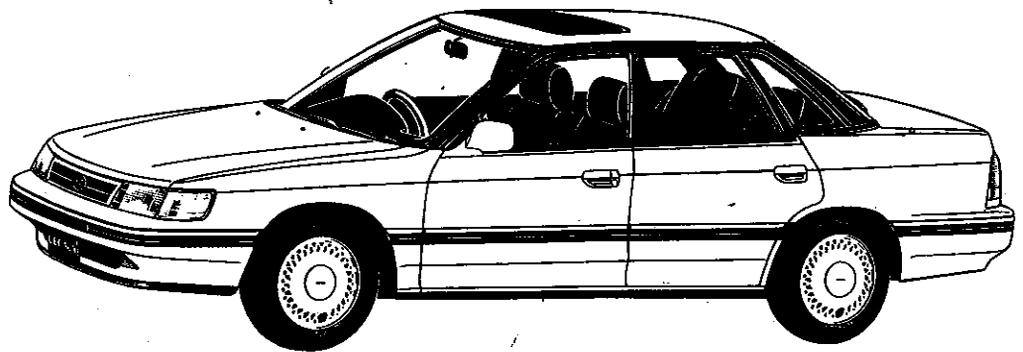




**SUBARU®**

**LIBERTY**

**1992  
SERVICE  
MANUAL**  
SECTION 3



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SUBA  
V.3



**FUJI HEAVY INDUSTRIES LTD.**

QUICK REFERENCE INDEX

**SUBARU®**

**1992**

**SERVICE MANUAL**

DATE DUE

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicle.

This manual include the procedures for maintenance disassembling, reassembling, inspection and adjustment of components and troubleshooting for guidance of both the fully qualified and the less-experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

**FUJI HEAVY INDUSTRIES LTD.**

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**3 TRANSMISSION AND DIFFERENTIAL SECTION**

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## IMPORTANT SAFETY NOTICE

Providing appropriate service and repair is a matter of great importance in the serviceman's safety maintenance and safe operation, function and performance which the SUBARU vehicle possesses.

In case the replacement of parts or replenishment of consumables is required, genuine SUBARU parts whose parts numbers are designated or their equivalents must be utilized.

It must be made well known that the safety of the serviceman and the safe operation of the vehicle would be jeopardized if he used any service parts, consumables, special tools and work procedure manuals which are not approved or designated by SUBARU.

## How to use this manual

- This Service Manual is divided into six volumes by section so that it can be used with ease at work. Refer to the Table of Contents, select and use the necessary section.

- Each chapter in the manual is basically made of the following five types of areas.

M : Mechanism and function  
S : Specifications and service data  
C : Component parts  
W : Service procedure  
(X : Service procedure)  
(Y : Service procedure)  
T : Troubleshooting

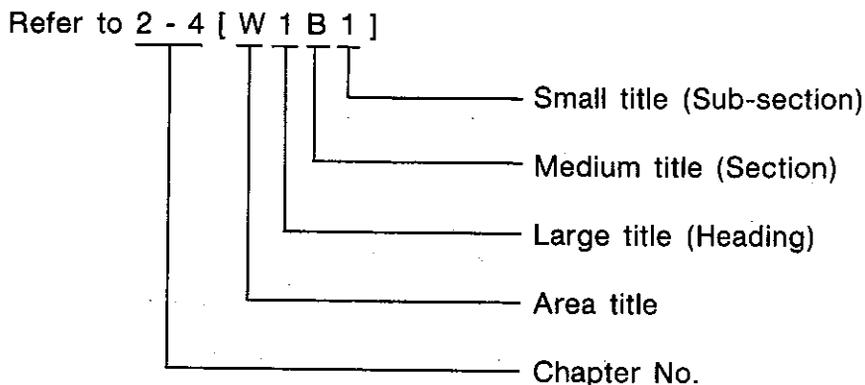
- The description of each area is provided with four types of titles different in size as shown below. The Title No. or Symbol prefixes each title in order that the construction of the article and the flow of explanation can be easily understood.

[Example of each title]

- Area title: W. Service procedure (one of the five types of areas)
- Large title (Heading): 1. Oil Pump (to denote the main item of explanation)
- Medium title (Section): A. REMOVAL (to denote the type of work in principle)
- Small title (Sub-section): 1. INNER ROTATOR (to denote a derivative item of explanation)

- The Title Index No. is indicated on the top left (or right) side of the page as the book is opened. This is useful for retrieving the necessary portion.

(Example of usage)



Example of title placement

2-10 [ W 1 A 0 ] CLUTCH

---

**W SERVICE PROCEDURE**

**1. General**

**A: PRECAUTION**

When servicing clutch system, pay attention to the following items.

- 1) Check the routing of clutch cable for smoothness.
- 2) Excessive tightness or looseness of clutch cable have a bad influence upon the cable durability.
- 3) Apply grease sufficiently to the connecting portion of clutch pedal.
- 4) Apply grease sufficiently to the release lever portion.
- 5) Position clutch cable through the center of toebboard hole

Adjustment is done by

**2. RELEASE LEVER**

Check lever pivot portion and the point of contact with holder for wear.

**2. Release Bearing and Lever**

**A: REMOVAL**

2) Seal

- In this manual, the following symbols are used.



: Should be lubricated with oil.



: Should be lubricated with grease.



: Sealing point



: Tightening torque

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**SUBARU®**

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# M MECHANISM AND FUNCTION

## 1. General

### 1. FWD

The transmission provides five forward speeds and one reverse speed and utilizes a floor shift lever design for gear selection. All forward gears are provided with synchromesh mechanisms that utilize inertia lock-key designs.

The transmission is unitized with the differential and housed in an aluminum case which is unitized with the clutch housing. The aluminum case is divided into left and right halves. Major features of the transmission are

as follows: The clutch shaft has been extended to form a mainshaft, the countershaft combines the function of the final reduction drive pinion shaft, and the hypoid gear is "offset" to form a compact power train design. The forward gears are helical and feature high tooth-face strength, high engagement ratios and quiet operation. Reverse direction is achieved by engaging a selective-sliding reverse idler gear with the drive gear on the mainshaft and the driven gear on the 1st-2nd synchronizer hub of the drive pinion shaft. In the case of the 2200cc model, the 1st and 2nd gears on the drive pinion side utilize sub-gears to reduce noise.

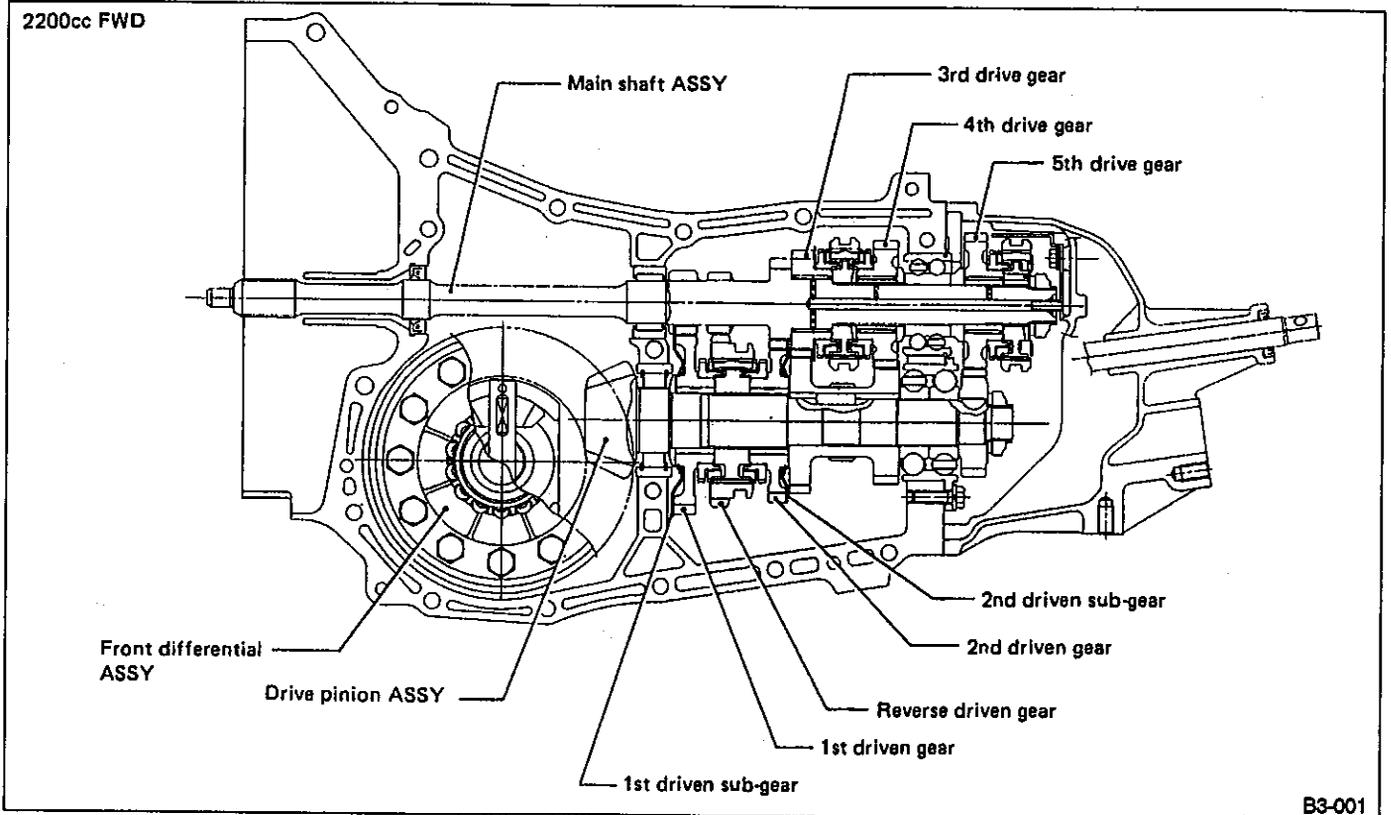


Fig. 1

**2. FULL-TIME 4WD**

The transmission which provides 4-wheel drive is a version of that used for front-wheel drive. It is a compact, "full-time" transmission that utilizes a center differential provided with a viscous coupling at the rear of a transfer unit. The viscous coupling serves as a differential-action control.

The center differential utilizes a highly reliable, bevel gear. It not only delivers an equal amount of drive power to both the front and rear, but controls the difference in rotating speed between the front and rear wheels. A viscous coupling and center differential gears are located in the center differential case to connect the

front and rear wheel drive shafts. With this arrangement, the transfer system realized a compact construction.

In addition, the viscous-coupling serves as a differential-action control to eliminate a mechanical lock mechanism. The major parts, such as the main case, mainshaft, front differential, etc., are the same types as those used with the transmission that provides front-wheel drive (FWD) for standardization purpose.

The dual-range model has an auxiliary transmission on the main shaft to enable selection of an overall gear ratio between the high and low gear ratios.

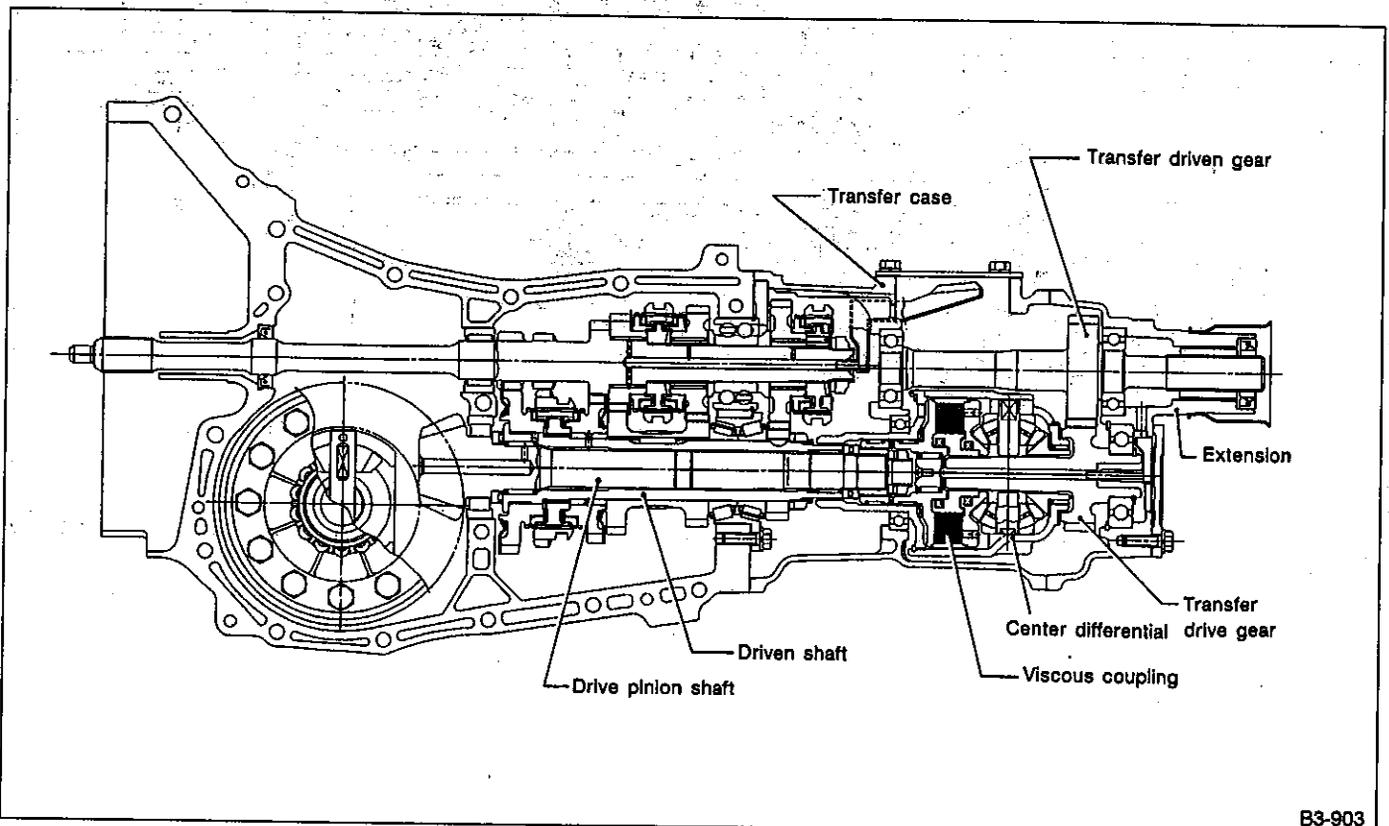


Fig. 2

B3-903

### 3. SELECTIVE 4WD

This is a 4WD transmission coupled with a transfer unit on the rear end to enable switching between front wheel drive (FWD) and four wheel drive (4WD).

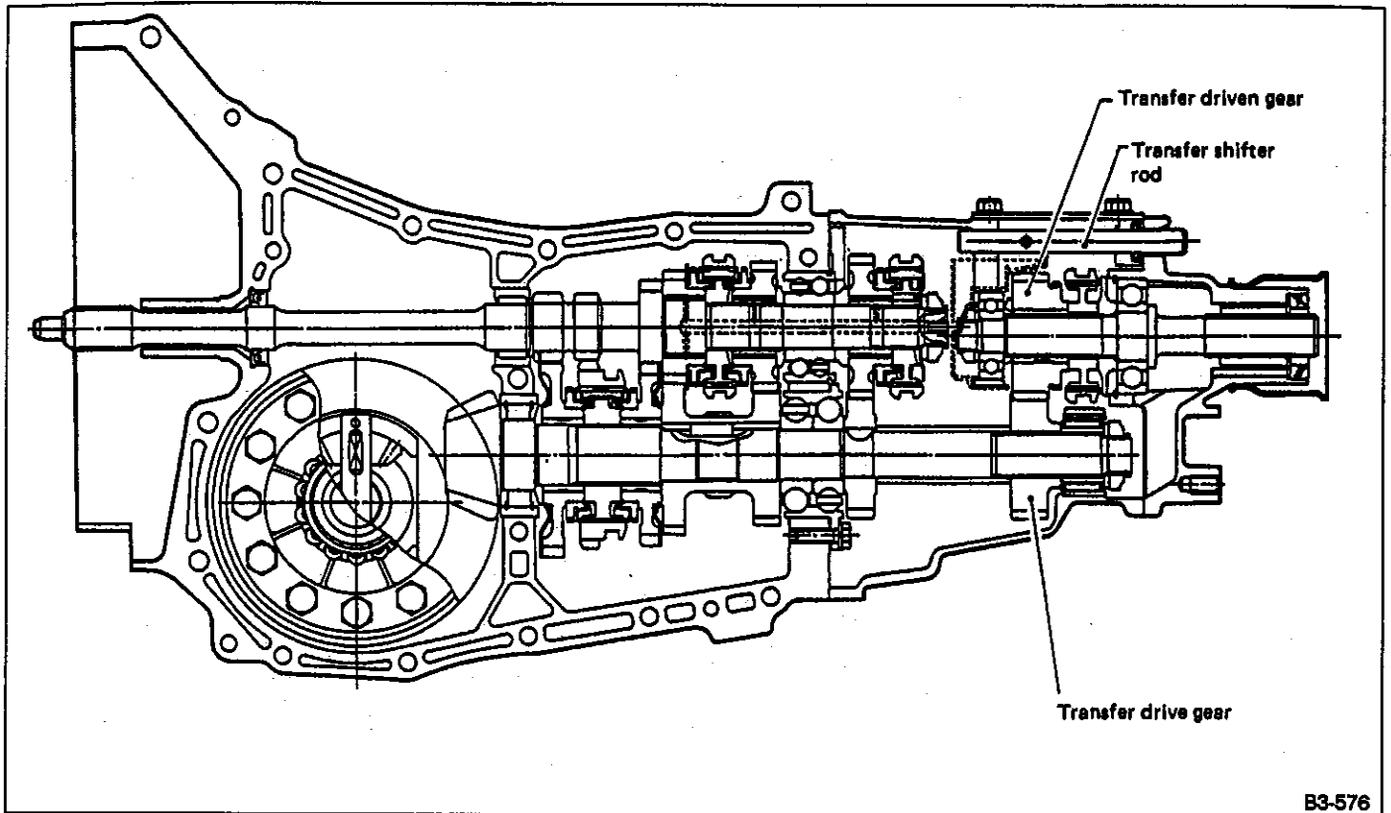


Fig. 3

## 2. Center Differential

### 1. CONSTRUCTION

The center differential utilizes a "shaft-to-shaft" design which connects the front-wheel drive pinion shaft and the rear-wheel drive transfer drive gear shaft via viscous coupling to achieve compact construction. With this arrangement, viscous torque is generated by a difference in rotating speed between the two shafts so that both differential action and drive torque distribution are properly controlled. This contributes to

improvement of driving stability.

The center differential provides a means of distributing engine torque (transmitted to the tubular driven shafts by way of the clutch, mainshaft and various gears) to the front- and rear-wheel driven shafts equally, as well as absorbing the difference in rotating speed between the front and rear wheels during turns.

When the front and/or rear wheels spin on muddy roads, etc., viscous coupling controls the differential action so that the optimum drive torque is automatically distributed to these wheels.

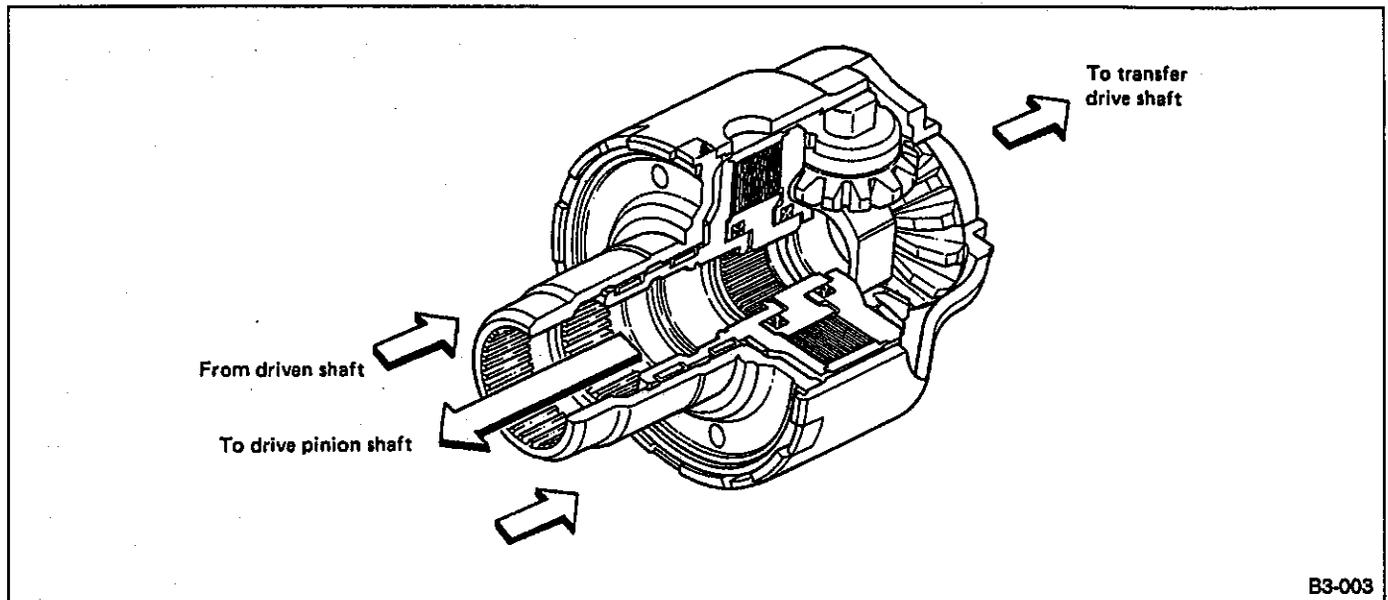


Fig. 4

### 2. MECHANISM OF VISCOUS COUPLING

The viscous coupling housing contains a number of inner and outer plates which are arranged alternately. The inner plate has its internal perimeter fitted to the external hub splines while the outer plate has its external perimeter fitted to the internal housing splines. A spacer ring is used to separate the inner and outer plates. The inner plate has no spacer ring and moves

slightly between the adjacent outer plates, along the hub splined shaft in the axial direction.

A mixture of silicone oil and air is sealed in the space inside the viscous coupling housing. An "X" seal ring prevents silicone oil from entering the transmission. This could occur when silicone oil is highly pressurized due to an increase in rotating speed difference between the front and rear wheels.

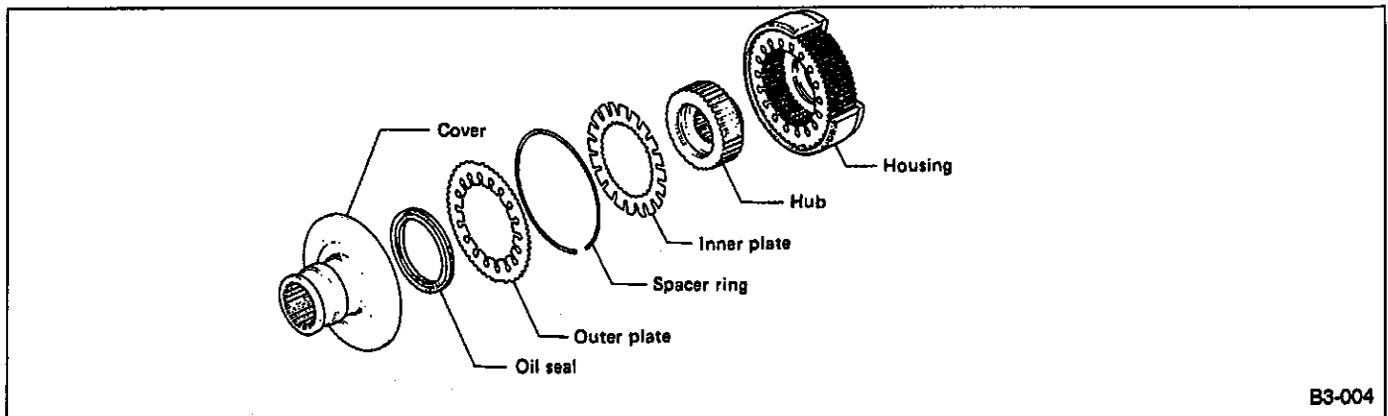


Fig. 5

### 1) Torque characteristics

When a difference in rotating speed between the viscous coupling housing and the hub occurs, a viscous shearing force is generated in the silicone oil between the outer and inner plates. The torque is then transmitted by the silicone oil between the housing and the hub. The greater the difference in rotating speed between the viscous coupling housing and the hub, the greater the shearing force of the silicone oil. The relationship between the torque transmission and rotation speed difference is shown in the figure. As can be seen from the figure, the smaller the rotating speed difference, the lesser the torque transmission and the differential-action.

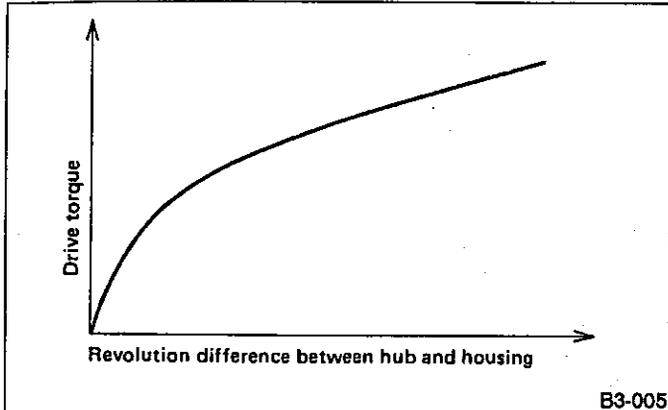


Fig. 6

### 2) "Hump" phenomenon

Silicone oil is heated and expands as differential action continues. This crushes air inside the viscous coupling so that the silicone oil "charging rate" will increase. As differential action continues, internal pressure will abruptly increase so that inner and outer plates (alternately arranged) come in contact. This causes quick torque transmission to occur, which is called a "hump" phenomenon.

The "hump" phenomenon eliminates the rotating speed difference between the housing and hub (which results in a state similar to "direct coupling"). This in turn decreases internal pressure and temperature. The viscous coupling returns to the normal operation. (The "hump" phenomenon does not occur under normal operating conditions.)

## 3. FUNCTION

During normal driving (when there is no speed difference between the front and rear wheels), the center differential delivers drive power to the front and rear wheels at a torque ratio of 50:50.

When a rotating speed difference occurs between the front and rear wheels, the center differential action is controlled by viscous coupling so that optimum drive forces are automatically distributed to the front and rear wheels.

#### 1) During normal driving

During normal straight driving (on flat roads at constant speed), all four wheels rotate at the same speed. The center differential delivers engine torque to the front and rear drive axles. The viscous coupling does not perform the differential-action control because there is no rotating speed difference between the front and rear drive shafts.

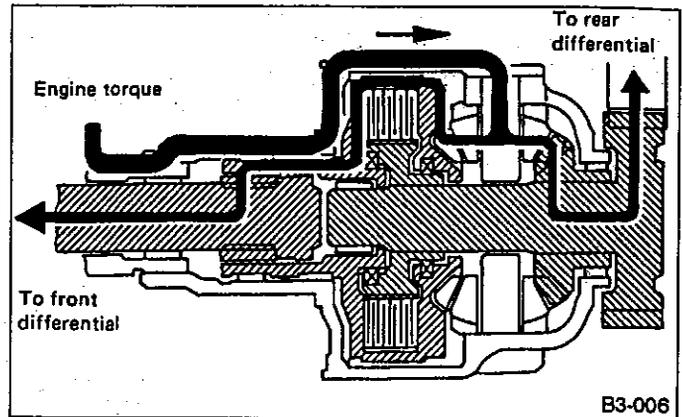


Fig. 7

#### 2) During turns at low speeds

During turns at low speeds, a rotating speed difference occurs between the front and rear wheels, as well as the left and right wheels. In other words, the front wheels rotate faster than the rear wheels. When there is a small rotating speed difference (when vehicle speed is low), the center differential acts to absorb the rotating speed difference, making it possible to drive smoothly. Although a slight rotating speed difference is transmitted to the viscous coupling, less torque transmission occurs because of the small rotating speed difference.

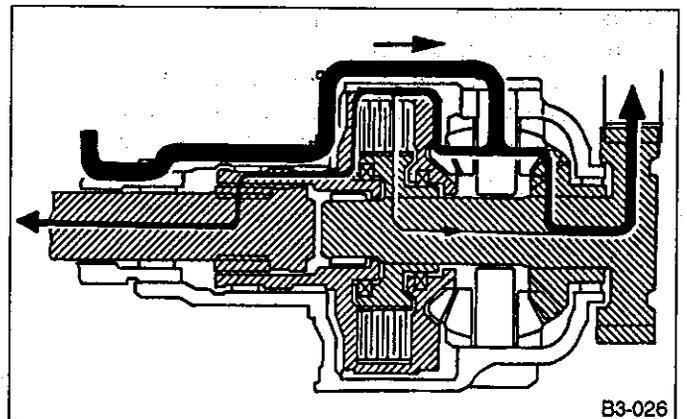


Fig. 8

#### 3) Acceleration during standing starts on a low "μ" road

During rapid acceleration from standing starts on a slippery (low "μ") road, front and rear wheel weight distribution changes. When the rear wheels begin to spin, the rotating speed difference between the two shafts increase simultaneously. This causes the viscous coupling to activate so that more torque is transmitted to

the front wheels than to the rear wheels. In addition, the center-differential's action is also restricted. In this way, acceleration performance during standing starts on low " $\mu$ " roads is greatly enhanced.

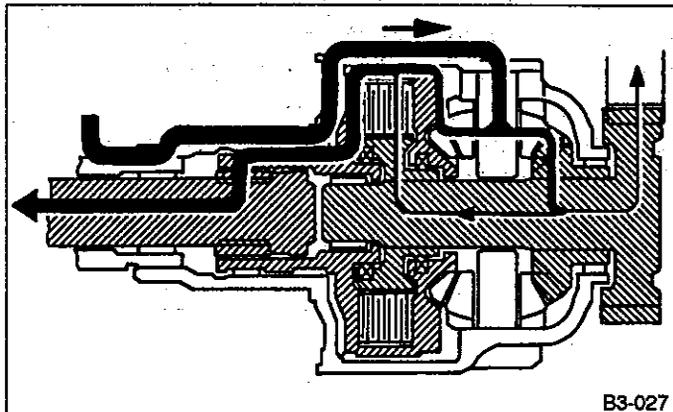


Fig. 9

4) Driving on rough roads

When one of the wheels begins to spin during rough-road driving, the rotating speed difference between the shafts is increased by the differential's action. At this point, the viscous coupling delivers large torque to the differential on the side which is not spinning. In this way, driving stability on rough roads is increased (The figure below shows an example of front wheel slip.)

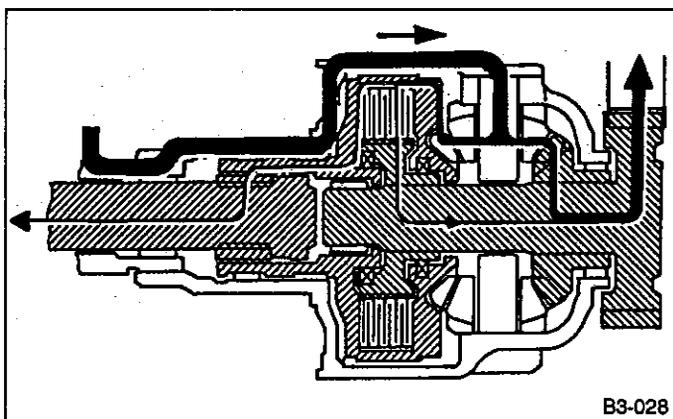


Fig. 10

### 3. Reverse Check Mechanism

#### 1. CONSTRUCTION

The sleeve ① is bolted to the transmission case. The shaft ② is inserted in the sleeve ①. On the smaller diameter side (in Fig. 11) of this shaft ②, the cam ③ is loosely mounted so that it can rotate, and the sleeve ① holds the cam in place with its stepped part.

The spring ④, which is inserted in the shaft ② presses the shaft to the left. Further, the spring ⑤ is placed in between the cam ③ and sleeve ①, which forces the cam ③ to the left and in the direction of rotation. Both springs are held down with the plate ⑥ that is attached to the sleeve ① with the snap ring ⑦. The shaft ② has a groove for reverse accent, in which the ball ⑧ and spring ⑧ are put through a hole drilled in the sleeve ①

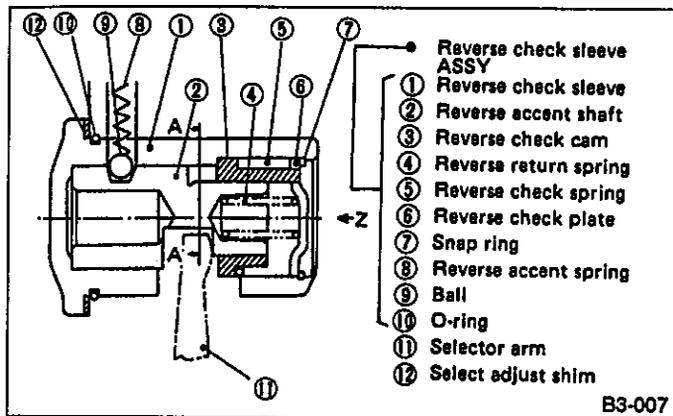


Fig. 11

#### 2. OPERATION

As shown in Fig. 11, the sleeve ① and shaft ② have a notch, and the arm ⑪ is placed between the notches. The position of the arm ⑪ shown in Fig. 11 is the neutral position (hereafter referred to as (N) position). The point where the arm stops when moved to the left is the 1st and 2nd position. Opposite this, the point where the arm stops when moved to the right is the 5th and reverse position. Fig. 12 shows the section A-A in Fig. 11, and Fig. 13 the view Z in Fig. 11.

1) When 5th and reverse side is selected  
The arm ⑪ pushes the shaft ② and cam ③ simultaneously and moves to the 5th and reverse side, as shown in [Fig. 12-(1)].

2) When shift is made to 5th  
As shown in [Fig. 12-(2)], the arm ⑪ moves to the 5th side pushing the shaft ②. When the arm ⑪ pulls out of the cam ③, the cam is returned to the original position by the spring ⑤.

3) When shift is made from 5th to reverse  
As shown in [Fig. 12-(3)], the arm ⑪ moves to the reverse side pushing the shaft ② and runs against the

cam ③ that has already returned. The cam ③ has, as shown in [Fig. 13], a stopper, which hits against the plate ⑥. Thus, the cam ③ cannot rotate further. Accordingly, the arm ⑪ comes to a stop at a point where it has turned the cam ③ to a certain degree (i.e., (N) position), and the cam ③ is pushed back to the (N) position by the shaft ② (i.e., the spring ④).

4) When shift is made to reverse  
From the position shown in [Fig. 12-(1)], the arm ⑪ again moves to the 5th and reverse side. When the shift is made to reverse, the arm ⑪ moves to the reverse position while pushing the shaft ② and cam ③ together.

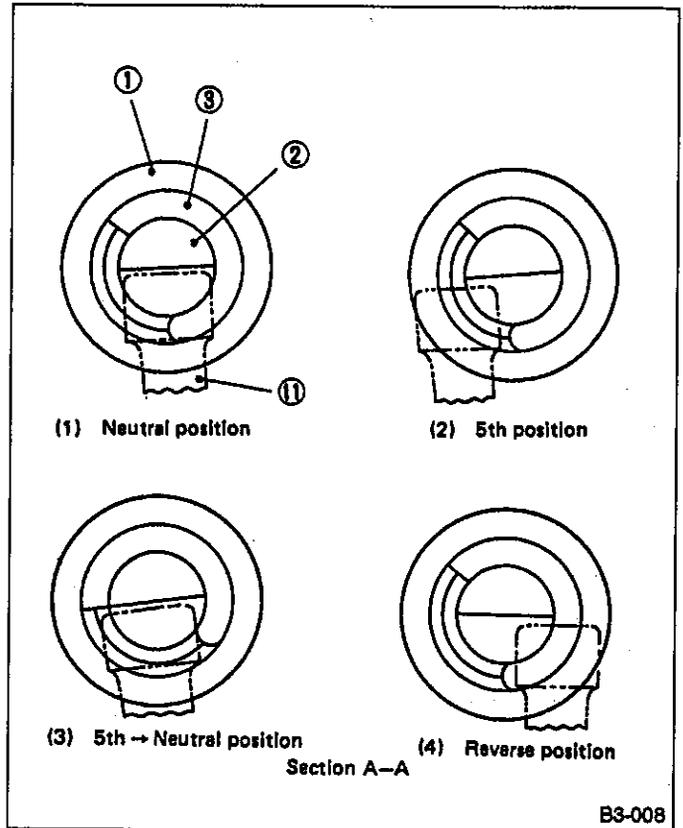


Fig. 12

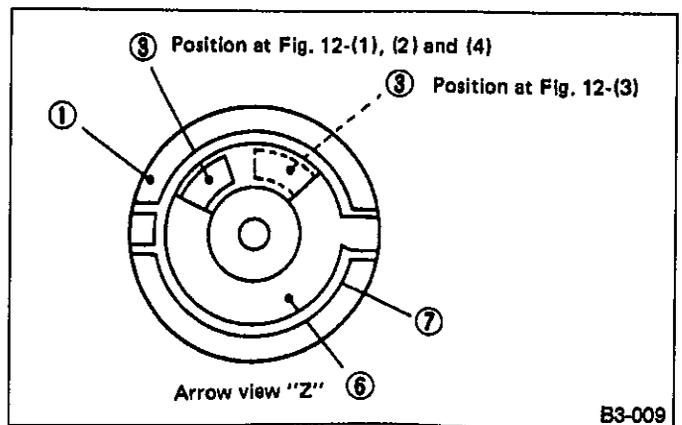


Fig. 13

# S SPECIFICATIONS AND SERVICE DATA

## A: SPECIFICATIONS

Item	Model	FWD				4WD			
		1600cc	1800cc	2000cc	2200cc	1800cc	2000cc	2200cc	TURBO
Type		5-forward speeds with synchromesh and 1-reverse *1 (5 x 2-forward speeds with synchromesh and 1-reverse)							
Transmission gear ratio	1st	3.636		3.545			3.545		
	2nd	2.105		2.111			1.947		
	3rd	1.428		1.448			1.366		
	4th	1.093		1.088			0.972		
	5th	0.885		0.871			0.780		
	Reverse	3.583		3.416			3.416		
*1 Auxiliary transmission gear ratio	High	—				1.000	1.000		—
	Low	—				1.592	1.196		—
Front reduction gear	Final	Type of gear	Hypoid						
		Gear ratio	4.111	3.900	3.700		4.111		3.900
Rear reduction gear	Transfer	Type of gear	—				Helical		
		Gear ratio	—				1.000		1.100
	Final	Type of gear	—				Hypoid		
		Gear ratio	—				4.111		3.900
Front dif-ferential	Type and number of gear	Straight bevel gear (Bevel pinion: 2, Bevel gear: 2)							
*2 Center dif-ferential	Type and number of gear	—				Straight bevel gear (Bevel pinion: 2, Bevel gear: 2 and viscous coupling)			
Rear dif-ferential	Type and number of gear	—				Straight bevel gear (Bevel pinion: 2, Bevel gear: 2)			
Transmission oil capacity		2.6 ℓ (2.7 US qt, 2.3 Imp qt)		3.3 ℓ (3.5 US qt, 2.9 Imp qt)		*2 3.5 ℓ (3.7 US qt, 2.1 Imp qt) *3 3.3 ℓ (3.5 US qt, 2.9 Imp qt)			
Rear differential gear oil capacity		—				0.8 ℓ (0.8 US qt, 0.7 Imp qt)			

\*1: Dual-range model only

\*2: Full time 4WD only

\*3: Selective 4WD only

**B: SERVICE DATA****1. EXTENSION (Full-time 4WD)**

Snap ring (Inner-72) to ball bearing side clearance:  
0 — 0.15 mm (0 — 0.0059 in)

Snap ring (Inner-72)	
Part No.	Thickness mm (in)
805172071	1.78 (0.0701)
805172072	1.90 (0.0748)
805172073	2.02 (0.0795)

Snap ring (Outer-30) to ball bearing side clearance:  
0 — 0.15 mm (0 — 0.0059 in)

Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

**2. TRANSFER CASE AND EXTENSION ASSY (Full-time 4WD)**

Center differential washer to thrust bearing clearance:  
0.35 — 0.55 mm (0.0138 — 0.0217 in)

Center differential washer	
Part No.	Thickness mm (in)
38965AA080	1.25 (0.0492)
38965AA090	1.40 (0.0551)
38965AA101	1.55 (0.0610)
38965AA110	1.70 (0.0669)
38965AA120	1.85 (0.0728)

Thrust washer (52 x 61 x T) to ball bearing side clearance:  
0.05 — 0.30 mm (0.0020 — 0.0118 in)

Thrust washer (52 x 61 x t)	
Part No.	Thickness mm (in)
803052021	0.50 (0.0197)
803052022	0.75 (0.0295)
803052023	1.00 (0.0394)

**3. TRANSFER CASE OR REAR CASE**

Neutral position adjustment

Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

## Reverse accent shaft (4WD and 2000\*2200cc FWD)

Part No.	Mark	Remarks
32188AA020	A	Neutral position is closer to 1st.
32188AA002	No mark or B	Standard
32188AA030	C	Neutral position is closer to reverse.

## Reverse accent shaft (1600\*1800cc FWD)

Part No.	Mark	Remarks
32188AA040	1	Neutral position is closer to 1st gear.
32188AA011	2	Standard
32188AA050	3	Neutral position is closer to reverse gear.

Reverse check plate adjustment

Reverse check plate			
Part No.	Mark	Angle $\theta$	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
33189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.

**4. REVERSE IDLER GEAR (4WD and 2000\*2200cc FWD)**

Adjustment of reverse idler gear position

Reverse idler gear CP to transmission case (LH) wall clearance  
6.0 — 7.5 mm (0.236 — 0.295 in)

Reverse shifter lever		
Part No.	Mark	Remarks
32820AA000	0	Further from case wall
32820AA010	No mark	Standard
32820AA020	2	Closer to the case wall

After installing a suitable reverse shifter lever, adjust reverse idler gear-to-transmission case wall clearance to within 0 to 0.5 mm (0 to 0.020 in) using washers.

Washer (20.5 x 26 x t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803020151	0.4 (0.016)	803020154	1.9 (0.075)
803020152	1.1 (0.043)	803020155	2.3 (0.091)
803020153	1.5 (0.059)		

**5. REVERSE IDLER GEAR (1600•1800cc FWD)**

Adjustment of reverse idler gear CP position

Reverse idler gear CP to transmission case (LH) wall clearance  
1.5 — 3.0 mm (0.059 — 0.118 in)

Reverse shifter lever		
Part No.	Mark	Remarks
440627101	1	Further from case wall
440627102	2 or No mark	Standard
440627103	3	Closer to the case wall

After installing a suitable reverse shifter lever, adjust reverse idler gear-to-transmission case wall clearance to within 0 to 0.5 mm (0 to 0.020 in) using washers, 5-speed models.

Washer (15.5 x 21 x t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803015081	0.6 — 0.8 (0.024 — 0.031)	803015084	1.8 — 2.0 (0.071 — 0.079)
803015082	1.0 — 1.2 (0.039 — 0.047)	803015085	2.2 — 2.4 (0.087 — 0.094)
803015083	1.4 — 1.6 (0.055 — 0.063)		

**6. SHIFTER FORK AND ROD (4WD and 2000•2200cc FWD)**

Select suitable shifter forks so that both coupling sleeve and reverse driven gear are positioned in the center of their synchromesh mechanisms.

1st-2nd shifter fork CP		
Part No.	Mark	Remarks
32804AA060	1	Approach to 1st gear by 0.2 mm (0.008 in)
32804AA070	No mark	Standard
32804AA080	3	Approach to 2nd gear by 0.2 mm (0.008 in)

3rd-4th shifter fork CP		
Part No.	Mark	Remarks
32810AA060	1	Approach to 4th gear by 0.2 mm (0.008 in)
32810AA070	No mark	Standard
32810AA100	3	Approach to 3rd gear by 0.2 mm (0.008 in)

5th shifter fork CP		
Part No.	Mark	Remarks
32812AA060	1	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA070	No mark	Standard
32812AA100	3	Become distant from 5th gear by 0.2 mm (0.008 in)

Rod end clearance

A: 1st-2nd — 3rd-4th

0.5 — 1.5 mm (0.020 — 0.059 in)

B: 3rd-4th — 5th

0.6 — 1.4 mm (0.024 — 0.055 in)

**7. SHIFTER FORK AND ROD (1600•1800cc FWD)**

Select suitable shifter forks so that both coupling sleeve and reverse driven gear are positioned in the center of their synchromesh mechanisms.

1st-2nd shifter fork CP		
Part No.	Mark	Remarks
32804AA001	1	Approach to 2nd gear 0.3 mm (0.012 in)
32804AA011	No mark	Standard
32804AA021	3	Approach to 1st gear 0.3 mm (0.012 in)

3rd-4th shifter fork CP		
Part No.	Mark	Remarks
32810AA110	1	Approach to 4th gear by 0.6 mm (0.024 in)
32810AA120	2	Approach to 4th gear by 0.3 mm (0.012 in)
32810AA130	No mark	Standard
32810AA140	4	Approach to 3rd gear by 0.3 mm (0.012 in)
32810AA150	5	Approach to 3rd gear by 0.6 mm (0.024 in)

Select a suitable 5th shifter fork so that coupling sleeve-to-5th driven gear clearance is within 1.2 to 1.5 mm (0.047 to 0.059 in), 5-speed models.

5th shifter fork CP		
Part No.	Mark	Remarks
32812AA032	1	Approach to gear side by 0.3 mm (0.012 in)
32812AA042	No mark	Standard
32812AA052	3	Become distant from gear side by 0.3 mm (0.012 in)

Rod end clearance

A & B: 0.3 — 1.6 mm (0.012 — 0.063 in)

## 8. TRANSMISSION CASE ASSEMBLY (4WD and 2000•2200cc FWD)

### Drive pinion shim adjustment

Drive pinion shim			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)	32295AA071	0.250 (0.0098)
32295AA041	0.175 (0.0069)	32295AA081	0.275 (0.0108)
32295AA051	0.200 (0.0079)	32295AA091	0.300 (0.0118)
32295AA061	0.225 (0.0089)	32295AA101	0.500 (0.0197)

Hypoid gear backlash:

0.13 — 0.18 mm (0.0051 — 0.0071 in)

### Selection of main shaft rear plate

Main shaft rear plate		
Dimension "A" mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA040	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA050	2

Snap ring (Outer—19) to counter washer clearance [4WD Dual-range only]

0.05—0.35mm(0.0020 — 0.0136in)

Snap ring ( Outer — 19 )	
Part No.	Thickness mm(in)
031319000	1.50(0.0591)
805019010	1.72(0.0677)

### Input shaft holder adjustment [4WD Dual-range only]

Dimension "D" mm (in)	Number of shim
52.46 — 53.23 (2.0654 — 2.0957)	Nothing
51.98 — 52.45 (2.0457 — 2.0650)	1
51.34 — 51.95 (2.0213 — 2.0453)	2

## 9. TRANSMISSION CASE ASSEMBLY (1600•1800cc FWD)

### Drive pinion shim adjustment

Drive pinion shim	
Part No.	Thickness mm (in)
32295AA110	0.15 (0.0059)
32295AA120	0.175 (0.0069)
32295AA130	0.20 (0.0079)
32295AA140	0.225 (0.0089)
32295AA150	0.25 (0.0098)
32295AA160	0.275 (0.0108)
32295AA170	0.30 (0.0118)
32295AA180	0.50 (0.0197)

Hypoid gear backlash:

0.13 — 0.18 mm (0.0051 — 0.0071 in)

### Selection of main shaft rear plate

Main shaft rear plate		
Dimension "A" mm (in)	Part No.	Mark
4.50 — 4.63 (0.1772 — 0.1823)	441347001	T81-1
4.37 — 4.50 (0.1720 — 0.1772)	441347002	T81-2

## 10. DRIVE PINION ASSY (Full-time 4WD)

Preload adjustment of thrust bearing:

Starting torque

0.3 — 0.8 N•m (3 — 8 kg-cm, 2.6 — 6.9 in-lb)

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

Assemble a driven shaft and 1st driven gear that are selected for the proper radial clearance adjustment.

Driven shaft		1st driven gear	
Part No.	Diameter A mm (in)	Part No.	Spec.
32229AA130	49.959 — 49.966 (1.9669 — 1.9672)	32231AA270	Non-turbo
		32231AA290	Turbo
32229AA120	49.967 — 49.975 (1.9672 — 1.9675)	32231AA280	Non-turbo
		32231AA280	Turbo

## 11. DRIVE PINION ASSY (Selective 4WD and 2000•2200cc FWD)

Selection of 1st driven gear:

1st driven gear	
Outer diameter of bushing mm (in)	Part No.
41.983 — 41.996 (1.6529 — 1.6534)	32231AA320
41.988 — 41.982 (1.6523 — 1.6528)	32231AA330
41.954 — 41.987 (1.6517 — 1.6522)	32231AA340

**12. INPUT SHAFT ASSY (4WD Dual-range)**

Input shaft cotter to ball bearing clearance  
0 — 0.08 mm (0 — 0.0031 in)

Input shaft cotter			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
35204AA000	2.43 (0.0957)	35204AA020	2.59 (0.1020)
35204AA010	2.51 (0.0988)		

Snap ring (Inner-56) to bearing clearance  
0 — 0.08 mm (0 — 0.0031 in)

Snap ring (Inner-62)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
805162011	1.75 (0.0689)	805162013	1.91 (0.0752)
805162012	1.83 (0.0720)		

**13. MAIN SHAFT (4WD Dual-range)**

Snap ring (Outer-25) to synchronizer hub clearance  
0.060 — 0.100 mm (0.0024 — 0.0039 in)

Snap ring (Outer-25)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
805025051	2.42 (0.0953)	805025055	2.62 (0.1031)
805025052	2.47 (0.0972)	805025056	2.67 (0.1051)
805025053	2.52 (0.0992)	805025057	2.72 (0.1071)
805025054	2.57 (0.1012)	805025058	2.37 (0.0933)

**14. CENTER DIFFERENTIAL**

Snap ring (Inner-110) to center differential case clearance:  
0 — 0.15 mm (0 — 0.0059 in)

Snap ring (Inner-110)	
Part No.	Thickness mm (in)
805100061	2.10 (0.0827)
805100062	2.21 (0.0870)
805100063	2.32 (0.0913)

Backlash adjustment axial movement:  
0.62 — 0.86 mm (0.0244 — 0.0339 in)

Adjusting washer (45 x 62 x t)	
Part No.	Thickness mm (in)
803045041	1.60 (0.0630)
803045042	1.80 (0.0709)
803045043	2.00 (0.0787)
803045044	2.20 (0.0866)
803045045	2.40 (0.0945)

**15. FRONT DIFFERENTIAL (4WD and 2000•2200cc FWD)**

Bevel gear to pinion backlash  
0.13 — 0.18 mm (0.0051 — 0.0071 in)

Washer (38.1 x 50 x t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)	803038023	1.025 — 1.050 (0.0404 — 0.0413)
803038022	0.975 — 1.000 (0.0384 — 0.0394)		

Pinion shaft to axle drive shaft clearance  
0 — 0.2 mm (0 — 0.008 in)

Snap ring (Outer-28)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
805028011	1.05 (0.0413)	805028012	1.20 (0.0472)

**16. FRONT DIFFERENTIAL (1600•1800cc FWD)**

Bevel gear to pinion backlash  
0.13 — 0.18 mm (0.0051 — 0.0071 in)

Washer (35.1 x 45 x t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803135011	0.925 — 0.950 (0.0364 — 0.0374)	803135014	1.000 — 1.025 (0.0394 — 0.0404)
803135012	0.950 — 0.975 (0.0374 — 0.0384)	803135015	1.025 — 1.050 (0.0404 — 0.0413)
803135013	0.975 — 1.000 (0.0384 — 0.0394)		

Pinion shaft to axle drive shaft clearance  
0 — 0.2 mm (0 — 0.008 in)

Snap ring (Outer-26)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
805026010	1.05 (0.0413)	031526000	1.20 (0.0472)

# C COMPONENT PARTS

## 1. Transfer Case and Extension (Full-time 4WD)

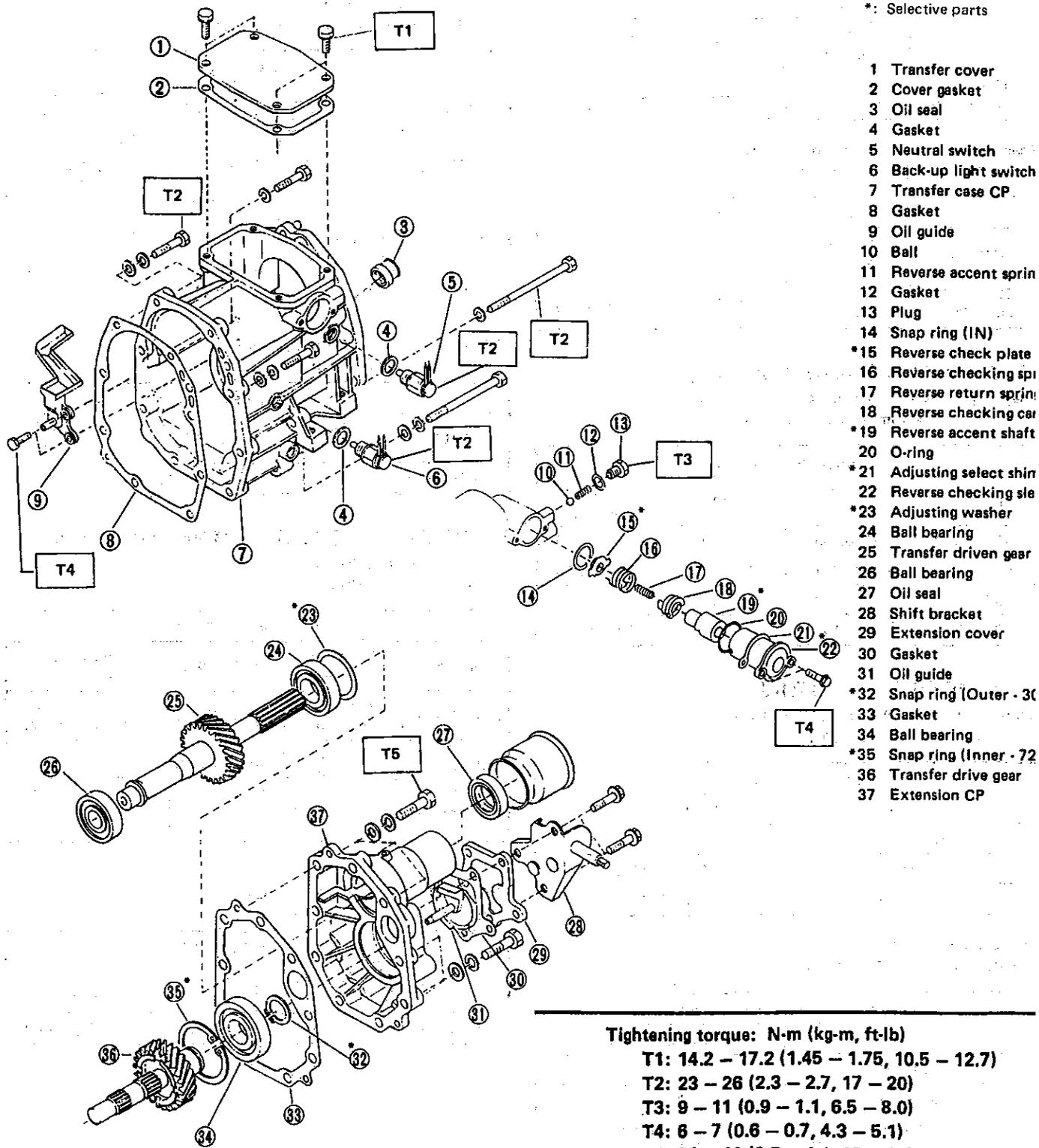
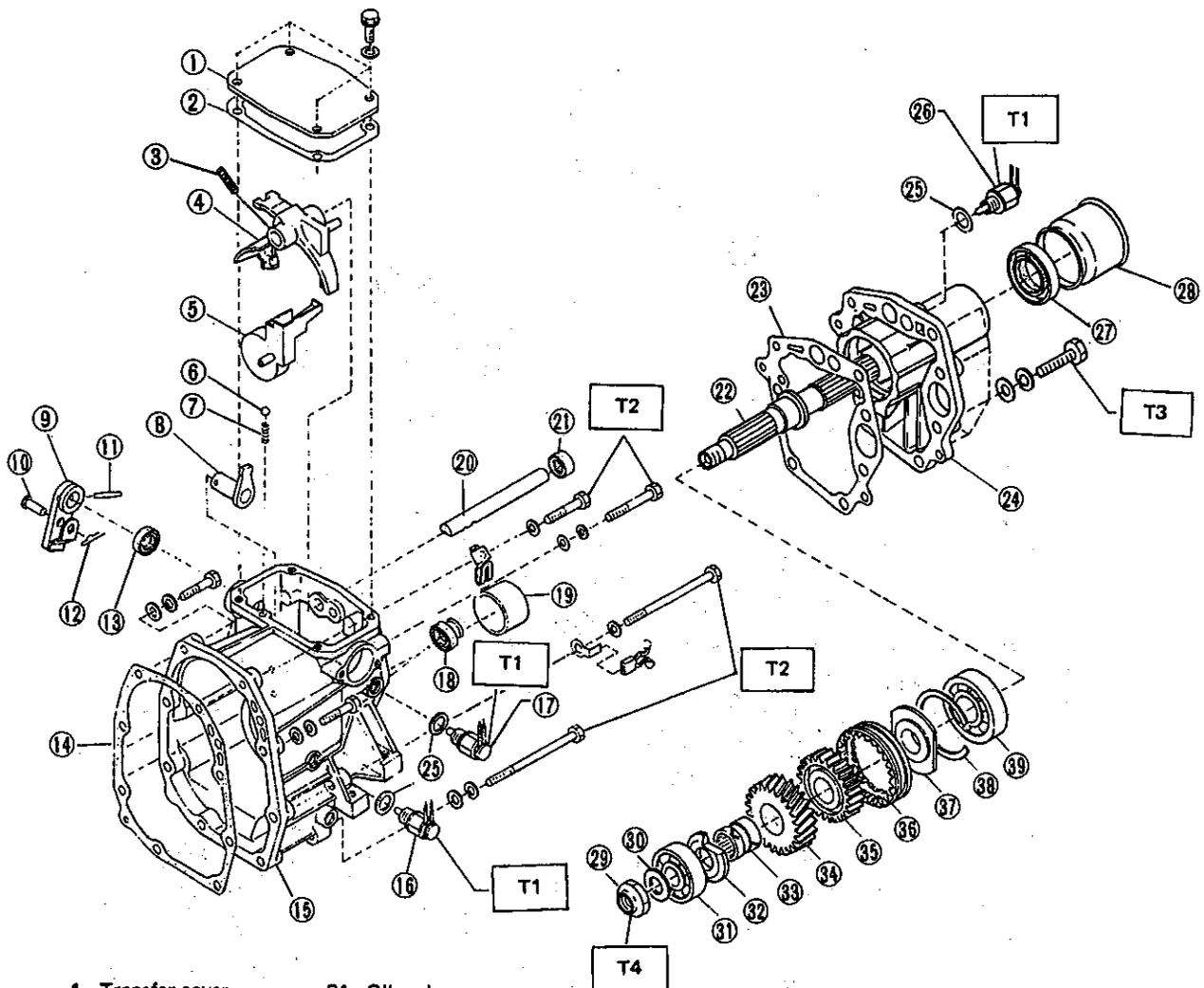


Fig. 14

B3-010

## 2. Transfer Case and Extension (Selective 4WD)



- |                          |                         |
|--------------------------|-------------------------|
| 1 Transfer cover         | 21 Oil seal             |
| 2 Gasket                 | 22 Rear drive shaft     |
| 3 Spring pin             | 23 Gasket               |
| 4 Transfer shifter fork  | 24 Extension            |
| 5 Oil guide              | 25 Gasket               |
| 6 Ball                   | 26 4WD switch           |
| 7 Spring                 | 27 Oil seal             |
| 8 Transfer shifter shaft | 28 Dust cover           |
| 9 Transfer shifter lever | 29 Lock nut             |
| 10 Clevis pin            | 30 Lock washer          |
| 11 Spring pin            | 31 Ball bearing         |
| 12 Snap pin              | 32 Thrust washer        |
| 13 Oil seal              | 33 Bushing              |
| 14 Gasket                | 34 Transfer driven gear |
| 15 Transfer case         | 35 Synchronizer hub     |
| 16 Back-up light switch  | 36 Sleeve               |
| 17 Neutral switch        | 37 Spacer               |
| 18 Oil seal              | 38 Snap ring (IN)       |
| 19 Needle bearing race   | 39 Ball bearing         |
| 20 Transfer shifter rod  |                         |

Tightening torque: N·m (kg·m, ft·lb)

T1: 18 (1.8, 13)

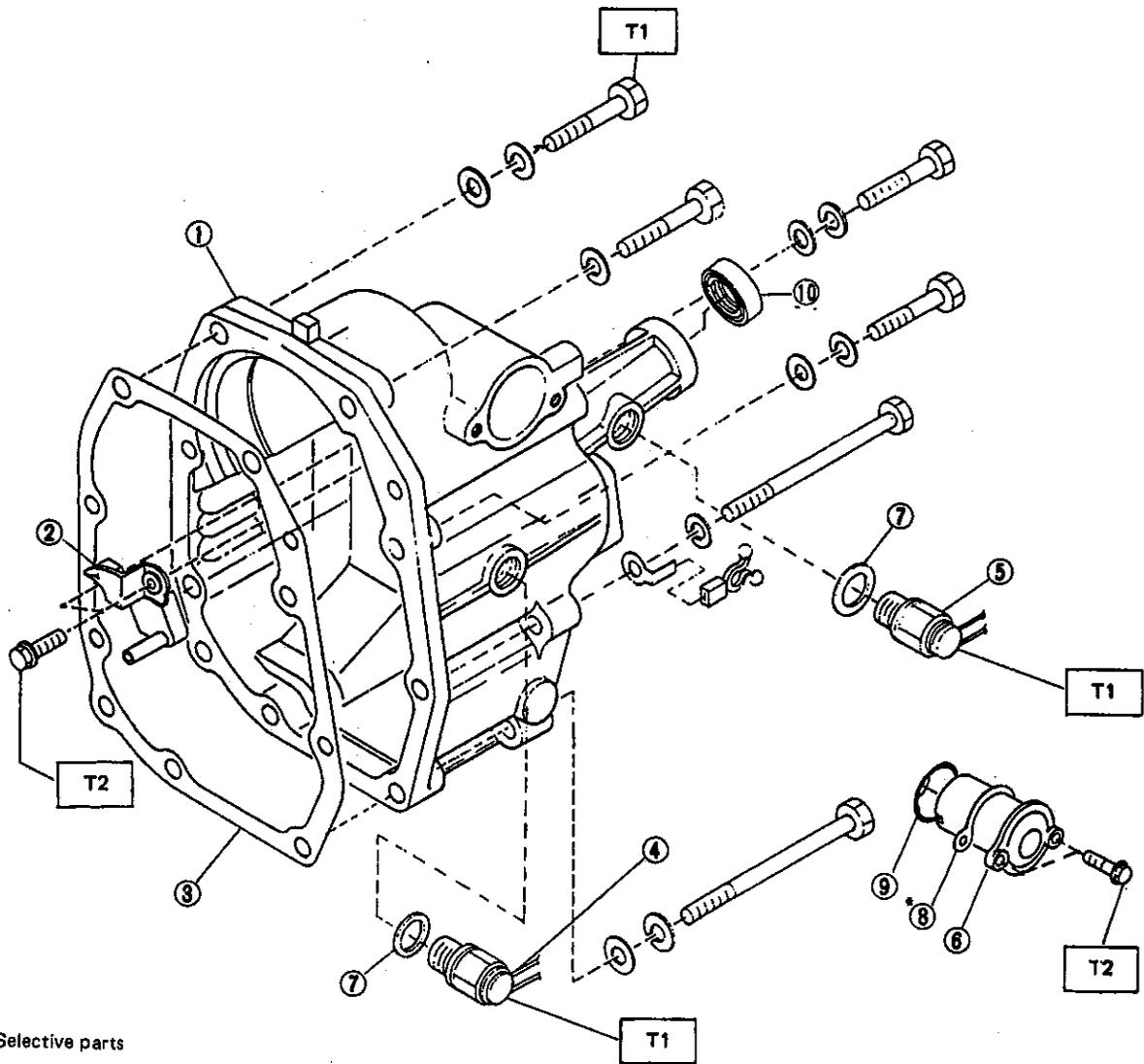
T2: 25 (2.5, 18)

T3: 34 - 40 (3.5 - 4.1, 25 - 30)

T4: 73 - 84 (7.4 - 8.6, 54 - 62)

Fig. 15

### 3. Rear Case (FWD)



\*: Selective parts

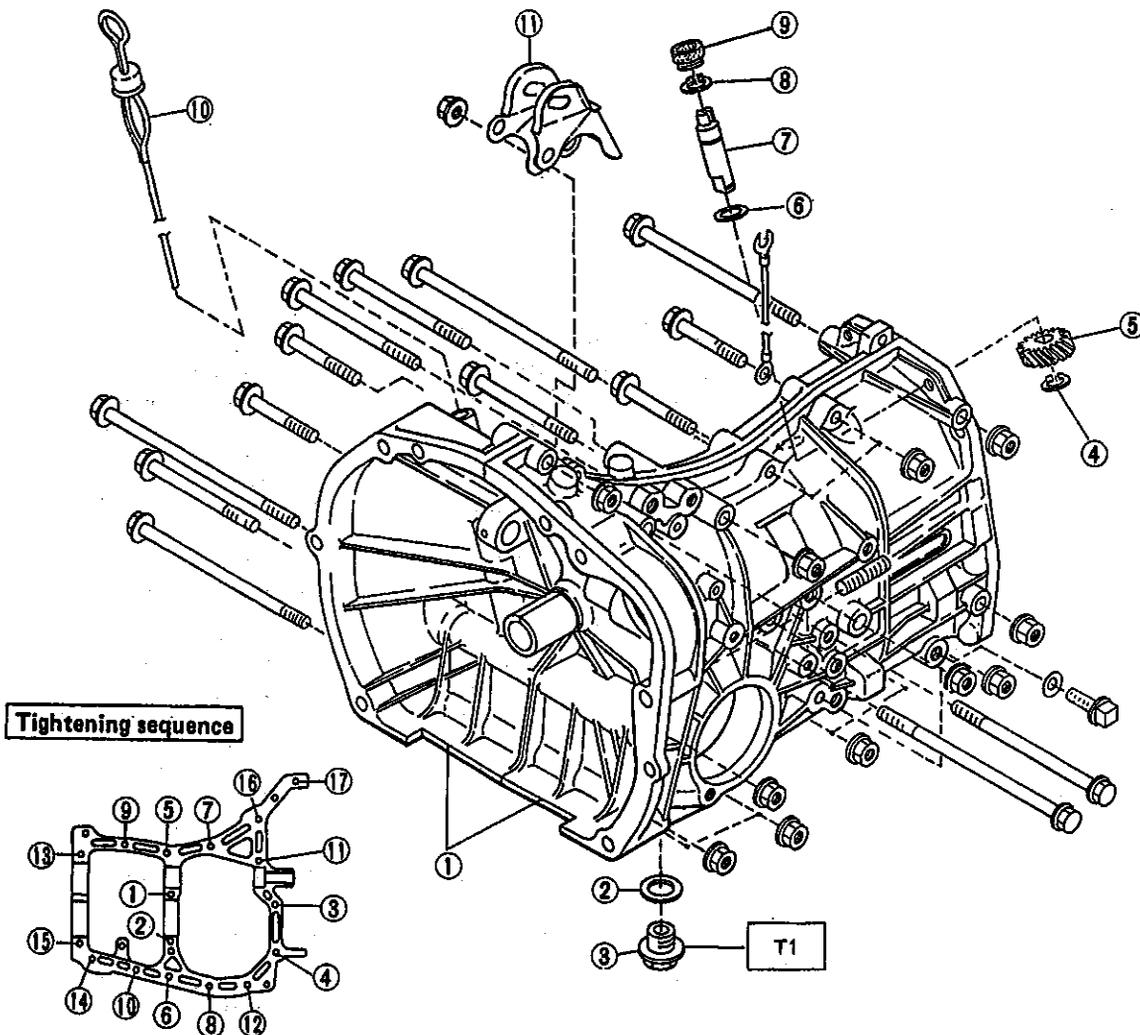
- 1 Rear case
- 2 Oil guide
- 3 Case gasket
- 4 Back-up light switch
- 5 Neutral switch
- 6 Reverse check sleeve ASSY
- 7 Gasket
- \*8 Adjusting shim
- 9 O-ring
- 10 Oil seal

**Tightening torque: N·m (kg·m, ft·lb)**  
**T1: 23 – 28 (2.3 – 2.7, 17 – 20)**  
**T2: 6 – 7 (0.6 – 0.7, 4.3 – 5.1)**

Fig. 16

B3-011

### 4. Transmission Case

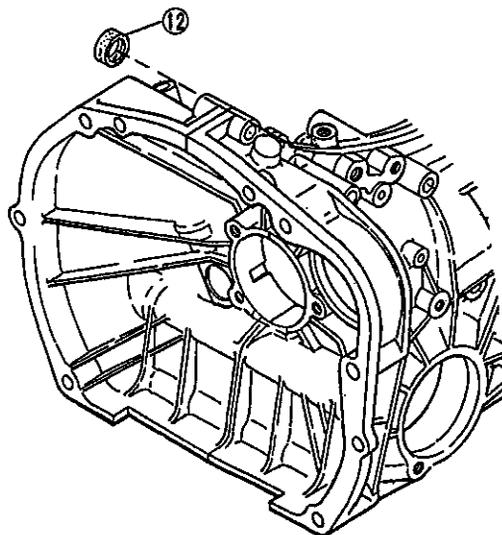


**Tightening sequence**

Size	All models	Torque
8 mm bolt	⑤ - ⑮	23 - 26 N·m (2.3 - 2.7 kg·m, 17 - 20 ft·lb)
10 mm bolt	① - ④ ⑯ - ⑰	36 - 42 N·m (3.7 - 4.3 kg·m, 27 - 31 ft·lb)

**Tightening torque: N·m (kg·m, ft·lb)**  
**T1: 41 - 47 (4.2 - 4.8, 30 - 35)**

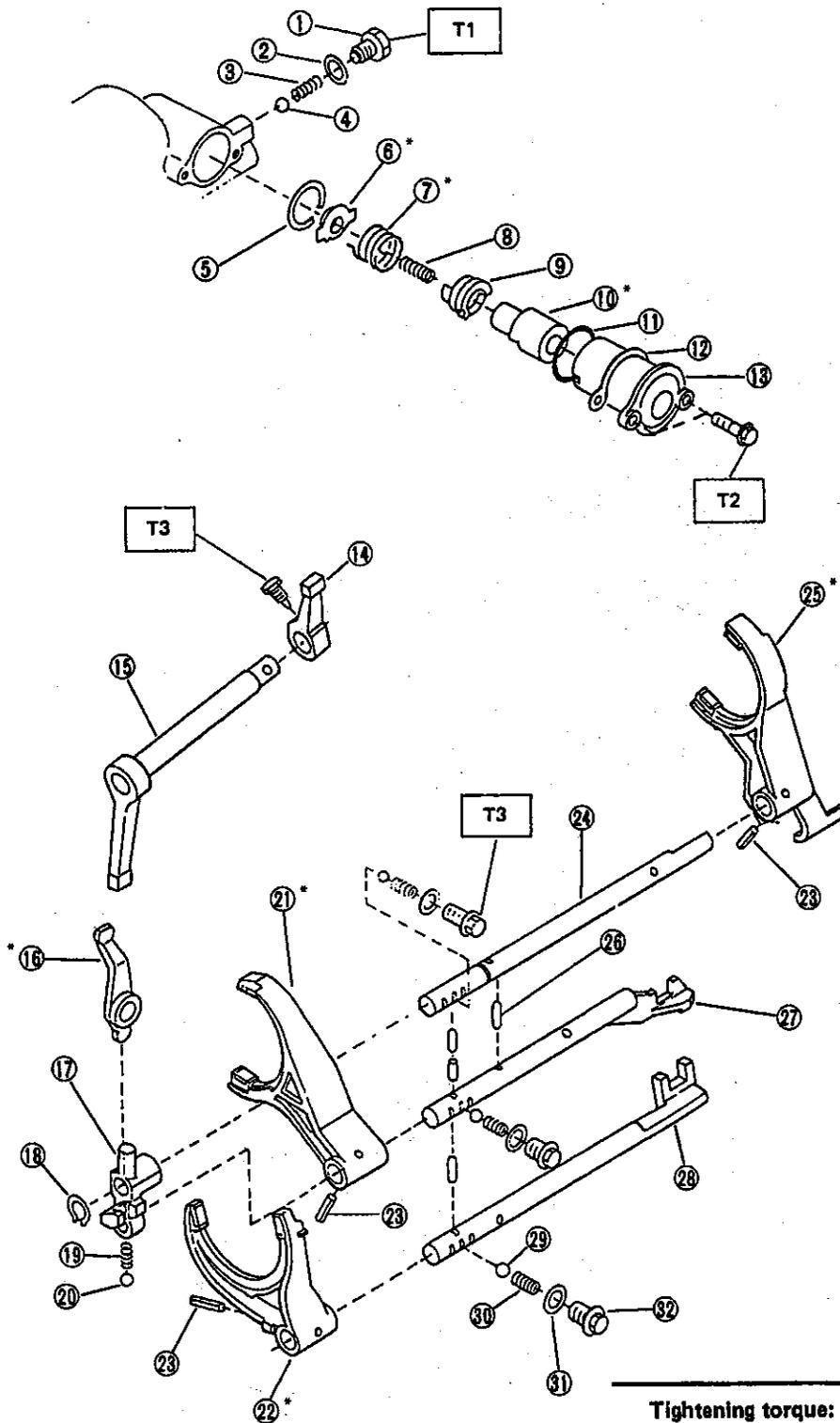
- 1 Transmission case ASSY
- 2 Gasket
- 3 Drain plug
- 4 Snap ring (OUT)
- 5 Speedometer driven gear
- 6 Washer
- 7 Speedometer shaft
- 8 Snap ring (OUT)
- 9 Oil seal
- 10 Oil level gauge
- 11 Pitching stopper bracket
- 12 Oil seal [4WD Dual-range]



[4WD Dual-range]

Fig. 17

### 5. Shifter Fork and Shifter Rod (4WD and 2000•2200cc FWD)



\*: Selective parts

- 1 Plug
- 2 Gasket
- 3 Reverse accent spring
- 4 Ball
- 5 Snap ring (IN)
- \*6 Reverse check plate
- \*7 Reverse checking spring
- 8 Reverse return spring
- 9 Reverse checking cam
- \*10 Reverse accent shaft
- 11 O-ring
- 12 Adjusting select shim.
- 13 Reverse checking sleeve
- 14 Selector arm
- 15 Shifter arm CP
- \*16 Reverse shifter lever CP
- 17 Reverse fork rod arm
- 18 Snap ring (OUT)
- 19 Spring
- 20 Ball
- \*21 3rd-4th shifter fork CP
- \*22 1st-2nd shifter fork CP
- 23 Straight pin
- 24 Reverse fork rod
- \*25 5th shifter fork CP
- 26 Interlock plunger
- 27 3rd-4th fork rod
- 28 1st-2nd fork rod
- 29 Ball
- 30 Checking ball spring
- 31 Gasket
- 32 Checking ball plug

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

**T1: 9 – 11 (0.9 – 1.1, 6.5 – 8.0)**

**T2: 6 – 7 (0.6 – 0.7, 4.3 – 5.1)**

**T3: 18.1 – 21.1 (1.85 – 2.15, 13.4 – 15.6)**

Fig. 18

## 6. Shifter Fork and Shifter Rod (1600•1800cc FWD)

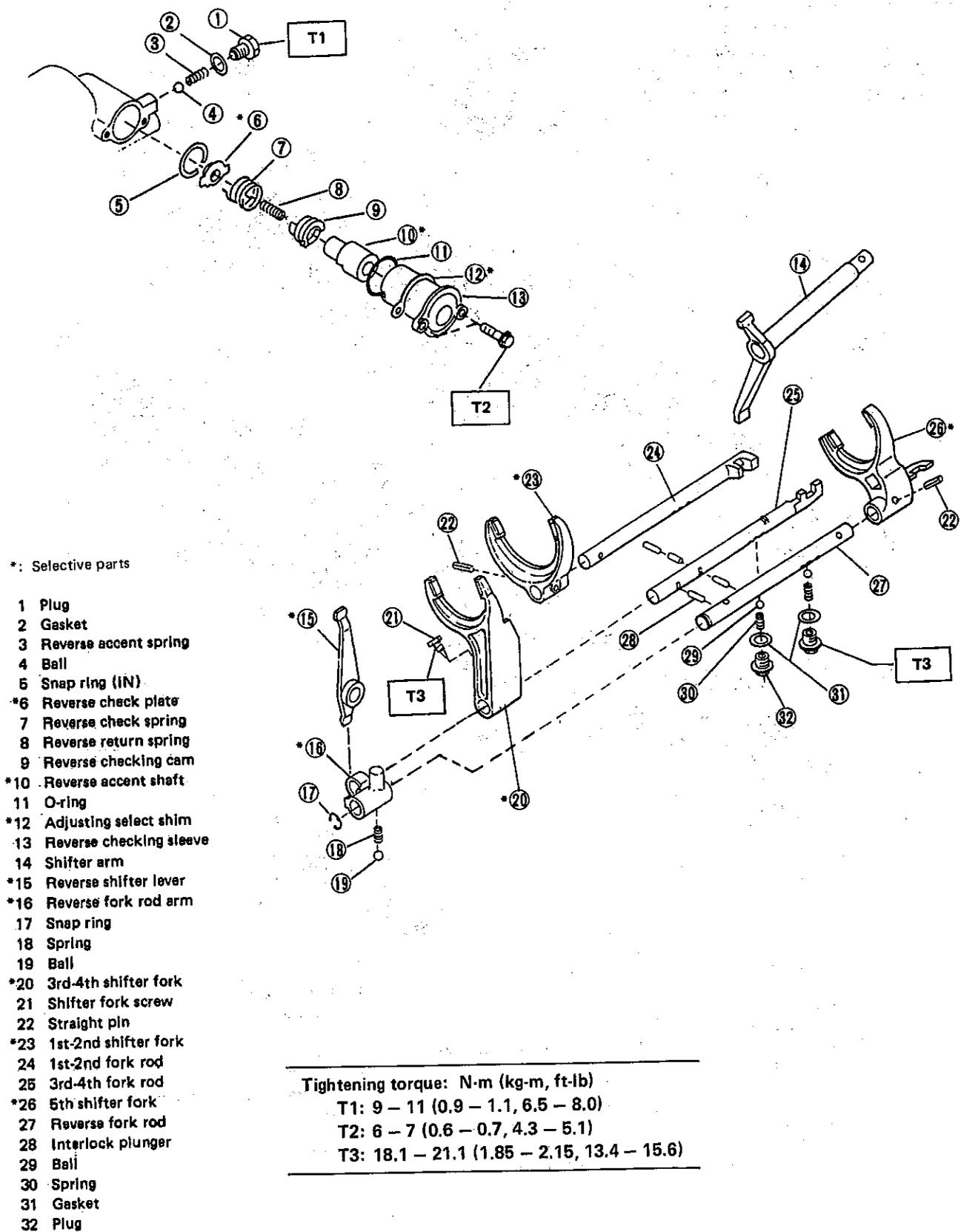
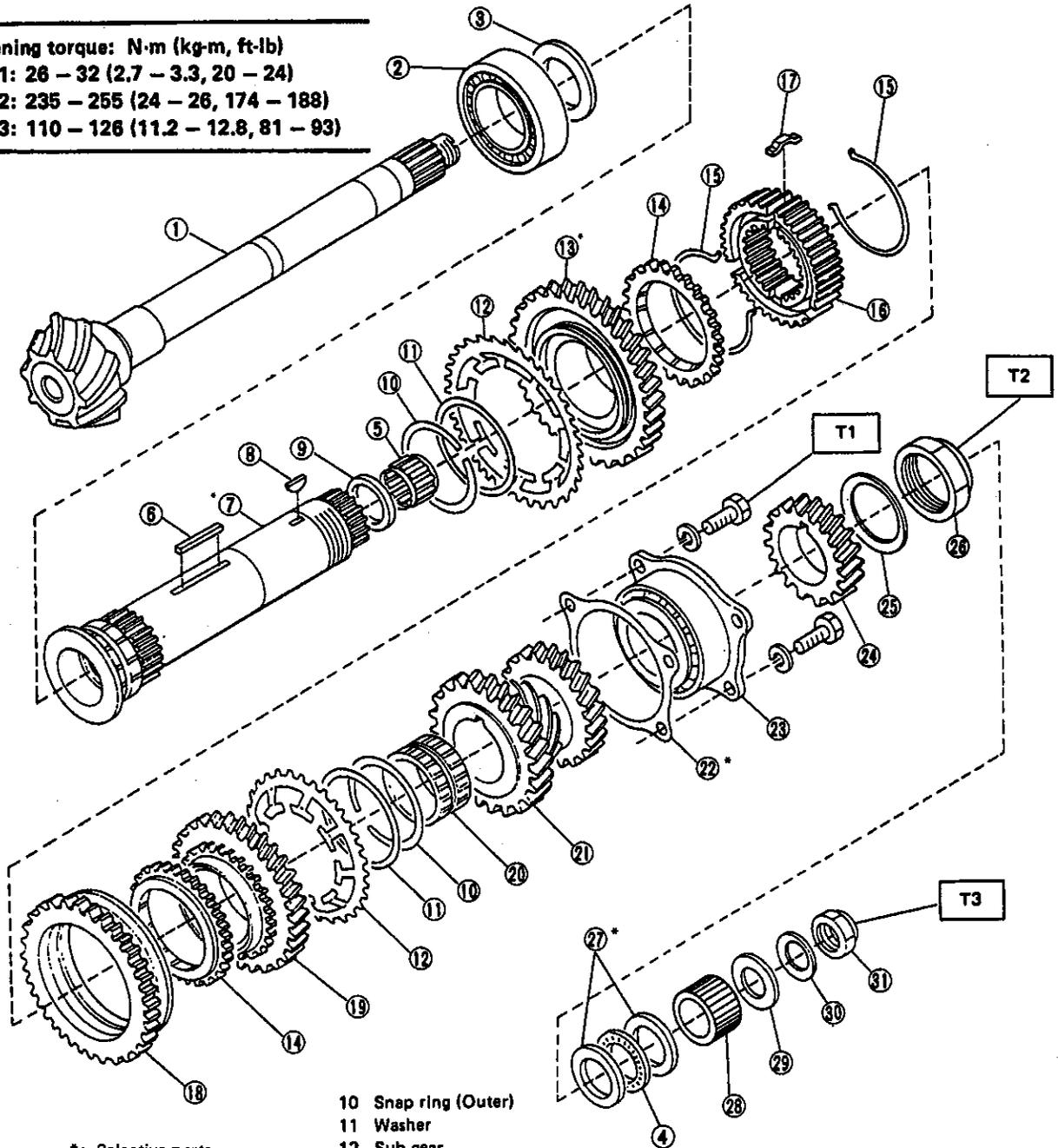


Fig. 19

# 7. Drive Pinion ASSY (Full-time 4WD)

Tightening torque: N·m (kg·m, ft·lb)  
**T1: 26 - 32 (2.7 - 3.3, 20 - 24)**  
**T2: 235 - 255 (24 - 26, 174 - 188)**  
**T3: 110 - 126 (11.2 - 12.8, 81 - 93)**



\*: Selective parts

- 1 Drive pinion shaft
- 2 Roller bearing
- 3 Washer
- 4 Thrust bearing
- 5 Needle bearing
- 6 Key
- \* 7 Driven shaft
- 8 Woodruff key
- 9 Drive pinion collar

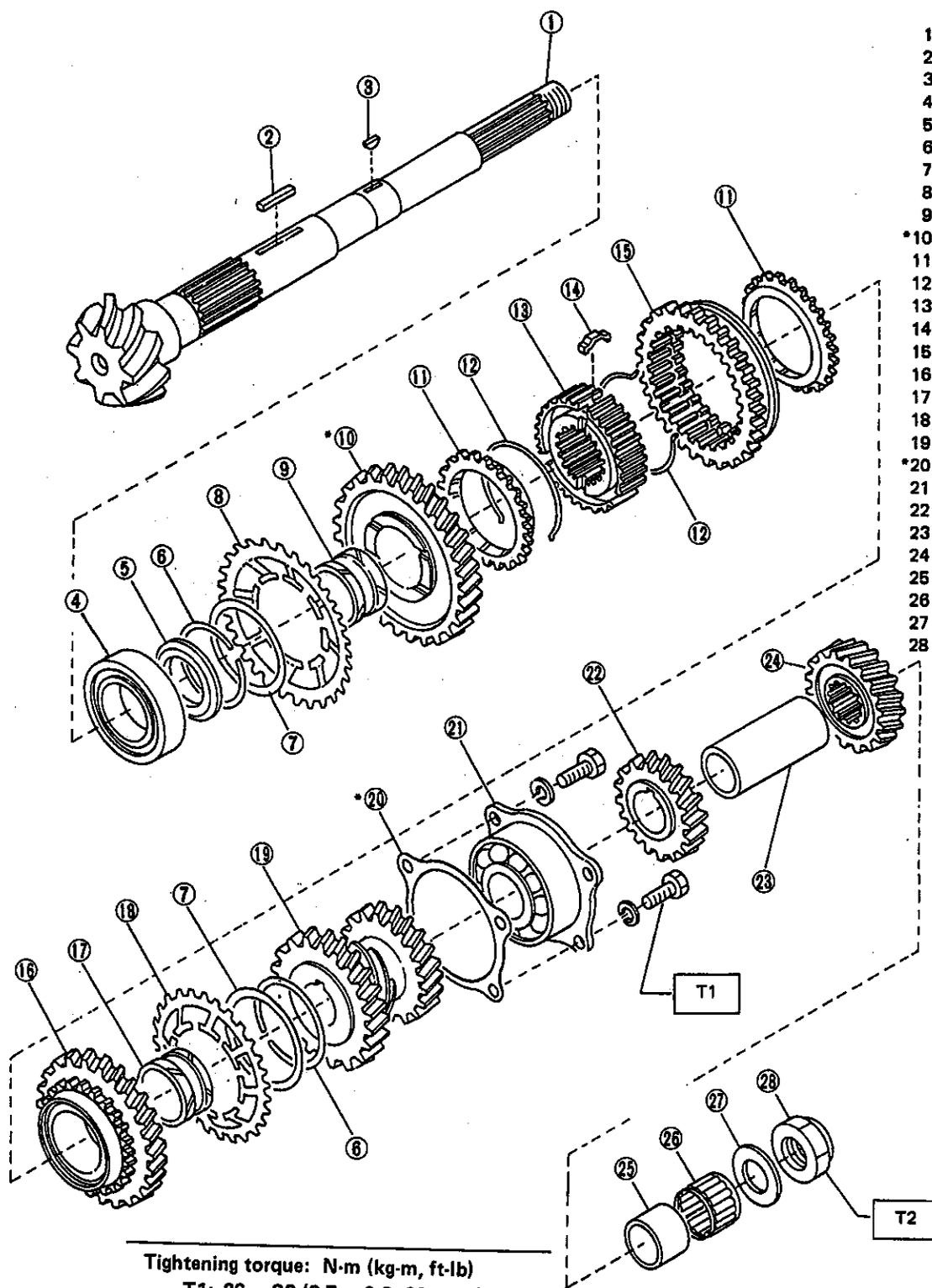
- 10 Snap ring (Outer)
- 11 Washer
- 12 Sub gear
- \* 13 1st driven gear
- 14 Baulk ring
- 15 Spring
- 16 1st-2nd synchronizer hub
- 17 Insert
- 18 Reverse driven gear
- 19 2nd driven gear
- 20 2nd driven gear bush
- 21 3rd-4th driven gear
- \* 22 Drive pinion shim

- 23 Roller bearing
- 24 5th driven gear
- 25 Lock washer
- 26 Lock nut
- \* 27 Washer
- 28 Differential bevel gear sleeve
- 29 Washer
- 30 Lock washer
- 31 Lock nut

Fig. 20

### 8. Drive Pinion ASSY (Selective 4WD)

\*: Selective parts

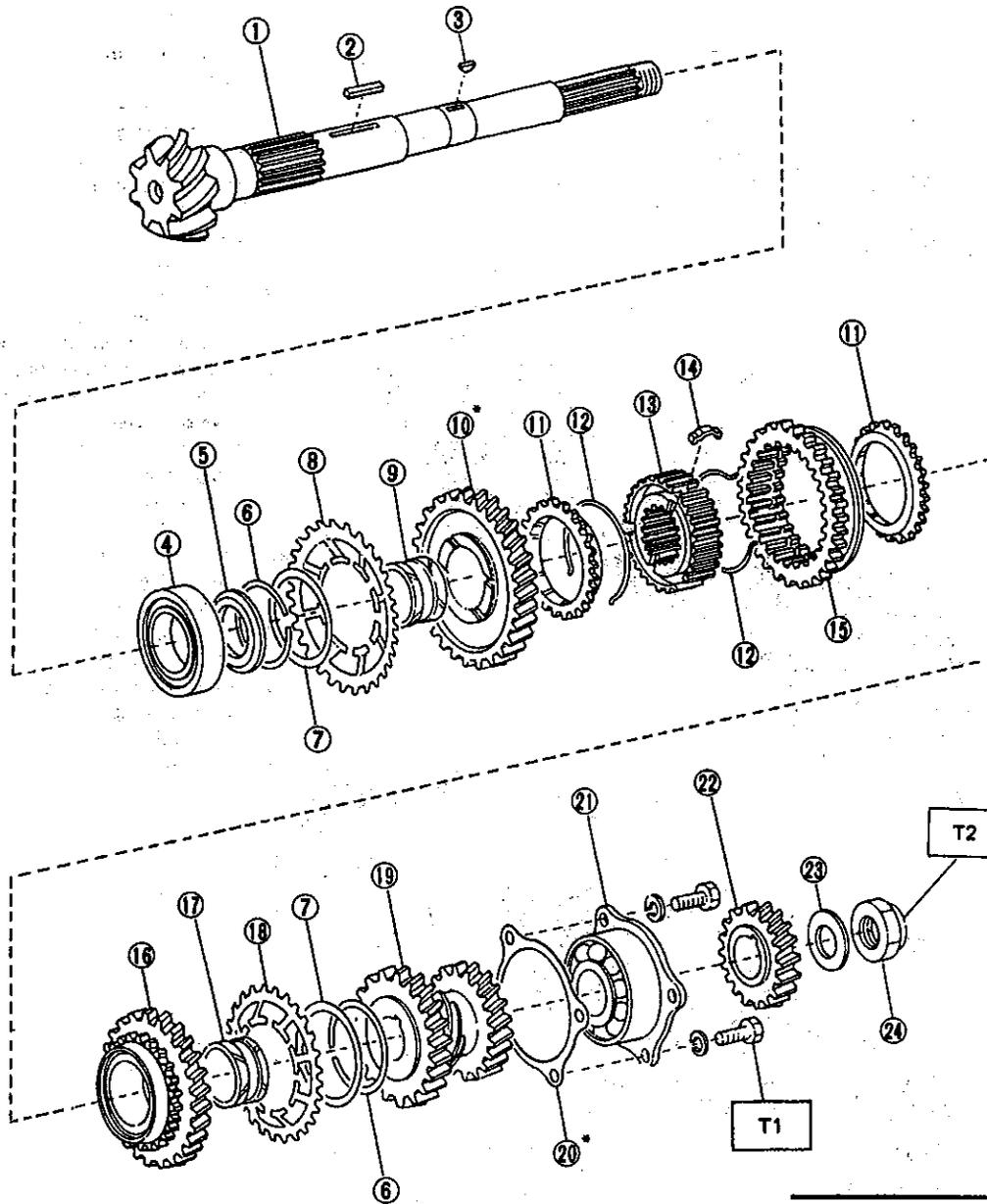


- 1 Drive pinion shaft
- 2 Key
- 3 Woodruff key
- 4 Roller bearing
- 5 1st gear thrust plate
- 6 Snap ring (Outer)
- 7 Washer
- 8 1st sub gear
- 9 1st gear bushing
- \*10 1st driven gear
- 11 1st-2nd baulk ring
- 12 1st-2nd synchronizer spring
- 13 1st-2nd synchronizer hub
- 14 1st-2nd synchronizer insert
- 15 Reverse driven gear
- 16 2nd driven gear CP
- 17 2nd gear bushing
- 18 2nd sub gear
- 19 3rd-4th driven gear
- \*20 Drive pinion shim
- 21 Ball bearing
- 22 5th driven gear
- 23 Drive pinion collar
- 24 Transfer drive gear
- 25 5th needle bearing race
- 26 Needle bearing
- 27 Lock washer
- 28 Lock nut

Tightening torque: N-m (kg-m, ft-lb)  
 T1: 26 - 32 (2.7 - 3.3, 20 - 24)  
 T2: 112 - 124 (11.4 - 12.6, 82 - 91)

Fig. 21

9. Drive Pinion ASSY (2000•2200cc FWD)

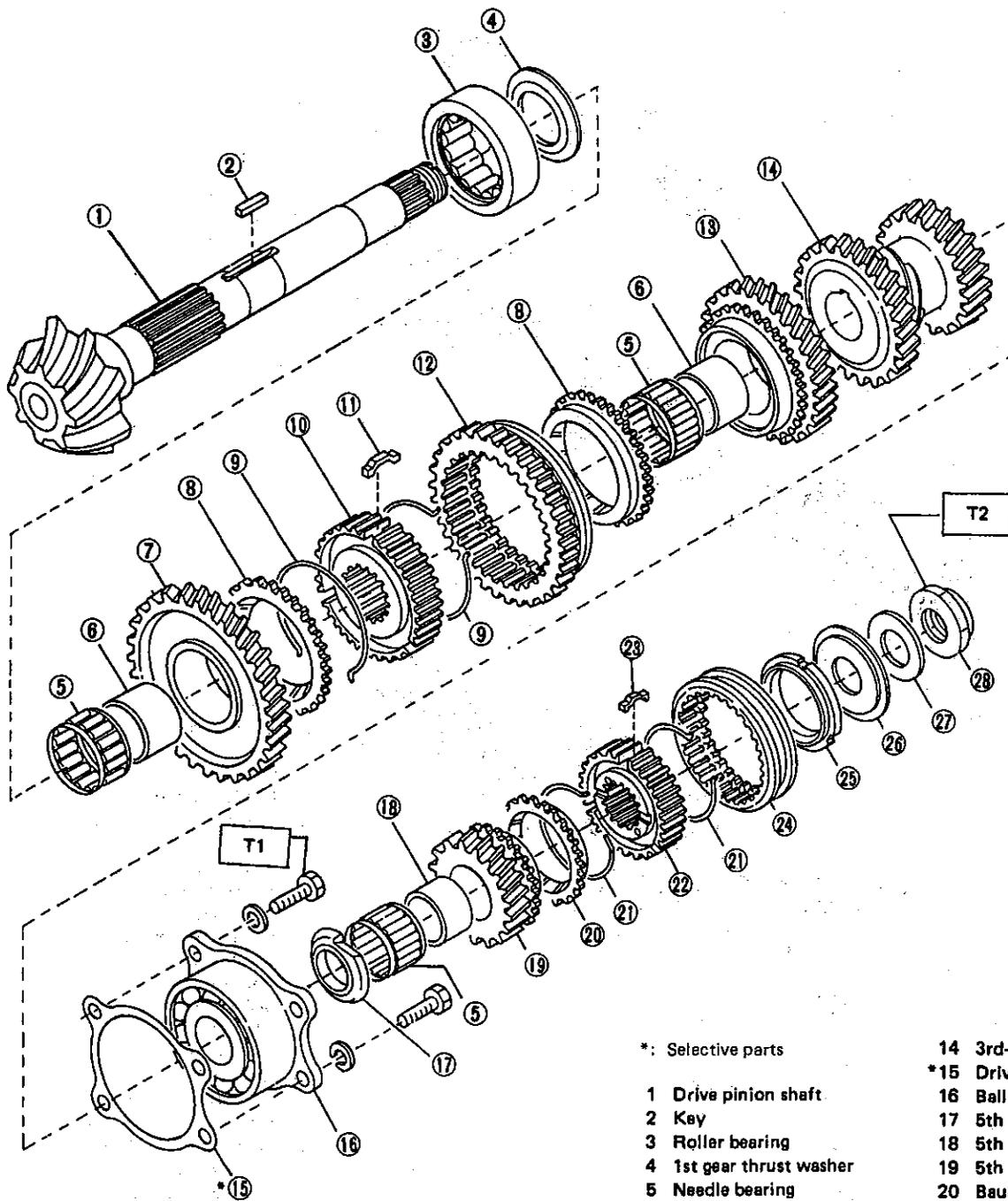


- \*: Selective parts
- 1 Drive pinion shaft
- 2 Key
- 3 Woodruff key
- 4 Roller bearing
- 5 1st gear thrust plate
- 6 Snap ring (Outer)
- 7 Washer
- 8 1st sub gear
- 9 1st gear bushing
- \*10 1st driven gear CP
- 11 1st-2nd baulk ring
- 12 1st-2nd synchronizer spring
- 13 1st-2nd synchronizer hub
- 14 1st-2nd shifting insert
- 15 Reverse driven gear
- 16 2nd driven gear CP
- 17 2nd gear bushing
- 18 2nd sub gear
- 19 3rd-4th driven gear CP
- \*20 Drive pinion shim
- 21 Ball bearing
- 22 5th driven gear
- 23 Lock washer
- 24 Lock nut

Tightening torque: N·m (kg·m, ft·lb)  
 T1: 26 – 32 (2.7 – 3.3, 20 – 24)  
 T2: 112 – 124 (11.4 – 12.6, 82 – 91)

Fig. 22

10. Drive Pinion ASSY (1600•1800cc FWD)



\*: Selective parts

- 1 Drive pinion shaft
- 2 Key
- 3 Roller bearing
- 4 1st gear thrust washer
- 5 Needle bearing
- 6 1st-2nd needle bearing race
- 7 1st driven gear
- 8 1st-2nd baulk ring
- 9 1st-2nd synchronizer spring
- 10 1-st-2nd synchronizer hub
- 11 1st-2nd shifting insert
- 12 Reverse driven gear
- 13 2nd driven gear

- 14 3rd-4th driven gear
- \*15 Drive pinion shim
- 16 Ball bearing
- 17 5th gear thrust washer
- 18 5th needle bearing race
- 19 5th driven gear
- 20 Baulk ring
- 21 Synchronizer spring
- 22 Synchronizer hub
- 23 Shifting insert
- 24 Coupling sleeve
- 25 Insert guide
- 26 Insert stopper plate
- 27 Lock washer
- 28 Lock nut

**Tightening torque: N·m (kg·m, ft·lb)**  
**T1: 26 – 32 (2.7 – 3.3, 20 – 24)**  
**T2: 78 (8.0, 58)**

Fig. 23

# 11. Main Shaft ASSY (4WD Single-range and 2000•2200cc FWD)

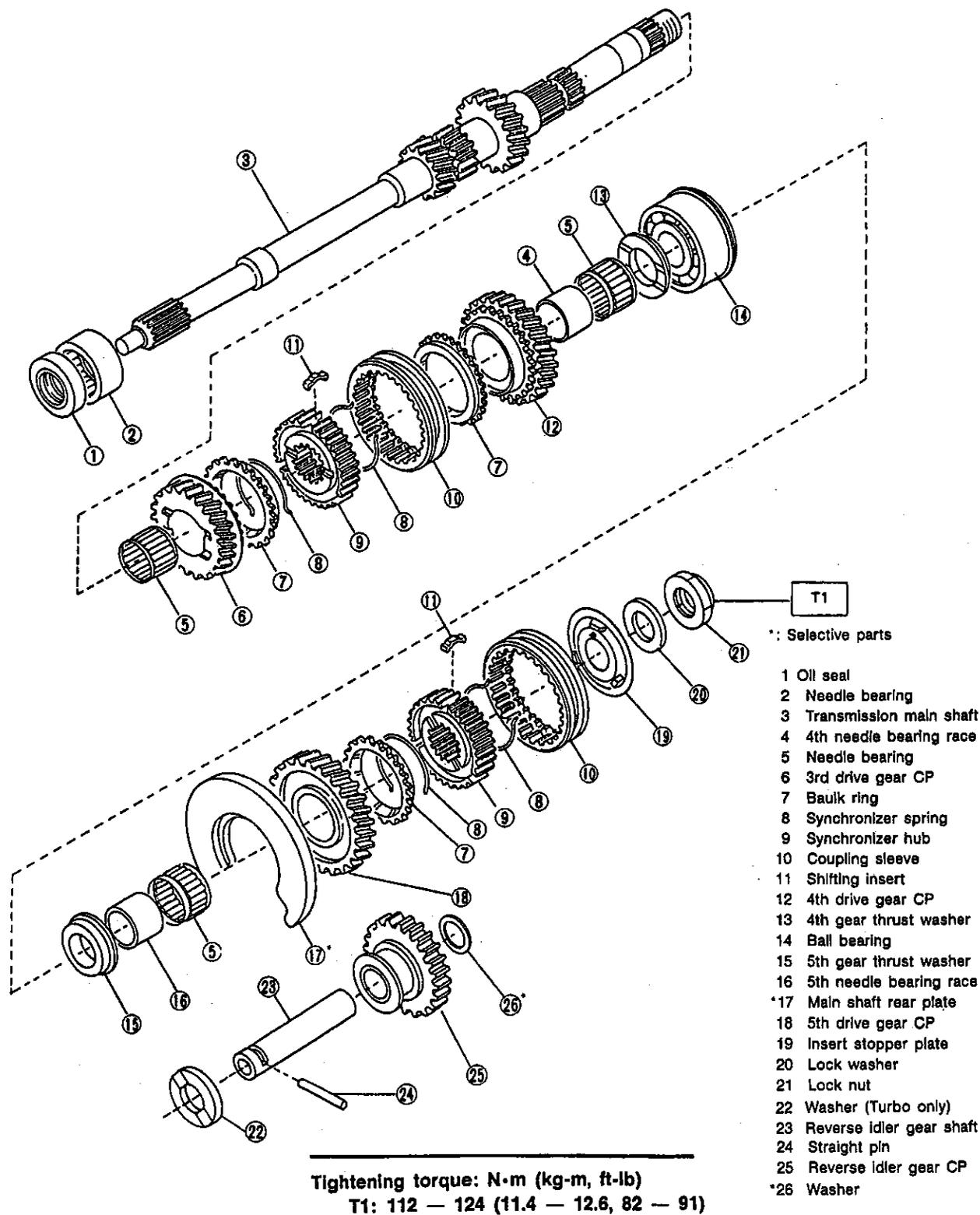
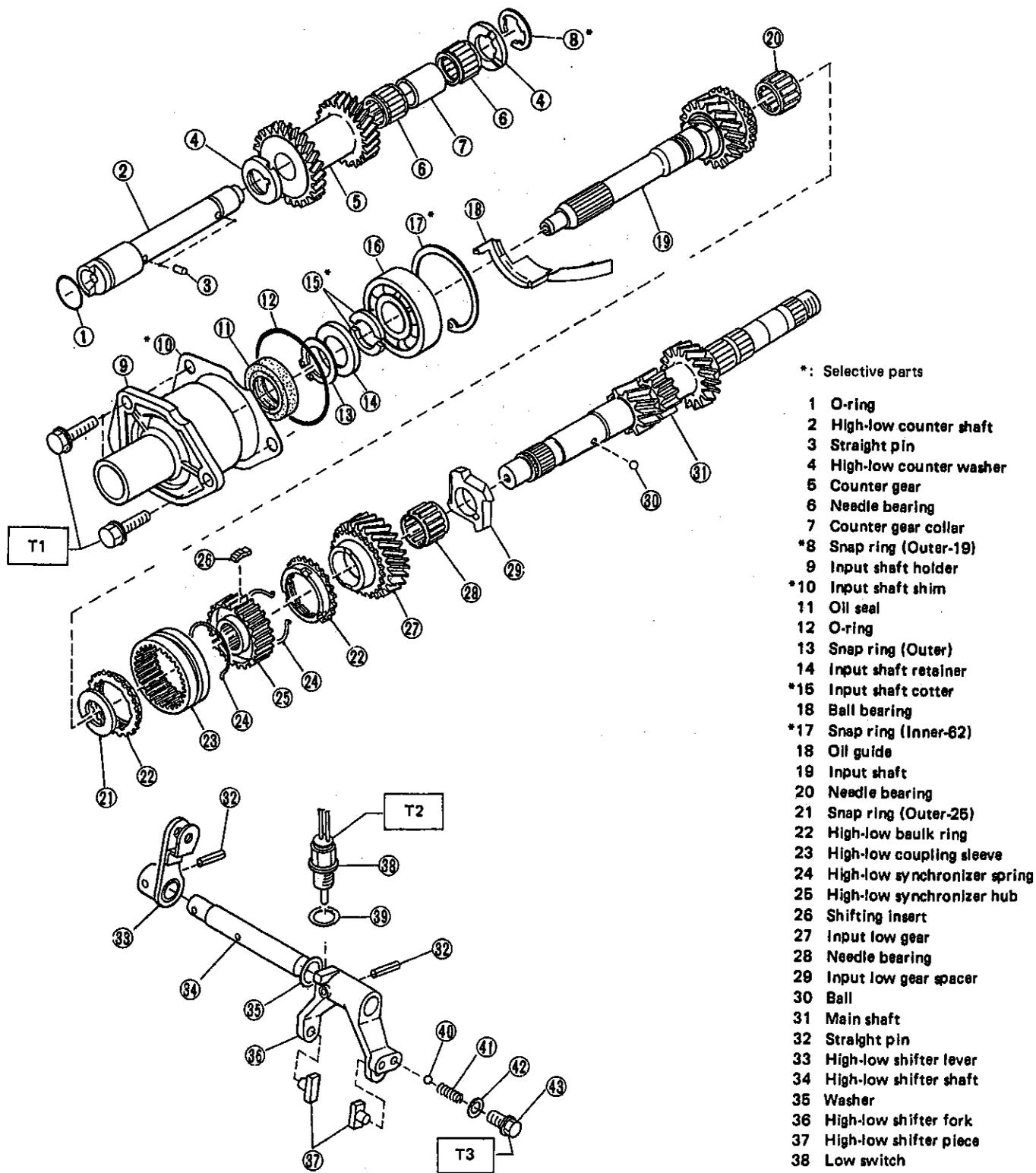


Fig. 24

## 12. Main Shaft ASSY (4WD Dual-range)



- \*: Selective parts
- 1 O-ring
  - 2 High-low counter shaft
  - 3 Straight pin
  - 4 High-low counter washer
  - 5 Counter gear
  - 6 Needle bearing
  - 7 Counter gear collar
  - \*8 Snap ring (Outer-19)
  - 9 Input shaft holder
  - \*10 Input shaft shim
  - 11 Oil seal
  - 12 O-ring
  - 13 Snap ring (Outer)
  - 14 Input shaft retainer
  - \*15 Input shaft cotter
  - 18 Ball bearing
  - \*17 Snap ring (Inner-62)
  - 18 Oil guide
  - 19 Input shaft
  - 20 Needle bearing
  - 21 Snap ring (Outer-25)
  - 22 High-low baulk ring
  - 23 High-low coupling sleeve
  - 24 High-low synchronizer spring
  - 25 High-low synchronizer hub
  - 26 Shifting insert
  - 27 Input low gear
  - 28 Needle bearing
  - 29 Input low gear spacer
  - 30 Ball
  - 31 Main shaft
  - 32 Straight pin
  - 33 High-low shifter lever
  - 34 High-low shifter shaft
  - 35 Washer
  - 36 High-low shifter fork
  - 37 High-low shifter piece
  - 38 Low switch
  - 39 Gasket
  - 40 Ball
  - 41 Spring
  - 42 Gasket
  - 43 Plug

Tightening torque: N·m (kg·m, ft·lb)

T1: 20 (2.0, 14)

T2: 18 (1.8, 13)

T3: 10 (1.0, 7)

Fig. 25

## 13. Main Shaft ASSY (1600•1800cc FWD)

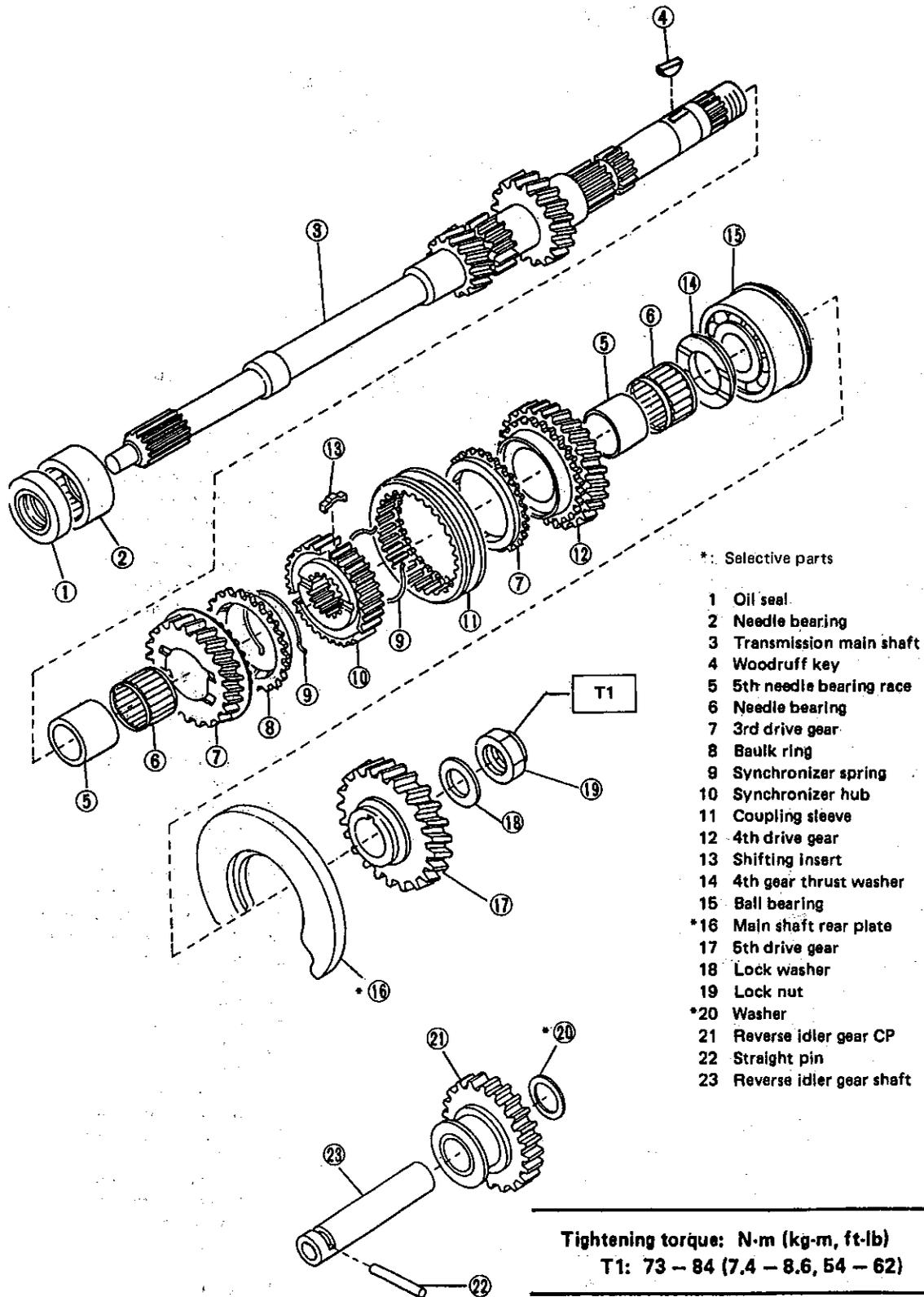
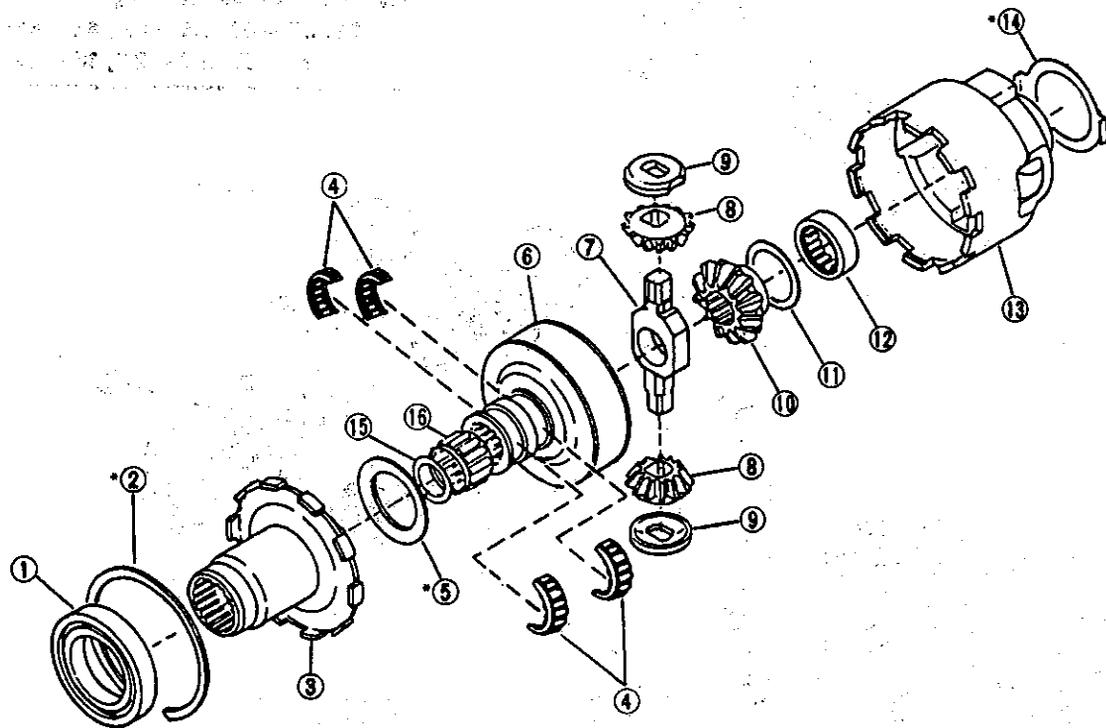


Fig. 26

# 14. Center Differential



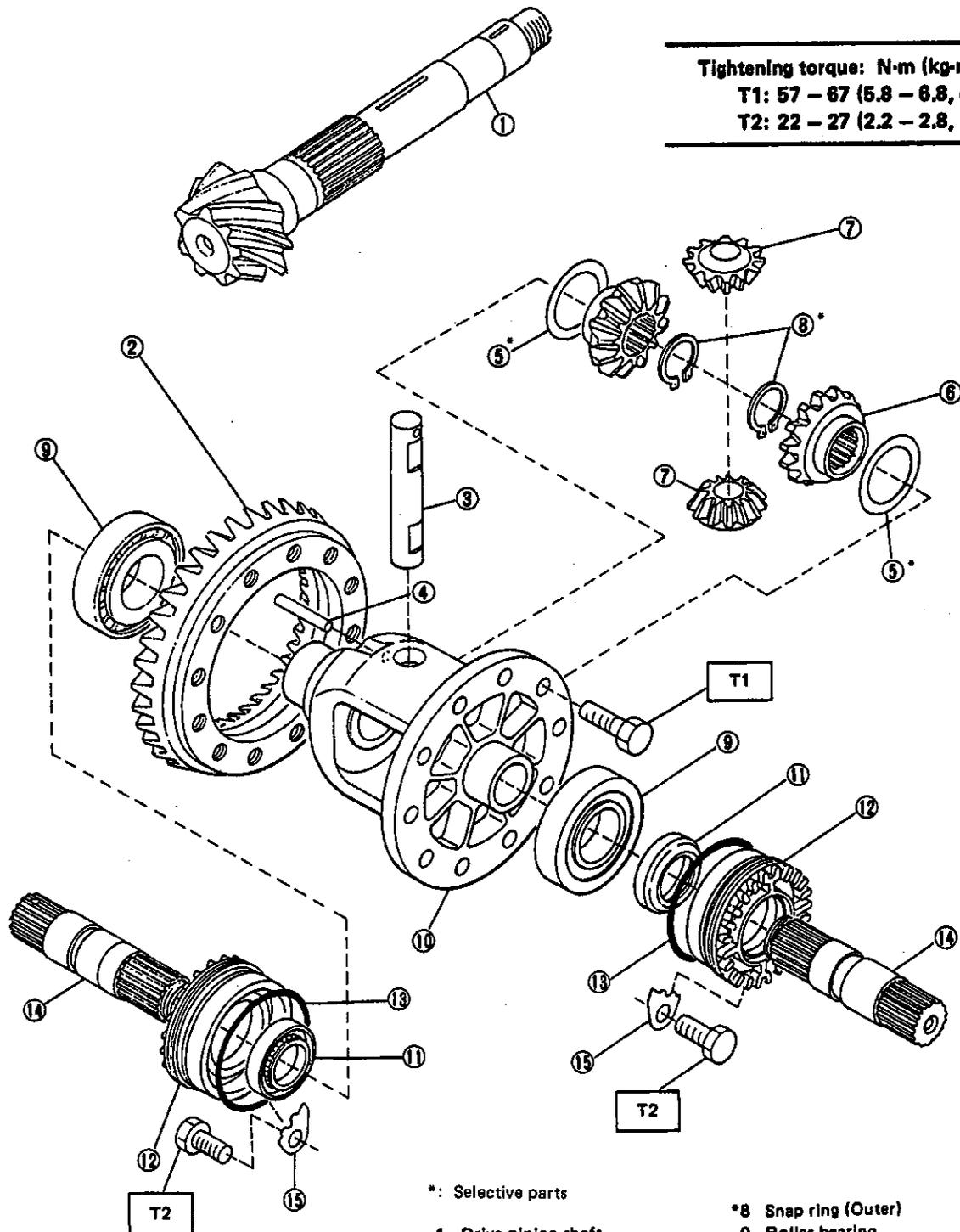
\*: Selective parts

- 1 Ball bearing
- \*2 Snap ring (Inner - 110)
- 3 Center differential cover
- 4 Needle bearing
- \*5 Adjusting washer
- 6 Viscous coupling
- 7 Pinion shaft
- 8 Differential bevel pinion
- 9 Retainer
- 10 Differential bevel gear
- 11 Washer
- 12 Needle bearing
- 13 Center differential case
- \*14 Adjusting washer
- 15 Snap ring
- 16 Roller bearing

Fig. 27

# 15. Front Differential

**Tightening torque: N-m (kg-m, ft-lb)**  
**T1: 57 - 67 (5.8 - 6.8, 42 - 49)**  
**T2: 22 - 27 (2.2 - 2.8, 16 - 20)**



\*: Selective parts

- 1 Drive pinion shaft
- 2 Hypoid driven gear
- 3 Pinion shaft
- 4 Straight pin
- \*5 Washer
- 6 Differential bevel gear
- 7 Differential bevel pinion

- \*8 Snap ring (Outer)
- 9 Roller bearing
- 10 Differential case
- 11 Oil seal
- 12 Differential side retainer
- 13 O-ring
- 14 Axle drive shaft
- 15 Retainer lock plate

Fig. 28

# W SERVICE PROCEDURE

## 1. General

**A: APPLICATION**

The table below shows the titles of the main sections in Service Procedures and the applicable vehicle models. Carry out service operations by referring to the sections applicable to the vehicle to be serviced.

Large title	Model	4WD				FWD	
		Full-time		Selective		2000cc 2200cc	1600cc 1800cc
		Single-range	Dual-range	Single-range	Dual-range		
1	General	○	○	○	○	○	○
2	Transfer Case and Extension (Full-time 4WD)	○	○				
3	Transfer Case and Extension (Selective 4WD)			○	○		
4	Rear Case (FWD)					○	○
5	Transmission Case (4WD Single-range and 2000*2200cc FWD)	○		○		○	
6	Transmission Case (4WD Dual-range)		○		○		
7	Transmission Case (1600*1800cc FWD)						○
8	Drive Pinion ASSY (Full-time 4WD)	○	○				
9	Drive Pinion ASSY (Selective 4WD)			○	○		
10	Drive Pinion ASSY (2000*2200cc FWD)					○	
11	Drive Pinion ASSY (1600*1800cc FWD)						○
12	Input Shaft ASSY (4WD Dual-range)		○		○		
13	Main Shaft ASSY (4WD Dual-range)		○		○		
14	Main Shaft ASSY (4WD Single-range and 2000*2200cc FWD)	○		○		○	
15	Main Shaft ASSY (1600*1800cc FWD)						○
16	Center Differential (Full-time 4WD)	○	○				
17	Front Differential	○	○	○	○	○	○

S/r: Single-range  
D/r: Dual-range

**B: PRECAUTIONS**

1) The following job should be followed before disassembly;

- Clean oil, grease, dirt and dust from transmission.
- Remove drain plug to drain oil. After draining, retighten it as before.

Replace gasket with a new one.

Tightening torque:

41 — 47 N·m (4.2 — 4.8 kg-m, 30 — 35 ft-lb)

- Attach transmission to TRANSMISSION STAND SET.

Special tool:

TRANSMISSION STAND SET (499937100)

- Rotating parts should be coated with oil prior to assembly.
- All disassembled parts, if to be reused, should be reinstalled in the original positions and directions.
- Gaskets and lock washers must be replaced with new ones.
- Liquid gasket should be used where specified to prevent leakage.

**C: INSPECTION**

Disassembled parts should be washed clean first and then inspected carefully.

## 1) Bearings

Replace bearings in the following cases:

- Bearings whose balls, outer races and inner races are broken or rusty.
- Worn bearings.
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.

The ball bearing on the rear side of the drive pinion shaft should be checked for smooth rotation before the drive pinion ASSY is disassembled. In this case, because a preload is working on the bearing, its rotation feels slightly dragging unlike the other bearings.

- Bearings having other defects.

## 2) Bushing (each gear)

Replace the bushing in the following cases:

- When the sliding surface is damaged or abnormally worn.
- When the inner wall is abnormally worn.

## 3) Gears

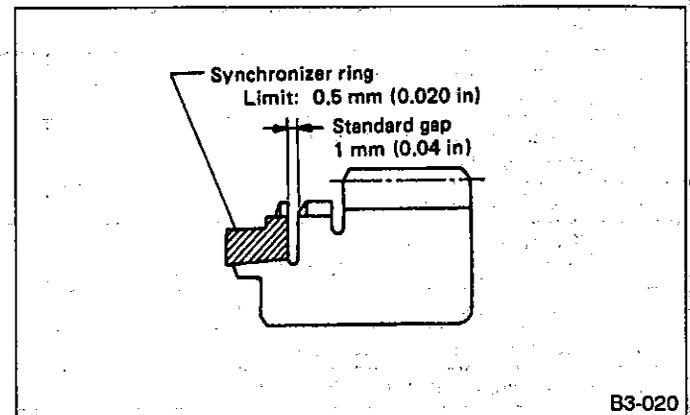
- Replace gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
- Correct or replace if the cone that contacts the balk ring is rough or damaged.

(3) Correct or replace if the inner surface or end face is damaged.

## 4) Balk ring

Replace the ring in the following cases:

- When the inner surface and end face are damaged.
- When the ring inner surface is abnormally or partially worn down.
- If the gap between the end faces of the ring and the gear splined part is excessively small when the ring is pressed against the cone.
- When the contact surface of the synchronizer insert is scored or abnormally worn down.



B3-020

Fig. 29

## 5) Insert (shifting)

Replace the insert if deformed, excessively worn, or defective in any way.

## 6) Oil seal

Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.

## 7) O-ring

Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.

## 8) Gearshift mechanism

Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

## 9) Differential gear

Repair or replace the differential gear in the following cases.

- The hypoid drive gear and drive pinion shaft tooth surface are damaged, excessively worn, or seized.
- The roller bearing on the drive pinion shaft has a worn or damaged roller path.
- There is damage, wear, or seizure of the differential bevel pinion, differential bevel gear, washer, pinion shaft, and straight pin.
- The differential case has worn or damaged sliding surfaces.

## 2. Transfer Case and Extension (Full-time 4WD)

### A: REMOVAL

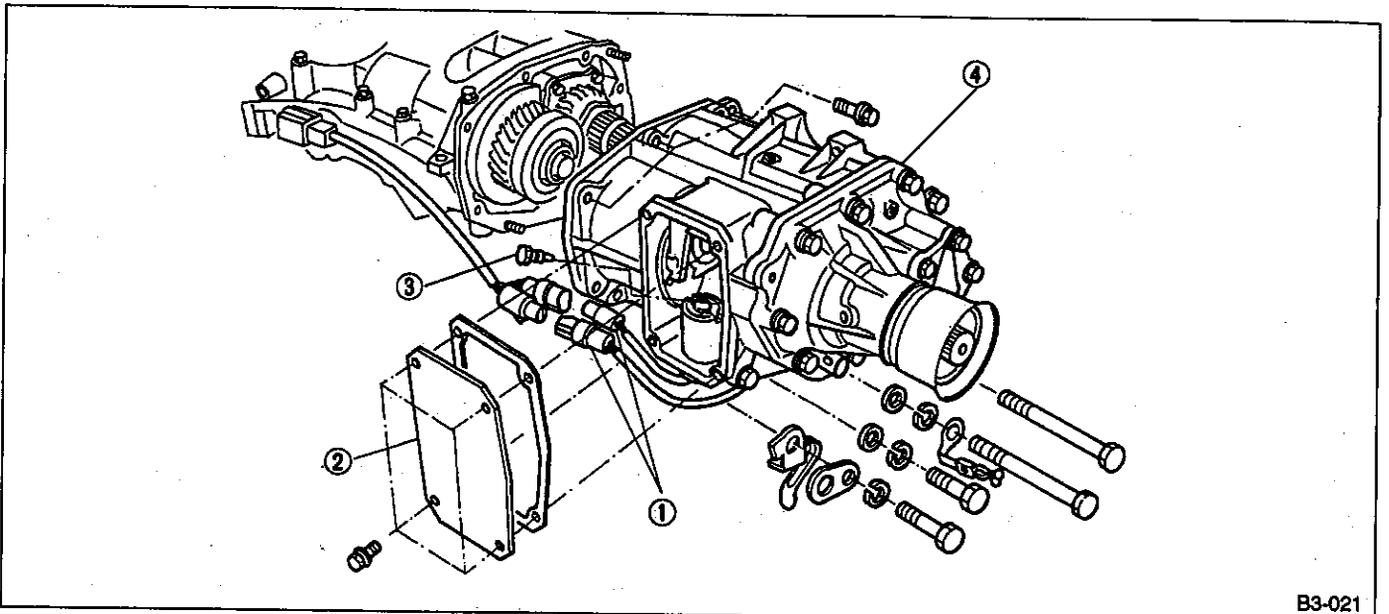


Fig. 30

B3-021

- 1) Disconnect each connector of transmission cord.
- 2) Remove transfer cover.

- 3) Remove shifter fork screw which secures selector arm to shifter arm.  
Remove transfer case with extension ASSY.

### B: DISASSEMBLY

#### 1. SEPARATION OF TRANSFER CASE AND EXTENSION ASSY

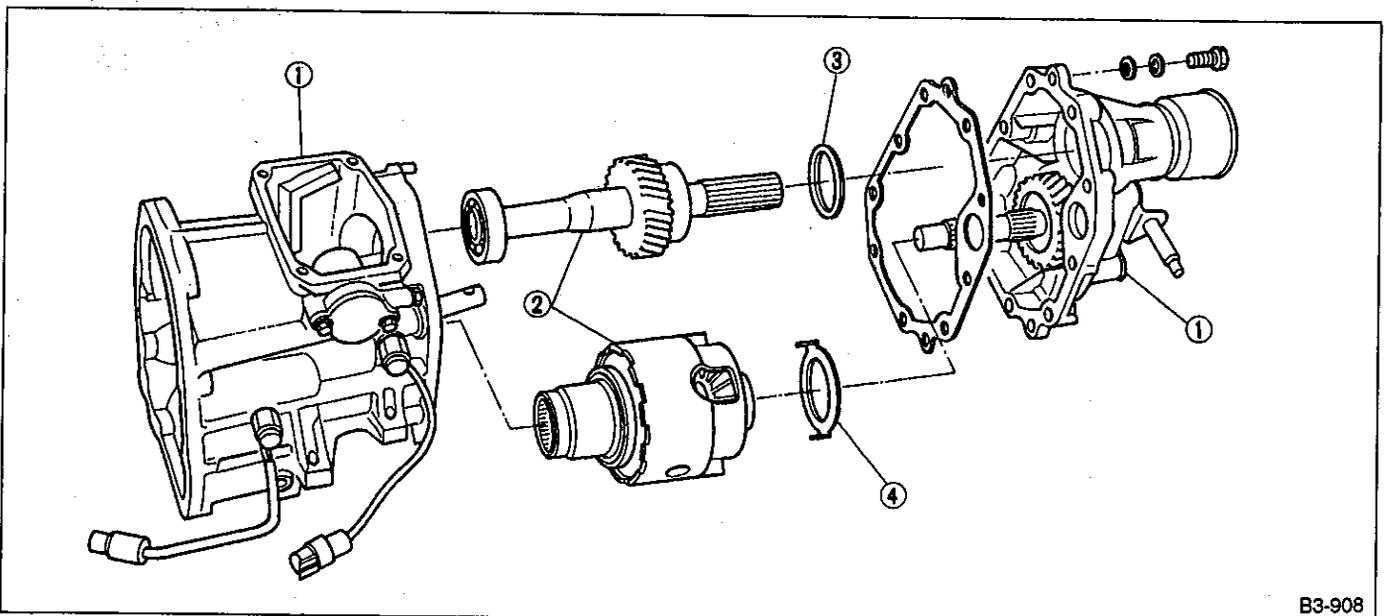


Fig. 31

B3-908

- 1) Separate transfer case and extension ASSY.

- 2) Remove transfer driven shaft and center differential as a set.

- 3) Remove thrust washer (52 x 61 x t).
- 4) Remove center differential washer.

## 2. TRANSFER CASE

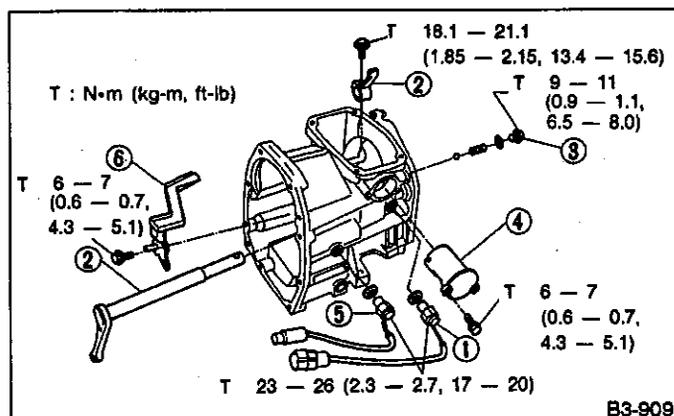


Fig. 32

- 1) Remove neutral switch.

Before removing shifter arm, disconnect neutral switch.

- 2) Draw out shifter arm and remove selector arm.
- 3) Remove plug, spring and reverse check ball.

## 3. EXTENSION

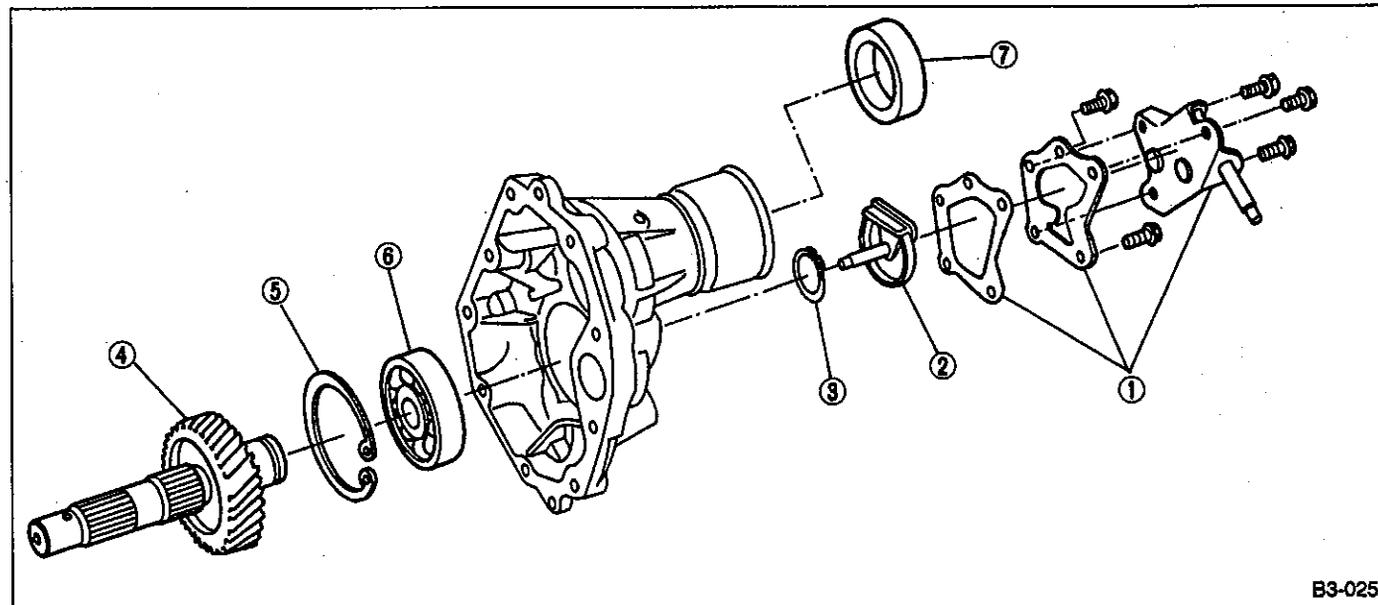


Fig. 34

- 1) Remove extension cover and shift bracket.
  - 2) Remove oil guide.
  - 3) Remove snap ring (Outer-30).
  - 4) Remove transfer drive shaft.
- Do not remove ball bearing unless replacing.

- 4) Remove reverse checking sleeve.
- Disassembly procedure is as follows:

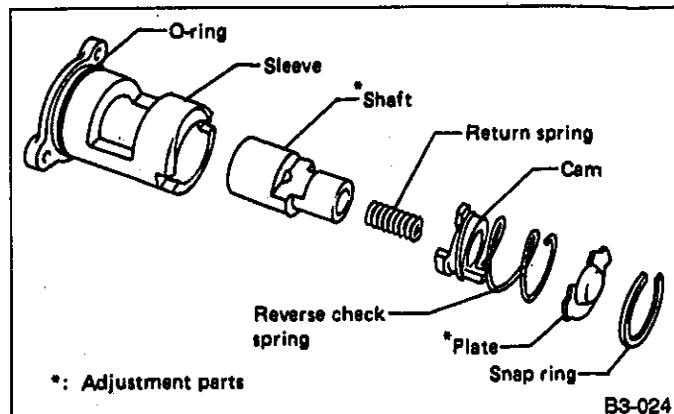


Fig. 33

- (1) Using a standard screwdriver, remove snap ring (inner 28).

Replace snap ring with a new one if deformed or weakened.

- (2) Remove reverse checking plate.
- (3) Remove reverse checking spring with cam.
- (4) Remove reverse return spring.
- (5) Remove reverse accent shaft.
- (6) Remove O-ring.

- 5) Remove back-up light switch.
- 6) Remove oil guide.

**C: ASSEMBLY**

**1. EXTENSION**

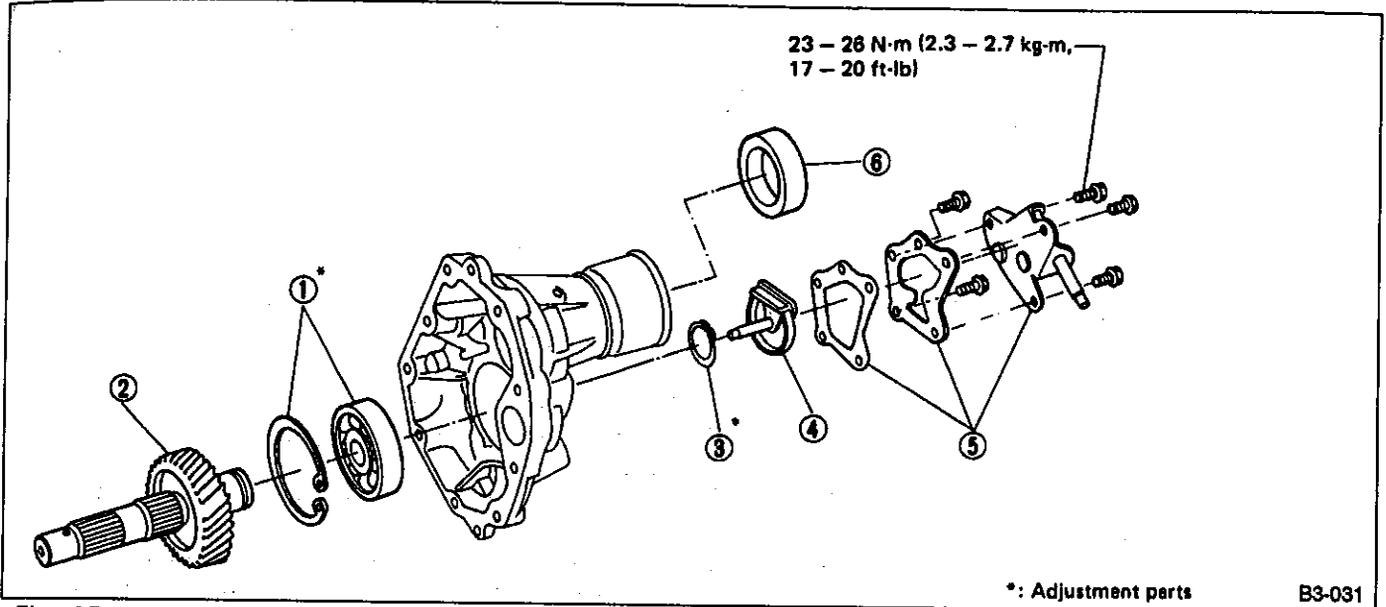


Fig. 35

1) Installation of ball bearing and selection of snap ring (Inner-72).

(1) Attach ball bearing (30 x 72 x 17) to extension and install snap ring.

(2) Measure clearance between snap ring and outer race of ball bearing.

Replace ball bearing with a new one.

Clearance: 0 — 0.15 mm (0 — 0.0059 in)

(3) If the measurement is not within the specification, select suitable snap ring.

Snap Ring (Inner-72)	
Part No.	Thickness mm (in)
805172071	1.78 (0.0701)
805172072	1.90 (0.0748)
805172073	2.02 (0.0795)

2) Installation of transfer drive shaft.  
Press transfer drive shaft into inner race of ball bearing.  
3) Selection of snap ring (Outer-30).

(1) Install snap ring on transfer drive shaft.

(2) Measure clearance between snap ring and inner race of ball bearing.

Clearance:  
0 — 0.15 mm (0 — 0.0059 in)

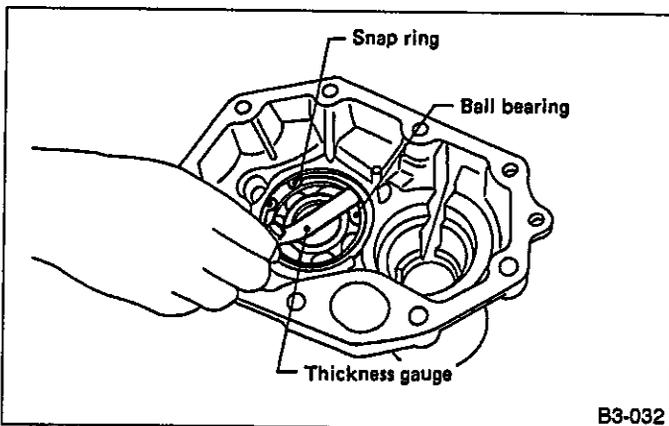


Fig. 36

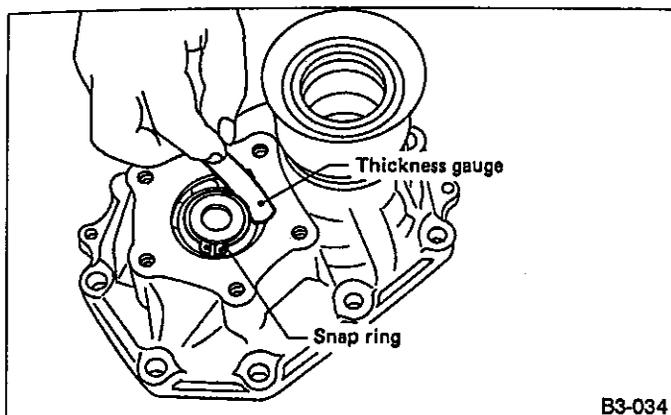


Fig. 37

(3) If the measurement is not within the specification, select suitable ring.

Snap Ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

4) Install oil guide.

The oil guide must be installed correctly. Before installing it, check to ensure that it stops at the correct portion of the extension cover.

5) Install extension cover and shift bracket.

**Use new gasket**

6) Install oil seal.

**Use new oil seal.**

## 2. TRANSFER CASE

Assembly of transfer case is in the reverse order to disassembly. Observe the following.

1) Assembly of reverse checking sleeve.

(1) Install reverse accent shaft, checking cam, return spring and checking spring onto reverse checking sleeve.

**Be sure the bent section of reverse checking spring is positioned in the groove in checking cam.**

(2) Hook the bent section of reverse checking spring over reverse check plate.

(3) Rotate cam so that the protrusion of reverse checking cam is at the opening in plate.

(4) With cam held in that position, install plate onto reverse checking sleeve and hold with snap ring (Inner-28).

(5) Position O-ring (35.4 x 1.5) in groove in sleeve.

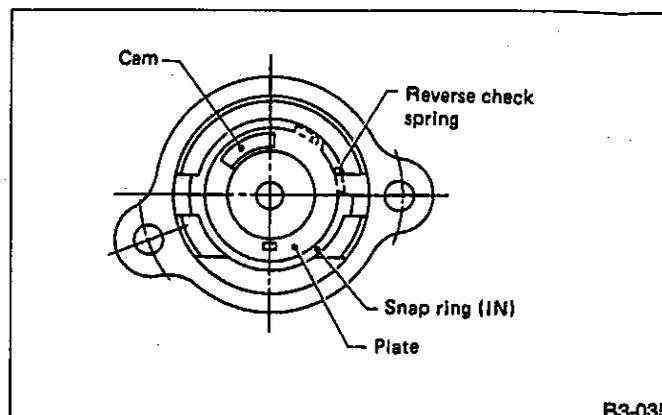


Fig. 38

a. Make sure the cutout section of reverse accent shaft is aligned with the opening in reverse checking sleeve.

b. Spin cam by hand for smooth rotation.

If it does not return properly, replace reverse checking spring.

c. Move cam and shaft all the way toward plate and release.

If cam does not return properly, replace reverse checking spring; if shaft does not, check for scratches on the inner surface of sleeve. If sleeve is in good order, replace spring.

d. Select a suitable reverse accent shaft and reverse check plate by referring to "Neutral Position Adjustment."

2) Installation of shifter arm and selector arm.

Install shifter arm into the partition from the front while inserting selector arm into the opening in reverse checking sleeve. Pass shaft through hole in selector arm until its end comes out of the rear of transfer case.

**Apply a coat of gear oil to shifter arm CP. Also make sure oil seal is positioned properly.**

3. COMBINATION OF TRANSFER CASE AND EXTENSION ASSY

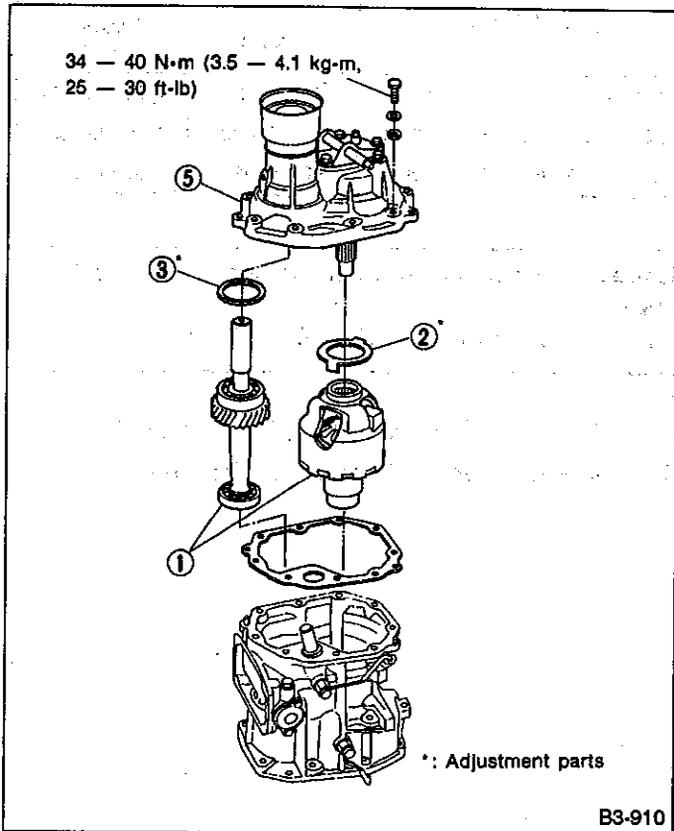


Fig. 39

- 1) Install center differential and transfer drive shaft into transfer casing.
- 2) Selection of center differential washer.
  - (1) Measure height "A" as shown in figure.

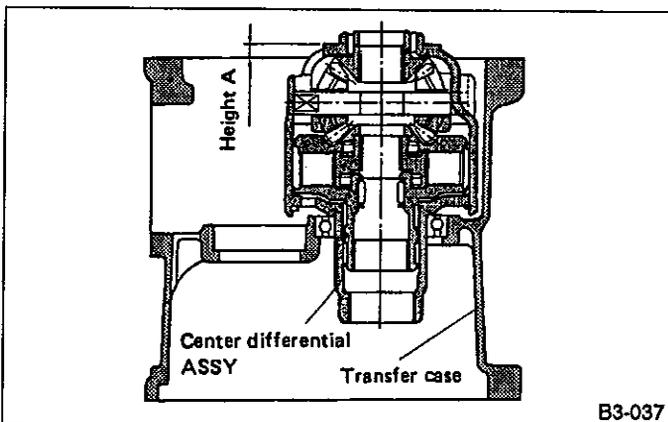


Fig. 40

- (2) Measure depth "B" as shown in figure.

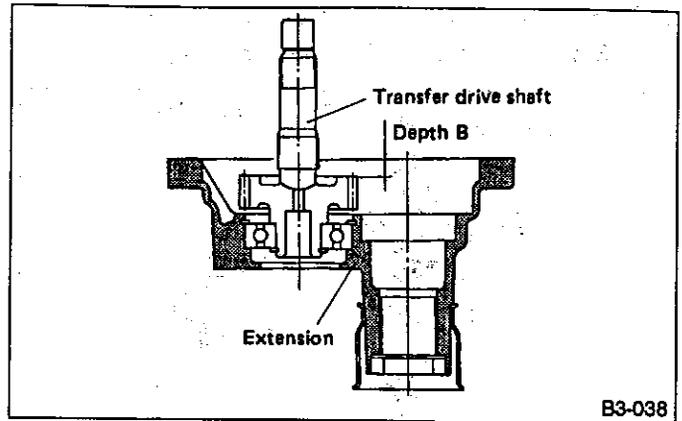


Fig. 41

- (3) Calculate space "C" using the following equation:  
 $C = B - A + 0.24 \text{ mm (0.0094 in)}$  [Thickness of gasket]

- (4) Select suitable washer in the following table.

Space "C" mm (in)	Center differential washer	
	Part No.	Thickness mm (in)
1.60 — 1.74 (0.0630 — 0.0685)	38965AA080	1.25 (0.0492)
1.75 — 1.89 (0.0689 — 0.0744)	38965AA090	1.40 (0.0551)
1.90 — 2.04 (0.0748 — 0.0803)	38965AA100	1.55 (0.0610)
2.05 — 2.19 (0.0807 — 0.0862)	38965AA110	1.70 (0.0669)
2.20 — 2.40 (0.0866 — 0.0945)	38965AA120	1.85 (0.0728)

Standard clearance between center differential washer and thrust bearing:

0.35 — 0.55 mm (0.0138 — 0.0217 in)

- (5) Install center differential washer on center differential as shown in figure.

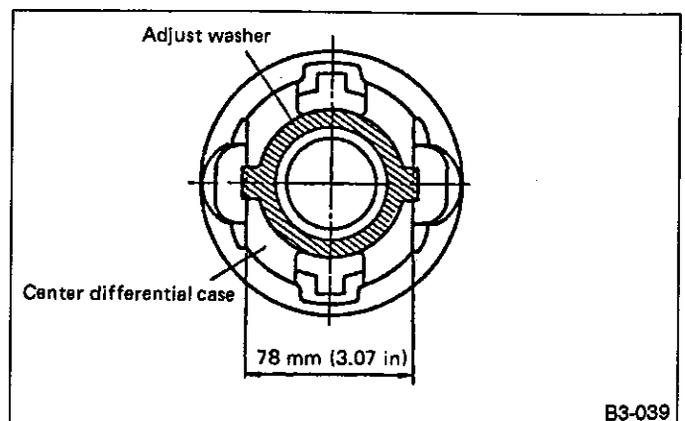


Fig. 42

## 3) Selection of thrust washers (52 x 61 x t).

(1) Measure height "W" as shown in figure.

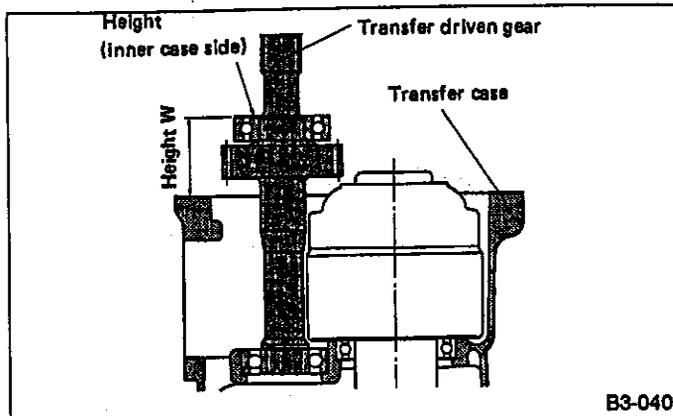


Fig. 43

(2) Measure depth "X" as shown in figure.

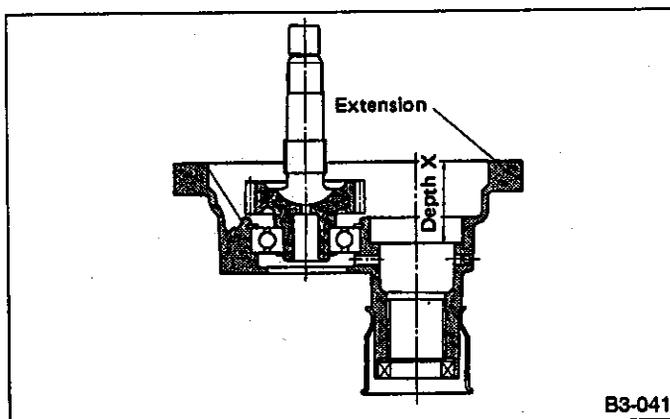


Fig. 44

(3) Calculate space "Y" using the following equation:  
 $Y = X - W + 0.24 \text{ mm (0.0094 in)}$  [Thickness of gasket]

(4) Select suitable washer in the following table.

Space "Y" mm (in)	Thrust washer (52 x 61 x t)	
	Part No.	Thickness mm (in)
0.55 — 0.79 (0.0217 — 0.0311)	803052021	0.50 (0.0197)
0.80 — 1.04 (0.0315 — 0.0409)	803052022	0.75 (0.0295)
1.05 — 1.30 (0.0413 — 0.0512)	803052023	1.00 (0.0394)

Standard clearance between thrust washer and ball bearing:

0.05 — 0.30 mm (0.0020 — 0.0118 in)

(5) Fit thrust washers on transfer drive shaft.

4) Install extension ASSY into transfer case.

**D: INSTALLATION**

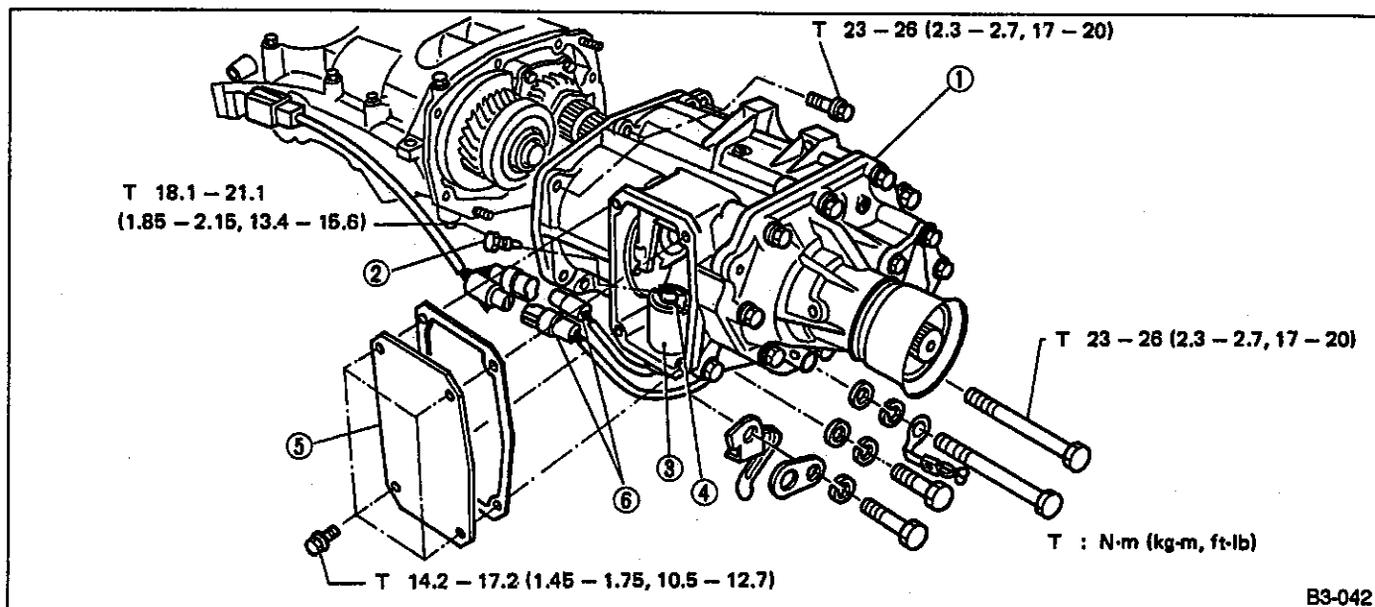


Fig. 45

- 1) Install transfer case with extension ASSY.
- 2) Secure selector arm to shifter arm CP with shifter fork screw. Shifter arm CP should be caught by pawl of rod. Selector arm must be engaged with reverse check sleeve ASSY.

3) Adjustment of neutral position.

- (1) Shift gear into 3rd gear position.
- (2) Shifter arm turns lightly toward the 1st/2nd gear side but heavily toward the reverse gear side because of the function of the return spring, until arm contacts the stopper.
- (3) Make adjustment so that the heavy stroke (reverse side) is a little more than the light stroke (1st/2nd side).
- (4) To adjust, remove bolts holding reverse check sleeve ASSY to the case, move sleeve ASSY outward, and place adjustment shim (0 to 1 ea.) between sleeve ASSY and case to adjust the clearance.

Be careful not to break O-ring when placing shim(s).

Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

- When shim is removed, the neutral position will move closer to reverse; when shim is added, the neutral position will move closer to 1st gear.
- If shims alone cannot adjust the clearance, replace reverse accent shaft and re-adjust.

Reverse accent shaft

Part No.	Mark	Remarks
32188AA020	A	Neutral position is closer to 1st gear.
32188AA002	No mark or B	Standard
32188AA030	C	Neutral position is closer to reverse gear.

- 4) Reverse check plate adjustment.  
Shift shifter arm CP to "5th" and then to reverse to see if reverse check mechanism operates properly. Also check to see if arm returns to Neutral when released from the reverse position. If arm does not return properly, replace reverse check plate.

Reverse check plate			
Part No.	No.	Angle $\theta$	Remarks
32189AA000	0	28°	Arm stops closer to "5th".
32189AA010	1	31°	Arm stops closer to "5th".
32189AA020	2	34°	Standard
32189AA030	3	37°	Arm stops closer to reverse.
32189AA040	4	40°	Arm stops closer to reverse.

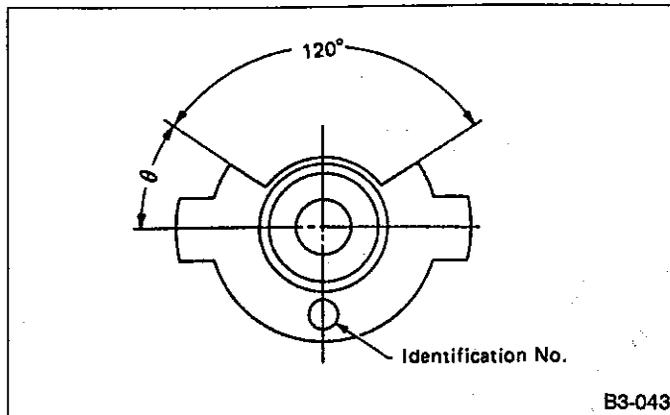


Fig. 46

- 5) Install transfer cover and gasket.
- 6) Connect each connector.

### 3. Transfer Case and Extension (Selective 4WD)

#### A: REMOVAL

##### 1) Removing actuator & cable ASSY

- (1) Disconnect connectors of transmission cord.
- (2) Using REMOVER II, drive out spring pin (5.2 x 28) connecting transfer shifter shaft and transfer shifter lever on the right side of transfer case.

##### Special tool:

REMOVER II (398791600)

- (3) Remove transfer shifter lever from transfer shifter shaft.
- (4) Remove snap pin and extract 8-mm clevis pin. Then, remove cable from transfer shifter lever.
- (5) Remove five 8-mm bolts & washers (three on actuator and two on cable) and remove actuator & cable ASSY.

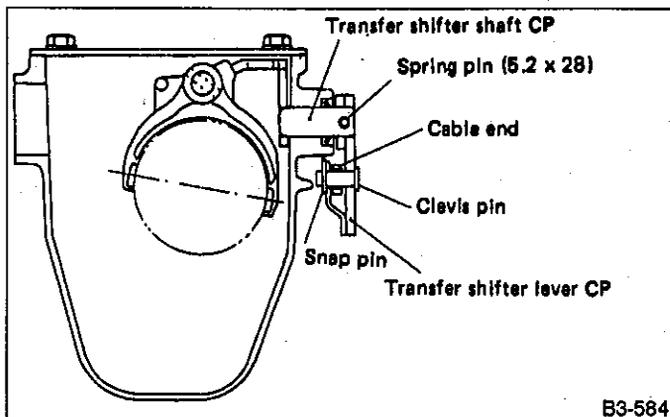


Fig. 47

- 2) Remove transfer cover by loosening four bolts.

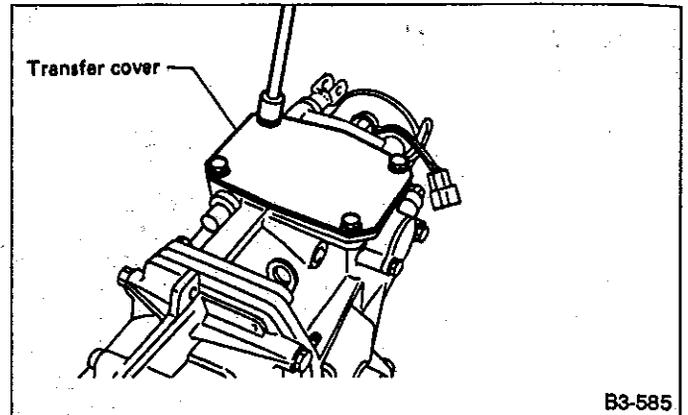


Fig. 48

- 3) Using REMOVER II, drive out straight pin (5 x 25) in transfer shifter fork.
- 4) Removing transfer shifter rod and transfer shifter fork

Extract transfer shifter rod by turning it 180°. Remove transfer shifter fork. Also remove ball and checking ball spring from transfer case.

- a. When taking out fork, move reverse checking sleeve 2 to 3 mm (0.08 to 0.12 in) toward outside by loosening it.
- b. Be careful not to drop ball when removing transfer shifter rod.

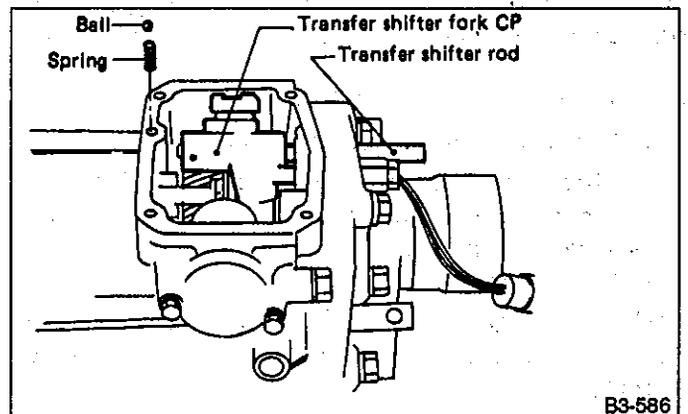
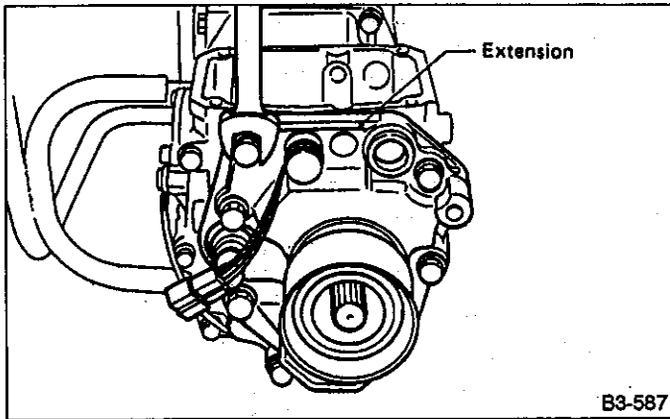


Fig. 49

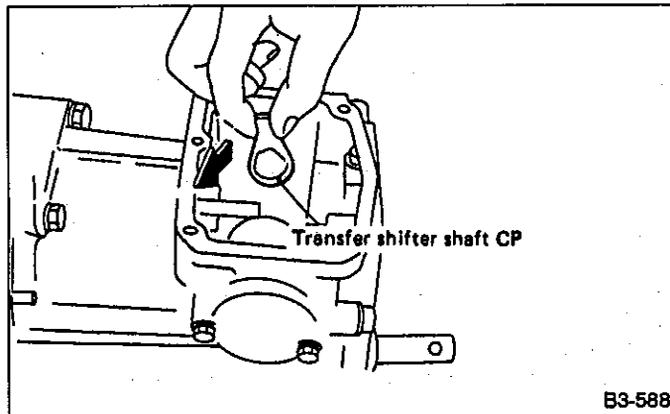
- 5) Remove the seven bolts from extension, and remove extension & transfer gear ASSY.



B3-587

Fig. 50

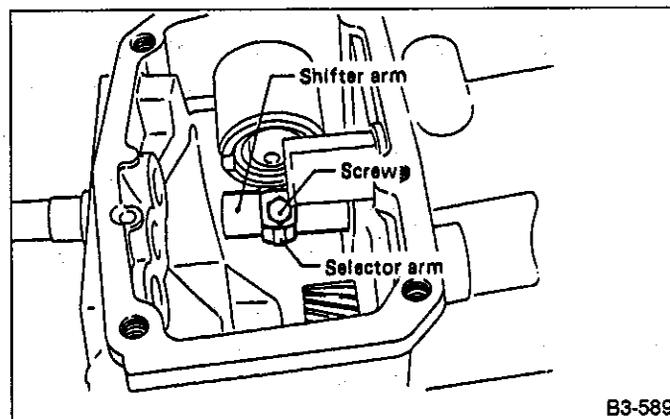
6) Extract transfer shifter shaft from the right side of transfer case.



B3-588

Fig. 51

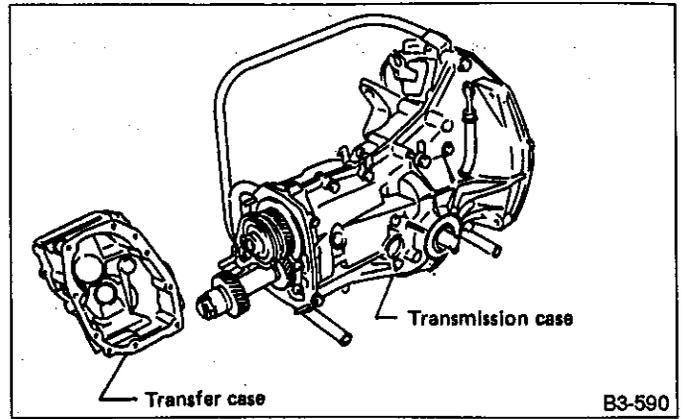
7) Remove transfer case plug with gasket and then remove reverse accent spring and ball (7.1438).  
 8) Remove the two bolts from reverse check sleeve ASSY and move the sleeve ASSY until it rotates freely.  
 9) Remove shifter fork screw securing selector arm to shifter arm CP.



B3-589

Fig. 52

10) Loosen eight bolts, and remove transfer case and shifter ASSY from transmission case by tapping with a plastic hammer.



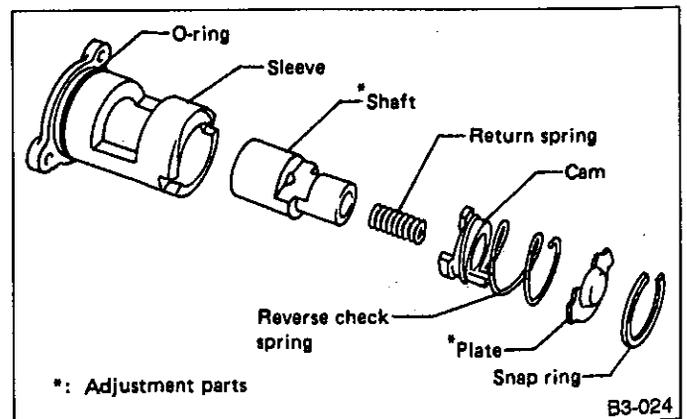
B3-590

Fig. 53

**B: DISASSEMBLY**

**1. TRANSFER CASE**

- 1) Pull out shifter arm CP and selector arm from transfer case.
- 2) Remove oil guide from transfer case.
- 3) Remove back-up light switch ASSY and neutral switch ASSY.
  - a. Some models are not equipped with neutral switch ASSY.
  - b. Replace aluminum gasket with a new one.
- 4) Remove reverse check sleeve ASSY by loosening 6-mm bolt and washer ASSY in two places.
  - a. Be careful not to damage O-ring fitted in reverse check sleeve.
  - b. 0 to 3 shim(s) are inserted between reverse check sleeve and transfer case. Be careful not to break them.
- 5) Disassembling reverse check sleeve ASSY.



B3-024

Fig. 54

(1) Using a standard screwdriver, remove snap ring (inner 28).

Replace snap ring with a new one if deformed or weakened.

- (2) Remove reverse check plate.
- (3) Take out return reverse spring and reverse check spring.

- (4) Take out reverse check cam.
- (5) Take out reverse accent shaft.
- (6) Remove O-ring (35.4 x 1.5).

## 2. EXTENSION AND TRANSFER GEAR ASSY

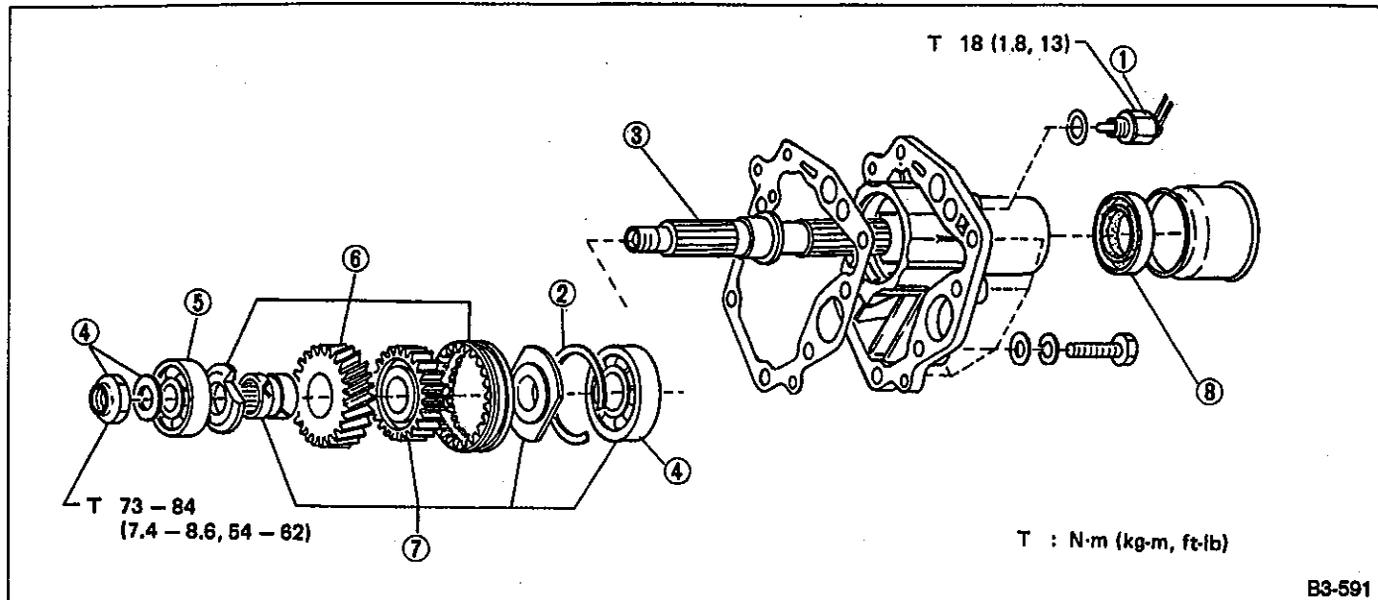


Fig. 55

- 1) Remove 4WD switch ASSY.

Replace aluminum gasket with a new one.

- 2) Using a snap-ring pliers, remove snap ring (Inner-68) from extension.

- 3) Remove rear drive shaft by tapping from the rear with an aluminum bar.

- 4) Put sleeve coupling in drive position, and remove locknut (18 x 10.5) with special tool.

Remove caulking before taking off locknut.

Special tool:

**TOP-THIRD DRIVEN GEAR HOLDER (899884100)**

- 5) Using special tool, remove ball bearing (20 x 52 x 15).

Special tool:

**REMOVER (899864110)**

**REPLACER (398517700)**

- 6) Remove 4th gear thrust washer, transfer driven gear and coupling sleeve from rear drive shaft.

- 7) Using special tool, remove following parts from rear drive shaft.

- Rear shaft driven bushing
- Transfer synchronizer hub
- Rear drive spacer
- Ball bearing (28 x 68 x 18)

Special tool:

**REMOVER (899714110)**

**TRANSMISSION MAIN SHAFT REMOVER (899864110)**

- 8) Remove oil seal.

Do not reuse oil seal.

### C: ASSEMBLY

#### 1. EXTENSION AND TRANSFER GEAR ASSY

- 1) Install oil seal onto the rear of extension CP using special tool.

Special tool:

**INSTALLER (399513600)**

- 2) Install 4WD switch ASSY on extension CP.

Do not forget to install aluminum washer.

- 3) Install ball bearing onto rear drive shaft.

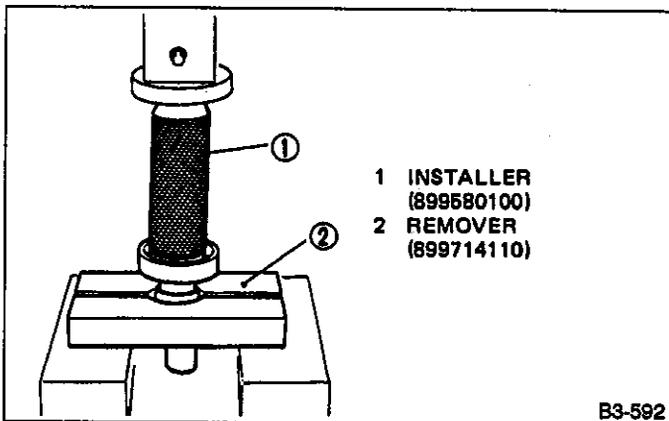


Fig. 56

4) Install rear drive spacer, synchronizer hub and sleeve onto rear drive shaft.

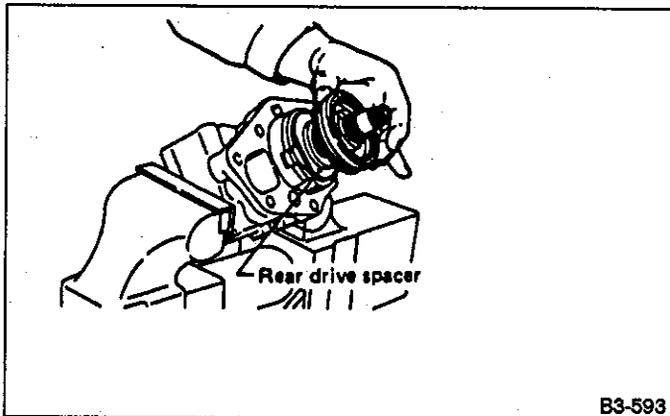


Fig. 57

5) Install transfer driven gear bushing onto rear drive shaft with special tool.

**Special tool:**  
INSTALLER (899874100)  
REMOVER (899714110)

6) Install coupling sleeve, transfer driven gear and thrust washer onto rear drive shaft.

7) Install ball bearing onto rear drive shaft with special tool.

**Special tool:**  
PRESS ASSY (899754110)  
REMOVER (899714110)

8) Shift sleeve to the drive position and tighten lock nut with special tool.

Stake the lock nut at four positions after tightening.

**Special tool:**  
HOLDER (899884100)  
SOCKET WRENCH (899988608)

9) Hammer rear drive shaft into extension with a plastic hammer. And fit snap ring to the groove inside of extension.

## 2. TRANSFER CASE

- 1) Install needle bearing race into bore in transfer case. **Be careful not to damage stopper on transfer case.**
- 2) Install back-up light switch ASSY and neutral switch ASSY on transfer case.

**Tightening torque:**

18 N·m (1.8 kg-m, 13 ft-lb)

a. Some models are not equipped with neutral switch ASSY.

b. Use new aluminum washer.

3) Install oil seal into bore in transfer case using OIL SEAL INSTALLER (498057000).

4) Install oil guide.

**Make sure oil guide is secure and tight.**

5) Assembling reverse check sleeve ASSY.

(1) Install reverse accent shaft, check cam, return spring and check spring onto reverse check sleeve.

**Be sure the bent section of reverse check spring is positioned in the groove in check cam.**

(2) Hook the bent section of reverse check spring over reverse check plate.

(3) Rotate cam so that the protrusion of reverse check cam is at the opening in plate.

(4) With cam held in that position, install plate onto reverse check sleeve and hold with snap ring (Inner-28).

(5) Position O-ring (35.4 x 1.5) in groove in sleeve.

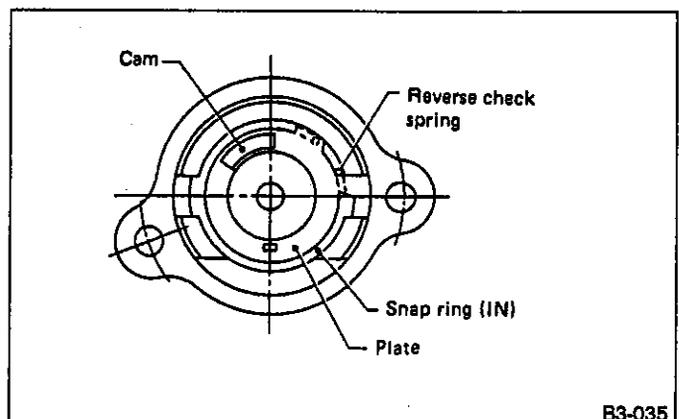


Fig. 58

a. Make sure the cutout section of reverse accent shaft is aligned with the opening in reverse check sleeve.

b. Spin cam by hand for smooth rotation.

If it does not return properly, replace reverse check spring.

c. Move cam and shaft all the way toward plate and release. If cam does not return properly, replace reverse check spring; if shaft does not, check for scratches on the inner surface of sleeve. If sleeve is in good order, replace spring.

d. Select a suitable reverse check plate by referring to "Neutral Position Adjustment".

6) Install reverse check sleeve ASSY onto transfer case and tighten with two bolts & washers.

**Tightening torque:**

10 N·m (1.0 kg-m, 7 ft-lb)

7) Install shifter arm CP into the partition from the front while inserting selector arm into the opening in sleeve ASSY. Pass shaft through hole in selector arm until its end comes out of the rear of transfer case.

Apply a coat of gear oil to shifter arm CP. Also make sure oil seal [18 x 28 x 7 mm (0.71 x 1.10 x 0.28 in)] is positioned properly.

8) Press oil seal [15 x 25 x 2 mm (0.59 x 0.98 x 0.08 in)] completely into the right boss section of transfer case.

9) Press oil seal [13 x 22 x 6 mm (0.51 x 0.87 x 0.24 in)] completely into bore for transfer shifter rod at rear of transfer case.

10) Insert transfer shifter shaft into the right side of transfer case from inside.

## D: INSTALLATION

1) Secure transfer case & shifter ASSY to transmission case with eight bolts.

**Tightening torque:**

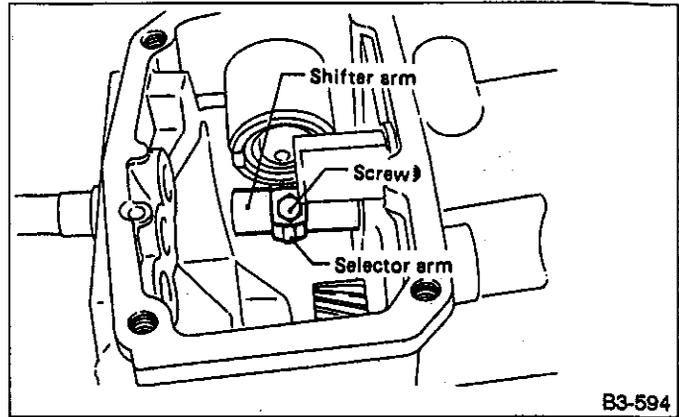
25 N·m (2.5 kg-m, 18 ft-lb)

Be sure gasket is positioned on the rear of the case.

2) Secure selector arm to shifter arm CP with shifter fork screw. Shifter arm CP should be caught by pawl of rod.

**Tightening torque:**

10 N·m (1.0 kg-m, 7 ft-lb)



B3-594

Fig. 59

### 3) Neutral position adjustment

(1) Shift gear into 3rd gear position.

(2) Shifter arm turns lightly toward the 1st/2nd gear side but heavily toward the reverse gear side because of the function of the return spring, until arm contacts the stopper.

(3) Make adjustment so that the heavy stroke (reverse side) is a little more than the light stroke (1st/2nd side).

(4) To adjust, remove bolts holding reverse check sleeve ASSY to the case, move sleeve ASSY outward, and place adjustment shim (0 to 1 ea.) between sleeve ASSY and case to adjust the clearance.

Be careful not to break O-ring when placing shim(s).

Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

• When shim is removed, the neutral position will move closer to reverse; when shim is added, the neutral position will move closer to 1st gear.

• If shims alone cannot adjust the clearance, replace reverse accent shaft and re-adjust.

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA020	A	Neutral position is closer to 1st gear.
32188AA002	No mark	Standard
32188AA030	C	Neutral position is closer to reverse gear.

### 4) Reverse check plate adjustment.

Shift shifter arm CP to "5th" and then to reverse to see if reverse check mechanism operate properly. Also check to see if arm returns to Neutral when released from the reverse position. If arm does not return prop

erly, replace reverse check plate.

Reverse check plate			
Part No.	No.	Angle $\theta$	Remarks
32189AA000	0	28°	Arm stops closer to "5th".
32189AA010	1	31°	Arm stops closer to "5th".
32189AA020	2	34°	Standard
32189AA030	3	37°	Arm stops closer to reverse.
32189AA040	4	40°	Arm stops closer to reverse.

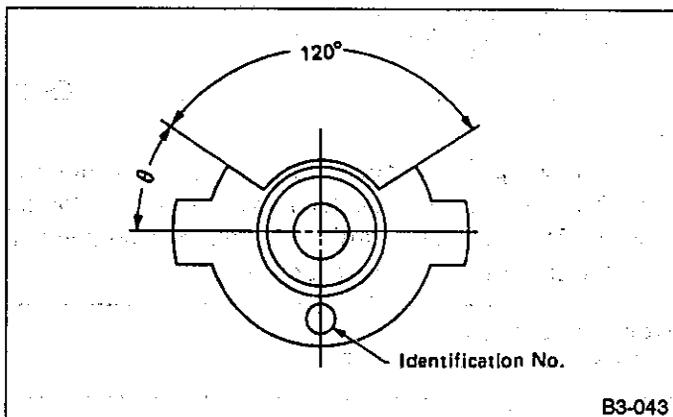


Fig. 60

5) Install ball (7.1438), reverse accent spring, aluminum gasket and plug in that order.

Use new aluminum gasket.

Tightening torque:

10 N·m (1.0 kg-m, 7 ft-lb)

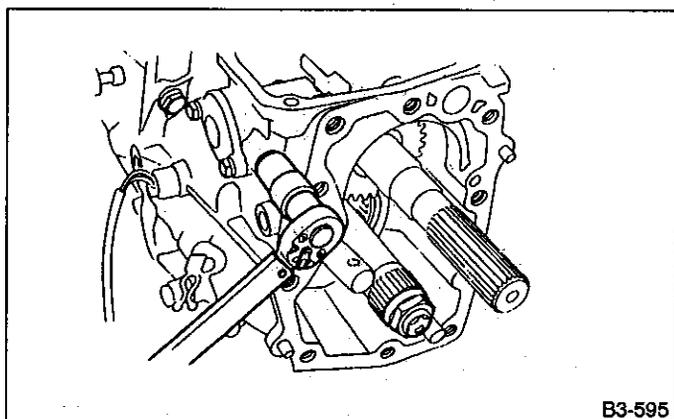


Fig. 61

6) Install extension with transfer gasket and tighten bolts.

Tightening torque:

34 — 40 N·m

(3.5 — 4.1 kg-m, 25 — 30 ft-lb)

While installing, the gears (transfer drive and driven) should engage each other.

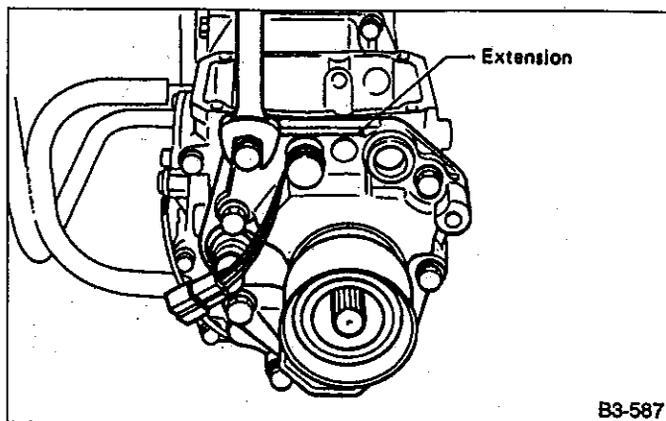


Fig. 62

7) Install transfer shifter fork to coupling sleeve and align the cutout section of fork with arm of transfer shifter shaft.

Apply a coat of oil to nylon pawl of fork.

8) Install checking ball spring and ball (6.35) in transfer case.

Be careful not to drop ball and spring into transfer case.

9) Installing transfer shifted rod

(1) Insert transfer shifter rod into bore in the upper center of extension with the cutout section facing the front.

(2) Pass it through transfer shifter fork while positioning ball and spring in the hole at the center of transfer case.

(3) Align the hole in transfer shifter fork with that in shifter rod and drive spring pin (5 x 25) into the holes.

a. Be sure each end of spring pin protrudes slightly beyond the holes when installing.

b. Position ball with the cutout section of shifter rod facing down. Be careful not to drop the ball.

c. To avoid scratching oil seal, apply a coat of oil to shifter rod before installing.

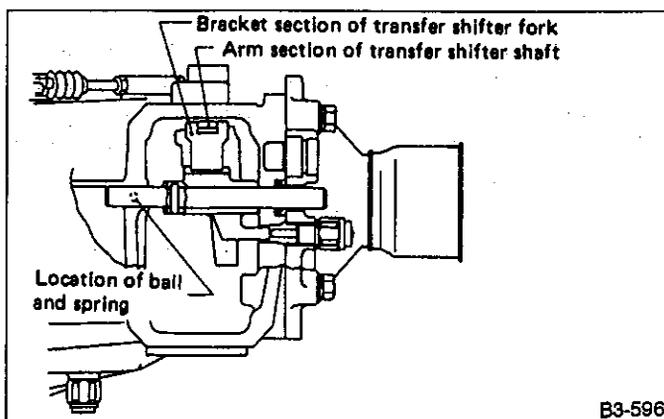
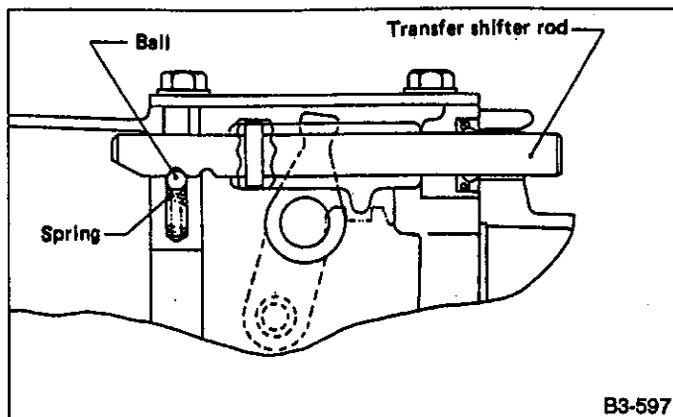


Fig. 63

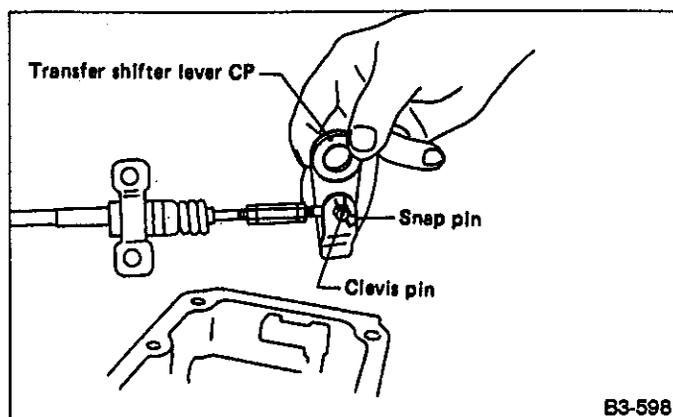


B3-597

Fig. 64

#### 10) Installing actuator & cable ASSY

- (1) Connect the end of cable and shifter lever with an 8-mm clevis pin and secure with a snap pin.



B3-598

Fig. 65

- (2) Secure actuator to the left side of transmission case with three 8-mm bolts & washers. Secure cable plate to transfer case with two 8-mm bolts & washers. All bolts should be tightened to the specified torque.

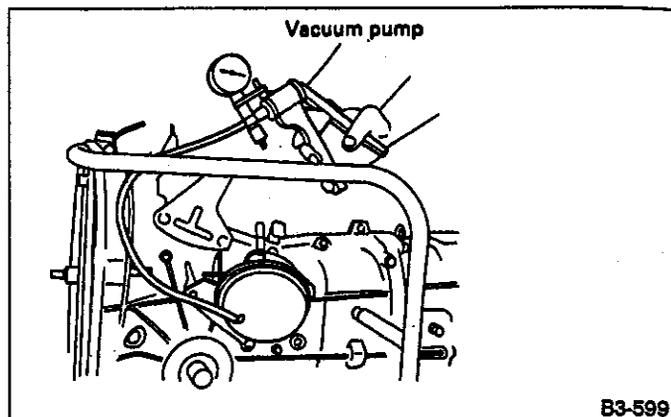
#### Tightening torque:

16 N•m (1.6 kg-m, 12 ft-lb)

#### 11) Adjustment of cable

- (1) Connect transfer shifter lever to transfer shifter shaft. Align the hole in transfer shifter lever with that in shifter shaft and drive spring pin into the holes.  
 (2) Connect a hose to pipe on the outside of actuator and apply vacuum pressure until cable is shortened as much as possible.

Use a vacuum pump or intake manifold to create vacuum.



B3-599

Fig. 66

- (3) While applying vacuum pressure, turn turnbuckle in the direction that shortens cable until it no longer turns. Then, back off turnbuckle 180° and tighten two lock nuts to the specified torque.

#### Tightening torque:

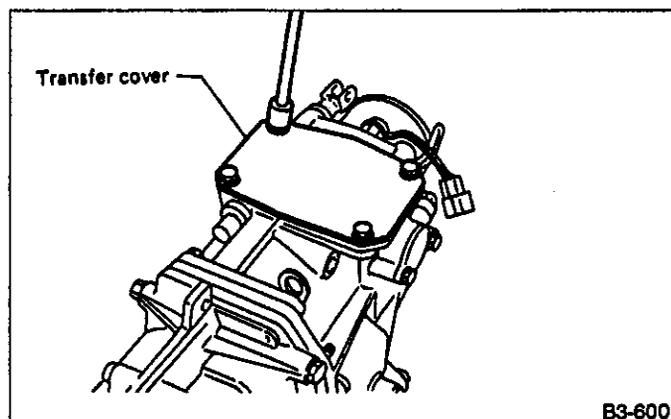
5 N•m (0.5 kg-m, 3.6 ft-lb)

- (4) Operate actuator to ensure that shifting from front-wheel drive to 4-wheel drive is smooth.

#### 12) Install transfer cover with gasket and tighten bolts.

#### Tightening torque:

15 — 18 N•m (1.5 — 1.8 kg-m, 11 — 13 ft-lb)



B3-600

Fig. 67

- 13) Connect transmission cord connectors.

## 4. Rear Case (FWD)

### A: DISASSEMBLY

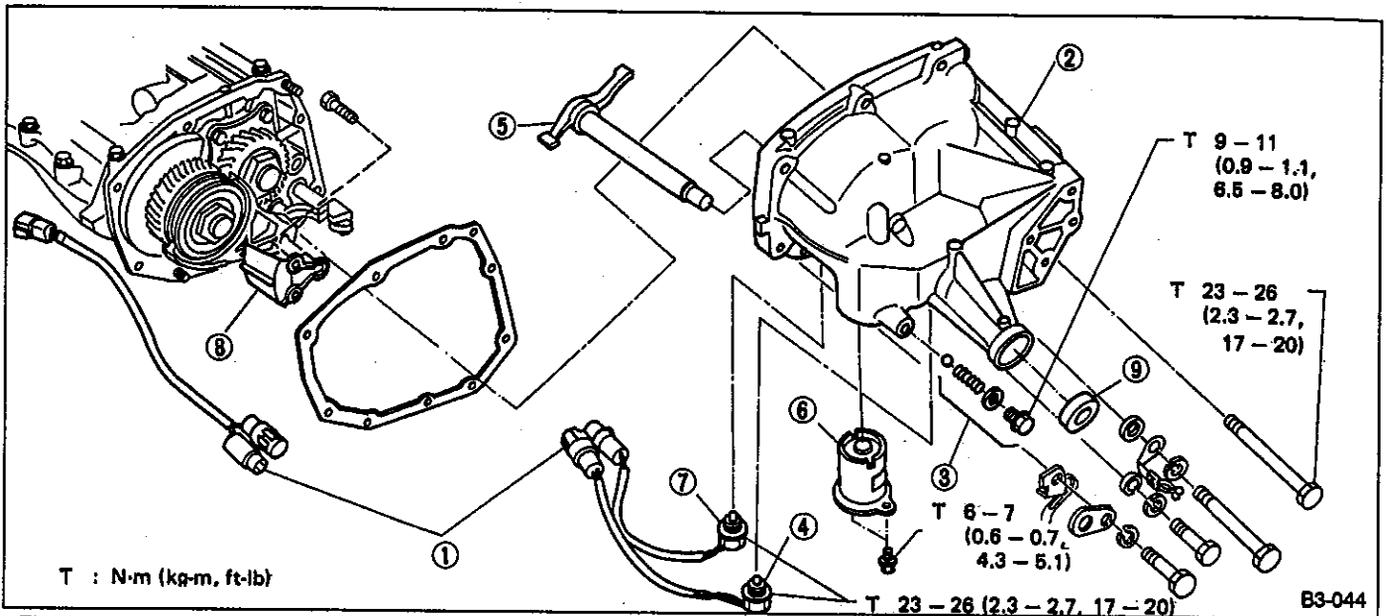


Fig. 68

- 1) Disconnect each connector of transmission cord.
- 2) Remove rear case.
- 3) Remove plug, spring and reverse check ball.
- 4) Remove neutral switch.
- 5) Pull out shifter arm and selector arm.
- 6) Remove reverse checking sleeve.

Procedure for disassembly is as follows:

- Reverse check sleeve ASSY uses an O-ring which should not be scratched.
- Be careful not to break adjustment shim placed between reverse check sleeve ASSY and case.

- (2) Remove reverse checking plate.
  - (3) Remove reverse checking spring with cam.
  - (4) Remove reverse return spring.
  - (5) Remove reverse accent shaft.
  - (6) Remove O-ring.
  - 7) Remove back-up light switch.
  - 8) Remove oil guide.
  - 9) Removal of oil seal.
- Do not reuse oil seal.

### B: ASSEMBLY

Assembly of rear case is in the reverse order of disassembly. Observe the following.

- 1) Assembly of reverse checking sleeve.
  - (1) Install reverse accent shaft, checking cam, return spring and checking spring onto reverse checking sleeve.

Be sure the bent section of reverse checking spring is positioned in the groove in checking cam.

- (2) Hook the bent section of reverse checking spring over reverse check plate.
- (3) Rotate cam so that the protrusion of reverse checking cam is at the opening in plate.
- (4) With cam held in that position, install plate onto reverse checking sleeve and hold with snap ring (Inner-28).
- (5) Position O-ring (35.4 x 1.5) in groove in sleeve.

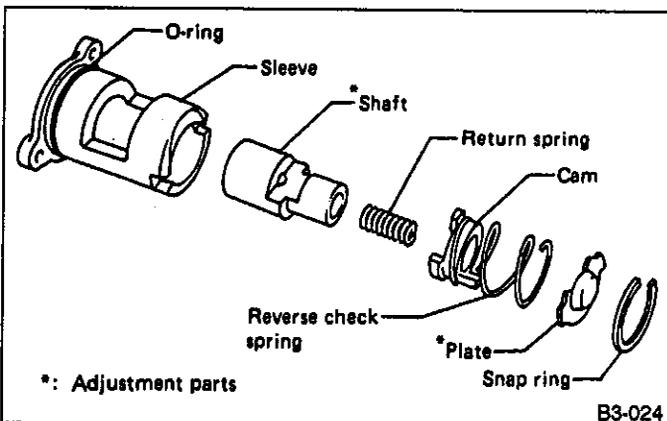


Fig. 69

- (1) Using a standard screwdriver, remove snap ring (inner 28).

Replace snap ring a new one if deformed or weakened.

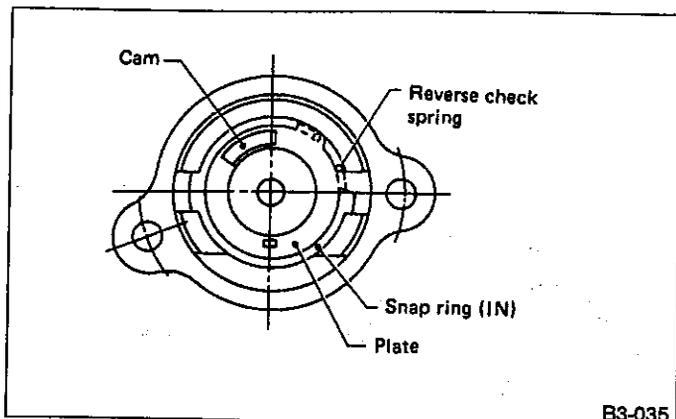


Fig. 70

a. Make sure the cutout section of reverse accent shaft is aligned with the opening in reverse checking sleeve.

b. Spin cam by hand for smooth rotation.

If it does not return properly, replace reverse checking spring.

c. Move cam and shaft all the way toward plate and release.

If cam does not return properly, replace reverse checking spring; if shaft does not, check for scratches on the inner surface of sleeve. If sleeve is in good order, replace spring.

d. Select a suitable reverse accent shaft and reverse check plate by referring to "Neutral Position Adjustment."

2) Installation of shifter arm and selector arm.

Install shifter arm into the partition from the front while inserting selector arm into the opening in reverse checking sleeve. Pass shaft through hole in selector arm until its end comes out of the rear of transfer case.

Apply a coat of gear oil to shifter arm CP. Also make sure oil seal is positioned properly.

3) Adjustment of neutral position.

After assembling and installing rear case, adjust neutral position.

(1) Shift gear into 3rd gear position.

(2) Shifter arm turns lightly toward the 1st/2nd gear side but heavily toward the reverse gear side because of the function of the return spring, until arm contacts the stopper.

(3) Make adjustment so that the heavy stroke (reverse side) is a little more than the light stroke (1st/2nd side).

(4) To adjust, remove bolts holding reverse check sleeve ASSY to the case, move sleeve ASSY outward, and place adjustment shim (0 to 1 ea.) between sleeve ASSY and case to adjust the clearance.

Be careful not to break O-ring when placing shim(s).

Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

• When shim is removed, the neutral position will move closer to reverse; when shim is added, the neutral position will move closer to 1st gear.

• If shims alone cannot adjust the clearance, replace reverse accent shaft and re-adjust.

Reverse accent shaft (2000*2200cc FWD)		
Part No.	Mark	Remarks
32188AA020	A	Neutral position is closer to 1st gear.
32188AA002	No mark or B	Standard
32188AA030	C	Neutral position is closer to reverse gear.

Reverse accent shaft (1600*1800cc FWD)		
Part No.	Mark	Remarks
32188AA040	1	Neutral position is closer to 1st gear.
32188AA011	2	Standard
32188AA050	3	Neutral position is closer to reverse gear.

4) Reverse checking plate adjustment.

After assembling and installing rear case, adjust reverse checking plate.

Shift shifter arm CP to "5th" and then to reverse to see if reverse checking mechanism operates properly. Also check to see if arm returns to Neutral when released from the reverse position. If arm does not return properly, replace reverse checking plate.

Reverse checking plate			
Part No.	No.	Angle $\theta$	Remarks
32189AA000	0	28°	Arm stops closer to "5th".
32189AA010	1	31°	Arm stops closer to "5th".
32189AA020	2	34°	Standard
32189AA030	3	37°	Arm stops closer to reverse.
32189AA040	4	40°	Arm stops closer to reverse.

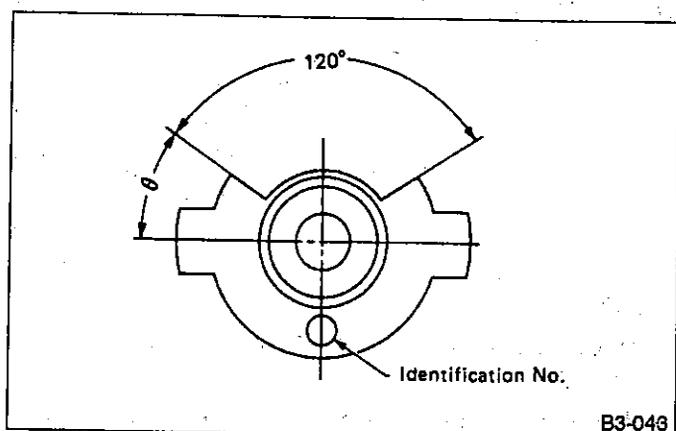
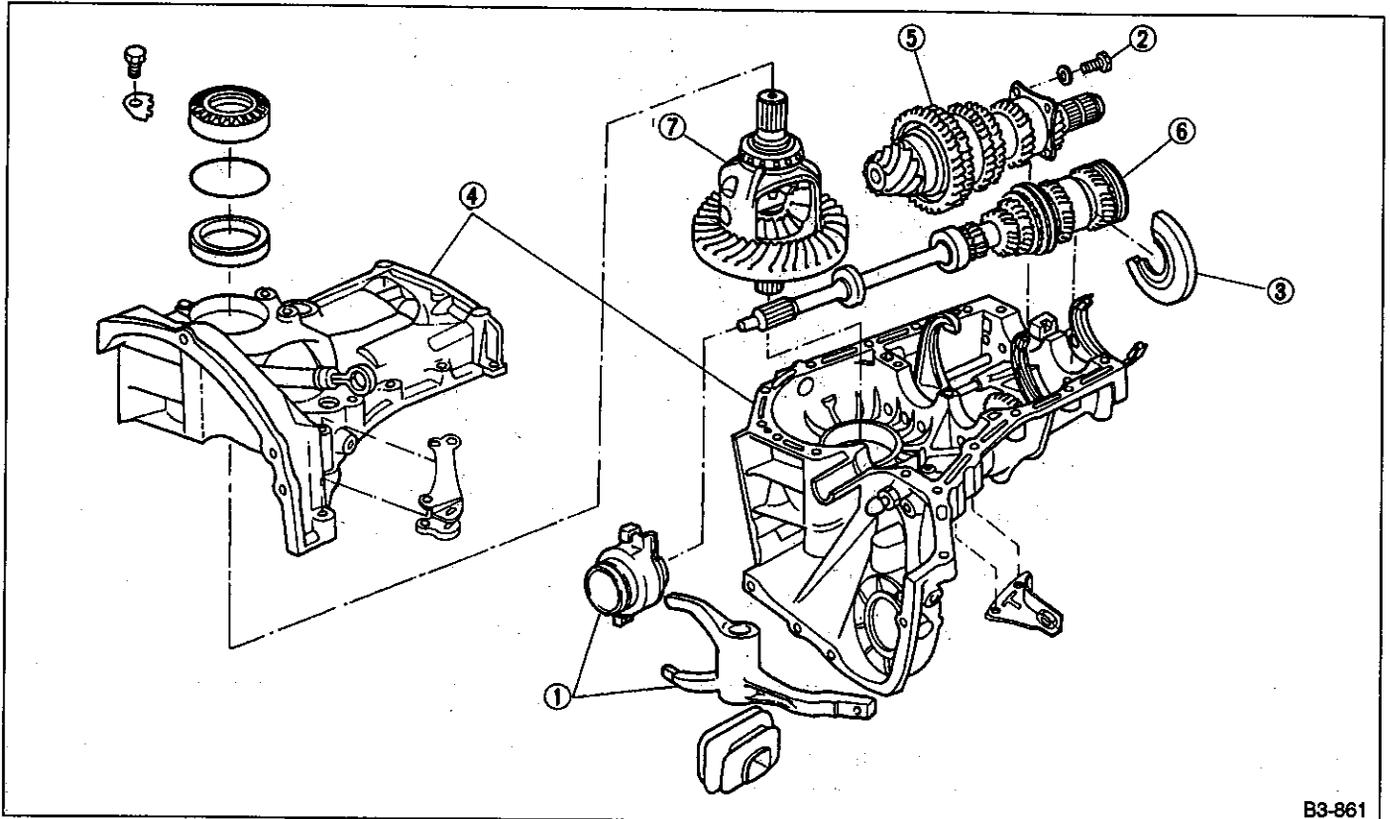


Fig. 71

## 5. Transmission Case (4WD Single-range and 2000-2200cc FWD)

### A: DISASSEMBLY

#### 1. SEPARATION OF TRANSMISSION



B3-861

Fig. 72

- 1) Remove clutch release lever and bearing. (Refer to 2-10 clutch.)
- 2) Remove bearing mounting bolts.
- 3) Remove main shaft rear plate.
- 4) Separating transmission case.

(1) Put vinyl tape around splines of right and left axle drive shafts to prevent damage to oil seals.

(2) Separate transmission case into right and left cases by loosening seventeen coupling bolts and nuts.

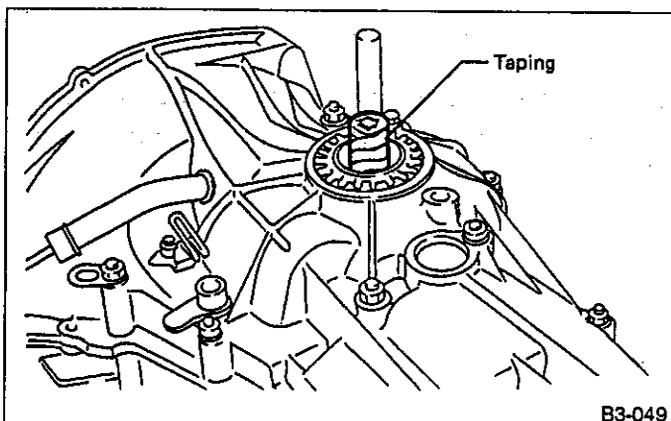
5) Remove drive pinion shaft ASSY from LH transmission case.

**Use a hammer handle, etc. to remove if too tight.**

- 6) Remove main shaft ASSY.
- 7) Remove differential ASSY.

a. Be careful not to confuse right and left roller bearing outer races.

b. Be careful not to damage retainer oil seal.



B3-049

Fig. 73

## 2. TRANSMISSION CASE

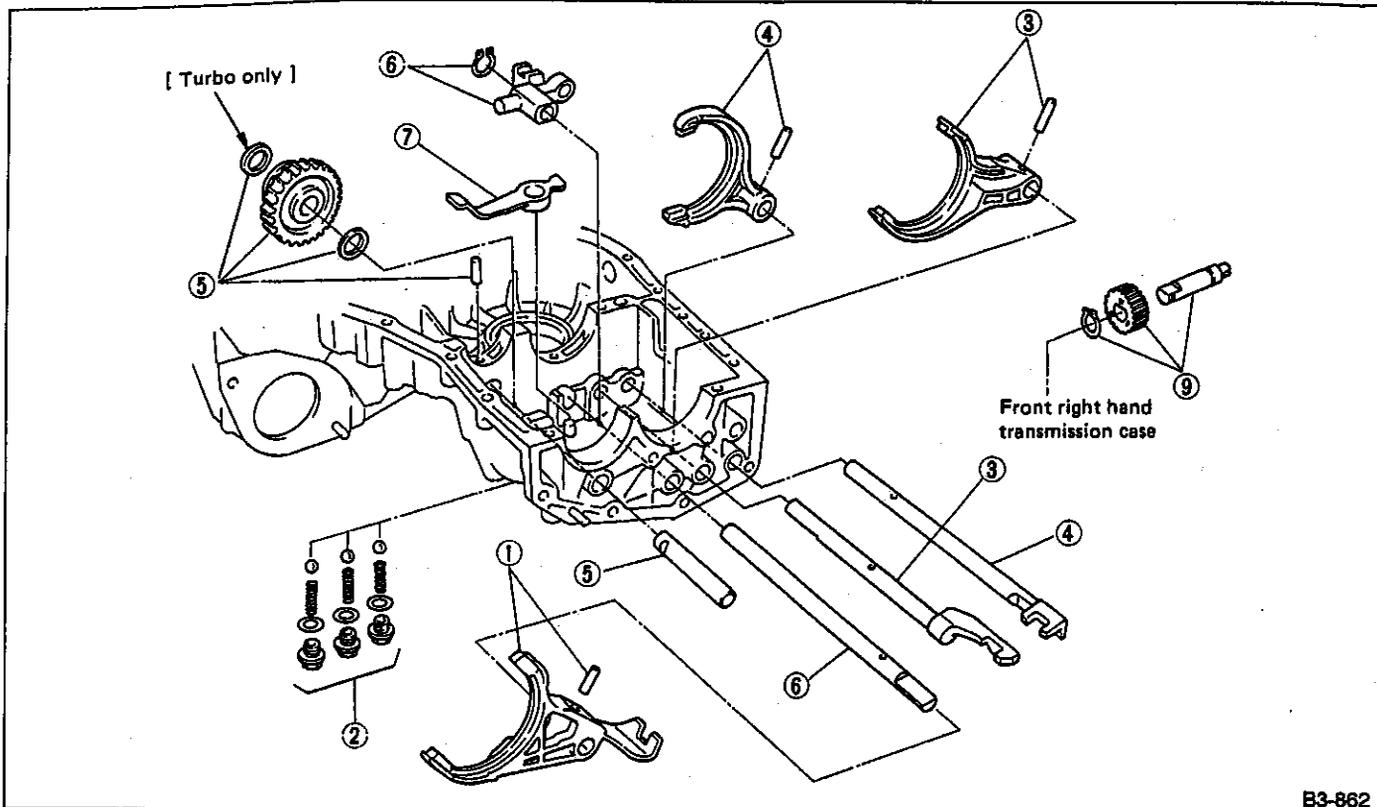


Fig. 74

- 1) Drive out spring pin, and remove 5th shifter fork.

**Special tool:**

**STRAIGHT PIN REMOVER 2: 398791700**

- 2) Remove plugs, springs and checking balls.
- 3) Drive out spring pin, and pull out 3-4 fork rod and shifter fork.

**When removing rod, keep other rods in neutral. Also, when pulling out spring pin, remove it toward inside of case so that it may not hit against case.**

- 4) Drive out spring pin, and pull out 1-2 fork rod and shifter fork.
- 5) Pull out straight pin, and remove idler gear shaft, reverse idler gear and washer.
- 6) Remove outer snap ring, and pull out reverse shifter rod arm from reverse fork rod. Then take out ball, spring and interlock plunger from rod. And then remove rod.

**When pulling out reverse shifter rod arm, be careful not to let ball pop out of arm.**

- 7) Remove reverse shifter lever.
- 8) Remove differential side retainers.

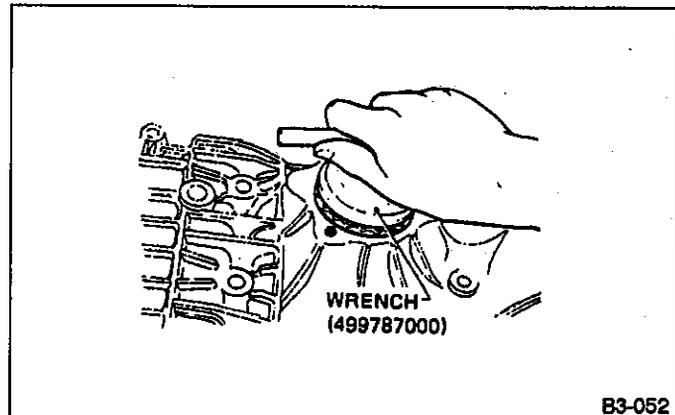


Fig. 75

- 9) Remove vehicle speed sensor 2. (TURBO only)
- 10) Remove outer snap ring and pull out speedometer driven gear. Next, remove speedometer shaft and washer.

**B: ASSEMBLY**

**1. TRANSMISSION CASE**

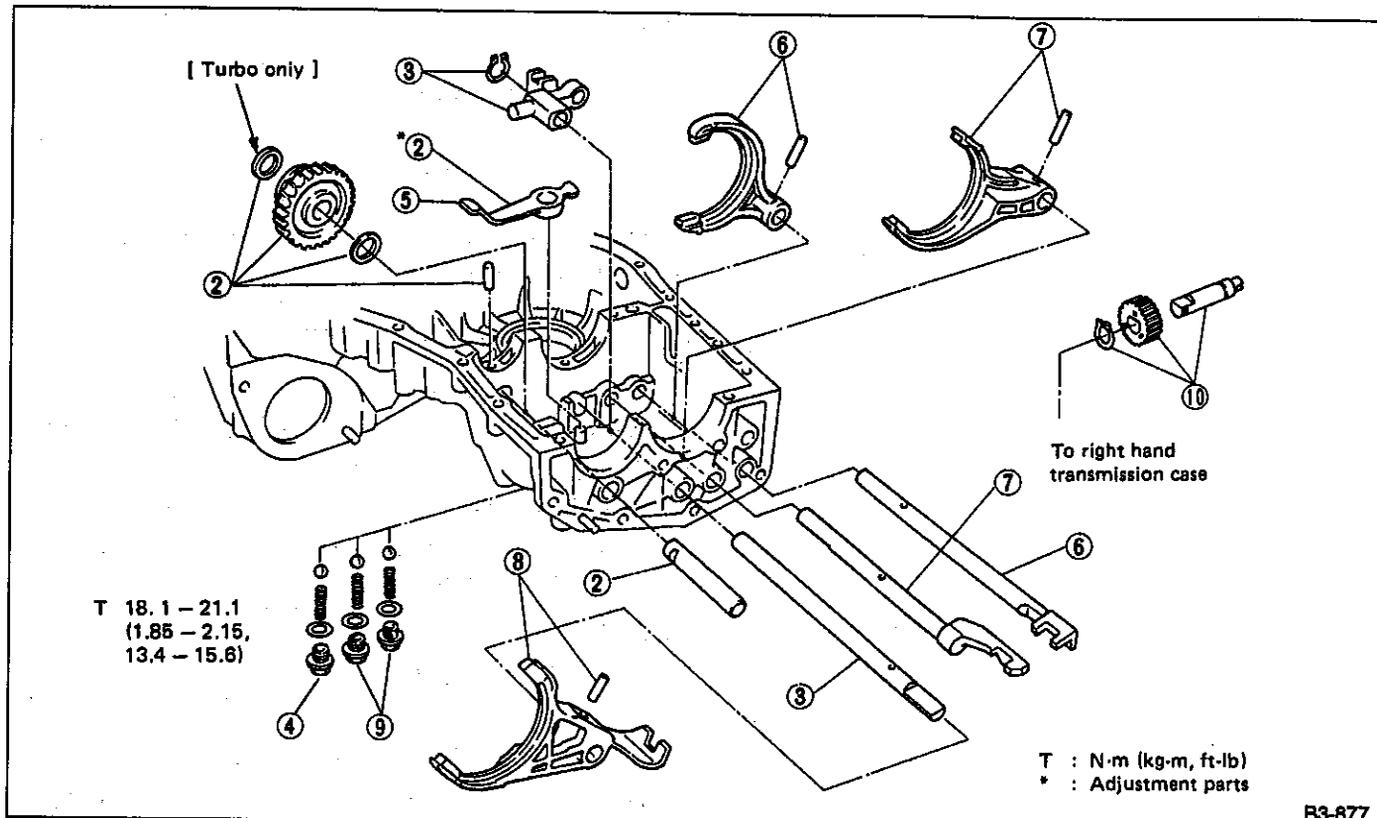


Fig. 76

- 1) Position interlock plungers (5.56 x 19.6), one plunger in hole between 1-2 and 3-4 fork rod holes, and one plunger in hole between 3-4 and reverse fork rod holes.
- 2) Install reverse shifter lever, reverse idler gear and reverse idler gear shaft, and secure with straight pin.

a. Be sure to install reverse idler shaft from the rear side.

b. On turbo model, there is a washer on the front side of reverse idler gear, too.

- 3) Install reverse arm fork spring, ball and interlock plunger (5.56 x 19.6) to reverse fork rod arm. Insert reverse fork rod into hole in reverse fork rod arm, and hold it with outer snap ring using special tool.

Apply grease to plunger to prevent it from falling.

**Special tool:**

**ACCENT BALL INSTALLER (399411700)**

- 4) Position ball (7.1438), spring and gasket in reverse shifter rod hole, on L.H. transmission case, and tighten checking ball plug.

Replace gasket with a new one.

- 5) Adjustment of reverse idler gear position.

- (1) Move reverse shifter rod toward REV side. Adjust clearance between reverse idler gear and transmission case wall, using reverse shifter lever.

**Clearance:**

6.0 — 7.5 mm (0.236 — 0.295 in)

Reverse shifter lever		
Part No.	No.	Remarks
32820AA000	0	Further from case wall.
32820AA010	—	Standard
32820AA020	2	Closer to case wall.

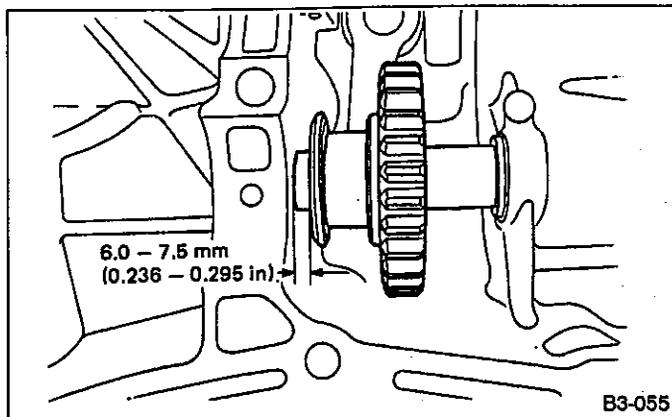


Fig. 77

(2) After installing a suitable reverse shifter lever, shift into Neutral. Adjust clearance between reverse idler gear and transmission case wall, using washer(s).

**Clearance:**

0 — 0.5 mm (0 — 0.020 in)

Washer (20.5 x 26 x t)	
Part No.	Thickness mm (in)
803020151	0.4 (0.016)
803020152	1.1 (0.043)
803020153	1.5 (0.059)
803020154	1.9 (0.075)
803020155	2.3 (0.091)

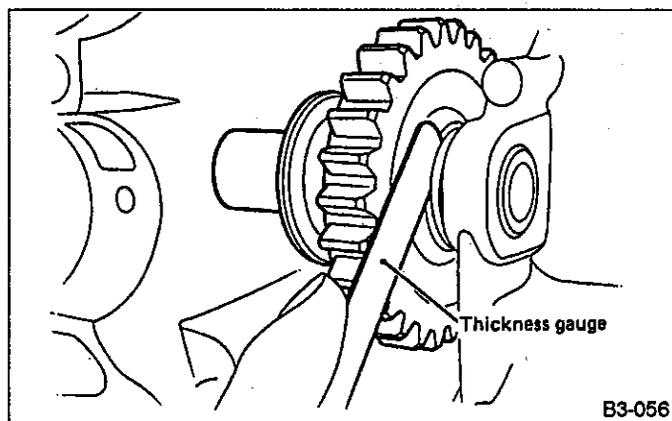


Fig. 78

## 6) Installation of 1-2 shifter fork and rod.

(1) Install 1-2 fork rod into 1-2 shifter fork via the hole on the rear of transmission case.

(2) Align the holes in rod and fork, and drive straight pin (6 x 22) into these holes using STRAIGHT PIN REMOVER (398791600).

a. Set other rods to Neutral.

b. Make sure interlock plunger (5.56 x 19.6) is on the 3-4 fork rod side.

## 7) Installation of 3-4 shifter fork and rod.

(1) Install interlock plunger (3 x 11.9) onto 3-4 fork rod.

Apply a coat of grease to plunger to prevent it from falling.

(2) Install 3-4 fork rod into 3-4 shifter fork via the hole on the rear of transmission case.

(3) Align the holes in rod and fork, and drive straight pin (6 x 22) into these holes.

a. Set reverse fork rod to Neutral.

b. Make sure interlock plunger (installed before) is on the reverse fork rod side.

8) Install 5th shifter fork onto the rear of reverse fork rod. Align holes in the two parts and drive straight pin into place.

9) Position balls (7.1438 mm dia.), checking ball springs and gaskets into 3-4 and 1-2 rod holes, and install plugs.

Replace gasket with a new one.

## 10) Installation of speedometer driven gear.

(1) Install washer and speedometer shaft, and press fit oil seal with special tool.

**Special tool:**

PRESS (899824100) or (499827000)

Use new oil seal, if it has been removed.

(2) Install speedometer driven gear and snap ring.

(3) Install vehicle speed sensor 2. (TURBO only)

Use new vehicle speed sensor 2, if it has been removed. (TURBO only)

2. COMBINATION OF TRANSMISSION CASE

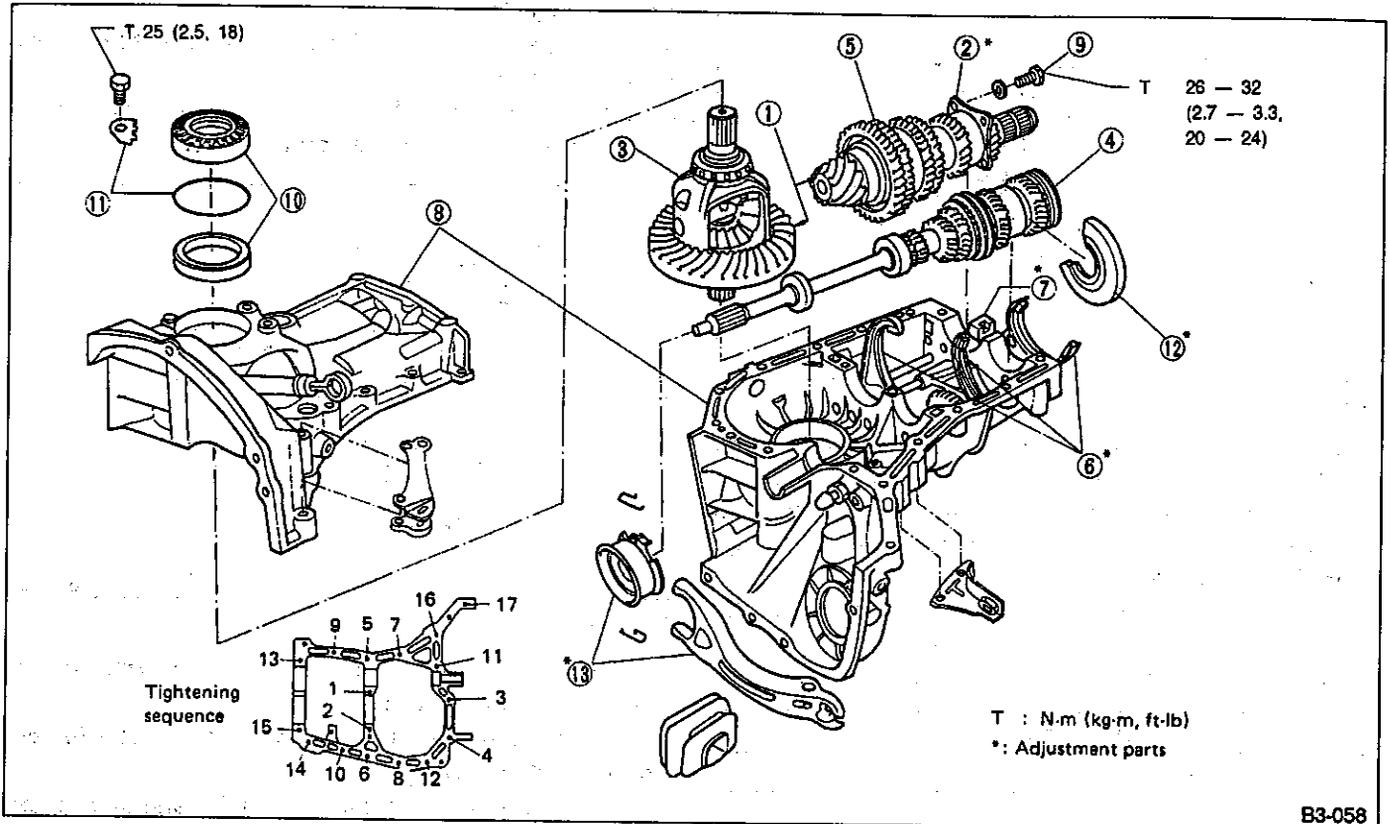


Fig. 79

1) Alignment marks/figures on hypoid gear set  
 The upper figure on driven pinion is the match number for combining it with crown gear. The lower figure is for shim adjustment. If no lower figure is shown, the value is zero. The figure on crown gear indicates a number for combination with drive pinion.

(2) Inspection and adjustment of GAUGE ASSY (499917500).  
 a. Loosen the two bolts and adjust so that the scale indicates 0.5 correctly when the plate end and the scale end are on the same level.  
 b. Tighten two bolts.

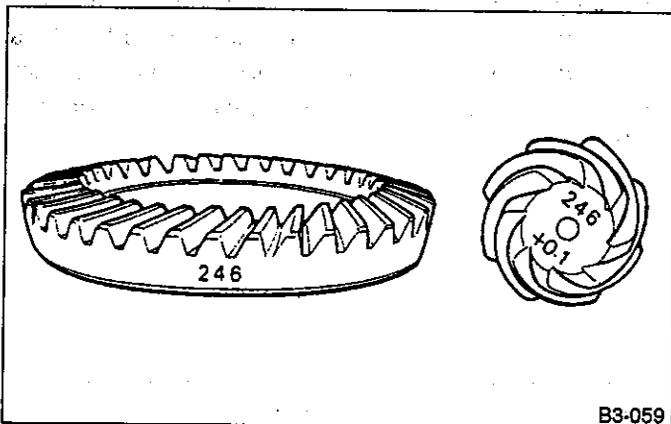


Fig. 80

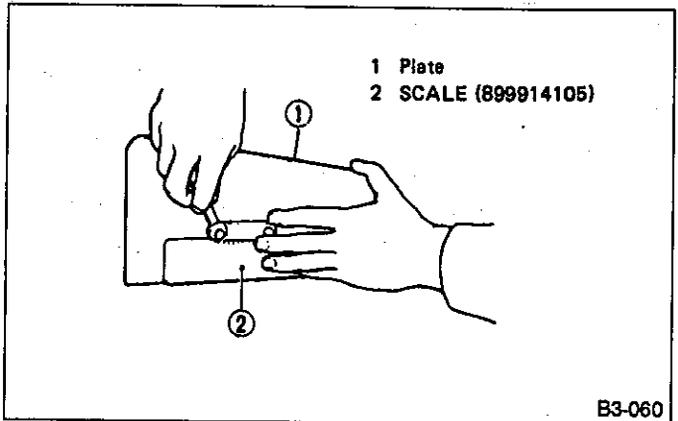


Fig. 81

2) Adjustment of drive pinion shim  
 (1) Place drive pinion shaft ASSY on right hand transmission main case without shim and tighten bearing mounting bolts.

(3) Position the gauge by inserting the knock pin of gauge into the knock hole in the transmission case.  
 (4) Slide the drive pinion gauge scale with finger tip and read the value at the point where it matches with the end face of drive pinion.

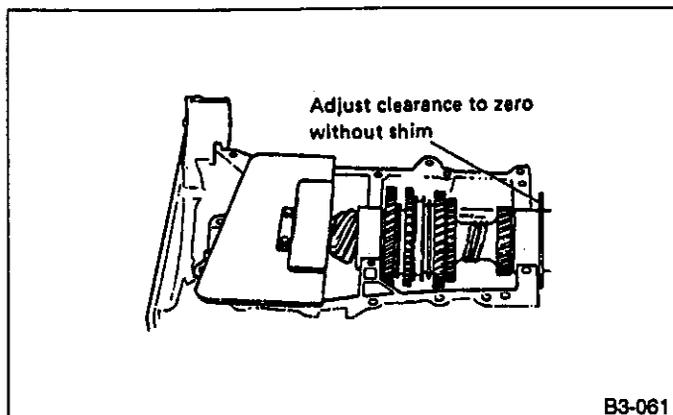


Fig. 82

(5) The thickness of shim shall be determined by adding the value indicated on drive pinion to the value indicated on the gauge. (Add if the figure on drive pinion is prefixed by + and subtract if the figure is prefixed by —.)

Select one to three shims from the next table for the value determined as described above and take a shim thickness which is closest to the said value.

Drive pinion shim	
Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)
32295AA041	0.175 (0.0069)
32295AA051	0.200 (0.0079)
32295AA061	0.225 (0.0089)
32295AA071	0.250 (0.0098)
32295AA081	0.275 (0.0108)
32295AA091	0.300 (0.0118)
32295AA101	0.500 (0.0197)

3) Install differential ASSY on left hand transmission case.

a. Wrap the left and right splined sections of axle shaft with vinyl tape to prevent scratches.

b. Be careful not to fold the sealing lip of oil seal.

4) Install needle bearing and oil seal onto the front of transmission main shaft ASSY, and position in LH transmission case.

a. Wrap clutch splined section with vinyl tape to prevent damage to oil seal.

b. Apply grease (Unilube #2 or equivalent) to the sealing lip of oil seal.

c. Align the end face of seal with surface A of LH transmission main case when installing oil seal.

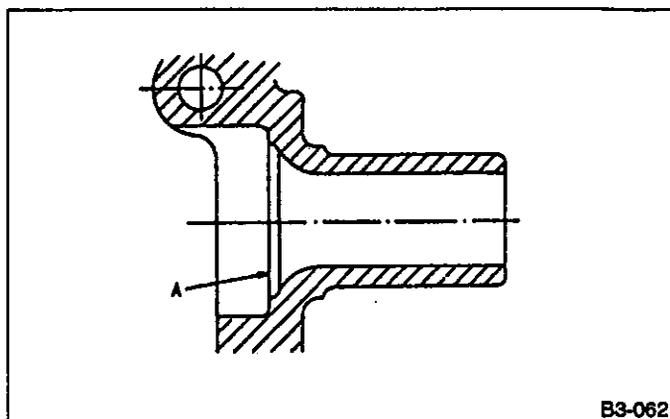


Fig. 83

d. Be careful not to drop oil seal when installing RH transmission main case.

e. Make sure straight pin is positioned in hole in needle bearing's outer race.

5) Install drive pinion shaft ASSY with shims selected before into transmission case.

Ensure that the knock pin of the case is fitted into the hole in the bearing outer race.

6) Selection of suitable 1st-2nd, 3rd-4th and 5th shifter fork CP's.

Set transmission main shaft ASSY and drive pinion shaft ASSY in position (so there is no clearance between the two when moved all the way to the front). Select suitable 1st-2nd, 3rd-4th and 5th shifter fork CP's so that coupling sleeve and reverse driven gear are positioned in the center of their synchronizing mechanisms.

1st-2nd shifter fork CP			3rd-4th shifter fork CP			5th shifter fork CP		
Part No.	No.	Remarks	Part No.	No.	Remarks	Part No.	No.	Remarks
32804AA060	1	Moves 0.2 mm (0.008 in) closer to 1st gear	32810AA060	1	Moves 0.2 mm (0.008 in) closer to 4th gear	32812AA060	1	Moves 0.2 mm (0.008 in) closer to 5th gear
32804AA070	—	Positions in the center	32810AA070	—	Positions in the center	32812AA070	—	Positions in the center
32804AA080	3	Moves 0.2 mm (0.008 in) closer to 2nd gear	32810AA100	3	Moves 0.2 mm (0.008 in) closer to 3rd gear	32812AA100	3	Moves 0.2 mm (0.008 in) further from 5th gear

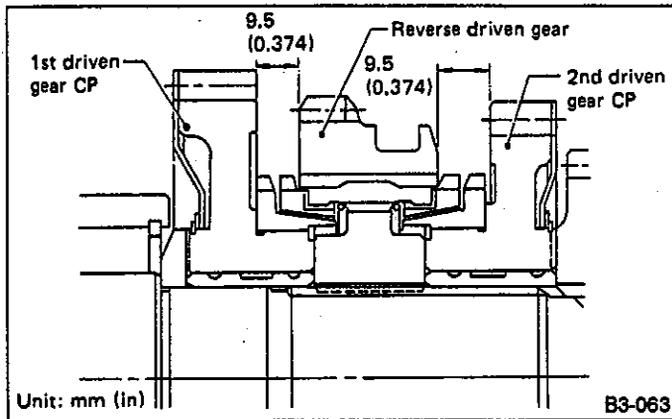


Fig. 84

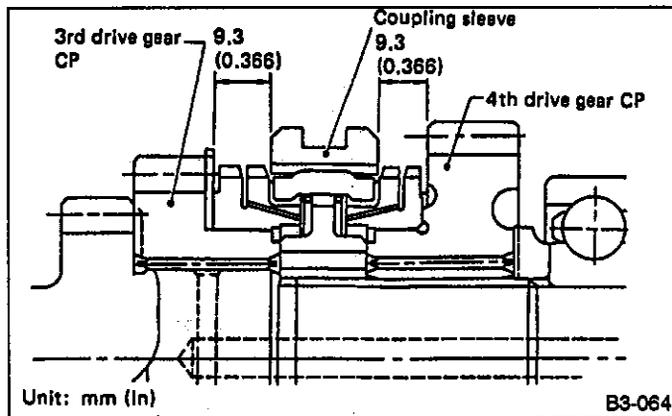


Fig. 85

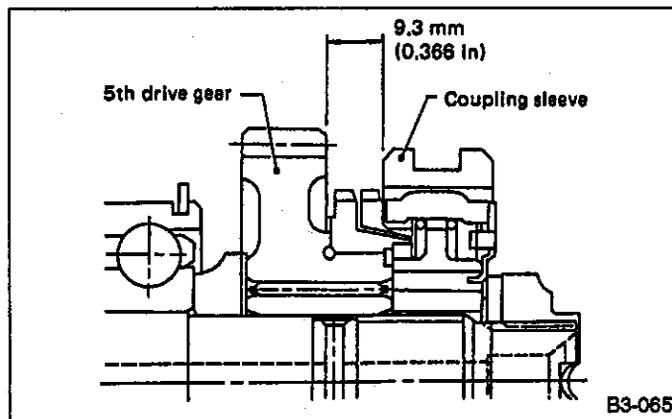


Fig. 86

7) Inspection of rod end clearance.  
Measure rod end clearances A and B. If any clearance is not within specifications, replace rod or fork as required.

A: 1st-2nd to 3rd-4th	0.5 — 1.5 mm (0.020 — 0.059 in)
B: 3rd-4th to 5th	0.6 — 1.4 mm (0.024 — 0.055 in)

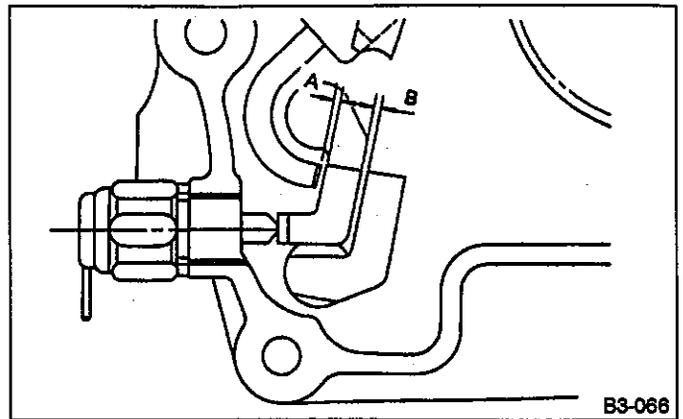


Fig. 87

8) Combination of transmission case.

(1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline, and apply liquid gasket, and then put case right hand and left hand together.

**Liquid gasket:**

**Three-bond 1215 or equivalent**

(2) Tighten 17 bolts with bracket, clip, etc. in the following sequence.

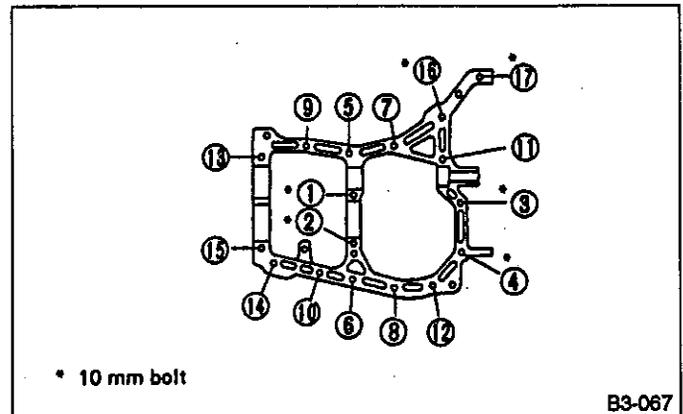


Fig. 88

**Tightening torque:**

**8 mm bolt**

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

**10 mm bolt**

36 — 42 N·m (3.7 — 4.3 kg-m, 27 — 31 ft-lb)

a. Insert bolts from the bottom and tighten nuts at the top.

b. Put cases together so that drive pinion shim and input shaft holder shim are not caught up in between.

c. Confirm that counter gear and speedometer gear are meshed, and high-low shifter shaft is inserted perfectly.

9) Tighten ball bearing attachment bolts.

10) Backlash adjustment of hypoid gear and preload adjustment of roller bearing.

Support drive pinion ASSY with special tool. [Full-time 4WD only]

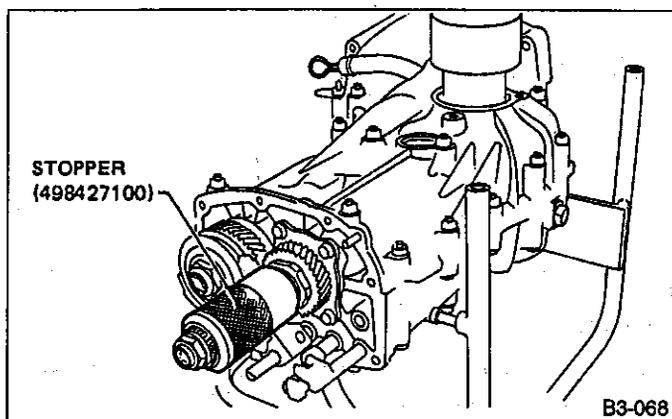


Fig. 89

(1) Place the transmission with case left hand facing downward and put WEIGHT on bearing cup.

(2) Screw retainer ASSY into case left hand from the bottom with WRENCH. Fit HANDLE on the transmission main shaft. Shift gear into 4th or 5th and turn the shaft several times. Screw in the retainer while turning HANDLE until a slight resistance is felt on WRENCH.

This is the contact point of hypoid gear and drive pinion shaft. Repeat the above sequence several times to ensure the contact point.

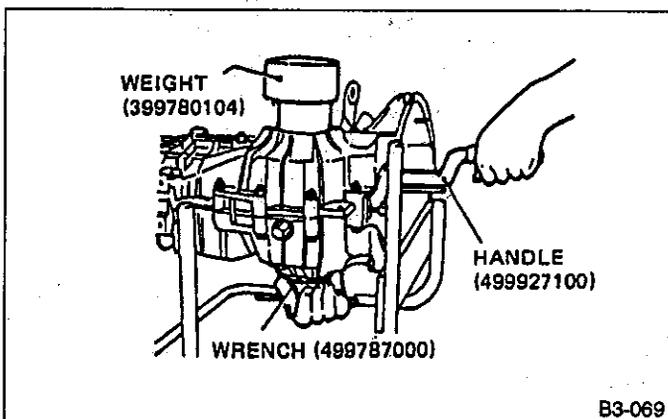


Fig. 90

(3) Remove weight and screw in retainer without O-ring on the upper side and stop at the point where slight resistance is felt.

At this point, the backlash between the hypoid gear and drive pinion shaft is zero.

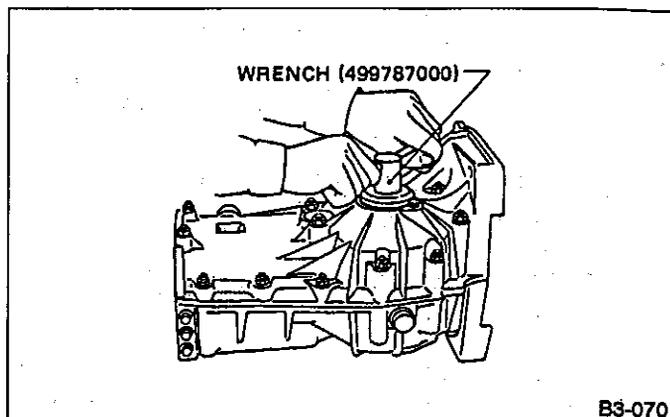


Fig. 91

(4) Fit lock plate. Loosen the retainer on the lower side by 1-1/2 notches of lock plate and turn in the retainer on the upper side by the same amount in order to obtain the backlash.

The notch on the lock plate moves by 1/2 notch if the plate is turned upside down.

(5) Turn in the retainer on the upper side additionally by 1 notch in order to apply preload on taper roller bearing.

(6) Tighten temporarily both the upper and lower lock plates and mark both holder and lock plate for later readjustment.

(7) Turn transmission main shaft dozens of turns while tapping around retainer lightly with plastic hammer.

(8) Set DIAL GAUGE and MAGNET BASE. Insert the needle through transmission oil drain plug hole so that the needle comes in contact with the tooth surface at a right angle and check the backlash.

#### Backlash:

0.13 — 0.18 mm (0.0051 — 0.0071 in)

a) If backlash outside specified range, adjust it by turning holder in RH case.

b) Turning holder pawl 1/2 rotation changes backlash by approximately 0.04 mm (0.0016 in).

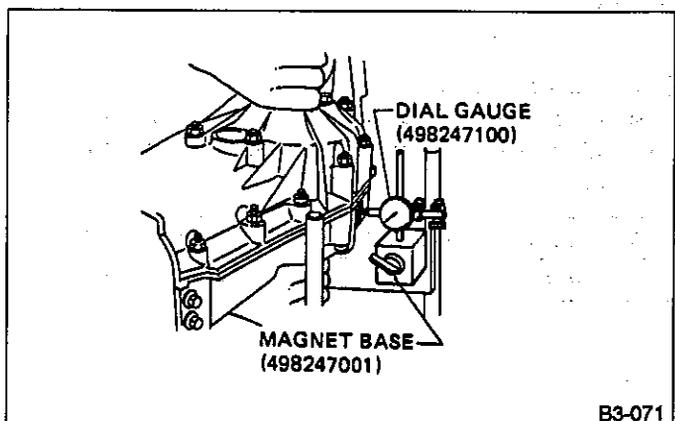


Fig. 92

(9) Check tooth contact of hypoid gear as follows: Apply a uniform thin coat of red lead on both tooth surfaces of 3 or 4 teeth of the hypoid gear. Move the hypoid gear back and forth by turning the transmission main shaft until a definite contact pattern is developed on hypoid gear, and judge whether face contact is correct. If it is incorrect, make the following correction.

- Tooth contact is correct.

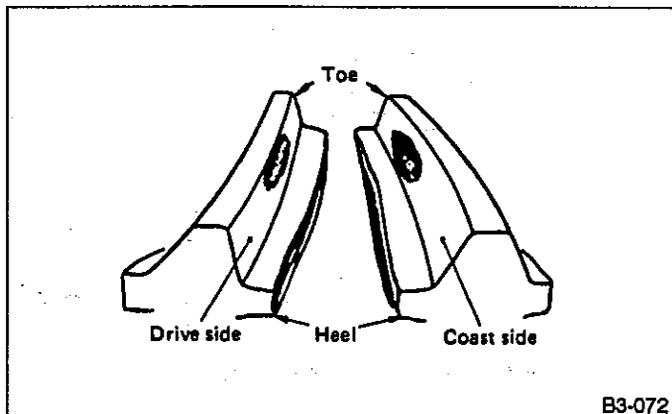


Fig. 93

- Backlash is excessive.  
To reduce backlash, loosen holder on the upper side (case R.H. side) and turn in the holder on the lower side (case L.H. side) by the same amount.

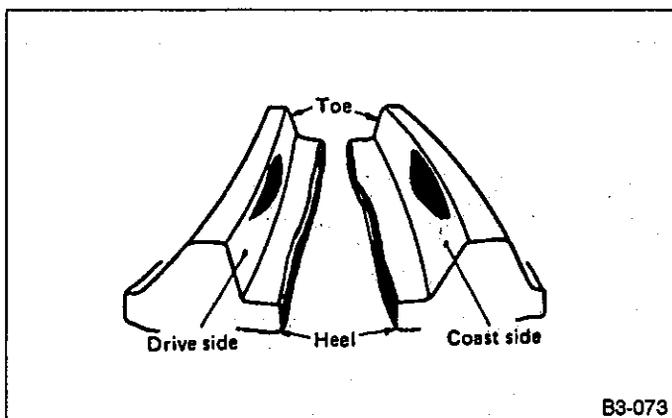


Fig. 94

- Backlash is insufficient.  
To increase backlash, loosen holder on the lower side (case L.H. side) and turn in the holder on the upper side (case R.H. side) by the same amount.

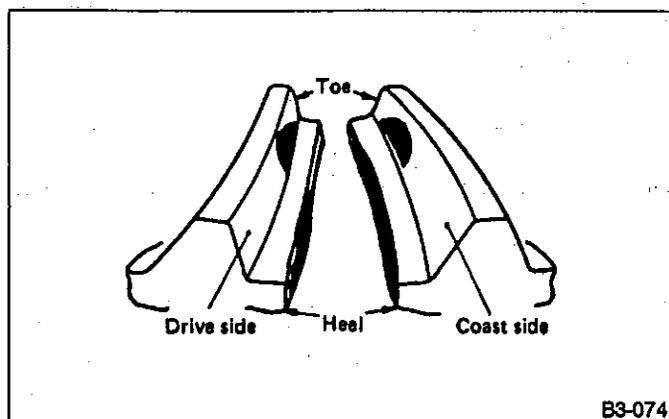


Fig. 95

- The drive pinion shim selected before is too thick.  
Reduce its thickness.

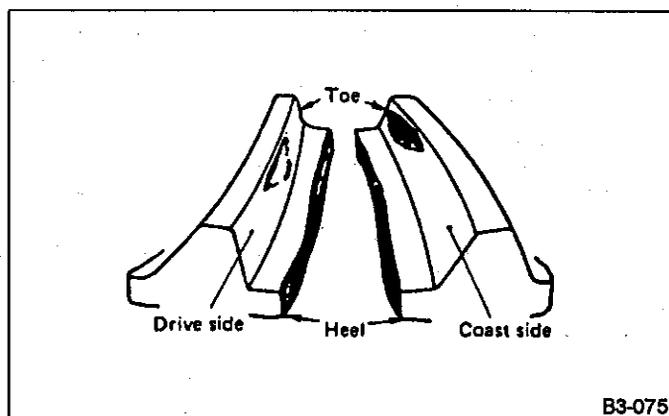


Fig. 96

- The drive pinion shim selected before is too thin.  
Increase its thickness.

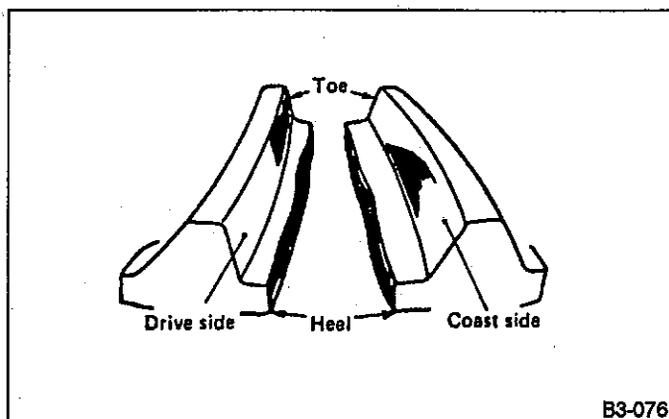


Fig. 97

11) After checking the tooth contact of hypoid gears, remove the lock plate. Then loosen retainer until the O-ring groove appears. Fit O-ring into the groove and tighten retainer into the position where retainer has been tightened in. Tighten lock plate.

**Tightening torque:**

22 — 27 N·m

(2.2 — 2.8 kg-m, 16 — 20 ft-lb)

Carry out this job on both upper and lower retainers.

12) Selecting of main shaft rear plate.

Using DEPTH GAUGE, measure the amount (A) of ball bearing protrusion from transmission main case surface and select the proper plate in the following table.

**Special tool:**

**DEPTH GAUGE (498147000)**

Dimension A mm (in)	Part No.	Identification
4.0 — 4.13 (0.1575 — 0.1626)	32294AA040	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA050	2

Before measuring, tap the end of main shaft by the plastic hammer lightly in order to make the clearance zero between the main case surface and the moving flange of bearing.

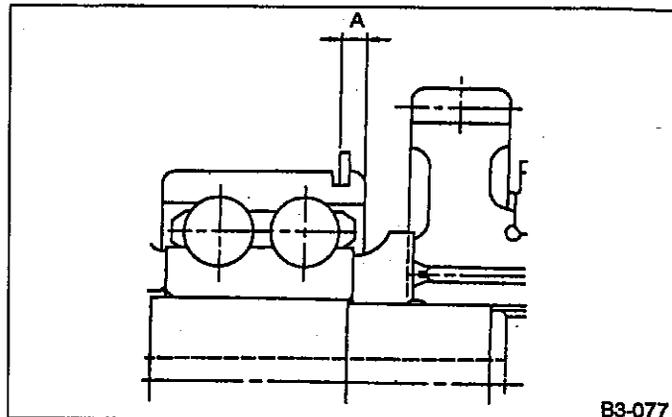


Fig. 98

13) Install clutch release lever and bearing.

## 6. Transmission Case (4WD Dual-range)

### A: DISASSEMBLY

#### 1. SEPARATION OF TRANSMISSION

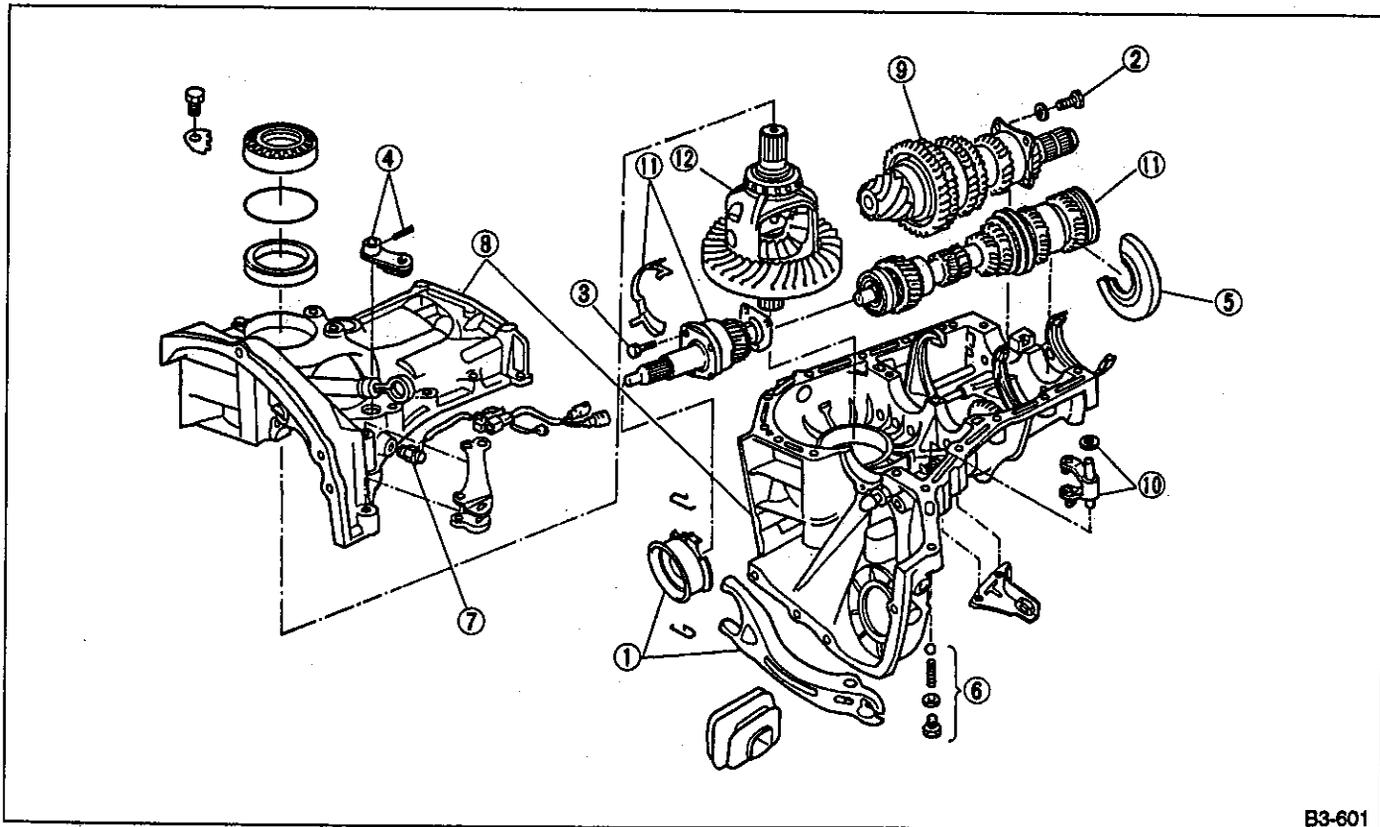


Fig. 99

- 1) Remove clutch release lever and bearing. (Refer to 2-11 clutch.)
- 2) Remove bearing mounting bolts.
- 3) Remove input shaft holder attaching bolts.
- 4) Using special tool, drive out straight pin, and remove high-low shifter lever.

**Special tool:**

**STRAIGHT PIN REMOVER 2 (398791700)**

When driving out straight pin (6 x 22), remove it in the direction that it does not butt against transmission case.

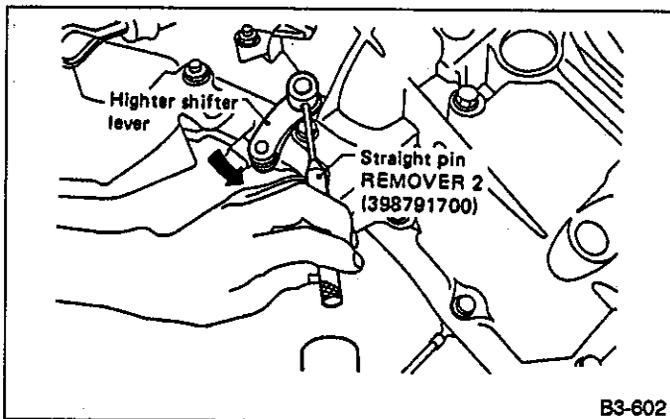


Fig. 100

- 5) Remove main shaft rear plate.
- 6) Remove plug, spring and ball.
- 7) Remove low switch.
- 8) Separating transmission case.
  - (1) Put vinyl tape around splines of right and left axle drive shafts to prevent damage to oil seals.

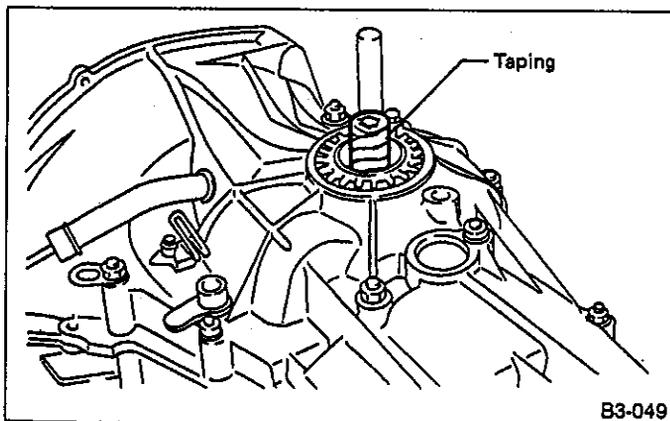


Fig. 101

- (2) Separate transmission case into right and left cases by loosening seventeen coupling bolts and nuts.

**Be careful of oil seal fitted in RH transmission case at point where shifter shaft projects.**

- 9) Remove drive pinion shaft ASSY from LH transmission case.

**Use a hammer handle, etc. to remove if too tight.**

- 10) Removing high-low shifter fork. Raise main shaft ASSY slightly, and remove high-low shifter fork together with high-low shifter shaft and washer.

**Be careful not to drop the two high-low shifter pieces.**

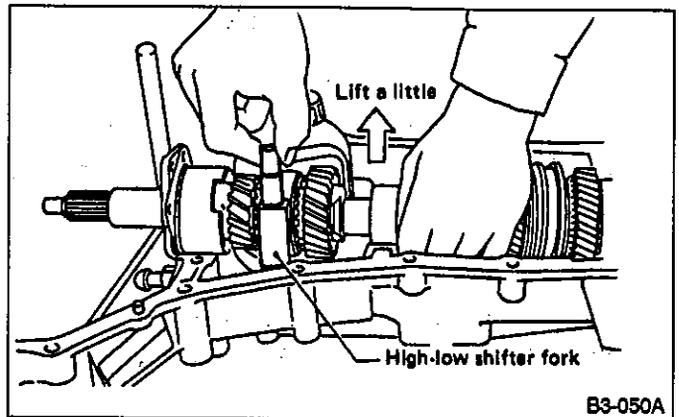


Fig. 102

- 11) Removing transmission main shaft ASSY and input shaft ASSY.

- (1) Remove main shaft ASSY and input shaft ASSY.

**Be careful not to drop input shaft and main shaft as they are separable.**

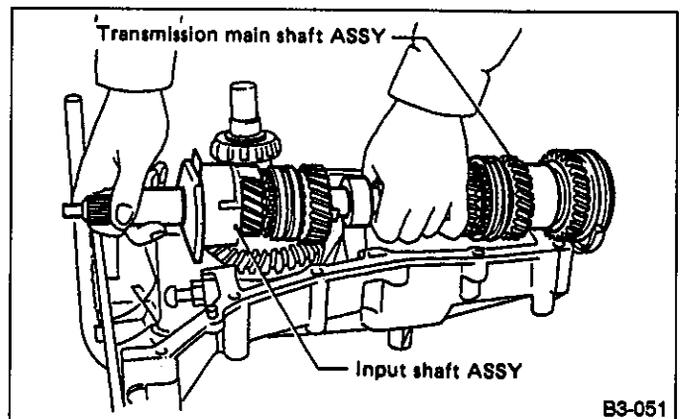


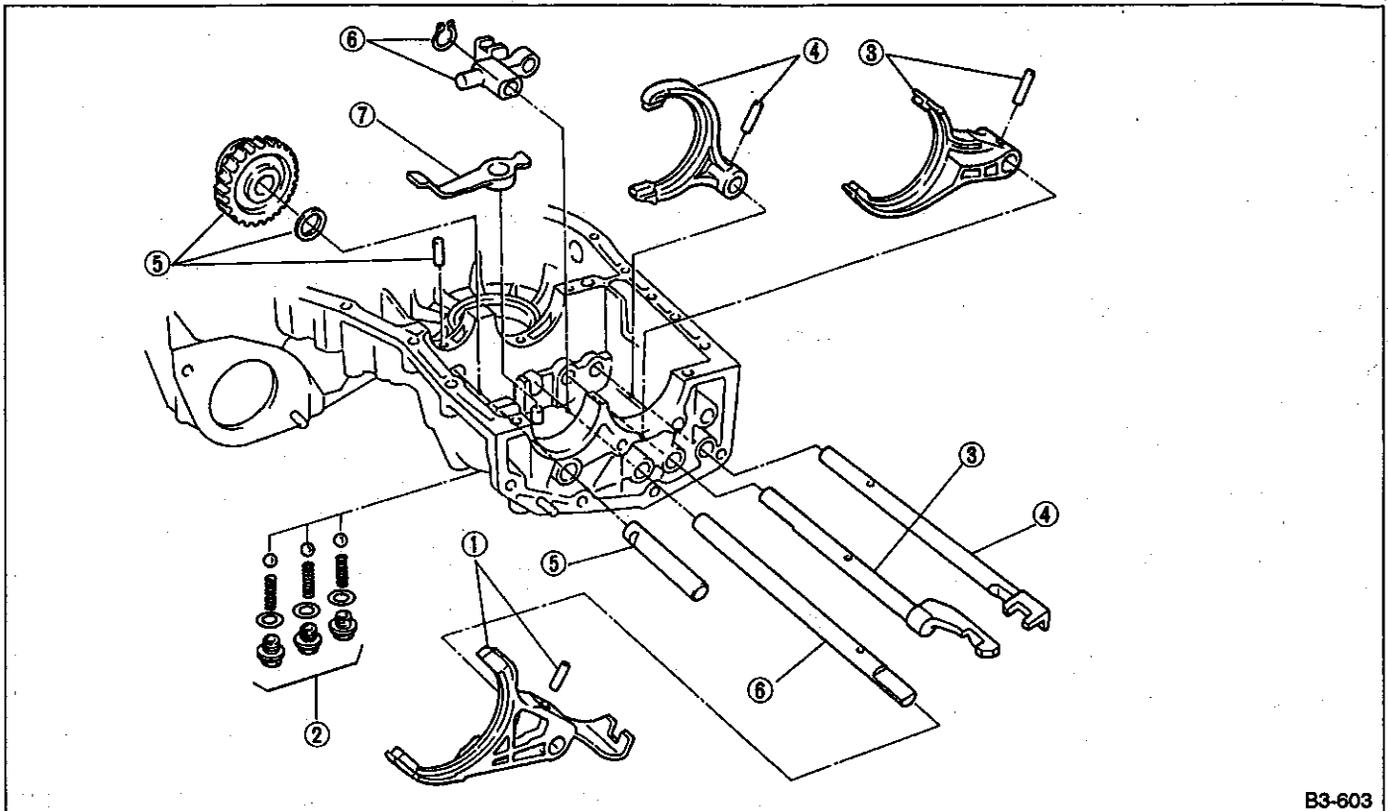
Fig. 103

- (2) Separate main shaft ASSY and input shaft ASSY. Make sure that needle bearing is inserted in input shaft. Also, keep high and low balk ring.

- 12) Remove differential ASSY.

- a. **Be careful not to confuse right and left roller bearing outer races.**
- b. **Be careful not to damage retainer oil seal.**

## 2. TRANSMISSION CASE (Left-hand)



B3-603

Fig. 104

1) Drive out spring pin, and remove 5th shifter fork.

7) Remove reverse shifter lever.

8) Remove differential side retainers.

**Special tool:**

**STRAIGHT PIN REMOVER 2: 398791700**

2) Remove plugs, springs and checking balls.

3) Drive out spring pin, and pull out 3-4 fork rod and shifter fork.

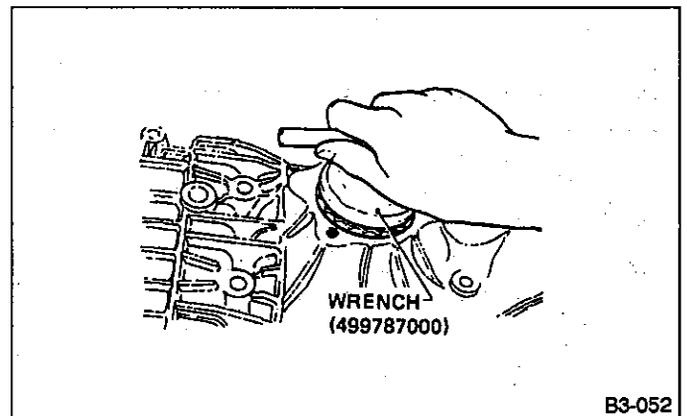
**When removing rod, keep other rods in neutral. Also, when pulling out spring pin, remove it toward inside of case so that it may not hit against case.**

4) Drive out spring pin, and pull out 1-2 fork rod and shifter fork.

5) Pull out straight pin, and remove idler gear shaft, reverse idler gear and washer.

6) Remove outer snap ring, and pull out reverse shifter rod arm from reverse fork rod. Then take out ball, spring and interlock plunger from rod. And then remove rod.

**When pulling out reverse shifter rod arm, be careful not to let ball pop out of arm.**



B3-052

Fig. 105

3. TRANSMISSION CASE (Right-hand)

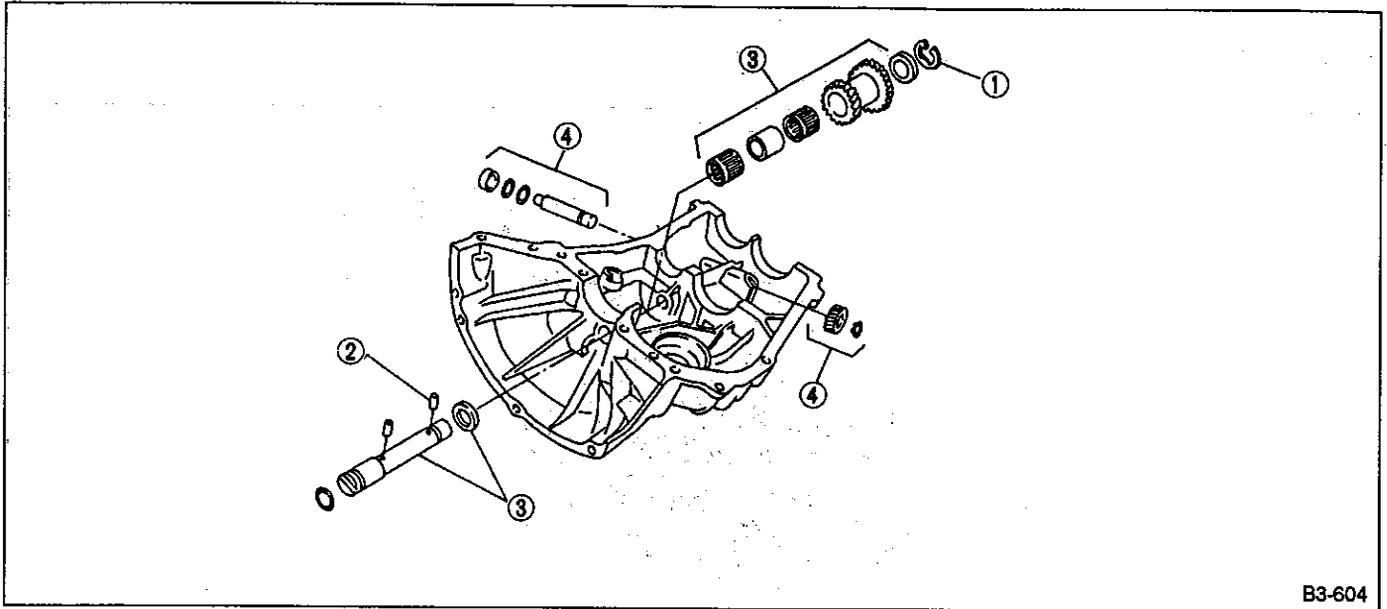


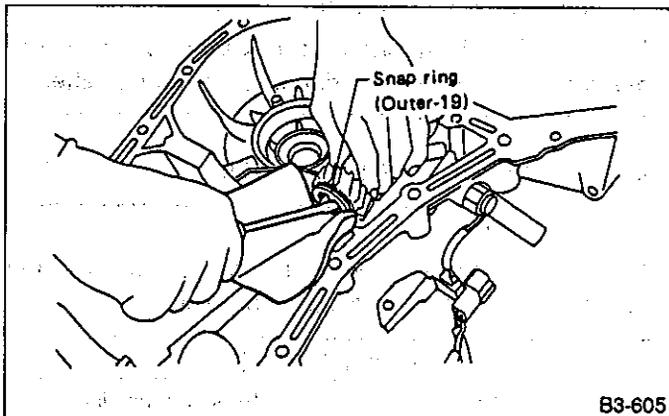
Fig. 106

B3-604

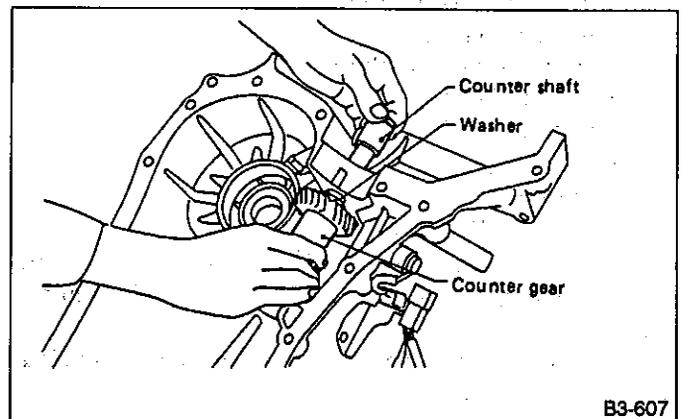
1) Move counter gear shaft until it touches transmission case, and remove snap ring (Outer-19) with a suitable tool.

3) Remove counter shaft from transmission case, taking care not to drop counter gear and two washers.

- a. Be careful not to damage O-ring.
- b. Be careful not to drop straight pin on front side.
- b. Be careful not to drop two needle bearings (22 x 28 x 23) and collar contained in counter gear.



B3-605



B3-607

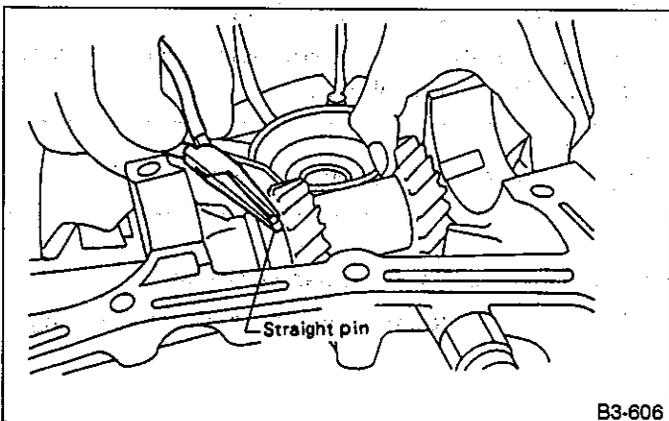
Fig. 109

4) Remove outer snap ring and pull out speedometer driven gear. Next, remove speedometer shaft and washer.

5) Remove differential side retainer.

Fig. 107

2) Slide washer at rear of high-low counter shaft, and remove straight pin from counter shaft.



B3-606

Fig. 108

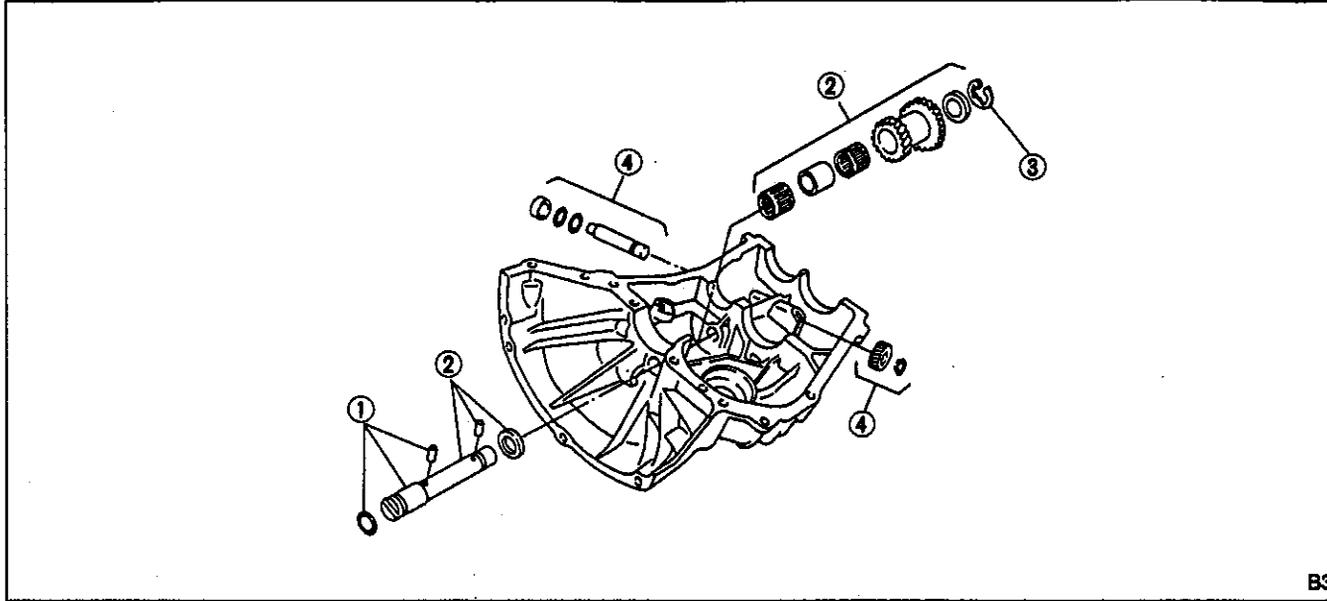
**B: ASSEMBLY****1. TRANSMISSION CASE (Right-hand)**

Fig. 110

1) Install O-ring and straight pin onto counter gear shaft.

2) Install the following parts in main case (RH), and push the shaft perfectly into case.

- Counter gear shaft
- Two counter gear washers
- Two needle bearings
- Counter gear collar
- Counter gear
- Straight pin
- Snap ring (Outer-19)

a. Make sure that cut-out end surface of counter gear shaft does not protrude above the end surface of the case.

b. Position the cut-out portion of counter gear shaft as shown in the figure.

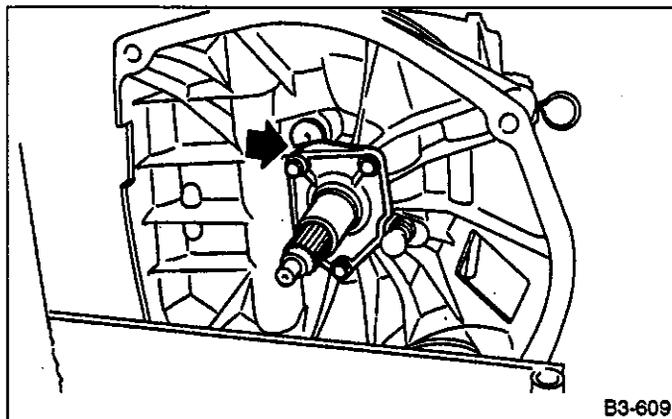


Fig. 111

3) Selection of snap ring (Outer-19).

(1) After installing snap ring (Outer-19), measure clearance between snap ring and counter washer.

**Clearance:**

**0.05 — 0.35 mm (0.0020 — 0.0138 in)**

(2) If the measurement is not within specification, select suitable snap ring.

Snap ring (Outer-19)	
Part No.	Thickness mm (in)
031319000	1.50 (0.0591)
805019010	1.72 (0.0677)

4) Installation of speedometer driven gear.

(1) Install washer and speedometer shaft, and fit oil seal with special tool.

**Special tool:**

**PRESS (899824100) or (499827000)**

**Use new oil seal, if it has been removed.**

(2) Install speedometer driven gear and snap ring.

2. TRANSMISSION CASE (Left-hand)

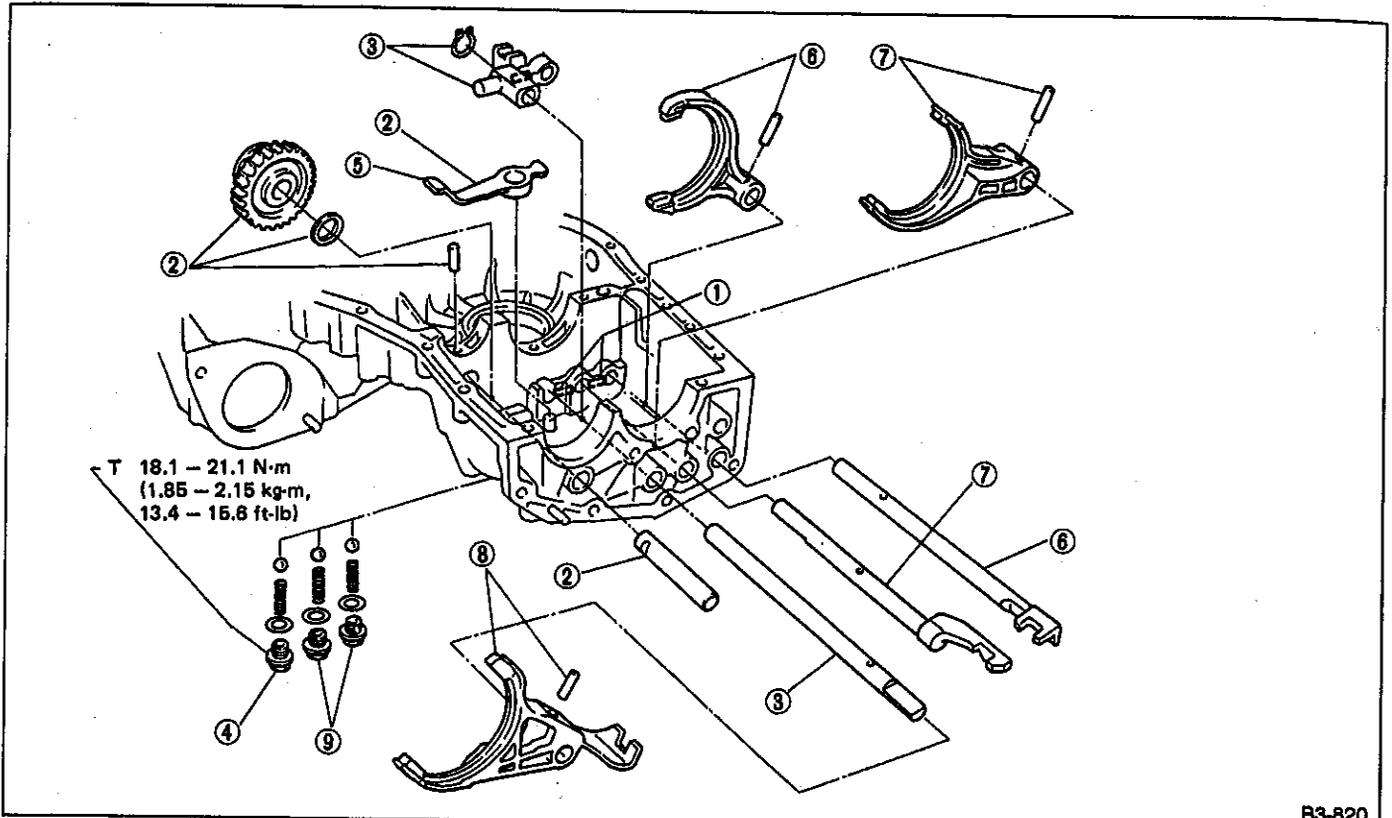


Fig. 112

B3-820

- 1) Position interlock plungers (5.56 x 19.6), one plunger in hole between 1-2 and 3-4 fork rod holes, and one plunger in hole between 3-4 and reverse fork rod holes.
- 2) Install reverse shifter lever, reverse idler gear and reverse idler gear shaft, and secure with straight pin. **Be sure to install reverse idler shaft from the rear side.**
- 3) Install reverse arm fork spring, ball and interlock plunger (5.56 x 19.6) to reverse fork rod arm. Insert reverse fork rod into hole in reverse fork rod arm, and hold it with outer snap ring using special tool.

Apply grease to plunger to prevent it from falling.

Special tool:

ACCENT BALL INSTALLER (399411700)

- 4) Position ball (7.1438), spring and gasket in reverse shifter rod hole, on L.H. transmission case, and tighten checking ball plug.

Replace gasket with a new one.

5) Adjustment of reverse idler gear position.

- (1) Move reverse shifter rod toward REV side. Adjust clearance between reverse idler gear and transmission case wall, using reverse shifter lever.

Clearance:

6.0 - 7.5 mm (0.236 - 0.295 in)

Reverse shifter lever		
Part No.	No.	Remarks
32820AA000	0	Further from case wall.
32820AA010	—	Standard
32820AA020	2	Closer to case wall.

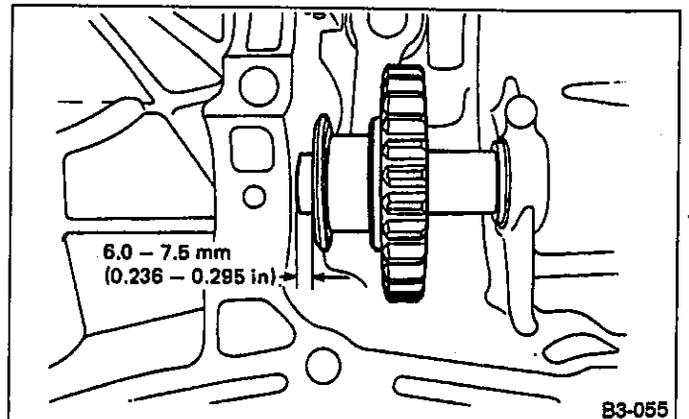


Fig. 113

83-055

- (2) After installing a suitable reverse shifter lever, shift into Neutral. Adjust clearance between reverse idler gear and transmission case wall, using washer(s).

**Clearance:**

0 — 0.5 mm (0 — 0.020 in)

Washer (20.5 x 26 x t)	
Part No.	Thickness mm (in)
803020151	0.4 (0.016)
803020152	1.1 (0.043)
803020153	1.5 (0.059)
803020154	1.9 (0.075)
803020155	2.3 (0.091)

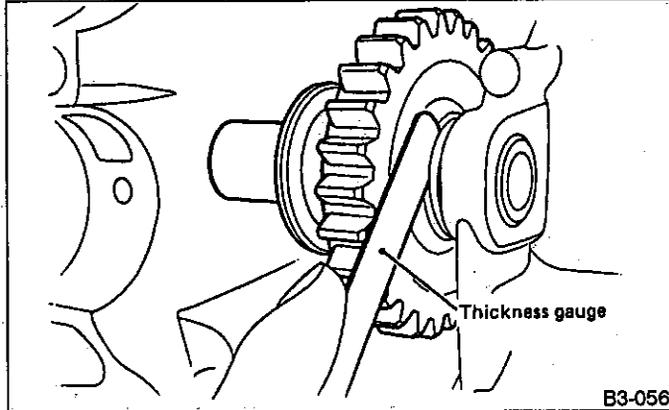


Fig. 114

**3. COMBINATION OF TRANSMISSION CASE**

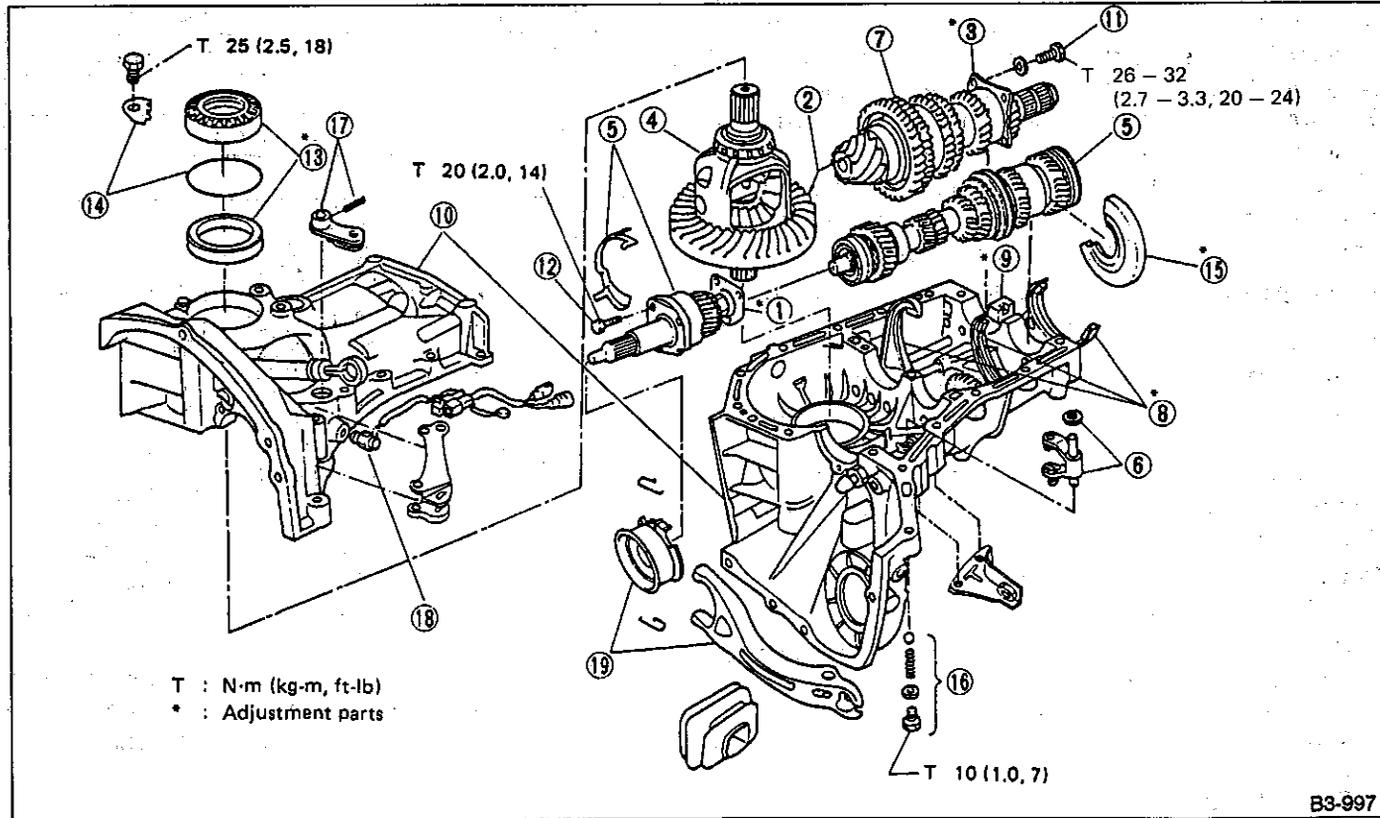


Fig. 115

6) Installation of 1-2 shifter fork and rod.

(1) Install 1-2 fork rod into 1-2 shifter fork via the hole on the rear of transmission case.

(2) Align the holes in rod and fork, and drive straight pin (6 x 22) into these holes using STRAIGHT PIN REMOVER (398791600).

a. Set other rods to Neutral.

b. Make sure interlock plunger (5.56 x 19.6) is on the 3-4 fork rod side.

7) Installation of 3-4 shifter fork and rod.

(1) Install interlock plunger (3 x 11.9) onto 3-4 fork rod.

Apply a coat of grease to plunger to prevent it from falling.

(2) Install 3-4 fork rod into 3-4 shifter fork via the hole on the rear of transmission case.

(3) Align the holes in rod and fork, and drive straight pin (6 x 22) into these holes.

a. Set reverse fork rod to Neutral.

b. Make sure interlock plunger (installed before) is on the reverse fork rod side.

8) Install 5th shifter fork onto the rear of reverse fork rod. Align holes in the two parts and drive straight pin into place.

9) Position balls (7.1438 mm dia.), checking ball springs and gaskets into 3-4 and 1-2 rod holes, and install plugs. Replace gasket with a new one.

1) Adjustment of input shaft holder shim

- (1) Place transmission main shaft ASSY and input shaft CP on transmission main case without shim.
- (2) The proper number of shim can be determined as follows:

$$D = A - (B + C)$$

- A: Main case length as shown in the figure.  
A = 353 mm (13.90 in)
- B: Input shaft CP length as shown in the figure.
- C: Main shaft ASSY length as shown in the figure.

Dimension D mm (in)	No. of shims
52.46 — 53.23 (2.0654 — 2.0957)	—
51.96 — 52.45 (2.0457 — 2.0650)	1
51.34 — 51.95 (2.0213 — 2.0453)	2

The thickness of shim is 0.45 to 0.55 mm (0.0177 to 0.0217 in).

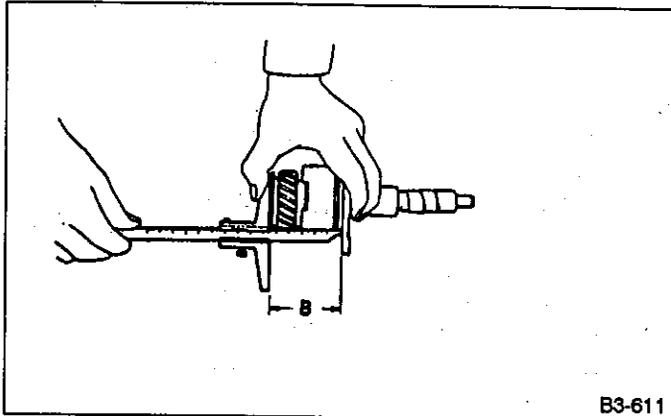


Fig. 116

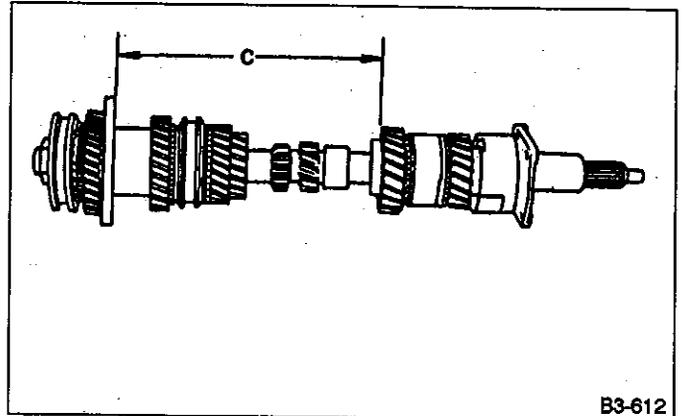


Fig. 117

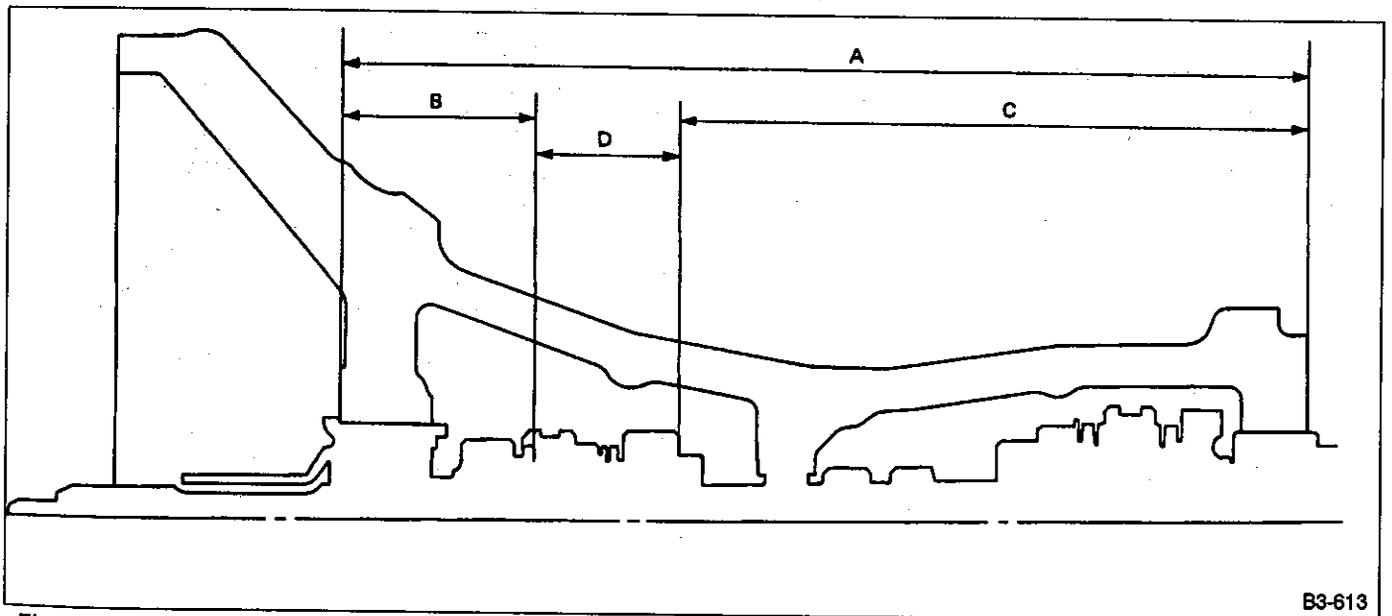


Fig. 118

B3-613

## 2) Alignment marks/figures on hypoid gear set

The upper figure on driven pinion is the match number for combining it with crown gear. The lower figure is for shim adjustment. If no lower figure is shown, the value is zero. The figure on crown gear indicates a number for combination with drive pinion.

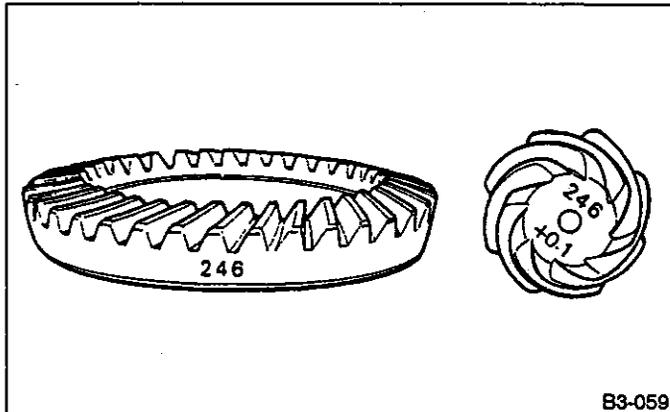


Fig. 119

## 3) Adjustment of drive pinion shim

(1) Place drive pinion shaft ASSY on right hand transmission main case without shim and tighten bearing mounting bolts.

(2) Inspection and adjustment of GAUGE ASSY (499917500).

a. Loosen the two bolts and adjust so that the scale indicates 0.5 correctly when the plate end and the scale end are on the same level.

b. Tighten two bolts.

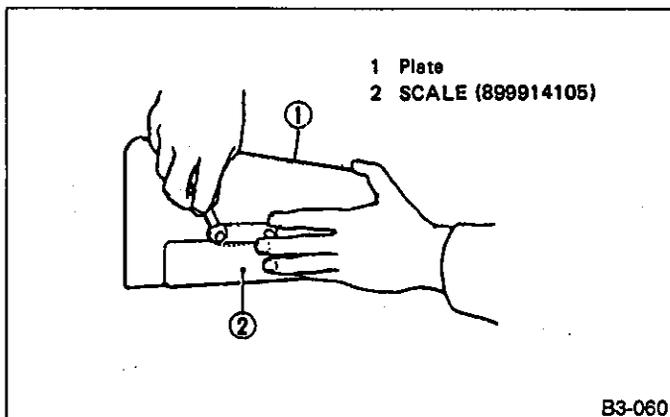


Fig. 120

(3) Position the gauge by inserting the knock pin of gauge into the knock hole in the transmission case.

(4) Slide the drive pinion gauge scale with finger tip and read the value at the point where it matches with the end face of drive pinion.

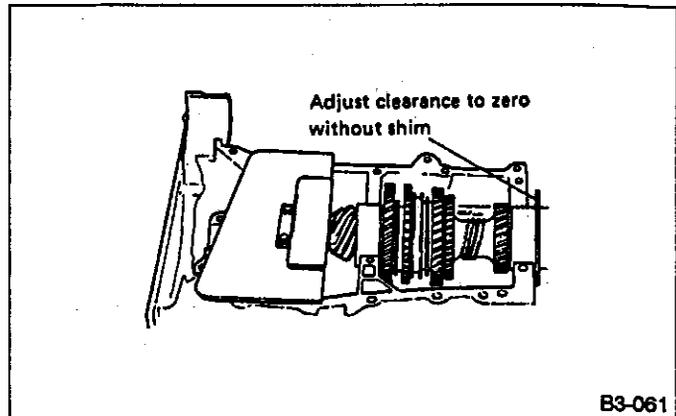


Fig. 121

(5) The thickness of shim shall be determined by adding the value indicated on drive pinion to the value indicated on the gauge. (Add if the figure on drive pinion is prefixed by + and subtract if the figure is prefixed by —.)

Select one to three shims from the next table for the value determined as described above and take a shim thickness which is closest to the said value.

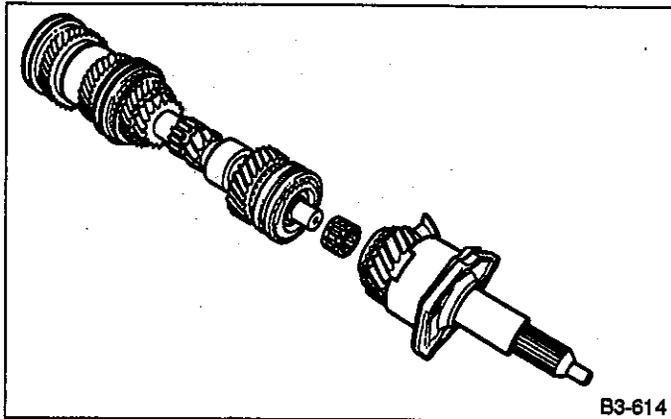
Drive pinion shim	
Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)
32295AA041	0.175 (0.0069)
32295AA051	0.200 (0.0079)
32295AA061	0.225 (0.0089)
32295AA071	0.250 (0.0098)
32295AA081	0.275 (0.0108)
32295AA091	0.300 (0.0118)
32295AA101	0.500 (0.0197)

4) Install differential ASSY on left hand transmission case.

a. Wrap the left and right splined sections of axle shaft with vinyl tape to prevent scratches.

b. Be careful not to fold the sealing lip of oil seal.

5) Put main shaft ASSY, needle bearing, high-low synchronizer ring, oil guide and input shaft CP together.



B3-614

Fig. 122

- a. When installing high-low synchronizer ring, align the ring groove and insert.
  - b. Be sure to install the input shaft holder shims (0 to 2 sheets) selected before.
- 6) Transmission main shaft ASSY
- (1) Install high-low shifter fork and two high-low shifter pieces as a unit onto high-low shifter sleeve.
  - (2) Raise transmission main shaft ASSY slightly and turn it 90° over the transmission.

(3) With transmission main shaft ASSY held in that position, insert high-low shifter shaft into hole in LH transmission case.

(4) Install washer onto high-low shifter shaft.

- a. Be careful not to separate input shaft CP from main shaft ASSY.
- b. Make sure that oil guide is positioned in the groove of main case (LH).
- c. Be sure straight pin is positioned in the hole of needle bearing.
- d. Apply a coat of gear oil to the nylon tip of fork.
- e. Face the cutout section of circlip on the bearing outer race (rear end of main shaft) toward the drive pinion shaft.

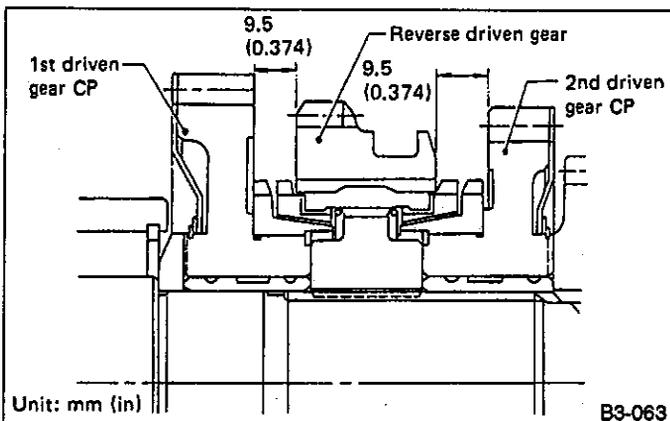
7) Install drive pinion shaft ASSY with shims selected before into transmission case.

Ensure that the knock pin of the case is fitted into the hole in the bearing outer race.

8) Selection of suitable 1st-2nd, 3rd-4th and 5th shifter fork CP's.

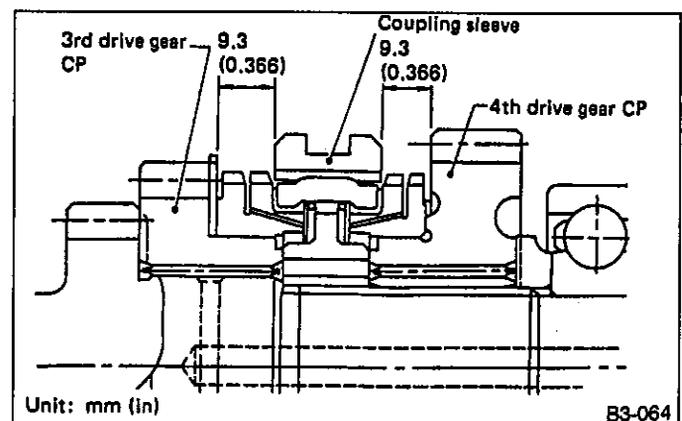
Set transmission main shaft ASSY and drive pinion shaft ASSY in position (so there is no clearance between the two when moved all the way to the front). Select suitable 1st-2nd, 3rd-4th and 5th shifter fork CP's so that coupling sleeve and reverse driven gear are positioned in the center of their synchronizing mechanisms.

1st-2nd shifter fork CP			3rd-4th shifter fork CP			5th shifter fork CP		
Part No.	No.	Remarks	Part No.	No.	Remarks	Part No.	No.	Remarks
32804AA060	1	Moves 0.2 mm (0.008 in) closer to 1st gear	32810AA060	1	Moves 0.2 mm (0.008 in) closer to 4th gear	32812AA060	1	Moves 0.2 mm (0.008 in) closer to 5th gear
32804AA070	—	Positions in the center	32810AA070	—	Positions in the center	32812AA070	—	Positions in the center
32804AA080	3	Moves 0.2 mm (0.008 in) closer to 2nd gear	32810AA100	3	Moves 0.2 mm (0.008 in) closer to 3rd gear	32812AA100	3	Moves 0.2 mm (0.008 in) further from 5th gear



Unit: mm (in)

B3-063



Unit: mm (in)

B3-064

Fig. 123

Fig. 124

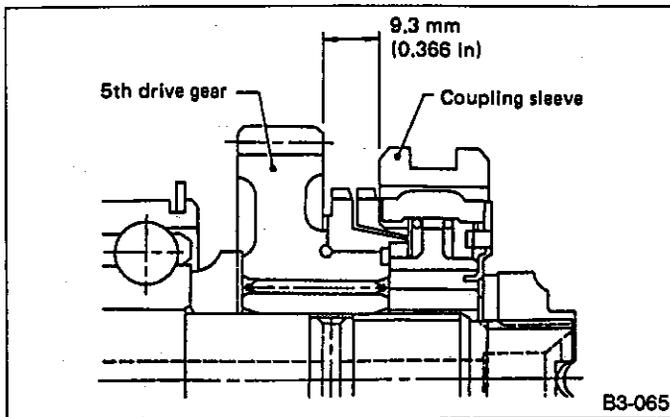


Fig. 125

9) Inspection of rod end clearance.  
Measure rod end clearances A and B. If any clearance is not within specifications, replace rod or fork as required.

A: 1st-2nd to 3rd-4th	0.5 — 1.5 mm (0.020 — 0.059 in)
B: 3rd-4th to 5th	0.6 — 1.4 mm (0.024 — 0.055 in)

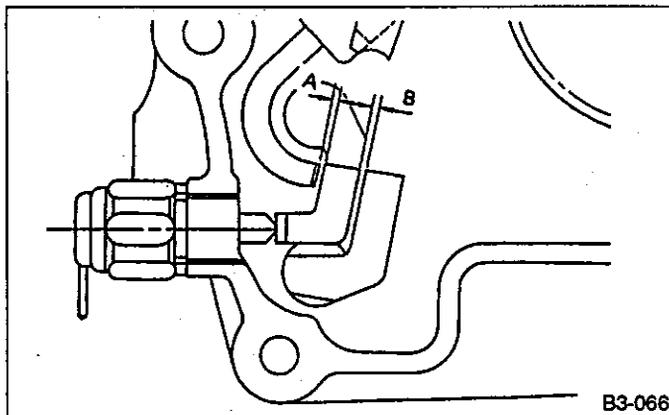


Fig. 126

10) Combination of transmission case.

(1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline, and apply liquid gasket, and then put case right hand and left hand together.

**Liquid gasket:**

Three-bond 1215 or equivalent

(2) Tighten 17 bolts with bracket, clip, etc. in the following sequence.

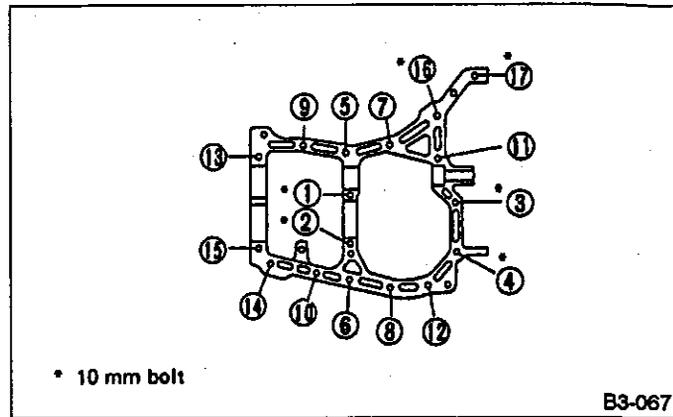


Fig. 127

**Tightening torque:**

8 mm bolt

23 — 26 N•m (2.3 — 2.7 kg-m, 17 — 20 ft-lb)

10 mm bolt

36 — 42 N•m (3.7 — 4.3 kg-m, 27 — 31 ft-lb)

a. Insert bolts from the bottom and tighten nuts at the top.

b. Put cases together so that drive pinion shim and input shaft holder shim are not caught up in between.

c. Confirm that counter gear and speedometer gear are meshed, and high-low shifter shaft is inserted perfectly.

11) Tighten ball bearing attachment bolts.

12) Install input shaft holder attaching bolts.

13) Backlash adjustment of hypoid gear and preload adjustment of roller bearing.

Support drive pinion ASSY with special tool. [Full-time 4WD only]

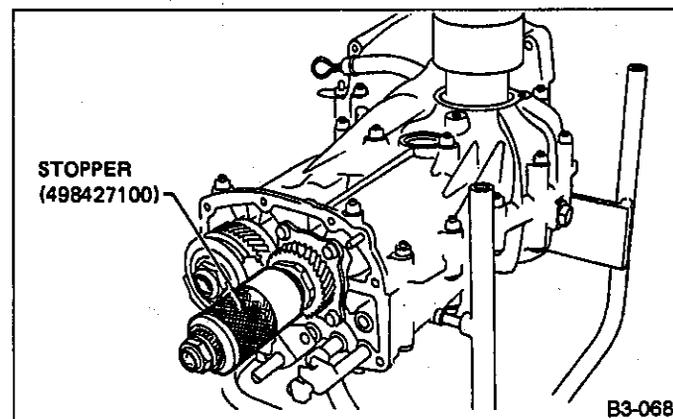


Fig. 128

(1) Place the transmission with case left hand facing downward and put WEIGHT on bearing cup.

(2) Screw retainer ASSY into case left hand from the bottom with WRENCH. Fit HANDLE on the transmission main shaft. Shift gear into 4th or 5th and turn the shaft several times. Screw in the retainer while turn

ing HANDLE until a slight resistance is felt on WRENCH.

This is the contact point of hypoid gear and drive pinion shaft. Repeat the above sequence several times to ensure the contact point.

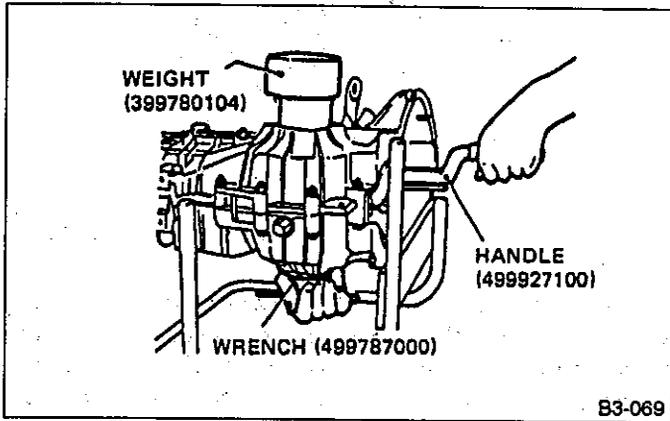


Fig. 129

(3) Remove weight and screw in retainer without O-ring on the upper side and stop at the point where slight resistance is felt.

At this point, the backlash between the hypoid gear and drive pinion shaft is zero.

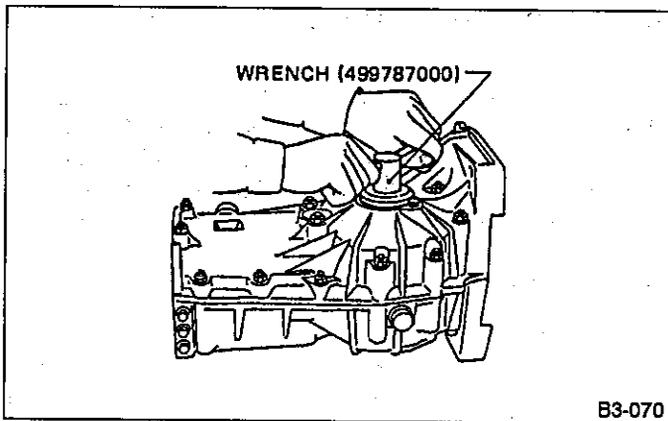


Fig. 130

(4) Fit lock plate. Loosen the retainer on the lower side by 1-1/2 notches of lock plate and turn in the retainer on the upper side by the same amount in order to obtain the backlash.

The notch on the lock plate moves by 1/2 notch if the plate is turned upside down.

(5) Turn in the retainer on the upper side additionally by 1 notch in order to apply preload on taper roller bearing.

(6) Tighten temporarily both the upper and lower lock plates and mark both holder and lock plate for later readjustment.

(7) Turn transmission main shaft dozens of turns while tapping around retainer lightly with plastic hammer.

(8) Set DIAL GAUGE and MAGNET BASE. Insert the needle through transmission oil drain plug hole so that the needle comes in contact with the tooth surface at a right angle and check the backlash.

Backlash:

0.13 — 0.18 mm (0.0051 — 0.0071 in)

a) If backlash outside specified range, adjust it by turning holder in RH case.

b) Turning holder pawl 1/2 rotation changes backlash by approximately 0.04 mm (0.0016 in).

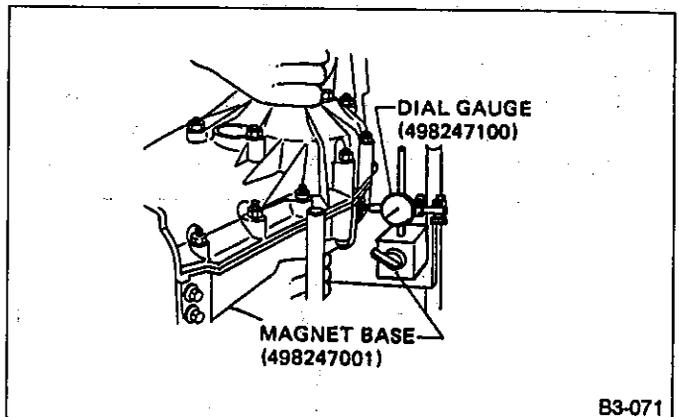


Fig. 131

(9) Check tooth contact of hypoid gear as follows: Apply a uniform thin coat of red lead on both tooth surfaces of 3 or 4 teeth of the hypoid gear. Move the hypoid gear back and forth by turning the transmission main shaft until a definite contact pattern is developed on hypoid gear, and judge whether face contact is correct. If it is incorrect, make the following correction.

- Tooth contact is correct.

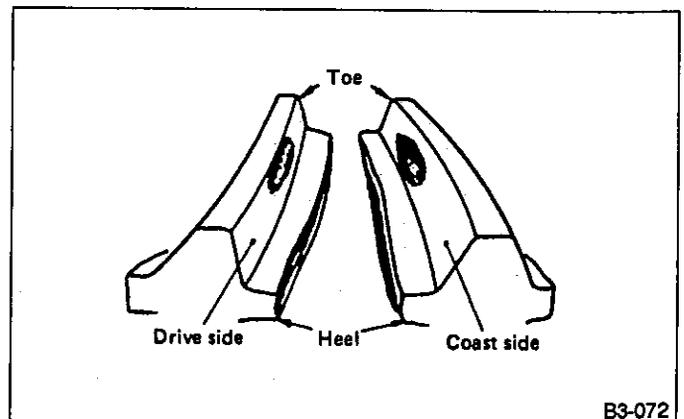


Fig. 132

- Backlash is excessive.

To reduce backlash, loosen holder on the upper side (case R.H. side) and turn in the holder on the lower side (case L.H. side) by the same amount.

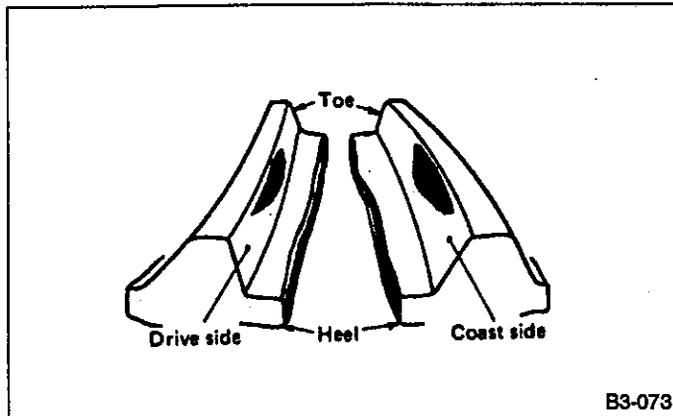


Fig. 133

- Backlash is insufficient.  
To increase backlash, loosen holder on the lower side (case L.H. side) and turn in the holder on the upper side (case R.H. side) by the same amount.

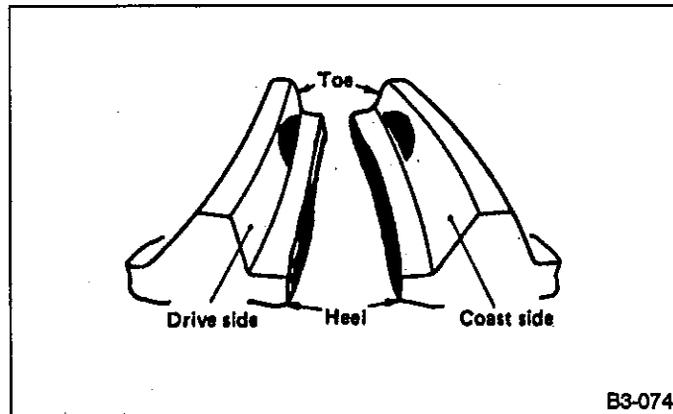


Fig. 134

- The drive pinion shim selected before is too thick.  
Reduce its thickness.

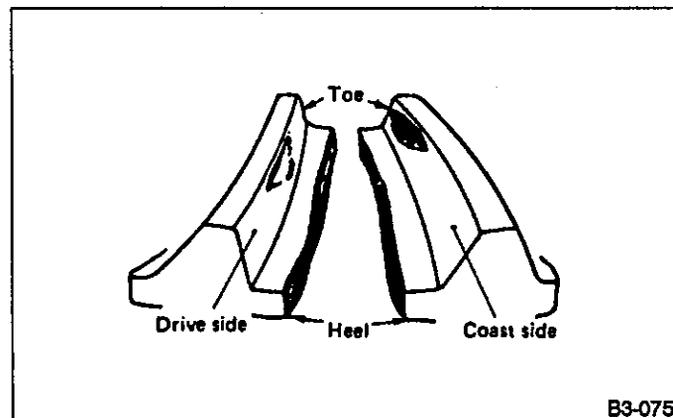


Fig. 135

- The drive pinion shim selected before is too thin.  
Increase its thickness.

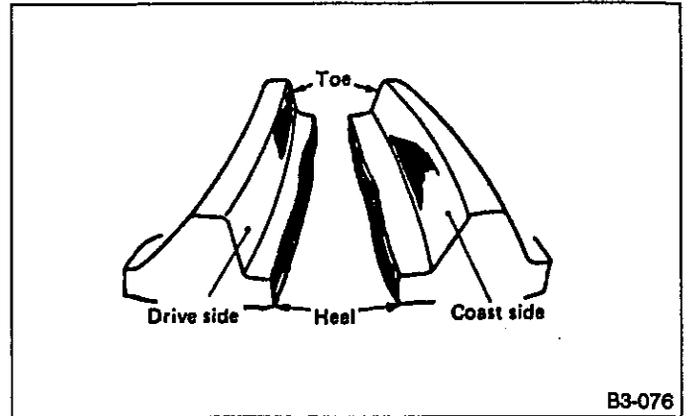


Fig. 136

14) After checking the tooth contact of hypoid gears, remove the lock plate. Then loosen retainer until the O-ring groove appears. Fit O-ring into the groove and tighten retainer into the position where retainer has been tightened in.  
Tighten lock plate.

**Tightening torque:**

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

Carry out this job on both upper and lower retainers.

15) Selecting of main shaft rear plate.  
Using DEPTH GAUGE, measure the amount (A) of ball bearing protrusion from transmission main case surface and select the proper plate in the following table.

**Special tool:**

**DEPTH GAUGE (498147000)**

Dimension A mm (in)	Part No.	Identification
4.0 — 4.13 (0.1575 — 0.1628)	32294AA040	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA050	2

Before measuring, tap the end of main shaft by the plastic hammer lightly in order to make the clearance zero between the main case surface and the moving flange of bearing.

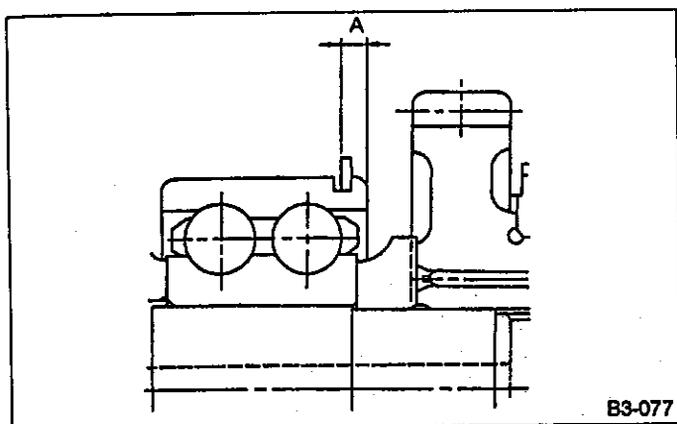


Fig. 137

16) Install ball, checking ball spring and gasket in transmission case and tighten plug.

17) Install high-low shifter lever CP onto high-low shifter shaft extending from RH transmission case, and secure with straight pin (6 x 22).

**Pay attention to the direction of high-low shifter lever CP when installing.**

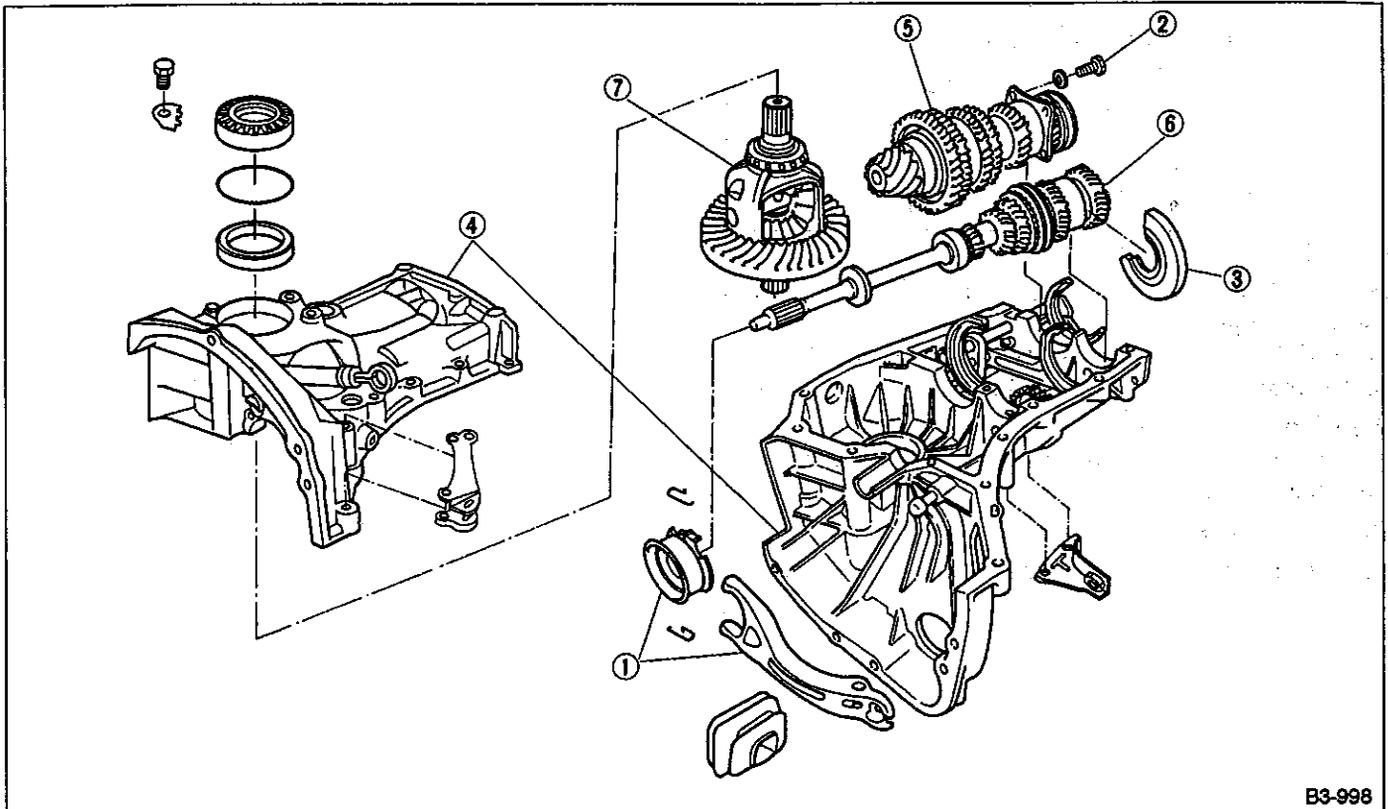
18) Install low switch.

19) Install clutch release lever and bearing.

## 7. Transmission Case (1600•1800cc FWD)

### A: DISASSEMBLY

#### 1. SEPARATION OF TRANSMISSION



B3-998

Fig. 138

- 1) Remove clutch release lever and bearing. (Refer to 2-11 clutch.)
- 2) Remove bearing mounting bolts.
- 3) Remove main shaft rear plate.
- 4) Separating transmission case.
  - (1) Put vinyl tape around splines of right and left axle drive shafts to prevent damage to oil seals.

- (2) Separate transmission case into right and left cases by loosening seventeen coupling bolts and nuts.

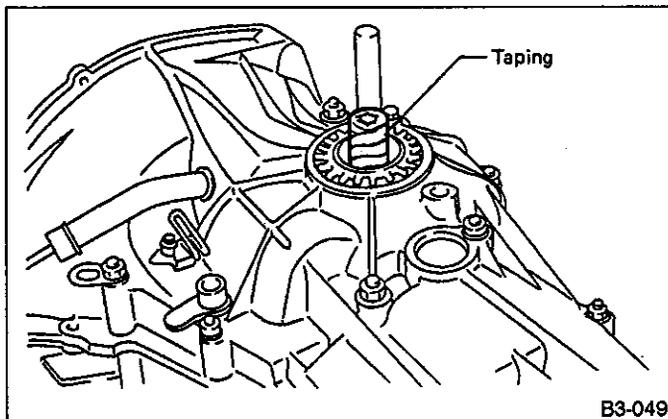
- 5) Remove drive pinion shaft ASSY from LH transmission case.

**Use a hammer handle, etc. to remove if too tight.**

- 6) Remove main shaft ASSY.
- 7) Remove differential ASSY.

**a. Be careful not to confuse right and left roller bearing outer races.**

**b. Be careful not to damage retainer oil seal.**



B3-049

Fig. 139

**2. TRANSMISSION CASE**

- 1) Drive out spring pin, and remove 5th shifter fork.

**Special tool:**  
**STRAIGHT PIN REMOVER 2: 398791700**

- 2) Remove three plugs, springs and checking balls.
- 3) Remove 3-4 shifter fork and 3-4 fork rod by loosening shifter fork screw.

When pulling out rod, keep other rod in neutral. Also, turn 3rd-4th rail 90° and remove it in order not to drop plunger.

- 4) Drive out straight pin from 1-2 shifter fork CP with STRAIGHT PIN REMOVER 2, and remove fork CP and 1-2 fork rod.

- 5) Removing reverse idler gear  
 Pull out straight pin and reverse idler gear shaft. Then remove reverse idler gear CP and washer.

When pulling out straight pin, wash off oil and blow air on it for easy removal.

- 6) Removing arm and rod  
 Remove outer snap ring and pull out reverse fork rod arm with ball, spring and interlock plunger from rod. Then take out rod.

When pulling out reverse shifter rod arm, be careful not to let ball pop out of arm.

- 6) Remove differential side retainer ASSY.

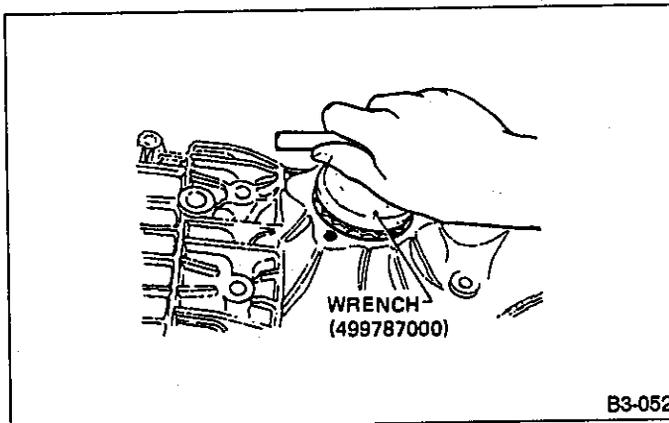


Fig. 140

- 7) Removing speedometer driven gear  
 Remove outer snap ring and pull out speedometer driven gear. Next, remove speedometer shaft CP and washer from main case.

**B: ASSEMBLY**

**1. TRANSMISSION CASE**

- 1) Assembly of differential side retainer  
 Press-fit oil seal to differential side retainer using special tool.

**SPECIAL TOOL:**

**Axle shaft oil seal installer (399790110)**

- a) Oil seal must be press-fitted from rear side of retainer.
- b) The oil seals are available in RH and LH types which must be installed correctly.

- 2) Installation of retainer  
 Install transmission case to TRANSMISSION STAND, and screw-in side retainer assembly from lower side of case using WRENCH ASSY.

**Special tool:**

**WRENCH (499787000)**

Side retainer assembly must not be screwed as deep as the normal position.

- 3) Installation of reverse fork rod arm
  - (1) Install reverse fork rod to LH transmission case.
  - (2) Put spring and ball into reverse fork rod arm, and push in ACCENT POLE INSTALLER.

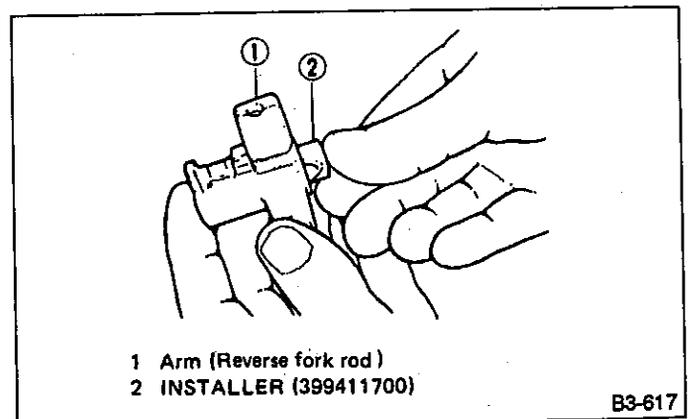


Fig. 141

- (3) Push out INSTALLER using reverse fork rod, and secure with outer snap ring.
- 4) Install reverse idler gear and reverse idler gear shaft and retain with straight pin.

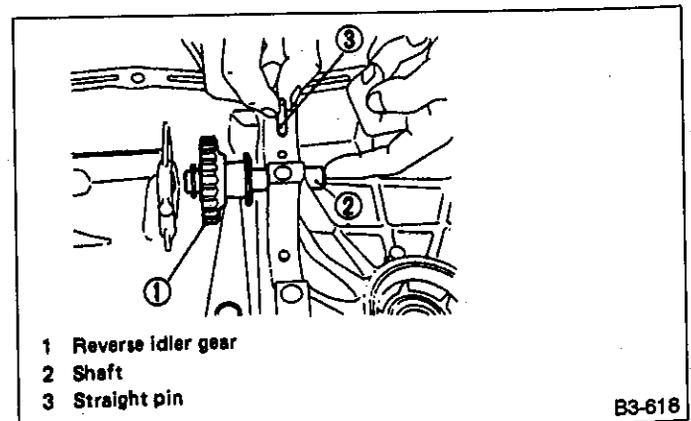
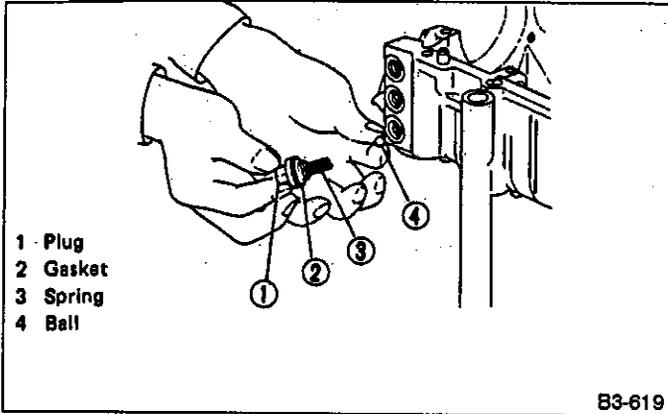


Fig. 142

5) For reverse shifter rail, install ball, spring and gasket into case and tighten plug.

**Tightening torque:**

18.1 — 21.1 N·m  
(1.85 — 2.15 kg-m, 13.4 — 15.6 ft-lb)



- 1 Plug
- 2 Gasket
- 3 Spring
- 4 Ball

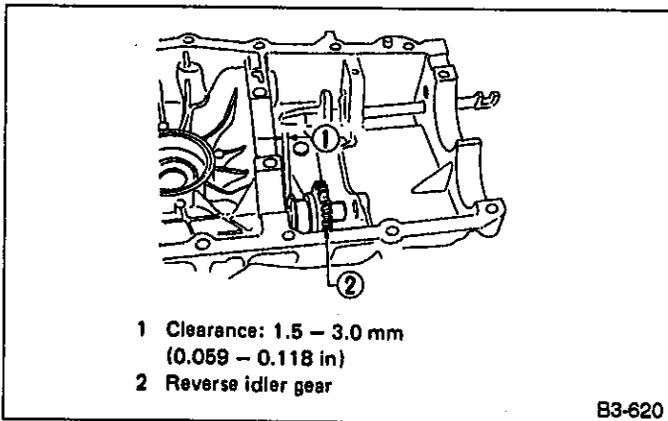
B3-619

Fig. 143

6) Adjustment of reverse idler gear CP position.  
7) Shift reverse fork rod to reverse side, and adjust reverse shifter lever position so that the specified clearance is obtained between idler gear and LH case wall.

**Clearance:**

1.5 — 3.0 mm (0.059 — 0.118 in)



- 1 Clearance: 1.5 — 3.0 mm (0.059 — 0.118 in)
- 2 Reverse idler gear

B3-620

Fig. 144

Reverse shifter lever		
Part No.	Mark	Remarks
440627101	1	Recedes from the case wall
440627102	No mark	Standard
440627103	3	Moves to the case wall

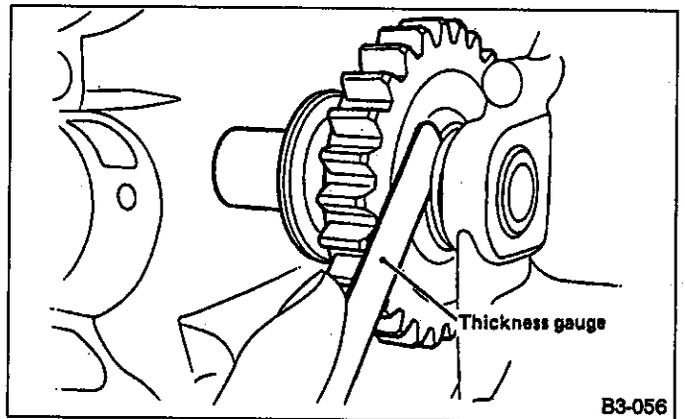
**8) Clearance adjustment**

Move reverse shifter lever to Neutral. Using washer(s), adjust reverse idler gear-to-transmission case wall clearance to specifications.

**Clearance:**

0 — 0.5 mm (0 — 0.020 in)

Washer (15.5 x 21 x t mm)	
Part No.	Thickness mm (in)
803015081	0.6 — 0.8 (0.024 — 0.031)
803015082	1.0 — 1.2 (0.039 — 0.047)
803015083	1.4 — 1.6 (0.055 — 0.063)
803015084	1.8 — 2.0 (0.071 — 0.079)
803015085	2.2 — 2.4 (0.087 — 0.094)

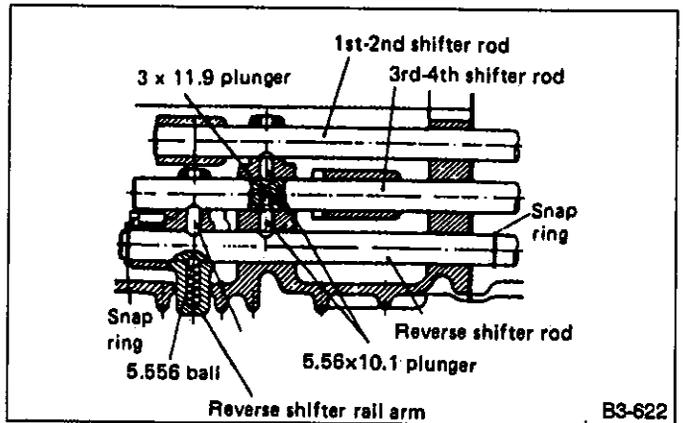


B3-056

Fig. 145

9) Installation of plunger (5.56 x 10.1)  
Fit plunger into LH transmission case and reverse shifter rod arm.

**Be sure to insert the correct plunger.**



B3-622

Fig. 146

**10) Installation of 5th shifter fork**

Install 5th shifter fork to reverse fork rod, and drive in straight pin.

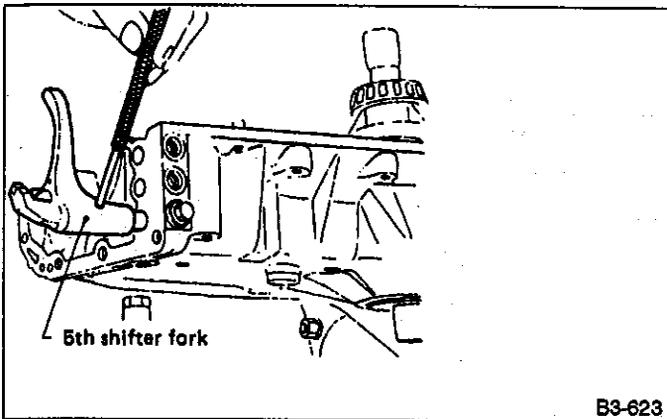


Fig. 147

11) Installation of 3rd-4th shifter fork  
Install 3rd-4th shifter fork. Fit plunger (3 x 11.9) to 3rd-4th fork rod, insert the fork rod into transmission case to connect fork and rod.

**Tightening torque:**  
18.1 — 21.1 N·m  
(1.85 — 2.15 kg-m, 13.4 — 15.6 ft-lb)

- a) When inserting 3rd-4th fork rod, keep other rods in neutral position.
- b) When inserting 3rd-4th fork rod into case, rotate it 90° so as to prevent plunger from dropping.

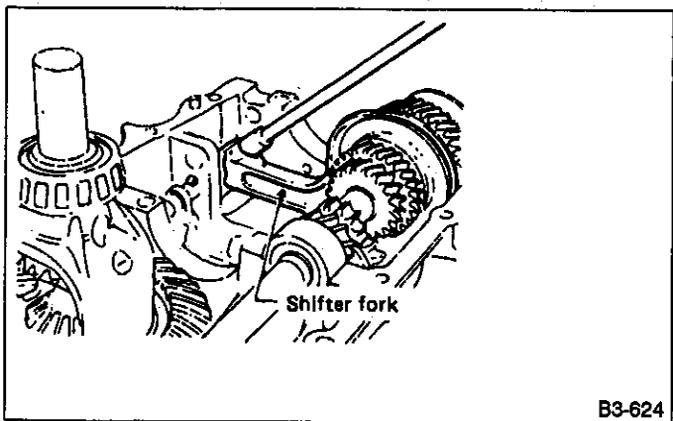


Fig. 148

12) Installation of 3rd-4th rod plug  
Fit the following parts into 3rd-4th rod plug hole of transmission case, and tighten plug.

- (1) Ball (7.1438)
- (2) Checking ball spring
- (3) Aluminium gasket (Use new part.)

**Tightening torque:**  
18.1 — 21.1 N·m  
(1.85 — 2.15 kg-m, 13.4 — 15.6 ft-lb)

13) Insert plunger (5.56 x 10.1) into hole of transmission case.

14) Installation of 1st-2nd shifter fork  
Install 1st-2nd shifter fork, and insert 1st-2nd fork rod, then connect fork and rod with straight pin (6 x 7.7).

When inserting 1st-2nd fork rod, keep other rods in neutral position.

15) Installation of 1st-2nd rod plug  
Insert the following parts into 1st-2nd rod plug hole of transmission case, and tighten plug.

- (1) Ball (7.1438)
- (2) Checking ball spring
- (3) Aluminium gasket (Use new part.)

**Tightening torque:**  
18.1 — 21.1 N·m  
(1.85 — 2.15 kg-m, 13.4 — 15.6 ft-lb)

16) Installation of speedometer driven gear  
(1) Put washer and speedometer shaft into RH case, then press-fit oil seal into the case using special tool and press.

**Special tool:**  
PRESS (899824100) or (499827000)

(2) Install speedometer driven gear, and secure with outer snap ring.

- When using old shaft, ensure that it is free from wear, rust, and damage. If worn, rusted, or damaged, replace with a new one.
- Do not re-use oil seal.

**2. COMBINATION OF TRANSMISSION CASE**

1) Alignment marks/figures on hypoid gear set

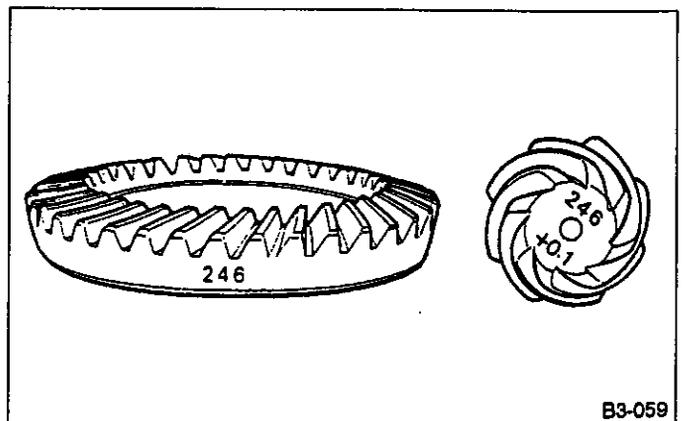


Fig. 149

The upper figure on driven pinion is the match number for combining it with crown gear. The lower figure is for shim adjustment. If no lower figure is shown, the value is zero. The figure on crown gear indicates a number for combination with drive pinion.

2) Adjustment of drive pinion shim  
(1) Place drive pinion shaft on transmission main case (R.H.) without shim and tighten drive pinion.

**Tightening torque:**

26 — 32 N·m (2.7 — 3.3 kg-m, 20 — 24 ft-lb)

(2) Inspection and adjustment of GAUGE ASSY (499917101).

- a. Loosen the two bolts and adjust so that the scale indicates 0.5 correctly when the plate end and the scale end are on the same level.
- b. Tighten two bolts.

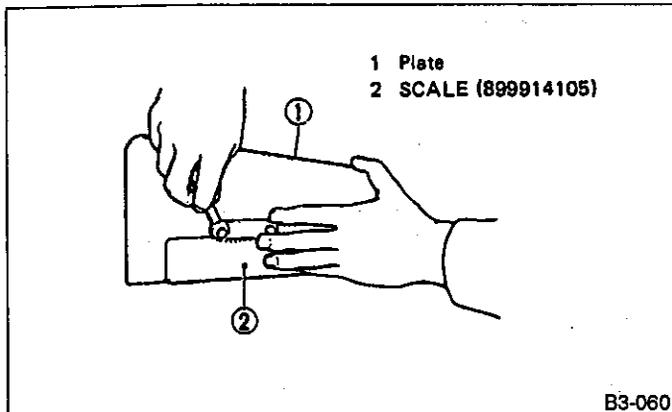


Fig. 150

(3) Position the gauge by inserting the knock pin of gauge into the knock hole in the transmission case.

(4) Slide the drive pinion gauge scale with finger tip and read the value at the point where it matches with the end face of drive pinion.

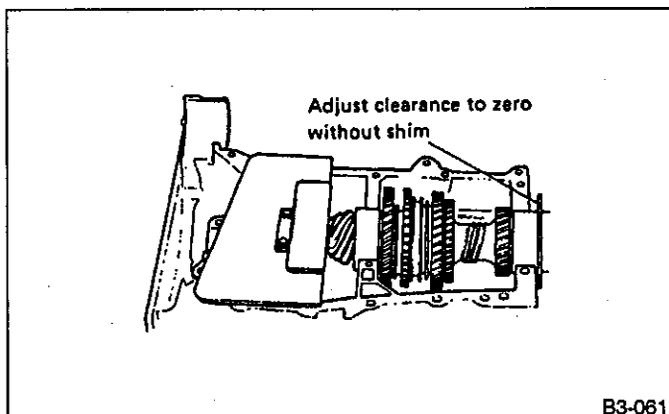


Fig. 151

(5) The thickness of shim shall be determined by adding the value indicated on drive pinion to the value indicated on the gauge. (Add if the figure on drive pinion is prefixed by + and subtract if the figure is prefixed by -.)

Select one to three shims from the next table for the value determined as described above and take a shim thickness which is closest to the said value.

Drive pinion shim	
Part No.	Thickness mm (in)
32295AA110	0.15 (0.0059)
32295AA120	0.175 (0.0069)
32295AA130	0.20 (0.0079)
32295AA140	0.225 (0.0089)
32295AA150	0.25 (0.0098)
32295AA160	0.275 (0.0108)
32295AA170	0.30 (0.0118)
32295AA180	0.50 (0.0197)

3) Install differential ASSY onto LH transmission case.

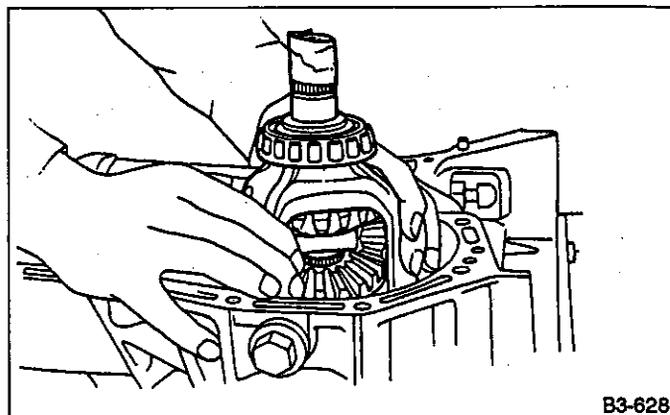


Fig. 152

a. Wrap the left and right splined sections of axle shaft with vinyl tape to prevent scratches.

b. Be careful not to fold the sealing lip of oil seal.

4) Transmission main shaft ASSY

Install needle bearing and oil seal onto the front of transmission main shaft ASSY, and position in LH transmission case.

a. Wrap clutch splined section with vinyl tape to prevent damage to oil seal.

b. Apply grease (Unilube #2 or equivalent) to the sealing lip of oil seal.

c. Align the end face of seal with surface A of LH transmission main case when installing oil seal.

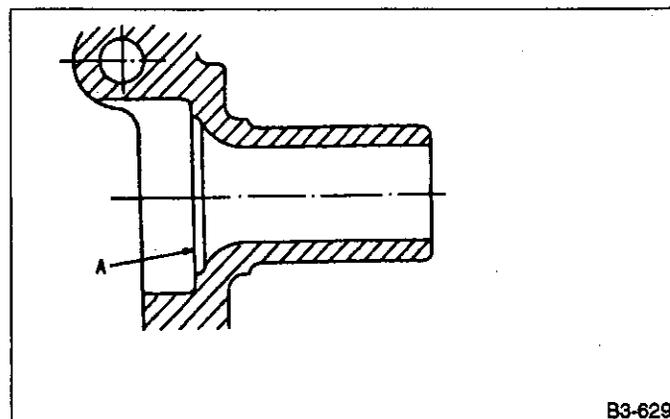


Fig. 153

d. Be careful not to drop oil seal when installing RH transmission main case.

e. Make sure straight pin is positioned in hole in needle bearing's outer race.

5) Install drive pinion shaft with shims selected before into transmission case.

Ensure that the knock pin of the case is fitted into the hole in the bearing outer race.

6) Selection of suitable 1st-2nd, 3rd-4th and 5th shifter fork CP's.

Set transmission main shaft ASSY and drive pinion shaft ASSY in position (so there is no clearance between the two when moved all the way to the front). Select suitable 1st-2nd, 3rd-4th and 5th shifter fork CP's so that coupling sleeve and reverse driven gear are positioned in the center of their synchronizing mechanisms.

1st-2nd shifter fork CP		
Part No.	Identification Mark	Remarks
32804AA001	1	Moves 0.3 mm (0.012 in) toward 2nd gear
32804AA011	No mark	Standard
32804AA021	3	Moves 0.3 mm (0.012 in) toward 1st gear

3rd-4th shifter fork		
Part No.	Identification Mark	Remarks
32810AA110	1	Moves 0.6 mm (0.024 in) toward 4th gear
32810AA120	2	Moves 0.3 mm (0.012 in) toward 4th gear
32810AA130	No mark	Standard
32810AA140	4	Moves 0.3 mm (0.012 in) toward 3rd gear
32810AA150	5	Moves 0.6 mm (0.024 in) toward 3rd gear

5th shifter fork CP		
Part No.	Identification Mark	Remarks
32812AA032	1	Moves 0.3 mm (0.012 in) toward gear side
32812AA042	No mark	Standard
32812AA052	3	Recedes 0.3 mm (0.012 in) from gear side

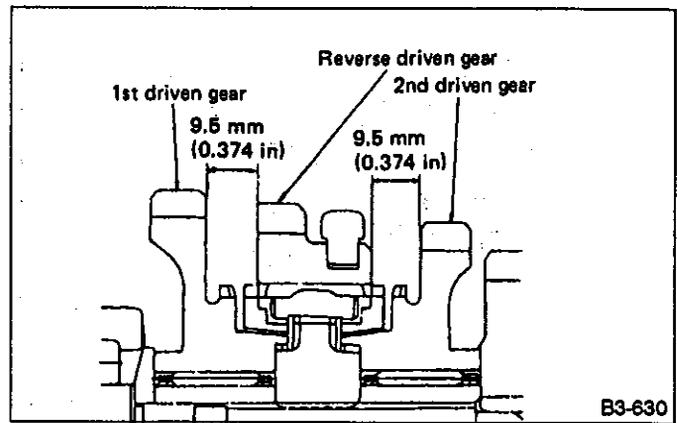


Fig. 154

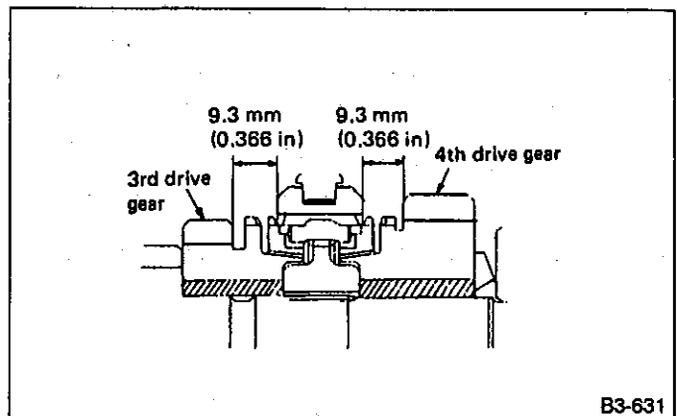


Fig. 155

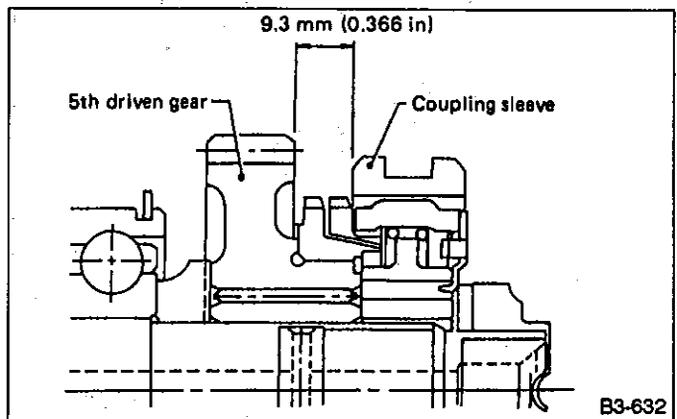


Fig. 156

7) Inspection of rod end clearance. Measure rod end clearances A and B. If any clearance is not within specifications, replace rod or fork as required.

Unit: mm (in)

	A	B
Clearance	0.3 — 1.6 (0.012 — 0.063)	0.3 — 1.6 (0.012 — 0.063)

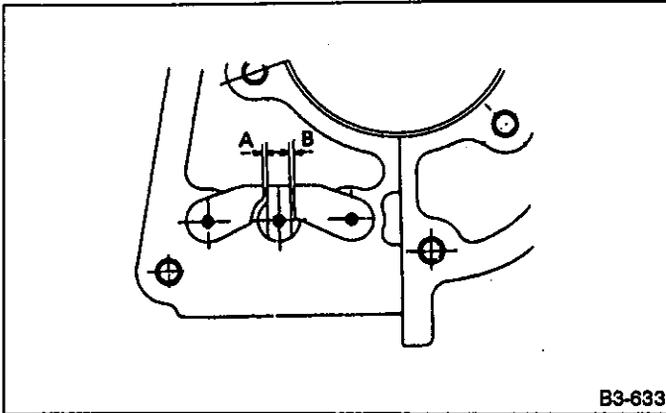


Fig. 157

8) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline, and apply liquid gasket, and then put case (RH) and (LH) together.

**Liquid gasket:**

Three-bond 1215 or equivalent

9) Tighten 17 bolts with bracket, clip, etc. in the following sequence.

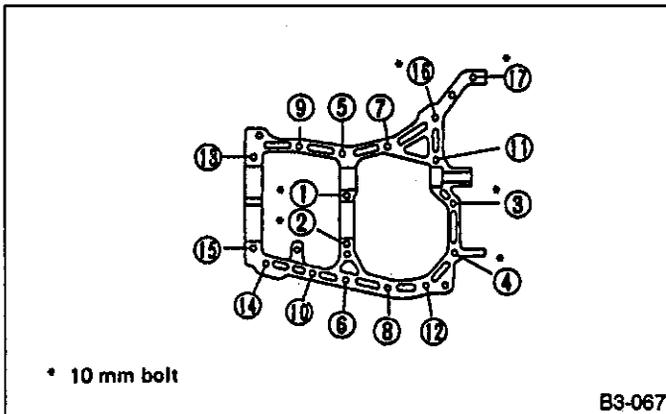


Fig. 158

**Tightening torque:**

8 mm bolt

23 — 26 N•m (2.3 — 2.7 kg-m, 17 — 20 ft-lb)

10 mm bolt

36 — 42 N•m (3.7 — 4.3 kg-m, 27 — 31 ft-lb)

a. Put cases together so that drive pinion shim is not caught up between.

b. Confirm that speedometer gear is meshed and is inserted perfectly.

10) Tighten ball bearing attaching bolts at the drive pinion shaft rear.

**Tightening torque:**

26 — 32 N•m

(2.7 — 3.3 kg-m, 20 — 24 ft-lb)

11) Backlash adjustment of hypoid gear and preload adjustment of roller bearing.

(1) Place the transmission with case (LH) facing downward and put WEIGHT on bearing cup.

(2) Screw retainer ASSY into case (LH) from the bottom with WRENCH. Fit HANDLE on the transmission main shaft. Shift gear into 5th and turn the shaft several times. Screw in the retainer while turning HANDLE until a slight resistance is felt on WRENCH.

This is the contact point of hypoid gear and drive pinion shaft. Repeat the above sequence several times to ensure the contact point.

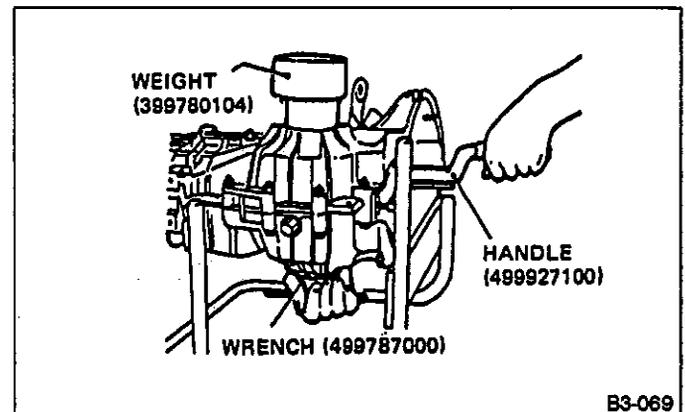


Fig. 159

(3) Remove weight and screw in retainer without O-ring on the upper side and stop at the point where slight resistance is felt.

At this point, the backlash between the hypoid gear and drive pinion shaft is zero.

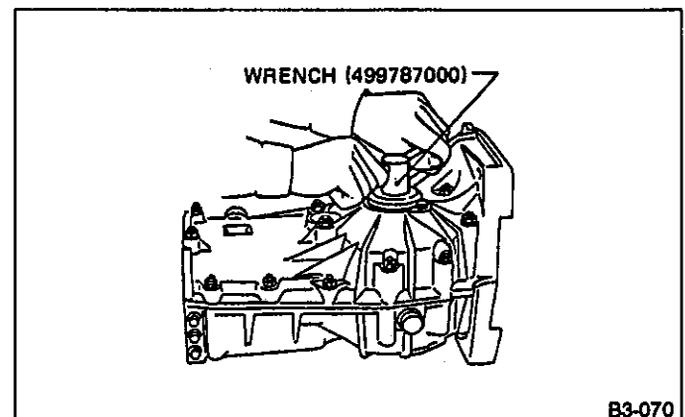


Fig. 160

(4) Fit lock plate. Loosen the retainer on the lower side by 1-1/2 notches of lock plate and turn in the retainer on the upper side by the same amount in order to obtain the backlash.

The notch on the lock plate moves by 1/2 notch if the plate is turned upside down.

(5) Turn in the retainer on the upper side additionally by 1/2 to 1 notch in order to apply preload on taper roller bearing.

(6) Tighten temporarily both the upper and lower lock plates and mark both holder and lock plate for later readjustment.

(7) Turn transmission main shaft dozens of turns while tapping around retainer lightly with plastic hammer.

(8) Set DIAL GAUGE and MAGNET BASE. Insert the needle through transmission oil drain plug hole so that the needle comes in contact with the tooth surface at a right angle and check the backlash.

**Backlash:**

0.13 — 0.18 mm (0.0051 — 0.0071 in)

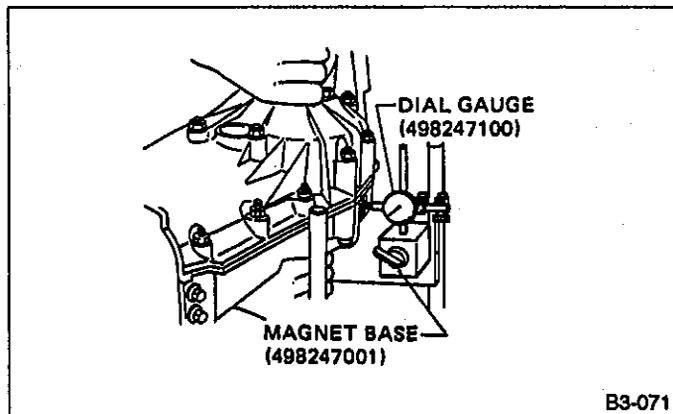


Fig. 161

12) Checking tooth contact of hypoid gear. Apply a uniform thin coat of red lead on both tooth surfaces of 3 or 4 teeth of the hypoid gear. Move the hypoid gear back and forth by turning the transmission main shaft until a definite contact pattern is developed on hypoid gear, and judge whether face contact is correct. If it is incorrect, make the following correction.

(1) Tooth contact is correct.

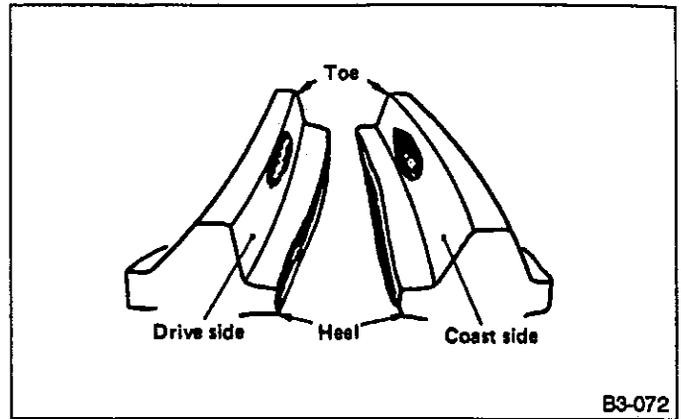


Fig. 162

(2) Backlash is excessive.

To reduce backlash, loosen holder on the upper side (case R.H. side) and turn in the holder on the lower side (case L.H. side) by the same amount.

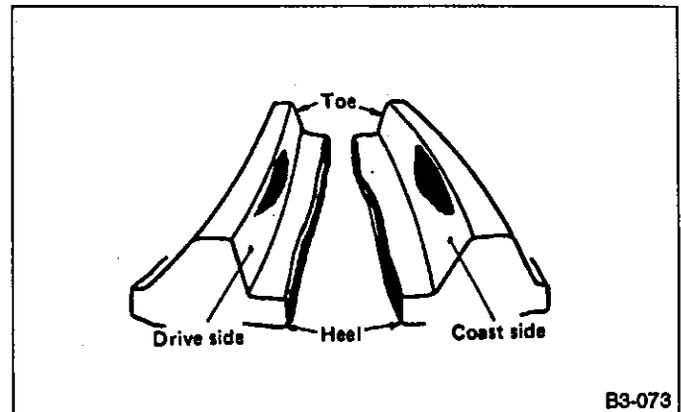


Fig. 163

(3) Backlash is insufficient.

To increase backlash, loosen holder on the lower side (case L.H. side) and turn in the holder on the upper side (case R.H. side) by the same amount.

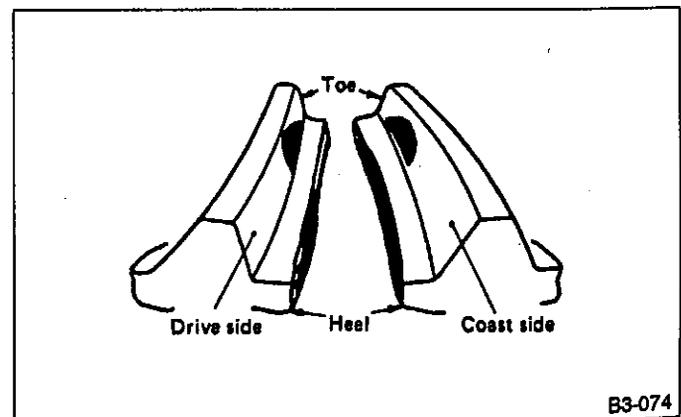


Fig. 164

(4) The drive pinion shim selected before is too thick. Reduce its thickness.

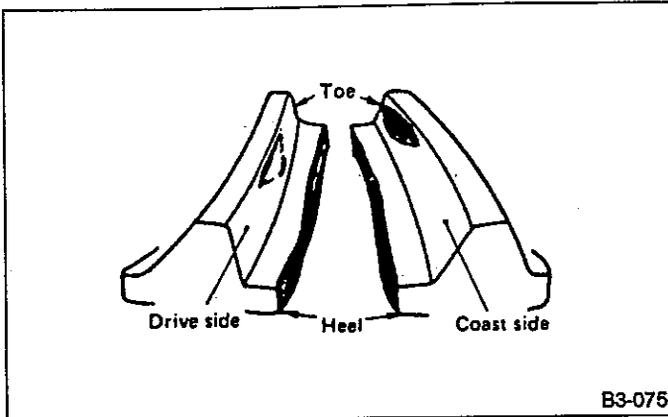


Fig. 165

(5) The drive pinion shim selected before is too thin. Increase its thickness.

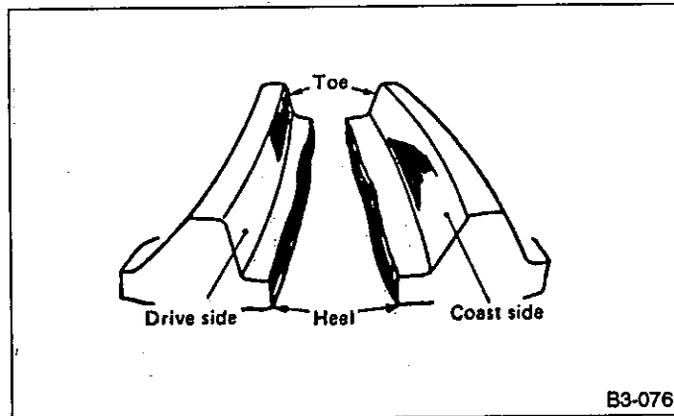


Fig. 166

13) After checking the tooth contact of hypoid gears, remove the lock plate. Then loosen retainer until the O-ring groove appears. Fit O-ring into the groove and tighten retainer into the position where retainer has been tightened in. Tighten retainer lock plate.

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

Carry out this job on both upper and lower retainers.

14) Selecting of main shaft rear plate. Using DEPTH GAUGE, measure the amount (A) of ball bearing protrusion from transmission main case surface and select the proper plate in the following table.

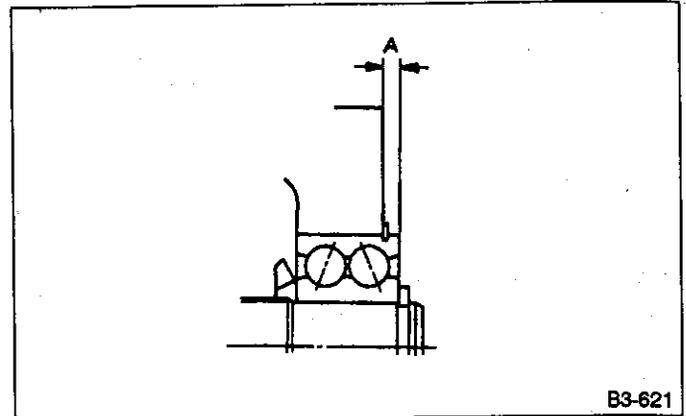


Fig. 167

Dimension A mm (in)	Part Number	Discrimination stamp
4.50 — 4.63 (0.1772 — 0.1823)	441347001	T81-1
4.37 — 4.50 (0.1720 — 0.1772)	441347002	T81-2

Before measuring, tap the end of main shaft by the plastic hammer lightly in order to make the clearance zero between the main case surface and the moving flange of bearing.

15) Install rear case & shifter ASSY

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

Be sure gasket is positioned on the rear of the case.

16) Neutral position adjustment

- (1) Shift gear into 3rd gear position.
- (2) Shifter arm turns lightly toward the 1st/2nd gear side but heavily toward the reverse gear side because of the function of the return spring, until arm contacts the stopper.
- (3) Make adjustment so that the heavy stroke (reverse side) is a little more than the light stroke (1st/2nd side).
- (4) To adjust, remove bolts holding reverse check sleeve ASSY to the case, move sleeve ASSY outward, and place adjustment shim (0 to 2 ea.) between sleeve ASSY and case to adjust the clearance.

Be careful not to break O-ring when placing shim(s).

Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

- When shim is removed, the neutral position will move closer to reverse; when shim is added, the neutral position will move closer to 1st gear.
- If shims alone cannot adjust the clearance, replace reverse accent shaft and re-adjust.

Reverse accent shaft		
Part No.	Identification Mark	Remarks
32188AA040	1	Neutral position is closer to 1st gear.
32188AA011	No mark	Standard
32188AA050	3	Neutral position is closer to reverse gear.

17) Reverse check plate adjustment.

Shift shifter arm CP to "5th" and then to reverse to see if reverse check mechanism operates properly. Also check to see if arm returns to Neutral when released from the reverse position. If arm does not return properly, replace reverse check plate.

Reverse check plate			
Part No.	No.	Angle $\theta$	Remarks
32189AA000	0	28°	Arm stops closer to "5th".
32189AA010	1	31°	Arm stops closer to "5th".
32189AA020	2	34°	Standard
32189AA030	3	37°	Arm stops closer to reverse.
32189AA040	4	40°	Arm stops closer to reverse.

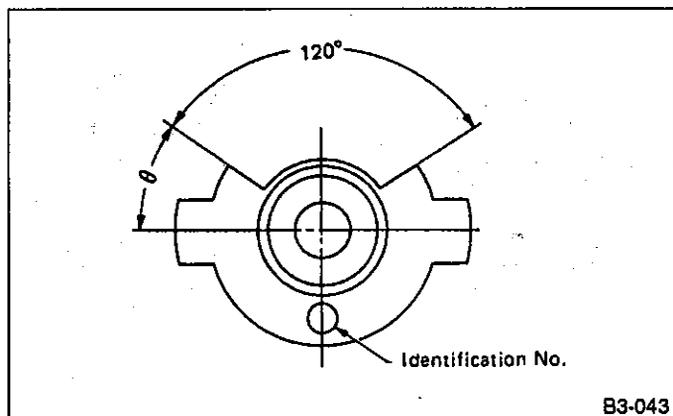


Fig. 168

18) Install clutch release lever and clutch release bearing.

## 8. Drive Pinion ASSY (Full-time 4WD)

### A: DISASSEMBLY

#### 1. DRIVE PINION SHAFT

1) Straighten lock nut at staked portion. Remove the lock nut using HOLDER and STOPPER.

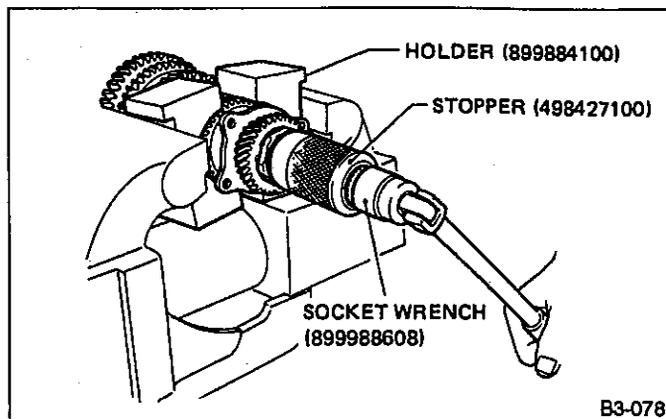


Fig. 169

2) Withdraw drive pinion from driven shaft. Remove differential bevel gear sleeve ①, Adjusting washer No. 1 ② (25 x 37.5 x t), Adjusting washer No. 2 ③ (25 x 37.5 x 4), thrust bearing ④ (25 x 37.5 x 3), needle bearing ⑤ (25 x 30 x 20), drive pinion collar ⑥, needle bearing ⑦ (30 x 37 x 23) and thrust bearing ⑧ (33 x 50 x 3).

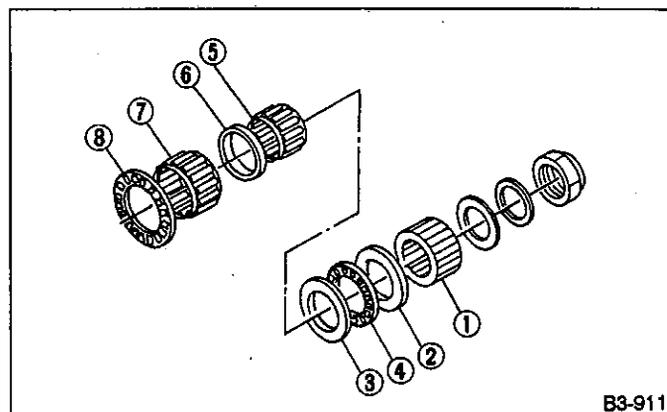


Fig. 170

3) Remove roller bearing and washer (33 x 50 x 5) using REMOVER and PRESS.

Do not reuse roller bearing.

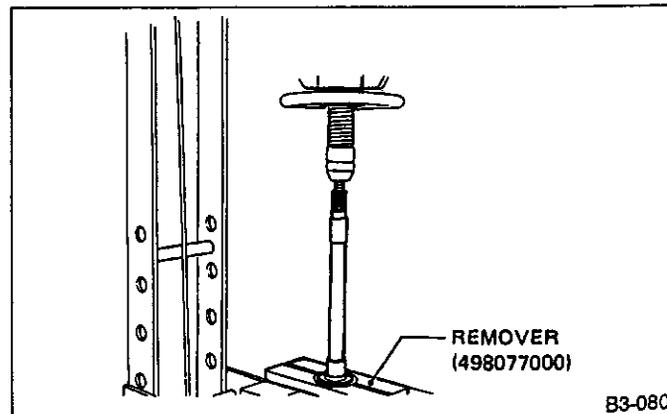


Fig. 171

**2. DRIVEN GEAR ASSY**

Attach a cloth to the end of driven shaft (on the frictional side of thrust needle bearing) during disassembly or reassembly to prevent damage.

1) Straighten lock nut at staked portion. Remove the lock nut using SOCKET WRENCH 50 and HOLDER.

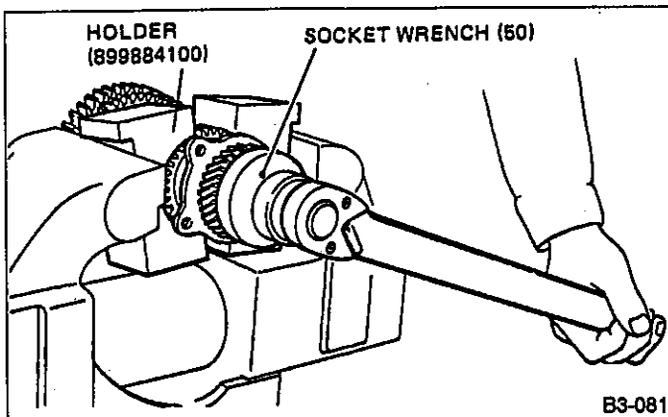


Fig. 172

2) Remove 5th driven gear using REMOVER.

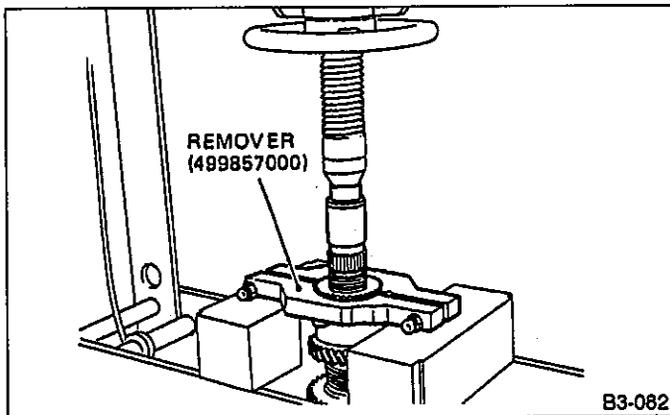


Fig. 173

3) Remove woodruff key.

4) Remove roller bearing (42 x 74 x 40) and 3rd & 4th driven gear using REMOVER.

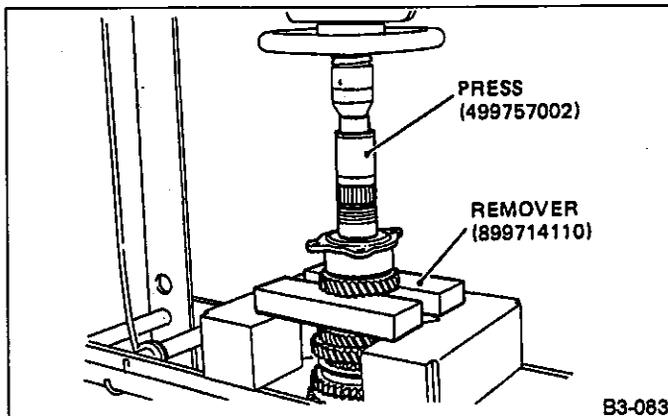


Fig. 174

5) Remove the key.

6) Remove 2nd driven gear ASSY.

7) Remove 1st driven gear, 2nd gear bushing, gear and hub using REMOVER and PRESS.

Replace gear and hub if necessary. Do not attempt to disassemble if at all possible because they must engage at a specified point. If they have to be disassembled, mark the engaging point beforehand.

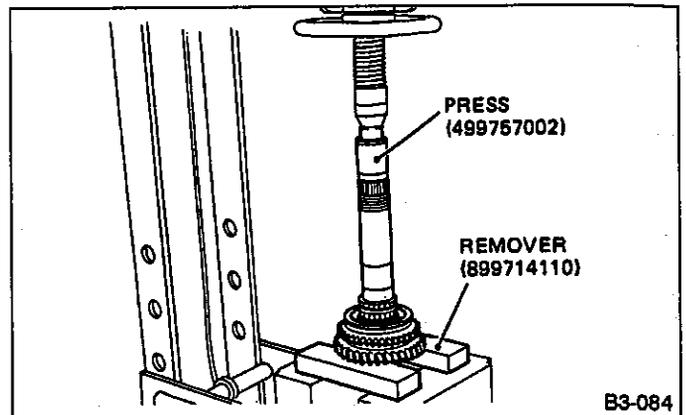


Fig. 175

8) Remove sub gears for 1st and 2nd driven gear.

**B: ASSEMBLY**

**1. GEAR & HUB ASSY**

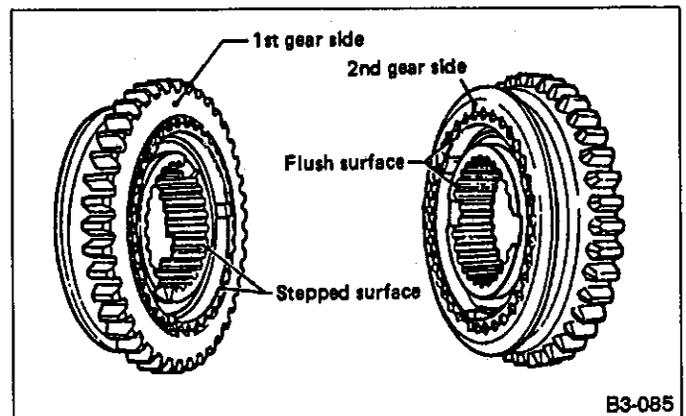


Fig. 176

Position open ends of springs 120° apart.

**2. DRIVEN GEAR ASSY**

Assemble a driven shaft and 1st driven gear that select for adjustment the proper radial clearance.

Driven shaft		1st driven gear	
Part No.	Diameter A mm (in)	Part No.	Spec.
32229AA130	49.959 — 49.966 (1.9669 — 1.9672)	32231AA270	Non-turbo
		32231AA290	Turbo
32229AA120	49.967 — 49.975 (1.9672 — 1.9675)	3231AA260	Non-turbo
		32231AA280	Turbo

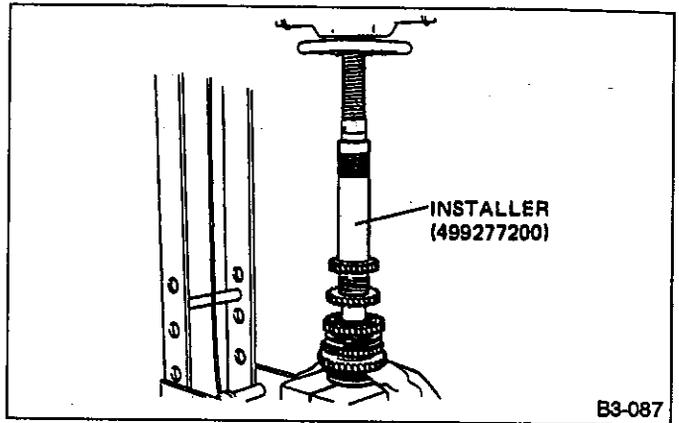


Fig. 179

4) Install a set of roller bearing (42 x 74 x 40) onto the driven shaft using INSTALLER and PRESS.

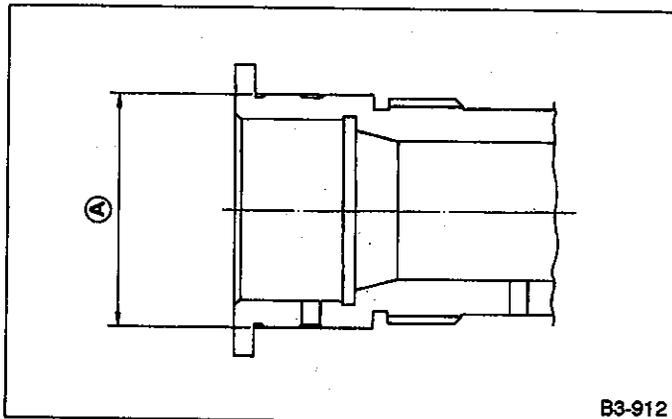


Fig. 177

1) Install 1st driven gear, 1st-2nd baulk ring and gear & hub ASSY onto driven shaft.

Take care to install gear hub in proper direction.

2) Install 2nd driven gear bushing onto driven shaft using INSTALLER and PRESS.

Attach a cloth to the end of driven shaft to prevent damage.

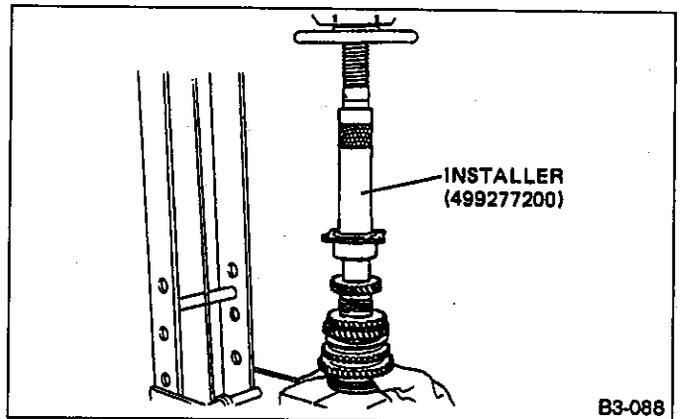


Fig. 180

5) Position woodruff key in groove on the rear of driven shaft. Install 5th driven gear onto drive shaft using INSTALLER and PRESS.

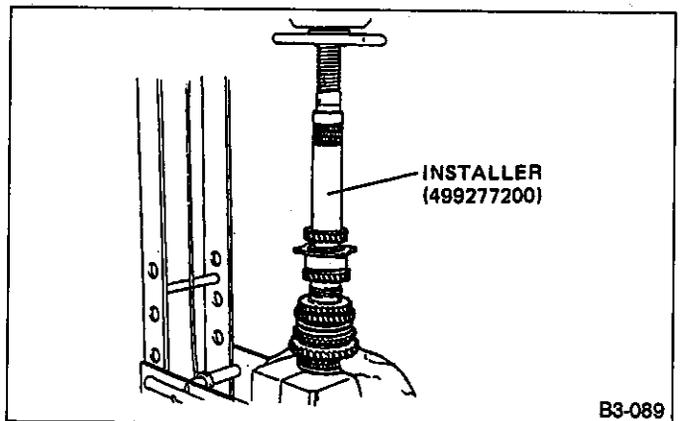


Fig. 181

6) Install lock washer (42 x 53 x 2). Install lock nut (42 x 13) and tighten to the specified torque using SOCKET WRENCH (50).

**Tightening torque:**

**245 ± 10 N·m (25 ± 1 kg·m, 181 ± 7 ft·lb)**

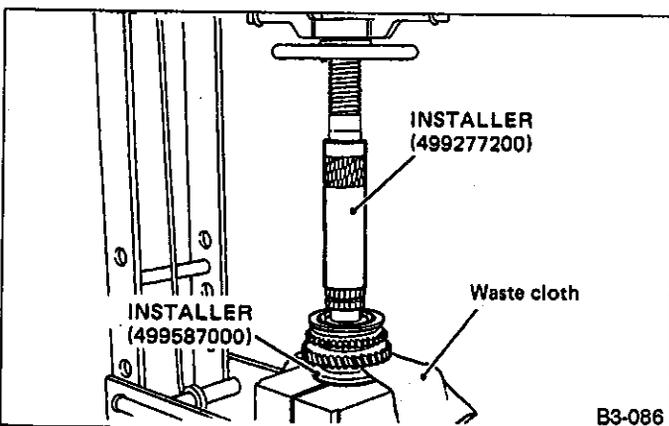


Fig. 178

3) Install 2nd driven gear, 1st-2nd baulk ring and insert onto driven shaft. After installing key on driven shaft, install 3rd-4th driven gear using INSTALLER and PRESS.

Align groove in baulk ring with insert.

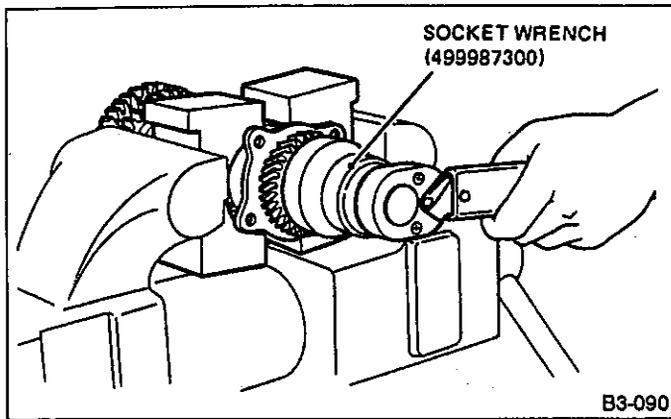


Fig. 182

- a. Stake lock nut at two points.
- b. Check that starting torque of roller bearing is 0.1 to 1.5 N·m (1 to 15 kg·cm, 0.9 to 13.0 in·lb).

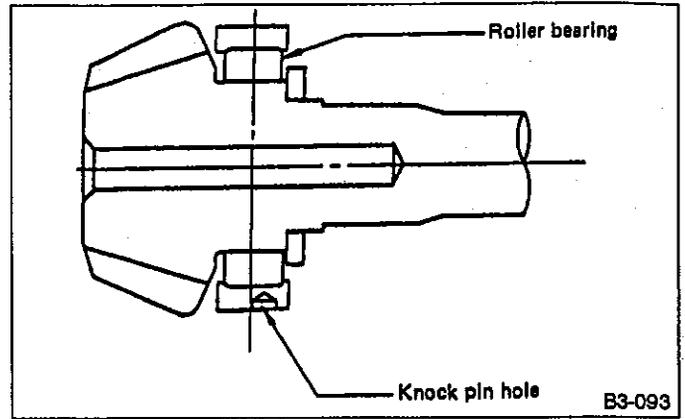


Fig. 185

- 2) Install thrust bearing (33 x 50 x 3) and needle bearing (30 x 37 x 23). Install driven shaft ASSY.

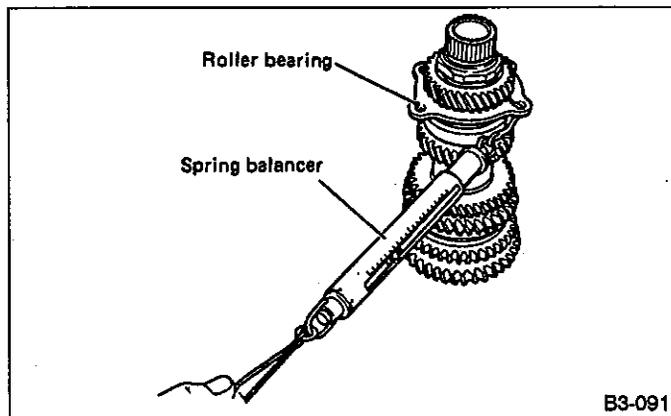


Fig. 183

**3. DRIVE PINION SHAFT**

- 1) Install roller bearing onto drive pinion. Install washer (33 x 50 x 5) using INSTALLER and PRESS.

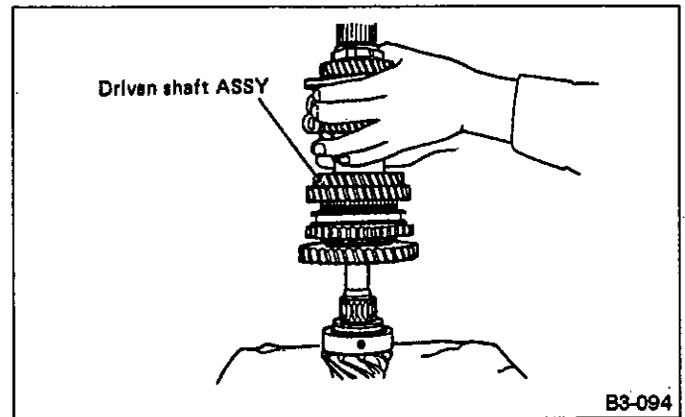


Fig. 186

- 3) Install drive pinion collar ①, needle bearing ② (25 x 30 x 20), Adjusting washer No. 2 ③ (25 x 36 x 4), thrust bearing ④ (25 x 37.5 x 3), Adjusting washer No. 1 ⑤ (25 x 36 x t) and differential bevel gear sleeve ⑥ in that order.

**Be careful because spacer must be installed in proper direction.**

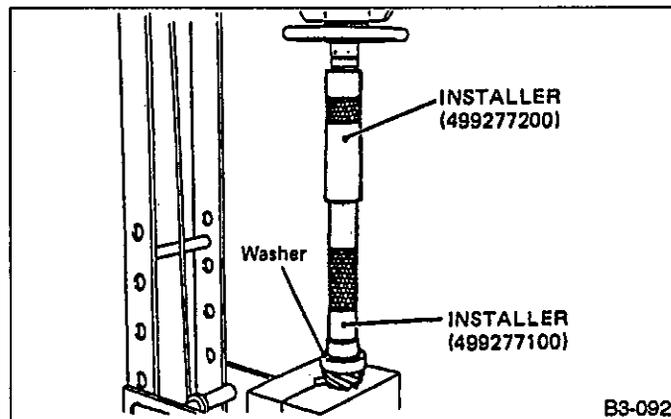


Fig. 184

**When installing roller bearing, note its directions (front and rear) because knock pin hole in outer race is offset.**

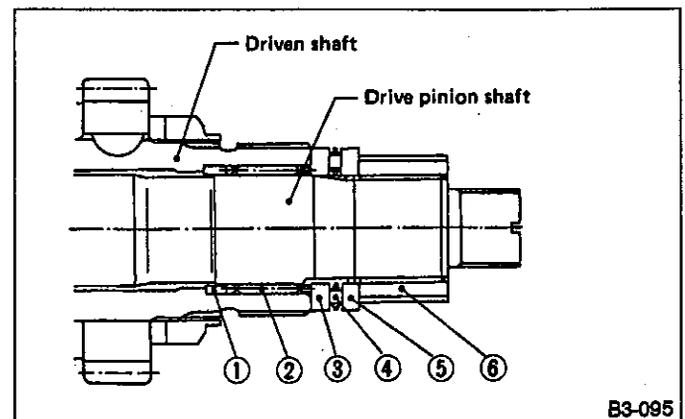


Fig. 187



**4. ADJUSTMENT OF THRUST BEARING PRE-LOAD**

1) After completing the preceding steps 1 through 3, select adjusting washer No. 2 so that dimension H is zero through visual check. Position washer (18.3 x 30 x 4) and lock washer (18 x 30 x 2) and install lock nut (18 x 13.5).

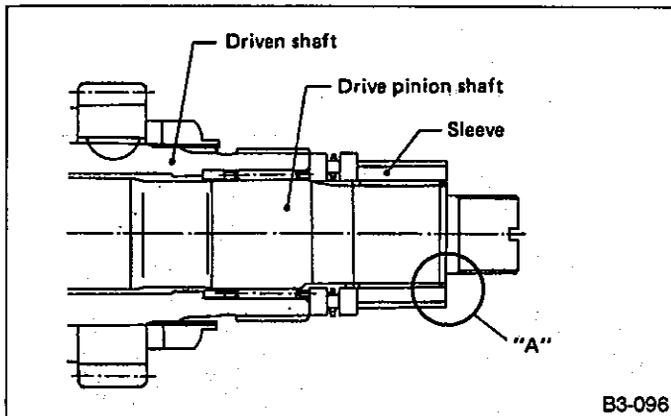


Fig. 188

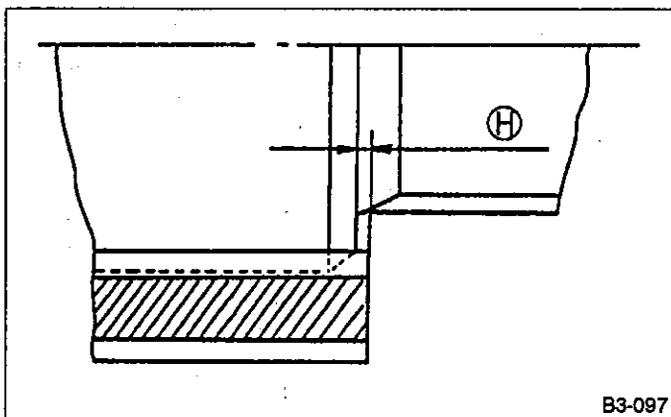


Fig. 189

2) Using HOLDER and STOPPER, tighten lock nut to the specified torque.

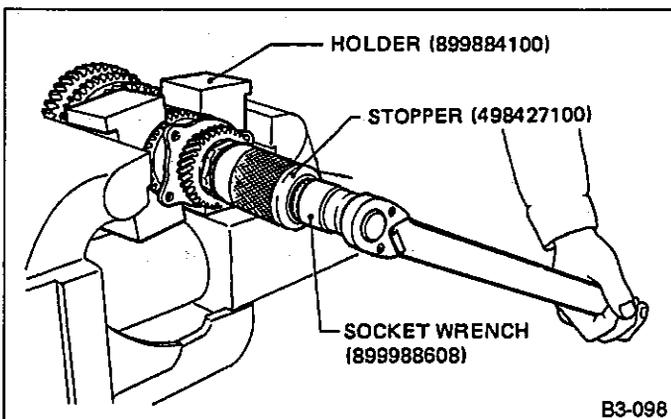


Fig. 190

**Tightening torque:**

$118 \pm 8 \text{ N}\cdot\text{m}$  ( $12 \pm 0.8 \text{ kg}\cdot\text{m}$ ,  $86.8 \pm 5.8 \text{ ft}\cdot\text{lb}$ )

3) After removing STOPPER, measure starting torque.

**Starting torque:**

$0.3 - 0.8 \text{ N}\cdot\text{m}$  ( $3 - 8 \text{ kg}\cdot\text{cm}$ ,  $2.6 - 6.9 \text{ in}\cdot\text{lb}$ )

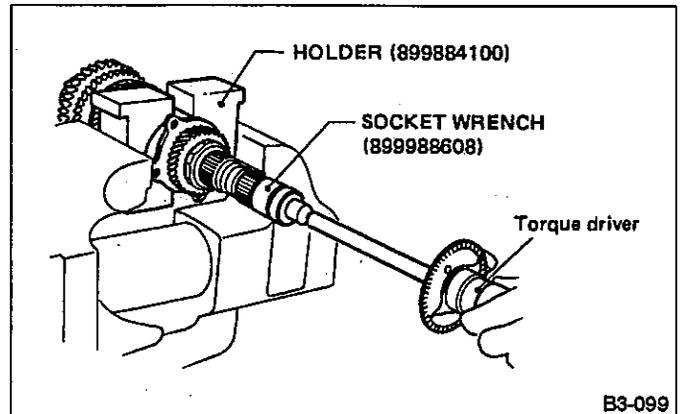


Fig. 191

4) If starting torque is not within specified limit, select new adjusting washer No. 1 and recheck starting torque.

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

5) If specified starting torque range cannot be obtained when a No. 1 adjusting washer is used, then select a suitable No. 2 adjusting washer from those listed in the following table. Repeat steps (1) through (4) to adjust starting torque.

Starting torque	Dimension H	Washer No.2
Low	Small	Select thicker one.
High	Large	Select thinner one.

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.950 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

6) Recheck that starting torque is within specified range, then clinch lock nut at four positions.



# 9. Drive Pinion ASSY (Selective 4WD)

## A: DISASSEMBLY

Remove caulking before taking off locknut.

- 1) Loosen locknut using special tool.

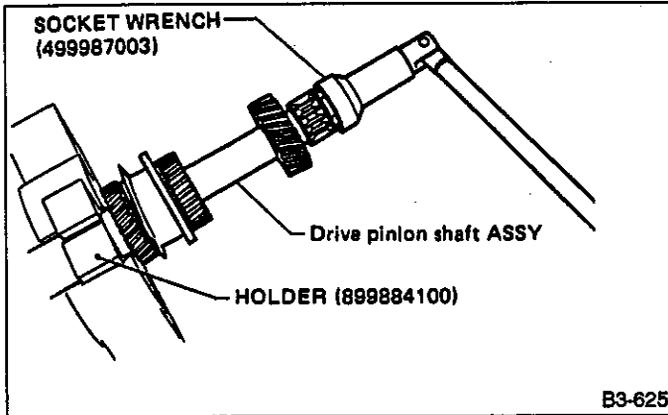


Fig. 192

- 2) Using special tool, remove 5th needle bearing race, needle bearing, and transfer drive gear.

**Special tool:**  
**TRANSMISSION SHAFT REMOVER (899864100)**  
**REMOVER (899714110)**

- 3) Remove drive pinion collar.
- 4) Remove 5th driven gear using special tool and a press.

**Special tool:**  
**5TH DRIVEN GEAR REMOVER (498077000)**

- 5) Remove woodruff key.
- 6) Using special tool and a press, remove ball bearing and 3rd and 4th driven gear.

**Special tool:**  
**REMOVER (899714110)**

- 7) Remove 2nd driven gear CP.
- 8) Using special tool and a press, remove 1st driven gear CP, 2nd gear bushing, and gear & hub ASSY.  
 Remove key before removing 2nd gear bushing.

**Special tool:**  
**REMOVER (899714110)**

- 9) Using special tool and a press, remove 1st gear bushing, 1st driven gear thrust washer, and roller bearing (41 x 71 x 23).

Replace roller bearing (41 x 71 x 23) with a new one if this disassembly is performed.

**Special tool:**  
**5TH DRIVEN GEAR REMOVER (498077000)**

## B: ASSEMBLY

- 1) Assemble gear & hub ASSY.

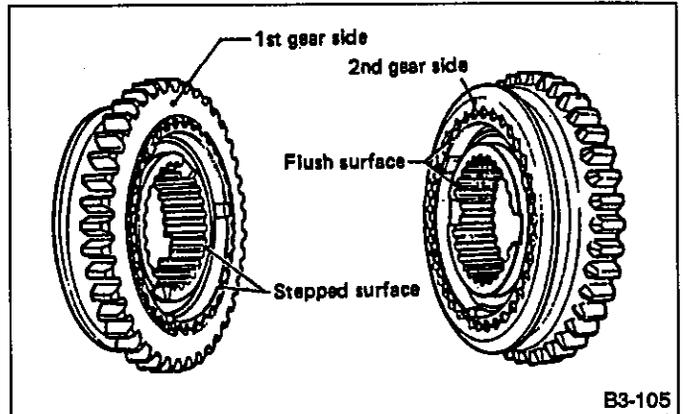


Fig. 193

Position open ends of springs 120° apart.

- 2) Drive roller bearing onto drive pinion shaft and 1st driven gear thrust washer using special tool.

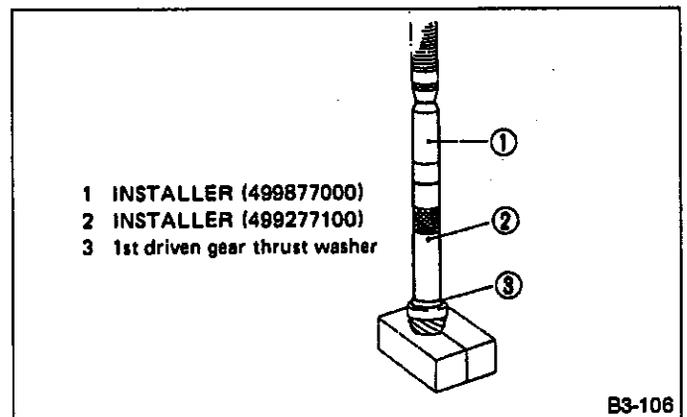


Fig. 194

- 3) Install driven gear bushing (42) onto drive pinion shaft using the same tools as in step 2) above.  
 Bushing may be installed with either side up.

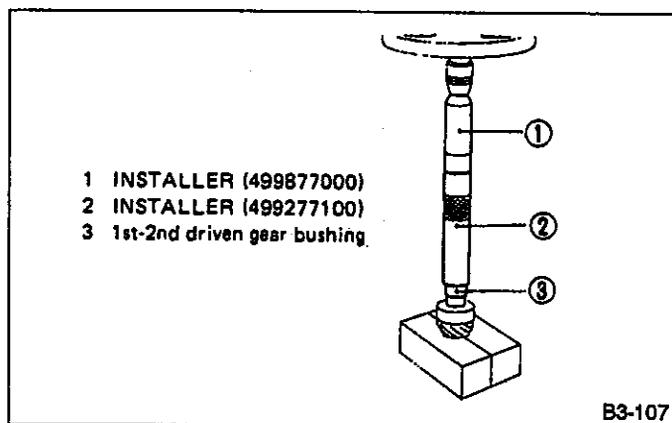


Fig. 195

4) Measure outside diameter of 1st driven gear bushing to determine suitable 1st driven gear.

Bushing outside diameter mm (in)	1st driven gear
41.983 — 41.996 (1.6529 — 1.6534)	32231AA320
41.968 — 41.982 (1.6523 — 1.6528)	32231AA330
41.954 — 41.967 (1.6517 — 1.6522)	32231AA340

5) Install 1st driven gear, 1st-2nd balk ring and gear & hub ASSY (already assembled in previous step) to drive pinion shaft.

Align ring groove with insert.

6) Install 1st-2nd driven gear bushing to drive pinion shaft.

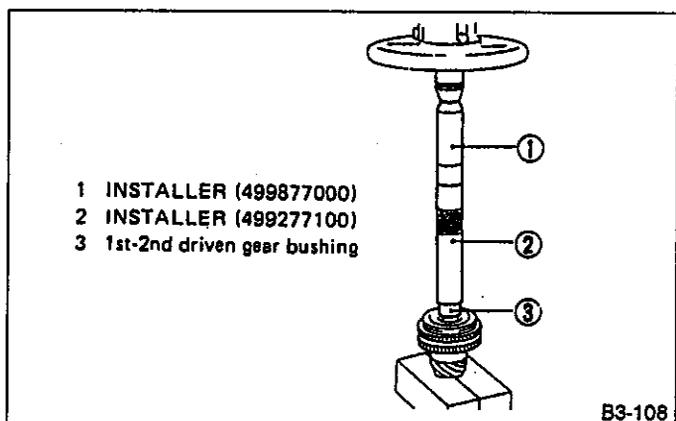


Fig. 196

7) Install 2nd driven gear, 1st-2nd balk ring and key to drive pinion shaft. Then, install 4th-3rd driven gear using the same tools as above.

8) Install ball bearing (29 x 74 x 38) to drive pinion shaft using special tool.

Ball bearing may be installed without using the tool. There should be no problem.

Special tool:  
1ST-2ND BUSHING INSTALLER (499277100)

9) Install woodruff key (5 x 6.5 x 1.5) to the rear section of drive pinion shaft. Using special tool and press, install 5th driven gear.

a. Face 5th driven gear in the correct direction.

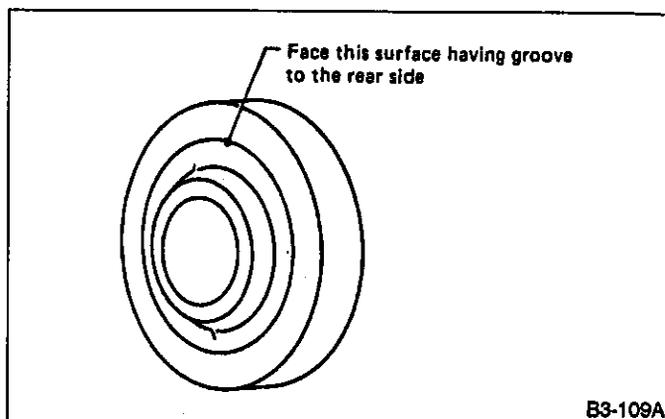


Fig. 197

b. Be careful not to dislocate woodruff key while installing 5th gear.

Special tool:  
1ST-2ND BUSHING INSTALLER (499277100)

10) Install drive pinion collar and transfer drive gear. Then, install 5th needle bearing race using special tool and a press.

Special tool:  
4TH-5TH RACE INSTALLER (499877000)

11) Install needle bearing and lock washer, then tighten lock nut to the specified torque.

Special tool:  
SOCKET WRENCH (35) (499987003)  
HOLDER (899884100)

Tightening torque:  
112 — 124 N•m (11.4 — 12.6 kg-m, 82 — 91 ft-lb)

Secure lock nut in two places.

## 10. Drive Pinion ASSY (2000•2200cc FWD)

### A: DISASSEMBLY

1) Loosen locknut using SOCKET WRENCH (35) (499987003) and HOLDER (899884100).

Remove caulking before taking off locknut.

2) Remove 5th driven gear using 5TH DRIVEN GEAR REMOVER (498077000) and a press.

3) Remove woodruff key (5 x 6.5 x 1.6).

4) Using REMOVER (899714110) and a press, remove ball bearing (28 x 74 x 28) and 3rd-4th driven gear.

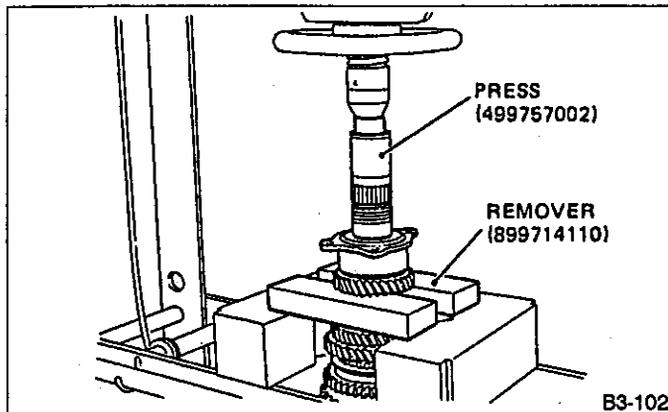


Fig. 198

5) Remove 2nd driven gear CP.

6) Remove 3rd-4th driven gear key.

7) Using REMOVER (899714110) and a press, remove 1st driven gear CP, 2nd gear bushing, and gear & hub ASSY.

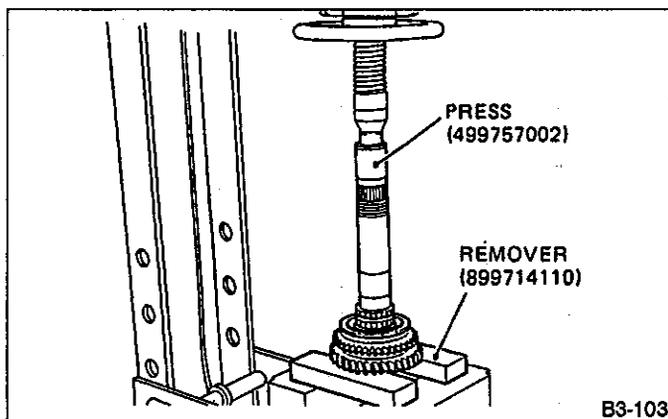


Fig. 199

8) Using 5TH DRIVEN GEAR REMOVER and a press, remove 1st gear bushing, 1st driven gear thrust plate, and roller bearing (41 x 71 x 23).

Replace roller bearing (41 x 71 x 23) with a new one if this disassembly is performed.

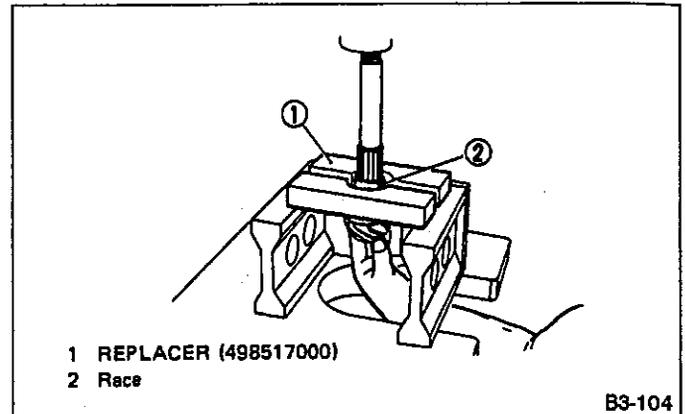


Fig. 200

### B: ASSEMBLY

1) Assemble gear & hub ASSY.

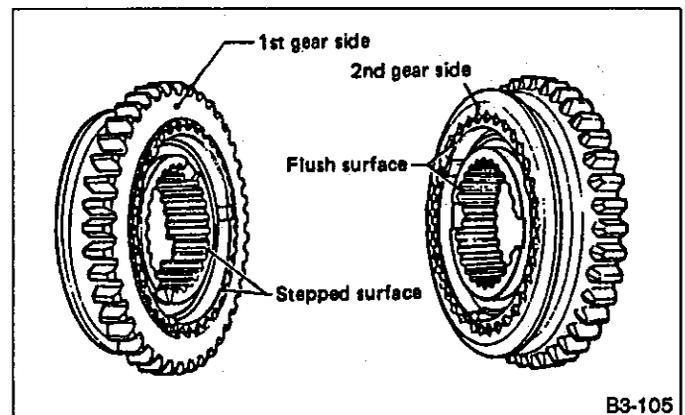


Fig. 201

Position open ends of springs 120° apart.

2) Drive roller bearing onto drive pinion shaft and 1st driven gear thrust washer using 1ST-2ND BUSHING INSTALLER and 4TH- 5TH RACE INSTALLER.

Use new roller bearing.

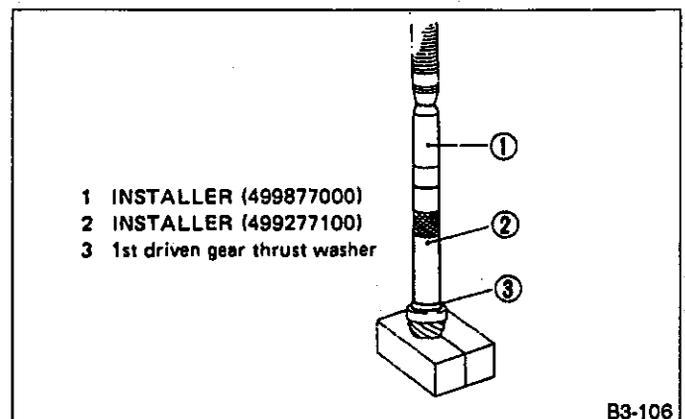


Fig. 202

3) Install 1st-2nd driven gear bushing onto drive pinion shaft.

Bushing may be installed with either side up.

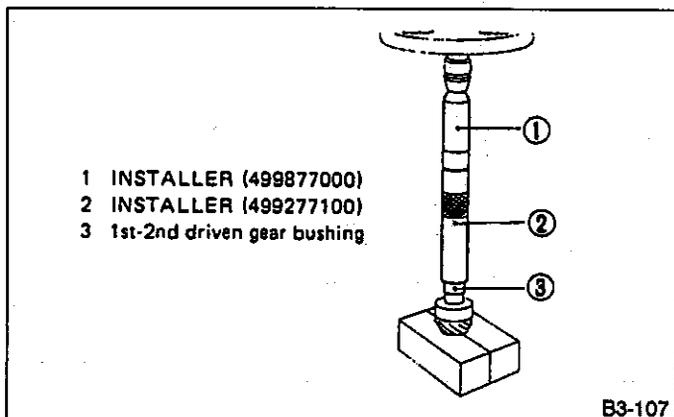


Fig. 203

4) Measure outside diameter of 1st driven gear bushing to determine suitable 1st driven gear.

Bushing outside diameter mm (in)	1st driven gear
41.983 — 41.996 (1.6529 — 1.6534)	32231AA320
41.968 — 41.982 (1.6523 — 1.6528)	32231AA330
41.954 — 41.967 (1.6517 — 1.6522)	32231AA340

5) Install 1st driven gear, 1st-2nd balk ring and gear & hub ASSY (already assembled in previous step) to drive pinion shaft.

Align ring groove with insert.

6) Install 1st-2nd driven gear bushing to drive pinion shaft.

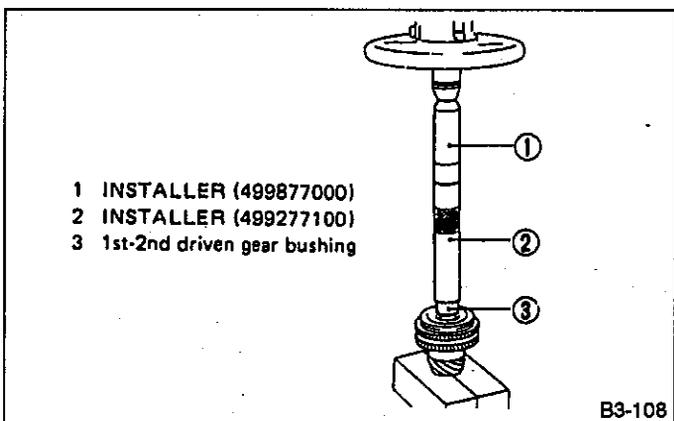


Fig. 204

7) Install 2nd driven gear, 1st-2nd balk ring and key to drive pinion shaft. Then, install 3rd-4th driven gear.

Special tool:  
INSTALLER (499877000)

8) Install ball bearing (29 x 74 x 38) on drive pinion shaft using INSTALLER.

Ball bearing may be installed without using the tool. There should be no problem.

Special tool:  
INSTALLER (499277100)

9) Install woodruff key (5 x 6.5 x 1.5) to the rear section of drive pinion shaft. Using INSTALLER and press, install 5th driven gear.

a. Face 5th driven gear in the correct direction.

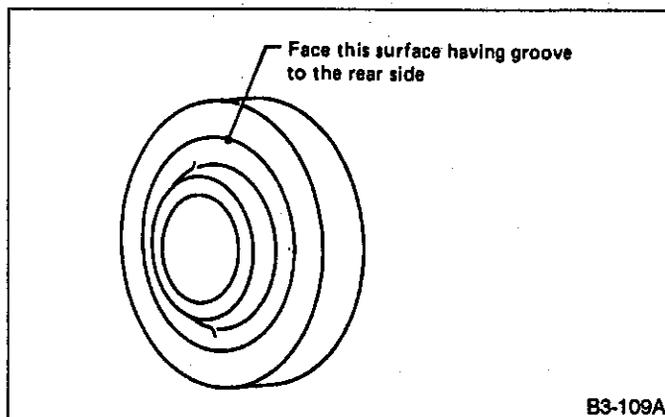


Fig. 205

b. Be careful not to dislocate woodruff key while installing 5th gear.

Special tool:  
INSTALLER (499277100)

10) Install lock washer and tighten lock nut to the specified torque.

a. Discard old lock nuts, and lock washer; replace with new ones.

b. Secure lock nut in two places.

Tightening torque:  
112 — 124 N·m (11.4 — 12.6 kg-m, 82 — 91 ft-lb)

Special tool:  
SOCKET WRENCH (35) (499987003)  
HOLDER (899884100)

## 11. Drive Pinion ASSY (1600•1800cc FWD)

### A: DISASSEMBLY

1) Remove locknut from drive pinion with special tool, and a vice.

Remove caulking before taking off locknut.

Special tool:

**SOCKET WRENCH (35) (499987003)**  
**HOLDER (899884100)**

2) Remove following parts:

- Insert stopper plate
- Insert guide
- Sleeve and hub ASSY
- Balk ring
- 5th driven gear
- Needle bearing

3) Using special tool, and a press, remove:

- 5th needle bearing race
- 5th gear thrust washer
- Ball bearing
- 3rd and 4th driven gear

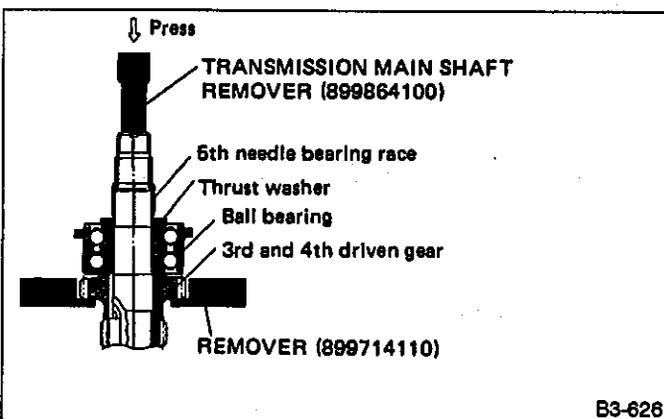


Fig. 206

4) First remove 2nd driven gear and needle bearing (39 x 44 x 23.8) using special tool. Then, using a press, remove 1st driven gear, 2nd needle bearing inner race, and gear and hub ASSY.

Remove key before removing 2nd needle bearing inner race.

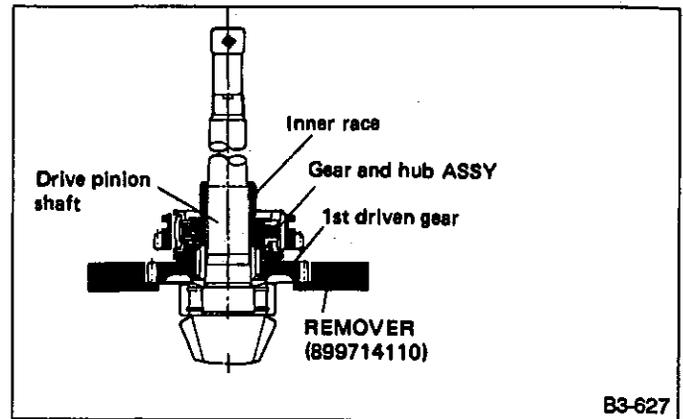


Fig. 207

5) Remove 1st needle bearing inner race and gear and hub ASSY.

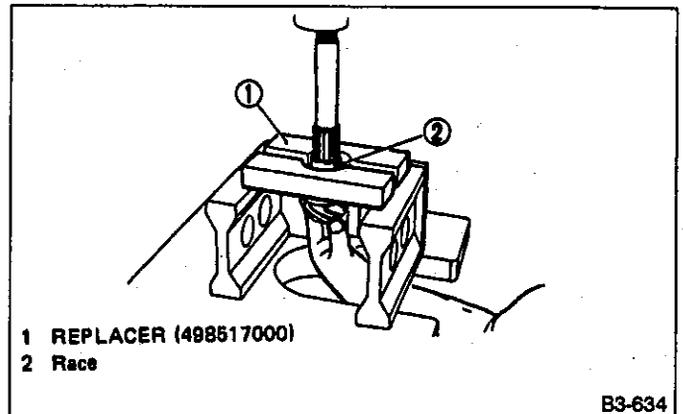


Fig. 208

### B: ASSEMBLY

1) Assemble gear & hub ASSY.

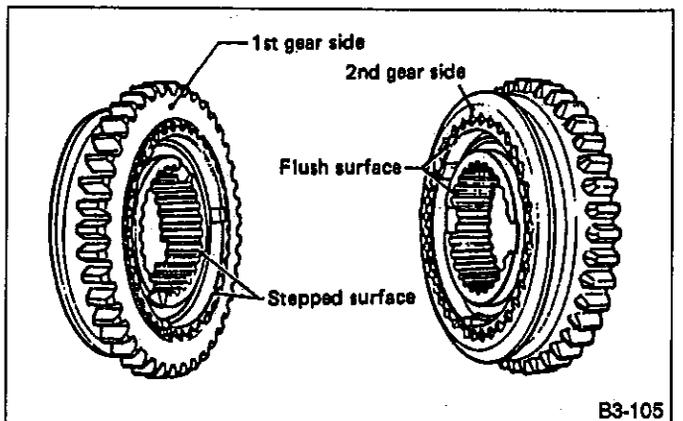


Fig. 209

Position open ends of springs 120° apart.

2) Assemble sleeve & hub ASSY.

Make sure bent sections of springs on both sides are kept 180° apart and hooked at hub's holes.

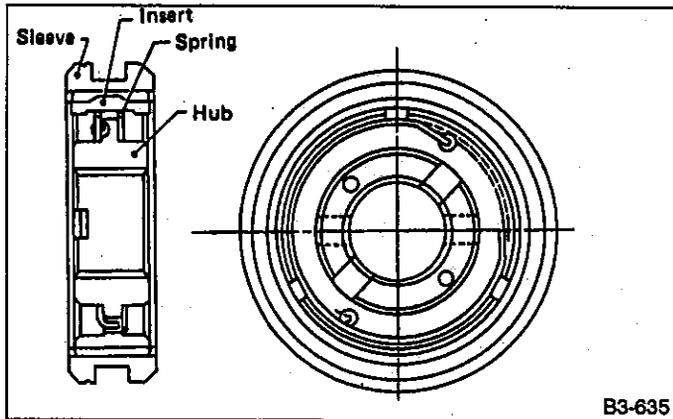


Fig. 210

3) Fit roller bearing in drive pinion shaft. Install 1st driven gear thrust washer.

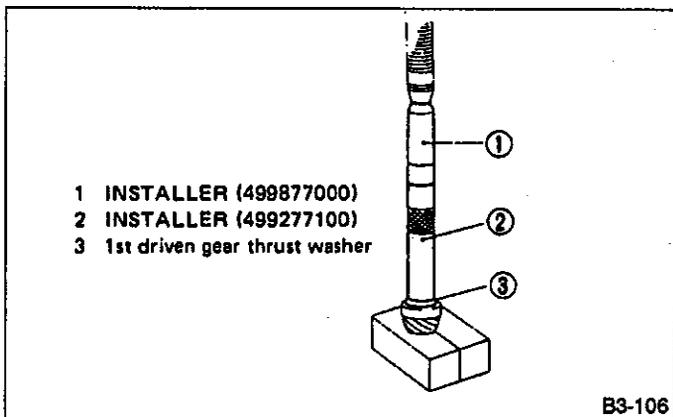


Fig. 211

4) Install needle bearing inner race.

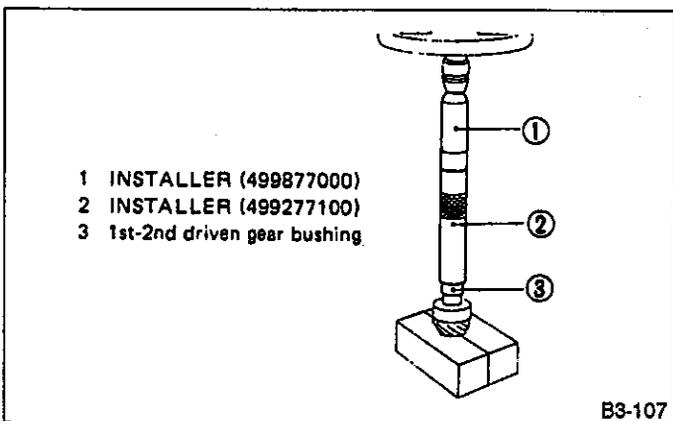


Fig. 212

5) Install needle bearing, 1st driven gear, 1st-2nd ring and gear & hub ASSY subassembled before.

Take care so that 1st-2nd synchronizer ring groove is in line with the insert.

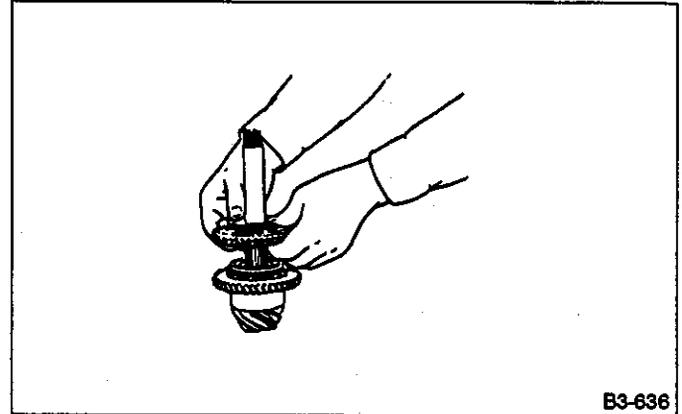


Fig. 213

6) Install needle bearing inner race.

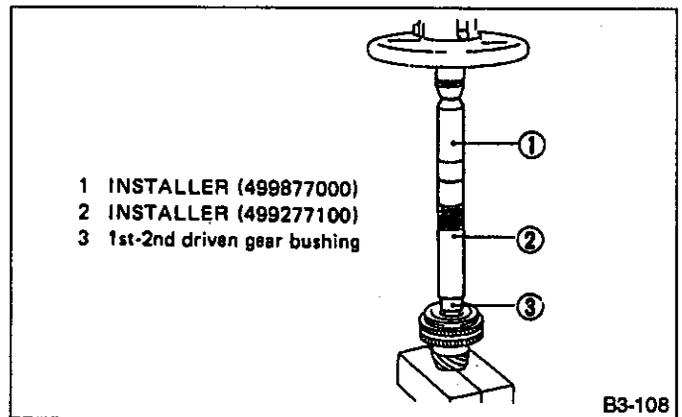


Fig. 214

7) Install needle bearing, 2nd driven gear.

8) Install key into the groove on drive pinion shaft and install 3rd-4th driven gear.

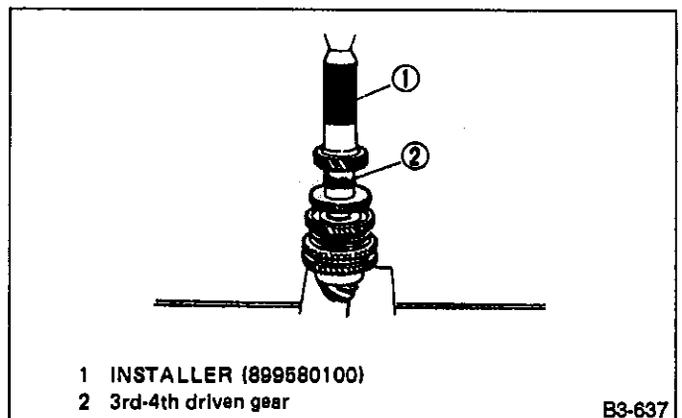
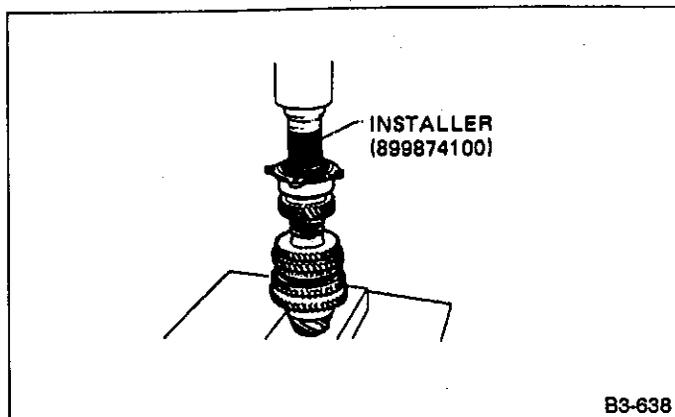


Fig. 215

9) Install ball bearing with special tool.

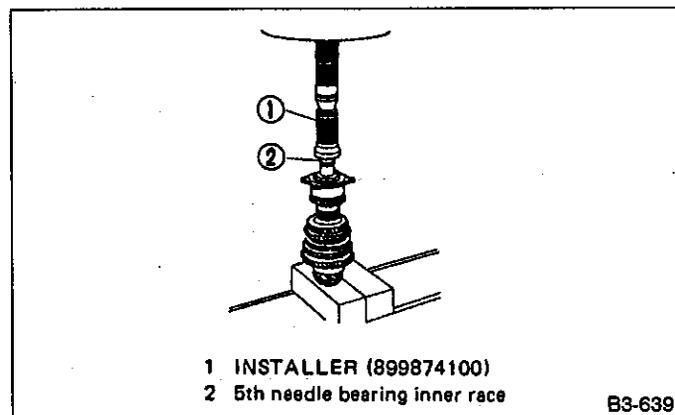


B3-638

Fig. 216

Some ball bearings may be installed in the drive pinion shaft without press tightness, but it causes no problem in practical operation.

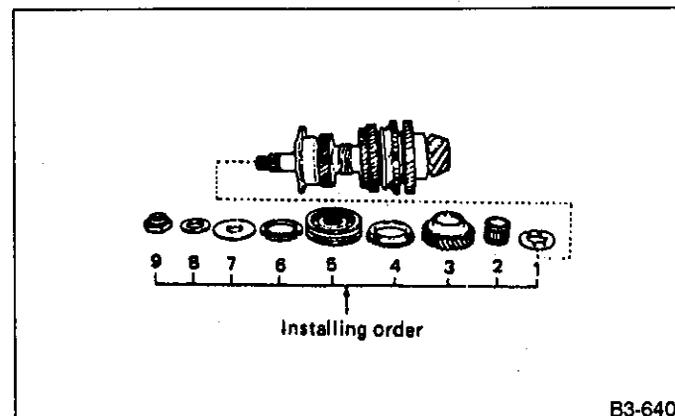
10) Install 5th driven gear thrust washer and then, install 5th needle bearing inner race.



B3-639

Fig. 217

11) Install needle bearing, 5th driven gear, rings, sleeve & hub ASSY, insert guide, insert stopper plate, lock washer and lock nut.



B3-640

Fig. 218

12) Tighten lock nut with special tool.

Special tool:

SOCKET WRENCH (499987003)

HOLDER (899884100)

Tightening torque:

73 — 84 N·m (7.4 — 8.6 kg-m, 54 — 62 ft-lb)

Stake the lock nut at 2 points.

## 12. Input Shaft ASSY (4WD Dual-range)

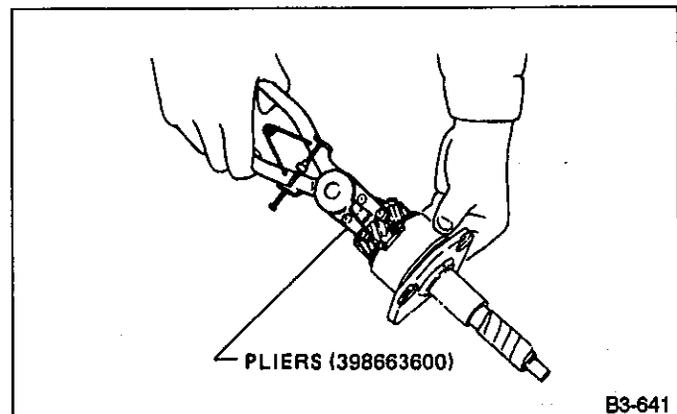
### A: DISASSEMBLY

1) Remove oil guide from input shaft holder. Also, remove input shaft holder shim.

Number of shims used varies from none to two.

2) Put vinyl tape around input shaft splines to protect oil seal from damage.

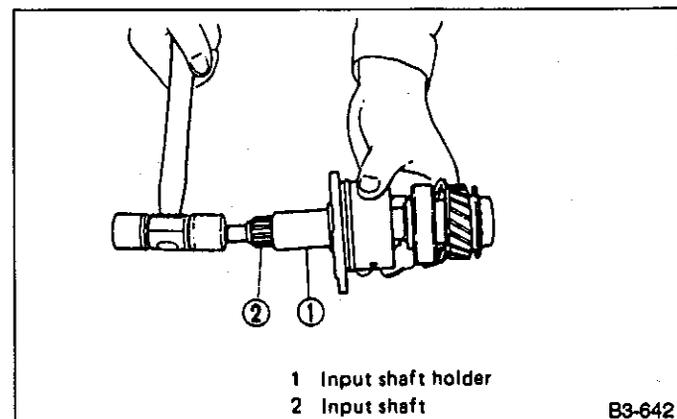
3) Remove inner snap ring (62).



B3-641

Fig. 219

4) Hold input shaft holder stationary and remove input shaft by tapping its end with a plastic hammer.



B3-642

Fig. 220

5) Remove outer snap ring. Then remove input shaft retainer and cotter.

6) Using a press and special tool, remove ball bearing (25 x 62 x 17).

Remove inner snap ring (62) before pressing.

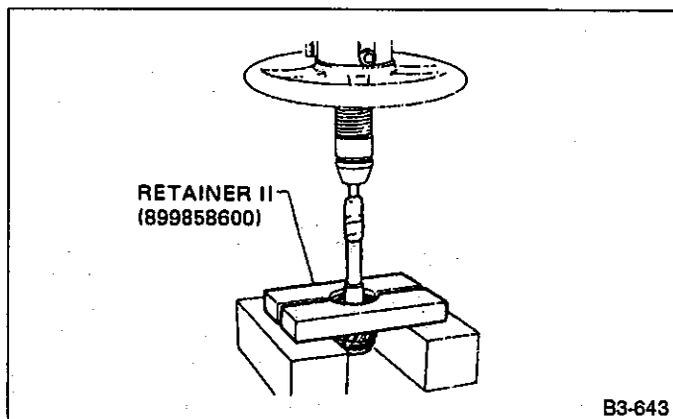


Fig. 221

**B: ASSEMBLY**

1) Install ball bearing (25 x 62 x 17) onto input shaft. Place snap ring (Inner-62) between input shaft gear and ball bearing beforehand. Use the table above step (5) as a guide in selecting a suitable snap ring.

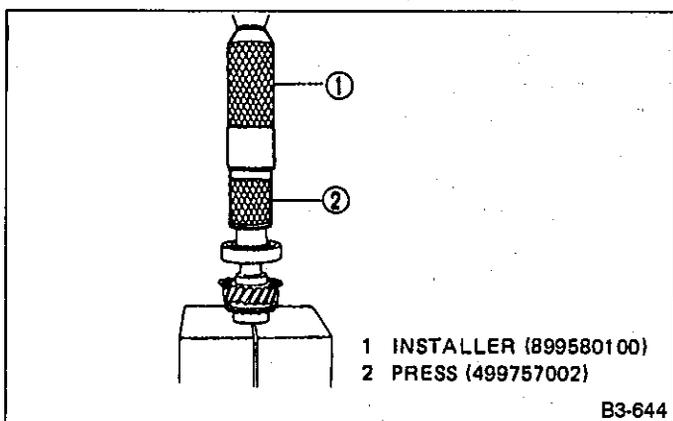


Fig. 222

2) Install cotter, retainer and snap ring on input shaft. Select a suitable cotter so that the axial play of ball bearing is held within 0 to 0.08 mm (0 to 0.0031 in).

Input Shaft Cotter	
Part No.	Thickness mm (in)
35204AA000	2.43 (0.0957)
35204AA010	2.51 (0.0988)
35204AA020	2.59 (0.1020)

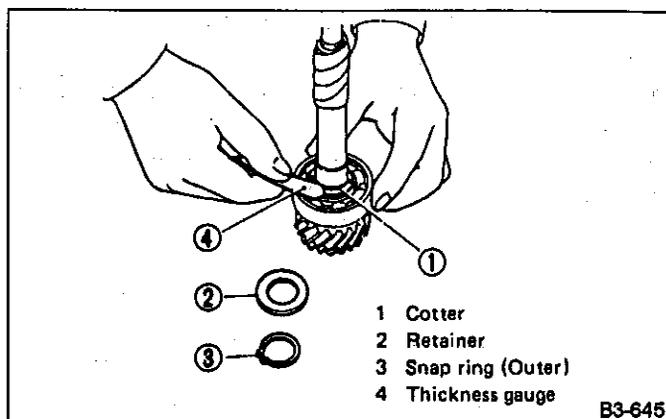


Fig. 223

3) Drive oil seal [25 x 44 x 10 mm (0.98 x 1.73 x 0.39 in)] into input shaft holder.

Apply a coat of grease to sealing lips before installing oil seal.

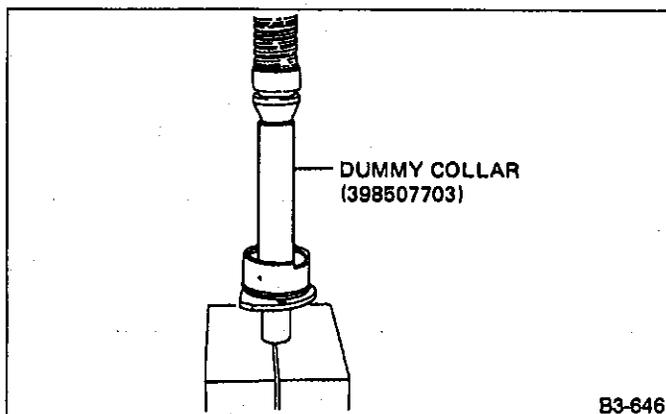


Fig. 224

4) Wrap vinyl tape around shaft splines and insert input shaft into holder by lightly tapping it by hand.

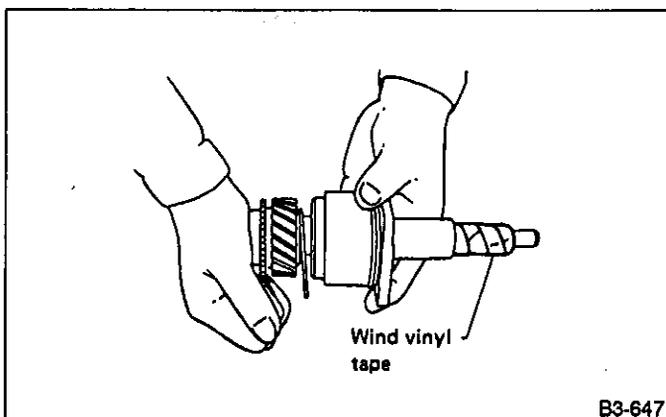


Fig. 225

5) Install snap ring (Inner-62) to input shaft holder.

Select a suitable snap ring so that clearance between snap ring and bearing is held within 0 to 0.08 mm (0 to 0.0031 in).

Snap Ring (Inner-62)	
Part No.	Thickness mm (in)
805162011	1.75 (0.0689)
805162012	1.83 (0.0720)
805162013	1.91 (0.0752)

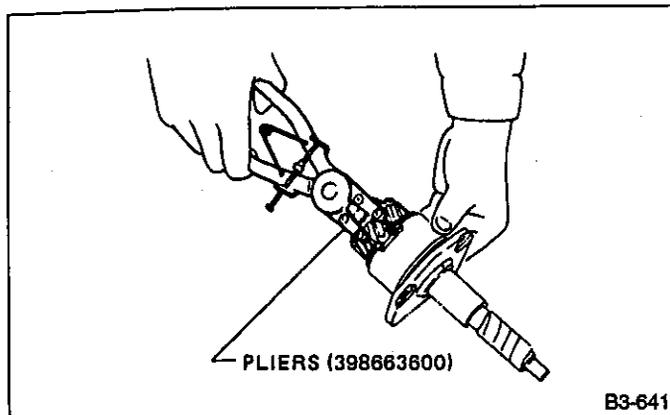


Fig. 226

6) Install O-ring (61.7 x 2.4) and oil guide on input shaft holder.

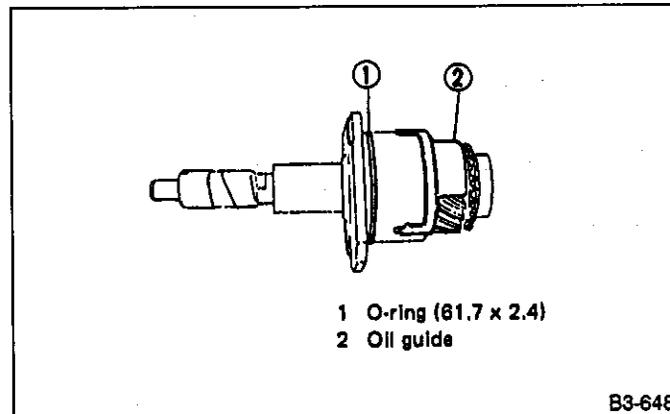


Fig. 227

## 13. Main Shaft ASSY (4WD Dual-range)

### A: DISASSEMBLY

1) Remove locknut.

Remove caulking before taking off locknut.

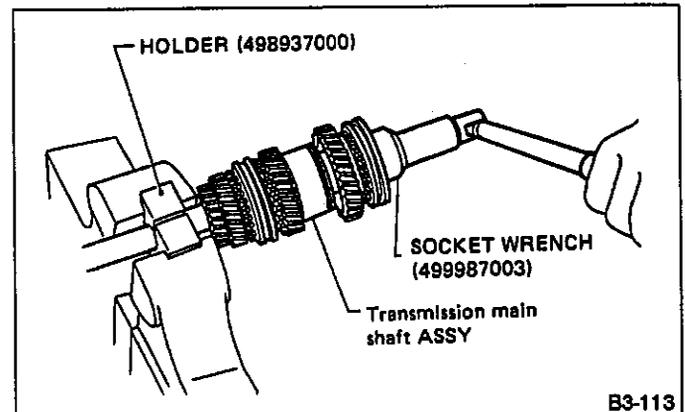


Fig. 228

2) Remove insert stopper plate, sleeve and hub ASSY No. 2, balk ring, 5th drive gear CP, and needle bearing (32 x 36 x 25.7).

3) Using special tool and a press, remove:

- 5th needle bearing inner race
- 5th gear thrust washer
- Ball bearing (25.5 x 65 x 31)
- 4th gear thrust washer
- 4th drive gear CP
- Sleeve and hub assembly
- Balk ring
- 4th needle bearing
- 4th needle bearing inner race
- 3rd drive gear CP
- 3rd-4th synchronizing

Special tool:  
TRANSMISSION MAIN SHAFT  
REMOVER (899864100)  
REMOVER (899714110)

Replace sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassemble, mark engagement point on splines beforehand.

4) Remove snap ring (Outer-25) from main shaft.

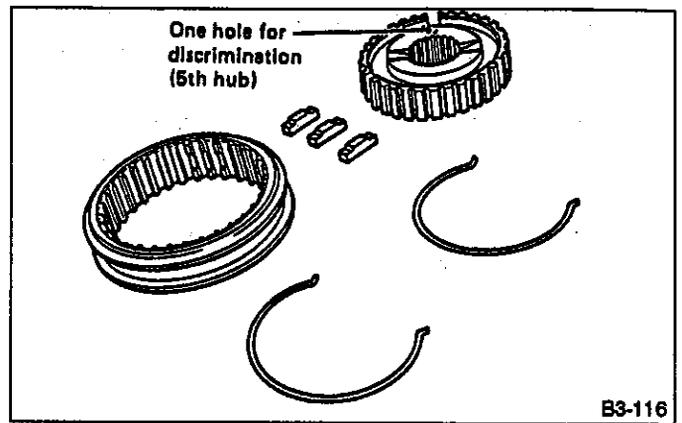
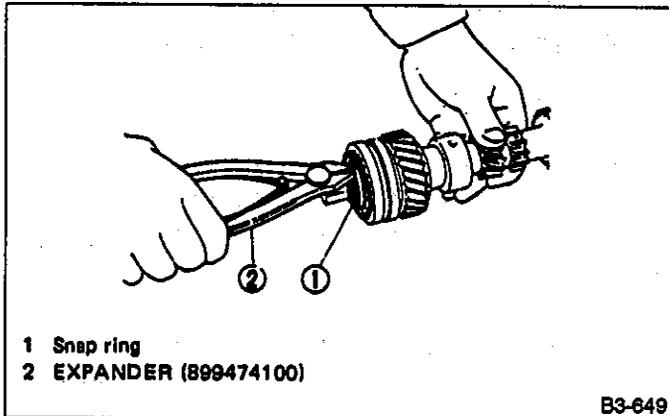


Fig. 231

Fig. 229

5) Remove following parts:

- Sleeve and hub ASSY No. 3
- High-low baulk ring
- Low input gear
- Needle bearing (25 x 33 x 24)
- Input low gear spacer
- Ball
- Needle bearing (27 x 46 x 21)

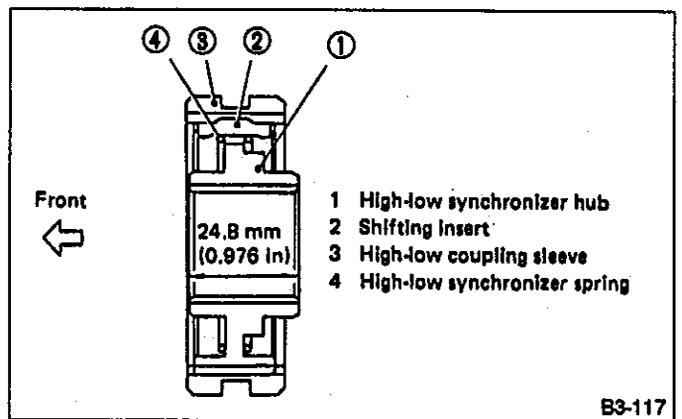


Fig. 232

**B: ASSEMBLY**

1) Assemble sleeve & hub ASSY for 3rd-4th, 5th and high-low synchronizing.

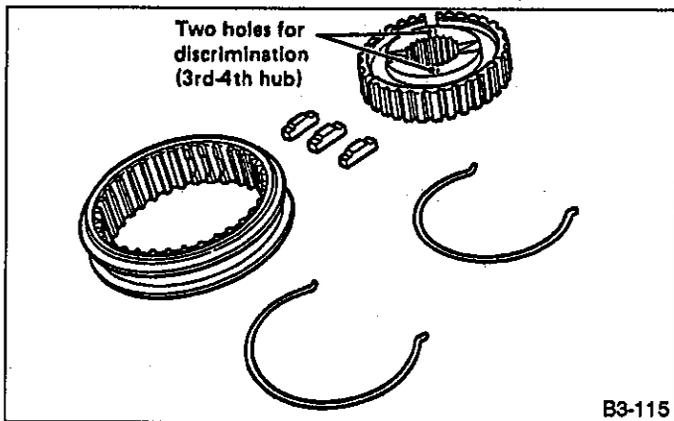


Fig. 230

Position open ends of spring 120° apart.

2) Install 3rd drive gear CP, baulk ring, and sleeve & hub ASSY for 3rd-4th needle bearing (32 x 36 x 25.7) on transmission main shaft.

Align groove in baulk ring with shifting insert.

3) Install 4th needle bearing race onto transmission main shaft using special tool and a press.

Special tool:

REMOVER (8997141100)

INSTALLER (499877000)

- 4) Install balk ring, needle bearing (32 x 30 x 25.7), 4th drive gear CP and 4th gear thrust washer to transmission main shaft.

Face thrust washer in the correct direction.

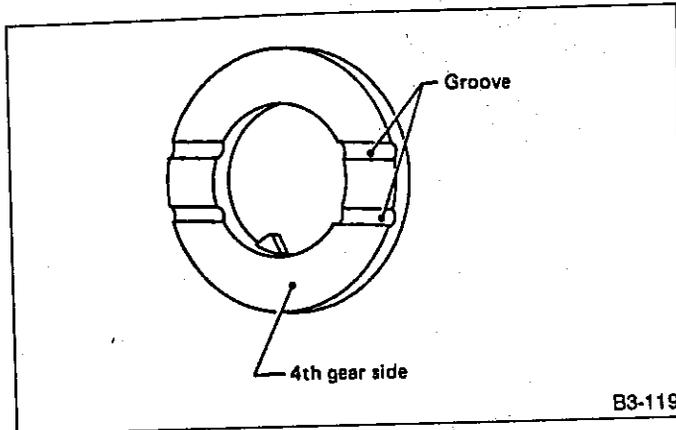


Fig. 233

- 5) Drive ball bearing onto the rear section of transmission main shaft using special tool and a press.

Special tool:

REMOVER (8997141100)

4TH-5TH RACE INSTALLER (499877000)

- 6) Using the same tools as in step 5) above, install the following parts onto the rear section of transmission main shaft.

- 5th gear thrust washer

Face thrust washer in the correct direction.

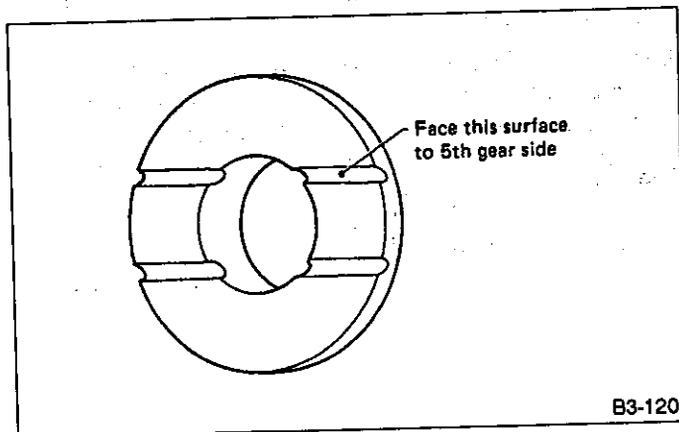


Fig. 234

- 5th needle bearing race

- 7) Install the following parts to the rear section of transmission main shaft.

- Needle bearing (32 x 36 x 25.7)
- 5th drive gear
- Balk ring
- Sleeve & hub ASSY

• Insert stopper plate

• Lock washer (22 x 38 x 2)

- Tighten lock nuts (22 x 13) to the specified torque using special tool.

Special tool:

SOCKET WRENCH (499987003)

TRANSMISSION MAIN SHAFT HOLDER  
(498937000)

- Align groove in balk ring with shifting insert.
- Be sure to fit pawl of insert stopper plate into 4 mm (0.16 in) dia. hole in the boss section of synchronizer hub.

Tightening torque:

112 — 124 N·m (11.4 — 12.6 kg-m, 82 — 91 ft-lb)

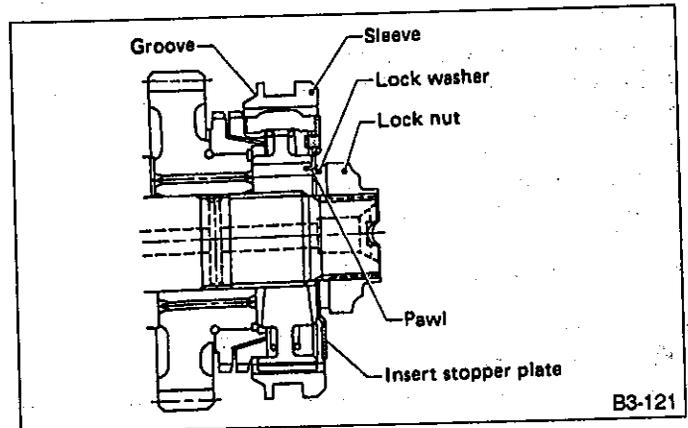


Fig. 235

- Secure lock nuts in two places after tightening.

- 8) Install the following parts to the front section of transmission main shaft.

- Needle bearing (27 x 46 x 21)
- Ball 3.9538
- Input low gear spacer

Face the grooved side toward input gear.

- Needle bearing (25 x 33 x 24.5)
- Input low gear
- High-low balk ring
- Sleeve & hub ASSY

- Be careful not to damage the graded section of transmission main shaft when installing needle bearing.

- Align high-low balk ring's groove with shifting insert.

- 9) Install snap ring (Outer-25) to the rod section of transmission main shaft using special tool.

- Use only new snap ring (Outer-25).

- Select a suitable outer snap ring so that axial clearance between snap ring and hub is held within 0.060 to 0.100 mm (0.0024 to 0.0039 in).

Snap ring (Outer-25)	
Part No.	Thickness mm (in)
805025058	2.37 (0.0933)
805025051	2.42 (0.0953)
805025052	2.47 (0.0972)
805025053	2.52 (0.0992)
805025054	2.57 (0.1012)
805025055	2.62 (0.1031)
805025056	2.67 (0.1051)
805025057	2.72 (0.1071)

**Special tool:**  
**SNAP RING PRESS (499757002)**  
**SNAP RING GUIDE (499757001)**

### 14. Main Shaft ASSY (4WD Single-range and 2000-2200cc FWD)

#### A: DISASSEMBLY

- 1) Put vinyl tape around main shaft splines to protect oil seal from damage. Then pull out oil seal and needle bearing by hand.
- 2) Remove locknut.

Remove caulking before taking off locknut.

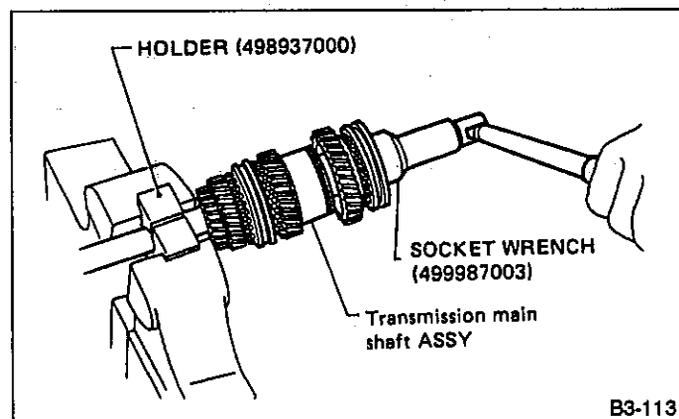


Fig. 236

- 3) Remove insert stopper plate, sleeve and hub ASSY No. 2, balk ring, 5th drive gear CP, and needle bearing (32 x 36 x 25.7).
- 4) Using special tool and a press, remove:
  - 5th needle bearing inner race
  - 5th gear thrust washer
  - Ball bearing (25.5 x 65 x 31)
  - 4th gear thrust washer
  - 4th drive gear CP
  - Sleeve and hub assembly
  - Balk ring
  - 4th needle bearing

- 4th needle bearing inner race
- 3rd drive gear CP
- 3rd-4th synchronizing

**Special tool:**  
**TRANSMISSION MAIN SHAFT  
 REMOVER (899864100)**  
**REMOVER (899714110)**

Replace sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassemble, mark engagement point on splines beforehand.

#### B: ASSEMBLY

- 1) Assemble sleeve & hub ASSY for 3rd-4th, 5th and high-low synchronizing.

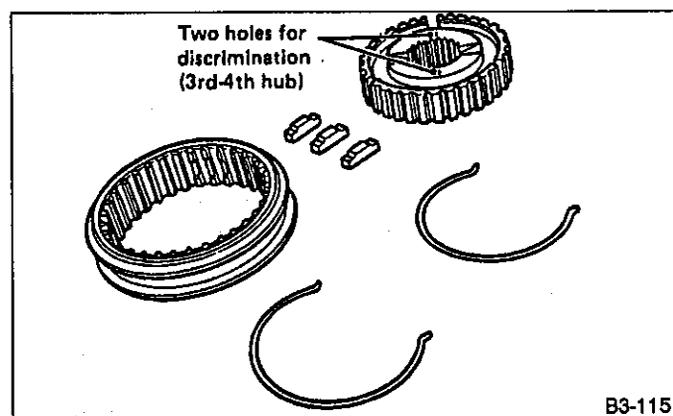


Fig. 237

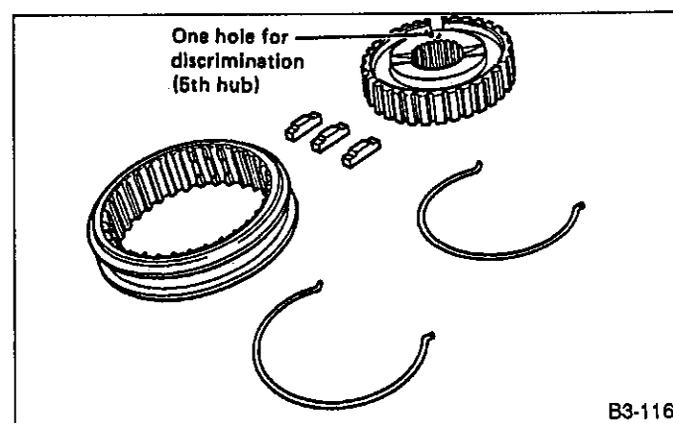


Fig. 238

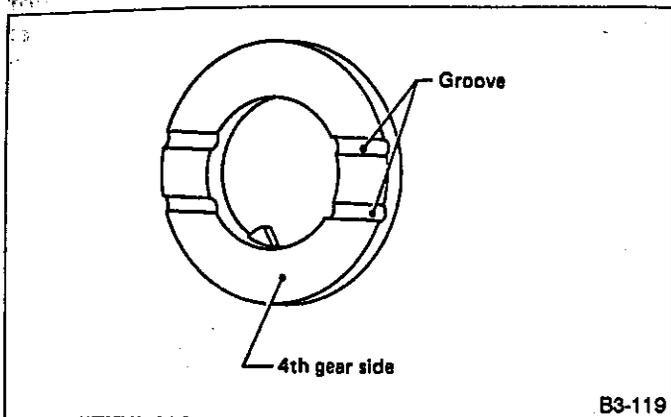
- Position open ends of spring 120° apart.
- 2) Install 3rd drive gear CP, balk ring, and sleeve & hub ASSY for 3rd-4th needle bearing (32 x 36 x 25.7) on transmission main shaft.
- Align groove in balk ring with shifting insert.
- 3) Install 4th needle bearing race onto transmission main shaft using special tool and a press.

- Balk ring
- Sleeve & hub ASSY
- Insert stopper plate
- Lock washer (22 x 38 x 2)
- Tighten lock nuts (22 x 13) to the specified torque using special tool.

**Special tool:**  
**SOCKET WRENCH (499987003)**  
**TRANSMISSION MAIN SHAFT HOLDER (498937000)**

4) Install balk ring, needle bearing (32 x 30 x 25.7), 4th drive gear CP and 4th gear thrust washer to transmission main shaft.

Face thrust washer in the correct direction.



B3-119

Fig. 239

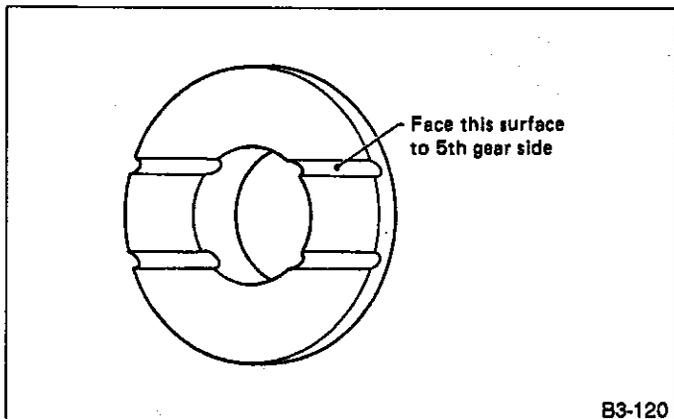
5) Drive ball bearing onto the rear section of transmission main shaft using special tool and a press.

**Special tool:**  
**REMOVER (899714110)**  
**4TH-5TH RACE INSTALLER (499877000)**

6) Using the same tools as in step 5) above, install the following parts onto the rear section of transmission main shaft.

- 5th gear thrust washer

Face thrust washer in the correct direction.



B3-120

Fig. 240

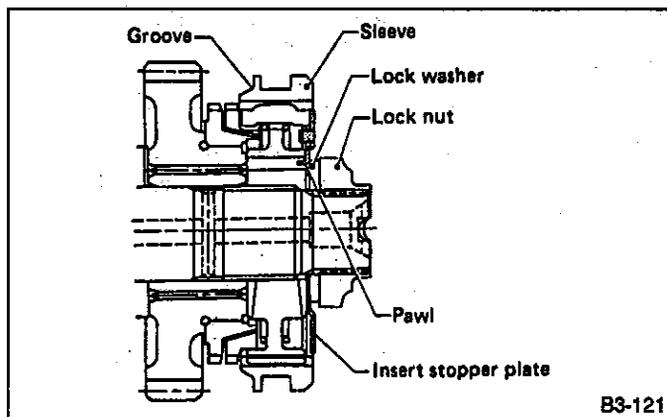
- 5th needle bearing race

7) Install the following parts to the rear section of transmission main shaft.

- Needle bearing (32 x 36 x 25.7)
- 5th drive gear

- a. Align groove in balk ring with shifting insert.
- b. Be sure to fit pawl of insert stopper plate into 4 mm (0.16 in) dia. hole in the boss section of synchronizer hub.

**Tightening torque:**  
**112 — 124 N·m (11.4 — 12.6 kg·m, 82 — 91 ft·lb)**



B3-121

Fig. 241

- c. Secure lock nuts in two places after tightening.

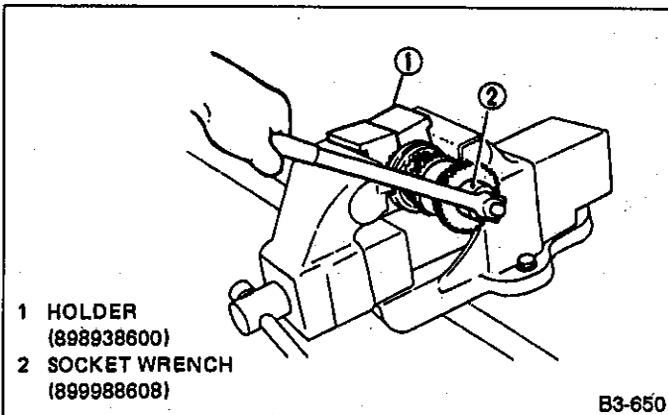
# 15. Main Shaft ASSY (1600•1800cc FWD)

## A: DISASSEMBLY

1) Put vinyl tape around main shaft splines to protect oil seal from damage. Then pull out oil seal and needle bearing by hand.

2) Removing locknut  
Remove locknut.

**Remove caulking before taking off locknut.**

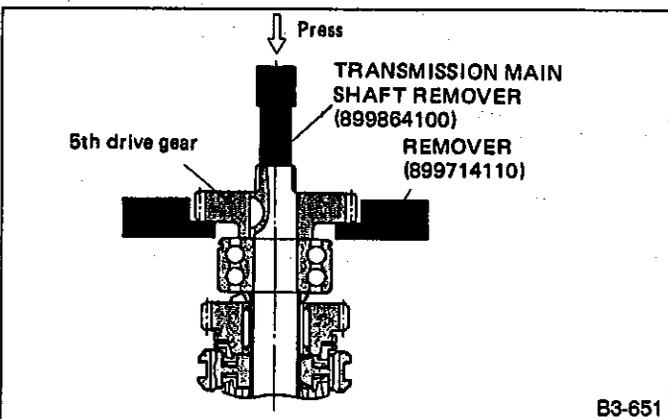


- 1 HOLDER (898938600)
- 2 SOCKET WRENCH (899988608)

B3-650

Fig. 242

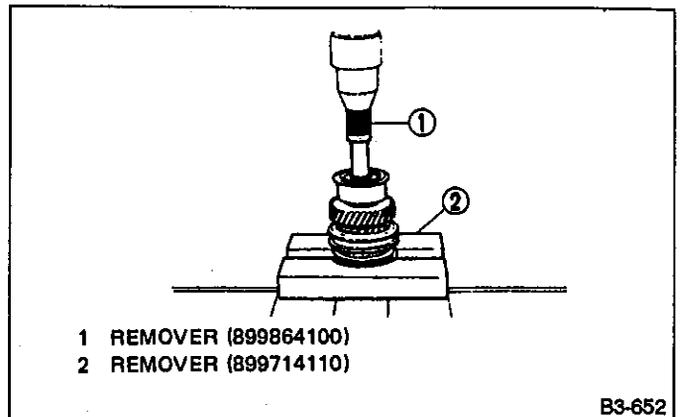
3) Removing 5th drive gear  
Remove 5th drive gear.



B3-651

Fig. 243

- 4) Remove woodruff key.
- 5) Remove the following parts:
  - Ball bearing
  - 4th thrust washer
  - 4th drive gear
  - 4th needle bearing and race
  - Sleeve and hub assembly
  - 3rd drive gear
  - 3rd needle bearing



- 1 REMOVER (899864100)
- 2 REMOVER (899714110)

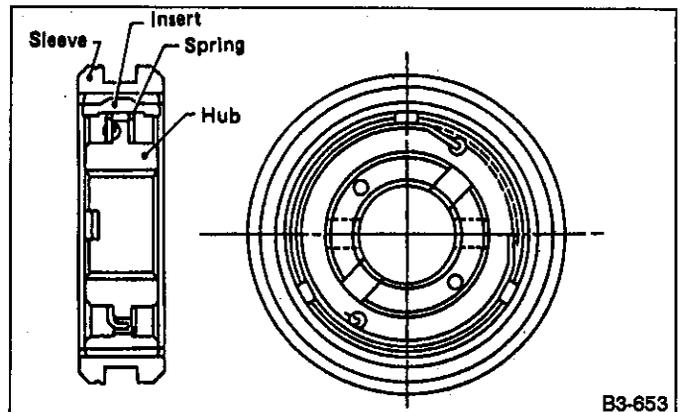
B3-652

Fig. 244

## B: ASSEMBLY

1) Assemble sleeve & hub ASSY.

**Make sure bent sections of springs on both sides are kept 180° apart and hooked at hub's holes.**



B3-653

Fig. 245

**Before assembling main shaft, apply transmission oil to needle bearing, ball bearing and bushings sufficiently.**

2) Install 5th needle bearing race with the following special tools.

**Special tool:**

- INSTALLER (899874100)**
- REMOVER (899714110)**

3) Install 3rd drive gear, ring and sleeve & hub ASSY subassembled before.

**Take care so that the insert is in line with the ring groove.**

4) Install 5th needle bearing race.

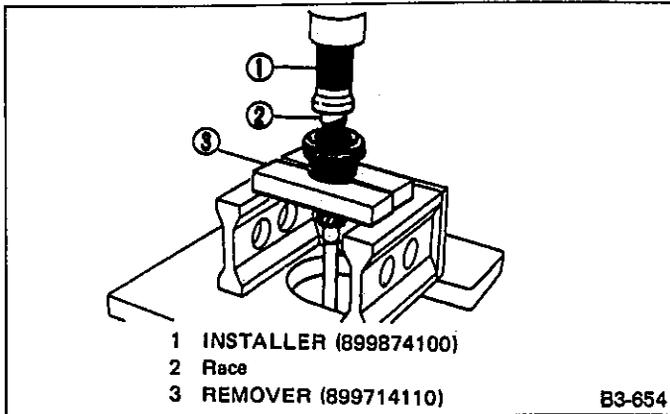


Fig. 246

5) Install ring, 4th drive gear and 4th drive gear thrust washer.

Pay attention to the assembling direction.

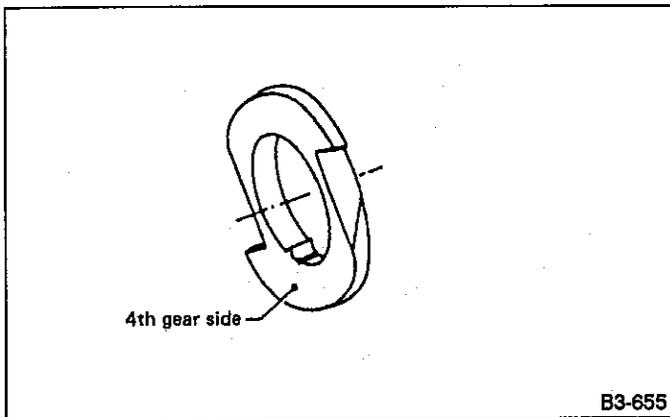


Fig. 247

6) Install ball bearing.

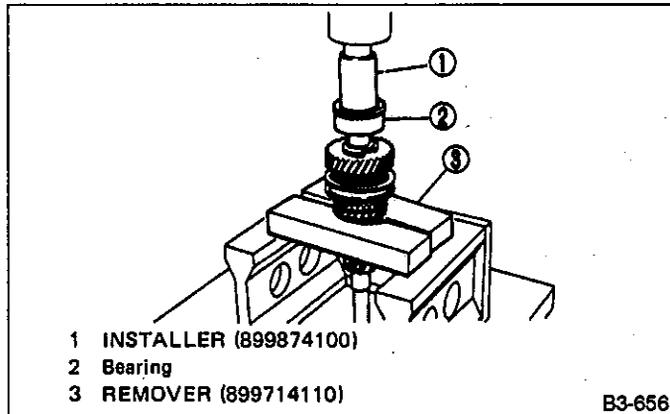


Fig. 248

7) Assemble woodruff key and then 5th drive gear.

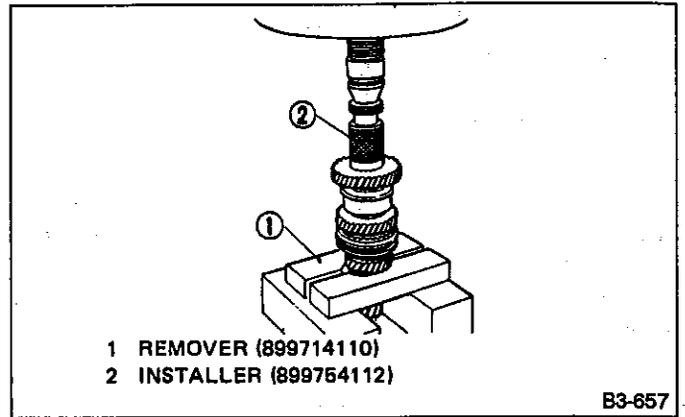


Fig. 249

When assembling key, pay attention to the groove.

8) Tighten lock nut.

Tightening torque:

73 — 84 N·m

(7.4 — 8.6 kg-m, 54 — 62 ft-lb)

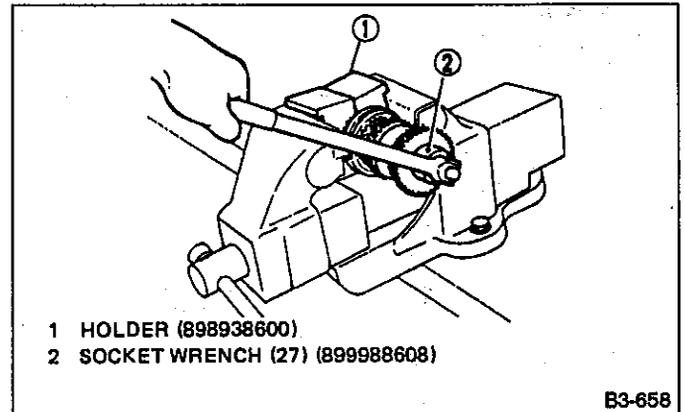


Fig. 250

After tightening the lock nut, stake it.

## 16. Center Differential (Full-time 4WD)

### A: DISASSEMBLY

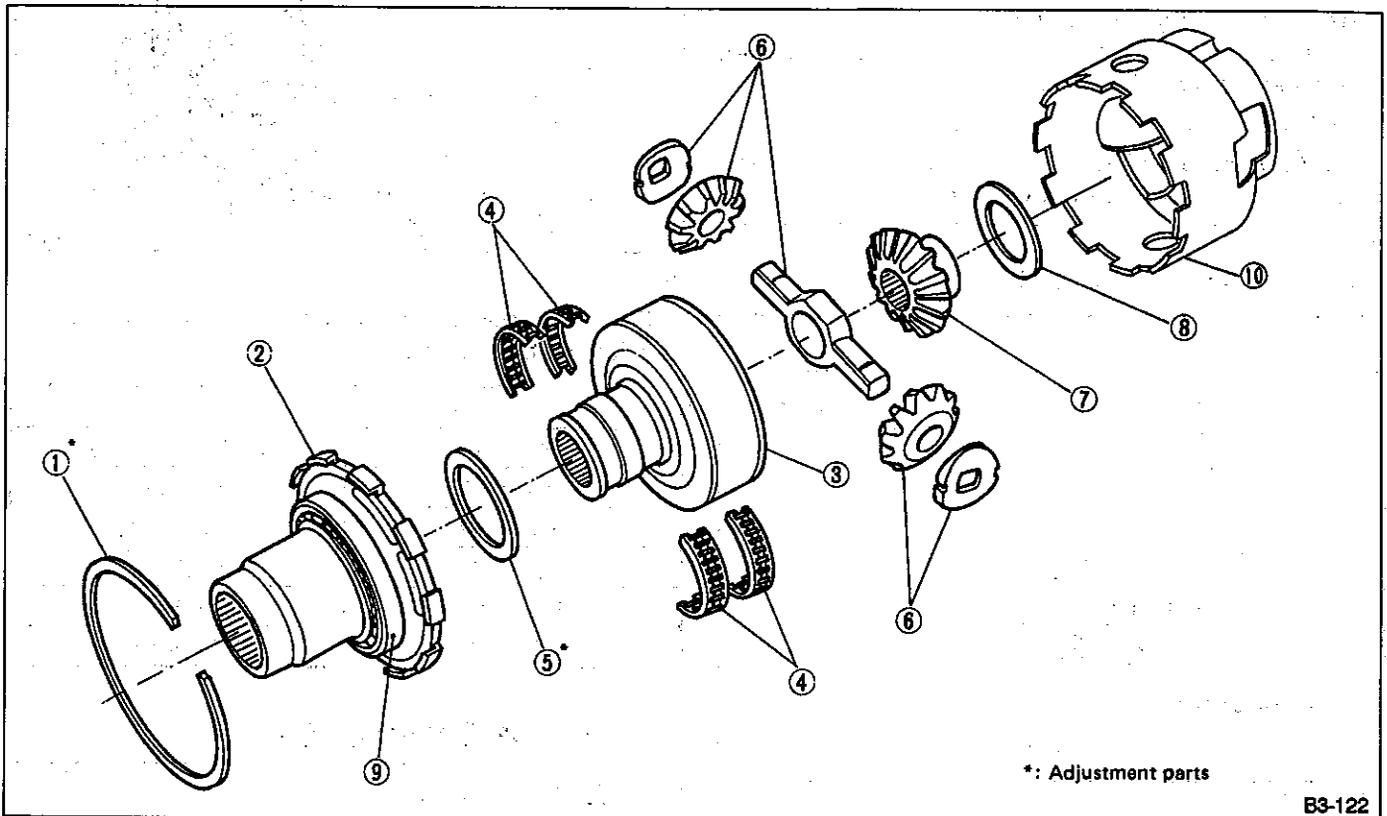


Fig. 251

- 1) Remove snap ring (Inner-110) using flat bladed screw driver.
- 2) Remove center differential cover.
- 3) Remove viscous coupling.
- 4) Remove needle bearings.
- 5) Remove adjusting washer (45 x 62 x t).
- 6) Remove pinion shaft, bevel pinions and retainers.
- 7) Remove side gear.
- 8) Remove thrust washer.
- 9) Remove ball bearing.

**Do not reuse roller bearing.**

**Special tool:**

**REMOVER (498077300)**

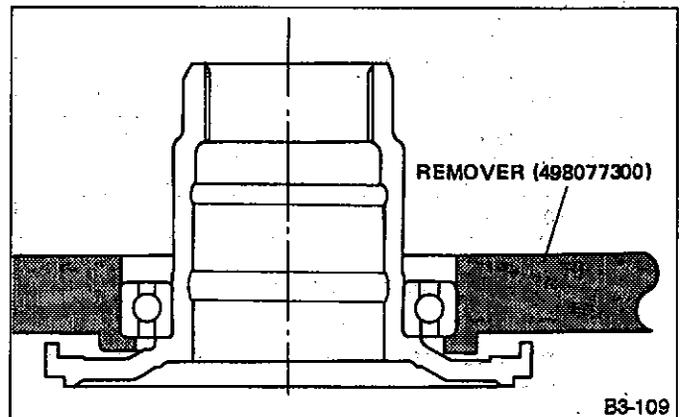


Fig. 252

- 10) Remove viscous coupling washer using pliers.

**Do not remove the washer except when replacing needle bearing in viscous coupling, because the washer must not be reused after removal.**

- 11) Take out needle bearing (35 x 42 x 12).

### B: ASSEMBLY

Assembly is in the reverse order of disassembly. Observe following;

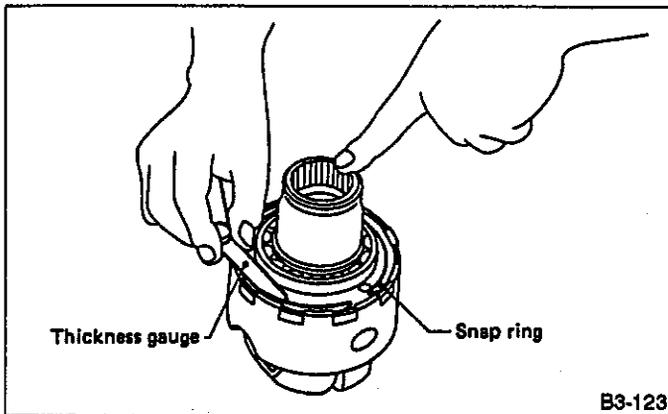
- When assembling needle bearing (35 x 42 x 12), press-fit the bearing together with a new viscous coupling washer using special tool.

**Special tool:****INSTALLER SET (499547300)**

- Install thrust washer with chamfered side of inner perimeter facing the side gear.
- Install adjusting washer with chamfered side of inner perimeter facing the viscous coupling.

**1) Selection of snap ring (Inner-110)**

- (1) After assembling, measure clearance between snap ring and center differential case.

**Clearance:****0 — 0.15 mm (0 — 0.0059 in)**

B3-123

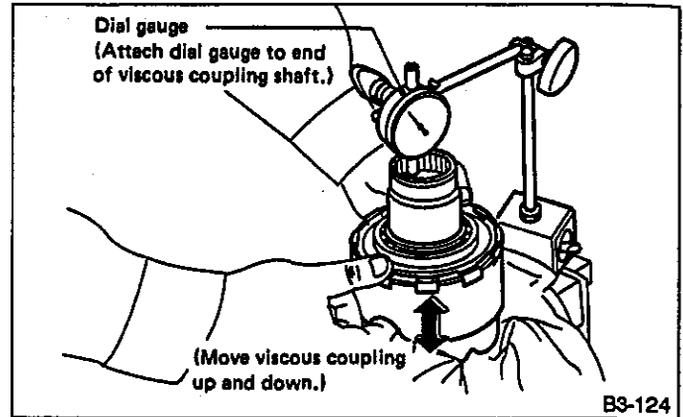
**Fig. 253**

- (2) If the measurement is not within the specification, select suitable snap ring.

Snap Ring (Inner-110)	
Part No.	Thickness mm (in)
805100061	2.10 (0.0827)
805100062	2.21 (0.0870)
805100063	2.32 (0.0913)

**2) Selection of adjusting washer (Backlash adjustment)**

- (1) After assembling, set up a dial gauge as shown in figure, and measure backlash in the axial direction.

**Backlash:****0.62 — 0.86 mm (0.0244 — 0.0339 in)**

B3-124

**Fig. 254**

- (2) If the measurement is not within the specification, select suitable washer.

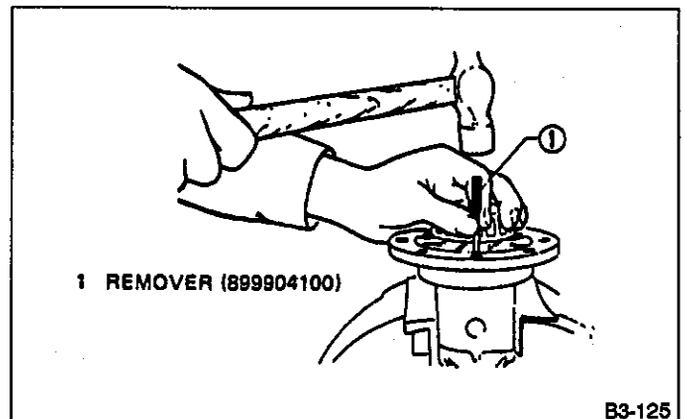
Adjusting washer (45 x 62 x t)	
Part No.	Thickness mm (in)
803045041	1.60 (0.0630)
803045042	1.80 (0.0709)
803045043	2.00 (0.0787)
803045044	2.20 (0.0866)
803045045	2.40 (0.0945)

**17. Front Differential****A: DISASSEMBLY**

- 1) Remove right and left snap rings from differential, and then remove two axle drive shafts.

**During reassembly, reinstall each axle drive shaft in the same place from which it was removed.**

- 2) Loosen twelve bolts and remove hypoid drive gear.
- 3) Drive out straight pin from differential ASSY toward crown gear.



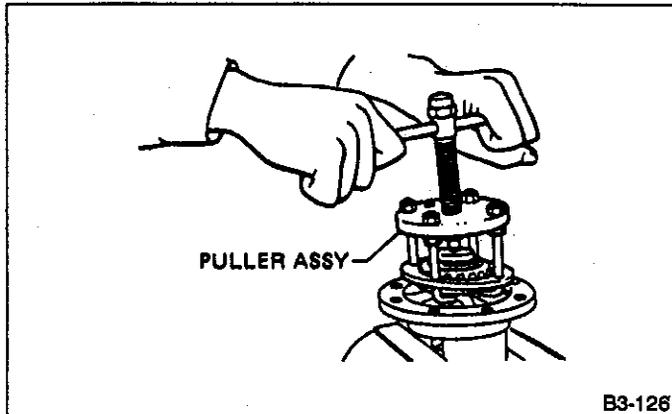
B3-125

**Fig. 255**

- 4) Pull out pinion shaft, and remove differential bevel pinion and gear and washer.
- 5) Remove roller bearing.

**Special tool:**

[1600•1800cc FWD] PULLER ASSY (899524100)  
 [Others] PULLER ASSY (399527700)



B3-126

•1600•1800cc FWD

Washer (35.1 x 45 x t mm)	
Part No.	Thickness mm (in)
803135011	0.925 — 0.950 (0.0364 — 0.0374)
803135012	0.950 — 0.975 (0.0374 — 0.0384)
803135013	0.975 — 1.000 (0.0384 — 0.0394)
803135014	1.000 — 1.025 (0.0394 — 0.0404)
803135015	1.025 — 1.050 (0.0404 — 0.0413)

•Others

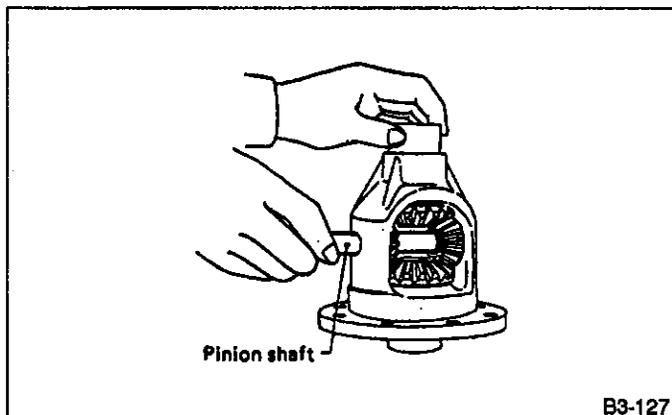
Washer (38.1 x 50 x t)	
Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)
803038022	0.975 — 1.000 (0.0384 — 0.0394)
803038023	1.025 — 1.050 (0.0404 — 0.0413)

Fig. 256

**B: ASSEMBLY**

1) Install bevel gear and bevel pinion together with washers, and insert pinion shaft.

Face the chamfered side of washer toward gear.



B3-127

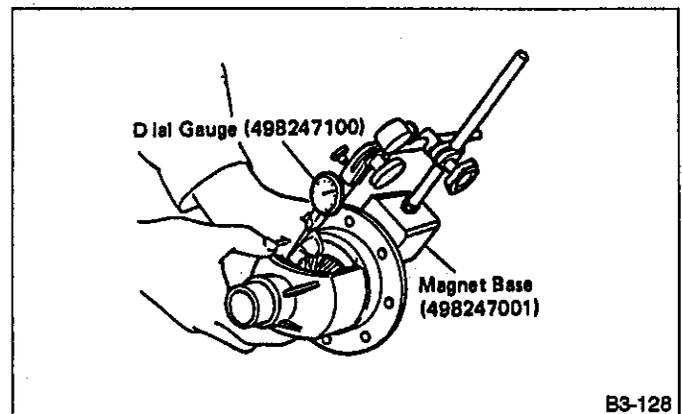
Fig. 257

2) Measure backlash between bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it.

**Standard backlash:**

0.13 — 0.18 mm (0.0051 — 0.0071 in)

Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.



B3-128

Fig. 258

3) Align pinion shaft and differential case at their holes, and drive straight pin into holes from the crown gear side, using STRAIGHT PIN REMOVER.

Lock straight pin after installing.

4) Install roller bearing (40 x 80 x 19.75) to differential case.

Be careful because roller bearing outer races are used as a set.

**Special tool:**

[1600•1800cc FWD]

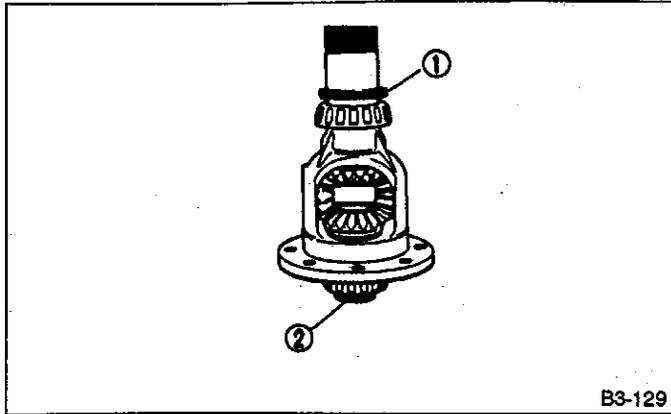
① INSTALLER (399790110)

② SEAT (399520105)

[Others]

① INSTALLER (499277100)

② ADAPTER (398497701)



B3-129

Fig. 259

5) Install crown gear to differential case using twelve bolts.

**Tightening torque:**

57 — 67 N·m (5.8 — 6.8 kg-m, 42 — 49 ft-lb)

6) Position drive axle shaft in differential case and hold it with outer snap ring(28). Make sure clearance between the shaft and case is within specifications.

**Clearance:**

0 — 0.2 mm (0 — 0.008 in)

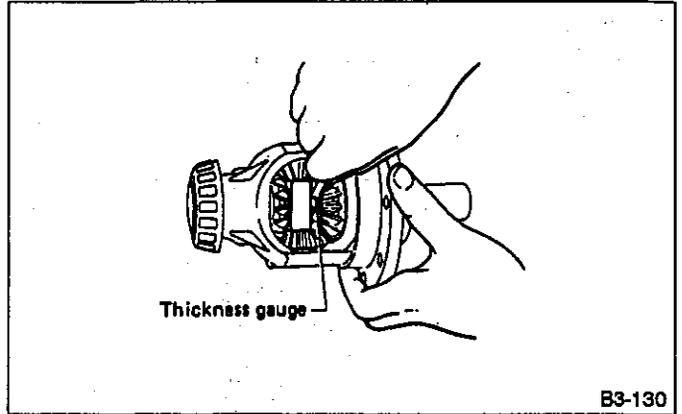
If it is not within specifications, replace snap ring with a suitable one.

•1600•1800cc FWD

Outer Snap Ring	
Part No.	Thickness mm (in)
805026010	1.05 (0.0413)
031526000	1.20 (0.0472)

•Others

Outer Snap Ring	
Part No.	Thickness mm (in)
805028011	1.05 (0.0413)
805028012	1.20 (0.0472)



B3-130

Fig. 260

# T TROUBLESHOOTING

Condition and possible cause	Corrective action
<p><b>1. Gears are difficult to intermesh.</b> The cause for difficulty in shifting gears can be classified into two kinds: one is malfunction of the gear shift system and the other is malfunction of the transmission. However, if the operation is heavy and engagement of the gears is difficult, defective clutch disengagement may also be responsible. Check whether the clutch is correctly functioning, before checking the gear shift system and transmission.</p>	
<p>(a) Worn, damaged or burred chamfer of internal spline of sleeve and reverse driven gear. (b) Worn, damaged or burred chamfer of spline of gears. (c) Worn or scratched bushings. (d) Incorrect contact between synchronizer ring and gear cone or wear.</p>	<p>Replace. Replace. Replace. Correct or replace.</p>
<p><b>2. Gear slips out.</b> (1) Gear slips out when coasting on rough road. (2) Gear slips out during acceleration.</p>	
<p>(a) Defective pitching stopper adjustment. (b) Loose engine mounting bolts. (c) Worn fork shifter, broken shifter fork rail spring. (d) Worn or damaged ball bearing. (e) Excessive clearance between splines of synchronizer hub and synchronizer sleeve. (f) Worn tooth step of synchronizer hub (responsible for slip-out of 3rd gear). (g) Worn 1st driven gear, needle bearing and race. (h) Worn 2nd driven gear, needle bearing and race. (i) Worn 3rd drive gear and bushing. (j) Worn 4th drive gear and bushing. (k) Worn reverse idler gear and bushing.</p>	<p>Adjust. Tighten or replace. Replace. Replace. Replace. Replace. Replace. Replace. Replace. Replace.</p>
<p><b>3. Unusual noise from transmission.</b> If an unusual noise is heard when the car is parked with its engine idling and if the noise ceases when the clutch is disengaged, it may be considered that the noise comes from the transmission.</p>	
<p>(a) Insufficient or improper lubrication. (b) Worn or damaged gears and bearings. (NOTE) If the trouble is only wear of the tooth surfaces, merely a high roaring noise will occur at high speeds, but if any part is broken, rhythmical knocking sound will be heard even at low speeds.</p>	<p>Lubricate or replace with specified oil. Replace.</p>
<p><b>4. Broken differential (case, gear, bearing, etc.)</b> Abnormal noise will develop and finally it will become impossible to continue to run due to broken pieces obstructing the gear revolution.</p>	
<p>(a) Insufficient or improper oil. (b) Use of vehicle under severe conditions such as excessive load and improper use of clutch. (c) Improper adjustment of taper roller bearing. (d) Improper adjustment of drive pinion and crown gear. (e) Excessive backlash due to worn differential side gear, washer or differential pinion. (f) Loose crown gear clamping bolts.</p>	<p>Disassemble differential and replace broken components and at the same time check other components for any trouble, and replace if necessary. Readjust bearing preload and backlash and face contact of gears. Add recommended oil to specified level. Do not use vehicle under severe operating conditions.</p>

Condition and possible cause	Corrective action
<p><b>5. Differential and hypoid gear noises.</b>            Troubles of the differential and hypoid gear always appear as noise problems. Therefore noise is the first indication of the trouble. However noises from the engine, muffler, tire, exhaust gas, bearing, body, etc. are easily mistaken for the differential noise. Pay special attention to the hypoid gear noise because it is easily confused with other gear noises. There are following four kinds of noises.</p> <p>(1) Gear noise when driving: If noise increases as vehicle speed increases it may be due to insufficient gear oil, incorrect gear engagement, damaged gears, etc.</p> <p>(2) Gear noise when coasting: Damaged gears due to maladjusted bearings and incorrect shim adjustment.</p> <p>(3) Bearing noise when driving or when coasting: Cracked, broken or damaged bearings.</p> <p>(4) Noise which mainly occurs when turning: Unusual noise from differential side gear, differential pinion, differential pinion shaft, etc.</p>	
(a) Insufficient oil	Lubricate.
(b) Improper adjustment of crown gear and drive pinion.	Check tooth contact.
(c) Worn teeth of crown gear and drive pinion.	Replace in a set. Readjust bearing preload.
(d) Loose roller bearing.	Readjust crown gear to drive pinion backlash and check tooth contact.
(e) Distorted crown gear or differential case.	Replace.
(f) Worn washer and differential pinion shaft.	Replace.

**SUBARU®**

**1992**

**SERVICE  
MANUAL**



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# M MECHANISM AND FUNCTION

## 1. General

### 1. FWD MODEL

This system utilizes a microcomputer for accurate control of the vehicle speed, engine brake operation, lock-up operation, gear shift timing and others. It corresponds to the throttle opening, actual vehicle speed, engine rpm and range position signal. Further, it is also provided with an automatic drive pattern selecting function which selects between the "normal drive pattern" suitable for ordinary economical driving and the "power drive pattern" suitable for acceleration and uphill driving depending upon depression of the accelerator pedal.

#### (Features)

- Two one-way clutches and four accumulators are used to reduce gear shift shock and gear select shock, and a fully electronic control system is employed for accurate gearshift control from 1st to 4th speed, hydraulic oil pressure (line pressure), lock-up operation, etc.
- A hydraulic lock-up type torque converter, variable delivery oil pump, gear train with two sets of simple planetary gears (permitting four forward and one reverse stage) are used to improve driving dynamics and fuel consumption.
- A push-pull cable featuring less vibration to the high rigid transmission case and control unit is used for improved quietness during driving.
- A self-diagnosis function and fail-safe function are incorporated for improved serviceability and reliability.

### 2. 4WD MODEL

An electronically controlled full-time 4WD system designed uniquely for SUBARU on the basis of the FWD transmission is adopted. This system has a transfer hydraulic pressure control unit incorporating duty solenoid and a multi-plate transfer (MPT) consisting of a wet type multi-plate clutch on the rear of the automatic transmission section.

The control unit stores optimum transfer clutch torque (duty ratio) data for various driving conditions. When actual driving conditions (vehicle speed, throttle opening, gear range, wheel slip, etc.) are detected by various sensors, the control unit selects the most suitable duty ratio from memory, and controls the transmitting torque of the transfer clutch by means of the hydraulic pressure controlling duty solenoid.

#### (Features)

1. The transfer clutch capacity can be accurately controlled by means of the electronic control system. This is especially effective for eliminating tight corner braking phenomenon which occurs at low speeds, thereby achieving smooth driving.
2. An optimum rear wheel drive distribution is achieved which corresponds to engine output and gear shift position and improves fuel consumption and steering stability.
3. For the car equipped with ABS, the braking performance is improved by the control of the clutch and gear locking at a particular shift position through ABS operation-time control.
4. Driveability and comfort are improved with the use of manual range.

3. CROSS SECTIONAL VIEW

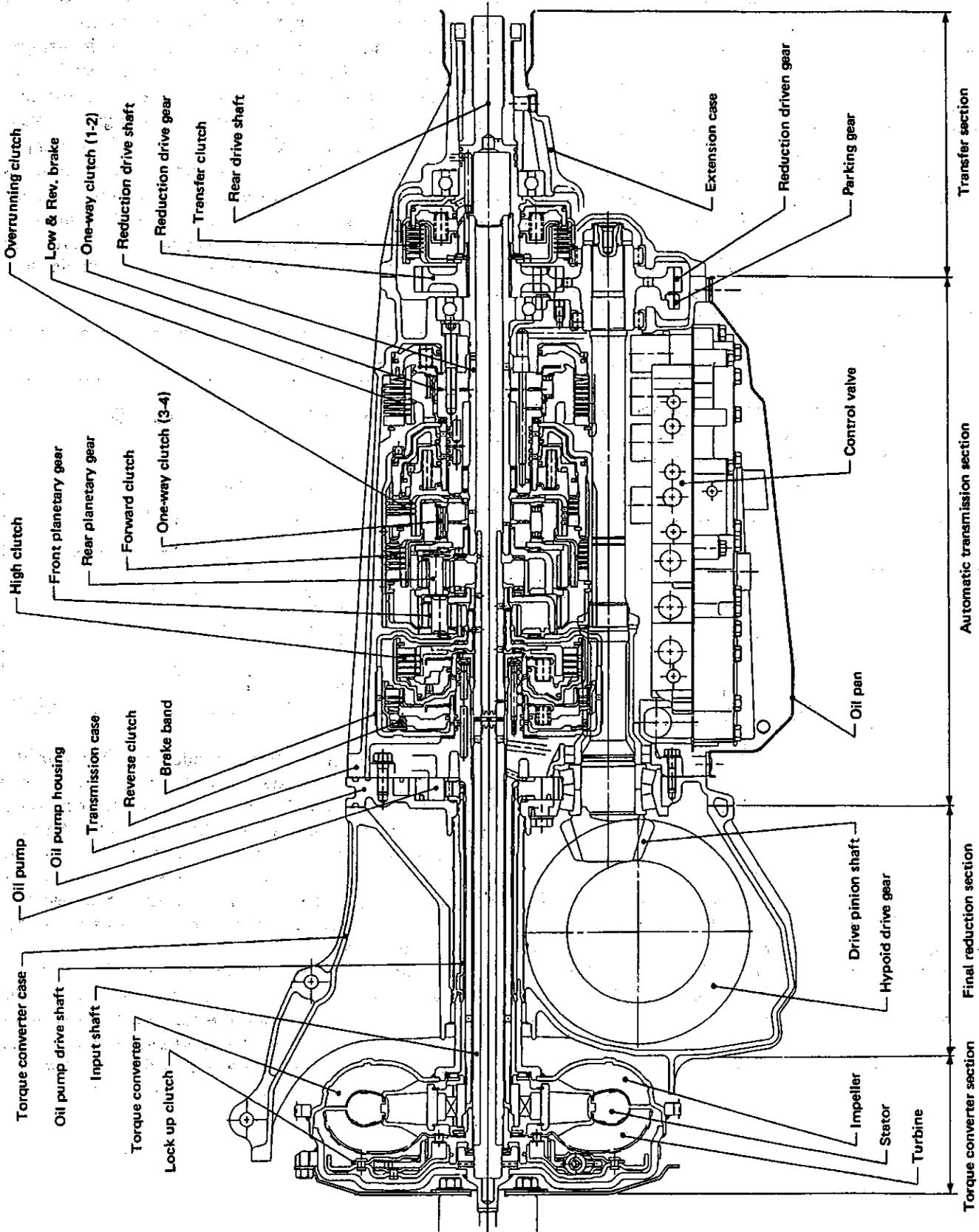


Fig. 1

## 2. Torque Converter

### A: 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 sprag 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.

### B: FUNCTION

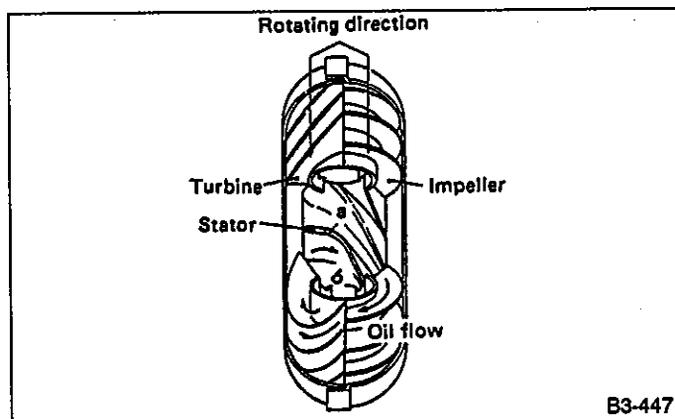


Fig. 2 Function of torque converter

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. 2). This direction is then changed by the stator so that the oil will assist impeller rotation (b in Fig. 2). 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 change-over 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.

### C: PERFORMANCE

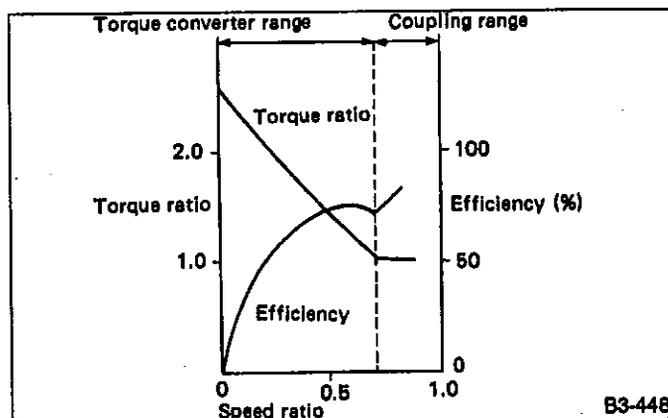


Fig. 3

The torque converter characteristics are shown in the above graph. The torque converter range refers to a range where the impeller and turbine rotate at different speeds and the torque is multiplied by a fixed stator. In the coupling range, on the other hand, the turbine rotates at high speed, and the stator is also rotating. The coupling range provides no torque multiplication because the torque converter functions as a fluid coupling in this range.

If the impeller (engine side) alone is rotating with stationary turbine (vehicle standstill) when the speed ratio is zero (0), this state is called the stall point. In this state, the torque ratio of impeller and turbine is the largest. The torque ratio in this state is called the stall torque ratio, and the engine rpm is called the stall rpm.

### 3. Lock-up Control System

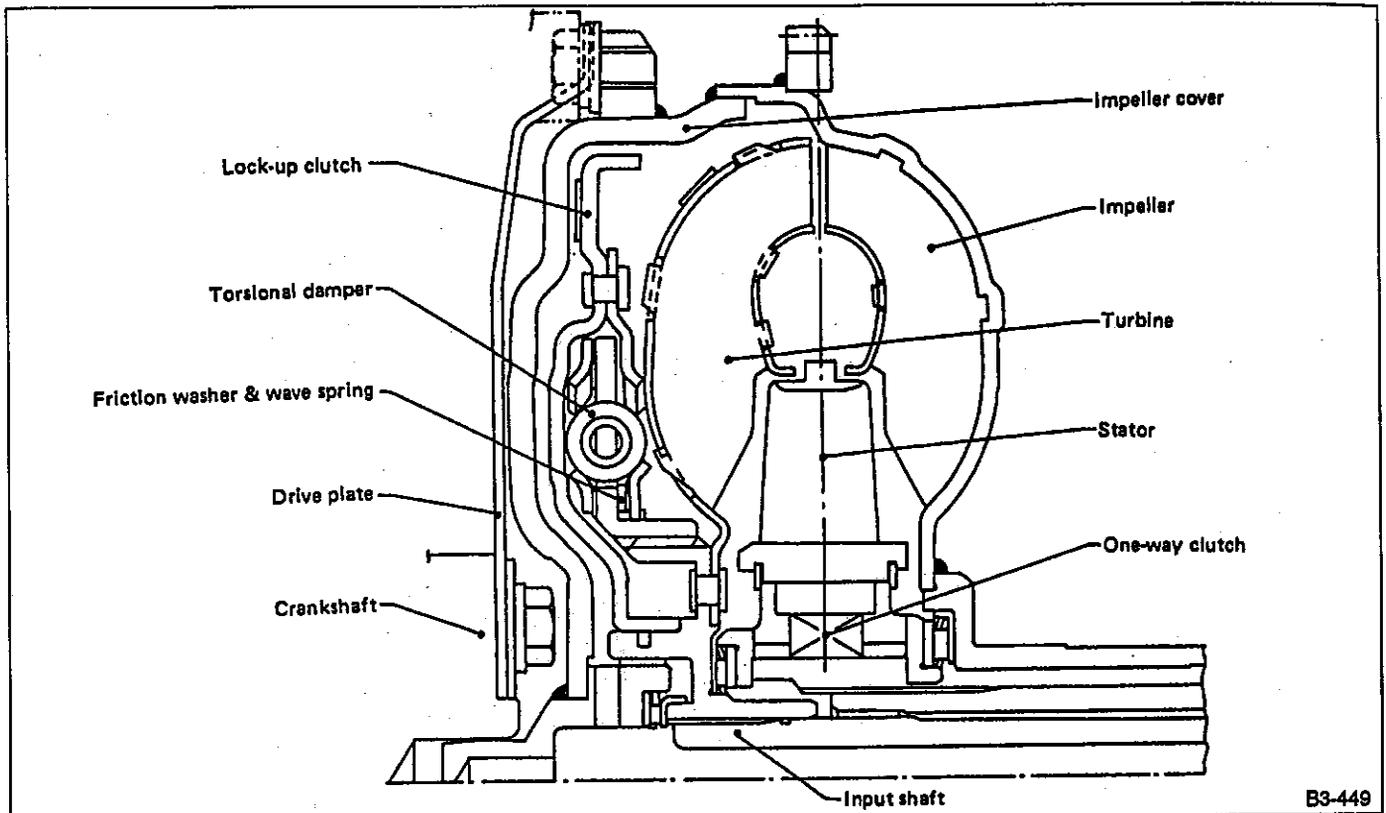


Fig. 4

#### A: CONSTRUCTION

This system causes the impeller and turbine to be coupled directly without the aid of oil when the engine rpm reaches a certain level. This direct coupling eliminates torque converter slip and thus leads to a reduction in engine rpm, which in turn results in less fuel consumption and less noise.

The single plate type lock-up clutch is used, and the transition hydraulic oil pressure is controlled for reducing the lock-up shock of the clutch thereby achieving smooth lock-up operation.

The lock-up clutch is fitted with torsional dampers and the diaphragm spring friction washers are adopted for reducing the vibration and noise in the driving system.

**B: FUNCTION**

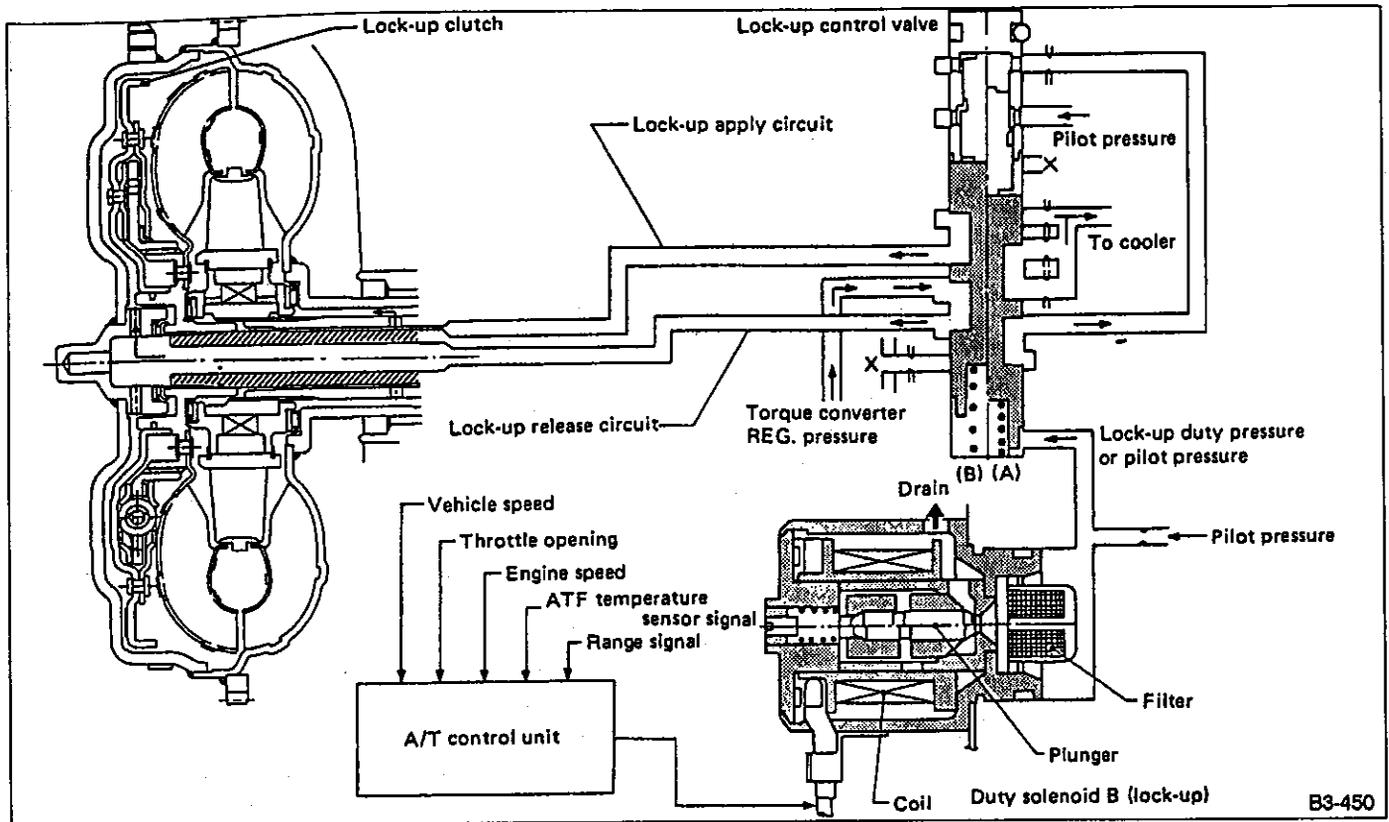


Fig. 5

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. 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. 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. SMOOTH CONTROL**

When the lock-up clutch activates, the clutch partially engages. Lock-up apply pressure increases smoothly to engage the lock-up clutch.

**4. NON-LOCK-UP OPERATION DURING "1ST SPEED", "N", "R" AND "P" POSITION**

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.

## 4. Oil Pump

### A: CONSTRUCTION

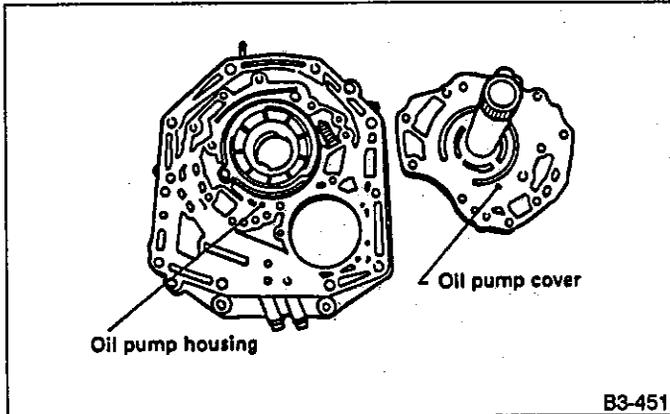


Fig. 6

The vane pump is housed in the oil pump housing. It consists of a rotor, vanes, vane rings, cam ring, control piston, return spring, seal ring and oil pump cover. Hydraulic pressure (feedback pressure) from the oil passage ② of the pressure regulator valve is applied to the back of the control piston.

### B: FUNCTION

- 1) The automatic transmission fluid (ATF) is drawn through the oil strainer mounted under the control valve ASSY, and is routed to the transmission case, to the oil pump housing, and to the oil pump cover. It then goes to the suction port of section A shown in the Figure.
- 2) The ATF sucked into section A rotates in the direction of the arrow (driven directly by engine), and is compressed at the delivery side of section B. It is then discharged.
- 3) The discharged ATF flows from the oil pump cover to the oil pump housing. It then goes to the transmission case, the control valve and to the regulator valve, thus serving as hydraulic oil and lubricating oil for the torque converter, valves, clutch and brake.
- 4) As engine speed increases, the delivery rate of the vane pump also increases.
- 5) Feedback pressure from the regulator valve is applied to section C in the Figure. The cam ring position (the amount of eccentricity) is controlled by this pressure so that the pump delivery rate remains constant at speeds exceeding the preset pump speed.
- 6) As the cam ring position changes, the suction volume at section A varies. In this manner, the pump delivery volume is controlled.

FIG. 7

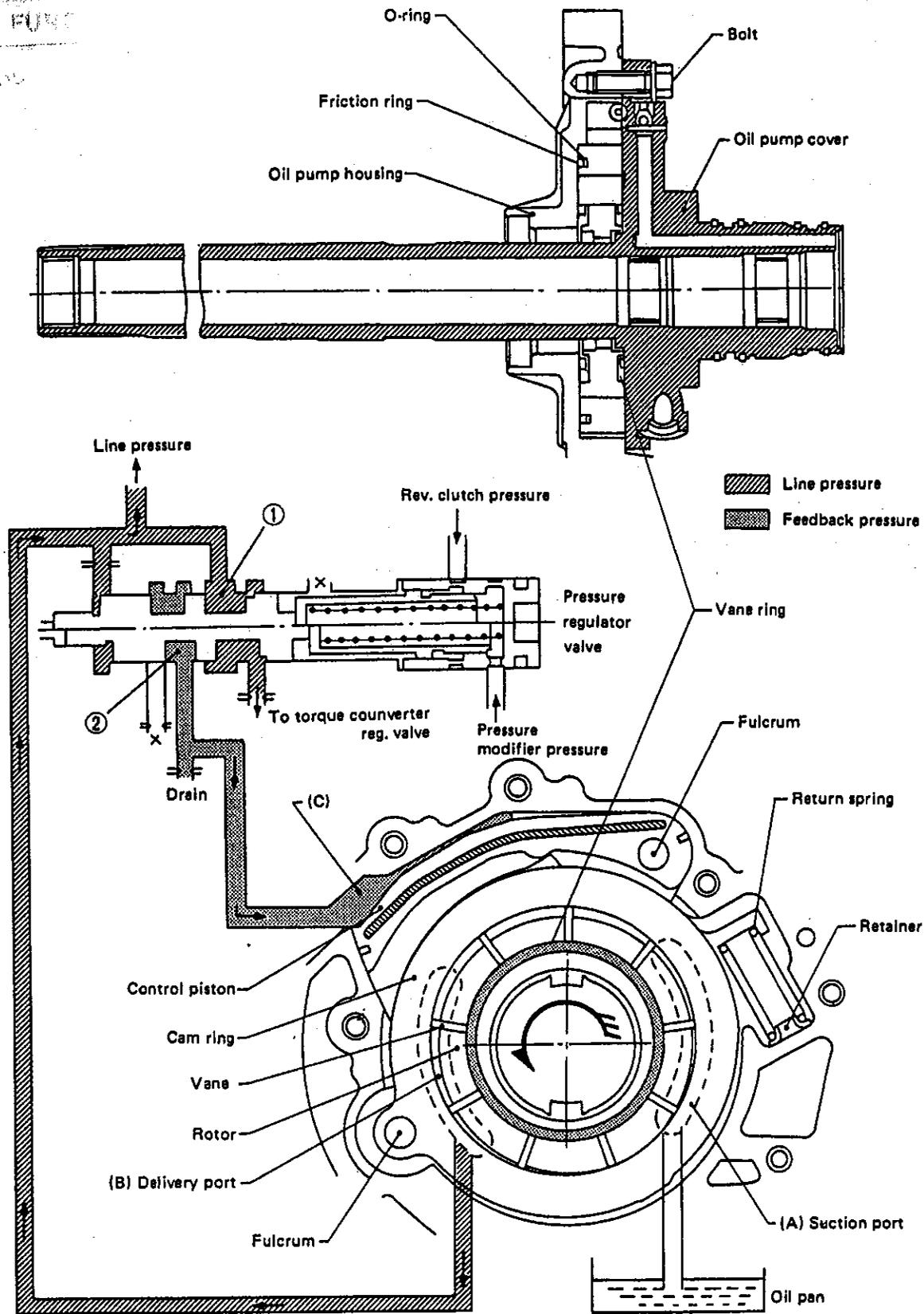


Fig. 7

## 5. Planetary Gear

### A: CONSTRUCTION

The planetary gear train uses two simple planetary gear sets (front planetary gear and rear planetary gear), four sets of multi-plate clutches (reverse clutch, high clutch, forward clutch, and overrunning clutch), one brake band, one set of multi-plate brake, and two sets of one-way clutches (one-way clutch 1-2 and one-way clutch 3-4) in order to allow shifting of four forward speeds and one reverse speed.

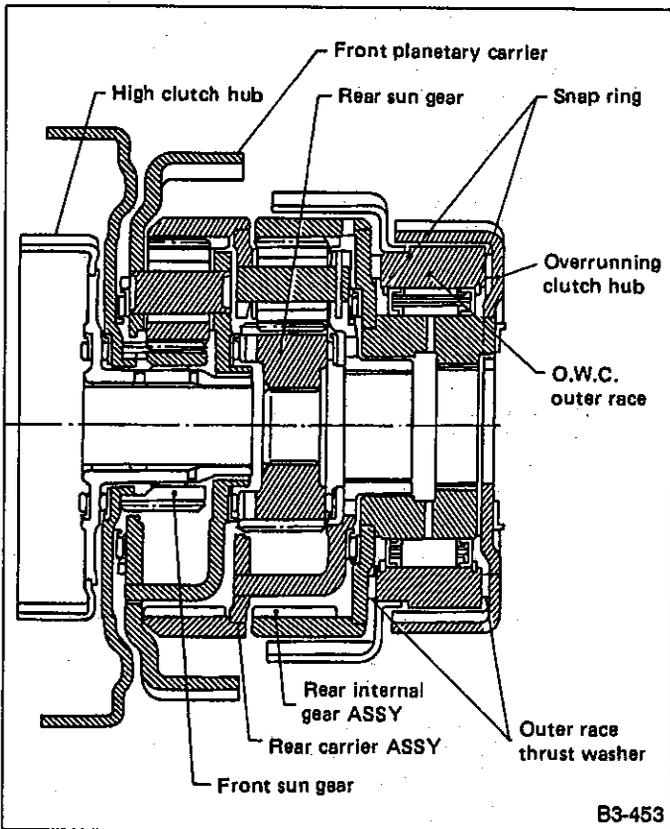


Fig. 8

Two sets of simple planetary gears are used to allow gear shifting from 1st speed to 4th speed or to reverse. Both the front and rear planetary gear carriers are made from pressed steel which is electron-beam welded to other structural members. The front planetary gear has

three pinions while the rear planetary gear has four pinions. Both are part of an integral unit, and disassembling is not allowed.

### B: FUNCTION

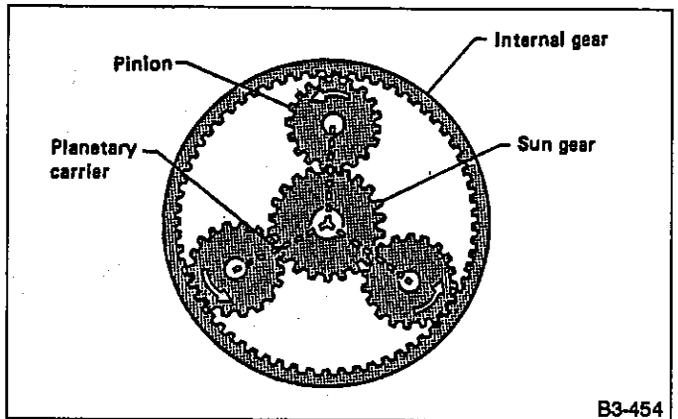


Fig. 9

The automatic transmission uses a planetary gear system instead of the parallel shaft (two shafts) gear system adopted in the manual transmission.

The advantage of the planetary gear system is that it is compact because it has only one center shaft. The gear ratio can be changed by simply locking or releasing or rotating certain portions, unlike the manual transmission that requires changing gear engagement.

The construction of the planetary gear is shown above. The sun gear is located at the center, and each of the pinion gears revolves around the sun gear while rotating on its axis. These gears are all enclosed in a large ring, called the internal gear. Each pinion gear is supported by a planetary carrier, so that the pinion gears revolve an equal amount in the same direction. As mentioned above, the planetary gear consists of four elements: the sun gear, pinion gears, internal gear, and planetary carrier. The gears are shifted by imposing certain conditions on two of the following three elements: sun gear, internal gear, and planetary carrier.

The clutches and brakes are used to impose the conditions on the planetary gear set.

## 6. Reverse Clutch

### A: CONSTRUCTION

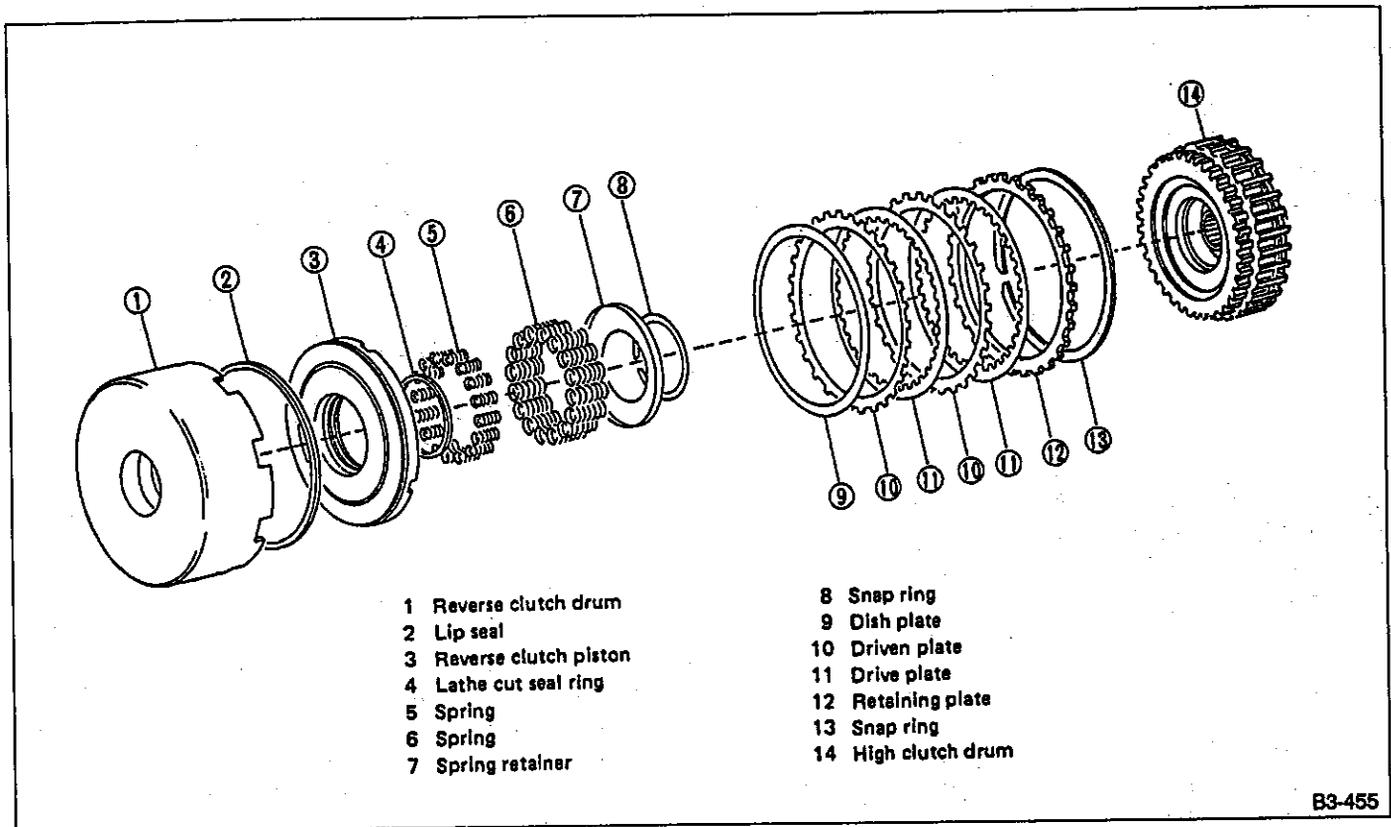


Fig. 10

### B: FUNCTION

#### DURING OPERATION

Hydraulic pressure is applied to the reverse clutch piston ① from the control valve when shifting in reverse. The drive plate ② and driven plate ③ are connected by this pressure, and engine power from the high clutch drum ④ is transmitted to the front sun gear.

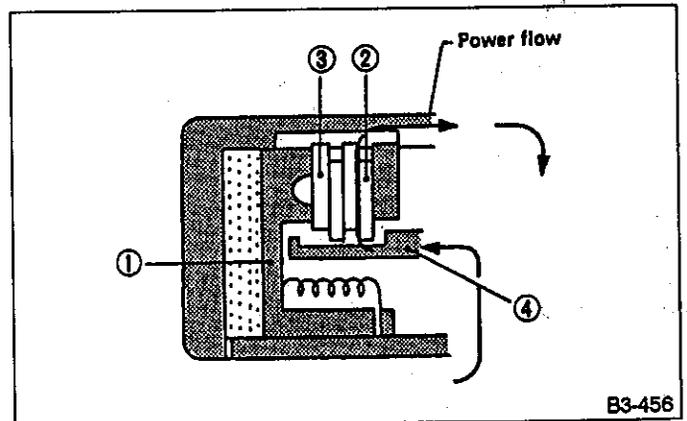
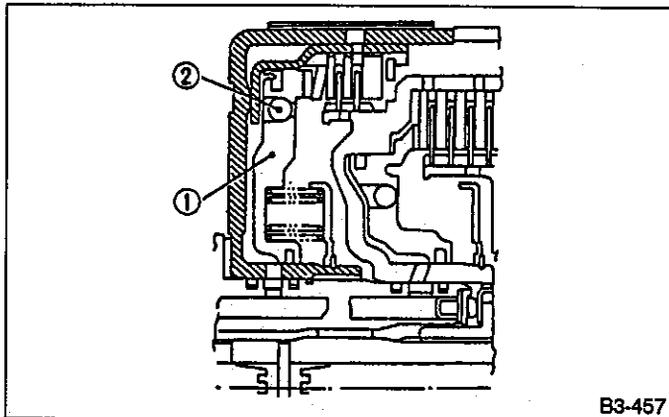


Fig. 11

**DURING NON-OPERATION**

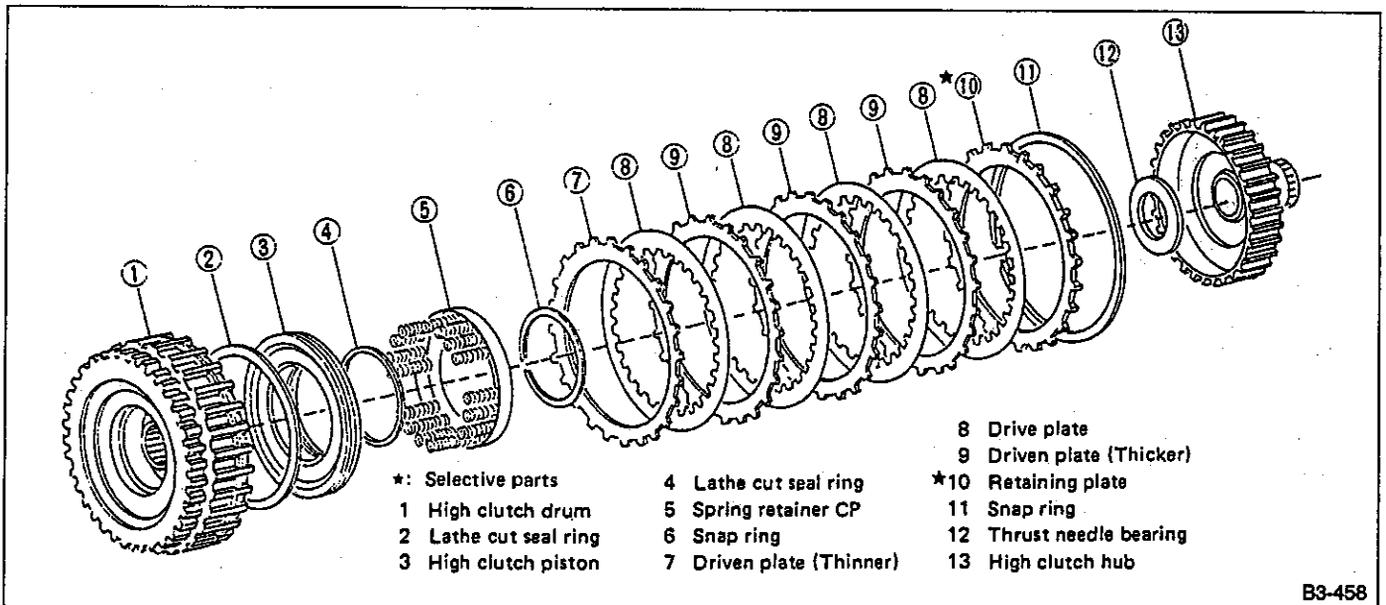


B3-457

When the shift lever is in any position other than reverse, no hydraulic pressure is applied to the reverse clutch piston ①. Hence the drive plate and driven plate are separated, and no power is transmitted. The check ball ② is built into the clutch piston. This check ball releases oil pressure from the clutch piston while the drum rotates idle. It thus avoids build-up of residual pressure in the clutch drum and a resultant half-engaged clutch, which may otherwise be caused by centrifugal oil pressure.

Fig. 12

**7. High Clutch**



B3-458

Fig. 13

In 3rd and 4th speed operation, hydraulic pressure is applied to the high clutch from the control valve and another hydraulic pressure controller. The clutch plates (drive and driven plates) are connected by this hydraulic pressure, and engine power from the input shaft is transmitted to the front planetary carrier through the high clutch hub.

# 8. Band Brake

## A: CONSTRUCTION

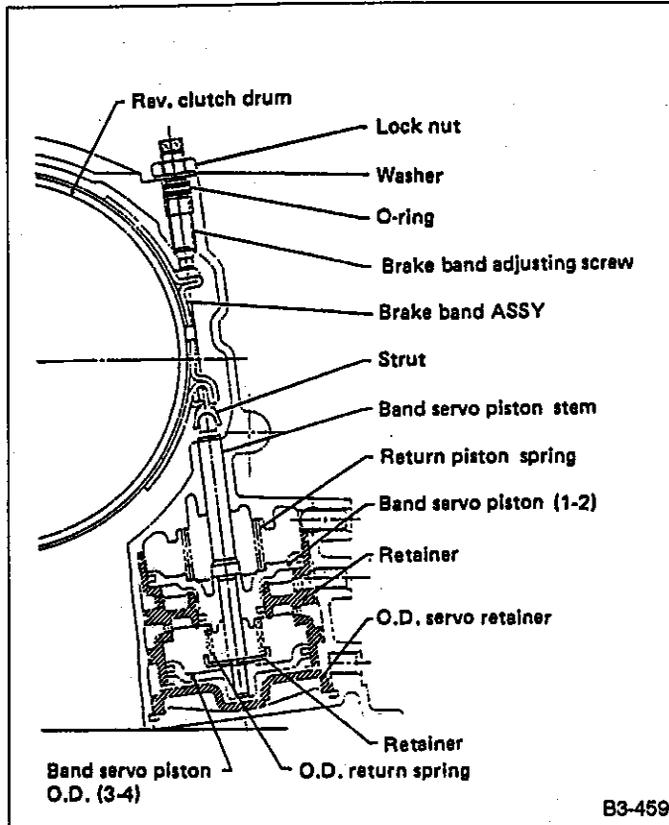


Fig. 14

The band brake consists of a flex type brake band, a band brake adjusting mechanism, two servo pistons, two retainers, two return springs, a stem, a strut, and others. The band brake can be adjusted as installed on the vehicle.

## B: FUNCTION

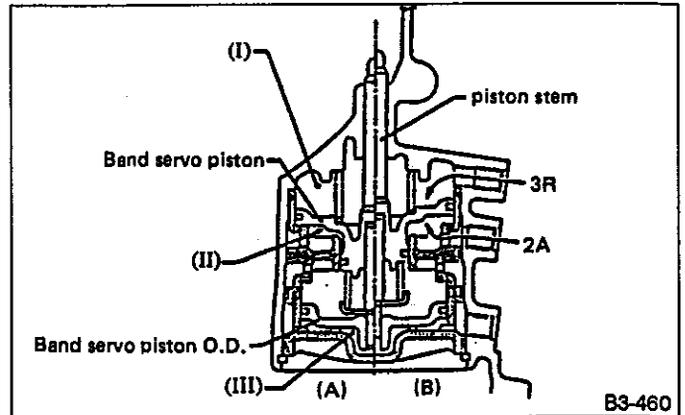


Fig. 15

One end of the brake band is secured to the transmission case via the brake band adjusting screw. When no hydraulic pressure is applied to the servo piston from the hydraulic pressure controller, the servo piston and band servo piston O.D. are forced downward by the return spring, as shown in (A) of the Figure. When hydraulic pressure 2A is applied to the servo chamber (II), it causes the band servo piston to come into contact with the stepped portion of the band servo piston stem, thereby pushing the band servo piston stem upward to state (B). Under this condition, the brake band slowly tightens the reverse clutch drum and fixes the front sun gear of the front planetary gear. (2nd speed state)

Next, when the release pressure 3R to the servo chamber (I) and the hydraulic operating pressure 2A to the servo chamber (II) are applied simultaneously, the band servo piston is pushed downward by the force of the return spring and the pressure difference between chamber (I) and chamber (II), caused by the difference in operating areas of the band servo pistons. Under this condition, state (A) is resumed, and the brake band loosens and releases the reverse clutch drum. (3rd speed state)

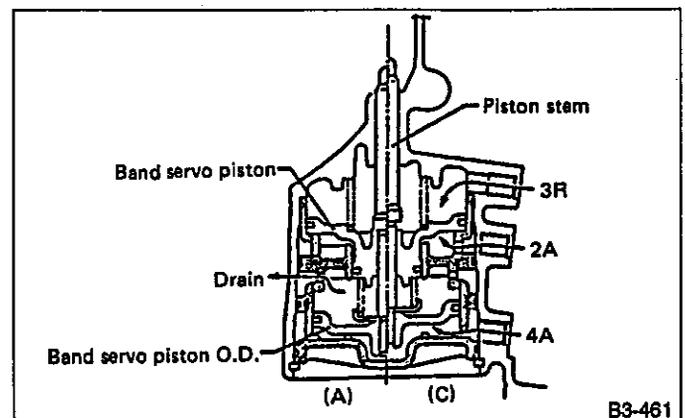


Fig. 16

When hydraulic pressure 4A is applied to the servo chamber (III) under the 3rd speed condition, the band servo piston O.D. is brought into contact with the retainer installed at the lower end of the band servo piston stem. Hence, the stem is pushed upward. As a result, state (C) is achieved where the brake band slowly tightens the reverse clutch drum and fixes the front sun gear of the front planetary gear. (4th speed state) The accumulator is built into the transmission case as shown in the Figure. When hydraulic pressures 2A, 3R, and 4A are applied from the hydraulic control unit to the respective servo chambers, the hydraulic shock loads are absorbed by the accumulator. This is because the accumulator piston moves slowly, and the brake band is tightened or released slowly. This results in smooth gearshift operation.

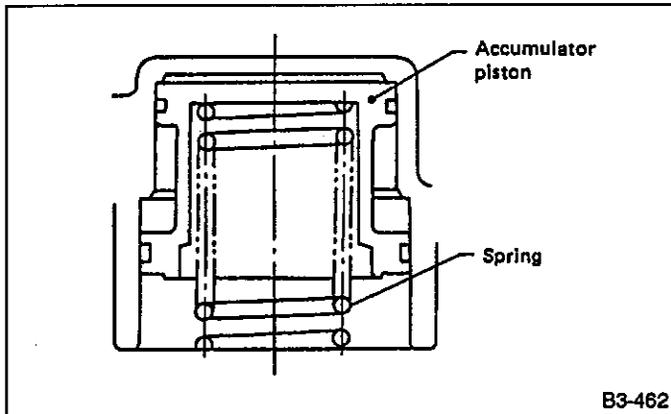


Fig. 17

## 9. One-way Clutch

### A: CONSTRUCTION

The one-way clutch (O.W.C.) is a Sprag type. Two clutches are used. One is mounted between the one-way clutch outer race and the rear internal gear ASSY. The other is located between the forward clutch drum and the one-way clutch inner race.

### B: FUNCTION

The former O.W.C. (3-4) is provided to prevent counterclockwise rotation (as viewed from the front) of the rear internal gear ASSY of the rear planetary gear during 1st, 2nd and 3rd speeds of the "D" range, "3" range, "2" range and "1st hold". At the 4th speed of the "D" range, therefore, the rear internal gear ASSY rotates clockwise so that the O.W.C. rotates freely to ensure smooth transition between 3rd and 4th speeds.

On the other hand, the latter O.W.C. (1-2) is provided to prevent counterclockwise rotation (as viewed from the front) of the forward clutch ASSY during 1st speed of the "D" range and 1st speed of the "3" range. Therefore, when shifting from 1st speed of the "D" range or "3" range to 2nd speed, the forward clutch ASSY rotates clockwise. As a result, the O.W.C. now rotates freely ensuring smooth transition between 1st and 2nd speeds.

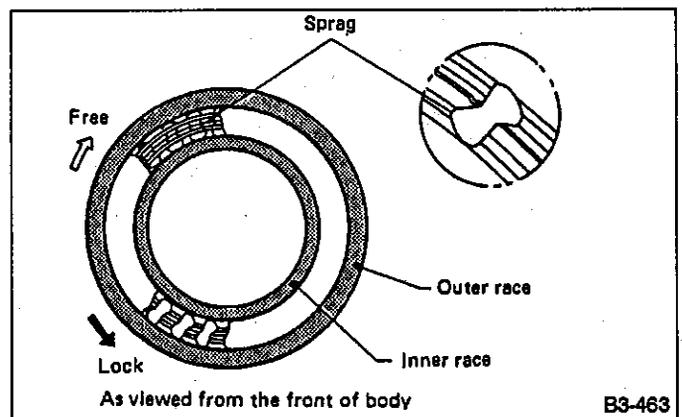


Fig. 18

## 10. Low & Reverse Brake

### A: CONSTRUCTION

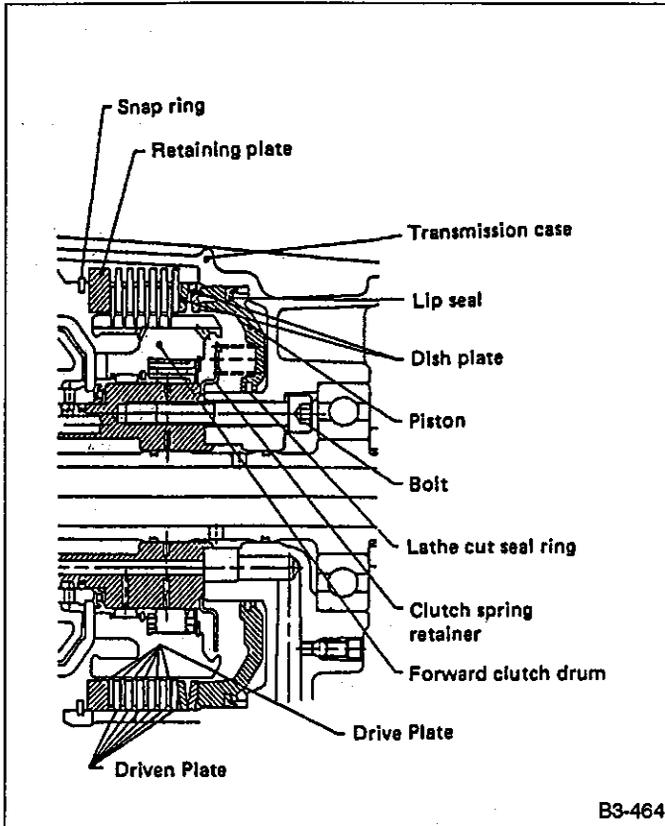


Fig. 19

The piston, dish plate, drive plate, driven plate, retaining plate and snap ring are mounted directly to the transmission case. The spring retainer which is integral with the spring is secured to the inner race of the transmission case engagement surface.

### B: FUNCTION

During 1st speed of the "2" range and 1st speed of the "1st hold", and reverse, hydraulic pressure from the hydraulic pressure controller is applied to the low & reverse piston. This pressure causes the drive plate and driven plate to engage, and the forward clutch to be fixed.

# 11. Forward Clutch & Overrunning Clutch

## A: CONSTRUCTION

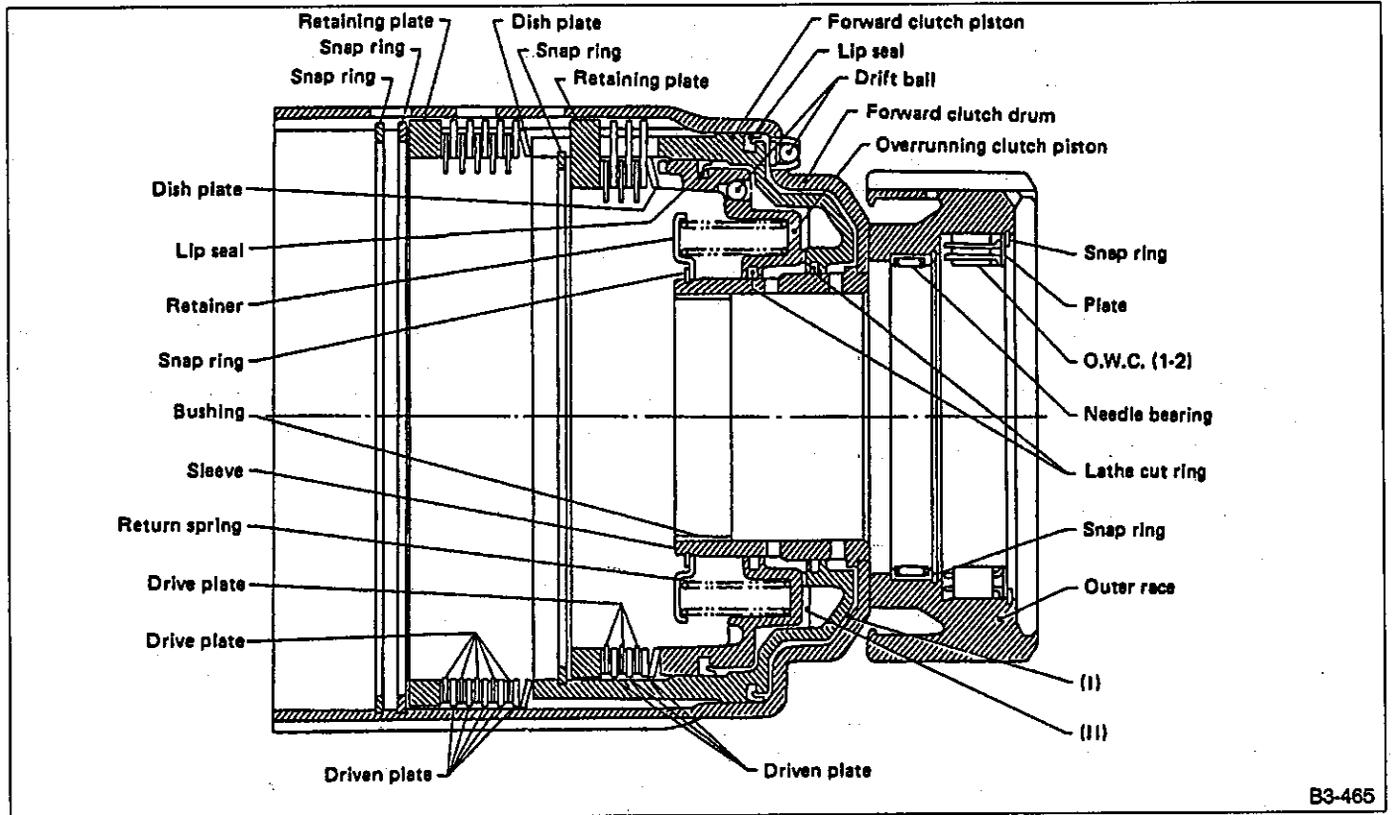


Fig. 20

The forward clutch drum is manufactured by pressing sheet metal. The clutch drum, outer race and sleeve are welded together by the electron beam welding technique. This clutch drum accommodates two multi-plate clutches (forward clutch and overrunning clutch). The overrunning clutch piston is mounted on the internal periphery of the forward clutch piston for common use of the return spring and reduction in size.

## B: FUNCTION

When hydraulic pressure is applied to the pressure chamber (I) from the hydraulic pressure controller during forward operation in the "D", "3", "2" range or "1st hold", the forward clutch piston forces the overrunning clutch piston. This causes the drive and driven plates of the forward clutch to engage while causing the drive

and driven plates of the overrunning clutch to slide forward.

A groove is provided on the outside of the retaining plate and driven plate of the overrunning clutch in which the forward clutch piston slides.

When hydraulic pressure is applied to the pressure chamber (II) from the hydraulic pressure controller during "3" range, "2" range or "1st hold" operation, the forward clutch piston is forced onto the side of the forward clutch drum. The overrunning clutch piston, however, is moved to the left by the hydraulic pressure. This causes the drive and driven plates of the overrunning clutch to engage. When this occurs, the outside splines of the overrunning clutch retaining plate and driven plate fit into the internal spline grooves of the forward clutch. This allows power to be transmitted between the overrunning clutch hub and the forward clutch drum.

## 12. Input Shaft

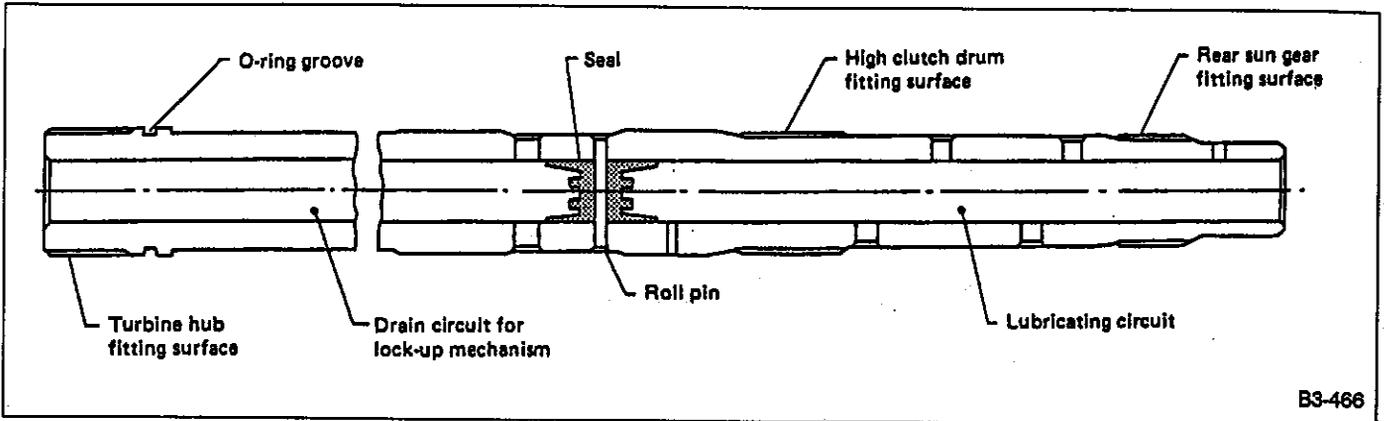


Fig. 21

The input shaft front end is spline-fitted to the torque converter turbine hub. The rear end is spline-fitted to the high clutch drum and rear sun gear. Power from the torque converter is transmitted to the high clutch drum and rear sun gear. The input shaft is hollow. A seal is

fitted inside the shaft by a roll pin. The torque converter side of the shaft becomes the drain circuit for the lock-up mechanism. The other side becomes the lubricating circuit for the planetary gears and high clutch.

## 13. Reduction Gear

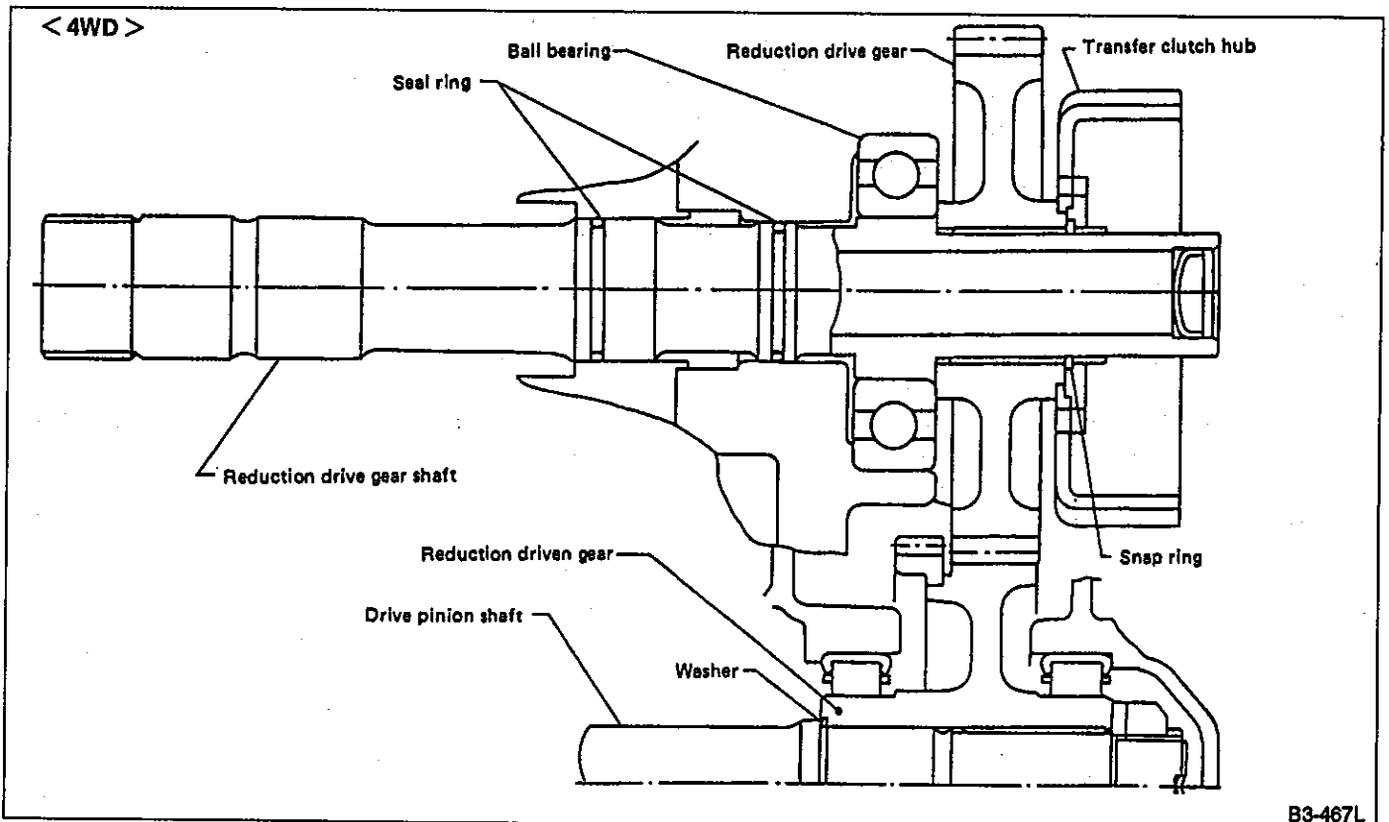


Fig. 22

Engine power is transmitted from the rear planetary carrier to the reduction drive shaft and the reduction drive gear. In an FWD vehicle, power is then transmitted to the final gear through the reduction driven gear and drive pinion. In a 4WD vehicle, power transmission to the front wheels is the same as an FWD vehicle. Power

to the rear wheels is transmitted from the transfer clutch hub, welded to the side of the reduction drive gear, and passes through the transfer clutch (multi-plate clutch), to the rear drive shaft → propeller shaft → rear differential → rear wheel.

## 14. Final Reduction Gears

### 1. GENERAL

The hypoid drive gear is mounted to the cast iron oil pump housing by double taper roller bearings. The hypoid driven gear and the differential are mounted to the differential case. Both ends rotate and are supported by taper roller bearings in the converter case.

### 2. HYPOID GEAR

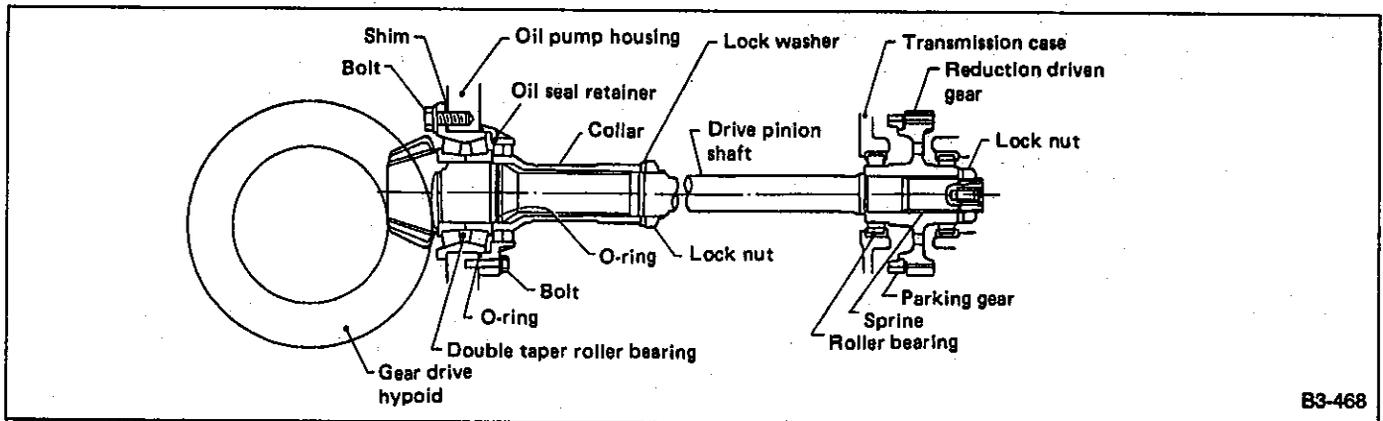


Fig. 23

The front end of the drive pinion shaft is supported by the double-taper roller bearing on the oil pump housing. The rear end is supported by two roller bearings on the transmission case and extension case. The double-taper roller bearing is preloaded by tightening the lock nut to a specified torque via the collar. The tooth contact of the hypoid gear is adjusted by changing the shim thickness between the double-taper roller bearing flange and oil pump housing.

The rear end of the drive pinion shaft is spline-fitted to the reduction driven gear, which is secured with a lock nut. The external helical spline has some lead, and the reduction driven gear is force-fitted to this shaft end.

3. DIFFERENTIAL GEAR

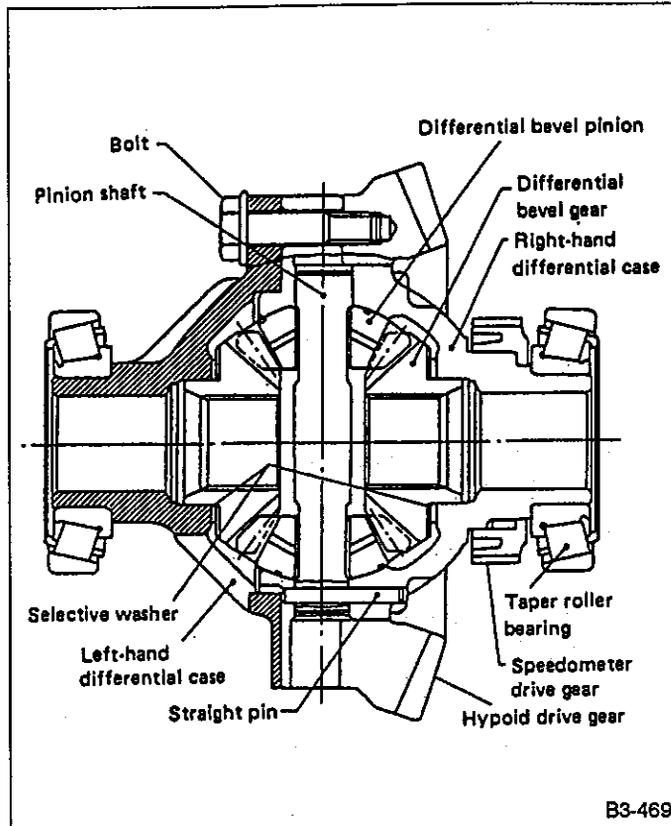


Fig. 24  
The differential bevel gear is locked to the axle shaft by a clip.

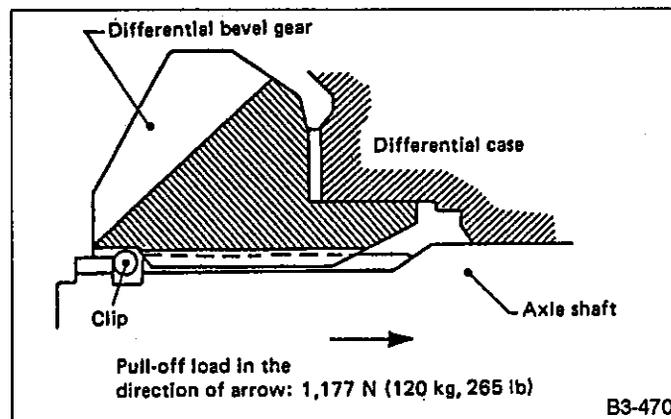


Fig. 25

4. SPEEDOMETER GEAR

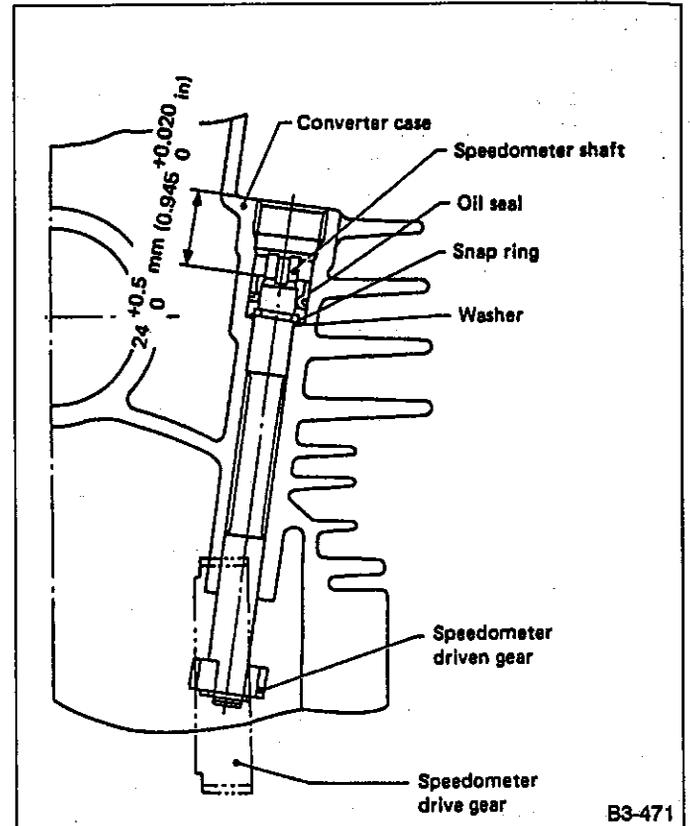


Fig. 26  
The speedometer drive gear is mounted directly on the differential case, and the flexible cable is led from the right side of the converter case. With this arrangement, the speedometer drive and driven gears are properly lubricated.

## 15. Range Select Mechanism

The range select mechanism consists of a select lever (on the floor/center console in the driver's compartment), push-pull cable, linkages, manual valve, parking pawl, etc.

When the select lever is moved either forward or backward, the push-pull cable moves in the corresponding direction. This turns the manual shaft by way of the range select lever. At this point, the pin at the end of the range select lever turns the inhibitor switch arm to transmit a range signal to the control unit.

A manual plate and manual lever are attached to the manual shaft. The manual plate is fan-shaped and is provided with seven grooves on its edge corresponding to shift ranges (from "P" to "1"). A detent spring

roller fits into the groove corresponding to the range selected. This regulates effort required to operate the select lever.

A hydraulically controlled manual valve is installed on the lower pin of the manual lever. It slides in response to rotation of the manual shaft, thereby selecting an oil passage inside the lower valve body in response to the position (P, R, N, D, 3, 2 or 1) of the select lever.

A parking rod located on the upper portion of the lever mechanically holds the output shaft when the select lever is shifted to "P".

A shift lock mechanism is incorporated in the select lever mount. For the shift lock mechanism, see "3-3 Transmission Control System".

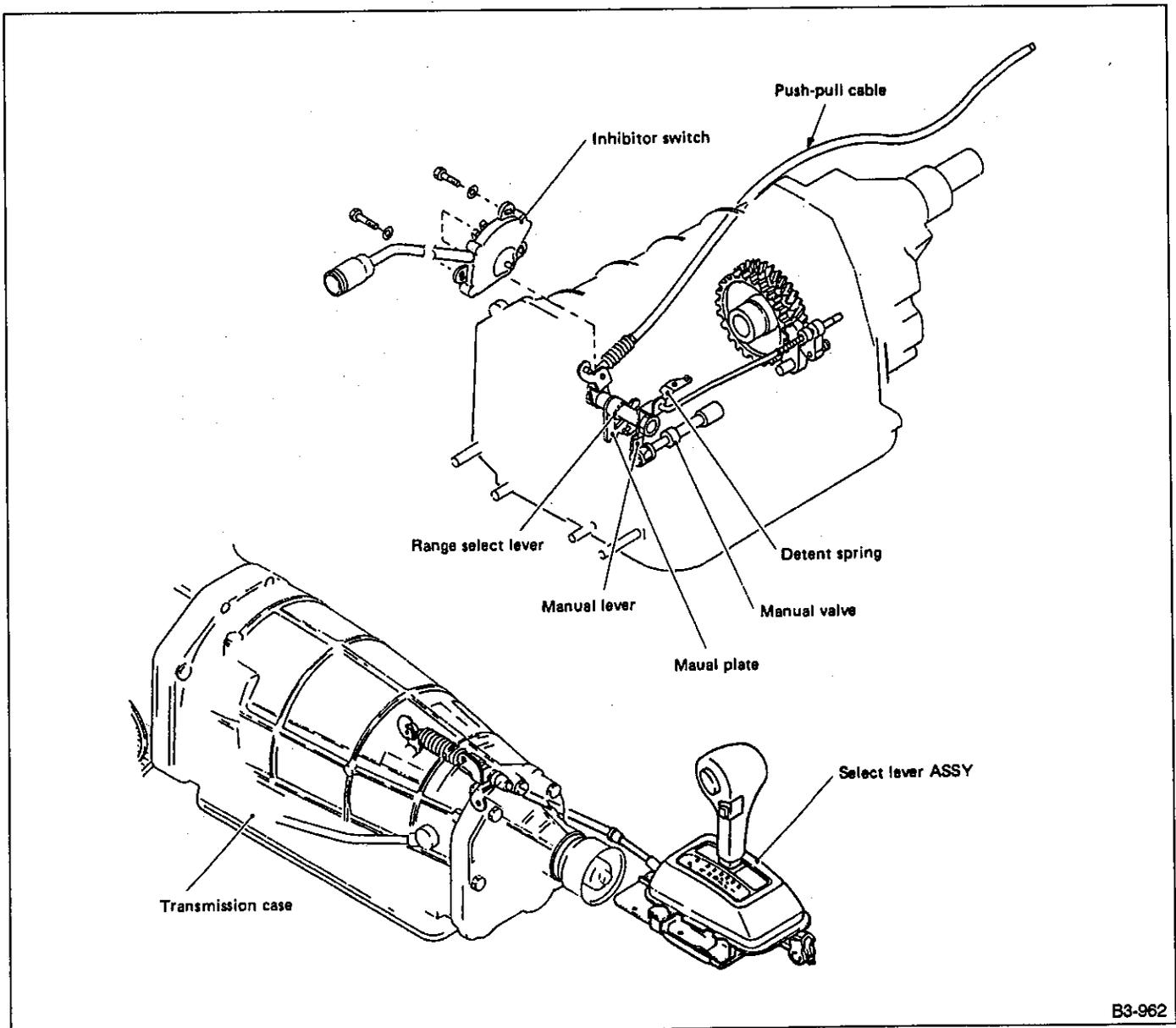


Fig. 27

## 16. Parking Mechanism

The end of the parking pawl engages mechanically with the gear groove of the parking gear. This gear is splined-fitted to the drive pinion shaft.

When the select lever is set to "P", the manual lever connected to the manual shaft turns, moving the parking rod backward. A cam and spring are installed on the rear of the parking rod. The parking cam slides freely on the parking rod. The parking rod and cam contact the "V" groove of the actuator (secured to the transmission case) and the back of the parking pawl. With this arrangement, when the parking rod moves backward, the cam moves to the back of the parking pawl and the "V" groove of the actuator. The parking pawl turns in

the direction of the parking gear using the parking pawl shaft as a pivot. It then engages with the parking gear groove.

If the end of the parking pawl rides over the tooth of the parking gear so that the parking cam does not move midway between the pawl and actuator, the parking rod will move to "P". This compresses the parking spring so that the parking cam is ready to move to "P". Under this condition, if the vehicle moves slightly, the parking gear will rotate to engage the pawl completely.

Except for the P range, the parking pawl is tensed by the parking pawl return spring in the direction that moves away from the parking gear.

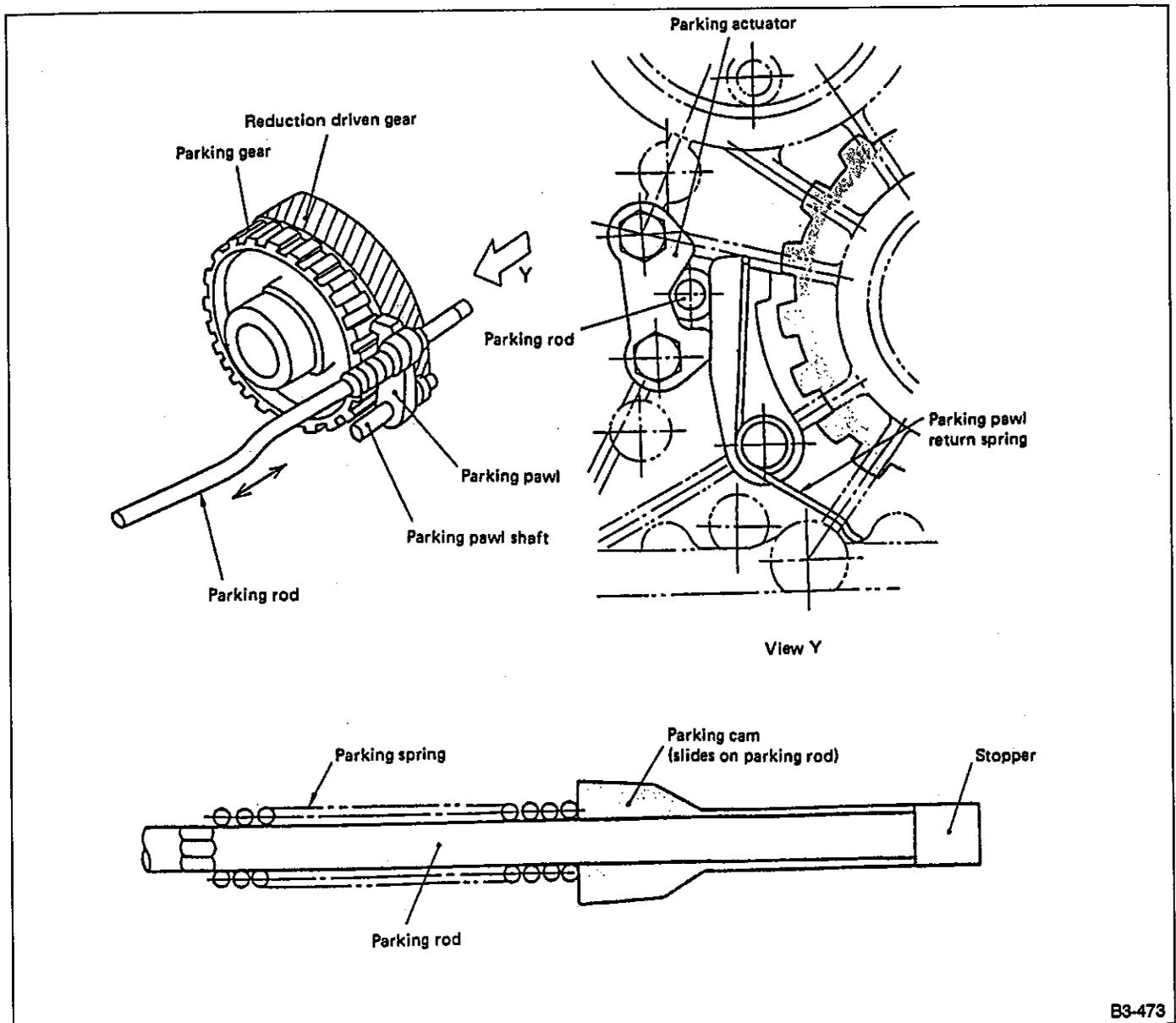


Fig. 28

B3-473

## 17. 4WD Transfer System

### 1. OUTLINE

This is the electronically controlled MP-T (multi-plate transfer) type 4WD transfer system, originally designed for SUBARU, consisting of a transfer hydraulic pressure control unit incorporating a vehicle speed sensor, control unit, and duty solenoid and a transfer clutch (hydraulic multi-plate clutch).

The control unit stores optimum transfer clutch torque data for a variety of driving conditions. When actual driving conditions (vehicle speed, throttle opening, gear

range, wheel slip, etc.) are detected by various sensors, the control unit selects a duty ratio most suitable to the given condition from the memory. It then controls the operation of the transfer clutch by means of the hydraulic pressure which controls the duty solenoid and provides optimum rear torque distribution.

Various sensors and the control unit also serve as gear shift control, lock-up control and hydraulic pressure control.

The 4WD transfer unit is housed in the extension case together with the bearing, rear drive shaft, etc.

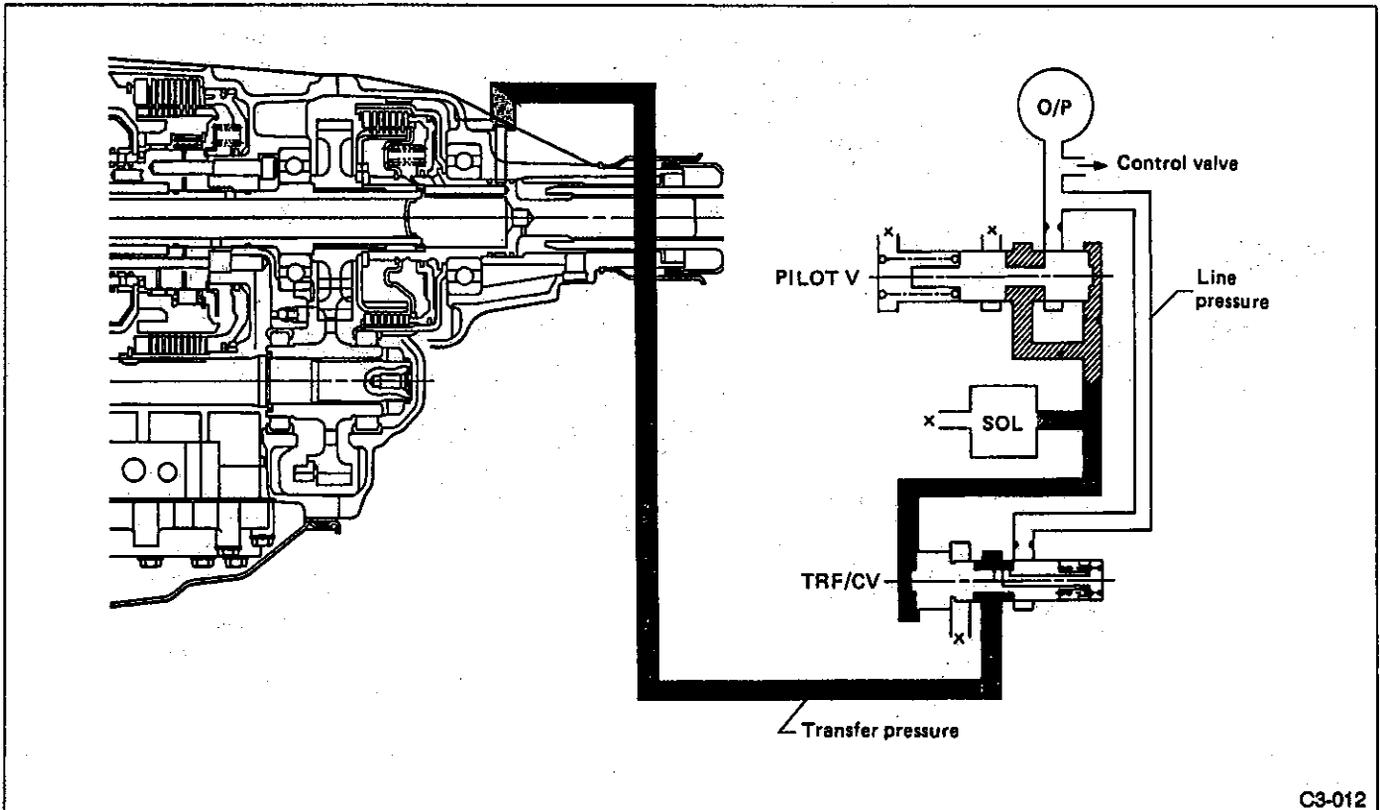


Fig. 29

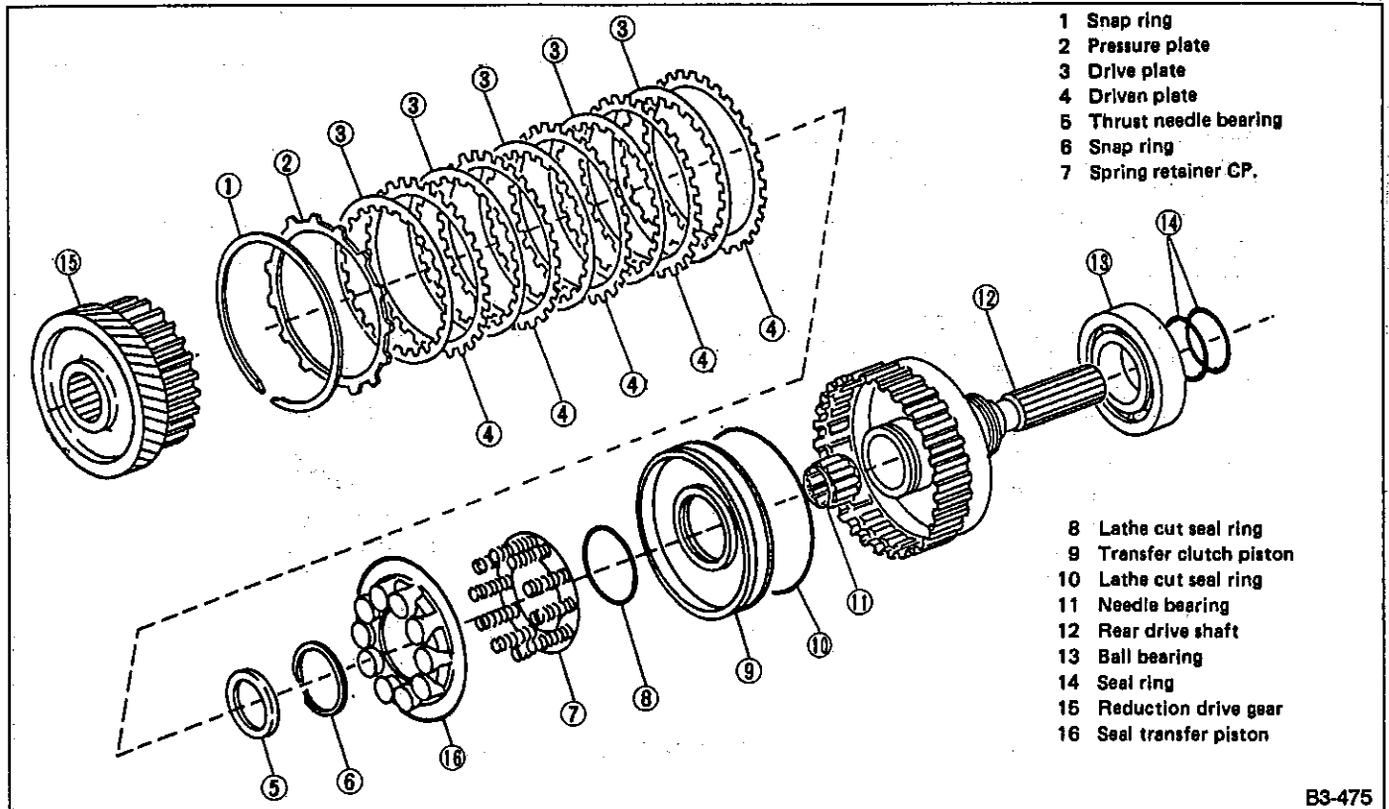
C3-012

**2. TRANSFER CLUTCH (MULTI-PLATE CLUTCH)**

The transfer unit consists of a hydraulic multi-plate clutch and a transfer hydraulic control system incorporating a duty solenoid valve. It is housed in the extension case together with the bearings, rear drive shaft, etc.

The transmission control unit has duty ratios memorized in advance according to running conditions. In order to obtain the optimum transfer torque for the running condition, the oil pressure that is applied to the

drive plates and driven plates is controlled by applying oil pressure to the transfer piston from the transfer oil pressure control device including the duty solenoid. Also, the transfer clutch drum and rear drive shaft are joined to each other by welding. The rear drive shaft has drilled oil passages for transfer clutch control and also for lubrication of extension bushing and ball bearing in it. A seal piston is positioned in the transfer clutch to accurately control transfer torque in the high-speed range.



B3-475

Fig. 30

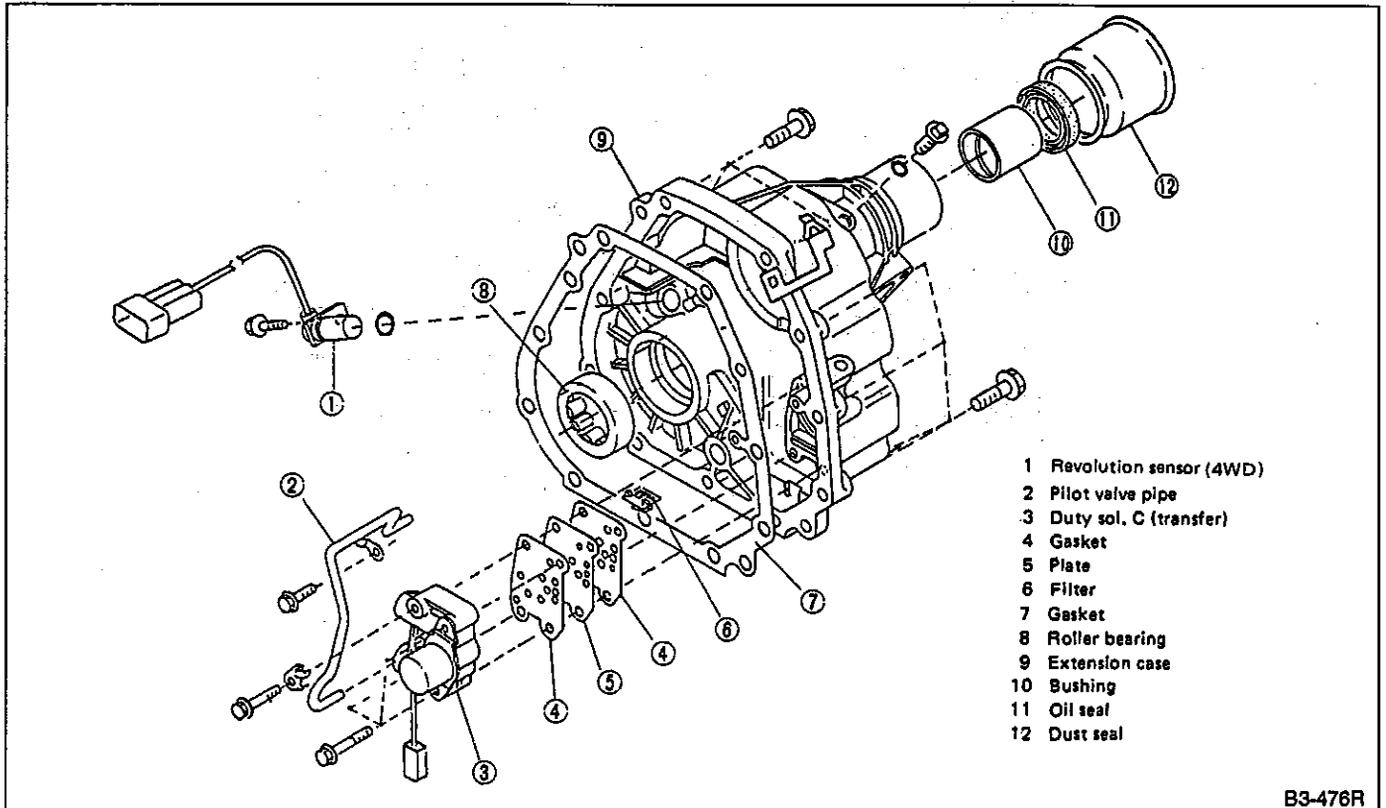
**3. TRANSFER OIL PRESSURE CONTROL DEVICE**

The transfer valve body is bolted to the side of the extension case through two gaskets and one separate plate.

Operating oil for the transfer valve body is routed to the extension case through a pipe connecting the discharge circuit of the oil pump on the front of the transmission case to the rear of the case. It is then delivered to the oil

pressure circuit provided in the plane on which the transfer valve body is mounted.

This line pressure is reduced to a fixed level by the pilot valve, and becomes the initial pressure of the duty solenoid C. Line pressure is also delivered to the transfer control valve where it is regulated by duty pressure variations to control the oil pressure so that optimum rear torque distribution is obtained according to running conditions.



B3-476R

Fig. 31

# 18. Hydraulic Control Valve

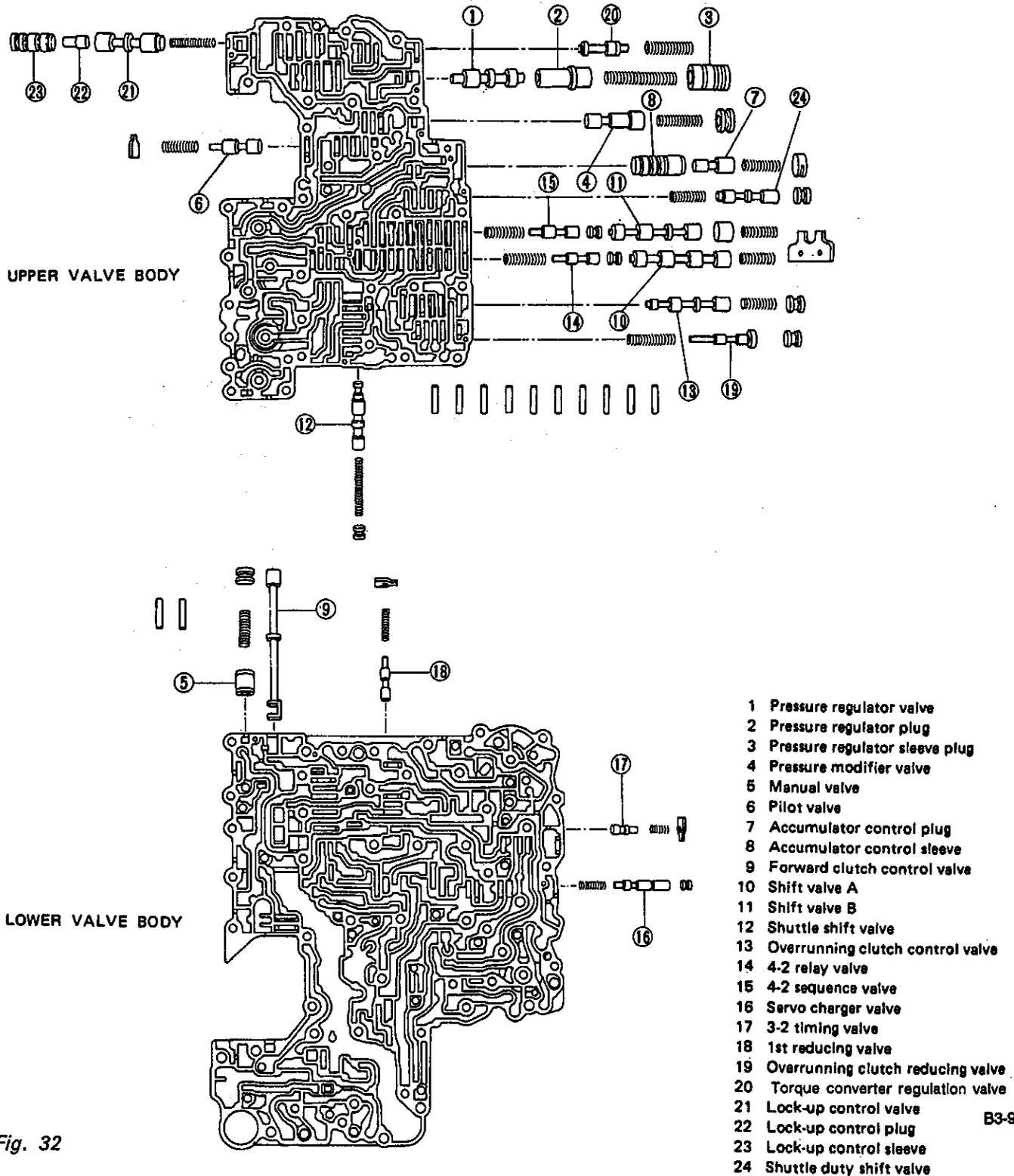
## A: GENERAL

The hydraulic control system consists of an oil pump, control valve bodies, clutches, brakes and connecting passages and pipes. When it is activated manually, or

automatically by the electronic control system, it hydraulically controls the gearshifting mechanism.

## B: CONSTRUCTION

### 1. OVERALL



B3-919

Fig. 32

2. VALVE BODY CONFIGURATION

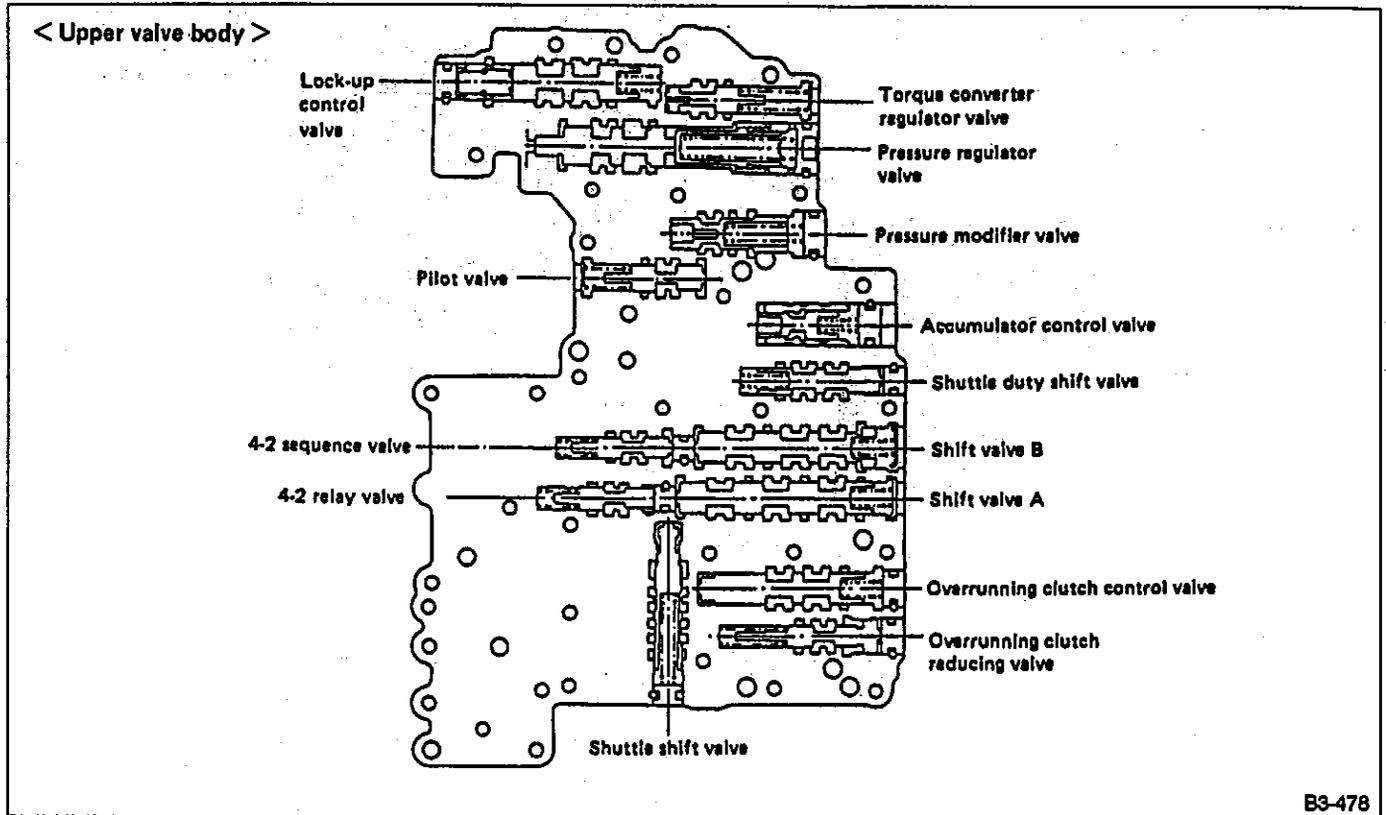


Fig. 33

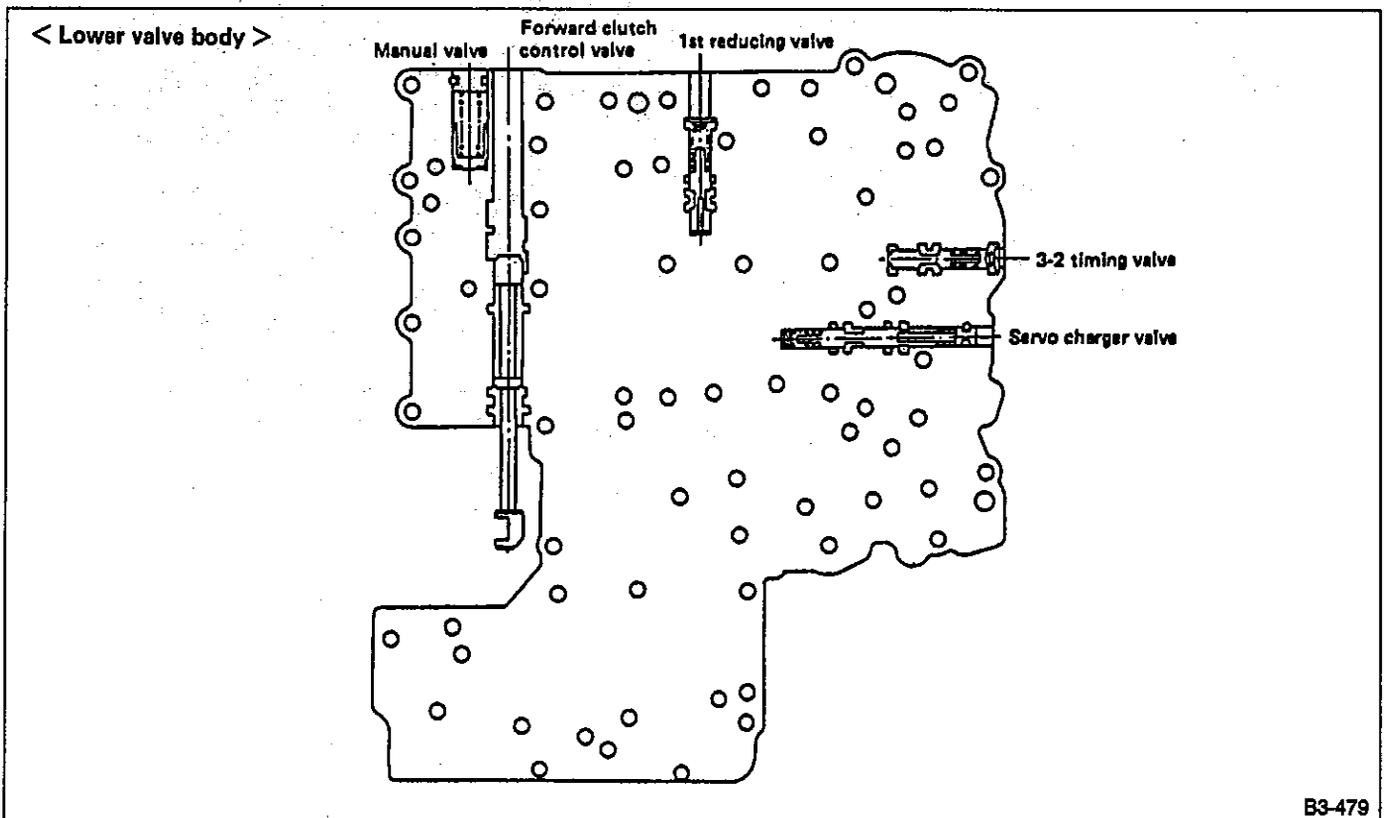


Fig. 34

**3. RELATED PARTS (1)**

The control valve body is fitted with Solenoid 1 (shift), Solenoid 2 (shift), Solenoid 3 (overrunning clutch), Duty solenoid A (line pressure), Duty solenoid B (lock-up) and an ATF temperature sensor.

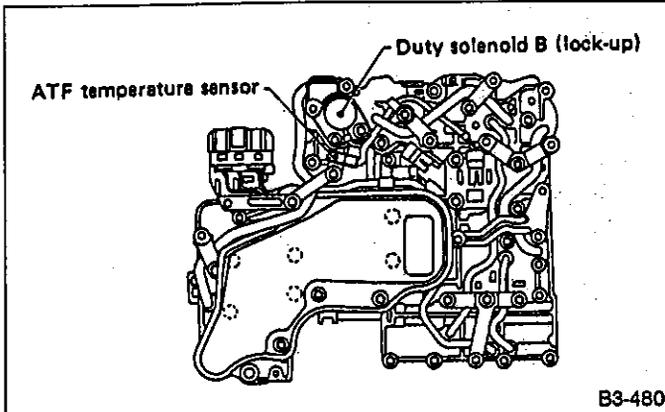


Fig. 35

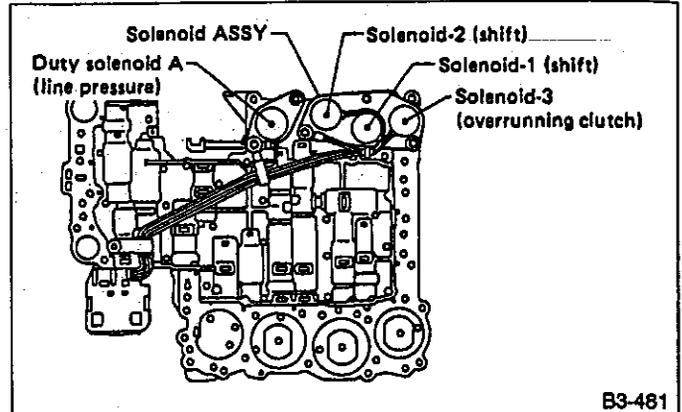


Fig. 36

**4. RELATED PARTS (2)**

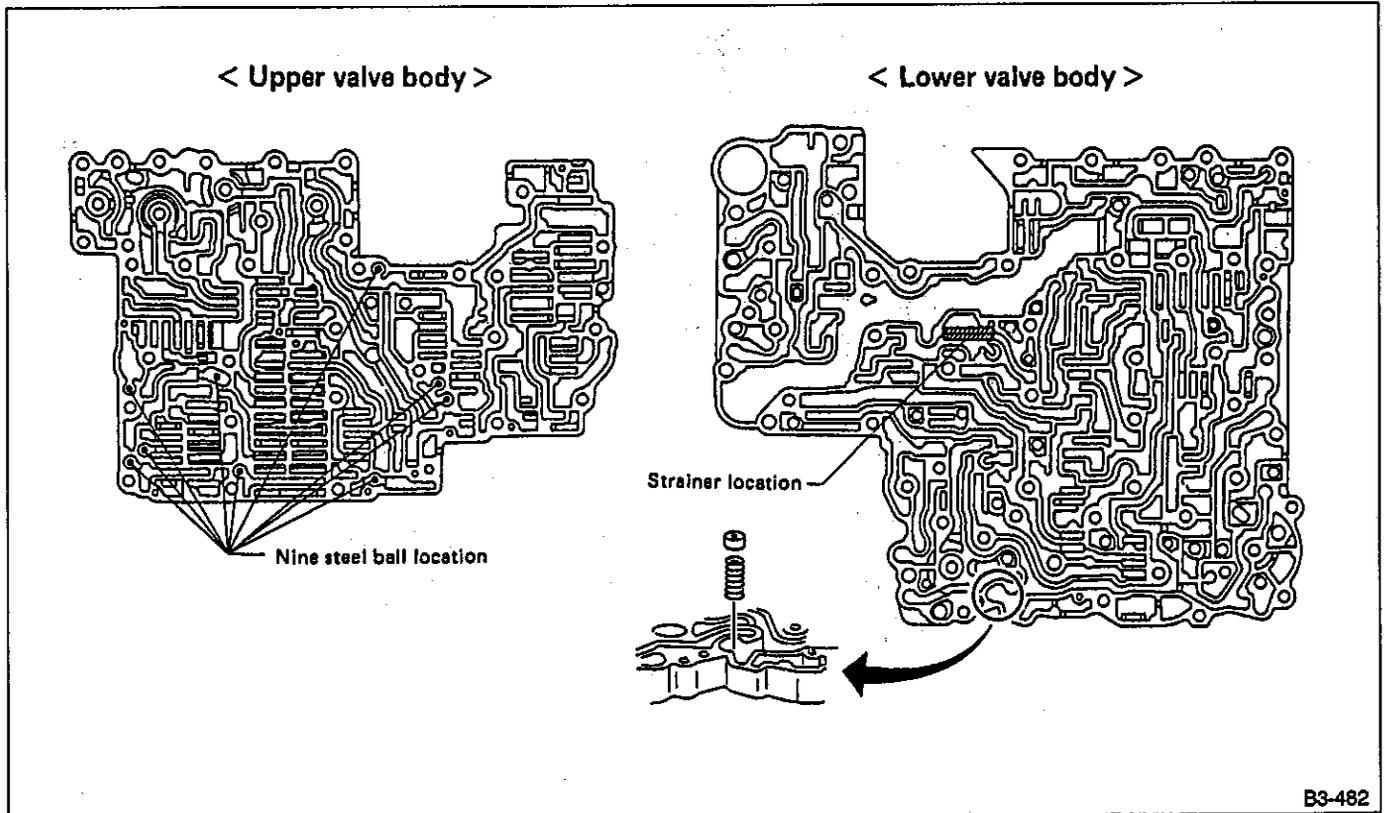
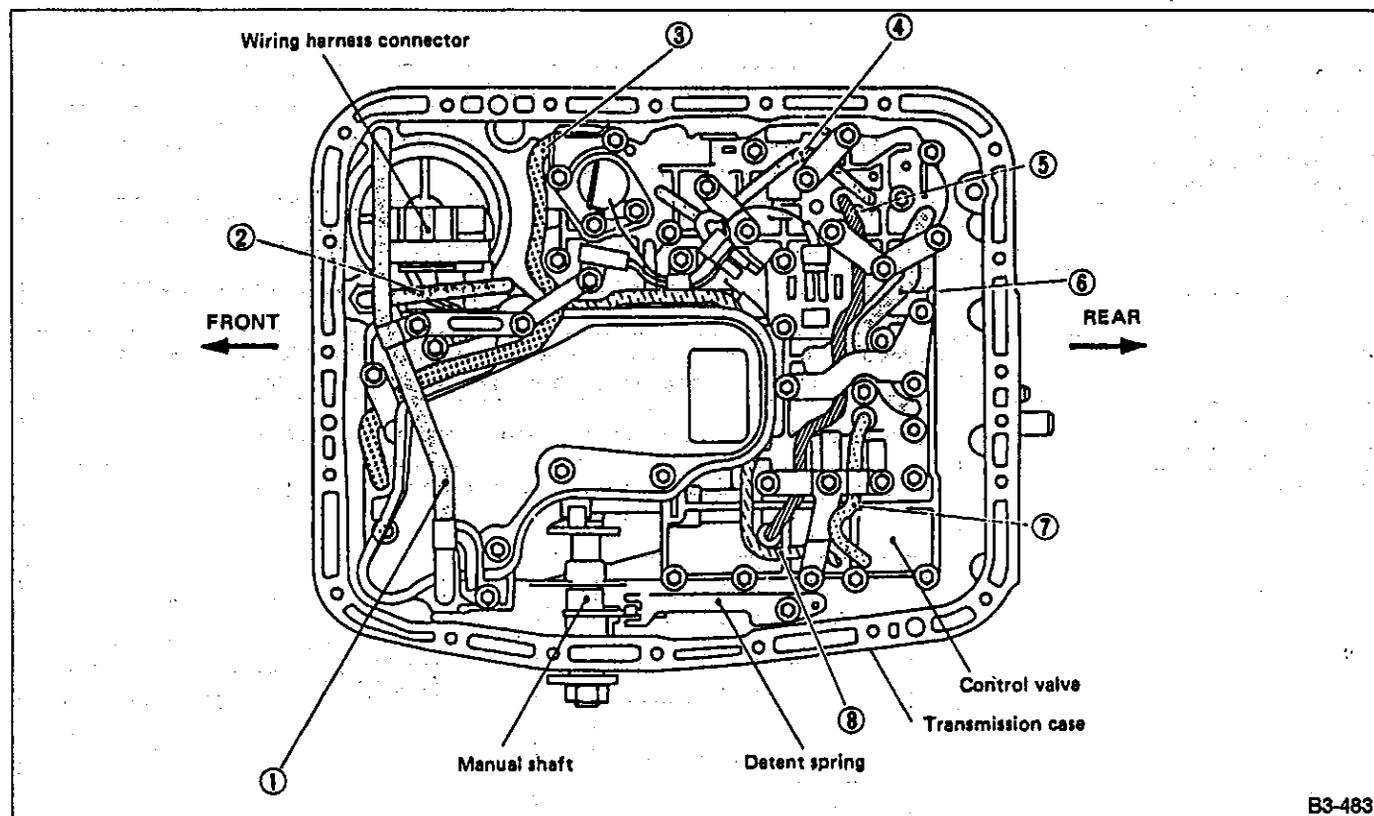


Fig. 37

5. RELATED PARTS (3)



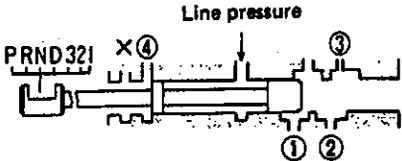
B3-483

Fig. 38

(Pipe names)

No.	Description	Hydraulic circuit
1	Oil cooler outlet pipe	Cooling line from control valve to oil cooler inside radiator
2	Transfer control pipe	Line-pressure supply line to transfer control valve
3	Reverse clutch pressure pipe	Accumulator circuit of reverse clutch pressure
4	4A pressure pipe	4A pressure circuit
5	3R pressure pipe	3R pressure circuit
6	Forward clutch pressure pipe	Supply line to N → D accumulator
7	Pilot pressure pipe	Pilot pressure supply line to shuttle shift valve S
8	Pressure-modifier pressure pipe	Supply line to pressure modifier accumulator

**C: FUNCTION**

Name	Function																																													
<ul style="list-style-type: none"> <li>• Pressure regulator valve</li> <li>• Pressure regulator plug</li> <li>• Pressure regulator sleeve plug</li> </ul>	Regulates the pressure of oil delivered from the oil pump to an optimum level (line pressure) corresponding to vehicle running conditions.																																													
Pressure modifier valve	An auxiliary valve for the pressure regulator valve. This valve adjusts pressure used to regulate line pressure to an optimum level corresponding to running conditions.																																													
Pressure modifier accumulator piston	Smooths the pressure regulated by the pressure modifier valve to prevent pulsation in line pressure.																																													
Pilot valve	Creates the constant pressure (pilot pressure) necessary to control line pressure, lock-up, overrunning clutch, 3-2 timing, and gearshift operations from line pressure.																																													
<ul style="list-style-type: none"> <li>• Accumulator control plug</li> <li>• Accumulator control sleeve</li> </ul>	Adjusts accumulator back pressure to correspond to running conditions.																																													
Manual valve	<p>Delivers line pressure to each circuit corresponding to the selected position.</p> <table border="1"> <thead> <tr> <th>Circuit</th> <th>①</th> <th>②</th> <th>③</th> <th>④</th> </tr> </thead> <tbody> <tr> <td>Range</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>P</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>R</td> <td></td> <td></td> <td></td> <td>○</td> </tr> <tr> <td>N</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>D</td> <td>○</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td>○</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>○</td> <td>○</td> <td></td> <td></td> </tr> <tr> <td>1</td> <td>○</td> <td>○</td> <td>○</td> <td></td> </tr> </tbody> </table>  <p style="text-align: right;"><i>Fig. 39</i> <span style="float: right;">B3-484</span></p> <p>When the valve is set in the "line pressure no delivery" position, the pressure is relieved.</p>	Circuit	①	②	③	④	Range					P					R				○	N					D	○				3	○				2	○	○			1	○	○	○	
Circuit	①	②	③	④																																										
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Shift valve A	Simultaneously changes three different oil passages using shift solenoid 1 output pressure corresponding to such operating conditions as vehicle speed and throttle opening. Combined with shift valve B, this valve permits automatic shifting of 1st ⇌ 2nd ⇌ 3rd ⇌ 4th speeds.																																													
Shift valve B	Simultaneously changes three different oil passages using shift solenoid 2 output pressure corresponding to such operating conditions as vehicle speed and throttle opening. Combined with shift valve A, this valve permits automatic shifting of 1st ⇌ 2nd ⇌ 3rd ⇌ 4th speeds.																																													
Shuttle shift valve S	Changes the 3-2 timing control and overrunning clutch control oil passages corresponding to the throttle opening. When the throttle is wide open, the overrunning clutch becomes inoperative to prevent interlocking at 4th speed.																																													
Overrunning clutch control valve	Changes oil passages so as to prevent simultaneous operation of the overrunning clutch when the brake band is actuated at 4th speed. (Operation of overrunning clutch at D4 speed results in interlocking.)																																													

**AUTOMATIC TRANSMISSION AND DIFFERENTIAL [4AT] [M18C0] 3-2a**

Name	Function
4-2 relay valve	Memorizes the 4th speed position, and prevents gear shifting from 4th to 3rd to 2nd speeds due to combined operation of the 4-2 sequence valve, shift valve A and shift valve B when shifting down from 4th to 2nd speeds.
4-2 sequence valve	Inhibits release of band servo operating pressure acting at 4th speed until the high clutch operating pressure and band servo release pressure (same hydraulic circuit) are drained when shifting down from 4th speed to 2nd speed.
Servo charger valve	The 2nd speed band servo actuating hydraulic circuit has an accumulator and one-way orifice for relieving shift shock when shifting from 1st speed to 2nd speed. The servo charger valve is installed to ensure sufficient oil flow when shifting down from 4th to 2nd speed, or from 3rd to 2nd speed. It operates at 3rd or higher speeds and supplies the 2nd speed band servo actuating pressure by bypassing the one-way orifice.
3-2 timing valve	When shifting down from D 3rd to D 2nd speed, the timing valve retards the release of band-servo pressure and creates a temporary neutral condition so that vehicle speed can be changed smoothly.
"1" Reducing valve	Reduces the low & reverse brake operating pressure so as to relieve engine braking shock when changing from "2" range 2nd speed to 1st speed.
Overrunning clutch reducing valve	Reduces the operating pressure applied to the overrunning clutch so as to relieve engine braking shock. In the "2" and "3" ranges, line pressure is applied to the valve to raise the pressure adjusting point, thereby increasing engine braking capacity.
Torque converter regulator valve	Prevents excessive rise of torque converter pressure.
<ul style="list-style-type: none"> <li>• Lock-up control valve</li> <li>• Lock-up control plug</li> <li>• Lock-up control sleeve</li> </ul>	<p>Controls the operation of the lock-up function.</p> <p>Smooths the transition between the lock-up state and release state.</p>
Shuttle shift valve D	<p>Changes the oil passage so that output pressure to the duty solenoid B (lock-up) will be applied to the lock-up valve in the "D" range 2nd, 3rd, or 4th speed.</p> <p>(Lock-up at 1st speed is inhibited.)</p> <p>* Lock-up control is not actuated if the lock-up solenoid does not generate output pressure when signaled from the control unit, even if the vehicle is in the "D" range 2nd, 3rd, or 4th speeds.</p>

# 19. Gearshifting Mechanism

## A: OPERATION TABLE

		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 ↑↓				○	○			○
		2ND ↑↓		○		○	○			
		3RD ↑↓			○	○	○	○		
		4TH ↑↓ *1		○	○	○				
	(2)	1ST ↑↓				○	○	○		○
		2ND ↑↓		○		○	○	○		
		3RD ↑↓ *1			○	○	○	○		
		4TH ↑↓ *1		○	○	○				
	(1)	1ST ↑↓ *1				○	○	○	○	
2ND ↑↓ *1			○		○	○	○			
3RD ↑↓ *1				○	○	○	○			
4TH ↑↓ *1			○	○	○					

\*1: For prevention of engine over-revolution

B3-485

Fig. 40

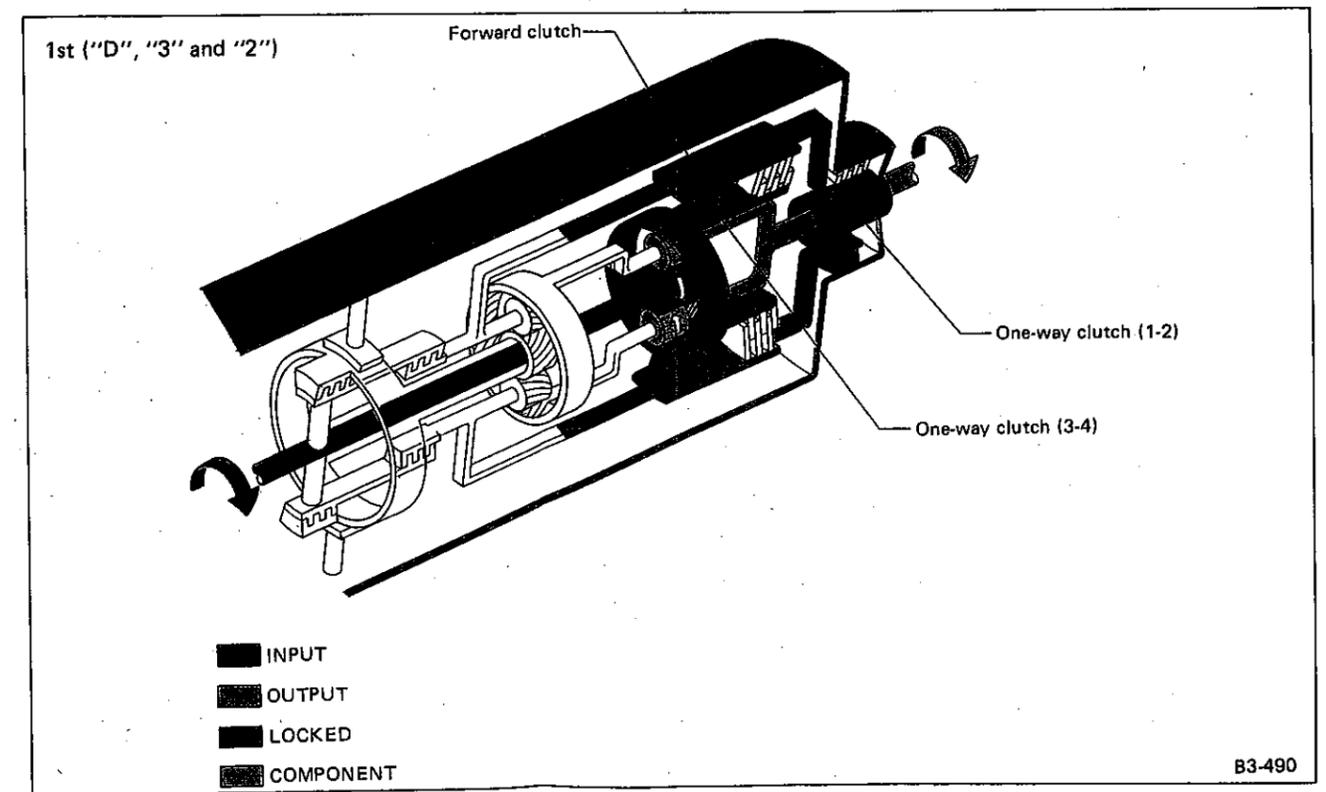
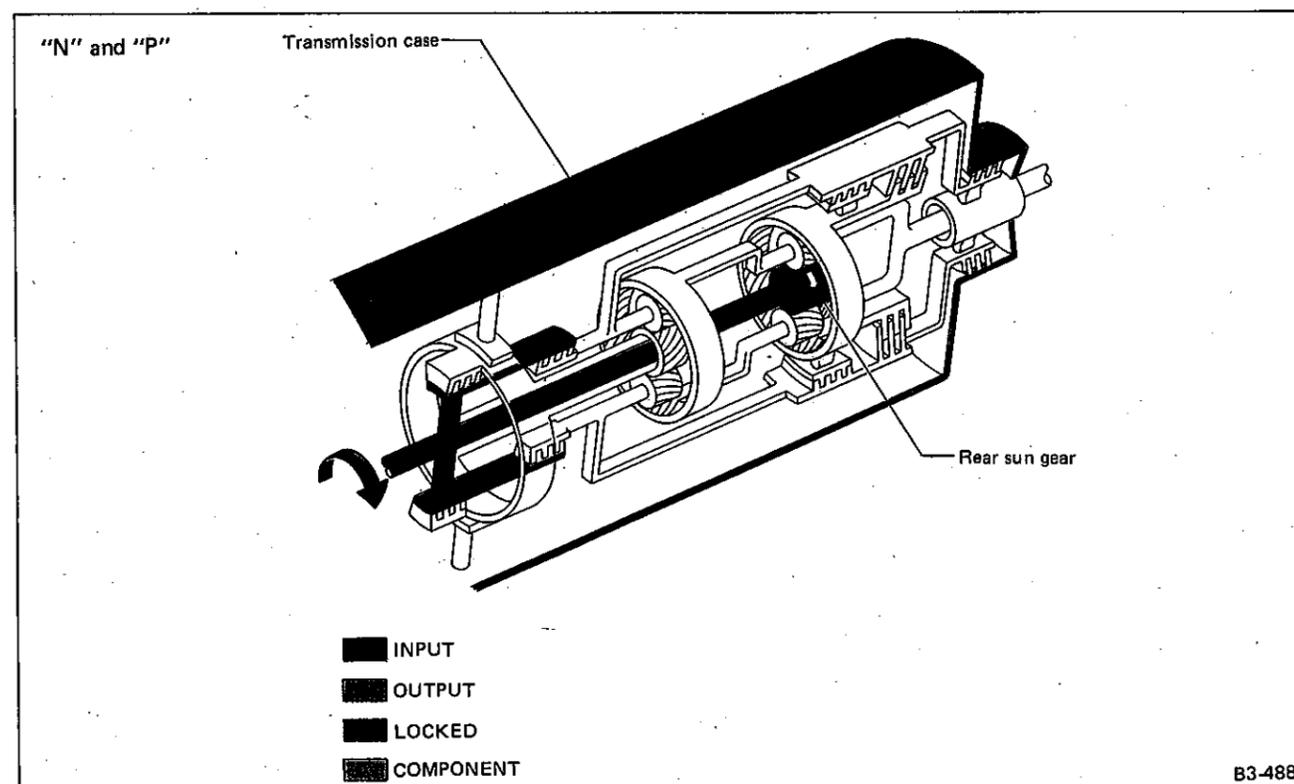
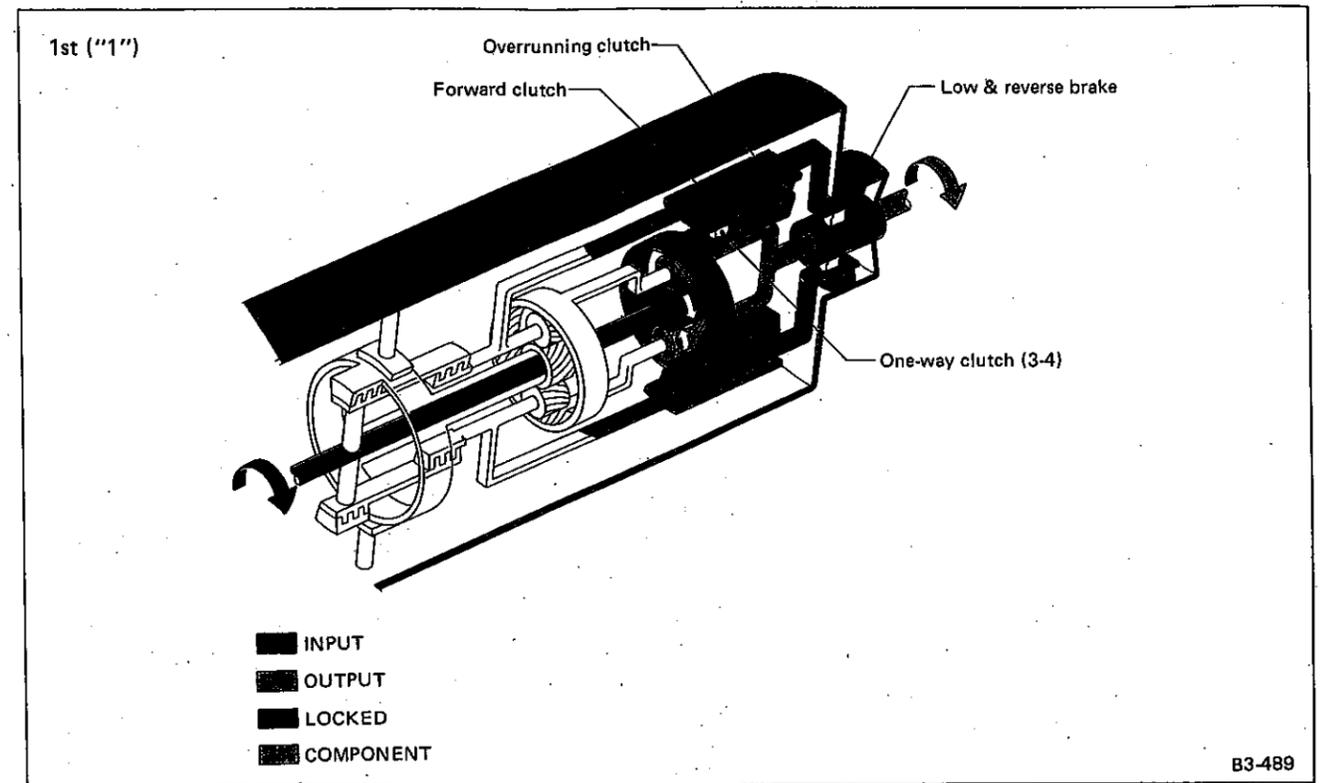
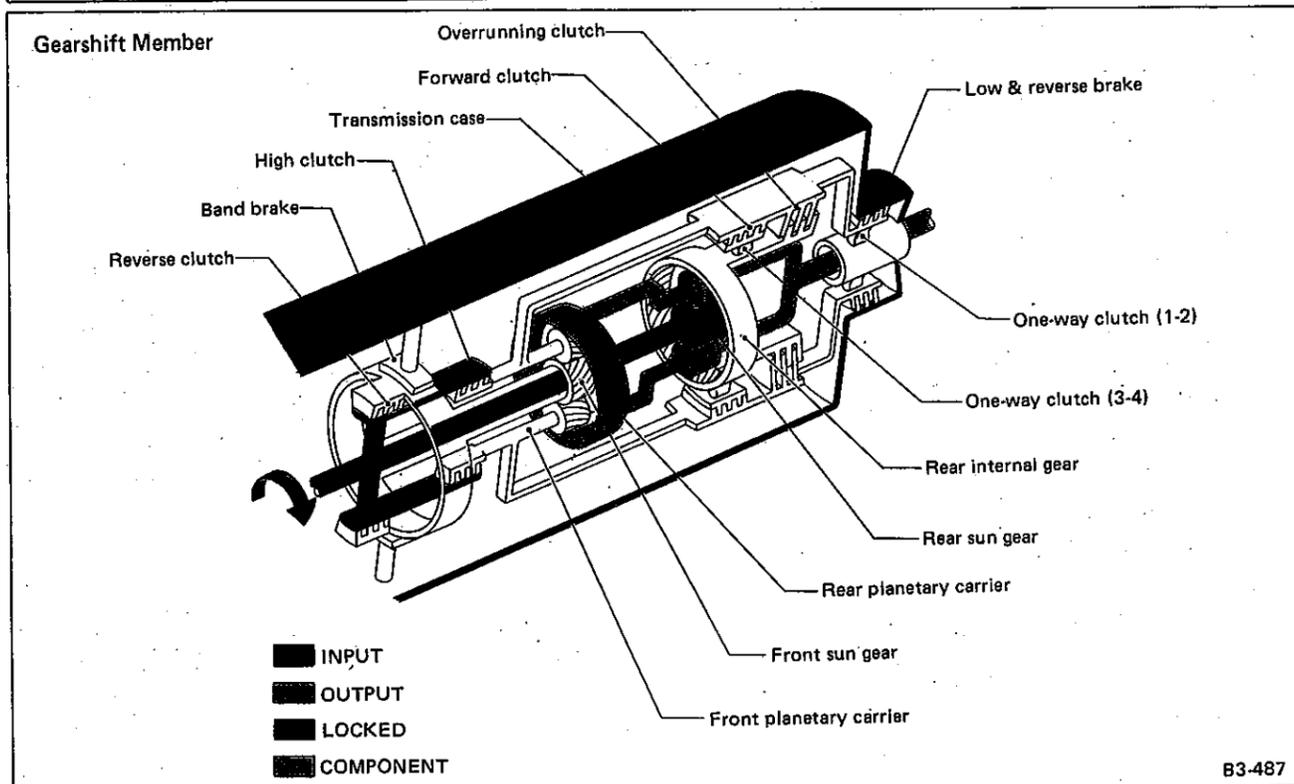
	1st	2nd	3rd	4th	Rev.
Input member	(RS)	(RS)	(RS) — (FC) — (RI)	(RS) — (FC)	(RS) — (FS)
Output member	(FI) — (RC)	(FI) — (RC)	(FI) — (RC)	(FI) — (RC)	(FI) — (RC)
Fixed member	(FC) — (RI)	(FS)	X	(FS)	(FC)
Free member	(FS)	(FC) — (RI)	(FS)	(RI)	(RI)
Gear ratio	2.785	1.545	1.000	0.694	2.272

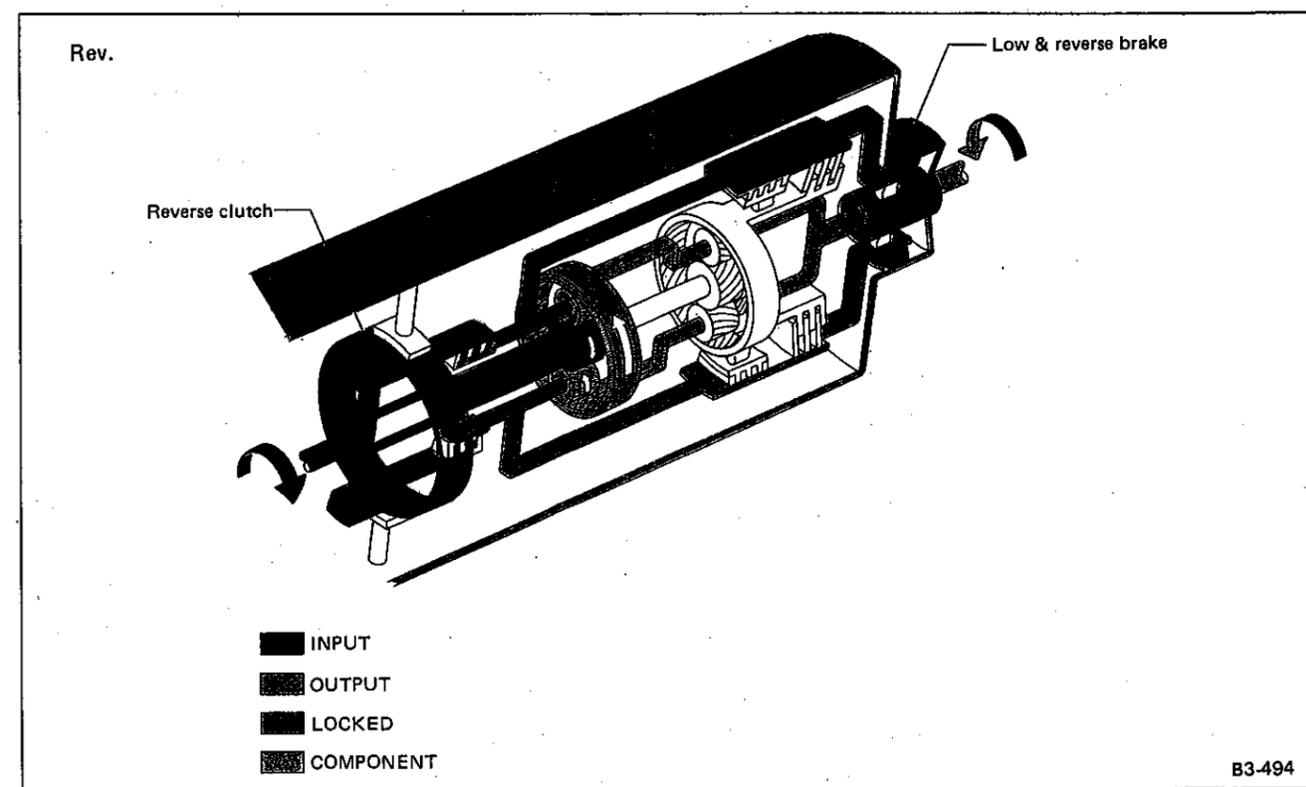
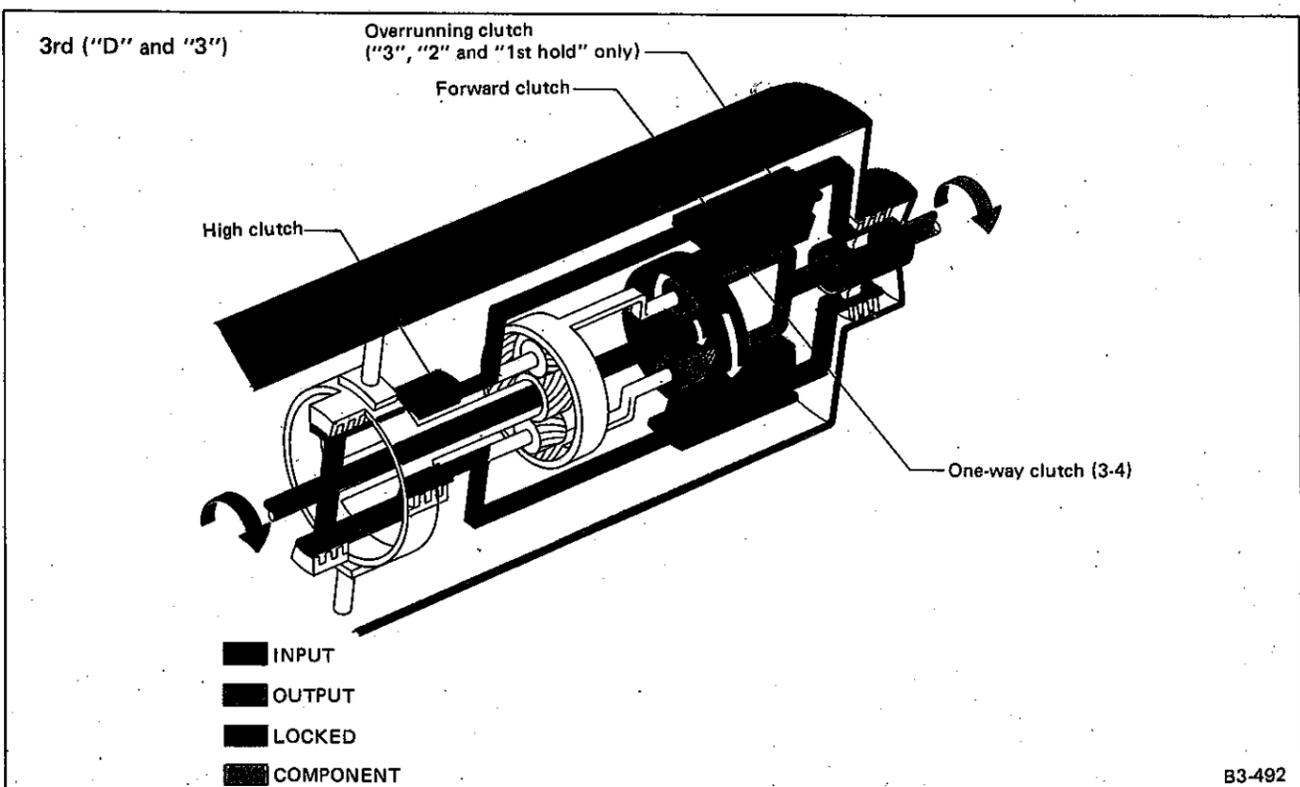
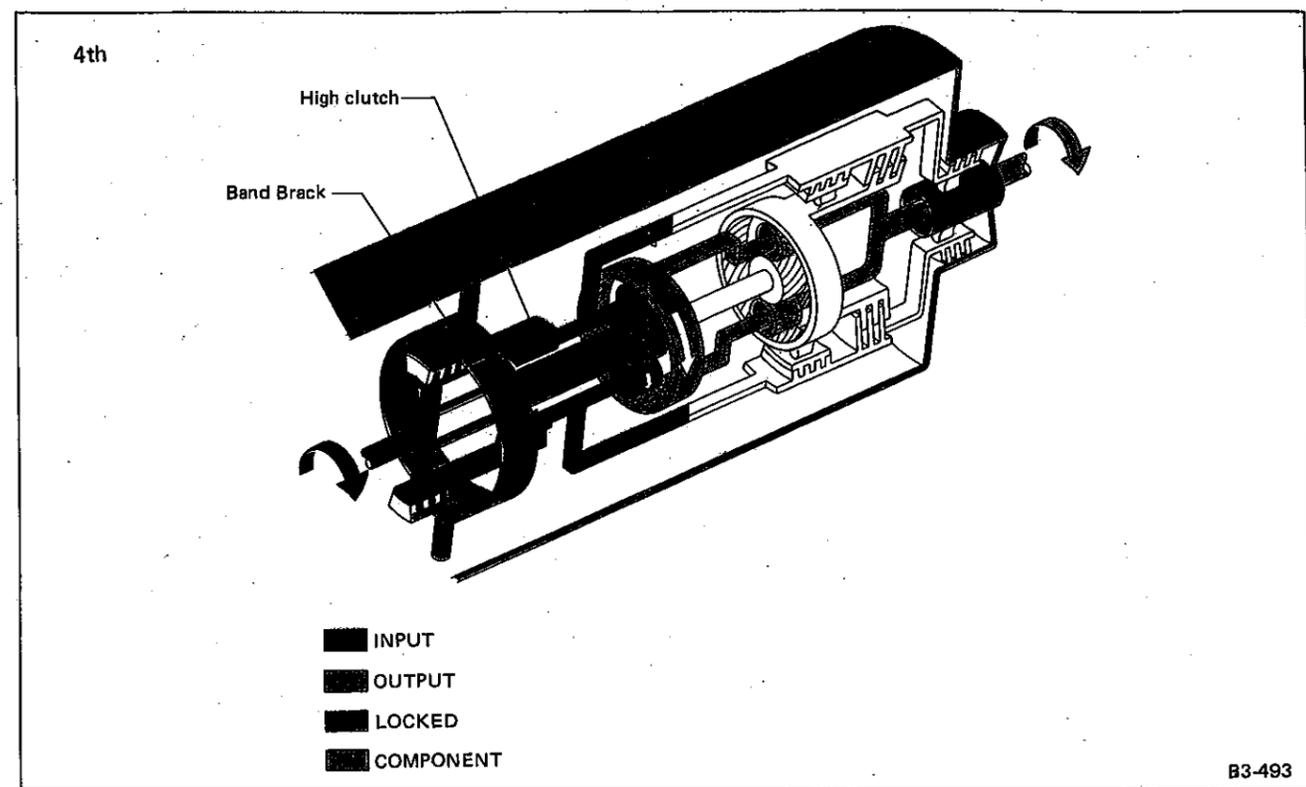
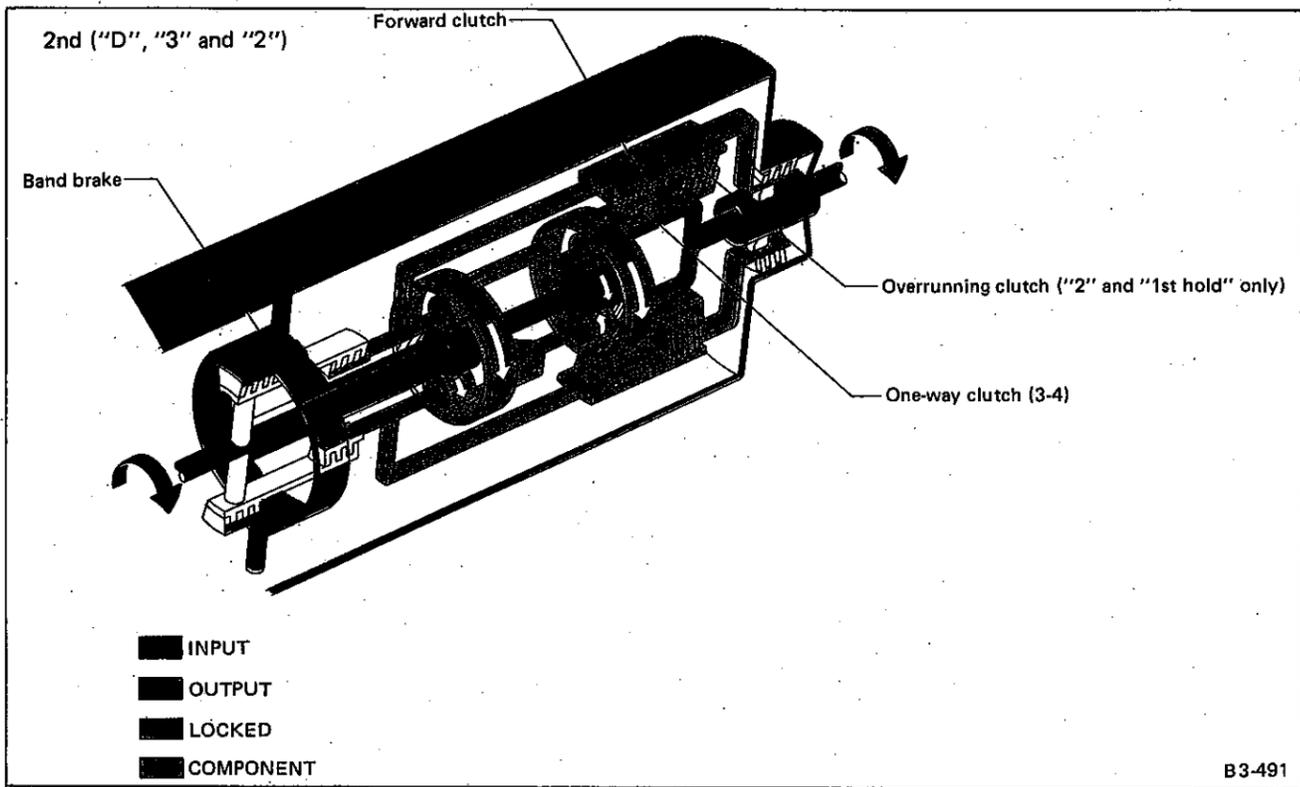
- Abbr.  
 FS : Front sun gear  
 RS : Rear sun gear  
 FC : Front planetary carrier  
 RC : Rear planetary carrier  
 FI : Front internal gear  
 RI : Rear internal gear

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Fig. 41

**B: SCHEMATIC DRAWING**



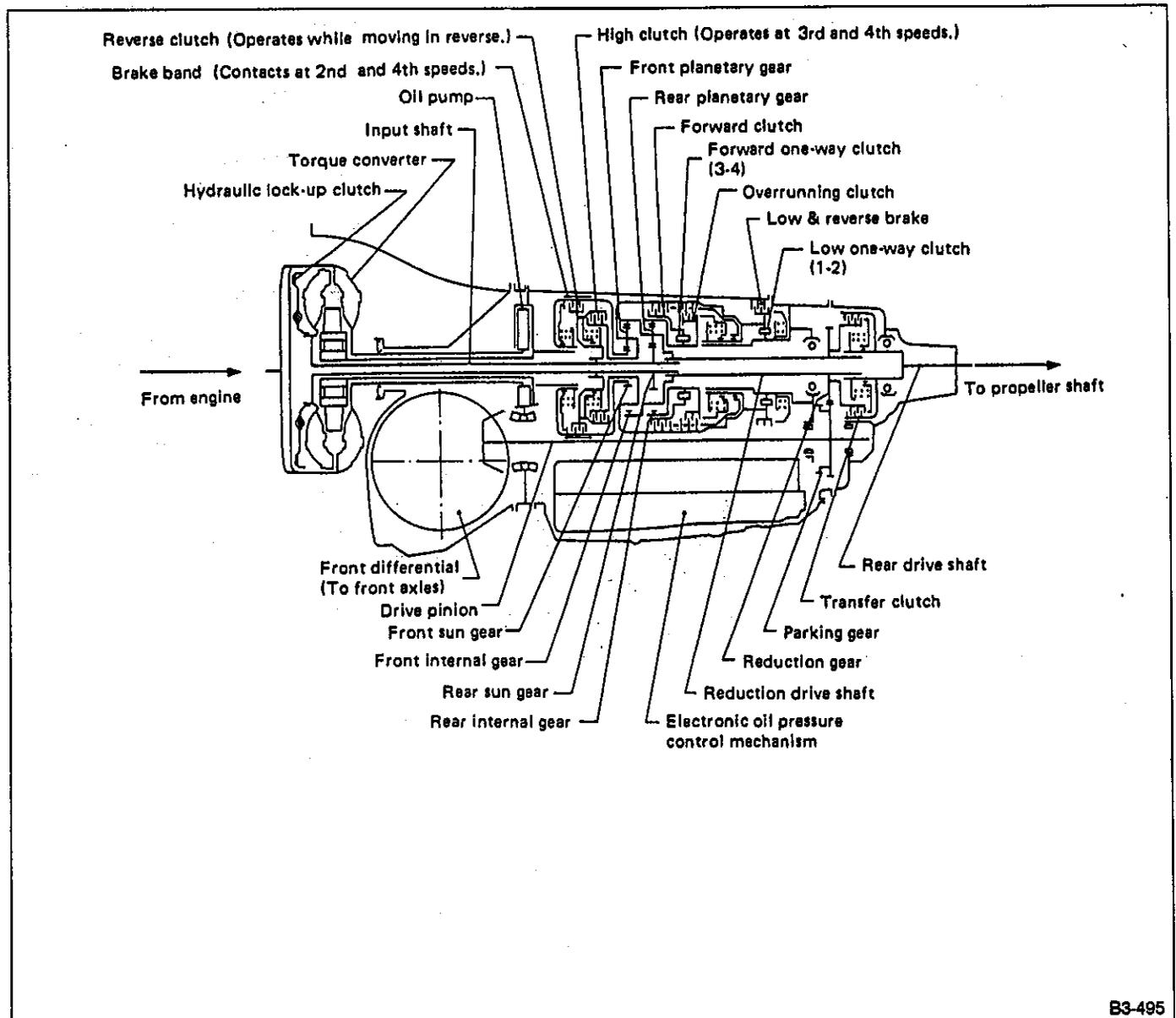


## 20. Power Train

### A: OPERATION

#### 1. GENERAL

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.



B3-495

Fig. 50

#### 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, 3 OR 2 RANGE (D<sub>1</sub>, 3<sub>1</sub>, 2<sub>1</sub>)

- 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.

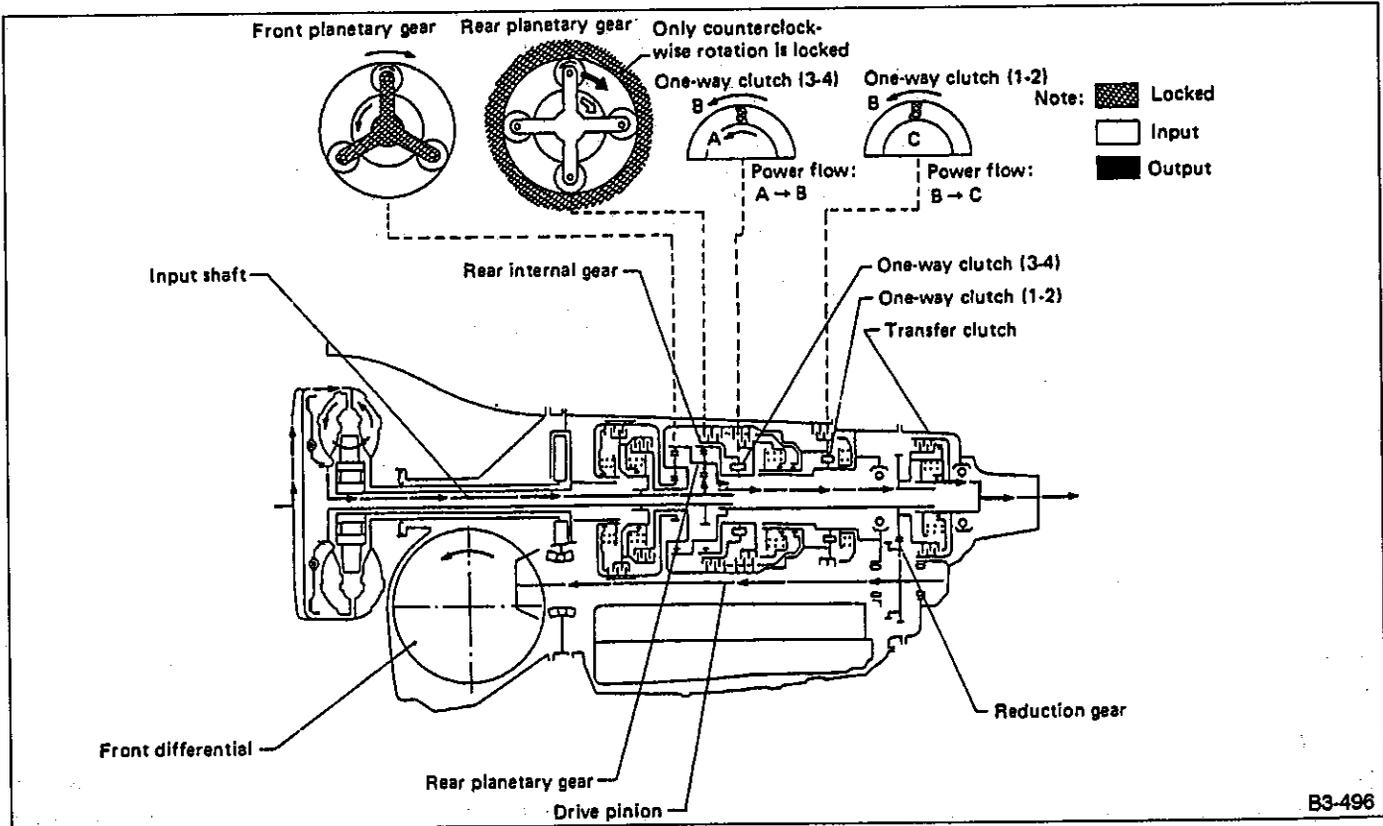
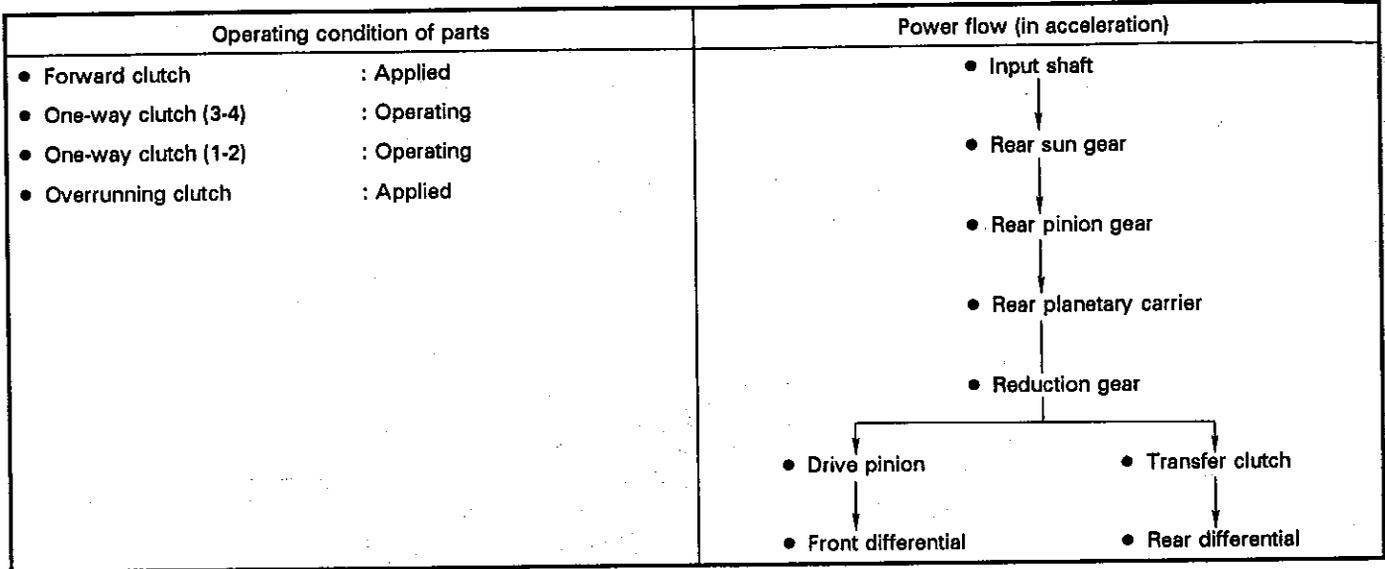


Fig. 51

B3-496

4. SECOND SPEED OF D, 3 OR 2 RANGE (D<sub>2</sub>, 3<sub>2</sub>, 2<sub>2</sub>)

- 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 con-

nected 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 at "2" range, 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.

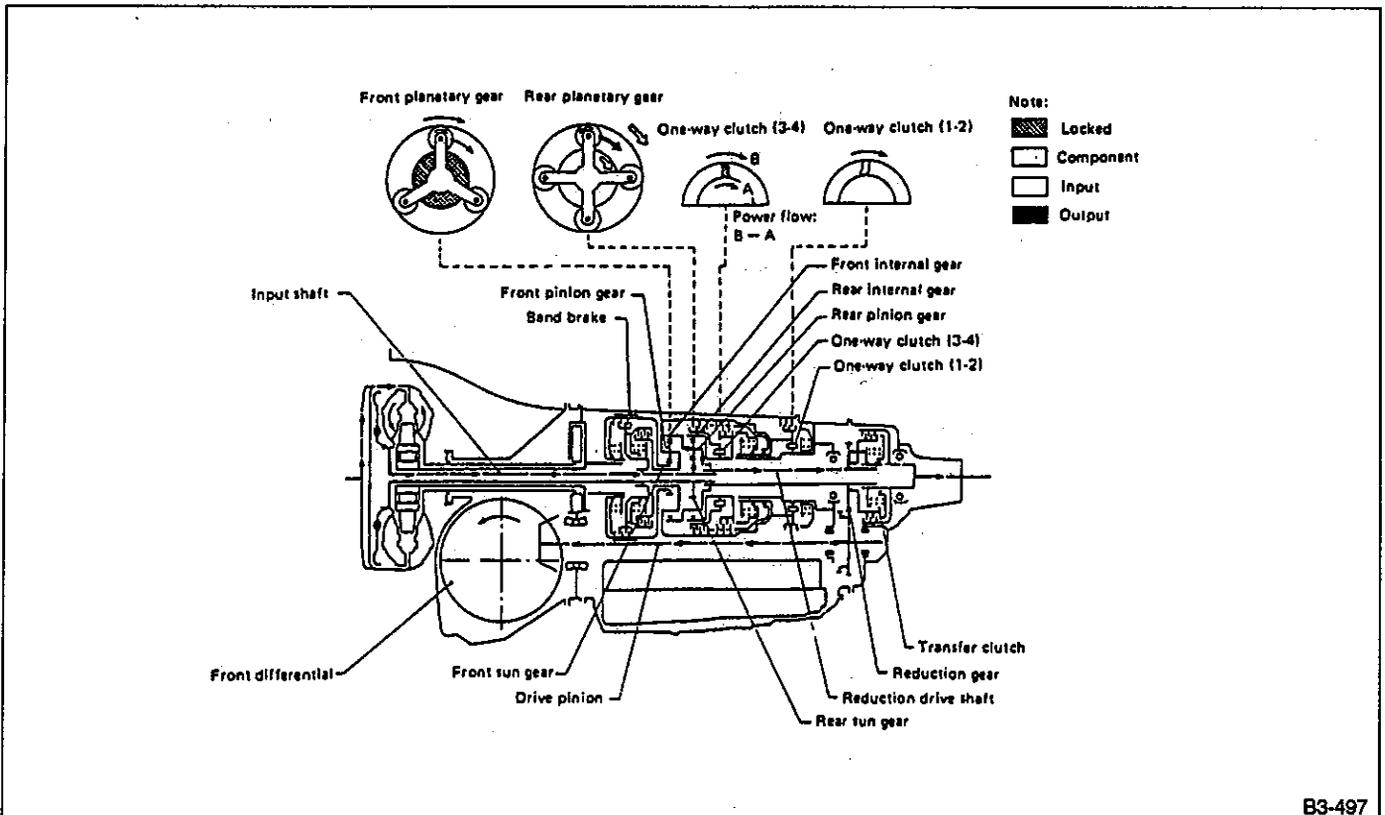
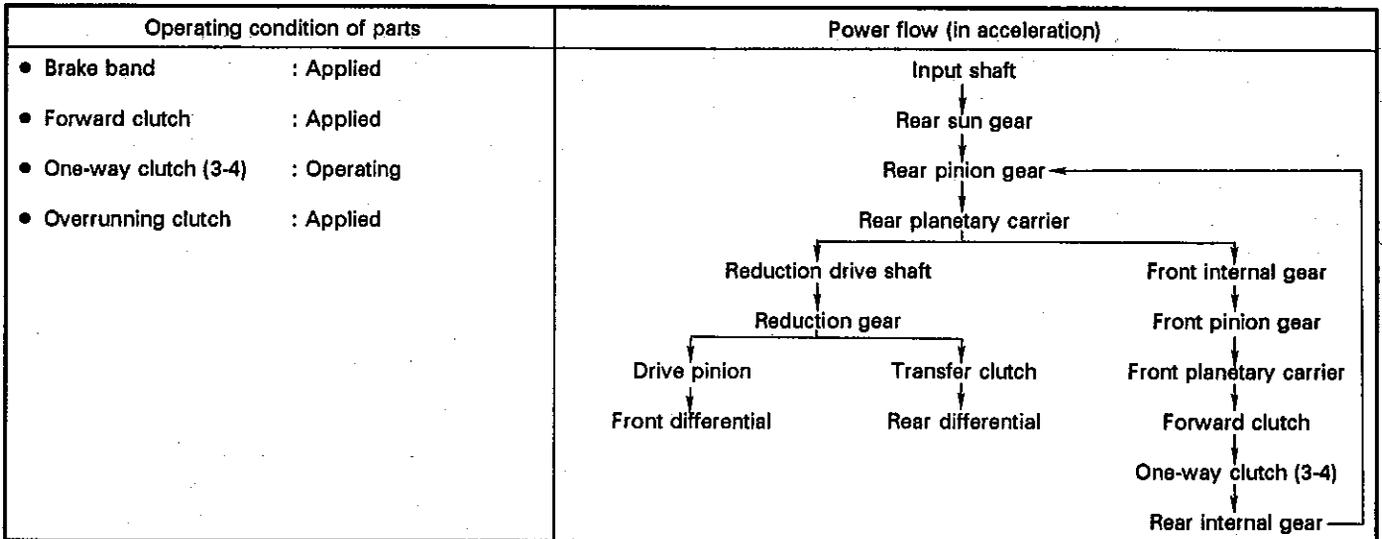


Fig. 52

B3-497

5. THIRD SPEED OF D OR 3 RANGE (D<sub>3</sub>, 3<sub>3</sub>)

- 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 at "D", 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 at "3", "2" or "1st hold" range, 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.

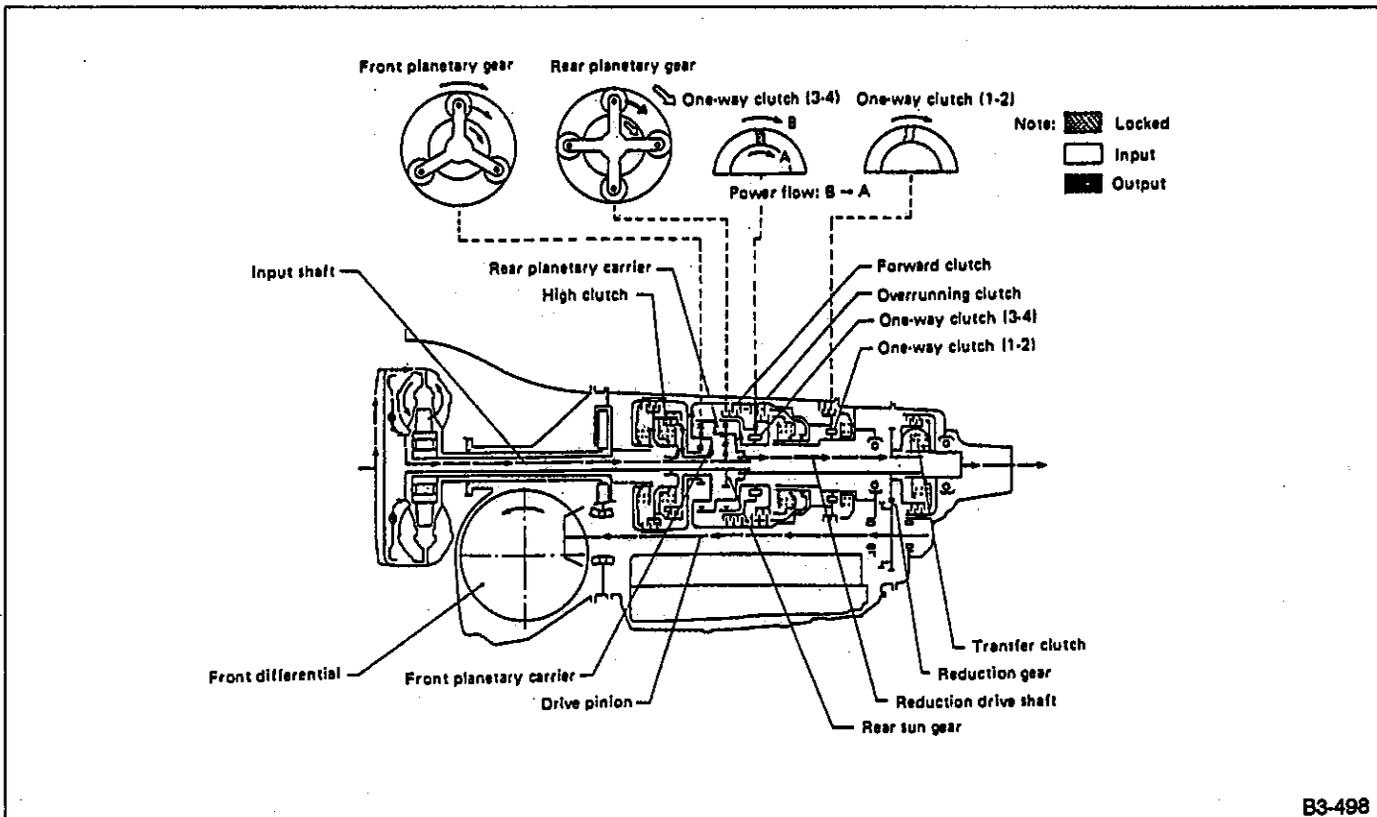
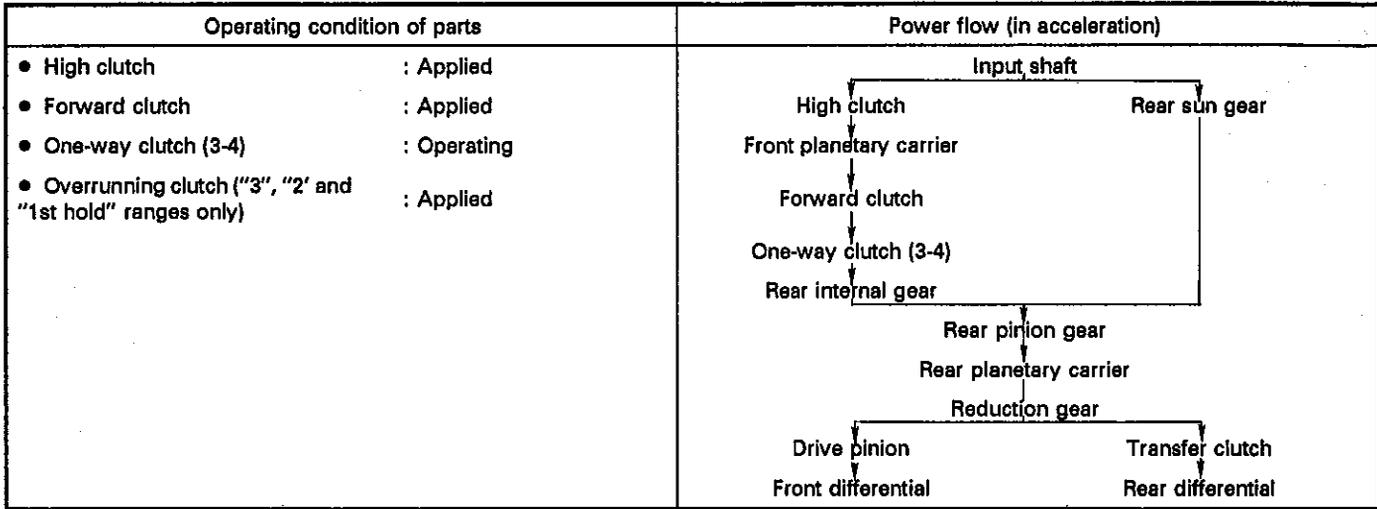


Fig. 53

B3-498

**6. FOURTH SPEED OF D RANGE (D<sub>4</sub>)**

- 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.

Operating condition of parts	Power flow (in acceleration)
<ul style="list-style-type: none"> <li>• High clutch : Applied</li> <li>• Brake band : Contracted</li> <li>• Forward clutch (Takes no part in power transmission.) : Applied</li> </ul>	<ul style="list-style-type: none"> <li>• Input shaft</li> <li>• High clutch</li> <li>• Front planetary carrier</li> <li>• Front pinion gear</li> <li>• Front internal gear</li> <li>• Rear planetary carrier</li> <li>• Reduction drive shaft</li> <li>• Reduction gear</li> </ul>
	<ul style="list-style-type: none"> <li>• Drive pinion</li> <li>• Front differential</li> <li>• Transfer clutch</li> <li>• Rear differential</li> </ul>

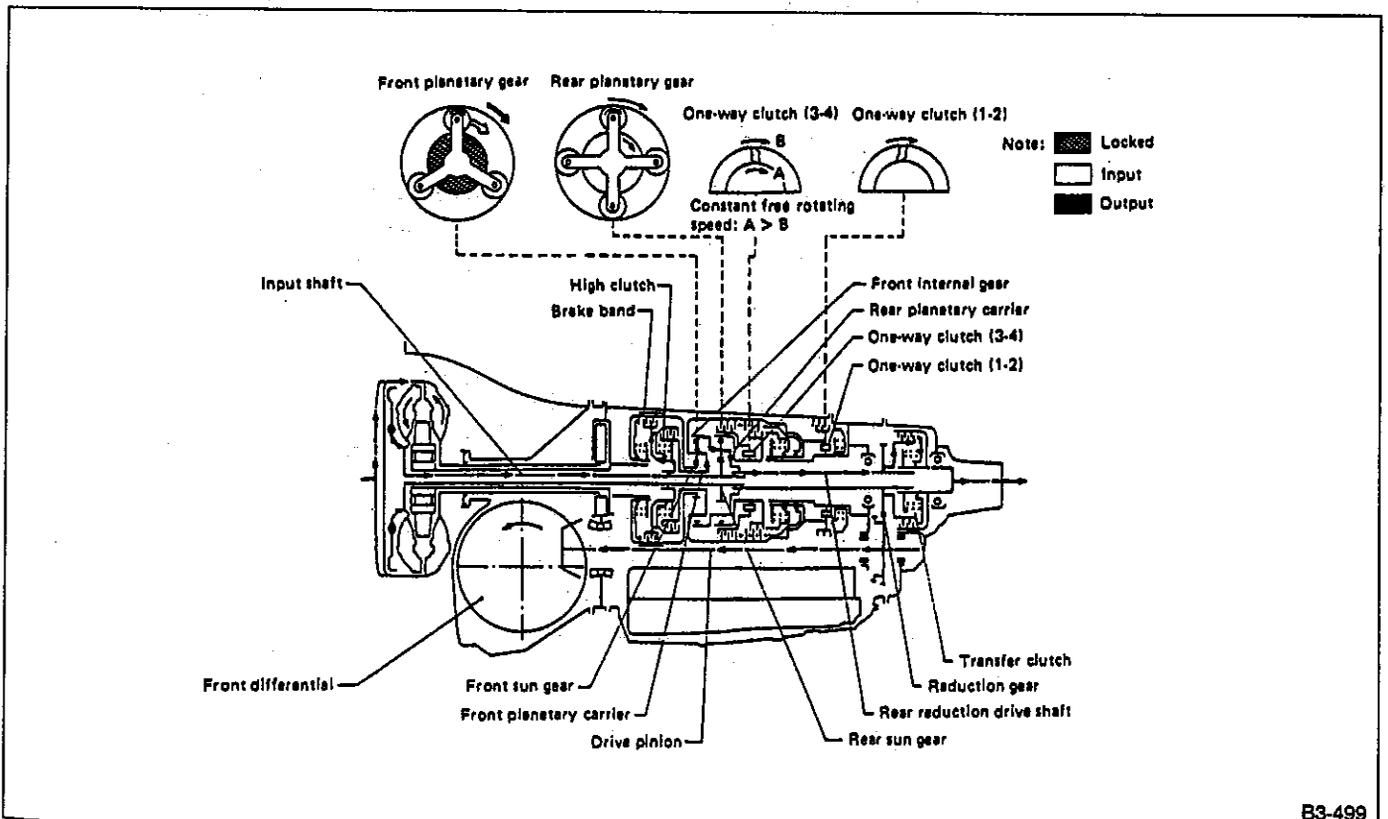


Fig. 54

B3-499

**7. FIRST SPEED OF 1 RANGE**

- 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.

- The low & reverse brake operates in place of the one-way clutch (1-2) and locks the rear internal gear.
- In coasting and deceleration, low & reverse brake and overrunning clutch are operating, so that reverse power is transmitted to the engine and engine braking action is provided.

Operating condition of parts	Power flow (in acceleration)
<ul style="list-style-type: none"> <li>• Forward clutch : Applied</li> <li>• One-way clutch (3-4) : Applied (in acceleration)</li> <li>• Overrunning clutch : Applied</li> <li>• Low &amp; reverse brake : Operating</li> </ul>	<ul style="list-style-type: none"> <li>• Input shaft</li> <li>• Rear sun gear</li> <li>• Rear pinion gear</li> <li>• Rear planetary carrier</li> <li>• Reduction gear</li> </ul> <div style="display: flex; justify-content: space-around;"> <ul style="list-style-type: none"> <li>• Drive pinion</li> <li>• Front differential</li> </ul> <ul style="list-style-type: none"> <li>• Transfer clutch</li> <li>• Rear differential</li> </ul> </div>

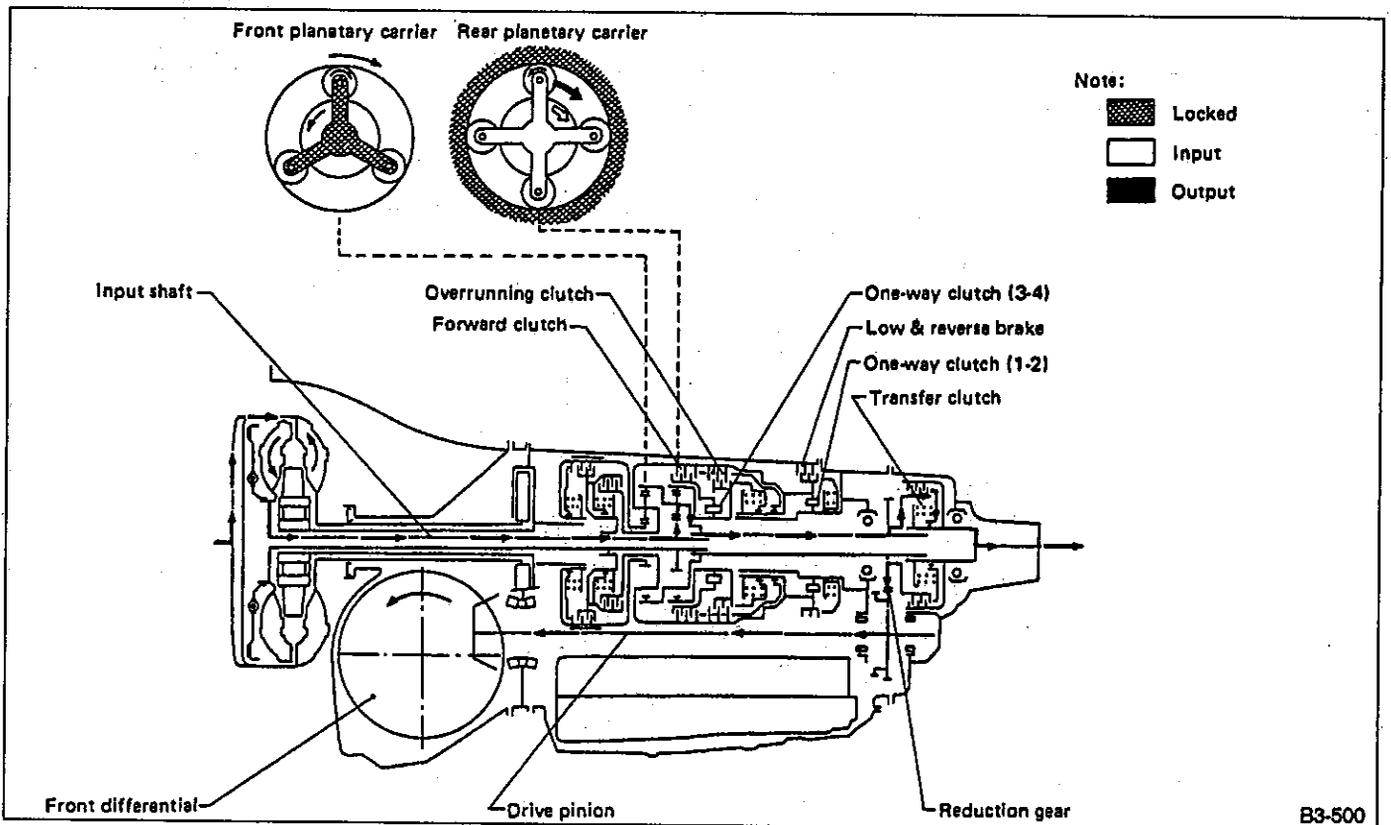


Fig. 55

**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.

Operating condition of parts	Power flow
<ul style="list-style-type: none"> <li>● Reverse clutch : Applied</li> <li>● Low &amp; reverse brake : Operating</li> </ul>	<ul style="list-style-type: none"> <li>● Input shaft</li> <li>● Reverse clutch</li> <li>● Front sun gear</li> <li>● Front pinion gear</li> <li>● Front internal gear</li> <li>● Reduction drive shaft</li> <li>● Reduction gear</li> <li>● Drive pinion</li> <li>● Transfer clutch</li> <li>● Front differential</li> <li>● Rear differential</li> </ul>

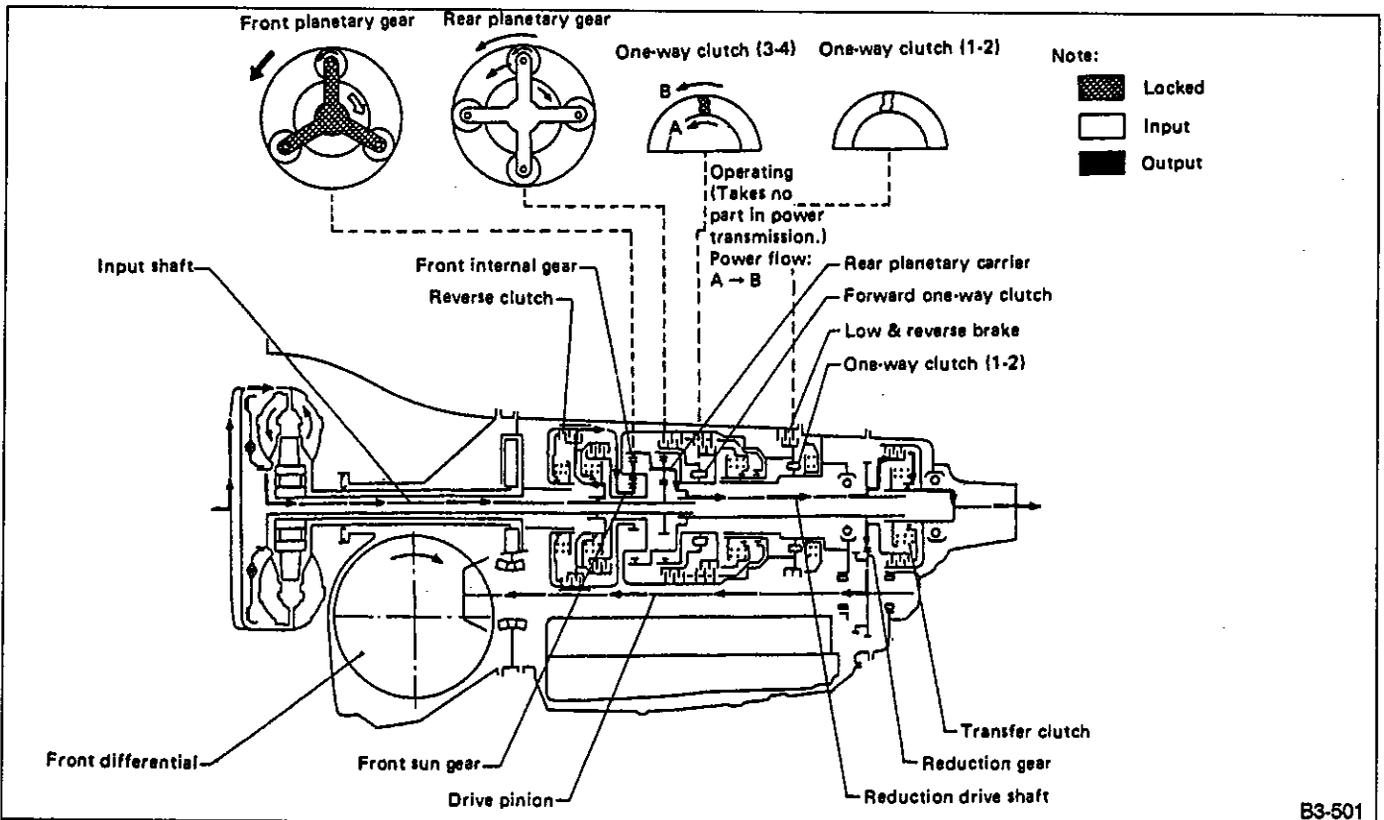
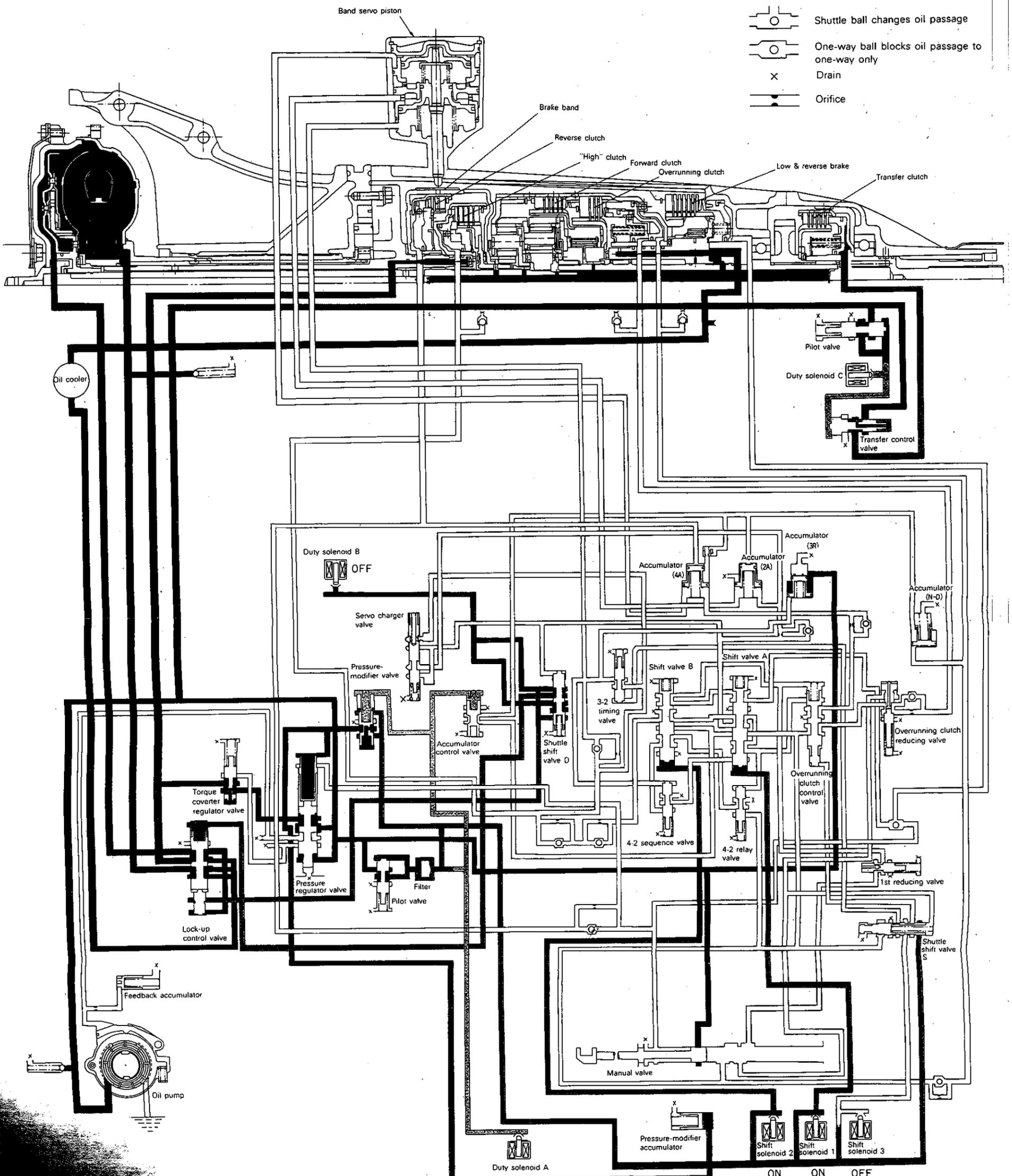


Fig. 56

B3-501

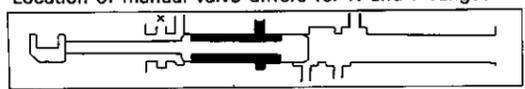
**B: SCHEMATIC DRAWING**

**1. N RANGE AND P RANGE**



-  Shuttle ball changes oil passage
-  One-way ball blocks oil passage to one-way only
-  Drain
-  Orifice

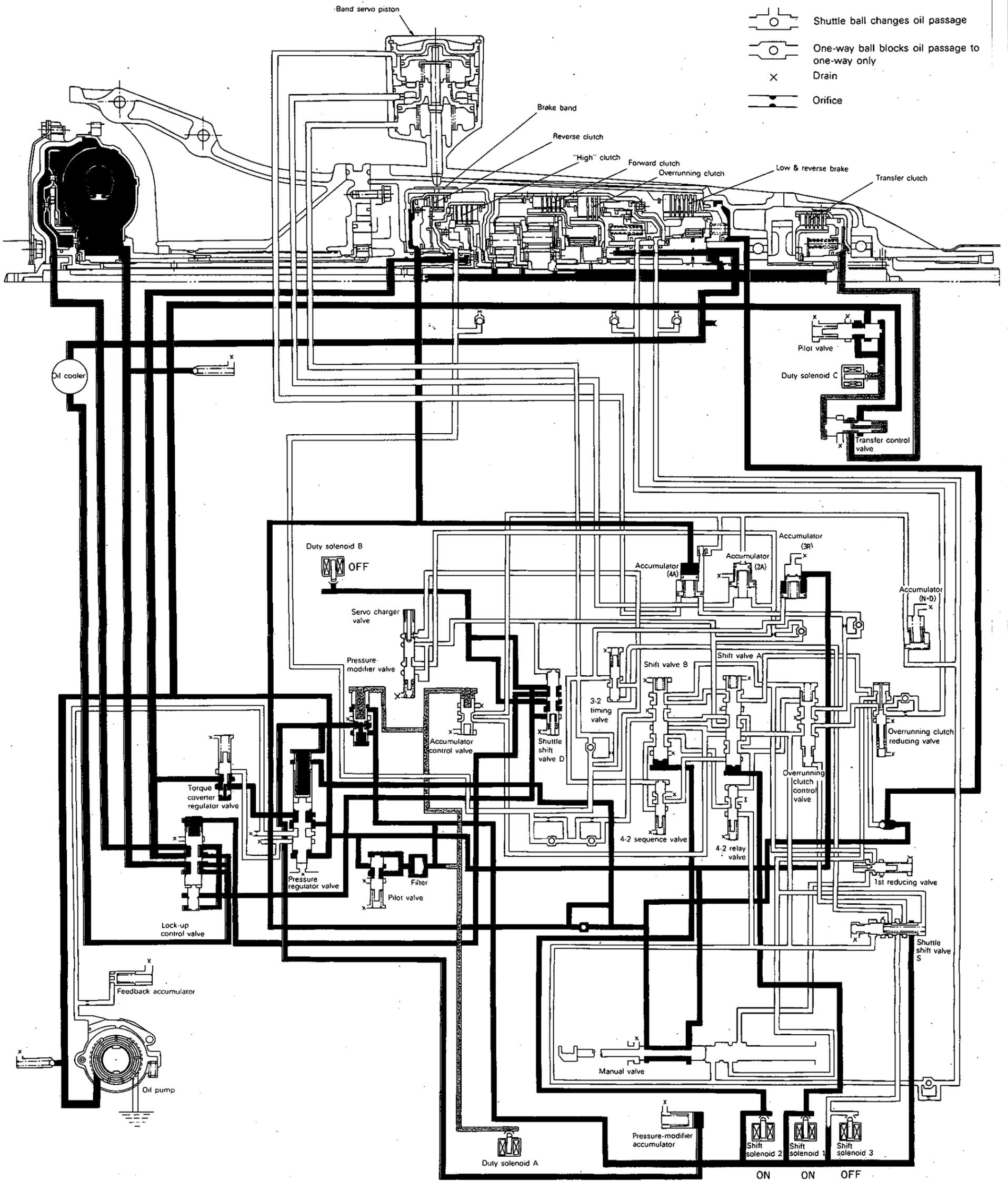
Location of manual valve differs for N and P ranges.



-  Overrunning clutch pressure
-  "1" reducing pressure
-  Transfer clutch pressure
-  Torque converter pressure
-  Cooler pressure
-  Lubricant pressure

ON ON OFF

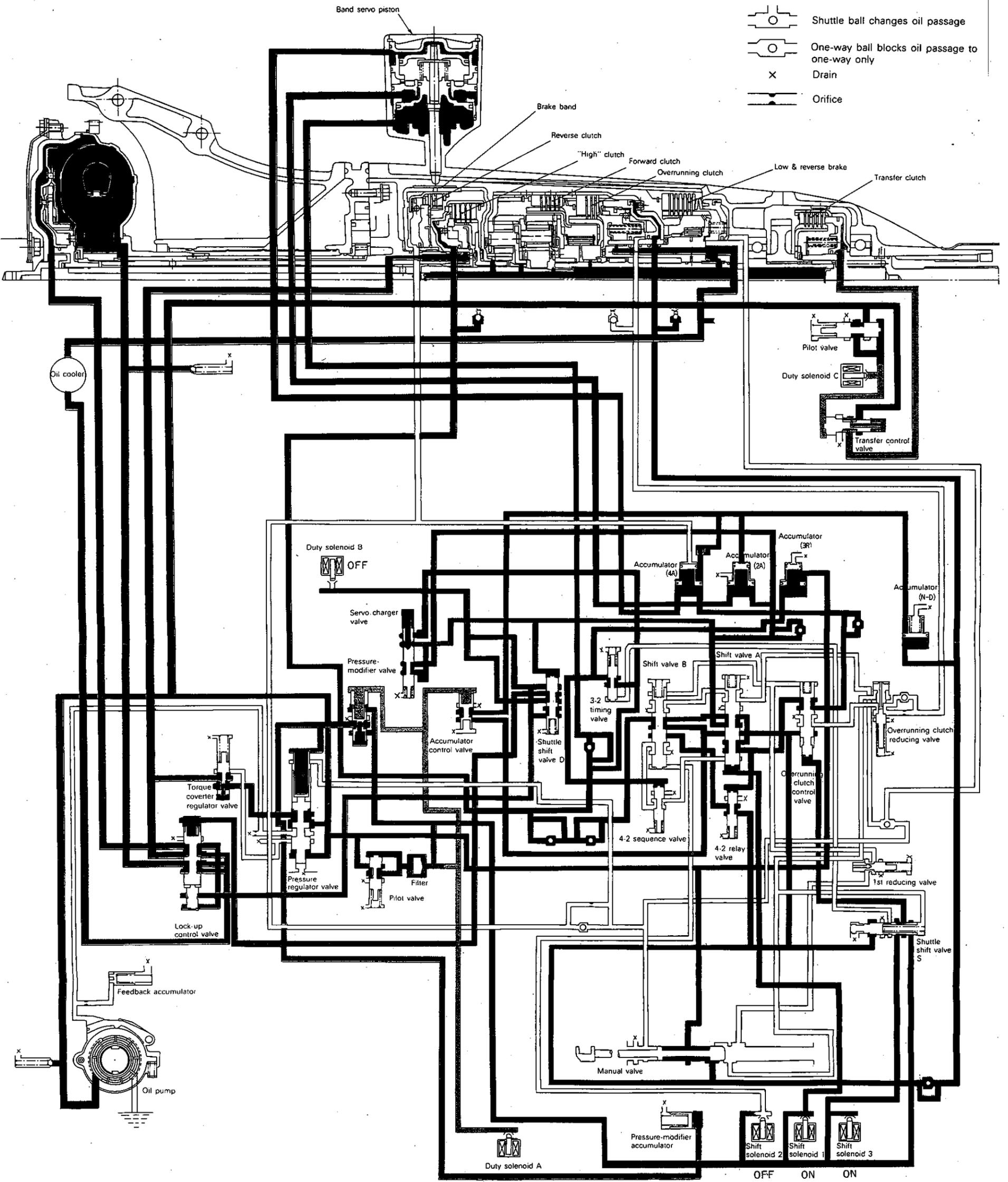
## 2. R RANGE



- Line pressure
- Pressure-modifier pressure
- Pilot pressure
- Duty-A pressure
- Duty-C pressure
- Oil pump control pressure
- Accumulator control pressure

- Overrunning clutch pressure
- "1" reducing pressure
- Transfer clutch pressure
- Torque converter pressure
- Cooler pressure
- Lubricant pressure

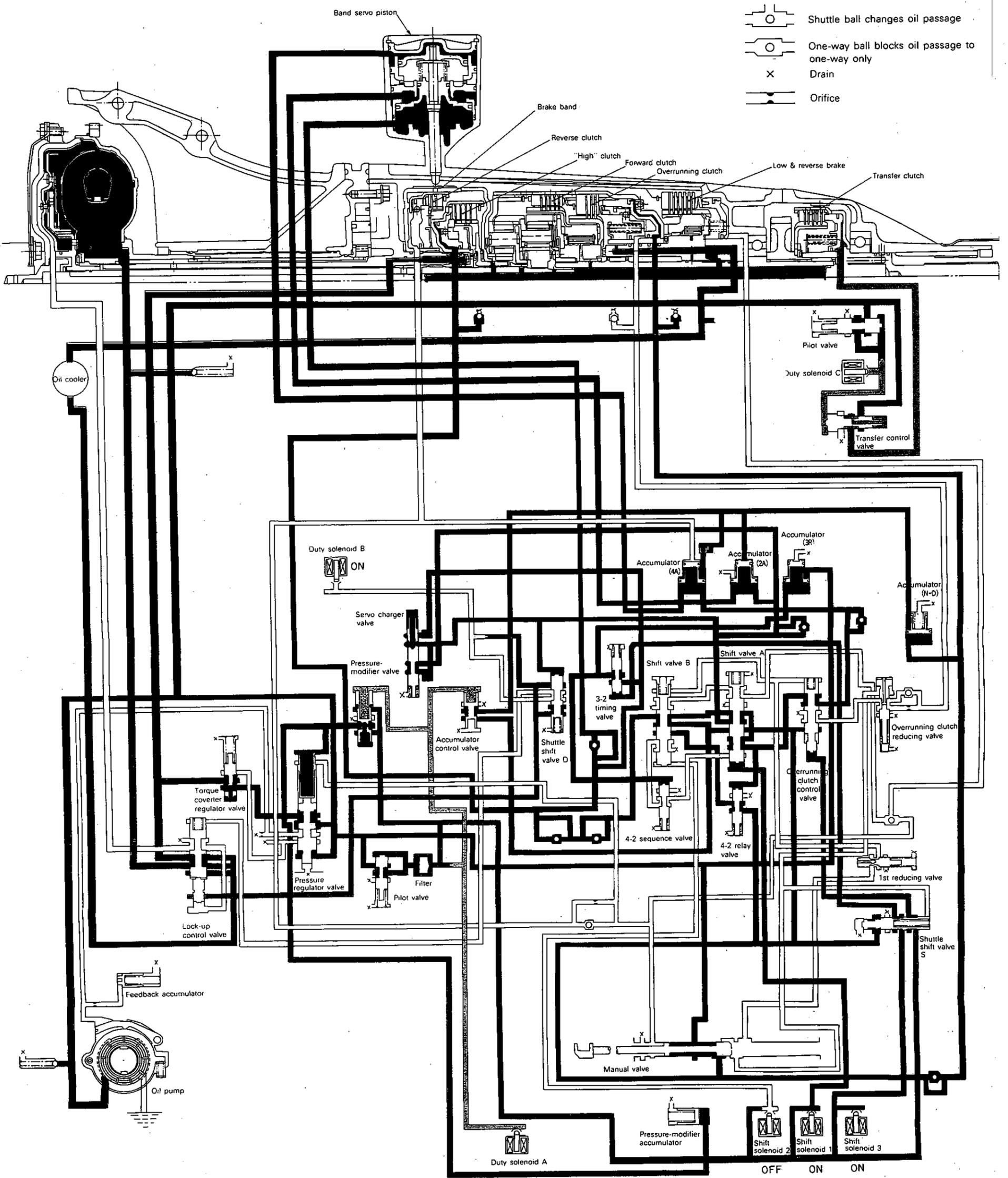
### 3. FOURTH SPEED OF D RANGE



- Line pressure
- Pressure-modifier pressure
- Pilot pressure
- Duty-A pressure
- Duty-C pressure
- Oil pump control pressure
- Accumulator control pressure
- Overrunning clutch pressure
- "1" reducing pressure
- Transfer clutch pressure
- Torque converter pressure
- Cooler pressure
- Lubricant pressure

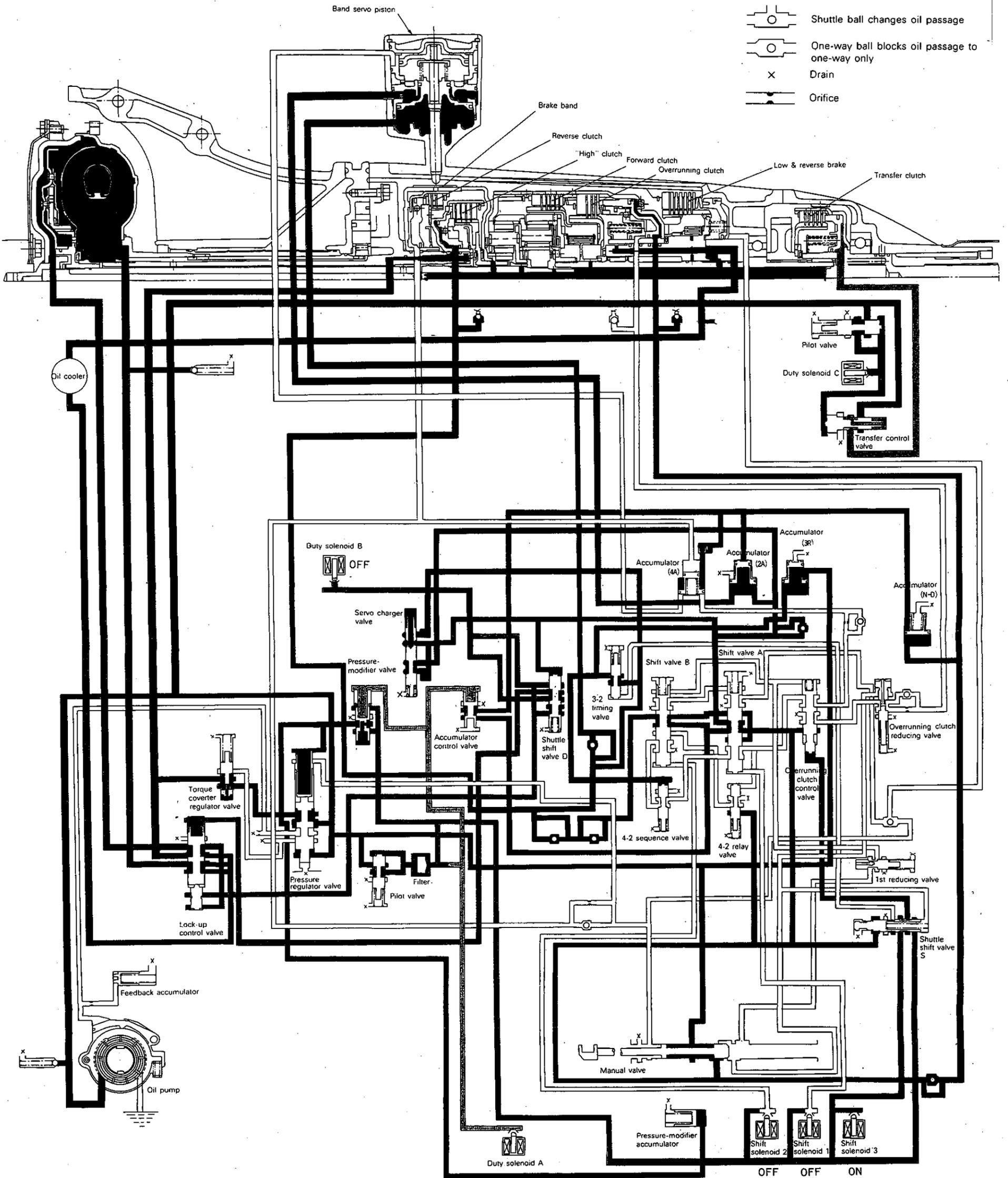
OFF ON ON

#### 4. FOURTH SPEED OF D RANGE (LOCK-UP)



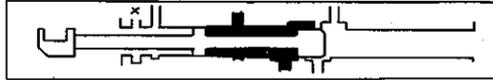
- |                              |                             |
|------------------------------|-----------------------------|
| Line pressure                | Overrunning clutch pressure |
| Pressure-modifier pressure   | "1" reducing pressure       |
| Pilot pressure               | Transfer clutch pressure    |
| Duty-A pressure              | Torque converter pressure   |
| Duty-C pressure              | Cooler pressure             |
| Oil pump control pressure    | Lubricant pressure          |
| Accumulator control pressure |                             |

# 5. THIRD SPEED OF D OR 3 RANGE

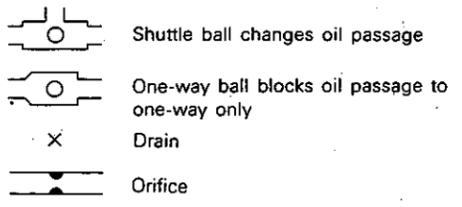
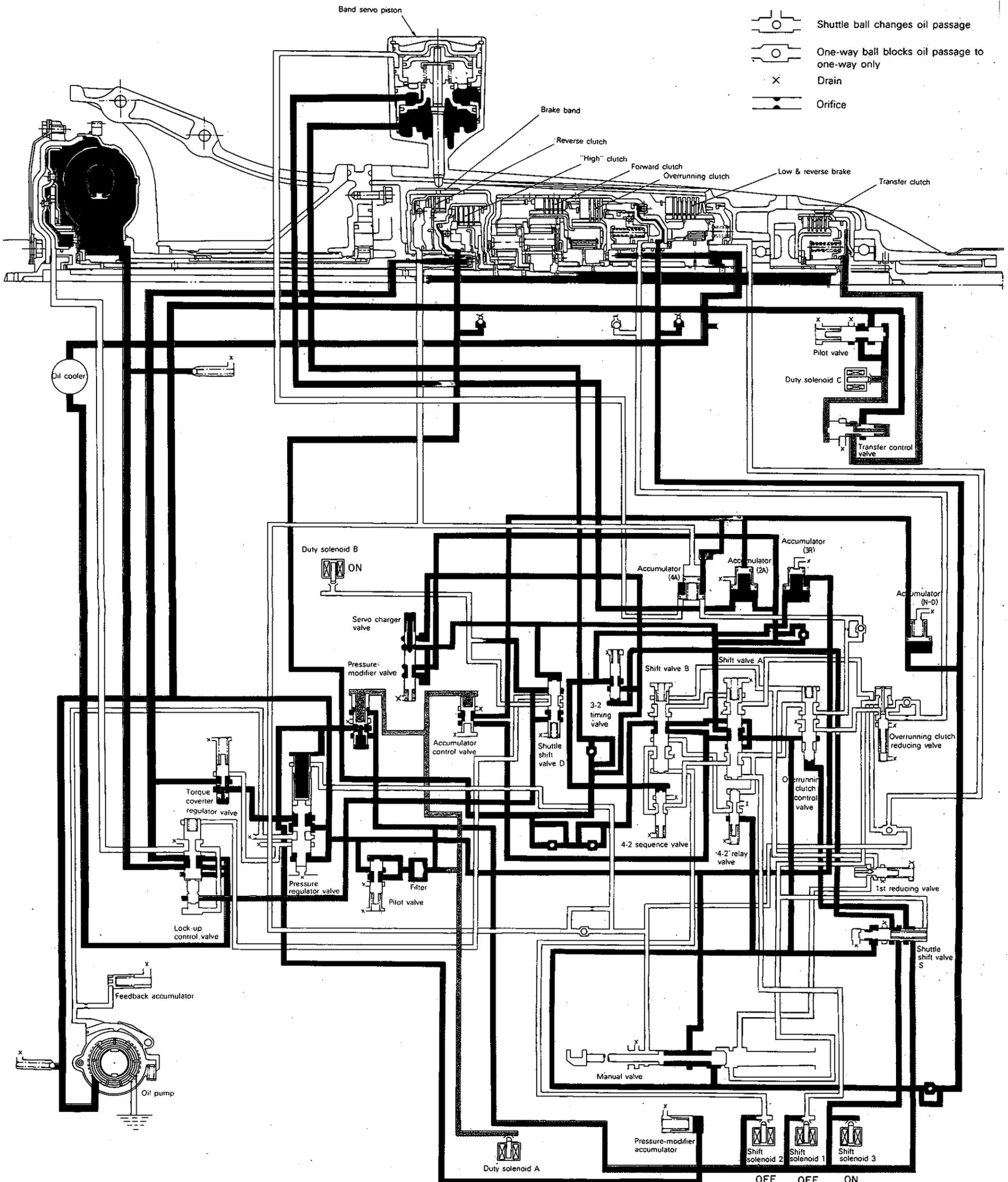


- Line pressure
- Pressure-modifier pressure
- Pilot pressure
- Duty-A pressure
- Duty-C pressure
- Oil pump control pressure
- Accumulator control pressure
- Overrunning clutch pressure
- "1" reducing pressure
- Transfer clutch pressure
- Torque converter pressure
- Cooler pressure
- Lubricant pressure

Location of manual valve differs for 3 and D ranges.



# 6. THIRD SPEED OF D OR 3 RANGE (LOCK-UP)

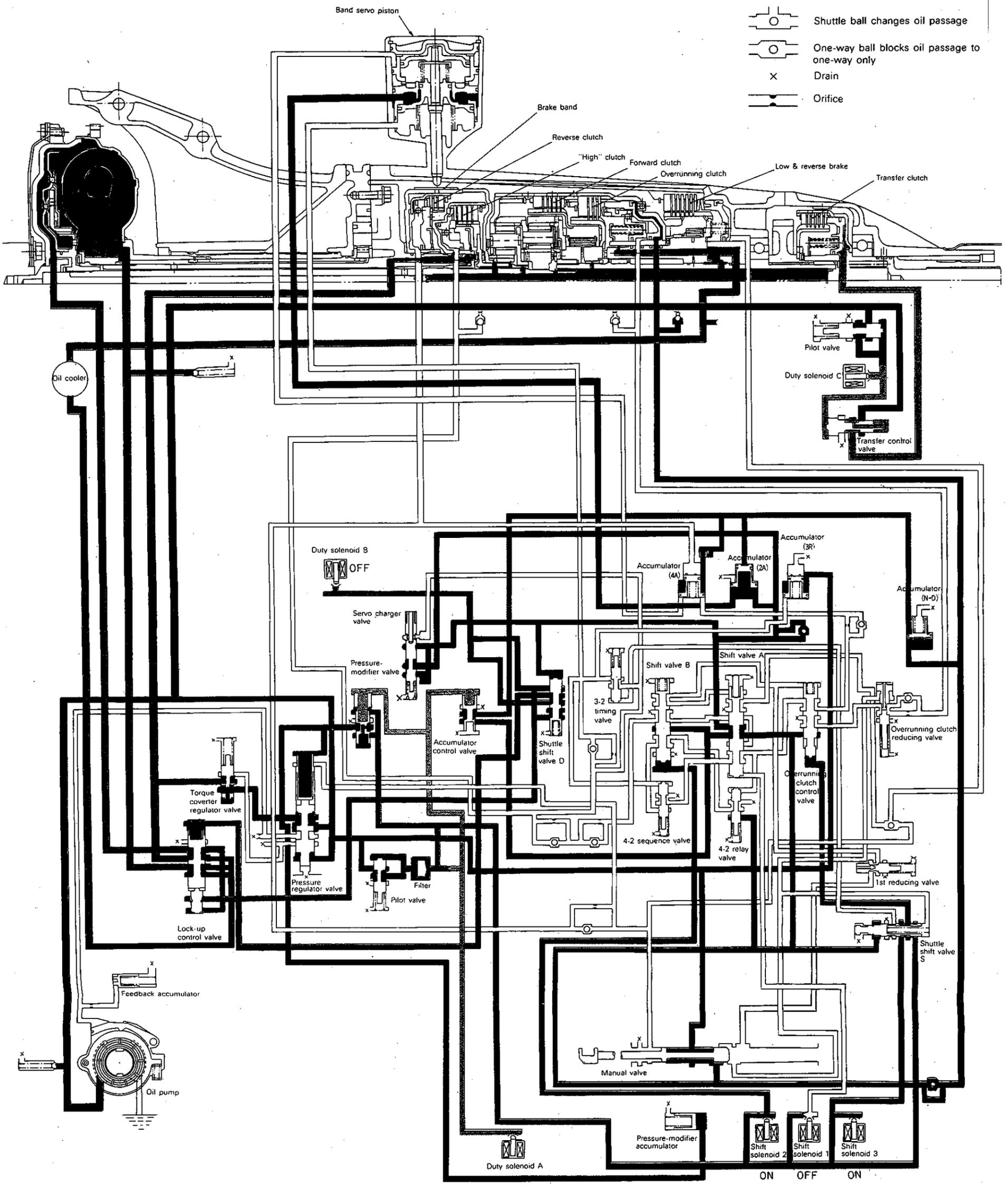


- Line pressure
- Pressure-modifier pressure
- Pilot pressure
- Duty-A pressure
- Duty-C pressure
- Oil pump control pressure
- Accumulator control pressure
- Overrunning clutch pressure
- "1" reducing pressure
- Transfer clutch pressure
- Torque converter pressure
- Cooler pressure
- Lubricant pressure

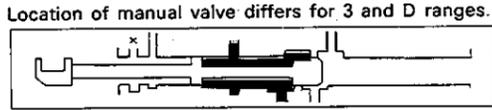
Location of manual valve differs for 3 and D ranges.



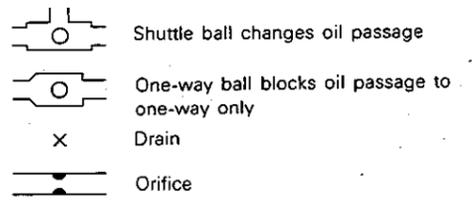
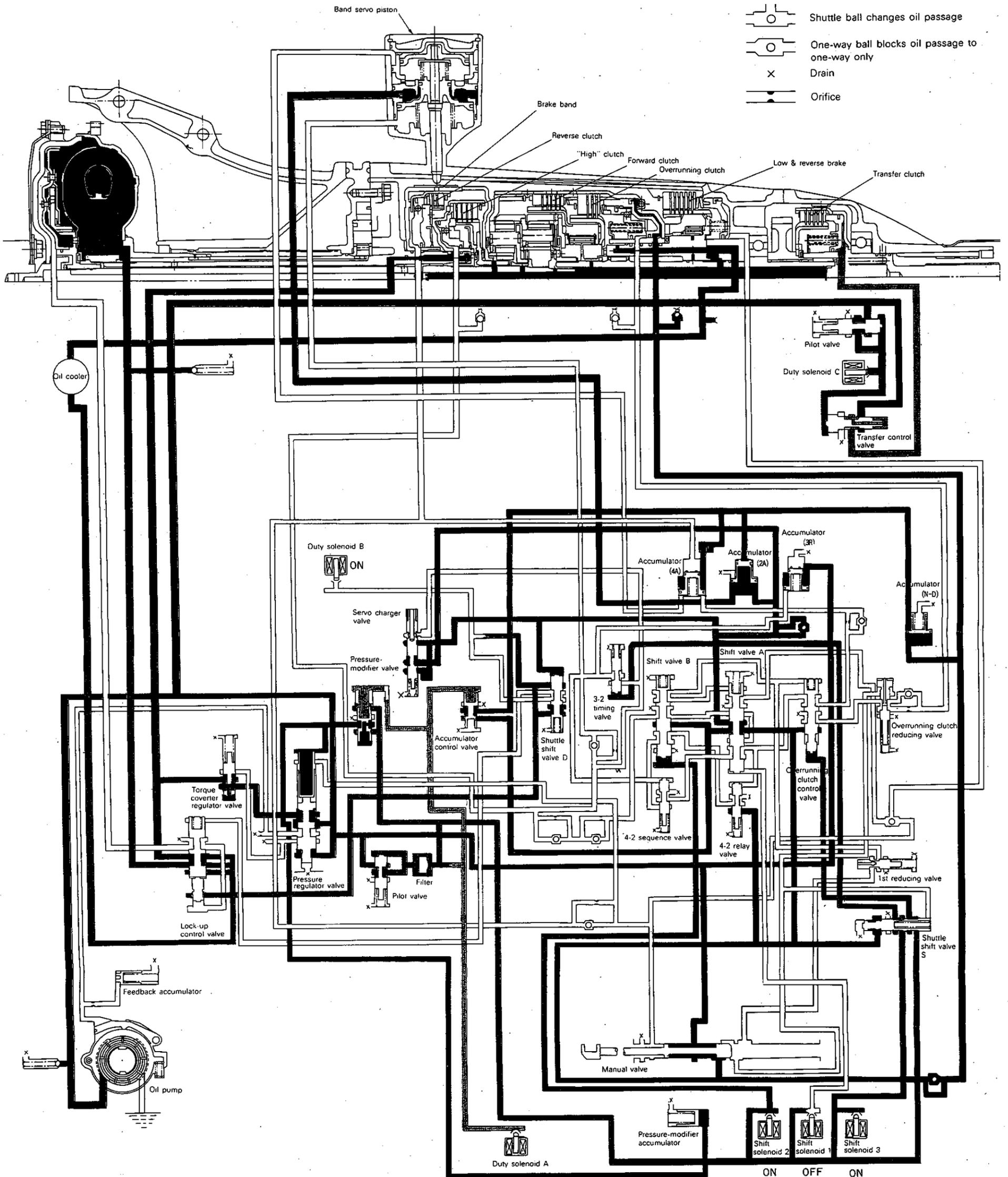
# 7. SECOND SPEED OF D OR 3 RANGE



- Line pressure
- Pressure-modifier pressure
- Pilot pressure
- Duty-A pressure
- Duty-C pressure
- Oil pump control pressure
- Accumulator control pressure
- Overrunning clutch pressure
- "1" reducing pressure
- Transfer clutch pressure
- Torque converter pressure
- Cooler pressure
- Lubricant pressure



# 8. SECOND SPEED OF D OR 3 RANGE (LOCK-UP)



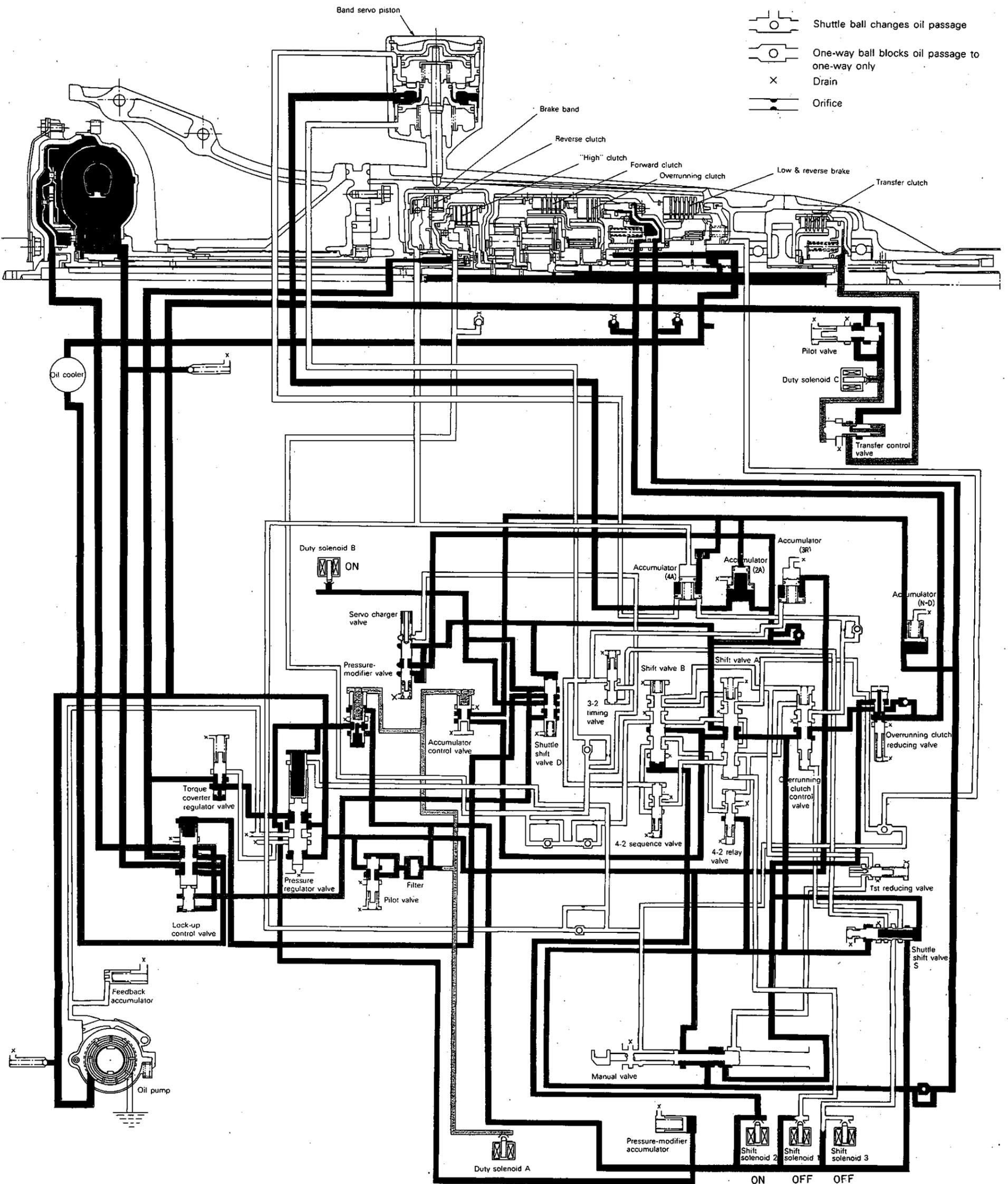
- Line pressure
- Pressure-modifier pressure
- Pilot pressure
- Duty-A pressure
- Duty-C pressure
- Oil pump control pressure
- Accumulator control pressure
- Overrunning clutch pressure
- "1" reducing pressure
- Transfer clutch pressure
- Torque converter pressure
- Cooler pressure
- Lubricant pressure

Location of manual valve differs for 3 and D ranges.



ON OFF ON

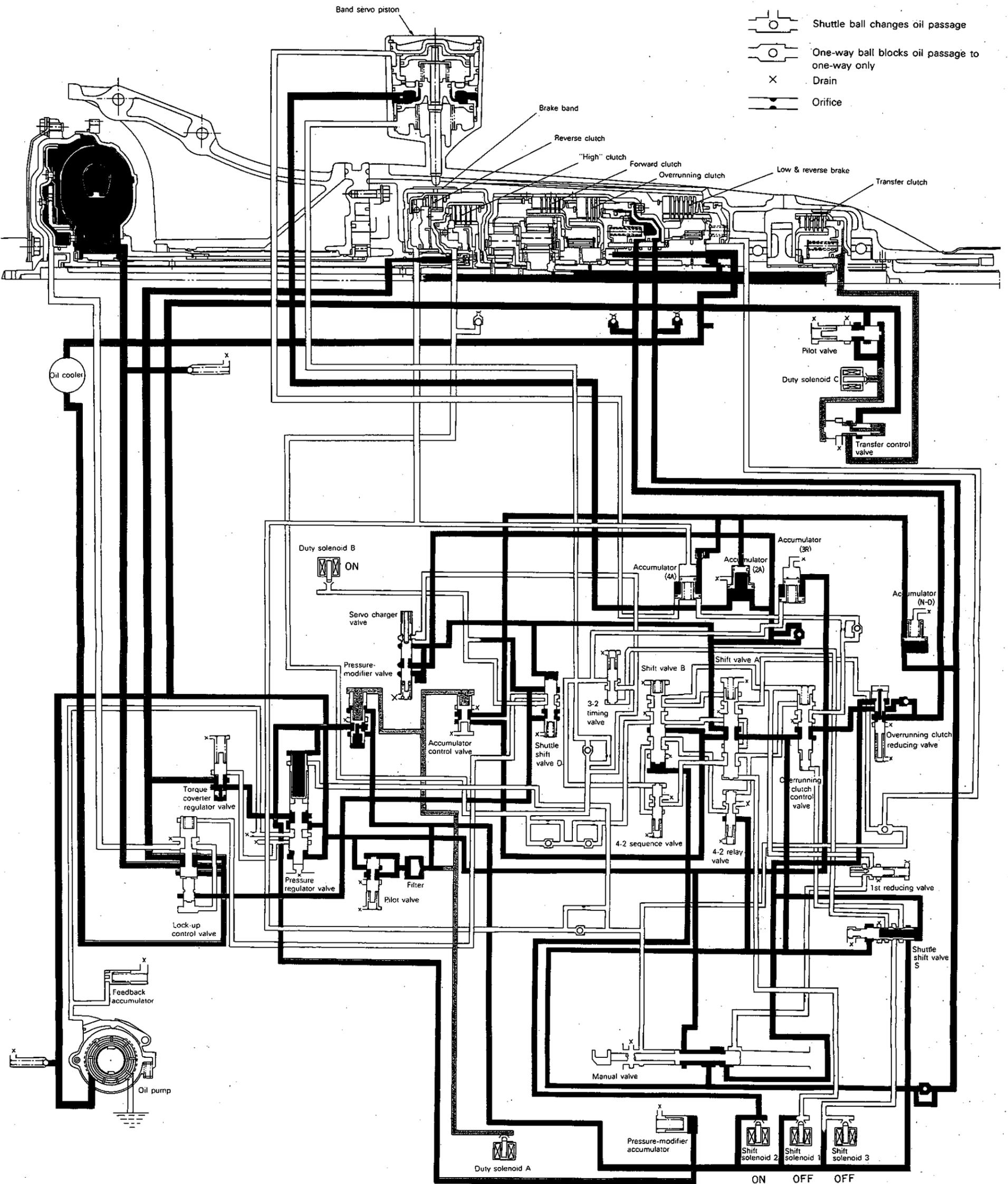
9. SECOND SPEED OF 2 RANGE.



- Line pressure
- Pressure-modifier pressure
- Pilot pressure
- Duty-A pressure
- Duty-C pressure
- Oil pump control pressure
- Accumulator control pressure

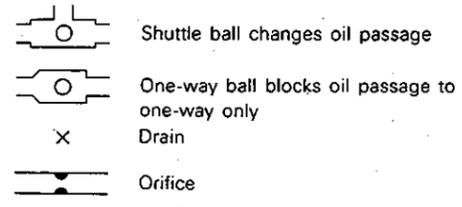
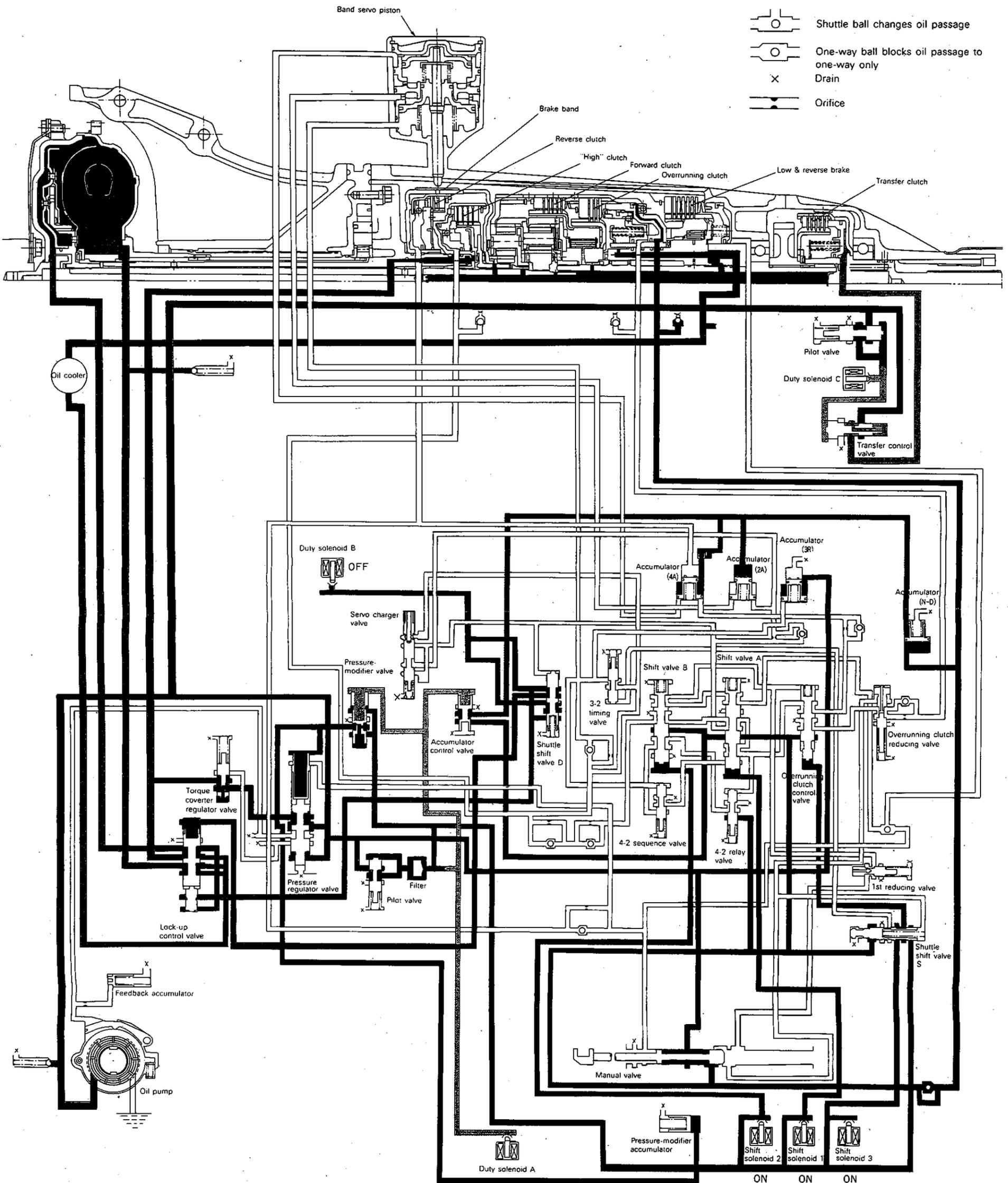
- Overrunning clutch pressure
- "1" reducing pressure
- Transfer clutch pressure
- Torque converter pressure
- Cooler pressure
- Lubricant pressure

# 10. SECOND SPEED OF 2 RANGE (LOCK-UP)



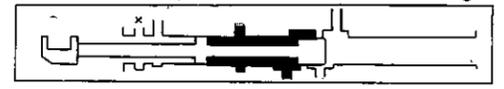
- Line pressure
- Pressure-modifier pressure
- Pilot pressure
- Duty-A pressure
- Duty-C pressure
- Oil-pump control pressure
- Accumulator control pressure
- Overrunning clutch pressure
- "1" reducing pressure
- Transfer clutch pressure
- Torque converter pressure
- Cooler pressure
- Lubricant pressure

# 11. FIRST SPEED OF D OR 3 RANGE

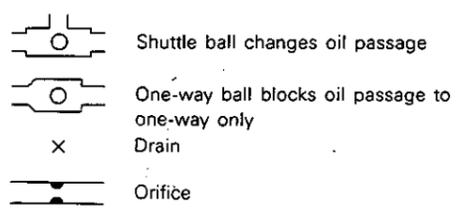
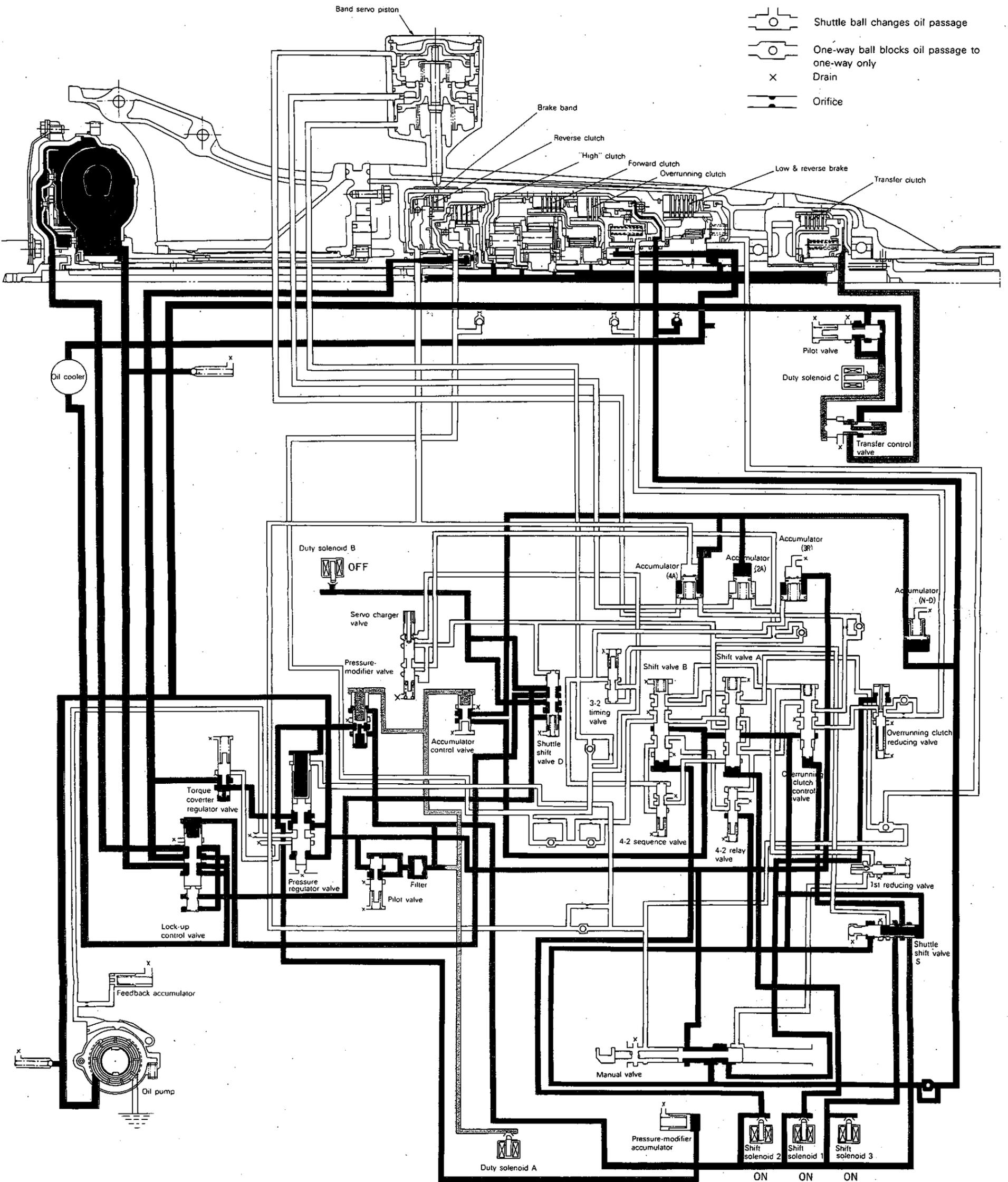


- Line pressure
- Pressure-modifier pressure
- Pilot pressure
- Duty-A pressure
- Duty-C pressure
- Oil pump control pressure
- Accumulator control pressure
- Overrunning clutch pressure
- "1" reducing pressure
- Transfer clutch pressure
- Torque converter pressure
- Cooler pressure
- Lubricant pressure

Location of manual valve differs for 3 and D ranges.



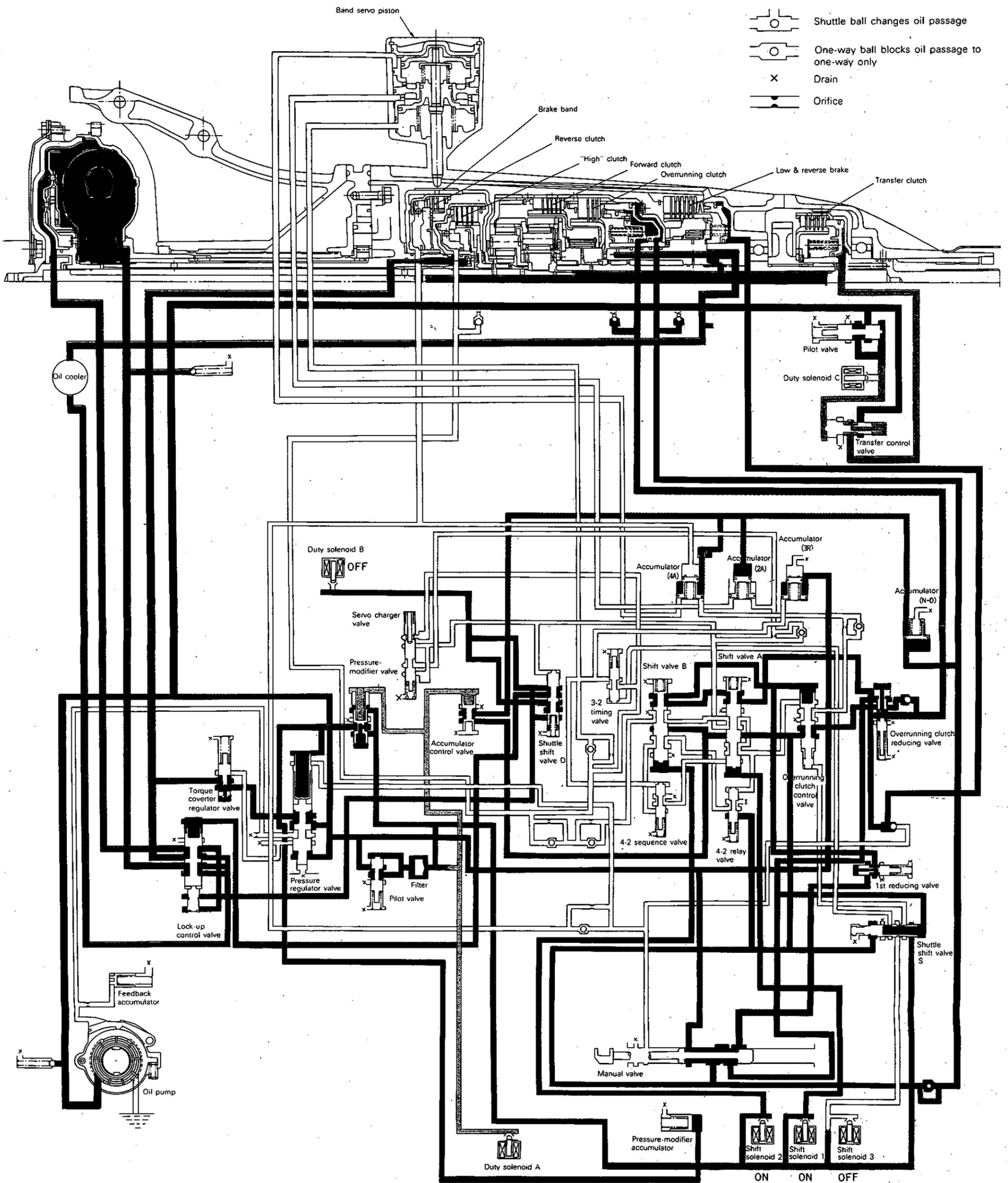
12. FIRST SPEED OF 2 RANGE



- Line pressure
- Pressure-modifier pressure
- Pilot pressure
- Duty-A pressure
- Duty-C pressure
- Oil pump control pressure
- Accumulator control pressure
- Overrunning clutch pressure
- "1" reducing pressure
- Transfer clutch pressure
- Torque converter pressure
- Cooler pressure
- Lubricant pressure

ON ON ON

13. FIRST SPEED OF 1 RANGE



- Line pressure
- Pressure-modifier pressure
- Pilot pressure
- Duty-A pressure
- Duty-C pressure
- Oil pump control pressure
- Accumulator control pressure
- Overrunning clutch pressure
- "1" reducing pressure
- Transfer clutch pressure
- Torque converter pressure
- Cooler pressure
- Lubricant pressure

## 21. Electronic-Hydraulic Control System

### A: GENERAL

The electronic-hydraulic control system consists of various sensors and switches, a transmission control unit (TCU) and the hydraulic controller including solenoid

valves. The system controls the transmission proper including shift control, lock-up control, overrunning clutch control, line pressure control, auto pattern select control and shift timing control. It also controls the 4WD transfer clutch. In other words, the system detects various operating conditions from various input signals and sends output signals to shift solenoids 1, 2 and 3 and duty solenoids A, B and C (a total of six solenoids).

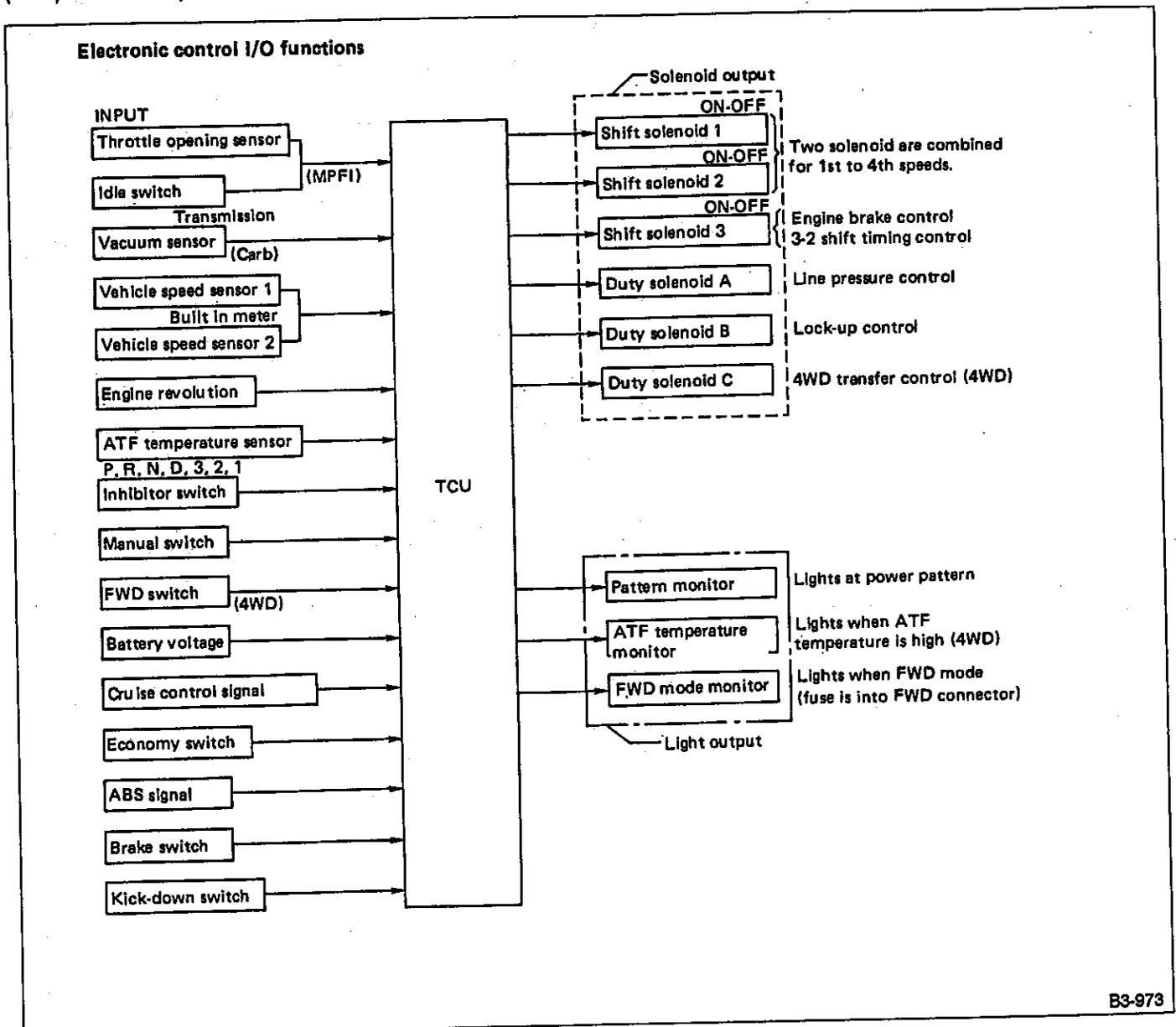


Fig. 57

**B: FUNCTION****1. INPUT SIGNAL**

Signal name	Major function
Throttle sensor (MPFI) Vacuum sensor (Carb)	Detects throttle opening and determines shift point, line pressure and lock-up vehicle speed according to engine load.
Vehicle speed sensor 1 (mounted to transmission)	Detects vehicle speed. This signal is used to control shifting, lock-up, line pressure, and transfer clutch.
Vehicle speed sensor 2 (built-in meter)	FWD ... Used as backup in case of failure of vehicle revolution sensor 1. 4WD ... Used to control transfer clutch and as backup in case of failure of vehicle speed sensor 1.
Engine revolution	Detects engine speed. This signal is used for lock-up clutch smooth, control at lock-up and to prevent engine overrunning at "2" and "1" range.
Inhibitor switch	Used to determine shifting and line pressure for respective ranges "P", "R", "N", "D", "3", "2" and "1".
Idle (I/D) switch	Detects throttle closing. This signal is used for lock-up release, and for line pressure control.
Cruise switch (cruise control)	Detects operation of cruise control, and expands "4th" operating range.
ATF temperature sensor	Detects ATF temperature. This signal is used for inhibition of lock-up, release of OD and detection of ATF temperature.
Manual switch	Used to maintain the transmission in select range 2nd, 3rd when going up or down steep hills, running on sand, mud, or slippery surfaces.
Economy switch	With this switch "ON", shift pattern is set in economy mode to improve fuel economy.
FWD switch	Used to change the mode from 4WD to FWD. Also used to adapt the vehicle to FWD tester roller. Changeover from 4WD to FWD can be accomplished by inserting a fuse into the fuse holder. (4WD only)
ABS signal	When ABS is operating, to optimize ABS control, transfer clutch torque is controlled to eliminate the influence of engine braking and reduce the degree of coupling between front and rear wheels.
Kick-down switch	Detects throttle full opening. This signal is used to control kick down.

**2. OUTPUT SIGNAL**

Signal name	Function
Shift solenoids 1, 2	Controls shift stage by turning solenoid ON/OFF. Relationship between solenoid operation and shifting stage is shown in Table below. When shifting, timing is controlled for each solenoid to reduce shock.
Shift solenoid 3 (Overrunning clutch)	Controls 3-2 shift timing and overrunning clutch operation. Shift timing is controlled by controlling release speed of oil pressure to reduce shock while downshifting. The overrunning clutch is controlled so that it will operate during coasting to apply engine brake.
Duty solenoid A (line pressure)	Regulates the line pressure according to driving conditions.
Duty solenoid B (lock-up)	Regulates the hydraulic pressure of the lock-up clutch and operates in three modes (open, smooth and lock-up).
Duty solenoid C (transfer pressure)	Regulates the hydraulic pressure of the transfer clutch and controls the driving force to the rear drive shaft.
"Power" indicator light	Indicates whether the shift pattern is "Normal" or "Power". The indicator lights in power mode. This light is also used for "self-diagnosis".
ATF temperature warning light	Lights when ATF becomes hot (exceeds a set temperature level). (4WD only)
FWD pilot light	Lights when fuse is into FWD connector.

**3. CONTROL ITEM**

Control item		Description of control	
Transmission control	Gear shift control	Normal shift control ● Normal pattern ● Power pattern	Upshifting and downshifting are set for each range, gear position and pattern according to throttle opening and vehicle speed.
		Control with ABS	Gear is locked in 3rd position when ABS signal enters.
		Control with cruise control	When cruise control is set, 4th gear operating range is expanded.
		ATF low temperature control	Shifting into 4th gear is prevented when ATF temperature is below the preset value.
		Manual control	Gear is held in selected range when manual switch is ON. (2 and 3 ranges only)
	Lock-up control	Normal lock-up control ● "Normal" : "D" range only ● "Power" : R, 3, 2 ranges	Lock-up ON/OFF is set for each range, gear position, and pattern according to throttle opening and vehicle speed. (Basically lock-up is OFF during gear shifting.)
		Smooth control	Smooth lock-up is performed when lock-up is switched on.
	Overrunning clutch control	Engine brake control	Overrunning clutch is operated according to range, vehicle speed, and cruise control signals in order to apply engine brake properly.
		3-2 timing control	This control speeds the release of servo piston pressure 3R when shifting down from 3rd to 2nd, thereby preventing engine racing.
	Line pressure control	Ordinary control	Line pressure is regulated according to throttle opening, vehicle speed and range signals.
		Shifting control	Line pressure is reduced when shifting to lessen shifting shock.
		Starting control	Line pressure is at a minimum so as to reduce engine cranking load.
	Automatic pattern select control	Power pattern control (POWER light ON)	Power pattern is selected when throttle opening change speed exceeds the preset value.
		Normal pattern control	When throttle opening is less than the preset value, normal pattern is resumed.
	Shift timing control	Shift step control	ON/OFF timing for shift solenoid is controlled.
		Lock-up control	When shifting, the lock-up clutch is temporarily released.
		Overrunning clutch control (3rd to 2nd: small throttle opening in coasting, 2nd to 1st: in coasting)	When shifting down, the overrunning clutch is temporarily disconnected to reduce shifting shock.
		Line pressure control	When shifting, line pressure is controlled to the optimum level so as to reduce shifting shock.
	4WD transfer clutch control	Ordinary transfer control	Transfer oil pressure is regulated according to the throttle opening angle and vehicle speed.
		1st range control	Transfer oil pressure is increased.
Slip control		Immediately after detecting a slip, transfer oil pressure is controlled to the same pressure as 1st range. (This control is canceled if V Ls 60 km/h (37 MPH), or when throttle is closed fully.)	
Control it turns		Transfer oil pressure is reduced after detecting the turn.	
ABS control		Transfer oil pressure is adjusted to set level immediately after reception of ABS signal.	

**4. POWER INDICATOR LIGHT**

The automatic transmission equipped vehicle is capable of automatically selecting two driving patterns; a normal pattern suitable for ordinary driving and a

power pattern suitable for driving uphill or rapid acceleration. The power indicator light lights when the power pattern is selected. See the table below:

Selector lever position	Changeover from normal pattern to power pattern	Power indicator light ON/OFF
"D" "3" "2" range	Pattern is changed automatically according to depression of accelerator pedal.	<ul style="list-style-type: none"> <li>● "Normal" pattern: OFF</li> <li>● "Power" pattern: ON</li> </ul>

**C: COMPONENTS**

**1. THROTTLE SENSOR**

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

**2. VEHICLE SPEED SENSOR 1 (MOUNTED INSIDE THE TRANSMISSION)**

[FWD]

A pulse signal is generated from the vehicle speed sensor 1 (output shaft rpm sensor) mounted to the parking gear coupled integral with the reduction driven gear in the transmission and the transmission case. The generated pulse signal is sent to TCU where it is converted to vehicle speed data.

[4WD]

The vehicle speed sensor (output shaft rotation sensor) is mounted to the extension case (from the outside of the case). The sensor outputs a pulse signal which is transmitted to the TCU where it is converted to vehicle speed.

The transfer clutch drum is connected directly to the rear wheel driving propeller shaft. Vehicle speed sensor 1 on the 4WD model detects rear-wheel speed.

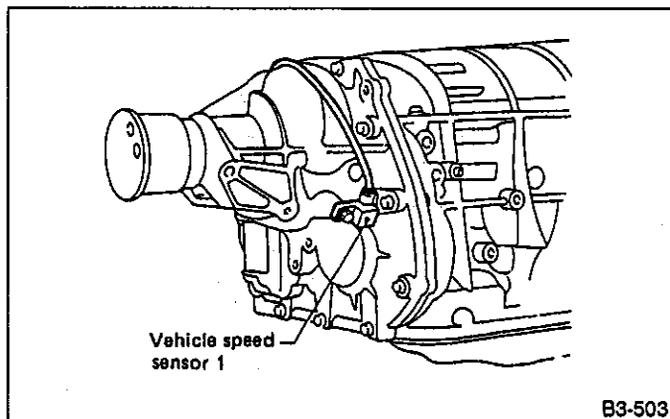


Fig. 58

**3. VEHICLE SPEED SENSOR 2**

The vehicle speed sensor 2 is in the combination meter. The read switch nearby speedometer is turned to ON or OFF by rotating of the speedometer inner shaft and that pulse signal is transmitted to the TCU.

**4. ATF TEMPERATURE SENSOR**

This sensor is mounted to the control valve in the transmission. It detects temperature change as an analog electrical signal. The output characteristics of the sensor are shown below.

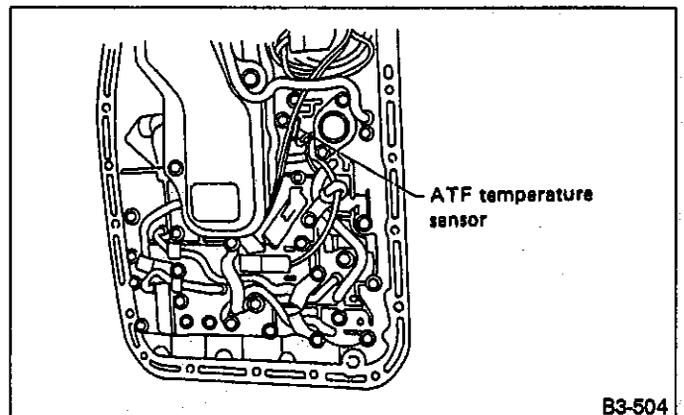


Fig. 59

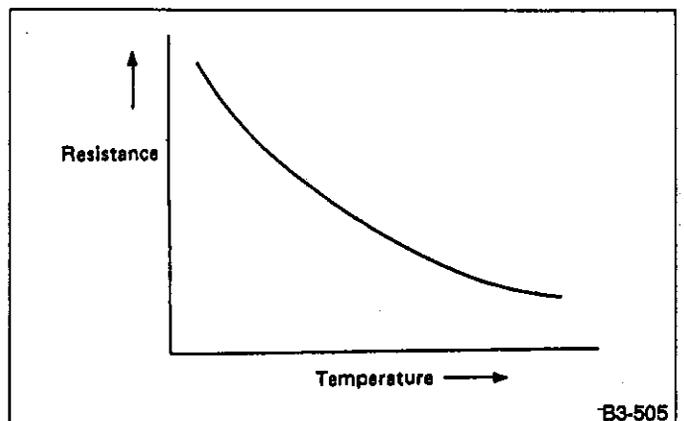


Fig. 60

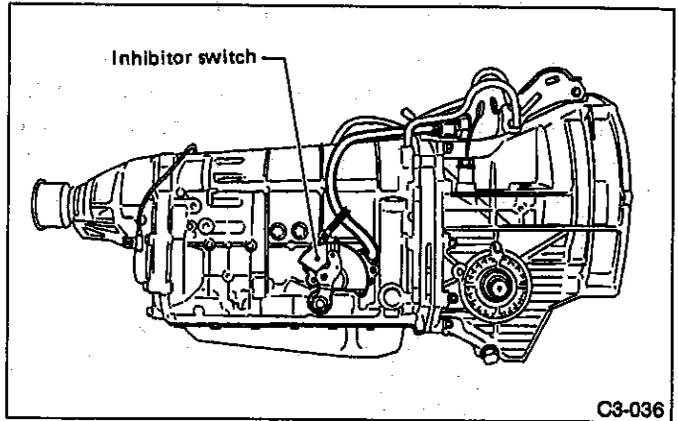
**5. INHIBITOR SWITCH**

The inhibitor switch assures safety when starting the engine. This switch is mounted on the right side of the transmission case, and is operated by the range selector lever.

When the selector lever is set to "P" or "N", the electrical circuit is connected in the inhibitor switch and the starter circuit is energized for cranking the engine.

When the selector lever is set to "R", "D", "3", "2", or "1" range, the electrical circuit is disconnected in the inhibitor switch. Hence engine cranking is disabled. In the "R" range, the backup light circuit is completed in the switch, and the backup lights come on.

In addition to the above function, the inhibitor switch incorporates a circuit for detecting the selected range position and sending the range signal to the TCU.



C3-036

Fig. 61

*PIN NO.	4	3	2	1	8	7	6	5	12	11	10	9
CODE POSITION	B	YL	Br	YG	YW	YB	R	GW	BY	BW	BW	GB
P	○	○							○	○		
R	○		○								○	○
N	○			○					○	○		
D	○				○							
3	○					○						
2	○						○					
1	○							○				

\*: Connector (E25)

**6. SOL. 1 (SHIFT) and SOL. 2 (SHIFT)**

These solenoids are mounted to the control valve. They are turned ON or OFF according to signals sent from the TCU. The gear positions are changed according to the ON and OFF condition of these solenoids.

**7. SOL. 3 (OVERRUNNING CLUTCH)**

This solenoid is also mounted to the control valve. It is turned ON or OFF according to the signal sent from the TCU. This operation controls the engagement and disengagement of the overrunning clutch.

**8. DUTY SOL. A (LINE PRESSURE)**

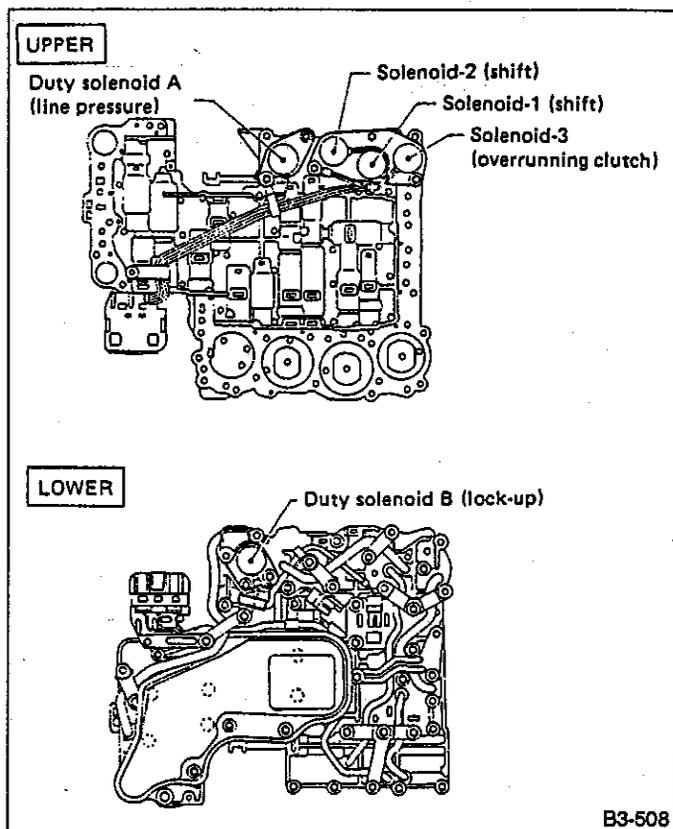
This solenoid is mounted to the control valve, and its duty ratio is controlled by the signal sent from TCU. This solenoid then controls the pressure modifier valve and pressure regulator valve to adjust the line pressure to an optimum pressure level suitable for operating conditions.

**9. DUTY SOL. B (LOCK-UP)**

This solenoid is mounted to the control valve, and its duty ratio is controlled by the signal sent from TCU. It then controls the lock-up control valve to provide smooth engagement and disengagement of the lock-up clutch.

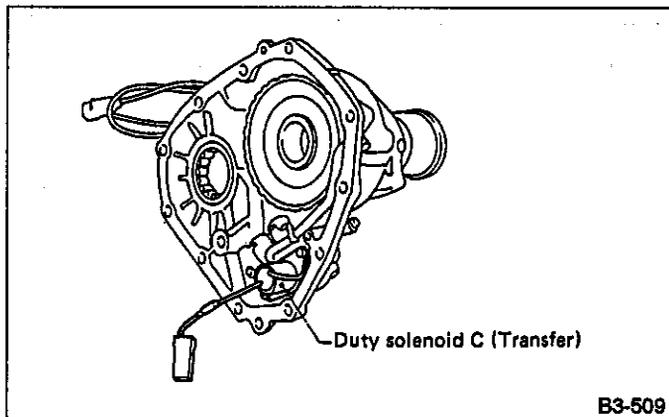
**10. DUTY SOL. C (TRANSFER)**

This solenoid is mounted to the transfer control valve on the side of extension case, and its duty ratio is controlled by the signal sent from TCU. It then controls the transfer control valve for controlling the transfer clutch hydraulic oil pressure.



B3-508

Fig. 62



B3-509

Fig. 63

## 22. Transmission Control Unit (TCU)

### A: GENERAL

TCU receives various sensor signals and determines the running conditions of the vehicle. It then sends control signals to each solenoid according to the preset gearshift characteristic data, lock-up operation data, and transfer clutch torque data (duty ratio).

#### 1. CONTROL SYSTEM

Input signal Control item	Throttle sensor idle switch	Vehicle speed sensor 1	Vehicle speed sensor 2	Engine revolutions (rpm)	ATF temperature sensor	Inhibitor switch	Manual switch	FWD switch	Cruise control signal	ABS signal	Economy switch	Kick-down switch
1. Shift control (1) Ordinary shift control	○	○	○	○		○					○	○
(2) ABS operation control										○		
(3) Cruise control operation									○			
(4) Hydraulic oil temperature control					○							
(5) Manual control						○	○					
2. Lock-up control (1) Ordinary lock-up control	○	○	○	○		○			○		○	
(2) Smooth control		○	○	○								
(3) Low oil temperature control					○							
3. Overrunning clutch control (1) Engine brake control	○	○	○			○	○		○			
(2) 3-2 timing control	○	○	○									
4. Line-pressure control (1) Ordinary line pressure control	○	○	○	○	○	○	○					
(2) Shifting control	○	○	○			○	○				○	
(3) Starting control				○	○							
5. Shift pattern select control (1) Power drive pattern control	○	○	○		○	○					○	
(2) Return to normal drive pattern	○	○	○			○						

3-2a [M22A1] AUTOMATIC TRANSMISSION AND DIFFERENTIAL [4AT]

Input signal Control item	Throttle sensor idle switch	Vehicle speed sensor 1	Vehicle speed sensor 2	Engine revolutions (rpm)	ATF temperature sensor	Inhibitor switch	Manual switch	FWD switch	Cruise control signal	ABS signal	Economy switch	Kick-down switch
6. Shift timing control												
(1) Shift range control	○					○	○					
(2) Lock-up control	○					○	○					
(3) Overrunning clutch control	○					○	○					
(4) Line pressure control	○	○	○			○	○					
7. 4WD transfer clutch control												
(1) Ordinary transfer control	○	○	○		○	○		○				
(2) Manual mode control	○	○	○			○	○					
(3) Slip detection control	○	○	○									
(4) Steering control	○	○	○									
(5) ABS operating control	○									○		

2. SYSTEM DIAGRAM

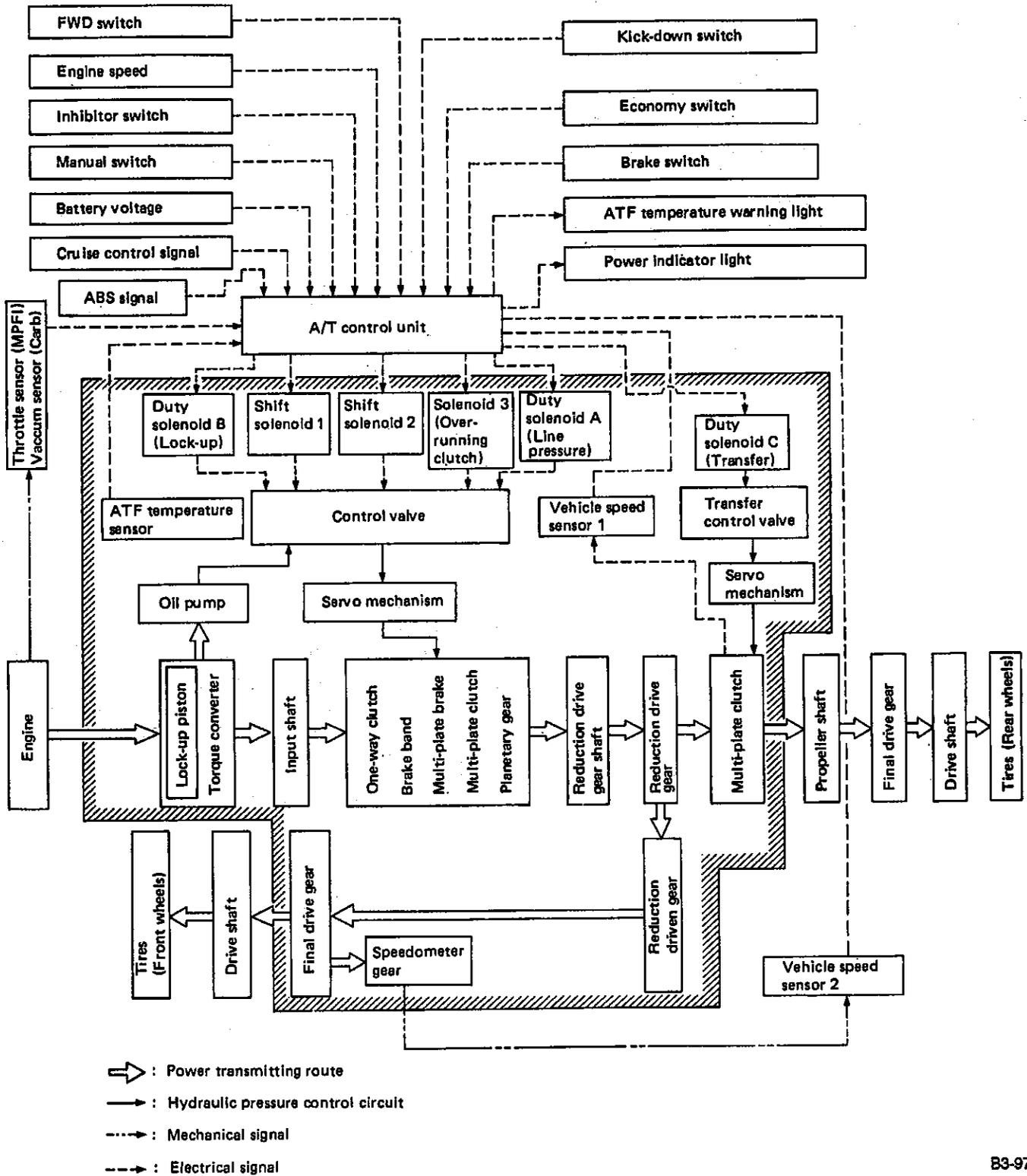
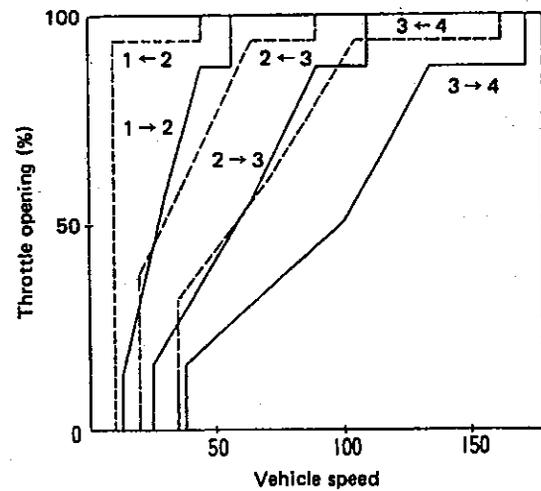


Fig. 64

**B: FUNCTION****1. SHIFT CONTROL**

Gearshifting is controlled in response to driving conditions, according to the shift point characteristic data, as shown in the following diagram, stored in the TCU. Solenoids are operated at the proper time corresponding to the shift pattern, throttle opening, and vehicle speed for smooth shifting.

	Solenoid 1	Solenoid 2
1st	O	O
2nd	X	O
3rd	X	X
4th	O	X



B3-511

*Fig. 65*

When oil temperature is below approximately 10°C (50°F), the vehicle cannot be shifted to the 4th range.

- ① Control unit activates both solenoids 1 and 2 in response to throttle and vehicle speed signals.
- ② Shift valve moves in response to solenoid operation, supplying/interrupting clutch pressure to the line.
- ③ Gears are shifted by ON-OFF operation of both solenoids as indicated in Table.

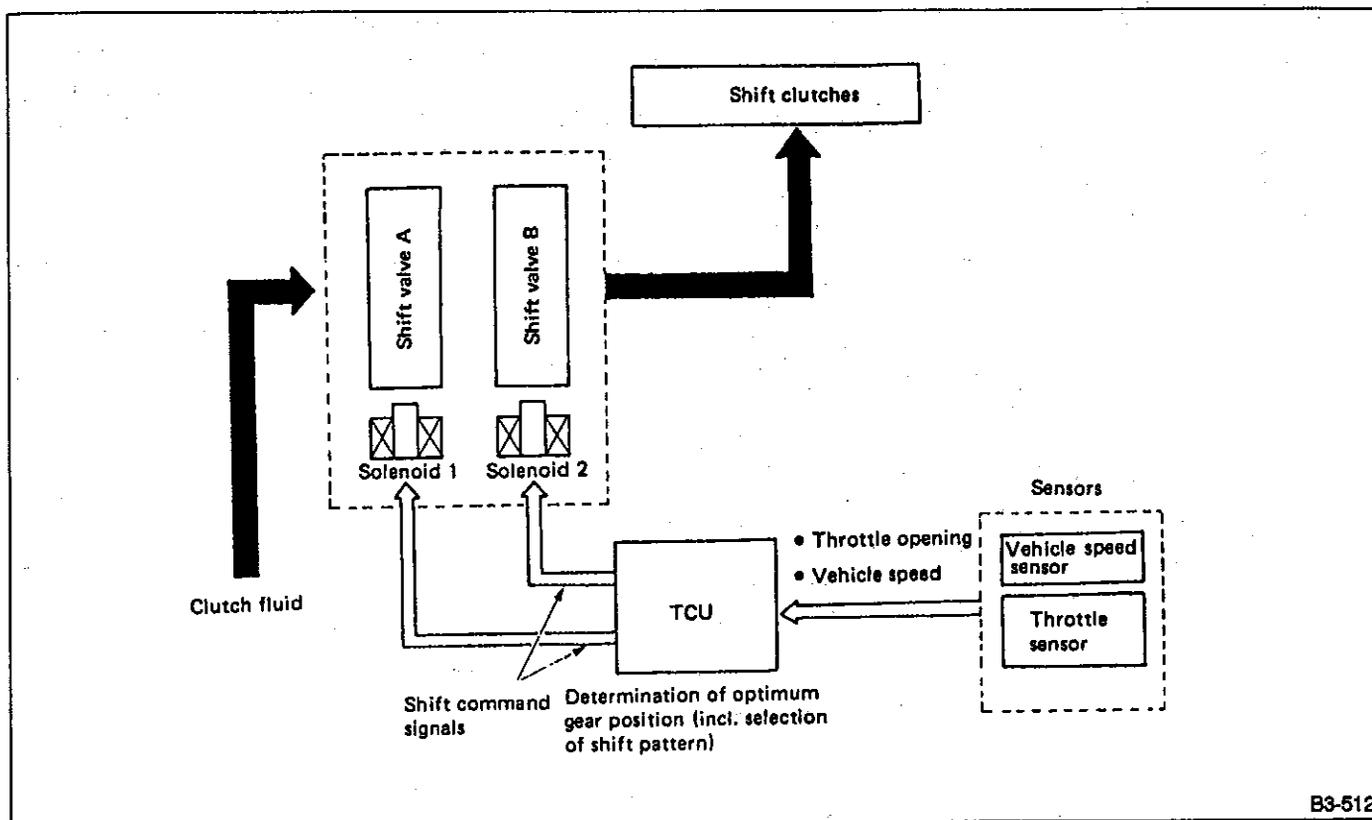


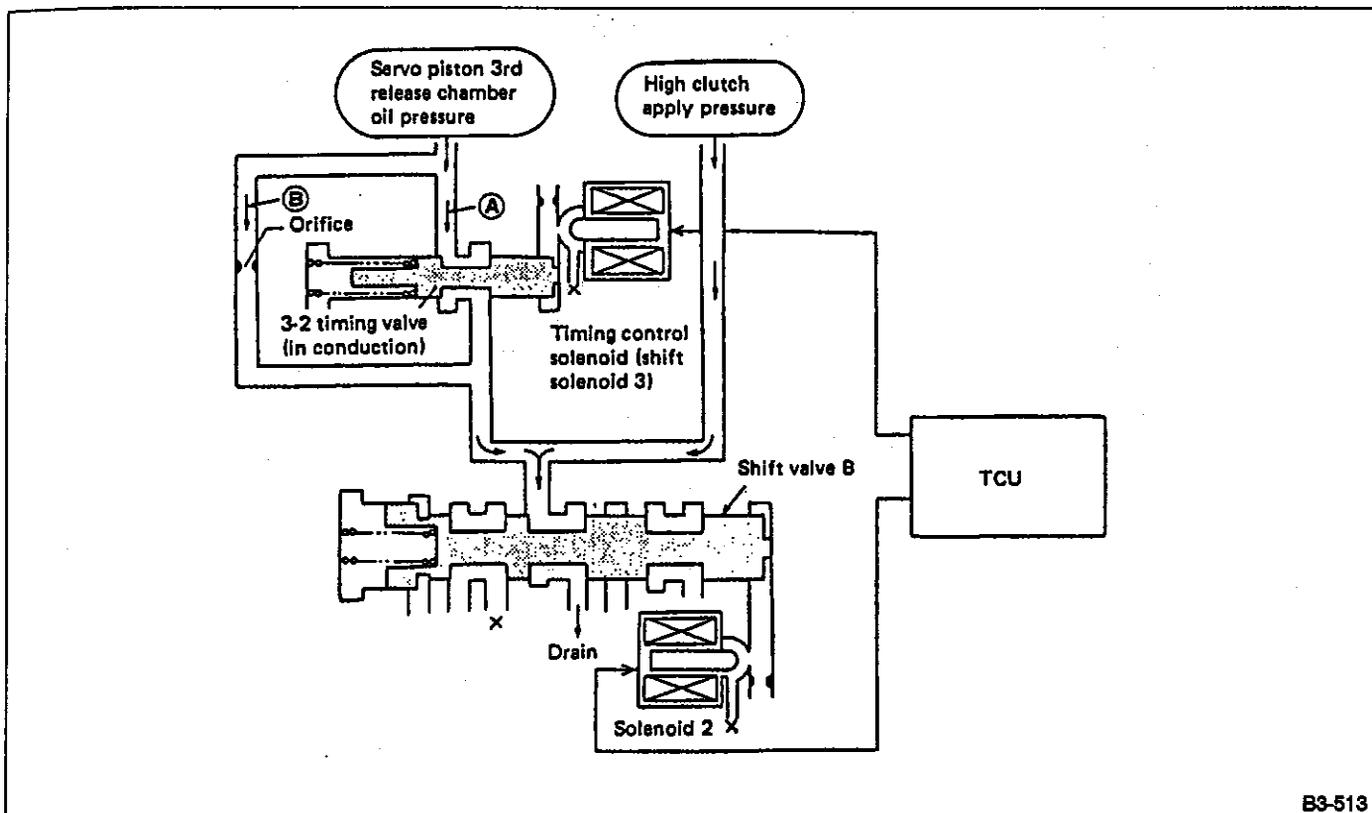
Fig. 66

## 2. 3-2 TIMING CONTROL

When shifting from 3rd to 2nd, the high clutch is disengaged. At the same time, oil pressure (which releases the brake band) is also released from the servo piston 3rd release chamber (3R).

At this point, the servo piston moves to release oil pressure from the 3rd release chamber (3R) and apply oil

pressure to the 2nd apply chamber. This causes the brake band to be applied. In other words, high clutch "release" and brake band "application" are properly timed by electronic control. This eliminates engine rev-up under no load or hesitation.



B3-513

Fig. 67

- When the 3-2 timing valve conducts, oil pressure applied to the 3rd release chamber is quickly released through passage **A**.
- When the 3-2 timing valve does not conduct, oil pressure applied to the 3rd release chamber is slowly released through passage **B** (provided with an orifice).

### 3. LOCK-UP CONTROL

The lock-up engaging and disengaging conditions are set for each gear shift range, gear position and shift pattern and correspond to the throttle opening and vehicle speed, and the duty solenoid is electronically controlled by TCU controls the lock-up clutch. The lock-up clutch engagement and disengagement are controlled by the lock-up control valve.

(When engaging and disengaging)

The shuttle shift valve D is actuated by the hydraulic pressure from the shift valve A. It controls the position of the lock-up control valve for engaging or disengaging the lock-up clutch.

#### 1) 1st gear, N, R, and P ranges

Since no operating pressure is generated from the shift valve A, the shuttle shift valve D sets the lock-up control valve in the "disengaging" position.

The lock-up operating pressure (torque converter regulator pressure) acts on the lock-up clutch disengaging circuit, while the engaging circuit communicates with

the oil cooler circuit. Accordingly, the lock-up clutch is disengaged by the pressure difference.

#### 2) 2nd, 3rd, and 4th gear

The operating pressure generated by the shift valve A is applied to the shuttle shift valve D, which pushes the lock-up control valve to the "engaging" position. Since the lock-up operating pressure is applied to the engaging side circuit while the disengaging circuit is drained, the lock-up clutch is engaged by the pressure difference.

(Smooth control)

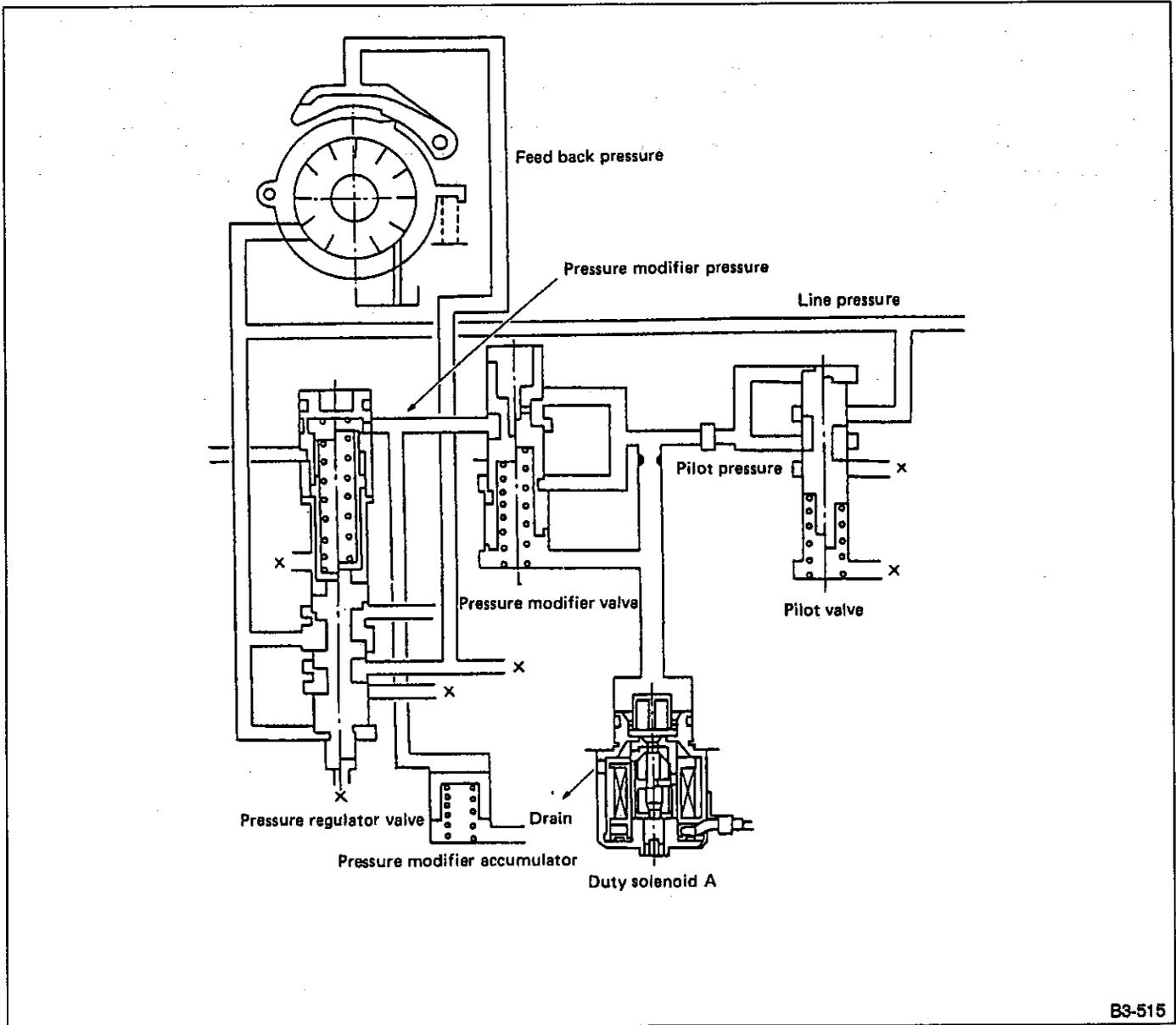
The duty solenoid B is controlled by the TCU and controls the operation of the lock-up control valve. Because the lock-up operating pressure is controlled by the lock-up control valve, the force applied to the lock-up clutch is controlled for smooth clutch operation.

When locking up, the clutch is set in the half-engaged state beforehand. After this, the lock-up operating pressure is gradually increased to achieve smooth locking up.

**4. LINE-PRESSURE CONTROL**

- 1) The oil pump delivery pressure (line pressure) is regulated to the constant pilot pressure by the pilot valve.
- 2) The pilot pressure applied to the pressure modifier valve is regulated by the line pressure controlling duty solenoid A and changed into the pressure modifier pressure.
- 3) The pressure modifier valve is an auxiliary valve for the pressure regulator valve, and it creates a signal pressure (pressure modifier pressure) for regulating the line pressure to an optimum pressure corresponding to the driving conditions.

- 4) This pressure modifier pressure is applied to the pressure regulator valve to control the oil pump delivery pressure.
- 5) The delivery pressure of the oil pump is regulated to an appropriate pressure (line pressure) corresponding to the driving condition to reduce the loss in the oil pump driving time and acceleration shock.
- 6) The pressure modifier pressure regulated by the pressure modifier valve is smoothed by the pressure modifier accumulator and pulsation in the line pressure is eliminated.



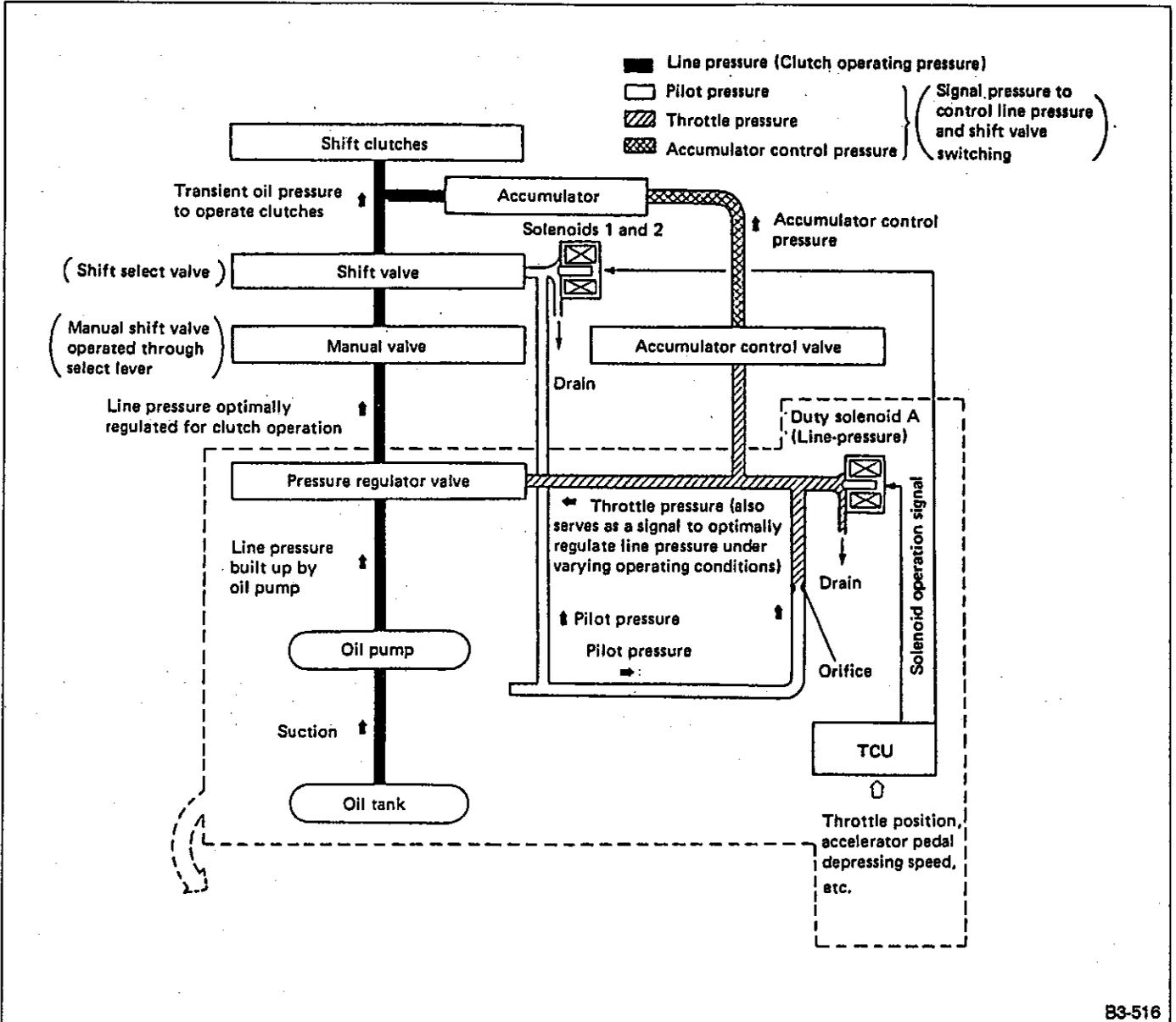
B3-515

Fig. 68

**5. LINE-PRESSURE SHIFTING CONTROL**

Oil pressure which engages shift clutches (to provide 1st through 4th speeds) is electronically controlled to meet varying operating conditions.

In other words, line pressure decreases to match the selected shift position, minimizing shifting shock.



B3-516

Fig. 69

- Electronic control of clutch oil pressure in summary
  - a. Solenoids activate through the TCU which receives various control signals (throttle signal, etc.)
  - b. Control signals are converted into throttle pressure, which is transmitted to the pressure regulator valve.
  - c. The pressure regulator valve optimally regulates line pressure (built-up by oil pump) in response to throttle pressure, matching varying operating conditions.

**6. SHIFT PATTERN SELECT CONTROL**

Shift pattern is selectable automatically between a normal pattern suitable for ordinary economy running and a power pattern suitable for climbing uphill or rapid acceleration.

In the power pattern, the shift down point and shift up point are set higher than those of the normal pattern. When the power pattern is selected, the POWER indicator light in the meter lights up.

Selector position	Changeover from normal to power pattern	Meter indication
D, 3, 2 range	Performed automatically corresponding to accelerator pedal depression.	<ul style="list-style-type: none"> <li>● Normal pattern: OFF</li> <li>● Power pattern: ON</li> </ul>

\* This happens, only when both manual switch and economy switch are OFF.

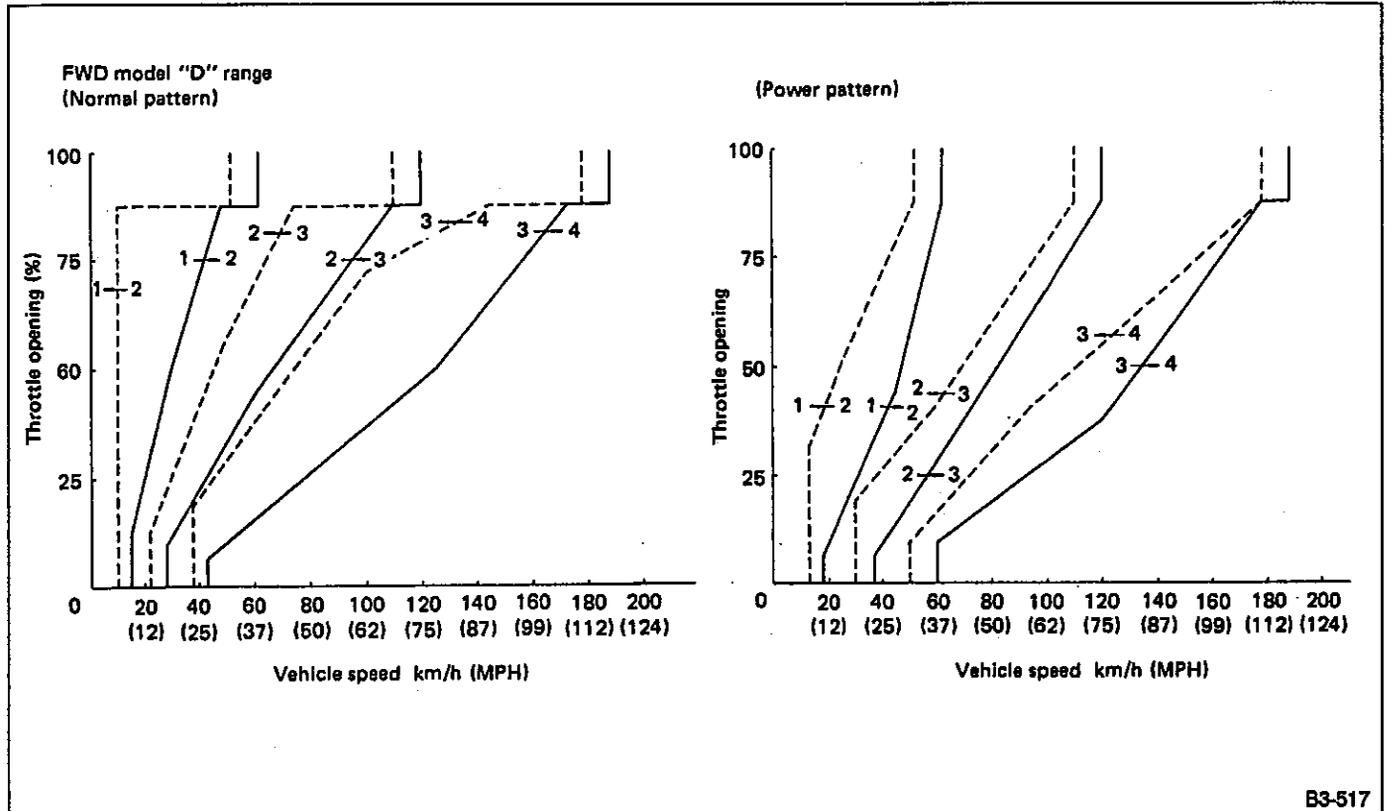


Fig. 70

① Normal pattern to power pattern

Select lever	D, 3, 2 range
Accelerator depression speed	Greater than set value

Depending on throttle opening and vehicle speed, 16 areas as shown in the figure are set. Accelerator depression speed for pattern changeover is set for each area.

When the accelerator depression speed exceeds this set value, the pattern changes from normal to power. This happens for the 3 or 2 range, only when the manual switch is OFF.

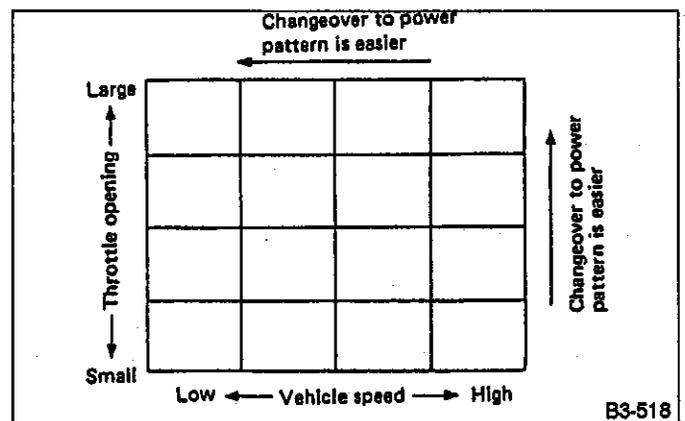


Fig. 71

② Power pattern to normal pattern

The power pattern is shifted to the normal pattern, depending on car speed. Shifting to the normal pattern is determined by the throttle position as shown in Figure below. Time lag in shifting is also determined by car speed. The maximum time lag is 3 seconds.

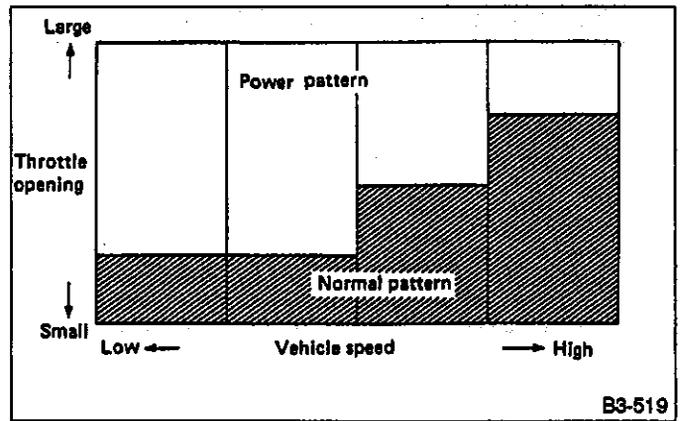


Fig. 72

7. ENGINE BRAKE CONTROL

The TCU controls the shift solenoid corresponding to such input signals as throttle opening, vehicle speed, shift range, and cruise control signals to automatically control the operation of the overrunning clutch and for positive application of engine brake.

1) In range D or 3, the overrunning clutch is kept inoperative by the action of the shuttle shift valve S when

the throttle opening is large. With small throttle valve opening, the overrunning clutch is engaged by the action of shift solenoid 3.

2) In range 2, the overrunning clutch is engaged by the operation of shift solenoid 3.

3) In range 1, the overrunning clutch is engaged irrespective of the operation of shift solenoid 3.

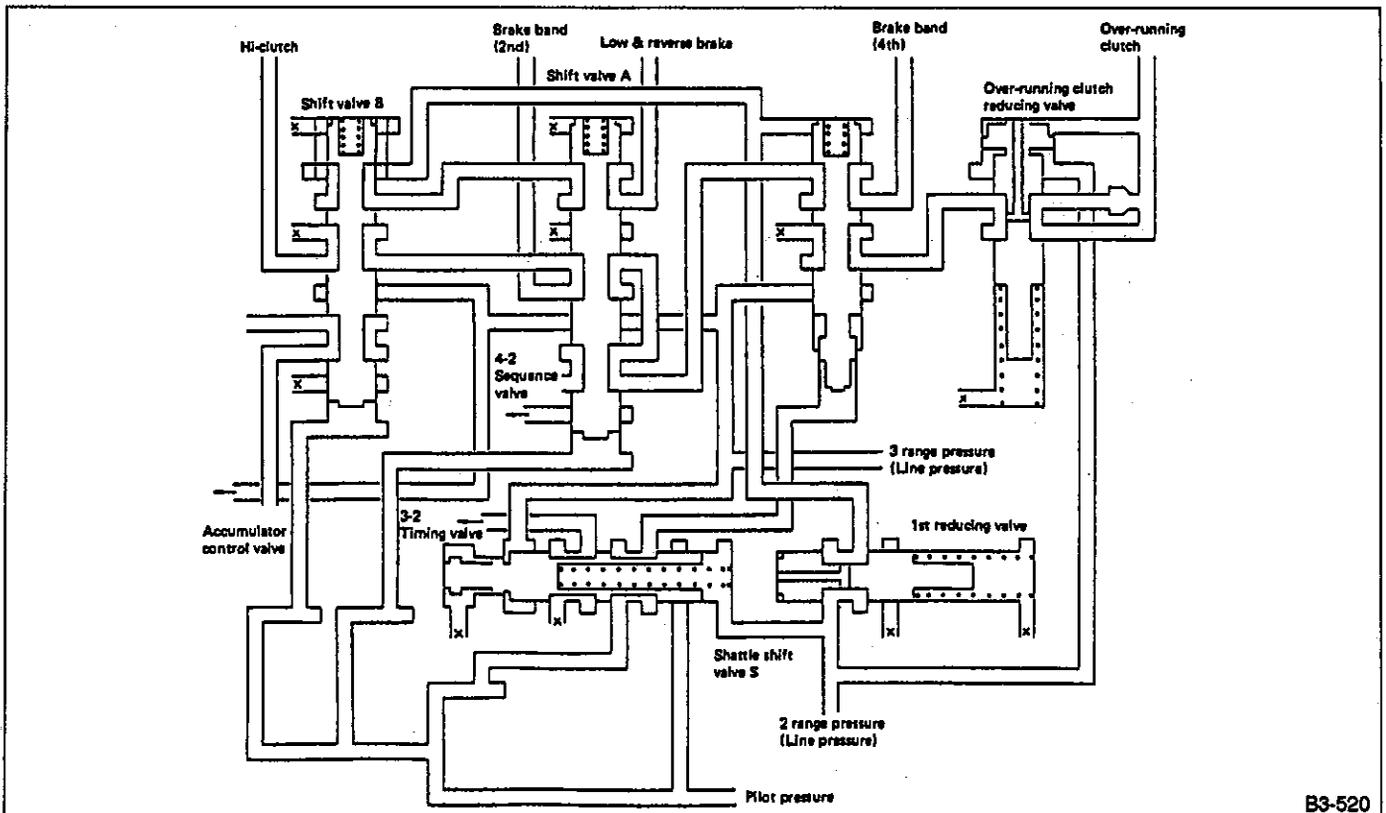
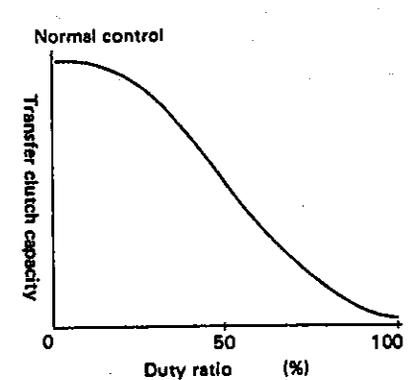


Fig. 73

8. 4WD TRANSFER CLUTCH CONTROL

		Type of control	Gear position	Remarks
1	Basic control	Regulates transfer oil pressure in response to throttle position and vehicle speed.	1st through 4th and reverse	 <p>Normal control</p> <p>Transfer clutch capacity</p> <p>Duty ratio (%)</p> <p>Fig. 74</p>
2	Control in 1st range	Increases transfer oil pressure (as compared with basic control 1.)	1st	
3	Control during "slip" detection	Returns transfer oil pressure to the same as in 1st range immediately after "slip" detection.	1st through 4th and reverse	Release: At more than set vehicle speed and fully closed throttle
4	Control in turns	Decreases transfer oil pressure upon detection of vehicle turns.	1st through 4th and reverse	—

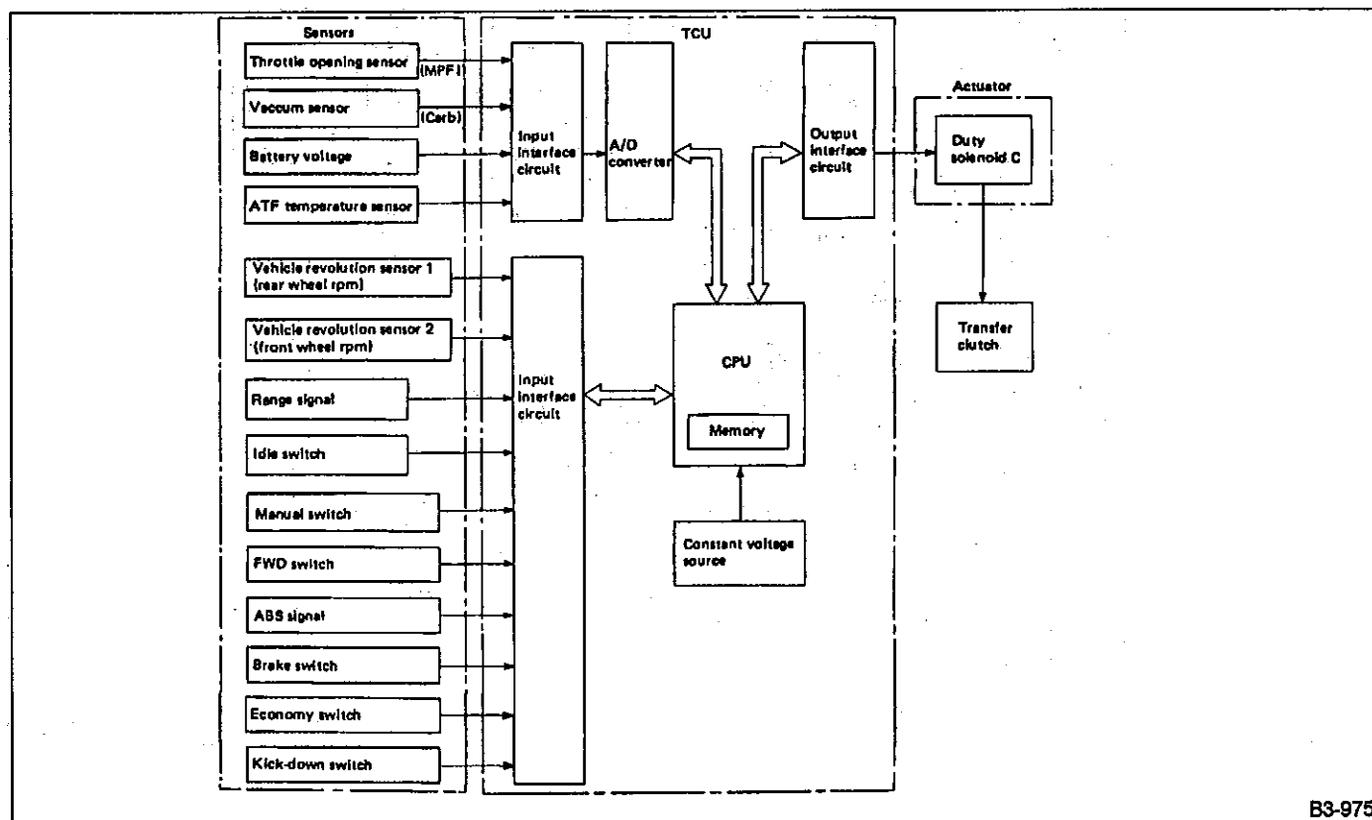


Fig. 75

B3-975

● Transfer control

The transfer hydraulic pressure control unit is fitted with the transfer valve body attached to the side face of the extension case via gasket and separate plate.

The hydraulic oil of the transfer hydraulic pressure control unit is led from the oil pump delivery pressure circuit on the transmission case front to the transmission case rear. From there it is further led to the extension case where it is fed to the hydraulic circuit of the transfer valve body.

The hydraulic oil pressure (line pressure) is regulated by the transfer pilot valve, duty solenoid C and transfer control valve for obtaining optimum rear torque distribution corresponding to the driving conditions.

1) The line pressure regulated to a proper pressure corresponding to the driving condition is further regulated to a constant pilot pressure by the transfer pilot valve.

2) The pilot pressure is regulated to the transfer duty pressure by the duty solenoid C whose duty ratio is controlled by the TCU corresponding to the driving condition. (The transfer duty pressure varies with the degree of duty control.)

3) The transfer duty pressure is applied to the transfer control valve.

4) The line pressure is led also to the transfer control valve where the pressure is regulated to the transfer clutch pressure by the transfer duty pressure. (The transfer clutch pressure varies with the transfer duty pressure.)

5) The transfer clutch pressure is applied to the transfer clutch and causes the clutch to be engaged.

In this way, the transfer clutch pressure is varied so that optimum rear torque distribution can be achieved which corresponds to the vehicle driving conditions.

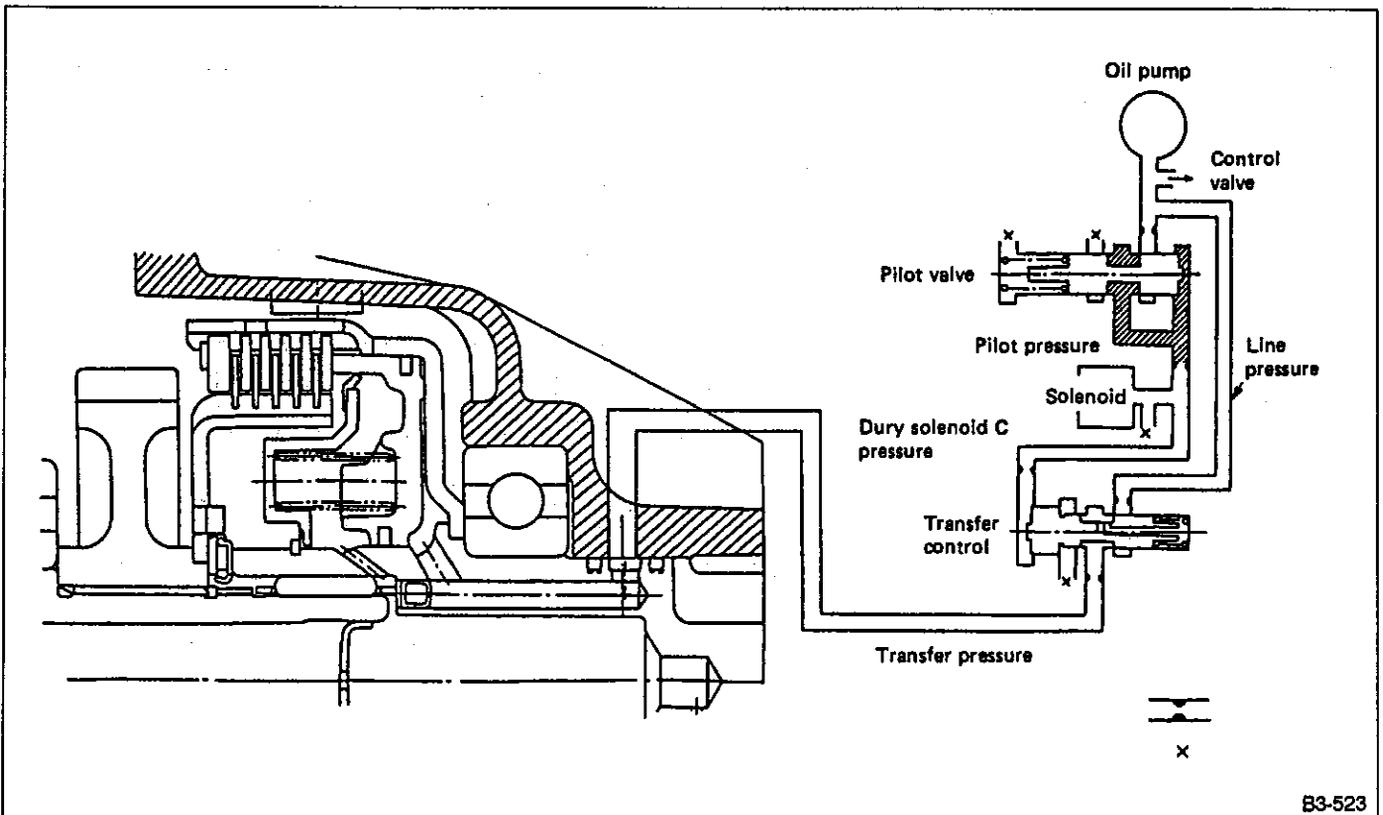


Fig. 76

## 23. Self-diagnosis System

### 1. FUNCTION

The self-diagnosis system is capable of detecting any trouble which has occurred in any of the following input and output signal systems.

- ① Vehicle speed sensor 1
- ② Vehicle speed sensor 2
- ③ Throttle sensor
- ④ Shift solenoid 1
- ⑤ Shift solenoid 2
- ⑥ Shift solenoid 3
- ⑦ Duty solenoid B
- ⑧ Duty solenoid C (4WD only)
- ⑨ ATF temperature sensor
- ⑩ Ignition pulse

- ⑪ Duty solenoid A
- ⑫ Atmospheric pressure sensor

The results of self-diagnosis are displayed by flashing power indicator lamp.

- (1) Repeated flashing at 4 Hz ...Error such as battery trouble
- (2) Repeated flashing at 2 Hz ...Normal
- (3) Output of trouble code ...Check faulty portion
- (4) Continued lighting of lamp ...Error in inhibitor switch, manual switch, idle switch, or wiring

### 2. OPERATION OF INDICATOR LAMP

If trouble occurs in any of the self-diagnosis items, the following display appears on the power indicator only once directly after starting the engine.

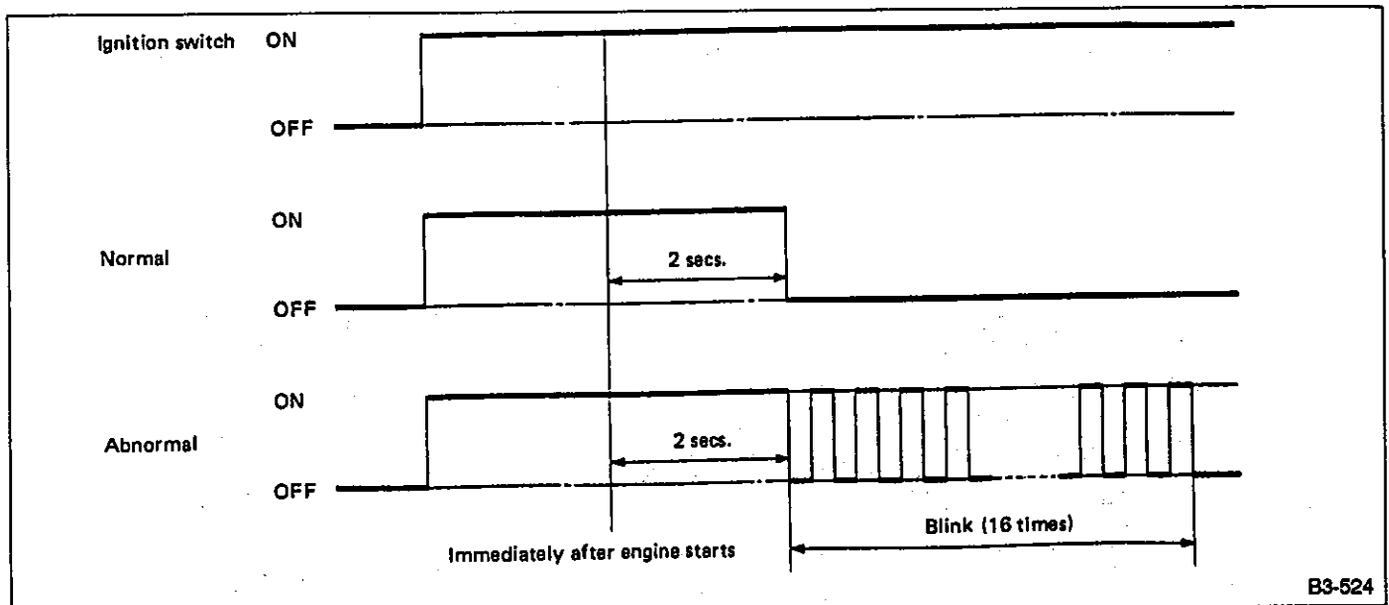


Fig. 77

B3-524

### 3. TROUBLE CODE

TROUBLE CODE	ITEM
11	Duty solenoid A
12	Duty solenoid B
13	Shift solenoid 3
14	Shift solenoid 2
15	Shift solenoid 1
21	ATF temperature sensor
23	Engine revolutions
24	Duty solenoid C
31	Throttle sensor
32	Vehicle speed sensor 1
33	Vehicle speed sensor 2

### 4. SELECT MONITOR

Various data and ON/OFF signals being processed in the TCU can be monitored by connecting the select monitor to the select monitor terminal located under the instrument panel. The trouble codes of the present and past problems can be indicated using a particular code.

#### Function Mode

Function mode	Description	Abbrev.	Unit
F01	Source voltage	VB	V
F02	Rear wheel speed	VSP 1	m/h
F03	Rear wheel speed	VSP 1	km/h
F04	Front wheel speed	VSP 2	m/h
F05	Front wheel speed	VSP 2	km/h
F06	Engine rpm	EREV	rpm
F07	ATF temperature	ATFT	°F
F08	ATF temperature	ATFT	°C
F09	Throttle opening	THSEN	V
F10	Gear position	GEAR	GEAR
F11	Line pressure duty	PLDTY	%
F12	Lock-up duty	LUPTY	%
F13	4WD duty	4WDTY	%

### 24. Fail-safe Function

A fail-safe function is provided to maintain driveability even if trouble should occur in the vehicle speed sensor, throttle sensor, inhibitor switch, or any of the solenoids.

#### 1) Vehicle speed sensor

A dual speed-sensing system is used. The speed signal is taken from the transmission (output shaft revolution sensor) and also from a sensor built into the speedometer. Even if one sensor system fails, the vehicle can be controlled normally with the other sensor system.

#### 2) Throttle sensor

If throttle sensor becomes faulty, throttle will be set to the predetermined position.

#### 3) Inhibitor switch

If two signals are inputted due to inhibitor switch failure, the vehicle can be driven under the following priority.

D > N (P) R 3 2 1

#### 4) Shift sol. 1 and 2

If trouble occurs in either of solenoids 1 and 2, both solenoids are turned OFF, and the vehicle is made driveable in the 3rd hold range.

If both solenoids should fail, the mechanical hydraulic circuit is used.

#### 5) Shift 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.

#### 6) 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.

#### 7) Duty sol. B (Lock-up)

If duty solenoid B fails, the solenoid is turned OFF and lock-up is released.

#### 8) 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)

# S SPECIFICATIONS AND SERVICE DATA

## A: SPECIFICATIONS

Torque converter	Type		Symmetric, 3-element, single stage, 2 phase torque converter coupling		
	Stall torque ratio		2.3 — 2.4		
	Nominal diameter		246 mm (9.69 in)		
	Stall speed (at sea level)		2200 cc MPFI : 2,600 — 3,000 rpm 2000 cc MPFI : 2,300 — 2,700 rpm 1800 cc Carburetor : 2,600 — 3,000 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	1.483	
			3rd	1.000	
			4th	0.729	
			Reverse	2.696	
			Tooth number of planetary gear	Front sun gear	33
		Front pinion		28	
		Front internal gear		89	
Rear sun gear	42				
Rear pinion	17				
Rear internal gear	75				

**AUTOMATIC TRANSMISSION AND DIFFERENTIAL [4AT]**

[S0A0] 3-2a

Automatic transmission	Transmission	Selector position	P (Park)	Transmission in neutral, output member immovable, and engine start possible		
			R (Reverse)	Transmission in reverse for backing		
			N (Neutral)	Transmission in neutral, and engine start possible		
			D (Drive)	Automatic gear change 1st c  2nd c  3rd c  4th		
			3 (3rd)	Automatic gear change 1st c  2nd c  3rd ←4th		
			2 (2nd)	Automatic gear change 1st c  2nd ← 3rd ← 4th		
			1 (1st)	1st gear locked (Deceleration 4th → 3rd → 2nd → 1st possible)		
		Control method	Hydraulic remote control			
	Oil pump	Type	Variable-capacity type vane pump			
		Driving method	Driven by engine			
		Number of vanes	9 pieces			
	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	4WD: 8.3 ℓ (8.8 US qt, 7.3 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	12 poles			
		Transmission harness	poles	FWD ... 11 4WD ... 13		
	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 (53/53)				
Final reduction	Final gear ratio	Front drive	2200 cc : 4.111 (37/9) 1800 cc, 2000 cc : 4.444 (40/9)			
		Rear drive	4WD 2200 cc : 4.111 (37/9) 4WD 1800 cc, 2000 cc : 4.444 (40/9)			
	Lubrication oil	API, GL-5				
	Oil capacity	Front drive	1.2 ℓ (1.3 US qt, 1.1 Imp qt)			
Rear drive		0.8 ℓ (0.8 US qt, 0.7 Imp qt)				
ATF cooling system	Radiation capacity	1.651 kW (1,420 kcal/h, 5,635 BTU/h)				

**B: ADJUSTING PARTS**

4WD

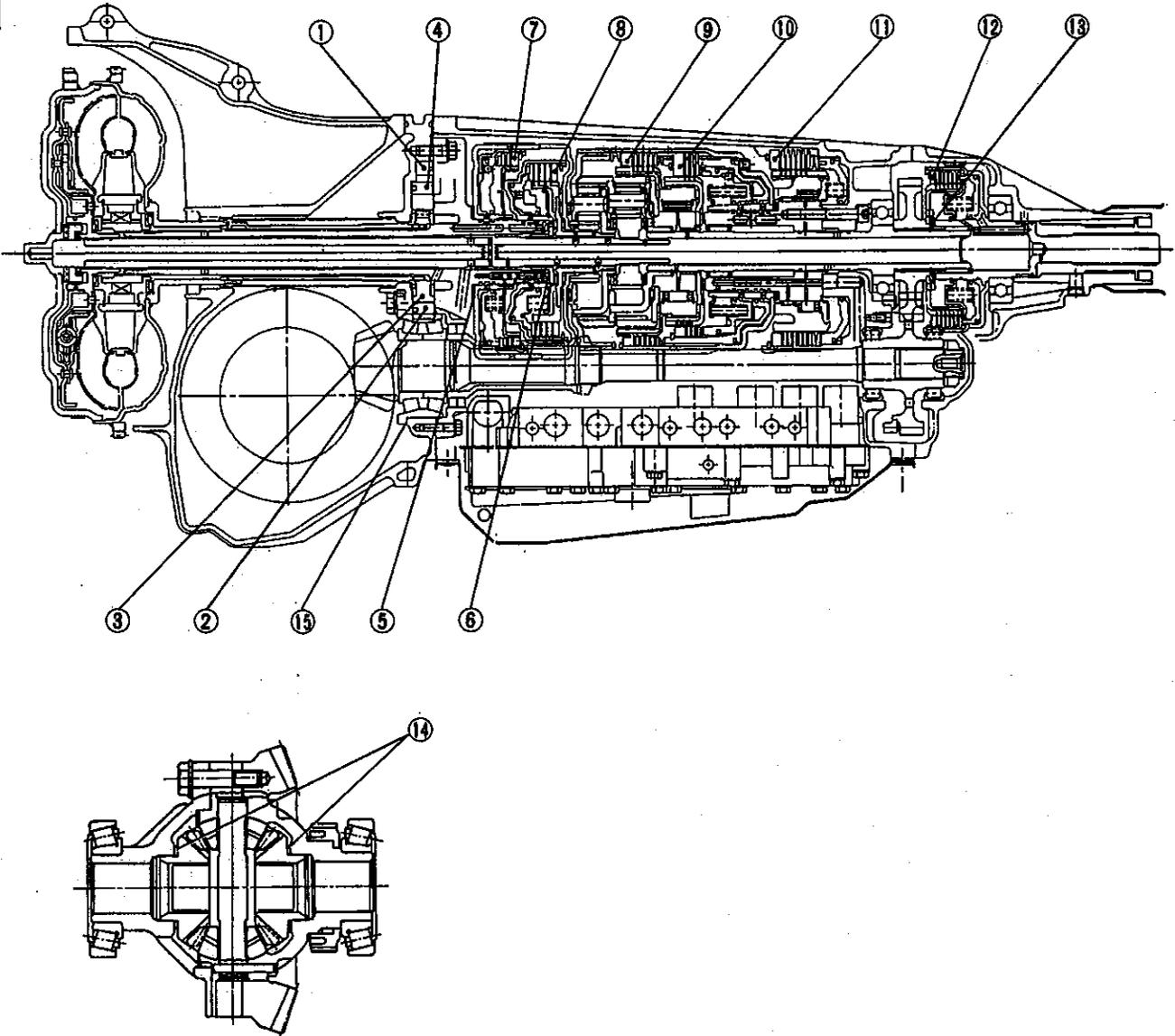


Fig. 78

B3-525

**AUTOMATIC TRANSMISSION AND DIFFERENTIAL [4AT]**

[S0B0] 3-2a

No.	Part Name	Part Number	Dimension mm (in)	Application
1	CONTROL PISTON	31235AA000 — 030	13.5 $\begin{smallmatrix} -0.080 \\ -0.037 \\ -0.018 \\ -0.023 \end{smallmatrix}$ (0.5315 $\begin{smallmatrix} -0.0012 \\ -0.0015 \\ -0.0008 \\ -0.0009 \end{smallmatrix}$ ), 13.5 $\begin{smallmatrix} -0.030 \\ -0.030 \\ -0.018 \end{smallmatrix}$ (0.5315 $\begin{smallmatrix} -0.0009 \\ -0.0012 \\ -0.0008 \end{smallmatrix}$ )	Adjusting side clearance of oil pump
2	CAM RING	31241AA000 — 030	17 $\begin{smallmatrix} -0.010 \\ -0.017 \\ +0.004 \\ -0.003 \end{smallmatrix}$ (0.6693 $\begin{smallmatrix} -0.0004 \\ -0.0007 \\ +0.0002 \\ -0.0001 \end{smallmatrix}$ ), 17 $\begin{smallmatrix} -0.008 \\ -0.010 \\ +0.011 \\ +0.004 \end{smallmatrix}$ (0.6693 $\begin{smallmatrix} -0.0001 \\ -0.0004 \\ +0.0004 \\ +0.0002 \end{smallmatrix}$ )	Adjusting side clearance of oil pump
3	VANE (Oil pump)	31243AA000 — 030	17 $\begin{smallmatrix} -0.080 \\ -0.037 \\ -0.018 \\ -0.023 \end{smallmatrix}$ (0.6693 $\begin{smallmatrix} -0.0012 \\ -0.0015 \\ -0.0008 \\ -0.0009 \end{smallmatrix}$ ), 17 $\begin{smallmatrix} -0.023 \\ -0.030 \\ +0.009 \\ +0.016 \end{smallmatrix}$ (0.6693 $\begin{smallmatrix} -0.0009 \\ -0.0012 \\ +0.0004 \\ +0.0006 \end{smallmatrix}$ )	Adjusting side clearance of oil pump
4	ROTOR (Oil pump)	31240AA000 — 030	17 $\begin{smallmatrix} -0.080 \\ -0.037 \\ -0.018 \\ -0.023 \end{smallmatrix}$ (0.6693 $\begin{smallmatrix} -0.0012 \\ -0.0015 \\ -0.0008 \\ -0.0009 \end{smallmatrix}$ ), 17 $\begin{smallmatrix} -0.030 \\ -0.030 \\ +0.009 \\ +0.016 \end{smallmatrix}$ (0.6693 $\begin{smallmatrix} -0.0009 \\ -0.0012 \\ +0.0004 \\ +0.0006 \end{smallmatrix}$ )	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 RANGE	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 overrunning 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	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
15	DRIVE PINION SHIM	31451AA050 — 100	0.15, 0.175, 0.2, 0.225, 0.275, 1.25 (0.0059, 0.0069, 0.008, 0.0089, 0.0108, 0.0492)	Adjusting drive pinion height

**C: LOCATION AND INSTALLING DIRECTION OF THRUST NEEDLE BEARING AND WASHER**

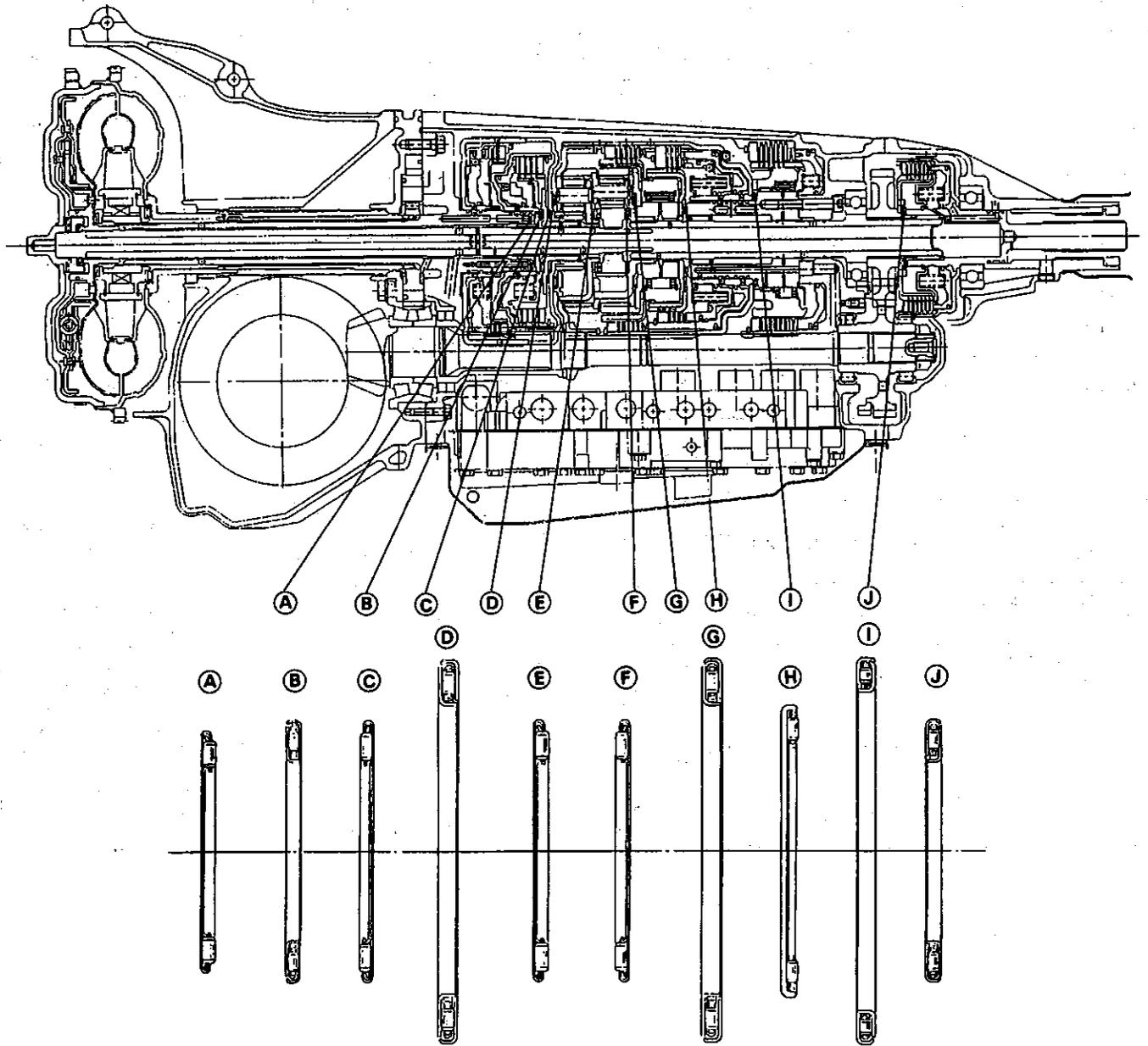


Fig. 79

B3-526

**D: FLUID PASSAGES**

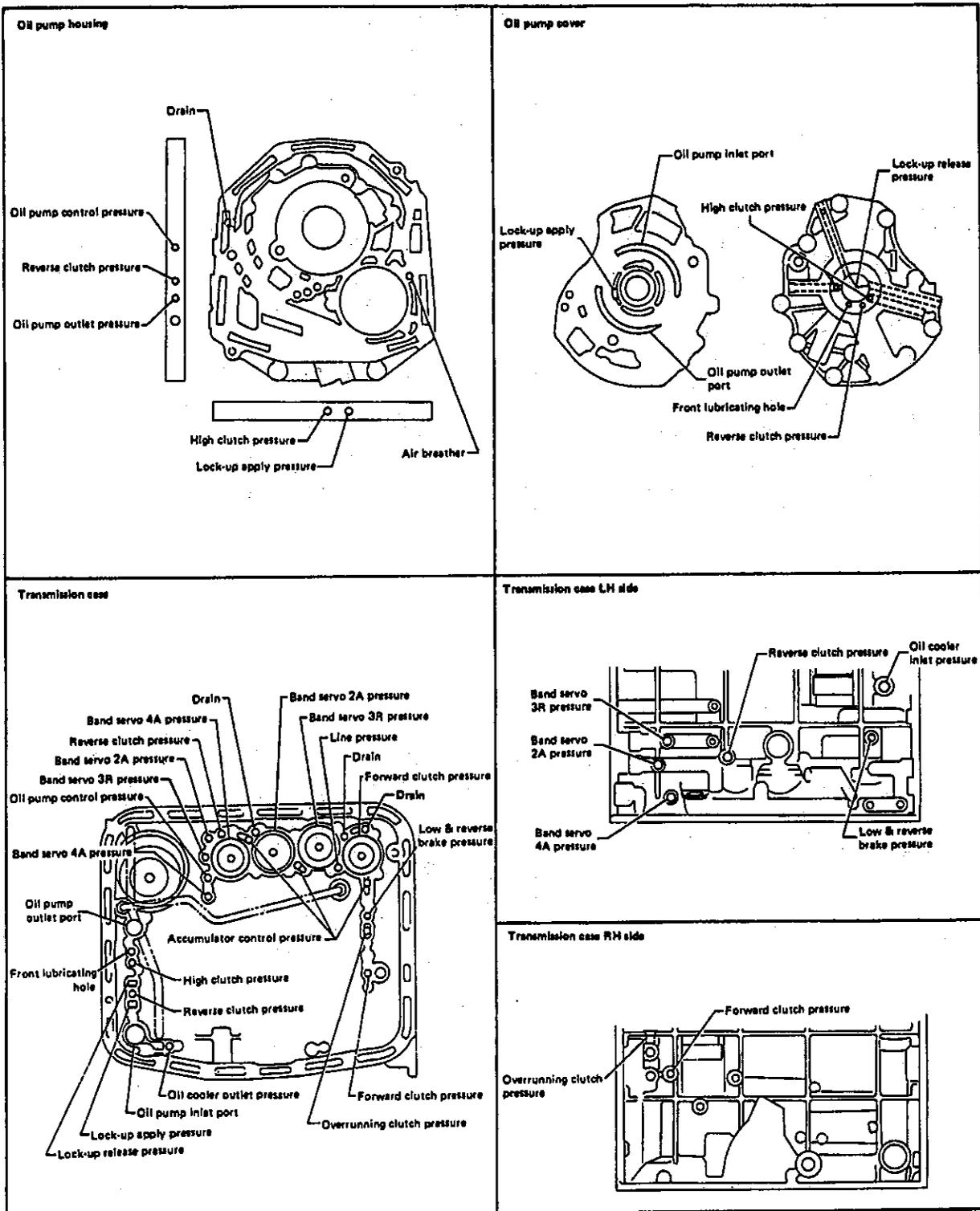


Fig. 80

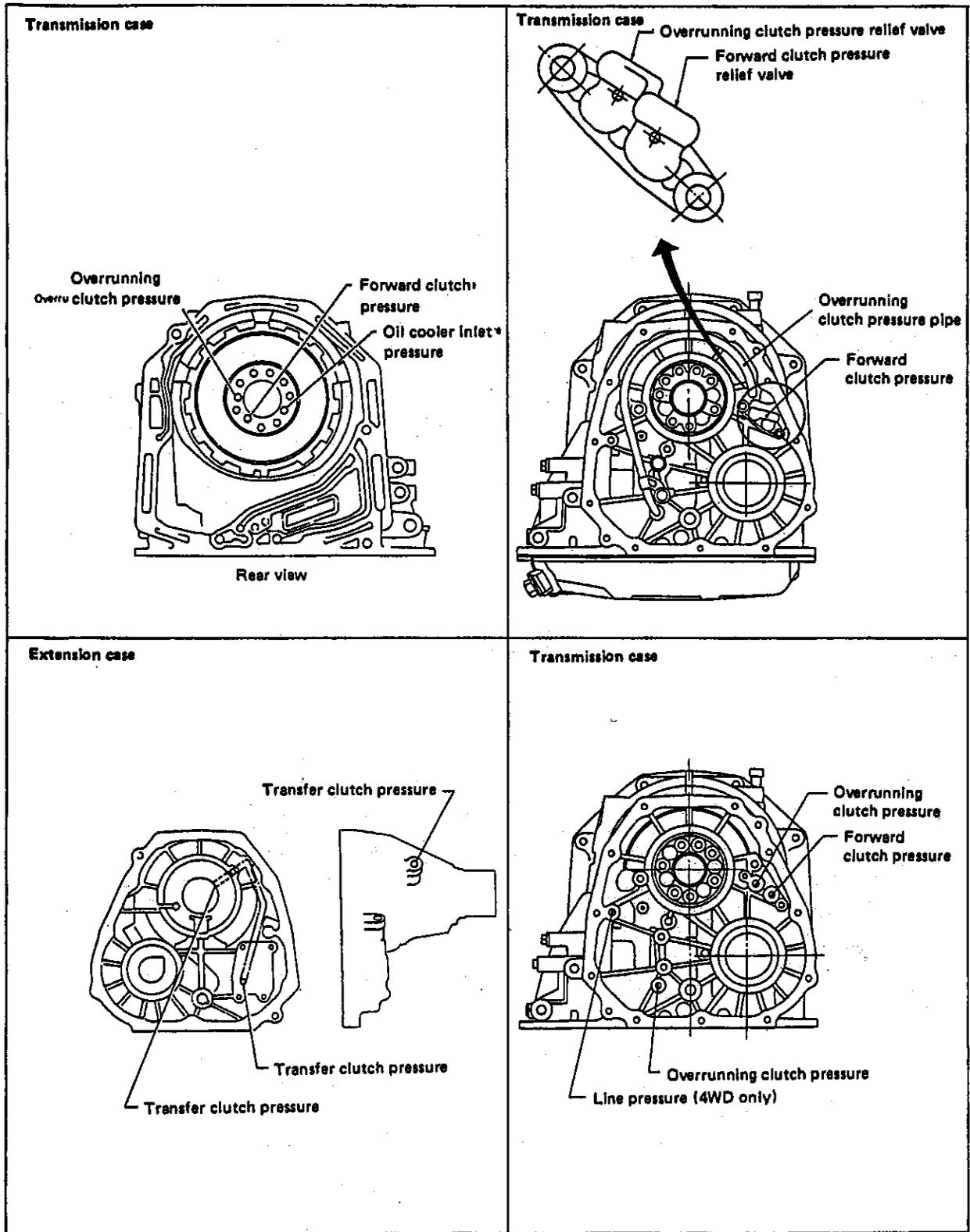
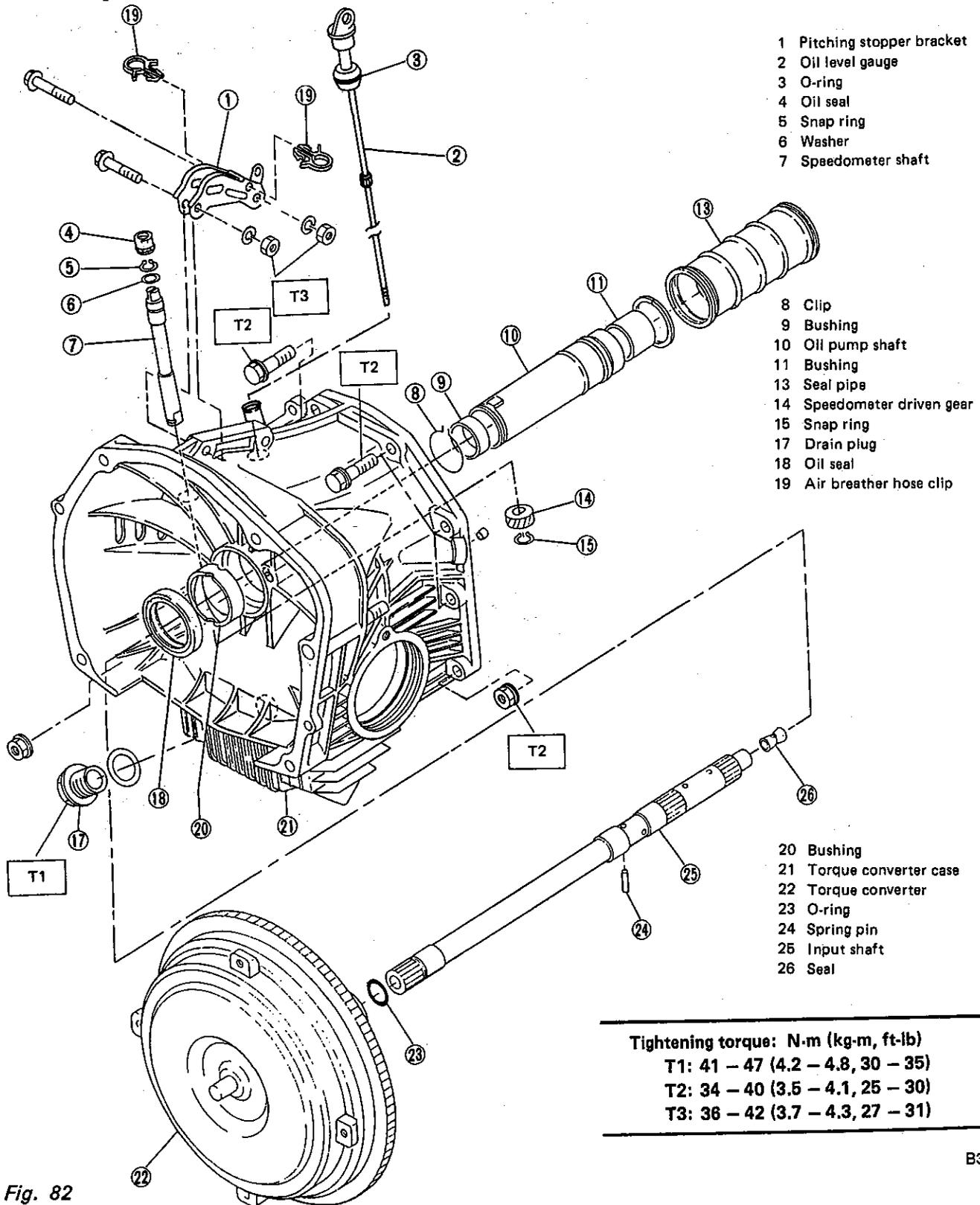


Fig. 81

# C COMPONENT PARTS

## 1. 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 Air breather hose clip

- 20 Bushing
- 21 Torque converter case
- 22 Torque converter
- 23 O-ring
- 24 Spring pin
- 25 Input shaft
- 26 Seal

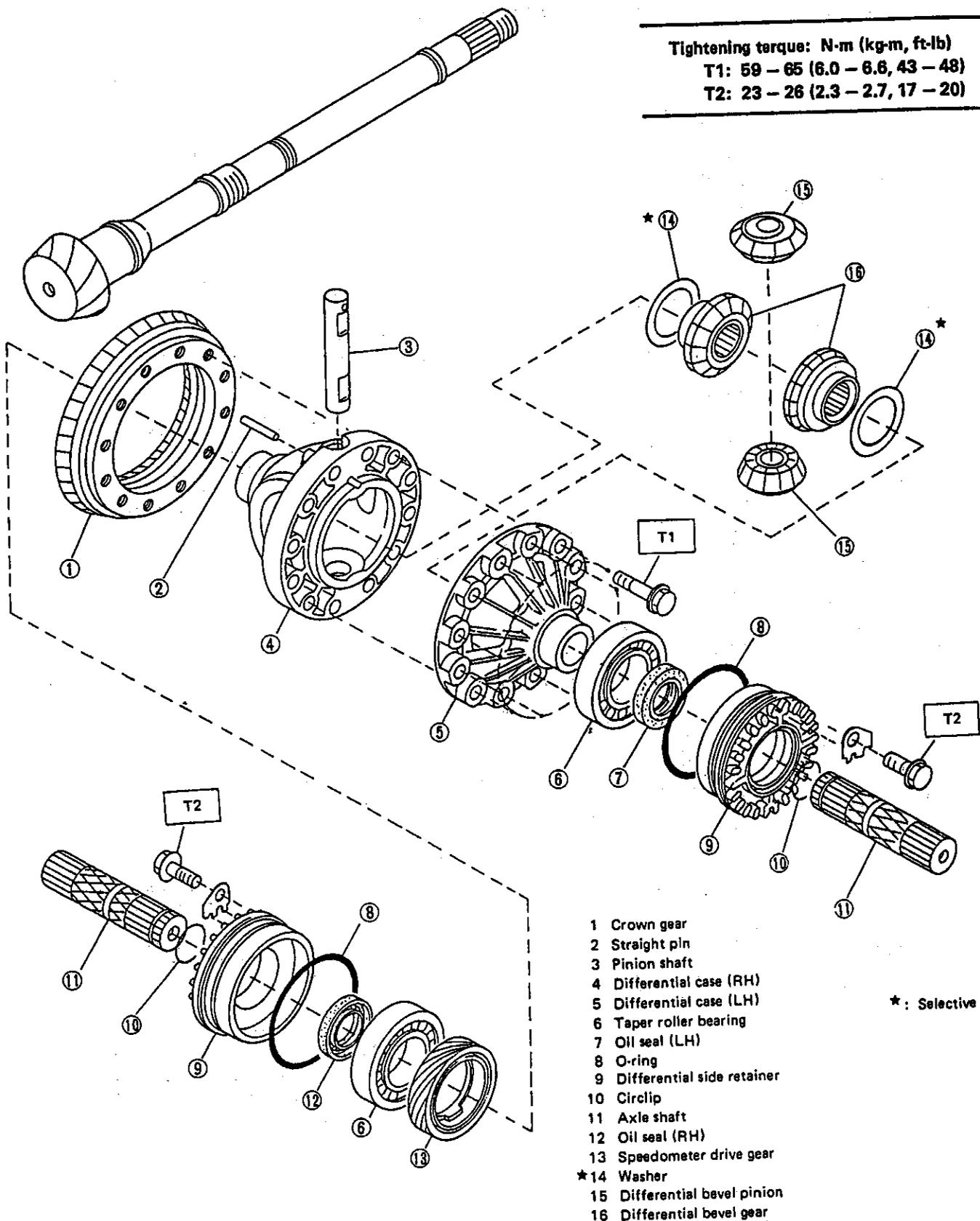
**Tightening torque: N·m (kg·m, ft·lb)**  
**T1: 41 - 47 (4.2 - 4.8, 30 - 35)**  
**T2: 34 - 40 (3.5 - 4.1, 25 - 30)**  
**T3: 36 - 42 (3.7 - 4.3, 27 - 31)**

Fig. 82

B3-964L

## 2. Differential Case

Tightening torque: N-m (kg-m, ft-lb)  
 T1: 59 - 65 (6.0 - 6.6, 43 - 48)  
 T2: 23 - 26 (2.3 - 2.7, 17 - 20)

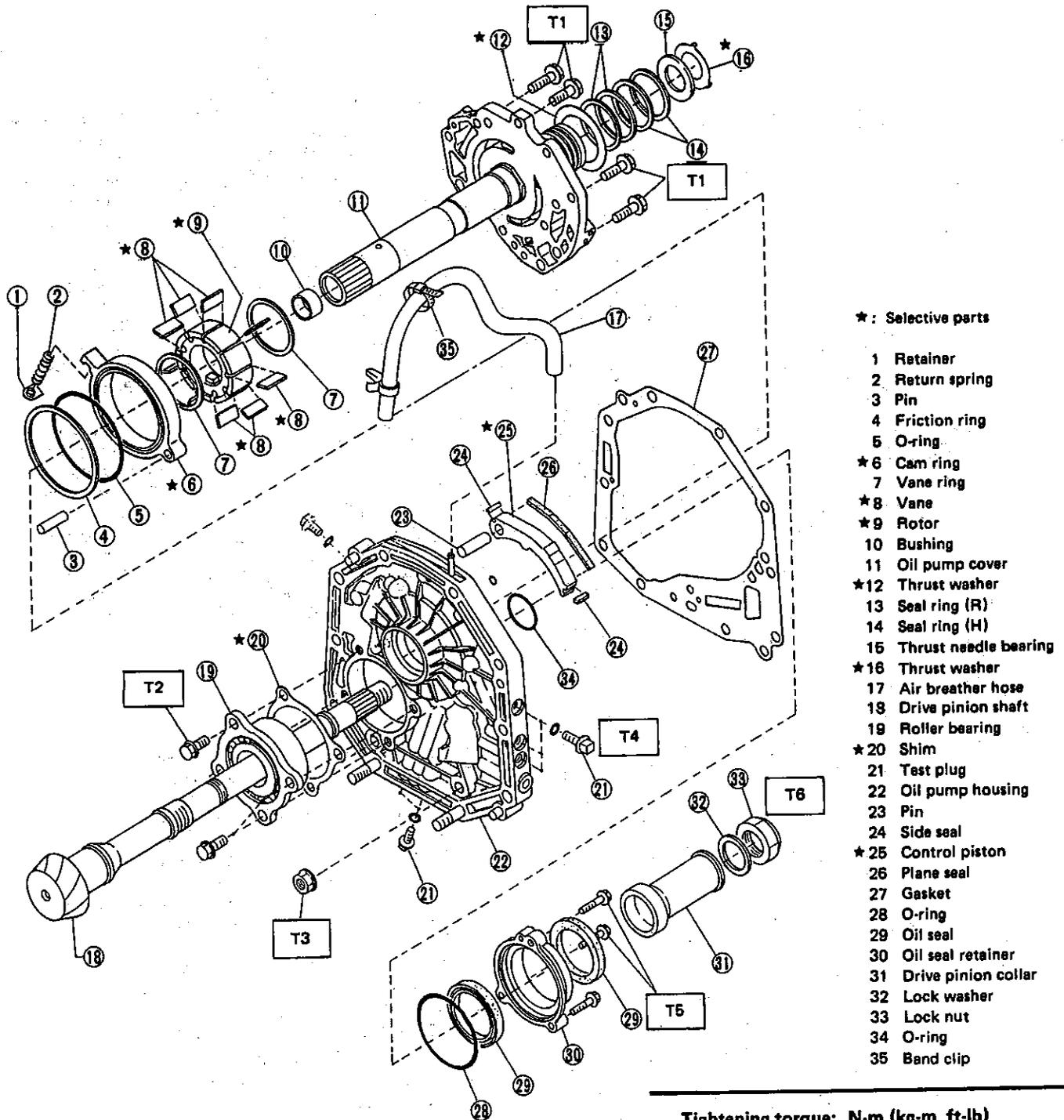


- 1 Crown gear
- 2 Straight pin
- 3 Pinion shaft
- 4 Differential case (RH)
- 5 Differential case (LH)
- 6 Taper roller bearing
- 7 Oil seal (LH)
- 8 O-ring
- 9 Differential side retainer
- 10 Circlip
- 11 Axle shaft
- 12 Oil seal (RH)
- 13 Speedometer drive gear
- ★14 Washer
- 15 Differential bevel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

★ : Selective parts

Fig. 83

### 3. Oil Pump



★ : 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 Drive pinion collar
- 32 Lock washer
- 33 Lock nut
- 34 O-ring
- 35 Band clip

**Tightening torque: N·m (kg·m, ft·lb)**

**T1: 23 – 26 (2.3 – 2.7, 17 – 20)**

**T2: 36 – 42 (3.7 – 4.3, 27 – 31)**

**T3: 38 – 44 (3.9 – 4.5, 28 – 33)**

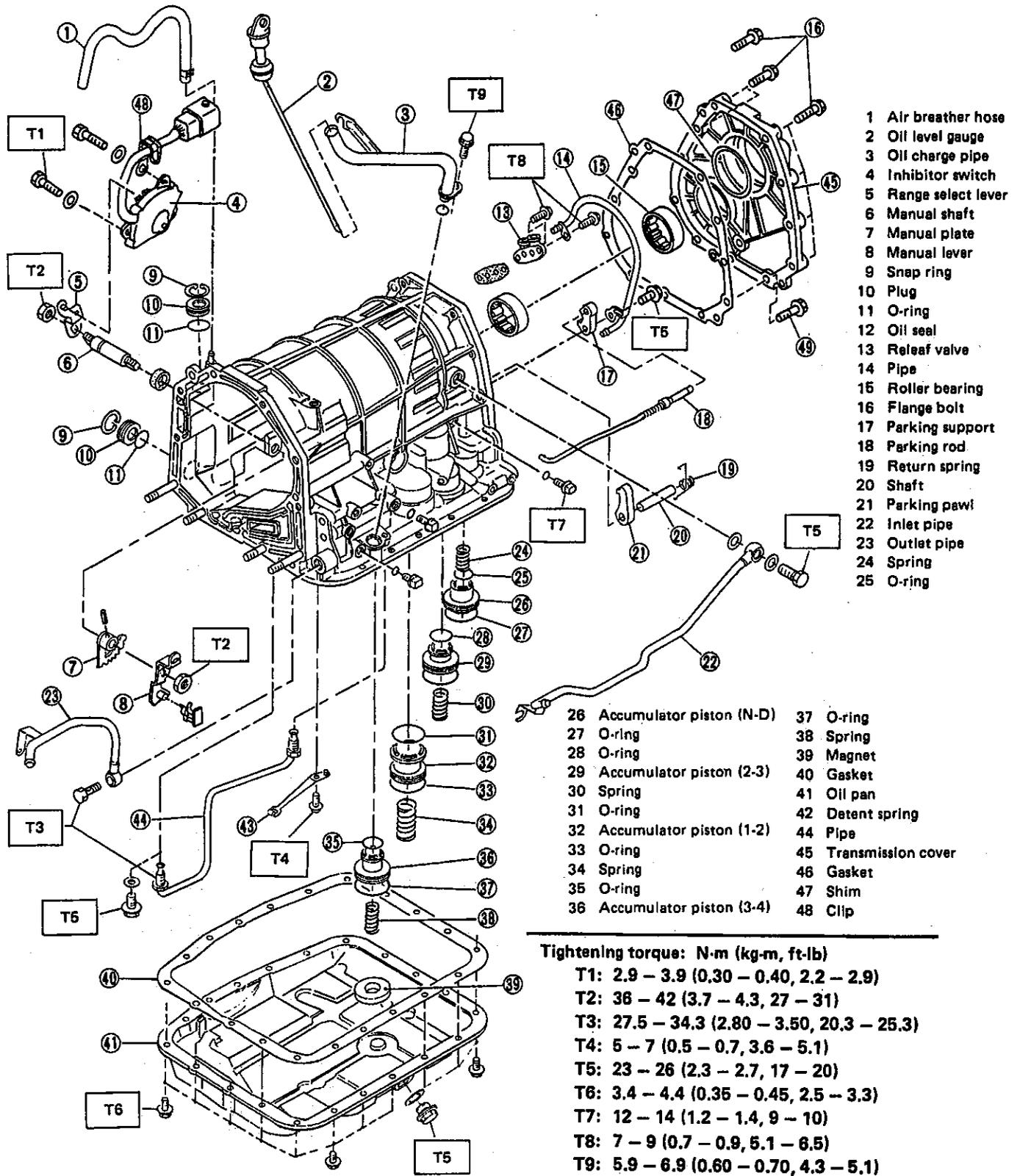
**T4: 12 – 14 (1.2 – 1.4, 9 – 10)**

**T5: 6 – 8 (0.6 – 0.8, 4.3 – 5.8)**

**T6: 108 – 118 (11.0 – 12.0, 80 – 87)**

Fig. 84

### 4. Transmission Case, Transmission Cover and Control Device



- 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 Relief valve
- 14 Pipe
- 15 Roller bearing
- 16 Flange bolt
- 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

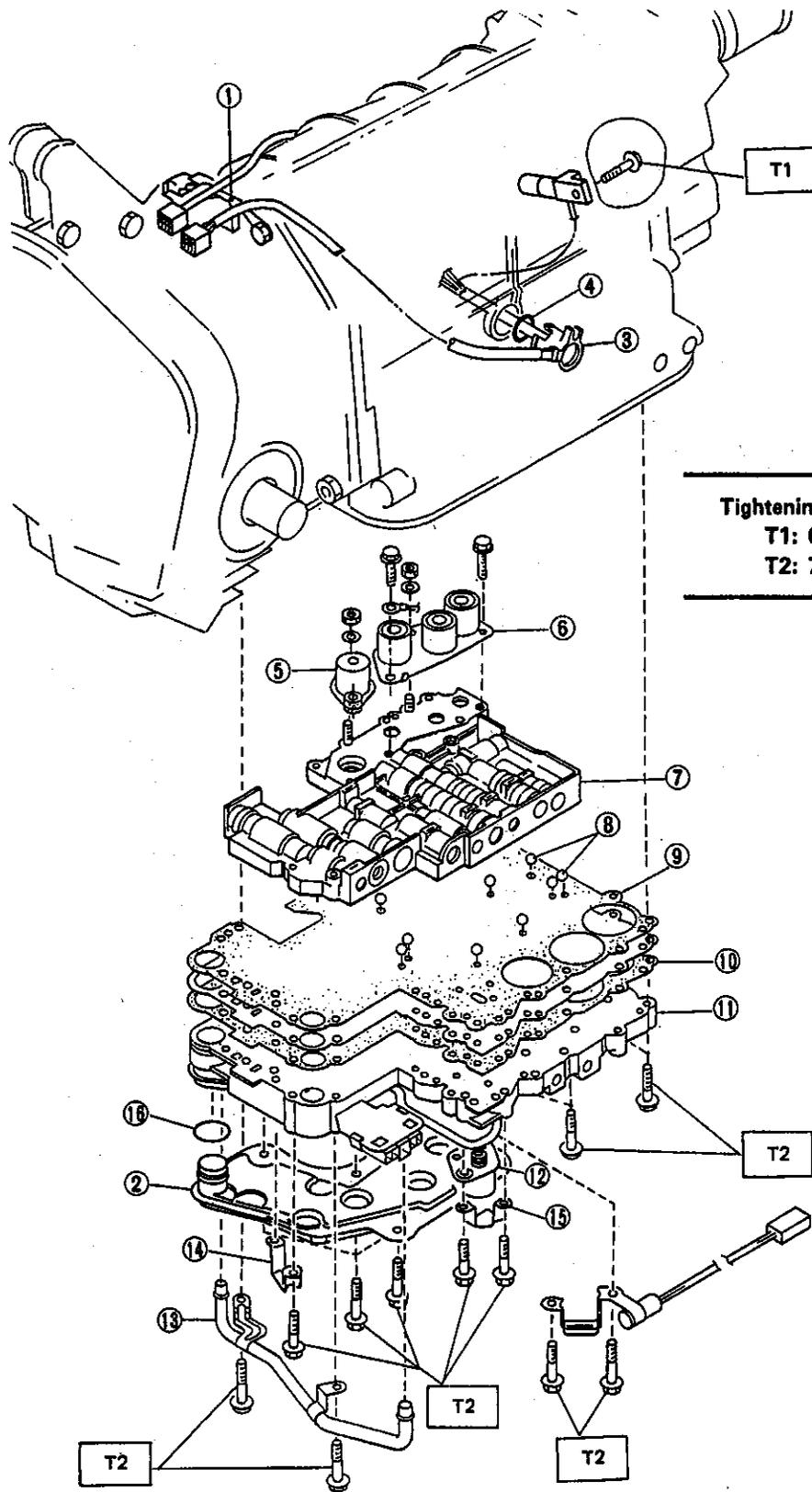
- 26 Accumulator piston (N-D)
- 27 O-ring
- 28 O-ring
- 29 Accumulator piston (2-3)
- 30 Spring
- 31 O-ring
- 32 Accumulator piston (1-2)
- 33 O-ring
- 34 Spring
- 35 O-ring
- 36 Accumulator piston (3-4)
- 37 O-ring
- 38 Spring
- 39 Magnet
- 40 Gasket
- 41 Oil pan
- 42 Detent spring
- 44 Pipe
- 45 Transmission cover
- 46 Gasket
- 47 Shim
- 48 Clip

**Tightening torque: N·m (kg·m, ft·lb)**

T1:	2.9 - 3.9 (0.30 - 0.40, 2.2 - 2.9)
T2:	36 - 42 (3.7 - 4.3, 27 - 31)
T3:	27.5 - 34.3 (2.80 - 3.50, 20.3 - 25.3)
T4:	5 - 7 (0.5 - 0.7, 3.6 - 5.1)
T5:	23 - 26 (2.3 - 2.7, 17 - 20)
T6:	3.4 - 4.4 (0.35 - 0.45, 2.5 - 3.3)
T7:	12 - 14 (1.2 - 1.4, 9 - 10)
T8:	7 - 9 (0.7 - 0.9, 5.1 - 6.5)
T9:	5.9 - 6.9 (0.60 - 0.70, 4.3 - 5.1)

Fig. 85

### 5. Control Valve and Harness Routing



Tightening torque: N·m (kg·m, ft·lb)  
 T1: 6 - 8 (0.6 - 0.8, 4.3 - 5.8)  
 T2: 7 - 9 (0.7 - 0.9, 5.1 - 6.5)

- 1 Stay
- 2 Oil strainer
- 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 Bracket
- 15 Bracket
- 16 O-ring

Fig. 86

### 6. Reverse Clutch and Band Brake

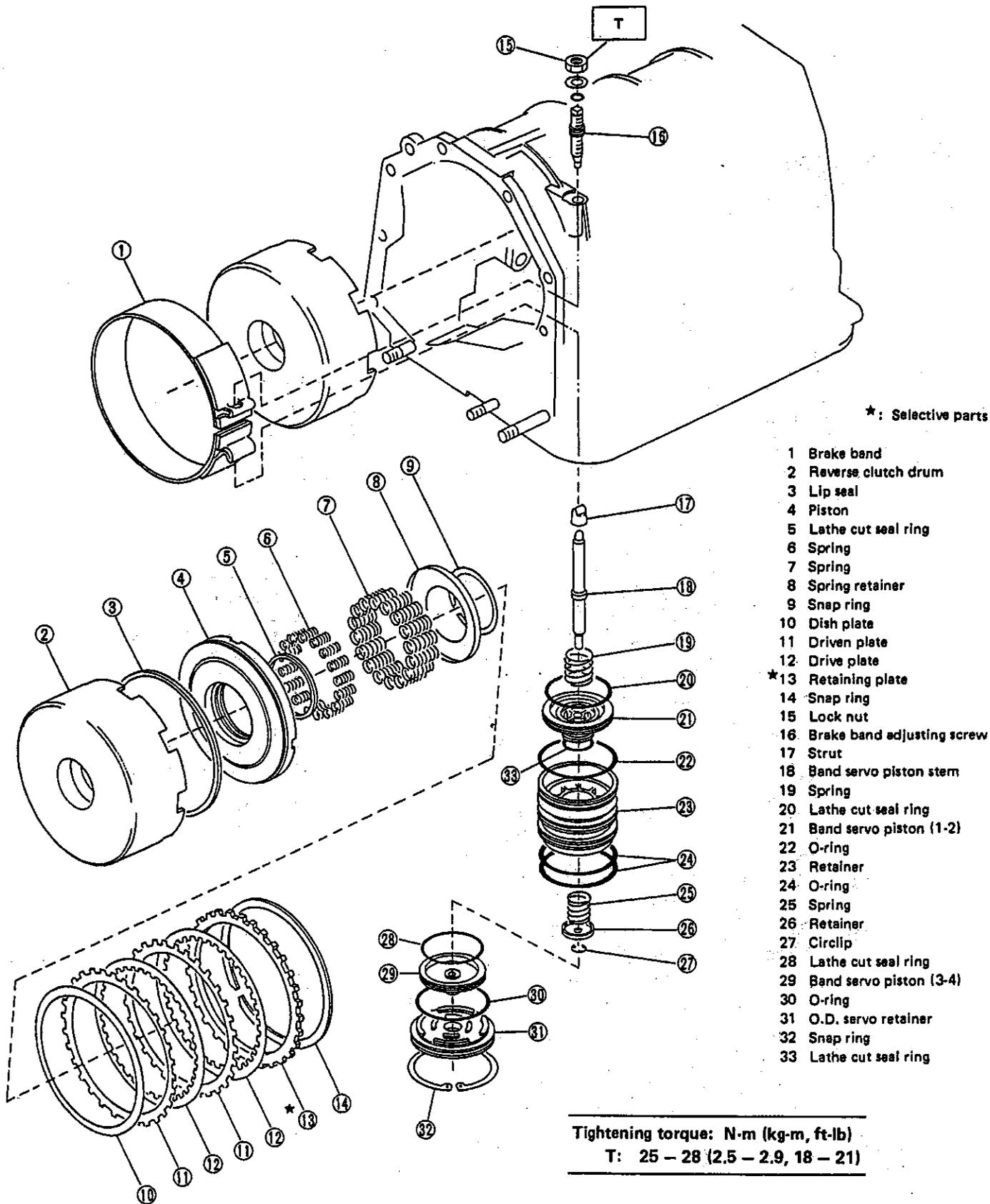
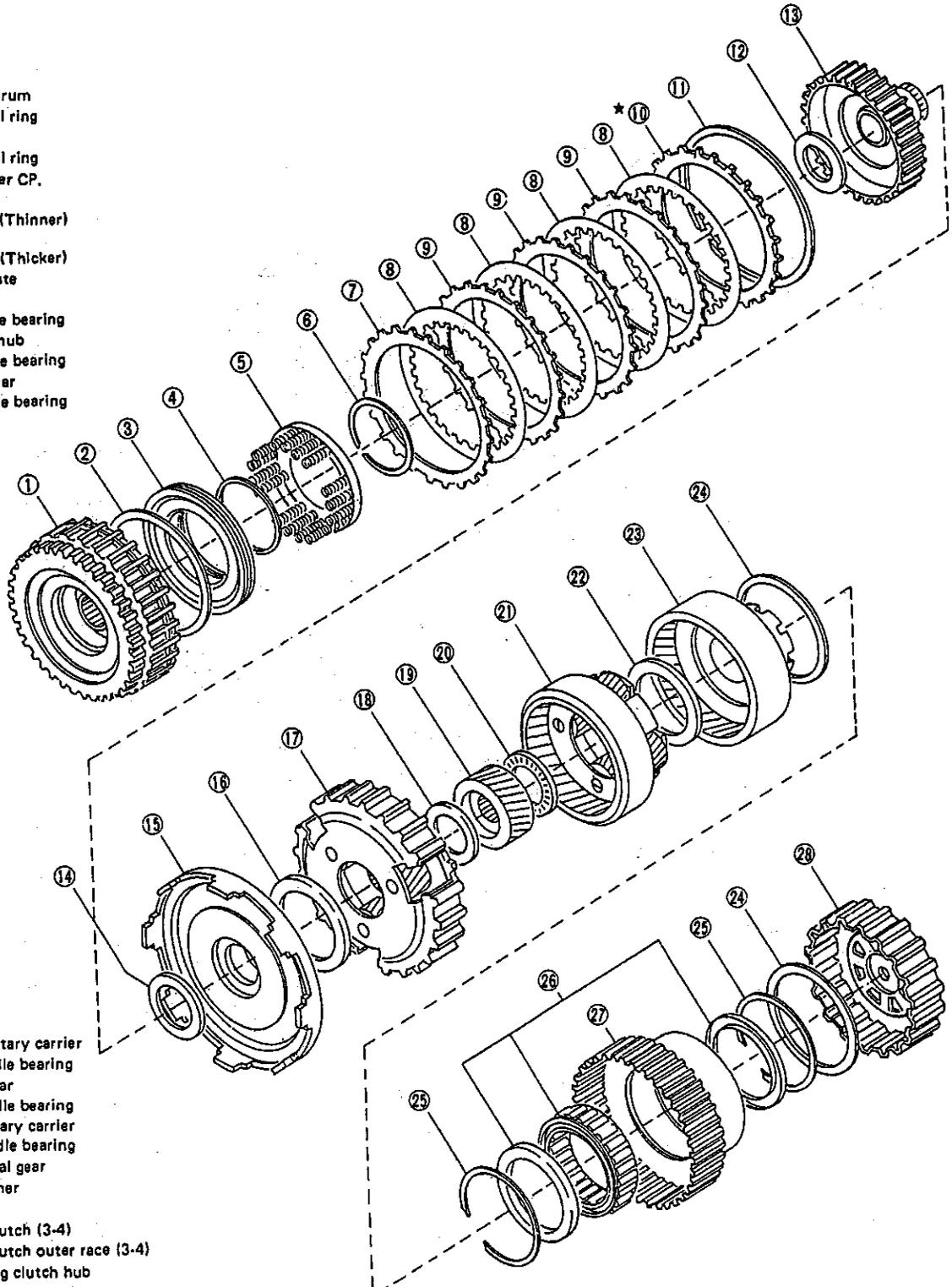


Fig. 87

## 7. 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. 88

### 8. Forward Clutch and Low & Reverse Brake

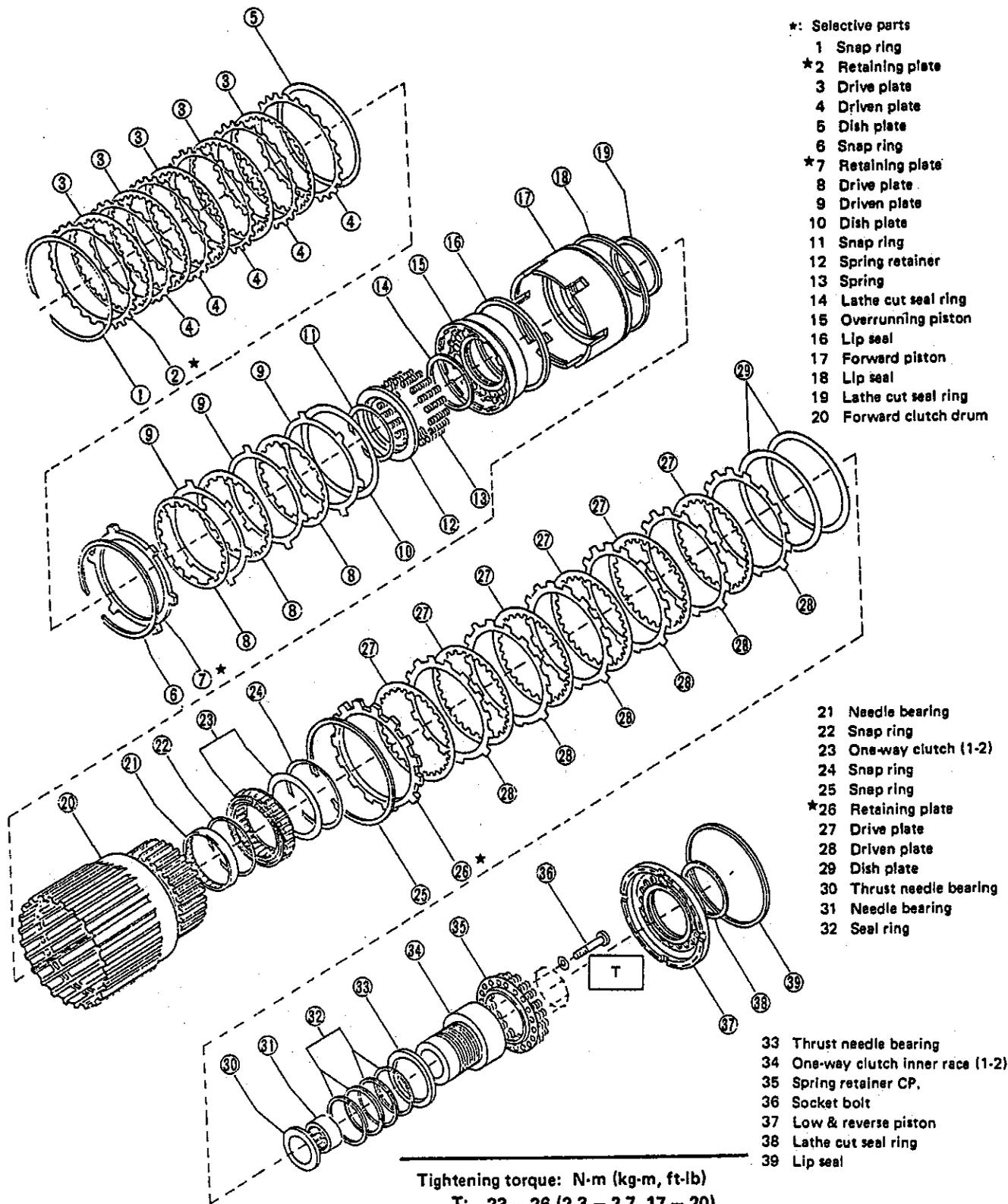


Fig. 89

### 9. Reduction Gear

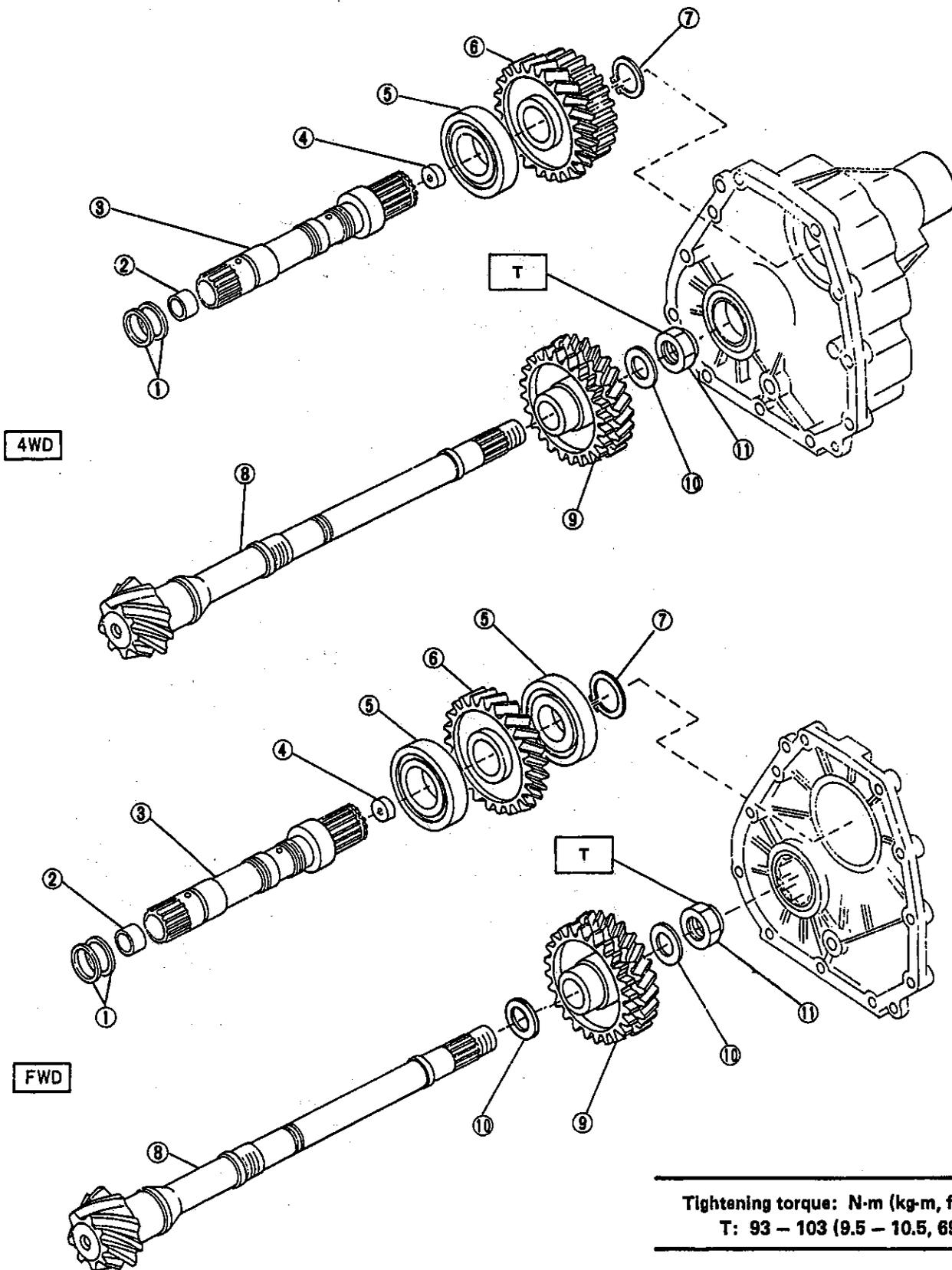


Fig. 90

# 10. Transfer and Extension

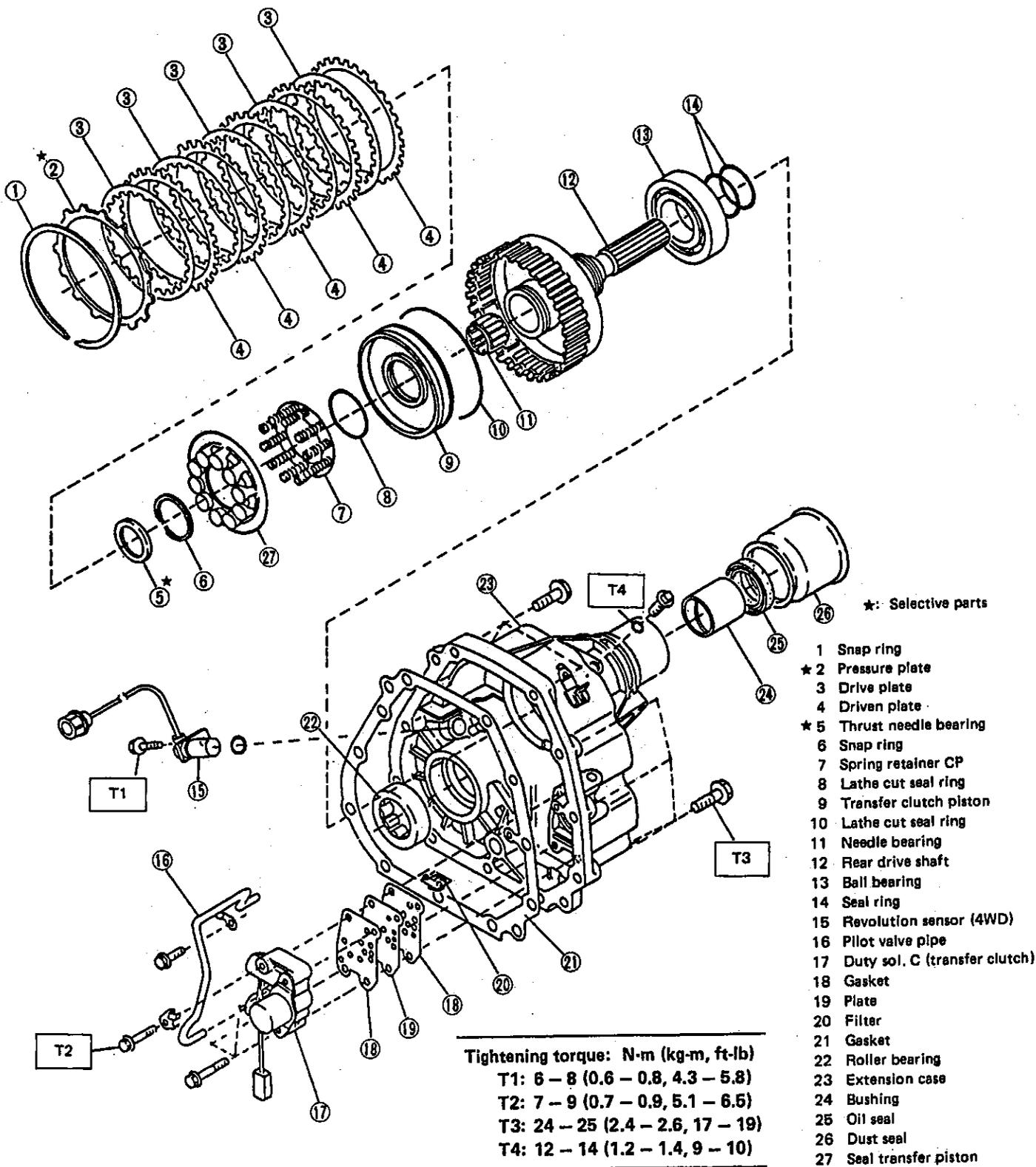


Fig. 91

## W SERVICE PROCEDURE

### 1. Precaution

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

#### 1) Workshop

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

#### 2) Worktable

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

#### 3) Cleaning of exterior

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

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

#### 4) Disassembly, assembly and cleaning

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

(2) During job, don't use gloves. Don't clean the parts with rags: Use chamois or nylon cloth.

(3) Pay special attention to the air to be used for cleaning. Get the moisture and the dust rid of the air as much as possible. Be careful not to scratch or dent any part while checking for proper operation with an air gun.

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

(5) Use kerosene, white gasoline or the equivalent as washing fluid. Use always new fluid for cleaning the automatic transmission parts and never reuse. The used fluid is usable in disassemble and assemble work of engine and manual transmission.

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

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

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

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

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

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

(12) Do not reuse old pipes, gaskets, spring pins, etc. Install new ones.

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

## 2. On-Car Service

### A: INSPECTION

#### 1. ATF LEVEL

1) Raise ATF temperature to 60 to 80°C (140 to 176°F) from 40 to 60°C (104 to 140°F) (when cold) by driving 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.

2) Ensure the vehicle is level. After selecting all positions (P, R, N, D, 3, 2, 1), set the selector lever in "P" range. Measure fluid level with the engine idling.

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

3) If the fluid level is below the center between upper and lower marks, add the recommended ATF until the fluid level is found within the specified range (above the center between upper and lower 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.

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

b. ATF level varies with temperature. Remember that the addition of fluid to the upper limit mark when the transmission is cold will result in the overfilling of fluid.

4) 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

5) 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.

#### 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.

#### 3. OIL LEAKAGE

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:

(Joining 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 (FWD)
- Transmission case and extension case jointing portion (4WD)

Converter housing

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

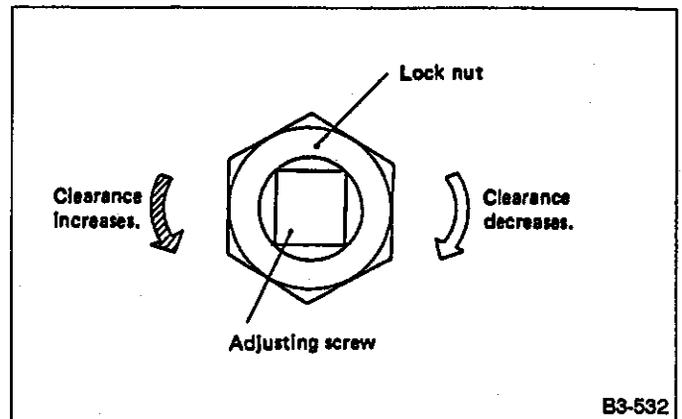
- Extension case (Defective casting)
- O-ring on the revolution sensor
- Rear drive shaft oil seal
- Checking blind plugs (steel ball)
- O-ring on the testing

Transmission cover

- Transmission cover (Defective casting)

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

- 1) 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.
- 2) Wipe clean the leaking oil and dust from a suspectable area, using a noninflammable organic solvent such as carbon tetrachloride.
- 3) 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. Also check for fluid leaks while shifting select lever to "R", "2", and "1".



B3-532

Fig. 93

● 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
399603610	SOCKET WRENCH

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

2) In case of the occurrence of problems 1 and 4 mentioned previously, perform the adjustment as follows:  
Adjusting procedure: Tighten adjusting screw to 9 N·m (0.9 kg-m, 6.5 ft-lb) torque, then back off three turns.

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

3) With the adjusting screw immobilized, tighten the lock nut to 25 — 28 N·m (2.5 — 2.9 kg-m, 18 — 21 ft-lb) torque.

**2. 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 light on the instrument panel.

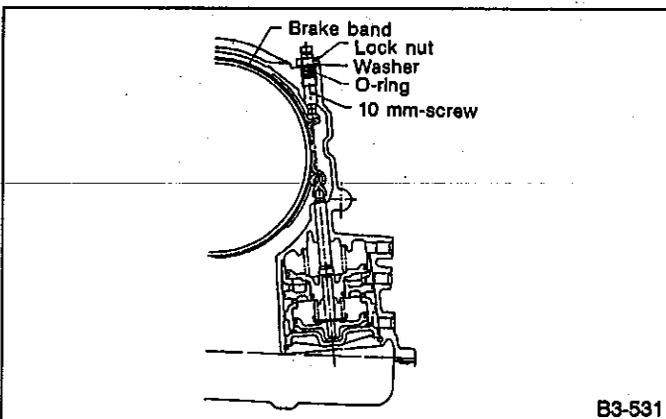
When light operation, driving condition or starter motor operation is erroneous, first check the shift linkage for improper operation. If the shift linkage is functioning properly, check the inhibitor switch.

**B: ADJUSTMENT**

**1. BRAKE BAND**

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

Improper brake band clearances and their symptoms	
Clearance	Problem
1. Too wide	Upshift from 1st directly to 3rd gear occurs.
2. Wide	<ul style="list-style-type: none"> <li>● Engine rpm increases abruptly while upshifting from 1st to 2nd gear or 3rd to 4th gear.</li> <li>● Time lag of at least one second occurs during kickdown operation from 3rd to 2nd gear.</li> </ul>
3. Small	"Braking" symptom occurs while upshifting from 2nd to 3rd gear.
4. Too small	Upshifts from 2nd to 4th gear and downshifts from 4th to 2nd gear occur repeatedly.



B3-531

Fig. 92

(Inspection)

- 1) Disconnect cable end from select lever.
- 2) Disconnect inhibitor switch connector.
- 3) Check continuity in inhibitor switch circuits with select lever moved to each position.

Pin No.	4	3	2	1	8	7	6	5	12	11	10	9
Lead color	B	YL	Br	YG	YW	YB	R	GW	BY	BW	BW	GB
Position												
P	○	○								○	○	
R	○		○									○
N	○			○						○	○	
D	○				○							
3	○					○						
2	○						○					
1	○							○				
	Signal sent to AT control unit							Ignition circuit		Back-up light circuit		

Also check that continuity in ignition circuit does not exist when selector lever is in R, 3, 2 and 1 ranges.

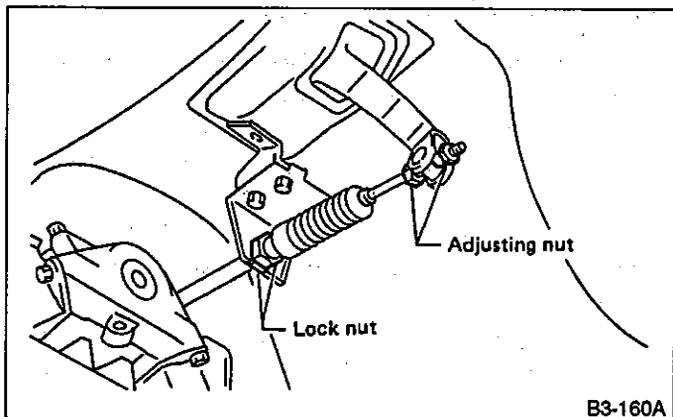


Fig. 94

- 4) Check if there is continuity at equal points when the select lever is turned 1.5° in both directions from the N range.

If there is continuity in one direction and the continuity in the other or if there is continuity at unequal points, adjust the inhibitor switch.

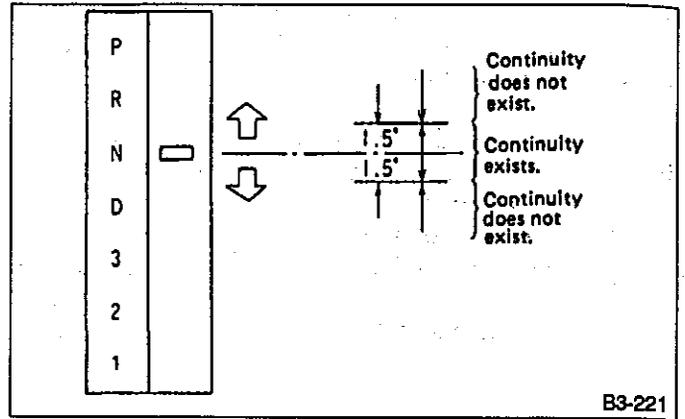


Fig. 95

(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:

3 — 4 N·m  
(0.3 — 0.4 kg-m, 2.2 — 2.9 ft-lb)

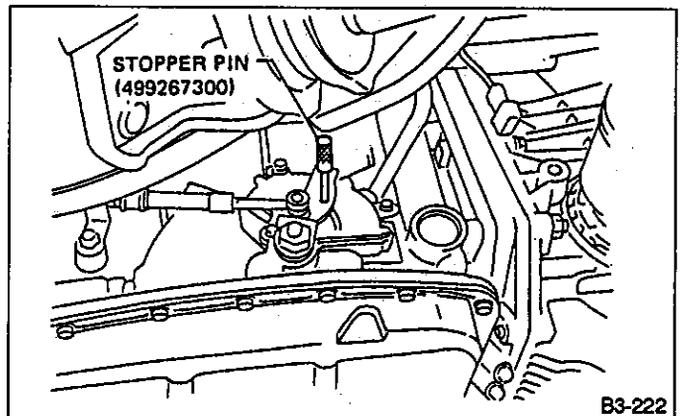


Fig. 96

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

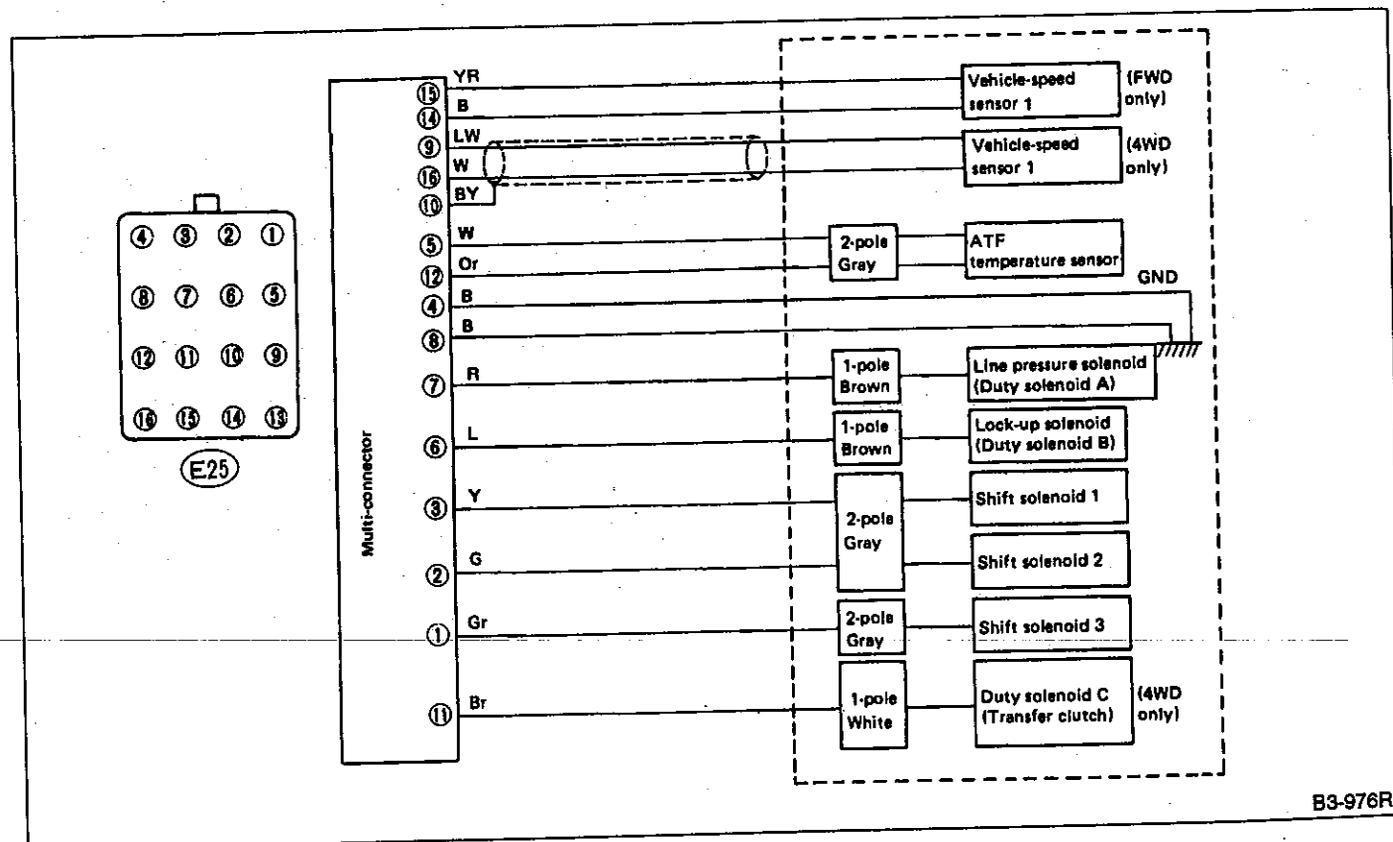
3. SENSOR (in transmission)

- 1) Check each sensor, solenoid and ground system for short circuits.

● **Standard values**

Part name	Terminal	Resistance (Ω)
Vehicle speed sensor 1	FWD	⑭—⑮
	4WD	⑨—⑯
ATF temperature sensor	⑤—⑫	100 — 6 k, 2.5 k/20°C (68°F)
Duty solenoid A (Line-pressure solenoid)	⑦—④ ⑧	Approx. 3
Duty solenoid B (Lock-up solenoid)	⑥—④ ⑧	Approx. 12
Shift solenoid 1	③—④ ⑧	Approx. 25
Shift solenoid 2	②—④ ⑧	Approx. 25
Shift solenoid 3	①—④ ⑧	Approx. 25
Duty solenoid C (4WD only) (Transfer clutch solenoid)	⑪—④ ⑧	Approx. 12

If part is faulty, its resistance value will be different from the standard value indicated above.



B3-976R

Fig. 97

2) Check vehicle speed sensor 2.

- (1) Disconnect 16-pin multiple connector from transmission.
- (2) Connect tester to connector receptacle on transmission.

(3) Drive vehicle at approximately 10 km/h (6 MPH).

(Judgement)

- Vehicle speed sensor is in good order if circuit tester registers 1 volt, AC.
- Resistance between connectors: Approx. 500 ohms

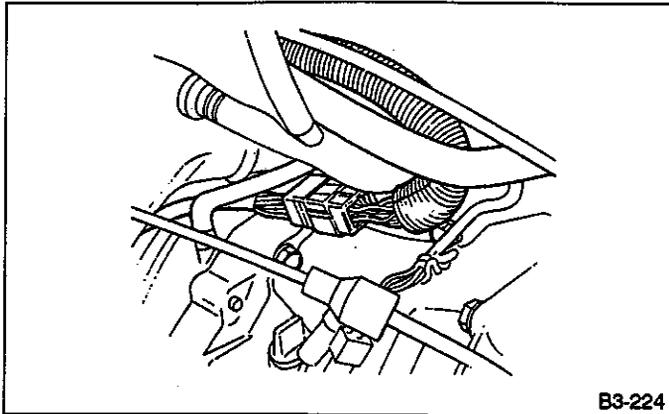


Fig. 98

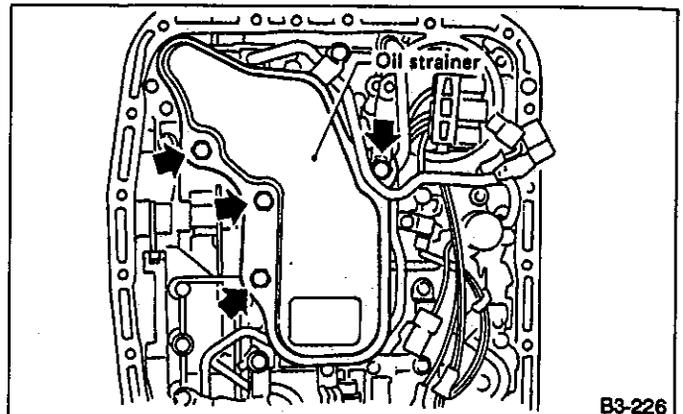


Fig. 100

**C: REMOVAL AND INSTALLATION**

**1. SHIFT SOLENOID, DUTY SOLENOID AND VALVE BODY**

1) Removal

- (1) Clean transmission exterior.
- (2) Drain ATF completely.

Tighten ATF drain plug after draining ATF.

Tightening torque:

23 — 26 N•m (2.3 — 2.7 kg-m, 17 — 20 ft-lb)

- (3) Remove oil pan and gasket.

Drain oil into a container.

- (4) Disconnect solenoid valve connectors. Remove connectors from clips and disconnect connectors at 5 places.

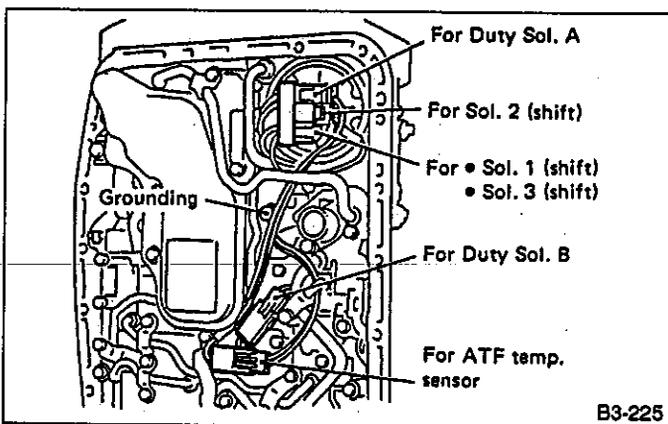


Fig. 99

- (5) Remove oil strainer. Disconnect oil pipe by removing the two bolts, and remove four bolts and oil strainer.

Be careful because oil flows from oil strainer.

- (6) Remove control valve body. Remove 8 long bolts (Black) and 11 short bolts (Yellow).

Be careful because oil flows from valve body.

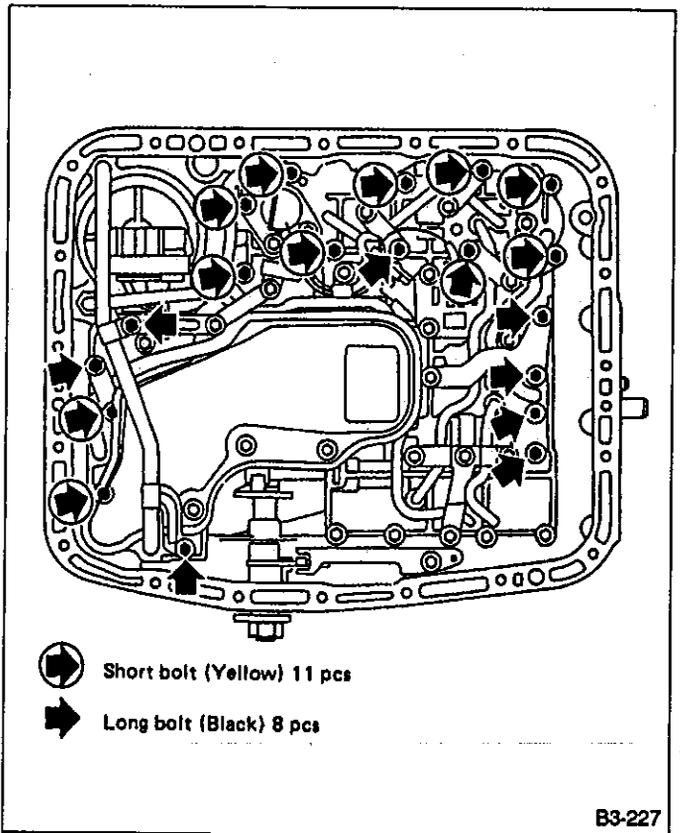


Fig. 101

(7) Remove shift solenoids 1, 2, and 3, and duty solenoid A.

(3) Install valve body.

**Tightening torque:**

8 N•m (0.8 kg-m, 5.8 ft-lb)

- a. Secure accumulator springs using vaseline.
- b. Align manual valve connections.
- c. Tighten duty solenoid B (lock-up) bracket and two bolts (also used to tighten valve body).

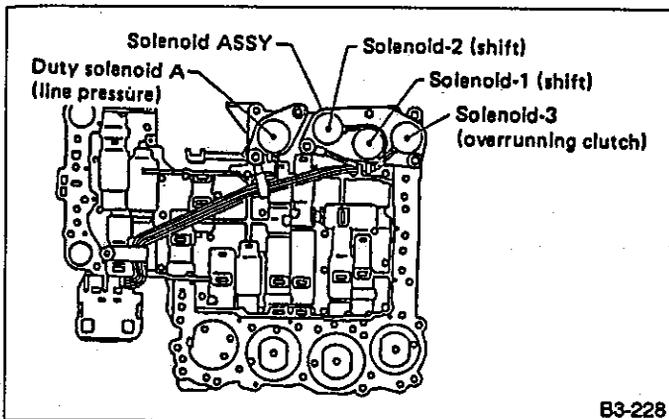


Fig. 102

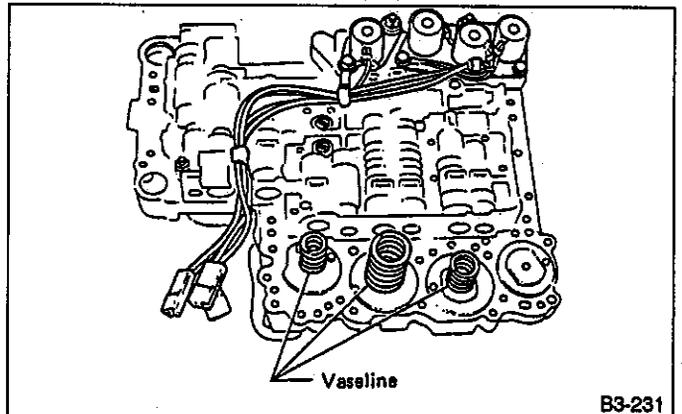


Fig. 105

2) Installation

(1) Install duty solenoid B (lock-up).

Tighten bolts shown by solid arrows. The two bolts and brackets shown by arrows "XX" must be tightened later.

(4) Install oil strainer.  
Also install oil pipe and harness connector bracket.

**Tightening torque:**

7 — 9 N•m (0.7 — 0.9 kg-m, 5.1 — 6.5 ft-lb)

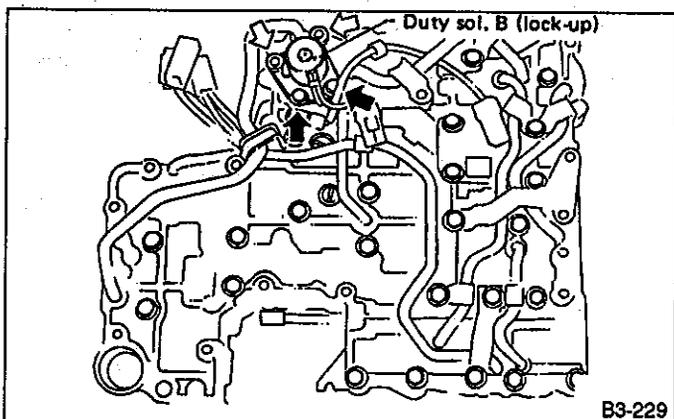


Fig. 103

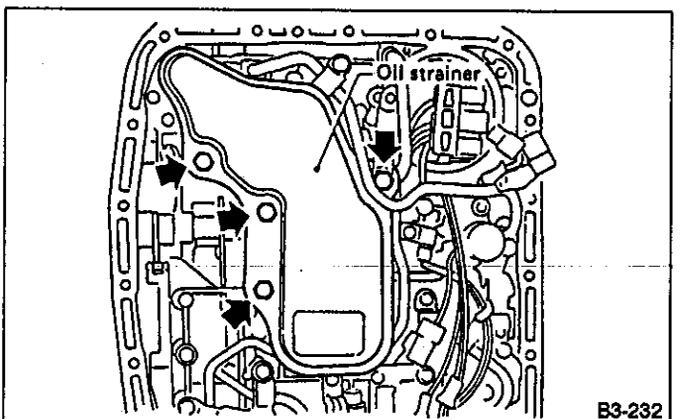


Fig. 106

(2) Install solenoid valves.

Shift solenoids, 1, 2 and 3, and duty solenoid A (line pressure).

(5) Connect harness connectors at 5 places.  
Connect connectors of same color, and secure connectors to valve body using clips.

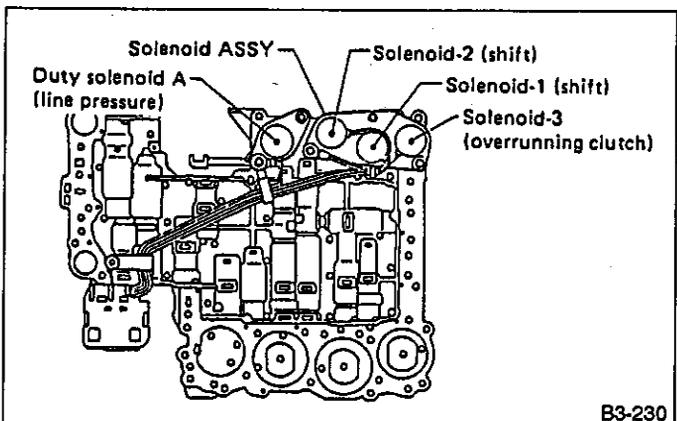


Fig. 104

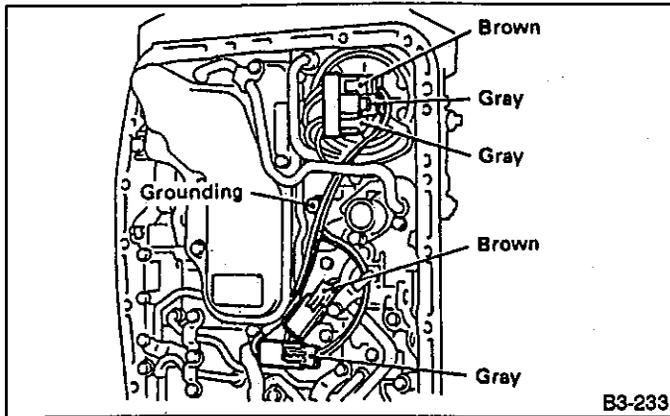


Fig. 107

(6) Install oil pan & gasket.

**Tightening torque:**

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

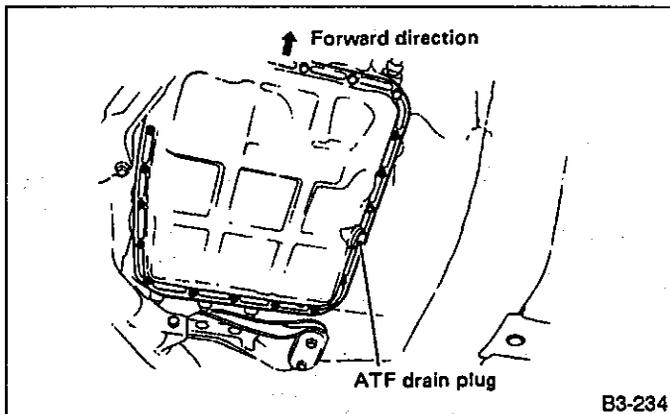


Fig. 108

(7) Add and check ATF.

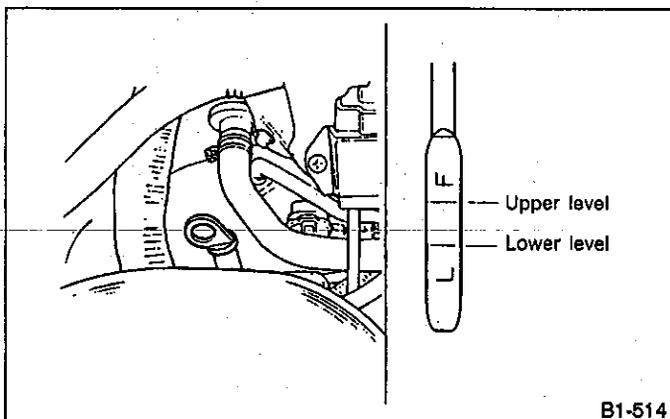


Fig. 109

## 2. DUTY SOLENOID C AND TRANSFER VALVE BODY

### 1) Removal

- (1) Remove pitching stopper.
- (2) Raise car and drain ATF.
- (3) Remove front exhaust pipe.  
Disconnect O<sub>2</sub> sensor connector, and remove exhaust pipe.
- (4) Remove propeller shaft.

**Before removing propeller shaft, scribe alignment marks on propeller shaft and rear differential coupling.**

- (5) Remove rear crossmember.

- Support transmission using a transmission jack and raise slightly.
- Remove bolts and nuts as shown in Figure.

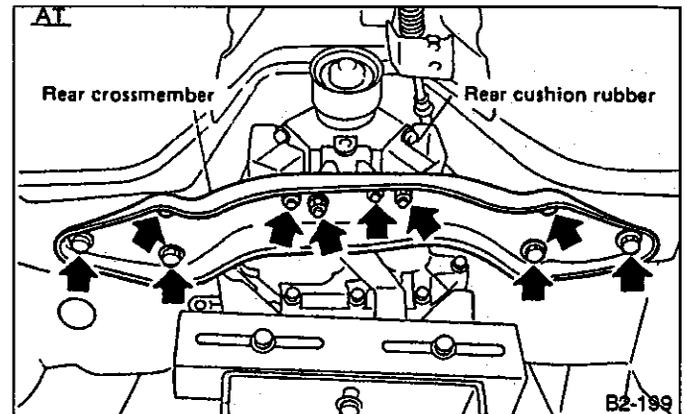


Fig. 110

- (6) Remove vehicle speed sensor 1.

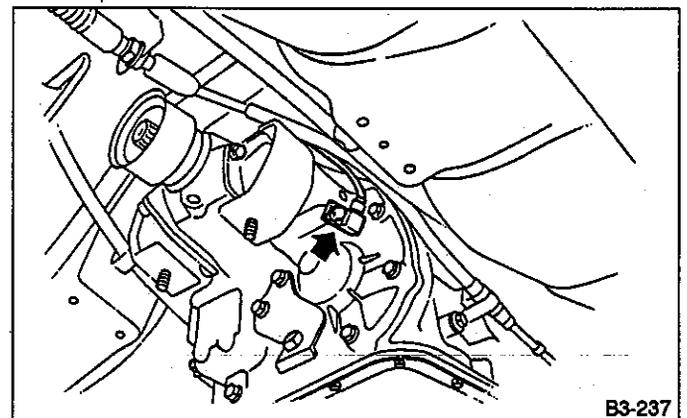
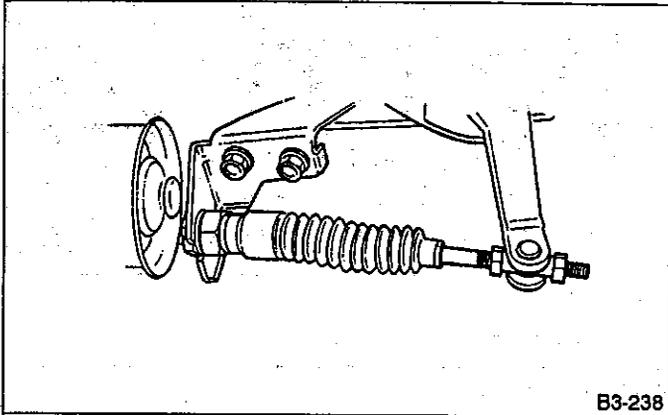


Fig. 111

(7) Remove extension & gasket.

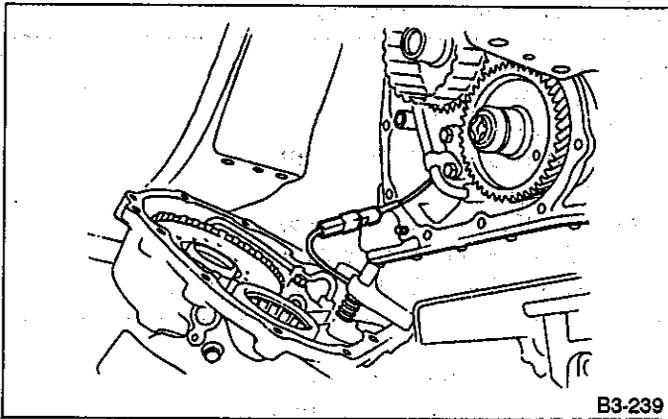
- Remove gear select cable nut.
- Move gear select cable so that extension bolts can be removed.



B3-238

Fig. 112

- Remove bolts.
  - Remove extension and disconnect duty solenoid C connector.
- a. Use a container to catch oil flowing from extension.  
 b. Do not force extension back before disconnecting solenoid connector. Otherwise, harness may be damaged.

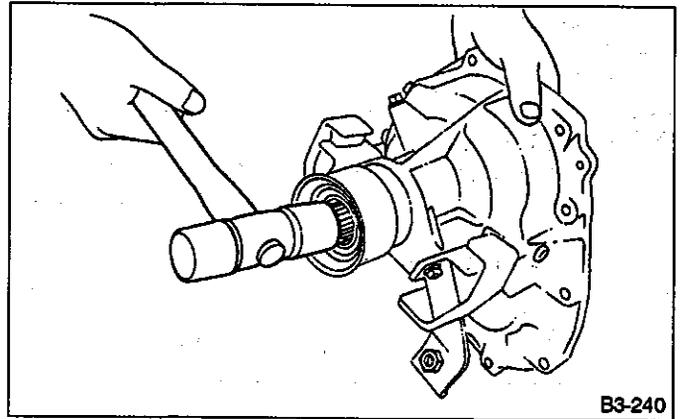


B3-239

Fig. 113

(8) Remove duty solenoid C & transfer valve body from extension.

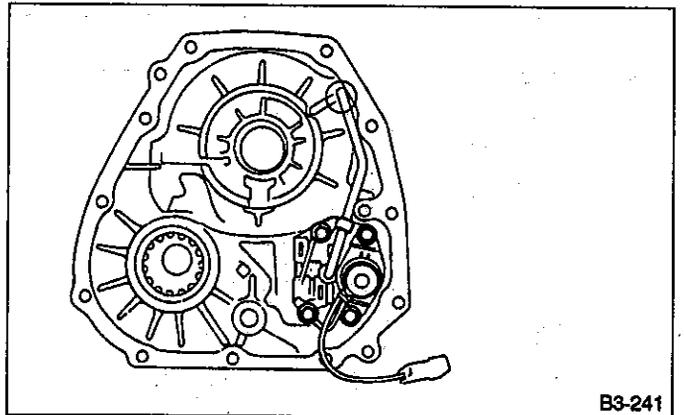
- Remove transfer clutch drum.



B3-240

Fig. 114

- Remove clamp which secures pipe.
- Remove bolts.



B3-241

Fig. 115

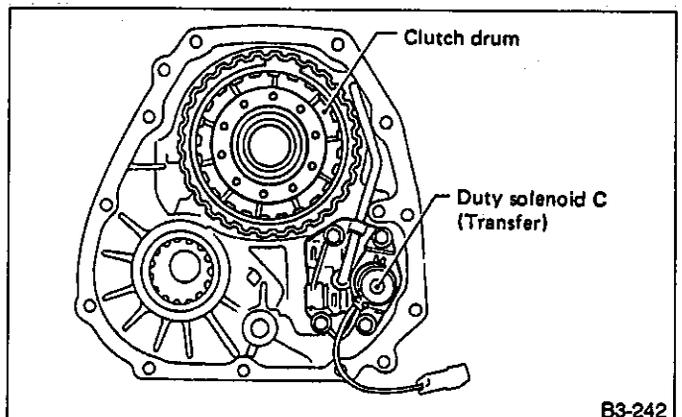
2) Installation

- (1) Install duty solenoid C & transfer valve body.
- Install duty solenoid C & transfer valve body.
  - Install pipe and clamp.

Tightening torque:

7 — 9 N•m (0.7 — 0.9 kg-m, 5.1 — 6.5 ft-lb)

- Install clutch drum.



B3-242

Fig. 116

- (2) Install extension.
- Connect connector.
  - Tighten 11 bolts.

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

- Install gear select cable.

**Tightening torque:**  
 10 — 18 N·m (1.0 — 1.8 kg-m, 7 — 13 ft-lb)

- (3) Install revolution sensor.

**Tightening torque:**  
 6 — 8 N·m (0.6 — 0.8 kg-m, 4.3 — 5.8 ft-lb)

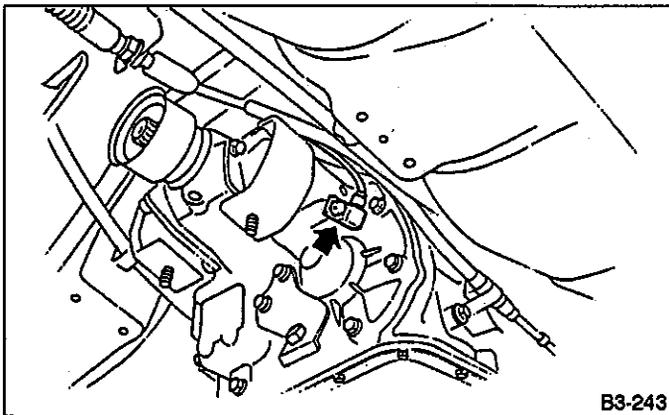


Fig. 117

- (4) Install rear crossmember.
- Tighten bolts.

**Tightening torque:**  
**Crossmember to body**  
 54 — 83 N·m (5.5 — 8.5 kg-m, 40 — 61 ft-lb)  
**Crossmember to cushion**  
 13 — 23 N·m (1.3 — 2.3 kg-m, 9 — 17 ft-lb)

- Low and remove transmission jack.

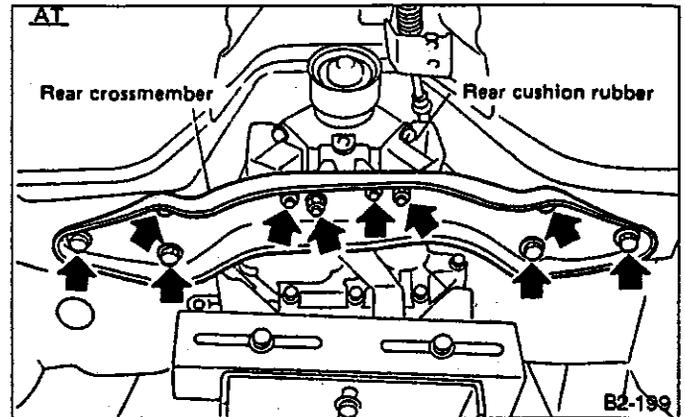


Fig. 118

- (5) Install propeller shaft.

**Tightening torque:**  
 N·m (kg-m, ft-lb)  
**At rear differential:**  
 18 — 27 (1.8 — 2.8, 13 — 20)  
**At center bearing:**  
 34 — 44 (3.5 — 4.5, 25 — 33)

Align marks on propeller shaft and rear differential coupling.

- (6) Install front exhaust pipe

**Tightening torque:**  
 N·m (kg-m, ft-lb)  
**At engine:**  
 25 — 34 (2.5 — 3.5, 18 — 25)  
**At hanger:**  
 25 — 34 (2.5 — 3.5, 18 — 25)  
**At front and rear connections:**  
 13 — 23 (1.3 — 2.3, 9 — 17)

- (7) Lower and remove jack.

- (8) Connect the following parts:

- O<sub>2</sub> sensor connector
- Revolution sensor connector
- Multi-connector

- (9) Install pitching stopper.

**Tightening torque:**  
 N·m (kg-m, ft-lb)  
 47 — 67 (4.8 — 6.8, 35 — 49) (Body side)  
 44 — 54 (4.5 — 5.5, 33 — 40) (Engine side)

- (10) Replenish ATF and check oil level. Check for leaks.

### 3. Performance Test

#### A: 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 (498575400).
- 4) OIL PRESSURE ADAPTER (498897200).
- 5) Stop watch.

#### B: STALL TEST

##### 1. GENERAL

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.
- 2) To check the operation of the torque converter.
- 3) To check engine performance.

##### 2. TEST METHODS

Preparations before test

- ① Check that throttle valve opens fully.
- ② Check that engine oil level is correct.
- ③ Check that coolant level is correct.
- ④ Check that ATF level is correct.
- ⑤ Check that differential gear oil level is correct.
- ⑥ Increase ATF temperature to 60 — 80°C (140 — 176°F) by idling the engine for approximately 30 minutes (with select lever set to "N" or "P").

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

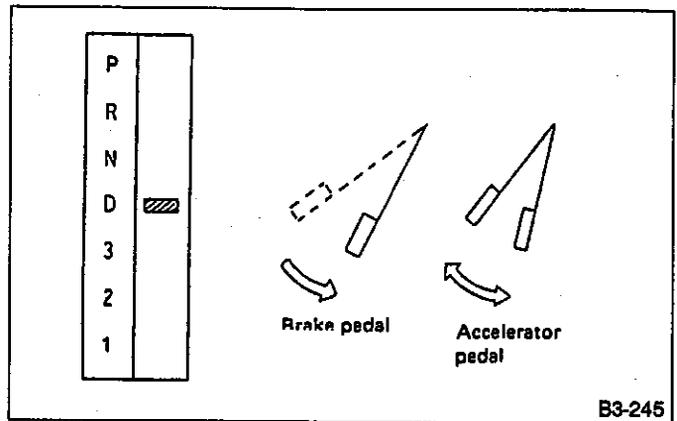


Fig. 119

- 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.

#### Specifications

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

- |                    |                   |
|--------------------|-------------------|
| 2200 cc MPFI       | 2,600 — 3,000 rpm |
| 2000 cc MPFI       | 2,300 — 2,700 rpm |
| 1800 cc Carburetor | 2,600 — 3,000 rpm |

### 3. EVALUATION

Stall speed (at sea level)	Position	Cause
Less than specifications	D, R, 2	<ul style="list-style-type: none"> <li>• Throttle valve not fully open</li> <li>• Erroneous engine operation</li> <li>• Torque converter's one-way clutch slipping</li> </ul>
Greater than specifications	D only	<ul style="list-style-type: none"> <li>• Line pressure too low</li> <li>• Forward clutch slipping</li> <li>• One-way clutch (1 - 2) malfunctioning</li> <li>• One-way clutch (3-4) malfunctioning</li> </ul>
	R only	<ul style="list-style-type: none"> <li>• Line pressure too low</li> <li>• Reverse clutch slipping</li> <li>• Low &amp; reverse brake slipping</li> </ul>
	2 only	<ul style="list-style-type: none"> <li>• Line pressure too low</li> <li>• Forward clutch slipping</li> <li>• Brake band slipping</li> </ul>
	R, D, 2	<ul style="list-style-type: none"> <li>• Line pressure too low</li> <li>• ATF insufficient</li> </ul>

### C: TIME LAG TEST

#### 1. GENERAL

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:

- Perform the test at normal operation fluid temperature (60 to 80°C or 140 to 176°F).
- Be sure to allow a one minute interval between tests.
- Make three measurements and take the average value.

#### 2. TEST METHODS

- Fully apply the parking brake.
- Start the engine.

Check idling speed (A/C OFF)

"N" range: 700 ± 100 rpm

- 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

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

Time lag: Less than 1.5 seconds

#### 3. EVALUATION

- If "N" → "D" time lag is longer than specified:
  - Line pressure too low

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

### D: LINE PRESSURE TEST

#### 1. GENERAL

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.

- Line pressure measurement (under no load)

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

- Maintain temperature of ATF at approximately 60 to 80°C (140 to 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".)

- Line pressure measurement (under heavy load)

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

- Measure line pressure when select lever is in "R", "D", "2" and "1" with engine under stall conditions.

- Measure line pressure within 5 seconds after shifting the select lever to each position. (If line pressure needs to be measured again, allow the engine to idle and then stop. Wait for at least one minute before measurement.)

- Maintain the temperature of ATF at approximately 60 to 80°C (140 to 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".)

#### 2. TEST METHODS

- Temporarily attach the OIL PRESSURE GAUGE ASSY (498575400) to a suitable place in the driver's compartment, remove the blind plug located in front of the toeboard and pass the hose of the GAUGE ASSY to the engine compartment.

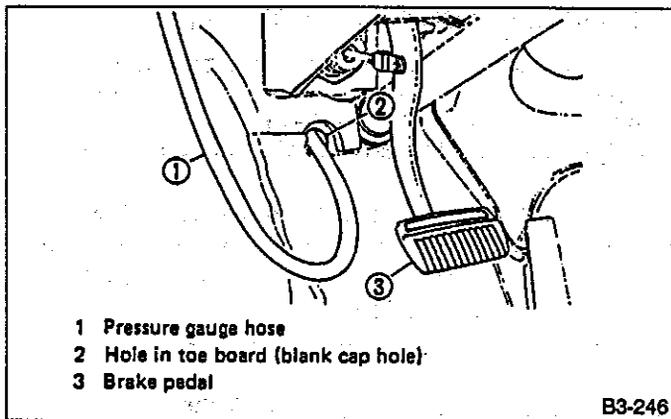


Fig. 120

2) Remove the test plug and install OIL PRESSURE GAUGE ADAPTER (498897200) instead.

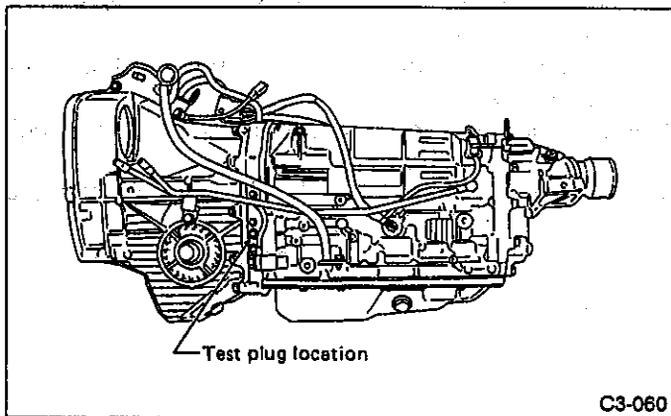


Fig. 121

3) Connect OIL PRESSURE GAUGE ADAPTER (498897200) with OIL PRESSURE GAUGE ASSY (498575400).

4) Start the engine and warm it up.

5) Check line pressure in accordance with the following chart.

### 3. EVALUATION

Under no load: "P", "R", "D", "3", "2" and "1"

Under full load: "R", "D", "3", "2" and "1"

(With engine running at stall speed)

<Standard line pressure>

Unit: kPa (kg/cm<sup>2</sup>, psi)

	Min. line pressure	Max. line pressure
Range	800 — 800 rpm	Stall rpm
P	441 — 569 (4.5 — 5.8, 64 — 82)	—
R	588 — 686 (6.0 — 7.0, 85 — 100)	1,422 — 1,589 (14.5 — 16.2, 206 — 230)
N	441 — 569 (4.5 — 5.8, 64 — 82)	—
D	441 — 569 (4.5 — 5.8, 64 — 82)	1,128 — 1,255 (11.5 — 12.8, 164 — 182)
3	441 — 569 (4.5 — 5.8, 64 — 82)	1,128 — 1,255 (11.5 — 12.8, 164 — 182)
2	441 — 569 (4.5 — 5.8, 64 — 82)	1,128 — 1,255 (11.5 — 12.8, 164 — 182)
1	441 — 569 (4.5 — 5.8, 64 — 82)	1,128 — 1,255 (11.5 — 12.8, 164 — 182)
Accelerator pedal	Fully-closed	Fully-open

### E: TRANSFER CLUTCH PRESSURE TEST

Check transfer clutch pressure in accordance with the following chart in the same manner as with line pressure.

Under no load: "R" and "D" ranges

Under heavy load:

"R" and "D" ranges in 4WD mode

"R" and "D" ranges in FWD mode

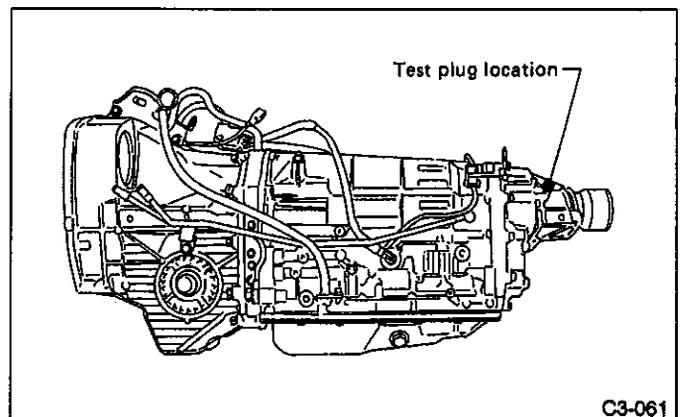


Fig. 122

Unit: kPa (kg/cm<sup>2</sup>, psi)

	4WD mode		FWD mode
	Low pressure side	High pressure side	High pressure side
Range	600 — 800 rpm	Stall rpm	Stall rpm
R	49 — 78 (0.5 — 0.8, 7 — 11)	716 — 785 (7.3 — 8.0, 104 — 114)	0 (0, 0)
D	49 — 78 (0.5 — 0.8, 7 — 11)	716 — 785 (7.3 — 8.0, 104 — 114)	0 (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.

## F: ROAD TEST

### 1. GENERAL

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

**When performing test, do not exceed posted speed limit.**

### 2. CHECKING FOR SHIFT PATTERNS

Check "kick-down" and engine brake operation.

**D-range: 1st ⇌ 2nd ⇌ 3rd ⇌ 4th**

**3-range: 1st ⇌ 2nd ⇌ 3rd ⇌ 4th (Manual switch OFF)**

**2nd ⇌ 3rd ⇌ 4th (Manual switch ON)**

**2-range: 1st ⇌ 2nd ⇌ 3rd ⇌ 4th (Manual switch OFF)**

**2nd ⇌ 3rd ⇌ 4th (Manual switch ON)**

**1-range: 1st ⇌ 2nd ⇌ 3rd ⇌ 4th**

### 3. CHECK FOR THE 4WD FUNCTION

If "tight-corner braking" occurs when the steering wheel is fully turned at low speed:

1) Determine the applicable trouble code and check the corresponding duty solenoid C (transfer) for improper operation.

2) If the solenoid is operating properly, check transfer clutch pressure.

3) If oil pressure is normal but "tight-corner braking" occurs:

Check the transfer control valve for sticking, and the transfer clutch facing for wear.

(Refer to Disassembly and Inspection of the Transmission.)

4. AUTOMATIC SHIFT CHARACTERISTICS

- 1800 cc Carburetor

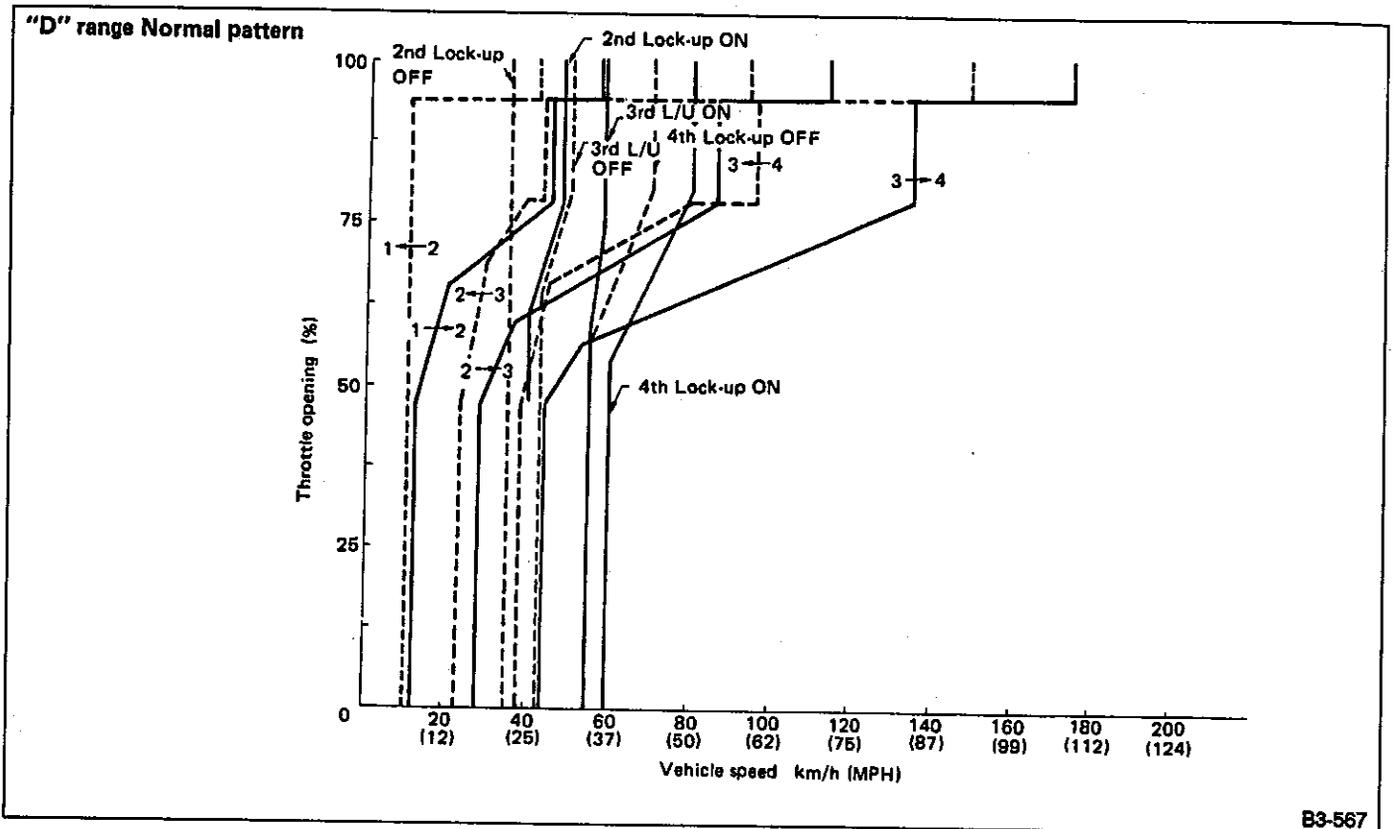


Fig. 123

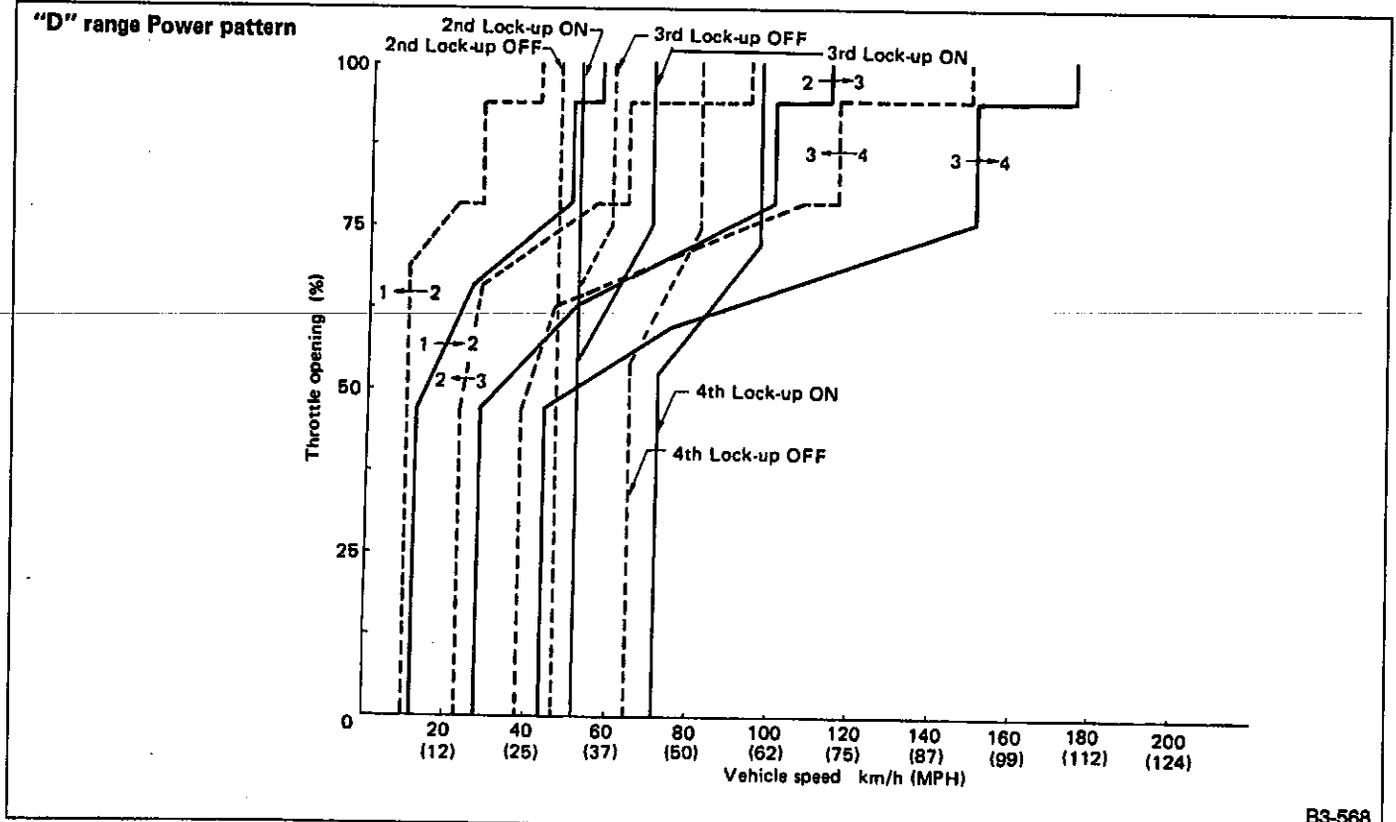
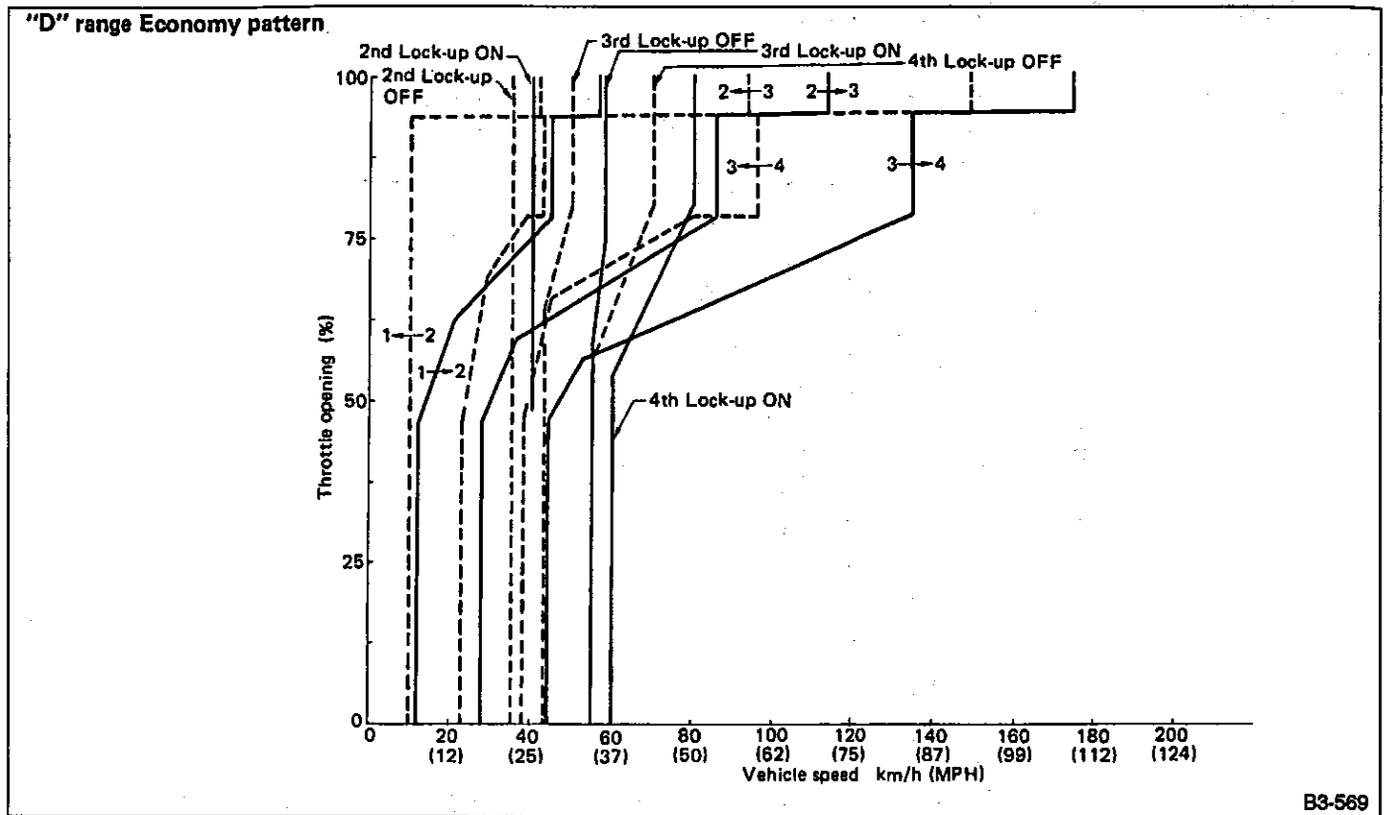


Fig. 124



B3-569

Fig. 125

● 2000 cc MPFI

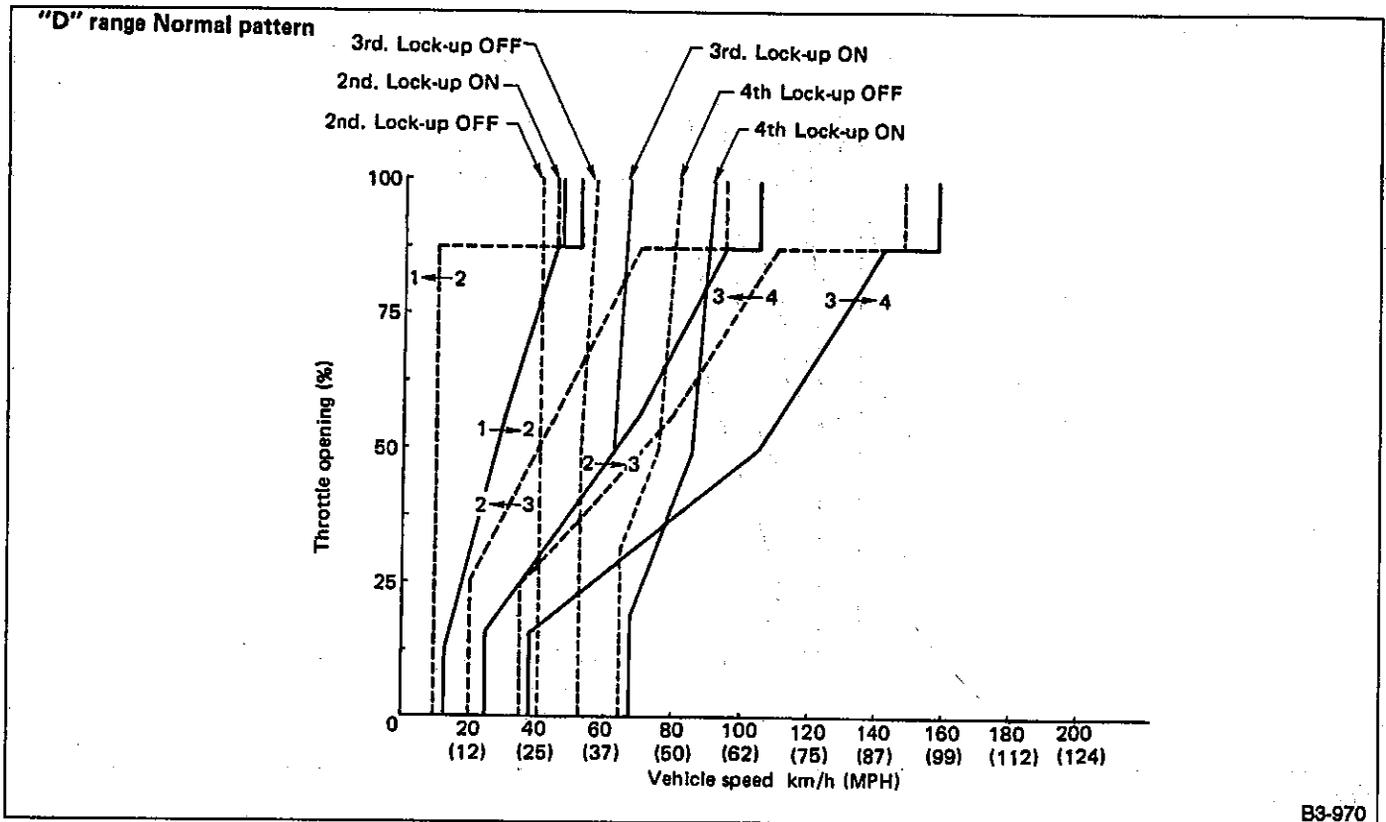


Fig. 126

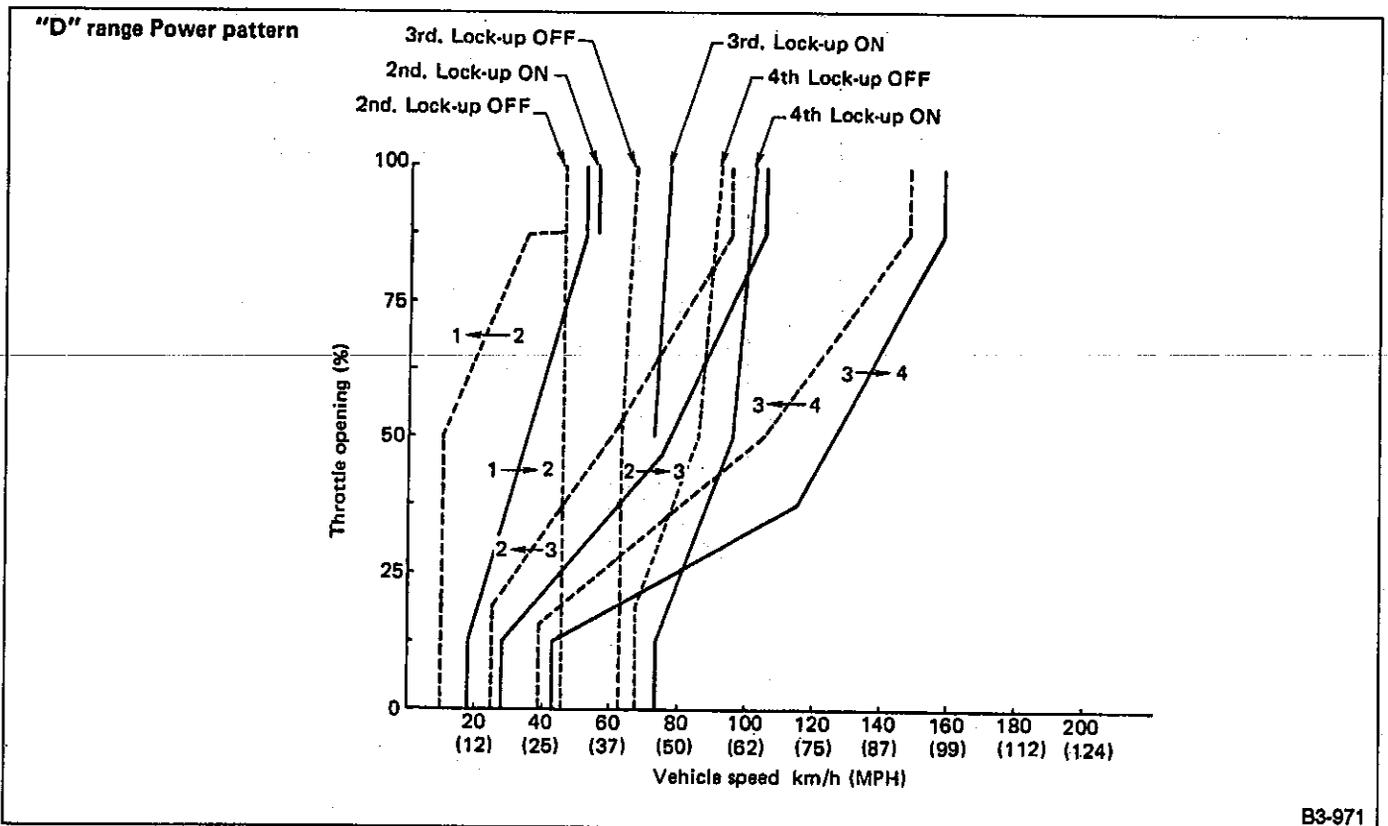


Fig. 127

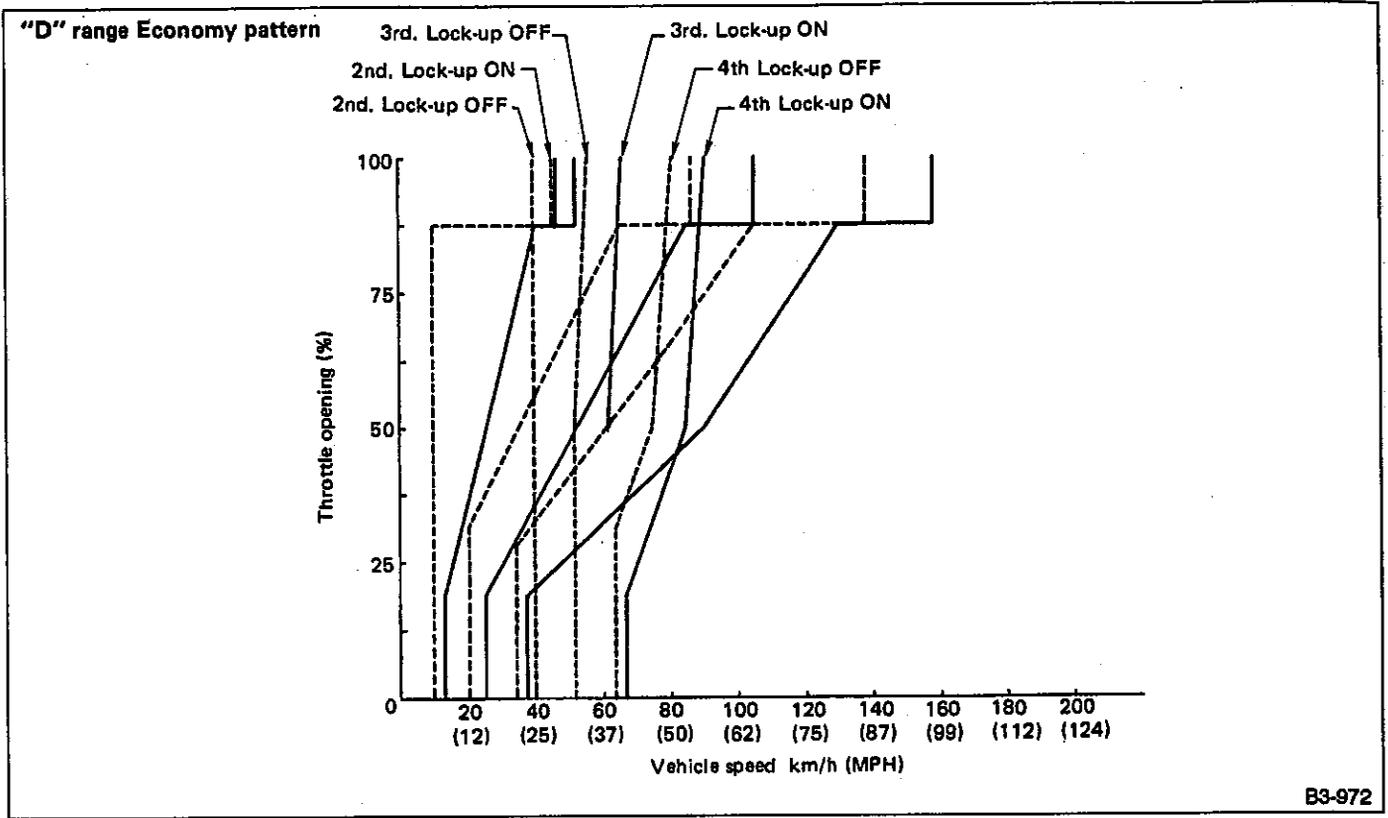


Fig. 128

- 2200 cc MPFI

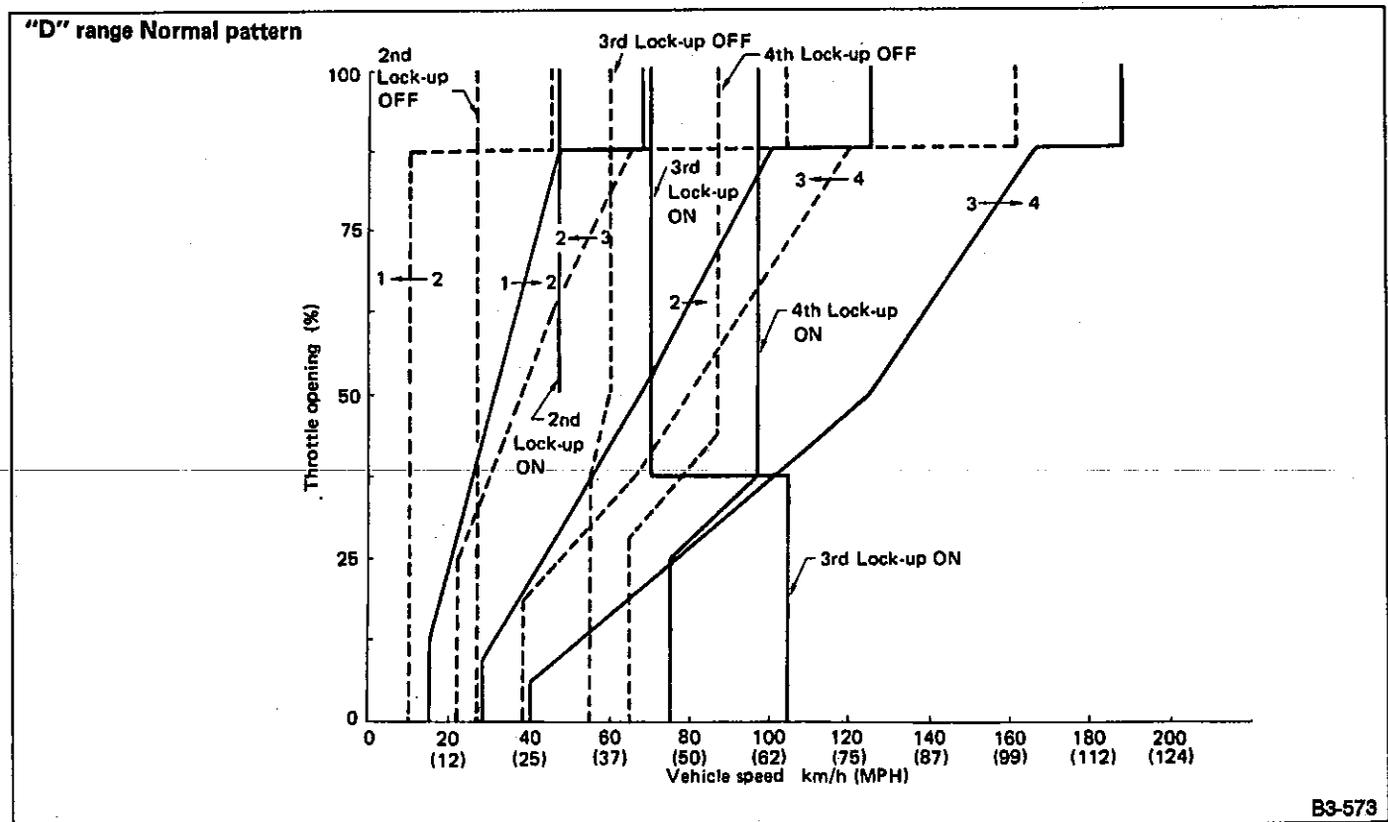


Fig. 129

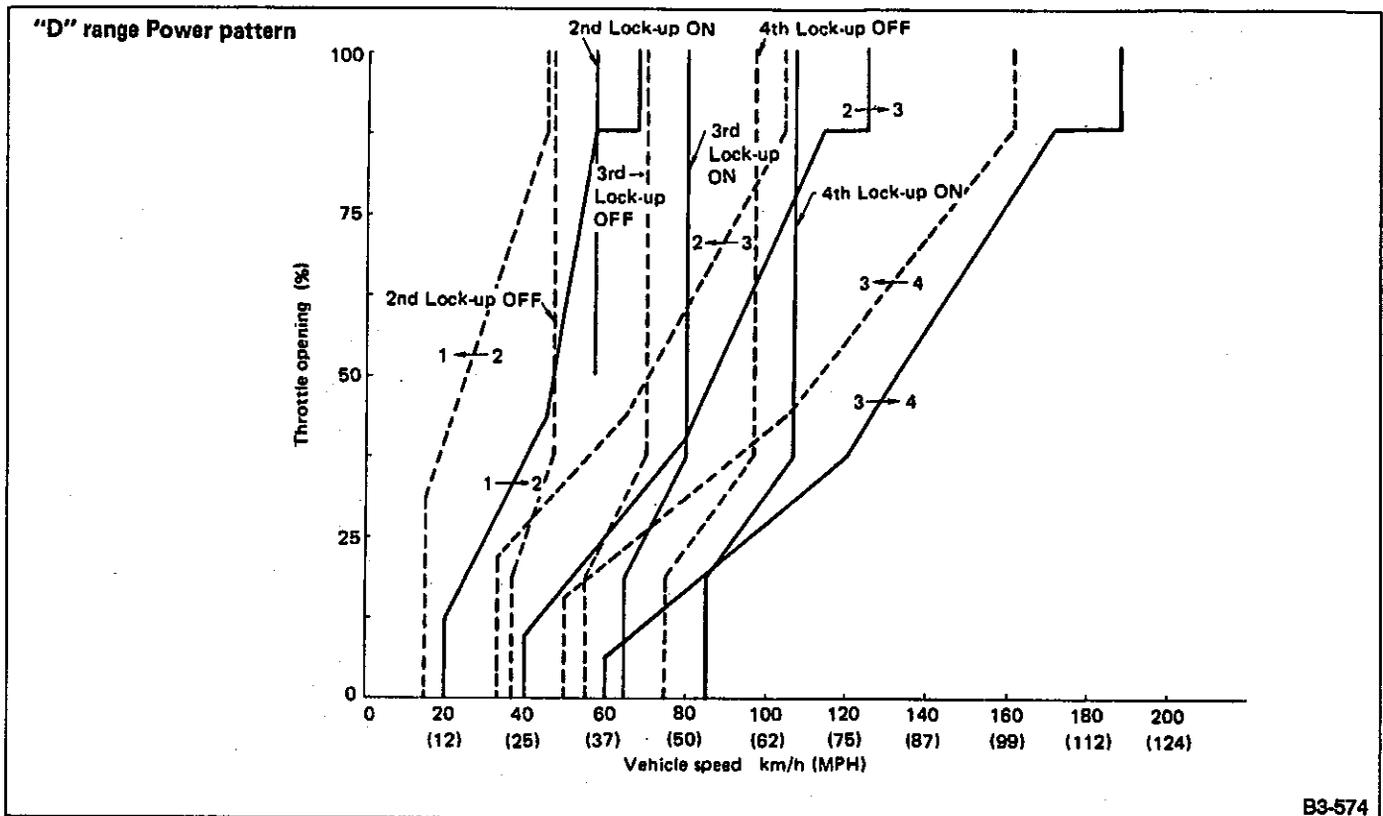


Fig. 130

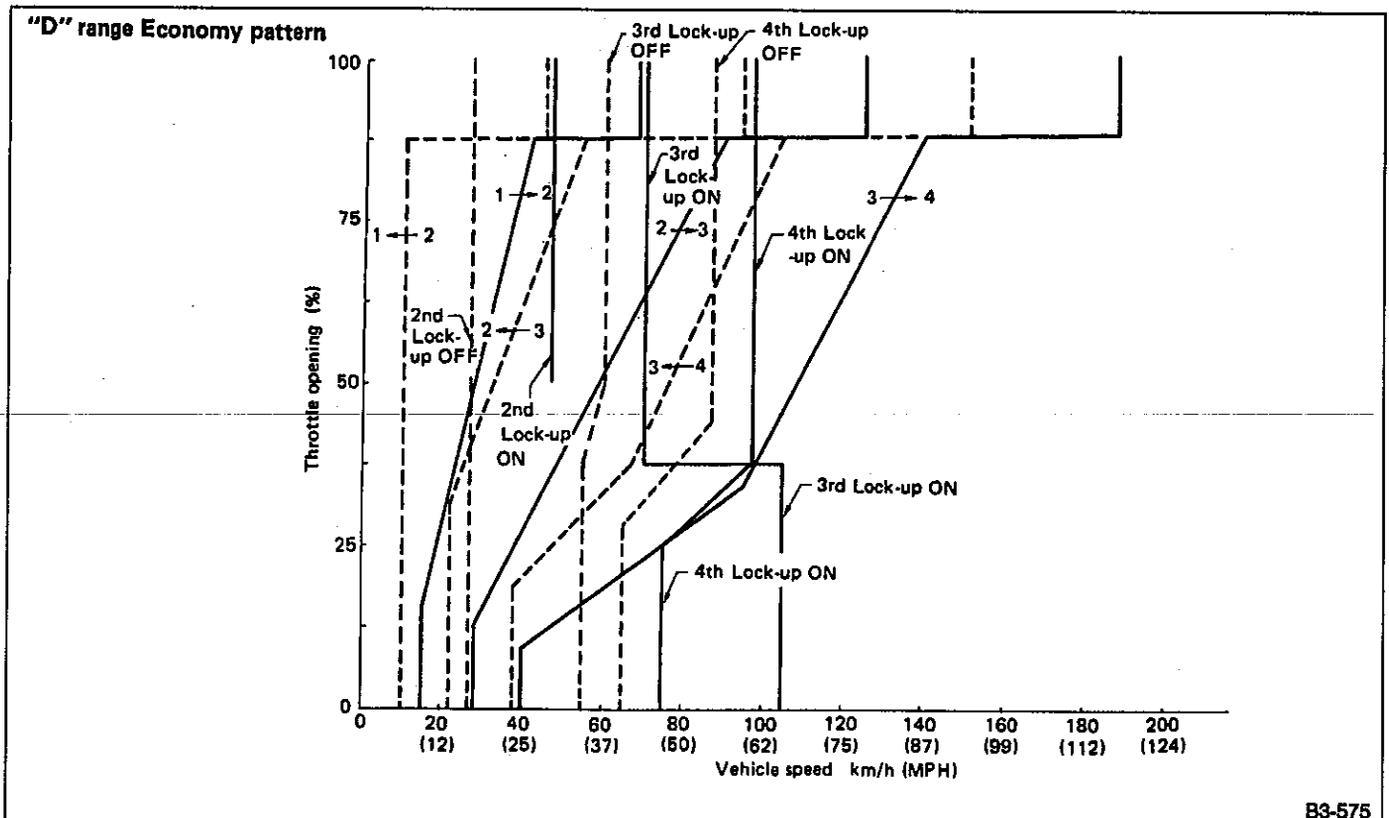
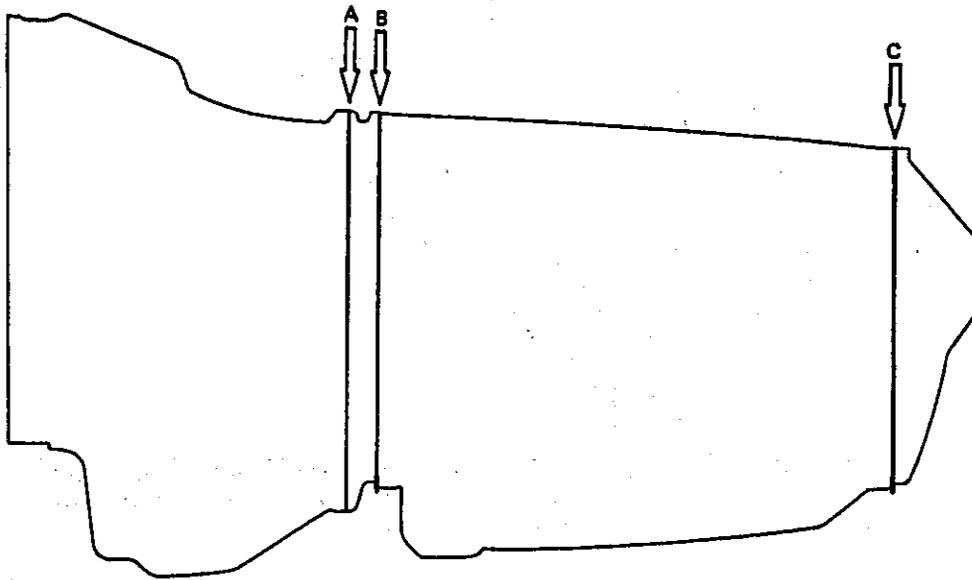


Fig. 131

### 4. Overall Transmission

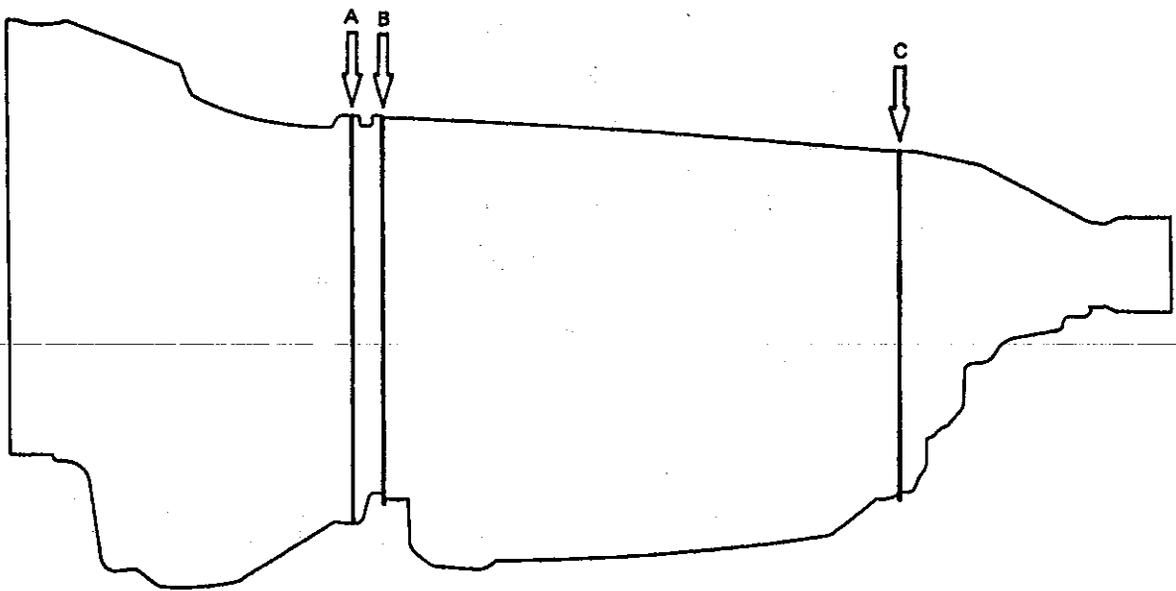
SECTIONS THAT CAN BE DETACHED/  
ASSEMBLED

FWD



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

4WD



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

B3-252L

Fig. 132

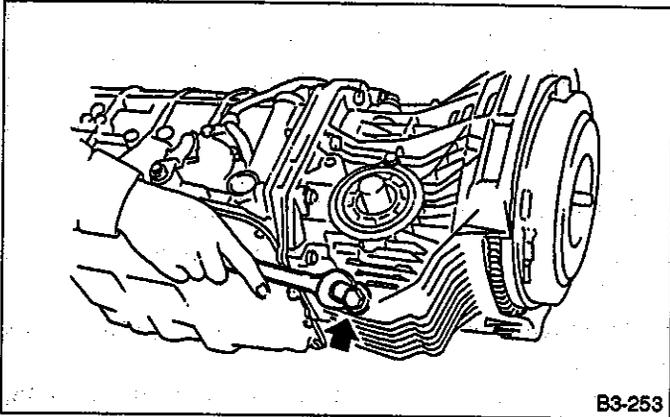
**A: DISASSEMBLY**

**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.**

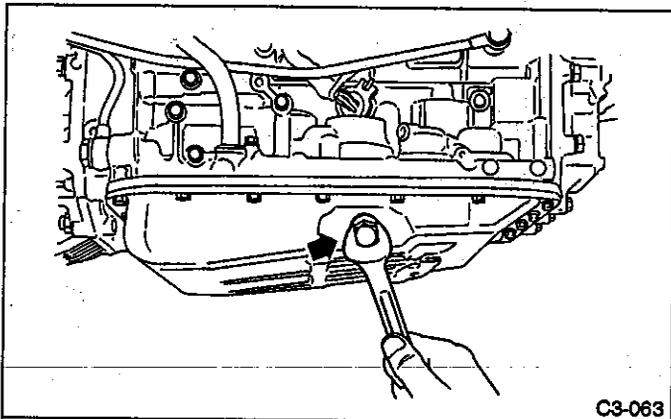
2) Remove the drain plug, and drain differential oil. Tighten the plug temporarily after draining.



B3-253

Fig. 133

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

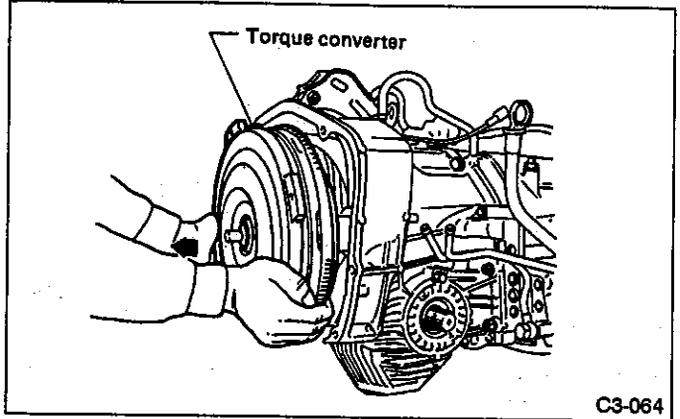


C3-063

Fig. 134

4) Extract the torque converter.

- a. Extract the torque converter horizontally. Be careful not to scratch the bushing inside the oil pump shaft.
- b. Note that oil pump shaft also comes out.

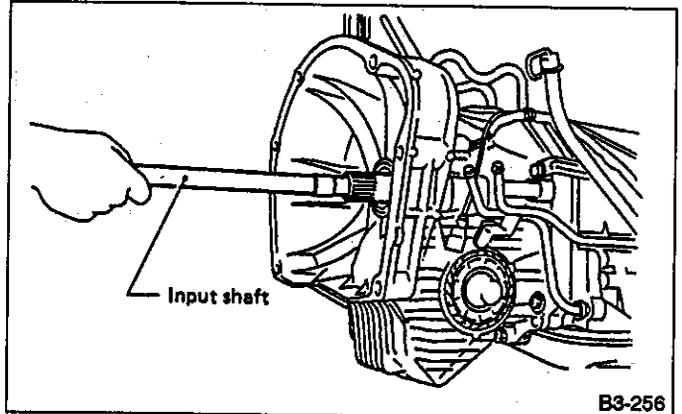


C3-064

Fig. 135

5) Remove the input shaft.

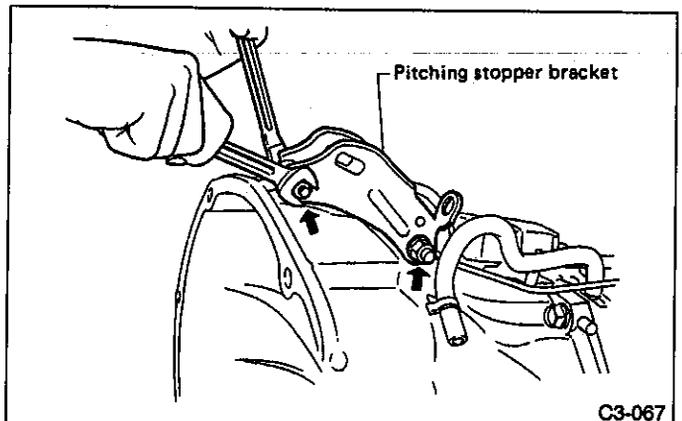
**Be careful not to scratch the bushing.**



B3-256

Fig. 136

6) Remove the pitching stopper bracket.



C3-067

Fig. 137

7) Disconnect the air breather hose.

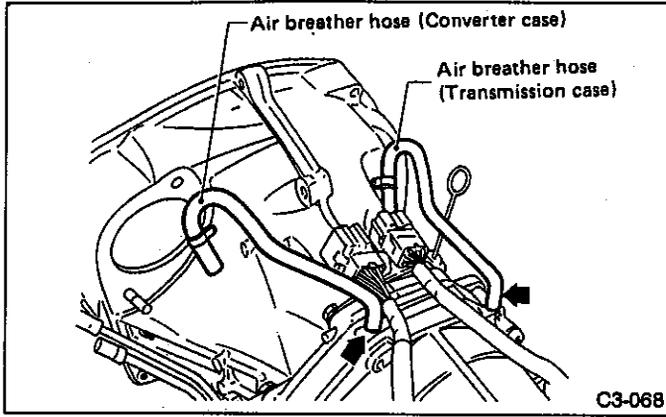


Fig. 138

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

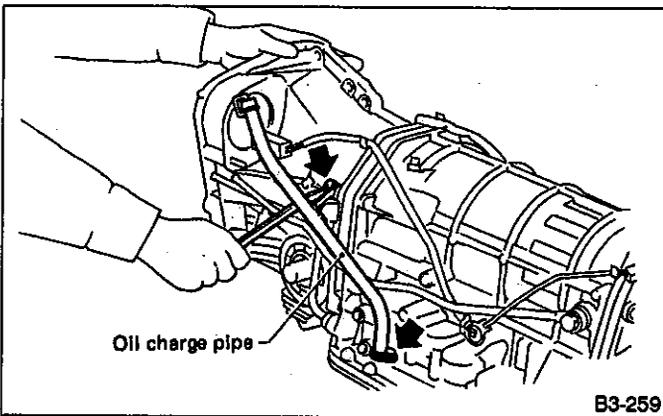


Fig. 139

9) Remove the oil cooler inlet and outlet pipes.

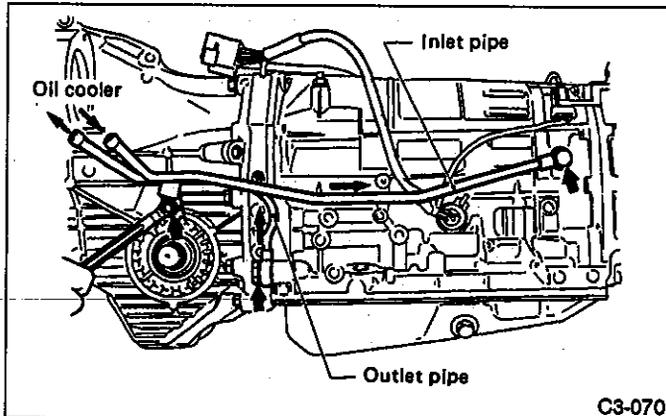


Fig. 140

10) Remove clips from the harnesses.

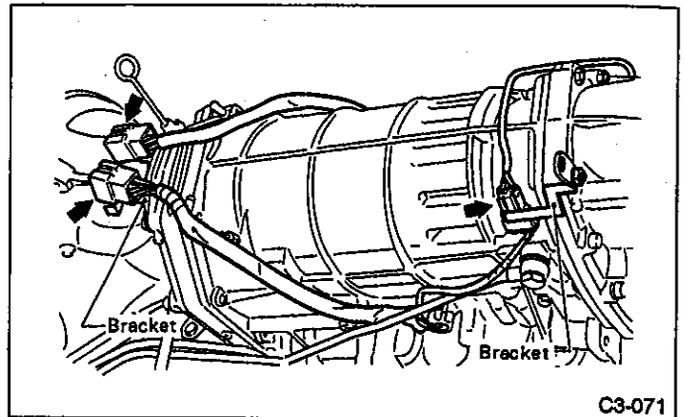


Fig. 141

**2. SEPARATION OF EACH SECTION**

1) 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.

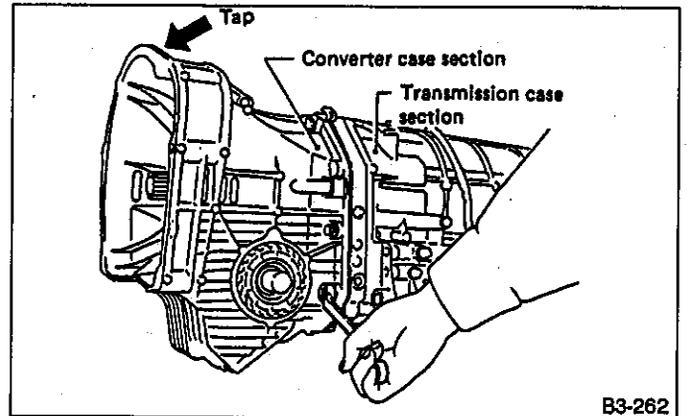


Fig. 142

2) Separation of transmission case and extension sections (4WD)

- (1) Remove the vehicle speed sensor 1. (4WD)

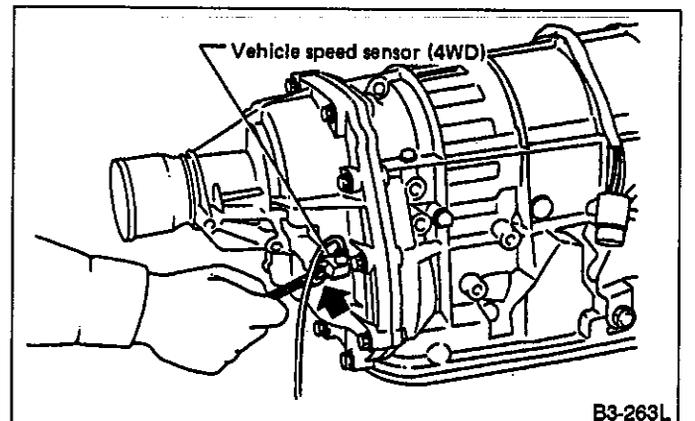
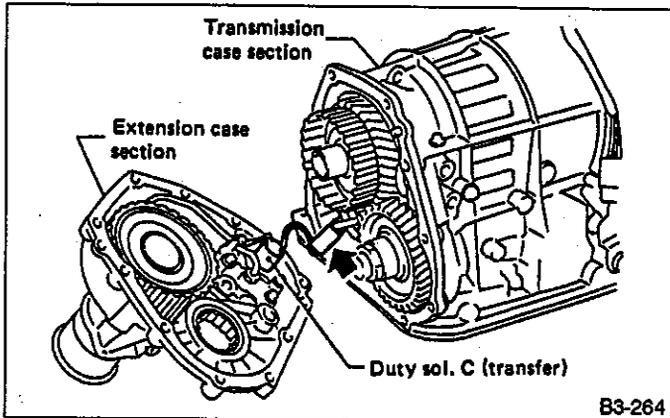


Fig. 143

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

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

Drill two holes in the puller.



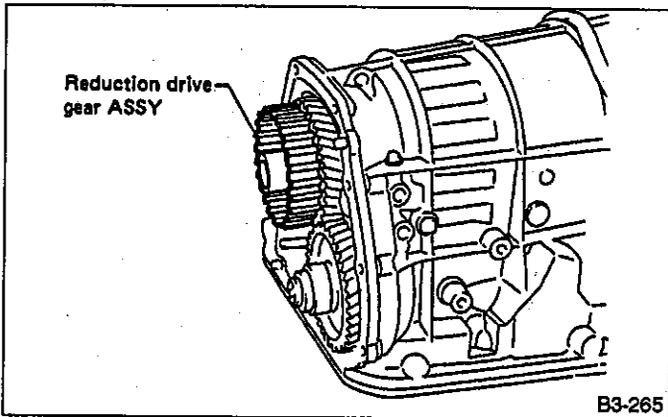
B3-264

Fig. 144

3) Separate both sections.

### 3. TRANSMISSION CASE SECTION

1) Remove the reduction drive gear ASSY.



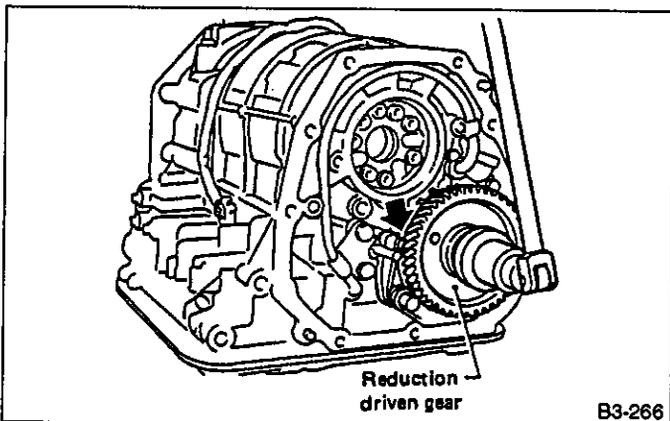
B3-265

Fig. 145

2) Remove the reduction driven gear:

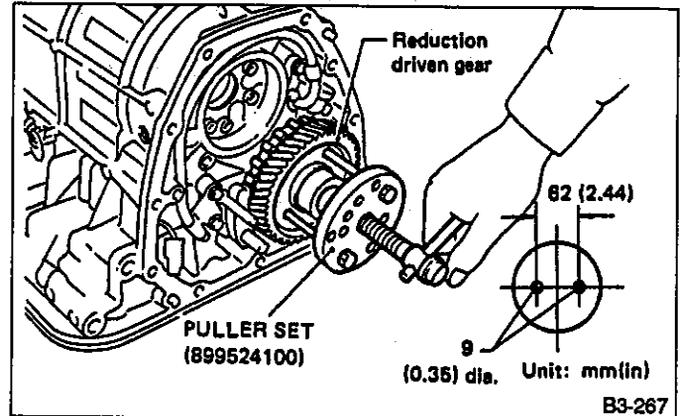
- Straighten the staked portion, and remove the lock nut.

Set the range selector lever to "P".



B3-266

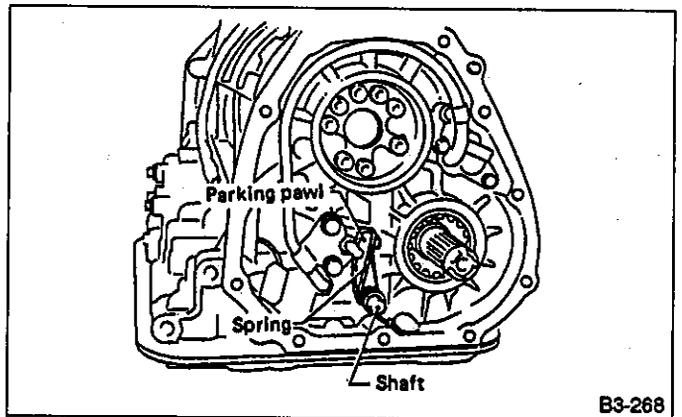
Fig. 146



B3-267

Fig. 147

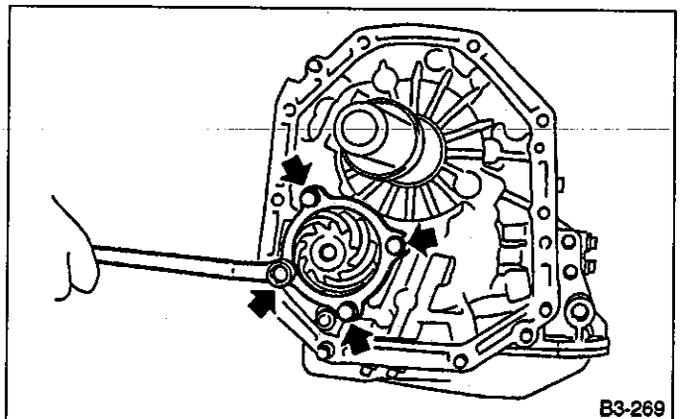
3) Remove the parking pawl, return spring and shaft.



B3-268

Fig. 148

4) Loosen the taper roller bearing mounting bolts.



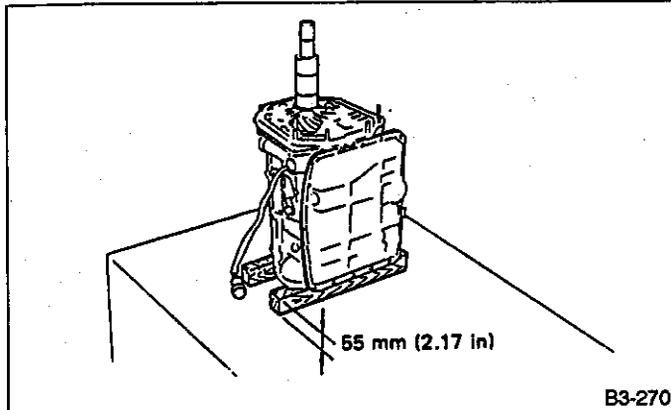
B3-269

Fig. 149

5) 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.

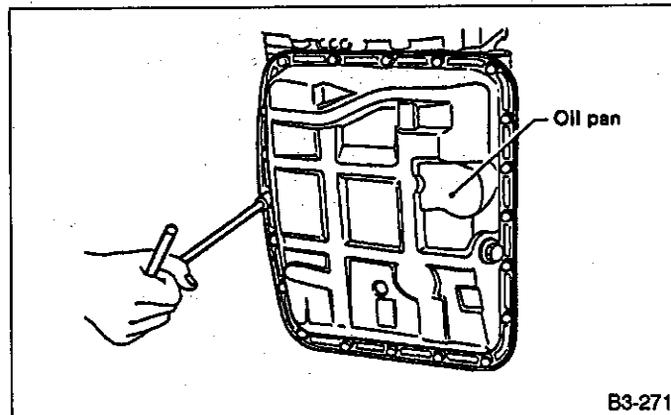


B3-270

Fig. 150

6) Remove the oil pan and gasket.

Tap the corners of the oil pan when removing.

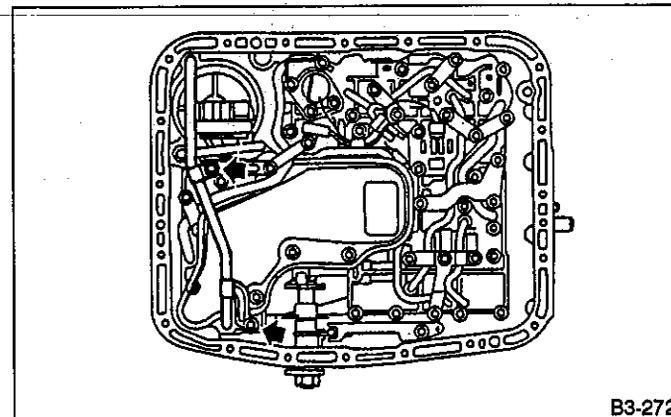


B3-271

Fig. 151

7) Remove the oil cooler outlet pipe.

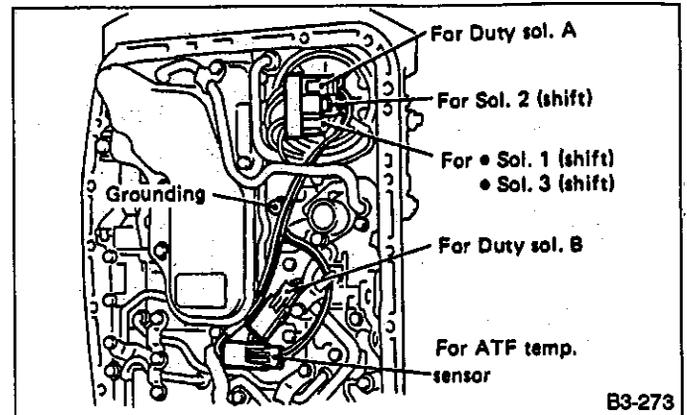
Be careful not to twist the pipe.



B3-272

Fig. 152

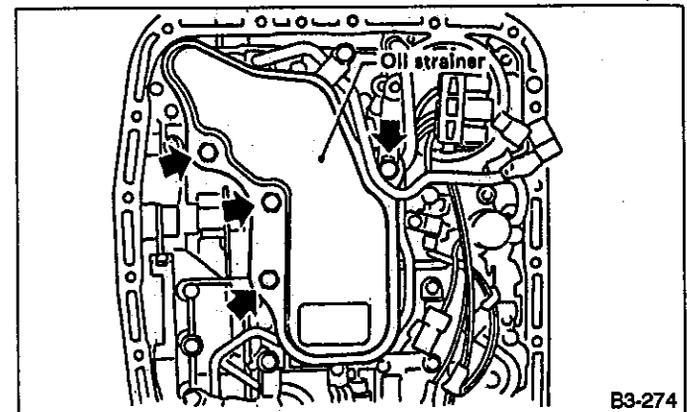
8) Disconnect the harness connectors for the solenoids and duty solenoids and the ground cord.



B3-273

Fig. 153

9) Remove the oil strainer.



B3-274

Fig. 154

Be careful not to damage O-ring on oil strainer.

10) Remove the control valve body.

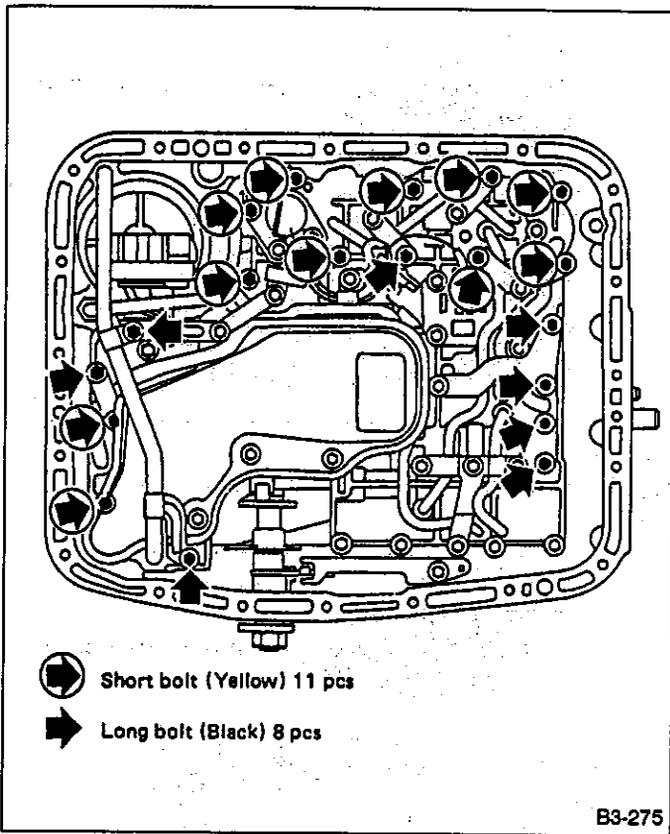


Fig. 155

11) Remove three accumulator springs.

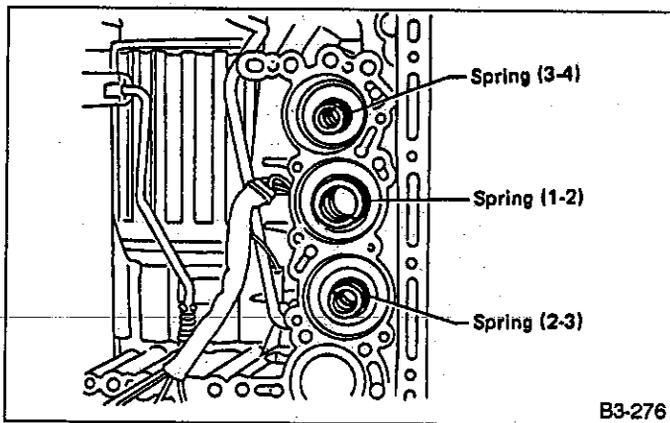


Fig. 156

12) Loosen 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.

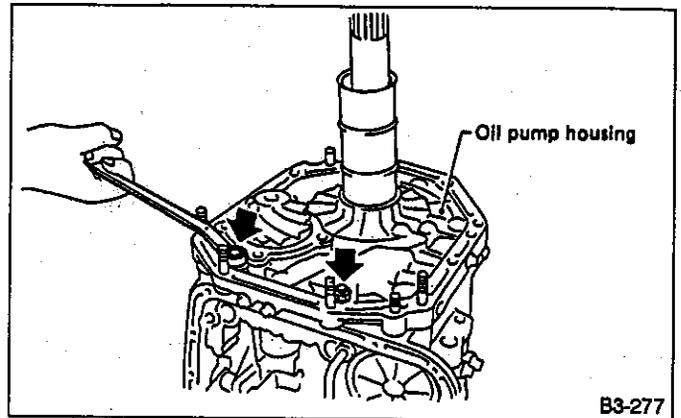


Fig. 157

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

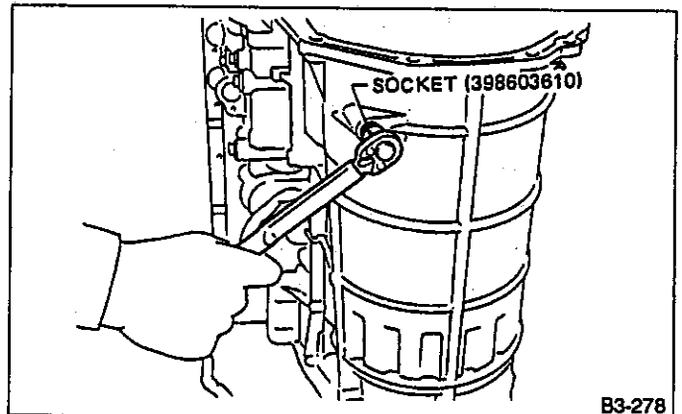


Fig. 158

14) Remove the brake band and reverse clutch. Contract the brake band with a clip.

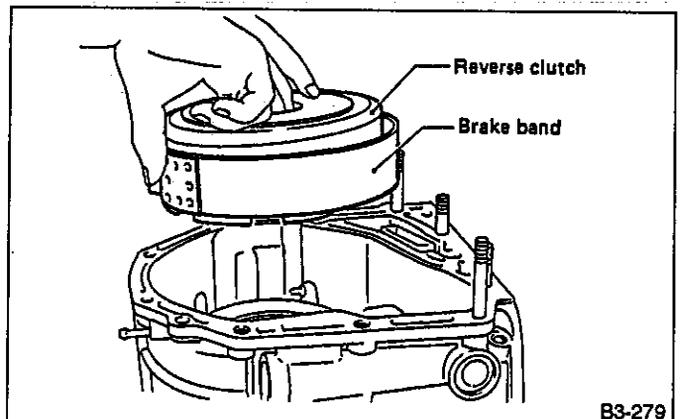


Fig. 159

15) Take out the high clutch.

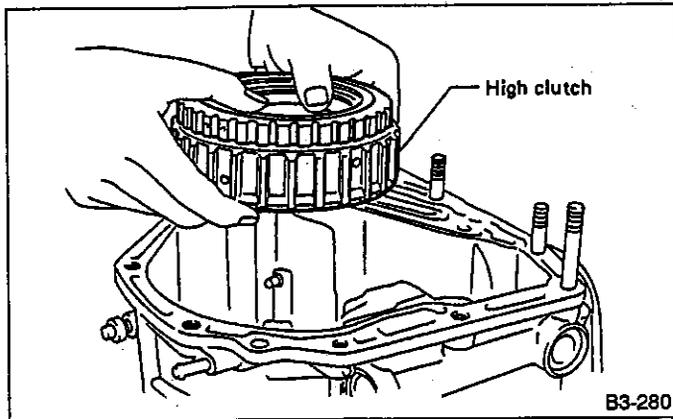


Fig. 160

Needle bearing is removed together with high clutch. Be careful not to lose it.

16) Take out the high clutch hub.

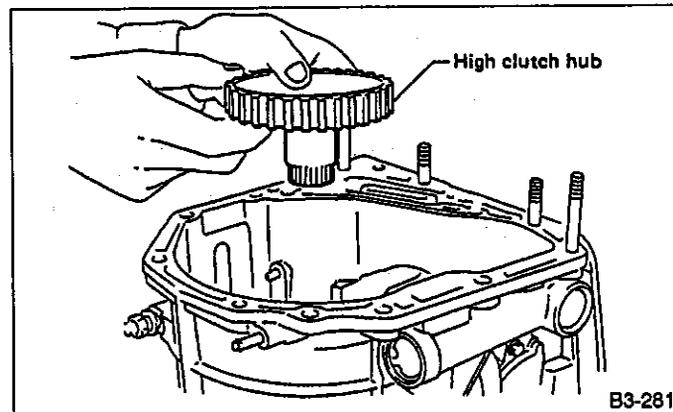


Fig. 161

17) Take out the front sun gear.

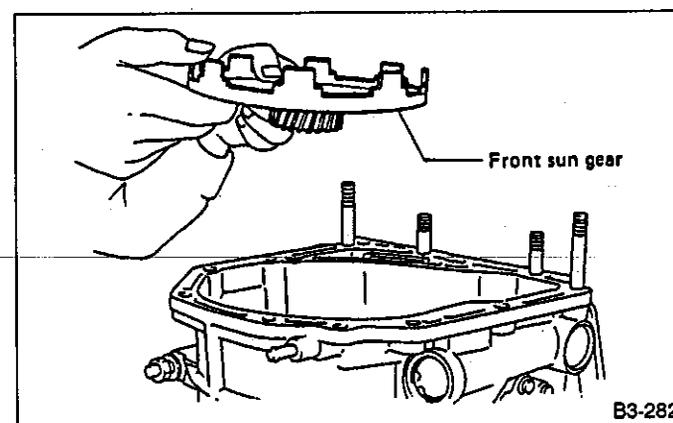


Fig. 162

18) Take out the front planetary carrier.

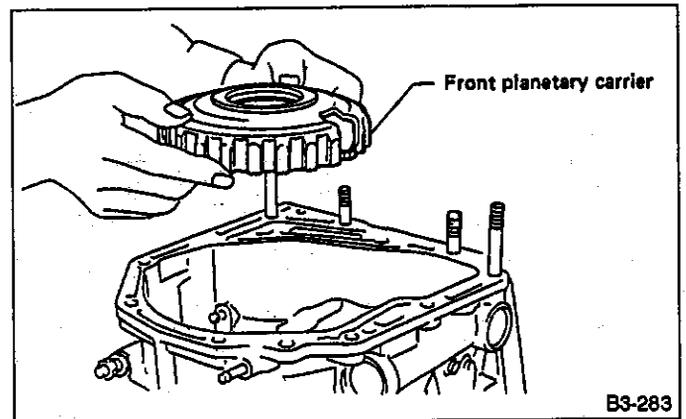


Fig. 163

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

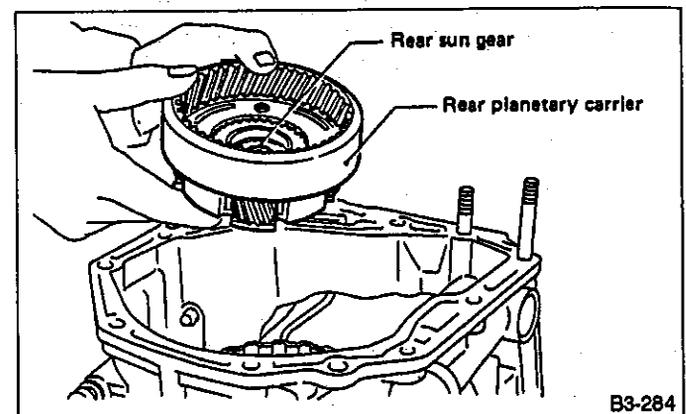


Fig. 164

20) Take out the rear internal gear.

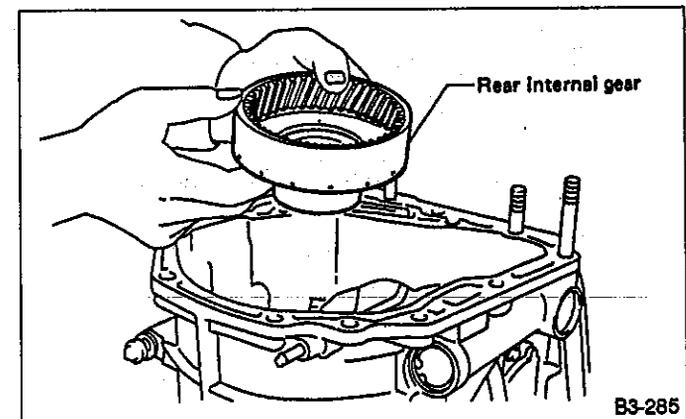


Fig. 165

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

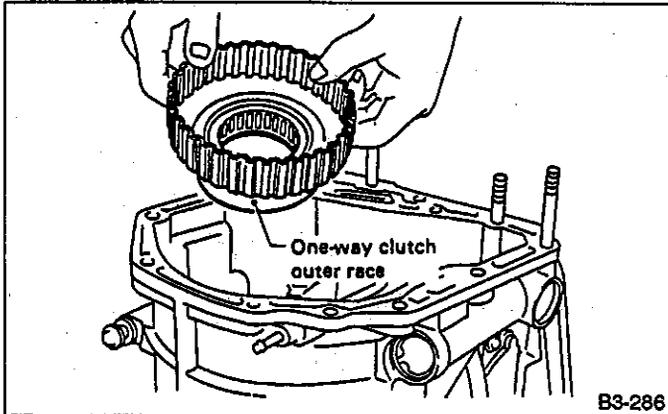


Fig. 166

22) Take out the overrunning clutch hub.

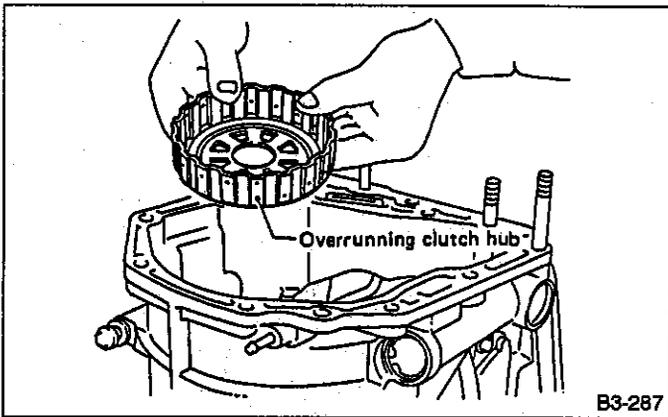


Fig. 167

23) Take out the forward clutch drum.

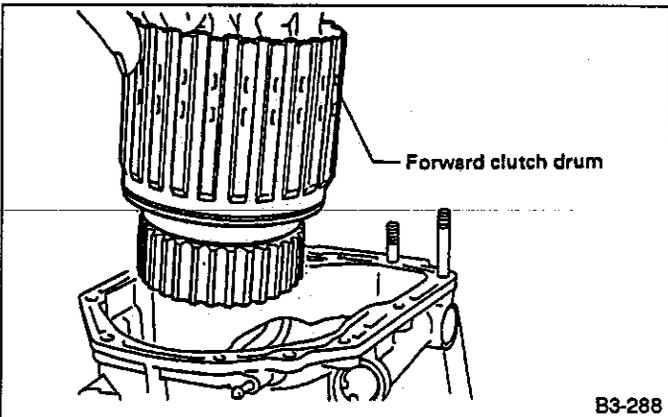


Fig. 168

24) Take out the low & reverse brake section.

- Remove the snap ring. Then remove the retaining plate, drive plates, driven plates, and dish plates as a unit.

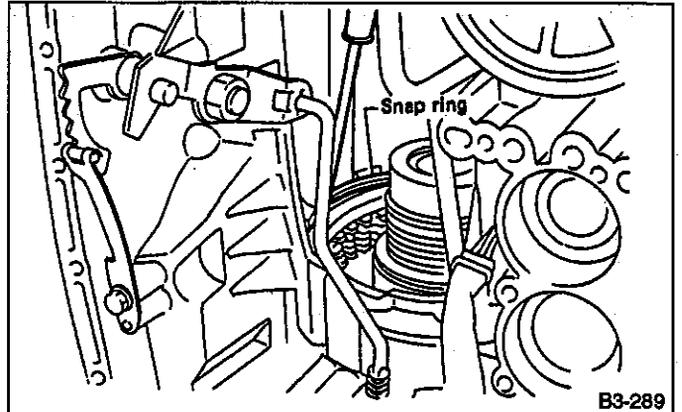


Fig. 169

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

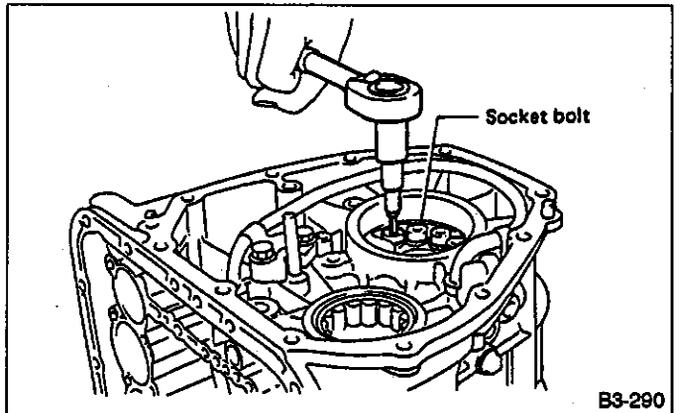


Fig. 170

- Take out the low & reverse piston by applying compressed air.

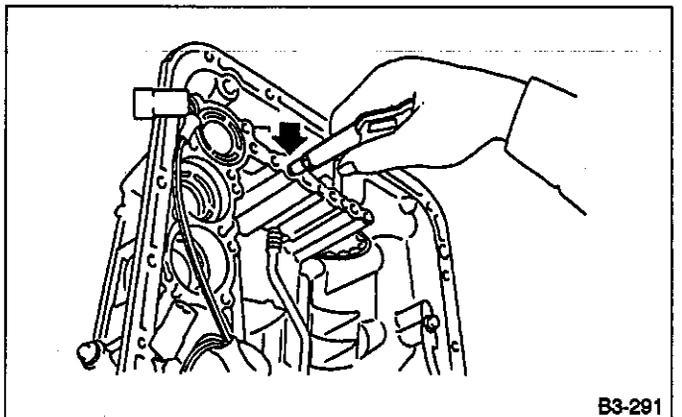


Fig. 171

25) 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.

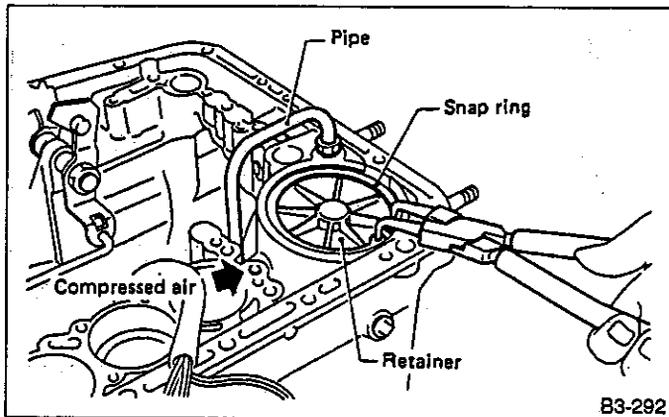


Fig. 172

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

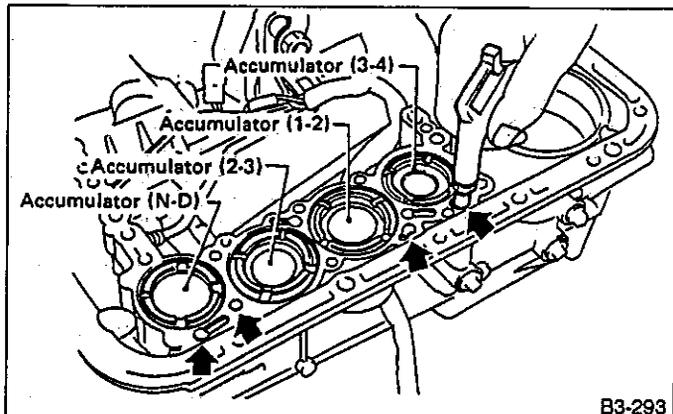


Fig. 173

27) Remove the range select lever.

28) Remove the detent spring.

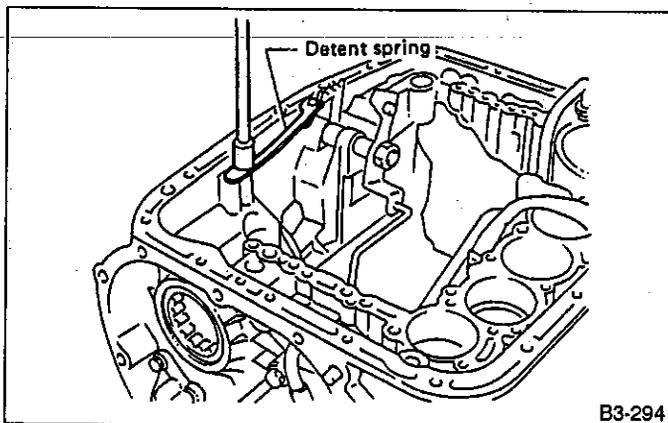


Fig. 174

29) 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.

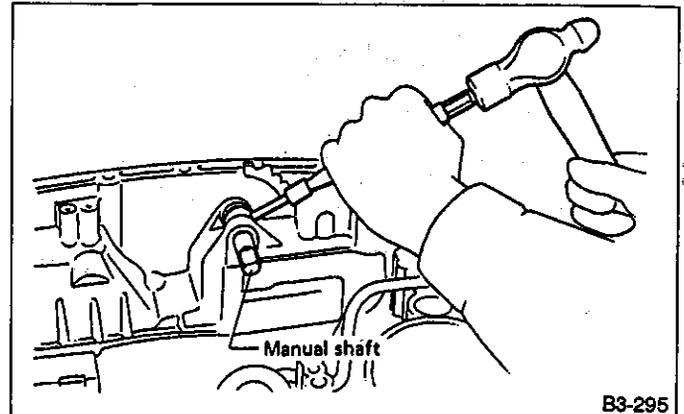


Fig. 175

30) Remove the inhibitor switch.

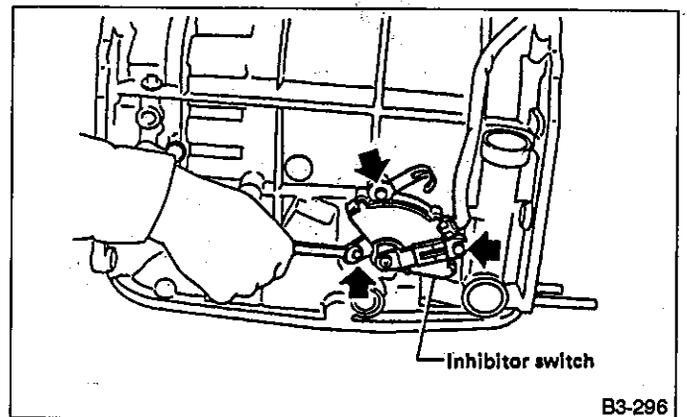


Fig. 176

31) Remove the transmission harness.

Be careful not to damage the cord insulation.

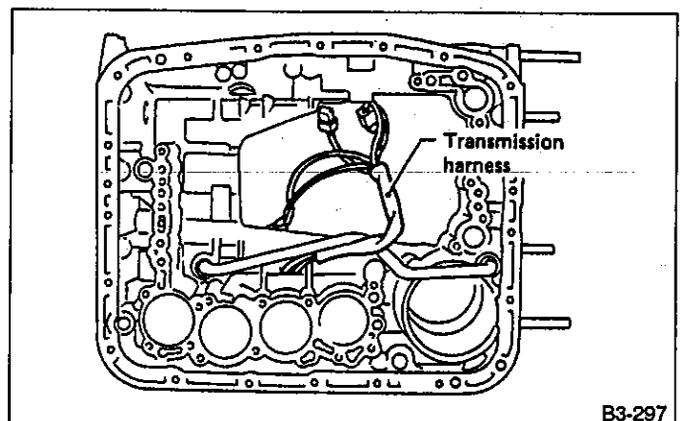
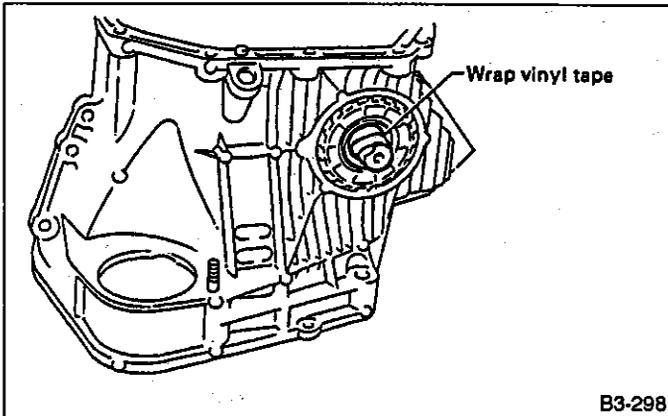


Fig. 177

#### 4. CONVERTER CASE SECTION

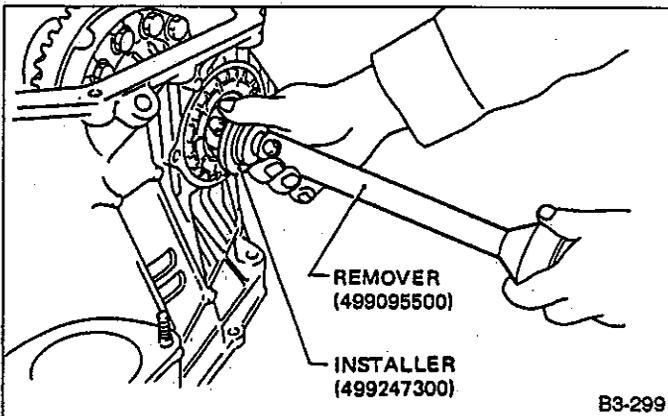
- 1) Wrap the axle-shaft serration with vinyl tape.



B3-298

Fig. 178

- 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.

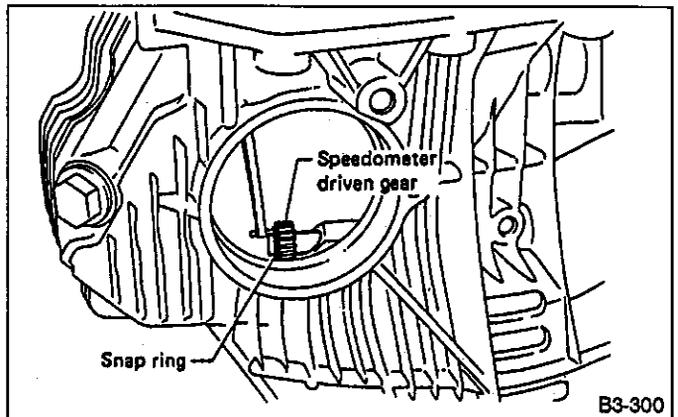


B3-299

Fig. 179

- 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.

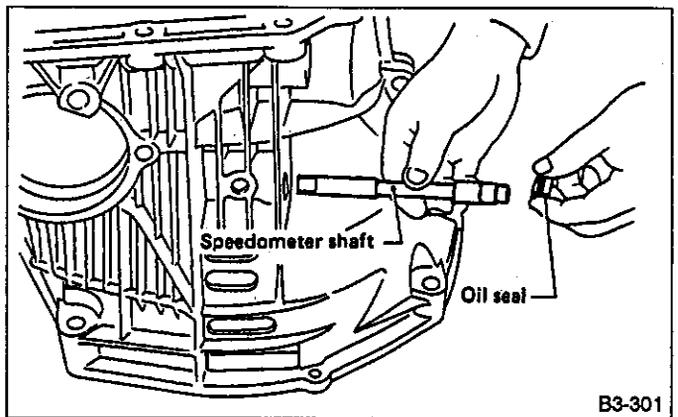
- 5) Remove the snap ring. Then remove the speedometer driven gear.
- 6) Remove vehicle speed sensor 2.



B3-300

Fig. 180

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

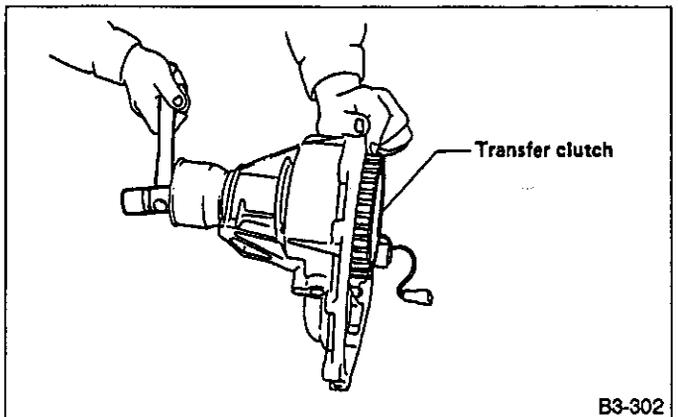


B3-301

Fig. 181

#### 5. 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.



B3-302

Fig. 182

- 2) Remove the transfer pipe.  
Be careful not to bend the pipe.

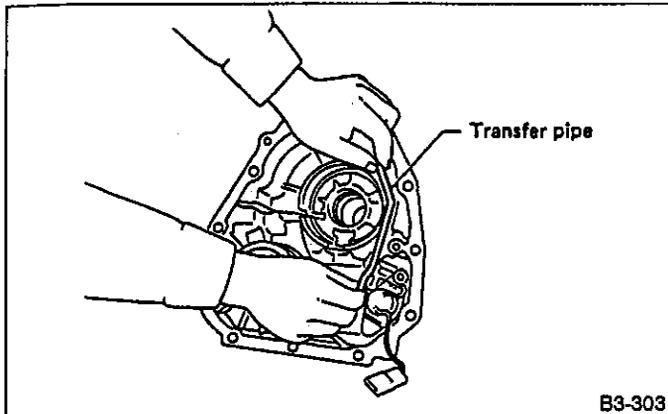


Fig. 183

- 3) Remove duty solenoid C and the transfer valve body.  
a. Take out the inlet filter.  
b. Do not damage the O-ring.

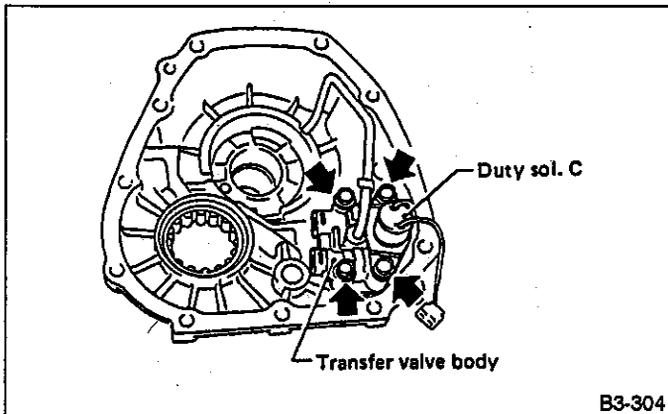


Fig. 184

- 4) Take out the roller bearing.

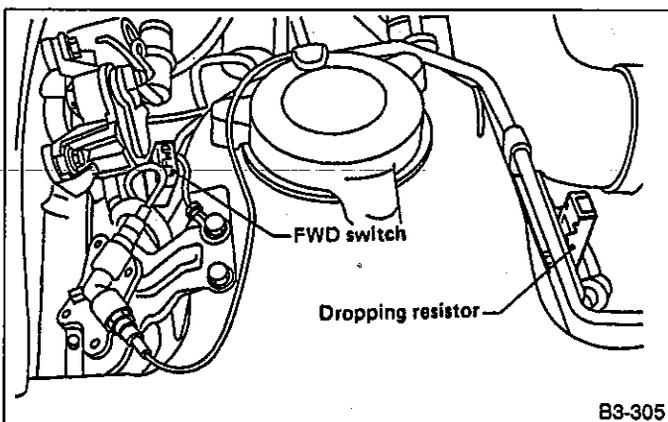


Fig. 185

## B: ASSEMBLY OF OVERALL 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.

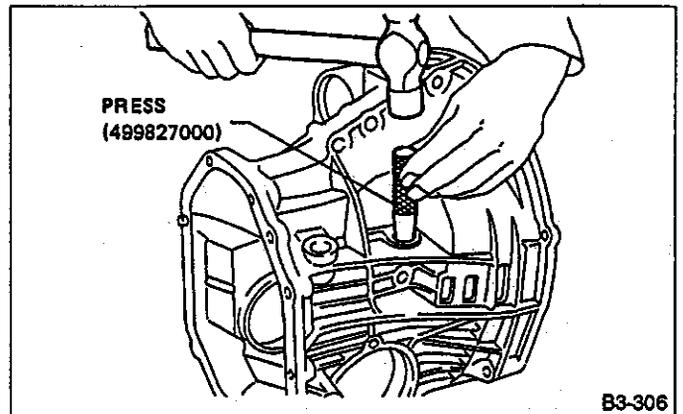


Fig. 186

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

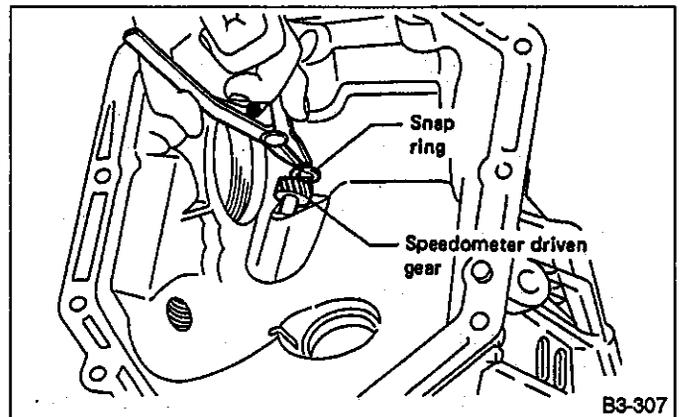


Fig. 187

- 4) Install the vehicle speed sensor 2.
- 5) Force-fit the oil seal to the converter case.

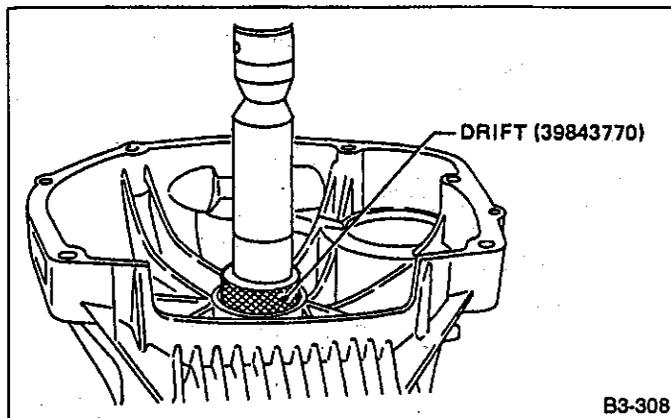


Fig. 188

- 6) 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).

- 7) Install the circlip 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 — 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 circlip.

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

- 9) 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.

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

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

- 11) 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.

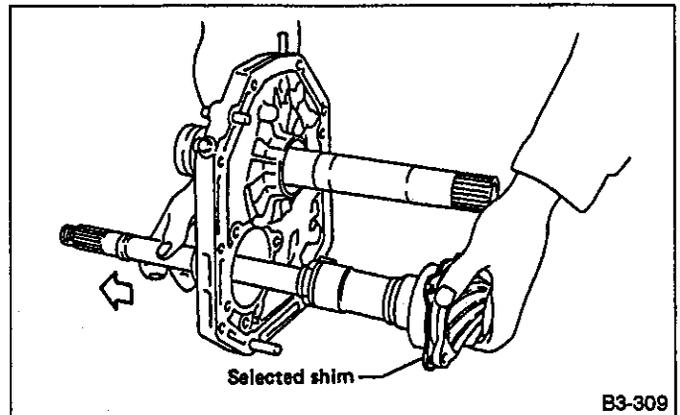


Fig. 189

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

**Tightening torque:**

36 — 42 N·m (3.7 — 4.3 kg-m, 27 — 31 ft-lb)

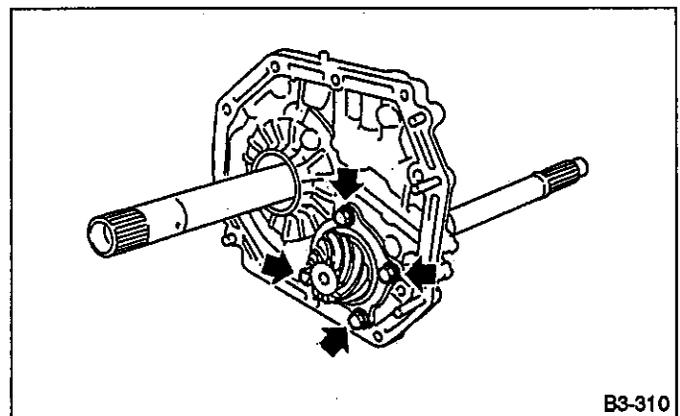


Fig. 190

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

**Tightening torque:**

30 — 36 N·m (3.1 — 3.7 kg-m, 22 — 27 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) Rotate the drive pinion several times.

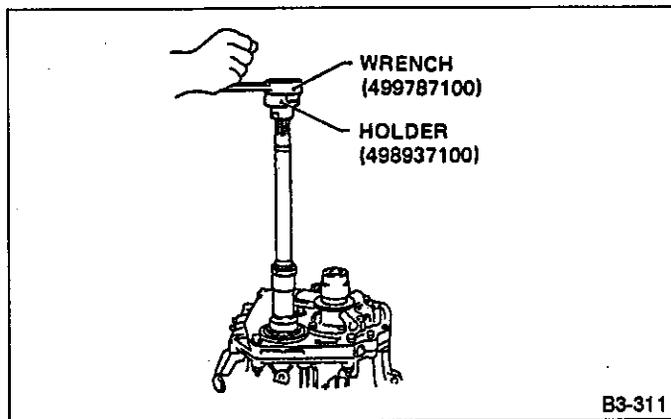


Fig. 191

(5) Tighten the LH retainer until contact is felt while rotating the shaft. Then loosen the RH retainer. Keep tightening the LH retainer and loosening the RH retainer until the pinion shaft can no longer be turned. This is the "zero" state.

(6) After the "zero" state is established, back off the LH retainer 3 notches and secure it with the locking tab. Then back off the RH retainer and retighten until it stops. Repeat this procedure several times. Tighten the RH retainer 1-3/4 notches further. This sets the preload. Finally, secure the retainer with its locking tab.

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

(7) 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.

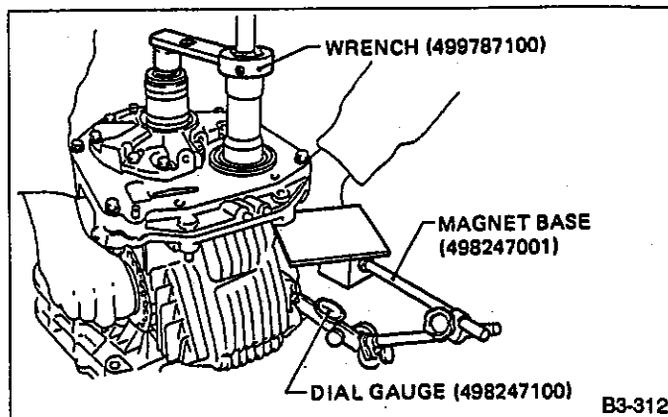


Fig. 192

(8) 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.

➡ : Adjusting direction of drive pinion      ⇨ : Adjusting direction of crown gear

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

B3-313

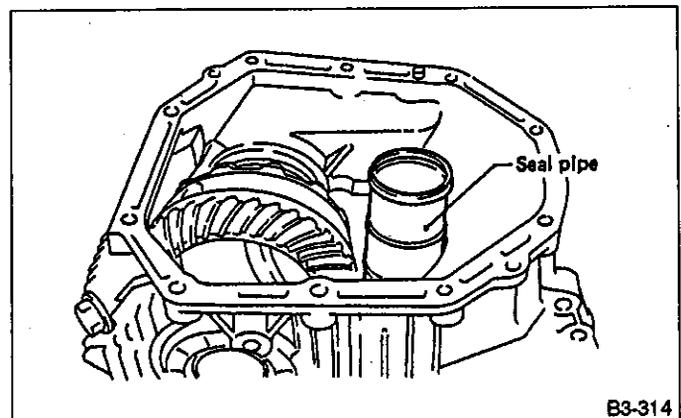
Fig. 193

(9) 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)

12) Install the seal pipe to the converter case.  
**Be sure to use a new seal pipe.**



B3-314

Fig. 194

13) 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.

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

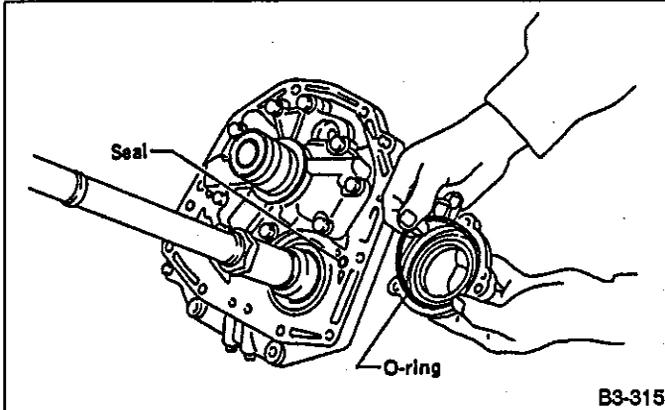


Fig. 195

15) 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:**

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

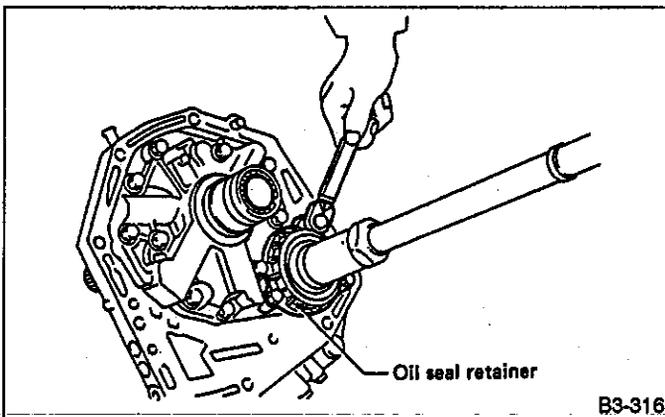


Fig. 196

16) 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.

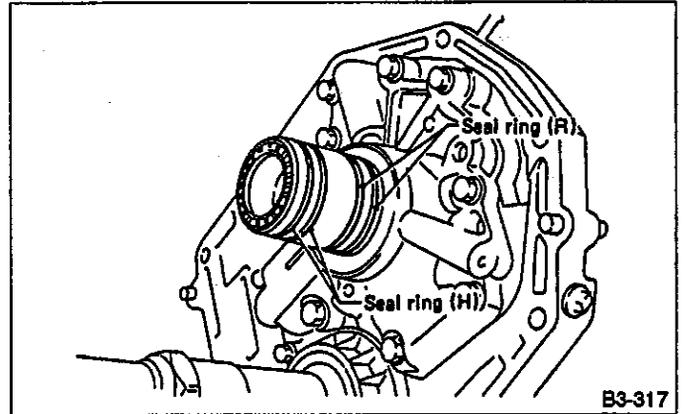


Fig. 197

17) Install the rubber seal to the converter case.

**Be careful not to lose the rubber seal.**

## 2. TRANSMISSION CASE SECTION

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

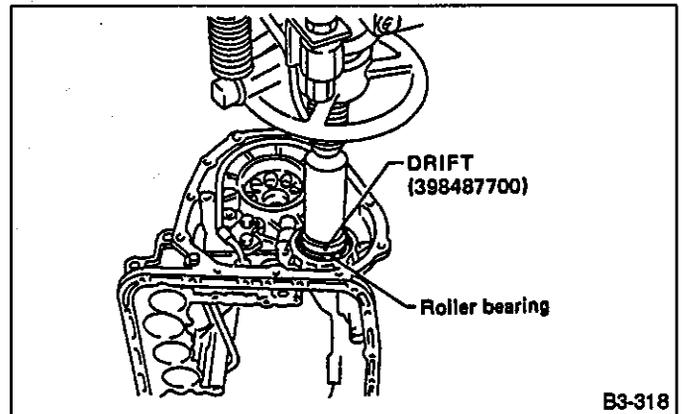


Fig. 198

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

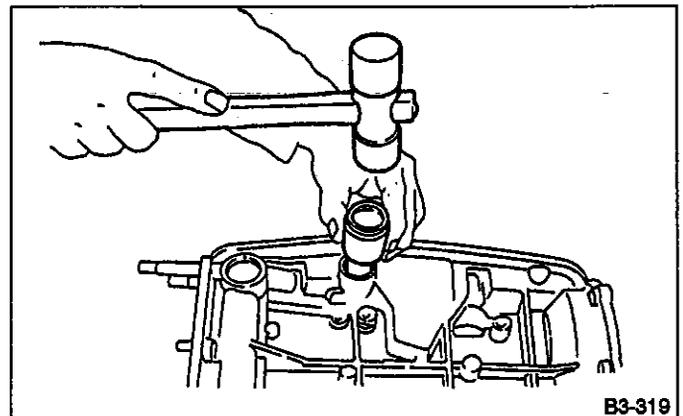


Fig. 199

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.

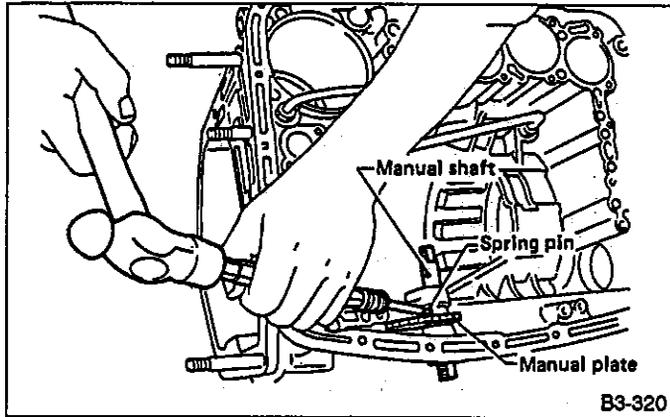


Fig. 200

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

**Tightening torque:**

36 — 42 N·m (3.7 — 4.3 kg·m, 27 — 31 ft·lb)

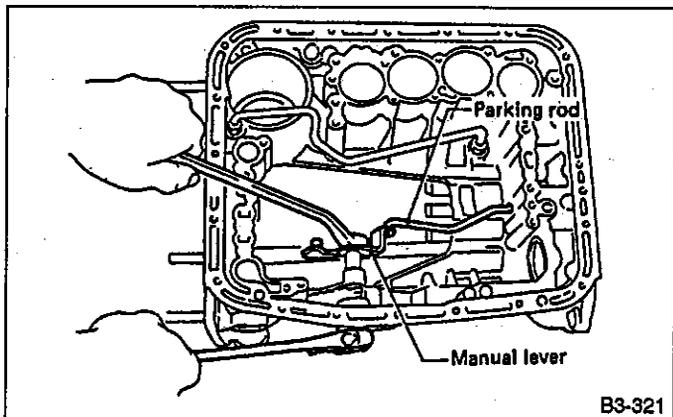


Fig. 201

5) Install the detent manual spring.

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

**Tightening torque:**

5 — 7 N·m (0.5 — 0.7 kg·m, 3.6 — 5.1 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.

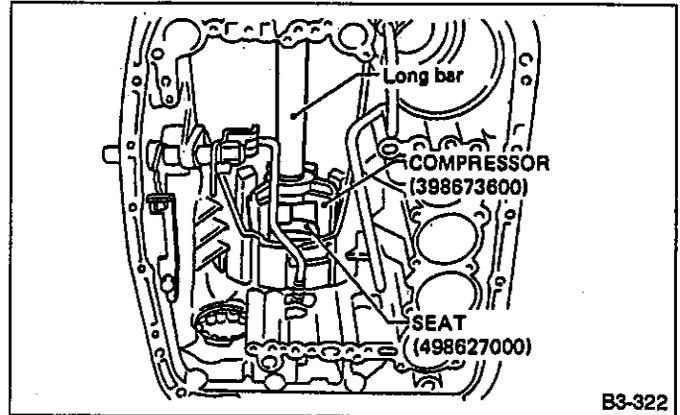


Fig. 202

7) Install the one-way clutch inner race.

- (1) Using a press, install the thrust needle bearing to the inner race.

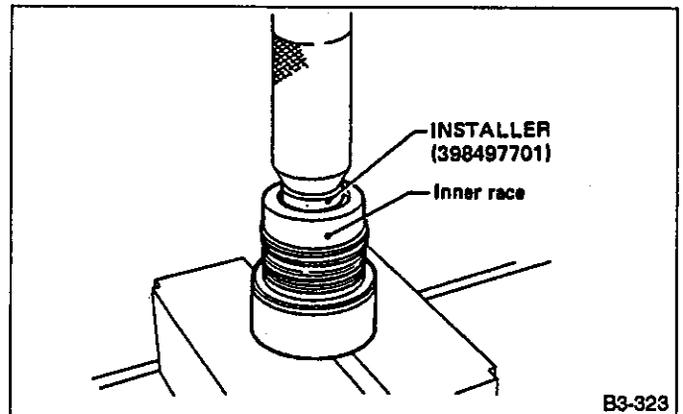


Fig. 203

Use the PULLER ASSY (398527700) when removing.

- (2) Install four seal rings.

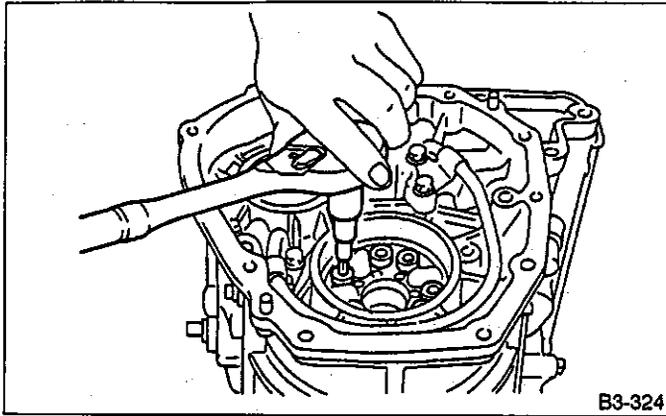
Apply vaseline to the groove of the inner race and to the seal ring after installation, so that the seal ring will not expand.

- (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:**

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

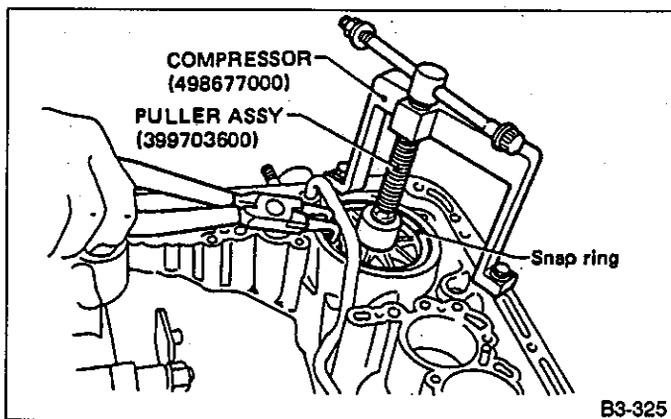
Be sure to tighten evenly.



B3-324

Fig. 204

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

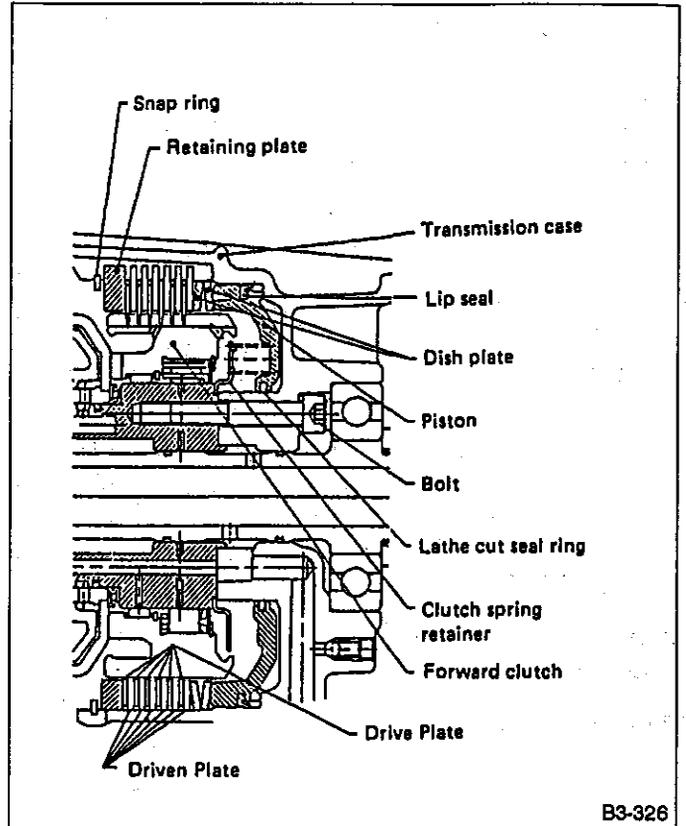


B3-325

Fig. 205

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

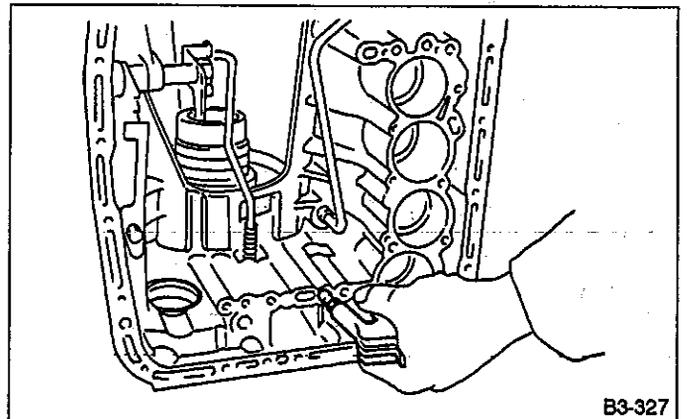
- 10) Installation of the low & reverse brake:



B3-326

Fig. 206

- (1) Install two dish plates, driven plates, drive plates, and a retaining plate, and secure with a snap ring.
- Pay attention to the orientation of the dish plate.
  - Driven plate :6  
Drive plate :6
  - Dish plate :2
- (2) Apply compressed air intermittently to check for operation.



B3-327

Fig. 207

(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)

Before measuring clearance, place the same thickness of shim on both sides to prevent retaining plate from tilting.

• Available retaining plates

Part No.	Thickness mm (in)
31667AA180	6.5 (0.256)
31667AA190	6.8 (0.268)
31667AA200	7.1 (0.280)
31667AA210	7.4 (0.291)
31667AA220	7.7 (0.303)
31667AA230	8.0 (0.315)
31667AA240	8.2 (0.323)
31667AA250	8.4 (0.331)

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

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.

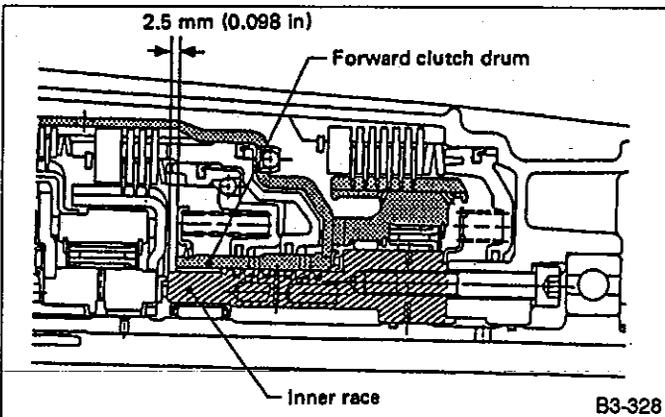


Fig. 208

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.

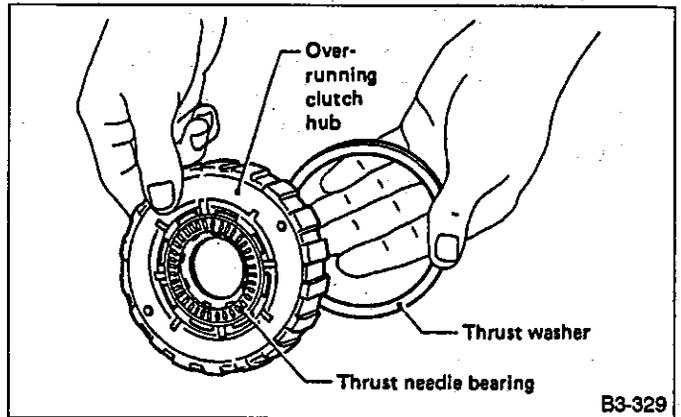


Fig. 209

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

Make sure the forward clutch splines are engaged correctly.

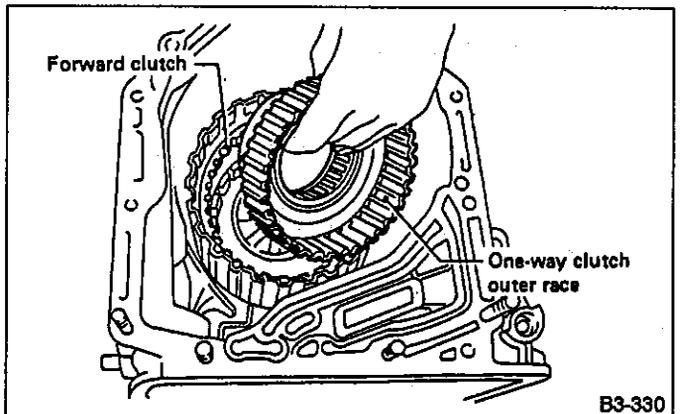


Fig. 210

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).

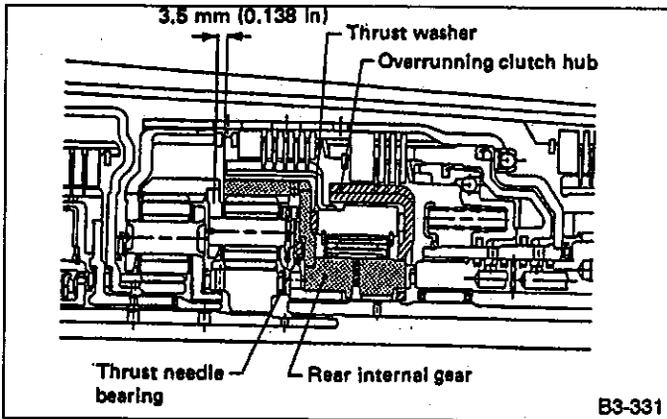


Fig. 211

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.

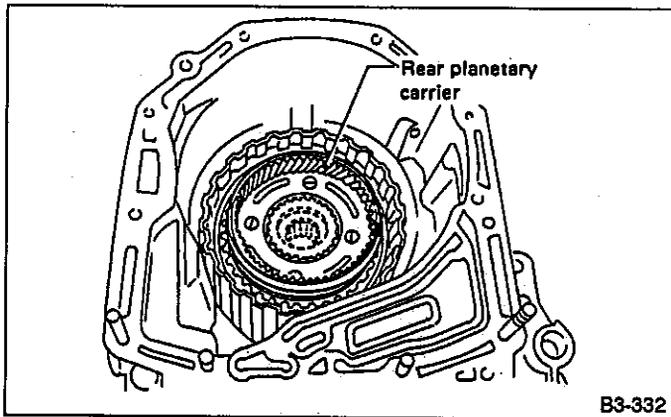


Fig. 212

17) Install the rear sun gear. Install the gear with the oil hole facing up.

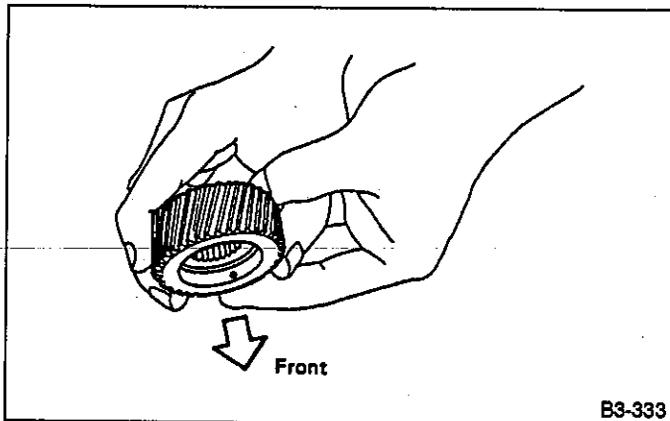


Fig. 213

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.

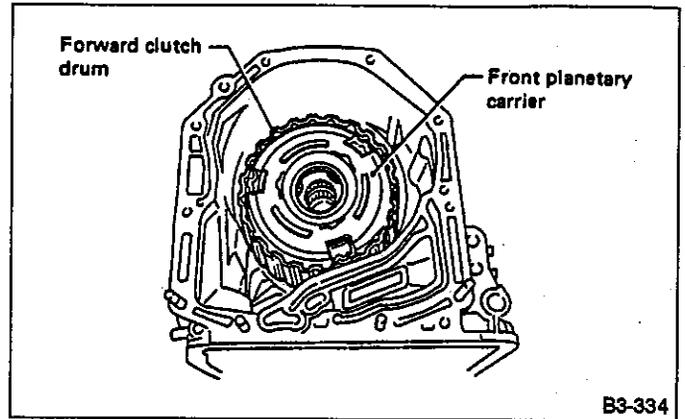


Fig. 214

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

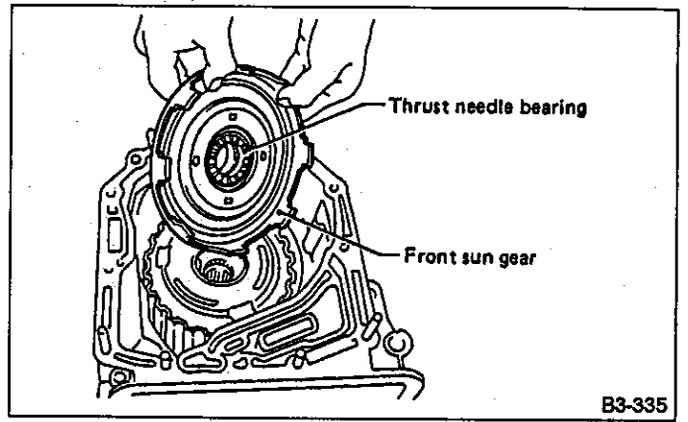


Fig. 215

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.

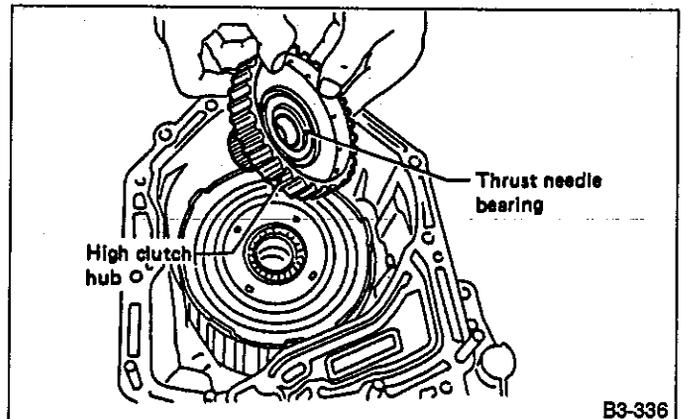


Fig. 216

21) Install the high clutch ASSY. Correctly engage the high clutch hub and clutch splines.

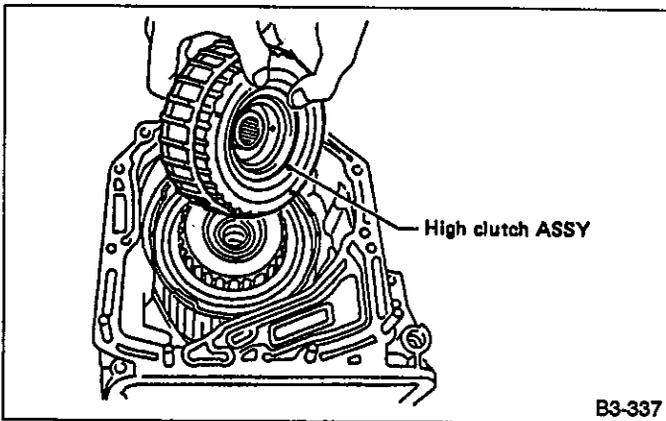


Fig. 217

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.

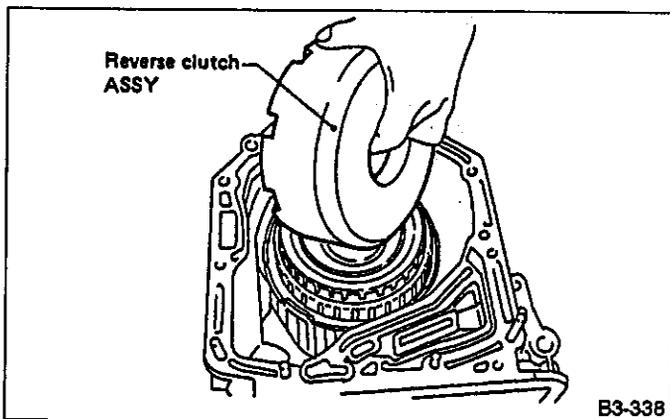


Fig. 218

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.

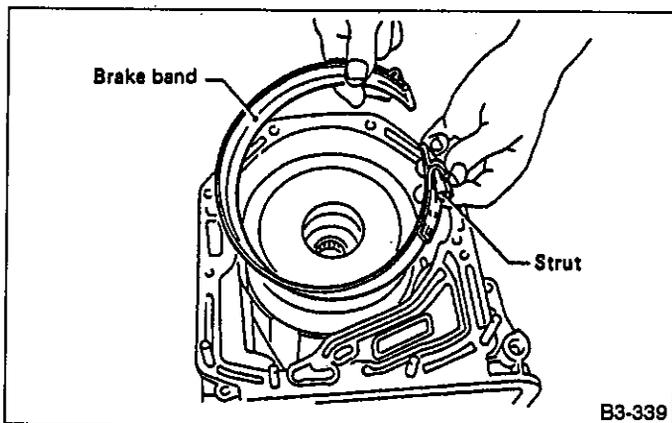


Fig. 219

24) Adjustment of total end play and reverse clutch end play

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

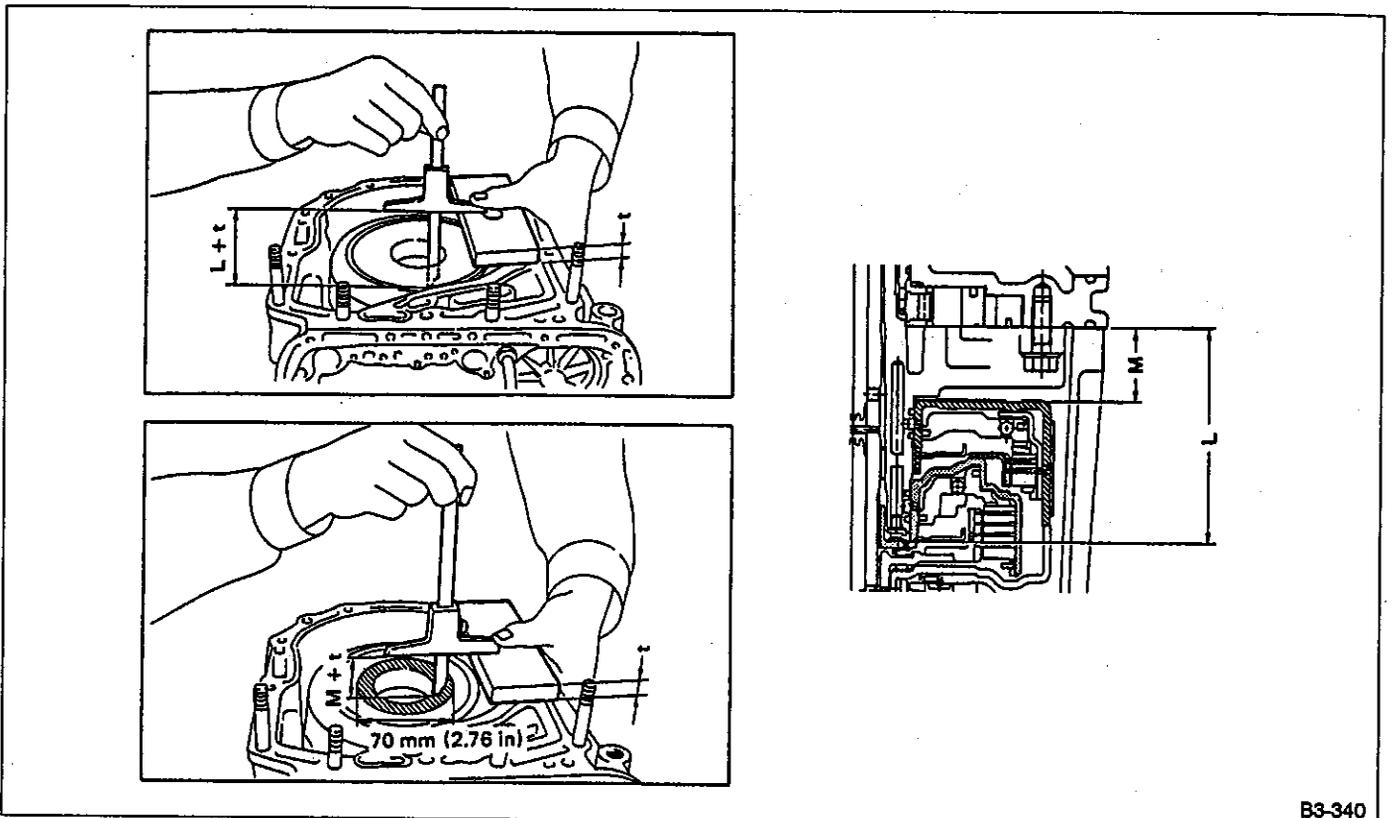
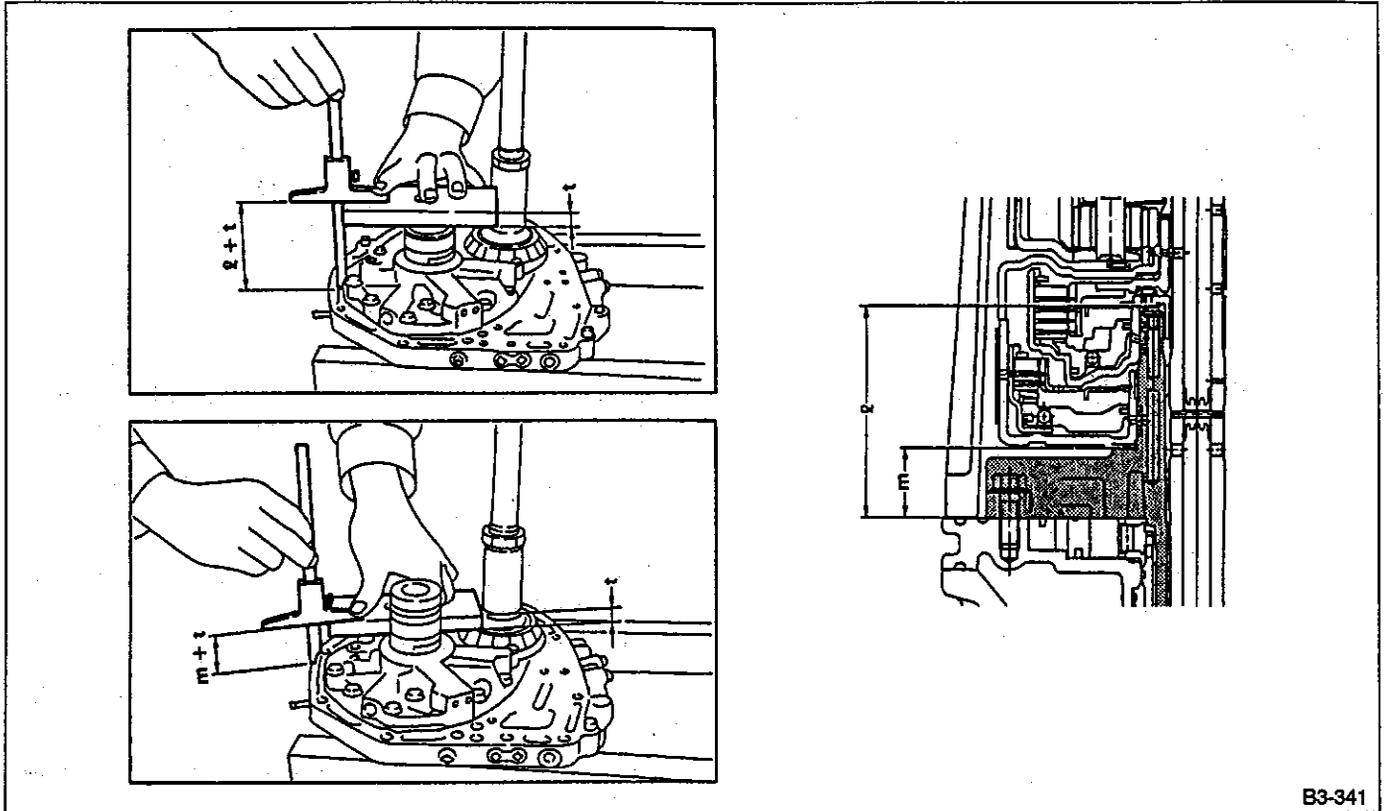


Fig. 220

B3-340

(2) Measure the distance from the oil pump housing mating surface to the top surface of the oil pump-cover with of the reverse clutch.



B3-341

Fig. 221

(3) Equation for calculation

● Total end play Unit: mm

$$C = (L + 0.4) - l$$

C : Clearance between concave portion of high clutch and end of clutch drum support

L : Length from case mating surface to concave portion of high clutch

0.4 : Gasket thickness

l : Height from housing mating surface to upper surface of clutch drum support

Select suitable bearing race from among those listed in the following table so that clearance C is in the 0.25 — 0.55 mm (0.0098 — 0.0217 in) range.

Part No.	Thickness mm (in)
803031021	0.8 (0.031)
803031022	1.0 (0.039)
803031023	1.2 (0.047)
803031024	1.4 (0.055)
803031025	1.6 (0.063)
803031026	1.8 (0.071)
803031027	2.0 (0.079)

● Reverse clutch end play

$$C = (M + 0.4) - m$$

C : Clearance between oil pump housing hose and end of reverse clutch

M : Distance from case mating surface to upper surface of reverse clutch

0.4 : Gasket thickness

m : Height from housing mating surface to thrust-receiving area of reverse clutch

Select suitable thrust washer from among those listed in the following table so that clearance C is in the 0.55 — 0.9 mm (0.0217 — 0.0354 in) range.

Part No.	Thickness mm (in)
31299AA000	0.7 (0.028)
31299AA010	0.9 (0.035)
31299AA020	1.1 (0.043)
31299AA030	1.3 (0.051)
31299AA040	1.5 (0.059)
31299AA050	1.7 (0.067)
31299AA080	1.9 (0.075)

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 and thrust needle bearing to the oil pump cover with vaseline.

(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.

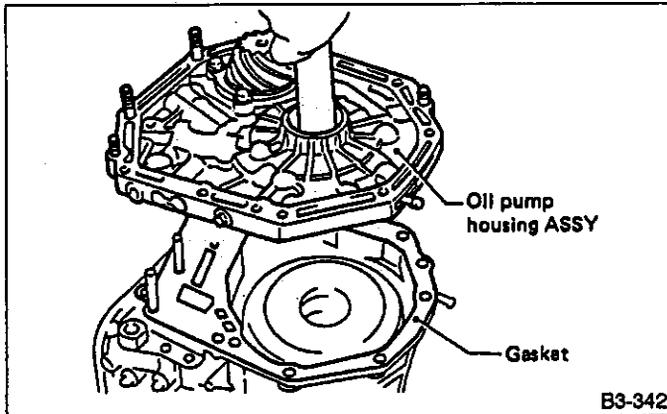


Fig. 222

(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:**

38 — 44 N·m (3.9 — 4.5 kg-m, 28 — 33 ft-lb)

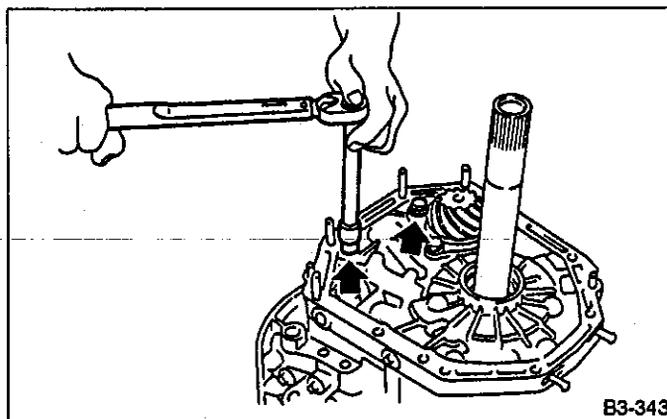


Fig. 223

**3. 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.

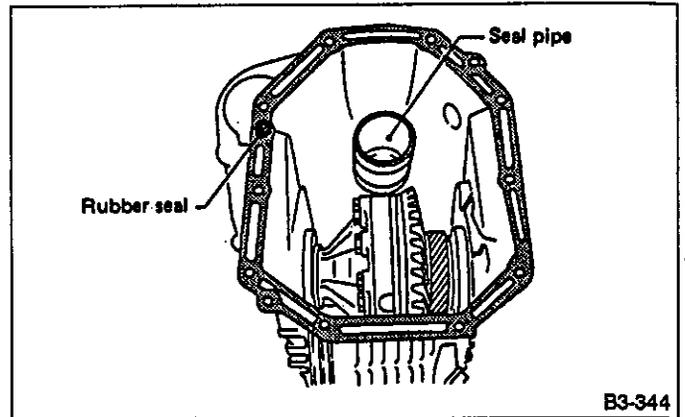


Fig. 224

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

**Tightening torque:**

34 — 40 N·m (3.5 — 4.1 kg-m, 25 — 30 ft-lb)

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

**4. CONTROL VALVE AND OIL PAN**

1) Install four accumulators with oil pans facing upward.

Be careful not to confuse the springs and installation positions.

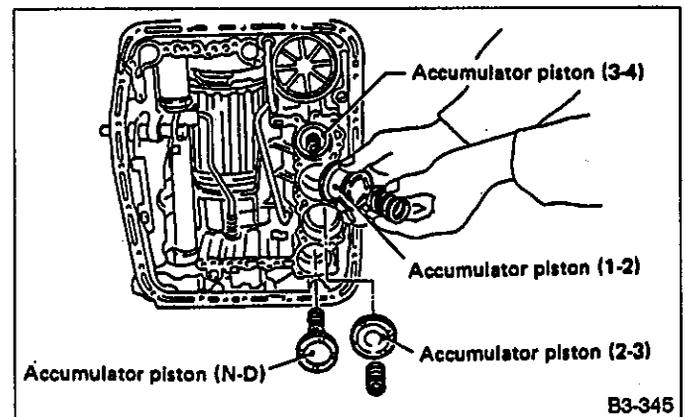


Fig. 225

- Spring spec.

Unit: mm (in)

Accumulator spring	Outer diameter	Free length
1 — 2	28.5 (1.122)	44.5 (1.752)
2 — 3	20.5 (0.807)	31.0 (1.220)
3 — 4	17.3 (0.681)	43.7 (1.720)
N — D	17.8 (0.701)	36.5 (1.437)

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 19 bolts.

**Tightening torque:**

7 — 9 N·m (0.7 — 0.9 kg-m, 5.1 — 6.5 ft-lb)

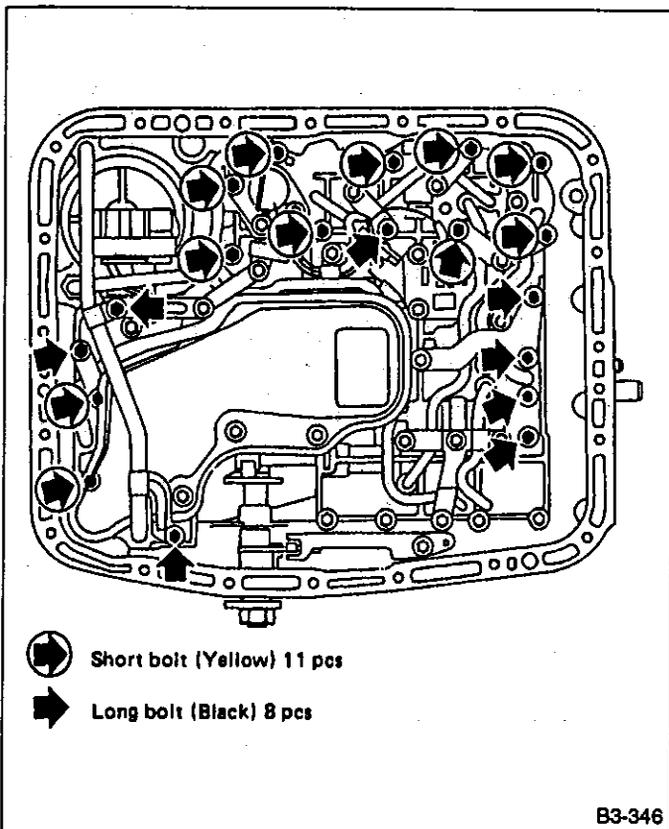


Fig. 226

- 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:**

7 — 9 N·m (0.7 — 0.9 kg-m, 5.1 — 6.5 ft-lb)

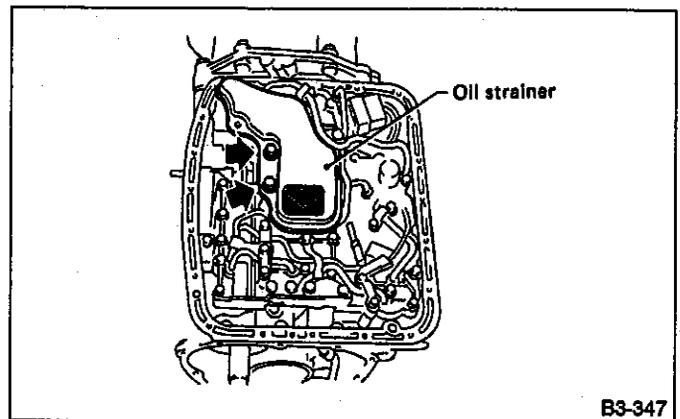


Fig. 227

5) Secure five connectors.

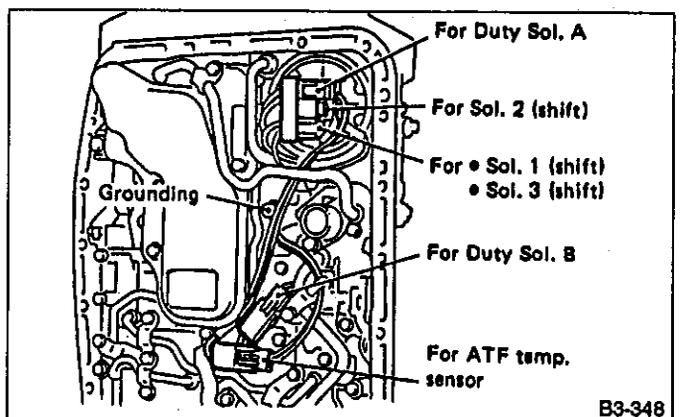


Fig. 228

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

**Tightening torque:**

7 — 9 N·m (0.7 — 0.9 kg-m, 5.1 — 6.5 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.

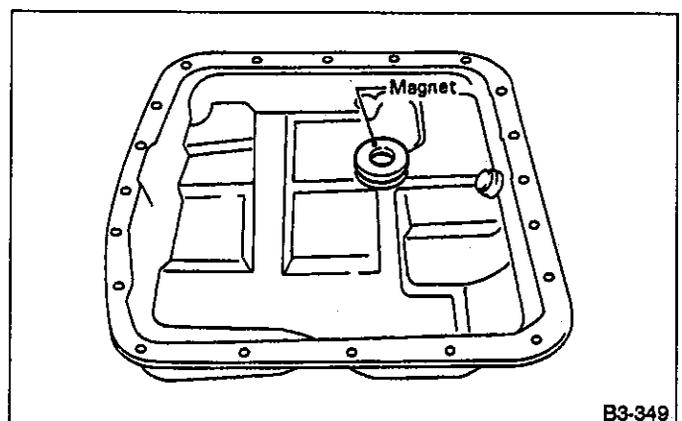


Fig. 229

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

**Tightening torque:**  
 3.4 — 4.4 N·m (0.35 — 0.45 kg-m, 2.5 — 3.3 ft-lb)

Tighten the bolts evenly.

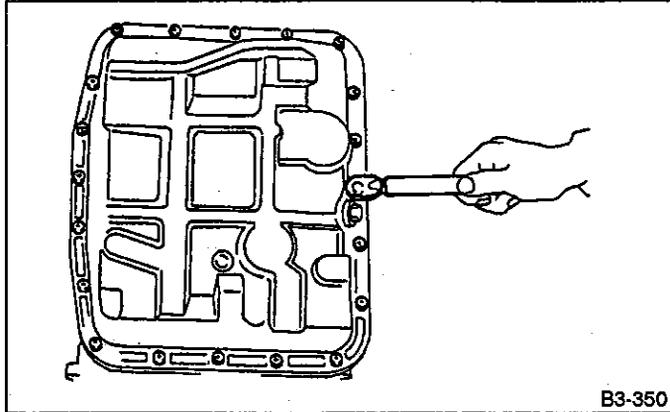


Fig. 230

**5. EXTENSION SECTION**

When installing new oil seal into extension case, press it with **INSTALLER (498057300)**.

- 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:**  
 7 — 9 N·m (0.7 — 0.9 kg-m, 5.1 — 6.5 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 OF EACH SECTION**

- 1) Install revolution sensor (vehicle speed sensor 1) on transmission case. [FWD only]

**Tightening torque:**  
 6 — 8 N·m (0.6 — 0.8 kg-m, 4.3 — 5.8 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:**  
 93 — 103 N·m (9.5 — 10.5 kg-m, 69 — 76 ft-lb)

After tightening, stake the lock nut securely.

- 4) Install the reduction drive gear ASSY.  
 Insert it fully into position until the bearing shoulder bottoms.

- 5) Measurement and adjustment of extension end play
  - (1) Measure distance L from end of extension case and rear drive shaft. (On FWD models, measure distance from end of case to point at bearing location.)

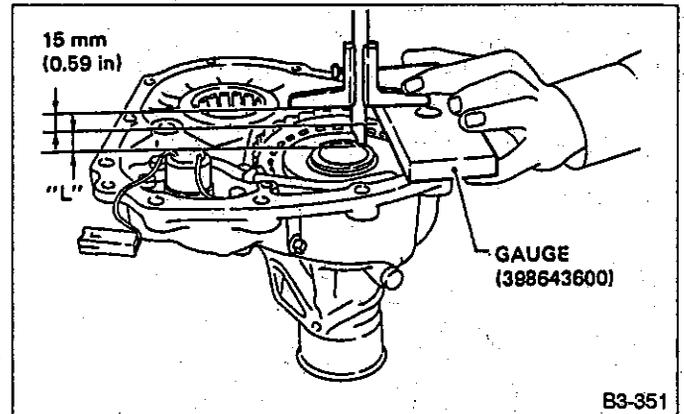


Fig. 231

L = Measured value — 15

- (2) Measure the distance "l" from the transmission case mating surface to the reduction drive gear end surface.  
 (On FWD models, measure distance from end of case to end of bearing.)

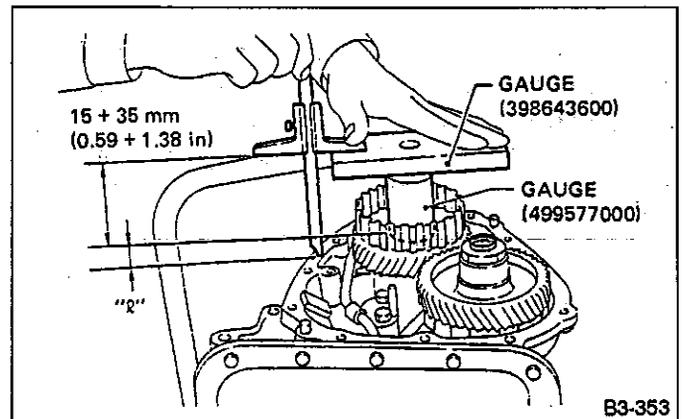


Fig. 232

$\ell$  = Measured value — 50

(3) Calculation equation: Unit: (mm)

$$T = (L + 0.4) - \ell$$

T : Clearance between end of reduction drive gear and end of rear drive shaft. (Clearance between end of reduction drive gear and end of bearing on FWD model)

L : Distance from end of extension case to end of rear drive shaft. (Distance from end of case to point at bearing location)

0.4: Gasket thickness

$\ell$  : Height from end of transmission case to end of reduction drive gear. (Height from end of case to end of bearing on FWD models)

Select suitable thrust needle bearing from among those listed in the following table to adjust clearance in the 0.50 — 0.2 mm (0.0197 — 0.0079 in) range.

● 4WD: Thrust needle bearing

Part No.	Thickness mm (in)
806535020	3.8 (0.150)
806535030	4.0 (0.157)
806535040	4.2 (0.165)
806535050	4.4 (0.173)
806535060	4.6 (0.181)
806535070	4.8 (0.189)
806535090	5.0 (0.197)

● FWD: Reduction gear shim

Part No.	Thickness mm (in)
31288AA000	0.15 (0.0059)

Select from one to five shims so that clearance is within specifications.

6) Installation of extension case 4WD, cover case FWD 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:

23 — 26 N•m (2.3 — 2.7 kg-m, 17 — 20 ft-lb)

FWD model:

(1) Attach selected shim to cover case using vaseline.

(2) Set the parking return spring.

(3) After positioning gasket, assemble cover case and transmission case.

**While aligning bearings, parking shaft, reduction driven gear, etc. assemble the two cases.**

(4) Tighten bolts.

Tightening torque:

23 — 26 N•m (2.3 — 2.7 kg-m, 17 — 20 ft-lb)

## 7. EXTERNAL PARTS

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

Tightening torque:

6 — 8 N•m (0.6 — 0.8 kg-m, 4.3 — 5.8 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 select lever into the shaft, and tighten the nut.

Tightening torque:

36 — 42 N•m (3.7 — 4.3 kg-m, 27 — 31 ft-lb)

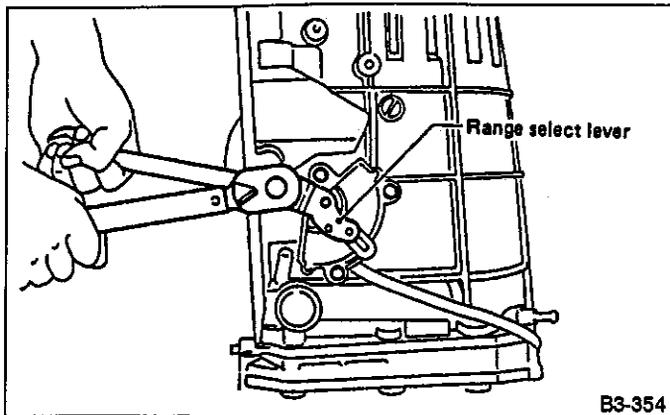


Fig. 233

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

Ensure that gauge moves properly.

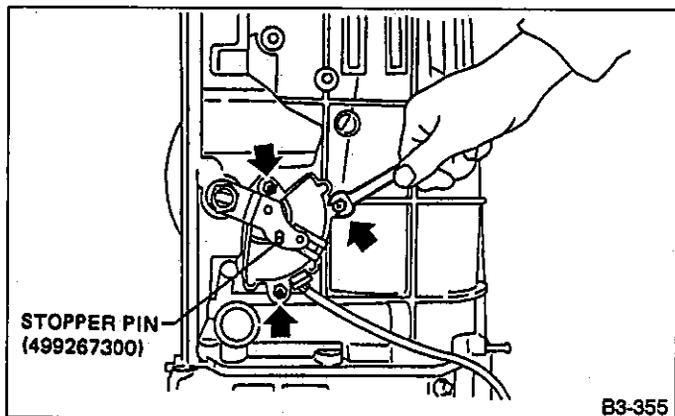


Fig. 234

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

**Tightening torque:**

2.9 — 3.9 N•m (0.30 — 0.40 kg-m, 2.2 — 2.9 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:**

27.5 — 34.3 N•m (2.80 — 3.50 kg-m, 20.3 — 25.3 ft-lb)

5) Install the oil cooler inlet pipe.

**Tightening torque:**

23 — 26 N•m (2.3 — 2.7 kg-m, 17 — 20 ft-lb)

Be sure to use a new aluminum washer.

6) Install the oil charge pipe.

**Tightening torque: N•m (kg-m, ft-lb)**

**UPPER**

34 — 40 (3.5 — 4.1, 25 — 30)

**LOWER**

5.9 — 6.9 (0.60 — 0.70, 4.3 — 5.1)

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.

**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 bracket.

**Tightening torque:**

36 — 42 N•m (3.7 — 4.3 kg-m, 27 — 31 ft-lb)

9) Tighten the drain plugs.

**Tightening torque: N•m (kg-m, ft-lb)**

**Diff.**

41 — 47 (4.2 — 4.8, 30 — 35)

**ATF**

23 — 26 (2.3 — 2.7, 17 — 20)

10) Install the air breather hose.

11) Insert the input shaft while turning lightly by hand.

Be careful not to damage the bushing.

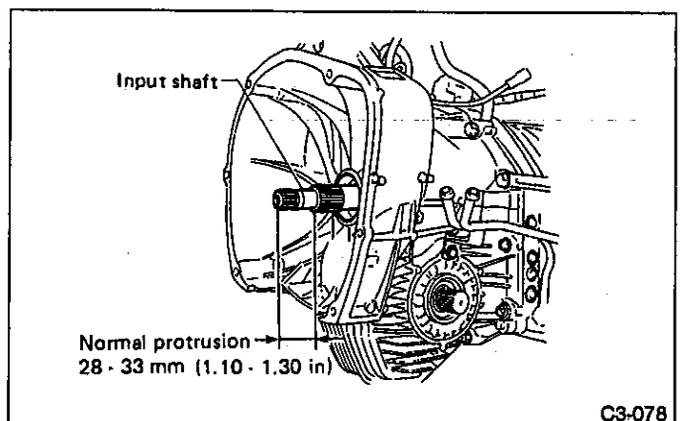


Fig. 235

- 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	8.3 — 8.6 (8.8 — 9.1, 7.3 — 7.6)

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

## 5. Reduction Drive Gear Assembly

### A: DISASSEMBLY

- 1) Take out the seal rings.  
**Be careful not to damage the seal rings.**

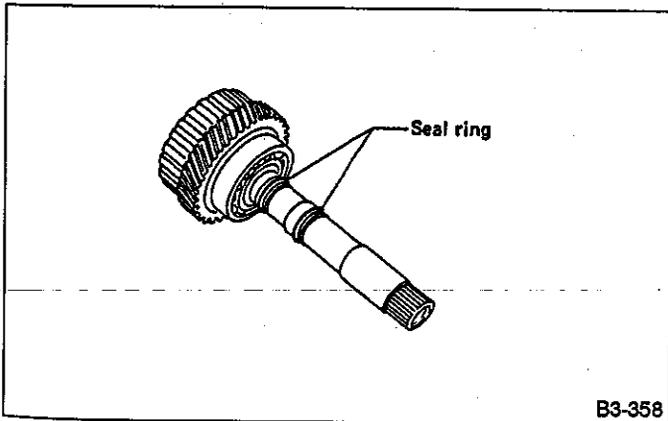


Fig. 236

- 2) Take out the snap ring (out).  
**Be careful not to damage the splines.**  
 3) Using a press, remove the reduction drive gear.

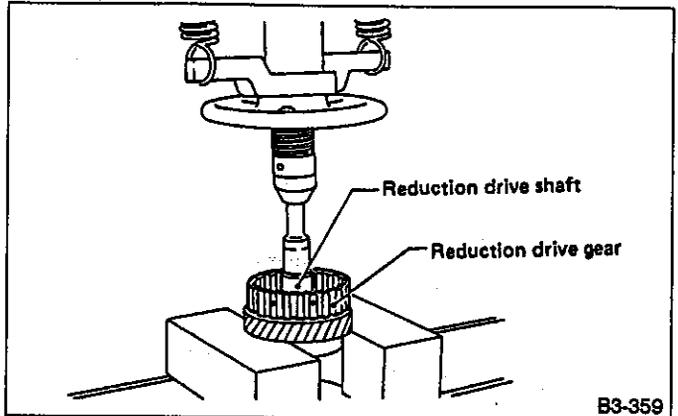


Fig. 237

- 4) Using a press, remove the ball bearing.

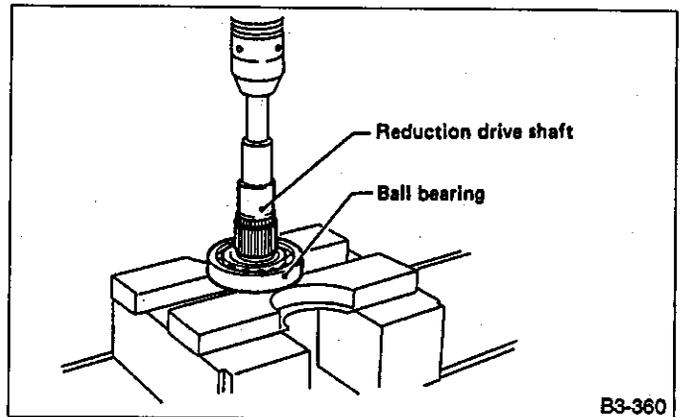


Fig. 238

### B: INSPECTION

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

**C: ASSEMBLY**

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

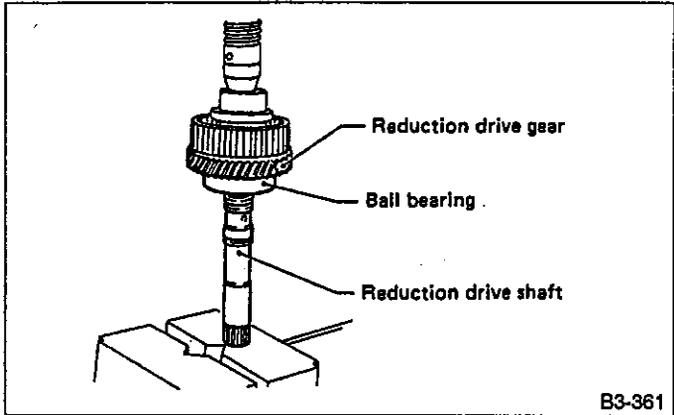


Fig. 239

- 2) 4WD: Fit the snap ring securely in the snap ring groove on the shaft.  
FWD: Press ball bearing into place and secure snap ring to groove in 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.

**6. Control Valve Body**

**A: DISASSEMBLY**

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

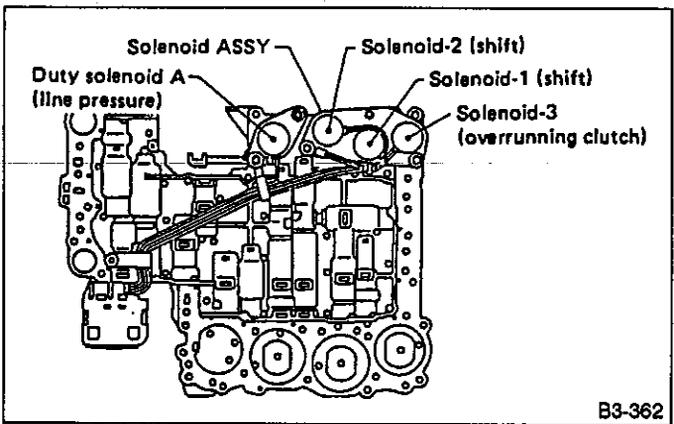


Fig. 240

2) Remove the following parts from the lower valve body.

- (1) Duty solenoid B (lock-up)
- (2) ATF temperature sensor

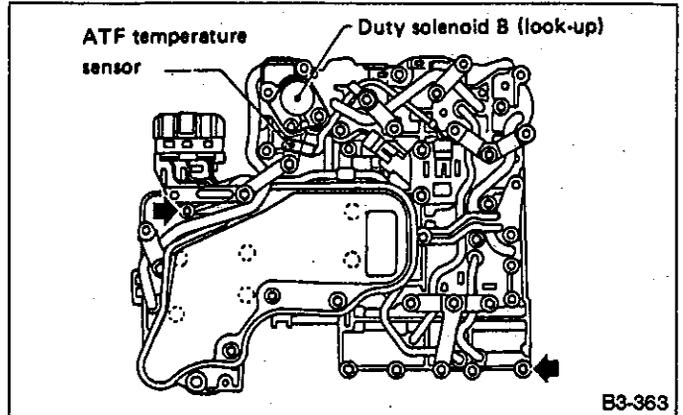


Fig. 241

- 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 locating bolts. (Fig. 241) 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.

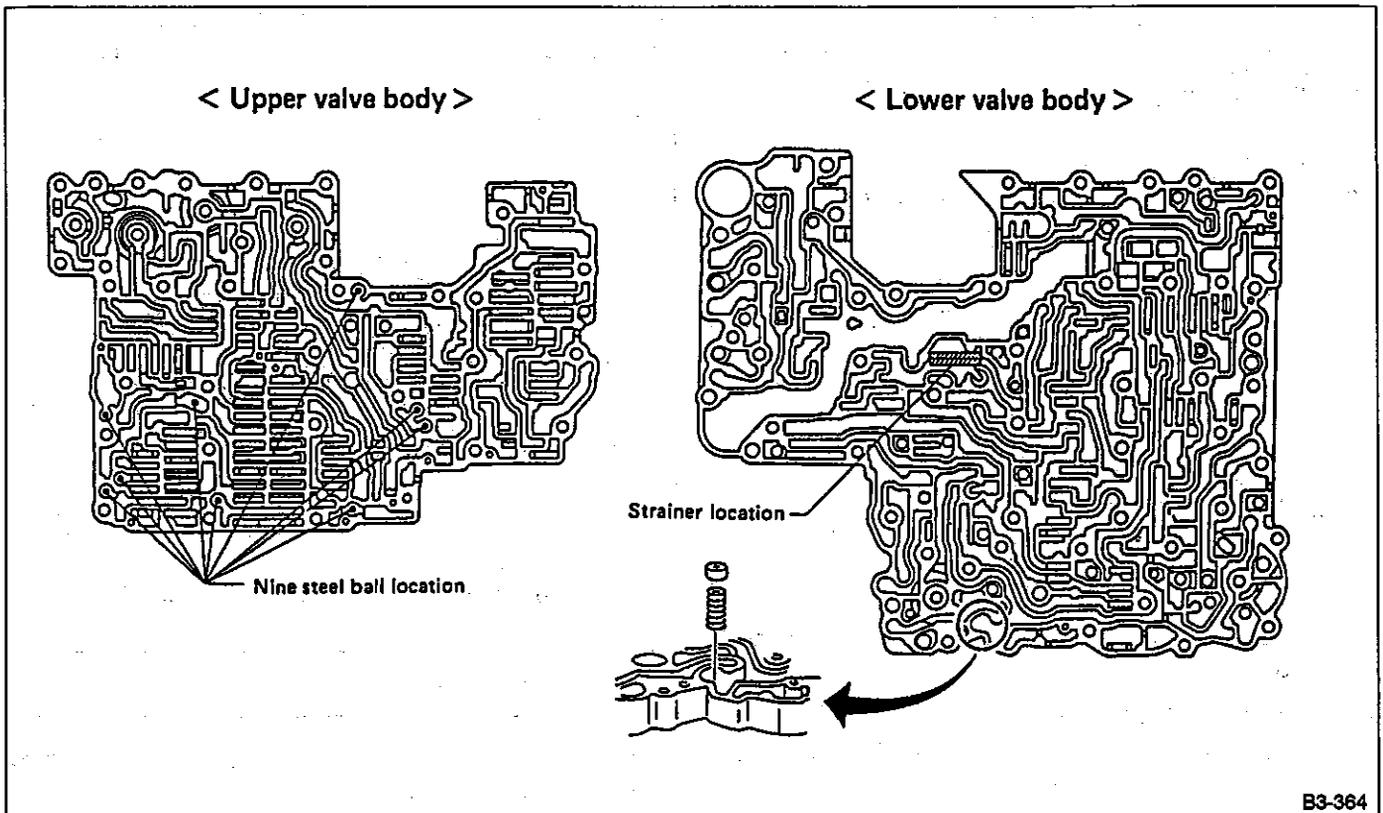
**B: INSPECTION**

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

**C: ASSEMBLY**

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

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



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Fig. 242

b. Tighten two locating 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)

## 7. Oil Pump Assembly

### A: DISASSEMBLY

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

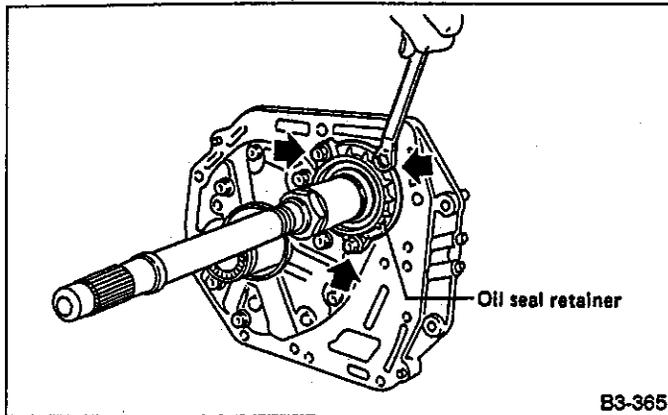


Fig. 243

- 2) Remove the oil pump cover.  
Lightly tap the end of the stator shaft to remove the cover.

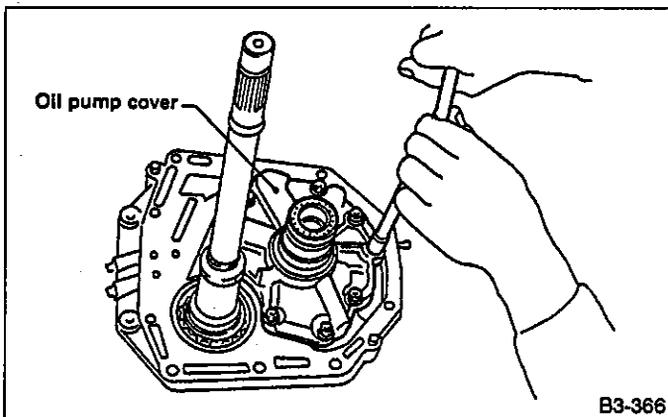


Fig. 244

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

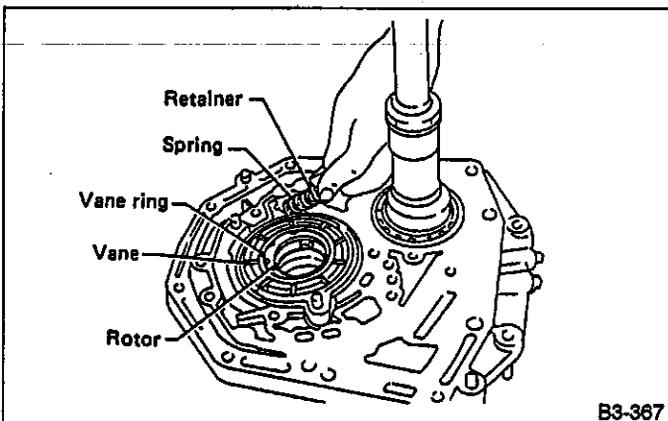


Fig. 245

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

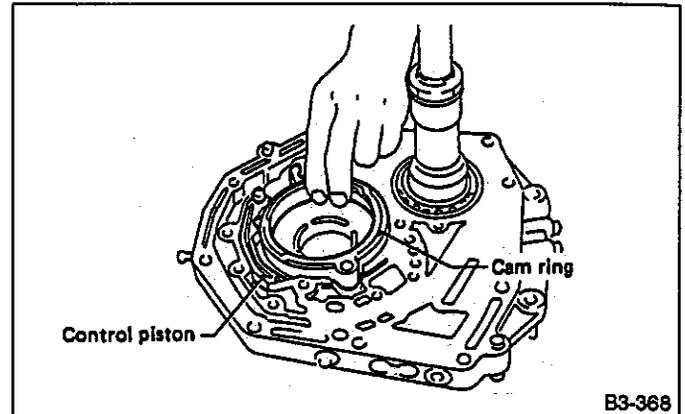


Fig. 246

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

### B: 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.

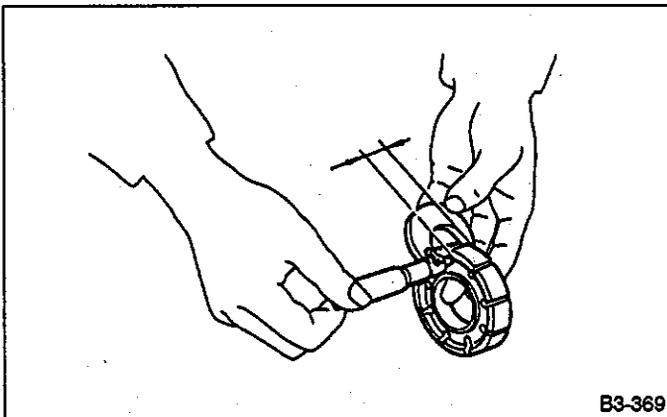


Fig. 247

(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.

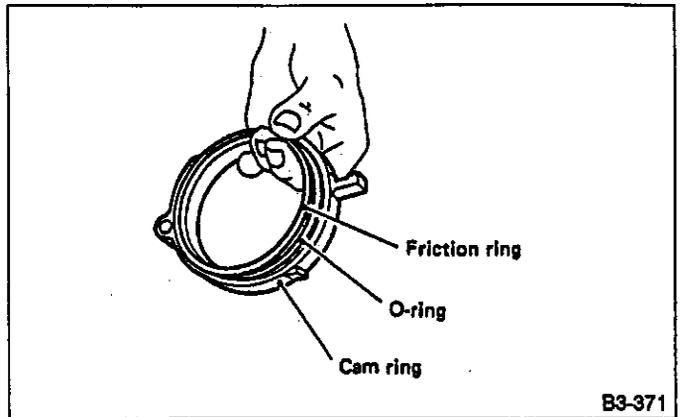


Fig. 249

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

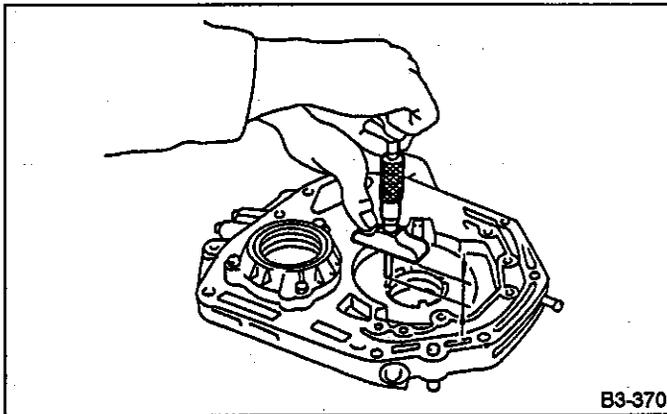


Fig. 248

(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.

Part name	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.

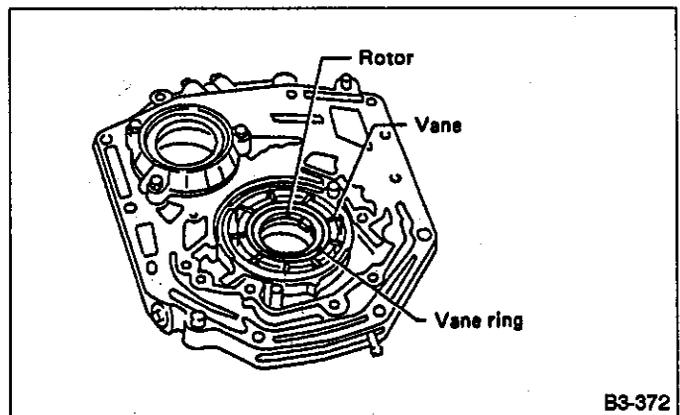


Fig. 250

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

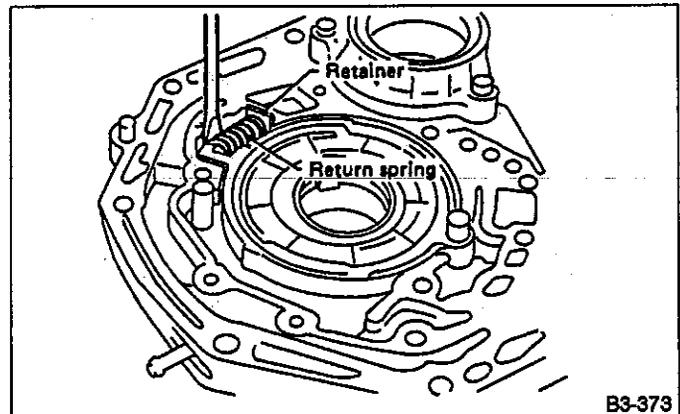


Fig. 251

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.)

**C: 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.

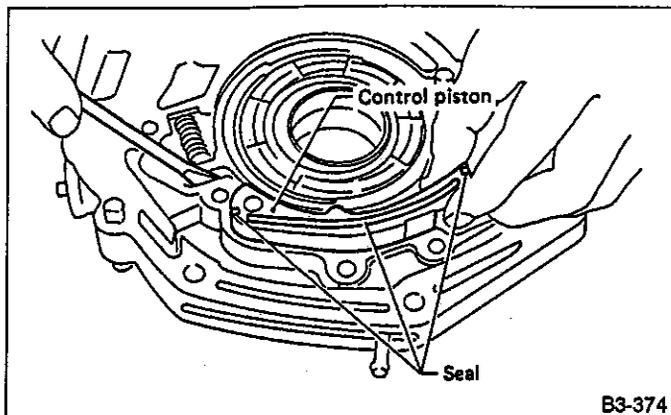


Fig. 252

- 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:**

23 — 26 N·m (2.3 — 2.7 kg-m, 17 — 20 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.

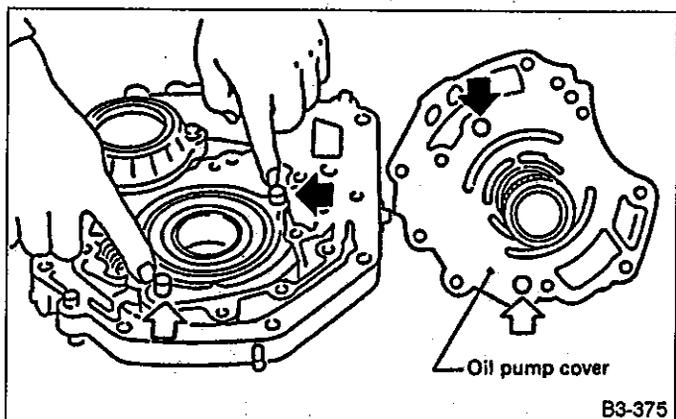


Fig. 253

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

## 8. Drive Pinion Shaft

### A: 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

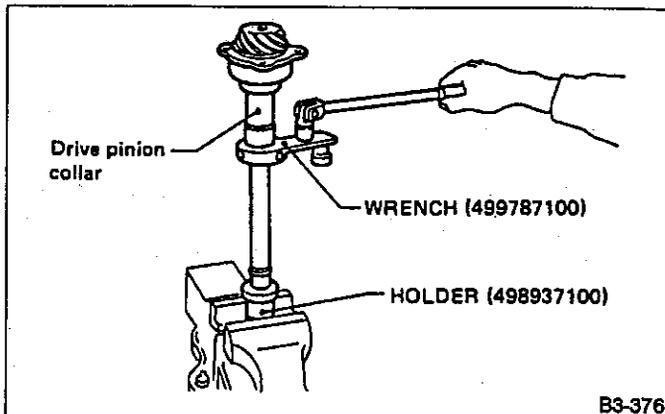


Fig. 254

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

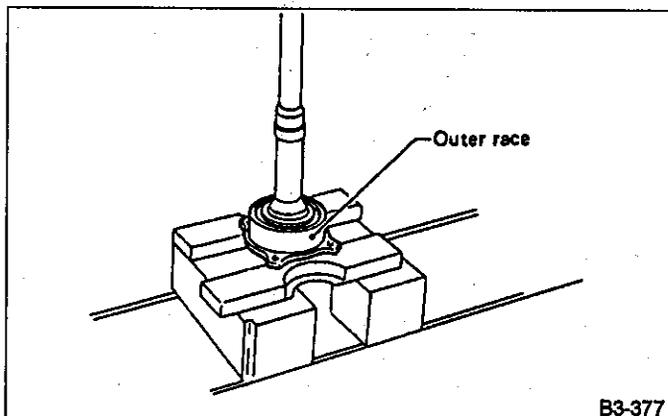


Fig. 255

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

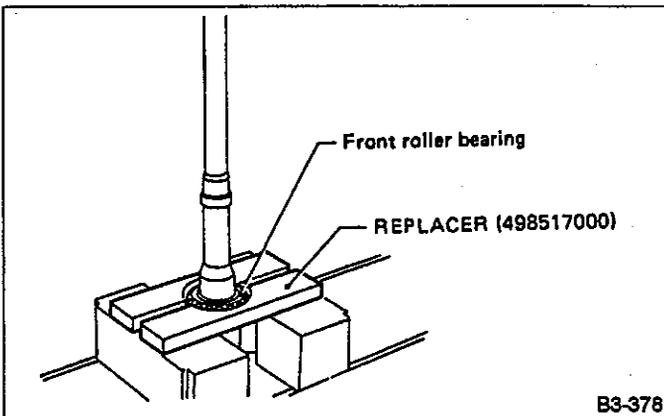


Fig. 256

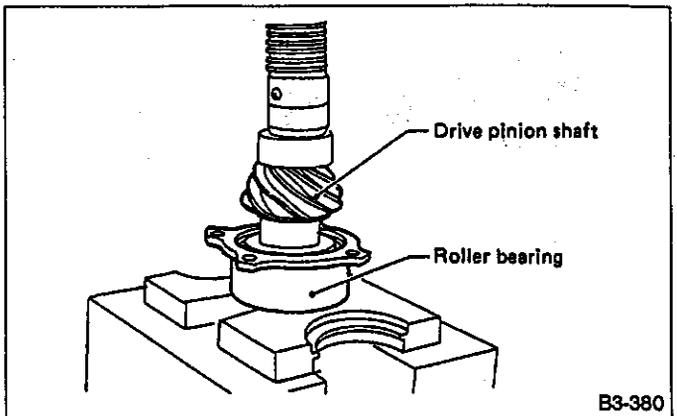


Fig. 258

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.

**Actual tightening torque:**

108 — 118 N·m (11.0 — 12.0 kg-m, 80 — 87 ft-lb)

- a. Pay attention to the orientation of lock washer.
- b. When using special tool WRENCH (499787100) and torque wrench, tighten it to 88 N·m (9 kg-m, 65 ft-lb).

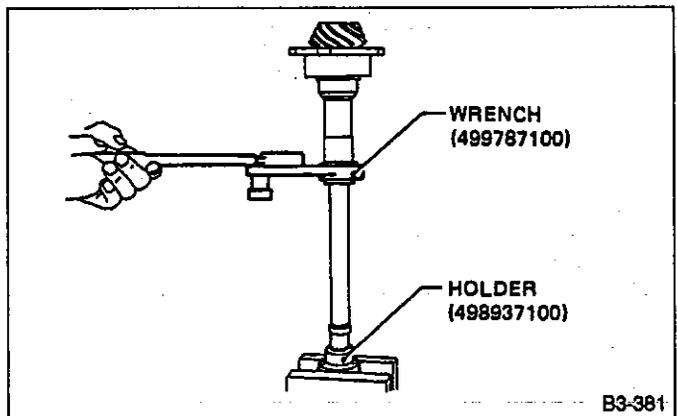


Fig. 259

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 — 17.4 in-lb)

**B: INSPECTION**

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

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

**C: ASSEMBLY**

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

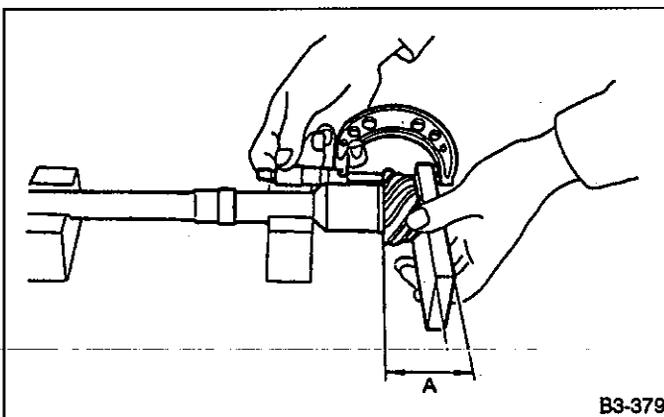
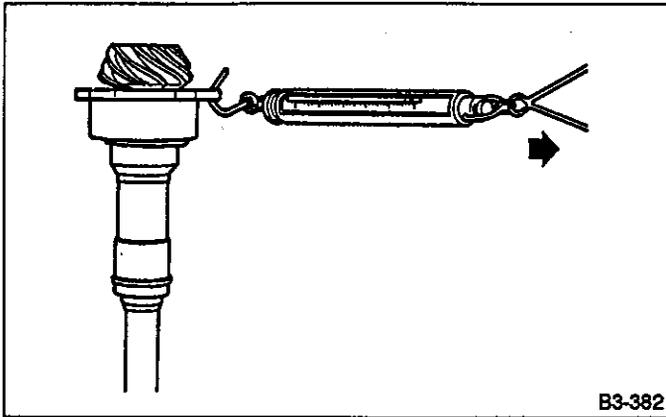


Fig. 257

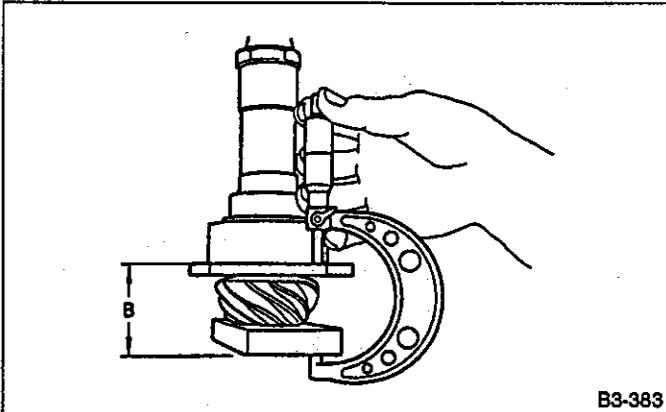
2) Using a press, force-fit the roller bearing in position. Do not change the relative positions of the outer race and bearing cone.



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Fig. 260

- 6) Stake the lock nut securely at two places.
- 7) Measure dimension "B" of the drive pinion shaft.



B3-383

Fig. 261

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

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$$t = 6.5 \pm 0.0625 - (B - A)$$

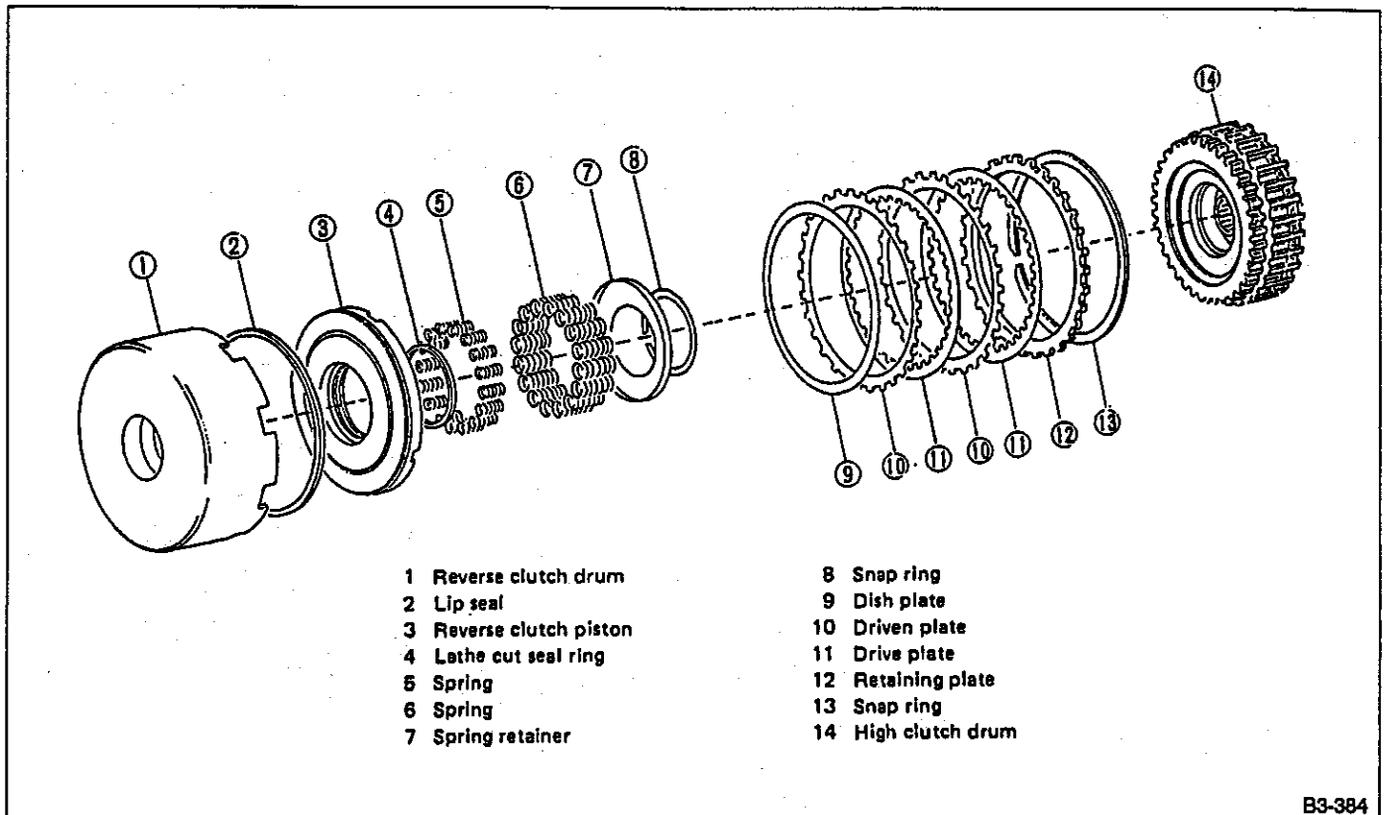

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The number of shims must be three or less.

• Available drive pinion shims

Part No.	Thickness mm (in)	
	31451AA050	0.15
31451AA060	0.175	(0.0069)
31451AA070	0.2	(0.008)
31451AA080	0.225	(0.0089)
31451AA090	0.25	(0.0098)
31451AA100	0.275	(0.0108)

## 9. Reverse Clutch



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Fig. 262

### A: 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.

### B: 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

### C: ASSEMBLY

- 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)

**Before measuring clearance, place the same thickness of shim on both sides to prevent retaining plate from tilting.**

• Available retaining plates

Part No.	Thickness mm (in)
31567AA000	4.6 (0.181)
31567AA020	4.8 (0.189)
31567AA030	5.0 (0.197)
31567AA040	5.2 (0.205)
31567AA050	5.4 (0.213)

# 10. High Clutch

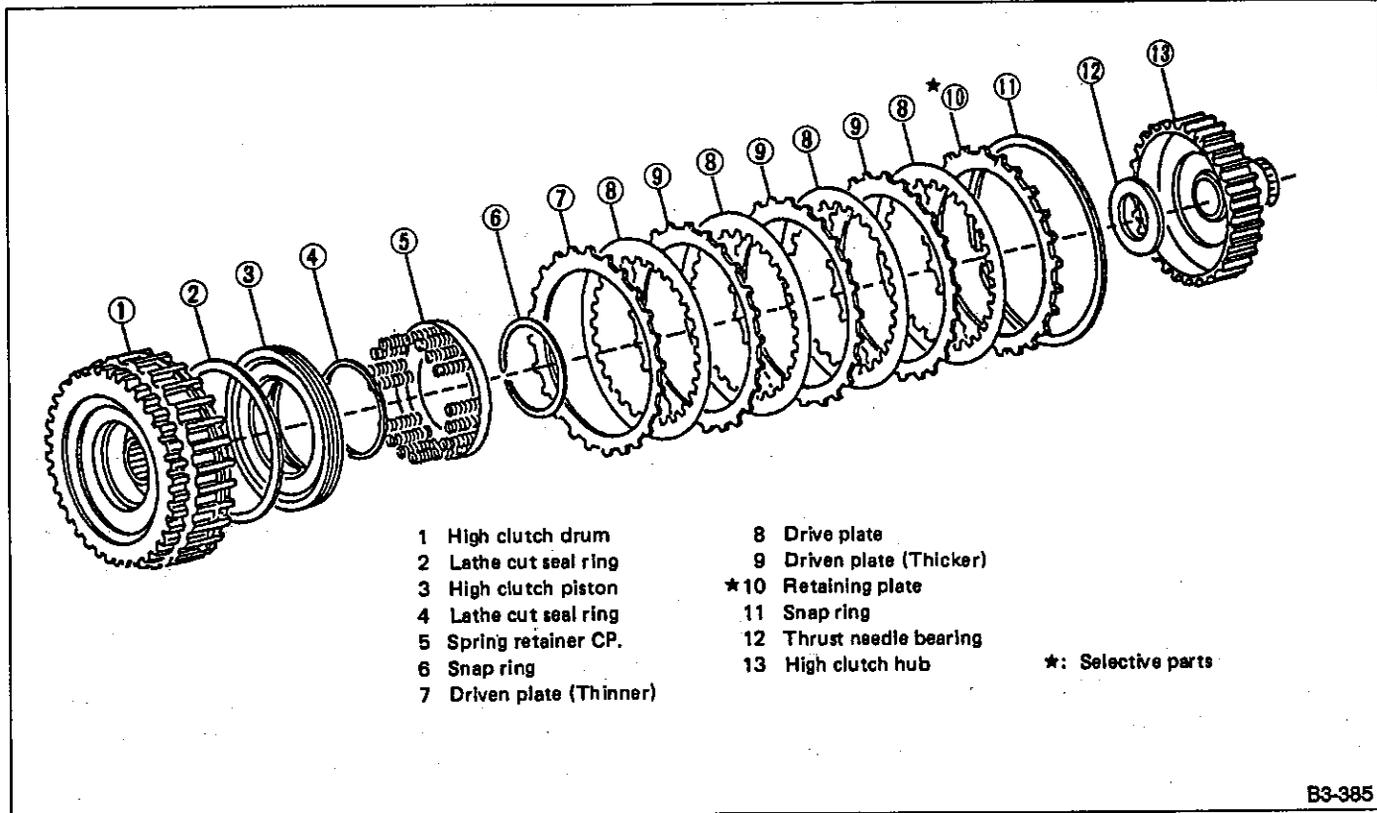
## A: DISASSEMBLY

- 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.

## B: 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

## C: ASSEMBLY



B3-385

Fig. 263

- 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)

**Before measuring clearance, place the same thickness of shim on both sides to prevent retaining plate from tilting.**

● **Available retaining plates**

Part No.	Thickness mm (in)
31567AA190	3.6 (0.142)
31567AA200	3.8 (0.150)
31567AA210	4.0 (0.157)
31567AA220	4.2 (0.165)
31567AA230	4.4 (0.173)
31567AA240	4.6 (0.181)
31567AA250	4.8 (0.189)
31567AA260	5.0 (0.197)

## 11. Forward Clutch Drum

### A: DISASSEMBLY

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

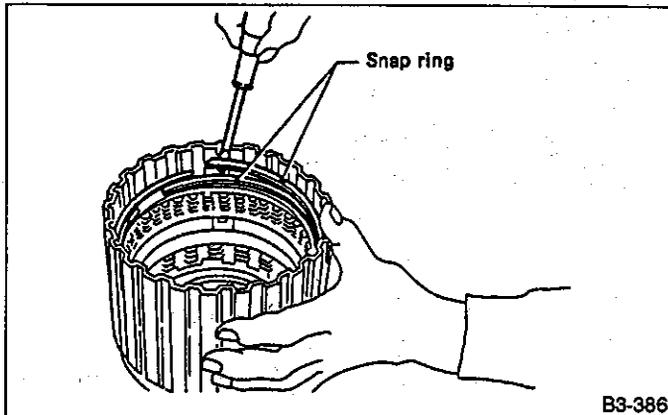


Fig. 264

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

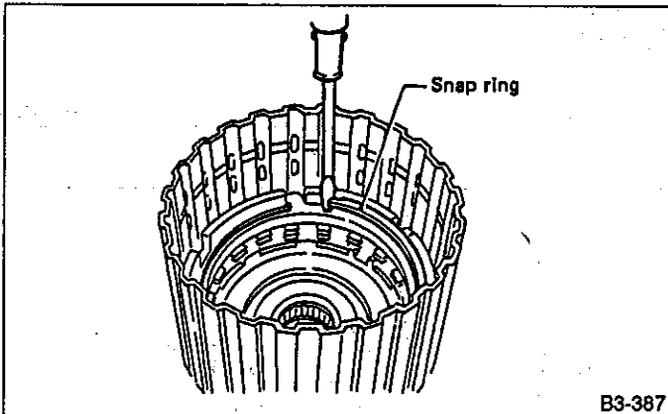


Fig. 265

- 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) and COMPRESSOR (398673600).
- 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.

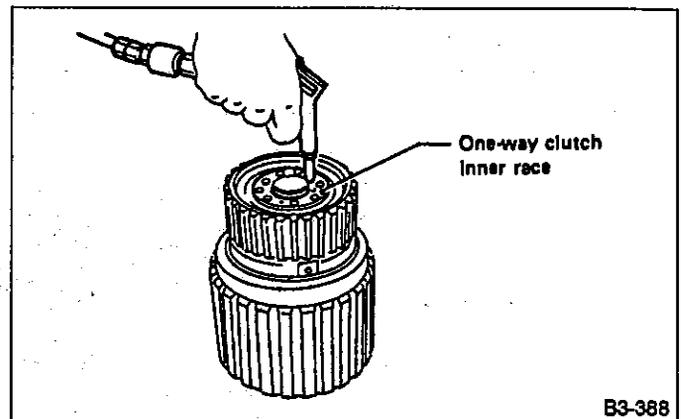


Fig. 266

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

### B: 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

**C. ASSEMBLY**

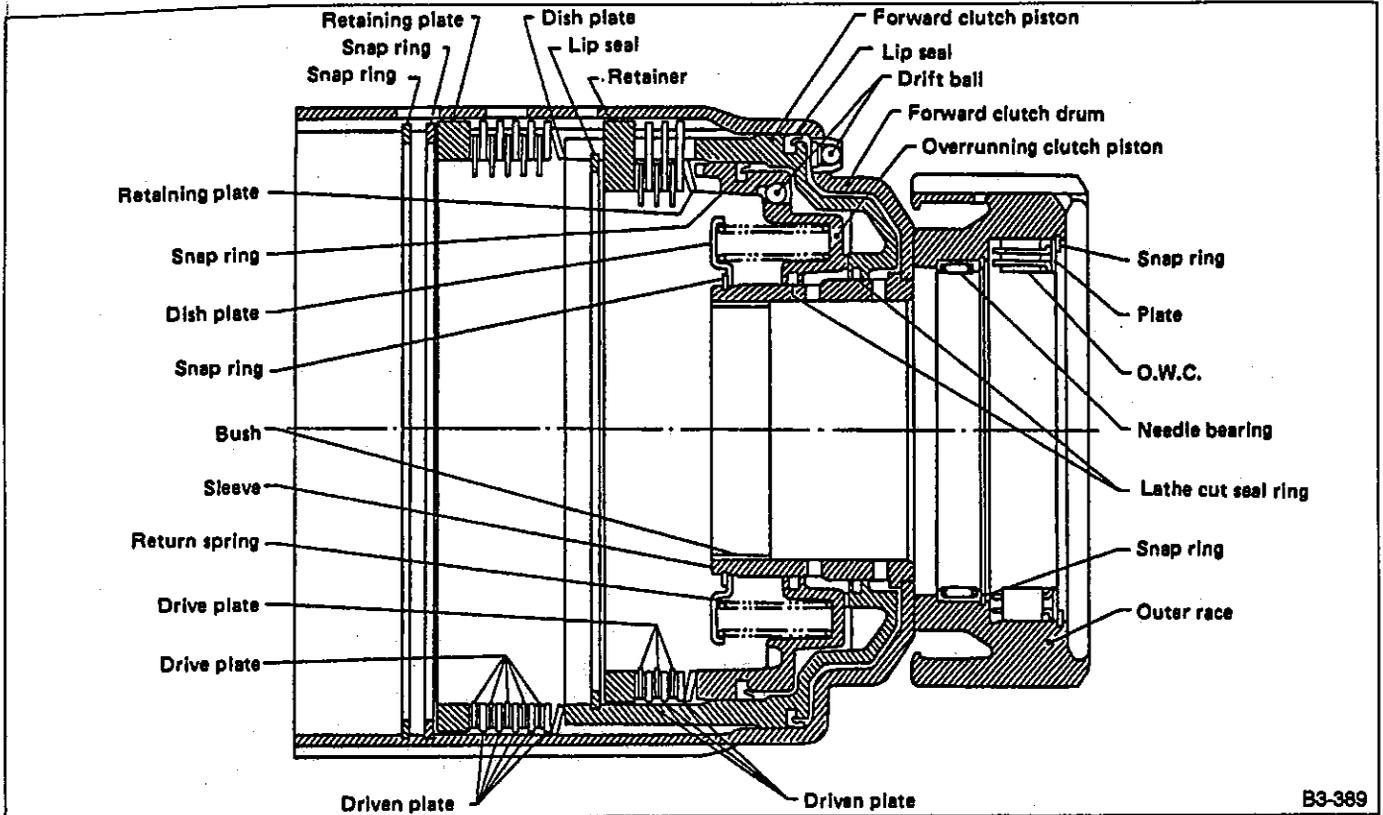


Fig. 267

- 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.

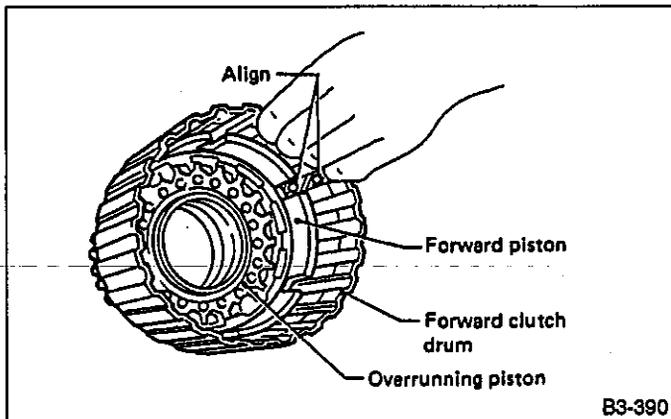


Fig. 268

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

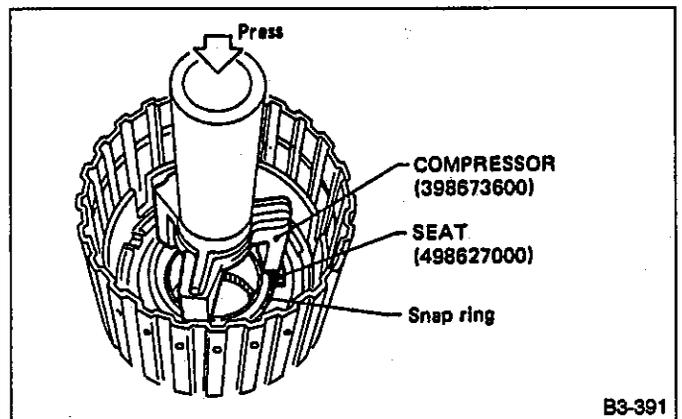


Fig. 269

- 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.

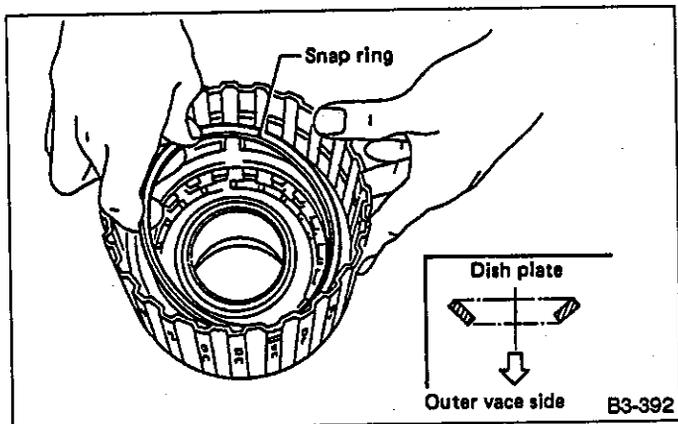


Fig. 270

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.

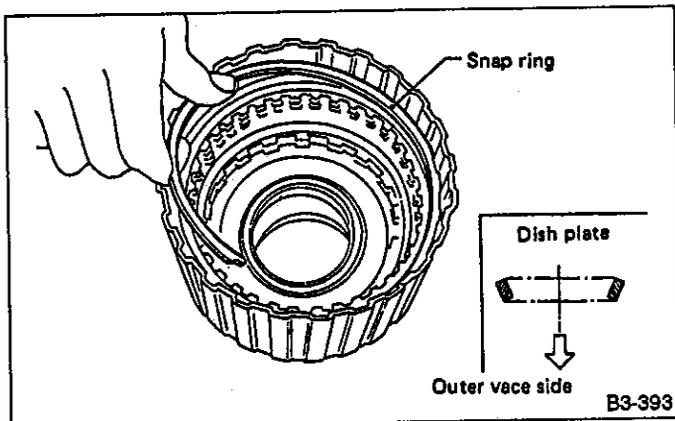


Fig. 271

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)

Before measuring clearance, place the same thickness of shim on both sides to prevent retaining plate from tilting.

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

(Forward clutch)

Part No.	Thickness mm (in)
31567AA010	8.0 (0.315)
31567AA060	8.2 (0.323)
31567AA070	8.4 (0.331)
31567AA080	8.6 (0.339)
31567AA090	8.8 (0.346)
31567AA100	9.0 (0.354)

(Overrunning clutch)

Part No.	Thickness mm (in)
31567AA120	8.0 (0.315)
31567AA130	8.2 (0.323)
31567AA140	8.4 (0.331)
31567AA150	8.6 (0.339)
31567AA160	8.8 (0.346)
31567AA170	9.0 (0.354)
31567AA180	9.2 (0.362)

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

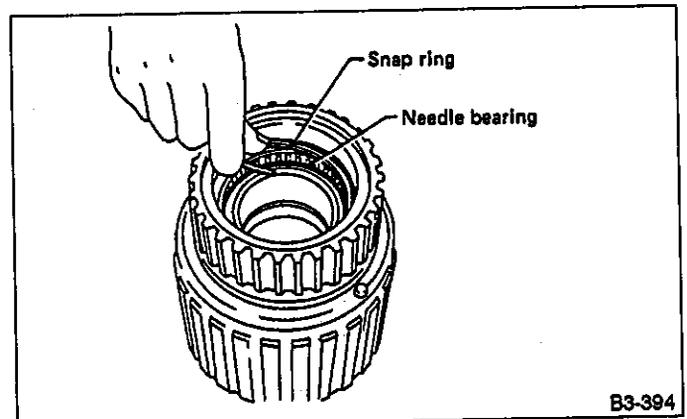


Fig. 272

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.

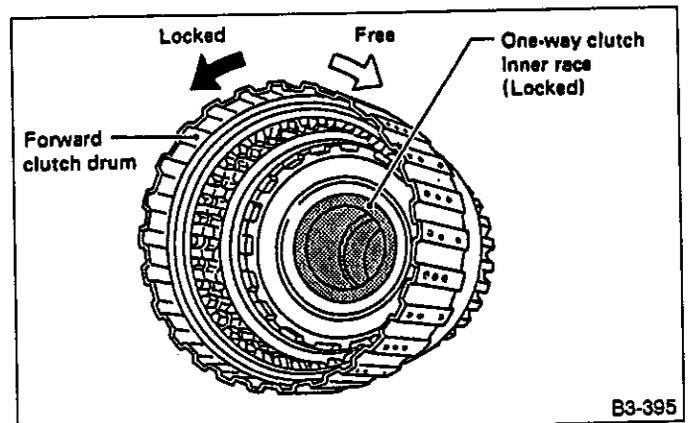


Fig. 273

## 12. One-way Clutch Outer Race

### A: DISASSEMBLY

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

### B: INSPECTION

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

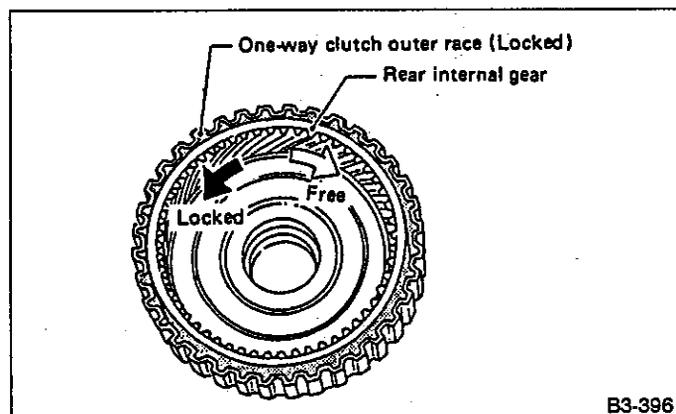
### C: ASSEMBLY

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 counter-clockwise direction.



B3-396

Fig. 274

## 13. Servo Piston

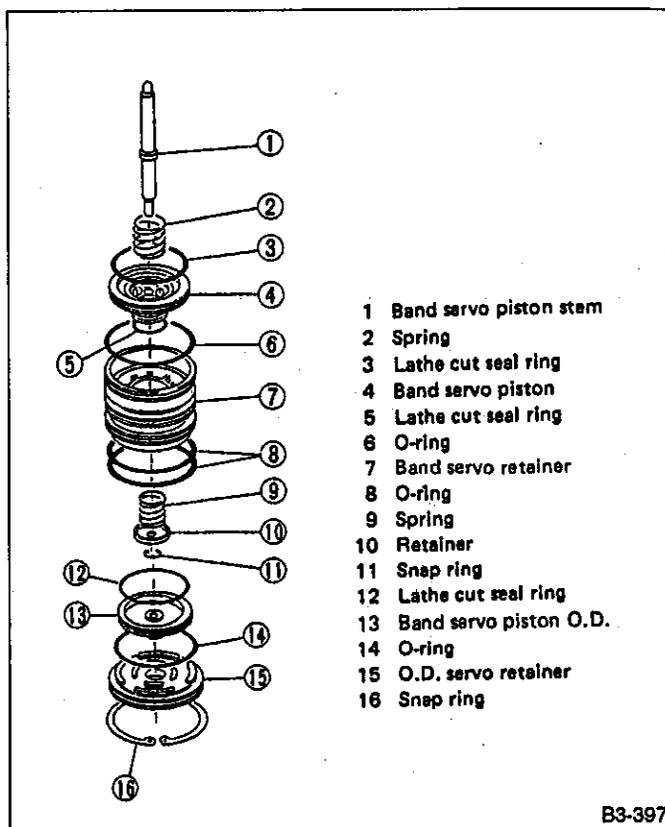
### A: DISASSEMBLY

- 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).

### B: INSPECTION

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

### C: ASSEMBLY



B3-397

Fig. 275

- 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.

## 14. Differential Case Assembly

### A: DISASSEMBLY

- 1) Using a press, remove the taper roller bearing.  
Be careful not to damage the speedometer drive gear.

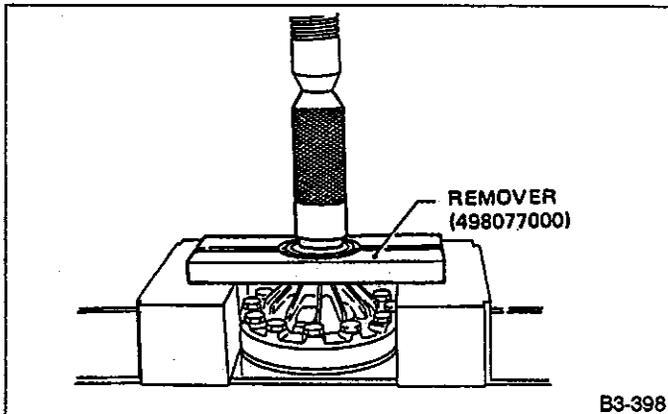


Fig. 276

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

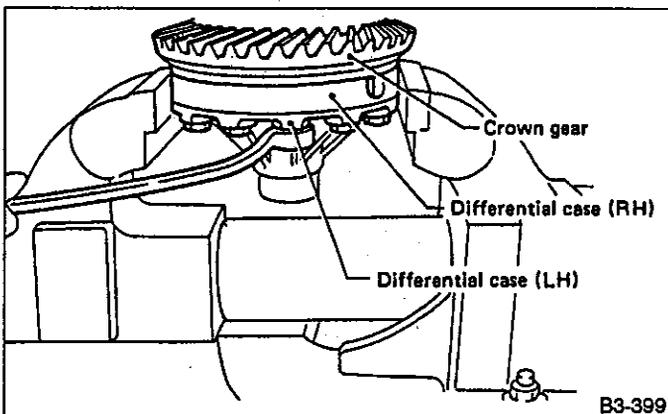


Fig. 277

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

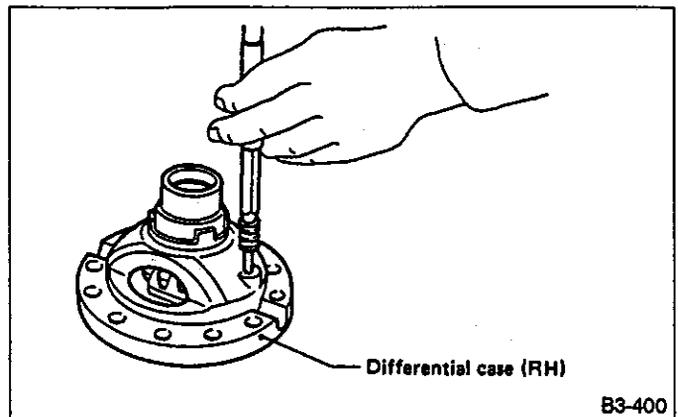


Fig. 278

### B: INSPECTION

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

### C: 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:**

59 — 65 N·m (6.0 — 6.6 kg-m, 43 — 48 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.

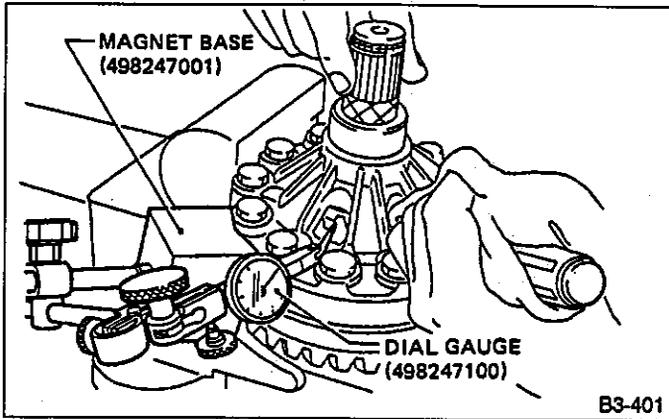


Fig. 279

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.

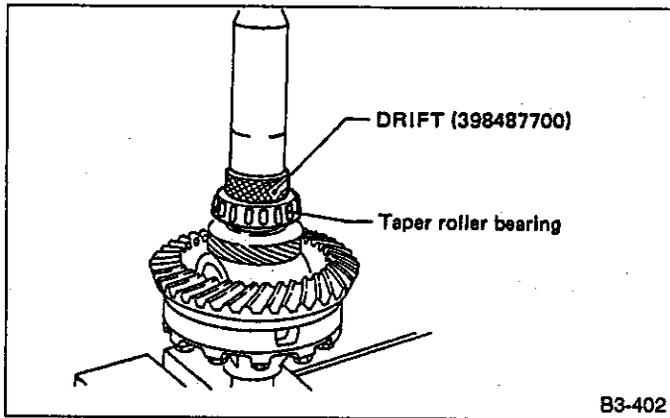


Fig. 280

## 15. Transfer Clutch

### A: DISASSEMBLY

1) Remove the seal ring.

Be careful not to damage the seal ring.

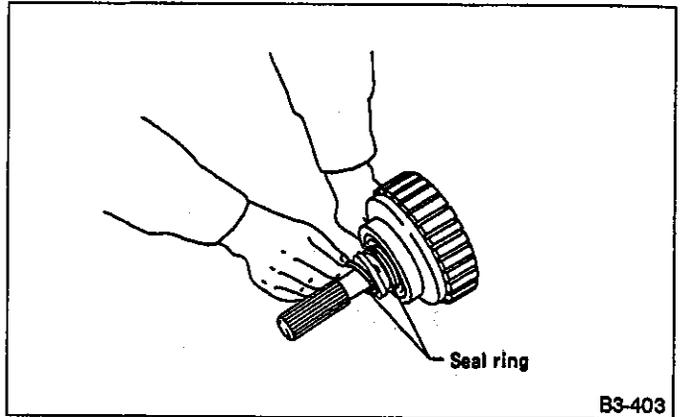


Fig. 281

2) Using a press, remove the ball bearing.

Do not reuse the bearing.

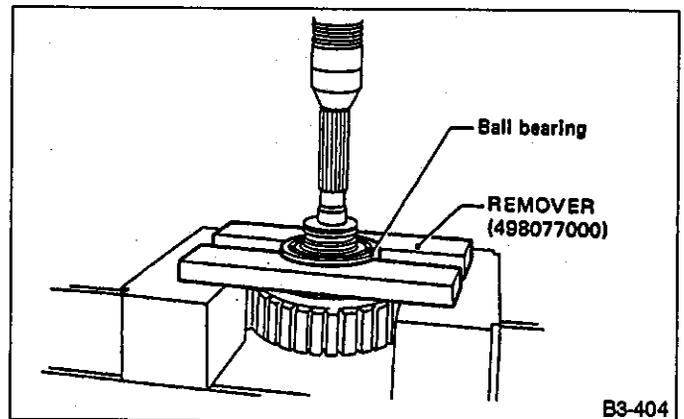


Fig. 282

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

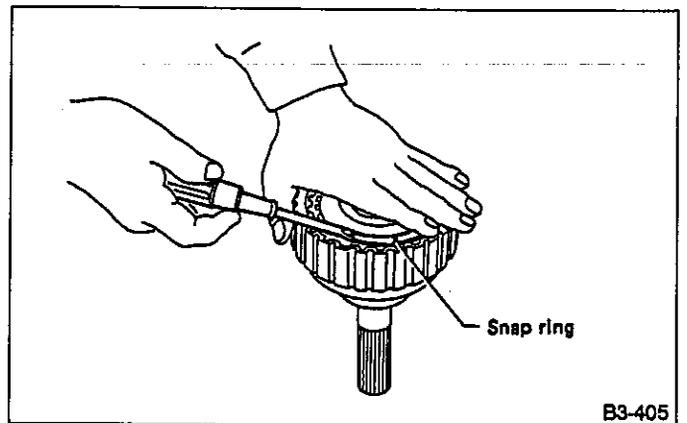


Fig. 283

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

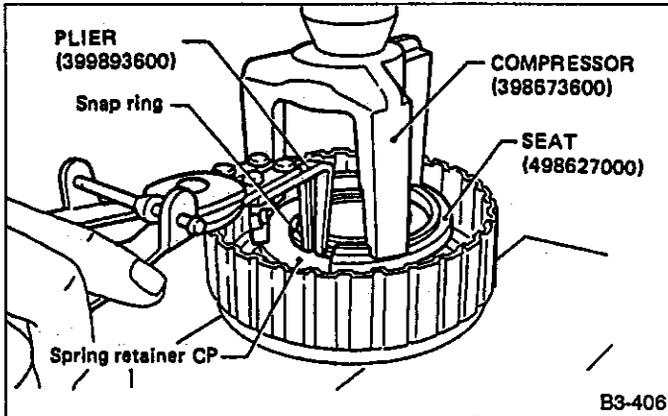


Fig. 284

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

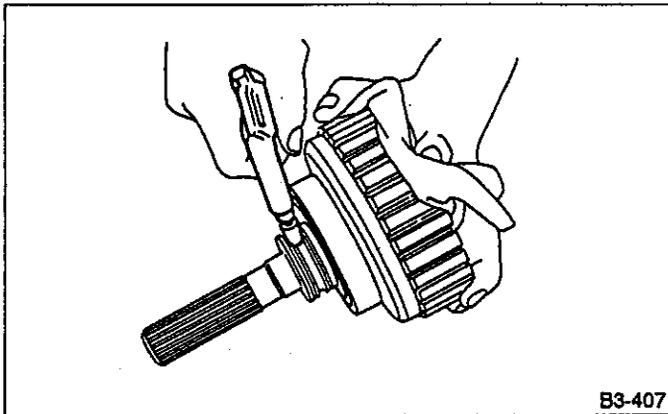


Fig. 285

**B: 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.

**C: ASSEMBLY**

- 1) Install the lathe cut seal ring to the I.D./O.D. of the transfer clutch piston.
- 2) Install piston.
  - (1) Connect piston to rear drive shaft (until it reaches hole in valve body).
  - (2) Install spring retainer to piston.
  - (3) Using SPECIAL TOOL, attach transfer piston seal to transfer piston seal guide.

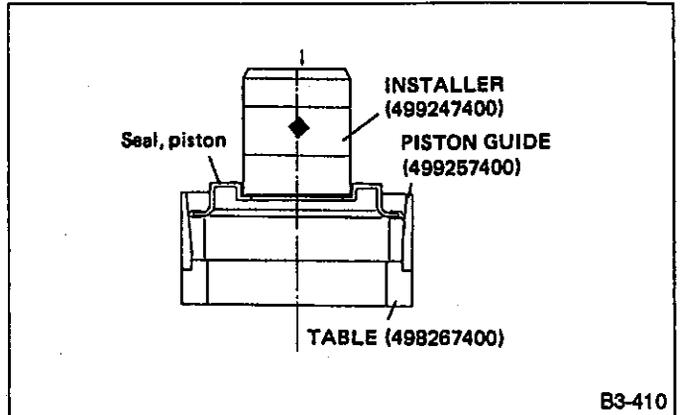


Fig. 286

Be careful not to tilt transfer piston seal.

(4) Place transfer piston seal guide onto rear drive shaft so that spring can be inserted into hole in transfer piston seal.

(5) Attach outer snap ring guide to rear drive shaft. Using an outer snap ring installer, press into place.

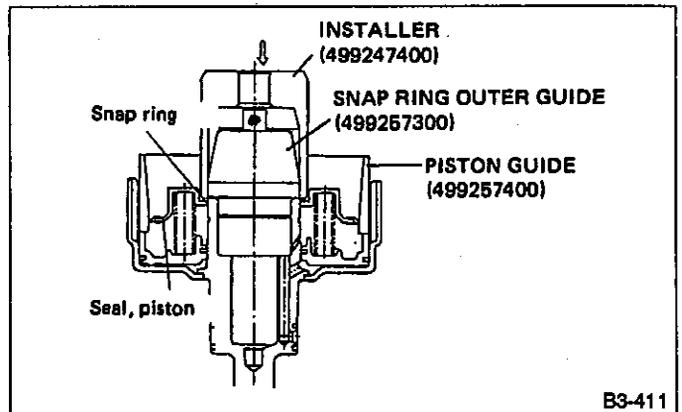


Fig. 287

Do not allow lip of transfer piston seal to fold back.

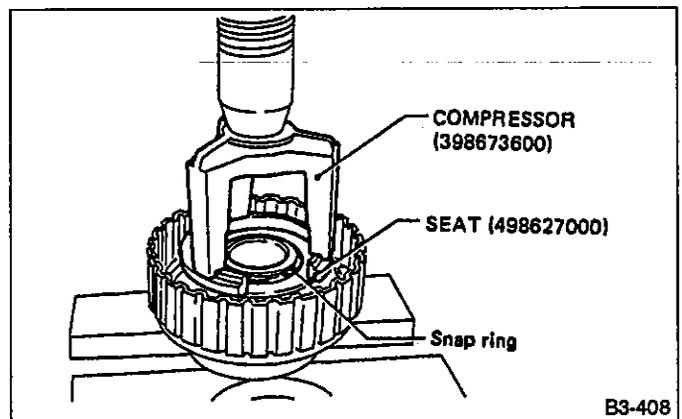


Fig. 288

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.

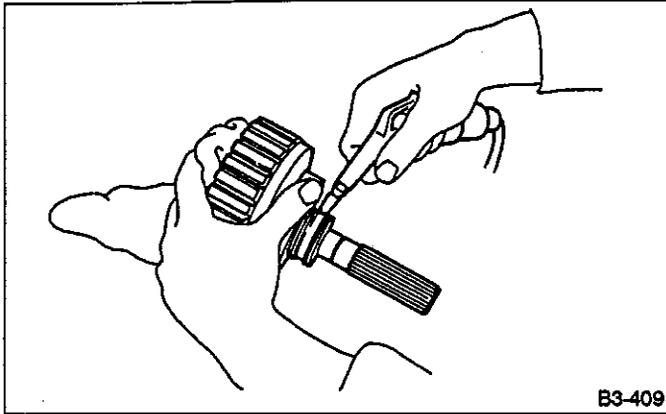


Fig. 289

5) Check the clearance:

**Standard value:**  
 0.2 — 0.6 mm (0.008 — 0.024 in)  
**Allowable limit:** 1.6 mm (0.063 in)

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

**Before measuring clearance, place the same thickness of shim on both sides to prevent pressure plate from tilting.**

• Available pressure plates

Part No.	Thickness mm (in)
31593AA150	3.3 (0.130)
31593AA160	3.7 (0.146)
31593AA170	4.1 (0.161)
31593AA180	4.5 (0.177)

6) Press-fit the ball bearing.

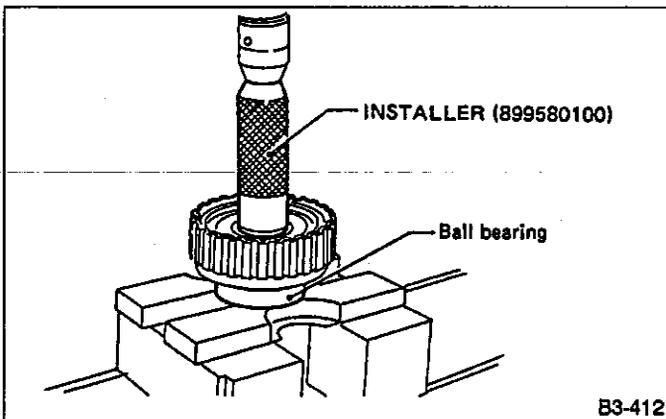


Fig. 290

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.**

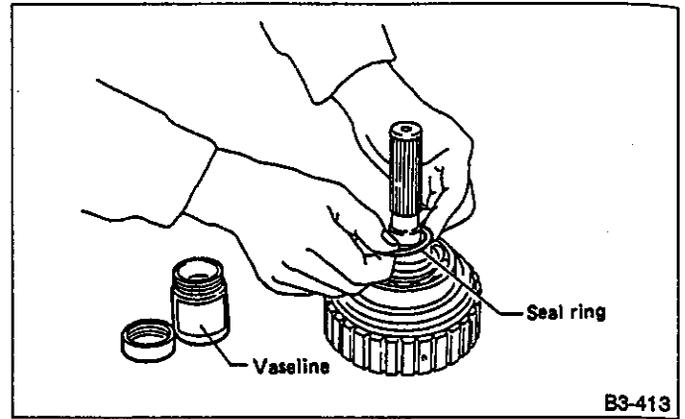


Fig. 291

## 16. Transfer Valve Body

### A: DISASSEMBLY

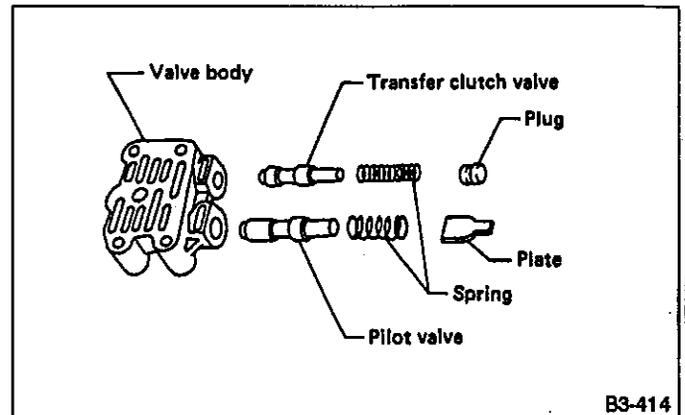


Fig. 292

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.**

### B: INSPECTION

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

### C: ASSEMBLY

To assemble, reverse the removal sequence.

**Make sure the valve slides smoothly after assembling.**

# T TROUBLESHOOTING

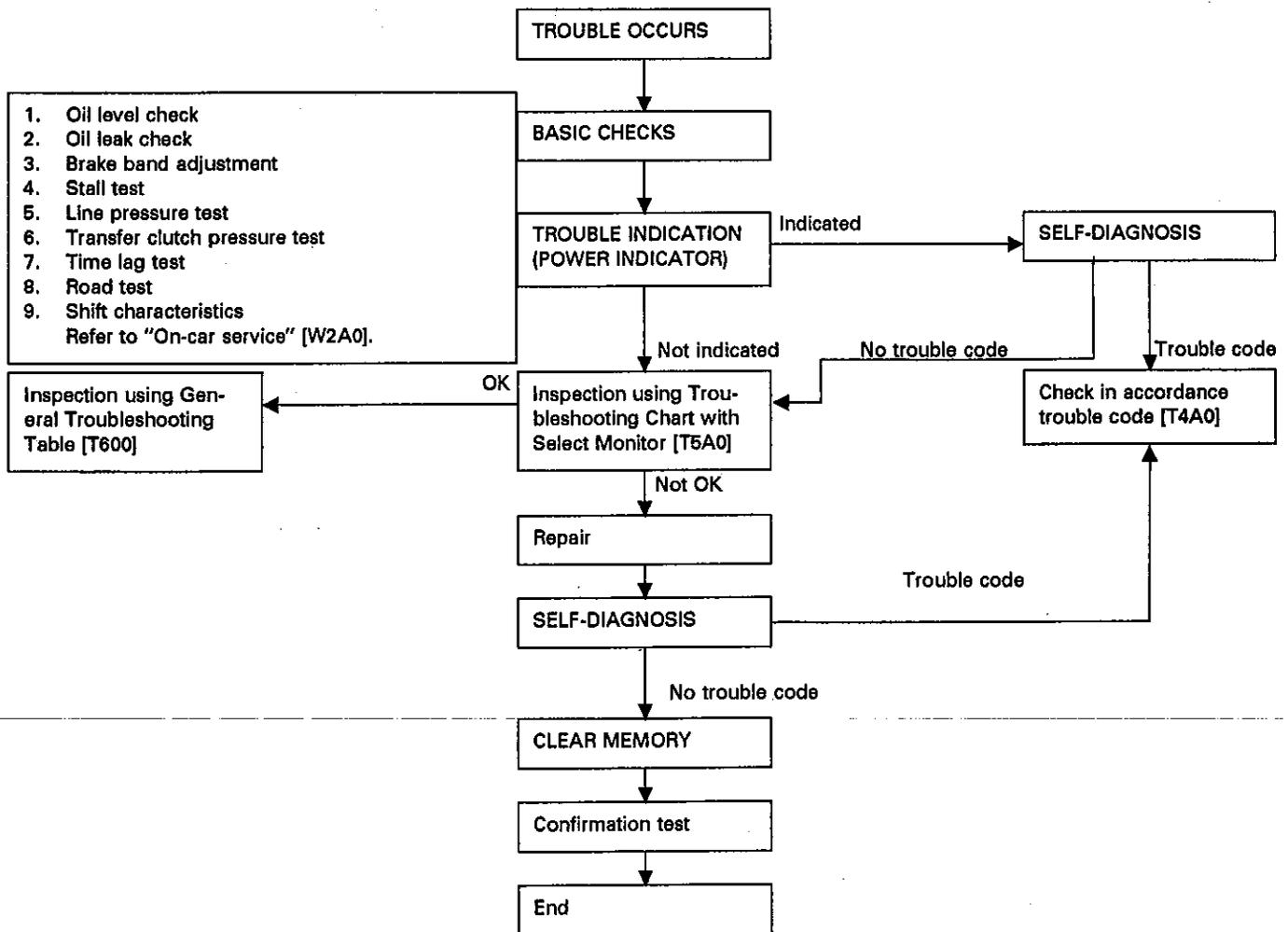
## 1. Precaution

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.

## 2. Troubleshooting Chart for Self-diagnosis System

### A: BASIC TROUBLESHOOTING PROCEDURE



### B: ABNORMAL DISPLAY ON POWER INDICATOR

When any self-diagnostic item is malfunctioning, the display on the power indicator blinks immediately after the engine starts.

The malfunctioning part or unit can be determined by a trouble code during self-diagnosis operation. Problems which occurred previously can also be identified through the memory function.

If the power indicator does not show a problem (although a problem is occurring), the problem can be determined by checking the performance characteristics of each sensor using the select monitor.

Indicator signal is as follows:

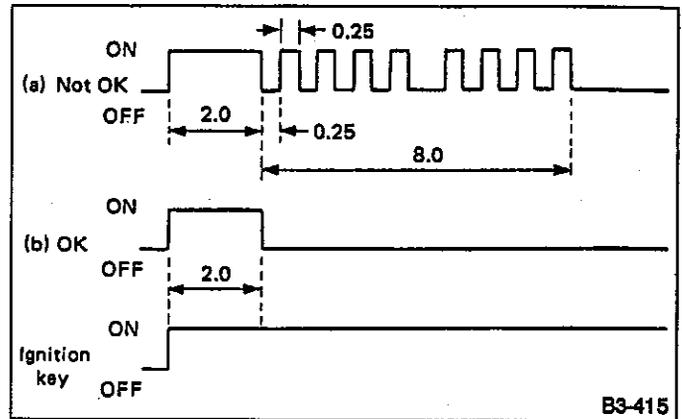
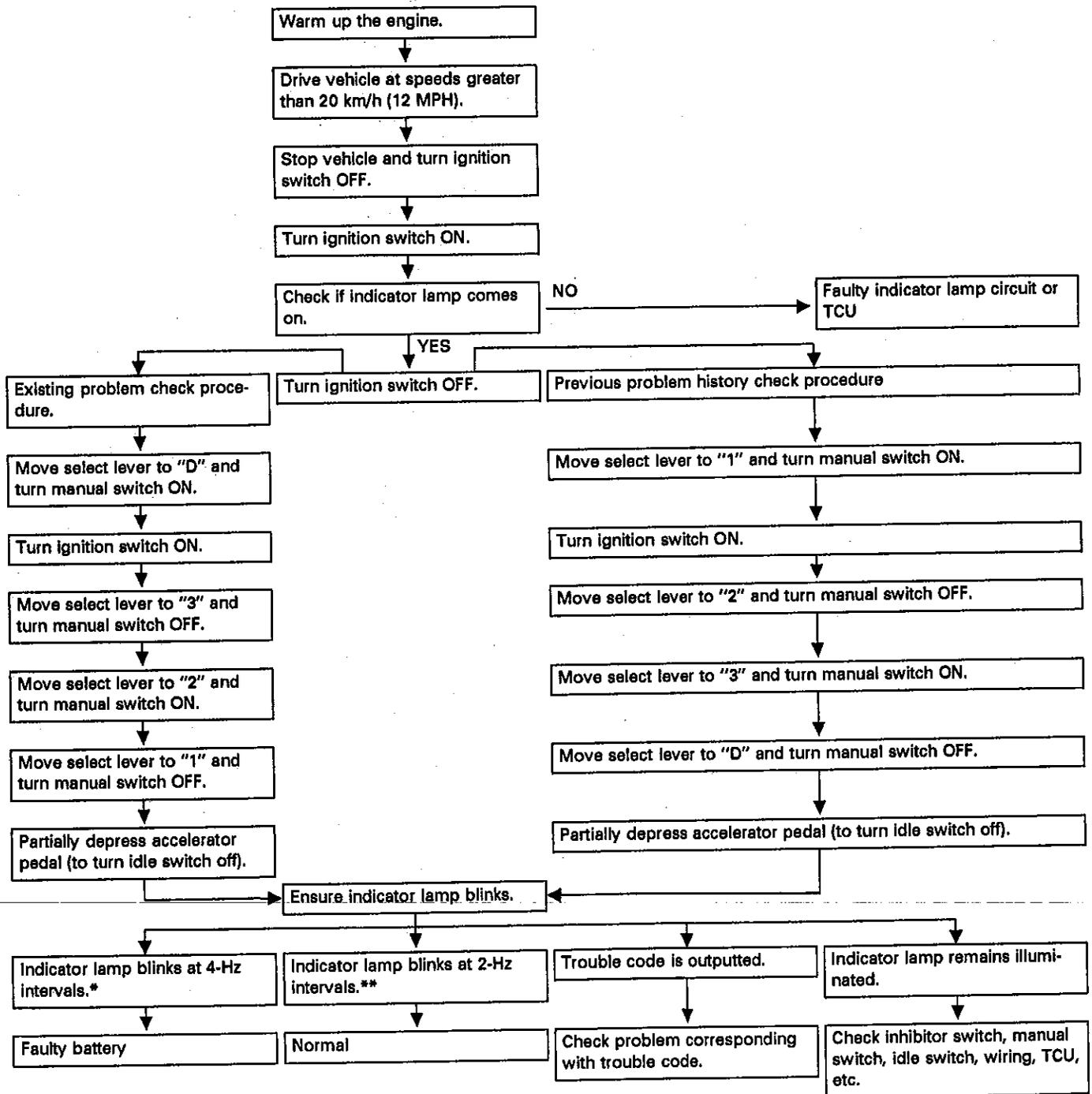


Fig. 293

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

**C: SELF-DIAGNOSIS**



\*: Blinks every 0.125 (1/8) seconds (with ignition switch OFF).

\*\* : Blinks every 0.25 (1/4) seconds (until ignition switch is turned OFF).

**D: SELF-DIAGNOSIS WITH SELECT MONITOR****1. CONNECT SELECT MONITOR.**

1) Connect select monitor to select monitor connector located under instrument panel (on driver's side).

**Applicable cartridge : Type "F" (No. 498348800)**

2) Turn ignition switch and select monitor switch ON.

3) After display is shown, press slash "/" key.

4) After AT mode is displayed, press function "[0]".

(Display returns to AT mode when slash "/" is pressed during self-diagnosis operation.)

**2. READ TROUBLE CODE SHOWN ON DISPLAY.**

1) Connect select monitor.

2) Designate mode using function key. Press [F] [B] [0] [ENT] in that order.

3) Ensure trouble code(s) is shown.

**3. PREVIOUS TROUBLE CODE READING**

1) Connect select monitor.

2) Designate mode using function key. Press [F] [B] [1] [ENT] in that order.

3) Ensure displayed trouble code(s).

**E: LIST OF TROUBLE CODE****1. TROUBLE CODE**

Trouble code	Item	Content of diagnosis	Abbr. (Select monitor)
11	Duty solenoid A	Detects open or shorted drive circuit, as well as valve seizure.	PL
12	Duty solenoid B	Detects open or shorted drive circuit, as well as valve seizure.	L/U
13	Shift solenoid 3	Detects open or shorted drive circuit, as well as valve seizure.	OVR
14	Shift solenoid 2	Detects open or shorted drive circuit, as well as valve seizure.	SFT2
15	Shift solenoid 1	Detects open or shorted drive circuit, as well as valve seizure.	SFT1
21	ATF temperature sensor	Detects open or shorted input signal circuit.	ATFT
23	Engine revolution signal	Detects open or shorted input signal circuit.	EREV
24	Duty solenoid C	Detects open or shorted drive circuit, as well as valve seizure.	4WD
31	Throttle sensor	Detects open or shorted input signal circuit.	THV
32	Vehicle speed sensor 1	Detects open or shorted input signal circuit.	VSP1
33	Vehicle speed sensor 2	Detects open or shorted input signal circuit.	VSP2

**2. HOW TO READ TROUBLE CODE OF INDICATOR LIGHT**

The long segment (1.2 sec on) indicates a "ten", and the short segment (0.2 sec on) signifies a "one".

The power indicator light flashes the code corresponding to the faulty part.

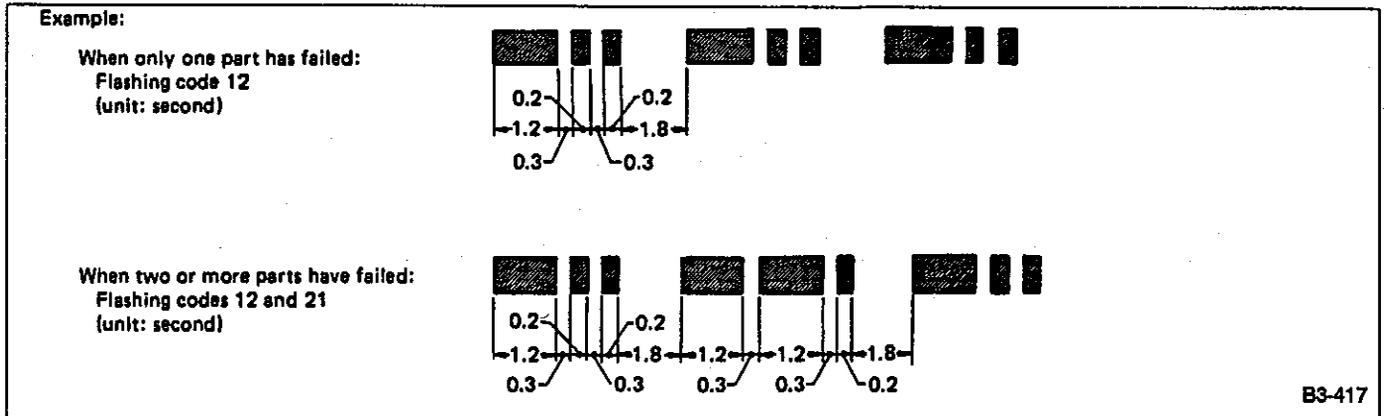


Fig. 294

**F: CLEAR MEMORY**

Current trouble codes shown on the display are cleared by turning the ignition switch OFF after conducting self-diagnosis operation. Previous trouble codes, however, cannot be cleared since they are stored in the ECU memory which is operating on the back-up power supply. These trouble codes can be cleared by removing the specified fuse (located under the right lower portion of the instrument panel), as shown in the following table.

"CLEAR MEMORY" can also be executed with the select monitor set in the "CO" function mode.

**CLEAR MEMORY:**

**Removal of No. 14 fuse (for at least one minute)**

- The No. 14 fuse is located in the line to the memory back-up power supply of the TCU and ECU (MPFI). Removal of this fuse clears the previous trouble codes stored in the TCU and ECU (MPFI) memory.
- Be sure to remove the No. 14 fuse for at least the specified length of time. Otherwise, trouble codes may not be cleared.

### 3. Transmission Control Unit (TCU) I/O Signal

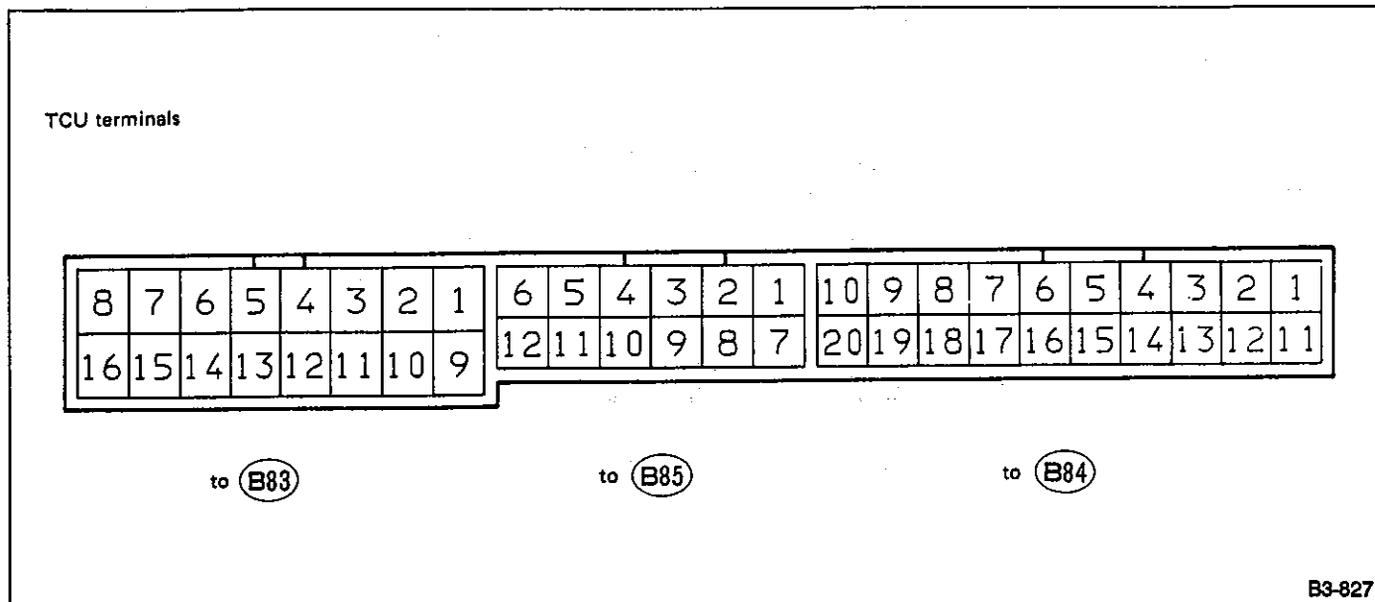


Fig. 295

Check with ignition switch ON.

Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	
Battery supply		B84	14	Ignition switch OFF	10 — 14	
Ignition power supply		B83 B85	1 6	Ignition switch ON (with engine OFF)	10 — 14	
Inhibitor switch	"P" range switch	Signal (—)	B84	9	Select lever in "P" range	Less than 1
					Select lever in any other than "P" range	9 — 13
	"R" range switch	Signal (—)	B84	10	Select lever in "R" range	Less than 1
					Select lever in any other than "R" range	6 — 10
	"N" range switch	Signal (—)	B84	8	Select lever in "N" range	Less than 1
					Select lever in any other than "N" range	9 — 13
	"D" range switch	Signal (—)	B85	1	Select lever in "D" range	Less than 1
					Select lever in any other than "D" range	4 — 7
	"3" range switch	Signal (—)	B85	2	Select lever in "3" range	Less than 1
					Select lever in any other than "3" range	6 — 10
"2" range switch	Signal (—)	B85	3	Select lever in "2" range	Less than 1	
				Select lever in any other than "2" range	6 — 10	
"1" range switch	Signal (—)	B85	4	Select lever in "1" range	Less than 1	
				Select lever in any other than "1" range	6 — 10	
Manual switch	Signal (—)	B84	6	Manual switch ON	Less than 1	
				Manual switch OFF	6 — 10	
Brake switch	Signal (+)	B84	7	Brake pedal depressed	10 — 14	
				Brake pedal released	Less than 0.5	
ABS signal (MPFI Model)	Signal (—)	B84	5	ABS switch ON	Less than 1	
				ABS switch OFF	6 — 10	

# AUTOMATIC TRANSMISSION AND DIFFERENTIAL [4AT]

[T300] 3-2a

Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Throttle sensor	Signal	B85	8	Throttle fully closed	*	—
				Throttle fully open	*	
Idle switch	Signal	B84	16	Throttle fully closed	Less than 0.5	—
				Throttle open at least 2 degrees	3 — 6	
ATF temperature sensor	Signal (+)	B85	10	ATF temperature 20°C (68°F)	3.0 — 3.5	2.3 k — 2.7 k
				ATF temperature 80°C (176°F)	1.0 — 1.3	280 — 360
Vehicle speed sensor 1	Signal (+)	B85	12	Vehicle stopped	0	450 — 650
				Vehicle speed at least 20 km/h (12 MPH)	Greater than 1 (AC range)	
Vehicle speed sensor 2	Signal (+)	B84	11	When vehicle is slowly moved at least 2 meters (7 ft)	Less than 1 ↔ greater than 4	—
Economy switch	Signal (—)	B84	4	Economy switch ON	Less than 1	—
				Economy switch OFF	6 — 10	
Cruise set signal	Signal (—)	B84	3	When cruise control is set (SET lamp ON)	Less than 1	—
				When cruise control is not set (SET lamp OFF)	6 — 10	
Shift solenoid 1		B83	14	Select lever in 1st or 4th gear	10 — 14	20 — 30
				Select lever in 2nd or 3rd gear	Less than 1	
Shift solenoid 2		B83	13	Select lever in 1st or 2nd gear	10 — 14	20 — 30
				Select lever in 3rd or 4th gear	Less than 1	
Shift solenoid 3		B83	15	Select lever in "N" range (with throttle fully closed)	Less than 1	20 — 30
				Select lever in "D" range (with throttle fully closed)	10 — 14	
Duty solenoid A		B83	8	Throttle fully closed (with engine OFF) after warm-up	1.5 — 3.0	1.5 — 4.5
				Throttle fully open (with engine OFF) after warm-up	Less than 0.5	
Dropping resistor		B83	7	Throttle fully closed (with engine OFF) after warm-up	5 — 14	9 — 15
				Throttle fully open (with engine OFF) after warm-up	Less than 0.5	
Duty solenoid B		B83	5	When lockup occurs	8 — 14	9 — 15
				When lockup is released	Less than 0.5	
Duty solenoid C		B83	3	Fuse on FWD switch	8 — 14	9 — 15
				Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear)	Less than 0.5	
Sensor ground line 1		B85	7	—	0	Less than 1
Sensor ground line 2		B84	20	—	0	Less than 1
System ground line		B84	1	—	0	Less than 1
Power system ground line		B83	10	—	0	Less than 1
FWD switch		B84	2	Fuse removed	10 — 14	
				Fuse installed	Less than 1	

\*:Refer to [T4JI].

### 4. Troubleshooting Chart with Trouble Code

#### A: TROUBLE CODE (11) — DUTY SOLENOID A —

**CONTENT OF DIAGNOSIS:**  
Output signal circuit of duty solenoid A or resistor is open or shorted.

**TROUBLE SYMPTOM:**  
Excessive shift shock

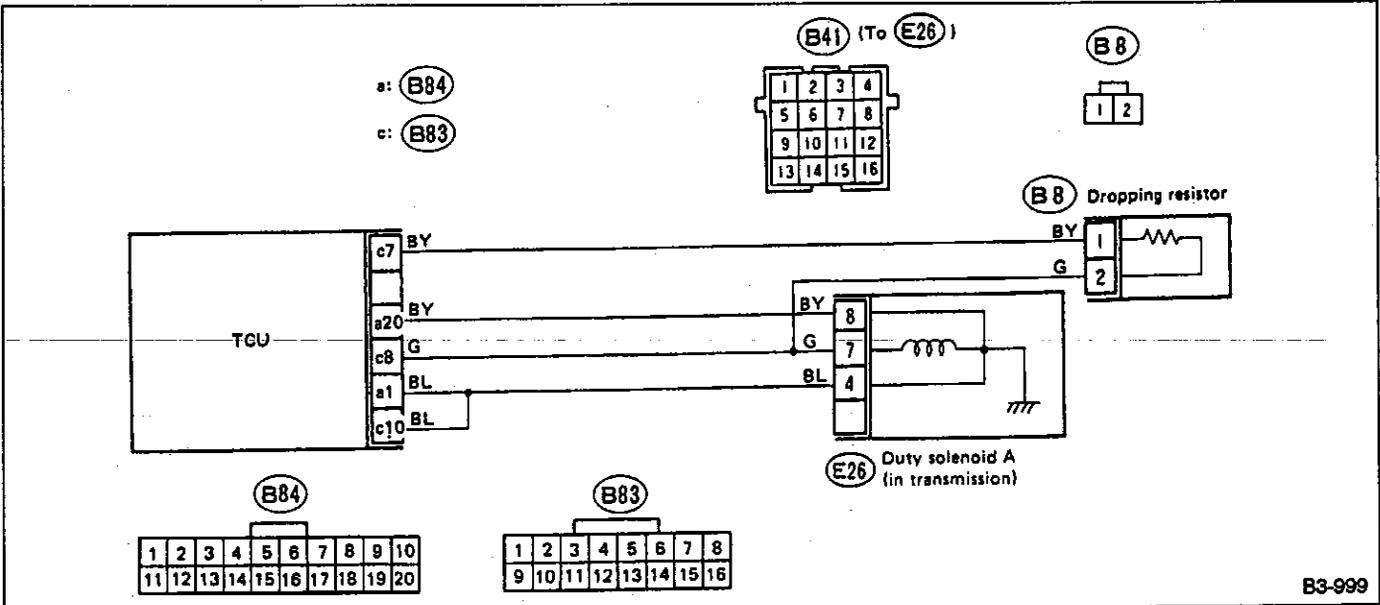
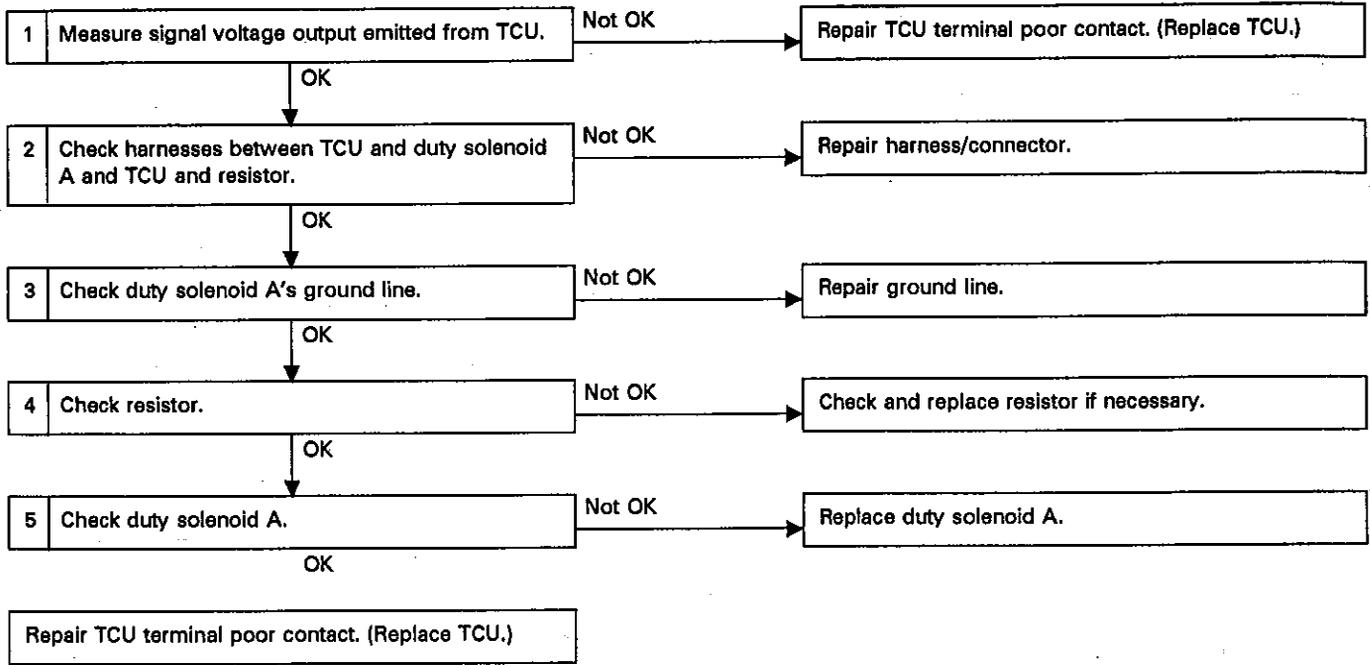


Fig. 296

**1. MEASURE SIGNAL VOLTAGE OUTPUT EMITTED FROM TCU.**

- 1) Warm up the engine and transmission.
- 2) Ignition switch ON (Engine OFF).

Carburetor model is (Engine ON)

- 3) Move shift lever to "N".
- 4) While opening and closing throttle valve, measure voltage between TCU connector and body.

**Connector & terminal / Specified resistance:**

- (B83) No. 8 — No. 10 /  
1.5 — 3.0 V (Throttle is fully closed.)  
0.5 V, max. (Throttle is fully open.)
- (B83) No. 7 — No.10 /  
5 — 14 V (Throttle is fully closed.)  
0.5 V, max.(Throttle is fully open.)

- 2) Disconnect connector from transmission.
- 3) Disconnect connector from resistor.
- 4) Measure resistance between TCU connector and transmission and between TCU connector and body.

**Connector & terminal / Specified resistance:**

- (B83) No. 8 — (B41) No. 7 / 0 Ω
- (B83) No. 8 — Body / 1 MΩ min.

- 5) Measure resistance between TCU connector and resistor connector and between TCU connector and body.

**Connector & terminal / Specified resistance:**

- (B83) No. 7 — (B8) No. 1 / 0 Ω
- (B83) No. 7 — Body / 1 MΩ min.

● **SELECT MONITOR FUNCTION MODE**

Mode: F11	
Condition: Ignition switch ON (Engine OFF) N range	
Specified data: PLDTY F11	
10%	(Throttle is fully open.)
100%	(Throttle is fully closed.)

**2. CHECK HARNESSES BETWEEN TCU AND DUTY SOLENOID A AND BETWEEN TCU AND RESISTOR.**

- 1) Disconnect connector from TCU.

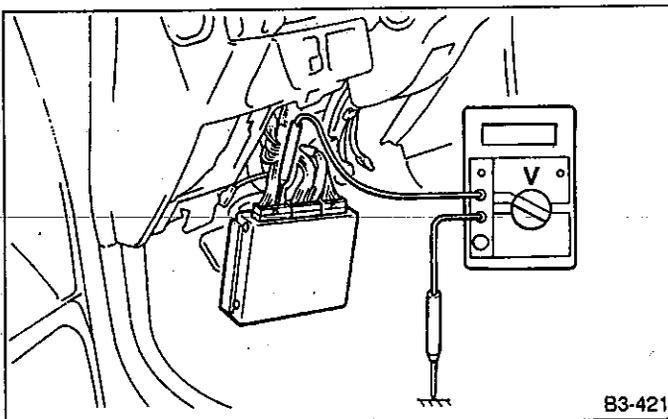


Fig. 297

**3. CHECK DUTY SOLENOID A'S GROUND LINE.**

- 1) Disconnect connector from transmission.
- 2) Measure resistance between transmission connector receptacle (on transmission) and transmission case.

**Connector & terminal / Specified resistance:**

- (E26) No. 4 — Transmission / 1 Ω max.

**4. CHECK RESISTOR.**

- 1) Disconnect connector from resistor.
- 2) Measure resistance between resistor terminals.

**Specified resistance:**

- 9 — 15 Ω

**5. CHECK DUTY SOLENOID A.**

- 1) Disconnect connector from transmission.
- 2) Measure resistance between transmission connector receptacle (on transmission) terminals.

**Connector & terminal / Specified resistance:**

- (E26) No. 7 — No. 4 / 1.5 — 4.5 Ω

**B: TROUBLE CODE 12 — DUTY SOLENOID B —**

**CONTENT OF DIAGNOSIS:**  
Output signal circuit of duty solenoid B is open or shorted.

**TROUBLE SYMPTOM:**  
No "locking-up" (after engine warm-up)

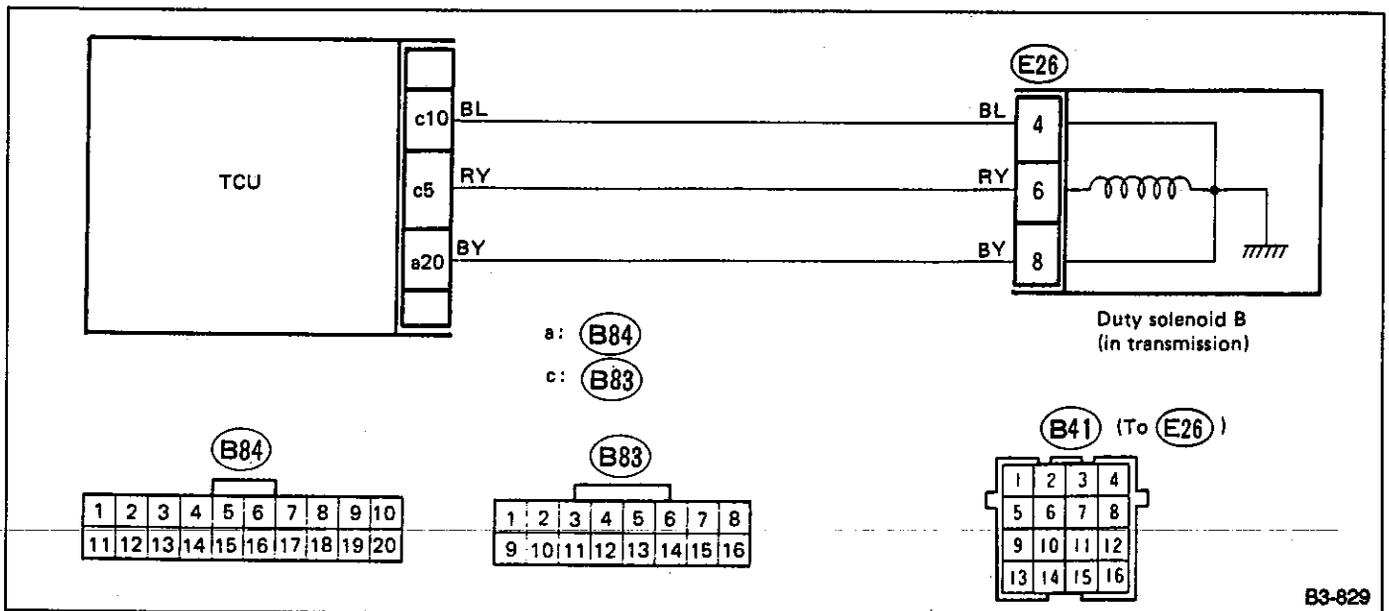
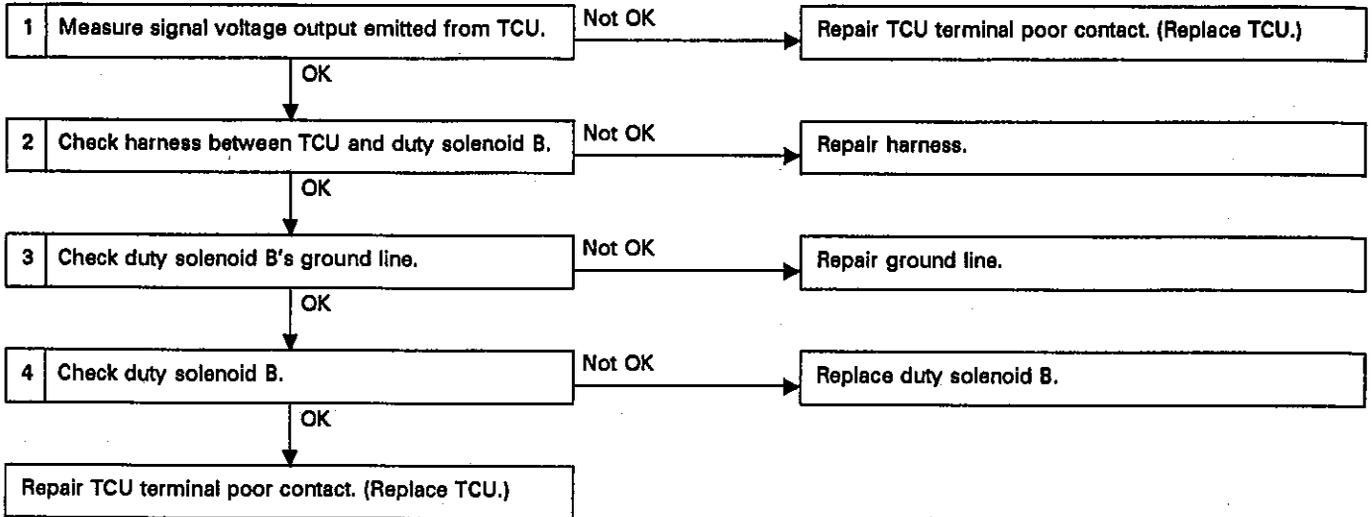


Fig. 298

B3-829

**1. MEASURE SIGNAL VOLTAGE OUTPUT EMITTED FROM TCU.**

- 1) Raise vehicle and support with safety stands.  
On 4-wheel drive models, raise all wheels off ground.
- 2) Warm up the engine and transmission.
- 3) Move shift lever to "D" and slowly increase vehicle speed to 60 km/h (37 MPH). Measure voltage output emitted from TCU.

**Connector & terminal / Specified voltage:**  
(B83) No. 5 — No. 10 / 8 — 14 V (when wheels are locked up.)

- 4) Return the engine to idling speed. Move shift lever to "N" and measure voltage output emitted from TCU.

**Connector & terminal / Specified voltage:**  
(B83) No. 5 — No. 10 / 0.5 V, max.

● **SELECT MONITOR FUNCTION MODE**

Mode: F12	
Condition: Start the engine and increase vehicle speed to 60 km/h (37 MPH). When wheels are locked up:	
Specified data: LUDTY F12	
95%	(wheel locked up)
5%	(release)

**2. CHECK HARNESS BETWEEN TCU AND DUTY SOLENOID B.**

- 1) Disconnect connector from TCU.
- 2) Disconnect connector from transmission.
- 3) Measure resistance between TCU connector and transmission connector, and between TCU connector and body.

**Connector & terminal / Specified resistance:**  
(B83) No. 5 — (B41) No. 6 / 0 Ω  
(B83) No. 5 — Body / 1 MΩ min.

**3. CHECK DUTY SOLENOID B'S GROUND LINE.**

- 1) Disconnect connector from transmission.
- 2) Measure resistance between transmission connector receptacle and transmission case.

**Connector & terminal / Specified resistance:**  
(E26) No. 4 — Transmission / 1 Ω max.

**4. CHECK DUTY SOLENOID B.**

- 1) Disconnect connector from transmission.
- 2) Measure resistance between transmission connector receptacle's terminals.

**Connector & terminal / Specified resistance:**  
(E26) No. 6 — No. 4 / 9 — 15 Ω

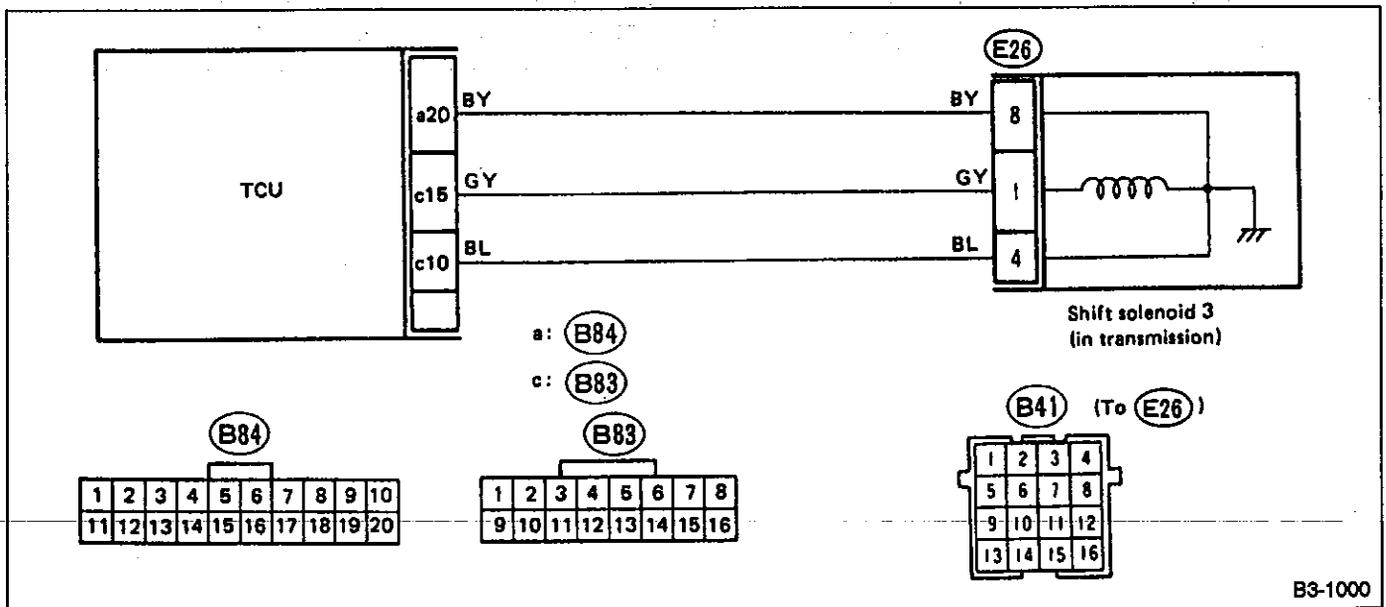
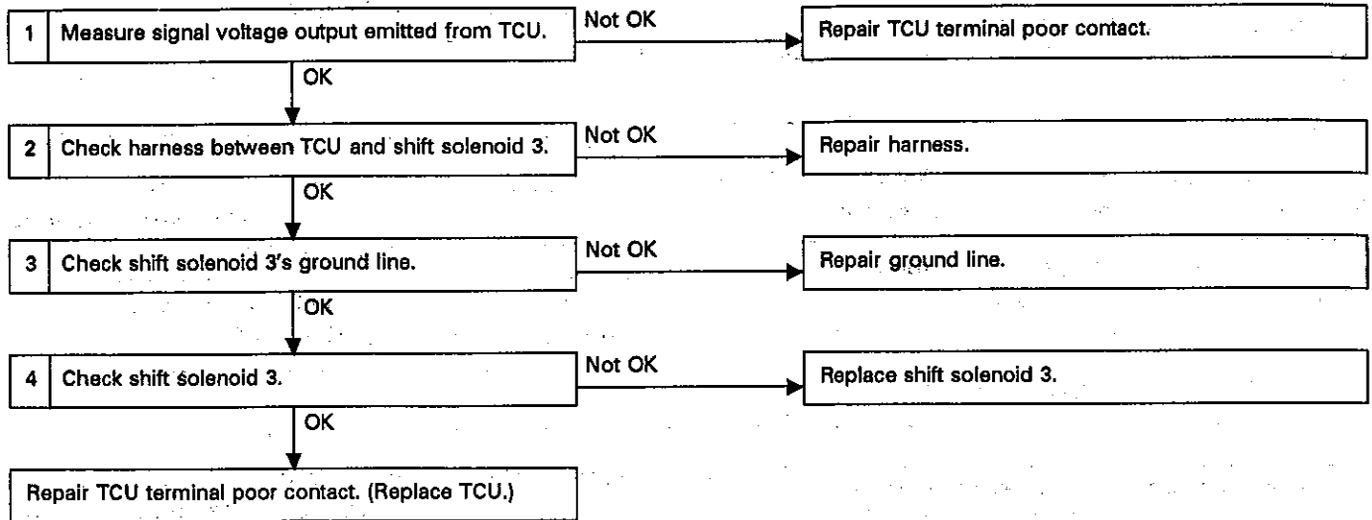
**C: TROUBLE CODE 13 — SHIFT SOLENOID 3 —**

**CONTENT OF DIAGNOSIS:**

Output signal-circuit of shift solenoid 3 is open or shorted.

**TROUBLE SYMPTOM:**

Ineffective engine brake with shift lever in "3"



B3-1000

Fig. 299

**1. MEASURE SIGNAL VOLTAGE OUTPUT EMITTED FROM TCU.**

- 1) Raise vehicle and support with safety stands.  
On 4-wheel drive models, raise all wheels off ground.
- 2) Warm up the engine and transmission.
- 3) Move shift lever to "D".
- 4) Measure signal voltage output emitted from TCU while idling the engine.

---

**Connector & terminal / Specified voltage:**  
(B83) No. 15 — No. 10 / 10 — 14 V

---

**2. CHECK HARNESS BETWEEN TCU AND SHIFT SOLENOID 3.**

- 1) Disconnect connector from TCU.
- 2) Disconnect connector from transmission.
- 3) Measure resistance between TCU connector and transmission connector, and between TCU connector and body.

---

**Connector & terminal / Specified resistance:**  
(B83) No. 15 — (B41) No. 1 / 0 Ω  
(B83) No. 15 — Body / 1 MΩ min.  
(B83) No. 10 — (B41) No. 4 / 0 Ω  
(B83) No. 10 — Body / 1 MΩ min.

---

**3. CHECK SHIFT SOLENOID'S GROUNDING LINE.**

- 1) Disconnect connector from transmission.
- 2) Measure resistance between transmission connector receptacle and transmission case.

---

**Connector & terminal / Specified resistance:**  
(E26) No. 4 — Transmission / 0 Ω

---

**4. CHECK SHIFT SOLENOID.**

- 1) Disconnect connector from transmission.
- 2) Measure resistance between transmission connector receptacle's terminals.

---

**Connector & terminal / Specified resistance:**  
(E26) No. 1 — No. 4 / 20 — 30 Ω

---

**D: TROUBLE CODE 14 — SHIFT SOLENOID 2 —**

**CONTENT OF DIAGNOSIS:**  
Output signal circuit of shift solenoid 2 is open or shorted.

**TROUBLE SYMPTOM:**  
No shift

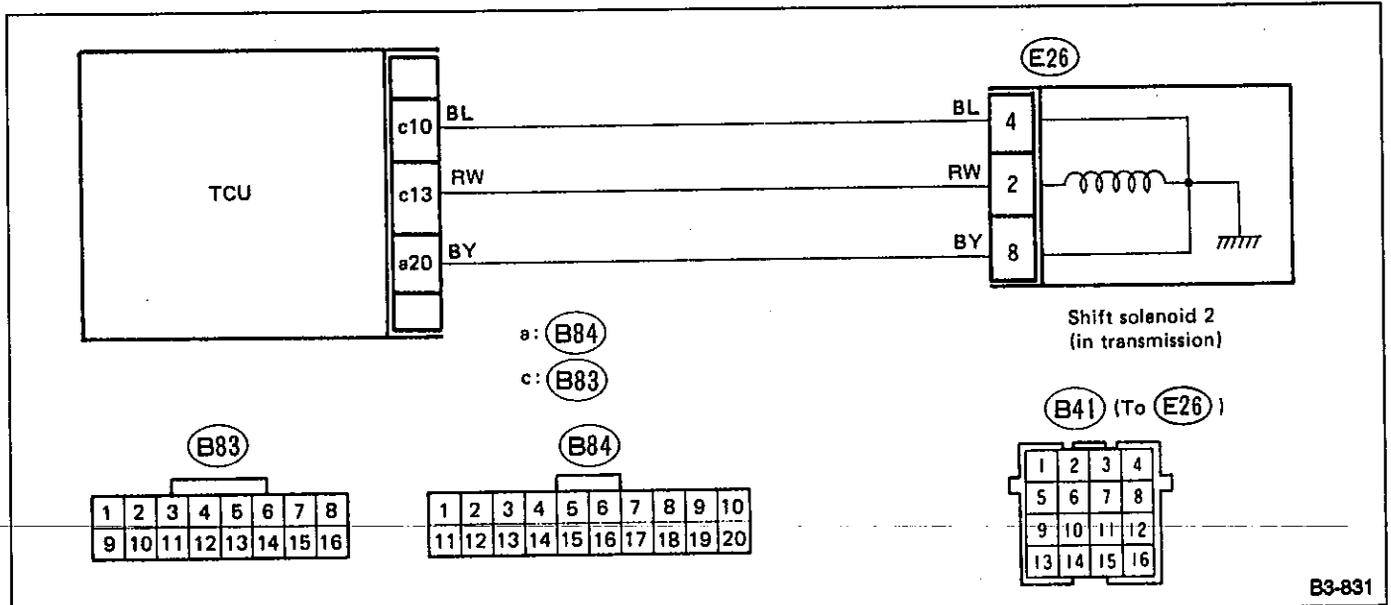
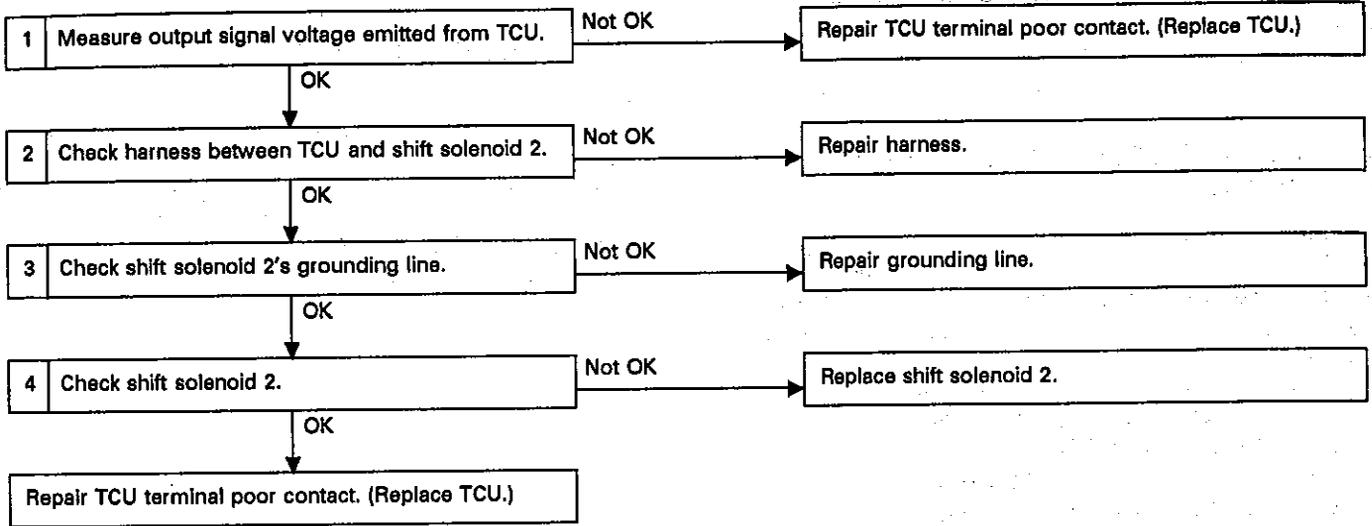


Fig. 300

B3-831

**1. MEASURE SIGNAL VOLTAGE OUTPUT EMITTED FROM TCU.**

- 1) Raise vehicle and support with safety stands.  
On 4-wheel drive models, raise all wheels off ground.
- 2) Warm up the engine and transmission.
- 3) Move shift lever to "D".
- 4) Measure signal voltage output emitted from TCU while idling the engine.

---

**Connector & terminal / Specified voltage:**  
(B83) No. 13 — No. 10 / 10 — 14 V

---

**2. CHECK HARNESS BETWEEN TCU AND SHIFT SOLENOID 2.**

- 1) Disconnect connector from TCU.
- 2) Disconnect connector from transmission.
- 3) Measure resistance between TCU connector and transmission connector, and between TCU connector and body.

---

**Connector & terminal / Specified resistance:**  
(B83) No. 13 — (B41) No. 2 / 0 Ω  
(B83) No. 13 — Body / 1 MΩ min.  
(B83) No. 10 — (B41) No. 4 / 0 Ω  
(B83) No. 10 — Body / 1 MΩ min.

---

**3. CHECK SHIFT SOLENOID 2'S GROUNDING LINE.**

- 1) Disconnect connector from transmission.
- 2) Measure resistance between transmission connector receptacle and transmission case.

---

**Connector & terminal / Specified resistance:**  
(E26) No. 4 — Transmission / 0 Ω

---

**4. CHECK SHIFT SOLENOID 2.**

- 1) Disconnect connector from transmission.
- 2) Measure resistance between transmission connector receptacle's terminals.

---

**Connector & terminal / Specified resistance:**  
(E26) No. 2 — No. 4 / 20 — 30 Ω

---

D:

**E: TROUBLE CODE 15 — SHIFT SOLENOID 1 —**

CONT  
Output  
shorte

**CONTENT OF DIAGNOSIS:**  
Output signal circuit of shift solenoid 1 is open or shorted.

**TROUBLE SYMPTOM:**  
No shift

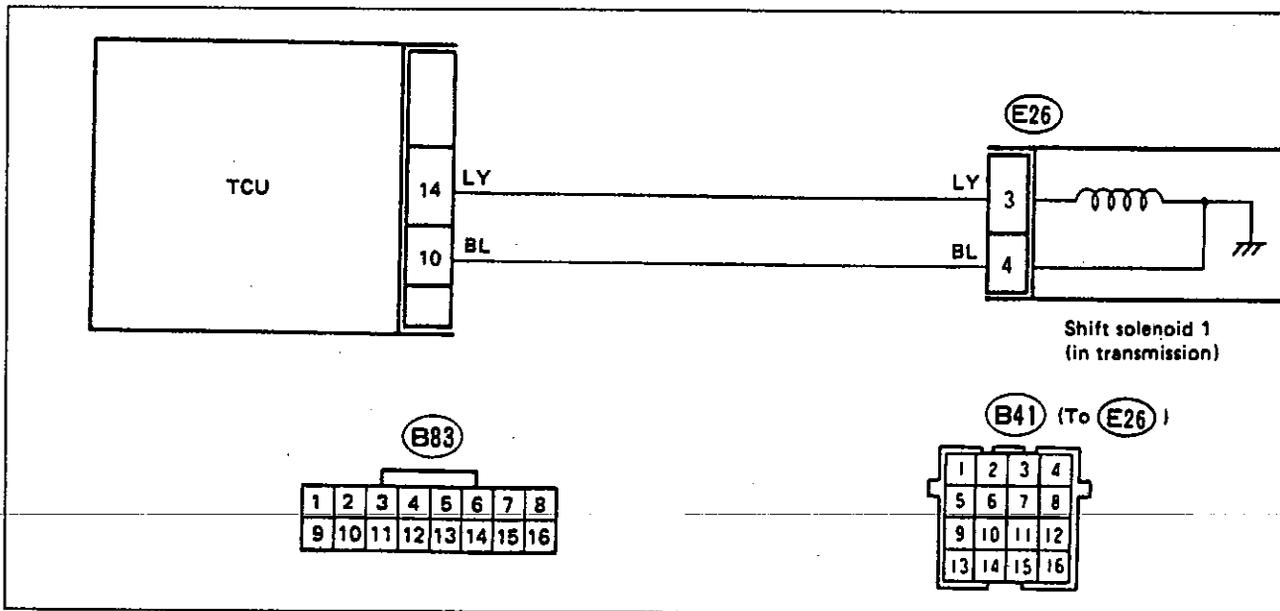
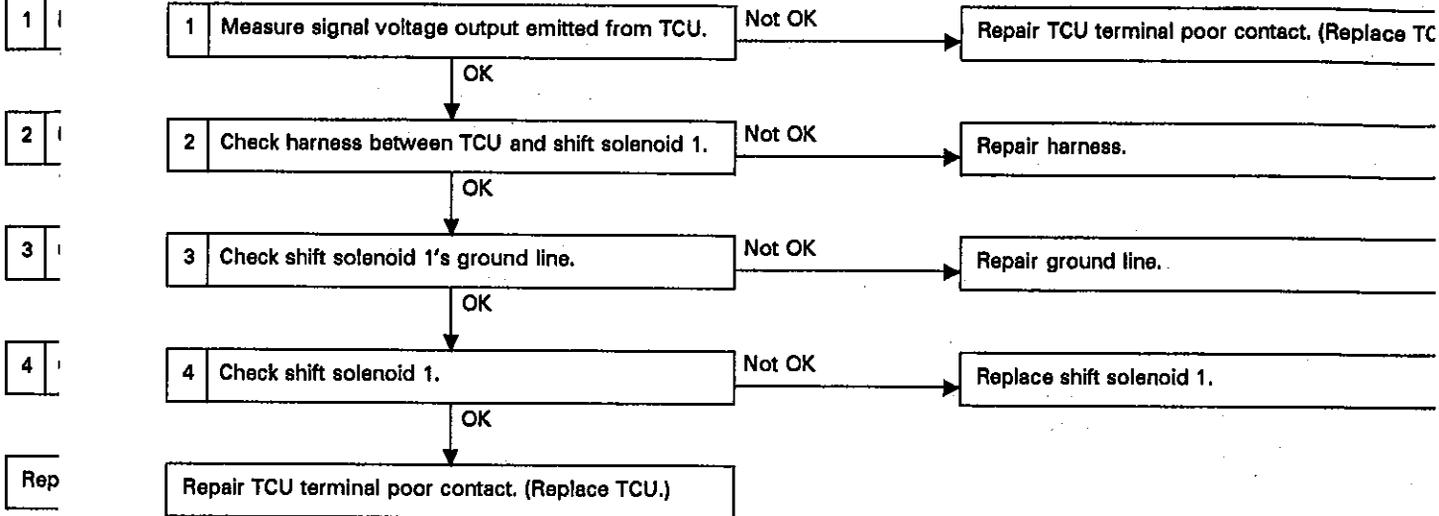


Fig.

Fig. 301

**1. MEASURE SIGNAL VOLTAGE OUTPUT EMITTED FROM TCU.**

- 1) Raise vehicle and support with safety stands.  
On 4-wheel drive models, raise all wheels off ground.
- 2) Warm up the engine and transmission.
- 3) Move shift lever to "D".
- 4) Measure signal voltage output emitted from TCU while idling the engine.

---

**Connector & terminal / Specified voltage:**  
(B83) No. 14 — No. 10 / 10 — 14 V

---

**2. CHECK HARNESS BETWEEN TCU AND SHIFT SOLENOID 1.**

- 1) Disconnect connector from TCU.
- 2) Disconnect connector from transmission.
- 3) Measure resistance between TCU connector and transmission connector, and between TCU connector and body.

---

**Connector & terminal / Specified resistance:**  
(B83) No. 14 — (B41) No. 3 / 0 Ω  
(B83) No. 14 — Body / 1 MΩ min.  
(B83) No. 10 — (B41) No. 4 / 0 Ω  
(B83) No. 10 — Body / 1 MΩ min.

---

**3. CHECK SHIFT SOLENOID 1'S GROUND LINE.**

- 1) Disconnect connector from transmission.
- 2) Measure resistance between transmission connector receptacle and transmission case.

---

**Connector & terminal / Specified resistance:**  
(E26) No. 4 — Transmission / 0 Ω

---

**4. CHECK SHIFT SOLENOID 1.**

- 1) Disconnect connector from transmission.
- 2) Measure resistance between transmission connector receptacle's terminals.

---

**Connector & terminal / Specified resistance:**  
(E26) No. 3 — No. 4 / 20 — 30 Ω

---

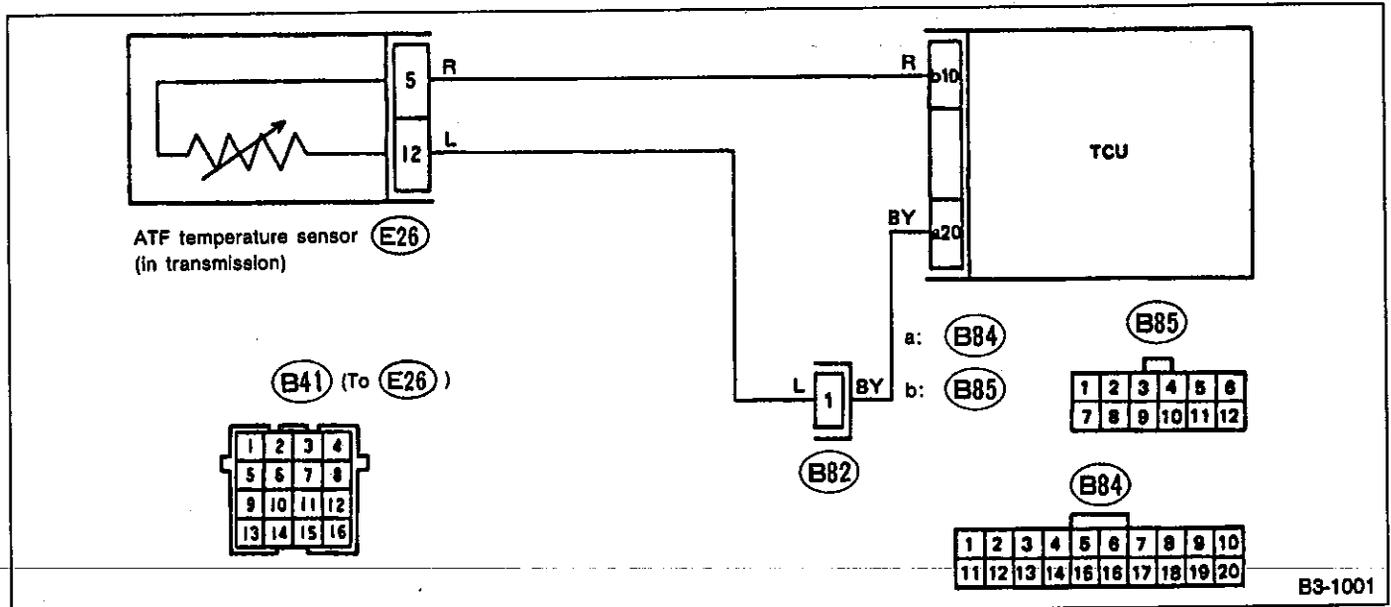
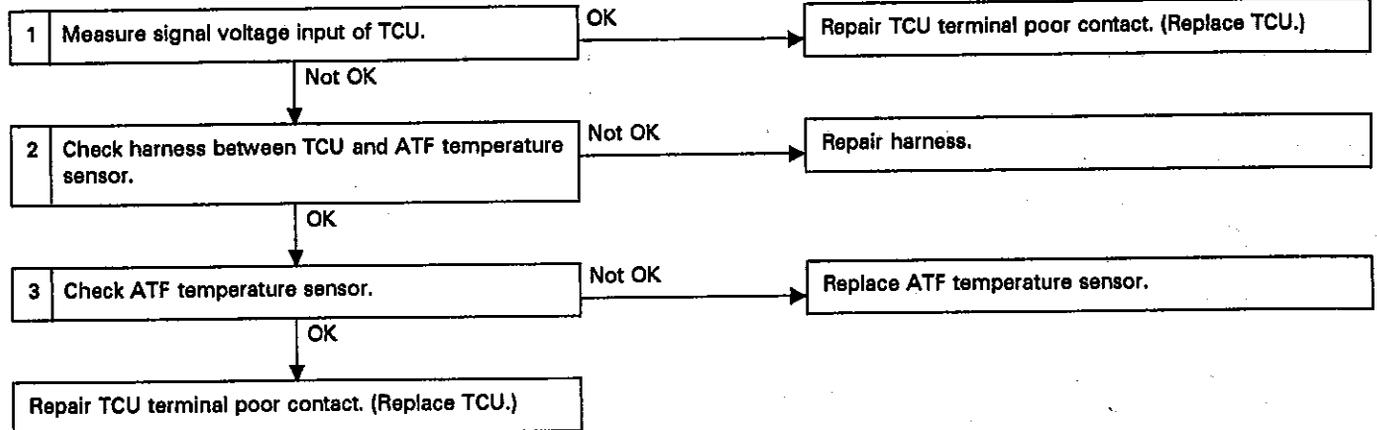
**F: TROUBLE CODE 21 — ATF TEMPERATURE SENSOR —**

**CONTENT OF DIAGNOSIS:**

Input signal circuit of TCU to ATF temperature sensor is open or shorted.

**TROUBLE SYMPTOM:**

- No shift up to 4th speed (after engine warm-up)
- No lock-up occurs (after engine warm-up)
- Excessive shift shock



B3-1001

Fig. 302

**1. MEASURE SIGNAL VOLTAGE INPUT OF TCU.**

- 1) Turn ignition switch ON (with engine OFF) and measure signal voltage input of TCU.
- 2) Start and warm up the engine. Measure signal voltage input of TCU.

**Connector & terminal / Specified voltage:**

- (B85) No. 10 — (B84) No. 20 /  
 1.4 — 1.7 V [ATF temperature: 20°C (68°F)]  
 0.3 — 0.6 V [ATF temperature: 80°C (176°F)]

**• SELECT MONITOR FUNCTION MODE**

**Mode:** 08 or 07

**Condition:**

Warm up the engine to increase ATF temperature.

**Specified data:**

ATFT F08 or 07

(Temperature shown on display increases)

**2. CHECK HARNESS BETWEEN TCU AND ATF TEMPERATURE SENSOR.**

- 1) Disconnect connector from TCU.
- 2) Disconnect connector from transmission.
- 3) Measure resistance between TCU connector and transmission connector, and between TCU connector and body.

**Connector & terminal / Specified voltage:**

- (B85) No. 10 — (B41) No. 5 / 0 Ω  
 (B85) No. 10 — Body / 1 MΩ min.  
 (B84) No. 20 — (B41) No. 12 / 0 Ω

**3. CHECK ATF TEMPERATURE SENSOR.**

- 1) Disconnect connector from transmission.
- 2) Measure resistance between transmission connector receptacle's terminals.

**Connector & terminal / Specified resistance:**

- (E26) No. 5 — No. 12 /  
 2.3 — 2.7 kΩ [ATF temperature: 20°C (68°F)]

- 3) Connect connector to transmission, and warm up the engine to increase ATF temperature.
- 4) Stop the engine and disconnect connector from transmission.
- 5) Measure resistance between transmission connector receptacle's terminals.

**Connector & terminal / Specified resistance:**

- (E26) No. 5 — No. 12 /  
 280 — 360 Ω [ATF temperature: 80°C (176°F)]

**H: TROUBLE CODE 23 — ENGINE REVOLUTION SIGNAL —**

**CONTENT OF DIAGNOSIS:**  
 Engine revolution input signal circuit is open or shorted.

**TROUBLE SYMPTOM:**  
 No lockup occurs (after engine warm-up).  
 Power indicator remains on when vehicle speed is "0".

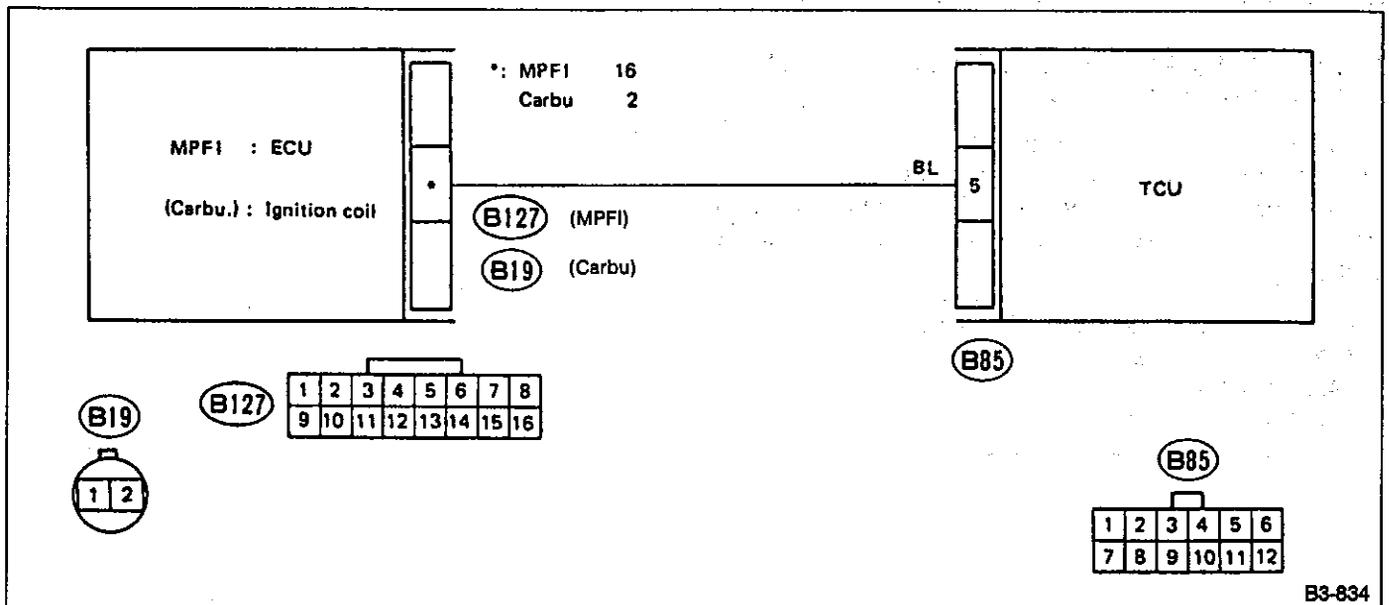
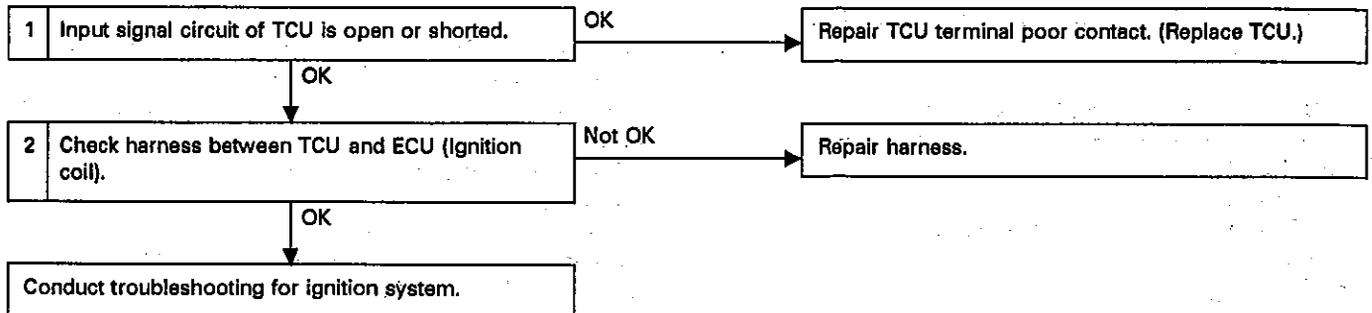


Fig. 303

B3-834

**1. MEASURE SIGNAL VOLTAGE INPUT OF TCU.**

- 1) Turn ignition switch ON (with engine OFF).
- 2) Measure signal voltage input of TCU.

---

**Connector & terminal / Specified voltage:**  
(B85) No. 5 — Body / 10 V, min.

---

**• SELECT MONITOR FUNCTION MODE**

---

**Mode: 06**

**Condition:**

After warming up the engine

**Specified data: EREV F06**

(Engine speed is shown in rpm.)

---

**2. CHECK HARNESS BETWEEN TCU AND ECU OR IGNITION COIL.**

- 1) Disconnect connector from TCU.
- 2) Disconnect connector from ECU, or ignition coil.
- 3) Measure resistance between TCU connector and ECU or ignition coil connector.

---

**Connector & terminal / Specified resistance:**  
(B85) No. 5 — (B127) No. 16 [MPFI] / 0  $\Omega$   
(B19) No. 2 [Carburetor] / 0  $\Omega$   
(B85) No. 5 — Body / 1 M $\Omega$  min.

---

**I: TROUBLE CODE 24 — DUTY SOLENOID C —**

**CONTENT OF DIAGNOSIS:**

Output signal circuit of duty solenoid C is open or shorted.

**TROUBLE SYMPTOM:**

Excessive "braking" in tight corners

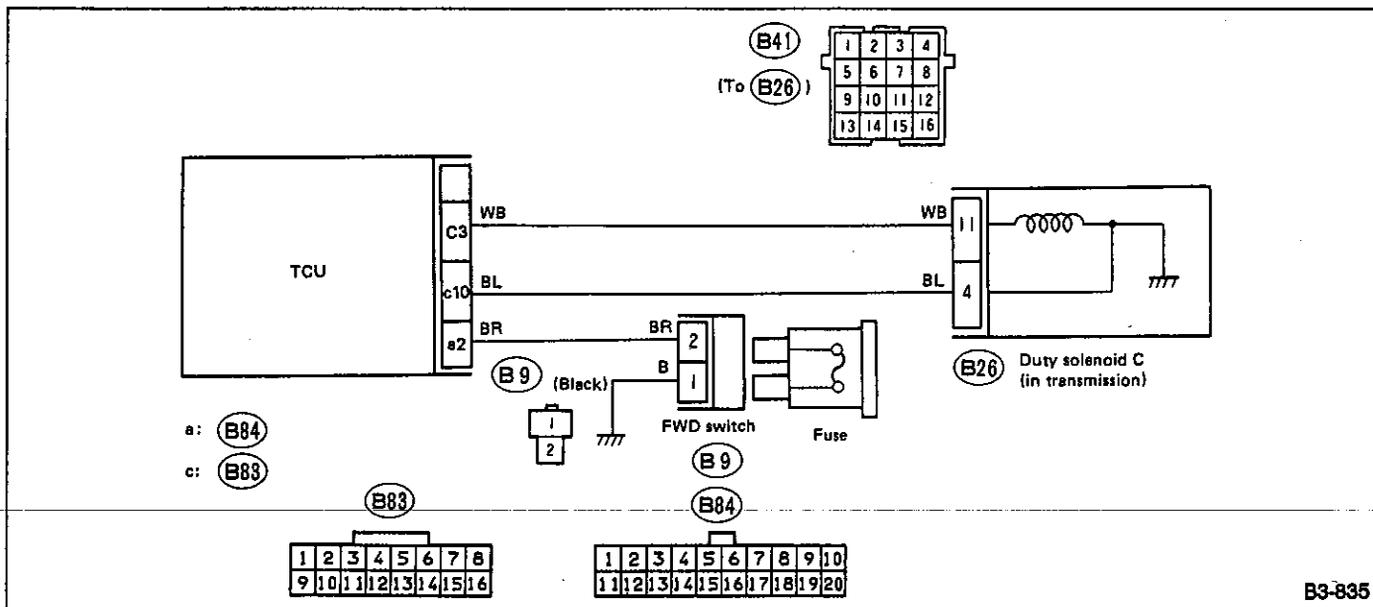
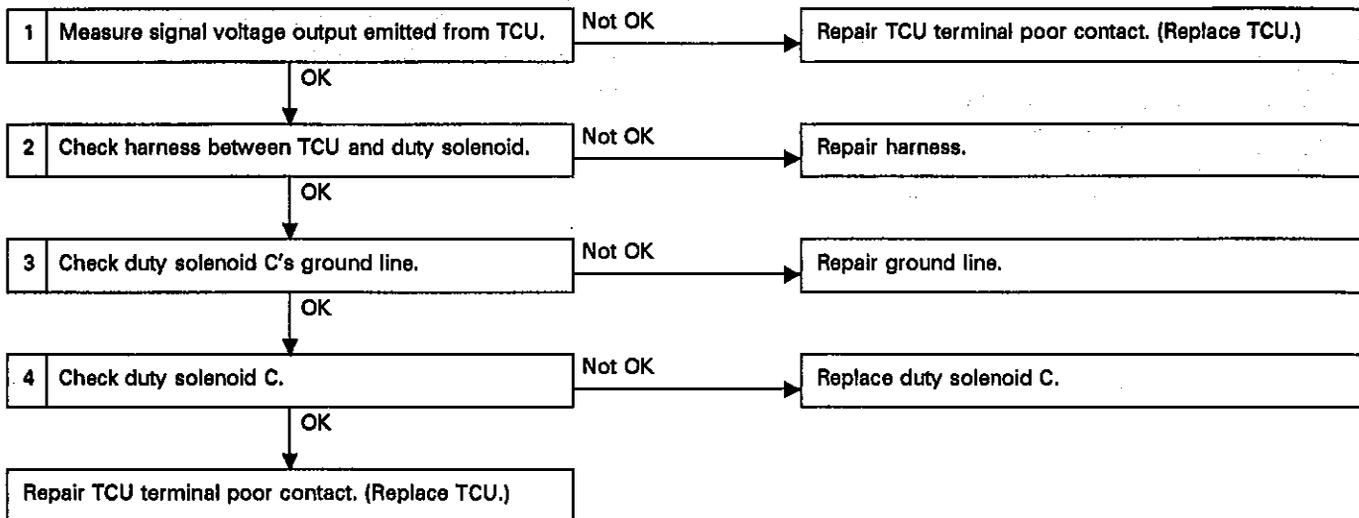


Fig. 304

B3-835

**1. CHECK SIGNAL VOLTAGE OUTPUT EMITTED FROM TCU.**

- 1) Install spare fuse on FWD switch and set in FWD mode.

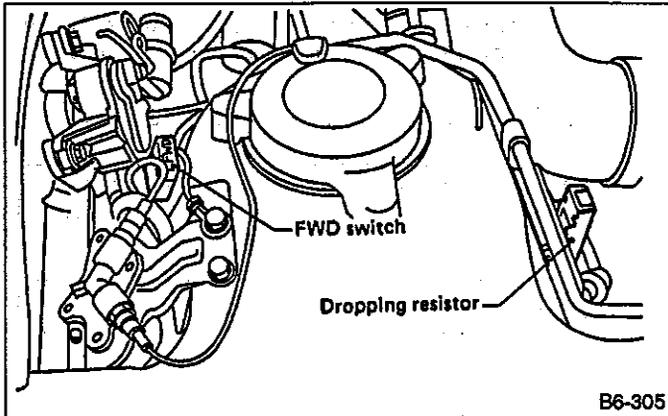


Fig. 305

- 2) Turn ignition switch ON (with engine OFF).
- 3) Move select lever to "D".
- 4) Measure voltage output emitted from TCU (with accelerator pedal released).

**Connector & terminal / Specified voltage:**  
(B83) No. 3 — No. 10 / 8 — 14 V

- 5) Turn ignition switch OFF.
- 6) Remove spare fuse from FWD switch.
- 7) Turn ignition switch ON (with engine OFF).
- 8) Move select lever to "D".
- 9) Measure voltage output emitted from TCU (with accelerator pedal fully depressed).

**Connector & terminal / Specified voltage:**  
(B83) No. 3 — No. 10 / 0.5 V, max.

● **SELECT MONITOR FUNCTION MODE**

**Mode: 13**

**Condition:**

Ignition switch ON (Engine OFF)

**Specified data:**

4WDTY F13

95% (FWD mode)

25%, max. (4WD mode, D-range, full throttle)

**2. CHECK HARNESS BETWEEN TCU AND DUTY SOLENOID C.**

- 1) Disconnect connector from TCU.
- 2) Disconnect connector from transmission.
- 3) Measure resistance between TCU connector and transmission connector.

**Connector & terminal / Specified resistance:**  
(B83) No. 3 — (B41) No. 11 / 0 Ω  
(B83) No. 3 — Body / 1 MΩ min.  
(B83) No. 10 — (B41) No. 4 / 0 Ω  
(B83) No. 10 — Body / 1 MΩ min.

**3. CHECK DUTY SOLENOID C'S GROUND LINE.**

- 1) Disconnect connector from transmission.
- 2) Measure resistance between transmission connector receptacle and transmission case.

**Connector & terminal / Specified resistance:**  
(E26) No. 4 — Transmission / 1 Ω max.

**4. CHECK DUTY SOLENOID C.**

- 1) Disconnect connector from transmission.
- 2) Measure resistance between transmission connector receptacle's terminals.

**Connector & terminal / Specified resistance:**  
(E26) No. 11 — No. 4 / 9 — 15 Ω

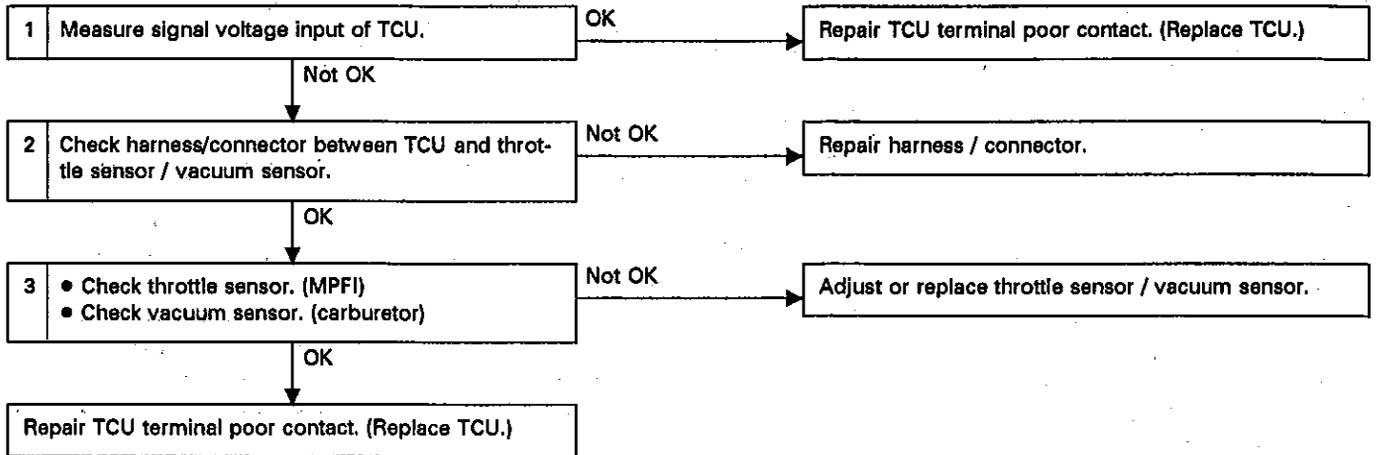
**J: TROUBLE CODE 31 — THROTTLE SENSOR —**

**CONTENT OF DIAGNOSIS:**

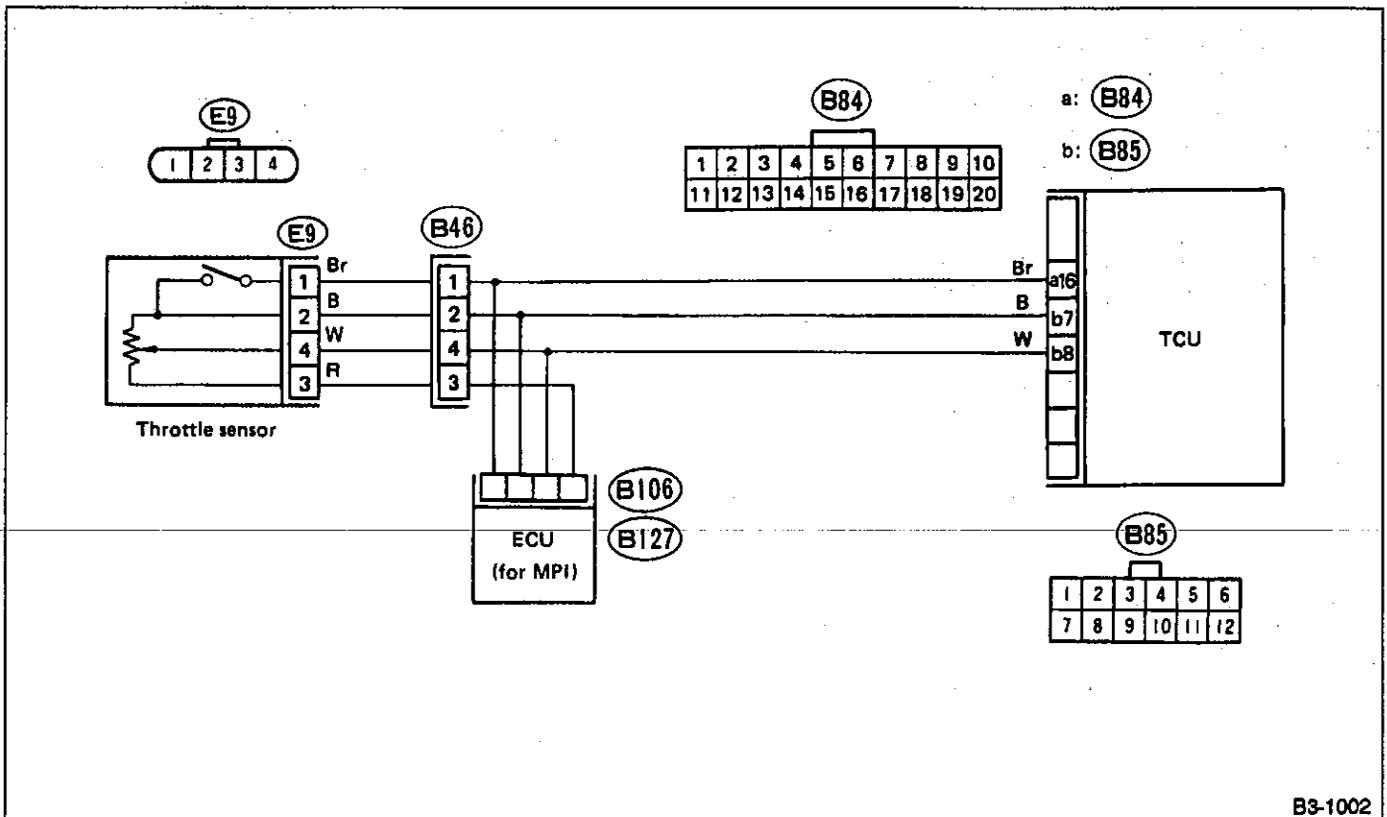
Input signal circuit of throttle sensor is open or shorted.

**TROUBLE SYMPTOM:**

Shift point too high or too low; engine brake not effected in "3" range; excessive shift shock; excessive tight corner "braking".



[MPFI]



B3-1002

Fig. 306

[Carburetor]

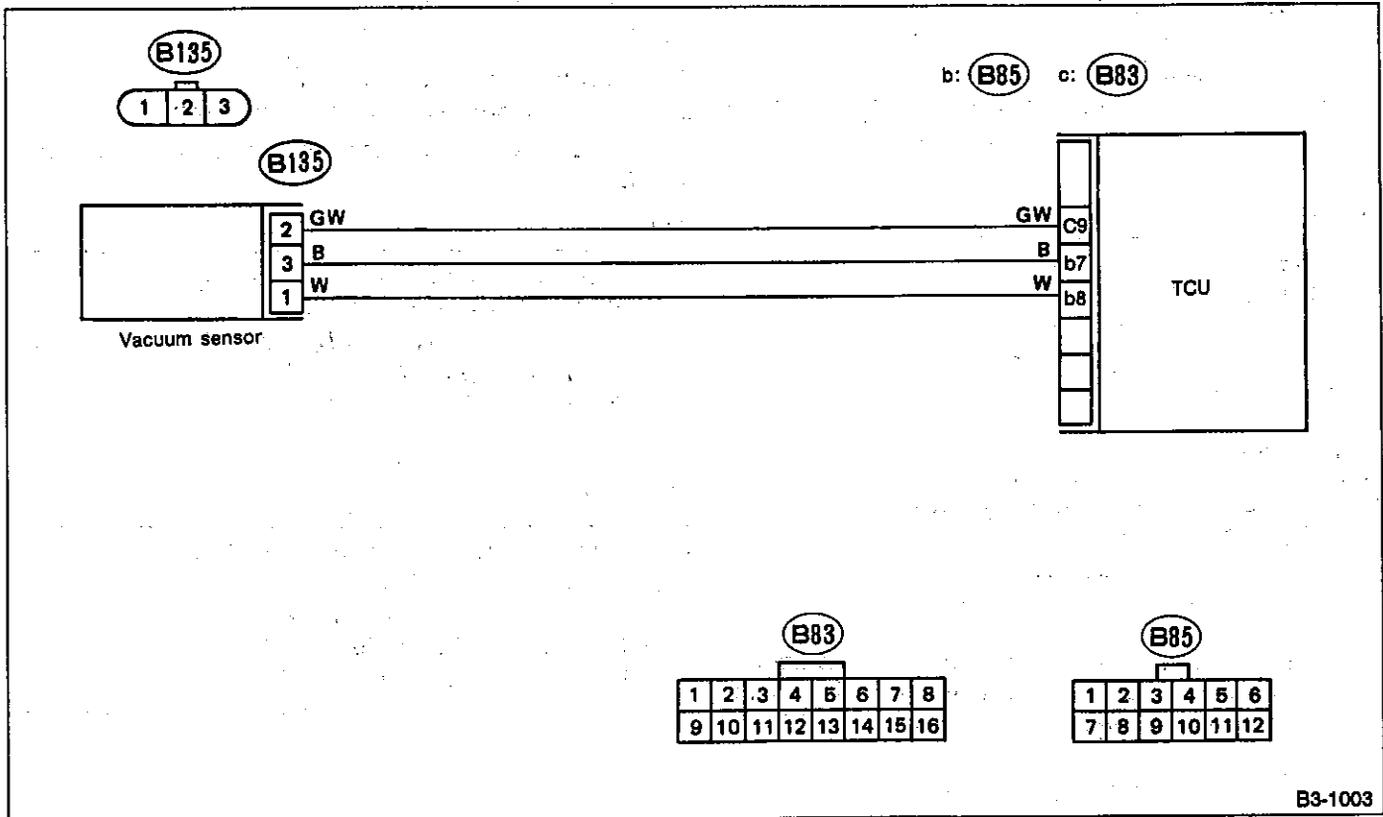


Fig. 307

B3-1003

**1. MEASURE SIGNAL VOLTAGE INPUT OF TCU.**

- 1) Turn ignition switch ON.  
MPFI : Engine OFF  
Carburetor: Engine ON
- 2) Measure signal voltage input emitted from throttle sensor with accelerator pedal fully depressed.

[MPFI]

**Connector & terminal / Specified voltage:**

- (B85) No. 7 — No. 8 /  
4.4 — 4.8 V (Throttle fully closed)
- 0.8 — 1.2 V (Throttle fully open)

[Carburetor]

**Connector & terminal / Specified voltage:**

- (B85) No. 7 — No. 8 /  
Approx. 1.7 V (Engine idling)

A vacuum sensor, which measures intake manifold vacuum pressure, is used in place of a throttle sensor. For this reason, voltage should be measured with the engine ON.

• **SELECT MONITOR FUNCTION MODE**

Mode: 09		
Condition: Ignition switch ON*		
Specified data:	THV F09	
	[MPFI] 4.8V → 0.8V [Carburetor] 1.7V → 3.6V	(Must be changed correspondingly with accelerator pedal operation (from "released" to "depressed" position.)

- \*: • Engine OFF (MPFI)
- Engine ON (Carburetor)

**2. CHECK HARNESS/CONNECTOR BETWEEN TCU AND THROTTLE SENSOR/VACUUM SENSOR.**

- 1) Disconnect connector from TCU.
- 2) Disconnect connector from throttle sensor.
- 3) Measure resistance between TCU and throttle sensor [MPFI].

[MPFI]

**Connector & terminal / Specified voltage:**

- (B85) No. 7 — (E9) No. 2 / 0 Ω
- (B85) No. 7 — Body / 1 MΩ min.
- (B85) No. 8 — (E9) No. 4 / 0 Ω
- (B85) No. 8 — Body / 1 MΩ min.

[Carburetor]

**Connector & terminal / Specified voltage:**

- (B85) No. 7 — (E135) No. 3 / 0 Ω
- (B85) No. 7 — Body / 1 MΩ min.
- (B85) No. 8 — (E135) No. 1 / 0 Ω
- (B85) No. 8 — Body / 1 MΩ min.

**3-1 CHECK THROTTLE SENSOR. [MPFI]**

- 1) Disconnect connector from throttle sensor.
- 2) Measure resistance between throttle sensor terminals.

**[MPFI]****Terminal / Specified resistance:**

No. 2 — No. 4 /

10 — 12 k $\Omega$  (Throttle fully closed)3 — 5 k $\Omega$  (Throttle fully open)**3-2 CHECK VACUUM SENSOR [Carburetor]**

- 1) Turn ignition switch ON (Engine ON).
  - 2) Measure voltage between vacuum sensor terminals.
- Don't disconnect vacuum sensor connector.**

**Terminal / Specified voltage :**

No. 1 — No. 3 / Approx. 1.7V (Engine idling)

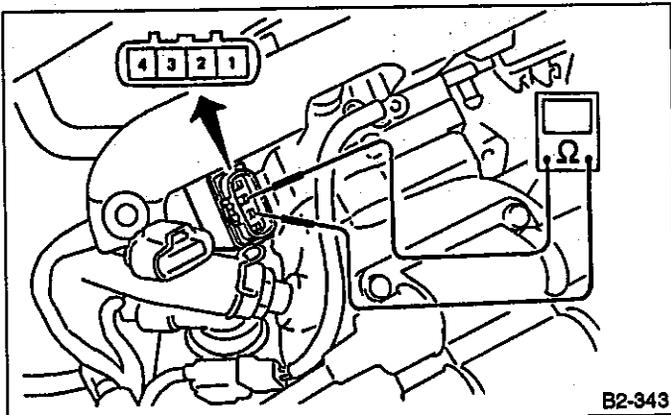
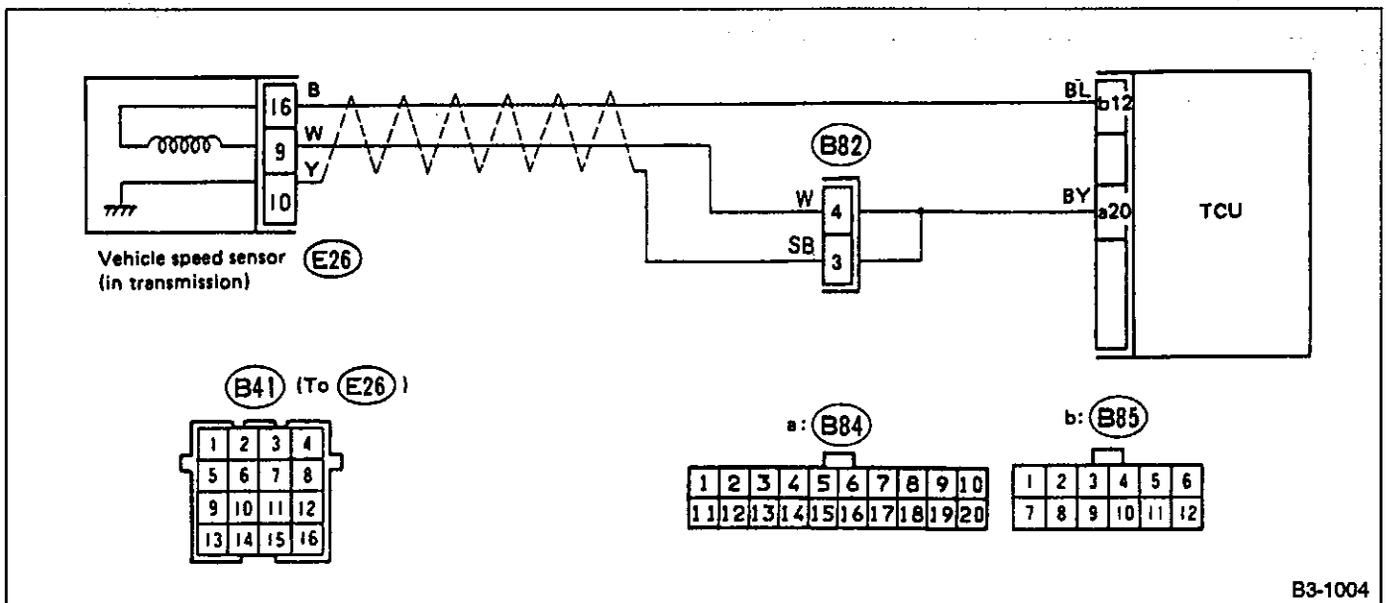
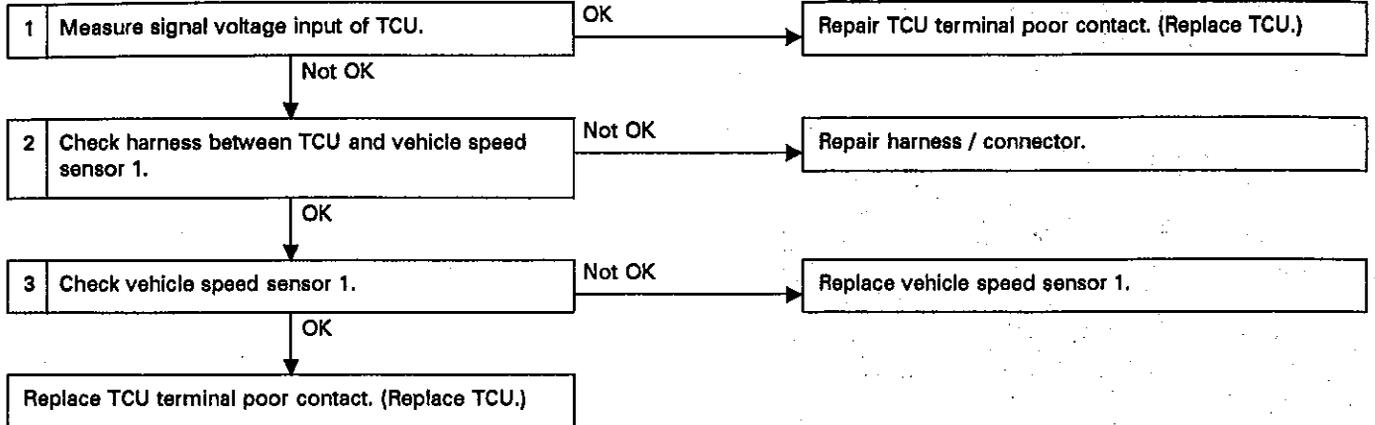


Fig. 308

**K: TROUBLE CODE 32 — VEHICLE SPEED SENSOR 1 —**

**CONTENT OF DIAGNOSIS:**  
Input signal circuit of TCU is open or shorted.

**TROUBLE SYMPTOM:**  
No shift or excessive tight corner "braking"



B3-1004

Fig. 309

**1. MEASURE SIGNAL VOLTAGE INPUT OF TCU.**

- 1) Raise vehicle and place safety stands.  
**On 4WD models, raise all wheels off floor.**
- 2) Start the engine. Set vehicle in 12 miles/h condition.
- 3) Measure signal voltage input of TCU.

**Connector & terminal / Specified voltage:**  
(B85) No. 12 — (B84) No. 20 / AC 1 V, min.

● **SELECT MONITOR FUNCTION MODE**

Mode: F02	
Condition: Simulated driving	
Specified data:	VSP1 F02 (Vehicle speed) miles/h

**Mode 03: "km/h" indication**

**2. CHECK HARNESS/CONNECTOR BETWEEN TCU AND VEHICLE SPEED SENSOR 1.**

- 1) Disconnect connector from TCU.
- 2) Disconnect connector from transmission.
- 3) Measure resistance between TCU connector and transmission connector.

**Connector & terminal / Specified resistance:**  
(B85) No. 12 — (B41) No. 16 / 0 Ω  
(B85) No. 12 — Body / 1 MΩ min.  
(B84) No. 20 — (B41) No. 9 / 0 Ω  
(B84) No. 20 — Body / 1 MΩ min.

**3. CHECK VEHICLE SPEED SENSOR 1.**

- 1) Disconnect connector from transmission.
- 2) Measure resistance between transmission connector receptacle's terminals.

**Connector & terminal / Specified resistance:**  
(E26) No. 16 — No. 9 / 450 — 650 Ω

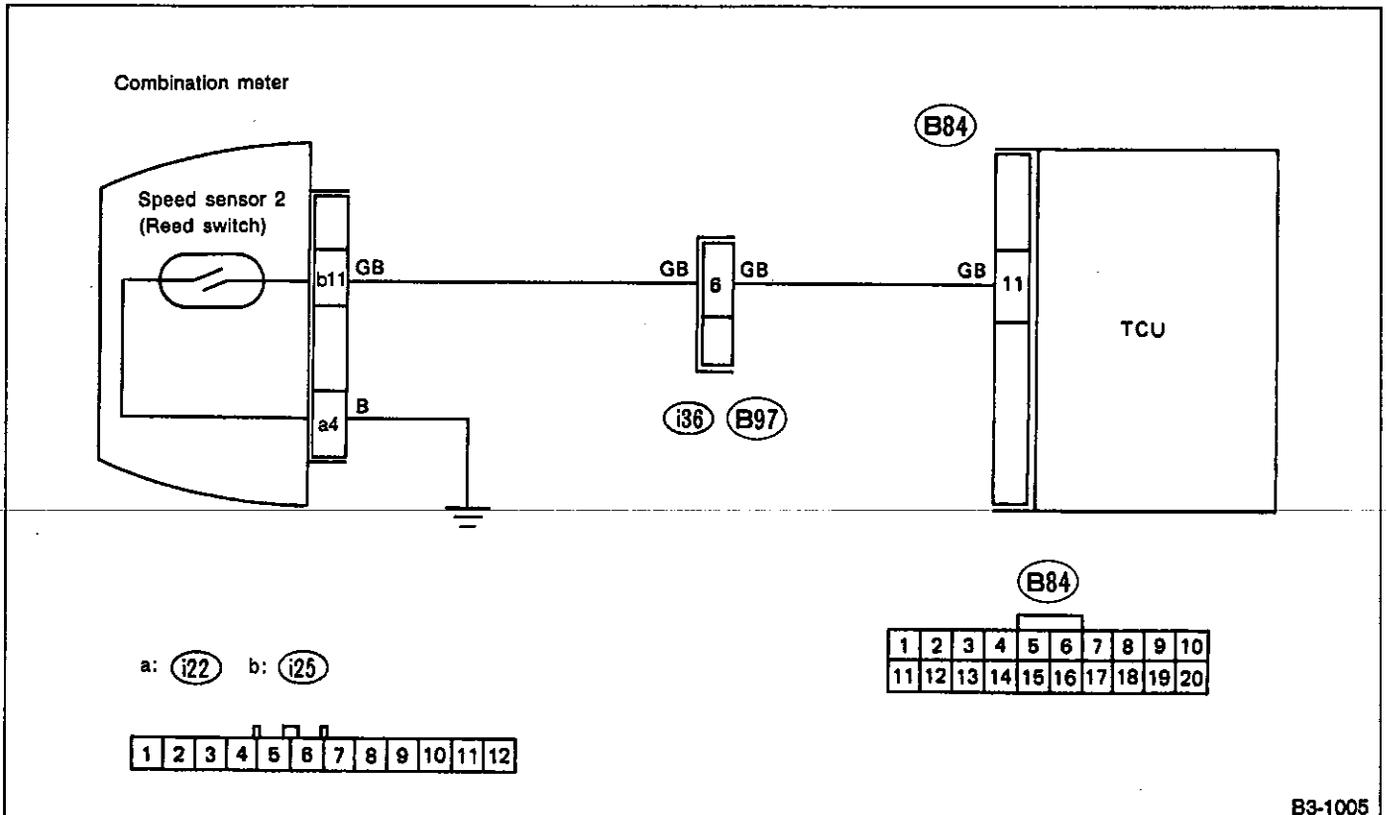
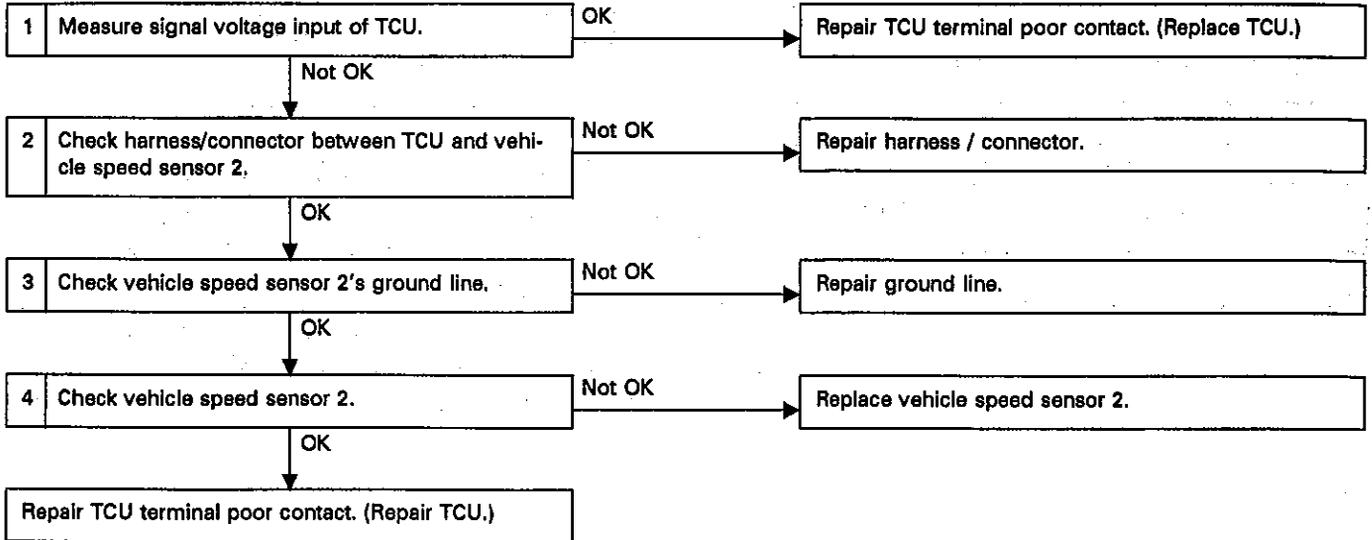
**L: TROUBLE CODE 33 — VEHICLE SPEED SENSOR 2 —**

**CONTENT OF DIAGNOSIS:**

Input signal circuit of vehicle speed sensor 2 is open or shorted.

**TROUBLE SYMPTOM:**

Improper shift points



B3-1005

Fig. 310

**1. MEASURE SIGNAL VOLTAGE INPUT OF TCU.**

- 1) Turn ignition switch ON (with engine OFF).
- 2) Move select lever to "N" and slowly move vehicle by pushing it.
- 3) While vehicle is slowly moving, measure signal voltage input of TCU.

**Connector & terminal / Specified voltage:**  
 (B84) No. 11 — (B84) No. 20 / repetition of 1 volt (max.) — 4 volts (min.)

● **SELECT MONITOR FUNCTION MODE**

Mode: 04	
Condition: Simulated driving	
Specified data:	VSP2 04 (vehicle speed) miles/h

"km/h" indication in mode 05.

**2. CHECK HARNESS/CONNECTOR BETWEEN TCU AND VEHICLE SPEED SENSOR 2.**

- 1) Disconnect connector from TCU.
- 2) Disconnect connector from rear of combination meter.
- 3) Measure resistance between TCU connector and combination meter cable connector.

**Connector & terminal / Specified resistance:**  
 (B84) No. 11 — (i25) No. 11 / 0 Ω  
 (B84) No. 11 — Body / 1 MΩ min.

**3. CHECK VEHICLE SPEED SENSOR 2'S GROUND LINE.**

- 1) Disconnect connector from rear of combination meter cable connector.
- 2) Measure resistance between combination meter cable connector and body.

**Connector & terminal / Specified resistance:**  
 (i22) No. 4 — Body / 0 Ω

**4. CHECK VEHICLE SPEED SENSOR 2.**

- 1) Remove combination meter from instrument panel. Connect body harness connector (i13, i16) to combination meter and turn ignition switch ON.
- 2) Rotate combination meter with a screwdriver inserted into-rear of combination meter at cable location.
- 3) Check that voltage across combination meter cable connector terminals changes (from 0 to 5) volts four times per rotation.

**Connector & terminal / Specified resistance:**  
 (i25) No. 11 — (i22) No. 4 / 0 ≅ 5 V

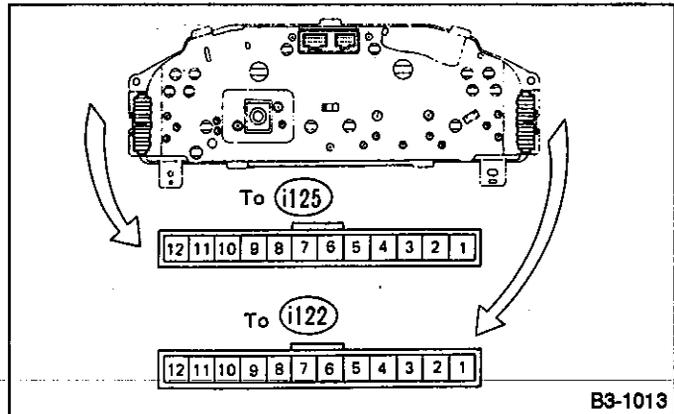


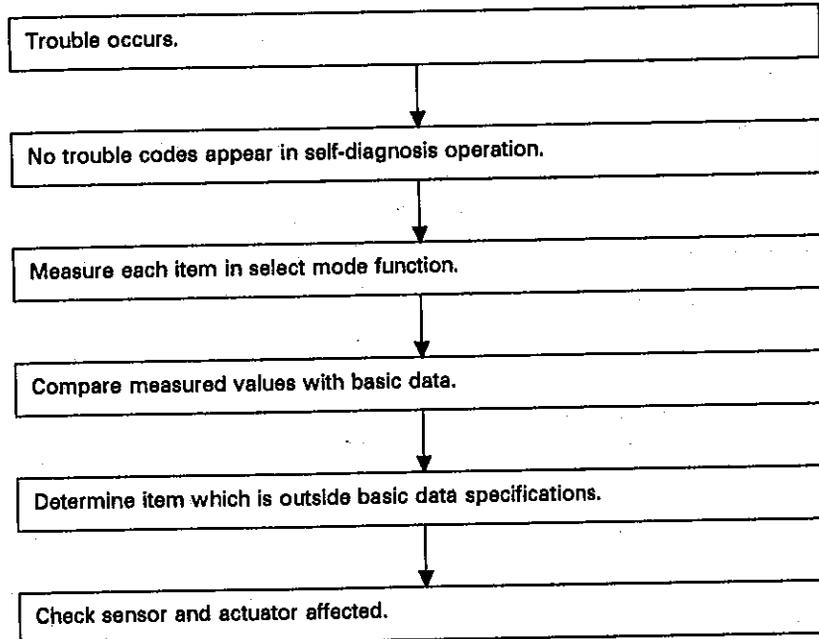
Fig. 311

B3-1013

## 5. Troubleshooting Chart with Select Monitor

If no trouble codes appear in the self-diagnosis function (although problems have occurred or are occurring), measure performance characteristics of sensors, actuators, etc., in the "F" mode (select-monitor function), and compare with the "basic data" to determine the cause of problems.

### A: BASIC TROUBLESHOOTING CHART



**B: LIST OF OUTPUT MODES****1. FUNCTION MODE**

Mode	Contents	Abbr.	Unit	Contents of display
F00	Mode display	—	—	AT or EGI mode (when monitor is connected)
F01	Battery voltage	VB	V	Battery voltage applied to control unit.
F02	Vehicle speed sensor 1	VSP1	m/h	Vehicle speed (miles/h) sent from vehicle speed sensor 1.
F03	Vehicle speed sensor 1	VSP1	km/h	Vehicle speed (km/h) sent from vehicle speed sensor 1.
F04	Vehicle speed sensor 2	VSP2	m/h	Vehicle speed (miles/h) sent from vehicle speed sensor 2.
F05	Vehicle speed sensor 2	VSP2	km/h	Vehicle speed (km/h) sent from vehicle speed sensor 2.
F06	Engine RPM	EREV	rpm	Engine speed sent from EGI unit.
F07	ATF temperature sensor	ATFT	°F	ATF temperature (°F) sent from ATF temperature sensor.
F08	ATF temperature sensor	ATFT	°C	ATF temperature (°C) sent from ATF temperature sensor.
F09	Throttle sensor	THV	V	Voltage sent from throttle sensor.
F10	Gear position	GEAR	—	Transmission gear position.
F11	Line pressure duty	PLDTY	%	Duty ratio flowing through duty solenoid A.
F12	Lock-up duty	LUPTY	%	Duty ratio flowing through duty solenoid B.
F13	4WD duty	4WDTY	%	Duty ratio flowing through duty solenoid C.

## 2. ON ↔ OFF SIGNAL LIST

Mode	LED No.	Contents	Display	LED "ON" requirements
FA0	5	ABS switch	AB	When ABS signal is entered.
	6	Cruise control set	CR	When cruise control is set.
	7	Economy switch	EC	When ECONOMY signals are entered.
	8	FWD switch	FF	When fuse is installed in FWD switch.
FA1	1	N/P range switch	NP	When N/P range is selected.
	2	R range switch	RR	When R range is selected.
	3	2 range switch	R2	When 2 range is selected.
	4	3 range switch	R3	When 3 range is selected.
	5	D range switch	RD	When D range is selected.
	6	1 range switch	R1	When 1 range is selected.
	7	Manual switch	MS	When manual switch is turned ON.
FA2	2	Idle switch	ID	When idle switch is turned ON.
	3	Brake switch	BR	When brake switch is turned ON.

## 3. DIAGNOSIS MODE

Mode	Contents	Abbr.	Contents of display
FB0	Self-diagnosis	DIAG.U	Current trouble code determined by self-diagnosis.
FB1	Self-diagnosis	DIAG.M	Previous trouble code stored in memory by self-diagnosis.
FC0	Back-up clear	—	Function of clearing trouble code stored in memory.

**C: MODE F00 — MODEL YEAR —**

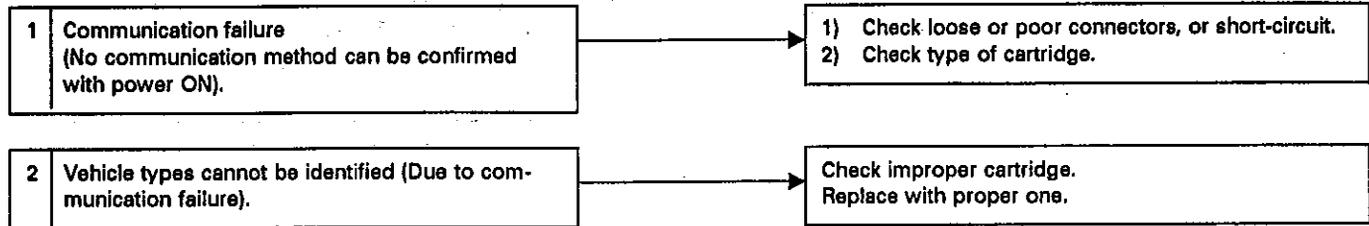
CONDITION:

SPECIFIED DATA:

E-4AT F00  
\*4WD 1992

\* or FWD

Probable cause (if outside "specified data")



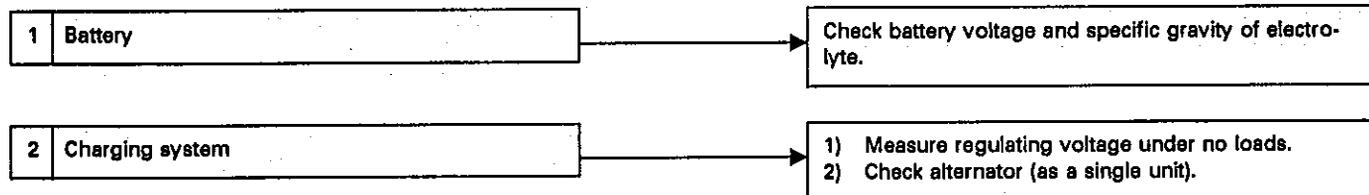
**D: MODE F01 — BATTERY VOLTAGE (VB) —**

CONDITION:

- 1) Ignition switch ON
- 2) Engine idling after warm-up

SPECIFIED DATA:

VB: 10 — 15 V



**E: MODE F02 — SPEED SENSOR 1 (VSP 1) —****CONDITION:**

Raise vehicle off ground and operate at constant speed.

**SPECIFIED DATA:**Compare speedometer with monitor indications.  
Probable cause (if indications are different.)

Probable cause (if outside "specified data")

1 Vehicle speed sensor 1

Check performance characteristics of vehicle speed sensor 1. (Ref. to [T4K0].)

OK

Check TCU and replace if necessary.

**F: MODE F04 — SPEED SENSOR 2 (VSP 2) —****CONDITION:**

Raise vehicle off ground and operate at constant speed.

**SPECIFIED DATA:**Compare speedometer with monitor indications.  
Probable cause (if indications are different.)

Probable cause (if outside "specified data")

1 Vehicle speed sensor 2

Check performance characteristics of vehicle speed sensor 2. (Ref. to [T4L0].)

OK

Check TCU and replace if necessary.

**G: MODE F06 — ENGINE SPEED (EREV) —**

**CONDITION:**

Measure with engine operating at constant speed.

**SPECIFIED DATA:**

Same as tachometer reading (in combination meter)

Probable cause (if outside "specified data")



**H: MODE F08 — ATF TEMPERATURE (ATFT) —**

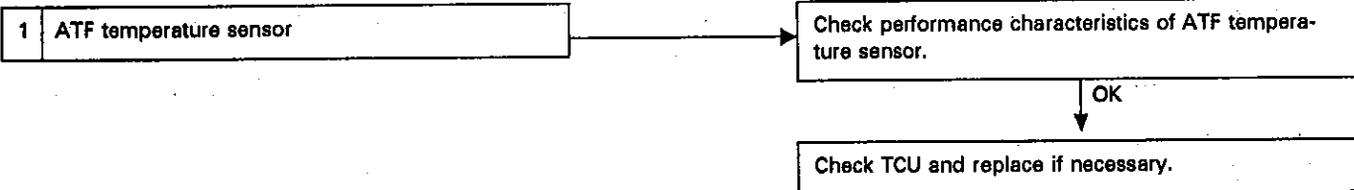
**CONDITION:**

- 1) Low ATF temperature (before engine / vehicle starts)
- 2) High ATF temperature (after driving vehicle for warm-up)

**SPECIFIED DATA:**

- 1) Ambient temperature:  $\pm 10^{\circ}\text{C}$
- 2) ATF temperature:  $70 - 110^{\circ}\text{C}$

Probable cause (if outside "specified data")



**F07 = ATF temperature (ATFT): to be indicated in "deg F".**

**I: MODE F09 — THROTTLE SENSOR (THV) —**

**CONDITION:**

Ignition switch ON\* Measure voltage while operating throttle valve from a fully closed position to a fully open position.

\*: Engine OFF [MPFI]

• Engine ON [Carburetor]

**SPECIFIED DATA:**

[MPFI] 4.8V → 0.8V

[Carburetor] 1.7V → 3.6V

Must change with accelerator pedal operation (from "released" to "depressed" position.)

Probable cause (if outside "specified data")

1	Throttle sensor / vacuum sensor
---	---------------------------------

Check performance characteristics of throttle sensor, vacuum sensor. (Ref. to [T4J0])

OK

Check TCU and replace if necessary.

**J: MODE F10 — GEAR POSITION (GEAR) —**

**CONDITION:**

Check while driving vehicle (after warm-up).

**SPECIFIED DATA:**

Gear position (Ref. shift performance characteristics chart)

Probable cause (item outside "specified data")

1	Shift solenoid 1
---	------------------

Check performance characteristics of shift solenoid 1. (Ref. to [T4E0.])

OK

2	Shift solenoid 2
---	------------------

Check performance characteristics of shift solenoid 2. (Ref. to [T4D0.])

OK

3	Shift solenoid 3
---	------------------

Check performance characteristics of shift solenoid 3. (Ref. to [T4C0.])

OK

Check TCU and replace as necessary.

**K: MODE F11 — LINE PRESSURE DUTY (PLDTY) —**

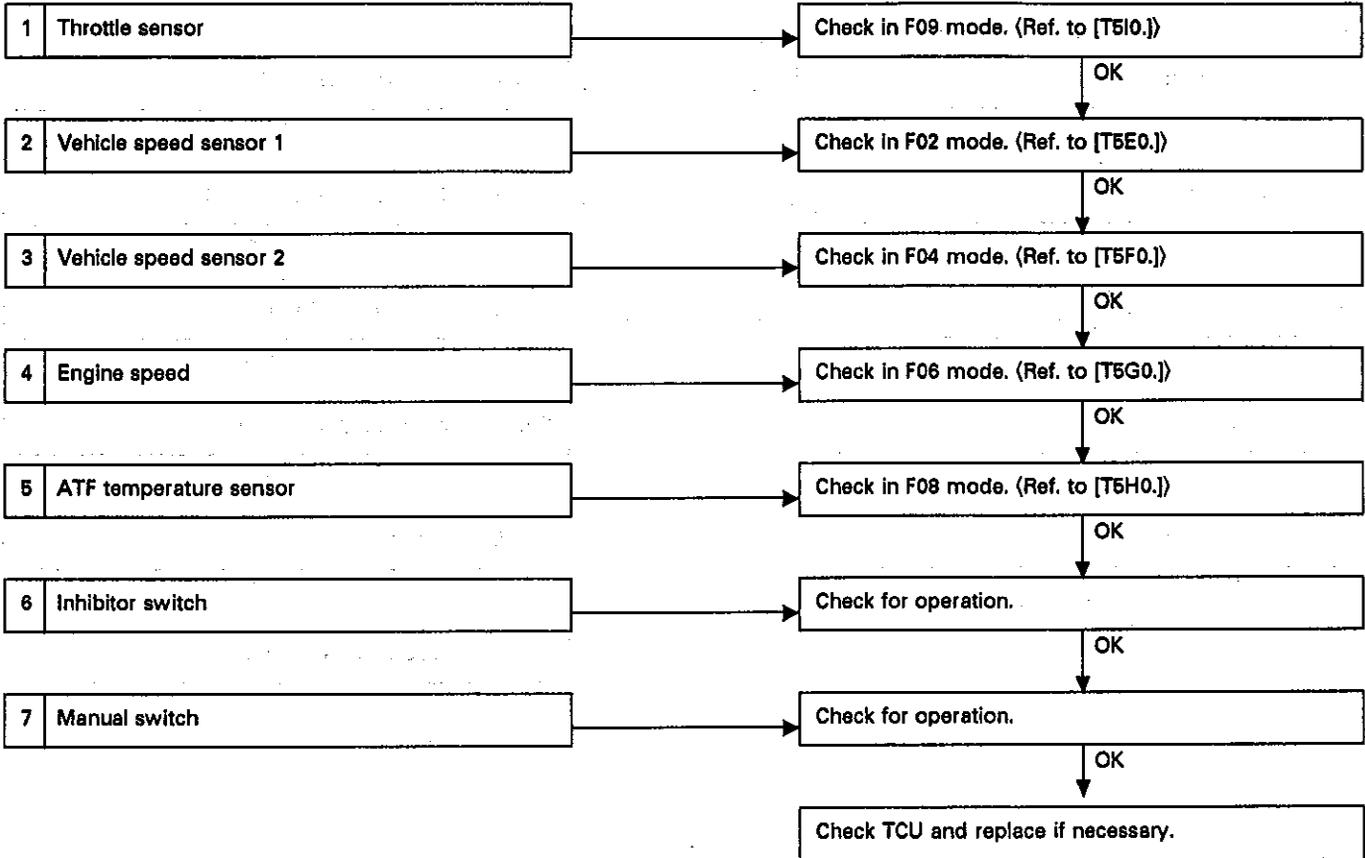
**CONDITION:**

- Ignition ON (engine OFF)
- N range

**SPECIFIED DATA:**

- Throttle fully closed: 100%
- Throttle fully open : 10%

Probable cause (if outside "specified data")



## L: MODE F12 — LOCK-UP DUTY (LUDTY) —

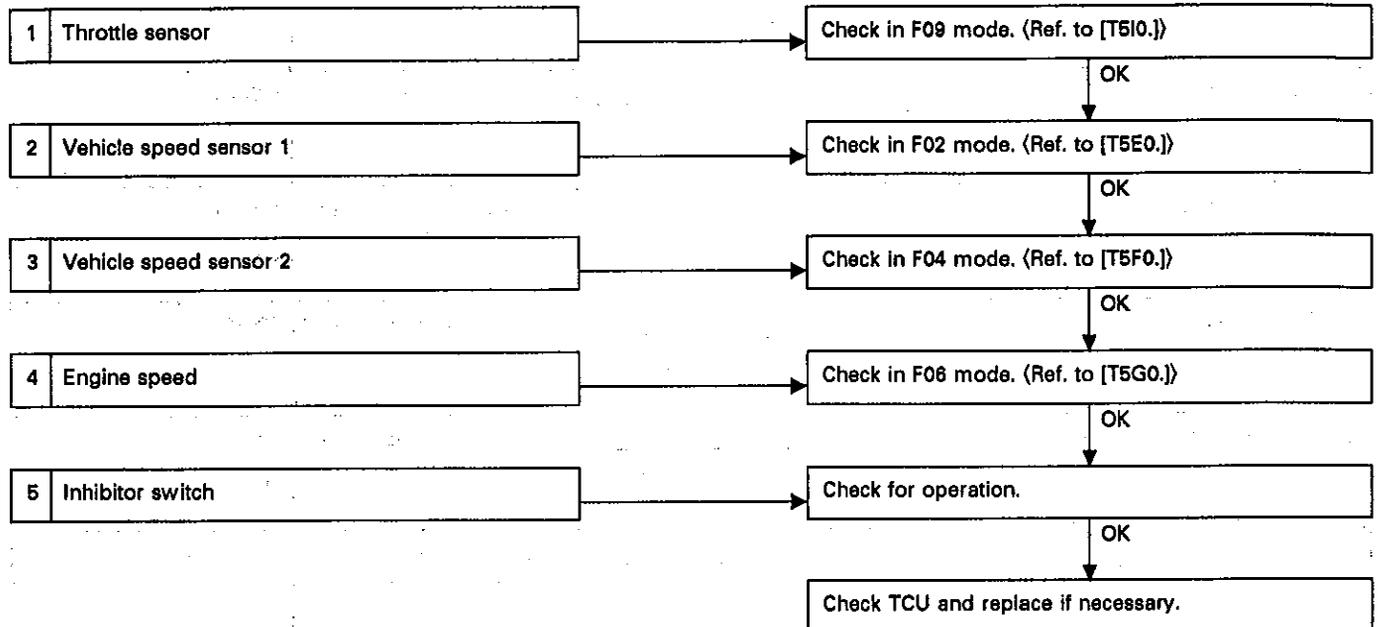
### CONDITION:

- 1) Idling (after sufficient warm-up) with lock-up system released
- 2) Driving at 50 km/h (31 MPH) (after sufficient warm-up) with lock-up system applied

### SPECIFIED DATA:

- 1) Lock-up system released: 5 %
- 2) Lock-up system applied: 95 %

### Probable cause (if outside "specified data")



**M: MODE F13 — 4WD DUTY (4WDTY) —**

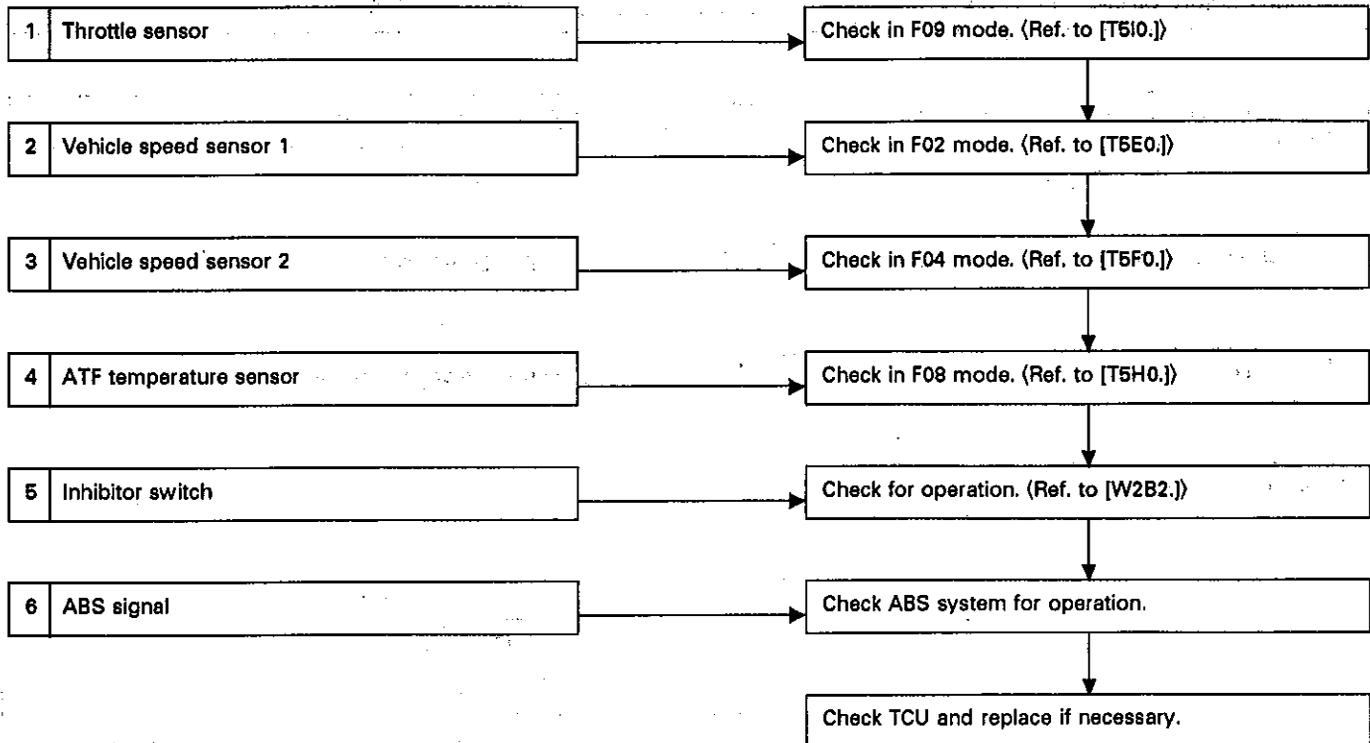
**CONDITION:**

- Ignition switch ON (engine OFF)
- 1) FWD mode
- 2) 4WD mode, D-range, full throttle

**SPECIFIED DATA:**

- 1) 95%
- 2) 25%, max.

**Probable cause (if outside "specified data")**



**N: FA0 MODE — LED NO.7, ECONOMY SWITCH —**

**CONTENT OF DIAGNOSIS:**  
LED does not come on when economy switch is ON.  
Economy switch circuits are open or shorted.

**TROUBLE SYMPTOM:**  
No power mode occurs.

Probable cause

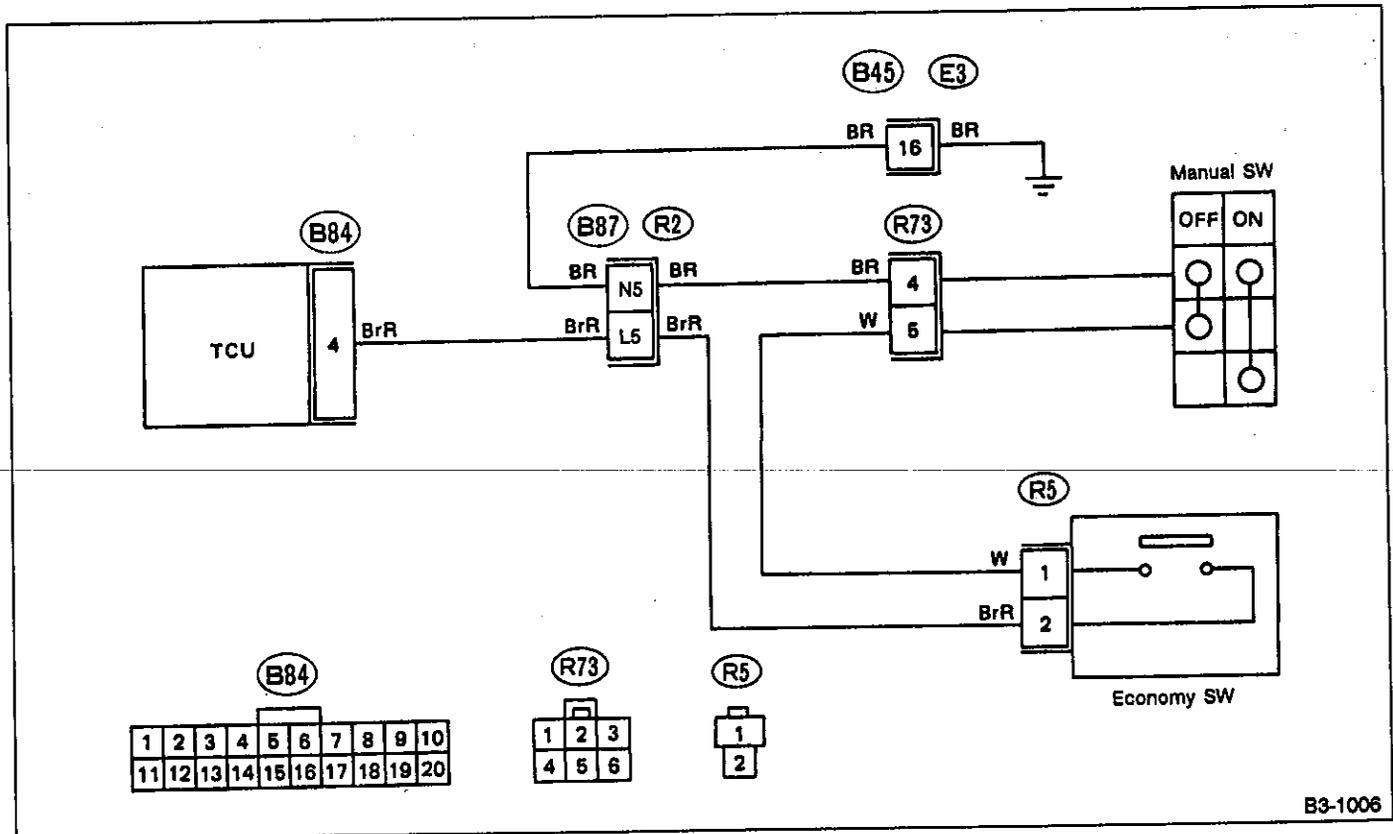
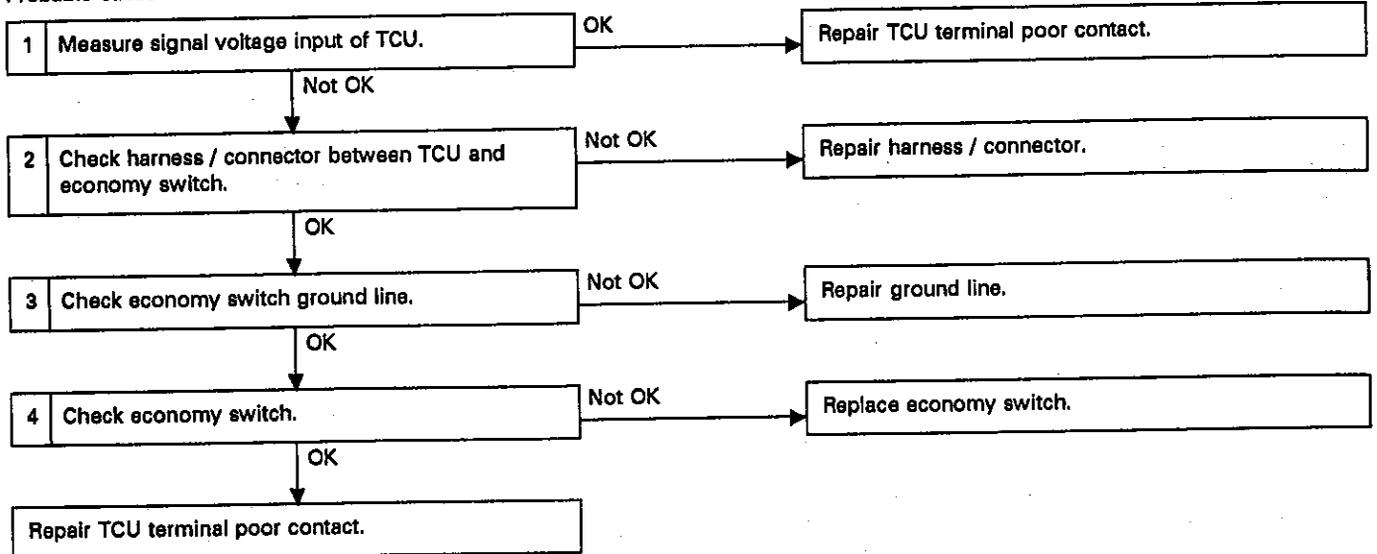


Fig. 312

B3-1006

**1. MEASURE SIGNAL VOLTAGE INPUT OF TCU.**

- 1) Turn ignition switch ON (with engine OFF).
- 2) Manual switch is OFF.
- 3) Measure difference in voltage inputs of TCU when economy switch is ON and OFF.

**Connector & terminal / Specified voltage:**  
 (B84) No. 4 — Body / 1 V (ON)  
 (B84) No. 4 — Body/ 6 — 10 V (OFF)

**2. CHECK HARNESS/CONNECTOR BETWEEN TCU AND ECONOMY SWITCH.**

- 1) Disconnect connector from TCU.
- 2) Disconnect economy switch connector from select lever connection.
- 3) Measure resistance between TCU connector and economy switch connector, and between TCU and body.

**Connector & terminal / Specified resistance:**  
 (B84) No. 4 — (R5) No. 2 / 0 Ω  
 (B84) No. 4 — Body / 1 MΩ min.

**3. CHECK ECONOMY SWITCH GROUND LINE.**

- 1) Disconnect economy switch connector from select lever connection.
- 2) Manual switch is OFF.
- 3) Measure resistance between economy switch connector and body.

**Connector & terminal / Specified resistance:**  
 (R5) No. 4 — Body / 1 Ω max.

**4. CHECK ECONOMY SWITCH.**

- 1) Disconnect economy switch connector from select lever connection.
- 2) Measure resistance between economy switch terminals.

**Specified resistance:**  
 (Switch ON) 0 Ω  
 (Switch OFF) 1 MΩ min.

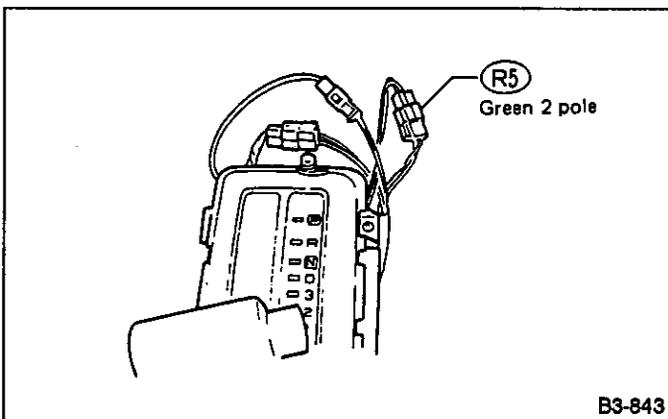


Fig. 313

**O: FA1 MODE — LED NO. 7, MANUAL SWITCH —**

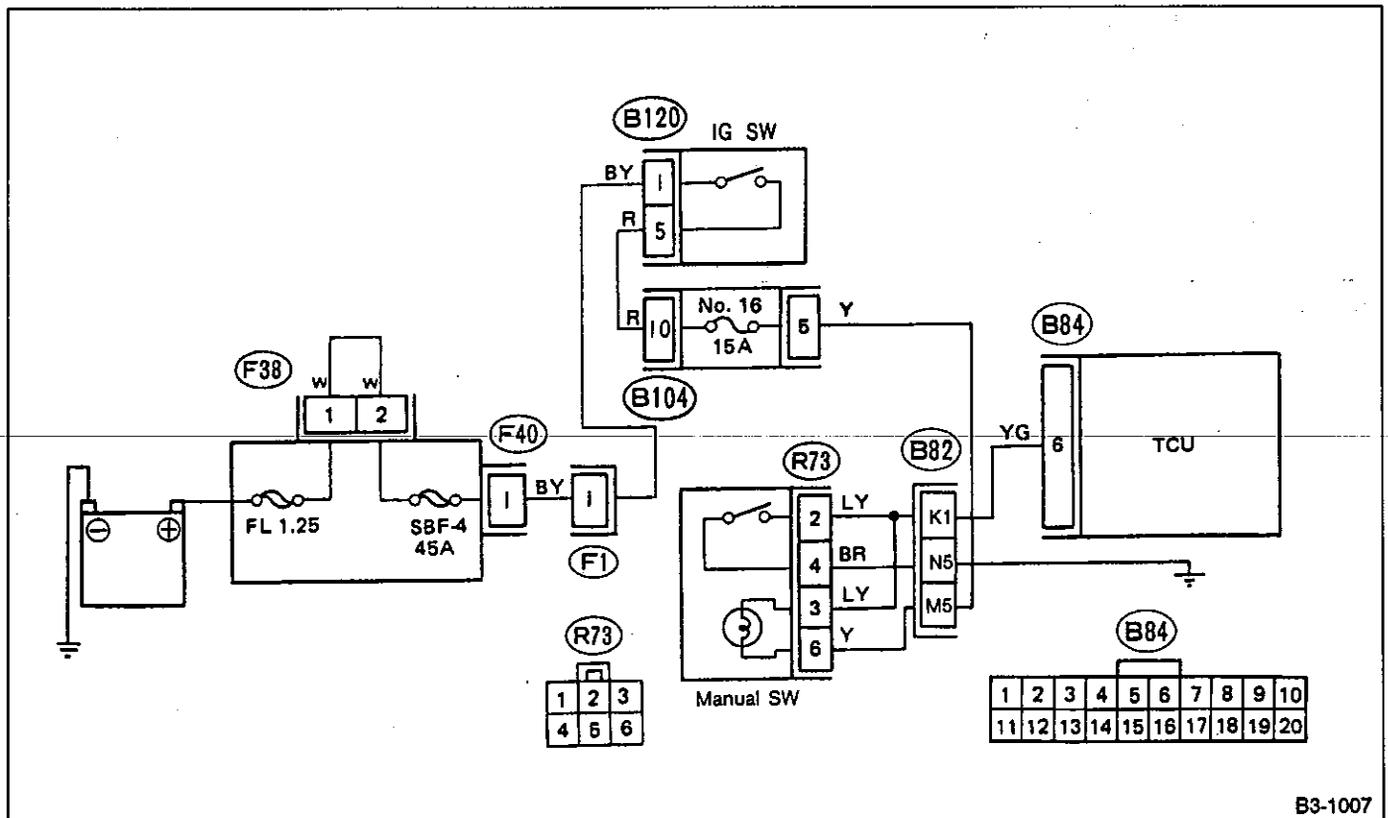
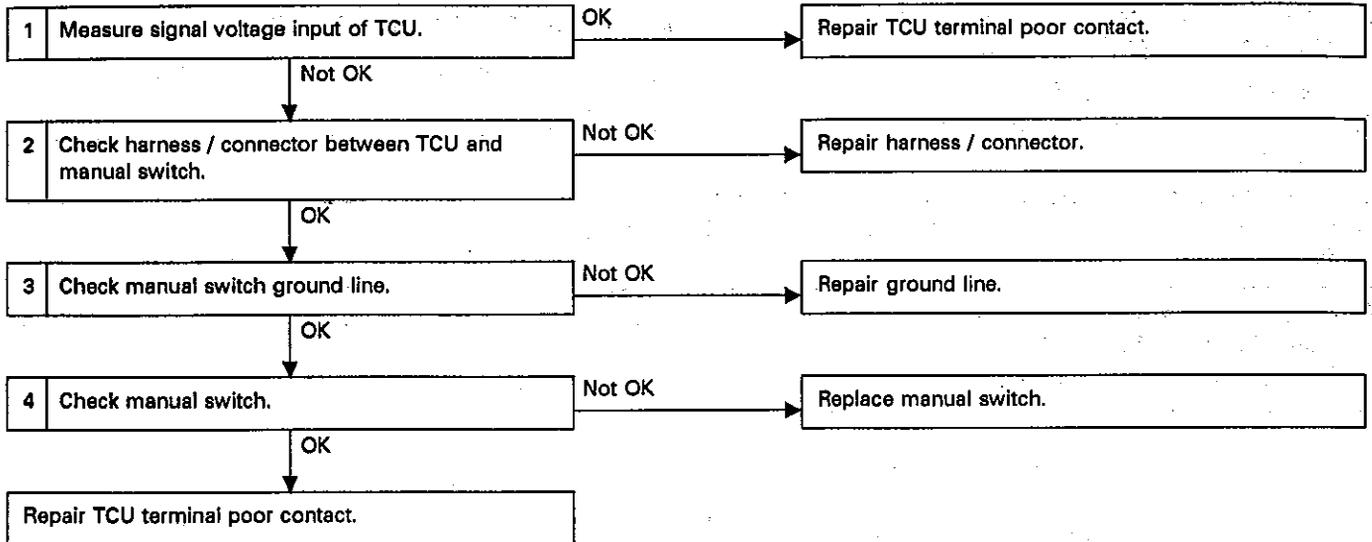
**CONTENT OF DIAGNOSIS:**

LED does not come on when manual switch is ON.  
Manual switch circuit is open or shorted.

**TROUBLE SYMPTOM:**

- Tight corner "braking"
- 2nd and 3rd gears not held
- Failure of vehicle to start in 2nd range 2nd gear

Probable cause (if outside "specified data")



B3-1007

Fig. 314

**1. MEASURE SIGNAL VOLTAGE INPUT OF TCU.**

- 1) Turn ignition switch ON (with engine OFF).
- 2) Measure difference in voltage inputs of TCU when manual switch is ON and OFF.

**Connector & terminal / Specified voltage:**

- (B84) No. 6 — Body / 1 V (ON)
- (B84) No. 6 — Body / 6 — 10 V (OFF)

**2. CHECK HARNESS/CONNECTOR BETWEEN TCU AND MANUAL SWITCH.**

- 1) Disconnect connector from TCU.
- 2) Disconnect manual switch connector from select lever connection.
- 3) Measure resistance between TCU connector and manual switch connector, and between TCU and body.

**Connector & terminal / Specified resistance:**

- (B84) No. 6 — (R73) No. 2 / 0  $\Omega$
- (B84) No. 6 — Body / 1 M $\Omega$  min.

**3. CHECK MANUAL SWITCH GROUND LINE.**

- 1) Disconnect manual switch connector from select lever connection.
- 2) Measure resistance between manual switch connector and body.

**Connector & terminal / Specified resistance:**

- (R73) No. 1 — Body / 1  $\Omega$  max.

**4. CHECK MANUAL SWITCH.**

- 1) Disconnect manual switch connector from select lever connection.
- 2) Measure resistance between manual switch terminals.

**Specified resistance:**

- (Switch ON) 0  $\Omega$
- (Switch OFF) 1 M $\Omega$  min.

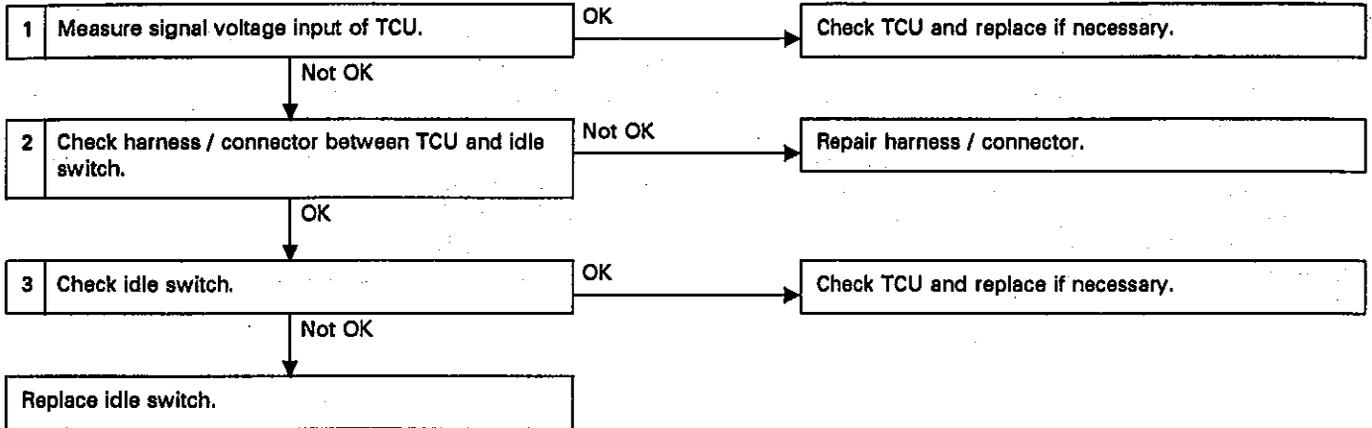
**P: FA2 MODE — LEAD NO. 2, IDLE SWITCH —**

**CONTENT OF DIAGNOSIS:**

LED comes on when idle switch is ON (throttle fully closed), and LED remains off (throttle fully open) when idle switch is OFF.  
 Input signal circuit of idle switch is open or shorted.

**TROUBLE SYMPTOM:**

No lockup occurs (after warm-up).



**[MPFI]**

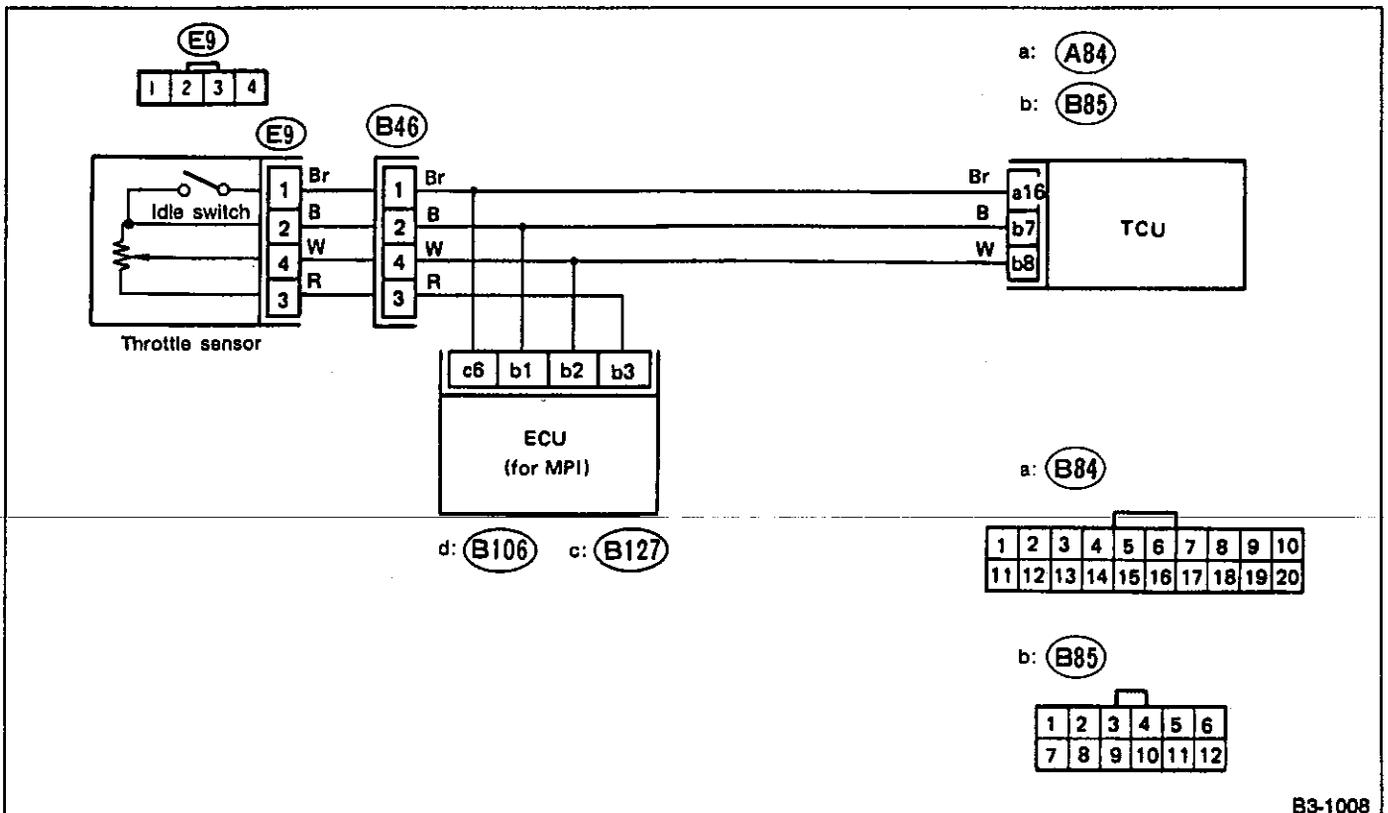


Fig. 315

B3-1008

[Carburetor]

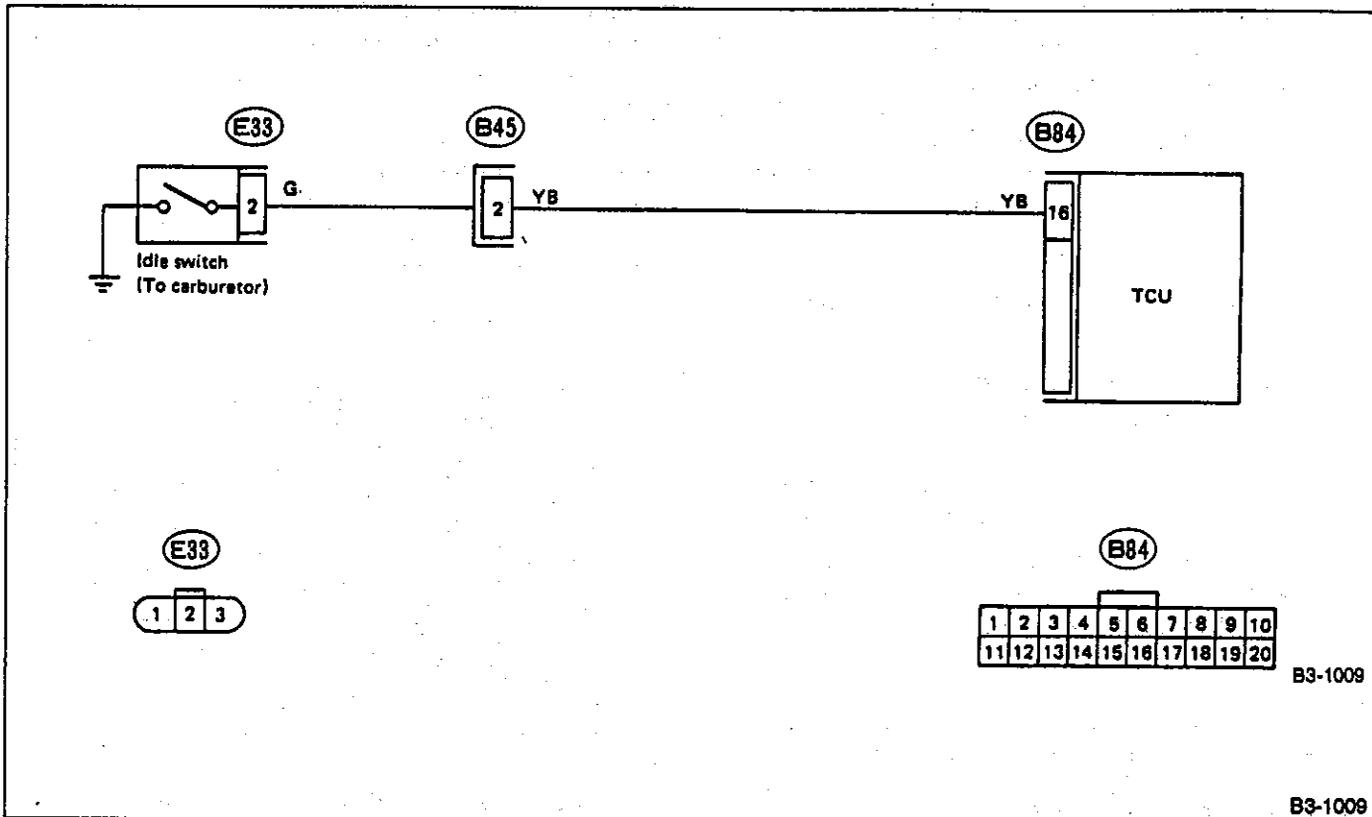


Fig. 316

**1. MEASURE SIGNAL VOLTAGE INPUT OF TCU.**

- 1) Turn ignition switch ON (with engine OFF).
- 2) Measure difference in signal voltage inputs of TCU when throttle valve is opened and closed.

**Connector & terminal / Specified voltage:**  
 (B84) No. 16 — Body / 0.5 V, max. (Fully closed)  
 3 — 6 V (Open)

**2. CHECK HARNESS/CONNECTOR BETWEEN TCU AND IDLE SWITCH.**

- 1) Disconnect connector from TCU.
- 2) Disconnect connector from ECU (Except Carburetor).
- 3) Disconnect connector from throttle sensor. (MPFI)  
Disconnect connector from Idle switch. (Carburetor)
- 4) Measure resistance between TCU connector and throttle sensor connector / Idle switch connector, and between TCU connector and body.

**[MPFI]**

**Connector & terminal / Specified resistance:**  
 (B84) No. 16 — (E9) No. 1 / 0  $\Omega$   
 (B84) No. 16 — Body / 1 M $\Omega$  min.

**[Carburetor]**

**Connector & terminal / Specified resistance:**  
 (B84) No. 16 — (E33) No. 2 / 0  $\Omega$   
 (B84) No. 16 — Body / 1 M $\Omega$  min.

**3-1 CHECK IDLE SWITCH. (MPFI)**

- 1) Disconnect connector from throttle sensor.
- 2) Measure resistance between throttle sensor terminals when throttle valve is opened or closed.

**[MPFI]**

**Terminal / Specified resistance:**  
 No. 1 — No. 2 / 0  $\Omega$  (Fully closed)  
 1 M $\Omega$  min. (Fully open)

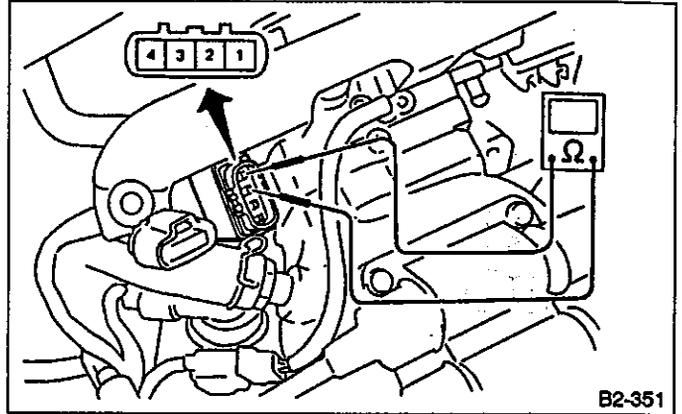


Fig. 317

**3-2 CHECK IDLE SWITCH. (Carburetor)**

- 1) Disconnect connector from Idle switch.
- 2) Measure resistance between Idle switch terminal when throttle is opened or closed.

**[Carburetor]**

**Terminal / Specified resistance:**  
 No. 2 — Body / 0  $\Omega$  (Fully closed)  
 1 M $\Omega$  min. (Fully open)

**Q: FA3 MODE — LEAD NO. 2, KICK-DOWN SWITCH —**

**CONTENT OF DIAGNOSIS:**

The LED remains off when the throttle is partially open but comes on when the throttle is fully opened. The kick-down switch is ON when the throttle is fully closed or partially open but is OFF when the throttle is partially open.

**TROUBLE SYMPTOM:**

No kick-down occurs (after warm-up).

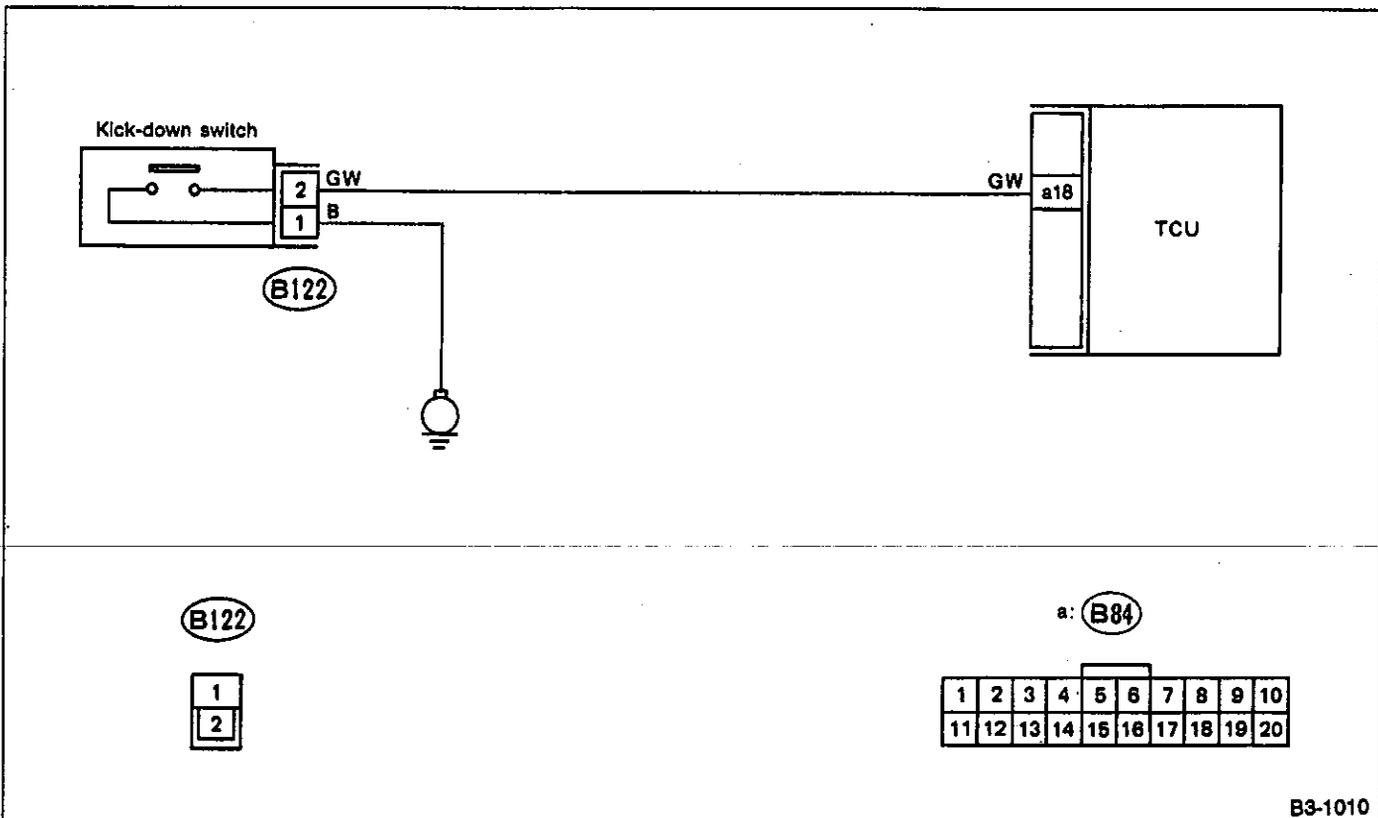
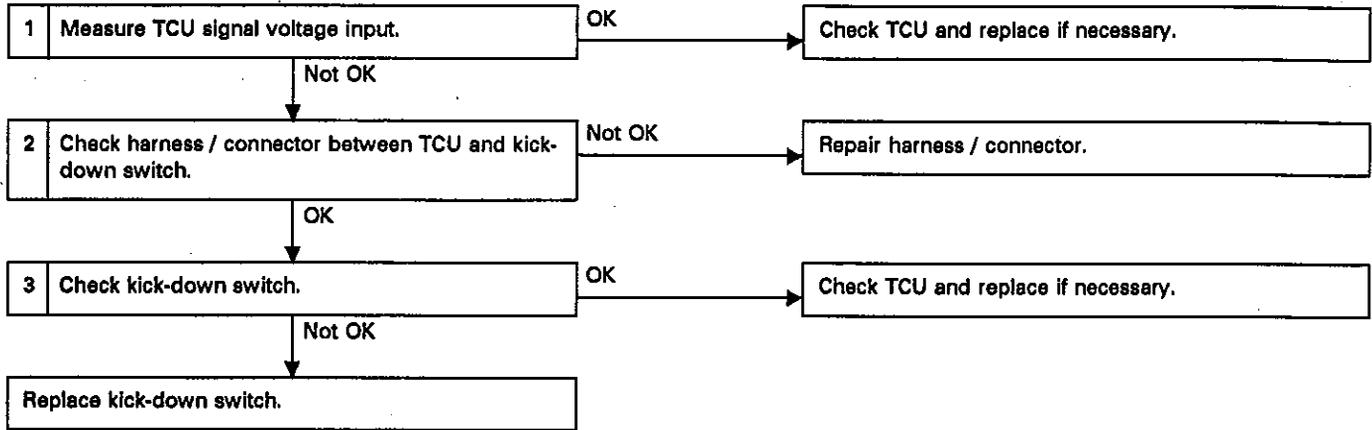


Fig. 318

**1. MEASURE TCU SIGNAL VOLTAGE INPUT.**

- 1) Turn ignition switch ON (with engine OFF).
- 2) Measure difference in TCU signal voltage input when throttle valve is open and when it is closed.

---

**Connector & Terminal / Specified voltage:**  
(B84) No. 18 — Body / 0.5 V, max. (Fully open)  
/ 3 — 6 V (Closed)

---

**2. CHECK HARNESS/CONNECTOR BETWEEN TCU AND KICK-DOWN SWITCH.**

- 1) Disconnect connector (B84) from TCU.
- 2) Disconnect connector (B122) from kick-down switch.
- 3) Measure resistance between connectors (B122), (B84) and body.

---

**Connector & Terminal / Specified voltage:**  
(B84) No. 18 — (B103) No. 2 / 0  $\Omega$   
(B122) No. 1 — Body / 0  $\Omega$

---

**3. CHECK KICK-DOWN SWITCH.**

Measure resistance between kick-down switch terminal when throttle is fully open and when it is closed.

---

**Terminal / Specified voltage:**  
No. 1 — No. 2 / 0  $\Omega$  (Fully open)  
/ 1 M $\Omega$  min. (Fully closed)

---





# TRANSMISSION CONTROL SYSTEM

# 3-3

## SUBARU®

## 1992

## SERVICE MANUAL

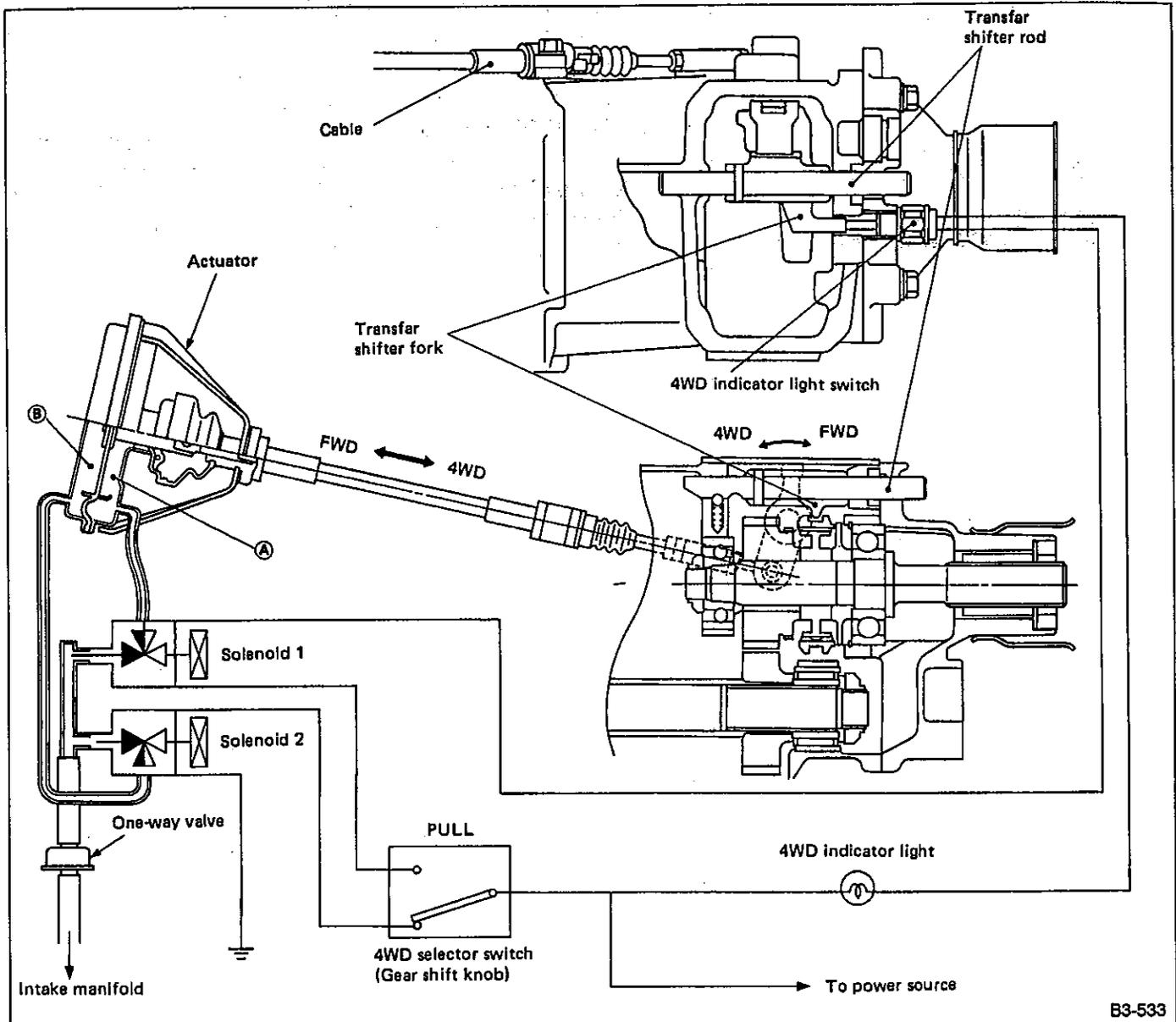
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# M MECHANISM AND FUNCTION

## 4WD Shift Mechanism (Selective 4WD)

Shifting from front-wheel drive (FWD) to 4-wheel drive (4WD) or vice versa is accomplished by utilizing the intake manifold vacuum pressure.



B3-533

Fig. 1

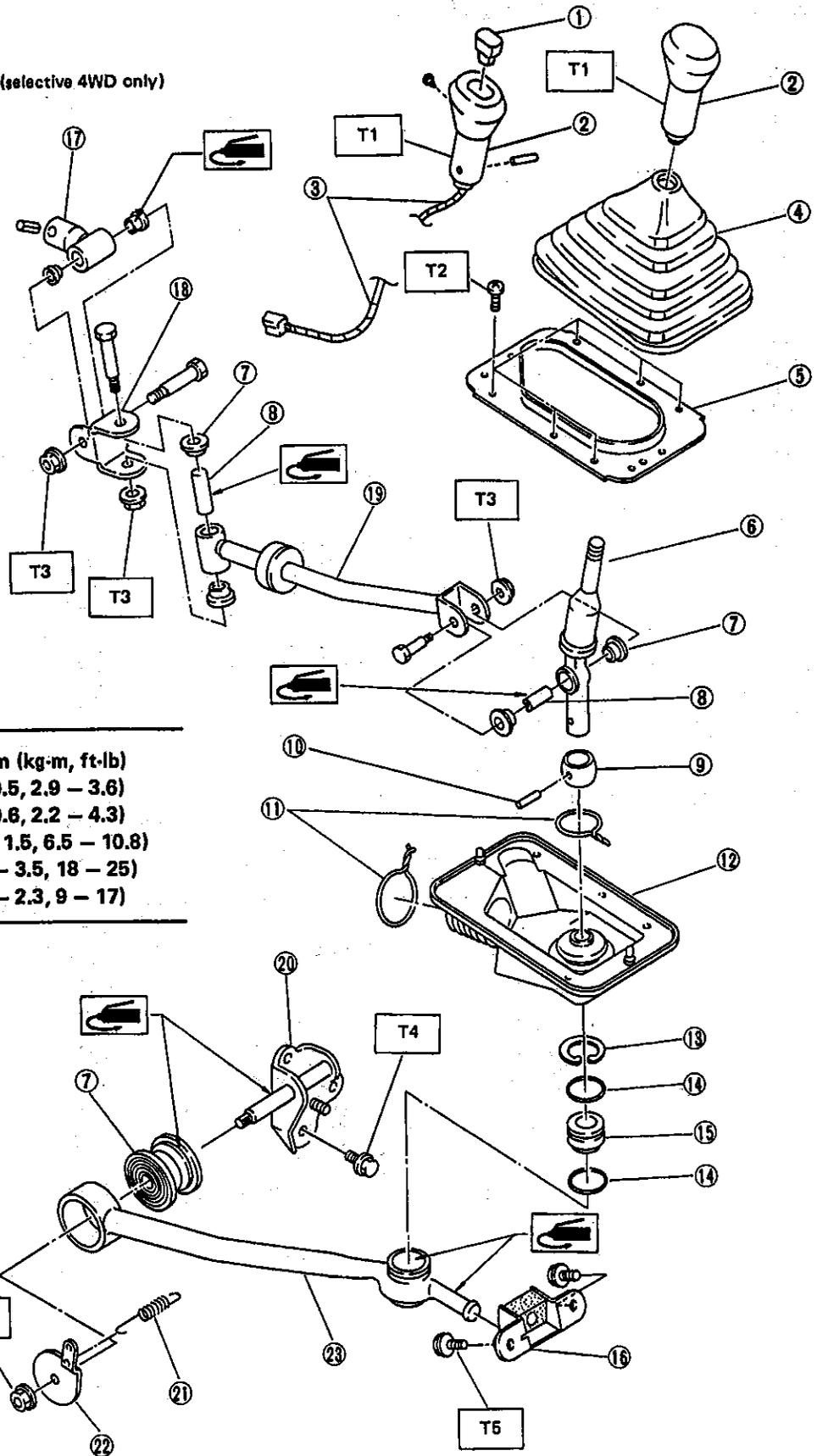
1) When the shift knob selector switch is OFF, solenoid 1 is closed and solenoid 2 is opened. Vacuum pressure from the intake manifold is transmitted to vacuum chamber ② in the actuator, thus the diaphragm pulls the cable putting the vehicle in FWD.

2) When the shift knob selector switch is ON, solenoid 1 is opened and solenoid 2 is closed. Vacuum pressure is transmitted to vacuum chamber ①, thus the diaphragm pushes the cable putting the vehicle in 4WD. At this time, the 4WD indicator light switch in the transfer turns on, turning on the 4WD indicator light in the combination meter.



## 2. Manual Transmission (4WD)

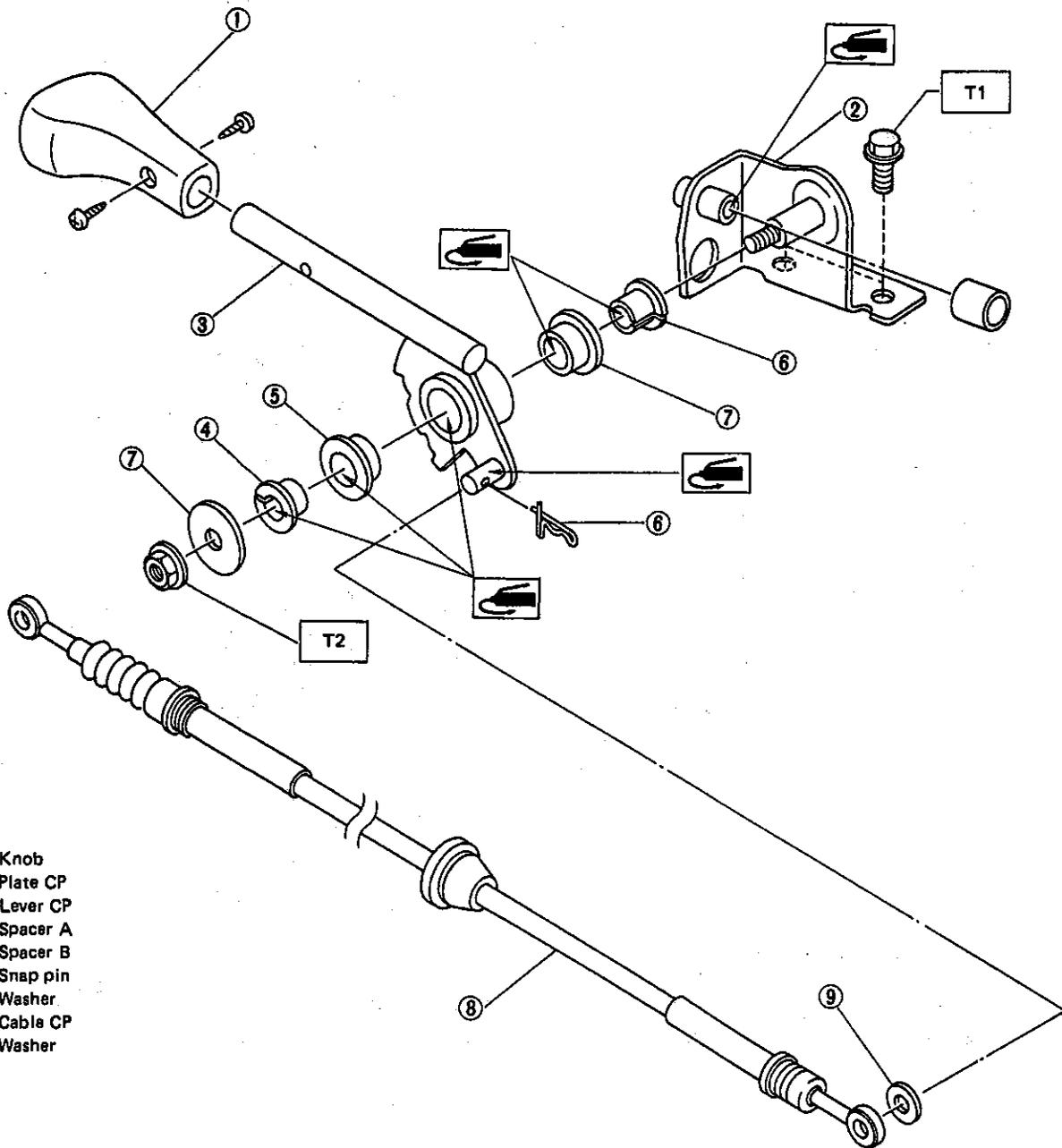
- 1 FWD/4WD selector switch (selective 4WD only)
- 2 Gear shift knob
- 3 Selector switch cable
- 4 Console boot
- 5 Boot plate
- 6 Gear shift lever CP
- 7 Bush
- 8 Spacer
- 9 Bush (lever)
- 10 Snap pin
- 11\* Locking wire
- 12 Boot
- 13 Snap ring
- 14\* O-ring
- 15 Bush
- 16 Cushion rubber
- 17 Boss CP
- 18 Joint CP
- 19 Rod
- 20 Bracket
- 21 Spring
- 22 Dynamic damper
- 23 Stay
- \*: Replacement parts



Tightening torque: N·m (kg·m, ft·lb)	
T1:	4 - 5 (0.4 - 0.5, 2.9 - 3.6)
T2:	3 - 6 (0.3 - 0.6, 2.2 - 4.3)
T3:	9 - 15 (0.9 - 1.5, 6.5 - 10.8)
T4:	25 - 34 (2.5 - 3.5, 18 - 25)
T5:	13 - 23 (1.3 - 2.3, 9 - 17)

Fig. 3

### 3. Drive Select Lever



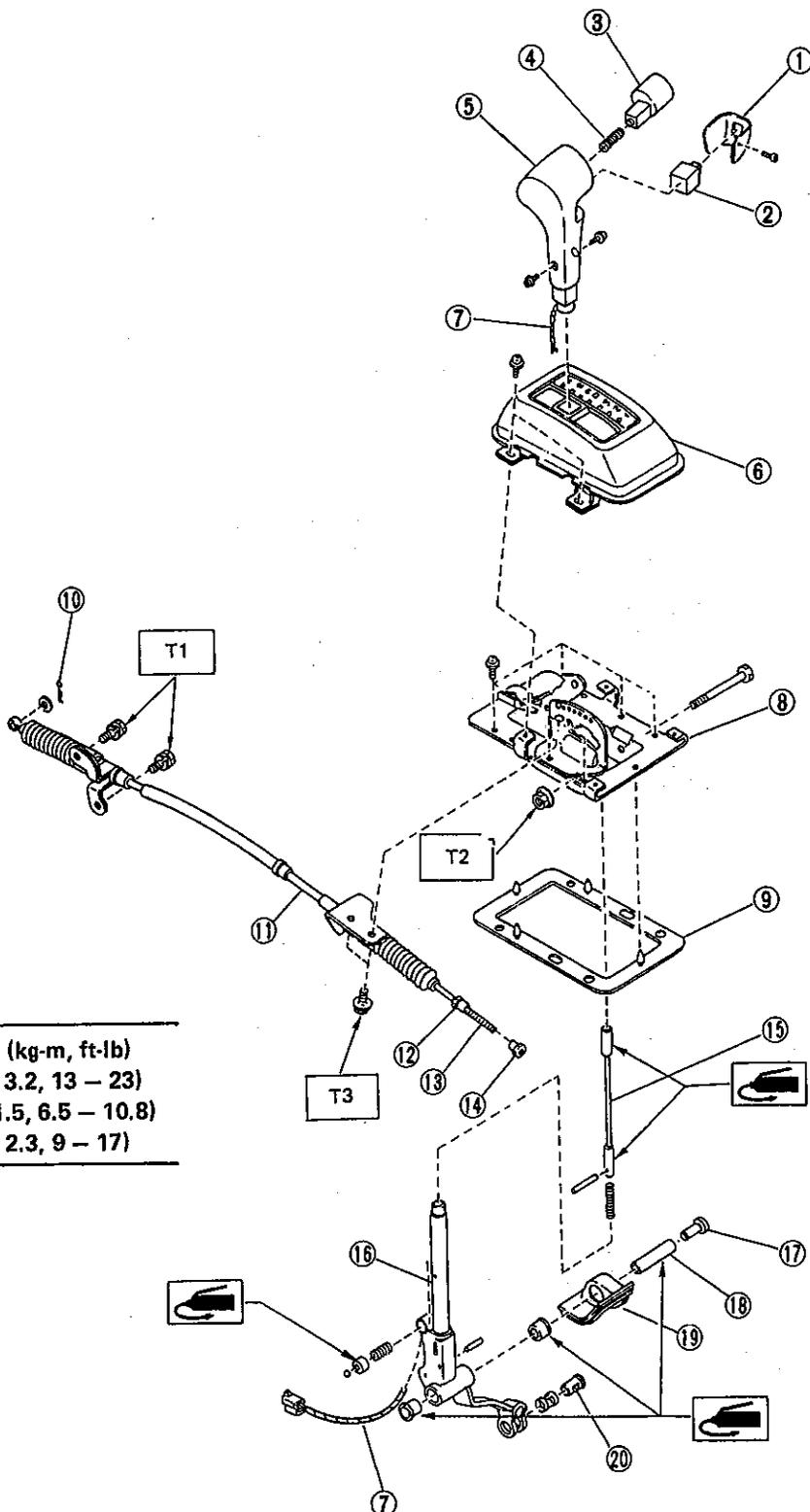
- 1 Knob
- 2 Plate CP
- 3 Lever CP
- 4 Spacer A
- 5 Spacer B
- 6 Snap pin
- 7 Washer
- 8 Cable CP
- 9 Washer

**Tightening torque: N·m (kg·m, ft·lb)**  
**T1: 13 – 23 (1.3 – 2.3, 9 – 17)**  
**T2: 9 – 15 (0.9 – 1.5, 6.5 – 10.8)**

Fig. 4

### 4. Automatic Transmission

- 1 Cover
- 2 Manual switch
- 3 Button
- 4 Spring
- 5 Grip
- 6 Indicator cover
- 7 Manual switch cable
- 8 Plate CP
- 9 Packing
- 10 Snap pin
- 11 Outer cable
- 12 Nut (2)
- 13 Inner cable
- 14 Nut (1)
- 15 Rod
- 16 Selector lever CP
- 17 Spacer
- 18 Spacer
- 19 Boot
- 20 Pin
- \*: Replacement parts



Tightening torque: N·m (kg·m, ft·lb)	
T1:	18 - 31 (1.8 - 3.2, 13 - 23)
T2:	9 - 15 (0.9 - 1.5, 6.5 - 10.8)
T3:	13 - 23 (1.3 - 2.3, 9 - 17)

Fig. 5

# W SERVICE PROCEDURE

## 1. Manual Transmission (FWD)

### A: REMOVAL

1) Remove the knob from the gearshift lever.

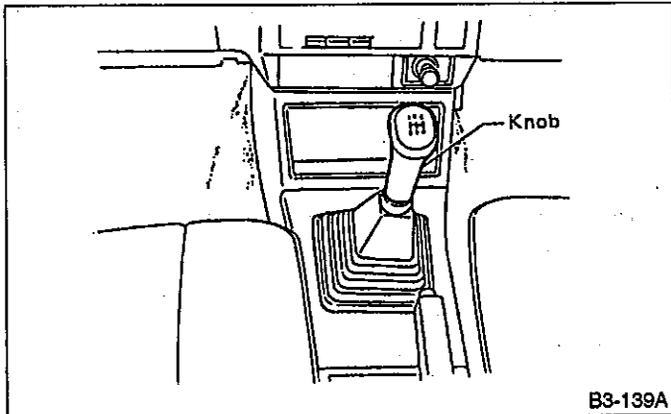


Fig. 6

2) Remove the console cover and the console boot.

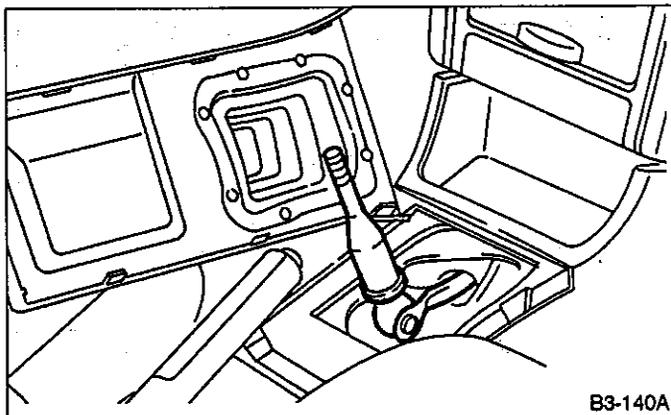


Fig. 7

3) Remove the rear console box.

4) Remove the front console box.

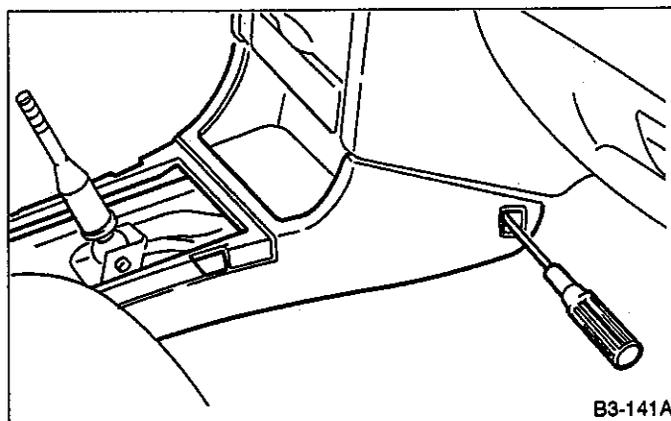


Fig. 8

5) Remove the boot plate from the body.

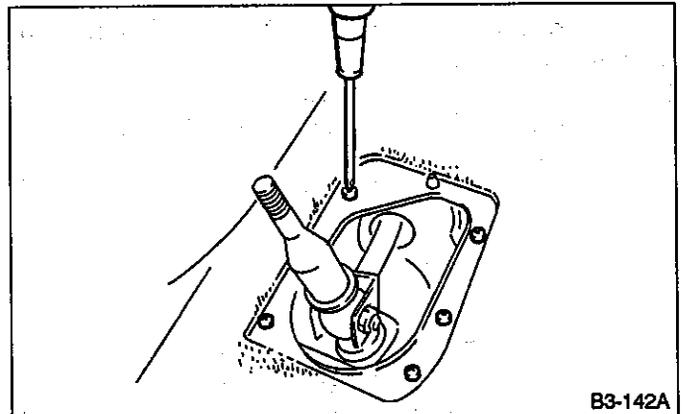


Fig. 9

6) Remove the gearshift lever ASSY from the transmission.

(1) Remove the spring between the joint CP and bracket CP.

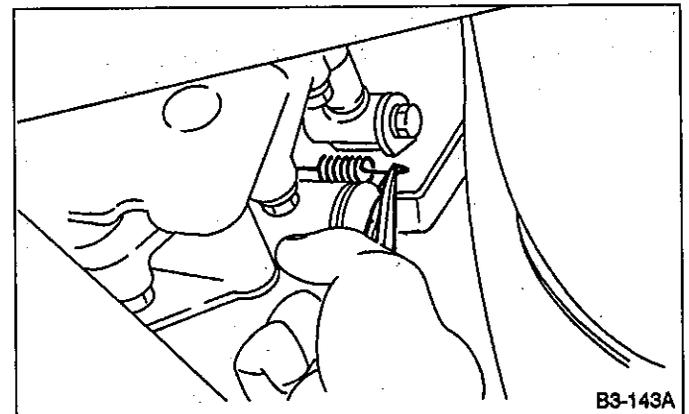


Fig. 10

(2) Remove the stay from the bracket CP.

(3) Remove the rod from the joint CP.

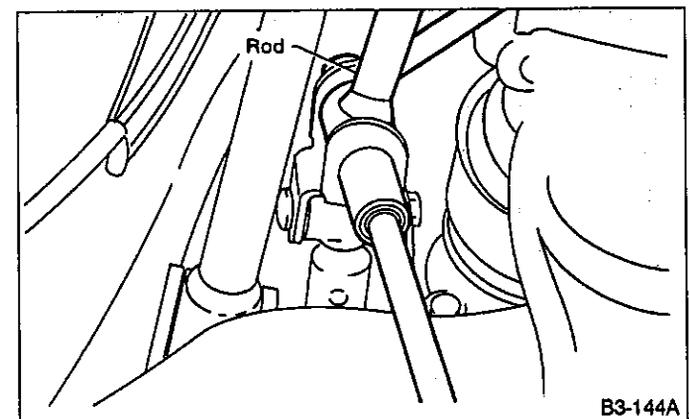


Fig. 11

7) Remove the cushion rubber from the body.

8) Remove the gearshift lever ASSY.

**B: DISASSEMBLY**

- 1) Remove the cushion rubber from the stay CP.
- 2) Remove the bolt to the take off rod CP from the gearshift lever ASSY.
- 3) Disconnect the locking wires.
- 4) Remove the rod CP from the gearshift lever ASSY.

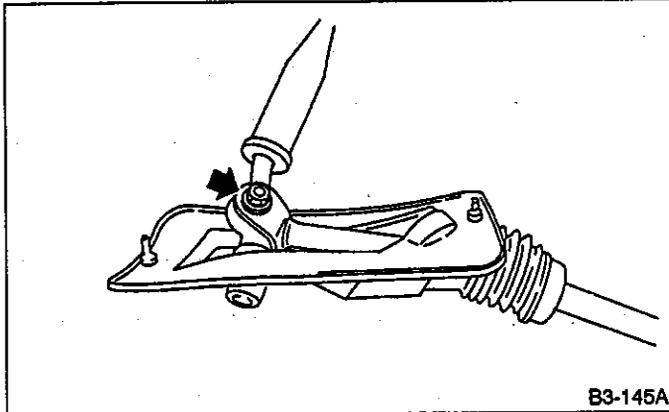


Fig. 12

- 5) Disconnect the snap ring.
- 6) Remove the gearshift lever from the stay CP.

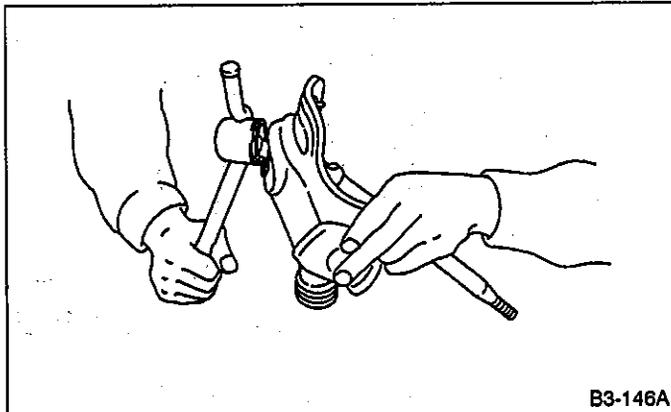


Fig. 13

- 7) Disconnect spring pin and bush from gearshift lever CP.
- 8) Remove the boot from gearshift lever CP.
- 9) Remove the following parts from the gearshift lever.
  - ① Locking wire
  - ② Boot
  - ③ Snap ring
  - ④ O-ring
  - ⑤ Bush
  - ⑥ Bush (lever)
  - ⑦ Spring pin

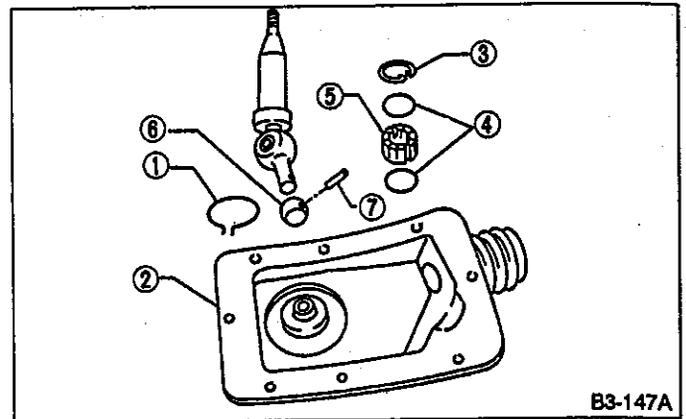


Fig. 14

- 10) Remove the following parts from the stay CP.

- ① Spacer
- ② Bush
- ③ Cushion rubber

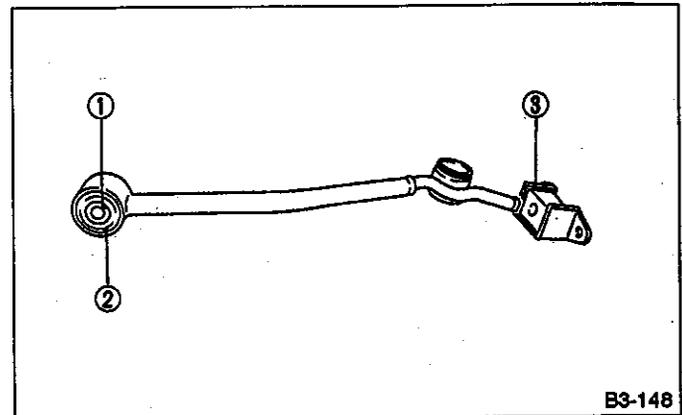


Fig. 15

**C: INSPECTION**

Check the following parts for deformation, damage and wear. Repair or replace any defective parts. Determine defective parts by comparing with new parts.

- ① Bush
- ② Cushion
- ③ Spacer
- ④ Boot
- ⑤ Link, rod and lever
- ⑥ Spring

**D: ASSEMBLY**

- 1) Clean all parts before assembly.
  - 2) Mount the following parts on the stay CP:
    - ① Cushion rubber
    - ② Bush
    - ③ Spacer
  - 3) Mount the following parts on the gearshift lever:
    - ① Boot
    - ② Snap ring
    - ③ O-ring
    - ④ Bush
    - ⑤ Bush (lever)
    - ⑥ Spring pin
- a. Always use new O-rings.  
 b. Apply grease [SUNLIGHT No. 2 (003602010) or equivalent] to the inner surface of the bush.

- 4) Mount the gearshift lever on the stay CP.

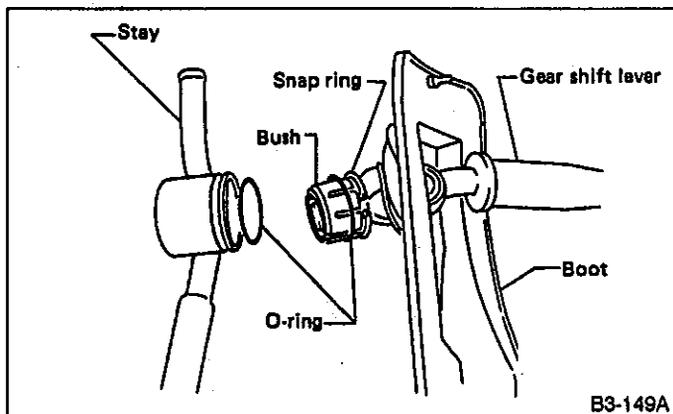


Fig. 16

- 5) Install the snap ring to the case of the stay.
- 6) Tighten with the locking wire to the extent that the boot will not come off.

Always use new locking wire.

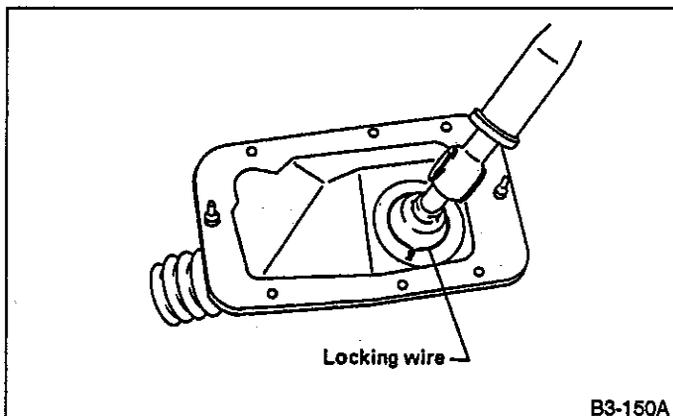


Fig. 17

- 7) Insert the rod into the boot hole.
- 8) Connect the rod to the gearshift lever ASSY.

Tightening torque:

9 — 15 N·m (0.9 — 1.5 kg-m, 6.5 — 10.8 ft-lb)

Locking torque:

2.7 N·m (0.28 kg-m, 2.0 ft-lb)

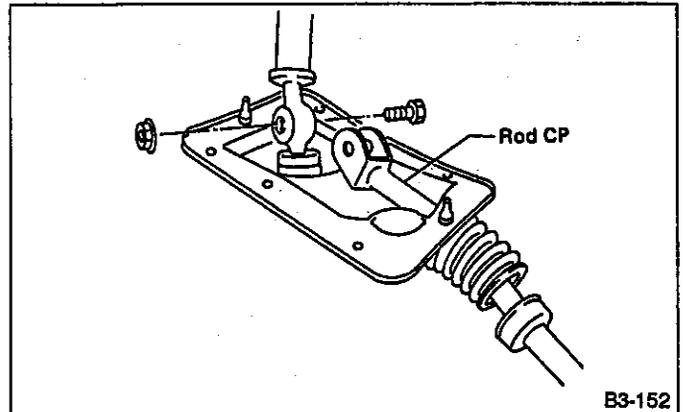


Fig. 18

- 9) Mount the following parts on the rod:
  - ① Bush
  - ② Spacer

- a. Apply grease [SUNLIGHT No. 2 (003602010) or equivalent] to the inner and side surfaces of the bush when installing the spacers.  
 b. The rod should be installed in the direction shown in the figure below.

- 10) Check that there is no excessive play and that the parts move smoothly.

**E: INSTALLATION**

- 1) Set the gearshift lever at the neutral position.
- 2) Put into gearshift lever ASSY from passenger compartment.
- 3) Mount the boot plate on the body.
- 4) Install the front console box.

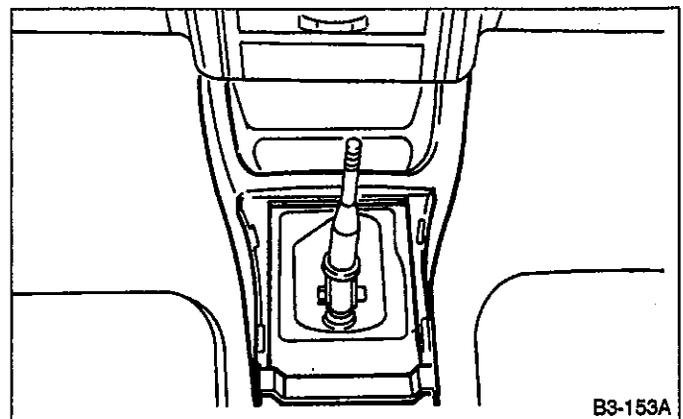
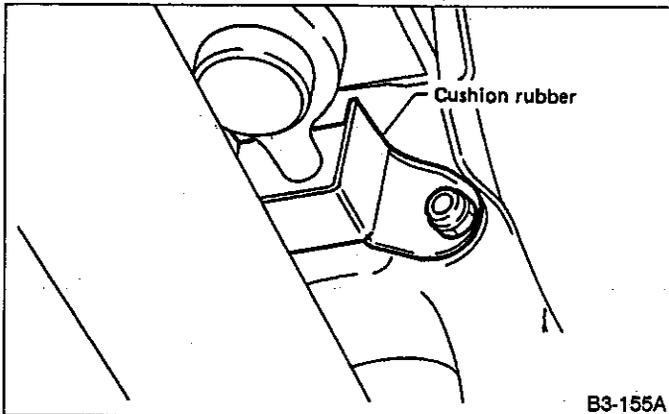


Fig. 19

- 5) Install the rear console box.
- 6) Tighten the screws to install rear and front console box.
- 7) Install the console cover and the boot.
- 8) Install the gearshift knob.
- 9) Mount the cushion rubber on the body.

**Tightening torque:**

9 — 15 N·m (0.9 — 1.5 kg-m, 6.5 — 10.8 ft-lb)



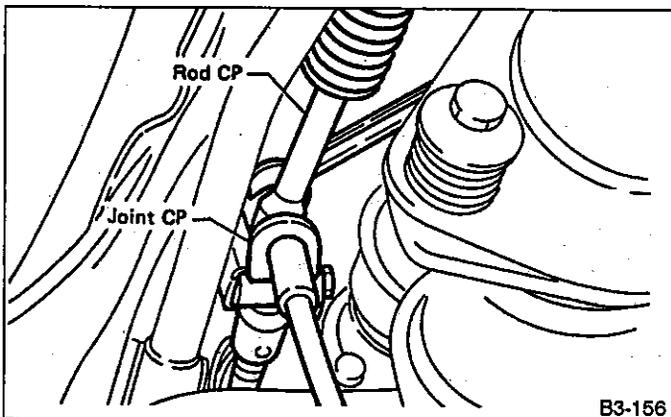
B3-155A

Fig. 20

- 10) Connect the rod to the joint CP.

**Tightening torque:**

9 — 15 N·m (0.9 — 1.5 kg-m, 6.5 — 10.8 ft-lb)



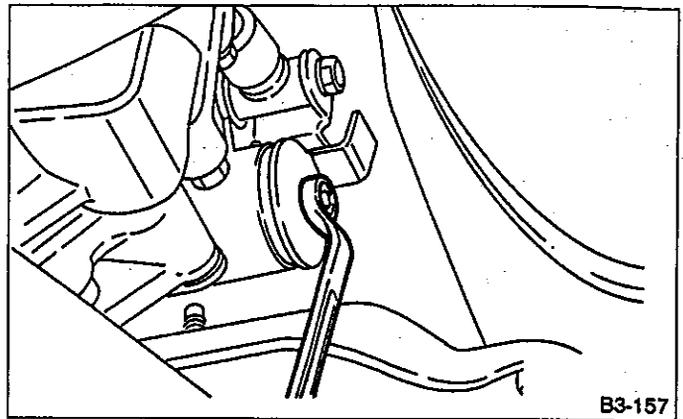
B3-156

Fig. 21

- 11) Connect the stay CP to the bracket CP.

**Tightening torque:**

9 — 15 N·m (0.9 — 1.5 kg-m, 6.5 — 10.8 ft-lb)

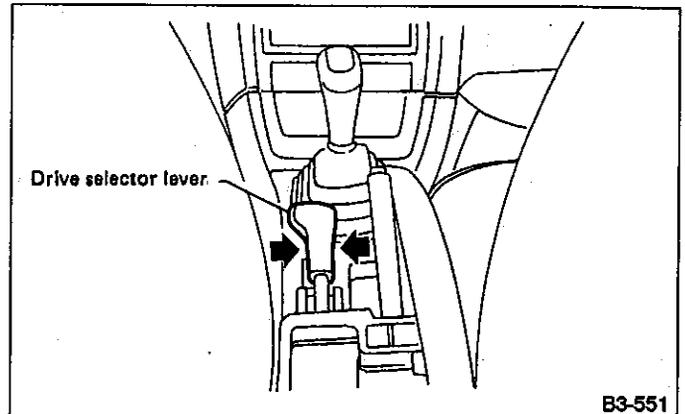


B3-157

Fig. 22

**2. Manual Transmission (4WD)****A: REMOVAL**

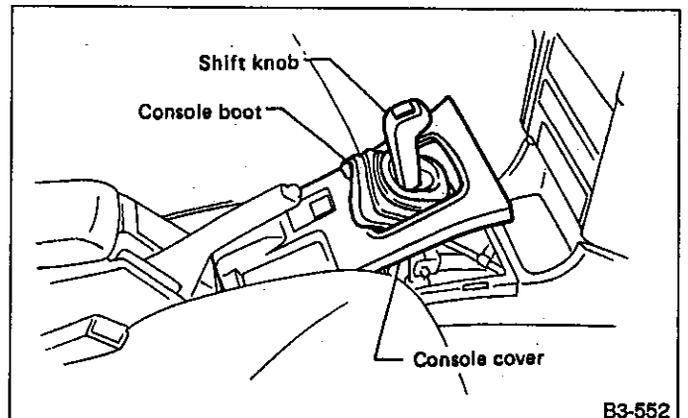
- 1) Remove the drive selector lever knob. (Dual-range 4WD model only)



B3-551

Fig. 23

- 2) Remove the console cover.



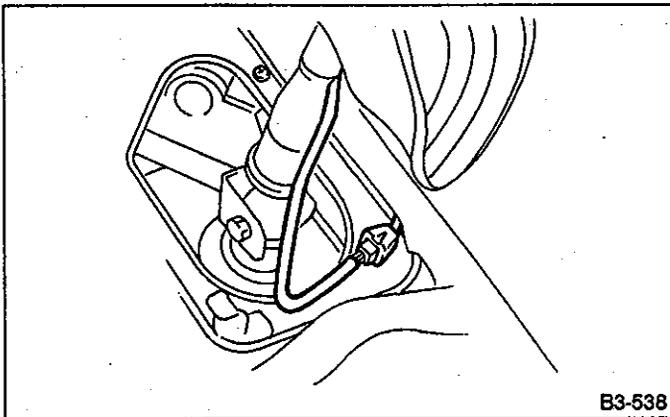
B3-552

Fig. 24

- 3) Remove drive selector lever ASSY. (Dual-range 4WD model only)

Refer to "Chapter 3-3 Dual range lever [W2E0]".

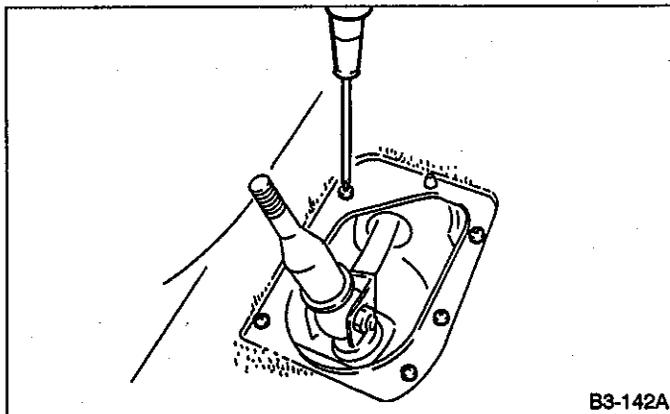
- 4) Remove the rear and front console boxes.
- 5) Disconnect the 4WD switch connector.



B3-538

Fig. 25

- 6) Remove the gearshift lever knob, and console boot.
- 7) Remove the boot plate from the body.

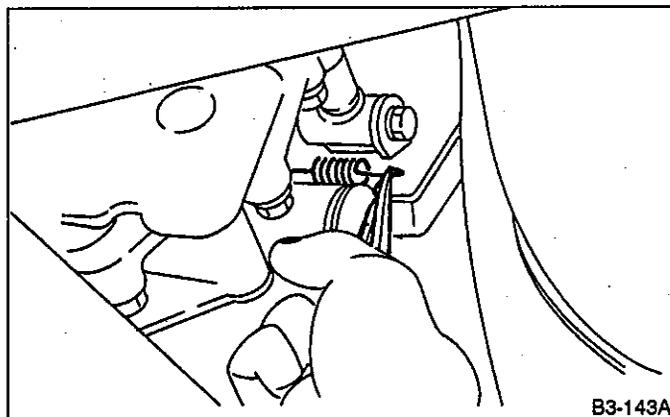


B3-142A

Fig. 26

- 8) Remove the gearshift lever ASSY from the transmission.

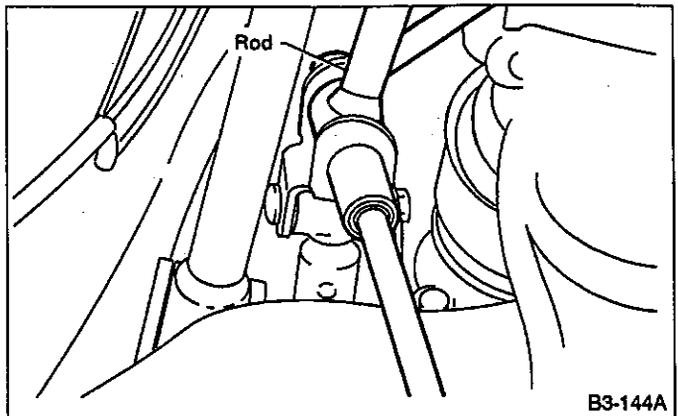
- (1) Remove the spring between the joint CP and the bracket CP.



B3-143A

Fig. 27

- (2) Remove the stay from the bracket CP.
- (3) Remove the rod from the joint CP.



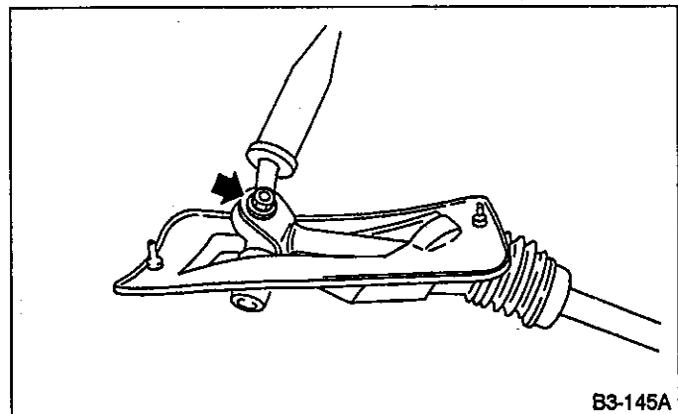
B3-144A

Fig. 28

- 9) Remove the cushion rubber from the body.
- 10) Remove the gearshift lever.

### B: DISASSEMBLY

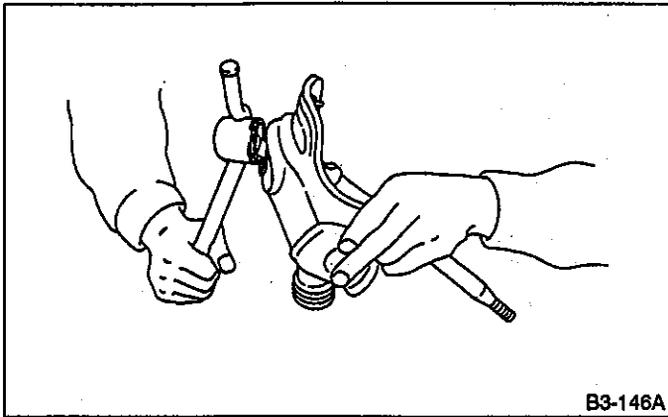
- 1) Remove the cushion rubber from the stay CP.
- 2) Remove the bolt to the take off rod CP from the gearshift lever.
- 3) Disconnect the locking wire.
- 4) Remove the rod CP from the gearshift lever.



B3-145A

Fig. 29

- 5) Remove the boot.
- 6) Disconnect the snap ring.
- 7) Remove the gearshift lever from the stay CP.
- 8) Disconnect spring pin and bush from gearshift lever CP.
- 9) Remove boot from gearshift CP.

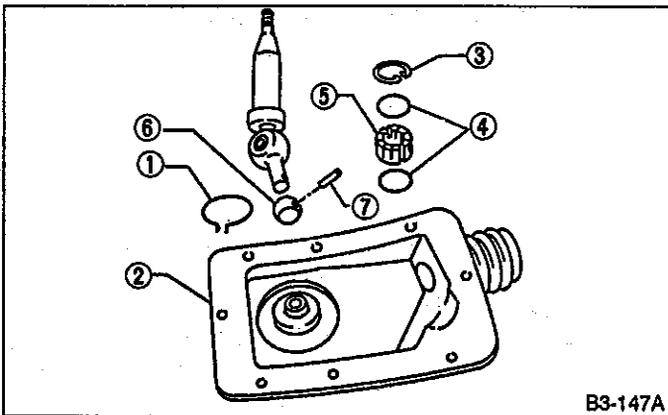


B3-146A

Fig. 30

10) Remove the following parts from the gearshift lever.

- ① Locking wire
- ② Boot
- ③ Snap ring
- ④ O-ring
- ⑤ Bush
- ⑥ Bush (lever)
- ⑦ Spring pin

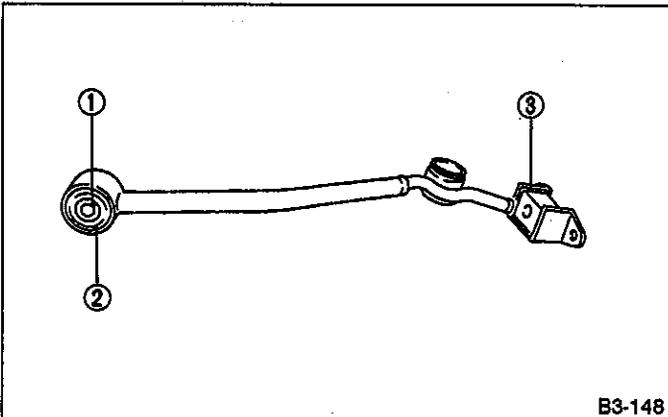


B3-147A

Fig. 31

11) Remove the following parts from the stay CP:

- ① Spacer
- ② Bush
- ③ Cushion rubber



B3-148

Fig. 32

### C: INSPECTION

Check the following parts for deformation, damage and wear. Repair or replace any defective parts. Determine defective parts by comparing with new parts.

- ① Bush
- ② Cushion
- ③ Spacer
- ④ Boot
- ⑤ Link, rod and lever
- ⑥ Spring

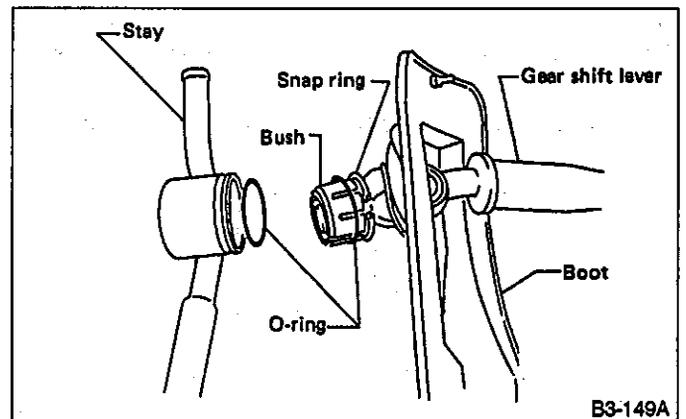
### D: ASSEMBLY

- 1) Clean all parts before assembly.
- 2) Mount the following parts on the stay CP:
  - ① Cushion rubber
  - ② Bush
  - ③ Spacer
- 3) Mount the following parts on the gearshift lever:
  - ① Boot
  - ② Snap ring
  - ③ O-ring
  - ④ Bush
  - ⑤ Bush (lever)
  - ⑥ Snap pin

a. Always use new O-rings.

b. Apply grease [SUNLIGHT No. 2 (003602010) or equivalent] to the inner surface of the bush.

- 4) Mount the gearshift lever on the stay CP.



B3-149A

Fig. 33

5) Install the snap ring to the case of the stay.

6) Tighten with the locking wire to the extent that the boot will not come off.

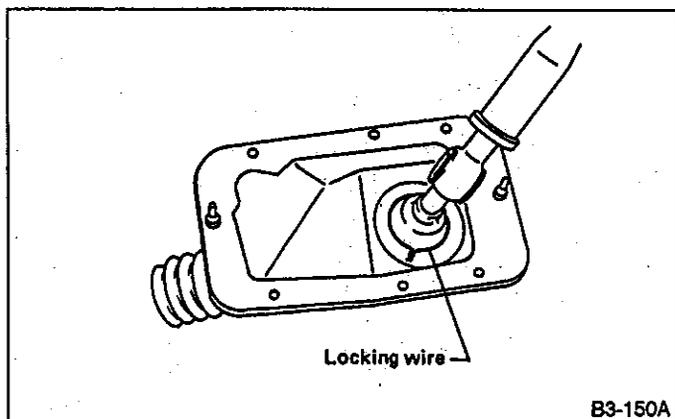


Fig. 34

- 7) Insert the rod into the boot hole.
- 8) Connect the rod to the gearshift lever ASSY.

**Tightening torque:**

9 — 15 N·m (0.9 — 1.5 kg-m, 6.5 — 10.8 ft-lb)

**Locking torque:**

2.7 N·m (0.28 kg-m, 2.0 ft-lb)

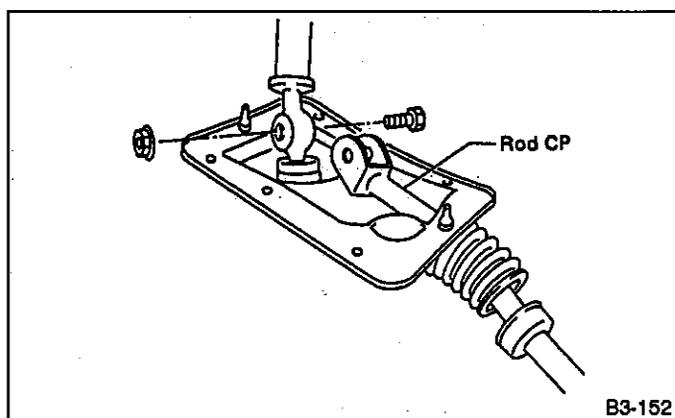


Fig. 35

- 9) Mount the following parts on the rod:

- ① Bush
- ② Spacer

a. Apply grease [SUNLIGHT No. 2 (003602010) or equivalent] to the inner and side surfaces of the bush when installing the spacers.

b. The rod should be installed in the direction shown in the figure below.

- 10) Check that there is no excessive play and that the parts move smoothly.

**E: INSTALLATION**

- 1) Set the gearshift lever at the neutral position.
- 2) Put into gearshift lever ASSY from passenger compartment.
- 3) Mount the boot plate on the body.
- 4) Install the console boot and gearshift knob on the gearshift lever.
- 5) Connect the 4WD switch connector. (Selective 4WD model only).

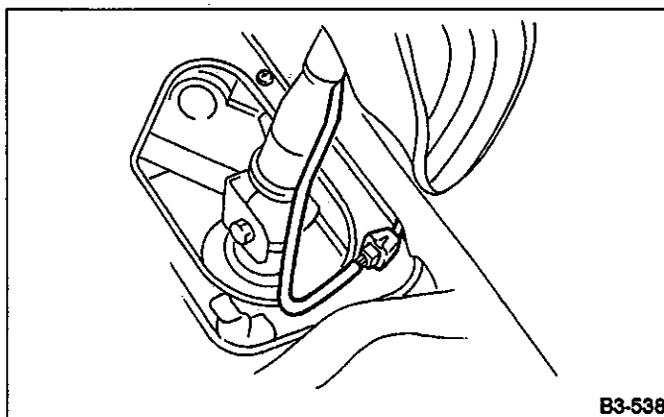


Fig. 36

- 6) Install the front and rear console boxes.
- 7) Install drive selector lever ASSY. (Dual-range 4WD model only)

Refer to "Chapter 3-3 [W3B0]".

- 8) Install the console cover.
- 9) Install the drive selector lever knob. (Dual-range 4WD model only)

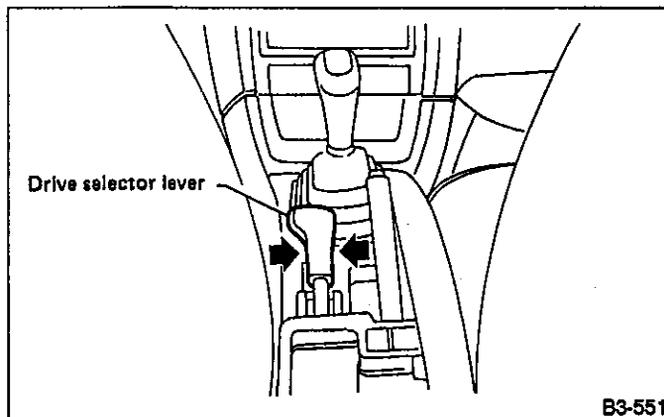


Fig. 37

10) Mount the cushion rubber on the body.

**Tightening torque:**

9 — 15 N·m (0.9 — 1.5 kg-m, 6.5 — 10.8 ft-lb)

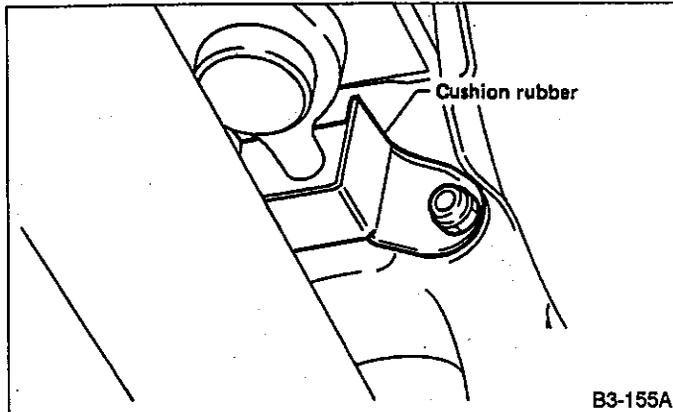


Fig. 38

11) Connect the rod to the joint CP.

**Tightening torque:**

9 — 15 N·m (0.9 — 1.5 kg-m, 6.5 — 10.8 ft-lb)

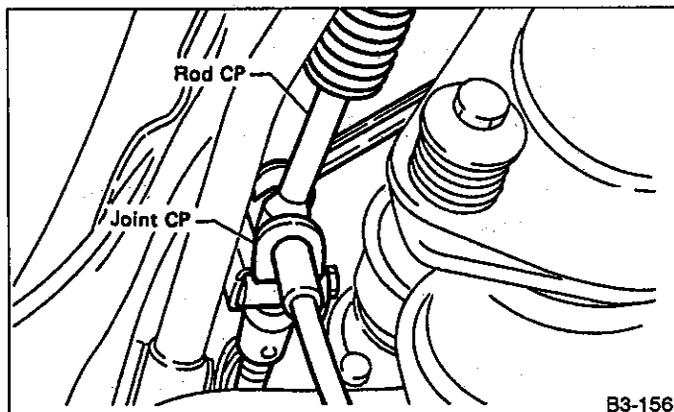


Fig. 39

12) Connect the stay CP to the bracket CP.

**Tightening torque:**

9 — 15 N·m (0.9 — 1.5 kg-m, 6.5 — 10.8 ft-lb)

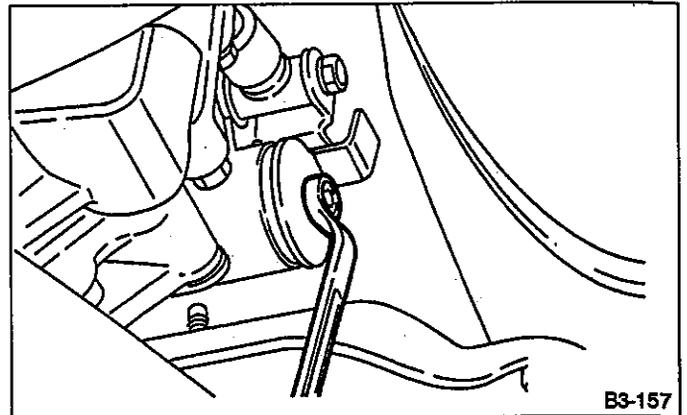


Fig. 40

### 3. Drive Select Lever

#### A: REMOVAL

1) Remove the drive select lever knob.

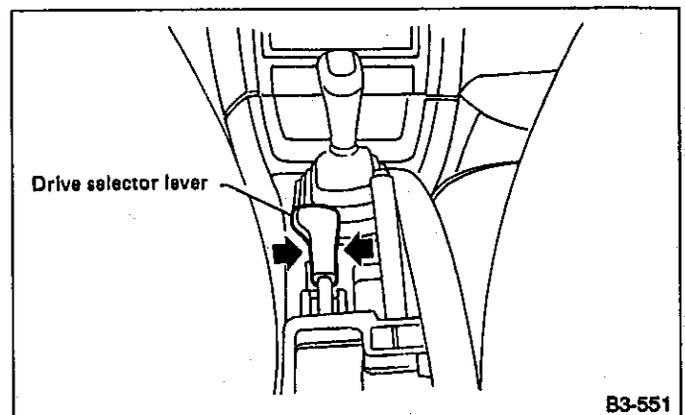


Fig. 41

2) Remove the console cover.

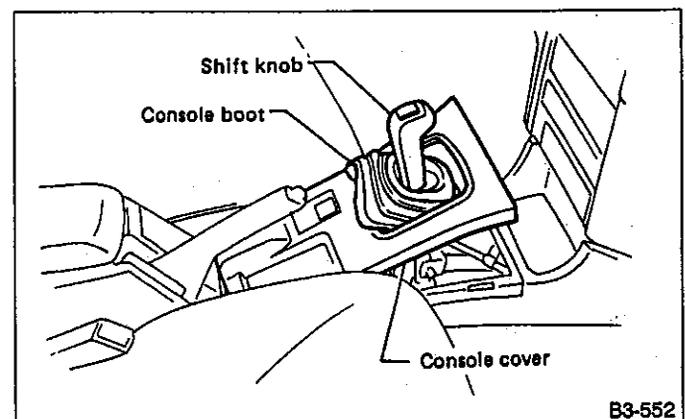


Fig. 42

3) Remove the bolt installing drive select lever ASSY on body.

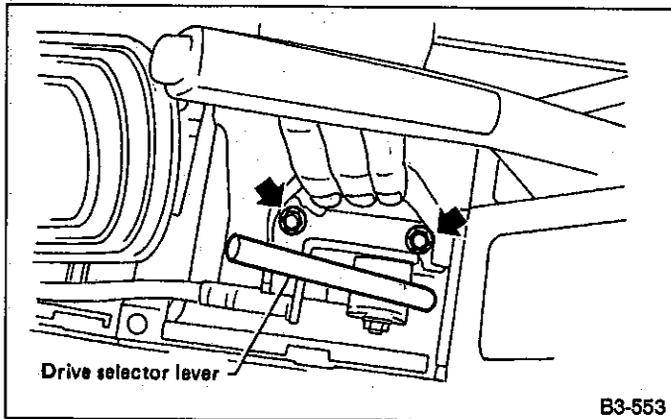


Fig. 43

4) Disconnect cable CP from drive select lever ASSY.  
 (1) Remove snap pin connecting the cable to lever ASSY.

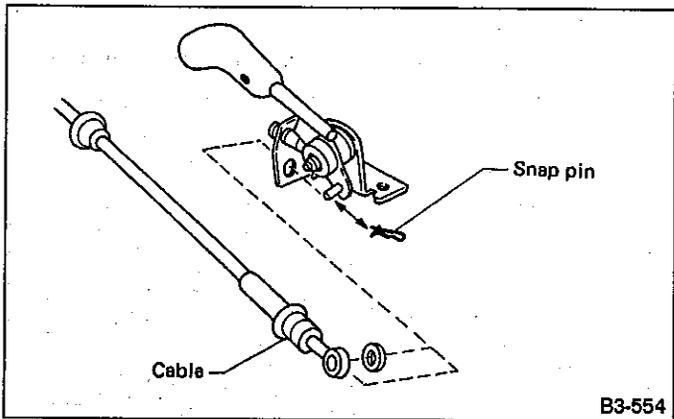


Fig. 44

(2) Remove snap pin connecting the cable to transmission case.

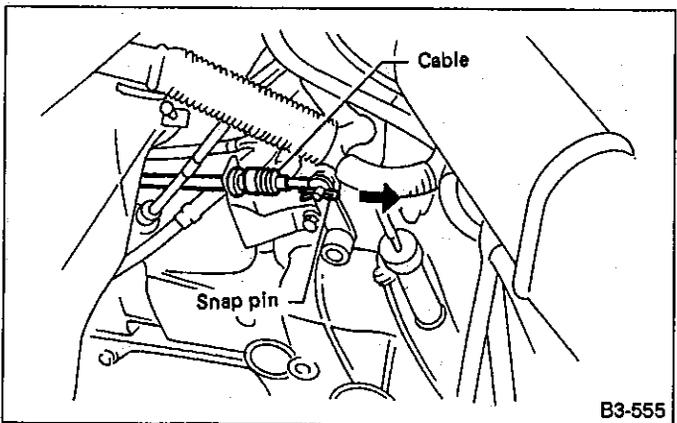


Fig. 45

(3) Remove cable CP from the under side of vehicle.

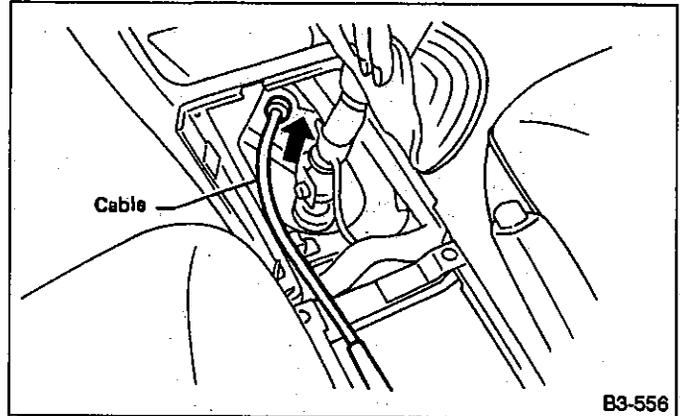


Fig. 46

**B: INSTALLATION**

1) Insert cable CP into the boot hole from the under side of vehicle.

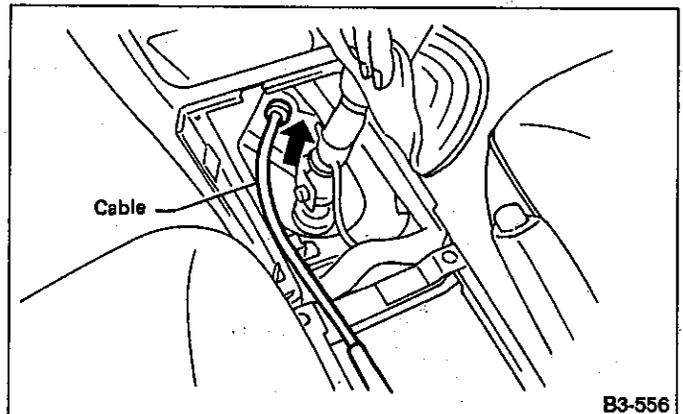


Fig. 47

2) Connect cable CP on drive select lever ASSY, and install snap pin.

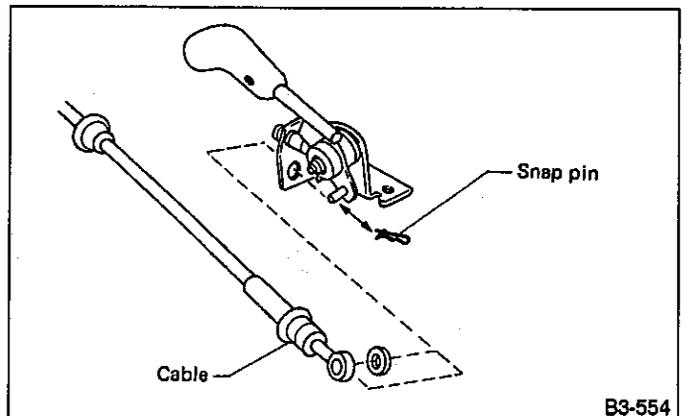


Fig. 48

3) Connect cable CP on transmission case, and install snap pin.

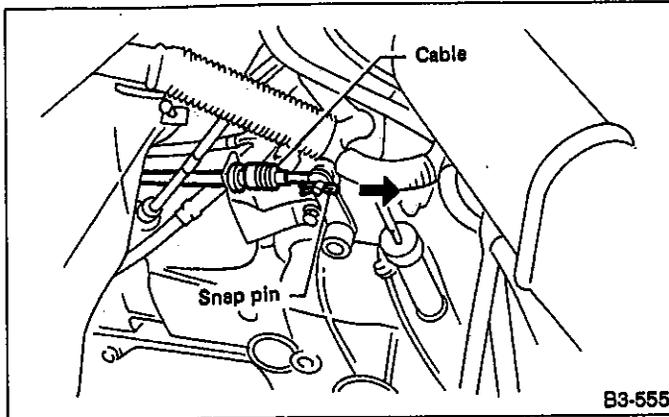


Fig. 49

Apply grease [SUNLIGHT 2 (P/N 003602010)] to parts which connect the cable.

4) Install drive select lever ASSY on body.

**Tightening torque:**

13 — 23 N·m (1.3 — 2.3 kg-m, 9 — 17 ft-lb)

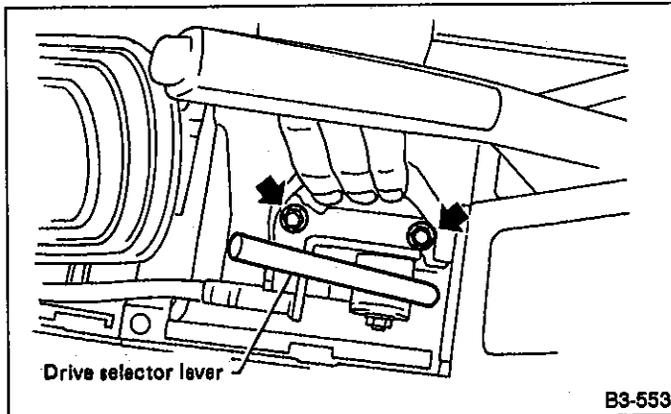


Fig. 50

5) Install the console cover.

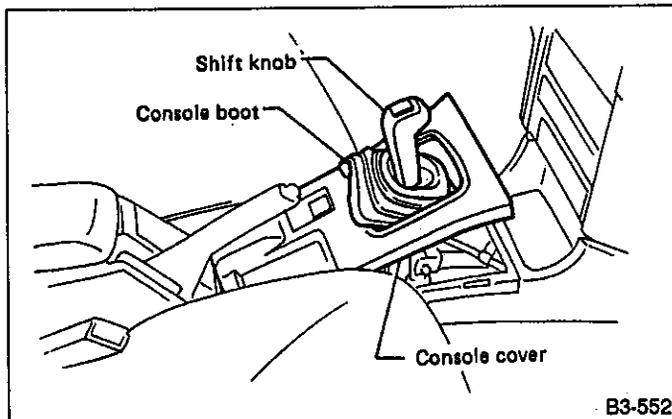


Fig. 51

6) Install the drive select lever knob.

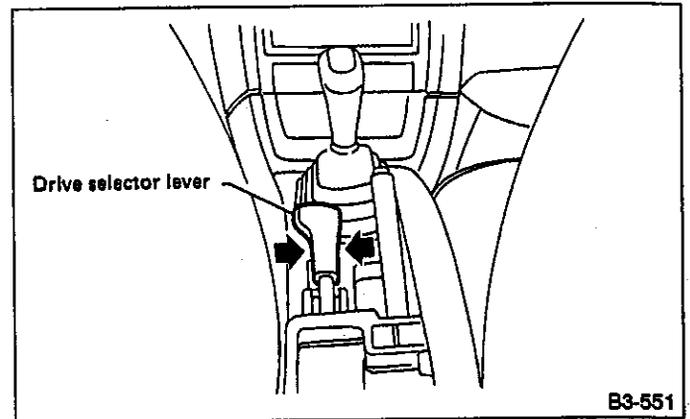


Fig. 52

## 4. Automatic Transmission

### A: REMOVAL

1) Remove the cable ASSY.

- (1) Separate the cable from the transmission lever.
- (2) Remove the clamp from transmission case.

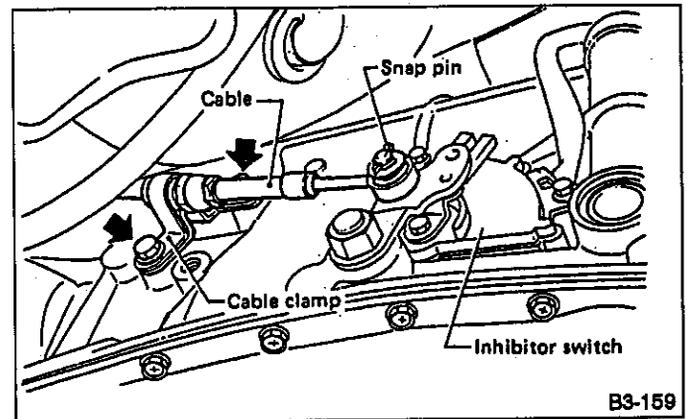


Fig. 53

- (3) Disconnect the cable from the selector lever.

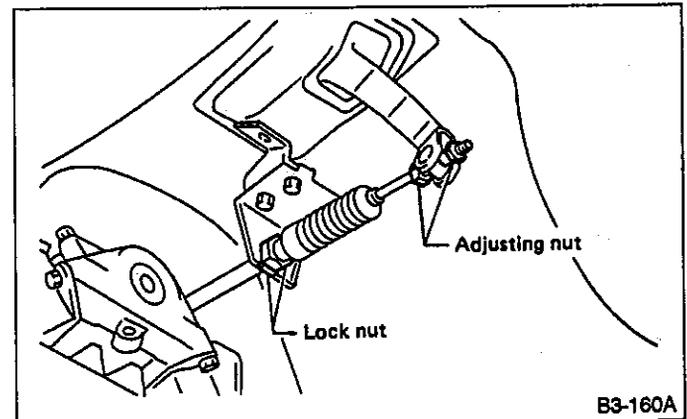


Fig. 54

- 2) Remove economy switch ASSY on the rear console box, and disconnect the manual switch ASSY connector.

- 7) Remove the selector lever ASSY  
 (1) Prior to removal, set the lever to "N".  
 (2) Remove the screws to take off the plate from the body.

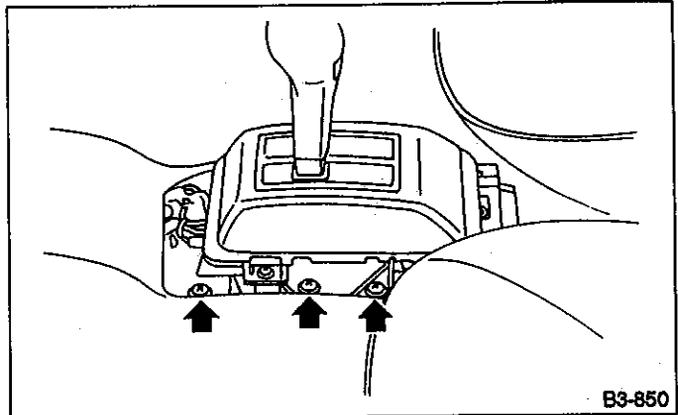
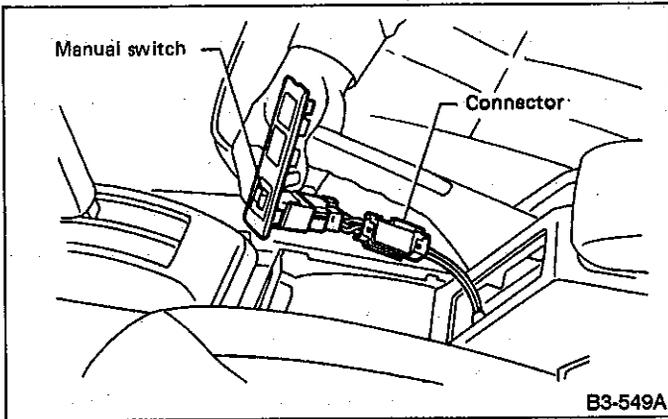
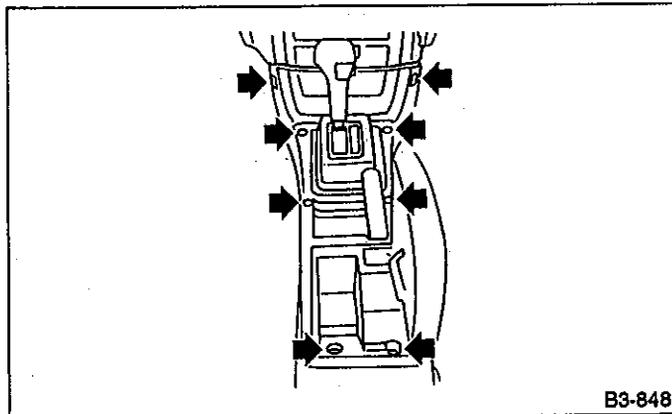


Fig. 55

Fig. 58

- 3) Remove all of the screws to take off the console box.



**B: DISASSEMBLY**

- 1) Remove the grip from the selector lever CP.  
 2) Remove the indicator from the plate.

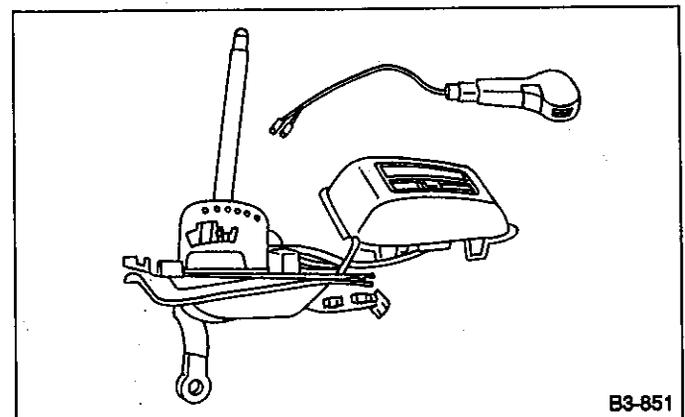


Fig. 56

Fig. 59

- 4) Remove the rear console box.  
 5) Remove the front console box.  
 6) Disconnect the connector.

- 3) Remove the following parts from the grip.  
 ① Button  
 ② Spring  
 ③ Cover (4AT)  
 ④ Manual Switch (4AT)

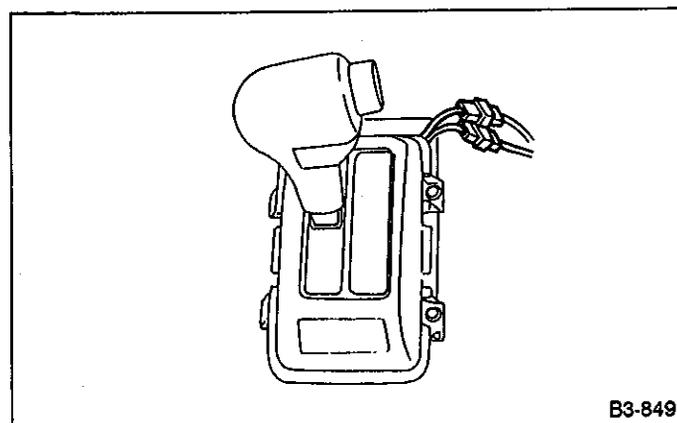
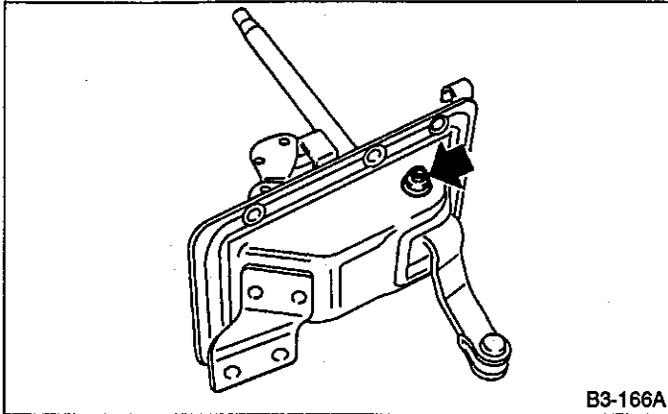


Fig. 57

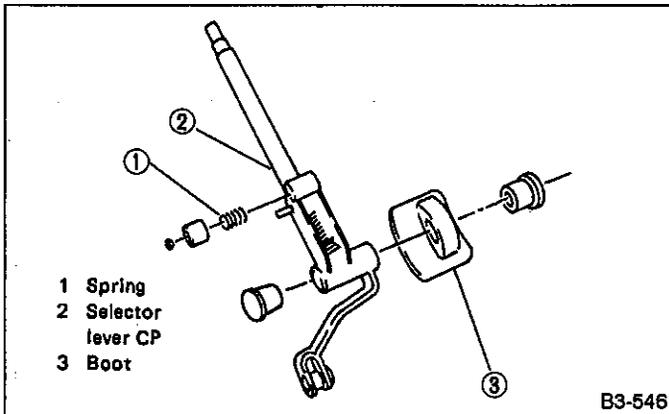
- 4) Remove the bolt to take off the selector lever CP from the plate.



B3-166A

Fig. 60

- 5) Remove the lock plate.  
6) Remove the selector lever CP from the plate.



B3-546

Fig. 61

### C: INSPECTION

- 1) Inspect the removed parts by comparing with new ones for deformation, damage and wear. Correct or replace if defective.  
2) Confirm the following parts for operating condition before ASSY.

- (1) Sliding condition of the button in the grip ... it should move smoothly.  
(2) Insertion of the grip on the selector lever ... when pushing the grip on the selector lever by hand, the screw holes should be aligned.  
(3) Operation of the selector lever and rod ... they should move smoothly.  
(4) Insertion of the spacer into the selector lever ... it should be inserted lightly by finger pressure.

### D: ASSEMBLY

- 1) Clean all parts before assembly.  
2) Assemble the selector lever CP and the lock plate to the plate.  
3) Insert the bolt and tighten the flange nut to the specified torque.

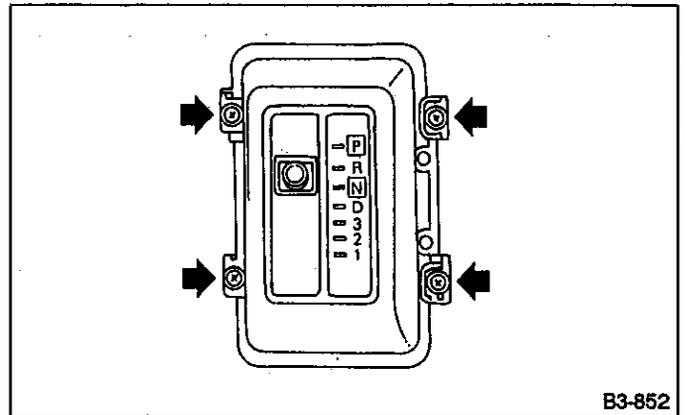
**Tightening torque (Flange nut):**

11 — 17 N·m (1.1 — 1.7 kg-m, 8 — 12 ft-lb)

- 4) Assemble the indicator to the plate.

**Tightening torque:**

1.3 — 2.6 N·m (0.13 — 0.27 kg-m, 0.9 — 2.0 ft-lb)

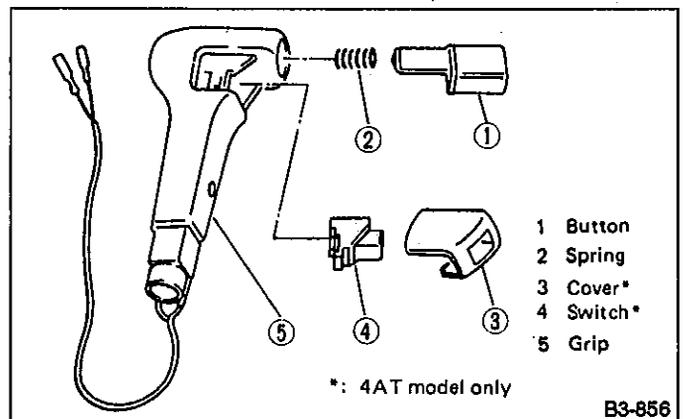


B3-852

Fig. 62

- 5) Assemble the following parts to the grip.

Apply grease on the sliding surfaces of the following parts.



B3-856

Fig. 63

6) Assemble the grip to the selector lever CP.

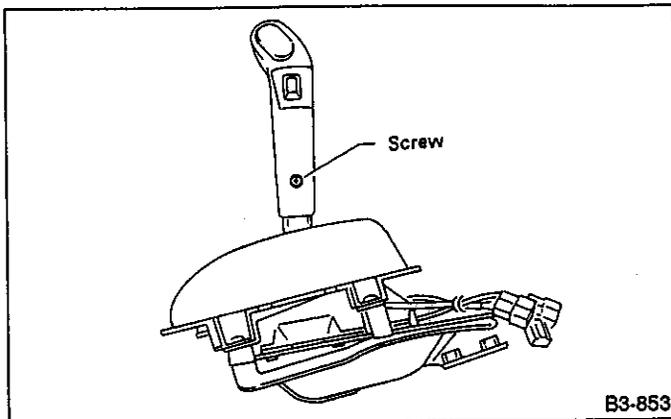


Fig. 64

7) After the completion of fitting, transfer the selector lever to range "P" ~ "1", pressing the button of the grip; then check whether the indicator and select lever agree, whether the pointer and position mark agree and what the operating force is.

**E: INSTALLATION**

- 1) Mount the selector lever ASSY onto the car body.
- 2) Tighten the six bolts to install the selector lever ASSY to the car body.

**Tightening torque:**  
 4.4 — 7.4 N·m (0.45 — 0.75 kg-m, 3.3 — 5.4 ft-lb)

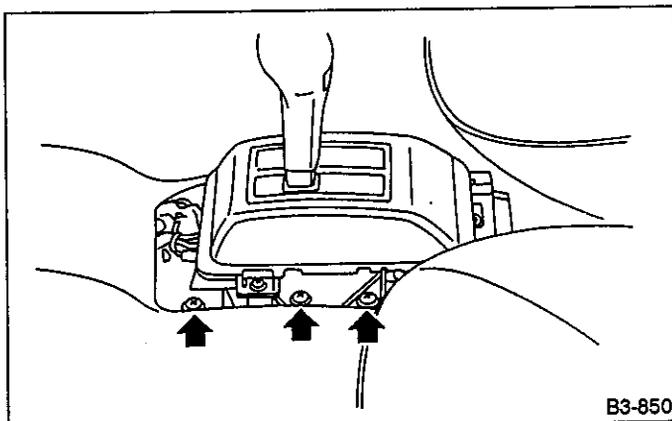


Fig. 65

- 3) Set the location of the selector lever at "N".
- 4) Set the location of the selector arm installed the transmission body at "N".

5) Pass the inner cable through the selector arm pin and then connect it using a washer and snap pin.

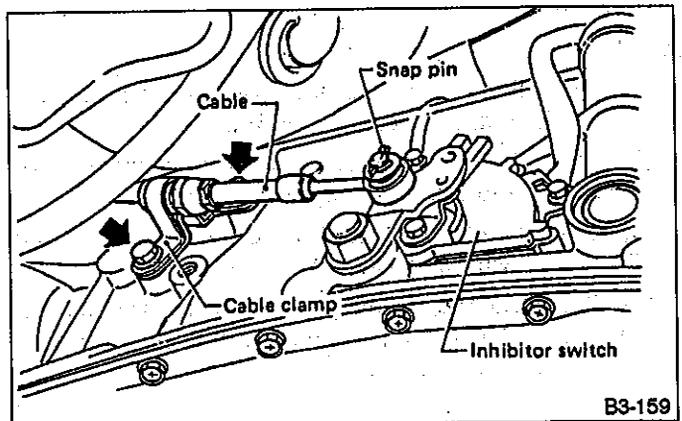


Fig. 66

- 6) Attach the outer cable to the transmission case with the bolts.
- 7) Insert the thread portion of the other inner cable and into the connector hole of the selector lever, and fix the other outer cable end to the bracket.
- 8) Adjust the inner cable length.

- (1) Put connector into contact with nut ②.
- (2) Tighten nut ①.

**Tightening torque:**  
 5.4 — 9.3 N·m (0.55 — 0.95 kg-m, 4.0 — 6.9 ft-lb)

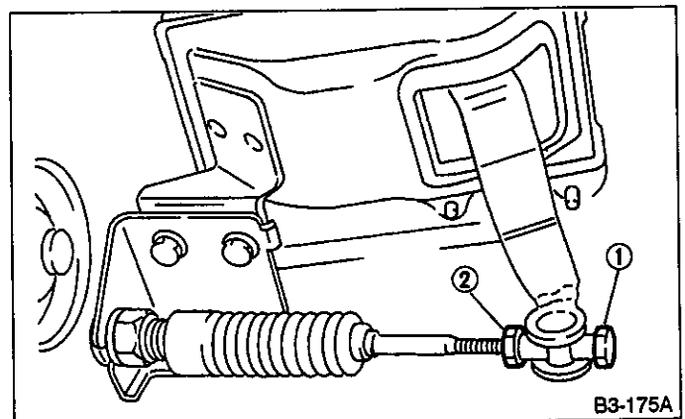


Fig. 67

- 9) After completion of fitting, make sure that the selector lever operates smoothly all across the operating range.
- 10) Connect the harnesses and check the following items.

- (1) The engine starts operating when the selector lever is in position "P", but not in other positions.
- (2) The back-up light is lit when the selector lever is in position "R", but not in other positions.

11) Check selector lever operation.

Stop the engine while checking the operation of the selector lever.

[4AT]

- (1) Check that the selector lever does not move from "N" to "R" without pushing the button.
- (2) Check that the selector lever does not move from "R" to "P" without pushing the button.
- (3) Check that the selector lever does not move from "P" to "R" without pushing the button.
- (4) Check that the selector lever does not move from "3H" to "2H" without pushing the button.

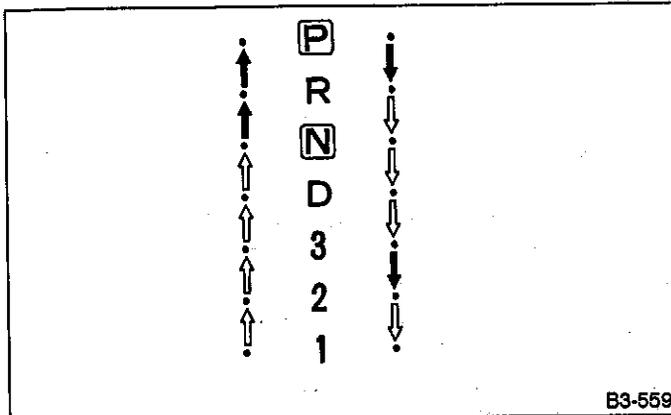


Fig. 68

**SUBARU®**

**1992**

**SERVICE  
MANUAL**



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# M MECHANISM AND FUNCTION

## 1. Propeller Shaft

The propeller shaft model utilizes a 2-piece design that is provided with three joints.

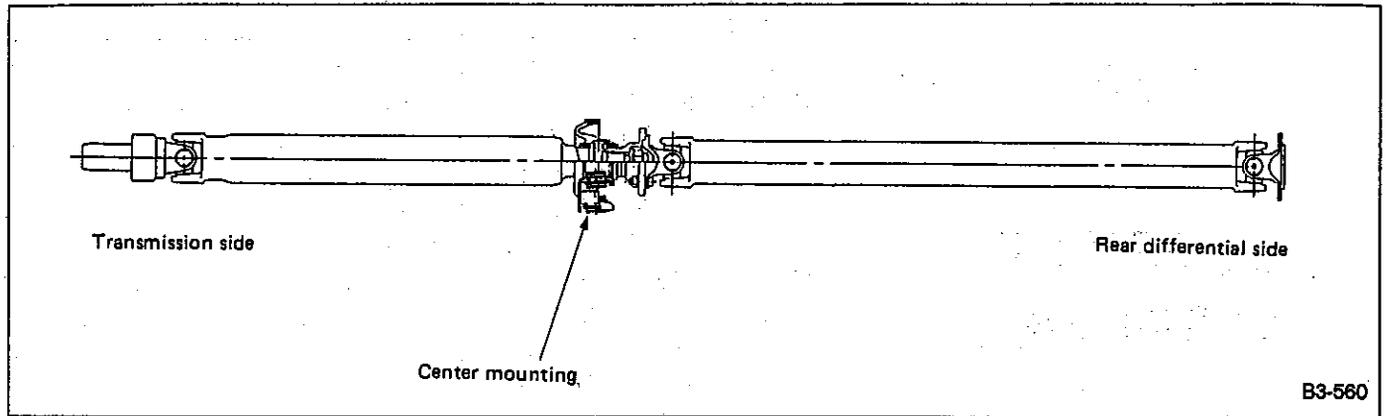


Fig. 1

## 2. Rear Differential

A hypoid drive gear with a nominal diameter of 160 mm (6.30 in) is used and the drive pinion shaft is supported on three bearings, the bearing preload being adjusted

by a selective spacer and washer. The drive pinion height is adjusted by selecting washers located at the drive pinion neck using Dummy Shaft and Gauge.

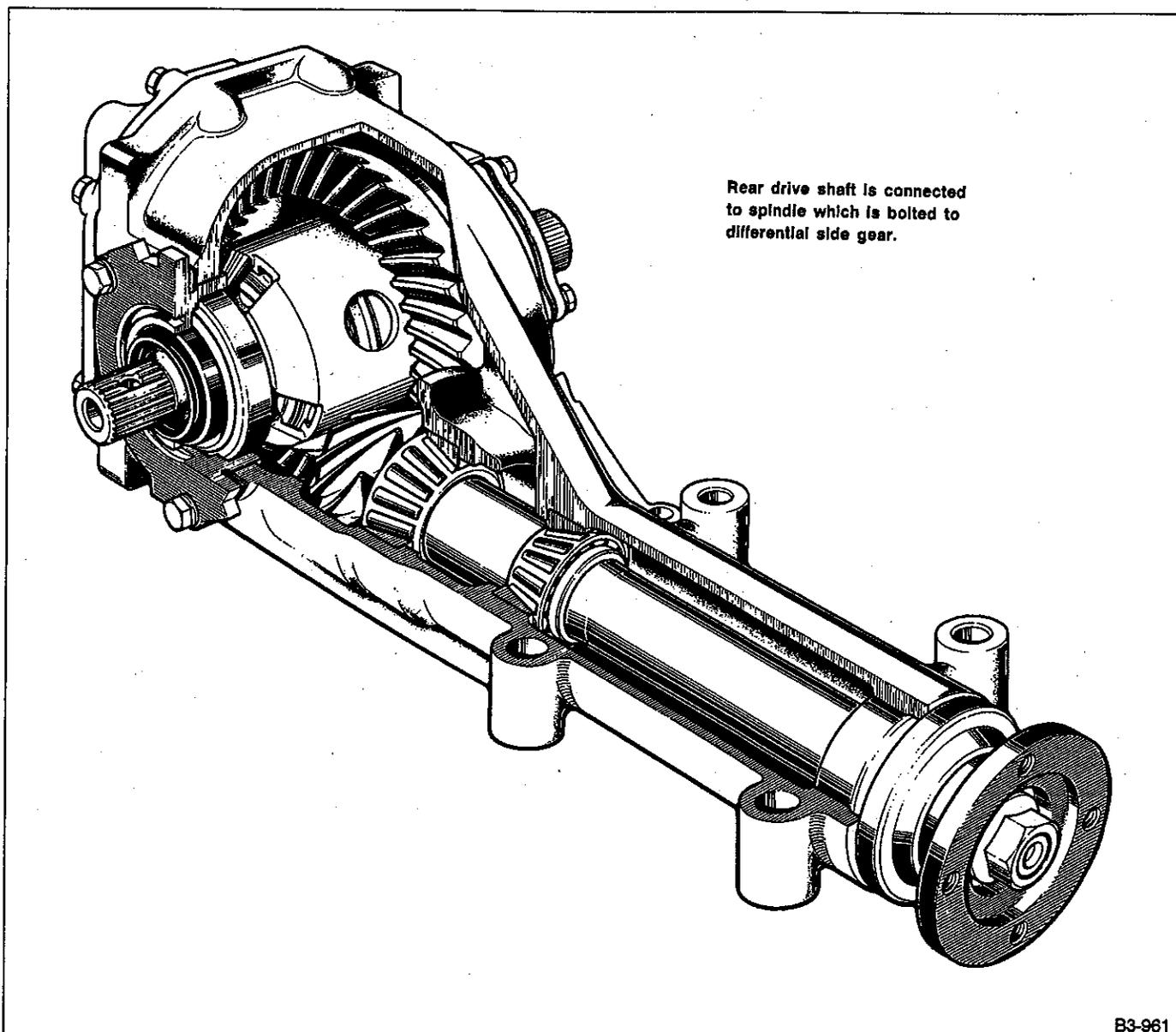


Fig. 2

### 3. Limited Slip Differential (LSD)

A viscous coupling (VC) type LSD has been adopted so as to ensure safe and smooth transfer of increased power under various driving conditions. This VC type LSD features ease of turning while maintaining excellent stability when driving over slippery roads or when using engine brake, thus enabling engine power to be utilized efficiently. Smooth restriction of the differential operation of the left and right wheels results in improved running stability on bad roads, snowy roads, and also on muddy roads.

#### 1. STRUCTURE

The VC type LSD adopts a "shaft to shaft system" in which the RH and LH rear drive shafts are coupled by a VC. This results in a compact structure with high performance.

The inside of the VC housing is formed by alternately combining the outer plates (the outer periphery of each plate engages with the internal spline of the housing) and inner plates (the inner periphery of each plate engages with the outer spline of the hub).

On the outer periphery of the outer plate, the spacer ring is fitted and set in position. On the inner plate, no positioning ring is used: The plate can be moved a certain amount on the hub spline in the axial direction.

Sealed inside the housing is a mixture of high viscosity silicon oil and air. The housing is sealed by X-rings so that silicon oil will not leak into the rear final drive even when the pressure increases due to a greater difference in the rotation speed between LH and RH wheels.

The spindle (LH) which is integral with the rear drive shaft (LH) is coupled by the VC case spline, and is fitted to the side gear (LH) which is integral with the VC case. The spindle (RH) which is integral with the rear drive shaft (RH) is spline fitted to the side gear (RH). The end of the spindle is fitted by splines to the VC hub. No disassembling of the VC is allowed.

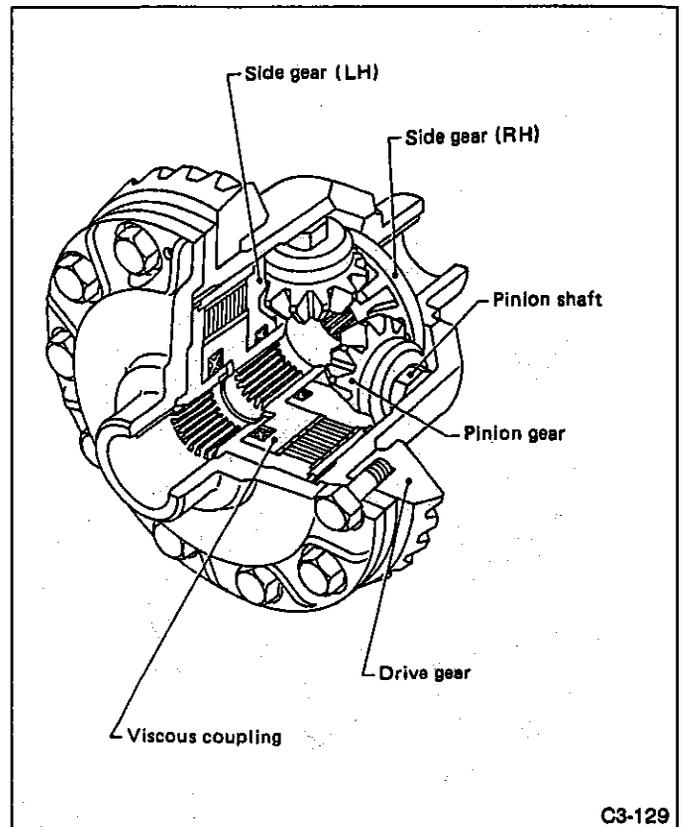
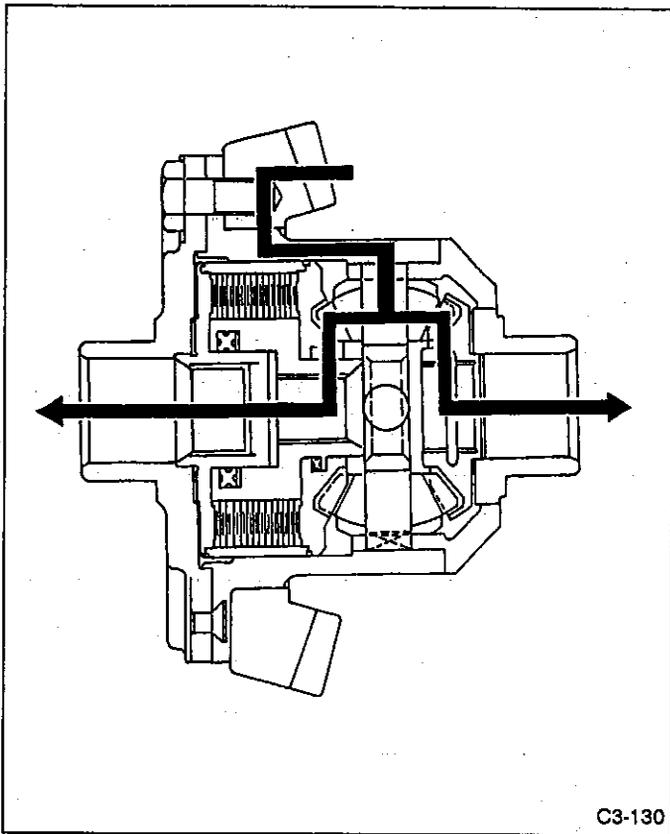


Fig. 3

#### 2. OPERATION

1) When right and left wheels turn at equal speed  
During normal straight-road driving where the right and left wheels run at an equal speed, the differential case and side gears rotate together, just as in conventional differentials. As a result, driving torque is transmitted equally to the right and left side gears as shown in Figure 4.

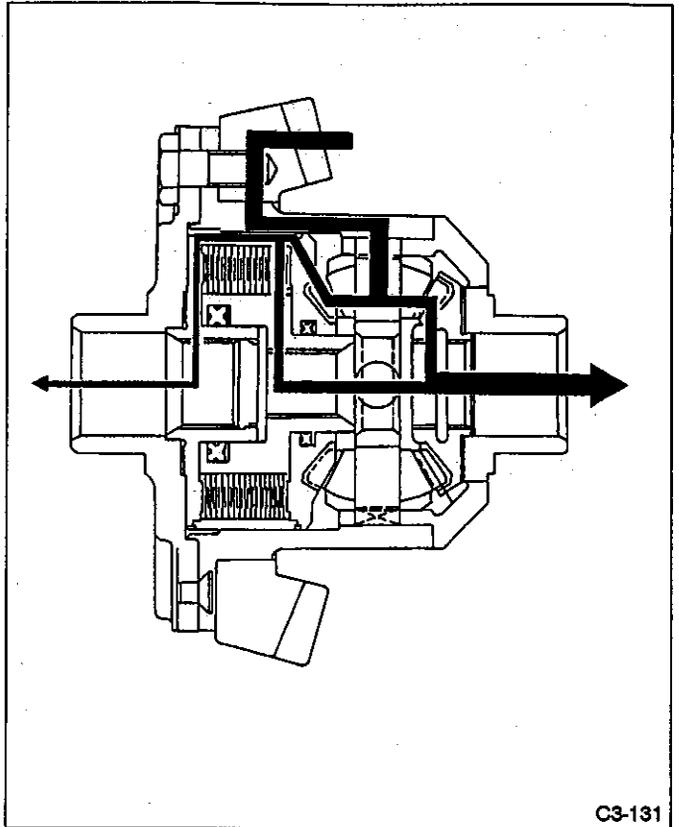


C3-130

Fig. 4

2) When right and left wheels turn at different speeds. When a speed difference occurs between the right and left wheels, the VC housing and VC hub turn relatively at the same speed difference as that of the rear drive shaft. Because of the shearing force caused in the silicon oil, a differential torque is generated, which controls differential operation (idle rotation). For example, if the left wheel turns idle due to a difference in the road resistance, a speed difference occurs between the right and left wheel. Since the VC is installed between the right and left wheels, a differential torque is generated in the VC corresponding to this speed difference, and this differential torque is transferred from the left wheel to the right wheel. Accordingly, a greater driving force

is transferred to the right wheel which is rotating at a lower speed as shown in Figure 5.



C3-131

Fig. 5

### 3. SERVICE PROCEDURES FOR LSD

The component parts of LSD ASSY are not available as piece parts.

Therefore, it is recommended to not disassemble LSD ASSY.

# S SPECIFICATIONS AND SERVICE DATA

## A: SPECIFICATIONS

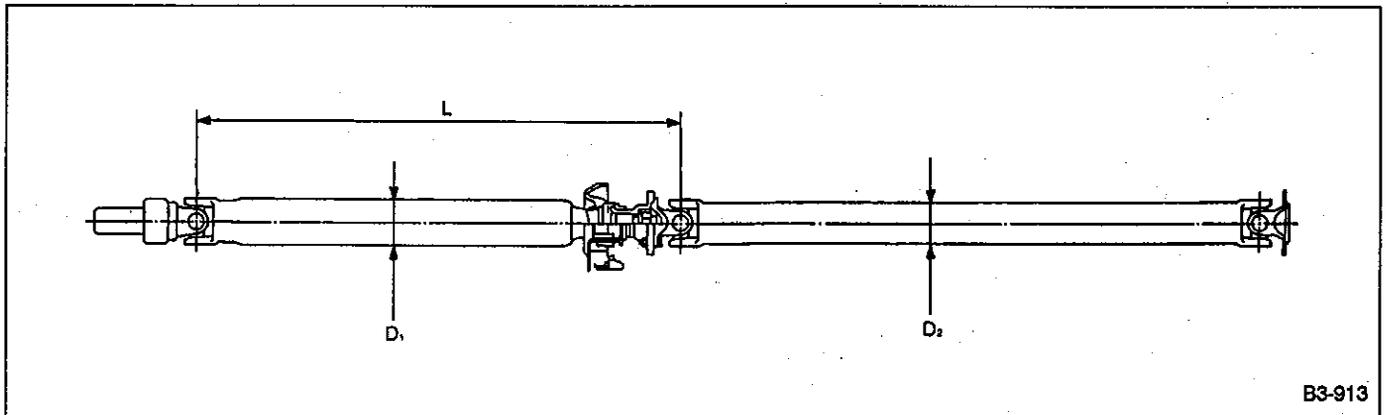
### 1. REAR FINAL REDUCTION GEAR RATIO

	1800cc		2000cc		TURBO*	2200cc	
	AT	MT	AT	MT	MT	AT	MT
Type of gear	Hypoid						
Gear ratio (Number of gear teeth)	4.444 (40/9)	4.111 (37/9)	4.444 (40/9)	4.111 (37/9)	3.545 (39/11)	4.111 (37/9)	3.900 (39/10)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)						

\*: With VC type LSD

### 2. PROPELLER SHAFT

	AT	MT	
		Full-time 4WD	Selective 4WD
Front propeller shaft joint-to-joint length: L mm (in)	489 (19.25)	548 (21.57)	613 (24.13)
Outside dia. of tube mm (in)	D <sub>1</sub>	63.5 (2.500)	
	D <sub>2</sub>	57.0 (2.244)	

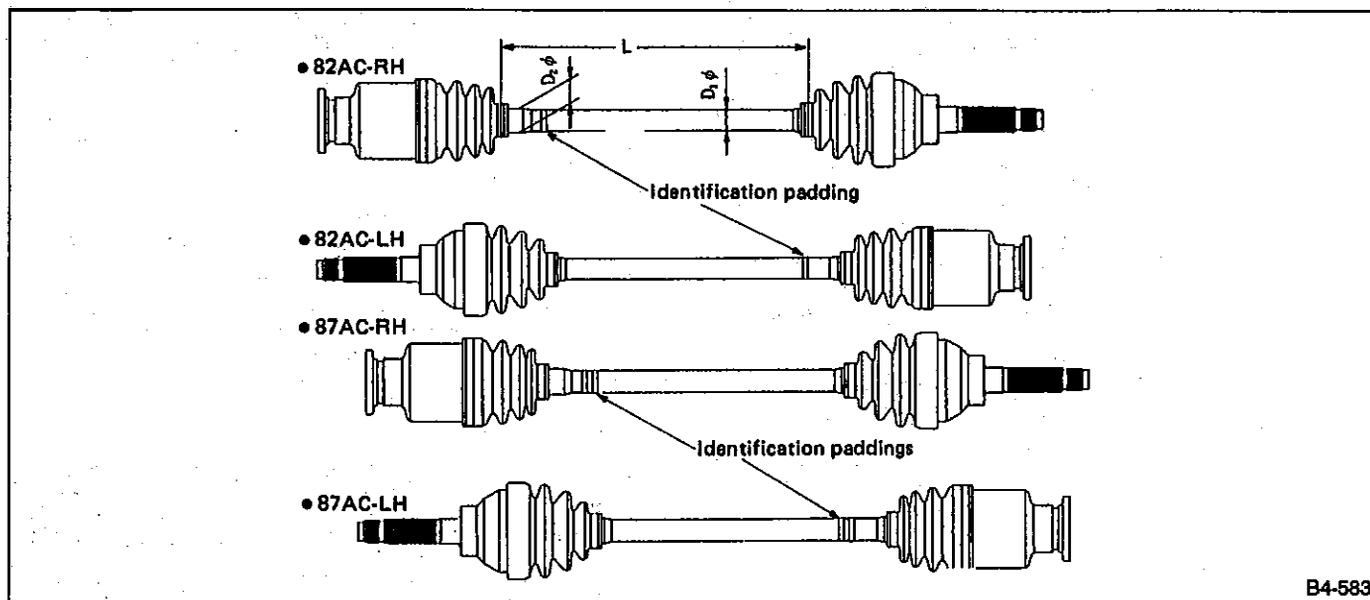


B3-913

Fig. 6

3. DRIVE SHAFT

Type of drive shaft ASSY	SHAFT			
	No. of identification paddings on shaft	Distance between inner and outer boots (L) mm (in)	Diameter (D) mm (in)	
			D <sub>1</sub>	D <sub>2</sub>
82AC-RH	1 (One)	304 (11.97)	21.2 (0.835)	24 (0.94)
82AC-LH		294 (11.57)		21.2 (0.835)
87AC-RH	2 (Two)	277 (10.91)	22.22 (7/8)	25 (0.98)
87AC-LH		267 (10.51)		22.22 (7/8)



B4-583

4. APPLICATION TABLE

	Power unit			
	1800cc	2000cc	2000cc Turbo	2200cc
Drive shaft	82AC-RH 82AC-LH		87AC-RH 87AC-LH	

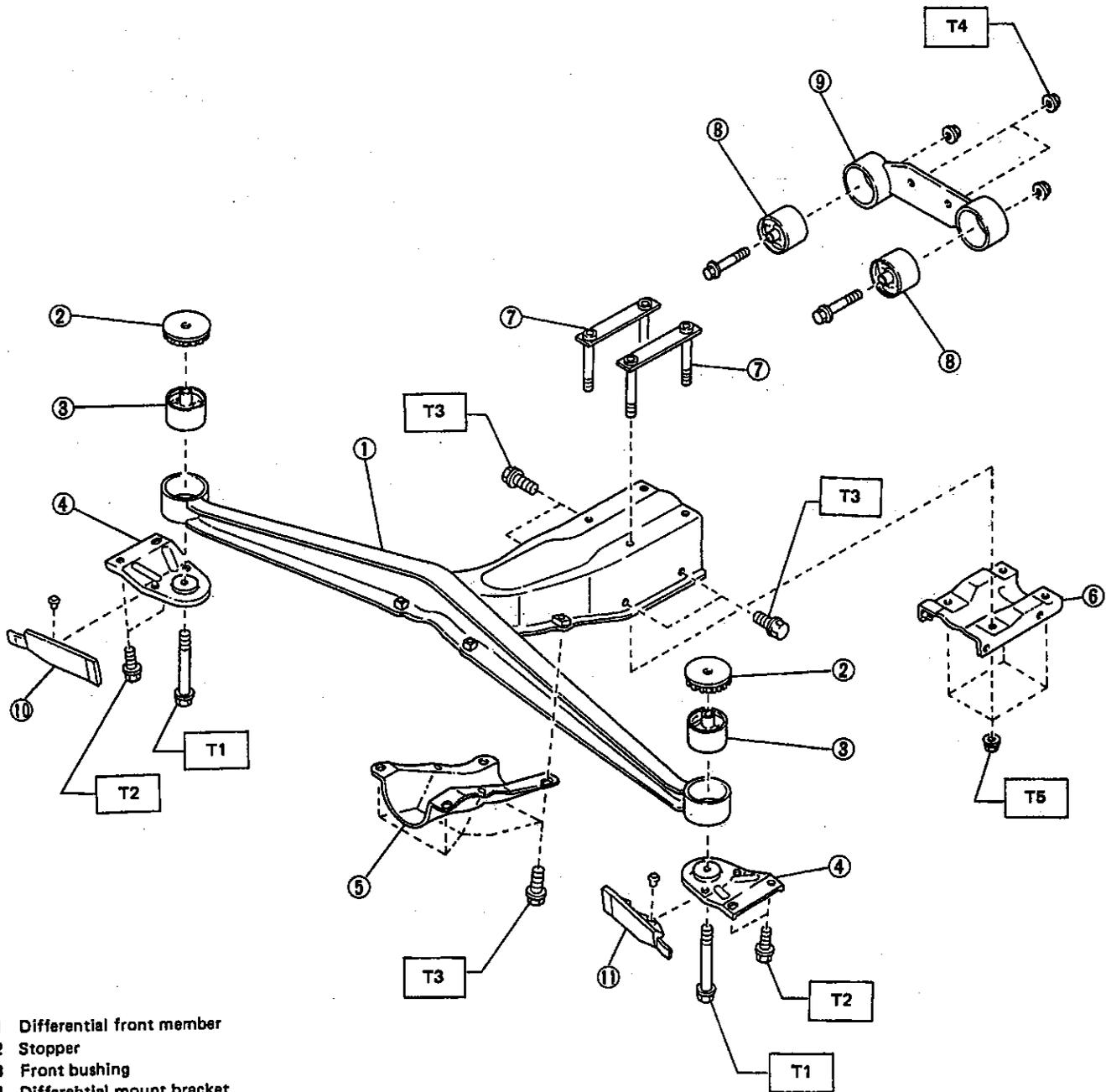
**B: SERVICE DATA****Rear differential**

Front & rear bearing preload at companion flange bolt hole	New bearing	19.6 — 28.4 N (2.0 — 2.9 kg, 4.4 — 6.4 lb)
	Used bearing	8.34 — 16.67 N (0.85 — 1.7 kg, 1.87 — 3.75 lb)
Preload adjusting washer length	Part No.	
	383705200	2.59 mm (0.1020 in)
	383715200	2.57 mm (0.1012 in)
	383725200	2.55 mm (0.1004 in)
	383735200	2.53 mm (0.0996 in)
	383745200	2.51 mm (0.0988 in)
	383755200	2.49 mm (0.0980 in)
	383765200	2.47 mm (0.0972 in)
	383775200	2.45 mm (0.0965 in)
	383785200	2.43 mm (0.0957 in)
	383795200	2.41 mm (0.0949 in)
	383805200	2.39 mm (0.0941 in)
	383815200	2.37 mm (0.0933 in)
	383825200	2.35 mm (0.0925 in)
	383835200	2.33 mm (0.0917 in)
	383845200	2.31 mm (0.0909 in)
Preload adjusting spacer length	Part No.	
	383695201	56.2 mm (2.213 in)
	383695202	56.4 mm (2.220 in)
	383695203	56.6 mm (2.228 in)
	383695204	56.8 mm (2.236 in)
	383695205	57.0 mm (2.244 in)
383695206	57.2 mm (2.252 in)	

Pinion height adjusting washer thickness	Part No.	
	383495200	3.09 mm (0.1217 in)
	383505200	3.12 mm (0.1228 in)
	383515200	3.15 mm (0.1240 in)
	383525200	3.18 mm (0.1252 in)
	383535200	3.21 mm (0.1264 in)
	383545200	3.24 mm (0.1276 in)
	383555200	3.27 mm (0.1287 in)
	383565200	3.30 mm (0.1299 in)
	383575200	3.33 mm (0.1311 in)
	383585200	3.36 mm (0.1323 in)
	383595200	3.39 mm (0.1335 in)
	383605200	3.42 mm (0.1346 in)
	383615200	3.45 mm (0.1358 in)
	383625200	3.48 mm (0.1370 in)
	383635200	3.51 mm (0.1382 in)
	383645200	3.54 mm (0.1394 in)
	383655200	3.57 mm (0.1406 in)
	383665200	3.60 mm (0.1417 in)
383675200	3.63 mm (0.1429 in)	
383685200	3.66 mm (0.1441 in)	
Side gear to thrust washer clearance		0.1 — 0.2 mm (0.004 — 0.008 in)
Side gear thrust washer thickness	Part No.	
	383445201	0.75 — 0.80 mm (0.0295 — 0.0315 in)
	383445202	0.80 — 0.85 mm (0.0315 — 0.0335 in)
	383445203	0.85 — 0.90 mm (0.0335 — 0.0354 in)
Side bearing standard width	20.00 mm (0.7874 in)	
Side bearing retainer shim thickness	Part No.	
	383475201	0.20 mm (0.0079 in)
	383475202	0.25 mm (0.0098 in)
	383475203	0.30 mm (0.0118 in)
	383475204	0.40 mm (0.0157 in)
383475205	0.50 mm (0.0197 in)	
Drive gear to drive pinion backlash		0.10 — 0.20 mm (0.0039 — 0.0079 in)
Drive gear runout on its back surface	Limit	0.05 mm (0.0020 in)
Oil capacity		0.8 ℓ (0.8 US qt, 0.7 Imp qt)

# C COMPONENT PARTS

## 1. Rear Differential Mounting System



- 1 Differential front member
- 2 Stopper
- 3 Front bushing
- 4 Differehtial mount bracket
- 5 Differential mount front cover
- 6 Differential mount lower cover
- 7 Plate
- 8 Rear bushing
- 9 Differential rear member
- 10 Protector (RH)
- 11 Protector (LH)

**Tightening torque: N·m (kg·m, ft·lb)**

**T1: 88 – 108 (9 – 11, 65 – 80)**

**T2: 25 – 40 (2.5 – 4.1, 18 – 30)**

**T3: 59 – 78 (6 – 8, 43 – 58)**

**T4: 69 – 88 (7 – 9, 51 – 65)**

**T5: 56 – 72 (5.7 – 7.3, 41 – 53)**

Fig. 8

## 2. Propeller Shaft and Drive Shaft

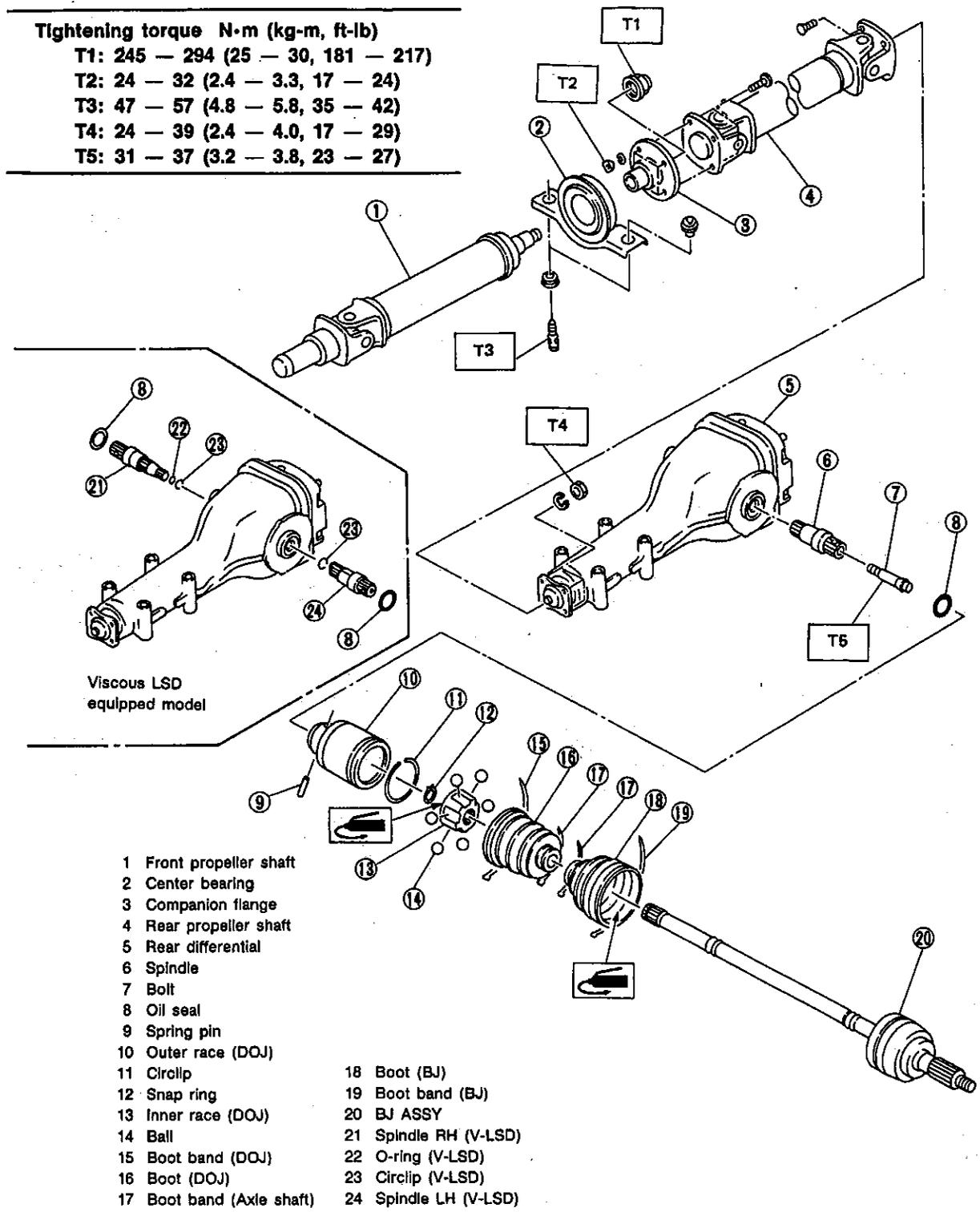


Fig. 9

### 3. Rear Differential Assembly

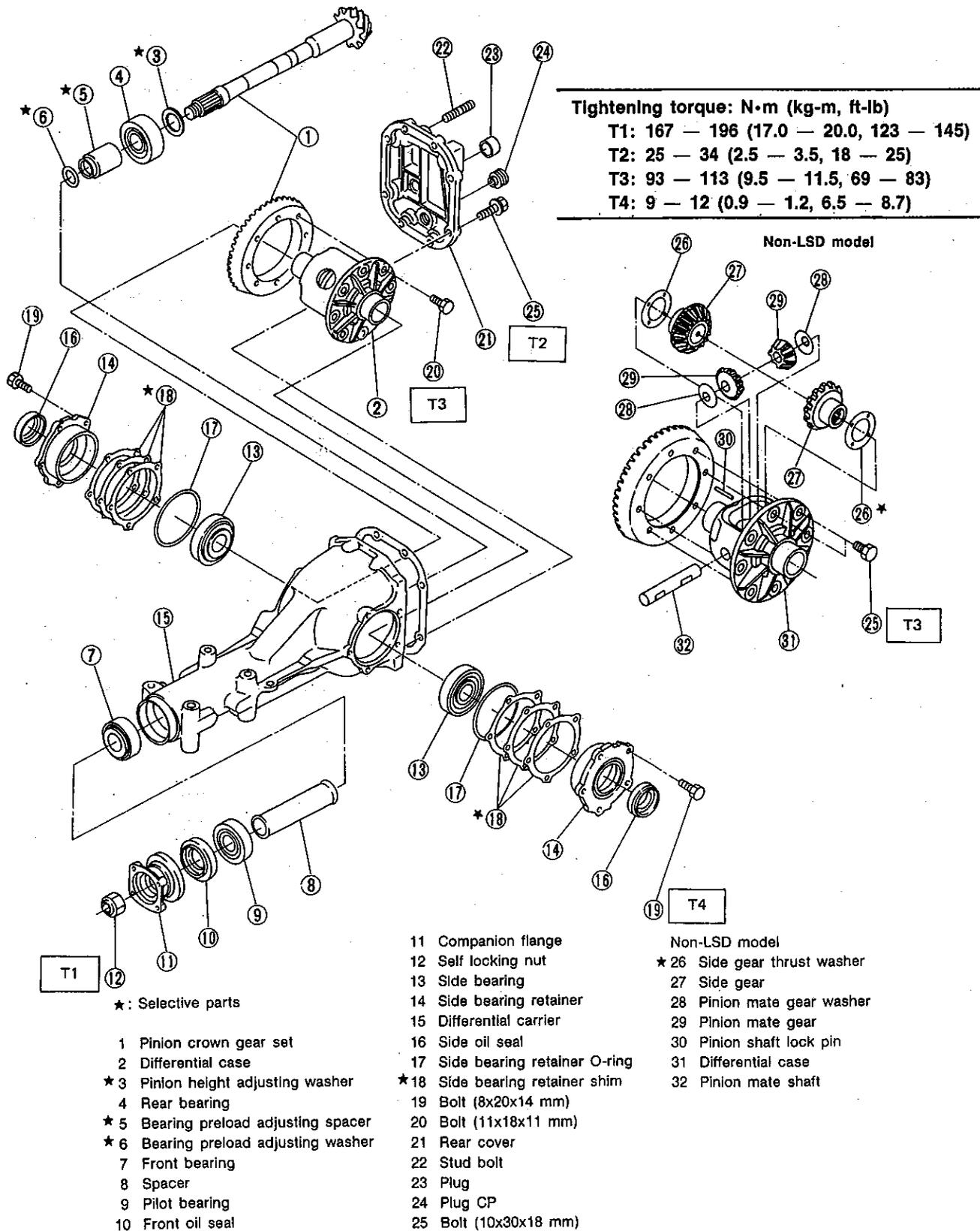


Fig. 10

# W SERVICE PROCEDURE

## 1. Propeller Shaft

### A: ON-CAR SERVICE

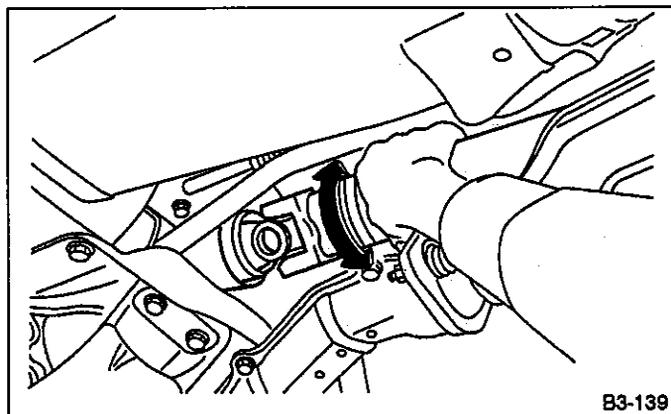
Check the following points with propeller shaft installed in vehicle.

#### 1) Joints and connections

Check for any looseness of yoke flange connecting bolts and center bearing retaining bolts.

#### 2) Splines and bearing locations

Turn propeller shaft by hand to see if abnormal free play exists at splines. Also move yokes to see if abnormal free play exists at spiders and bearings.



B3-139

Fig. 11

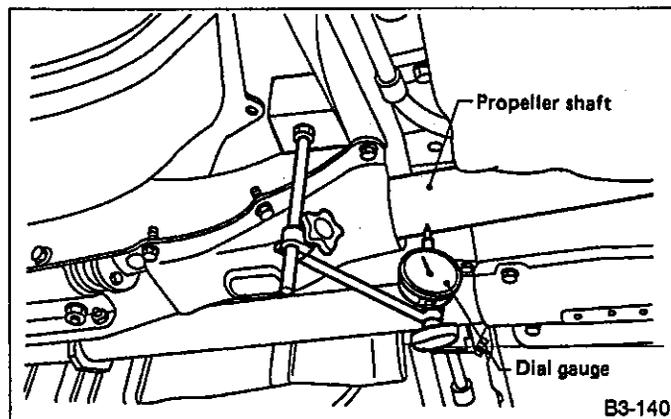
#### 3) Runout of propeller shaft

Turn rear wheels by hand to check for "runout" of propeller shaft.

Run out:

Limit 0.6 mm (0.024 in)

Measure runout with a dial gauge at the center of front and rear propeller shaft tubes.



B3-140

Fig. 12

#### 4) Center bearing free play

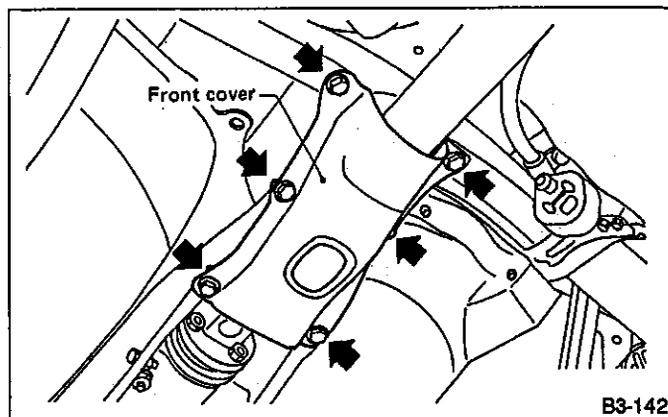
While holding propeller shaft near center bearing with your hand, move it up and down, and left and right to check for any abnormal bearing free play.

### B: REMOVAL

Before removing propeller shaft, wrap metal parts with a cloth or rubbered material.

#### 1) Remove rear exhaust pipe and muffler.

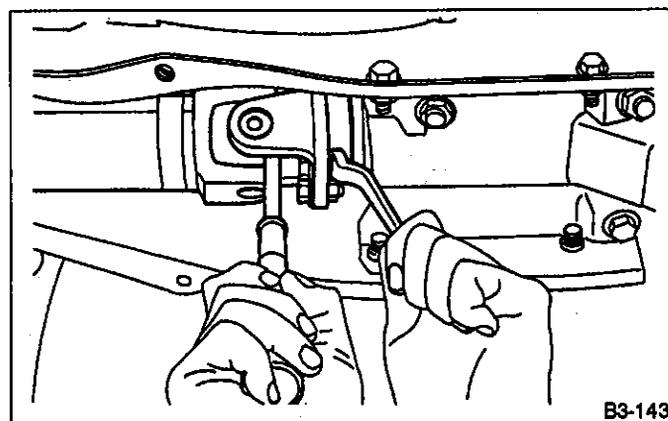
#### 2) Remove front cover of rear differential mount.



B3-142

Fig. 13

3) Remove the four bolts which hold propeller shaft to rear differential.



B3-143

Fig. 14

4) Remove the two bolts which hold center bearing to car body.

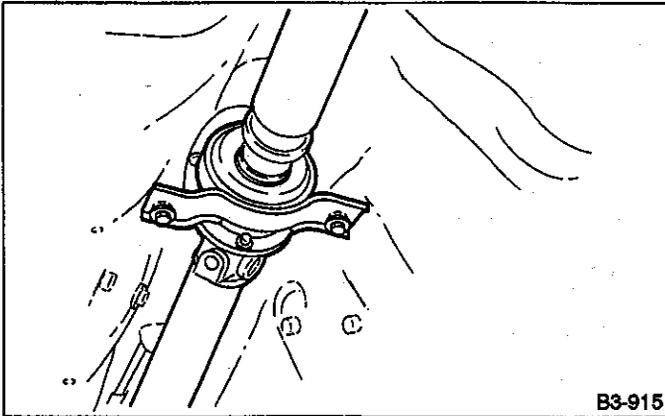


Fig. 15

5) Remove propeller shaft from transmission.

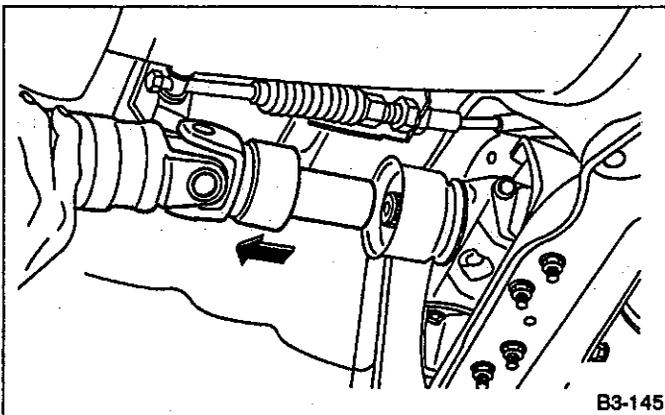


Fig. 16

- a. Be sure to use an empty oil can to catch oil flowing out when removing propeller shaft.
- b. Be sure not to damage oil seals and the frictional surface of sleeve yoke.
- c. Be sure to plug the opening in transmission after removal of propeller shaft.

**C: DISASSEMBLY**

Before removing center bearing, check its condition. If it does not operate smoothly or if there is any free play or leakage, remove as follows:

1) Put aligning marks on affected parts.

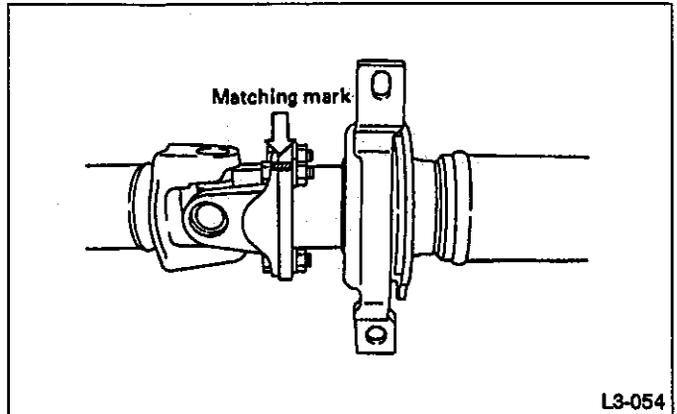


Fig. 17

- 2) Remove bolts which hold front propeller shaft to rear propeller shaft.
- 3) Place companion flange in a vise and remove stake nut.

Be sure not to hold propeller shaft pipe portion in the vise.

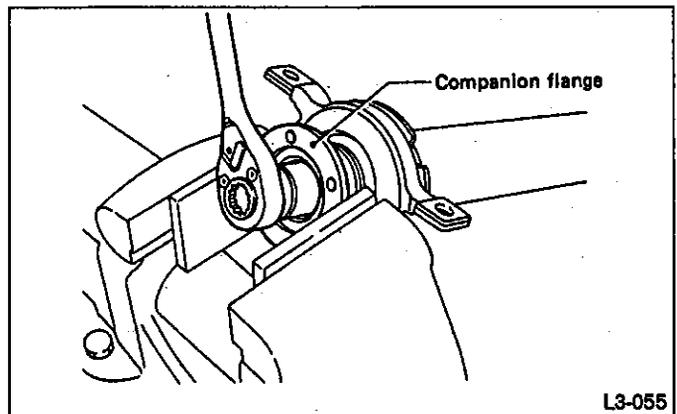


Fig. 18

- 4) Drive out companion flange with a puller or press. Before disassembling, put alignment mark on affected parts.
- 5) Lightly tap the head of front propeller shaft with a copper hammer until center bearing is removed. Be careful not to damage the thread portion.

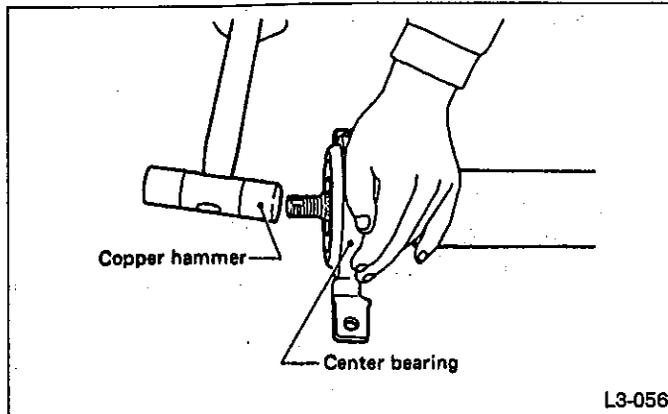


Fig. 19

### D: INSPECTION

Do not disassemble propeller shaft. Check the following and replace if necessary.

- 1) Tube surfaces for dents or cracks
- 2) Splines for deformation or abnormal wear
- 3) Joints for non-smooth operation or abnormal noise
- 4) Center bearing for free play, noise or non-smooth operation
- 5) Oil seals for abnormal wear or damage
- 6) Center bearing for breakage

### E: ASSEMBLY

- 1) Install center bearing onto front propeller shaft.
- 2) Align marks and install companion flange.
- 3) Tighten stake nut until center bearing is set in position.

Be sure to install new stake nut.

**Tightening torque:**  
245 — 294 N·m (25 — 30 kg-m, 181 — 217 ft-lb)

Stake the nut after tightening.

- 4) Align marks and connect front and rear propeller shafts.

**Tightening torque:**  
24 — 32 N·m (2.4 — 3.3 kg-m, 17 — 24 ft-lb)

### F: INSTALLATION

- 1) Insert sleeve yoke into transmission and attach center bearing to car body.

**Tightening torque:**  
47 — 57 N·m (4.8 — 5.8 kg-m, 35 — 42 ft-lb)

- 2) Connect flange yoke and rear differential.

**Tightening torque:**  
24 — 39 N·m (2.4 — 4.0 kg-m, 17 — 29 ft-lb)

- 3) Install front cover of rear differential mount.
- 4) Install rear exhaust pipe and muffler.

## 2. Rear Differential

### A: ON-CAR SERVICE

#### 1. FRONT OIL SEAL

- 1) Drain gear oil.
- 2) Jack up rear wheels and support the vehicle body with rigid racks.
- 3) Remove propeller shaft from body.

Wrap metal parts with a cloth or rubbered material to prevent it from damage by interference with adjacent metal parts.

- 4) Measure turning resistance of companion flange.

Measure turning resistance after making sure that the companion flange turns smoothly.

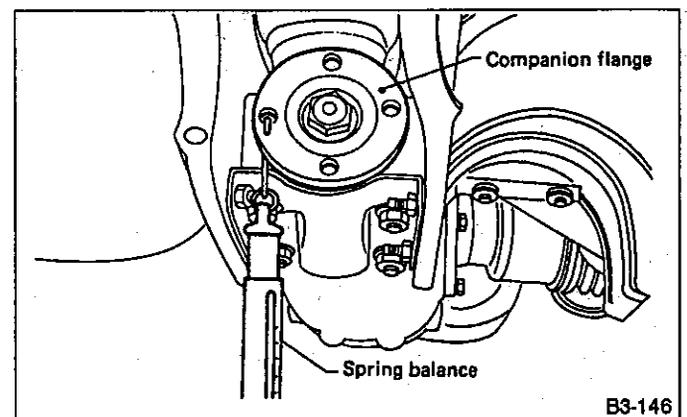


Fig. 20

- 5) Remove self-locking nut while holding companion flange with FLANGE WRENCH.

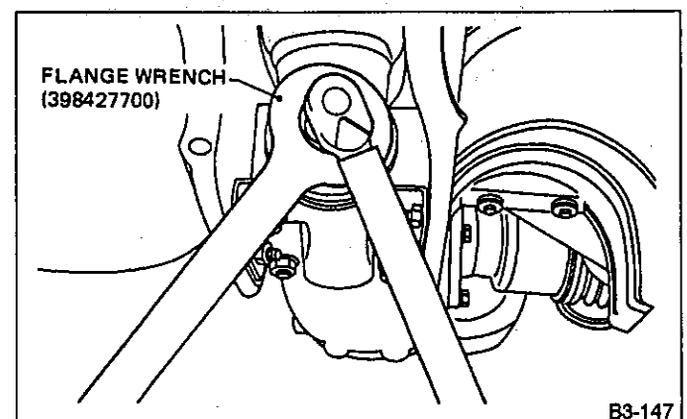


Fig. 21

- 6) Extract companion flange with a puller.
- 7) Remove oil seal.

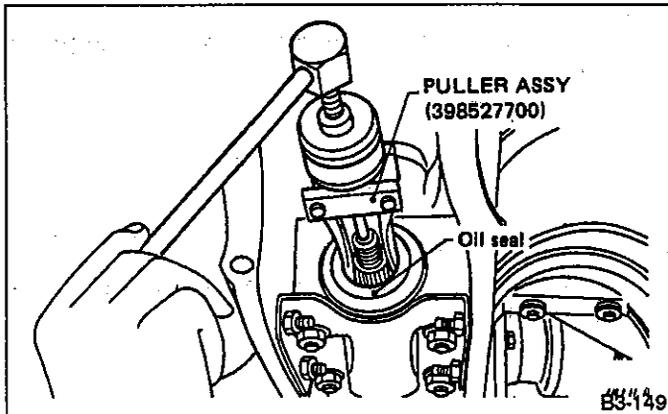


Fig. 22

- 8) Fit a new oil seal.

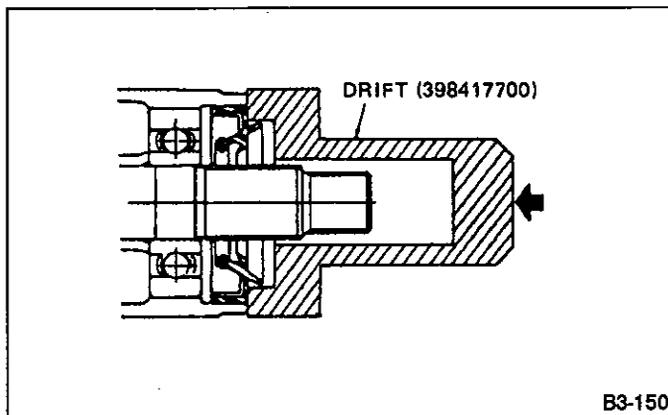


Fig. 23

- 9) Install companion flange.
- 10) Tighten self-locking nut within the specified torque range so that the turning resistance of companion flange becomes the same as that before replacing oil seal.

**Torque (Drive pinion nut):**  
 167 — 196 N•m  
 (17.0 — 20.0 kg-m, 123 — 145 ft-lb)

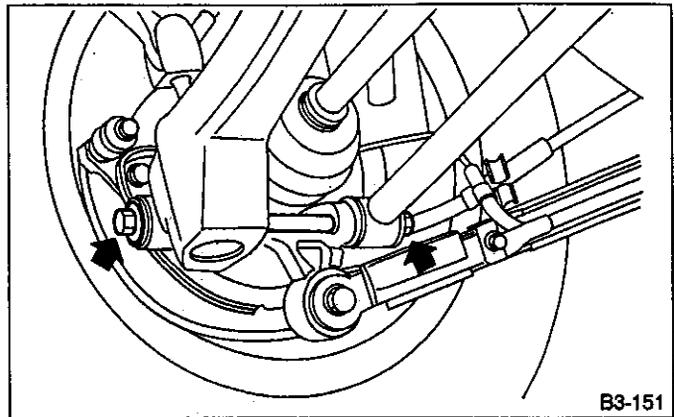


Fig. 24

- 6) Drive out spring pin from DOJ of rear drive shaft by using 6 mm (0.24 in) diameter steel rod.

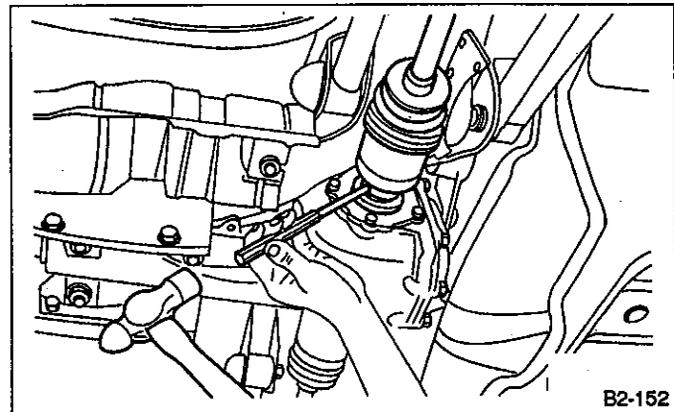


Fig. 25

- 7) Remove the DOJ from rear differential spindle while pushing rear housing outward. Suspend removed drive shaft using a wire.
- 8) Loosen differential spindle set bolt by using WRENCH and remove spindle with packing. (Non-LSD model)

**Special tool:**  
**WRENCH (925560000)**

- 11) Reassembling procedure hereafter is the reverse of the disassembling.

**2. SIDE OIL SEAL**

- 1) Loosen both wheel nuts.
- 2) Jack up the vehicle and support it with rigid racks.
- 3) Remove wheels.
- 4) Remove bolt connecting lateral link to rear housing.  
**Do not reuse self locking nut.**
- 5) Remove bolt connecting trailing link to rear housing.  
**Do not reuse self locking nut.**

- 9) Remove spindle using REMOVER and INSTALLER. (LSD model)

**Special tool:**  
**REMOVER (499095500)**  
**INSTALLER (499247300)**

10) Remove oil seal.

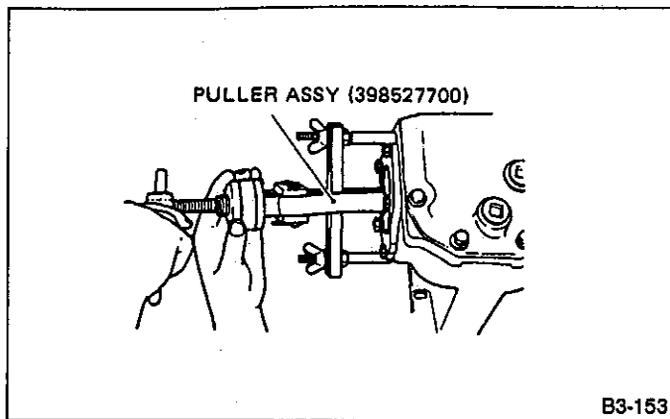


Fig. 26

11) Drive in a new oil seal with DRIFT. (Non-LSD model)

Apply chassis grease between the oil seal lips.

**Special tool:**  
DRIFT (398437700)

12) Assemble spindle into differential ASSY and tighten bolt with WRENCH. (Non-LSD model)

**Special tool:**  
WRENCH (925560000)

13) After assembling circlip on spindle, set spindle into differential and install by hitting it with a plastic hammer. (LSD model)

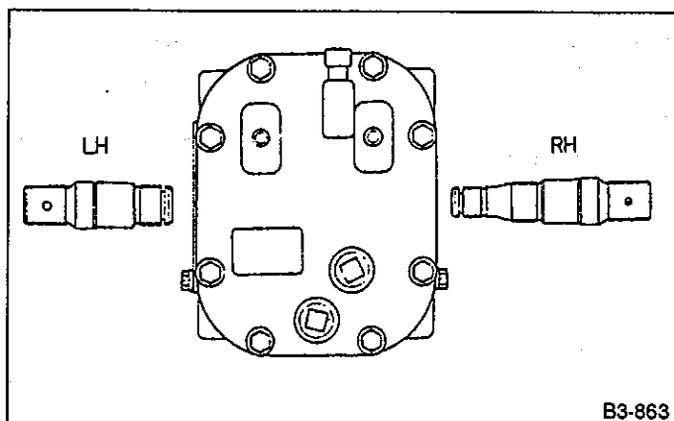


Fig. 27

a. Always use a new circlip.

b. Check that spindle thrust play is within specifications.

If not, check if spindle is completely driven into place. If it is, replace with a new one.

**Specifications:**  
0.3 — 0.5 mm (0.012 — 0.020 in)

c. Check that oil seal lip is not folded over inward.

14) Reassembling procedure hereafter is the reverse of the disassembly.

**B: IDENTIFICATION**

Using the different rear differential ASSY causes the drive line and tires to "drag" or emit abnormal noise when 4WD is selected.

When replacing a rear differential ASSY, select the correct one according to the following table.

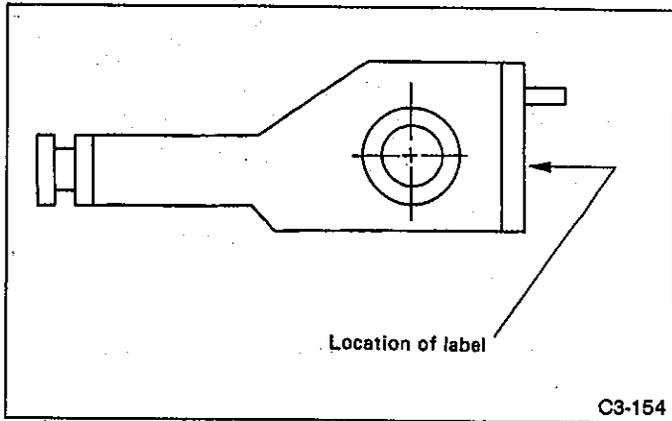


Fig. 28

Gear ratio	Identification mark	Part number	Label stuck on rear differential
3.545	JQ	27011AA230	PART NUMBER <b>27011AA230</b> VISCOUS LSD GEAR RATIO <b>3.545</b> ● FUJI HEAVY INDUSTRIES LTD. J Q
3.900	W2	27011AA151	PART NUMBER <b>27011AA151</b> GEAR RATIO <b>3.900</b> ● FUJI HEAVY INDUSTRIES LTD. W2
4.111	W3	27011AA111	PART NUMBER <b>27011AA111</b> GEAR RATIO <b>4.111</b> ● FUJI HEAVY INDUSTRIES LTD. W3
4.444	W4	27011AA121	PART NUMBER <b>27011AA121</b> GEAR RATIO <b>4.444</b> ● FUJI HEAVY INDUSTRIES LTD. W4

Fig. 29

**C: REMOVAL**

- 1) Remove rear exhaust pipe and muffler.
- 2) Remove front cover of rear differential mount.

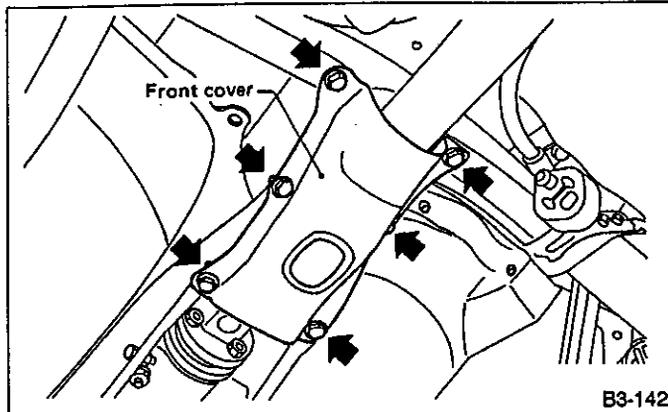


Fig. 30

- 3) Remove propeller shaft.
  - a. Prepare an oil can and cap since the transmission oil flows out from the extension at removing propeller shaft.
  - b. When removing propeller shaft, pay attention not to damage the sliding surfaces of rear drive shaft (extension) spline, oil seal and sleeve yoke.
  - c. Insert the cap into the extension to prevent transmission oil from flowing out immediately after removing the propeller shaft.
- 4) Remove spring pins from DOJ of rear drive shafts.
- 5) Remove heat sealed cover.
- 6) Remove clamps and bracket of parking brake cable.

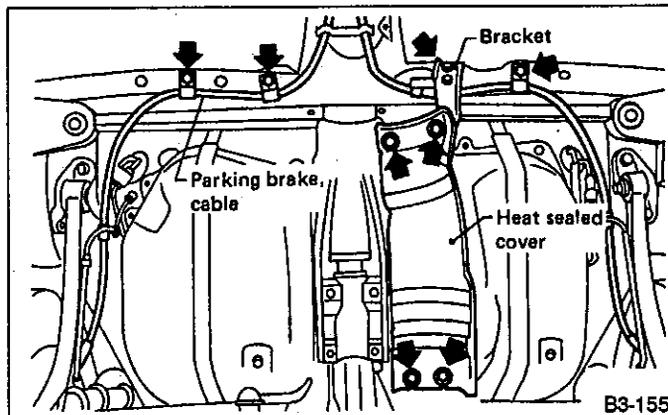


Fig. 31

- 7) Remove lower differential bracket.

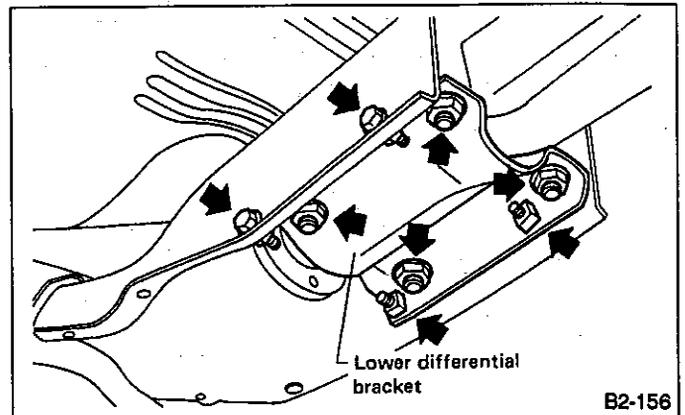


Fig. 32

- 8) Support rear differential with transmission jack.

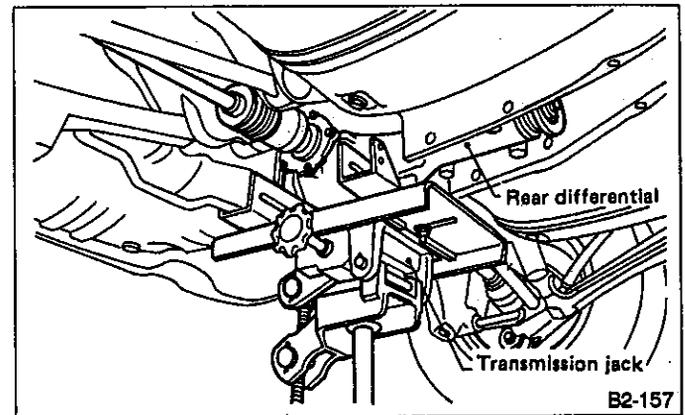


Fig. 33

- 9) Remove self-locking nuts connecting rear differential to rear member.

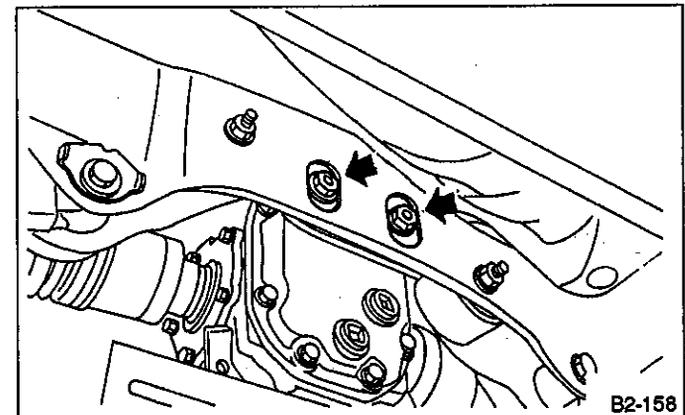
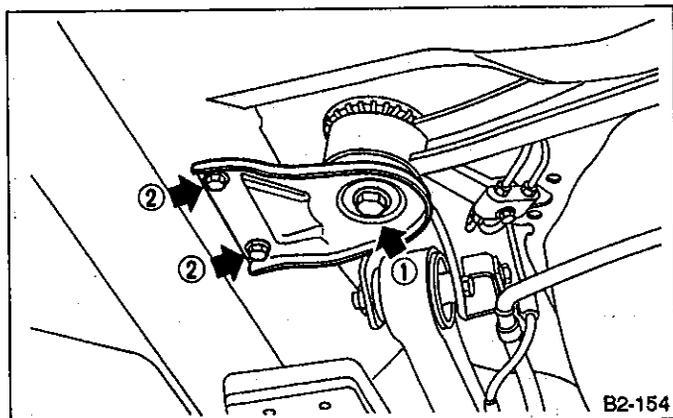


Fig. 34

10) Remove bolts which secure rear differential front member to body.

Loosen bolt ① first, then removal bolts ② .

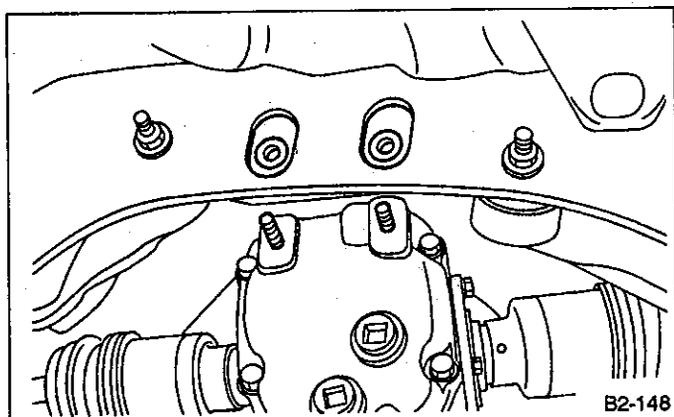
Support front member with the use of a helper to prevent it from dropping.



B2-154

Fig. 35

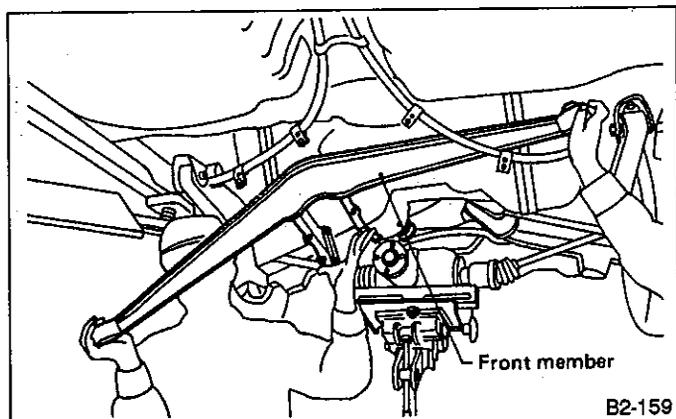
11) While slowly lowering transmission jack, move rear differential forward and remove bolts from rear member.



B2-148

Fig. 36

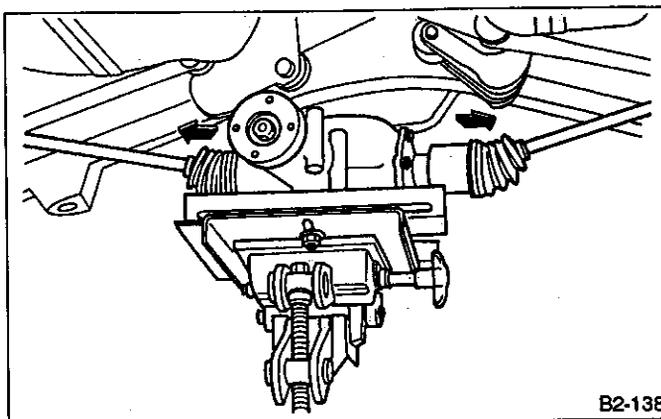
12) Remove front member from body.



B2-159

Fig. 37

13) Remove rear drive shaft from rear differential, and remove rear differential from body.



B2-138

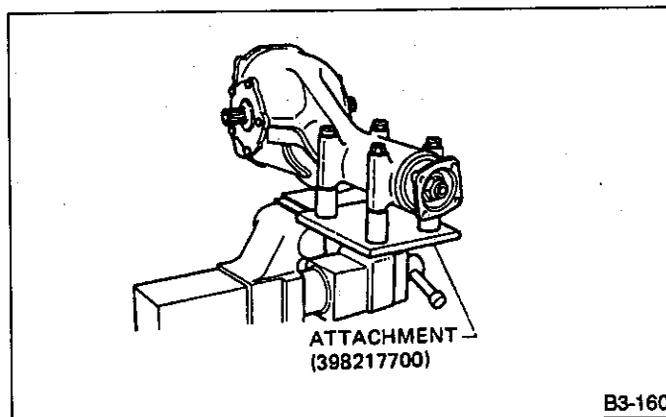
Fig. 38

**D: DISASSEMBLY**

To detect real cause of trouble, inspect the following items before disassembling. (Refer to "ASSEMBLY" for inspection procedures.)

- Tooth contact of hypoid drive gear and pinion, and backlash
- Runout of drive gear at its back surface
- Turning resistance of drive pinion

1) Set ATTACHMENT on vise and install the differential assembly to Attachment.



B3-160

Fig. 39

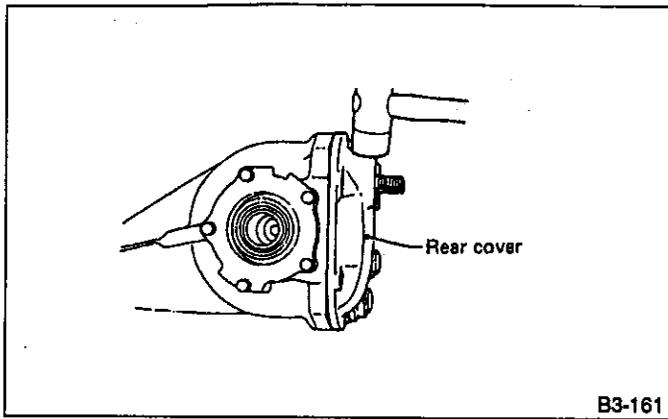
- 2) Drain gear oil by removing plug.
- 3) Remove spindles with special tool.

**Special tool:**

Non-LSD model  
WRENCH (925560000)

LSD model  
REMOVER (499095500)  
INSTALLER (499247300)

4) Remove rear cover by loosening retaining bolts.

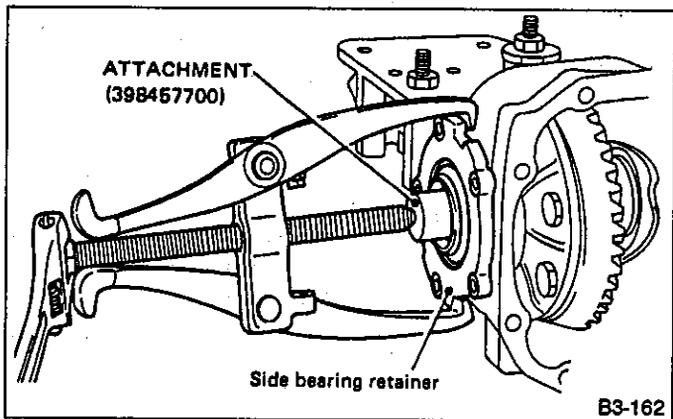


B3-161

Fig. 40

5) Make right and left side bearing retainers in order to identify them at reassembly. Remove side bearing retainer attaching bolts, set ATTACHMENT to differential case, and extract right and left side bearing retainers with a puller.

Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.

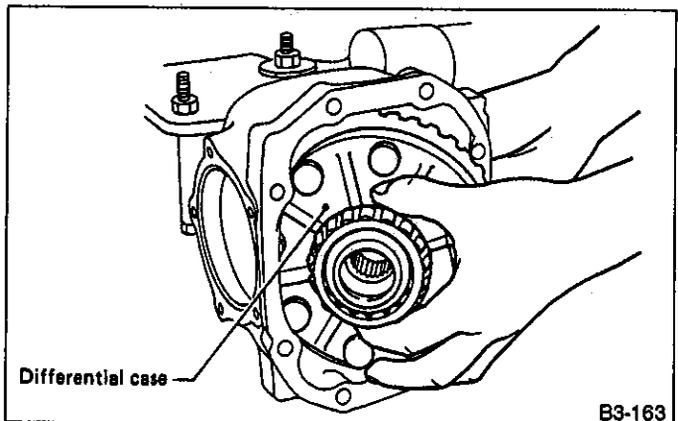


B3-162

Fig. 41

6) Pull out differential case.

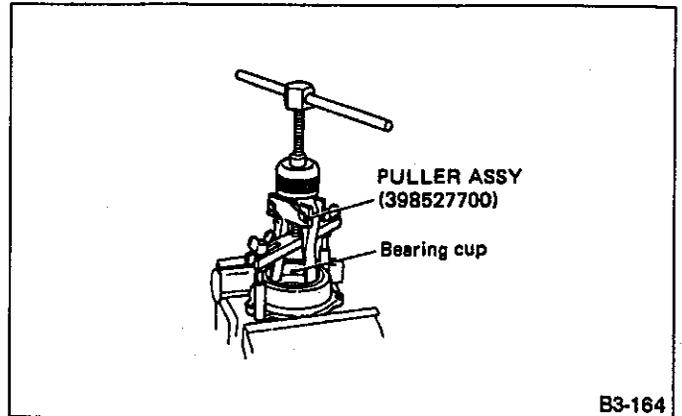
Be careful not to permit the teeth to contact the case.



B3-163

Fig. 42

7) When replacing side bearing, pull bearing cup from side bearing retainer.



B3-164

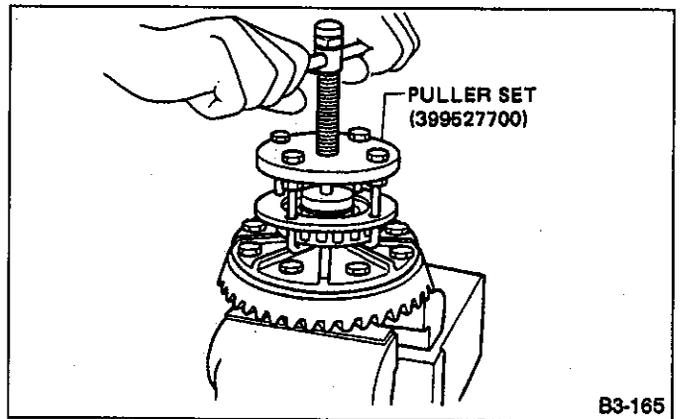
Fig. 43

8) Extract bearing cone with PULLER SET.

a. Set Puller so that its claws catch the edge of the bearing cone.

b. Never mix up the right and left hand bearing cups and cones.

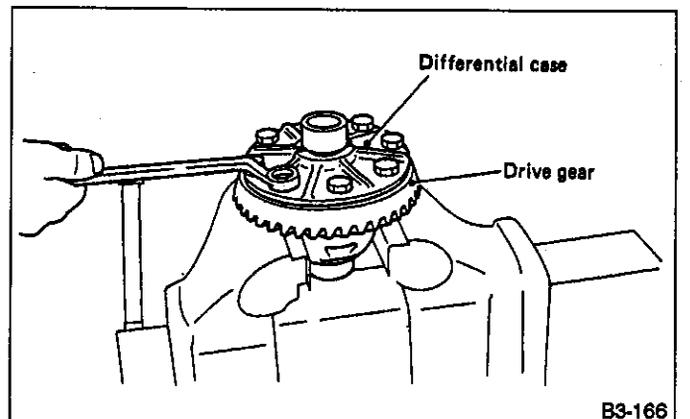
Do not attempt to disassemble the parts unless necessary.



B3-165

Fig. 44

9) Remove drive gear by loosening drive gear bolts.

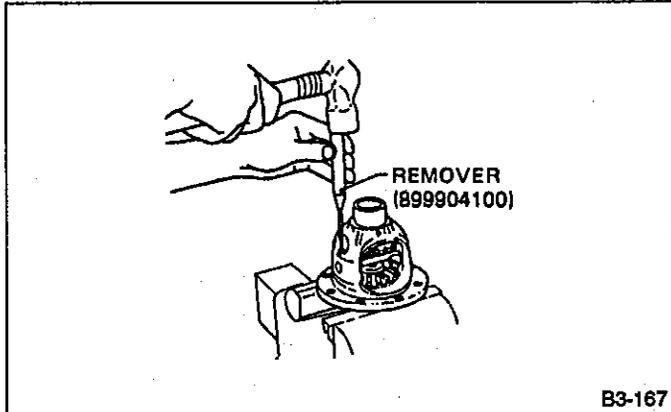


B3-166

Fig. 45

Further disassembling of viscous LSD ASSY is not allowed.

10) Drive out pinion shaft lock pin from drive gear side. The lock pin is staked at the pin hole end on the differential carrier; do not drive it out forcibly before unstaking it.



B3-167

Fig. 46

11) Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers.

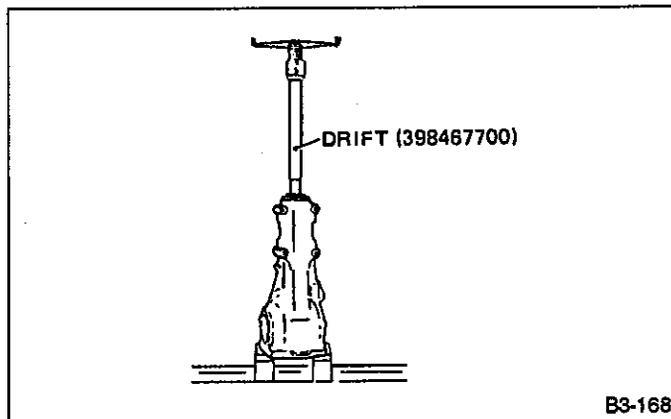
The gears as well as thrust washers should be marked or kept separated left and right, and front and rear.

12) Hold companion flange with FLANGE WRENCH and remove drive pinion nut.

13) Extract the companion flange with a puller.

14) Press the end of drive pinion shaft and extract it together with rear bearing cone, preload adjusting spacer and washer.

Hold the drive pinion so as not to drop it.

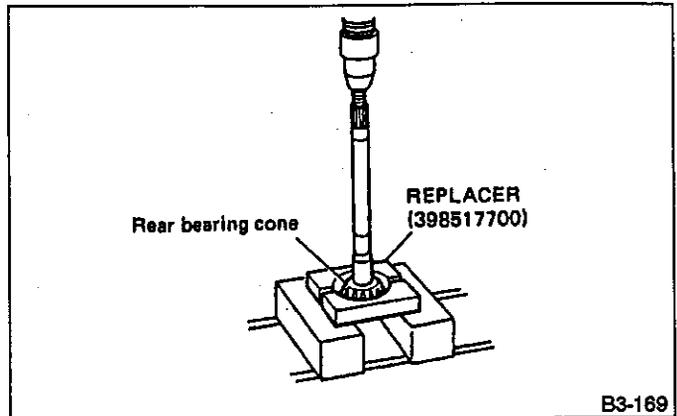


B3-168

Fig. 47

15) Remove rear bearing cone from drive pinion by supporting cone with REPLACER.

Place the replacer so that its center-recessed side faces the pinion gear.

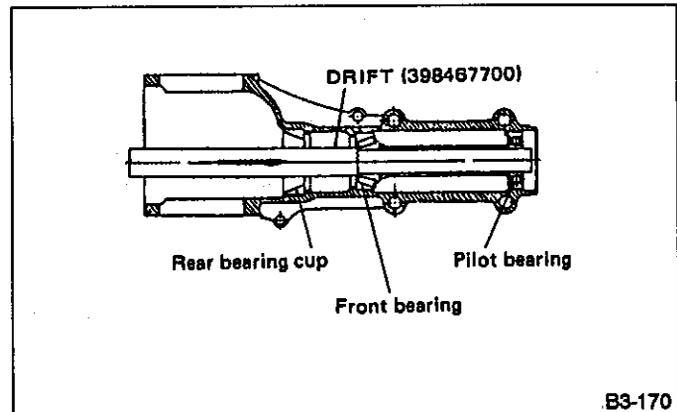


B3-169

Fig. 48

16) Remove front oil seal from differential carrier.

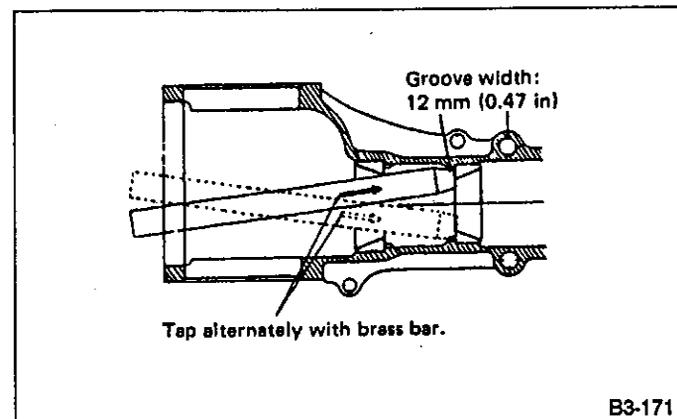
17) Remove pilot bearing together with front bearing cone.



B3-170

Fig. 49

18) When replacing bearings, tap front bearing cup and rear bearing cup in this order out of case by using a brass bar.



B3-171

Fig. 50

**E: INSPECTION**

Wash all the disassembled parts clean, and examine them for wear, damage, or other defects. Repair or replace defective parts as necessary.

## 1) Drive gear and drive pinion

(1) If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear if excessively worn or incapable of adjustment.

(2) If crack, score, or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.

## 2) Side gear and pinion mate gear

(1) Replace if crack, score, or other defects are evident on tooth surface.

(2) Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.

## 3) Bearing

Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.

4) Thrust washers of side gear and pinion mate gear  
Replace if seizure, flaw, abnormal wear or other defect is evident.

## 5) Oil seal

Replace if deformed or damaged, and at every disassembling.

## 6) Differential carrier

Replace if the bearing bores are worn or damaged.

## 7) Differential case

Replace if its sliding surfaces are worn or cracked.

## 8) Companion flange

Replace if the oil seal lip contacting surfaces have flaws.

**F: ASSEMBLY**

## 1) Precautions for assembling

(1) Assemble in the reverse order of disassembling. Check and adjust each part during assembly.

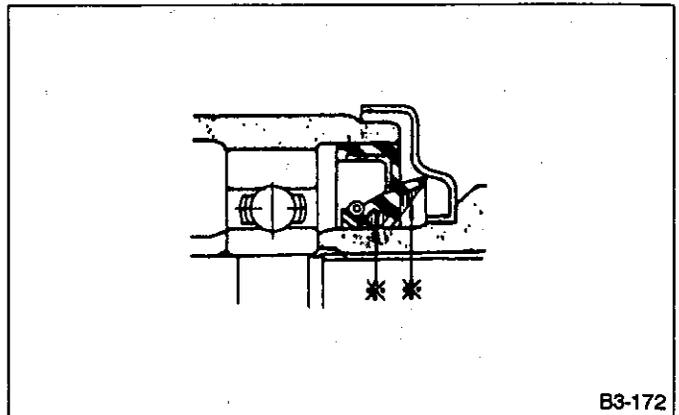
(2) Keep the shims and washers in order, so that they are not misinstalled.

(3) Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.

(4) Apply gear oil when installing the bearings and thrust washers.

(5) Be careful not to mix up the right and left hand cups of the bearings.

(6) Replace the oil seal with new one at every disassembly. Apply chassis grease between the lips (\*) when installing the oil seal.



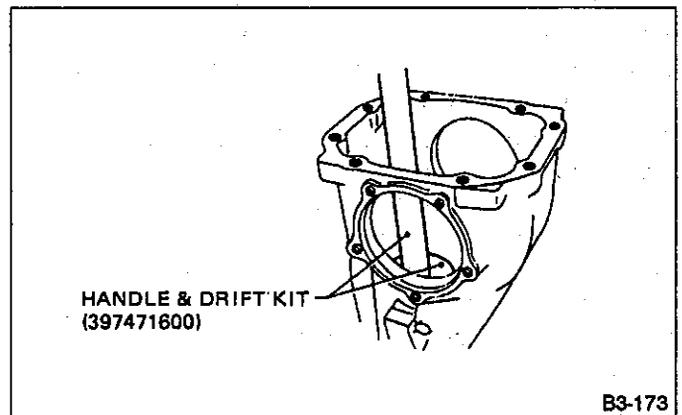
B3-172

Fig. 51

## 2) Adjusting preload for front and rear bearings.

Adjust the bearing preload with spacer and washer between front and rear bearings. Pinion height adjusting washer has nothing to do with this adjustment. The adjustment must be carried out without oil seal.

(1) Press front and rear bearing cups into differential carrier.

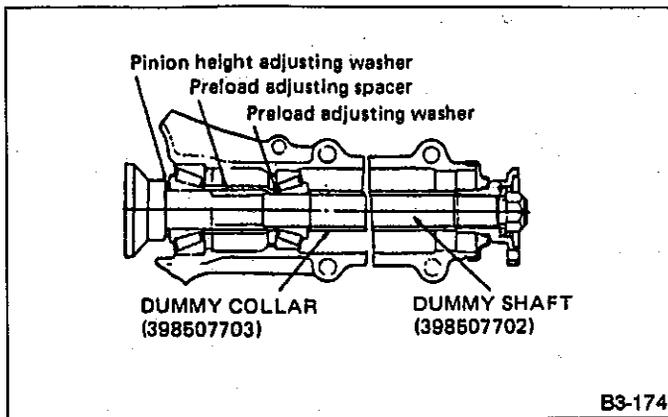


B3-173

Fig. 52

(2) Insert DUMMY SHAFT with pinion height adjusting washer and rear bearing cone fitted on it into case.

Reuse the used washer if they show normal tooth contact pattern when checked before disassembly.



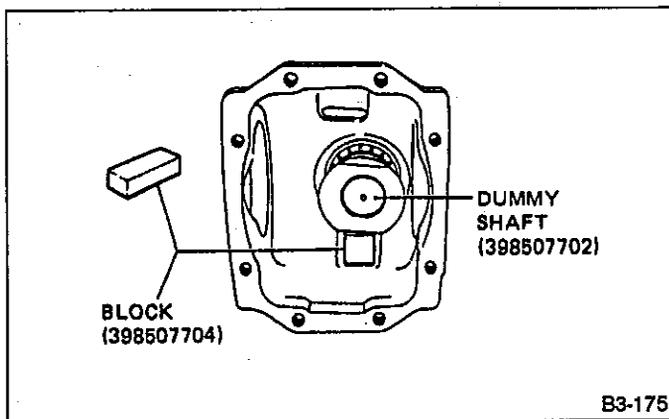
B3-174

Fig. 53

(3) Then, install preload adjusting spacer and washer, front bearing cone, DUMMY COLLAR, companion flange, washer and drive pinion nut.

(4) Turn Dummy Shaft with hand to make it seated, and tighten drive pinion nut while measuring the preload with spring balance as shown in the figure. Select preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

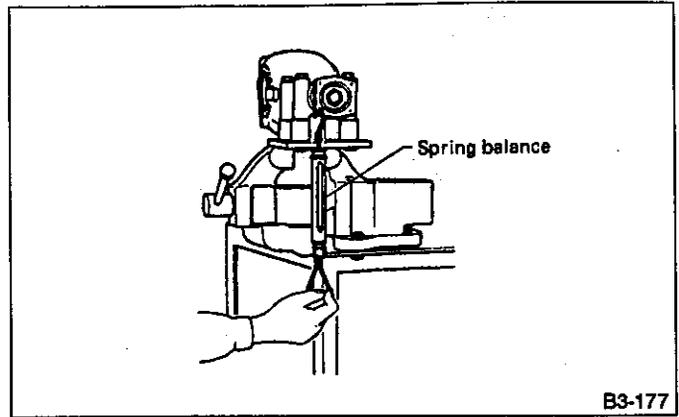
- a. Be careful not to give excessive preload.
- b. When tightening the drive pinion nut, lock Dummy Shaft with BLOCK as illustrated here.



B3-175

Fig. 54

**Torque (Drive pinion nut):**  
 167 — 196 N·m (17.0 — 20.0 kg·m, 123 — 145 ft·lb)



B3-177

Fig. 55

Front & rear bearing preload
For new bearing: 19.6 — 28.4 N (2.0 — 2.9 kg, 4.4 — 6.4 lb) at companion flange bolt hole
For used bearing: 8.34 — 16.67 N (0.85 — 1.7 kg, 1.87 — 3.75 lb) at companion flange bolt hole

**Preload adjusting washers**

Part No.	Length mm (in)
383705200	2.59 (0.1020)
383715200	2.57 (0.1012)
383725200	2.55 (0.1004)
383735200	2.53 (0.0998)
383745200	2.51 (0.0988)
383755200	2.49 (0.0980)
383765200	2.47 (0.0972)
383775200	2.45 (0.0965)
383785200	2.43 (0.0957)
383795200	2.41 (0.0949)
383805200	2.39 (0.0941)
383815200	2.37 (0.0933)
383825200	2.35 (0.0925)
383835200	2.33 (0.0917)
383845200	2.31 (0.0909)

**Preload adjusting spacers**

Part No.	Length mm (in)
383695201	56.2 (2.213)
383695202	56.4 (2.220)
383695203	56.6 (2.228)
383695204	56.8 (2.236)
383695205	57.0 (2.244)
383695206	57.2 (2.252)

3) Adjusting drive pinion height  
 Adjust drive pinion height with washer installed between rear bearing cone and the back of pinion gear.

(1) Install Dummy Shaft, Collar and Gauge, as shown in the figure, and apply the specified preload on the bearings. (Refer to 2.) Adjusting preload for front and rear bearings.

At this time, install a pinion height adjusting washer which is temporarily selected or the same as that used before.

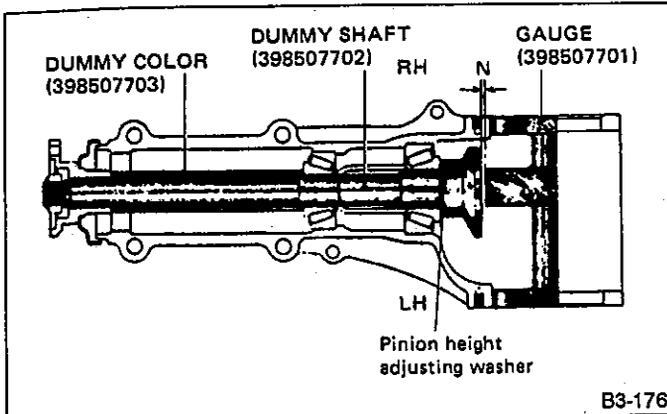


Fig. 56

(2) Measure the clearance N between the end of Gauge and the end surface of Dummy Shaft by using a thickness gauge.

Make sure there is no clearance between the case and Gauge.

(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed washer with this one.

$$T = T_o + N - (H \times 0.01) - 0.20 \text{ (mm)}$$

where

T = Thickness of pinion height adjusting washer (mm)

T<sub>o</sub> = Thickness of washer temporarily inserted (mm)

N = Reading of thickness gauge (mm)

H = Figure marked on drive pinion head

(Example of calculation)

$$T_o = 2.20 + 1.20 = 3.40 \text{ mm}$$

$$N = 0.23 \text{ mm } H = +1,$$

$$T = 3.40 + 0.23 - 0.01 - 0.20 = 3.42$$

Result: Thickness = 3.42 mm

Therefore use the washer 383605200.

#### Pinion height adjusting washers

Part No.	Thickness mm (in)
383495200	3.09 (0.1217)
383505200	3.12 (0.1228)
383515200	3.15 (0.1240)
383525200	3.18 (0.1252)
383535200	3.21 (0.1264)
383545200	3.24 (0.1276)
383555200	3.27 (0.1287)
383565200	3.30 (0.1299)
383575200	3.33 (0.1311)
383585200	3.36 (0.1323)
383595200	3.39 (0.1335)
383605200	3.42 (0.1348)
383615200	3.45 (0.1358)
383625200	3.48 (0.1370)
383635200	3.51 (0.1382)
383645200	3.54 (0.1394)
383655200	3.57 (0.1406)
383665200	3.60 (0.1417)
383675200	3.63 (0.1429)
383685200	3.66 (0.1441)

4) Install the selected pinion height adjusting washer on drive pinion, and press the rear bearing cone into position with INSTALLER.

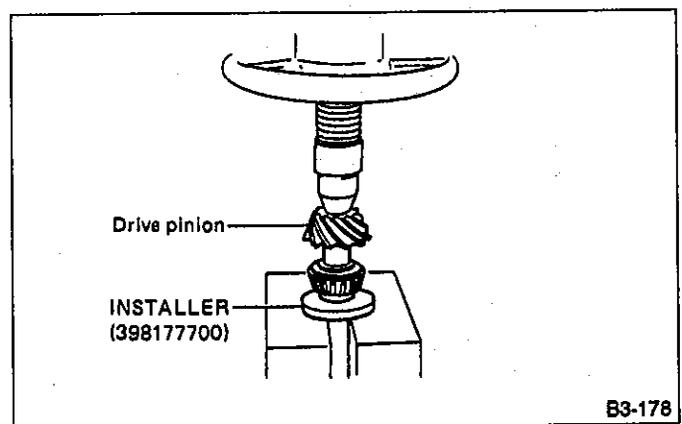
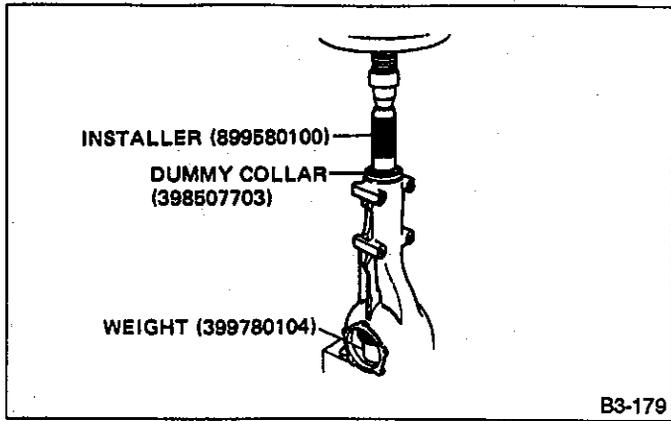


Fig. 57

5) Insert drive pinion into differential carrier, install the previously selected preload adjusting spacer and washer.

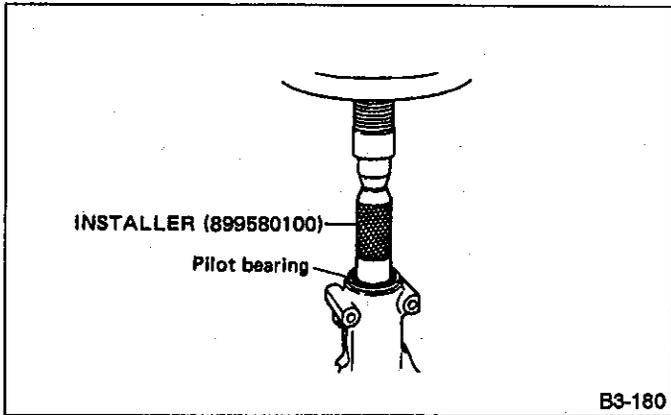
6) Press-fit front bearing cone into case.



B3-179

Fig. 58

7) Insert spacer, then press-fit pilot bearing with WEIGHT and INSTALLER.



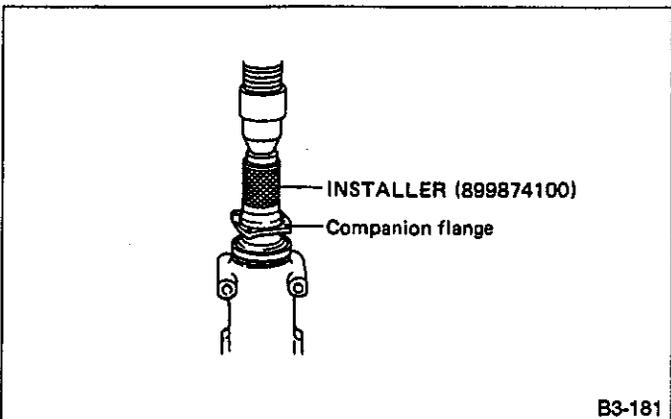
B3-180

Fig. 59

8) Fit a new oil seal with DRIFT.  
Apply grease between the oil seal lips. (Refer to 1.)  
Precautions for assembling.

**Special tool:**  
DRIFT (398417700)

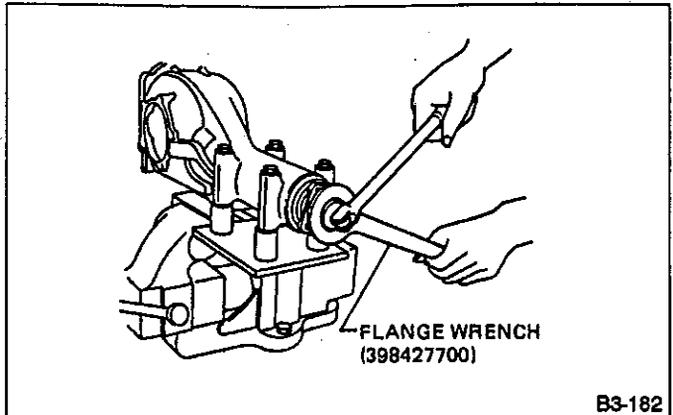
9) Press-fit companion flange with INSTALLER and WEIGHT.



B3-181

Fig. 60

10) Install self-locking nut with washer.



B3-182

Fig. 61

**Torque (Drive pinion nut):**  
167 — 196 N·m (17.0 — 20.0 kg-m, 123 — 145 ft-lb)

11) Assembling differential case  
Install side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case.

Apply gear oil on both sides of the washer and on the side gear shaft before installing.  
Insert the pinion mate shaft into the differential case by aligning the lock pin holes.

- (1) Measure the clearance between differential case and the back of side gear.
- (2) Adjust the clearance as specified by selecting side gear thrust washer.

**Side gear back clearance:**  
0.1 — 0.2 mm (0.004 — 0.008 in)

**Side gear thrust washers**

Part No.	Thickness mm (in)
383445201	0.75 — 0.80 (0.0295 — 0.0315)
383445202	0.80 — 0.85 (0.0315 — 0.0335)
383445203	0.85 — 0.90 (0.0335 — 0.0354)

- (3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.
- (4) After driving in pinion shaft lock pin, stake the both sides of the hole to prevent pin from falling off.
- (5) Install drive gear on differential case.

**Torque (Drive gear bolt):**  
93 — 113 N·m (9.5 — 11.5 kg-m, 69 — 83 ft-lb)

Tighten diagonally while tapping the bolt heads.

12) Before installing side bearing, measure the bearing width by using a dial gauge, WEIGHT and GAUGE.

**Standard bearing width:**  
20.00 mm (0.7874 in)

Set the dial gauge needle to zero, using a standard bearing or block of specified height in advance.

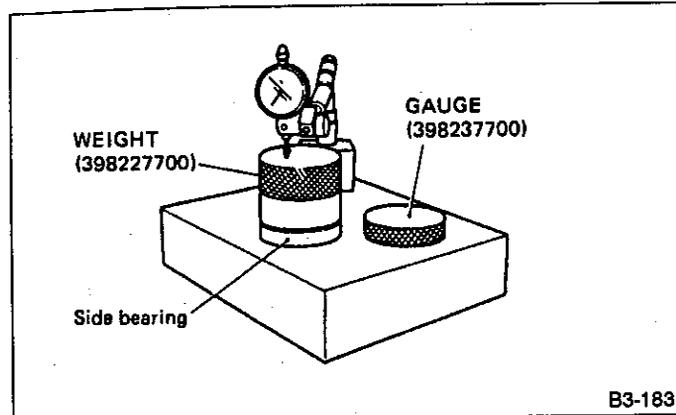


Fig. 62

13) Press side bearing cone onto differential case with DRIFT and ADAPTER included in PULLER SET (399527700).

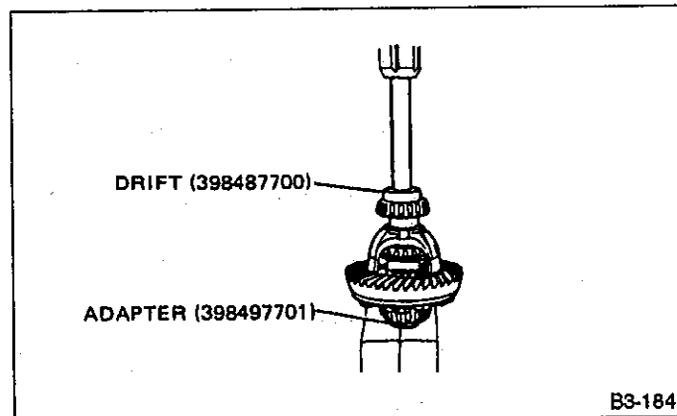


Fig. 63

14) Adjusting side bearing retainer shims

- (1) The drive gear backlash and side bearing preload can be determined by the side bearing retainer shim thickness.
- (2) When replacing differential case, differential carrier, side bearing and side bearing retainer, obtain the right and left retainer shim thickness from the following formulas.

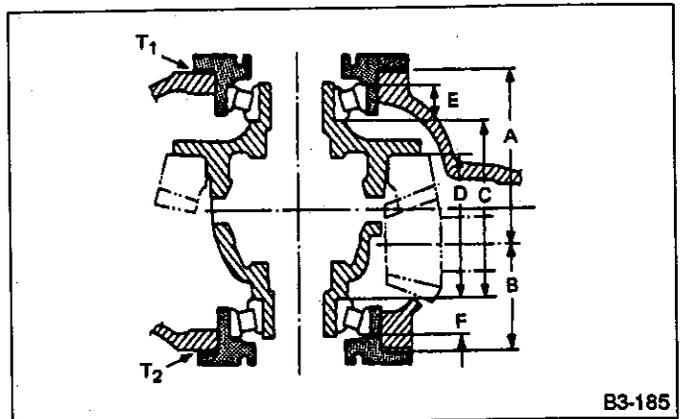


Fig. 64

$$T_1 \text{ (Left)} = (A + C + G_1 - D) \times 0.01 + 0.76 - E \text{ (mm)}$$

$$T_2 \text{ (Right)} = (B + D + G_2) \times 0.01 + 0.76 - F \text{ (mm)}$$

$T_1$  &  $T_2$  : Thickness of left and right side bearing retainer shim (mm)

A & B : Number marked on differential carrier.

C & D : Number marked on differential case.

E & F : Difference of width of left and right side bearing from standard width 20.0 mm, expressed in a unit of 0.01 mm. For example, if the bearing measured width is 19.89 mm, value of E or F is as follows.  $20.00 - 19.89 = 0.11$  (E or F)

$G_1$  &  $G_2$  : Number marked on side bearing retainer.

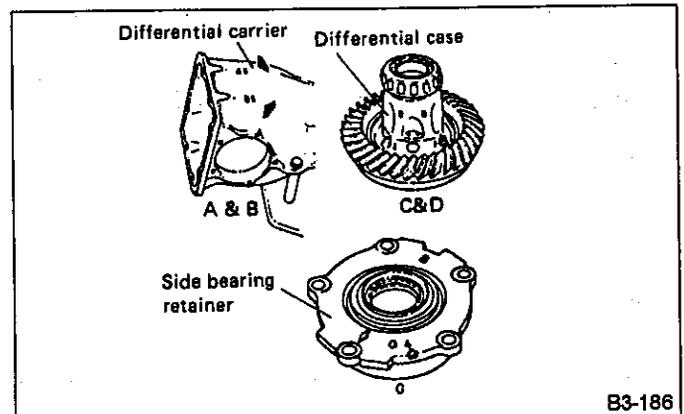


Fig. 65

If a number is not marked, regard it as zero.

Use several shims to obtain the calculated thickness.

**Side bearing retainer shims**

Part No.	Thickness mm (in)
383475201	0.20 (0.0079)
383475202	0.25 (0.0098)
383475203	0.30 (0.0118)
383475204	0.40 (0.0157)
383475205	0.50 (0.0197)

**Example of calculation**

Ex. 1

$$A = 5, B = 5, C = 3, D = 3, G_1 = 4, G_2 = 1,$$

$$E = 0.10 \text{ mm}, F = 0.15 \text{ mm}$$

Left side

$$T_1 = (A + C + G_1 - D) \times 0.01 + 0.76 - E$$

$$= (5 + 3 + 4 - 3) \times 0.01 + 0.76 - 0.10$$

$$= 0.09 + 0.76 - 0.10 = 0.75 \text{ mm}$$

The correct shims are as follows

Thickness	Q'ty	
0.25	x 1	= 0.25
0.50	x 1	= 0.50
Total shim thickness = 0.75 mm		

Right side

$$T_2 = (B + D + G_2) \times 0.01 + 0.76 - F$$

$$= (5 + 3 + 1) \times 0.01 + 0.76 - 0.15$$

$$= 0.09 + 0.76 - 0.15$$

$$= 0.70 \text{ mm}$$

The correct shims are as follows

Thickness	Q'ty	
0.20	x 1	= 0.20
0.50	x 1	= 0.50
Total shim thickness = 0.70 mm		

Ex. 2

$$A = 2, B = 3, C = 0, D = 3, G_1 = 2, G_2 = 3,$$

$$E = 0.22 \text{ mm}, F = 0.10 \text{ mm}$$

Left side

$$T_1 = (A + C + G_1 - D) \times 0.01 + 0.76 - E$$

$$= (2 + 0 + 2 - 3) \times 0.01 + 0.76 - 0.22$$

$$= 0.01 + 0.76 - 0.22$$

$$= 0.55 \text{ mm}$$

The correct shims are as follows

Thickness	Q'ty	
0.25	x 1	= 0.25
0.30	x 1	= 0.30
Total shim thickness = 0.55 mm		

Right side

$$T_2 = (B + D + G_2) \times 0.01 + 0.76 - F$$

$$= (3 + 3 + 3) \times 0.01 + 0.76 - 0.10$$

$$= 0.09 + 0.76 - 0.10$$

$$= 0.75 \text{ mm}$$

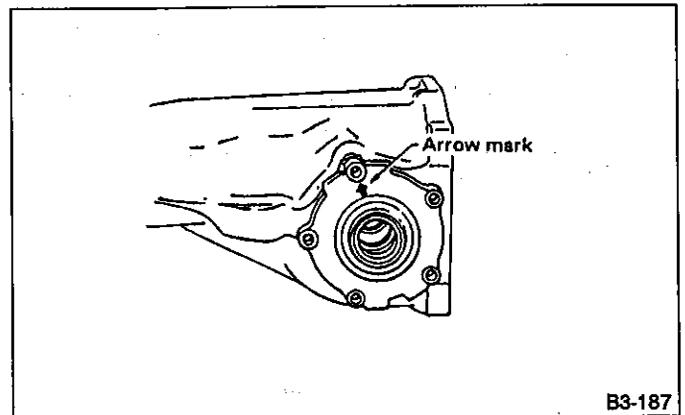
The correct shims are as follows

Thickness	Q'ty	
0.25	x 1	= 0.25
0.50	x 1	= 0.50
Total shim thickness = 0.75 mm		

(3) Install the differential case ASSY into differential carrier in the reverse order of disassembling.

(4) Fit the selected shims and O-ring on side bearing retainer and install them on differential carrier with the arrow mark on the retainer directed as shown in Figure.

**Be careful that side bearing cup is not damaged by bearing roller.**



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Fig. 66

(5) Tighten side bearing retainer bolts.

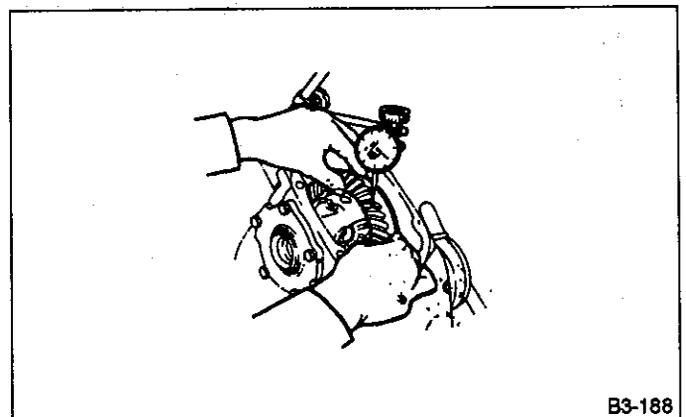
**On vehicle with LSD, apply a coat of Three Bond 1215 (P/N 004403007) to threads.**

**Torque (Side bearing retainer):**

**9 — 12 N·m (0.9 — 1.2 kg-m, 6.5 — 8.7 ft-lb)**

(6) Measure the drive gear-to-drive pinion backlash. If the reading is not within the specified range, correct by decreasing the shim thickness on one side and increasing the shim thickness on the other side the same amount. Total shim thickness must be the same to maintain proper preload.

**Backlash: 0.10 — 0.20 mm (0.0039 — 0.0079 in)**



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Fig. 67

- (7) At the same time, measure the turning resistance of drive pinion. Compared with the resistance when differential case is not installed, if the increase of the resistance is not within the specified range, readjust side bearing retainer shims.

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**Turning resistance increase:**

0.1 — 0.6 N·m (1 — 6 kg-cm, 0.9 — 5.2 in-lb)

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- (8) Recheck drive gear-to-pinion backlash after readjusting shims.

- (9) Check the drive gear runout on its back surface, and make sure pinion and drive gear rotate smoothly.

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**Limit of runout:**

0.05 mm (0.0020 in)

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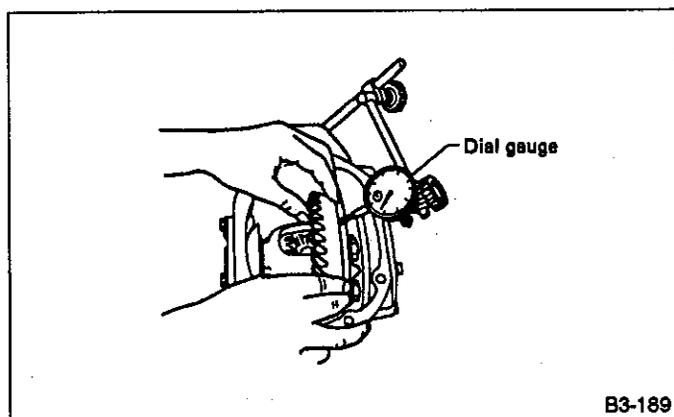


Fig. 68

- 15) Checking and adjusting tooth contact of drive gear.

(1) Paint evenly both sides of three or four teeth on drive gear with red lead. Check the contact pattern after rotating drive gear several revolutions back and forth until definite contact pattern develops on drive gear.

(2) When the contact pattern is incorrect, readjust according to the instructions given in "Tooth contact pattern".

Be sure to wipe off red lead completely upon completion of adjustment.

(3) After completing the above adjustment, install oil seal in side bearing retainer.

- a. Use DRIFT (398437700) to press the oil seal into position.

- b. Apply chassis grease between the oil seal lips.

(4) Install rear cover.

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**Torque (Rear cover bolt):**

19 — 25 N·m (1.9 — 2.6 kg-m, 14 — 19 ft-lb)

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- 16) Assemble spindle into differential and tighten bolt with WRENCH. (Non-LSD model)

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**Special tool:**

WRENCH (925560000)

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- 17) After assembling circlip on spindle, set spindle into differential and install by hitting it with a plastic hammer. (LSD model)

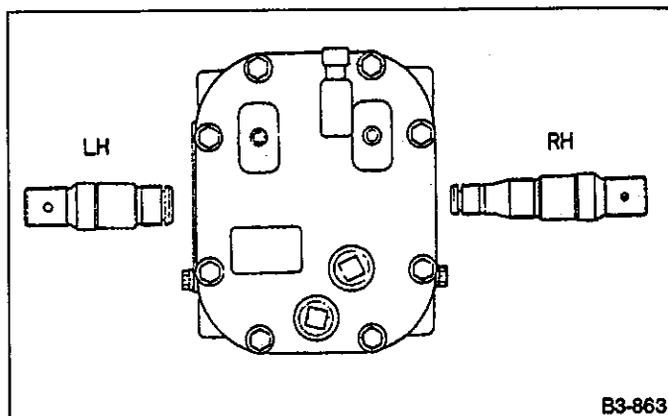


Fig. 69

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**G: MOUNTING**

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- 1) While raising rear differential with a transmission jack, insert rear drive shaft DOJ into differential spindle. Tighten four self-locking nuts at the front and two self-locking nuts at the rear.

- 2) Position front member on body by passing it under parking brake cable, and secure to rear differential.

- 3) Install other parts in the reverse order of dismantling.

- 4) After installation fill differential carrier with gear oil to the upper plug level.

**Apply fluid packing to plug.**

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**Fluid packing:**

Three-bound 1205 or equivalent

**Oil capacity:**

0.8 ℓ (0.8 US qt, 0.7 Imp qt)

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TOOTH CONTACT PATTERN

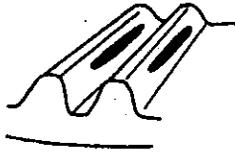
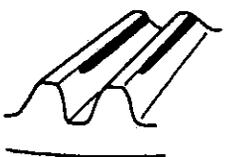
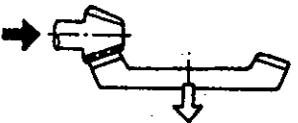
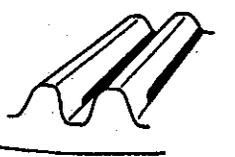
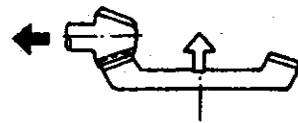
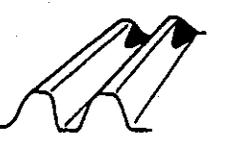
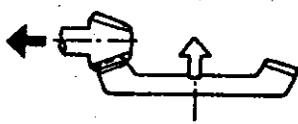
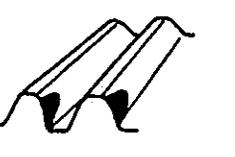
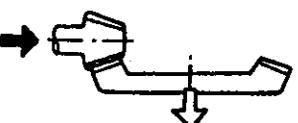
Condition	Contact pattern	Adjustment
<p>Correct tooth contact.</p> <p>Tooth contact pattern slightly shifted towards toe under no load rotation. (When loaded, contact pattern moves toward heel.)</p>		
<p>Face contact</p> <p>Backlash is too large.</p>	 <p>This may cause noise and chipping at tooth ends.</p>	 <p>Increase thickness of drive pinion height adjusting washer in order to bring drive pinion closer to drive gear center.</p>
<p>Flank contact</p> <p>Backlash is too small.</p>	 <p>This may cause noise and stepped wear on surfaces.</p>	 <p>Reduce thickness of drive pinion height adjusting washer in order to move drive pinion away from drive gear.</p>
<p>Toe contact</p>	 <p>Contact area is small. This may cause chipping at toe ends.</p>	 <p>Adjust as for flank contact.</p>
<p>Heel contact</p>	 <p>Contact area is small. This may cause chipping at heel ends.</p>	 <p>Adjust as for face contact.</p>

Fig. 70

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# T TROUBLESHOOTING

## 1. Rear Differential

Symptom and possible cause	Remedy
<b>Oil leakage</b>	
<ul style="list-style-type: none"> <li>Worn, scratched, or incorrectly seated front or side oil seal. Scored, battered, or excessively worn sliding surface of companion flange.</li> </ul>	Repair or replace.
<ul style="list-style-type: none"> <li>Clogged or damaged air breather.</li> </ul>	Clean, repair or replace.
<ul style="list-style-type: none"> <li>Loose bolts on differential spindle or side retainer, or incorrectly fitted O-ring.</li> </ul>	Tighten bolts to specified torque. Replace O-ring.
<ul style="list-style-type: none"> <li>Loose rear cover attaching bolts or damaged gasket.</li> </ul>	Tighten bolts to specified torque. Replace gasket and apply liquid packing.
<ul style="list-style-type: none"> <li>Loose oil filler or drain plug.</li> </ul>	Retighten and apply liquid packing.
<ul style="list-style-type: none"> <li>Wear, damage or incorrectly fitting for spindle, side retainer and oil seal.</li> </ul>	Repair or replace.
<b>Seizure</b>	
Seized or damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	
<ul style="list-style-type: none"> <li>Insufficient backlash for hypoid gear.</li> </ul>	Readjust or replace.
<ul style="list-style-type: none"> <li>Excessive preload for side, rear, or front bearing.</li> </ul>	Readjust or replace.
<ul style="list-style-type: none"> <li>Insufficient or improper oil used.</li> </ul>	Replace seized part and fill with specified oil to specified level.
<b>Damage</b>	
Damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	
<ul style="list-style-type: none"> <li>Improper backlash for hypoid gear.</li> </ul>	Replace.
<ul style="list-style-type: none"> <li>Insufficient or excessive preload for side, rear, or front bearing.</li> </ul>	Readjust or replace.
<ul style="list-style-type: none"> <li>Excessive backlash for differential gear.</li> </ul>	Replace gear or thrust washer.
<ul style="list-style-type: none"> <li>Loose bolts and nuts such as drive gear bolt.</li> </ul>	Retighten.
<ul style="list-style-type: none"> <li>Damage due to overloading.</li> </ul>	Replace.
<b>Noises when starting or shifting gears</b>	
Noises may be caused by differential ASSY, universal joint, wheel bearing, etc. Find out what is actually making noise before disassembly.	
<ul style="list-style-type: none"> <li>Excessive backlash for hypoid gear.</li> </ul>	Readjust.
<ul style="list-style-type: none"> <li>Excessive backlash for differential gear.</li> </ul>	Replace gear or thrust washer.
<ul style="list-style-type: none"> <li>Insufficient preload for front or rear bearing.</li> </ul>	Readjust.
<ul style="list-style-type: none"> <li>Loose drive pinion nut.</li> </ul>	Tighten to specified torque.
<ul style="list-style-type: none"> <li>Loose bolts and nuts such as side bearing retainer attaching bolt.</li> </ul>	Tighten to specified torque.

Symptom and possible cause	Remedy
<b>Noises when cornering</b>	
• Damaged differential gear.	Replace.
• Excessive wear or damage of thrust washer.	Replace.
• Broken pinion mate shaft.	Replace.
• Seized or damaged side bearing.	Replace.
<b>Gear noises</b>	
Since noises from engine, muffler, transmission, propeller shaft, wheel bearings, tires, and body are sometimes mistaken for noises from differential ASSY, be careful in checking them. Inspection methods to locate noises include coasting, accelerating, cruising, and jacking up all four wheels. Perform these inspections according to condition of trouble. When listening to noises, shift gears into four wheel drive and fourth speed position, trying to pick up only differential noise.	
• Improper tooth contact of hypoid gear.	Readjust or replace hypoid gear set.
• Improper backlash for hypoid gear.	Readjust.
• Scored or chipped teeth of hypoid gear.	Replace hypoid gear set.
• Seized hypoid gear.	Replace hypoid gear set.
• Improper preload for front or rear bearings.	Readjust.
• Seized, scored, or chipped front or rear bearing.	Replace.
• Seized, scored, or chipped side bearing.	Replace.
• Vibrating differential carrier.	Replace.

## 2. Propeller Shaft

Trouble and possible cause	Remedy
<b>Vibration of propeller shaft</b>	
Vibration is caused by propeller shaft during operation and is transferred to vehicle body. Generally vibration increase in proportion to vehicle speed.	
• Worn or damaged universal joint.	Replace.
• Unbalanced propeller shaft due to bend or dent.	Replace.
• Loose installation of propeller shaft.	Retighten.
• Worn or damaged center bearing and damaged center mounting rubber.	Replace.
<b>Tapping when starting and noise while cruising, caused by propeller shaft.</b>	
• Worn or damaged universal joint.	Replace.
• Worn spline of sleeve yoke.	Replace.
• Loose installation of propeller shaft.	Retighten.
• Loose installation of joint.	Replace.
• Worn or damaged center bearing and damaged center mounting rubber.	Replace.

Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.