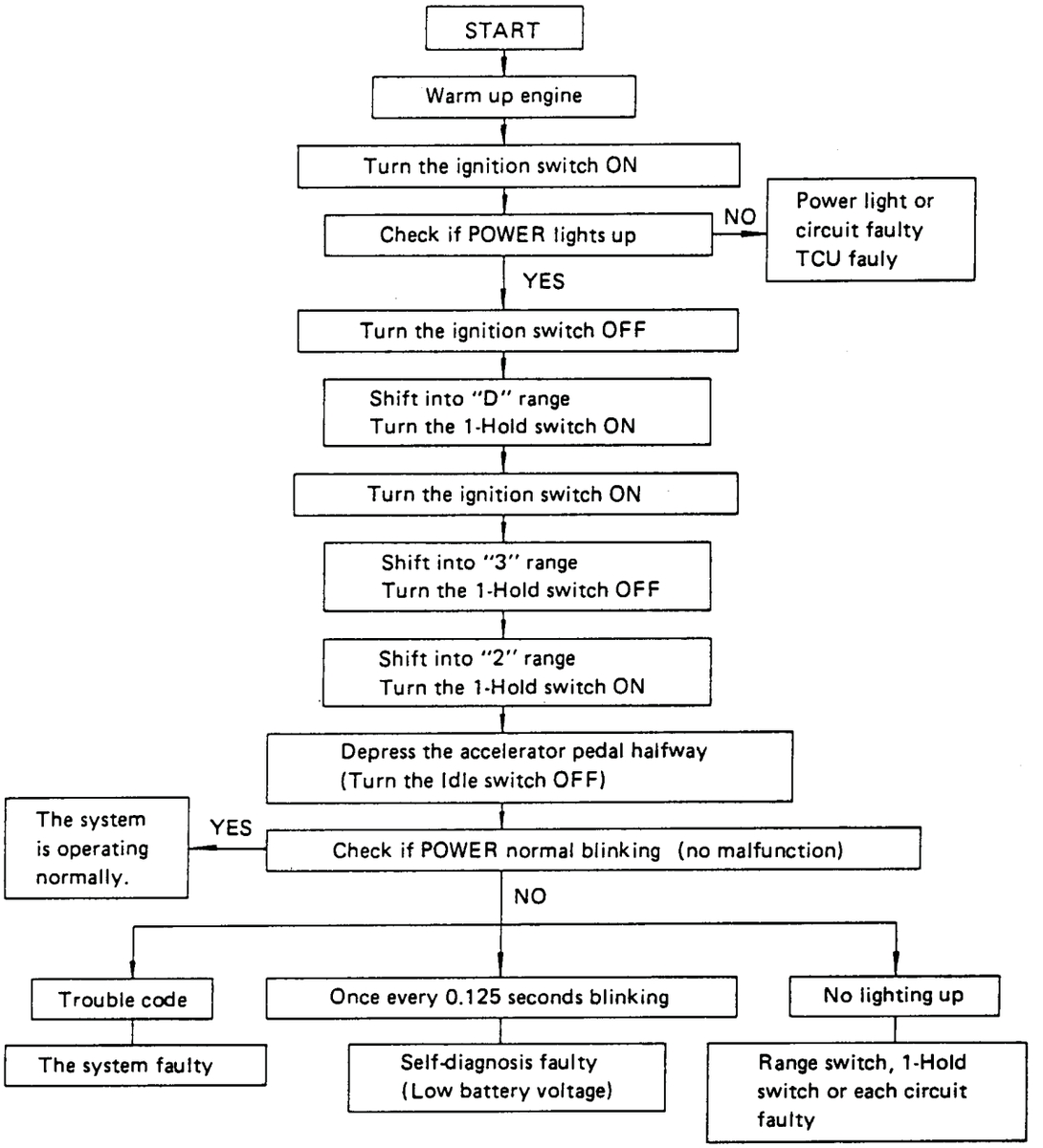


Fig. 274 POWER indicator signal (unit: second)

2) The diagnostic code can be read by the pattern of POWER indicator blink, according to specified operating procedure.
3) The diagnostic code (trouble code) is being memorized in the CPU (of TCU) and is not canceled even though the engine is turned off, dueing to back-up voltage. Consequently, after repair, it is necessary to turn the ignition switch off and then remove the fuse or disconnect the control unit connector for canceling the diagnostic code.

Low battery voltage will cause faulty operation of the diagnosis system. Therefore, always be sure to check the battery voltage first.

OUTPUT OF DIAGNOSTIC CODE



HOW TO READ TROUBLE CODE

In case of malfunction, trouble code will be observed by the specified signal of POWER indicator. The sequence of blinking shows each faulty system and the term of long segment (0.6 sec) blink means its own faulty system code. (See Fig. 2.)
Example: Shift solenoid No. 1 fault

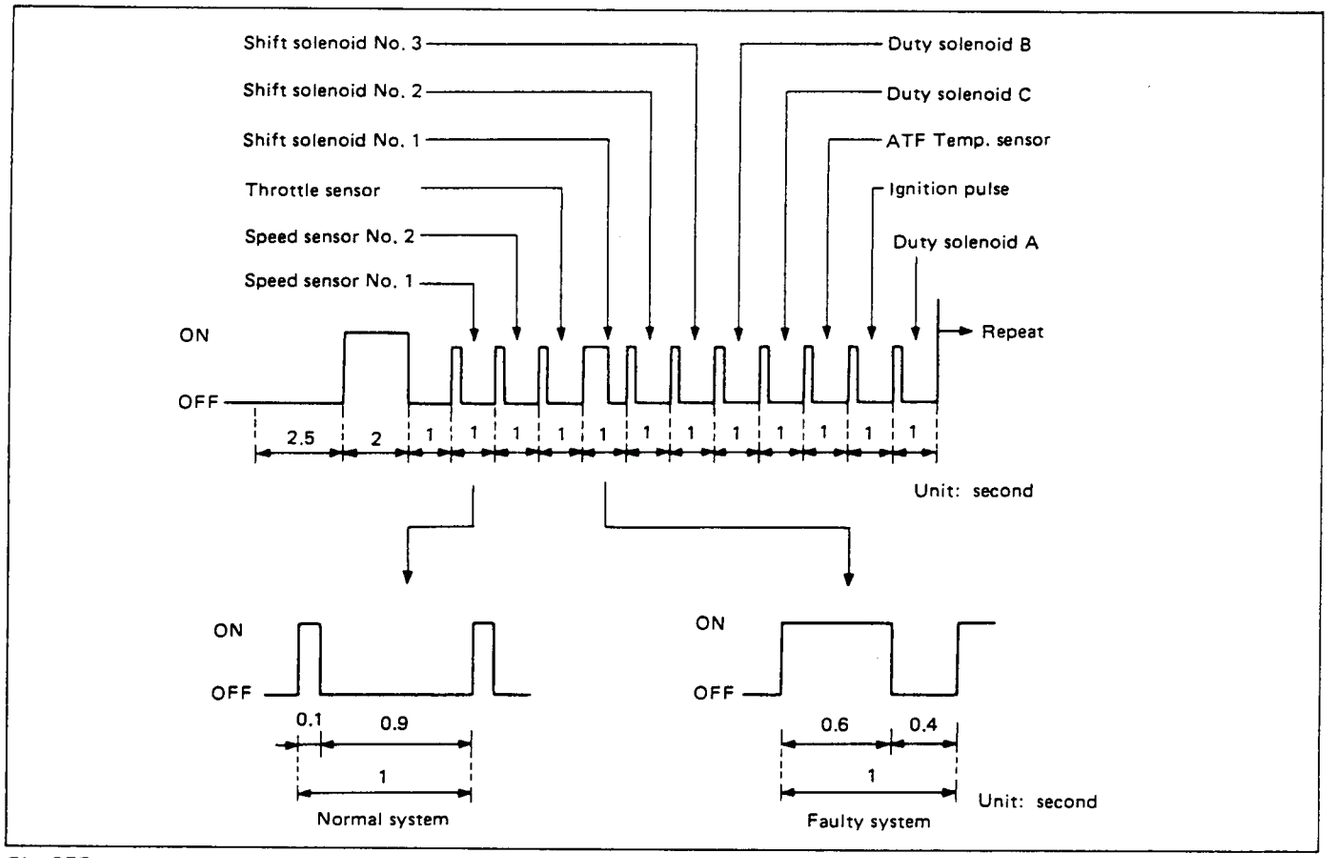
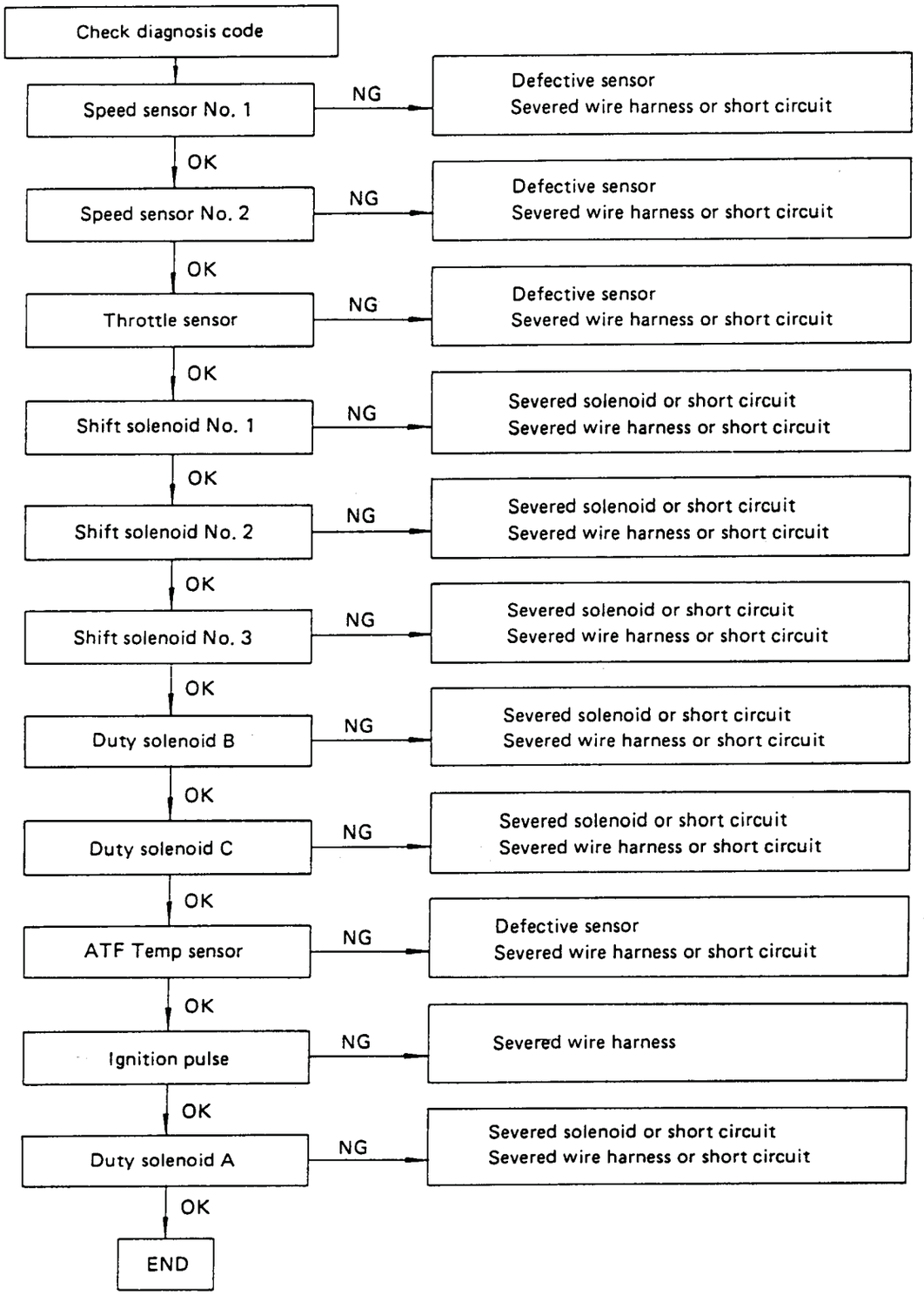


Fig. 275

Blinking POWER Indicator
(when the ignition switch is turned to ON)



	Trouble	Possible cause
1	No shift	① Shift solenoid No. 1 and/or No. 2 • Severed or short circuit ② Speed sensor No. 1 and No. 2 • Defective or severed ③ Power source and grounding • Severed or short circuit
2	Shift point too high or too low	① Throttle sensor • Defective, severed or short circuit ② Speed sensor No. 1 • Defective or severed
3	No up-shift to overdrive (after warm-up)	① Range switch • Severed or short circuit ② ATF temp sensor • Defective or severed ③ Cruise control unit • Operation unusual or short circuit
4	No back-up (after warm-up)	① Duty solenoid B • Severed or short circuit ② ATF temp sensor • Defective, severed or short circuit ③ Ignition pulse • Severed wire harness ④ Idle switch • Severed or short circuit
5	No engine braking effect at "3" range	① Shift solenoid No. 3 • Severed or short circuit ② Throttle sensor • Defective, severed or short circuit ③ Range switch • Severed or short circuit
6	Excessive shift shock	① Duty solenoid A • Severed or short circuit ② Throttle sensor • Defective, severed or short circuit
7	Excessive tight corner braking	① Duty solenoid C • Severed or short circuit ② Throttle sensor • Defective, severed or short circuit ③ Speed sensor No. 1 • Defective, severed or short circuit

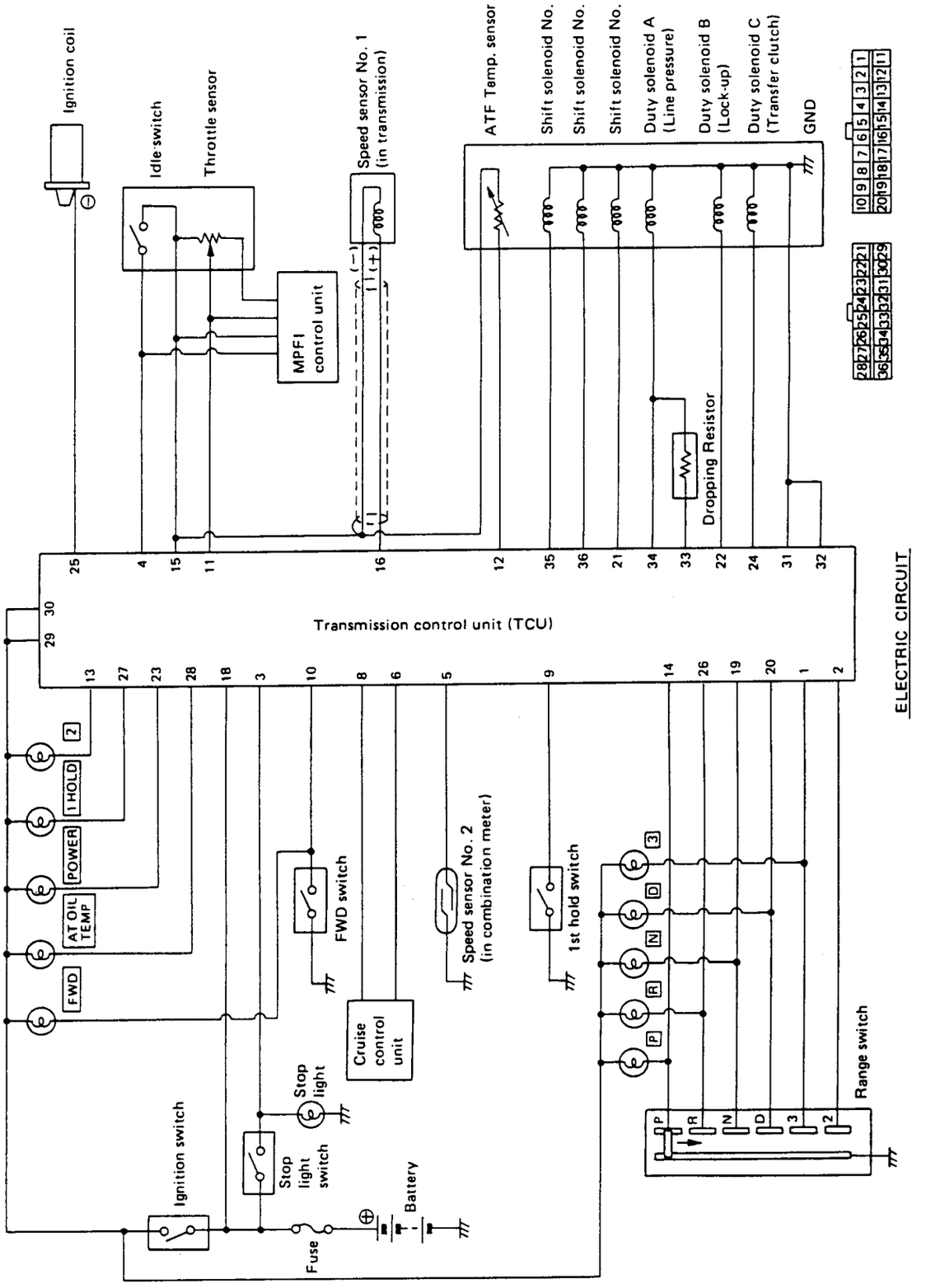

Ignition coil
Idle switch
Throttle sensor
Speed sensor No. 1 (in transmission)
ATF Temp. sensor
Shift solenoid No. 1
Shift solenoid No. 2
Shift solenoid No. 3
Duty solenoid A (Line pressure)
Duty solenoid B (Lock-up)
Duty solenoid C (Transfer clutch)
GND
MPFI control unit
Dropping Resistor
Transmission control unit (TCU)
ELECTRIC CIRCUIT
2
1 HOLD
POWER
AT OIL TEMP
FWD
FWD switch
Speed sensor No. 2 (in combination meter)
1st hold switch
Cruise control unit
Stop light
Stop light switch
Ignition switch
Battery
Fuse
Range switch
P
R
N
D
3
2

Fig. 276

3 Troubleshooting Chart

Symptom	Reference No.		Probable cause
	On-car check	Unit check	
Starter runs in R, D or 2 range, but not in P or N range.	1, 2, 6, 7, 9		Transmission exterior parts: 1. Inhibitor switch out of adjustment 2. Faulty inhibitor switch 3. Faulty control unit 4. Faulty car-revolution sensor 1 5. Faulty car-revolution sensor 2 6. Select cable out of adjustment 7. Faulty select lever 8. FWD fuse remains installed 9. Faulty starter motor or harness 10. Faulty throttle sensor 11. Faulty 1st hold switch Parts inside oil pan: 12. Faulty N-D accumulator 13. Faulty 2A accumulator 14. Faulty 4A accumulator 15. Faulty 3R accumulator 16. Faulty ATF temperature sensor 17. Clogged strainer 18. Faulty duty solenoid A 19. Faulty duty solenoid B 20. Faulty shift solenoid 1 21. Faulty shift solenoid 2 22. Faulty shift solenoid 3 23. Valve sticking 24. Faulty detent spring 25. Faulty manual plate 25a. Faulty strainer seal Parts inside extension case: 26. Faulty transfer clutch 27. Transfer valve sticking 28. Transfer pilot valve sticking 29. Faulty transfer pipe 30. Faulty duty solenoid C 31. Noisy duty solenoid C 32a. Faulty forward clutch relief ball 32b. Faulty overrunning clutch relief ball
Noise is emitted in N or P range.	72, 65, 31	40	
Noise (shudder) is emitted when car starts.	72, 25a		
Noise is emitted in D_1 range.	73	37, 60, 61	
Noise is emitted in D_2 range.	73	37, 60, 61	
Noise is emitted in D_3 range.	73	37, 61	
Noise is emitted in D_4 range.	73	37, 60, 61	
Engine stalls while shifting to any range.	23, 76	77	
Engine stalls in P range and driving in N range.		42	
Shock is felt when shifting from N to D range.	70, 12, 23, 3		
Lengthy time lag when shifting from N to D range.	23, 32	41	
Shock is felt when shifting from N to R range.	23, 14, 70		
Lengthy time lag when shifting from N to R range.	23	49, 51	
Car does not move in any range though engine revs up.	72, 17, 23	64, 65, 56, 57, 33, 34, 35, 36, 60, 40	
Engine stalls in all ranges.		62	
Car does not move in R range though engine revs up.	23	49, 51	
Engine stalls in R range.		42, 48	
Car does not move in D or 3 range though engine revs up.		53, 54	
Car does not move in D, 3 or 2 range though engine revs up.		41, 32	

Symptom	Reference No.		Probable cause
	On-car check	Unit check	
Engine stalls in D, 3 or 2 range.		52	Parts inside differential case: 33. Drive pinion broken 34. Crown gear broken 35. Axle shaft broken 36. Differential gear broken 37. Poor/improper contact of final gear 38. Faulty seal pipe 39. Faulty speedometer gear Parts inside transmission: 40. Oil pump seized or broken or foreign matter in pump 41. Forward clutch slippage 42. Forward clutch seized 43. Overrunning clutch slippage 44. Overrunning clutch seized 45. High clutch slippage 46. High clutch seized 47. Band & servo slippage 48. Band seized 49. Low & reverse brake slipping 50. Low & reverse brake seized 51. Reverse clutch slippage 52. Reverse clutch seized 53. Faulty O.W.C. (1-2) 54. Faulty O.W.C. (3-4) 55. Faulty double oil seal 56. Input shaft broken 57. Reduction drive shaft broken 58. Planetary gear broken 59. Reduction gear broken 60. Poor/improper contact of planetary gear 61. Poor/improper contact of reduction gear 62. Faulty parking brake mechanism
Car does not move in D, 3 or 2 range though engine revs up.	23, 3	54	
Poor acceleration: • High stall rpm • Low stall rpm • Proper stall rpm (Poor acceleration in D, 3 or 2 range) • Proper stall rpm (Poor acceleration in R range)	 72, 23 3, 23 23	 41, 51 76, 66, 40 46, 48 46, 48, 44	
No shifts: • 1 → 2 • 2 → 3 • 3 → 4 • K/D	 3, 23 3, 23 3, 23, 16 3, 10	 47 45 47	
No engine braking in: • 3 range only • 3, 2 or 1 range • 1 range only	 3, 23, 10 32a 3, 23	 43 49	
Erroneous shift points	3, 23, 10	47	
No lock-up operation	3, 23, 16, 10	68	
No power mode in D range	3, 10		
Power mode not released in D range	3, 10		
Parking brake failure: • No braking • Dragging or failure to release	 6, 7 6, 7	 62 62	
Unusual select force: • Considerable effort required • No or light effort required	 7, 24, 25 24, 25		
Fluid overflow • ATF • Differential oil	 74 75		
Unusual changes in differential oil level		38, 55	
Odor from oil supply pipe	70	41, 43, 45, 47 49, 51	

Symptom	Reference No.		Probable cause
	On-car check	Unit check	
Abnormalities during shifting:			Other parts: 63. Faulty torque converter ring gear 64. Faulty drive plate 65. Improper installation of drive plate 66. Torque converter or OWC burned or broken 67. Worn parts in torque converter 68. Lock-up facing worn 69. Faulty lock-up damper 70. Deterioration of ATF 71. Deterioration of differential oil 72. ATF level too low 73. Differential oil level too low 74. ATF level too high 75. Differential oil level too high 76. Poor engine performance 77. Lock-up clutch seized
• Shock in 1 → 2 shift	3, 23, 13, 10, 70, 76		
• Slippage in 1 → 2 shift	3, 23, 13, 10	47	
• Shock in 2 → 3 shift	3, 23, 10, 70, 15, 76	47, 45	
• Slippage in 2 → 3 shift	3, 23, 15, 10	47, 45	
• Shock in 3 → 4 shift	3, 23, 10, 70, 14, 76	43	
• Slippage in 3 → 4 shift	3, 23, 14, 10	47	
• Shock in 3 → 2 shift	3, 23, 10, 70	43, 47	
• Shock in D → 3 shift	3, 23, 10, 70	43	
• Shock in 2 → 1 shift	3, 23, 10, 70	49, 43	
Shock is felt when accelerator pedal is released at medium speed or above.	3, 23, 10, 76	69, 77	
Vibration in straight-forward driving	3	69, 77	
Select lever slips out of detents during acceleration or on rough roads.	6, 24, 25		
During 4WD operation:			
• Vibration in tight corner	4, 70, 10, 3, 11	29, 26, 27, 28, 30	
• Front tires slip on start.	5, 10, 3, 11	29, 26, 27, 28, 30	
• Failure to shift into 2WD mode	3, 10, 8	26, 27, 28, 29, 30	

Remember

2 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 throttle body is functioning properly. (Check the full-opened and fully-closed positions.)
3) See that no fluid is leaking from the ATF cooler circulation pipe.
4) Check that the electrical circuits of inhibitor switch are functioning properly.
5) Confirm that the manual linkage adjustment has been completed.
6) See that no fluid is leaking out of the transmission.
7) See that the ATF level and differential oil level are normal.

Disassembly of Transmission

1. External Parts

1) Place the transmission unit on a workbench, with the oil pan facing down.

Be careful not to bend or damage external parts.

2) Remove the drain plug, and drain differential oil. Tighten the plug temporarily after draining.

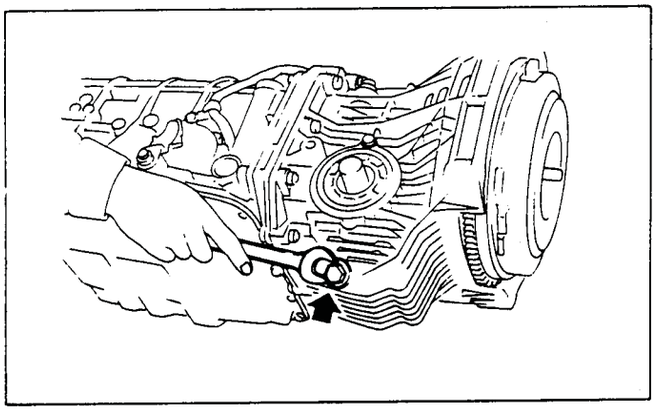


Fig. 115

3) Remove the drain plug, and drain automatic transmission fluid (ATF). Tighten the plug temporarily after draining.

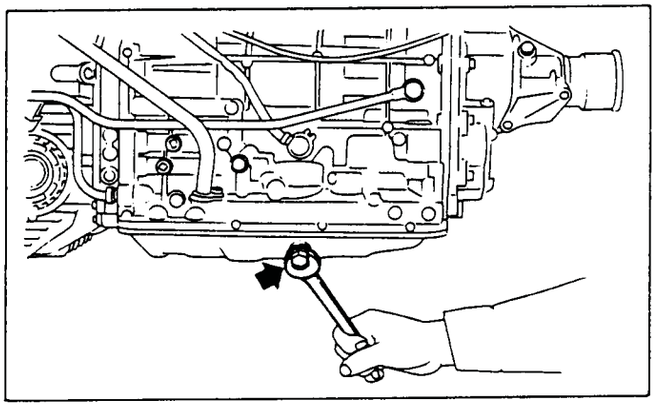


Fig. 116

4) Extract the torque converter.

Extract the torque converter horizontally. Be careful not to scratch the bushing inside the oil pump shaft.

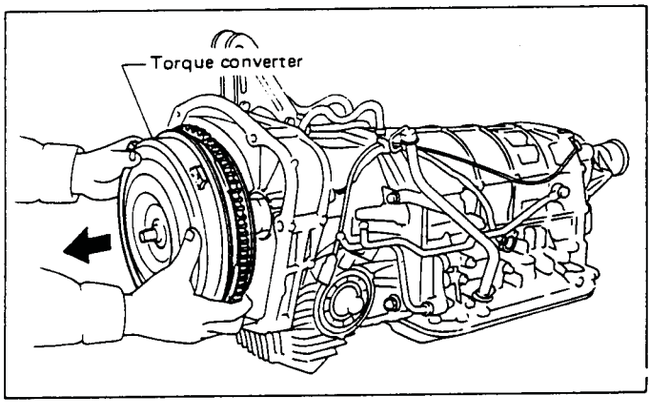


Fig. 117

5) Remove the input shaft.

Be careful not to scratch the bushing.

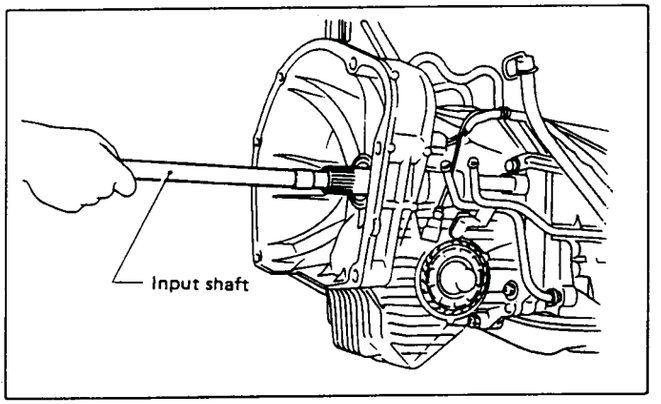


Fig. 118

6) Remove the pitching stopper bracket.

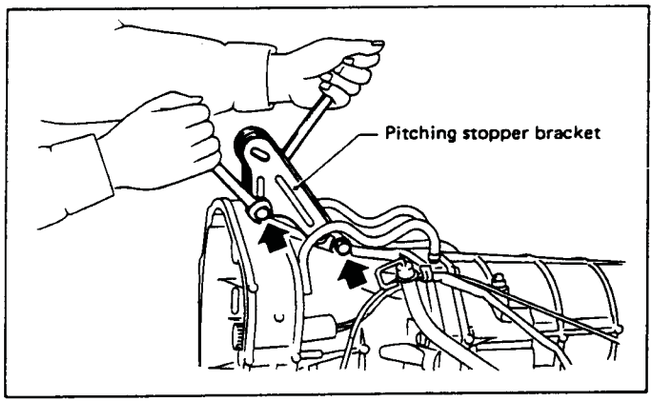


Fig. 119

7) Disconnect the air breather hose.
No. of hoses 4WD: 2
2WD: 1

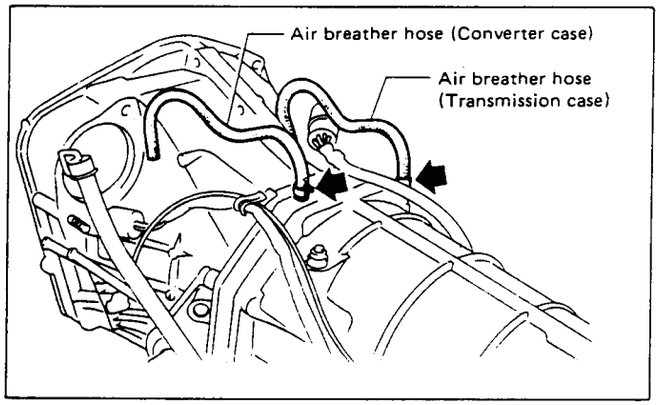


Fig. 120

8) Remove the oil charger pipe, and remove the O-ring from the flange face. Attach the O-ring to the pipe.

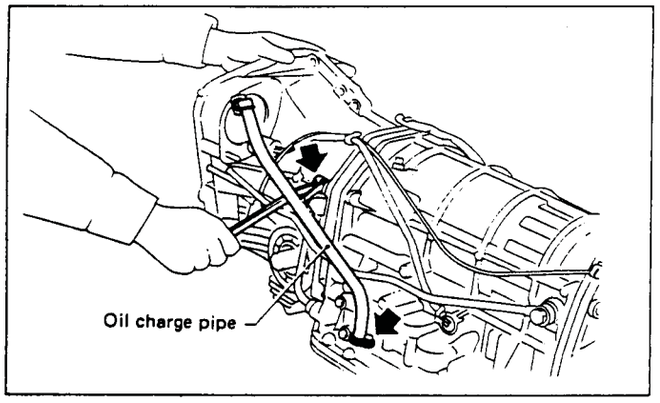


Fig. 121

9) Remove the oil cooler inlet and outlet pipes.

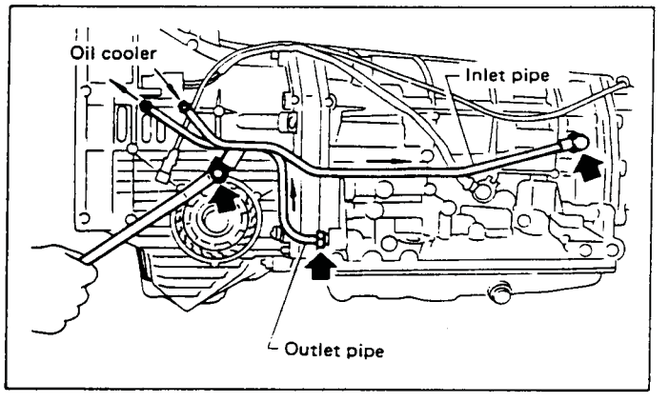


Fig. 122

10) Remove clips from the harnesses.
No. of harnesses 4WD: 3
2WD: 2

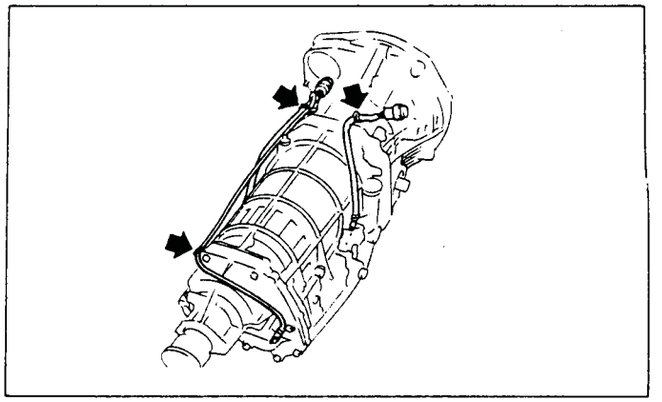


Fig. 123

2. Separation of Converter Case and Transmission Case Sections

a. Separate these cases while tapping lightly on the housing.
b. Be careful not to damage the oil seal and bushing inside the converter case by the oil pump cover.

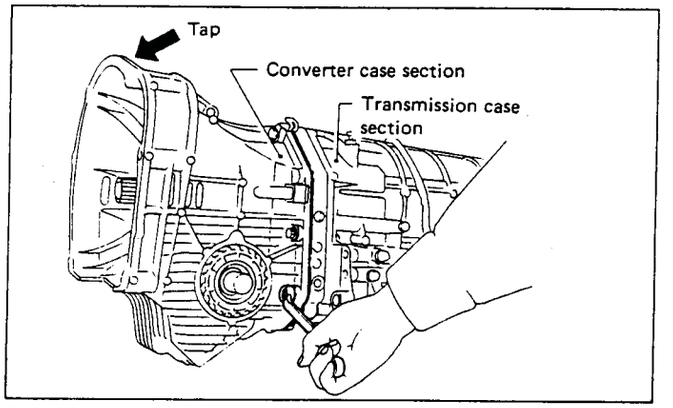


Fig. 124

3. Separation of Transmission Case and Extension Sections (4WD)/ Transmission Cover Sections (2WD)

1) Remove the revolution sensor. (4WD)

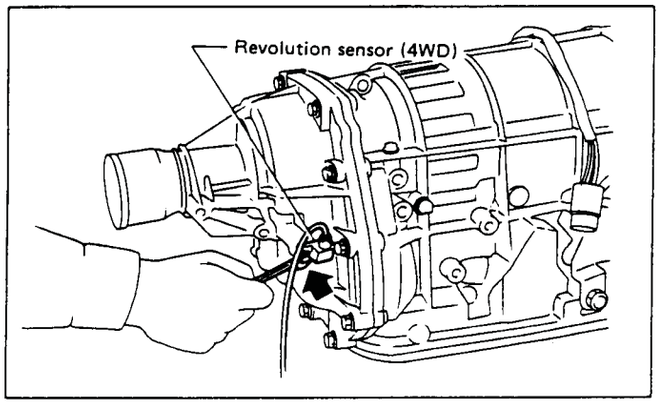


Fig. 125

2) While pulling the extension slightly, disconnect the connector for the duty solenoid C (transfer).

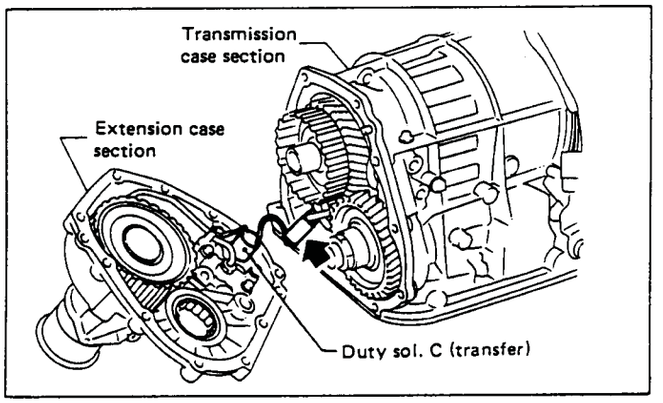


Fig. 126

3) Separate both sections.

4. Transmission Case Section

1) Remove the reduction drive gear ASSY.

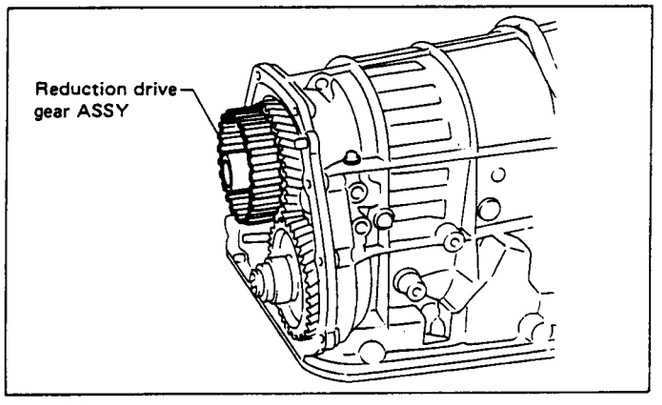


Fig. 127

2) Remove the reduction driven gear:
(1) Straighten the staked portion, and remove the lock nut.

Set the range selector lever to "P".

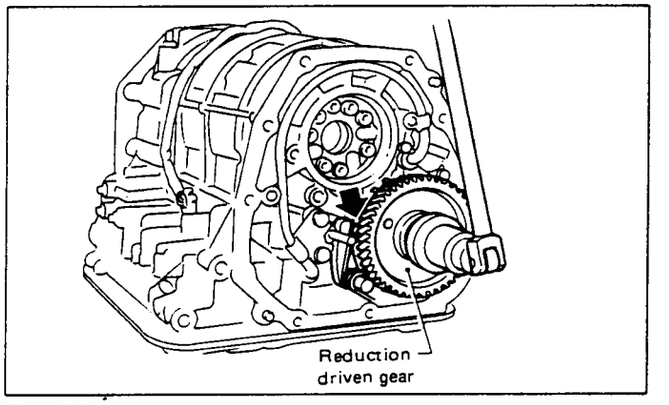


Fig. 128

(2) Using the PULLER SET (899524100), extract the reduction driven gear.

Drill two holes in the puller.

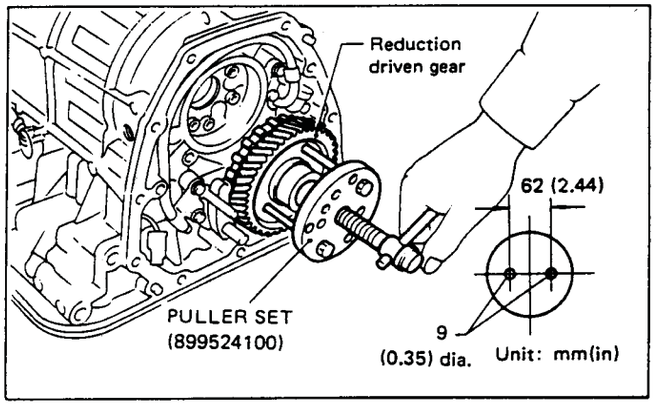


Fig. 129

3) Remove the parking pawl, return spring and shaft.

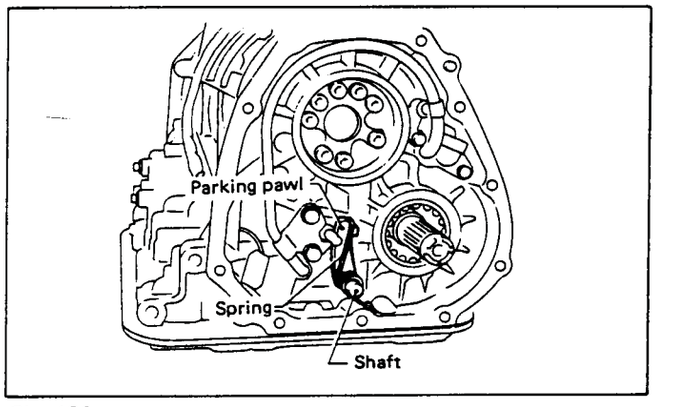


Fig. 130

4) Loosen the taper roller bearing mounting bolts.

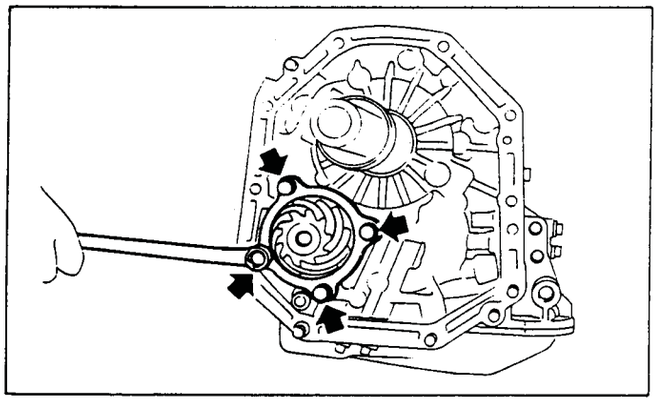


Fig. 131

5) Remove the revolution sensor. (2WD)

Keep the sensing element in the transmission case.

6) Place two wooden blocks on the workbench, and stand the transmission case with its rear end facing down.

a. Be careful not to scratch the rear mating surface of the transmission case.
b. Note that the parking rod and drive pinion protrude from the mating surface.

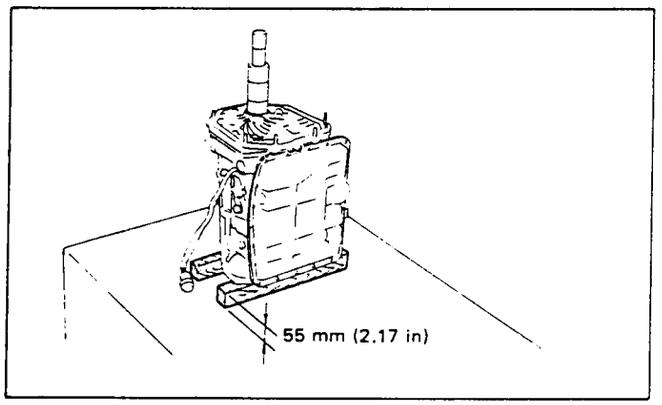


Fig. 132

7) Remove the oil pan and gasket.

Tap the corners of the oil pan when removing.

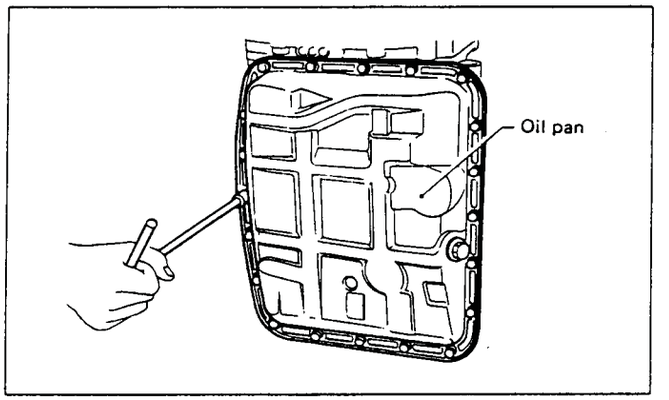


Fig. 133

8) Remove the oil cooler outlet pipe.

Be careful not to twist the pipe.

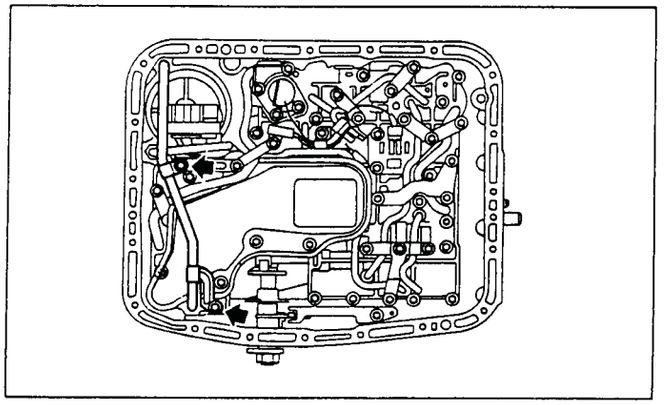


Fig. 134

9) Disconnect the harness connectors for the solenoids and duty solenoids and the ground cord.

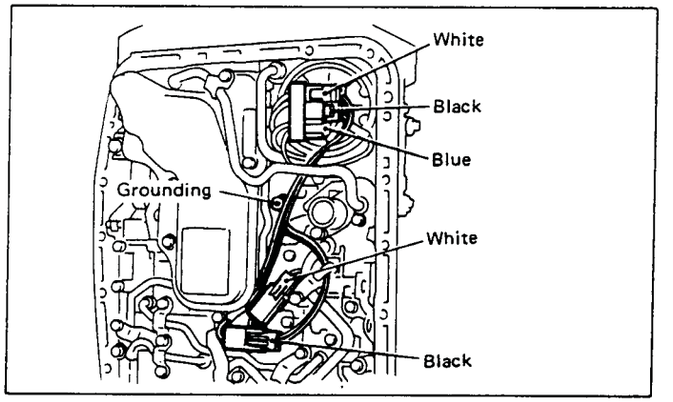


Fig. 135

10) Remove the oil strainer.

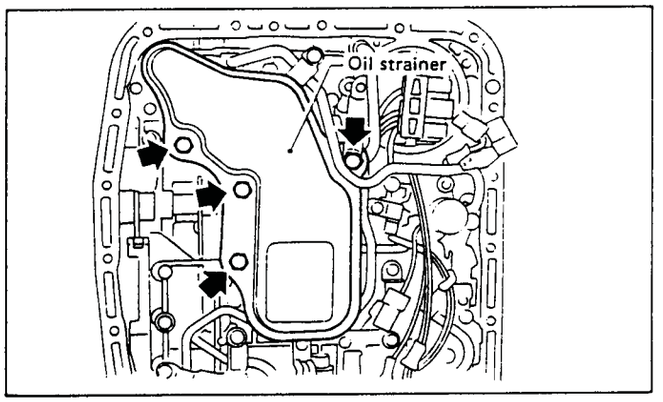


Fig. 136

11) Remove the control valve body.

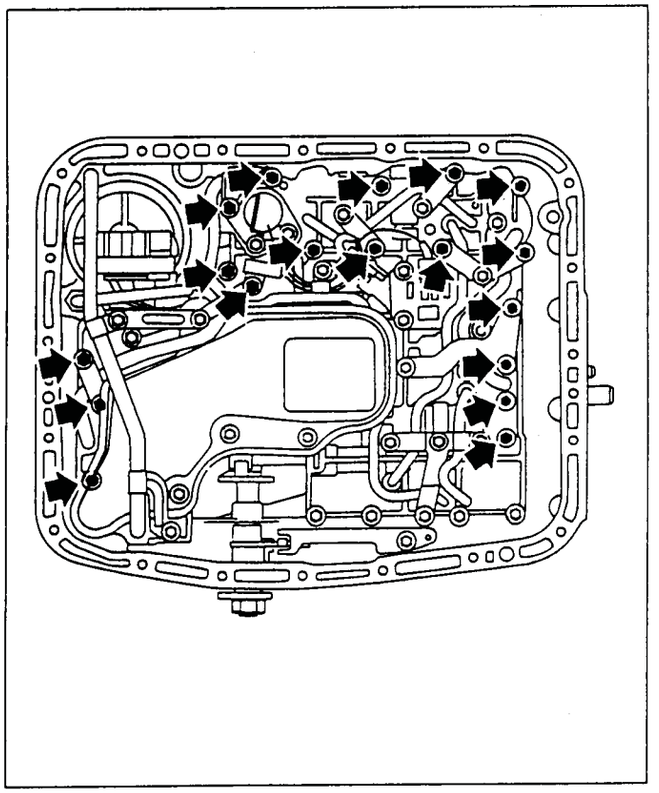


Fig. 137

12) Remove three accumulator springs.

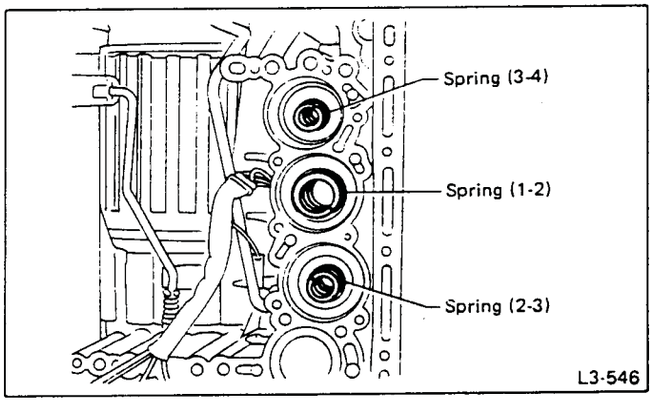


Fig. 138

13) Tighten the reverse clutch drum lightly by turning the adjusting screw. Then remove the oil pump housing.

Be careful not to lose the total end play adjusting thrust washer.

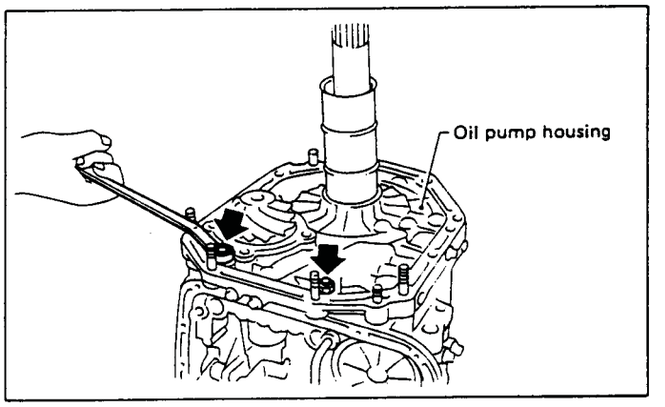


Fig. 139

14) Loosen the brake band adjusting screw, and take out the strut.

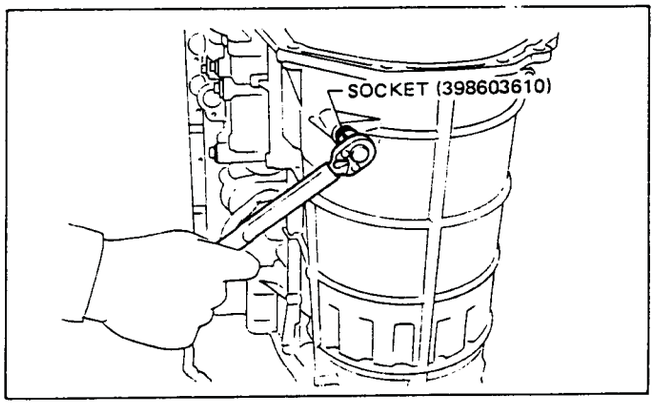


Fig. 140

15) Remove the brake band and reverse clutch.

Contract the brake band with a clip.

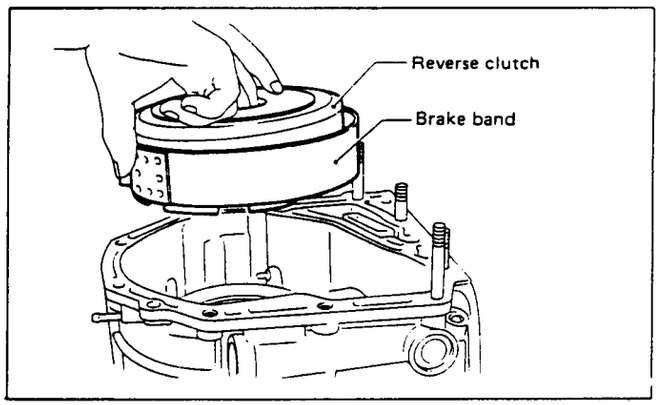


Fig. 141

16) Take out the high clutch.

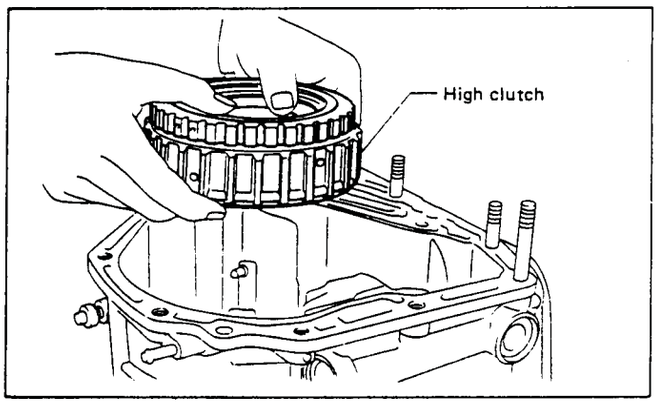


Fig. 142

17) Take out the high clutch hub.

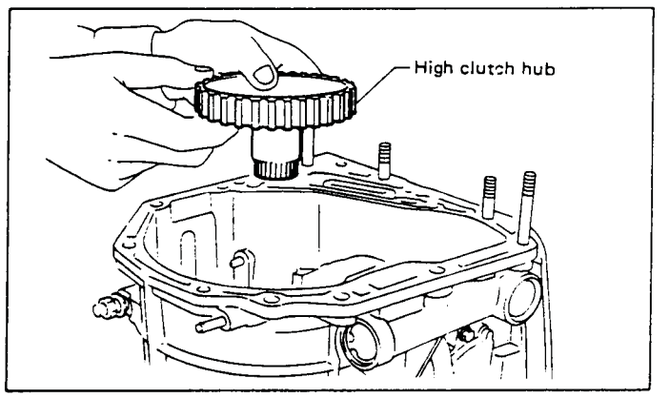


Fig. 143

18) Take out the front sun gear.

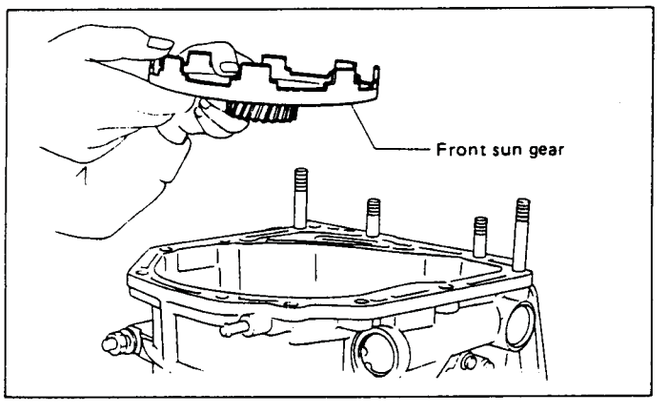


Fig. 144

19) Take out the front planetary carrier.

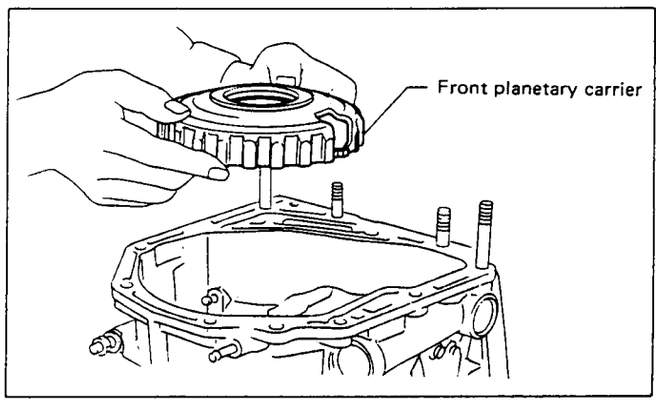


Fig. 145

20) Take out the rear planetary carrier and rear sun gear.

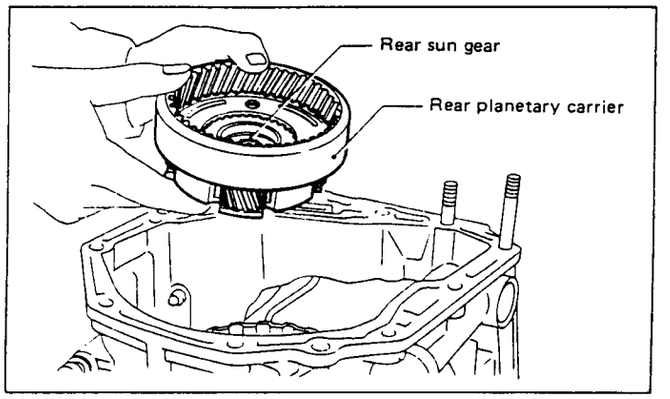


Fig. 146

21) Take out the rear internal gear.

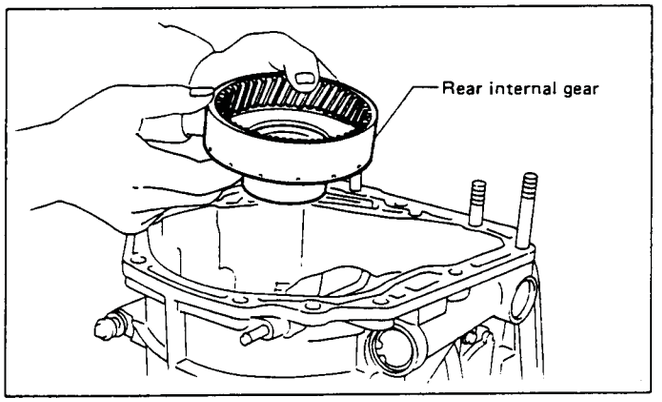


Fig. 147

22) Take out the one-way clutch outer race.

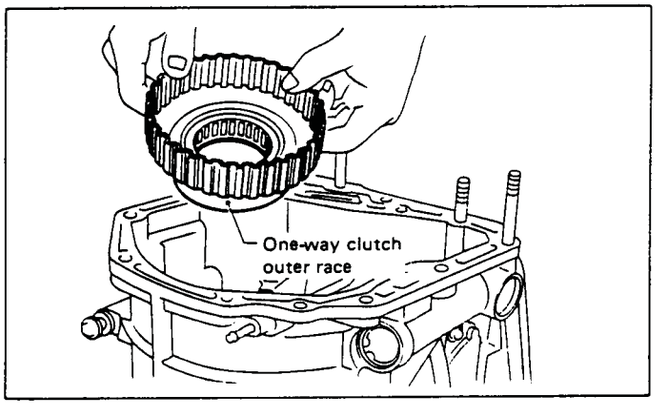


Fig. 148

23) Take out the overrunning clutch hub.

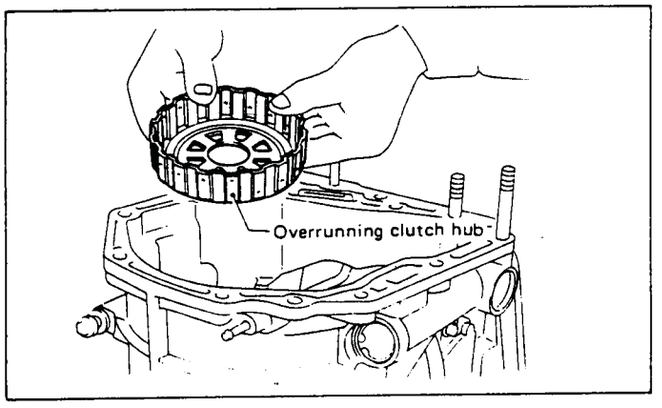


Fig. 149

24) Take out the forward clutch drum.

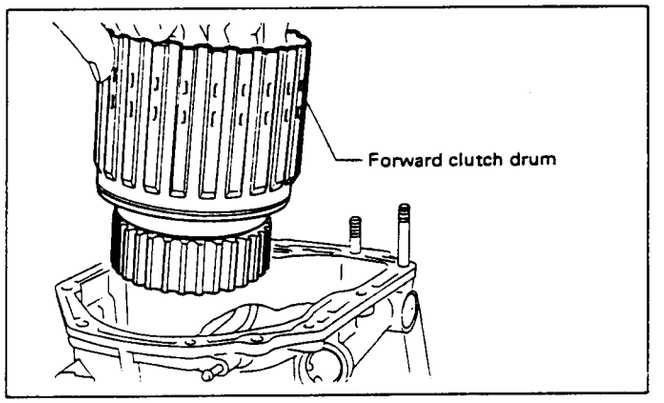


Fig. 150

25) Take out the low & reverse brake section.
(1) Remove the snap ring. Then remove the retaining plate, drive plates, driven plates, and dish plates as a unit.

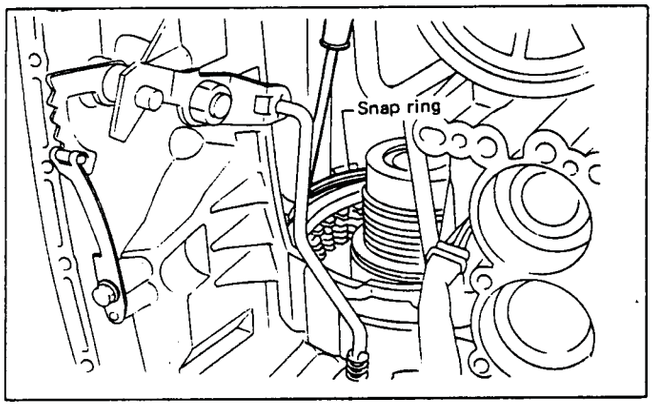


Fig. 151

(2) Turning the case upside down, take out the one-way clutch inner race and spring retainer CP.

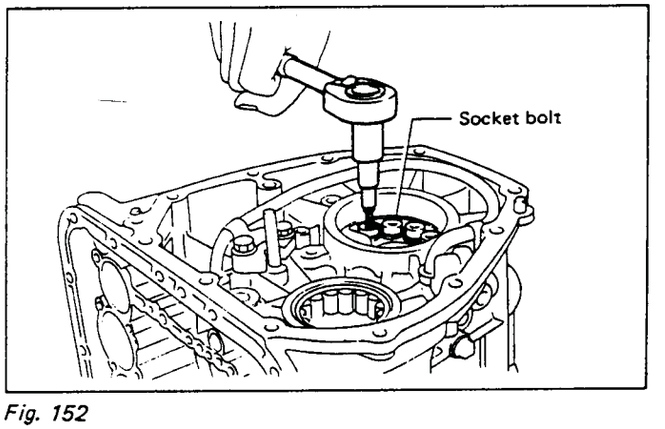


Fig. 152

(3) Take out the low & reverse piston by applying compressed air.

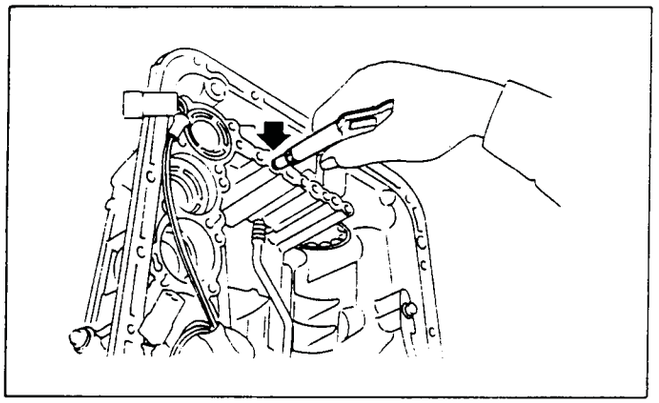


Fig. 153

26) After removing the snap ring (inner), take out the servo piston by applying compressed air from the release pressure side.

Hold the servo piston with a rag so that it will not be ejected with the air pressure. In this case, do not allow your finger to be pinched between the pipe and retainer.

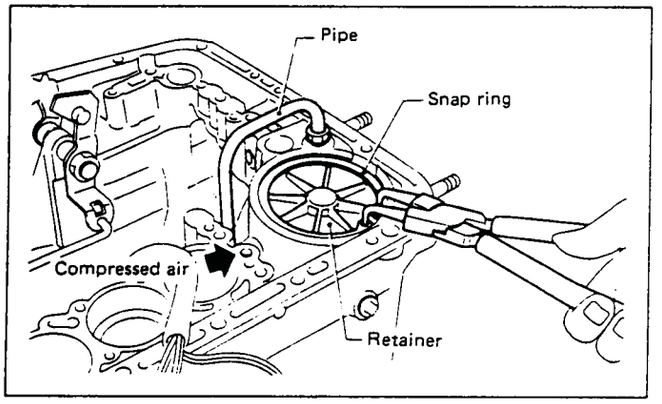


Fig. 154

27) Apply compressed air from the operating pressure side, and take out accumulator (3-4), accumulator (1-2), accumulator (2-3), and accumulator (N-D).

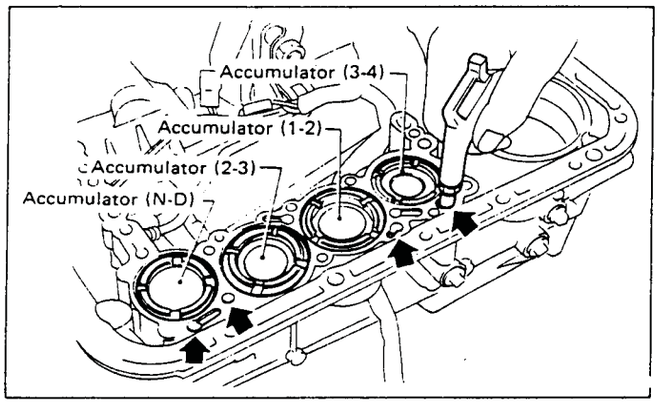


Fig. 155

28) Remove the range select lever.
29) Remove the detent spring.

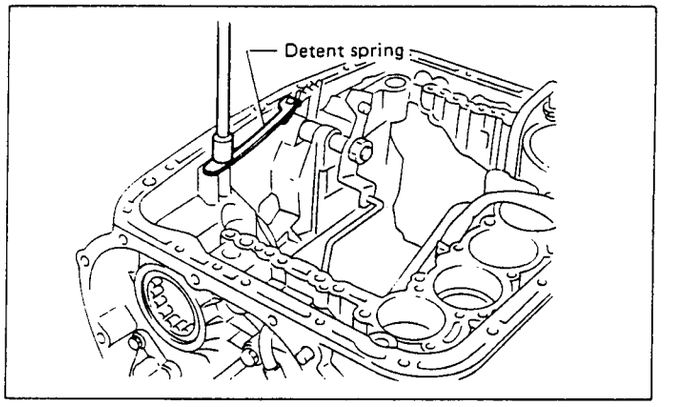


Fig. 156

30) Remove the parking rod together with the manual lever. Then remove the manual shaft by pulling off the straight pin.

Be careful not to damage the lips of the press-fitted oil seal in the case.

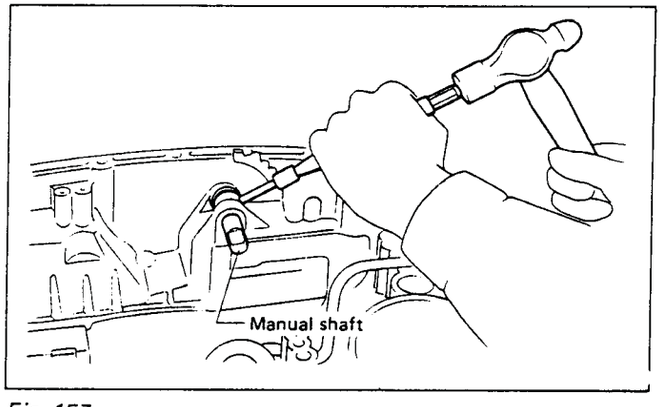


Fig. 157

31) Remove the inhibitor switch.

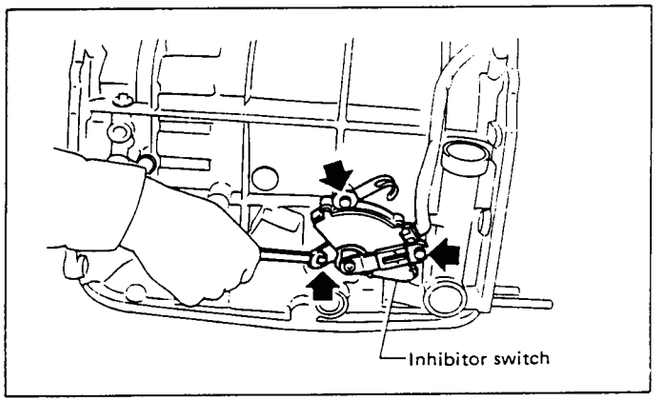


Fig. 158

32) Remove the transmission harness.

Be careful not to damage the cord insulation.

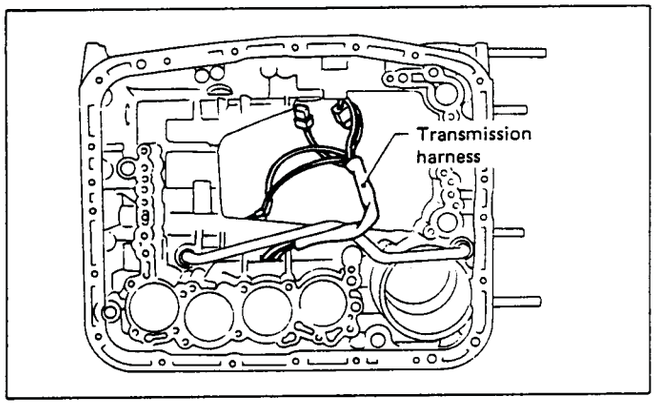


Fig. 159

5. Converter Case Section

1) Wrap the axle-shaft serration with vinyl tape.

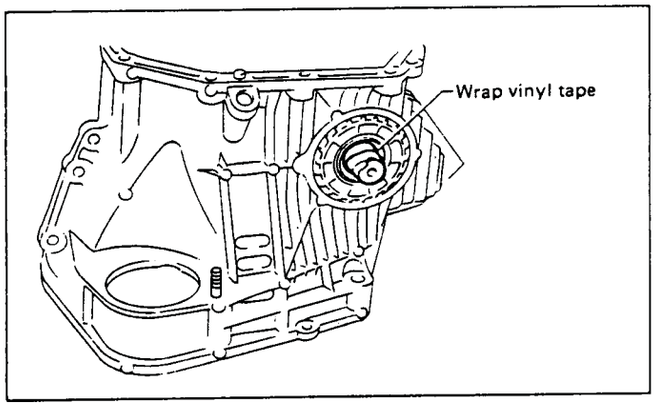


Fig. 160

2) Remove the differential side retainer.

Hold the differential case ASSY by hand to avoid damaging retainer mounting hole of the converter case and speedometer gears.

3) Extract the axle shaft.

Do not reuse the circlip.

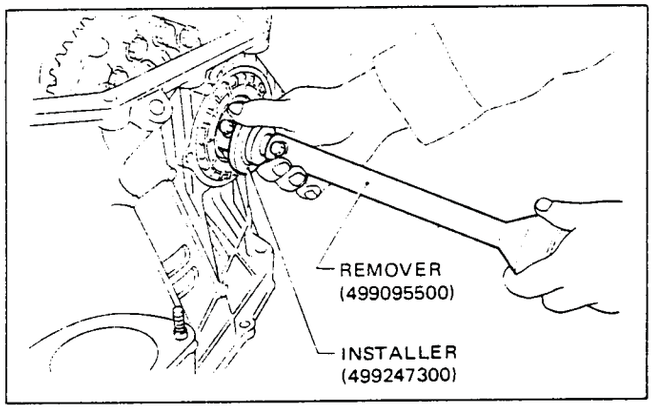


Fig. 161

4) Remove the differential case ASSY.

a. Remove the seal pipe if it is attached. (Reusing is not allowed.)
b. Be careful not to damage the retainer mounting hole of the converter case and the speedometer gears.

5) Remove the snap ring. Then remove the speedometer driven gear.

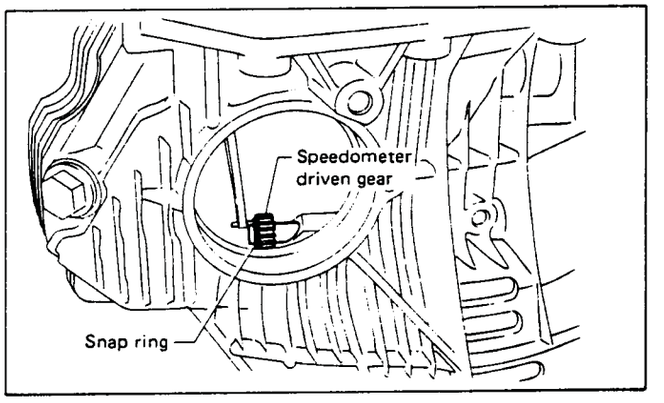


Fig. 162

6) Tap out the speedometer shaft to the outside of the case, and remove the oil seal.

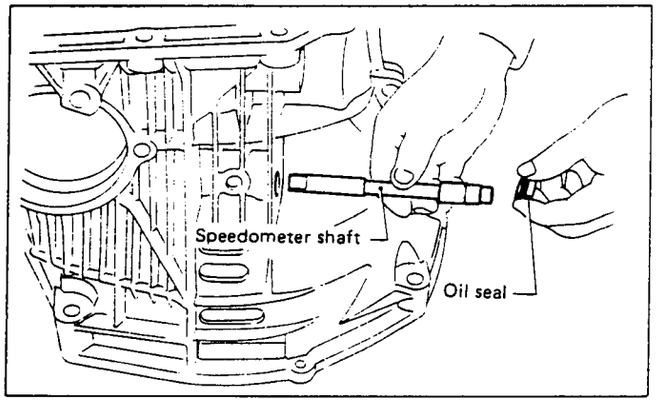


Fig. 163

6. Extension Section

1) Take out the transfer clutch by lightly tapping the end of the rear drive shaft.

Be careful not to damage the oil seal in the extension.

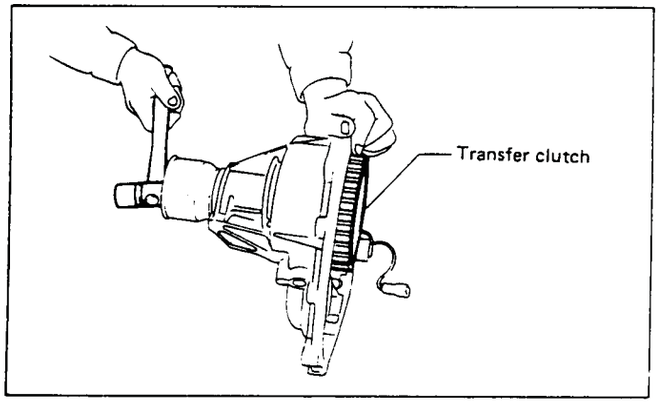


Fig. 164

2) Remove the transfer pipe.

Be careful not to bend the pipe.

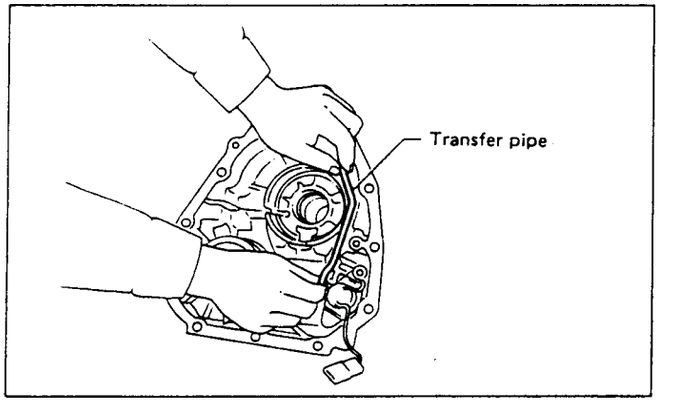


Fig. 165

3) Remove duty solenoid C and the transfer valve body.

a. Take out the inlet filter.
b. Do not damage the O-ring.

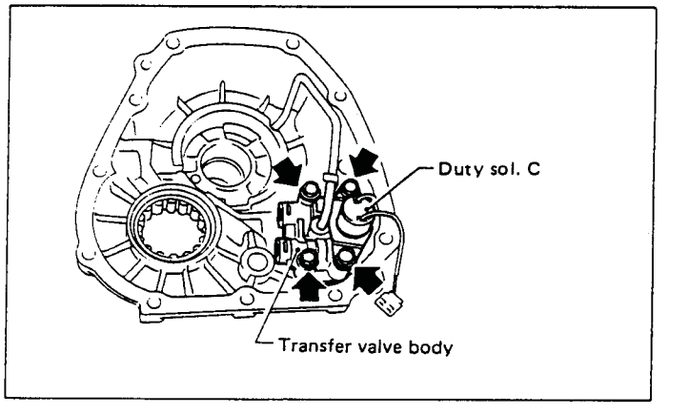


Fig. 166

4) Take out the roller bearing.

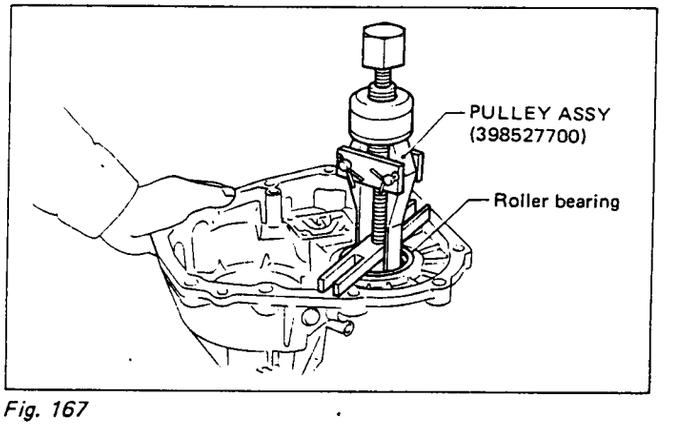


Fig. 167

3 Disassembly, Inspection and Assembly of Each Component

1. Reduction Drive Gear Assembly

DISASSEMBLY

1) Take out the seal rings.

Be careful not to damage the seal rings.

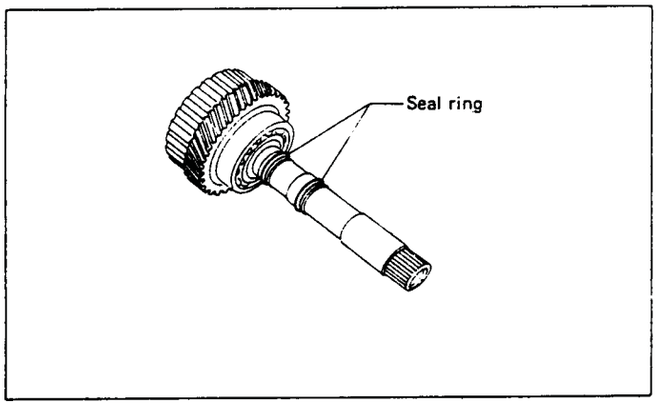


Fig. 168

2) Take out the snap ring (out).

Be careful not to damage the splines.

3) Using a press, remove the reduction drive gear.

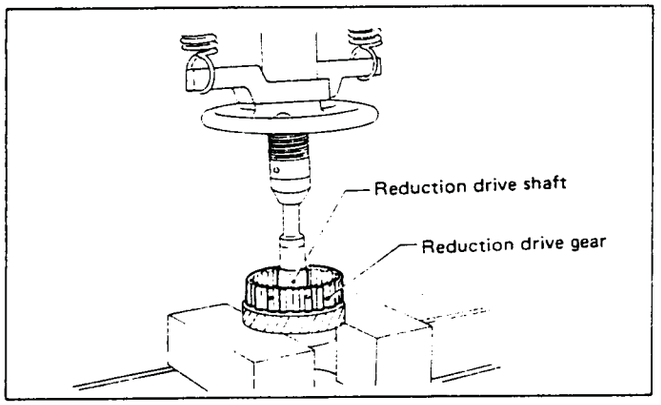


Fig. 169

4) Using a press, remove the ball bearing.

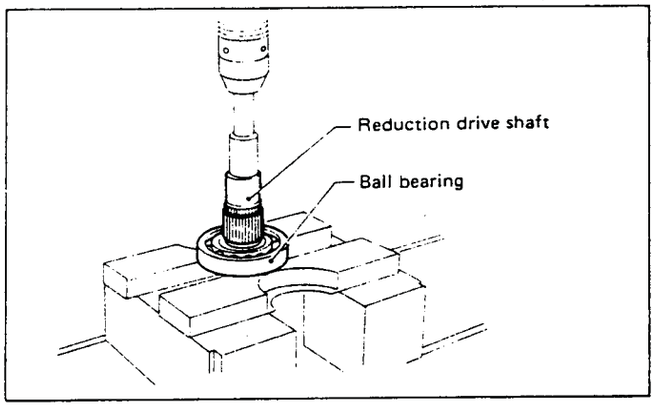


Fig. 170

INSPECTION

Make sure that each component is free of harmful gouges, cuts, or dust.

ASSEMBLY

1) Press-fit the ball bearing and reduction drive gear to the shaft.

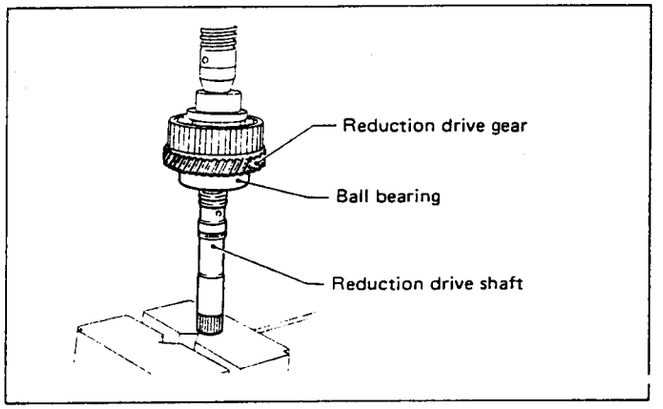


Fig. 171

2) 4WD: Fit the snap ring securely in the snap ring groove on the shaft.
2WD: Press-fit the ball bearing using a press, then fit the snap ring to the snap ring groove on the shaft.
3) Attach two seal rings.

To make subsequent assembly easier, apply vaseline to the grooves of the shaft and to the exterior of the seal ring.

2. Control Valve Body

DISASSEMBLY

1) Remove the following parts from the upper valve body.
   (1) Solenoid ASSY (shift 1-2-3)
   (2) Duty solenoid A (line pressure)

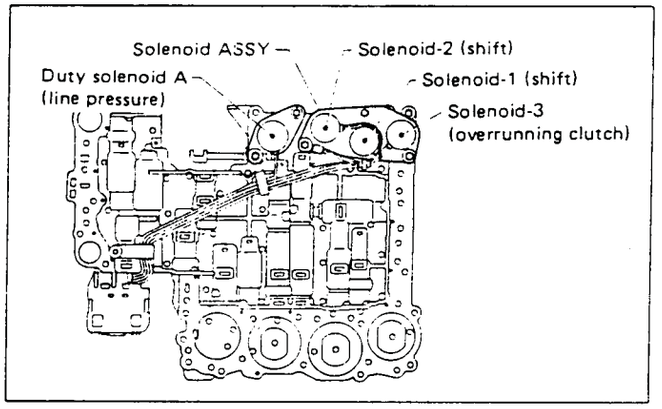


Fig. 172

2) Remove the following parts from the lower valve body.
   (1) Duty solenoid B (lock-up)
   (2) ATF temperature sensor

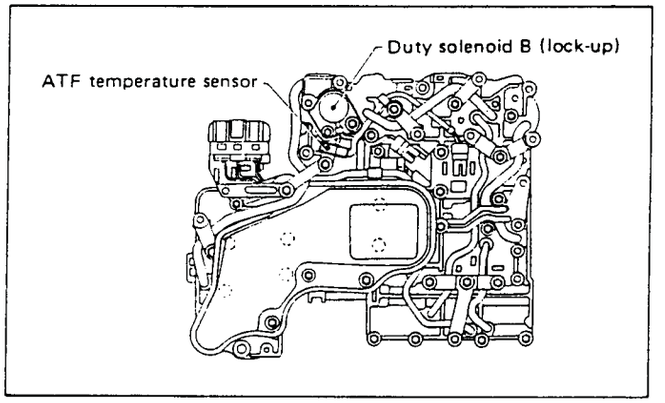


Fig. 173

3) Separate the upper valve body and lower valve body.

a. Do not lose the nine (9) steel balls contained in the upper valve body.
b. Do not lose an orifice and a strainer contained in the lower valve body.
c. Remove the upper-lower valve body tightening bolts. Then remove two reamer bolts.

During ordinary servicing, clean the control valve bodies in this condition, without further disassembly.
In the event of a seized clutch or other problem, disassemble the control valve bodies further, and clean the component parts.

COMPONENTS ATTACHED TO CONTROL VALVE

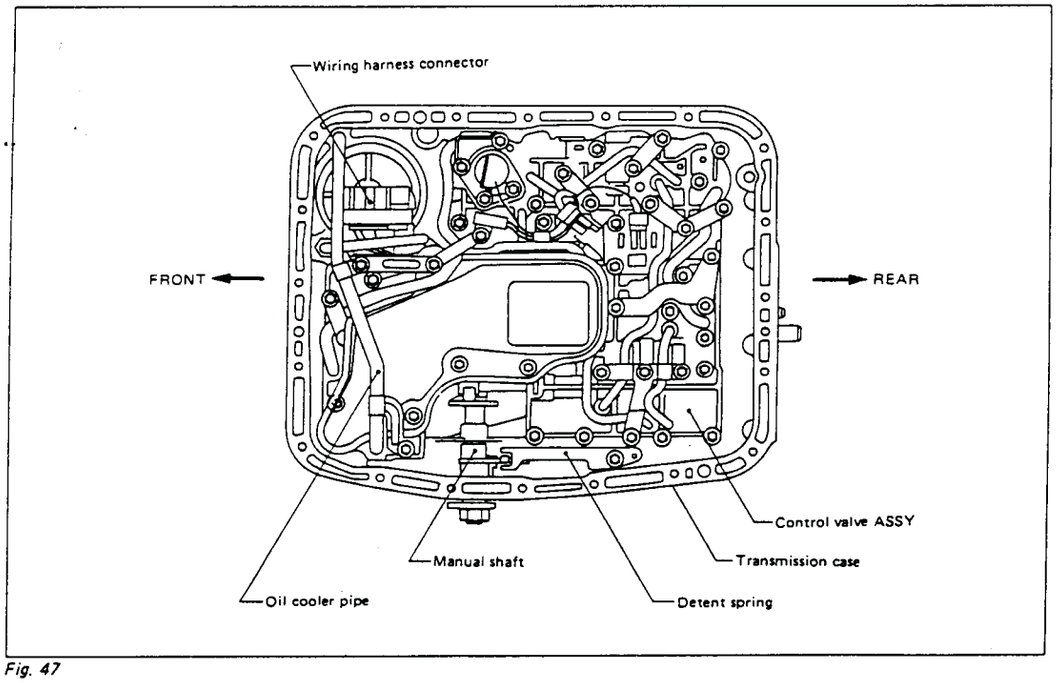
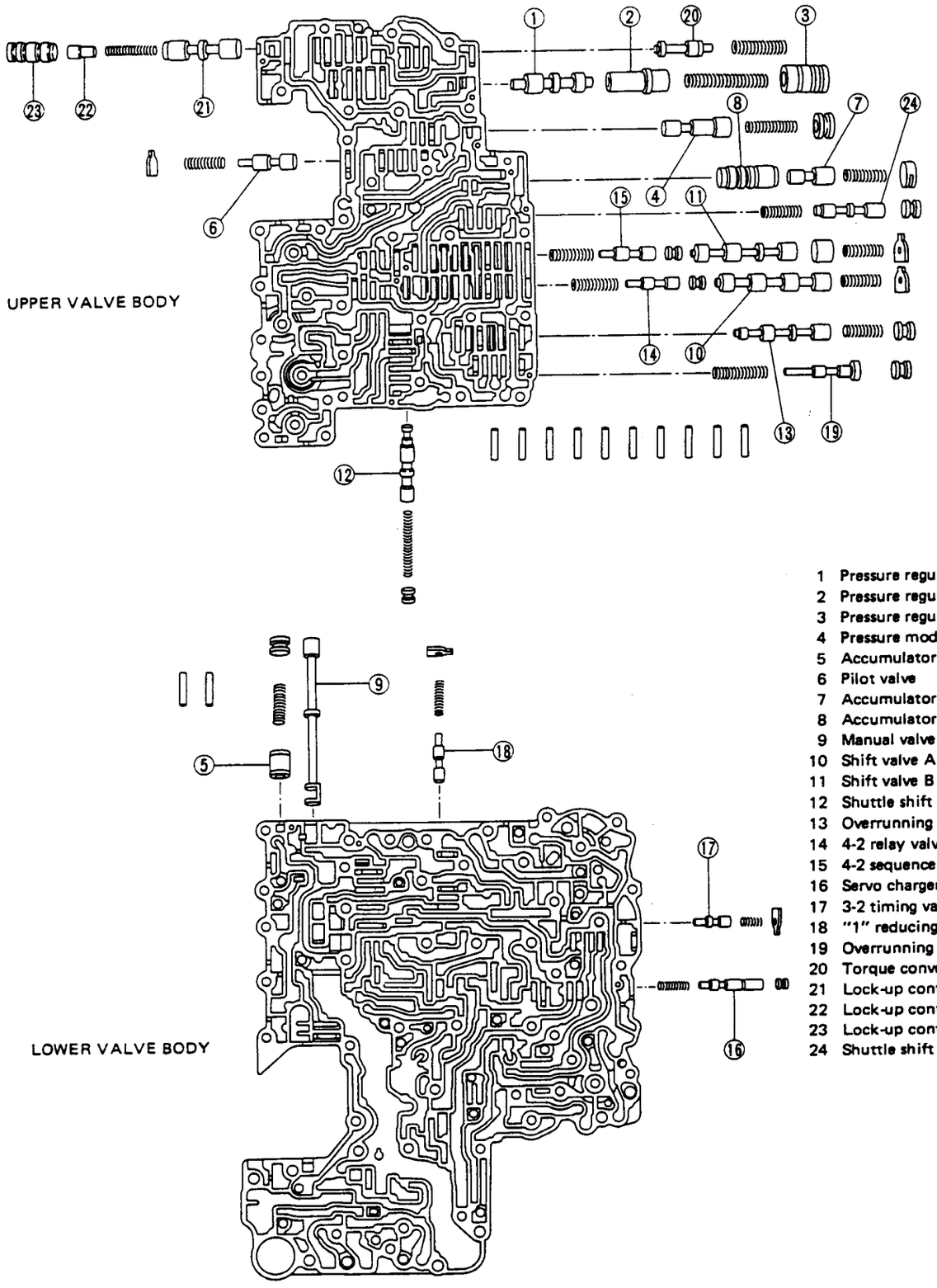


Fig. 47

CONTROL VALVE



1 Pressure regulator valve
2 Pressure regulator plug
3 Pressure regulator sleeve plug
4 Pressure modifier valve
5 Accumulator piston
6 Pilot valve
7 Accumulator control plug
8 Accumulator control sleeve
9 Manual valve
10 Shift valve A
11 Shift valve B
12 Shuttle shift valve B
13 Overrunning clutch control valve
14 4-2 relay valve
15 4-2 sequence valve
16 Servo charger valve
17 3-2 timing valve
18 "1" reducing valve
19 Overrunning clutch reducing valve
20 Torque converter relief valve
21 Lock-up control valve
22 Lock-up control plug
23 Lock-up control sleeve
24 Shuttle shift valve D

Fig. 41

ASSEMBLY

Reverse the disassembly sequence, paying attention to the following points:

a. Be sure to properly position the steel balls, orifice and strainer.

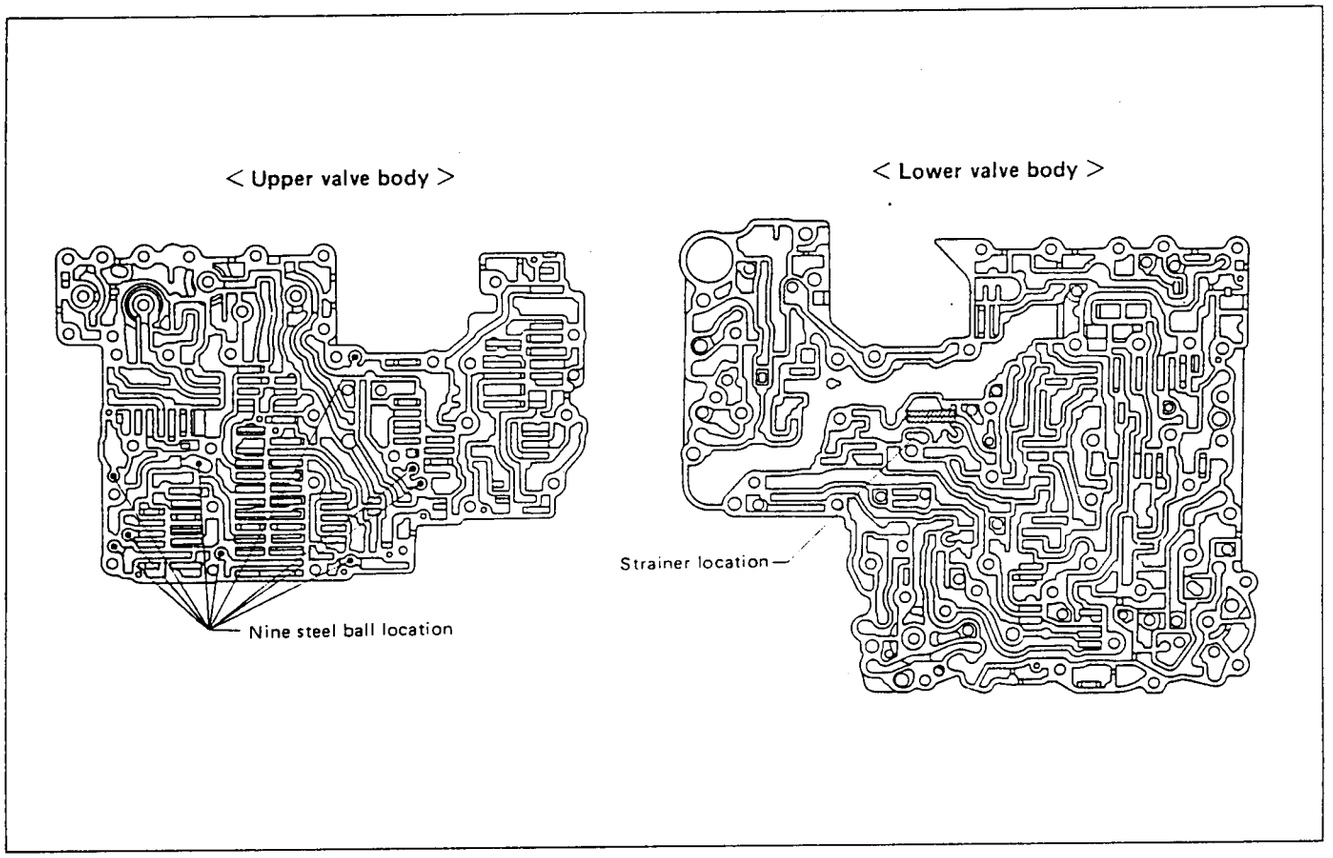


Fig. 174

b. Tighten two reamer bolts. Then tighten the upper-lower valve body tightening bolts.

Tightening torque:
7 – 9 N·m (0.7 – 0.9 kg-m, 5.1 – 6.5 ft-lb)

3. Oil Pump Assembly

DISASSEMBLY

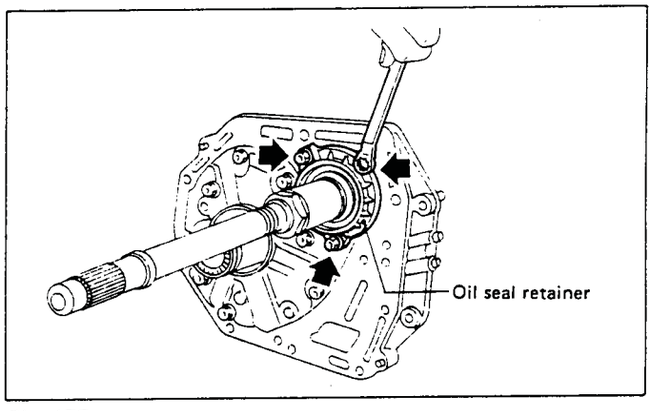


Fig. 175

1) Remove the oil seal retainer.
Also remove the O-ring and oil seal (air breather).

2) Remove the oil pump cover.

Lightly tap the end of the stator shaft to remove the cover.

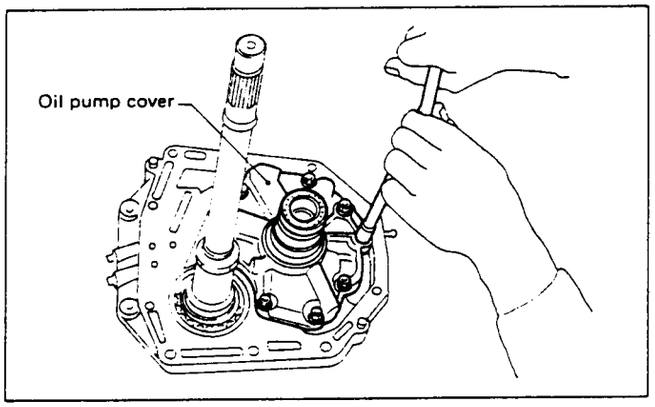


Fig. 176

3) Remove the retainer and return spring. Then remove the rotor, two vane rings and nine vanes.

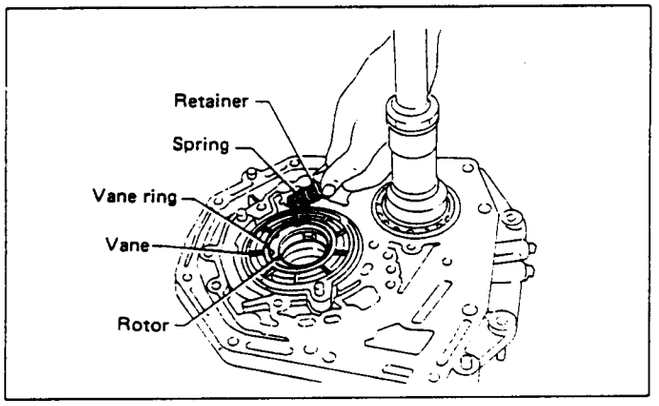


Fig. 177

4) Remove the cam ring and control piston.
Also remove the O-ring, friction ring, two side seals, and plain seal.

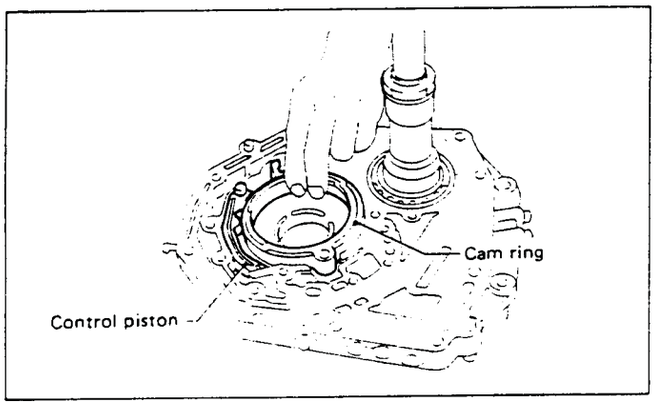


Fig. 178

5) Remove two seal rings (R) and two seal rings (H).

INSPECTION

1) Make sure that each component is free of harmful gouges, cuts, and dust.
2) Selection of oil pump components (rotor, vanes, control piston and cam ring):
   (1) Using a micrometer, measure the height of the rotor, vanes, control piston and cam ring in at least four positions. (Measure the height at one place for each of the nine vanes.)

a. Remove the control piston seals when measuring.
b. Remove the friction ring from the cam ring when measuring.

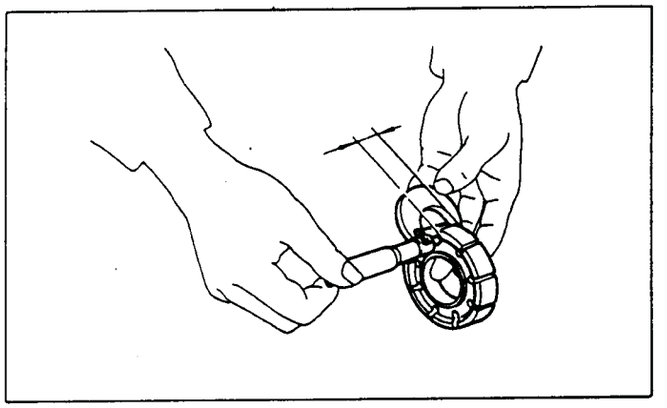


Fig. 179

(2) Using a depth gauge, measure the depth of the oil pump housing from the contact/sliding surface of the above-mentioned component parts in the same manner as above.

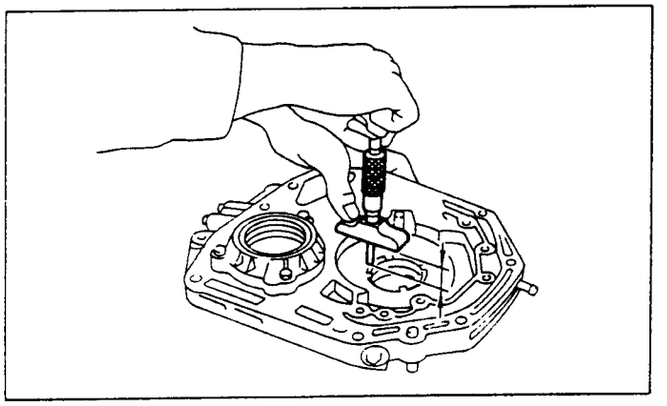


Fig. 180

(3) Make sure that the clearances are within the specified wear limits. If the wear limit is exceeded, select pump components so that the standard clearance can be obtained.

	Wear limit	Standard value
Rotor, control piston, vanes	0.054 mm (0.0021 in)	0.030 – 0.044 mm (0.0012 – 0.0017 in)
Cam ring	0.034 mm (0.0013 in)	0.010 – 0.024 mm (0.0004 – 0.0009 in)

Select vanes which are the same height as the rotor.

ASSEMBLY

1) Coat both the O-ring and friction ring with vaseline and attach to the cam ring. Then fit them into the oil pump housing.

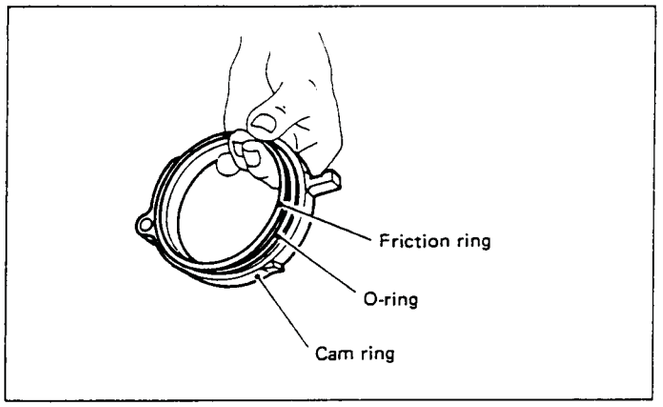


Fig. 181

2) Install the vane ring, rotor, vanes, and vane ring into the housing in this sequence.

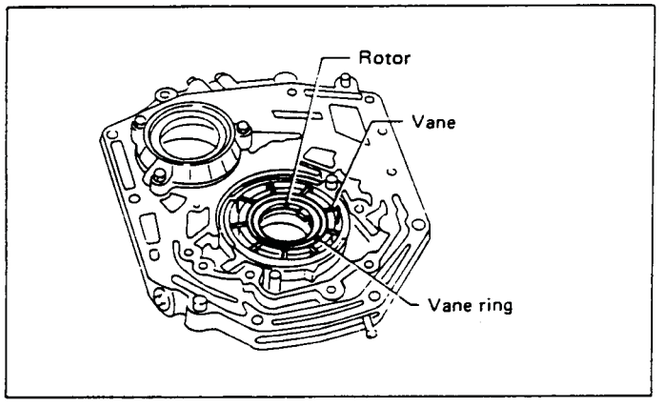


Fig. 182

3) Install the return spring and retainer between the housing and cam ring.

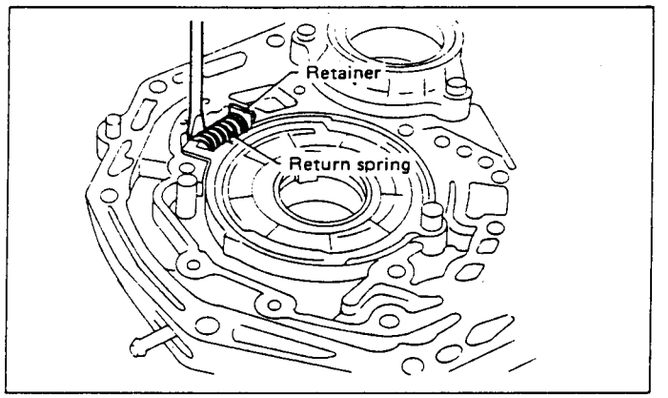


Fig. 183

4) Install the control piston to the oil pump housing.

Fit the seal in the piston groove, with the red seals facing the top side. (Two side seals and one plain seal are attached.)

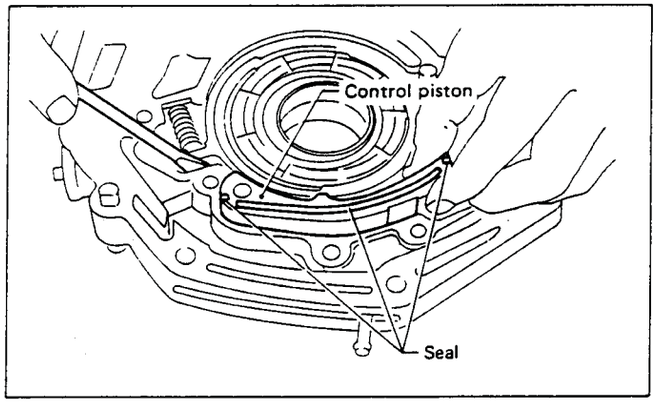


Fig. 184

5) Set the rotor at the center of the housing bore. Apply ATF abundantly to each rotary portion.
6) Install the oil pump cover.

Tightening torque:
25 ± 2 N·m (2.5 ± 0.2 kg-m, 18.1 ± 1.4 ft-lb)

a. Align both pivots with the pivot holes of the cover, and install the cover being careful not to apply undue force to the pivots.
b. After assembling, turn the oil pump shaft to check for smooth rotation of the rotor.

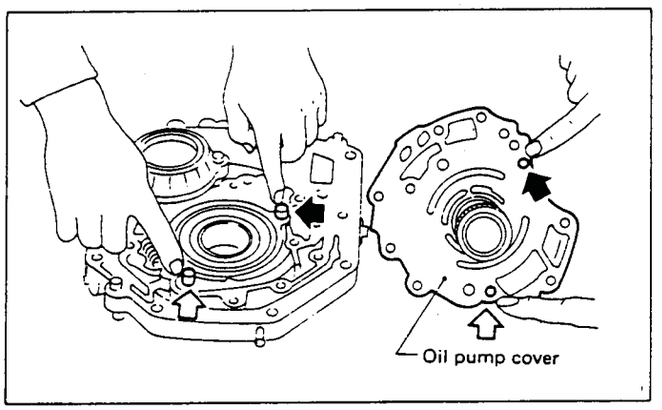


Fig. 185

Install the oil seal retainer and seal rings (R) and (H) after adjusting the drive pinion backlash and tooth contact.

4. Drive Pinion Shaft

DISASSEMBLY

1) Straighten the staked portion of the lock nut, and remove the lock nut while locking the rear spline portion of the shaft. Then pull off the drive pinion collar.

Remove the O-ring

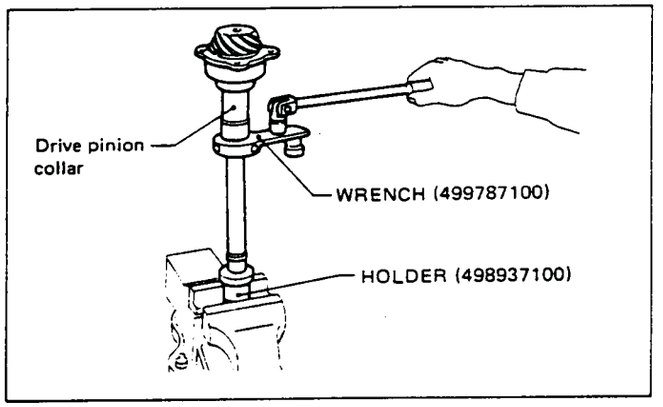


Fig. 186

2) Using a press, separate the rear roller bearing and outer race from the shaft.

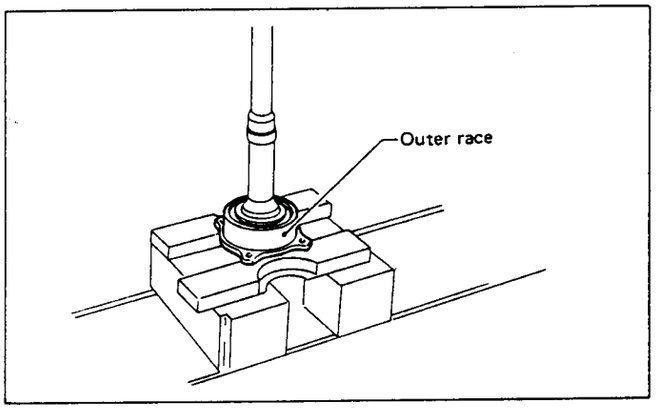


Fig. 187

3) Using a press, separate the front roller bearing from the shaft.

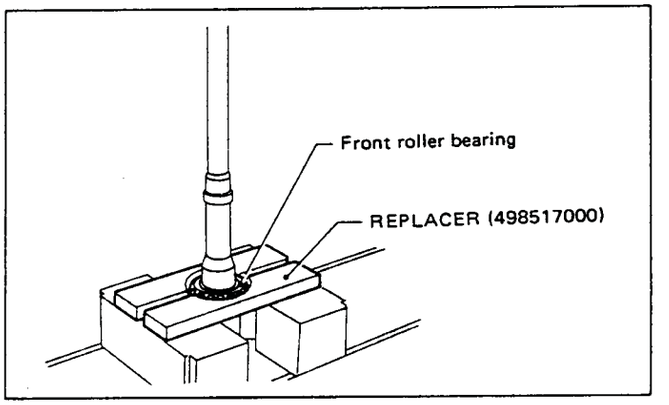


Fig. 188

INSPECTION

Make sure that all component parts are free of harmful cuts, gouges, and other faults.

ASSEMBLY

1) Measure dimension "A" of the drive pinion shaft.

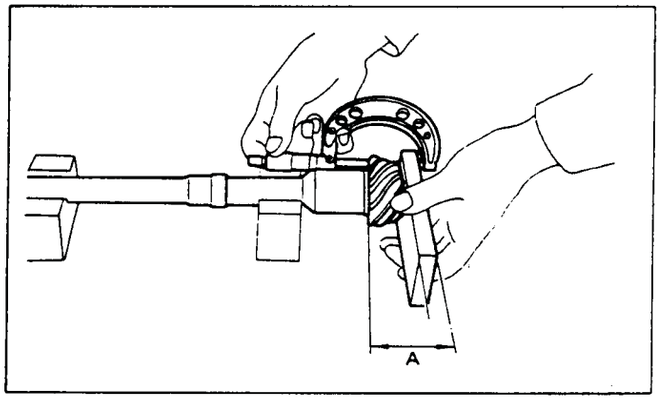


Fig. 189

2) Using a press, force-fit the roller bearing in position.

Do not change the relative positions of the outer race and bearing cone.

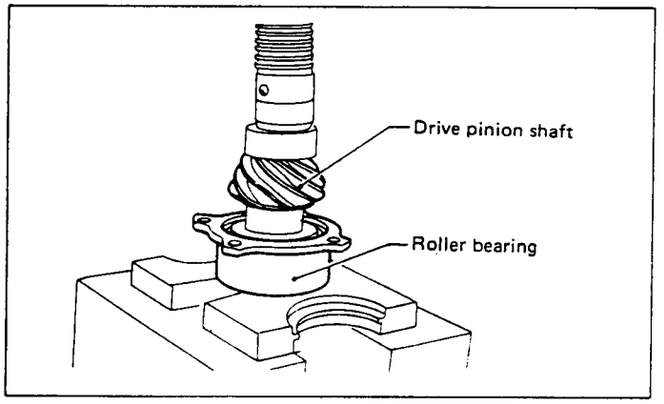


Fig. 190

3) After fitting the O-ring to the shaft, attach the drive pinion collar to the shaft. Be careful not to damage the O-ring.

4) Tighten the lock washer and lock nut.

Tightening torque:
113 ± 5 N·m (11.5 ± 0.5 kg-m, 83.2 ± 3.6 ft-lb)

a. Pay attention to the orientation of lock washer.
b. When using "900 GL", tighten it to 88 N·m (9 kg-m, 65 ft-lb).

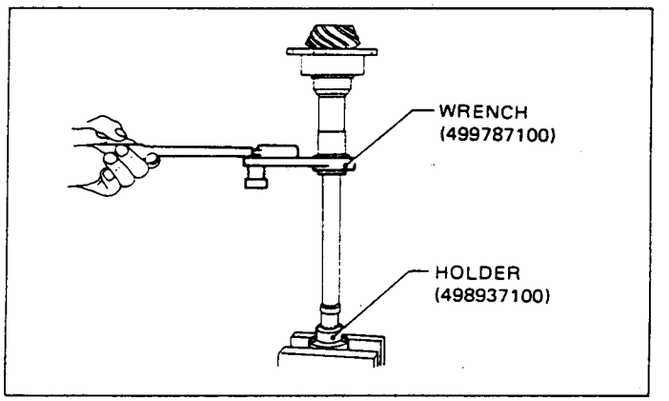


Fig. 191

5) Measure the starting torque of the bearing.
Make sure the starting torque is within the specified range. If out of the allowable range, replace the roller bearing.

Starting torque:
0.3 – 2.0 N·m (3 – 20 kg-cm, 2.6 – 16.4 in-lb)

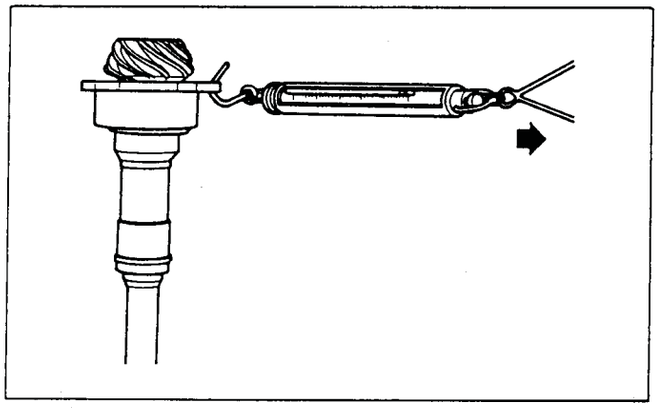


Fig. 192

6) Stake the lock nut securely at two places.

7) Measure dimension "B" of the drive pinion shaft.

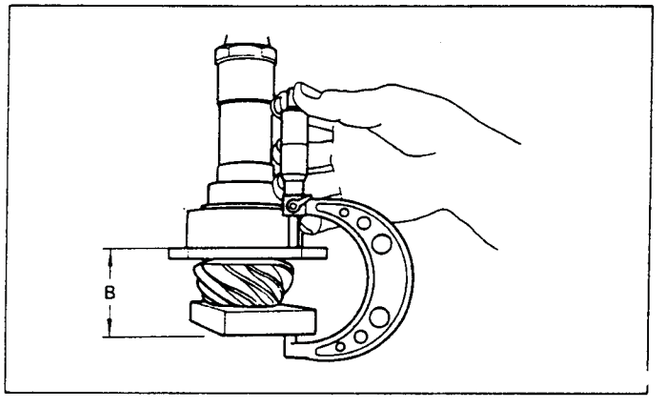


Fig. 193

8) Determine the thickness t (mm) of the drive pinion shim.

$$t = 6.5 \pm 0.0125 - (B - A)$$

The number of shims must be three or less.

5. Reverse Clutch

DISASSEMBLY

1) Remove the snap ring, and take out the retaining plate, drive plates, driven plates, and dish plate.

2) Using the COMPRESSOR (398673600), INSTALLER (398177700) and PLIER (399893600), remove the snap ring and take out the spring retainer and springs.

3) Take out the piston by applying compressed air.

INSPECTION

1) Drive plate facing for wear and damage

2) Snap ring for wear, return spring for breakage or setting, and spring retainer for deformation

3) Lip seal and lathe cut seal ring for damage

4) Piston check ball for operation

ASSEMBLY

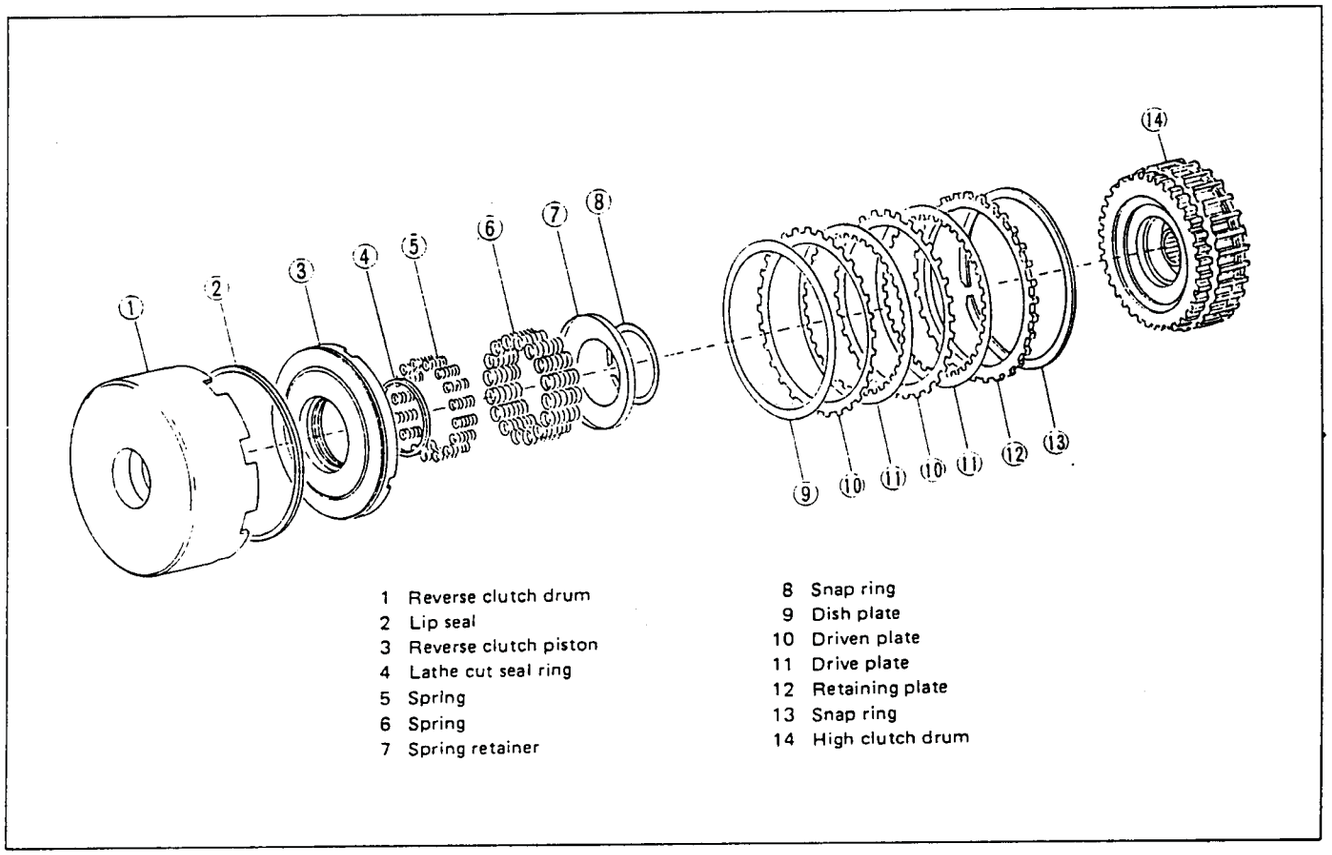


Fig. 194

1) Using the same special tools as those used in disassembling, assemble piston the return springs, spring retainer and snap ring.

2) Assemble the dish plate, driven plates, drive plates and retaining plate in that order and attach the snap ring.

Pay attention to the orientation of the dish plate.

3) Checking operation:
Apply compressed air intermittently to the oil hole, and check the reverse clutch for smooth operation.

4) Measuring clearance (Retaining plate selection).

Standard value:
0.5 – 0.8 mm (0.020 – 0.031 in)
Allowable limit: 1.2 mm (0.047 in)

6. High Clutch

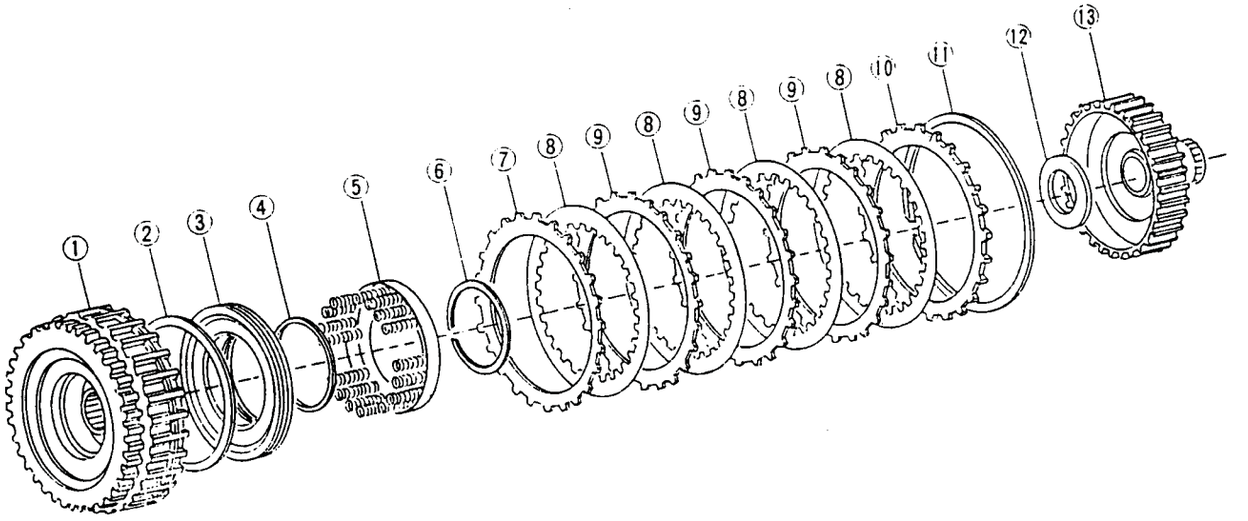
DISASSEMBLY

1) Remove the snap ring, and take out the retaining plate, drive plates, and driven plates.
2) Using the COMPRESSOR (398673600), INSTALLER (398177700), and PLIERS (399893600), remove the snap ring and take out the spring retainer CP.
3) Apply compressed air to the clutch drum to remove the piston.

INSPECTION

1) Drive plate facing for wear and damage
2) Snap ring for wear, return spring for setting and breakage, and spring retainer for deformation
3) Lathe cut rings (large) (small) for damage
4) Piston check ball for smooth operation

ASSEMBLY



1 High clutch drum
2 Lathe cut seal ring
3 High clutch piston
4 Lathe cut seal ring
5 Spring retainer CP.
6 Snap ring
7 Driven plate (Thinner)
8 Drive plate
9 Driven plate (Thicker)
10 Retaining plate
11 Snap ring
12 Thrust needle bearing
13 High clutch hub

Fig. 195

1) Using the same special tools as those used in disassembling, assemble the piston, spring retainer CP, and snap ring.
2) Install the driven plate (thin), drive plates, driven plates, and retaining plate in that order. Then attach the snap ring.
3) Checking operation:
Apply compressed air intermittently to the oil hole, and check the high clutch for smooth operation.
4) Measuring clearance (Retaining plate selection).

Standard value:
1.8 – 2.2 mm (0.071 – 0.087 in)
Allowable limit: 2.6 mm (0.102 in)

7. Forward Clutch Drum

DISASSEMBLY

1) Remove two snap rings from the forward clutch drum.

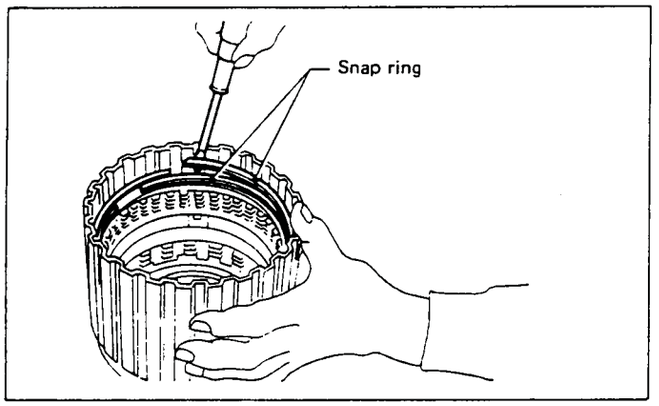


Fig. 196

2) Remove the retaining plate, drive plates, driven plates and dish plates. (Forward clutch)
3) Remove the snap ring from the forward clutch drum.

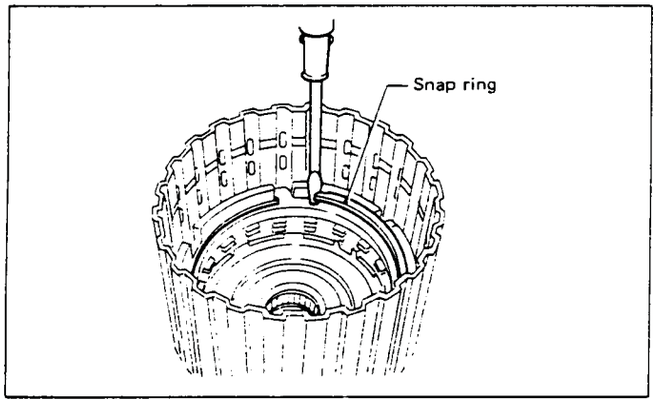


Fig. 197

4) Remove the retaining plate, drive plates, driven plates and dish plate. (Overrunning clutch)
5) Compress the spring retainer, and remove the snap ring from the forward clutch, by using SEAT (498627100), COMPRESSOR (398673600) and SEAT (498627000).
6) Install the one-way clutch inner race to the forward clutch drum, and apply compressed air to remove the overrunning piston and forward piston.

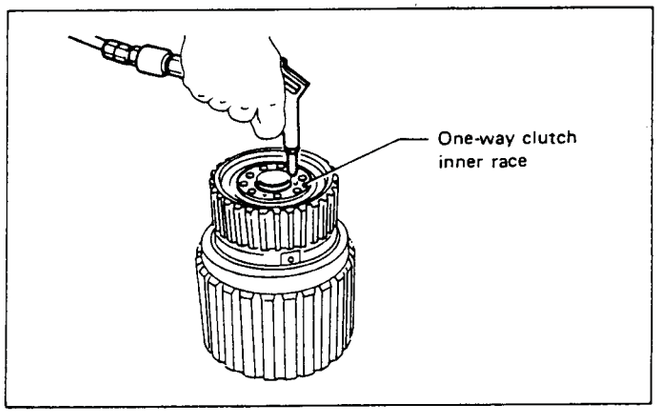


Fig. 198

7) Remove the one-way clutch after taking out the snap ring.
8) Remove the needle bearing after taking out the snap ring.

INSPECTION

1) Drive plate facing for wear and damage
2) Snap ring for wear, return spring for setting and breakage, and snap ring retainer for deformation
3) Lip seal and lathe cut ring for damage
4) Piston and drum check ball for operation

ASSEMBLY

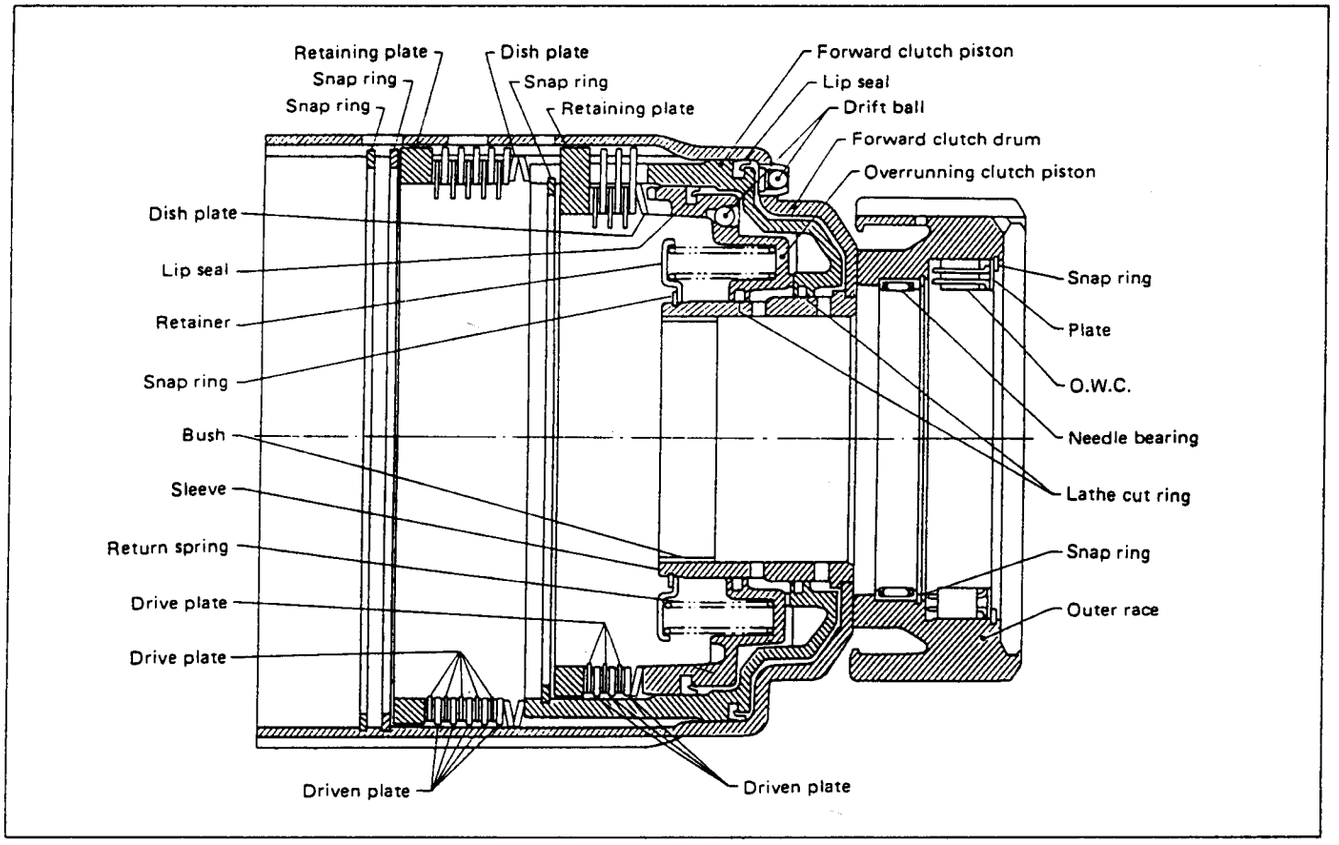


Fig. 199

1) Fit the forward piston and overrunning piston to the forward clutch drum.

Align the forward piston cut-out portion with the spline of the drum.

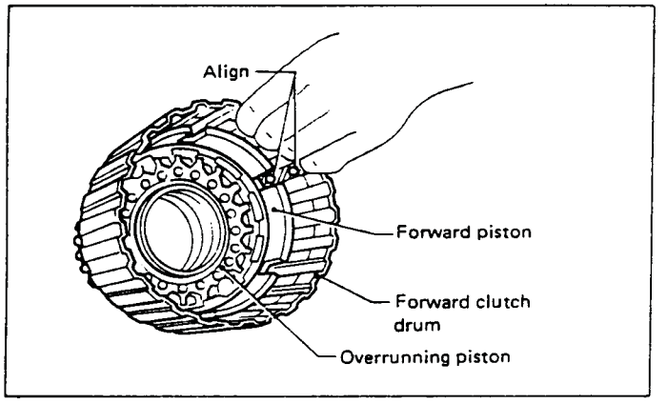


Fig. 200

2) Set the springs and retainer on the piston with a press and attach the snap ring.

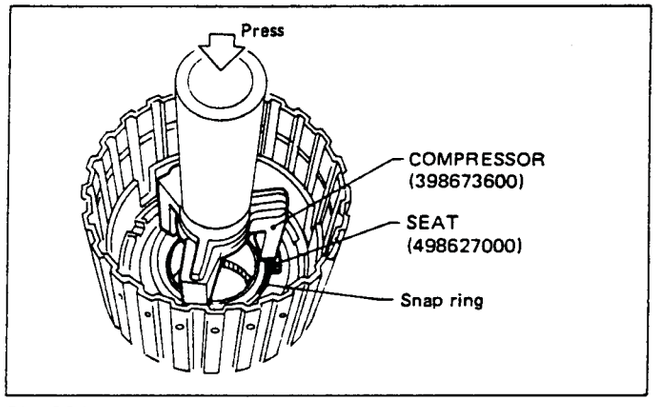


Fig. 201

3) Install the dish plate, driven plates, drive plates, and retaining plate, and secure with the snap ring. (Overrunning clutch)

Pay attention to the orientation of the dish plate.

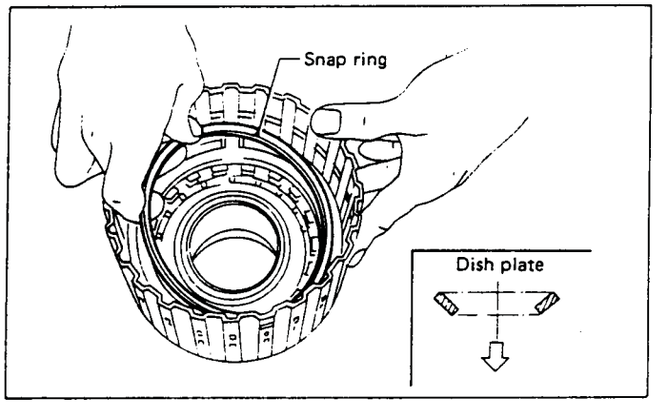


Fig. 202

4) Install the dish plates, driven plates, drive plates, and retaining plate, and secure with the snap ring. (Forward clutch)

Pay attention to the orientation of the dish plate.

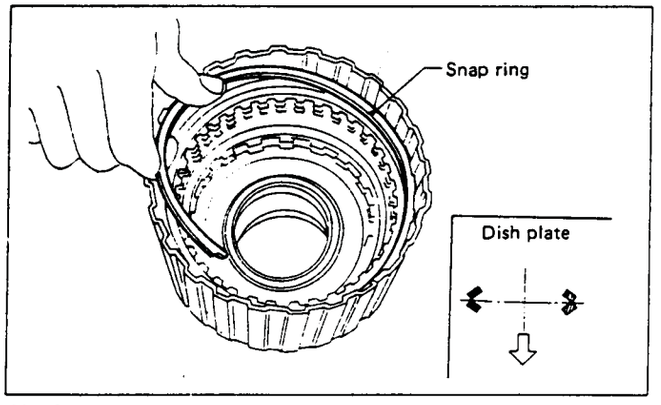


Fig. 203

5) Install the snap ring (for front planetary carrier).
6) Check the forward clutch and overrunning clutch for operation.
Set the one-way clutch inner race, and apply compressed air for checking.
7) Checking clearance:

	Standard value mm (in)	Allowable limit mm (in)
Forward clutch	0.45 – 0.85 (0.0177 – 0.0335)	1.6 (0.063)
Overrunning clutch	1.0 – 1.4 (0.039 – 0.055)	2.0 (0.079)

If the clearance is out of the specified range, select a proper retaining plate so that the standard clearance can be obtained.

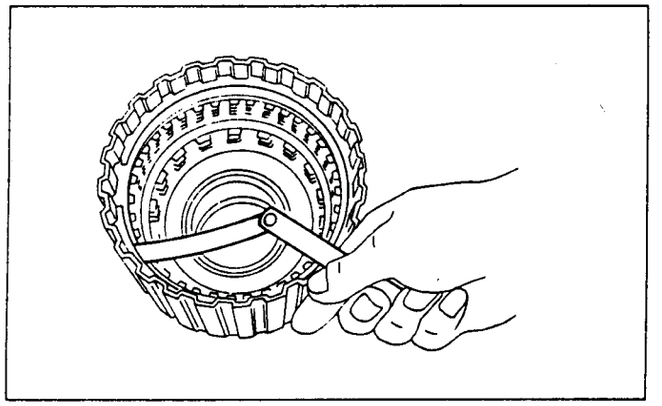


Fig. 204

8) Install the needle bearing, and secure with the snap ring.

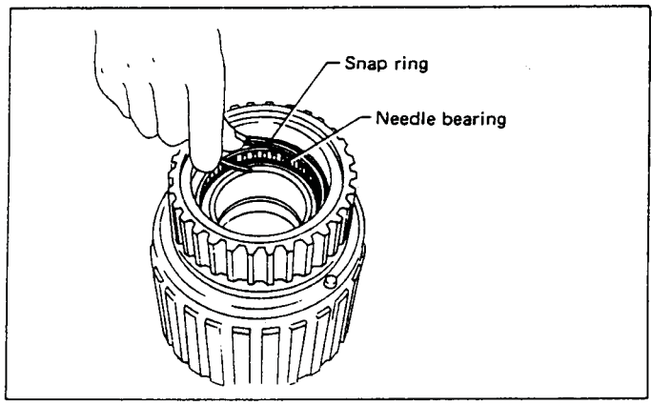


Fig. 205

9) Install the one-way clutch (1-2) and plate, and secure with the snap ring..

Set the inner race. Make sure that the forward clutch is free in the clockwise direction and locked in the counterclockwise direction, as viewed from the front of the vehicle.

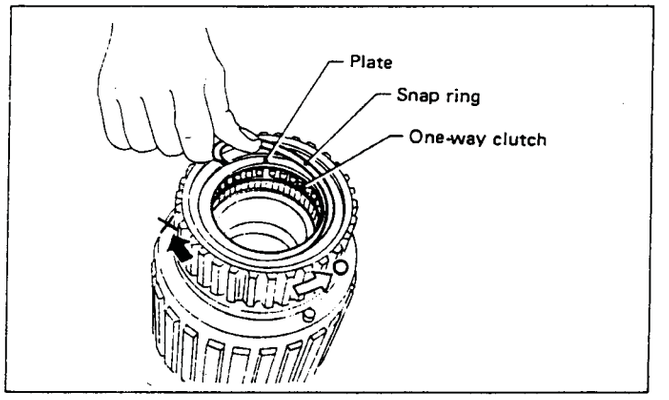


Fig. 206

8. One-Way Clutch Outer Race

DISASSEMBLY

Remove the snap ring. Then remove the one-way clutch (3-4).

INSPECTION

Check the sliding surface and one-way clutch (3-4) for any harmful cuts, damage, or other faults.

ASSEMBLY

Assemble the one-way clutch (3-4), and secure with the snap ring.

Pay attention to the orientation of the one-way clutch (3-4).

Confirm:
Assemble the rear internal gear, and secure the outer race. Make sure that the internal gear is locked in the clockwise direction, and free to rotate in the counterclockwise direction.

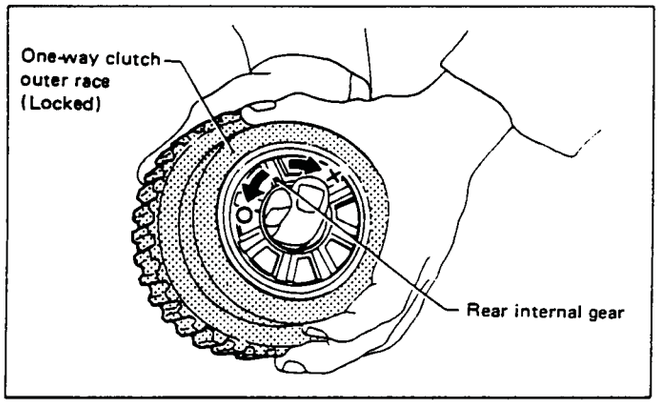


Fig. 207

INSPECTION

1) Check each component for harmful cuts, damage, or other faults.
2) Check the O-ring and lathe cut ring for damage.

ASSEMBLY

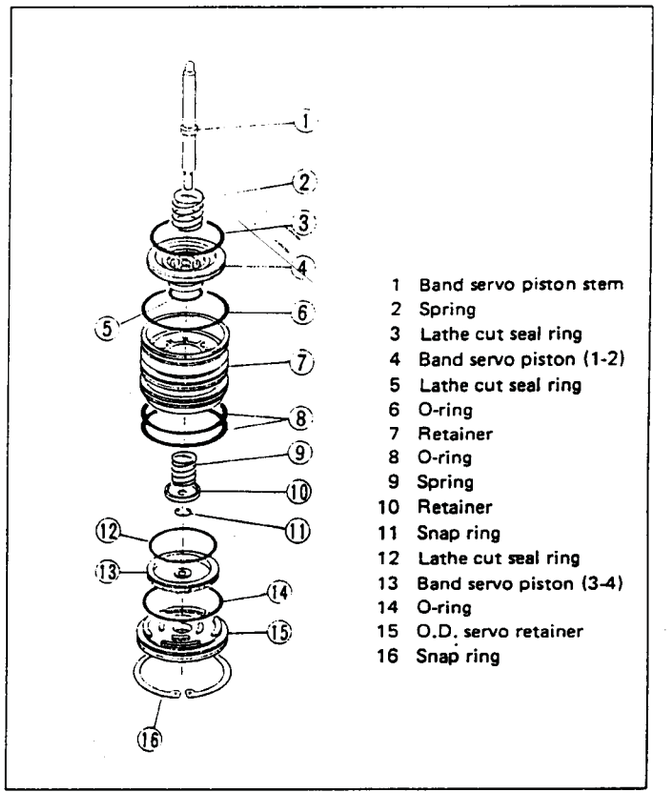


Fig. 208

9. Servo Piston

DISASSEMBLY

1) Remove the spring.
2) Remove the band servo piston (3-4).
3) While compressing the retainer from above, remove the snap ring. Then remove the retainer, spring and stem.
4) Take out the band servo piston (1-2).

1) Install the band servo piston (1-2) to the retainer, and insert the stem.
2) Put the spring and retainer on the piston. Fit the snap ring securely while compressing the spring.
3) Install the band servo piston (3-4).
4) Install the spring securely to the band servo piston (1-2).

a. Many different O-rings and lathe cut rings are used. Be careful not to confuse them when installing.
b. Be careful not to damage O-rings and lathe cut rings.

10. Differential Case Assembly

DISASSEMBLY

1) Using a press, remove the taper roller bearing.

Be careful not to damage the speedometer drive gear.

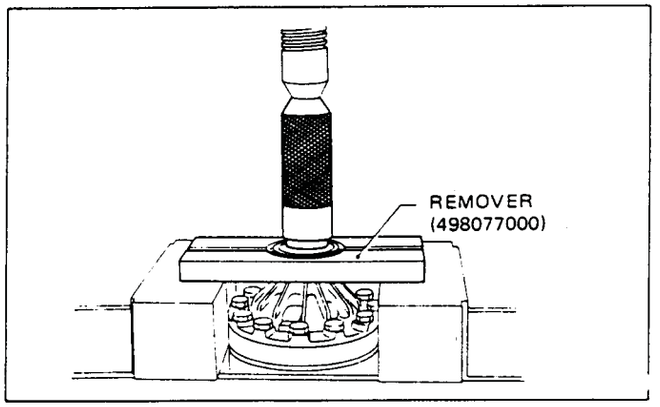


Fig. 209

2) Secure the case in a vise and remove the crown gear tightening bolts, then separate the crown gear, case (RH) and case (LH).

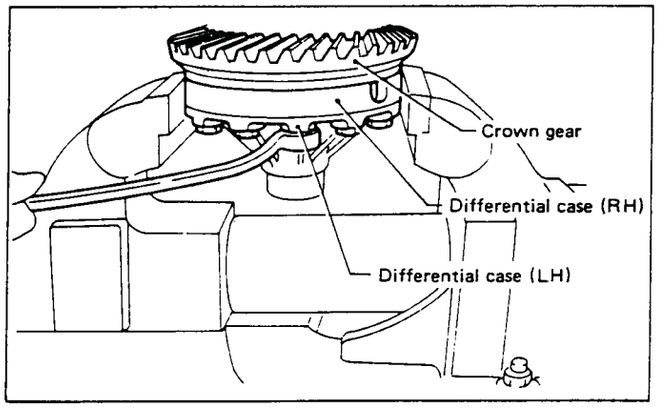


Fig. 210

3) Pull out the straight pin and shaft, and remove the differential bevel gear, washer, and differential bevel pinion.

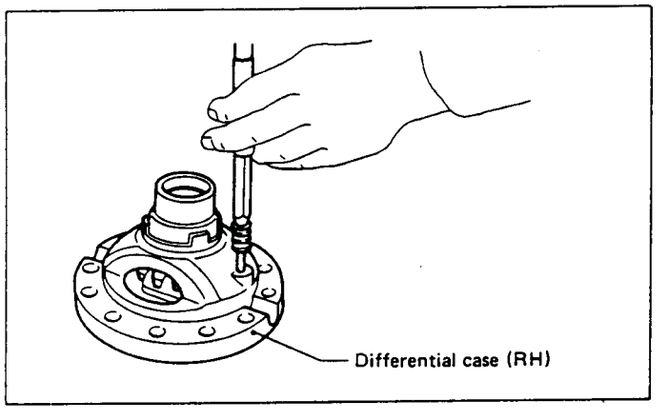


Fig. 211

INSPECTION

Check each component for harmful cuts, damage, and other faults.

ASSEMBLY

1) Install the washer, differential bevel gear, and differential bevel pinion in the differential case (RH). Insert the pinion shaft, and fit the straight pin.

Make sure that the case (RH) is staked in order to lock the straight pin.

2) Install the washer and differential bevel gear to the differential case (LH). Then put the case over the differential case (RH), and connect both cases.

3) Install the crown gear and secure by tightening the bolt.

Standard tightening torque:
57 – 67 N·m (5.8 – 6.8 kg-m, 42 – 49 ft-lb)

4) Measurement of backlash (Selection of washer).
Measure the gear backlash by inserting a dial gauge through the access window of the case.

Standard value:
0.13 – 0.18 mm (0.0051 – 0.0071 in)

Measure the backlash by applying a pinion tooth between two bevel gear teeth.

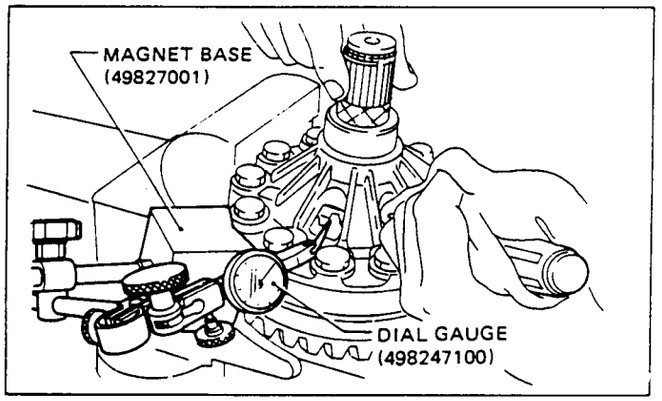


Fig. 212

5) Install the speedometer drive gear. Then force-fit the taper roller bearing with a press.

Be sure to position correctly the locking end of the speedometer drive gear.

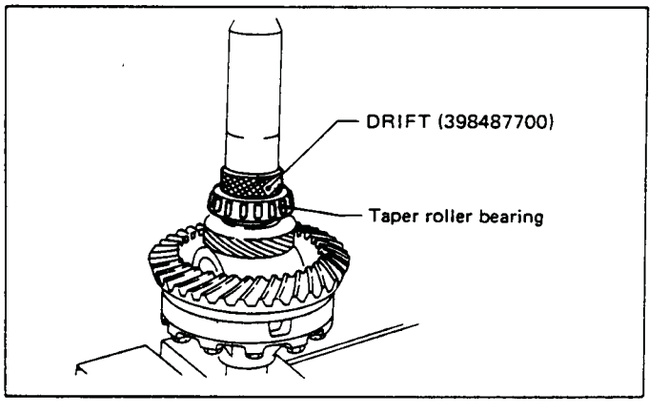


Fig. 213

11. Transfer Clutch

DISASSEMBLY

1) Remove the seal ring.

Be careful not to damage the seal ring.

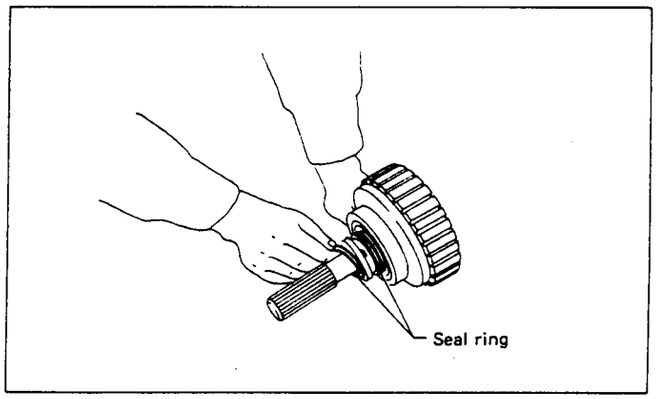


Fig. 214

2) Using a press, remove the ball bearing.

Do not reuse the bearing.

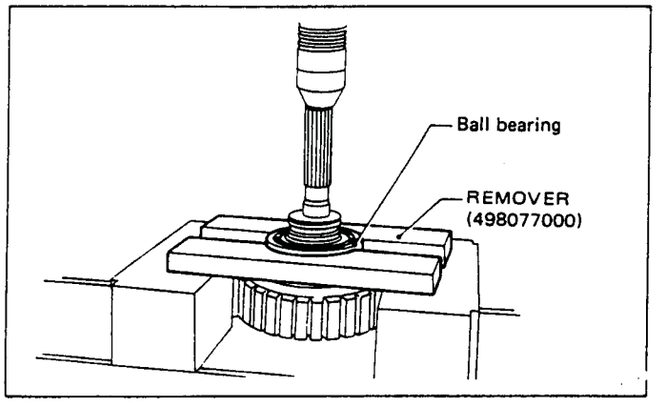


Fig. 215

3) Remove the snap ring, and take out the pressure plate, drive plates, and driven plates.

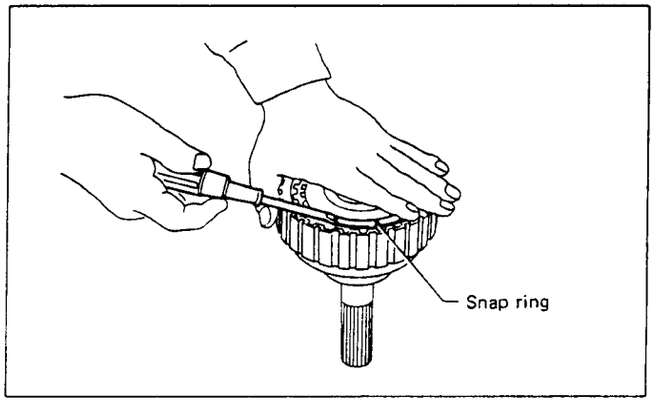


Fig. 216

4) Remove the snap ring, and take out the spring retainer CP.

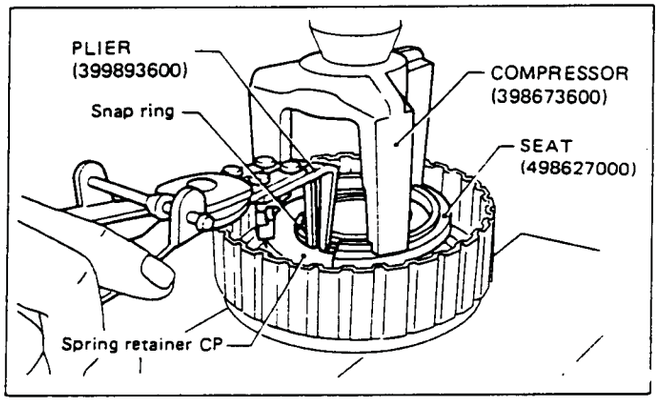


Fig. 217

5) Apply compressed air to the rear drive shaft to remove the piston.

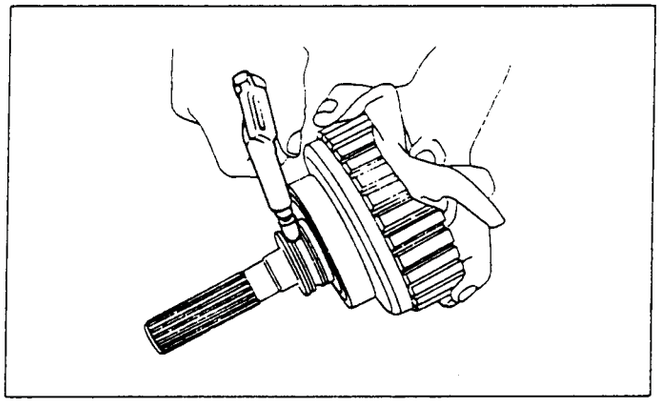


Fig. 218

INSPECTION

1) Check the drive plate facing for wear and damage.
2) Check the snap ring for wear, return spring for permanent set and breakage, and spring retainer for deformation.
3) Check the lathe cut ring for damage.

ASSEMBLY

1) Install the lathe cut seal ring to the I.D./O.D. of the transfer clutch piston.
2) Install the piston and spring retainer, and secure with a snap ring.

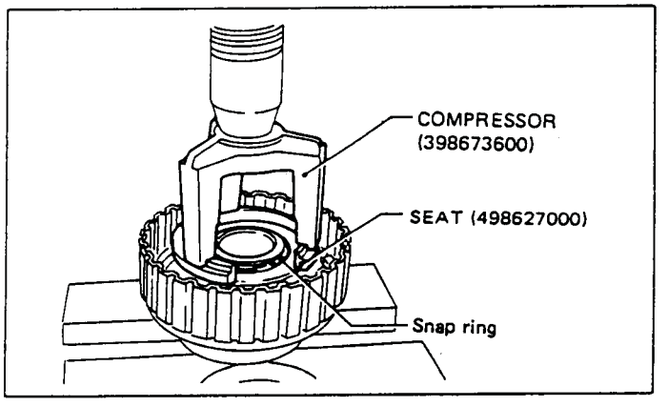


Fig. 219

3) Install the driven plates, drive plates, and pressure plate, and secure with a snap ring.
4) Apply compressed air to see if the assembled parts move smoothly.

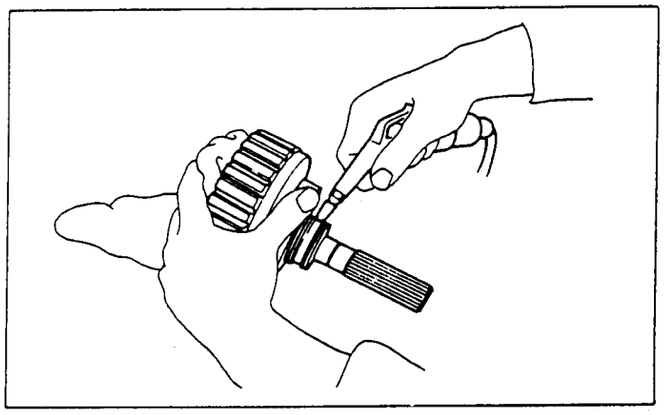


Fig. 220

5) Check the clearance:

Standard value:
0.2 – 0.9 mm (0.008 – 0.035 in)
Allowable limit: 1.6 mm (0.063 in)

If the clearance is not within the specified range, select a proper pressure plate.

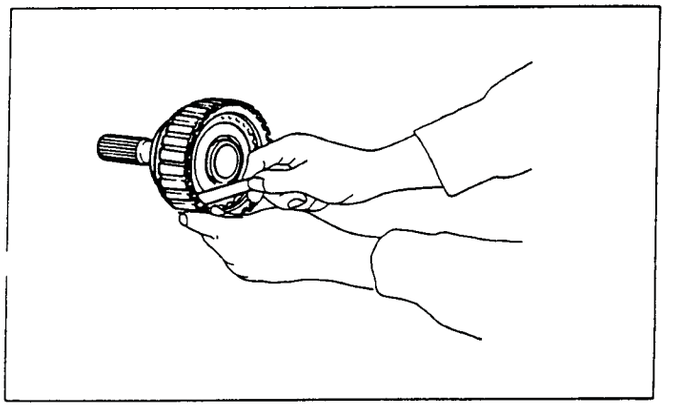


Fig. 221

6) Press-fit the ball bearing.

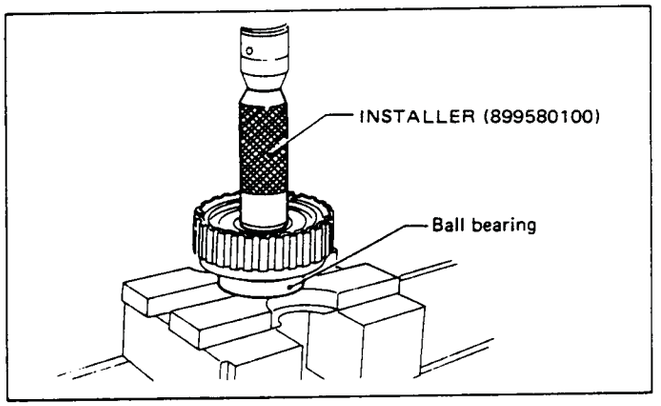


Fig. 222

7) Coat the seal ring with vaseline, and install it in the seal ring groove of the shaft.

Do not expand the seal ring excessively when installing.

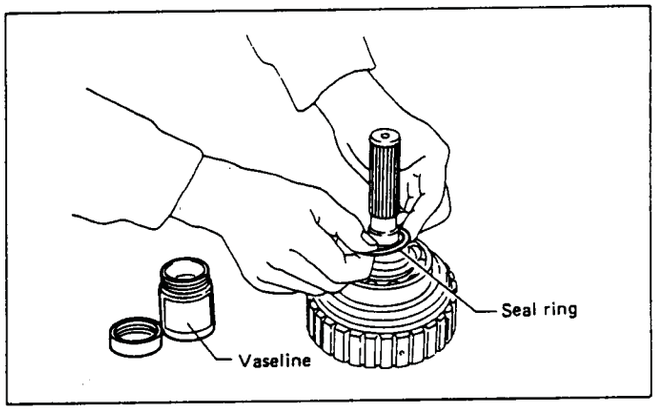


Fig. 223

12. Transfer Valve Body

DISASSEMBLY

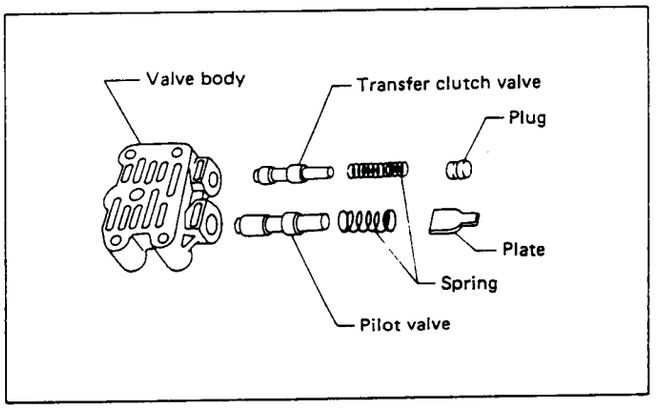


Fig. 224

1) Remove the plate. Then remove the spring and pilot valve together.
2) Remove the straight pin and pry out the plug with a screwdriver. Then extract the spring and transfer clutch valve together.

Be careful not to damage the valve and valve body.

INSPECTION

Check each component for harmful cuts, damage, or other faults.

ASSEMBLY

To assemble, reverse the removal sequence.

Make sure the valve slides smoothly after assembling.

4 Assembly Transmission

1. CONVERTER CASE SECTION

1) Check the appearance of each component and clean.

Make sure each part is free of harmful cuts, damage, and other faults.

2) Install the washer and snap ring to the speedometer shaft, and set the oil seal. Then force-fit the shaft to the converter case.

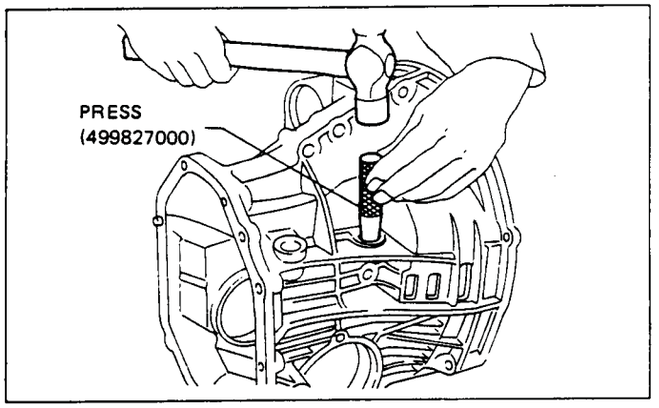


Fig. 225

3) Install the speedometer driven gear to the speedometer shaft, and secure with a snap ring.

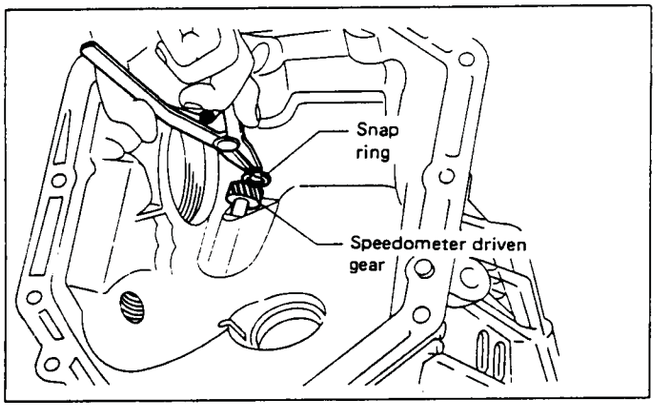


Fig. 226

4) Force-fit the oil seal to the converter case.

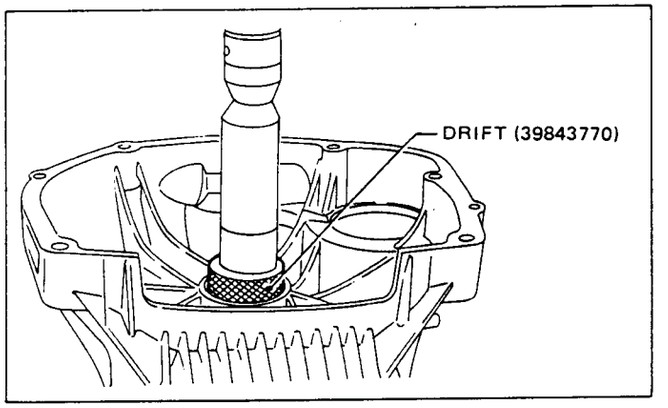


Fig. 227

5) Install the differential ASSY to the case, paying special attention not to damage the speedometer gears (drive and driven) and the inside of the case (particularly, the differential side retainer contact surface).

6) Install the snap ring to the axle shaft, insert the shaft into the differential assembly, and tap it into position with a plastic hammer.

Thrust play:
Approx. 0.3 mm – 0.5 mm (0.012 – 0.020 in)

a. If no play is felt, check whether the shaft is fully inserted. If shaft insertion is correct, replace the axle shaft.
b. Be sure to use a new snap ring.

7) Wrap vinyl tape around the splined portion of the axle shaft.

8) Install the oil seal and outer race (taper roller bearing) to the differential side retainer. Then screw in the retainer after coating the threads with oil.

a. Pay attention not to damage the oil seal lips.
b. Do not confuse the RH and LH oil seals.
c. Keep the O-ring removed from the retainer.

9) Using the HANDLE (499787000), screw in the retainer until light contact is felt.

Screw in the RH side slightly deeper than the LH side.

10) Hypoid gear backlash adjustment and tooth contact check
(1) Assemble the drive pinion assembly to the oil pump housing.

a. Be careful not to bend the shims.
b. Be careful not to force the pinion against the housing bore.

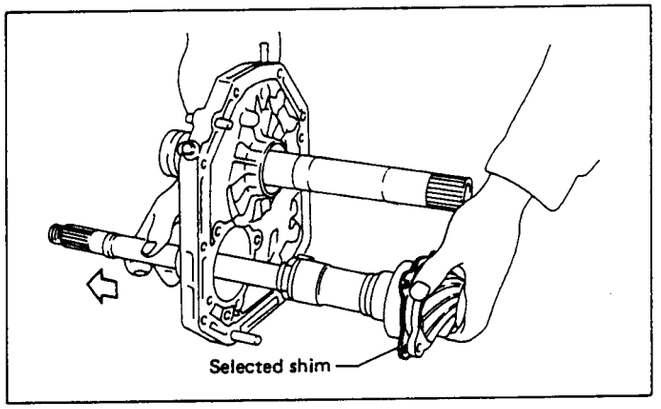


Fig. 228

(2) Tighten four bolts to secure the roller bearing.

Tightening torque:
39 ± 3 N·m (4.0 ± 0.3 kg-m, 28.9 ± 2.2 ft-lb)

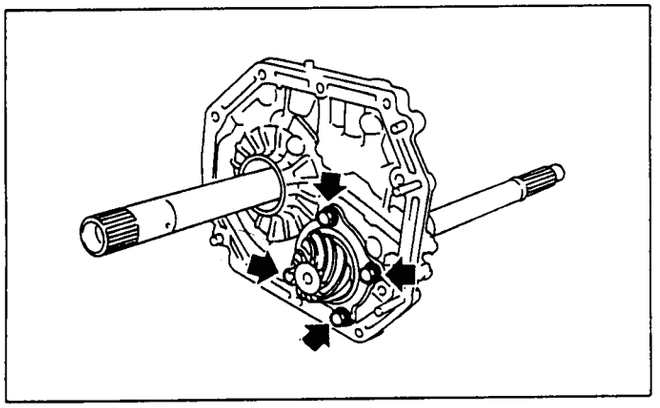


Fig. 229

(3) Install the oil pump housing assembly to the converter case, and secure evenly by tightening four bolts.

Tightening torque:
33 ± 3 N·m (3.4 ± 0.3 kg-m, 24.6 ± 2.2 ft-lb)

a. Thoroughly remove the liquid gasket from the case mating surface beforehand.
b. Use an old gasket or an aluminium washer so as not to damage the mating surface of the housing.

(4) Turn the drive pinion several times. Then screw in the LH side retainer until light contact is felt.

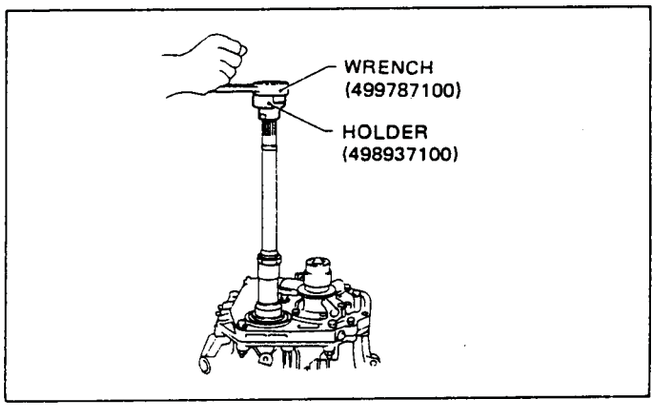


Fig. 230

(5) Repeat this operation several times to confirm the position where light contact is felt.

This is called the backlash "zero" state.

(6) Screw in the RH side retainer until light contact is felt.
(7) Apply the lock plate. Then screw out the LH side retainer by "three teeth" of the plate. Screw in the RH side retainer by the same amount.

Turning the retainer by one tooth changes the backlash about 0.05 mm (0.0020 in).

(8) Temporarily tighten the LH side lock plate.
(9) Screw in the RH side retainer another "1.75 teeth". Then tighten the lock plate temporarily.
(10) Turn the drive pinion several rotations and check to see if the backlash is within the standard value.

Backlash:
0.13 – 0.18 mm (0.0051 – 0.0071 in)

After confirming that the backlash is correct, check the tooth contact.

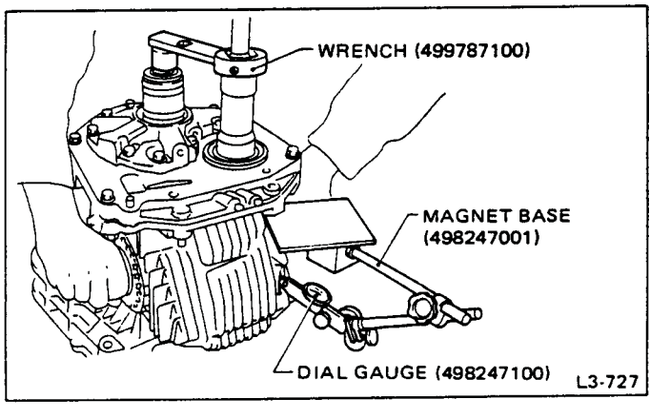


Fig. 231

(11) Apply red lead evenly to the surfaces of three or four teeth of the crown gear. Rotate the drive pinion in the forward and reverse directions several times. Then remove the oil pump housing, and check the tooth contact pattern.
If tooth contact is improper, readjust the backlash or shim thickness.

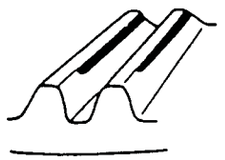
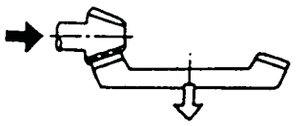
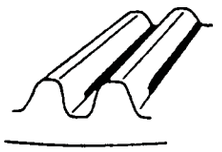
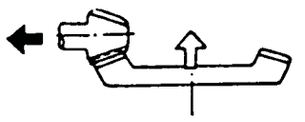
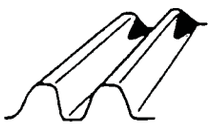
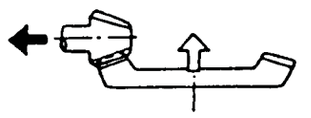
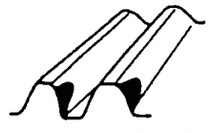
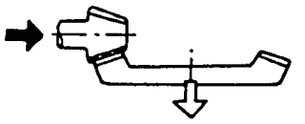
Checking item	Contact pattern	Corrective action
Correct tooth contact Tooth contact pattern slightly shifted toward toe under no-load rotation. (When loaded, contact pattern moves toward heel.)		
Face contact Backlash is too large.	 This may cause noise and chipping at tooth ends.	 Increase thickness of drive pinion hight 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 hight 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. 232

(12) If tooth contact is correct, mark the retainer position and loosen it. After fitting the O-ring, screw in the retainer to the marked position. Then tighten the lock plate to the specified torque.

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

11) Install the seal pipe to the converter case.

Be sure to use a new seal pipe.

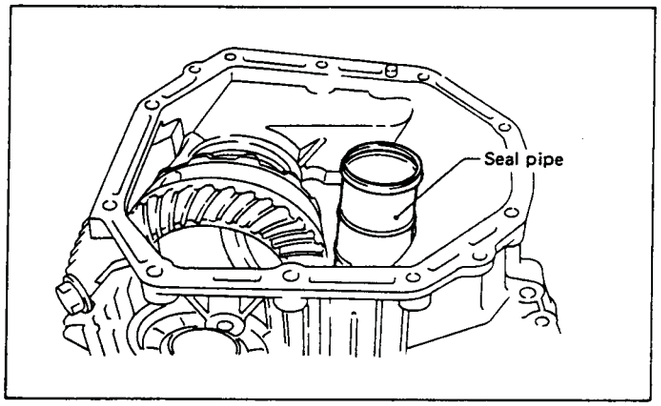


Fig. 233

12) Install two oil seals to the oil seal retainer with INSTALLER (499247300).

a. Pay attention to the orientation of the oil seals.
b. Be careful not to damage the seal lips. If any damage is found, replace with a new one.

13) Attach the O-ring to the oil seal retainer with vaseline. Install the seal to the oil pump housing bore.

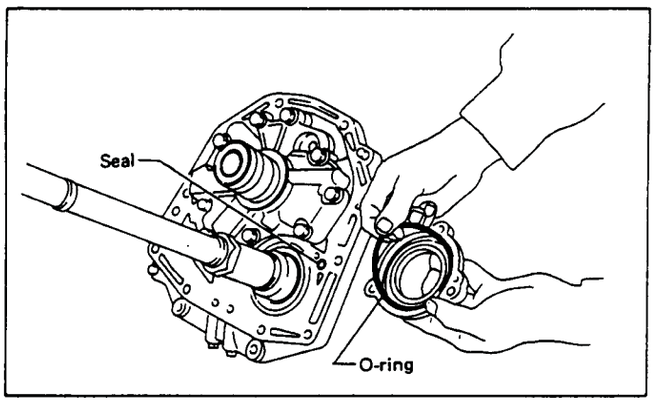


Fig. 234

14) Install the oil seal retainer taking care not to damage the oil seal lips. Then secure with three bolts.

Make sure the O-ring is fitted correctly in position.

Tightening torque:
7 ± 1 N·m (0.7 ± 0.1 kg-m, 5.1 ± 0.7 ft-lb)

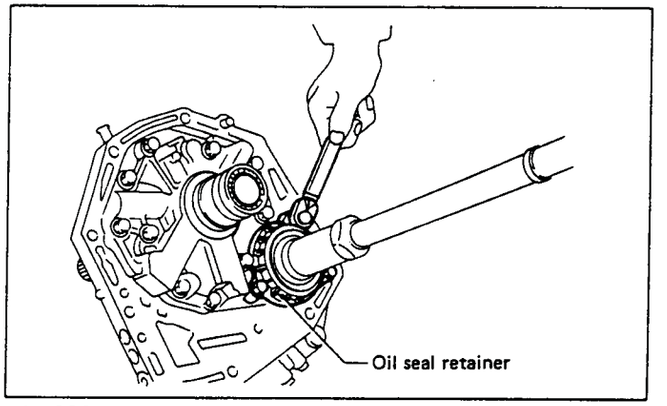


Fig. 235

15) Apply vaseline to the groove on the oil pump cover, and install two (R) seal rings and two (H) seal rings.

a. Fit the seal ring after compressing, and rub vaseline into the seal ring to avoid expansion.
b. The "R" seal ring has a large diameter, while "H" has small diameter.

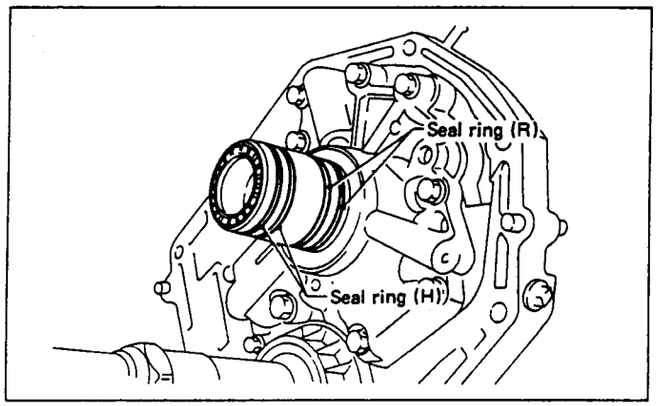


Fig. 236

16) Install the rubber seal to the converter case.

Be careful not to lose the rubber seal.

2. TRANSMISSION CASE

1) Press-fit the roller bearing to the transmission case.

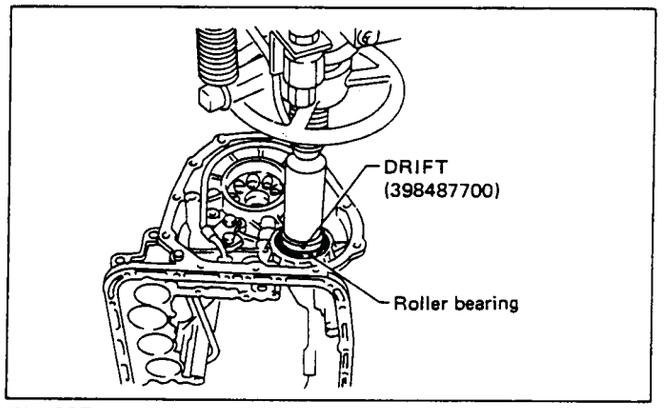


Fig. 237

2) Using a plastic hammer, force-fit the oil seal.

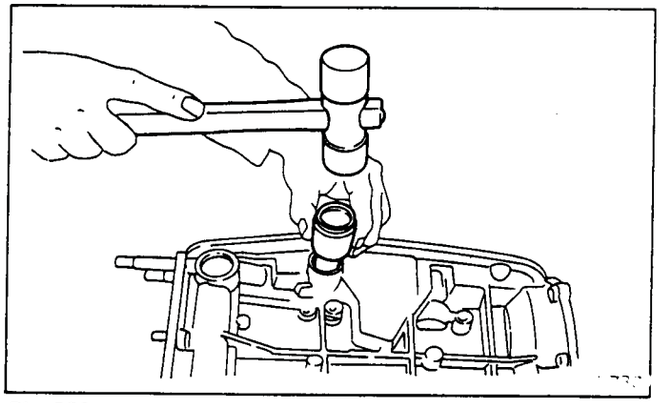


Fig. 238

3) Install the manual plate and shaft, and secure with a spring pin.

a. Be careful not to damage the oil seal lip.
b. After installation, make sure of smooth movement.

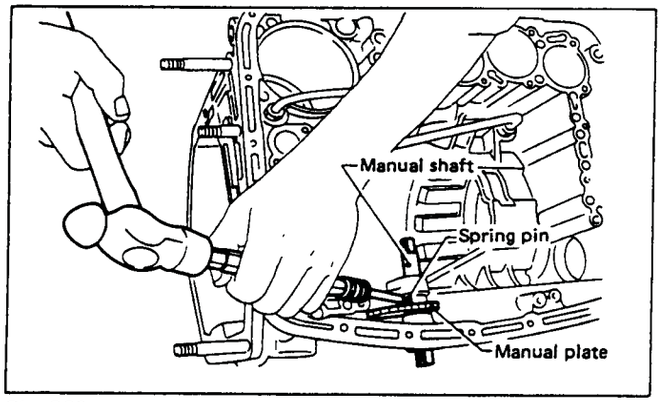


Fig. 239

4) Assemble the manual lever and parking rod to the inside shaft, and secure with a nut.

Tightening torque:
39 ± 3 N·m (4.0 ± 0.3 kg-m, 28.9 ± 2.2 ft-lb)

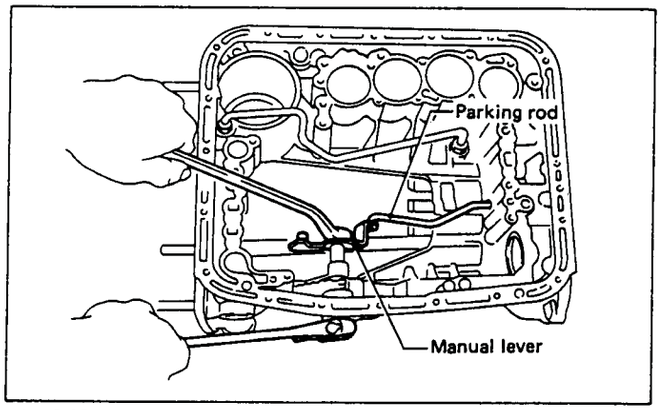


Fig. 240

5) Install the detent manual spring.

Position the spring so that its center is aligned with the center of the manual plate.

Tightening torque:
6 ± 1 N·m (0.6 ± 0.1 kg-m, 4.3 ± 0.7 ft-lb)

6) Install the lathe cut seal ring and lip seal to the I.D./O.D. of the low & reverse piston. Then install the piston into the case with a press.

a. Be careful not to tilt the piston when installing.
b. Be careful not to damage the lip seal.

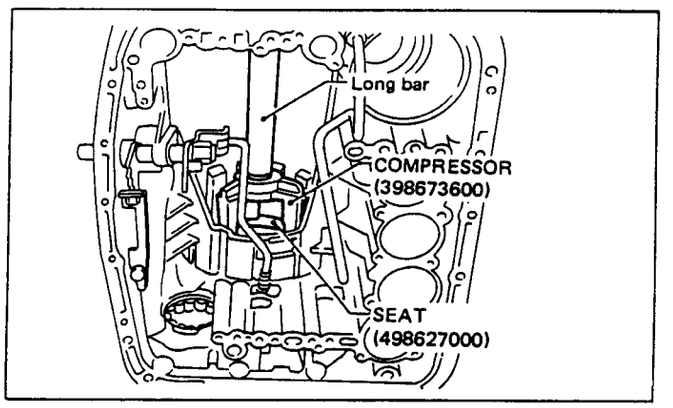


Fig. 241

7 Install the one-way clutch inner race.
(1) Using a press, install the thrust needle bearing to the inner race.

Use the PULLEY ASSY (398527700) for removal.

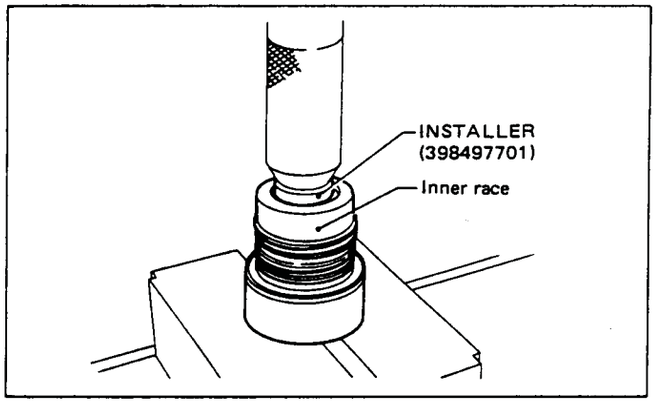


Fig. 242

(2) Install four seal rings.

Apply vaseline to the groove of the inner race and to the seal ring after installation, so that the seal ring will not expand.

(3) Place the spring retainer CP on the inner race. Install the spring to the recessed portion of the piston. Then tighten eight socket head bolts from the rear side of the transmission case.

Tightening torque:
25 ± 2 N·m (2.5 ± 0.2 kg-m, 18.1 ± 1.4 ft-lb)

Be sure to tighten evenly.

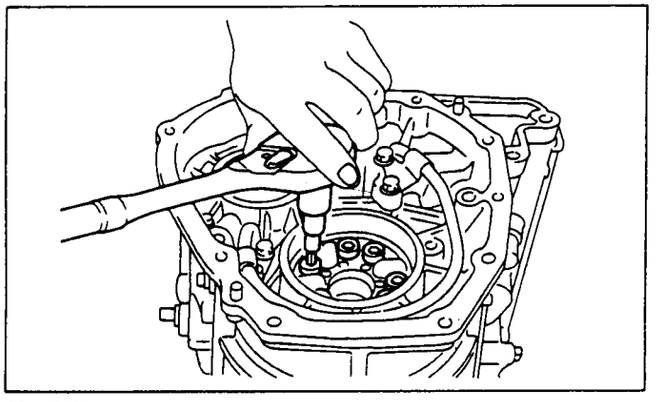


Fig. 243

8) Install the band servo sub ASSY.
9) Press the O.D. servo retainer into position, and secure with a snap ring.

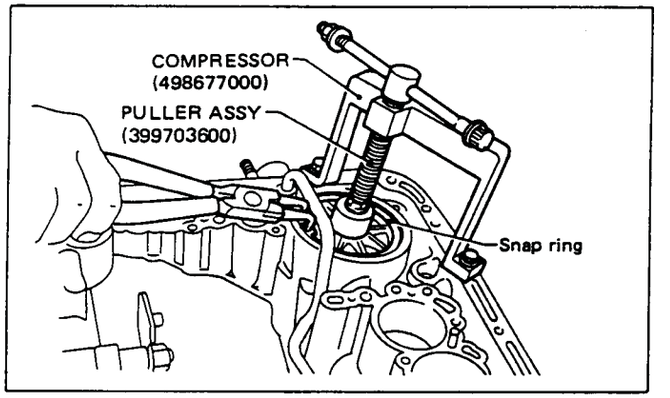


Fig. 244

* Perform the following operations with the transmission case set vertically on wooden blocks.

10) Installation of the low & reverse brake:

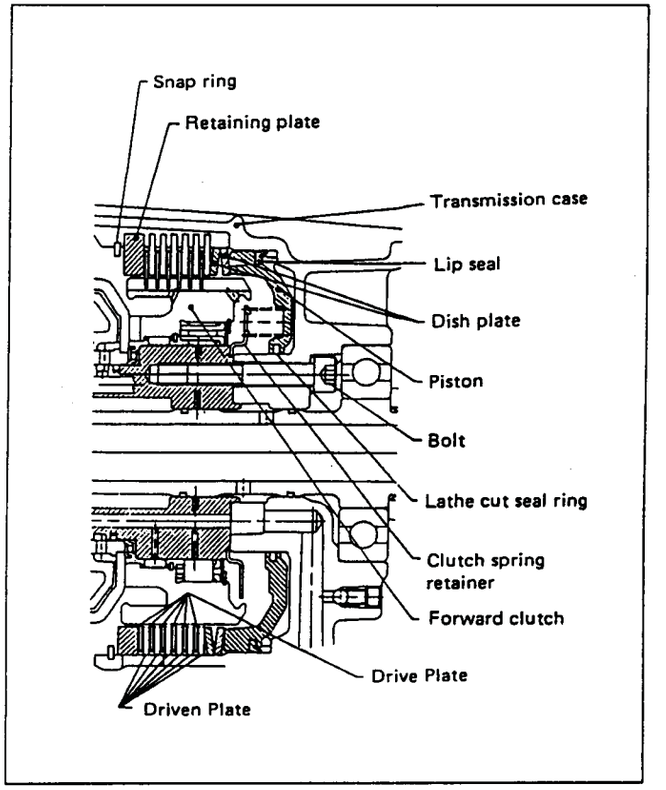


Fig. 245

(1) Install two dish plates, driven plates, drive plates, and a retaining plate, and secure with a snap ring.

a. Pay attention to the orientation of the dish plate.

b. Driven plate	**Non-TURBO**	**: 4**
Drive plate	**TURBO**	**: 6**
c. Dish plate	**Non-TURBO**	**: 2**
	TURBO	**: 1**

(2) Apply compressed air intermittently to check for operation.

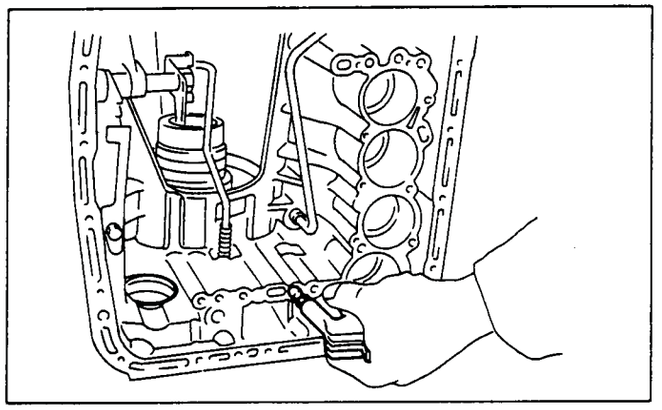


Fig. 246

(3) Check the clearance (Selection of retaining plate)

Standard value:
1.1 – 1.7 mm (0.043 – 0.067 in)
Allowable limit: 2.7 mm (0.106 in)

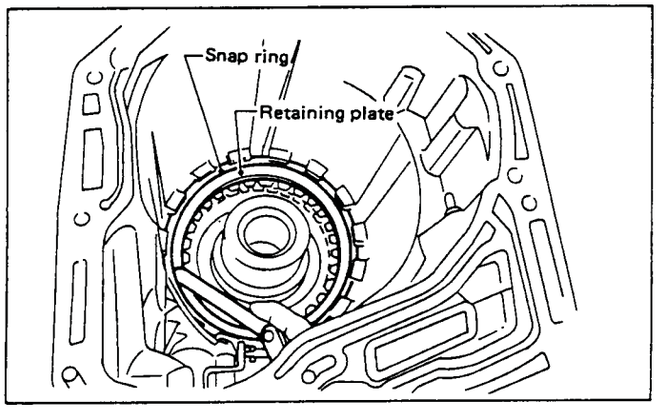


Fig. 247

11) Install the thrust needle bearing to the inner race.

Refer to 3 "Location and installing direction of thrust needle bearing and washer" for the orientation of the bearing. Carefully check the orientation of all parts indicated by an asterisk * in the following pages.)

12) Install the forward clutch drum ASSY.
(1) Install carefully while rotating the drum slowly paying special attention not to damage the seal ring.
(2) Installation is complete when the drum recedes 2.5 mm (0.098 in) from the inner race surface.

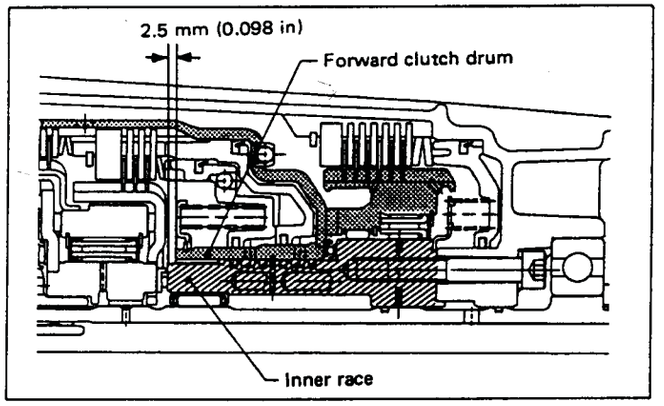


Fig. 248

13) Assemble the overrunning clutch hub.

a. Join the thrust needle bearing* and thrust washer with vaseline, and then install them together.
b. Make sure that the splines are engaged correctly.

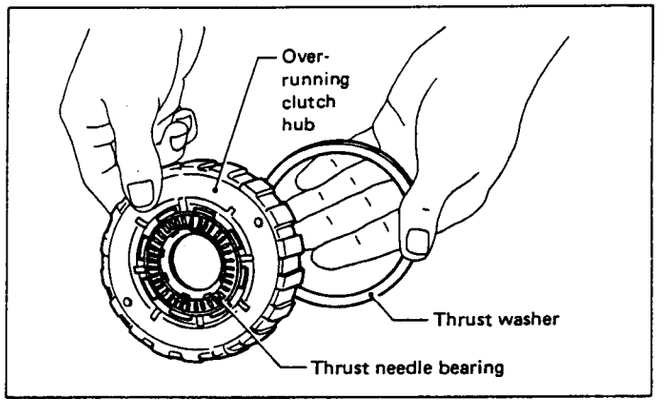


Fig. 249

14) Install the one-way clutch outer race ASSY.

Make sure the forward clutch splines are engaged correctly.

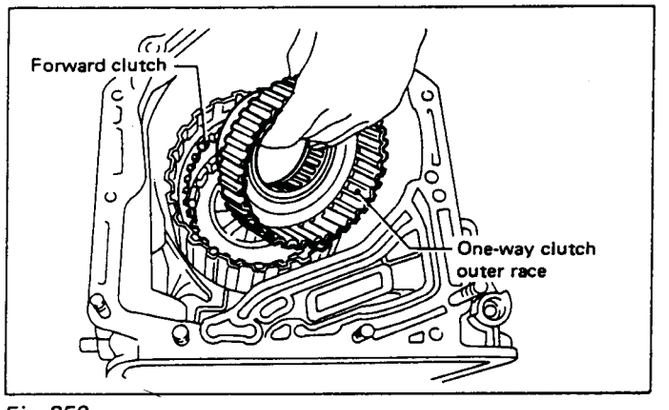


Fig. 250

15) Assemble the rear internal gear.
(1) Join the thrust needle bearing* and thrust washer to the gear with vaseline, and install the gear while rotating it.
(2) Securely engage the bearing with the dog of the overrunning clutch hub.

Installation is complete when the snap ring top surface of the forward clutch drum recedes approximately 3.5 mm (0.138 in).

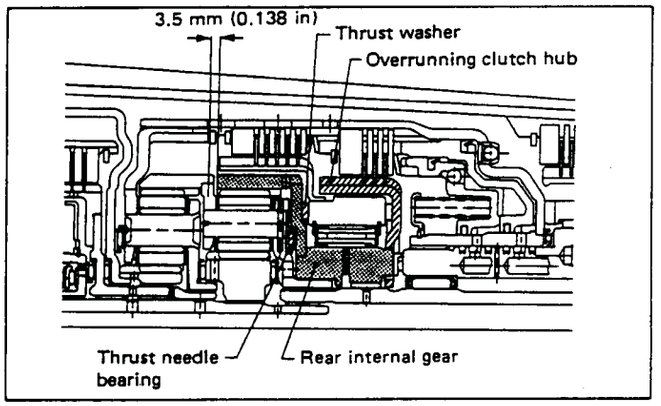


Fig. 251

16) Install the rear planetary carrier.
Attach the thrust needle bearing* to the inside of the carrier with vaseline. Then install the carrier while rotating slowly.

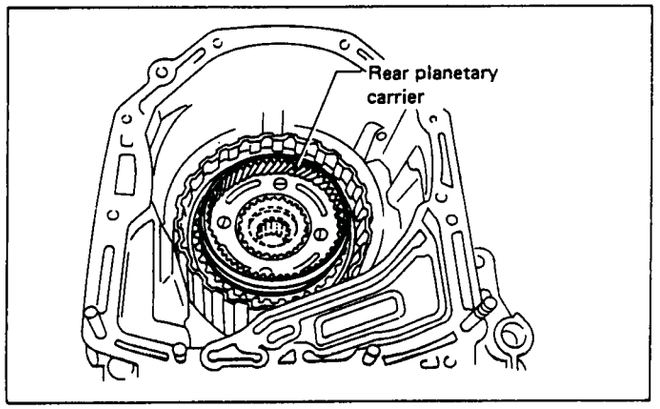


Fig. 252

17) Install the rear sun gear.

Install the gear with the oil hole facing up.

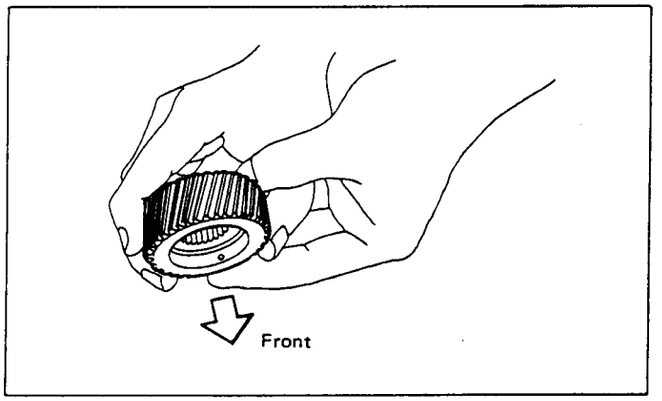


Fig. 253

18) Install the front planetary carrier.
Attach the thrust needle bearings* to both sides of the carrier with vaseline. Install the carrier carefully, while aligning with the splines of the forward clutch drum, and while rotating the pinion.

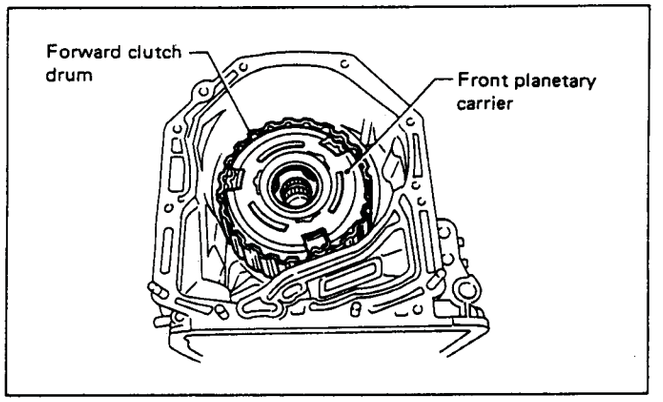


Fig. 254

19) Install the front sun gear.
Attach the thrust needle bearing* to the gear, and install the gear while turning slowly.

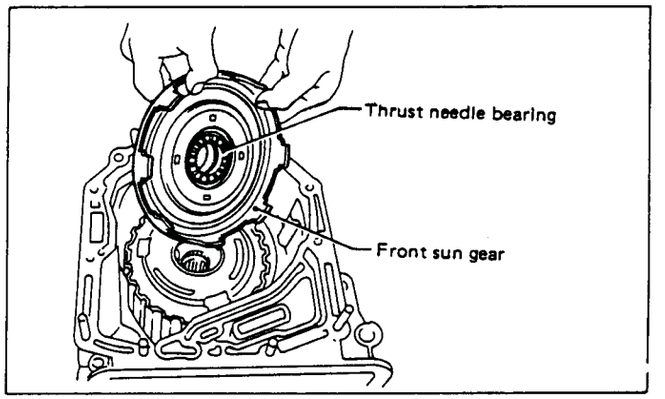


Fig. 255

20) Install the high clutch hub.
Attach the thrust needle bearing* to the hub with vaseline and install the hub by correctly engaging the splines of the front planetary carrier.

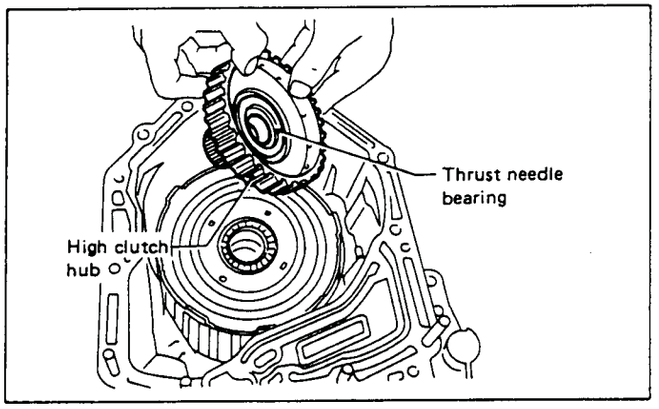


Fig. 256

21) Install the high clutch ASSY.

Correctly engage the high clutch hub and clutch splines.

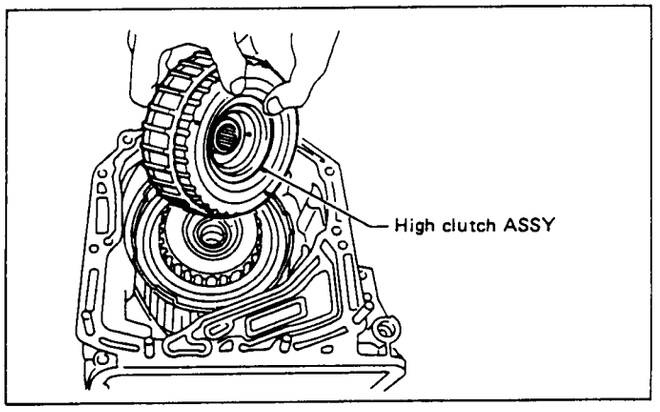


Fig. 257

22) Install the reverse clutch ASSY.

Engage the high clutch outer spline with the reverse clutch spline and the front sun gear with the cut-out portion of the reverse clutch drum correctly when installing.

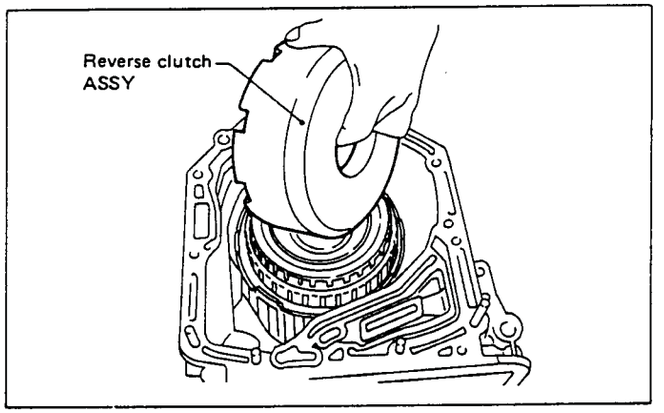


Fig. 258

23) Install the brake band ASSY.

a. Be careful not to damage the brake band when installing.
b. Install the strut to the band servo piston stem. Then tighten it temporarily to avoid tilting the band.

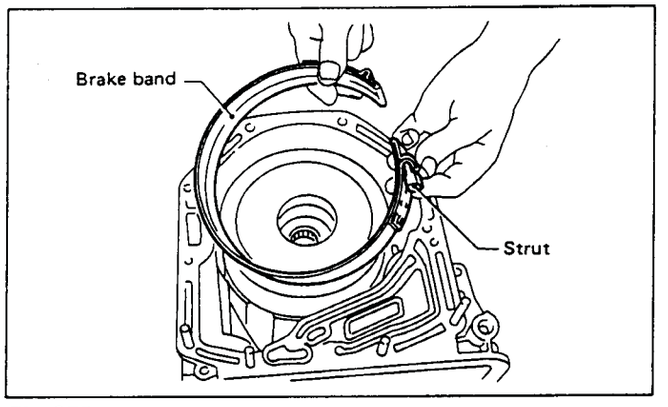


Fig. 259

24) Adjustment of total end play

(1) Measure the distance from the transmission case mating surface to the recessed portion of the high clutch drum, and the distance to the top surface of the reverse clutch drum.

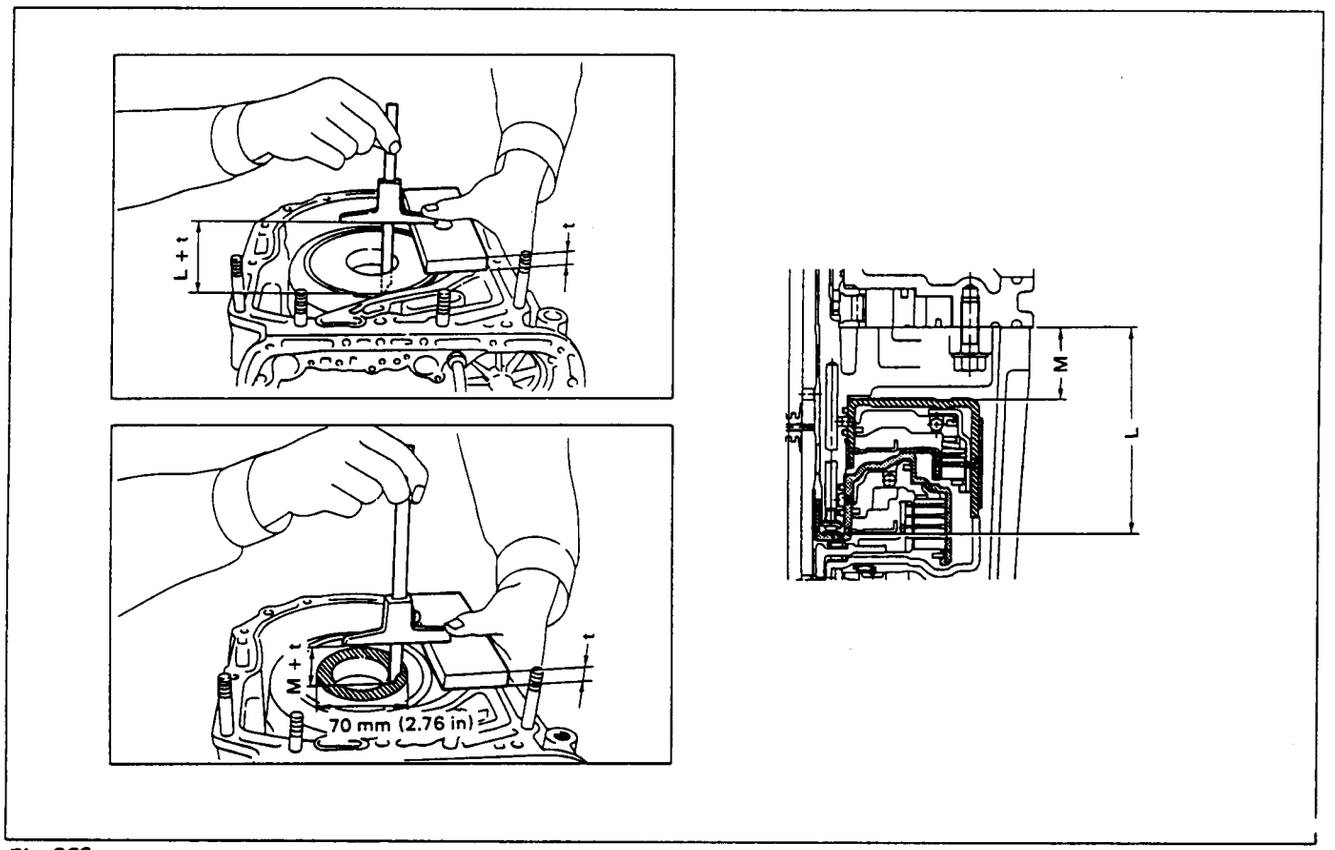


Fig. 260

(2) Measure the distance from the oil pump housing mating surface to the top surface of the oil pump cover with needle bearing, and to the thrust surface of the reverse clutch.

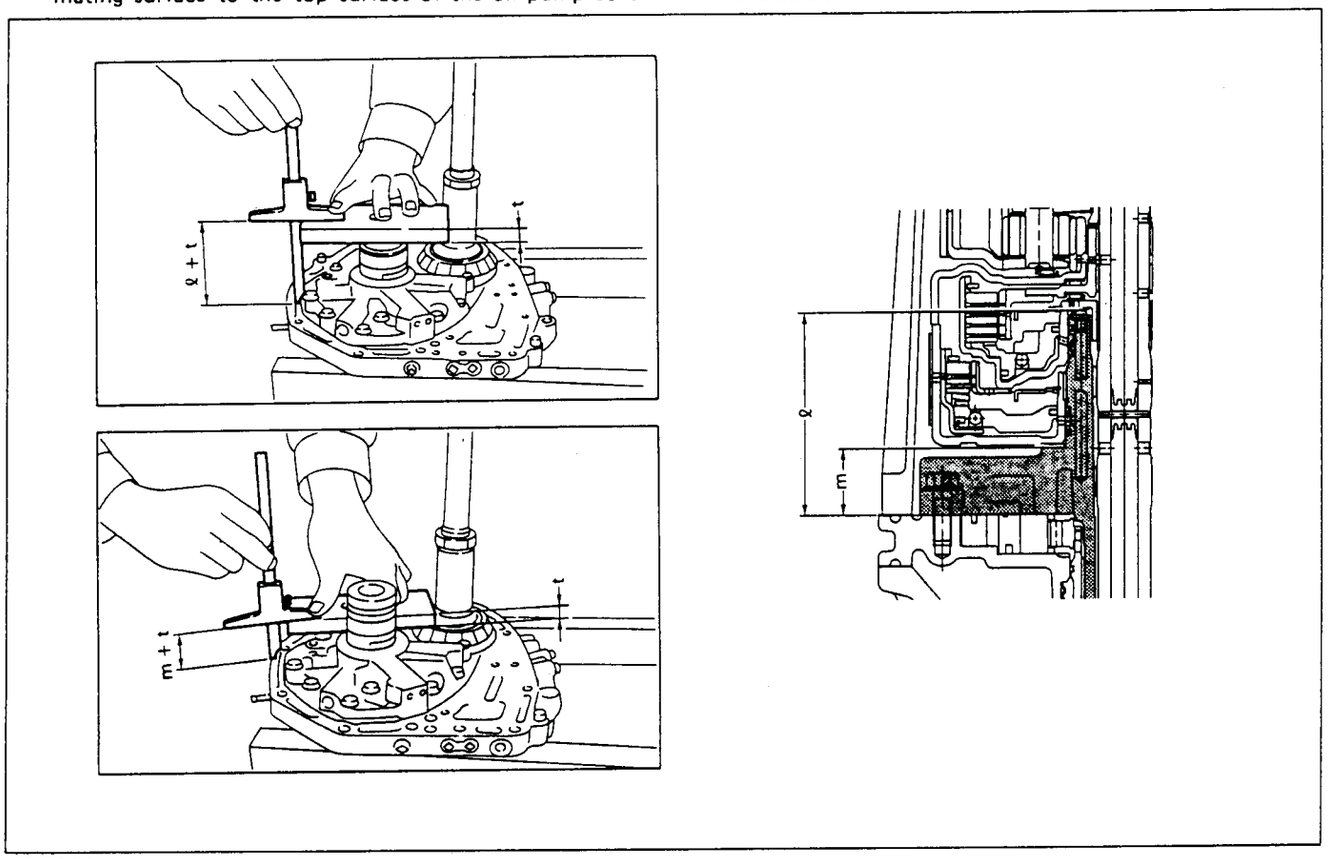


Fig. 261

(3) Equation for calculation Unit: mm

$$T = (L + 0.4) - \ell - (0.25 \text{ to } 0.55)$$

T: Thickness of bearing race
L: Depth of the recess of high clutch drum from case mating surface
ℓ: Height of top surface of the oil pump cover with needle bearing from the mating surface of the housing
0.4: Thickness of gasket
0.25 to 0.55: Total end play standard value

$$t = (M + 0.4) - m - (0.55 \text{ to } 0.9)$$

t: Thickness of thrust washer
M: Depth of top surface of reverse clutch drum from case mating surface
m: Height of reverse clutch thrust surface from housing mating surface.
0.4: Thickness of gasket
0.55 to 0.9: Total end play standard value

25) Install the oil pump housing ASSY.
(1) After completing end play adjustment, insert the bearing race* in the recess of the high clutch. Attach the thrust washer to the oil pump cover with vaseline.

ASSY. Be careful to avoid hitting the drive pinion

(2) After correctly installing the gasket to the case mating surface, carefully install the oil pump housing ASSY. Be careful to avoid hitting the drive pinion against the inside of the case.

a. Be careful not to damage the seal ring.
b. Be sure to use a new gasket.

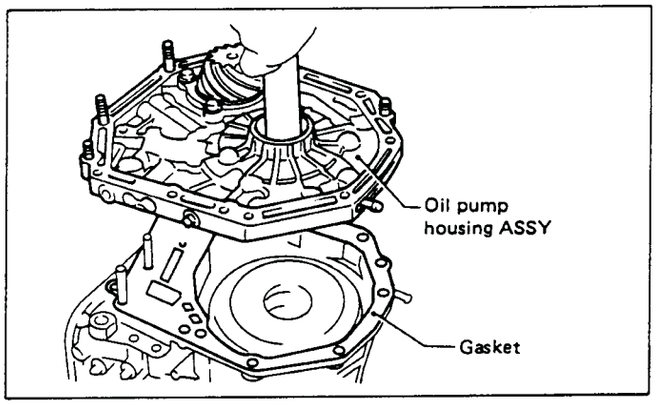


Fig. 262

(3) Install both parts with dowel pins aligned. Make sure no clearance exists at the mating surface.

Any clearance suggests a damaged seal ring.

(4) Secure the housing with two nuts.

Tightening torque:
33 ± 3 N·m (3.4 ± 0.3 kg-m, 24.6 ± 2.2 ft-lb)

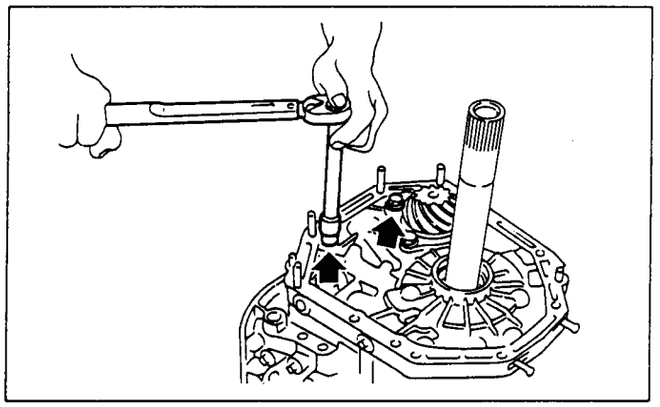


Fig. 263

3. CONNECTION OF CONVERTER CASE AND TRANSMISSION CASE

1) Apply proper amount of liquid gasket (Three-bond #1215) to the entire converter case mating surface.

Make sure that the rubber seal and seal pipe are fitted in position.

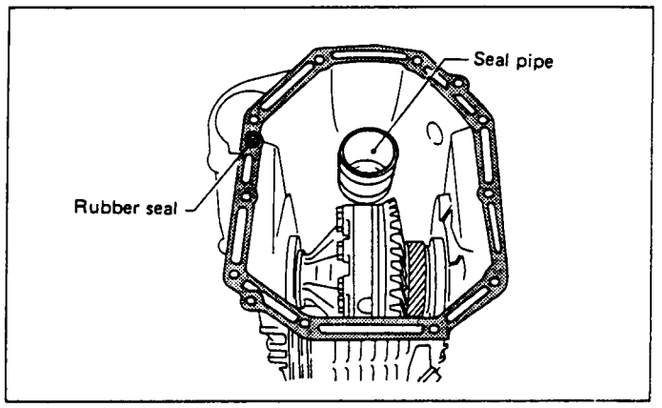


Fig. 264

2) Install the converter case ASSY to the transmission case ASSY, and secure with six bolts and four nuts.

Tightening torque:
33 ± 3 N·m (3.4 ± 0.3 kg-m, 24.6 ± 2.2 ft-lb)

When installing, be careful not to damage the converter case bushing and oil seal.

4. INSTALLATION OF CONTROL VALVE AND OIL PAN

1) Install four accumulators.

Be careful not to confuse the springs and installation positions.

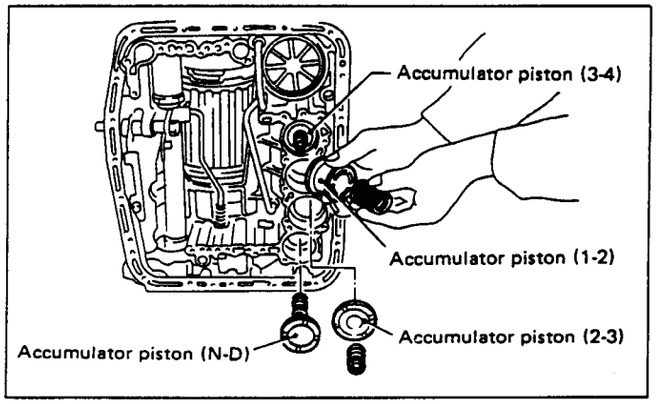


Fig. 265

2) Install and route the transmission harness.

Be careful not to damage the harness.

3) Install the control valve ASSY.
(1) Set the select lever in range "2".

(2) Install the control valve by engaging the manual valve and manual lever, then tighten the 18 bolts.

Tightening torque:
8 ±1 N·m (0.8 ± 0.1 kg-m, 5.8 ± 0.7 ft-lb)

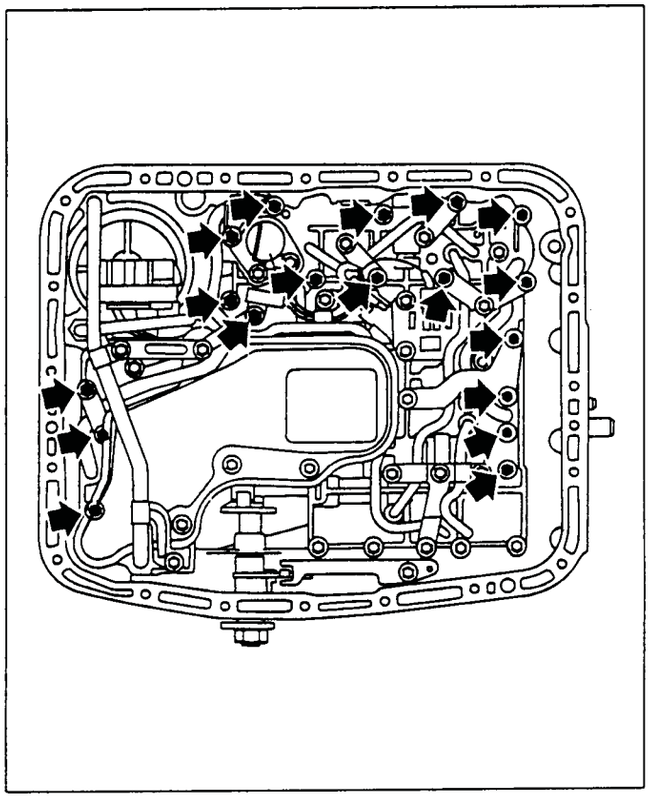


Fig. 266

a. Be careful not to pinch the harness roll the gasket.
b. Tighten the control valve mounting bolts evenly.

4) Install the oil strainer to the control valve. Be careful not to cut or break the O-ring. Then tighten bolts.

Tightening torque:
8 ± 1 N·m (0.8 ± 0.1 kg-m, 5.8 ± 0.7 ft-lb)

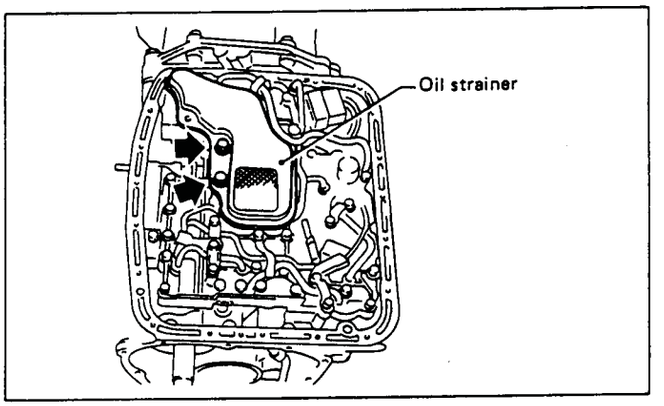


Fig. 267

5) Secure five connectors.

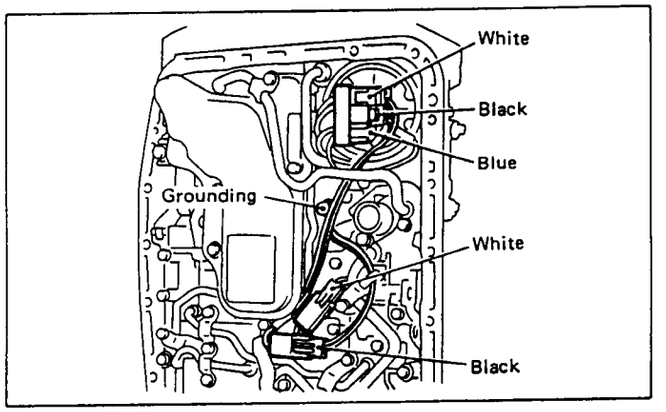


Fig. 268

6) Install the oil cooler outlet pipe, and secure with two bolts.

Tightening torque:
8 ± 1 N·m (0.8 ± 0.1 kg-m, 5.8 ± 0.7 ft-lb)

Fit the pipe into position. Be careful to avoid twisting.

7) Install the oil pan.
(1) Attach the magnet at the specified position.

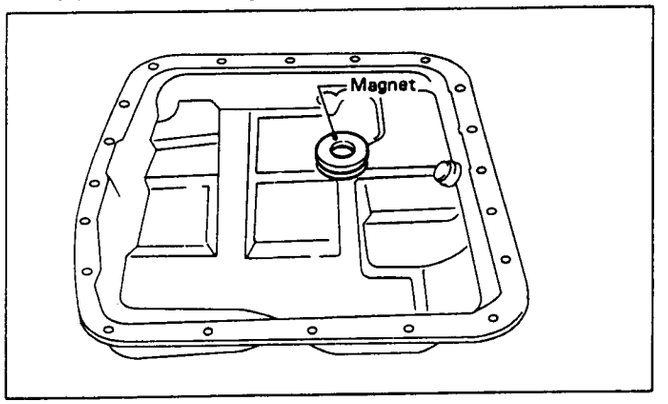


Fig. 269

(2) With gasket inserted, secure the oil pan by tightening 20 bolts.

Tightening torque:
3.9 ± 0.5 N·m (0.4 ± 0.05 kg-m, 2.9 ± 0.4 ft-lb)

Tighten the bolts evenly.

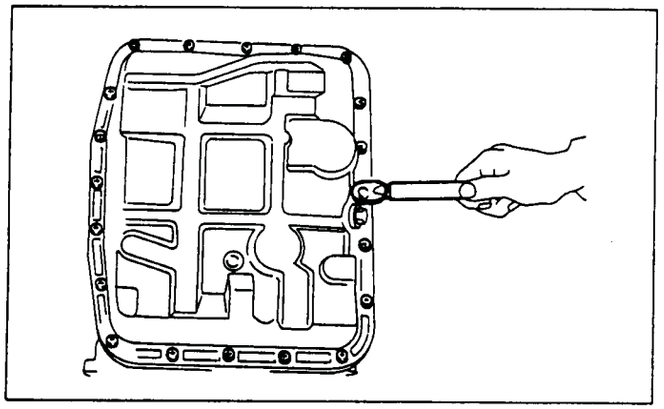


Fig. 270

5. EXTENSION CASE

1) Install the filter in the extension case.

Pay attention to the orientation of the filter.

2) Install the transfer clutch valve ASSY, and secure with four bolts.

Tightening torque:
8 ± 1 N·m (0.8 ± 0.1 kg-m, 5.8 ± 0.7 ft-lb)

a. Be sure to tighten the going lead with one of these bolts.
b. Be sure to use a new gasket.

3) Install the pipe, and clamp securely.
4) Install the transfer clutch assembly to the case.

a. Be careful not to damage the seal rings.
b. Insert the clutch assembly fully into position until the bearing shoulder bottoms.

6. CONNECTION BETWEEN EXTENSION CASE AND TRANSMISSION CASE

1) Install the revolution sensor to the transmission case with one bolt. (2WD model only)

Tightening torque:
7 ± 1 N·m (0.7 ± 0.1 kg-m, 5.1 ± 0.7 ft-lb)

2) Install the reduction driven gear.
3) Install the parking pawl and shaft, set the select lever in the "P" range and tighten the drive pinion lock nut.

Tightening torque:
98 ± 5 N·m (10 ± 0.5 kg-m, 72.3 ± 3.6 ft-lb)

After tightening, stake the lock nut securely.

4) Install the reduction drive gear ASSY.

Insert the ASSY fully into position until the bearing shoulder bottoms.

5) Adjustment of extension end play:
(1) Measure the distance from the transmission case mating surface to the reduction drive gear end surface.

2WD model: Measure the distance from the transmission case mating surface to the bearing end face.

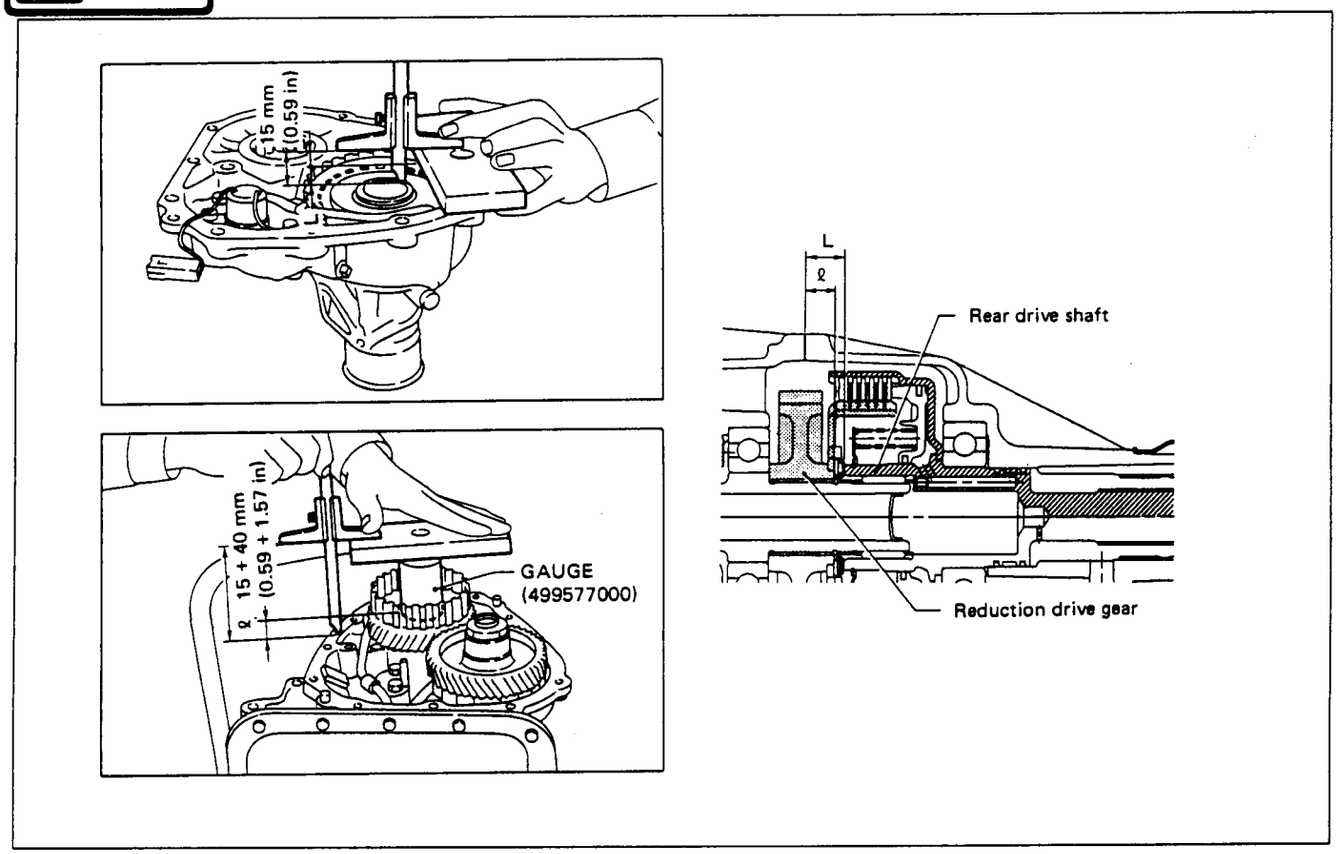


Fig. 271

(2) Measure the distance from the extension case mating surface to the rear drive shaft end face.

2WD model: Measure the distance from the cover case mating surface to the bearing mounting surface.

(3) Calculation equation: Unit (mm)

$$T = (L + 0.4) - \ell - (0.05 \text{ to } 0.25)$$

T: Thickness of thrust bearing
(2WD model: Thickness of Al washer)
L: Distance of rear drive shaft end face from extension case mating surface
(2WD model: Depth of bearing mounting face from cover case mating surface)
ℓ: Height of reduction drive gear end surface from transmission case mating surface
(2WD model: Height of bearing end face from transmission case mating surface)
0.4: Thickness of gasket
0.05 to 0.25: Standard value of end play

6) Installation of extension case 4WD, cover case 2WD and transmission case

4WD model:

(1) Attach the selected thrust needle bearing* to the end-surface of reduction drive gear with vaseline.

(2) Set the parking return spring.

(3) Remove the transfer clutch from the extension case. Set the needle bearing on the reduction drive shaft and then install transfer clutch to the transfer clutch hub.

Be sure to engage the spline teeth correctly.

(4) With gasket inserted between them, install the extension case to the transmission case. (Be sure to use a new gasket.)

a. After inserting the extension case halfway, connect the connector for duty sol. C. Be careful not to jam the cord in the case.
b. Be careful not to damage the rear drive shaft seal ring.

(5) Tighten bolts to secure the case.

Tightening torque:
25 ± 2 N·m (2.5 ± 0.2 kg-m, 18.1 ± 1.4 ft-lb)

2WD model:
(1) Attach the selected aluminum washer to the cover case with vaseline.
(2) Set the parking return spring.
(3) With gasket inserted between them, install the cover case to the transmission case.

a. Be sure to use a new gasket.
b. Install the case while ensuring proper alignment of the bearing, parking shaft, and reduction driven gear.

(4) Tighten bolts to secure the case.

Tightening torque:
25 ± 2 N·m (2.5 ± 0.2 kg-m, 18.1 ± 1.4 ft-lb)

7. INSTALLATION OF EXTERIOR PARTS

1) Install the revolution sensor. (4WD only)

Tightening torque:
7 ± 1 N·m (0.7 ± 0.1 kg-m, 5.1 ± 0.7 ft-lb)

2) Installation and adjustment of inhibitor switch:
(1) Install the inhibitor switch to the transmission case. Fit the projecting portion of the switch in the recessed portion of the case, and tighten three bolts temporarily.
(2) Insert the range selector lever into the shaft, and tighten the nut.

Tightening torque:
39 ± 3 N·m (4.0 ± 0.3 kg-m, 28.9 ± 2.2 ft-lb)

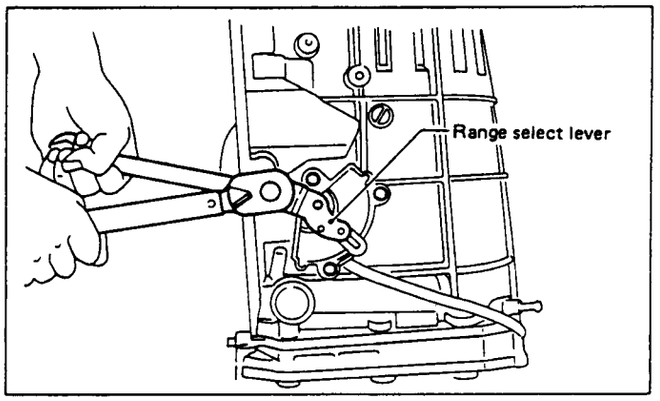


Fig. 272

(3) With the selector lever set to "N" adjust the inhibitor switch so that the hole of range selector lever is aligned with the inhibitor switch hole.

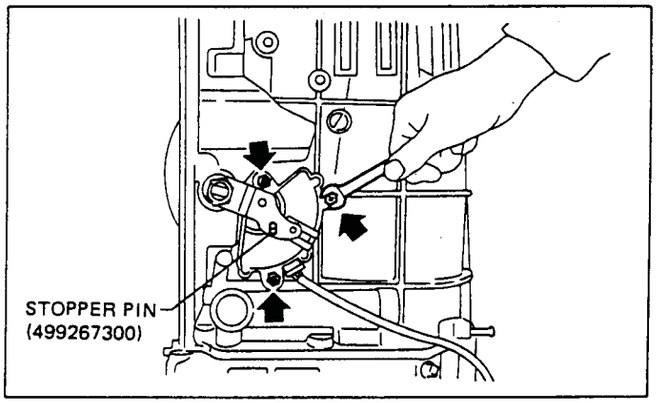


Fig. 273

(4) With hole aligned, tighten three bolts to secure the inhibitor switch.

Tightening torque:
3.4 ± 0.5 N·m (0.35 ± 0.05 kg-m, 2.5 ± 0.4 ft-lb)

3) Clip the following cords and harness:
(1) Transmission harness
(2) Inhibitor switch cord
(3) Revolution sensor cord (4WD only)
4) Install the oil cooler outlet pipe.

Tightening torque:
30.9 ± 3.4 N·m (3.15 ± 0.35 kg-m, 22.8 ± 2.5 ft-lb)

5) Install the oil cooler inlet pipe.

Tightening torque:
25 ± 2 N·m (2.5 ± 0.2 kg-m, 18.1 ± 1.4 ft-lb)

Be sure to use a new aluminum washer.

6) Install the oil charge pipe.

Tightening torque:
30.9 ± 3.4 N·m (3.15 ± 0.35 kg-m, 22.8 ± 2.5 ft-lb)

Be careful not to damage the O-ring.

7) Adjustment of brake band:
(1) After tightening the brake band adjusting screw to 9 N·m (0.9 kg-m, 6.5 ft-lb) torque, back it off three turns. Then secure with a lock nut.

Lock nut tightening torque:
25 – 28 N·m (2.5 – 2.9 kg-m, 18 – 21 ft-lb)

When tightening the lock nut, be careful not to turn the adjusting screw.

8) Install the pitching stopper.

Tightening torque:
39 ± 3 N·m (4.0 ± 0.3 kg-m, 28.9 ± 2.2 ft-lb)

9) Tighten the drain plugs.

Tightening torque:
Diff.
44 ± 3 N·m (4.5 ± 0.3 kg-m, 32.5 ± 2.2 ft-lb)
ATF
25 ± 2 N·m (2.5 ± 0.2 kg-m, 18.1 ± 1.4 ft-lb)

10) Install the air breather hose.
11) Insert the input shaft while turning lightly by hand.

Be careful not to damage the bushing.

12) Install the torque converter assembly.
(1) Install the oil pump shaft to the torque converter.

Make sure the clip fits securely in its groove.

(2) Holding the torque converter assembly by hand, carefully install it to the converter case. Be careful not to damage the bushing. Also, to avoid undue contact between the oil pump shaft bushing and stator shaft portion of the oil pump cover.
(3) Rotate the shaft lightly by hand to engage the splines securely.

13) Add oil:

Specified quantity ℓ (US qt, Imp qt)
Diff.
1.3 – 1.5 (1.4 – 1.6, 1.1 – 1.3)
ATF
2WD: 9.3 – 9.6 (9.8 – 10.1, 8.2 – 8.4)
4WD: 9.5 – 9.8 (10.0 – 10.4, 8.4 – 8.6)

After adding oil, insert the oil level gauge into the oil inlet.

MECHANISM AND FUNCTION

1 Cross Sectional View

2WD

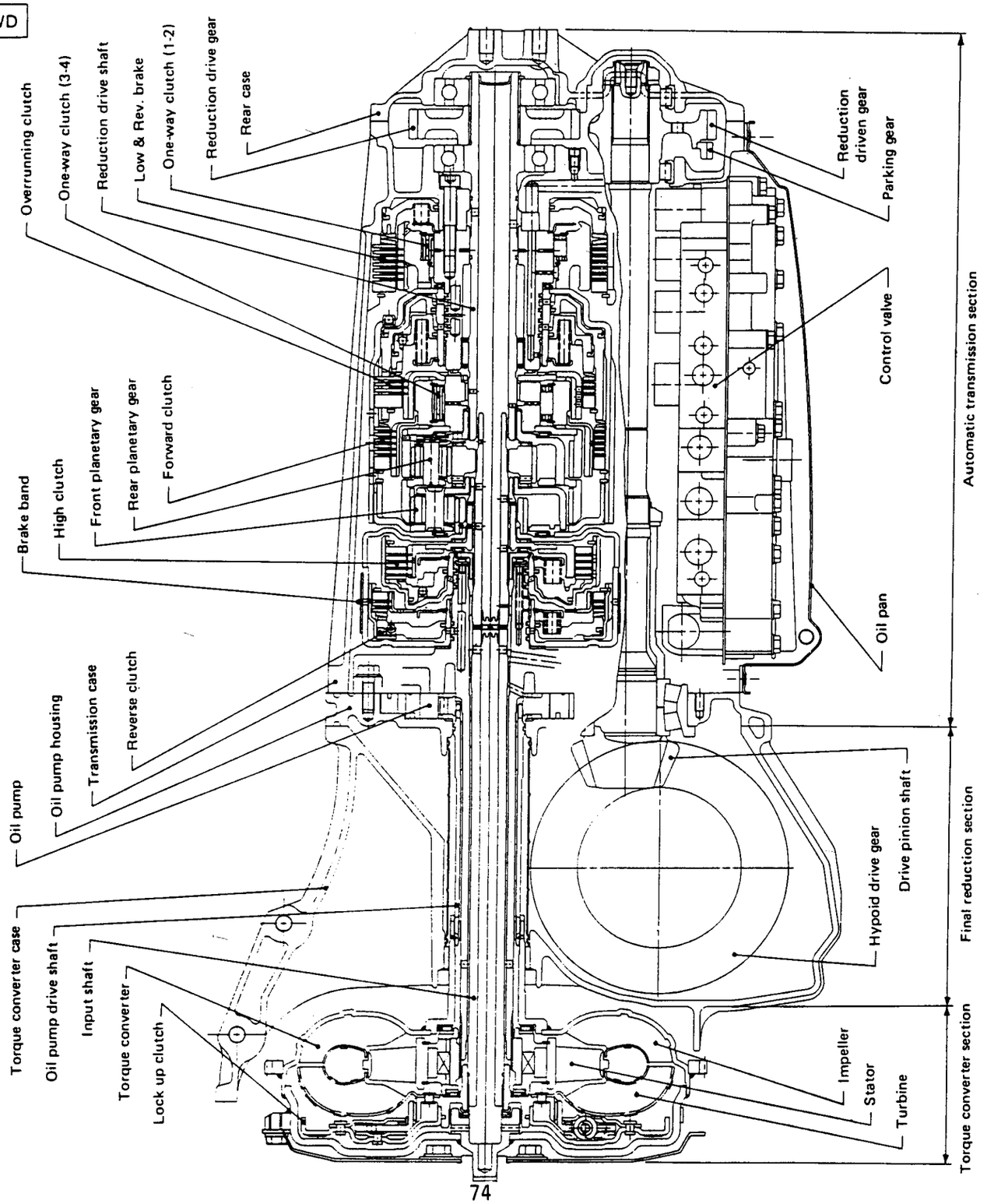


Fig. 1

2 Outline

(1) Automatic Transmission (2WD)

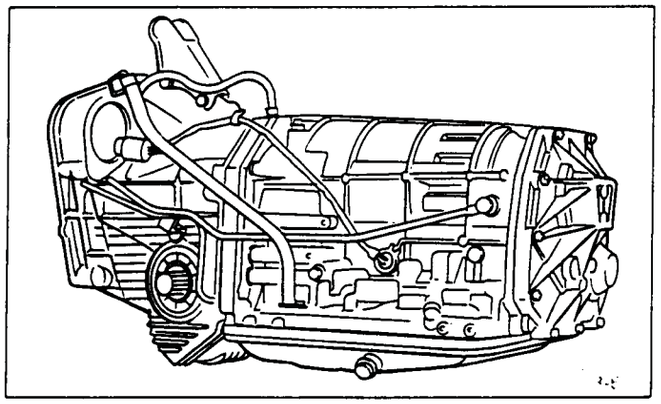


Fig. 3

This newly-designed transmission is an electronically-controlled, 4-speed fully-automatic transmission for FF vehicles. It fully utilizes the latest electronics technology.
In this automatic transmission, various control operations such as gear shifting, engine brake application, locking-up operation, selection of proper gear shift timing, etc. are controlled accurately by a microcomputer according to vehicle operating conditions indicated as throttle opening signal, vehicle speed signal, engine rpm signal, drive range signal, etc. This transmission also features a new function a drive pattern automatic-selection. This function automatically selects an optimum driving pattern for the vehicle. It ranges between a normal pattern, suitable for ordinary economy driving, and a power pattern suitable for driving uphill or accelerating, corresponding to accelerator pedal depression.

< FEATURES >

1) One-way clutches and accumulators and a fully electronic control system have been used for drastic reduction of shock during shifting.
2) A hydraulic lockup-type torque converter and a variable capacity oil pump have been employed to improve driving performance and fuel economy.
3) Self-diagnosis and fail-safe functions are used to improve serviceability and reliability.
4) A push-pull cable is used in the control system to improve quietness.

(2) Automatic Transmission (4WD)

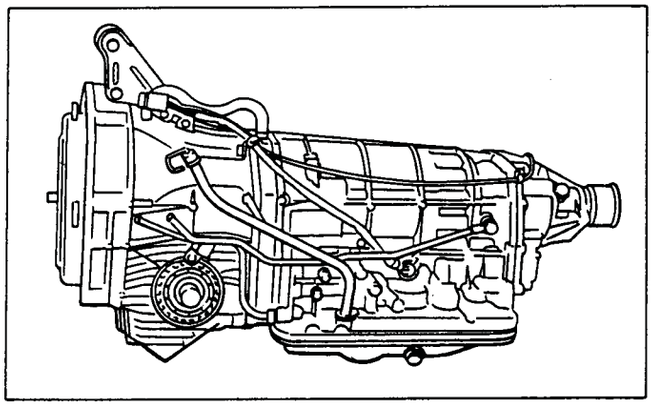


Fig. 4

This transmission is SUBARU's unique, electronically-controlled Multi-Plate-Transfer (MP-T) system, full-time, 4WD automatic transmission. Its design is based on the above-mentioned electronically-controlled, 4-speed fully-automatic transmission for 2WD. This transmission is equipped with a transfer hydraulic control system, including a duty solenoid and hydraulic multi-plate clutch in the transfer section on the rear of the transmission.
The transmission control unit stores optimum transfer clutch torque (duty ratio) data corresponding to various vehicle operating conditions. As signals are sent from various sensors indicating actual operating conditions (car speed, throttle opening angle, range position, wheel slip, etc.), the control unit selects the optimum duty ratio for current conditions. It, then, controls the torque of the transfer clutch (hydraulic multi-plate clutch) by activating the duty solenoid to control hydraulic pressure. This system allows the transfer clutch torque to be finely controlled corresponding to the various vehicle operating conditions, in contrast to the conventional 4WD automatic transmission where transfer clutch torque is controlled only by vehicle speed and throttle angle.

< FEATURES >

In addition to the features of the 2WD automatic transmission, the 4WD automatic transmission has the following features:
1) It permits transfer clutch capacity to be finely controlled by an electronic system. This eliminates the tight-corner braking phenomenon which occurs when the steering wheel is turned fully at low speeds.
2) It permits optimum distribution of rear wheel driving power corresponding to engine output and gear position.
3) It facilitates non-slip control. This improves the ability to get off bad roads or slippery surfaces at low speeds.
4) The "1st hold" range improves driving performance.

3 Electronic Control System Schematic

2WD

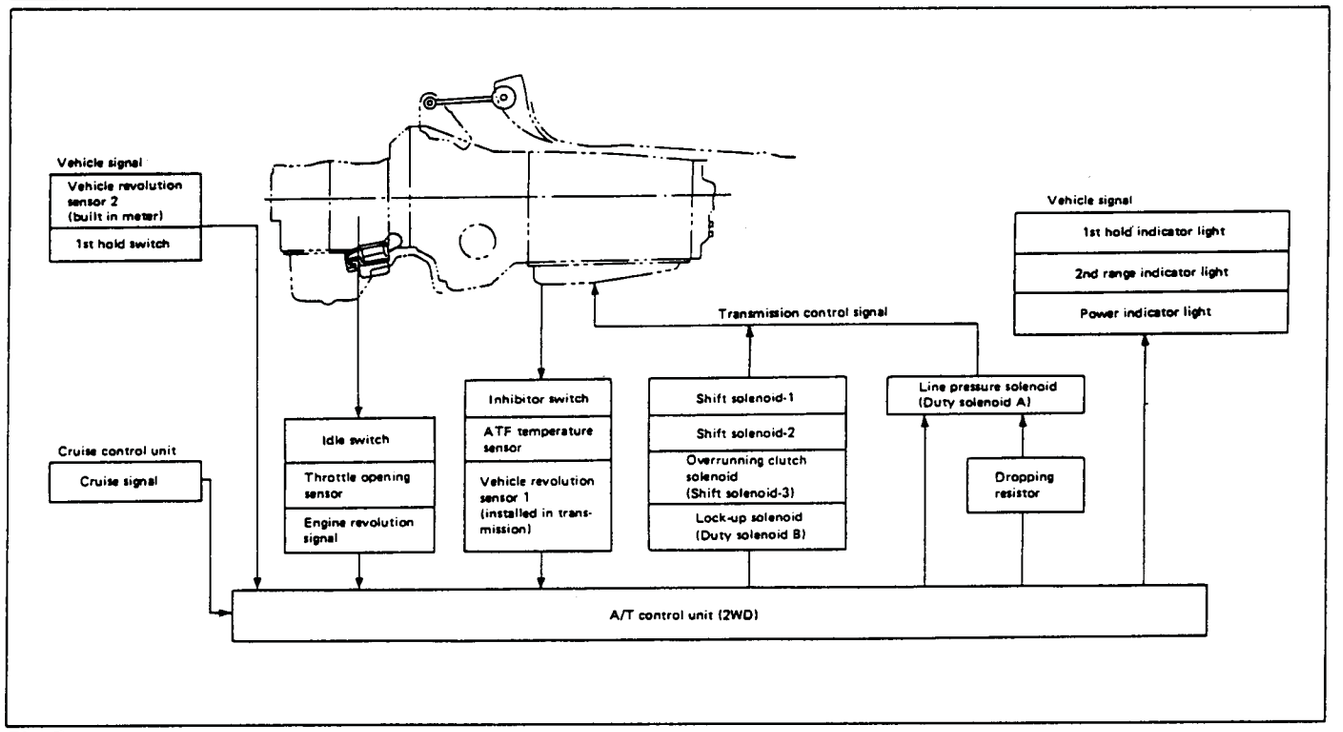


Fig. 5

4WD

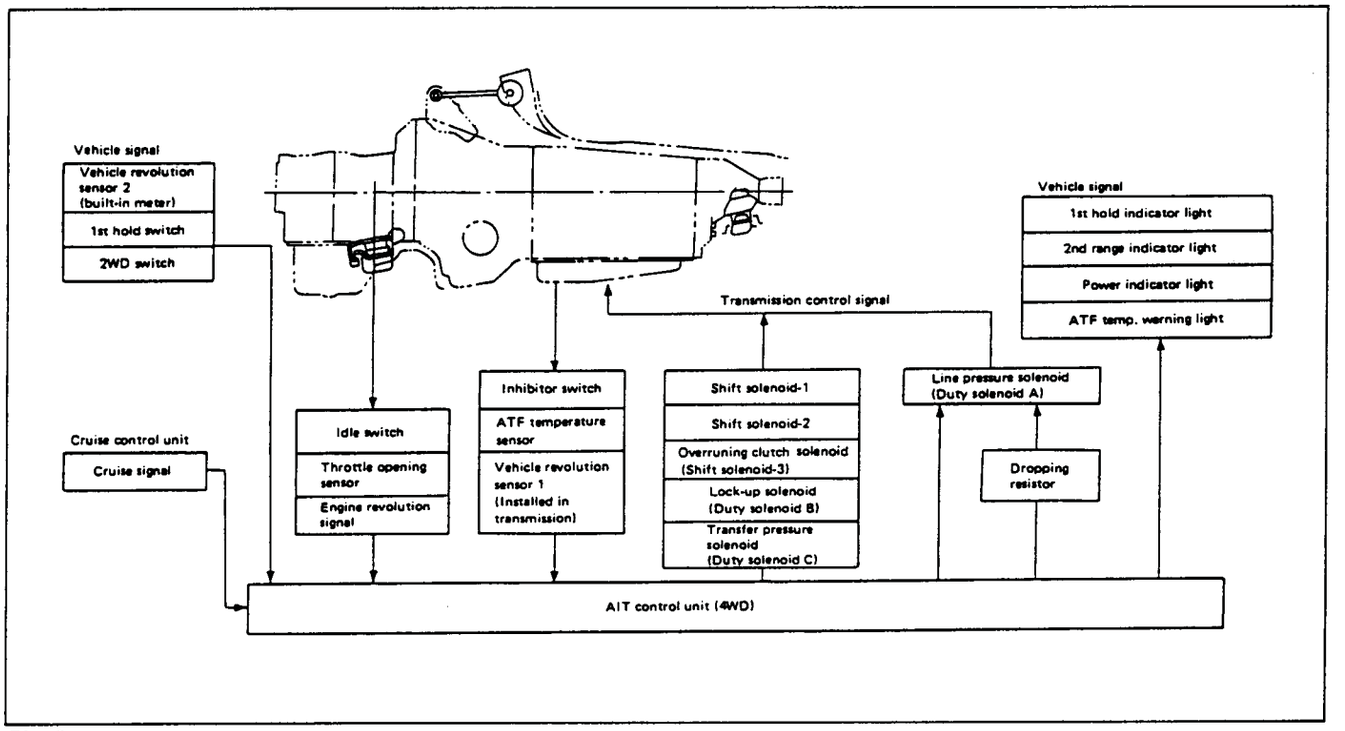


Fig. 6

4 Construction and Features of Each Component

4-1 Torque Converter

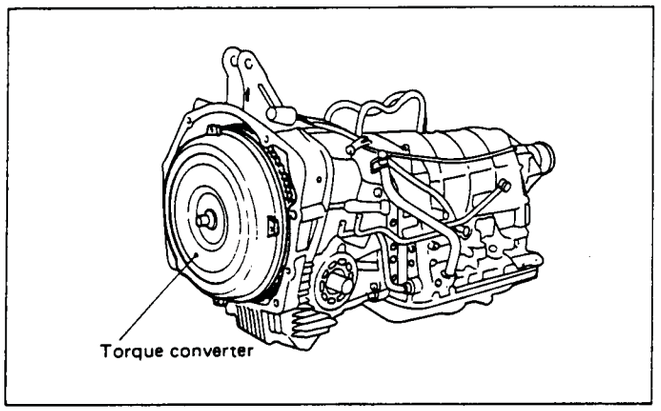


Fig. 7

The newly developed torque converter is designed to match a wide range of engine designs from large to small displacement. The O.D. and width of fluid passages, and the vane shape have been modified to improve starting acceleration and reduce fuel consumption. The torque converter also has an electronically controlled, built-in hydraulic lock-up clutch system that prevents slip loss during medium to high speed operation. In addition, clutch engagement shock is minimized through transient control of the actuating hydraulic pressure. The lock-up clutch uses torsional dampers arranged on its periphery. It also uses a wave spring and friction washer in combination to minimize vibration and noise of the driveline.

	New 4AT	Current production model
Type	Symmetric, 3-element 1-stage, 2-phase torque converter coupling (with hydraulic lockup clutch)	Symmetric, 3-element, 1-stage, 2-phase torque converter coupling
O.D. of fluid passage	246 mm (9.69 in) dia.	236 mm (9.29 in) dia.
Width of fluid passage	66 mm (2.60 in)	76 mm (2.99 in)
One-way clutch	Sprague type	Sprague type
Stall-torque ratio	2.4 – 2.5	2.0 – 2.1
Oil capacity	2.8 ℓ (3.0 US qt, 2.5 Imp qt)	2.8 ℓ (3.0 US qt, 2.5 Imp qt)

Construction and Function

1) CONSTRUCTION

- The torque converter is composed of impeller, turbine, stator, and lock-up clutch. It is filled with oil; therefore it must not be disassembled.
- The impeller is directly coupled to the crankshaft via a drive plate. A sleeve for driving the oil pump, which is the source of the hydraulic pressure for the automatic transmission, is welded to the rear of the impeller.
- The turbine transmits multiplied engine torque in the torque converter range, unmultiplied engine torque in the coupling range, or engine torque itself directly through the lock-up clutch to the automatic transmission via the input shaft spline fitted to the internal spline of the turbine hub.
- The stator incorporates a Sprague type one-way clutch. The stator is spline-fitted to the oil pump cover via the inner race of the one-way clutch, and secured to the torque converter case.

2) FUNCTION

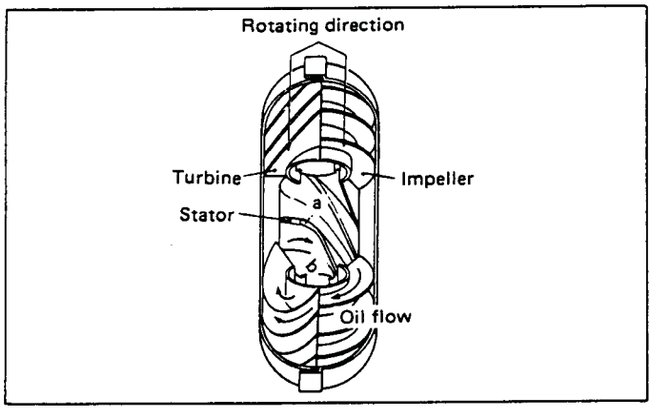


Fig. 8 Function of torque converter

When the impeller rotates, centrifugal force pushes out oil which then enters the turbine. The oil flows along the turbine blade and exerts force on the blade. This causes the turbine to rotate and power is transmitted to the input shaft.

If turbine speed is below impeller speed, the oil leaving the turbine flows in the direction impeding impeller rotation (a in Fig. 8). This direction is then changed by the stator so that the oil will assist impeller rotation (b in Fig. 8). With this action, the torque is multiplied.

The stator is subject to reverse torque when it changes the direction of oil flow, hence it must be secured to the casing. As turbine speed increases and approaches impeller speed, the oil from the turbine begins to push directly on the back of the stator blade. (This changeover point is called the "coupling point".) If the stator is still fixed under this condition, the oil flow will be impeded by the stator. To avoid this, the stator is mounted to the case via a one-way clutch so that it can rotate freely in the same direction as the impeller and turbine.

3) PERFORMANCE

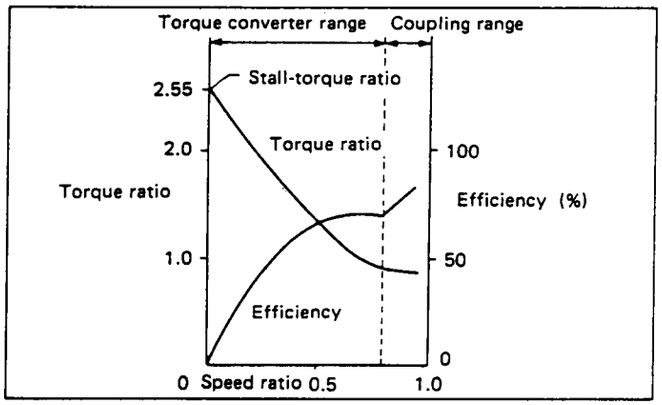


Fig. 9

The performance curve of the torque converter is shown in Fig. 9. The torque ratio, speed ratio, and efficiency respectively are represented by the following equations.

$$\text{Torque ratio} = \frac{\text{Turbine shaft (output shaft) torque}}{\text{Impeller shaft (input shaft) torque}}$$

$$\text{Speed ratio} = \frac{\text{Turbine shaft (output shaft) speed}}{\text{Impeller shaft (input shaft) speed}}$$

$$\text{Efficiency} = \frac{\text{Output horse-power}}{\text{Input horse-power}} \times 100\ (\%)$$

The torque multiplication range with stator fixed is called the "torque converter range". The range in which the stator rotates together with the impeller and turbine is called the "coupling range". In this coupling range, the torque converter functions similarly to the fluid coupling, and the torque is not multiplied. When the speed ratio is zero (0), that is, the condition in which the impeller shaft (engine side) alone rotates and the turbine shaft does not rotate, is called the "stall point" (the vehicle is at a standstill). At this stall point, the torque ratio of the input shaft and impeller shaft is at a maximum. The torque ratio at this point is called the "stall torque ratio", and the engine speed is called the stall speed.

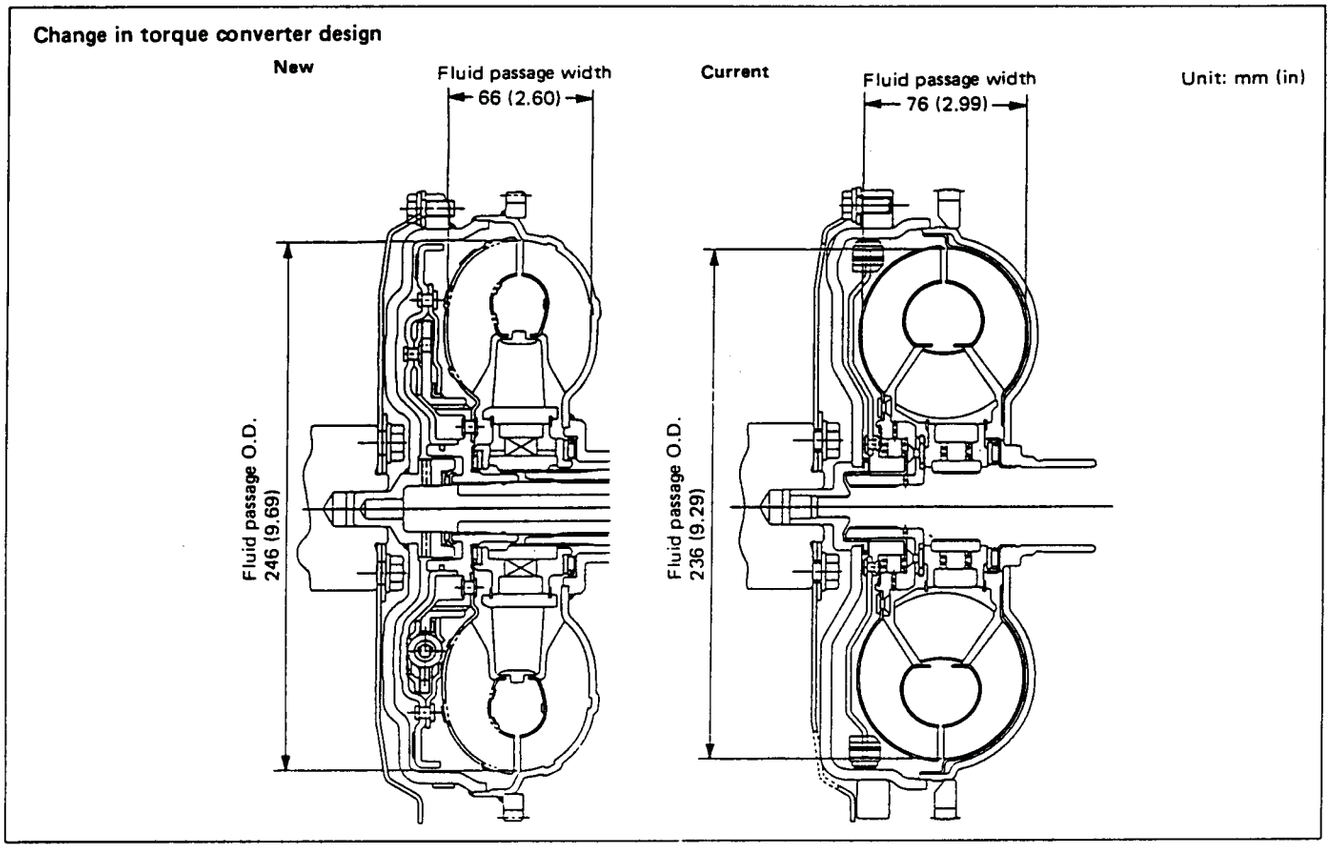


Fig. 10 Change in torque converter design

Lock-up Clutch System

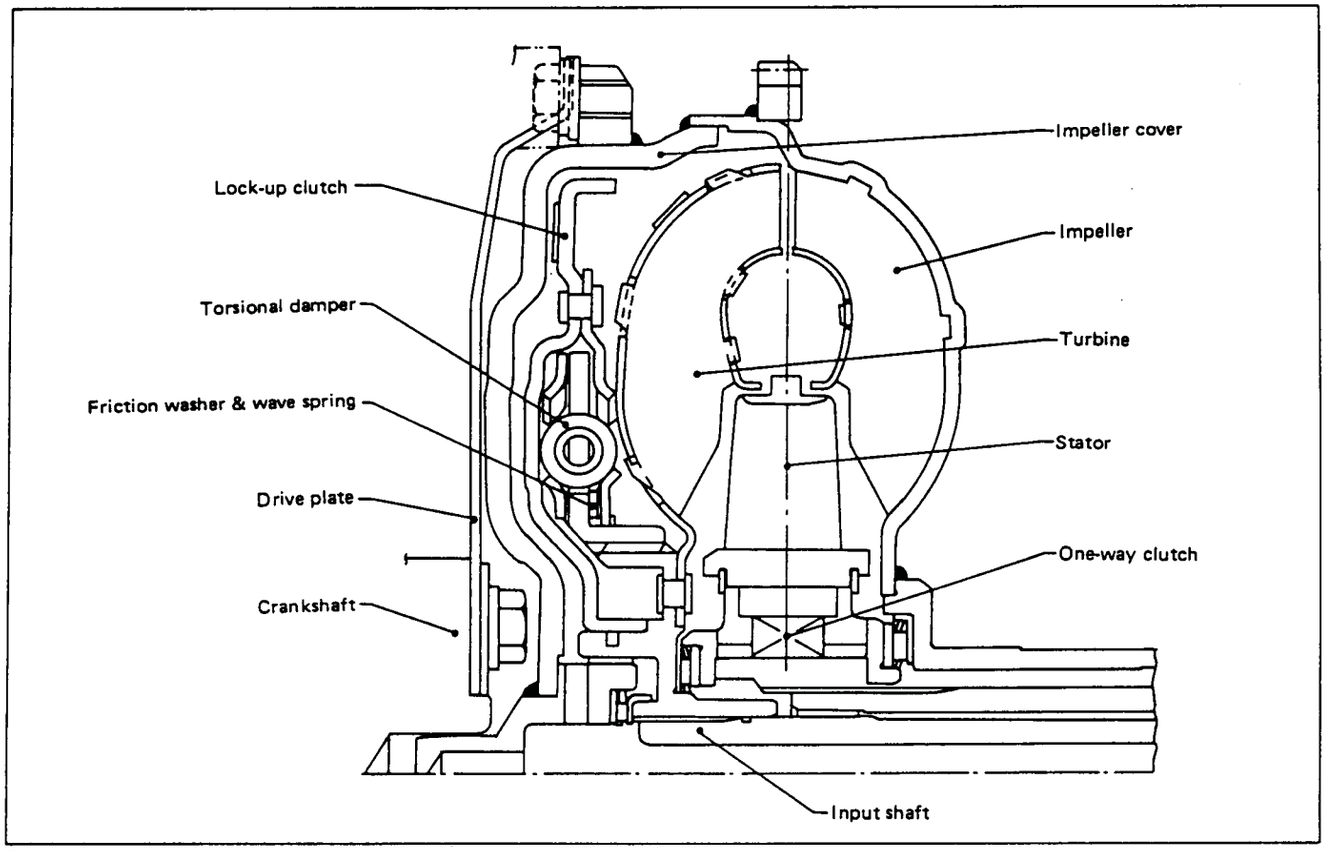


Fig. 11

The control unit controls the 50 Hz duty control (pulse width modulation) solenoid by changing its on/off time ratio. The lock-up control valve actuated by this solenoid switches the oil passages, and controls the hydraulic pressure applied to the lock-up clutch.

Pulse Width Modulation

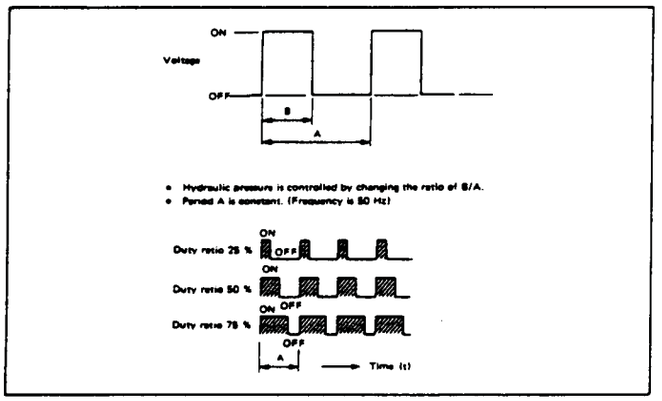


Fig. 12

The duty control solenoid is operated by applying on-off voltage pulses; and the percentage modulation is used to indicate its performance. This percentage modulation is also called the duty ratio, which is represented by the following expression.

$$\text{Duty ratio} = \frac{\text{ON time}}{\text{ON time + OFF time}} \times 100\,(\%) = \frac{B}{A} \times 100\,(\%)$$

The repetition period A is defined as follows:

Period A = ON time + OFF time

Pulse width modulation means variation of duty ratio while keeping period A constant.

Content of lock-up control

<table>
<tr><th colspan="2"></th><th>Control content</th><th>Remarks</th></tr>
<tr><td>Lock-up control

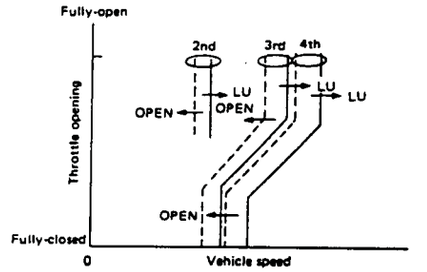
Lock-up on
Duty ratio 95%
Lock-up off
Duty ratio 5%</td><td>(1) Normal control</td><td>• Lockup on/off characteristics are set for each range, gear position and pattern by throttle opening and vehicle speed.
• Fuel consumption, power performance and shift characteristics are taken into account.
<table>
<tr><th>Range</th><th>Mode</th><th>Purpose</th></tr>
<tr><td rowspan="2">D</td><td>Normal</td><td>Lower fuel consumption</td></tr>
<tr><td>Power</td><td>Higher performance</td></tr>
<tr><td>3</td><td>Power</td><td>Same as above</td></tr>
<tr><td>2</td><td>Power</td><td>Same as above</td></tr>
</table></td><td> 

Fig. 13
Lock-up non-operation condition
1) ATF temperature 40°C (104°F) or lower.
2) 1st speed, N, R.
3) During gear shifting.
4) When throttle is fully closed. If cruise control is set, or if V > 140 km/h, lock-up operates even when throttle is fully closed.
5) Rapid accelerator pedal depression.</td></tr>
<tr><td>(2) Smooth control</td><td>When switching from lock-up off to lock-up, the duty ratio is first set to 25% and then gradually changed to 95% for smooth lock-up operation.</td><td>No transient control when lock-up is off.</td></tr>
</table>

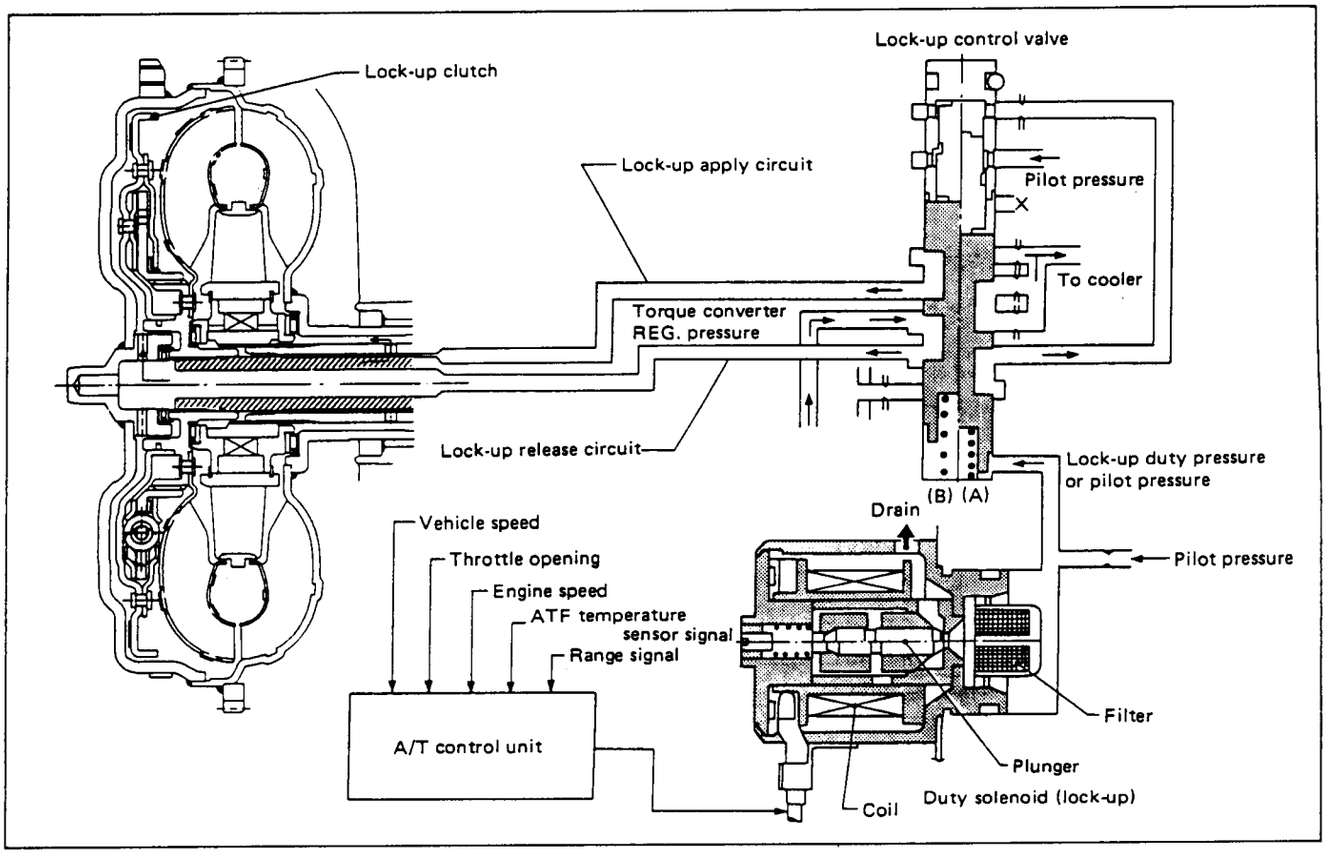


Fig. 14

The lock-up control valve is pushed downward by torque converter REG pressure and pilot pressure. It is pushed upward by lock-up duty pressure and spring force.

(1) DURING LOCK-UP OPERATION

Oil pressure at the lock-up control duty solenoid valve is drained (duty ratio 95%) by a signal from the automatic transmission control unit so that no lock-up duty pressure is developed and the lock-up control valve remains in condition (A). As a result, hydraulic oil flows into the lock-up apply circuit. On the other hand, the lock-up release circuit drains. This causes a pressure differential across the lock-up piston. The piston is then forced against the impeller cover and turned as an integral unit with the cover. Thus, power from the engine is directly transmitted to the transmission input shaft. That is, the transmission is directly coupled to the engine.

(2) DURING NON-LOCK-UP OPERATION

In this mode, the lock-up control duty solenoid is driven at a 5% duty ratio. This causes the lock-up duty pressure (pilot pressure) to be generated. With this pressure, the lock-up control valve is set to condition (B), and hydraulic oil flows into the lock-up release circuit. On the other hand, the lock-up apply circuit is connected to the oil cooler in the radiator. Accordingly, the relationship between "lock-up release pressure lock-up apply pressure" is established. As a result, the lock-up piston is forced to separate from the impeller cover, and power is transmitted from impeller to turbine to input shaft, as with an ordinary torque converter coupling.

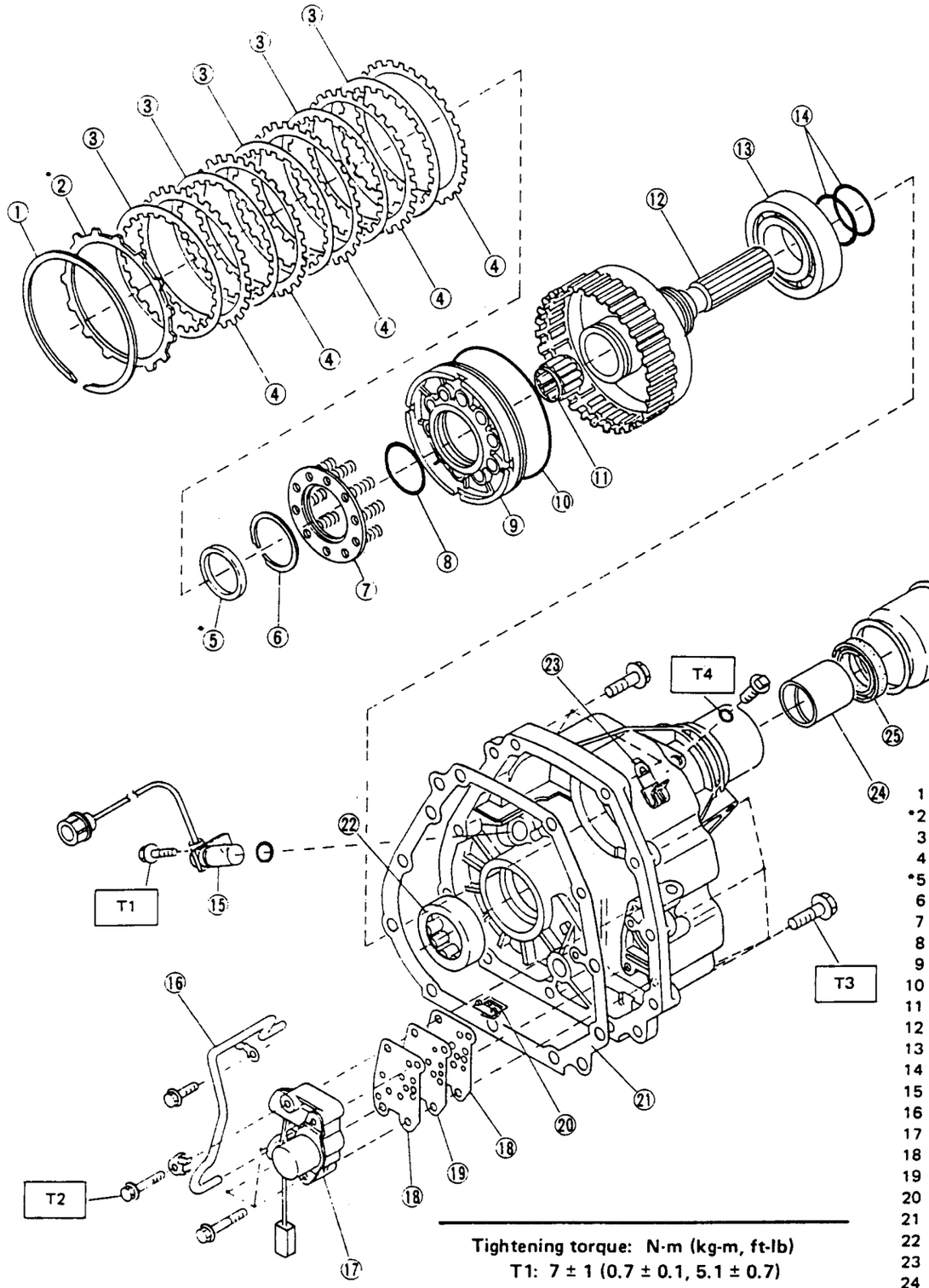
(3) DURING SMOOTH CONTROL

When the lock-up clutch is operated, the duty ratio of the lock-up control duty solenoid does not increase directly to 95%. Instead, it is first modulated to a preset value, then smoothly changed to 95%. This operation allows lock-up duty pressure to be changed smoothly, achieving shockless engagement of the lock-up clutch.

(4) NON-LOCK-UP OPERATION DURING "1ST SPEED", "N" and "R"

In this mode of operation, pilot pressure is generated, and the lock-up control valve is set to condition (B) where lock-up is inoperative.

Transfer and Extension



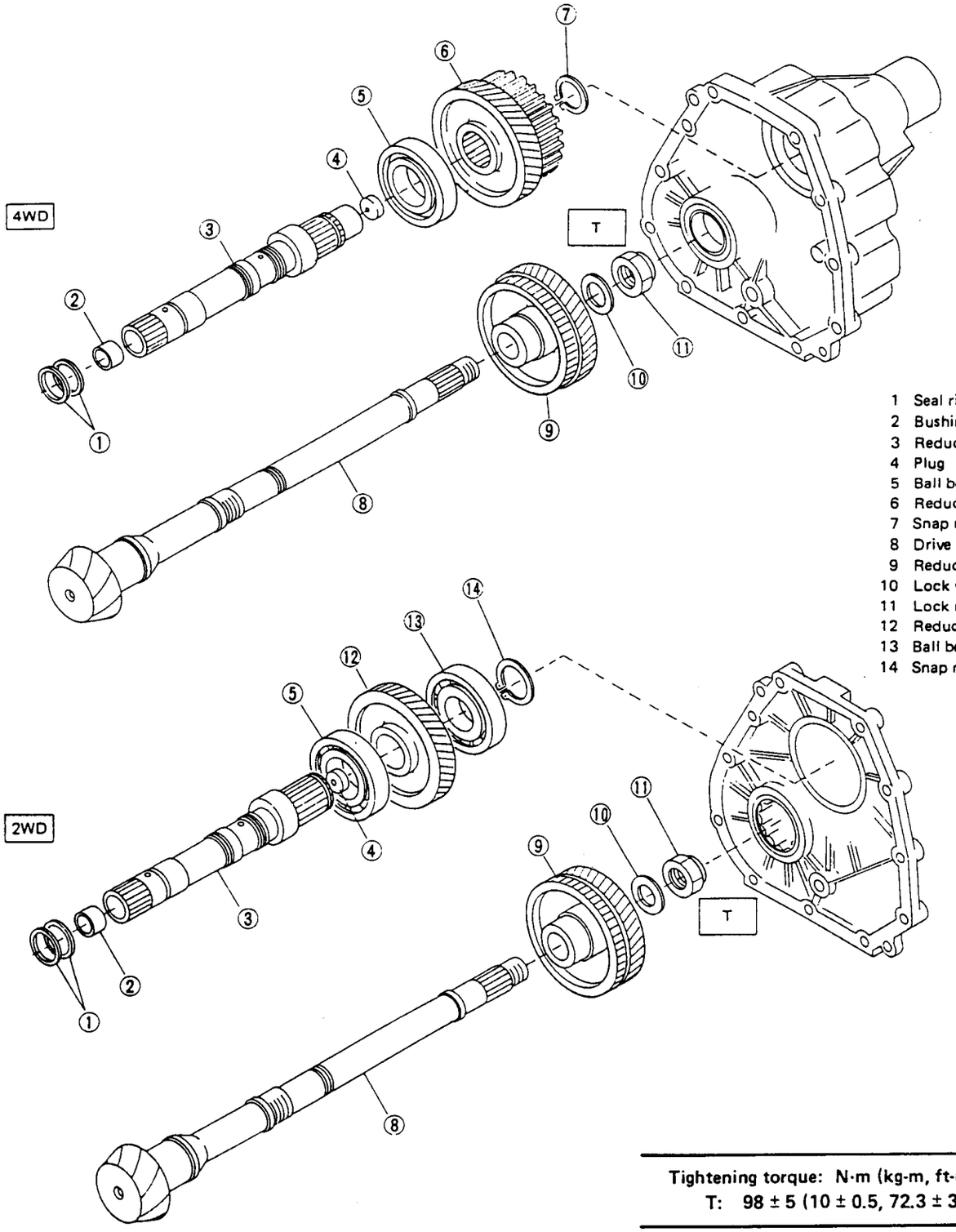
: Selective parts

1 Snap ring
*2 Pressure plate
3 Drive plate
4 Driven plate
*5 Thrust needle bearing
6 Snap ring
7 Spring retainer CP
8 Lathe cut seal ring
9 Transfer clutch piston
10 Lathe cut seal ring
11 Needle bearing
12 Rear drive shaft
13 Ball bearing
14 Seal ring
15 Revolution sensor (4WD)
16 Pilot valve pipe
17 Duty sol. C (transfer)
18 Gasket
19 Plate
20 Filter
21 Gasket
22 Roller bearing
23 Extension case
24 Bushing
25 Oil seal
26 Dust seal

Tightening torque: N·m (kg-m, ft-lb)
T1: 7 ± 1 (0.7 ± 0.1, 5.1 ± 0.7)
T2: 8 ± 1 (0.8 ± 0.1, 5.8 ± 0.7)
T3: 25 ± 1 (2.5 ± 0.1, 18.1 ± 0.7)
T4: 13 ± 1 (1.3 ± 0.1, 9.4 ± 0.7)

Fig. 113

Reduction Gear

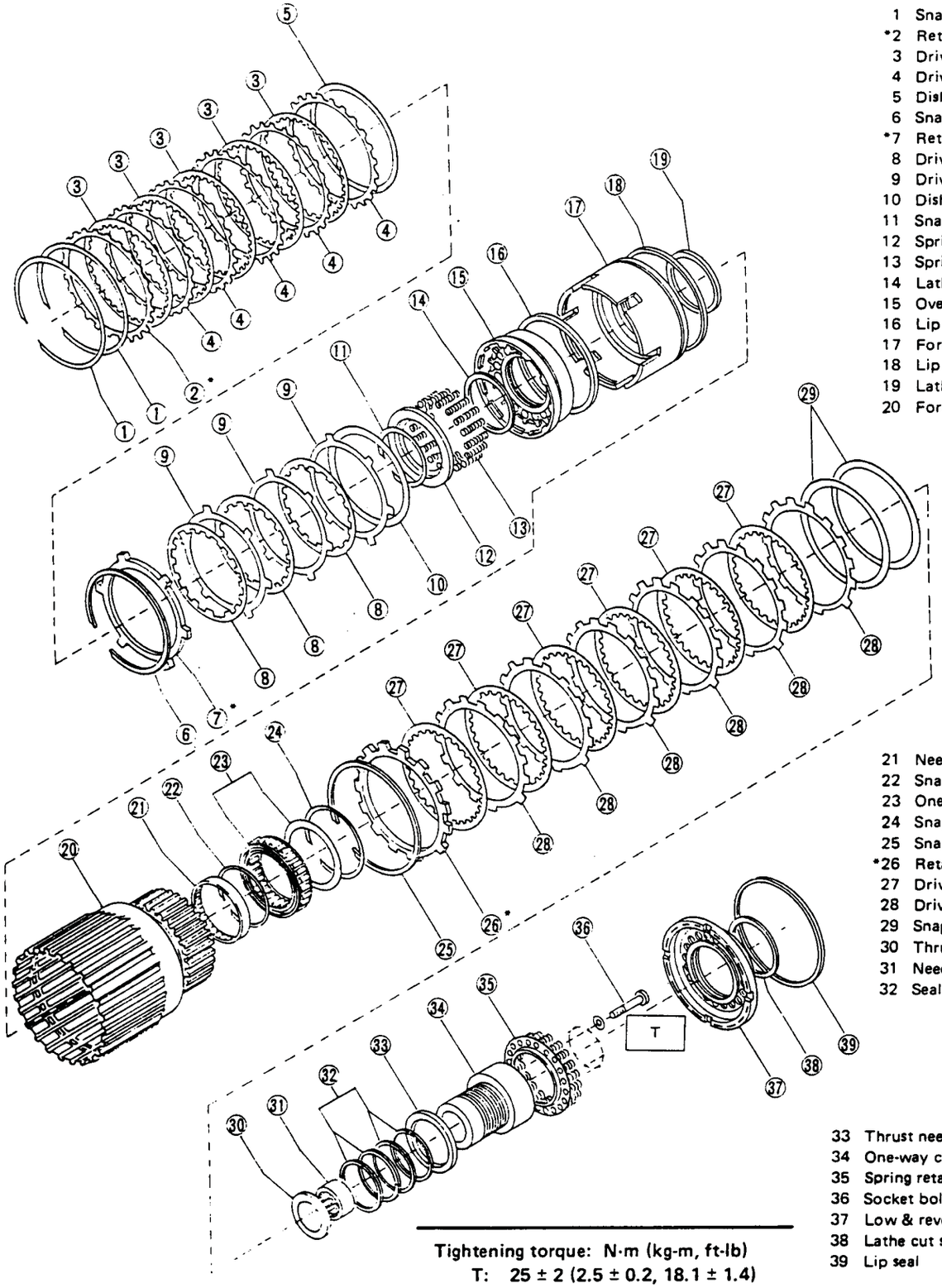


1 Seal ring
2 Bushing
3 Reduction drive shaft
4 Plug
5 Ball bearing
6 Reduction drive gear
7 Snap ring
8 Drive pinion shaft
9 Reduction driven gear
10 Lock washer
11 Lock nut
12 Reduction drive gear
13 Ball bearing
14 Snap ring

Tightening torque: N·m (kg-m, ft-lb)
T: 98 ± 5 (10 ± 0.5, 72.3 ± 3.6)

Fig. 112

Forward Clutch and Low & Reverse Brake



1 Snap ring
*2 Retaining plate
3 Drive plate
4 Driven plate
5 Dish plate
6 Snap ring
*7 Retaining plate
8 Drive plate
9 Driven plate
10 Dish plate
11 Snap ring
12 Spring retainer
13 Spring
14 Lathe cut seal ring
15 Overrunning piston
16 Lip seal
17 Forward piston
18 Lip seal
19 Lathe cut seal ring
20 Forward clutch drum
21 Needle bearing
22 Snap ring
23 One-way clutch (1-2)
24 Snap ring
25 Snap ring
*26 Retaining plate
27 Drive plate
28 Driven plate
29 Snap ring
30 Thrust needle bearing
31 Needle bearing
32 Seal ring
33 Thrust needle bearing
34 One-way clutch inner race (1-2)
35 Spring retainer CP.
36 Socket bolt
37 Low & reverse piston
38 Lathe cut seal ring
39 Lip seal

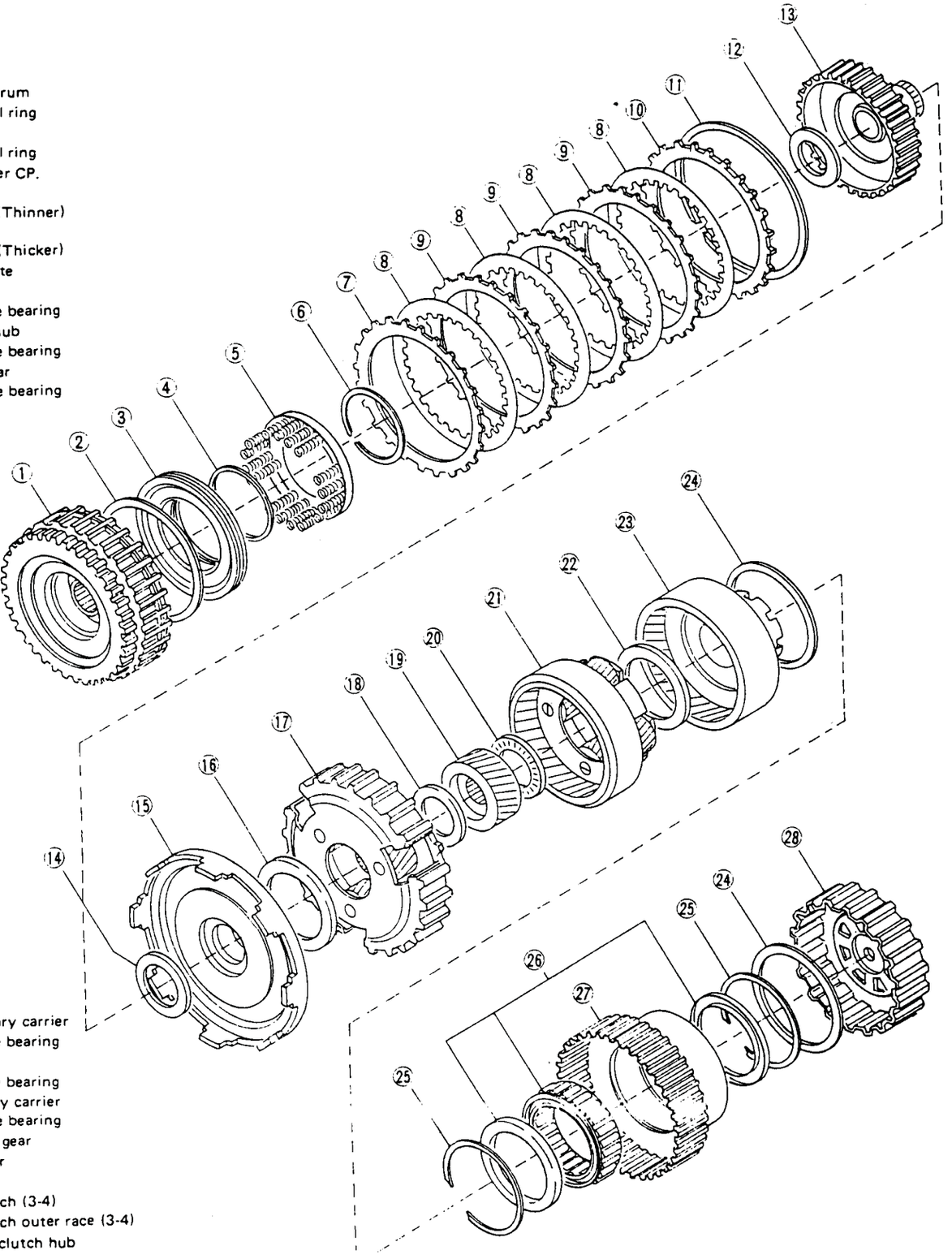
Tightening torque: N·m (kg-m, ft-lb)
T: 25 ± 2 (2.5 ± 0.2, 18.1 ± 1.4)

Fig. 111

High Clutch and Planetary Gear

*: Selective parts

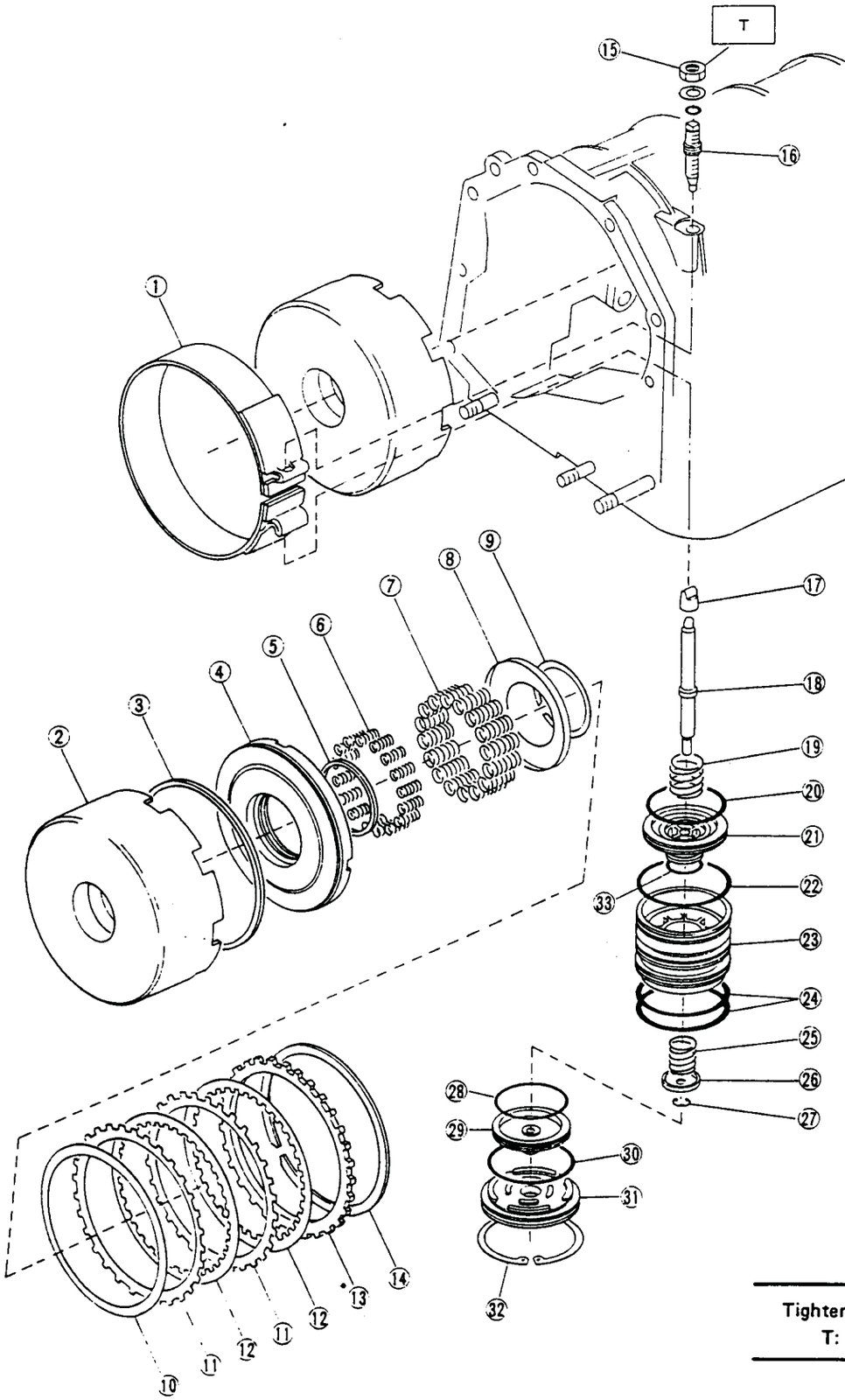
1 High clutch drum
2 Lathe cut seal ring
3 Piston
4 Lathe cut seal ring
5 Spring retainer CP.
6 Snap ring
7 Driven plate (Thinner)
8 Drive plate
9 Driven plate (Thicker)
*10 Retaining plate
11 Snap ring
12 Thrust needle bearing
13 High clutch hub
14 Thrust needle bearing
15 Front sun gear
16 Thrust needle bearing



17 Front planetary carrier
18 Thrust needle bearing
19 Rear sun gear
20 Thrust needle bearing
21 Rear planetary carrier
22 Thrust needle bearing
23 Rear internal gear
24 Thrust washer
25 Snap ring
26 One-way clutch (3-4)
27 One-way clutch outer race (3-4)
28 Overrunning clutch hub

Fig. 110

Reverse Clutch and Band Brake



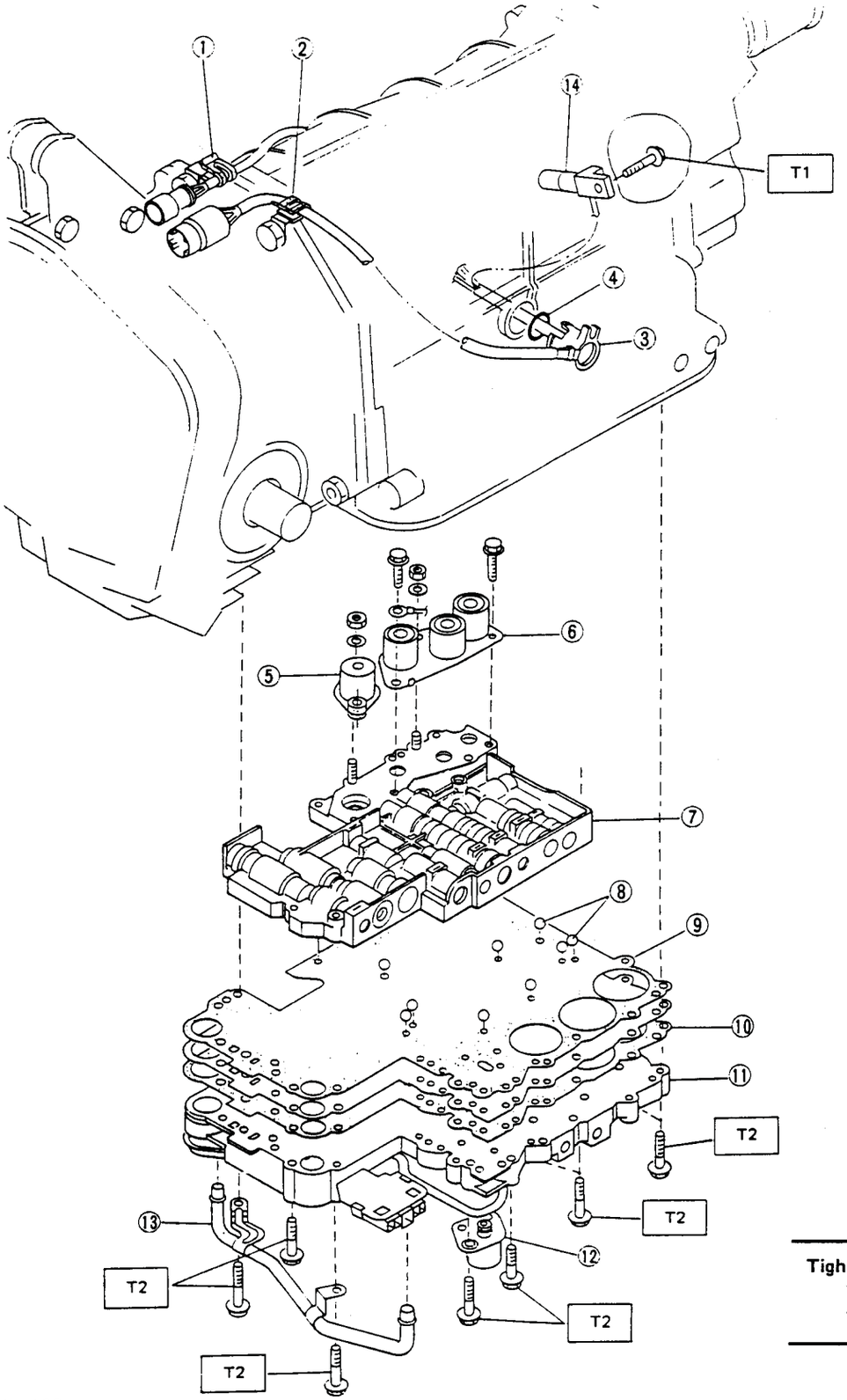
*: Selective parts

1 Brake band
2 Reverse clutch drum
3 Lip seal
4 Piston
5 Lathe cut seal ring
6 Spring
7 Spring
8 Spring retainer
9 Snap ring
10 Dish plate
11 Driven plate
12 Drive plate
*13 Retaining plate
14 Snap ring
15 Lock nut
16 Brake band adjusting screw
17 Strut
18 Band servo piston
19 Spring
20 Lathe cut seal ring
21 Band servo piston (1-2)
22 O-ring
23 Retainer
24 O-ring
25 Spring
26 Retainer
27 Circlip
28 Lathe cut seal ring
29 Band servo piston (3-4)
30 O-ring
31 O.D. servo retainer
32 Snap ring
33 Lathe cut seal ring

Tightening torque: N·m (kg-m, ft-lb)
T: 25 – 28 (2.5 – 2.9, 18 ± 21)

Fig. 109

Control Valve and Harness Louting

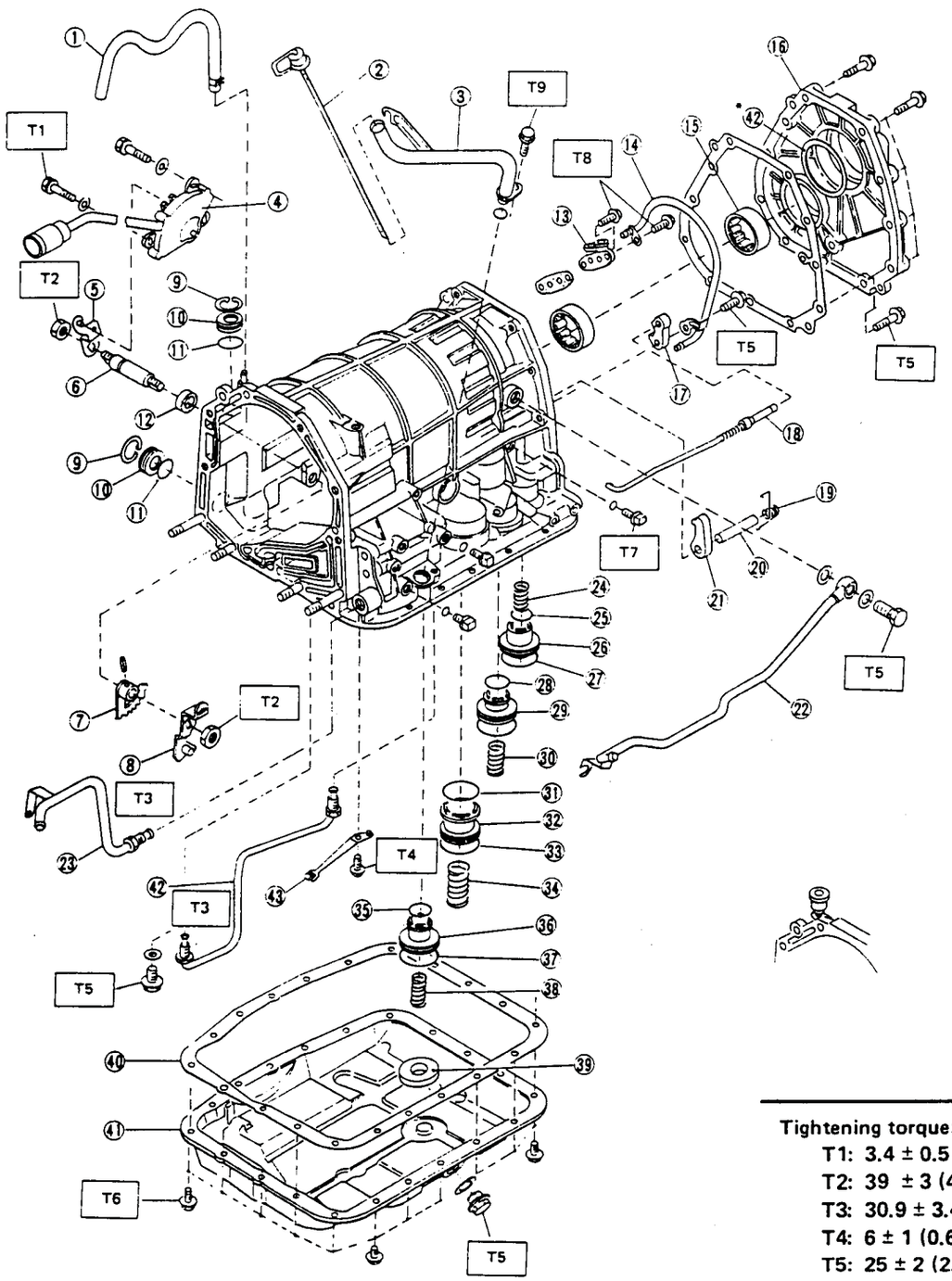


1 Clip
2 Clip
3 Transmission harness
4 O-ring
5 Duty sol. A (Line-pressure)
6 Sol. Assy
7 Upper valve body
8 Ball
9 Upper separator plate
10 Lower separator plate
11 Lower valve body
12 Duty sol. B (Lock-up)
13 Pipe
14 Revolution sensor (2WD)

Tightening torque: N·m (kg-m, ft-lb)
T1: 7 ± 1 (0.7 ± 0.1, 5.1 ± 0.7)
T2: 8 ± 1 (0.8 ± 0.1, 5.8 ± 0.7)

Fig. 108

Transmission Case, Transmission Cover and Control Device



*: Selective parts

1 Air breather hose
2 Oil level gauge
3 Oil charge pipe
4 Inhibitor switch
5 Range select lever
6 Manual shaft
7 Manual plate
8 Manual lever
9 Snap ring
10 Plug
11 O-ring
12 Oil seal
13 Releaf valve
14 Pipe
15 Roller bearing
16 Transmission cover (2WD)
17 Parking support
18 Parking rod
19 Return spring
20 Shaft
21 Parking pawl
22 Inlet pipe
23 Outlet pipe
24 Spring
25 O-ring
26 Accumulator piston (N-D)
27 O-ring
28 O-ring
29 Accumulator piston (2-3)
30 Spring
31 O-ring
32 Accumulator piston (1-2)
33 O-ring
34 Spring
35 O-ring
36 Accumulator piston (3-4)
37 O-ring
38 Spring
39 Magnet
40 Gasket
41 Oil pan
*42 Shim

Tightening torque: N·m (kg-m, ft-lb)

T1: 3.4 ± 0.5 (0.35 ± 0.05, 2.5 ± 0.4)
T2: 39 ± 3 (4.0 ± 0.3, 28.9 ± 2.2)
T3: 30.9 ± 3.4 (3.15 ± 0.35, 22.8 ± 2.5)
T4: 6 ± 1 (0.6 ± 0.1, 4.3 ± 0.7)
T5: 25 ± 2 (2.5 ± 0.2, 18.1 ± 1.4)
T6: 3.9 ± 0.5 (0.4 ± 0.05, 2.9 ± 0.4)
T7: 13 ± 1 (1.3 ± 0.1, 9.4 ±0.7)
T8: 8 ± 1 (0.8 ± 0.1, 5.8 ± 0.7)
T9: 6.4 ± 0.5 (0.65 ± 0.05, 4.7 ± 0.4)

Fig. 107

Oil Pump

Tightening torque: N·m (kg-m, ft-lb)
- T1: 25 ± 2 (2.5 ± 0.2, 18.1 ± 1.4)
- T2: 39 ± 3 (4.0 ± 0.3, 28.9 ± 2.2)
- T3: 33 ± 3 (3.4 ± 0.3, 24.6 ± 2.2)
- T4: 13 ± 1 (1.3 ± 0.1, 9.4 ± 0.7)
- T5: 7 ± 1 (0.7 ± 0.1, 5.1 ± 0.7)
- T6: 113 ± 5 (11.5 ± 0.5, 83.2 ± 3.6)

: Selective parts

1 Retainer
2 Return spring
3 Pin
4 Friction ring
5 O-ring
*6 Cam ring
7 Vane ring
*8 Vane
*9 Rotor
10 Bushing
11 Oil pump cover
*12 Thrust washer
13 Seal ring (R)
14 Seal ring (H)
15 Thrust needle bearing
*16 Thrust washer
17 Air breather hose
18 Drive pinion shaft
19 Roller bearing
*20 Shim
21 Test plug
22 Oil pump housing
23 Pin
24 Side seal
*25 Control piston
26 Plane seal
27 Gasket
28 O-ring
29 Oil seal
30 Oil seal retainer
31 Seal
32 Lock washer
33 Lock nut

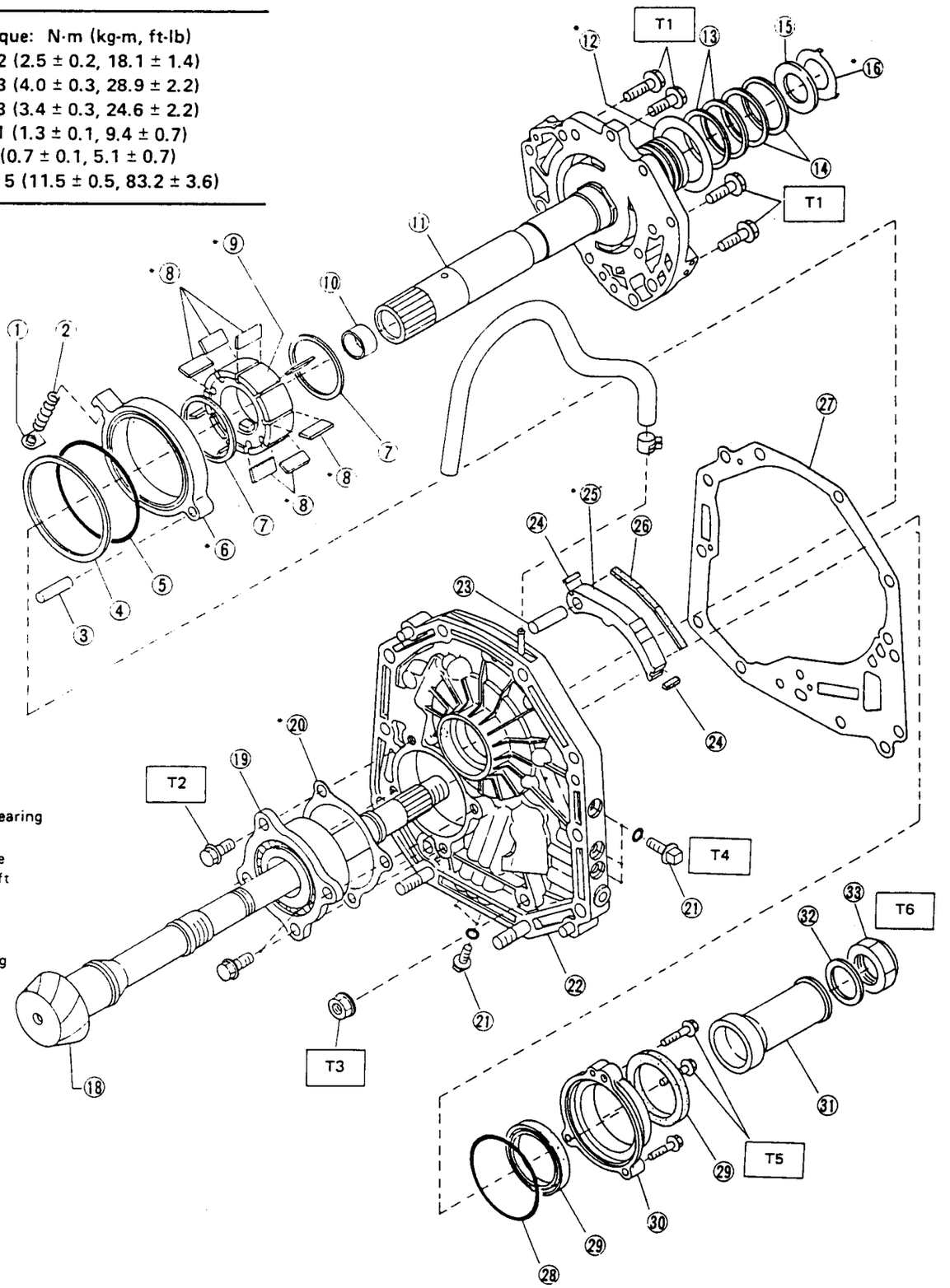
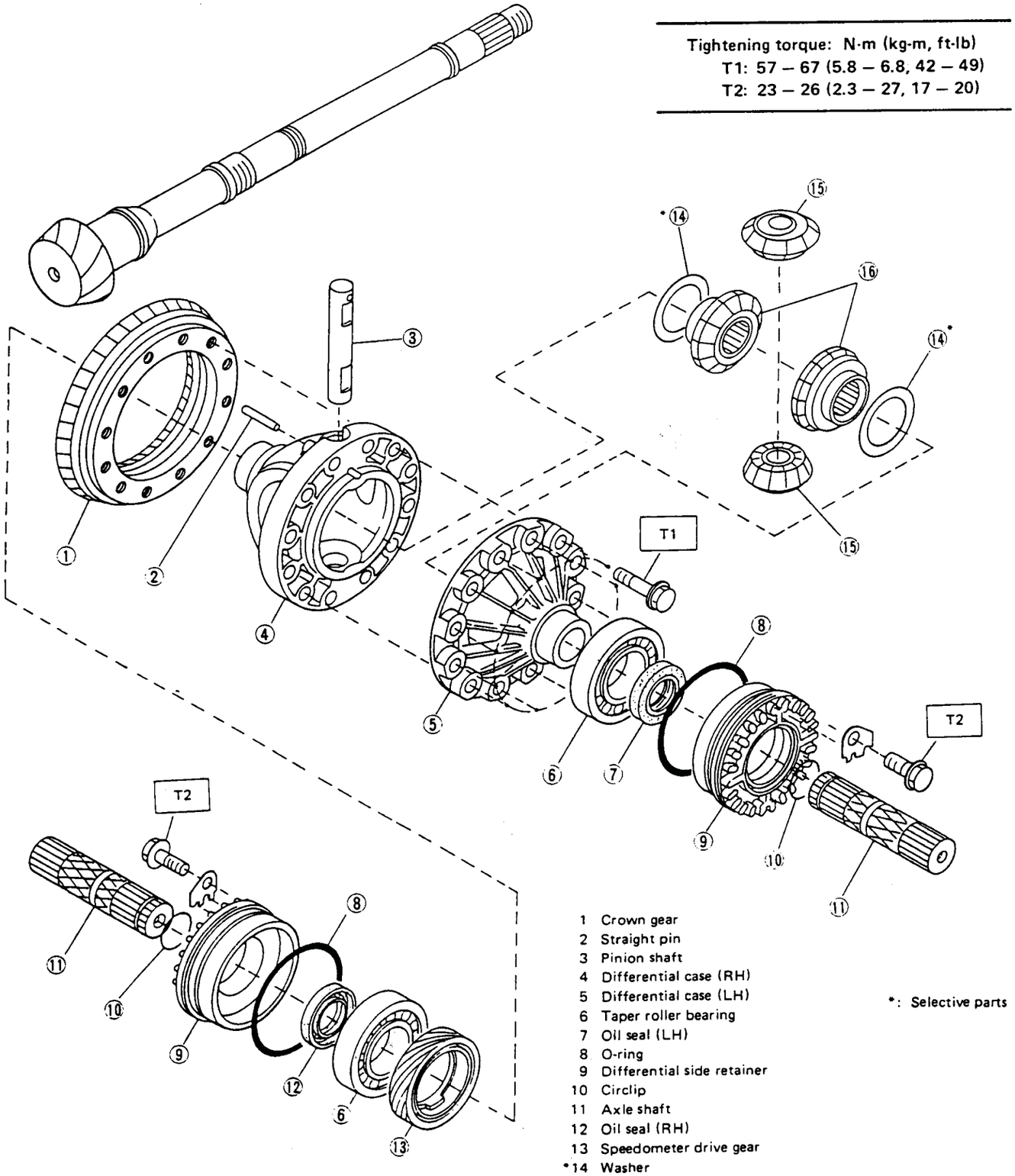


Fig. 106

Differential Case

Tightening torque: N·m (kg-m, ft-lb)
T1: 57 – 67 (5.8 – 6.8, 42 – 49)
T2: 23 – 26 (2.3 – 27, 17 – 20)



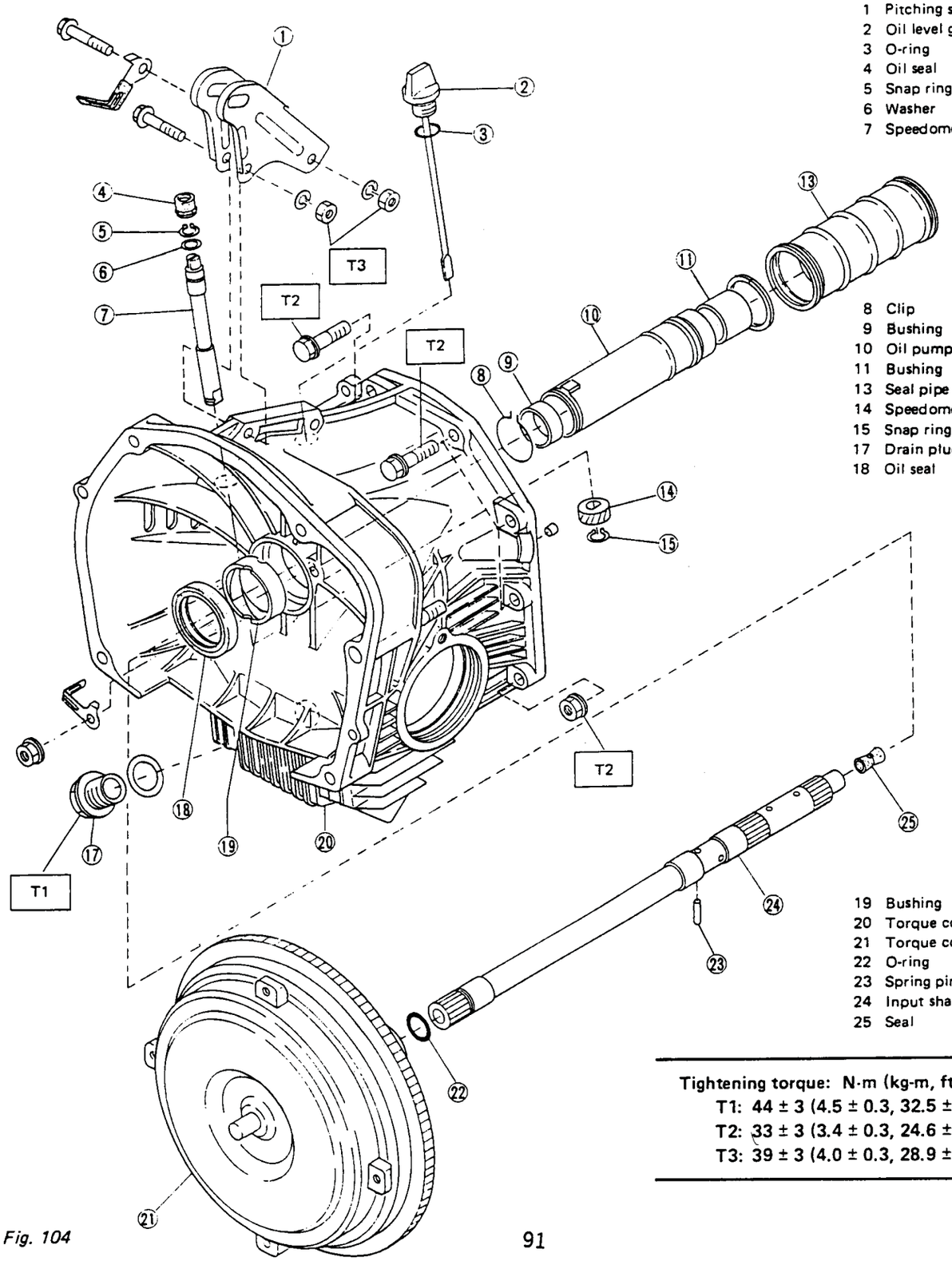
1 Crown gear
2 Straight pin
3 Pinion shaft
4 Differential case (RH)
5 Differential case (LH)
6 Taper roller bearing
7 Oil seal (LH)
8 O-ring
9 Differential side retainer
10 Circlip
11 Axle shaft
12 Oil seal (RH)
13 Speedometer drive gear
*14 Washer
15 Differential bevel pinion
16 Differential bevel gear

*: Selective parts

Fig. 105

COMPONENT PARTS

Torque Converter and Converter Case



1 Pitching stopper bracket
2 Oil level gauge
3 O-ring
4 Oil seal
5 Snap ring
6 Washer
7 Speedometer shaft
8 Clip
9 Bushing
10 Oil pump shaft
11 Bushing
13 Seal pipe
14 Speedometer driven gear
15 Snap ring
17 Drain plug
18 Oil seal
19 Bushing
20 Torque converter case
21 Torque converter
22 O-ring
23 Spring pin
24 Input shaft
25 Seal

Tightening torque: N·m (kg-m, ft-lb)
T1: 44 ± 3 (4.5 ± 0.3, 32.5 ± 2.2)
T2: 33 ± 3 (3.4 ± 0.3, 24.6 ± 2.2)
T3: 39 ± 3 (4.0 ± 0.3, 28.9 ± 2.2)

Fig. 104

4 Location and Installing Direction of Thrust Needle Bearing and Washer

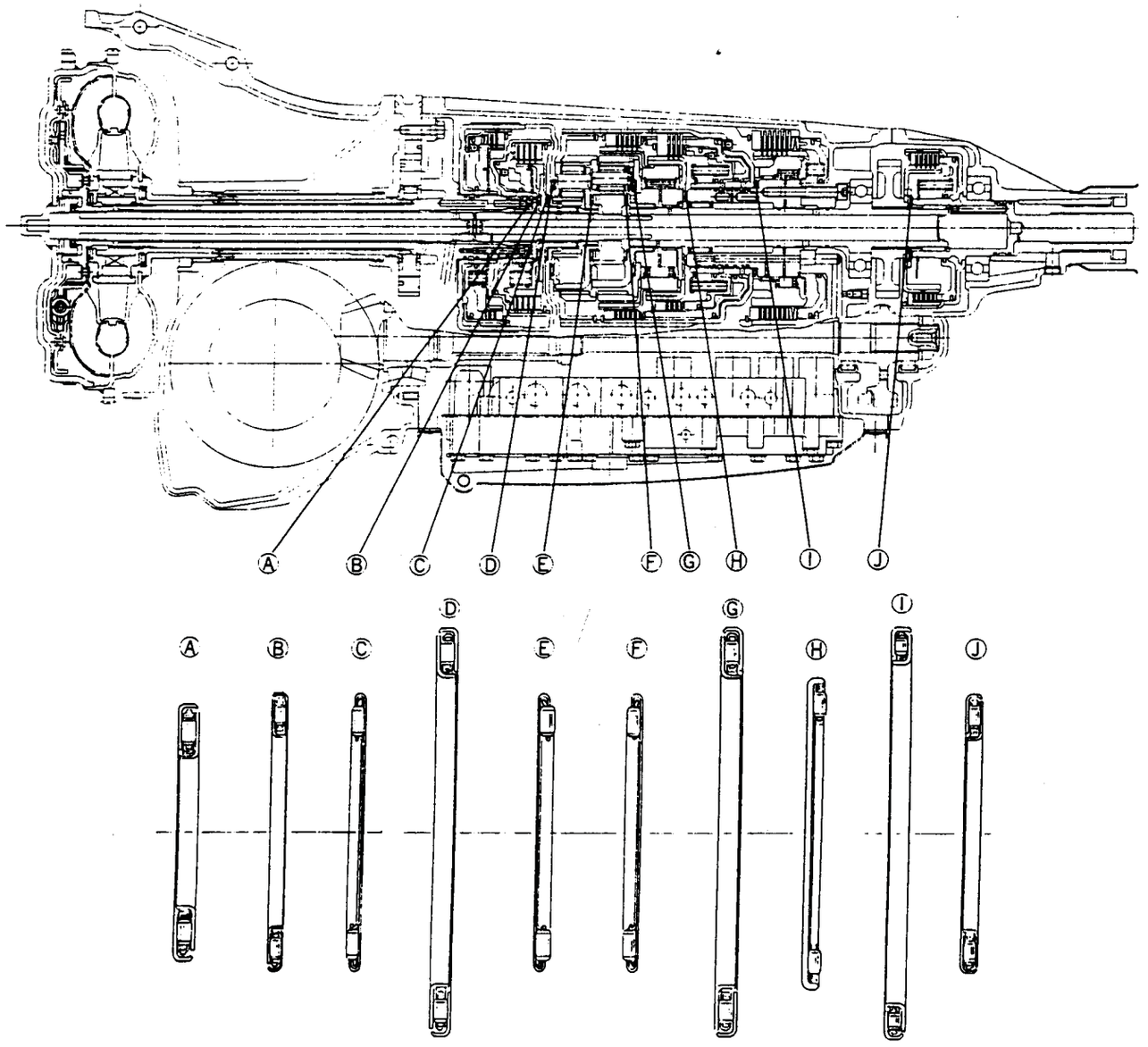


Fig. 103

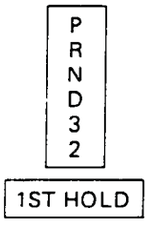
No.	Part Name	Part Number	Dimension mm (in)	Application
1	CONTROL PISTON	31235AA000 – 030	$13.5\ ^{-0.030}_{-0.037}$ ($0.5315\ ^{-0.0012}_{-0.0015}$), $13.5\ ^{-0.023}_{-0.030}$ ($0.5315\ ^{-0.0009}_{-0.0012}$), $13.5\ ^{-0.016}_{-0.023}$ ($0.5315\ ^{-0.0006}_{-0.0009}$), $13.5\ ^{-0.009}_{-0.016}$ ($0.5315\ ^{-0.0004}_{-0.0006}$)	Adjusting side clearance of oil pump
2	CAM RING	31241AA000 – 030	$17\ ^{-0.010}_{-0.017}$ ($0.6693\ ^{-0.0004}_{-0.0007}$), $17\ ^{-0.003}_{-0.010}$ ($0.6693\ ^{-0.0001}_{-0.0004}$), $17\ ^{+0.004}_{-0.003}$ ($0.6693\ ^{+0.0002}_{-0.0001}$), $17\ ^{+0.011}_{+0.004}$ ($0.6693\ ^{+0.0004}_{+0.0002}$)	Adjusting side clearance of oil pump
3	VANE (Oil pump)	31243AA000 – 030	$17\ ^{-0.030}_{-0.037}$ ($0.6693\ ^{-0.0012}_{-0.0015}$), $17\ ^{-0.023}_{-0.030}$ ($0.6693\ ^{-0.0009}_{-0.0012}$), $17\ ^{-0.016}_{-0.023}$ ($0.6693\ ^{-0.0006}_{-0.0009}$), $17\ ^{-0.009}_{-0.016}$ ($0.6693\ ^{-0.0004}_{-0.0006}$)	Adjusting side clearance of oil pump
4	ROTOR (Oil pump)	31240AA000 – 030	$17\ ^{-0.030}_{-0.037}$ ($0.6693\ ^{-0.0012}_{-0.0015}$), $17\ ^{-0.023}_{-0.030}$ ($0.6693\ ^{-0.0009}_{-0.0012}$), $17\ ^{-0.016}_{-0.023}$ ($0.6693\ ^{-0.0006}_{-0.0009}$), $17\ ^{-0.009}_{-0.016}$ ($0.6693\ ^{-0.0004}_{-0.0006}$)	Adjusting side clearance of oil pump
5	THRUST WASHER (Reverse clutch)	31299AA000 – 060	0.7, 0.9, 1.1, 1.3, 1.5, 1.7, 1.9 (0.028, 0.035, 0.043, 0.051, 0.059, 0.067, 0.075)	Adjusting end play of reverse clutch drum
6	BEARING RACE	803031021 – 27	0.8, 1.0, 1.2, 1.4, 1.6, 1.8, 2.0 (0.031, 0.039, 0.047, 0.055, 0.063, 0.071, 0.079)	Adjusting total end play
7	RETAINING PLATE	31567AA000, 020 – 050	4.6, 4.8, 5.0, 5.2, 5.4 (0.181, 0.189, 0.197, 0.205, 0.213)	Adjusting clearance of reverse clutch
8	RETAINING PLATE	31567AA190 – 260	3.6, 3.8, 4.0, 4.2, 4.4, 4.6, .4.8, 5.0 (0.142, 0.150, 0.157, 0.165, 0.173, 0.181, 0.189, 0.197)	Adjusting clearance of high clutch
9	RETAINING PLATE	31567AA010, 060 – 110	8.0, 8.2, 8.4, 8.6, 8.8, 9.0, 9.2 (0.315, 0.323,0.331, 0.339, 0.346, 0.354, 0.362)	Adjusting clearance of forward clutch
10	RETAINING PLATE	31567AA120 – 180	8.0, 8.2, 8.4, 8.6, 8.8, 9.0, 9.2 (0.315, 0.323, 0.331, 0.339, 0.346, 0.354, 0.362)	Adjusting clearance of over-running clutch
11	RETAINING PLATE No. 2	31667AA180 – 250	6.5, 6.8, 7.1, 7.4, 7.7, 8.0, 8.2, 8.4, (0.256, 0.268, 0.280, 0.291, 0.303, 0.315, 0.323, 0.331)	Adjusting clearance of low & reverse clutch
12	PRESSURE PLATE (Front)	31593AA150 – 180	3.3, 3.7, 4.1, 4.5 (0.130, 0.146, 0.161, 0.177)	Adjusting clearance of transfer clutch
13	THRUST BEARING (35 x 53 x T)	806535020 – 090	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 end play of transfer clutch
14	SHIM (Reduction gear)	31288AA000	0.15 (0.0059)	Adjusting end play of reduction drive gear
15	WASHER (38.1 x 50 x T)	803038021 – 023	0.95, 1.00, 1.05 (0.0374, 0.0394, 0.0413)	Adjusting backlash of differential bevel gear

2 Service Data

			2WD		4WD
			Non-TURBO	TURBO	TURBO
Automatic transmission	Hydraulic control	Type	Electronic/hydraulic control (Four forward speed changes by electrical signals of car speed and accelerator (throttle) opening)		
		Fluid	Automatic transmission fluid (ATF) DEXRON II		
		Fluid capacity	9.3 – 9.6 ℓ (9.8 – 10.1 US qt, 8.2 – 8.4 Imp qt)		9.5 – 9.8 ℓ (10.0 – 10.4 US qt, 8.4 – 8.6 Imp qt)
	Lubrication	Lubrication system	Forced feed lubrication with oil pump		
		Oil	Automatic transmission fluid (above-mentioned)		
	Cooling	Cooling system	Liquid-cooled cooler incorporated in radiator		
	Harness	Inhibitor switch	11 poles		
		Transmission harness	11 poles		10 poles
		Resolution sensor	–		3 poles
Transfer	Transfer clutch		–		Hydraulic multi-plate clutch
	Control method		–		Electronic, hydraulic type
	Lubricant		–		The same Automatic transmission fluid used in Automatic transmission
	1st reduction gear ratio		1.000 (47/47)		
Final reduction	Final gear ratio	Front drive	3.900 (39/10)	3.700 (37/10)	3.700 (37/10)
		Rear drive	–		3.700 (37/10)
	Speedometer gear ratio		0.840 (21/25)		
	Lubrication oil		API, GL-5		
	Oil capacity	Front drive	1.4 ℓ (1.5 US qt, 1.2 Imp qt)		
		Rear drive	–		0.8 ℓ (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)		

SPECIFICATIONS AND SERVICE DATA

1 Specifications

			Non-TURBO (2WD)	TURBO (2WD & 4WD)
Torque converter	Type		Symmetric, 3-element, single stage, 2 phase torque converter coupling	
	Stall torque ratio		2.4 – 2.5 : 1	
	Nominal diameter		246 mm (9.69 in)	
	Stall speed (at sea level)		2,450 – 2,850 rpm	2,750 – 3,150 rpm
	One-way clutch		Sprag type one-way clutch	
Automatic transmission	Transmission	Type	4-forward, 1-reverse, double-row planetary gears	
		Control element	Multi-plate clutch	4 sets
			Multi-plate brake	1 set
			Band brake	1 set
			One-way clutch (sprag type)	2 sets
		Gear ratio	1st	2.785
			2nd	1.545
			3rd	1.000
			4th	0.694
			Reverse	2.272
		Tooth number of planetary gear	Front sun gear	33
			Front pinion	21
			Front internal gear	75
			Rear sun gear	42
			Rear pinion	17
			Rear internal gear	75
		Selector pattern		

6 Fluid Passages

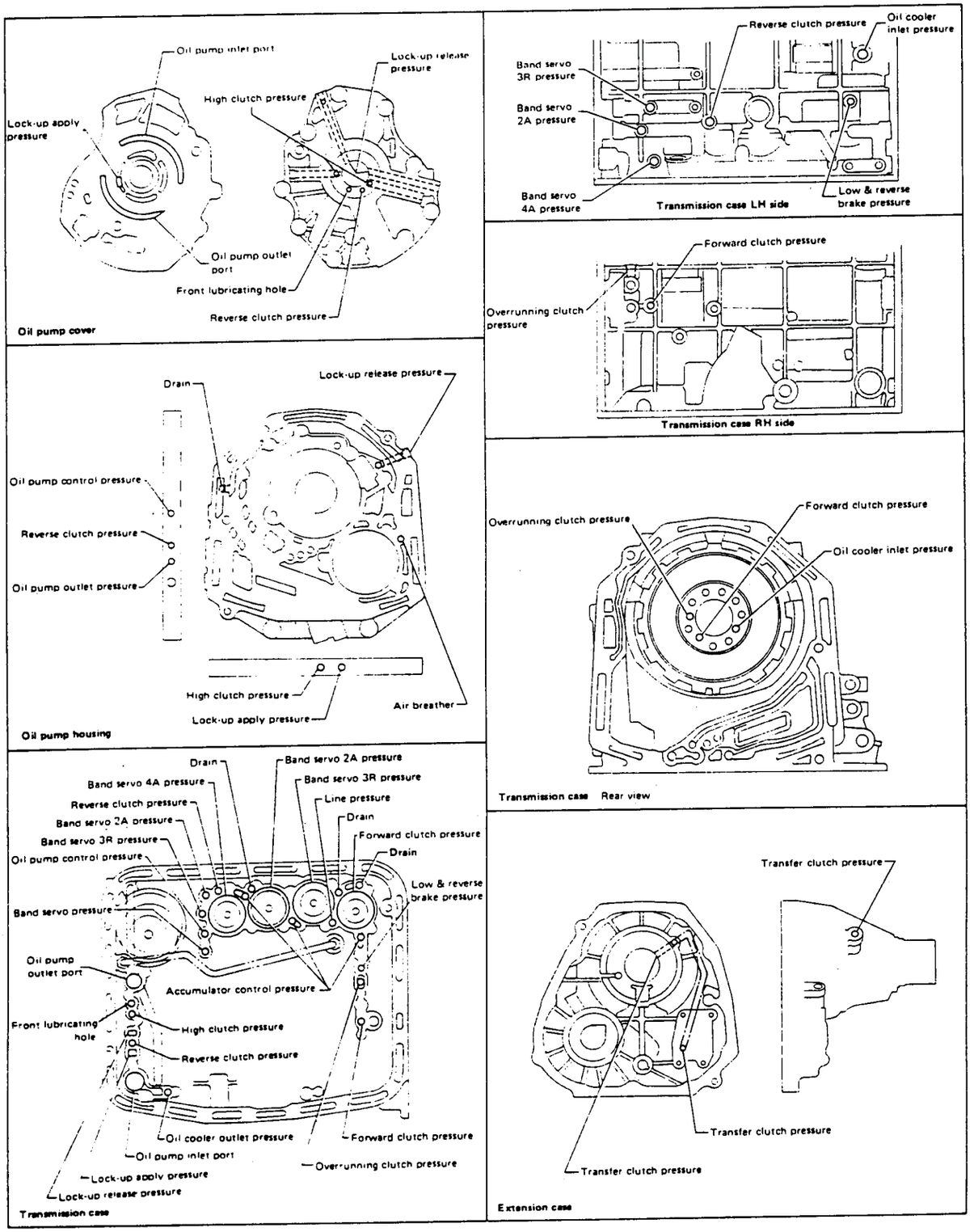


Fig. 101